Iron Ore Deposits of the Western U.S.

A high level review of iron ore potential in the western U.S., excluding Alaska.

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Why Iron Ore?

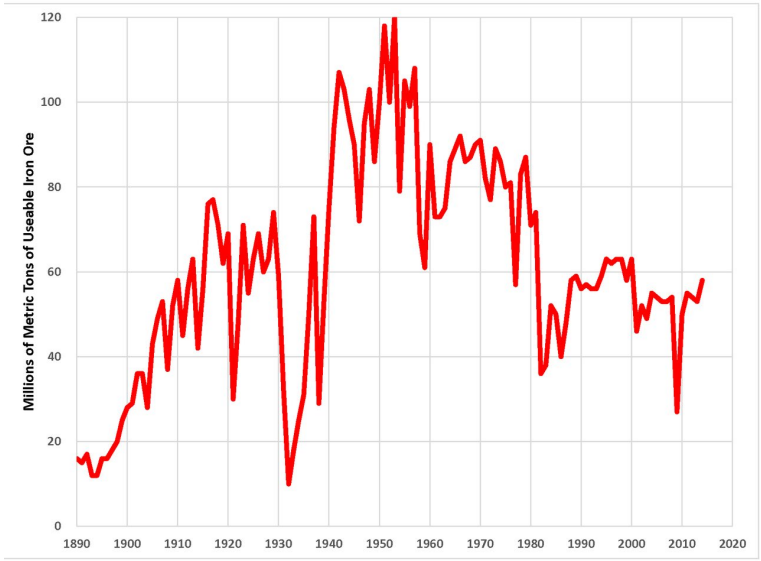
- Global Iron ore market to reach 2.7 Gt by 2026
  - Projected annualized growth 3-4%
- Primary steel ingredient (95% Fe in steel)
- U.S. accounts for 1.5% of global demand but domestic sources of raw materials are in the spotlight
- Demand expected to grow, dominated by Chinese smelter consumption but multiple niche markets for various steel products
- Big Players:
  - Asia consumes 1.74 Gta
  - Australia produces 900 Mta
  - Australia “reserves” estimated at 50+ Gt


