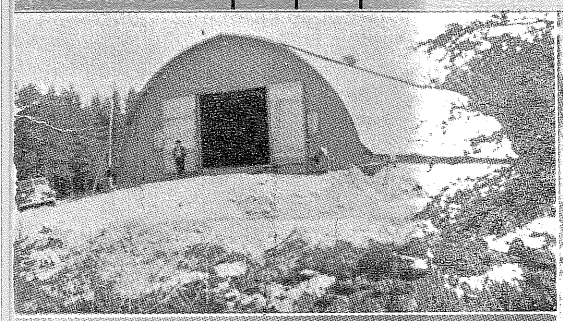
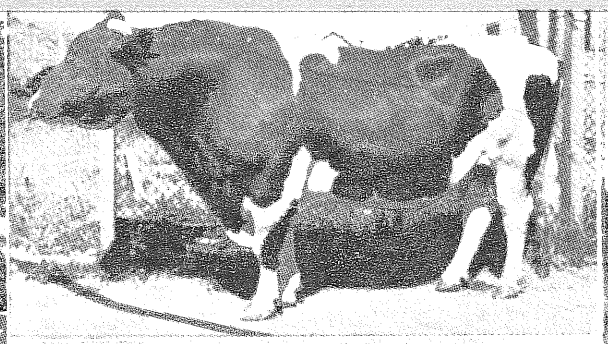
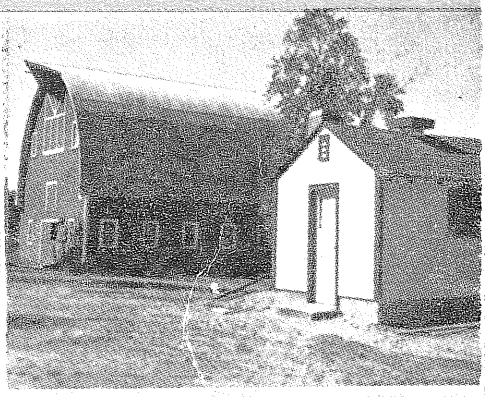
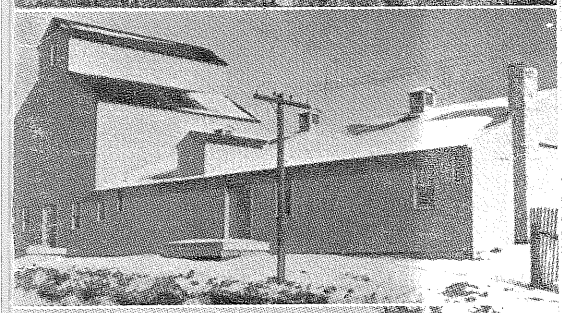
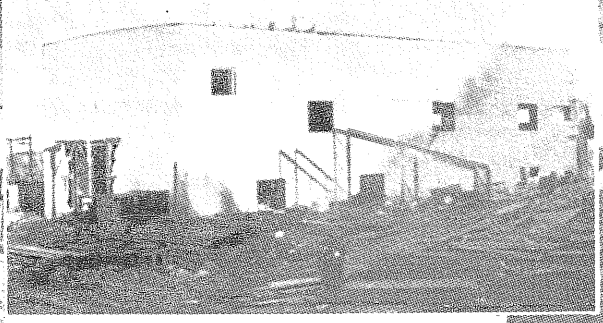
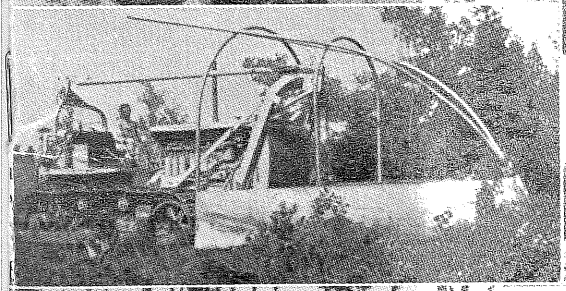
Developing the Resources of Minnesota

A Progress Report from the Commissioner of Iron Range Resources and Rehabilitation






OFFICE OF COMMISSIONER OF THE

Iron Range Resources and Rehabilitation

LUTHER W. YOUNGDAHL
GOVERNOR

ROBERT E. WILSON
COMMISSIONER

622 STATE OFFICE BUILDING
SAINT PAUL 1, MINNESOTA

To the Honorable Luther W. Youngdahl
and to the Members of the Fifty-fifth
Session of the Minnesota State Legislature

I am submitting herewith the Biennial Report of the Office of Commissioner of the Iron Range Resources and Rehabilitation for 1945-47.

The factual material and pictures contained herein reflect, not only the progress this department has made, but also the possibilities for further future development.

I believe this report will be significant to the members of the legislature, organizations, agencies and individuals who are interested in the natural resources and industrial development of Minnesota.

Respectfully submitted,

R. E. Wilson
Commissioner

BIENNIAL REPORT

of

ROBERT E. WILSON, COMMISSIONER
OF THE IRON RANGE RESOURCES
AND REHABILITATION

622 State Office Building Saint Paul 1, Minnesota

* * *

January 1, 1945

to

January 1, 1947

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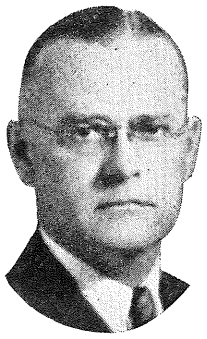
We will be pleased to supply, upon request, additional copies of this report or additional information regarding any phase of development. All requests should be addressed to

IRON RANGE RESOURCES AND REHABILITATION
622 State Office Building
St. Paul, Minnesota

* * *

Members of Commission



SENATOR C. A. DAHLE
Duluth, Minn.
Chairman

This body was created by the 1943 legislature to advise and guide the Commissioner in his development program of the resources of Minnesota.

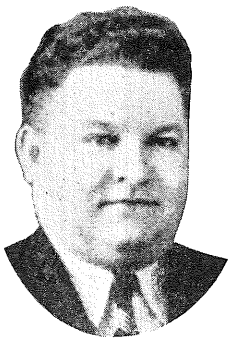
The projects described herein have all been approved by the Commission. Therefore, the program is not that of the Commissioner alone but the Commission members as well. By consolidating our ideas, we have achieved a development program of action.

I wish to thank my advisory Commission for their splendid cooperation and guidance during the past two years. Their broad concepts of the problems confronting the people of Minnesota have been a profound inspiration to me.

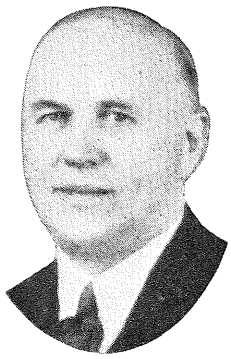
These members of the legislature are to be complimented in the manner in which they have guided this department and for giving so generously of their time in its behalf.

* * * * *

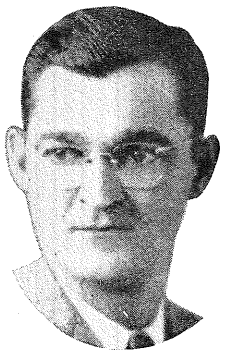
To my staff, I want to express my sincere appreciation for the conscientious manner in which each one has conducted the duties of his office and for the contributions they have made towards this report.



REP. FRED SCHWANKE
Deerwood, Minn.
Secretary



SENATOR GEORGE O'BRIEN
Grand Rapids, Minn.



REP. THOS. VUKELICH
Gilbert, Minn.

SENATOR M. J. GALVIN
Winona, Minn.

CHESTER S. WILSON
Com. of Conservation

REP. J. J. DAUN
St. Peter, Minn.
Vice Chairman

Minnesota Offers . . .

No state in the union has a richer, more varied or romantic heritage than Minnesota. It has been richly endowed with an abundance of natural resources, rich soil, mineral deposits, forests, water and wildlife.

Hundreds of years before Minnesota was proclaimed a territory of the United States, white men found their way into this region. The Mississippi River was a large contributing factor in the early exploration of the heart of the great northwest. The head waters of the Mississippi was the goal of many early French and English explorers and legends are told of their adventures with the Indians who inhabited the land.

After the explorers, many fur and skin traders thronged into the territory because of the luxuriousness of the fur-bearing animals. The towering forests provided enormous wealth for those interested in lumbering. The richness of the soil was an incentive which attracted hundreds of industrious farmers to settle in the area. In short, all of these factors have contributed towards building Minnesota as it is today.

The great Mississippi River has a humble beginning in Lake Itasca in Northern Minnesota. The river gains courage and force as it passes through many of Minnesota's ten thousand lakes along its path. It enters triumphantly into Minneapolis with all the power and vigor of youth. At this point the Mississippi tumbles over the Falls of St. Anthony, providing a natural source of power. As the river wends its way down through the southern part of the state, it is ever revitalized with rich, young current of other Minnesota waters.

The towering forests standing straight, as a clear call to God, lift their arms silently and reverently into the majestic heavens, offering to the peripatetic philosopher, the naturalist and the lover of the great outdoors both enjoyment and inspiration. The enormous wealth of our forests provided to those interested in lumbering and the manufacture of lumber products a thriving industry for many years.

The most productive iron mines in the world are located in the rugged northeastern part of Minnesota. It contains three famous iron ranges, the Vermilion, Mesabi, and Cuyuna. Building stones (granite, sandstone, limestone), brick, clay, sand and gravel are other minerals of commercial importance within the state.

"Gold is precious, iron is priceless, but bread is indispensable" is a saying which punctuates very vividly the importance of Minnesota as an agricultural state. Some of the most productive wheat lands in the world lie within the boundaries of Minnesota. Dairying and cattle raising are also very important enterprises. Corn is a leading crop in the southern part of the state. The annual rainfall is light, but owing to the amount of moisture in the soil and the fact that most rains occur when needed in the growing season, it is sufficient for splendid crops. The snow that blankets the ground throughout the winter is an additional protection to the vegetation which grows with marvelous rapidity in the spring.

Year around recreational allure attracts thousands of natives and visitors alike to the great outdoors. In the spring there is the pleasure and satisfaction of fishing in any one of the ten thousand lakes, which can be reached conveniently from any section of the state. In summer there is more extensive fishing, boating and swimming. In the autumn, in a blaze of red and yellow glory, Minnesota becomes a hunters' paradise. The winter season provides enjoyment for skaters and skiers.

To those who come to fish or hunt or canoe among our lakes and streams in Northern Minnesota it is a truly beautiful spot as well as a favorite recreational region of the nation. But to the inhabitants of the area, the farmers, businessmen, foresters and governmental officials, this area was

PICTURED ON FRONT COVER

First row, left to right: Potato warehouse near Aurora; one of the many bulls used in the artificial breeding program; modern milkhouse. Second row: Seed elevator and warehouse at Cook, Minn.; iron powder building at Aurora; open pit iron ore mine at Hibbing. Third row: Land clearing machine; peat processing plant at Floodwood. Fourth row: Hauling pulpwood; view showing terrain of site for iron powder plant at Aurora; school boys working on pulpwood lots.

rapidly becoming a distressed region. The giant forests, which once endowed prosperous timber industries as well as contributed substantially through land and timber stumpage sales to the permanent trust funds of our state, were disappearing. The exploitation of the forests, unwise attempts at farming and the technological improvements of the mining industry, which was diminishing labor's chances, were contributing factors to the economic problems facing this area. Therefore, in spite of the region's potential resources, even before the depression, the unemployment problem became crucial. During the depression the relief needs of this area were above the average for the state. Local governments had to depend more and more upon state grants, not only for relief funds, but for the ordinary expense of schools and other public services. Thus the reestablishment of the economic independence of the cut-over area was a problem in which the prosperity of the entire state was involved. Though many of the resources had been depleted, they could be restored again, and there were others with great potentialities lying dormant. The economic difficulties of the cut-over area originated chiefly from the misuse of the natural resources. The greatest asset for a balanced economy lies in these natural resources, and the road back to self-sufficiency was by reconstruction and use of the resources in a manner which would maintain their permanent productivity.

The importance of the human and natural resources of the state, specifically in the area we refer to as the "cut-over," prompted the 1941 legislature to create the Office of the Commissioner of the Iron Range Resources and Rehabilitation. It charged the department with the duty of developing all resources and providing vocational training and rehabilitation to residents of any county in which natural resources had been depleted resulting in unemployment and distress.

With the recognition of the problems confronting the area, a program of action was initiated whereby through intelligent research and development we could utilize the resources, conserve high grade iron ore, by discovering new methods of utilizing the low grade ores, revive lumbering and agriculture on a sound basis and develop new industries from unused resources. The only permanent solution to the problems of the cut-over region would be to restore the natural resources. This of course cannot be accomplished in a single generation. Reliance must be placed on the healing processes of nature. Many things could be done, however, which would hasten this process and meanwhile relieve the distress of the people.

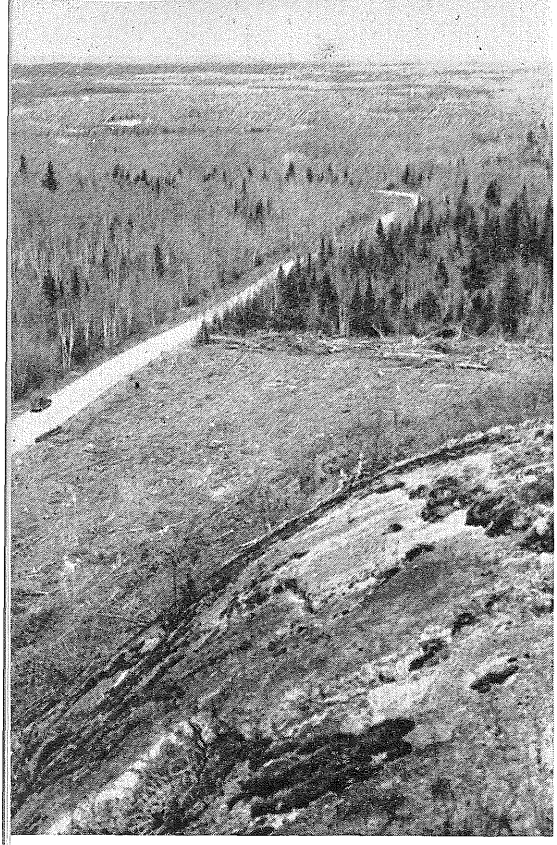
This program was designed to be more than one of crystal gazing and wishful thinking. Merely spending the funds "because they are there for that purpose" provided no sound basis for establishing a durable framework for the creative side of the rehabilitation problems. Familiarity with the realities of rehabilitation in a concrete rather than abstract way was essential. Some trial and error, some gamble, is involved in whatever is attempted in this field, yet this factor can be minimized if not eliminated through advance understanding and investigation.

Developing the vast deposits of Minnesota's natural resources and thereby encouraging new industry to build a richer and better way of life for the people of the area has been uppermost in the minds of the present administration for the past five years. Realizing that man has been recklessly wasteful with the unevenly distributed mineral resources of the earth, we believe that these resources, though generous, need to be exploited with economy and with due regard for the requirements of posterity. Therefore, the application of scientific research of our iron deposits, as well as our forests and peat resources of the state, became part of our program.

A complete survey of the area was taken in 1941 and although some regarded the outlook with a great deal of pessimism, there were sound reasons to justify optimism. A philosophy was adopted that the future can be anything we want to make it. There are no frontiers to the mind, there are no limits to the vast unexplored fields of scientific research awaiting discovery. We accepted the challenge and set in motion a long range intelligent and aggressive "action" program with humble faith in our ability to solve the problems as they presented themselves. The war emergency somewhat relieved the critical situation and provided us an opportunity to get our program underway.

In the last Biennial Report, we had achieved certain marked progress with our program, and many other projects were just in the proposal stage. To expect miracles or grandiose developments overnight are not in the cards of finance. Certain ambitious, costly and uncertain projects could not be undertaken where too much risk was involved. Therefore, it has been necessary to conduct this office with a certain degree of prudence in the administration of this fund. Since our last report, world hostilities have ceased. The far-reaching consequence of the transition from war to peace has affected every one of us. During the war years we produced at such an accelerated pace

(Continued on page 29)



Plant Site Is Cleared

Chemical Process Puts Low Grade Ore to Work

A new page in the history of the rugged iron mining country is being written with the building of the iron powder plant at Aurora, Minnesota.

It is supposedly said that its historical importance will outrank the gold rush days of 1865 which excited the scantily populated state into a futile fifteen-year search for the precious metal around Vermillion Lake. It may take its place alongside the historical date of July 31, 1884, when the first shipment of iron ore from a Minnesota mine was made from Soudan, thirty-five miles north of Aurora. Probably none of the workmen, or visiting Chippewa Indians, who helped load the 220 tons of ore into ten empty cars knew the vast significance of that day. It is just as possible that few of the 130 men constructing the iron powder project five miles from Aurora know its real significance.

The five-ton-per-day pilot plant is the largest research ever attempted by the state government and is now approximately 47% complete.

The basic problem of conservation of the State of Minnesota's mineral resources, while assuring profitable employment in the range areas, is being vigorously attacked from two sides. Development of low cost methods of processing the huge tonnages of low grade ore required for blast furnace use, to replace the dwindling supplies of high grade ore, has been under way for years with the more progressive private mining interests.

The other attack is the recently inaugurated program of the Commissioner of the Iron Range Resources and Rehabilitation to develop an industry employing greater numbers of workers per ton of finished product, to produce iron powder of considerably higher value than any mineral product yet produced in the state.

No such tonnages of iron powder can be expected as those attained by ore for blast furnace uses. But the successful oper-

Pouring Cement for Foundations

Cement Foundations Ready for Steel Construction

ation of the iron plant now under construction with the Commission's fund will provide year-around employment in the range area to increasing numbers in a modern chemical plant, the first of its kind in the state.

Subsidiary manufacturing plants using the powder may be expected in the area, especially if programs now under way for the processing of peat for production of gas prove successful.

Because this development may change the pattern of industrial effort in the state, it is profitable to note in some detail the outstanding features of the product, iron powder, and of the Firth Process by which it is proposed to be made.

Iron in the form of a fine powder has been used, in varying degrees of purity, to form metallic parts such as bearings, pinions, cams and other machine parts. The powder is compacted to shape under great pressure in a die (more or less as plastics are molded). The smoother finished part is then given its strength by treatment in a furnace in which the air is excluded, so that after cooling it emerges smooth and true to dimension.

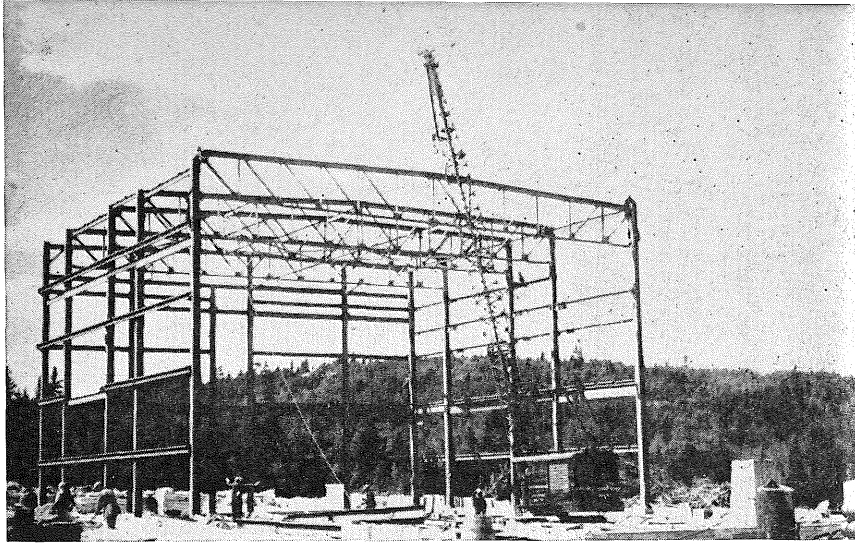
Great savings result especially when the part is intricate in shape and would require much skilled machining to produce by conventional methods. During the war many bottlenecks of equipment and skilled labor were avoided by the use of this method for parts for machine guns, anti-aircraft weapons, and precision gauges.

The use of the method has been greatly restricted by the high cost of pure iron powder presently available (40 cents or more per pound). The lower grade of iron powder available at lower prices presents serious drawbacks due to scoring of dies and unsatisfactory strength.

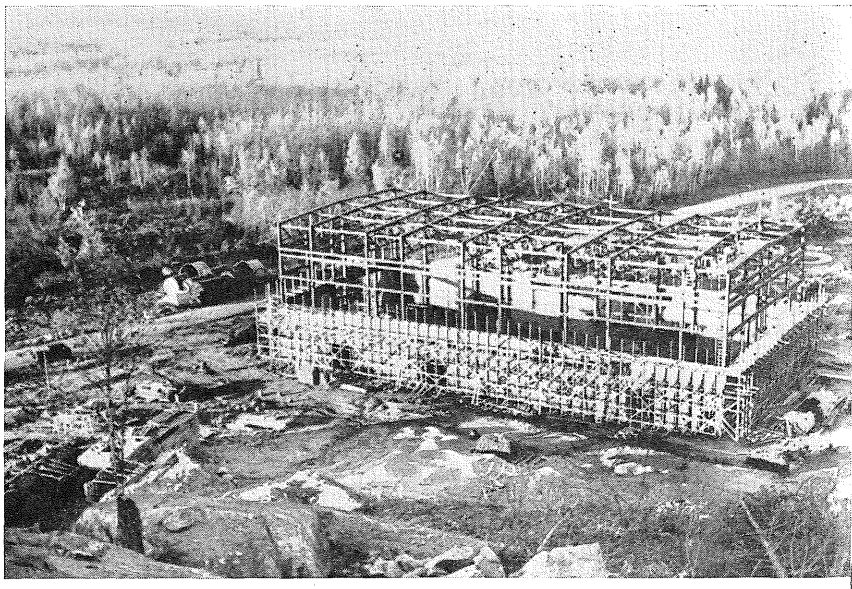
The late Charles V. Firth of the Mines Experiment Station of the University of Minnesota developed a method for production of iron powder of purity over 99% by a chemical process from iron carbonate slate, a waste product overlying large areas of the iron ranges. Low cost was indicated for volume production.

Tests of this powder in forming compacts, notably by Continental Machines, Inc., proved that it was ideally suited to the purpose; and with the consent of the University, Continental Machines arranged for and processed a patent application on the process.

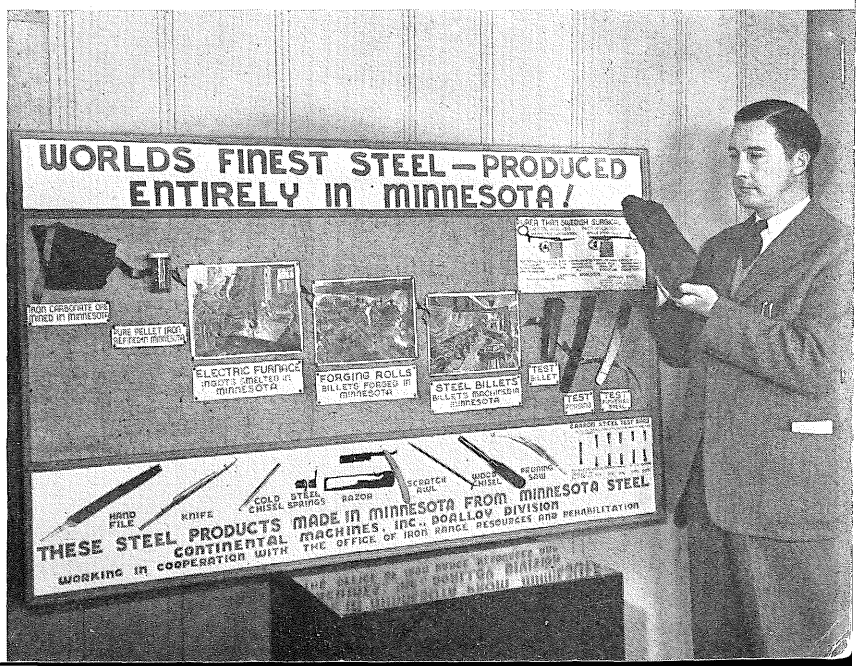
The small lot method of production of this

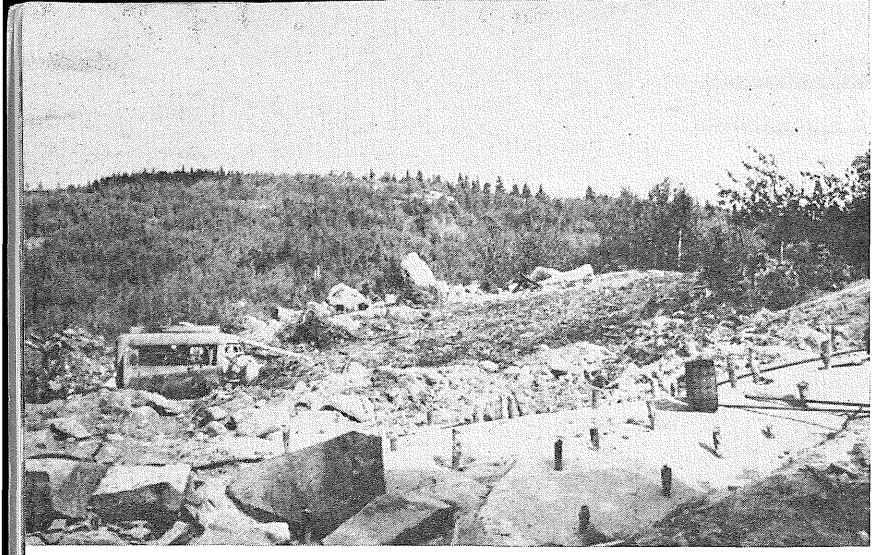


Massive Steel Girders Being Placed

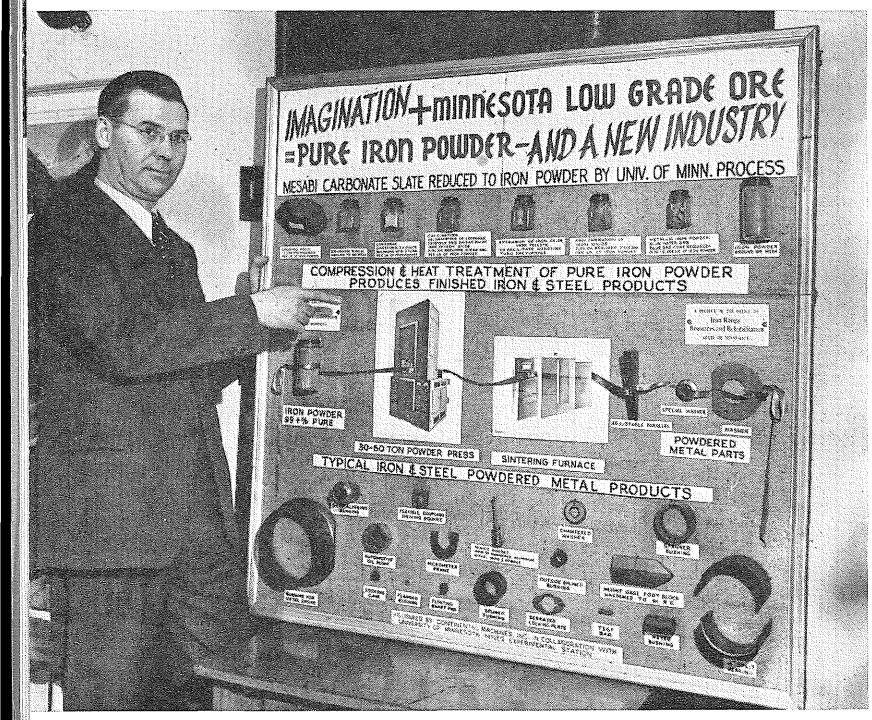


Cement Blocks Form the Walls

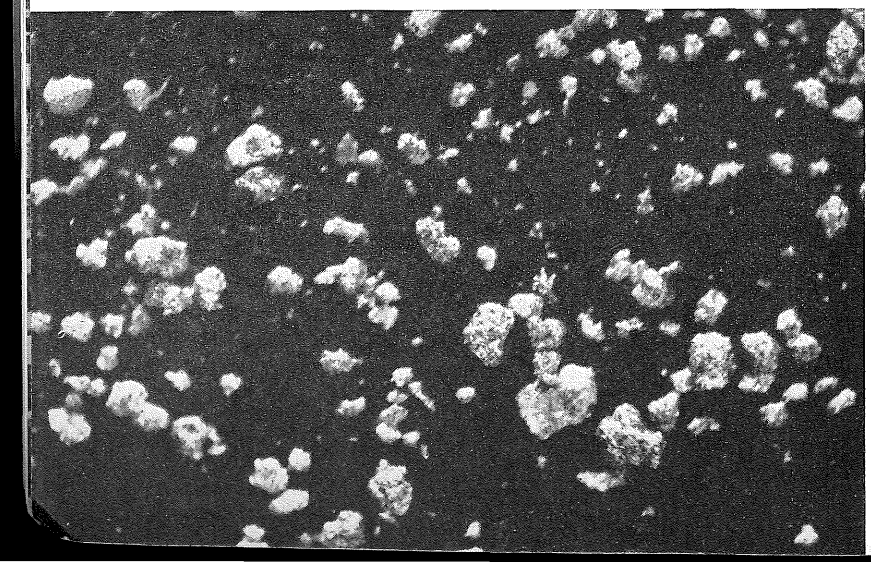




Ready to Set Off Charge to Remove Rock, This Ledge Is Location of Large Primary Crusher



Microscopic Photo of Iron Powder Particles



powder in the original tests could give no real indication of production costs or tonnages, which would be needed before private industry could build a production plant to use the process. However, it was apparent to many, both in industry and in the state government, that the process had by far the greatest possibilities for development of resources and for rehabilitation of the range area of any project yet proposed.

