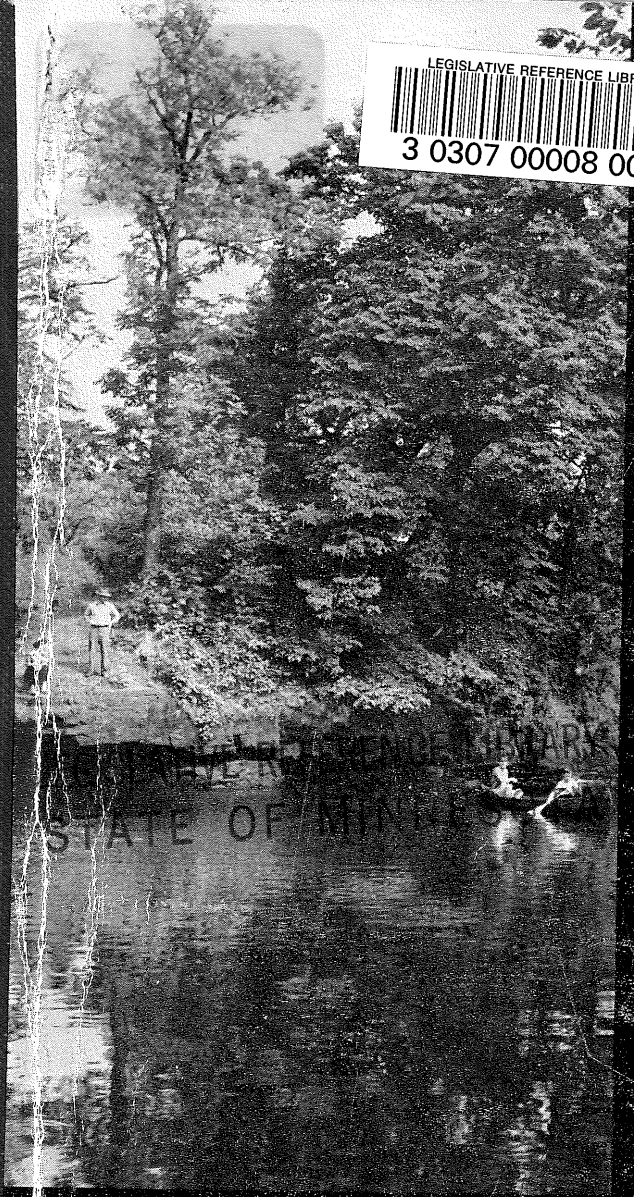

Eighth Biennial

Report

1945
1946

STATE OF MINNESOTA

DEPARTMENT OF CONSERVATION

CHESTER S. WILSON, Commissioner

State of Minnesota

Department of Conservation

CHESTER S. WILSON, *Commissioner*

Eighth Biennial Report

BIENNIUM ENDING
JUNE 30, 1946

JANUARY, 1947

CONSERVATION *Pledge:*

"I give my pledge as an American to save and faithfully to defend from waste the natural resources of my country—its soil and minerals, its forests, waters, and wildlife."

—*Foreman.*

To the Governor and the Legislature

of the State of Minnesota:

I have the honor of transmitting herewith the Biennial Report of the Department of Conservation for the Biennium ending June 30, 1946.

The purpose of this report is not merely to give account of the work of the department during the past biennium, but to review the condition of our natural resources upon which all existence depends, and to point out what must be done to provide for the effective care and wise use of these resources, to the end that Minnesota may hold her place in the economy of the nation and the world, and that future generations may enjoy the high standards of living and public welfare which we desire for them as well as for ourselves.

Respectfully submitted,

Chester S. Wilson

Chester S. Wilson
Commissioner of Conservation

PERSONNEL

Revised as of November 1, 1946

ADMINISTRATION

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E. V. Willard — Deputy Commissioner of Conservation
J. H. Burwell — Assistant Attorney General for the Department of Conservation
M. J. Marrinan — Cost Analyst

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Alfred L. Nelson — Lecturer in Charge of Photographic Department
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Claes T. Ekman — Deputy Director and Chief Designing Engineer
Carl J. Bark — Construction Engineer
S. A. Frellsen — Hydrologist in Charge of Control
L. A. Johnson — Hydraulic Engineer in Charge of Surveys and Designs
A. W. Sturman — Drainage Engineer

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Clarence Prout — Deputy Director
Howard B. Munson — Executive Assistant
A. E. Pimley — In Charge of Fire Control
Harold Ostergaard — In Charge of Recreation and Lands
Raymond Clement — In Charge of Nurseries and Planting
Wm. M. Byrne — In Charge of Railway Fire Prevention
J. C. Gannaway — In Charge of State Timber
E. L. Lawson — In Charge of Forest Management
Arthur F. Oppel — In Charge of Special Projects
L. B. Ritter — In Charge of Blister Rust Control

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Gordon Wollan — Supervisor, Bureau of Administration
Rose French — Acting Supervisor, Bureau of Game
Richard J. Dorer — Game Projects Coordinator (Federal Aid)
Norman L. Moe — Supervisor, Bureau of Fish Propagation
Lloyd L. Smith, Jr. — Supervisor, Bureau of Fisheries Research
Claer H. Dethmers — Supervisor, Bureau of Rough Fish Removal
George Weaver — Supervisor, Bureau of Licensed Commercial Fishing
Thomas Evans — Supervisor, Bureau of Stream Improvement
T. Surber — Fisheries, Technical Adviser

DIVISION OF LANDS AND MINERALS

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F. B. Getchell — Deputy Director
H. A. Lever — Chief Mining Engineer
H. V. Reusswig — Assistant Chief Mining Engineer
Alice W. Killorin — Chief Clerk
W. F. Fleming — Chief Land Clerk

DIVISION OF STATE PARKS

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John H. Martin — Deputy Director
Hugo V. Zaiser — District Supervisor
Norvald Nygaard — District Supervisor
Ralph E. Welte — District Supervisor

TOURIST BUREAU

Verne E. Joslin — Director

CONTENTS

DIVISION OF WATER RESOURCES AND ENGINEERING

TABLES

DIVISION OF FORESTRY

TABLES

FIGURES

DIVISION OF GAME AND FISH

TABLES

Figure No.

FIGURES

DIVISION OF LANDS AND MINERALS

Table No.

TABLES

FIGURES

DIVISION OF STATE PARKS

TABLES

FIFURES

MINNESOTA TOURIST BUREAU

Department Service Record

GAME AND FISH

W. G. ALEXANDER, Crosby
CLARENCE AMDAHL, Madelia
HARRY AMES, Little Falls
MERLE ANDERSON, Forest Lake
ALAN BERGH, International Falls
MATTHEW BLAESER, Orr
ELVIN BROCK, Worthington
NORMAN G. BURANDT, Elk River
LAWRENCE BROWN, St. Paul
KENNETH CARLANDER, St. Paul
C. EDWARD CARLSON, Stillwater
CHARLES V. CARLTON, Pequot
MILO CASEY, Forest Lake
PARKER DRAGOO, Ortonville
L. E. FIERO, St. Paul
FRED FISCHER, Caledonia
JERRY FLICEK, Madelia
NELS FLAGSTAD, Madelia
GLENN FREDELL, Buffalo
CHARLES GULASCH, Forest Lake
ORVILLE HAGMAN, Mound
*HARVEY HANSON, Forest Lake
WALTER H. HARSCH, Northome
CONRAD HENDRICKSON, French River
PAUL HIGHBY, St. Paul
L. E. HINER, Minneapolis
LLOYD J. HOFFMANN, Warroad
ALVIN L. HOGER, Walker
CLARENCE HUBER, Wyoming
TAYLOR HOUSTON, St. Paul
WILLIAM JAMESON, St. James
DANIEL JOHNSON, Anoka
MILTON JOHNSON, St. Paul
O. J. JOSEPHSON, Bagley
PAUL I. KRUEGER, Crosby
HARRY LANGDON, St. Paul
LORING M. LARM, Minneapolis
MELVIN J. LARSON, Ray
GEORGE LATOURELL, Madelia
CLINTON LOSTETTER, Minneapolis
JAMES LAUGHY, Baudette
ELMER J. LENZEN, Chaska
RODNEY A. MARSHALL, Park Rapids
FRANK MATHESON, Wyoming
LESTER MCCANN, Minneapolis
CLAUDE MEADE, Minneapolis
NOBEL MONSON, Wyoming
MARIUS MORSE, Robbinsdale
W. D. MILLER, Crookston
CARL J. MOSCA, Winton
JOHN MUHAR, Keewatin
LORENTZ OLSON, Forest Lake
HENRY H. NELSEN, Appleton
JOHN H. NELSON, International Falls
L. J. PELOQUIN, Hibbing
KENNETH C. NELSON, Anoka
WARREN O'BRIEN, Blackduck
GEORGE PIERING, Minneapolis
JOHN F. PAPAIK, Carlton
C. E. READ, Cotton
EDWARD W. REED, Silver Lake
VINCENT REID, Minneapolis
WM. C. RICHARDS, Finland
MATT SAARI, Rochester
KENNETH SANDERUDE, Wyoming
A. SCHARLEMAN, St. Paul
FRANCIS SCHUMACHER, Buffalo
DONALD SJOQUIST, St. James
ROBERT SHARP, St. Paul
HIRAM SOUTHWICK, Slayton
J. DONALD SMITH, St. Paul
CYRIL STRNAD, Roosevelt
JAMES SULLIVAN, Madelia
EVERETT L. SUTTON, Bemidji
A. M. TOMLINSON, Eden Valley
DONALD TOMMELA, Biwabik
ORVILLE TRENDA, Bayport
*S. E. TRONDSON, Minneapolis
BYRON TRESSLER, Blackduck
LYLE TWEET, Montevideo
DAVID VESALL, Stillwater
DONALD WARNER, Forest Lake
LLOYD WATTERS, Long Prairie
HAROLD WESTBY, Forest Lake
VERNON WESTMAN, Forest Lake
C. E. WHITNEY, Onamia
GORDON WOLLAN, St. Paul
THOMAS WYATT, Forest Lake
JOHN ZORICHAK, Duluth

*Killed in Action

Department Service Record

BUREAU OF INFORMATION

MERVIN S. CLARK, Minneapolis
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JOSEPH HUDALLA, St. Paul
HAYMOND NAT. JOHNSON, White Bear Lake
WILFRED LACOURSE, St. Paul
CARL MOEN, St. Paul
CYRIL PLATTES, St. Paul
VERNON STEINER, St. Paul

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JOHN K. CHILDS, Akeley
WM. R. DOELL, St. Paul
OTTO C. EGGERT, Crane Lake
REGINALD ELLIOTT, Cloquet
EDWIN E. ERICKSON, Orr
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JOSEPH A. KEHBORN, Grand Rapids
EDWARD L. LAWSON, Minneapolis
HILTON H. LEMKE, Hill City
CARL A. LIND, Backus
CARTHEL M. MALUGEN, Littlefork*
JOSEPH H. MOCKFORD, Blackduck
WALDEMORE V. MOHL, Ely
LESTER V. NELSON, Minneapolis
LEONARD O'DONNELL, Warroad
JOHN A. PEDERSON, Brainerd
HERMAN RADI, Bemidji
GEORGE ROGOSHESKE, Akeley
MATTHEW B. STONICH, Grand Rapids
QUENTIN R. STROPP, Merrifield
ARTHUR J. WARD, Brainerd
LUCILLE YOST, Deer River
NORMAN O. ZAUCHE, Williams

LANDS AND MINERALS

FRANK DESLICH, Chisholm
PAUL T. EBB, Hibbing
L. J. ECKENRODE, Hibbing
RUDOLPH EKAR, Chisholm
FOREST F. FOSS, Bovey
R. C. LUCAS, Chisholm
EVERT MAKI, Kinney
M. JOHN MULVAHILL, Hibbing
HELMER E. OLSON, Hibbing
MAX O'MELIA, Marble
THOMAS L. RUNDLE, Crosby
CARL E. SUNDQUIST, Marble
J. C. LONG, Cloquet

STATE PARKS

MELVIN BERGQUIST, Lake Itasca
ELON CARY, Two Harbors
VICTOR DENGEL, Little Falls
CLARENCE DETERMAN, Currie
FREDERICK JORGENSON, St. Charles
WAINO KNOTOLA, Alexandria
JOSEPH LUDWIG, Hinckley
WILLIAM LUDWIG, Hinckley
PALMER ROEN, Two Harbors
ALLART RUDD, Fairfax
HOWARD SCHEER, Bigfork
FRANCIS J. SCULLY, St. Paul*
DELMAR SCHAPEKAHM, New Ulm
CLARA TRAUN, Park Rapids
PETER VUKADINOVICH, Side Lake
FRED WILCOX, Hinckley

WATER RESOURCES

ADELBERT AMES, St. Paul
JOHN EGAN, Remer
LOYAL A. JOHNSON, Minneapolis
JAMES L. MULLIN, Bertha
KENNETH PEDERSON, St. Paul

*Killed in Action

COMMISSIONER'S REPORT

Foreword

The commissioner's portion of this report deals with major aspects of conservation and various special activities with which his office is concerned, leaving it to the division reports which follow to cover their respective fields of work in detail. As a background, see the last previous department report (Seventh Biennial), especially pages 15 to 39, reviewing the conservation situation during the war and outlining plans for postwar development. For further information on the program for the coming biennium, see budgets and recommendations for new legislation which will be submitted separately to the Legislature.

General Aims of Conservation

The end of the second world war found the available stock of natural resources severely shrunk by consumption, waste, inroads of war, and lack of conservation. The effect of depletion of resources is strikingly illustrated in the report entitled "Economic Analysis of Minnesota," prepared under the direction of the Minnesota Resources Commission and submitted to the 1945 Legislature (see Volume I, pages 11 and 12, and Exhibit No. V-K-1). That report points out that before and during the decade between 1890 and 1900, the per capita wealth of this state was more than 20 per cent above the national average. That period, often regarded as the golden age of Minnesota, was really killing geese that laid golden eggs. The people of that day prospered through exploitation of natural resources — soil, waters, forests, wild life, and iron ore — with little or no provision for replenishment of the source of supply. In the following decade, concurrently with the exhaustion of the virgin forests, the wearing out of fertile farm land, the failure of improvident land drainage and reclamation schemes, the decline of wild life, and the depletion of the most accessible iron ore deposits, Minnesota's relative prosperity index took a deep drop, and has since leveled off at about 18 per cent below the national average, where it has shown a tendency to remain more or less constant, subject to temporary fluctuations.

That the people of Minnesota are uneasy about this situation is manifested by their increasing concern for conservation. Much progress has been made in recent years, especially since former separate agencies were consolidated into the present conservation department in 1931. However, the means provided have been far short of imperative needs. Only by full-scale action in carrying out a comprehensive and sustained conservation program can Minnesota hope to pull herself up to par with the rest of the nation.

The opportunity is here. Despite past losses there is enough left on which to build again. Renewable resources — soil, water, forests, and wild life— can be restored and maintained so as to provide permanent support for an

even better standard of living than was enjoyed during the so-called "good old days." Iron ore and other minerals, it is true, are non-renewable, but with good management and improved methods of use they can be made to last a long time and contribute substantially to the economic welfare of the state while renewable resources are being developed to the stage of greater productivity.

In connection with the resources commission report before mentioned, an eminent eastern engineer, appraising Minnesota's prospects, made the following statement: "The greatest asset of Minnesota is the unique skill and intelligence of its people." Assuredly it was the wealth of natural resources and attractions — fertile soil, myriad lakes and streams, immense evergreen and hardwood forests, abundant game and fish, and rich mineral deposits — which drew that kind of people to Minnesota. They found here a good place to live and to make a living. To maintain and improve that opportunity is the chief aim of conservation.

During the war many activities of the Conservation Department had to be curtailed or suspended due to absence of department personnel in war service and shortage of manpower and materials. In spite of these handicaps much essential work was carried on, as will appear from the division reports. The war servicemen have now returned, and the department is ready to proceed with an expanded program along all lines to make up for the set-backs of the war as soon as conditions permit and the necessary funds are made available. Some lines of work are still hampered by inability to get necessary materials or equipment. Until July 1, 1947, the department will be operating on the limited war-time appropriations made by the 1945 Legislature. The progress which will be possible thereafter will depend on the means provided by the 1947 Legislature.

Following is a review of the essentials of a comprehensive conservation program for the state, based on past experience and a study of the present needs of the entire field.

ESSENTIALS OF A STATE CONSERVATION PROGRAM

I. NATURAL RESOURCES THE SUPPORT OF ALL EXISTENCE

Natural resources are the support of all forms of life, the underlying means of industry and employment, the ultimate source of all income, the basis of the standard of living of the people, and the prime requisite to the future existence of civilization. Our natural resources have been severely drained by past use and abuse, and have been consumed and destroyed by war to an appalling extent. Provision for good care and wise use of all remaining natural resources is a fundamental function of government. Realizing that conservation is essential to maintain the ultimate sources of all public tax revenue and private income, that money used for conservation is not expenditure but investment, and that the returns in benefits to the people are worth many times the cost, it behooves every legislative body, as a primary obligation for preservation of

the state, to provide ample means for a comprehensive and effective state conservation program. Skimping on funds for conservation is false economy of the worst kind, for it results in depreciation of the very source of wealth and in lowering the standard of living for all.

In this proposition the Conservation Department speaks not for itself but for all the people of the state and their posterity. All will be poorer if conservation fails.

With due regard for other important state activities, there is no escape from the fact that adequate provision for maintaining natural resources, the primary source of all public and private income, must take precedence over all other demands; otherwise there will be less for all purposes in the long run. Those who want better schools, better public institutions, better roads, and better public services of all kinds should first insist on better conservation, for without it neither public enterprises nor private living standards can long be maintained at a high level. Witness the ghost towns after the old logging days, and consider the financial distress of some of our Iron Range communities. The situation is like that of a farmer, who may want a new car, a bathroom, and many other desirable things, but who, if he expects to get them, must first provide for seed, fertilizer, cultivation, soil conservation, and other essentials for production of the wherewithal.

Every activity of the Conservation Department either makes money for the state (for example, through sales of land, timber, iron ore and other minerals, and game and fish license fees), or promotes business, employment, private income, and public tax revenue (for example, protection and improvement of soil, waters and timber, utilization of minerals, and promotion of tourist business), or provides means for public recreation and enjoyment; improving the attractiveness of the state as a place of residence and enhancing property values throughout the state (for example, by maintaining state parks and related facilities, conserving game and fish, and protecting other natural attractions). There is no other function of the state government which yields so much in direct benefits to the people as conservation.

(See Seventh Biennial Report, pages 20-24.)

II. STATE AND FEDERAL RESPONSIBILITY FOR CONSERVATION

The state, as the basic unit of government, owning or controlling a large portion of the natural resources within its borders, should assume responsibility for conservation to the fullest extent of its capacity, leaving to the federal government only such conservation functions as involve a national interest and cannot be effectively discharged by the state.

It is gratifying to report that the principle above stated, although perhaps not fully achieved in every particular, is now quite generally accepted as the rule governing the respective fields of state and federal conservation operations in Minnesota. The chief federal agencies concerned with conservation

of one type or another in Minnesota are the U. S. Soil Conservation Service, the U. S. Forest Service, the U. S. Fish and Wildlife Service, the U. S. Corps of Engineers, and the U. S. Geological Survey. They perform highly important functions of great benefit to the people of Minnesota. Occasional conflicts of policy have arisen, but in recent years there has been, for the most part, effective cooperation between these government agencies on the one hand and the state Conservation Department and other state agencies on the other in furtherance of common objectives.

Federal encroachment on the proper field of state activity has usually occurred because the state itself failed to meet some public need. It cannot be said that the state of Minnesota has yet fully measured up to all the needs of conservation within her borders. We have done fairly well in some lines, but are far short of the mark in others, such as soil and water conservation, water pollution control, forest fire prevention, timber management on private land, tree planting, and maintenance of state parks. Federal support of corresponding activities has not been adequate either, though more liberal in some lines than that given by the state.

It is folly for the state to attempt to shift any of its proper burden of conservation work to the federal government. The state thereby weakens its control over its own interests. State agencies, if adequately supported, can respond to local needs and handle local problems more promptly and effectively than federal agencies under remote control. Usually no saving results from turning over state conservation functions to the federal government, because the same taxpayers will ultimately pay the bill in one way or another. Furthermore, all conservation operations pay dividends in some form, and when the federal government takes over the management of resources, it usually appropriates the benefits or at least assumes control over their disposition, thus impairing the state's authority and sometimes diverting revenue from state channels.

On that score (with limited special exceptions) there is little ground for criticism of federal activities relating to conservation in Minnesota at present. They benefit the state and in general do not encroach materially on the power of the state over its own affairs. However, in order to avert any future occasion for federal invasion of the state's domain, the rule should be for the state to carry on all conservation activities within its borders to the fullest extent of its means, except those where national interest demands the exercise of federal authority.

(See Seventh Biennial Report, pages 30-31.)

III. CONSERVATION EDUCATION

Education is the spearhead of progress in conservation as in everything else. Successful conservation of natural resources depends on public understanding and personal cooperation by individuals in conservation activities. Ample provision should be made for a comprehensive program of conservation education in the schools and other educational institutions throughout the state. Adequate

provision should also be made for public information service on all important aspects of conservation.

Conservation education gets more results per dollar spent than any other conservation activity. Its chief objectives are as follows:

Stimulating personal cooperation by people throughout the state in—

—observance of laws for protection of game, fish, forests, waters, state parks, and other natural resources,
—forest fire prevention,
—safety measures;

Encouraging intelligent observation of conditions and intelligent study of conservation problems by sportsmen's clubs and other organizations instead of the all too common practice of hasty jumping at conclusions without knowledge of the facts;

Enlisting public support for sound conservation measures;

Cultivating appreciation of wild life, scenic beauty, and outdoor recreation.

High priority in the allocation of funds for conservation purposes is therefore due the department's Bureau of Information, which collects and distributes material on the whole field of conservation for the use of schools, newspapers, radio stations, sportsmen's clubs, farmers' associations, civic associations, women's clubs, and other groups concerned with conservation, publishes the highly rated department magazine, The Conservation Volunteer, maintains a widely popular film and speakers' service, and conducts (with the assistance of the Minnesota Federation of Women's Clubs and other organizations) the annual high school essay contest and conservation youth caravan.

(See Seventh Biennial Report, pages 19, 24-25, 40-46.)

The most urgent present need in the field of conservation education is the development of a systematic program for teaching conservation in all the schools of the state, with provision for teacher training in the higher educational institutions. Only in this way can the message of conservation be carried to the great majority of the younger generation who do not belong to youth organizations such as the Boy or Girl Scouts or Four-H Clubs. Conservation instruction in the schools and participation in outdoor projects in connection therewith provide a splendid outlet for youthful energy and a potent antidote for juvenile delinquency and vandalism. The young people take home the spirit of what they learn in school or field, and so arouse interest in conservation among their elders. No greater challenge confronts our school system today than the need for effective instruction in conservation.

Progressive educators have already introduced conservation instruction in a number of schools and colleges. Through a bill to be submitted to the legislature the State Department of Education, with the support of the Conservation Department, will seek authority and funds for state-wide expansion of the program. The cost will be small in comparison with the lasting benefits.

IV. SOIL AND WATER — BASIC RESOURCES

Conservation of the basic resources, soil and water, upon which all living and renewable resources depend, is the cornerstone of the conservation program. There must be an adequate soil conservation program, with the state doing its full share in cooperation with federal agencies. Closely related and equally important is sound management of waters for maintenance and improvement of lakes and streams, navigation, flood control, prevention of erosion, drainage, water supplies, power production, and other purposes.

Soil and water conservation go hand in hand. Erosion ruins farms. Silt from erosion ruins lakes and streams. The joint problem of soil and water conservation is by far the most important in the entire field, and engages a large share of the effort of the Conservation Department through the commissioner's office as well as the Divisions of Water Resources and Engineering, Game and Fish, and Forestry, in cooperation with other state and federal agencies.

(See Seventh Biennial Report, pp. 26 and 37.)

Soil Conservation

No more urgent problem confronts the people of Minnesota today than that of conservation of the soil, the state's primary resource, which is continually being depleted at an accelerated rate through water and wind erosion, aggravated by man's carelessness. For a striking example, everyone should visit the Whitewater game refuge and public hunting ground project in Winona County, where thousands of acres of once valuable and productive farm land have now been so ruined by bad farming and erosion that the owners have been glad to sell out to the state for average prices of less than $20 per acre. Slowly but surely (and in some cases quite rapidly) these destructive forces are sapping the productivity and value of land throughout the farming region of the state.

General administration of soil conservation work in the state is a joint enterprise of the State Soil Conservation Committee, the University Agricultural Extension Service, and the U. S. Soil Conservation Service. The state committee (consisting of the director of the Agricultural Extension Service of the state university, the dean of the University Department of Agriculture, the state commissioner of conservation, the state commissioner of agriculture, dairy and food, and the federal soil conservation coordinator for the state) has charge of the organization and general supervision of farmers' soil conservation districts. The state committee also cooperates with the other agencies in educational work to promote adoption of soil conservation practices by farmers. The U. S. Soil Conservation Service furnishes technical service to farmers in the planning and application of soil conservation practices, also furnishes some equipment and tree planting stock to the districts.

However, the U. S. Soil Conservation Service regards the furnishing of tree planting stock as a job that properly belongs to the state, and expects to withdraw from that line as soon as the state is prepared to take it over.

Minnesota is far behind other states in tree planting for soil conservation and other purposes. For recommendations for a state-wide tree planting program, see the report of the Division of Forestry, herewith.

The present soil conservation program was officially initiated in Minnesota by adoption of the soil conservation law in 1937, as part of a nation-wide movement which took shape in that year. However, subsequent progress in Minnesota has been shamefully slow, in camparison with other states which started at the same time or later. Less than one-third of the farming region of Minnesota where soil conservation is needed has been organized into soil conservation districts. All the surrounding states have made more than twice as much relative progress with the district organization program as Minnesota.

After organization of districts, there remains the far greater task of educating the farmers to cooperate in adopting and maintaining soil conservation practices. This work is well advanced in a few of the older Minnesota districts, but in most of the areas only a small fraction of the farmers are practicing effective soil conservation.

Minnesota's past backwardness in soil conservation is due largely to failure of the state to make adequate provision for organizational, educational, and promotional work among farmers. The 1945 Legislature gave some increase over previous appropriations to the state Soil Conservation Committee, but a considerable part of this went for payment by the state of the per diem of local district supervisors, which was then authorized for the first time. Little money was available for badly needed expansion of the constructive program. The state committee is requesting additional funds for the coming biennium to speed up this work, in an effort to catch up with our neighbor states. The amount required is small in comparison with the importance of the work and the resulting benefits in land improvement.

In order to have more money available to the state committee for organization, education, and promotion, it is proposed that the counties be required to pay the per diem and mileage of local district supervisors, as is done in Wisconsin. The amount chargeable to each county would be very small, probably less than $300 per year in most cases. It is also proposed that county boards be authorized, in their discretion, to spend additional amounts for soil conservation work, up to certain limits. The counties can well afford to make these contributions, as the returns which they will receive through enhancement and maintenance of the taxable value of farm land will far exceed the outlay.

Every one interested in saving taxes should get this inescapable fact in mind: the less is done for soil conservation the lower will be the taxable value of Minnesota farm land.

Special Soil Conservation Activities of the Department of Conservation.

Recognizing that soil conservation is essential not only for farm production but for maintenance of wild life habitat and for general improvement of the outdoor attractions of the state for public recreation and enjoyment,

the Conservation Department devotes a substantial amount of money and effort to various types of soil conservation work, in addition to the service of the commissioner on the State Soil Conservation Committee.

The Division of Water Resources and Engineering performs a large amount of service for county boards, for the highway department, and for the Division of Game and Fish in the solution of drainage and erosion control problems, contributing materially to soil conservation.

The Division of Game and Fish carries on an extensive program of erosion control, watershed protection, and planting of trees and cover plants for improvement of wild life habitat, all of which promotes soil conservation directly or indirectly. Much of this program is closely related to the farm soil conservation work, and is carried on in cooperation with the farmers and local soil conservation districts.

The Division of Forestry distributes quantities of trees for planting on public land, and is seeking authority to provide planting stock for farms and other private land throughout the state for soil conservation as well as other conservation purposes.

Water Conservation

There are four general aspects of water conservation, all more or less closely tied in with or affected by soil conservation:

(1) Securing water supplies for domestic, municipal, and industrial use;

(2) Maintaining and improving lakes and streams for general public use and recreation;

(3) Maintaining and improving lakes and streams as habitat for fish, waterfowl, and aquatic animals;

(4) Drainage and flood control.

In the Conservation Department these functions are in charge of the Division of Water Resources and Engineering, except as to certain lake and stream improvement operations for the benefit of wild life which are carried on by the Division of Game and Fish. Under a cooperative arrangement between the two divisions, Game and Fish funds are allocated to the Division of Water Resources and Engineering to cover the cost of engineering and maintenance service rendered on projects and operations benefiting wild life.

There is urgent need for additional funds and facilities to enable the Division of Water Resources and Engineering to carry on needed research and field surveys, to furnish engineering service on hydraulic problems which is being demanded at an increasing rate by county boards, the Highway Department, and other agencies, also to enable the division to repair and maintain a large number of dams and other water control structures built by the W. P. A. and other federal agencies in the years before the recent war and turned over to the Conservation Department for operation and maintenance.

Another important function of the Division of Water Resources and Engineering requiring more adequate support is the investigation of cases arising under the water conservation act of 1937, as amended, involving hearings before the commissioner on applications for permits for use of public waters for various purposes, also involving enforcement proceedings where necessary to protect public waters against encroachment or other damage.

(See Seventh Biennial Report pages 26 and 27.)

Flood Control

By reason of the fact that Minnesota has only moderate average rainfall and is situated in the upper portion of the main drainage basins included within the state boundaries, flood control is of much less importance in this state than in other parts of the country which are subject to heavier run-off or to flood waters coming down from higher portions of the drainage basins in which they are situated. However, intermittent flooding is a more or less serious problem in some sections of Minnesota, especially along the Minnesota River, some of the tributaries of the Red River of the North, parts of the upper Mississippi River, and some of the tributaries of the Mississippi in southeastern Minnesota.

Before the inception of the public work relief program in 1933 the State of Minnesota never undertook to construct or operate flood control projects of any magnitude. Local drainage problems were handled by town, county, or judicial ditch systems. The law also authorized the organization of drainage and conservancy districts to handle larger projects, but up to date this provision has been inoperative. Since most flood control problems involved interstate streams or their tributaries under the jurisdiction of the federal government, flood control, in a major sense, was regarded as a federal function. Most flood control projects of any consequence in this region were handled by the federal government, through the War Department and the U. S. Corps of Engineers, with the state and local agencies cooperating to such extent as might be necessary to meet the federal requirements for local participation. Generally speaking, this is still the case. A recent example is the pending project for flood control along the Red Lake and Clearwater Rivers in the Red River Valley. Flood problems along the Minnesota and Upper Mississippi Rivers as well as various others have also received consideration by the army engineers.

Big Stone and Lac qui Parle Water Control Projects

Despite the long established state policy of avoiding direct participation in flood control, the state got its foot into some sizable flood control operations as a result of the work relief program inaugurated in 1933, of which the most important were the Big Stone and Lac qui Parle water control projects. These projects require constant attention, entailing considerable expense for maintenance. They need substantial and costly improvements. By reason of the inherent conflict between flood control, requiring fluctuating reservoirs, on the one hand, and water conservation for the benefit of wild

life and other public interests, requiring stabilized water levels, on the other, both projects have provoked much dissension among local groups having different interests. Several important questions presented by these projects now await action by the legislature.

The Big Stone and Lac qui Parle water control projects were extensive and costly work relief projects sponsored by the State Executive Council, constructed by W. P. A. under federal authority, and paid for out of both state and federal relief funds. Both projects were designed to serve multiple purposes of flood control and water conservation, and were approved by the War Department on that basis. However, no local participation was required, as in the case of ordinary War Department flood control projects, nor were any assessments levied on benefited farm lands, as in the case of federal reclamation projects or local drainage projects. It is doubtful whether the value of the farm land to which benefits might accrue from these projects would have been enough, taken alone, to warrant the expenditure. It was only because of the urgent demand from the inhabitants of the surrounding territory for water conservation and maintenance of lake levels, the need for which was intensified by the drouth prevailing at the time, that the high cost of the Big Stone and Lac qui Parle projects could be justified.

Now the shoe is on the other foot. The record drouth of the 1930 decade was followed by a series of excessively wet years. In total precipitation the four years from 1942 to 1945, inclusive, surpassed any corresponding period recorded by the U. S. Weather Bureau for the Minnesota River Valley. During this time farmers throughout the valley, both above and below the control works, have had trouble from surplus water, and this, of course, has accentuated the demand for flood control.

After completion of the water control works proper, both the Big Stone and Lac qui Parle projects were turned over to the state conservation department for operation in 1937. Substantial benefits have since resulted from the operation of these projects. Greater benefits could have been attained if additional features recommended by the conservation department engineers had been incorporated when the projects were constructed by W. P. A. Due apparently to the high cost already incurred and to lack of additional funds, these features were not included in the projects and no funds therefor have since been made available either by Congress or the state legislature. Nevertheless it has been the aim of the department to get the best results possible out of these projects under existing limitations.

On Big Stone Lake a much better stabilized lake level (based on a normal summer elevation of 966, at the crest of the concrete spillway on the dam) has been maintained by the control works than would have existed in a state of nature. This has resulted in substantial benefits to public interests in fish and other wild life and to recreation and other public uses, as well as private property around the lake. Through maintenance of the lake as a retarding basin, the farmers downstream have also received considerable flood control benefits by reduction of peak floods from which they would have suffered in a state of nature. However, unless the improvements recommended by the conservation department are provided, it will not be possible

to give the land owners any greater measure of flood control with the present works. In this connection the interests of South Dakota are involved, as will be further discussed.

Through the Lac qui Parle project the lake level there has been raised and maintained substantially in accordance with the original plan of operation as indicated on the bronze plaques affixed to the control works, and a considerable degree of flood control has been provided for the farm land along the Minnesota River below the main dam, so that the farmers have been able to raise crops which they could not have raised in a state of nature. However, the raising of the lake level has not completely fulfilled the desires of the sportsmen and the general public for better water conservation, because fluctuation necessary for flood control has appreciably curtailed the benefits to fish, waterfowl, and public recreation which would have been attained with a more uniform level.

Recent wet years have aggravated the flood problems of the farmers in this area as well as elsewhere in the valley above and below the control works. In an effort to give the farmers along the river below the Lac qui Parle dam some additional relief, the conservation department in 1946 modified the method of operation by reducing the normal summer level of Lac qui Parle Lake from 934.2 (the elevation contemplated by the original plan, corresponding with the crest of the main outlet spillway, same as 936, old datum), a difference of about three feet, thereby increasing the available storage room for flood water in the reservoir and affording better protection against floods during the crop season.

It will not be possible to increase the flood control benefits materially beyond those already attained without either or both of two expedients: (a) a radical change in the method of operation involving further sacrifice of benefits to wildlife and public use of the lake, or (b) substantial enlargement of the main river channel at high cost.

In view of the fact that the Lac qui Parle project was built at great public expense with the general understanding that the benefits would be fairly divided between water conservation and flood control, and the fact that no charge for flood control has been made against the benefited farm land, the conservation department is not willing, unless expressly authorized by the Legislature, to make any further radical changes in the method of operation whereby public interests in water conservation would be sacrificed for flood control.

With the expectation that federal funds might be obtainable for improvement and operation of the Lac qui Parle project for better flood control, the Legislature of 1943 authorized the transfer of the project to the United States, and this proposal has been tentatively approved by the U. S. Corps of Engineers. In consideration of the transfer the state would be reimbursed by the government to the extent of about $350,000, and this money would be used for needed improvements of the Big Stone or Lac qui Parle control systems. However, for various legal reasons, consummation of this transfer has been delayed, and prospects for settlement at any time in the near future are uncertain because of present shortage of funds available to the War

Department. It seems probable that the state will have to continue to operate the Lac qui Parle project for some time to come. At present it is impossible to predict how long.

There is little or no prospect that the Big Stone project will be taken over by the federal government. It is therefore probable that the state will have to continue to operate it for an indefinite period, if not permanently.

The Big Stone outlet control works are entirely in Minnesota, but they affect boundary waters lying between Minnesota and South Dakota. Hence the latter state is entitled to a voice in the regulation of the water levels to the extent that its interests are affected. An agency for joint deliberation by the two states on this matter is already provided through the official South Dakota-Minnesota Boundary Waters Commission, which took preliminary steps toward the adoption of a system of regulation some time ago, and now contemplates holding further hearings and conferences in the near future with a view to working out a more definite arrangement satisfactory to both states. However, this commission can do no more than determine what method of control of the water levels is desirable. It has no power to take charge of the control works or assume responsibility for their operation, and at present has no funds.

The South Dakota authorities have indicated their willingness to recommend some contribution by that state toward the cost of certain improvements of the control works, provided a method of regulating the water levels satisfactory to them is adopted. In that connection, it must be remembered that South Dakota wants no flood control, but only water conservation with maintenance of a stabilized lake level for the benefit of wild life and public recreation. On the other hand, in Minnesota the interests are divided, with the general public and the property owners around the lake desiring water conservation on one side, and the farmers downstream desiring flood control on the other.

The Big Stone situation may be summed up as follows:

(1) The present method of operation, stabilizing the lake level as done in recent years, with substantial benefit to wild life and other public interests together with a limited measure of flood control, can be continued, if so determined, with no considerable expenditure for improvements.

(2) If a higher stabilized lake level is desired for the benefit of wild life, public recreation, and other water conservation purposes, improvements will be necessary at high cost, which both states should share in proportion to the relative benefits;

(3) If better flood control is desired for the benefit of Minnesota land owners, improvements will be necessary at high cost, which Minnesota will probably have to pay because South Dakota has no interest in flood control;

(4) As long as Minnesota continues to own and operate the outlet control works, she must assume the final responsibility for operation, and therefore could not undertake any new method of operation entailing increased cost or liability, even though approved by the boundary waters commission, unless funds were provided to meet such cost or liability.

The following problems in connection with these two projects now confront the Legislature:

(1) Appropriating at least enough money to the Division of Water Resources and Engineering to continue operation and maintenance of the present control works as long as Minnesota remains in charge of them;

(2) Authorizing the conservation department to adopt any method of operation of the Lac qui Parle project deemed necessary and feasible for better flood control, thereby making a radical change from the original plan of operation and entailing further sacrifice of public benefits from water conservation and maintenance of the lake level, if such change is deemed advisable by the Legislature;

(3) Appropriating additional money for improvement of the Lac qui Parle control works for better flood control, if such improvements are desired in the near future;

(4) Appropriating additional money for improvement of the Big Stone control works either for better flood control or for maintaining a higher lake level for water conservation purposes, if such improvements are desired in the near future with due allowance for the interests of South Dakota.

The Division of Water Resources and Engineering has been making as much study of these questions as limited funds and personnel permitted, and will submit the results of its findings to the Legislature, if desired. The commissioner, division director, and staff have held a number of public meetings and conferences with groups interested in these projects in an effort to promote better understanding, pointing out that maximum flood control cannot be obtained without sacrifice of water conservation, and vice versa, and that in order to serve both interests it will be necessary to work out a compromise, whereby neither side will get all it wants but everybody will get a fair share of benefits.

Flood Control on the Lower Minnesota River

Recent wet years have aggravated flood damage to farm land in the lower Minnesota River valley as well as elsewhere, resulting in increasing demands for flood control from the farmers of that area. This is a major problem. The Big Stone and Lac qui Parle projects in the upper valley can do little to relieve flood trouble in the lower valley because of the large area of watershed which lies between, with at least 20 tributary streams pouring in flood water below the Lac qui Parle control works and two power dams across the intervening stretch of the main Minnesota river. It will take a comprehensive survey to determine whether or not effective flood control for the lower valley is feasible. Such a survey by the U. S. Corps of Engineers is already in progress but has been delayed for lack of funds and other reasons. Further action will have to await the completion of that survey and the report of the U. S. Engineers thereon.

V. WATER POLLUTION CONTROL

Pure water is a universal need for public health and recreation, for domestic and industrial water supplies, for livestock, fish, waterfowl, and aquatic animals. Dangerous and disgraceful pollution problems, aggravated by war conditions, exist in many places. Progress in dealing with these problems under the progressive new water pollution control law passed by the 1945 Legislature has been hampered by lack of funds. There is urgent need for more adequate support for administration of this law and for an aggressive program to expedite construction of necessary sewage treatment plants by state institutions, municipalities, industries, and other agencies.

The value of lakes and streams is lost if the waters are contaminated by man-made wastes so as to be unfit for human use or for wild life habitat. Under the Minnesota Water Pollution Control Act of 1945, widely hailed as one of the best in the country, the Water Pollution Control Commission (consisting of the Secretary and Executive Officer of the State Board of Health, the Commissioner of Conservation, the Commissioner of Agriculture, Dairy and Food, the Secretary and Executive Officer of the State Livestock Sanitary Board, and a member at large appointed by the governor) has set to work on the Herculean task of cleaning up all the polluted water in the state. Under the law the technical and engineering service required for this work is provided by the State Board of Health, which has organized an operating unit for this purpose under the Division of Sanitation. Despite lack of sufficient funds, creditable headway has been made in laying the foundation for an effective state-wide pollution control program. Since the commission was organized on June 1, 1945, investigations and reports have been made in many cases, and action has been taken on a large number of applications for permits for operation of existing sewage disposal systems, for sewer extensions, for construction or improvement of sewage treatment plants, and for industrial waste disposal facilities.

Among the notable cases given attention were the waste disposal problem of the large beet sugar plant proposed for construction at Moorhead, the first large industry to receive a permit under the new law, and the control of pollution from the paper mill at International Falls and the communities along the Rainy River, on which a public hearing was held in order to emphasize the need for action. The commission's engineers have cooperated with the Division of Public Institutions and the Department of Administration in preparation of plans and estimates for sewage treatment facilities for all state institutions where such facilities are now lacking, thereby taking steps to overcome what has been a notorious disgrace to the state for some time past. Construction of such facilities will depend on appropriations by the Legislature and in some cases, action by local municipalities where joint plants are desirable. Field investigations have been made and reports prepared as a basis for future action on cases of municipal or industrial pollution along the Mississippi River, the Minnesota River, the St. Croix River, and many other places in the state.

Since the beginning of the recent war construction of sewage treatment or waste disposal facilities has been hampered by shortage of materials and

equipment. However, more favorable conditions are in sight, and a heavy program of extensions, improvements, and new plant construction in the near future may be expected. This will not only increase the work of making field tests and examining plans but will add to the already sizable job of periodical inspection of operating plants to assure compliance with prescribed standards of treatment. Another growing field of work is the instruction of sewage treatment plant operators.

On the whole, the work of administering the new pollution control law is bound to increase greatly during the coming biennium, and it will be impossible to give the service needed to make this law effective without a very substantial increase over previous meager appropriations.

In that connection, it is estimated that between 30 and 40 per cent of the benefits of water pollution control work over the state as a whole will accrue to fish, waterfowl, and other aquatic life, the remainder to public health and other public interests. The Conservation Department therefore considers that a contribution from the game and fish fund of a corresponding proportion of the total appropriation for water pollution control would be in order. This is not a diversion of game and fish funds, but rather an application of such funds to work of great value to the conservation of aquatic wild life.

In view of the importance of water pollution control to conservation, the commissioner of conservation is called upon to devote much time to that work, and has served as chairman of the Water Pollution Control Commission since its organization. The aquatic biologists of the Division of Game and Fish and the engineers of the Division of Water Resources and Engineering also cooperate frequently with the Board of Health technicians and engineers in the study of pollution problems. The annual high school conservation essay contest for 1947 will have for its subject "Clean Water" — the aim of the whole pollution control program.

VI. FORESTRY

Our forests are vital to the economy and general welfare of the state. Despite much progress in recent years, support for forest conservation still falls short of the imperative needs of an adequate program to prevent loss and realize the full value of forest resources. Ample means and authority should be provided by the legislature for effective forest fire control, management of timber for sustained yield on public and private land, and a comprehensive tree planting program for reforestation of areas not amenable to natural reproduction and for improvement of farms and wild life habitat. The system of taxation of timber land should be revised so as to encourage owners to hold timber to maturity.
(See Seventh Biennial Report, pages 28-29.)

Forests a Priceless Asset

The forests and woodlands of Minnesota are literally a priceless asset, as can be realized by imagining what a picture of desolation would appear

if all our trees were gone. Forests not only have great commercial value, which can be estimated, but they have immeasurable value as a major element of the natural beauty of the state, as an important factor in water conservation and erosion control, and as the dwelling place for a great abundance and variety of wild life. An effective forest conservation program must recognize all these values and must take into consideration the varying needs and problems of all parts of the state.

(See Seventh Biennial Report, pages 27 and 30.)

Economic Value of Forests

It is encouraging to discover that in spite of wholesale past destruction and consumption of timber by fire, cutting, and other means, and in spite of many existing handicaps, the output of Minnesota's forest industries has attained in recent years a gross annual sales value of more than $75,000,000. In terms of jobs, wages, tax revenue, and other income, the forest industries mean more to the people of the state today than they ever did in the height of the old logging days.

However, there is an ominous side to the picture. If adequate fire prevention and effective management of timber for sustained yield had been provided fifty years ago, it is safe to say that the productive value of Minnesota's forests would be at least double what it is today. This points to the challenging conclusion that our present forest production can be more than doubled within the next fifty years if an effective forest conservation program is undertaken with all possible speed. The beginnings of such a program are already under way. Full-scale expansion and development is the job ahead.

(See Seventh Biennial Report, page 27.)

Forest Fire Protection

As always, the number one "must" is fire protection. Minnesota, lagging behind Wisconsin and Michigan, still persists in the economic fallacy of providing less than half the support needed for an effective system of preventing and controlling forest fires. Over the years this penny-wise, pound-foolish policy has lost and will continue to lose at least three times as much in timber and other property destroyed by fire as it would cost to stop the fire. We have a splendid force of well trained fire fighters, but there are no where near enough of them, and they have no where near enough equipment to combat the forest fire hazards successfully in the bad seasons which are bound to come. In no other way can the state spend money with greater profit than by immediate expansion of the forest fire fighting forces to meet the needs of their task. Minnesota has greater potential forest resources than either Wisconsin or Michigan. We should lead, not follow, our sister states.

Timber Management on Private Land

In the field of constructive as distinguished from protective forest conservation, the most urgent need is for better management of private

timber holdings for sustained yield. Fortunately Minnesota has a higher percentage than most other states of forest land in public ownership and under more or less effective management, comprising approximately two-thirds of the northern forest area. The remaining third in private ownership presents a difficult problem. There has been heavy over-cutting of private timber, especially during the war, and it is practically impossible for most private owners to practice good forest conservation on an effective scale under present conditions. Assistance and direction through public authority will be required for the solution of this problem.

Taxation of Timber Lands

The most serious handicap to good management of private timber is the present system of ad valorem taxation of standing timber, which penalizes progress in raising timber, and imposes a continuing incentive for the owner to cut his timber as soon as possible instead of letting it grow to the point of maximum production. There are gross inequalities in the assessment of this tax. A reform of the assessment system would help materially, but this alone would not solve the problem. The tax burden must be adjusted so as to apply fairly according to the productive capacity of the land and the value of the timber at maturity.

Different methods are in force in different states. Minnesota already has the auxiliary forest law (amended and approved at the 1945 session of the legislature), with a flat annual land tax and a 10% timber yield tax. However, on account of optional features, this law is making slow progress in actual use, and it is doubtful whether it will ever be applied to more than a small fraction of the private timber land in the state.

The problem is urgent. What is needed is a system that will provide for classification of land for purposes of taxation and apply automatically to all lands so classified. A few other states have such systems. Development of an effective timber tax system in Minnesota will require an extensive study of the tax structures and timber stands in the counties of the forest region to determine how they would be affected and what the best method of taxation would be under the conditions prevailing in this state. Immediate provision should be made for such a study, to be reported to the legislature for consideration and action as soon as possible.

Legal Regulation of Timber Cutting

The present Minnesota timber cutting regulation law has done much good in preventing the cutting of immature timber and in educating timber owners to the value of selective cutting and other timber conservation methods. However, cutting restrictions are necessarily limited in their application, and cannot go very far alone to solve the major problem of timber management. If coupled with a sound system of taxation of timber land and standing timber, providing inducements for growing timber to maturity, cutting regulations could be made much more effective.

Coordination of Timber Management — Timber Inventory

To secure maximum sustained yield from all forest lands of the state there must be coordination of management among all the agencies or

proprietors in charge of such land — federal, state, county, and private. It will take time to develop an effective system for such coordination. The first essential step is a comprehensive timber survey and inventory to take stock of what is now on hand as a basis for future management and development of new industries. The necessary funds for this undertaking, to be carried on by state and federal forest services cooperating, should be provided as soon as possible.

Forestry Service for Private Land Owners

The need for the service of competent foresters in planning timber management and cutting on private land was recognized by a group of timber operators who recently contributed $8,000 to enable the State Division of Forestry to employ trained men for that purpose. Such foresters can be as helpful to timber operators as county agricultural agents are to farmers. Provision should be made for expanding this service and making it a permanent establishment.

Forestry Extension Service

The present small staff of the Forestry Extension Service, maintained by the State University and the Conservation Department cooperating, is doing excellent work in promoting interest in forest conservation and participation in tree planting and other conservation projects in the schools as well as among farmers, timber operators, conservation organizations, and the general public. This work should be continued and expanded as may be necessary to meet the growing needs in this field.

Timber Supply for Industries

From the economic standpoint the value of forests is measured by what they produce for human use through industry. As already pointed out, the forest industries of Minnesota are substantial, with a gross sales value of over $75,000,000 per year, not counting the value of unprocessed pulpwood which is exported. A cord of wood manufactured into paper or other finished products within the state yields four or five times as much in benefits to the people of the state in the form of wages, tax revenue, and other income as a cord of raw wood exported from the state. In recent years as much as 300,000 cords of pulpwood, or more than three-eighths of the total Minnesota cut, has been shipped to mills outside the state.

At various places outside of Minnesota existing wood processing plants are being expanded and new plants are being constructed. At present two large pulp and paper plants, capable of providing support for sizable communities, are being established as branches of American industries in Ontario north of Lake Superior.

The facts above cited prompt two critical questions affecting the future of Minnesota's forest industries:

(1) Why have not Minnesota forest industries expanded so as to process the pulpwood which is now being exported from the state?

(2) Why do not outside forest industries seeking locations for branch plants come to Minnesota instead of going to Ontario or elsewhere?

Although there are other contributing causes, one of the principal factors which now tends to retard the expansion of existing industries and to discourage the location of new industries in Minnesota is the lack of assurance of long-range wood supply.

Better fire protection and increase of timber yield through better management will in time provide a partial solution for this problem. However, no satisfactory answer has yet been given to the question as to how a particular industry can assure itself of the wood supply needed for long-range maintenance of its plant at a given location in Minnesota.

It was thought that under the auxiliary forest system private industries would be able to provide themselves with adequate reserves of timber on their own land. However, as before pointed out, it is now evident that this system is too slow in development and too limited in scope to provide a complete solution for the industrial timber supply problem. There are many industries which are not in a position to make the long-range investments necessary to acquire land and grow their own timber. Furthermore, there are many parts of northern Minnesota where so much of the land is in state or federal ownership and not for sale that it would be difficult if not impossible for industries to acquire enough land of their own in those areas. It will be necessary to devise some means for giving industries assurance of a certain amount of long-range timber supply from these public lands to supplement what is available from other sources.

Ontario has a system which has proved effective in encouraging the development of new forest industries. They have a great advantage in this matter because most of their timber land belongs to the Province of Ontario and is under unified control. There is an act of congress designed to assist private industries in obtaining long-range timber supplies in the national forests of the United States to augment their own sources of supply. No attempt has yet been made to invoke this law in the national forests in Minnesota. The problem in Minnesota is difficult because of the divided and scattered ownership of timber land among federal, state, and county agencies as well as many private owners.

Adoption of a state law to encourage the expansion of existing forest industries and the establishment of new industries in Minnesota by facilitating the procurement of dependable long-range wood supplies, applicable to state forest lands and other state lands as well as to tax-forfeited lands in charge of the counties, providing for coordination with the federal government and private owners, and containing adequate safeguards to protect the public interests and insure fair treatment of all industries concerned, large and small, is one of the important forest conservation matters deserving consideration by the legislature. This is an urgent problem, now that the war is over and industries are seeking new opportunities for expansion and development. Unless Minnesota prepares to deal with the industrial timber supply problem on an effective scale without delay, other areas offering better inducements will continue to outstrip us in the development of forest industries.

Management of Public Timber Land

Roughly speaking, two-thirds of the timber land of northern Minnesota is in public ownership, whereas in central and southern Minnesota the timber land consists mainly of farm woodlands in private ownership. The northern publicly owned timber land comprises approximately 12,000,000 acres, of which the largest share, considerably over one-third, is tax-forfeited land owned by the state but in charge of the county authorities under present laws, a little over one-third is in absolute state ownership (mostly trust fund land), and the remainder, somewhat less than one-third, is in absolute federal ownership.

The portion in absolute state or federal ownership is under complete and effective legal control for timber management and other forest conservation purposes, requiring only more adequate provision for maintenance and necessary expansion of the existing agencies in charge, the State Division of Forestry in the case of the state lands and the U. S. Forest Service in the case of the federal lands. In spite of heavy war-time demands, timber cutting on both state and federal lands has been kept well within allowable limits, and adequate reserves have been maintained. What is needed on those lands is better provision for constructive forest conservation measures and for coordination with other sources of timber production, as elsewhere pointed out in this report.

On the tax-forfeited land under county control the situation is not so favorable. Most of this land was cut over or burned over before forfeiture, but it bears considerable merchantable timber as well as reproduction in various stages of growth. Management of the tax-forfeited land and timber is a major problem in all the northern forest counties.

County Land Use and Timber Management—Tax Forfeited Land

All signs indicate that between 4,000,000 and 5,000,000 acres of tax-forfeited timber land in northern Minnesota will remain permanently in public ownership. As already pointed out, this is more than a third of all the publicly owned timber land in the state. Effective management of this land to improve the timber yield and secure maximum returns to the public is of great importance to the state from the broad standpoint of timber economy and to the counties and local taxing districts from the standpoint of their interest in revenue from timber sales.

With a few notable exceptions, the county authorities are not prepared to give the tax-forfeited timber land good management. There is a vast difference in the efficiency of the agencies in charge from one county to another. County authorities frequently call on state foresters for advice and assistance in the management and sale of timber, but with present limited personnel it is not possible for the state forces to give close supervision to county operations. A more or less effective check on county appraisals of timber for sale is exercised by the state Division of Forestry under present laws, but this reaches only one side of the management problem.

The county zoning system has contributed to better land use and timber management and has saved money in the counties where it has been adopted. Counties remaining unzoned should proceed to zone as rapidly as possible in furtherance of their own interests. However, zoning does not reach the core of the timber management problem.

The problem as to tax-forfeited land within or near the present state forests could be solved by transfer of the land to control of the Conservation Department under present laws. Thereupon the state assumes all responsibility for management and pays the county 50% of the gross income received from timber sales or other sources from such land. However, transfers under this law are optional with the county boards. A few transfers have been made, but thus far they comprise only a small fraction of the total acreage involved. However, this procedure, even if widely adopted by the counties, would not solve the whole problem, as there is much tax-forfeited land outside of that which would be suitable for inclusion in the state forests.

What is needed is a comprehensive review of the whole tax-forfeited land and timber situation with a view to adoption of measures that will insure efficient management in the public interest throughout the forest region of the state, coordinated with state and federal forestry operations to secure maximum benefits and avoid duplication of work.

Forest Land Exchange

Effective management of Minnesota's timber resources is hampered by the jumbled pattern of timber land ownership, with federal, state, and private holdings mixed up like the pieces of a crazy quilt, causing much confusion, duplication of effort, and unnecessary expense. It is as if all the farms in a county were cut up in small tracts and shuffled, so that every farmer had to travel to many different fields, miles apart, in the course of his operations. In order to authorize exchanges for the purpose of consolidating the various land holdings, state, federal, and private, in furtherance of better management, the land exchange amendment to the state constitution was adopted in 1938, followed by enabling legislation. However, on account of the war and other causes, little progress with the exchange program has thus far been made. This work should now be stepped up by all means available. The cost will be saved many times over in the long run through economy of management and improvement of general timber production. The faster the exchange program proceeds, the greater will be the ultimate saving.

Authority over land exchanges is vested in the Land Exchange Commission, consisting of the governor, the state auditor, and the attorney general, with the assistance of the conservation department in formulating exchange proposals, appraising land, and determining land values. The major part of the work is in the land appraisals, carried on by the Division of Lands and Minerals, with the cooperation of the Division of Forestry in passing on questions affecting forest policy. On the basis of their recommendations the commissioner of conservation makes findings to be submitted to the Land Exchange Commission for final decision, after public hearing.

Most important objective of the exchange program is the consolidation of large scattered holdings of state and federal forest land. To facilitate this

some amendments of the present law are desirable, liberalizing present restrictions on exchange of lake shore land, also simplifying appraisal methods.

County authorities have proposed that state lands outside of state forests be exchanged for tax-forfeited lands in charge of the counties within the state forests in furtherance of better consolidation. Such exchanges, however, would not be permissible under the constitutional amendment so far as state trust fund lands would be involved. At any rate, the legislature has full power to make such other provision as it deems best for the management and disposition of tax-forfeited land and timber in furtherance of the best interests of the public.

Tree Planting

By reason of short-sighted legal obstructions, Minnesota is years behind Wisconsin, Michigan, and almost all other states in tree planting on private land for reforestation, soil erosion control, farm shelter belts and woodlots, improvement of wild life habitat, and other conservation purposes. There is urgent need for such planting all over the state, especially in the central and southern agricultural areas. Planting on public land has made much better progress, but it is the need for planting on private land which presents the most critical problem.

Experience with the 1945 act authorizing the conservation department to obtain planting stock by contract from private growers for resale to land owners has demonstrated that this method is utterly inadequate. Private growers can never produce the required types of planting stock at prices low enough to get the stock out in large quantities to the places where it is most needed, as is being done in almost all other states through state nurseries. All that is necessary to get this long-delayed program under way in Minnesota is for the legislature to repeal present legal restrictions and authorize the conservation department to produce the required planting stock at the state nurseries and distribute it at cost, with safeguards against use of such stock for purposes that would compete with private nurseries. In no other way can so much be done for good forest conservation in the state at so little expense. This is one of the most important matters demanding consideration by the 1947 Legislature.

For further discussion of this problem, see the report of the Division of Forestry, herewith, also Seventh Biennial Report, pages 29-30.

County, Municipal, School and Local Forest — War Memorials

All possible encouragement should be given to the establishment of county, municipal, and school forests, as well as other local forests, public or private. Such projects stimulate public interest in good forest conservation and have great recreational, educational, and aesthetic value. They also make appropriate war memorials. Expansion of the tree planting program as proposed in preceding paragraphs will give a great impetus to the development of such forests.

(See Seventh Biennial Report, page 30.)

Roadside, Lakeshore, and Stream-bank Timber

Trees along roads and along the shores of lakes and streams are scenic and recreational assets of inestimable value. Much private timber on such locations was cut before and during the war, leaving unsightly stumps to mar the view and give travelers unfavorable impressions of the state. Special attention should be given to the reforestation of such areas in connection with the tree planting program. To encourage this and prevent further cutting of timber along the roadsides or the shores of lakes or streams, the state should offer inducements to the owners, through tax rebates or other means of compensation, for the protection and maintenance of such timber. A property owner cannot be expected to maintain for other people's pleasure stands of timber from which he gets no income and on which he must pay taxes.

Systematic provision should also be made for tree planting along the sides of the public rights of way of trunk highways and secondary roads throughout the state, following up the good work done along that line by WPA and CCC crews before the war.

New Forestry Interim Commission

The Interim Forestry Commission created by the 1943 Legislature rendered notable service to the state by collecting and compiling valuable information on forestry problems and by recommending constructive measures, some of which were adopted by the 1945 Legislature. See the Commission's printed report, published in December, 1944. However, as that report indicates, there are many important problems in the broad realm of forestry requiring further study, such as the taxation of timber land and other matters to which attention has been called herein. The department believes that these problems are of sufficient importance to warrant the appointment of another interim commission.

VII. WILD LIFE

Abundance of wild life is one of the greatest assets of the state for public recreation and enjoyment. A comprehensive program of wild life conservation, embracing protection, propagation, and improvement of habitat for game and fish, should be continued and expanded to meet future needs. To that end the present laws dedicating receipts of game and fish funds to game and fish conservation purposes should be reaffirmed, and safeguards should be set up against diversion of such funds to unrelated purposes. Ample provision should be made for research and field investigation so that all operations may be planned and conducted for maximum results.

Conservation of wild life is the only field of conservation in Minnesota which receives adequate financial support. This is true because people are willing to pay license fees for the privilege of hunting and fishing. There are now substantial balances in the dedicated game and fish funds because it was impossible to spend all the receipts to advantage during the war on account of shortages of man-power and material. However, there will be

need for all the money available as soon as conditions permit construction of new projects and expansion of other activities of the Division of Game and Fish.

In any event, in the case of agencies such as the Division of Game and Fish which are financed by dedicated revenues derived from fluctuating sources, substantial reserves must always be maintained to carry regular operations through periods of low revenue. License fee collections as well as receipts from other sources rise and fall under the influence of changes in economic conditions as well as other variable and unpredictable factors. The possibility must always be faced that in some years it may be necessary to close certain hunting or fishing seasons altogether for conservation purposes, resulting in a heavy drop in license revenue. The Division of Game and Fish must never be left in the position of having to depend entirely on current annual receipts to carry essential operations. So far as the conservation department has authority in the matter, no game or fish season will ever be opened merely for the sake of obtaining revenue when closing is necessary for protection of the species concerned. This is a compelling reason for maintenance of adequate reserve funds.

During the past year there has been much concern in sportsmen's circles over the possibility of diversion of game and fish funds to other purposes. There was no official basis for such fears, as far as we can discover. The department is unalterably opposed to any such diversion, and the legislature appears to be firmly committed to the established system of dedicating funds to game and fish purposes. There are those who oppose all dedication of public funds to specific purposes and advocate payment of all public revenues into the general revenue fund, subject to direct appropriation by the legislature. This would be unsound so far as game and fish funds are concerned for the following reasons, among others:

(1) Game and fish funds are not derived from taxes on private property or income which might otherwise yield revenue for the general fund (as is the case with the motor vehicle tax, the income tax, and other dedicated revenue), but come mainly from license fees for the privilege of utilizing public wild life resources, which are replenished and increased by the use of the money thus raised.

(2) The knowledge that all the license fees are used to help conserve wild life, gives hunters and fishermen an incentive to cooperate in such conservation, and makes them willing to pay enough to provide adequate support for this activity. This incentive would be greatly weakened if not destroyed if the license fees were paid into the general revenue fund, subject to possible use for other purposes.

(3) Conservation of wild life improves the desirability of the state as a place of residence and stimulates a substantial amount of business along various lines, thereby enhancing taxable property values and increasing the potential sources of general revenue. In the long run the sources of general revenue will benefit more by insuring the use of all hunting and fishing license fees for good conservation than they would by tapping those fees for other purposes.

(4) The game and fish funds are subject to the control of the legislature and to the budgeting and allotment procedure prescribed by law to the same extent as appropriations from general revenue.

(See Seventh Biennial Report, page 22.)

Despite the large balances of game and fish funds now in sight, there is no ground for assuming that more money than necessary will be available for wild life conservation in the future. With the growth of population the pressure on wild life from hunting and fishing is continually increasing, and the available wild life habitat will inevitably decrease unless protected and improved. Much more work will be necessary in the future than in the past to maintain desirable species of game and fish under these conditions, with greater emphasis on measures for improvement of the habitat, including soil and water conservation, water pollution control, rough fish removal, control of predators, planting of trees and shrubs for food and cover, establishment and maintenance of game refuges, waterfowl feeding projects, and public hunting grounds, securing cooperation of farmers in protection and propagation of game, and other long-range activities.

With the general approval of far-sighted sportsmen, the practice of appropriating money from game and fish funds to other agencies which carry on activities beneficial to wild life, especially for basic habitat improvement, is already well established; for example, forest fire protection, soil and water conservation, and water pollution control. Use of a reasonable proportion of game and fish funds to support publication of the department magazine and other educational work in furtherance of good wild life conservation is also generally approved. The department considers that such appropriations are justified so far as commensurate benefits to wild life conservation result from the use of the money.

However, the present statutory provision for a five per cent diversion from game and fish funds for state administration purposes cannot be justified on the same grounds. It is a source of irritation to the sportsmen of this state, and produces so little money annually as to be of no practical benefit to the general revenue fund. We renew our previous recommendation that this provision be repealed.

VIII. STATE PARKS, WAYSIDES, AND LAKE ACCESS GROUNDS

To provide opportunities for healthful outdoor recreation and use of the state's natural attractions by all classes of people, and to meet the increasing need for rest and recuperation for men and women who served in the armed forces, especially for the disabled, for children, and for the public generally, ample provision should be made for the maintenance and improvement of all state parks, highway wayside grounds, and access grounds on lakes and streams, and for the acquisition and improvement of desirable new sites for such facilities before all the suitable places are occupied by private developments.

Noted industrialists, leading physicians, and prominent social scientists agree that recreation, especially outdoor recreation, is essential to health

and happiness. The most convincing evidence of this need is a great increase in recent years in the use of state parks and other recreational facilities by the public.

Minnesota has the groundwork for as fine a system of state parks as any state in the country. Our provision for maintenance, however, is far below par. Many excellent buildings and other improvements were constructed in our state parks by WPA or CCC before the war, and a large part of the cost was paid from federal funds. In view of the large proportion of the present state park establishment which the state thus obtained free of charge, the state can well afford to make adequate provision for maintenance. In fact, it cannot afford to fail, because without adequate provision for maintenance, buildings and facilities depreciate, service are curtailed, and the public, especially visitors from other states, get a bad impression of Minnesota. This is intensified by comparison with other states which appreciate the value of state parks both for public recreation and as "show windows" for visitors, and give their parks better support.

Thanks to the action of the last legislature, Minnesota made some notable additions to the state park system during the past biennium through acquisition of the following new sites: Baptism River State Park and Split Rock Wayside on the North Shore of Lake Superior, McCarthy's Beach State Park in St. Louis County, and the Wegman Farm at Itasca State Park. Funds for purchase of McCarthy's Beach property were contributed one-half by the state and one-half by the city of Chisholm and the village of Hibbing. Acquisition of land for Kilen Woods State Park in Jackson County is in progress, awaiting completion of legal proceedings. Final steps in the consummation of the exchange of land with the federal government for Nerstrand Woods State Park in Rice County is likewise awaiting completion of legal proceedings. Among the finest additions to the entire state park system was the gift by Miss Alice O'Brien, of St. Paul, of a large tract on the St. Croix River above Marine on St. Croix, to be known as William O'Brien State Park in memory of her late father. All these newly acquired sites, when developed, will provide unsurpassed opportunities for public recreation at most desirable locations. However, they cannot be made useful to the public until funds are provided for necessary improvement and maintenance.

Patronage at several of the state parks last year was so heavy as to greatly over-tax the facilities. A bad impression is created when people who have driven long distances cannot get accommodations or service at the state parks. There is urgent need for adequate support for all the state parks, through reappropriation of revenues and through direct appropriations, to improve and maintain them on a scale commensurate with the standing of the state.

(See Seventh Biennial Report, page 33.)

Roadsides, Picnic, or Camping Grounds

The highway roadside picnic or camp grounds of which a number were constructed with WPA or CCC labor before the war, present another problem

for which the conservation department is not responsible. These places are now in charge of the state highway department. However, that department, by reason of limitations on the use of trunk highway funds, cannot give these places proper care. Many of them are in bad condition, and give visitors a decidedly poor impression of Minnesota. Bills to put these sites in charge of the conservation department, appropriating money for their repairs and maintenance, have been introduced at the last two sessions of the legislature but have failed to pass. This problem deserves further consideration at the coming session of the legislature.

(See Seventh Biennial Report, page 33.)

IX. TOURIST TRAFFIC

The tourist traffic is the basis of one of the state's largest industries, with rapid growth in prospect. By promoting the state's advantages and attractions among hosts of visitors from other regions, the tourist traffic increases business, employment, income, tax revenue, and property values throughout the state. There should be ample provision for expansion and continuance of an effective program for advertising the natural features of the state, stimulating improvement of tourist facilities, and other measures designed to increase and maintain the tourist business of the state.

Minnesota competes with Wisconsin, Michigan, and Canada, as well as with other resort areas of the country for summer tourist traffic. Continuous advertising of the attractions of the state is necessary to stimulate the flow of that traffic and to assure that a fair share will come to Minnesota. The money spent by the state Tourist Bureau in promoting the state's attractions pays large dividends to the state. Larger appropriations to expand the advertising campaign would pay still larger dividends, and should be provided.

X. IRON AND OTHER MINERALS

In view of the vital importance of the state's deposits of iron ore both to the economy and prosperity of the state and the safety and welfare of the nation, a comprehensive scientific study should be made forthwith of the nature and value of the remaining deposits, with a view to the adoption of a sound, long-range program for the conservation and mining of such iron ore and for developing new methods of using low-grade ore, so as to prolong the life of the mining industry, provide for balanced utilization of high-grade and low-grade ore, and secure the maximum benefits therefrom to the state and to the nation. Provision should be made for stockpiling iron ore for national defense and security. Development and use of other minerals should be encouraged.

Of the many aggregations of natural resources which have contributed to the greatness of the nation and the welfare of the state, none is more important than the iron ore of Minnesota. When the forces of nature collected

the rich deposits of the three Minnesota iron ranges, centrally located on the continent, well protected against external attack, accessible through the Great Lakes waterway, and with immense beds of high grade ore available for cheap and speedy open pit mining, it might well be called a providential dispensation. There are many other large deposits of iron ore in the country and throughout the world, but none thus far opened up has any such combination of favorable conditions for human use as those in Minnesota.

Within the past fifty years, covering most of the time since active iron mining began in Minnesota, these ranges have sent forth over a billion and a half tons of iron ore, supplying the major part of the needs of the nation during the period of its greatest industrial growth as well as the demands of two great world wars. The Minnesota mines furnished about two-thirds of all the iron used by this country during the second world war in making ships, tanks, guns, motor vehicles, airplanes, and other equipment used by our nation and our allies in the war effort. The readily accessible open pit mines of Minnesota served as a natural stock pile of high grade ore, and were unquestionably one of the essential factors in the winning of both world wars. It is doubtful whether victory would have been possible without them.

Up to 1946, Minnesota's immense iron ore resources had contributed to the state and its political subdivisions nearly $500,000,000 in ad valorem taxes on the ore in the ground, and over $110,000,000 in occupation and royalty taxes on the operations of iron mining. That industry has provided the principal means of support for many thriving communities on the iron ranges, with a total population of over 80,000.

About 15% of the total output of iron ore thus far mined has come from trust fund lands belonging to the state, and the proceeds from this ore, plus the allotted share of the occupation taxes, have enriched the state school funds and other trust funds to the tune of more than $115,000,000. Thus over three-fourths of the present total capital of those funds, now amounting to about $150,000,000, has come from iron ore.

Past production has now consumed about 60%, or nearly two-thirds, of the known Minnesota iron ore that is merchantable or commercially usable under present methods. The remaining known reserves of such ore amount to something over a billion tons, of which about 10% belongs to the state, the balance to private owners. This includes both high grade ore which can be shipped direct to the blast furnaces, and low grade ore requiring concentration for shipment, but not taconite or other inferior grades, not now classed as merchantable ores. Somewhat over half of the remaining known merchantable ore is available for open pit mining. The remainder will require underground mining, costing much more and taking much more time.

Unfortunately the high grade ore, especially in the more accessible open pit deposits, has been removed at a relatively faster rate than the low grade ore or the less accessible deposits. In consequence the remaining ore, on the average, is much poorer with respect to commercial availability and will be more difficult and expensive to mine than what is gone. A coordinated program for mining all types of ore in proper proportions would be more economical in the long run.

The past lop-sided exploitation of high grade and accessible ore has been induced by various factors affecting the price of ore and the cost and profits of mining. Although other motives influence operations to some extent, mining companies naturally tend to skim the cream of the ore on which the greatest profits can be made, leaving the poorer quality behind.

The state has aggravated this tendency by a short-sighted system of **ad valorem** taxation imposed on iron ore in the ground. This tax, which is applied as soon as a body of potentially merchantable ore has been discovered and valued, discourages prospecting and exploration for ore deposits and hastens the mining of known deposits, especially those of higher grade or greater accessibility. The effect is similar to the **ad valorem** tax on standing timber, which acts as an incentive to premature cutting. Thus Minnesota has used the power of taxation in direct conflict with the conservation of two of its most valuable natural resources.

The history of these resources in Minnesota furnishes a striking illustration of the adage that hindsight is better than foresight. Very little of either has yet been applied to the conservation of iron ore in this state, though some progress has been made with better forest management. The legislature has passed some laws designed to limit local **ad valorem** tax levies and to adjust occupation tax rates so as to encourage the mining of low grade or less accessible iron ore, but these measures have not by any means provided an effective solution of the major problem of iron ore conservation.

The **ad valorem** tax on iron ore figures so largely in the tax base of the iron range counties and communities that it would be very difficult now to make any substantial changes in the system without providing adequate substitute sources of revenue for these taxing districts. Some of the local communities depend on iron ore for over 90% of their revenue. Depletion or exhaustion of local ore bodies, with consequent reduction in tax receipts, has brought acute financial distress to the communities concerned in several cases. On this account as well as for conservation reasons a study of the whole problem of iron ore taxation, with a view to sensible revision, is imperative.

Readjustment of taxes on iron ore or on the business of iron mining does not necessarily mean reduction of the total taxes thereon. The iron mining industry can and should pay ample taxes commensurate with the value of the iron ore resources affected. It does not appear that the total tax burden which they have borne in the past has been unduly burdensome. What is needed is to find some means for readjusting the tax load so that it will promote rather than hamper good conservation of the remaining iron ore and will at the same time meet the essential financial requirements of the iron range counties and communities, also yield as large returns for the state trust funds and general revenue funds as can reasonably be obtained.

Despite all that can be done for better conservation in the future, the days of the presently known merchantable ore deposits are numbered. It would be possible to exhaust the high-grade ore available for open pit mining within the next fifteen or twenty years, and by the end of another fifty years the greater part of the remaining deposits of merchantable ore of all types

will probably be gone. The hopes of the mining industry for the years to follow are pinned on taconite and similar ores of such low iron content that they do not now rate as commercial ores, and are not even assessed for **ad valorem** taxes. Such ores are present in Minnesota in vast quantities, of which no definite estimate has yet been made. Research carried on by the state university, the Division of Lands and Minerals, and various mining companies gives promise that methods for the practical use of such ores will be developed at no distant date. However, owing to the high cost of recovery of iron from such ores, the development of mining operations based thereon will be influenced largely by the availability of remaining commercial ore deposits in Minnesota and elsewhere, so the present prospects of such industry are uncertain.

The state should give all possible encouragement to the utilization of taconite and other ores of inferior grade. As such ores become usable they will acquire value. In connection with the taxation of such ores, the mistakes of the past should be avoided, and tax laws and other measures should be adopted which will promote sound conservation.

It is obvious that the country as a whole has a vital interest in Minnesota's iron deposits both for industrial use and for the purposes of national defense and security. Owing to the depletion which has already occurred, the fact must be faced that the Minnesota ranges no longer have enough reserves of accessible open pit ore to serve as natural stock piles for a future war emergency, in addition to supplying industrial needs. It has therefore been suggested that the federal government promote and finance a program for stock-piling iron ore mined from the lower grade or less accessible deposits, to be held in reserve for use in case of a national emergency, under such conditions as would encourage conservation of the remaining deposits and permit ample production for industrial purposes. Such a program would not only insure an adequate supply of iron for national defense and security but it would go far to promote conservation of the remaining ore, stabilize the mining industry, and strengthen the economic underpinning of the iron range counties and communities. The state should do everything possible to encourage such a stock-piling program.

The handwriting is on the wall to remind the nation, the state, the local counties and communities, and the mining companies that the iron ore of Minnesota is irreplaceable and that the reserve supply is steadily getting smaller. It behooves all these agencies to join without further delay in working out an effective program for conservation and use of what remains so that vital public interests may be protected and maximum value realized from the ore in the long run.

Management of State Mines — Research

The Division of Lands and Minerals in the Conservation Department is charged with the management of the state iron mines and the collection of the income therefrom. This not only entails a large amount of engineering and administrative work but also requires continuous research in order to enable the division to keep abreast of new developments in mining methods

and make sure that the lessees of state mines are employing the best practicable methods so as to secure maximum returns to the state. This work requires a considerable staff of trained personnel as well as adequate facilities. Under present salary schedules the division has difficulty in retaining competent engineers, especially for research, against the competition of private mining companies.

Initial steps have been taken for the construction of a badly needed office and laboratory building for the division at Hibbing, under an appropriation previously made by the legislature. Whether an adequate building can be constructed for the amount available, in view of the increase in construction costs, remains to be seen.

(For further data on the state iron mines, see the report of the Division of Lands and Minerals, herewith.)

Iron Range Resources and Rehabilitation

Foreseeing the decline of the mining industry which will accompany the gradual depletion and ultimate exhaustion of Minnesota's iron deposits, the state has undertaken a far-reaching program, in charge of the Commissioner of Iron Range Resources and Rehabilitation, financed by a percentage of the occupation tax on iron mining, to develop remaining resources and find new means of livelihood for the populations of the areas affected. The Conservation Department has a substantial interest in advancing this program, and the commissioner of conservation serves, together with three senators and three representatives from the state legislature, on the commission established by law to advise with the Commissioner of Iron Range Resources and Rehabilitation. Among the pending projects under this provision of special interest from the conservation standpoint are the system of giving financial assistance to counties for better land and timber management, and the promotion of experiments in production of powdered iron, use of peat, and the processing and marketing of timber products. Further information as to these and other activities may be obtained from the Commissioner of Iron Range Resources and Rehabilitation.

State Land

One of the important functions of the Division of Lands and Minerals is the management and sale of state lands which have not been reserved from sale for forests or other purposes. It is highly desirable that provision be made for a general survey and inventory of all the unsold lands as a guide for setting up a systematic program for sale or other disposition of these lands in order to realize the greatest possible value therefrom for the trust funds to which they belong.

An important special problem in this connection is the future use or disposition of state lands along lakes and streams which are now reserved from sale by law. Some of these lands are in use for public purposes. Others for which there is no present public use are being leased to private individuals as sites for cabins, summer homes, or resorts. Others are serving no special purpose at present. There is considerable demand from the county boards

concerned as well as from private individuals for the sale of these lands having water frontage in order that they may be improved and developed so as to serve useful purposes and provide tax revenue. On the other hand it is desirable to reserve enough of this frontage to provide ample opportunities for public access and use along lakes and streams.

In the absence of accurate information as to the nature and potential public uses of the reserved water front lands, the department is in no position to make any specific recommendations regarding their future disposition. This emphasizes the need for a survey as above proposed so that the condition of these lands can be determined and reported for possible action at the next session of the legislature.

Land Exchange

The subject of land exchange has already been discussed under the heading "Forest Land Exchange." There may be occasion for a few exchanges of land for agricultural or other purposes. However, they do not present any serious problems. The major problems of land exchange involve forest lands.

(For further data on state lands, see the reports of the Division of Lands and Minerals and the Division of Forestry, herewith.)

CONCLUSION ON ESSENTIALS OF CONSERVATION

The milk and honey days are over. Nature's storehouse will not stand unlimited raiding without replenishment. Only by the utmost effort in conserving all types of natural resources—soil, water, forests, wild life, and minerals—can the people of Minnesota maintain their place in the nation and provide for themselves and their posterity the abundant life which all desire.

* * * * *

DEPARTMENT ADMINISTRATION

So far as known there is no other state conservation department in the country which covers as wide a field under single management as the Minnesota department, with its six divisions — Lands and Minerals, Water Resources and Engineering, Forestry, Game and Fish, State Parks, and Tourist Bureau — all coordinated through the commissioner's office, with a Bureau of Information and a Legal Bureau performing the services indicated by their titles for the entire department. The commissioner as head of the department is charged with the duties of determining policies, prescribing regulations, delegating responsibilities to subordinates, and making decisions on various matters under the authority conferred on him by law. In short, he is required to act as general manager, coordinator, spark plug, trouble-shooter, and shock-absorber for the entire department. In discharging these functions the commissioner considers that it is his principal obligation, under the governor, to represent the interests of all the people of the state, and to see that all activities of the department are so planned and conducted as to render maximum service to the public. Accordingly it is the constant aim of the com-

missioner to keep in touch with the operations and projects of all the divisions throughout the state, as far as possible, and to give all citizens concerned therewith an opportunity to furnish information and express their views on such activities whenever desired. The office files and diaries of the commissioner and deputy commissioner will reveal how fully their time is occupied with these manifold duties both in and out of office hours.

Most of the matters dealt with by the commissioner's office involve activities covered in the foregoing sections or elsewhere in this report, and it is not necessary to recapitulate them here. However, there are some administrative matters of general interest which deserve further comment.

Department Policies

During the past biennium the department has continued to set its course under the general policy already in force, which is to base all decisions, plans, and operations on the facts, in accordance with the principles of good conservation, and in furtherance of the greatest good to the greatest number of people in the long run, regardless of personal or political pressure to the contrary. Adherence to this policy is not always easy, because of the highly controversial nature of most conservation problems, frequently involving sharp conflicts of interest or opinion among the people concerned. It is gratifying and encouraging to be able to report that in spite of many difficulties we have succeeded in upholding the policy above declared, with the support of the governor, the members of the legislature, conservation organizations, and the general public, under the protection given by the conservation organization act and the civil service act. Unswerving adherence to this policy is the key to all constructive progress in conservation, and it is to be hoped that the people of the state and their responsible officials will always continue to maintain it.

(See Seventh Biennial Report, p. 35)

Department Personnel

The strength of any organization lies in a combination of able leadership and competent rank and file. We think it can be said with confidence that few, if any public agencies in the state are staffed with employees who, on the whole, are better qualified for or more devoted to their work than the Conservation Department.

The chief personnel difficulty which the department has encountered in recent years has been the loss of several administrative or technical men in important positions who have left to accept higher salaries in the services of federal agencies, other states, or private employment. Some responsible positions requiring special training and experience remain unfilled because the salaries payable under present schedules are too low to attract competent men. Loss of key men or inability to fill key positions seriously impairs the efficiency of the operations affected. Much of the work of the Conservation Department is technical and complicated, requiring able planning and supervision by trained and experienced men. Actual knowledge of the field of

operations is especially important in conservation work. Change of leadership or lack of leadership is always a severe handicap to such work.

The conservation of the state's natural resources is important enough to command the best talent available. This work is certainly no less important than that of the federal government, other states, or private concerns. The state is the basic unit of government in this country, and should not play second fiddle to any other agency. Private industry proved long ago that it pays to employ the best qualified people that can be found for administrative and supervisory positions. The state does not gain but loses by paying salaries too low to attract and hold good men or women for such jobs. A study of this problem should be made with a view to the adoption of salary schedules that will insure the employment and retention of high-grade trained personnel wherever needed in the state service. This will unquestionably be the most economical policy in the long run.

There is also another personnel problem of equal or greater importance, namely, the need for readjustment of the salaries of all state employees to keep up with the increase in the cost of living which has occurred during and since the war. It is generally conceded that present state salary scales are inadequate in practically all grades, and that this is one of the important problems deserving immediate consideration by the legislature.

Special Activities of the Commissioner's Office

In addition to his regular departmental duties, the commissioner serves as ex officio member of the Water Pollution Control Commission (of which he is chairman), the Soil Conservation Committee, the Iron Range Resources and Rehabilitation Commission, the State Geographic Board, the Tri-State Waters Commission, and the South Dakota-Minnesota Boundary Waters Commission.

Mississippi and Missouri River Projects

The commissioner and deputy commissioner have represented the governor on the Upper Mississippi Valley Water Use Council and the Missouri River States Committee, interstate bodies formed to coordinate and secure recognition of the common interests of the respective states in connection with federal projects and operations in these river basins.

In this connection the Minnesota representatives have taken an active part in promoting cooperation among the states concerned and in advancing the principle that in all public projects and operations due recognition shall be given to conservation and all other public interests affected in proportion to the related public benefits. A recent notable example of progress along this line is the joint effort made by the state authorities, supported by conservation organizations, to curtail winter drawdowns of the Mississippi River pools practiced by the War Department in aid of navigation down stream, resulting in a decision by the War Department to dispense with such drawdowns in the future, also in a movement to secure passage of an act of congress prohibiting such drawdowns.

Northern Great Lakes Area Council

The commissioner of conservation and the director of the Tourist Bureau have participated in the organization and subsequent activities of the Northern Great Lakes Area Council, sponsored jointly by the governors of Michigan, Wisconsin, and Minnesota and the premier of the Province of Ontario, to carry on a widespread advertising campaign to attract tourists to this area.

Quetico-Superior Wilderness Project

The commissioner has taken a leading part, in cooperation with the officials of the U. S. Forest Service, county officials, and interested organizations, in promoting a program for the consolidation of the roadless areas of the Superior National Forest and the establishment of an international wilderness memorial area in the Quetico-Superior region on both sides of the boundary between Minnesota and Ontario. The object is to preserve a reasonable portion of this unique wilderness territory in its natural condition for public use and enjoyment, serving as a central attraction for resorts and other accommodations to be developed outside. An essential feature of this program, of great importance to the northern Minnesota counties, is a proposal for an act of congress providing adequate compensation to the counties in lieu of taxes lost on government-owned land in the national forests.

International Boundary Waters

The proceedings before the International Joint Commission for regulation of the international boundary waters between Minnesota and Ontario have continued to receive attention from the commissioner's office and the Division of Forestry. After years of effort, a definite plan for regulation of the large reservoirs controlled by the dams at International Falls and Kettle Falls has been evolved and is now under consideration, with good prospects that it may be adopted and put into effect in the near future. If this is consummated, it will go far to provide a satisfactory solution for a troublesome problem of long standing.

