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Minnesota. Dept - Minnesota's Iron Range Trail.



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MINNESOTA'S IRON RANGE TRAIL

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STATE OF MINNESOTA
SAINT PAUL, MN



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The Iron Range Trail has been established by the Minnesota Department of Conservation to provide the public with an opportunity to view and understand iron mining in the state. The trail marks scenic and recreational areas as well as historic sites and local tourist centers where visitors may obtain more details on the area's attractions. As development continues, the Iron Range Trail will include many more significant sites along the ranges.

INTRODUCTION

Over 700 million years ago a sea covered what is now Minnesota, Wisconsin and Michigan. This sea was unique in that it contained large amounts of soluble iron and silica.

These elements accumulated at the sea bottom for millions of years, forming sedimentary beds hundreds of feet thick. Compaction and heat eventually transformed these sediments into a hard rock called taconite.

Later uplifting of the earth's crust brought these iron ores to the surface, where rock strata above the iron formations were eroded away. Glaciers then moved over the area and retreated, leaving a blanket of silt, sand and gravel covering the land.

The original taconite contained 20–35% iron in the form of carbonate, oxides and silicates. Circulating water followed fractures in the taconite, dissolving the silica and oxidizing the iron minerals. The silica was carried away with the water and the iron oxides remained.

Where the silica leaching was thorough, high grade iron ore deposits were created. Iron from these can be shipped directly to the steel plants.

Where the silica was not completely carried off, the ore requires a beneficiation process to remove it. Iron ore needing such beneficiation is called concentrating ore.

The shift in mining production from direct shipping ores to beneficiated ores to the complex process of taconite utilization has been the major theme of Minnesota's iron ranges. The Iron Range Trail will allow Minnesotans and tourists an opportunity to view and understand iron mining in the state.

GEOLOGY

CUYUNA RANGE: Belts of iron bearing rock extend southwest from central Aitkin County through Crow Wing and Morrison Counties to the eastern part of Todd County.

The iron formation is intensely folded and subject to abrupt changes in iron content. It is not as continuous or uniform as that in the Mesabi district. Most Cuyuna ore is composed of soft, brown and red iron oxides except in the northern area, where it is dark gray to black.

These ores are important for their manganese content, which can be as high as 35%. Manganese is a necessary ingredient for making steel, and the Cuyuna range supplies the chief sources of domestic, manganiferous ore.

Most Cuyuna ore bodies are narrow and deep, with widths ranging up to several hundred feet and lengths up to a mile. The narrow width of Cuyuna ore bodies, along with the thick overburden, makes open pit mining expensive.

MESABI RANGE: The 500-ft. thick Biwabik Iron Formation of the Mesabi Range consists of four distinct layers, or "horizons". Each horizon of the Biwabik has its own characteristics and degrees of iron content, and mining operations commonly encounter lean ores and waste material.

Such materials are stockpiled near the pits to await the day when the demand for iron and an improved technology enable them to be processed. Many stockpiles have already been profitably reworked.

Because the iron bearing strata occur at or near the surface, ores on the Mesabi have generally been mined by open pit methods.

Three general ore types are mined here: direct shipping, concentrating and taconite. The first two are found on about 10% of the range, the rest being some form of taconite.

VERMILION RANGE: The iron bearing strata of the Vermilion district make up the Soudan Iron Formation extending through parts of St. Louis, Lake and Cook Counties. The formation is 5 to 15 miles wide and is not a continuous formation, but a complex of isolated and relatively small lenses of iron bearing rock.

The ore bodies within this formation vary from a hard, dense, blue hematite in the Tower-Soudan area to a soft, red hematite at Ely. The mines near Ely are all within a downfold in the Earth's surface and are very deep.

At Soudan the iron bearing strata have been tilted to a near vertical position. Consequently, the beds are very deep and narrow, necessitating underground mining methods.

THE MINING PROCESS

The first step in developing a mine is exploratory drilling. The drill cores are analyzed by geologists and metallurgists and classified as direct shipping ore, wash ore, heavy density ore, or taconite. Further drilling is employed to more closely define the ore body.

Additional lands must then be acquired to provide space for stripping stockpiles, plant facilities and tailings basins. The placement of stockpiles and tailings must be carefully planned to avoid covering any part of the ore body that may be mined.

After the type and amount of ore has been established, a cost analysis determines if the ore can be mined at a profit. Factors calculated include the cost of stripping overburden, mining, beneficiation, equipment, salaries, royalty payments and taxes.

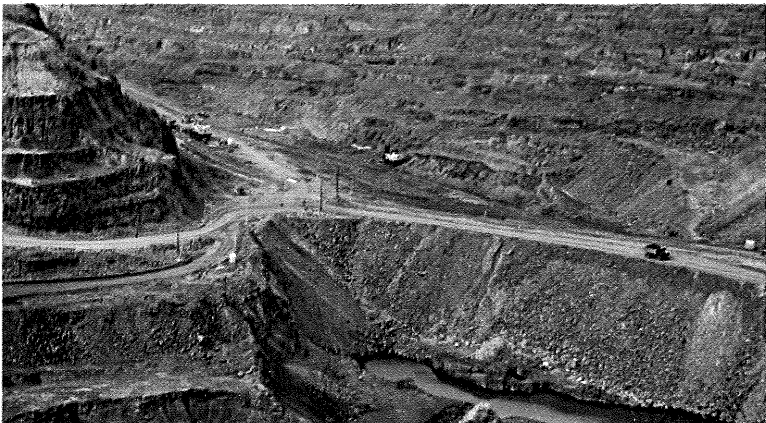
These costs are then calculated on a cost per ton of ore, and a profit per ton of ore derived.

Four methods of hauling the ore from the mine to the beneficiating plant are used in Minnesota's iron mines — rail, truck, conveyors and skip hoisting.

Rail hauling has been used for many years in large mines, but the limited grade and turn radius of trains prohibits their use in smaller mines.

Trucks have become popular due to their increasing capacity, higher grade limits and maneuverability. Conveyors eliminate the need for maintaining extensive road systems, but are relatively fixed in their location.

Skip hauling — the hoisting of ore-loaded cars, or "skips" — is practical in very deep, open pit mines where steep walls restrict the use of trucks and conveyors.



