

The Minnesota Iron Ranges: an Industrial Frontier

Human Geography
Macalester College

Geography of industrialization requires a general systems theory approach.

- Mineral elements
- Resources are cultural achievements
- Supply and demand influenced by changes in technology
- Connections among places of resource development, manufacturing and marketing critical.

Discovery of ore

- Pre-European population exploited copper deposits on South Shore of Lake Superior
- Discovery of iron ranges in Upper Peninsula of Michigan (1844) and Northern Wisconsin lead some to believe ore also could be found in Minnesota
- Gold Rush in 1865-1866 brought a prospector to the area who found Iron in Vermilion range

Discovery of Mesabi Range

- Discovery and development of Vermilion Range brought mining expertise to Northern Minnesota
- Prospecting off the Vermillion was not encouraged
- The Merritt brothers were convinced iron could be found away from Vermillion
- While timber cruising they prospected and discovered the deposits of the Mesabi

Three ranges eventually developed

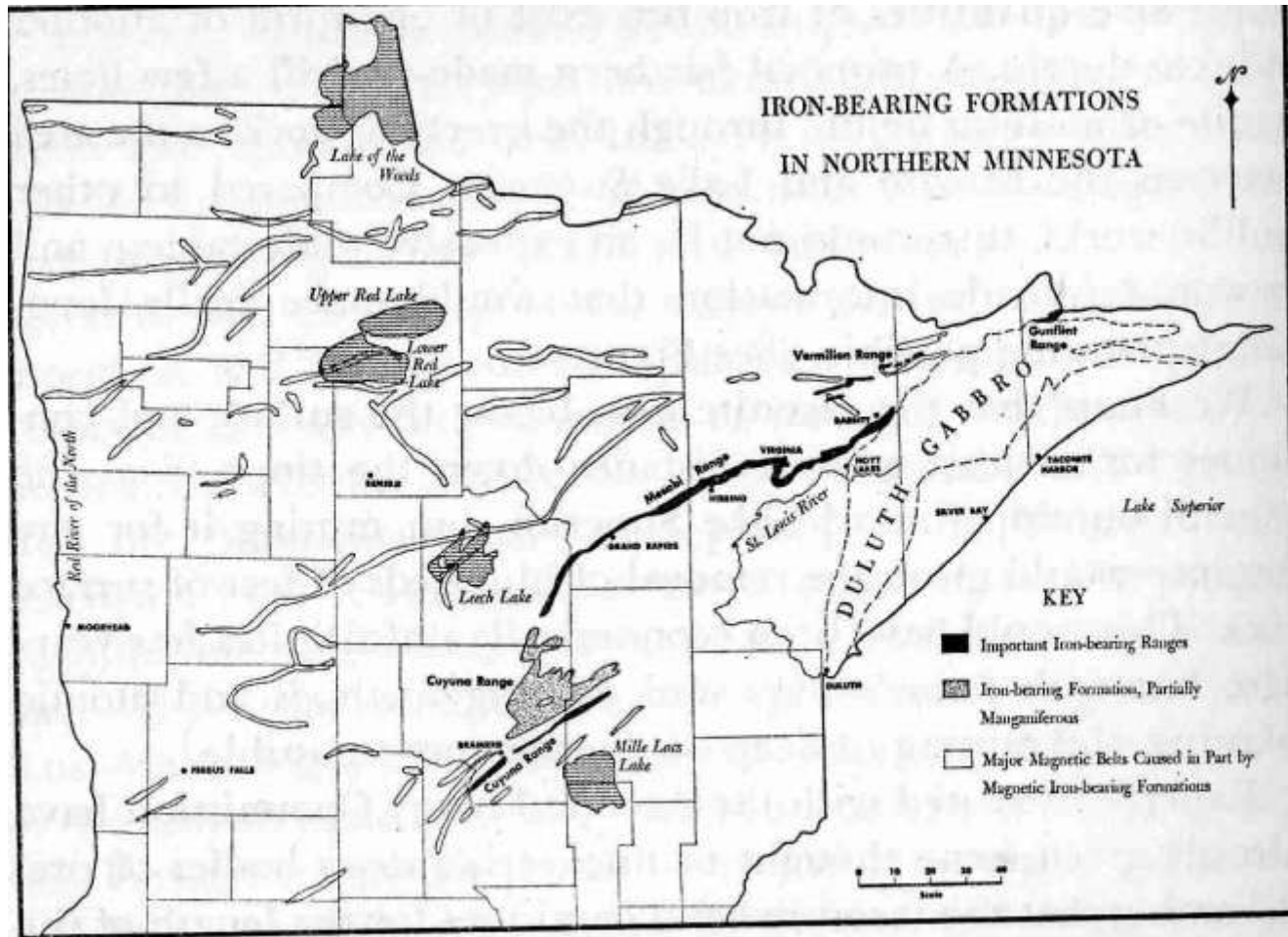


FIGURE 15. Iron-bearing formations in northern Minnesota. Based on information prepared by the Minnesota Geological Survey.

Problems of Development

- How to acquire a sufficient amount of capital to operate the resource system?
- How to get the ore out of the ground economically?
- Should the steel plants be relocated?
- How to ship the ore to the steel plants?
 - Railroad from mines to Ports
 - Great Lakes shipping
- How to get a labor force to frontier?

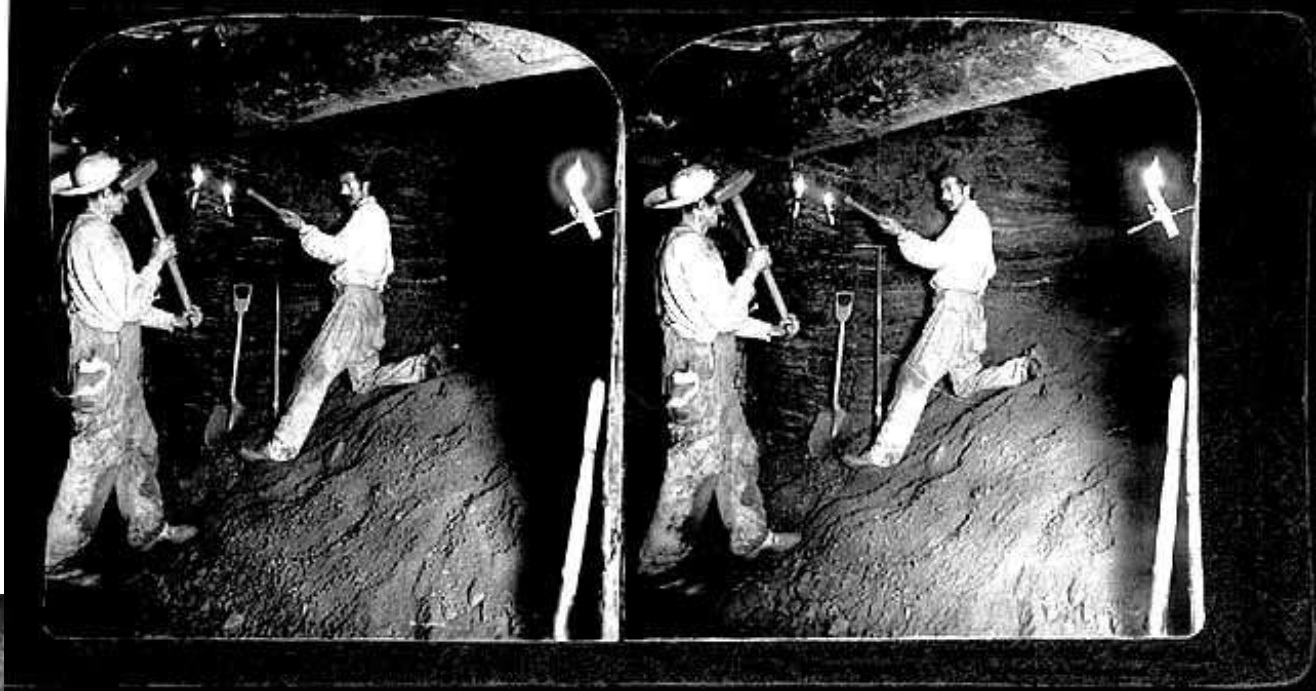
How to acquire a sufficient amount of capital to operate the resource system?

- Boom and Bust pattern of late 19th Century made it difficult to finance the large integrated industrial complex.
- Pioneers were under capitalized and lost control of the ore bodies to eastern capitalists and industrialists.
- Rockefeller and Carnegie eventually took over the Vermillion and Mesabi Ranges during panic of 1893
- Merritt Bros lost control of the Mesabi.
Charlemagne Tower developer of the Vermilion held control of railroad

How to get the ore out of the ground economically?