Keep Minnesota Green

The department, through the commissioner's office and the Division of Forestry, has continued to give active support to the Keep Minnesota Green Committee, sponsored by the governor and supported by many interested organizations and concerns, which is carrying on an effective educational campaign throughout the state to promote public cooperation in forest fire prevention.

(See Seventh Biennial Report, pages 35-36.)

Legal Bureau

The Legal Bureau, officially a branch of the attorney general's office, is an indispensable adjunct of the conservation department, and the cost of operating it is paid from department funds. It normally handles a large volume of routine legal business for all branches of the department, including advice on legal questions, preparation and approval of contracts, leases, and other documents, and drafting of orders, regulations, and legislative

bills. The attorneys of the bureau conduct investigations and represent the state in numerous hearings and court proceedings in which the department is interested. They handle acquisition of land for various projects, and examine titles for such acquisitions as well as for land exchanges.

With the resumption of normal activities in all fields since the end of the war, the work of the bureau is on the increase and taxes the capacity of the staff. Occasionally it is necessary to employ additional legal assistance for special cases. It is absolutely essential that sufficient funds be provided, either through regular appropriations to the department or attorney general or through earmarked contingent funds, so that adequate legal service will be available at all times to handle the department's business and protect important interests of the state.

Topographic Mapping

At the last session of the legislature the conservation department joined with the highway department, county authorities throughout the state, engineering societies, university departments, and many others in recommending appropriations for cooperation with the U. S. Geological Survey in completing the standard topographic survey of the state. Minnesota is at the foot of the list of states in progress with this survey. For lack of it the study of important engineering projects is handicapped, and much time and effort are spent in local and unrelated surveys which would be saved if a standard general topographic survey were completed. The state and its political subdivisions are continually losing time and money on this account. Moreover, since half the cost of this survey is paid from federal funds, Minnesota, through federal taxes, is helping to pay for the survey in other states, where it has advanced much further, but is getting little benefit from it herself. We renew our previous recommendations for an adequate appropriation to expedite completion of this survey in Minnesota without further delay.

(See Seventh Biennial Report, pages 37-38.)

Acknowledgments

Sincere acknowledgment is due to the governor, the members of the legislature, school officials, teachers, and pupils, conservation or sportsmen's associations, and many other organizations of men and women, boys and girls, as well as individuals interested in conservation throughout the state, for their cooperation in many worthwhile projects and activities and for their general support of a progressive conservation program. Without such support little real progress would be possible. Thanks are due to the officials and personnel of many federal, state, and local agencies concerned with conservation who have cooperated earnestly in furtherance of common objectives. We are also indebted to the directors of the several divisions and other officers and employees of the department for their loyalty and diligence in the performance of their work. To all of these and to many others not specifically mentioned we are deeply grateful for their aid in our efforts to advance the cause of conservation.

CHESTER S. WILSON
Commissioner of Conservation

Bureau of Information

CARL W. MOEN, *Director*

INTRODUCTION

"Conservation through Education" has been the motto of the bureau of information since it was established more than six years ago. The success of many conservation projects is dependent upon public understanding and support of the objectives sought. The best of conservation legislation or the most enlightened order from the commissioner's office may be nullified by public opinion if the people of Minnesota do not have a sympathetic understanding of the intent and purpose of the proposed action.

The functions of the bureau are a blend of information and education because of their close interrelationship and inseparable ends. The news releases issued by the bureau, for example, would seem to be largely informational, yet who would deny that they have an educational value? The bureau has proceeded on the assumption that, whether it be information or education, Minnesotans both young and old need to be reminded of the human stake they have in our natural resources and be prodded into an awareness of the fact that neither Minnesota nor the United States is any richer than the wealth represented by what remains of these resources.

The bureau staff consists of a director, deputy director, editor of publications, news release editor, educational adviser, special projects supervisor, film and literature circulation manager, photographer, and two stenographic employees. Predicated on the theme of conservation education, the principal functions of the bureau are:

Publication of a departmental magazine
Dissemination of conservation literature
Preparation of informational news releases
Maintaining a film loan library
Production of film shorts and movies
Maintaining a lecture service
Providing photographic service for the department
Promoting special conservation projects
Sponsoring a safety program

PUBLICATIONS

THE CONSERVATION VOLUNTEER, official magazine of the Department of Conservation, has been published since October, 1940. Only 3,000 copies of the first few issues were circulated but widespread public interest in the magazine has made it necessary to increase the circulation several

times until now 18,000 copies of each issue are published. There has been no increase in circulation during the war period and further increases cannot be made with present available funds. As a result, the magazine has a long waiting list of persons who are anxious to receive it.

Because of lack of funds to continue on a monthly basis, in September, 1943, The Conservation Volunteer became a bi-monthly. The six-issues-a-year publication basis continued during the war and is still in effect. If the magazine is to accommodate the thousands of Minnesotans who have expressed their desire to be placed on the mailing list, the bureau will need to receive a considerable larger appropriation than in the past.

An expanded circulation would permit the Volunteer to go to every public school and library in the state where its educational value would be greatly enhanced as a reference source. Many teachers have written to the bureau emphasizing the ease with which the material in the magazine can be adapted to classroom use.

Fossils and stones are on the agenda as Mildred Ericson leads a nature study group in Minnehaha Park, Minneapolis.

The Volunteer has a small out-of-state circulation to conservation agencies and a limited number of individuals professionally engaged in conservation work. Many of these people who have had an opportunity to compare our publication with the official magazines of the other state conservation departments praise the magazine and commend the quality of its

articles and the wide variety of factual material not published elsewhere concerning Minnesota's vast wealth of natural resources.

The department of conservation receives a large volume of mail from Minnesotans who seek information on specific subjects. It would not be feasible to answer all of these queries by personal letter since many of the correspondents desire detailed information. To answer this need and also to provide comprehensive coverage of individual subjects for general distribution, the bureau has published a series of special bulletins. Some of them are compilations of articles that have appeared in The Conservation Volunteer. Two of these bulletins have come out during the biennium:

LITTLE KNOWN FISHES OF MINNESOTA (Conservation Bulletin No. 9) is a description of the life histories and food value of many species of fish that are little known to Minnesota anglers.

MINNESOTA'S BIRDS OF PREY (Conservation Bulletin No. 10) provides a source of authentic information about the hawks and owls. This bulletin was published in view of the increased interest in these birds resulting from the fact that most of them were extended protection by the Legislature of 1945.

A supply of bulletins published in other years as well as those obtained from other conservation agencies are available in limited numbers to meet the demands for conservation literature that pour into the department of conservation every day in the year. In addition to requests that come directly to the bureau from outside of the department, a large number are received by the bureau from the six divisions of the department. To comply with these requests, 58,248 pieces of conservation literature, exclusive of the regular circulation of The Conservation Volunteer, were sent out from the mailing room of the bureau during the biennium.

Many letters have been received from enthusiastic users of these bulletins who have found them of aid in school instruction, boy and girl scout work, 4-H programs, and in other youth and adult education projects.

VISUAL EDUCATION

Because visual education attains greater popularity every year, the bureau's film loan library has been expanded during the past two years. The library now has 27 different films which have been reproduced so that there are in all 75 reels made up into 37 sets in circulation from the library. These sets were sent out 1,187 times to schools, conservation clubs, and various civic organizations in all parts of the state during the biennium. Approximately 300,000 persons attended the showing of the conservation films.

Now that wartime restrictions on films and other material and equipment have been lifted, the bureau will, if the necessary funds are provided, undertake to further expand its program of motion picture production during the coming two years. This must be done if the bureau is to respond

to the mounting number of requests for conservation films. Films showing the same subject become obsolete in a relatively short time. If a film library is to function as a medium of education and entertainment, it must have new subjects constantly added. Under present limitations many requests for films have to be refused and reservations have to be placed a long time in advance of the dates on which they are to be shown.

The experience of the armed services during the war indicated the value of visual education in stimulating learning processes. The agencies that seek to promote conservation education should lose no time in expanding the production of motion pictures and other visual aids as a means of reaching and enlisting the support of many persons and organizations who can not be reached in any other way.

One of the valuable services rendered by the bureau to the several divisions of the department of conservation is the carrying out of a large variety of photographic assignments. They include the assignment of the bureau's photographer in the field, developing, printing, enlarging and coloring photographs. Illustrative of photographic assignments in the field is the aerial game census conducted in the spring of 1946 which enabled the bureau of game through Pittman-Robertson cooperation to census big game populations from the air by means of aerial photographs. Because of the obvious economy of using the bureau's photographer and darkroom facilities, the service has grown rapidly.

SPECIAL SERVICES

Lecture service provided by a trained staff, is believed to be a most direct and effective means of promoting conservation education in schools, civic organizations and youth groups. Bureau representatives have appeared before 480 group meetings, reaching an estimated aggregate attendance of 60,000 people during the biennium. Many of these meetings included a showing of the bureau's motion pictures.

A series of special projects designed to further the study and comprehension of Minnesota's natural heritage and the problems related thereto have been carried out during the biennium. Members of the bureau staff cooperated in conservation programs and study groups at summer camps, 4-H and other youth organizations. A member of the bureau's staff spent a week lecturing and showing films at a short course for resorters at Grand Rapids in May 1946, sponsored by the University of Minnesota.

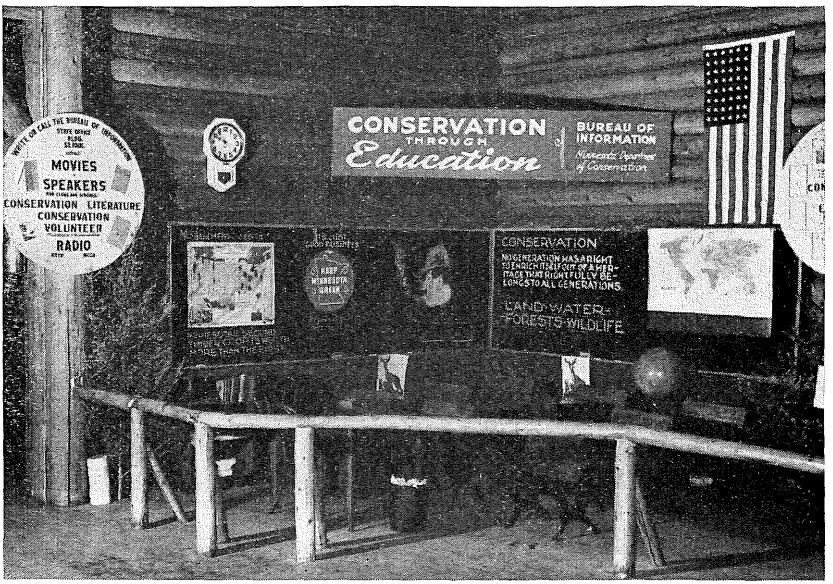
Essay Contests

"Our Land" was the subject of the second annual statewide high school essay contest co-sponsored by the Minnesota department of conservation and the Minnesota federation of women's clubs during the year of 1945. The contest aroused widespread interest and 175 high schools participated. Thousands of students submitted competitive essays dealing with the general subject of soil conservation. The essays from each of the ten women's clubs'

districts were judged by a committee of the district. The essays of the winning boy and girl in each district were then submitted to the bureau. A state-wide winner was named by a committee selected by the bureau from outstanding educators and conservation leaders.

The twenty state winners were awarded a five-day trip, expenses paid, into northern Minnesota as a conservation youth caravan. They made Douglas Lodge in Itasca state park their headquarters from which they made numerous side trips to learn of conservation problems and the natural history of the surrounding territory.

The third annual conservation essay contest dealt with the subject "Our Wildlife Heritage," and was held during the year of 1946. Interest in wildlife conservation and the gain in popularity of these contests was reflected in a total of 192 high schools officially entering the contest. Each year as these contestants become familiar with phases of conservation that might otherwise have escaped their attention, they become emissaries to pass on to others in their respective communities the information they have gained and thus advance the process of "conservation through education" another step.



Conservation Education Theme of State Fair Exhibit.

Conservation Building

The supervision and management of the conservation building at the state fair grounds has been assigned as a definite responsibility of the bureau. This building ranks as one of the most attractive buildings devoted exclusively to conservation found on any fair grounds and is increasing in popularity with fair visitors each year.

Water and Hunting Safety

For several years the director of the bureau of information has been secretary of the water and hunting section of the Minnesota safety council. The department of conservation is concerned directly with the prevention of injuries and fatalities caused by drowning and hunting accidents since both of these classes of accidents occur within fields of activity under the jurisdiction of the department. The bureau is keeping a record of accidents

Hunting safety posters mailed by Game and Fish Division in safety campaign.

and in other ways is attempting to cooperate with the Minnesota safety council in collecting factual information on which to base safety prevention education.

During 1944 there were 81 firearms accidents, 19 resulting in death. In 1945 there were 74 accidents, with 23 deaths.

In 1944, 10 deer hunters, 6 duck hunters, 2 pheasant hunters, and 1 other small game hunter lost their lives. In 1945, 9 deer, 5 duck, 4 pheasant and 5 other small game hunters were killed. In both years more injuries and deaths resulted from shots fired by others than by the victims.

During 1944 and 1945 there were 180 and 167 drownings respectively. These totals include those not directly related to recreation. The use of boats and canoes, swimming and fishing caused most of the accidents from drowning.

Overloading boats, standing while casting and raising anchor, and

changing of positions while fishing are causes of most drowning accidents. Failing to heed the advice of experienced boatmen and signs of threatening weather add to the totals.

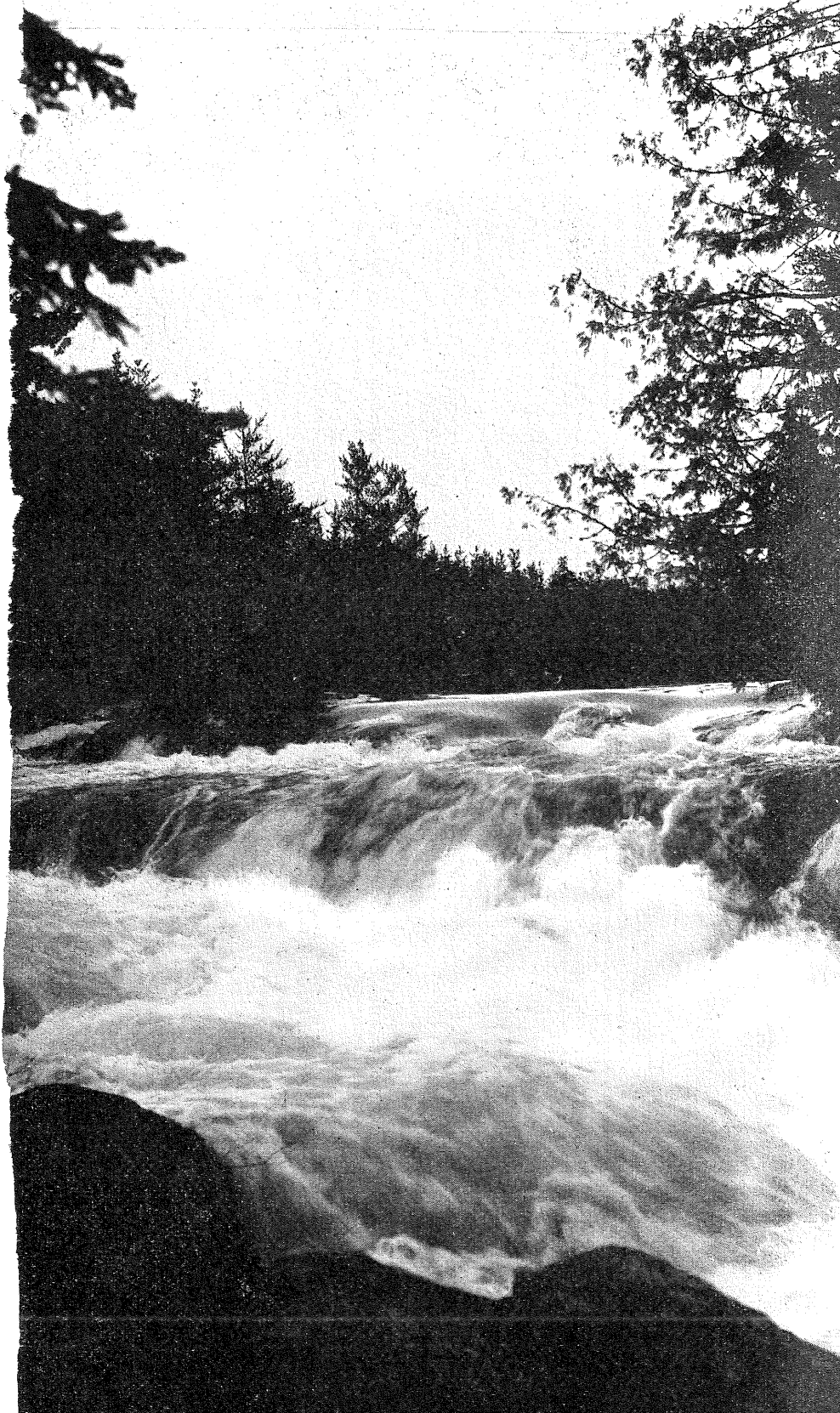
Warning signs for hunters, swimmers and boat users have been distributed by the bureau each year in the interests of safety. Many newspaper releases have been issued. Before the war, safety education was deemed important enough to merit the full-time service of a specialist in this field. Lack of funds does not permit such a specialist on the present staff.

RECOMMENDATIONS

The preceding report indicates the necessity of continued support of the major activities of the bureau of information, with increased emphasis in the following particularized fields:

1. The Conservation Volunteer
2. Visual Education, and
3. Safety

It is the recommendation of the bureau of information that the circulation of The Conservation Volunteer be substantially increased, that necessary maintenance and equipment be provided for efficient photographic service, and that safety be restored to pre-war status in the program of the bureau of information.



Division of Water Resources and Engineering

WALTER S. OLSON, *Director*

INTRODUCTION

The effects of the termination of hostilities have been reflected in many ways in the operation of the division. Those of the personnel who were granted leave for military service and defense production operations have returned. The lag in the rehabilitation of the nation's industries supplying necessary materials and equipment has delayed the resumption of the normal program. All construction, with the exception of emergency items, has had to be deferred because of high priorities assigned to materials and equipment needed to promote housing and industrial programs.

The scope of the work and problems for which the services of the division have been requested has greatly broadened during the past biennium and has created a backlog of requests which the division will not be able to take care of for several years unless augmented by additional personnel. Investigation of the water resources of the state in their relation to industrial development has required a considerable amount of effort and time. The added impetus given to the recognition and development of recreational facilities has resulted in a large increase in the number of requests for investigation of our lakes and streams. Preservation of public rights to the use of our public waters against encroachment by private and industrial development and the administration of laws relating to our public waters has been greatly emphasized during the biennium. The return of normal and greater than normal precipitation in the past three or four years has precipitated many requests for investigations to ascertain the practicability and feasibility, as well as public and private rights in the control and utilization of water supplies. Drainage of agricultural lands, problems of flood control and those involving the maintenance of lake levels have progressively increased far beyond the ability of the present staff to take care of them properly.

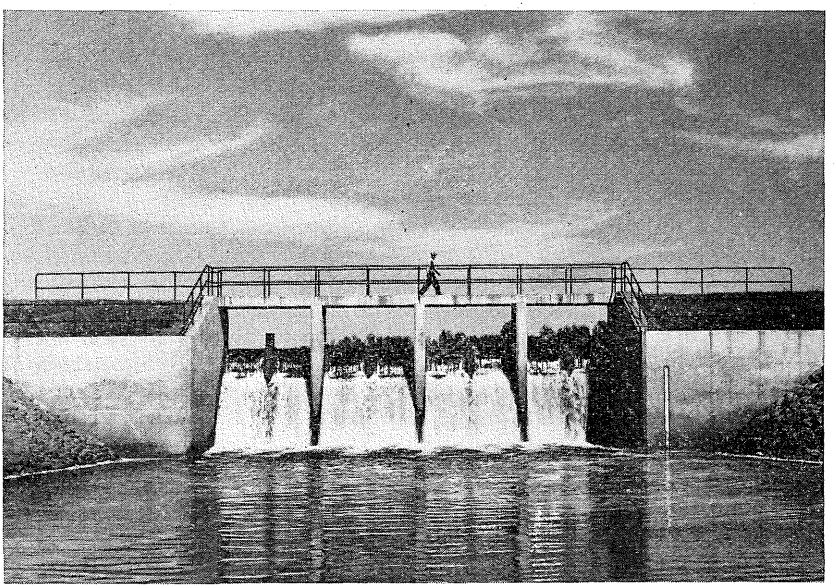
The division has confined itself closely to such investigations, surveys, designs, and studies necessary to aid in the adjudication of private and public rights on public bodies of water and in the preparation of a reservoir of well developed and soundly designed projects available for immediate construction in the post-war period when conditions permit and funds become available.

In addition to its own program, the division of water resources has made numerous investigations and surveys and prepared engineering and architectural plans for the division of game and fish. See tables No. 2 and 3. Construction of those projects which require materials essential for the housing program, should be held in abeyance until the present demand becomes less acute.

War time demands for increased agricultural production, together with

recent abnormally heavy precipitation have revived interest in drainage work. This is reflected in a marked increase in the number of drainage projects which have been submitted to the division for review and recommendations as required by law.

One of the functions of the division is to act in an advisory capacity to the courts and county boards in public drainage proceedings by examining and approving, making recommendations for changes or disapproving plans submitted by engineers appointed to act in the proceedings. It is recognized that the productivity of the soil and the use value of the lands to be affected by a proposed drainage ditch should be given every consideration in the extent to which its drainage can be justified.



Willow River dam and bridge.

Notwithstanding experiences with alternate drouth and excessive rainfall, the public is slow to appreciate the value of the adoption and uninterrupted pursuit of a program for the development of water supplies, perhaps its most valuable and widely essential natural resource, so as to provide for its control and use under varying conditions of precipitation. Much more must be learned of the volume and sources of our water resources after water has reached us from rain and snow. Much has been written about the development of the industrial life of the state, nearly all of which has been possible only because of the availability of water, but scant reference is made to the critical part that water is playing in the industrial role. Furthermore, new manufacturing processes are continually being developed which create constantly increasing demands upon our limited water supply. The development of adequate supplies of water for the beneficiation of low

grade iron ores for instance, is a problem of considerable magnitude confronting iron range mining operators. The processing of raw agricultural products into finished foods, fibers and valuable bi-products is state-wide in scope, and its successful progress is being measured by the extent and quality of water available for the purpose.

A dependable appraisal of the volume and sources of supplies for these and other private and public needs calls for a vast amount of information and data not yet available. The establishment of policies with regard to the use of our water supplies to provide a fair and equitable apportionment among the many users is dependent upon an understanding by the public, first, of the public character of the ownership of the water and, second, the allocation of their use so that they may produce the greatest benefits to the largest number of people for the longest time. This understanding of the difference between public and private rights in the use of water, we believe to be the greatest present need in the development of this natural resource. The issues which arise in the use of water for recreation have been given public attention quite extensively in recent years and as a result the value of water regulated or proposed to be regulated is being reappraised for uses other than those for which the projects were originally constructed or designed so as to include a broader recognition of all possible public needs.

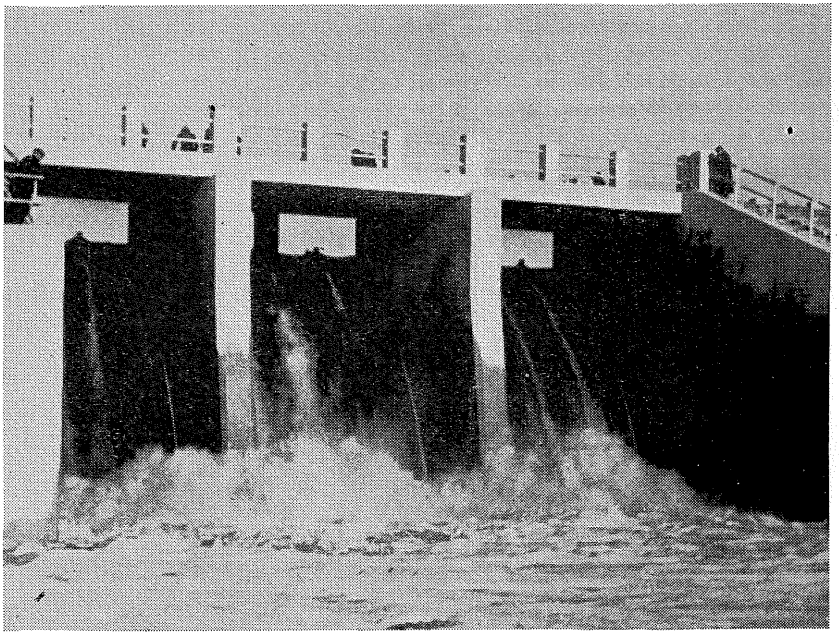
More liberal financial support of essential projects necessary to bring about a greater and more beneficial use of our waters is an outstanding need if further substantial progress in this field is to be made.

The division will continue to bring to the attention of the public the basic facts bearing on our supplies, the growing demands upon our water resources for beneficial public uses, to aid and encourage the promotion of projects that will enhance the use of these resources and to supervise the use of the waters of the state in the best public interest. The degree to which these objectives can be attained most effectively will be measured by the available data bearing on the location, quantity and quality of our supplies for use in the promotion of domestic, industrial and recreational uses, thus to add to the social life and economic prosperity of the people. These aims can be accomplished only through increased funds for surveys and research and a sustained public support for the solution of problems now pending and those that will continue to arise in the administration of the water resources of the state.

DRAINAGE ACTIVITIES

The activities of the agricultural industry to put to use increased acreages to meet the present demands for food production have included the restoration of large acreages of lands through drainage. Drainage projects have included the repair or improvement of old as well as the construction of new systems. These activities have brought to light a number of errors and failures in the earlier systems.

Past experiences have proven that insufficient consideration was given



Before construction of this dam, creating Bronson Lake, Kittson county, water was hauled as far as 30 miles during the drought.

to the economic phases of this problem in proceedings for the establishment and construction of public drainage systems. Lands of highly productive soils in need of drainage located near favorable markets justify relatively heavy expenditures for drainage. On the other hand less productive lands and lands handicapped by distance from market or climatic limitations and which, because of these limitations, yield less from their operations, cannot carry the financial burden of the same thorough reclamation as the more favored lands. It is therefore necessary in any well-designed system to balance the cost of the improvements against the probable returns to be expected from the lands after they are drained.

Maintenance of public drainage systems have been grossly neglected with the result that in many instances the cost of rehabilitating old drains to their original designs and construction far exceeds the original cost. Recent years of heavy precipitation have emphasized this neglect in keeping ditches operative and the importance of continuous maintenance, more especially of systems that serve as outlets.

Grass, brush and tree growth in the ditches together with the caving in of relatively steep side slopes have reduced the capacity of ditch systems in varying degrees, in some instances nullifying the benefits for which the projects were built.

Many of the early drainage systems were constructed to meet economic

conditions prevailing at that time, and their restoration to their original design or construction is not found sufficient to adequately meet the present day demands of agriculture. To meet this demand deepening, widening and otherwise improving the old systems will not be adequate in many instances but will require the establishment of entirely new projects.

The capacity of the older drains to carry away the surface waters entering them has been wholly inadequate in too many cases. Many of these were designed and constructed without a coordination between the total areas contributing waters and the capacities of the drains to carry them away. Then as extensions were later added the original system became overburdened resulting in the flooding of lands that had been assessed for the original costs and were supposed to be protected from overflow.

During the periods of drought large areas of lands located along streams and adjacent to lakes were temporarily made available for the production of hay and pasturage by receding water levels. Some of these accretions were actually cultivated. On the return of normal precipitation restored water levels again reclaimed these lands for storage. This use of shore lands for farming purposes for a period of fifteen years and longer during the unbroken drought following 1920 had materially increased the income of the operators. As a result when normal rain and snowfall returned and these border lands were again brought back to their natural conditions as beds of lakes and marshes, efforts were being made in many instances to launch projects for the continuation of drought-time use of these lands by drainage improvements. These projects are generally costly and of a flood control nature and reclamation of lands generally looked upon as having been dedicated to public use is meeting with considerable opposition. The economic justification of such ventures merits careful study both from the viewpoint of costs as well as the ultimate adaptability of such reclaimed lands for profitable farming.

Recognizing these major faults of drainage practices as emphasized by experiences with the old ditch systems, the division has attempted to emphasize to petitioners and public drainage officials the importance of designing and constructing drainage works adequate to meet present needs rather than to restore old systems, already proved inadequate, to their original condition. Flattened side slopes which will permit the use of farm machinery to cut and remove brush, weeds and grasses as well as the pasturing of live stock and thus greatly reduce the cost of maintenance is being encouraged. Although the initial cost of such drains may be greater, the cost of long time maintenance will be very much reduced.

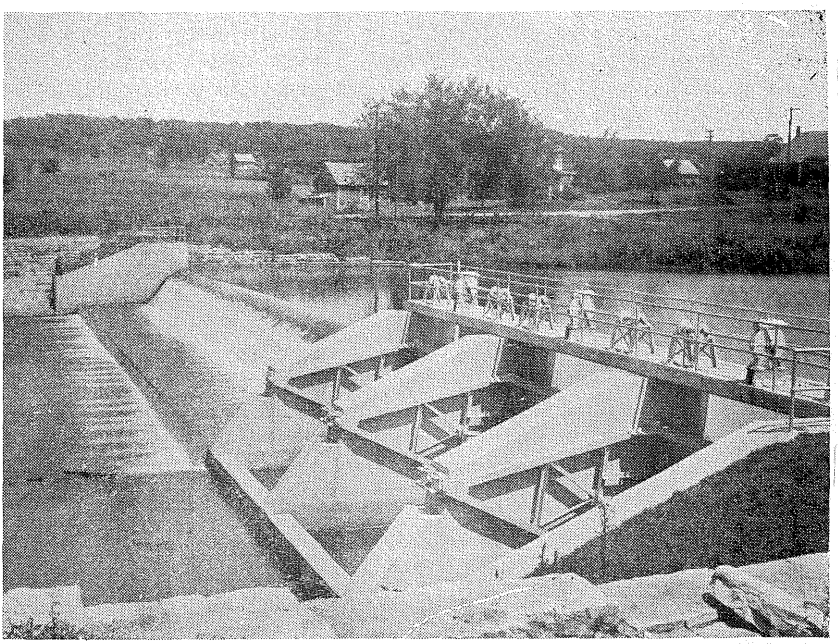
Drainage Legislation

The large number of requests for the rehabilitation of old public drainage systems in the past five or six years has forcibly brought to light the ambiguous and wholly unworkable character of the drainage statutes in force prior to 1945. The old statutes authorizing repairs have been so amended to meet varying public opinion through the years as to make im-

possible either a clear understanding of their meaning or even to differentiate between repair and improvement. The statutes, as amended from time to time, made the maintenance and restoration of the original ditches almost prohibitive.

The legislature of 1945, after a careful study of the drainage statutes, enacted several amendments to meet this situation. Laws 1945, Chapters 71 and 82, provide clearly defined procedures for improvements and repairs, respectively, of old drainage systems, under which each may be accomplished, as well as authorizing, in the case of the repair amendment, changes in the prisms or sections of the ditches to provide for flatter side slopes and the leveling of spoil banks. Laws 1945, Chapter 33, further provide that 25% of the freeholders, whose property is flooded on a ditch which has been made an outlet for subsequent drainage systems, can petition for relief and ask that property benefited by later ditches be included and assessed for the cost of the enlarging and reconstructing the original outlet so as to relieve the situation.

Because of the large number of amendments which have been made to the public drainage statutes during the forty or more years since the drainage of lands became a public function, the changes which have taken place in land values and in farm practices and marketing call for a reappraisal of the old ditch systems in terms of present economic conditions. The old code has become obsolete and ineffective in many important details in coping



Equipped with Taintor gates and a long ogee spillway, this special dam handles flash floods of the Zumbro River at Rochester.

with present conditions. The need for a revised code has been recognized for many years but has been emphasized by the recent increase in rainfall, reducing farm production at a time when the demand for increased production, high prices of products, increased land values, and high taxes all combine to stress the hazard confronting farmers operating lands subject to saturation and flooding.

At the urgent demands of representatives from areas in need of drainage, the legislature of 1945 created an interim committee to draw up a new drainage code. This committee, consisting of three members of the senate, three members of the house, and the attorney general with the assistance of a legal counsel appointed by the committee and the division of water resources and engineering have prepared such a code for presentation to the legislature of 1947 for review and approval. With the prevailing state-wide need for the rehabilitation of existing public drainage systems and the many new projects being proposed, a workable and understandable drainage code is an imperative necessity.

WATER CONTROL

The administration of the present laws concerning the use and allocation of the waters of the state has become increasingly complex. The demands for additional supplies for present and for prospective future users have brought to light the limitation of the supply. The state is recognized as having the largest water surface area of any state in the nation, yet an analysis of the situation emphasizes the fact that we are dependent almost entirely on the rain and snow that fall within the state for our supplies. This precipitation, over the state, averages approximately 25 inches per year. The problem confronting the state in its stewardship of this natural resource is to capture and conserve as much of this precipitation and make it available for use as many times as is possible before it leaves the state. This means a progressively closer control of our water supplies as demands continue to grow and an aggressive campaign to prevent the polution of the sources from which we seek our supplies.

Even during the last biennium it has been impossible to provide sufficient water for developments that are pending. The solution to the problem of finding additional supplies and of distributing them equitably hinges on a complete knowledge of the quantity, quality and location of this natural resource. Impressed as we are with the water we see in our lakes and streams, the greatest source of supply is perhaps that held in storage in the ground, commonly known as sub-surface waters. Very little is known about our underground waters. An intensive program of research in this field is necessary in order to reveal where dependable supplies may be had from this source.

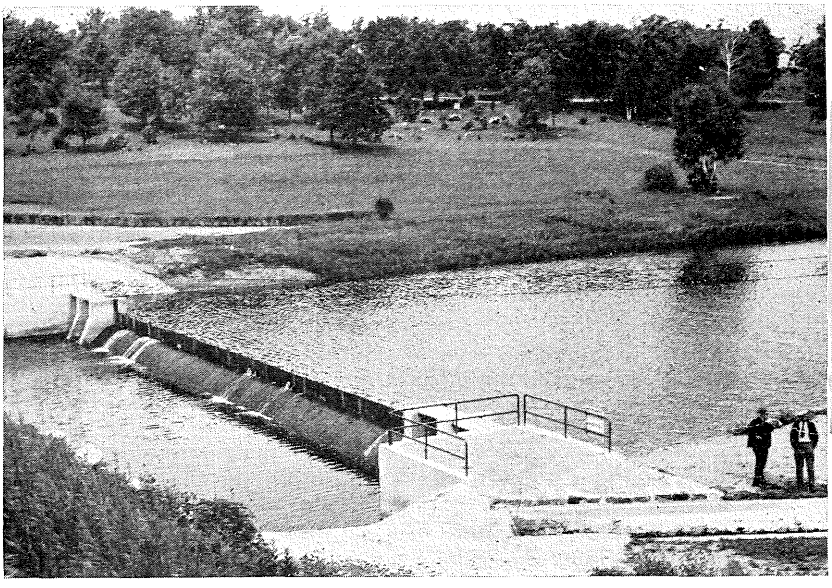
Lake Levels

Minnesota has a total area of approximately 54,000,000 acres, of which 3,500,000 acres embracing 11,000 lakes and thousands of miles of streams

are water. As an element to add to the attractiveness of the state, none other compares with it. This is reflected in the increased public interest shown in the manner in which these water areas, particularly the lakes, may be made to contribute most to the general public welfare and enjoyment.

The issue as to how far shore lines and beds of lakes are public as compared with the rights of private riparian land owners to the use of such shores and beds is being raised in an increasing number of cases. Laws 1937, Chapter 468, authorizes the department of conservation to make investigations to determine natural ordinary high levels. The level defined by the state supreme court as the line which separates the public from private rights to lake shores and beds. Requests for these investigations have continued on the increase, even during the war period, and have occupied the division to the full extent of its resources. These investigations and subsequent public hearings on the recommendations of the department require extensive surveys and preparation of evidence.

The division has requests for determination of natural ordinary high-water levels on upwards of 100 lakes, on which it has been impossible to act for lack of personnel.



Rum River water conservation dam.

Control

The trend in activities of the division with respect to controls of waters are reflected to a marked degree by the abundance or scarcity of precipitation. During periods when precipitation is below normal and when lakes recede to objectionably low stages and flows in streams decrease, the public

demands action to bring about the conservation of supplies and the maintenance of lake levels by regulation of outflow. During such a period the division is called upon to use all of its resources to meet and solve problems created by water shortages.

During periods of heavy rain and snowfall, when lakes rise above the desired levels and lands become saturated to a point where production suffers, the pendulum swings to the other extreme and the public expects the division to aid in land drainage, increase outflow from lakes to prevent their rising to objectionably high stages, solve flood problems, and in general to operate lake and reservoir controls for flood control rather than for conserving supplies.

Full realization of the benefits derived from the construction and operation of water conservation projects can be attained only when policies are founded on an authentic knowledge of the behavior of the lakes and streams to be regulated. This knowledge must be gained from hydrological data accumulated on each lake or stream where control is exercised.

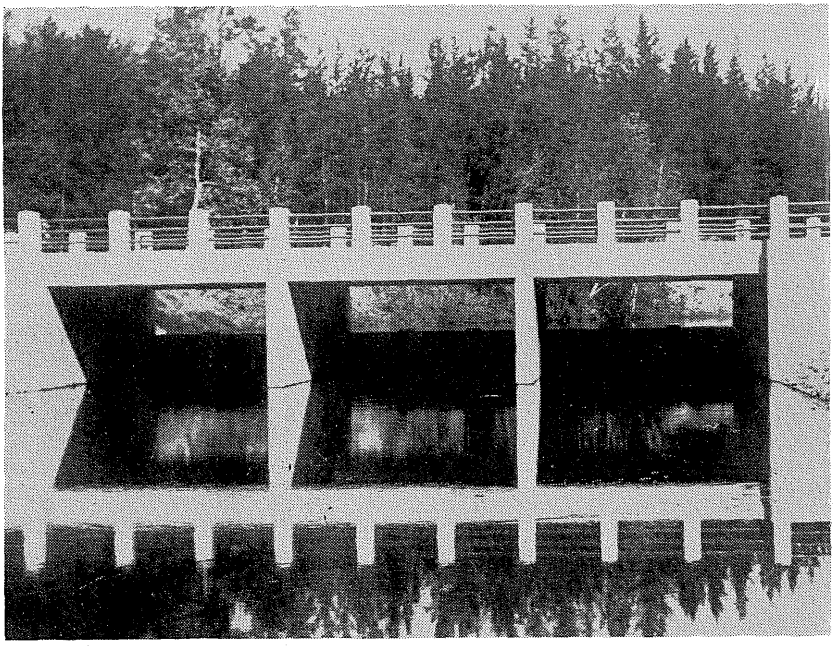
With few exceptions the structures with which control of lakes is now exercised are of the low-head type and, because rights to regulate levels above natural ordinary high levels have not been acquired except in rare instances, function only within natural fluctuations. They act to prevent extreme lowering in times of deficient precipitation and have been so designed as to permit the outlet to function as in a state of nature at all of the higher stages of levels and outflow. In other words, during periods of high discharge, the control structures have capacities equal to or greater than those of the water channels below the location of the controls.

It has been the practice to control reservoirs for a single purpose such as the generation of hydro-electric power, storage for various purposes, flood control and other uses. During recent years many of the large structures over the United States have been erected to serve more than one purpose or use. These are termed "multiple purpose" reservoirs. Only two such structures have been erected in Minnesota, namely, the Lac qui Parle and Big Stone Lake projects. The design and operation of "multiple purpose" structures is difficult due to extremes of precipitation but primarily to the conflicts in the attitudes of interests affected in the objectives which they wish to have accomplished. It is difficult to reconcile these conflicting viewpoints largely because of lack of understanding by the people affected, of the fact that "multiple purpose" projects are at best a compromise to provide relief in extreme conditions of flooding and shortages of water during which times each of these objectives will have to yield something to the other. They should not expect the operation as a complete cure-all to these conflicting opposing situations. Controls of this type should be subject to change in operation when a re-evaluation of the uses which it serves indicates that the public would be better served by such a change.

The division has more than 350 lake control structures under its supervision operating at the present time and collects and records approximately fifty thousand gage readings annually. Approximately 300 part-time observ-

ers are employed to gather these data. In localities where paid observers cannot be secured, game wardens and forest rangers cooperate in this work. Controls are operated and observations are made at such intervals as may be determined by and in accordance with instructions furnished by the division. Gages are being maintained on 41 lakes on which there are no controls but where data are being collected in order to learn of their behavior and characteristics. These latter readings are obtained through a cooperative agreement with the United States Geological Survey. By means of a similar cooperation, gage readings are observed and reported at twenty-five privately owned dams and one hundred eighteen stream gaging stations to aid in studies of stream flow.

Since the technique of controlling the levels of a body of water must be developed from a knowledge of its size, shape, slope, soil, cover, and other characteristics of the area contributing run-off waters, it is clearly seen how each lake or other body of water becomes a problem in itself. These characteristics, together with those of the outlet stream, define the relationship between the inflow and the outflow, which must be understood if artificial control is to be kept within legal limitations. A lake receiving inflow from a drainage area fifty or more times as large as that of the lake itself is much more limited as to the possibility for artificial control as compared to one where the ratio between the drainage area and lake area is not so great. Knowledge, therefore, of the characteristics of the catchment areas as well as of the lakes themselves is fundamental and can only be obtained from



This modern combination bridge and dam regulates Potato Lake, Hubbard county, to the same level as the old timber dam.

studies of weather bureau records, stream gaging records, observations of lake stages, and topography and cover found on lands yielding run-off waters to the lakes under control.

A maximum use of this natural resource is largely dependent upon the development of strategically located control structures and their efficient operation.

INDUSTRIAL USES

The adequacy of water supplies, perhaps more than any other single factor, will be a measure of future industrial expansion in the state. It will require more than is needed for normal domestic, municipal and power demands. The economic advantages of processing agricultural products raised within the state as a means of creating employment and reducing transportation cost of raw material is being recognized more and more. Food processing plants need large volumes of water not only in manufacturing but in the sanitary disposal of the wastes. As the known supplies of merchantable iron ores approach depletion, the low grade ore which must be treated and concentrated will have to take their place. This treatment of low grade ores requires large volumes of water available in the vicinity where these ores are found. Future expansion of low grade iron mining may well be limited by insufficient water supplies. An intense study of both surface and underground sources will have to precede any material expansion of this class of mining operations.

A small beginning was made during the biennium in an effort to find additional potential underground water supplies in the Moorhead-Fargo area where the proposed establishment of a sugar beet plant and other food processing plants were held in abeyance pending assurances that dependable water supplies were available. Test wells for the discovery of underground sources are being drilled and, if found, studies will be made to determine if such sources are of the type that may be recharged artificially against depletion by increased percolation of waters from the surface.

These investigations are being carried on in cooperation with and under the supervision of the United States Geological Survey. A fund of $30,000 to defray their costs has been contributed by the following agencies and in the amounts indicated:

United States Geological Survey	50 %	$15,000.00
State of Minnesota	8⅓ %	2,500.00
State of North Dakota	8⅓ %	2,500.00
Clay County, Minnesota	8⅓ %	2,500.00
Cass County, North Dakota	8⅓ %	2,500.00
City of Moorhead	8⅓ %	2,500.00
City of Fargo	8⅓ %	2,500.00
Totals	100 %	$30,000.00

Then there are a number of other smaller industries, such as wild rice lture on lakes, development of cranberry marshes, construction or selection minnow rearing ponds for private production of bait, all of them de-

pendent on water and how and where it may be found. In all ventures of this type the advice of the division is sought and is presumed to have information as to the practicability of these plans.

The legislature of 1941 empowered the Department of Conservation to order the capping of artesian wells to control the flow to actual quantities needed so as to maintain the ground water at as high a level as possible and to insure as far as practicable an equitable distribution of water to all wells supplied from the same source as a step toward conserving underground water supplies. In the administration of this law, the division has made many investigations of flowing wells and has enlisted the cooperation of the owners of wells in the installation of devices to limit the flow to actual needs.

WATER POLLUTION

The prevention of pollution of waters of the state is primarily the function of the department of public health and water pollution control commission created by the legislature in 1945. Because of the inseparable relation which exists between sources and extent of supplies and sources and type of pollution, an increasing number of problems relating to pollution and disposal of waste products are being referred to the division.

The treatment of waste materials creating water pollution differ with the types of wastes and are many and varied. The treatment of domestic sewage can be partial or complete, as the conditions demand, by any one of several methods. The treatment of wastes from industries such as canneries, dehydration plants, creameries, beet sugar plants, iron ore concentration plants and paper pulp plants each becomes a problem largely by itself. Waste materials from industrial plants are relatively greater in volume and much higher in oxygen demand than is generally true of domestic sewage. The immediate treatment of many industrial wastes is costly and often found prohibitive. To reduce this cost, many industrial plants are resorting to the ponding of their waste materials in artificially constructed basins or reservoirs where bacterial action from natural processes over a period of time lowers the oxygen demand and permits them to be flushed into the streams and rivers during periods of high flow in the early spring months.

The disposal of mine waters and the treatment of low-grade iron ores on the iron ranges are creating a source of pollution by discolorations and turbidity which is becoming more and more of a problem as the mining of low-grade ores expands. During the past three operating seasons, the division has contacted, consulted, and advised mine operators on plans to meet this situation especially on the construction of tailings basins to prevent their failure and on methods to be used to prevent or reduce to a minimum the discharge of heavily polluted wash waters from treatment plants and mine waters into adjacent streams and lakes. Diversion of streams around mining operations, pumping of colored mine waters into swampy areas where solids may settle and filter out are among other expediences which have been suggested and found practicable in several instances. Mine owners realize their responsibilities to protect public waters and generally are

cooperating whole-heartedly in solving their waste disposal problems and at considerable expense have cooperated with the division in finding ways and means of preventing mine wastes from entering streams and lakes.

INVESTIGATIONS AND SURVEYS

Requests for surveys and investigations of projects for water use and regulation by individuals and public agencies have far exceeded the capacity of the division to give them full attention.

In the list are 105 requests for the determination of natural ordinary high water levels on as many lakes and rivers, of which 23 have been completed, hearings held and orders made; seven floods have been investigated; examinations have been made of plans for 79 public drainage systems, including 12 on which field studies were conducted, and reports and recommendations made and filed with drainage officials; 35 investigations were made of tailings basins, stilling basins, dikes, and appurtenant works in connection with the treatment of low-grade iron ores. In addition upwards of 200 applications have been received asking for permits to dredge in lakes and streams and for uses of water, on all of which some action has been taken. Nearly 150 topographic surveys have been made of sites and flowage for proposed lake and stream improvement structures, of which 60 were made at the request of the division of game and fish.

CONSTRUCTION

War time and post war restrictions in the use of labor and critical materials, coupled with scarcities thereof, has made it necessary for the division to defer proposed construction work pending the time when near normal conditions will have returned.

A backlog of plans for an extensive program of work is ready and actual construction work can be commenced on most of these projects at any time when conditions affecting the construction industry will permit and funds are available. Table No. 1 reports the water conservation projects for which construction plans are complete. Tables Nos. 2 and 3 deals with proposed new construction for the division of game and fish. Table No. 2 fish rearing ponds. Table No. 3 fish hatcheries. Since the unemployment relief program, funds for the construction of projects for the conservation and betterment of the use of our waters have been restricted to monies made available by private individuals and groups and such public agencies clothed with authority to expend funds for these purposes. No state funds have been made available to the division for construction purposes. If the state is to make the most efficient use of its waters in deriving the maximum benefit from them, their development and control will necessitate the expenditure of state funds. With the vast sums being expended in other sections of the nation for these purposes, the lack of recognition by the state in the development of this resource will be very deeply reflected in the social life and economic welfare of its people.

TABLE NO. 1

POST-WAR WATER CONSERVATION PROJECTS

Plans Complete for Construction

Ident. No.	Name of Lake	County	Description	Man Days	Labor Cost	Material and Equipment Cost	Total Cost
1-11	Spring Creek	Goodhue	Dam and Culvert	2155	$11,850.00	$10,364.00	$22,214.00
1-18	Rice	Dodge and Steele	Special Dam, Dam and Bridge	430	2,365.00	875.00	3,240.00
1-23	Zumbro River	Dodge	Special	2930	16,115.00	10,424.00	26,539.00
2-23	Jefferson	Le Sueur	Equalizer Culvert	216	1,184.00	1,278.00	2,462.00
2-27	Fox	Martin	Type "C" Dam	235	1,290.00	600.00	1,890.00
2-37	Cobb River Dam	Blue Earth	Special Dam	1500	8,250.00	4,512.00	12,762.00
2-56	Cannon River	Rice	Special Dam	2136	11,750.00	7,250.00	19,000.00
2-59	Wilson	Watonwan	Type "C" Dam	314	1,727.00	1,373.00	3,100.00
2-61	Charlotte	Martin	Type "C" Dam	140	770.00	600.00	1,370.00
2-65	Creek	Martin	Special	445	2,450.00	1,860.00	4,310.00
2-67	Cottonwood	Watonwan	Culvert & Type "C" Dam	521	2,865.00	3,165.00	6,030.00
2-69	Martin	Martin	Type "C" Dam	341	1,875.00	935.00	2,810.00
2-85	High	Martin	Type "C" Dam	209	1,150.00	1,042.00	2,192.00
2-86	Irish	Watonwan	Type "C" Dam	615	3,380.00	2,375.00	5,755.00
2-99	Perch	Martin	Type "C" Dam	271	1,488.00	1,642.00	3,130.00
2-102	Rice	Nicollet	Type "C" Dam	117	645.00	525.00	1,170.00
2-109	School	Watonwan	Type "C" Dam	500	2,750.00	1,185.00	3,935.00
2-123	Rice	Blue Earth	Type "C" Dam	499	2,720.00	1,010.00	3,730.00
3-18	Clear	Lyon	Diversion	704	3,873.00	3,014.00	6,887.00
3-21	Augusta	Cottonwood	Type "C" Dam	594	3,270.00	2,360.00	5,630.00
3-25	Double	Cottonwood	Type "C" Dam	953	5,212.00	2,630.00	7,842.00
3-37	Lime	Murray	Type "C" Dam	426	2,340.00	1,225.00	3,565.00
3-87	Corabelle	Murray	Type "C" Dam	218	1,200.00	550.00	1,750.00
4-14	Crow River near New London	Kandiyohi	Drop Inlet	2800	15,400.00	8,845.00	24,200.00
4-18	Addie	McLeod	Dam and Culvert	596	3,275.00	2,000.00	5,275.00
4-29	Boon	Renville	Type "C" Dam	466	2,560.00	1,540.00	4,100.00
4-36	Eagle	Sherburne	Dam and Culvert	435	2,390.00	1,310.00	3,700.00
4-42	Otter	McLeod	Special Dam	2145	11,800.00	11,180.00	22,980.00
4-48	Long	Carver	Type "C" Dam	186	1,025.00	650.00	1,675.00
4-53	Mud	Renville	Type "C" Dam	359	1,975.00	1,850.00	3,825.00
4-62	Round Grove	McLeod	Diversion	545	2,995.00	2,435.00	5,430.00
4-63	Sand	Sibley	Diversion	411	2,260.00	3,108.00	5,368.00
4-64	Silver	Wright	Type "C" Dam	445	2,450.00	1,580.00	4,030.00
4-67	Titlow	Sibley	Type "C" Dam	500	2,625.00	2,230.00	4,855.00
4-77	Winsted	McLeod	Dam and Culvert	910	5,000.00	3,500.00	8,500.00
4-128	Belle	Meeker	Culvert and Control	230	1,380.00	920.00	2,300.00
4-142	Hoff	Meeker	Dam and Culvert	350	1,925.00	1,975.00	3,900.00
4-143	Jennie	Meeker	Type "C" Dam	82	490.00	360.00	850.00
5-27	George	Anoka	Dam and Culvert	240	1,320.00	1,080.00	2,400.00
5-65	Sand Creek	Scott	Park Project	3390	18,640.00	16,345.00	34,985.00

5-75	Nine Mile	Hennepin	Type "C" Dam	351	1,930.00	2,230.00	4,160.00
5-165	Huften	Hennepin	Dam and Culvert	231	1,270.00	515.00	1,785.00
6-55	Frank	Swift	Diversion	3206	17,633.00	8,272.00	25,905.00
6-57	Goose	Pope	Diversion	300	1,650.00	8,350.00	10,000.00
6-60	Hassel	Swift	Type "C" Dam	175	960.00	920.00	1,880.00
6-81	Moore	Swift	Equalizer Culvert	20	110.00	465.00	575.00
6-150	Nelson	Grant	Type "C" Dam	194	1,160.00	940.00	2,100.00
7-12	Sylvia	Stearns	Dam and Bridge	1130	6,215.00	4,260.00	10,475.00
7-52	Moose	Todd	Type "C" Dam	164	902.00	678.00	1,580.00
8-10	Rush	Chisago	Type "C" Dam	400	2,120.00	3,540.00	5,660.00
8-19	Paul	Isanti	Type "C" Dam	232	1,275.00	1,050.00	2,325.00
8-25	Tozer	Pine	Special	927	5,100.00	4,480.00	9,580.00
8-33	Oak	Pine	Type "C" Dam	220	1,210.00	875.00	2,085.00
8-41	North Branch Sunrise River	Chisago	Drop Inlet	2800	15,400.00	10,000.00	25,400.00
8-206	Comfort	Chisago	Dam and Bridge	670	3,680.00	2,745.00	6,425.00
9-18A	Bucks Mills	Becker	Bridge	593	3,260.00	2,100.00	5,360.00
9-59	Buchanan	Otter Tail	Diversion	220	1,200.00	2,200.00	3,400.00
9-71	Pelican River, Pelican Rapids	Otter Tail	Special Dam	2410	13,255.00	9,320.00	22,575.00
10-6	Hubert	Crow Wing	Bridge-Culvert Type "C" Dam	500	2,750.00	4,280.00	7,130.00
10-72	Duck	Crow Wing	Dam and Bridge	306	1,685.00	1,860.00	3,545.00
11-7	Cameron	Polk	Diversion	358	1,970.00	1,409.00	3,379.00
11-16	Roseau River	Roseau	Dam and Bridge	4682	25,750.00	22,604.00	48,354.00
11-18	Sand Hill River	Polk	Special	700	3,842.00	4,155.00	7,997.00
11-28	Turtle	Polk	Diversion	3890	21,380.00	33,340.00	54,720.00
12-72	Grant	Beltrami	Type "C" Dam	283	1,555.00	920.00	2,475.00
12-86	Long	Hubbard	Drop Inlet	1345	7,397.00	6,878.00	14,875.00
12-245	Cass	Cass and Beltrami	Special	4200	21,000.00	27,400.00	48,400.00
14-31	Long	Itasca	Drop Inlet	2031	11,169.00	7,281.00	18,450.00
14-32	Mud	Cass	Bridge	1136	6,250.00	5,870.00	12,120.00
14-56	Howard	Cass	Dam and Culvert	273	1,500.00	690.00	2,190.00
14-84	Big Rice	Cass	Type "C" Dam, Special Dam, etc	1939	10,665.00	5,800.00	16,465.00
14-92	Squaw	Itasca	Special	1971	10,843.00	8,212.00	19,055.00
16-10	Bear Island	St. Louis	Special	1473	8,100.00	4,084.00	12,184.00
16-12	Burntside	St. Louis	Type "C" Dam	524	2,880.00	1,750.00	4,630.00
16-18	Vermilion	St. Louis	Special	1571	8,640.00	4,525.00	13,165.00
16-30	Shagawa	St. Louis	Special	858	4,720.00	4,495.00	9,215.00
16-35	Loon	St. Louis	Special	1051	5,780.00	3,950.00	9,730.00
16-166	Long	St. Louis	Type "C" Dam	82	490.00	360.00	850.00
17-23	Dodo	St. Louis	Dam and Culvert	340	1,862.00	1,740.00	3,602.00
17-51	Schultz	St. Louis	Type "C" Dam	255	1,400.00	1,290.00	2,690.00
17-57	Stone	St. Louis	Dam and Culvert	472	2,350.00	993.00	3,343.00
18-10	Fall	Lake	Special	722	3,610.00	5,240.00	6,850.00
18-133	Slate	Lake	Special	1666	9,165.00	9,705.00	18,870.00
			Total (Pre-war Costs)	77430	$423,112.00	$351,473.00	$775,240.00

TABLE NO. 2
PROPOSED NEW CONSTRUCTION—GAME AND FISH DIVISION
FISH REARING PONDS

		Hinckley FP-4	St. Peter Ponds FH-5	Sturgeon Lake FP-16	Straight Lake FP-22	Park Rapids FP-23	Big Stone FP-30	Cedar Lake FP-35	Total
Number of Ponds	Ea.	2	6	.....	2	2	1	1	14
Bridges (Timber)	Ea.	.....	.....	.....	.....	.....	.....	.....	.....
Bridges (Concrete)	Ea.	.....	.....	.....	.....	.....	.....	.....	.....
Bulkheads	Ea.	3	1	.....	.....	.....	.....	1	5
Special Dams	Ea.	.....	6	1	.....	.....	.....	.....	7
Pumping Stations	Ea.	1	.....	.....	.....	.....	1	.....	2
Pipeline (Steel)	Lin. Ft.	700	1,465	.....	400	840	.....	.....	3,405
Ditch	Lin. Ft.	500	.....	.....	900	.....	440	400	2,240
Excavation (Common)	Cu. Yds.	23,000	33,500	.....	26,000	28,500	21,595	7,500	140,095
Concrete	Cu. Yds.	90	170	65	.....	155	67	80	627
Reinforcing Steel	Tons	2.5	5.2	1.2	.....	1.15	1.95	2.0	14
Structural Steel	Lbs.	600	1,080	530	.....	200	350	400	3,160
Sheet Piling	FBM	2,400	5,700	2,700	.....	2,000	800	2,500	16,100
Bearing Piling	Lin. Ft.	.....	.....	.....	.....	.....	560	.....	560
Pipe Railing (1½")	Lin. Ft.	.....	.....	80	.....	64	.....	100	244
Lumber	M	5.0	6.0	3.0	2.0	3.0	3.2	3.0	25.2
Clearing and Grubbing	Acres	3.0	2.0	.....	5.0	10	2.0	17	39
Road	Cu. Yds.	.....	2,000	.....	1,900	1,600	.....	2,300	7,800
Dikes	Lin. Ft.	1,200	3,200	2,500	1,800	2,020	1,600	1,100	13,420
Channel	Lin. Ft.	.....	1,500	.....	.....	1,240	.....	.....	2,740
Drain Tile	Lin. Ft.	900	.....	.....	.....	710	.....	.....	1,610
Rip-Rap (Grouted)	Sq. Yds.	.....	.....	.....	.....	.....	.....	.....	.....
Rip-Rap (Common)	Sq. Yds.	400	300	300	600	300	250	600	2,750
Gravel Blanket	Cu. Yds.	150	200	150	400	450	150	300	1,800
Grass Planting	Acres	2.0	3.0	.....	2.0	4	4	1.0	16
Sodding	Sq. Yds.	1,200	1,500	400	600	2,300	1,200	1,200	8,400
Topography	Acres	15	20	.....	16	35	20	16	122
Profile	Mi.	1.0	2.0	.....	3.0	.....	0.5	1.0	7.5
Control Structure	Ea.	1	6	.....	.....	2	1	2	12
Fencing	Lin. Ft.	.....	2,400	.....	3,000	3,745	.....	2,400	11,545
Hand Sloping	Sq. Yds.	8,900	10,600	1,000	21,500	25,000	12,300	7,000	86,300
Pipe (CMC)	Lin. Ft.	160	40	.....	.....	140	200	40	580
Pipe (Concrete)	Lin. Ft.	.....	.....	.....	.....	.....	.....	.....	.....
Well (6"—100 Ft.)	Ea.	.....	.....	.....	.....	1	.....	.....	1
Garage (Truck)	Ea.	1	.....	.....	.....	.....	.....	.....	1
Excavation (Struct.)	Cu. Yds.	150	.....	200	.....	155	200	150	855
Concrete Tanks	Ea.	.....	.....	.....	.....	10	.....	.....	10
Misc. Contingents Inc. Land	Cost	.....	.....	.....	.....	8,392	.....	.....	8,392
Man Months		200	220	60	180	250	190	160	1,260
Estimated Cost (Pre-war Costs)		$17,600	$22,500	$5,200	$13,300	$28,600	$16,250	$10,200	$113,650

TABLE NO. 3
PROPOSED NEW CONSTRUCTION—GAME AND FISH DIVISION
FISH HATCHERIES

		Mounds Park FH-1	Detroit Lakes FH-3	St. Peter FH-5	Lanesboro FH-7	Park Rapids FH-14	Baudette FH-17	Waskish FH-18	Total
Pumping Unit, Electric	Ea.		1					2	3
Hatchery Building	Ea.		1	1		1			3
Garage (Truck)	Ea.	1		1		1	1		4
Pump House	Ea.				1		1	1	3
Ice House	Ea.								
Latrine	Ea.					1			1
Sidewalks	Sq. Yds.	500		600	300		300		1,700
Curb and Gutter	Lin. Ft.	100			50				150
Roads	Cu. Yds.	1,500	30,000	1,500	1,000	1,800	800	600	37,200
Dikes	Cu. Yds.							4,700	4,700
Culvert (C. M. C.)	Lin. Ft.			30				70	100
Rip-Rap	Sq. Yds.							300	300
Well	Ea.		1		1	1			3
Car Parking Area	Ea.	1		1					2
Gravel Blanket	Cu. Yds.							60	60
Fish Tanks (Concrete)	Ea.	2			1				3
Control Structures	Ea.			2				1	3
Bulkheads	Ea.							1	1
Water Storage Tanks	Ea.								
Sodding	Sq. Yds.	6,500			100		1,200	1,500	9,300
Pipeline (Steel)	Lin. Ft.			200		450			650
Concrete	Cu. Yds.	120			9	40	30	61	260
Reinforcing Steel	Tons	2.1			0.5	1.2	0.3	2.6	6.7
Structural Steel	Lbs.	100						500	600
Lumber (Form)	M.	2.0			1.0	2.0	2.0	3.0	10.0
Landscaping	Acres	3.0	1.0	3.0		2.0	1.0	3.0	13.0
Excavation	Cu. Yds.	500	200	150		250	185	340	1,625
Storage Yard	Sq. Ft.	5,000							5,000
Spring Development	Ea.	1		1	1				3
Drain Tile	Lin. Ft.	180							180
Water Supply System	Ea.			1	1	1		1	4
Sewage Disposal System	Ea.				1				1
Man Months		70	210	40	60	54	34		468
Estimated Cost (Pre-war Costs)		$7,500	$21,530	$3,600	$5,800	$4,980	$3,280	$4,850	$51,540

Maintenance

The continuous maintenance of nearly 800 water use structures distributed over the entire state is an obvious need. The action of wind, wave, ice and rain, along with rodents, causes constant deterioration of earth dike structures, especially during the early years following construction. Continued maintenance is necessary to prevent failures of the structures themselves with resulting losses much greater than the cost of continuous upkeep. The division is required by law to maintain structures under its jurisdiction. Until a few months ago, only one truck and crew were available for the entire state. One additional crew was added recently. A request is contained in the budget for the next biennium for two additional maintenance units and funds with which to construct and operate two district garages and shops in which to store and repair maintenance equipment. If these requests are granted, many smaller construction jobs as well as alterations to existing control structures, where necessary, can be done by the division's regular maintenance crews at considerable saving in costs.

Hydraulic Experiments

Experiments have been conducted in the laboratory of the University of Minnesota in cooperation with the Agricultural Experiment Station, Soil Conservation Service and the Armco Drainage and Metal Products Company on the functioning of drop inlets of different designs.

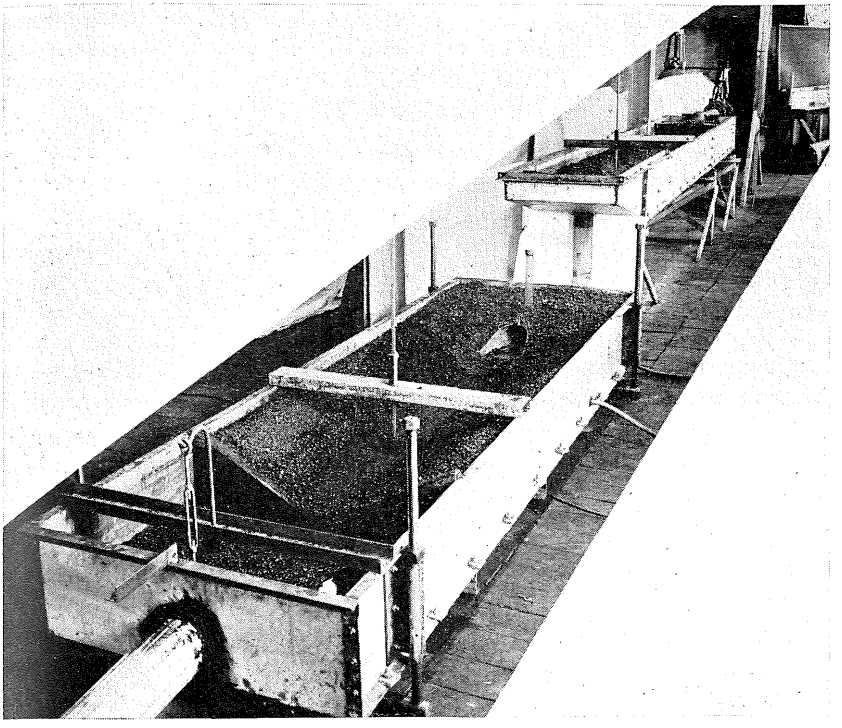
The need for adoption of designs of drop inlets that may be used in drains to reduce and control economically the velocity of water has become apparent from plans which are being received and analyzed by the division.

Fast moving waters erode ditches at high gradients and deposit the silt burden at points where gradients decrease. This is a destructive process and creates costly maintenance problems. Installation of "drops" to control gradients, if not too costly, can be made not only to check erosion and sedimentation but to actually reduce the volume of excavation at the time of original construction. Installations of drop inlets already made in a few instances are proving their worth.

WATER RESOURCES LAWS

In conjunction with their studies and recommendations for the revision and codification of the present state laws relating to drainage, the legislative interim committee has given some study to the existing laws relating to the improvement of bodies of water by counties and municipalities as well as those relating to the surface and underground water resources of the state. The laws pertaining to state water resources proposed by the committee for the consideration of the next legislature are based primarily upon Laws 1937, Chapter 468, improving the old code from experiences obtained in its administration.

There is still much to be desired in the form of policy and legislation in the handling of our water resources, if many of the problems which are



Hydraulic Research Lab—Drop inlet experiment in university hydraulic research laboratory. Scale Ratio 12:1. View represents a drop of approximately 20 feet.

now in sight are to be recognized, and a workable plan developed for their most beneficial use. It is hoped that as these problems become more clarified and specific, policies will be set by the legislature in the form of additions to the present proposed code.

TOPOGRAPHIC MAPPING

The United States Geological Survey in cooperation with the states has been engaged for sixty years or more in making a standard topographic map of the nation. Twelve states have already been completely surveyed and mapped and half of them have at least 50 per cent of their areas completed. Approximately forty-eight per cent of the entire area of the United States has been mapped. Minnesota, with its wealth of resources and opportunities for growth, its diversity of occupations and industries, and desperately needing data on its topography for economic development, ranks forty-eighth, at the foot of the list of states, with less than twelve per cent of its area mapped.

Lack of authentic topographic maps is becoming felt more and more as

the pressure for more intensive development increases and the economic worth of establishing new industries within the state are being weighed. In a singular manner, the absence of these maps is felt and reflected in all studies having to do with the behavior of water after it falls upon the surface of the ground from precipitation. On a knowledge of the behavior of surface waters hinges the progress and accuracy of studies of the source and extent of underground water supplies and the control of erosion that destroys soil fertility and carries sediment into the streams. Minnesota desperately needs a vigorous promotion of the completion of a topographic map of its area.

Duplication of the costs of preliminary studies and investigations made necessary because of the lack of standard maps has cost the state perhaps many times the expense of making them available. The surveys and mapping are done by the United States Geological Survey and the costs are shared by the state and federal government on a fifty-fifty basis.

DRAIN TILE RESEARCH

Extensive research work to discover how drain tile might be made more resistent to action of chemicals in solution in ground waters as well as to increase general bearing strength has been conducted by the division in cooperation with the University Farm Experiment Station and the Soil Conservation Service over a period of twenty-five years. The data obtained are of an inestimable value to farmers in the selection of type and quality of tile most suitable for use in drainage systems, particularly in areas containing soil alkalies which occur quite extensively in the soils of western Minnesota.

Considerable work remains to be done particularly on the compilation of data for publication, making them available for ready reference for application by farmers and tile manufacturers. Funds with which to continue the work in the laboratory on inspection of tile submitted by farmers for testing, contacting tile manufacturers in an effort to stimulate their interest in improving the quality of their product, and on the completion of this report is urgently recommended.

The progress of the work of Drain Tile Testing Laboratory at the University Experiment Station follows.

PROGRESS REPORT OF THE WORK OF THE COOPERATIVE DRAIN TILE TESTING LABORATORY[1]

July 1, 1944 — May 31, 1946

The various activities of the laboratory have been described in considerable detail in previous reports of the department, particularly in the report for the biennium ending June 30, 1940. This report, therefore, is prepared chiefly to show progress during the past two years.

Nature and Extent of Work Done During 1945:

Only new work this year consisted of making and testing for sulfate resistance 1,000 lean mortar bars (1 x 1 x 6½ inches). This is a continuation of the studies to develop a short time test for determining the resistance of Portland cements for drain tile to be exposed to soil alkalies of the type found in the sub-soils of western Minnesota and in all states further west.

Other work done during the year consisted of collecting and testing 1,176 experimental concrete and mortar cylinders exposed in Minnesota and Wisconsin peats for 19 years and collecting and testing 3,304 experimental cylinders exposed to the waters of Medicine Lake, South Dakota and to sulfate solutions in the laboratory for periods ranging from five to twenty years.

Major Results:

These studies have made it possible to correlate the durability of concrete drain tile installed in peat with the physical properties of the concrete, as determined by strength and water absorption tests, and the acidity of the peat as indicated by pH determinations. It has been definitely shown that concrete drain tile of the smaller diameters are not suitable for drainage of any peats with pH values below 6.0 and are of questionable durability in peats with pH values above 6.0 unless the tile are of an unusually high order. So far as known, there are not more than two or three plants in the Middle West that make commercial concrete drain tile of the smaller diameters that are suitable to use in any of the peats except only with full appreciation of the fact that long time service can not be expected. The poorer tile in the more acid peats may fail within five years and may do little better in the peats of low acidity. On the other hand, extremely well-made concrete drain tile may give satisfactory service in the low acid peats upward to 35 or 40 years, or longer, but can not be recommended for use in high acid peats.

Most of the essential details have been worked out for determining the sulfate resistance properties of Portland cements by measuring the linear expansions of 1 x 1 x 6¼ inch lean mortar bars (1-5 mix of Ottawa standard sand) exposed for 28 to 56 days in 0.15 molar solutions of magnesium sulfate and sodium sulfate.

[1]By Dalton G. Miller, Senior Drainage Engineer, Division of Drainage and Water Control, Soil Conservation Service, U. S. Department of Agriculture, in charge of laboratory at University Farm, St. Paul, conducted under cooperative agreement of the Soil Conservation Service of the U. S. Department of Agriculture, the Agricultural Experiment Station at the University of Minnesota, and the Division of Water Resources and Engineering, Department of Conservation, State of Minnesota.

Practical Application of Results or Public Benefits:

The concrete durability studies make it possible to advise regarding the type and quality of drain tile suitable for use in peats and in soil sulfate areas. The short-time lean mortar bar tests provide a fairly satisfactory acceptance test for cements to be used in concrete drain tile, irrigation structures, foundations, sewer and water pipe, etc., wherever the conditions to which they are to be exposd warrant specifying sulfate resisting cements.

Based on the cooperative studies in Minnesota, a map has been prepared, as a service to the state, that shows the general locations in Minnesota in which soil sulfates are known to occur in such large quantities that extra precautions in the selection of suitable drain tile are definitely indicated.

Recent Publications Issued or Manuscripts Prepared:

"Choose your drain tile to fit your soil." Minnesota Farm and Home Science, Vol. II, No. 3, May 1945. This has been widely circulated in Minnesota.

"Report on comparative short time tests of 121 commercial cements for sulfate resistance." Will shortly appear as a publication by the American Society for Testing Materials. The galley proof for this article was corrected and returned to the Society some weeks ago.

"Durability of concrete drain tile in peat soils." The manuscript for this bulletin is assembled and will be offered as a U.S.D.A. bulletin upon completion of the tests of field specimens in 1946. The manuscript as assembled consists of 40 typewritten pages of text, exclusive of 19 figures and 10 sizeable tables.

There are recorded in the following table the number of individual specimens tested by the drain tile laboratory for the periods indicated. Well over 100,000 of these were experimental specimens made expressly for these studies. These were made in the laboratory with the exception of the experimental drain tile which were made at commercial tile plants.

Summary of Tests Made by Drain Tile Laboratory Since It Was Established July 1, 1921 to May 31, 1946

	July 1, 1944 to May 31, 1946	July 1, 1921 to May 31, 1946
Drain tile tested for strength	.....	6,672
Drain tile tested for strength and absorption	301	5,411
Drain tile tested for strength, absorption and resistance	.....	645
Aggregates tested for use in concrete drain tile	15	380
Experimental drain tile installed for field tests	.....	4,514
Experimental concrete cylinders made for tests in laboratory and field studies on resistance to soil alkalies	3,304	72,616
Experimental concrete cylinders tested in field studies on resistance to peats	1,176	11,013
Experimental concrete cylinders made for laboratory and field studies of effect of steam curing on resistance to soil alkalies and peats	.....	4,500

Experimental mortar briquets made and tested in laboratory studies of Portland cements for resistance to soil alkalies	.....	6,072
Compression tests of experimental concrete cylinders	4,500	64,500
Lean mortar bars made and tested in studies to develop a short-time test of cements for sulfate resistance	1,000	10,140
Soil and water samples examined for soil alkalies	12	1,012
Silo staves tested for strength, absorption and resistance to silage action and unclassified miscellaneous tests	300	7,133
Total of all tests	10,608	194,608

REPORT OF STREAM GAGING IN THE STATE OF MINNESOTA DURING THE BIENNIUM ENDING JUNE 30, 1946

In order to deal intelligently with the problem of water utilization, which is of major importance in the industrial and economic development of the State as a whole, it is essential that a thorough knowledge of the state's water resources be obtained. Modern industry is becoming more and more dependent upon an adequate supply of water for use in processing as well as for cooling. With an increase in post war expansion of industry, more thought is being given to the problem of water supply in locating new industries or when increasing present plant facilities. Along with this industrial expansion, arises the problem of waste disposal which in many locations has already reached serious proportions. The disposal of wastes in natural stream courses can have an adverse effect on a large number of individuals who are dependent upon the stream for water supply unless the the flow is accurately known and a close control kept on the dilution.

The only way this information can be obtained with respect to surface water supply is by the development of long-term stream-flow records. During the past biennium, the Division of Water Resources and Engineering has continued cooperation with the U. S. Geological Survey in obtaining stream-flow records at various locations throughout the State. By taking advantage of this cooperation, the records were made available to the State at half cost as the Federal Government matched the State funds on a dollar for dollar basis.

A fair start has been made on this important work, and many valuable records are available for use. However, constant requests from engineers, power companies, cities and industrial corporations for more data has shown that our present records are sadly inadequate to meet the demands of a rapidly expanding period in the State's development.

On June 30, 1946, there were in operation in Minnesota, 121 stream-gaging stations including those on the Red River of the North and on the Canadian boundary streams as well as two stations on the Mississippi River at Prescott and LaCrosse, respectively. In addition to these, 11 stations were discontinued during the biennium due to lack of funds. Of the stations

in operation at the close of the period, 34 were maintained or partly maintained by cooperative funds from the State of Minnesota, and the remainder by funds furnished by other agencies.

The following tables, 4 to 12, show the status of the gaging stations throughout the state. From the table showing the various funds expended, it is readily seen that, while a fairly general stream-gaging program has been carried out, the State of Minnesota has contributed a minor portion of the cost. As a result of this, records were often obtained for a very specific purpose and were of short duration. Had more been obtained on a long-time basis, a much greater contribution to the general knowledge of one of the State's greatest natural resources would have resulted. This lack of extended records is the greatest handicap at the present time in making plans for future development.

TABLE NO. 4

Gaging Stations Maintained by the U. S. Geological Survey in Cooperation With the Minnesota Division of Water Resources and Engineering

Station	Type of Gage
Baptism River near Beaver Bay, Minn.	Recorder
Bois de Sioux River near White Rock, S. Dak.	Recorder
Buffalo River near Dilworth, Minn.	Recorder
Cannon River at Welch, Minn.	Recorder
Clearwater River near Leonard, Minn.	Staff
Clearwater River at Red Lake Falls, Minn.	Recorder
Cottonwood River at New Ulm, Minn.	Staff
Crow River at Rockford, Minn.	Recorder
Crow Wing River at Nimrod, Minn.	Chain
Elk River near Big Lake, Minn.	Recorder
Minnesota River near Odessa, Minn.	Chain
Minnesota River at Ortonville, Minn.	Recorder
Mississippi River at St. Paul, Minn. (part cost)	Recorder
Mustinka River above Wheaton, Minn.	Chain
North Fork Crow River near Regal, Minn.	Chain
Otter Tail River near Detroit Lakes, Minn.	Recorder
Otter Tail River below Pelican River near Fergus Falls, Minn.	Staff
Poplar River at Lutsen, Minn.	Recorder
Rabbit River at Crosby, Minn.	Recorder
Red River of the North at Fargo, N. Dak. (part cost) (to October 31, 1944)	Staff
Red Lake River at Crookston, Minn.	Recorder
Red Lake River at High Landing near Goodridge, Minn.	Recorder
Red Lake River near Red Lake, Minn.	Recorder
Redwood River near Redwood Falls, Minn.	Wire-weight
Root River near Houston, Minn.	Recorder
Rum River near St. Francis, Minn.	Recorder
Sauk River near St. Cloud, Minn.	Recorder
South Branch Two Rivers at Lake Bronson, Minn.	Chain
South Branch Whitewater River near Altura, Minn.	Recorder
South Fork Crow River near Mayer, Minn.	Wire-weight
Thief River near Thief River Falls, Minn.	Recorder
West Fork Des Moines River at Jackson, Minn.	Wire-weight
Whetstone River near Big Stone City, S. Dak. (Big Stone Lake Div.)	Recorder
Wild Rice River at Twin Valley, Minn.	Recorder
Zumbrota River at Zumbro Falls, Minn.	Recorder

TABLE NO. 5

Gaging Stations Maintained by the U. S. Geological Survey in Cooperation With the Minnesota State Iron Range Resources and Rehabilitation Commission

Station	Type of Gage
Dark River near Chisholm, Minn.	Recorder
Embarrass River at Embarrass, Minn.	Recorder
Partridge River near Aurora, Minn.	Recorder
St. Louis River near Aurora, Minn.	Recorder
Sturgeon River near Chisholm, Minn.	Recorder

TABLE NO. 6

Gaging Stations Maintained by the U. S. Geological Survey in Cooperation With the Corps of Engineers, U. S. Army

Station	Type of Gage
Blue Earth River near Rapidan, Minn. (discontinued Sept. 30, 1945)	Recorder
Buffalo River near Hawley, Minn.	Chain
Bull Dog Run River near Warroad, Minn.	Staff
Chippewa River near Milan, Minn.	Recorder
Clearwater River near Pinewood, Minn. (discontinued Sept. 30, 1945)	Staff
Clearwater River near Plummer, Minn.	Staff
East Branch Warroad River near Warroad, Minn.	Staff
Lac qui Parle River near Lac qui Parle, Minn.	Recorder
Leech Lake River at Federal Dam, Minn.	Staff
LeSueur River near Rapidan, Minn. (discontinued September 30, 1945)	Recorder
Little Minnesota River near Peever, S. Dak. (Lake Traverse Div.)	Recorder
Middle River at Argyle, Minn. (dis. Sept. 30, 1945)	Chain
Minnesota River near Carver, Minn. (part cost)	Recorder
Minnesota River at Judson, Minn.	Wire-weight
Minnesota River near Lac qui Parle, Minn.	Recorder
Minnesota River at Mankato, Minn.	Recorder
Minnesota River at Montevideo, Minn.	Recorder
Mississippi River near Deer River, Minn.	Staff
Mississippi River at Grand Rapids, Minn.	Recorder
Mississippi River at LaCrosse, Wis.	Recorder
Mississippi River below Sandy River near Libby, Minn.	Recorder
Mississippi River at Aitkin, Minn.	Staff
Mississippi River at St. Paul, Minn. (part cost)	Recorder
Mustinka Ditch above Twelve Mile Creek near Charlesville, Minn.	Reference Point
Mustinka Ditch below Twelve Mile Creek near Charlesville, Minn.	Reference Point
North Branch Two Rivers near Lancaster, Minn.	Staff
North Branch Two Rivers near Northcote, Minn.	Staff
Pelican River near Detroit Lakes, Minn.	Staff
Pelican River near Fergus Falls, Minn.	Staff
Pomme de Terre River near Appleton, Minn.	Staff
Rabbit River at Campbell, Minn.	Chain
Red River of the North at Wahpeton, Minn.	Chain
Redwood River near Green Valley, Minn.	Chain
Redwood River at Marshall, Minn.	Chain
Redwood River near Seaforth, Minn.	Chain
Root River below South Fork near Houston, Minn.	Chain
Root River near Lanesboro, Minn.	Recorder

Rush Creek near Rushford, Minn.	Recorder
Sand Hill Ditch at Beltrami, Minn.	Chain
Sand Hill River at Beltrami, Minn.	Staff
Sand Hill River at Climax, Minn.	Chain
Snake River at Alvarado, Minn. (discontinued Sept. 30, 1945)	Chain
Snake River near Argyle, Minn. (discontinued Sept. 30, 1945)	Chain
Snake River at Warren, Minn. (discontinued Sept. 30, 1945)	Chain
South Branch Buffalo River near Sabin, Minn.	Chain
South Branch Wild Rice River near Borup, Minn.	Chain
South Fork Crow River near Cosmos, Minn.	Chain
Spring Creek near Clarkfield, Minn.	Staff
Spring Creek near Hazel Run, Minn.	Chain
State Ditch 85 near Lancaster, Minn.	Staff
Tamarac River at Stephen, Minn. (discontinued Sept. 30, 1945)	Chain
Tamarac River near Stephen, Minn. (discontinued Sept. 30, 1945)	Chain
Twelve Mile Creek below Mustinka Ditch near Charlesville, Minn.	Reference Point
Two Rivers near Hallock, Minn.	Chain
Vermilion River near Empire City, Minn. (discontinued June 30, 1945)	Staff
Vermilion River at Empire City, Minn. (discontinued June 30, 1945)	Chain
Vermilian River at Hastings, Minn.	Staff
Watonwan River at Garden City (discontinued Sept. 30, 1945)	Chain
West Branch Warroad River near Warroad, Minn.	Chain
Whitewater River at Beaver, Minn.	Recorder
Wild Rice River at Hendrum, Minn.	Chain
Yellow Bank River near Odessa, Minn.	Recorder
Yellow Medicine River near Cottonwood, Minn.	Wire-weight
Yellow Medicine River near Granite Falls, Minn.	Staff
Yellow Medicine River near Hanley Falls, Minn.	Wire-weight
Zumbro River near Theilman, Minn.	Chain

TABLE NO. 7

Gaging Stations Maintained by the U. S. Geological Survey With Funds Transferred from the U. S. Department of State

Roseau River Survey

Station	Type of Gage
Mud Creek near Sprague, Manitoba	Recorder
Pine Creek near Pine Creek, Minn.	Recorder
Red River of the North at Drayton, N. Dak.	Wire-weight
Red River of the North at Grand Forks, N. Dak.	Recorder
Red River of the North at Halstad, Minn.	Wire-weight
Red River of the North at Oslo, Minn.	Staff
Roseau River near Badger, Minn.	Recorder
Roseau River near Haug, Minn.	Recorder
Roseau River at International Boundary near Caribou, Minn.	Recorder
Roseau River at Oak Point, Minn.	Staff
Roseau River near Malung, Minn.	Staff
Roseau River at Roseau, Minn.	Staff
Roseau River near Roseau, Minn.	Staff
Roseau River at Roseau Lake, Minn.	Staff
Roseau River at Ross, Minn.	Recorder

Roseau River below State Ditch 51 near Caribou.....Staff
South Fork Roseau River near Malung, Minn.....Staff

Rainy River Survey

Basswood River near Winton, Minn.....Recorder
Big Fork River at Big Falls, Minn.....Recorder
Little Fork River at Little Fork, Minn.....Recorder
Pigeon River at Middle Falls below International Bridge, Minn. .....Recorder
Rainy River at Manitou Rapids, Minn.....Recorder
Vermilion River below Lake Vermilion near Tower, Minn...Recorder

TABLE NO. 8

Gaging Stations Maintained by the U. S. Geological Survey in Cooperation With the Minnesota Highway Department

Station	Type of Gage
Gilmore Creek at Winona, Minn.	Recorder

TABLE NO. 9

Gaging Stations Maintained by the U. S. Geological Survey in Cooperation With the City of Austin, Minnesota

Station	Type of Gage
Cedar River near Austin, Minn.	Recorder

TABLE NO. 10

Gaging Stations Maintained by the U. S. Geological Survey in Cooperation With Federal Power Commission Licensees

Minnesota Power and Light Co.

Station	Type of Gage
Mississippi River near Royalton, Minn.	Powerhouse Records
Kawishiwi River near Winton, Minn.	Powerhouse Records

Ford Motor Co.

