

STATE OF MINNESOTA

Department of Conservation

SECOND BIENNIAL REPORT

Fiscal Years 1933-1934



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DECEMBER 1934

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STATE OF MINNESOTA Department of Conservation

SECOND BIENNIAL REPORT

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DECEMBER 1934



"YOUTH REBUILDS" Civilian Conservation Corps at Work Improving Forests

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RICHARD R. BAILEY, Vice Chairman WM. M. ERICSON ERNEST R. REIFF

FRANK YETKA, Secretary

E. V. WILLARD, Commissioner of Conservation

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С.	McFarlane	Deputy Dire	ector
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$\mathbf{L}.$	Friedel Chief Clerk and Executive	Assistant
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R.	J. MooreChief Mining	Engineer

TOURIST BUREAU

G. BradleyDirector

MINNESOTA CONSERVATIONIST

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А.	с.	Hanson Managing Edit	tor



ORGANIZATION DIAGRAM OF DEPARTMENT OF CONSERVATION

DEPARTMENT OF CONSERVATION

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SECOND BIENNIAL REPORT

IN MEMORIAM



WILLIAM D. STEWART

Born, August 14, 1869, Seaforth, Ontario.

Died, November 24, 1933, St. Paul, Minnesota.

Appointed Commissioner, Department of Game & Fish, January 9, 1931.

Appointed Director, Division of Game & Fish, Department of Conservation, September 1, 1931.

"Bill" Stewart is dead. To those of us who had learned to know him intimately in our daily contacts the words fall upon our ears and hearts with a cruel crushing force. A kindly and tender man has passed on. His life's aim seems to have been to please others at the sacrifice of all else. Strife and dissension grieved and crushed his tender spirit.

"A patient and considerate administrator of the affairs of his official family, a warm and generous man among men, we mourn his passing. His record as a tender and loyal friend runs like a vine around his memory."

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COMMISSION'S REPORT

Hon. Floyd B. Olson, Governor of Minnesota, and the Legislature of 1935.

Ladies and Gentlemen:

The Conservation Commission of the State of Minnesota hereby respectfully submits its report for the Department of Conservation for the biennium beginning July 1st, 1932.

With a view to bringing this report up to date as nearly as possible, it has been made to cover a few topics up to October 1st. This applies especially to matters affected by seasonal rather than fiscal regulations.

A detailed report of the various divisions and statistics bearing on the problems of each is appended. By way of an introduction the Commission desires to refer to a few subject matters which it is deemed should be given special consideration and emphasis because of their importance in a long time planning for the constructive administration of the natural resources of the state.

Land Use

The lands of the original public domain of the state were disposed of to land owners by the state and federal governments largely without a plan and without a policy. Of a gross land area of the state of about fifty-two million acres, all but five million are now in some form of private ownership. The lands in public ownership consist chiefly of national forests, Indian Reservation and state owned trust fund lands. Through a policy of trial and error we now find that from twelve to sixteen million acress of land which have found their way into private hands are unfit for agriculture, with timber and other resources having been removed or destroyed. Of this amount not less than seven million acres, located mostly in the northern counties, are tax delinquent.

"Conservation Areas" aggregating more than three million acres have been created by the legislature in order to permit the state to assume tax and special assessment burdens. These areas have not only ceased to contribute appreciably to local and state tax revenues but demands for roads, schools and other governmental facilities by the few scattered settlers who still live within them are proving an inequitable and unbearable burden on the tax payers at large of the counties most seriously affected. Millions of acres have been abandoned, leaving decadent homesteads, villages and extensive drainage systems growing up to brush and trees as mute evidences of a program that has failed. These tracts have become a "No Man's Land" deserted by private owners yet not subject to control and management by Description of the effects of tax delinquencies on the public agencies. financial and social structures of the northern counties have been made so often as to make further comments on the subject seem trite and commonplace.

The legislature has already obligated the state to the extent of millions of dollars in an effort to keep solvent counties most seriously affected. While this form of relief has averted a crisis, those who recognize conditions as

they exist, see the need of extending the same kind of financial assistance to nearly all of the northern counties unless some form of economic adjustment can be worked out which will enable the counties to rebuild their fiscal, educational and social structures so as to merit and sustain the confidence of agriculture and business in the soundness of local government and give reasonable assurance that present untenable conditions shall not again be repeated because of aimless and haphazard public policies.

The subject of "Land Use" has received exhaustive study, nationally and within the state, by a number of eminent authorities, over a period of several years. Economists of the State University have made Minnesota's land problems a subject of special study. The committee on Land Utilization appointed by Governor Floyd B. Olson in the summer of 1932, made up of prominent economists, forest specialists, educators and business men, has made a thorough study of the same subject. Its report has just recently been published. National groups have dealt with the topic on a nation-wide scale. A federal project for the purchase and retirement from agricultural use of sub-marginal lands in the Beltrami Island State Forest is actually under way. It would seem therefore that sufficient facts bearing on the causes as well as plausible remedies for present chaotic conditions, should be available. At any rate it should be quite evident by this time that much improvement cannot be hoped for by a continued watchful waiting inaction or that a magic formula will be found to indicate the way out.

The Conservation Commission is by law made the custodian of conservation areas and state forests, and the land, water, forests and wild life resources within such areas. Very little can be done with any of these resources until title to the vast areas of tax delinquent and abandoned lands have become vested in the state. Neither will the counties affected be able to plan for a permanent recovery until the status of the areas which no longer produce tax revenues but are a constant drain on the taxpayers at large has been settled.

Although 70% or more of privately owned lands within legally established state forests are tax delinquent they may not be managed for forestry or other conservation purposes because title is still in the owners of record. The location of federal ECW forest and park camps is made contingent on a showing that sufficient areas of publicly owned lands can be made available on which such camps may be gainfully employed on work of a public character. The President has already indicated his plans to make ECW permanent. If tax delinquent lands within state forests are allowed to revert in the spring of 1935, ample publicly owned areas will be made available for ECW activities for an indefinite period. On the other hand if the date of reversion to the state of these lands is again postponed most of the ECW work will in all probability be lost to the state because of want of publicly owned areas on which to operate.

The Commission respectfully urges upon the legislature of 1935 serious consideration of the land use problem and recommends:

1. That the legislature cause all lands located within conservation areas and state forests which have been delinquent for five years or longer, in the spring of 1935 to revert to the state in fee. In order that

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the state may be assured of clear title to such lands, legislation should be enacted which will enable the courts to convey ownership as expediently as possible.

- 2. That legislation be enacted and funds provided which will enable the Department of Conservation to classify all of the lands within counties most seriously affected by tax delinquencies as to the uses for which they are by nature, soil and environs best suited.
- 3. That the legislature enact a zoning law which will make it the duty of the Boards of County Commissioners, by and with the advice of the Conservation Commission, to zone all of the lands within their respective counties into agricultural and non-agricultural zones.
- 4. That a statute be enacted which will make it possible for the Department of Conservation to exchange any lands acquired by the state as a result of tax delinquencies for other privately owned lands so as to enable the state to consolidate its lands within state forests and other conservation areas or conservation projects.
- 5. That all mineral and other reservations contained in deeds be placed on the tax rolls.
- 6. That all land records be transferred from the office of the State Auditor to the Department of Conservation and suitable storage space be provided for the same.
- 7. That a complete inventory be made of all trust fund lands.

Water Conservation

The almost total lack of legislation delegating to the department regulatory and supervisory powers for the protection, use and general conservation of our public waters has been emphasized repeatedly in numerous reports and during each succeeding session of the legislature for many years. Bills in some form or other providing for public administration of our water resources have been before the legislature during many past sessions but have failed of enactment. Lack of a crystallized public opinion and opposition from interests who for selfish reasons look askance at state regulations of every nature, especially when they may affect the use of resources found in nature, are undoubtedly the chief reasons for this situation.

Of all the natural resources with which Minnesota abounds, none compare with its water. Leadership in the production of crops, dairy and livestock, hinges on an adequate rainfall. Municipal growth and industry depend on a constant supply of water. The effects of drouth which has prevailed over the state for the past fifteen years have impressed vividly on our minds the extent to which our crops, forests, lakes and streams are dependent on normal precipitation. Without the shelter and food provided by our forest cover and the thousands of lakes and streams to supply fish and other forms of aquatic life, Minnesota would be just "another state" to the thousands of people in quest of recreation instead of a state nationally known because of its many attractions, most of which have their origin in and around our lakes and streams.

The need of some degree of public regulation of the use of our waters has always been recognized. Conditions brought about by the present drouth have made it imperative. Public demands on the department during the past two years to conserve in the general public interest, water wherever available, to prevent water famines, save lakes, prevent wholesale destruction of fish life and maintain stream flow, have had to go unheeded because of the department's lack of legal authority to deal with the situation. Not only has it been necessary to plead lack of funds but those willing to assume their equitable share of the costs of needed works have found that no orderly legal procedure has been available under which costs may be equitably distributed and riparian owners and the public given a hearing in court on their respective rights.

What is it worth to a community to be assured of a dependable supply of drinking water and other domestic supplies during periods of the kind we are now passing through? Ask the officials and people who live in the cities and villages alaong the Bois de Sioux, Upper Red River and Red Lake What are lakes worth in dollars and cents to cities and communi-Rivers. ties located on their shores? The manner in which receding levels have affected property values around such lakes as Minnetonka, the Chisago chain of lakes and other vanishing bodies of water on which cities have prospered and other extensive residential development has taken place, is an impressive and convincing reply. What is it worth in terms of costs of public service and dividends on investments to have a supply of water sufficient to furnish dependable water power or water for steam and condensation purposes in the operation of municipally and corporately owned steam and hydro-electric plants of the state? Consult any city or village with a municipally owned power plant or corporations which furnish public service for an answer. And lastly, what are our thousands of lakes as a whole worth to the state as an added attraction to invite people to come here and live or as an inducement for visiting tourists to spend their leisure time at rest and recreation. The annual tourist business, already ranking among the foremost of the state's "industries," is the reply.

No laws or regulations can be made to add to our initial water supply. It comes from rain and snow and nothing man can do can be made to appreciably change this amount. It is possible, however, to determine in a large measure how the rain and snow fall shall be used after it becomes available to us as surface water. Because of its geographic location on the top of one of the continent's principal divides, Minnesota more than perhaps any other state should have a concern about the manner in which its waters are being utilized while they are available and before they pass on beyond our reach. Our waters drain away from the state in all directions-north to Hudson's Bay, east to the Atlantic through the Great Lakes and the St. Lawrence, southwest through the Missouri River and south into the Gulf of Mexico through the Mississippi. Very little water reaches us from areas outside of the state. Having this in mind and the further fact that less than 10% of the total rainfall becomes available as water to supply lakes and streams and ground storage, the need of storing and conserving the water we do receive and making it serve our needs while we have it becomes apparent.

SECOND BIENNIAL REPORT

The increasing of the natural storage capacity of our lakes involves control of outflow by dams and other works. Such control affects riparian owners and their rights become involved. In order to determine the extent to which such rights are affected, legal machinery giving jurisdiction to the courts over proceedings to create artificial storage within natural lakes is an outstanding need.

The present emergency conditions brought about by the drouth and the helplessness of the department to meet even a small fraction of the public demands for relief by causing waters to be stored and discharged under control to avert water famines, to prevent wholesale destruction of fish life, save valuable lakes and kindred water conservation problems, emphasizes as never before the imperative need of the courageous facing of this issue and the enactment of constructive workable legislation to enable the department to deal in some measure in the problems relating to our waters.

To this end the Commission recommends:

- (1) That sufficient funds be appropriated to the Division of Drainage and Waters to enable this important branch of the department to function effectively on research and the formulation of plans on which sound policies for the conservation and protection of the state's water resources in the general public interest may be promulgated.
- (2) The enactment of a general "water code" in which may be embodied in understandable language, and readily available, rules and practices established by past court decisions affecting the right of private and public interests in the use of public waters, such code to form a basis for a general water regulatory act placing jurisdiction over public waters in the Department of Conservation.
- (3) The enactment of a law through which the judges of the District Court may be given jurisdiction over lands surrounding lakes in proceedings for the fixing of lake levels and creating storage within natural lakes and artificial reservoirs.
- (4) An appropriation for the classification of our lakes with respect to location, area, depth, source of supply, natural fluctuations, plant life and adaptability for the propagation of various species of fish; resort development and recreation; wild waterfowl nesting grounds and refuges; reservoirs for the development of power and flood control and storage of municipal supplies and many other purposes for which lakes may be used. To defray the cost of a state-wide study of our lakes and other water resources, those who profit directly from the use of water may well be required to contribute in proportion to such use. A small percentage of receipts from fishing licenses should also be used for such a survey.
- (5) Amend Chapter 412, Laws 1933, relating to the use of boundary waters along the Canadian border so as to stipulate that before any repairs, alterations or reconstruction of any existing dams or new dams shall be commenced an application shall be filed with

the Department of Conservation setting forth the nature and extent of such proposed work and asking permission to undertake the improvement before any work shall be begun. Applications for dams and other structures, which, under the act must be authorized by the legislature, should be referred by the department to each legislature for action while those of a temporary character shall be authorized by the Conservation Commission in accordance with the present provisions of the act.

Allocation of Forest Areas for National and State Management.

Congress has made available large appropriations for the purchase of additional forest lands for the expansion of National Forests. As a result the question of the allocation of areas within Minnesota to be acquired and managed by the U. S. Forest Service as against other areas which are to remain under the jurisdiction of the state is of importance.

The Conservation Commission in conference with representatives of the U. S. Forest Service has attempted to stimulate to the fullest degree, consistent with what the commission believes to be the state's own interest, expansion of National Forests under the present federal program. To this end the two agencies have agreed on new federal purchase unit areas without serious differences.

In the selection of new areas to be added to the Superior National Forest, however, issues have arisen between the commission and organizations who are promoting the setting aside of wilderness areas in Minnesota and Ontario along the boundary between Canada and the United States as an international forest. The area within Minnesota proposed to be included in such a forest includes Pigeon Point on the east and extend westerly almost as far as International Falls. It embraces the present Grand Portage and Kabetogama State Forests as well as the Superior National Forest and includes the entire border lakes region, the most famed recreational area in the state.

The commission has insisted on keeping intact the two state forests and has refused to recommend them to the U. S. Forest Service as new purchase units. In the first place these state forests were created by the Legislature of 1933 on the recommendation of the commission to be developed and managed by the department as state forests. Secondly, the Superior National Forest as it existed prior to the present proposed expansion, embraced more than 100 miles of the choicest lake and forest recreational land in the state, the only portion of the border lakes country that remained under state jurisdiction being found within the boundaries of the Grand Portage and Kabetogama State Forests. The commission felt that its desire to keep just a small fraction of this popular and valuable recreational region under state jurisdiction was entirely justifiable and was a modest expression of what it believes is the hope and wish of every citizen of the state who knows of the attractiveness of the Minnesota Arrowhead and boundary waters.

Those interested in the promotion of an international forest take the position that the presence of these state forests within such a forest jeopardizes their program. The commission on the other hand has not been convinced that state forests will in any way interfere with the proposed international project.

The matter of recommending forested areas within the state as between national and state agencies came up for further consideration when the National Resources Board through the Minnesota State Planning Board requested recommendations as to what portions of the forested counties of Minnesota should be placed under federal management and control and what others should be recommended to be managed by state agencies as an integral part of a long-time planning of a forest management program for the state. Here again it became necessary for the Conservation Commission to differ with the recommendations of a forest land use committee. made up of representatives of the Department of Conservation, U. S. Forest Service and other leading foresters, made to the Minnesota State Planning Board. The commission recognized in the recommendations of this committee that by far the most desirable lake areas as well as areas most adaptable for forest production, were placed under the management of federal agencies while the less desirable areas were allotted to the state for state management. The commission viewed this inequitable division of forest lands as a handicap to the state by creating a perpetual disparity to the continuous disadvantage of state forest agencies. Any plan or program which would impose relatively greater burdens on state forest agencies by failing to recognize and include the things which are held in high public esteem and which have a lasting value not only for forest conservation and protection but for recreational uses, does not in the opinion of the commission reflect proper consideration for the state's future interest in reforestation. Unless state forests offer the same opportunities for successful management as national forests, enthusiastic public support for a sustained state forest program cannot be expected.

In view of recently expanded federal activities along all lines of conservation for the relief of unemployment, the state Legislature should by law indicate a policy to guide the Conservation Commission and other state agencies with respect to the attitude that should be assumed in dealing with the federal government and its agencies on forest management as well as other developments having to do with a long-time management program for the protection and utilization of the state's natural resources and how far recommendations made by unofficial groups as well as legally established state and federal departments shall be recognized without specific consent of the legislature.

Rehabilitation of Groves, Wood Lots and Shelter Belts.

The destruction wrought by the drouth to groves and wood lots planted fifty to seventy-five years ago throughout the prairie sections of the state, brings to a sharp focus the need of extending forestation and reforestation methods to areas other than the so-called forest lands.

From investigations already made by the Division of Forestry, University Farm, from thirty to seventy per cent of the trees in groves throughout counties which have suffered most from the drouth are dead or dying. It will be necessary to remove all dead and insect infested trees and replant with others. Emergency conditions which confront the farmers generally

and the need for immediate action calls for organized efforts and aid. Not only should land owners be aided and encouraged to replant tracts already used for groves, wood lots and shelter belts, but a plan to expand present planted areas and to manage and maintain them in the future is an urgent need for the promotion of which state and federal agencies may well devote energies and funds.

The federal government has already announced as a part of its relief program the allocation of funds for the removal of dead and diseased trees and for supplying stock for replanting. As a means of encouraging and promoting a sustained interest in this class of forestation throughout the prairie sections of the state the legislature should consider seriously authorizing the department of conservation to expand its nursery facilities so as to include the raising of species of trees adapted to such uses and making them available to farmers. The success which has attended past efforts at establishing groves and wood-lots in non-forested areas in Minnesota indicates that much may be hoped for by a sustained and publicly directed tree planting program.

Game and Fish Administration Financing.

If future enjoyment and benefit are to be derived from hunting and fishing by the people of the state, propagation of fish and wild life and the enforcement of game laws so as to adequately protect these resources must be supported by revenues received from the sale of licenses and other sources at the sacrifice if need be of any and all other activities relating to wild life management. This has become apparent to the followers of these sports and to others who have observed the trend towards extinction of wild life everywhere evident and the tendencies toward depletion of popular and valuable species by ever increasing demands from a larger number of hunters and fishermen with more and more leisure time to devote to recreational pursuits.

The requirements of wild life propagation, protection and administration are especially burdensome and involved in a state like Minnesota. To conserve and promote natural reproduction of fish and restock with hatchery propagated species our thousands of lakes and unknown thousands of miles of streams presents a tremendous problem in itself unlike that of any other state in the nation. For the same reasons the patrolling of all of these bodies of water to enforce the game laws calls for a relatively larger force of game wardens and wardens' equipment. What has been said of the administration of our fish resources applies with equal force to small and large game and fur bearers and for the same reasons.

Granting that propagation, protection and administration should receive prior consideration in the allocation of revenues, an analysis of recent past trends in the disbursement of funds accruing to the department during recent years, emphasizes the fact that this aim is being defeated rather than promoted. Numerous legislative limitations which have been imposed, consciously or unconsciously, upon the expenditure of game and fish revenues have brought about a situation where the financing of the functions which should be of major importance are made contingent on first supplying funds for the support of lesser activities and for financing an increasing number of projects brought within the scope of game and fish expenditures by special acts of the legislature. In other words, instead of giving game and fish administration, propagation and protection major consideration in the department's fiscal plans, these fundamental functions are made dependent on whatever residue remains after other demands have been met.

There is for example the "Fish Lakes Improvement Revolving Fund" which is made up of revenues received from the sale of rough fishing, which revenues must be used for the removal of such fish and for the improvement of lakes. The "Public Hunting Ground and Game Refuge Fund" is supported by one-half of the revenues received from the sale of hunting licenses and must be used for the "acquisition and maintenance of Public Hunting Grounds, Game Farms and Game Refuges." There are several other funds of minor importance created by law into which certain specified revenues must be paid.

In addition to these funds which have been set up and administered within the Division of Game and Fish, the legislature has diverted for special purposes a material portion of the revenues accruing to the Division. All the wolf bounties for instance, are to be paid from game and fish reve-Likewise the cost of pollution studies are financed from the same nues. source. The last legislature appropriated \$50,000 from game and fish funds for fire fighting. The same legislature appropriated all of the funds to defray the cost of the administration of the Department of Conservation from game and fish revenues. All of these appropriations come from revenues not already specifically set aside by law for other purposes. This means that they come from that portion of receipts which originally was intended to be made available for the financing of the administration, propagation and protection of wild life.