NUCOR Steel Utah


Evraz Oregeon Steel Mill

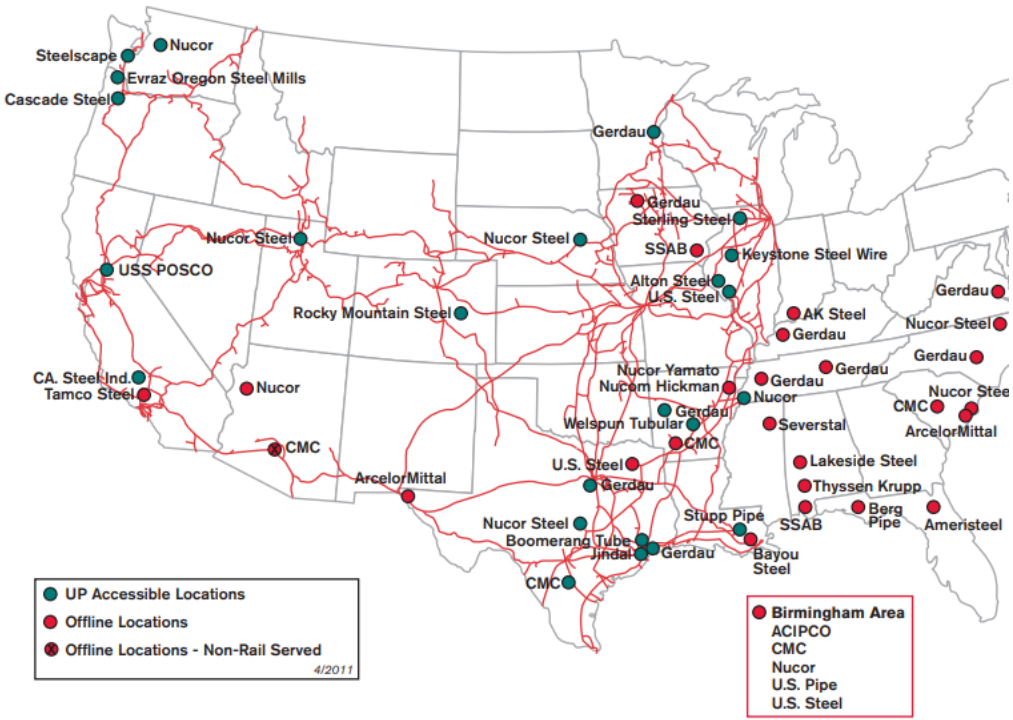
U.S. iron mining

- Dominated by the Great Lakes Region since the late 1800s
- Mesabi Range of Minnesota has produced over 75% of U.S. iron ore
- U.S. market dominance peaked in ~ 1945
- Large, long-life, open pit, low-cost producers in Minnesota & Michigan
- Western U.S. producers largely peaked in 1950-60s
- Opportunities for polymetallic production due to skarn/IOCG type deposits



Western U.S. Markets

- Domestic steel mills - opportunities for locally sourced material.
- Competition with high quality imports
- Iron not on Federal register for critical minerals but many secondary metals:
  - Cobalt, manganese, titanium, vanadium…



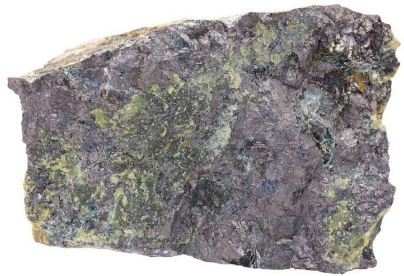
Favorable Iron Ore Geology

Banded Iron Formation (BIF)

- Archean or Proterozoic
- Larger, stratigraphic
- Sedimentary origin, typically minor deleterious mat'ls
- Mesabi, Labrador Trough, etc

Skarn/Iron-Ore-Cu-Au (IOCG)

- Metasomatic replacement
- Smaller, higher grade
- Hydrothermal in origin, assoc with other metal deposits, often higher impurities (polymetallic)
- Kiruna, Olympic Dam, Pumpkin Hollow, China



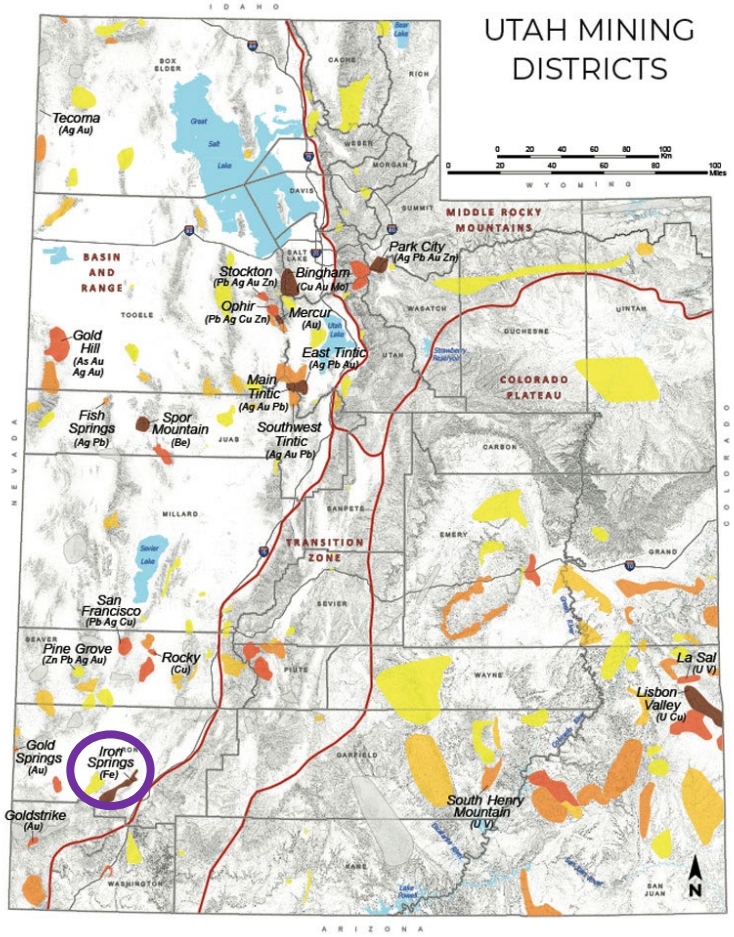
Opportunities in Western U.S.?

