INFORMATION SERIES 88

Colorado Mineral and Energy Industry Activities 2024-2025

by Michael K. O'Keeffe

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EXECUTIVE SUMMARY and TAX REVENUE

The Colorado Geological Survey (CGS) estimates the total value of 2024 mineral and energy fuels production in Colorado to be $19.5 billion, a ~5.2% decrease from the 2023 estimate of $20.58 billion primarily due to lower average prices for natural gas and oil. In 2024, the top commodities produced in terms of production value include: oil, natural gas, coal, molybdenum, gold, sand and gravel, cement, crushed rock, and industrial gases (carbon dioxide). Estimated mineral production values for 2024 are shown by commodity type in **Figure ES-1**. Oil and natural gas production accounted for ~84.4% of Colorado's total mineral and energy production value in 2024. Estimated mineral and energy production values for 1994 through 2024 are shown in **Figure ES-2.**

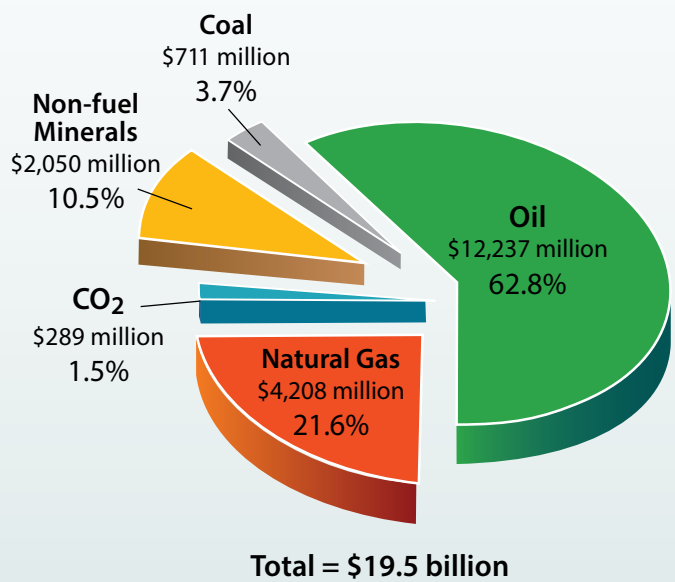


Figure ES-1. 2024 Colorado mineral production value by commodity type (U. S. dollars).

The total value of Colorado oil and natural gas production in 2024 is ~16.4 billion which is 5.2% lower than last year's value of 17.3 billion. Although production remains elevated when compared to historical values, average prices for both oil and gas decreased in 2024. Colorado has the eighth largest proven oil reserves and the ninth largest proven natural gas reserves in the U.S. (EIA, 2025a). The estimated value of Colorado coal production in 2024 is $711 million which is ~2.7% higher than the 2023 value of ~$692 million. Coal production decreased in 2024 but average prices higher.

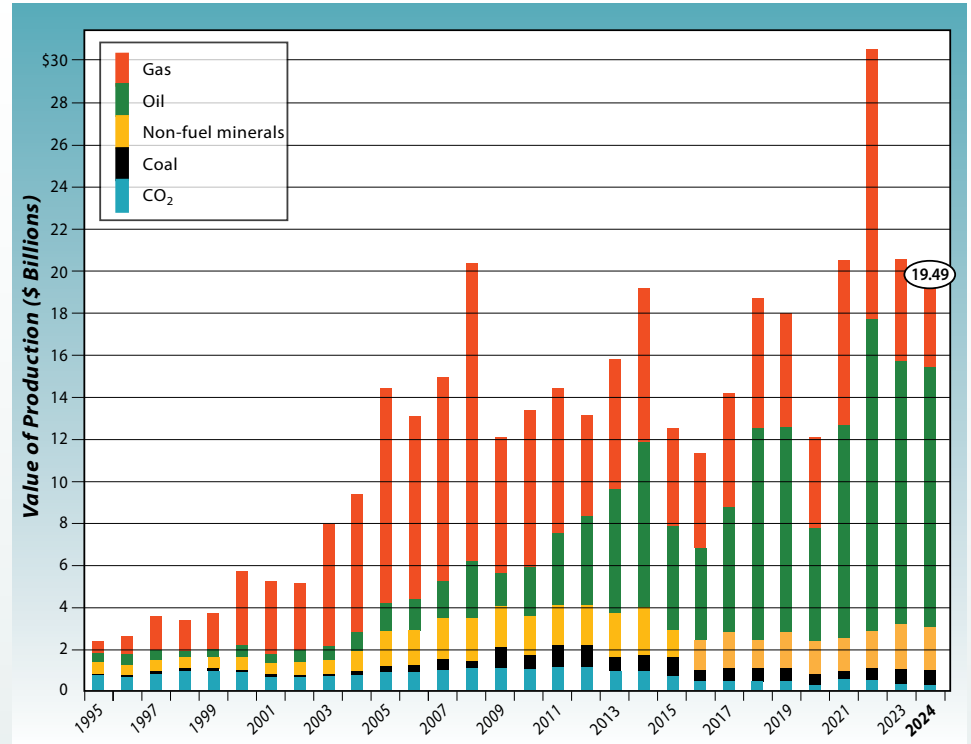


Figure ES-2. Mineral and energy fuel production value in Colorado, 1995–2024.

The overall decreasing trend in coal production over the last several years is due primarily to the increased use of natural gas and renewable energy resources nationwide. In 2024, Colorado is the 10th largest coal producer in the U.S. (EIA, 2025b) with both underground and surface mines currently in operation.

Non-fuel mineral production includes metals (molybdenum and gold), aggregate, limestone, cement, industrial minerals (gypsum, nahcolite), and gases (carbon dioxide, helium). The total estimated value of Colorado's production of non-fuel minerals in 2024 is $2.05 billion (USGS, 2025a). Colorado is the fourth largest gold producing state in the U.S. (behind Nevada, Alaska, and South Carolina) based on the total 2024 production from a single mine. Two Colorado mines continue to produce molybdenum, and the state was the second largest domestic producer of this metal in 2024. Although Colorado has been a producer in the past, there was no uranium mine production within the state in 2024.

Carbon dioxide produced in Colorado is used primarily for enhanced oil recovery in the Permian Basin oil fields of Texas and New Mexico. The production value estimate for 2024 is $289 million. Helium is produced in Cheyenne County and other areas in Colorado, however, production estimates from these facilities are not available.

Severance taxes are state taxes collected on companies who produce nonrenewable resources including oil, gas, coal, molybdenum, and gold. Companies that extract these resources pay severance tax as well as other taxes including income, sales, and property taxes. A portion of the severance tax funds are distributed to counties, municipalities, and school districts. Severance tax revenues provide approximately 72 percent of the Colorado Geological Survey's state funding and also support additional programs within the Colorado Department of Natural Resources (DNR). The distribution hierarchy of total collected state severance tax revenue is shown in **Figure ES-3**. The Colorado Legislative Council Staff provides a summary of severance tax rates, credits by mineral type, and distribution (Colorado General Assembly, 2025).

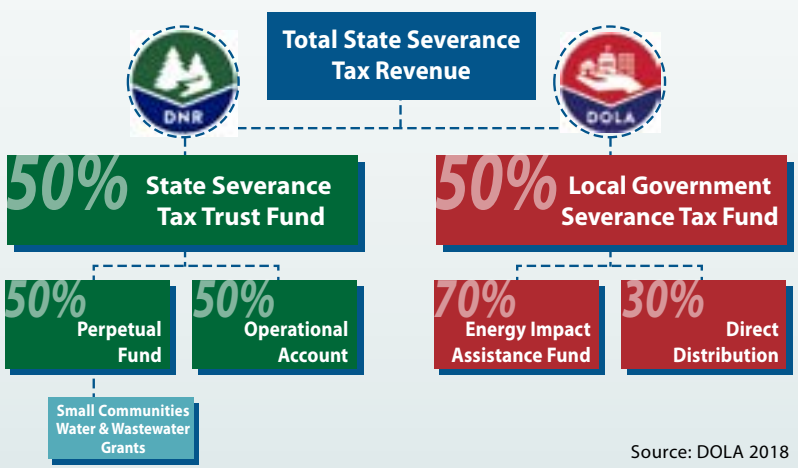


Figure ES-3. Distribution of state severance tax revenue in Colorado.

The Colorado Department of Local Affairs (DOLA) administers the distribution of severance tax revenue to county and local governments. In fiscal year (FY) 2023/2024 (23/24), July 1st through June 30th, Colorado net severance tax from metal, coal, and oil/gas producers is ~$187.4 million (DOLA, 2024). About 98.5% of these tax collections are from oil and gas operations. **Figure ES-4** shows the severance taxes collected by fiscal year since 1994. In FY 24/25, ~$2.0 million of severance tax was distributed to counties. This is a ~93%

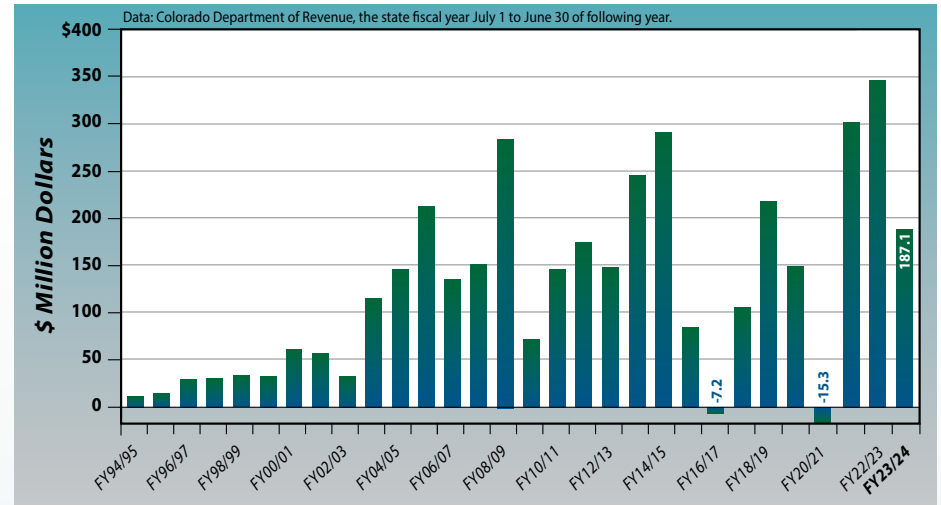


Figure ES-4. Colorado net severance tax collections FY94/95-FY22/23 (NOTE: In FY16/17 and in 20/21, severance refunds exceeded collections, hence the negative value).

decrease from the last fiscal year distribution of $29.2 million largely due to a historic amount of oil and gas refunds (Colorado Legislature, 2025). The map in **Figure ES-5** shows the distribution of severance taxes to each county in FY 24/25.

The State of Colorado owns ~2.8 million surface acres and ~4 million subsurface (mineral estate) acres of trust lands which are managed and leased by the Colorado State Land Board (SLB). Revenue generated by the SLB is held in public trusts that provide financial support to Colorado public schools and other public institutions. Trust lands are leased for several purposes that include mining and oil and gas. In FY 23/24, the Colorado state trust assets were valued at $4.4 billion and SLB assets generated ~$230.1 million in gross revenue (SLB, 2024a). The SLB provides funds for the Colorado Department of Education's Building Excellent Schools Today (BEST) program that provides grants for construction of new schools or the renovation of existing facilities. In FY 23/24, the SLB provided $144 million to the BEST program (SLB, 2024a). Also, the SLB's financial assets are associated with the Public School Permanent Fund which provides revenue to Colorado public schools. In FY 23/24, the SLB received ~$190.7 million in mineral revenue (SLB, 2024b). The revenues include the following: oil and natural gas royalties and rentals, ~$179.61 million; coal, ~$5.26 million; other minerals, ~$2.59 million; and other revenues, ~$3.26 million (SLB, 2024b). **Figure ES-6** shows the SLB revenues from FY 96/97 to FY23/24.

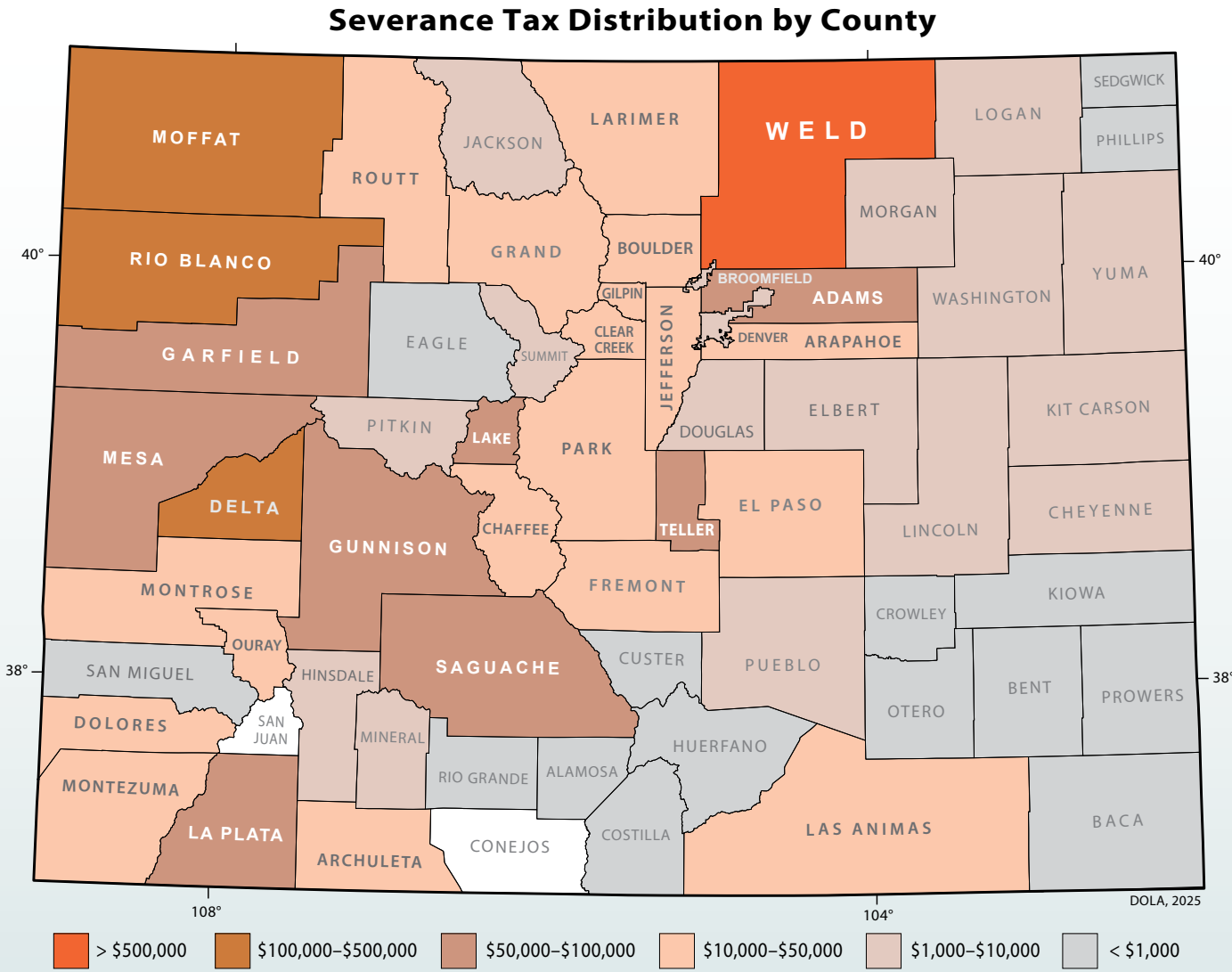


Figure ES-5. Colorado mineral severance tax distributions by county, FY 24/25.

Lands owned by the federal government make up over 35% of Colorado's acreage. The State of Colorado receives 50% of the rental, royalty, and bonus revenue from mineral and energy fuel leases on federal land. This includes bonus, rents, royalties, and other revenue associated with oil, gas, coal, oil shale, geothermal, and sodium (nahcolite) federal leases in Colorado. DOLA distributes a portion of these funds to local governments affected by mineral and energy development. In 2024, federal mineral lease revenues generated totaled ~$215 million with ~$89 million disbursed back to the state (U.S. Department of Revenue [USDR], 2025). **Figure ES-7** shows the revenue from federal mineral leases from 2008 to 2024.

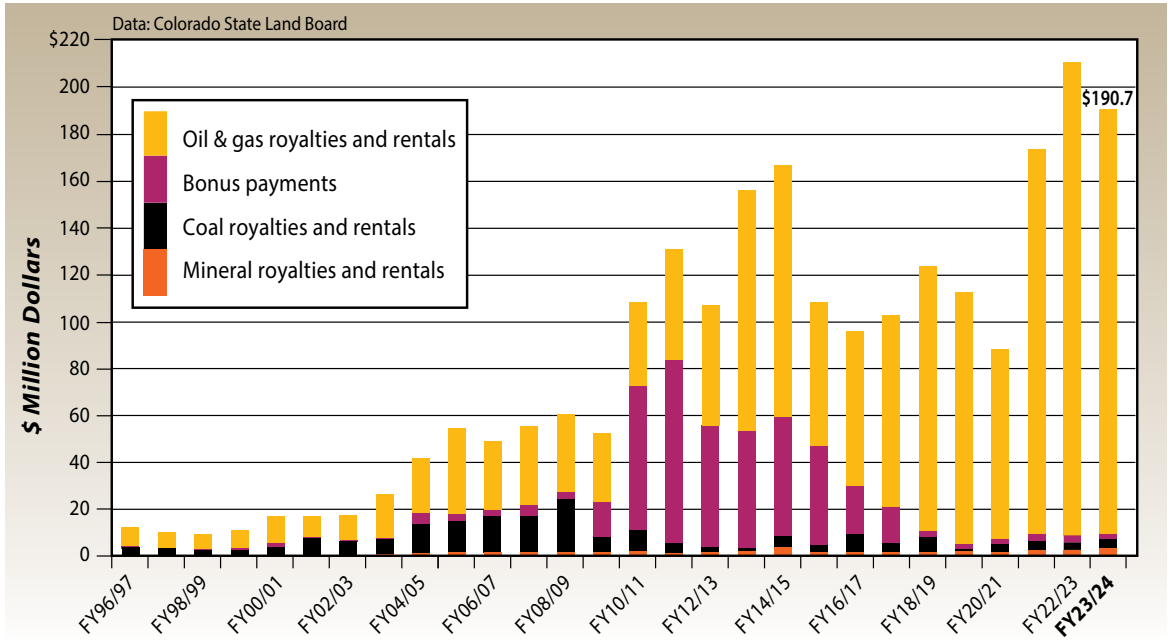


Figure ES-6. Colorado State Land Board (SLB) mineral revenues.