BENEFICIATION

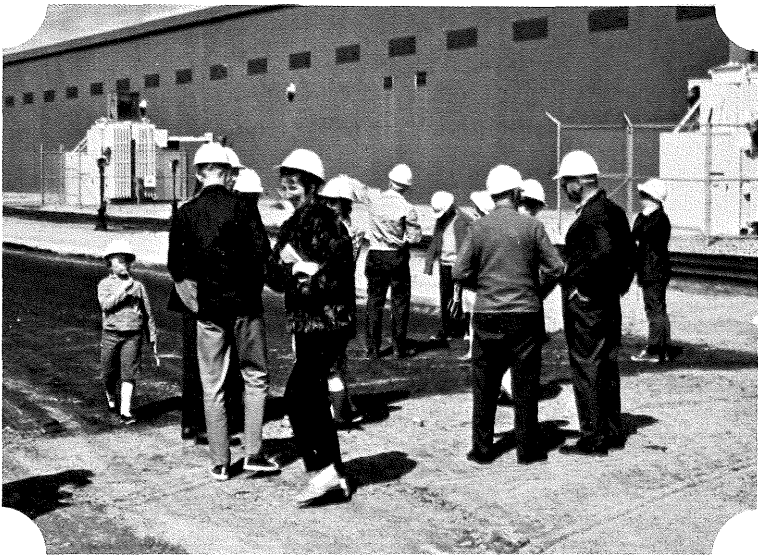
Beneficiation of low grade ores is not new to the iron range. The first commercial beneficiation plant in Minnesota was built at Trout Lake in the early 1900's by Oliver Mining Company, now the Minnesota Ore Division of United States Steel Corporation. Many such plants now operate on the Mesabi.

There are two general types of beneficiation — washing and heavy media separation. Wash ores contain high amounts of fine-grained silica combined with the more coarse iron ore. By screening or washing the larger ore particles from the finer silica, wash ore concentrates are produced. This process can upgrade an ore from 42% iron to 58% iron.

Heavy media separation is employed when the silica and iron ore particles are of similar size. The mixed particles are placed in a liquid having a specific gravity between that of silica and iron ore. The iron ore simply sinks while the silica floats. This process can increase the ore's iron content from 35% to 57%.

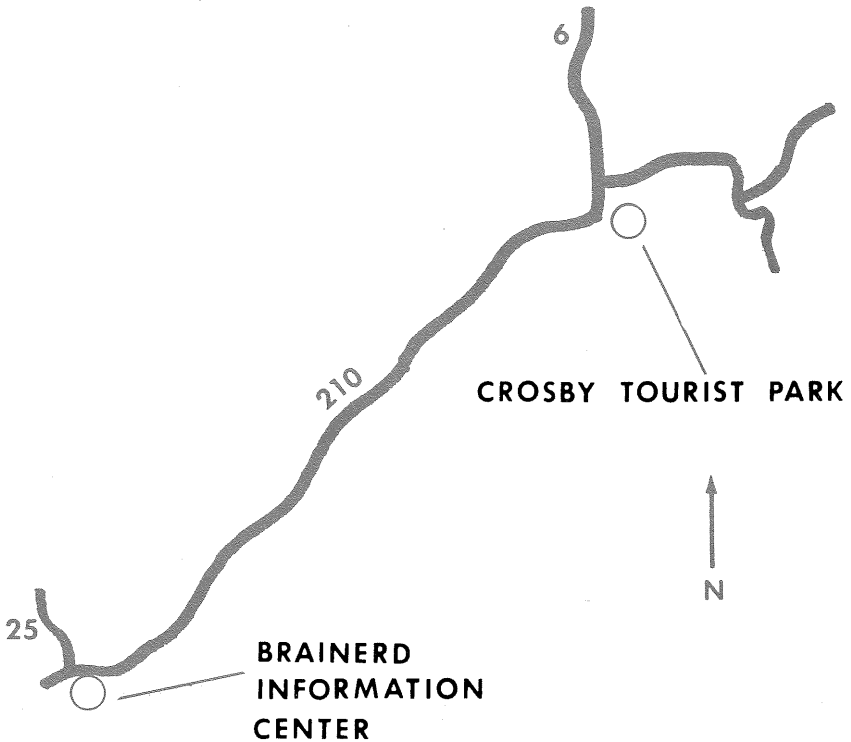
The material separated from the iron ore by either process often contains 20–25% iron. It is a potential source of ore when technology and economics make its processing practical. Therefore, tailings from the beneficiation process are stockpiled and ownership carefully recorded.

Many tailings and lean ore stockpiles, too low in iron content to mine previously, are now being processed.



Minntac Plant tour

CUYUNA RANGE



BRAINERD INFORMATION CENTER

Located on 6th and Washington, next to the old water tower. Open from Memorial Day to Labor Day 9 a.m. to 9 p.m. Sunday hours are 9 a.m. to 6 p.m.

The Brainerd Information Center is an excellent stop for visitors to the Cuyuna Range area. Free literature on the many recreational activities in the Brainerd region is available. The area sports many beautiful lakes and modern resorts, making it a favorite for fishermen and sightseers.