Mississippi River near Anoka, Minn.	Recorder

TABLE NO. 11

Gaging Stations Maintained by the U. S. Geological Survey Solely from Federal Funds

Station	Type of Gage
Minnesota River near Carver, Minn. (part cost)	Recorder
Mississippi River at Elk River, Minn.	Recorder
Mississippi River at Prescott, Wis.	Recorder
Mississippi River at Winona, Minn.	Recorder

TABLE NO. 12

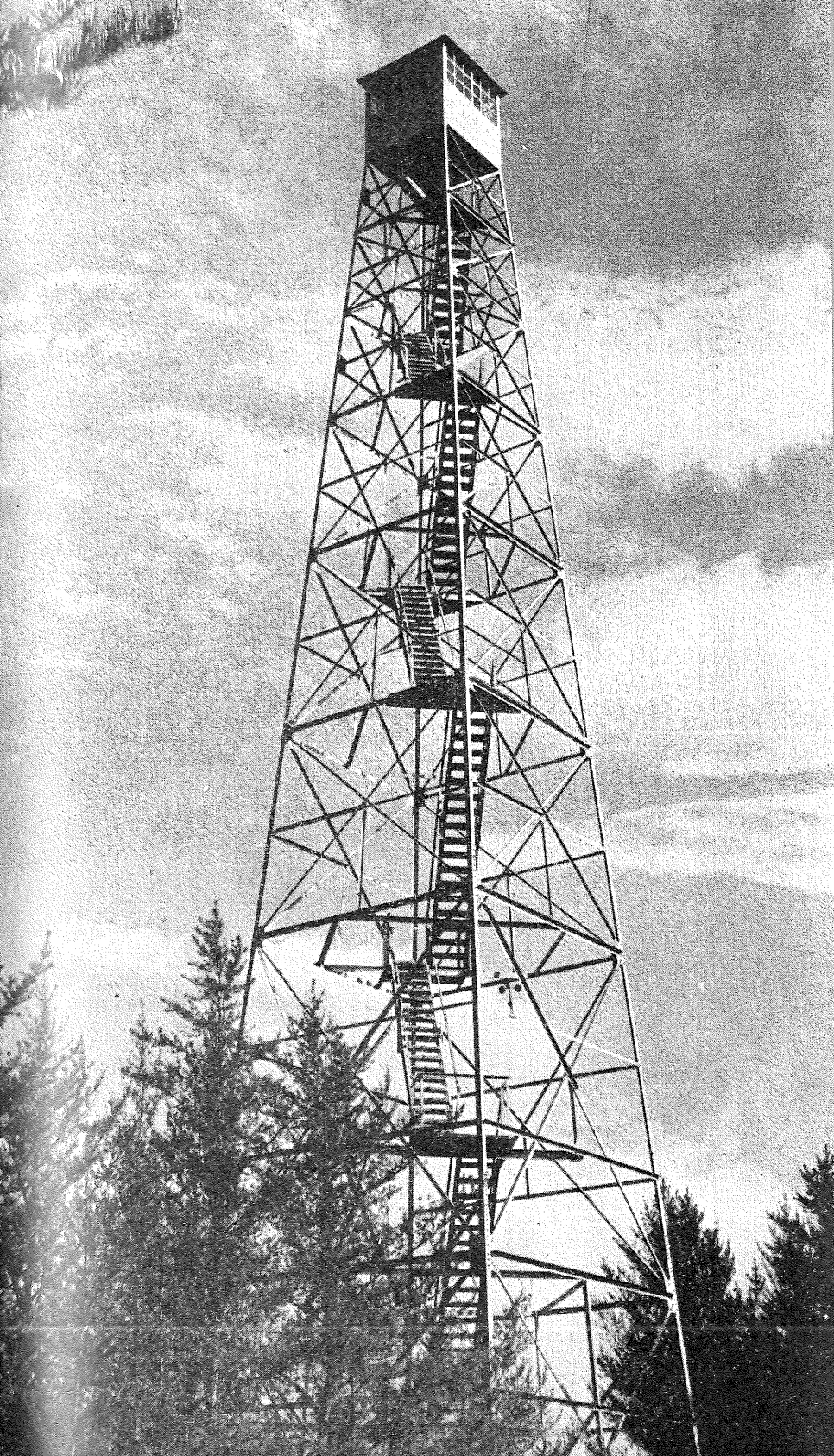
Funds Spent in State During the Past Biennium for Streamflow Studies Except Those for Main Stem Stations on Red River of the North

Minnesota State Conservation Department, Division of Water Resources and Engineering	$ 14,700.00

Minnesota State Iron Range Resources and Rehabilitation Commission	2,500.00
Minnesota State Highway Department	500.00
Municipal Cooperation	960.00
Federal Cooperative Funds	18,660.00
Corps of Engineers, U. S. Army	45,453.00
U. S. Dept. of State	16,335.00
U. S. Geological Survey	7,000.00
Federal Power Commission Licensees	634.46
	$106,742.46

Lake Stations

On June 30, 1946, The Division of Water Resources and Engineering was cooperating with the U. S. Geological Survey in obtaining records of stage on 344 lakes throughout the State. Of these, 99 were published in the 1945-46 Government report. Periodic discharge measurements were made at the outlets of several lakes during the period in connection with a project for rating the spillways of outlet structures. The lake program was carried out on a cooperative basis, with the Federal Government matching the funds provided by the State for a total expenditure of $28,440 for the past two years.



Division of Forestry

H. G. WEBER, *Director*

INTRODUCTION

Forestry in Minnesota started in the early 90's with the realization that some type of protection must be given to the forests and people against disastrous fires which raged throughout the timbered areas of the state.

After the Hinckley fire in 1894 the legislature created the office of chief fire warden and made a start toward fire control and the practice of forestry in Minnesota. The Baudette and Spooner fires of 1910 led to the establishment of the present Minnesota forest service, and the Moose Lake and Cloquet fires of 1918 led to larger legislative appropriations and laws which strengthened the position of the forest service.

In succeeding years as new problems developed, legislation was passed authorizing the forestry department to deal with these problems until at the present time the division of forestry is not only charged with the protection of the forested area against fire damage but with the management of all state owned timber, development and supervision of state nurseries, advancement of education in forestry, development and management of state forests, establishment and supervision of auxiliary forests, cooperation with municipalities in the establishment of municipal forests, control of forest insects, supervision of traffic in evergreens used for Christmas trees or other decorative purposes, examination of timber on tax-forfeited lands proposed to be sold, control of white pine blister rust in cooperation with the federal government, and related activities.

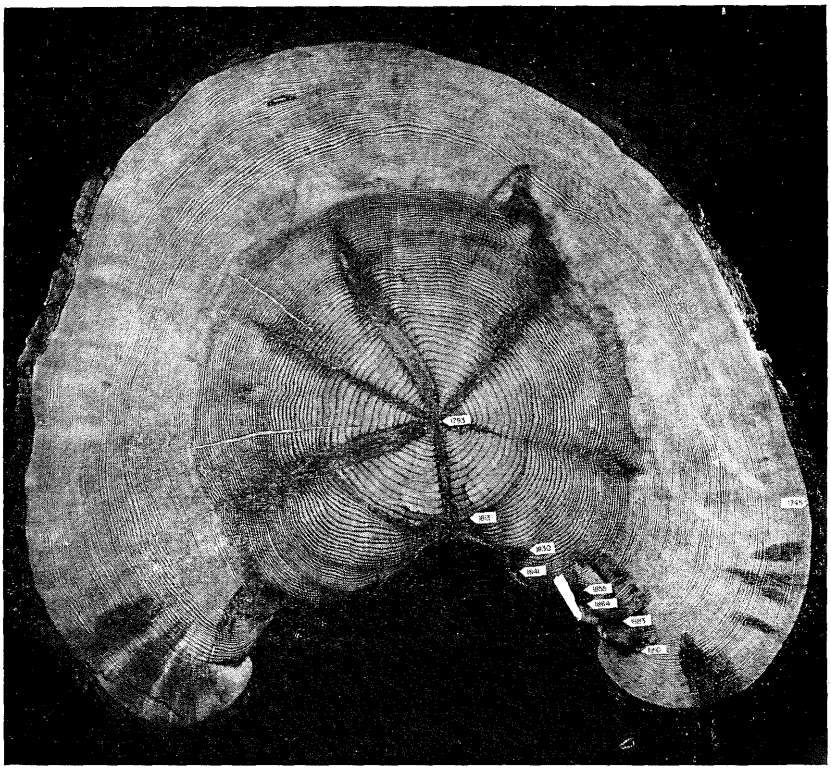
Forest Protection

Fires continue to be the number one responsibility of this division. Due to peculiar weather conditions, the fire seasons of the biennium were abnormal, starting very early in the spring and extending into November.

Equipment continues to be scarce, although the division has been able to secure some new tractors, pumps, and trailers. Much of the automotive equipment now owned by the division is over five years old and will have to be replaced as rapidly as equipment of this type becomes available.

The personnel quota for field positions outlined in the last biennial report has not been reached. Some progress has been made, however. The division has added seven graduate foresters to the field force. Additional trained personnel are needed.

In order to secure competent trained field personnel, the division initiated a training program for veterans under the so-called G. I. bill of rights. Twenty veterans were enrolled for a year's training. Upon completion of



Cross section of log cut in Cloquet Experimental Forest in 1945 showing scars of seven major fires. Tree was 152 years old.

this program the trainees will be placed in forest ranger I positions and given further training.

Due to lack of funds with which to engage competent men, little progress has been made in extending forestry service to the southern and southeastern parts of the state. Protection, woodlot management, and soil erosion are major problems of this region and eventually the division of forestry must be staffed to render this service to this part of the state.

Forest Situation

The forests of Minnesota are a priceless economic asset vital to the welfare of the people of this state. Every effort must be made to protect, develop, and manage this renewable resource. During 1945, forest products valued at 75 million dollars were produced in Minnesota.

Considerable progress has been made during the biennium in the management of both state and private forests. Large timber companies are now managing and improving their forest holdings. The policy of "cut-out and

get-out" is passing out of the picture in this state. The employment of staffs of technical foresters by the larger companies and the service given by the state on forest management problems should result in economically sound forest management.

The division has set as a goal in forest management:

1. The placing of all state forests and large blocks of state-owned forest land under management as rapidly as possible.

2. Greatly expand the forest planting program.

3. Continue to encourage and render services to small woodlot owners in solving their forestry problems.

4. Expand services of value to wood-using industries which may wish to secure raw material from our state forests.

5. Inventory as rapidly as possible new forest management units, and place these units under forest management in order to stabilize the supply of wood to local industry.

The legislature of 1943 authorized the appointment of an interim forestry commission which was charged by law as follows:

"Such Commission shall make a study and investigation of the problem of the use and disposition of lands which are forfeited to the state and of decreasing tax revenues to municipal units of government because of tax delinquency, and in respect to forest fire protection, the management of state timber, afforestation and reforestation, establishment and maintenance of woodlots, windbreaks, and shelterbelts throughout the state, tax remission as an inducement for forest practices, state appropriations needed in carrying out a long-time comprehensive forestry program and related matters pertaining to the development of an adequate state-wide program as will enable the Commission to fully report and make its recommendations."

This commission, after considerable study of the information obtained at public hearings and on field trips in Wisconsin and Michigan, made a report to the legislature in which it recommended:

1. Changes in the auxiliary forest law which would eliminate the charge for fire protection purposes and which would increase the amount of money paid to the counties. These amendments were made to the auxiliary forest law by the legislature.

2. Changes in the law pertaining to tax-forfeited lands in order to facilitate the service of notice, give adequate notice to the commissioner of conservation of sale proposals and clarifying bidding where land and timber were offered for sale.

3. That changes be made in the method of withdrawal from sale of state forest lands.

4. After considerable study and comparison of the fire protection costs of the three lake states, the commission recommended that the legislature appropriate $450,000 annually for fire pre-suppression purposes. The legisla-

ture appropriated $339,480 for the fiscal year 1945-46, and $370,480 for the fiscal year 1946-47. This was a substantial increase over previous appropriations.

5. That the land exchange laws be amended so as to permit land exchanges between the state and counties.

6. That the legislature authorize the commissioner of conservation to make contracts for obtaining planting stock from private growers and to sell this stock to land owners at cost for planting woodlots, windbreaks, shelterbelts, soil conservation, and other conservation purposes.

7. That in order to keep separate money alloted to the division of forestry by the federal government through the Clark McNary Act, a special account be set up by the state treasurer and any balance in the account at the end of the fiscal year be not transferred to the general revenue fund.

8. That the state be allowed to supply the political subdivisions of the state which were designated as cooperatives at fire prevention work with fire fighting equipment at state cost and that the commissioner of conservation be empowered to sell the authorized agencies the equipment at cost and provide that the money received from such sale be deposited in a fund from which the purchases were made and thus be made available for further purchases.

A law making it possible for the division to purchase fire fighting equipment and sell it at cost to cooperating political subdivisions was passed by the legislature of 1945.

All of these recommendations were acted upon favorably by the legislature with the exception of recommendation 5, dealing with land exchange between the state and counties.

FOREST FIRE CONTROL

A. E. PIMLEY, *in Charge*

Forest Fire Protection Area

Approximately two-thirds of Minnesota is in need of protection from forest, brush and grass fires, but only the portions in which extreme fire hazards exist and where the greatest values are involved can, with the present organization, be placed under intensive organized protection.

This region includes the state's largest timber producing tracts, the major portion of the summer resort and recreational areas. It also embraces the original pine belt which is perhaps the only part of the state where a conflagration of such proportions as to endanger human life would be possible. For these reasons and also to utilize the fire protection funds appropriated by the legislature to best advantage, the available manpower, equipment and other facilities have been concentrated in this territory.

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southern Minnesota where many brush and grass fires occur each year. These fires are not as spectacular nor as devastating as those in the northern part but they do cause a large amount of damage and should be controlled. They not only destroy the hardwood timber and reproduction in farm forests, woodlots, and timbered pastures but also burn the game cover, brush and other vegetation on the hill slopes, thus encouraging soil erosion and consequently causing the silting and pollution of streams.

Hazard and Risk

Hazard conditions and the risk of fires starting vary greatly in different localities. In the northern part the hazard is, in general, exceptionally high. This results from the types of timber and natural cover, the numerous highly inflammable grass, peat bog and open brush areas, the large amount of debris resulting from timber and land clearing operations and perhaps most important, from the unfavorable weather conditions which periodically occur throughout this territory.

The hazard in the southern half is normally lower than in the north. However, during periods of intensive drought it becomes quite acute and fires starting at such times burn fiercely, spread rapidly and are difficult to control.

The risk of fires starting is also greater in the northern half of the state than in the southern part. This is partially due to the influx of vacationists, campers, hunters, and fishermen into the area during the months when the fire season is at its peak. A large number of land clearing and timber cutting operations and the promiscuous burning over of wild meadow lands also add to the risk.

Over 98% of the fires started in Minnesota are caused by man, either through indifference, carelessness, or ignorance of the danger. Consequently the risk of starting can be quite accurately gauged by the number of people living and traveling in the affected region and by the extent of certain activities which are being carried on.

Of the three major phases of fire protection—prevention, presuppression, and combat—prevention is perhaps the most important. If the public could be made to understand thoroughly the fire problems and would fully cooperate in prevention, the need for presuppression and combat would become negligible. This would also decrease the area burned over, eliminate most of the damage caused each year and would naturally reduce the cost of protection.

Protection Organization

Forest fire protection in Minnesota is under the supervision of the director of the division of forestry. The intensively protected area is divided into two regions, each under a regional coordinator. The regions are, in turn, divided into administrative areas, districts and sub-districts, under the direct supervision of supervisors, rangers and guards respectively. Each

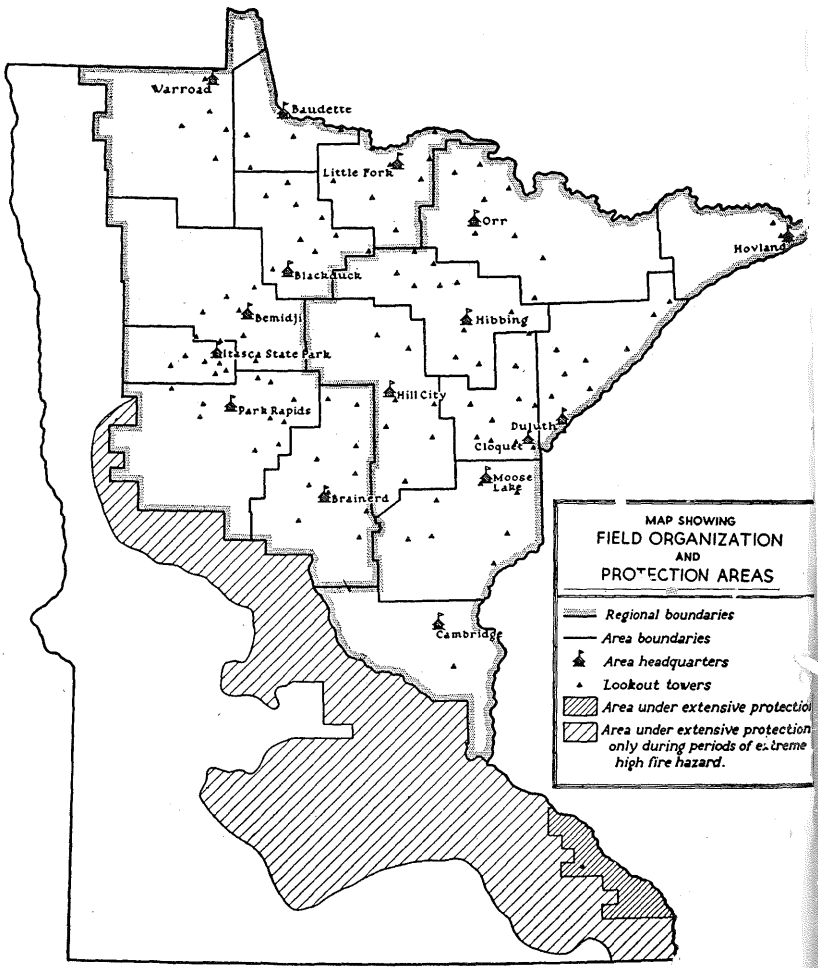


FIGURE 1

Map showing field organization and protection area.

man is responsible to his immediate superior for the proper handling of fire problems within the territory assigned to him.

This group of men is highly trained in all phases of control activities and constitutes a skeleton force which organizes schools and supervises the combat crews, consisting of township fire wardens, cooperators and temporary fire fighters.

Rangers and guards assigned to specific districts are responsible for administering the work of the towermen, smokechasers, and standby crews. They also assume the leadership in organizing auxiliary fire fighting units. This auxiliary force consists of organized groups such as the state guard

ompany employees, veterans organizations, boy scouts, and others, as well s individuals who are interested in and willing to cooperate with the divi- ion in fire control.

Fire Weather

The study of weather and the forecasting of probable fire conditions in dvance of occurrence is an important part of protection. To assist in this ork and to provide the director's office with complete information on the ire situation each day, weather recording points, known as danger stations, have been established at strategic locations throughout the protection zone. A daily, monthly and yearly record is kept at each of them consisting of wind velocity and direction, temperature, relative humidity, precipitation, and other useful information.

Forty of these stations were in operation in 1944 but from experience it was found that certain localities were not satisfactorily covered and twenty-six more installations were added in 1946, making a total of sixty-six.

The only expense of setting up these stations is the actual cost of the weather instruments, since they are all located at established area, district and sub-district headquarters.

All pertinent data from each of these stations are assembled each day in the area supervisor's office, and submitted to the director in St. Paul. The information is not only used in general administrative planning but also greatly increases the effectiveness of local forecasting.

The readings from the more important key stations are submitted daily to the U. S. weather bureau at Chicago where the material is used in pre- casting anticipated fire weather for Minnesota covering the following 48-hour period.

These forecasts are made available by telegraph to each of the sixteen area headquarters and to the St. Paul office. This service, of great assistance in fire control work, is furnished by the weather bureau at no cost to the state.

Most of the members of the fire control organization are trained in the fundamentals of weather recording and their knowledge of local conditions made possible by the use of various instruments together with assembled general weather data and fire weather forecasts referred to above, provide material from which the following days' activities can be intelligently planned. As a result of this procedure the fire control personnel can be shifted, increased or in certain cases decreased, burning permit regulations changed and other measures taken to meet any anticipated situation.

Cooperation

The cooperation received by the state in fire prevention from timber oper- ators, organized groups, and individuals was particularly good during the war

years. A nation-wide program in prevention was sponsored by many local organizations as a part of the national defense program and for this reason, a much greater interest was shown in the work than could otherwise have been expected.

In order that the gain made in this phase of cooperation may be maintained in its present state of effectiveness, and also to expand and further perfect it, a special campaign is being carried on in the state with special emphasis placed on fire prevention. Foremost in this activity is the "Keep Minnesota Green" committee which is doing an excellent job in presenting the problems to the public. A full-time secretary-manager directs public relations work. Special signs have been provided and posted and various contacts are being made with interested agencies and individuals in an effort to coordinate all available assistance. Several of the larger lumber companies are participating in the general plan and one of them has organized a cooperative field fire protection unit under the direction of experienced foresters. This company not only has trained personnel to carry on this work but has acquired considerable fire fighting equipment to augment that of the state. The division of forestry considers this type of cooperation to be of great importance in the state-wide plan and it is hoped that other companies may be induced to promote similar organizations.

The Minnesota state guard also did a splendid job in training its officers and men in the technique of fire control and this activity which was started early in the war is still in progress. A supply of fire fighting equipment has been assigned to southeastern Minnesota by the division and stored at the Winona armory for use of the local guard units and other cooperators.

The agricultural extension division of the university of Minnesota has been exceptionally active in fire prevention through its extension forester. The contacts made through this source with farm groups, county agents, 4-H clubs, and others have been very beneficial particularly in the prevention of fires on farms. Also participating in the program are various sportsmen's organizations, game clubs, the Red Cross (through its local senior and junior chapters), 4-H clubs, boy and girl scouts and many other organized groups.

Fire Fighting Equipment

Heavy mechanical equipment is being used more and more in fire suppression. Many new developments in this type of machinery were made during the war and it is being found, through experimentation, that some of it is readily adaptable to fire fighting uses. Some items have already been made available to governmental agencies and undoubtedly more will be released within the next year.

During the past biennium the division acquired the following major items of fire fighting equipment, part of which were obtained from the war surplus stocks and part through state purchases:

1—Tractor combination, mower and plow
4—Rowboats, 18'
5—Outboard motors, 9 to 22 h.p.
20—300 gal. water tanks
30—100 gal. water tanks
20—Fire fighting cooking units (for 25 men)
24—Fire fighting cooking units (for 10 men)
6,000 ft. Linen fire fighting hose—1½"
3,000 ft. Rubber fire fighting hose—¾"
7—Tilt bed trailers (7½-ton capacity)
7—Tractors (30 h.p.)
2—Bulldozers (30 h.p.)
1—Bulldozer (130 h.p.)
12—Fire fighting trucks (1-ton)
2—Fire fighting trucks (1½-ton)
24—Power pumpers (3,600 g.p.h.)
6—Power pumpers (3,000 g.p.h.)
18—Power pumpers (fan belt type)
5—Power plows (middlebuster type)
10—Power plows, standard 22"

Fire Plan Maps

A major mapping project was brought to completion during the biennium. This consists of a set of forest protection maps covering the entire intensive protection area of the state. They will fill a need which has been inadequately supplied by former maps. Their primary purpose is for locating fires by means of triangulation from the lookout towers. For this purpose they are mounted on the map board in the towers, and as wall maps in the ranger district headquarters, with protractors attached for reading azimuths to the fire. Mounted as wall maps in the area headquarters, they serve for dispatching fire fighting crews, for planning and recording permanent improvements, and for general administration of many phases of the division's work. Bound in sets, they serve the supervisory personnel of the division in a similar manner.

Cost of Protection

At present, approximately 20,000,000 acres are under intensive protection in Minnesota and the annual state appropriation made by the legislature of 1945 for this purpose provides for approximately $.015 per acre of area. In addition to this, the federal government, through the Clarke-McNary cooperative agreement with the state, made allotments, during the past two years averaging nearly an equal amount. This provides a total for protection of approximately $.03 per acre.

The estimated annual cost for adequately protecting this area, based on controlling the annual burn to a maximum of .2 of 1% of the total area protected, and considering a 5-year period for the development of the program, will require approximately $.065 per acre or more than double that now available. After such a plan has been fully developed forest protection will then resolve itself largely into a maintenance and replacement problem and the annual cost will be somewhat reduced. At this point, the centralized overhead, equipment and other facilities will have been sufficiently developed so that the organization will be able to branch out and, with little if any additional costs, cover the remainder of the state in need of protection but not at present included. Taking into account the inestimable value of the forest resources within the area that will be thus protected, the costs will be exceedingly cheap insurance.

It is estimated that there are over 19,000,000 acres of forest land in the state, much of which at present is productive. Inventories of present merchantable and potential future forest products within this area represent a large stock pile in which Minnesota and its people and industries have an investment that merits the highest possible measure of protection.

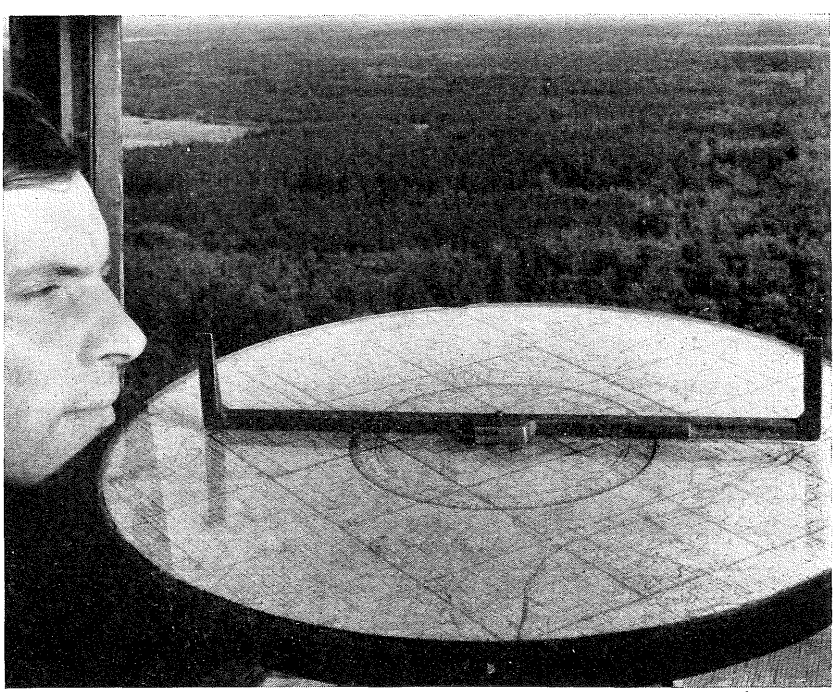
Figures computed by the forest industries information committee for 1944 show that finished forest products alone processed in Minnesota that year exceeded $78,000,000.00 and forest products which were shipped out of the state for processing elsewhere amounted to over $4,356,000.00.

It is impossible, of course, to compute in dollars and cents the losses represented by the sacrifice of human lives, destruction of homes of settlers, denudation of water-sheds, blotting out of game and game cover, and the aesthetic values of green forests which make Minnesota an outstanding tourist resort state, and are an aid in sustaining one of the state's largest industries.

The 1944 Fire Season

During the 1944 season there were 542 fires on which control action was required as compared with 753 for 1943 and 598 for 1942.

The average rainfall for the fire season, April 1st to November 1st, was slightly above that of either of the past two years.



Sighting forest fire across alidade in lookout tower.

In September there was a deficiency in the normal amount of precipitation of .81" and in October, 1.49".

Normally the fire season ends around the 15th of October but in 1944 it extended well into November and 92 fires were recorded during these two months. In general, however, weather conditions were quite favorable as compared with other years.

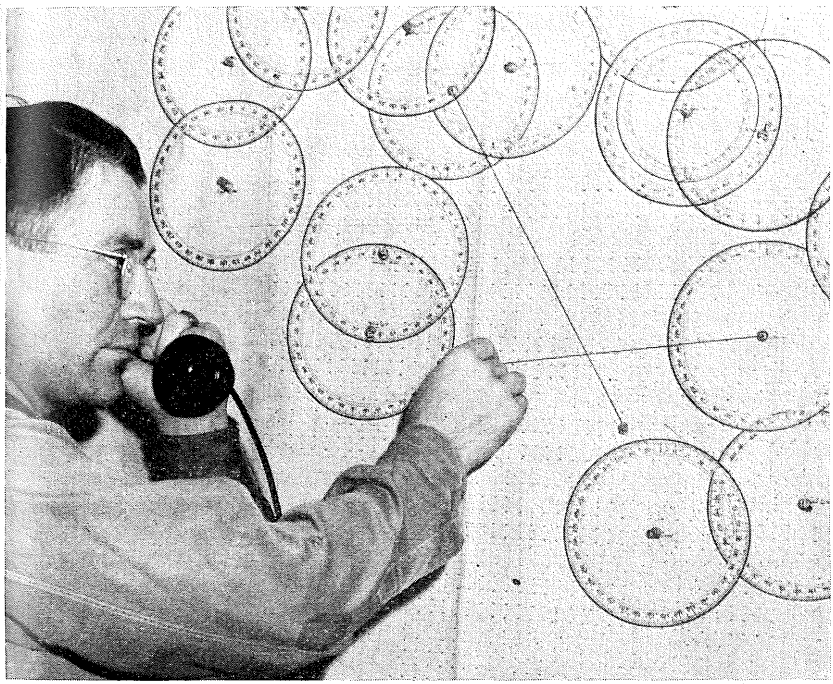
A total area of 41,612 acres was burned over of which 282 acres were merchantable timber land, 10,551 acres reproduction or young growth, 13,029 acres denuded forest land, and 17,750 acres non-forest land.

An estimated total damage resulting from the 542 fires was $73,745 classified as follows: merchantable timber—$1,646.00; reproduction—$25,924.00; watersheds and soil—$12,918.00; game cover and recreation—$24,339.00; miscellaneous—$8,918.00.

The 1945 Fire Season

Precipitation was somewhat less from April 1st to November 1st, 1945, than during the same period for either of the previous two years.

An uneven distribution of the rain caused numerous short periods of drought in portions of the protection area, thus making it necessary to place



Getting report from tower man. Lines cross on map at fire.

on duty as many employees as could be engaged with available funds throughout most of the time from March to November.

Fires occurred every month during 1945 ranging from 36 in March to 2 in November. Control action was required on 869 fires as compared with 753 for 1943 and 542 for 1944. The area burned over included 176 acres of merchantable timber land, 4,445 acres of reproduction, 6,271 acres of denuded forest land, and 11,381 acres of non-forest land, making a total average burned over for the season, 22,273 acres.

The estimated damage which was considerably less than in 1944 is classified as follows: merchantable timber—$226.00; reproduction—$9,583.00; watersheds and soil—$6,210.00; game cover and recreation—$13,970.00; miscellaneous—$9,112.00, making a total of $39,101.00.

The record for 1945 shows an exceptionally large number of railroad fires. This was not the result of negligence or faulty equipment but was due to the use of wartime coal, the sparks of which did not cool as rapidly after leaving the engine stack as those from the regular standard grades of fuel used in pre-war operations. This naturally caused many fires which would otherwise not have occurred. The use of the coal was discontinued as soon as a better grade of fuel became available.

The 1946 Spring Fire Season

An abnormally warm period occurred during the last ten days in March, melting the snow over much of the protection zone and rapidly drying the dead vegetation. Fires immediately began to spring up in the southern and west-central areas and by the last of the month 133 fires had been recorded, the greatest number for this same period since 1938.

On March 21st the first lookout towers were manned and on the 23rd the first fire broke out. Fires continued to increase in number and intensity each day until the night of March 30th when the most dangerous conditions were lessened in parts of the state by light, scattered showers. During the following few days 14 more fires were reported but by the end of the first week in April rain and snow had covered the entire north half of the state temporarily relieving the situation. This respite was of short duration, however, as high temperatures and warm winds rapidly melted the snow and again dried out dead vegetation so that within a week fires were again springing up in greater numbers than before. The continuation of abnormally high winds and temperatures, together with exceptionally low relative humidities and little or no rainfall, created an extremely hazardous situation throughout most of the protection region. By April 30th, 667 fires had been extinguished by the control organization, the greatest number for the months of March and April since 1931.

On May 1st, when this report was written, drouth and unfavorable fire conditions still prevailed.

Tables 1 to 10 inclusive, present statistical data relating to forest fire protection compiled by the division.

TABLE 1

Number of Fires Per Year by Causes
Period 1940-1945

Causes	1940	1941	1942	1943	1944	1945
Lightning	9	11	2	3	1	1
Railroads	99	103	52	176	68	397
Campfires	66	14	29	22	12	22
Smokers	266	85	131	179	109	141
Land Clearing	133	25	82	76	63	76
Incendiary	25	14	37	11	34	19
Lumbering	7	11	12	14	8	6
Meadow Burning	283	37	164	178	192	141
Miscellaneous	108	29	89	94	55	66
Total:	996	329	598	753	542	869

TABLE 2

Number of Fires Per Year by Classes
Period 1940-1945

Causes	1940	1941	1942	1943	1944	1945
Farmers	414	71	253	258	238	202
Hunters	136	26	54	65	52	39
Fishermen	61	22	32	19	10	30
Berry Pickers	21	17	0	5	8	3
Work Crews	35	22	17	35	16	14
Trappers	13	1	0	0	0	0
Travelers	99	26	61	69	46	87
Miscellaneous	56	25	148	148	110	106
Locomotives	71	93	33	154	62	388
Unknown	90	26	0	0	0	0
Total:	996	329	598	753	542	869

TABLE 3

Areas Burned Over by Causes
Period 1940-1945

Causes	1940	1941	1942	1943	1944	1945
Lightning	12	22	0	0	0	0
Railroads	587	162	302	1,403	1,002	1,503
Campers	513	22	3,078	689	126	474
Smokers	37,041	1,689	2,854	14,445	4,678	2,463
Land Clearing	6,058	701	6,006	10,026	6,187	3,897
Incendiary	2,476	254	2,703	363	2,036	2,656
Lumbering	197	339	220	324	132	86
Meadow Burning	24,450	827	13,329	18,106	22,541	9,303
Miscellaneous	2,839	305	5,902	2,350	4,910	1,891
Total:	74,173	4,321	34,394	47,706	41,612	22,273

TABLE 4

Forest Fire Damage
Period 1940-1945

Year	Merc. Timber	Young Growth	Soil and Watershed	Game Cover and Recreation	Miscl. Damage	Total Damage
1940	$ 854	$22,859	$14,511	$26,522	$ 5,803	$70,549
1941	193	5,078	1,180	3,284	2,228	11,963
1942	1,679	28,839	11,571	23,419	9,477	74,985
1943	2,213	25,160	13,368	25,052	13,318	79,111
1944	1,646	25,924	12,918	24,339	8,918	73,745
1945	226	9,583	6,210	13,970	9,112	39,101

TABLE 5

Precipitation Record for Fire Season—Deviation from Normal
Period 1940-1945

Month	1940	1941	1942	1943	1944	1945
April	+0.49"	+0.96"	—0.06"	—1.00"	—0.09"	+0.58"
May	—1.27"	+0.27"	—2.28"	+1.17"	+1.93"	—0.62"
June	—0.35"	+1.01"	—0.44"	+1.61"	+2.39"	+0.35"
July	—0.58"	—1.00"	—0.10"	+0.81"	+0.86"	+0.68"
August	+1.30"	+0.65"	—1.41"	+0.72"	+1.83"	+0.26"
Sept.	—1.79"	+1.92"	—1.68"	—1.05"	—0.81"	+0.65"
October	+0.91"	+1.34"	—0.81"	—0.17"	—1.49"	—1.35"

TABLE 6

Average Monthly Rainfall
Period 1940-1945

Month	1940	1941	1942	1943	1944	1945
April	2.59"	3.08"	2.06"	1.10"	2.01"	2.69"
May	1.91"	3.45"	5.51"	4.42"	5.22"	2.66"
June	3.67"	5.05"	3.60"	5.67"	6.50"	4.46"
July	2.68"	2.24"	3.35"	4.07"	4.13"	3.97"
August	4.51"	3.88"	4.67"	3.99"	5.14"	3.57"
Sept.	1.01"	4.76"	4.55"	1.80"	2.02"	3.50"
October	2.77"	3.23"	1.06"	1.70"	0.36"	.46"

TABLE 7

Number Fires by Months
Period 1940-1945

Month	1940	1941	1942	1943	1944	1945
April	....	58	488	255	372	82
May	....	134	29	133	49	499
June	....	7	8	6	10	109
July	....	66	8	39	12	48
August	....	37	13	14	5	23
Sept.	....	0	1	79	2	8
October	....	19	76	223	84	62

TABLE 8

Damage from Fires Per Year by Causes
Period 1940-1945

Causes	1940	1941	1942	1943	1944	1945
Lightning	$ 94	$ 228	$ 1	$ 1	$ 150	$ 0
Railroads	842	1,585	602	6,678	2,133	3,494
Campfires	1,935	101	9,299	778	679	3,620
Smokers	12,049	2,793	5,150	16,258	9,681	3,522
Land Clearing	11,277	2,097	14,650	16,847	12,144	5,498
Incendiary	6,584	1,280	8,118	673	6,287	1,243
Lumbering	677	2,151	931	1,722	315	147
Meadow Burning	30,195	958	16,816	29,391	33,712	11,801
Miscellaneous	6,897	771	19,418	6,763	8,644	9,776
Total:	$70,550	$11,964	$74,985	$79,111	$73,745	$39,101

TABLE 9

Type of Area in Acres Burned Over
Period 1940-1945

Year	Merchantable Timber	Reproduction	Denuded Forest Land	Non-Forest Land	Total
1940	145	10,542	14,510	48,976	74,173
1941	10	1,779	1,396	1,136	4,321
1942	661	10,700	11,696	11,337	34,394
1943	837	10,832	13,376	22,661	47,706
1944	282	10,551	13,029	17,750	41,612
1945	176	4,445	6,271	11,381	22,273

TABLE 10

Classification of Fires by Size
Period 1940-1945

Year	A Under ¼ Acre	B ¼ Acre to 10 A.	C 10 Acres to 100 A.	D 100 Acres to 1000 A.	E Over 1000 A.	Total
1940	190	411	318	70	7	996
1941	133	138	49	9	0	329
1942	56	229	232	77	4	598
1943	142	293	251	62	5	753
1944	58	177	207	99	1	542
1945	314	305	197	52	1	869

RAILWAY FIRE PREVENTION

WM. M. BYRNE, *in Charge*

With the opening up of the vast northern area of Minnesota to settlement came the railroads. While they were a great factor in the development of the country, it is also true that they caused a great many fires, principally through the use of equipment which lacked safeguards against the starting of forest fires, and other contributing factors such as the type of fuel used, steep grades and narrow cuts and inflammable material along the rights-of-way. At that time the railroads were one of the chief offenders in the starting of forest fires, which were exceeded in number only slightly by the settlers' clearing fires.

Now that the modern locomotives have been perfected against the setting of fire, and a system of detecting and suppressing fires has been developed, few fires of railroad origin attain very large proportions. Notwithstanding all of these precautions the operation of railroads throughout forested areas does create a fire hazard which is a constant menace to the forests, particularly during seasons of high fire hazards. The division of forestry is by law responsible for the supervision and enforcement of regulations for the prevention and suppression of railroad forest fires in common with other sources of fire which are a menace to forests.

While steam locomotives are one cause of railroad fires, the use of fire by maintenance crews is another. Regular inspection of locomotives is made in order to ascertain that they have no mechanical defects which may cause fires while being operated. The division and the railroads have worked together in the development of spark arresters and other safety devices in order to provide the greatest mechanical safety against the setting of fires.

In spite of all mechanical improvements, locomotives can and do set fires. To suppress these a detection system is set up within railroad maintenance and operating crews, which works cooperatively with the division's own fire detection system.

Patrolmen follow trains during hazardous periods. Of the 2,300 miles of railroad within the intensely protected forest area of Minnesota, 1,583 miles are patrolled by special men on speeders, and 196 miles by section crew patrol.

In addition to the legal responsibility for preventing and detecting railroad fires, the railroads have voluntarily organized for fire suppression, working in cooperation with the division.

Control of the hazard created by fire set by maintenance crews in their normal clearing and burning of brush and rubbish on rights-of-way is being exercised to the highest possible degree by restricting burning to places and times fixed by burning permits which must be obtained from the division, and by the organization of fire detection and suppression crews from railroad employees.

The following tables indicate the cause of fires and area burned over and the detection and origin of the fires caused by railroads.

TABLE 11

Cause of Fires and Area Burned Over on All Roads

	Locomotives		Debris Burning		Other Ry.	Fires
	Number	Area	Number	Area	Number	Area
2nd 6 Mo. 1944....	11	167¼ A.	2	2 A.	5	½ A.
1st 6 Mo. 1945.....	370	1155¼	4	319	2	1
Total	381	1322½ A.	6	321 A.	3	1½ A.
2nd 6 Mo. 1945....	68	34¼ A.	1	0 A.	....	.....
1st 6 Mo. 1946.....	156	1179	9	79¼	2	¾ A.
Total	224	1213¼ A.	10	79¼ A.	2	¾ A.
Sub-Total	605	2535¾ A.	16	400¼ A.	5	2¼ A.

Grand Total: Number of Fires—626 Area Burned Over—2938¼ A.

TABLE 12

Detection and Origin

	Discovered By						Locomotives			Burning Debris			Other Ry. Fires		
	R. R. Patrol	Sec. Men	Other R. R. Employees	M.F.S.—U.S.F.S.	Outsiders	Burned Out	A	B	C	A	B	C	A	B	C
2nd 6 Mo. 1944..	5	1	1	1	5	1	5	5	1	0	2	0	0	1	0
1st 6 Mo. 1945 ..	215	60	54	26	20	1	251	90	27	1	1	3	2	1	0
Total	220	61	55	27	25	2	256	95	28	1	3	3	2	2	0
2nd 6 Mo. 1945..	22	16	13	5	11	2	47	21	0	1	0	0	0	0	0
1st 6 Mo. 1946 ..	61	39	18	25	24	0	62	72	22	1	5	3	1	1	0
	83	55	31	30	35	2	109	93	22	2	5	3	1	1	0
Sub-Total	303	116	86	57	60	4	365	188	50	3	8	6	3	3	0
Grand Total:				626				603			17			6	

There were 626 fires during the biennium for which the railroads were responsible, burning over a total of 2,938 acres. Of these fires, 603 were set by locomotives, 17 were caused by burning of debris on railroad rights-of-way, and 6 of miscellaneous origin.

Although 603 fires were set by railroads during the past two years, they account for only a relatively small percentage of the grand total area burned by all causes due to the effectiveness of preventing, detecting and suppressing fires of this kind.

While the railroad fire hazard has been minimized in Minnesota by rigid inspections of locomotive equipment and rights-of-way, the success of controlling fires of this kind is due largely to the active cooperation of the railroads themselves in the disposing of fires along their rights-of-way by the maintenance of speeder patrol during dry periods. They recognize the ever present danger of fire and that constant vigilance is the price they have to pay for protection to their own and other publicly and privately owned forest resources.

NURSERIES AND PLANTING

R. CLEMENT, *in Charge*

April 18, 1946, marked the completion of fifty years of forestry activity in Minnesota, which began with the appointment of General C. C. Andrews in the capacity of chief fire warden.

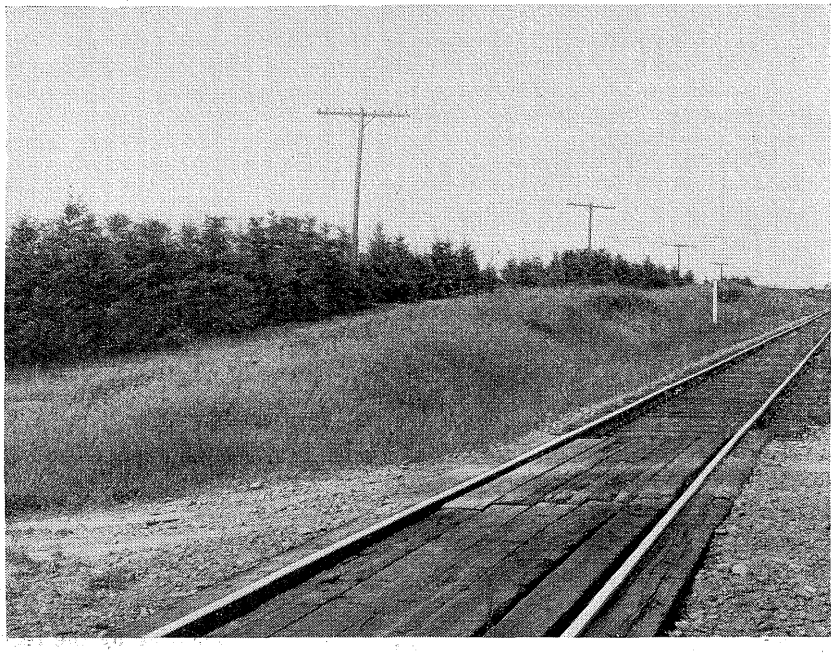
Records indicate that the first active forestry efforts of the chief fire warden were concerned with tree planting, and were promoted in the early years by the distribution of tree seeds for volunteer planting by the recipients.

Tree planting has played an important part in the state's forestry program since the enactment of the very first conservation law.

Available early records are meager and we find no mention of planting or distribution of seed or trees until about 1895 and 1896. In the "Tree Planter's Manual" there is a notation to the effect that 2,500 packages of green ash seed and 2,000 young evergreens were distributed in the winter and spring of 1896. In the chief fire warden's report for 1897, appears an article entitled "The Foresting of Wastelands." Therein General C. C. Andrews says, "It is more profitable to raise forests from natural seeding, but where land has been entirely cleared, forests of pine and spruce can be renewed only by artificial planting or sowing. . . . It is utterly out of the question for individuals to plant this wasteland with forest; the state can do so, and if it would, what a magnificent patrimony it would possess."

In 1897, the legislature appropriated $3,000 to the state forestry association to be expended on the "promotion and encouragement of raising forest trees on the open prairies, and for continuous interest in forest and water conservation throughout the state, for the free distribution of forest seeds and plants for trial, and for the distribution of information concerning tree planting in general."

The first time actual planting is mentioned is in the annual report of the chief fire warden for 1901. Quoting therefrom: "In the spring of 1900 an experiment in young pines on cutover lands was begun at the Minnesota



There are many kinds of tree plantations. This one forms a "live snow fence" along a Minnesota railroad.

sub-experimental station near Grand Rapids under the direction of its superintendent, Mr. H. H. Chapman. Ten acres or more were planted with small white and Norway pines, a foot to three feet in height."

On April 10, 1903, the forestry board approved the establishment of the first forest tree nursery. In September of that year the board accepted a proposition from Lars M. Hope, a Norwegian-American homestead settler living one-half mile from the Pillsbury reserve, to prepare one acre for a nursery on the southeast quarter of the southwest quarter of section 1, township 134 north, range 30 west. No direct appropriation was made for the carrying out of this project.

Continuing to quote from annual reports of chief fire warden Andrews, this time for the year 1905: "With regard now to the situation in Minnesota, it may be said that tree planting can be done only during the few weeks in the spring. Lack of labor prevents its being done on a larger scale; consequently, a beginning should be made without further delay. The state is losing time. The forestry staff is anxious to begin, but they have not been able to secure money for tree planting from the legislature."

The legislature of 1907 appropriated $2,500 to the forestry board for tree planting and some 600,000 evergreens were planted that year in the Burntside reserve.

The 1910 report to the legislature, reports that the board in 1909 and 1910 had planted 56,000 seedlings on a 1000 acre tract in Cass county donated to the state by the late John S. Pillsbury and known as the Pillsbury reserve. A total of 225 acres of the reserve was covered by these plantings.

Quoting from the report of 1912: "Since 1877 the state has been paying a bounty for the encouragement of tree planting on the prairies. In all, $546,447.13 has been paid out for this purpose. No doubt a great deal of encouragement was thus afforded the farmers in planting rows of shelterbelts throughout the prairie region.

"The northwestern provinces of Canada, as well as the states of Vermont, New Hampshire and New York, maintain state nurseries and furnish seedlings of forest trees to farmers and others practically at cost. The several commercial nurseries in Minnesota are not devoting much attention to forest seedlings, and there is a real need for a supply of such stock. A state nursery would be of value in several ways; it would furnish reliable stock for planting in the state forests and parks and would also meet the demand from landowners who wish to establish plantations and even windbreaks and shelterbelts."

Again the report of 1913 states: "Up to the present time, forest planting by private parties in Minnesota has been confined largely to woodlot and windbreak planting. Forest planting of cutover timber areas of northern Minnesota presents an entirely different planting problem. This branch of the practice of forestry up to the present time has not made the progress which it should have. This is due principally to the lack of funds for the work. The only extensive operation in planting carried on by the forest

service this year was on the Burntside state forest, when some 19,500 trees were set out."

"During the spring of 1914," according to the report for that year, "the Minnesota Forest Service began its real work in reforestation of part of the cutover and barren land within the state forests. A total of 725,000 trees of nursery stock was purchased and 65,000 trees of wild stock were dug in the woods. The planting was done on the Burntside State Forest, Pillsbury State Forest and in Itasca State Park."

The years 1915 and 1916 saw considerable activity in planting, with over 200,000 trees being set out in the Burntside state forest.

As noted from the report for the year 1918, all planting plans were suspended due to the war.

From this time on, we find the state forest service doing some planting every year, with communities, boy scouts, women's clubs and other organizations doing most of the planting. Hardly a year went by but what some trees were available from various sources to carry out a meager planting program.

In 1931, the legislature made an appropriation to the division of forestry available for the years 1932 and 1933, under the terms of which the division was authorized to establish the first nursery ever developed from direct appropriations by the state.

For a period between 1933 and 1942 immediately following the establishment of the nursery, forestry was promoted and advanced through work relief programs carried on by such agencies as TRA, ERA, SERA, ECW, CCC, and WPA. The work relief programs enabled the division of forestry to carry out a large and definitely prescribed planting program throughout the forest area. More than forty million trees were planted upon publicly owned lands through the medium of these agencies.

It is to be noted that even with money to establish a nursery, no funds were appropriated for the actual planting of trees.

In connection with the operation of the nurseries and tree planting, it should be emphasized that while the legislature has appropriated funds for the nurseries as such, no appropriation has ever been made for the actual planting on forest lands of the seedlings reared in the nurseries. The record of planting made in the 30's above referred to was made possible only because of personnel and equipment made available to the relief agencies who did the work. If further extensive tree planting is to continue funds will have to be provided for the purpose.

Table 13 lists by years the number of trees that have been planted on forest lands during the period 1901-1946.

TABLE 13

Number of Trees Planted in Minnesota From 1901 to Spring, 1946, Inclusive

1901	10,000	1926	100,700
1907	600,000	1933	1,892,700
1909	56,800	1935	6,518,200
1913	17,500	1936	3,234,695
1914	790,000	1937	6,894,070
1916	200,000	1938	5,636,657
1918	45,000	1939	4,660,314
1919	125,000	1940	5,622,421
1920	210,000	1941	4,225,245
1921	62,000	1942	1,520,980
1922	81,000	1943	157,294
1923	227,400	1944	162,943
1924	164,000	1945	362,899
1925	62,000	1946	665,481

During 1943, the author designed and had built a tree planting machine, with a planting capacity of about 1,500 per hour. A second machine, with some improvements, was built during 1944 and plans contemplate the completion of others as funds become available. The development of additional machine planting would considerably expedite the state's forest planting.

Two men sit in rear of tree-planting machine and alternately feed trees through center slot.

Plantings were continued during the biennium in cooperation with the

Minnesota department of highways, and within state forests, state parks and on other lands, and in county and municipal forests.

Credit is due the many cooperating agencies that have cooperated with the division in the tree planting programs, making progress possible even during the war years. Public-spirited groups, including civic and commerce associations, chambers of commerce, 4-H clubs, boy and girl scouts, the Izaac Walton league women's chapters, veterans' organizations, community clubs, and a number of school children, their teachers and parents have contributed liberally of their labor in the planting of trees on public land dedicated to forestation use.

Farm planting of trees has been encouraged and promoted during the biennium with legal limitations and to the extent permitted by the funds of the division. Cooperation with municipalities, counties, and schools in the establishment of forests has expanded. The division of forestry furnished trees for planting upon public lands as indicated in Table 14.

TABLE 14

Number of Trees Planted in Minnesota on Public Lands During the Biennium of 1945-1946

DIVISION OF FORESTRY

	1945	1946
Aitkin Ranger Station	225	.....
Gen. C. C. Andrews State Forest	12,350	40,025
Bemidji Ranger Station	2,500	.....
Birch Lake Ranger Station	3,000	.....
Blueberry Tower Site	.....	255
Borden Lake Ranger Station	.....	950
Bowstring State Forest	.....	175
Brainerd Ranger Station	.....	1,000
Paul Bunyan State Forest	.....	2,100
Cambridge Ranger Station	.....	1,450
Coleraine Tower Site	.....	80
Crow Wing State Forest	.....	4,500
D. A. R. State Forest	1,000	.....
Faunce Ranger Station	.....	675
Foothills State Forest	.....	26,500
Gull Lake Ranger Station	.....	2,050
Grand Portage State Forest	5,000	.....
Hill City Ranger Station	405	40
Koochiching State Forest	10,000	.....
Land O'Lakes State Forest	.....	500
Martin Lake Project	.....	4,000
Minnesota State Forest	.....	5,000
Mississippi Headwaters State Forest	2,200	.....
Moose Lake Ranger Station	2,000	.....
Pine Island State Forest	.....	3,500
Ray Ranger Station	.....	500
Sand Dunes State Forest	40,400	273,225
Smoky Hills State Forest	1,600	.....
Spider Lake Ranger Station	500	.....
	81,230	366,495

DIVISION OF STATE PARKS

Itasca State Park	.....	10,000
St. Croix State Park	.....	15,600
		25,600

DIVISION OF GAME AND FISH

Carlos Avery Nursery	.....	10,550
French River Fish Hatchery	.....	6,000
Isanti County Game Refuge	.....	1,800
Red Lake Game Refuge	.....	1,650
		20,000

MINNESOTA DEPARTMENT OF HIGHWAYS

Littlefork—Highway 71	7,500	7,000
Princeton to Zimmerman—Hwy. 169	2,500	.....
Austin—Highway 15	6,500	5,000
Carlton County—Highway 23	.....	23,800
Pine County—Highway 23	.....	35,250
Monticello—Highway 25	.....	700
Bagley—Highway 92	.....	35,000
	16,500	106,750

OTHER STATE-OWNED LANDS

Anoka State Hospital	2,500	7,200
Moose Lake State Hospital	13,650	.....
Cloquet Forest Experiment Station	.....	1,500
Red Wing Training School for Boys	.....	2,000
Sec. 10-118-42, Lac qui Parle Co.	425	.....
Sec. 24-119-43, Lac qui Parle Co.	425	.....
Sec. 36-146-34, Beltrami County	.....	2,000
Sec. 19-147-37, Clearwater County	.....	1,150
	17,000	13,850

FEDERAL COOPERATION

U. S. Department of Agriculture (University Farm Experiment Station)	1,250	200
Sandstone Federal Prison	23,000	.....
U. S. Army (Camp Ripley)	.....	8,000
	24,250	8,200

COUNTY FORESTS

Anoka County	41,000	20,000
Crow Wing County	.....	5,000
Dakota County	900	.....
St. Louis County	3,000	2,000
Ramsey County	1,000	.....
	45,900	27,000

MUNICIPAL FORESTS

	1945	1946
Alexandria	10,250	.....
Annandale	.....	1,000
Aurora	25,000	.....
Backus	17,000	.....

Bagley	1,600	850
Balaton	325	.....
Buffalo	1,300	.....
Cannon Falls	7,000	.....
Chisholm	.....	2,500
Deer River	.....	15,000
Duluth	8,000	11,000
Eden Valley	500	.....
Elk River	.....	500
Hendricks	170	.....
Hill City	.....	80
Meadowlands	400	.....
Moose Lake	500	.....
Orrock	.....	550
Red Wing	500	.....
Rochester	25,000	2,000
Russell	.....	400
Sauk Centre	300	.....
Stephen	.....	6,000
Tower	6,000	.....
Waseca	.....	3,250
Winona	200	.....
	104,045	43,130

SCHOOL FOREST

Appleton	65	.....
Baudette	.....	675
Brainerd	.....	350
Carlton	.....	1,950
Danvers	132	.....
Dilworth	16	.....
Eden Valley	400	.....
Foreston	.....	350
Foxhome	.....	60
Gilbert	1,000	.....
Goodland	.....	300
Holloway	75	.....
Isle	.....	50
Isanti County	8,250	.....
Keewatin	65	71
Mentor	.....	4,000
Mille Lacs County	39,500	38,500
Murdock	200	.....
Ortonville	1,950	1,750
Saint Paul (Hillcrest School)	2,000	.....
Sherburne	.....	4,000
Sturgeon Lake	1,950	.....
Virginia	18,000	.....
Wadena County	450	.....
West Saint Paul	.....	400
Willow River	.....	2,000
Winthrop	21	.....
	73,974	54,456
GRAND TOTAL	362,899	665,481

Tree Planting on Private Land

While forest conservation in Minnesota has forged ahead along various lines in recent years, including tree planting on public land, there is one field in which we are far behind, namely, tree planting on private land for reforestation of denuded areas, for soil conservation, for erosion control, for replenishment of depleted farm woodlots, for improvement of game habitat, and for other conservation purposes. Achievement of these purposes is not merely beneficial to land owners, but is of crucial importance to the future economy and welfare of the entire state. Our neighboring states of Wisconsin, Michigan, and many others are years ahead of us in this type of work. Millions of acres of private land in Minnesota which are not suitable for cultivation and which now lie bare and largely unproductive should be growing trees, and much of this land would today be covered with a thrifty growth of trees if we had set up an effective tree planting program when other states were doing so. There is urgent need for such a program throughout the state, not only in the northern forest regions, but in the central and southern agricultural areas as well.

An adequate program for Minnesota, according to experience in Wisconsin and other states, will require planting ten million trees or more per year. It will take some years of educational and organizational work among farmers and other land owners throughout the state to attain such a volume of planting. However, with the cooperation of interested state and federal agencies, a substantial program for planting trees on private land could be carried out at comparatively small cost to the state. Experience in other states has shown that under a properly organized system a considerable part of the cost can be recovered through the sale of tree planting stock to farmers, timber producers, and other land owners.

The conservation department, supported by interested organizations and individuals, tried for many years to get authority from the legislature to provide planting stock for private land, but without response until 1945. For some years the division of forestry has had two large nurseries in operation, as well as other locations that could be developed if needed. However, the state nurseries have been limited by law to the production of native coniferous stock for planting on public land only. Until 1945 there was no provision for supplying stock under state authority for conservation tree planting on private land. Experience has shown that without public assistance and direction, a broad-scale tree planting program on private land cannot succeed. Suitable planting stock in sufficient quantity at low cost is not available from the regular commercial nursery trade. Organization of a coordinated system of production, distribution, and planting under state supervision is essential. The immediate critical problem in Minnesota is supply of planting stock.

In an effort to meet this need, the 1945 legislature passed an act authorizing the conservation department to contract with private nurserymen for the growing of trees to be distributed by the state at prices covering the cost of production and distribution. Experience under this plan, though brief, has raised a serious question as to whether it will ever be adequate

to cope with the problem of supplying the kinds and quantities of planting stock needed for reforestation and other conservation purposes.

In most of the states which carry on successful tree planting programs on a scale comparable to what is needed in Minnesota, the state produces and distributes the planting stock at much lower cost than it could be purchased from private growers. For example, in Wisconsin the state has been growing and selling tree planting stock to land owners for conservation purposes at prices ranging from $2.00 for seedlings to $5.00 per thousand for transplants, with a discount of 25% for all orders of 50,000 and over. Michigan, according to the 1946 price list, furnished deciduous seedlings at $3.00 to $4.00 per thousand and coniferous at $3.00 to $7.00 per thousand.

The first attempt made by the Minnesota conservation department to secure planting stock from private growers under the 1945 act was made in the fall of 1945. It resulted in bids so high they were rejected. A second attempt, made in March, 1946, resulted in the letting of contracts for 550,000 deciduous seedlings at an average price of about $11.00 per thousand, and 450,000 coniferous transplants at an average price of about $21.00 per thousand, to be ready for delivery in the fall of 1947 or the spring of 1948. These prices, though lower than the previous bids, are still far above the prices at which other states are furnishing trees for such purposes, and much higher than what it would cost the state to produce the stock at its own nurseries. At conservative estimates, this stock could be produced at the state nurseries at an actual cost of $6.00 to $8.00 per thousand or less, with due allowance for post-war increases in cost of operation. However, it was thought best to accept the bids in order to have some stock for distribution in 1947 and 1948, and avoid another year's delay.

The issue is now clearly presented for decision, whether to continue with the private contract system under the 1945 act after fulfilment of the present contracts, or to authorize the conservation department to produce the planting stock for subsequent years at the state nurseries. If the contract system be continued, it will mean that higher prices must be paid for the planting stock than if it were produced by the state. This will materially retard the progress of the planting program, because the higher the cost, the less planting will be done by land owners, especially the owners of low value land where tree planting is most needed. Is there any good reason why the planting program, for the benefit of certain private growers, should be burdened with prices more than double the cost of furnishing the stock from state nurseries?

In the past the commercial nurseries have stoutly opposed state production of conservation tree planting stock for private land on the ground that it would put the state in competition with private enterprise. The nurserymen have also asserted that they could produce the stock as cheaply or even more cheaply than the state.

The claim of state competition with private enterprise is groundless, because the program of tree planting for reforestation and other conservation purposes on private land is largely undeveloped in Minnesota, and there

will be no demand for any substantial amount of planting stock for such purposes unless the state or some other public authority promotes and directs the program. In short, the field of systematic tree planting for conservation purposes is not now occupied by private enterprise, and cannot be developed on a large scale by private enterprise unaided by public authority. Experience elsewhere has shown that when the state has promoted extensive conservation tree planting on private land, it has not hurt the commercial nurserymen but has rather benefited their business by stimulating interest in planting trees and shrubs generally for other purposes.

The fact is that the stock required for reforestation and other conservation purposes is mostly of a quite different type from that produced by commercial nurseries for fruit growing, ornamental planting, and similar private purposes, so there is little or no actual conflict between the two fields of tree planting. The state has no desire or intention of invading the field already occupied by commercial nurseries. The present contract law is framed to prevent any such intrusion, and similar restrictions could be incorporated in any future law authorizing the state to produce planting stock.

If it were true that tree planting for conservation purposes encroached upon the field of the private nursery industry, the effect would not be averted by the purchase of planting stock from private growers by the state under the contract system authorized by the 1945 act. It is essential to the success of a large scale conservation tree planting program that the stock be grown in large quantities to meet special requirements, and distributed to land owners under direction of the state at prices much lower than prevailing commercial prices. If the state obtains the stock from private nurserymen, the business will necessarily be confined to a very few large growers who will equip themselves to meet the special requirements and produce the necessary quantities. All the other private nurserymen would suffer from the competition, if it actually had any adverse effect, just as much as if the stock were produced by the state itself. However as already pointed out, the effect of conservation tree planting programs in other states has not been detrimental but rather beneficial to the private nursery industry.

Although bidding under the 1945 law was open to all Minnesota nurseries, only three bids were received in response to the first advertisement and three in response to the second. Apparently most of the nurserymen are not interested in this type of business. In the absence of more aggressive competition than this among the nurserymen themselves, they have little ground for objecting to state production of planting stock.

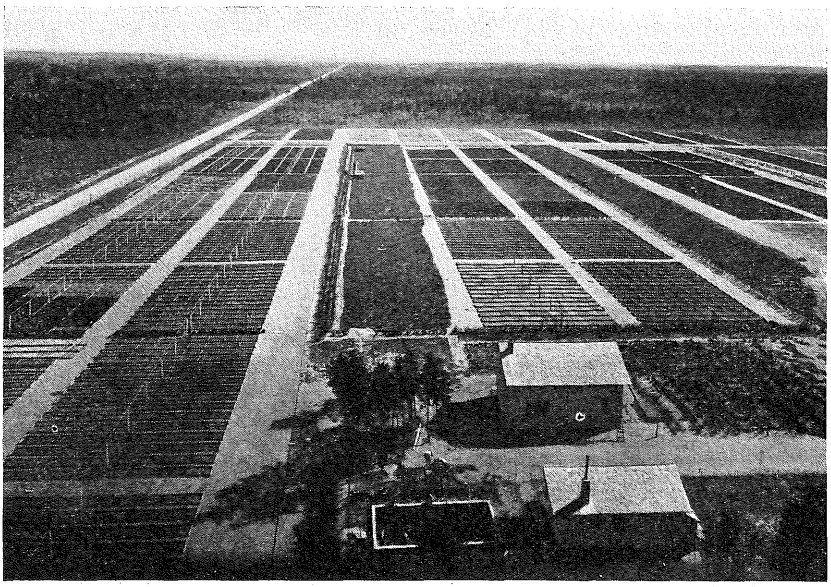
At any rate, in almost all other states where state production of tree planting stock for conservation purposes has been established for many years, commercial nurserymen are apparently quite reconciled to this system.

The bids received under the present contract law as well as evidence from other sources demonstrate beyond question that the private nurserymen in Minnesota will never be able to produce planting stock under the conditions required for conservation purposes as cheaply or effectively as

the state nurseries. In the first place, the state nurseries have a basic advantage in that they pay no taxes, interest on investments, or insurance premiums, and need not make a profit. Since the conservation planting program is based on public welfare, it should have the full benefit of these advantages. The situation is quite different from that which would exist if the state were actually engaging in a private enterprise, where it might be proper, in fixing prices, to charge the state production with amounts equivalent to taxes, interest, insurance, and profit.

The state nurseries have other practical advantages in production of planting stock for conservation purposes which private nurseries cannot expect to overcome. State nurseries have extensive facilities already developed for production of such planting stock for public land, and these facilities can readily be expanded at comparatively small cost to supply all the needs of a statewide planting program on private land. Furthermore, the state nurseries are staffed with men experienced in producing and handling the special types of planting stock required for conservation purposes. On the other hand, most commercial nurseries have had little or no experience with such planting stock, and must adopt methods differing considerably from their customary practices in order to meet the special requirements therefor.

The state nurseries have an additional advantage in that they are located in the northern part of the state. Spring digging and planting of stock while dormant, for both deciduous and coniferous species, is desirable for most conservation purposes. Since the ground thaws later in the north, stock grown in the north can be dug in the spring while dormant and shipped



Forest seedlings grown at Badoura nursery for reforestation program.

for planting anywhere in the state, whereas stock grown in the central or southern part of the state is not as suitable for shipment and planting northward. It is a well settled rule, based on experience, that for conservation purposes in Minnesota planting stock should be shipped south rather than north. Few commercial nurseries can do this, as most of them are in central or southern Minnesota. Hence they are not in good position to supply the large northern areas requiring planting for reforestation and other conservation purposes.

Problems of supervision and distribution of stock would obviously be much simpler and the cost of those operations to the state would be much less if the stock were produced at the existing state nurseries than if it were obtained from private growers at different points.

An operation so important to the public welfare as conservation tree planting should be carried on at the least possible cost to the public. If it appears that state production of planting stock will result in lower cost without material harm to private industry, it is obvious that that method should be adopted.

On the basis of all experience in Minnesota and elsewhere, it is clear that the cheapest and most effective method of producing tree planting stock for conservation purposes on private land is through the state nurseries, and that thereby this important program will progress much faster than under the private contract system. Whether to authorize state production or to continue with the more expensive, cumbersome, and less effective plan for procuring planting stock from private growers is a matter for determination by the legislature. The action taken, whatever it may be, will have a far reaching effect on the future course of the entire conservation tree planting program, because it is necessary to make long range plans in advance for the production of planting stock and for organization and direction of distribution and planting in accordance with the method of supply which is adopted. It is desirable to have a decision by the legislature on this question one way or the other as early as possible in the 1947 session as a basis for production operations which must be started during the coming season for stock to be delivered in 1948 and 1949.

Christmas Trees

Minnesota has witnessed a steady and healthy growth in its Christmas tree activities since the passage of the first control measure in 1933. This control has helped stabilize the industry, and has given almost complete protection to the land owners from bootleggers who made a practice of cutting trees without regard to ownership.

It is estimated that a total of over two and a half million Christmas trees were cut during the season of 1945 yielding a revenue to the Christmas tree industry of from $1,500,000 to $2,000,000.

In reviewing the tables submitted herewith, it should be kept in mind that tag sales represent the trees sold in Minnesota only. Minnesota Christ-

mas trees are shipped all over the nation and in fact, to many foreign countries. The greater number of Yule trees exported to parts outside of the state go to markets in the eastern United States.

State trust fund lands yielded 450,215 Christmas trees in 1944 and 407,358 in 1945, from which the state derived a total stamp revenue of $16,824.48.

Receipts from the sale of evergreen tree tags and licenses increased considerably in 1945 over the 1944 figures. The spirit of our first peace time Christmas season since 1941 gave increased impetus to the buying of Christmas trees and was reflected in an increased activity in 1945.

TABLE 15

Statement of Receipts from Christmas Tree Activities under the Evergreen Tree Tag Law for the Biennium of 1944-1945

	1944		1945	
Area	No. of 2c Tags Sold	Amount	No. of 2c Tags Sold	Amount
Saint Paul	137,703	$2,754.06	189,798	$3,795.96
Moose Lake	102,582	2,051.64	122,835	2,456.70
Cloquet	45,846	916.92	76,576	1,531.52
Brainerd	11,221	224.42	17,544	350.88
Hibbing	10,367	207.34	8,926	178.52
Hill City	75,979	1,519.58	111,261	2,225.22
Bemidji	14,227	284.54	14,684	293.68
Park Rapids	20,174	403.48	26,805	536.10
Arago	2,773	55.46	2,098	41.96
Warroad	22,942	458.84	15,859	317.18
Baudette	1,580	31.60	218	4.36
Blackduck	6,594	131.88	19,602	392.04
Littlefork	7,600	152.00	1,824	36.48
Orr	6,431	128.62	13,085	261.70
Duluth	14,141	282.82	42,472	849.44
Hovland	35	.70	5,010	100.20
	480,195	$9,603.90	668,597	$13,371.94

Sale of seized confiscated trees in 1944 yielded $115.35, and $800 was derived from the sale of four licenses for out of state shipment. Seizures produced $14.85 and licenses $600 in 1945.

TABLE 16

Revenue Yielded the State from Operations Under the Evergreen Tree Tag Law for the Period 1936 to 1945, Inclusive

1936	$10,582.31
1937	13,169.03
1938	13,653.65
1939	13,822.41
1940	13,132.39
1941	14,124.83
1942	10,113.09
1943	19,457.73
1944	10,519.25
1945	13,986.79

FOREST MANAGEMENT

E. L. LAWSON, *in Charge*

The State of Minnesota owns or controls over 4,800,000 acres of land including trust fund lands, conservation lands, and lands acquired by gift or purchase. Most of this state land, or 4,100,000 acres of the total, is forest land. This acreage represents 20.8 per cent of the total forest area of Minnesota.

In the development and management of state-owned timber lands, the division of forestry's objective has been to keep such lands continuously productive, cutting mature timber in such a way as to insure the restocking of the land. Primarily the plan is to safeguard future yields by regulating the volume cut from forest properties. In this connection, the division of forestry is formulating and applying promptly adequate management plans to state forest lands. Specific measures included in such plans aim toward the orderly handling of state forest lands and the establishment of sustained yield units. In line with this program, first consideration has been given to blocking out state-owned forest properties where there is a large concentration of state-owned timber land into definite management units.

State Forest Inspectors keep a close check on Christmas tree cutting operation, thereby insuring the future of the $2,000,000 industry.

Each forest block will be operated under simple generalized management plans which will serve as a guide to regulate current removal of timber from the management unit.

Forest management blocks established under this program, including land areas, forest cover and condition, and status of work plans, are shown in Table 17.

Private Forest Management Service

The sum of $8,000 was made available to the division of forestry in the form of a gift from the Minnesota forest industries information committee for the employment of two project foresters qualified to furnish forest land owners competent forest management services in marking, measuring, and marketing harvested forest products.

Services of these project foresters have been available since March 1, 1946, and are available without charge upon request from owners of forest woodlands of less than 1,000 acres with preference in the assignment of such employees being given to land owners in the fourteen northeastern counties of the state.

Present funds from private sources to carry on forest management service to small woodland owners terminates April 1, 1947. It is, therefore, urgent that if such work is to be continued on a more permanent and expanded basis, it will have to be done under state appropriations. These woodlands play an important role in the state's economy by furnishing over 30 per cent of the industrial timber requirements as well as supplying local and farm needs. Farm and other small privately-owned woodlands in Minnesota during 1944 produced 98 million feet of sawlogs, 225,000 cords of pulpwood and 1,767,000 cords of fuel and other products. Since these timber products were contributed by 38 per cent of the total forest land area and by 90 per cent of the forest land owners, a project to help in the promotion and management of farm woodlands merits public aid. In this program a reasonable share of the expense should be accepted by the land owner.

Black Spruce Utilization Study

Black spruce utilization studies will be carried on during the 1946-47 logging season on a tract of state timber embracing 150 acres with about 1,700 cords of spruce pulpwood timber. This timber was sold by the state to the Minnesota and Ontario Paper Company at a public sale. Terms under this sale provided that an experimental project in spruce pulpwood utilization should be carried on in cooperation with the division of forestry to determine the economic practicability of cutting pulpwood to top diameters ranging down to 2½ inches. The experiment is to determine the cost as well as the time element involved in the operation from the stumpage to the final conversion of the wood into sulphite pulp. It will also include a study of the problems encountered in barking the small material and the yield and quality of pulpwood produced as compared with the same factors involved in the processing of pulpwood sticks of a larger top diameter.

Approximately one-third of the volume will be cut by the standard methods of utilizing sticks 8 feet in length to a top diameter of 4 inches,

TABLE 17
FOREST MANAGEMENT UNITS

Block Designation	Location	Gross Land Area	State Land Area		Forest Cover Types on State Lands		Condition of Forest Stands on State Lands		Present Status of Work		
		Acres	Acres	Percent		Percent		Percent	Timber Survey	Forest Type Maps	Forest Mgmt. Plans
1. Craigville	In Southern Koochiching and Northern Itasca Counties.....	751,314	283,453	37.7	Aspen.....	29	Mature.....	36	Completed	To be revised	Completed July '45
					Spruce Swamp.....	26.4	Growing Merch..	33			
					Cedar.....	17.6	Young Growth..	31			
					Spruce-Balsam.....	15.9					
					Pine, Misc. Hdwds., other.....	11.0					
2. Big Falls	In Pine Island State Forest Southwestern Koochiching County..	367,071	280,788	76	Spruce Swamp.....	29	Mature.....	22	Completed for 9 twps.	Completed for 9 twps.	Will be completed shortly
					Tam., Cedar.....	20	Growing Merch..	28			
					Aspen, Sp.-Balsam..	12	Young Growth..	50			
					Pine, Misc. Hdwds .	2					
					Stagnant Sp., nonproductive.....	37					
3. Dentaybow	In the Koochiching State Forest Southeastern Koochiching Cty.	296,870	149,915	50	Similar to Big Falls Block.....		*		Completed for 7 twps.	Completed for 7 twps.	*
4. Black River	Northwest Koochiching County .	374,190	185,900	49.7	Similar to Big Falls Block		*		TBR Survey planned for winter 1946 and 1947	*	*
5. Pelican Lake	In Kabetogama State Forest St. Louis County and embracing two adjacent twps. in Eastern Koochiching County	171,252	48,630	28.4	Aspen-Birch.....	47.8	Mature.....	60	Completed for 6 twps.	6 twps. completed	Will be completed shortly
					Spruce Swamp.....	20.7	Growing Merch..	11			
					Spruce-Balsam.....	13.3	Young Growth..	29			
					Pine (White, Norway, Jack).....	11.1					
					Tam., Cedar, Misc. Hdwds.....	7.1					
6. Burntside	St. Louis County in Burntside State Forest.....	22,127	22,127	100	Jack Pine.....	50.9	Mature.....	57	Completed	Completed	Will be completed shortly
					Spruce Swamp.....	19.4	Growing Merch..	40			
					Aspen-Birch.....	17.5	Young Growth..	3			
					Norway Pine, White Pine, Bal-Spruce, other.....	12.2					

*Complete data not available at present date.

TABLE 17—Continued

FOREST MANAGEMENT UNITS

Block Designation	Location	Gross Land Area	State Land Area		Forest Cover Types on State Lands		Condition of Forest Stands on State Lands		Present Status of Work		
		Acres	Acres	Percent		Percent		Percent	Timber Survey	Forest Type Maps	Forest Mgmt. Plans
7. Third River	Itasca County in Third River State Forest and embracing approximately 2½ twps. bordering its west boundary	169,915	45,250	26.7	Aspen-Birch, Balsam Spruce Swamp Tam., Cedar Jack Pine Misc. Hdwds.	27 22 23 13 15	Mature Growing Merch. Young Growth	33 16 51	Partially Completed	Partially Completed	*
8. Savannah	In Savannah State Forest, Northeastern Aitkin County	201,200	90,400	45	Nor. Hdwds., Aspen Spruce Swamp-Tam. Pine (White, Norway, Jack) Stagnant Sp., nonproductive	48 18 5 29	Mature Growing Merch. Young Growth	14 32 54	TBR Survey planned for winter 1946 and 1947	To be revised	*
9. Meadowbrook	St. Louis County in Kabetogama State Forest and embracing six adjacent twps. on its south bdry.	213,070	48,918	23.0	*		*		Partially Completed	Partially Completed	*

*Complete data not available at present date.

one-third will be cut to 3 inches top diameter, and the remaining one-third to a top diameter of 2½ inches.

STATE FOREST LANDS AND RECREATION

H. OSTERGAARD, *in Charge*

Special Use Permits

The division of forestry is responsible for the administration of all state lands lying within the 32 designated state forests. This agency is empowered to issue special use permits and leases on state lands within these forests suitable for summer homesites, resorts, rights-of-way, hay and other miscellaneous uses. Since the program began, ninety tracts, ranging in size from one to eighty homesites on each, have been platted. This platted lakeshore property is located on numerous lakes, all in the northern two-thirds of the state. The demand for cottage sites has been active and continues to be so. Lakeshore was platted on Crane and Wilson Lakes, opening up new sites, and additional tracts were platted on Vermillion and Rainy Lakes during the biennium.

Table 18 shows the income derived by the state from leases and permits issued within state forests for the fiscal years 1943 to 1946, inclusive.

TABLE 18

Permits in Force and Revenue Collected

	1943		1944		1945		1946	
Homesites	283	$3,069.10	256	$2,814.50	289	$3,050.00	324	$3,470.00
Hay and Farm..	172	1,343.72	181	1,394.17	190	1,491.51	157	1,220.46
Commercial	43	1,067.56	42	1,389.10	54	2,047.43	60	1,471.28
Rights-of-Way..	26	203.34	29	228.90	31	204.42	23	163.92
Total:	524	$5,683.72	508	$5,826.67	564	$6,783.36	564	$6,940.66

Public Camp Grounds

The division of forestry supervises and maintains numerous camp grounds on state lands, particularly on lakeshores and streams where people can stop and picnic or camp for several days. At present there are twenty-five camp grounds with tables, fire places, water and other facilities.

Such camp grounds have considerable public value in providing access to good lakes on public lands. They lessen the danger of camp fires spreading into the forest by having such fires concentrated on prepared areas. The campers on public grounds can be more readily contacted and instructed in forest fire prevention.

Because the use of such facilities was curtailed during the war and partly because the division has not had sufficient means to do the work, no new camp grounds have been established in recent years. Some necessary

maintenance work has been done but it has not been adquate. If the program is to continue satisfactorily, funds must be appropriated for this work.

Lakeside campsite fireplace and table.

Land Acquisition

For several years the division of forestry has received an annual appropriation of $850.00 for acquiring administrative sites. The following sites have been purchased during this biennium:

Aitkin Ranger Station, 3 lots	.5 acres
Alborn Ranger Station	40.00 acres
Northome Ranger Station	1.19 acres
Backus Ranger Station	1.00 acres
Warroad Headquarters	.5 acres
Cromwell Ranger Station	2.00 acres
Cook Ranger Station	.2 acres
Nevis Ranger Station	1.00 acres
Pillager Ranger Station	.5 acres
Total:	46.89 acres

Under the provisions of Laws of 1943, Chapter 171, the counties relinquished their equities in tax forfeited land to the state for conservation purposes as follows:

Sherburne County	280 acres
Cass County	680 acres
Pine County	2,120 acres
Crow Wing County	160 acres
Itasca County	40 acres

Hubbard County	12,800 acres
Beltrami County	2.5 acres
Total:	16,082.5 acres

Buildings

The division of forestry has numerous buildings consisting of administrative offices, warehouses, garages, cabins and minor service buildings such as woodsheds, storage sheds, ice houses, etc. These buildings are used in forest fire protection work and to a lesser degree in timber sale and other timber management activities.

Most of the maintenance of buildings is done by forestry personnel when time can be spared from their other activities. The division has two painters who spend almost all of their time on painting and another man who does plumbing and electrical work as needed and otherwise works at the Grand Rapids supply depot.

Because of the scarcity of building materials new construction during the biennium was confined to the following structures:

1 combination warehouse and office, 30′ x 52′—City of Aitkin

1 combination warehouse and office, 30′ x 64′—Village of Cromwell

1 warehouse, 30′ x 66′—City of Warroad

1 tower cabin 14′ x 18′—Village of Pinewood

1 storage shed, 25′ x 70′—City of Grand Rapids

1 latrine, 6′ x 6′—Village of Cromwell

Three buildings were moved from a site on Lake Vermillion to a new site at Cook where they will serve a greater use. A lumber shed was moved from the C.C.C. camp at Deer Lake to the Thistledew ranger station where it will be used as a storage shed for heavy equipment. A portable building originally constructed by W.P.A. was moved from the General C. C. Andrews nursery to the Birchdale ranger station where it was placed on a foundation and will be used as a permanent warehouse and storage shed. A small warehouse was also moved from the tower at Beauty Lake to the Toivola ranger station. Three portables which were constructed by the C.C.C. were moved, one to the Orr headquarters, one to the Northome tower, and one to Malmo. A tower cabin was moved from Hill City to a new ranger station site near Jacobson and another from Hill City to Big Fork; the latter to be used primarily in timber sales and management work.

TIMBER ADMINISTRATION

J. C. GANNAWAY, *in Charge*

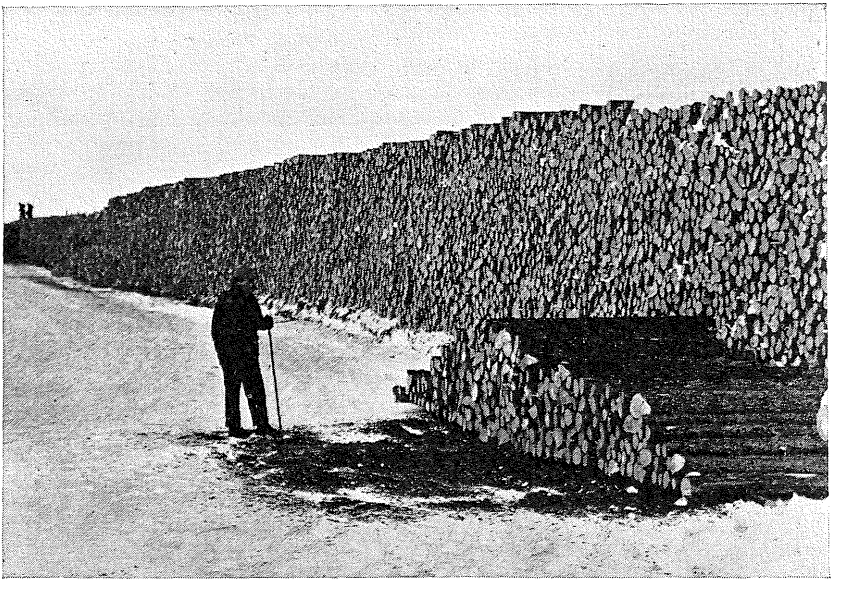
Timber Sales

The demand for state-owned timber has been high for the biennium, the products being used mostly for the conduct of the war. Because of the severe shortage of housing and the large number of reconversion projects requiring timber products, present indications are that the demand will continue to be as heavy for the next year or longer.

In spite of the heavy demand for all forest products, production fell below that of the preceding biennium. This was due to several reasons, but chiefly to the lack of experienced woods labor, old and worn out logging equipment that could not be replaced, the many federal regulations of prices and various priorities. No doubt as these conditions are corrected under peace time regulations, production will increase to meet the urgent demand.

During the war years some species of timber were cut far in excess of their growths. This was especially true with reference to black spruce, which was in heavy demand by paper mills to meet war needs. The division is now working on a return to peace time management plans and placing all of our timber on a sustained yield basis, so that the cut will not exceed the growth.

In order to place all of our forests under sound sustained yield management plans so as to assure the state of a continuous financial yield, it will



Pulpwood stockpile at a Minnesota papermill.

be necessary to have a force of trained technical men to take over and carry on this work. During the war this type of men was not available, but many of the returned veterans have the necessary university training and are anxious to get into this branch of forestry work.

Steady progress is being made in developing better methods of cutting the various species of timber, but there is much experimental work to be done to determine what methods are best to assure natural reproduction through the proper cutting procedure. Research in this field will be conducted in co-operation with the lake states experimental station and private industry.

Trespass on state-owned lands continues to be a problem that requires a great deal of the fieldmen's time. The policy of the department for years has been to base trespass charges on stumpage values. This policy has been changed and charges are now based on the value of the product where it is found. It is, therefore, impossible for the trespasser to make a profit on products illegally cut on state-owned lands. This should eliminate considerable trespass.

In order to efficiently administer the state's vast timber resources there should be a complete inventory made of all of its timber holdings. Our present cutting budgets are based upon the best information available, but much of this information is obsolete and therefore unreliable on which to establish cutting budgets. Funds should be made available with which to complete this inventory at the earliest possible date.