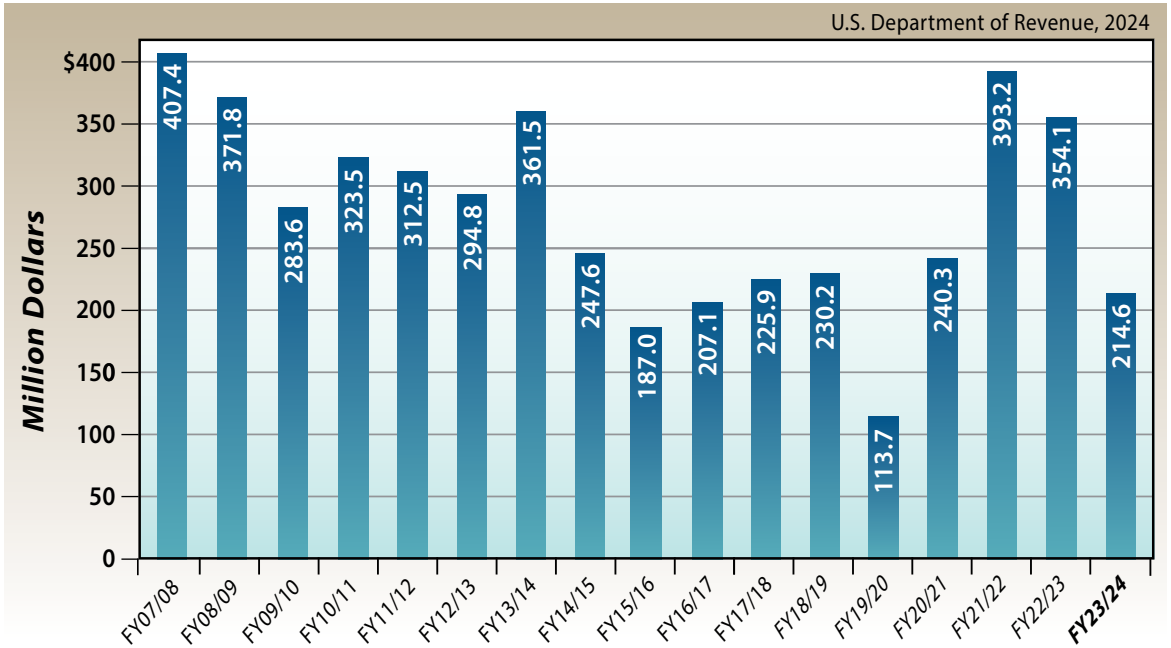


Figure ES-7. Federal mineral lease revenue generated in Colorado (50% is distributed to the state).

Oil and Natural Gas

Most of the drilling activity and production increases in the last several years are in unconventional reservoirs, especially in the Denver-Julesburg (DJ) Basin of northeastern Colorado. The map in **Figure 1** shows the major sedimentary basins in Colorado and the location of 2024 oil and natural gas approved drilling permits (Colorado Energy and Carbon Management Commission [ECMC], 2025a). According to the U.S. Department of Energy (DOE), Energy Information Agency (EIA), ~64% of the total U.S. crude oil production in 2023, ~3.04 billion barrels, was produced from tight oil formations (EIA, 2024). Hydraulic fracturing and horizontal drilling techniques allow relatively cheap production from unconventional reservoirs which include shale, sandstone, and carbonate rock formations with low permeability. The DJ Basin includes unconventional oil and gas resources in the Upper Cretaceous Niobrara Formation which has been a target of more recent exploration and production located to the northeast of Denver.

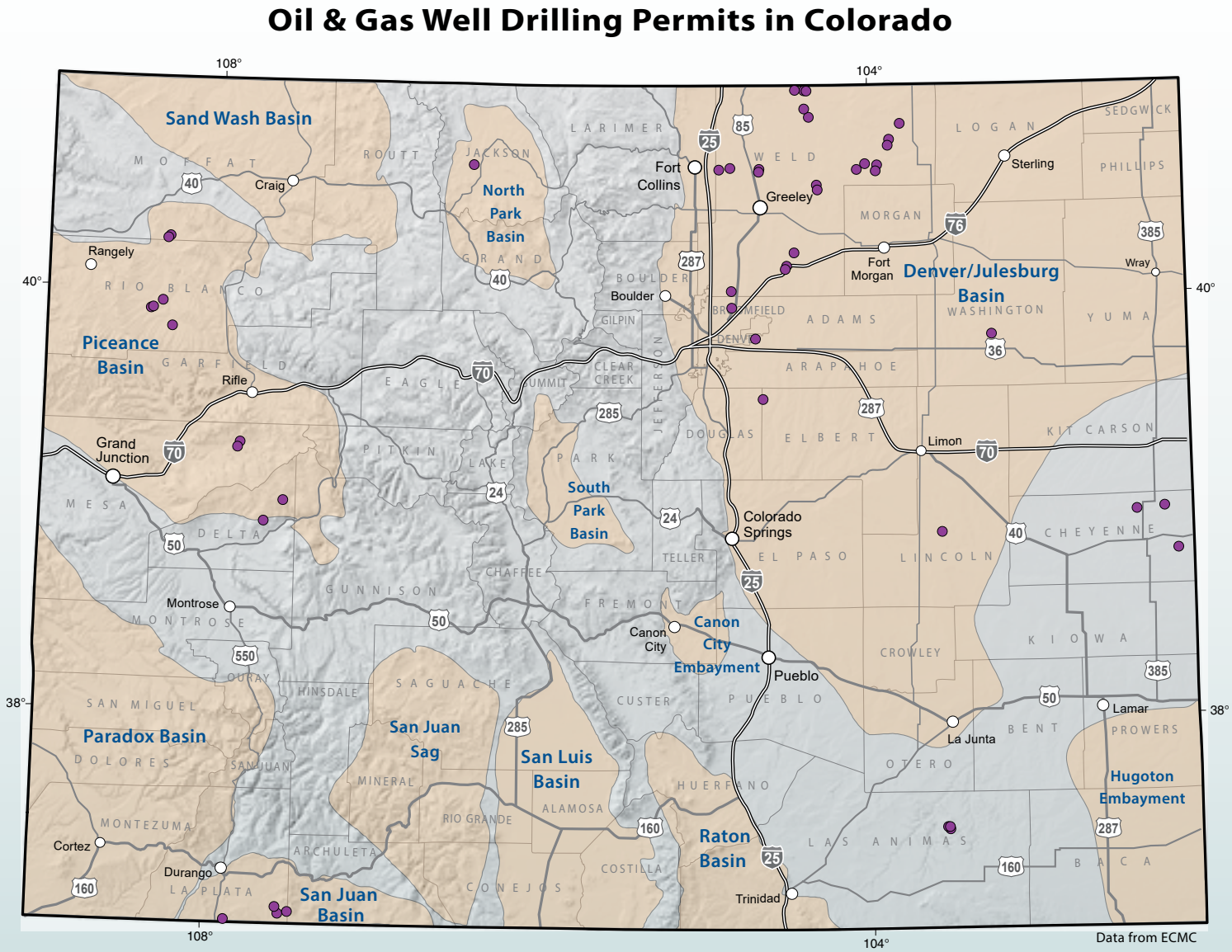


Figure 1. Sedimentary basins and the location of oil and gas well drilling permits (purple dots) approved January 2024 to December 2024.

Average annual oil prices decreased in 2024 to $71.95 per barrel (EIA Colorado Domestic Crude Oil First Purchase Price) from an average of $74.85 in 2023 (EIA, 2025d). Using this price and the Colorado Energy and Carbon Management Commission (ECMC) production estimate (ECMC, 2025a), the estimated overall oil production value in 2024 for Colorado is $12.24 billion, a decrease of ~1.9% when compared to the 2023 estimated oil production value of $12.48 billion (**Figure 2**). Estimated oil production in Colorado between 2023 and 2024 increased by over 3.3 million barrels to ~170.1 million barrels. Oil production in Colorado and the average annual price per barrel over time are shown in **Figure 3**. At the beginning of 2024, Colorado ranked ninth among the top ten states with estimated proven oil reserves of ~1.069 billion barrels of oil (BO) (**Figure 4**). Texas ranked first with estimated proven oil reserves of 20.173 BO (EIA, 2025e).

The 2023 average spot price for natural gas was $2.28 per thousand cubic feet (Mcf) (based on a heat content of 1.038 British Thermal Units per Mcf) (EIA, 2025f) (**Figure 5**). This natural gas price is ~13.3% lower than the 2023 average spot price of $2.63 Mcf reported last year (O'Keeffe, 2025). Colorado's natural gas production decreased from ~1,894 billion cubic feet (Bcf) in 2022 to ~1,838 Bcf in 2023 (ECMC, 2024a).

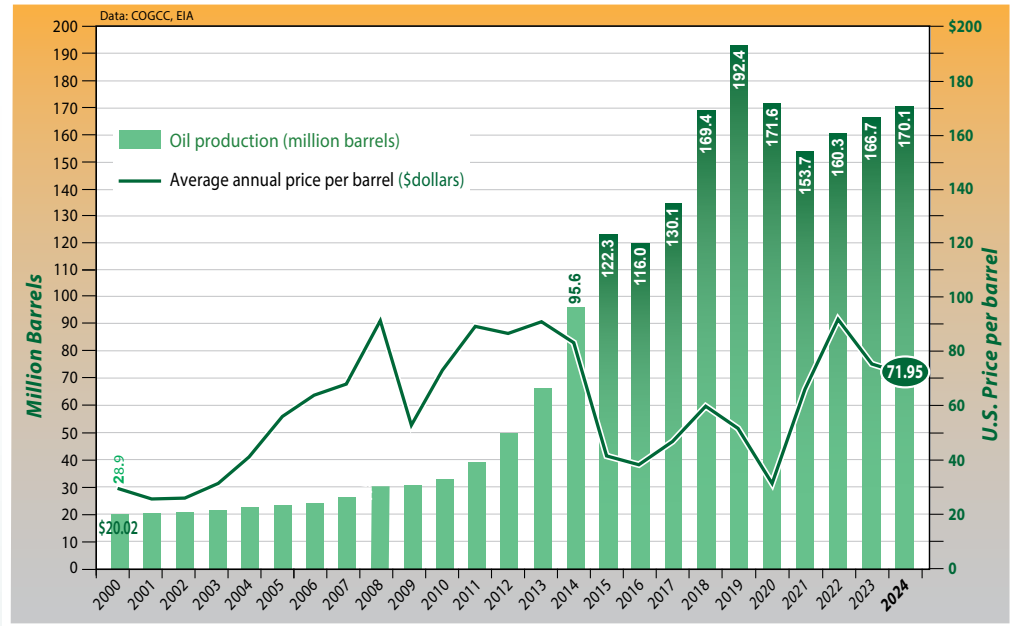


Figure 3. Colorado oil production and average annual price per barrel, 2000–2024.

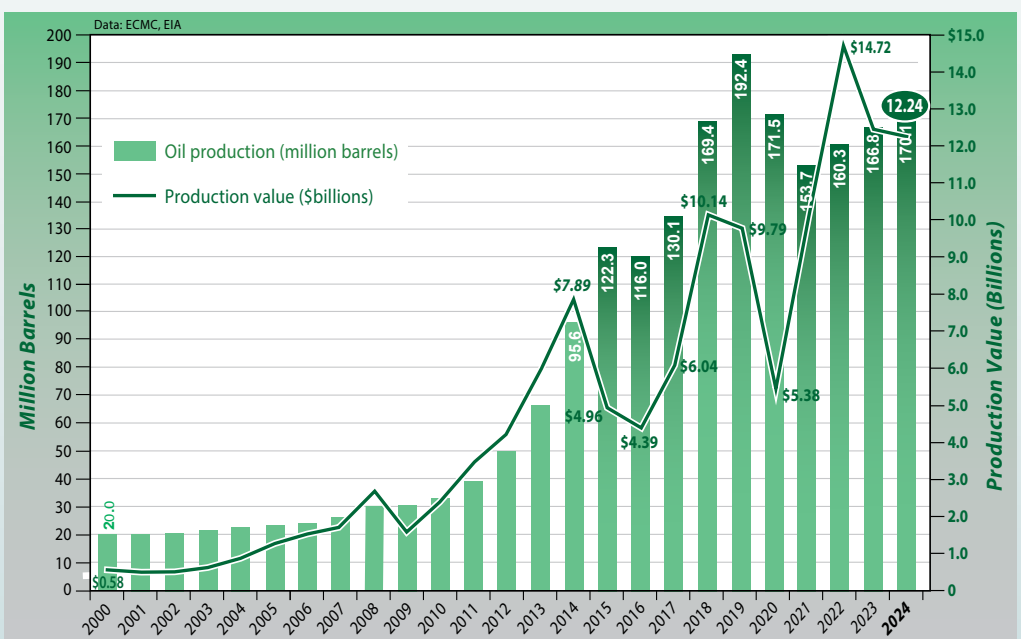


Figure 2. Oil production and estimated production value in Colorado, 2000–2024.

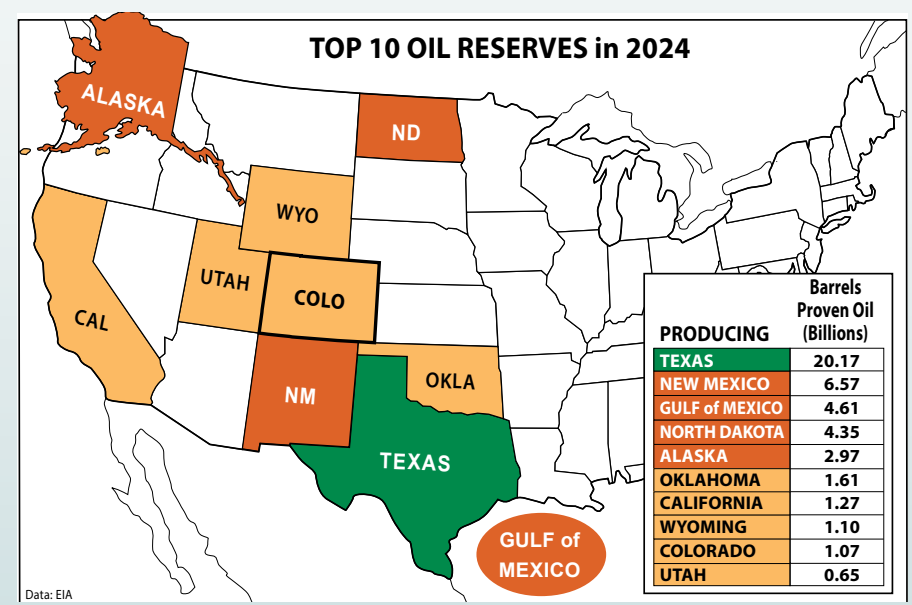


Figure 4. Top 10 states (including the Gulf) with proven oil reserves in 2024.

The estimated total 2024 natural gas production value in Colorado, using the Henry Hub spot price (EIA, 2025f) and ECMC production data (ECMC, 2025a), is $4.21 billion. This is a decrease of ~13% compared to the 2023 estimated natural gas production value of $4.83 billion (O'Keeffe, 2025). At the end of 2024, Colorado had estimated proved natural gas resources of 18,003 Bcf, which was the ninth largest in the U.S. (EIA, 2025e) (**Figure 6**). Texas ranked first with estimated proved natural gas reserves of 148,854 Bcf.

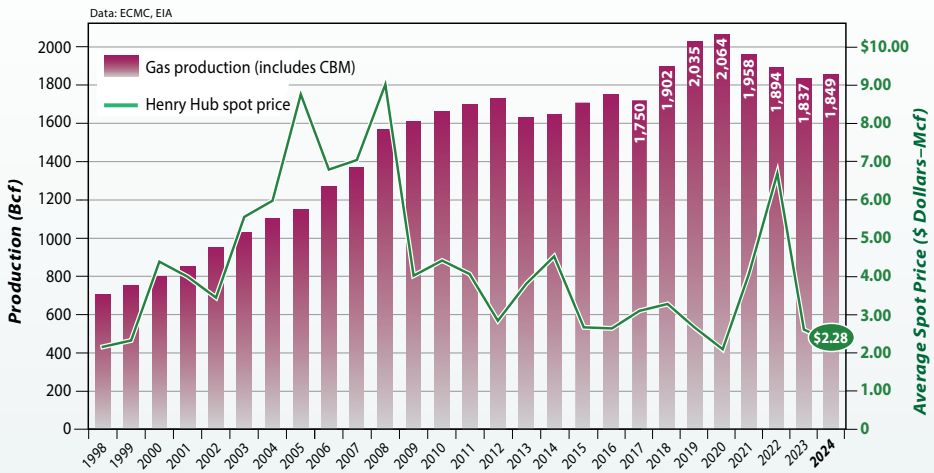


Figure 5. Colorado natural gas production and average price, 1998–2024.

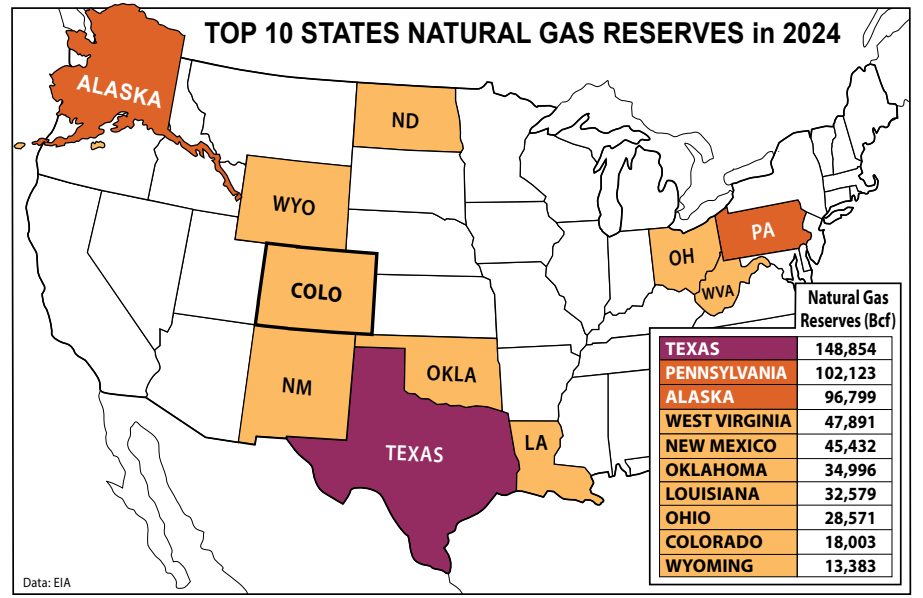


Figure 6. Top 10 states with proven natural gas reserves in 2024 (year's end).