- The underground mining of the hard rich ores Vermillion range was the result of the transfer of technology developed in Cornwall, Michigan and Wisconsin





The Mesabi's rich and soft ore enabled open pit mining



Geographical issues

- How to get a labor force to frontier?
- Can the steel plants come to the Iron Mines?
- How to ship the ore to the steel plants?
 - Railroad from mines to Ports
 - Great Lakes shipping

No local work force

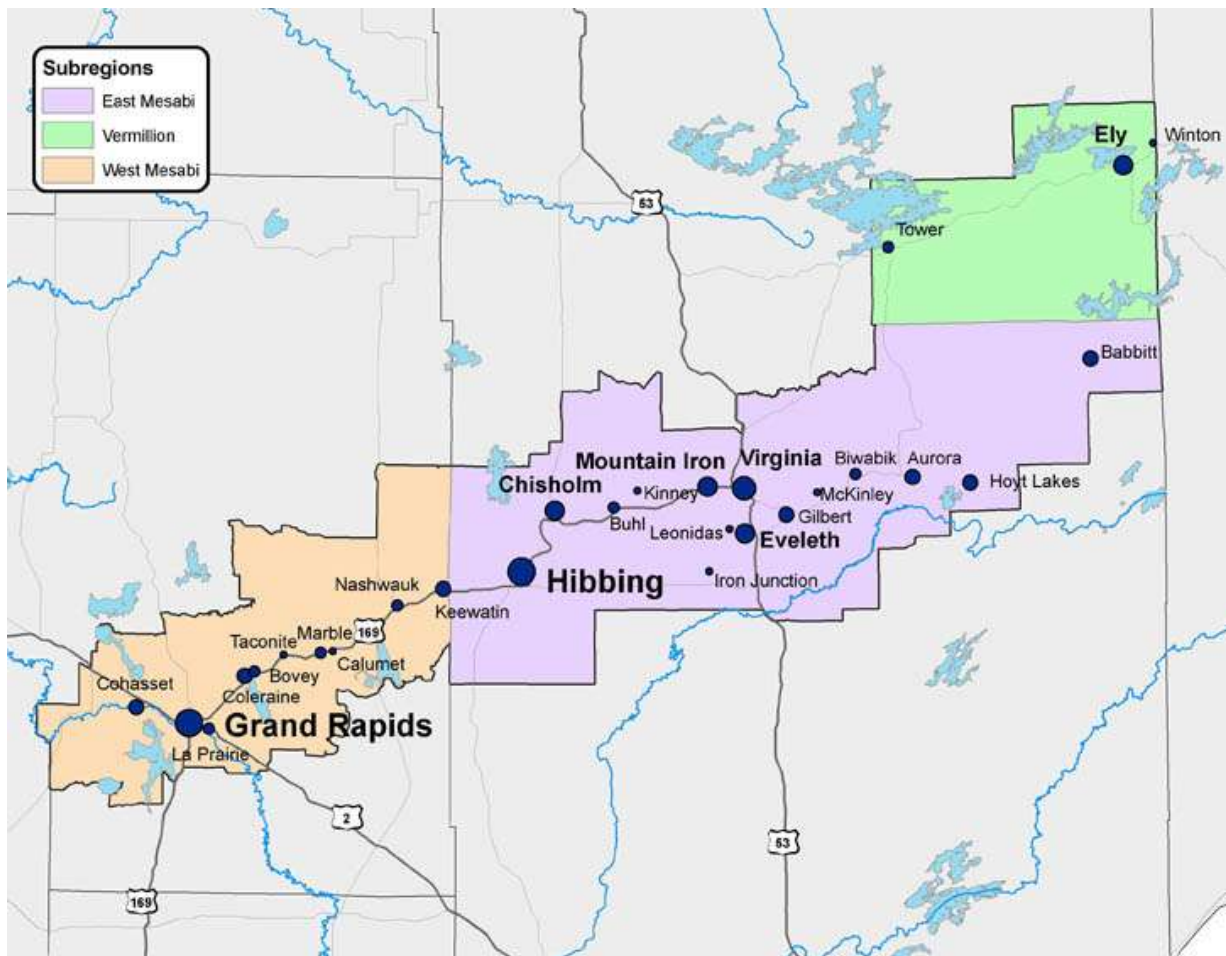
- Skilled miners migrated from other ranges in the Superior region to work the underground mines
 - Cornish
 - Swedish
 - Slovenian

Unskilled labor drawn from immigrant pools in Eastern US and Eastern and Southern Europe

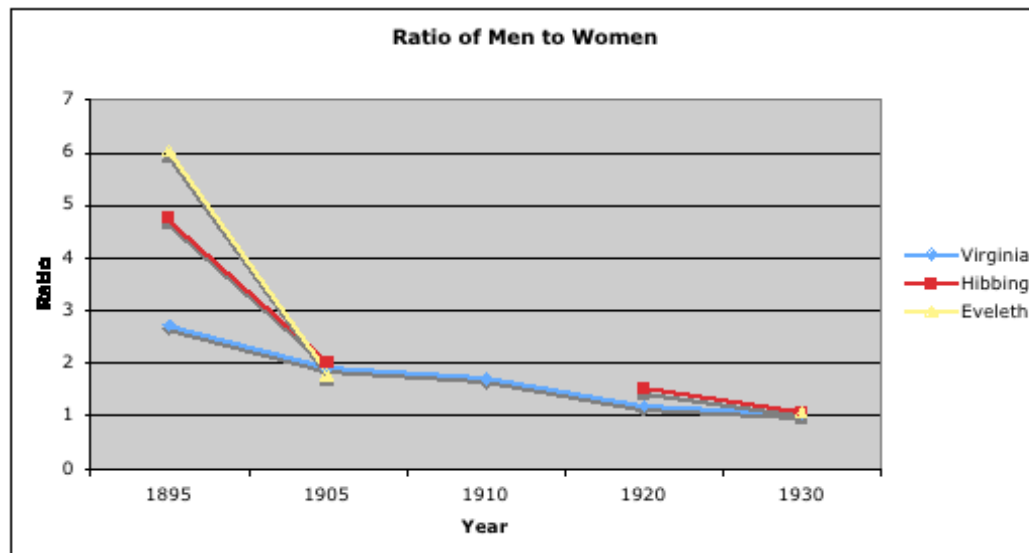
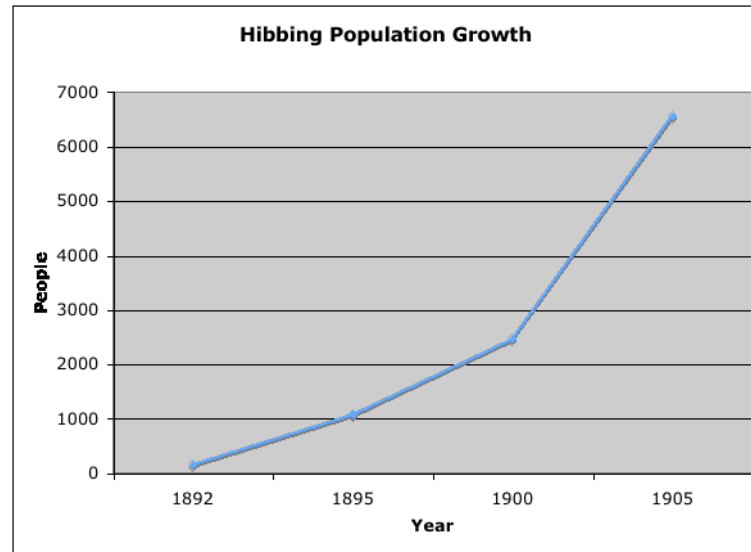
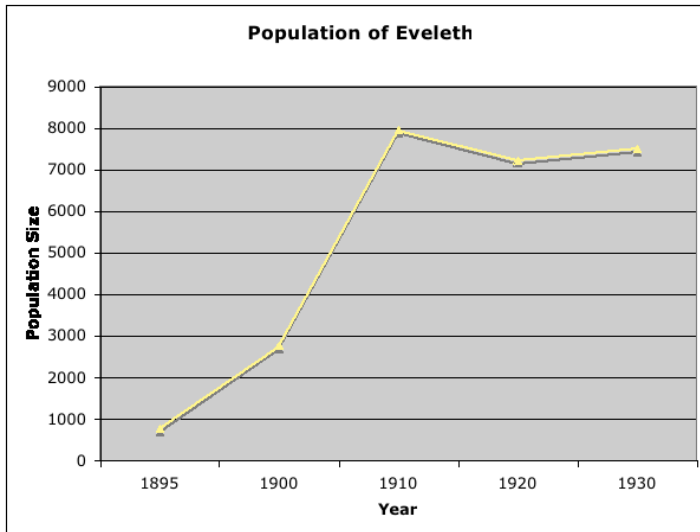
- State Census of 1905 reported
 - people born in Finland, Austria
(Croatian, Slovenians, Serbs and
Montenegrins) Sweden, Canada, Italy
and Norway accounted for 88.5% of
population in 12 towns on Mesabi Range

Ethnic groups had limited impact on landscape





Towns were typical boom towns



Ethnic pattern on Range Differs from state as whole

- Slavic population of state concentrated in Range Towns, Ports and South St Paul
- Small “out-post” populations in rural settlements
 - Slovenes in Stearns County (Central part of state)

South Slavs a general term

Participated in the great wave of immigration
from 1880 to 1914

Early records did not distinguish nationality
just recorded country of origin.

Many listed as Austrian because they came
from the Empire.