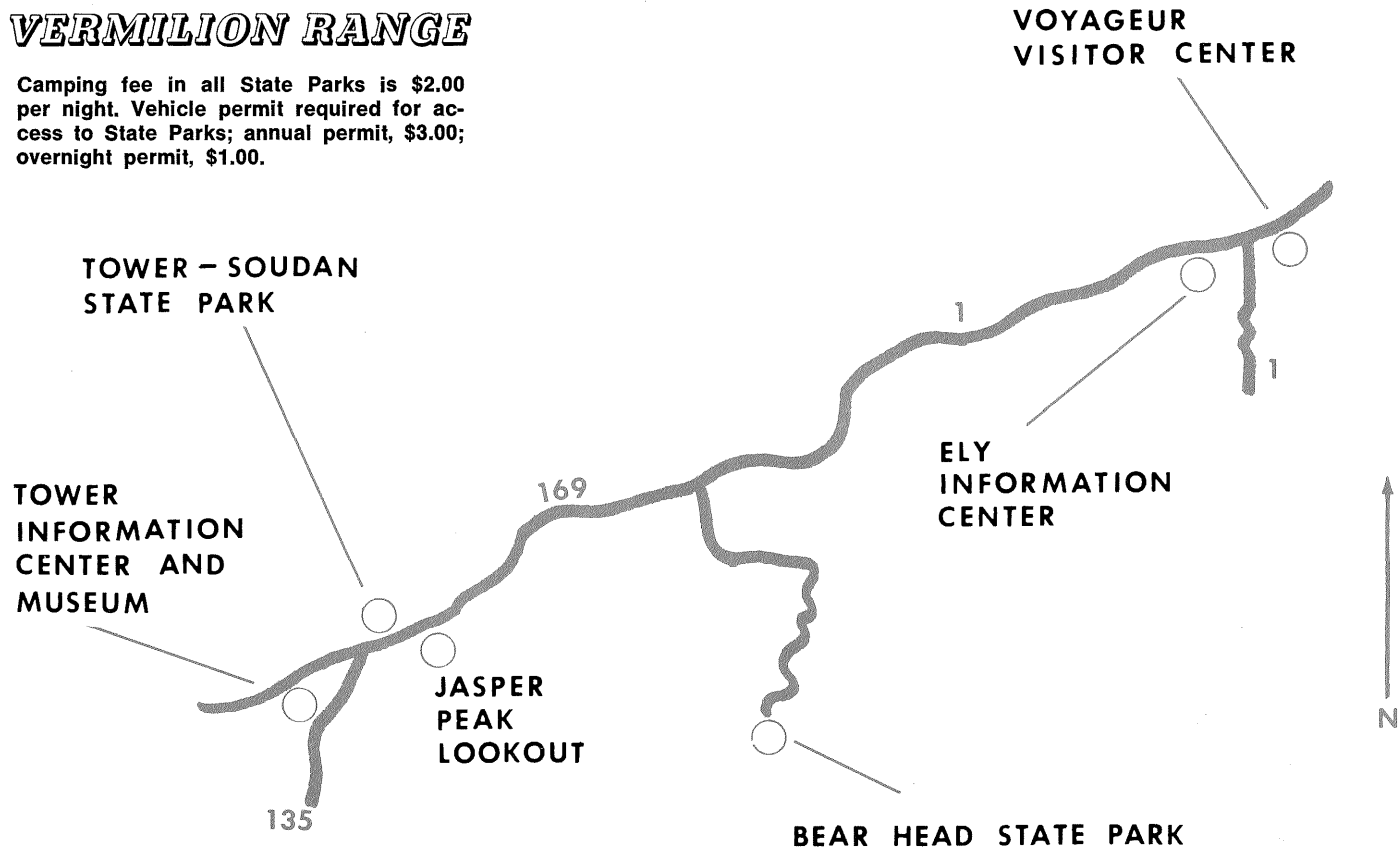
CROSBY TOURIST PARK

Located in Crosby on Highway 210 on the northwest side of Serpent Lake. The Park is open from May 1 to October 1.

Camping, picnicking and swimming facilities are available, including playground equipment and a boat launching ramp. Two lifeguards patrol the beach from 9 a.m. to 8 p.m. There is an overnight parking fee of \$1.50, but no charge for day use activities.

VERMILION RANGE

Camping fee in all State Parks is \$2.00 per night. Vehicle permit required for access to State Parks; annual permit, \$3.00; overnight permit, \$1.00.



ABRAHAMSON MUSEUM AND TOWER INFORMATION CENTER

Located at the intersection of Highways 169 and 35 at the west end of Tower. The museum is open from May 30 to September 2, Monday through Saturday, 10 a.m. to 3 p.m. and from 6 p.m. to 9 p.m. during July and August.

The museum has many artifacts from Tower history such as a steam pumper fire engine, a homesteader log cabin, a rock collection and Indian artifacts.

TOWER-SOUDAN STATE PARK AND UNDERGROUND MINE TOUR

Located $\frac{1}{2}$ mile north of Soudan and 2 miles northeast of Tower on Highway 169. The park is open for tours starting the third week in May through the first week in September from 11 a.m. to 4 p.m. Winter tours are available by reservation.

Both surface and underground tours are available. The underground tour consists of an elevator ride to a depth of 2,400 feet and a 3,000-ft. long train ride through a tunnel to the mining area, with experienced guides in charge. The underground mine temperature averages 52° , so a jacket is recommended.

Admission is \$2.00 for adults, \$1.00 for children under 17, plus 3% sales tax. There is no charge for tours of surface mining facilities.

The Soudan Mine was opened and operated by the Oliver Iron Mining Company for 78 years and closed in 1962. The Company donated the mine, surface facilities and 1026 acres of land to the state for the development of a park.

Campers are referred to Bear Head State Park. A large picnic area and hiking trails are available at Tower-Soudan State Park.

JASPER PEAK LOOKOUT TOWER

Located $\frac{1}{4}$ mile east of Soudan, south of Highway 169, Jasper Peak rises 350 feet above Lake Vermilion and crests 1,710 feet above sea level.

The peak is one of the highest in the region, offering a spectacular view from the lookout tower. Outcrops of Jasper are visible at the site and picnic facilities are available.

BEAR HEAD STATE PARK

Located 8 miles south of Highway 169 between Soudan and Ely. Access to the camping area is through 6 miles of winding wilderness roads, passing by and around 12 lakes within the boundaries of the park.

Picnic facilities, nature and hiking trails, lake and stream fishing are also available along with swimming and boat and canoe rentals.



Historic train at Tower, Minnesota

Boats and canoes are \$1.00 the first hour and 25¢ each additional hour. Deposit required.

ELY INFORMATION CENTER

Located at 30 South First Avenue in Ely, the Information Center can provide maps and literature on local campsites, resorts, fishing lakes and outfitters. Open May 16 through September 30, 8:30 a.m. to 9 p.m. every day.

U.S. FOREST SERVICE VOYAGEUR VISITOR CENTER

Located ½ mile east of Ely on Highway 169, the center is open from 9 a.m. to 9 p.m. during the summer. An exhibit hall illustrates activities of Indians, Voyageurs, miners and loggers in Minnesota's history.

Displays of wildlife, geology and modern forest management are provided, with programs on related subjects each evening at 7 p.m. The Center has a lounge, restrooms, phones, a forest trail and naturalists to answer any questions. Admission is free.

MESABI RANGE

GRAND RAPIDS WELCOME HOUSE

Located at the junction of Highways 2 and 169. Information on county wide recreational activities is available at Welcome House.

Winter hours are 9 a.m. to 5 p.m. (closed at noon) Monday through Friday; 9 a.m. to noon on Saturday, September 8 through June 1; closed Memorial Day.

Summer hours are 8 a.m. to 8 p.m. Monday through Saturday; 9 a.m. to 5 p.m. on Sunday, June 2 through September 7; closed Labor Day.

LIND-GREENWAY VIEWPOINT

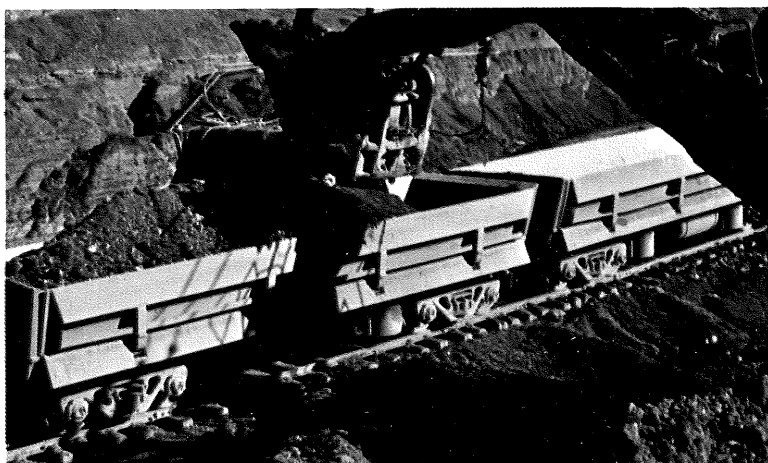
Located 4 miles northeast of Grand Rapids and 1 mile east of Highway 38. Access is on County Road 61. Open from May to November during daylight hours, the viewpoint offers picnic facilities and free rock samples.

The Lind-Greenway mine is operated by Jones and Laughlin Steel and is a natural iron ore operation. The site of the present mine was noted as showing evidence of iron ore by Henry H. Eames, the first state geologist, in the early 1860's.