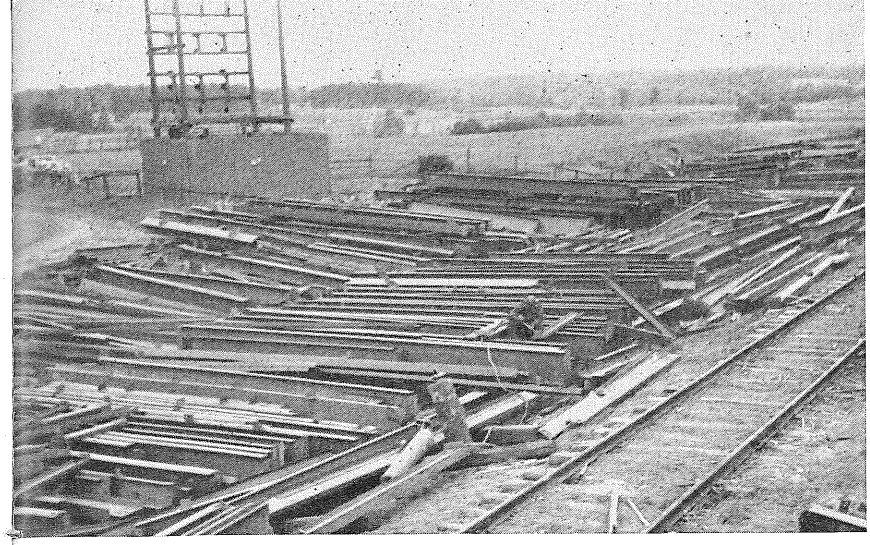
This, coupled with the desire of Continental Machines to expand their machine tool business by the production and sale of metal powders as well as the tools for processing them, led to the appropriation by the Commissioner of $650,000 for the construction of a modern pilot plant to test the commercial feasibility of the project.

Continental Machines was entrusted with the construction of the plant and with the operation of it, the latter at its own expense, with the provision that royalties would be paid on sales, and that the Firth process and any improvements made on it at the plant were to be available for use by any others in the state.

Accordingly, construction was started in the summer of 1946 at a site at the eastern end of the Mesabi range near Aurora, which is within three miles of a tremendous body of carbonate slate, proved by drilling, and within two miles of a water supply from the Embarrass River.

Since ten tons of slate must be handled to process one ton of iron powder, it was necessary not only to be within a short truck haul from the proposed pit but provisions had to be made for a stock pile of crushed ore sufficient to last through the winter season if year-around operation, needed for economy, was to be attained. This resulted in a choice of a site which included a steep bluff, on which the primary crusher is being mounted and below which a stock pile may be fed into the building. Before cold weather shut down construction work, the building was erected and the six-inch pipeline to the river was nearly completed.

An aggressive campaign with the War Assets Administration in Washington was carried on by the Commissioner and the personnel of Continental Machines, and, with the assistance of Senator Joseph H. Ball, secured for the project, at great reduction in cost, more than half of the equip-



1030 Tons of Steel Went Into the Framework of Main Building

ment needed to outfit the plant. Slow delivery of the balance of the equipment would have compelled halting of construction even if winter costs had not been excessive.

The willingness of Continental Machines to accept responsibility for the construction of the plant, under recent conditions of rising costs and unavailable materials, has made the project possible where many others have been postponed or abandoned, and it bespeaks for this company the utmost consideration by all agencies of the government and the general public who will benefit from their effort.

Once inside the plant proper the ore will be crushed further and ball milled to a fine sand, which will then be dissolved in acid to separate the iron from the impurities (largely silica).

From this solution, relatively pure crystals of iron sulphate will be prepared by a series of filtering, evaporating and crystallizing operations, using some of the most modern chemical equipment.

These crystals are further purified by a selective roasting operation which changes the iron sulphate to red iron oxide but leaves the impurities in such form that they may be washed out of the iron oxide.

This red oxide, over 99% pure, is then fed through furnaces in which it is reduced to pure iron by contact with gas made in the plant from coke. A series of milling and sizing operations brings the pure iron to a uniform standard of physical characteristics so necessary for successful use.

It is quickly recognized that the above process is neither short nor simple, and success of the method will depend on the extent to which purity can be maintained, production rate kept up, and operating and maintenance costs kept down. Of course, success will breed success, in that the more iron powder that can be sold, the less it will cost to produce. The site has been chosen, and the equipment so laid out, as to allow for all expansion possible in the present plant before new construction will be required.

(Continued on page 29)

Building Nears Completion
60 Feet High
80 Feet Wide
180 Feet Long

The Mineralogy and Geology of the Taconite and Iron Ores of the Mesabi Range

The following is an abstract of a valuable bulletin entitled "Mineralogy and Geology of the Mesabi Range" written under the auspices of and published by the Office of the Commissioner of the Iron Range Resources and Rehabilitation, by John W. Gruner, Professor of Geology and Mineralogy, University of Minnesota.

The demand for a concise but detailed investigation and report on the minerals and ores of the Mesabi Range prompted the publication of this timely bulletin. As the report is written it should be of value not only to the geologist but of just as much aid to the mining engineer and metallurgist concerned with problems of ore concentration. The minerals of the taconites are more complex than had been previously thought. In the processes of concentration and beneficiation of ores, an understanding of the structures and compositions of the minerals will be of greatest value. The discovery of new silicates in the taconites and the classification of these rocks according to their usefulness and behavior in the concentration plants makes estimates of future reserves of "low grade oxidized ores" and concentrable taconites not only possible but more reliable than in the past.

Much new information has been obtained on the chemical composition of taconite in the different parts of the ranges. The all important **magnetic** iron content has been plotted and discussed from the viewpoint of tonnage of concentrates and reserves.

Some earlier estimates have been found too large. The economically minable portions of the magnetic taconite are estimated at about five billion tons. The concentrates from such quantities would be about two billion tons, that is about as much as the figures on the original total high grade ores of the Mesabi. All these estimates are based on the probability that modern machines will be able to drill, blast, crush, grind, and concentrate the magnetic taconites at a low enough cost which can meet foreign competition.

The high grade ores are discussed in detail with regard to their correlations with the taconites. The shapes and distribution of the ore bodies are given. With regard to reserves of high grade ores the Minnesota Tax Commission has published figures on ore reserves since about 1915. These are based on ore estimates submitted by fee owners and operators who are compelled by law to supply such data. If one plots these figures and compares them with the tonnages of ore mined each year, he observes that the ore reserves have declined only one-third as rapidly as would have been expected on the basis of reserves in 1915. In other words, while almost 1000 million tons were shipped, the reserves decreased only about 300 million tons. The reasons for this apparent discrepancy are:

1. Discovery of new ore, particularly in the detailed development of already known large bodies.

2. Reclassification as ore of material formerly believed not minable because of some changes in blast furnace practice.

3. All-around advances in beneficiation, particularly in washing, which opened vast reserves on the West Mesabi range formerly not classified as ore.

It would be a mistake to assume that this trend of "discovery" could be maintained for many years —that each year the decrease would be 20 million tons less than expected on the basis of ore mined. During the war years, 1940-1945, greater inroads have been made, particularly on the ore reserves minable by open pit, than in any previous **10 year** period. The Mesabi range is the only district in North America that could double its output "at a moment's notice" and, therefore, its reserves of high grade ore have decreased at an alarming rate during the war. It is estimated that about 150 million tons of high grade ore have not yet been discovered. A similar amount of so-called wash ores, figured as concentrates, will also become available over and above the present estimates of the Tax Commission. It may be claimed that the future life of the range based on these ores is about 30 to 40 years. There will be some decline, however, toward the end of the third decade and a much more rapid one after 30 to 40 years.

Copies of this report are still available for distribution and may be obtained by writing the Iron Range Resources and Rehabilitation.

Assisting Private Industry in Developing Our Resources

Many companies, large and small, new and old, have come to our office to avail themselves of the benefits of our experience and for assistance with their various problems. It is impossible to go into explicit details concerning each and every instance but we have selected the following summarization as a typical example of cooperation between this department and private industry.

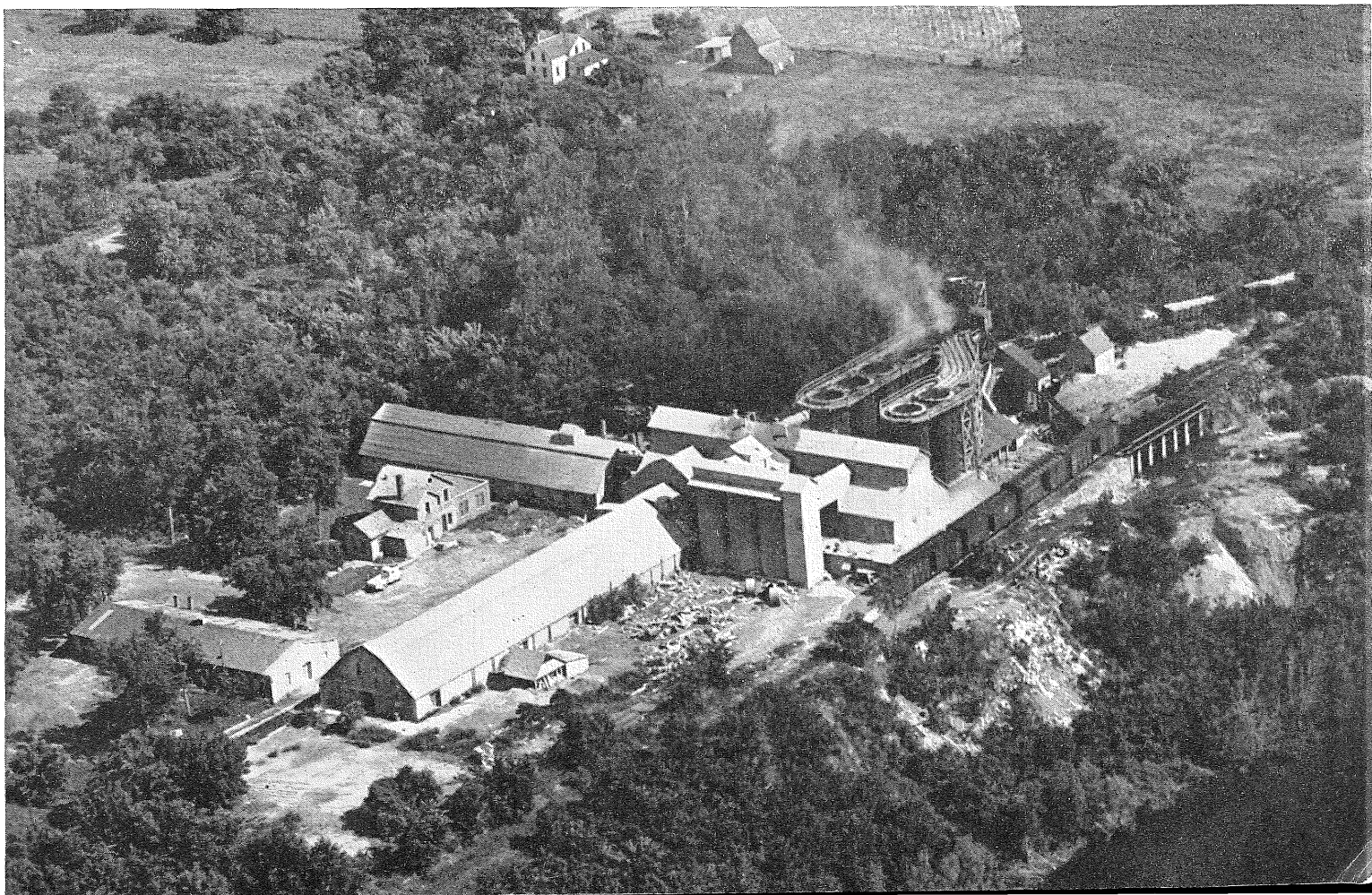
The Carney Company of Mankato, Minnesota, was the first to produce natural cement, west of the Mississippi River in 1883, first to produce masonry cement in the United States in 1904, first to introduce natural cement for blended concrete in the northwest in 1939, first to produce rockwool in the state in 1940 and first to enter large scale permanent agricultural limestone production in southern Minnesota augumented by production of concrete aggregate, road rock, railroad ballast and asphalt filler.

One of the jobs of the Iron Range Resources and Rehabilitation is to search thoroughly for opportunities to utilize the dormant natural resources of Minnesota. It is our chief responsibility through our development program to encourage private industry to develop these resources thereby creating new jobs for our citizens and greater industrial life in Minnesota. Although we are fundamentally concerned with the northeastern portion of Minnesota, our servies and research facilities are available to all industries desiring to avail themselves of the information we have accumulated from our years of experience and research in the various fields of development.

In giving the new industry of the Carney Company some technical information we availed ourselves of a chance not only to stimulate industry but also make available large quantities of crushed limestone to the farmers throughout the state.

Limestone is considered the backbone of a good crop production and soil conservation of this region. The aim should be, first, to use sufficient lime to bring the soil reaction to the proper point, and

Air View of Carney Natural Cement Plant at Mankato



Loading Limestone Aggregate, Which Will Be Used to Re-lime Many Acres of Minnesota Farmlands

thereafter to apply enough to balance amount lost each year by bleaching, over and above what is returned by manure and crop residues.

Thus our help was twofold, first to build a new industry, secondly, to aid agriculture. In our work of assisting new industries there are two facts taken from the annals of American Industrial history which we would like to mention. First, fifteen of our major manufacturing industries have been developed since 1870, and it has been estimated that they have created fifteen million jobs never dreamed of before. Second, on the basis of these figures, about one out of every four persons gainfully employed today owes his job in whole or in part, to development based upon scientific research.

The policy of our state towards industry was voiced very adequately in a speech which Governor Thye delivered at the opening of the Carney crushed rock division. "Today we have the opportunity of viewing the evidence of industrial confidence in Minnesota. With our vast deposits of natural resources, Minnesota outranks any state in potential development possibilities. We have our limestone, our granite, our iron ore, our forests, our peat and many other resources that offer great opportunities. All that is necessary is that we build the confidence of industry and assure it that the state is willing to assist in all ways to help develop these natural resources into a great industrial future. Once that confidence is assured, men of vision, like Mr. Carney and his associates, Minnesota will go forward and maintain a high position in the world of industry. Minnesota will be happier and see better days when the people themselves awaken to their own responsibility, which is that they must contribute to the development of private enterprise by lending it their hearty and loyal support. In return private industry, too, must realize that upon its shoulders rests the responsibility of providing jobs for those who want to work. Here we see, so to speak, that opportunity realized. The Carney Company is opening a new industry that will create new jobs and at the same time, use an important resource of the State of Minnesota.

We are working for security for the state as a whole as well as for us as individuals. This can only be achieved from the bottom up, from opportunities offered and successfully used, risks met and overcome, responsibilities assumed and successfully carried out. In unity there is strength and in strength there is success, success for all of us and a peace of mind with full employment."

History of the Carney Industries

The Carney Company, Inc., is the result of a merger of Carney Rockwool Company into The Carney Company on July 1, 1946.

Rockwool Division

Carney Rockwool Company was founded in 1939 as a subsidiary of The Carney Company at Mankato, Minnesota. Production commenced at a grand opening on October 25, the same year. Today the Rockwool Company is a division of the new The Carney Company, Inc. In 1940, its first full year of operation, the Rockwool plant produced $85,000 of goods and employed approximately 25 men. The Rockwool Division of The Carney Company, Inc., in 1946 will produce $1,300,000 worth of goods and

Carney Quarry Supplies Stone for Crushed Limestone, Natural Cement, Rock Wool

employs approximately 80 people. A new cupola now being installed with a second rockwool batt machine will enable the rockwool division to produce $2,300,000 worth of goods in 1947 and the rockwool division will employ approximately 100 people.

Crushed Rock Division

This business opened November 15, 1945, to produce from Carney's deposit of some 37,000,000 ton supply of rock agricultural limestone, road stone, railroad ballast, fluxing stone and stone for cement and rockwool products. Governor Thye under the auspices of the Office of the Commissioner of the Iron Range Resources and Rehabilitation formally dedicated the new plant. This business is just getting under way and produced approximately 100,000 tons of crushed rock materials in 1946 and now employs about 15 people. The management of The Carney Company, Inc., estimate this tonnage to be at least doubled in 1947, with a total employment of 22-25 people.

Cement Division

This eighty-three year old business was founded in 1883 for the production of natural cement. The plant was generally expanded and was the first producer of masonry cement in the United States, which business has expanded into a national industry, there being today some one hundred manufacturers of this type of product. Through the assistance of the Iron Range Resources and Rehabilitation, the State of Minnesota successfully experimented with blended concrete, a mixture of portland cement and Minnesota Natural Cement, manufactured by the Carney Plant. This opened an entirely new horizon for Minnesota resources. The plant has been and is undergoing a large expansion program to enable it to produce for the hungry building trade in excess of 600,000 barrels of cement in 1947. Many G.I. homes and urgently needed buildings are going ahead today using Carney's theory of blended concrete that otherwise would have been impossible due to the shortage of portland cement. This division employs approximately 42 men and in 1947 the employment estimate is 60.

> Whenever a new force has been brought under control, whenever a new material has been turned to use, the lot of man on earth has been made happier. Enough evidence is on hand to prove beyond doubt that facts can be turned into abundance and therefore that people neither starve nor live in misery.

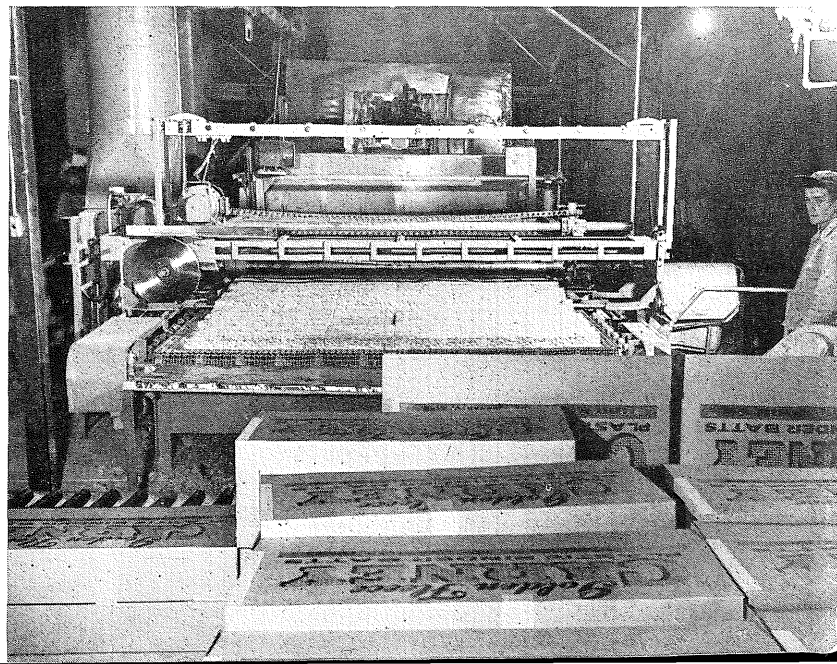
The State Fair Exhibit shows the diversification of our program.

TOPOGRAPHIC MAPPING A NECESSITY

There is a growing interest evidenced by this department in our topographic mapping project. In 1944 we gave this project consideration as it appeared certain that concentration of Mesabi taconite was only a question of time.

The area which supplies the world's largest iron ore district should be mapped. It will also be valuable for the concentration of low grade ores where operators are confronted with serious problems of water supply, tailings disposal, plant location, roads, etc. The mapping of the state area will provide accurate physical data for agencies, for counties, cities and villages. It will provide a means whereby the resources and other physical features of the state may be presented to prospective commercial interests, visitors, and tourists. In fact, these maps will serve as the base data for all preliminary planning, reconnaissance, and examination of industrial, engineering and scientific projects.

Rock Wool Batt Machine — An Exclusive of the Carney Company



Beneficiation of Manganiferous and Low Grade Iron Ores

This is the report submitted by Dr. E. W. Davis, Director of the Mines Experiment Station at the University of Minnesota, on his work, which was carried on during the biennium at an expense of $100,000, appropriated from the Iron Range Resources and Rehabilitation fund by the 1945 session of the legislature.

The appropriation from the Iron Range Resources and Rehabilitation Fund supports the research work being done at the Mines Experiment Station on the low grade ores of the State of Minnesota. As the higher grade ores are depleted the steel companies must look for new ore reserves. After careful investigation, several of these companies have decided that their future ore supplies must come from the low grade ores of the Lake Superior district or from some source outside the United States. We are making every effort to prove that a long-time supply of ore can be secured more cheaply and with greater certainty in Minnesota than elsewhere. The success of our endeavors is evidenced by the activities of at least four large steel companies. These companies have recently acquired great areas of mineral land in Northern Minnesota and are actively engaged in the study of these properties and the processing necessary to manufacture high grade iron ore from the low grade iron-bearing rock, called "taconite," which exists in such enormous quantities in our iron ranges.

The future of our iron mining industry depends upon the success of these investigations. Great progress has been made but much remains to be done before the steel companies and their mining subsidiaries will be convinced that they can replace their dwindling ore reserves by utilizing beneficiated taconite. They know that enormous investments will be required and that payrolls will be greatly increased, but the final shipping product which can be made from the taconite will be a much better smelting ore than the ore they are now receiving. If costs can be kept down, the steel companies would much prefer to get their future ore supplies from Minnesota than from some foreign country.

During the past year, much of the work at the Mines Experiment Station has been connected with the agglomeration into lumps of the fine, powdery concentrate that is secured after concentrating the taconite. This is the final processing step and is one of the most expensive. If the agglomerating process upon which we are now working is successful, the cost of this step will be less than half the cost of the standard agglomerating processes now in use. We are told by some of the steel company officials that this is the most important question remaining to be answered.

Industry is found in every part of Minnesota. It is found in the great counties of Northeastern Minnesota where many are dependent upon the forest products and mining industries. It is found in metropolitan communities and at county cross roads.

Industry is, by no means, confined to the large cities of the state. From census facts it may be shown that 53 per cent of the manufacturing employment of Minnesota is found in the three large cities of Minneapolis, St. Paul and Duluth. Forty-seven per cent is found outside of these three large cities.

The largest single industry in Minnesota is the processing or preserving of agriculture products. This is found wherever farms are found.

There are 73 communities in Minnesota with a population of over 2500 people. A large part of the population of these communities is supported primarily through activities founded upon business and industry.

Processing Our Forest Products

The Iron Range Resources and Rehabilitation has set out to prove that Minnesota's small lumber producers can produce again and market as fine a quality and true grade lumber as any other area through its small producers, the farm lot logger and portable saw-mill operator.

The background of the timber industry in Minnesota was financed during the logging days by large organizations. As the large stands of White and Norway pine disappeared, the large companies moved west to virgin timber regions. Shifting forest industries and disregard for the permanent productivity of the forests, led to the downfall of Northern Minnesota. During the recent years operations have been on a comparatively small scale, with limitations on equipment and capital. Consequently, the efficiency of the operations has not been high enough to normally bring local lumber onto a competitive basis with western timber cut and processed by large operators.

The wood processing project will show what good preparation, and agressive merchandising of forest products can do for the cut over country in the way of profits and rehabilitation.

Deer River was selected as the site for the proposed new industry as it is the most centralized point for the handling of timber products, and is located in the heart of the Chippewa National Forest. In the past, it has proven itself to be one of the largest shipping points in Northern Minnesota.

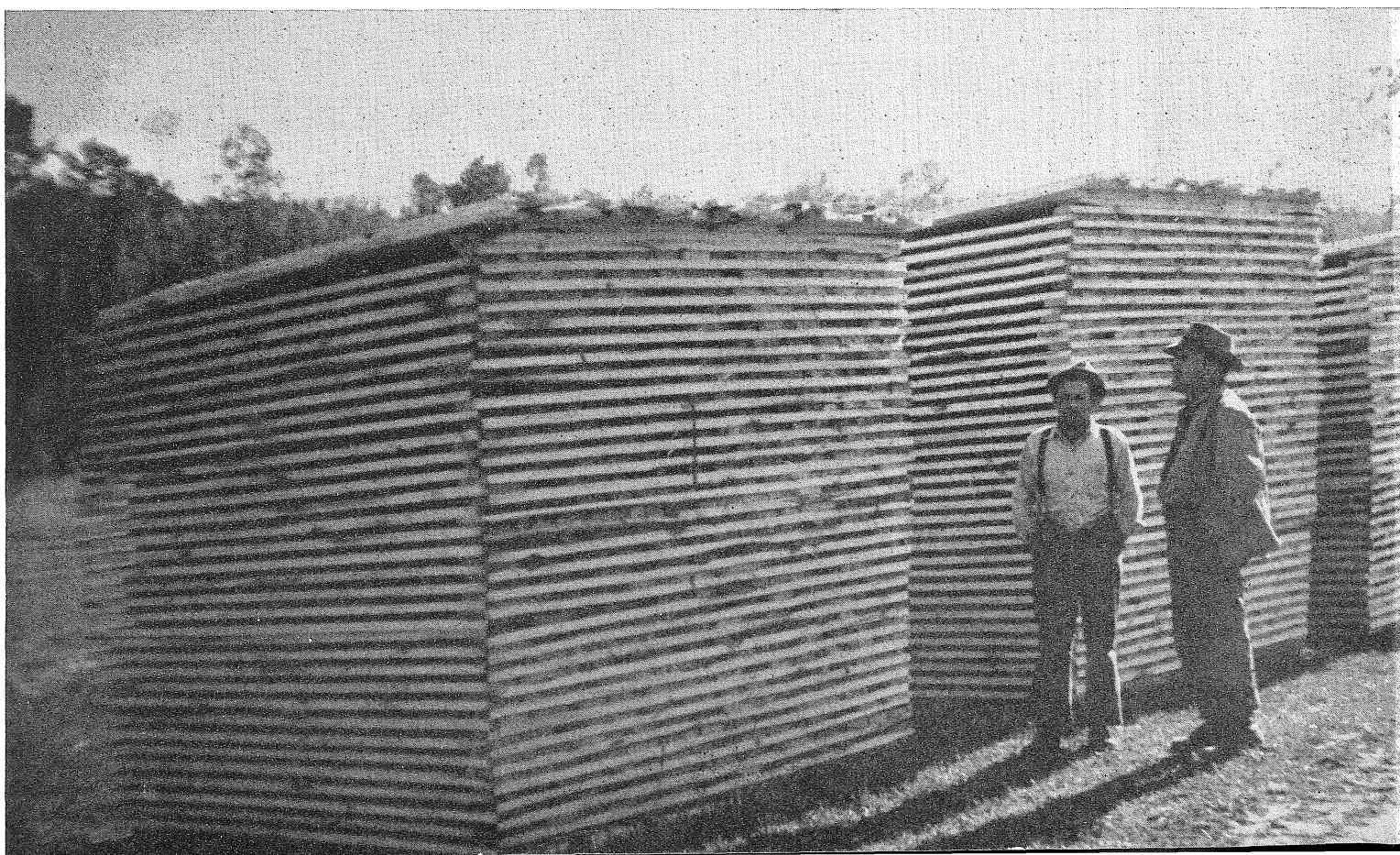
The pilot plant will consist of a double dry kiln, capable of handling from 30,000 to 35,000 feet of lumber per day, grading chain, planer, resaw, and matchers. In addition a fibre mill will be installed to utilize the lower grade species and produce from what would otherwise be waste material, a raw fiber, which is greatly in demand by roofing manufacturers.

The equipment for this project has been purchased and will be delivered this spring. The site is graded and ready for the construction of the buildings.

It might be well to explain briefly why this project has been somewhat delayed. Building costs have skyrocketed beyond our budget and delivery on the specially designed equipment slow, due to the scarcity of materials. Therefore, with the equipment ordered, bids will be called for again in March and the plant will be ready for operation this summer.

