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IRON IMPACT

How Iron Forged Utah's Iron County

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Special Report

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Since 1945, leaders, legislators, and community members have relied upon the **illuminating, independent, and nonpartisan public-policy research** produced by the Utah Foundation to support informed decision-making on topics that matter most. As a 501(c)3 with broad community support and a 60-member board, the Utah Foundation exists to empower **civic engagement as the foundation for enhanced quality of life for Utahns.**

INTRODUCTION

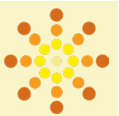
Iron extraction is a core part of the history of Iron County. That said, the county's iron extraction industry has seen booms and busts, which are characteristic of most extraction industries.

Utah Iron, LLC, currently produces iron concentrates. These iron concentrates are exported to China. Utah Iron's "Clean Iron Project" looks to process iron concentrates into metallic iron pellets – a more widely marketable product. This will create more jobs for Iron County, which has greatly diversified since the 1960s when the iron extraction industry was the community's largest industry, employer, and taxpayer.

This report highlights the historical background of iron extraction in Iron County. It places these operations within the national industry context and provides background for the Clean Iron Project.



Columbia Steel Company in Ironton, Utah, 1942.



KEY FINDINGS OF THIS REPORT

- While the influence of the iron extraction industry has waxed and waned over the years, it was essential to Iron County's founding and post-war economic expansion. Iron extraction now plays an important role in a diversified economy.
- Since 2010, more than 99% of the iron mined in the United States has come from the Iron Range in Michigan and Minnesota. Utah is the only other state that has produced more than token amounts over the same period.
- Iron extraction in Utah is susceptible to global economic conditions. Global iron prices and trade conditions can make or break Utah's local iron extraction industry.



Remains of the “Iron Mission” to Southern Utah in the 1850s and 1860s.

HISTORICAL IRON EXTRACTION IN IRON COUNTY

Iron County was part of the Old Spanish Trail in the 1830s which connected Santa Fe, New Mexico to southern California. Early Utah pioneers relied on trade from southern California and ran annual expeditions from 1847 to 1851. Journals of one of these expeditioners’ assistants was the first to mention the area’s potential in writing, noting its “immense quantities of rich iron ore.”¹

In 1849, Brigham Young and the provincial legislature commissioned an expedition to determine whether the area would support a colony. Iron was in short supply in the newly settled Salt Lake County and considered essential for self-sufficiency. The expedition returned confirming the rich iron ore deposits and a report of a “Little Salt Lake Valley” (named for a small seasonal lake of brackish water) that could support between 50,000 and 100,000 inhabitants. Little Salt Lake County was among the first six counties to be established, and Iron County was renamed within a year in recognition of the reserves of vital material.²

1 Seegmiller, Janet Burton, *A History of Iron County; Community Above Self* (Salt Lake: Utah State Historical Society, 1998).

2 Ibid.

Brigham Young organized a colony in Iron County in 1850. When enough volunteers did not respond, he formed an “Iron Mission” where men and their families were requested to spend 12 months establishing a community and developing the iron extraction industry. The first iron was produced in 1852. However, there were troubles with weather, crop shortages, and an inexperienced industry with limited output. The mission was terminated, and iron works were shut down in 1858 when the arrival of the U.S. Army as part of the Utah War in the Salt Lake Valley brought an influx of iron to the community.³

The iron extraction industry picked up a second time in 1868. While the mining process was much more successful, no foundry was interested in purchasing the iron produced. Accordingly, production ended in 1871. For several decades, further development of the industry was hindered by the legal contesting of mining claims and complications of the 1872 federal mining law changes.⁴

In 1923 and 1924, iron extraction began in earnest. A company known as Columbia Steel Industry became interested in Utah because of the proximity of coal and iron deposits. It was also the year that the railroad to the Cedar City area was finally completed. In many ways, the iron extraction industry supported the economy and growth of Iron County in the last half of the 1920s when the area’s agricultural industries experienced difficulties. Over the next 13 years, 2.4 million tons of iron ore was exported from the county.⁵

3 Seegmiller, Janet Burton, *A History of Iron County; Community Above Self* (Salt Lake: Utah State Historical Society, 1998).