HAWKINS VIEWPOINT

Located on the west end of Main Street in Nashwauk, ½ block west of Highway 169.

Now inactive, the Hawkins mine yielded 25.2 million tons of ore from 1902 to 1968. International Harvester Company operated the mine until 1945, and Cleveland-Cliffs Iron Company mined it from 1947-1962.



Loading ore at the Sherman Mine

HULL-RUST VIEWPOINT: WORLD'S LARGEST OPEN PIT IRON MINE

Located near Hibbing about 1½ miles north of Howard St. and First Avenue East. Take First Avenue East to 17th St., then go right on 17th to Third Avenue East. Go left on Third Avenue East to the viewpoint.

The Hull-Rust pit is actually the consolidation of twenty mining properties of which Hull, Rust, Mahoning, Susquehanna, Scranton, Penobscott, Pierce and Webb are the biggest ore producers. Since its opening in 1895, the pit has produced 600 million tons of ore. It is nearly 4 miles long, 2 miles wide and as much as 500 feet deep.

Attendants are at the site from 9 a.m. to 9 p.m. June 1 through Labor Day. Rock samples and informative literature are available.

HIBBING INFORMATION CENTER

Hibbing has two information centers for visitors to the city. One is located in the Chamber of Commerce office at 508 East Howard Street, and the other is operated by the Jaycees at 1200 East Howard Street.

MINERS LOOKOUT — PILLSBURY MINE

Located one mile west of Chisholm on Highway 169. Picnic and parking area overlook the inactive mine. Use caution coming from the east, as the access can easily be missed.

Owned by John S. Pillsbury, former Minnesota Governor, the mine lands and minerals produced nearly 8.2 million tons of ore during 1898–1961.

MINNESOTA MUSEUM OF MINING

Located in Chisholm on West Lake Street at the junction of Highways 169 and 73. Open from May 30 daily from 8 a.m. to 6 p.m.

Tours of 30-45 minutes each are conducted every hour on the hour of the fascinating exhibits of an underground mine and mining equipment. Fees are adults, 75¢, and children, 35¢.

SHERMAN MINE VIEWPOINT

Located one mile east of Chisholm on Highway 169. Attendants are at the viewpoint from 8 a.m. to 5 p.m., July 1 through Labor Day.

The Sherman Mine is a natural ore mine, producing soft hematite and limonite iron ore. The site offers views of ore trains and electric shovels, and free rock samples and literature are available.

MOUNTAIN IRON MINE VIEWPOINT

Located in Mountain Iron, at the end of Biwabik Avenue north of Highway 169, the viewpoint overlooks the first discovery of iron ore on the Mesabi Range by J. A. Nicols in 1890.

U.S. STEEL MINNTAC TOUR

The tour starts at the Mountain Iron Recreational Building on Second Avenue off Highway 169 in Mountain Iron. The 1½ hour tour is available each hour from 8:30 a.m. to 4:30 p.m. July 1 through Labor Day. Guides escort visitors to the mine and plant via free buses. Playground and picnic facilities are available.

The U.S. Steel Minntac Plant was completed in 1967. It currently produces 4.5 million tons of taconite pellets annually, but production capacity is being expanded to 12 million tons.

NORTHEAST MINNESOTA INFORMATION CENTER

Located 10 miles south of Eveleth on Highway 53, the center is open 9 a.m. to 5 p.m. July 15 to Labor Day. Camping and picnic areas are available.

This information center is sponsored by the towns of Ely, Gilbert, Chisholm, Virginia, Eveleth, Cook, Crane Lake, Hibbing, Tower, Orr, Pelican Lake and Grand Rapids.

VIEWPOINT IN THE SKY, VIRGINIA

The viewpoint is located 1½ miles east of Virginia and ½ mile off Highway 169. Attendants are on the site from July 1 to Labor Day, 8 a.m. to 5 p.m. to explain the mining operation.

The viewpoint is on top of a 20-story high stockpile overlooking the Rouchleau Mine. This mine produces a natural ore of soft hematite and limonite.

FISHERMAN'S POINT RECREATION AREA

Entrance to the area is ¼ mile west of Hoyt Lakes on County Highway 110, on a peninsula in White Water Lake. The lake serves as a reservoir for Erie Mining Company's taconite operation.

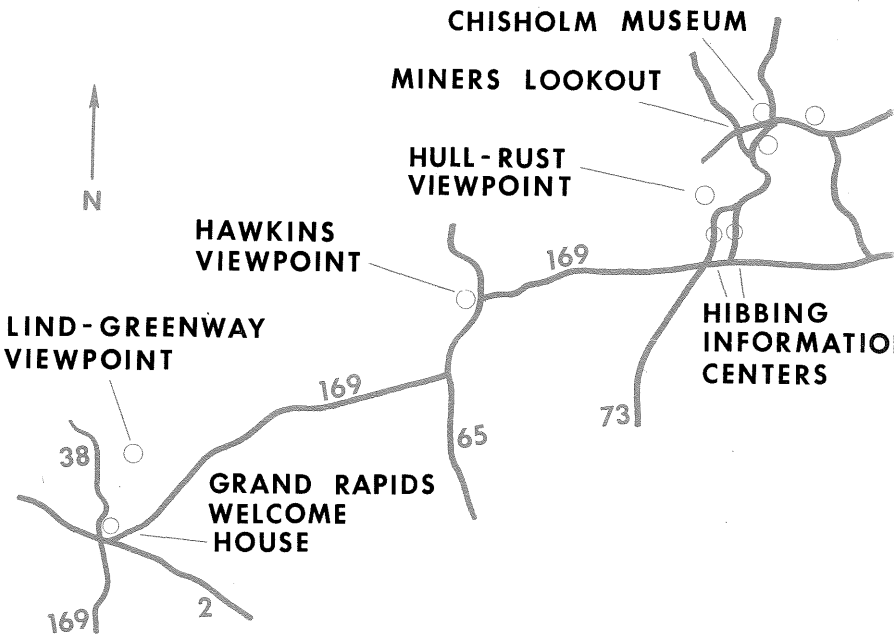
There are 42 individual campsites, a boat launching ramp, fish-cleaning house, picnic area and rest room facilities at the point.

ERIE TACONITE PLANT TOUR

The tour starts at the Erie Administration Building, located 2 miles north of Mesaba on County Road 110, at 12:45 p.m. and lasts for two hours. Visitors are asked to register in advance by calling the Erie Public Relations Office (218/225-7319). Tours are conducted daily, Monday through Friday, from the first Monday in June to the last Friday in August.