A department to handle rough or semi-processed

Box Lumber Well Piled for Proper Seasoning



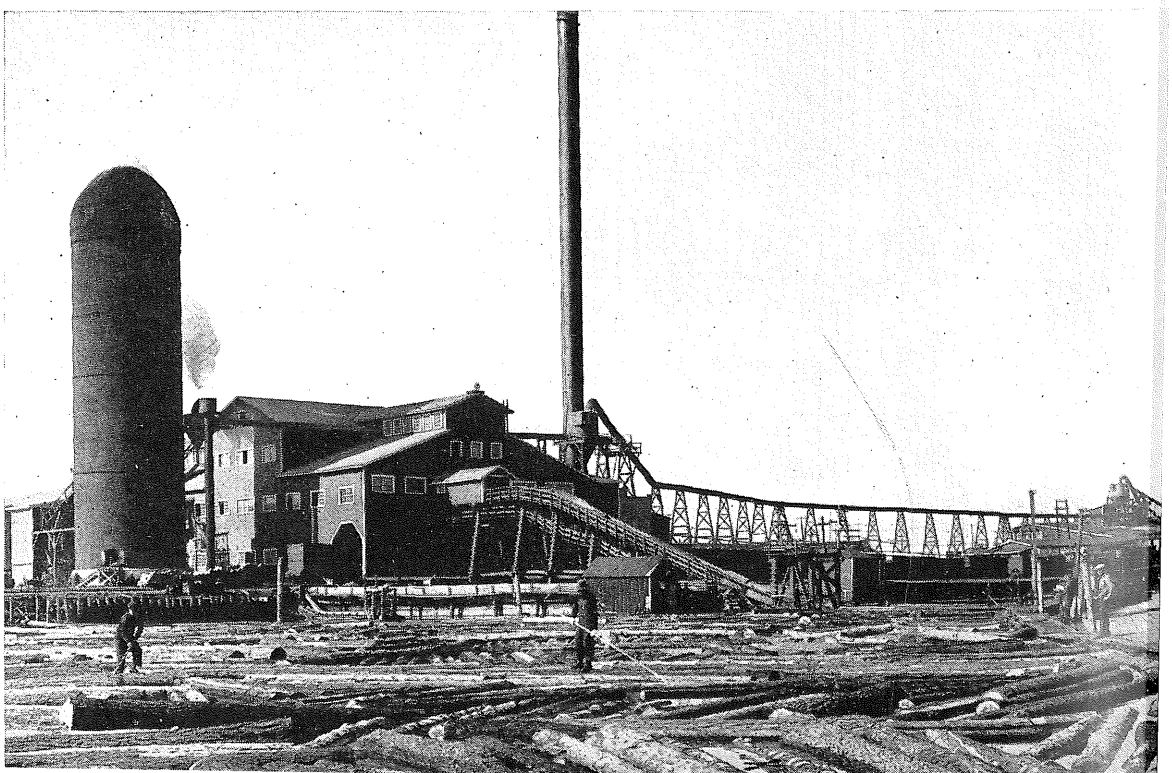
The white pine stump in the background is four feet in diameter while the paper birches in the foreground are but four inches in diameter. This tells the story of what happened in regions cut over years ago.

products such as poles, ties and posts is a possible feature of this project. Future plans call for a treating plant to make hardwood from soft wood and to utilize the great abundance of popple that has grown up in the cut-over land since the great logging units of earlier generations swept through Minnesota and moved on to virgin timber forests. Experiments will be conducted to impregnate color into the wood to simulate walnut and mahogany as well as to do research on plasticizing wood.

The chemical utilization of wood, wood waste and inferior species is a subject that has kindled the imagination of many scientists during the past few years. The fulfillment of these dreams, however, is a much bigger task than appears on the surface. Most of the obstacles are of an economic rather than a chemical nature.

We are at last discovering that our trees are something more than just wood to burn as fuel or boards to build houses — that wood is one of the world's greatest storehouses of chemicals — Cellulose, lignin, sugar, resin, gum and waxes. In this we have a new challenge to our thinking and it is a substantial beginning towards utilizing our timber more than ever before. The greatest asset of this

(Continued on page 29)



Many northern communities grew up around large sawmills of this kind. Closing of these mills left the working population stranded. Wisely managed forests will support permanent small-scale mills and lasting communities.

Developing Peat Resources For Local Fuel Supply

Minnesota, Remote from Coal Supply, Must Develop Peat as Its Only Local Source of Fuel

Minnesota, rich in iron, is entirely without fuel, except for the seven billion tons of bog peat, available mostly in its northern tier of counties. Minnesota is not only barren of coal, but at least the northern end of the state, where the weather is of the Arctic variety, is just about the longest freight haul for coal in the United States. Minnesota is not only farthest from a natural source of coal, but it is also beyond the reach of an adequate supply of natural gas for proper industrial development of the area.

For fuel purposes, two tons of peat are equivalent to one ton of good quality coal. On this ratio, the peat deposits of Minnesota are equivalent to three and one-half billion tons of coal.

Previous Studies of Economic Value of Peat Fuel

The potential industrial fuel value of Minnesota peat deposits has not gone entirely unnoticed in the past. The value of this peat has been fully recognized for years by both the industrial and political economists of the state and much has been written on the subject. However, the delivered price of coal and the local market were such, that in times past, there was no economic incentive to develop the peat resources of the state.

The U. S. Bureau of Mines, in a very extended report on peat, published in 1926, concluded that the low cost of high quality coal, the high freight rate on peat, and the remoteness of the market, did not, at that time, justify the exploitation of peat resources.

At that time, the authors raised the following fairly valid objections:

1. The cost of mining would be too high. They visualized operations with drag lines and bucket elevators with all of the interference incident to such an operation by buried roots, stumps, logs, etc.
2. The cost of drying would be prohibitive, assuming that it was dried to a moisture similar to commercial coal.
3. The cost of transportation per heat unit would be prohibitive, since peat is a bulky material. They planned on preparing the fuel at the bog and shipping it by rail to the consuming centers.
4. Minnesota peat could not compete with coal which, at that time, was laid down in the bunkers of the power houses on the range for $5.25 per ton.

Changing Times, Engineering Improvements, And Market Developments Reverse the Economic Status of Peat

Twenty years have passed since the Bureau of Mines' report was made. The far-reaching changes which have taken place in those twenty years provide good and sufficient reasons to believe that the time has now arrived to take advantage of modern mechanical and scientific progress to convert the latent value of Minnesota peat into an industrial asset which will assure the economic welfare of the state for many years to come.

Present plans visualize the hydraulic excavation and local transportation of bog peat to adjacent dewatering and consuming plants. It is contemplated that peat will be used with a relatively high moisture content; the practice in Russia being to burn peat having a moisture content of from 32% to 50%. The use of this high-moisture, low density fuel will necessitate the erection of large gas, steam and power generating plants at the bog to eliminate the cost of transporting the raw fuel.

Coal, today, is selling on the Iron Range for $9.00 a ton. This is an increase of $3.75 or 71% in the cost of a ton of coal in the past twenty years. This is a significant change in basic cost which operates to promote the exploitation of Minnesota peat deposits.

The shortage of fuel during the recent war and the realization that another year of war would have brought extreme suffering, due to coal shortages, is too fresh in our minds to ignore the vital importance of making available the local fuel supply which will always be under the state's control.

Coal shortages do develop and the state authorities would be less than diligent if they did not properly explore local fuel sources that can soften the impact of acute national coal deficiencies.

Low Cost Fuel is of Prime Importance for Sound Industrial Development

One need only analyze the industrial welfare of the American centers of industry to clearly see that unlimited cheap fuel is at the base of all industrial prosperity. Minnesota has such a source of cheap fuel; its extended use awaits only the

application of research and engineering to balance the present agricultural prosperity with a comparable industrial economy.

Rapidity with Which Reserves of Direct Shipping Ores are Vanishing Spot-Lights the Growing Need For a Cheap Local Fuel for Beneficiation of Low Grade Ores

During the recent war emergency, it became necessary to ship increasing quantities of lower-grade ores. This is just one indication that the high-grade direct shipping ores are diminishing with alarming rapidity. Additional evidence of this condition is to be found in the increasing quantities of ore that is subject to concentrating operations before shipment. Additional conclusive evidence is the fact that some ore producers have nearly exhausted their supplies of direct shipping ores and are currently planning very extensive beneficiation operations.

The mining literature for the past several years has increasingly emphasized the rapidity with which the reserve of high-grade ore is diminishing and the importance of perfecting economic benefication of the Taconite ore to assure the raw material for the arsenal of democracy and the better way of life.

The progressive advance in the cost of coal at the mine, accompanied by steadily advancing transportation charges, makes it increasingly evident that Minnesota's vast deposits of Taconite ore cannot be beneficiated and profitably marketed if the necessary fuel must be imported from remote coal mines.

Improved Methods and Mechanical Plant are Now Available

An important change that now favors the economical development of peat is the progress that has been made during the past twenty years in material handling methods and equipment. Costs of handling material have been greatly reduced through the use of modern material-handling equipment, such as:

Walking drag lines
Improved hydraulic excavators
Dredges
Twenty-three ton grab buckets
Thirty-three yard steam shovels
Aerial tramways
Wide variety of mechanical excavators
Bulldozers
Automatic skip hoists
Wheeled scrapers
Ten-mile belt conveying systems

The use of modern material handling equipment permits mass production with lower overhead and labor costs. During the past twenty years, Europe has profited handsomely by the development of economical methods for the production of peat as an industrial fuel. American areas remote from coal deposits, but possessed of extensive peat deposits, can also profit from similar large scale developments.

Proof of the success of peat as a fuel for steam generation is well established and can be found in various publications.

European Practices Assures Successful Developments of Minnesota Peat Deposits

According to the latest reports:

Russia's annual peat consumption for industrial fuel purposes is in excess of 60,000,000 tons.

Approximately 23% of Russian power output is generated from peat fuel.

Russia has the distinction of having the world's largest peat-burning power station with an installed capacity of approximately 204,000 K.W.

Frederick Alton, eminent British Power Engineer, states:

"With the development during the last decade of economical methods for the production and use of peat as an industrial fuel, the utilization of such enormous potential fuel resources has finally become a practical proposition. So far, outstanding progress in this direction has been made only in the Soviet Union and, to a far more modest extent, in Ireland; but it is to be hoped that a more scientifically planned fuel economy in the coming days of peace will lead to similar developments in other countries possessing large resources of this fuel."

Since the utilization of the enormous potential peat resources has become a successful industrial operation in Europe, it seems only logical that the United States should profit by that experience and convert peat into a source of cheap fuel for gas and electric power for treating the adjacent Taconite ores.

The research leading to the development of this latent fuel is obviously the obligation of the Iron Range Resources and Rehabilitation, which has long recognized the obligation as such. Its peat development research was delayed because of the acute manpower shortage during the war and the difficulty in securing competent scientific talent.

In the spring of 1946, the Commissioner was sucessful in selecting a Chemical Engineer, with the proper background and experience in research, in the person of Clayton E. Plummer. Mr. Plummer started his activities at Chisholm in the month

(Continued on page 30)

Transportation and Freight Rates

The Commissioner has continued to watch developments in the famous case known as the Class Rate Investigation, 1939, I. C. C. Docket No. 28300. The presentation of the case for the State of Minnesota was made jointly by the Railroad and Warehouse Commission and the Commissioner of Iron Range Resources and Rehabilitation, who at that time was also acting Executive Secretary of the Minnesota Resources Commission. An elaborate presentation of economic evidence covering Minnesota resources and their distribution and use was made to the Interstate Commerce Commission by Dr. Edmund A. Nightingale,* Assistant Professor Economics and Transportation, University of Minnesota, acting as consulting transportation economist for the Commissioner.

The reductions in interstate railway freight class rates which were to have become effective in the West and South on January 1, 1946, under the order of the Interstate Commerce Commission were postponed by a temporary injunction received by nine eastern states and the western railroads in December 1945. The special three judge federal court for the northern district of New York upheld the Interstate Commerce Commission's order on May 9, 1946, but because of the novel questions of law involved felt that the matter should be referred to the United States Supreme Court for final judgment. This case will be argued before the Supreme Court on March 3 and 4, 1947.

Table 1. Principal Intraterritorial Scales for Class 100 (first-class rates) Including the General 10 Per Cent Increase of 1938*

(Cents per 100 pounds)

	Official Territory		Southern Territory	Western Trunk Line Territory		W.T.L. and S.W. Zone III	Docket No. 28300 maximum scale
Miles	Eastern	New England Zone A		Zone I	Zone II		
5	33	36	40	35	37	40	40
50	47	50	57	53	61	65	60
100	62	65	79	73	83	90	70
200	80	85	112	97	111	123	90
400	109	114	156	136	156	172	125
600	135	142	189	176	200	220	155
800	160	167	222	210	239	263	185
1,200	204	.....	275	270	307	338	240

*Subject to Exporte 162 increases of January 1, 1947

The investigations initiated by the Interstate Commerce Commission involve two complementary issues. These are, first, the lawfulness of interstate class rates of rail and water carriers between all points in the United States lying generally east of the Rocky Mountains. Second, the lawfulness of ratings of articles, carload minimum weights, and descriptions given in the Consolidated Freight Classifications, in so far as nation-wide interstate commerce is concerned. The proposed changes will not apply to all freight rates. Commodity rates and exception rates are not at issue. These cover important segments of traffic such as coal, grain, livestock, potatoes, forest products, and numerous manufactured articles. If there is no applicable commodity rate or "exception" rating, the class rate will apply. Class rates apply more generally on less-than-carload traffic, but in order to meet motor vehicle competition in recent years carriers have published many exceptions and commodity rates applicable to l.c.l. traffic. The Interstate Commerce Commission held hearings on the two related investigations simultaneously in several cities over a period of four years and heard the oral argument of the interested parties. The commission's report, 262 ICC 447, dated May 15, 1945, covers 320 pages.

In fairness to the carriers it should be noted that the interstate class rates found to be unjust and unreasonable are, in general, those prescribed by the commission in earlier important cases before it had its present powers. In some cases carriers voluntarily reduced interstate class rates. A clear authorization for eliminating any regional district or territorial discrimination in rates was first given by the Transportation Act of 1940.

Summarized briefly, the commission found that the present ratings in the Official, Southern, Western, and Illinois classifications are unjust and unreasonable and a substantial number of differences in such ratings result in undue and unreasonable advantage and disadvantage. Interstate class rates, intraterritorial and interterritorial, are also found to be unjust and unreasonable. The relation between existing class rate scales is found to give undue preference and advantage to Official and Illinois territories, as a whole, and to subject shippers and receivers of freight in the other three territories, as a whole, to undue and unreasonable prejudice and disadvantage in violation of the Interstate Commerce Act.

Official or Eastern Territory embraces generally the area east of the Mississippi River up to Dubuque, Iowa, and north of the Ohio to Cincinnati, thence north of a line to Norfolk, Virginia. Southern Territory includes the area south of Official Territory and east of the Mississippi River. Western Classification Territory lies west of Official and Southern territories.

*This section of the report was prepared with the assistance of Dr. Edmund A. Nightingale, of the University of Minnesota, who acts as Transportation Consultant for the Iron Range Resources and Rehabilitation.

The commission ordered the carriers to establish a uniform classification containing 30 classes, which provide for a more accurate grouping of articles according to their transportation characteristics.

The class rates found to be unlawful will be replaced ultimately by a new scale of uniform class rates, which become applicable simultaneously with the new uniform classification. In order to give temporary relief until such time as the classification revision is completed, the commission ordered that the existing applicable interstate class rates within Official Territory (including Illinois Territory) should be increased 10 per cent as maxima and that the existing interstate class rates within and between Southern, Southwestern, and Western Trunk Line territories and also between those territories and Official Territory (including Illinois Territory) should be reduced by 10 per cent subject to specified distance rates as minima.

It has been estimated that the ad interim or temporary increases in Official Territory will amount to about $16,000,000 or 0.59 per cent. The decreases in Southern Territory are estimated at $7,000,000 or 0.85 per cent; the reductions in Western Territory (excluding Mountain-Pacific) will be around $14,000,000 or 0.88 per cent. The interstate class rate scale applicable within Official Territory is much lower than the interstate scales for comparable mileages in other territories. The first-class (Class 100) rates presented in table 1 indicate the differences in existing interstate class rates and the Docket No. 28300 scale of ultimate maximum distance rates which will become effective simultaneoulsy with the new uniform classification if the commission's order in the Class Rate Case survives the federal court tests.

Because of differences in class rate structures and classification ratings the charge for moving the same article the same number of miles within various territories may differ widely at present. If an article is rated Class 5 in the Official and Southern classifications and Class A in the Western classification, carload minimum weight, 30,000 pounds, the percentage relationships to first class are respectively 35, 45, and 45. This means, in the absence of commodity rates or exception ratings, that for a 400-mile rail haul (shortest workable distance) the rate in Official Territory under the Eastern Scale is 38 cents per hundred pounds; if the haul is in Southern Territory the rate is 70 cents; if the movement is in Western Trunk Line Zone I, e.g., from a point in Iowa to Duluth, the rate is 61 cents; if the movement is in Western Trunk Line Zone II, e.g., from a point in eastern Nebraska to eastern South Dakota or western Minnesota the rate is 70 cents; in the case of a shipment from western Kansas to western South Dakota through Western Trunk Line Zone III or a shipment from Oklahoma to Texas in Southwestern Zone III, the rate is 77 cents. If, for example, Class 45 should be established under the new uniform classification, the maximum rate for a 400-mile haul of the article within any of the territories named above would be 56 cents.

Table 2. First-Class Rates (Class 100) under I.C.C. Docket No. 28300*

Between	Rate-making mileage	Present	Ad interim	Ultimate maximum
Twin Cities-New York	1,183	$2.39	$2.39	$2.40
Twin Cities-Detroit	591	1.64	1.55	1.40
Twin Cities-Chicago	391	1.39	1.25	1.25
Twin Cities-St. Louis	534	1.60	1.46	1.46
Twin Cities-Aberdeen	273	1.31	1.18	1.06
Twin Cities-Minot	465	1.80	1.62	1.37
Duluth-Aberdeen	364	1.51	1.36	1.22
Fargo-Chicago	631	1.98	1.78	1.61
New York-Detroit	632	1.35	1.49	1.61
Houston-Oklahoma City	465	1.92	1.73	1.37
Minot-Rapid City	612	2.22	2.00	1.58

*Subject to Exporte 162 increases of January 1, 1947

Examples of the ad interim and ultimate first-class (Class 100) rates under the Class Rate Case order are given in table 2.

In the decision of the Interstate Commerce Commission in the Western Class Rate Investigation, 164 I.C.C. 1 (1930), Minnesota was divided into two zones. The division was made along the line of the Northern Pacific Railway from Duluth to Hinckley, thence along the line of the Great Northern Railway to the Twin Cities, thence along the line of the Omaha and Chicago and Northwestern Railways to Mankato, St. James, Worthington, and Sioux Falls, South Dakota. The portion of Minnesota, including the Iron Range District, lying west of the line is in Western Trunk Line Zone II, and that portion of the State lying east of the line is in Western Trunk Line Zone I. The scale of interstate class rates provided for Zone II has been generally 11 to 12 per cent higher than that for Zone I. As a result of our strong presentation of the economic evidence, in the Class Rate Case the Interstate Commerce Commission has eliminated the former division of the State of Minnesota into two zones with different levels of interstate class rates.

It is unlikely that the changes in the interstate class-rate structure, if permitted to become effective, will initiate a wholesale migration of industry from the East to Minnesota or affect materially the marketing of agricultural products. The adjustments indicated in tables 1 and 2 will nevertheless

(Continued on page 22)

New Market Possibilities For Surplus Fish Supply

In our endless search to create new industries for the State of Minnesota and as a tangible evidence of our broad interests in all the state's resources we started an experimental project to determine the feasibility of canning North Shore Herring commonly referred to as Blue Fins.

The North Shore fishermen have a number of things in common with the farmers. The fisherman, like the farmer, in general, is not a wage earner. He has no minimum wage guarantee for his efforts. His income depends upon the results of his harvest. If the catch or crop and the price is good he prospers — if poor, he suffers.

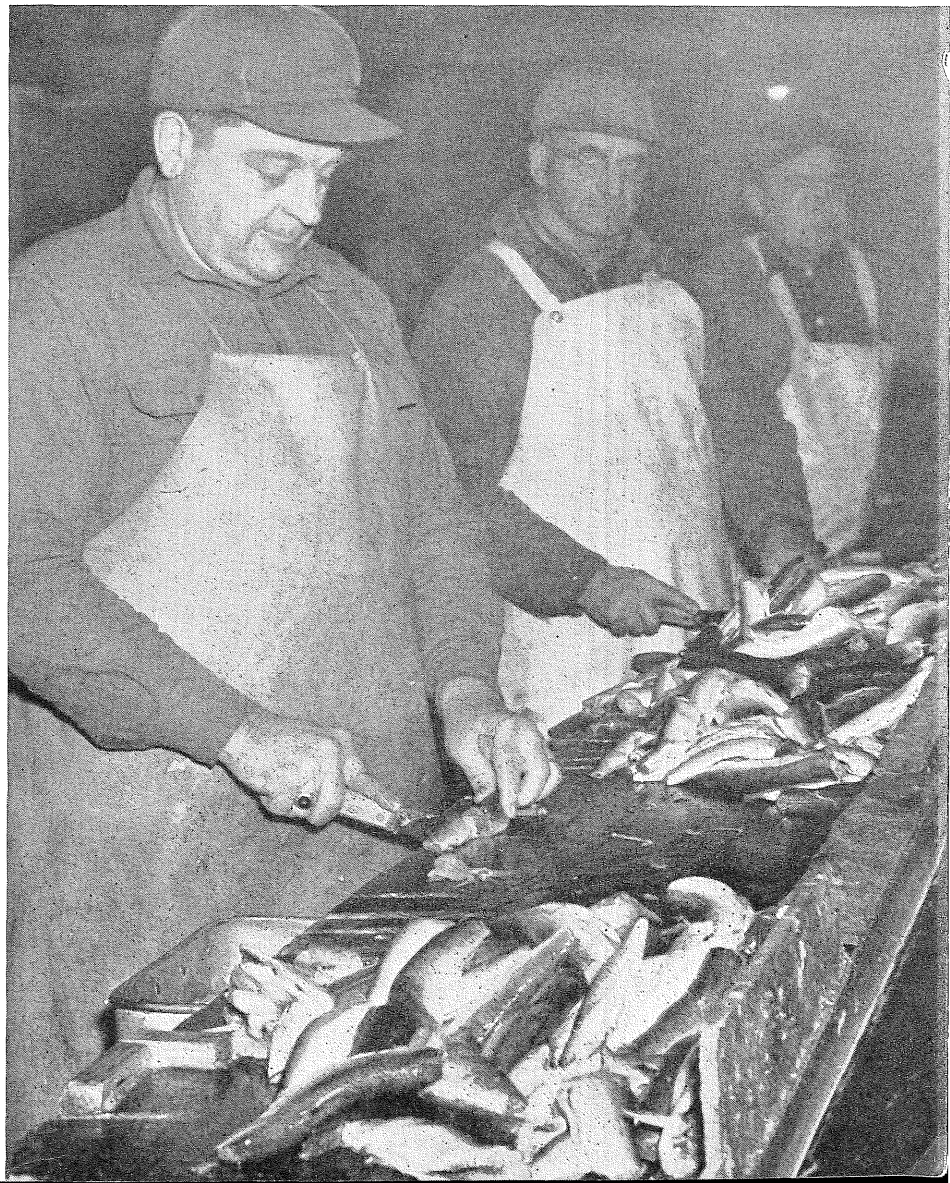
The fisherman like the farmer is a producer of raw materials. Some products may be consumed essentially as produced but in general, the products are both subjected to some type of perservation or manufacturing operation before reaching the consumer.

Both the fisherman and the farmer are small business men producing materials whose utility and value are vitally influenced by scientific development. Neither, as an individual, can conduct the necessary research to develop the scientific data required in furthering the utility or value of his product. This information must originate largely from the research activities of governmental agencies and institutions.

This experimental project is endeavoring to create a market for the surplus fish. Most of the year's herring catch is taken during October and November, which results in an abundance of fish on the market at one time. The surplus amount of the raw product tends to create a distressed market condition. The fish are perishable and with no storage facilities on the North Shore except in Duluth, they must be marketed as soon as possible. They are smoked or frozen but most go as fresh fish, at the mercy of the wholesaler and fluctuating market. Although herring accounts for about ninety per cent of the fish catch by Lake Superior fishermen, there is no canned herring product on the market to date. Now the surplus fish find their way to grinders for fertilizer and feed bins of mink and fox farmers. Many mink and fox farms have sprung up along the north shore to take advantage of the poorer grades of fish for animal consumption. However, there would still be an ample supply of unedible fish which would be available to satisfy the demands of the fur raising trade.

Disposing of the fishermen's surplus as fertilizer and feed causes the fishermen a hardship inasmuch as they receive such a low price for their catch that their endeavors are not profitable and

Trimming and Cleaning Superior Blue Fins



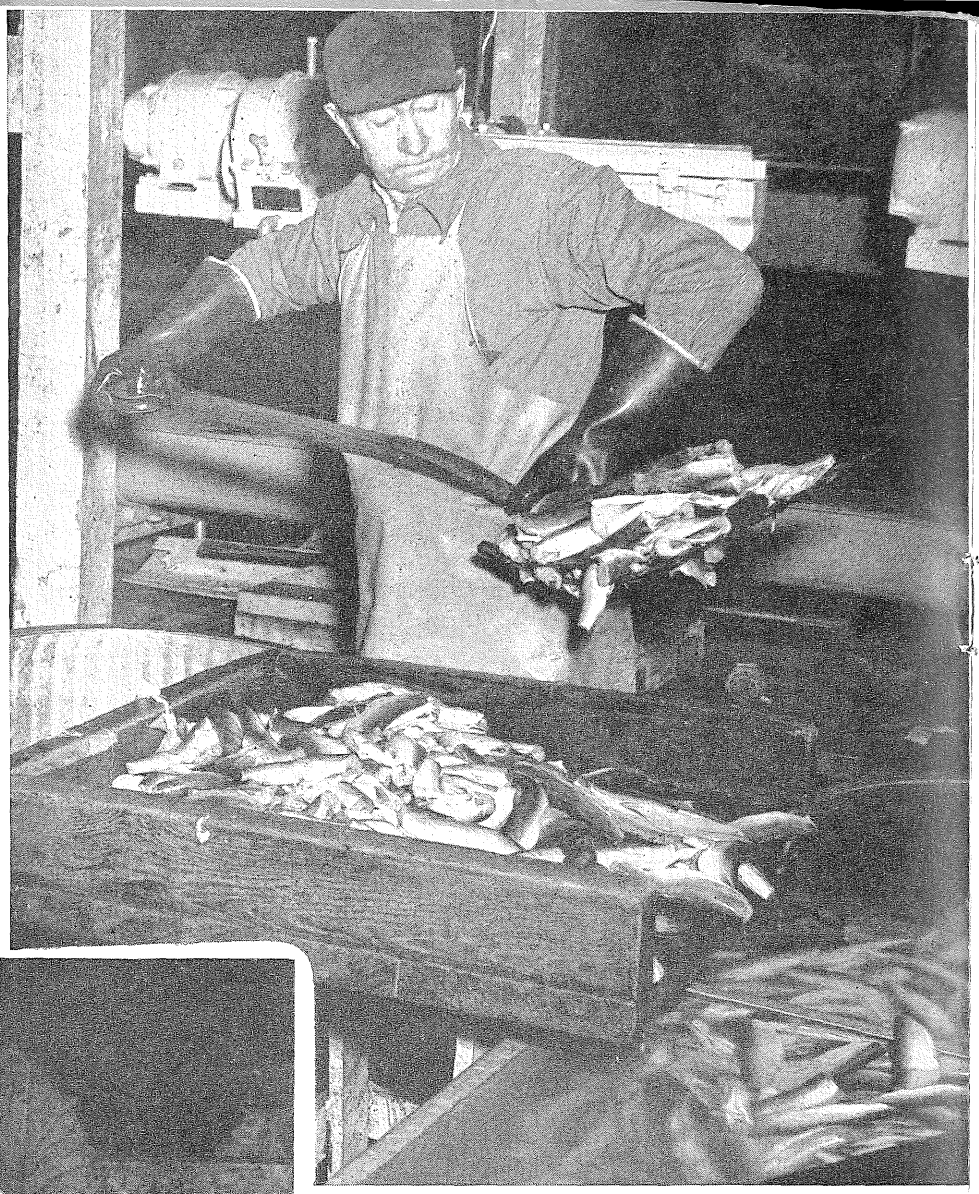
many are compelled to engage in some other business to make a livelihood.

We believe this enterprise will be an important phase in stabilizing the market of some 7,000,000 to 9,000,000 pounds of Lake Superior Herring each year. By canning the surplus, we endeavor to create a larger market for the product through nationwide distribution. The canned product will return a profitable income and allow the price paid for the raw material to be sufficient to create a higher income for those engaged in the fishing industry.

TRANSPORTATION—
(Continued from page 20)

enable any Minnesota products shipped on class rates to move farther into Official Territory than at present; stated in other words, for the same rate the article can be shipped a greater number of miles before reaching the rate equalization line. Cost of shipping such articles within Western Trunk Line Territory will be materially lowered. The charge of regional, district, or territorial discrimination with respect to the class-rate structure and the freight classifications will be eliminated, as well as earlier boundaries of rate territories which have lost meaning with changes in the national economy. The trend toward uniformity of freight classification ratings and of the class-rate structure indicates the emergence of a national class-rate structure from the earlier patchwork of regionalized foundations.

Packing the Blue Fins Into Cans



Loading Fish on Conveyor

Farm Forestry and Woodlot Management

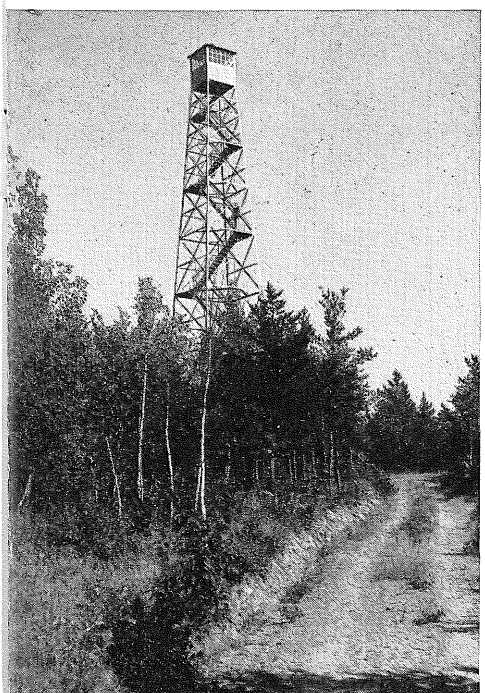
The cut-over is essentially a forest region. Volumes have been written concerning our forests and forest industries in Minnesota. Likewise, competent forestry experts have recommended programs designed to improve existing conditions, and point the way towards recreating, protecting and safeguarding this resource which provides a source of state revenue.