Tables 19 and 20 show the timber of each species cut under contract and in trespass during the fiscal years of 1945 and 1946 respectively. Table 21 lists private sales made under the provisions of Laws of 1939, Chapter No. 352.

FOREST INSECTS AND FOREST TREE DISEASES

ARTHUR F. OPPEL, *in Charge of Special Projects*

The forest insect and forest tree disease survey made in cooperation with the division of entomology and economic zoology, the division of plant pathology and botany, University of Minnesota, state entomologist, and the division of forestry was continued through the biennium.

This project, like many others, was affected by the manpower shortage during the war and as a result, fewer reports were received than during the last biennium. The only serious outbreak of insects was the northern walking stick in the Gull Lake area in 1945. Projects have been set up to determine the best methods of controlling this insect.

The records compiled by Dr. A. C. Hodson, division of entomology and economic zoology, and Dr. C. M. Christensen, division of plant pathology and botany, University of Minnesota, for 1944 and 1945 are a report* quite complete in themselves and are quoted here:

*Paper No. 2296, Scientific Journal, Series, Minnesota Agricultural Experiment Station, St. Paul 8, Minnesota.

TABLE NO. 19
TIMBER CUT UNDER AUCTION SALE TIMBER PERMITS
FISCAL YEARS 1945 AND 1946

SPECIES	FEET		CORDS		TIES		POLES		POSTS		TREES		VALUE	
	1945	1946	1945	1946	1945	1946	1945	1946	1945	1946	1945	1946	1945	1946
Pine, White and Norway	4,091,440	5,353,470											$40,264.43	$48,062.43
Jack Pine	1,306,470	1,771,648	10,228	13,485									20,869.75	24,587.52
Spruce	679,564	1,196,596	52,658	64,354									127,582.66	177,200.46
Tamarack	19,800	188,107	104		8,878	7,197				89			1,210.08	1,842.80
Tamarack and Nor. Mining Timber	137,620	*57,086											747.55	142.72
Poplar	1,333,910	1,886,480	2,662	4,576									7,172.56	10,859.26
Balsam	153,700	333,880	7,456	7,822									10,292.92	11,326.09
Birch	3,570	7,490			14,612	11,449							2,275.52	2,141.86
Basswood	660	1,600											3.65	18.69
Cedar					15,976	14,714	25,264	60,477	136,607	147,000			11,886.73	22,996.50
Oak	190												.95	
Mixed Timber	3,700	6,450		279	2,541	189							221.94	179.20
Jack Pine and Cedar Lagging			726	430									330.37	206.58
Mixed Bolts			1,429	1,391									2,836.00	1,712.58
Fuelwood			752	859									278.29	317.82
Christmas Trees											258,399	184,854	4,609.21	3,509.11
Totals	7,730,624	10,745,721	76,015	93,196	42,007	33,549	25,264	60,477	136,607	147,089	258,399	184,854	$230,582.61	$305,103.62
													Extension Interest	8,056.71	11,010.65
													Penalty Interest	64.69	165.52
														$238,704.01	$316,279.79

Lineal Feet—57,086

TABLE NO. 20

TIMBER CUT IN TRESPASS ON STATE LANDS
FISCAL YEARS 1945 AND 1946

SPECIES	FEET		CORDS		TIES		POLES		POSTS		TREES		VALUE	
	1945	1946	1945	1946	1945	1946	1945	1946	1945	1946	1945	1946	1945	1946
Pine, White and Norway	46,223	42,730											$463.44	$838.23
Jack Pine	3,615	1,410	60	72									105.20	403.44
Spruce	170	2,570	73	390									316.23	1,728.69
Tamarack	1,770	2,382			27	13			110	275			38.70	86.48
Tamarack Mining Timber		*616												11.36
Poplar	3,000	3,722	187	43									192.11	154.57
Balsam	852	7,486	49	74									212.49	464.05
Birch	450	230			20	12							4.70	8.84
Basswood		640												9.60
Oak		237												3.79
Cedar					31	10	65	227	2,465	2,210			63.15	256.41
Mixed Timber	2,983	8,300	25	4	20								38.51	192.71
Mixed Bolts			12	17									24.20	33.00
Fuelwood			54	41									34.55	55.79
Christmas Trees											1,392	1,649	51.00	102.02
Totals	59,063	69,707	460	641	98	35	65	227	2,575	2,485	1,392	1,649	$1,544.28	$4,348.98
*Lineal Feet		*616										Penalty	$1,375.29	$3,890.34
													$2,919.57	$8,239.32

TABLE NO. 21

TIMBER SOLD AT PRIVATE SALE
LAWS 1939, CHAPTER 352
FISCAL YEARS 1945 AND 1946

SPECIES	FEET		CORDS		TIES		POLES		POSTS		TREES		VALUE	
	1945	1946	1945	1946	1945	1946	1945	1946	1945	1946	1945	1946	1945	1946
Pine, White and Norway	1,687,868	2,221,731											$9,869.45	$14,516.94
Jack Pine	1,383,601	1,890,785	7,114	4,817									17,438.56	17,646.64
Spruce	332,040	405,890	18,067	22,714									45,673.72	58,467.14
Tamarack	76,195	117,420	7		2,911	3,323			27,215	8,913			1,071.88	1,267.47
Tamarack	*8,000													
Tamarack Mining Timber and Poles	*314,054	*91,756											785.11	229.39
Poplar	1,797,684	2,365,985	8,492	17,696									13,660.83	23,967.30
Balsam	97,160	218,980	7,215	7,630									9,939.26	11,293.65
Birch	56,185	4,635			10,645	12,028							1,440.84	1,536.42
Basswood	67,090	185,952											253.22	769.13
Cedar					6,449	4,753	9,824	18,983	101,065	93,284			3,700.13	7,355.78
Oak	6,680	6,968											44.12	41.81
Mixed Timber	390,885	492,827	95	435	3,899	3,531		1,764					1,786.47	2,836.54
Jack Pine and Cedar Lagging			354	153									128.99	91.56
Mixed Bolts			6,019	7,741									8,407.87	10,205.10
Fuelwood			9,799	11,580									3,951.37	4,874.83
Christmas Trees											147,567	383,439	3,154.05	6,197.17
Totals	5,895,388	7,911,173	57,162	72,766	23,904	23,635	9,824	20,747	128,280	102,197	147,567	383,439	$121,305.87	$161,296.87
*Lineal Feet	*322,054	*91,756												

General Conditions in 1944 and 1945

"The weather was unusually cool and wet during the spring and early summer both years. In 1945 the growing season was delayed at least two weeks by the first week in June with the result that the time of hatching or emergence of many insects was delayed. For example, Le Conte's sawfly completed only one generation in 1945 when there are usually two generations each year. The combination of cool temperatures and abundant rainfall caused an unusual occurrence of leaf diseases and other fungus infections, and moist season insects such as aphids were unusually abundant in both 1944 and 1945.

Diseases Reported 1944-1945

Leaf blight of oaks was unusually heavy on burr oaks during the early summer of both years. The area of infestation extended from St. Cloud to the Iowa border. Many burr oak trees, even large mature ones, were totally defoliated by this disease in late June and, in some cases, the second crop of leaves was severely infected in July.

Wilt of red oaks was found commonly in the Twin Cities area and in southern Minnesota. Recent investigations in Iowa indicate that the fungus causing this disease "over-winters" in burr and white oaks in which it causes stagheading; and that removing the infected branches of these trees and recently killed red oak trees offers some promise of control.

Selective harvesting of timber can soon begin from this fine stand of white pine planted in 1915 at Lake Vadnais, St. Paul.

Light to moderate infection of spruce needle rust was found near Duluth in 1944-1945. The heavy infection occurred near Onamia in 1944. A light infection was reported in spruce nursery stock at Eveleth in 1944. This disease can reduce the value of spruce for Christmas tree stock as evidenced by the reports of one of the commercial operators who has found several stands made worthless by infection of a few years ago.

Light infections of ink spot of aspen were present generally throughout the northern part of the state and in a few localities infection was heavy enough to cause noticeable defoliation.

Insects Reported 1944-1945

The insects most important in 1944 were jack pine budworm, Le Conte's sawfly, Nantucket pine shoot moth, cankerworms, red-humped oak and variable oak caterpillars, numerous species of gall mites, and the pine tortoise scale. In 1945 all except the oak caterpillar were important again and, in addition, the Northern walking stick caused heavy defoliation near Brainerd and Roy Lake.

The jack pine budworm caused heavy defoliation in 1944 only near Faunce, Pencer, and Lake George; while less severe damage was reported from Bemidji, Pinewood, and Park Rapids. In 1945 the only reports of budworm damage to jack pine were from Pencer and Lake George—two areas with considerable open-grown and orchard-type trees. Staminate flower production was also at a low point in nearly all jack pine areas in 1945.

The Nantucket pine tip moth became one of the most important pests of jack pine during the 1944-1945 seasons. Plantations and natural reproduction were heavily infested at Willow River, Bagley, Brainerd, Side Lake, Park Rapids, Brimson, Cloquet, and Itasca Park.

The pine tortoise scale was present in small numbers at Brainerd, Baudette, and at the Cloquet Forest Experiment Station; but there was a serious outbreak of the scale near the General Andrews Nursery at Willow River and in plantations at the Carlos Avery Game Refuge in Anoka county. The heavy infestation at Willow River was found in an extensive area of open grown, medium-aged jack pine. The lower branches of many of these orchard-type trees were badly infested and much of the young reproduction which would have filled up the stands was killed or crippled.

The Le Conte's sawfly had been found in small numbers in only two localities before 1944. In both 1944 and 1945 it caused complete defoliation of jack pine in plantings at Duluth, Zimmerman, and Willow River. The jack pine in the latter two localities were growing in road-side plantings along highways. In both cases jack and red pine were interplanted and yet only jack pine was attacked.

The spruce budworm was found on small white spruce at Pencer and Finland in 1944. No specimens were collected from black spruce. No significant infestation of balsam fir was reported.

The larch sawfly was reported from Pencer to Cloquet Valley and Grand Marais. The infestation at Pencer in 1945 was of outbreak proportions with heavy defoliation reported. The Eastern larch bark beetle continued to kill tamarack in a bog near Cambridge.

An extensive outbreak of the birch leaf-skeletonizer was observed over most of northeastern Minnesota in both 1944 and 1945. The larvae were so abundant that they caused some injury to basswood and oaks growing with the birch in 1945.

The variable oak caterpillar and the red-humped oak caterpillar were both very abundant in 1944 causing complete defoliation of oak, maple, and basswood on the west side of Gull Lake near Brainerd and at Garrison. In the fall of 1944, soil samples showed an average of six larvae per square foot under infested trees. A check in the spring of 1945 revealed the nearly complete destruction of these larvae. Mice and shrews probably were responsible because the soil and duff were literally plowed with rodent tunnels. No larvae were found feeding in 1945.

No trace of the Northern walking stick was found in 1944. The outbreak at Brainerd, Roy Lake, and St. Cloud continued in 1945 with increased damage and a further extension of the area over that reported in 1943. The Gull Lake infestation near Brainerd has lasted long enough now to cause a visible effect on the mixed forest. The red oaks and hazel brush are gradually being killed out, and conifer reproduction is being released in areas most heavily defoliated. Experimental barriers produced by spraying strips with lead arsenate indicated that migration from a heavily infested area was checked with a barrier only 100 feet wide when both the trees and the understory brush were sprayed with lead arsenate at the rate of 4 pounds to 100 gallons.

An observation which should be interesting to rangers and resort owners is the fact that the newly hatched walking stick feeds heavily at first on low vegetation such as wild strawberries and purple pea. This means that some control can be accomplished by spraying the ground vegetation and brush with the aid of light portable equipment."

Aside from fire, more timber is destroyed by insects and diseases than by any other single agency. It is estimated by entomologists that insects alone cause a loss in the forests of this country of approximately $200,000,000 annually.

The danger of further epidemics is always present. Proper forest management, cutting of infested trees, knowledge of the life cycle of diseases and insects will help to keep this threat at a minimum.

The constant checking carried on by the division of forestry fieldmen in cooperation with the division of entomology and economic zoology and the division of plant pathology and botany of the University of Minnesota supplies information valuable in predicting possible outbreaks of diseases and insects, and thus enables the division to take steps to stop or minimize potential damage.

WHITE PINE BLISTER RUST CONTROL*

L. B. RITTER, *Pathologist in Charge*

Minnesota's original white pine stands did not occupy the vast areas commonly believed. Pure white pine stands were rare. However, white pine occurred in mixture with other pines, spruce, balsam and hardwoods, often as individual trees of regal proportions. Thus, it was the tree that lent

Infection on white pine transmitted from gooseberry plant at right.

character and distinction to the entire northern forest. The white pine has always been America's most highly prized softwood. It is not surprising that the early loggers of Minnesota logged only white pine. Many changes have and are occuring in wood utilization. However, lumber is still by far the most important forest product, and there is no reason for assuming that it will not continue to be so for many decades.

The early logging operations, and particularly the fires that followed them, greatly changed the character of Minnesota's forest resources. The original white pine-red pine, spruce-balsam and hardwoods forests were

*Performed in co-operation with the Bureau of Entomology & Plant Quarantine, U. S. Department of Agriculture.

largely destroyed. Nature to a large extent replaced them with temporary forests of aspen and jack pine. In recent years logging has been on a smaller scale. Forest fire control has been quite effective. As a result, nature is replacing the temporary aspen and jack pine forests with more permanent forest types including white pine. In many areas the acreage of young white pine stands has more than doubled in the past ten years. Blister rust control records indicate that in Minnesota white pine trees are present on about one million acres. On approximately 300,000 acres, white pine values present justify the cost of their protection against blister rust.

White pine blister rust was imported from Europe during the early part of the century on white pine nursery stock. It is well established in all parts of Minnesota's white pine growing areas. During the past ten years the amount of blister rust infection present in unprotected young white pine stands has increased at a most disconcerting rate.

The fungous organism that causes the disease lives alternately on two hosts; the white pines and the various wild and cultivated species of currants and gooseberries. The disease does not spread from one white pine tree to another. It can be controlled by destroying the currants and gooseberries growing in and near white pine stands. For protection to maturity, the average white pine area requires three workings approximately five years apart to remove currants and gooseberries.

During the biennium, blister rust control continued on a greatly reduced wartime basis. Accomplishments for the biennium are reported in Table 22. Table 23 sets forth the status of control of December 31, 1945.

TABLE 22

WHITE PINE BLISTER RUST CONTROL

	Acres White Pine Protected	Acres Worked	Currants and Gooseberries Pulled	Man-days Expended
Initial Working				
1944	695	1,158	510,189	1,978
1945	1,870	2,810	723,723	3,726
Total for Biennium	2,565	3,968	1,233,912	5,704
Total to December 31, 1945	162,888	389,363	60,133,440	153,602
Reworking				
1944	866	1,183	283,325	1,143
1945	801	1,298	192,717	1,900
Total for Biennium	1,667	2,481	476,042	3,043
Total to December 31, 1945	57,602	115,993	7,778,528	39,936

Blister rust will cause serious damage. It is imperative that the control program be greatly increased in size not only to initially protect white pine stands but also to maintain control established originally with CCC and WPA labor. Federal blister rust control appropriations are being increased.

Funds for work on federal lands will be nearly adequate to handle their control problem. Federal funds for work on state and private lands are available in direct proportion to state and local expenditures. The amount of state funds available must be greatly increased if extensive damage to white pine stands is to be prevented.

TABLE 23

Status of Blister Rust Control, by Ownerships, December 31, 1945

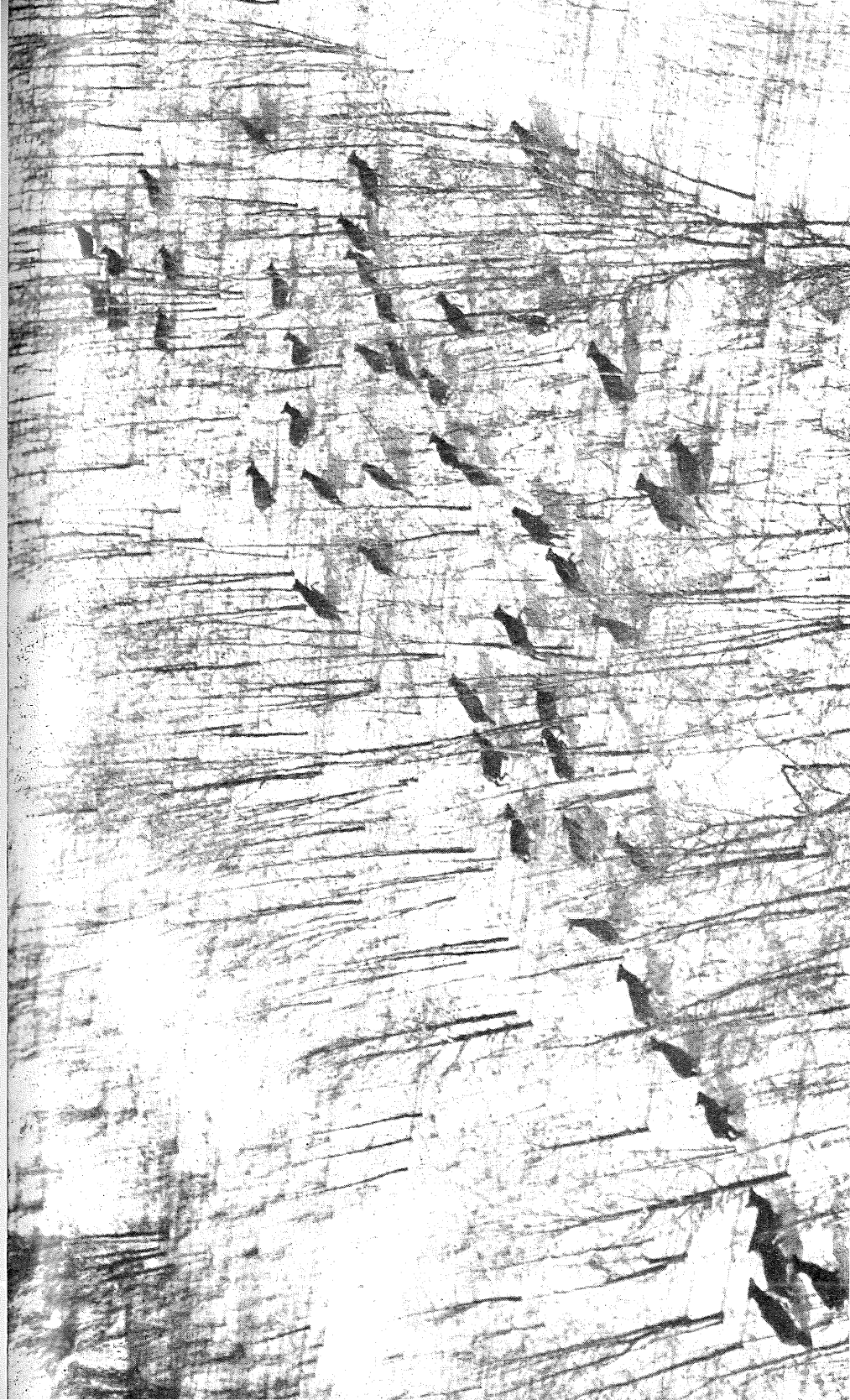
Ownership Class*	Total Control Problem, Acres**		Acres Initially Worked		Acres on Maintenance***	
	Acres White Pine	Acres to Work	Acres White Pine	Acres Worked	White Pine	Control Area
U. S. F. S.	108,919	191,434	42,654	72,612	12,260	22,843
U. S. I. S.	19,205	29,383	18,728	28,659	4,794	7,836
State Forests	54,683	104,571	28,839	55,888	7,965	15,977
State Parks	4,809	9,087	4,717	8,925	.....	.....
Other State	2,136	12,125	1,624	6,668	802	3,138
Municipal	1,244	3,831	996	2,865	35	80
Private	88,731	277,387	66,571	207,485	15,080	36,078
Totals	279,727	627,818	164,129	282,102	40,936	85,952

*Includes lands within gross boundaries of State, Federal and Indian Forests.

**The Total Control Problem includes only the better stands of white pine.

***A pine area is on maintenance when it requires little, if any, additional currant and gooseberry eradication to prevent commercial damage before it matures.

Forest fires have killed more forests than have been cut by lumberjacks since logging began in this country.



Division of Game and Fish

L. E. FIERO, *Director*

The scope of the division's activities and accomplishments during the biennium are detailed in the reports of the heads of the several bureaus which make up the body of this report.

By way of introduction reference will be made to a few matters which have tended to confuse rather than promote the most efficient administration of the division and others thought worthy of emphasis.

New Game and Fish Code

The new game and fish code enacted by the Legislature of 1945 has simplified legal procedures generally by eliminating obsolete and redundant material and clarifying many of the provisions of the old code. It was not to be expected that in the brief time this matter was before the legislature that a perfect code would result and that its application would in all respects parallel the provisions of the old code. As is true in the case of all new and untried statutes the attorney general's advice has had to be sought on a large number of new questions that have arisen in connection with the interpretation and enforcement of the new law. Not only did the code introduce new issues within the department but also has made it necessary to adopt new procedures in dealing with other state departments at upper levels who by law must approve many of the activities of the division of game and fish. These matters have created new problems in all of the bureaus of the division. It took considerable time and effort to acquaint field personnel with the new statute and the procedures and regulations which have been developed under it. Several amendments to clarify ambiguous provisions and otherwise change the act where experience with its applications has indicated a need, will be asked of the next legislature.

The new code transferred to the commissioner and director several responsibilities of management which under the old code were fixed by law by the legislature. This is a step toward fixing responsibility where it properly belongs and one for which conservationists have been asking for many years. It makes it possible for the department to make decisions on currently available information without awaiting action by the legislature at two year intervals and is in line with authority given conservation departments in other progressive states.

But this transfer of responsibilities from the legislature to the commissioner and director has thrown into the department for direct solution and disposal a number of problems on which there always has been and perhaps always will be a wide difference of public opinion. The successful administration of these problems will hinge on cooperation by the public which in time must be established by an expanded and persistent program of educat-

ing the people to what the department is doing and must do in order to promote and apply policies based on facts acquired through the medium of trained personnel.

Fur Bearers

The wild furs of Minnesota founded some of the largest fortunes in the early days of commercial trappers. The fur bearing animals were ruthlessly exploited until a point was reached where many of them were threatened with extinction. However, the impact on the public of the threat to the trade and the possibility of preserving and restoring fur bearers brought about protective laws which are now bringing back to a high productive stage many of our most valuable of these animals. Furs have become one of our basic resources and are yielding an estimated annual income of from 5 to 10 million dollars. Because of the possibilities of increasing fur bearers in nearly every section of the state, they should be given the same careful study as are our fish and game birds with a view to encouraging greater reproduction of valuable species. Expansion in scientific research on fur propagation techniques, greater vigilance in the enforcement of laws against violations, studies of catches and effects of predators on desirable species, use of airplanes in patrolling against violators and illegal transportation of furs in interstate traffic both in closed and open seasons, are a part of the division's future expanded plans.

Rough Fish Removal

The past biennium has produced a record aggregate catch of rough fish from our lakes and streams. This is encouraging so far as value of production is concerned. This fact however should not dull our feeling of responsibility in this field. If carp, buffalo, sheepshead and other types of rough fish are compared to weeds which infest the farmers fields and gardens a realistic understanding may be had of the menace of overpopulation of rough fish and the problem which confronts the division and those responsible for the control and conservation of game fish. No matter how diligently the farmer weeds his vegetables and his crops during any one year he knows that in a year or two they will have taken possession of his crops unless he keeps the weeds under continuous control. This battle against weeds in the fields parallels so closely the problem of keeping rough fish under control as to make the comparison striking. It follows that while we can never hope to completely eradicate rough fish from waters in which they can breed and multiply by any present known methods, our hope is to be able to control them.

The present organization of state crews, contract fishermen and permittees is proving a well coordinated machine for the waging of war on rough fish. With the return to the markets of new gear, at present so desperately needed, and with qualified personnel becoming available from returned servicemen, the rough fish removal program should move forward to newer and higher accomplishments during the next biennium.

For further information on the extent of the last biennium's operations

reference is made to the report of the supervisor of rough fish removal found elsewhere in this report.

Fish Propagation Projects

Expressions of impatience are being heard from several sections of the state over the division's delay in starting and prosecuting projects for the expansion of fish propagation in the post-war period. As everyone knows, construction of public works of this type could not be attempted during the war. The end of hostilities has not improved the situation and, if anything, has made it worse. High priorities given building material for housing, excessive construction costs, scarcity of critical material and demands for available labor for housing and reconversion of industry from a war-time to a peace-time basis have made attempts at reviving the construction of fish propagation units impracticable. Furthermore public authorities are expected to cooperate and are simply doing their duty when they postpone all construction work except projects of critical importance, and defer others until more normal conditions have returned and it becomes possible to get good work done at reasonable cost.

Trial efforts have been made to let contracts for some of the most important fish propagation improvements. Bids were asked for the completion of the Straight Lake rearing pond project near Park Rapids, started before the war, but on which work was suspended at the outbreak of hostilities. The proposals received were entirely too high to be considered.

Most fish propagation projects go into operation in the spring. Should priorities and other present limiting conditions make construction possible there might still be sufficient time to begin construction on some of the most urgent projects and have them ready for operation in the spring of 1947.

Due to adverse conditions affecting construction which have already been described, the bureau of fisheries was able to use or encumber only $48,750 of a special allocation of $125,000, available for the fiscal year 1946. The balance of about $76,240 remains in the game and fish fund subject to future allocation by the legislature. Another special appropriation of $125,000 becomes available to the bureau of fisheries on July 1, 1946, for the fiscal year 1947. Because of the scarcity of materials, priorities for veterans and general housing which apparently will affect general construction well into the fiscal year 1947, this latter allocation will probably be sufficient to finance all projects for which contracts can be awarded advantageously within this period.

The key to success in fish propagation is thorough scientific investigation in advance. The division of game and fish is carrying on such investigations throughout the state as rapidly as available means and manpower will permit and will found its propagation units on facts disclosed by such investigations.

Game Cover

"Clean farming" operations during the war have erased nearly all of the game cover on the best farm lands in Minnesota, leaving little if any cover or winter food for game birds. If Minnesota is to continue to provide sport from upland game hunting, energetic efforts will have to be made to bring about acceptance by the farmer of the fact that game birds when controlled within balanced limits are an asset on every farm. Permitting field corners to go back to natural cover and encouraging the growth of berry and seed producing bushes may actually demonstrate that weed control may be naturally promoted through the foraging of birds from shelters in nearby natural bush coverts. Cover and a supply of gravel are both essential to attract birds. Expenditures for the purchase and leasing of land by means of which to increase upland game birds are authorized from Pittman-Robertson funds. An expanded program for establishing better game bird habitat under this program and the solicitation of the cooperation of farmers toward the same objective is a post-war aim of the division.

Fixing of Seasons and Bags

The fixing of seasons, bag limits and areas from which each species may be taken are determined from all-year investigations and reports by conservation wardens and game biologists. Each year, and prior to the time when decisions must be made on length of seasons, bag limits, and areas to be opened, sportsmen's groups are censused for their opinions as to the abundance or scarcity of each species of game in their communities and are asked to make a report to the department. These data are carefully analyzed and classified and, together with reports from game wardens and game biologists, are used in making decisions on seasons and bags. Every possible source of information is consulted in order that a fair and as nearly as possible correct cross-section is had of the conditions affecting each species.

Game and fish management is becoming recognized as an operation which must be founded on scientific knowledge of the facts. Only by the employment of specialists trained in each field of management can the best results be obtained. Most successful game and fish administrators agree that the employment of the best trained game specialists is an investment paying large dividends to sportsmen and in a state like our own with its diversity of upland game, big game, fur bearers and fish, with almost unlimited opportunities to create wildlife environs in our forests, lakes and streams, scientific research for basic data on how advantage may best be taken of these resources to increase the sports of hunting and fishing, is needed in order to initiate and carry out wildlife management.

Considering war restrictions and the handicaps to normal operations which have had to be tolerated because of them, the results of the work of the division during the past biennium have been highly gratifying.

WARDEN SERVICE BUREAU

E. R. STARKWEATHER, *Chief of Law Enforcement Bureau*

Organization

During the past biennium the warden service bureau has been composed of from 110 to 130 full-time game wardens, two warden supervisors, one clerk-steno III and one clerk-steno II, and the deputy director acting in the dual capacity of assistant director and chief of the law enforcement or warden service bureau.

Functions of the Bureau

Minnesota state wardens, due to their strategic locations throughout the State, must of necessity perform a great variety of duties for the entire Conservation Department and cooperate with other state agencies as well. In addition to the regular wildlife enforcement problem of apprehending and handling prosecutions of law violators, the bureau must investigate property damage by deer, beaver, pheasants, muskrats, bear and other wildlife; post and manage most of the statutory game refuges, including the issuance of permits to take species doing damage, and seal and tag the pelts of the furbearers of such species; cooperate in the maintenance of stream control structures throughout the state, issue various types of special permits and assist in innumerable surveys inaugurated by both fisheries research and game research supervisors; organize, supervise and install fair displays, represent the department and speak on behalf of the bureau's activities at public schools, sportsmen's meetings, civic gatherings, before boy scout and 4-H Club organizations.

Many wardens are qualified first aid instructors under the Red Cross training program and many have advanced training certificates. Some are part of mobile first aid units, developed and organized to deal with any emergency. Wardens participate in pistol and rifle club competition in state and national associations, and some are qualified instructors in this field.

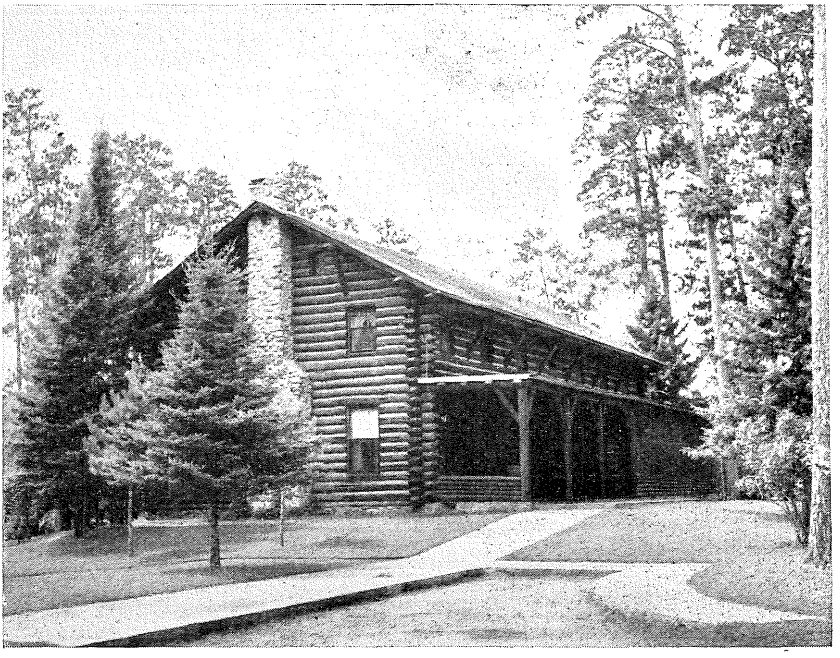
The fifth and sixth annual wardens' schools were conducted at the Northcentral Agricultural School and Station at Grand Rapids, during the past biennium. The Minnesota warden school is attracting nation-wide interest and other states have asked our assistance in inaugurating like training schools for their law enforcement departments. Minnesota department personnel has already participated in the programs of schools in other states.

The Minnesota department was the 1946 host to the third annual meeting of the association of midwest fish and game law enforcement officers. E. R. Starkweather, deputy director of the Minnesota division of game and fish, was president of this association for the past year. The membership of the association is composed of eleven midwest states and the enforcement officers of the federal fish and wildlife service in these states. The following states were affiliated members during 1945-6: Illinois, Iowa, Kentucky, Michigan, Missouri, Minnesota, Nebraska, South Dakota, North Dakota, Wisconsin, Indiana and the U. S. Fish and Wildlife Service.

At the Minnesota convention the association unanimously passed a resolution calling the attention of the various conservation departments and state legislators of the member states to certain conditions in which action was believed essential. These matters were set forth as follows:

1. We solicit the attention of the administration heads of the conservation or game and fish departments of the member states and urge their cooperative efforts toward the end that uniform fur-marketing regulations may be considered in the wise conservation of wildlife resources.

2. We recommend the appointment of a standing committee consisting of six member states to formulate uniform regulations to be urged upon legislative authorities, designed to control, limit and regulate the interstate shipment and transportation of birds, game, fish and all other protected wild animals and to keep proper records relative to the same; that this association use its best efforts in supporting the adoption of such regulations by all member states and exercise its best efforts to include similar provisions as an amendment of the Lacy act by the congress of the United States. We further recommend that such standing committee make its report to the members of this Association on or before January 1, 1947, and that upon approval by member states, the committee be instructed to take all possible steps for the adoption of the regulations so proposed.



Douglas Lodge, popular northern resort mecca, is now operated by the division of state parks.

3. We recommend to the members of this association and to their respective superiors a careful study and investigation of modern means of game law enforcement including airplane facilities and two-way radio communications; and that efforts be directed toward the designation of radio frequencies for conservation communications.

The organized sportsmen of Minnesota also participated in this particular convention which was held at Douglas Lodge, Itasca State Park, June 5th and 6th, 1946, providing very fine entertainment, refreshments and informational service to all delegates and visitors.

Problems

The normal problems of the Bureau have been multiplied many times during the past biennium due to the war emergency and the constant shifting of personnel to cope with situations as they develop in the field. It has been necessary to transfer or abolish 15 permanent warden headquarters, involving 69 permanently stationed wardens. Twenty-three wardens resigned from the service, two were retired, two were promoted to positions outside the warden service and three vacancies were created by deaths. Twenty-two wardens returned from military service and ten from leaves of absence in essential war work. It has been necessary to make 30 provisional appointments, of which 17 are still employed.

Such appointees being new and inexperienced in the work, must be transferred about the state for approximately six months' training before given a permanent assignment. This, too, has curbed our warden service to some extent. In some instances, due to the housing situation, wardens have had to locate in other cities than the one it was felt should be permanent headquarters. Such conditions cannot be avoided under present circumstances, but will be corrected as soon as possible.

Difficulties in replacing worn-out and obsolete equipment also handicapped the service. The lack of modern equipment, such as airplanes and portable radio units, is a definite handicap that increases from day to day. Purchase of such equipment was contemplated and provided for in the past biennium by a request for funds. The over-all appropriation to the bureau contained sufficient funds for the purchase of such equipment but approval by the department of administration for release of funds could not be secured. Furthermore there are at present in the Bureau wardens who are qualified commercial pilots, and others experienced in portable radio communication so that from the standpoint of personnel the bureau is prepared to initiate airplane patrol.

However, in the protection of the wildlife resources of the state, the handicaps encountered were in a great measure compensated for by the timely action of the legislators during the past two sessions in the enactment of more stringent protective legislation and the increase in penalties for major violations. Furthermore the Minnesota courts and county attorneys' offices, with but few exceptions, have been very cooperative in applying

the statutes to protect the public's interests in our wildlife heritage and to curb any major development in black market activities.

Future Needs of the Bureau

It is obvious from the above information that major problems during the next biennium will be to secure equipment when available to re-equip wardens so that they may be able to render proper patrol service, and to train new personnel and when properly trained to re-establish various warden patrol headquarters on a normal pre-war basis. A substantial increase in the next biennium's appropriation will be necessary to meet these requirements. A minimum of two planes, fully equipped for land, water and snow patrol, and two-way radio communications, are needed. In addition, ten mobile radio units and twenty walkie-talkie or portable units are essential. Our request for the next biennium contemplates a warden service bureau composed of 130 game wardens, three warden supervisors, two stenographers and one supervisor of the warden service bureau. However, a warden force to render adequate minimum service should be made up of not less than 150 wardens. An increase to the latter number would require approximately an additional $90,000.00 per year in salary and travel allowances. Personnel adjustments will continue to be a major problem for the next biennium; by and large the warden service looks to the future with enthusiasm aimed at organizing and improving its service.

TABLE 1

Game and Fish Violations and Seizures by Classes
Biennium Ending June 30, 1946

ARRESTS

Class of Violation	Fiscal Year 1945	Fiscal Year 1946	Recapitulation
Big Game	282	227	509
Small Game	274	276	550
Fishing	834	925	1,759
Netting	59	79	138
Trapping	222	386	608
Fur	33	52	85
Guns Set-Up	572	330	902
Hunting and Carrying Guns in Game Refuge	30	46	76
Miscellaneous	40	27	67
Totals	2,346	2,348	4,694

TABLE 1a

SEIZURES

Article Confiscated	Fiscal Year 1945	Fiscal Year 1946	Recapitulation
Firearms			
Pistols	.....	2	2
Revolvers	.....	1	1

Article Confiscated	Fiscal Year 1945	Fiscal Year 1946	Recapitulation
Rifles	80	54	134
Shotguns	46	34	80
Fishing Equipment			
Boats — Flatbottom	.....	4	4
Row	5	.....	5
Fish Basket	.....	1	1
Fish Hooks	.....	22	22
Fish House	1	2	3
Fish Traps	10	19	29
Fishing Lines	74	55	129
Fishing Sticks	27	16	43
Nets—Basket	.....	1	1
Ciscoe—Feet	2,600	.....	2,600
Dip	5	.....	5
Gill	63	95	158
Herring	3	129	132
Hoop	6	9	15
Minnow	1	1	2
Miscellaneous—Feet	882	.....	882
Number	.....	17	17
Pocket	.....	4	4
Scoop	1	.....	1
Trammel	1	1	2
Trout	.....	2	2
Whitefish	2	.....	2
Minnow Bucket	1	.....	1
Poles	20	13	33
Reels	24	25	49
Rods	24	26	50
Set Lines	.....	8	8
Spears	42	90	132
Tackle Box	2	2	4
Hunting Equipment			
Decoys	1	1	2
Holster	.....	1	1
Packsack	1	2	3
Live Animals			
Badger	.....	1	1
Deer	1	2	3
Mink	8	16	24
Pheasant	1	.....	1
Raccoon	4	7	11
Miscellaneous			
Beaver Carcasses	.....	2	2
Animal Cage	1	1	2
Cars	1	2	3
Deer Heads	14	1	15
Eagle	.....	1	1
Flashlights	22	49	71
Headlights	1	3	4
Heron	1	1	2
Lantern	1	10	11

Pitchforks	.....	3	3
Spotlights	2	3	5
Swan	2	1	3
Wash Tubs	2	.....	2
Wild Rice—Pounds	92	245	337
Pelts			
Badger	17	3	20
Beaver	664	457	1,121
Deer	35	17	52
Fisher	2	2	4
Fox—Gray	41	23	64
Red	.....	1	1
Lynx	13	8	21
Mink	350	390	740
Moose	1	1	2
Muskrat	44,030	13,118	57,148
Otter	18	11	29
Raccoon	293	316	609
Skunk	132	89	221
Weasel	82	63	145
Wolf	15	11	26
Perishables			
Deer—Cans	6	4	10
Number	372	450	822
Packages	5	35	40
Pounds	909	122	1,031
Quarts	183	7	190
Mourning Doves	2	.....	2
Ducks—Number	848	266	1,114
Packages	15	29	44
Elk	.....	2	2
Fish—Boxes	9	14	23
Number	6,005	4,721	10,726
Packages	65	30	95
Pounds	1,654	2,127	3,781
Sacks	5	2	7
Tubs	.....	4	4
Frog Legs—Boxes	2	.....	2
Kegs	2	.....	2
Geese	1	3	4
Grouse—Number	1	13	14
Packages	.....	3	3
Minnows—Gallons	.....	6	6
Moose—Number	7	4	11
Pounds	270	20	290
Partridge—Number	8	12	20
Packages	.....	3	3
Pheasants—Containers	.....	6	6
Number	988	260	1,248
Packages	56	13	69
Squirrel	60	81	141
Trapping Equipment			
Traps	114	1,380	1,494

BUREAU OF FISH PROPAGATION

NORMAN L. MOE, *Supervisor*

The activities of the Fish Propagation Bureau include the operation and maintenance of state-owned fish hatcheries and ponds for the production of fish to stock the public waters of the state; distribution of hatchery and pond production to public waters; management of fish rescue operations; transfer of fish from over-populated waters to other waters that need stocking, and cooperation with sportsmen's clubs and other organizations in the operation and management of cooperative fish rearing projects.

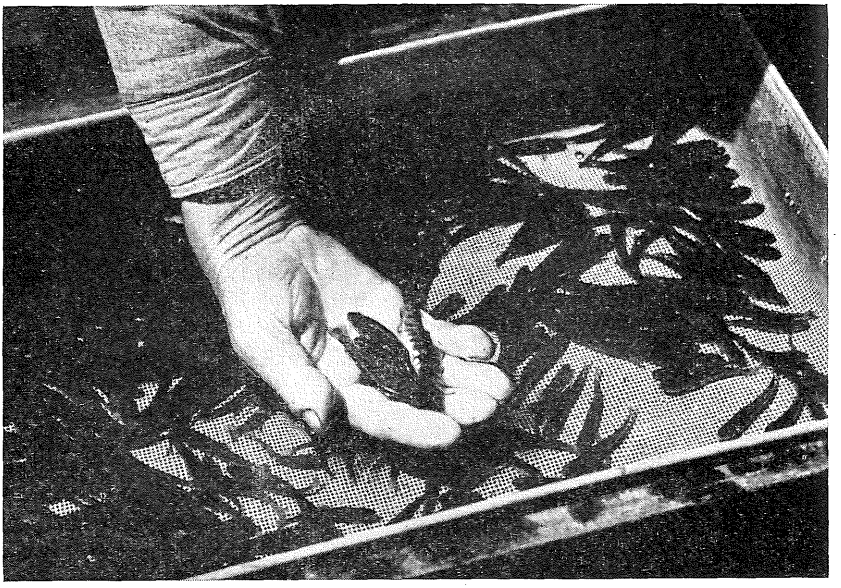
In common with nearly every other organization, the bureau suffered from the effects of the war by loss of trained personnel to the armed forces, and by inability to secure new or replace old equipment. These handicaps are reflected in the results accomplished during the biennium. In spite of these difficulties the bureau has been fortunate in being able to carry on a fairly stable program of fish propagation, although the lack of equipment such as trucks, seines and other gear with which to carry on the work continues to be a handicapping factor. Furthermore, the advance in costs of construction and material makes progress towards normal post-war operations slow and uncertain.

Fish Propagation

Through the continuous efforts of cooperative rearing pond sponsors such as resort owners, sportsmen's clubs, 4-H clubs, civic organizations, the federal fisheries and other agencies, the maintenance of production through the war years and the biennium has been gratifying, despite difficulties encountered. Walleyed pike, northern pike, whitefish, herring, suckers and trout are being hatched by the state in state-owned hatcheries. Some walleyes, bass, panfish and trout are reared by the state to fingerling size, limited only by the carrying capacity of available state-owned ponds. However, the volume of walleye fingerlings to date are produced mainly in ponds sponsored by organizations cooperating with the bureau. In the case of local sponsorship the local organization secures the use of a natural body of water, or, as in some instances, constructs a pond. The state examines the site, and if found suitable for rearing purposes, supplies fish fry or brood fish, offers recommendations for management, and when the fingerlings are ready for harvesting, furnishes manpower and equipment with which to remove the fish. Sponsors assist by furnishing manpower. Production from cooperative rearing units is liberated in waters recommended by the sponsors and approved by the division.

Pond rearing of walleyed pike is on the increase and results have been gratifying. Although there seems to be considerable interest in the rearing of northern pike, technical difficulties in the rearing of this species have not been sufficiently mastered to warrant attempts at large scale production. Because of the cannibalistic nature of the species, present production practices are not satisfactory. Investigations indicate that it requires about 1,500 forage fry to feed one northern pike to a 4-inch fingerling. Unless ample forage fish are supplied, the northerns devour one another to a point

where the residual yield makes rearing northern pike, as presently managed, of doubtful expediency.



Trout fingerlings ready for planting in trout streams.

The new fisheries program does not recommend the rearing of either sunfish or crappies in state or cooperative ponds. These species are so prolific that over-population is usually the problem and natural reproduction is usually more than able to sustain normal angling pressure. By protected spawning beds, shortening seasons for angling, and moving fish from over-populated waters to others in need of replenishment, the successful management of panfish species can be most effectively accomplished.

Spawning Beds

Natural fish propagation is promoted by selecting certain lake areas with natural spawning grounds and closing such areas to fishing of all kinds for a specific period; and imposing other protective restrictions which will encourage natural reproduction and conserve brood stock. There had been little opportunity to develop the spawning bed program since this activity was transferred to the bureau in the winter of 1946, with the expanded program launched the past spring. However, progress to date has emphasized the importance of such a program in the future plans for protecting nest-building species. Development of natural spawning grounds, although not a cure-all or even beneficial in all cases, offers a large field of research in which natural, as compared with artificial, propagation of fish may be studied.

During the past spawning season field personnel periodically checked selected established areas to follow the spawning and hatching activities and the progress of the fry to fingerling size. Where beds were established in an environment suitable to the species, and were not molested by carp or other fish, it was estimated that an acre of protected area can produce 100,000 bass fry and a million sunfish or crappies. In certain types of areas these fishes will spawn together making spawning grounds combined environments for these several species of prolific fish.

From observation it has been found that the matter of size or location of areas to be posted is not as important as that of the environment for the species to be encouraged. A bay of several hundred acres, selected on the basis of convenience of posting may produce fewer fingerlings because of adverse environment than a single acre selected because of its natural advantages for production. In the case of certain species, however, environment may be selected to control the production of the species desired.

For example, if a lake is already over-populated with sunfish and contains an area especially adapted to bass spawning, it is possible to encourage the bass without enhancing the spawning of sunfish. Areas infested heavily with rough fish usually are not suitable for the rearing of game fish. A check has been made of several such areas. In one instance, in an area containing about 1,000 nests of bass, crappies and sunfish, the eggs were found pretty well intact on the day they were checked but on the following day nearly all the eggs had disappeared and the adults had deserted the nests. Carp had invaded the spawning grounds, resulting in the destruction of eggs and spawn. This emphasizes the importance of controlling undesirable species as one means of increasing the survival of game fish to meet the greater angling pressure of today.

In addition to selecting spawning bed areas on lakes, spawning areas on streams inhabited by small-mouth bass have been established for the first time. All spawning areas are posted with appropriate signs from the opening date of the fishing season to July 15 and fishing in any manner is prohibited in these areas during that time.

Fish Management

The fish propagation bureau continues to emphasize the need for more extensive field management and improvement of our lakes and streams by means other than raising and stocking of fish fry and fingerlings. Improvement of waters by removing and balancing the undesirable species against the desirable ones is most important. The stabilization of lake levels to prevent fluctuation, detrimental to fish perpetuation is emphasized. Fry and fingerlings are planted only in waters which have suitable environment for the species and which can not at present be otherwise encouraged to perpetuate themselves. Seeing fish planted in a lake or stream may be soothing to the eye but an assurance that they will survive and reproduce is after all the only real measure of success.

Fish culture is difficult. Artificial propagation has been practiced many

years, and has been accepted quite generally as the approved and orthodox method of preventing the depletion of game fish in angling waters. Recent research points to the futility of attempting to produce in hatcheries and ponds enough fish, in comparison with natural reproduction, to even remotely replace the game fish which annually are removed from lakes and streams. Research points to the probable conclusion that if a proper balance is maintained between various species, natural spawning processes will reproduce successfully where many years of planting of artificially hatched fry has failed to show results. The tendency to turn away from old hatchery methods and look over the opportunities furnished by nature for propagation and stress improvement of natural environment is reflected not only in Minnesota, but in the fish propagation practices of other states as well.

Rearing Ponds and Improvements

Much public interest has been revived following the war in the resumption of a vigorous fish management program, particularly in the construction of more rearing ponds. Some misunderstanding exists as to funds available for the purpose and other factors which should govern the initiation of projects. The most enthusiastic promoters of a pond may have their hopes for successful operation frustrated by failure to evaluate basic considerations that may not be apparent to them and not reflected in size, location, and other factors, such as the nature of the pond bed, quality, and dependability of the water supply. These are all matters which must be carefully weighed when passing on the merits of a proposal for a rearing pond.

The worth of a rearing unit must be measured further, by the need of waters to be served and managed from the production of the proposed unit, and by its ability to produce fingerlings economically over a long time range. Its value is not necessarily measured by the initial cost of site and development. Selection of sites because they are "cheap" but lack in essentials may prove a total waste of funds. Other units with an initial cost which may seem high, but having the elements required for successful operation, may in the long run prove the best investments. Failure to launch more of the approved rearing pond units for construction following the war is not due to lack of funds but because of the inability of the division to secure bids within reasonable costs. Scarcity of critical material and high priorities given material for housing and industrial uses have made it impossible to award construction contracts.

What has been said about the bureau's inability to go forward with the construction of new units applies equally to the purchase of trucks and other operating equipment to replace units that wore out during the war years. Funds allotted for these purposes are intact and may be made available by the legislature for the future under more stabilized conditions and when material and manpower become available.

The extent to which it may prove economical to engage in an expanded program of rearing walleyed pike fingerlings has not yet been demonstrated by research. For this reason it would seem advisable for promoters of rear-

ing ponds to temper their enthusiasm and zeal for ponds pending further careful studies of the efficacy of the various methods of maintaining fish populations against angling pressure.

Bait and Forage Fishes

Added interest in sources of bait has developed during the present biennium and the production of bait fishes by the individual bait dealer is a live issue. Although the division has realized for some time the necessity of balanced forage in our lakes if game fish are to increase, it is a difficult problem to regulate. The laws permit the public and licensed dealers to take forage fishes for bait purposes, and give authority to the commissioner and director to close certain waters prohibiting the seining of bait. Because of a shortage of bait fishes, many individuals have started producing their own supply. No one knows the number of minnows used for bait each year in Minnesota, but on the basis of comparison with other states where surveys have been made, the total of 25 million dozen minnows may be a conservative estimate.

The control and conservation of our minnow supply involves not only the closing of certain waters to seining, but also regulation in the handling, hauling and holding of the minnows to insure against loss after they have been caught. It is generally agreed that more minnows are destroyed in handling and holding after being removed from the water than are placed on the fisherman's hook.

The trend of increase in the use of minnows for bait is reflected in the sales of the various types of minnow dealers' licenses. The sale of local dealers' licenses reached a high of 2,200 in 1941, and, reflecting the effects of the war, dropped to 1,300 in 1943. The number gradually increased again to 1,700 in 1945 and for the first half of the calendar year 1946 reached 2,000. The itinerant dealer's license which became effective in 1941 for the first time permits dealers to travel all over the state and take and sell minnows. That year 113 of such licenses were sold, the number dropping to 78 in 1943. They increased to 129 in 1945, while for the first half of 1946 sales almost doubled those of 1945. The phenomenal increase in licenses during 1946 presages what may be expected during the next few years of return to normal fishing.

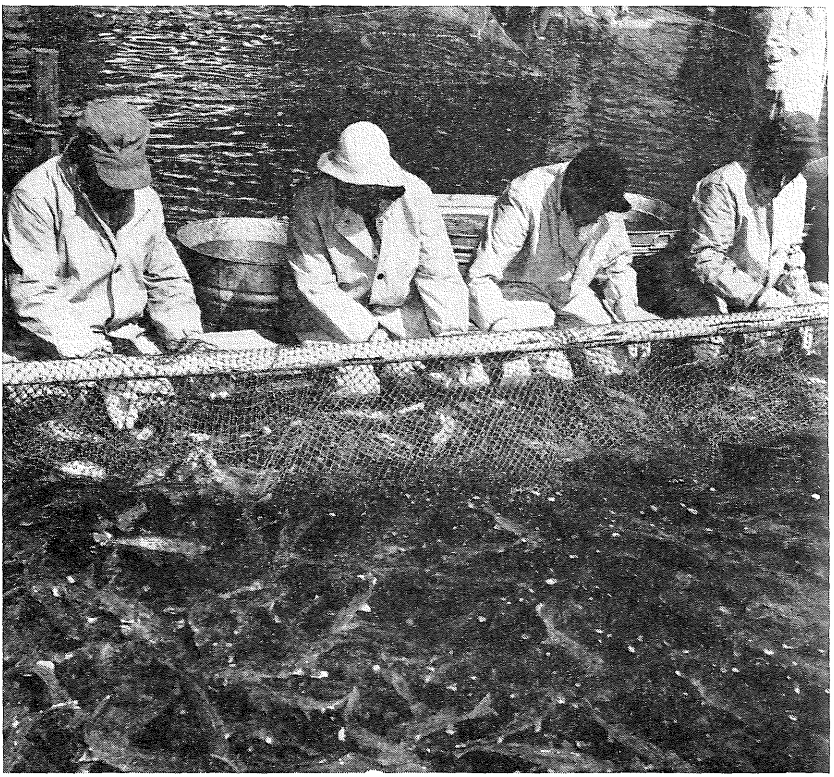
The bureau issues the private hatchery licenses required from those who plan to raise fish of any species. Minnow production by private individuals or concerns is in this class and has shown a marked increase during the past two years. A total of sixteen such licenses were issued in 1944, 31 in 1945 and 60 up to June 1 in 1946. Licensees may have from two to twelve ponds under one license ranging from one up to several acres each. The rearing of minnows by private individuals has brought many requests to this bureau for information and advice. All ponds have had to be checked and sucker fry or eggs supplied. Twenty million sucker fry were furnished to private hatchery licensees under this program in the spring of 1946.

In anticipation of an expanded program in the rearing of bait minnows,

the bureau has classified about 75 lakes over the state for state minnow management which are stocked, controlled and open to seining for bait. The lakes vary in size from a few acres to several hundred acres. These lakes are not suitable for game fish.

Conclusion

Until very recent years the fish management work was confined largely to hatching and planting of walleyed pike and trout, the former in the form of fry and the latter as fingerlings. There were only about half a dozen rearing ponds used for bass and panfish. During the past five or six years in addition to the operation of hatcheries above referred to, large numbers



Pike trapped for stripping to secure eggs for hatchery operations.

of trout have been reared to yearling or catchable size and walleyed pike to fingerling size. Hatching of northern pike in considerable numbers has also been added. Table 2 shows the distribution of fry and fingerlings by species for the calendar years 1944 and 1945.

The cooperative rearing ponds program started in 1941 multiplied until at present from 150 to 200 ponds are operated each year. These ponds require a lot of attention and time by the bureau's personnel.

Records of truck mileage covering the past several years disclose transportation demands have almost doubled, an indication of added service and operative requirements. Management of our fish resources is similar to the management of any other resource. In Minnesota, with its thousands of lakes and miles of streams, it is developing into a tremendous job. As the bureau's scope of work and responsibilities grow, because of service demanded by the public, its staff must be augmented especially by specialists trained in fish management. At the present time, ten returned war veterans are in training in this bureau under the veterans trainee program for fish culturists or fish managers.

The bureau's staff has not been increased appreciably during the past several years. However, normal expansion and increased demands by the public for the launching of a more vigorous fish management program, will make additional personnel necessary.

TABLE 2

Distribution of Fry and Fingerlings by Species for Calendar Years 1944 and 1945

	Calendar Year 1944	Calendar Year 1945
L. M. Bass, Fgl.	922,941	561,693
S. M. Bass, Fry	25,000	.....
S. M. Bass, Fgl.	535	9,989
Crappies, Fgl.	785,426	950,338
Sunfish, Fgl.	1,966,068	1,286,704
Stream Tr., Fgl.	1,050,260	1,599,665
Stream Tr., Yrl.	454,884	263,656
W. E. Pike, Fry	456,966,000	493,775,009
W. E. Pike, Fgl.	626,359	1,056,349
Nor. Pike, Fry	25,784,580	15,241,505
Nor. Pike, Fgl.	23,291	11,090
Lake Tr., Fry	2,454,300	3,271,800
Whitefish, Fry	1,255,414	2,124,000
Herring, Fry	14,417,200	14,206,000
Suckers, Fry	2,080,000	2,927,377
Suckers, Adl.	21,004	.....
Perch, Adl.	91,004	6,353
Bullheads, Adl.	2,635,208	514,492
Minnows, Adl.	604,635	1,468,941
Buffalo, Yrl.	17,250	44
Catfish, Yrl.	1,005	61,265
Rock Bass	.....	2,909
Silver Bass	.....	1,381
	512,182,364	539,340,560

BUREAU OF ROUGH FISH REMOVAL

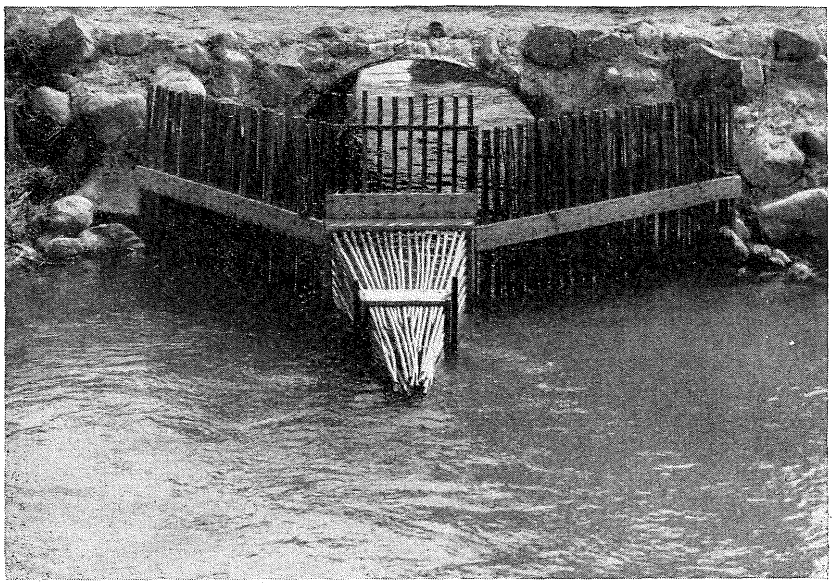
CLAER H. DETHMERS, *Supervisor*

The function of the Bureau of Rough Fish Removal is to remove and reduce the populations of undesirable fish species which prey upon game fish and their habitat in order to improve lakes and streams for angling. This is the only justification for rough fish removal operations under the

statutes. This fact has been stated time and again in the public policies promulgated by the department but is reemphasized here in order that the limitation affecting this activity may be fully understood.

The figures given in the various tables which follow outline the progress made in the removal of rough fish from the state's waters during the biennium. Tables 2 and 3 give in detail the species and volume of rough fish produced by contract and state day labor crews during the biennium.

Rough fish removal, like other conservation operations, has been greatly hampered during the war by shortage of manpower and equipment. Nevertheless steady progress has been made during the war years. The average

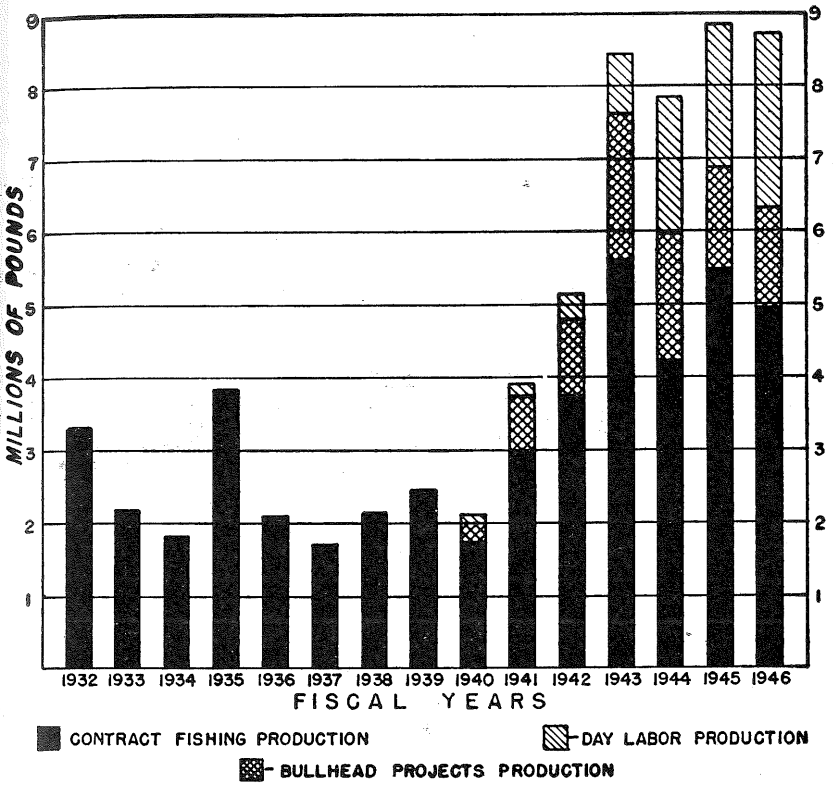


Rough fish are trapped in sections of streams for removal.

take of rough fish during the five years preceding the war was about 2,160,000 pounds per year, whereas during the last five years the average was over 6,800,000 pounds per year.

All previous records for removal of carp and other rough fish were broken in the fiscal year ending June 30, 1945, with a total of 8,853,163 pounds. See Figure 1 for comparison by years of rough fish production for the years 1932-1946, inclusive. On the whole, contract and state crew day-labor operations produced gratifying results during the biennium yielding an aggregate well over the seven million pound mark. Without a doubt the fiscal year 1946 would have been a most outstanding year had it not been for adverse weather conditions. Ice conditions during the winter seriously interfered with operations. Nevertheless results were reasonably satisfactory.

FIGURE 1



The day will perhaps never arrive when these undesirable fishes will be entirely eradicated from our waters. Under present known methods of removal the best we can hope to accomplish is to prevent the increase in the number of these species so as to keep them from becoming more of a menace to our game fishes.

Contract Fishing

In order to carry on a balanced program of rough fish control, both contract fishermen and state crews are used, employing the method that will be most effective under the conditions of each case to get maximum results. State crews are used mainly for various special operations where contract fishing is not practical.

Experience shows that in waters yielding a large catch of salable fish, contract fishermen working on a percentage basis will get the best results. The more fish they catch, the more they earn, giving them an incentive to greater effort. The contract fishermen made an impressive showing during the war, accounting for more than two-thirds of the total production in the past five years. Their operations are closely supervised to insure protection of game fish and retention and disposal of unsalable small rough fish. Any

violation of these requirements discovered by the department are promptly dealt with.

During the fiscal year 1945, 28 contracts were issued and operations carried on in 67 lakes and rivers and during 1946, 32 contracts covered operations on 81 lakes and streams. As already indicated fishermen operating under contract, as well as state day-labor crews, experienced difficulties in

Dipping carp and buffalo fish from pocket of seine following pulling of net on Big Stone Lake.

procuring fishing gear and other equipment necessary to carry on removal operations. Notwithstanding equipment and manpower troubles the total poundage of rough fish removed by contract fishermen during the fiscal year 1945 was comparable to that of 1943 when a record production under contract fishing was made. During the fiscal year 1946 the production was reduced by weather conditions. See Table 3.

The majority of contract fishermen now operating are experienced, well qualified and generally operate efficiently. Their continued operations under present rigid supervision should reflect in a marked reduction in the rough fish populations if a normal supply of labor and equipment becomes available and weather conditions permit.

Day Labor Operations

State crews operated in 105 lakes and streams during the fiscal year

1945 and in 82 lakes and streams during 1946. These crews have operated under a serious handicap for lack of essential equipment and manpower. Even now after the termination of the war it is almost impossible to secure nets, trucks and other equipment. This lack of equipment has prevented the outfitting of crews at the rate it was hoped they could be put to work, also making it necessary for the operating crews to work with improvised and bad-order gear of all types.

The measure of the effectiveness of the work done by day-labor crews is not merely the volume of fish they catch. They operate in water areas where, for various reasons, contract fishermen are unable to meet costs of operation and realize a reasonable profit. Day-labor crews operate in lakes that perhaps have never been seined before to catch rough fish which would spawn and be a source of infestation of other waters. They operate in creeks and streams to intercept the movement of carp and other undesirable species on their way to valuable game fish waters. Although this work may not be reflected in pounds of fish or revenue yielded from sales, its effectiveness as a preventive measure against the spreading of carp to other waters is perhaps one of the most efficient agencies used in the control of rough fish.

Table No. 4 reports the species of rough fish and value of each produced by state day labor crews.

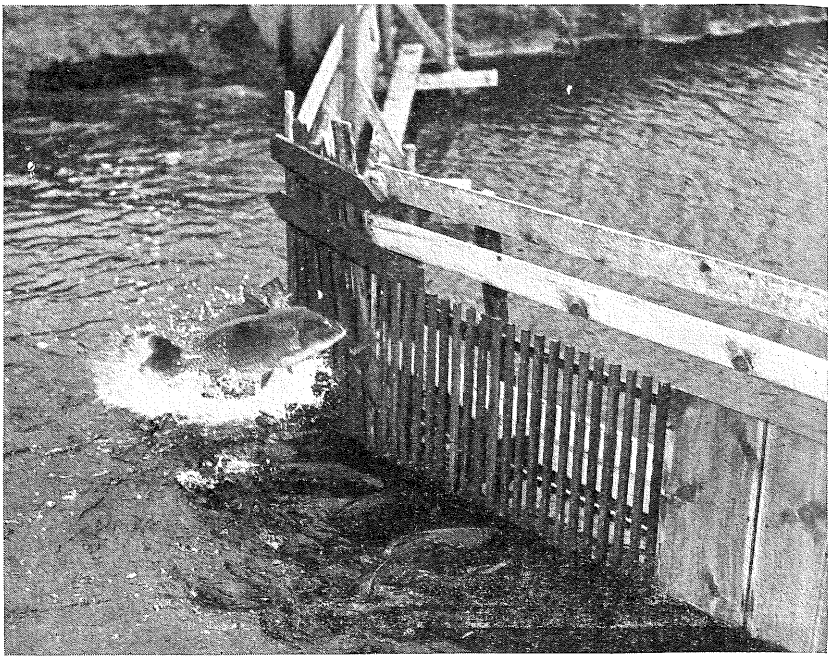
At present eight state crews are operating, including one crew stationed at the warehouse at Hutchinson engaged in the repair and assembly of rigging. As soon as proper equipment becomes available the plan is to put three additional crews to work. Material ordered months ago includes trucks, seines, pulling machines and miscellaneous gear.

Table No. 5 summarizes the value and volume of rough fish removal by contract and state day labor operations by fiscal years from 1932 to 1946.

Rough Fish Removal Permits

In order to expedite rough fish removal by extending the privilege to catch carp and other undesirable species to a larger number of people, a plan to issue permits to individuals to operate traps was initiated in 1945. The permits are issued by local game wardens to responsible parties, and permittees are subject to supervision by wardens. Two hundred fifty thousand pounds of rough fish of all kinds were removed by permittees in 1945. Table No. 6 reports the number of permits issued and volume of rough fish taken for the calendar year 1945.

An improved permit program was worked out by the department for the 1946 season. Numerous persons now operating under permits are finding their endeavors both interesting and profitable. The 1946 permits extend to October 31. Up to July 1, 1946, about one-half million pounds of rough fish had been taken under the 1946 permits.



In some years over 8,000,000 lbs. of rough fish are seined from Minnesota waters.

Bullhead Removal Operations

Bullhead removal operations have been carried on at the state weighing stations throughout the biennium. It will be noted from Table 7 that the production at Cut-Foot-Sioux Station has been on the decline. The Bena and Walker stations have been closed. The falling off in production at stations indicates successful reduction in bullhead populations to the benefit of game fish populations and justifies this operation as a means of creating and preserving more desirable habitat for game fish.

Disposition of Rough Fish

During the war because of the scarcity of meats and the need for making available all manner of food supplies for the armed forces there was a greater demand for carp and other species of rough fish than in the pre-war period. Consequently the market kept at a higher and more stable level. At the conclusion of the war, however, and the easing up of meat rationing, prices dropped rapidly and it became difficult for a time to dispose of all of the fish produced. Table No. 8 reports the sources of receipts for rough fish removal operations for the fiscal years 1945 and 1946.

Nearly all of the rough fish taken in Minnesota and adjoining states has to find an outlet in the eastern markets far away from the sources of pro-

duction and the prices received from such a market are adversely affected by long distance shipping costs and unpredictable factors of a remote market. Small fish under two pounds were difficult to sell at any price and were often given away for fertilizer, hog feed, or to rendering plants. More than 400,000 pounds of unsalable rough fish were thus disposed of in 1945. In

Pulling the net in rough fish seining operation.

that year the Lakefish Canning Company of Mankato launched an enterprise for the canning of rough fish for food and has made an outlet for much of the small fish produced.

Future Plans

Contract operations will be continued as at present in waters offering sufficient production of salable fish to pay costs and a reasonable profit. Operating as they do on a percentage basis, the greater the catch the greater their income. Contractors operating under rigid supervision by the bureau have produced excellent results and deserve a continued prominent place in rough fish removal activities.

The bureau plans, as soon as equipment and manpower become available, to add three more state day-labor crews, increasing to a total of 11 of such crews operating in the state. As equipment becomes available and as men become properly trained and qualified to do the work, this expansion

in state labor crews obviously will provide a more adequate organization for combating the rough fish problem.

Furthermore it is the plan to continue the permittee system already described. This will provide a larger organization for operating in our waters in that the right and privilege to take rough fish will be extended to a larger number of people. This activity, if properly supervised, augurs well for the enhancement of the scope of activities by the bureau.

The time is probably not far distant when there will be greater public demand for the removal of perch, tullibees, eelpout and dogfish which now infest many of our northern Minnesota lakes. This problem will be given continuous study and recommendations will be made in line with the findings.

TABLE 3

Species of Rough Fish and Volume of Each Produced under Contracts

Fiscal Years 1945 and 1946

Species	1945	1946
Carp	3,807,357 lbs.	3,326,766 lbs.
Buffalofish	1,245,179 lbs.	1,151,382 lbs.
Sheepshead	281,465 lbs.	457,587 lbs.
Eelpout	1,255 lbs.	134 lbs.
Garfish	195 lbs.	1,150 lbs.
Bullheads	126,903 lbs.	4,110 lbs.
Dogfish	8,409 lbs.	4,386 lbs.
Turtles	20 lbs.	350 lbs.
Suckers	9,737 lbs.	10,374 lbs.
Mooneyes	9,001 lbs.	6,251 lbs.
Catfish	285 lbs.	8,684 lbs.
	5,489,806 lbs.	4,971,174 lbs.

TABLE 4

Species of Rough Fish and Volume of Each Produced by State Day Labor Crews

Fiscal Years 1945 and 1946

Species	1945	1946
Carp	1,137,852 lbs.	1,357,276 lbs.
Buffalofish	105,957 lbs.	486,129 lbs.
Sheepshead	16,025 lbs.	2,373 lbs.
Eelpout	12,273 lbs.	16,145 lbs.
Garfish	810 lbs.	.....
Perch	242,433 lbs.	137,236 lbs.
Bullheads	421,937 lbs.	340,941 lbs.
Dogfish	45,799 lbs.	52,515 lbs.
Turtles	1,268 lbs.	29 lbs.
	1,984,354 lbs.	2,392,644 lbs.

TABLE No. 5
SUMMARY SHOWING
VALUE OF ROUGH FISH AND BULLHEADS REMOVED BY CONTRACT AND STATE DAY LABOR OPERATIONS BY FISCAL YEARS—Period 1932 to 1946

SEASONS	Total Lbs. Rough Fish*	Total Lbs. Bullheads	Gross Receipts	Net to State	Net to Contractors
1932	2,903,649	393,863	$139,426.39	$24,817.79	$114,608.60
1933	1,991,818	182,906	66,671.09	11,843.62	54,827.47
1934	1,814,147	5,613	56,581.24	11,453.09	45,128.15
1935	3,412,927	384,211	103,320.45	21,683.19	81,637.26
1936	1,686,356	327,506	[1]80,655.29	19,407.77	60,759.66
1937	1,647,101	55,211	[2]56,772.82	12,668.07	42,489.24
1938	1,963,182	195,300	[3]59,359.20	12,624.68	44,487.64
1939	2,268,779	185,726	[4]56,688.38	11,294.07	44,436.97
1940	1,662,213	134,097	[5]35,126.77	6,263.04	28,250.64
1941	3,011,456	.....	[6]79,537.64	[8]18,599.43	58,809.66
1942	3,956,609	91,751	[7]144,631.87	[8]30,301.43	111,026.70
1943	5,982,838	308,878	[9]353,868.80	86,518.19	257,656.92
1944	5,418,417	561,199	[10]299,664.42	104,635.05	185,028.31
1945	6,925,320	548,840	[11]446,019.58	156,578.07	273,332.47
1946	7,018,767	345,051	[12]422,414.95	181,307.06	229,453.51

[1]Includes $487.86 South Dakota's share from sale of fish taken from Big Stone Lake.
[2]Includes $1,615.51 South Dakota's share from sale of fish taken from Big Stone Lake.
[3]Includes $2,246.88 South Dakota's share from sale of fish taken from Big Stone Lake.
[4]Includes $957.35 South Dakota's share from sale of fish taken from Big Stone Lake.
[5]Includes $613.14 South Dakota's share from sale of fish taken from Big Stone Lake.
[6]Includes $2,128.19 South Dakota's share from sale of fish taken from Big Stone Lake.
[7]Includes $3,304.10 South Dakota's share from sale of fish taken from Big Stone Lake.
[8]36c shortage in account—remitted during 1941-1942 season.
[9]Includes $9,693.69 South Dakota's share from sale of fish taken from Big Stone Lake.
[10]Includes $10,001.06 South Dakota's share from sale of fish taken from Big Stone Lake.
[11]Includes $16,109.04 South Dakota's share from sale of fish taken from Big Stone Lake.
[12]Includes $11,654.38 South Dakota's share from sale of fish taken from Big Stone Lake.
*Rough fish as referred to above, includes carp, buffalo, sheepshead, dogfish, garfish, etc.
Gross receipts include amounts received from sale of fish caught through day labor operations.

TABLE 6

Rough Fish Removal Permits Issued
Calendar Year 1945

Number of permits issued		199
Trapping	41	
Net and seine	13	
Spearing	145	
Permittees reporting "no fish taken"		53
Trapping	18	
Net and seine	3	
Spearing	32	
Active Permittees		146
Rough Fish taken by these permittees		
Carp	174,101 lbs.	
Buffalo	74,221 lbs.	
Other fish	2,165 lbs.	
	250,487 lbs.	
Value of above fish for permittees		$12,726.92

TABLE 7

Resume of Bullhead Fishing Projects
Fiscal Years 1945 and 1946

	1945	1946
Cut-Foot-Sioux, Itasca County		
Administrative deductions	$12,779.81	$ 5,412.06
Amount credited to fishermen	38,339.07	16,236.16
Gross value of fish sold	$51,118.88	$21,648.22
Production—Bullheads	618,144 lbs.	256,488 lbs.
Dogfish	3,194 lbs.	1,079 lbs.
Bena, Cass County		
Administrative deductions	$ 9,908.88	
Amount credited to fishermen	28,905.43	
Gross value of fish sold	$38,814.31	
Production—Bullheads	445,974 lbs.	
Dogfish	5,590 lbs.	
Walker, Cass County		
Administrative deductions	$ 4,249.57	
Amount credited to fishermen	12,757.16	
Gross value of fish sold	$17,006.73	
Production—Bullheads	190,680 lbs.	
Dogfish	11,315 lbs.	

Mud Lake, Traverse County				
Administrative deductions	$ 1,563.56			
Amount credited to fishermen	4,689.16			
Gross value of fish sold	$ 6,252.72			
Production—Bullheads	103,074	lbs.		
Carp	3,420	lbs.		
Traverse Mud Lakes, Traverse County				
Administrative deductions			$20,623.35	
Amount credited to fishermen			54,141.89	
Gross value of fish sold			$74,765.24	
Production—Bullheads			846,252	lbs.
Carp			5,492	lbs.
Blackduck, Beltrami County				
Administrative deductions			$ 3,948.29	
Amount credited to fishermen			11,845.05	
Gross value of fish sold			$15,793.34	
Production—Bullheads			171,880	lbs.
Dogfish			2,334	lbs.
Cass Lake, Cass County				
Administrative deductions			$ 1,889.67	
Amount credited to fishermen			5,670.06	
Gross value of fish sold			$ 7,559.73	
Production—Bullheads			90,562	lbs.
Dogfish			409	lbs.

TABLE No. 8
SOURCES OF RECEIPTS
ROUGH FISH REMOVAL OPERATIONS
Fiscal Years 1945 and 1946

SOURCES	STATE		CONTRACTOR		GROSS		Total
	1945	1946	1945	1946	1945	1946	
Rough Fish Removal Revolving Fund—							
Contract Fishing	[1]$98,167.95	[2]$77,309.96	$273,332.47	$229,453.51	$371,500.42	$306,763.47	$678,263.89
Boxes			[3]1,370.95	[3]2,481.25	1,370.95	2,481.25	3,852.20
Day Labor	74,519.16	115,651.48			74,519.16	115,651.48	190,170.64
Boxes	[5]1,576.95	[5]2,480.45			1,576.95	2,480.45	4,057.40
Bullhead Fishing—							
Cut-Foot-Sioux	12,779.81	5,412.06	[4]38,339.07	[4]16,236.16	51,118.88	21,648.22	72,767.10
Bena	9,908.88		[4]28,905.43		38,814.31		38,814.31
Cass Lake		1,889.67		[4]5,670.06		7,559.73	7,559.73
Traverse—Mud Lakes		20,623.35		[4]54,141.89		74,765.24	74,765.24
Walker	4,249.57		[4]12,757.16		17,006.73		17,006.73
Blackduck		3,948.29		[4]11,845.05		15,793.34	15,793.34
Boxes	[5]186.30				186.30		186.30
Mud	1,563.56		[4]4,689.16		6,252.72		6,252.72
Total	$202,952.18	$227,315.26	$359,394.24	$319,827.92	$562,346.42	$547,143.18	$1,109,489.60

[1]Includes $16,109.04 South Dakota's share of proceeds from sale of fish taken from Big Stone Lake.
[2]Includes $11,654.38 South Dakota's share of proceeds from sale of fish taken from Big Stone Lake.
[3]Boxes sold by contractors, reimbursements by purchasers.
[4]Amounts returned to fishermen employed by the state in bullhead operations.
[5]Reimbursements for boxes by purchasers.

BUREAU OF LICENSED COMMERCIAL FISHING

GEORGE WEAVER, *Supervisor*

The report of the Bureau of Licensed Commercial Fishing is in the form of tables which show the nature and scope of the bureau's field of work.

TABLE 9

Interstate Commercial Fishing
Resume of Licenses Issued and Revenue Derived
Calendar Years 1944 and 1945

	1944	1945	
Set Line		old	new
Number of licenses issued	311 (2 dup)	51	234 (20)*
Number of licensees reporting	118		8
Number of licensees reporting 'no fishing'	33		5
Number of licensees not reporting	160		221
Seine and Net			
Number of licenses issued	51	59	56 (31)*
Number of licensees reporting	36		40
Number of licensees reporting 'no fishing'	2		....
Number of licensees not reporting	13		16
Revenue Derived from Sale of Licenses			
Interstate set line licenses	$388.75		$1,195.00*
Interstate seine and net	669.50		1,429.50

Set Line

*The 51 licenses were issued previous to May 15, 1945, under the old code, and of these licenses 20 were reissued under new code. The revenue derived from the old licenses was $63.75 from which a credit of $38.75 was deducted, making a balance of $25.00 which is added to the revenue derived from licenses issued under the new code in the amount of $1,170.00; thus making the total revenue $1,195.00.

Seine and Net

The 59 licenses were issued previous to May 15, 1945, under the old code, and of these licenses, 28 were reissued under the new code. The revenue derived from the old licenses was $756.00 from which a credit of $539.00 was deducted, making a balance of $217.00 which is added to the revenue derived from licenses issued under the new code in the amount of $1,212.50; thus making the total revenue $1,429.00.

TABLE 10

Interstate Commercial Fishing Production and Value of Fish Taken
Calendar Years 1944 and 1945

	1944			1945	
Species	Pounds	Value		Pounds	Value
Buffalofish	146,363	$14,954.99		105,486	$15,036.65
Carp	446,402	22,732.20		884,099	47,747.51
White Carp	9,562	497.03		5,030	262.17
Catfish	32,767	7,434.80		13,446	3,326.55
Suckers	4,006	139.00		1,129	46.12
Dogfish	17,657	410.96		21,797	327.97
Sheepshead	26,259	2,601.84		40,188	6,034.68
Bullheads	171	35.40		.....	.....
Garfish	8,422	.....		995	.....
Eels	298	10.00		.....	.....
Turtles	2,237	18.93		3,512	154.42
Shinners	70	2.44	Shad	450	.....
Mooneyes	945	47.25	Misc.	1,309	19.77
Sturgeon	11 fish	1.28		.....	.....
TOTAL	686,737	$48,886.12		1,075,996	$72,955.84
	8,422	no value		1,445	no value

TABLE 11

Lake Superior Commercial Fishing
Resume of Licenses Issued and Revenue Derived
Calendar Years 1944 and 1945

	1944	1945
Number of Masters Licenses issued	268	24*
Number of Master licensees reporting	252	10
Number of Master licensees reporting "no fishing"	7	1
Number of Master licensees not reporting	16	12
Number of Lake Superior "helper's" licenses issued	38	8**
Revenue derived from Lake Superior "Master's" licenses	$2,680.00	$240.00
Revenue derived from Lake Superior "helper's" Licenses	190.00	40.00**
Number of Lake Superior Commercial fishing licenses issued		275
Number of Lake Superior Commercial fishermen reporting catch		219
Number of Lake Superior Commercial fishermen reporting "no fishing"		10
Number of Lake Superior Commercial fishermen not reporting		46
Revenue derived from Lake Superior Commercial fishing licenses		$4,755.00

*Lake Superior "Masters" fishing licenses were issued up to May 15, in 1945. There were 204 such licenses issued of which all but 24 were issued Lake Superior Commercial fishing licenses.

**No Lake Superior "helper's" licenses were issued after May 15, 1945.

Equipment:

1945

203 Lake Superior Commercial fishermen fished from boats 18 feet in length or less.

35 Lake Superior Commercial fishermen fished from boats over 18 feet in length, but not more than 24 feet in length.

37 Lake Superior Commercial Fishermen fished from boats over 24 feet in length but not more than 35 feet in length.

Lake Superior Fish Buyers

	1944	1945
Licenses issued	12	14
Revenue derived	$300.00	$350.00

TABLE 12

Lake Superior Commercial Fishing Production and Value of Fish Taken
Calendar Years 1944 and 1945

	1944		1945	
Species	Pounds	Value	Pounds	Value
Trout	308,771	$90,657.10	263,675	$82,955.42
Herring	5,069,243	228,081.95	4,408,742	249,505.62
Ciscoes	175,582	30,311.50	101,032	19,452.27
Ciscoets	23,534	4,329.31	23,180	4,721.52
Pickerel	62	11.80	50	10.00
Menominees	3,050	402.30	3,039	610.03
Whitefish	14,610	4,240.89	12,472	4,558.99
Bluefins	64	10.00	31	3.02
Pike	48	7.20	.....	.....
Suckers	180	9.70	2,034	130.36
	5,595,144	$358,061.75	4,814,255	$361,947.23

TABLE 13

International Commercial Fishing
Resume of Licenses Issued and Revenue Derived
International Fishing Operations
Calendar Years 1944 and 1945

	1944			1945		
	Lake of the Woods	Rainy Lake	Namekan Lake	Lake of the Woods	Rainy Lake	Namekan Lake
Number of licensed fishermen	39	10	2	38	10	3
Number of fishermen reporting	39	10	2	38	10	3
Number of international helper's licenses issued		37			36	
Revenue derived from helper's licenses				$ 37.00		$ 36.00
Revenue derived from sale of fishermen's licenses				4,732.50		4,007.50
Fees paid by Lake of the Woods fishermen toward Baudette Hatchery				780.00		760.00
Total				$5,549.50		$4,803.50

Fishing Gear Used

	1944			1945		
	Lake of the Woods	Rainy Lake	Namekan Lake	Lake of the Woods	Rainy Lake	Namekan Lake
Gill nets (feet)	88,500	19,000	5,000	88,500	19,000	7,000
Pound nets (number)	43	10	0	30	10	0
Fyke nets (number)	75	0	0	20	0	0
Trap nets (number)	0	0	0	20	0	0

International Fish Buyers	1944	1945
Number of wholesale international fish buyers licenses issued	6	5
Number of international resident fish buyers licenses issued	2	2
Number of international peddler's fish buyers licenses issued	9	8 (2 no fee) (veteran)
Revenue derived from wholesale international fish buyers licenses	$150.00	$500.00
Revenue derived from resident international fish buyers licenses	20.00	20.00
Revenue derived from peddler's international fish buyers licenses	45.00	30.00
Total	$215.00	$550.00

TABLE 14

Commercial Fishing Production
International Waters
Calendar Years 1944 and 1945
1944

Species	Lake of the Woods		Rainy Lake		Namekan Lake	
	Lbs.	Value	Lbs.	Value	Lbs.	Value
Yellow Pike	346,183	$54,307.75	33,991	$4,668.21	4,005	$ 446.40
Pickerel	104,921	6,821.69	14,574	1,039.17	618	32.67
Whitefish	1,465	283.68	15,593	3,047.19	4,795	879.10
Bluefins	56	3.36	37,309	1,081.75	2,202	.....
Redfins	419	18.06	308	9.24	.....	.....
Perch	8,703	990.55	348	42.16	.....	.....