There can be no doubt but what the creation of the so-called Public Hunting Ground and Game Refuge Fund was a forward step in the promotion of our wild life resources and has been reflected in the acquisition of some valuable areas for wild life refuges. Neither can anyone question the wisdom of having the revenues accruing from the removal of rough fish applied to the financing of such activities and to the improvement of lakes. There is some doubt, however, as to the justification of diverting from game and fish funds the total bounties to be paid by the state for the extermination of wolves, the entire cost of administration of the Department of Conservation and funds for fire fighting. As a result of the present methods of distributing funds, the department faces a situation where these diversions together with the phenomenal drop in revenues brought about by depressed economic conditions have so depleted the funds which should be available for the major functions of the department as to create a most unsatisfactory situation.

It has become necessary to reduce the game warden force to a point where adequate law enforcement is not possible and the salaries being paid the wardens now in service are not commensurate with the services they do or should render. The relative importance of the various activities that receive their support from game and fish revenues; a reconsideration

of some of the fees and licenses charged for hunting, fishing and trapping, and a frank and unbiased analysis of the fairness and justice of diverting from game and fish revenues large sums of money which have not heretofore been considered charges against such revenues, merit serious consideration by the next legislature.

We direct attention to a discussion of this same item contained under the caption Game and Fish finances under the report of the Director of the Division of Game and Fish.

The Commission Should Be Authorized to Fix Seasons.

The seasons within which wild life may be taken are at present fixed by the legislature and except as they may be modified by executive order, are to be enforced by the department. It is a significant fact however, that conditions which affect the population of the various species of upland birds, big and small game and fish are no respectors of laws. Sudden changes affecting wild life can be brought about by disease, climate and environmental factors which cannot be anticipated by the legislature meeting every two years. The effect of such changes has been demonstrated not only in Minnesota but in other states and that laws aiming to rigidly fix seasons, areas, bag limits, sex of game to be taken and other factors are not proving satisfactory. There is need of sufficiently elastic laws to permit conservation administrative bodies to regulate hunting and fishing privileges so as to have them conform with what appears to be the necessary safeguards for each species of game and fish at the time.

No better proof of the futility of attempting by legislation to provide in detail game and fish regulations, is needed, than the flood of bills calling for additional laws and amendments to existing laws which appear at each session of the legislature reflecting the views of sportsmen's groups and wild life conservationists from different sections of the state. Each one is disappointed with existing provisions because of their effects on some one or several species of wild life in their community. No two sections are agreed as to the remedies for the reason that no two sections have been similarly affected. Laws enacted by one legislature to meet existing conditions appear to have been all wrong to a succeding session. Instead of tending toward stability remedial legislation becomes more and more voluminous and confusing without apparently offering a satisfactory solution.

The sudden reduction in the number of ringneck pheasants in the fall of 1934 after the open season had been fixed as compared with only a few months previous is an illustration of a situation which may develop at any time and which cannot be met by legislative enactments. Conditions prevailing during the statutory big game season last November is another case in point. It so happened that, with one minor exception, there was no snow in deer areas at any time of the hunting season, creating conditions unsatisfactory both from the standpoint of the hunter as well as that of the best conservation of game. Because of the want of tracking snow a large number of animals were left in the woods, a total waste. Authority which would have enabled the commission to move the season

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forward to the first week or ten days in December would have proven more satisfactory to all concerned.

Present statutes permit the Governor by order to change, within fixed limits, legal game and fish regulations upon a showing of a need therefore. The increase in recent years of regulations by executive order indicates that rigid statutory regulations are not meeting the situation.

It is believed the Conservation Commission as now constituted is in a position to sense current trends in wild life cycles and factors which affect different species in different sections of the state and should be given an opportunity to regulate the taking of game and fish in the light of such trends rather than in conformity with rigid laws. The commission is composed of five men appointed from widely scattered sections of the state. To the extent that they are removed from departmental administration they react without prejudice to public opinion in their respective communities. They meet once each month as a commission and to that extent they are in touch with data and information in possession of the department bearing on game and fish conditions. For these reasons the commission should be in a better position to formulate detailed regulations for the protection and management of wild life than should be expected of the legislature meeting every two years.

The enactment of legislation to extend authority to the Conservation Commission to fix seasons, areas of the state where open seasons are to prevail, designation of species to be affected by such seasons, bag limits, possession limits and other detail regulations would seem an act in the interest of intelligent wild life protection and management.

The Commission recommends:

- 1. That the fee for resident fishing licenses should be increased from fifty cents to one dollar.
- 2. For the purposes of better law enforcement hunting licenses should be required from all persons 16 years or over who wish to take by hunting any species of quadrupeds and birds unprotected and protected. For this purpose the present small game license should be made to include unprotected as well as protected species now covered by such license.
- 3. That all residents 16 years and over who wish to trap any species of wild animals should be made to procure a trapping license for which a fee of \$1.00 should be paid.
- 4. That a license fee of \$5.00 be charged dealers in minnows and other kinds of bait, 18 years or over, who maintain regular established places of business from which they vend live bait.
- 5. That a license or fee be charged fur buyers for operating within the state as follows:
 - (a) Local resident fur buyers license, \$50.00.
 - (b) Resident travelling fur buyers license, \$100.00.
 - (c) Non-resident local or travelling fur buyers license, \$200.00.
 - (d) Resident wholesale fur buyers license, \$10.00.

6. Optional to recommendations under 7, it is recommended that consideration be given the passage of a law which will require the payment of a tax on all raw pelts taken in Minnesota, to be paid by the fur buyer or fur dealer in accordance with the following proposed schedule of taxes:

Black Fox\$3.00	Mink\$.25
Silver Fox 3.00	Bear	.25
Cross Fox 1.50	Wolf	.25
Red Fox	Wolverine	.25
White Fox 1.50	Skunk	.10
Blue Fox	Weasel	.05
Fisher 1.50	Muskrat	.05
Marten 1.00	Badger	.25
Beaver 1.00	Lynx 1	L.00
Otter 1.00		

- 7. That the Conservation Commission be empowered to fix seasons and areas of the state where open seasons are to prevail, designation of species to be affected by such seasons, bag limits, possession limits and other detail regulations.
- 8. That the carrying of rifles larger and more powerful than a .22 calibre either by a person or in a vehicle, in the woods, fields or open lands outside of the confines of any village or city in any territory inhabited by deer be prohibited.
- 9. That the so-called "shining" of deer at night be made a gross misdemeanor and that any automobile or vehicle used in such shining operations shall be confiscated by the state.
- 10. That commercial fishing of game fish in Rainy and Namakan Lakes be prohibited.
- 11. That the use of gill nets in commercial fishing of game fish be prohibited.
- 12. That County Auditors be given the customary fee for the sale of all kinds of licenses sold by the Department of Conservation.
- 13. That the killing or taking of fawn be prohibited.
- 14. That winter fishing be closed on all waters on January 15th of each year.
- 15. That the engineering department and all engineering activities at present within the Division of Game and Fish be transferred to the Division of Drainage and Waters and placed under the jurisdiction and supervision of the Director of Drainage and Waters.

In addition to these specific recommendations there are numerous others that will require attention and for which remedial legislation will be asked.

Iron Ore Resources

In fifty years there has been removed from the iron mines of Minnesota, one billion tons of ore. From present known sources there still remains in the ground one and one-quarter billion tons of merchantable ores and untold billions of the leaner grades not now merchantable. At the rate ores were removed prior to the present depression or during the ten year period 1920-1929, the average annual tonnage removed from all of the iron mines of the state was 36,963,713 tons. At this rate and assuming no additional merchantable ores are discovered, the end of the state's iron mining industry, second only to agriculture and dairy products in importance, is in sight.

Royalty payments on ore removed from state-owned mines alone have enriched the state trust funds by \$33,000,000. The trust funds and the general revenue funds have received from occupational taxes since 1921 approximately \$32,500,000. The royalty tax since its first levy in 1923 has yielded another \$8,500,000. In addition to these sums, ad valorem taxes paid to the state and several municipalities in the past ten or a dozen years have reached the impressive sum of \$200,000,000. To these amounts should be added a gross earnings tax yield on the haulage of these volumes of ore from the mines to the docks and furnaces during the last decade of \$10,000,000. From ten to fifteen thousand men have been given employment in the mines and in the transportation of ores. Iron mining has built up our range cities and communities with an aggregate population of 100,000 people where agricultural products raised in the farming sections of the state find a ready market.

Under present mining conditions the decline of this industry, one of the state's major sources of wealth, is but a short distance into the future. Unlike forests and wild life, ores may not be replenished through any known human ingenuity and when once spent will leave in their wake decadent cities and industries. The very thought of what the loss of the iron industry or even a portion of it would mean to Minnesota, the world's greatest producer of this basic metal, should make economists and state planners stop in sober contemplation and resolve that this eventuality must be postponed no matter what the cost.

Under existing leases iron ores are removed from any given mine until the costs of mining plus royalties, taxes, transportation and other fixed charges aggregate a cost approaching the price which the ores will bring in the open market in competition with similar ores from other fields at which point the mine and any remaining ores are abandoned. The decision when the point of unprofitable operation has been reached rests largely with the lessors. Mines once abandoned fill with water, structures decay and any ores that may have been left because of unprofitable operations might be lost to the state.

With the known supplies of merchantable ores approaching depletion it becomes increasingly important to encourage the removal to complete exhaustion of high grade deposits wherever encountered by mine operators. To insure that this will be done the state legislature should consider the enactment of legislation which will authorize, under proper safeguards, the modification of terms of trust fund land leases where the best interests of the state indicate that such a course is advisable.

Regardless of what means may be adopted to encourage the removal of high grade merchantable ores, the extension of the mining industry into the future rests with the discovery of commercial processes whereby our low grade ores may be beneficiated and made to add to the present mer-

chantable high grade ores. In this field, Minnesota can look nowhere for precedent. No state is confronted with a similar problem on as large a scale. Untold millions in taxes, industry and general business hinge on the discovery of processes that will place ores now considered non-merchantable on the market.

Sufficient progress on the treatment of low grade ores has already been made to indicate possibilities. Since 1906, one hundred sixty-five million tons have been improved by crushing, screening, washing, drying and sintering. This has been done through the limited funds and facilities which have been furnished the University School of Mines and the department working in co-operation with mine operators.

It is possible by present day blast furnace practices to reduce any of Minnesota's ordinary low grade iron ores to pig iron. The point at which reduction of ores in this manner ceases to be economically profitable is reached when the costs of handling and transporting the worthless impurities from the mine to the blast furnaces places a handicap on low grade ores which eliminates them from the market because of competition from the higher grades. Minnesota's low grade ores cannot thus compete unless the greater bulk of impurities can be removed at the mines on a commercial scale. Extensive and sustained research to discover such processes is the answer.

How much can the state afford to contribute for scientific research to assure the continuance for one hundred years and longer of a business bringing to the state and its people an annual **tax** income of between seven and eight million dollars? Shall we let the wholesale abandonment and decadence that followed the wake of our forests be repeated in our iron producing areas? Is there any other resource of the state more staple and for which there is likely to be a more dependable and universal demand than for our iron and what other resource is capable of bringing greater and quicker returns?

The Commission is of the firm conviction that there is no program of development of greater immediate concern than a sustained vigorous research into the possibilities to be derived from a large scale beneficiation of low grade iron ores now while they may be mined and marketed along with what remains of our merchantable ores. The Commission believes that past feeble attempts at this class of research are wholly inadequate to meet the situation and urges upon the legislature to appropriate funds from which this work may be carried on, not in college laboratories alone but in the field, in the mines and in the factories where machinery and equipment for the treatment of iron ores are being planned and erected.

Investigations made and experimentations carried on thus far indicate great possibilities from the treatment of low grade ores at the mines. Further research should be provided by expanded laboratory facilities at Hibbing where many operating questions relative to lean ores arise almost daily and by enabling the University Mines Experimental Station to equip itself for making tests on a scale comparable to a commercial unit. It is recommended:

- (a) That a bill be enacted providing for the extension of the terms of certain iron mining leases.
- (b) That the Division of Lands and Minerals be provided with sufficient funds to enable it to enlarge its field research laboratory.

State Park Management Organization

Management of state parks has never been given serious consideration by the state. Parks and monuments have been created by the legislature from time to time without much thought having been given to their development. Prior to the creation of the Conservation Commission, parks were supervised by the State Auditor. In the re-organization act they were transferred to the Division of Forestry of the Department of Conservation.

Since the advent of federal emergency conservation work and participation by the National Park Service in the development of state parks, federal monies for supervising work and purchasing materials for improvements within state parks aggregating \$139,000 have been expended. This does not include wages and subsistence paid by the federal government to enrollees, which aggregates an additional \$1,800,000. National Park Service officials have approved and carried through these improvements on the supposition that the state will take seriously its responsibilities to manage and maintain these parks and improvements for the benefit of the mass of people who should be given recreational opportunities in public park areas.

As indicated, state parks are now under the supervision of the Division of Forestry. The legislature thus far has not provided for a park organization. Such supervision as has been given state parks has been furnished by one of the technical foresters devoting part time to this work. At the time the National Park Service was urged to establish ECW park camps the department was placed on the defensive because of the fact that there was not within its organization a trained park specialist with whom the federal park agencies might deal to perfect plans for improvements and supervise the work. To overcome this objection arrangements were made whereby a trained director of parks was appointed by the Commissioner, his salary to be paid from federal funds with the understanding that the budget to be submitted to the next legislature would contain an item for the continuation of a park director on the department payroll together with such assistants and expenses as might be found necessary to enable him to supervise and manage state parks in an efficient manner.

With the many splendid facilities which will be available in our present state parks as a result of federal emergency conservation work improvements, the legislature should consider seriously the enactment of legislation which will authorize the Conservation Commission to charge for special privileges rendered the users of state park improvements. This should include rental of camp sites, cabins, bathing lockers, boats and other privileges. The director of parks should be authorized to either operate concessions as a department activity or lease them in parks where the demands

are sufficient to warrant their operation. Such operation or leasing should be done according to a definite legal policy, concessionaires to furnish good and sufficient bonds guaranteeing the carrying out of their leases and contracts.

It is believed that after park lands have been acquired and improvements and conveniences have been provided at public expense and because practically all past maintenance costs have been paid from state appropriations that the legislature is justified in authorizing the Conservation Department to set up a system of revenue producing activities, the income from which should go toward aiding in maintaining and operating public parks. Actual users and beneficiaries of park developments should be made to pay at least a portion of the cost of operation.

The Commission is requesting an item in the next budget from which to pay the salary and expenses of a director of parks. The creation and maintenance of such an organization is essential if the state is to lay claim to further National Park Service emergency conservation work camps for the further improvement of state parks.

Soil Erosion Control

Public attention has been directed to problems relating to the conservation of forest, mineral, wild life and recreational resources to the exclusion of serious consideration, until very recently, of another form of waste and denudation of a most serious nature, namely that resulting from soil erosion.

Soil erosion control is the youngest member of the family of conservation problems, especially in Minnesota. The reason for this is the slow rate at which the process of soil erosion operates and the relatively small areas that are affected in a sufficiently striking manner to attract public attention. Although slow in operation the fact remains that the ultimate destruction of some of the best and highest priced agricultural lands located in the most intensively developed sections of the state from soil depletion is certain, unless methods are adopted to stay its progress. Not only are its immediate effects in removing fertile top soil and destroying farms by gullying of concern but the impairment by silting of natural streams and drainage channels by detritus carried from tributary cultivated fields is of equal consequence.

The sections most seriously affected are (1) the area drained by small streams into the west end of Lake Superior; (2) the southeastern counties draining directly into the Mississippi below St. Paul and the tributaries of the Vermillion, Cannon, Zumbro, Whitewater and Root Rivers and smaller tributary creeks; (3) the lands immediately adjacent to the Minnesota River, and (4) extensive areas found throughout the entire southern half of the state where the declivities of cultivated fields are sufficient to cause moving surface water to carry away top soils by sheet erosion.

Soil erosion control possibilities are being demonstrated in the southeastern counties by the National Forest Service ECW soil erosion control camps. The works erected and improvements undertaken however are not intended to completely remedy the situation in any one community or even on any one farm. Their purpose is to show to the land owners what can

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be done as a means of encouraging them to pursue on their own initiative, soil conservation activities. Much can be done by the individual farmer to save soil fertility by terracing, contour cultivation and other simple practices. It is clearly to be seen however, that an extended program to embrace any considerable portion of the cultivated fields subject to destructive erosion processes will have to be promoted as district or community enterprises if the desired results are to be achieved. Before this can be done a law must be enacted which will authorize the organization of erosion control or terracing districts, granting authority to such districts to purchase terracing machinery or award contracts to others for the construction of the necessary works, outline methods of financing costs and furnish legal machinery for undertaking projects on a larger scale than can be undertaken by the individual farmer.

It is time to consider and recognize the eventuality which is certain to overtake large areas within what has been the most prosperous communities of the state and which will cause their abandonment for agricultural pursuits unless the processes which have steadily removed fertile top soils are stayed. Productive surface soils when once removed cannot be replaced. Public concern is being shown in the conservation of forests, wild life and waters, and public funds annually expended for replenishing, preserving and protecting these resources. Conservation of soil fertility, the basic source of agricultural prosperity, certainly merits a conspicuous place in the state's conservation program.

The direction of soil erosion control should be definitely placed within the Department of Conservation with sufficient funds made available to enable it to co-operate effectively with land owners in the promotion, improvement, methods of cultivation, tree and shrub planting and other means that will tend to stay soil destruction.

Topographic Mapping.

Perhaps one of the most wasteful expenditure of public and private funds results from the multiplicity of unrelated and uncoordinated surveys and investigations continually being made for the large variety of industrial agriculture and general development and research purposes. Surveying and mapping in order to secure a knowledge of the state's area and its resources began with a survey of public lands by the U. S. Land Office and have continued down the years until it is perhaps safe to state that today there is no section of the state that has not been surveyed and resurveyed many times over. Yet there is nowhere an authentic map of Minnesota supplying reliable general information available for ready reference.

The standard topographic map of the United States which is being prepared under the direction of the U. S. Geological Survey in co-operation with the several states is a base map which when once completed will be available for ready reference by all persons and agencies desiring authentic basic data on all problems depending for their solution on a knowledge of the surface area of the state. In addition to showing the information usually shown on the average map such as lakes, streams, railroads and highways standard topographic maps picture relief as well. Hills, valleys,

slopes and other features which affect surface elevations are shown by contour lines. The maps indicate at a glance the altitude of all points referred to above sea level. Fall in streams, differences in elevations of surfaces of lakes, slope of ground surfaces, height of banks of streams and depths of valleys and gorges may all be quite accurately visualized by a study of such maps.

Approximately 45% of the entire area of the United States has been covered by topographic mapping. Ten states have had their entire areas completed. Sixteen states have in excess of 75% finished. Twentyfive states have completed one-half or more of their areas. Minnesota has only $9\frac{1}{2}\%$ covered. Only one state—Florida—has a smaller percentage of topographic mapping than our own. Mapping within Minnesota should be resumed as a purely economic investment. Federal funds are made available on a fifty-fifty allocation of cost basis within states which appropriate funds of their own for the purpose.

Co-operative topographic mapping has been at a standstill in Minnesota since 1917 when the work was abandoned as a war time measure. It will not be resumed again until funds are provided. The Commission urges upon the legislature to make an appropriation for topographic mapping so that this work may again be resumed and continued until those portions of the state where immediate development problems await solution have been covered.

Tourist Bureau Support

With the close of the Century of Progress Exposition, those in quest of recreation are going to seek out places where opportunities are the best and where communities and states advertise such opportunities. With an upturn in business and economic conditions generally the American people will again resume travelling. When this time comes Minnesota should be prepared to make an aggressive bid for a fair share of the tourist business.

Tourist trade has yielded the state an average of fifty million dollars per year during the last decade. It constitutes one of the state's major industries. The degree to which the state as such is made wealthier because of contributions by out-of-state visitors is impressive. More than a million dollars is paid into the state treasury annually in the form of gasoline taxes. A hundred thousand dollars is yielded the Department of Conservation through the sale of non-resident fishing and hunting licenses alone. To these items should be added the vast amount of tax revenues which are paid by owners of resorts and others whose business comes largely from tourist trade.

States are alert to appreciate the importance of attracting tourists and competition is yearly growing more keen. Minnesota with its marvelous natural attractions should make its "tourist crop" the biggest of any of its bounteous harvests. To do this or even to survive in the field of keen competition the state must advertise. Private corporations find it necessary to advertise to sustain business. Minnesota, a corporation of more than 2,500,000 resident share-holders, must advertise its wares of lakes abounding in fish and offering unprecedented recreational opportunities, its forests with its abundance of birds and game and its cooling and refreshing summer climate, if the state is to reap its share of financial returns from these natural attributes.