Here, again, the Iron Range Resources and Rehabilitation assimilated the findings of experts and a perceptible start has been made. Since 1941 we have pioneered, so to speak, our forestry program, analyzing existing timber resources to find what is available, where it is located, and how it can best be used. This task cannot be accomplished at once but it was begun at once.

Knowledge, through both research and experience, gets at the heart of the meaning of the word "education." In its final analysis, education is civilization's only problem, and it would seem that the world's reservoir of knowledge is now sufficient to insure man's highest development. But the acquisition of knowledge is only the first step. It must be remembered that coupled with the "know how" must be the disposition "to try" and the will "to do." Here we have the everlasting trinity of attainments.

Consequently we initiated a Farm Forestry Program designed to educate and train farmers on the broad concept of conservation problems and woodlot management. This is definitely desirable as woodlots on farms can be made a valuable source of income. Education in connection with forestry consists of more than mere knowledge of the technical aspects of that field. There must result the disposition to use the results of experience and research in the conservation and use of forest resources. This is not easy. A new idea is always difficult and requires a steady pull to get people generally to accept the truth resulting from research and to apply it to their own particular problems.

The Farm Forestry Education Program is being carried on in three counties, St. Louis, Carlton and Lake, at the present time. This program is the only one of its kind in the United States. The need for such a program arises from a number of sources. It is well known that the predominant pattern of agriculture in northeastern Minnesota is one of part-time farming because the average farm has too small an acreage of cleared crop and pasture (22.4 acres per farm in St. Louis County in 1941) to provide the farm family with a decent standard of living or to utilize fully the farm labor available. The result is that most farmers are forced to supplement their farm income with income derived from outside employment in the



From towers throughout the forest region lookouts keep watch for the first signs of a fire. Fire protection plays an important part in restoring the forest. It costs less to prevent fires than to fight them once they start.

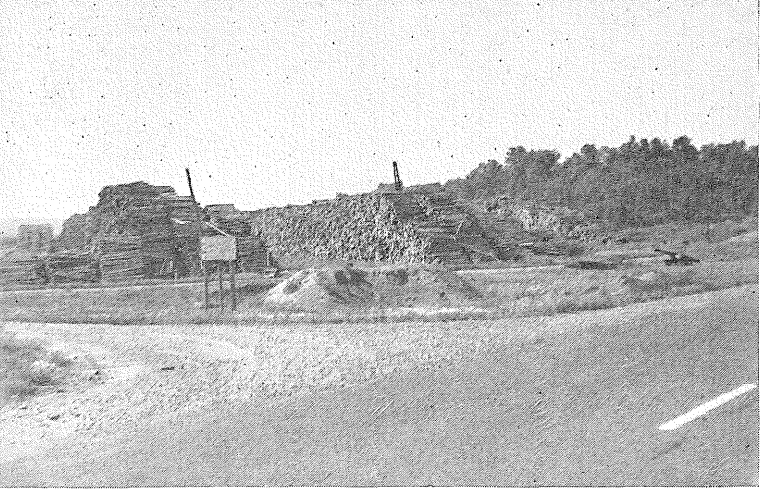
Middle-aged Jack pine after thinning.

Poor management causes dense growths such as this. Timber in stands of this type are very worthless and will never mature into merchantable timber.

mines, on the road, driving school buses or logging. Employment in the mines takes place primarily in the summer and thus interferes seriously with farm operations. The state and county highway systems are largely on a maintenance basis and comparatively few can be employed an appreciable length of time, while even fewer can find jobs driving school buses. Logging offers the farmer a market for his labor during the winter when the farm work is at its lowest ebb, but too frequently the tract of timber is located at such a distance that he spends too much time in travel to realize much benefit financially or else he must stay in a logging camp and cannot care for his livestock. A reasonably well-managed farm woodlot has much to offer. It can provide an outlet for his spare labor, yet require a minimum of travel time, supply all the home needs for wood, provide a substantial income, and yet all work except tree planting can be done in the winter, with the exception of emergencies such as fires. The average farm has a sizeable woodlot (62.8 acres per farm for St. Louis County in 1941) and the management of a woodlot is merely another form of land use

Proper cutting in farm woods produces fuel wood and improves the chances of growth of the remaining trees.

Much timber on public and private lands is ready for cutting. Its harvesting provides winter work for farmers at a time when they are idle.

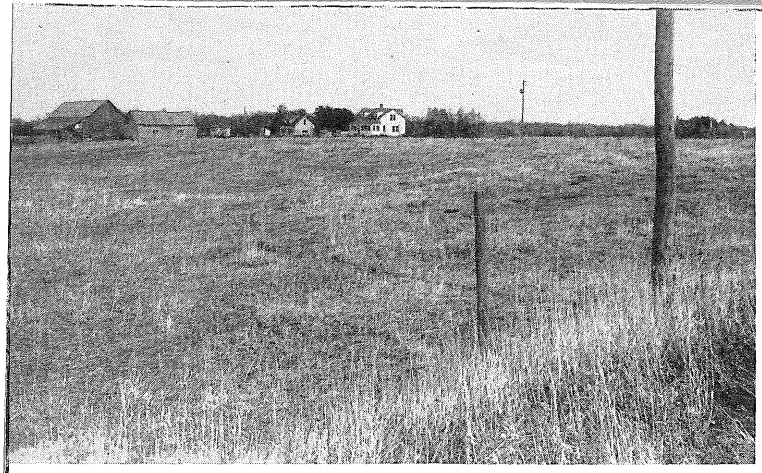


Part of the pulpwood supply needed in one year by one paper mill.

management, so the average farmer need not experience great difficulty in applying good forestry to his wood. However, very few farmers have the requisite knowledge of forestry principles, hence are unable to manage their timber. Clearing more land for pasture should take the place of permitting stock to graze in the woods, as pasturing the woods is not good for either the stock or the woods. The condition of the farm woodlots varies from very poorly stocked to well stocked and from very young trees to overmature timber, with too high a proportion of poor stocking and inferior species of very young age classes. Aspen or popple is the most common species and jack pine probably next. These are inferior species but by no means worthless. In fact, due to their rapid growth, they may be the best species for the farm woodlot. To bring these woodlots under management will take many years and considerable technical assistance. The Forest Cutting Act can do no more than provide minimum measures for keeping forest land productive, and cannot take the place of management under technical supervision. The Farm Forestry Education Program is designed to remove most of the obstacles from farm woodlot management.

The biggest and probably the most important phase of the program is teaching of the principles and practices of woodlot management to rural school youth and veterans enrolled in on-the-job training in agriculture, as carried on in the rural high schools. A review of the teaching materials available showed that it was desirable to concentrate more on the practices of woodlot management than on theory and principles. Accordingly, a series of ten lessons on farm forestry have been prepared, which are being taught by demonstration and practice. These lessons, in the order in which they are being taught are: "Using the Compass," "Using the Biltmore Stick," "Using the Hypsometer," "Estimating Timber," "Timber Culture," "Scaling Timber," "Suggestions for the Farm Woodlot Management Plan," "Important Forest Insects," "Common Tree Diseases," and "Forest Fire Control." In addition, all materials formerly used will continue to be used as references. The preparation of these lessons required much time and thought in order to keep them understandable at the high school level and keeping in mind the basic principle that farm forestry must be designed to contribute to a more successful agriculture and that forestry for forestry's sake has no place on the farm. The education of the younger people presents two advantages. Their minds are more receptive to new ideas and by developing their enthusiasm it frequently is possible to arouse the interest of their parents. The past tendency has been to regard the woods as merely a hindrance to agriculture which must be cleared out to provide more crop and pasture land. This tendency must be eliminated to the extent that the woodlot is regarded as a valuable, productive part of the farm. The high prices paid for forest products has awakened many farmers to the value of their woodlots and also has increased the pressure to cut whatever can be sold in order to cash in as much as possible. One obstacle to the practice of forestry by farmers is the publicity given to the length of time necessary to grow a crop of trees, while it is equally true that once a crop of timber has grown, it is possible to secure an annual harvest of wood by cutting only as much each year as grows upon that tract in one year. Because of the necessity for limiting the cut to the equivalent of the growth, it is seemingly paradoxical that, while a woodlot under management will yield a greater average income over a period of years, it will yield less in a period of one or two years. However, when one considers that

Pulpwood cut in thinning mixed Norway and Jack pines.



One of the farms on which a windbreak was established in 1946, near Cook, Minnesota.

Cotton school boys planting trees on the school grounds.

this apparently greater income from cutting everything that will sell is really the result of the growth of a generation or more, the difference no longer is apparent.

Another important phase of the Farm Forestry Education Program is the woodlot management contest. Sponsored by wood-using industries, this contest is open to rural youth in schools in Aitkin, Carlton, Cook, Itasca, Lake and St. Louis counties, with age limits of 16 to 21, inclusive. Points are scored for cutting forest products, good cutting practices, reforestation, and for an essay consisting of a description of the work and a plan for management of the woodlot, emphasis being on reforestation. Awards are given for individuals and for groups such as Future Farmers of America Chapters and 4-H Clubs. The prizes are substantial, a $50 Savings Bond being first prize in each division. The contest provides additional stimulus to placing the woodlot under management. When coordinated with the instruction in the vocational agriculture classes, it presents a very good means of arousing real interest in the woodlot as a productive tract of land. A management plan outline containing a sample plan is furnished each entrant, and at least two good plans were submitted by entrants in 1945. It is planned to make the contest an annual affair.

Because the principles and conditions dealt with in farm forestry are less easily coordinated than those pertaining to agricultural practices, it is deemed advisable to provide visual aids for classroom instruction. Available materials are not local enough in application to be of the greatest benefit; consequently, a file of visual aids, including slides and motion pictures, is being built up. It is felt that these will facilitate development of the proper

(Continued on page 30)

Selective cutting of young spruce and balsam fir for Christmas trees does not damage the forest yet it provides off-season work for farmers.

Industry Creates Cash Market for Farmers and Offers Employment to Many

As the result of our diligent work in growing acres of Laurentian rutabagas we learned that rutabagas grow to best advantage in a cool climate and rich virgin soil which is characteristic of the cut-over lands of Northern Minnesota. The sound foundation on which we established our agricultural program was such that as we progressed, we studied new channels to provide a larger market for the surplus rutabagas, as well as a new industry for the State of Minnesota. Creating new and wider markets for farm products is an important phase of our program. After analyzing the marketing possibilities of this venture, the embryonic canning industry was begun at Grand Rapids, Minnesota.

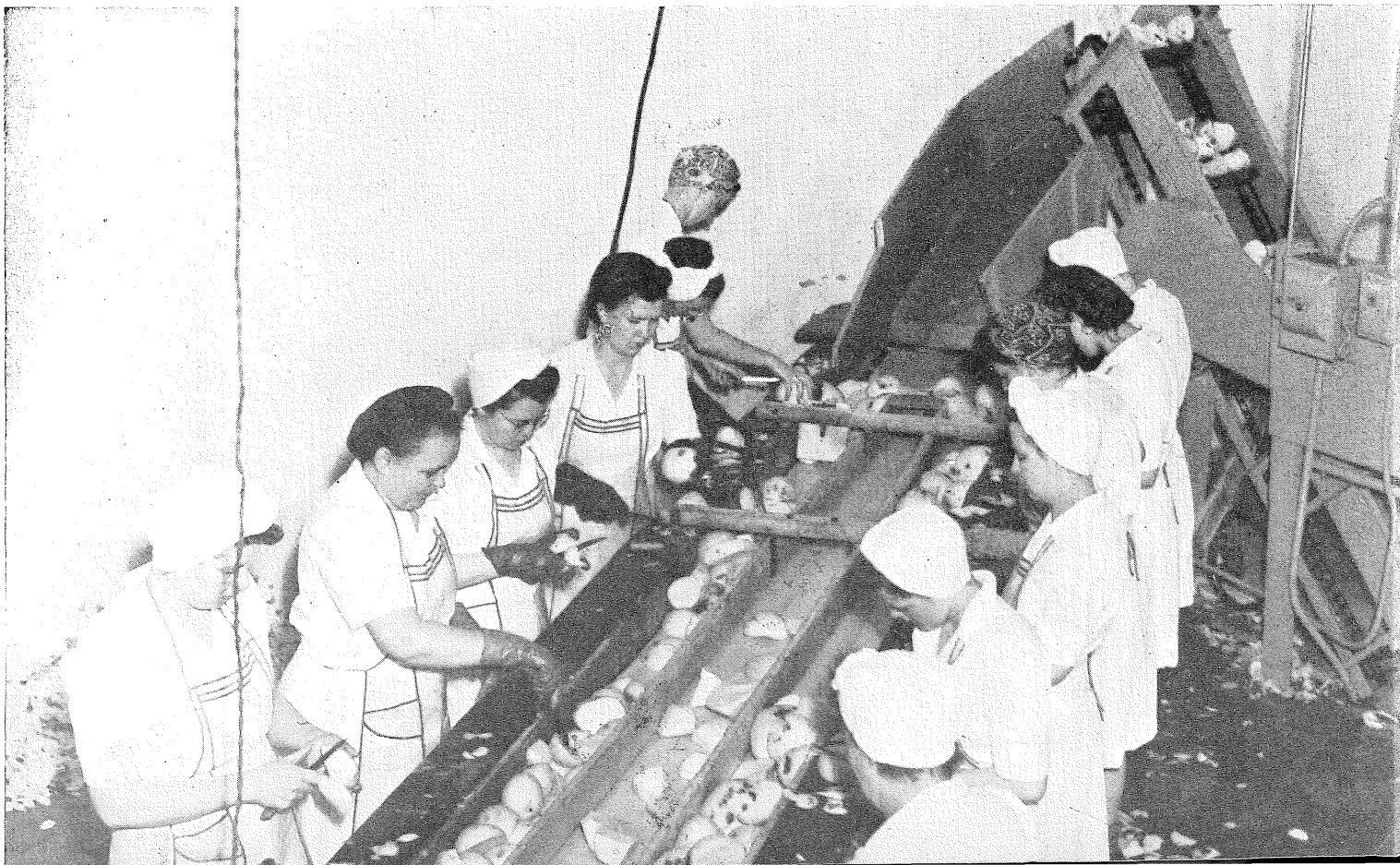
The Iron Range Resources and Rehabilitation undertook the rutabaga canning project to demonstrate the quality of the canned rutabaga, the best procedure for canning, and the salability of the product.

The canning factory was begun in a building made available for this purpose by the Grand Rapids Creamery Company in October, 1945. However, there was a great scarcity of cookers, peelers, dicers, tins and cartons at that time and consequently the industry had a very humble beginning. It is the only known one of its kind in the United States.

The canning company operated from 4:30 in the afternoon until 8:30 in the morning. During the day the steam plant was required for the operation of the creamery. The payroll during the first year listed sixty employees, and the production for the first canning season was 100,000 cases. This far exceeded the expectations for the first season's operation. Food brokers throughout the nation enthusiastically welcomed this product.

In many parts of the nation rutabagas are seldom eaten. In most of the country they are used only a few months in the fall and winter. Ruta-

Inspection in the canning factory. After the rutabagas are peeled, washed, quartered and hand trimmed they go to the dicer.

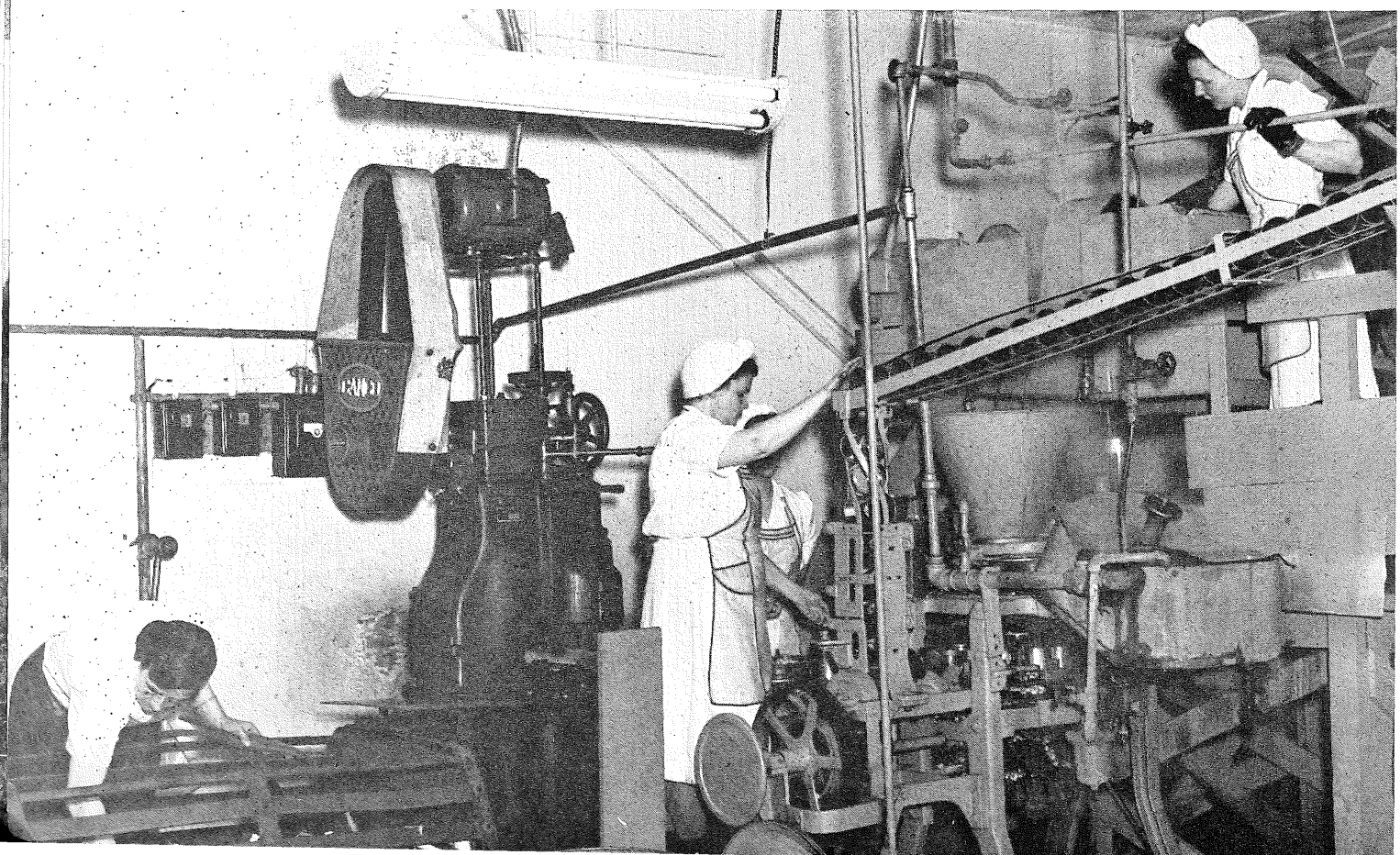


Children like rutabagas from the can, as is in evidence by the enthusiasm shown in the picture.

bagas have never attained the popularity they rightly deserve. Analyses show that they are high in vitamin content, particularly in vitamin C, and are comparable in caloric content to carrots and beets. As a variety vegetable the rutabaga deserves a place with the other staple vegetables. Another feature that the housewives appreciate is the fact that pre-cooking eliminates the odor which usually accompanies the preparation of this vegetable.

While the new industry has enjoyed an auspicious beginning and the Iron Range Resources and Rehabilitation has been repaid for their financial assistance, we are still guiding the new industry with the experience we have attained in the field of agriculture, canning, marketing and research.

At the extreme right operator inspects the trimmed rutabagas before they enter the dicing machine. In the foreground the cans pass from filler to the closing machine.



MINNESOTA OFFERS—

(Continued from page 5)

that we soared to great heights; now we are in the process of a hazardous but challenging descent. It is the descent that is presenting so much uncertainty and so many problems.

Northern Minnesota, the front door to vacationland, is now also offering great promise to industry. This center of the richest national resources and abundant facilities for expansion and progress provides a "perfect combination" for successful enterprise and great opportunities to those who are looking for a place to establish a factory or branch away from high cost and congested areas. The intelligent level of the people is a contributing factor which adds a great deal to the industrial life of the state.

The Commissioner has conscientiously endeavored to handle the duties of the Iron Range Resources and Rehabilitation with the highest degree of efficiency and with the good of all of the people in mind, not just a select group. The position requires "vision to see, faith to believe and courage to do."

This department has enjoyed the splendid cooperation of the state administration, as well as numerous farm and civic organizations throughout the state, also private industry, who are in accord with our program and have offered so much encouragement. To all who are cooperating to make the Iron Range Resources and Rehabilitation so effective, the Commissioner offers his sincere appreciation. With God's blessing, we hope that our program will continue to function as successfully in the future as it has in the past, with greater progress attained to benefit the people of Minnesota and especially those in the fourteen county cut-over area of Northeastern Minnesota.

Our record of constant growth, the ever-spreading acceptance among thoughtful people of our program, as well as the progress made in our five years of existence, all combine to increase our responsibility to the future. To my mind, the most significant of all encouraging signs is the phenomenal growth of our program, which is gradually sweeping the entire cut-over area, despite the opposition from those who misunderstand it or believe that their personal interest will be served by its failure. I confidently accepted the challenge and responsibility knowing that our program would not fail, because it is pointed in the direction of progress and based upon sound philosophy. Our program continually expands and recreates itself and any opposition gradually smothers under sound reality and true value.

Therefore, it is a genuine pleasure and privilege for me to bring to the attention of the state and nation the functions and progress of the Iron Range Resources and Rehabilitation.

Digging rutabagas with modern machinery.

IRON POWDER—

(Continued from page 9)

This project is of such importance to everyone in the State of Minnesota that it should be watched and encouraged in every possible way.

We cannot, in this report, dwell extensively on all the existing factors and problems concerning the iron mining situation as it exists today. However, in view of recent announcements, in which two major mining companies are investing venture capital in the processing of taconite indicates that the longevity of the iron range will be extended hundreds, if not thousands, of years. Therefore, with the $650,000 iron powder plant, the $1,250,000 Pickands Mather plant and the $34,000,000 Oliver Mining Company expansion program, there is every indication of a new era for the iron mining industry in Minnesota. With large companies making huge industrial investments, we will reach a more balanced economy. As prosperity continues in Northern Minnesota, the entire state will share the benefits.

FOREST PRODUCTS—

(Continued from page 16)

resource is that it is a ever renewable raw material which can be grown from year to year especially in scientifically managed forests. Forest research will aid tremendously in pointing the way to commercial use of the present day waste.

Therefore the Deer River project is being watched with considerable interest because its success will mean a great deal to the economy of the forested areas of Northern Minnesota.

Startling things are happening to the forest regions of Minnesota which may be the beginning of a new orientation from which not only the forest regions but the entire state will profit.

PEAT—

(Continued from page 18)

of June. The research program is now going forward and will be pressed with all speed consistent with accurate results. The results, to date, encourage the belief that the long dormant peat bogs will soon be playing an important part in the future industrial prosperity of the state.

Local Research and Study Now in Progress

Before starting any extensive research development program, it is always necessary to first make a careful study of the literature in order to evaluate the results of previous investigators. This has been done.

In June, 1946, the County Peat Library was transferred from Virginia to Mr. Plummer's office at the Public Library at Chisholm by Mr. A. F. Benson of Virginia, with the consent of the St. Louis County Board of Commissioners. The Peat library is to be used in the best interest of the Mining Industry, the County and State until such a time as it may be recalled by the County Board.

Mr. Odin A. Sundness, General Manager of the Snyder Mining Company, has played an active and valuable part in peat development. He has made available his peat library, files and all data on drying tests made under his direction. The proposed Sundness Method for wet bogs and those containing many stumps and roots is briefly as follows:

> The peat is torn down with high pressure hydraulic jets, operating at 150 to 200 pounds pressure; the peat sludge, containing approximately 95% water, is pumped into tanks for draining to a moisture content of approximately 90%; the peat is then transferred into elevated screen tanks where the peat is mechanically stirred during the air drying operation.

In the Sundness Process, peat is air dried in tanks supported off the ground, the drying is facilitated by mechanical stirring. This has a decided advantage over any former processes where the peat is dried on the ground and where the blocks are turned by hand.

A careful survey has been made of the literature, and the work of other investigators has been carefully analyzed and evaluated. The patents have been carefully examined and classified.

Encouraging progress is being made in our peat program and the results confirm the findings reported by Mr. Sundness.

Local Developments to Date

Our experiments have brought forth valuable information. Many tests are being made to determine the best drying conditions in order that sufficient data will be available for pilot plant design. Bogs are being accurately sampled to determine the most suitable location for plant operations. Samples for tests have been taken by the use of a post-hole digger, which permits taking representative samples to depths in excess of 20 feet.

Present information obtained from small scale tests show many advantages to be gained by drying and mixing the peat as pellets and drying them in screen tanks. Peat containing approximately 85% water forms dense pellets when rolled in drums or trommel screens and then air dried. Present indications are that the pellets will be a good fuel for industrial furnace use.

Well drained bogs and those free from roots and stumps might, with proper material handling equipment, be economically excavated by means other than the hydro-peat method; and the peat might be dried in the form of pellets in screen tanks. Larger scale tests are being conducted to obtain data more indicative of plant operations. Machinery companies are showing a keen interest in developments and are making valuable suggestions that will contribute handsomely to the development of a successful flow-sheet for the economic production of peat fuel.

Conclusion

The results of the recent developments in research and actual practice in Europe encourage the belief that the Minnesota bogs are of enormous potential industrial value and that no expense should be spared to accelerate the determination of proper technical procedure to exploit these economic possibilities on a commercial scale.

In view of this fact, the progress of peat development in Minnesota can be greatly accelerated by the proposed visit of a properly qualified engineering commission to those European countries and especially Russia, where peat has been successfully used as an industrial fuel on an important scale.

If the economy of the State of Minnesota and the industrial preeminence of this nation are going to persist, a cheap source of fuel for gas and electric power must be made available for treating our Taconite ores.

FARM FORESTRY—

(Continued from page 26)

concepts among the students through making it easier for them to visualize classifications and operations as described in class and applied in the woods. The use of visual and audio-visual aids is increasing tremendously in all fields of education.

A second important phase of the farm forestry education program is direct extension work with farmers, which is carried on in cooperation with the county agents and the extension forester. This work includes stimulation of interest in community forests and survey, timber marking and other demonstrations in the woodlots and talks to various groups such as farmers' clubs. To obtain information necessary to formulate an extension program in St. Louis County, the Extension Service, the Minnesota Forest Service, the U. S. Forest Service and the Office of Iron Range Resources and Rehabilitation cooperated in a farm forest survey of Owens Township and a part of Beatty Township near Cook. The report on this survey is being compiled at University Farm and is not available yet. However, the survey did show that the farm woodlots are not producing their share of the farm income.

A third important phase of the program is the establishment of demonstration windbreaks. A good windbreak is an asset to any farm in Minnesota. It can make the farm home more comfortable, reduce fuel consumption as much as 25 per cent, reduce the drifting of snow in the farmyard, enhance the appearance of the farm, and, by protecting the barnyard, help bring the stock through the winter in better condition on the same amount of feed. Its economic contribution is indirect, aside from increasing the value of the farm, and lies in reduced fuel consumption and its benefit to the stock. Reduced fuel consumption allows more wood to be available for sale. A windbreak, by demonstrating how rapidly trees really grow, also stimulates the farmer's interest in his woodlot; thus it has a considerable educational value. Thirty-five windbreaks have been established in St. Louis County by farmers, plus at least as many more planted by members of Future Farmers of America Chapters in St. Louis and Carlton counties, with approximately 55,000 trees being planted. At least one hundred more windbreaks would have been established if an adequate supply of trees had been available at a reasonable price. The problem of securing planting stock at a reasonable cost threatens sharply to curtail the demonstration windbreak project. Current prices quoted by commercial nurseries are higher than most farmers are willing to pay and the state is forbidden by law to sell planting stock to be planted upon privately owned land. Farmers are increasingly receptive to the idea of a windbreak so the difficulty of securing trees is particularly unfortunate.