All groups listed as Yugoslavs after 1929

THEY CHOSE MINNESOTA



Map 20.1. Yugoslavia and its Historic Components

Slovenes first to come

- Dispute over their origin: direct from old country or from Michigan
- In 1888 Tower's population was 25% Slovenian and 40% in 1909
(800 of the 2000 residents.)
- Ely was 1/3 Slovenian in 1909

Largest concentration of South Slavs on Mesabi Range

- Demand for unskilled workers in open pit mining brought new immigrants from cities in eastern states and abroad
- 1910 13 communities counted 50,000 residents
 - 3600 Slovenes
 - 3410 Croats
 - 2650 Montenegrins
 - 515 Serbs

Oliver Mining work force in 1907

- Total workforce of 12,018
- 84.4% were foreign born
- Almost 50% of foreign born resided in USA less than 2 years.
- South Slavs made up 30% of foreign born or about 3065 workers
- 48.6% of workforce spoke English

Low levels of English speakers among Oliver's Slavic workers in 1907

- Slovenes 79%
- Croats 30.8%
- Montenegrins 27.5%
- Serbs 14.7%

Two years later Croatian and Serbian rates
much higher 70.8% and 47.8%

Serbian pattern different

- Small number-estimates range from 200,000-400,000 Americans of Serbian ancestry in USA today
- Austrian empire used Serbs as frontier population on Turkish border
- Most Serbs who immigrated came from the military areas and Dalmatian coast.
- Few Serbs immigrated from Kingdom of Serbia

Pechalba

- Although largest group of immigrants were young male peasants they did not come to work on farms
- They came to make money and return home thereby following a long established practice in Europe

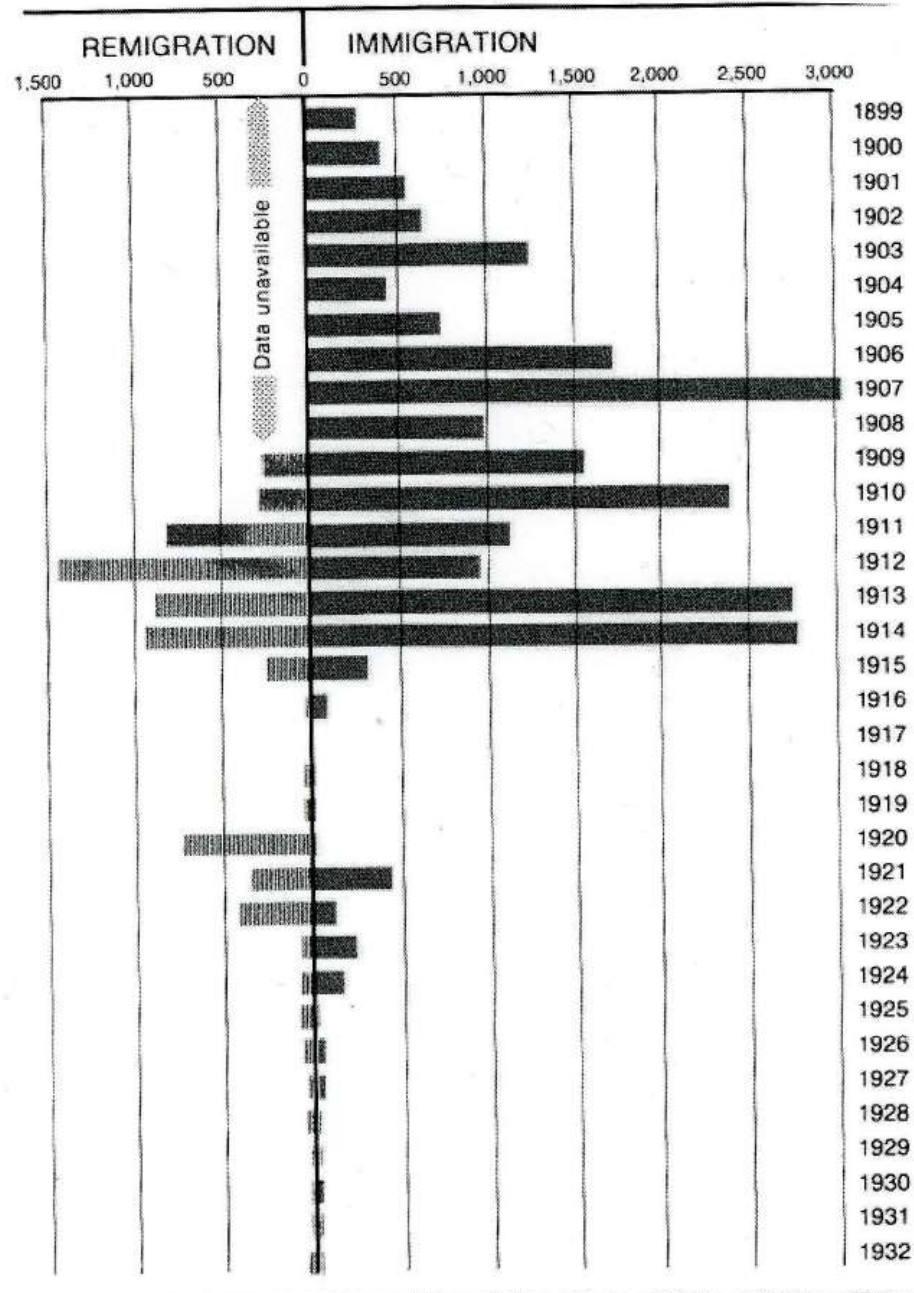


Table 20.2. Yugoslav Migration to and from Minnesota

Kumstvo

- Kum or Kuma –godfather and mother in Serbian
- Boter or botra in Slovenian
- persons unrelated by blood who are bound to assist and co-operate with each other through life

Prejudice by mine officials

- Serbs, Croats and Montenegrins
“Unsuitable for any but the most menial work”
- “Dark, shagged, stoop-shouldered and forbidding”

From *Survey* magazine 1916

- South Slavs on Mesabi lived “very much like cattle” and “spend much of their money on liquor . . . Of such matters as sanitation or the proper respect for women, and other factors of American progress which we deem vital they know nothing”
- Concluded that future migration should be prevented- which it was.

Public Safety Commission

- Because of the 1916 strike and large number of Immigrants on the Range the PSC targeted the communities as if they were German sympathizers
- The union and its leaders were regarded as very dangerous.

Webber's model meant the mills would not move.

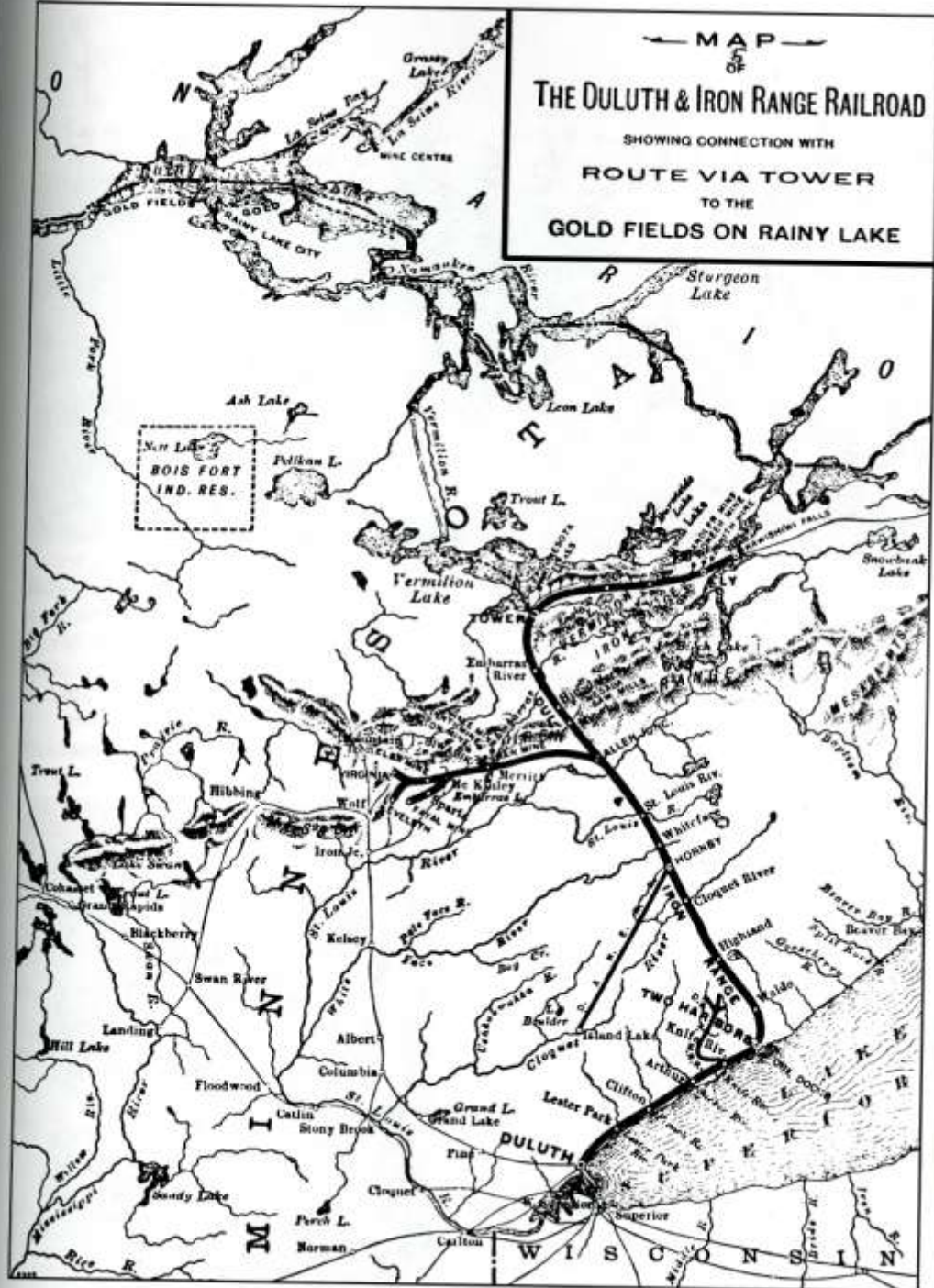
- Multiple modal transportation costs
- Ratio of raw materials in steel production
 - Four tons of coal
 - One ton of iron ore
 - One half ton of limestone
 - ***Yields one ton of Steel.***

If that wasn't enough!