A sufficiently large appropriation to enable the Tourist Bureau to take its place among the advertising agencies of other states should not be looked upon as an item of outright expense but as an investment that can be made to bring big dividends. With large areas of tax delinquent lands having ceased to contribute toward local and state government, their use for recreational purposes is one way in which to make them assume their share of management expense.

The appropriation made by the last legislature for the support of the Tourist Bureau has made it impossible for the Bureau to make uneffective bid for Minnesota's share of tourist trade. The Commission urges upon the legislature to appropriate not less than \$50,000 per year for the next biennium for the support of the Tourist Bureau.

Financing of Free Copies of "The Minnesota Conservationist"

Attention is directed to the discussion of this subject under the caption of the Minnesota Conservationist contained in another portion of this report.

It is recommended that the legislature appropriate three thousand dollars to pay the cost of publishing and distributing the free copies of this publication as provided by the statutes.

Departmental Civil Service

The Commission, early after assuming its duties, declared as one of the department's policies that the merit system shall prevail in the selection, employment and discharge of personnel, in order to eliminate so far as possible the effects of influences other than qualifications for service to be performed and to build up the efficiency and morale of employes. The need of especially trained and qualified men and women to deal with problems relating to mineral, wild life, forest and water resources, is recognized by all who have given conservation serious thought. The Commission's action in incorporating intra-departmental civil service was prompted by a determination to elevate the plane of performance of individual employes and of the department as a whole.

Experiences are proving, however, that the application of any merit system established through intra-departmental regulations has its limitations. Such regulations lack a legal status and constantly create issues which cannot be determined or settled for lack of authority.

The Commission respectfully submits to the legislature the advisability of enacting a law which will make it possible to introduce civil service within the department of conservation.

DEPARTMENT POLICIES

The Commission has from time to time promulgated and established policies for the more effective administration of the department in the general public interest. Some of the more important ones now in effect are referred to briefly:

INTRA-DEPARTMENTAL

1. All employes of the department are prohibited from actively participating in any state or local political controversy and from directly or indirectly soliciting or receiving any assessment, subscription or contribution, for any political purposes.

2. Contributing or failure to contribute to solicitations for political or other purposes made by individuals or organizations other than those in the employ of the department shall in no wise affect the status of any employe.

3. Employes and other persons connected with the Department of Conservation are prohibited from entering into contracts for the purchase of lands for any purpose without first securing approval thereto by the Conservation Commission.

4. Employes who were transferred to the federal payrolls because of Public Works, Emergency Conservation Work, Civil Works Administration and other relief projects, shall be considered as having been granted leaves of absence from their regular duties.

5. In the employment and removal of game wardens, the merit system shall govern.

LAND USE

1. No state trust fund lands located within legally established "conservation areas" are to be offered for sale until the legislature has been given an opportunity to legalize classification and zoning of lands within such areas, except to the extent that it may be found necessary for the department to offer lands for sale on which principal and interest payments are delinquent in order to repossess the state with title.

2. No state trust fund lands shall be offered for sale anywhere unless examinations have shown them to be suitable for agriculture and then only if they are located within easy and economical reach of already existing schools, roads and other government facilities.

3. No state trust fund or other land in which the state has an interest shall be leased to be used as private hunting lodges or trapping or shooting grounds by any of the divisions of the department and all duck passes owned by the state shall be made available for use by the public under proper safeguards.

4. The Conservation Commission has memorialized Congress to cede to the State of Minnesota all unentered homestead lands located outside of national forests so as to enable state and local agencies to coordinate land use programs without interference by or conflict with federal land policies.

5. The Attorney-General has been asked to have the courts determine the right of the state to lease ore lands which constitute beds of public waters.

6. The Conservation Commission has questioned the constitutionality of that part of session laws 1933, chapter 412, which grants perpetual rights

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to water power owners to use state owned lands on reservoirs under certain conditions, on the grounds that the legislature granted a perpetuity in violation of Article 4, Section 23, of the Constitution of the State of Minnesota.

FORESTRY

1. A policy has been adopted declaring in favor of an expanded national forest program so as to have the state benefit to the fullest degree from congressional appropriations made available for the purchase of national forest lands and emergency conservation work, consistent with the state's own long-time needs and interests. In urging national forest expansion, however, the Commission has insisted on reserving for the state and retaining under state jurisdiction such areas as are of outstanding value for the development of the state's own program, not only of forest promotion and management but of keeping for the state and its citizens to be developed and managed under state laws and regulations, an equitable portion of the recreational assets of which the northern counties abound. The Commission views the state forests created by the Legislature of 1933 as not being subject to transfer to new national forest purchase units without the approval of the legislature.

2. As a means of making available publicly owned lands on which federal emergency conservation work activities may be carried on, the Commission urged upon the Federal Surplus Relief Corporation to purchase marginal and sub-marginal lands within state forests and deed the lands to the state on a tenure deed, such lands to be developed and managed by the state as long as they are used for forests and other conservation purposes. One such sub-marginal land retirement project affecting the Beltrami Island State Forest has already been completed and submitted for approval to the Federal Surplus Relief Corporation. If this project is approved it is estimated that the government will purchase three hundred farms within the forest, remove the settlers and purchase lands in more favored locations outside of the forest on which to rehabilitate not less than 200 of such farmers.

3. The Commission has authorized the Commissioner of Conservation to enter into negotiations for the acquisition by purchase, gift or condemnation of lands on which were located the historic Grand Portage headquarters, the Grand Portage trail and Fort Charlotte within the Grand Portage State Forest, on which to reconstruct these old historic structures for the perpetuation of the scenes of early Minnesota history to be maintained as historic monuments, and for purposes of consolidation.

4. The Commissioner of Conservation has been directed to cooperate with the Commissioner of Highways in locating highways and beautifying roadsides through and near state parks and forests in order to enhance scenic attractions.

5. No public highways shall be approved for construction into or through state forests except those needed to connect with forest recreational areas and for fire protection.

6. The Commission has authorized the expenditure of seventy-five thousand dollars from the Public Hunting Ground and Game Refuge Fund of the Division of Game and Fish for the purchase of tax delinquent lands within state forests as authorized by laws 1933, chapter 419.

7. Recommendations have been made to the Bureau of Indian Affairs of the U. S. Department of Interior, urging a cooperative survey of the wild rice fields in the areas within the state in order that state and federal programs for the development of rice resources may be coordinated for the accomplishment of the greatest good to the Indians as well as to provide feeding grounds for wild migratory fowl.

TIMBER

1. The Commission has declared against the sale of any state owned timber during the year of 1934 unless it is clearly shown that such sales become necessary in order to protect the state from loss.

2. Recommendations have been made to the Executive Council urging that no extensions be granted holders of permits to cut timber on state owned lands where records indicate that four or more such extensions have already been granted, and that the liabilities of all present permittees be determined and that proceedings to collect amounts due the state be initiated.

PUBLIC HUNTING GROUNDS AND GAME REFUGES

1. The following public hunting grounds and refuges have been established by the Conservation Commission by the acquisition of portions or all of the needed areas from the Public Hunting Ground and Game Refuge Funds of the Division of Game and Fish:

(1) Whitewater Refuge, Winona and Olmstead Counties.

(2) Carlos Avery Refuge, Anoka and Chisago Counties.

(3) Turtle-Cross Connection Lake, Polk County.

(4) Gooseberry, Lake County.

(5) Brule, Cook County.

(6) King Williams Narrows, St. Louis County.

In addition to these areas proceedings are pending for the creation of the following additional areas for migratory waterfowl:

Green-Calhoun Lakes, Kandiyohi County,

Lower Rice Lake, Clearwater County,

Talcott Lakes, Cottonwood County.

2. In the acquisition and planning of public hunting grounds and game refuge areas adjacent to or in the vicinity of densely populated centers, consideration shall be given to the use of portions of such areas on which to establish camps for the use of people of limited means, for under-privileged children whose opportunities for outdoor recreation are limited, and for the use of students and educational institutions in which they may pursue nature studies and research and that such areas be managed so far as practicable so as to afford and encourage all year recreational activities. A definite area of one hundred acres has already been set aside within the Carlos Avery refuge for the use of the State University on which to carry on such work. 3. A general rule has been established to discourage initiation of land acquisition proceedings for the establishment of any public hunting ground and game refuge unless the project may ultimately be made to include not less than two thousand acres.

4. The Commissioner of Conservation has been directed to urge the establishment and acquisition by the U. S. Biological Survey of wild migratory fowl nesting places and breeding grounds throughout the state, under the federal marginal and sub-marginal land retirement program. An area embracing Mud Lake and surrounding marsh lands in Marshall County aggregating more than fifty thousand acres has already been approved and proceedings begun for the acquisition of the lands. Other nesting and breeding grounds areas within the state are being considered by the Survey.

INTERSTATE FISHING

The Commission and the Conservation Commission of the state of Wisconsin have adopted and put into effect uniform regulations for the taking of fish and the enforcement of fishing laws in the Mississippi River and the St. Croix River where the same form the boundaries between the two states.

POLLUTION

1. No portion of the Fish Lakes Improvement Revolving Fund of the department shall be used for the improvement of lakes and streams and no fish or fish fry of any kind propagated by the state at the expense of state funds shall be distributed in lakes or streams unless and until the Department of Conservation shall have been definitely assured that no organized municipality or industrial establishment is discharging untreated sewage or industrial wastes in bodies of water so proposed to be improved or stocked with fish.

2. Pollution has been declared a menace to aquatic life in the Cannon, Straight and Vermillion Rivers and in the Mississippi River below St. Paul.

3. In cooperation with the State Board of Health a conference has been held with the Minister of Health and the Department of Fisheries of the Province of Ontario with a view to eliminating wastes destructive of fish life in Rainy River below International Falls and an international movement is now under way to have a project for the elimination of pollution in this stream made a reference before the International Joint Commission.

WATER CONSERVATION

1. The Commission has urged upon federal and other officials in charge of promoting the 9 foot channel in the Mississippi River to consider the effects of proposed dams and other improvements, not only on navigation but on the natural beauty of the stream and valley, future environments for wild life, silting behind the proposed dams by sediment carried into the stream by erosion and other changes which will tend to disturb natural conditions.

2. The Legislature of 1933 was asked to memorialize Congress to enact a law which will extend to the proper authorized agencies within the respective states, concurrent jurisdiction over all public waters subject to the

supervision and control of the Federal Power Commission, which will authorize the states, jointly with the Federal Power Commission, to establish minimum and maximum water levels in all reservoirs and lakes used for power development purposes.

3. The Commission proposed for approval by the Federal Public Works Administration as all-federal projects, five major water conservation projects in the western and northwestern part of the state and directed the Commissioner of Conservation to prepare applications and complete plans for each of them. The projects are:

- a. Red Lake and Red Lake River Flood Control and Water Conservation Project.
- b. Lac Qui Parle Lake Flood Control and Water Conservation Project.
- c. Lake Traverse Flood Control, Water Conservation, and Wild Life Nesting Area Project.
- d. Whetstone River Diversion-Big Stone Lake Project.
- e. Roseau River Flood Control Project.

4. The Commission made formal protest against the arbitrary raising and lowering of the lakes and bodies of water controlled by the Kettle Falls dams in the border lake area, for purposes of repairing these dams.

5. The selection and preservation of primitive lake areas within state forests whenever practicable, has been declared as a policy by the Commission.

6. The Commission has recorded its opposition to the further development of water power within the border lakes area and directed the Commissioner of Conservation to join with the Attorney-General of the state in opposing the granting of the petition of the Minnesota & Ontario Power Company for the development of power reservoirs within the Upper Rainy River drainage basin in proceedings before the International Joint Commission.

7. In an effort to avert a water famine in many areas of the state, the Commission directed all employees of the Department of Conservation on their own initiative, to investigate conditions prevailing in the territories in which they work and operate with a view to aiding local communities and organizations to conserve all of the available water supplies for use during the winter months. The Commission made a state-wide appeal for cooperation between all agencies to meet the emergency which had been created by drouth.

MINERAL LEASES

A policy has been adopted declaring that royalties to be charged for the mining of gold, silver and other precious metals shall be fixed on a sliding scale based on the metal contents of the ores.

Acknowledgments.

The Conservation Commission acknowledges its grateful appreciation to the large number of government and state departments, private and public organizations and individuals who have given of their time and energies to

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aid the department in the performance of its work during the biennium. Special acknowledgment is due Governor Floyd B. Olson for his keen and sustained interest in the promotion of the cause of conservation, especially for his personal efforts in behalf of unemployment relief projects; to the U. S. Forest Service for the part it has performed in aiding the department in planning and directing extensive emergency conservation work within state forests and erosion and drouth areas and for the spirit of co-operation and harmonious relations which have prevailed; to the National Park Service for the service it has rendered in connection with the approval of emergency conservation work park camps within state parks, preparation of plans for park improvements, planning and directing of state park projects and the friendly co-operation shown at all times; to the U. S. Geological Survey for data gathered and compiled and aid extended the department on problems affecting public waters, information which has been of special value in efforts to extend relief to communities faced with water shortages because of drouth, and for results made available through its general state-wide research bearing on water resources; to the U.S. Biological Survey for its interest in the establishment of wild migratory fowl nesting and feeding grounds within Minnesota; to radio broadcasting stations WCCO, KSTP and WRHM (now WTCN) for their generous assignment, without charge, of valuable radio time for the discussion of conservation topics; to the U. S. Bureau of Agricultural Engineering; to the University of Minnesota and the Minnesota Department of Public Health for their aid and co-operation in planning and solving conservation enterprises and to individuals and sportsmen's organizations who have cooperated in dealing with wild life protection and other problems.

The Commission wants to make special acknowledgment of the industry, loyalty and devotion to duty shown by the rank and file of department employes without whose diligent application to tasks assigned them, the fullest and most constructive conservation program ever attempted in Minnesota could not have been a success.

To conclude this acknowledgment without making special reference to Mr. E. V. Willard, Commissioner of Conservation, would indeed be thoughtless on the part of the Commission.

At the time Mr. Willard was employed as Acting Commissioner the Commission did not contemplate that a great program of public relief work would be undertaken by the state and federal government. In addition to his many arduous duties as Commissioner of Conservation he has undertaken and helped carry forward, by his untiring efforts and singular devotion to duty, the many additional burdens, not contemplated by the statutes, thrown upon him as a result of this relief work. He has performed all of his work in an exceptional meritorious manner, "above and beyond the call of duty."

Respectfully submitted,

JOHN R. FOLEY, Chairman. RICHARD R. BAILEY, Vice-Chairman. FRANK YETKA, Secretary. ERNEST R. REIFF. WILLIAM M. ERICSON.

LETTER OF TRANSMITTAL BY COMMISSIONER OF CONSERVATION

To the Conservation Commission of the State of Minnesota.

Gentlemen:

I submit herewith my report on the administration of the department for the biennial period beginning July 1st, 1932 and the functions and activities of the various divisions.

Because of the large field covered by the scope of the department's functions, many topics, although undoubtedly of general public interest, have not been included herein and the subjects which are discussed are dealt with briefly in order to conserve space.

This is the second biennial report of the department. Prior to its creation by the Legislature of 1931, each division was an independent state department and as such functioned independently of the others. An attempt has been made to have this report embody statistical information showing not only what has been accomplished during the past biennium but enough of facts and figures bearing on past administration of the state's natural resources to furnish a background and link past work with that of the present department.

Financial statements showing the expenditures, receipts and balances are not included herein as this information is available from other sources. Exception is made in the case of the report of the Division of Game and Fish in which the finances of this division are discussed.

General Statement

Unexpected developments which could not be anticipated prior to the adjournment of the Legislature of 1933, have taxed to the limit the financial resources and personnel of the department during the biennium. Many problems have come up which do not normally belong within the department's field of activity and for which no administrative funds were provided. Chief among these was the mass of work created by projects which originated through state and federal relief agencies and programs and problems arising from the effects of the worst drouth in the history of the state.

The Legislature of 1933, reflecting the distress prevalent over the state at large because of depressed economic conditions, reduced appropriations for the support of the normal activities of the department to a minimum. Even before the legislature had adjourned extensive federal relief programs were in the making. The President had already announced his plan of launching a program of emergency conservation work through which unemployed young men between the ages of 18 and 25 might receive gainful employment on forest improvements, soil erosion prevention and public park developments. The planning of projects for this work in Minnesota fell to the department.

The number of ECW enrollees allotted to Minnesota, based on the original quota of 250,000 men for the entire nation, was approximately 5,200. Later the total for the nation was increased 10% to include 25,000

ex-service men. This increase together with a small number of trained local men approved for each camp, increased Minnesota's quota to about 6,000 enrollees or the equivalent of thirty Emergency Conservation Work Camps of 200 men each.

Immediately following the announcement of this program and at the direction of the Conservation Commission, all avilable resources of the department were applied to the task of preparing plans for the promotion of forest, soil and park betterments under this federal program. It meant the selection of not less than two locations for each camp from which the War Department might make a final choice. In the case of forest camps it meant finding publicly owned lands, preferably within state forests, of sufficient extent to keep camps of 200 men each gainfully employed for a period of not less than six months, on the classes of work approved by the Federal Director of Emergency Conservation Work. For soil erosion control camps it meant not only the selection of suitable locations but the stimulation of public interest in this class of work sufficient to bring about the necessary cooperation between private land owners and federal agencies. For park camps it meant the "selling" of our state parks to the National Park Service in order to acquaint this federal agency with our park needs. For each camp it meant that working plans had to be prepared giving for each project the estimated cost and kinds of equipment required, estimated number of man-days for each project, selection and submission for approval by federal ECW agencies of all supervisory personnel, setting up and providing office space for detached employes and numerous other details incident to the establishment and supervision of this program. Pending the establishment and opening up of the initial camps, nearly all of the preliminary work had to be done by employes on the department's payroll.

As a result of the energetic work of the directors of the various divisions and their staffs and with the effective cooperation of the U. S. Forest Service and National Park Service, sixty-one Emergency Conservation Work Camps employing a total of nearly 15,000 men were approved and established for the state during the opening enrollment period. Although the department was not prepared to assume the large amount of extra work imposed on it by this program, the results accomplished have more than compensated for the efforts expended. Forest improvements, soil erosion control structures and park betterments, represent expenditures of hundreds of thousands of dollars and have advanced the cause of conservation of forests, soils and recreational facilities to an extent which without this federally sponsored program could not have been possible for many years to come.

Immediately after the passage by Congress of the National Industrial Recovery Act, setting aside large sums of money for public works, the department began the planning of public works projects for the state. Under the provisions of the act, a state, county or municipality in order to participate in the funds appropriated for public works, was required to show to the satisfaction of the Public Works Administrator that it had the money, taxing authority or credit to defray 70% of the cost of any project proposed, in order to receive the balance of 30% from congressional appropriations. The Department of Conservation had no funds at its disposal

from which to pay 30% or any other portion of public works improvements. Because of this limitation the department could not petition for or secure approval of any state projects coming within its jurisdiction. The Conservation Commission, however, recognized that there were several major water conservation projects in the western part of the state which are interstate in character and which have proven beyond the reach of the laws and machinery of any state to undertake. These improvements, therefore, if they are to be dealt with successfully, must be undertaken as allfederal projects. Accordingly the commission directed the Commissioner of Conservation to prepare applications for the approval as all-federal enterprises, five major water conservation developments located in the western part of the state. Specific reference to these proposed improvements is contained in another section of this report.

Application for these public works were completed and were filed with the Public Works Administrator in September, 1933. None of them have as yet been approved as PWA projects. The Whetstone River Diversion-Big Stone Lake Reservoir and the Lac Qui Parle Reservoir have, however, been released by PWA and are being undertaken by the State Emergency Relief Administration. The data compiled by the department is available and is being used by the Emergency Relief Administrator in the latter's plan for carrying out the work.

In addition to the ECW and PWA work above referred to, the department has taken an active part in aiding in the planning and execution of a large number of other relief enterprises. During the brief duration of the Civil Works Administration a number of improvements were initiated by the department. Few of them, however, were completed because of the short time in which this form of relief was in operation. Many of the incompleted CWA projects were continued and a large number of additional improvements have been initiated and are under construction as transient relief administration and other emergency relief undertakings.

Effects of Drouth

The effects of fifteen years of deficient rainfall are assuming alarming proportions in many sections of the state. Water is so intimately a part of nature and affects the material well-being and pleasures of people as to make it a measure of almost every kind of material progress. The failure of crops over large areas of the state and the necessity of furnishing relief to farmers at once created a demand for hay and pasturage in sections where forage was available. The demand for hay stumpage leases and pasturage on state owned trust fund lands, within public hunting grounds and game refuges and in state forests and parks has thrown upon the divisions involved an unexpected and disproportionate volume of work during the biennium. Reference is made to a report of the effects of these conditions on the leasing of lands which is contained in the report under "Division of Lands and Minerals."