The Farm Forestry Education Program has as its ultimate objective the practice of forest management upon every farm in the area. This objective is being striven for through teaching principles and practices of farm woodlot management in high school vocational agriculture classes, and on-the-job training in agriculture to veterans, through extension work with farmers and through coordination of its activities with the county unit of the Keep Minnesota Green Committee, which is the first such unit in the state. The objective is many-fold:

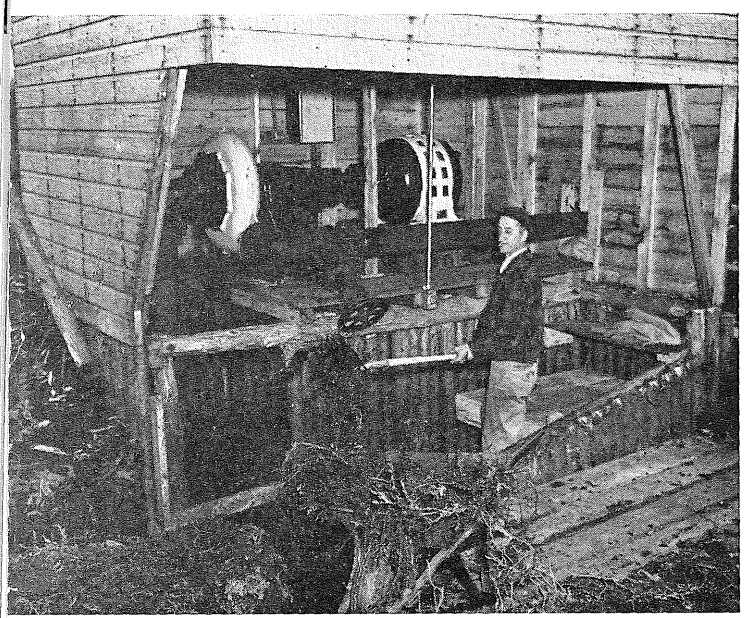
1. Land Use—All marginal, submarginal and other lands unfit for, or not now needed for agricultural use which still are capable of sustaining forest growth, should be protected, planted or otherwise reproduced and managed as farm forests until economic conditions make it imperative that such use be changed.
2. Timber Supply—Timber is a renewable resource. It is vital that timber be grown to supply industry, to control prices of wood substitutes, to compete with imported forest products and to provide opportunities for employment. Federal and state timber sale policies should be so formulated as not to compete unfairly with operators of well-managed farm woodlands.
3. Forest Industries—Forestry and farm forestry are essential to the continuous production of a supply of raw material that is adequate in both quantity and quality for industrial needs. Rural prosperity is increased by large areas of forest land capable of supporting permanent industries, thus creating markets for agricultural labor and produce.
4. Protection—A proper forest cover builds soils, prevents erosion, regulates water levels in lakes, promotes more uniform and continuous stream flow for power and domestic purposes and provides homes for aquatic life and animal life that is depending upon lakes and streams.
5. Wild Life—The existence of abundant wild life is dependent upon forest cover. Forests provide food, breeding grounds and protection from the elements and natural enemies.

Other objectives in the forest program are based on the dependence of this resource for our recreational activities, scenic beauty, flood reduction and effects upon weather.

From an economic standpoint, the farm woodlot can be a source of appreciable income. An analysis of yield tables shows that, at fairly con-

(Continued to page 34)

A hydraulic pressure hose forces the wet peat from the bog and down a sluice, from there to the pumping station as shown below.



Wet peat is pumped through 800 feet of eight-inch pipe into a screening room where all debris is removed.

Minnesota

New Plant to Develop Va
Moss Found in Minn

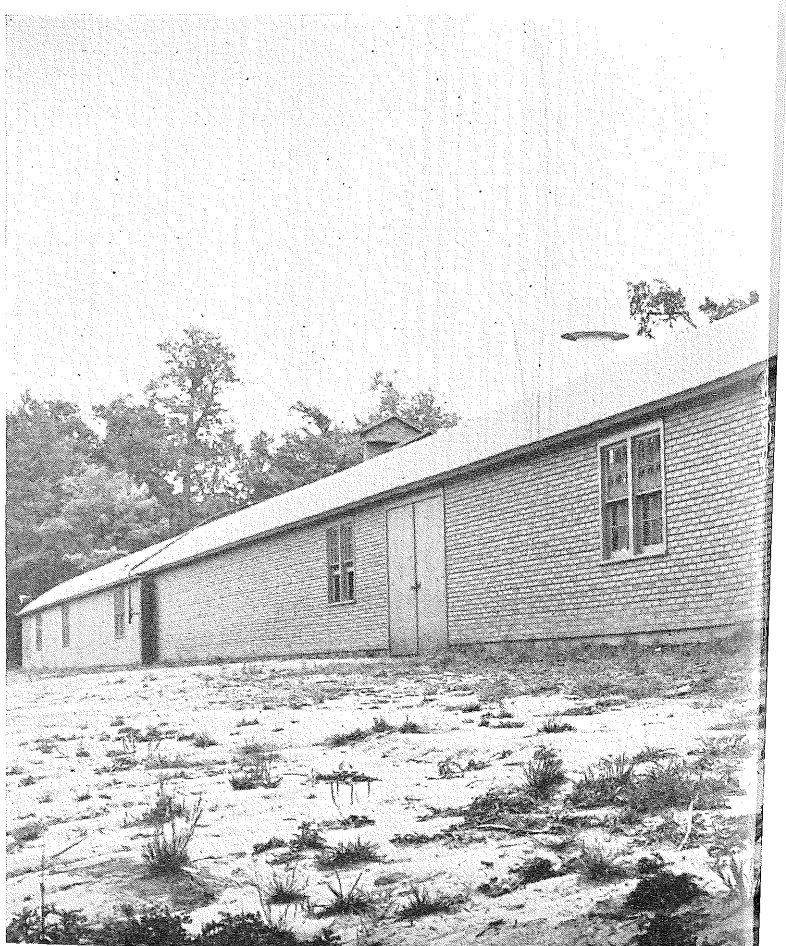
Since 1873, when a legislative act resulted in the first investigation of the millions of acres of peat beds in the state, Minnesota has been interested in ways to utilize them.

Minnesota has over 60% of the peat deposits of the United States. In fact, with the exception of Russia, we have the largest deposits in the world. It has been estimated that 7,000,000 acres of peat are to be found within the borders of Minnesota.

Until the war, the major part of the peat moss used in the United States was imported from Denmark, Sweden and Germany, the latter being the largest source of supply.

After evaluating the knowledge that was available concerning our huge peat deposits, the Iron Range Resources and Rehabilitation undertook to build an experimental plant four miles west of Floodwood to process sphagnum moss on a commercial scale into poultry litter, for chicken and turkey raisers, as well as for horticultural purposes. This plant is the only one of its kind in the world, with specially designed machinery to process the peat.

The Peat Moss Pilot plant is housed in a 235-foot longb



Peat Moss

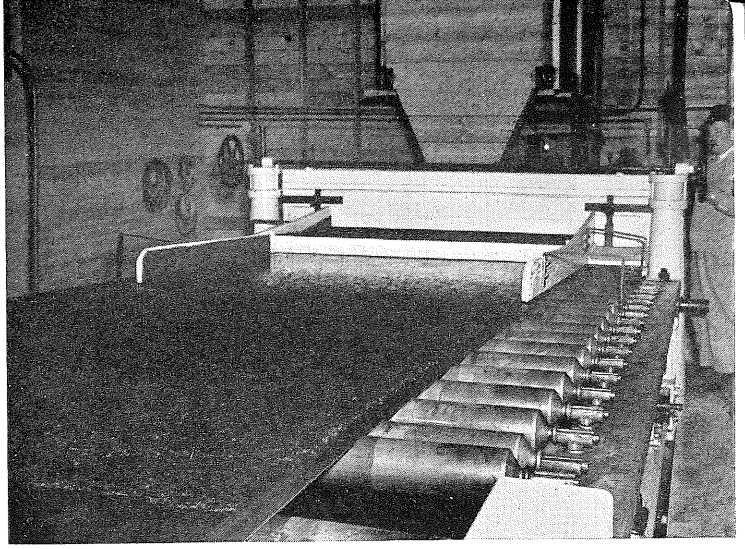
Vast Acres of Sphagnum nnesota Wastelands

The plant is 252 feet long and 50 feet wide. The moss is removed from a nearby bog by means of of hydraulic pressure, is floated through small trenches to a pump which forces it through a two-block long pipe into the washroom adjoining the plant. There it is washed and cleaned thoroughly and leaves this room free from all foreign material. It then enters the main plant, going first through the fordinear. It is carried by conveyor belt into the 135-foot tunnel oven where it is dried to about 25% moisture, thence to the hammermill room and finally to the baler.

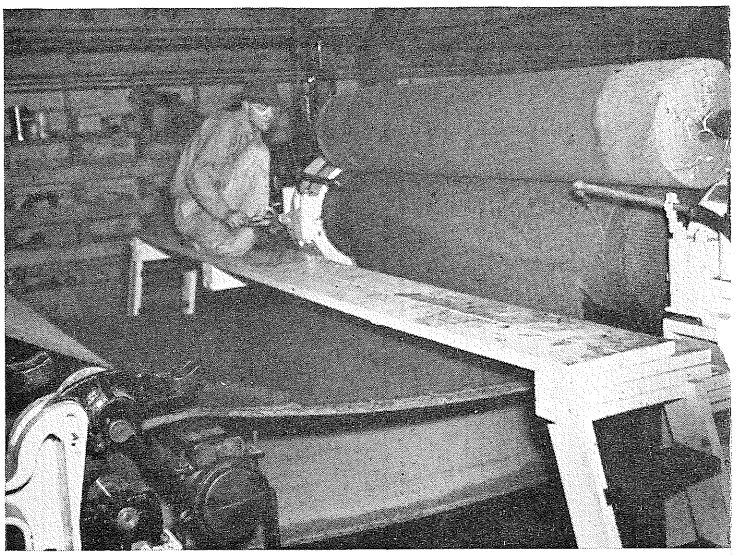
The pilot plant has a production capacity of 750 bales a day weighing 80 to 100 pounds per bale. Present plans call for around-the-clock operation to meet the demand for peat moss in the field of horticulture, and for poultry and stable litter. The new plant will provide year-around employment for approximately 40 persons residing in the Floodwood vicinity.

A successful trial run of the plant was made late in 1946, and clinched the faith that this office has had in the ability to process successfully Minnesota

ıgbuilding located 4½ miles from Floodwood, Minnesota.

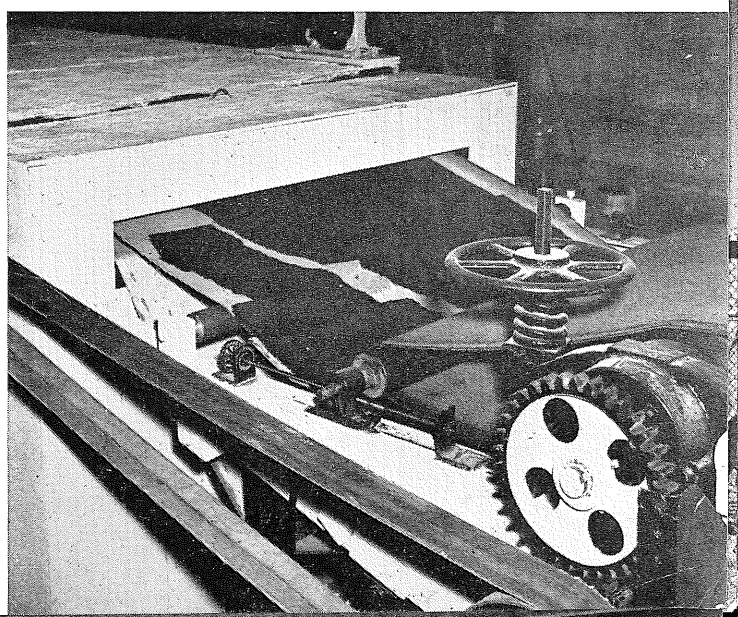


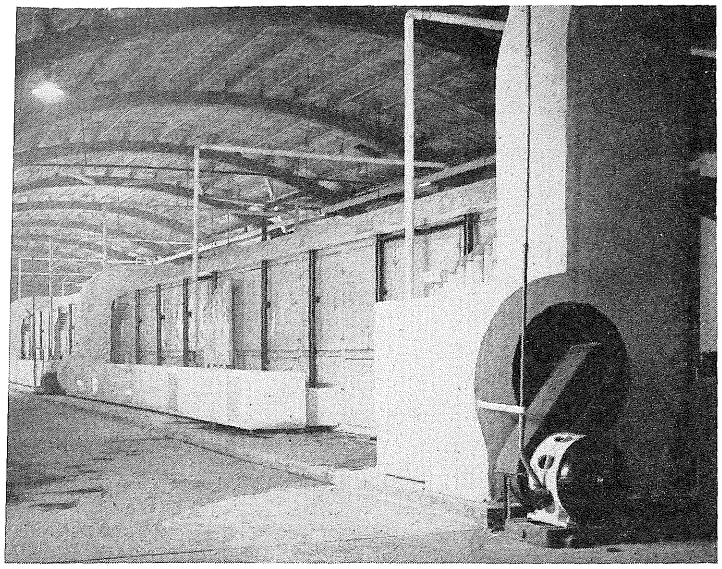
From the screening room the wet peat flows onto a conveyor forming a sheet one-half inch thick.



Large rollers remove moisture and press the peat before it enters drying ovens.

After being formed into a sheet the peat leaves the fordinear and enters drying oven.

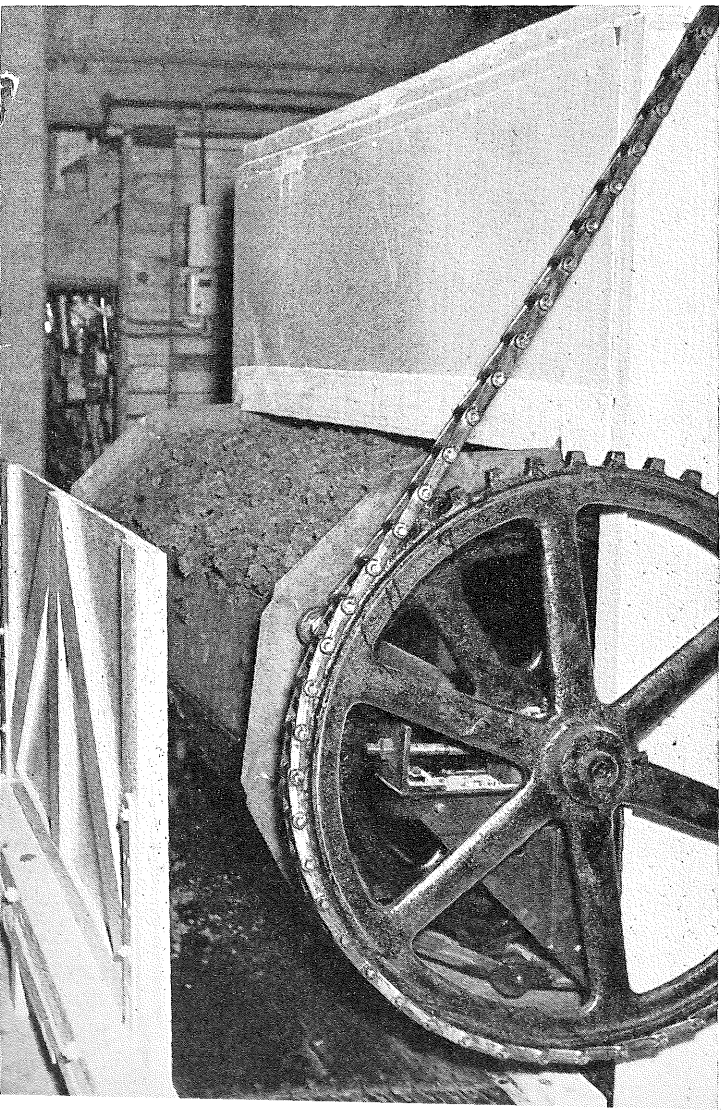




Huge ovens 135 feet long and containing 17,000 feet of 1¼-inch heating coils draw out moisture and dry the peat.

☆

Emerging from the drying ovens the peat fibre is conveyed to the shredding and baling room.



sphagnum moss. The plant will start full time operation as soon as the frost is out of the bog.

Research work will also be conducted in this plant with the hopes of developing other useful products from peat. We believe that this abundant resource will eventually find its way into the manufacture of wallboard as well as the production of plastics. We believe that we have just tapped the surface, so to speak, of the possibilities that will be uncovered through continued research in this field.

FARM FORESTRY—

(Continued from page 31)

servative stumpage prices, a soil rent of from $0.75 to $5.00 or more per acre per annum is possible, after deducting taxes, depending both upon the species present and upon the productive capacity of the land for those species. This does not include the value of timber utilized from improvement cuttings. In addition, the farmer who does his own logging receives an appreciable return in the form of wages for his labor. Therefore, the total income which can be derived from the woodlot can and should be considerably greater than the analysis shows.

During the war, considerable time and effort was devoted to cooperation with the Timber Production War Project, primarily in assisting with a census of production and the production of visual aid materials designed to stimulate production for the war effort without destructive cutting. These slides are in the files of the Farm Forestry Education Program and will have considerable value even though the war is over. As a service to producers of forest products, a file of O.P.A. ceiling prices was maintained. These prices were kept up to date and when forest products were decontrolled current market prices replaced ceiling prices.

The Farm Forestry Education Program is being carried on in Lake, Carlton, and St. Louis counties, with virtually all high schools having vocational agriculture departments cooperating both with the high school youths and the veterans enrolled in on-the-job training in agriculture under the "G.I. Bill of Rights." These two phases, of which the woodlot management contest is a part, should result in a number of woodlots put under management within a few years. Farm woodlot and windbreak extension will add to the total. The program is needed and because of the fact that several years are required to bring a tract of timber under management, the program necessarily is a long-time program and should be recognized as such.

Agricultural Opportunities of Northeastern Minnesota

The development of our Agriculture program was based upon certain fundamental principles:

1. It was necessary to study the existing conditions.
2. To set up the objectives to be attained.
3. Evaluate the methods and techniques for bringing about the improvement desired.
4. Putting these techniques into practice towards the ultimate goal.
5. A periodical review of the progress to date.

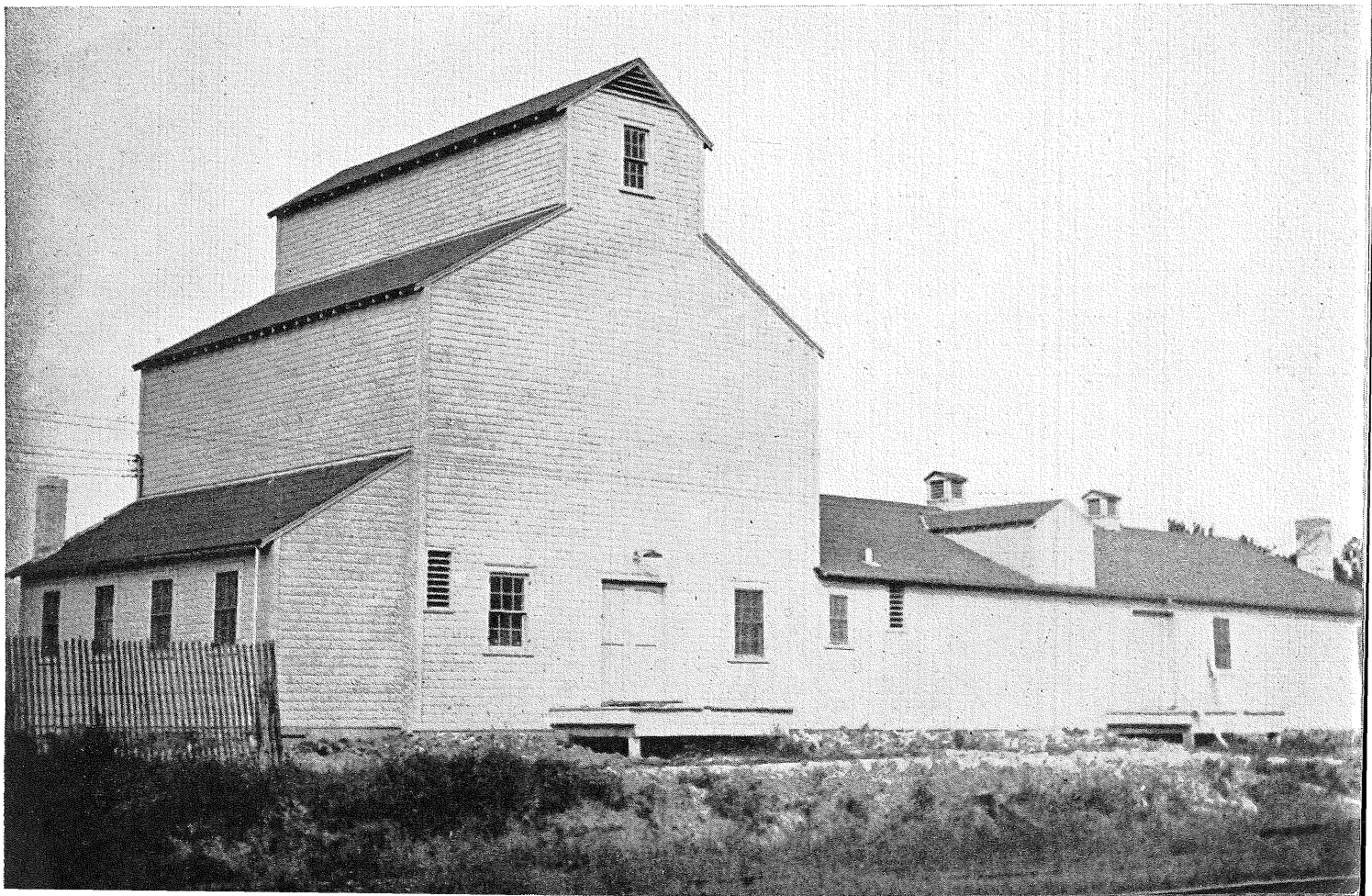
It was necessary that our Agricultural Program be elastic, progressive and subject to certain changes as conditions demand it.

At the beginning it was necessary to observe very closely the area, in this case the 14 cut-over counties of northeastern Minnesota. The 1940 census showed there are a total of 18,251,520 acres of land in these counties of which 3,503,515 acres are in farms, 19.2% of the total acreage in the area. In 1940 there were 33,601 farms with an average value of $2,478. These farms averaged 39.1 acres of crop land or 37.5% of the total farm acreage. The farm development had been seriously hampered by the large number of pine stumps remaining from the early logging days; however, these stumps have now become a less acute problem as most of them are quite easily removed. Now a second growth of timber must be cut before the land can be developed.

Major emphasis was placed on dairying, as it was deemed one of the most logical farm enterprises to be developed. The area had a wealth of grasses which could be profitably used for hay and pasture. Although dairying was considered a principal source of income for the farmers of the area, there remained many problems to be solved and rectified. Consequently, our efforts were directed towards developing projects which would improve existing conditions.

Recent studies conducted substantiate that the major source of farm income has been from the dairy enterprise. A report just published on the findings of a survey in Owens Township in St. Louis County indicates that 55.4% of the income of all the farmers in the township is from dairy

Seed Elevator and Agriculture Warehouse at Cook, Minne sota Constructed by the Iron Range Resources and Rehabilitation provides marketing facilities for the farmers of this area.



products and surplus dairy animals. A study of a township in Carlton County indicates that in 1945, 86% of all the income of the farmers in that township was from dairying. The 1945 agricultural census lists 169,230 cows kept on the farms in these counties for the production of milk, an increase of 8.5% since 1940. The following table summarizes the dairying in the area for 1945.

TABLE I
PRODUCTION OF DAIRY PRODUCTS IN NORTHEASTERN MINNESOTA—1945
(Report of State Dairy and Food Department)

County	Number of Cows	(Powdered) Milk Production	Cheese Production	Butter Production
Aitkin	17,160	.....	683,392	1,848,654
Beltrami	12,601	.....	.....	2,623,114
Carlton	15,631	.....	908,926	1,875,194
Cass	13,540	.....	.....	1,294,267
Clearwater	10,630	.....	.....	1,712,372
Crow Wing	10,537	1,688,600	.....	1,668,162
Hubbard	8,226	.....	.....	1,354,622
Itasca	11,161	630,525	.....	1,250,182
Koochiching	5,192	.....	.....	547,589
Lake	936	.....	.....	26,487
Lake of the Woods	3,791	.....	.....	425,195
Pine	30,548	13,553,029	717,380	3,846,204
St. Louis	28,987	2,246,751	2,145,285	4,692,157
Cook	290	.....	.....	.....
Total 14 counties	169,230	18,118,905	4,454,983	23,164,199

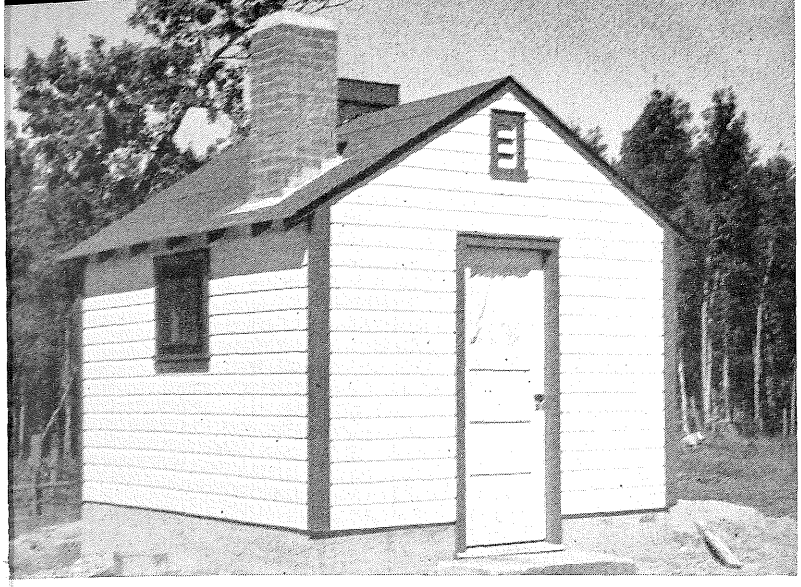
DAIRY PROGRAM

The dairy improvement program as developed by the Office of Iron Range Resources and Rehabilitation has been very well accepted in as much of the area as it has been possible to reach and has been working efficiently in developing the objectives planned for.

TABLE II
1945 CENSUS ON DAIRYING

County	Number[1] Cows	Av. Prod. Per[1] Cow, Lbs. B.F.	Cows Tested[3] No.	Cows Tested[3] %	Cows Bred[4] Artificially No.	Cows Bred[4] Artificially %
St. Louis	28,987	212.54	1,896	6.5	3,546	12.2
Carlton	15,631	201.48	650	4.1	1,456	9.3
Pine	30,548	194.63	30	.1	1,052	3.4
Lake	936	185.92[2]	.....	....	.....	....
Aitkin	17,160	170.40	1,402	8.1	156	.9
Koochiching	5,192	170.38	30	.5	.....	....
Crow Wing	10,537	169.60	.....	....	.....	....
Itasca	11,161	169.01	1,031	9.2	587	5.2
Hubbard	8,226	163.75[2]	140	1.7	.....	....
Cass	13,540	160.78	.....	....	.....	....
Clearwater	10,630	157.91[2]	.....	....	.....	....
Lake of the Woods	3,791	154.74[2]	.....	....	.....	....
Beltrami	12,601	146.43	100	.8	.....	....
Cook	290	146.20[2]	.....	....	.....	....
	169,230	.....	5,279	3.1	6,806	4.0
Minnesota	1,665,000	194.00	19,339	1.1	21,213	1.2

[1]1945 U. S. Census.
[2]Per cent of butterfat estimated at 4%.
[3]From testers' reports.
[4]From technicians' reports.



Modern milk houses protect health and increase dairy farmers' income.

The dairy herd improvement work of DHIA is considered one of the outstanding methods of improving the dairy enterprise. Leading dairymen throughout the United States recognize this work as the best technique in increasing the efficiency of the dairy herds, especially in the factors of care, feeding and management of the cows. Eight associations are now operating under the auspices of the Iron Range Resources and Rehabilitation. The South Itasca County Association with headquarters at Cohasset is typical of all the associations in the area. In the year ending July 1, 1945, 469 cows were tested each month on 26 farms in the area where this association operates. The cows' average was 297 lbs. of butterfat as compared with a state average of 194 lbs. and a county average of 169.01 lbs. In 1946 the average increased to 308 lbs. for the 518 cows on 27 farms where testing was done. The interesting feature, however, is in the fact that 17 farmers who had tested in both years increased from 301.3 lbs. to 317.8 lbs. or an average increase per cow of 16.5 lbs. of fat as compared to an average increase in the state of 17 lbs. in a 20-year period.

A compilation of data obtained in dairy-herd-improvement associations in the United States in 1945 shows how income over feed cost rises as the production level increases.

TABLE III

Level of Butterfat Production (Pounds)	Value of Product (Dollars)	Feed Cost (Dollars)	Income Over Feed Cost (Dollars)
100	100	98	2
200	192	109	83
300	280	126	154
400	371	144	227
500	457	160	297
600	538	177	361

As the data shows, good cows are good property and dairy-herd-improvement association members have the records which enable them to develop good cows and herds. The herds are gradually being improved through the knowledge gained in culling intelligently, feeding properly and breeding constructively.

The cow-testing associations in Northeastern Minnesota have also made very fine records for the year. A number of cows made records of over 500 pounds of butterfat and a large number over 300 pounds of butterfat in 12 months. The real criteria to judge success of cow-testing association work is:

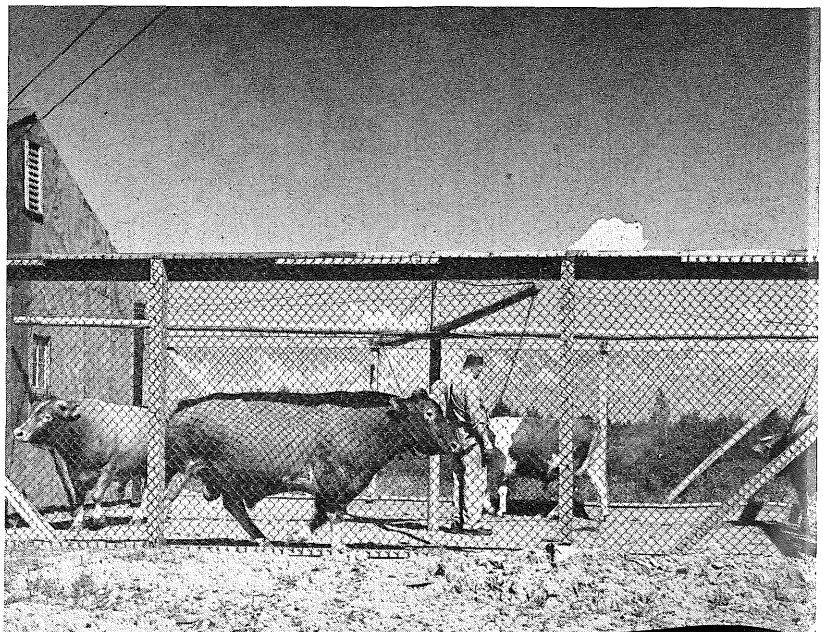
1. The acceptance by the dairymen of this service. Each association has a waiting list.