- Cost of labor higher on industrial frontier was higher than in lower Great Lakes.
- Cost of shipping finished goods to market was greater from North Shore than the south shores of Erie and Michigan.

Railroads were built to get ore from mine to ports





Rail technology increased scale but length of trains was limited by law.

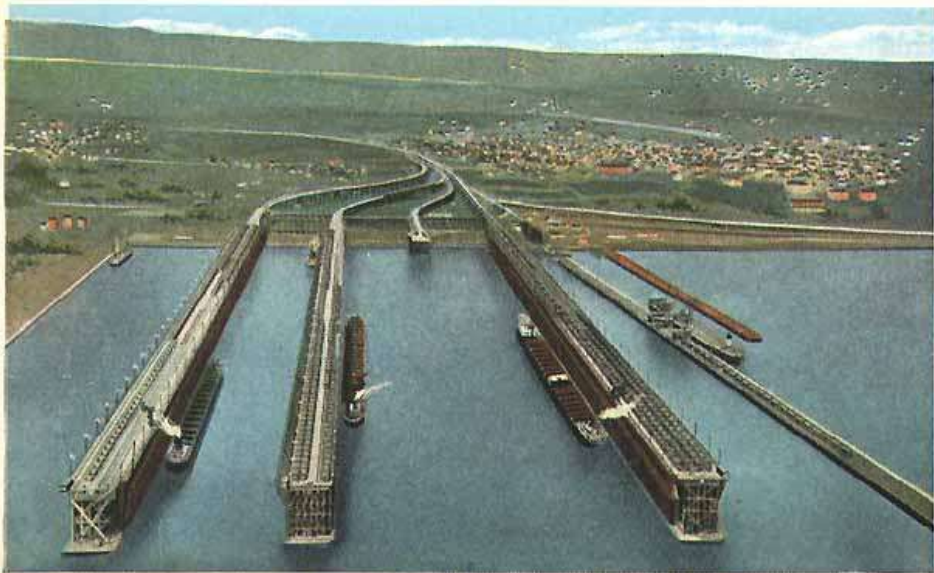


Harbors had to be developed



Special Port facilities needed to be created to handle the trains of ore





AEROPLANE VIEW, MAMMOTH ORE DOCKS, DULUTH SUPERIOR HARBOR, DULUTH, MINN.

97281

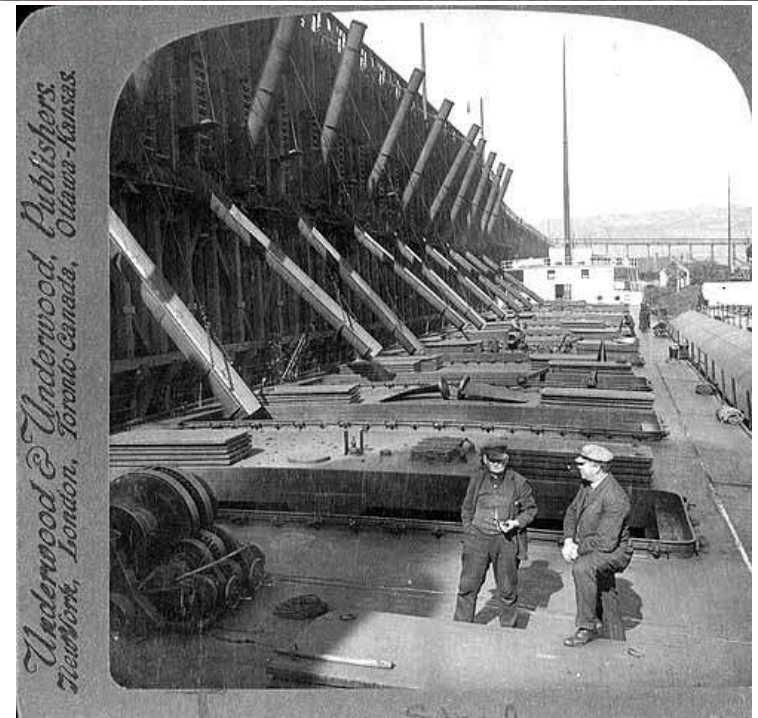
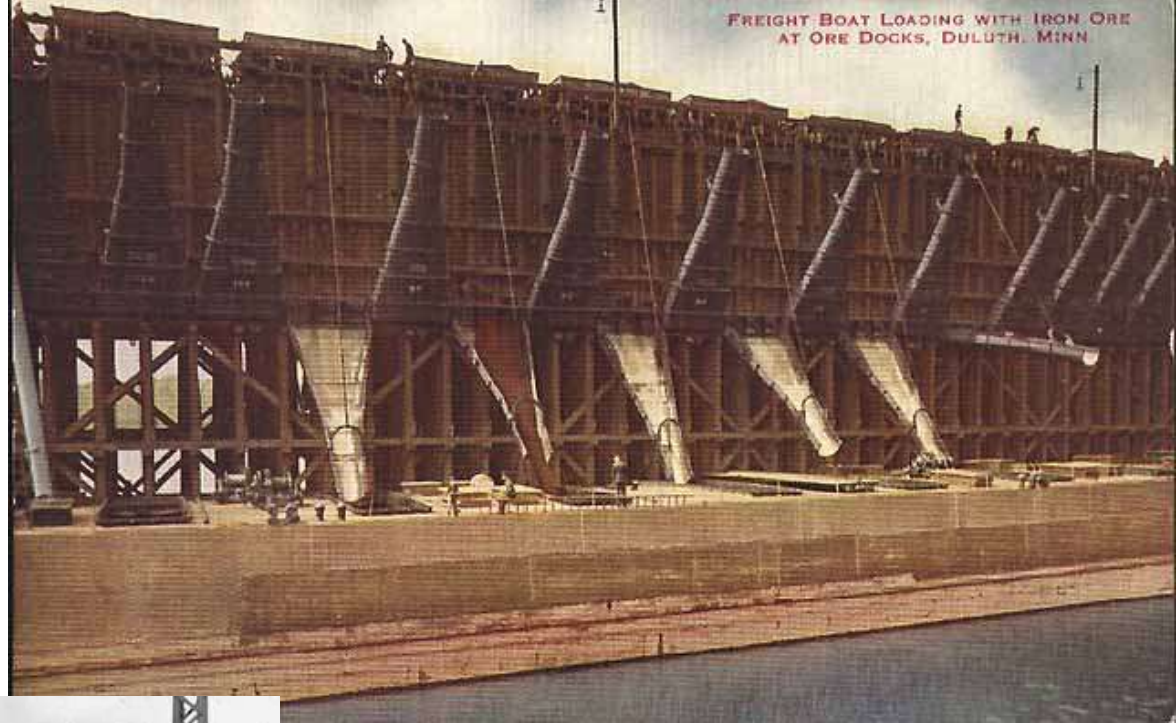


Freight Boat Loading Iron Ore at Ore Docks,
Duluth, Minn.



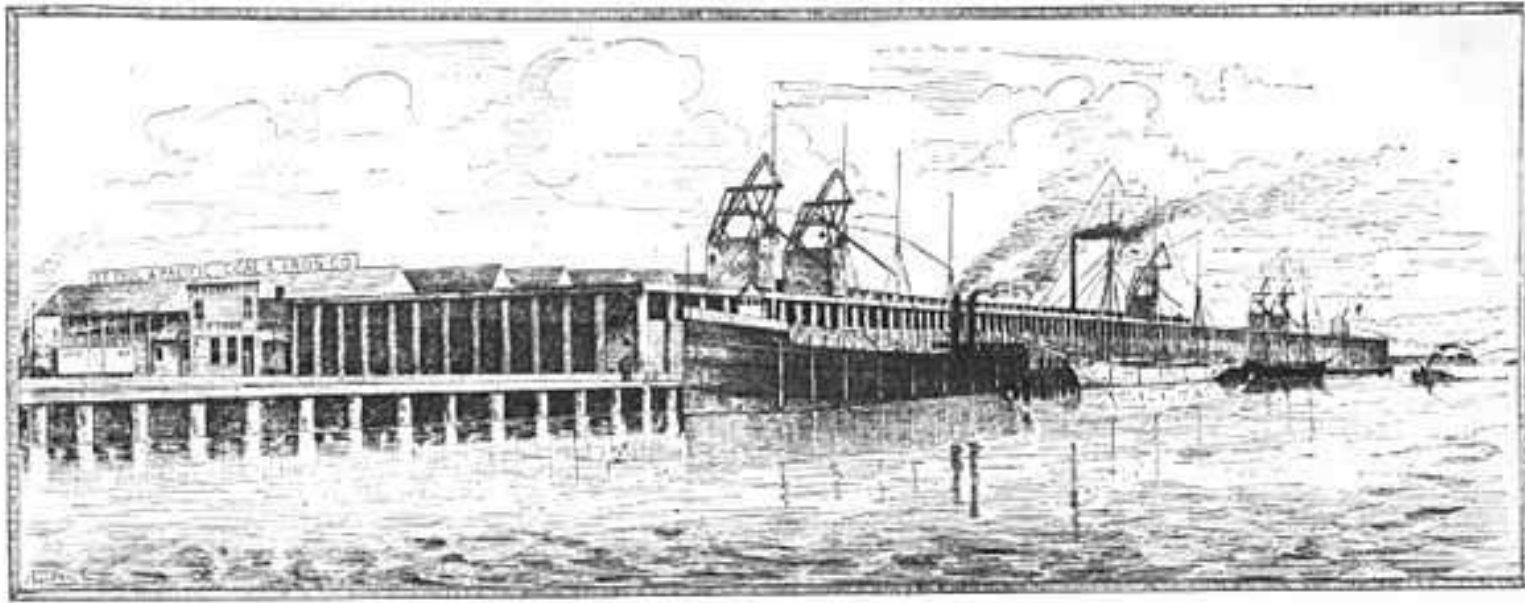
U.S. STEEL CORPORATION ORE DOCKS, DULUTH, MINN.

