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
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 Sterns 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
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.
A specialized fleet of lake freighters was designed and built.
Rail and ships were directly connected at ore docks.
Ship design changed to increase capacity.
Shape of ships is determined by locks and harbor entrances.
Changing seasons added to normal hazards of shipping
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
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 Constitute 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 Steal 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
- Reserved 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% ion 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:

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 final version of the DNR's project list. The status of these projects may change. Updates may include changes in timing or project scope. This list is provided for informational purposes only. Use caution when interpreting the data. The Minnesota Department of Natural Resources is not responsible for the accuracy of the information provided in this document.
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

Vacuum Degasser

Ladle Furnace

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.