Coalbed Methane

Figure 7 shows Colorado's annual coalbed methane (CBM) production versus conventional natural gas over time. CBM is a type of natural gas, mainly methane with minor amounts of hydrocarbons and other gases, which is generated and stored in coal beds (Zou, 2017). CBM production in Colorado reached its highest level, 59%, of the total natural gas production during 1998 and has continuously declined to ~8.7% of the total natural gas production (161 Bcf) in 2024 (ECMC, 2025a). This decline is largely due to the increase of general natural gas production as well as the development of unconventional reservoirs using horizontal drilling and hydraulic fracturing techniques.

County Rankings – Oil and Natural Gas Production

Colorado oil production increased ~80% in the last ten years mostly due to the increased use of horizontal drilling and fracturing techniques. Thirty-six of Colorado's 64 counties produced crude oil and/or natural gas in 2024. To rank each county's contribution to the state's total production value, production from each county was multiplied by average annual prices. The EIA 2024 Colorado First Purchase price of $71.95 per BO for the average annual price of oil (EIA, 2025f) and the average spot price for natural gas of $2.28 per Mcf (EIA, 2025d) were used with the ECMC (2025a) production totals to calculate the production values. The total 2024 estimated oil and natural gas production value for Colorado is ~$16.4 billion. **Figure 8** shows the estimated total oil and natural gas production value by county.

As it has been for many years, Weld County is the single largest producer of oil and natural gas in Colorado with an estimated total production value of ~$12.33 billion in 2024. A large portion of more recent crude oil production is from the Upper Cretaceous Niobrara Formation in Weld County which is within the DJ Basin (**Figure 1**) and Wattenberg Field. This field is one of the top ten oil and natural gas fields based on proved reserves (EIA, 2025g). The Wattenberg Field has been one of the most important oil and gas reservoirs in Colorado for the last 50 years where several conventional and unconventional resources have been developed since its discovery in 1970 (Sonnenberg, 2016). In the Denver Basin (a large asymmetric basin formed largely during the Laramide orogeny), the Niobrara Formation (~82 to 89.5 Ma) was deposited in the Western Interior Seaway during a major marine transgression and consists of deep-water chalks and marl units (Sonnenberg, 2016).

In 2023, Adams County has the second largest natural gas and oil production value with an estimated total of $0.90 billion. Arapahoe County ranks third in natural gas and oil production value with an estimated total of ~$0.85 billion. Most of the production value in Arapahoe County is from the production of oil (~94.6%). On the other hand, Garfield County ranks third in natural gas and oil production ($0.84 billion) but most of the production value (91.7%) is from natural gas production. La Plata and Rio Blanco counties have a combined oil and natural gas production value of ~$0.77 billion. **Figures 9 and 10** show the estimated oil and natural gas production by county for 2024, respectively.

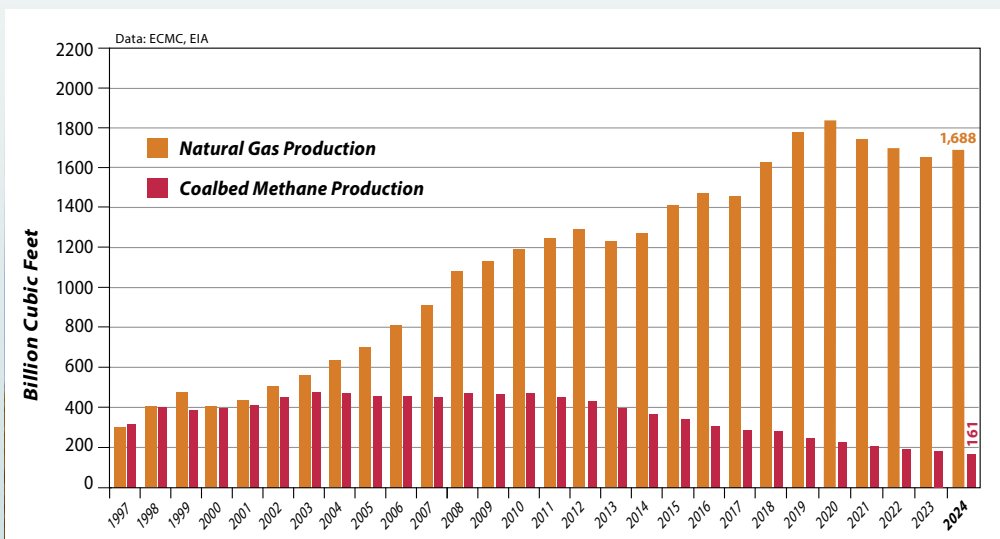


Figure 7. Coalbed methane vs. non-coalbed natural gas production in Colorado, 1997-2024.

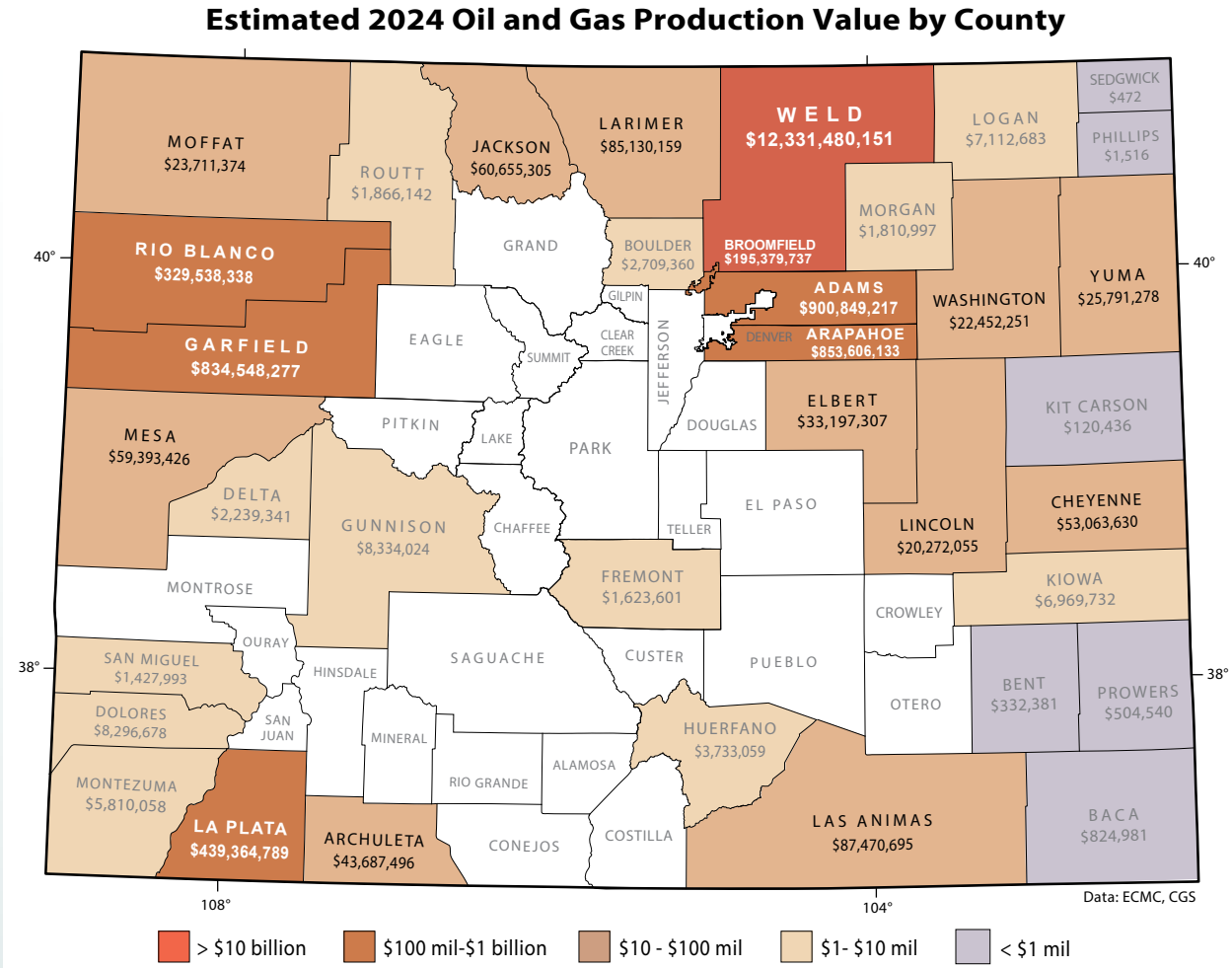


Figure 8. Estimated oil and natural gas production value by county in Colorado, 2024.

Drilling Permits

Weld County remains the center for new oil and gas drilling permits with lesser amounts in other oil and natural gas producing counties. The ECMC received 1010 applications for drilling permits (617 well starts) in 2024, a ~1% increase from 2024. Sixty-three percent of the approved permits were in Weld County followed by Rio Blanco County (6%) (ECMC, 2025b). **Figure 11** shows the number of annual oil and natural gas drilling permits in Colorado from 1994 to 2024.

Oil Shale

Oil shale is different from oil produced from shale reservoirs. Currently, oil shale resources have not been developed in Colorado. More than half of the world's known oil shale resources are in the Eocene Green River Formation, which covers ~16,000 square miles in the Green River Basin in Wyoming, the Piceance Basin in Colorado, and the Uinta Basin in Utah. The Green River Formation was deposited in an ancient lake, known as Lake Gosiute, which occupied varying parts of these basins from between ~52.5 to 47.5 million years ago (Smith and others, 2008). Recovery of oil from oil shale is more difficult and expensive than oil from conventional or unconventional petroleum resources. Heat applied to the kerogen layers (solid bituminous material) releases the oil allowing the product to flow. Estimates show the kerogen may contain 4.285 trillion barrels of

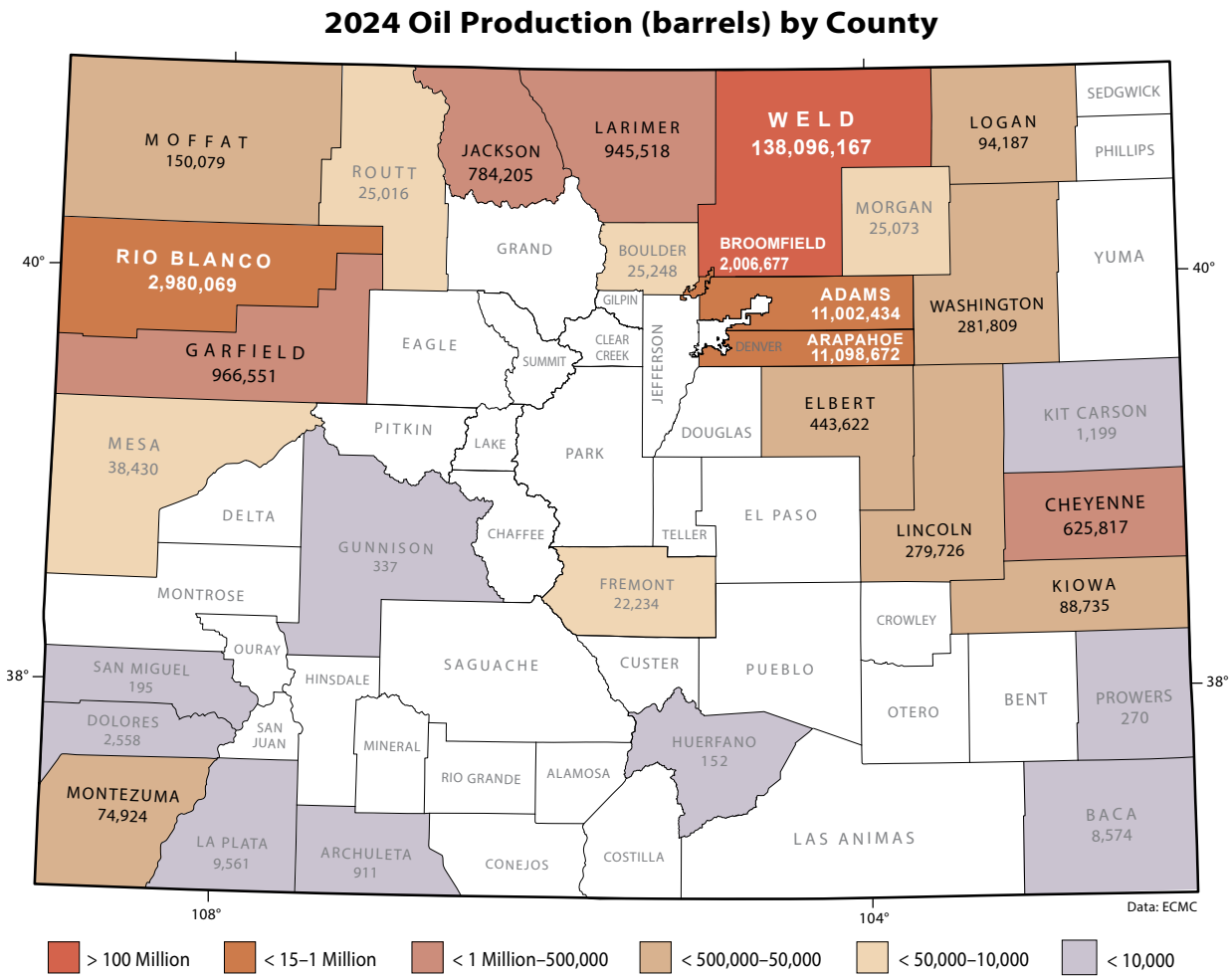


Figure 9. Total oil production by county in Colorado, 2024.

recoverable oil (USGS, 2013). The Piceance Basin, a subbasin within the Greater Green River Basin, has an estimated 1.525 trillion BO of this potential resource with ~920 billion BO in place at an oil yield of 15 gallons per ton (gpt) or greater and ~352 billion BO at an oil yield of 25 gpt or greater (USGS, 2013). For more details about this assessment, see Johnson and others (2011).

Colorado Energy and Carbon Management Commission Update

Colorado Senate Bill (SB) 19-181, "Protect Public Welfare Oil and Gas Operations" passed in 2019 requires the Colorado Energy and Carbon Management Commission (ECMC), part of the Department of Natural Resources, to place more emphasis on public and environmental health and safety and addressing cumulative impacts from oil and gas activities. In 2023, Colorado SB 23-285 entitled "Energy & Carbon Management in Colorado" passed into law which included expanding the ECMC's regulatory authority over emerging energy technologies including geothermal energy, underground natural gas storage, and carbon capture and storage (CCS) (ECMC, 2025b). In response to these new laws, the ECMC is working with stakeholders through the rulemaking process to update the Code of Colorado Regulations

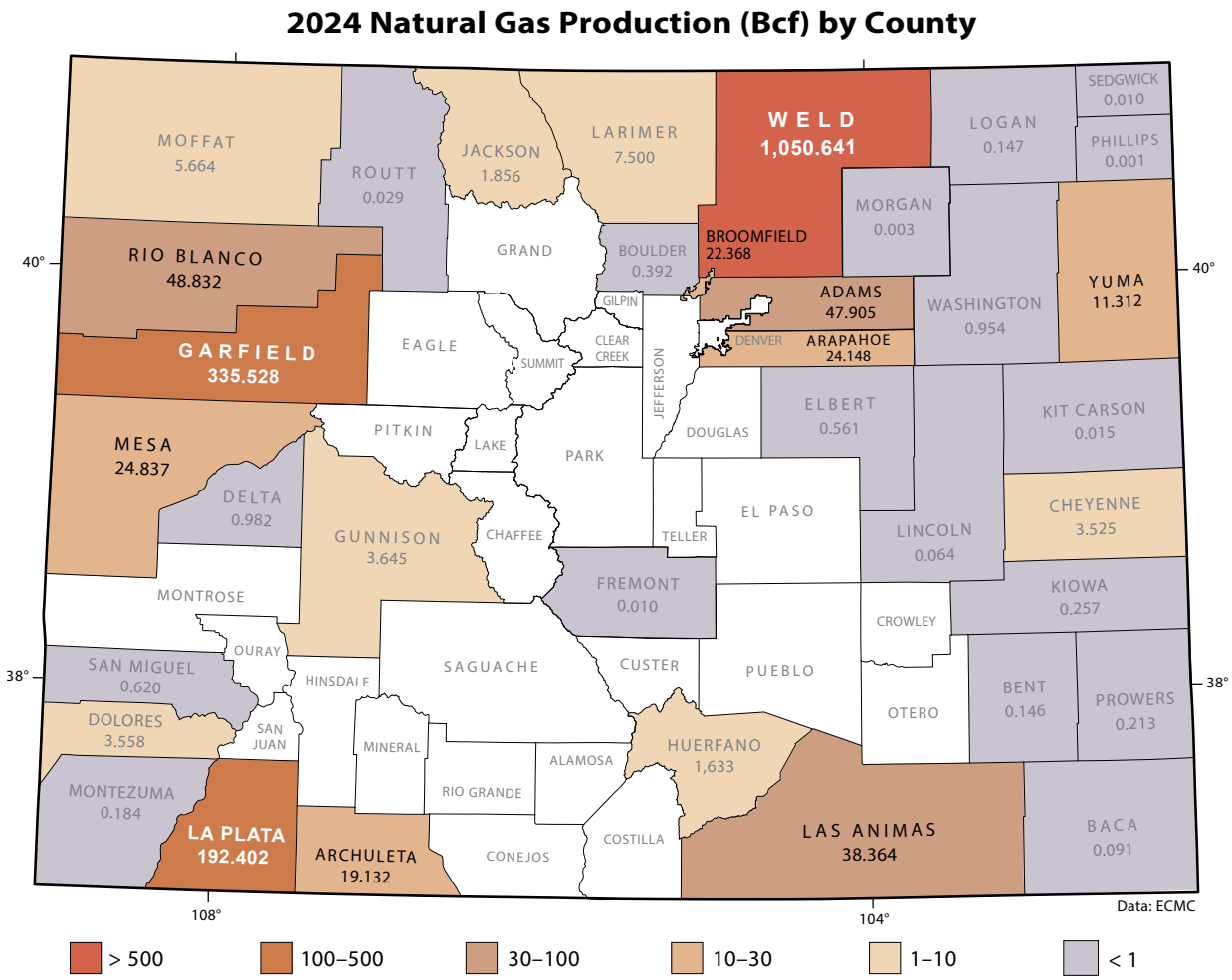


Figure 10. Total natural gas production (Bcf) by county in Colorado, 2024.