4 Ibid.

5 Ibid.



Old Iron mining equipment in Iron county.

‘Fabricated’ by Flickr user arbyreed under CC2.0-BY-NC-SA



Columbia Steel Company in Ironton, Utah, 1942.

Leading up to World War II, the U.S. selected Orem, Utah, as the optimal place for an inland steel mill due to its proximity to coal and iron deposits, good transportation facilities, and equidistance from naval facilities. The Orem facilities required four times the iron demanded by the previous plant. As a result, from 1940 to 1944, the number of Iron County's mine workers increased from 21 to over 300.⁶

Post-war, the federal government stopped production. However, the purchase of the Geneva plant in Orem by U.S. Steel and the plant's conversion to peacetime operations allowed for continued iron extraction industry in Iron County. Geneva produced over 17 million net tons of iron ore in the 1940s, while producing nearly 42 million tons in the 1950s. By the next decade, U.S. Steel cut its mining operations in Iron County in half after Utah legislation increased taxes on the iron it mined from the state, shipping in iron from Wyoming instead. During the '60s and '70s, iron extraction played an essential but somewhat reduced role in the economy but was still the primary industry, major employer, and significant taxpayer.

⁶ Seegmiller, Janet Burton, *A History of Iron County; Community Above Self* (Salt Lake: Utah State Historical Society, 1998).

However, complications in complying with the Environmental Protection Agency resulted in a temporary closure of the Geneva plant in 1979 and again in 1980. By 1984, the iron extraction industry appeared dead due to increased operating costs, complex labor contract negotiations, and the Geneva plant complications.

The Geneva plant reopened from 1987 to 1995. Still, Iron County mines only reported providing a fraction of iron compared to its peak production (under half a million tons annually or just 12% of the nearly four million tons produced annual during the 1950s).⁷ Much of this iron may have been from stockpiles rather than freshly mined material.⁸

The iron extraction industry was dormant for most of the 2000s but restarted at the end of 2009. From 2009 to 2014, almost a million tons were mined annually – about a quarter of the peak 1950s production. However, economic fluctuations and falling iron prices in 2014 ended such developments.⁹

7 UtahRails.net, 2021, "Utah's iron ore industry," <https://utahrails.net/mining/iron-mountain.php>; Utah State Geological Survey, 2024, "Table 8.1: Production of metals in Utah 1865-2022," Utah Geological Survey, <https://geology.utah.gov/energy-minerals/info/energy-mineral-statistics/#toggle-id-8>. Utah Foundation calculations.

8 Seegmiller, op. cit.

9 UtahRails.net, 2021, "Utah's iron ore industry," <https://utahrails.net/mining/iron-mountain.php>.



The Iron Process

Mining and Extraction

Iron ore is extracted through surface mining or underground mining. Surface mining tends to be more common and cost-effective.¹ Iron extraction generally involves removing the overlying soil and rock to expose the iron ore deposits. Once the iron ore is exposed, it is blasted or mechanically broken down into smaller pieces for easier transportation and processing. Blasting involves drilling holes into the iron ore deposit and filling them with explosives. When the explosives are detonated, the force of the explosion fractures the iron ore into smaller pieces, making it easier to extract and transport. Mechanical breaking involves using heavy machinery to break the iron ore into smaller pieces.²

Milling

The extracted iron ore is then transported to a processing plant, undergoing several stages to produce usable iron. The first step in the processing plant is crushing, where the larger lumps of iron ore are reduced to smaller sizes to make it easier to process. This is often done through mills. A ball mill tumbles the extracted iron with large steel balls to break down the iron ore and other materials, while in a semi-autogenous grinding mill, grinding is done by large pieces of the ore itself.³