2. The progress that the farmers make in increasing their production as shown by their increase in average production per cow.

3. The number of cows culled from the herd because of low production or other factors for which it seems desirable to eliminate them from the herds. The following table gives some of this data for all the associations in DHIA in 1945.

Association	Number Farmers	Number Cows Tested	Number Cows Culled
Hibbing	37	697	125
Cook	51	647	142
Floodwood	45	454	-----
Itasca (North)	41	356	12
Itasca (South)	31	541	101
Aitkin County	79	1,179	183
Carlton	42	697	89
Total	326	4,571	652

Bulls out for daily exercise which keeps them fit—Hibbing Association



ARTIFICIAL INSEMINATION

The first practical demonstration of artificial insemination of dairy cattle was at the North Central Experiment Station at Grand Rapids in 1937. In 1939, the first year in which any figures are available, there were 7,539 cows bred. This has increased until in 1945 there were a total of 579,477 cows bred artificially in the United States. This is a more rapid growth than any other practice in dairying or, for that matter, in any enterprise in the field of agriculture. By use of artificial insemination it is possible to make the service of outstanding bulls available to a larger number of farmers than by any other means known at the present time. It is also more economical and safer than keeping bulls on each individual farm.

The first artificial insemination association in the United States was established at Floodwood in 1938. The Office of Iron Range Resources and Rehabilitation has encouraged and rendered financial assistance to a number of these associations in the range area. In order to encourage these associations to become self-supporting, the Office of Iron Range Resources and Rehabilitation requested them to raise their fees to $5.00 per first breeding, which has had some effect on the decrease in the number of cows bred in 1946 as compared to previous years. The following table summarizes the operations to October 1, 1946:

TABLE IV

	1945		Jan. 1 - Oct. 1, 1946	
	Number Farms	No. Ind. Cows Bred	Number Farms	No. Ind. Cows Bred
Hibbing	238	1,014	192	650
Cook	187	957	133	551
Floodwood	336	1,774	386	1,799
Grand Rapids	30	75	115	609
Aitkin	.....	.....	102	343

The fact that the recent market demands the sale of whole milk instead of cream has hampered materially the raising of as many dairy heifers as are needed in the area. Milk has received a good price and has been sold instead of being used for feed. Additional emphasis will have to be placed on the advisability of breeding and raising more good dairy cows.

At the present time plans are under way for the organization of additional breeding units to be federated into a central organization which will maintain a bull stud and make service available throughout the area. This will be far more economical and efficient than the individual bull studs now maintained. It is hoped that these plans can be completed and the central bull stud be in operation soon.

The fact that 6,806 cows were bred to outstanding sires in the cut-over area in Minnesota in 1945 was very encouraging. This program should be expanded to reach 15,000 to 20,000 cows within the next two years. Only through making better breeding service available to a larger percentage of the farmers in the area can we hope to increase the efficiency of our dairy production. The abundance of roughage produced in the area is of little or no value unless used as feed for livestock. More efficient cows in the territory will mean greater and more economical production, larger income and more profit for the dairyman.

The University of Minnesota checked 129 farmers in Carlton County in 1940 and found 68% of their cash income was from dairying. Five years later, when 100 of the same farmers were again checked, it was found dairying accounted for 86% of their cash income.

The creameries and cheese factories in St. Louis County in 1942 formed the St. Louis County Milk Quality Improvement Association in hopes of stimulating a definite program for production of better quality milk for their plants and the consumers they serve. The first test made in 1942 showed 29% of all the milk offered for sale was undergrade. In the last report this has changed to only 1% undergrade, a very definite record of improvement for the area.

The Office of Iron Range Resources and Rehabilitation has cooperated with this organization in the improvement work. In 1943 100 prefabricated milkhouses were purchased. At the present time 99 of these houses have been sold and erected on farms in the area. Undoubtedly these better facilities have been instrumental in the progress that the association has made. These milkhouses have been sold to the farmers at cost on a contract calling for payment of $5.00 per month. Their acceptance by the farmers in the area rewards our effort in this field. The farmers are taking very good care of these houses and using them to the fullest extent possible and are getting real results. A great many more houses have been built by farmers in the area using their own plans and building material.

Land Clearing With Modern Equipment

Legendary Paul Bunyan and his blue ox must look to their laurels. Unless they return to their home in Northern Minnesota and contest the giant land clearing machine now clearing the land at the rate of two acres an hour, they will lose their reputation. Paul Bunyan would be amazed to see this modern machine in operation.

The problem of more acres of crop land on the farms in Northeastern Minnesota has challenged agricultural workers from the time that the first efforts were made in building farms in the cut-over region. In Northern Minnesota we originally had a heavy growth of pine and other coniferous trees. Many of the stumps there resisted all efforts in the fifty years of development of farms in the area. At the present time, however, the stump problem is not as serious as it has been in the past. When we consider that 81% of all the timber harvested in Minnesota in 1945 came from these 14 counties, we realize their stumps are not all gone. However, there is also a very abundant second-growth of poplar and other species at the present time. All these factors have been a handicap and the people should be commended for the efforts they have made in clearing land for farm use. In most cases by the time a man has eighty acres cleared for farming, he is oftentimes too old or too tired to go ahead to farm the land well.

While large machines have been developed for mining ore and the building of new roads, very little effort has been made until recently in the clearing of land for farm use. This work has been done with grub hoe and axe largely by the farmer and his family. Hiring of additional help has proven too expensive. For a number of years dynamite was used extensively but was of very little value in the clearing of second-growth timber. Bulldozers have been tried quite extensively but it must be remembered that a bulldozer was designed to move dirt and as a land clearing machine is still a good dirt mover, oftentimes leaving the debris harder to clean up than if the work had all been done by hand and no dozer used. While some efforts have been made in the building of large machines, the Office of Iron Range Resources and Rehabilitation really initiated this project in a big way by the construction of a machine pushed by a large caterpillar tractor.

Immense V type blades, sixteen feet on a side, are cutting swaths ten to twelve feet wide through thick growths of popple, elm, and pine, at three to six miles an hour. Looking like giant bread knives, they cut through trees up to eight inches in diameter as if they were made of cheese and don't leave a single stump. Now trees up to nineteen inches in diameter are cut off without difficulty.

The machine is built like a large snowplow, and is mounted in front of a large track-type tractor and has a cable hoist to lift it over stones and stumps. The cutting is done by heavy, rounded and beveled saw tooth blades, a foot long, seven inches deep and five-eighths of an inch thick. As it slides along the surface of the ground it leaves a clear track the full width of the machine.

Land clearing is profitable if done in the right place. This old method requires a generation to clear a self-supporting farm.

To guard against falling trees, two-inch pipes protect the machine and a steel canopy covers the operator. The results of the fruits of vision of this enterprise have inspired several large companies with ideas for building machines of their own to do this work.

This machine has been used intermittently during the past two years and is capable of cutting trees and stumps on two acres of land per hour. The people of Itasca County have formed an association and are buying the machine for work in their county. On practically every farm where the machine has been used, the amount of cleared acreage has been doubled at a nominal cost to the farmer.

Of the farms in Itasca and St. Louis counties, seventy per cent have less than thirty acres of cleared land, yet within the past two years each Itasca County farmer who has had the service of the state's land clearing machine has more than doubled his cleared acreages.

After the trees are cut flush with the ground they are pushed into windrows, or roads are cleared through them. Axes and power saws take out the merchantable wood for lumber, pulp and fuel. The rest is allowed to dry and is burned. This provides winter work for the farmer and his family and returns fair wages. Farmers clearing land consider their work half done when the trees are felled by this mammoth machine.

Many farmers follow the land-clearing machine with a giant harrow. Mounted on the front of the tractor like a bulldozer blade, it has immense curved teeth that grub out the tree roots and pile them to dry and be burned. Some farmers plow their land after clearing, but this is not generally considered necessary.

Cleared land, free of stumps, brush, and trees, is first planted to a pasture mixture of alsike, red or sweet clover and timothy or brome grass. By the second year each acre will carry two cows for five months. It is important to keep it pastured and to prevent sprouts from shooting up. Sheep have been tried by several farmers for this purpose, but there are too many bears in the surrounding woods. They are too hungry to give the sheep a sporting chance.

The cost of operating this machine averages about $12.00 per hour. This may seem expensive, however, similar work done by hand would cost $1.00 per man hour and would require at least one hundred man hours to accomplish as much as a machine does in one hour.

Fast and modern method of clearing land in cut-over area.

Rehabilitation of Green Mountain Potatoes

Embarrass, a sandy loam area lying between the Vermillion range and the easterly Mesabi range, has long been known for its Green Mountain potatoes. This community shipped 102 carloads of that variety in 1920. By 1941, however, the annual volume had slipped back to an insignificant amount.

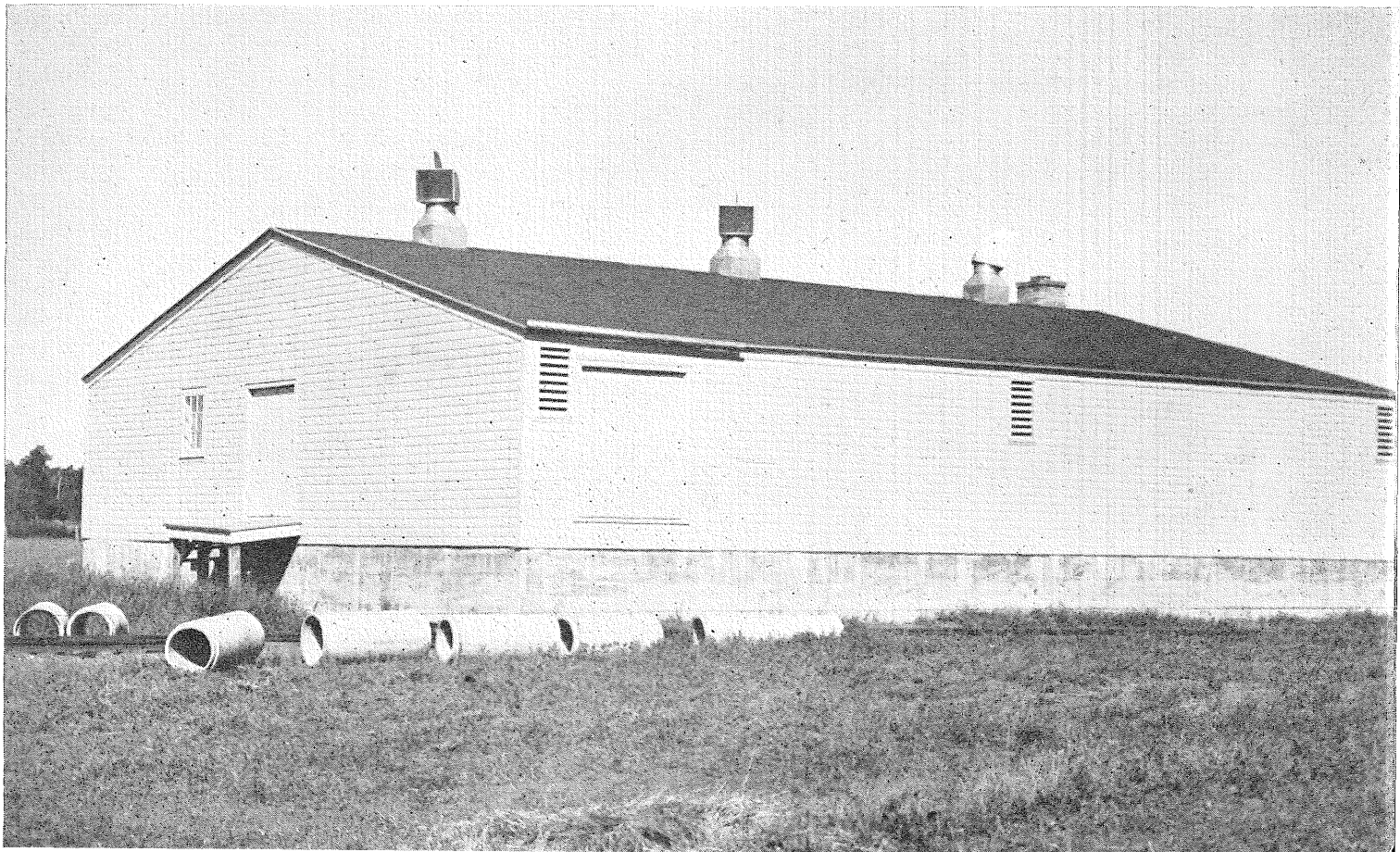
Here was a challenge to the Office of Iron Range Resources and Rehabilitation in its job of replenishing the income of the farmers of the iron range country. Plans were drawn and a potato warehouse was built at Embarrass. A potato consultant was employed and a pool of foundation Green Mountain seed potatoes were made available to new growers on a seed-return basis. Results of this project have been gratifying. In 1945 and 1946 the annual production jumped back to more than 30,000 bushels, or half that of 1920, and the quality of the crop is better than ever.

The growers are interested, cooperative, and enthusiastic towards our program. They are organized into the Embarrass Region Co-operative Potato Association, and are intent upon developing the potato possibilities of the community to the fullest extent. A careful survey of the area indicates that the community has enough good potato land to reach at least ten times the present production within a few years. At the same time, expansion to other favorable areas is already under way. In the fourteen counties of Northeastern Minnesota there are a total of 6,000,000 acres of sandy loam soil which if adapted could establish potato growing into a leading industry along with iron, timber and peat.

Green Mountain potatoes under this program are recognized among dealers and consumers as a product reducing the call for outside potatoes in Minnesota and increasing the demand for Minnesota table potatoes in outside markets. It is a Quality Potato Program that calls for expansion into "quantity of quality." It is under way as a six-point program:

1. Producing a higher quality potato.
2. Increasing the yield per acre.

The Potato Warehouse at Embarrass, Minnesota, is providing adequate facilities for efficient merchandising of potatoes.



Prize-winning potatoes being inspected by United States Senator Ed Thye and County Agent August Newbaurer.

3. Adoption of rigid grading practices.
4. Use of packages bearing labels to bring repeat demands for quality pack.
5. Promotion of quality Minnesota potatoes.
6. Cooperation with distributors to determine consumer preferences and to improve distribution during peak shipment and supply periods.

This program is bringing premium prices for potatoes from the iron range country. There must be no relaxation of effort after the gains already made.

Other Commercial Vegetables

The rutabaga project initiated in 1942 has made excellent progress in 1945 and 1946. Rutabagas are destined to rank with potatoes as a leading cash crop in Northeastern Minnesota. Potatoes should not be grown commercially in heavy clay soils; but rutabagas do well in heavy soils because the roots are half above the ground and thus not handicapped in type by compactness of soil. They do, of course, require good drainage, a matter not fully understood by some in locating their rutabaga fields. Wet spots in fields and prolonged rainy spells were, in fact, serious handicaps in rutabaga growing in 1945 and 1946; so the element of luck has been against many otherwise good growers.

Wartime transportation difficulties reduced the usual marketing channels, but new outlets have developed with the increased attention that has been given to rutabaga growing. Especially notable among these new outlets is the rutabaga cannery at Grand Rapids.

We need only be challenged by what Canada is doing to see the opportunity that lies ahead in rutabaga growing in Northeastern Minnesota. Canada ships into the United States annually 4,000 to 5,000 carloads of rutabagas for table purposes. In the province of Ontario there were raised in 1939, our most recent figures, 26,034,000 bushels of rutabagas. Why not a comparable crop in Minnesota by 1950?

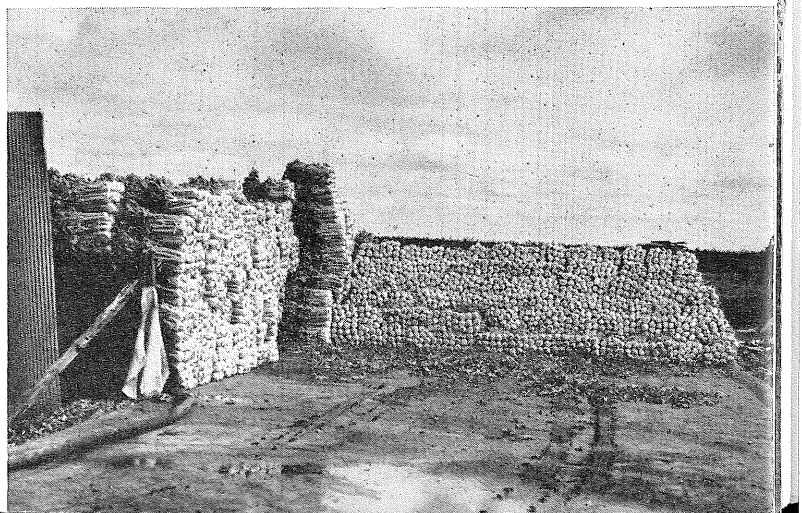
Introduction of the Laurentian rutabaga variety, smooth, round, uniform, flavorful and productive, has been a big factor in sales promotion. They have made the rutabaga bin an attractive part of the grocery counters at all the stores they reach.

Production of commercial vegetables is an important industry in Northeastern Minnesota and capable of great expansion. In view of this fact, the vegetable man on the staff of the Office of Iron Range Resources and Rehabilitation has continued to give much time to the problems of these crops, cooperating with growers, county agents and specialists from the University in an area-wide way.

Meadowlands shipped seventy-five carloads of head lettuce and twenty-three carloads of cauliflower in 1925. Fens has long been known for its celery and head lettuce as well as carrots and other commercial vegetables. Wrenshall is recognized for the superiority of its cabbage. What has been done once can be done again and on a larger scale. (Continued on page 43)

Harvesting seed potato crop in northeastern Minnesota.

Celery Ready for Marketing.



Experimental Greenhouse at Two Harbors

In the winter of 1944 a hothouse was constructed on the school grounds of the Lake County High School. The hothouse, a structure 18′ x 45′, includes a glass enclosure 18′ x 33′, and a building 18′ x 12′ housing the soil bins and heating unit. This building project was financed by this department, and the operating costs are assumed by the school district. The purpose is to develop agricultural possibilities in Lake County. The project is under the direct supervision of the agricultural instructor and the boys and girls in his classes furnish all labor as part of their agriculture course.

The project has been very favorably received in the community. In fact, a member of the school board claimed, "it is the best project we've ever had in the district."

During the operation of the hothouse in the last two years some 18,000 tomatoes, 15,000 cabbage plants, 6,000 cauliflower, 5,000 celery, 500 head lettuce, with lesser amounts of egg plant, peppers, ground cherries, broccoli, brussels sprouts, and other plants were started by the agriculture classes and distributed throughout the county.

Also, some plots of blueberry plants were started from selected seed and placed on an experimental plot near Two Harbors.

The project has been very helpful in this community as the recommended varieties of early plants can be selected and the people of the community are assured of plants that will bear in the community. As seasons are very short in this territory the varieties that will do well in the area must be introduced through experimentation.

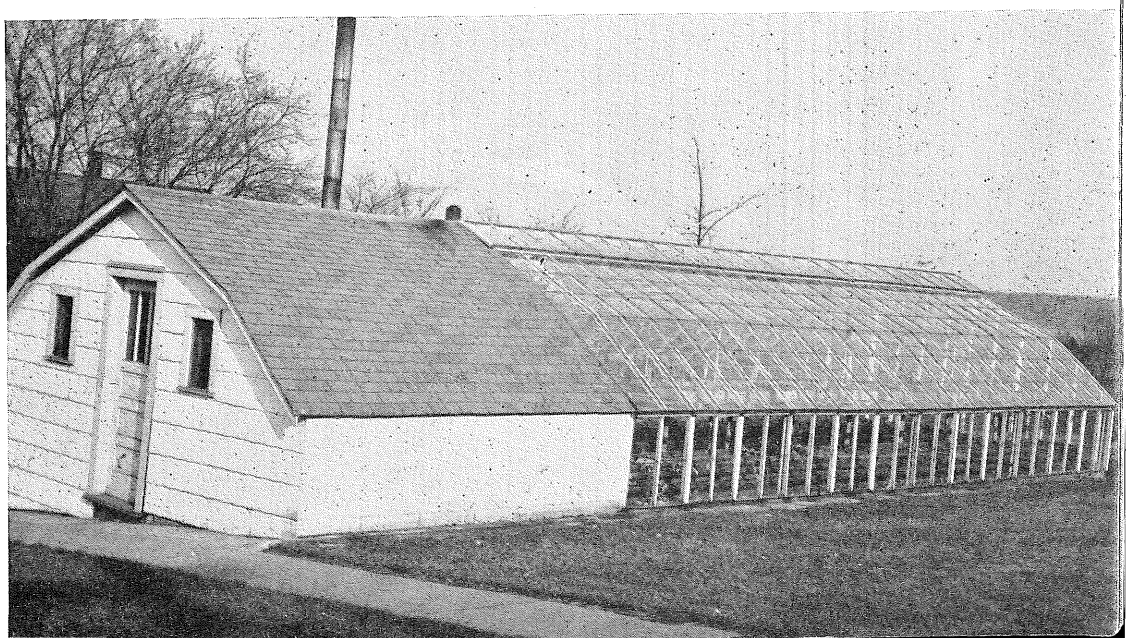
In addition, the boys of Lake County are given the opportunity to get first-hand information in growing plants.

VEGETABLES—

(Continued from page 42)

Exacting crops such as celery, head lettuce, cauliflower, etc., are perhaps best confined to expert operators. They give substantial per acre returns to the grower, and they employ much local labor in the various field and marketing operations. Vegetables like peas and rutabagas are grown by general farmers under contract for processors in the area. Then near the centers of population, market gardeners produce vegetables in large assortment for sale at public markets to stores or to homes.

Northeastern Minnesota is an area particularly adapted to root crops and other cool season vegetables. In total they are big sources of income.



Research is the keynote to progress. Throughout the country today people are becoming more aware of the great need for research. Industries are urging it—Legislatures are supporting it—Chemurgists are doing it.

Irish Cobbler Certified Seed Potatoes

The Irish Cobbler seed potato acreage in St. Louis County has rapidly increased during the past two-year period (1945-46) with the financial and supervisional contributions made by the Office of Iron Range Resources and Rehabilitation. Funds were made available in the spring of 1945 to purchase 1,000 bushels of foundation stock certified Irish Cobblers.

The seed potatoes from this pool were distributed to selected potential growers who, without this seed, would have been unable to get into certified seed potato production. The first year's rehabilitation effort was well rewarded as the 1945 Irish Cobbler acreage was 165% greater than the 1944 acreage. The acreage continued to expand in 1946. As a result the total acreage for this year was 252% greater than the 1944 acreage. The total value of the 1945 and 1946 certified Irish Cobbler crop was approximately $150,000 compared to the total value of the previous two-year crop valued at $50,000.

The rehabilitation of the certified seed potato industry has not only benefited the growers, but it has provided employment. The total man hours required to grow the 1946 Irish Cobbler seed potato crop was approximately 21,000 hours. During the harvest season alone the extra labor needed to pick and haul the crop to storage was approximately 7,000 man hours.

The certified seed potato industry has attracted a number of World War II veterans. These first-year producers of high-quality seed potatoes have made excellent progress in care of the growing crop and marketing. They have received the necessary guidance in selection of high-quality seed, disease and insect control, careful harvesting, proper grading, and efficient marketing. One of the major objectives of the Office of Iron Range Resources and Rehabilitation's certified seed potato program is to devise ways and means of producing a disease-free, high quality seed potato and to secure reliable, steady market outlets.

The rural youth have not been overlooked in the seed potato rehabilitation program. Twenty-one members of the 4-H Club and Future Farmer chapters are at present becoming established in the production of certified seed potatoes. The youths secured their seed from the Iron Range Resources and Rehabilitation seed pool and are repaying the seed bushel to bushel at the end of the harvest. According to H. J. Aase, St. Louis County 4-H Club Leader, the area served by the Office of Iron Range Resources and Rehabilitation is the only region with 4-H Club members in certified seed potato club work in the state.

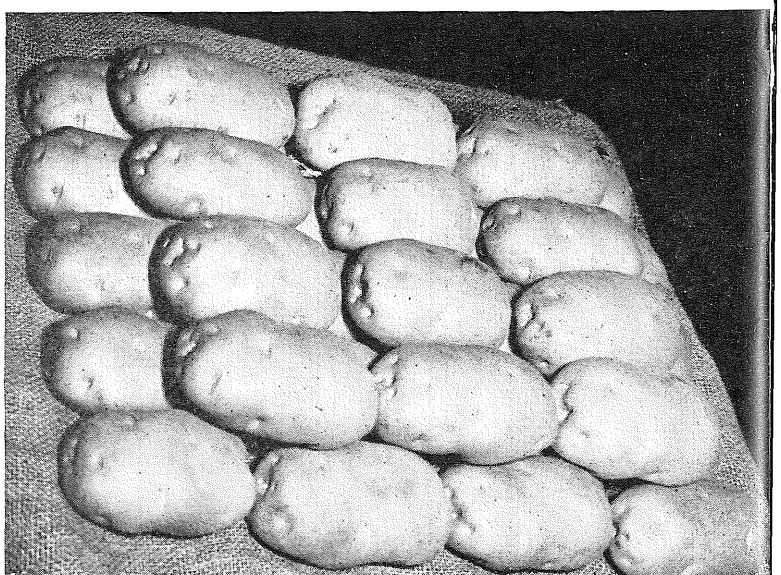
At present, certified seed potatoes are being shipped to seed potato markets in the southern and western parts of Minnesota, Iowa, Missouri, Maine, California, New York, Wisconsin, North Dakota, South Dakota, Michigan and Illinois. An intensive program in production with no foresight in securing markets would mean an unsound and unstable rehabilitation program.

There is considerable room for expansion in the production of certified seed potatoes in St. Louis County as only 5% of the county's total potato acreage is in certified planting and less than 1% of the total acres under cultivation is in potato acreage.

The rehabilitation of the certified seed potato industry in the Northeastern Minnesota counties will be completed and the program will be on a self-supporting basis when reliable, steady seed markets have been established, and when an active, sound association has been organized.

Mr. and Mrs. William Henke, pioneers of St. Louis County, proudly look over potato field which yielded bumper crop.

Perfection makes prize winners.



Decentralization of Big Industry Brings Job Opportunities to Range Area

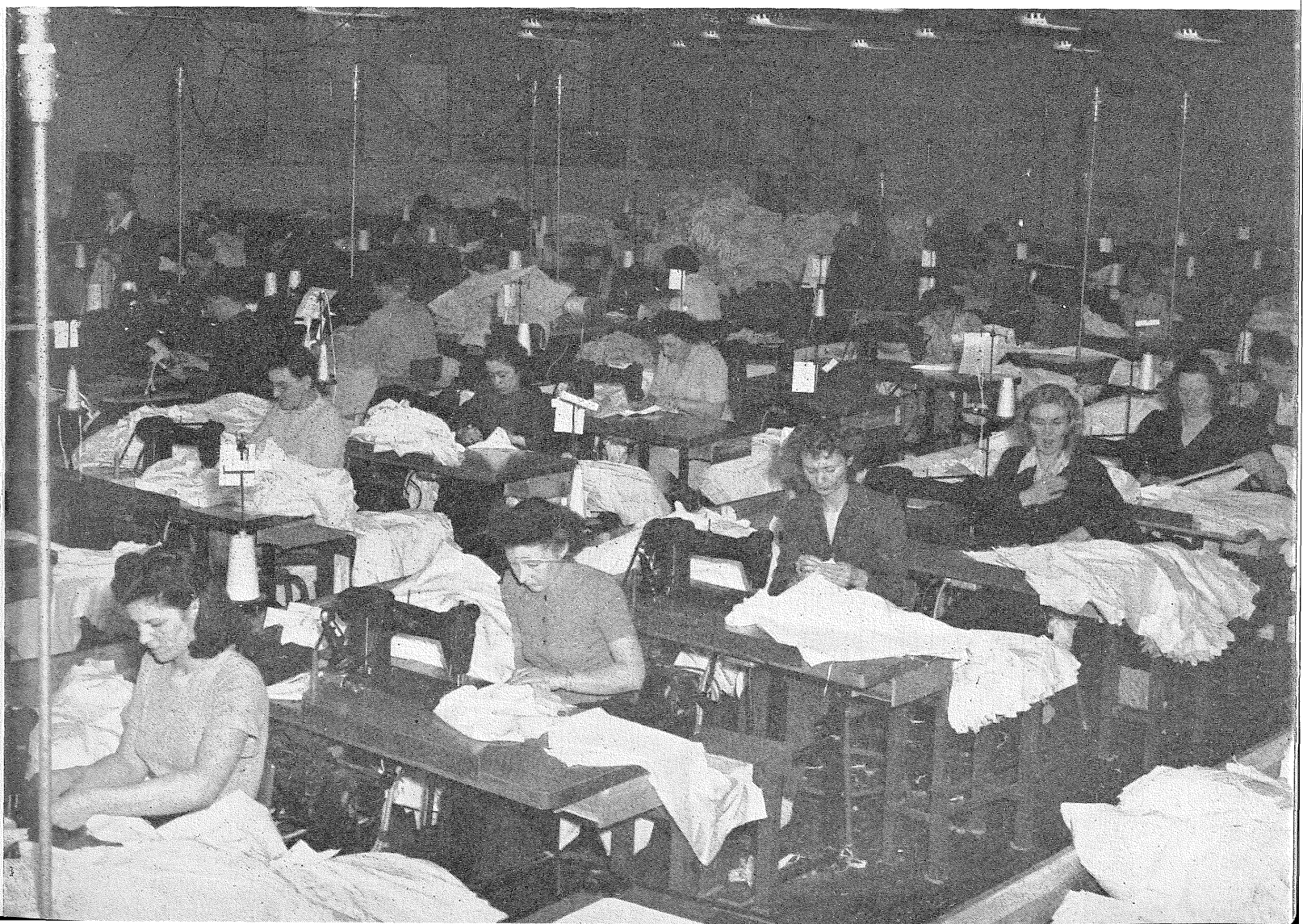
In our effort to create new industries by utilizing our natural resources, we have not overlooked any possibilities to supplement or transplant an industry to provide immediate job opportunities for the citizens of the iron range communities. With a program like the Iron Range Resources and Rehabilitation functioning, it gives a new lease on life to the towns on the iron range.