Suckers	105,614	2,789.40	30,097	363.12	1,825	.....
Tullibees	689,175	56,860.94	5,352	97.20	.....	.....
White Carp	1,470	32.53	.....	.....	.....	.....
Bullheads	17,573	2,634.34	.....	.....	.....	.....
Saugers	33,458	2,618.09	.....	.....	.....	.....
Trout	54	12.24	.....	.....	.....	.....
Burbot	39,634	722.77	20,798	135.04	705	8.10
Burbot liver	.....	.....	.....	.....	.....	.....
Dressed Pike	.....	.....	465	51.54	.....	.....
	1,348,725	$128,095.40	158,835	$10,534.62	10,123	$1,346.27
					4,027*	
	Total Pounds		Total Value			
	1,517,683		$139,976.29			
	4,027*					

1945

Yellow Pike	364,194	$97,731.32	28,865	$6,907.58	2,163	$ 429.09
Pickerel	90,652	9,093.99	16,555	1,746.86	306	31.60
Whitefish	876	285.13	19,230	5,915.77	5,773	1,129.17
Bluefins	90	2.70	34,541	3,402.00	12,541	921.86
Redfins	482	41.01	383	23.33	.....	.....
Perch	6,328	1,201.49	379	54.40	.....	.....
Suckers	107,726	6,579.41	34,062	1,791.00	2,363	90.24
Tullibees	238,204	31,009.02	4,098	407.79	.....	.....
White Carp	3,241	196.19	.....	.....	.....	.....
Bullheads	12,462	2,385.80	.....	.....	.....	.....
Saugers	37,913	6,409.30	.....	.....	.....	.....
Trout	.....	.....	.....	.....	.....	.....
Burbot	122,839	2,643.58	25,238	416.69	2,051	.....
Dressed Pike	.....	.....	.....	.....	.....	.....
	987,897	$157,810.14	163,351	$20,665.42	23,146	$2,601.98
					2,051*	
	Total Pounds		Total Value			
	1,174,394		$181,109.14			
	2,051*					

*No value.

TABLE 15

Mussel Fishing
Resume of Licenses Issued and Revenue Derived
Calendar Years 1944 and 1945

	1944	1945
Number of licenses issued	7	9
Number of licensees not reporting	1	2
Number of licensees reporting "no fishing"	2	2
Revenue derived from sale of licenses	$35.00	$45.00

TABLE 16

Mussel Production and Value
Calendar Years 1944 and 1945

	1944			1945		
	Total Tons	Pounds	Total Value	Total Tons	Pounds	Total Value
Cannon River	....	.....	.....	1	1,750	$157.62
Crow Wing River	32	.....	$1,280.00	3	860	232.00

Lake Pepin	1	200	not sold	....	.....	.....
Mississippi River	1	1,000	not sold	....	1,000	not sold
TOTALS	34	1,200	$1,280.00	4	3,610	$389.62
				or		
				5	1,610	

TABLE 17

Resume of Licenses Issued and Revenue Derived
Minnesota River Set Line Fishing Calendar Year 1944

Licenses issued	6
Revenue derived	$6.00

Minnesota and Mississippi River Set Line Fishing Calendar Year 1945

Licenses issued	11
Revenue derived	$11.00

TABLE 18

Inland Mississippi River Fishing
Resume of Licenses Issued and Revenue Derived
Calendar Years 1944 and 1945

	1944	1945	
Licenses issued	5	12	(9 @ $5.00)
Revenue derived	$25.00	$75.00	(3 @ $10.00)

TABLE 19

Minnow Dealer's Licenses
Resume of Licenses Issued and Revenue Derived
Calendar Years 1944 and 1945

1944

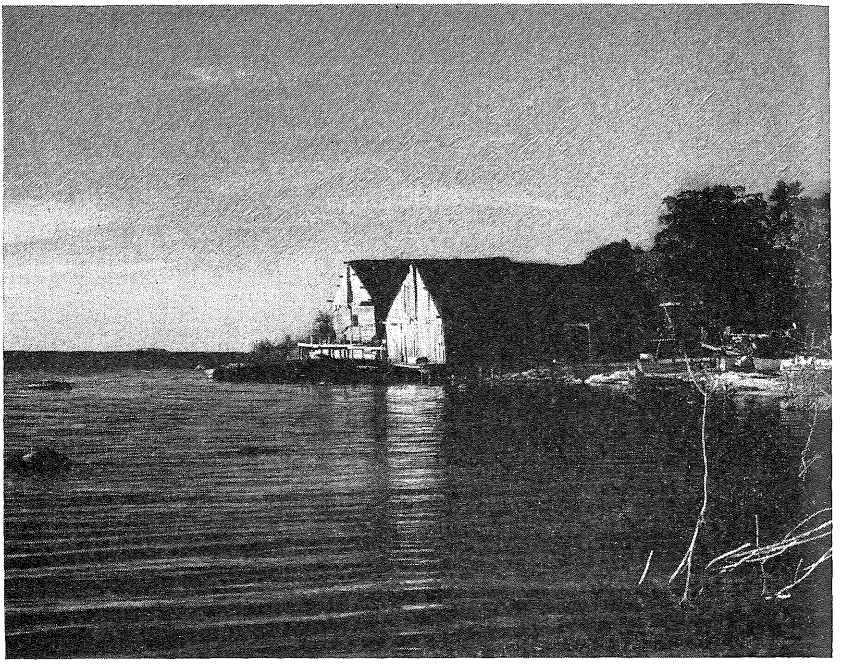
1,407	Local Minnow Dealer's licenses issued, at $2.50 each	$3,517.50	
92	Itinerant Minnow Dealer's licenses issued, at $25.00 each	2,300.00	

1945

1,702	Local Minnow Dealer's licenses issued, at $2.50 each	$4,247.50	(3 duplicate)
129	Itinerant Minnow Dealer's licenses issued, at $25.00 each	3,175.00	(2 duplicate)

Recommendations

It is recommended that the Legislature of 1947 be asked to amend the present licensed commercial fishing laws so as to authorize the issuance of a helper's license to commercial fishermen on Lake Superior and interstate waters and to local and itinerant minnow dealers fixing the license fee on Lake Superior and interstate waters at $5 and for minnows at $2.50. The law when so amended will authorize operators on Lake Superior and interstate waters and minnow dealers licensed to employ a helper the same as is now provided by law for fishermen on international waters. Such an amendment would tend to uniformity and would enable operators to legally engage assistants in their fishing and commercial minnow operations.



The old Arnesen fishery at Lake of the Woods weathered 48 years before being replaced recently.

BUREAU OF FISHERIES RESEARCH

LLOYD L. SMITH, JR., *Fisheries Research Supervisor*

Function of Bureau

During the biennium ending June 30, 1946, Bureau of Fisheries Research although greatly hampered by absence of trained personnel on military leave and scarcity of essential materials, has devoted itself to the furtherance of four major objectives: (1) the gathering of basic physical, chemical, and biological data from state waters through lake and stream surveys; (2) the working out of a new and improved fisheries methods; (3) the preparation of complete management plans for lake and streams on a basis of watershed and fish management areas; (4) the maintenance of a biological service program for area fisheries managers. Activities were concentrated on maintenance of basic investigations which could not be dropped without serious loss, and on surveys of problem lakes. During the war period three biologists were forced to carry the load of eight employed on the pre-war force.

Careful planning of postwar survey projects has indicated that there are approximately 3,000 lakes yet to be surveyed to determine proper means of managing their fisheries resources. Since one crew of three biologists can

work only 30 to 40 lakes each season, the magnitude of the task is apparent. Because problem lakes must be checked at least once every five years to determine trends, it is evident that some machinery must be set up in addition to regular reconnaissance survey. Adequate periodic checks can only be made if a biologist thoroughly familiar with the particular lake region is available continually in each principal problem area. Therefore, future development of the bureau is pointed toward the maintenance of present lake and stream surveys, the conduct of basic investigations, and, in addition, an expansion of facilities to permit the establishment of eight area biologists. It is estimated that the present availability of satisfactory personnel and funds will permit the establishment of only four of these stations during the next two years. These biologists, working directly with the area fisheries managers, will be able to give prompt service to all problems arising in their districts.

Lake and Stream Survey

General. During the biennium, 1,125 miles of stream were surveyed and 19 problem lakes were completely checked. In 1944, 200 miles of stream were covered to complete the St. Louis River system. All lake surveys were

The small sized dredge brings up samples of lake bottom soils for study.

suspended during the war and no new river system surveys started. In the 1945 season it was possible to put one crew in the field. It covered 650 miles of trout stream in the Root River drainage to complete this system. Permanent personnel covered nine problem lakes in the 1945 season and prepared complete management plans. The most outstanding feature observed on most of these lakes was the prolific natural reproduction. Three survey crews were again available during the last quarter of the biennium. They covered 185 miles of the Whitewater system and examined 10 lakes in the last two weeks of June, 1946. The large number of problem lakes accumulated during the war years necessitated widespread travel by the crews during 1946 to all parts of the state. It is planned in the future to have one crew check problem lakes and to have the others carry on a systematic check of lakes by watersheds. The trout streams will be completed as soon as possible and then smallmouth bass and other warm-water streams given attention.

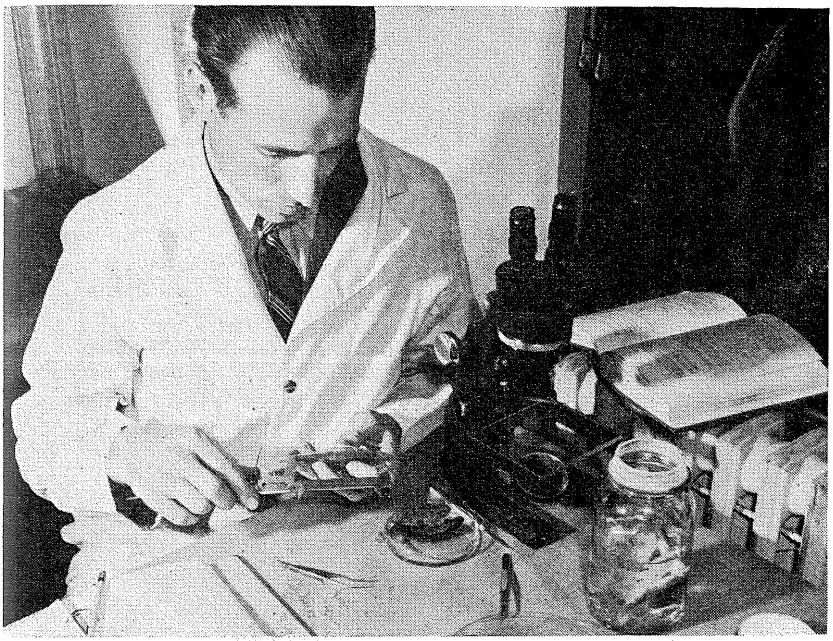
Upper Mississippi Survey. The Upper Mississippi River Conservation Survey started in 1943 and carried on cooperatively by the states of Missouri Illinois, Iowa, Wisconsin, and Minnesota, and the Fish and Wildlife Service, was instituted to provide scientific data on the sport and commercial fisheries of the Upper Mississippi River and on the effects of fluctuating water levels on wildlife resources, particularly those caused by the periodic artificial lowering and filling of the 9-foot navigation channel pools. The very significant work being accomplished and the importance of the river make it highly desirable that the river survey be carried on for two more years so that effective management practices can be promoted. Until the spring of 1946, operations were limited by scarcity of personnel. Full scale activities were started in April of 1946 and results to date have been gratifying. Since the beginning of the survey in 1943, creel census of anglers, careful check on commercial fishermen, investigations of the effect of winter drawdowns on navigation pools, and other pertinent data have been collected and preliminary reports prepared (First and Second Progress Reports). Minnesota is contributing to the cooperative effort the services of two biologists and periodic service of three creel census clerks as well as equipment and necessary traveling expenses. All funds for this project have come from the regular budget of the bureau since the cooperative agreements were not entered into at the time budgets were prepared for the current biennium. The requirements of this project have limited the regular state-wide functions of the bureau, and it is believed that future operations should be provided for by funds allotted for this purpose.

Lake of the Woods Investigation. Investigations on Lake of the Woods commercial fishery have been continued and the predictions of downward trends in fish production have been verified. Revision of some commercial fisheries practices is probably necessary to maintain maximum fish production. Abatement of pollution of the Rainy River is also essential to proper maintenance of fish populations.

Basic Fishery Investigations

Population Studies. One of the most important fields of fisheries inves-

tigations is the evaluation of standing populations in both lakes and streams. Without accurate information it is impossible to make proper plantings, to control habitats, to balance populations for maximum yield and to formulate careful catch regulations. During the fall of 1944 and the summer of 1945 and the spring of 1946, the bureau conducted a series of stream population studies by use of the electric shock method. This technique effectively samples all fish in the stream without killing them and so permits the return of desirable species to the water after data has been collected from them. Population studies were carried on in the Root River, the Whitewater, the Manitou, and the Caribou systems. Results showed that stream fish populations



Fisheries research supervisor Dr. Lloyd L. Smith, Jr. leads a staff of aquatic biologists.

vary widely. Information already gathered has substantially changed stocking recommendations. Future activities along these lines will be much expanded as material and personnel become available.

Total population census on one small lake was also made using the rotenone poisoning method. Scarcity of this material due to war-time limitations precluded further investigations.

Trout Production and Survival Studies. Investigations carried on over the period of the last four years have indicated that the average cost of catchable-sized hatchery trout planted and subsequently returned to the angler's creel is approximately 60 cents each. This high cost is based on production costs of 15 cents and an average return of planted trout of 25

per cent. The need for the most careful planting techniques is therefore obvious. Overstocking of poor waters must be avoided and planting must be emphasized where heavy fishing load exceeds the potential natural reproduction. Careful creel census and fish tagging in Duschee Creek has been continued. Checks on the contribution of hatchery fish to the stream populations was started in the Whitewater system by the placement of 12,000 fin-clipped fish in the south branch of that stream. These studies, which are still in progress, indicate the necessity of frequent spring and summer plantings and the desirability of encouraging natural reproduction to the greatest possible extent.

Fishway Investigations. Fishway investigations started during the previous biennium were carried on during the 1944 season and results confirmed those published earlier. In low-head dams the Denil type fishway was shown to carry more rough fish than fine fish. Panfish use the fishway least, being passed over it in negligible quantities. These investigations indicate that in the majority of cases, fishways in dams of Minnesota are probably more detrimental than beneficial. Some exceptions may occur in the pike or trout areas where rough fish are not prevalent.

General Service Activities. During the latter part of the biennium the Bureau of Fisheries Research cooperated with Pittman-Robertson biologists in the conduct of plant food surveys and the analysis of water from duck lake investigations. Careful coordination of these two activities has eliminated possible duplication of work and has made more intensive coverage possible. Cooperation with area fisheries managers and hatchery personnel was intensified as more problems were brought to the bureau by fieldmen.

Electrical shocking devices momentarily stun fish so they can be collected for count and weight studies. They are released unharmed.

Recommendations

Fishery research in Minnesota and other states has led to the revision of outmoded fishing practices and has pointed the way toward more effective use of available fish management funds. It has shown the futility of promiscuous planting of panfish by establishing the fact that most panfish lakes are amply provided with young fish by nature and in many cases that they are overcrowded. Effective utilization of catchable-sized trout has been permitted by careful stream survey, tagging studies and population investigations. The desirability of liberalizing season and catch restrictions has been indicated in the case of panfish and such liberalization was incorporated into the present game and fish code. To maintain present advances and to extend investigations and carefully balanced management plans to a greater number of state waters, the following recommendations are presented:

(1) Maintain five lake survey crews and two stream survey crews.

(2) Set up cooperative Mississippi River Survey on an independent operating budget under direction of the Research Bureau.

(3) Expand basic fishery investigations in the fields of population studies, survival of planted fish, commercial fishery procedures on Lake of the Woods, basic productivity studies, and effects of population control on both lakes and streams.

(4) Set up four area biologist stations in connection with area fisheries managers to carry on routine investigations and biology service work for particular areas.

BUREAU OF STREAM CONTROL

THOMAS R. EVANS, *Stream Control Supervisor*

Improvement and Development of Streams for Fishing Purposes

Introduction

The objective of this program is to improve and develop fish habitat in Minnesota by

(a) Reducing silt in the streams through soil erosion control.
(b) Maintenance of lower water temperatures through shade tree planting, spring development and confining flow to narrow channels.
(c) Improving spawning conditions through exposure and creation of gravel beds.
(d) Creating deep water areas by dam and deflector installation.

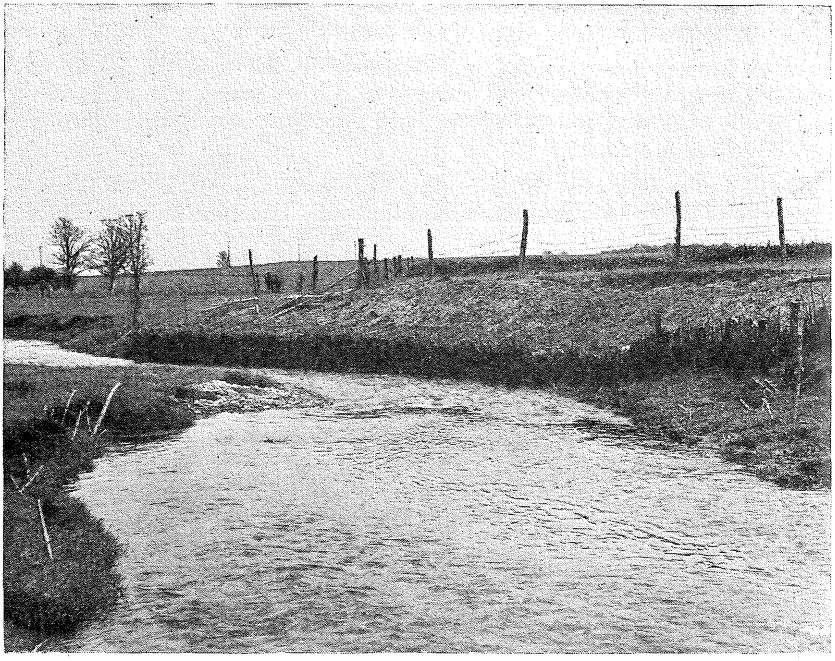
War Time Activity

As was the case during the previous biennium most of the stream improvement activity was along the line of planning and collection of data which would insure a better program when field work could be resumed.

Fifteen streams on the North Shore of Lake Superior were covered for the purpose of getting data on which to base the post-war program.

Studies of the Knife River improvements installed in 1942 were continued to determine the best types of structures to use. Very little maintenance has been required on this project. In 1943 the total maintenance expenditure was $117.12. In 1944 only $64.78 worth of maintenance was required. No maintenance was required in 1945. Observations on this project indicate that some minor changes in structural design are desirable to further reduce maintenance costs. No dams or deflectors have been destroyed during the four-year period since installation and only five of the original seventy-nine floating shelters have been lost. The majority of the pools created on the river are as deep as or deeper than they were when created.

Since beaver ponds present a problem on some streams, observational studies were conducted to learn more of the beaver-trout relationship in the North Shore area. These studies included the suitability of various ponds as trout habitat and the effect of the ponds on the stream systems as trout



Willow stake revetmen installed on Spring Valley Creek (Fillmore county) to prevent silting of trout streams.

habitat. It is apparent from these studies that each pond must be considered on its own merits. Some are assets to trout fishing, some are neutral and some are definitely detrimental and should be removed. It is also apparent that beaver should be controlled on some sections of streams to prevent the stream from becoming worthless to trout.

Control of soil erosion is the principal consideration in the improvement

of streams in the agricultural areas of the state. This phase of the work has therefore been further developed. Soil conservation districts have been organized on an extensive scale. Inasmuch as these districts have been organized to combat soil erosion a cooperative program has been developed between the Division of Game and Fish and eight districts, in Houston, Fillmore, Winona, Olmsted, Dodge, and Goodhue counties.

Efforts have been continued to secure necessary easements along the streams. This effort has been concentrated in southern Minnesota since adequate easements have already been secured on a number of North Shore streams.

During the spring of 1945 the conservation clubs at St. Charles and Spring Valley became interested in doing some stream improvement work. Accordingly technical assistance was provided to assist them in tree planting along the Whitewater river and in the installation of a willow stream bank erosion control revetment on Spring Valley Creek as a demonstration to land owners in the vicinity of the effectiveness of such erosion control.

Accomplishments

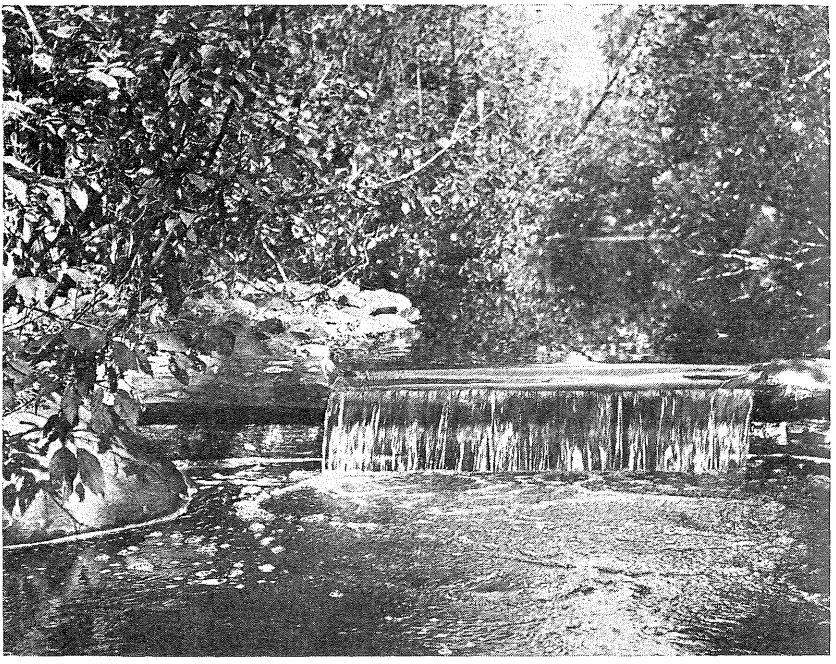
Following the end of the war in 1945 plans were laid for the resumption of field activity as soon as labor, materials and equipment should become available. Equipment was secured as it came on the market and with the increase in the labor supply by spring of 1946 definite plans were made to put one crew to work in Houston county and one in St. Louis county. Work was actually started on the South Branch of Crooked Creek in Houston county on May 1, 1946. The work included tree planting, fencing to protect trees from livestock damage and the installation of stream bank erosion control revetments. These latter are chiefly of the willow mat and willow stake type which will provide permanent living control of the stream banks. Figure 2 is an example of bank control by means of a willow stake revetment

In addition to controlling erosion along the stream banks it is essential to prevent silt from washing into the streams from the adjacent tilled fields. To hasten the adoption of soil conservation practices such as strip cropping, contouring, etc., by landowners along the streams, a stream control-soil conservation technician was hired. His duties are to assist farmers in preparing adequate soil conservation plans for their farms, plan stream bank erosion control measures and give technical supervision to the crew installing the control structures.

Work on the French river was begun in May, 1946, with tree planting along open stretches of the streams. During the summer log dams, deflectors, shelters and erosion control structures similar to those used on the Knife river will be installed on approximately six miles of the stream.

Recommendations for Biennium

There are some 250-500 miles of trout and bass streams in Minnesota



Single log dam installed on the Knife River (Lake county).

on which improvement is warranted in varying degrees. In order to speed up the development of these waters so they may better support the heavy fishing pressure anticipated in the future it is recommended that the program be expanded to permit operation of four improvement crews. Two of these would work in the southern part of the state and two in the northern part.

Due to the immensity of the job of soil erosion control and the importance of it to stream improvement it is further recommended that provision be made to employ another man trained in soil conservation work. With adequate assistance on watershed soil and water conservation it will be possible to begin a stream improvement project with watershed control on the uplands and carry it on down to the stream banks and stream channel. This will insure more complete control than to merely improve the banks and channels while permitting silt to wash into the streams from the fields and gullies.

BUREAU OF GAME

FRANK D. BLAIR, *Supervisor*

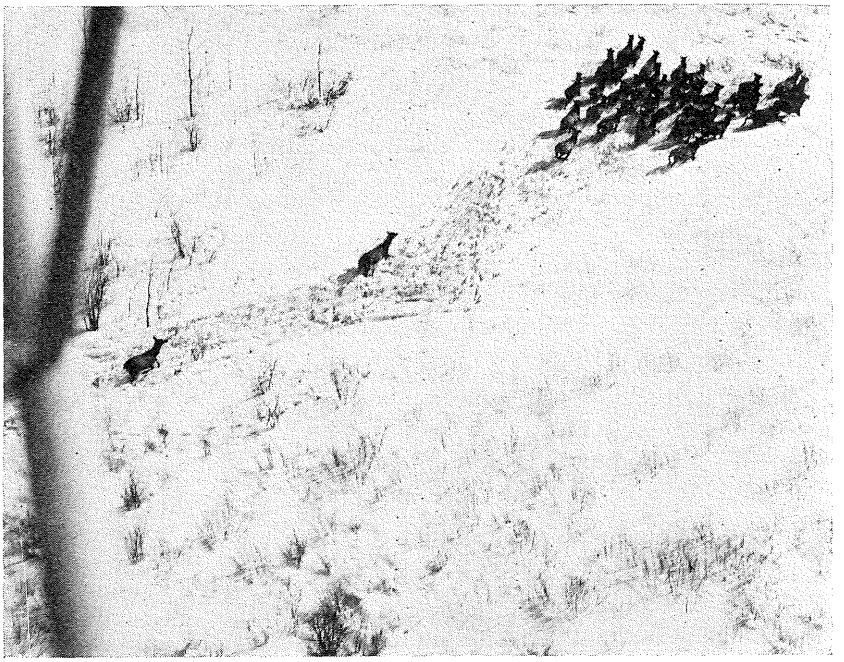
General Functions

Under state laws and orders of the director of the Division of Game and Fish, all game and fur-bearing animal operations are consolidated in the Bureau of Game. The primary responsibility of this bureau is to conserve and increase game life.

One of the 234,542 small game hunters of 1945.

Funds for game operations, including original cost of Pittman-Robertson or federal aid projects, comes from 50% of the hunting and trapping license fees received by the Division of Game and Fish. This money is credited to what is known as the "Public Hunting Grounds Fund." Although the hunting license fees remain the same as when established in 1915, the 50% going into the game fund will be sufficient for increased operations, if it is appropriated by the Legislature and approved by the Department of Administration.

The Game Bureau carries on certain phases of game work that compare favorably with parallel fisheries activities, and is carried on under six separate units, and to a minor degree with the warden service and the Division of Forestry. These units comprise game propagation, predator control, game refuges and public hunting grounds, licensed commercial trapping, habitat improvement and game research. In addition, game management operations include control of aquatic vegetation, airplane hunting of species upon which the state pays a bounty, investigation of complaints of damage



As the plane approaches, these American wapiti break into a run. The present herd has grown from 27 "elk" released in 1935.

by wildlife and giving relief to complainants, investigation of game conditions and recommendations on open and closed seasons and bag limits on game and fur bearers, control of timber leases on federally owned lands within the Beltrami Island portion of the Red Lake game preserve, farming and hay leasing on game refuge lands, the operation of food and cover plant nurseries, construction and maintenance of roads, fire lanes, dykes, dams and telephone lines; general farming on refuge lands; repairs to road and farm machinery; cutting timber, sawing lumber, making of posts, poles, etc.

In the past it has been possible to deal successfully with claims for damages done by wildlife because of the high plane of sportsmanship and cooperation of Minnesota farmers who have suffered damages and the efficient manner in which the wardens and other field personnel have investigated and dealt with the claimants. However, with the deer herd moving farther and farther into highly developed agricultural communities and, as the range of the beaver expands, the control of these animals will become an increasingly difficult management problem.

Some plan for dealing with emergency jobs which develop in the course of the normal operations of this bureau is a need. Quick action at the place damages are in the making or have occurred such as from forest fires, washing out of bridges, breaking of dykes, dams or equipment may mean the difference between small and large losses of property as well as loss of

wildlife. A contingent fund should be available in the budget to take care of such emergencies.

The Game Bureau keeps records of conservation clubs and their officers and attempts to keep in continuous contact with such clubs. Probably the most important public contact is with the thousands of farmers who, because of their sportsmanship, plant feed for the use of game life during the winter months. This work is done by the farmers in cooperation with the wardens and the clubs. See Table 25 and Figure 3 for record of plantings for game feed.

War Period

During the war, game operations were difficult and although every effort was made to keep up the supply of game life with our limited personnel (39 out of 64 were in the armed forces) protection and propagation suffered.

Weather conditions reduced the supply of upland game for three consecutive seasons and predatory species, such as crows, fox, lynx, wolves, weasels, mink and certain hawks and owls, showed a large increase during the war period because of a shortage of hunters and trappers as well as of ammunition. These species took an increased toll of game life. The effects of restored predator control following the end of the war is already evident and a better control is in effect. The results should be reflected in a large increase of most game species by the autumn of 1947.

Veteran Training Program

About July 1, 1945, a veteran training program for game refuge patrolmen and gamekeepers was inaugurated. Some time was required before workable procedures were completed by the Veterans' Administration and agreements made with the Division of Game and Fish.

On June 30, 1946, the fixed maximum of eight game refuge patrolmen trainees were on game refuges, and six out of a maximum of eight gamekeeper trainees were on game farms. The program is working out satisfactorily.

Minnesota Ranks a Leading Game State

According to available records, the total weight of all species of game life taken in Minnesota exceeds that of any other state. Most of the naturalists who know about Minnesota game conservation work believe that our extensive game refuge system, inaugurated in 1915, is primarily responsible for the saving from extinction of some of the native species such as the pinnated grouse, and the keeping up of the supply of other species which has permitted the taking annually of a large crop of game and furbearers by hunters and trappers.

The operation of game refuges has definitely shown that by offering protection and refuge especially during the opening hunting season and

when harassed by predators various species seek protection therein, thus conserving and producing brood stock of sufficient numbers to produce a crop in subsequent years.

The only game species upon which control has been necessary within protected areas during the past several years have been deer and pheasants, and during the past two years, deer only. The opening of game refuges to the taking of any species that has become over abundant, as for instance Itasca and St. Croix State Parks opened in 1945 to the hunting of deer, must be very limited so as to not cut too heavily into the brood stock. Species made subject to hunting in such areas where the game life has known protection, could be exterminated unless the effects on reducing the population are carefully observed, precautionary regulations made to apply.

Madelia Game Farm

This farm has been used for the rearing of pheasants for restocking purposes. In 1942, production of birds for release was cut down, and entirely discontinued in 1943. For three years, only brood stock was reared to be in readiness for the resumption of rearing and producing birds for release could be immediately stepped up at the termination of the war. This year, 1946, the output will reach 75 per cent of normal or about 35,000 birds.

In some portions of the state where pheasant restocking is necessary each year to permit fair hunting, sportsmen's clubs requested and were supplied with day-old chicks for rearing under their sponsorship. Many of the clubs purchased or built their own rearing equipment while others obtained the services of local commercial hatcheries. This has greatly helped to keep up a brood stock of pheasants. These clubs are to be commended for their excellent cooperation. Some of the clubs with valuable equipment continued this work in 1946. In 1944, 11,825 chicks were distributed to cooperating clubs from which, according to reports, 6,435 pheasants were reared and released. In 1945, 23,982 chicks were sent out from which 12,349 birds were reared and released.

A few clubs have undertaken the incubation of pheasant eggs during the last two years. In support of this project the bureau supplied a total of 12,560 eggs from which returned reports show that only 2,272 pheasants were reared and released.

Hungarian partridge brood stock was ready on the Madelia game farm from which to start production for release in 1942. Again because of loss of gamekeepers, rearing for release at that time had to be abandoned. However, the brood stock was kept up, so that in the spring of 1946, 253 pair were available with which to start production. Of these, two hundred pair were moved to the Carlos Avery game farm and 53 pair kept at Madelia. Beginning in 1947, all Hungarian partridges will be raised on the Carlos Avery farm.

The present capacity of the Madelia farm is 45,000 pheasants. This should be stepped up to 60 or 75 thousand. To do this, additional rearing buildings and equipment will be necessary.

A total of 6,529 pheasants and 4,996 Hungarian partridges were released from the Madelia game farm during the biennium. Several of the returned trained game keepers, like many other ex-service men, have married and must have housing accommodations on the game farms. If qualified trained men are to be expected to remain as game keepers, a remedy must be found for the house shortage.

Carlos Avery Game Farm

The operations at the Carlos Avery game farm, in common with other activities suffered from the war. Chukar partridges and bobwhite quail brood stock only was maintained to be ready for production at the close of the war. Only surplus birds over and above the necessary brood stock were released during the years 1943, 1944 and 1945.

The Chukar partridge experiment has been a failure except in the northeastern part of the state. Most of the 1946 production will go to St. Louis, Lake and Cook counties where birds already released appear to be reproducing in the wild state. Results by the spring of 1947 should show definitely whether this species can survive and develop into another source of game birds in that part of the state.

Quail have been restocked in the southeast quarter of the state. About 12,000 quail will be released in this area and 5,000 Hungarian partridges in the southwestern and western border counties.

Minnesota is the only state that is rearing Hungarian partridges under control. Four thousand Hungarian partridges, 4,390 bob-white quail and 4,616 Chukar partridges were released from the Carlos Avery farm during the biennium ending June 30, 1946. Surplus mallard ducks were moved to this farm from the Blair game farm in the winter of 1946 where young ducklings are being reared so that a larger stock will be available in 1947 for placing on eastern waters, not for stocking purposes so much as for decoys to retain more wild ducks for nesting at such places. The present capacity of the Carlos Avery farm is 45,000 birds. If production is to be increased above the capacity additional rearing buildings and equipment are necessary. The Carlos Avery farm, too, is in need of additional living quarters for married game keepers, all of whom are ex-service men.

Carlos Avery Nursery

Like the game farms, the nursery was only maintained during the war with no production for distribution and planting. Surplus stock was removed, most of which was released to the state highway department, with small plantings on a few of the game refuges. During the years 1944 and 1945, 16,355 and 10,469 seedlings were released respectively for planting.

Operated Game Refuges and Public Hunting Grounds
Carlos Avery (Anoka and Chisago Counties)

About all that could be accomplished during the war was to maintain roads, fire lanes, dykes, bridges, buildings and farm and road equipment. A new metallic telephone line was constructed during the biennium to replace the old grounded line. Telephone poles for this project were cut on the Red Lake game refuge and bureau employees did all of the work.

Boundry-line sign on the Minnetonka Game Refuge.

A combination type dam and bridge was washed out in the spring of 1945. Efforts to replace this structure were unsuccessful because of the exorbitant high bids received from contractors responding to proposals for doing the work.

The Carlos Avery public hunting grounds were opened to hunting of pheasants, quail, ducks, rabbits, squirrel and deer during the season of 1944 and 1945. The estimated number of hunters seeking game within the area was 1,860 in 1944 and 3,735 in 1945. It is estimated that during these two seasons an aggregate of 11,550 ducks; 3,475 pheasants; 4,500 squirrels; 6,200 rabbits and 422 deer were bagged within the area. A total of 545 acres were seeded to grain for game birds and 300 lbs. of wild rice were planted in lakes and ponds. Forty-seven leases for use of refuge lands for farming and hay stumpage were made during the two-year period, a record of predators taken is shown in Table 26.

Thief Lake (Marshall County)

Buildings and equipment have been maintained during the biennium. Waterfowl is the chief source of hunting within this area. An estimated 750 hunters, used the area in 1944 and 2,450 in 1945, bagging an estimated total of 26,000 ducks and 180 geese during the two-year period. A total of 243 acres were seeded to grain and 400 lbs. of wild rice planted for game feed. Twenty-two leases for use of refuge lands for farming and hay stumpage were made during the biennium. In addition to the planting of feed within the refuge, 1,200 lbs. of millet and 825 lbs. of buckwheat were furnished the U. S. Fish and Wildlife Service for planting within federal Mud Lake area. Two and one-half miles of drainage ditches were rehabilitated in the spring of 1946.

Talcot Lake (Cottonwood County)

The game refuge portion of this area is under control of the federal government while the public hunting grounds portion is managed by the state. The refuge area contains about 800 acres and the public hunting grounds cover 1,438 acres. The game refuge manager is paid by the state and one-third of the salary is reimbursed by the federal government. Although the dual operation has been generally satisfactory, the entire area should be under state control in order that both refuge and shooting grounds management may be coordinated under a single plan of development.

A new food and cover plant nursery has been started on this area to provide future planting needs for game cover in southwestern Minnesota.

This refuge and public hunting grounds contain the largest population of pheasants and Hungarian partridges of any area of like size in the state. The habitat for waterfowl has become more depreciated each year because of the destruction of duck feeds by carp. Most of the water area is under control of the federal government. Recommendations have been made to drain the lake so as to destroy the carp, and to clean out dead trees and other obstacles to successful seining of the carp. If this were done, and the carp populations kept under control, the Talcot Lake refuge could be made an excellent duck area.

Postwar plans call for a Pittman-Robertson development project to include headquarters buildings, a nursery, a duck house for surplus mallards and to house ducks forced to winter in the area and intensive duck feed planting. Plans are now in the making for this development.

Additional land purchases are contemplated under Pittman-Robertson authorization so as to enlarge and square off this refuge and public hunting grounds.

Dietrich Lange (Kandiyohi County)

While this contains only 678 acres it can be made into an excellent waterfowl refuge and public hunting grounds. Postwar plans call for a

Pittman-Robertson project to purchase additional lands and for development. Little has been done on this area since the original purchase of the lands. The only road on the areas has been used as a duck pass and has provided excellent hunting for several years. An effort has been made to improve this road and provide car parking areas, but bids received for doing the work have been too high to be accepted.

Whitewater (Winona, Wabasha and Olmsted Counties)

The original Whitewater land purchases were scattered along the three branches of the Whitewater River in such a way as to make it extremely difficult to manage them for game refuge and public hunting ground purposes. In 1943, a Pittman-Robertson project was approved for the purchase of a total of 11,647 acres so as to consolidate an area extending from the original tracts purchased at Crystal Springs and extending north and east beyond the town of Beaver. The total estimated cost of $197,000.00. Federal government appraisers examined all of the lands listed in the project and determined the value of each parcel. The project extends over a five-year period or until June 1948 when it is hoped the land acquisition will be completed. A total of 5,175 acres has already been purchased and within the appraised values.

This project, for game restoration purposes, will prove of great incidental benefits to Winona County as a step in controlling damaging erosion and reducing flash floods. Because of these possibilities and the potential source of hunting and trout fishing, all civic and conservation organizations in Winona County wholeheartedly support this project. Because of the fact that the lands acquired are those that have suffered the greatest damage from erosion, owners generally were willing to sell and for the price determined by the appraisers.

A postwar Pittman-Robertson project for the development of the refuge is in the making. Actual operations of this area were begun in June, 1946. A crew of eight men started wrecking fourteen farmsteads to salvage the lumber to be used in the construction of headquarters buildings on this and other refuges.

The Crystal Springs tract, the initial piece purchased for this refuge some thirteen years ago, has been turned over to the Bureau of Fish Propagation and is being developed for trout rearing purposes.

Red Lake (Beltrami and Lake of the Woods Counties)

This is the largest managed game refuge and public hunting grounds in the state. It is within the Red Lake Game Preserve, established by the legislature in 1929. Within this area is the Beltrami Island land utilization and restoration project created for the purpose of authorizing the federal Resettlement Administration to buy out, move and resettle distressed settlers. About 80,000 acres within this area were purchased by the federal government as a part of this venture. These lands, together with federal owned

equipment, have been leased to the state for a period of fifty years for conservation management purposes and are operated in connection with the Red Lake game refuge and public hunting grounds.

Headquarters are located at Norris camp, 18 miles south of Roosevelt. In addition to building and maintaining roads, fire lanes, dykes, dams, bridges and telephone lines within the area, poles and posts for use on other refuges have been cut on this refuge. In addition 20,000 feet B.M. of natural pine were cut and processed for use in the construction of buildings on this and other refuges.

Because of the difficulty of obtaining maintenance equipment during the war, the federal government gave permission to use the equipment

Landing on the Red Lake refuge airfield, this game census plane stalled, had toboggans lashed to its skis.

leased for use on the Beltrami Island project on other refuges and for general fish and game management purposes. Through this source much needed trucks, cots, bedding material, cooking utensils and miscellaneous tools and equipment were made available for rough fish removal, warden service, fish propagation and fisheries research activities.

Repairs to trucks and other machinery and equipment are done by game refuge employees on this area.

A postponed Pittman- Robertson development project for the construction of roads, fire lanes, bridges and miscellaneous improvements will prob-

ably make this one of the largest and most productive big game refuges in the United States.

An aerial survey was made of the Red Lake Preserve area and the Northwest Angle early in 1946. The plane, equipped with skis, was landed on and operated from the refuge airport, one mile south of Norris Camp. This airport can, with small expense, be placed in first-class condition for use in air patrolling and making investigations from the air of the area. Gravel deposits, lumber and equipment for maintaining the roads, fire lanes and bridges, are to be found on the project. Because of the vast area to be patrolled the purchase of an airplane would represent an economical investment.

Superior Game Refuges

The oldest game refuge in Minnesota was established within the Superior National forest more than 30 years ago and originally embraced one and one-half million acres. This refuge was abolished by the legislature of 1945 by the enactment of the new game and fish code. Because of its size this refuge gave protection to game and fur-bearing animals and because surpluses were never harvested thousands of animals were born and died within its boundaries which should have been made available for recreation to hunters and serve other beneficial uses.

In order that surplus game within this area might be taken and that the purposes for which game refuges are being established might be more nearly realized in this large wilderness area, the original large area has been divided into 14 smaller refuges within a pattern of management adopted after careful studies and numerous conferences with the United States Forest Service extending over several years. These new refuges were posted with temporary signs in 1945 with plans to post with permanent metal posts and signs in 1946.

A game refuge supervisor with three patrolmen were assigned to the new refuges in the summer of 1945. Early in 1946, four veteran trainees were sent to Winton to work with these patrolmen on management operations. Two new overnight log cabins have been approved for construction on state owned land and one on U. S. Forest land. It is hoped that these cabins may be completed by December 1, 1946. With the repair of several old state-owned cabins and the use of U. S. Forest Service buildings, patrolmen and wardens will be able to find night quarters from all points within the areas.

More than 50 per cent of the lands within these refuges are state and federally owned; this is also true of the hunting grounds adjacent to them. By designating hunting grounds between and adjacent to the refuges, a material increase in the harvesting of surplus games and furbearers from this vast area along the international boundary for beneficial uses should result.

Statutory Game Refuges

Although most of this type of refuges are located on privately owned lands, a number of them are within state and national forests where most of the land is publicly owned and controlled.

The new game and fish code specifies how statutory refuges are to be posted and the number and kind of signs that are to be used to make game refuges legal. In order to comply with this provision of law it became necessary to post the refuges before the opening of the 1945 open hunting season. This required much work and additional funds. The new code abolished what was known as waterfowl refuges, all of these less than 640 acres. These refuges were difficult to operate and, in some cases, perhaps had not been established originally according to law. The refuges thus abolished are listed in Table 20.

TABLE 20

Waterfowl Refuges Abolished During Biennium

Refuge	County	Area
Lily Lake Waterfowl	Blue Earth	400 acres
Grass Lake Waterfowl	Cass	390 acres
Moss Lake Waterfowl	Cass	360 acres
Sunday Lake Migratory Waterfowl	Hubbard	62 acres
Lake Elizabeth Waterfowl	Isanti	314 acres
German Lake Waterfowl	Isanti	389 acres
Phare Lake Waterfowl	Renville	480 acres
School Section Lake Waterfowl	Stearns	564 acres
Morgan Lake Waterfowl	Wadena	70 acres
		3,029 acres

A number of the larger statutory game refuges in northern Minnesota require surveying before they can be adequately posted. Some of this work will be completed in 1946.

Statutory game refuges vacated on petition or by law are listed in Table 21.

TABLE 21

Statutory Game Refuges Vacated on Petition or by Law During Biennium

Refuge	County	Area
Gopher Ordinance	Dakota	2,235 acres
Part of Paul Bunyan	Hubbard	680 acres
Pike Bay	Cass	960 acres
Twin Lake Duck	St. Louis	666 acres
Kinnerberg	Cass	640 acres
Lake Arthur Waterfowl	Polk	760 acres
Sherburn Waterfowl	Martin	779 acres
Part of Minnesota Valley	Dakota	1,530 acres
Wahkon	Mille Lacs	2,000 acres
Superior Game Refuge	St. Louis, Lake and Cook Counties	1,255,480 acres
Total area		1,265,730 acres

New statutory refuges were established during the biennium as shown in Table 21.

TABLE 22

New Statutory Refuges Established During Biennium

Refuge	County	Area
West Mississippi River	Hennepin	5,120 acres
Swan Lake	Nicollet	650 acres
Brooklyn Center	Hennepin	9,800 acres
Addition to Stillwater	Washington	65 acres
Phare Lake	Renville	779 acres
School Section Lake	Stearns	680 acres
Addition St. Cloud	Stearns	4,200 acres
2d Addition Caledonia Twp.	Houston	680 acres
Faribault	Rice	680 acres
St. James	Watonwan	711 acres
Two Harbors	Lake	784 acres
Superior Game Refuge, Unit 1	Cook	6,765 acres
Superior Game Refuge, Unit 2	Cook	13,720 acres
Superior Game Refuge, Unit 3	Cook	3,765 acres
Superior Game Refuge, Unit 4	Cook and Lake	465,280 acres
Superior Game Refuge, Unit 5	Cook	2,880 acres
Superior Game Refuge, Unit 6	Lake	5,120 acres
Superior Game Refuge, Unit 7	Lake	6,170 acres
Superior Game Refuge, Unit 9	St. Louis	129,120 acres
Superior Game Refuge, Unit 10	St. Louis	48,640 acres
Superior Game Refuge, Unit 11	St. Louis	1,920 acres
Superior Game Refuge, Unit 12	Lake	3,200 acres
Superior Game Refuge, Unit 13	St. Louis	4,800 acres
Superior Game Refuge, Unit 15	St. Louis	6,400 acres
Superior Game Refuge, Unit 16	St. Louis	2,980 acres
Total area		724,869 acres

On July 1st, 1946, there were within the state a total of 196 game refuges of all types, including state parks units, an aggregate area of 2,584,781 acres.

TABLE 23

Summary of Publicly Owned and Controlled Hunting Grounds

Game and Location	Acres
Carlos Avery—Anoka and Chisago Counties (Game Refuge—5,151 acres) Ducks, shore birds, pheasants, quail, deer, grouse, rabbits, squirrel.	10,304
Thief Lake—Marshall County (Game Refuge 5,257) Waterfowl, grouse, shore birds, hare, deer and moose.	10,525
Dietrich Lange—Kandiyohi County (Game Refuge 226) Ducks, shore birds, pheasants and rabbits.	452
Talcot Lake—Cottonwood County (Federal Refuge 1,000) Waterfowl, shore birds, pheasants, Hungarian partridge, rabbits and deer.	1,438

Whitewater—Winona County..... 4,437
(Game Refuge 2,213)
Ducks, quail, pheasants, grouse, rabbits, squirrel and deer.
Mostly owned by the State but under full control and managed by Division of Game and Fish:

Red Lake Game Preserve District
Lake of the Woods, Beltrami and Koochiching counties.....1,847,550
(Red Lake Game Refuge 391,780)
(Lake of the Woods Game Refuges 8,320)
(Kelliher Game Refuge 31,770)
Elk, caribou, moose, deer, bear, grouse, snowshoe hare and waterfowl.

1,874,706

TABLE 24

Public Hunting Grounds in State and National Forest

	Acres
Mostly owned by the State:	
Under control of Division of Forestry.....	5,332,040
Predator control and law enforcement work only on refuges by Division of Game and Fish. (Game Refuges 264,606 acres) Moose, deer, bear, grouse, waterfowl and hare. Mostly owned by United States Forest Service—Balance State and private lands—St. Louis, Lake and Cook Counties:	
Superior National Forest.....	2,171,603
Game management started latter part of 1945. (14 game refuges 700,760 acres) Moose, deer, bear, grouse, waterfowl and snowshoe hare.	
Chippewa National Forest.....	1,303,344
Predator control and law enforcement work only on refuges. (Game Refuges 9,644) Moose, deer, bear, grouse, waterfowl and snowshoe hare.	
	8,806,987

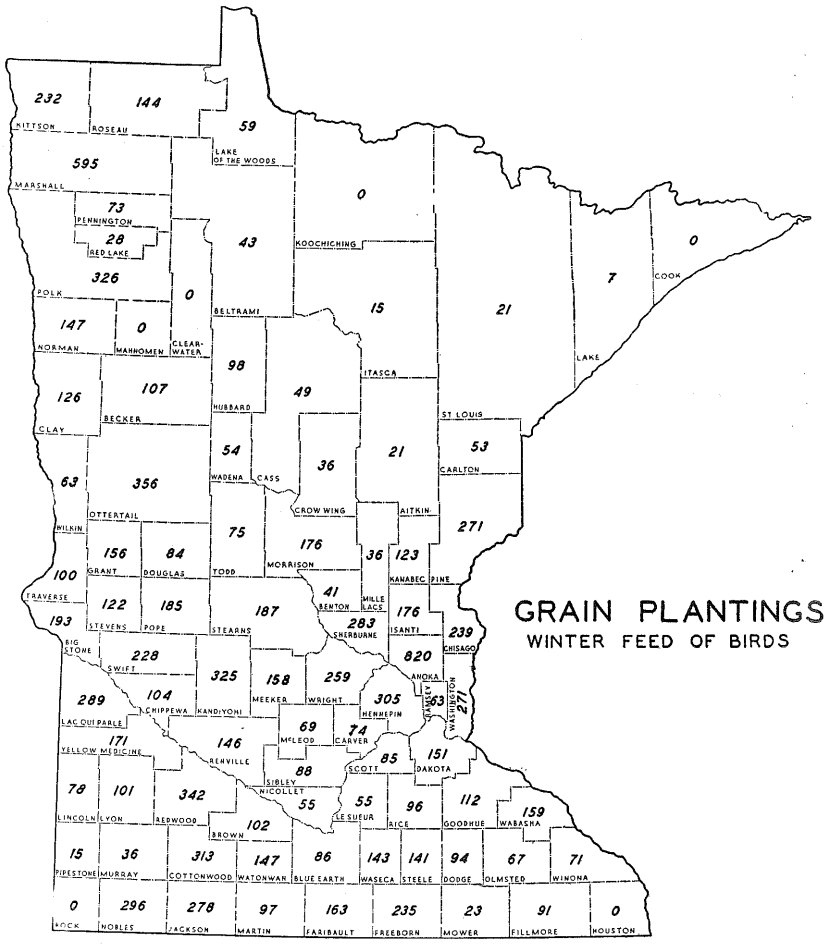
General Game Operations

Starting the latter part of 1945, requisitions were made for trucks, tractors, road and farm machinery to replace equipment worn out during the war as well as for the operation of new game refuge areas. Six jeeps were purchased for game refuge work in the spring of 1946. They have proved economical and satisfactory. Other equipment, such as road and farm machinery, was not available up to June 30.

Feed Plantings

Feed plantings continued during the war. The extent of such plantings are shown in Table 25. The totals are as follows: 1944: cane—1,853 acres; millet — 1,894 acres; buckwheat — 198 acres; miscellaneous experimental plantings—270 acres. 1945: cane—1,821; millet—1,937, buckwheat—427; miscellaneous experimental plantings—293. 1946: cane 1,241; millet—1,150; buckwheat—496; sunflower—265; miscellaneous experimental plantings—152. This makes a grand total of 11,997 acres. The distribution by counties is indicated on the map in Figure 3.

FIGURE 2



Map showing acreage, by counties, of the total grain plantings for a three-year period — 1944, 1945 and 1946.

TABLE 25

Summary of Plantings of Game Feed Years 1944, 1945, 1946

Seed	Acres		
	1944	1945	1946
Cane	1,853	1,821	1,241
Millet	1,894	1,937	1,150
Buckwheat	198	427	496
Sunflower	.....	.....	265
Misc.	270	293	152
TOTALS	4,215	4,578	3,204
Grand Total Acreage of all types:			11,997

Winter Feeding

Because of the planting of plots of grain by farmers for use of birds during the winter months, artificial feeding has been gradually reduced and, except in severe winters, is no longer deemed necessary. To provide for extreme emergencies during cold weather, a fund has been set up each year for that purpose. The total money spent for feed for birds in 1944 was $168.01 and in 1945—$238.75; during the winter of 1944—$143.00, for feed for deer in Itasca Park. No artificial feeding of deer was necessary in 1945.

Predator Control

Lack of manpower and ammunition, because of war demands, gave predators an opportunity to increase in numbers. Within game refuges, however, a fair measure of control was had through the vigilance of game refuge patrolmen and permit trappers. Foxes and wolves over the state generally were reduced to the extent reflected by the bounties which were paid. Not until the spring of 1946 was it possible for the Bureau of Game to secure ammunition in quantities sufficient to supply all of the game wardens for predatory control work. Table 26 shows predators taken within game refuges during the biennium and Tables 28 and 29 are a record of the type and number of these animals taken for which bounties were paid, listed by counties during the calendar years 1944 and 1945 respectively.

TABLE 26

Predators and Other Species Doing Damage Taken on State-Owned and Statutory Game Refuges Biennium Ending June 30, 1946

Species	State-Owned Game Refugees by Patrolmen	Statutory Game Refuges by Wardens	Statutory Game Refuges by Permittees
Badger	1	3	6
Bear	.....	11	1
Beaver	63	7	155
Cats	517	815	378
Crows	1,678	1,066	.....
Dogs	89	129	41
Fox—Red	91	690	127
Grey	69	38	73
Gopher	631	834	611
Hawks (unprotected)	256	464	42
Lynx—Bay	14	1	48
Canada	1	.....	3
Mink	107	11	607
Muskrats	86	18	14,384
Otter	1	.....	.....
Owls (Great Horned)	241	146	109
Porcupine	161	143	76
Raccoon	10	3	166
Skunk—Large	108	15	445
Civet	15	3	76
Squirrel	15	13	446
Weasel	209	44	308
Wolves—Timber	33	3	52

Coyote	7	1	1
Woodchucks	153	622	201
	4,556	5,080	18,356

The practice of issuing permits to take predators within game refuges not only has proven effective in keeping down these species, but has been a source of revenue to resident permittees. Under the system protected fur bearers may be taken, and when each pelt is properly identified by a tag furnished by the division at a cost of 25 cents, may be legally sold by the permittees themselves. This is a decided improvement over the past practice of requiring permittees to send their pelts to the division to be stored in vaults and sold by the division at public auctions. Responsibility for keeping large quantities of valuable furs, elimination of extensive bookkeeping and the disbursing of sales proceeds to permittees is being accomplished by present procedures. A total of 15,402 tags were sold to permittees during the biennium.

Hunting by Airplane

The species permitted to be taken under airplane hunting regulations are confined to those on which bounties are paid. This type of hunting under Commissioner's regulations was inaugurated in January 1946. Applications granted have been held to a minimum in order to learn how the regulations would work and how hunting by this means would be received by the public.

TABLE 27

Permits for Airplane Hunting issued and animals taken up to June 30, 1946

Permit No.	Number Taken	County
1. Robert A. Claggett (Pilot)		
2. W. H. Claggett (Hunter)	30 Red Fox	Lac qui Parle
	32 Red Fox	Chippewa
3. Melvin Wik (Hunter)	1 Wolf—4 Red Fox	Chippewa
6. Lyle Knudson (Hunter)		
4. Bernard N. Frye (Pilot)		
5. Alfred C. Kruse (Hunter)	70 Red Fox	Lac qui Parle
7. Harold Schlesselman (Pilot)		
8. A. C. Brossard (Hunter)	32 Red Fox	Blue Earth
	30 Red Fox	Murray
10. E. W. Fynbo (Pilot)		
11. Otto M. Nelson (Hunter)	21 Red Fox	Freeborn
	1 Grey Fox	Freeborn
12. Richard E. Sommer (Pilot)		
13. Fred A. Pasche (Hunter)	11 Red Fox	Stevens
6a. Gordon Camp (Pilot)		
9. John T. O'Tolle (Hunter)	4 Red Fox	Pennington
	1 Red Fox	Pennington
14. George Busse (Hunter)		
15. Ned Powers (Pilot)		St. Louis
16. Lyle Hendricks (Hunter)		
17. Gordon Newstrom (Pilot)	3 Red Fox	Itasca
18. Hugh J. Leach (Hunter)	16 Coyote	Itasca

Control of Aquatic Vegetation

The 1945 Game and Fish code provides for the protection for all aquatic vegetation in public waters. Regulations were issued in 1946 governing the taking, planting or destroying of aquatic plant life. Permits are granted by the Division of Game and Fish to responsible citizens and each permit must be countersigned by the State Entomologist before becoming valid. Eight permits were issued during 1946 for taking and planting and none for destroying.

Public Entrance to Meandered Waters

The 1945 Game and Fish code provides for the establishment of entrance ways to public meandered waters and for camp sites of not to exceed five acres in each instance. Funds for the purchase of lands for these purposes are not available and must be authorized by legislature. Forms have been prepared for use of local residents in applying for the acquisition entrances into lakes and streams and camp sites. Twenty-eight such applications were received in 1946. Proposals require investigation in each instance. The biennial budget will have a request for funds to take care of these projects.

TABLE 28

Kind and Number of Predators Taken and Bounties Paid by Counties January 1 to December 31, 1944

County	Wolf Cubs	Wolf Adults	Grey Fox	Red Fox
Aitkin	11	62	69	10
Anoka	2	.....	.....	.....
Becker	.....	31	.....	643
Beltrami	14	164	.....	135
Benton	.....	5	113	.....
Big Stone	.....	1	.....	213
Blue Earth	.....	1	33	327
Brown	.....	1	38	84
Carlton	.....	54	16	27
Carver	.....	.....	34	27
Cass	37	89	43	26
Chippewa	4	2	20	360
Chisago	1	4	115	2
Clay	4	5	4	386
Clearwater	.....	23	.....	.....
Cook	2	75	.....	.....
Cottonwood	.....	.....	8	110
Crow Wing	2	33	249	77
Dakota	.....	.....	69	13
Dodge	.....	.....	.....	133
Douglas	.....	.....	156	342
Faribault	.....	.....	13	47
Fillmore	.....	1	404	.....
Freeborn	.....	.....	34	132
Goodhue	.....	.....	170	.....
Grant	.....	2	.....	301
Houston	.....	.....	347	635
Hubbard	15	48	.....	.....
Isanti	.....	1	144	45
Itasca	10	249	.....	.....
Jackson	.....	.....	.....	221

Kanabec	.....	9	142	3
Kandiyohi	.....	6	4	565
Kittson	.....	25	.....	658
Koochiching	1	166	.....	.....
Lac qui Parle	.....	.....	.....	418
Lake	1	82	.....	.....
Lake of the Woods	3	127	.....	113
Le Sueur	.....	.....	28	68
Lincoln	.....	1	.....	362
Lyon	7	.....	.....	469
McLeod	.....	.....	14	4
Mahnomen	6	5	2	311
Marshall	.....	14	.....	1,122
Martin	.....	.....	.....	116
Meeker	.....	2	68	182
Mille Lacs	.....	4	130	.....
Morrison	3	15	327	204
Mower	.....	.....	24	419
Murray	.....	2	.....	161
Nicollet	.....	.....	15	88
Nobles	.....	1	.....	308
Norman	.....	1	.....	756
Olmsted	.....	3	.....	.....
Ottertail	.....	1	.....	1,056
Pennington	.....	4	.....	452
Pine	18	124	256	42
Pipestone	.....	.....	.....	108
Polk	11	3	.....	1,180
Pope	6	1	21	407
Red Lake	.....	4	.....	365
Redwood	.....	2	11	374
Renville	.....	.....	1	269
Rice	.....	.....	31	240
Rock	.....	2	.....	124
Roseau	1	109	.....	715
St. Louis	.....	72	.....	.....
Scott	.....	.....	55	125
Sherburne	.....	1	125	60
Sibley	.....	.....	14	74
Stearns	.....	1	751	.....
Steele	.....	.....	26	201
Stevens	.....	.....	.....	280
Swift	.....	3	.....	403
Todd	1	2	212	586
Traverse	.....	2	.....	335
Wabasha	.....	.....	245	.....
Wadena	1	19	78	241
Waseca	.....	.....	15	97
Washington	.....	.....	36	5
Wilkin	.....	1	.....	.....
Winona	.....	.....	571	.....
Wright	.....	1	95	62
Yellow Medicine	2	2	3	189
	163	1,668	5,379	18,613

TABLE 29

Kind and Number of Predators Taken and Bounties Paid by Counties January 1 to December 31, 1945

County	Wolf Cubs	Wolf Adults	Grey Fox	Red Fox	Bear Cubs	Bear Adults
Aitkin	8	102	196	58	8	39
Anoka	....	1	74	47	.....	.....
Becker	....	35	.....	710	.....	.....
Beltrami	8	63	4	264	20	66
Benton	....	3	66	.....	.....	.....
Big Stone	....	.....	.....	303	.....	.....
Blue Earth	....	1	44	315	.....	.....
Brown	....	.....	35	233	.....	.....
Carlton	2	140	143	58	5	15
Carver	....	.....	34	57	.....	.....
Cass	34	88	214	142	10	25
Chippewa	....	1	1	412	.....	.....
Chisago	....	1	229	1	.....	.....
Clay	8	4	.....	895	.....	.....
Clearwater	2	40	.....	.....	.....	.....
Cook	2	51	.....	.....	.....	.....
Cottonwood	....	1	2	363	.....	.....
Crow Wing	6	38	310	112	7	7
Dakota	....	.....	76	253	.....	.....
Dodge	....	.....	27	191	.....	.....
Douglas	....	.....	.....	511	.....	.....
Faribault	....	1	.....	185	.....	.....
Fillmore	....	1	323	.....	.....	.....
Freeborn	....	.....	27	132	.....	.....
Goodhue	....	1	203	.....	.....	.....
Grant	....	.....	.....	231	.....	.....
Hennepin	....	1	.....	.....	.....	.....
Houston	....	.....	356	312	.....	.....
Hubbard	13	65	151	23	.....	.....
Isanti	....	3	173	65	.....	.....
Itasca	15	258	.....	.....	44	127
Jackson	8	2	.....	420	.....	.....
Kanabec	1	28	134	.....	.....	.....
Kandiyohi	....	1	71	461	.....	.....
Kittson	....	18	.....	812	.....	.....
Koochiching	7	142	.....	.....	.....	.....
Lac qui Parle	....	.....	.....	498	.....	.....
Lake	4	130	.....	.....	5	65
Lake of the Woods	1	79	.....	107	4	40
Le Sueur	....	1	49	150	.....	.....
Lincoln	....	.....	15	417	.....	.....
Lyon	7	4	.....	510	.....	.....
McLeod	....	.....	5	170	.....	.....
Mahnomen	9	9	.....	322	.....	.....
Marshall	22	.....	.....	964	.....	.....
Martin	....	.....	.....	313	.....	.....
Meeker	....	.....	37	301	.....	.....
Mille Lacs	....	11	127	6	.....	.....
Morrison	5	22	312	206	.....	.....
Mower	....	1	66	389	.....	.....
Murray	....	2	.....	278	.....	.....
Nicollet	....	.....	10	202	.....	.....
Nobles	....	.....	.....	380	.....	.....
Norman	....	3	.....	849	.....	.....
Olmsted	....	.....	64	652	.....	.....

Otter Tail	....	7	.....	1,147	.....	.....
Pennington	....	13	.....	386	.....	.....
Pine	9	158	398	118	.....	.....
Pipestone	16	5	.....	239	.....	.....
Polk	....	1	.....	1,081	.....	.....
Pope	25	1	21	455	.....	.....
Red Lake	....	1	.....	380	.....	.....
Redwood	....	.....	30	429	.....	.....
Renville	....	.....	11	377	.....	.....
Rice	....	.....	53	295	.....	.....
Rock	6	5	.....	301	.....	.....
Roseau	....	93	.....	650	.....	.....
St. Louis	7	642	.....	.....	58	142
Scott	....	.....	23	145	.....	.....
Sherburne	....	2	62	67	.....	.....
Sibley	4	.....	39	266	.....	.....
Stearns	....	1	559	.....	.....	.....
Steele	....	1	17	233	.....	.....
Stevens	....	.....	.....	284	.....	.....
Swift	5	2	.....	463	.....	.....
Todd	....	2	105	641	.....	.....
Traverse	....	.....	.....	454	.....	.....
Wabasha	....	.....	366	278	.....	.....
Wadena	....	13	82	188	.....	.....
Waseca	....	.....	20	156	.....	.....
Washington	....	.....	49	70	.....	.....
Wilkin	....	.....	.....	173	.....	.....
Winona	....	1	525	.....	.....	.....
Wright	....	.....	48	115	.....	.....
Yellow Medicine	....	.....	.....	340	.....	.....
	234	2,300	5,986	24,011	161	526

TABLE 30

Hunting Licenses Sold and Estimated Total Game Bag
Calendar Years 1944 and 1945

	1944	1945
Big Game Licenses Sold	96,491	115,416
Small Game Licenses Sold	231,145	234,154
Estimated Total Game Bag		
Deer	62,820	67,057
Ducks	2,450,507	2,610,040
Shorebirds	99,899	100,756
Geese	5,689	12,725
Pheasants	910,285	738,882
Hungarian Partridge	9,343	4,163
Bobwhite Quail	1,156	551
Doves	12,742	10,692
Fox Squirrel*	101,058	70,899
Gray Squirrel*	254,102	203,990
Cottontail Rabbit*	119,050	71,920
Snowshoe Hare*	34,688	22,283
Raccoon*	8,410	13,292

*Does not include those taken by trappers nor those taken on private land where damage is done. It is estimated that the total take of rabbits including cottontail and jackrabbits, and snowshoe hare, exceeded two million each year.

TABLE 31

Trapping Licenses Sold and Estimated Number of Fur-bearing Animals Taken Calendar Years 1944 and 1945

	1944	1945
Trapping Licenses Sold	20,860	45,279
Total Furbearers Taken		
Badger	1,969	2,511
Beaver	1,302*	9,477**
Bobcat (Bay Lynx)	1,880	3,085
Civet Cat (Spotted Skunk)	18,185	15,107
Fox (Gray)	6,269	5,467
Fox (Others)	17,542	17,751
Hare, Snowshoe	3,241	3,021
Lynx	20	56
Mink	79,220	95,782
Muskrat	22,393*	1,211,106
Opossum	117	278
Otter	Closed season	46***
Rabbit, Cottontail	8,683	9,273
Rabbit, Jack	2,055	3,845
Raccoon	10,396	20,140
Skunk	86,530	82,860
Squirrel, Gray	2,271	4,643
Squirrel, Fox	1,688	3,024
Weasel	47,680	85,125
Wolf, Brush (Coyote)	2,336	1,961
Wolf, Timber	349	413
Total Pelts Taken	341,126	1,574,971
Estimated Value	$1,858,175.35	$6,674,105.23

*Permit Trapping.
**Includes 2,077 taken under permit.
***Reported in questionnaire to wardens.

GAME RESEARCH

Pittman-Robertson Authorizations

RICHARD J. DORER, *Game Projects Coordinator*

Introduction

Of the nine biologists of the project staff who served in active duty with the armed forces all had returned by the month of February, 1946, to resume their duties. At present there are eight full-time and one half-time biologist, and one stenographer. It is planned to employ two biologists' aides to assist with seasonal work on the vegetational lake surveys in the summertime. Although the project's activities were curtailed by wartime restrictions and loss of personnel during most of the past biennium, the project is now well under way in its major phases. The following data are presented as a summary of the more important aspects of the last two years' work.

Big Game Investigations

Big game investigations were extended to include aerial population counts of elk and moose in addition to studies on the white-tailed deer.

Since the last open season in the agricultural areas in 1943, the deer herd has built up again to a level where further control by hunting is required. This condition is reflected by greatly increased damage to farm crops.

State game wardens have tallied deer seen in the course of their patrols in October and November. Results since 1942 are summarized in Table No. 32. In the year 1943 the distance traveled was greatly reduced and the results for that year may be questioned on the basis of inadequate sampling. The results for the years 1944 and 1945 when a great many more miles were traveled indicate some degree of stability in the deer population.

TABLE 32

Trend of Minnesota Deer Population

1942-45

Year	Total Number Miles Traveled	Total Number Deer Tallied	Number Miles Traveled Per Deer Seen
1942	142,673	4,712	30.3
1943	95,744	3,876	24.7
1944	175,935	4,815	36.5
1945	248,377	6,832	36.3

Aerial deer census trials in January and February, 1946, in Itasca and St. Croix state parks and northern Kandiyohi county proved highly successful. Aerial counts of moose and elk were made for the first time in the Red Lake game preserve district. On a 494 square mile area, moose and elk populations were found to be 260 and 71 animals, respectively. Census of the Northwest Angle revealed only 42 moose. Aerial censuses, to date, have demonstrated the practicability and accuracy of this method of count, which is far superior to any other system.

To alleviate a condition of extremely over-browsed deer range in Itasca and St. Croix state parks, these areas were opened, in part, to deer hunting in 1945 for the first time in their history. Surveys of browse conditions in May, 1946, indicated that the measured 1945 kill of 1,862 and 1,292 deer, respectively, has already given some relief to the range. On the Gegoka sample township in the Superior national forest the measured 1944 kill of 2.4 deer per square mile was a 33 per cent increase over the kill for 1943.

Despite open seasons in 1942 and 1943, the Minnesota deer harvest in 1944 and 1945 held up well as shown by comparative data in Table 33.

TABLE 33

Deer Harvest and Hunter Success, 1942-45

Year	Total No. Licenses Sold	Total Deer Kill	Per Cent Hunters Successful
1942	102,571	76,950	75.7
1943	105,482	67,719	64.2
1944	96,497	62,820	65.1
1945	115,416	67,057	58.1

Deer have repeatedly browsed this five-year-old jack pine seedling.

Deer "yarding" has notably decreased due to a series of mild winters. Studies of old deer yards in later winter of 1945 and 1946 revealed that the yards have not recovered appreciably from the heavy browsing which occurred during previous severe winters. Consequently, regular harvests of the herd should be continued in order to permit natural restoration of browse species in these areas.

Upland Game Investigations

1. Pheasants

Studies of pheasant mortality, reproduction and habitat requirements have continued. The two most significant periods of pheasant mortality in Minnesota occur in winter and spring. During blizzards small cover patches

drift full. Pheasants are inundated and suffocate. A recent example of this was the storm of February 5, 1946, which reduced pheasants severely in northwestern Minnesota. One flock of 75 was reduced to five birds; another flock of 50 to 60 birds was reduced to 20. Crowing census revealed that nesting populations were much lower than last year from Norman county northward. Winter cover improvements can be made in the prairie regions. The logical starting point is the farm shelterbelt.

Extremely wet and cold weather conditions in the springs of 1943, 1944 and 1945 reduced nesting success and caused brood mortality. Coupled with this was the severe loss which occurred in mowing alfalfa fields and roadsides. Studies in 1944 revealed one nest destroyed for every 3.3 acres of alfalfa. Thirty per cent of the incubating hens were either killed or injured which prevented their renesting. New types of flushing devices are being studied. Methods for the creation of safe nesting areas are being investigated.

Investigations of a possible mineral deficiency in southeastern Minnesota have not yielded significant results to date. Age and weight data of pheasants taken during the hunting season have been collected. New and improved methods of determining age have been developed.

Roadside census of pheasants has been continued by the biologists. Mileage restrictions reduced the effectiveness of the work, but basic data were obtained. The year 1942 had the highest pheasant population in our history. Since then, there has been a decline. The return of favorable nesting and brooding conditions should initiate an upward trend in population.

2. Prairie Chickens—Sharp-tailed Grouse

Intensive life history and management study of these birds begun in 1941 was interrupted by the war. Booming ground surveys in four northwestern counties were made in 1945 and 1946. Prairie chickens showed a decrease from 1945. Sharp-tailed grouse remained about the same. Serious thought should be devoted to the conservation of some of our remaining prairie land as undisturbed habitat for these species.

3. Ruffed Grouse

Decline of ruffed Grouse, as revealed by census of sample areas by the biological staff, began in 1943 and has continued to the present time. Populations in 1945 and 1946 reached the lowest levels recorded since the census areas were set up in 1935. So few birds were seen on the census areas in these two years that no accurate population computations could be made. Past history of this species indicates a rising population for the next several years.

4. Chukar Partridge

Attempts to establish Chukar partridge by substituting their eggs under incubating pheasants have been made. The experiment was not successful

because of the large proportion of nests destroyed or deserted before the substitution of eggs could be made.

5. Hungarian Partridge and Bobwhite Quail

Although of limited scope additional information was gathered on the distribution, abundance, reproduction and habitat requirements of these species with a view of bettering their management. Hungarian partridge have suffered severely in northwestern Minnesota because of abnormally high rainfall in recent years.

Hungarian partridge nest in alfalfa field destroyed by mower and rake.

Furbearers Investigations

1. Beaver

Because of war-time restrictions the beaver census initiated in 1940 was not conducted in 1944 and was carried out on a much reduced scale in 1945. Table 34 shows the census results. This annual information is used together with other observations each year when recommendations are made for trapping seasons.

TABLE 34

Minnesota Beaver Census, 1940-45

Year	Number Townships Censused	Total Number Colonies	Colonies Per Township
1940	25	191	7.6
1941	26	213	8.2
1942	32	238	7.4
1943	25	127	5.0
1944	None	.....	....
1945	8	45	5.6

During May, 1946, the possibilities of censusing beaver colonies by airplane were investigated. The results of preliminary flights indicate a very practical census method for beaver. That beaver colonies can be readily discerned from the air is illustrated by the accompanying aerial photograph.

The beaver season was closed in 1944 to allow the population to recover from the heavy catch of 10,207 taken in April, 1943. During the December season in 1945, 7,400 beavers were trapped.

Nuisance beaver colonies have increased considerably, mainly in agricultural areas, during the past wet years. Special permits were issued in 1945 for the taking of 2,077 beaver which were causing damage. Control of nuisance colonies must be continued by open seasons and permit trapping.

2. Muskrats

Results of three annual muskrat censuses, begun in 1943, are shown in Table 35. Census data together with other observations is considered when recommendations are made annually regarding trapping seasons and regulations.

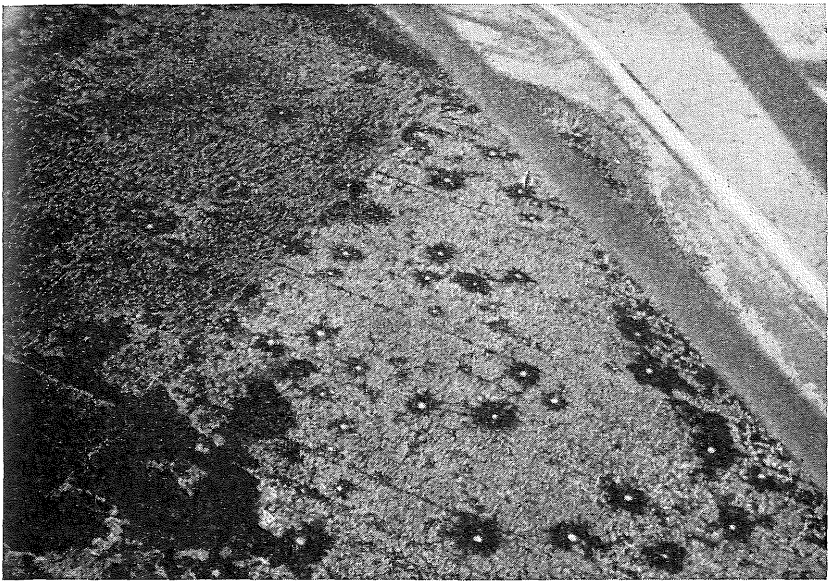
TABLE 35

Minnesota Muskrat Census

Year	Number Counties Censused	Number Miles Censused	Muskrat Houses Per 100 Miles
1943	41	1,212	143
1944	59	2,147	52
1945	41	1,286	161

A trial aerial muskrat census made in April, 1946, shows promise of being a speedy and practical method for appraising the annual muskrat population.

A study of muskrat building activities on 29 sloughs in 1945 showed that building started the week of September 5-11, when 91 structures were seen, and terminated with the freeze-up during the week of October 31 to November 6, when 1,137 structures were noted. Structures appeared to



Aerial view of muskrat houses at about 500 altitude.

increase at a fairly uniform rate. This study indicated that the muskrat census should be taken in late October for the sake of comparable results.

The trapping season was closed in 1944 except for trapping of freeze-out marshes by special permit. The fifteen day season in December, 1945, resulted in a catch of 1,211,106 muskrats, an average of 31 muskrats per trapper. The value of this catch to the trappers was estimated at $2,603,-878.00.

3. Mink

Although the mink catch was high in 1944, the 1945 catch resulted in a higher and record crop of 95,782 animals valued at $3,065,024.00 to the trappers of the state.

4. General

The value of the total fur harvest in 1945 to the licensed trappers of the state is estimated at $6,674,105.00, the greatest in the state's history. From this valuable resource the state of Minnesota realized a return of approximately $60,000.00 from the sale of trapping licenses and seals. This return from the trappers is only about one-half the total estimated cost to the state of regulating the fur business.

Migratory Waterfowl Investigations

In 1942 an intensive banding program of young ducks was undertaken at the Thief Lake Refuge. Since that time banding returns have been re-

ceived after each hunting season. Enough time has now elapsed since the banding operations were completed so that few if any more returns can be expected; therefore, a final summary of the results was prepared.

Of 854 ducks banded 143, about 17 per cent, were recovered. Table No. 36 illustrates the distribution of the kill between Minnesota and the other states for the three year period, 1942-1944. We are concerned chiefly with the first year's kill, for it indicates where the annual production is harvested. In 1942, 52 per cent of the banded juvenile ducks were taken in Minnesota. This indicates that Minnesota hunters take more than one-half of the ducks of the year raised in Thief Lake. Any increase in Minnesota's duck production from the Thief Lake region should result in improved duck shooting within the state.

TABLE 36

Distribution of Kills by Years and Locations

	Minnesota		Outside		Total	
Year	Number Recovered	Percentage of Year	Number Recovered	Percentage of Year	Number Recovered	Percentage of Year
1942	55	52.4	50	47.6	105	73.4
1943	6	24.0	19	76.0	25	17.5
1944	1	7.6	12	92.4	13	9.1
Total	62	43.4	81	56.6	143	100.0

Although 68 per cent of the total banded were puddle ducks only 14 per cent were recovered, as compared to 22 per cent of the banded diving ducks. This indicates a disproportionate bag with a heavier kill of diving ducks. There was little difference between the percentage of young and adult birds taken; 16 per cent as compared to 18 per cent.

An analysis of the returns by species gave interesting results. Mallards for the most part moved directly down the Mississippi flyway. Redheads were divided with greater numbers going east along the Great Lakes to the Atlantic coast. All of the canvasbacks recovered went to the east coast.

Wildlife Disease Investigations

Disease conditions have been investigated among game species and other wild animals in cooperation with the division of entomology and economic zoology, and the division of veterinary medicine of the university of Minnesota.

The investigations have followed inquiries of the sportsmen, and other interested people of the state regarding the fitness of game for human food, and the causes of losses of birds and mammals in which they are interested. Specimens collected and sent in by game wardens, biologists, and sportsmen were diagnosed and reports made.

The effects of domestic livestock and poultry disease on game is under

investigation, to determine their limiting effect on game populations in agricultural areas.

A malaria-like disease (Leucocytozoon bonasae) has been found in the ruffed grouse over a widespread area in the grouse's normal range. Muskrats are particularly susceptible to an infectious disease which has caused serious loss where it has occurred. Studies are being directed toward determining the cause of this muskrat die-off and instituting some control and conservation of the fur crop in affected water areas. Occasional reports of the discovery of dead beavers are being investigated.

Hunting and Trapping Regulations

The reports of game and fur animals taken by licensed hunters and trappers were tallied and estimates made of the annual legal take of big game, small game and furbearing animals.

Each year the results of the census work on deer, beaver, muskrat and upland game birds were analyzed and interpreted in the light of current conditions and past records. Recommendations were made regarding regulations for the hunting and trapping seasons, with the objective of an annual harvest of the surplus and the conservation of adequate breeding stocks.

Federal Aid in Wildlife Restoration Projects

The purpose of the Pittman- Robertson Surveys and Investigations Project is to provide the Division of Game and Fish with information which will aid in the efficient administration of the state's wildlife resources. Under the terms of the Federal Aid in Wildlife Restoration Act the project's work plans must be approved by the Secretary of the Interior. The state is reimbursed 75 per cent of the project's expenditures from federal aid funds apportioned to the state by the U. S. Fish and Wildlife Service from congressional appropriations authorized by the Pittman-Robertson Act. The money is derived from the excise tax on sporting arms and ammunition. In addition to current annual surveys the project's plans include studies to determine the requirements of game and furbearing species for the purpose of managing lands for the restoration of conditions suitable for increased wildlife production.

The act provides that Pittman-Robertson funds may be used for surveys and investigations projects, land acquisition, development and the coordination of these activities, but that expenditures are permitted only to cover the costs of projects emanating from the state's Bureau of Game and approved by the United States Fish and Wildlife Service. Projects are financed by the Division of Game and Fish from hunters' license revenues, with reimbursements of 75 per cent of all approved disbursements being credited to the state's account from its allotments as shown under Table 37.

TABLE 37

Funds Allotted to Minnesota Under Pittman-Robertson Authorization

Date	Period	Amount
July 1, 1938	Fiscal year, 1939	$ 26,352.06
July 1, 1939	Fiscal year, 1940	40,860.49
January 26, 1940	Supplementary Apportionment, 1940	592.18
July 1, 1940	Fiscal year, 1941	74,269.58
July 1, 1941	Fiscal year, 1942	76,662.12
July 1, 1942	Fiscal year, 1943	41,264.92
July 1, 1943	Fiscal year, 1944	28,500.01
July 1, 1944	Fiscal year, 1945	29,734.80
July 1, 1945	Fiscal year, 1946	31,556.68
	Total	$349,792.84

Of the 16 projects inaugurated since December 21, 1938, 10 have been completed, and 5 are active of which two, those for surveys and investigations and coordination, are renewable annually. The contributions to their costs are shown under Table 38.

TABLE 38

Federal and State Contributions to Approved Pittman-Robertson Projects

		Total	Federal	State
1-D	Carlos Avery Game Refuge Posting	$ 1,387.84	$ 1,040.88	$ 346.96
2-L	Carlos Avery Game Refuge Land Purchase	9,500.00	7,125.00	2,375.00
3-L	Thief Lake Game Refuge Land Purchase	800.00	600.00	200.00
5-D	Pheasant and Quail Release in Game Refuges	12,034.36	9,025.77	3,008.59
6-L	Carlos Avery Game Refuge Land Purchase	45,768.31	34,326.24	11,442.07
7-D	Carlos Avery Game Refuge Planting Program	6,345.59	4,759.19	1,586.40
8-D	Talcot Lake Game Refuge Planting Program	2,686.83	2,015.12	671.71
9-D	Red Lake Game Refuge Posting, Fencing and Clearing	1,798.83	1,349.12	449.71
10-D	Posting Statutory Game Refuges	20,666.52	15,499.89	5,166.63
11-R	Wildlife Restoration and Management Planning Project, 1941	11,009.73	8,257.24	2,752.49
11-R	Wildlife Restoration and Management Planning Project, 1942	29,014.55	21,760.91	7,253.64
11-R	Wildlife Restoration and Management Planning Project, 1943	19,197.55	14,398.17	4,799.38
11-R	Wildlife Restoration and Management Planning Project, 1944	13,654.11	10,240.58	3,413.53
11-R	Wildlife Restoration and Management Planning Project, 1945	19,619.51	14,714.63	4,904.88

11-R	Wildlife Restoration and Management Planning Project, 1946	33,307.36[1]	24,980.52	8,326.84
11-R	Wildlife Restoration and Management Planning Project, 1947	55,733.41[1]	41,800.06	13,933.35
12-C	Wildlife Management Coordination Project, 1942	5,735.28	4,301.46	1,433.82
12-C	Wildlife Management Coordination Project, 1943	7,973.24	5,979.93	1,993.31
12-C	Wildlife Management Coordination Project, 1944	5,973.03	4,479.77	1,493.26
12-C	Wildlife Management Coordination Project, 1945	5,451.80	4,088.85	1,362.95
12-C	Wildlife Management Coordination Project, 1946	9,604.30[1]	7,203.23	2,401.07
12-C	Wildlife Management Coordination Project, 1947	9,451.55[1]	7,088.66	2,362.89
13-D	Thief Lake Game Refuge Development Project	20,622.96[2]	15,467.22	5,155.74
14-L	Carlos Avery Game Refuge Land Purchase (S. Addition)	27,272.37	20,454.28	6,818.09
15-L	Whitewater Game Refuge Land Purchase	126,790.18[2]	95,092.64	31,697.54
16-D	Permanent Cover Planting	00.00[3]	00.00	00.00
	Totals	$501,399.21	$376,049.36	$125,349.85

Present Status of Active Pittman-Robertson Projects

11-R. The Wildlife Restoration and Management Planning Project

The entire trained personnel assigned to this project had returned from the armed services or essential industries by February 25, 1946. Previous to that date the investigational activities during the biennium were conducted by provisional employees representing approximately 50 per cent of a normal complement. When this project is renewed, the operating program will emphasize the solution of problems arising from intensified timber cutting, agricultural and other wartime activities, which affected appreciably our wildlife resources. Also, considerable time will be devoted to evaluating water areas with a view to their improvement for waterfowl and furbearers.

12-C. Wildlife Coordination Project

This single administrative unit was designed to direct and coordinate all activities under Pittman-Robertson authorizations. Curtailment of its wartime operations was necessitated because of reduced federal allotments and acute shortages of both manpower and materials. But during this period long term operating schedules were formulated which will insure expanded and intensified work in game management, land acquisition and development when the project is renewed on July 1.

13-D. Thief Lake Game Refuge Development Program

The Thief Lake game refuge development project was approved on

[1]Encumbered Amount, Project Active and Renewable Annually.
[2]Encumbered Amount, Project Active.
[3]Approved May 24, 1946, No funds encumbered during the biennium.

March 13, 1942. A subsequent amendment included a variety of essential improvements ranging from the construction of a bridge and the planting of vegetative species to the remodeling of buildings.

Before all phases of this diversified project could be completed, wartime shortages of manpower and materials became so acute that, in November of 1943, permission was requested and secured for its temporary suspension. However, work was again resumed on June 22, 1946, and unless something unforeseen occurs the project should be completed before the close of the next biennium.