- Utah Iron, LLC currently mining at Iron Mountain, UT producing concentrate exported to East Asia from Los Angeles.
- Historic appreciable production in WY, CA, NV, and UT.
- WWII boom for domestic iron sources (USBM)
- Most sources gossan/skarn related to base metals = high impurities
- Multiple historic pits with remaining mineralization

Iron Mountain Project, Cedar City, UT circa 2012

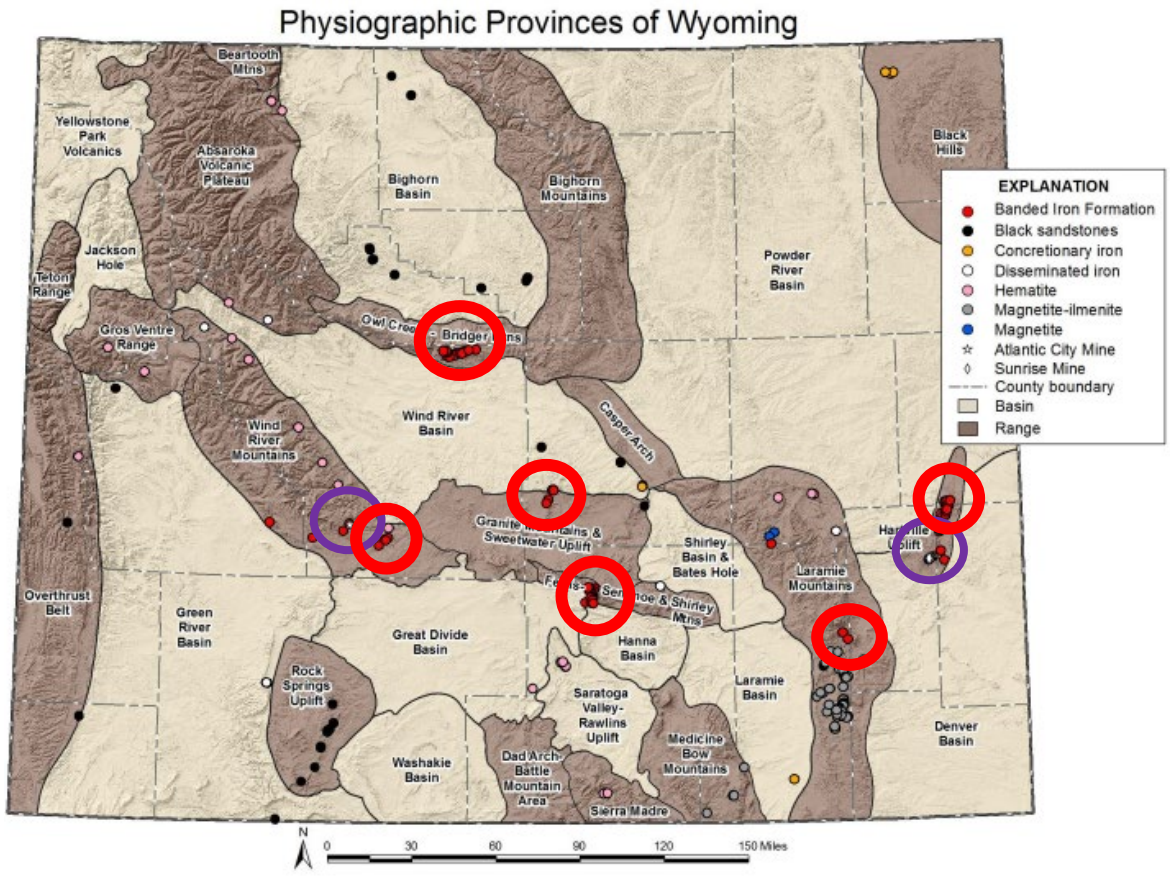
Utah

- Iron Mountain/Iron Springs
  - Comstock-Mountain Lion iron deposit
  - skarn (hematite + magnetite)
  - 1923-present
  - Utah Iron LLC
  - **~ 40 Mt @ 45% Fe** (circa 2009)
- Multiple smaller gossan-related iron deposits
  - Typically associated with base metals
  - Small tonnage, high impurities