Alfred P. Sloan, Jr., Chairman of General Motors, in a speech provided us with inspiration when he said: "It is desirable that industry move towards operating in more places rather than concentrate in already congested areas. The cost of living in the small communities is generally less. It is a better type of living. The same wage scale means a higher standard of living as well as a better one; an equivalent standard of living is possible at a lower wage rate hence influencing lower prices and expanding job opportunities."

The Chicago Daily News in June of 1946 "hailed Minnesota as an Oasis of Industrial Peace," which is a splendid recommendation for all progressive businessmen and industrialists who are looking for a place to establish or expand their enterprises.

Minnesotans have the reputation of being intelligent, skillful and dependable people, which are qualities of utmost importance for the success of any business.

For more than half a century, Eveleth, like a dozen other towns on the iron range, has prospered and built many educational structures from the taxes paid by the mining companies. In view of the labor saving machinery which has reduced employment in the mines to a minimum and with an



eye to the future, when there is a possibility that high grade ore will be depleted, the Iron Range Resources and Rehabilitation has been diligently persuing ways and means to utilize the human resources by providing employment opportunities to the people of this area. With this thought in mind, we enthusiastically cooperated with the officials of Eveleth in their efforts to bring the Cluett Peabody and Company of Troy, N. Y., manufacturers of Arrow Shirts and other products, to Eveleth. The trend towards decentralization of industrial plants is providing us opportunities to provide large scale employment if we encourage industries to move to Minnesota.

Eveleth had excellent facilities available for the new industry. A three-story recreation building was standing idle. A rapid remodeling job took place, through the united cooperation of all civic leaders. Truckloads of machinery and equipment were rushed to Eveleth. Before long there stood in evidence a dream transposed into a reality.

The first floor of the recreation building was designated as a cutting room. The second floor accommodates approximately 220 power sewing machines and the third floor is reserved for a lunch room, kitchen and rest rooms for the personnel.

A survey was conducted to determine those interested in work of this kind. The response was most gratifying and the company's officials were pleasantly surprised at the high caliber of the prospective worker. It is expected that this new industry will provide Eveleth with a $500,000 annual payroll.

It was necessary to train the 350 employees of the plant to cut and operate the power sewing machines. The Iron Range Resources and Rehabilitation set up a training center for the personnel.

The results of this industry reflects how cooperation between city, county and state officials united in a common cause can materially benefit the iron range territory.

Officially, the Iron Range Resources and Rehabilitation is receptive towards all industries. Our office stands ready to serve any industry desiring to know more about the favorable factors and potentialities of Minnesota.

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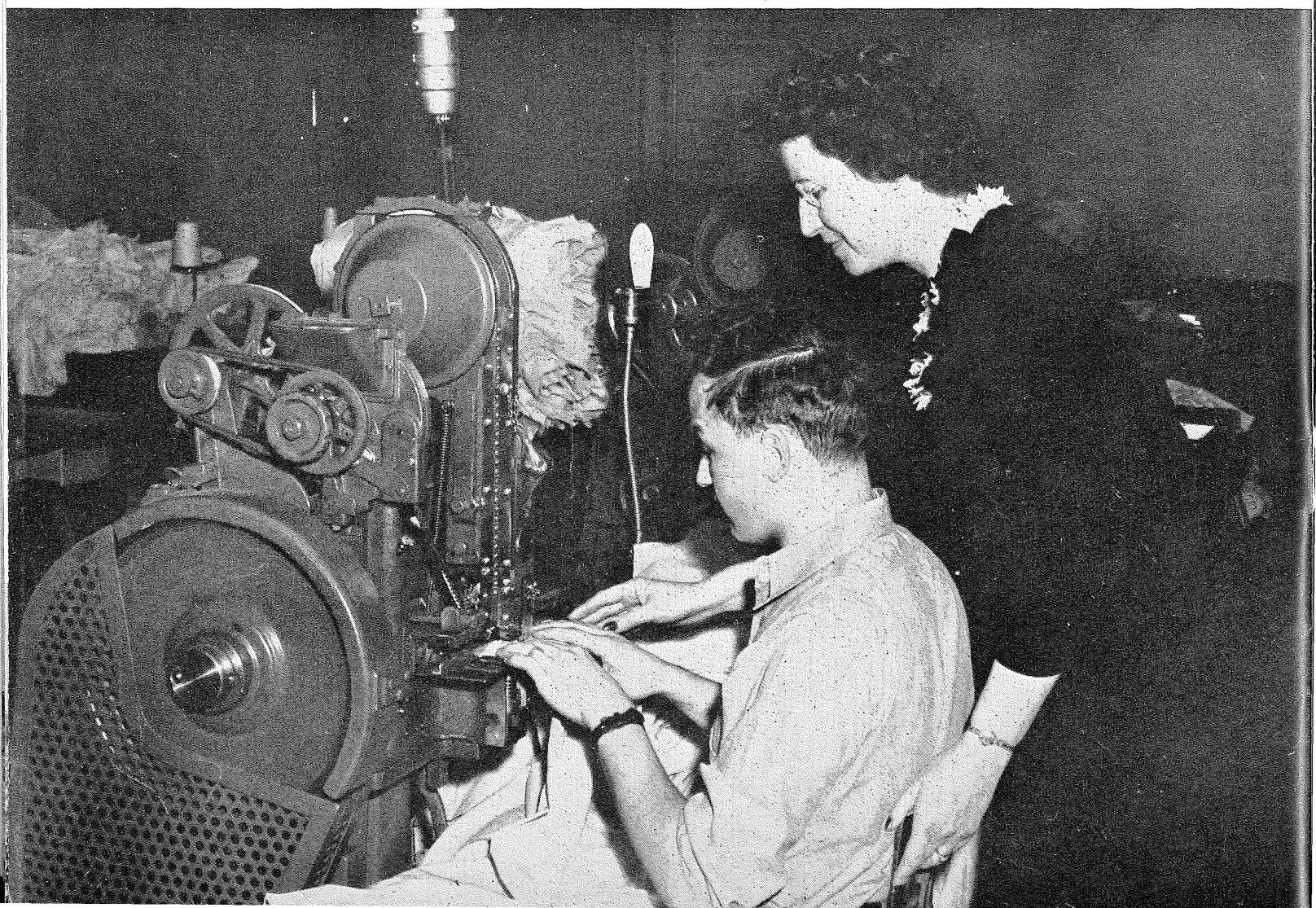
Attaching snaps with Scovill machine at "shorts" factory in Eveleth.



Minnesota-N. Dak. Resources Development Commission

The Minnesota-North Dakota Resources Development Commission, of which the Commissioner of the Iron Range Resources and Rehabilitation is a member, is comprised of three members from each state and the Governor of each acting in an ex-officio capacity.

This commission was formed early in 1943 when the Steel Shortage Investigating Committee appropriated federal funds to experiment with North Dakota lignite and Minnesota low grade ores. This project was deemed essential since the war crisis threatened us with a severe shortage of steel and fuel. The commission is vitally interested in the production of hydrogen gas as a fuel from lignite for beneficiating Minnesota's low grade ores.

The work was undertaken by the Bureau of Mines with these two objectives:

1. Ascertain the best methods for producing hydrogen from the limitless supplies of lignite.
2. Develop suitable techniques for concentrating iron-bearing rock, supplies of which are virtually inexhaustible.

The experiments determined that three kinds of gases could be made from lignite; first, synthesis gas from which petroleum is made; second, high hydrogen used chemically, and, third, plain industrial gas for fuel and industrial purposes.

Now further experiments are being conducted to determine the cost of making each kind of gas. We are most vitally concerned in the high hydrogen because there is a potential demand for it in the iron powder plant at Aurora, Minnesota. It is another development with which this department is assisting since we are ever alert and willing to cooperate with any enterprise that will aid in the industrial development of our state.

This office has been consulted on numerous occasions by the majority of the existing state and federal agencies as well as many industries operating within Minnesota. It is our policy to cooperate and assist whenever or wherever there is a possibility to promote good will and advance the progressive attitude which is so essential to the industrial growth of Minnesota.

The large scope of activities covered by this department adequately provides us with the foundation of data for all industrial developments. We have worked effectively and efficiently to build a better Minnesota and have conducted the affairs of the Iron Range Resources and Rehabilitation in such a manner that it will reflect a living tribute to the administration.

We have been working closely with various engineering societies in our work and there is keen interest displayed by this group. The widespread acceptance of our program is further evidenced by the scores of requests we receive of national and international significance.

(Continued on page 60)

Double needle machine which does seat inverting at Eveleth factory.

Land Use Program

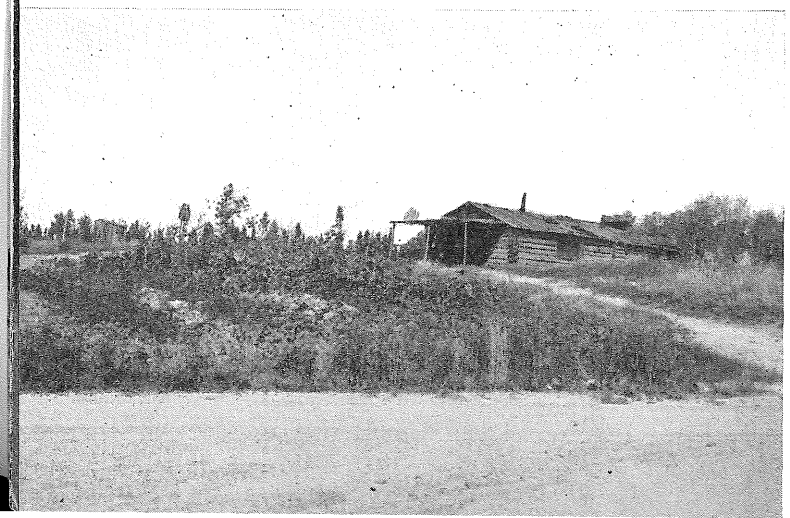
The decade just passed has worked a revolution in land ownership in Northern Minnesota. Where public land in 1930 amounted to only two and one-half million acres, public agencies today control not less than twelve million acres — three-fifths of all the cut-over region of the state. More than half of this vast acreage has come into public hands by route of forfeiture for unpaid taxes and the acreages continues to grow each year as additional tax liens are foreclosed.

This violent shift in land ownership has meant a greatly reduced tax base and tax income for the counties, township and school districts. For many local governments it has meant near disaster. These fiscal problems still are far from solved. Serious as they are, however, the financial effects of this revolution in land are certain to be less lasting than the task of taking care of the land which the former private owners have abandoned.

Public acquisition of large acreages of land through tax forfeiture was foreseen during the 1920's when widespread tax delinquency began to appear in all northern counties. There followed a long series of bargain-counter tax settlement laws, tax moratoriums and installment-payment schemes, all in an effort to keep lands on the tax rolls. These measures were unable to stem the tide, however, because the cut-over lands in the main were producing too little revenue to pay the high tax levies prevailing in the northern counties. Provision for outright forfeiture of delinquent lands was made in 1935. Finally, in 1939, after a dozen years of trial and error, of controversy and court decisions, the legislature defined a policy for handling the tax-forfeited land problem.

Lands forfeited for taxes belong to the state. The State Conservation Department, however, has only secondary and incidental responsibility for the administration and management of most of these lands. Chief responsibilities in these matters are imposed by law on the county boards and county auditors. The county boards are the custodians of the land. Subject to approval of township boards, they are required to classify forfeited lands as to their suitability for agricultural and conservation uses. The county boards alone are responsible for determining the appraised value of all lands which they consider suitable for sale. Timber standing on lands to be sold for agricultural purposes also must be appraised by the county, but timber valuation must be approved by the Conservation department before the land may actually be sold.

Many settlers are trying to farm on poor soil and rock covered land.

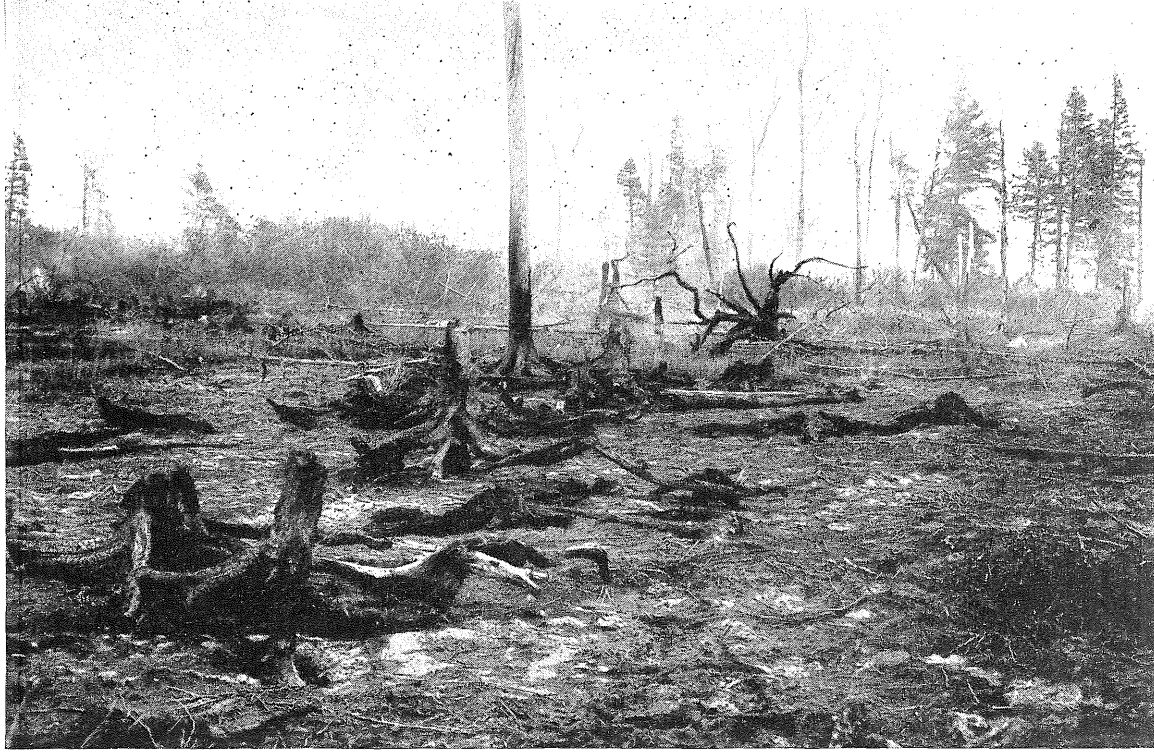


Forfeited lands classified by the county board as "conservation lands" cannot be sold. At its own option, the board may cede its jurisdiction over such lands to the Conservation Department for management by the state as other state lands. Or it may choose to retain control itself. In the latter choice, it may sell timber and other products from the land after the Conservation Department has approved the county's appraised valuations and forestry practices to be required of timber operators.

Sales of land and timber are conducted by the county auditor. All income from forfeited lands under jurisdiction of the counties is payable to the taxing districts which had an interest in the unpaid taxes. After certain special assessments and debts outstanding against the lands have been met, proceeds from land and timber sales go 30 per cent to the county, 40 per cent to the school district, 20 per cent to the township, and 10 per cent to the state.

In broad outline, therefore, Minnesota's tax-forfeited land policy calls for cooperative effort between the Conservation Department and the county boards, with the county having the principal responsibility and authority; in the classification of the land the state has no voice; in matters involving timber sales and methods of cutting, the state exercises a veto power.

This scheme of administration has no direct parallel in any other state. No guideposts of procedure were to be found, therefore, in the experience of others. Moreover, when the millions of acres of land suddenly came into public ownership, the county boards and other local officers had no background of experience in large-scale land administration. Previously, the roll of the county in tax delinquency and tax forfeiture had been



Desolation follows the forest fire. Here the fertile top soil has been entirely destroyed. The land must be replanted if it is to become productive again.

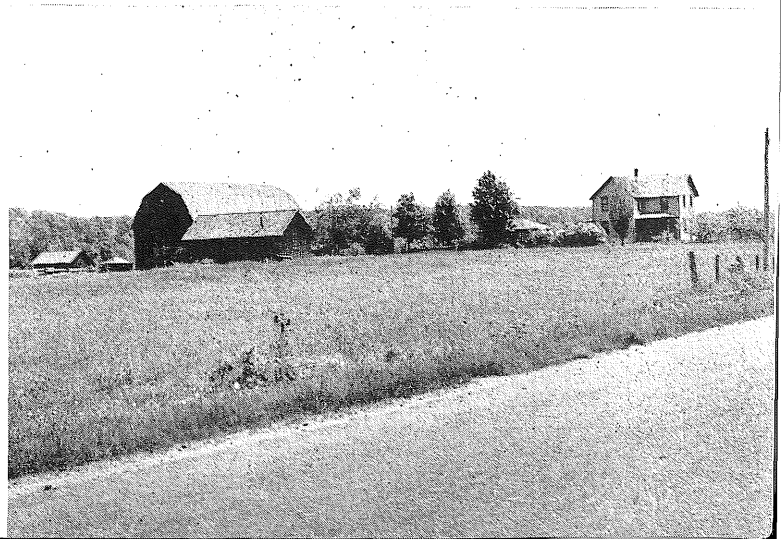
merely that of a go-between in the transfer of land from one taxpayer to another. It was scarcely conceived that the county should undertake permanent custodianship of these lands and manage them for productive uses on its own responsibility. In the practical job of translating the new legislative policy into terms of land classification, appraisals and sales, therefore, both the counties and the Conservation Department have had to feel their way over new ground.

Initial efforts by the various counties have differed greatly both in approach and in effectiveness. Some counties struck out bodly to restore forfeited lands immediately to the tax rolls, following traditional thought in tax delinquency matters. To clear the way for quick sales, large acreages were classified as non-conservation land with little consideration given to its suitability for agricultural development. Most of the counties which set out upon this course have been quick to see the futility of indiscriminate land sales. It soon became apparent that the largest share of buyers at these sales were people interested not in permanent ownership of the land but only in the second-growth timber standing on it. Such buyers were required to pay at time of purchase 10 to 25 per cent of the land value and the appraised value of standing timber, if indeed any timber was appraised at all. With the removal of the timber, the cut-over land once more was dropped and ceased to pay further taxes. Under this procedure, second-growth forests well on their way to self-restoration were reduced once more to unproductive lands and the local governments become the loser.

Experience of this kind during the first years of land sales has led to more sober consideration of long-range objectives of county land programs by the people living in the cut-over region. During the past five years most of the counties in which there is a large acreage of forfeited land have carried on comprehensive land-use planning surveys. In this effort they have had the invaluable assistance of the Agricultural Extension Service of the University of Minnesota. Committees of farmers, county, township and school officials and representatives of various state and federal agencies have held hearings and conducted studies in almost every local community in the northern counties. They have studied data on land ownership, scattered settlement, taxes, public debts and governmental costs. They have analyzed the present status of farming, timber and other industries in each locality. In the light of these facts, they have classified all of the land as to its suitability

(Continued on page 60)

There is much good farm land in northern Minnesota. With a source of cash income while he is clearing such land, the settler can develop a paying farm.



Small Fruits . . . Good Cash Crop

Minnesota is one of the leading states in commercial red raspberry production, ranking third in acreage according to the U. S. Department of Agriculture census.

Development of the commercial red raspberry production in Northeastern Minnesota began in 1920 and by 1930 the production in the Duluth region exceeded local demand. Consequently, berries often sold for no more than one dollar per crate.

In 1934 several leading berry growers organized an association in order to develop outside markets for their fruit. A gradual expansion of this industry has taken place. Shipments in carlot quantity have been made to large terminal markets such as Chicago, Milwaukee and New York.

Several large plantings were established during the past year, and there are a number of growers contemplating putting in plantings of a half acre or more next spring. Prices received by those who did care for their plantations were very gratifying. During the past year the Head of the Lakes Fruit Growers Association marketed 1,000 cases of berries, which was an increase of about 400 cases over 1945. These berries sold for $8.61 gross per case on the Chicago market. Prices like these stimulated interest in berry growing, and it will be only a matter of a few years before our berry industry will be built up to a higher point.

By this time, the high quality of red raspberries from Northeastern Minnesota has become firmly established in the Chicago and Milwaukee markets. Prices received are consistently higher than in any other raspberry producing region in the United States, except California, and no California berries have reached midwest markets since 1942. The normal harvest season at Duluth is from July 15 to August 20 and because of the late picking season, the berries at present have little competition from other regions.

Interest in small fruits is picking up in the Duluth region. The same increased interest is evident in all parts of St. Louis County. During the war years most of the small fruit plantings were neglected because of the many opportunities for earning money which were offered by defense industries. As these alternative earning opportunities diminished, there is a drifting back to growing fruit.

Production and transportation were the major problems, as berries from this region had already established an enviable reputation for quality in several larger terminal markets. As this industry continued to develop, certain difficulties were encountered which threatened to limit further progress, such as losses from mold developing on the fruit in transit to terminal markets, and winter injury to the fruiting canes.

In the winter of 1945-46, however, there wasn't a great deal of winter injury. Experience seems to indicate that bending over and covering berries has some beneficial effects.

One thousand Madawaska raspberry canes were distributed in the spring of 1946. These canes were shipped in from Canada and were distributed to approximately 35 growers. The Madawaska berry appears to be somewhat Mosaic resistant. The canes do not grow too high and the berries are larger than the Latham. In some of the trials, Madawaska appeared very susceptible to Anthracnose. Some plantings appear entirely free from the disease—others were heavily infected. Next year we will attempt spraying with lime sulphur and also with fermate as a control measure.

A comprehensive study of the production problems was begun in 1942 and completed in 1944 through the cooperation of this department, which financed the project, the Minnesota Agricultural Experiment Station, which conducted the investigations, and the Lake Fruit Growers' Association, which made available their facilities for research in transportation problems and contributed in part to the financing.

Red raspberries from Northeastern Minnesota already have an established market in considerably greater volume than production has yet been able to supply.

Transportation facilities to large terminal markets are excellent at Duluth but are not so favorable at other points in the region. Difficulties in getting the fruit to market without serious loss in transit appears to have been overcome. The major problem, therefore, is that of production.

Investigations indicate that greater difficulty may be expected in the vicinity of Hibbing and Virginia than in the Duluth region in developing large scale commercial production of red raspberries because of fewer suitable planting sites and less favorable shipping facilities.

A minimum of 150 acres of red raspberries in production is required for a shipping association to function economically. At least 25 acres of new planting will be required each year to provide adequate replacement for old plantings going out of

production. Such an acreage should have an annual production of not less than 16,000 crates. A daily production of 2½% of the total volume may be expected after the first two or three pickings, thus providing a full carload of fruit every other day. This production may be expected to increase to a daily maximum of 7% at the height of the harvest.

Because investigations made in 1942 and 1943 revealed that many sites were unsuitable for commercial raspberry production, a comprehensive survey was made in 1944 to determine whether there is sufficient acreage of suitable land in the immediate vicinity of Duluth to permit the development of a permanent industry. This survey was made in the townships of Rice Lake, Lakewood and Herman, and in the Greysolon Farm District within the city limits of Duluth. It included a careful analysis of soil conditions on 187 farms, but did not cover all the possible planting sites in the three townships. A total of 494 acres suitable for commercial red raspberry production was found. These tracts ranged in size from one-fourth to 15 acres, averaging 2.6 acres.

On the basis of this survey, it was estimated that at least 1,000 acres of land suitable for red raspberry production could be found in the vicinity of Duluth.

The Duluth area presents possibilities for the development of a highly successful red raspberry industry. It produces a berry of high quality that comes on the market at a time when there is very little competition from other districts. It is a specialty crop which requires intelligent handling and considerable labor, but produces a relatively high cash return per acre.

It has been ascertained that an ample supply of suitable land is available in the area, but it is scattered in small patches on many farms. If the industry survives and expands, it will be in the hands of a large number of small scale growers who must maintain an effective cooperative marketing and shipping association. This should present no difficulties since such an organization is already functioning.

It has been demonstrated that a quality product can be produced and delivered in carload lot to markets which will absorb a far greater volume than has been available.

The success of the individual grower depends upon his judgment in selecting a suitable soil and site and on his willingness and ability to practice approved methods of culture, harvesting and marketing.

Raspberry plots such as this result in good cash income.

Strawberries

The possibilities of developing commercial strawberry production in Northeastern Minnesota has been given careful consideration. It will provide additional crop volume to support a cooperative marketing association and furnish an additional source of income to the grower.

Relatively little commercial production of strawberries has been attempted, although a few commercial plantings have been made. However, it has been proven by the results of these plantings as well as by many small home plantings throughout Northeastern Minnesota that strawberries can be grown successfully in the region. It is interesting to note that many planting sites that are not suitable for raspberries can be used for strawberries.

With the development of a large scale commercial strawberry production a berry marketing association could be adequately developed and maintained.

The late ripening season affords excellent market opportunities, as most of the crop from other regions has been harvested by the time that the berries from the Duluth area are ready to be shipped.

Fruit Trees

Emphasis has been placed on home orchards so that farm families can raise their own fruit. By passing out information on the best varieties adapted for the area, it appears that fruit growers will be successful if they follow approved practices.

Approximately 2,000 apple trees were planted during the past year. Seven pruning demonstrations were held. Apple tree pruning in this area has been neglected for many years and there is an intense interest in knowing the correct way to

(Continued on page 57)

Water Resources Important To Industrial Development

Minnesota has the largest acreage of open water of any state and the water resources of the region are among its most valuable natural assets. They are important both as a source of potential power development in the northern counties, and as a refuge for wildfowl, fish and aquatic life upon which the entire tourist industry depends. Lakes and swamps also help to maintain ground-water levels in the agricultural districts and act as a feeder for the Mississippi River during season of low rainfall.

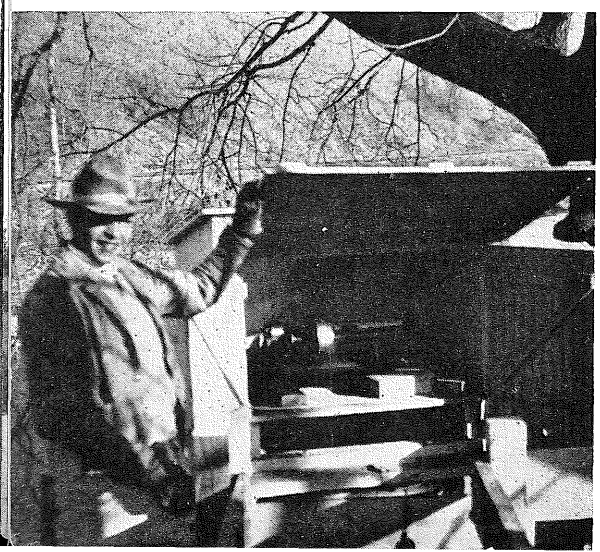
This project of investigation of the surface-water resources on the range was started in 1942 in cooperation with the U. S. Geological Survey in order to determine the water supply available for use in the expanding rehabilitation program. It was continued during the biennium 1945-46 on about the same scale as during the preceding biennium.

It has been shown that future development and expansion of the resources in the area is directly dependent on the available water supply and, in view of the limited known underground water supply, it is mandatory that surface waters be inventoried to determine the available quantity and the locations best suited for an intelligent, long range rehabilitation program.

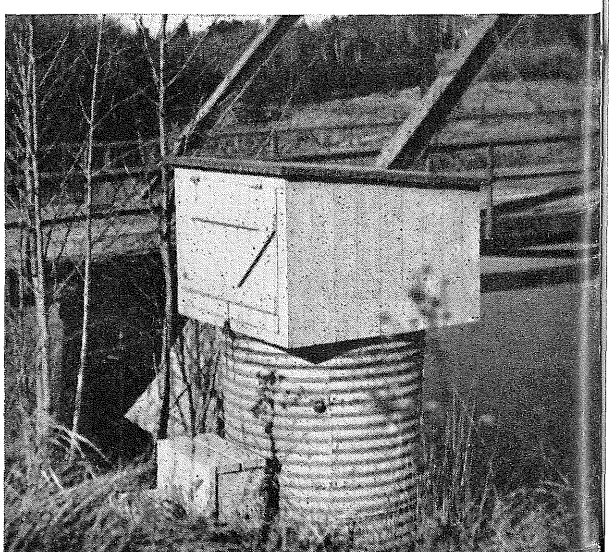
It is no secret that the atomic bomb plant at Hanford, Washington, was located on the Columbia River where the average annual flow of over 100,000 second feet is available to function as a control for atomic reaction. Yet with this very large flow, it is reported that the temperature rise of the Columbia was appreciable as the result of the operation of this plant. The flow of the Columbia is many times the total of all the streams originating on the Mesabi range and one cannot visualize an atomic bomb plant being located in the area because of the limited water supply available. Water is, however, an absolute necessity for all industrial activity and growth, and such industries as can be operated advantageously on the range—canneries, dairies, iron powder plant, ore beneficiation, textile, plastics and others—all require quantities of water for processing.