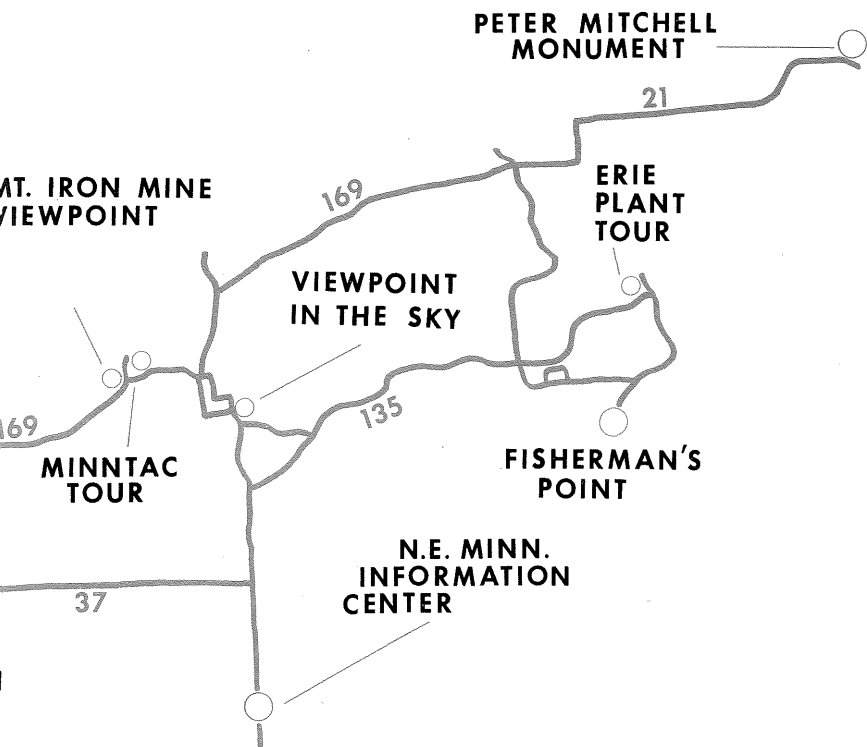
The tour is limited to persons 9 years old and above. Women

MESABI RANGE



are required to wear slacks and low heeled shoes. A maximum of 32 persons may take any one tour (the capacity of the bus used), which offers a close-up view of all taconite operations.

The Erie Plant produces 10.3 million tons of taconite pellets annually, which are shipped to Taconite Harbor on Erie's own railroad.

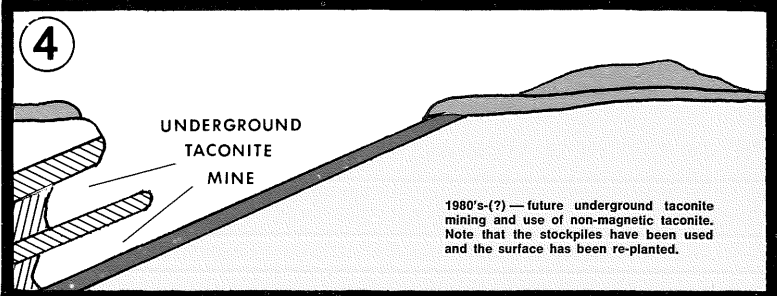
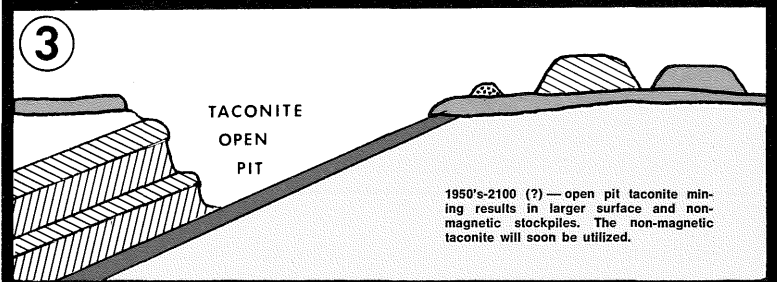
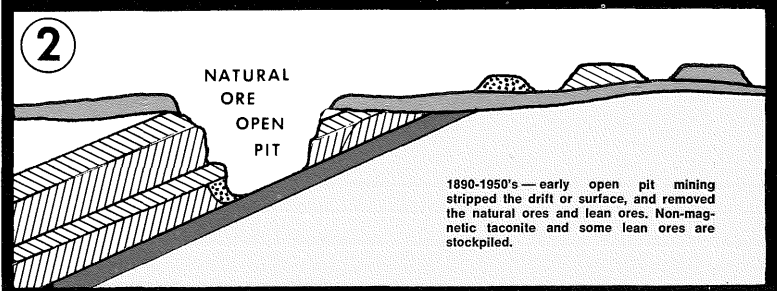
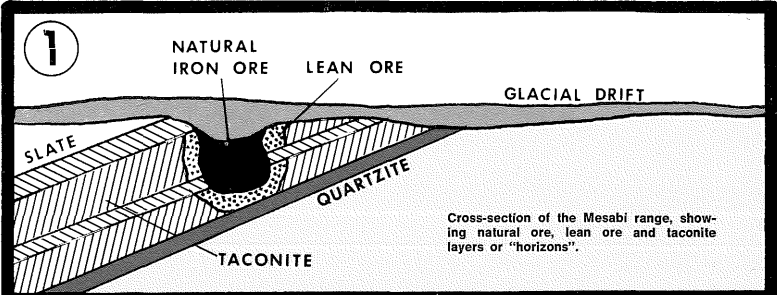


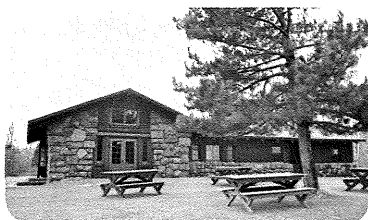
PETER MITCHELL MONUMENT, BABBITT

Located at the Babbitt Shopping Center, the monument commemorates the work of Peter Mitchell, who sunk the first iron ore test pit near Babbitt in 1871 — the first in Minnesota's history.

The site of that first pit is now part of Reserve Mining Company's taconite mine. Babbitt celebrates Mitchell's discovery of taconite during the last weekend in June each year.

MESABI RANGE - PAST, PRESENT AND FUTURE MINING STAGES





TACONITE HARBOR VIEWPOINT

Located on Highway 61 at Taconite Harbor, the viewpoint offers an excellent view of dock loading activities of the Erie Mining Company. Both ore and coal are handled here; trains bring ore from the Hoyt Lakes plant and return with oil and coal.