The effects of the drouth on the water resources of the state have been disastrous. Many of our most valuable and attractive lakes have all but disappeared. Fish life has been endangered and actually exterminated in many lakes. Water shortages have been faced by communities

in the Red River Valley for two years. This shortage took on the nature of an emergency during the summer of 1934. In an effort to furnish relief the Executive Council authorized the department to proceed with the adoption of measures and preparation of plans to insure a dependable water supply during this winter. As a result of the activities of the Division of Drainage and Waters and through the establishment by the Federal Director of Emergency Conservation Work of several drouth relief camps in the areas affected, sufficient water to meet immediate needs and through the coming winter seems assured.

Lack of workable legal machinery through which orderly court procedures may be instituted for the determination of the rights of the public as against the rights of riparian owners in the development, use and enjoyment of public waters is making it difficult for the department to function in emergencies like these at present confronting the state. The need of delegating to the Department of Conservation regulatory and supervisory powers and duties over lakes and streams in the state in so far as such regulation relates to the conservation of water supplies has been set forth in previous reports and before legislative members for several years and further emphasis of the importance of this legislation would seem unnecessary.

Division Reports

The reports which follow and which deal with the activities of the divisions, are based largely on the reports of the directors to the Commissioner of Conservation. They have been abbreviated to save space.

Acknowledgments

Grateful acknowledgment is made of the hearty cooperation of the Conservation Commission and each individual member thereof and their devotion to the cause of conservation and the affairs of the department shown at all times during the biennium. They have spent much time away from their own business and professional affairs without compensation and too often with little appreciation of their efforts. Without their loyal support of department policies the signal progress recorded during the biennium could not have been possible.

I also want to express my genuine appreciation of the cooperation, application to duty and loyalty of the directors of the various divisions and all of the employees of the department in the performance of the work assigned them during the two-year period. All have been called on to work long hours and on difficult and unusual assignments, all of which is gratefully acknowledged.

Respectfully submitted,

E. V. WILLARD,

Commissioner of Conservation.

DIVISION OF DRAINAGE AND WATERS

WALTER S. OLSON, Director.

Funds appropriated by the Legislature of 1933 for salaries for the support of the division have been inadequate to maintain a working organization and drastic reductions in appropriations made for supplies and expenses imposed still further limitations on its sphere of usefulness to aid in solving the many problems which have been created by the drouth as well as to plan work projects for unemployment relief arising from state and federal relief programs. As a result it has not been possible to make investigations and furnish information and advice to public agencies and citizens who have been faced with emergency conditions and who have looked to the division and the department for constructive aid and leadership. For this apparent failure to render public service there has been considerable criticism and expressions of impatience.

Agricultural Drainage

The same drouth conditions which have prevailed during the past several years have made farm land drainage unnecessary. Coupled with the lack of rainfall are the effects of surplus production and general economic depression on the prices of farm lands and products which have discouraged investments of every kind by the farmers.

There has been no public land drainage reported during the biennium.

The same deficient precipitation which has made farm land drainage unnecessary for several years has resulted in the neglect of drainage improvements which were constructed by farmers at great expense during past wet periods. As a consequence many tile drainage systems have become obstructed and open ditches have become ineffective through tree and brush growth and deposits of silt. If and when normal precipitation again returns, owners of drained lands will be confronted with the need of expending large sums of money on the repair of open and closed drains. Because of the apparent uselessness of drainage structures under present drouth conditions, rehabilitation of broken down and obstructed drains have not been included in public relief problems to the extent that the importance of this class of work would seem to indicate.

Drain Tile Investigations.

The division has continued its co-operative relationship with the University Experiment Station and the U. S. Bureau of Agricultural Engineering under substantially the same agreement as that which has been in effect since the establishment of the tile research laboratory at the University Farm fifteen years ago. The question may well be asked as to why research on drain tile should be continued at a time when there is so little need and demand for land drainage. The answer is that the processes which destroy drain tile in the ground through the action of destructive ingredients present in soil and soil water and by freezing and thawing, are slow and their effects cannot be observed except by subjecting specimens of different mixtures and treatments to exposure over a long period of years. Research of this kind, like nearly every other class of research, is difficult to justify to the average citizens on the face of immediate returns. The fact remains however that the cost of the maintenance of this laboratory has been returned many fold to land owners by preventing the installation of drains where they cannot be expected to survive the attack of destructive soil ingredients and in bringing about improvements in the quality of the manufactured product. Since 1921 when the laboratory testing service was first made available to purchasers of drain tile, no concrete tile failure has been known to occur on projects where inspected products were used.

Years of abundant and excessive precipitation will follow the present drouth as it has followed all previous drouths. When cultivated farm lands again become saturated to a point where crops will be damaged, large quantities of drain tile will again be in demand. Uninterrupted studies should be continued on the thousands of specimens which are now under observation in the laboratory, in peat deposits in the various sections of the state and in Medicine Lake, South Dakota, for a sufficient number of years to accurately determine reactions by elements of destruction present in the soil so that the information bearing on the manufacture and durability of drain tile can be used as a reliable basis in passing upon the value of the various kinds of materials used in costly farm drainage enterprises.

In addition to the testing of drain tile the research carried on under the co-operative agreement referred to has been extended to include run-off and ground water studies in the peat marshes of northern Minnesota and in a limited way to studies of ground waters generally throughout the state.

The report of Dalton G. Miller, Senior Drainage Engineer of the U. S. Department of Agriculture in charge of the Tile Testing Laboratory at the University Farm, showing the scope of the work which has been accomplished, follows:

Report of Cooperative Drain Tile Laboratory

University Farm, St. Paul, Minnesota. October 22, 1934.

DALTON G. MILLER, Senior Drainage Engineer.

Bureau of Agricultural Engineering, United States Department of Agriculture.

During recent years of heavy crop losses because of drouths it is easy to forget that not so many years ago heavy crop losses because of too much water were the usual thing on many of the poorly drained farm lands of Minnesota. A natural question now arising in the minds of many is whether there ever again will occur years as wet as were those experienced in the past. Perhaps the nearest approach to any answer to the query is to be found after a study of existing precipitation records.

The oldest known authentic continuous precipitation records in the Mississippi Valley are for St. Louis, Missouri, and for the Twin City area of Minnesota. Since we are most interested in conditions in Minnesota there is presented a graph showing the precipitation for each of the past 97 years as recorded in the Minneapolis office of the U. S. Weather Bureau, (Fig. 1). This graph clearly indicates that dry weather is not peculiar to recent years.



Fig. 1

In particular, note that the present dry period which the Upper Mississippi River basin is experiencing is by no means unprecedented. As example, the total precipitation for the twenty years 1914-1933,inclusive, has been 518 inches, while away back between the twenty years 1837-1856 it totaled but 501 inches. Also during the twenty years 1882-1901 the precipitation totaled 519 inches—only one inch more rain during this twenty years has fallen than during 1914-1933. Furthermore, during the ten years 1924-1933 the precipitation has totaled 246 inches, compared with a total of but 241 inches for the ten years 1882-1891.

Dry periods of the past eventually have been followed by wetter years, and it seems fair to conclude that this dry period likewise will come to an end. With wetter years should come a general rise of ground water, increased run-off, higher lake levels and more water in wells and streams and on low lying farm lands.

Purpose of Laboratory

The words "drain tile" a generation ago implied a kiln-burned product made of surface clays and shales. About 1910, following ten years of phenomenal growth of the Portland cement industry, machines were developed for making concrete drain tile so cheaply that frequently it was possible to undersell clay and shale tile, and the use of concrete tile rapidly extended. So little attention was given, at first, to the quality of the output that in some cases tile actually were made on the ditch bank from unwashed and ungraded sand and gravel from the ditch, and installed almost immediately without any curing. Even this was not the height of bad practice, for in at least one instance a portable tile machine was put on the market that operated on the ditch bank and made and laid the tile directly in the newly constructed ditch. Many men inexperienced in any kind of concrete work bought tile machines and went into the tile making business to the extent that in Minnesota there were at one time nearly 100 tile plants.

The natural result of all this was, eventually, that a large amount of concrete tile of very poor quality was made and installed, and in 1918 failures of tile systems were reported to have occurred in southwestern





Location of projects supervised by the Drain Tile Laboratory, University Farm, St. Paul, Minnesota. The cross-hatched areas are townships in which were found waters rich in sulphates. One or more water samples containing at least 1500 parts per million (0.15%) of total salts was taken in each cross-hatched township. This area totals 2,200,000 acres and is slightly more than 11% of the total crop area of the state. More than 1600 water samples were examined from tile drains, soil auger holes, and shallow wells.



Minnesota. Examination in Lyon County during the spring and fall of 1919 and summer and fall of 1920, disclosed the fact that as a rule, it was concrete tile that had given the trouble.

Following these earlier examinations, a co-operative laboratory was equipped at University Farm, St. Paul, with funds made available July 1, 1921, by an appropriation of the Minnesota State Legislature, and since that date tests and experiments have been conducted in the laboratory, looking toward a solution of the problem. The laboratory operates under a co-operative agreement between the Division of Drainage and Waters of the Department of Conservation, State of Minnesota; Department of Agricultural Engineering, University of Minnesota; and the Bureau of Agricultural Engineering of the U. S. Department of Agriculture.

The terms of the act of the 1920 session of the Minnesota Legislature establishing the drain tile laboratory called for "investigation of the causes of failure of agricultural drain tile, the means of obviating such failures and mapping of areas where extra precautions are necessary." In accordance with the provisions of this act the map (Fig. 2) based on more than 1,600 water analyses, has been prepared, locating in a general way many such areas. As indicated, these areas lie wholly in western and southwestern Minnesota where this particular problem apparently is confined, judging from all work done to date. The finding of alkali waters injurious to concrete tile in any township does not necessarily mean that the waters of the entire township are injurious nor, on the other hand, is any absolute assurance to be had that alkali waters are not to be found in townships other than the ones indicated. This map, in a general way, furnished a reliable index of those sections of the state where concrete tile, as ordinarily made, should be installed only after soil examinations have been made; and in which, unless this practice is continued, the use of concrete tile cannot be recommended. The area of the separate townships, as indicated on the map, totals 2,200,000 acres, which is slightly more than 11 per cent of the crop area of the state, and is almost wholly valuable farm land in which the installation of tile drains by the owners will continue for many years to come.

In 1921 following the field work of 1919-20, the statement was made that, "until it is possible to make concrete tile that will definitely resist all action of sulfate waters, it is recommended that in doubtful areas soilwater samples be collected at intervals along the routes of proposed tile drains and submitted for analyses. If the results indicate sulfates in more than nominal quantities, concrete tile should not be considered."* This suggestion was favorably received by engineers and contractors engaged in drainage work, with one or two exceptions, and as a consequence there have been no failures of any concrete tile in any public ditch in Minnesota where the tile used were made since the laboratory was established and where the engineer for the ditch tests co-operated with the laboratory in having made soil tests and of the tile previous to selecting the material for the drain. This is believed to be a very satisfying result in view of the fact that

^{*}Report of Concrete-Alkali Investigations in Minnesota, 1919-1920. Department of Drainage and Waters, July, 1921. Page 31.

since July 1, 1921, fully 1,250 miles of tile have been installed in the public ditches of Minnesota at a total cost of nearly \$4,000,000. In probably 75 per cent of this work, assistance was rendered by the laboratory.

Reports of failures of tile in some of the earlier systems still continue although the groundwater has fallen so greatly during the extreme dry weather of recent years that few tile lines have carried any appreciable quantity of water for many months. With the return of wetter seasons and these tile systems again are taxed to capacity it is believed many failures will become evident that are not now known to exist.

In 1923 the work of the laboratory was broadened to include studies of the action of peat and muck, of which Minnesota has nearly 7,000,000 acres, on concrete tile; and in 1925 it was again extended to include studies of the effect of frost action on clay tile, in order to encourage the use and development of clay tile of the smaller sizes more resistant to the action of frost than are many of those now sold in the state. So the laboratory has been running the following drain tile investigations of a research nature in addition to rendering service to engineers, manufacturers, and individuals by testing tile and examining for alkali, soil water submitted:

1. Action of alkali on concrete tile.

2. Action of peat and muck on concrete tile.

3. Action of frost on clay tile.

Figures 3 and 4 show characteristic failures of tile from two of these causes and attention is called to the completeness of failure in each case.



Fig. 3 Effects of Alkali on Farm Drain Tile.

Fig. 4 Effects on Tile From Peat and Muck.

In addition to tests of several thousand specimens carried on in the laboratory, many experimental tile and cylinders have been installed under field conditions. Locations of these installations (See Fig. 2), with number and types of specimens and conditions of exposure follow:

1. Minnesota Agricultural College, University Farm, Ramsey County neutral mineral soil, 580 tile and 1,250 cylinders representing a total of 50 different types of specimens.

2. Broughton Farm, Lyon County—Alkali soil sulfate type, 395 tile representing 9 different types of specimens.



Fig. 5 Effects of Alkali on Specimen of Different Cements, Aggregate Proportions and Curing.

Fig. 6 Typical Crate of Specimen After Exposure to Alkali Waters in Medicine Lake, South Dakota.

3. Southern Peat Experimental Farm, Coon Creek, Anoka County— Raw peat soil high in lime and underlaid by sand, 405 tile and 1,250 cylinders representing a total of 50 different types of specimens.

4. North Central Experimental Farm, Grand Rapids, Itasca County— Raw peat low in lime and underlaid by clay, 1,250 cylinders representing 50 different types of specimens.

5. Karlstad Peat Experimental Field, Kittson County—Raw peat high in lime and underlaid clay, 1,250 cylinders representing 50 different types of specimens.

6. Medicine Lake, Codington County, South Dakota—Alkali water, sulfate type. For this work more than fifty thousand 2 by 4-inch cementconcrete and cement-mortar cylinders, 1,000 cement-mortar briquets, 3,000 specially made concrete draintile, and numerous miscellaneous specimens, have been made. The experiments, while originally planned to aid in the general improvement of farm draintile, have a wide application to the use of concrete culverts, water and sewer pipe, irrigation structures, foundations, and all other types of concrete construction that, in service, must resist the action of soils or waters rich in sulphates.

Medicine Lake lies 18 miles northwest of Watertown, South Dakota. Analyses of water samples taken from Medicine Lake at different seasons of the year have shown a total salt content ranging between 2.34 and 12.19

per cent, consisting almost entirely of magnesium and sodium sulfates in which the magnesium salt greatly predominates. These are the salts that have caused trouble in Minnesota. The larger of these two figures represents water with a total salt content three times that of any soilwater so far found in contact with any tile in Minnesota, and much more severe than is ordinarily encountered in agricultural lands anywhere. As this lake lies wholly outside the boundaries of Minnesota, all expenses of crating and expressing the specimens and installing them in the lake have been borne by the U. S. Department of Agriculture.

Clay Tile Testing

Too often, in considering some of the weak points of concrete tile for farm drainage, the fact is overlooked that clay tile of poor quality may be of short life, owing to frost action. Considerable financial losses have resulted to tile users in Minnesota because of this. In most cases these losses have been the direct consequence of allowing clay tile to lie on the ground, along a new ditch line, through a winter. Poor quality clay tile so exposed for a season will require heavy culling before installation if they are to be safely used. If carefully culled and the damaged tile discarded, the financial loss is much less than if some of the weakened tile are laid in the ditch and fail later.

Frost resistance of clay tile is largely dependent upon two factors— (1) quality of the raw clay or shale and their manufacture and (2) degree of burning. Different clays require different burning temperatures and many of the poorer clays cannot properly be burned to make frost resistant tile of marketable quality. Ordinarily, the hardest burned tile from any plant is lowest in absorption and most resistant to frost. Some clay tile plants have raw materials of such high quality that the entire output is frost resistant. Other, less fortunate, plants can produce frost resistant tile only by burning at the highest temperatures the clay will stand. Other plants, still less fortunate, cannot make frost resistant tile at all. As coal is the greatest single item of cost entering into the manufacture of clay tile, the tendency in many cases is to market an underburned product of low frost resistance.

In Minnesota, in view of the fact that almost all the smaller clay tile are laid above the frost line, it would be poor practice to use any clay tile that did not at least meet the standard frost tests. To make such tests is quite tedious, as freezing and thawing of individual specimens from 24 to 48 times are required, depending upon the grade of tile specified. It so happens the relation of frost resistance to absorption is such that it is possible to secure with reasonable certainty a frost-resistant product by specifying a limit for absorption, once such limit has been determined. The laboratory is now equipped to make enough frost tests to fix the limit of absorption permissible for clay tile from each plant now furnishing such material in any considerable quantity for use in Minnesota, and much work along this line has been completed. It is believed that this is no less important than the concrete-alkali or concrete-peat work.

Laboratory Work Summarized

The data of Table 1 give a general idea of the number and nature of the tests made in the laboratory during the thirteen years since it was established, July 1, 1921. No effort has been made to tabulate the number of briquette tests or many other minor and incidental tests.

Table 1—Tests Made by Drain Tile Laboratory,

July 1, 1921-October 22, 1934.

Tile tested for strength	5.844
Tile tested for absorption	4.515
Tile tested for resistance to frost	578
Aggregate tested for use in concrete tile and experimental cylinders	194
Water samples examined	939
Experimental tile installed for field tests	4,414
Experimental concrete cylinders made for laboratory tests of relative	
alkali resistance	8,787
Experimental concrete cylinders made for field tests of relative alkali	
resistance	35,775
Experimental concrete cylinders made for field tests of relative peat	
resistance	11,013
Experimental concrete cylinders made for laboratory tests relative	
to steam curing	4,500
Experimental concrete cylinders tested for compression	38,626
Experimental concrete cylinders tested for absorption	$5,\!541$
Unclassified miscellaneous tests	5,024
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Total	25,750

Recommendations and Suggestions Based on Work in Laboratory

Some of the following recommendations apply to all types of concrete to be exposed to sulphate attack, and some are applicable only to concrete pipe and other products similarly manufactured.

The resistance of a cement which is to be exposed to sulphate action should be tested in accordance with the routine suggested on page 43, Technical Bulletin 358, U. S. Department of Agriculture. Cements very low in resistance may then be rejected. Only cements that are above the average in resistance should be considered for use where sulphates are known to be present. (See Fig. 5.)

With any given cement and any predetermined condition of curing, care should be observed in all particulars to obtain the highest practicable 25-day strength. That strength, although fallible for comparing different concretes, has much value as an index of the permeability and sulphate resistance of the products of the same cement and method of manufacture, particularly with rich mixes.

Concrete should be kept from intimate contact with sulphates until it has had opportunity to dry and harden in air for the longest time practicable. Depending on the particular cement used, air hardening may

greatly increase resistance and, as a precautionary measure, should be continued for 30 days if possible, and 90 days or longer is desirable.

To develop the highest resistance in draintile, sewer pipe, and other products of concrete, they should be steamed cured when 12 to 24 hours old at temperatures of 212° F. or higher for 48 hours or longer. (See Fig. 6.)

Alumina may be used advantageously for concrete structures subject to extremely severe conditions of sulphate exposure if the concrete will be continuously moist at temperatures generally below 60°F. And rarely exceeding 70°F. These moisture and temperature conditions are about the average for draintile after installation.

The following results of the experiments suggests methods of increasing the resistance of concrete to sulphate attack, but check tests are too limited to justify basing definite recommendations on them.

Very resistance concrete has been made by using curing temperatures of 100° and 155° F. in conjunction with additions of the commercial high-iron product Ironite, and equally good results have followed the use of curing temperatures of 155° in conjunction with additions of calcium chloride and of the calcium chloride product Cal. These results appear to hold some promise, as it is now common practice at many tile plants to use curing temperatures between 100° and 155° . (See Fig. 7.)



Fig. 7

Concrete containing certain quantities of one of the admixtures Ironite, Cal, calcium chloride, trass, blast-furnace slag, and moler, after curing in water vapor at room temperatures, when exposed in Medicine Lake displayed resistance sufficiently increased to make the use of those materials seem justifiable where conditions of sulphate exposure are only moderately severe. These admixtures might have some merit in sea-water construction.

Concrete Tile in Peat

No definite conclusions can yet be drawn of the factors that influence the durability of concrete tile when subjected to the action of peat. The

work done indicates enough difference, both in peat and types of concrete, materially to influence experimental results. Four hundred specimens installed in peat for ten years come up for testing in the fall of 1934; and these ten-year tests, together with similar tests of 1935-39, should give much conclusive information on this subject.

Frost Action on Clay Tile

Studies of the effect of frost action on drain tile were summarized December, 1930, in a 36-page mimeograph progress report. This work has made possible, within reasonable limits, to predict from results of standard absorption tests the frost resistance of clay tile from any one of twentythree Minnesota and Iowa plants that furnish practically all clay tile used in Minnesota, thus greatly simplifying and expediting the testing of clay tile to be used in Minnesota.