Wyoming

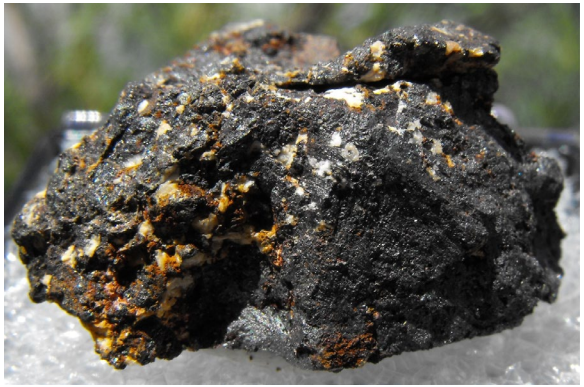
- 132 Mt produced
- Atlantic City Mine/Hartville District
  - BIF/taconite
  - 1962-1983
  - ~ 100 Mt @ 34% Fe (magnetite)
- Sunrise Mine
  - Schist-replacement (skarn/IOCG)
  - 1898 – 1980
  - ~ 20 Mt @ 55% Fe (hematite)



Sutherland and Cola, Iron Resources in Wyoming, WGSG Report No. 67, 2015

Nevada

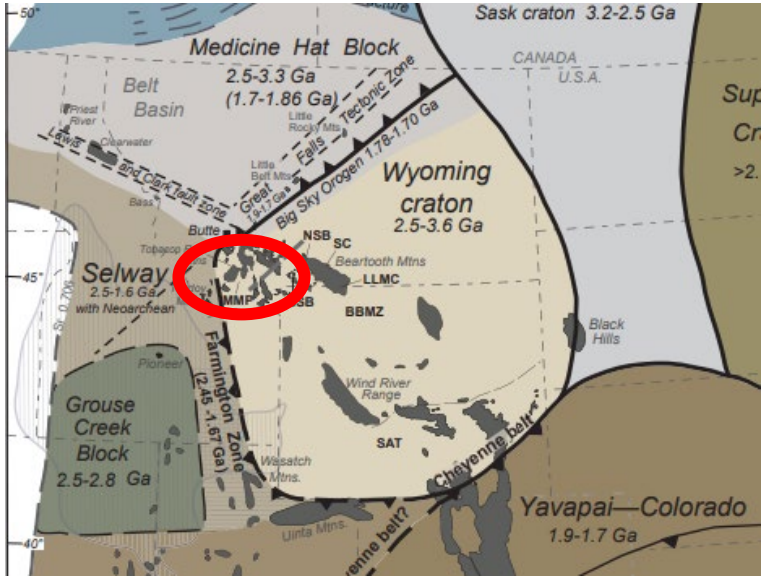
- Buena Vista Iron Mine
  - Started in 1880, feed steel mills in CA and exports to Asia
  - Skarn/IOCG
  - Mineral Reserves (NI 43-101) **111.2 Mt @ 18.6% Fe**
- Multiple smaller mines exported to Japan steel smelters in 1950s
  - Many rich in V and Ti
- Nevada Copper
  - Significant magnetite mineralization
  - Mineral Resources (NI 43-101) **M&I 9.6 Mt @ 17.8% Fe**