Concentration

The crushed iron ore is then separated from unwanted materials, such as rocks and other minerals, through a process called concentration. This is typically done using techniques such as magnetic separation or froth flotation. The magnetic separation process can remove magnetic iron from non-magnetic minerals such as quartz, feldspar, and mica.⁴ The froth flotation separation method involves using a chemical to make the targeted materials adhere to air bubbles in a foam. The foam can then be scraped off the surface for further processing while the remaining particles settle to the bottom and are discarded.⁵

Agglomeration (Pelletizing)

Agglomeration is the process when crushed iron particles are collected into larger units. After being concentrated, the small iron particles are formed into marble-sized ½ inch balls using a binding agent in a rotating drum. These are then roasted to complete the pelletizing process.⁶

Reduction

The iron pellets are not pure iron but iron oxide – a compound of iron and oxygen. The pellets are put through a reduction process to remove the oxygen and create pure iron. Either coal or natural gas can be used. Natural gas is broken into carbon monoxide and hydrogen. The carbon monoxide and hydrogen then react with the oxygen in the iron oxide, creating carbon dioxide and water, leaving the iron in a metallic state. This iron can then be used to make wrought iron or steel.⁷

1 Encyclopaedia Britannica, Inc. 2022, "Iron processing," Encyclopaedia Britannica, Inc. <https://www.britannica.com/technology/iron-processing>.

2 Encyclopaedia Britannica, Inc. 2022, "Blasting," Encyclopaedia Britannica, Inc. <https://www.britannica.com/technology/blasting>.

3 Carter, Russell, A, 2014, "Mining the Iron Mountain," Engineering and Mining Journal, <https://www.e-mj.com/features/mining-the-iron-mountain/>; Kintek Solution, 2024, "What is the difference between a ball mill and a SAG mill?" <https://kindle-tech.com/faqs/what-is-the-difference-between-a-ball-mill-and-a-sag-mill>.

4 U.S. Department of Energy, 2013, "Energy and environmental profile of the U.S. mining industry: Iron" U.S. Department of Energy, <https://www.energy.gov/sites/prod/files/2013/11/f4/iron.pdf>.

5 Ibid.

6 Ibid.

7 Gosh, Amanda Mohan, N Vasudevan, and Sachin Kumar, 2021, "Compendium: Energy-efficient technology options for Direct Reduction of Iron process (sponge iron plants). New Delhi: The Energy and Resources Institute, <https://www.teriin.org/sites/default/files/2021-08/Direct%20Reduction%20of%20Iron%20Process.pdf>.



Iron Ore Docks, Two Harbors, Minnesota on Lake Superior North Shore.

HOW UTAH FITS IN THE NATIONAL IRON EXTRACTION INDUSTRY

Recent Production

Between 2010 and 2021, over 99% of the iron ore mined in the United States came from an area near Lake Superior known as the Iron Ranges.¹⁰ Utah's Iron Mountains in Iron County contributed 0.4% of the iron ore extracted during this time given that the mines have not always been active.¹¹ During the years of activity from 2012 to 2014, Iron County produced 1% to 2% of the nation's iron production.¹²

Iron production in the United States peaked during Utah's production from 2011 to 2014.¹³ This is possibly because iron prices were also peaking – both in the domestic market and the international market.¹⁴

¹⁰ United States Geological Survey, Table 2 from the Mineral Yearbooks for Iron Ore from 2021-2010. These yearbooks and associated data tables can be found at <https://www.usgs.gov/centers/national-minerals-information-center/iron-ore-statistics-and-information>.

¹¹ Ibid.

¹² Ibid.

¹³ United States Geological Survey, Table 1 from the Mineral Yearbooks for Iron Ore from 2021-2010. These yearbooks and associated data tables can be found at <https://www.usgs.gov/centers/national-minerals-information-center/iron-ore-statistics-and-information>.

¹⁴ Ibid.