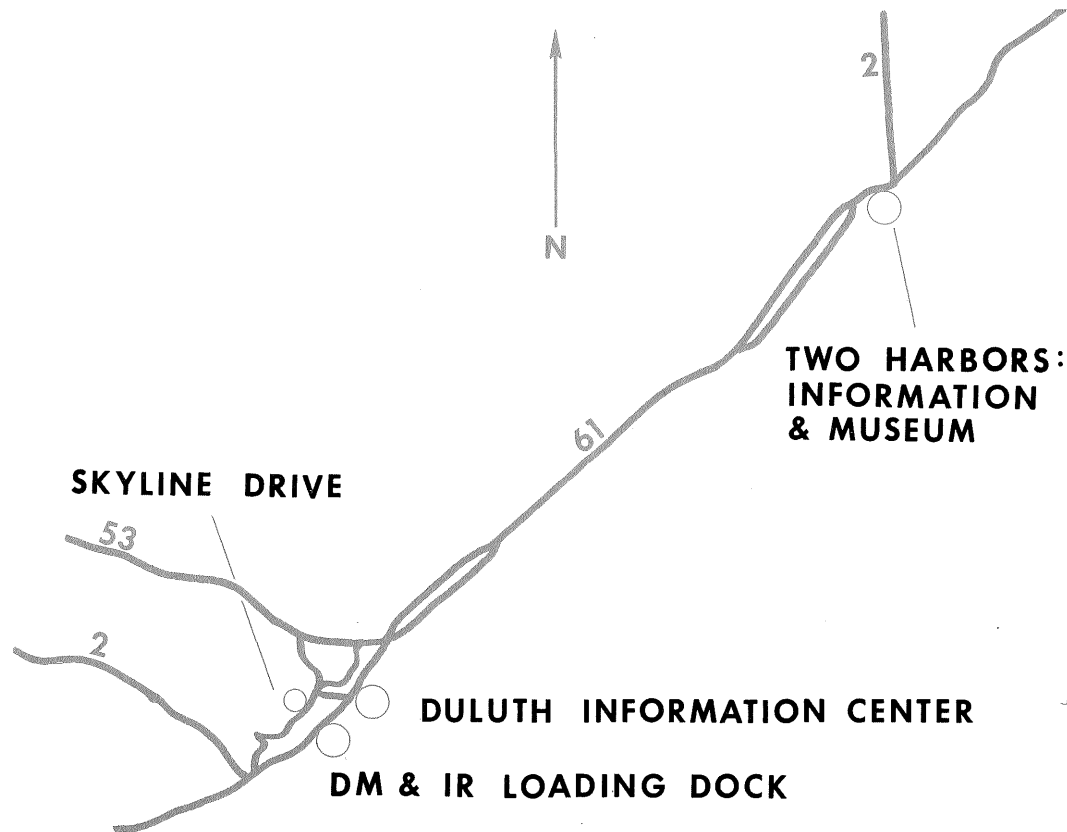
Power plant facilities for the docks, mine, and taconite plant are located in the harbor area.

CARIBOU FALLS STATE PARK

Located 45 miles northeast of Two Harbors on Highway 61, the park offers picnic grounds, hiking trails and stream fishing. The park also contains a spectacular waterfall and deep gorge. A rugged trail leads upstream to the falls which are considered among the most beautiful in the state.

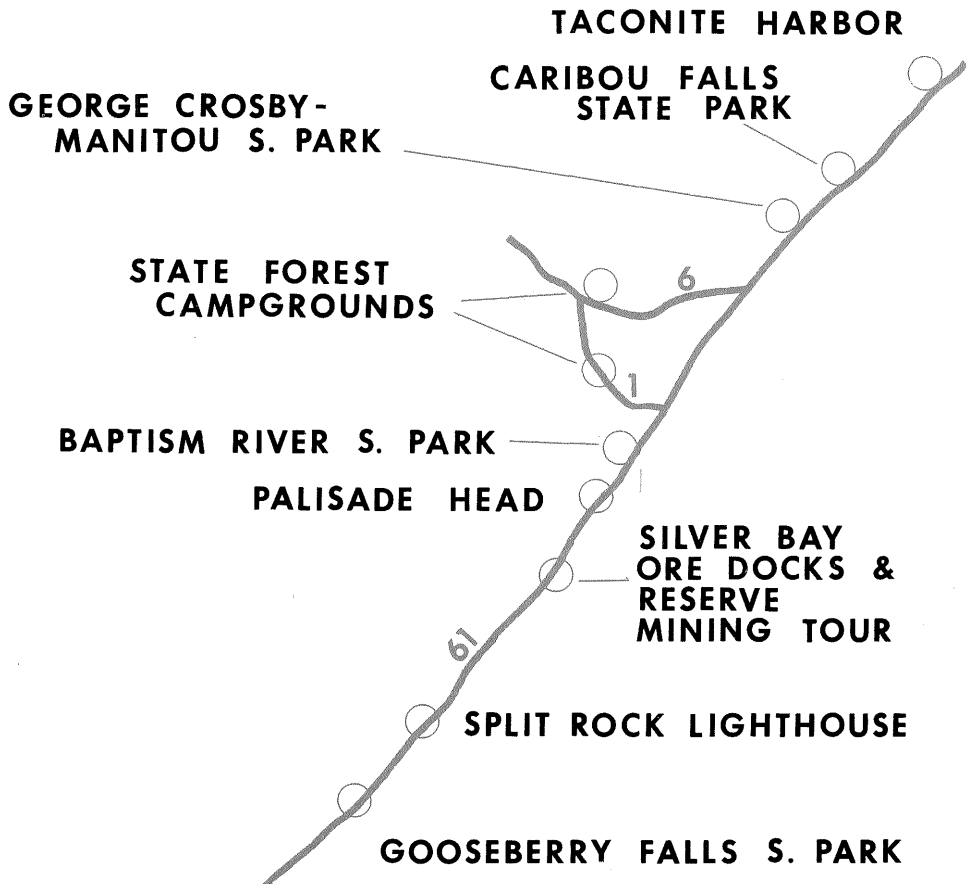
GEORGE CROSBY — MANITOU STATE PARK

Located 7 miles north of Illgen City, access to the park is from County Road 7 north of Finland. Hiking trails and stream fishing in a mountainous rock and forest area along the Manitou River make the park a favorite spot.



NORTH SHORE

Camping fee in all State Parks is \$2.00 per night. Vehicle permit required for access to State Parks; annual permit, \$3.00; overnight permit, \$1.00.



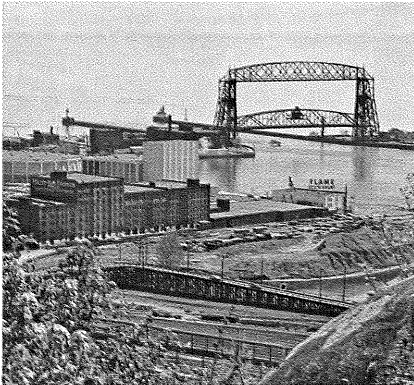
ECKBECK AND FINLAND STATE FORESTS CAMPGROUNDS

Eckbeck Campground is 3 miles south of Finland on State Highway 1 and has 31 campsites. Finland Campground is ¼ mile east of Finland on County Road 6 and has 18 campsites. Both are on the Baptism River and both have fireplaces, tables, toilets and drinking water.