46263



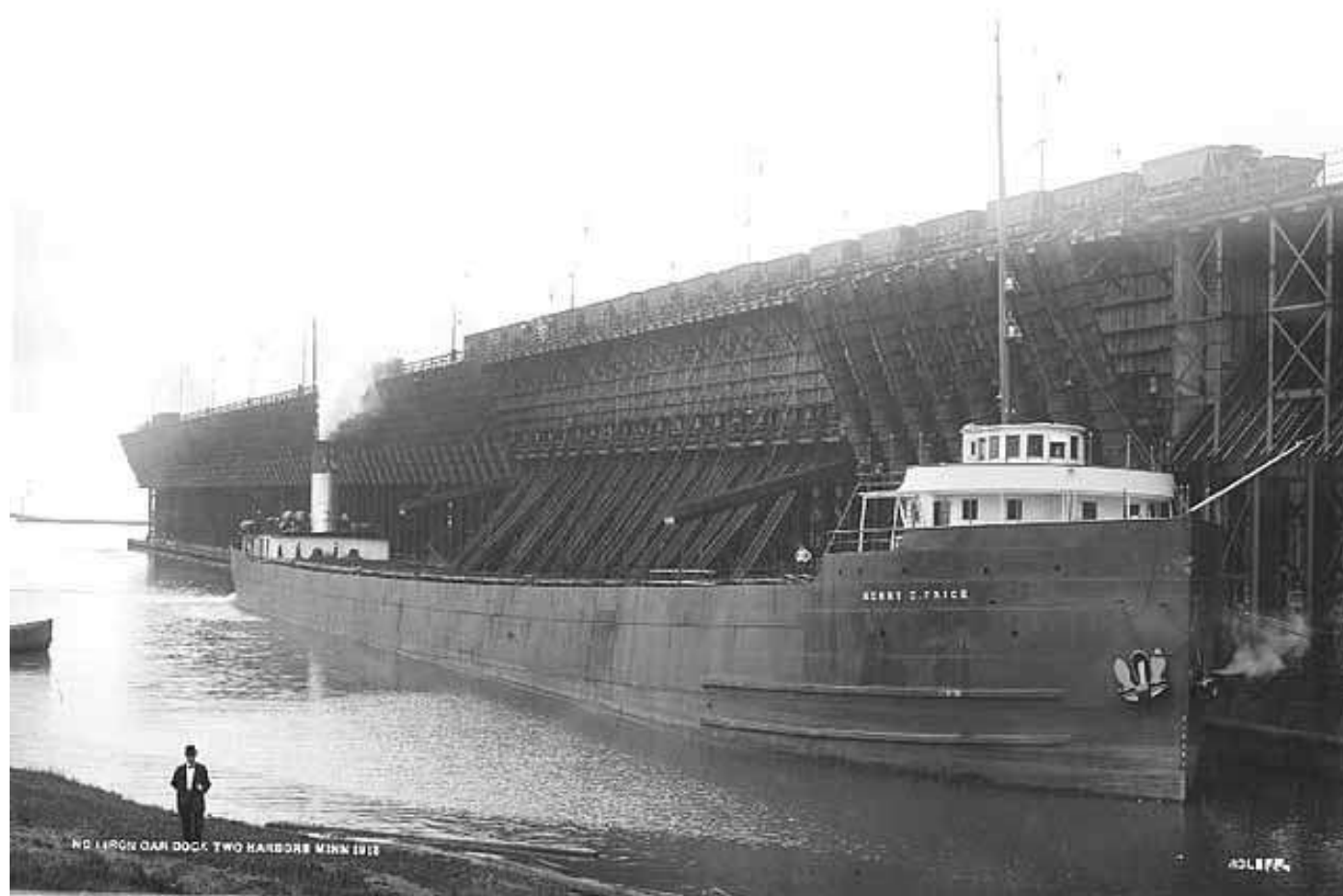
*Underwood & Underwood, Publishers.
New York, London, Toronto-Canada, Ottawa-Kansas.*

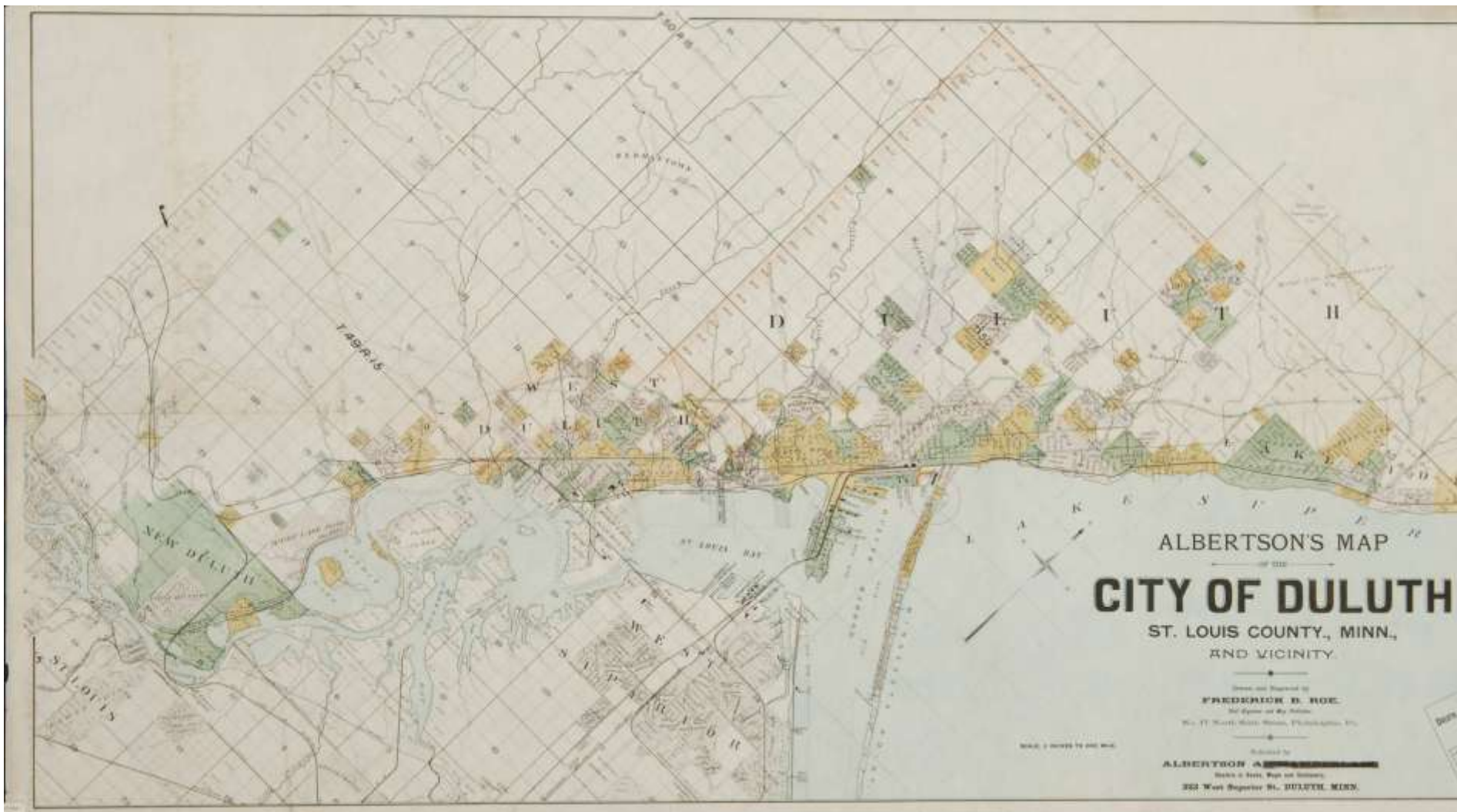
A specialized fleet of lake freighters was designed and built



ST. PAUL & PACIFIC COAL AND IRON COMPANY'S DOCK AT DULUTH, MINNESOTA.

Rail and ships were directly connected at ore docks.





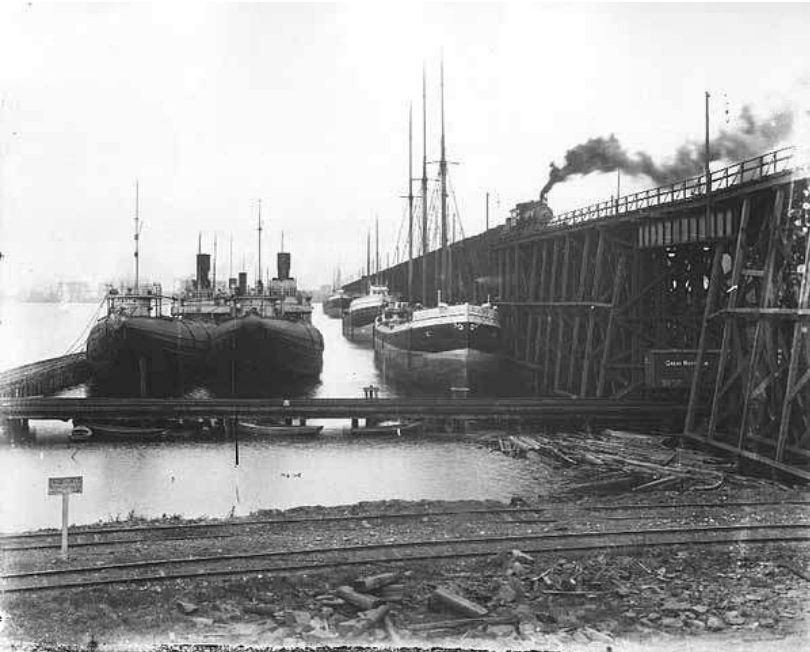
ALBERTSON'S MAP
OF THE
CITY OF DULUTH
ST. LOUIS COUNTY, MINN.,
AND VICINITY.