The five locations at which stations are being operated at the present time are on the Partridge, Sturgeon, Embarrass, Dark and St. Louis rivers. The data obtained from these stations show the quantity of water available from day to day and year to year. This group constitutes a bookkeeping system for the surface water of the area and is as indispensable in the intelligent utilization of the streams as is a system of accounting to a business. A start has been made, and while the period of record at these stations has as yet been of too short duration to give a clear picture of the situation, valuable records have been obtained regarding the flows which may be expected, and with the continued operation of this project the information made available will permit an intelligent and efficient utilization of water to the advantage of all interests involved. The importance of this project was emphasized at the recent hearing upon application to withdraw water from the Embarrass River for use of an industry to be located near Aurora. The records would have been more valuable if they had included the years of very low flow prior to 1940.

Recording instruments for river level recordings.



Housing the recording mechanism.



Dams like this one help maintain water levels, control floods and check soil erosion.

In agriculture, water uses have expanded many fold. Controlled experiments in the Tennessee Valley, where the precipitation is much heavier than in Northeastern Minnesota, have demonstrated the value of supplemental irrigation. Sweet potato yields per acre are reported to have been increased five times. Bean crop yields have been doubled and in Ohio, potato yield and quality have been phenomenal by the use of supplemental irrigation. If water can be made available, the practice will undoubtedly become widespread with correspondingly greater incomes for the farmers and communities

The following tables summarize the information collected at the five stations to date. More detailed copies of the records are available and may be had upon application to the Office of the Commissioner of the Iron Range Resources and Rehabilitation.

Tables of Monthly Discharges in Cubic Feet Per Second

Sturgeon River near Chisholm, Minn.

1941-42

	Max.	Min.	Mean
Oct.	-----	-----	-----
Nov.	-----	-----	-----
Dec.	-----	-----	-----
Cal. Year 1941	-----	-----	-----
Jan.	-----	-----	-----
Feb.	-----	-----	-----
Mar.	-----	-----	-----
April	-----	-----	-----
May	-----	-----	-----
June	-----	-----	-----
July	-----	-----	-----
Aug. 7-31	90	34	49.6
Sept.	117	43	58.3
Water Year 1941-42	-----	-----	-----

1942-43

	Max.	Min.	Mean
Oct.	58	40	46.8
Nov.	100	50	74.4
Dec.	48	28	32.6
Cal. Year 1942	-----	-----	-----
Jan.	26	16	20.8
Feb.	20	16	18.0
Mar.	44	20	22.2
April	975	85	415
May	489	240	332
June	785	214	434
July	227	68	122
Aug.	124	39	77.5
Sept.	167	41	77.0
Water Year 1942-43	975	16	139

1943-44

	Max.	Min.	Mean
Oct.	68	49	58.1
Nov.	75	48	61.3
Dec.	46	16	27.5
Cal. Year 1943	975	16	139
Jan.	15	7.0	9.74
Feb.	9.5	6.0	7.22
Mar.	15	6.5	10.7
April	246	16	134
May	928	163	388
June	1,230	217	528
July	992	190	483
Aug.	232	97	150
Sept.	138	78	102
Water Year 1943-44	1,230	6.0	164

1944-45

	Max.	Min.	Mean
Oct.	83	50	66.5
Nov.	133	42	79.1
Dec.	38	18	28.4
Cal. Year 1944	1,230	6.0	166
Jan.	20	17	18.3
Feb.	17	15	16.4
Mar.	973	15	337
April	558	312	421

May	290	117	165
June	393	113	193
July	145	32	61.6
Aug.	147	23	52.2
Sept.	354	27	128
Water Year 1944-45	973	15	131

May	-----	-----	-----
June	-----	-----	-----
July	-----	-----	-----
Aug. 7-31	19	7.8	11.6
Sept.	24	9.5	13.1
Water Year 1941-42	-----	-----	-----

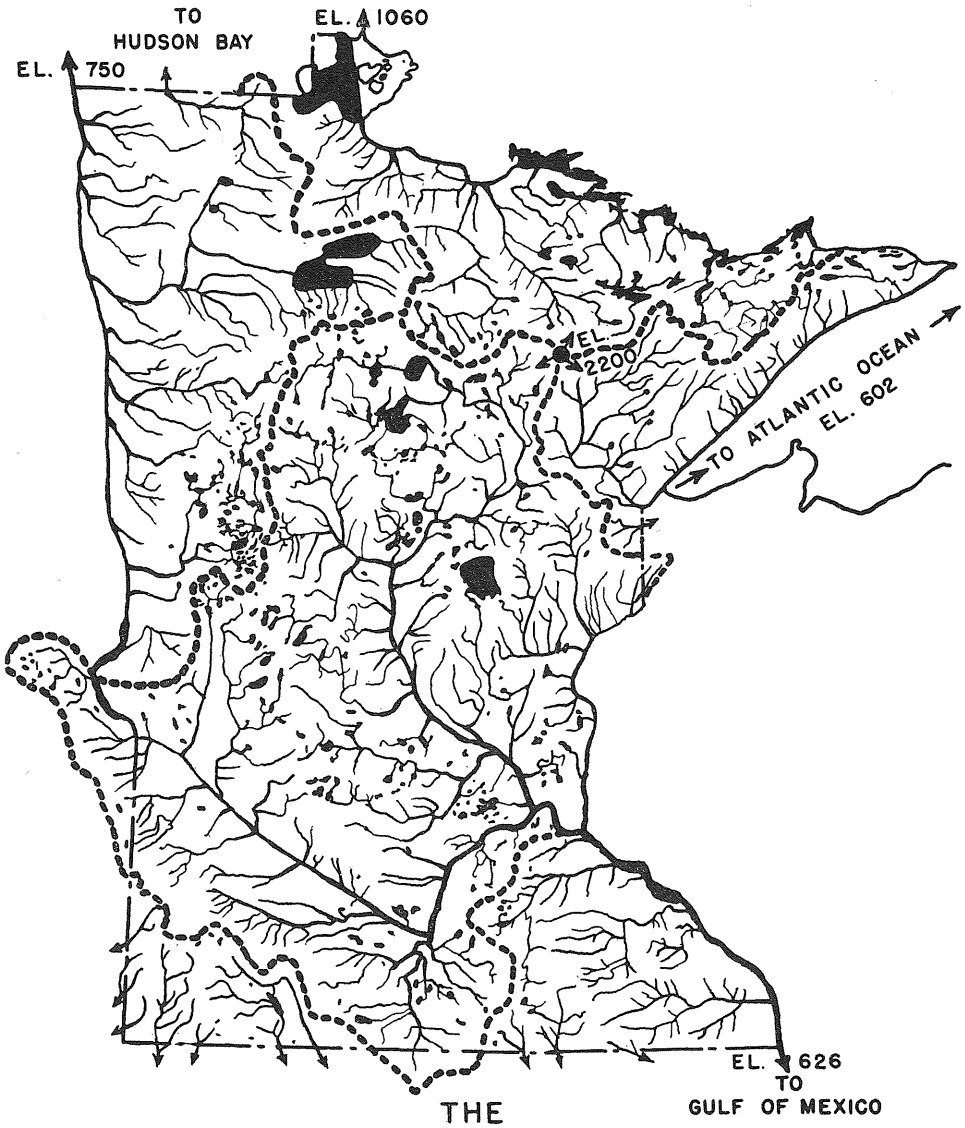
Dark River near Chisholm, Minn.

1941-42

	Max.	Min.	Mean
Oct.	-----	-----	-----
Nov.	-----	-----	-----
Dec.	-----	-----	-----
Cal. Year 1941	-----	-----	-----
Jan.	-----	-----	-----
Feb.	-----	-----	-----
Mar.	-----	-----	-----
April	-----	-----	-----

1942-43

	Max.	Min.	Mean
Oct.	17	9.5	12.2
Nov.	27	17	20.8
Dec.	18	7.0	9.65
Cal. Year 1942	-----	-----	-----
Jan.	7.0	5.0	5.76
Feb.	8.0	5.5	6.62
Mar.	15	7.5	9.65
April	128	17	92.2
May	132	62	93.3



THE
RIVER SYSTEMS
OF
MINNESOTA

June	162	50	109
July	57	20	29.7
Aug.	32	9.8	21.1
Sept.	52	12	27.0
Water Year 1941-42	182	5.0	36.4

1943-44

	Max.	Min.	Mean
Oct.	19	11	15.3
Nov.	18	12	14.4
Dec.	11	7.0	8.44
Cal. Year 1943	182	5.0	36.1
Jan.	6.0	4.6	5.07
Feb.	4.8	4.2	4.34
Mar.	6.5	4.4	5.11
April	84	6.5	44.1
May	329	66	133
June	295	57	142
July	229	36	116
Aug.	57	16	29.9
Sept.	30	17	24.1
Water Year 1943-44	329	4.2	45.3

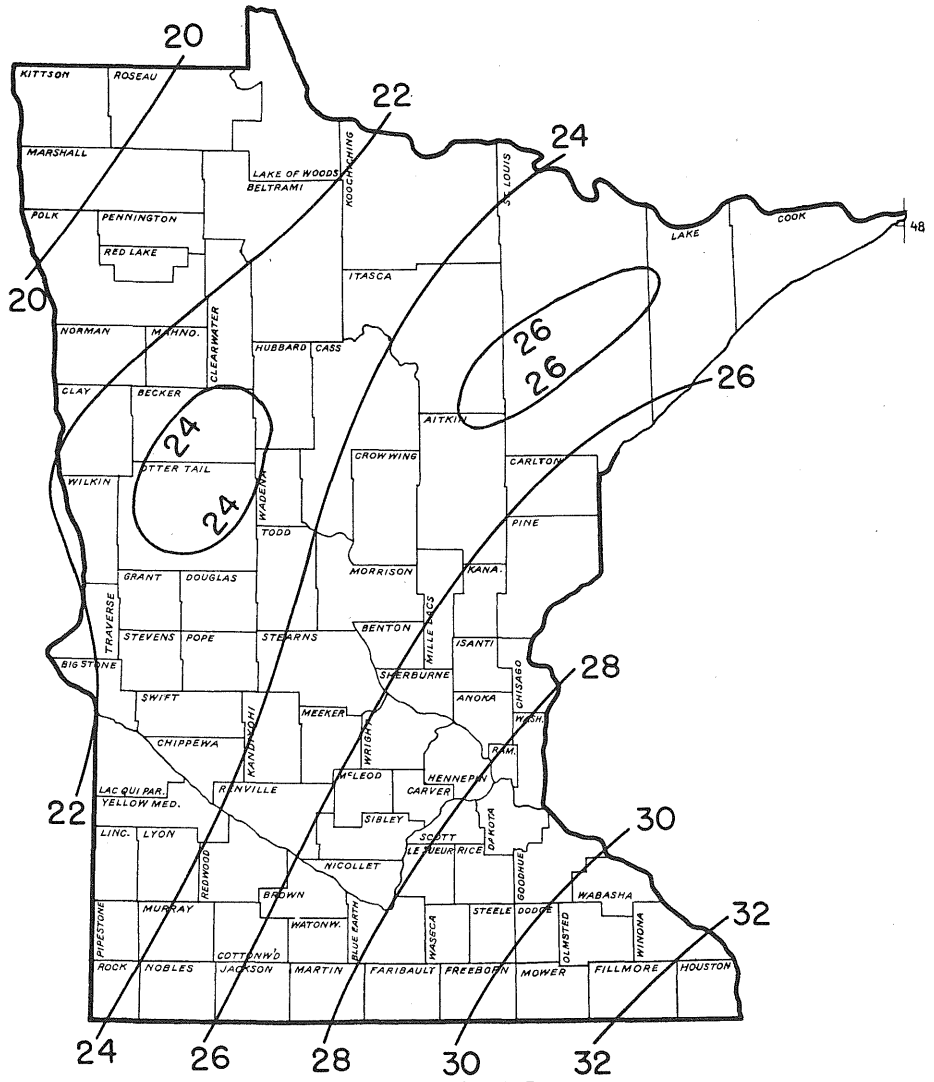
1944-45

	Max.	Min.	Mean
Oct.	20	13	16.1
Nov.	37	13	24.1
Dec.	19	10	14.7
Cal. Year 1944	329	4.2	46.6
Jan.	10	8.0	8.85
Feb.	11	8.0	9.45
Mar.	312	10	88.5
April	197	82	120
May	76	29	42.5
June	111	36	65.0
July	34	12	19.7
Aug.	54	8.0	20.9
Sept.	64	13	30.0
Water Year 1944-45	312	8.0	38.3

St. Louis River near Aurora, Minn.

1941-42

	Max.	Min.	Mean
Oct.	------	------	------
Nov.	------	------	------



AVERAGE
ANNUAL PRECIPITATION
IN INCHES DEPTH

Dec.	-----	-----	-----
Cal. Year 1941	-----	-----	-----
Jan.	-----	-----	-----
Feb.	-----	-----	-----
Mar.	-----	-----	-----
April	-----	-----	-----
May	-----	-----	-----
June	-----	-----	-----
July	-----	-----	-----
Aug. 5-31	82	32	51.9
Sept.	59	36	43.8
Water Year 1941-42	-----	-----	-----

1942-43

	Max.	Min.	Mean
Oct.	114	52	81.3
Nov.	185	96	143
Dec.	140	45	75.3
Cal. Year 1942	-----	-----	-----
Jan.	46	26	34.1
Feb.	28	24	25.4
Mar.	40	24	26.5
April	860	55	419
May	970	487	695
June	1,090	508	714
July	613	158	292
Aug.	508	110	286
Sept.	467	160	263
Water Year 1942-43	1,090	24	255

1943-44

	Max.	Min.	Mean
Oct.	185	98	146
Nov.	185	140	155
Dec.	130	65	93.9
Cal. Year 1943	1,090	24	263
Jan.	65	42	50.8
Feb.	55	7.5	22.8
Mar.	19	7.5	13.9
April	776	19	328
May	1,670	582	985
June	3,860	652	1,541
July	1,130	279	623
Aug.	323	102	223
Sept.	275	153	220
Water Year 1943-44	3,860	7.5	367

1944-45

	Max.	Min.	Mean
Oct.	155	78	118
Nov.	224	76	140
Dec.	150	75	95.9
Cal. Year 1944	3,860	7.5	363
Jan.	75	40	58.5
Feb.	40	28	33.8
Mar.	1,990	24	567
April	1,510	596	965
May	573	229	329
June	546	203	317
July	232	107	161
Aug.	105	55	76.4
Sept.	514	58	186
Water Year 1944-45	1,990	24	254

Partridge River near Aurora, Minn.

1941-42

	Max.	Min.	Mean
Oct.	-----	-----	-----
Nov.	-----	-----	-----
Dec.	-----	-----	-----
Cal. Year 1941	-----	-----	-----
Jan.	-----	-----	-----
Feb.	-----	-----	-----
Mar.	-----	-----	-----
April	-----	-----	-----
May	-----	-----	-----
June	-----	-----	-----
July	-----	-----	-----
Aug. 15-31	28	9.2	16.6
Sept.	26	10	15.0
Water Year 1941-42	-----	-----	-----

1942-43

	Max.	Min.	Mean
Oct.	83	26	47.1
Nov.	101	41	76.0
Dec.	49	12	20.9
Cal. Year 1942	-----	-----	-----
Jan.	11	9.0	9.56
Feb.	10	9.0	9.56
Mar.	18	8.4	9.45
April	580	24	270
May	630	235	400
June	680	200	395
July	325	65	131
Aug.	308	49	145
Sept.	235	74	126
Water Year 1942-43	680	8.4	137

1943-44

	Max.	Min.	Mean
Oct.	101	42	74.7
Nov.	88	48	69.4
Dec.	-----	-----	32.5
Cal. Year 1943	680	8.4	140
Jan.	-----	11	13.7
Feb.	11	6.5	8.40
Mar.	6.5	6.5	6.50
April	530	6.5	233
May	965	235	550
June	2,920	260	904
July	738	128	349
Aug.	158	43	106
Sept.	139	68	102
Water Year 1943-44	2,920	6.5	204

1944-45

	Max.	Min.	Mean
Oct.	66	29	47.5
Nov.	130	27	72.5
Dec.	70	22	42.6
Cal. Year 1944	2,920	6.5	203
Jan.	22	13	14.6
Feb.	14	12	13.3
Mar.	1,560	11	358
April	1,060	249	511
May	239	100	133
June	274	98	155

July	138	55	83.8
Aug.	68	22	38.7
Sept.	314	27	109
Water Year 1944-45	1,560	11	132

Embarrass River at Embarrass, Minn.

1941-42

	Max.	Min.	Mean
Oct.	-----	-----	-----
Nov.	-----	-----	-----
Dec.	-----	-----	-----
Cal. Year 1941	-----	-----	-----
Jan.	-----	-----	-----
Feb.	-----	-----	-----
Mar.	-----	-----	-----
April	-----	-----	-----
May	-----	-----	-----
June	-----	-----	-----
July	-----	-----	-----
Aug. 6-31	17	6.7	10.8
Sept.	33	7.8	15.9
Water Year 1941-42	-----	-----	-----

1942-43

	Max.	Min.	Mean
Oct.	53	11	23.8
Nov.	47	7.0	32.6
Dec.	6.0	4.6	5.31
Cal. Year 1942	-----	-----	-----
Jan.	5.0	4.4	4.83
Feb.	5.5	4.6	5.22
Mar.	44	3.6	5.92
April	258	65	150
May	315	119	205
June	405	140	252
July	126	16	52.7
Aug.	140	7.6	36.5
Sept.	140	29	55.4
Water Year 1942-43	405	3.6	69.0

1943-44

	Max.	Min.	Mean
Oct.	44	18	29.7
Nov.	37	23	28.9
Dec.	22	12	17.2
Cal. Year 1943	405	3.6	70.2
Jan.	13	3.8	5.69
Feb.	5.0	2.0	2.89
Mar.	4.2	2.0	2.97
April	190	3.8	103
May	540	114	274
June	1,090	136	433
July	400	98	238
Aug.	98	22	60.7
Sept.	78	25	43.2
Water Year 1943-44	1,090	2.0	103

1944-45

	Max.	Min.	Mean
Oct.	34	17	24.8
Nov.	114	16	50.3
Dec.	32	11	20.8
Cal. Year 1944	1,090	2.0	105
Jan.	11	7.0	8.86
Feb.	7.5	5.5	6.51
Mar.	774	5.5	199
April	438	162	285
May	152	56	83.0
June	220	53	104
July	78	19	41.5
Aug.	50	12	21.9
Sept.	138	13	51.5
Water Year 1944-45	774	5.5	74.8

The program is being carried out by cooperative agreement with the U. S. Geological Survey with that organization matching funds offered by the Iron Range Resources and Rehabilitation on a dollar-for-dollar basis. The work is performed by the Survey following the uniform system of gathering and publishing records throughout the United States that was begun in 1888.

SMALL FRUIT—

(Continued from Page 51)

prune. By conducting these demonstrations it is possible to spread this information to a large number of farmers. Many interested people have attended these demonstrations during the past year. They will all do pruning at their home farms and will pass the information on to others.

Some 35 orchards were sprayed this spring to control scab and oyster shell scale. A sprayer was located and two ex-G.I.'s assisted in lining up spray jobs. The results were very gratifying. Orchards which were sprayed showed a decided lack of oyster shell scale on the new growth.

During the past year special meetings were held on growing fruits, and many farm calls were made assisting farmers with their fruit growing problems. In addition to helping people select the proper variety of preferred trees for this area, approximately 50 trees of new varieties were distributed for trial.

Human Resources Important Asset To State

The human resources of the region are definitely considered an asset. At the beginning of the program a comprehensive survey revealed some pertinent facts concerning the people who are living in the iron ore mining region of Minnesota. Within the fourteen counties there is slightly less than 400,000 people. Half of the population is concentrated in Duluth and the iron range cities, while the remainder is divided between surrounding farms and small communities. The geographic distribution of population in the cut-over counties differs greatly from that in other sections of the state where people are more evenly settled over the rural areas. In the north, there are tracts as large as two million acres containing no villages. Farms are found at infrequent intervals along side roads often five to ten miles from a neighbor and twenty miles from a town.

During our pioneer days the logging camps and the sawmills attracted people to Northern Minnesota. Then the Mesabi and the Vermillion iron ranges were opened and railroads and highways built. Villages were founded and farms sprang up around the lumber and mining towns. Jobs at that time were plentiful. The region was young and growing rapidly.

Through the years that followed there was a steady dwindling of employment. When the cream of the timber disappeared the sawmills were dismantled and moved to virgin forests. Manpower in the mines was replaced by machinery. The majority of the people were, directly or indirectly, affected in the maintenance of a livelihood by the operation of the mining industry. The people of the area are the assets which give significance to its natural wealth. It was their labor, courage, hardiness and technical skill, coupled with industrial enterprise, which provided the ways of extracting and processing the material wealth. Consequently, the uncurbed exploitation from the state's earliest days coupled with misguided and planless settlement resulted in a distressed condition in the area. The loss of many jobs unfavorably affected the entire north. Many of the people classified as farmers were unable to make a living from the land alone. The relief problem of this area became acute.

There was a crying need for a program to aid the distressed area. It was with this clear picture of the existing conditions that our program of social and economic planning had its origin. The picture of desolation was relieved by the fact that Northern Minnesota had a wealth of natural resources which, we believed through proper management, could adequately support the people. The land is naturally productive and could be used for growing timber and farm crops. There were unsurpassed recreational resources within the region and opportunities for employment in its abundance of iron ore and forest industries which the region could sustain. It was obvious that this area was given the raw materials of prosperity; there only remained the problems of finding ways and means to use them to the best advantage for the people.

This department was therefore created to accept the challenge and provide a better way of life for the people of the cut-over area. With a diligent pursuit of our efforts to develop the resources and provide new sources of income by encouraging new industries, the optimism we have always had is becoming a reality.

Our development of the region brought into being a number of closely knit communities centered around small industrial plants engaged in the manufacturing and processing of timber and farm products and offering a regular source of employment. Farming was encouraged and assisted. Now farms on productive soil in surrounding districts are supplying foodstuffs for the canneries, warehouses and outside markets. In slack farming seasons, the forests, regional industries, specialty crops and tourist trade are providing part-time employment. The communities are now organized so that people can enjoy the social advantages which modern civilization has made possible. Less tangible, but equally important, are the gains in cultural and social relationships that com-

The tourist trade is one of Minnesota's largest industries.

munity life has made possible. Consequently, with marked progress towards utilizing our resources we can see the fruits of our efforts in the stimulation of community development which is so desirable for Minnesota.

The need to put Northern Minnesota back on its feet, so to speak, will materially lighten the burden of other parts of the state, and provide a balanced economy. By providing the people with an opportunity to produce the wealth which is contained in the resources of the cut-over land as well as an adequate share in return for their effort, then self-support will result and they can readily be restored as an integral part of the state's economy. As prosperity returns to the north, the entire state will share in its benefits. We are providing a new lease on life for the residents of this area, and their conscientious cooperation and assistance has accounted in no small way towards the success of our program.

Vocational Training Program

To assist further the people of this area a Vocational Training Program was initiated. Various occupational courses were given throughout the area depending upon the area personnel to be trained and the facilities available within the district for this purpose. The basic purpose of all the classes was that of providing individuals with skills and abilities which would have a marketable value and thus make it desirable for someone to invest in their services. Because the war was in progress during the early years of our program, it was only natural that the type of courses offered were influenced and designed to meet the emergency need as well as eventualities and pending requirements of industry within the area. While the demands of the war-time emergency undoubtedly influence the increased need for clerical workers, it also reflects an expansion evident in this field for the past several years. With the noticeable shift from an agricultural to an industrial economy in the nation as a whole, the need and number of clerical workers increased rapidly at the turn of the century. Consequently, the commercial subjects offered were most popular. However, the laboratory manipulations in iron ore analysis proved to be a new field for women, since it was suggested by the mining companies that this course be offered to women who could be called upon to replace the men called into military service. Courses were also offered in nursing, photography, radio, navigation and meteorology, furniture, homemaking, chemistry, auto mechanics, languages and communications. However, this phase of our program was completed in August, 1945.

Because the people of this area feel that their industrial life is changing at an accelerated rate of speed and that the vocational training of the people should be in a position to meet and to prepare for these changes, they requested that a vocational training survey be conducted to ascertain the possibility of establishing an area trade school, similar to Dunwoody Institute of Minneapolis, on the iron range. This department made a comprehensive survey with which the State Department of Education cooperated. It was determined by the survey that a trade school is desired by the people of this area, but nothing tangible has been done to date regarding this report.

Recreation

Vast forests, innumerable streams and lakes, combined with an abundance of fish and game and a cool refreshing summer climate, make Minnesota a prominent national center for outdoor recreation. The recreational attractions must therefore be considered among the natural assets of the region. Thousands of tourists visit Minnesota annually and provide a partial means of livelihood for many hundreds of people. The Minneapolis Aquatennial and the St. Paul Winter Carnival have achieved national importance. The splendid cooperation and enthusiasm displayed by the smaller cities and towns throughout the state who participate in these events reflect the spirit of the people.

Minnesota is known for its number of beautiful cities and towns.

Minnesota has excellent schools and colleges and the University is one of the outstanding ones in the United States.

Minnesota's medical achievements have attracted worldwide attention.

Minnesota is one of the leading music centers of the world. Its symphony orchestras are known wherever there are lovers of music.

Minnesota has many important art collections and galleries of interest.

Minnesota provides many opportunities to study music, art and drama.

Minnesota is famous for its sport activities. Great variation is provided by the changing seasons.

Minnesota has given the world many famous authors as well as furnished the background for many novels.

Minnesota enjoys the entertainment of world famous artists throughout the year.

Therefore, with all the advantages Minnesota has to offer — every man, woman and child should BOOST MINNESOTA.

JOB OPPORTUNITIES—

(Continued from page 46)

Since the opening of the Eveleth plant, plans have been completed for similar operations by this industry at Gilbert, Virginia and Chisholm, thereby giving the Mesabi range four new industrial units. They will offer approximately eleven hundred job opportunities to the residents of the area.

Any manufacturer looking for an advantageous location for his business or considering establishment of a branch plant is invited to consider Minnesota. Facts which the Iron Range Resources and Rehabilitation is ready to present will prove that Minnesota has many favorable factors.

DEVELOPMENT COMMISSION—

(Continued from page 47)

Another example of the department's popularity is reflected in the editorial comments, new stories, magazines and trade journal articles which have appeared relating to our work.

It was the privilege of the Commissioner of the Iron Range Resources and Rehabilitation to be in the official party when three scientists from South America recently toured our state to view our mineral deposits.

The Commissioner has extended an official invitation to a group of Russian scientists and engineers to visit our peat deposits this spring and render assistance and suggestions for improving the process and methods we are experimenting with. The invitation has been accepted and by reciprocal agreement a group of Minnesota engineers and scientists will visit the peat operations being carried on in Russia this summer.

LAND USE PROGRAM—

(Continued from page 49)

for agricultural development. On the whole, they have built up a broad understanding of land problems in relation to the best future long-range development of the region.

This better knowledge of local conditions is showing itself in the conservative handling of tax-forfeited lands. A number of counties now are committed to a definite policy of selling only high grade land, favorably located as to schools and roads. All other lands are held indefinitely for conservation uses, with timber sales limited to mature stands of timber or to clean up operations.

Principal difficulty in carrying out a sound land program along these lines is the lack of adequate funds to employ sufficient technical personnel to do essential field work. With many thousands of acres to be examined and hundreds of individual sales to be supervised, each county has need for a staff of competent men experienced in making appraisals and in forestry and timber operations. The Conservation Department, which has the responsibility of reviewing timber phases of country programs, has too few men to discharge its duties on the scale which the situation requires.

In recognition of this need and of the vital importance of a sound land policy in the future development of Northern Minnesota, the Office of the Iron Range Resources and Rehabilitation has undertaken cooperative projects in St. Louis, Beltrami, Aitkin, Crow Wing, Itasca, Koochiching and Clearwater counties to carry on the land use program. Men assigned to these projects not only are responsible for land classification and appraisals, but are undertaking a comprehensive inventory of the tax-forfeited lands as a basis for future development and are carrying on a rural zoning program. The undertaking already has shown itself to be a self-supporting program, and during the past two years marked progress has been made.

It has been argued that administration of large acreages of land, especially forest lands, by local governments, such as counties, is not practical or desirable. The experience of some Minnesota counties during the first few years of tax-forfeited land administration would seem to support this claim. On the other hand, there are some undeniably strong advantages in favor of local administration if long range aspects of the problems are adequately recognized. The progress made in county administration during the past four years shows that a good local administration is possible. There is indication that Minnesota's approach to the tax-forfeited land problem has become an object lesson for other states to follow.

A forestry survey of the 14 counties of Northeastern Minnesota, which is a final phase of our Land Use Program, is now underway.