BAPTISM RIVER STATE PARK

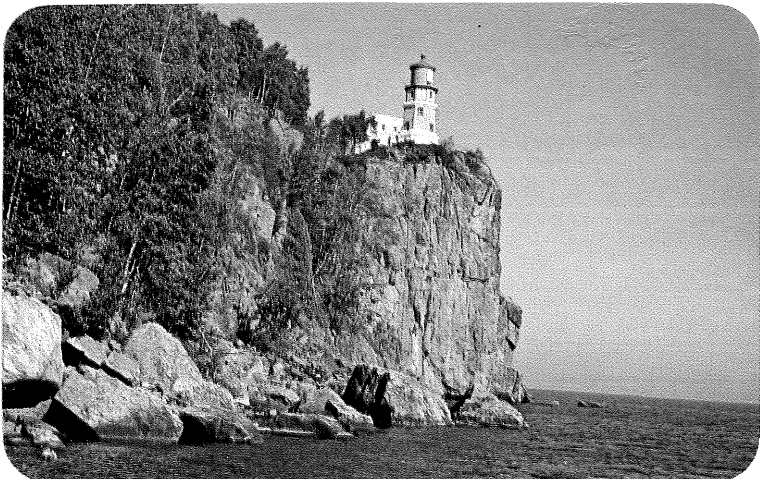
The park is 4½ miles north of Silver Bay on Highway 61. In addition to the highest waterfall in Minnesota, it sports picnic grounds, hiking trails and stream fishing.

The park is in an area commonly called the Sawtooth Mountains, with the rugged topography having been formed by the erosion of ancient lava flows extending from Duluth to Grand Portage. An outstanding scenic area.



Duluth Harbor with its famous aerial lift bridge.

Split Rock Lighthouse, one of the highest in the United States, provides one of many beautiful scenes along the north shore.



PALISADE HEAD WAYSIDE

Located 1 mile south of Illgen City on Highway 61, this way-side offers a spectacular view of Lake Superior from the top of the headland.

SILVER BAY ORE DOCKS VIEWPOINT AND RESERVE MINING COMPANY TOUR

The viewpoint is a short distance southeast of Highway 61 opposite the entrance to the residential and business section of Silver Bay. Manned by attendants during the summer, it provides an excellent view of concentrating facilities and dock loading equipment at Silver Bay. Rock samples and literature are available.

Bus tours of the plant are conducted Monday through Friday during the summer. Space on the bus is limited and visitors who register in advance are given priority. Tours are limited to persons 16 years and above; no cameras are permitted in the plant area; women are requested to wear slacks and low heeled shoes.

Reserve Mining Company mines enough ore at its Babbitt mine to produce 10.7 million tons of taconite pellets annually at Silver Bay.

SPLIT ROCK LIGHTHOUSE WAYSIDE

This wayside, 8 miles southwest of Beaver Bay on Highway 61, overlooks Split Rock Light Station and Lake Superior. It offers hiking trails and stream fishing.

The Light Station was built by the U.S. Lighthouse Service for navigation assistance along the dangerous Lake Superior trade routes, and began operation in 1910. Built on a rock escarpment 170 feet above the lake, its light was visible for 22 miles. Modern electronic navigation aids have made its light obsolete, however, and it was closed in 1969.

The Split Rock Lighthouse area is a Minnesota State Park. For information on open hours and facilities available, check with the park superintendent.

GOOSEBERRY FALLS STATE PARK

Located 14 miles north of Two Harbors on Highway 61, the park offers a picnic area, modern campgrounds with 125 campsites, laundry facilities, hiking trails, stream fishing and swimming.

The Gooseberry River, so named by the French over 250 years ago, cascades over two waterfalls and drops 240 feet down a series of spectacular rapids. Each step in the rapids represents an individual lava flow eroded by the river.

Early lumber camps were located near the river's mouth between 1898 and 1909.

TWO HARBORS INFORMATION CENTER AND LAKE COUNTY HISTORICAL SOCIETY MUSEUM

Located 8 blocks south of Highway 61 in Two Harbors, the museum is open from June 1 to September 30, daily from 9 a.m. to 4 p.m. and 1 to 4 p.m. on Sundays. Loading operations at Two Harbors docks can be observed from near the museum.

Housed at the original site of the Duluth and Iron Range Railway Depot, the museum has exhibits relating to the mining and logging history of the region, including two steam locomotives used in early mining operations. The Three Spot, first locomotive to carry ore from the Soudan Mine to Two Harbors, is displayed.

DULUTH INFORMATION CENTER

Located on the waterfront area east of the Duluth Arena-Auditorium, the hours are daily from 8 a.m. to 9 p.m. June 1 through September 30.

The Center provides information on events and entertainment in Duluth as well as on all outdoor recreation activities in the area.

DM & IR ORE LOADING DOCK VIEWPOINT

The best access is from 40th Avenue West across 35W to the east frontage road. Follow the frontage road north into the DM & IR parking lot.

The Duluth, Mesabi and Iron Range Railroad hauls ore from the Mesabi Range and, formerly, from the Vermilion. The Railroad requires large land areas for railroad maintenance, ore and pellet storage and car shipment make-up. The yard north of the loading docks is used for pellet storage during the winter when ore boats cannot navigate the icebound Lake Superior. Iron ore is stored in cars at Proctor, 8 miles west of Duluth, until the shipping season begins.

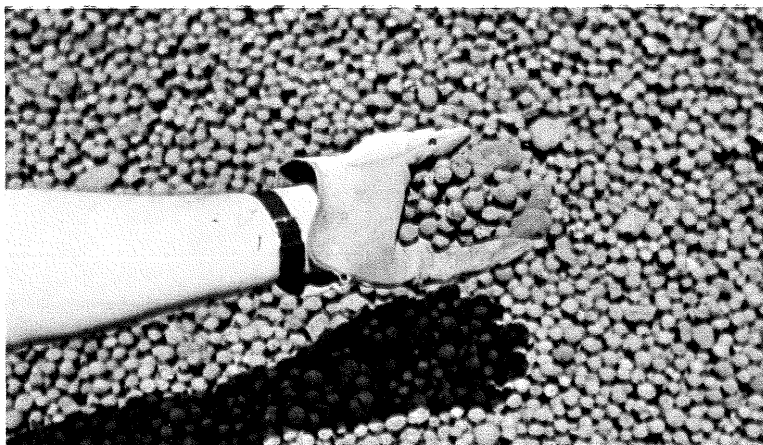
Because the minerology and chemistry of each car load of ore can vary, the content of each car is carefully analyzed, weighed and recorded. Ore boats are loaded according to a "recipe" supplied by the buyer. The recipe states the proportion of iron, phosphorous, silica, alumina and manganese that the steel-maker needs. At Proctor the ore cars are then arranged to produce the required mixture and pulled to the Duluth docks for loading.

The site provides exciting views of the loading process and a booklet available there explains the complete operation.

SKYLINE DRIVE TURNOUT

Located $\frac{2}{3}$ mile west of Highway 53, the Drive overlooks the city and harbor of Duluth. The DM & IR ore boat loading facilities can be seen directly below the viewpoint.