(CCR) (see Colorado State Administrative Rules, 2025). Specifically, this includes updating the CCR with regards to the new ECMC regulatory authority associated with deep geothermal resources (non-tributary to water rights and >2,500 feet deep) and obtaining primacy for Class VI underground injection control (UIC) well regulatory authority from the U.S. Environmental Protection Agency (EPA):

Although the Colorado Division of Water Resources (DWR) maintains regulatory authority over shallow geothermal wells, ECMC regulates deep geothermal wells and is working to streamline the geothermal regulatory process (ECMC, 2024a; ECMC, 2025b). The ECMC completed a geothermal resource assessment, in collaboration with the CGS and other stakeholders (ECMC, 2024b), and a geothermal regulatory study (ECMC, 2024a) in 2024 which are both available on their website. Also in 2024, the ECMC completed several reports associated with the regulations for Class VI wells used for geologic sequestration of CO_2 and adopted new Class VI UIC rules to support its application to obtain primacy from the EPA over the regulation of these wells (ECMC, 2024c; ECMC, 2024d; ECMC, 2025b).

Hydrogen may play an important role in future energy supplies. Natural accumulations of hydrogen (or "geologic hydrogen" as there are other sources) exist in many parts of the world and exploration from these resources is ongoing. Recently, the U.S. Geological Survey (USGS) published a map showing regions that have a greater potential to contain natural accumulations of hydrogen in the subsurface based on modeling (Gelman and others, 2025). Currently, it is difficult to determine the location and quantity of potential hydrogen resources in Colorado due to the lack of data. SB 23-285, SB 23-016, and House Bill 24-1346 expanded ECMC regulatory authority to include the potential for the regulation and permitting of hydrogen. In 2024, the ECMC conducted a study to better understand the regulatory environment of this emerging industry and to develop recommendations associated with the permitting of underground hydrogen storage, pipeline transportation of hydrogen, and other related underground hydrogen operations subject to ECMC's directive and regulatory authority (ECMC, 2024e). This study, as well as many of the other ECMC reports referenced above, are available on their website:

https:// ecmc.colorado.gov/data-maps-reports/technical-reports

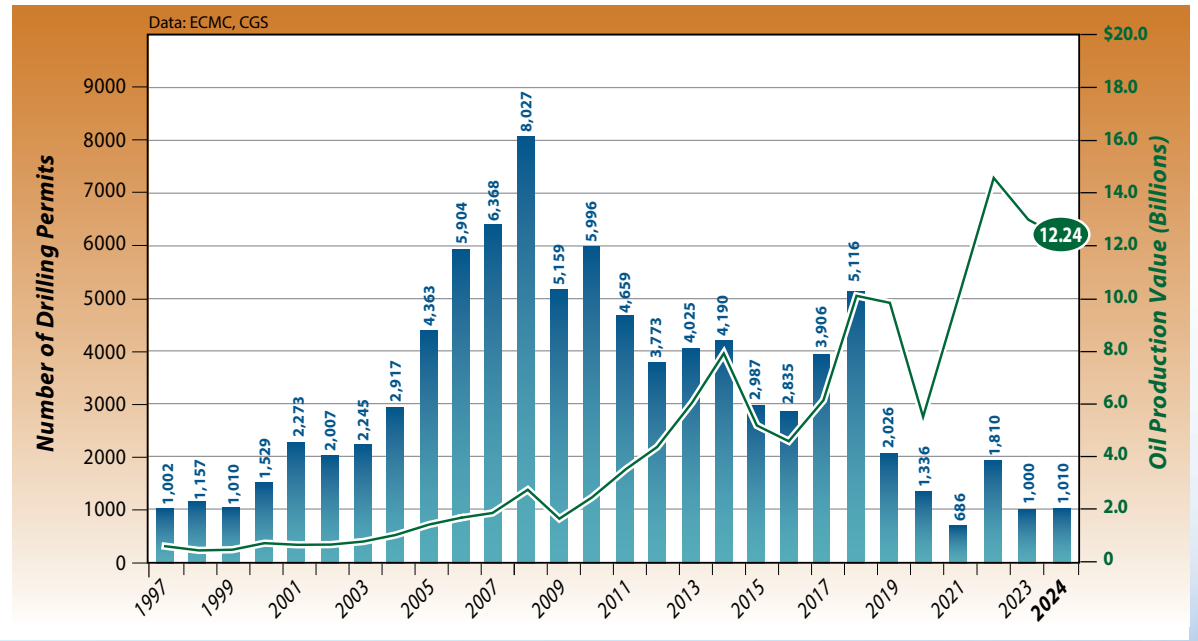


Figure 11. Annual oil and gas drilling permits and oil production value in Colorado, 1995–2023.

CONVENTIONAL ENERGY RESOURCES: COAL

Domestic coal production decreased 11.3% compared to 2023 largely due to decreased production west of the Mississippi River (EIA, 2025b). Although U.S. coal production has generally decreased since 2012, coal is still a significant source of Colorado's electrical power. In 2024, coal-fired plants provided ~27% of Colorado's net electricity generation while natural gas (~29%) and renewable resources (~43%), especially wind (67% of the renewable total) and solar (27% of the renewable total), accounted for most of the remaining generation (EIA, 2024g).

For comparison, in 2015, 60% of the electricity generated in Colorado came from coal. The general decline of the use of coal for electricity generation is due to lower natural gas prices, state and federal greenhouse gas regulations and taxes designed to cut carbon dioxide emissions, and the growing use of renewable energy sources. In June 2025, the EPA proposed to repeal greenhouse gas emissions for fossil fuel-fired plants (including both coal and natural gas) however, the impacts of these changes to Colorado are currently unknown. Most of the fossil-fuel power plants in Colorado are associated with natural gas and, of the six existing coal-burning facilities, one will convert to natural gas in 2026 and remaining five are scheduled to retire between 2025 and 2031. In 2022, domestic renewable electric generation surpassed coal and nuclear in the power sector for the first time (EIA, 2023). In 2024, natural gas, coal, and renewables accounted for ~43.4%, ~15.1%, and 22.7% of the total U.S. utility-scale electricity generation, respectively (EIA, 2025h).

Between 2011 and mid-2020, 96 gigawatts (GW) of coal electricity generating capacity were retired in the U.S., or switched to another fuel (EIA, 2020). In 2021, the EIA reported that power plants plan to retire 28% (59 GW) of the current coal-fired power capacity by 2035 (EIA, 2021). These closures will decrease the U.S. coal electricity generating capacity to less than 200 GW which is a ~36% decrease compared to its peak of 314 GW in 2011 (EIA, 2020). As of September 2021, ~212 GW of coal-fired generating capacity was operating in the U.S. (EIA, 2021). In 2024, utility-scale coal-fired generating summer capacity decreased to ~174 GW (EIA, 2025i).

In 2010, Colorado passed the Clean Air, Clean Jobs Act which promotes the replacement of Front Range coal-fired power plants with natural gas plants. Since 2010, utilities have shut down several coal-fired plants and other units have been converted to natural gas. Also, a new natural gas power plant, Mountain Peak, opened near Keenesburg, CO, in 2025 (United Power, 2025). The last several MEIA reports give a summary of these shutdowns/conversions since 2012 (O'Keeffe, 2022 through 2025). Additionally, the Colorado General Assembly passed the Greenhouse Gas Emission Reduction Measures bill (SB23-016) in 2023 which outlines the goals for additional greenhouse gas emission reductions in Colorado (Colorado General Assembly, 2023). Coal-fired plants that will retire in the future include:

- Although the current federal administration is attempting to keep coal fired units operating (White House, 2025a), the Craig Generating Station in Moffat County will still close coal-fired units 1, 2, and 3 by 2025, 2028, and 2028, respectively (Colorado Sun, 2025).
- Xcel Energy will close coal-fired Unit 1 by the end of 2028 and Unit 2 by the end of 2027 at the Hayden Generating Station in Moffat County (Xcel, 2022).
- The Pawnee Station will convert to natural gas by 2026 (Xcel, 2022).
- Rawhide and Nixon power stations will retire in 2030.
- Comanche Station will be fully retired by the end of 2030.

Colorado has some of the cleanest burning coal (low-sulfur and mercury content) in the U.S. and several CGS publications include summary information about Colorado's coal quality compared to other regions (Carroll, 2004). In 2024,

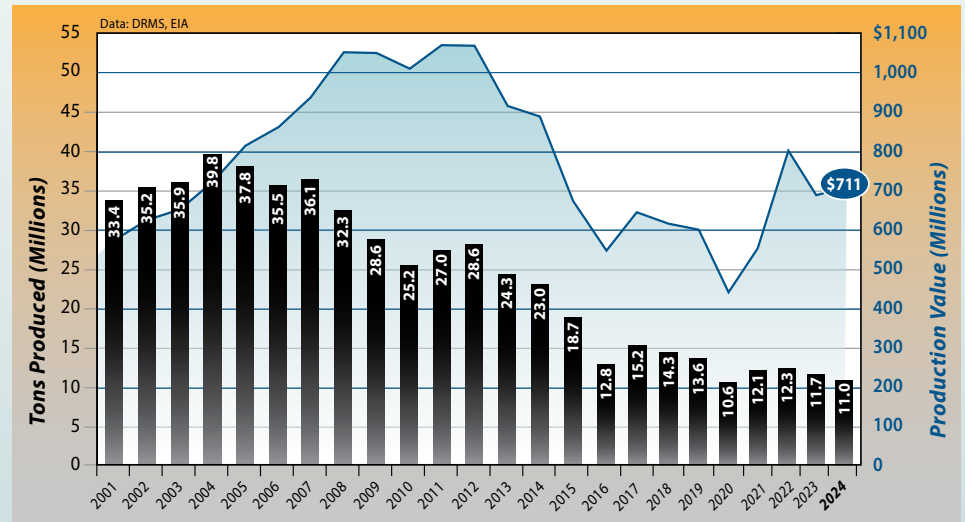


Figure 12. Production and value of coal mined in Colorado, 2001–2024.

Table 1. Coal production, price, value, and employment, 2002–2024.

Year	Production Tons (Millions)	Colorado Average Annual Coal Price $/Ton	Product Value (Millions)	Coal Miner Employment
2002	35.20	$17.72	$624	1,854
2003	35.88	$18.21	$653	1,859
2004	39.81	$18.10	$721	1,903
2005	37.82	$21.63	$818	1,963
2006	35.49	$24.27	$861	2,065
2007	36.14	$25.99	$939	2,069
2008	32.34	$32.67	$1056	2,124
2009	28.58	$36.71	$1049	2,247
2010	25.21	$40.00	$1008	2,061
2011	27.03	$39.88	$1078	2,254
2012	28.64	$37.54	$1075	2,279
2013	24.27	$37.58	$912	1,857
2014	22.98	$38.64	$888	1,512
2015	18.73	$36.12	$676	1,326
2016	12.80	$42.54	$499	1,211
2017	15.18	$42.52	$645	1,119
2018	14.28	$43.30	$618	1,160
2019	13.63	$44.21	$602	1,098
2020	10.63	$41.45	$441	901
2021	12.14	$46.02	$559	957
2022	12.33	$65.00	$802	1,093
2023	11.71	$59.12	$692	1,043
2024	11.04	$64.37	$711	958

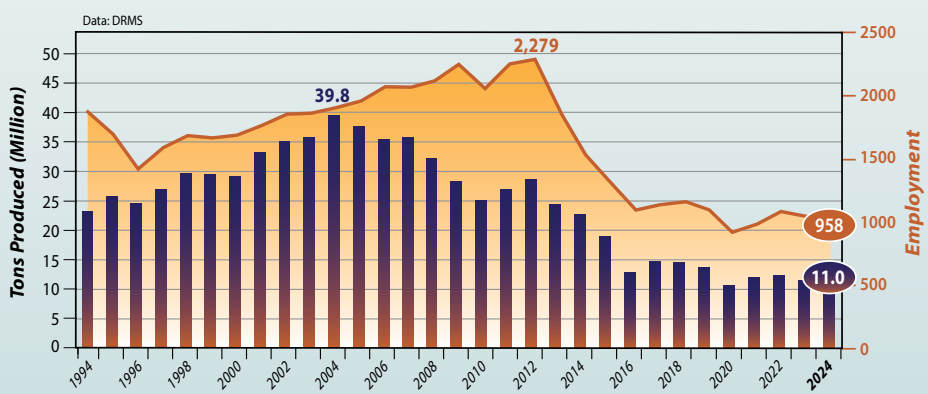


Figure 14. Coal production and employment in Colorado, 1994–2024.

power generation in Colorado consumed ~60% of the coal mined in the state. The rest was shipped primarily to Utah (35%) and 17 other states (EIA, 2025j). Coal production from Colorado mines in 2024 is 11.04 million tons (DRMS, 2025). The estimated value of Colorado coal production in 2024 is $711 million (**Figure 12 and Table 1**) and the estimated average value of a ton of Colorado coal is $64.37 (EIA, 2025b). Colorado coal production and average prices since 2001 are shown in **Figure 13**. In 2024, six Colorado coal mines were active (**Table 2**) employing 958 coal miners (DRMS, 2025) (**Figure 14**).

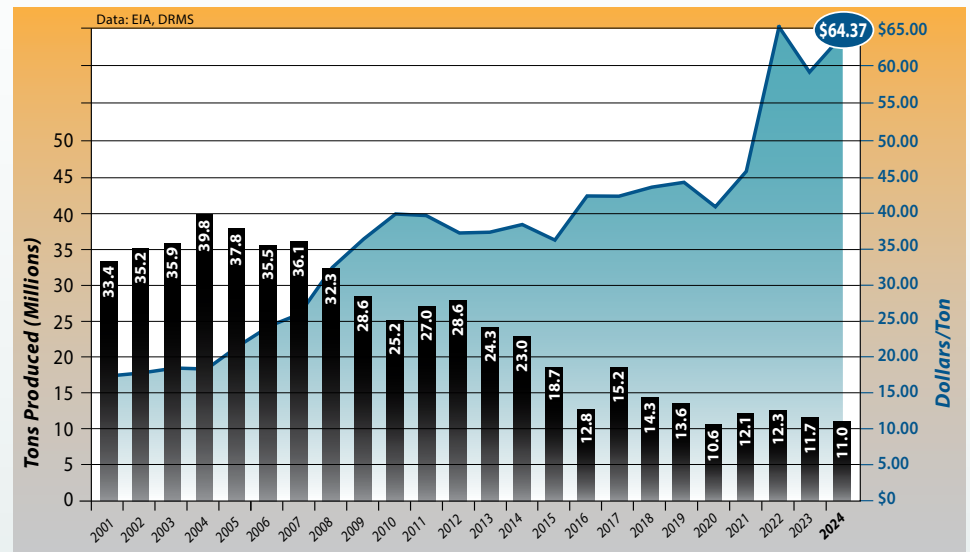


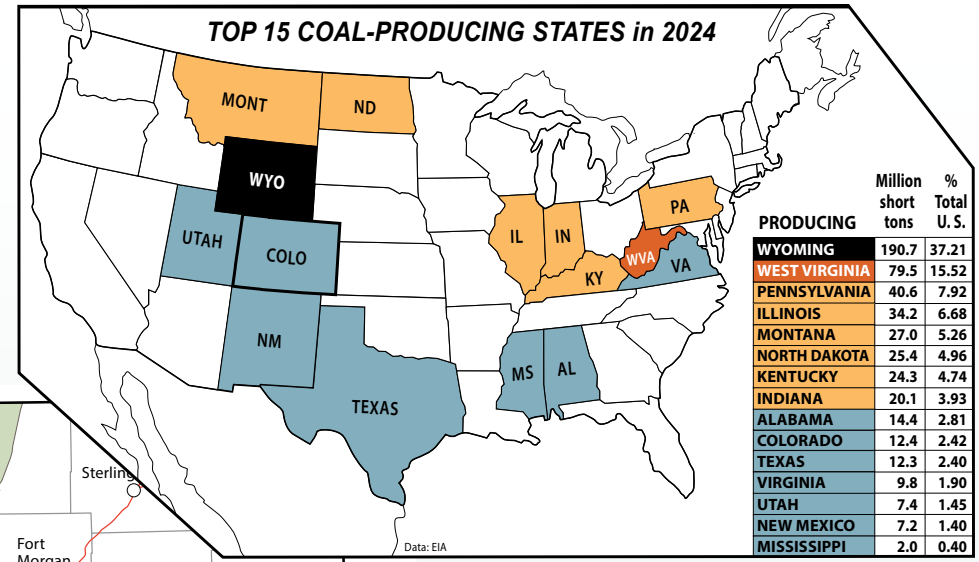
Figure 13. Coal production and average annual coal price in Colorado, 2001–2024.

Table 2. Active coal mines in Colorado, 2024.

Mine	Operator	County	Mine Type	2024 Prod. (tons)
New Elk Mine	Basin Resources	Las Animas	Underground	0
Colowyo	Colowyo Coal Co. L.P.	Moffat	Surface	1,893,271
Deserado	Blue Mountain Energy	Rio Blanco	Underground	2,335,267
Foidel Creek	Twentymile Coal Co./Peabody Energy	Routt	Underground	1,007,039
King II	GCC Energy LLC	La Plata	Underground	579,605
Trapper	Trapper Mining Inc.	Moffat	Surface	1,522,698
West Elk	Mountain Coal Co./Arch Coal	Gunnison	Underground	3,702,937
Total				**11,040,817**

Data: DRMS

In 2024, Colorado was ranked 10th in coal production in the U.S. (**Figure 15**) (EIA, 2025b). Wyoming, the leading U.S. producer by far (~190.73 million tons), mined over 15 times as much coal as Colorado. The locations of Colorado's active coal mines, coal-fired power plants, coal types and regions, and estimated coal-fired plant closing dates are shown on **Figure 16**.



PRODUCING	Million short tons	% Total U. S.
WYOMING	190.7	37.21
WEST VIRGINIA	79.5	15.52
PENNSYLVANIA	40.6	7.92
ILLINOIS	34.2	6.68
MONTANA	27.0	5.26
NORTH DAKOTA	25.4	4.96
KENTUCKY	24.3	4.74
INDIANA	20.1	3.93
ALABAMA	14.4	2.81
COLORADO	12.4	2.42
TEXAS	12.3	2.40
VIRGINIA	9.8	1.90
UTAH	7.4	1.45
NEW MEXICO	7.2	1.40
MISSISSIPPI	2.0	0.40

Figure 15. Top 15 coal-producing states in 2024.