Drawn and Engraved by
FREDERICK B. ROE.
301 Spruce St. St. Louis.
No. 11 North Main Street, Philadelphia, Pa.

Published by
ALBERTSON & [illegible]
Books & Stationery
222 West Superior St., DULUTH, MINN.

Scale: 1 inch to 1 mile.

Ship design changed to increase capacity



Shape of ships is determined by locks and harbor entrances

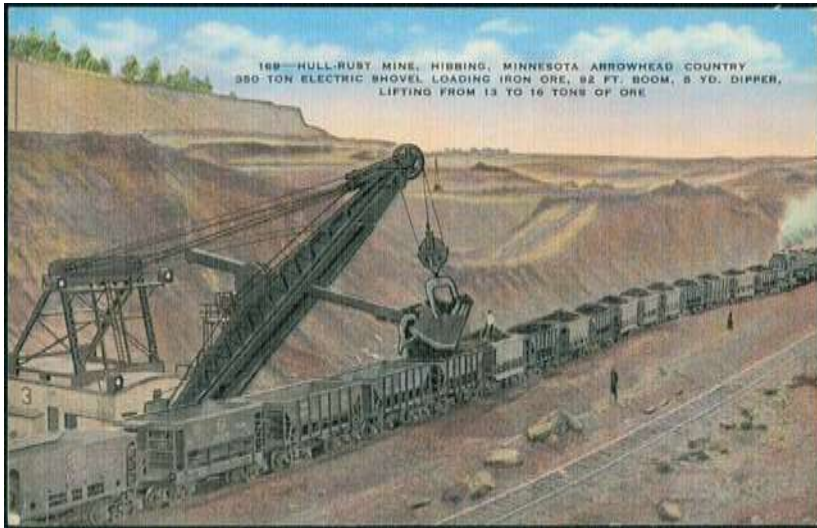


Changing seasons added to normal hazards of shipping



ONE OF THE LARGE ORE BOATS FOUNDERED ON LAKE SUPERIOR, NEAR DULUTH.

Mining changed scale to meet growing demand for steel

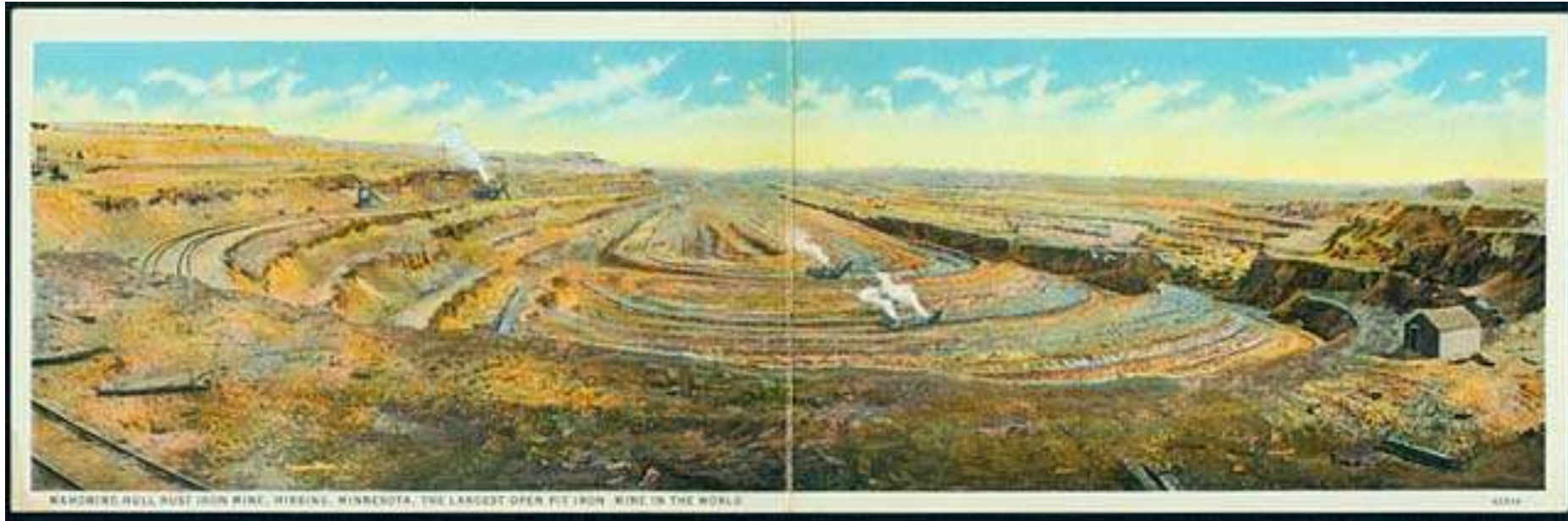


Mn Iron Country production of high grade ores

- 1917 41 million tons
- 1929 43 million tons
- 1932 2 million tons
- 1938 15 million tons
- 1939 33 million tons
- 1939 49 million tons
- 1940 49 million tons
- 1941 64 million tons
- 1942 75,300,000

188,310,00 tons of iron ore during WWII

The vast production resulted in giant open pits



Trains hauled the enormous tonnage of ore out of the pits



State of Minnesota forced US Steel to establish a steel plant in Duluth

- USS argued that the transportation costs made Duluth Mill uneconomic.
- State told USS to build a mill or face confiscatory tax rate.
- In 1907 United States Steel announced it would build a “monster plant” in Duluth for the manufacture of steel at the new town of Morgan Park



MAP OF
DULUTH
(MINNESOTA)
AND
SUPERIOR
(WISCONSIN)
SHOWING LINES OF
THE DULUTH
STREET RAILWAY COMPANY

UNITED
STATES
STEEL
PLANT



Not only were transport costs high but labor supply was an issue.

- One of the most important concerns facing the success of the factory was securing a permanent labor force in an area that was dominated by seasonal work.
- Therefore it was deemed necessary to create better housing conditions for workers than were available in other towns and settlements

Professionals at the time thought Morgan Park was an example of what could happen when the best design principles were used.

The broad streets, spacious lots, parks, and other elements of the infrastructure were thought capable of improving or maintain the health of the workers.

Design work began in 1913 and housing was occupied in 1914.



US Steel claimed the plant never made a profit and never operated it at full capacity. In 1970 all operations ceased



Taconite

- By 1940 it was clear high grade ore would give out.
- Efforts made to develop the more common lower grade deposit
- The mother rock of the higher grade ore is 30 % iron and comprises a deposit 100 miles long several miles wide

Need to be beneficiated to be viable.

- First attempt in to beneficiate the rock 1915 -1925 failed.
- University of Minnesota School Mines worked on developing an economic process for beneficiating taconite from 1925 to 1945.
- Developed a viable process just time, because the creation of Seaway in 1950s meant foreign ore could be delivered to Great Lakes Steel Mills.

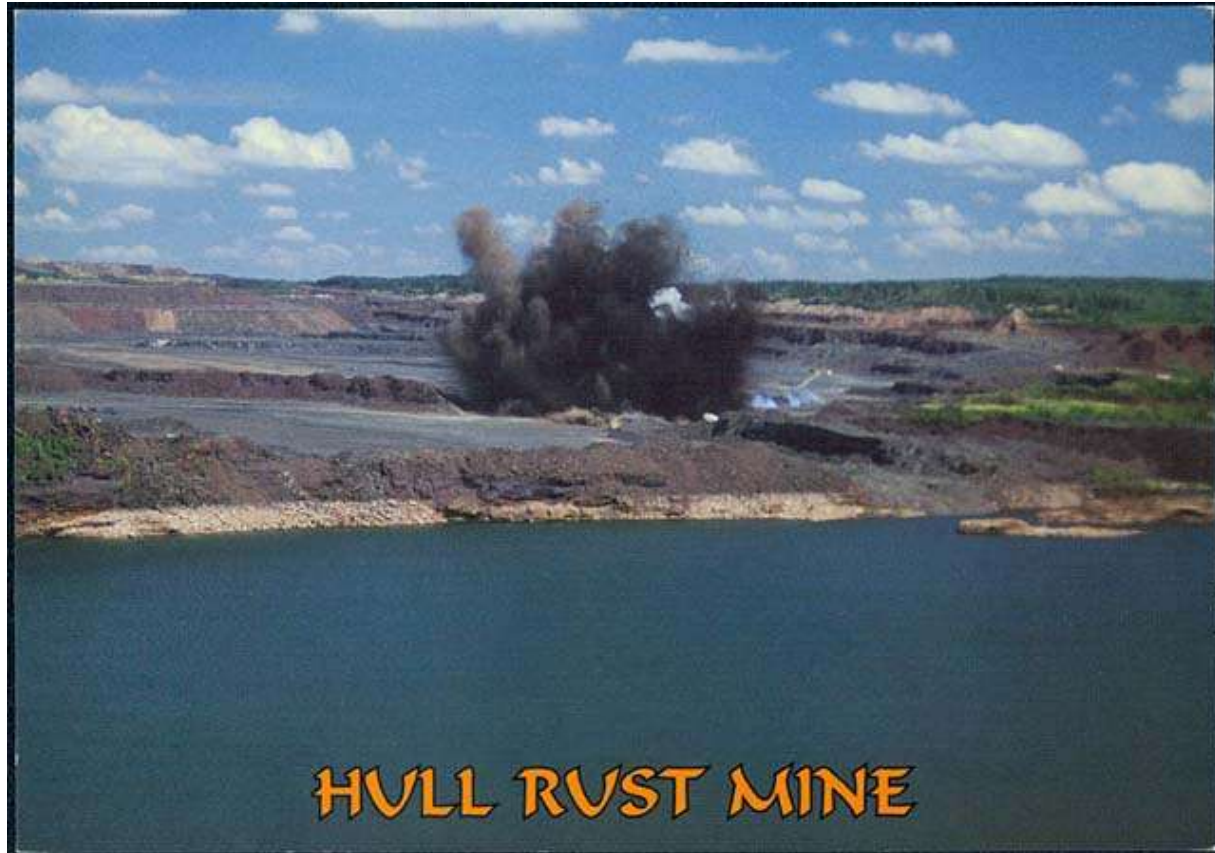
New taconite mines connected to plants.