- Dayton, Lyon, Segerstrom-Heizer, Thomas, Cortez Iron prospects

Montana

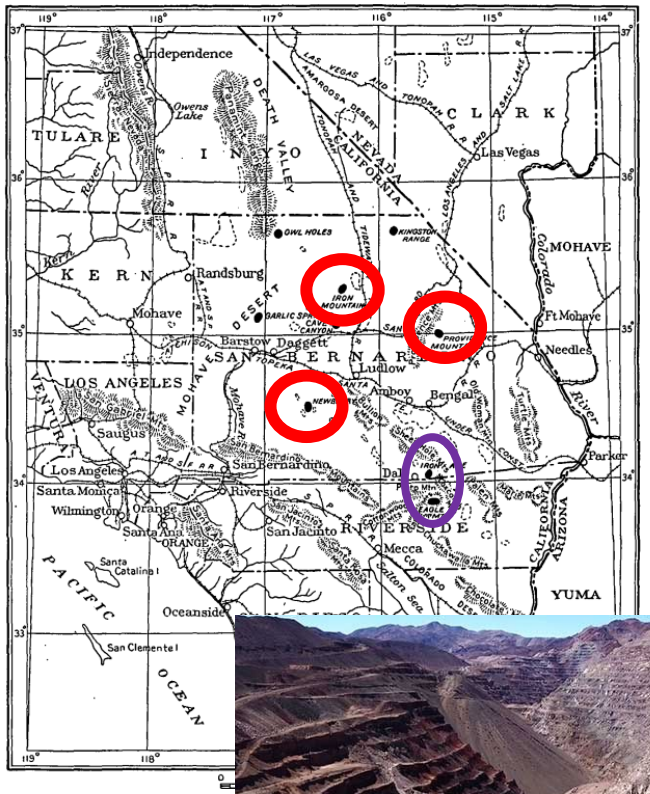
- Multiple small skarn deposits throughout state
  - Stafford Deposits
- BIF in Southwestern Montana
  - 20 – 33% Fe
  - Ruby, Tobacco Root, Gravelly, and Madison Ranges.
  - Carter Creek deposit (Ruby Range) est. **95 Mt @ 28% Fe**
  - Kelly Iron deposit (NE Ruby Range) est **15 Mt @ 33% Fe**

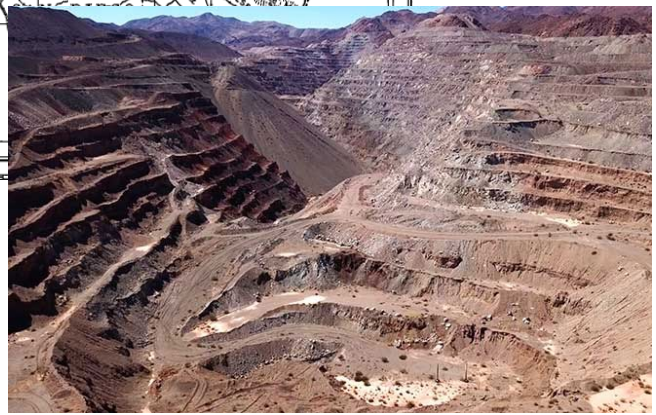


- BIF in the Tobacco Root mtns experienced higher grade metamorphism, akin to “taconite” of Mesabi and Labrador Trough areas.
- Volumes considered small.