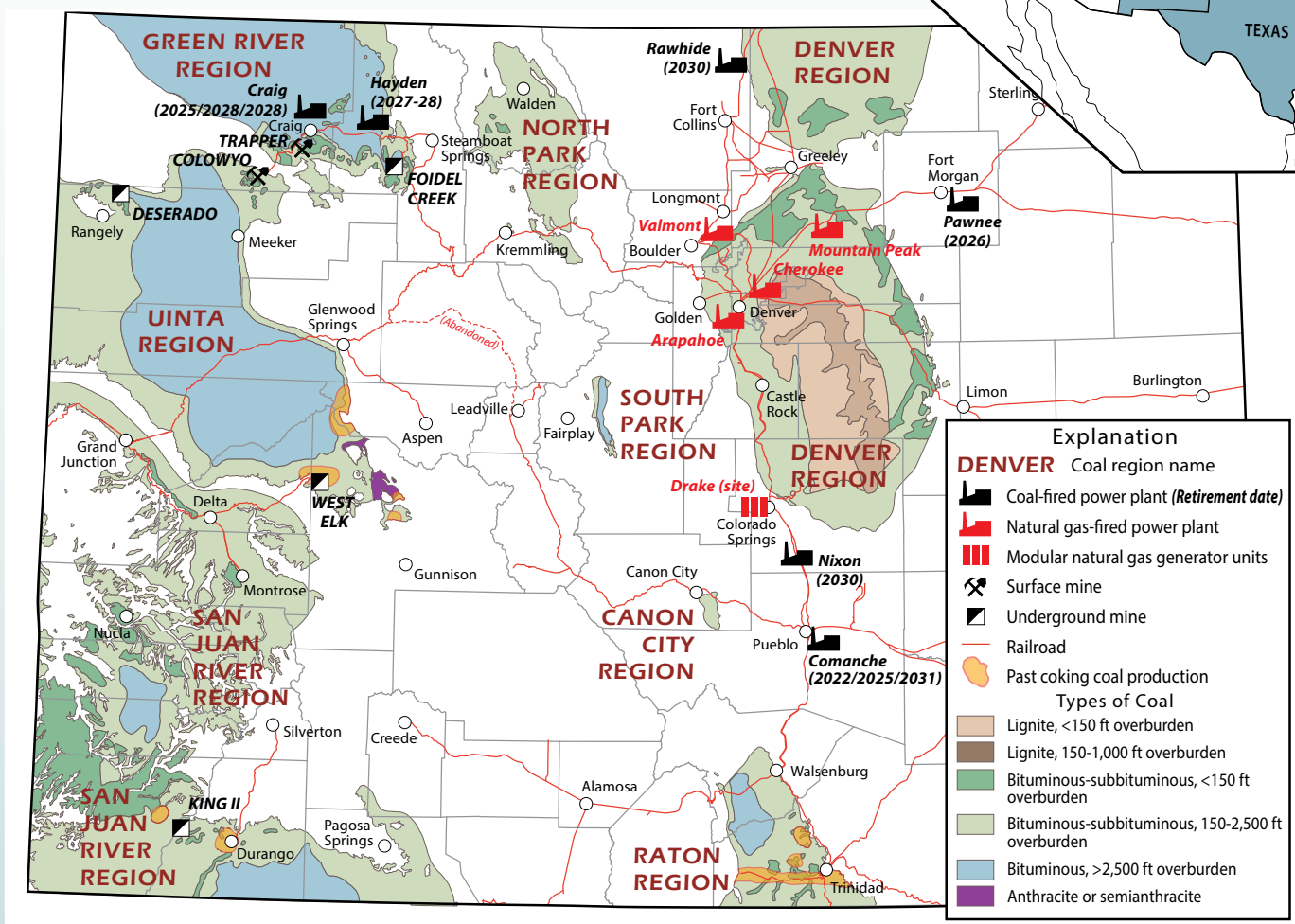


Figure 16. Locations of active coal mines, power plants, railroads, and coal-bearing regions in Colorado, 2024. Dates in parentheses are estimated retirement dates for coal-burning units.

CONVENTIONAL ENERGY RESOURCES: URANIUM

According to the EIA, the total U.S. production of uranium concentrate (triuranium octoxide or U_3O_8) increased significantly from 50,000 pounds in 2023 to 677,000 pounds in 2024 (EIA, 2025k). This production is still historically low when compared to domestic uranium concentration production prior to 2018. Although Colorado has been a producer of uranium in the past, there were no producing uranium mines or mills in 2024 within the state. Most of the uranium purchased by U.S. civilian nuclear power reactors over the last several decades was imported from foreign countries. In 2024, 55.9 million pounds of triuranium octoxide was purchased by owners and operators of these nuclear power plants with ~92.3% purchased from foreign suppliers (EIA,2024m). In 2024, most of the uranium delivered to U.S. civilian nuclear power reactors came from other countries including Canada (33.3%), Kazakhstan (22.3%), Australia (15.3%), and Uzbekistan (8.1%) (EIA, 2025m).

Although oil, natural gas, and coal imports from Russia were banned in 2022 (White House, 2022), uranium was not. However, in 2024, the U.S. passed H.R. 1042 Prohibiting Russian Uranium Imports Act which limits the importation of uranium to the U.S. from Russia (U.S. Congress, 2024). In 2023, the DOE published a list of critical materials that included uranium. They classified uranium, as well as other materials, as "near critical" in the short term (2020 to 2025). A near critical classification indicates that the importance to energy is high but the short-term supply risk is lower than other materials. DOE short-term critical materials, with regards to their importance to energy and supply risk, included dysprosium, cobalt, gallium, graphite, iridium, neodymium, and terbium (DOE, 2023). In 2025, the U.S. Geological Survey added uranium to the critical mineral list (USGS, 2025b) and the White House released an executive order that provides immediate measures to increase U.S. mineral production including uranium (White House, 2025b).

In 2025, Colorado passed House Bill 25-1040 concerning the inclusion of nuclear energy as a source of clean energy. As reported by the Colorado General Assembly (2025), *"The statutory definition of "clean energy" determines which energy projects are eligible for clean energy project financing at the county and city and county level. The statutory definition of "clean energy resource" determines which energy resources may be used by a qualifying retail utility to meet the 2050 clean energy target. The act updates the 2 statutory definitions to include nuclear energy; except that, for property valuations made for tax purposes, the act exempts from the definition of "clean energy resource" nuclear energy generated by a public utility".*

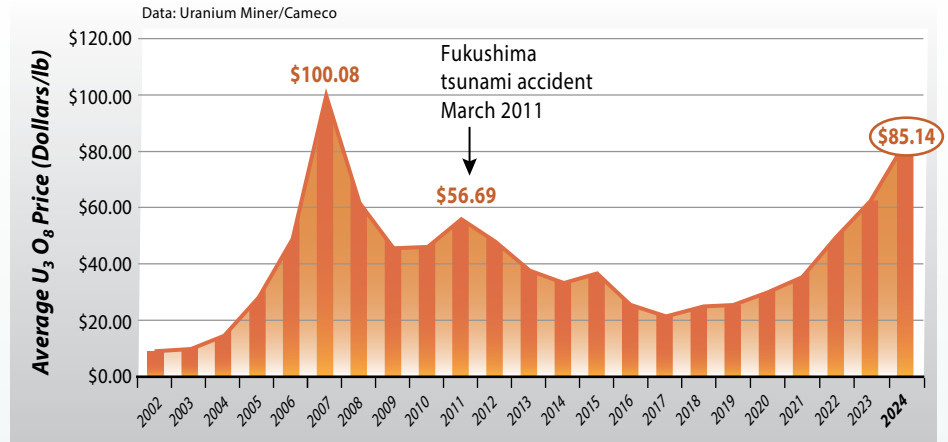


Figure 17. Average annual U_3O_8 price per pound in U. S., 2002–2024.

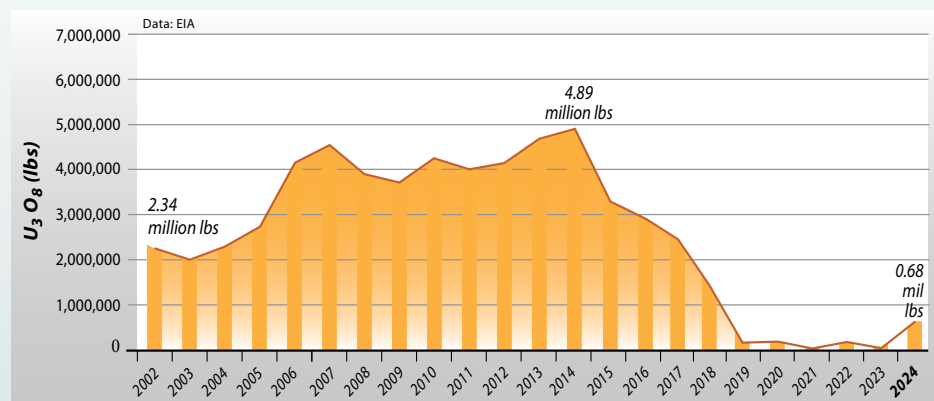


Figure 18. Annual production of uranium concentrate in U. S., 2002–2024.

The weighted-average price reported by the EIA for uranium increased slightly from $43.80 per pound in 2023 to $52.71 per pound in 2025 (EIA, 2025m). Average spot prices of uranium in 2024 were about $85.14 per pound and decreased to an average of about $72.81 per pound through November 2025 (Cameco, 2025). **Figure 17** shows the average annual spot uranium prices in the U.S. since 2002. **Figure 18** shows the estimated annual production of uranium concentrate in the U.S. between 2002 and 2024.

In the fourth quarter of 2024, the White Mesa Mill, located in Utah near the border with Colorado, was the largest domestic producer of uranium concentrate (~157,525 pounds U_3O_8) (EIA, 2025k). This mill continued to be the largest domestic producer of uranium concentrate in the first and second quarters of 2025 (EIA, 2025l). In June 2025, Western Uranium & Vanadium Corporation (Western) began delivering uranium-bearing feedstock from the Sunday Mine Complex, located in western San Miguel County, CO, to the White Mesa Mill in Utah which included historic stockpiled material supplemented by new production (Western, 2025).

Uranium tailings in southwestern Colorado.

NON-FUEL MINERAL RESOURCES

Non-fuel mineral resources include metals, industrial minerals, and construction materials (e.g., gold, molybdenum, Portland cement, crushed rock, sand, and gravel). The total U.S. 2024 non-fuel mineral production value was estimated at $106 billion, a ~1.0% increase from last year's estimated total of $105 billion (USGS, 2025a). Colorado ranked 18th in U.S. non-fuel mineral production value and produced an estimated $2.050 billion, or ~1.94% of the estimated total U.S. production value (USGS, 2025a). **Figure 19** shows the estimated non-fuel mineral production value in Colorado over time.

Metal Mining

Metals mined in Colorado include gold and molybdenum. The CGS estimates that the 2024 production value of gold and molybdenum in Colorado is ~$990 million. This is ~8% lower than the estimated value of these two commodities in 2023 of ~$1,074 million mainly due to lower average price of molybdenum. Silver is also produced in Colorado and is a by-product of gold mining. Silver production values for Colorado were unavailable.

Molybdenum

Molybdenum is typically used in the production of engineering steels, stainless steel, molybdenum metal, tool steels, nickel alloys, foundries, and chemical production. In 2024, according to the International Molybdenum Association (IMOA, 2025), about 64% of the world production of new molybdenum (not recycled or remelted) was used in engineering and stainless steels. Also, about 23% was used in tool steels, foundries, Mo-metals, and nickel alloys. About 13% was used in chemical production (IMOA, 2025). The global production of molybdenum was estimated at ~260,000 metric tons in 2024 (USGS, 2025a). The top 2024 producers included: China (~110,000 metric tons), Peru (~41,000 metric tons), Chile (~38,000 metric tons), and the U.S. (~33,000 metric tons) (USGS, 2025a).

Colorado's annual production and the average annual price per pound for molybdenum trioxide (MoO_3) are shown in **Figure 20**. Estimated average prices decreased from $24.64 in 2023 to $21.32 per pound in 2024 (USGS, 2025a). Most of the 2024 primary molybdenum production in the U.S. was from two Colorado mines that produced ~30 million pounds combined (Freeport, 2025). In the U.S., Colorado ranked second in molybdenum production following by molybdenum recovered as a by-product of copper mining at Arizona mines (**Figure 21**).

Colorado hosts several known Climax-type porphyry molybdenum deposits. These are relatively rare deposit types found in the continental interior of western North America (Ludington and Plumlee, 2009; Audetat and Li, 2017). Freeport mines some of these deposits at their Climax and Henderson mines in Colorado. The Climax open pit mine is located northeast of Leadville, at Fremont Pass. As reported by Freeport, the operation includes a 25,000 metric ton per day mill with the ability to produce ~30 million pounds of molybdenum per year. Freeport reports that the Climax open pit mine produced 14 million

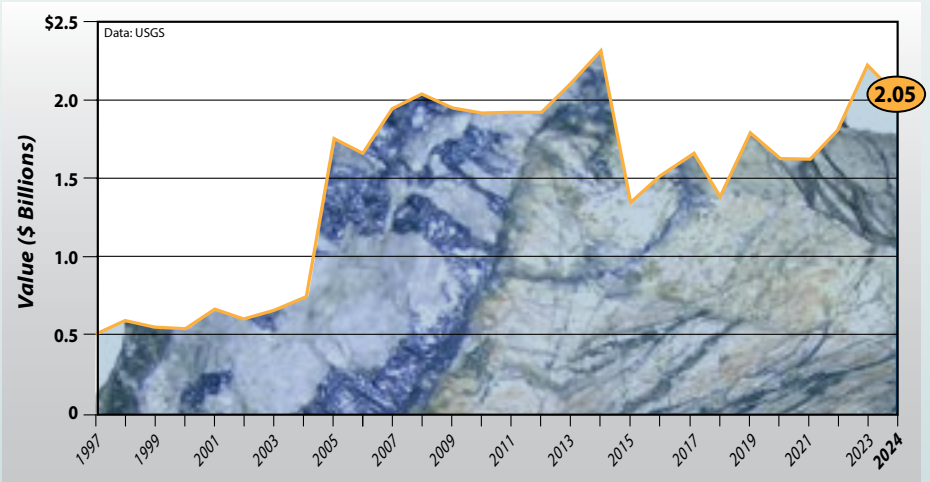


Figure 19. Total non-fuel mineral production value in Colorado, 1997–2024.

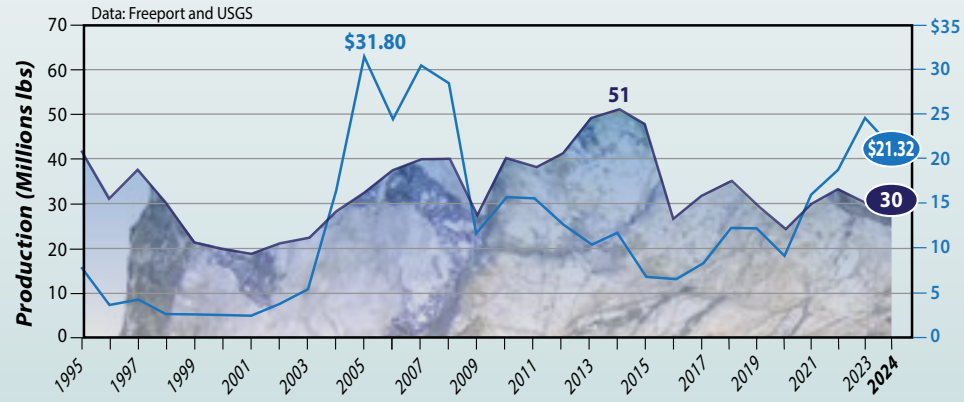


Figure 20. Molybdenum production in Colorado and average annual price 1995-2024.

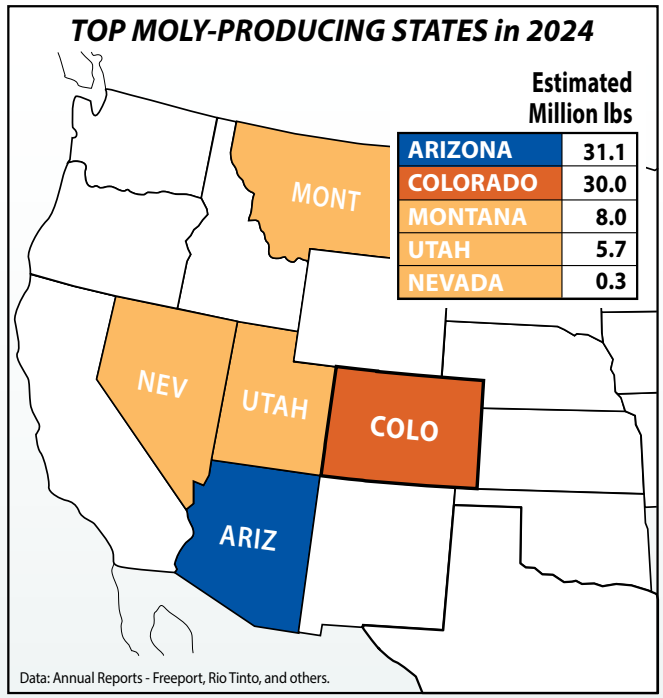


Figure 21. Top molybdenum producing states, 2024.

pounds in 2020, 18 million pounds in 2021, 21 million pounds in 2022, 17 million pounds in 2023, and 18 million pounds in 2024. At the end of 2024, Freeport also reported that the Climax Mine had 130 million metric tons of proven reserves at an average grade of 0.15% molybdenum and 11 million metric tons of probable reserves at an average grade of 0.10% (Freeport, 2025).

The Henderson Mine, located near Empire in Clear Creek County, has been in operation since 1976. Per Freeport, this operation is a large block-cave underground mine connected to a 32,000 metric tons per day concentrator in adjacent Grand County by a 15-mile-long conveyor. Freeport reported that the Henderson Mine produced 10 million pounds in 2020, 12 million pounds in both 2021 and 2022, 13 million pounds in 2023, and 12 million pounds in 2024. At the end of 2024, Freeport also reported that the Henderson Mine had 31 million metric tons of proven reserves at an average grade of 0.16% molybdenum and probable reserves of 13 million metric tons at an average grade of 0.16% (Freeport, 2025).

Gold

U.S. gold mine production decreased from 170 metric tons (~5.466 million troy ounces) in 2023 to an estimated 160 metric tons (5.144 million troy ounces) in 2024 with a value over $12.3 billion based on average prices reported by the USGS (USGS, 2025a). In 2024, the U.S. was the fifth largest producer of gold (~160 metric tons) in the world following China (~380 metric tons), Russia (~310 tons), Australia (~290 tons), and Canada (~200 tons). World production of gold in 2024 was ~3,300 metric tons (~106.1 million ounces) (USGS, 2025a).