Run-Off and Groundwater Studies in the Peat Marshes of Northern Minnesota

This work is conducted in co-operation with the same agencies that contribute to the support of the laboratory.

Thirteen observation wells were installed the fall of 1926, immediately following drainage of a small bog near Bena, and readings have been taken every two to four weeks during the growing season. The Forest Service of the United States Department of Agriculture has co-operated in taking the well readings and is keeping record of tree growth on this bog.

Fifty observation wells were installed during December 1932 in a large swamp northwest of McGregor for the purpose of securing data from which it is hoped to be able to determine the effects of existing drainage ditches on groundwater elevations and the rate of run-off.

During the season of 1934 these groundwater studies were extended by installing automatic water level recorders in swamps in Aitkin, Beltrami, and Roseau Counties.

The object underlying these soilwater studies is to ascertain the extent to which ditches have affected water storage capacity of Minnesota marshes, and the effects (if any) of drainage of peat marshes upon maintenance and stabilization of lake levels and stream flow.

Stream Gaging

Stream gaging has been carried on in co-operation with the Water Resources Branch of the U. S. Geological Survey during the biennium under the same general co-operative agreement which has been in effect for the past several years.

The importance of this work cannot be over estimated, especially during present drouth conditions. The value of authentic data on the behavior of surface waters is recognized wherever water is of value for promoting human welfare and industry. It is of particular value in a state like Minnesota where surface waters play such an important part in the state's every phase of development. The sources from which waters may be expected to yield supplies during such emergency conditions as have prevailed in

many sections of the state during the past few years and the rate at which such waters may be had are matters of grave concern to communities facing such conditions.

Data derived from the measurement of flow in streams are basic to an intelligent understanding and solution of all of our water conservation problems. The information is essential in the design of flood control improvements, planning of control structures for the regulation of outflow from lakes and artificial storage reservoirs, determination of the concentration of impurities from pollution, planning of agricultural drainage, determination of the economic soundness of investments for water power development and the dependability of a stream flow to supply cities and communities with water and kindred water utilization and conservation problems.

State and federal co-operation on water resources investigations during the present biennium was made possible by an appropriation of \$5,000 per year made by the Legislature of 1933. This amount has been matched by an equal amount from federal funds. In addition to the work carried on under this agreement, the U. S. Geological Survey, under federal appropriations made available for other projects within the state, has carried on an extensive program of stream gaging for which no state funds have been contributed. As a result of an expanded federal program, a total of approximately \$63,000 of federal funds has been expended on water resources investigations within the state during the biennium.

Stream gaging should be continued without interruption for a sufficiently long period of years to include extremes of both high and low run-off in order to be of maximum value. The records of low discharge which are being secured at the present time are going to be of inestimable value in preparing for similar conditions which may recur in the future. The report of Mr. C. L. Batchelder, District Engineer of the Geological Survey, in charge of co-operative stream gaging and located in St. Paul, follows:

Department of Interior United States Geological Survey

Report of Co-operative and Other Stream Gaging Activities in Minnesota for Biennium Ending June 30, 1934.

C. L. BATCHELDER, District Engineer.

The following statement describes briefly the stream-gaging work carried on by the U. S. Geological Survey in co-operation with the State of Minnesota during the period October 1, 1932, to September 30, 1934.

This is actually a report of progress. In my report to you two years ago, a program for stream gaging in Minnesota was recommended. The program presented at that time is given below with a synopsis of what has been accomplished on each item thereof.

a. Continue the operation of gaging stations already established and now maintained by State and Federal co-operative funds.

This has been accomplished 100 per cent.

b. Establish and operate gaging stations on those streams where problems arise that require stream-flow data to protect the State's interest.

> Two new gaging stations have been established and a large number of miscellaneous current meter measurements made.

c. Establish and operate gaging stations in the Arrowhead region where no hydrometric work is being carried on at present.

Seven gaging stations have been established and operated in the northeastern part of Minnesota; two by co-operative funds and five by funds provided by the U. S. Department of State.

d. Install recording gages at desirable locations where reliable records cannot otherwise be obtained.

Unusual progress has been made in the equipping of gaging stations with water stage recorders. Seventeen recorders have been installed or are under construction. Fifteen of these installations have been made wholly from Federal funds obtained from the Public Work Administration and two from State Co-operative Funds.

- e. Collect more information on lake levels. Records are being obtained from five more lakes.
- f. Arrange, so far as seems warranted, when the Federal organizations can no longer continue them, to include in the State program those stations which are now being operated and financed from Federal funds for special investigations.

Fortunately Federal Organizations provided sufficient funds to continue most of the stations that were being operated for special investigations. The State co-operative funds were called on to take over five stations and this was accomplished.

g. Assemble and publish in one volume all stream-flow data collected in the State from 1913 to 1932.

> This is the only item upon which progress was not made. Sufficient funds have not been available to complete this project and it is not advisable to start unless it can be continued to completion. This is a desirable project and should be undertaken at the first opportunity.

History

The U. S. Geological Survey started to gather stream-flow records in Minnesota in 1901. Only a few base stations were maintained prior to 1909, when co-operation with the State of Minnesota was arranged and between 1909 and 1912, there was carried on a very extensive program of stream gaging. The funds available for this work gradually decreased after 1912 until in 1917 State co-operation ceased and most of the gaging stations were discontinued, leaving only 8 stations in the State at which stream-flow records were obtained. These were financed by the Army Engineers, Federal Power Commission licensees, private parties, and a small amount of State money allotted to pay a few observers on the northern streams.

Problems arose in 1928 for the solution of which the Federal Government required stream-flow data. The Water Resources Branch of the Geological survey was called upon by the U. S. Department of State to gather stream-flow records on the Roseau River and tributaries and by the U. S. War Department to gather stream-flow records on the Mississippi River and tributaries. A district office was established in Thief River Falls to carry on the Roseau River work and the Mississippi River work was carried on from the Madison office.

Co-operation was arranged with the State of Minnesota in 1930 through the Department of Drainage and Waters. A district office was established in St. Paul and the Mississippi River work and the Roseau work were transferred to this office, the Thief River Falls office being retained as a suboffice.

This concentrated in the St. Paul office all the stream gaging in Minnesota and on the rivers bounding the State except that on the St. Croix which is still operated from the Madison office. Co-operation with the State has been continuous since 1930.

Scope of Work

Co-operative stream gaging was carried on from October 1, 1932, to June 30, 1933, on a restricted scale on the balance of an allotment of \$1,250 by the Division of Drainage and Waters and a like contribution by the Federal Government. The 1933 Minnesota State legislature appropriated \$5,000 for each year of the biennium beginning July 1, 1933, for co-operative stream gaging "provided that this allotment shall be available only to the amount and in the event that funds for the same purpose are made available by the Federal Government."

Funds made available by the Federal Government for the same purpose during the biennium beginning July 1,1933, amount to \$63,000.00. This has not only permitted a more comprehensive stream gaging program throughout the State but has also made possible a notable improvement in equipment.

Public Works

The Public Works Administration of the Federal Government allotted funds to the Geological Survey to be used for rehabilitation of existing gaging stations, to include repairs, replacement of equipment and improvement of records. In distributing the funds to the various states, the cooperative situation had to be taken into account. The co-operative situation was fortunate in Minnesota as the 1933 legislature had appropriated funds which would insure the operation of the gaging stations after they were rehabilitated. A total of \$29,000 of Public Works funds has been secured for improvement of stream gaging equipment for gaging stations in which the State of Minnesota is interested. With these funds 15 recording gage stations have been constructed, six cable ways, four concrete controls installed and numerous repairs and improvement of equipment made. The stream gaging equipment was put in first class condition such as could not have been accomplished in many years on the basis of the usual appropriations.

Civil Works

Full advantage was taken of the Civil Works and the services of two engineers and a clerk were secured during the winter of 1933-34. The value of their salaries amounted to \$1,324.

Roseau and Red River Investigations

The International Joint Commission has not made its final report on the Roseau River Flood Control problem. The United States Department of State has continued to provide funds for carrying on field investigations in the Roseau and Red River Basins. The funds have been decreased some each year and a few of the gaging stations that were formerly operated on these funds have been taken over on the State co-operative funds. There are 25 gaging stations in these drainage basins now being operated in the State of Minnesota wholly at the expense of the Federal Government.

Rainy River Investigation and Pigeon River

The Pigeon River and the Rainy River are international streams and form the international boundary between the United States and Canada from Lake Superior to Lake of the Woods. The use of the waters of Rainy River has already been the subject of a reference to the International Joint Commission who made a report this year. In order that stream flow data may be available for use in solving future problems that may arise regarding these waters, the U. S. Department of State has provided funds for equipping and maintaining five gaging stations on these rivers and their principal tributaries.

The continued drought has lowered the levels of most of the lakes in Minnesota. In order to provide general information regarding the behavior of the lakes of Minnesota, gages have been installed on a few of the larger lakes during the past two years and water levels observed. To better aid in the solution of water conservation problems, water levels should be obtained on many more lakes of the State.

Drought

Precipitation in Minnesota, according to records of the U. S. Weather Bureau, has been below normal every year since 1919 except for the year 1927 when the precipitation was practically normal. The continued deficient precipitation has been reflected in decreased stream flow, depletion of ground water supplies and lowering of lake levels. This condition has become most serious during the summer of 1934 for many municipalities depending upon lakes and streams for their domestic water supplies. Information of stream flow and lakes stages in the Spring of 1934 afforded the basis for predicting the extreme low stages that could be expected in the late summer so emergency measures to conserve water were adopted by the State in ample time to prevent water famines in those communities.

Requests for Data

Requests for stream flow data have been received in ever increasing numbers from many of the State Departments and Planning boards for purposes of domestic water supply, conservation of water, river pollution, silt investigation, bridge openings, etc., and from many Federal Agencies for the same purposes and for navigation studies on the Mississippi River. In addition, there have been innumerable requests from private agencies and other interested parties.

Availability of Records

Records of the daily gage height and discharge and other detailed information collected at gaging stations in Minnesota are available for use and may be obtained from the district office of the United States Geological Survey in the New Post Office Building, St. Paul, Minnesota. All records collected are published annually in Federal water-supply papers.

Location and Types of Gaging Stations

On September 30, 1934, a total of 77 gaging stations in the State of Minnesota were being maintained. The following list shows the name of each of these stations, the type of gage installed, and the basis for maintaining the stations:

Stations Maintained in Cooperation With State of Minnesota

Station	Type of Gage
Baptism River near Beaver Bay	Recorder
Buffalo River near Dilworth	Chain
Burntside Lake near Ely	Staff
Cannon River at Welch	Recorder
Chippewa River near Watson	Chain
Clearwater Lake near Leonard	Staff
Clearwater River near Leonard	Staff
Cottonwood River near New Ulm	Chain
Crow River at Rockford	Recorder
Crow Wing River at Nimrod	Chain
Des Moines River near Jackson	Chain
Elk River near Big Lake	Recorder
Heron Lake Outlet near Heron Lake	Staff
Itasca Lake at Lake Itasca	Staff
Lac Qui Parle River near Lac Qui Parle	Staff
Little Sand Lake Outlet near Dorset	Staff
Mille Lacs Lake at Calthwood	Staff
Mississippi River at St. Paul	Staff
Mustinka River at Wheaton	Chain
Platte River near Royalton	Chain
Pomme de Terre River near Appleton	Staff
Poplar River at Lutsen	Chain
Red Lake near Red Lake	Recorder
Red Lake River near Red Lake	Recorder
Redwood River near Redwood Falls	Chain
Rum River near St. Francis	Recorder
Sauk River near St. CloudRecorder u	nder construction
Thief Lake near Middle River	Staff
Thief River near Thief River Falls	Staff
Tuttle Lake near Cevlon	Staff

Whetstone River near Big Stone	Chain
Wild Rice River at Twin Valley	Recorder under construction
Yellow Medicine River near Granite Falls.	Chain

Stations Maintained in Cooperation With U. S. Army Engineers

Minnesota River at Montevideo	Recorder under construction
Minnesota River at Mankato	Recorder
Mississippi River at La Crosse	Recorder
Root River near Houston	Recorder
Zumbro River at Zumbro Falls	Recorder

Stations Maintained by Funds Transferred From U. S. Department of State

For	Roseau River Investigation:
	Roseau River at MalungStaff Roseau River near RoseauStaff Roseau River at RossRecorder
	Roseau River near BadgerRecorder
	Roseau River at head of State Ditch 51
	Roseau River at Oaknoint Staff
	Roseau River below cutoff ditch near Caribou Recorder
	Roseau River at International Boundary near Caribou Recorder
	South Fork Roseau River near Malung
	Mud Creek near Sprague, Manitoba
	Pine Creek near Pine CreekRecorder
	Badger Creek near Badger
	South Fork Two Rivers at PelanChain
	South Fork Two Rivers at BronsonChain
	Middle Fork Two Rivers near HallockStaff
	North Fork Two Rivers near Lancaster
	State Ditch 65 near Lancaster Staff
For	Red River Investigations:
	Red River at FargoStaff
	Red River at Grand ForksRecorder
	Red River at Emerson, ManitobaChain
	Bois des Sioux River near Fairmount, North DakotaStaff
	Ottertail River near Fergus FallsRecorder
	Red Lake River at HighlandingStaff
	Red Lake River at CrookstonRecorder
For	Rainy River Investigations:
	Rainy River near BirchdaleRecorder
	Basswood River near WintonStaff
	Vermilion River below Vermilion Lake near TowerStaff
	Big Fork River at Big FallsStaff
	Little Fork River at Little ForkChain
	Pigeon River at International BridgeChain

Stations Maintained by U. S. Geological Survey Solely From Federal Funds

Mississippi River at Libby	Recorder
Mississippi River at Elk River	$\operatorname{Recorder}$
Mississippi River at Prescott	Recorder
Mississippi River at Winona	Recorder
Minnesota River near Carver	Recorder

Stations Maintained in Cooperation With Federal Power Commission Licensees

Minnesota Power & Light Co.:

Kawashiwi	River	at W	inton	Powerhouse	records
Mississippi	River	near	Royalton	Powerhouse	records

Ford Motor Co.:

Mississippi River below Coon Rapids near Anoka......Recorder

Summary:

State Cooperation	33
U. S. Army Engineers	5
U. S. Dept. of State	31
U. S. G. S. (Federal Sta.)	5
Fed. Power Com. Licensees	3

Future Program

It is essential that adequate funds be provided for the maintenance and operation of the fine group of gaging stations that have now been constructed. As Public Work funds were limited to use on "existing" stations only, it was not possible to include any of the new stations needed and these still remain to be equipped. I recommend the same program for the next biennium that was presented two years ago and is outlined at the beginning of this statement.

Water Power

Approximately 300,000 horsepower of water power has been developed within the state, with perhaps an additional 200,000 subject to future development. Owing to the extreme fluctuations of stream flow, even under normal conditions of rainfall, stand-by steam plants are necessary to augment water under a continuous load during periods of insufficient flow. Many plants have been idle for long periods and others are operating only three or four hours per week. Most of the water power in or near the more thickly populated regions have long since been developed. The undeveloped sites are located distant from industrial centers and are of less value as a source of power because of transmission costs. If some of this power could be used locally in the manufactures of products from local sources of supply it could be made an important factor in the building of community industries in areas where other industrial power is not available and thus save cost of transmission over long distances.

It should be emphasized too that water power of the kind that is produced by streams in Minnesota does not have the value at the present time that it had twenty-five to thirty years ago. Increased efficiency of large steam plants has made steam power a formidable competitor with water power plants, especially those which have to depend on steam auxiliaries for dependable output.

Water power, however, has a singular value in a state like ours where coal and oil are lacking and where all other forms of power producing elements have to be imported. Any plan for the better utilization of our surface waters should therefore be made to include a consideration of the enhancement of water power wherever this is possible.

Table 2 gives data on the developed water powers within the state and includes plants of 100 H. P. or more.

Table No. 2-State of Minnesota

Developed Water Power—Jan. 1, 1933 Plants of 100 Horsepower or More Taken from the Report of U. S. Geological Survey

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Rei No	. Stream	Sec.	Town	Range	County	Owner	\mathbf{Head}	Installed Horse Power	Generator Capacity
1	Wild Rice River	†16 Heiberg	144N Plant	44W	Norman	Federal Public Service Co., 516 Hodgson Bldg., Minneapolis Minn.	18	230	296
$\frac{3}{4}$	Red Lake River	†33 †14	154N 151N	43W 44W	Pennington Red Lake	City of Thief River Falls Northern States Power Co.	$10 \\ 14$	920 804	$787 \\ 750$
7	St. Louis	Red Lal	ke Falls 48N	16W	Carlton	Minn. Power & Light Co.	364	69 700	59.250
8	Mississippi	+19	129N	29W	Morrison	Duluth Minn, Power & Light Co	23	5 770	4 200
		Little F	alls Plant	2011	Morrison	Duluth	20	0,110	4,200
9	Mississippi	† 19	129N	29W	Morrison	Northwestern Milling Co., Little Falls	23	150	
10	Mississippi	† 9	56N	31W	Benton & Stearns	Watab Paper Co., Sartell	18	7,800	1,680
12	M1ss1ss1pp1	727 Coon R	31N anids Plant	24 W	Anoka	Northern States Power	20	10,500	8,125
13	Mississippi	†23 St Anti	29N bory Falls Plan	24W	Hennepin	St. Anthony Falls Wt.	46.5	6,700	
14	Mississippi	†23	29N	24W	Hennepin	St. Anthony Falls Wt.	48	12,000	9,000
15	Mississippi	†23	29N	24W	Hennepin	St. Anthony Falls Wt.	19	10,000	7,000
16	Mississippi	†23	29N	24W	Hennepin	Minneapolis Mill Co.,	46.5	25,000	
17	Mississippi	†23 Main St	29N	24W	Hennepin	Northern States Power	46	1,500	1,200
18	Mississippi	†17 High De	28N	23W	Ramsey	U. S. Government	$\frac{22}{26}$ to	18,000	18,000
19	Fish Nook	†25 Park B	140N anida Plant	35W	Hubbard	Minn. Power & Light Co.,	$15^{50.5}$	330	246
20	Crow Wing	†20 Pillagor	133N Plant	30W	Cass	Minn. Power & Light Co.,	22	2,700	1,900
21	Crow Wing	†30 Svlvan	135N Plant	29W	Cass	Minn. Power & Light Co.,	22	3,000	1,800
22	Sauk	†16	126N	34W	Stearns	Central Minn. Pr. & Mfg.	11	144	• • •
23	Sauk	† 35	126N	33W	Stearns	Melrose Milling Co.	14	308	
24	Sauk	†22	123N	30W	Stearns	Cold Springs Granite Co.,	9	316	
25	Elk River	†32	33N	26W	Sherburne	Cold Springs Elk River Pr. & Lt. Co.,	15	520	344
26	Rum	† 6	31N	24W	Anoka	Pillsbury Flour Mills Co.,	14	725	
27	Minnesota	†1	115N	39W	Chippewa	Minneapons Minnesota Valley Pr. Co., Granite Falls	17	800	600

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DEPARTMENT OF CONSERVATION

2 8	Pomme de Terre	†14	180N	43W	Swift	W. J. Jennison Co.,	10	150	•••
30	Redwood	†36	$113\mathbf{N}$	36W	Redwood	Redwood Falls Lt. & Pr.	85	700	625
31	Kettle	†22	42N	20W	Pine	Minnesota Power & Lt. Co., Duluth	21	780	533
32	Snake	†26	39N	21W	Pine	Eastern Minnesota Power Co., Pine City	15	420	320
$\begin{array}{c} 33\\ 34 \end{array}$	Sunrise Cannon River	† 5 †36	35N 110N	20W 21W	Chisago Rice	Frank A. Spivak, Sunrise H. H. King Flour Mills	$\begin{array}{c} 13\\14\end{array}$	$\begin{array}{c} 234 \\ 525 \end{array}$	130
35	Red Cedar	†15	102N	18W	Mower	Geo. A. Hormel & Co., Austin	13	300	250
36	Cannon River	+15	111N	20W	Rice	Weaver Milling Co., Inc.	10¼	168	•••
37	Zumbro	†35	107 N	14W	Olmstead	Rochester Milling Co., Rochester	15	235	50
39	Root River (N. Br.)	†35 Brightdale	104N e Plant	10W	Fillmore	Root River Pr. & Lt. Co., Preston	32	500	625
40	Root	†18	103N	9W	Fillmore	Lanesboro Roller Mill Co., Lanesboro	26	135	
41	Root River (S. Br.)	†	103N	9W	Fillmore	City of Lanesboro	$27 - \frac{1}{2}$	210	165
42	Root	†22 Rushford	104N Plant	8 W	Fillmore	Federal Public Service Co., Minneapolis	12	340	312
43	Mississippi	*19	55N	25W	Itasca	Itasca Paper Co., Grand Rapids	17	4,150	875
44 ,	Prairie River	*†2	55N	25W	Itasca	Prairie River Pr. Co., Grand Rapids	35	1,500	1,340
45	Rainy River	*27	71N	24W	Koochiching	Minn. & Ontario Paper Co., International Falls	25 to 32	12,300	
46	Br. of Crow River	*10	121N	34W	Kandiyohi	New London Milling Co., Willmar	17	150	•••
47	Cannon River	* 7	112 N	17W	Goodhue	Cannon Valley Milling Co., Minneapolis	16	488	
18	Zumbro	+27	109N	14W	Wabasha	City of Rochester	55	2,700	1,900
49	Cannon	†1 3	112 N	18W	Goodhue	Northern States Pr. Co., Minneapolis	48	2,600	2,100
50	Blue Earth River	; † 8	107N	27W	Blue Earth	Northern States Pr. Co. Minneapolis	61	2,200	1,500
51	Des Moines River	†24			Jackson	City of Jackson	9	200	125
52	St. Louis River	†13 Knife Fal	49N Is	17W	Carlton	Minn. Pr. & Lt. Co. Duluth	20	3,300	3,000
53	Red Cedar River	† 2	102N	18W	Mower	Geo. A. Hormel & Co., Austin	11	225	225
54	Ottertail	† 5 Pisgah Pl	132N ant	43W	Ottertail	Ottertail Power Co., Fergus Falls	30	850	650
55	Ottertail	†20 Dayton H	132N ollow Plant	43W	Ottertail	Ottertail Power Co., Fergus Falls	35	2,150	1,500
56	Ottertail	†36 Root Lake	133N Plant	43W	Ottertail	Ottertail Power Co., Fergus Falls	70	3,600	2,650

(Continued on next page.)