However, from 2013 to 2016, the price of iron on the export market fell by more than half, from \$135 to \$62 per ton.¹⁵ Some claim these falling prices were responsible for the closing of iron mining operations in the mid-teens.¹⁶ Iron extraction levels also fell over the same period, although to a more minor degree.¹⁷ Data at the national level are only available until 2021. However, Utah's state geological services' annual report notes that Utah's iron mines restarted at the end of 2020 and had significant production in 2021 and 2023.¹⁸

Utah Iron, LLC, successfully began operations in 2020. Although data are somewhat limited, it appears that iron is being extracted at roughly the same levels as in the twenty-teens – about a million tons per year.¹⁹

15 United States Geological Survey, Table 1 from the Mineral Yearbooks for Iron Ore from 2021-2010. Utah Foundation Calculations. These yearbooks and associated data tables can be found at <https://www.usgs.gov/centers/national-minerals-information-center/iron-ore-statistics-and-information>.

16 Ibid.

17 Rupke, Andrew, Stephanie E. Mills, Michael D. Vanden Berg, and Taylor Boden, 2023, "Utah mining 2022: metals, industrial minerals, uranium, coal, and unconventional fuels," Utah Geological Survey, page 8-9.

18 Annual reports submitted by Utah Iron to the Department of Natural Resources – Division of Oil, Gas and Mining. See <https://ut-dnr-ogm-prod-sf-public-bucket.s3.amazonaws.com/5633102.pdf>, <https://ut-dnr-ogm-prod-sf-public-bucket.s3.amazonaws.com/5625457.pdf>, and https://ut-dnr-ogm-prod-sf-public-bucket.s3.amazonaws.com/a0B8z000000iJmGEAU_1720794064792_M0210008.pdf.

19 Ibid.



Magnetite skarn from Iron Mountain, Utah. by Flickr user 'James St. John' under CC-BY 2.0

Employment

The mines in the Lake Superior region have employed an average of 4,900 individuals from 2010 to 2022. Utah Iron reported employing 135 miners. This would represent just 2.8% of the national iron extraction workforce.²⁰ There are no other substantial iron mining operations in Utah.

Exports

On average, almost 90% of the iron exported by mass from the United States between 2010 and 2021 was iron pellets.²¹ Six percent of exports have been iron concentrates, which Utah Iron exports. However, 2021 represented a high-water mark for iron concentrate exports – hitting 12% of iron exports by mass.²² Although exports are not broken out by state, the timing of the increase in iron concentrate exports parallels Utah Iron restarting its operations in late 2020 and early 2021.

On average, 72% of the iron exported by mass from 2010 to 2021 from the United States was to Canada.²³ Nine percent went to Japan, and eight percent to China – the current buyer of most of Utah’s iron concentrates. Other countries to which the United States has exported at least a million tons between 2010 and 2021 include Mexico, Brazil, and Slovakia.

CONCLUSION

The history of iron extraction in Iron County, Utah, reflects a cyclical pattern of industrial activity, influenced primarily by fluctuations in iron prices, the demand for steel, and regulatory considerations. Historical production levels, peaking in the 1950s and experiencing subsequent declines, demonstrate a complex relationship between local economic opportunities and broader national market demands. Similarly, current operations, are subject to national and international economic and trade pressures. These activities represent a sustained, though relatively small, contribution to U.S. iron pellet production, primarily directed towards export markets. Utah Iron’s “Clean Iron Project” enters a context of established industrial heritage and ongoing market dynamics.

20 United States Geological Survey, Table 2 from the Mineral Yearbooks for Iron Ore from 2021-2010. These yearbooks and associated data tables can be found at <https://www.usgs.gov/centers/national-minerals-information-center/iron-ore-statistics-and-information>.

21 United States Geological Survey, Table 5 from the Mineral Yearbooks for Iron Ore from 2021-2010. Utah Foundation Calculations. These yearbooks and associated data tables can be found at <https://www.usgs.gov/centers/national-minerals-information-center/iron-ore-statistics-and-information>.

22 Ibid.

23 United States Geological Survey, Table 5 from the Mineral Yearbooks for Iron Ore from 2021-2010. Utah Foundation Calculations. These yearbooks and associated data tables can be found at <https://www.usgs.gov/centers/national-minerals-information-center/iron-ore-statistics-and-information>.



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