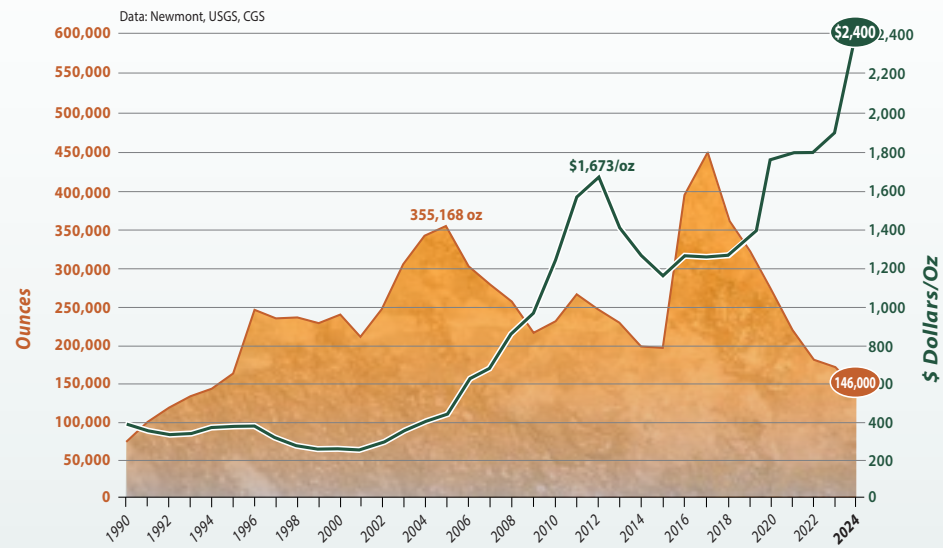


Figure 22. Colorado estimated gold production and average annual price per ounce, 1990–2024.

Figure 22 shows the price of gold and Colorado gold production from 1990 to 2024. In 2024, Colorado was the fourth largest producer of gold (146,000 ounces) in the U.S. (**Figure 23**) following Nevada (~3,479,748 ounces), Alaska (~753,000 ounces), and South Carolina (~212,560 ounces). The average gold price increased from $1,945 per ounce in 2023 to an estimated $2,400 per ounce in 2024 (USGS, 2025a). In 2025, the spot price of gold started off at ~$2,669 per ounce in January and steadily increased to $4,243 per ounce by early December with a peak in late October at ~$4,359 per ounce.

Newmont Corporation (Newmont) is the largest gold-mining company in the world, with operations in Africa, Australia, North America, South America, and Papua New Guinea. Its corporate headquarters are in Denver, CO. Production of gold at Newmont's Cripple Creek and Victor (CC&V) mine located in Teller County decreased from 172,000 ounces in 2023 to 146,000 in 2024 (Newmont, 2025). At the end of 2024, proven and probable gold reserves at CC&V totaled

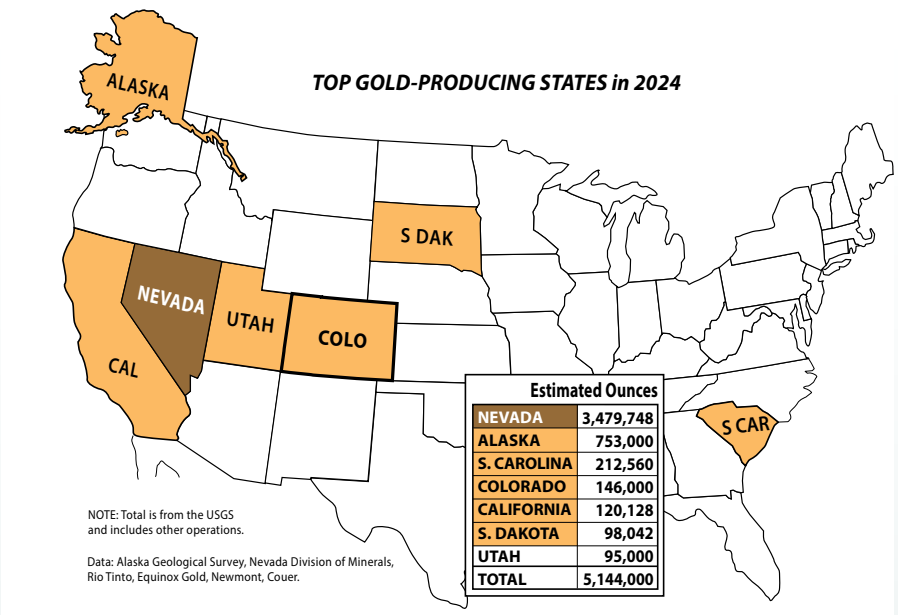


Figure 23. Major gold-producing states in 2024.

150.2 million metric tons at a grade of 0.50 grams per ton (Newmont, 2025). At the end of February 2025, Newmont completed the sale of CC&V to SSR Mining Inc. (SSR) based in Vancouver, Canada. SSR is headquartered in Denver, CO, and has assets in the U.S., Türkiye, Canada, and Argentina. Gold production at CC&V increased by about 32% in the first six months of 2025 when compared to the same period in 2024. At the end of June 2025, the total gold production from CC&V was about 83,344 ounces while production over the same period in 2024 was ~63,000 ounces (SSR, 2025).

Sand and gravel aggregate operations recover a small amount of placer gold along some of Colorado's rivers and streams including the South Platte, Arkansas, and Colorado rivers, as well as Clear Creek. Additionally, a few small lode gold mines operated by private individuals or small groups also produce small tonnages of high-grade gold and silver ore. As of December 2025, there are currently 40 active mining permits with gold listed as the primary mined commodity in the Colorado Division of Reclamation, Mining and Safety (DRMS) database (DRMS, 2025).

Other Exploration Activities

Worldwide exploration budget estimates for nonferrous metals decreased from $12.5 billion in 2024 to 12.4 billion in 2025 (S&P, 2025). Most of this estimated total budget is for exploration targeting gold (49.6%), copper (26.3%), lithium (4.8%), silver (4.3%), zinc-lead (2.9%) and other commodities (S&P, 2025). Gold and copper had the largest exploration budget increases from 2024 while nickel and lithium budgets had significant decreases (S&P, 2025).

A list of some select current exploration and/or development projects (in no particular order) in Colorado are included below. This list does not include all the projects located in the state. See the references for more information.

- Wet Mountains project (rare earth elements) (Magnum, 2025);
- San Juan Silver project (silver and other base metals) (Hecla Mining, 2025);
- Homeland Uranium (uranium/vanadium) (Homeland, 2025)
- Silver Cliff (silver) (Viscount Mining, 2025);
- Iron Hills (titanium, rare earth elements, other metals) (Canamera, 2025);
- Several projects in Western Colorado (uranium, vanadium) (Nuvemco, 2025);
- Slick Rock / West Slope projects (uranium, vanadium) (Anfield Energy, 2025);
- Dawson project (gold) (Zephyr Minerals, 2025);
- Golden Wonder Mine (gold) (LKA Gold, 2025);
- Several projects in Western Colorado (uranium, vanadium) (Thor Energy, 2025);
- Several projects in Western Colorado (uranium, vanadium) (Metals One, 2025);
- La Plata project (copper, gold, silver, and other metals) (Metallic Minerals, 2025);
- Rex project (uranium, vanadium) (Moab Minerals, 2025);
- Patriot project (lithium) (United Lithium, 2025);
- Several projects in Colorado (uranium, vanadium) (Western Uranium & Vanadium, 2025b); and
- Whirlwind (uranium, vanadium) (Energy Fuels, 2025).

Critical Minerals

As defined by the Energy Act of 2020 (White House, 2020), "critical minerals" are defined as the minerals, elements, substances, or materials that (Nassar and others, 2025), *"(i) are essential to the economic or national security of the United States; (ii) the supply chain of which is vulnerable to disruptions (including restrictions associated with foreign political risk, abrupt demand growth, military conflict, violent unrest, anti-competitive or protectionist behaviors, and other risks throughout the supply chain); and (iii) serve an essential function in the manufacturing of a product (including energy technology-, defense-, currency-, agriculture-, consumer electronics-, and healthcare-related applications), the absence of which would have significant consequences for the economic or national security of the United States."*

The final 2022 critical mineral list includes: aluminum, antimony, arsenic, barite, beryllium, bismuth, cerium, cesium, chromium, cobalt, dysprosium, erbium, europium, fluorspar, gadolinium, gallium, germanium, graphite, hafnium, holmium, indium, iridium, lanthanum, lithium, lutetium, magnesium, manganese, neodymium, nickel, niobium, palladium, platinum, praseodymium, rhodium, rubidium, ruthenium, samarium, scandium, tantalum, tellurium, terbium, thulium, tin, titanium, tungsten, vanadium, ytterbium, yttrium, zinc, and zirconium. The critical minerals list was updated in November 2025 and added boron, copper, lead, metallurgical coal, phosphate, potash, rhenium, silicon, silver, and uranium to the list (USGS, 2025b; Nassar and others, 2025). In 2023, the DOE also published a "critical material" list for energy that includes: aluminum, cobalt, copper, dysprosium, electrical steel, fluorine, gallium, iridium, lithium, magnesium, natural graphite, neodymium, nickel, platinum, praseodymium, silicon, silicon carbide and terbium (DOE, 2023). Recent activities associated with the U.S. government's goal of securing critical mineral supply chains for domestic manufacturing (White House, 2025b) include investments in MP Materials (DOW, 2025), owner of the Mountain Pass rare earth element mine in California, and the joint Lithium Americas Corporation/General Motors lithium project at Thacker Pass, Nevada (DOE, 2025).

Minerals containing almost all the elements provided in the critical mineral list occur in Colorado. However, many of these may not occur in sufficient quantities to mine economically. Colorado is a known producer or past producer of many of the minerals/mineral materials provided in the critical minerals list especially (in no particular order) silver, lead, zinc, copper, uranium, tungsten, fluorspar, metallurgical coal, and vanadium. The CGS is currently working with the USGS in specific areas that may contain potential resources of critical minerals, known as critical mineral focus areas or focus areas, in Colorado based on a mineral system approach (Hofstra and Kreiner, 2020). The latest version of the critical mineral focus areas (Dicken and others, 2022) is available here: https://doi.org/10.5066/P9DIZ9N8. An online interactive map with the focus areas for the U.S. is available here: https://mrdata.usgs.gov/earthmri/focus-areas/.

Geological mapping projects associated with these priority areas are funded through the USGS Earth Mapping Resources Initiative (EarthMRI) and some matching funds are provided by state geological surveys. The USGS EarthMRI acquisitions interactive map viewer provides an overview of the current projects in Colorado and the entire U.S. (USGS, 2025e): https://ngmdb.usgs.gov/emri/#3/40/-96. These projects include current CGS projects as well as geophysical surveys recently completed and currently being conducted by the USGS in Colorado (Grauch and others, 2023; USGS, 2024b; USGS, 2025c: USGS, 2025d). Additionally, the CGS recently completed two investigations associated with critical minerals in historic mine waste (Giebel and O'Keeffe, 2025) and in historic mine-related effluent (Jones-Fredrickson and others, 2025). For more information about the USGS EarthMRI program, see: https://www.usgs.gov/special-topics/earth-mri.

Sand, Gravel, and Crushed Stone

In 2024, domestic construction aggregate (sand, gravel, and crushed stone) production accounted for ~35.8% of the total estimated value of U.S. nonfuel mineral production of $106 billion (USGS, 2025a). As it was in 2023, crushed stone was the leading nonfuel mineral commodity in 2024 with an estimated production value of $25.7 billion (24% of the total U.S. nonfuel mineral production estimated value) (USGS, 2025a). In 2024, the ~890 million tons of construction sand and gravel produced domestically was used primarily for Portland cement concrete aggregates (~42%), road base/coverings (~20%), construction fill (12%), and asphalt/other bituminous mixtures (~9%) (USGS, 2025a). Other uses include concrete products, drainage/rip-rap, filtration, golf course maintenance, landscaping, masonry sand, pea gravel, and several other uses (USGS, 2025a). In 2024, ~1,500 million metric tons of crushed stone (e.g., limestone, dolomite, granite, and other rock types) were produced domestically. This material was used primarily for construction aggregate (~72%) (especially for road construction and maintenance), cement manufacturing (~17%), lime manufacturing (~6%), agricultural uses (~1%), and for other uses (USGS, 2025a). DRMS currently lists over 1,000 active permits for sand, gravel, aggregate, and aggregate-related quarries in Colorado (DRMS, 2025).

Colorado quarry operators produced ~48.7 million short tons of aggregate (sand, gravel, and crushed stone) in 2024 (USGS, 2025f) (**Figure 24**). Colorado was the eighth leading producer of construction sand and gravel in the U.S. (USGS, 2025a) and the estimated 2025 production value was $455 million for sand and gravel and $188 million for crushed stone. Average prices and production for sand and gravel and crushed stone are shown in **Figure 25** and **Figure 26**, respectively.

Colorado uses a large amount of aggregate to build and maintain infrastructure. The cost of aggregate to the user is highly dependent on transportation costs. Locating quarries close to population centers helps lower overall costs. However, residential and commercial development near an aggregate source can make permitting a new or expanding quarry a challenge. To help local governments identify potential sources of sand, gravel and quarry aggregates, the CGS published maps of sand, gravel, and quarry aggregate resources for Colorado Front Range counties which are available for download on our website (Schwochow and others, 1974; O'Keeffe and others, 2022).

Cement

Portland cement in Colorado is used primarily in the production of concrete. Concrete consists of a mixture of aggregates (e.g., sand, gravel, or crushed stone) mixed with water and cement. Concrete contains between about 60 and 75% coarse and/or fine aggregate. A common way to create Portland cement is by heating lime, clay, silica, alumina, iron, and other materials at high temperatures in a cement kiln which creates small round pellets (called "clinkers") that are

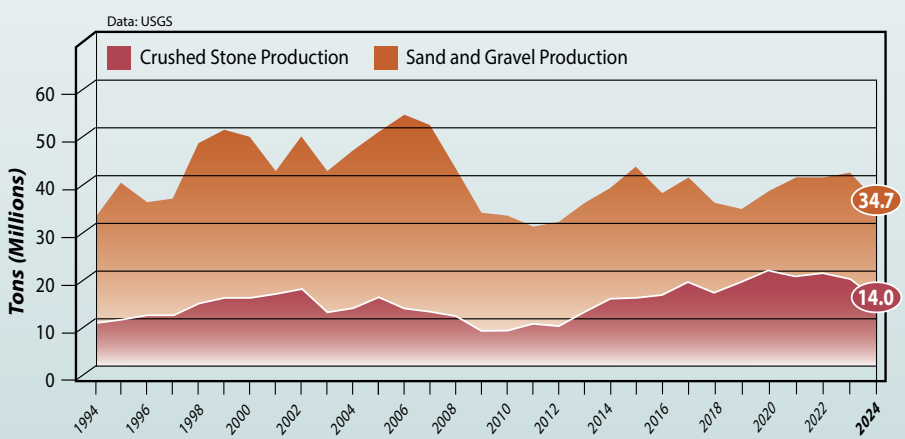


Figure 24. Aggregate production in Colorado, 1994–2024.

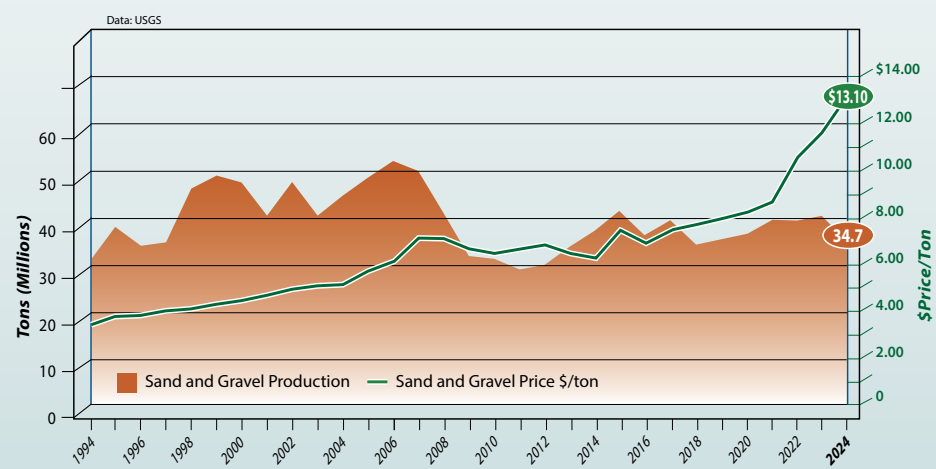


Figure 25. Price and production of sand and gravel aggregate in Colorado, 1994–2024 (sold or used by producers in the U.S.).

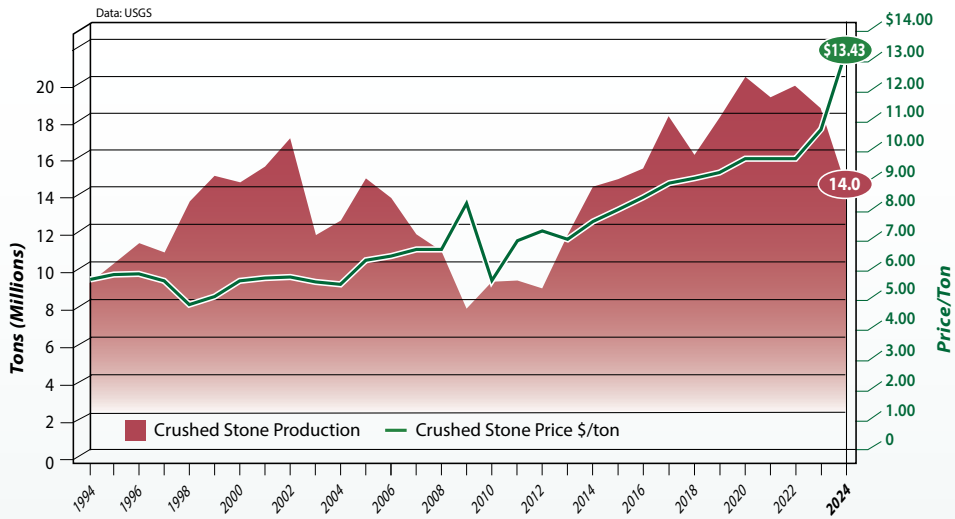


Figure 26. Price and production of crushed stone aggregate in Colorado, 1994–2024 (sold or used by producers in the U.S.).