15-L. The Whitewater Game Refuge Land Acquisition Project

This project, which was approved in June, 1943, and subsequently amended, proposes the purchase of 10,940 acres of land in Olmsted, Winona and Wabasha Counties. If this acreage can be acquired and added to lands already owned by the state along the principal tributaries of the Whitewater River, total holdings of approximately 13,380 acres can be developed into an excellent game refuge and public shooting ground.

The curtailment of wartime budgets only partially impeded the progress that has characterized the project since its inception. At the close of the biennium, 25 tracts totaling 5,659.08 acres either had been brought into state ownership or optioned for purchase.

As each tract was acquired, plans were formulated for its development so that restoration of the wildlife habitat could be initiated as soon as sufficient acreage had been purchased and consolidated to form an administrative unit. Under such an operating plan it is felt that the lands will be in full game production and furnishing recreational facilities earlier than was anticipated.

16-D. Permanent Cover Planting Project

On May 24, 1946, approval was granted for the proposed planting of permanent game cover at selected sites in 44 counties situated in the south quarter of the state.

Permission to plant holdings, other than public property, is secured through the medium of conservation leases or easements, which are drawn in favor of the Division of Game and Fish and are binding for a period of 25 years. If the present plans covering the planting of windbreaks, shelterbelts, stream and ditch banks, lake shores, etc., are to be prosecuted effectively, there must be full cooperation of landowners, sportsmen and representatives of the Bureau of Game.

The restoration and maintenance of permanent cover long has been advocated as the soundest method of increasing an upland game species to the carrying capacity of its range. Therefore, in view of the recent unprecedented agricultural operations, which have greatly reduced the effectiveness of game cover throughout the entire proposed planting area, this project is both timely and extremely important if hunting is to be continued seasonally.

Proposed Projects

During the next biennium it is hoped that Pittman-Robertson funds will be made available for the following projects, which are incorporated in our 25 year expansion and development plan:

1. The further expansion of the Thief Lake game refuge so that permanent boundaries may be established and posted to facilitate administration.

2. The further expansion of the Carlos Avery game refuge to include several sub-marginal tracts that could be developed into good waterfowl areas.

3. The further expansion of Talcot Lake game refuge.

4. The construction of headquarters buildings at the Talcot Lake and Whitewater refuges.

5. The further development of the Thief Lake, Carlos Avery and the Whitewater game refuges.

6. The further posting of statutory and state-owned game refuges.

The necessity for each of these projects has been thoroughly analyzed, as approval cannot be secured unless it can be shown that the benefits to wildlife are commensurate with the expenditures involved.

Conclusion

During the war every effort was made to formulate projects in anticipation of peace-time demands. As the work progressed it became evident that there must be a closer operating coordination among the various agencies, whose activities have a bearing on our wildlife resources, if the ultimate results are to prove satisfactory.

In reality, such coordination gradually is shaping itself into a comprehensive land usage program, in which each acre shall be assigned the task for which it is best suited. At present, a plan of this type may seem idealistic, but its benefits to agriculture, forestry, and wildlife would exceed our fondest expectations.

DIVISION FINANCES

GORDON B. WOLLAN, *Head of Administration Bureau*

The Legislature of 1945, chapter 609, section 39, subdivision G, made maximum appropriations to the division of game and fish for purposes specified but provided that any of these items might be increased by not more than 15% in the event of an emergency which in the discretion of the commissioners of conservation and administration would warrant such increase.

To the maximum appropriations granted in the above act for warden service, bureau of fisheries and the bureau of game, there was provided for each year of the biennium special appropriations of $40,000, $125,000 and

$70,000, respectively, or so much thereof as might be necessary for the purpose of carrying out construction or maintenance work if material and manpower conditions permitted. Of these special appropriations $37,271.31 was released for warden service, $118,704.48 for the bureau of fisheries and $69,266.54 for the bureau of game for the fiscal year 1946.

Transfers from game and fish funds by the Legislature of 1945 were in the following amounts and for the purposes indicated.

Conservation Administration	$ 29,650.00
Information and Legal Bureaus	63,438.60
Water Resources and Engineering	73,218.40
Forestry—Fire Fighting	50,000.00
Pollution Survey	10,000.00
Wolf and Fox Bounties	92,500.00
General Administration 5% (Appro.)	146,000.00
Total	$464,807.00

Since July 1, 1943, rough fish removal operations have been financed from a revolving fund of $150,000 created by the Legislature of 1943. If this fund is less than $150,000 at the end of any fiscal year, it must be restored to that amount as of July 1 of the following fiscal year. The restoration of this fund is accomplished by transferring the required amount from such of the other funds where available balances indicate this may be done without their impairment. Table 39 is an analysis of the financing of rough fish removal operations under the revolving fund for the fiscal years 1945 and 1946.

TABLE 39

FINANCIAL STATEMENT ON ROUGH FISH REMOVAL OPERATIONS
Fiscal Years Ending June 30, 1946

	Unencumbered Cash Balance July 1, 1944	Receipts	Transfers	Expenditures	Unencumbered Cash Balance June 30, 1945
Contract	$59,128.06	$307,600.44	**$35,000.00**	$249,700.18	$82,028.32
Bullheads	57,646.27	117,394.02	**30,000.00**	105,309.38	39,730.91
Day Labor	16,810.22	76,103.52	84,875.00	171,154.28	6,634.46
Totals	$133,584.55	$501,097.98	$19,875.00	$526,163.84	$128,393.69
	Unencumbered Cash Balance July 1, 1945	Receipts	Transfers	Expenditures	Unencumbered Cash Balance June 30, 1946
Contract	$82,028.32	$308,897.19	**$50,000.00**	$262,281.10	$78,644.41
Bullheads	39,730.91	117,609.96	**10,000.00**	113,280.20	34,060.67
Day Labor	6,634.46	118,131.93	60,000.00	168,332.12	16,434.27
Totals	$128,393.69	$544,639.08	.....	$543,893.42	$129,139.35

Operations are divided into contract, bullhead and day-labor fishing. During the past biennium the cost of the operation of this activity aggregated $1,070,057.26 with receipts totalling $1,045,737.06, indicating expendi-

tures in excess of receipts of $24,320.20. During the same period the division bought equipment for approximately $50,000. If this capital outlay is deducted from total expenditures and only depreciation of equipment charged to the cost of operation, the operating costs do not exceed the total income.

For the purpose of financing projects under Pittman-Robertson authorizations, the legislature created a revolving fund of $50,000 to be reimbursed by 75% of the costs of approved projects. During the past biennium, $161,848.20 was disbursed for land acquisition, land development and research and $45,000 was transferred from the public shooting fund to the revolving fund so as to restore it to its original total of $50,000 on July 1st of the next following fiscal year.

The funds of the division are in a sound condition as indicated by a study of the tables which follow, with a greater free balance on July 1, 1946, than perhaps at any other time in its history. At that time there was a total unencumbered balance of $1,979,650.94. This is an increase of more than $600,000 over the free balance of two years ago or on June 30, 1944. Despite the adverse effects during the war years on the sale of licenses because of the large number of hunters and fishermen having joined the armed forces, there was a steady increase in fund reserves. On December 31, 1941, immediately after Pearl Harber there was a free balance in the game and fish funds of $514,056.33. This was increased during the war years or between January 1, 1942, and June 30, 1946, by almost one and one-half million dollars. The building up of this seemingly large fund during the war period was of course due largely to the inability of the division to maintain its personnel, and carry on its normal programs of construction and fish and game propagation due to war time restrictions. This enforced curtailment of normal operations, inability to purchase equipment to replace that which had become worn out and obsolete and curtailment of all construction, while it has resulted in a saving of funds, it has also built up a backlog of delayed programs and improvements which are ready and are awaiting action as soon as personnel requirements can be filled, restrictions in the use of material and equipment have been lifted and the legislature has released funds with which to bring the division up to its normal and necessary operating levels.

It should be emphasized at this point that because the division operates on anticipated and uncertain receipts and is obligated to contribute sums fixed by the legislature for many specified purposes, only a portion of the unencumbered balance standing to the credit of the division at any one time can be considered as available for its own current operations and expenses. A reserve above the amount required for normal operations must continu-

ally be maintained. If for instance it should become necessary to declare a closed season on pheasants or deer or, under extremely unfavorable conditions, on both of these species in any year, the division's income would be drastically reduced, with reliance having to be placed on accumulated reserves to tide over the period until normal income would again have been restored. Furthermore the aggregate of all of the sums fixed by the legislature to supplement other activities is considerable. Substantial portions of the total maintenance appropriations for conservation administration, legal bureau, and bureau of information are appropriated in fixed amounts from game and fish revenues. A large part of the appropriations for the division of water resources and engineering likewise comes from the same source. Considerable sums are set aside for wolf and fox bounties and for water pollution control. The division of forestry is allotted an annual appropriation from game and fish funds to supplement its fire fighting appropriations. Under the 5% levy law, a substantial amount must be paid by the division into the general revenue fund annually for general state administrative costs. The rough fish removal revolving fund must be restored to $150,000 on July 1 of each year according to the mandate of the legislature. Likewise a revolving fund of $50,000 has been created from which funds are to be made available with which to cooperate with the federal government under Pittman-Robertson authorizations.

It will be seen from this analysis that accumulated reserves must be adequate at all times to provide a backlog from which to support a large number of items over which the division has no control, as well as to provide for contingencies to care for sudden decreases in receipts which cannot be anticipated. It is estimated that safe and sound financing for the immediate future will require maintenance of a reserve of not less than $750,000 as of July 1, each year.

TABLE 40

RECEIPTS FROM ALL SOURCES BY FUNDS
Fiscal Years 1944-1945 and 1945-1946

FUND	1944-1945		1945-1946	
FISHING LICENSES				
Game and Fish Fund				
Non-resident Individual	$ 105,384.00		$ 179,991.60	
Non-resident Combination	71,278.20		147,466.80	
Non-resident Shipping Coupons	11,018.90		13,977.60	
Non-resident Short Term	85.50		148.50	
Non-resident Courtesy	101.80		180.00	
Resident Individual	230,336.50		272,715.90	
Resident Combination	250,055.25		298,861.80	
Fishhouse	21,029.40		28,361.80	
Whitefish and Herring Netting	2,443.00	$ 691,732.55	2,865.50	$ 944,569.50
HUNTING LICENSES				
Resident Small Game	207,959.50		215,580.50	
Non-resident Small Game	8,777.50		11,020.00	
Resident Big Game	197,915.45		233,501.80	
Non-resident Big Game	9,321.25		15,959.52	
Non-resident Bow and Arrow	30.75		41.00	
Resident Sportsmens		424,004.45	1,639.00	477,741.82
TRAPPING LICENSES				
Resident Trapping	17,573.00		42,272.90	
Special Beaver Permits	1,367.50		1,225.00	
Beaver Trapping			9,690.75	
Beaver Trapping Seals	1,676.00	20,616.50	9,424.00	62,612.65
GAME BREEDERS LICENSES				
Game Breeders	2,417.35		6,127.55	
Pet Permits	32.50		3.00	
Posters	3.50	2,453.35	1.25	6,131.80
COMMERCIAL LICENSES				
International Commercial	3,807.50		4,757.50	
International Commercial "Helpers"	33.00		33.00	
International Fish Buyers, Wholesale	425.00		500.00	
International Fish Buyers, Resident	20.00		20.00	
International Fish Buyers, Peddlers	35.00		35.00	
International Restocking Fees			920.00	
Lake Superior "Masters"	3,045.00		6,825.00	
Lake Superior "Helpers"	95.00			
Lake Superior Trout Permits	381.00			
Lake Superior Fish Buyers	375.00		350.00	
Interstate Set Line and Net Fishing	2,225.50		3,635.50	
Inland Mississippi Fishing	57.00		190.00	
Minn.-Wisc. River Fishing	14.00		47.00	
Mussel Fishing	30.00		85.00	
Minnow Dealers, Local	3,900.00		6,455.00	
Minnow Dealers, Itinerant	2,950.00		6,167.50	
Fur Buyers, Local	1,185.00		1,250.00	
Fur Buyers, Traveling	4,390.00		6,915.00	
Fur Buyers, Non-resident	2,000.00		8,200.00	
Fur Tanning and Dressing	6.00		4.00	
Taxidermist	112.00		154.00	
Wild Rice Harvesting	367.00		1,466.00	
Wild Rice Buying	90.00		1,656.00	
Private Fish Hatchery	120.00		355.00	
Net Retaining Tags	349.75	$ 26,012.75	2,141.50	$ 52,162.00
Fines	22,135.55		21,741.73	
Warden Costs	2,257.40		2,144.83	
Seizures	5,018.45		5,961.35	
Sale of Furs	51,963.65		33,901.85	
Rents	348.00		318.00	
Money Returned by Sellers of Illegal Furs	2,935.45			
Sale of Equipment			2,489.50	
Supervision of Field Trials	72.10			
Donation	10.00			
Reimbursements	59.50		170.23	
Miscellaneous			47.36	
Suspense Account	300.80	85,100.90	40.87	66,815.72
		1,249,920.50		1,610,033.49

TABLE 40—Continued
RECEIPTS FROM ALL SOURCES BY FUNDS
Fiscal Years 1944-1945 and 1945-1946

FUND	1944-1945		1945-1946	
COMMERCIAL LICENSES—Concluded				
Less ½ Hunting and Trapping License Receipts to Public Shooting Grounds Fund		212,002.23		270,013.32
		1,037,918.27		1,340,020.17
Less 60% Resident Fishing License Receipts to State Fish Propagation Fund		288,235.05		343,143.42
		749,683.22		996,876.75
Less Lake Superior License Receipts to French River Hatchery Fund		2,756.00		.....
Total to Game and Fish Fund		746,927.22		996,876.75
Permittee Trappers Refunds				
Sale of Furs	35,587.74	35,587.74	12,804.20	12,804.20
State Fish Propagation				
60% of Resident Fishing Licenses	288,235.05		343,143.42	
Rents	1,039.00		1,240.00	
Sale of Fish	854.40		1,444.85	
Baudette Hatchery Fees	700.00		.....	
Sale of Scrap	.....		15.25	
Reimbursements	4.45	290,832.90	48.10	345,891.62
French River Hatchery				
Lake Superior Licenses	2,756.00	2,756.00	.....	.....
Public Shooting Grounds				
½ Hunting and Trapping License Receipts	212,002.23		270,013.32	
Sale of Furs	2,169.24		7,433.10	
Sale of Pelt Tags	522.25		3,002.00	
Rents	1,730.55		4,677.27	
Sale of Buildings	1,057.00		1,100.00	
Sale of Livestock	144.23		26.80	
Sale of Hay, Oats, Rye	580.85		758.26	
Sale of Gravel	.....		7.45	
Sale of Wood	.....		17.88	
Sale of Birds	250.00		.....	
Reimbursements	1,741.75	220,198.10	109.00	287,145.08
Public Shooting Grounds (County Share)				
35% of Refuge Rents	1,334.12		1,459.26	
35% of Sale of Gravel, Wood, Hay, etc	15.52		39.04	
Federal Aid A. A. A	19.94	1,369.58	.....	1,498.30
Public Hunting Grounds				
Rents	2,503.71		.....	
Sale of Gravel, Wood, Hay, etc	28.83		.....	
Federal Aid A. A. A	37.05	2,569.59	.....	.....
Rough Fish Removal Revolving				
CONTRACT FISHING				
Sale of Fish	306,229.49		306,415.94	
Sale of Boxes	1,370.95		2,480.25	
Reimbursements	.....	307,600.44	1.00	308,897.19
BULLHEAD FISHING				
Sale of Fish	115,238.07		117,609.96	
Sale of Boxes	2,155.95	117,394.02	.....	117,609.96
DAY LABOR FISHING				
Sale of Fish	74,519.17		115,651.48	
Sale of Boxes	1,576.95		2,480.45	
Reimbursements	7.40	76,103.52	.....	118,131.93
Pittman-Robertson Revolving				
RESEARCH				
Federal Grants	11,676.47	11,676.47	11,149.81	11,149.81
REFUGES				
Federal Grants	15,118.36	15,118.36	57,610.90	57,610.90
Beltrami Island Federal Lease				
Rents	349.25		634.50	
Rent of Equipment	1,400.00		700.00	
Sale of Pulpwood	1,094.08		638.24	
Sale of Buildings	224.00	3,067.33	255.00	2,227.74
Total of All Receipts		$1,831,201.27		$2,259,843.48

TABLE No. 41
SUMMARY OF FUNDS
Fiscal Year 1944-4

ACCOUNTS	Cash Balance July 1, 1944	Previous Encumbrances Liquidated	Unencumbered Balance July 1, 1944	Receipts	TRANSFERS Out	TRANSFERS In	Disbursements Current Year	Cash Balance June 30, 1945	Unliquidated Encumbrances	Total Expenditures	Free Balance 6-30-45
Game and Fish Fund	$556,463.67	$20,956.87	$535,506.80	$746,927.22	$143,498.08	$34,304.86	$436,733.84	$736,506.96	$24,502.53	$461,236.37	$712,004.43
Wild Rice Harvest	385.59	49.09	336.50	.....	1,825.86	3,000.00	1,467.54	43.10	43.10	1,510.64	.....
Game Law Pamphlets	.....	.....	.....	.....	.....	4,500.00	.....	4,500.00	3,558.57	3,558.57	941.43
Permittee Trappers Refunds	9,394.45	9,391.31	3.14	35,587.74	3.14	18.86	35,605.60	1.00	.....	35,605.60	1.00
Auditors and Agents Refunds	748.48	.....	748.48	.....	748.48	3,815.25	3,815.25	.....	.....	3,815.25	.....
State Fish Propagation	331,425.60	4,524.60	326,901.00	290,832.90	37,478.75	.....	131,888.89	448,366.26	10,641.90	142,530.79	437,724.36
French River Hatchery	2,388.35	182.23	2,206.12	2,756.00	.....	5,250.00	5,955.82	4,256.30	533.33	6,489.15	3,722.97
Public Shooting Grounds	270,014.94	3,049.26	266,965.68	220,198.10	150,383.74	4.72	52,973.09	283,811.67	3,574.75	56,547.84	280,236.92
Public Hunting Grounds	5,043.82	2,146.94	2,896.88	2,569.59	1,360.07	47,891.35	41,513.33	10,483.92	1,922.46	43,436.29	8,561.46
Public Hunting County Portion	.....	.....	.....	1,369.58	.....	1,360.07	.....	2,729.65	2,729.65	2,729.65	.....
Soil Conservation Committee	2,207.10	921.23	1,285.87	.....	984.71	2,700.00	2,592.43	408.73	106.94	2,699.37	301.79
State Rough Fish Removal Revolving Fund											
Contract Fishing	59,787.82	659.76	59,128.06	307,600.44	35,000.00	.....	248,065.79	83,662.71	1,634.39	249,700.18	82,028.32
Bullhead Fishing	65,502.93	7,856.66	57,646.27	117,394.02	30,000.00	.....	99,000.54	46,039.75	6,308.84	105,309.38	39,730.91
Day Labor Fishing	29,300.57	12,490.35	16,810.22	76,103.52	125.00	85,000.00	144,755.22	33,033.52	26,399.06	171,154.28	6,634.46
Pittman-Robertson—Research	11,948.44	359.88	11,588.56	11,676.47	.....	10,000.00	19,111.83	14,153.20	477.85	19,589.68	13,675.35
Pittman-Robertson—Refuges	51,646.65	81.25	51,565.40	15,118.36	.....	25,000.00	52,738.73	38,945.03	4,641.95	57,380.68	34,303.08
Beltrami Island Federal Lease	1,393.98	677.05	716.93	3,067.33	.....	.....	257.21	3,527.05	303.72	560.93	3,223.33
Miscellaneous Legislative Claims	13,084.91	.....	13,084.91	.....	8,001.32	.....	2,202.41	2,881.18	481.18	2,683.59	2,400.00
Totals	$ 1,410,737.30	$ 63,346.48	$ 1,347,390.82	$ 1,831,201.27	$ 409,409.15	$ 222,845.11	$ 1,278,678.02	$ 1,713,350.03	$ 87,860.22	$ 1,366,538.24	$ 1,625,489.81

Transfers to Other Activities

General Administration 5% Assessment	.....	$54,424.21
General Revenue Fund	.....	92,900.00
Board of Health	.....	5,000.00
Wolf and Fox Bounties	.....	56,500.00

Return of Unused Transfers

Conservation Administration	$2,598.89	.....
Water Resources and Engineering	5,046.35	.....
Forestry Fire Fighting	14,614.93	.....
Totals	$431,669.32	$431,669.32

TABLE No. 42
SUMMARY OF FUNDS
Fiscal Year 1945-46

ACCOUNTS	Cash Balance July 1, 1945	Previous Year's Encumbrance Liquidated	Unencumbered Balance July 1, 1945	Receipts	TRANSFERS		Disbursements Current Year	Cash Balance June30, 1946	Estimated Encumbrances	Estimated Total Expenditures	Free Balance June30, 1946
					Out	In					
	$	$	$	$	$	$	$	$	$	$	$
Game and Fish Fund	736,506.96	24,502.53	712,004.43	996,876.75	148,220.15	25,823.65	521,317.97	1,065,166.71	49,118.10	570,436.07	1,016,048.61
Wild Rice Harvest	43.10	43.10									
Game Law Pamphlets	4,500.00	3,558.57	941.43		341.43			600.00			600.00
Permittee Trappers Refunds	1.00		1.00	12,804.20	1.00		12,804.20			12,804.20	
Auditors and Agents Refunds						4,745.29	4,745.29			4,745.29	
State Fish Propagation	448,366.26	10,641.90	437,724.36	345,891.62	23,469.24	3,722.97	236,391.97	527,477.74	60,030.13	296,422.10	467,447.61
French River Hatchery	4,256.30	533.33	3,722.97		3,722.97						
Public Shooting Grounds	283,811.67	3,574.75	280,236.92	287,145.08	47,467.29	9,241.59	174,199.79	354,956.51	37,536.20	211,735.99	317,420.31
Public Hunting Grounds	10,483.92	1,922.46	8,561.46		8,561.46						
Public Hunting County Portion	2,729.65	2,729.65		1,498.30				1,498.30			1,498.30
Soil Conservation Committee	408.73	106.94	301.79		301.79						
State Rough Fish Removal Revolving											
Contract Fishing	83,662.71	1,634.39	82,028.32	308,897.19	50,000.00		261,152.99	79,772.52	1,128.11	262,281.10	78,644.41
Bullhead Fishing	46,039.75	6,308.84	39,730.91	117,609.96	10,000.00		109,445.13	37,895.74	3,835.07	113,280.20	34,060.67
Day Labor Fishing	33,033.52	26,399.06	6,634.46	118,131.93		60,000.00	120,456.53	64,309.86	47,875.59	168,332.12	16,434.27
Pittman-Robertson Research	14,153.20	477.85	13,675.35	11,149.81		10,000.00	27,905.37	6,919.79	833.55	28,738.92	6,086.24
Pittman-Robertson Refuges	38,945.03	4,641.95	34,303.08	57,610.90			22,203.36	69,710.62	33,935.60	56,138.96	35,775.02
Beltrami Island Federal Lease	3,527.05	303.72	3,223.33	2,227.74			545.94	4,905.13	1,669.63	2,215.57	3,235.50
Miscellaneous Legislative Claims	2,881.18	481.18	2,400.00					2,400.00			2,400.00
	$	$	$	$	$	$	$	$	$	$	$
Totals	1,713,350.03	87,860.22	1,625,489.81	2,259,843.48	292,085.33	113,533.50	1,491,168.54	2,215,612.92	235,961.98	1,727,130.52	1,979,650.94

Transfers to Other State Activities		
General Administration 5% Assessment		$69,305.59
General Revenue Fund		105,105.80
Board of Health		5,000.00
Wolf and Fox Bounties		25,000.00
Return of Unused Transfers		
Conservation Administration	$1,669.01	
Water Resources and Engineering	5,507.13	
Forestry Fire Fighting	17,905.24	
Game and Fish Interim Commission	98.05	
Wolf and Fox Bounties	680.13	
Totals	$317,944.89	$317,944.89

TABLE 43

EXPENDITURES FOR ALL PURPOSES BY CLASSIFICATIONS
Fiscal Year 1944-1945

EXPENDITURE CLASSIFICATIONS	Game and Fish Fund	Permittee Trappers Refunds	Auditors and Agents Refunds	State Fish Propagation	Public Shooting Grounds	Public Hunting Grounds
Full Time Employees	$304,101.49	$	$	$73,949.66	$33,560.36	$30,793.99
Part Time Employees	58.87	.....	.....	7,348.92	.....	.....
Seasonal Employees	3,955.21	.....	.....	15,523.79	5,021.44	838.98
Sub-Totals	$308,115.57	.....	.....	$96,822.37	$38,581.80	$31,632.97
Rents and Leases	556.45	.....	.....	181.00	19.75	19.80
Advertising and Publications	650.28	.....	.....	311.31	.....	119.18
Repairs and Maintenance	1,785.38	.....	.....	6,741.92	725.27	541.18
Bonds and Insurance	82.35	.....	.....	.....	.....	.....
Printing and Binding	17,800.47	.....	.....	327.16	80.13	923.36
Non-State Employee Service	137.55	.....	.....	430.80	20.16	136.35
Communications	4,723.03	.....	.....	969.43	271.29	155.93
Travel and Subsistence	110,846.39	.....	.....	7,881.71	1,053.33	5,955.61
Freight and Express	836.57	.....	.....	119.65	145.89	35.90
Utility Service	45.55	.....	.....	1,684.11	585.64	97.43
Other Contractual Services	703.24	.....	.....	790.41	180.20	231.57
Stationery and Office Supplies	2,961.31	.....	.....	136.54	54.86	9.85
Gas, Lubricants—Auto. Equipment	1,489.95	.....	.....	4,868.20	952.70	1,233.35
Medical and Hospital Supplies	11.82	.....	.....	25.38	334.92	5.28
Scientific and Educational Supplies	382.26	.....	.....	12.60	80.00	.....
Clothing and Sewing Supplies	82.13	.....	.....	309.67	58.90	10.49
Forage and Care of Animals	.....	.....	.....	9,717.71	5,076.54	133.00
Fuel	79.00	.....	.....	2,912.66	1,235.15	182.53
Maintenance and Construction Materials	393.00	.....	.....	3,104.34	1,694.92	722.75
Miscellaneous Materials and Supplies	635.09	.....	.....	2,308.93	4,636.50	811.41
Annuities and Pensions	6,202.00	.....	.....	702.05	30.13	158.32
Awards and Indemnities	.....	.....	.....	.....	.....	.....
Rewards	30.00	.....	.....	.....	.....	.....
Land and Interest in Land	.....	.....	.....	100.00	.....	.....
Buildings and Improvements	.....	.....	.....	2,636.64	.....	.....
Motor Vehicles	.....	.....	.....	9.00	.....	90.00
Furniture and Fixtures	141.29	.....	.....	262.92	50.00	142.37
Education and Scientific	32.40	.....	.....	29.28	.....	.....
Livestock	.....	.....	.....	375.00	183.00	.....
Other Equipment	1,522.33	.....	.....	5,249.15	492.76	87.66
Stores for Resale	2,344.20	.....	.....	.....	.....	.....
Repayments of Deposits	.....	.....	.....	.....	.....	.....
Refund of Income Receipts	157.40	35,605.60	3,815.25	.....	4.00	.....
Totals	$462,747.01	$35,605.60	$3,815.25	$149,019.94	$56,547.84	$43,436.29

TABLE 43—Continued

EXPENDITURES FOR ALL PURPOSES BY CLASSIFICATIONS
Fiscal Year 1944-1945

Public Shooting Grounds County Portion	Soil Conservation Committee	Rough Fish Removal	Pittman-Robertson Research	Pittman-Robertson Refuges	Beltrami Federal Lease Fund	Legislative Claims	Game Law Pamphlets	Totals
$	$	$16,941.42	$13,138.32	$4,445.25	$	$	$	$476,930.49
.....	645.00	128,867.63	1,200.00	.....	.....	.....	.....	138,120.42
.....	.....	.....	.....	.....	.....	.....	.....	25,339.42
.....	$645.00	$145,809.05	$14,338.32	$4,445.25	.....	.....	.....	$640,390.33
.....	.....	1,921.00	420.96	420.96	.....	.....	.....	3,539.92
.....	164.50	50.87	.....	.....	.....	.....	.....	1,296.14
.....	.....	2,294.86	.....	.....	32.40	.....	.....	12,121.01
.....	.....	17.55	.....	4.05	.....	.....	.....	103.95
.....	110.16	501.74	44.35	3.78	.....	.....	3,558.57	23,349.72
.....	.....	776.90	.....	.....	.....	.....	.....	1,501.76
.....	217.32	1,844.68	93.50	70.08	.....	.....	.....	8,345.26
.....	1,488.41	34,697.75	4,625.52	736.95	.....	.....	.....	167,285.67
.....	.....	34.47	1.24	.....	.....	.....	.....	1,173.72
.....	.....	280.13	24.48	29.10	.....	.....	.....	2,746.44
.....	.60	352.00	.....	4.50	.....	.....	.....	2,262.52
.....	60.45	90.99	35.24	8.71	.....	.....	.....	3,357.95
.....	.....	3,530.05	.....	.....	.....	.....	.....	12,074.25
.....	.....	36.54	.....	.....	.....	.....	.....	413.94
.....	.....	.....	.....	.....	.....	.....	.....	474.86
.....	.....	108.26	.....	.....	.....	.....	.....	569.45
.....	.....	109.40	.....	.....	.....	.....	.....	15,036.65
.....	.....	758.35	.....	.....	.....	.....	.....	5,167.69
.....	.....	2,379.85	.....	.....	.....	.....	.....	8,294.86
.....	12.93	2,652.88	6.07	.....	528.53	.....	.....	11,592.34
.....	.....	1,567.64	.....	.....	.....	.....	.....	8,660.14
.....	.....	.....	.....	.....	.....	2,683.59	.....	2,683.59
.....	.....	.....	.....	.....	.....	.....	.....	30.00
.....	.....	.....	.....	51,657.30	.....	.....	.....	51,757.30
.....	.....	.....	.....	.....	.....	.....	.....	2,636.64
.....	.....	5,634.64	.....	.....	.....	.....	.....	5,733.64
.....	.....	228.70	.....	.....	.....	.....	.....	825.28
.....	.....	.....	.....	.....	.....	.....	.....	61.68
.....	.....	.....	.....	.....	.....	.....	.....	558.00
.....	.....	7,521.66	.....	.....	.....	.....	.....	14,873.56
.....	.....	1,964.00	.....	.....	.....	.....	.....	4,308.20
.....	.....	310,999.88	.....	.....	.....	.....	.....	310,999.88
2,729.65	.....	.....	.....	.....	.....	.....	.....	42,311.90
$2,729.65	$2,699.37	$526,163.84	$19,589.68	$57,380.68	$560.93	$2,683.59	$3,558.57	$1,366,538.24

TABLE No. 44

EXPENDITURES FOR ALL PURPOSES BY CLASSIFICATION

Fiscal Year 1945-6

EXPENDITURE CLASSIFICATIONS	Game and Fish Fund	Permittee Trappers Refunds	Auditors and Agents Refunds	State Fish Propagation	Public Shooting Grounds	Rough Fish Removal	Pittman-Robertson Research	Pittman-Robertson Refuges	Beltrami Federal Lease Fund	Totals
Full Time Employees	$364,985.07	$	$	$140,555.88	$96,329.17	$13,755.72	$20,025.33	$7,266.00	$	$642,917.17
Part Time Employees				316.74	907.53		1,436.87			2,661.14
Seasonal Employees				32,468.13	11,068.82	106,685.59	972.33			151,194.87
Sub-Totals	$364,985.07			$173,340.75	$108,305.52	$120,441.31	$22,434.53	$7,266.00		$796,773.18
Rents and Leases	458.97			2,831.65	2,856.40	817.50	441.34	841.92		8,247.78
Advertising and Publications	885.95			627.97	491.68	301.25				2,306.85
Repairs and Maintenance	2,562.65			3,344.08	713.22	1,665.01	42.23	3.00	152.18	8,482.37
Bonds and Insurance	267.95			97.75	46.00	95.45	14.95			522.10
Printing and Binding	15,782.17			1,602.54	1,067.64	638.69	105.22			19,196.26
Non-State Employee Service	377.90			5,546.14	604.56	212.06				6,740.66
Communications	5,672.07			1,092.07	634.10	2,157.34	116.35	87.05		9,758.98
Travel and Subsistence	125,035.18			17,283.24	11,523.42	33,515.13	4,972.70	622.60		192,952.27
Freight and Express	608.16			233.23	145.52	29.22	6.51			1,022.64
Utility Service	101.18			2,089.83	837.48	157.41	52.24	48.32		3,286.46
Other Contractual Services	1,134.88			3,971.33	782.24	433.22		22.90		6,344.57
Stationery and Office Supplies	4,223.76			594.65	83.41	30.18	118.38	31.57		5,081.95
Gas, Lubricants—Auto. Equipment	1,338.39			5,777.67	3,131.09	3,598.25	1.17			13,846.57
Medical and Hospital Supplies	10.50			78.97	318.08	29.01				436.56
Scientific and Educational Supplies				536.27			20.34			556.61
Clothing and Sewing Supplies	961.45			955.11	419.18	266.90	11.43			2,614.07
Provisions				8.50						8.50
Forage and Care of Animals				9,627.07	8,883.98	15.00				18,526.05
Fuel	132.40			2,940.47	1,821.30	652.06				5,546.23
Maintenance and Construction Materials	1,583.20			5,961.27	28,026.26	2,689.24	45.57			38,305.54
Miscellaneous Materials and Supplies	708.59			6,310.18	10,649.68	4,841.57	15.19		568.30	23,093.51
Annuities and Pensions	9,113.87			429.04	2,579.62	1,558.17				13,680.70
Awards and Indemnities										
Rewards	30.00									30.00
Land and Interest in Lands				11.00	296.00			47,215.60		47,522.60
Buildings and Improvements				17,450.67	10.81					17,461.48
Motor Vehicles	23,666.92			14,397.92	24,118.12	6,567.09			1,256.23	70,006.28
Furniture and Fixtures	539.57			2,097.58	523.68	329.08	40.58			3,530.49
Educational and Scientific				565.72			174.33			740.05
Livestock				511.86	50.00					561.86
Other Equipment	10,026.79			16,107.57	2,817.00	29,321.76	125.86		238.86	58,637.84
Stores for Resale	84.00					1,135.10				1,219.10
Repayments of Deposits						332,396.42				332,396.42
Refund of Income Receipts	144.50	12,804.20	4,745.29							17,693.99
Totals	$570,436.07	$12,804.20	$4,745.29	$296,422.10	$211,735.99	$543,893.42	$28,738.92	$56,138.96	$2,215.57	$1,727,130.52

TABLE 45
EXPENDITURES OF GAME AND FISH BY BUREAUS
Fiscal Year 1944-1945

EXPENDITURE CLASSIFICATION	Bureau of Administration	Bureau of Warden Service	Bureau of Fisheries Research	Wild Rice Harvest	Totals
Full Time Employees	$51,596.40	$238,078.40	$13,826.69	$600.00	$304,101.49
Part Time Employees	.....	.....	58.87	.....	58.87
Seasonal Employees	.....	.....	3,855.21	100.00	3,955.21
Sub-Totals	$51,596.40	$238,078.40	$17,740.77	$700.00	$308,115.57
Rents and Leases	$15.75	$216.70	$324.00	.....	$556.45
Advertising and Publications	508.82	.....	.....	$141.46	650.28
Repairs and Maintenance	165.03	1,331.05	289.30	.....	1,785.38
Bonds and Maintenance	72.35	10.00	.....	.....	82.35
Printing and Binding	16,014.21	530.82	1,151.25	104.19	17,800.47
Non-State Employee Service	49.45	88.10	.....	.....	137.55
Communications	3,791.43	864.70	66.90	.....	4,723.03
Travel and Subsistence	2,519.24	104,363.67	3,398.49	564.99	110,846.39
Freight and Express	756.95	64.98	14.64	.....	836.57
Utility Service	.....	45.55	.....	.....	45.55
Other Contractual Services	97.56	229.16	376.52	.....	703.24
Stationery and Office Supplies	2,738.32	.....	222.99	.....	2,961.31
Gas and Lubrication—Auto. Equip.	.....	1,335.62	154.33	.....	1,489.95
Medical and Hospital Supplies	11.82	.....	.....	.....	11.82
Scientific and Educational Supplies	.....	.....	382.26	.....	382.26
Clothing and Sewing Supplies	12.94	.....	69.19	.....	82.13
Fuel	.....	79.00	.....	.....	79.00
Maintenance and Construction Supplies	.....	383.03	9.97	.....	393.00
Miscellaneous Materials and Supplies	127.89	322.07	185.13	.....	635.09
Annuities and Pensions	.....	5,953.45	248.55	.....	6,202.00
Rewards	.....	30.00	.....	.....	30.00
Furniture and Fixtures	26.59	.....	114.70	.....	141.29
Educational and Scientific Equipment	.....	.....	32.40	.....	32.40
Other Equipment	4.35	1,385.98	132.00	.....	1,522.33
Stores for Resale	.....	2,344.20	.....	.....	2,344.20
Refund of Income Receipts	157.40	.....	.....	.....	157.40
Totals	$78,666.50	$357,656.48	$24,913.39	$1,510.64	$462,747.01

TABLE 46
EXPENDITURES OF GAME AND FISH FUND BY BUREAUS
Fiscal Year 1945-1946

EXPENDITURE CLASSIFICATION	Bureau of Administration	Bureau of Warden Service	Totals
Full Time Employees	$63,670.96	$301,314.11	$364,985.07
Rents and Leases		458.97	458.97
Advertising and Publications	820.41	65.54	885.95
Repairs and Maintenance	1,153.63	1,409.02	2,562.65
Bonds and Insurance	96.60	171.35	267.95
Printing and Binding	15,589.89	192.28	15,782.17
Non-State Employee Service	99.40	278.50	377.90
Communication	4,837.37	834.70	5,672.07
Travel and Subsistence	3,713.29	121,321.89	125,035.18
Freight and Express	497.43	110.73	608.16
Utility Service		101.18	101.18
Other Contractual Services	153.61	981.27	1,134.88
Stationery and Office Supplies	4,186.39	37.37	4,223.76
Gas and Lubrication—Auto Equipment		1,338.39	1,338.39
Medical and Hospital Supplies	10.50		10.50
Clothing and Sewing Supplies		961.45	961.45
Fuel		132.40	132.40
Maintenance and Construction Materials	1,050.12	533.08	1,583.20
Miscellaneous Materials and Supplies	80.58	628.01	708.59
Annuities and Pensions		9,113.87	9,113.87
Rewards		30.00	30.00
Motor Vehicles		23,666.92	23,666.92
Furniture and Fixtures	373.37	166.20	539.57
Other Equipment		10,026.79	10,026.79
Stores for Resale		84.00	84.00
Refund of Income Receipts	144.50		144.50
Totals	$96,478.05	$473,958.02	$570,436.07

TABLE 47
EXPENDITURES FOR FISH PROPAGATION BY ACTIVITIES
Fiscal Year 1944-1945

EXPENDITURE CLASSIFICATIONS	Lake and Stream Maintenance	Lake & Stream Improvement & Development	Natural Propagation	Lake and Stream Control	Artificial Propagation	French River Hatchery	Total
Full Time Employees	$176.49	$3,884.76	$2,580.00	.....	$63,562.16	$3,746.25	$73,949.66
Part Time Employees	386.50	64.78	.....	.....	5,837.89	1,059.75	7,348.92
Seasonal Employees	.....	.....	20.15	.....	15,503.64	.....	15,523.79
Sub-Totals	$562.99	$3,949.54	$2,600.15	.....	$84,903.69	$4,806.00	$96,822.37
Rents and Leases	.....	2.00	.....	.....	179.00	.....	181.00
Advertising and Publications	.....	.....	311.31	.....	.....	.....	311.31
Repairs and Maintenance	33.50	.....	.....	.....	6,697.52	10.90	6,741.92
Printing and Binding	.....	41.15	201.90	.....	84.11	.....	327.16
Non-State Employee Services	.....	.....	.....	.....	430.80	.....	430.80
Communications	.....	18.40	.....	.....	865.18	85.85	969.43
Travel and Subsistence	234.50	1,463.57	.....	.....	5,962.44	221.20	7,881.71
Freight and Express	.....	.....	.....	.....	119.65	.....	119.65
Utility Service	.....	.....	.....	.....	1,373.15	310.96	1,684.11
Other Contractual Services	.....	13.40	.....	.....	777.01	.....	790.41
Stationery and Office Supplies	.....	28.04	.....	.....	108.50	.....	136.54
Gas and Lubrication—Auto Equip.	51.20	.....	.....	.....	4,817.00	.....	4,868.20
Medical and Hospital Supplies	.....	.....	.....	.....	25.38	.....	25.38
Scientific and Educational Supplies	.....	2.26	.....	.....	10.34	.....	12.60
Clothing and Sewing Supplies	.....	.....	.....	.....	305.99	3.68	309.67
Forage—Animal Care	.....	.....	.....	.....	9,717.71	.....	9,717.71
Fuel	.....	.....	.....	.....	2,466.45	446.21	2,912.66
Maintenance and Construction Material	119.82	656.23	355.19	.....	1,884.79	88.31	3,104.34
Miscellaneous Materials and Supplies	4.25	.....	.....	.....	2,277.99	26.69	2,308.93
Annuities and Pensions	.....	.....	.....	.....	702.05	.....	702.05
Land and Interests in Land	.....	.....	.....	100.00	.....	.....	100.00
Buildings and Improvements	.....	.....	.....	.....	2,222.64	414.00	2,636.64
Motor Vehicles	.....	.....	.....	.....	9.00	.....	9.00
Furniture and Fixtures	.....	25.72	.....	.....	161.85	75.35	262.92
Educational and Scientific Equipment	.....	29.28	.....	.....	.....	.....	29.28
Livestock	.....	.....	.....	.....	375.00	.....	375.00
Other Equipment	.....	367.65	.....	.....	4,881.50	.....	5,249.15
Totals	$1,006.26	$6,597.24	$3,468.55	$100.00	$131,358.74	$6,489.15	$149,019.94

TABLE 48

EXPENDITURES FOR FISH PROPAGATION BY ACTIVITIES

Fiscal Year 1945-1946

EXPENDITURE CLASSIFICATION	Stream Improvement & Development	Natural Propagation	License Fishing Operations	Fisheries Research	Artificial Propagation	Lake and Stream Improvement	Lake Level Control	Total
Full Time Employees	$5,952.80	$5,332.16	$4,824.00	$23,128.75	$101,247.94	$70.23		$140,555.88
Part Time Employees				228.54		88.20		316.74
Seasonal Employees	2,700.68	64.50	8,659.32	5,974.71	15,068.92			32,468.13
Sub-Totals	$8,653.48	$5,396.66	$13,483.32	$29,332.00	$116,316.86	$158.43		$173,340.75
Rents and Leases	30.00	18.00	24.00	424.00	690.80	1,644.85		2,831.65
Advertising and Publications		557.77	38.25	31.95				627.97
Repairs and Maintenance	812.07	44.33		215.35	2,264.33	8.00		3,344.08
Bonds and Insurance	6.90		11.50	14.95	64.40			97.75
Printing and Binding	28.84	561.21	25.95	825.52	161.02			1,602.54
Non-State Employee Service				35.44	510.70		5,000.00	5,546.14
Communications	27.93		5.30	79.75	975.59	3.50		1,092.07
Travel and Subsistence	1,636.65	338.85	1,653.06	7,019.50	6,551.53	83.65		17,283.24
Freight and Express				15.77	217.46			233.23
Utility Service				51.02	2,038.81			2,089.83
Other Contractual Services				230.91	3,740.42			3,971.33
Stationery and Office Supplies	75.84	.80		451.04	66.97			594.65
Gas, Lubricants—Auto. Equipment	121.35	297.85	10.00	219.57	5,111.16	17.74		5,777.67
Medical and Hospital Supplies	20.62				58.35			78.97
Scientific and Educational Supplies	33.45			502.82				536.27
Clothing and Sewing Supplies	260.47			167.26	527.38			955.11
Provisions					8.50			8.50
Forage and Care of Animals					9,627.07			9,627.07
Fuel					2,940.47			2,940.47
Maintenance and Construction Materials	1,306.65	861.43		998.93	2,614.61	179.65		5,961.27
Miscellaneous Materials and Supplies	376.71	227.38		574.03	5,132.06			6,310.18
Annuities and Pensions					429.04			429.04
Land and Interest in Land	11.00							11.00
Buildings and Improvements					17,450.67			17,450.67
Motor Vehicles	3,354.62	1,284.01		2,787.22	6,972.07			14,397.92
Furniture and Fixtures	143.60			789.20	1,164.78			2,097.58
Educational and Scientific	1.00			564.72				565.72
Livestock					511.86			511.86
Other Equipment	207.43			272.20	15,627.94			16,107.57
Totals	$17,108.61	$9,588.29	$15,251.38	$45,603.15	$201,774.85	$2,095.82	$5,000.00	$296,422.10

TABLE 49

EXPENDITURES IN ROUGH FISH REMOVAL OPERATIONS BY ACTIVITIES

Fiscal Year 1944-1945

EXPENDITURE CLASSIFICATION	OPERATIONS			
	Contract Fishing	Bullhead Fishing	Day Labor Fishing	Totals
Full Time Employees	$6,920.35	$2,618.40	$7,402.67	$16,941.42
Part Time Employees	12,210.92	10,670.22	105,986.49	128,867.63
Sub-Totals	$19,131.27	$13,288.62	$113,389.16	$145,809.05
Rents and Leases	10.00	.....	1,911.00	1,921.00
Advertising and Publications	.....	50.87	.....	50.87
Repairs and Maintenance	.....	38.30	2,256.56	2,294.86
Bonds and Insurance	.....	.....	17.55	17.55
Printing and Binding	274.21	108.08	119.45	501.74
Non-State Employee Services	123.75	284.04	369.11	776.90
Communications	421.16	478.04	945.48	1,844.68
Travel and Subsistence	3,970.47	4,217.20	26,510.08	34,697.75
Freight and Express	.....	6.48	27.99	34.47
Utility Service	.....	.....	280.13	280.13
Other Contractual Services	59.65	73.15	219.20	352.00
Stationery and Office Supplies	5.14	7.20	78.65	90.99
Gas and Lubrication—Auto. Equipment	.....	.....	3,530.05	3,530.05
Medical and Hospital Supplies	.....	.....	36.54	36.54
Clothing and Sewing Supplies	.....	.....	108.26	108.26
Forage—Animal Care	.....	.....	109.40	109.40
Fuel	.....	80.50	677.85	758.35
Maintenance and Construction Materials	.....	131.40	2,248.45	2,379.85
Miscellaneous Material and Supplies	.....	.....	2,652.88	2,652.88
Annuities and Pensions	.....	1,179.95	387.69	1,567.64
Motor Vehicles	.....	.....	5,634.64	5,634.64
Furniture and Fixtures	.....	35.20	193.50	228.70
Other Equipment	.....	35.00	7,486.66	7,521.66
Stores for Resale	.....	.....	1,964.00	1,964.00
Repayments of Deposits	225,704.53	85,295.35	.....	310,999.88
Totals	$249,700.18	$105,309.38	$171,154.28	$526,163.84

TABLE 50

EXPENDITURES IN ROUGH FISH REMOVAL OPERATIONS BY ACTIVITIES

Fiscal Year 1945-1946

EXPENDITURE CLASSIFICATION	OPERATIONS			
	Contract Fishing	Bullhead Fishing	Day Labor Fishing	Totals
Full Time Employees	$3,393.97	$3,409.00	$6,952.75	$13,755.72
Seasonal Employees	10,724.11	12,909.97	83,051.51	106,685.59
Sub-Totals	$14,118.08	$16,318.97	$90,004.26	$120,441.31
Rents and Leases		26.50	791.00	817.50
Advertising and Publications	138.20	147.13	15.92	301.25
Repairs and Maintenance		43.77	1,621.24	1,665.01
Bonds and Insurance	36.80	28.75	29.90	95.45
Printing and Binding	470.78	67.03	100.88	638.69
Non-State Employee Service	93.72	4.00	114.34	212.06
Communications	674.35	635.35	847.64	2,157.34
Travel and Subsistence	3,954.51	4,202.61	25,358.01	33,515.13
Freight and Express		27.88	1.34	29.22
Utility Service			157.41	157.41
Other Contractual Services	87.85	45.25	300.12	433.22
Stationery and Office Supplies	7.84	20.25	2.09	30.18
Gas and Lubrication—Auto Equipment		19.23	3,579.02	3,598.25
Medical and Hospital Supplies			29.01	29.01
Clothing and Sewing Supplies			266.90	266.90
Forage—Animal Care			15.00	15.00
Fuel		28.50	623.56	652.06
Maintenance and Construction Materials		362.02	2,327.22	2,689.24
Miscellaneous Materials and Supplies		158.95	4,682.62	4,841.57
Annuities and Pensions	2.75	1,142.29	413.13	1,558.17
Motor Vehicles			6,567.09	6,567.09
Furniture and Fixtures	125.01	54.07	150.00	329.08
Other Equipment		122.44	29,199.32	29,321.76
Stores for Resale			1,135.10	1,135.10
Repayments of Deposits	242,571.21	89,825.21		332,396.42
Totals	$262,281.10	$113,280.20	$168,332.12	$543,893.42

TABLE 51

EXPENDITURES OF PUBLIC SHOOTING GROUNDS FUND BY ACTIVITY

Fiscal Year 1945-1946

EXPENDITURE CLASSIFICATION	Game Farms and General	Game Refuges	Totals
Full Time Employees	$51,286.10	$45,043.07	$96,329.17
Part Time Employees	.....	907.53	907.53
Seasonal Employees	5,069.73	5,999.09	11,068.82
Sub-Totals	$56,355.83	$51,949.69	$108,305.52
Rents and Leases	25.50	2,830.90	2,856.40
Advertising and Publications	.....	491.68	491.68
Repairs and Maintenance	337.44	375.78	713.22
Bonds and Insurance	13.80	32.20	46.00
Printing and Binding	79.66	987.98	1,067.64
Non-State Employee Service	70.25	534.31	604.56
Communications	442.25	191.85	634.10
Travel and Subsistence	1,995.77	9,527.65	11,523.42
Freight and Express	113.76	31.76	145.52
Utility Service	692.84	144.64	837.48
Other Contractual Service	257.62	524.62	782.24
Stationery and Office Supplies	63.57	19.84	83.41
Gas, Lubricants—Auto Equipment	1,183.10	1,947.99	3,131.09
Medical and Hospital Supplies	304.52	13.56	318.08
Clothing and Sewing Supplies	35.43	383.75	419.18
Forage—Animal Care	8,733.76	150.22	8,883.98
Fuel	1,576.57	244.73	1,821.30
Maintenance and Construction Material	4,807.69	23,218.57	28,026.26
Miscellaneous Material and Supplies	8,261.48	2,388.20	10,649.68
Annuities and Pensions	599.30	1,980.32	2,579.62
Land and Interests in Land	.....	296.00	296.00
Buildings and Improvements	.....	10.81	10.81
Motor Vehicles	4,977.94	19,140.18	24,118.12
Furniture and Fixtures	104.70	418.98	523.68
Livestock	50.00	.....	50.00
Other Equipment	457.76	2,359.24	2,817.00
Totals	$91,540.54	$120,195.45	$211,735.99

Division of Lands and Minerals

RAY D. NOLAN, *Director*

INTRODUCTION

During the period covered by this biennial report this nation and our allies saw the victorious end of World War II, and any report on minerals would be incomplete without some reference to Minnesota's contribution of two-thirds of all of the domestic iron consumed during the war.

From 1941 to 1945, inclusive, Minnesota produced and shipped 338,748,000 tons of iron ore; and over 93% of this tonnage came from the same national stockpile that was used in World War I, namely, the open pit iron mines of Minnesota.

Figures mean little to the average citizen as the world has been bogged down during the last few years by the radio and press with statistics of every description, but some idea of the enormous amount of iron ore that was produced during the war period in Minnesota may be gained by the following example:

A 10,000-ton iron ore lake boat is about 525 feet long, and it would take about ten of these, end to end, to cover a mile. If Minnesota's war-time shipments of iron ore were loaded into 10,000-ton boats and they were placed end to end, they would span the Atlantic Ocean from New York to Liverpool, a distance of 3,162 miles; and you would still have enough boats left over if stacked vertically to build an observation tower 200 miles high to view the flight of rocket planes that may some day be soaring to Mars.

Over 5,000 of these 10,000-ton ore carriers could have been loaded from state-owned mines, as 15% of the total, or 50,636,909 tons, were shipped from this source during the five war years.

Shipments of iron ore from all Minnesota mines up to January 1, 1945, totaled 1,569,562,000 tons, of which 14%, or approximately 220,000,000 tons, were shipped from state-owned mines.

It is apparent that Minnesota's reserve of commercial iron ore was heavily depleted during the war period, but there still remains about 40% of the original reserve, or one billion tons.

The Minnesota Mining Directory of the University Mines Experiment Station for 1946 shows the following classification of iron ore reserves as of May 1, 1945:

Hill Annex Open Pit Mine, Calumet, Minnesota (Shown on Page 235): Showing electric shovels loading ore, electric and truck haulage, and conveyor belt system for transporting iron ore to surface.

Open Pit Direct	498,363,000 tons
Open Pit Concentrate	110,989,000 tons
Total Open Pit	609,352,000 tons
Underground Direct	388,962,000 tons
Underground Concentrate	55,851,000 tons
Total Underground	444,813,000 tons
Total Ore in Ground	1,054,165,000 tons
Total Ore in Stockpile	11,333,000 tons
Total Minnesota Reserve	1,065,498,000 tons

Forty per cent of the remaining commercial reserve of Minnesota iron ore consists of underground ore, which in a few short years will undoubtedly exceed the open pit reserve, as less than than 7% of our war-time shipments came from underground mines. If we should be so unfortunate as to have another war within twenty-five years, our commercial reserve of open pit ore, which served as a stockpile for the last two wars, will probably be exhausted, and a stockpile of iron ore for use in a future emergency should be established.

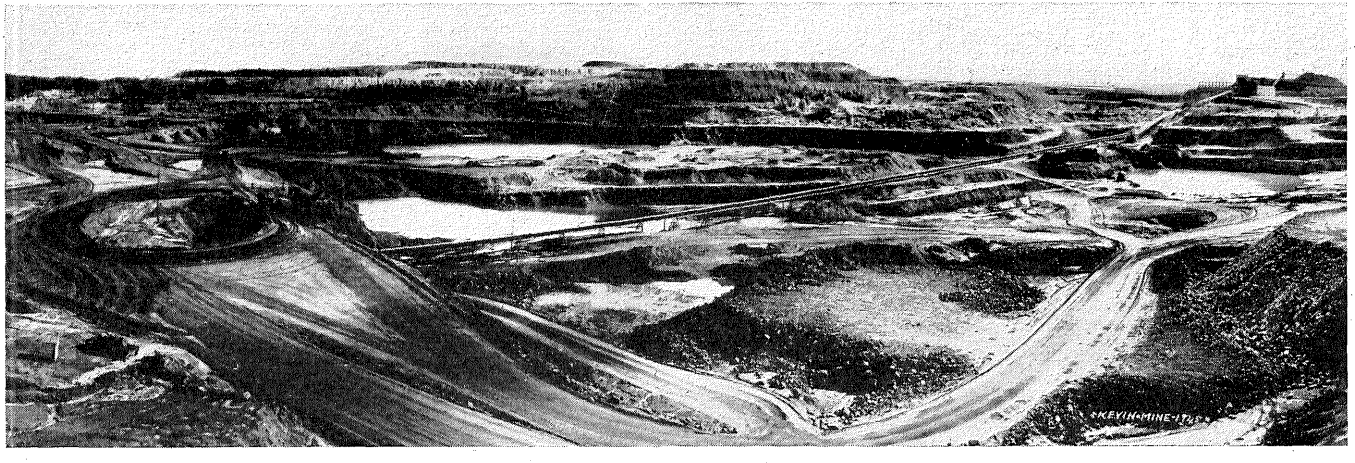
An Iron Ore Stockpile for National Defense

The 79th Congress laid the groundwork for such a stockpile by enacting a law known as the "Strategic and Critical Materials Stockpiling Act," approved by the President on July 23, 1946. Despite the development of the atomic bomb and the opposition from some sources to any national stockpile of strategic materials, congress clearly recognized the necessity of such a national stockpile, and this is evidenced by Section 1 of the stockpiling act which reads as follows:

"That the natural resources of the United States in certain strategic and critical materials being deficient or insufficiently developed to supply the industrial, military, and naval needs of the country for common defense, it is the policy of the Congress and the purpose and intent of this Act to provide for the acquisition and retention of stocks of these materials and to encourage the conservation and development of sources of these materials within the United States, and thereby decrease and prevent wherever possible a dangerous and costly dependence of the United States upon foreign nations for supplies of these materials in times of national emergency."

However, the stockpiling act does not designate the materials to be stockpiled. Under the act the Secretary of War, Secretary of Navy and the Secretary of the Interior, acting jointly through the agency of the Army and Navy Munitions Board, are authorized and directed to determine, from time to time, which materials shall be stockpiled under the provisions of the act. The law further provides:

"In determining the materials which are strategic and critical and the quality and quantities of same to be acquired the Secretaries of State,



Kevin Mine showing electric shovel loading, and trucks hauling low grade iron ore to screening plant in bottom of pit; the longest continuous conveyor belt on the Mesabi Range (3,530 feet) transports the screened ore to the Patrick Concentrating Plant shown in the background.

Treasury, Agriculture, and Commerce shall each designate representatives to cooperate with the Secretary of War, the Secretary of the Navy, and the Secretary of the Interior in carrying out the provisions of this Act."

Under normal conditions there would be no need of a stockpile of iron ore as there still exists a large reserve throughout the United States; but except for the open pit ore that still remains in Minnesota, there is no reserve of iron ore anywhere in the nation that can be mined and produced on a basis comparable to Minnesota's performance in the last two wars.

A plan for stockpiling underground iron ore and taconite concentrates has already been proposed by the Mesaba Range Municipalities and Civic Association and the state to the federal officials who will administer the stockpiling act.

Authorities agree that being prepared is the best way to prevent war and they also agree that any future war will begin on short notice without the opportunity that this nation had in World War II of organizing its resources after war was declared. For this reason it is apparent that this nation should have at least a two years' war supply, or approximately 200,000,000 tons of iron ore stockpiled at the lower lakes to replace the stockpile of Minnesota open pit ore which saved the nation from disaster in World War I and World War II.

An iron ore stockpiling program will be difficult to establish as some government officials have not been convinced that Minnesota's open pit stockpile will not be available for another emergency. Appropriations allotted for the stockpiling of strategic materials will be limited, and competition from the producers of other strategic minerals will be a strong factor in eliminating iron ore from the program. There is also a question as to whether or not the iron mining industry approves such a program, having in mind that it might interfere with the economic future of the industry. However, in view of the fact that any stockpiled material will be under the control of congress, there is very little likelihood that stockpiled iron ore would be returned to the open market if not needed for national defense purposes, except in an orderly manner that will not interfere with the normal operation of the mining industry.

One thing is certain. It will take the combined efforts of the iron range communities, the state and the iron mining industry to promote a stockpiling program of iron ore. In addition to achieving the primary goal of establishing a stockpile that is needed for national defense, such a program would stimulate underground mining, the concentration of taconite, and tend to stabilize employment in the mining districts by employing men during the winter months who are normally unemployed due to the seasonal nature of open pit mining.

New Mineral Laws

In order to keep pace with the progress that is being made in open pit mining and in the concentration of low grade iron ore, it becomes necessary to go before the legislature each session and propose new mineral laws or

to suggest amendments to existing laws. During the 1945 session several laws and amendments were passed which will promote the development of low grade iron ore and taconite. Two of these affect the development of taconite as follows:

Laws 1945, Chapter 275, grants the power of eminent domain to any corporation engaged in, or proposing to engage in, the business of mining and beneficiating taconite, and authorizes the commissioner of conservation to grant permits and leases on or across lands owned by the state for the purpose of depositing stripping, lean ore, tailings or waste products of any taconite operation.

Laws 1945, Chapter 283, is an act relating to the use of the water of Birch Lake and the damming and use of the water of Dunka River flowing into Birch Lake and of the state lands adjacent thereto, in the aid of the concentration of taconite.

At the end of the last biennium the state had approximately 19 million tons of lean ore material in stockpiles stored on properties which were not under mineral lease, but this stockpiled ore could not be leased for the reason that our iron ore lease laws only applied to unmined ore.

Laws 1945, Chapter 342, authorized the commissioner of conservation to divide all stockpiled iron ore belonging to the state into mining units, and to issue permits and leases on this stockpiled material under the same terms and conditions governing unmined state-owned iron ore, with the exception of some minor changes which naturally would apply to stockpiled iron ore.

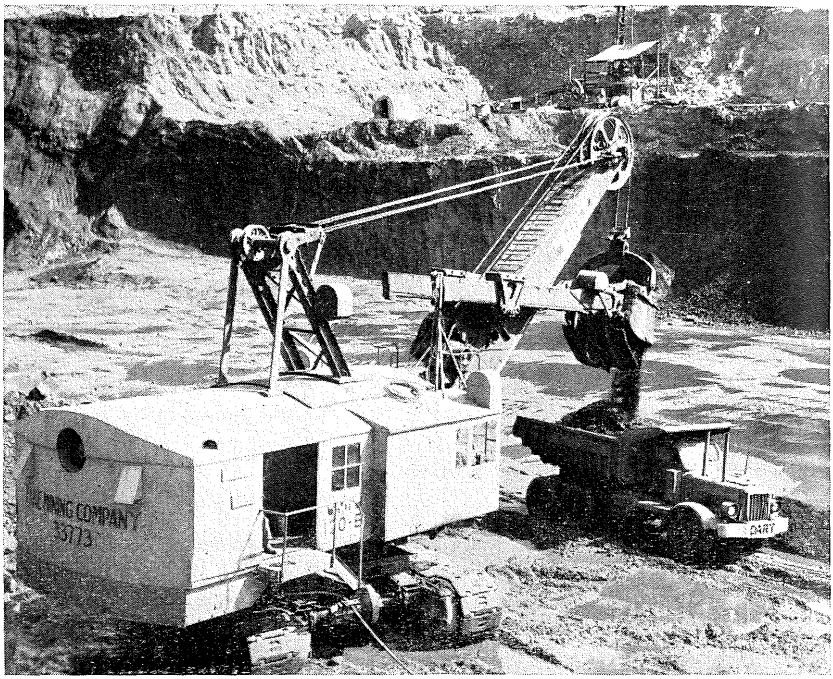
Under this stockpile act, five iron ore prospecting permits were awarded during the biennium covering approximately 15 million tons of stockpiled lean ore and taconite. These five permits cover seven stockpiles as shown in Table 14 of this report.

Early in July of 1946 one of these permits was converted into a taconite mining lease and covered the Missabe Mountain-Minnewas taconite stockpile. The other was converted into an iron mining lease and covered the Missabe Mountain-Minnewas lean ore stockpile.

One other act was passed dealing with low grade iron ore — Laws 1945, Chapter 321 — which authorizes the commissioner of conservation to grant leases and licenses for terms not exceeding twenty-five years on any public lake not exceeding 160 acres in area, for the purpose of depositing tailings from any iron ore beneficiation plant. No permit or lease may be issued until a public hearing has been held under the Water Control Act, Laws 1937, Chapter 468, and it has been determined "that such use of each lake is necessary and in the best interests of the public, . . ." To date no permit or lease has been issued under this act.

Lake Bed Iron Ore

In 1909 the legislature reserved for the state all iron ores and other minerals located beneath the waters of public lakes and rivers. Under Laws



Embarrass Mine showing 120-ton electric shovel with 5 cubic yard dipper loading ore into 20-ton trucks to be transported to surface crushing plant. Drill in background is boring a 30-inch hole for deep well drainage.

1917, Chapter 110, the state issued two lake bed leases — one in 1918 which covered the bed of Syracuse Lake located on the Mesabi Range between Biwabik and Aurora, and the other in 1924 covering a portion of the east bay of Rabbit Lake which is located near Crosby on the Cuyuna Range.

The riparian owners of the land bordering on each of these lake beds questioned the state's ownership of this lake bed iron ore. In 1945 the attorney general filed an action in the district court of Saint Louis county to determine the title of the Syracuse Lake bed. In April, 1946, the district court held that the state is the owner of the lake bed below low water mark in its sovereign, governmental capacity, with the right to dispose of the lake bed iron ore by lease.

The Syracuse Lake bed is a part of the Embarrass mine which is being operated by Pickands-Mather and Company of Cleveland for the state's lessee, the Lake Mining Company of Saint Paul. The mining of this lake bed iron ore was started in June, 1944, and up to June 30, 1946, the production from this lake bed totaled 1,788,830 tons.

Mining operations have not been started in the Rabbit Lake mine, but the draining of the east bay of Rabbit Lake, which was started in June, 1945,

has been completed, and the mining of this lake bed iron ore will undoubtedly be started during the next biennium.

The two existing lake bed leases which were issued under Laws 1917, Chapter 110, provide for a royalty of 50c a ton on the ore as mined. In 1943 the legislature enacted our present lake bed iron ore law, Chapter 208, under which royalty is based on the iron content of the ore when shipped, and the minimum royalties are the same as those provided for in our regular iron ore lease law, Laws 1941, Chapter 546, as amended. To date no leases have been issued under this act but a number of prospecting permits have been awarded and considerable lake bed exploration has been conducted. The court's decision in regard to the ownership of lake bed iron ore will undoubtedly stimulate the mining of lake bed ore, and lake bed leases will probably be issued under existing iron ore prospecting permits.

Mineral Research

Minnesota's new iron ore lease laws have resulted in the leasing and development of most state-owned mines which contain a known tonnage of ore, including marginal ore deposits, and have also resulted in the leasing of over 5,000 acres of state-owned taconite lands. Twelve new taconite leases were issued during the biennium, bringing the total to 56. As indicated elsewhere in this report, 44 of these cover trust fund lands and 12 tax-forfeited mining units.

An extensive program of exploration and research on taconite has been carried on by Pickands-Mather and Company since 1941 for the affiliated companies who hold most of the state taconite leases.

In March of 1946 the Reserve Mining Company acquired two state taconite leases. This company already owns or has under lease a large section of the magnetic taconite formation which is located on the eastern end of the Mesabi Range. The University Mines Experiment Station has been working on magnetic taconite for a long period of time; and as a process has been developed for separating the iron from the magnetic taconite or low grade magnetite, it is possible that this company will construct a commercial concentrating plant some time in the near future if the overall cost of delivering taconite concentrates to the furnaces is not too high.

The two taconite laws, Chapter 275 and Chapter 283, enacted in 1945, one of which grants the power of eminent domain to any corporation engaged in the mining of taconite, and the other dealing with the use of the waters of Birch Lake and Dunka River, were passed by the legislature to pave the way for the development of a proposed taconite plant to be built by the Reserve Mining Company on the eastern end of the Mesabi Range.

During the biennium many of the mining companies in Minnesota have constructed or established research laboratories, and most of the companies have enlarged their mineral research programs in order to develop iron ore reserves to replace the high grade ore which is being rapidly depleted.

Due to the war-time reduction of personnel, the research section of this division has been mainly engaged in ore examination, ore testing and other laboratory work required in connection with the operation of our state-owned mines. The termination of the war resulted in a reduction of the exploration work conducted by mining operators during the last year of the biennium. Despite this reduction in exploration work, our research section received, classified and filed samples representing 35,570 feet of exploration work or almost seven miles of vertical drilling on state-owned mineral lands.

During the biennium a Dings magnetic separator was added to our laboratory equipment to be used primarily in connection with the study of magnetic taconite. Our present research quarters are inadequate; but as a result of the appropriation received from the 1945 legislature, a new laboratory will be built during the next biennium and our normal program of research can be resumed.

New Mines and Minerals Building

Laws 1941, Chapter 529, Section 1, Sub-division 11, provided: "For a mines and minerals building at Hibbing, Minnesota.....$75,000

"Provided that the money appropriated by this subdivision shall not be available until satisfactory sale has been made of the existing building and provided further, that the proceeds of the sale of the existing building shall be deposited in the Minnesota state building fund to reduce the amount of bonds by the amount so deposited authorized to be issued under this act."

Due to the fact that the appropriation was inadequate to construct a proper building, and to the further fact that our present building could not be sold, as it is located in North Hibbing at the edge of the Hull-Rust-Mahoning open pit mine, no action could be taken in regard to the construction of a new engineering and research building to replace the present division headquarters at Hibbing.

Through the cooperation of the department of administration and the 1945 legislature, the original building appropriation of $75,000 was made available without the restriction that the old building had to be sold, and an additional $75,000 was appropriated to make available $150,000 for the construction of a new mines and minerals building at Hibbing.

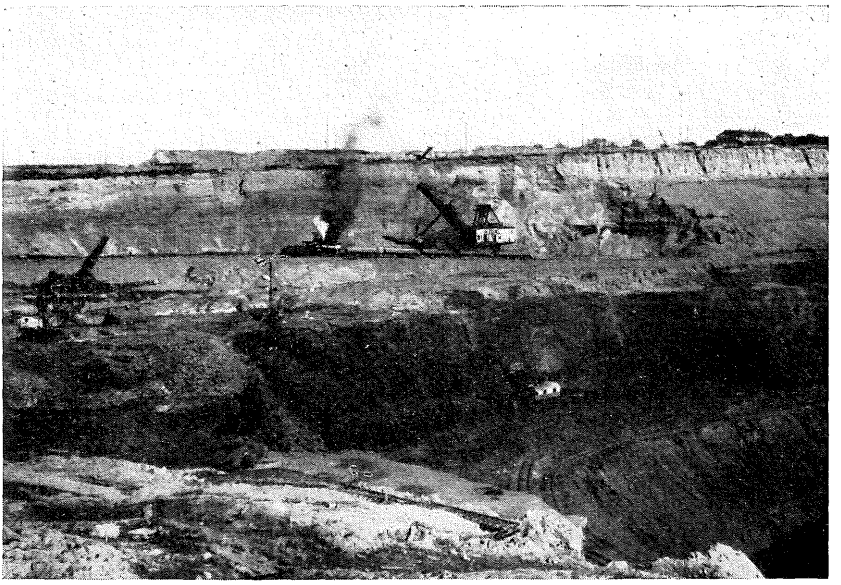
The Village of Hibbing is cooperating with the state in furnishing a site which will be located in the west section of Bennett Park on the corner of Sixteenth Street and Third Avenue, a short distance from the business section of South Hibbing.

Present plans include a general engineering and office section, a research laboratory section, a chemical laboratory section, and a 10-car storage garage and repair shop. This building will be erected as soon as building material is available. These new quarters will make possible a more efficient administration of our state-owned mines and the expansion of our mineral research program.

Land and Mineral Revenue

Article 4, Section 32, and Article 8, Sections 2 and 4 of the constitution, provide that the principal income derived from certain state lands shall be forever preserved inviolate and undiminished. Under these two articles, the permanent trust funds of the state were established.

An additional source of revenue was provided when an amendment to Article 9 of the constitution was adopted November 4, 1922. It provides that one-half of the occupational tax paid on iron ore is to be added annually to the public school and university trust funds.



Scranton Mine West Extension showing 300-ton shovel loading surface stripping; 120-ton shovel loading ore on a bench 100 feet below top of ore. The water level shown in bottom of pit is maintained by pumping while upper ore is being mined in pit extension.

During the biennium ended June 30, 1946, permanent trust funds show an increase of $17,008,983.53. Of this amount $9,569,107.13 was derived from the sale and leasing of state lands and minerals. Of the latter amount $8,967,193.86 represents revenue from iron ore and other mineral prospecting permits and leases.

On June 30, 1946, the state treasurer reported that the permanent trust funds of the state totaled $149,877,982.38, shown by funds and totals in Table 1.

TABLE 1

Permanent Trust Funds, June 30, 1946

Permanent School Fund	$115,660,551.60
Permanent University Fund	19,376,056.60
Swamp Land Fund	14,551,567.46
Internal Improvement Land Fund	289,806.72
Total Permanent Trust Funds	$149,877,982.38

The annual income from the permanent trust funds is distributed to our public schools, the State University and other state educational and charitable institutions.

During the two years ending June 30, 1946, the revenue derived from the sale and lease of state lands and minerals totaled $9,585,194.62, as shown in Table 2. This represents an increase over the previous biennium of $364,527.45.

TABLE 2

Revenue Derived from Trust Fund and Tax-Forfeited Lands
Biennium Ending June 30, 1946

	Fiscal Year Ending June 30, 1945	Fiscal Year Ending June 30, 1946
Revenue from Iron Ore and Other Mineral Permits and Leases	$4,777,493.76	$4,189,700.10
Principal Payments on Land Contracts	172,674.62	283,676.27
Interest and Penalty Payments	35,225.34	53,862.99
Lease Rentals	36,383.46	36,178.08
Total	$5,021,777.18	$4,563,417.44

Table 3 shows the amount expended from appropriations for salaries, supplies and expenses made by the legislature from the general revenue fund. The administration expense as compared to total revenue amounts to approximately two and three-quarters per cent, as indicated in Figure 1.

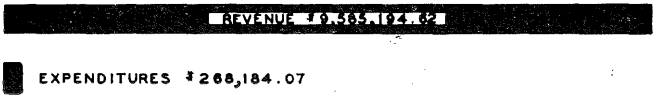
TABLE 3

Administration Expense
Biennium Ending June 30, 1946

	Fiscal Year Ending June 30, 1945	Fiscal Year Ending June 30, 1946
Salaries	$101,829.71	$119,528.82
Supplies and Expense	17,421.95	18,533.13
Testing Low Grade Ore	5,008.20	5,862.26
Total	$124,259.86	$143,924.21

FIGURE 1

GRAPH SHOWING COMPARISON OF ADMINISTRATION EXPENSE WITH REVENUE DERIVED FROM TRUST FUND AND TAX FORFEITED LANDS, FOR BIENNIUM ENDING JUNE 30, 1946.

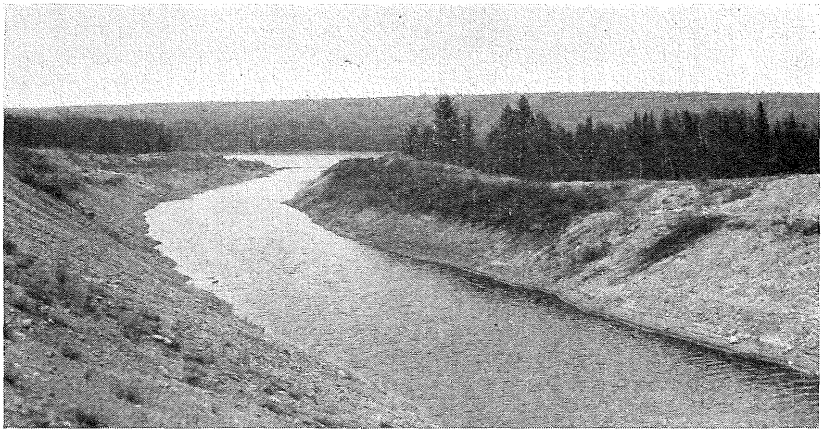


Iron Ore Leases

Under our state mineral laws, minerals are not sold. State lands containing minerals are leased for a period of years and a royalty is paid to the state for each ton of ore mined. Mineral leases provide for an annual minimum royalty, or ground rental, when no ore is mined.

In Table 4 the minimum iron ore royalty rates in cents per ton, as established by the legislature in Laws 1941, Chapter 546, are shown. These are the minimum royalties which may be accepted. The prospective lessee may offer a higher rate.

Table 5 gives the factors which may be used to calculate the royalty rate from the base royalty bid for 25% dried iron in Schedules 1 to 6 and 40% dried iron in Schedule 7.



Embarrass Mine Diversion Channel

TABLE No. 4

MINIMUM IRON ORE ROYALTY IN CENTS PER TON UNDER LAWS OF 1941, CHAPTER 546 AS AMENDED

DRIED IRON	Schedule 1 Open Pit Direct	Schedule 2 Open Pit Wash Concentrate	Schedule 3 Other Open Pit Concentrate	Schedule 4 Underground Direct	Schedule 5 Underground Wash Concentrate	Schedule 6 Other Underground Concentrate	Schedule 7 Taconite Concentrate
25%	12.00	12.00	12.00	11.00	11.00	11.00	.....
26%	12.60	12.54	12.48	11.39	11.33	11.22	.....
27%	13.23	13.10	12.98	11.78	11.67	11.44	.....
28%	13.89	13.69	13.50	12.20	12.02	11.67	.....
29%	14.59	14.31	14.04	12.62	12.38	11.91	.....
30%	15.32	14.95	14.60	13.06	12.75	12.15	.....
31%	16.08	15.63	15.18	13.52	13.14	12.39	.....
32%	16.89	16.33	15.79	14.00	13.53	12.64	.....
33%	17.73	17.07	16.42	14.48	13.93	12.89	.....
34%	18.62	17.83	17.08	14.99	14.35	13.15	.....
35%	19.55	18.64	17.76	15.52	14.78	13.41	.....
36%	20.52	19.47	18.47	16.06	15.23	13.68	.....
37%	21.55	20.35	19.21	16.62	15.68	13.95	.....
38%	22.63	21.27	19.98	17.20	16.15	14.23	.....
39%	23.76	22.22	20.78	17.81	16.64	14.51	.....
40%	24.95	23.22	21.61	18.43	17.14	14.80	11.00
41%	26.19	24.27	22.48	19.07	17.65	15.10	11.11
42%	27.50	25.36	23.37	19.74	18.18	15.40	11.22
43%	28.88	26.50	24.31	20.43	18.73	15.71	11.33
44%	30.32	27.69	25.28	21.15	19.29	16.02	11.45
45%	31.84	28.94	26.29	21.89	19.87	16.34	11.56
46%	33.43	30.24	27.35	22.65	20.46	16.67	11.68
47%	35.10	31.60	28.44	23.45	21.08	17.01	11.79
48%	36.86	33.03	29.58	24.27	21.71	17.35	11.91
49%	38.70	34.51	30.76	25.12	22.36	17.69	12.03
50%	40.64	36.06	31.99	26.00	23.03	18.05	12.15
51%	42.67	37.69	33.27	26.91	23.72	18.41	12.27
52%	44.80	39.38	34.60	27.85	24.43	18.78	12.39
53%	47.04	41.16	35.98	28.82	25.17	19.15	12.52
54%	49.39	43.01	37.42	29.83	25.92	19.53	12.64
55%	51.86	44.94	38.92	30.87	26.70	19.93	12.77
56%	54.46	46.97	40.48	31.96	27.50	20.32	12.90
57%	57.18	49.08	42.10	33.07	28.33	20.73	13.03
58%	60.04	51.29	43.78	34.23	29.18	21.14	13.16
59%	63.04	53.60	45.53	35.43	30.05	21.57	13.29
60%	66.19	56.01	47.35	36.67	30.95	22.00	13.42
61%	69.50	58.53	49.25	37.95	31.88	22.44	13.56
62%	72.98	61.16	51.22	39.28	32.84	22.89	13.69
63%	76.63	63.91	53.27	40.66	33.82	23.35	13.83
64%	80.46	66.79	55.40	42.08	34.84	23.81	13.97
65%	84.48	69.80	57.61	43.55	35.88	24.29	14.11

TABLE No. 5

TABLE FOR CALCULATING STATE IRON ORE LEASE ROYALTIES UNDER LAWS OF 1941, CHAPTER 546, AS AMENDED

To obtain the royalty rate per ton for any dried iron analysis, multiply the factor shown in table by the base royalty bid for 25% dried iron in Schedules 1 to 6, inclusive, and for 40% dried iron in Schedule 7.

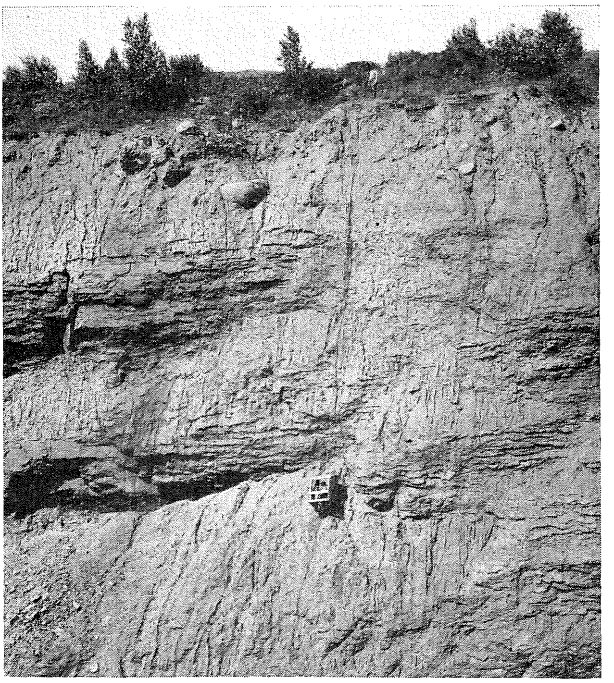
Dried Iron Per Cent	Schedule 1 5%	Schedule 2 4½%	Schedule 3 4%	Schedule 4 3½%	Schedule 5 3%	Schedule 6 2%	Schedule 7 1%
25	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	.....
26	1.0500	1.0450	1.0400	1.0350	1.0300	1.0200	.....
27	1.1025	1.0920	1.0816	1.0712	1.0609	1.0404	.....
28	1.1576	1.1412	1.1249	1.1087	1.0927	1.0612	.....
29	1.2155	1.1925	1.1699	1.1475	1.1255	1.0824	.....
30	1.2763	1.2462	1.2167	1.1877	1.1593	1.1041	.....
31	1.3401	1.3023	1.2653	1.2293	1.1941	1.1262	.....
32	1.4071	1.3609	1.3159	1.2723	1.2299	1.1487	.....
33	1.4775	1.4221	1.3686	1.3168	1.2668	1.1717	.....
34	1.5513	1.4861	1.4233	1.3629	1.3048	1.1951	.....
35	1.6289	1.5530	1.4802	1.4106	1.3439	1.2190	.....
36	1.7103	1.6229	1.5395	1.4600	1.3842	1.2434	.....
37	1.7959	1.6959	1.6010	1.5111	1.4258	1.2682	.....
38	1.8856	1.7722	1.6651	1.5640	1.4685	1.2936	.....
39	1.9799	1.8519	1.7317	1.6187	1.5126	1.3195	.....
40	2.0789	1.9353	1.8009	1.6753	1.5580	1.3459	1.0000
41	2.1829	2.0224	1.8730	1.7340	1.6047	1.3728	1.0100
42	2.2920	2.1134	1.9479	1.7947	1.6528	1.4002	1.0201
43	2.4066	2.2085	2.0258	1.8575	1.7024	1.4282	1.0303
44	2.5270	2.3079	2.1068	1.9225	1.7535	1.4568	1.0406
45	2.6533	2.4117	2.1911	1.9898	1.8061	1.4859	1.0510
46	2.7860	2.5202	2.2788	2.0594	1.8603	1.5157	1.0615
47	2.9253	2.6337	2.3699	2.1315	1.9161	1.5460	1.0721
48	3.0715	2.7522	2.4647	2.2061	1.9736	1.5769	1.0829
49	3.2251	2.8760	2.5633	2.2833	2.0328	1.6084	1.0937
50	3.3864	3.0054	2.6658	2.3632	2.0938	1.6406	1.1046
51	3.5557	3.1407	2.7725	2.4460	2.1566	1.6734	1.1157
52	3.7335	3.2820	2.8834	2.5316	2.2213	1.7069	1.1268
53	3.9201	3.4297	2.9987	2.6202	2.2879	1.7410	1.1381
54	4.1161	3.5840	3.1187	2.7119	2.3566	1.7758	1.1495
55	4.3219	3.7453	3.2434	2.8068	2.4273	1.8114	1.1610
56	4.5380	3.9139	3.3731	2.9050	2.5001	1.8476	1.1726
57	4.7649	4.0900	3.5081	3.0067	2.5751	1.8845	1.1843
58	5.0032	4.2740	3.6484	3.1119	2.6523	1.9222	1.1961
59	5.2533	4.4664	3.7943	3.2209	2.7319	1.9607	1.2081
60	5.5160	4.6673	3.9461	3.3336	2.8139	1.9999	1.2202
61	5.7918	4.8774	4.1039	3.4503	2.8983	2.0399	1.2324
62	6.0814	5.0969	4.2681	3.5710	2.9852	2.0807	1.2447
63	6.3855	5.3262	4.4388	3.6960	3.0748	2.1223	1.2572
64	6.7048	5.5659	4.6164	3.8254	3.1670	2.1647	1.2697
65	7.0400	5.8164	4.8010	3.9593	3.2620	2.2080	1.2824

Under existing mineral laws, there were on June 30, 1946, 101 iron ore mining leases in effect on state-owned lands and mineral rights. Of these, 45 were iron ore leases on state-owned school, swamp and university lands. The 45 leases cover 34 mines which are operated or held by 22 separate companies and individuals. One of these leases is held under Laws 1943, Chapter 277, commonly known as the "Wild Cat" law.

In addition to the 45 iron ore leases, there were 56 taconite leases in effect as follows: 29 on school lands, 14 on University lands, 1 on swamp land and 12 on tax-forfeited lands. Most of these taconite leases are owned by affiliates of Pickands-Mather & Co. as follows: 12 by the Erie Mining Company, 12 by the Huron Land Co. and 25 by the Ontario Iron Co., all of Cleveland, Ohio.

During the biennium just ended the Reserve Mining Co. of Ramsey, Michigan, acquired 2 taconite iron mining leases on school lands which adjoin the magnetic taconite deposit near Babbit formerly operated by the Mesabi Iron Company and J. A. MacKillican of Hibbing, Minnesota, was issued 5 taconite iron mining leases, 4 on University lands and 1 on school land.

The individual data for all leases in effect on June 30, 1946, are shown in Tables 6 to 11 inclusive.



Division employees check sampling on 85 foot ore bank in a state-owned mine by means of a safety cage lowered from crest of open pit. Note shallow depth of surface above ore (15 feet).