TACONITE MINING



Finished taconite pellets

The first attempt to utilize low grade taconites occurred during the early 1920's. Mesaba Iron Company built a large plant at Babbitt and produced a useable iron concentrate for several years. But the operation was premature.

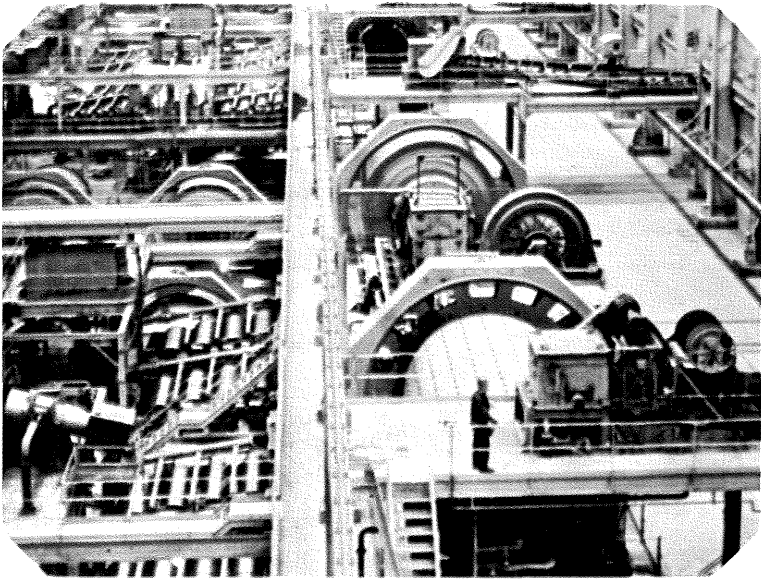
High costs, primitive equipment and the abundance of high grade natural ores restricted the profit of taconite mining. Although the pioneer plant was abandoned, it became the model for later, more successful taconite operations.

Meanwhile, taconite beneficiation research was conducted by private organizations and the University of Minnesota's Mines Experiment Station. A technology developed by the Station, combined with a diminished supply of natural ores, led to a renewed interest in taconite. Seven taconite plants now operate in Minnesota, producing more than 33 million tons of iron ore pellets annually.

Taconite mining is confined to the eastern and central section of the Mesabi range where the primary iron mineral is magnetic (magnetite).

The iron in non-magnetic taconites is usually in the form of hematite. These taconites are softer, easier to drill, blast and crush. Such ore is also readily accessible in the exhausted western Mesabi pits. Hematite, however, is more difficult to separate from the silica because it does not respond to magnetic segregation. If current research yields a practical method for extracting the iron from non-magnetic taconites, Minnesota's ore resources will be greatly increased.

TACONITE PROCESSING



Taconite concentrator

After exploratory drilling, evaluation and overburden stripping, special jet piercing or rotating drills are used to make blast holes in the hard taconite. These are loaded with explosives such as ammonia-nitrate and fuel oil and are detonated. The blasted taconite is loaded by power shovel into trucks or trains for transport to the primary crusher.

Three stages of crushing and two types of grinding reduce the taconite ore to the consistency of flour. This taconite powder undergoes magnetic separation and is filtered to remove excess water. It is then mixed with a special clay and rolled into pellets of three-eighths inch to one-half inch in diameter. These "green" pellets are baked in one of a variety of furnaces or kilns.

The original taconite rock contains 25-30% iron. The finished pellet has an iron content of about 65%.

To produce a ton of pellets requires 100 kwh of electricity, 50 tons of water and three tons of taconite ore. Although the water requirements for a taconite plant may be close to 100,000 gallons per minute, recirculation cuts make-up water to about 10% of the total demand. Such volumes of water necessitate construction of reservoirs for each taconite facility.

The large amounts of waste material produced requires enormous storage areas called tailings basins.

SHIPPING

With the exception of Reserve Mining Company, which ships crude taconite to Silver Bay for processing, taconite companies produce pellets on or near the Mesabi and ship them to Lake Superior ports by train.

Great Lakes ore carriers then transport them to steel-making centers in Chicago, Gary and Cleveland, or to Lake Erie ports for further rail transport to steel plants in Pittsburgh.



SUMMARY

Mining on the Minnesota iron ranges is a long term process marked by cycles of mining and dormancy of any one property. Mining occurs when the demand for iron ore and the practical means for its extraction coincide. All iron bearing rock on the ranges, therefore, has potential value.

Even the exhausted pits may one day be drained and the lean ores on the pit walls and floors recovered. Low grade materials encountered during the mining must be stockpiled to await later processing.

Minnesota has produced over 60% of the nation's domestic iron ore during the past 85 years. And forty-five billion tons of magnetic taconite reserves, plus even larger quantities of non-magnetic taconite, are still available.

The continued demand for iron and the increased efficiency in iron extraction assures Minnesota a long and productive future in iron ore mining.

SIGNIFICANT HISTORIC DATES

Mesabi

- 1866 Iron ore on Mesabi Range first noted by Henry H. Eames.
- 1869-1872 Magnetic taconite indications and discovery by Peter Mitchell in northwest corner of Section 20, T. 60 N., R. 12 W.
- 1877 Cassius Merrit discovers iron ore on Missabe Mountain.
- 1890 J. A. Nicols discovers iron ore near Mountain Iron, Minnesota.
- 1892 Completion of D.M. & I.R. to Mountain Iron.
- 1892 October 17, first shipment of iron ore from the Mesabi Range. Shipped from Mountain Iron Mine to Two Harbors, 4,295 tons.
- 1907-1910 Trout Lake Concentrator employs first natural ore and beneficiation process.
- 1922-1924 First taconite beneficiation operation near Babbitt.

Cuyuna

- 1859 Strong magnetic variations noted by U.S. Land Survey.
- 1882 Test pits sunk by Henry Pajari in Sections 28 and 32, T. 46, R. 29.
- 1890's Cuyler Adams explores Cuyuna region.
- 1904 Adams discovers ore by drilling in Deerwood Township.
- 1911 First ore shipped from Cuyuna Iron Range — Kennedy Mine near Crosby.

Vermilion

- 1850 Iron ore found by J. G. Norwood near Gunflint Lake.
- 1865 Iron ore discovered by Eames and Stuntz at location of Soudan Mine near Lake Vermilion.
- 1874 Duluth and Iron Range Railroad formed.
- 1882 Founding of Minnesota Iron Company by Charlemagne Tower.
- 1882 Founding of Mesabi Iron Company with Alexander Ramsey as president.
- 1884 Completion of Duluth and Iron Range Railroad from Two Harbors to Tower.
- 1884 July 31 — first shipment of iron ore from Soudan Mine to Two Harbors.
- 1886 Iron ore discovered at Ely — Chandler Mine.
- 1886 Minnesota Iron Company purchases Soudan Mine, Railroad and loading Docks at Two Harbors. Minnesota Iron Company later becomes part of United States Steel.