California

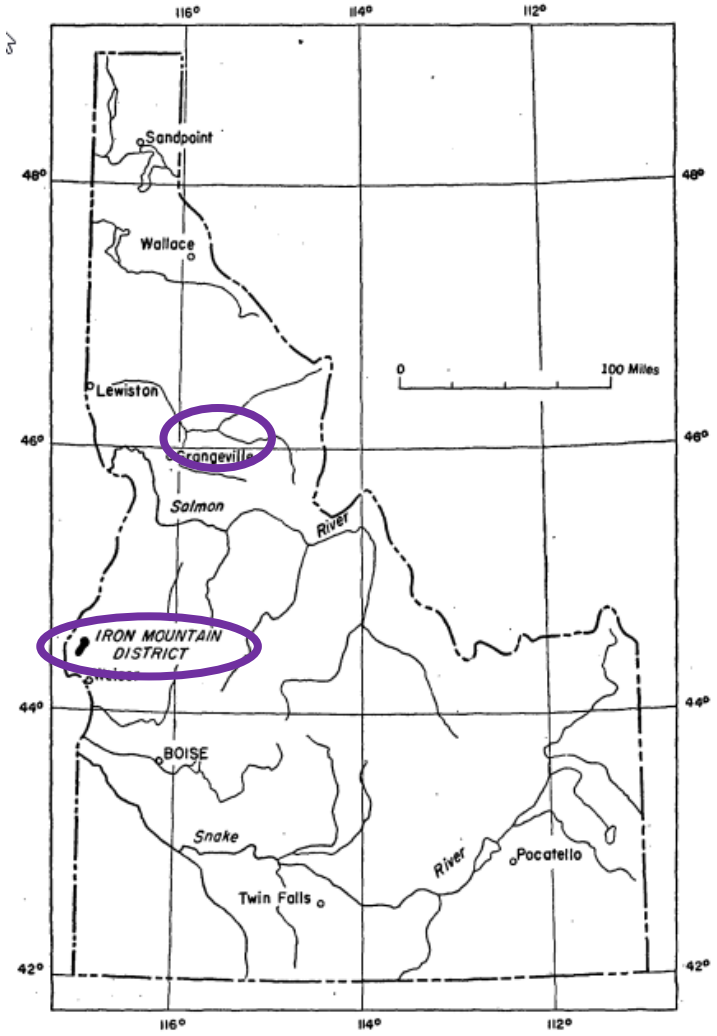
- Eagle Mountain Mine
  - 120 Mt produced
  - 1948-1982
  - Skarn/IOCG (pyrite contains ~3% Co)
  - Targeted for LA County landfill
  - Ghost town community
  - 11 km strike length
- Iron Age Mine
- Vulcan Mine (Mojave Nat Preserve)
- Most supplied the Kaiser Steel Works in Fontana, CA





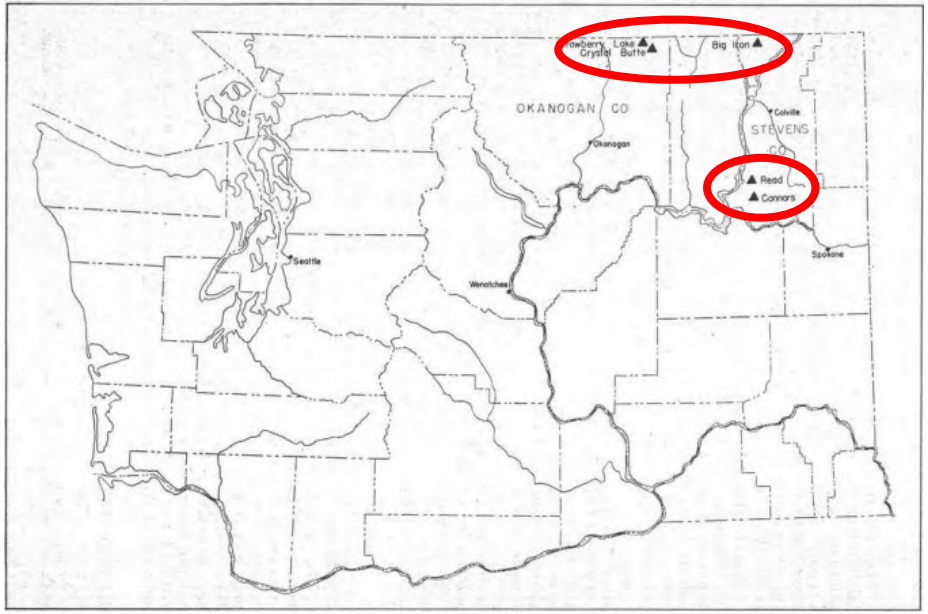
Idaho

- Minimal potential in State
- Skarn/IOCG
  - High grades, small tonnages, vein or lenses
  - Potential for high impurities.
- Iron Mountain District, Washington Co.
- Clearwater District, Idaho County
  - High grade skarns



Washington

- Minimal potential in State
- Magnetite prospects in Stevens and Okanogan Cos.
- Skarn deposits related to larger mineralized belts
- Limited potential for future production



Summary

- Opportunities exist for Western U.S. iron ore deposits
- Typically smaller, often impure but potential source for domestic steel industry
- Difficult to compete with international and Great Lakes on economics
- Highest potential:
  - Large skarn (UT)
  - Select BIF deposits (WY, MT)
  - Polymetallic deposits also hosting Critical Minerals (Pumpkin Hollow)

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