SECOND BIENNIAL REPORT

			(C	ontinue	d from preceding pa	ge.)				
Re: No	f. . Stream	Sec.	Town	Range	County	Own	er	Head	Horse Power Installed	Capacity Generator
57	Ottertail	†34 Central	133N Plant	43W	Ottertail	Ottertail	Power Co., Falls	24	700	500
58	St. Louis	†19 Scanlon	49N _	16W	Carlton	Minn. P Duluth	r. & Lt. Co.,	15	2,460	2,000
$\begin{array}{c} 60\\ 61 \end{array}$	Sunrise Kawishiwi	†32 †20	35N 63N	$^{20W}_{11W}$	Chisago Lake	P. K. Ne Minn. P	elson, North Branch r. & Lt. Co.,	$\frac{12}{67}$	$167 \\ 5,000$	94 5,000
62	St. Louis	Winton † 6	Plant 48N	15W	St. Louis	Duluth Minn. P	r. & Lt. Co.,	74	15,950	15,000
63	Mississippi	Fon du †32 20	Lac Plant 128N 30N	27W 32W	Morrison	Duluth Minn. P Duluth	r. & Lt. Co.,	45	18,200	15,000
64	Mississippi	Blancha	rd Plant 146N	32W	Beltrami	Interstat	e Pr. Co., Dubuque	22	825	925
65 66	Ottertail	†35 +91	137N	39 W	Becker	Ottertail Fergus	Falls Falls	15	125	200
67	Mississinni	101	1941	44 W	Steering	Fergus	Falls States Pr. Co	18	3 480	2 250
60	Mississippi	119	114N	20 99	Departile	Minnes	apolis	10	1 200	1.950
00	Bed Lehe Binne	Minnesc	ta Falls Plant	00 W	Renvine D. ll.	Minnes	apolis	10 . 19	1,300	1,200
69. 70 72	Red Lake River	786 †27 †31	150N 150N 138N	46 W 46W 29W	Polk	Interstat	e Pr. Co., Dubuque e Pr. Co., Dubuque Public Service Co.	e 12 e 18 8-14	2,250 166	1,875 125
73	Mississippi	Pine Ri	ver Plant 45N	20 W	Crow Wing	Minnes	apolis st Paper Co.,	18	6.500	1.400
74	St. Louis River	*13	49 N	17W	Carlton	Cloque Northwe	t, Minn. st Paper Co.,	39	9,504	5,300
75	Upper Iowa River	†34	101 N	11W	Fillmore	Cloque Lewis N Grange	t, Minn. . Hanson, er, Minn.	10	135	100
	†Indicates Public Utilities.					•				
	"Indicates Industrial.				SUMMARY					
					Total I	Public Utility Municipal	and I	Manuac Misce	turing and	
	State— Number o: Plants	f	Capacity In Horsepower		Number of Plants	Capacity I Horsepowe	n Number r Plant	r of	Capaci Horse	ty In power

DEPARTMENT OF CONSERVATION

				Public Utility and Municipal	Manuact Miscel	uring and laneous
State—	Number of Plants	Capacity In Horsepower	Number of Plants	Capacity In Horsepower	Number of Plants	Capacity In Horsepower
Minnesota—1933	67	287,289	46	193,561	21	93,728

Water Conservation

Minnesota perhaps more than any other state in the nation, should be concerned with using the waters which come to it in the form of rainfall, while they are within reach. The state is located on the top of one of the continent's principal divides. All waters supplied by rain and snowfall drain away from the state in all directions. The waters which fall upon the northwestern section find their way into the Red and Rainy rivers and pass on to Hudson Bay. The run-off from the northeastern section drains into the Great Lakes and on to the Atlantic Ocean by way of the St. Lawrence River. Surface drainage from the central and southern sections finds its way into the Mississippi River and on into the Gulf of Mexico. A small portion of the extreme southwestern part of the state drains into the Missouri River. A very small amount of run-off water is brought within reach of the state for our use from areas outside of the state.

With this picture before us we can better understand why we should be concerned with retaining and storing for intensive use as much of our rain and snowfall as possible before it has passed on beyond our reach. The possibilities for such conservation in areas where lakes are numerous are almost unlimited if their natural storage capacities are augmented by artificial control of outflow. Careful investigations will reveal that much added storage can be provided in natural lakes within ranges in fluctuations that need not seriously impair riparian rights. By such simple methods of utilizing lakes wherever strategically located and by creating artificial storage where there are no natural lakes, run-off waters which now escape in periods of normal to excessive rainfall, can be stored and made to serve human needs, wild life and recreation, during periods of deficient supplies.

An analysis of each of the four major drainage basins which make up the surface area of the state to ascertain natural storage possibilities and where artificial storage must be resorted to in order to store available runoff waters for increased uses, is of interest.

St. Lawrence River Basin

That portion of the St. Lawrence basin within Minnesota which drains through Pigeon River may be said to be subject to almost perfect natural control. The large number of lakes scattered through this area serve as natural reservoirs which store and discharge waters at a rate which need not be materially augmented by the creation of additional storage. At any rate any additional storage that might be desired for a better regulated flow from this area can be had by a very limited artificial regulation and without seriously affecting the lands surrounding any of the lakes.

The portion of the St. Lawrence basin which drains through the St. Louis River is provided with natural control not only because of a number of lakes but also because of extensive marsh areas. Here too any additional storage may be had by increasing the capacity of natural lakes by simple devices which need not as a rule entail serious damages to riparian owners.

There is a rim however, immediately adjacent to the north shore of Lake Superior ranging from a few miles to about twenty miles in width, which is practically devoid of natural control. Here the streams originate

on a high plateau and find their way into the lake through deep gorges and gulleys grooved through granite falling over a series of cascades and waterfalls which create one of the most scenic regions of the state. The storage of waters on the upper reaches of these streams in such a way as to stabilize flow can be made to add materially not only to the beauty of this region but to the possibilities of maintaining fish life in the only promising trout streams found within the state. Such regulation can also be made to increase power development possibilities on such of the streams which have a large enough drainage area to make them of value for power development purposes.

Hudson Bay Drainage Area

What has been said with reference to the Pigeon River drainage area draining into the St. Lawrence River, applies equally to the area draining into the Hudson Bay basin through Rainy River. The large number of lakes found within Minnesota along the International boundary from and including the eastern rim of the Rainy River catchment area to the point where the stream enters Lake of the Woods, exercise almost per-Artificial storage and control already exercised by fect natural control. power dams has already materially increased natural storage. Such additional control as may be desired within the area, if distributed throughout the lakes generally, can be had without serious effects upon abutting shore lands. The Little Fork and Big Fork Rivers which outlet into Rainy River from the Minnesota side do not have the natural lake control that the main stream enjoys. Some additional storage can be had in some of the head water lakes but generally speaking any additional material storage of water will have to be provided in more extensive artificial reservoirs. There are few if any natural sites for such artificial storage of water. Generally speaking however, the Rainy River water shed has never been subject to serious depletion because of deficiency in precipitation and recession of lakes stages is not likely to seriously affect or cause concern to people and communities located in this area.

The portion of the Hudson Bay catchment area which drains through the Red River of the North and its several tributaries presents perhaps the most perplexing problem as regards the conservation of sufficient water to meet the demands of municipalities and industries. The region lacks the lakes which act as storage basins in the Rainy and Pigeon areas. Perhaps less than 20% of the run-off yielded by this catchment area is subject to natural control because of lake storage. A relatively larger portion of the Red River basin is cultivated lands. With the exception of the eastern and southeastern edge all is open prairie. Coupled with these conditions we find here the lowest average annual precipitation in the state. A combination of these circumstances makes the problem of conserving and distributing water supplies to meet needs, especially in periods of deficient rainfall, perhaps the most difficult one in the state.

A look at the map suggests that the upper portion of the Ottertail River basin is subject to ideal natural control. The thousands of lakes which dot this area provide sufficient storage to make any extensive artificial increase unnecessary. Additional storage to conserve more of the

run-off waters yielded by this relatively small portion of the Red River basin which may be wastefully discharged through the Ottertail River under natural conditions, can be provided in natural lakes without serious effects upon the surrounding lands if a carefully conceived and coordinated plan of distribution and control is made effective.

With the exception of the lakes found in the upper portions of the basins of the Ottertail and Clearwater Rivers the only other natural storage available within the entire Red River catchment area is that offered by the Red Lakes, the source of the Red Lake River, and Lake Traverse. Red Lake is the largest lake within the state. The fact remains however, that it controls the run-off waters from less than two thousand square miles. Small as this area may seem in proportion to the total of the Red River, cities and communities located on tributaries below Red Lake are nevertheless dependent on their water from this lake more than all other sources combined and when outflow from Red Lake ceases serious water shortages at once develop.

Lake Traverse on the western boundary of the state offers natural storage for much of the waters yielded by the Mustinka River and tributaries, a total area of about eleven hundred square miles. Its capacity should be increased artificially to impound more of its inflow, and outflow regulated to better meet the needs of communities along Red River.

Projects for increasing the natural storage capacities of both Red Lake and Lake Traverse and the control of outflow have been submitted by the department to and are now pending before PWA.

The future growth and expansion of cities and municipalities and the establishment of industries in the Red River Valley will hinge largely on how available water supplies may be conserved and utilized. All natural lakes so located as to offer opportunities for storing more run-off must be so used. There are few sites adapted for artificial storage reservoirs, but such as are to be found will eventually have to be converted to such use. In the absence of large storage reservoir locations a greater number of smaller basins will have to be developed so that reservoirs and pools may be made available as stand-by sources to supply the needs of the region when stream flow is threatened in times of drouth. If water supplies can be made dependable, the Red River Valley has a wealth of other natural resources which may well make it one of the wealthiest sections of the state.

Mississippi River Drainage Basin

The area which drains into the Mississippi River above St. Paul is another section of Minnesota the run-off waters from which are subject to extensive natural control by the large number of lakes found within the area. Here also additional storage may be provided by increasing natural storage capacities of existing lakes. The present Upper Mississippi River Reservoirs operated by the federal government in the interest of navigation are already providing artificial storage to the yield of the upper portion of the basin and offer an illustration of how waters may be stored and discharged and of the effects of regulation of outflow.

The Mississippi River drainage basin supplies the water needs of the metropolitan centers of this state and is subject to greater demands than any other area. For this reason any serious depletion or unexpected interruption in the volume of flow are widespread in their effects both as regards supplies for domestic needs as well as industrial requirements and waste disposal. With increasing metropolitan developments will come a still greater demand for the utilization of more and more of the run-off yielded by this portion of the drainage basin. The opportunities for increasing natural storage within existing lakes are extensive and can be made to improve in a material way the availability and distribution of water. Favorable sites for artificial reservoirs are few although considerable storage can be provided by the utilization of such sites as are available.

The area of the Mississippi basin which drains through the Minnesota River presents a picture somewhat analogous to that of the Red River of the North. Natural lake storage is relatively scarce on the tributaries which drain into the Minnesota River. The declivity of the tributaries is much greater than that of the Minnesota River itself causing the waters to descend into the Minnesota River Valley with damaging effects at each succeeding flood. Because of lack of natural lakes in which some of the run-off might be retarded, there is a large volume of water wastefully precipitated into the valley and carried on down to the Mississippi River, which if stored in communities where the need for it is greatest, could be made to serve many useful purposes.

Lack of natural lakes makes the problem which confronts this area one of providing artificial storage. Fortunately there are several sites within the valley of the Minnesota River itself which may be developed and utilized as storage reservoirs. Public agitation for the creation of such reservoirs has been carried on for many years and several extensive plans have already been perfected which if carried out would go a long ways toward relieving conditions both as regards providing supplies during drouths as well as preventing floods in times of excess precipitation.

One such reservoir has been proposed in Big Stone Lake. It is planned to increase the natural storage capacity of the lake so as to store the flood waters from the Whetstone River. Another reservoir has been proposed by the construction of a dam in the outlet of Lac qui Parle Lake creating a continuous reservoir extending from the foot of Lac qui Parle Lake up stream to about the outlet of the Yellow Medicine River a distance of between 30 and 40 miles. Two or three additional reservoirs have been advocated at strategic points further down the valley.

The Whetstone River Diversion—Big Stone Lake Reservoir and the Lac qui Parle Reservoir are now in process of being constructed by SERA funds and under its supervision.

In order to picture the effects of extreme fluctuations in flow between high and low stages and to enable us to comprehend the significance of the behavior of water under varying conditions of precipitation as well as to indicate why a better controlled flow of streams is necessary, table 4 which follows is of interest. The table indicates the extreme fluctuations at the stations noted.



Fig. 8



Fig. 9

DEPARTMENT OF CONSERVATION



Fig. 10

Figure 8 shows graphically the relationship between total precipitation in inches and run-off in depth of inches from the Mississippi River drainage basin as recorded at Minneapolis for the years 1900-1932. Figure 9 gives the same data for the Minnesota River at Mankato and Figure 10 for the Red River of the North at Fargo.
Lake Resources

Minnesota is undoubtedly known more widely because of her "Ten Thousand Lakes" than for any other one of her many attributes. Yet we know very little about this resource, as no serious attempt has as yet been made to learn of their properties and how they might best be utilized.

The extent of our lakes is not known with any degree of accuracy. The meandered lakes alone furnish nearly 4,000 square miles of water surface for navigation, water supply, and recreation. The aggregate length of shore lines bordering on these same lakes is probably upwards of 17,000 miles. It is impossible to make even an estimate of the extent and length of shore lines of the non-meandered bodies but they are certain to add considerable to the totals. When a full realization is had of the many advantages our lakes possess to interest tourist trade and those seeking attractive locations for homes, it is not difficult to conceive how this resource may well develop into one of Minnesota's chief contributions toward the future economic prosperity and happiness of its people.

First of all we should have enough information concerning our lakes to enable us to answer intelligently, questions relating to their properties and behavior, areas, length and condition of shore lines and adaptability for different uses. This suggests their orderly classification. Such classification at the outset, need not necessarily mean a detailed and costly survey of all of our lakes. A broad grouping with respect to their most obvious properties would furnish fasic data from which much, if not most, of the information of the immediate urgent need could be secured.

What important lakes lower in times of drouth so as to injuriously expose beds and shore lines and exterminate or endanger fish life? What group of lakes have in excess of a given percentage or their shore lines, What lakes offer outstanding feeding and resting places for marsh? aquatic fowl? Around what lakes is agricultural development and protection likely to be of paramount public interest and around what other lakes does residential promotion and development appear to be of greater public concern? In what lakes is the state warranted in planting a certain species of fish and in what other lakes, other species? What lakes are best adapted for use as reservoirs for power development, flood control, water supply? How may lakes in communities where they are scarce be better developed and conserved? These are a few of the questions which need be answered. A policy declaring in favor of such a classification consistently and persistently pursued for a number of years into the future, and carried on as a side line to other activities by the several divisions, directed by the Division of Drainage and Waters ought not to call for a large annual appropriation, and would produce information of great value.

In addition to classifying lakes as suggested there is need for promoting a sympathetic understanding of the conflicting view-points of those who look upon and are affected differently by fluctuations in lake stages. Past experiences have proven that if lake stages are to be fixed or controlled artificially it must be accomplished through cooperation by all interests to be affected. Any artificial control of lakes put into effect by one faction over the protest and opposition of another even though the promoters are

in the majority, is likely to prove a source of contention and develop into an affair which never becomes completely quieted. An understanding and respect for the rights of riparian owners as well as those of the state and the public to the use of public waters, will go a long way toward removing past obstacles encountered in attempts at regulation of lake stages.

Pollution

The reduction in the volume of flow of a large number of our streams and the complete drying up of others has brought the effects of pollution upon water supplies to a focus as perhaps nothing else could have done. Streams which under normal conditions have sufficient water flowing in them to dilute and carry away domestic and industrial waste, have become open sewers of concentrated impurities creating situations which not only create nuisances but are actually dangerous to health and life. This condition has made the general public more concerned about pollution prevention. There has been a marked increase in the number of sewage treatment plants in the last few years, not only because of reduced flow in streams but also because of aid in financing municipal improvements afforded by the federal relief funds.

Pollution studies as they affect wild life center in the Division of Game and Fish, working in cooperation with the state Board of Health.

Relief Activities

In the spring of 1933, at the time the federal emergency conservation work program was announced, the planning and general supervision of soil erosion camps within the state were assigned to the Division of Drainage and Waters. Nine erosion camps were approved for Minnesota and were established in the southeastern counties of the state. These camps continued during the working season of 1933 and were removed to other locations for the winter months of 1933-34. In the spring of 1934, eight erosion camps were re-established in the same general area, and were operated during the working season. In addition, three drouth relief camps were approved and established in the western part of the state in the fall of 1934, which were also placed under the general direction of the division.

At the time the federal Civil Works Administration announced its program for general work relief, not only were a number of projects prepared on behalf of the department, but the director of the division was called upon to aid in advising with a large number of municipalities and public agencies throughout the state in promoting and planning civil works projects in the various communities affected.

Immediately after the National Industrial Recovery Act was enacted by Congress in the summer of 1933, the Conservation Commission directed the department to prepare plans and designs for five extensive water conservation projects located in the western part of the state, for submission and approval, to the Federal Administrator of Public Works. The assembling of data and information bearing on these projects was assigned to the division.

Under an agreement with the State Emergency Relief Administrator, all projects dealing with public waters are being referred to the division for examination, approval and recommendations. This involves considerable work of a continuous nature and requires much of the time of the limited personnel of the division.

Federal Emergency Conservation Work Soil Erosion Camps.

The President's emergency conservation work relief program announced in the spring of 1933, was made to include soil erosion prevention within its scope. Early in May, a soil erosion prevention project for the state of Minnesota was outlined at a conference between representatives of the State Highway Department, the U. S. Bureau of Agricultural Engineering, Lake States Forest Experimental Station, University of Minnesota and the Department of Conservation. At this conference a committee was created which drew up a project plan for soil erosion work in southeastern Minnesota. This plan was presented to the Regional Forest, U. S. Forest Service and in due time was approved. Nine emergency conservation work soil erosion camps to carry out this project were approved for the southeastern counties and placed under the general supervision of the Division of Drainage and Waters. Soil erosion prevention being of a comparatively recent origin had to be planned without precedent in so far as the state of Minnesota was concerned. A reconnaissance survey of general conditions preceded the establishment of camps and as a result were located at Red Wing, Wabasha, Rochester, Whitewater State Park, Chatfield, Preston, Hokah, Caledonia and Winona. The camps were operated on their original locations during the first enrollment period or from the latter part of June until the middle of November 1933.

Not only was it necessary to plan the structures which were thought to be necessary to bring about the needed relief and set up the supervisory personnel and organize the work but land owners on whose property the work was to be carried on had to be made acquainted with the objects and purposes to be accomplished and sufficient general interest stimulated to encourage a friendly co-operative relationship between land owners and federal and state agencies.

The camps which were established and operated during the open season of 1933 were removed for the winter months. In the spring of 1934 eight erosion camps were again approved and located in this same general area. During the open season of 1934 camps were operated at Red Wing, Lake City, Lewiston, Rochester, Chatfield, Lanesboro, Houston, and Caledonia.