Limestone in the Niobrara Formation near Lyons.

ground, mixed with limestone and gypsum, and used to make concrete (ACA, 2025). Several Portland cement plants operated in Colorado during 2024 including: LafargeHolcim (US), Inc. (LafargeHolcim) in Florence, the GCC of America (GCC) plant in Pueblo, and CEMEX plant near Lyons. LafargeHolcim and GCC use Niobrara Formation as feed stock for their cement products. The Upper Cretaceous Niobrara Formation was deposited during a major marine transgression of the Western Interior Seaway around 82 to 89.5 million years ago (Sonnenberg, 2016). It is also a major source of oil and gas in the DJ Basin (**Figure 1**). Like the aggregate business, the production of cement is largely tied to the construction industry.

Clay and Shale

Clay is mined primarily in eastern Colorado along the Front Range and is used mostly to make brick and tile. Clay has been mined from the Laramie Formation, Dawson Arkose, and Denver Formation as well as the Dakota Group. DRMS records indicate that there are 43 active permits for clay and 4 for shale in Colorado (DRMS, 2025). Two brick companies currently operate in the Denver area: General Shale and Summit Brick Co. The Summit Brick Co. also operates a clay brick manufacturing facility in Pueblo. Production data for common clay and shale in Colorado is withheld for proprietary reasons (USGS, 2025g). In 2017 and 2018 the production of common clay and shale was estimated at 297,000 short tons, respectively (O'Keeffe, 2025). The estimated average price of common clay was ~$18.00 per metric ton in 2024 (USGS, 2025a).

Arcosa Lightweight (Arcosa) produces lightweight aggregate in Jefferson County from shale. They quarry Cretaceous Pierre Shale near their production facility which is then heated in a high temperature kiln at temperatures over 2,000 degrees Fahrenheit where it expands and hardens. This creates a ceramic lightweight aggregate, with a lower bulk density of natural aggregates, and is used in asphalt surface treatments, structural lightweight concrete, concrete masonry, geotechnical fill, and other applications (Arcosa, 2025).

Gypsum

In 2024, domestic crude gypsum production was 22 million tons, and the majority is used for agriculture, cement production, and wallboard/plaster manufacturing (USGS, 2025a). Gypsum mined in Colorado is used to produce wallboard, as an ingredient in cement production, a soil conditioner, and for other industrial uses. There are currently 8 active mine permits associated with gypsum in Colorado (DRMS, 2025).

American Gypsum Co. operates a large quarry and fabrication plant for wallboard in Eagle County, near the town of Gypsum, and is the fifth largest producer of gypsum wallboard in North America (American Gypsum, 2025). In this area, gypsum (hydrated calcium sulfate) occurs in the Pennsylvanian Eagle Valley Evaporite which is composed of both gypsum and anhydrite (calcium sulfate) as well as halite (salt). These evaporite minerals were reportedly deposited in a landlocked marine trough where marine circulation and interchange was limited (Mallory, 1971). Near Eagle, Colorado, the evaporite interval can be 9,000 feet thick (Mallory, 1971). Gypsum for the cement industry and soil amendment is mined from the Munroe Quarry north of Fort Collins in Larimer County (Lien, 2025). Gypsum is also mined in Fremont County.

Sodium Bicarbonate (Nahcolite)

Sodium bicarbonate (more commonly known as baking soda) is primarily used in food preparation and baking, personal care products, pharmaceuticals, animal feed products, pool and water treatment, and other applications. Natural Soda, LLC. (Natural Soda), operates a nahcolite solution mine in Rio Blanco County. Nahcolite is the naturally occurring mineral of sodium bicarbonate ($NaHCO_3$). High grade nahcolite (greater than 80%) is recovered from the Parachute Creek Member of the Eocene Green River Formation in the Piceance Basin. The Green River Formation was deposited in an ancient lake, known as Lake Gosiute, which occupied this area from between ~52.5 to 47.5 million years ago (Smith and others, 2008). Nahcolite is present in the oil shale deposits where it occurs as disseminated aggregates, nodules, bedded units of disseminated brown crystals, and white crystalline beds associated with other minerals (e.g., dawsonite and halite) (USGS, 2009). Mine operators pump hot water down a well ~1,900 feet deep to dissolve the nahcolite. Other wells recover the sodium bicarbonate enriched solution and pump it to the surface where the solution cools and precipitates sodium bicarbonate which is further dried and prepared to produce a commercial grade product (Hardy and others, 2003; Brownfield and others, 2010).

The USGS estimated that the Parachute Creek Member of the Eocene Green River Formation in the Piceance Basin, Rio Blanco County, contains an estimated in-place resource of over 43 billion short tons of nahcolite over ~170,000 acres (USGS, 2009). Natural Soda's estimated average yearly production was ~249,000 tons between 2020 and 2024.

Parachute Creek Member of the Eocene Green River Formation in the Piceance Basin.

Dimension and Decorative Stone

Dimension stone is any visually appealing rock that is quarried, cut, or shaped into useful forms. Colorado has many dimension stone and decorative stone producers who quarry sandstone, granite, marble, rhyolite, and alabaster (a form of gypsum) for use as dimension stone. DRMS lists over 20 active quarries for stone, marble, dimension stone, and quartzite (DRMS, 2025) which includes the marble quarry outside Marble, CO, as well as the Lyons Sandstone Quarry. Dimension stone is used to construct buildings, wall cladding or veneer, monuments, floor tiles, walkways (flagstone), landscaping features, and sculptures. Decorative stone is any type of rock that is used in its natural form for aesthetic purposes. In Colorado, various types of rock are mined locally for decorative use. In 2024, Texas, Wisconsin, Vermont, Indiana, and Georgia accounted for ~73% of U.S. production (USGS, 2025a). The rock types sold in the U.S. in 2024 by descending value included limestone (47%), granite (23%), sandstone (10%), dolomite (5%), marble (5%), and other miscellaneous stone (10%) (USGS, 2025a).

INDUSTRIAL GASES (NON-ENERGY)

Carbon Dioxide

Naturally occurring carbon dioxide gas (CO_2) was produced in 2024 primarily from three areas in Colorado (in order of decreasing production volume): McElmo Dome in Montezuma County, Doe Canyon Deep in Dolores County, and the Sheep Mountain Field in Huerfano County (ECMC, 2025a). The Rangely Field (Rio Blanco County) and the McCallum Field (Jackson County) have also produced CO_2 in the past. Kinder Morgan's (KM) McElmo Dome, in operation since 1983, and the Doe Canyon Deep units are the largest producers in Colorado. About 92.6% of the 2024 production of CO_2 in Colorado was from Montezuma County (ECMC, 2025a). According to KM, McElmo Dome is one of the largest known pure CO_2 fields in the world and contains over 20 trillion cubic feet of CO_2 with ~5 trillion cubic feet of recoverable CO_2 remaining to be produced (KM, 2025a). Most of the CO_2 is produced from the Mississippian Leadville Limestone at depths ranging from ~6,600 to 8,400 feet (Gerling, 1983). The source of the CO_2 is thought to be mainly from the *"thermal decomposition of calcite in carbonate reservoirs in the area, predominantly the Leadville Limestone, during a period of elevated geothermal gradients in early to mid-Tertiary time"* (Cappa and Rice, 1995). CO_2 is also produced from the Leadville Limestone at the Doe Canyon Deep facility (DOE, 2014; Shelton and others, 2016). CO_2 production at Sheep Mountain is from the Cretaceous Dakota Sandstone and Jurassic Entrada Sandstone (Roth, 1983).

CO_2 is produced from wells in a similar way to natural gas production. Most of the CO_2 is used during enhanced oil recovery (EOR), also known as improved or tertiary recovery (as opposed to primary or secondary recovery), in Texas and New Mexico. EOR techniques are implemented to increase the extraction of crude oil from mature oil fields and residual oil zones (KM, 2025b). CO_2 is used to extend the life of a well after the initial pressure in the well decreases. Other uses for CO_2 include welding gases, manufacture of dry ice, and in the food and beverage industry. In 2024, Colorado produced an estimated 280 billion cubic feet (Bcf) of CO_2 (ECMC, 2025a) at an average CGS calculated price of ~$1.03 per thousand cubic feet (Mcf) and production value of ~$289 million. **Figure 27** shows Colorado's estimated CO_2 production for the period 1994-2024.

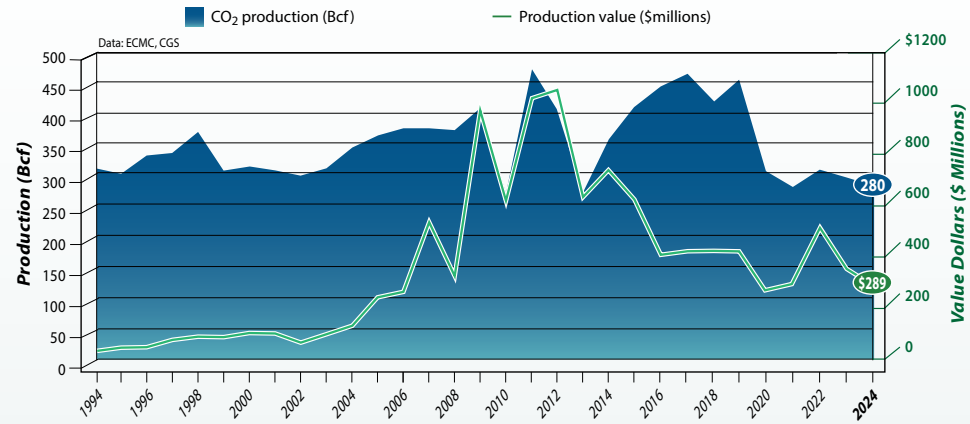


Figure 27. CO_2 production and estimated production value, 1994–2024.

Helium

In 2024, helium was primarily used for or in: specialty gases, lifting gas, magnetic resonance imaging, fiber optics, semiconductors, and other applications (USGS, 2025a). The estimated price for private industry grade-A helium in 2024 was ~$390 per Mcf (USGS, 2025a). In 2024, the U.S. Bureau of Land Management completed the sale of the Federal Helium System to Messer, Inc (BLM, 2024).

The USGS estimates that the Rocky Mountain region of the U.S., which includes most of Colorado, contains ~148 Bcf of recoverable helium resources from known natural gas reservoirs (Brennan and others, 2021). The southeastern Colorado Ladder Creek gas plant facility located in Cheyenne Wells, Cheyenne County, produces Grade-A helium. Tumbleweed Midstream LLC (Tumbleweed) operates the Ladder Creek Helium Plant and gathering system. The helium plant is located south of Cheyenne Wells in Cheyenne County. The gathering system includes ~730 miles of pipeline, located in both Colorado and Kansas, and the plant has a current processing capacity of 40 million cubic feet (MMcf) per day which could be expanded to 50 MMcf per day. The plant also produces natural gas liquids and residue gas (O'Keeffe 2024, 2025).

In 2015, Air Products and Chemicals, Inc. (Air Products) built a helium production facility in Doe Canyon. They extract most of the helium from a gas

stream composed primarily of carbon dioxide. The plant has a capacity of ~230 MMcf per year and 2019 production is reportedly ~140 MMcf per year (Edison, 2021). Several companies continue to explore and develop helium properties associated with the Permian Lyons Formation in Las Animas County. Desert Eagle operates the Red Rocks helium processing unit in Las Animas County and has been producing helium for the last 2.5 years (GeoExPro, 2025). As reported over the last few years (O'Keeffe, 2023 through 2025), Blue Star Helium Ltd. (Blue Star) continues to explore and develop their Voyager and Galactica/Pegasus helium properties in Las Animas County. In 2025, Blue Star started construction of a production facility pad and gathering system at their Galactica property. Future expansion is expected to include a CO_2 by-product stream. More information is available on their website (Blue Star, 2025). Additional potential helium resources in Colorado include the Sagebrush Project in southwest Colorado (Mosman, 2025).

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References

American Cement Association (ACA), 2025, Cement and concrete: https://www.cement.org/cement-concrete/.

American Gypsum, 2025, https://www.americangypsum.com/our-company.

Anfield Energy, 2025, Slick Rock and West Slope projects, https://anfieldenergy.com/projects.

Arcosa Lightweight (Arcosa), 2025, https://arcosalightweight.com/about/production-process.

Audetat, A. and Li, Wanting, 2017, The genesis of Climax-type porphyry Mo deposits: insights from fluid inclusions and melt inclusions: Ore Geology Reviews, v. 88, August 2017, p. 436–460, https://doi.org/10.1016/j.oregeorev.2017.05.018.

BLM (U.S. Bureau of Land Management), 2024, BLM completes sale of Federal Helium System: U.S. BLM news release, 27 June 2024, https://www.blm.gov/press-release/blm-completes-sale-federal-helium-system.

Blue Star Helium Ltd. (Blue Star), 2025, https://www.bluestarhelium.com/.

Brennan, S.T., Rivera, J.L., Varela, B.A., and Park, A.J., 2021, National assessment of helium resources within known natural gas reservoirs: U.S. Geological Survey Scientific Investigations Report 2021-5085, 5 p., https://pubs.er.usgs.gov/publication/sir20215085.

Brownfield, M.E., Mercier, T.J., Johnson, R.C., and Self, J.G., 2010, Nahcolite resources in the Green River Formation, Piceance Basin, Colorado: U.S. Geological Survey Digital Data Series DDS–69–Y, chapter 2, 51 p., https://pubs.usgs.gov/dds/dds-069/dds-069-y/REPORTS/69 Y CH 2.pdf.

Cameco, 2024, Uranium price: Cameco, accessed December 2025, https://www.cameco.com/invest/markets/uranium-price.

Canamera Metals Corporation, 2025, Iron Hills: https://canamerametals.com/iron-hills/.

Cappa, J.A. and Rice, D.D., 1995, Carbon dioxide in Mississippian rocks of the Paradox Basin and adjacent areas, Colorado, Utah, New Mexico, and Arizona: U.S. Geological Survey Bulletin 2000-H, 21 p., https://pubs.usgs.gov/bul/2000h/report.pdf.

Carroll, C.J., 2004, 2003 Summary of coal resources in Colorado: Colorado Geological Survey Special Publication 54, 25 p., https://coloradogeologicalsurvey.org/publications/summary-coal-resources-colorado-2003/.

Colorado General Assembly, 2023, SB23-016 Greenhouse Gas Emission Reduction Measures: 2023 Regular Session, https://leg.colorado.gov/bills/sb23-016.

Colorado General Assembly, 2024, Legislative council staff severance tax: accessed December 2024, https://leg.colorado.gov/agencies/legislative-council-staff/severance-tax-0.

Colorado General Assembly, 2025, HB25-1040 Adding nuclear energy as a clean energy resource: accessed December 2025, https://leg.colorado.gov/bills/hb25-1040.

Colorado Legislature, 2025, Economic & revenue forecast, September 2025: Legislature Council Staff, 110 p., https://content.leg.colorado.gov/sites/default/files/images/sept2025forecast-accessible.pdf/.

Colorado State Administrative Rules, 2025, Code of Colorado Regulations, State Administrative Rules: accessed December 2025, https://www.sos.state.co.us/CCR/NumericalDeptList.do#400.

Colorado Sun, 2025, Coal-fired power plant in northwestern Colorado still set for 2028 closure despite Trump administration orders: The Colorado Sun, M. Jaffe, 15 April 2025, https://coloradosun.com/2025/04/15/coal-fired-power-craig-tri-state-xcel-trump-orders/.

Dicken, C.L., Woodruff, L.G., Hammarstrom, J.M., and Crocker, K.E., 2022, GIS, supplemental data table, and references for focus areas of potential domestic resources of critical minerals and related commodities in the United States and Puerto Rico: U.S. Geological Survey data release, revised 29 April 2024, https://doi.org/10.5066/P9DIZ9N8.

DOE, 2014, Subsurface sources of CO2 in the contiguous United States, Volume 1, Discovered reservoirs: U.S. Department of Energy, Office of Fossil Energy, 5 March 2014, DOE/NETL-2014/1637, 89 p., https://www.osti.gov/biblio/1503261.

DOE, 2023, Critical materials assessment: U.S. Department of Energy, July 2023, https://www.energy.gov/cmm/what-are-critical-materials-and-critical-minerals.

DOE, 2025, Department of Energy restructures Lithium Americas deal to protect taxpayers and onshore critical minerals: U.S. Department of Energy, 1 October 2025, https://www.energy.gov/articles/department-energy-restructures-lithium-americas-deal-protect-taxpayers-and-onshore.

DOLA (Colorado Department of Local Affairs), 2024, Colorado Department of Revenue Fiscal Year 2023 2024 annual report: State of Colorado, 98 p., https://cdor.colorado.gov/data-and-reports/cdor-annual-reports.

DOW (U.S. Department of War), 2025, Office of strategic capital announces first loan through DoD agreement with MP Materials to secure critical materials supply chain: U.S. Department of War, 20 August 2025, https://www.war.gov/News/Releases/Release/Article/4270722/office-of-strategic-capital-announces-first-loan-through-dod-agreement-with-mp/.

DRMS (Colorado Division of Reclamation, Mining and Safety), 2025, accessed October 2025, https://drms.colorado.gov/data.

ECMC (Colorado Energy and Carbon Management Commission), 2024a, Regulation of geothermal resources in Colorado, a legislative proposal: Colorado Department of Natural Resources, ECMC and Colorado Division of Water Resources, 124 p., https://ecmc.colorado.gov/data-maps-reports/technical-reports.

ECMC, 2024b, Geothermal in Colorado – Resources, use strategies, and impact considerations: Colorado Department of Natural Resources, ECMC, July 2024, 237 p., https://ecmc.colorado.gov/data-maps-reports/technical-reports.

ECMC, 2024c, Subsurface injection regulation – Program design and implementation considerations for the State of Colorado: Colorado Department of Natural Resources, ECMC, December 2024, 61 p., https://ecmc.colorado.gov/data-maps-reports/technical-reports.

ECMC, 2024d, Carbon capture and storage – Safety and impact considerations from source to sequestration: Colorado Department of Natural Resources, ECMC, February 2024, 117 p., https://ecmc.colorado.gov/data-maps-reports/technical-reports.

ECMC, 2024e, Colorado regulation of underground storage and transport of hydrogen, final administrative report: Colorado Department of Natural Resources, ECMC, prepared by DNV, 1 July 2024, 77 p., https://ecmc.colorado.gov/data-maps-reports/technical-reports.

ECMC, 2025a, Colorado Energy and Carbon Management System (COGIS): ECMC, accessed August 2025, https://ecmc.state.co.us/data.html#/cogis.