- Mines could produce 80,000 to 100,000 tons of ore a day.
- Mills produced pellets that were 65% iron in a uniform size and shape that smelted more efficiently in blast furnaces.
- Furnaces could produce twice as much pig iron per day by using taconite instead of natural ore

Companies demanded tax break

- Companies wanted Taconite exempted from Ad Valorem tax.
- Ad Valorem taxed ore in ground at market rate. Huge amounts of taconite would produce tax bills that would make mines unprofitable.
- 1964 “Taconite Amendment” to State Constitution passed.

Mining process consists of blasting,



Huge shovels scoop ore into trucks that haul ore to plant



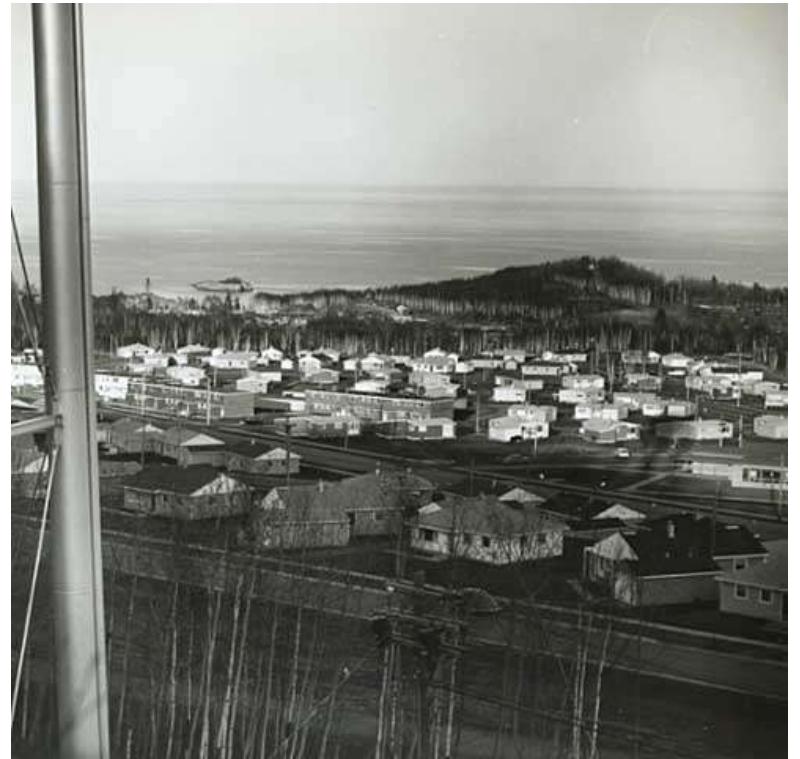
The taconite trucks can carry 300 tons



Reserve Mining of US Steel opened first very large operation.



US Steel built a port and town at Silver Bay.



Plant was located at port to take advantage of Lake Superior as a waste rock dump site.



Boom and Bust

- The taconite industry boomed in the 1970s
- Reserve forced to stop dumping in Lake as a result of landmark law suit in 1978.
- Increased costs of environmental regulations and economic downturn in 1980s caused Reserve to be dissolved in 1986 and several other mining and beneficiation operations to close.

Government tries to change equation

- A series of tax laws were passed that protected the Taconite industry from paying “unfair taxes.”
- Attempt to establish a protective tariff for steel failed.
- A portion of taconite tax was devoted to Iron Range Resources and Rehabilitation Board that tried to invest money in ways to improve and diversify the economy.
- IRRRB money could also be used to support mining and processing research.

Minnesota Operations of US Steel MinnTac



Taconite industry expanding

- World wide demand for steel has created new market for American made steel and Minnesota ore.
- Great production accomplished with fewer workers.
- New technologies produce pellets that are 70% iron and “**iron Nuggets**” that are 95% pure iron.
- Webberian constraints still keeping coal fired blast furnaces in lower Great Lakes.

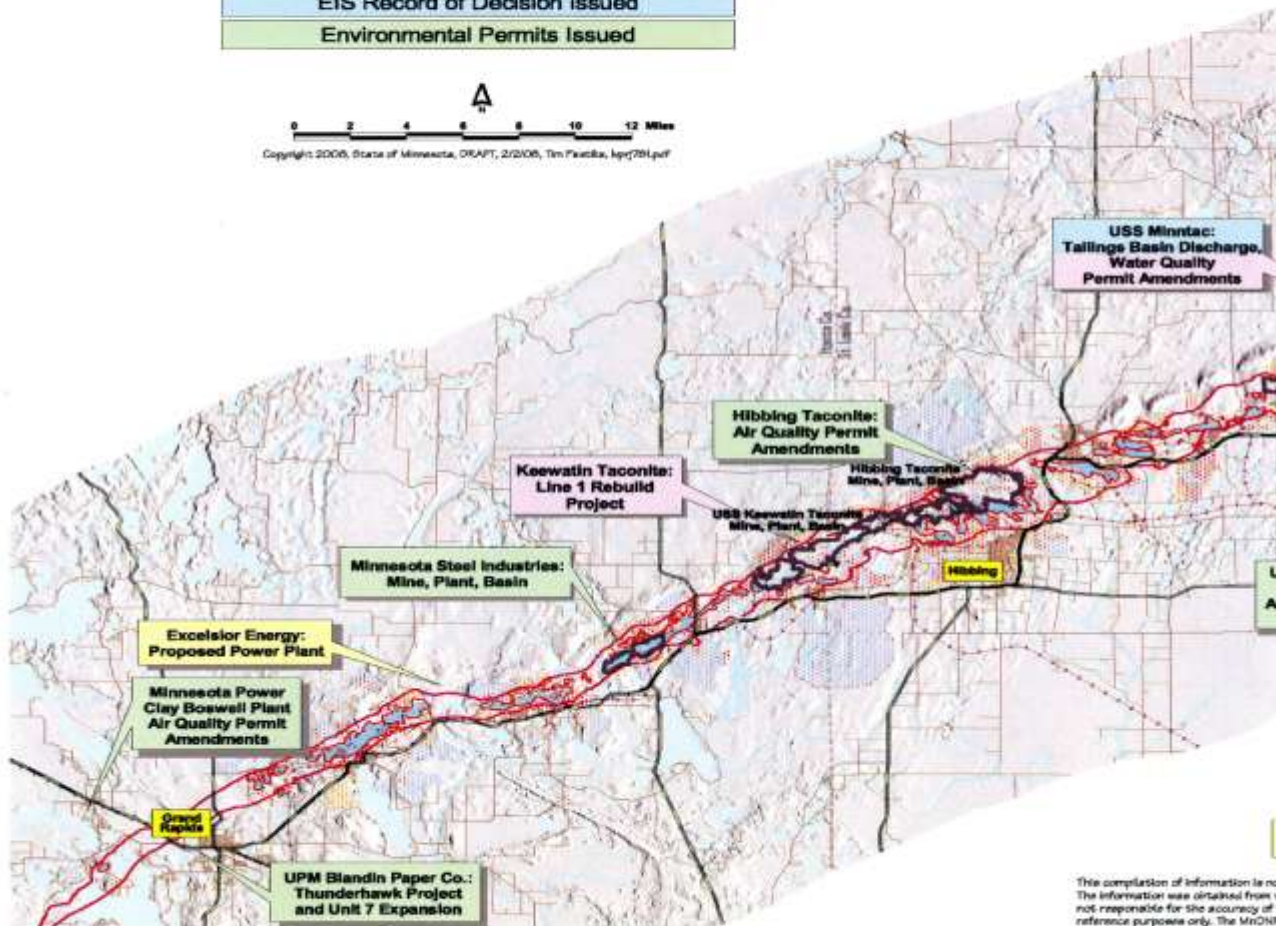
Currently Billions of dollars being invested in
expansion of taconite operations

Large Scale Projects of the Mesabi Range Area:

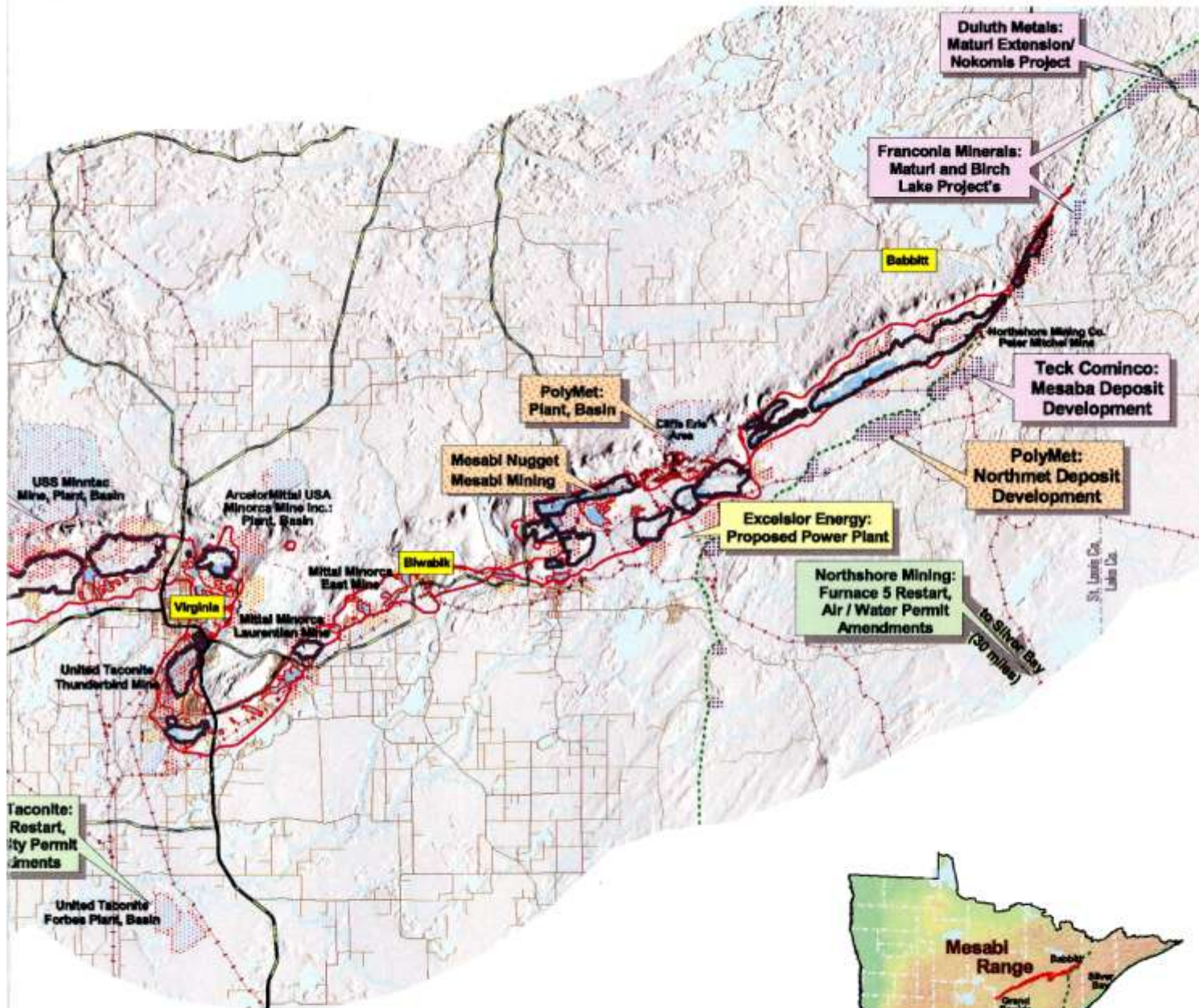
Laurentian
Transforming the Landscape

Project Status as of 2/7/08:

Site Defined
Project Proposed for Environmental Review
Draft EIS Submitted
EIS Record of Decision Issued
Environmental Permits Issued



This compilation of information is not
The information was obtained from various
not responsible for the accuracy of the
reference purposes only. The MNDNR is
resulting from the use of the information
further information about this Laurentian



The new economic geography

- Japanese technology can create “Iron Nuggets” from taconite.
- Because nuggets are 95% pure iron they can be used in the Mini-Steel Mills that are fired by electricity.
- Mesabi Nugget Delaware, LCC’s \$235 million iron nugget plant is now under construction near Hoyt Lakes.

MINNESOTA STEEL: Project Flow Sheet



DRI to the market

Direct
Reduction
Module



Iron oxide pellets

Electric
Arc
Furnace



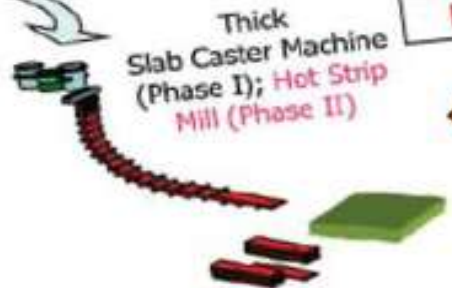
Ladle
Furnace



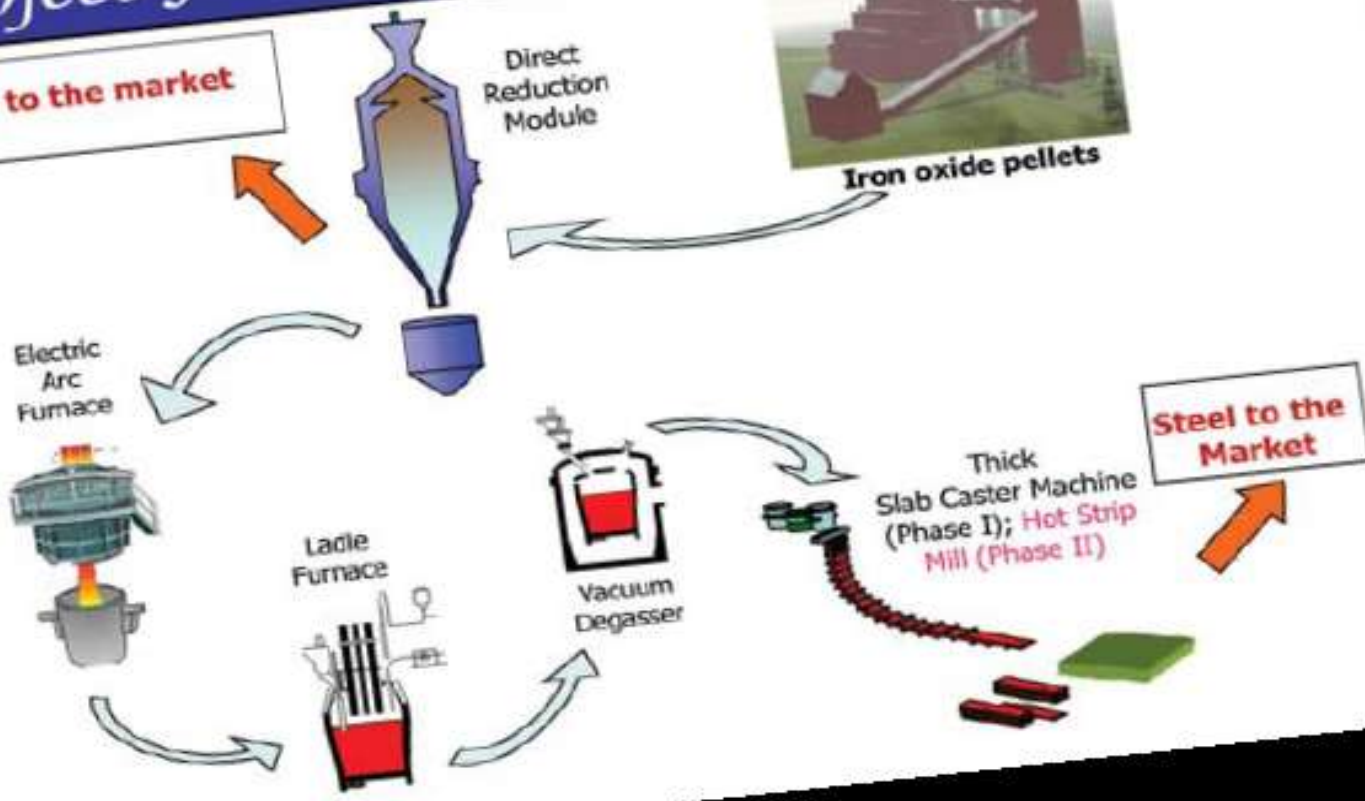
Vacuum
Degasser



Thick
Slab Caster Machine
(Phase I); Hot Strip
Mill (Phase II)



**Steel to the
Market**



Essar to make steel on Range

- *The proposed project is Minnesota Steel, which will make high quality and low-cost steel through ore processing, direct-reduced iron (DRI) production and steel making all on one site within 48 hours.
- Once completed, it will have an annual estimated production of 2.5 million tons of steel product

Steel will be transported to Algona mills
at Sioux St Marie for further/final
processing



Expanded Foreign ownership

- Essar Steel Holdings of India Pending successful completion if EIS agreed to invest the necessary \$1.65 billion to build the integrated steel making facility.
- Essar also closed a deal on Algoma Steel in Sault Ste. Marie, Ontario in June 2008, adding strength to the Minnesota Steel project by providing a large footprint for the India-based.
- Process doesn't require coke and because they will be making steel on site, less energy will be required to transport waste products.
- ***It could transform the way we think about mining in Minnesota***

But geographic concepts remain valid

- Resources are cultural achievements
 - Changes in technology produced uses for lower quality ore bodies.
- Transportation costs are critical in the location of industrial processes.
- Improvements in transportation and communication technology have opened the world to investors.