As a means of providing relief to unemployment in regions most seriously affected by the drouth, the federal director of emergency conservation work last July approved a number of drouth relief camps for Minnesota. Cities and communities located along Ottertail River, Upper Red River and Red Lake River have been faced with a water shortage of serious proportions. This situation became especially acute during the summer of 1934. A reconnaissance survey made by the division in co-operation with the U. S. Geological Survey indicated that the lakes located within the upper portions of the catchment areas of the Ottertail, Red Lake and Clearwater rivers were the only sources from which water could be secured to supply

the sections most seriously affected. The problem was one of bringing the water from the lakes to the communities in need before winter set in. A project for the cleaning out of river channels to stimulate flow from lakes in which water was available was approved by ECW and three drouth relief camps were approved and established at Breckenridge, Fergus Falls and Frazee, with a side camp located on the Red Lake River near Neptune.









Fig. 11

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Crews were set to work at once to clean out the channel of the Ottertail River from weeds, logs, boulders and other debris so as to expedite the flow of water from the lakes located above. The seriousness of the situation can be realized when it is understood that pools behind the small dam which holds the water supply for the city of Fargo began to lower below the crest from the effects of city pumping, on the 22nd day of May and that the city was in constant danger during the remainder of the summer, having all of its supplies exhausted. Channel improvements stimulated flow in the stream so that on October 12th a discharge of approximately 11 cu. ft. per second was recorded or three times the amount of water necessary to supply domestic consumption, passed Fargo and had filled the pools behind the storage dams. These channel improvements together with supplies held in storage in several of the lakes on the upper Ottertail River will assure these communities of a water supply during the winter.

Fig. 11 is a map indicating points at which soil erosion and drouth relief camps have operated during the past biennium. It also indicates where streams have been improved for water supply purposes and the location of the five water conservation projects proposed under PWA. Location of gaging streams, developed power sites and areas covered by topographic surveys are also shown.

Work Accomplished in E. C. W. Minnesota Erosion Control Camps During 1933 and 1934. Minnesota Department of Conservation, Division of Drainage and Waters.

Table 4.	1933.	1934.
Number of Camps		8
Average Number of Technical Overhead Men.		76
Approximate Working Days		134
Man Days Work of C. C. C. Men	103,097	159,246
Number of Structures Completed	1,608	944
Masonry Laid, Cubic Yards	16,525	20,820
Terracing, Lineal Feet	0	291,965
Fish Ponds Constructed	2	. 1
Acres Protected by Structures	36,966	22,913
Excavation, Cubic Yards	19,582	29,398
Fill and Embankment, Cubic Yards	41,714	37,524
Seeding, Acres	0	80
Number of Trees Planted	80,000	1,034,390
Number of Trees Healed		176,040
Costs:		
1. Salaries	\$ 54,339.40	\$ 54,742.44
2. Travel	5,528.34	6,514.89
3. Supplies, Materials and Equipment	63,400.00	$51,\!147.85$
4. Transportation	5,865.52	163.55
5. Utilities	399.18	159.95
6. Miscellaneous	413.33	153.57
Sub Total	\$129,945.77	\$112,555.15
C. C. Labor at \$3.00	309,291.00	477,738.00
Total	\$439,236.77	\$589,293.15

Work Accomplished in E. C. W. Minnesota Water Conservation and Drouth Relief Camps During 1934. Minnesota Department of Conservation. Division of Drainage and Waters.

Table 5.

Number of Camps 3		1 Side	Camp
23			
61			
36,083			
348.5			
208			
8,688.40			
877.70			
6,925.70			
428.80			
1.61			
	5	\$16.922	.21
118,249.00	,		
	3 23 61 36,083 348.5 208 8,688.40 877.70 6,925.70 428.80 1.61 118,249.00	3 and 23 61 36,083 348.5 208 8,688.40 877.70 6,925.70 428.80 1.61 	3 and 1 Side 23 61 36,083 348.5 208 8,688.40 877.70 6,925.70 428.80 1.61 \$16,922 118,249.00

\$135,171.21







DIVISION OF FORESTRY

GROVER M. CONZET, Director

STATE FORESTS

The Legislature of 1933 by the enactment of Chapter 419, created thirteen state forests and defined their boundaries. This act was timely and gave the department the only grounds on which it could justify requests for the approval and establishment of ECW camps within the state. While publicly owned lands within the larger number of these forests are too limited in extent to furnish lands on which ECW forest improvements can be carried on for any length of time, the fact that the legislature did create these forests was sufficient evidence of the state's good faith in recognizing its forest problems and preparing for their future development and management to prevail on the National Forest Service to grant a liberal number of camps throughout the forests and forest areas of the state.

Due to the severe curtailment of all lumbering activities and particularly those on state owned lands very little has been accomplished during the past two years by way of the removal of mature timber, reservations of areas of immature trees or the reservation of seed trees. One exception to the above general statement should be noted, however, the sale of dead and down timber for wood and other uses has continued, because of a demand for fire wood brought about by the depression. Not only does this wood serve a useful relief purpose but its removal has proven to be a very good forest management activity by providing better growing conditions and reproduction as well as to reduce the fire hazard.

Much progress has been made on planting and improving stands of young timber through the activities of ECW camps. More areas have been planted during the past year than in any previous year. This applies to thinning and improvement cuttings as well. The achievements of ECW are more specifically referred to and detailed in this report under the caption "Relief Activities."

Following is a description of present State Forests and summaries of ECW improvements within each of them where camps have been operated.

BELTRAMI ISLAND STATE FOREST PROJECT

Location:	Ten miles south of Warroad in Lake of the Woods and Roseau counties.
Area:	Gross Area
Ownership:	State None State recently acquired None
	Federal
	Private

Taxation:	Taxable Area	
	Tax Paying 74,920 :	acres
	Tax Delinquent	acres
	Assessed Valuation \$2.37	per acre
	Indebtedness	per acre
Population:	One to each 244 acres. Average income per worker\$355.87	
Desirability:	Good timber growing possibilities. Nat	ural game area for

upland birds, deer and moose.

Three U. S. Forest Service ECW State Forest camps operating within the Beltrami Island State Forest during the first enrollment period have constructed forty-four miles of telephone lines and 68 miles of truck trails. A total of fifty-six miles of roadside cleaning, 2.1 miles of fire break construction and 12.5 miles of lineal surveys were completed. Fire hazard reduction covered 1,438 acres. Two hundred acres were covered by timber surveys and sixty acres of forest stand improvements were completed. Five buildings were constructed and the equivalent of 8,976 man-days were spent on fire fighting.

CLOQUET VALLEY FOREST

Location:	Twenty miles northeast of Duluth in St. Louis County.
Area:	Gross Area
Ownership:	State4,058 acresState recently acquiredNoneFederalNonePrivate214,077 acres
Taxation:	Taxable Area214,077 acresTax Paid37,807 acresTax Delinquent176,509 acresAssessed Valuation\$2.56 per acreTax Assessed (1930).34 per acreTax Collected (1930).12 per acreIndebtedness.09 per acre
Population:	One to every 336 acres. Average income per worker\$436.50
Desirability:	Recreational opportunities for Duluth and Iron Range. Pro- duction of timber and fuelwood.

Stabilization of timber markets and employment.

One U. S. Forest Service ECW State Forest camp which has operated within the Cloquet Valley State Forest through the four first enrollment periods has constructed sixty-nine miles of telephone lines, 33.9 miles of truck trails and two buildings. A total of seventy-five miles of lineal surveys, 6.5 miles of roadside cleanup, 4,618.5 acres of hazard reduction, 215.4 acres of planting, 364 acres of forest stand improvement and 8,710 acres of timber surveys are among the projects noted. Seeds for nursery planting

aggregating 504 bushels were collected. Blister Rust control has been extended to 1,962.5 acres. The equivalent of 4,694.5 man-days was spent on fire fighting.

FINLAND STATE FOREST

Location:	Eighteen miles north of Beaver Bay in Lake County.	
Area:	Gross Area 49,681 acres	
	Water Area 1,033 acres	
	Land Area 48,648 acres	
Ownership:	State 10,288 acres	
	Private 40,000 acres	
Taxation:	Taxable Area	
	Tax Paid 20,192 acres	
1.	Tax Delinquent 19,201 acres	
	Assessed Valuation \$2.76 per acre	
	Indebtedness	
Population:	One to each 547 acres.	
	Average income per worker \$466.89	
Desirability:	About 90 acres of cultivated lands and land seemingly fit for	

agriculture. Good recreational opportunity for summer homesites and fine

trout fishing. Good forest growth. Accessible to Duluth.

One U. S. Forest Service ECW State Forest camp which has operated within the Finland State Forest during all four enrollment periods has constructed 8.5 miles truck trails, improved 15 acres of camp grounds, planted 56 acres, collected 327 bushels of seed, completed 5,288 acres of timber surveys, finished 51.9 of roadside cleanup and 9,815 acres of hazard removal. Six buildings were constructed, 54 lineal miles of surveys run, blister rust control extended to 162 acres and forest stand improvement covered 62 acres. The equivalent of 1,458 man-days were spent on fire fighting.

FOND DU LAC STATE FOREST

Location:	Six miles west of Cloquet in Carlton and St. Louis counties.
Area:	Gross Area
Ownership:	State 3,500 acres
	State recently acquired None
	Federal and Private 87,040 acres
Desirability:	Swamps suitable for waterfowl and other game. Highland, rolling sandy loam producing good timber.
Sales:	Dead and down timber 426 cords.

Trespass: 179 cords, 217 pieces, 4 poles, 1000 B. F.

One U. S. Forest Service ECW State Forest camp which has operated within the Fond Du Lac State Forest during the first four enrollment periods has constructed 6.1 miles of telephone lines, 22.7 miles truck trails and erected one building. Totals of 60 miles of fire break construction, 689.7 acres of hazard reduction, 33.9 miles of roadside cleanup, 399.8 acres of forest stand improvement are among the completed projects. One lookout

tower has been constructed, 368.5 acres have been planted, 85 bushels seed collected and 817.5 acres covered by blister rust control. Timber surveys cover 78,217.5 acres and 180 lines of lineal surveys have been run. Nursery work consumed 458 and fire fighting 1,149 man-days.

FOOT HILLS STATE FOREST

Location:	Begins about 3 miles south of Walker and continues 30 miles
	in the same direction.
Area:	Gross Area
Ownership:	State 4,400 acres
	State recently acquired None

Desirability: Most of it is on a high divide consisting of topography too rough and sandy for farming but entirely suited for timber production.

One U. S. Forest Service ECW State Forest camp which operated within the Foot Hills State Forest during the first enrollment period constructed 2.1 miles of truck trails, erected three buildings, completed 131 acres of forest stand improvement and 20.5 acres hazard reduction. Fire fighting consumed 931 and nursery work 1,026 man-days. Thirty miles of lineal surveys were run.

GEORGE WASHINGTON STATE FOREST

Location:	Twenty miles north of Hibbing and Iron Range in St. Louis and Itasca Counties.
Area:	Gross Area
	Water Area 19,800 acres
	Land Area
Ownership:	State
-	Private
	State recently acquired None
	Federal None
Taxation:	Taxable Area
	Tax Paid
	Tax Delinquent
	Assessed Valuation \$2.97 per acre
	Indebtedness
	Total Delinquent Tax 1.00 per acre
Population:	One to each 334 acres.
-	Average income per worker \$714.52
Desirability:	Recreational opportunity for Range towns. Many lakes, and adjoins Scenic state park. Good game area, and is accessible source of timber and fuelwood for the Iron Range.
Sales:	Dead and down timber 82,000 ft., 2,796 cords, 2,125 ties.
Trespass:	7,500 feet, 1,331 cords.

Four U. S. Forest Service ECW State Forest camps which have operated within the George Washington Memorial State Forest over an aggregate of twelve six-months periods have constructed thirty-five miles of tele-

phone lines, 61.5 miles truck trails and two miles fire breaks. Hazard reduction covers 954.5 acres, roadside cleanup 35 miles, forest stand improvement 1,848 acres, blister rust control 9,678 acres and timber surveys 13,320 acres. Fifteen buildings have been erected. Nursery work consumed 510, fire fighting 5,488 man-days. Planting to the extent of 712 acres is noted and 15.4 acres of camp grounds were improved. Seed collection yielded 441 bushels and lineal surveys covered 105 miles.

GRAND PORTAGE STATE FOREST

Location:	Northeastern part of state in Cook County.	
Area:	Gross Area	
Ownership:	State and Government 54,201 acres State recently acquired None Private 99,317 acres	
Taxation:	Taxable Area99,317 acresTax Paid49,658 acresTax Delinquent49,659 acresAssessed Valuation\$2.69 per acreIndebtedness.11 per acre	
Population:	One to each 331 acres. Average income per worker—(This information not com- pleted.)	
Desirability:	Historical value. Recreational use and fair timber growth.	

West portion excellent game country.

Three U. S. Forest Service ECW State Forest camps which have operated an aggregate of seven six-months periods constructed 18.5 miles of telephone lines, 21.2 miles of truck trails, two buildings and one lookout tower. Roadside clean-up covered 28.9 miles, hazard reduction 59.2 acres, planting 113 acres and forest stand improvement 222 acres. Blister rust control was extended to seven acres and timber surveys 11,392 acres. Six miles of lineal surveys were run. Fire fighting consumed 2,109 man-days.

KABETOGAMA STATE FOREST

Location:	Northwest corner of St. Louis County.	
Area:	Gross Area	acres acres
Ownership:	State .135,516 State recently acquired .22,713 Federal and Indian .2,400 Private .575,573	acres acres acres
Taxation:	Taxable AreaTax Paid215,573Tax Delinquent360,000Assessed Valuation\$2.79Indebtedness.28	

Population: One to each 351 acres.

> Average income per worker \$434.55 Acres

Desirability:

Finest wilderness area in midwestern states. Good game and recreational opportunities. Many summer homesites on beautiful lakes. Timber future good.

Sales: Dead and down timber 1,575 ft., 662 cords.

Trespass: 13,000 ft., 136 cords, 45 ties, 50 posts, 20 pieces.

Three U. S. Forest Service ECW State Forest camps operating within the Kabetogama State Forest an aggregate of ten six-months periods have constructed 129.5 miles of telephone lines, four lookout towers, 18.6 miles truck trails and five buildings. Hazard reduction covers 4,040 acres, forest stand improvement 3,587.4 acres, planting 250.3 acres, timber surveys 8,329.7 acres and camp ground improvements 77 acres. Twenty miles of roadside clean-up, 111.5 miles of lineal surveys and collections of 148 bushels of seed are among the projects noted. Nursery work consumed 788 and fire fighting 2.766 man-days.

LAND O' LAKES STATE FOREST

Location:	Southwestern Cass County about 30 miles north of Brainerd.
Area:	Gross Area
Ownership:	State
Desirability:	A combination of highland and swamp with many lakes.

PINE ISLAND STATE FOREST

Location	Between International Falls and Red Lake. West of Highway U. S. 71.
Area:	Gross Area
Ownership:	State262,420 acresState recently acquiredNoneFederal and Private119,780 acres
Desirability:	Primarily a swampy region with numerous ridges and islands. Excellent game area where the last caribou herd in U. S. spends part of its time.

Sales: Dead and down 329,000 ft., 129 cords, 1,415 ties, 725 ties, 2,700 posts.

Trespass: 5,000 ft., 49 cords, 52 ties, 68 poles.

Three U. S. Forest Service ECW State Forest camps which have operated within the Pine Island State Forest through an aggregate of six sixmonths periods have constructed 55.5 miles of telephone lines, 21 miles of truck trails, ten buildings and 48.5 miles of fire break. Hazard reduction has been extended to 255 acres, roadside clean-up, 36.7 miles, forest stand improvements 3,420 acres, planting 52 acres, blister rust control 320 acres, timber surveys 3,360 acres and camp ground improvements 9.5 acres. Fire fighting consumed 10,605 man-days and 18 miles of lineal surveys run.

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SAVANNA STATE FOREST

Location:	North of McGregor in Aitkin County.
Area:	Gross Area
	Land Area
Ownership:	State
	State recently acquired None
	Federal None
	Private
Taxation:	Taxable Area
	Tax Paid
	Tax Delinquent
	Indebtedness \$.57 per acre
Population:	One to each 91 acres.
	Average income per worker \$500.60
Desirability:	Excellent recreational and game area, accessible to Twin Cit- ies and Duluth. Historical value. Timber growing good.
Tresnass	31 cords 366 ties

One U. S. Forest Service ECW State Forest camp during one six-month enrollment period has constructed within the Savanna State Forest eight miles of truck trails, 2 buildings, and 2 lookout towers. Hazard reduction has been extended to 42 acres, roadside clean-up to thirty-two acres and planting to 25.9 acres. Fire fighting consumed 795 man-days.

THIRD RIVER STATE FOREST

Location:	Ten miles southeast of Blackduck in Itasca County.
Area:	Gross Area
Ownership:	State and Government 10,893 acres
. 's { · · ·	State recently acquired None
3	Private 34,907 acres
Taxation:	Taxable Area
	Tax Paid 14,577 acres
$=$ $\{j\}$	Tax Delinquent 20,350 acres
l.	Assessed Valuation \$1.54 per acre
• j	Indebtedness
Population:	One to each 370 acres.
•	Average income per worker \$258.85
Desirability:	Very fine stand of merchantable timber. Good game area with possibility of recreational use.

Sales: Dead and down 178 cords, 170 ties.

One U. S. Forest Service ECW State Forest camp which has operated within the Third River State Forest during four six-month enrollment periods has constructed 80.2 miles of telephone lines, 15.8 miles truck trails, 8 miles of fire break, one lookout tower and six buildings. Hazard reduction has been extended to 1,410 acres, roadside clean-up to 25.2 miles, forest stand improvement to 701.5 acres and blister rust control 619.2 acres. Tim-

ber surveys cover 7,720 acres. Eleven acres of camp ground have been improved. 54.5 acres planted and 10.5 miles of lineal surveys run. Seed aggregating 100 bushels has been collected. Fire fighting consumed 3,410 man-days.

WHITE EARTH STATE FOREST

Location:	Immediately west of Itasca Park in Becker, Clearwater and Mahnomen Counties.
Area:	Gross Area
Ownership:	State, Government and Indian15,536 acresState recently acquired600 acresFederalNonePrivate253,129 acres
Taxation:	Taxable Area
Population:	One to each 161 acres (including a number of Indians.) Average income per worker \$453.40
Desirability:	Excellent recreational and game area, accessible to people of northwestern Minnesota and prairie regions. Headwaters of

northwestern Minnesota and prairie regions. Headwaters of rivers supplying prairie cities in Red River Valley. Source of timber and fuelwood for that section of the state.

Four U. S. Forest Service ECW State Forest camps which have operated within the White Earth State Forest through an aggregate of eleven six-month periods have constructed 117.8 miles of telephone line, 13.3 miles of fire breaks, 169.3 miles of truck trails, three buildings and two lookout towers. Hazard reduction covers 120 acres, roadside clean-up 50.6 miles, forest stand improvement 1,943.5 acres, blister rust 1,682 acres and timber surveys 14,880 acres. Seventeen acres have been planted, 200 bushels of seed collected. Ten man-days were spent on nursery work and 2,991 mandays were consumed on fire fighting. Lineal surveys covered 58.9 miles.

NOTE:—Some of the buildings listed under ECW activities such as garages, tool rooms and foremen's quarters are for use of the camp only and will be of no permanent benefit to the forest.

RECOMMENDED ADDITIONAL STATE FORESTS

The total aggregate area within boundaries of legally established state forests is approximately 3,000,000 acres. In addition there are about 414,000 acres of state owned trust fund lands within national forests withdrawn from sale and dedicated to forestry purposes. It is estimated that the gross area within the state more suitable for forest culture and management than for other purposes, is approximately 10,000,000 acres. With an expanded national forest program under way, made possible because of large federal relief appropriations and the necessity of providing more publicly owned lands for ECW camp operations, the state should consider on its own behalf and as a part of its own planning for the future, the selection of additional state forests.

The following areas are submitted for consideration as additional state forests:

Buena Vista:

About 60,000 acres in the upper Turtle Lake region, north and west of Bemidji.

Nimrod:

About 100,000 acres of sand plains and swamp area in Hubbard, Cass and Wadena counties lying between the Badoura State Nursery and the Nimrod ECW camp.

Paul Bunyan:

About 150,000 acres in northeastern Hubbard county.

Schoolcraft:

About 50,000 acres in north Hubbard county and practically contiguous with Paul Bunyan.

Buckboard-Rice Lake:

About 40,000 acres. This is the area around Lower Rice Lake and vicinity and adjoins the White Earth State Forest on the north and possibly would better be considered as an addition to the White Earth.

Smoky Hills:

About 60,000 acres, in Becker County, extending from Ponsford southwesterly towards Detroit Lakes.