TABLE No. 6

IRON ORE LEASES ON STATE SCHOOL LANDS, JUNE 30, 1946

Name	Lease No.	Description	Expires	Lessee	Sub-Lessee or Operator
Atkins	2014	SW NW, 12-58-19	1992	Inland Steel Co	Inland Steel Co.
Buckeye	2012	W½ NE, 36-56-25	1992	Evergreen Mines Co	Hanna Ore Mining Co.
Buckeye	2013	E½ NW, 36-56-25	1992	Evergreen Mines Co	Hanna Ore Mining Co.
Buckeye	2017	E½ NE, 36-56-25	1993	Evergreen Mines Co	Hanna Ore Mining Co.
Duncan	2005	SW SW, 26-58-20; SE SE, 27-58-20	1992	Evergreen Mines Co	Hanna Ore Mining Co.
Embarrass Lake Mine	Lake Bed Lease No. 1	Ore beneath Syracuse Lake Portions of several Lots in Sections 5 and 6, 58-15	1968	Lake Mining Co	Pickands-Mather & Co.
Frantz	2032	NW NW, 21-58-19	1996	J. A. MacKillican	J. A. MacKillican
*Grant	174	NE NW, S½ NW & NW SW, 20-58-19	1952	Inter-State Iron Co	Inter-State Iron Co.
Hill Annex	374	SE¼, 16-56-23	1950	Arthur Iron Mining Co	Inter-State Iron Co.
Hill Annex	375	SW¼, 16-56-23	1950	Arthur Iron Mining Co	Inter-State Iron Co.
Hill Annex	377	NW¼, 16-56-23	1950	Arthur Iron Mining Co	Inter-State Iron Co.
Hill Annex	378	NE¼, 16-56-23	1950	Arthur Iron Mining Co	Inter-State Iron Co.
*Leonidas	221	NE¼, 36-58-18	1965	Oliver Iron Mining Co	Oliver Iron Mining Co.
*Leonidas	224	SE¼, 36-58-18	1965	Oliver Iron Mining Co	Oliver Iron Mining Co.
Martin	2006	Lot 2 (NW NW) 16-46-29	1992	Evergreen Mines Co	Hanna Ore Mining Co.
Minnewas	2028	W½ SW, 16-58-17	1994	Inter-Range Mining Co	Inter-Range Mining Co.
Minnewas	2029	W½ NW, 16-58-17	1994	Inter-Range Mining Co	Inter-Range Mining Co.
Missabe Mountain	2018	E½ NE, 8-58-17	1993	Charleson Iron Mining Co	Charleson Iron Mining Co.
Missabe Mountain	2019	W½ NE, 8-58-17	1993	Charleson Iron Mining Co	Charleson Iron Mining Co.
Morton	2035	SW SW, 11-57-21 & NW NW, 14-57-21	1996	J. A. MacKillican	J. A. MacKillican
Oliver Reserve	480	SE NE, 9-58-18	1952	Oliver Iron Mining Co	Oliver Iron Mining Co.
Oliver Reserve	569	SE SE, 4-58-18	1952	Oliver Iron Mining Co	Oliver Iron Mining Co.
Prindle	449	SE¼, 36-59-18	1951	Oliver Iron Mining Co	Oliver Iron Mining Co.
Prindle	451	NE¼, 36-59-18	1951	Oliver Iron Mining Co	Oliver Iron Mining Co.
Rabbit Lake Mine	Lake Bed Lease No. 2	Ore beneath part of Rabbit Lake, Sec. 20, 29 & 30, 47-28	1974	Youngstown Mines Corp	Pickands-Mather & Co.
Tioga No. 2 Reserve	671	Lots 3, 4 & 6, 26-55-26	1956	Clement K. Quinn	Clement K. Quinn
Wacoutah	387	SE SW & S½ SE, 3-58-18	1950	Wheeling Steel Corp	Wheeling Steel Corp.

*Lease extended under Laws 1937, Chapter 488.

TABLE No. 7

IRON ORE LEASES ON STATE SWAMP LANDS, JUNE 30, 1946

Name	Lease No.	Description	Lease Expires	Lessee	Sub-Lessee or Operator
Gray Reserve	2030	E½ NW, 14-57-21	1994	Butler Brothers	Butler Brothers
Gray Reserve	2031	N½ NE, 14-57-21	1994	Butler Brothers	Butler Brothers
*Scranton	392	N½ NE & SW NE, 12-57-21	1960	Hoyt Mining Co	Pickands-Mather & Co.
Tioga No. 1 Reserve	675	Lots 3 and 8, 34-55-26	1956	Ford Motor Co	North Range Mining Co.
*Warben	752	SW SE, SE SW, 4-63-9	1965	Warben Land Co	Warben Land Co.
Wearne	775	SW SE, 2-46-29	1957	Geo. H. Crosby, et al	Hanna Ore Mining Co.
Weggum	2016	E½ SE, 6-57-20	1992	Philbin Mining Co	Butler Brothers

*Lease extended under Laws 1937, Chapter 488.

TABLE No. 8

IRON ORE LEASES ON STATE UNIVERSITY LANDS, JUNE 30, 1946

Name	Lease No.	Description	Expires	Lessee	Sub-Lessee or Operator
Bennett Reserve	2033	E½ SE, 24-57-22	1996	J. A. MacKillican	J. A. MacKillican
Kevin	376	SE NW, N½ SW, SW SW, 1-56-23	1950	Arthur Iron Mining Co	Butler Brothers
Majorca	2034	S½ SW, 9-56-23	1996	J. A. MacKillican	J. A. MacKillican
Mesabi Chief	2025	W½ SW, 23-57-22	1993	Hanna Ore Mining Co	Hanna Ore Mining Co.
Mesabi Chief	2027	NE SW, 23-57-22	1994	Hanna Ore Mining Co	Hanna Ore Mining Co.
Mississippi No. 1	355	W½ NE, 23-57-22	1949	Arthur Iron Mining Co	Hanna Ore Mining Co.
Mississippi No. 2	356	S½ NW, 24-57-22	1949	Arthur Iron Mining Co	Hanna Ore Mining Co.
*Stein	282	NE NW, S½ NW, 23-57-22	1958	Jacob Stein, et al	Hanna Ore Mining Co.
Sullivan No. 2 Reserve	455	SW SW, 2-56-23	1952	Hale and Sullivan	Inter-State Iron Co.
Wyman	2011	SE SW, 22-57-22	1992	Butler Brothers	Butler Brothers

*Lease extended under Laws 1937, Chapter 488.

TABLE No. 9

TACONITE LEASES ON STATE LANDS, JUNE 30, 1946

Lease No.	Description	Trust Fund	Lease Expires	Lessee	Operating Company
3001	W½ NE and SE¼ 14-59-14	University	1991	Erie Mining Co	Pickands-Mather & Co.
3002	S½ NW 14-59-14	University	1991	Erie Mining Co	Pickands-Mather & Co.
3003	SW¼ 14-59-14	University	1991	Erie Mining Co	Pickands-Mather & Co.
3004	SE NE, E½ SE, SW SE and S½ SW 15-59-14	University	1991	Erie Mining Co	Pickands-Mather & Co.
3005	SE NW 15-59-14	University	1991	Erie Mining Co	Pickands-Mather & Co.
3006	SW¼ 16-59-14	School	1991	Erie Mining Co	Pickands-Mather & Co.
3007	SE¼ 16-59-14	School	1991	Erie Mining Co	Pickands-Mather & Co.
3008	NE¼ and NE SE 22-59-14	University	1991	Erie Mining Co	Pickands-Mather & Co.
3009	E½ NE 21-59-14, NW¼ 22-59-14	University	1991	Erie Mining Co	Pickands-Mather & Co.
3010	NE¼ and E½ NW 23-59-14	University	1991	Erie Mining Co	Pickands-Mather & Co.
3011	W½ NW and SW¼ 23-59-14	University	1991	Erie Mining Co	Pickands-Mather & Co.
3012	SE¼ 36-60-14	School	1991	Erie Mining Co	Pickands-Mather & Co.
3013	N½ SW 1-58-19	School	1991	Ontario Iron Co	Pickands-Mather & Co.
3014	S½ SW 2-58-19	School	1991	Ontario Iron Co	Pickands-Mather & Co.
3015	SW SE 2-58-19	School	1991	Ontario Iron Co	Pickands-Mather & Co.
3016	NE SE 2-58-19	School	1991	Ontario Iron Co	Pickands-Mather & Co.
3017	W½ SW 9-58-19	School	1991	Ontario Iron Co	Pickands-Mather & Co.
3018	NE SW 9-58-19	School	1991	Ontario Iron Co	Pickands-Mather & Co.
3019	S½ SE 9-58-19	School	1991	Ontario Iron Co	Pickands-Mather & Co.
3020	N½ NE 10-58-19	School	1991	Ontario Iron Co	Pickands-Mather & Co.
3021	S½ NE 10-58-19	School	1991	Ontario Iron Co	Pickands-Mather & Co.
3022	S½ NW 11-58-19	School	1991	Ontario Iron Co	Pickands-Mather & Co.
3023	N½ NW 11-58-19	School	1991	Ontario Iron Co	Pickands-Mather & Co.
3024	S½ NE 11-58-19	School	1991	Ontario Iron Co	Pickands-Mather & Co.
3025	N½ NE 11-58-19	School	1991	Ontario Iron Co	Pickands-Mather & Co.
3027	E½ NW 16-58-19	School	1991	Ontario Iron Co	Pickands-Mather & Co.
3028	W½ NW 16-58-19	School	1991	Ontario Iron Co	Pickands-Mather & Co
3029	NW NE 8-57-21	Swamp	1991	Ontario Iron Co	Pickands-Mather & Co.
3030	W½ NE 36-58-21	School	1991	Ontario Iron Co	Pickands-Mather & Co.
3031	E½ NE 36-58-21	School	1991	Ontario Iron Co	Pickands-Mather & Co.
3032	E½ SW 36-58-21	School	1991	Ontario Iron Co	Pickands-Mather & Co.
3033	W½ SW 36-58-21	School	1991	Ontario Iron Co	Pickands-Mather & Co.
3034	W½ NW 36-58-21	School	1991	Ontario Iron Co	Pickands-Mather & Co.
3035	E½ NW 36-58-21	School	1991	Ontario Iron Co	Pickands-Mather & Co.
3036	NW NW 12-58-19	School	1992	Ontario Iron Co	Pickands-Mather & Co.
3037	SE¼ 36-58-21 (Pool)	School	1994	Ontario Iron Co	Pickands-Mather & Co.
3038	SE SE, 20-59-14	University	1995	Huron Land Co	Pickands-Mather & Co.
3039	SW¼, 16-60-12	School	1996	Reserve Mining Co	Oglebay, Norton & Co.

TABLE No. 9—Continued

TACONITE LEASES ON STATE LANDS, JUNE 30, 1946—Continued

Lease No.	Description	Trust Fund	Lease Expires	Lessee	Operating Company
3040	NW¼, 16-60-12	School	1996	Reserve Mining Co.	Oglebay, Norton & Co.
3041	S½ SE, 9-56-23	University	1996	J. A. MacKillican	J. A. MacKillican
3042	N½ SE, 10-56-23	University	1996	J. A. MacKillican	J. A. MacKillican
3043	SW NW, NW SW, 10-56-23	University	1996	J. A. MacKillican	J. A. MacKillican
3044	NE NE, 10-56-23; NW NW, 11-56-23	University	1996	J. A. MacKillican	J. A. MacKillican
3045	S½ SE, 16-56-24	School	1996	J. A. MacKillican	J. A. MacKillican

TABLE No. 10

TACONITE LEASES ON TAX FORFEITED LANDS, JUNE 30, 1946

Lease No.	Description	Trust Fund	Lease Expires	Lessee	Operating Company
T-5001	NW NW 14-59-14	Special	1993	Huron Land Co.	Pickands-Mather & Co.
T-5002	SW NE 24-59-15	Special	1994	Huron Land Co.	Pickands-Mather & Co.
T-5003	SW NW and SE NW 23-59-15	Special	1994	Huron Land Co.	Pickands-Mather & Co.
T-5004	NE SE 23-59-15	Special	1994	Huron Land Co.	Pickands-Mather & Co.
T-5005	SW SW 34-59-15	Special	1994	Huron Land Co.	Pickands-Mather & Co.
T-5006	SE SW and W½ SE 28-59-17	Special	1994	Huron Land Co.	Pickands-Mather & Co.
T-5007	SW NW and SE NW 33-59-17	Special	1994	Huron Land Co.	Pickands-Mather & Co.
T-5008	N½ SW 33-59-17	Special	1994	Huron Land Co.	Pickands-Mather & Co.
T-5009	NW NW, 29-59-14	Special	1995	Ontario Iron Co.	Pickands-Mather & Co.
T-5010	S½ SE and SE SW, 13-59-15	Special	1995	Huron Land Co.	Pickands-Mather & Co.
T-5011	SW SW, 28-59-15; NW NW, 33-59-15 (1)	Special	1995	Huron Land Co.	Pickands-Mather & Co.
T-5012	N½ SW, NW SE and SW NE, 15-59-14 (2)	Special	1995	Huron Land Co.	Pickands-Mather & Co.

(1) Undivided ⅞ interest in mineral rights.
(2) Undivided 14/15 interest in mineral rights.

TABLE No. 11

IRON ORE LEASE, LAWS 1943, CHAPTER 277—JUNE 30, 1946

Lease No.	Description	Trust Fund	Lease Expires	Lessee	Operating Company
I-9001	N½ NE, E½ NW 28-46-25	School	1994	Glen Development Co.	Glen Development Co.

Iron Ore Shipments

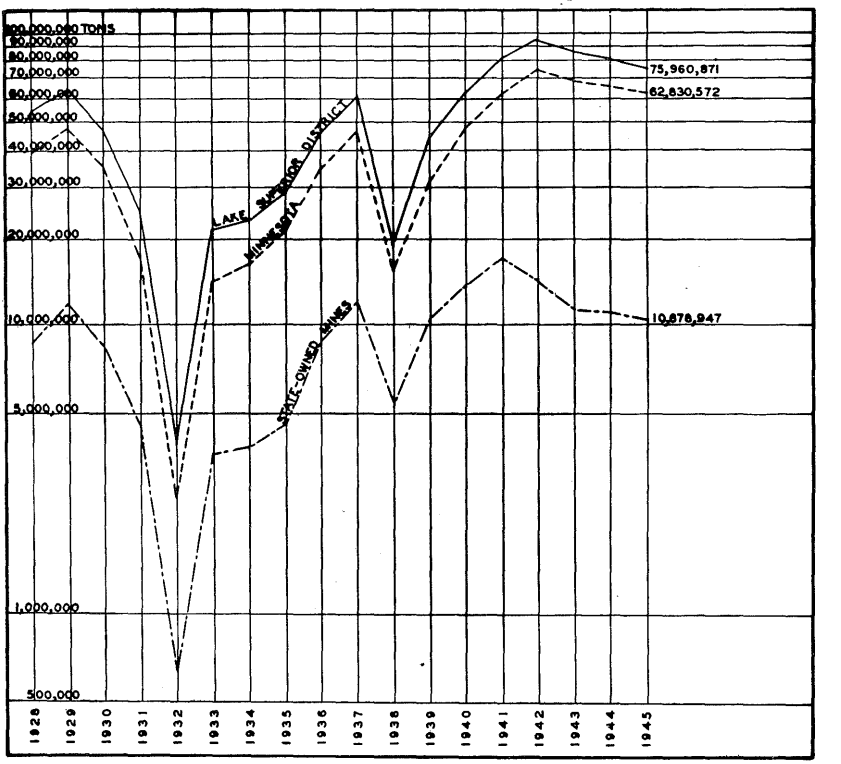
During the biennium ending June 30, 1946, 19 state-owned mines produced 19,945,194 tons of royalty ore.

In 1944 shipments from all mines in Minnesota totaled 66,586,264 tons as compared to 62,830,572 tons in 1945. Shipments from state-owned mines contributed an approximate 14% of these totals.

Production from the 19 operating state-owned mines and revenue from the inactive mines and taconite leases during the biennium ended June 30, 1946, benefited the permanent trust funds of the state by approximately $9,000,000.00. This is an increase of about $500,000.00 over the preceding biennium.

The graph following shows a comparison of the shipments from the Lake Superior district and Minnesota with royalty ore produced from state-owned mines. The trend of production follows very closely that of the Lake Superior district and the State of Minnesota.

FIGURE 2



Graph showing iron ore shipments for the Lake Superior district and Minnesota as compared with royalty ore produced from state-owned mines from 1928 through 1945.

Table 12 lists by mines and class of ore the production of state-owned mines during the biennium ending June 30, 1946. Table 13 shows total ore produced from state-owned mines to June 30, 1946. Figure 3 is a graph showing the yearly production of iron ore from state-owned mines from 1893 through 1945. Table 14 shows the lean ore material stored in stockpiles not under lease June 30, 1946. The Minnewas and Missabe Mountain stockpiles were leased in July of 1946 and permits for prospecting were in effect on five other stockpiles as of June 30, 1946.

TABLE No. 12

PRODUCTION OF IRON ORE FROM STATE-OWNED MINES

For the Biennium—June 30, 1944 to June 30, 1946

MINE	Total Royalty Tonnage	Direct Merch.	Screened Merch.	Screened and Crushed	Screened Crude	Concentrates	% Recovery	Lease No.	Issued	Expires
Atkins	338,198	338,198						2014	1942	1992
Buckeye	571,872					571,872		2012, 2013, 2017	1942	1992
Embarrass Lake Bed	1,763,959	12,468		1,751,491				Lake Bed #1	1918	1968
Grant	482,163			360,672		121,491		174	1892	1952
Hill Annex	6,050,033	63,922	73,217		5,912,894	3,842,970	65.00	374,375,377,378	1900	1950
Kevin	2,420,787				2,420,787	1,341,362	55.41	376	1900	1950
Leonidas	5,680	5,680						221-224	1892	1965
Margaret	23,261	6,009				17,252		2010	1942	Canceled
Martin	162,449	21,355		130,611	14,535	10,483	72.12	2006	1942	1992
Mesabi Chief	17,840	7,983				9,857		2025	1943	1993
Minnewas	157,388	157,388						2028-2029	1944	1994
Missabe Mountain	1,797,587	1,797,587						2018-2019	1943	1993
Mississippi No. 1	1,680,289	181,000			1,499,289	1,047,547	69.87	355	1899	1949
Prindle	1,308,941			937,734	371,207	267,881	72.16	449-451	1901	1951
Scranton	1,381,624	851,670		529,954				392	1900	1960
Stein	220,622				346,488	220,622	63.67	282	1893	1958
Wacoutah	537,916	537,916						387	1900	1950
Wearne	122,429	44,916	13,077		64,436	45,273	70.26	775	1907	1957
Weggum	902,156	61,841				840,315		2016	1942	1992
TOTALS	19,945,194	4,087,933	86,294	3,710,462	10,629,636	8,336,925				

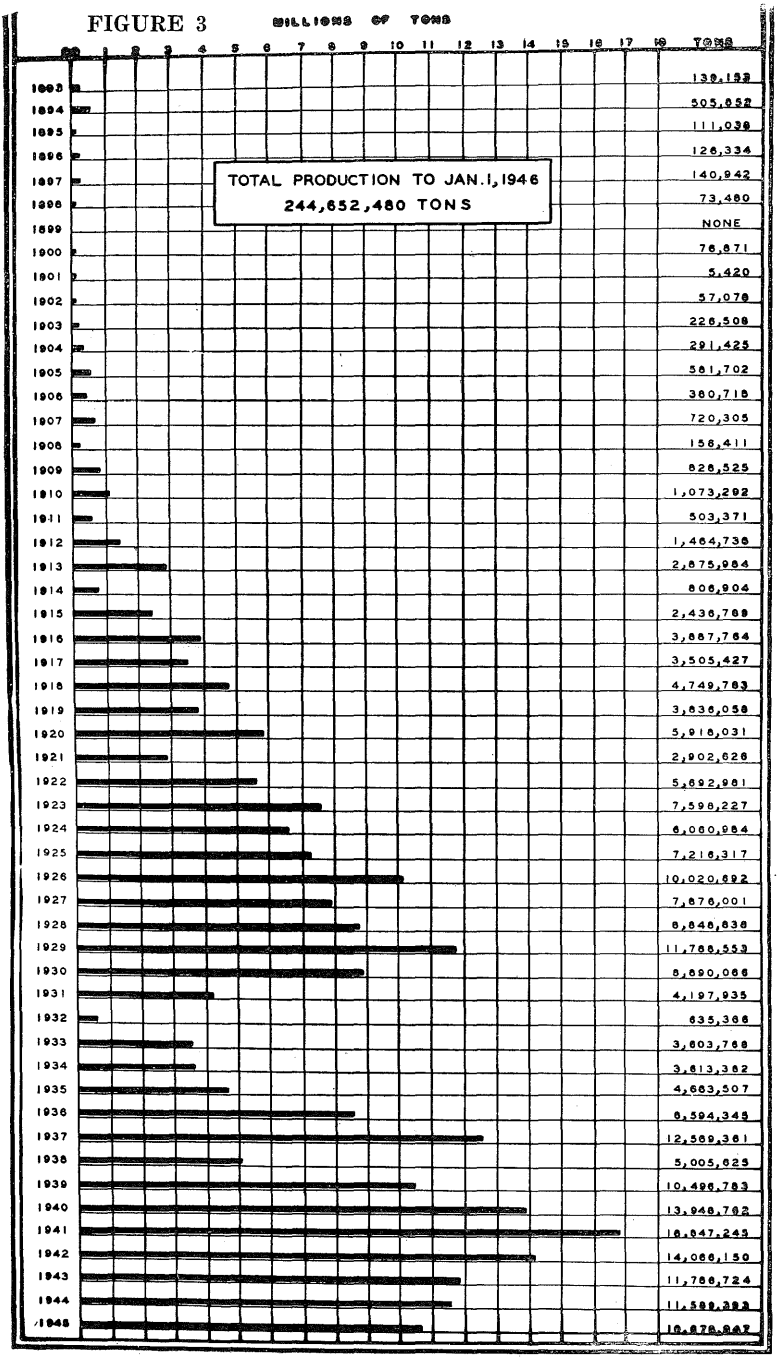
TABLE 13

Total Ore Production from State Mines to June 30, 1946

	Mine	Lease No.	Location	Tonnage
1.	Alan	2003-2004	Mt. Iron	50,091
	Hanna	364	Mt. Iron	1,661,490
2.	Alberta (Lily)	655	Virginia	136,535
3.	Atkins	2014	Kinney	710,643
4.	Barbara	415	Calumet	995,448
5.	Buckeye	2012-2013-2017	Coleraine	994,893
6.	Carson Lake	443-2015	Hibbing	5,131
7.	Cavour	699	Kinney	177,964
8.	Deacon	404	Kinney	347,512
9.	Draper	478-2001-3043	Calumet	296,141
10.	Duncan	65-2005	Chisholm	87,761
11.	Eaton	391	Buhl	3,548
12.	Embarrass	Syracuse Lake Bed Lease No. 1	Biwabik	1,788,830
13.	Fay	346	Virginia	1,264,531
14.	Frantz	365-2032	Buhl	744,474
15.	Grant	174	Buhl	8,898,095
16.	Helen	A-1-2008	Cooley	243,625
17.	Helmer	402	Kinney	1,369,231
18.	Hill Annex	374-375-377-378	Calumet	52,338,639
19.	Kevin	376	Cooley	11,661,127
20.	Leonidas	221-224	Eveleth	20,858,689
	Leonidas Stockpile No. 9	Sub-lease 221	Eveleth	80,010
21.	Maderia	558-3030-3031	Hibbing	195,495
22.	Majorca	456-2034-3041	Calumet	2,983,447
23.	Margaret	Part 363-2010	Buhl	1,462,237
24.	Martin	776-2006	Ironton	203,045
25.	Mesabi Chief	268-2025-2027	Keewatin	10,810,975
26.	Minnewas	218-219-2020-2021-2028-2029	Virginia	12,016,944
27.	Minnewas-Coons	Part 218	Virginia	564,341
28.	Missabe Mountain	59-2018-2019	Virginia	69,621,630
29.	Mississippi No. 1	355	Keewatin	3,912,429
30.	Mississippi No. 2	356	Keewatin	296,467
31.	Morton	468-2026-2035	Hibbing	205,452
32.	Pilot	353	Mt. Iron	239,040
33.	Pool	85-2023-2024-3037	Hibbing	3,951,344
34.	Prindle	449-451	Virginia	2,170,816
35.	Scranton	392	Hibbing	12,862,648
36.	Section 17	477	Buhl	21,159
37.	Seville	371-2007	Kinney	76,459
38.	Shiras	362	Buhl	1,051,718
39.	Silver	618	Virginia	174,813
40.	Smith	384-A-12-2002	Hibbing	971,800
41.	Stein	282	Keewatin	1,672,811
42.	Vernon	A-4-2022	Cooley	26,160
43.	Wacoutah "A"	387	Mt. Iron	6,484,025
44.	Wacoutah "B"	388	Mt. Iron	112,965
45.	Wanlass	363	Buhl	2,247,888
46.	Wearne	775	Crosby	2,441,799
47.	Weggum	2016	Hibbing	1,409,157
	Philbin	389	Hibbing	1,235,908
48.	Wheeling	A-6	Mt. Iron	223,685
49.	Woodbridge	370	Buhl	1,655,155
50.	Yates	366	Kinney	678,690
	GRAND TOTAL			246,644,910

Note—Leases numbered in 3000 series are Taconite Leases

FIGURE 3



Graph showing yearly production of iron ore from state-owned mines 1893-1945.

TABLE No. 14
LEAN ORE MATERIAL IN STOCKPILES NOT UNDER LEASE
As of June 30, 1946

MINE	LOCATION	LEAN ORE			TACONITE			PAINT ROCK			
		Tons	Iron	Sil.	Tons	Iron	Sil.	Tons	Iron	Sil.	Total Tons
Barbara	Calumet				49,568	32.85					49,568
Coons	Virginia	79,298	40.49								79,298
Deacon	Kinney	2,922	50.42								2,922
Draper	Calumet	17,153	44.83		288,960						306,113
Duncan	Chisholm	5,306	51.79	15.15							5,306
Helen	Nashwauk				35,312	37.55					35,312
Margaret	Buhl	83,121	42.18		135,865	41.71					218,986
Majorca	Calumet	9,224	45.00		163,020	35.50					172,244
Mesabi Chief	Keewatin	303,737	36.59	39.14	2,644,356	31.32	49.47	1,453,926	36.88	28.14	4,402,019
Missabe Mt	Virginia	540,000	40.62	29.90							540,000
Morton	Hibbing				36,712	42.53	27.97				36,712
Shiras	Buhl	18,200	40.68								18,200
Vernon	Nashwauk				3,920	29.16					3,920
Totals		*1,058,961	39.77	33.11	3,357,713	29.46	49.17	1,453,926	36.88	28.14	5,870,600

The above does not include the following which are under permit.

Alan	Mt. Iron	28,997									28,997
Fay	Virginia	24,765	46.32	25.13	25,661	34.31					50,426
**Minnewas	Virginia	344,931	44.57	29.38	1,368,428	33.80	44.76				1,713,359
**Missabe Mt	Virginia	3,888,366	43.95	29.68	9,480,805	34.92	44.38				13,369,171
Pilot	Mt. Iron	3,301	49.71	18.09							3,301
Wacoutah	Mt. Iron	4,885	44.83	16.67							4,885
Wheeling	Mt. Iron	19,020	45.72	25.55	110,755	40.81					129,775

*Average analyses are based on available data.
**Lease on these two stockpiles executed in July, 1946.

REPORT ON MINES IN PRODUCTION DURING THE BIENNIUM

Following is a brief report on each of the state-owned mines that produced ore during the biennium.

ATKINS MINE—Kinney, St. Louis County

Lease No. 2014—Laws 1941, Chapter 546
Lessee—Inland Steel Company
Loading Contractor—R. Maturi & Co. of Chisholm
Biennium production—338,198 tons merchantable ore.

The mining of open pit ore within the present pit limits, was completed in the fall of 1944. Some of this ore was put in stockpile on surface and was loaded out during the 1945 ore season. The mine has produced a comparatively low iron, low silica, and high alumina ore.

BUCKEYE MINE—Coleraine, Itasca County

Leases No. 2012, 2013 and 2017—Laws 1941, Chapter 546
Lessee—Evergreen Mines Company
Operator—Hanna Ore Mining Company
Biennium production—571,872 tons Wash and jig concentrates.

The Hanna Ore Mining Company took over the operation of this property on Jan. 1, 1945. They continued the development of the open pit, and made improvements on the washing plant, including a heavy density cone unit which was put in operation shortly after the start of the 1945 ore season. Recent test drilling has proved new ores on the property to warrant further enlargement of the open pit.

EMBARRASS LAKE BED—Biwabik, St. Louis County

Lease L-1—Laws 1917, Chapter 110
Lessee—Lake Mining Company
Operator—Pickands Mather & Co.
Biennium production—1,763,959 tons merchantable ore.

The development of this property into a producing mine included the excavation of a diversion channel to by-pass the waters of Wine Lake around Syracuse Lake and into Embarrass Lake. Syracuse Lake was dewatered and a large open pit has been developed by truck haulage. The mine produced its first ore in 1944. The ore is truck-hauled from the open pit to the surface screening and crushing plant and thence belt-conveyed to the railroad loading pocket.

GRANT MINE—Buhl, St. Louis County

Lease No. 174—Lease Extension, Laws 1937, Chapter 488
Lessee and Operator—Inter-State Iron Company
Biennium production—482,163 tons merchantable ore and wash concentrates.

The operating company entered into agreements with the adjoining property owners whereby they can load and ship their ores adjacent to the Grant property lines. This has released a large tonnage of State-owned ore which otherwise would have been tied up in the open pit slopes necessary for protection of the adjoining properties. A washing plant has been added at the mine to handle lower grade ores from the bottom of the pit which proved amenable to washing.

HILL ANNEX MINE—Calumet, Itasca County

Leases No. 374, 375, 377 and 378—Laws 1889, Chapter 22

Lessee—Arthur Iron Mining Company

Operator—Inter-State Iron Company

Biennium production—6,050,033 tons merchantable ore and crude wash ore.

The four leases cover all of Section 16, Township 56, Range 23. A large open pit has been developed on the west half of the section. The operation has been converted to the truck and belt conveyor method of haulage. The truck dump pocket and the coarse screen are located on the bottom of the pit. Screened rock is stockpiled on bottom rock within the open pit area, and screened wash ore is belt conveyed to the surface loading pocket, whence it is transferred by electric haulage to the concentrating plant.

KEVIN MINE—Nashwauk, Itasca County

Lease No. 376—Laws 1889, Chapter 22

Lessee—Arthur Iron Mining Company

Operator—Butler Brothers

Biennium production—2,420,787 tons crude wash ore.

Butler Brothers continue their research on low grade ores, trying to improve the percentage of recovery and the quality of the concentrates. Some changes have been made in the cone or heavy density plant which will improve its flexibility in meeting the varying conditions of the incoming crude ore. Crude ore is conveyed by a 3400 foot belt conveyor from the pit bottom to the top of the washing plant.

LEONIDAS MINE—Eveleth, St. Louis County

Leases No. 221 and 224—Lease Extension, Laws 1937, Chapter 488

Lessee and Operator—Oliver Iron Mining Company

Biennium production—5,680 tons merchantable ore.

No ore was mined during the biennium. The above tonnage was shipped from stockpile. The new hoisting shaft started in 1945, has been completed from surface to ledge. Underground crews drifted in to the new location and raised through rock to connect with the shaft sunk through the surface. The work of enlarging the raise to complete shaft size is in progress.

MARGARET MINE—Buhl, St. Louis County

Lease No. 2010—Laws 1941, Chapter 546
Lessee and Operator—C. W. Moore and Co., Inc.
Biennium production—23,261 tons merchantable ore and wash concentrates.

This mine was in production during part of the 1944 ore season. Before the mine closed down, the pit was completely de-watered in search of any ore that might be available to the mining operations.

MARTIN MINE—Ironton, Crow Wing County

Lease No. 2006—Laws 1941, Chapter 546
Lessee—Evergreen Mines Company
Operator—Hanna Ore Mining Co.
Biennium production—162,449 tons merchantable ore and wash concentrates.

The Hanna Ore Mining Company took over the operation of all Evergreen Mines Company's property on the Cuyuna Range on January 1, 1945. The major portion of the tonnage from this mine is treated at the Huntington crushing plant before loading in railroad cars. The mine produces manganiferous iron ore and straight iron ore.

MESABI CHIEF MINE—Keewatin, Itasca County

Leases No. 2025 and 2027—Laws 1941, Chapter 546
Lessee and Operator—Hanna Ore Mining Company
Biennium production—17,840 tons merchantable ore and wash concentrates.

The acreage of the original Mesabi Chief Mine is now divided into two mining units. The ore deposit is essentially wash ore and the above shipments were made from the west unit, Lease No. 2025. The operating company has enlarged the open pit to the east, thereby releasing additional tonnage for open pit shipments.

MINNEWAS MINE—Virginia, St. Louis County

Leases No. 2028 and 2029—Laws 1941, Chapter 546
Lessee—Kleffman & Haley, Hibbing, Minn.
1944 Operator (By assignment)—Taylor Mining Company, Duluth
1945 & 1946 Operators (By assignment)—Inter-Range Mining Co.
Biennium production—157,388 tons merchantable ore.

This mine produces high quality direct ores from the open pit and underground workings. The underground ore was belt conveyed to a loading pocket within the pit area for truck haulage to the railroad cars. Additional open pit ore is made available for shipment from time to time by new stripping along the old pit slopes.

MISSABE MOUNTAIN MINE—Virginia, St. Louis County

Leases No. 2018 and 2019—Laws 1941, Chapter 546
Lessee and Operator—Charleson Iron Mining Company
Biennium production—1,797,587 tons merchantable ore.

These leases were granted in June 1942. The new operator converted immediately from railroad to the truck and conveyor method of haulage. The mine produces a high grade open pit merchantable ore. This mine paid the highest average royalty rate received by the State during the biennium.

MISSISSIPPI NO. 1 MINE—Keewatin, Itasca County

Lease No. 355—Laws 1889, Chapter 22
Lessee—Arthur Iron Mining Company
Operator—Hanna Ore Mining Company
Biennium production—1,680,289 tons merchantable ore and crude wash ore.

This open pit produced its first ore in 1942. Transportation of pit ore is handled by truck and belt conveyor to a pocket on surface where the merchantable ore is loaded into railroad cars for shipment and the crude wash ore is loaded into electric powered trains for haulage to the Mesabi Chief washing plant. This lease expires in 1949.

PRINDLE MINE—Virginia, St. Louis County

Leases No. 449 and 451—Laws 1889, Chapter 22
Lessee and Operator—Oliver Iron Mining Company
Biennium production—1,308,941 tons merchantable ore and crude wash ore.

Mine haulage is by truck and belt conveyor system. More than one-half of the production is loaded direct to railroad cars after crushing. The open pit ore will probably be mined out by the time the lease expires in 1951.

SCRANTON MINE—Hibbing, St. Louis County

Lease No. 392—Lease Extension, Laws 1937, Chapter 488
Lessee and Operator—Hoyt Mining Co. (Pickands Mather & Co.)
Biennium production—1,381,624 tons merchantable ore.

The open pit operation has been extended over the northwest part of the property by agreement with the adjoining owners. The Scranton operator can trespass over the line, loading other ore to the Scranton account and a joint engineering crew adjusts ownership. State ore which normally would have to be left in the pit slope, has been released for shipment in this area of the pit. Under the extension agreement the lease will expire in 1960.

STEIN MINE—Keewatin, Itasca County

Lease No. 282—Lease Extension, Laws 1937, Chapter 488
Lessee and Operator—Hanna Ore Mining Company
Biennium production—220,622 tons wash ore concentrates.

This mine returned to the production list during this biennium. The Mississippi No. 1 open pit was extended into the east part of the Stein property. The new area was developed by trucks, and the crude wash ore is loaded through the Mississippi No. 1 mine's conveyor-belt system for railroad haulage to the Mesabi Chief washing plant. The area between the old and new pits has been uncovered so the property should be in production for several years.

WACOUTAH MINE—Mt. Iron, St. Louis County

Lease No. 387—Laws 1889, Chapter 22
Lessee and Operator—Wheeling Steel Corporation
Biennium production—537,916 tons merchantable ore.

This open pit mine, with railroad type haulage, produces a uniform annual tonnage of direct shipping merchantable ore for use in its own furnaces. The open pit ore will probably be mined out by the time the lease expires in 1950.

WEARNE MINE—Crosby, Crow Wing County

Lease No. 775—Laws 1889, Chapter 22
Lessee and Operator—Hanna Ore Mining Co.
Biennium production—122,429 tons merchantable crude wash and sintered ores.

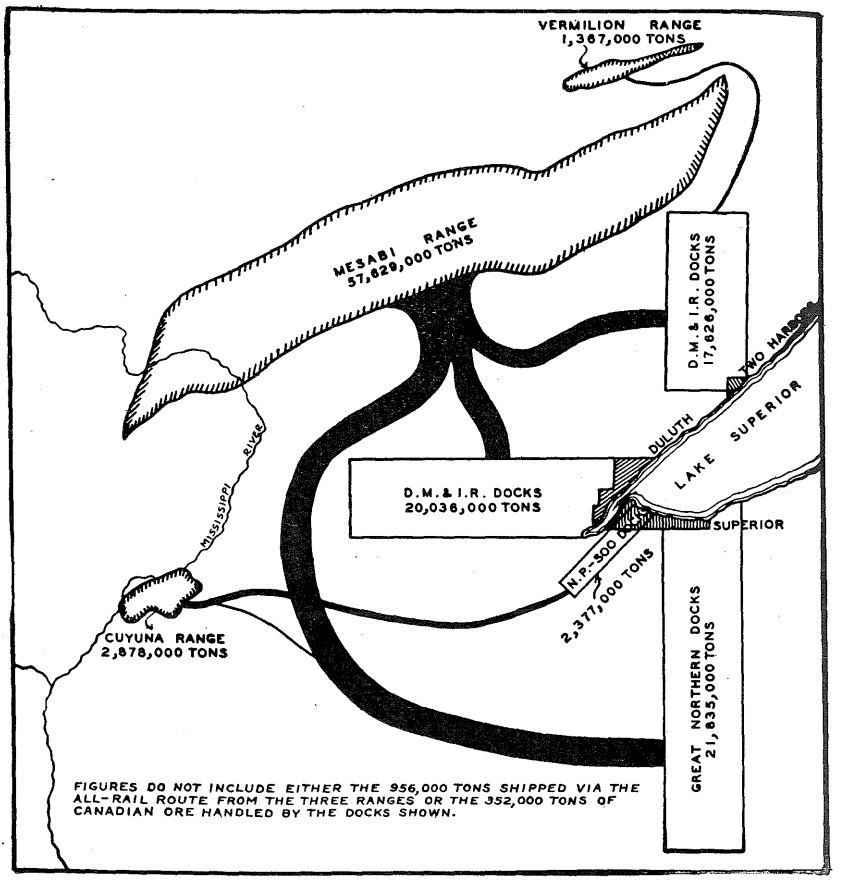
This mine is a unit of the Evergreen Mine and was operated for the lessee by the Evergreen Mines Company. The Hanna Ore Mining Company took over management of the group on Jan. 1, 1945. The mine produces various types of Cuyuna Range ores, most of which take some form of beneficiation before being shipped to the ore docks.

WEGGUM MINE—Hibbing, St. Louis County

Lease No. 2016—Laws 1941, Chapter 546
Lessee—Philbin Mining Company
Operator—Butler Brothers
Biennium production—902,156 tons merchantable ore, dried ore and wash concentrates.

This open pit was developed and is operated by the truck and belt conveyor method of haulage. Full cooperation by the adjoining property owners has made it possible to load out all bank ore on the north and west sides of the pit. Property line ownership of ore is estimated by joint engineering crews. The washing plant and the drying plant at the Weggum Mine are used to process ores from other mines under contracts with the adjoining property owners.

FIGURE 4



Graphic map showing distribution of iron ore shipments from mines to Lake Superior docks—1945 shipments.

Inactive Mines Under Permit or Lease

Following is a brief lease record of mines under permit or lease that were inactive during the biennium but that have been on the shipping list in the past:

BARBARA MINE—Calumet, Itasca County

Prospecting Permit No. 1133—Laws of 1941, Chapter 546
Holder—J. A. MacKillican, Hibbing, Minn.

The original lease covering this property, issued under Laws of 1889, Chapter 22, was surrendered by Butler Brothers on January 31, 1945. A prospecting permit was issued to Mr. J. A. MacKillican at the June, 1946, sale of permits.

CARSON LAKE MINE—Hibbing, St. Louis County

Prospecting Permit No. 1131—Laws of 1941, Chapter 546
Holder—Syracuse Mining Company (Pickands Mather & Co.)

The original lease, Laws of 1889, was surrendered by the Oliver Iron Mining Company in 1936. Lease No. 2015, issued to the Charleson Iron Mining Company on December 8, 1942, was surrendered on April 27, 1943. Permit No. 1095, issued to Butler Brothers on December 16, 1943, was allowed to expire. Permit No. 1120, issued to J. A. MacKillican on December 11, 1945, was cancelled May 26, 1946. The Syracuse Mining Company bid in the property at the June, 1946 sale of permits.

DRAPER MINE—Calumet, Itasca County

Taconite Lease No. 3043—Laws 1941, Chapter 546
Lessee—J. A. MacKillican, Hibbing, Minnesota.

Original lease surrendered by Hobart Iron Co. (Pickands Mather & Co.) in 1934. Lease No. 2001 issued August 1, 1941, to Evergreen Mines Co. terminated September 15, 1943. Permit No. 1096 issued December 16, 1943, to Evergreen Mines Company, expired December 15, 1944. Permit No. 1125, issued December 11, 1945, to J. A. MacKillican was converted to a taconite lease May 27, 1946.

DUNCAN MINE—Chisholm, St. Louis County

Lease No. 2005—Laws 1941, Chapter 546
Lessee—Evergreen Mines Co. Operators—Hanna Ore Mining Co.

Original lease surrendered by the Oliver Iron Mining Company in 1936 Present lease issued June 1, 1942.

FRANTZ MINE—Buhl, St. Louis County

Lease No. 2032—Laws 1941, Chapter 546
Lessee—J. A. MacKillican, Hibbing, Minn.

Original lease, operated by The Consumers' Ore Co., M. A. Hanna Co., Agent, surrendered in 1931. Permit No. I-1036 issued June 12, 1941, to D. D. Haley, was surrendered May 27, 1942. Permit No. 1118 issued Dec. 11, 1945, to J. A. MacKillican was converted to lease No. 2032 on May 27, 1946.

MAJORCA MINE—Calumet, Itasca County

West Unit, Lease No. 2034—Laws 1941, Chapter 546
East Unit, Taconite Lease No. 3041—Laws 1941, Chapter 546
Lessee—J. A. MacKillican, Hibbing, Minn.

Original lease surrendered by Syracuse Mining Co. (Pickands Mather & Co.) September 20, 1945. Prospecting permits on the two mining units were issued to J. A. MacKillican December 11, 1945. The west unit was

converted to Iron Ore Lease No. 2034, and the east unit to Taconite Lease No. 3041, on May 27, 1946.

MISSISSIPPI NO. 2 MINE—Keewatin, Itasca County

Lease No. 356—Laws 1889, Chapter 22
Lessee—Arthur Iron Mining Co. Operator—Hanna Ore Mining Co.
Date of Expiration of Lease—1949.

MORTON MINE—Hibbing, St. Louis County

Lease No. 2035—Laws 1941, Chapter 546
Lessee—J. A. MacKillican, Hibbing, Minn.

The original lease No. 468 held by the Margaret Mining Company, et al, was canceled August 30, 1933. However, prior to that date, Tod-Stambaugh Co., agent for the Morton Mining Co., operated the property as an underground mine and later it was sub-leased to Inland Steel Co. This property produced 205,452 tons of royalty ore. Permit No. I-1087 issued to Kleffman & Haley, December 15, 1942, was converted to lease No. 2026, December 14, 1943, which was surrendered March 19, 1945. Permit No. 1128 issued to J. A. MacKillican December 11, 1945, was converted to an iron ore mining lease No. 2035 on May 27, 1946.

POOL MINE—Hibbing, St. Louis County

Taconite Lease No. 3037, Laws 1941, Chapter 546
Lessee—Ontario Iron Co. (Pickands Mather & Co.)

Original lease held by the Oliver Iron Mining Company expired in 1942. Leases Nos. 2023 & 2024 issued June 1, 1943, to Evergreen Mines Company were surrendered in October, 1943. Permit No. 1098 issued Dec. 16, 1943, to Ontario Iron Co. was converted to Taconite Lease No. 3037 on Feb. 15, 1944.

SEVILLE MINE—Kinney, St. Louis County

Prospecting Permit No. 1109—Laws 1941, Chapter 546
Holder—Rhude and Fryberger

Original lease operated by Seville Iron Mining Co., surrendered in 1922. Permit I-1042, issued June 12, 1941, to Evergreen Mines Company, was converted to Lease No. 2007, June 1, 1942. This lease was surrendered July 24, 1944. Permit No. 1109 was issued to Rhude & Fryberger July 11, 1945.

SHIRAS MINE—Buhl, St. Louis County

Original lease, operated first by the Oliver Iron Mining Co. and later by the Hanna Ore Mining Co., was surrendered in 1934. Permit No. 1108, issued to the Evergreen Mines Company June 11, 1944, was terminated on June 10, 1945. Permit No. 1117, issued to J. A. MacKillican on Dec. 11, 1945, was canceled May 29, 1946.

STATE LANDS

By F. B. Getchell, Deputy Director

Land owned by the state was acquired through several acts of congress, the first of which was passed in 1857 authorizing a state government, and later grants were made in 1860, 1862 and 1870. Table 15 is a record of the permanent trust fund lands:

TABLE 15

Permanent Trust Fund Land, in Funds and Acres

School	2,974,455
University	91,524
Agricultural College	119,987
Internal Improvement	496,482
Swamp	1,882,333
Total	5,564,781

A marked upward trend in the sale and leasing of state land was noted during the biennium. The "back to the land" movement usually following a war period was to be expected, and it has been especially gratifying to this Division to have been of some assistance to returning servicemen in making state land well suited to agricultural use available to them through purchase at our land sales in the northern counties of the State. Many of the tracts sold were purchased by veterans who are developing new farms or use the land in connection with a previously established farm unit.

A large number of the long term land contracts were paid in full and 787 patents were issued conveying title to private ownership of 37,532 acres.

State lands may be sold only at public auction to the highest bidder at land sales held at the county seat of the county in which they are situated. All lands must first be appraised by bonded appraisers of this Division and may not be sold for less than their appraised value and the minimum, as fixed by law, may not be less than $5.00 per acre.

Up to June 30, 1946, a total of 2,586,271 acres of state land had been sold and patented to private ownership, 191,811 acres are under active sales contracts and 2,769,735 acres situated in 69 counties of the state are still unsold or have reverted to the state. Approximately 1,000,000 acres of this unsold or reverted land is located in state forests.

TABLE 16

Statement Showing Acres of Unsold and Reverted Trust Fund Lands as of June 30, 1946

(Including 12,029.88 acres classified as Trust Fund Lands under Laws 1939, Chapter 343, and Laws 1941, Chapter 393, Section 8)

County	Acres Unsold	Acres Reverted	Total Acres
Aitkin	10,819.37	132,043.11	142,862.48
Anoka	.....	641.82	641.82
Becker	6,060.57	13,440.53	19,501.10
Beltrami	22,211.74	40,700.17	62,911.91
Benton	.....	300.00	300.00
Big Stone	.....	254.35	254.35
Blue Earth	.....	80.00	80.00
Carlton	3,295.78	17,684.55	20,980.33
Cass	84,793.40	58,171.49	142,964.89
Chisago	.....	200.00	200.00
Clay	.....	3,528.02	3,528.02
Clearwater	11,101.33	14,359.30	25,460.63
Cook	132,240.84	888.25	133,129.09
Crow Wing	3,439.67	18,257.79	21,697.46
Dakota	8.28	130.44	138.72
Dodge	.....	80.00	80.00
Douglas	120.00	40.00	160.00
Goodhue	.....	120.00	120.00
Grant	.....	40.00	40.00
Houston	.....	554.83	554.83
Hubbard	7,546.41	21,765.17	29,311.58
Isanti	80.00	524.00	604.00
Itasca	207,379.36	98,723.20	306,102.56
Kanabec	240.10	7,864.69	8,104.79
Kandiyohi	.....	160.00	160.00
Kittson	3,327.02	35,980.53	39,307.55
Koochiching	783,017.33	69,906.78	852,924.11
Lake	167,623.31	4,746.22	172,369.53
LeSueur	80.00	.....	80.00
Mahnomen	8,420.94	439.65	8,860.59
Marshall	2,560.47	40,421.85	42,982.32
Martin	.....	51.27	51.27
Meeker	.....	80.00	80.00
Mille Lacs	40.00	11,756.44	11,796.44
Morrison	560.00	6,951.81	7,511.81
Nobles	.....	80.00	80.00
Norman	.....	2,959.86	2,959.86
Otter Tail	288.86	3,170.83	3,459.69
Pennington	120.00	4,463.22	4,583.22
Pine	.....	28,299.99	28,299.99
Polk	80.26	12,106.02	12,186.28
Red Lake	.....	4,395.66	4,395.66
Redwood	.....	80.00	80.00
Renville	.....	40.00	40.00
Rice	.....	40.00	40.00
Roseau	28,449.84	105,917.48	134,367.32
St. Louis	402,149.07	103,651.50	505,800.57
Scott	40.00	.....	40.00
Sherburne	337.90	1,240.00	1,577.90
Sibley	.66	40.00	40.66
Stearns	80.00	766.24	846.24
Swift	80.00	160.00	240.00
Todd	1,050.95	3,851.13	4,902.08

County	Acres Unsold	Acres Reverted	Total Acres
Traverse	.....	120.00	120.00
Waseca	.....	80.00	80.00
Wadena	40.00	6,754.58	6,794.58
Wilkin	.....	1,852.50	1,852.50
Winona	202.19	280.00	482.19
Wright	.....	60.00	60.00
	1,888,045.65	881,689.52	2,769,735.17

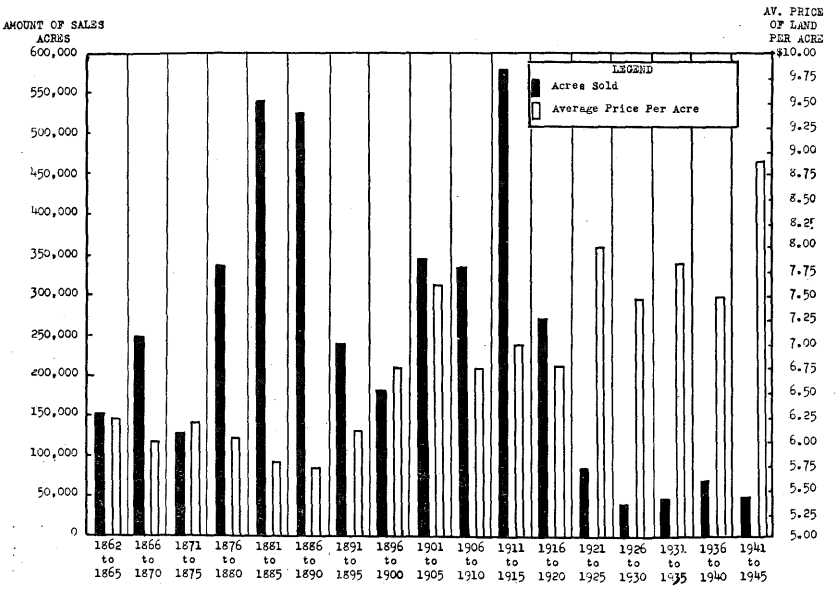
TABLE 17

Statement Showing Number of Acres of State Trust Fund Lands Under Sale Contracts and the Amount of Unpaid Balance of the Purchase Price as of June 30, 1946

County	No. Contracts in Force	Acres Under Contract	Unpaid Balance
Aitkin	327	13,437.85	$ 67,363.43
Anoka	13	520.00	2,503.25
Becker	118	3,805.85	25,519.95
Beltrami	150	5,985.58	30,963.00
Benton	8	320.00	2,074.84
Big Stone	2	200.00	2,754.00
Blue Earth	11	40.00	680.00
Carlton	88	2,574.24	18,070.66
Cass	231	5,623.72	50,605.41
Chisago	6	120.00	697.00
Clay	41	2,479.07	22,665.50
Clearwater	87	3,388.83	17,591.66
Cook	4	145.80	1,687.23
Crow Wing	75	2,792.71	13,861.61
Dakota	6	150.00	670.62
Douglas	3	120.00	1,122.00
Fillmore	5	200.00	1,088.00
Goodhue	5	226.40	1,069.20
Hubbard	77	3,120.65	17,318.49
Isanti	5	200.00	1,640.00
Itasca	555	21,569.59	122,556.02
Kanabec	9	339.00	3,009.74
Kandiyohi	11	109.80	1,286.90
Kittson	77	3,414.06	20,028.35
Koochiching	303	12,327.27	66,736.59
Lake	33	1,340.86	7,283.83
Lincoln	1	80.00	1,292.00
Mahnomen	14	571.35	2,702.02
Marshall	338	14,199.46	86,031.85
Mille Lacs	46	1,561.30	10,001.53
Morrison	75	2,967.20	18,009.76
Murray	1	80.00	1,162.80
Norman	43	2,141.15	17,244.38
Olmsted	1	10.00	178.46
Otter Tail	86	3,494.08	17,080.87
Pennington	33	1,318.97	6,806.60
Pine	56	2,335.11	12,464.02
Pipestone	2	280.00	3,893.00
Polk	159	6,589.26	42,153.24
Pope	15	555.00	3,175.44
Red Lake	38	1,501.62	12,185.12

County	No. Contracts in Force	Acres Under Contract	Unpaid Balance
Redwood	1	80.00	2,976.70
Renville	1	43.29	1,324.66
Roseau	1023	41,213.81	265,174.79
St. Louis	499	19,023.00	128,852.67
Sherburne	9	360.00	1,712.35
Stearns	9	358.07	3,337.35
Stevens	1	40.00	198.90
Swift	5	387.06	3,754.00
Todd	37	1,690.03	12,568.35
Wadena	74	2,955.91	15,513.23
Washington	1	40.00	510.00
Watonwan	10	144.60	3,354.81
Wilkin	49	2,899.74	30,298.99
Wright	2	60.00	766.80
Winona	2	80.00	476.00
Total	4,881	191,811.29	$1,206,047.97

FIGURE 5



Graph showing sales of trust fund lands during each five-year period from 1862 to 1945.

Appraisal and Sale

Three appraisal districts have been established by the Division in the northern section of the State in order to facilitate administration of field work. The Eastern District with headquarters and field office is located at Hibbing, a Central District with headquarters and field office is located at Bemidji, and a Western District with field office and headquarters is located at Thief River Falls. Each district is in charge of a district appraiser who

is assisted by a land clerk. The appraisers examine, classify, and appraise state land for sale and lease, investigate trespass on state owned lands, interview contract holders in regard to interest payments, and confer with county officials relative to tax delinquent and forfeited lands.

Land and lease appraisal reports submitted by the appraisers are checked and reviewed in the divisional office at St. Paul, and lists of the tracts selected for sale are prepared for public sales to be held at the county seats of the counties in which the lands are situated. Sales are usually held during the fall each year in counties where the need of and demand for the lands warrant. The lands are sold to the highest bidder, either for cash or on terms. At least 15% of the purchase price of the land in addition to the full appraised value of the timber must be paid at the time of sale. The balance of the purchase price may be paid in not to exceed 20 equal annual installments payable on June 1st each year following that in which the purchase was made, with interest at 4% per annum on the balance remaining unpaid, payable with installments on the principal.

The payment on the purchase price at the time of sale as well as subsequent installments of principal and interest are made to the county treasurer of the county in which the land is situated.

All lands are sold subject to regulations of any zoning ordinance in force or hereafter adopted by the county board of the counties in which the state land is situated.

Only such lands as are well suited to and needed for agricultural use or in connection with previously established farm units are offered for sale. These lands for the most part are well located in relation to roads, schools, settlements and market facilities.

During the biennium ending June 30, 1946, state land examinations for sale, lease, classification, exchange, trespass, etc., in the three appraisal districts were made as follows:

	No. of Tracts	No. of Acres
Eastern Appraisal District	1,942	54,182
Central Appraisal District	1,243	49,708
Western Appraisal District	2,220	87,918
Total	5,405	191,809

TABLE 18

Statement by Counties of Trust Fund Lands Sold During the Biennium Ending June 30, 1946

County	Acres Sold	Amount of Sale	Paid for Timber and Improvements
Aitkin	965.50	$ 6,956.25	$ 1,033.45
Becker	1,040.00	7,580.00	320.50
Beltrami	680.00	5,180.00	422.50
Benton	80.00	640.00	87.50
Big Stone	480.00	7,120.00	.....
Blue Earth	.....	.....	.....
Carlton	451.78	2,842.46	557.25

County	Acres Sold	Amount of Sale	Paid for Timber and Improvements
Cass	1,478.46	10,912.72	807.00
Chisago	.....	.....	.....
Clay	1,200.00	10,080.00	.....
Clearwater	326.07	2,510.35	300.50
Crow Wing	200.00	2,080.00	200.00
Dakota	40.00	600.00	170.00
Dodge	.....	.....	.....
Hubbard	916.21	8,646.68	646.50
Itasca	2,308.07	16,154.67	2,149.10
Kanabec	320.00	1,900.00	118.50
Kittson	440.00	3,480.00	25.00
Koochiching	1,171.85	9,297.75	800.00
Lake	249.84	3,024.84	564.75
Mahnomen	40.24	201.20	.....
Marshall	1,268.92	8,893.28	463.50
Mille Lacs	516.67	3,560.02	402.00
Morrison	1,054.17	7,582.26	636.00
Murray	80.00	1,520.00	.....
Norman	820.00	7,060.00	.....
Olmsted	10.00	350.00	.....
Otter Tail	520.00	4,440.00	149.00
Pennington	160.00	1,280.00	.....
Pine	360.00	2,200.00	426.00
Polk	1,518.85	9,452.45	70.00
Pope	80.00	700.00	.....
Red Lake	240.00	2,520.00	.....
Renville	43.29	1,731.60	.....
Rock	80.00	2,120.00	.....
Roseau	3,606.66	29,962.18	772.25
St. Louis	1,500.79	14,160.07	1,416.85
Sherburne	160.00	1,400.00	22.50
Stearns	160.00	3,120.00	.....
Stevens	40.00	260.00	.....
Swift	.....	.....	.....
Traverse	.....	.....	.....
Todd	199.00	4,010.00	30.00
Wadena	640.00	4,380.00	1,196.50
Waseca	.....	.....	.....
Wilkin	1,760.00	28,120.00	30.00
	27,206.37	238,028.78	13,817.15

TABLE 19

Income Derived from Principal and Interest Payments on Trust Fund Lands Under Contract During Biennium Ending June 30, 1946

Fund	Amount
School	$280,646.83
University	45,956.58
Swamp	88,248.12
Internal Improvement	12,862.73
State Land Improvement	46.86
	$427,761.12

Leasing

State trust fund lands are leased for temporary uses and rentals are established according to the purpose for which the land is to be used. Hay, farm, and pasture leases are made on a seasonal basis and are sold at public auction in counties where land sales are held. In other counties bids are accepted by mail and leases issued to the highest bidders.

Lands bordering meandered lakes and other public waters of the state were withdrawn from sale by legislative act in 1923. These lands are not subject to sale but where they are suitable for cabin sites and have been subdivided for that purpose, leases are issued on a ten year basis and usually are renewable. The minimum rental for any cabin site on land under the supervision of the division is set at $12.00 per year, but the actual rental rate is determined from a field investigation made by appraisers of the division and depends upon the location and desirability of the tract. Leases for garden and dwelling sites on the Mesabi Range are issued on an annual basis and for the most part to employees of the mining companies operating mines in the locality. Leases for gravel and other earth material used mainly in road construction work are issued on a yardage basis with a minimum annual rental when no gravel is removed. Leases for miscellaneous uses are issued after field investigation by our appraisers and for rates consistent with the purpose for which the land is to be used.

TABLE 20

Statement Showing Receipts from Rentals for Leases on State Trust Fund Lands During the Biennium Ending June 30, 1946

Kind of Lease	No. of Leases	Amount
Hay, Farm and Pasture	1,283	$30,108.94
House	597	6,686.00
Garden	261	610.76
Lakes	168	2,106.00
Sandpit	22	6,015.51
Billboard	24	468.00
Miscellaneous	292	13,396.67
Total	2,647	$59,388.88

Tax-Forfeited Lands in the Red Lake Game Preserve and Conservation Areas

Laws 1929, Chapter 258, created the Red Lake Game Preserve in Beltrami, Koochiching and Lake of the Woods counties. Laws 1931, Chapter 407, created the conservation areas in Aitkin, Mahonomen and Roseau counties, and Laws 1933, Chapter 402, the conservation area in Marshall County.

Privately owned lands in these areas, upon forfeiture for the non-payment of taxes, become the property of the state and the responsibility of their administration is largely with the department of conservation.

The appraisal and sale of agricultural lands, however, are functions of the county board and county auditor of the county in which the land is situated.

Laws 1935, Chapter 210, as amended, provides for the classification and sale of agricultural lands in the Red Lake Game Preserve.

Laws 1939, Chapter 320, provides for the classification and sale of agricultural lands in the conservation areas. Both the classification and sale of agricultural lands in the Red Lake game preserve and conservation areas must be approved by the commissioner of conservation before sale.

Lists of tax-forfeited lands, classified as agricultural land and appraised for sale by the county boards, are submitted by the county auditors to the commissioner of conservation for approval. These lists are referred to the division of lands and minerals for field investigation and recommendation, and lands approved for sale are then offered for sale by the county auditor at public auction.

Leases on agricultural lands approved for sale in the conservation areas are also made by the county auditor, as well as collections for rentals, and reported to this division.

Rentals for leases on lands in the Red Lake game preserve and unclassified lands in the conservation areas are made by this division, and a total of 590 leases were issued and $5,944.72 collected for rentals during the biennium ending June 30, 1946.

The following tables show the area of the Red Lake game preserve and conservation areas, the number of acres of tax-forfeited lands therein, the lands classified as agricultural lands during the last biennium, the lands sold and the collections made.

TABLE 21

Statement Showing Tax-Forfeited Lands in Red Lake Game Preserve and Conservation Areas as of June 30, 1946

Red Lake Game Preserve

County	Total Area	Acres Tax Forfeited
Beltrami	661,619	548,020
Koochiching	318,009	227,560
Lake of the Woods	754,188	510,042
Total	1,733,816	1,285,622

Conservation Areas

Aitkin	455,288	246,820
Mahnomen	41,073	22,220
Marshall	425,850	126,697
Roseau	480,520	199,120
Total	1,402,731	594,857

Summary

	Total Area	Acres Tax Forfeited
Red Lake Game Preserve	1,733,816	1,285,622
Conservation Areas	1,402,731	594,857
GRAND TOTALS	3,136,547	1,880,479

TABLE 22

Summary of Classification and Sale of Tax-Forfeited Lands, in the Red Lake Game Preserve and Conservation Areas, During the Biennium Ending June 30, 1946

Red Lake Game Preserve

	Acres Classified	Ac. Appr. By Comm. of Cons.	Acres Sold	Sale Price	Average Price Per Ac.
Beltrami	6,720.00	4,266.26	2,313.68	$ 9,205.67	$ 3.98
Koochiching	680.00	680.00	680.00	3,256.90	4.79
Lake of the Woods	8,040.00	6,560.00	5,481.70	19,662.25	3.59
Total	15,440.00	11,506.26	8,475.38	$32,124.82	$ 3.79
Conservation Areas					
Aitkin	2,644.24	1,141.54	969.61	$ 4,136.84	$ 4.27
Aitkin (Platted Lots)	549 Lots	280 Lots	58 Lots	7,279.00	125.50
Mahnomen	24,120.00	19,240.00	5,565.74	21,419.00	3.85
Marshall	7,360.00	6,960.00	7,072.06	26,879.00	3.81
Roseau	7,560.00	6,440.00	5,274.90	31,390.35	5.95
Total	41,684.24	33,781.54	18,882.31	83,825.19	4.44
R.L.G.P.	15,440.00	11,506.26	8,475.38	32,124.82	3.79
Grand Total	57,124.24	45,287.80	27,357.69	$115,950.01	$ 4.24

TABLE 23

Revenue Derived from Sale of Tax-Forfeited Lands, in the Red Lake Game Preserve and Conservation Areas, During the Biennium Ending June 30, 1946

Red Lake Game Preserve

	Principal	Interest	Rental	Timber and Improvements	Total
Beltrami	$ 13,997.52	$ 3,080.52	$1,407.35	$1,561.00	$ 18,639.04
Koochiching	2,190.39	451.02	32.00	86.50	2,731.91
Lake of the Woods	32,539.95	7,813.00	89.50	2,262.80	42,615.75
Total	$ 48,727.86	$11,344.54	$1,528.85	$3,910.30	$ 63,986.70
Conservation Areas					
Aitkin	23,945.29	825.69	1,754.20	2,110.06	27,178.04
Mahnomen	19,034.00	.....	891.17	.....	19,239.00
Marshall	8,329.35	1,522.03	1,866.40	200.00	10,399.38
Roseau	24,793.66	4,612.59	802.10	575.00	30,025.25
Total	76,102.30	6,960.31	5,313.87	2,885.06	86,841.67
R.L.G.P.	48,727.86	11,344.54	1,528.85	3,910.30	63,986.70
Grand Total	$124,830.16	$18,304.85	$6,842.72	$6,795.36	$150,828.37

Tax-Forfeited Lands Held in Trust for Taxing Districts Under Laws 1927, Chapter 119; Laws 1935, Chapter 386, and Acts Amendatory and Supplementary Thereto

Tax forfeitures and the laws governing procedures, for the management and administration of lands that revert to the state because of nonpayment of taxes, are complicated. The degree to which they affect the financial and social structures of the counties, division of authority in their administration and what is being done to make these lands take their place for the future, are questions of interest to, but perhaps little understood by, the general public.

Tax forfeited lands have been a topic of public discussion for many years and much has been said of the large acreage of tax-forfeited lands located in northern Minnesota with which something should be done for their restoration to the tax rolls or use for public benefit. It has been stated that there are more than 20,000,000 acres forfeited to the state for taxes.

In order to establish the facts as to the acreage involved, the discussion and tables which follow are based on figures obtained from the records of this office and reports received from the county auditors of the state. It is emphasized that in the following report only lands which have forfeited have been taken into consideration and do not include lands which may be tax delinquent but were not actually forfeited at the time this report was prepared.

According to lists received from the county auditors of the state, in 77 of the 87 counties 8,941,557 acres had forfeited up to June 30, 1946. There are no forfeitures in ten counties. Of this acreage, 848,471 acres are trust fund lands which were under contract of sale to private owners and where the contract holder's interest has been terminated. 1,880,479 acres are located within the Red Lake Game Preserve and conservation areas, title having been transferred to the state by law upon forfeiture. These lands are now under the supervision of the department of conservation. This leaves a total of 6,212,607 acres forfeited in trust for the taxing districts and under the control of the county boards and county auditor of the counties in which the lands are situated.

Approximately 1,436,000 acres of this forfeited land has either been repurchased by the former owner or re-sold by the county.

The only authority vested in the department in connection with these tax forfeited lands is to review the timber appraisals established by the county boards on lands offered for sale.

With the exception of a few counties, tax forfeited lands are not grouped in large areas. They are located in 77 of the counties, consequently their administration becomes somewhat of a problem. Much of the land is marginal land and of little or no value as agricultural land, and of questionable value for timber reproduction or as a matter of fact for any profitable use except for public recreation.

Tax forfeited lands, with the exceptions of those in the Red Lake Game Preserve and conservation areas, are classified as conservation and non-

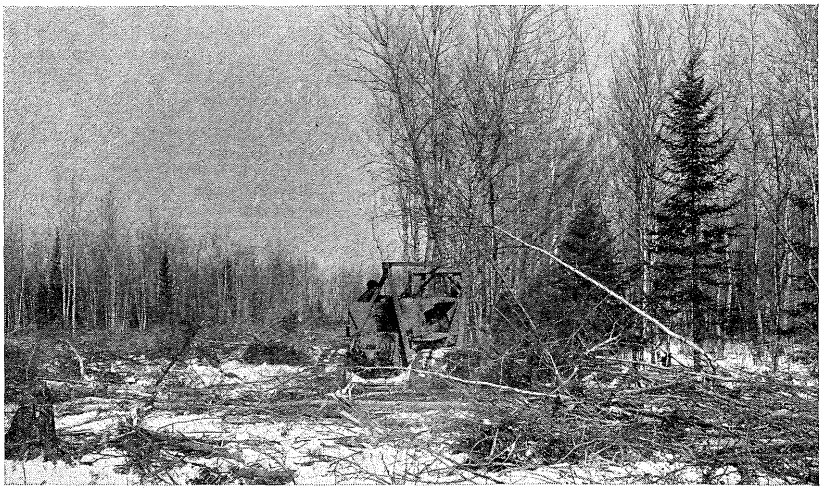
conservation lands by the county boards. The lands classified as non-conservation lands may be sold by the county auditor after classification and appraisal by the county board, as provided by Laws 1941, Chapter 511, as amended. When timber is listed separately, however, its appraised value must be approved by the commissioner of conservation prior to sale.

Lands classified as conservation lands, unless reclassified as non-conservation lands, sold to a government subdivision of the state, or released from the trust in favor of the taxing districts, are held under the supervision of the county board of the county in which such parcels lie. The county boards may resolve that certain lands classified as conservation lands shall be devoted to conservation uses and may submit such resolution to the commissioner of conservation. If, upon investigation, the commissioner of conservation determines that the land can be managed and developed for conservation purposes, he may accept them on behalf of the state. The lands accepted are then under the supervision and control of the commissioner of conservation.

Each year copies of the lists of lands, which have forfeited for the nonpayment of taxes during the current year, are submitted by the county auditors to the commissioner of conservation and are filed in the records of the division of lands and minerals.

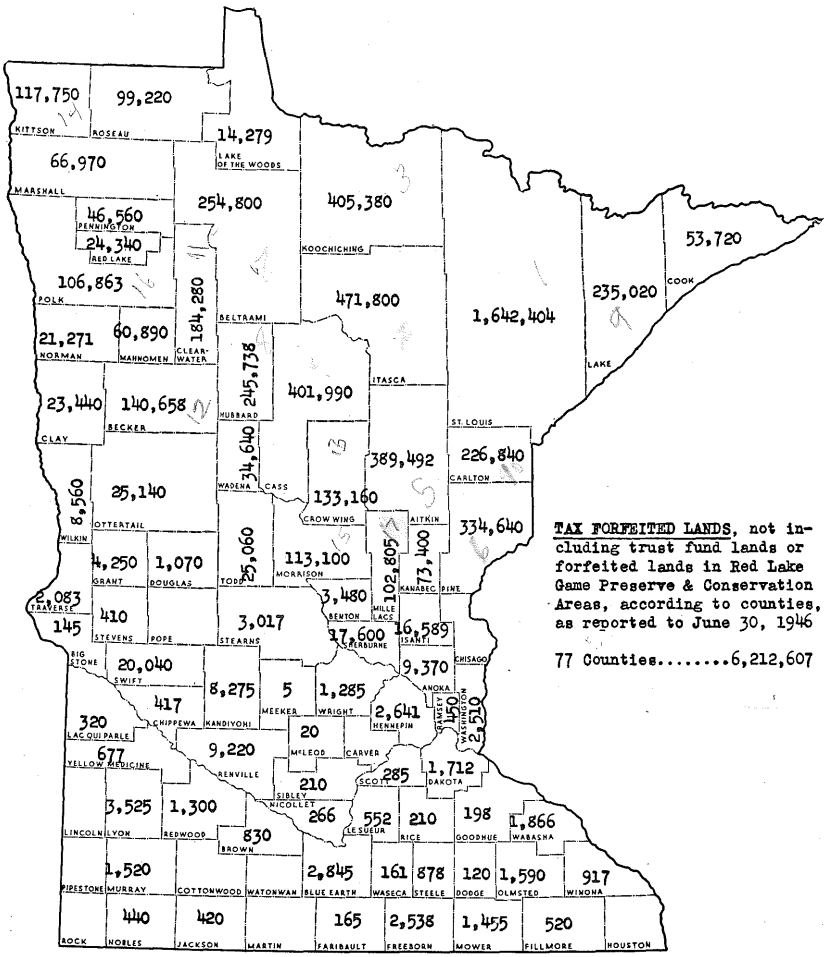
If trust fund lands are included on any of the lists of forfeited lands, the county auditor is notified and the trust fund lands are stricken from the list so as not to be included on the county sale list.

The following is a map showing the counties of the state in which the tax forfeited lands are situated and the acreage in each, as reported to June 30, 1946:



Bulldozer clearing cut-over land in Northern Minnesota.

FIGURE 6



TAX FORFEITED LANDS, not including trust fund lands or forfeited lands in Red Lake Game Preserve & Conservation Areas, according to counties, as reported to June 30, 1946

77 Counties.....6,212,607

Tax Forfeited Lands.

LAND EXCHANGE

General Exchange Program

Exchange of land between the state, the federal government, and private owners to consolidate present scattered holdings for better management is recognized as one of the most important pending programs in furtherance of better land use, maximum timber production, and protection of natural resources throughout northern Minnesota. Exchanges between the state and other owners, federal or private, are provided for by the constitutional amendment adopted by the people in 1938 (after four previous failures) and by the land exchange act, Laws 1941, Chapter 393, under which every

exchange must be unanimously approved by the Minnesota land exchange commission, consisting of the governor, the state auditor, and the attorney general.

The potential scope of the exchange program is measured by the total acreage of land available and suitable for exchange. The exchange program involves two major types of exchanges, state-federal exchanges and state-private exchanges, as well as some of lesser importance, where some special problems are involved. As will be seen from the amounts of land involved, the program as a whole is one of great potential magnitude, and its accomplishment on any considerable scale will take many years.

State-Federal Exchanges

The potential scope of the state-federal exchange program is measured by the total acreage of state land, amounting to over 713,000 acres, within the Superior and Chippewa National Forests, plus tracts aggregating in the neighborhood of 150,000 acres, adjacent to the Red Lake Indian Reservation, the latter having been designated by federal authorities in a tentative proposal for exchange for Indian lands intermingled with state lands in the Red Lake Game Preserve and in the Northwest Angle. As yet no specific proposals for such exchanges have been submitted to the land exchange commission. As trading stock the federal government now owns only about 375,000 acres of land within state forests and outside of the national forests, and therefore will have to acquire considerably more if it expects to acquire by exchange all or substantially all of the state land within the national forests. With respect to the Indian lands, there is more nearly an even balance of potential trading stock.

State-Private Exchanges

It is estimated that there is perhaps 1,000,000 acres of private land within the boundaries of state forests which may be desirable for consolidation with present state holdings by exchange. As potential trading stock against this private land there is substantial acreage of state land outside state forests. No estimates are now available as to how much of this state land would be available and suitable for exchange.

Other Types of Exchanges

Other types of exchanges may involve state, federal, or private land suitable for special purposes other than those already enumerated, as well as tax-forfeited land under the jurisdiction of the county boards. No estimates are available as to the potential scope of such exchanges, but it is not likely that they will aggregate anywhere near as much in acreage as those above described.

Division and County Program

During the war emergency, circumstances made it necessary for the department of conservation to modify the land exchange program as it was

not possible to investigate or give full consideration to the applications received.

It was impossible during the war to obtain men with training and experience to make field investigations and appraisals of lands under the land exchange act. This spring, however, it was possible to obtain two appraisers for field work who have had technical training in forestry. These men worked in the field with our regular land appraisers for further training in the appraisal of state land for sale purposes.

These men have now been permanently assigned to field investigations on land exchange proposals and definite progress in the land exchange program should be accomplished.

Under the land exchange act, Laws 1941, Chapter 393, two classes of lands are designated. Class A lands are those lands owned in fee by the state and under the jurisdiction of the commissioner of conservation. Class B lands are tax forfeited lands under the jurisdiction of the county board of the county in which the lands are situated. These lands are lands forfeited for the non-payment of taxes and held in trust for the taxing districts.

The division of lands and minerals was designated by the land exchange commission as the agency to appraise and examine lands under the land exchange act, and was selected as the agency through which Class A land exchange proposals are to be cleared.

The appraisers of the division also examine, investigate and check Class B land exchange proposals when they are submitted by the counties to the land exchange commission for approval. Exchanges of both Class A and Class B lands are subject to the unanimous approval of the land exchange commission.

To date only a few Class B land exchange proposals have been completed, but it is anticipated that during the next biennium, many of the northern counties will take advantage of this method of exchanging lands in connection with their county land zoning programs.

Legislative Recommendations

It is recommended:

1. That Minnesota Statutes 1945, Section 93.08, covering the removal of sand and gravel and the mining of all minerals, except iron ore, under the waters of any meandered lake or stream, be amended in order to simplify the procedure for issuing permits and leases.

2. That Minnesota Statutes 1945, Section 93.19, be amended to provide for the conversion of an iron mining lease into a taconite lease after the merchantable ore in a mining unit has been exhausted.

Under the present act a taconite iron ore mining lease may be converted into an iron mining lease, if merchantable ore of substantial value is discovered under a taconite lease, and this mining unit can be reconverted into

a taconite lease after the merchantable ore has been exhausted. However, there is no provision under this act which makes it possible to convert an original iron mining lease into a taconite lease. Such a provision will enable iron mining lessees to develop the taconite in mining units after the merchantable iron ore has been exhausted.

3. That Minnesota Statutes 1945, Section 93.285, Subdivision 3, which deals with permits to prospect for stockpiled iron ore, be amended to correct an error which was made in the 1945 act, which reads as follows: "No permit for the same unit shall be issued to the same person for two 6-month periods in succession."

This should be amended to read: "No permit for the same unit shall be issued to the same person for two **one-year** periods in succession."

4. That Minnesota Statutes 1945, Section 84.415, be amended to cover land under the control of the commissioner of conservation and to eliminate the maximum rental that may be charged by the state for use of land under this act.

5. That present laws authorizing the commissioner of conservation to issue right-of-way easements or permits across state lands be amended to include the right to lease rights-of-way for gas pipe lines, water lines and other uses involving a long period of time.

6. That Minnesota Statutes 1945, Section 84.027, be amended with reference to the duties of the commissioner of conservation and the state auditor in the administration of trust fund lands and tax forfeited lands in the Red Lake Game Preserve and Conservation Areas.

7. That assignments of state land contracts be recorded in the register of deeds office of the county in which the state land is situated, and also require notice of assignment to be filed with the commissioner of conservation.

8. That Minnesota Statutes 1945, Section 92.14, be amended to eliminate the publication of notice of sale of trust fund lands in the St. Paul papers. There appears to be no need of publishing such notice except in the county in which the land is located.

9. That legislation be enacted to provide for the payment into the permanent trust funds of the value of trust fund lands withdrawn from sale for special purposes.

10. That Minnesota Statutes 1945, Section 282.221 to 282.226, inclusive, relating to the classification, appraisal and sale of tax forfeited lands in the Red Lake Game Preserve, and Minnesota Statutes 1945, Section 282.14 to 282.22, relating to the classification, appraisal and sale of tax-forfeited lands in conservation areas, be amended to coordinate the work of both state and county officials in the administration of tax-forfeited lands in both areas.

Provision should also be made for the payment of necessary expenses to county officials in connection with the classification, sale and collections of money due on the sale of these tax-forfeited lands. Reports of collections made by the county treasurer and county auditor for the sale of tax-forfeited lands in these areas should be unified and made in the same form and manner as is now being used by county officials for reporting sales and collections covering state trust fund lands.

Division of State Parks

HAROLD W. LATHROP, *Director*
to August 31, 1946

L. E. FIERO, *Direetor*
since September 1, 1946

(The material for this report was prepared mainly by Mr. Lathrop, prior to his resignation as Director of the Division of State Parks, as of August 31, 1946, after having served as first Director of the Division, since July 1, 1935. Mr. Fiero, former Director of the Division of Game and Fish, succeeds Mr. Lathrop.)

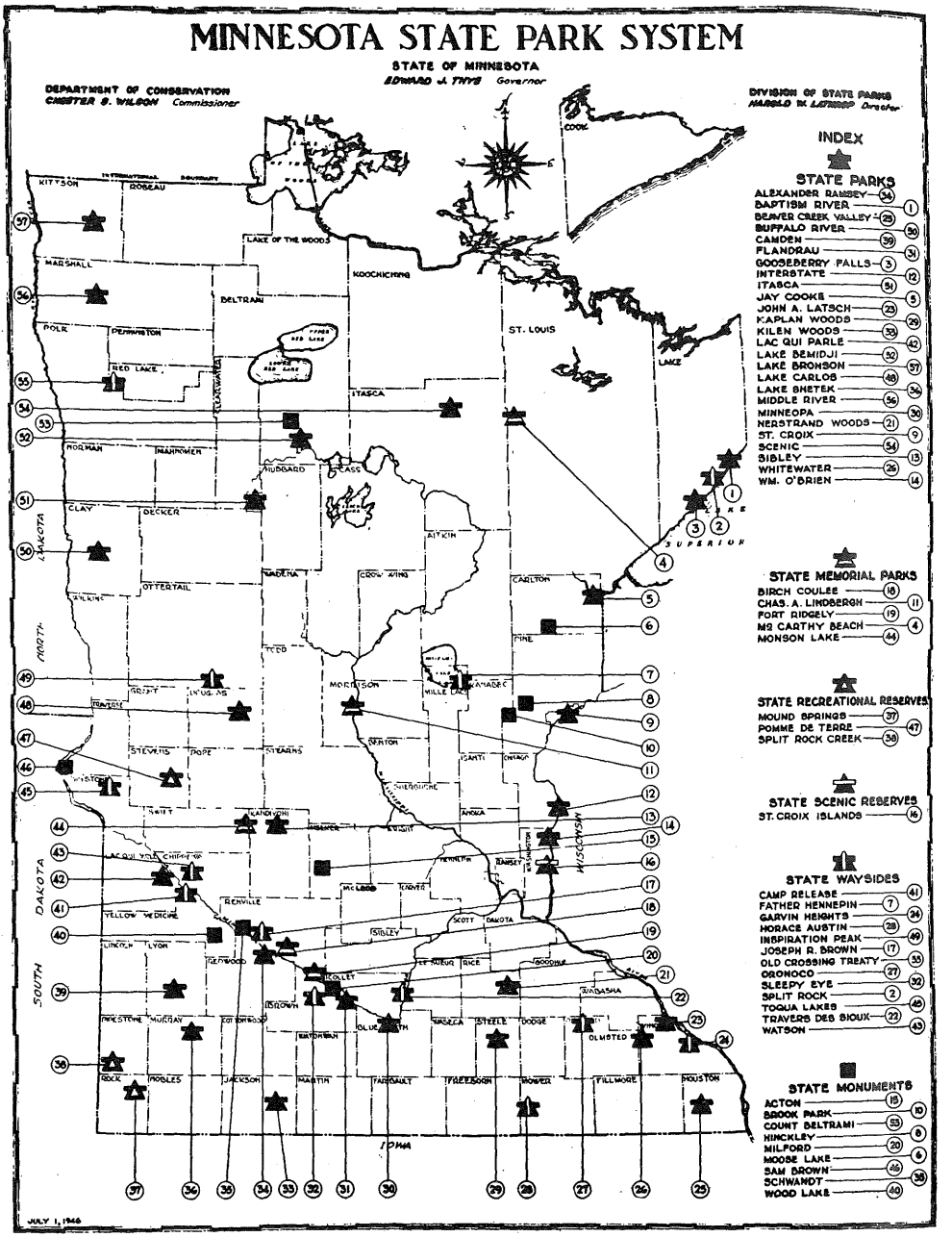
Introduction

The Division of State Parks has, during the past two years, experienced considerable difficulty in adequately serving the public demands and providing the protection necessary to perpetuate the rich natural heritage of the areas under its control. The restricted travel of the war period made people more aware of the recreational opportunities of their own communities and this feature of increased local use maintained park attendance in areas close to large population centers at the pre-war levels. However, the reverse was true of parks located in sections of the state more remote from the dense population centers. They suffered a severe lack of attendance. The end of world hostilities and resumption of travel, as was to be expected, swelled the attendance to unprecedented levels in all units of the park system. Local people continued to enjoy the parks they discovered in their back yards during the war, and old and new visitors from distant points flocked to Minnesota State Parks to enjoy their recreational opportunities and natural beauty. Many people, harried by the stress of war, were able to relieve this strain and find a new outlook on life through the relaxation and recreational opportunities of state parks. The service rendered during the trying war years by the state parks cannot be measured in dollars and cents, but will serve to build up the attendance in the parks in ever-increasing volume.

At the outset of the war, buildings and facilities, most of them built during the work-relief period, 1933-38, were still in a fairly good state of repair, and as a result, we were able to serve public demand quite well during the war-time period with curtailed maintenance personnel and material. June 30, 1946, finds these buildings and facilities in need of many minor repairs and protective maintenance operations, which must be accomplished if the facilities are to be kept reasonably safe for public use. Material and equipment shortages, coupled with the demands for improved facilities and protection of newly acquired land areas, will greatly increase the cost of service and has already severely strained our available personnel. Rising living costs require increases in salaries for existing personnel, and additional personnel is necessary to meet expanding needs and protection of newly dedicated areas.