ECMC, 2025b, 2024 annual report to the Water Quality Control Commission (WQCC) and Water Quality Control Division (WQCD) of the Colorado Department of Public Health and Environment (CDPHE): Colorado Energy and Carbon Management Commission, Department of Natural Resources, 10 February 2025, 45 p., https://cdphe.colorado.gov/sb-89-181-implementing-agencies-annual-reports.

Edison (Edison Investment Research), 2021, Global helium market update: market shifting to oversupply by mid-2020s: Edison Investment Research, May 2021, https://www.edisongroup.com/wp-content/uploads/2021/05/Helium report050521 final.pdf.

EIA, 2020, As U.S. coal-fired capacity and utilization decline, operators consider seasonal operation: U.S. Energy Information Administration, 5 December 2025, https://www.eia.gov/todayinenergy/detail.php?id=44976.

EIA, 2021, Of the operating U.S. coal-fired power plants, 28% plan to retire by 2035: U.S. Energy Information Administration, dated 5 December 2025, https://www.eia.gov/todayinenergy/detail.php?id=50658#:~:text=As%20of%20September%202021%2C%20212,Preliminary%20Monthly%20Electric%20Generator%20Inventory.

EIA, 2023, Renewable generation surpassed coal and nuclear in the U.S. electric power sector in 2022: U.S. Energy Information Administration, 27 March 2023, https://www.eia.gov/todayinenergy/detail.php?id=55960#.

EIA, 2024, How much shale (tight) oil is produced in the United States: U.S. Energy Information Administration, 28 March 2024, accessed December 2025, hhttps://www.eia.gov/tools/faqs/faq.php?id=847&t=6.

EIA, 2025a, U.S. crude oil and natural gas proved reserves, year-end 2023: U.S Energy Information Administration, https://www.eia.gov/naturalgas/crudeoilreserves/.

EIA, 2025b, Annual coal report 2024: U.S. Energy Information Administration, November 2025, 67 p., https://www.eia.gov/coal/annual/.

EIA, 2025d, Petroleum and other liquids, domestic crude oil first purchase prices by area: U.S. Energy Information Administration, accessed June 2025, https://www.eia.gov/dnav/pet/pet pri dfp1 k a.htm.

2025e, U.S. crude oil and natural gas proved reserves, year-end 2023: U.S. Energy Information Administration, 25 June 2025, https://www.eia.gov/naturalgas/crudeoilreserves/.

EIA, 2025f, Henry Hub natural gas spot price: U.S. Energy Information Administration, accessed June 2025, https://www.eia.gov/dnav/ng/hist/rngwhhdA.htm.

EIA, 2025g, Colorado state profile and energy estimates: U.S. Energy Information Administration, 20 June 2024, accessed December 2025, https://www.eia.gov/state/analysis.php?sid=CO.

EIA, 2025h, Electric power annual, Table 1.1 Total electric power industry summary statistics, 2024 and 2023: U.S. Energy Information Administration, accessed December 2025, https://www.eia.gov/electricity/annual/.

EIA, 2025i, Electric power annual, Table 4.2 Existing net summer capacity by energy source and producer type, 2014 through 2024: U.S. Energy Information Administration, accessed December 2025, https://www.eia.gov/electricity/annual/.

EIA, 2025j, Annual coal distribution report: U.S. Energy Information Administration, 19 November 2025, https://www.eia.gov/coal/distribution/annual/.

EIA, 2025k, Domestic uranium production report: U.S. Energy Information Administration, July 2025, 17 p., https://www.eia.gov/uranium/production/annual/.

EIA, 2025l, Domestic uranium production report - quarterly: U.S. Energy Information Administration, October 2025, 9 p., https://www.eia.gov/uranium/production/quarterly/.

EIA, 2025m, 2024 Uranium marketing report: U.S. Energy Information Administration, September 2025, https://www.eia.gov/uranium/marketing/.

Energy Fuels, 2025, Whirlwind property: https://www.energyfuels.com/standby-mines/.

EPA (U.S. Environmental Protection Agency), 2025, Fact Sheet – Proposal to repeal greenhouse gas emissions standards for fossil fuel-fired power plants: U.S. EPA, 11 June 2025, https://www.epa.gov/system/files/documents/2025-06/6.11.25-fact-sheet-ghg-standards-proposed-repeal-final.pdf.

Freeport (Freeport-McMoRan Inc.), 2025, Form 10-K annual report: Freeport-McMoRan Inc., https://www.fcx.com/.

Gelman, S.E., Hearon, J.S., and Ellis, G.S., 2025, Prospectivity mapping for geologic hydrogen: U.S. Geological Survey Professional Paper 1900, v. 1.2, January 2025, 43 p. https://doi.org/10.3133/pp1900.

GeoExPro, 2025, Successful near-field helium exploration: by Reitsma, M., 13 August 2025, https://geoexpro.com/successful-near-field-helium-exploration/.

Giebel, A.R. and O'Keeffe, M.K., 2025, Reconnaissance investigation of critical minerals in mine-related waste, Colorado: Colorado Geological Survey Open-File Report 24-10, v. 1.0, 73 p., https://doi.org/10.58783/cgs.of2410.pzqo5194.

Gerling, C.R., 1983, McElmo Dome Leadville carbon dioxide field, Colorado: in Oil and Gas Fields of the Four Corners Area, Volume III, Four Corners Geological Society, p. 735–739, https://archives.datapages.com/data/fcgs/data/016/016001/735 four-corners160735.htm.

Grauch, V.J.S., Anderson, E.D., Brown, P.J., and Allen Langhans, A.D., 2023, Airborne magnetic and radiometric survey of the Wet Mountains and surrounding region, Custer and Fremont Counties, south-central Colorado, 2021: U.S. Geological Survey data release, https://doi.org/10.5066/P9PISI0X.

Hardy, M., Ramey, M., Yates, C, and Nielsen, K., 2003, Solution mining of nahcolite at the American Soda Project, Piceance Creek, Colorado: 2003 Society for Mining, Metallurgy & Exploration, Annual Meeting, Feb. 24–26, Cincinnati, Ohio, Preprint 03-104, https://www.agapito.com/mining-engineering/solution-mining/.

Hecla Mining Company, 2025, San Juan Silver project; https://www.hecla.com/exploration#san-juan-silver.

Hofstra, A.H. and Kreiner, D.C., 2020, Systems-deposits-commodities-critical minerals table for the Earth Mapping Resources Initiative: U.S. Geological Survey Open-File Report 2020-1042, 26 p., https://doi.org/10.3133/ofr20201042.

Homeland Uranium, 2025, Coyte Basin project: https://www.homeland-uranium.com/projects/coyote-basin.

IMOA (International Molybdenum Association), 2025, Molybdenum market information, accessed December 2025, https://www.imoa.info/molybdenum/molybdenum-market-information.php.

Johnson, R.C., Mercier, T.J., Ryder, R.T., Brownfield, M.E., and Self, J.G., 2011, Assessment of in-place oil shale resources in the Eocene Green River Formation, Greater Green River Basin, Wyoming, Colorado, and Utah, chapter 1 of Oil shale resources of the Eocene Green River Formation, Greater Green River Basin, Wyoming, Colorado, and Utah: U.S., Geological Survey Digital Data Series 69–DD, 63 p., https://pubs.usgs.gov/dds/dds-069/dds-069-dd/.

Jones-Fredrickson, E., Goodman, A., O'Keeffe, M.K., and Ranville, J., 2025, Reconnaissance investigation of critical minerals in historic mine-related effluent, Colorado: Colorado Geological Survey Open-File Report 24-11, v. 1.0, 77 p., https://doi.org/10.58783/cgs.2411.zdkt2450.

LKA Gold Incorporated, 2025, Golden Wonder Mine: https://lkagold.com/services/gold-exploration/golden-wonder-mine-150462444. KM (Kinder Morgan), 2024a, Enhanced oil recovery: accessed December 2024, https:// https://www.kindermorgan.com/Operations/CO2/Index#tabs-co2 supply.

KM, 2024b, CO_2 overview: accessed December, 2024, https://www.kindermorgan.com/Operations/CO2/Index#.

Lien (Pete Lien and Sons), 2025, https://www.petelien.com/locations.

Ludington, S. and Plumlee, G.S., 2009, Climax-type porphyry molybdenum deposits: U.S. Geological Survey Open-File Report 2009-1215, 16 p., https://pubs.usgs.gov/of/2009/1215/pdf/OF09-1215.pdf.

Magnum Mining and Exploration, 2025: https://www.mmel.com.au/site/content/.

Mallory, W.W., 1971, The Eagle Valley Evaporite, Northwest Colorado – a regional synthesis: U.S. Geological Survey Bulletin 1311-E, 37 p., https://pubs.usgs.gov/bul/1311e/report.pdf.

Metallic Minerals Corporation, 2025, La Plata project, https://mmgsilver.com/projects/laplata/property-overview/.

Metals One, 2025, Uravan belt uranium-vanadium project: https://metals-one.com/projects/uranium-vanadium-projects/.

Moab Minerals Limited, 2025, Rex Project, uranium-vanadium: https://www.moabminerals.com.au/rex-project-new/.

Mossman Oil and Gas, 2025, Sagebrush Project: https://www.mosmanoilandgas.com/operations/usa/.

Nassar, N.T., Pineault, D., Allen, S.M., McCaffrey, D.M., Padilla, A.J., Brainard, J.L., Bayani, M., Shojaeddini, E. Ryter, J.W., Lincoln, S., and Alonso, E., 2025, Methodology and technical input for the 2025 U.S. list of critical minerals – Assessing the potential effects of mineral commodity supply chain disruptions on the U.S. economy: U.S. Geological Survey Open-File Report 2025-1047, https://pubs.usgs.gov/of/2025/1047/ofr20251047.pdf.

Newmont (Newmont Corporation), 2025, Form 10-K annual report: Newmont Corporation, https://newmont.com/.

Nuvemco, LLC, 2025, Uranium, vanadium, permits, projects, technology and people: http://www.nuvemco.com/Projects.

O'Keeffe, M.K., 2023, Colorado mineral and energy activities 2021-2022: Colorado Geological Survey Information Series 85, 34 p. https://coloradogeologicalsurvey.org/publications/colorado-mineral-energy-industry-activities-2022/.

O'Keeffe, M.K., 2024, Colorado mineral and energy activities 2022-2023: Colorado Geological Survey Information Series 86, 29 p., https://doi.org/10.58783/cgs.is86.kgin1364.

O'Keeffe, M.K., 2025, Colorado mineral and energy activities 2023-2024: Colorado Geological Survey Information Series 87, 29 p., https://doi.org/10.58783/cgs.is87.pusj8408.

O'Keeffe, M.K., Morgan, M.L., Keller, S.M., and Lindsey, K.O., 2022, Reconnaissance map of sand, gravel, and quarry aggregate resources, Elbert County, Colorado: Colorado Geological Survey ON-007-09D/M, 10 p., https://cologeosurvey.maps.arcgis.com/apps/webappviewer/index.html?id=9eff494fdf984a4d9cdec0f6299def18, data download: https://coloradogeologicalsurvey.org/publications/aggregate-resources-elbert-data/.

Roth, G., 1983, Sheep Mountain and Dike Mountain Fields, Huerfano County, Colorado; A source of CO2 for enhanced oil recovery: Four Corners Geological Society – Oil and gas fields of the Four Corners area, p. 740–744, https://archives.datapages.com/data/fcgs/data/016/016001/pdfs/740.pdf.

S&P Global, 2025, CES 2025 Overview – Exploration in numbers: by Dela Cruz, E.G., 13 November 2025, https://www.spglobal.com/market-intelligence/en/news-insights/research/2025/11/ces-2025-overview-exploration-in-numbers.

Schwochow, S.D., Shroba, R.R., and Wicklean, P.C., 1974, Sand, gravel, and quarry aggregate resources, Colorado Front Range counties, Colorado Geological Survey, Special Publication 5-A and 5-B, 47 p. and 220 p., respectively, https://coloradogeologicalsurvey.org/publications/atlas-sand-gravel-quarry-aggregate-colorado-front-range/.

Shelton, J.L, McIntosh, J.C., Hunt, A.G., Beebe, T.L., Parker, A.D., Warwick, P.D., Drake II, R.M., and McCray, J.E., 2016, Determining CO2 storage potential during miscible CO2 enhanced oil recovery: Noble gas and stable isotope tracers: International Journal of Greenhouse Gas Control, v. 51, p. 239–253.

SLB (Colorado State Land Board), 2024a, Annual report fiscal year 2023-2024: State Land Board, 15 p., https://slb.colorado.gov/reports.

SLB, 2024b, Income and inventory report, fiscal year 2023-24, annual review of income generated by State Trust lands, Colorado State Board of Land Commissioners: Colorado State Land Board, 22 p, https://slb.colorado.gov/reports.

Smith, M.E., Carroll, A.R., and Singer, B.S., 2008, Synoptic reconstruction of a major ancient lake system—Eocene Green River Formation, western United States: Geological Society of America Bulletin v. 120, nos. 1-2, p. 54–84, https://pubs.geoscienceworld.org/gsa/gsabulletin/article/120/1-2/54/125468/Synoptic-reconstruction-of-a-major-ancient-lake.

Sonnenberg, S.A., 2016, Stratigraphic architecture of the Niobrara Formation, Wattenberg Field Area, Colorado: SPE/AAPG/SEG Unconventional Resources Technology Conference, San Antonio, Texas, paper number

URTEC-2435024_MS, 15 p., https://onepetro.org/URTECONF/proceedings/16URTC/All-16URTC/URTEC-2435024-MS/152101.

SSR Mining, Inc., 2025, SSR mining reports second quarter 2025 results: SSR Mining, 5 August 2025, https://ir.ssrmining.com/investors/news/default.aspx.

Thor Energy PLC, 2025, Uranium-vanadium projects: https://thorenergyplc.com/projects/uranium-vanadium-projects-usa/.

U.S. Congress, 2024, H.R.1042 - Prohibiting Russian Uranium Imports Act,: https://www.congress.gov/bill/118th-congress/house-bill/1042.

United Lithium, 2025, Patriot project: https://unitedlithium.com//colorado-usa/.

United Power, 2025, United Power celebrates Mountain Peak Power Plant at ribbon cutting: United Power, 27 August 2025, https://www.unitedpower.com/united-power-celebrates-mountain-peak-power-plant-ribbon-cutting.

USDR (U.S. Department of Revenue), 2025, Natural resources revenue data: U.S. Department of the Interior, U.S. Department of Revenue, accessed June 2025, https://revenuedata.doi.gov/.

USGS (U.S. Geological Survey), 2009, Nahcolite resources in the Green River Formation, Piceance Basin, Northwestern Colorado: U.S. Geological Survey, Oil Shale Assessment Project Fact Sheet 2009-3011, March 2009, https://pubs.usgs.gov/fs/2009/3011/pdf/FS09-3011.pdf.

USGS, 2013, In-place oil shale resources examined by grade in the major basins of the Green River Formation, Colorado, Utah, and Wyoming: U.S. Geological Survey Fact Sheet 2012-345, January 2013, 3 p., https://pubs.usgs.gov/fs/2012/3145/FS12-3145.pdf.

USGS, 2024, Airborne Magnetic and Radiometric Survey, Colorado Mineral Belt, Southwest Block, 2023: U.S. Geological Survey data release, https://doi.org/10.5066/P1F3EHPN.

USGS, 2025a, Mineral commodity summaries 2025: U.S. Geological Survey, 212 p., https://pubs.usgs.gov/publication/mcs2025.

USGS, 2025b, Interior department releases final 2025 list of critical minerals: https://www.usgs.gov/news/science-snippet/interior-department-releases-final-2025-list-critical-minerals.

USGS, 2025c, Earth MRI acquisitions viewer: U.S. Geological Survey, https://ngmdb.usgs.gov/emri/#6.25/38.524/-105.81.

USGS, 2025d, Airborne magnetic and radiometric survey, Colorado Mineral Belt, mid-block: U.S. Geological Survey data release, 29 January 2025, White House, 2020, Energy Act of 2020: The White House, https://www.sciencebase.gov/catalog/item/67368344d34e282e7505bcb1.

USGS, 2025e, Airborne magnetic and radiometric survey, Sierra Madre-Elkhead Mountains-Medicine Bow Mountains region, Wyoming and Colorado: U.S. Geological Survey data release, 26 August 2025, https://www.sciencebase.gov/catalog/item/67f8dcafd4be024f83032201.

USGS, 2025f, Crushed stone and sand and gravel in the third quarter 2025: U.S. Geological Survey, 7 p., https://www.usgs.gov/centers/national-minerals-information-center/crushed-stone-statistics-and-information.

USGS, 2025g, Clays statistics and information: U.S. Geological Survey, https://www.usgs.gov/centers/national-minerals-information-center/clays-statistics-and-information.

Viscount Mining Corporation, 2025, Silver Cliff: https://viscountmining.com/projects/silver-cliff/.

Western (Western Uranium & Vanadium Corporation), 2025a, 2025 Mid-Year Update: dated 15 August 2025, https://western-uranium.com/newsreleases.html.

Western, 2025b, Uranium and vanadium: https://western-uranium.com/mines-projects.html. White House, 2020, Energy Act of 2020: The White House, https://science.house.gov/2020/12/energy-act-of-2020.

White House, 2022, Fact sheet, United States bans imports of Russian oil, liquified natural gas, and coal: 8 March 2022, https://bidenwhitehouse.archives.gov/briefing-room/statements-releases/2022/03/08/fact-sheet-united-states-bans-imports-of-russian-oil-liquefied-natural-gas-and-coal/.

White House, 2025a, Reinvigorating America's beautiful clean coal industry and amending Executive Order 14241: The White House Presidential Actions, 8 April 2025, https://www.whitehouse.gov/presidential-actions/2025/04/reinvigorating-americas-beautiful-clean-coal-industry-and-amending-executive-order-14241/.

White House, 2025b, Immediate measures to increase American mineral production: The White House Presidential Actions, 20 March 2025, https://www.whitehouse.gov/presidential-actions/2025/03/immediate-measures-to-increase-american-mineral-production/.

Xcel (Xcel Energy), 2022, 2021 Clean energy plan, transitioning out of coal responsibly information sheet: Xcel Energy, https://www.xcelenergy.com/staticfiles/xe-responsive/Environment/Responsible-Coal-Transition-info-sheet.pdf.

Zephyr Minerals, 2025, Dawson gold property: https://www.zephyrminerals.com/.

Zou, C., 2017, Unconventional petroleum geology: 2nd Edition, Petroleum Industry Press, Elsevier Inc., 500 p.