Shelter and refectory buildings in the established parks initially provided through the efforts of the CCC, WPA and National Park Service, are

FIGURE 1


MINNESOTA STATE PARK SYSTEM
STATE OF MINNESOTA
EDWARD J. THYE Governor
DEPARTMENT OF CONSERVATION
CHESTER S. WILSON Commissioner
DIVISION OF STATE PARKS
HAROLD W. LATHROP Director
INDEX
STATE PARKS
ALEXANDER RAMSEY 34
BAPTISM RIVER 1
BEAVER CREEK VALLEY 28
BUFFALO RIVER 30
CAMDEN 39
FLANDRAU 31
GOOSEBERRY FALLS 3
INTERSTATE 12
ITASCA 51
JAY COOKE 5
JOHN A. LATSCH 23
KAPLAN WOODS 29
KILEN WOODS 33
LAC QUI PARLE 42
LAKE BEMIDJI 32
LAKE BRONSON 37
LAKE CARLOS 48
LAKE SHETEK 34
MIDDLE RIVER 54
MINNEOPA 30
NERSTRAND WOODS 21
ST. CROIX 9
SCENIC 54
SIBLEY 13
WHITEWATER 26
WM. O'BRIEN 14
STATE MEMORIAL PARKS
BIRCH COULEE 18
CHAS. A. LINDBERGH 11
FORT RIDGELY 19
MT CATHY BEACH 4
MONSON LAKE 44
STATE RECREATIONAL RESERVES
MOUND SPRINGS 37
POMME DE TERRE 47
SPLIT ROCK CREEK 38
STATE SCENIC RESERVES
ST. CROIX ISLANDS 16
STATE WAYSIDES
CAMP RELEASE 41
FATHER HENNEPIN 7
GARVIN HEIGHTS 24
HORACE AUSTIN 28
INSPIRATION PEAK 49
JOSEPH R. BROWN 17
OLD CROSSING TREATY 35
ORONOCO 27
SLEEPY EYE 32
SPLIT ROCK 2
TOQUA LAKES 40
TRAVERS DES SIOUX 22
WATSON 43
STATE MONUMENTS
ACTON 15
BROOK PARK 10
COUNT BELTRAMI 53
HINCKLEY 8
MILFORD 20
MOOSE LAKE 6
SAM BROWN 46
SCHWANDT 36
WOOD LAKE 40
KITTSON
ROSEAU
MARSHALL
POLK
PENNINGTON
RED LAKE
BELTRAMI
LAKE OF THE WOODS
KOOCHICHING
COOK
ST. LOUIS
LAKE
ITASCA
NORMAN
MAHNOMEN
HUBBARD
CASS
CLAY
BECKER
AITKIN
OTTERTAIL
WILKIN
WADENA
CROW WING
CARLTON
TODD
PINE
MORRISON
MILLE LACS
GRANT
TRAVERSE
DOUGLAS
POPE
STEVENS
STEARNS
BENTON
SHERBURNE
WRIGHT
ANOKA
KANDIYOHI
MEEKER
ISANTI
CHISAGO
HENNEPIN
RAMSEY
WASHINGTON
LAC QUI PARLE
CHIPPEWA
MCLEOD
CARVER
RENVILLE
YELLOW MEDICINE
SIBLEY
SCOTT
DAKOTA
LINCOLN
LYON
GREENWOOD
LE SUEUR
RICE
GOODHUE
WABASHA
NICOLLET
BROWN
COTTONWOOD
MURRAY
REDWOOD
BLUE EARTH
WASECA
STEELE
DODGE
OLMSTED
WINONA
ROCK
NOBLES
JACKSON
MARTIN
FARIBAULT
FREEBORN
MOWER
FILLMORE
HOUSTON
IOWA
NORTH DAKOTA
SOUTH DAKOTA
MISSISSIPPI
SUPERIOR
LAKE
JULY 1, 1948

now in need of expansion and improvement, to provide greater facilities for the use of increasing numbers of visitors. Shelter buildings need screening and in some cases windows, to provide protection against mosquitoes and weather. Additional building is required for employee housing and to meet refectory and boating demands.

Custodial employees must be stationed at new acquisitions to prevent destruction of timber and vandalism to existing buildings, otherwise these areas will suffer irreparable damage. Some damage has already occurred. Baptism River, McCarthy's Beach, William O'Brien, Nerstrand Woods and other new acquisitions will require some capital improvement funds to insure protection of their natural resources and equip these areas for public use. Such needs will be reflected in the biennial budget request.

The following portion of the report gives evidence of the ever-increasing public use of the various units of our state park system, with a summary in the last section, projecting the future needs. State parks serve not only as our people's playgrounds, but as show windows of our attractions for hosts of tourists who visit us annually. In natural features our state parks are unsurpassed but in improvements and facilities for public use we fall far short of many other states, and suffer by comparison. There is urgent need for prompt action in carrying out the recommended program for improvement and maintenance, to keep the state park system moving forward in step with public demand and with progress in other states.

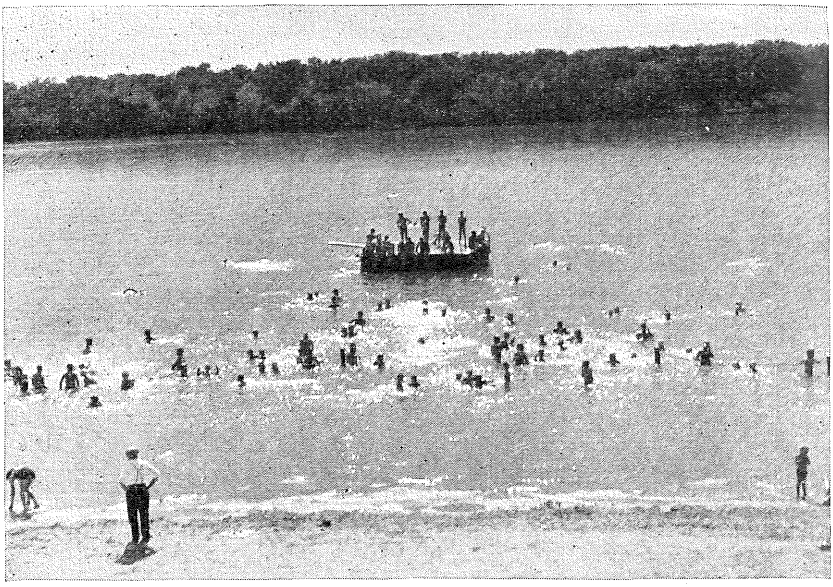
History

The Minnesota State Park system had its beginning fifty-seven years ago, but little did any of the members of the 1889 Legislature realize, when they appropriated funds to acquire the Camp Release battlefield, the progressive portent of that action. By the dedication of that historic site, to memorialize an event of the 1862 Sioux Uprising, followed by the authorization by subsequent legislatures to preserve several similar historic sites and numerous outstanding natural areas of scenic and geologic value, a fine group of units have been established, which comprise the present state park system.

Between 1889 and 1925, the twenty-four parks and monuments so established, with the exception of Itasca and Sibley State Parks, were under the direction of the State Auditor. Itasca was supervised by the state forester, and Sibley by the Game and Fish Commissioner.

From 1925 to 1931, with three additional monuments established, all areas were placed under the supervision of a Conservation Commission, made up of the State Auditor as Land Commissioner, and the Commissioners of Game and Fish, and Forestery and Fire Prevention.

With the re-organization of the Department of Conservation in 1931, all state parks were placed under the Division of Forestry, and four additional areas were added to the system, to make a total of thirty-one areas, aggregating approximately 39,200 acres.



Lake Shetek bathing beach.

Since the creation of the Division of State Parks by the Legislature of 1935, twenty-six additional units have been added to the system, making a total of fifty-seven units, having an aggregate area of 82,650 acres as of June 30, 1946.

Prior to 1935, many of the park units were managed independently of each other by local committees using legislative appropriations and with only superficial control by the Division of Forestry. Some of the larger parks, however, were managed directly by that division more in keeping with general park policies.

With a new division established solely to administer the state parks, all areas have been integrated into a system which has been functioning under uniform state-wide policies and procedures, both as to maintenance and facility operations, and in accordance with generally accepted nation-wide standards.

For several years the Division did, however, experiment with different methods of management of facility operations, and finally reached the conclusion that the public could be served better under state-operation than by leased concessions. The 1941 legislature authorized the establishment of a State Parks Working Capital Fund, thus permitting all special services and facilities furnished park visitors under fees or charges to be state-operated. Since 1943, when Douglas Lodge in Itasca State Park was placed under state operation, all major facilities in the system, with the exception of two excursion boat concessions, are handled by state employees, all receipts being credited to the Working Capital fund. Park visitors have

evidenced satisfaction with such management, and there appears to be little doubt as to the propriety of such state-operated services as a means of permitting the public to better enjoy their visits to the parks which are furnished by their state for their recreation and pleasure.

Classification of Units

Each of the units in the state park system was established for a prime purpose, such as: to preserve superlative scenic values; to memorialize some outstanding historical event or personage; or to provide adequate opportunities for healthful outdoor recreation. Many of the larger areas encompass all three purposes, while others may in a very small area serve but one purpose. Therefore, in order to indicate by the official title the purpose each unit serves, a classification schedule has been established, as indicated by the following designations in the several accompanying tables and charts:

S.P. — State Park
S.M.P. — State Memorial Park
S.W. — State Wayside (Scenic, Historic or Memorial)
S.R.R. — State Recreational Reserve
S.S.R. — State Scenic Reserve
S.M. — State Monument

Figure No. 2, Information Relative to Each State Park Unit, shows the characteristics of each unit. Figure No. 3, Index of Activities and Facilities Available in State Park Areas, shows the type of activities provided.

The Chronological Table relative to the Establishment of State Units, (Table No. 1), shows the numerical order and year of establishment of each of the units, the general classification and the administrative set-up at the time of such establishment.

TABLE No. 1

Chronological Table Relative to the Establishment of State Park Units

I. State Auditor and Local Committees.

Order	Year	Park Name	Class
1.	1889	Camp Release	S.W.
2.	1891	*Itasca	S.P.
3.	1893	Birch Coulee	S.M.P.
4.	1895	Interstate	S.P.
5.	1899	Hinckley	Mon.
6.	1905	Minneopa	S.P.
7.	1905	Traverse des Sioux	S.W.
8.	1905	Lake Shetek	Mon. & S.P.
9.	1907	Wood Lake	Mon.
10.	1909	Acton	Mon.
11.	1911	Alexander Ramsey	S.P.
12.	1911	Fort Ridgely	S.M.P.
13.	1913	Horace Austin	S.W.

Order	Year	Park Name	Class
14.	1915	Jay Cooke	S.P.
15.	1915	Brook Park	Mon.
16.	1915	Schwandt	Mon.
17.	1919	*Sibley	S.P.
18.	1919	Whitewater	S.P.
19.	1919	Toqua Lakes	S.W.
20.	1921	Scenic	S.P.
21.	1921	Sleepy Eye	S.W.
22.	1922	Garvin Heights	S.W.
23.	1923	Lake Bemidji	S.P.
24.	1925	John A. Latsch	S.P.

II. Conservation Commission composed of State Auditor, Commissioner of Forestry, Commissioner of Game & Fish.

25.	1929	Milford	Mon.
26.	1929	Moose Lake	Mon.
27.	1929	Sam Brown	Mon.

III. Department of Conservation, Division of Forestry.

28.	1931	Chas. A. Lindbergh	S.M.P.
29.	1931	Inspiration Peak	S.W.
30.	1931	Old Crossing Treaty	S.W.
31.	1931	Lac qui Parle	S.P.

IV. Department of Conservation — Division of State Parks

32.	1935	Camden	S.P.
33.	1935	Kaplan Woods	S.P.
34.	1937	Beaver Creek Valley	S.P.
35.	1937	Buffalo River	S.P.
36.	1937	Flandrau	S.P.
37.	1937	Gooseberry Falls	S.P.
38.	1937	Middle River	S.P.
39.	1937	Lake Bronson	S.P.
40.	1937	Monson Lake	S.M.P.
41.	1937	Mound Springs	S.R.R.
42.	1937	Pomme de Terre	S.R.R.
43.	1937	Split Rock Creek	S.R.R.
44.	1937	Oronoco	S.W.
45.	1937	Joseph R. Brown	S.W.
46.	1938	Lake Carlos	S.P.
47.	1941	Watson	S.W.
48.	1941	Father Hennepin	S.W.
49.	1943	St. Croix	S.P.
50.	1943	St. Croix Islands	S.S.R.
51.	1945	Baptism River	S.P.
52.	1945	Split Rock	Wayside
53.	1945	McCarthy's Beach	S.M.P.
54.	1945	William O'Brien	S.P.
55.	1945	Kilen Woods	S.P.
56.	1945	Count Beltrami	Mon.
57.	1945	Nerstrand Woods	S.P.

*Under State Forester and Game and Fish Commissioner.

FIGURE 2

INFORMATION RELATIVE TO EACH STATE PARK UNIT

NAME OF AREA	DATE ESTABLISHED	COUNTY	ACRES	CHARACTERISTICS: Botanical	Geological	Scenic	Historical	Wildlife	River	Lake	Stream	Falls	Islands
STATE PARKS													
Alexander Ramsey	1911	Redwood	185.38	X	X	X			X			X	
Baptism River	1945	Lake	506.00	X	X	X			X	X	X		
Beaver Creek Valley	1937	Houston	325.17	X	X	X					X		
Buffalo River	1937	Clay	241.86	X		X			X				
Camden	1935	Lyon	469.96	X		X	X		X				
Flandrau	1937	Brown	836.48						X	X			X
Gooseberry Falls	1937	Lake	637.83	X	X	X			X			X	
Interstate	1895	Chisago	154.00	X	X	X			X				X
Itasca	1891	Clrwtr, Hubb., & Becker	31,976.00	X		X	X	X	X			X	X
Jay Cooke	1915	Carlton	8,366.70	X	X	X			X			X	X
John A. Latsch	1925	Winona	350.20	X	X	X			X				
Kaplan Woods	1935	Steele	180.00	X					X				
Kilen Woods	1945	Jackson	104.10	X		X			X		X		X
Lac Qui Parle	1941	Chippewa & Lac Qui Parle	457.49	X		X			X				X
Lake Bemidji	1923	Beltrami	205.48	X		X		X					
Lake Bronson	1937	Kittson	745.62	X		X		X					
Lake Carlos	1938	Douglas	403.56	X		X		X					
Lake Shetek	1937	Murray	184.62	X		X					X		X
Middle River	1937	Marshall	285.00	X		X			X				
Minneopa	1905	Blue Earth	110.24	X		X						X	X
* Nerstrand Woods	1945	Rice	467.55	X		X						X	X
St. Croix	1943	Pine	30,557.40	X	X	X			X	X			X
Scenic	1921	Itasca	2,121.30	X		X			X		X		X
Sibley	1919	Kandiyohi	378.83	X		X			X		X		
Whitewater	1919	Winona	688.28	X	X	X			X				
Wm. O'Brien	1945	Washington	180.30	X		X			X				X
STATE MEMORIAL PARKS													
Birch Coulee	1893	Renville	82.00	X			X				X		
Chas. A. Lindbergh	1931	Morrison	110.42	X			X			X			
Fort Ridgely	1911	Nicollet	224.80	X			X				X		
Mc Carthy Beach	1945	St. Louis	135.00	X			X						
Monson Lake	1937	Swift	198.95	X			X			X			
STATE RECREATIONAL RESERVES													
Mound Springs	1937	Rock	194.90	X	X	X				X			
Pomme de Terre	1937	Stevens	363.51							X	X		
Split Rock Creek	1937	Pipestone	227.64			X				X			
STATE SCENIC RESERVES													
St. Croix Islands	1943	Washington	39.36			X			X				X
STATE WAYSIDES													
Camp Release	1889	Lac Qui Parle	17.80				X						
Father Hennepin	1941	Mille Lacs	129.75	X			X			X			
Garvin Heights	1922	Winona	17.00			X							
Horace Austin	1913	Mower	50.00				X		X				
Inspiration Peak	1931	Ottertail	82.00	X		X							
Joseph R. Brown	1937	Renville	3.00				X						
Old Crossing Treaty	1931	Red Lake	111.00			X	X		X				
Oronoco	1937	Olmsted	105.00			X				X			
Sleepy Eye	1921	Brown	40.00			X	X			X			
Split Rock	1945	Lake	35.00	X	X	X		X		X			
Toqua Lakes	1919	Big Stone	40.00			X				X			
Traverse des Sioux	1905	Nicollet	2.27				X						
Watson	1938	Chippewa	12.00			X			X				
STATE MONUMENTS													
Acton	1909	Meeker	0.10				X						
Brook Park	1915	Pine	0.25				X						
* Count Beltrami	1945	Beltrami	1.00				X						
Hinckley	1899	Pine	0.10				X						
Milford	1929	Brown	1.00				X						
Moose Lake	1929	Carlton	0.10				X						
Sam Brown	1929	Traverse	1.00				X						
Schwandt	1915	Renville	0.10				X						
Wood Lake	1907	Yellow Medicine	1.00				X						

* *Transfer of title incomplete as of July 1, 1946*

FIGURE 3

INDEX OF ACTIVITIES AND FACILITIES AVAILABLE IN STATE PARK AREAS

NAME OF AREA	CLASSIFICATION	ACTIVITIES & FACILITIES																	
		Amphitheater	Bathhouse	Boats	Cabins	Camping - Tent	Camping - Trailer	Camp Kitchen	Dining Room	Excursion Boat	Fishing	Group Camp	Horse Trails	Museum	Nature Trails	Picnic Grounds	Playfields	Refectory	Shelter Building
Alexander Ramsey	S.P.														X	X	X	X	X
Baptism River	S.P.						Undeveloped												
Beaver Creek Valley	S.P.										X					X			
Birch Coulee	S.M.P.															X			
Buffalo River	S.P.		X			X									X	X	X	X	X
Camden	S.P.	X	X			X						X			X	X	X	X	X
Camp Release	S.W.															X			
Chas. A. Lindbergh	S.M.P.										X			X	X	X		X	X
Flandrau	S.P.		X	X						X	X	X			X	X		X	X
Father Hennepin	S.W.						Undeveloped												
Fort Ridgely	S.M.P.	X												X	X	X	X	X	X
Garvin Heights	S.W.															X			
Gooseberry Falls	S.P.					X	X	X			X				X	X	X	X	X
Horace Austin	S.W.															X			
Inspiration Peak	S.W.														X	X			
Interstate	S.P.			X	X	X	X	X		X	X				X	X		X	X
Itasca	S.P.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X
Jay Cooke	S.P.						X	X					X		X	X	X	X	X
John A. Latsch	S.P.						X	X			X				X	X			
Joseph R. Brown	S.W.						Undeveloped												
Kaplan Woods	S.P.										X				X	X			
Kilen Woods	S.P.						Undeveloped												
Lac Qui Parle	S.P.	X		X							X			X	X	X			X
Lake Bemidji	S.P.		X			X	X	X							X	X	X	X	X
Lake Bronson	S.P.		X	X		X				X	X				X	X	X	X	X
Lake Carlos	S.P.	X	X	X		X					X				X	X		X	X
Lake Shetek	S.P.		X	X		X		X			X				X	X		X	X
McCarthy Beach	S.M.P.						Undeveloped												
Middle River	S.P.	X	X			X									X	X	X	X	X
Minneopa	S.P.														X	X	X	X	X
Monson Lake	S.M.P.	X													X	X			X
Mound Springs	S.R.R.										X				X	X			
Nerstrand Woods	S.P.						Undeveloped												
Old Crossing Treaty	S.W.										X				X	X			
Oronoco	S.W.										X					X			
Pomme de Terre	S.R.R.		X	X							X					X		X	
St. Croix	S.P.				X	X		X			X	3			X	X	X	X	X
St. Croix Islands	S.S.R.						Undeveloped												
Scenic	S.P.		X	X	X	X	X				X		X		X	X	X	X	X
Sibley	S.P.	X	X	X		X	X				X				X	X	X	X	X
Sleepy Eye	S.W.										X					X	X		
Split Rock	S.W.						Undeveloped												
Split Rock Creek	S.R.R.										X					X			
Togua Lakes	S.W.	X														X	X		
Traverse des Sioux	S.W.															X			
Watson	S.W.															X			X
Whitewater	S.P.	X	X			X	X	X			X		X		X	X	X	X	X
Wm. O'Brien	S.P.						Undeveloped												

Activities and Facilities

There has been no major change during the past biennium, either as to activities or facilities, primarily because the legislature provided no funds for any expansion other than land acquisition.

It was evident, however, shortly after the end of the war in Europe in May, that the parks would, during the 1945 season, be required to serve an attendance almost equal to the pre-war season of 1941, and such was the case. All bathhouses were operated. In a few instances it was necessary to employ competent swimmers in place of qualified lifeguards, of whom there was a shortage because of the war. Shortage of meat apparently stimulated fishing, resulting in a heavy demand for rental of boats.

Group camp use increased in 1945 at St. Croix State Park by the return of an agency which could not operate in 1944 because of a shortage of competent counselors. Other agencies began to show renewed interest in the activity which all but terminated during the first three war years. Two camps were utilized for housing prisoners-of-war assigned for work in canneries.

Victory over Japan in August, which brought gasoline rationing to an end, caused an unprecedented rush to the parks, and the attendance during the last few weeks of the season furnished an index as to what might be anticipated in 1946. The estimated 1945 attendance exceeded one and one quarter million.

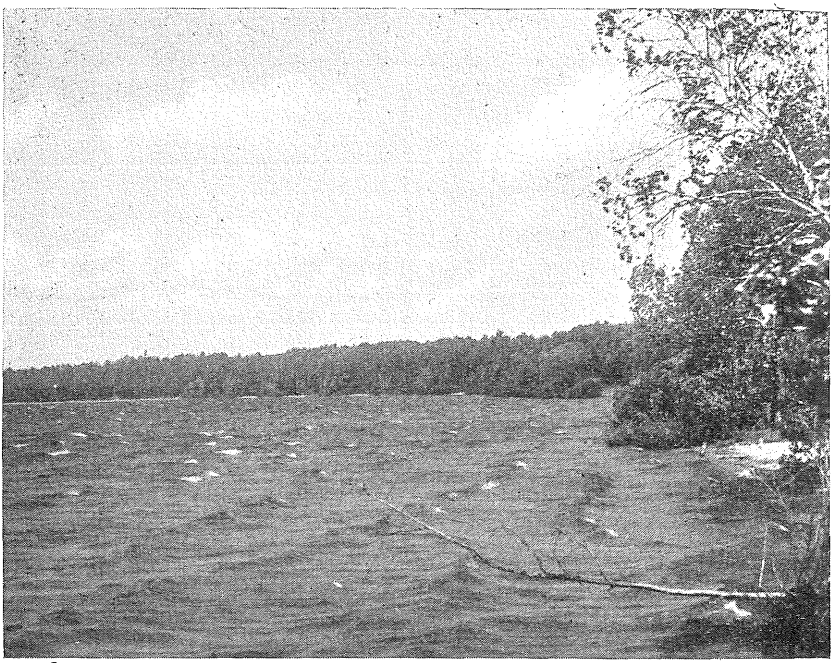
A warm April started off the 1946 season for what will undoubtedly bring the heaviest attendance ever recorded in our state parks. Should the ratio of increase in attendance over 1941 continue, the season's total should approach the two million mark.

New Park Areas

Several new park areas were authorized by the 1945 legislature, the most important of which was Baptism River State Park on the North Shore of Lake Superior. It embraces the lower one and three-quarters miles of the Baptism River, with three of its four major waterfalls, one of which is the highest waterfall lying entirely within our state. This 506 acre tract also includes one and one-half miles of Lake Superior shoreline, of which well-known Shovel Point is a part. The variety of natural and scenic values combine to make this one of the finest examples of the purpose of state parks in preserving such outsanding portions of original Minnesota.

Split Rock State Scenic Wayside, comprising 35 acres, consists of a high knob overlooking the well-known Split Rock Lighthouse, which has long been a beacon for Lake Superior mariners.

Through the heroic efforts of civic-minded individuals and organizations in Hibbing and Chisholm, McCarthy Beach, comprising 135 acres, one of the last remnants of the large pine forests in western St. Louis County, was set aside for state park purposes. Funds were raised to acquire an option



McCarthy's Beach State Park is located between Sturgeon and Side lakes, 16 miles north of Chisholm and Hibbing.

on the timber rights, which had been sold to a logger, until the 1945 legislature had an opportunity to consider legislation for acquisition. The legislature appropriated half the cost and the two communities raised a fund through popular subscription to match the appropriation. This is the first instance where local government units contributed to the acquisition cost of a state park. This tract, located on a narrow strip between Sturgeon and Side Lakes, contains the finest natural beaches in the state park system. The adjacent land can be developed ideally for picnicking and camping, to serve the heavy use which must be anticipated.

Kilen Woods State Park was authorized by legislative action to preserve a fine hardwood area along the Des Moines River in Jackson County, and well situated to serve the needs of a section of the state for which no state park facilities existed. Of the 258 acres authorized, 104 have been acquired as of June 30, 1946.

Count Beltrami Monument was authorized for the purpose of memorializing the famous explorer who discovered the height of land on the Continental Divide in 1823. A one-acre tract near the south shore of Lake Julia, formerly used as a rural school site, has been designated for transfer to the Division for the location of this State Monument.

After more than ten years of effort to establish Nerstrand Woods in Rice County as a State Park, progress was made when the last legislature

designated the lands which are to be transferred to the state by the Federal government under a land exchange arrangement. Legal steps for consummation of the transfer are in progress under the Attorney General's office.

One of the most notable additions to the system resulted from the donation of 180 acres of land bordering on the St. Croix River, two miles north of Marine in Washington County, by Miss Alice O'Brien of St. Paul. This beautifully wooded section of the river valley, to be known as William O'Brien State Park, offers excellent opportunities for providing facilities for picnicking, canoe party camping, and other outdoor activities for which there is so great a demand by the residents of the Twin City metropolitan area.

Another remarkable addition, although not as a new park, was the 160 acres acquired at the north edge of Itasca State Park. The land was vitally needed for the expansion of the main picnic grounds and will eliminate for all time the danger of encroachment by private commercial establishments on the area immediately overlooking Lake Itasca.

The legislature authorized the changing of the official name of Cottonwood River State Park to Flandrau State Park and of Two Rivers State Park to Lake Bronson State Park, both of which met with the favor of the general public.

Improvements

Due to the shortage of materials and labor, only the absolutely necessary construction work was done during the biennium. The most important job was the construction of a superintendent's residence at Interstate State Park, by which proper control could be exercised at all seasons of the year. The work was done mainly by the regular staff, and most of the materials used came from surpluses in other parks.

In order that Beaver Creek Valley State Park might better accommodate park visitors who ventured into this undeveloped park for picnicking and hiking, two pit toilets were constructed.

An additional room was added to one of the quarters for help in St. Croix State Park.

Some very necessary maintenance work was done at Douglas Lodge. The main lodge porch was in such condition as to require complete rebuilding, and some protective work was also done to overcome serious deterioration in the log walls. Two portable former CCC buildings were moved from Jay Cooke State Park to serve as quarters for help at Douglas Lodge.

The appraised inventory value of the state park lands and improvements, based on the worth of lands at the time they were acquired or donated to the state, and adding the appraised value of the permanent improvements, is shown in Table 2.

TABLE No. 2

INVENTORY VALUE OF STATE PARK LANDS AND IMPROVEMENTS

As of June 30, 1946

PARK NAME	LAND		IMPROVEMENTS		TOTALS
	Purchase	Donations	State	Federal	
Acton Monument	$25.00		$2,500.00		$2,525.00
Alexander Ramsey	14,409.53	$3,317.00	25,947.44	$19,902.56	63,576.53
Baptism River	15,200.00				15,200.00
Beaver Creek Valley	9,532.15		410.00		9,942.15
Birch Coulee	7,252.00	1,376.00	10,852.29	21,896.21	41,376.50
Brook Park Monument		100.00	2,500.00		2,600.00
Buffalo River	15,890.87		10,561.50	64,657.50	91,109.87
Camden	21,627.00	600.00	11,304.59	139,706.41	173,238.00
Camp Release	330.00		5,400.00	150.00	5,880.00
Chas. A. Lindbergh		9,000.00	32,417.13	32,622.84	74,039.97
Father Hennepin		3,243.75			3,243.75
Flandrau	77,107.47		76,859.55	237,864.21	391,831.23
Fort Ridgely	17,391.21		17,276.87	109,417.13	144,085.21
Garvin Heights		1,020.00	1,037.82	162.18	2,220.00
Gooseberry Falls	25,000.00		2,847.08	283,147.92	310,995.00
Hinckley Monument		100.00	2,500.00		2,600.00
Horace Austin	5,000.00		12,725.00		17,725.00
Inspiration Peak	2,000.00		1,325.00		3,325.00
Interstate	3,651.00	23,300.00	30,356.45	59,336.83	116,644.28
Itasca	1,192,160.00	582,340.00	155,718.45	570,930.74	2,501,149.19
Jay Cooke	113,048.61	48,300.00	72,126.86	178,272.14	411,747.61
John A. Latsch		26,265.00	1,665.00	150.00	28,080.00
Joseph R. Brown		60.00			60.00
Kaplan Woods	15,505.25		650.00	150.00	16,305.25
Kilen Woods	6,210.65				6,210.65
Lac qui Parle	15,221.00		4,646.14	26,738.86	46,606.00
Lake Bemidji	43,056.54		7,470.72	15,439.28	65,966.54
Lake Bronson	16,996.26		19,789.89	53,897.26	90,683.41
Lake Carlos	8,838.59		16,480.40	27,678.68	52,997.67
Lake Shetek	27,854.20		34,827.75	128,377.25	191,059.20
McCarthy Beach	24,516.72	24,516.73			49,033.45
Middle River	8,996.56		14,687.03	44,161.97	67,845.56
Milford Monument		100.00	2,688.00		2,788.00
Minneopa	9,350.00	160.11	24,344.04	18,316.00	52,170.15
Monson Lake	16,110.00		3,906.04	32,423.96	52,440.00
Moose Lake Monument		150.00	2,500.00		2,650.00
Mound Springs	15,623.13		6,506.33	23,043.82	45,173.28
Old Crossing Treaty			500.00	1,820.00	2,320.00
Oronoco	7,500.00		1,279.65	9,933.10	18,712.75
Pomme de Terre	18,097.81		15,887.16	48,163.84	82,148.81
St. Croix		109,194.42	11,314.43	454,660.00	575,168.85
St. Croix Islands		500.00			500.00
Sam Brown Monument	2,500.00		2,500.00		5,000.00
Scenic	58,195.00		775.00	92,018.00	150,988.00
Schwandt Monument		10.00	275.00		285.00
Sibley	24,800.00		222.15	162,608.85	187,631.00
Sleepy Eye	1,296.50	6,704.00	4,050.00	480.00	12,530.50
Split Rock Creek	12,951.22		3,202.92	20,637.08	36,791.22
Split Rock Wayside		3,500.00			3,500.00
Toqua Lakes	2,733.00		1,440.00	6,600.00	10,773.00
Traverse des Sioux	250.00	250.00	1,225.00	150.00	1,875.00
Watson Wayside	336.00		903.51	8,236.49	9,476.00
Whitewater	9,491.58	4,713.20	18,499.27	186,787.73	219,491.78
William O'Brien		25,000.00			25,000.00
Wood Lake Monument	250.00		2,500.00		2,750.00
Total	$1,866,304.85	$873,820.21	$679,401.46	$3,080,538.84	$6,500,065.36

Acquisition of Equipment

The major expenditures for additional equipment were attributable to increased facility operations. The authority to acquire the equipment formerly owned by the operator of Douglas Lodge carried over three years, but the entire inventory was paid up within two years. Several refrigeration units were purchased for Douglas Lodge and other large operations, as were some items of furniture and fixtures. A new gas range was purchased to replace the old coal burning range at Douglas Lodge. Twenty aluminum boats were acquired at a very reasonable price and distributed to six of the parks. It is believed that such type boats will prove very practical for park purposes from a maintenance standpoint.

Aluminum boats on the St. Croix River, St. Croix Park.

The need for automotive equipment to replace existing equipment is becoming increasingly acute, present vehicles ranging from 1931 to 1936 models. Purchase orders have been issued for two units to supplement the present units. No deliveries have yet been made, and it appears now as if all of the antiquated equipment must remain in use, even at a pyramiding cost of maintenance until such time as all major parks are provided with adequate transportation.

The largest single class of equipment purchased for the maintenance program was ten power mowers. Some of these were to replace 1935 models, others for parks where more such type of equipment was necessary.

The inventory value of tools and equipment in each of the units of the system is shown in Table 3.

TABLE 3

Valuation of State Park Tools and Equipment as of June 30, 1946

Administration	$ 5,794.77
Alexander Ramsey	1,995.90
Baptism River	185.25
Beaver Creek Valley	165.50
Birch Coulee	417.65

Buffalo River	1,035.94
Camden	2,868.43
Camp Release	153.78
Chas. A. Lindbergh	1,218.68
Flandrau	9,812.51
Fort Ridgely	3,268.79
Garvin Heights	27.20
Gooseberry Falls	4,675.18
Horace Austin	335.00
Inspiration Peak	113.60
Interstate	5,866.40
Itasca	29,971.21
Douglas Lodge	34,210.44
Jay Cooke	8,172.46
John A. Latsch	699.90
Kaplan Woods	258.70
Lac qui Parle	1,273.42
Lake Bemidji	1,169.86
Lake Bronson	4,080.36
Lake Carlos	2,017.20
Lake Shetek	5,170.34
McCarthy Beach	69.54
Middle River	1,815.03
Milford Monument	36.50
Minneopa	1,331.04
Monson Lake	234.20
Moose Lake Monument	30.12
Mound Springs	434.46
Old Crossing Treaty	253.68
Oronoco	356.35
Pomme de Terre	613.27
St. Croix	34,790.52
Scenic	6,748.22
Sibley	3,960.95
Sleepy Eye	481.30
Split Rock Creek	409.00
Toqua Lakes	671.50
Traverse des Sioux	195.20
Whitewater	8,224.67
Wood Lake	50.00
Total	$186,757.02

Organization

The problem of maintaining an efficiently operating organization is difficult even in normal times for such a varying seasonal enterprise as the state park system. This problem became all the more difficult under conditions prevailing during the war and the following period of transition back to a peace-time basis.

Several personnel changes were effected in the central office secretarial and clerical staff. The unfortunate death in military service of Francis J. Scully, the division accountant prior to 1942, called for a permanent assignment to fill the job held by a person who had served as the accountant for the duration.

With the return from service of several former employees, all were

either reemployed in their former positions or promoted to better positions except one, who chose not to re-enter state service.

The former manager of Douglas Lodge was assigned as northern district supervisor, and the manager's position was filled by a former park superintendent. Theretofore one district supervisor had, for the duration of the war, covered the entire state in that capacity, but this was impractical with the return of heavy use after the war.

Because of the rapid expansion of facility operations, a considerable increase has been made in both laborer and custodial worker assignments.

Table No. 4 shows the actual number of persons employed in each classification for the month of June, 1946.

TABLE No. 4

Number of Employees by Classification on State Park Payroll During June, 1946

1	Director
1	Park Maintenance Supervisor
3	District Park Supervisors
1	Civil Engineer I
1	Accountant I
1	Clerk-Stenographer III
1	Clerk-Stenographer II
4	Clerk-Typist I
3	Park Superintendent II
16	Park Superintendent I
11	Park Custodians
3	Carpenters — part-time
3	General Repairmen
5	Laborer II
54	Laborer I — full and part-time
1	Cook IV
2	Cook II
1	Baker II
1	Food Service Supervisor
1	Laundry Worker I
93	Custodial Worker I — Full and part-time

Financial Reports

The finances of the division, except for special funds earmarked for land acquisition, are covered by the following funds: Administration Salaries; Administration Expense; Maintenance of Parks; and the Working Capital Fund (Revolving). For several years, a recommendation has been made in each biennial budget, proposing that the first three funds be combined to eliminate excessive accounting procedures. This same recommendation is again repeated as a step in the direction of simplified accounting.

The Working Capital Fund, by which the operations of all special services and facilities are financed, has shown an increase in volume of business each successive year since first authorized by the 1941 session, and there is now a pressing need for new legislation, clearly defining the purposes and

limitations of such operations as to both expenditures and receipts. Further reference will be made to this matter under "Facility Operation."

The "Summary of Receipts and Expenditures," Table No. 5 for the two fiscal years shows a considerable increase both in receipts and expenditures for 1946 over 1945, resulting from the salary adjustments authorized by the 1946 legislature and the constantly expanding facility operations.

TABLE No. 5

Summary of Receipts and Expenditures

Fiscal Year 1945			
RECEIPTS			
Appropriation for			
Administrative Salaries	$ 9,600.00		
Administrative Expense	2,100.00		
Maintenance and Improvements	64,500.00	$ 76,200.00	
Balance carried forward in Working Capital Fund	$ 6,489.19		
Receipts Credited to			
Working Capital Fund	$ 72,054.08		
Maintenance and Improvements	3,649.77	$ 82,193.04	$158,393.04
Non-Dedicated Receipts reverted to General Revenue Fund		*$1,048.88	
EXPENDITURES			
Administrative Salaries	$ 9,533.68		
Administrative Expense	2,068.61		
Maintenance and Improvements	67,681.71		
Working Capital	71,034.91	$150,318.91	
Balance carried forward in Working Capital Fund	$ 7,500.00		
Reversion from Working Capital Fund to General Revenue Fund	*$8.36		
Unexpended balances from Appropriations reverted to General Revenue Fund	*$565.77	$ 8,074.13	$158,393.04
Fiscal Year 1946			
RECEIPTS			
Appropriation for			
Administrative Salaries	$ 15,156.00		
Administrative Expense	2,450.00		
Maintenance and Improvements	90,301.00	$107,907.00	
Balance carried forward in Working Capital Fund	$ 7,500.00		
Receipts Credited to			
Working Capital Fund	$113,732.72		
Maintenance and Improvements	4,219.00	$125,451.72	$233,358.72
Non-dedicated Receipts reverted to General Revenue Fund		*$2,900.45	

*Total of credits to General Revenue Fund—$1,623.01.

EXPENDITURES

Administrative Salaries	$ 15,010.00		
Administrative Expense	2,374.90		
**Maintenance and Improvements	93,482.43		
**Working Capital	110,435.75	$221,303.05	
Balance carried forward in Working Capital Fund	$ 7,500.00		
Reversion from Working Capital Fund to General Revenue Fund	*$ 3,297.00		
Unexpended Balances from Appropriations reverted to General Revenue Fund	*$ 1,258.67	$ 12,055.67	$233,358.72

*Total of credits to General Revenue Fund—$7,456.12.
**Expenditures as of June 30, 1946.

Table No. 6 is an itemization of the receipts from the various parks, credited to the General Revenue Fund for both fiscal years.

Tables No. 7 and No. 8 itemize the receipts from the several facility operations in the several parks which were credited to the Working Capital (Revolving) Fund.

Table No. 9 itemizes the expenditures in each of the parks and the administrative office from appropriations made for administrative salaries, administrative expense and maintenance and improvement of parks.

Table No. 10 itemizes the expenditures in each of the parks where facility operations have been carried on under the Working Capital (Revolving) Fund.

TABLE No. 6

STATE PARK RECEIPTS CREDITED TO GENERAL REVENUE FUND

Fiscal Years 1945 and 1946

PARK	Fines and Damages	Land Rentals		Sale of Wood, Hay, Ice		Sale of Buildings	Miscellaneous and Other Sales		Total	
	1945	1945	1946	1945	1946	1946	1945	1946	1945	1946
Baptism River						$ 10.00				$ 10.00
Birch Coulee		$122.50							$ 122.50	
Buffalo River					$ 50.00					50.00
Camden				$ 2.00					2.00	
Flandrau		112.00	$ 88.00				$ 3.00	$75.00	115.00	163.00
Fort Ridgely	$ 2.50				175.00				2.50	175.00
Itasca			20.00			1,207.00				1,227.00
Kaplan Woods					15.00					15.00
Jay Cooke							16.00		16.00	
Lac qui Parle		90.50	124.00	12.00					102.50	124.00
Lake Bemidji				74.38	84.40				74.38	84.40
Lake Carlos	1.50	85.00						1.05	86.50	1.05
Lake Shetek	3.00					702.00			3.00	702.00
Middle River				26.00	26.00				26.00	26.00
Minneopa		20.00	30.00						20.00	30.00
Mound Springs		40.00	40.00						40.00	40.00
Old Crossing Treaty					6.00					6.00
Pomme de Terre		100.00		80.00					180.00	
St. Croix	12.50	21.00		5.00			5.00		43.50	
Split Rock Creek		89.00	25.00						89.00	25.00
Toqua Lakes		76.00							76.00	
Whitewater		50.00	220.00					2.00	50.00	222.00
Totals 1945	$19.50	$806.00		$199.38			$24.00		$1,048.88	
Totals 1946			$547.00		$356.40	$1,919.00		$78.05		$2,900.45

TABLE No. 7

RECEIPTS CREDITED TO STATE PARKS REVOLVING FUND

Fiscal Year 1945

PARK	Bathhouse	Boat Rentals and Watercraft Permits	Launch Rides Other Serv. and Boat Concessions	Cabin Rents and Guest Housing	Camping and Group Camps	Merchandise for Resale	Electricity and Telephone	Phonograph and Other Commissions	Linen Rentals	Petty Cash and Other Refunds	Exch. & M. O. (deduct)	Totals
Alexander Ramsey						$ 356.05				$ 51.77		$ 407.82
Buffalo River	$ 127.30				$ 3.75	638.40				32.57		802.02
Camden	127.80				1.75	595.48				44.48		769.51
Chas. A. Lindbergh						414.70				40.98		455.68
Douglas Lodge		$ 388.75	$560.98	$10,311.70		24,562.29	$ 146.72	$320.62	$ 2.40	258.53		36,551.99
Flandrau	296.90	372.25	9.25		1,947.26	1,810.65	2.00	105.70		85.56		4,629.57
Fort Ridgely						681.10	3.26			61.61		745.97
Gooseberry Falls					64.25	1,529.94				93.35		1,687.54
Interstate		316.21		295.50	44.00	2,117.35			22.40	31.00		2,826.46
Itasca	31.55	834.00		1,274.75	171.85	1,407.37	944.13	13.10	54.10	52.93		4,783.78
Jay Cooke				140.00		677.45		23.00		72.90	$0.33	913.02
Lac qui Parle		5.00						15.00				20.00
Lake Bronson	107.15	499.25	39.01		65.00	1,635.03				$2.25	.65	2,427.04
Lake Carlos	32.00	76.25			14.50	286.08				65.80		474.63
Lake Shetek	179.35	355.75			155.05	995.31				291.91	.10	1,977.27
Middle River	146.00				5.25	548.35				29.84		729.44
Minneopa						1,409.21				38.03		1,447.24
Monson Lake								9.53				9.53
Pomme de Terre	85.15	43.25				305.92				21.04		455.36
St. Croix				425.00	1,388.95	841.01	147.77		30.55	70.40		2,903.68
Scenic		245.75		306.50	43.25	131.70			8.80	30.00		766.00
Sibley	51.05	47.00			117.70	1,252.92				89.53		1,558.20
Whitewater	307.65			1,347.75	826.95	2,053.18			38.10	138.70		4,712.33
Totals	$1,491.90	$3,183.46	$609.24	$14,101.20	$4,849.51	$44,249.49	$1,243.88	$486.95	$156.35	$1,683.18	$1.08	$72,054.08

TABLE No. 8

RECEIPTS CREDITED TO STATE PARKS REVOLVING FUND

Fiscal Year 1946

PARK	Bathhouse	Boat Rentals and Watercraft Permits	Launch Rides Other Serv. and Boat Concessions	Cabin Rents and Guest Housing	Camping and Group Camps	Merchandise for Resale	Electricity and Telephone	Phonograph and Other Commissions	Linen Rentals	Petty Cash and Other Refunds	Totals
Alexander Ramsey						$ 491.50				$ 10.00	$ 501.50
Baptism River				$ 30.00							30.00
Buffalo River	$ 208.30				$ 13.75	1,013.00				20.50	1,255.55
Camden	116.75				4.50	757.57				20.00	898.82
Chas. A. Lindbergh					1.00	790.20				42.00	833.20
Douglas Lodge		$ 690.10	$ 745.86	12,922.27		43,012.42	$ 218.82	$399.58	$299.83	200.00	58,488.88
Flandrau	382.75	462.75			1,716.97	2,390.10	3.25	121.65		20.00	5,097.47
Fort Ridgely					10.00	1,340.30	2.92			20.00	1,373.22
Gooseberry Falls				41.75	131.50	3,889.42			1.75	40.00	4,104.42
Interstate			468.64	259.75	62.25	4,756.75			18.30	30.00	5,595.69
Itasca	36.95	1,600.00		2,165.50	218.75	3,115.01	1,200.37	23.35	49.20		8,409.13
Jay Cooke				90.00	8.50	1,563.71				20.00	1,682.21
John A. Latsch					2.00						2.00
Lake Bronson	128.45	471.50	16.03		62.50	2,624.57		9.04		20.00	3,332.09
Lake Carlos	55.05	85.25			18.25	481.54				20.00	660.09
Lake Shetek	162.60	284.00	13.25		125.95	1,099.49	1.50	.25		20.00	1,707.04
Middle River	161.05				4.85	509.03				20.00	694.93
Minneopa						2,693.36				20.00	2,713.36
Pomme de Terre	111.70	45.75				338.90				11.00	507.35
St. Croix		40.50	140.63	452.50	3,371.21	1,559.13	441.61	23.25	35.90	50.00	6,114.73
Scenic		394.50		822.50	66.50	295.01		.50	24.00	30.00	1,633.01
Sibley	68.95	110.00			224.00	1,815.23				20.50	2,238.68
Whitewater	378.35			1,558.75	1,287.30	2,528.15			41.80	65.00	5,859.35
Totals	$1,810.90	$4,184.35	$1,384.41	$18,343.02	$7,329.78	$77,064.39	$1,868.47	$577.62	$470.78	$699.00	$113,732.72

TABLE No. 9

EXPENDITURES BY DIVISION OF STATE PARKS FOR ADMINISTRATION SALARIES, ADMINISTRATION EXPENSE, AND MAINTENANCE AND IMPROVEMENTS OF PARKS

Fiscal Years 1945 and 1946

PARK	Salaries		Other Services		Materials and Supplies		Acquisition of Property		Totals	
	1945	1946	1945	1946	1945	1946	1945	1946	1945	1946
Administration	$14,813.68	$16,942.00	$2,550.71	$ 3,400.38	$ 600.92	$1,584.16	$144.00	$ 950.11	$18,109.31	$22,876.65
Alexander Ramsey	1,350.50	1,639.40	37.30	75.25	43.65	37.35			1,431.45	1,752.00
Baptism River			56.32					185.25	56.32	185.25
Beaver Creek		338.32		99.94		109.17				547.43
Birch Coulee	215.70	335.62		14.70	42.24	93.99			257.94	444.31
Brook Park			41.00	41.00					41.00	41.00
Buffalo River	459.00	571.14	55.91	41.50	16.59	32.97			531.50	645.61
Camden	2,154.77	2,028.55	179.30	362.76	72.05	108.32			2,406.12	2,499.63
Camp Release	10.20	20.88	12.28		4.80				27.28	20.88
Chas. A. Lindbergh	918.00	959.19	95.37	231.94	12.36	15.16			1,025.73	1,206.29
Douglas Lodge		1,508.03	124.70	71.94	158.76	16.52			283.46	1,596.49
Flandrau	2,426.37	2,781.96	431.49	839.59	571.68	155.53			3,429.54	3,777.08
Fort Ridgely	1,500.90	1,707.90	219.87	202.91	117.59	47.20			1,838.36	1,958.01
Garvin Heights	3.06								3.06	
Gooseberry Falls	1,637.96	2,805.19	363.63	420.82	137.37	206.80			2,138.96	3,432.81
Horace Austin	510.00	557.50			12.50	70.31			522.50	627.81
Inspiration Peak	98.94	75.98		5.00	4.71				103.65	80.98
Interstate	2,651.58	3,696.54	408.32	521.68	388.43	393.06		2,541.97	3,448.33	7,153.25
Itasca	5,993.63	7,202.56	550.49	368.62	826.94	631.26			7,371.06	8,202.44
Jay Cooke	3,298.50	3,203.02	390.82	841.22	291.17	301.72			3,980.49	4,345.96
John A. Latsch	731.25	760.00	83.00	61.75	5.58	6.16			819.83	827.91
Kaplan Woods	213.18	376.60		19.13					213.18	395.73
Lac qui Larle	1,025.91	891.58	114.77	101.90	16.94	16.00			1,157.62	1,009.48
Lake Bemidji	240.00		3.00		1.00				244.00	
Lake Bronson	1,982.83	2,389.86	600.98	548.39	172.97	59.67			2,756.78	2,997.92
Lake Carlos	1,835.08	1,875.57	403.97	212.53	88.90	97.66	98.80		2,426.75	2,185.76
Lake Shetek	1,795.43	2,212.87	144.47	93.57	278.13	138.22			2,218.03	2,444.66
Middle River	549.86	996.86	100.08	111.14	94.13	67.09			744.07	1,175.09
Milford Monument			41.00	56.54					41.00	56.54
Minneopa	1,787.00	2,282.56	160.66	162.81	27.95	34.15			1,975.61	2,479.52
Monson Lake	16.83	248.24							16.83	248.24
Moose Lake			41.00	41.00					41.00	41.00
Mound Springs	70.38	373.80		8.00	13.50	9.80			83.88	391.60
Old Crossing Treaty	165.75	285.36	2.00			14.62			167.75	299.98
Oronoco	242.25	444.46		22.18	5.09	4.37			247.34	471.01
Pomme de Terre	459.00	575.00	1.75	4.00	2.23	4.18			462.98	583.18
St. Croix	4,157.57	6,320.98	419.34	626.50	1,428.84	1,269.68	30.51	147.16	6,036.26	8,364.32
Scenic	1,711.75	2,042.13	179.11	208.03	177.52	162.99			2,068.38	2,413.15
Sibley	1,986.80	2,245.44	253.95	273.09	87.69	43.10	12.00		2,340.44	2,561.63

TABLE No. 9—Continued

EXPENDITURES BY DIVISION OF STATE PARKS FOR ADMINISTRATION SALARIES, ADMINISTRATION EXPENSE, AND MAINTENANCE AND IMPROVEMENTS OF PARKS

Fiscal Years 1945 and 1946

PARK	Salaries		Other Services		Materials and Supplies		Acquisition of Property		Totals	
	1945	1946	1945	1946	1945	1946	1945	1946	1945	1946
Sleepy Eye	116.54	230.84	.....	22.65	4.11	.....	.....	.....	120.65	253.49
Split Rock Creek	719.79	.....	.....	1.27	38.31	.....	.....	.....	758.10	1.27
Split Rock Wayside	.....	.....	.....	26.00	.....	.....	.....	.....	.....	26.00
Supervisors	3,525.00	3,960.00	887.76	1,486.84	1.60	.....	.....	.....	4,414.36	5,446.84
Toqua Lakes	356.28	527.00	.60	14.54	.....	3.47	.....	.....	356.88	545.01
Traverse des Sioux	63.75	117.16	.....	17.10	.....	.....	.....	.....	63.75	134.26
Whitewater	2,150.40	2,548.04	246.70	267.88	74.37	87.25	.....	.....	2,471.47	2,903.17
William O'Brien	.....	.....	.....	15.50	.....	.....	.....	.....	.....	15.50
Wood Lake	.....	.....	31.00	41.00	.....	.....	.....	.....	31.00	41.00
Totals 1945	$63,945.42		$9,232.65		$5,820.62		$285.31		$79,284.00	
Totals 1946		$78,078.13		$11,982.59		$5,821.93		$3,824.49		*$99,707.14

*This total represents payments of 1946 encumbrances through August 31, 1946.

TABLE No. 10

EXPENDITURES BY DIVISION OF STATE PARKS FOR FACILITY OPERATIONS UNDER REVOLVING FUND

Fiscal Years 1945 and 1946

PARK	Salaries		Other Services		Materials and Supplies		Acquisition of Property		Merchandise for Resale		Totals	
	1945	1946	1945	1946	1945	1946	1945	1946	1945	1946	1945	1946
Administration	$ 702.75	$ 2,420.29	$ 557.36	$ 857.86	$ 401.34	$1,210.55	$ 4.50	$ 468.45	$ 1,646.94	$ 2,363.25	$ 3,312.89	$ 7,320.40
Alexander Ramsey	92.80	62.70	.....	.....	3.00	6.00	.....	.....	317.90	405.66	413.70	474.36
Beaver Creek Valley	.....	.....	.....	1.18	.....	.....	.....	.....	.....	.....	.....	1.18
Buffalo River	108.40	207.64	.18	.....	30.05	99.44	.....	.....	432.59	860.69	571.22	1,167.77
Camden	35.20	305.94	31.18	37.77	70.58	49.10	.....	50.25	540.12	722.35	677.08	1,165.41
Chas. A. Lindbergh	193.60	367.40	36.07	28.20	7.50	8.00	.....	.....	180.98	520.71	418.15	924.31
Douglas Lodge	15,327.93	21,374.11	593.45	916.18	2,294.89	2,153.75	3,744.71	705.33	16,334.60	26,616.09	38,295.58	51,765.46
Flandrau	505.57	1,061.80	59.81	72.31	43.03	52.04	.....	249.27	1,202.65	1,661.70	1,811.06	3,097.12
Fort Ridgely	92.60	182.33	30.74	37.21	20.00	32.00	.....	.....	483.10	927.78	626.44	1,179.32
Gooseberry Falls	353.57	542.03	79.98	143.77	140.16	178.50	.....	.....	1,403.13	2,858.94	1,976.84	3,723.24
Interstate	443.18	1,015.30	82.19	181.75	66.76	196.32	.....	50.25	1,416.48	3,488.68	2,008.61	4,932.30
Itasca	4,045.92	7,234.25	1,328.79	1,741.25	445.17	572.19	45.15	390.00	828.17	1,391.97	6,693.20	11,329.66
Jay Cooke	96.40	215.05	25.79	52.40	10.73	23.20	.....	.....	597.75	1,394.41	730.67	1,685.06
Lac qui Parle	28.80	660.15	.....	.....	.....	.....	.....	.....	.....	.....	28.80	660.15
Lake Bronson	241.00	573.17	45.06	59.33	115.27	88.75	.....	252.39	1,528.99	1,883.71	1,930.32	2,857.35
Lake Carlos	170.91	282.43	7.80	19.97	39.79	3.60	.....	.....	268.85	316.49	487.35	622.49
Lake Shetek	213.40	352.55	22.39	30.54	85.16	55.83	.....	400.34	1,009.52	837.15	1,330.47	1,676.41
Middle River	214.96	168.30	4.70	10.78	.....	55.00	.....	48.25	419.88	626.90	639.54	909.23
Minneopa	236.70	326.70	3.53	24.95	32.00	43.00	.....	.....	1,003.96	2,029.02	1,276.19	2,423.67
Pomme de Terre	129.80	701.60	.....	4.50	16.41	13.00	.....	50.25	204.61	294.54	350.82	1,063.89
St. Croix	1,080.17	1,464.15	255.30	427.65	262.34	398.90	155.00	601.65	513.43	1,032.03	2,266.24	3,924.38
Scenic	90.40	204.61	31.52	10.24	4.20	104.66	.....	245.25	123.93	89.73	250.05	654.49
Sibley	171.32	451.00	33.82	.49	69.12	189.84	.....	.....	862.53	1,482.30	1,136.79	2,123.63
Supervisors	587.50	3,030.00	73.17	.....	.....	.....	.....	122.12	.....	.....	660.67	3,890.22
Whitewater	556.01	738.10	152.00	226.25	126.23	79.95	.....	.....	1,479.21	1,895.83	2,313.45	2,202.03
Totals 1945	$25,718.89		$3,454.83		$4,283.73		$3,949.36		$32,799.32		$70,206.13	
Totals 1946		$43,941.60		$4,884.58		$5,613.62		$3,633.80		$53,699.93		*$111,773.53

*This total represents payments of 1946 encumbrances through August 31, 1946.

Facility Operations

When the 1941 legislature established the Working Capital Fund, providing for state operation of the several revenue producing facilities, there was some question as to whether such operation would be practical. After a trial period of two seasons, this plan succeeded so well that the 1943 session authorized the division to take over the operation of Douglas Lodge, and even earmarked receipts, yet to be collected, for the purchase of the former concessionaire's equipment and stock, the inventory of which exceeded $14,000. This was a gratifying vote of confidence from the legislature, considering that war-time restrictions and controls had made it extremely difficult to operate without loss.

Since the establishment of this fund, a definite policy has been followed, by which the cost of maintenance of the free use facilities, available to everyone, and the cost of general protection of the park areas has been charged against the legislative appropriations, while all special facilities and services for which fees or charges were made have been maintained from the Working Capital Fund.

For example, the rental of boats is justified as a special facility for which a charge is made, because they are necessary to enable park visitors to enjoy the recreational value of the lakes. Likewise, cabins may properly be provided at reasonable rates for the accommodation of park visitors at locations where private resorts or hotels are not conveniently available. Provision for meals and refreshments may also be desirable in a state park where there are no suitable private establishments at hand. However, it is not the purpose of the division to engage extensively in such operations in competition with private business. The aim is to provide only those services which are reasonably necessary to enable visitors to enjoy the attractions of the state parks.

The public demand for increased facilites becomes greater each season, but, with the exception of Douglas Lodge, no new operations have been set up to meet the needs of the pyramiding attendance. Surpluses are now being realized which could logically be utilized for expansion of facilities, but existing legislation does not allow for enlarged refectories, more cabins, or additional bathhouses. In the past such surpluses have been used primarily to purchase new or to replace antiquated equipment.

The following tabulation shows the growth in receipts credited to the Working Capital Fund since it was established April 28, 1941:

4/28 to 6/30/41	$ 5,102.30
Fiscal year 1942	34,383.44
Fiscal year 1943	34,561.43
Fiscal year 1944	52,895.43
Fiscal year 1945	72,054.08
Fiscal year 1946	113,732.72

Tables No. 7 and 8 show the breakdown by parks as to the sources of such receipts for the fiscal years of 1945 and 1946.

The state fiscal year terminates at a time when park facilities are at their operational peak, and to avoid costly and disturbing inventories on or about June 30 each year, operational statements are prepared on the calendar year basis. Table No. 11 gives a complete breakdown of the Working Capital Fund for the five year period ending December 31, 1945. It should be noted that of the $54,879 surplus accruing from all operations during the five seasons, more than $29,000 has been returned to stock and equipment inventories. Thus with an original appropriation of but $7,500, state park facility operations have "lifted themselves by their bootstraps" to a point where they can now be considered as a sound financial venture, and if given proper authority to use their earnings can further expand to help meet a portion of the free use services.

TABLE No. 11

Operation Statement of State Parks Working Capital Fund for Five Season Period — April 1, 1941 to January 1, 1946

RECEIPTS		
Revenue from Sale of Merchandise		$188,073.54
Revenue from Other Sources:		
Bathhouse	$ 7,519.05	
Electricity	3,184.14	
Telephone	4,562.48	
Launch and Other Services	1,750.80	
Boat Rentals	11,503.30	
Watercraft Permits	3,847.07	
Cabin Rentals	17,896.48	
Camping and Parking	3,303.60	
Group Camps	14,353.07	
Guest Housing and Employe rents	30,725.72	
Phonograph	949.95	
Other Commissions and Boat Concessions	790.99	
Linen Rentals	743.76	
Golf Course Fees	1,850.50	
Miscellaneous (less remittance fees)	421.09	
Truck Service	140.63	
Sale of Firewood	4.50	
Ice Sales	423.91	
Merchandise Sold at Wholesale	390.47	104.361.51
Grand Total of Receipts		$292.435.05

EXPENDITURES			
Stores for Resale			
Purchased		$117,957.13	
Less Merchandise Returned	$1,091.49		
Less Inv. 1/1/46	5,424.37	6,515.86	
Total Net Cost of Merchandise Sold			111,441.27
Operation Costs:			
Personal Services		101,260.94	
Other Services		15,855.15	
Materials and Supplies		9,275.03	
		126,391.12	

Less overstated 1944 Expenses	272.59	126,118.53	237,559.80
Plus understatement of cash 1944			4.00
Surplus from Operations			54,879.25

BALANCE SHEET

January 1, 1946

Cash Balance 1/1/46		$ 35,457.16	
Petty Cash — Itasca		50.00	
Merchandise Inventory 1/1/46		5,424.37	
Equipment and non-expendable materials			
Prior years'	16,632.98		
Acquired 1945	7,452.39	24,085.37	
Appropriation	7,500.00		
Less canc. to Gen. Rev. Fund 6/30/42 $534.19			
Less canc. to Gen. Rev. Fund 6/30/45 8.36	542.55		6,957.45
Accounts Payable			3,180.20
Net Surplus 4/1/41 to 1/1/45 Adjusted $276.59			37,918.38
Net Surplus Current Period			16,960.87
		$ 65,016.90	$ 65,016.90

The legislature of 1947 will be asked for an act which will list specifically the various services and facilities authorized to be operated by the division and how receipts may be used to finance such activities, not only the maintenance of special operations, but the enlargement of existing structures and the construction of new buildings required to meet the public demands.

In line with the requirement that dedicated funds meet their portion of the cost of service rendered by other state departments, it seems only logical that five per cent of the gross receipts realized from park operations be paid into the general revenue fund at the close of each fiscal year as a contribution of the division of state parks, rather than the present practice of paying into the General Revenue Fund at the end of each fiscal year all earnings in excess of $7,500, and that the amounts and purposes for which such earnings may be spent appear as regular items in the state department appropriation bill.

A complete system of accounting controls have been put into effect, under which all operations may be properly checked, and which fully comply with the requirements of the Public Examiner's Office. This system requires additional clerical employees in the division office who are carried as an expense in the Working Capital Fund.

Reference was made in the previous biennial report to the need for a new dining room and lounge to replace Douglas Lodge rapidly approaching decadency. It was suggested that certificates of indebtedness be authorized,

to be amortized over a period of not to exceed fifteen years. It is recommended that this proposal be again submitted to the next legislature for consideration and approval.

Maintenance

A continuing shortage of many types of maintenance materials such as plumbing supplies, paint and lumber, has made it extremely difficult to provide even the most necessary repairs. High wages for private construction have made it all but impossible to employ skilled artisans, and only where park personnel were experienced in the trades could any such maintenance work be done.

The return of wet seasons has increased the load on our overtaxed park crews, by requiring more frequent mowings in the public use areas.

Vandalism has been on the increase in recent years, reflected in the breaking of windows, breaking into buildings, defacing of walls, stealing of fixtures and other depredations. Whether such disregard for public property can be blamed to the war is a question. An enlightened public should be on the alert, to protect both the natural attractiveness of the parks as well as the appurtenances by means of which parks and their beauties may be enjoyed to their fullest.

The continuing increase in prices of maintenance commodities such as cleansers, toilet paper, paint, repair parts for equipment, etc., have taxed the very limited maintenance appropriations, coupled with the unprecedented heavy attendance to be served.

Park road maintenance has always been a problem because of the lack of adequate equipment. A thorough study was made of this problem by the Legislative Interim Committee in 1944, and proposals were submitted for improving the situation. Reference is again made to the suggestions contained in the report of this committee.

State Aid Parkways

The State Aid Parkway law was amended by the Legislature of 1945. It authorizes the Gas Tax Allotment Board to allot funds to counties in which state parks and state institutions are located for the maintenance of roads leading to and located within such areas. Resolutions were passed by several county boards, requesting the establishment of such parkways and allotment of funds for such purposes, without any requirement for matching by county funds.

It is too early to evaluate the results to be realized through this new procedure, but a sincere interest has been evidenced on the part of several county boards and the Allotment Board members to give it a fair trial as a step toward improved road facilities to and in state parks.

Table No. 12 shows the amounts alloted to counties for state aid parkway maintenance or improvements by the Gas Tax Allotment Board, upon resolutions adopted by the Boards of County Commissioners.

TABLE No. 12

Special Allotments for State Aid Parkways

County	Amount	Park
Beltrami	$ 500	Lake Bemidji
Big Stone	1,000	Toqua Lakes
Carlton	6,200	Jay Cooke
Clay	1,000	Buffalo River
Clearwater	1,500	*Itasca
Houston	2,000	Beaver Creek Valley
Hubbard	500	*Itasca
Kandiyohi	1,250	Sibley
Kittson	500	Lake Bronson
Lac Qui Parle	1,000	Lac Qui Parle
Lyon	4,000	Camden
Marshall	1,700	Middle River
Mille Lacs	4,300	Father Hennepin
Murray	2,000	Lake Shetek
Pine	2,000	St. Croix
Renville	500	Birch Coulee
Rock	1,000	Mound Springs
Swift	1,500	Monson Lake

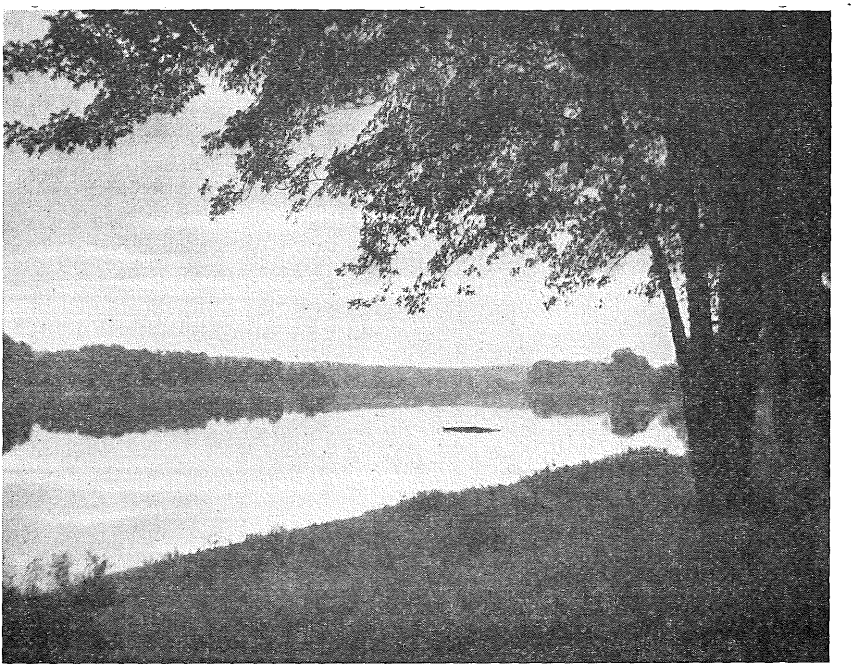
*The roads in Itasca State Park are within the limits of both Clearwater and Hubbard counties.

Deer Hunting

The opening of Itasca and St. Croix State Parks to deer hunting during the 1945 open deer season as a means of bringing about a reduction of the deer herds and thus stimulate a natural reproduction of the once fine timber stands brought excellent results. Such conservation measures have been recommended for Itasca ever since the division was established, and it is encouraging to note already for the first time during such period, evidence of a natural reproduction of both norway and white pine as a result of only one year's attempt to control deer population. A more complete report of the survey of the results obtained will be found in the Game and Fish section of this biennial report.

Recommended Permanent Improvements

The present extensive improvement of the state parks is largely the result of nine years of activities of federal work relief agencies, with expenditures of more than fifteen million dollars, a relatively small portion of which was contributed by the state. In view of the small part state funds played in the development of grounds, erection of buildings, installation of water supply and sanitation facilities and other appurtenant works, it becomes extremely difficult now to justify to the legislature and the public the increasing needs for maintaining this extensive park plant and for adding improvements to meet ever-increasing public use. But unless structures are kept in repair, depreciation will be rapid and decadence will rapidly multiply maintenance and repair costs as well as cause parks to degenerate in both appearance and use.



Dawn on the St. Croix. Taken just above where the Sunrise river enters the St. Croix.

As stated previously, any construction for facility operations can and rightfully should be paid from operational surpluses. A study of trends in needs and public demands during past operations within each of the parks will aid in determining the order of priority to give each item for which operation surpluses should be allotted. Lake Bronson and Buffalo River State Parks, for instance, hold first priority as regards housing for employees, and Gooseberry Falls, Middle River, Lake Carlos, and Beaver Creek Valley rank high as lacking work shops and storage accommodations.

Parks, recently created, all need major improvements requiring substantial appropriations, even to provide the minimum amount of protection and primary facilities. It is not to be expected that new areas can be acquired and remain undeveloped for several years and retain their intrinsic natural values.

Publicly owned lands for the care and protection of which no one is responsible soon become common property for general public use. Without regulations and control, such use soon destroys many of the natural assets for which the areas are valued. McCarthy Beach, William O'Brien, Old Crossing Treaty Wayside and Kilen Woods State Park are without adequate protection and funds should be provided for such purposes before additional state park land acquisitions are authorized.

Heavy windstorms have felled a considerable number of trees in Itasca

State Park. They can be processed so as to furnish material for a project to construct knock-down picnic tables for the several parks, appurtenances which are sorely needed.

Likewise, camp fireplaces on a production basis to serve the entire system could be produced in the shops in St. Croix State Park from material brought there from other places. Signs, too, could thus be produced in well equipped park shops and distributed to parks where needed.

Equipment Needs

In addition to the equipment needs already indicated, there is imminent need for additional tractor mowers, equipped with power take-offs for wood cutting for the larger areas.

Much time and expense could be saved if the larger parks were equipped with machinery with which to process material for making repairs of various kinds. Many parks lack adequate small tools for making miscellaneous maintenance repairs.

Personnel Problems

In the light of the increased responsibility on the part of many superintendents, because of increased use of the parks and facilities, a re-study should be made by the Civil Service Department to assure comparable classification for comparable jobs. Only three parks now rate Superintendent II classification but it is evident that at least three more deserve the same rating.

A survey by the Civil Service Department of duties for the central office staff may suggest some changes in assignment and justify the establishment of at least one more supervisor's position to correlate and integrate operations with maintenance.

Appropriations have not permitted the employment of a sufficient number of employees to supplement the services of the permanent personnel. Increasing maintenance, expanding operations and record attendance all require corresponding increases in personnel.

Policies

The policies which have governed the administration and operation of the Minnesota State Parks have evolved gradually through lessons learned by experience in meeting and solving the problems created by the public, through their use of the areas. Every attempt has been made to so develop the facilities as to best serve the public and at the same time afford protection to the dominant natural assets which give the parks their value. Parks are justified not for themselves as such, but for what they contribute to public enjoyment. State Parks attempt to provide for the more extensive types of recreation not afforded by municipalities and at the same time preserve the natural values to the maximum in order that posterity may enjoy some of the God-given beauties of nature which this generation has been privileged to inherit and enjoy.

Tourist Bureau

VERNE E. JOSLIN, *Director*

Recreation as a Business

The most rapidly mushrooming and most sought form of big business in America today is the recreation business.

In 1939 the U. S. Department of the Interior estimated the retail expenditures of recreational travelers at $138,000,000 in Minnesota and $5,750,000,000 in the nation.

After a wartime setback, the National Association of Travel Officials estimated the national expenditures would be multiplied three-fold to around 15 billions for 1946, while Minnesota showed an increase to 150 millions for 1941 and an estimated rise to about 200 millions for 1946, FAR BELOW the estimated national rate of climb.

While Minnesota's share of the recreational spending makes it one of the state's largest industries, and while this huge sum is vital to its economy, creating employment for tens of thousands, markets for products of its farms and factories and a cushion against mounting tax burdens, it still is far short of potential goals that can be attained and which have been attained by Minnesota's neighbors.

This state with its huge acreage, greater than any other state to the south or east, with more lakes and more fresh water fish than any other state and its delightful summer climate and scenery, could easily double its present volume of recreation business—if more people in distant places could be told about all these things.

When Minnesota established its Tourist Bureau in 1933 with an appropriation of $12,500 it was abreast of the times, for at that time there were but six states spending state money for state advertising.

But that it has failed to keep pace with its competitors can be seen from the records showing that by 1939 there were 42 states bidding for this business through expenditure of state funds for state promotion and some of them were, and are, spending more in a single year than the total of all the Minnesota appropriations combined since its bureau was established.

Value of Advertising

That advertising pays and that, in fact, it is non-sensical NOT to advertise, can be shown clearly by records of private businesses which regard expenditures of four to five per cent of business volume as reasonable expenditures for promotion.

A five per cent advertising budget for a 200 million recreational business in Minnesota would amount to ten million dollars a year, in contrast to the less than one-tenth of one per cent it has been spending.

Some have said that "the resort and hotel people ought to do their own advertising without calling on the state for help." They do. It is estimated conservatively that the resorts and hotels now spend seven to eight times as much as the state for advertising, although they receive only about 15 cents out of each recreation dollar, the remainder going to all other residents of the state, directly or indirectly.

Although among the first to realize its opportunity, by 1937-38 Minnesota had slipped to 20th place among the states in its volume of advertising investment, with appropriations of $52,500 a year.

In the next biennium it dropped to 23rd place with $50,000, while Wisconsin was sixth with $137,230, and Michigan was eighth with $125,000.

Does state advertising pay?

Up to 25 years ago Southern California had a winter tourist business but practically no travel in the summer. The All-Year club of that region changed that through an aggressive advertising campaign which is reputed to have cost around a million dollars in some years. But it was good business because it produced a summer tourist business yielding upwards of 125 million dollars a year and exceeding the volume of the winter business, at a cost of less than one per cent.

1945 Appropriation

When the 1945 Minnesota Legislature adopted its appropriation bills and adjourned in the spring of that year, Americans were fighting and winning battles and dying at the most appalling rate in our nation's history.

There was no intimation that the collapse of Hitler's Germany was near at hand, or that still unheard-of atom bombs in a few months would destroy whole Japanese cities and the enemy's dream of conquest.

So great were the war demands on all forms of transportation that encouragement of travel for pleasure was undesirable.

Under such circumstances the current budget for the Tourist Bureau was designed. It was a wartime budget and the Bureau must continue to operate under it through the fiscal year ending June 30, 1947.

This has placed your Tourist Bureau at a disadvantage in the race for patronage because, being near the top among the states in recreational attractions to "sell" visitors from other states, it is near the bottom of the list in state funds provided for promotion.

Biennium Accomplishments

Following is a summary of some of the things the Tourist Bureau has been able to accomplish in the current biennium and also recommendations

for expansion of some services and addition of others which the director believes can be made to return handsome profits to the state on its investment:

The work of the Bureau, especially the volume of inquiries from all parts of the world, many calling for research and personal replies, has been heavier than during any year since its establishment in 1933.

Besides preparing and carrying out an increased advertising campaign in the spring and summer of 1946, in which many daily newspapers in the midwest and several national outdoor travel magazines were used, the Bureau also maintained state displays at eight midwest outdoor sports shows. It also furnished displays and literature for several national conventions at various points throughout the United States.

Motion Pictures

Our all-sound, all-color film, "Minnesota, Land of 10,000 Lakes," has been in great demand and is being shown throughout the United States almost constantly. During the next biennium it will be necessary to have a new film made, not only because the present picture is four years old, but also because, due to its popularity, it already has been seen in all parts of the country during that time.

Constant and adequate replenishment of publicity material of all kinds is imperative for obvious reasons.

Foremost of these is the consideration that we are now riding the crest of a boom in recreation business. Although the tourist industry will break all records in Minnesota during the current season, this is a temporary post-war situation which will level off, with the floating patronage going to the states which go after it most aggressively.

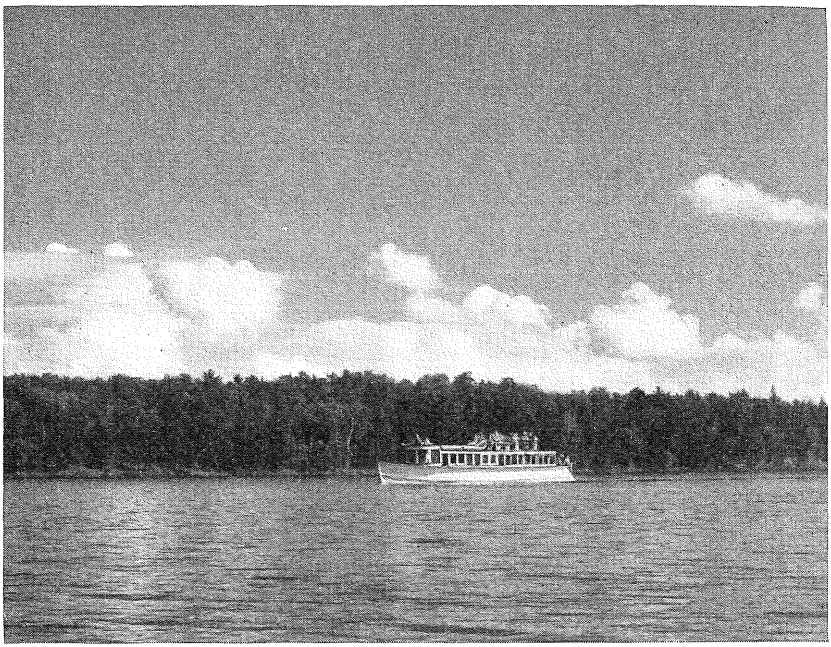
It is vitally important to maintain and expand present publicity and service campaigns to keep this business coming to this state. Increased personnel already is greatly needed to handle the increased work of mailing literature and answering inquiries, and to assist in attending meetings and outdoor sports shows in this and other states from which we draw the bulk of our patronage.

Multiplying demands for literature describing Minnesota attractions call for additional funds for printing and advertising services.

Value of Advertising

In round figures, when Minnesota invests $50,000 a year in advertising itself through the Tourist Bureau, and does $150,000,000 worth of tourist business, it is making "sales" of $3,000 worth of goods and services for each $1 spent for promotion.

If additional dollars invested brought only one-tenth of that rate of return, or $300 for each $1, it still would be marvelous business, and there is as yet no limit in sight.



A launch trip on Lake Itasca highlights the conservation youth caravan into Minnesota's north country.

In contrast to mining and lumbering, which exist through taking away resources, and intensive farming, which impoverishes the soil, every recreational installation improves its community and visitors take away little or none of our resources, though they leave their gold behind when they depart.

The Minnesota Resources Commission, in its "Interpretation of the Economic Analysis of the State of Minnesota by the J. G. White Engineering Co.," said of the tourist industry:

"Two desirable courses of action are recommended for the future development and expansion of the tourist industry.

"One would be to so staff the Tourist Bureau as to permit the accumulation of statistical and factual data bearing upon this important phase of the state's economy.

"Where the tourists now come from, what other income levels or geographic areas might be interested in coming, what they wish to see and experience, and how best those wishes might be realized, are types of information that are needed before an intelligent market analysis can be formulated.

"A second course of action follows naturally from the first.

"When it is more definitely known just what the product is and the market for it, a planned sales program should result in an appreciable and

growing profit to the state, in return for the INCREASED BUDGET ALLOWANCE THAT SHOULD BE DEVOTED TO IT."

An adequate Tourist Bureau staff will make it possible to attain the maximum possible return for every dollar invested.

And it should be kept in mind that money spent in keeping out-of-state recreation seekers coming to Minnesota is not in any sense an expense, but an investment. Nonresidents spend upwards of $300,000 a year for fishing licenses alone and they contribute more than a million dollars a year in Minnesota gasoline taxes before they even really begin the heavy spending.

Every line of business and profession in Minnesota benefits directly or indirectly from the tourist industry. Agriculture benefits directly because of the increased demand for all kinds of farm products. Nineteen per cent of our farmers sell direct to tourists and 20 per cent of farm families have one or more members employed full or part time in the resort business.

Other states which have recreational facilities similar to Minnesota's to offer the traveling public, and some which do not have nearly as much either as to quality or quantity, are given appropriations much larger than that of Minnesota to advertise and publicize their states.

It is true that word of mouth advertising would maintain some recreational business without any paid publicity, but serious and well-planned campaigns are necessary to bring those extra hundreds of thousands of visitors whose spending means the difference between just "getting by" and handsome profits.

Comparative Expenditures

A few examples of what other states are spending for state advertising follow:

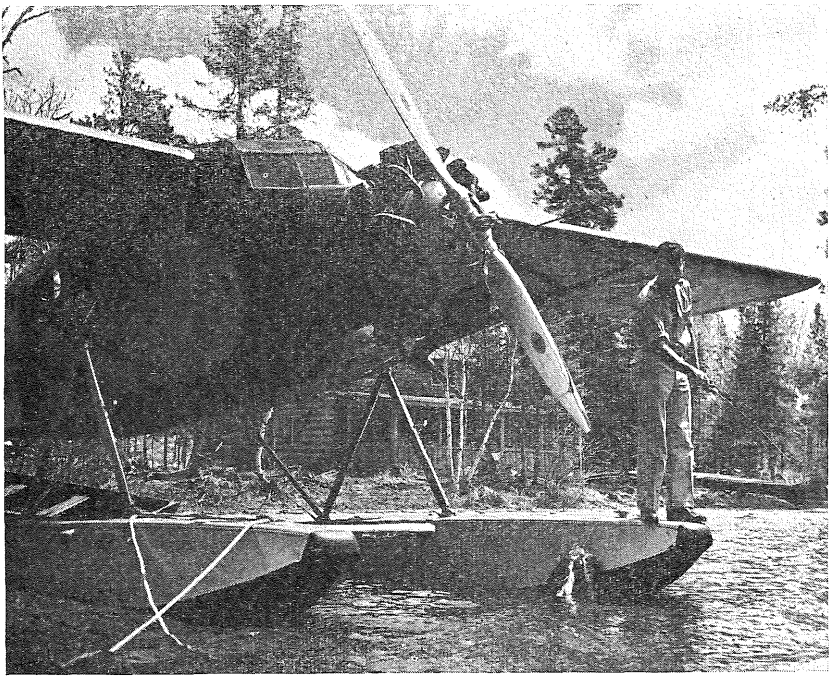
Michigan	$250,000 a year	Pennsylvania	$400,000 a year
Maine	200,000 a year	Utah	300,000 a year
Connecticut	240,000 a year	Washington	242,000 a year
New York	200,000 a year	Oklahoma	139,000 a year
New Mexico	120,000 a year	New Hampshire	115,000 a year
New Jersey	100,000 a year	South Dakota	100,000 a year

Minnesota must have a much larger appropriation than at present in order to meet the intensive competition which other states offer for the tourist business.

Additional funds also are needed so that Minnesota may cooperate financially in the Northern Great Lakes Area Council, an organization which includes Minnesota, Wisconsin, Michigan and the Canadian province of Ontario.

This organization was formed to publicize the Northern Great Lakes area as a whole, the members realizing that if more people from throughout the United States can be persuaded to come to this area, EACH ONE of the units will get its share of the increased business.

There are fifteen other such areas throughout the United States, all competing for the tourist business, and the Northern Great Lakes Area council can do a great deal toward attracting a greater share of this business into this area.



Air travel will develop a new era in Minnesota.

It will not interfere in any way with the efforts of any of the four units, but by cooperating as an area it can accomplish a great deal more toward advertising this part of the country on a nationwide scale than any one unit can do individually.

The travel and recreation business is the ONLY remaining great Minnesota resource which still remains under-exploited, but partially developed and whose true greatness lies in the future.

It holds the greatest hope of restoring the state's sagging per capita wealth which 40 years ago stood 32 per cent above the national average, skidded to the national average in 1924, and by 1932 had plunged to 18 per cent BELOW the national average, where it remains.

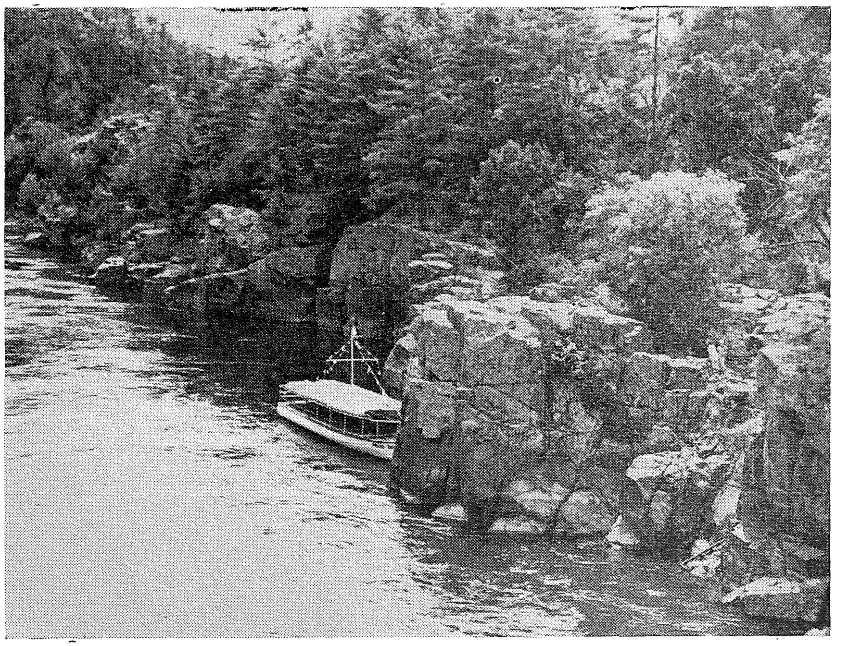
Recommendations

To accomplish this objective, which obviously would promptly elevate the standard of living of all our people, requires the intelligent re-investment

of but a fraction of one per cent of the revenue already being derived from the industry.

An appropriation of $150,000 a year for the coming biennium would amount to less than one-tenth of the increase in gasoline taxes paid by tourists during three summer months. It would amount to less than half the sum non-resident visitors pay for Minnesota fishing licenses each summer.

And yet it would still be less than other comparable states have been receiving each year for a long time, though it would give the Minnesota Tourist Bureau much needed funds for additional personnel, literature, supplies, advertising and publicity to enable the state to meet competition for the tourist business.



The Dalles of the St. Croix are particularly popular with Twin City residents.

In the past the Tourist Bureau and the industry have been aided immensely by the newspapers, magazines and radio stations of this and other states which have been generous in their contributions of free time and space.

It is anticipated that this aid will be continued by these agencies but the volume of this most desirable form of publicity can be stepped up in proportion to the Bureau's financial ability to maintain the flow of fresh, timely and readable material, and especially news photographs which are in constant demand.

The Bureau possesses several thousand Minnesota scenic photographs, and negatives, of which the better ones have been published up to a dozen times by various newspapers and magazines in the past several years.

These views are now largely obsolete due to changes in styles such as bathing suits and even men's clothing, which "date" the pictures back into the 30's. They must be replaced with modern action photos.

There also is a marked new demand for kodachrome views of Minnesota and people for reproduction in full colors by Sunday newspapers and magazines, at no expense to the state except the lending of the negatives.

In order to take advantage of these and other opportunities to promote the best interests of the State of Minnesota, an appropriation of not less than $150,000 a year is urgently requested.