Little Mississippi:

About 150,000 acres in Beltrami county, including towns such as Pinewood and Solway.

Vineland:

About 50,000 acres along the west side of Mille Lacs Lake.

Rum River:

About 50,000 acres. East of the Rum River and south of Onamia and Waukon, Mille Lacs County.

White Pine:

About 60,000 acres east of Mille Lacs Lake in the vicinity of McGrath, Aitkin County.

New additions and new forests subject for legislative action.

SPECIAL USE PERMITS

No new home site areas within state forest were opened up for leasing during the biennium. Two areas on Kabetogama Lake on which improvements were begun in the previous biennium have been completed and are ready for leasing.

Table 6 shows the extent of leasing of home sites, commercial sites and right-of-way leases for the two years.

TABLE 6

Number, nature and revenues from special use leases.

·		1933		1934		
	Number	Amount	Number	\mathbf{A} mount		
Homesite Leases	. 116	\$1,239.25	112	\$1,212.00		
Commercial Leases	. 11	250.00	13	251.00		
Hay Leases	. 17	136.73	105	850.46		
Right-of-way	. 11	336.29	8	1,044.93		
Total collected		\$1,962.27	• •	\$3,338.39		

FOREST LAND ACQUISITION

Through the enactment of laws 1933, Chapter 419, the legislature not only set aside definite areas for state forests but for the first time provided authority for the orderly acquisition of privately owned lands as a means of extending and consolidating publically owned and controlled areas within state forests for forest development and management. This act was an answer to a long time public demand for a constructive recognition of our forest needs and became effective just at a time when the federal emergency conservation work program was announced and when the department became confronted with the problem of promoting and justifying the establishment of Emergency Conservation Work camps within Minnesota. Obviously the activities of these camps had to be confined to work of a public nature. The only publically owned lands within state forests prior to 1933 were state owned trust fund and unentered federal lands scattered throughout the forests in small parcels. Location of these isolated tracts and planning for their improvement by federal emergency conservation work enrollees operating from the various camps meant loss of time and efficiency. Even though time and funds did not permit of the purchase of extensive areas for camp operations the fact that the state legislature did provide authority whereby this may be done was sufficient evidence of good faith to aid materially in commanding the interest of the U.S. Forest Service in our forestry problems and the approval for the state of a generous number of forest camps.

In the selection of lands for purchase the division has been guided by certain fundamental requirements which are basic to the formulation and execution of a sound forest management plan. The first step was to conceive a definite plan for each forest before any land acquisition was to be commenced. Because of the limited funds available it was deemed advisable to select purchase areas and confine acquisition to a few of the forests rather than to diffuse purchases to all of them. By this plan areas to be consolidated, locations of headquarters to meet requirements for the economical operation of ECW camps and other essential needs for forest management could be selected in the light of the adaptability and needs of each of the forests affected.

After the forests to be affected by land acquisitions had been selected, the first efforts were centered on the location of headquarters. From this location all activities such as fire detection, fire fighting, telephone and road and trail communications and other activities must radiate and plans made accordingly. Roads and trails to all strategic portions of the forest were imposed on the plan. Silvicultural projects of planting and thinning were considered in the light of the economical and effective utilization of Emergency Conservation Work camps. The conservation and development of the water resources of the forest not only as a means of fire protection but of enhancing public recreational possibilities was given a prominent place. Game cover and nesting and feeding grounds and refuges and public hunting grounds likewise were included as projects worthy of serious consideration.

With such a plan for each forest having been completed the next step was a field survey to locate the lands which were needed for the several projects. Having selected the lands it became necessary to determine who owned them and whether they fell within the scope of lands which could be legally purchased. It often meant meeting with the Boards of County Commissioners in an effort to obtain their friendly cooperation and acquiescense to the proposed purchase program and secure their approval of some reasonable plan of tax settlement. After the ownership of the various parcels of land had been determined proposals were solicited from the owners of record as to the terms on which they would consider the sale of the property to the state. Where purchase negotiations appeared to be accepta-ble the proposals and options were presented to the conservation commission for approval. Under the law before any lands may be purchased the Executive Council must give its approval to such negotiations. Following the approval by the Executive Council of the purchase of any list of lands the next step was to secure a deed and abstract from the owner conveying clear title. Obviously all of these steps entail considerable work and at the best makes land acquisition a slow process.

Acquisition has advanced farthest within the White Earth, Third River, Kabetogama and George Washington State Forests. Increased activity in the acquisition of lands is anticipated in the Fond Du Lac, Finland, Grand Portage and Savanna forests.

Table No. 7 shows a statistical summary of land acquisitions within state forests. An aggregate of 26,426.38 acres was purchased for \$35,358.87 or at an average price of \$1.34 per acre.

Through the activities of federal emergency conservation work camps, state forest planning and management have advanced to a point where it becomes highly essential for the legislature to consider seriously the adoption of a sound and permanent policy which will make it possible for the department to continue this work of forest development now well under way.

The President has already announced his intention to request Congress to make Emergency Conservation Work permanent. If Minnesota is to benefit from such work it becomes absolutely necessary to acquire sufficient areas of publically owned lands on which forest improvements may be carried on.

One method whereby such lands may be made available is to permit tax delinquent lands to revert to state ownership. If this were done the problem of making available areas for development by emergency conservation work would at once be solved. If such lands are not permitted to revert in the spring of 1935 some other means will have to be provided for the acquisition of publically owned forest lands if Minnesota is to benefit to an appreciable degree from future federal emergency conservation work.

Forest	Examined in Field and Ownership Determined	Approved by Commission	Approved by Commission and Executive Council	Abstracts Forwarded to AttyGen'l For Examination	Deeds in Process of Preparation	Purchase Completed
	Acreage	Acreage	Acreage	Acreage	Acreage	Acreage
Beltrami Island	480	80.00	40.00	- V.		
Cloquet Valley	23,040	16,360	3,812.35	2.919.30		
Finland	3,520	1,060.20	1,060.20	420.15		40.00
Fond du Lac	2,960	120.00	120.00			
Foot Hills	560	None	None			
Geo. Washington	19,800	7,783	7,782.87	$5,\!184.67$		
Grand Portage	10,800	3,520	$3,\!488.98$	3,000.00		*3,000.00
Kabetogama	26,200	25,880	23,060.66	22,713.68		22,713.68
Land O' Lakes	None	None	None	None	None	None
Pine Island	720	160	160.00			
Savanna	4,880	638	119.25	40.00		
Third River	6,520	4,080	2,783.25	1,512.02		
White Earth	17,400	15,560	9,110.92	5,107.01		672.70
Total	116,880.00	75,241.20	51,538.48	40,896.83		26,426.38

Table 7—Division of Forestry, Land Acquisition Progress Report,November, 1934

*Approximate

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STATE FOREST NURSERY

The present nursery located in the northwest quarter of section sixteen in Badoura Township, Hubbard County, was begun by the department of forestry in 1930 without any special funds or authorization except the general powers delegated to the department to carry on educational work and promote the cause of forestry. As an initial improvement to the property a lookout tower with the necessary buildings were erected. Subsequently a building to house additional men was constructed and a small nursery established. Two acres of ground surrounding an old camp site were already cleared. The soil was prepared for seed beds, seed gathered, extracted and planted and shelters built with labor recruited from the regular fire protection force during periods when fire conditions permitted. The first season, upwards of half a million seedlings were started with a hundred per cent survival. The first appropriation for the support of the nursery was made by the Legislature of 1931. Under the terms of the bill making available public funds for this project, the state is permitted only to grow native coniferous seedlings to be planted on state owned lands.

During the brief period this nursery has been in operation, results have been highly satisfactory. During the fall of 1932, 1,250,000 Norway, White Pine and White Spruce seedlings were started. With the establishment of ECW camps creating an increased demand for trees it was deemed advisable to increase the capacity of the nursery so as to make available as much planting stock as possible for the use of these organizations. During the latter part of last May an additional one million Jack Pine seedlings were planted. Later in the same month two million Norway and White Pine were added. The results were highly successful with the end of the season finding a splendid stand of young plants from nearly all of the seeds planted.

Due to the fact that Colorado blue spruce is quite immune from damage by rabbits and deer after the seedlings are planted in the forests and parks, the state nursery law should be amended so as to permit the growth of this specie which is now prohibited.

An effort is being made to add Hemlock, a rare species in Minnesota, to the varieties to be raised in the nursery. It is too early at this time to predict the results of this venture as seed from which to start the trees is difficult to secure.

Following an inspection of the nursery for insect pests, a scale was found on Jack Pine which had been left standing in strips nearby to act as wind-breaks to prevent the drifting of sand and snow and protect the nursery against severe winds. It therefore became necessary not only to remove all of these wind-break strips but to free the nursery of all pine for a distance of not less than 250 feet from the seed beds. The removal of these protective strips made it necessary to replant with other species. To secure planting stock, arrangements were made with the two nurseries to take their surplus stock. From these sources of supply two truck loads have been secured and started in new wind-breaks. It is hoped that additional shrubbery and trees can be obtained for this purpose during the coming spring.

Seed Extraction

During the past year 175 bushels of Norway Pine cones for nursery use was purchased from settlers in the region for which \$1.00 per bushel was paid. White Pine cones were picked by CCC crews near Duluth. The White Pine crop was poor and as a result it has been found difficult to gather enough cones and seeds of this variety.

With the heavy increase in the demands for seeds, created by extensive forest improvements and developments carried on by ECW camps, a serious problem has developed in connection with securing a supply of seeds of coniferous trees, particularly Norway and White Pine. During the past 20 years the cone gathering and seed extraction business in this state has probably aggregated from five to ten thousand dollars annually. Because of the high producing qualities of Minnesota pine tree seeds, the state's cone producing trees were called to meet, not only state demands but an active demand from the U. S. Forest Service as well as a result of these seed requirements.

Pine cone gathering has developed into an occupation of extensive proportions, aggregating perhaps \$25,000 annually. The relatively high prices paid for cones coupled with the present economic stringency has caused many farmers and other settlers to turn to this type of work to increase their income. The more careless of these cone gatherers in their zeal to secure the cones are destroying the most valuable sources of seed supply by cutting the limbs from the trees from the very top to the ground. In an effort to stop this practice, forest rangers have been instructed not to buy any cones from those offering to sell them unless they know how and where the cones have been gathered. The Regional Forester's Office of the U. S. Forest Service at Milwaukee and National Forestry Supervisors were notified of this new form of vandalism and were requested to co-operate by not purchasing cones except from persons they knew or from those who could furnish proper certification as to where and how the cones had been picked.

Transplants

Sixty thousand transplants were set out during the spring of 1934 with a 100% survival. A portion of these transplants were set out for field planting during the fall. The plan is to keep a considerable number of transplants on hand for planting in state parks where rapid growth is desirable. From data obtained thus far on nursery production costs it appears that the expense involved in handling transplants is as great or greater than all other costs combined. It is believed that for general forestry planting that two or three year old seedlings not transplanted will reduce production costs materially. Table 8 shows the production and distribution of stock from the nursery during the past two years. Inventory of nursery stock as of June 30, 1934, showed seedlings and transplants all ages and spruces aggregating 6,000,000 trees. Plans are under way to have 15,000,000 seedlings started in the nursery in the spring of 1935.

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Another problem which has to be solved in connection with the successful operation of the nursery is the location and eradication of current and gooseberry bushes to prevent infection from White Pine blister rust. A crew of ECW recruits under the instruction of representatives of the U. S. Forest Service destroyed twenty-six thousand plants over an area of twenty-five acres.

In an effort to control destructive rodents, hundreds of pocket gophers have been shot and poisoned. Exhaust gas from an automobile was also used to aid in eradicating the pests. Red squirrels, too, had to be eliminated and as a result of a decrease in their population a great many more numbers and varieties of song birds have established their nesting places on the nursery grounds.

Transplant fields which were not used during the past summer were planted to corn to keep down the weeds. This corn was left in the fields as food for game birds. The success had thus far with this project indicates that it will be continued permanently. It is not unusual to see from 50 to 100 prairie chickens and pheasants come to the feeding grounds at daybreak. Deer, too, have been found feeding on the corn as well as the stalks.

Permanent Improvements

A new bunk and pump house was completed during the early spring of 1934. This is a 16x26 ft. building with a full basement 10 ft. high. The upper part serves as a bunk house while the lower story is being used as a pump house. The construction is of frame type finished on the inside with insolite and is of the same general type and color as other buildings on the grounds. The pumps furnish water supplies for the nursery. To insure a dependable supply, three fifteen hundred gallon per hour Fairbanks-Morse type of pumps and one Fairbanks-Morse No. 9 deep well pumps are used. The deep well is used only in emergency and is held in reserve in case of failure of the other wells. Power for the operation of the pumps is furnished by two 3 H. P. Fairbanks-Morse engines. \mathbf{As} a means of furnishing water to the seed beds a 1,600-ft. Skinner sprinkler system furnished by U. S. Forest Service ECW was installed during the spring of 1934. This supplemented the 500 feet of sprinkler system previously purchased and installed by the Division of Forestry. It is possible by this system to cover 50 feet of space or supply water to two 12-ft. seed beds on each side of the center line. The system is of the portable type and can be transferred from one area to another as needed.

Because of the demand for planting stock brought about by the activities of ECW, the nursery will be greatly expanded during the planting season of this fall and the spring of 1935. It is anticipated that with the seedlings now in the nursery and those to be planted that there will be fifteen million seedlings available next summer. The expansion of the seed beds to take care of this output will overtax the present pumping and water system. Accordingly it is planned to install an additional well and pump to take care of this expanded program.

In addition to these major improvements, an oil house for the storage of gasoline and oil was constructed during the month of July, 1934. This building is a 10x10 structure with a concrete foundation extended 4 feet above the ground to eliminate fire hazards which are created by oil soaked floors and walls.

A double fire lane around the nursery site is being provided.

ECW and Transient Relief Camp Improvements to Nursery

Emergency Conservation Work Camp No. 66 has performed much valuable work in connection with the nursery. The cleaning out of seed beds, reduction of ribes in the surrounding area, fire fighting and weed control were some of the projects which were aided materially by recruits from this camp. At the request of the county relief board of Hubbard County an emergency relief project on the nursery was also sponsored. Men residing within a radius of five miles of the nursery in need of employment were asked to report to the nursery. Arrangements were made to pick up the men each morning and take them home at night with part of their subsistence furnished from the nursery. These men cleaned up road sides on the nursery site and cleared some of the fire breaks.

There is at the present time a transient crew at the Badoura Nursery of about 50 men. Some of them are engaged in lifting seedlings that will be distributed to ECW camps. Others are working on a new set of buildings to accommodate a camp of 75 to 100 men. These camp buildings are expected to be completed by December 1st. It is expected that this camp will furnish ample crew for the operation of the nursery to whatever extent it may be found necessary and desirable. The work to be done during the winter will be fire hazard reduction on state owned lands at the nursery and vicinity and the building of fire breaks and the improvements of roads and trails in the vicinity of the nursery.

× · · · · · · · · · · · · · · · · · · ·	White	Pine	Norwa	y Pine	Jack	Pine	White	Spruce
Destination	1933	1934	1933	1934	1933	1934	1933	- 1934
George Washington State Forest	169,000	160,000	326,000		42,000		30,000	36,000
Finland State Forest	15,000		24,600			· · · · ·		2,000
Savanna State Forest	3,200		5,000		5,200		1,600	
Pine Island State Forest			40,000					
Third River State Forest	4,000	10,000	200,000					
Cloquet Valley State Forest	60,000	25,000	72,600			10,000		20,000
Cloquet Experimental Station			25,000	··				
Camp Ripley	65,000		100,000				8,000	
Jay Cooke State Park	35,000	5,000	10,000				35,000	10,000
Kabetogama State Forest			39,000	. 		15,000	25,000	
Bemidji State Park			5,000			• • • • •		·
Sturgeon Lake Transplanting			150,000				50,000	
Roadside Planting S. T. H. No. 60 and								
Tourist Park, Big Falls				· · · · · ·			4,000	
Co-operative Highway Planting and								
Supplying ECW Camps Nos. 62							*	
and 68	20,000						20,000	· · <u>.</u> · ·
fort Snelling	1,000		1,000		· ·		500	
State Home for Girls, Sauk Center	1,000			• • • • •			1,000	
ovelis Lake		25,000						10,000
Scenic State Park	• • • • •	1,000						10,000
Totals	373,200	226,000	998,200		47,200	25,000	175,100	88,000

Table 8—Distribution of Nursery Stock, Years 1933-1934

			~ ~ ~ ~	LILLOW			 ~.	, ,	U	~~~	 	 ~ ~ ~ ~	 •		
White Pine					 	:	 				 	 	 		599,200
Norway Pin	е				 		 				 	 	 		998,200
Jack Pine					 		 				 	 	 		72,200
White Spruc	е				 		 				 	 	 		263,100
Not Listed a	is to S	peci	ies		 		 				 	 	 		147,874
Grand 7	lotal													-	000 574
Granu 1	. uuar				 		 				 	 	 	4	1,000,014

Table 9-Summary of Nursery Stock Distribution

Table 10—Distribution of Nursery Stock to State Parks, 1933-1934 All Species

Scenic State Park	
Side Lake Project	60,000
Sleepy Eye	
Fort Ridgley	
Camp Release	700
Inter-State	
Whitewater	
Alexander Ramsey	600
Sibley	
Toqua Lakes	
Jay Cooke	
Bemidji	5,000
St. Cloud Teachers College	
Total	

Blister Rust Control

Blister Rust is a disease of white pine trees of European origin known to be present in Minnesota since 1916. It cannot spread from tree to tree but must spend a part of its life cycle on an alternate host, any of the various wild and cultivated currants and gooseberries.

The spread of blister rust in Minnesota has been slow but steady. All evidence indicates that the first infection on native pine in the state occurred in Chisago and Washington counties or in the southern part of the natural white pine range. In 1932 the known range of white pine blister rust in Minnesota was extended but little. During 1933 one outstanding new infection area was located in Cook county. Another infection was found within the Red Lake Indian Reservation in Beltrami county. In 1934 a heavy infection area was located in Becker county about ten miles east of Detroit Lakes. The disease is not present essentially over the entire range of white pine in the state. No young white pine growing in association with currants and gooseberries has a reasonable chance of reaching commercial maturity.

The great increase in forest activity during the past two years brought about by the widespread ECW program was accompanied by a large blister rust control program in state forests and parks, and national and Indian forests.

The blister rust control organization with definite objectives and working plans was able to make efficient use of the labor and financial resources placed at its command by the various emergency programs. During the last half of 1932 blister rust control was extended to only 84 acres to protect thirty acres of white pine. During 1933, 1,524,000 currant and gooseberry bushes were removed from 18,104 acres to protect 6,647 acres of pine. During the months of July and August, 1934, an additional thirty-seven thousand acres were examined with a destruction of 8,500,000 bushes to extend protection to sixteen thousand acres of white pine. During 1933 practically all control activities were conducted from ECW camps. A federal public works appropriation of \$67,500 became available on August 19, 1933. An extensive survey of the state's white pine resources was made during the winter of 1933-1934. During 1934 control operations were conducted out of ECW camps and by public works crews. The organization has reasonable information as to the location of white pine stands in the state and estimates as to the cost of their control. An extensive program has been provided for the immediate future. This includes an addition to and the refinement of pine location data; the establishment of control not only for choice white pine stands but for larger portions of the poorer stands as well; maintenance of existing nursery sanitation zones and other projects in connection with effective protection of white pine from this fatal disease.

Table No. 11 gives statistics covering blister rust eradication during the biennium.

The nursery where white pine seedlings are started are the source of the stock with which to plant denuded areas. It is therefore essential to make every effort to furnish protection to the planting of stock where it is started.

In 1933 nursery sanitation activities were carried on in the following nurseries:

George Washington Memorial Forest Nursery, Badoura.

Side Lake, M. F. S. Nursery.

U. S. Forest Service Nursery, Cass Lake.

Cloquet Forest Experiment Station Nursery, Cloquet.

J. V. Bailey Nursery, Newport.

Lake City Nurseries, Inc., Lake City.

Ferndale Nursery, Askov.

In 1934 all the nurseries were reworked with the exception of Ferndale at Askov. The latter has discontinued the growing of white pine.

Table No. 12 summarizes nursery sanitation for the period July 1, 1932—July 1, 1934.

Cultivated Black Currant Eradication

The European or cultivated black currant is more susceptible to blister rust than any other species of currants and gooseberries. It becomes infected up to distances of 150 miles or more from diseased pines and is capable of infecting white pine up to a distance of one mile. Field observations have established the fact that cultivated black currant is responsible for the establishment of new infection areas and is largely responsible for the wide distribution of the disease. Its elimination from white pine growing areas of the state is absolutely essential to protect the state's pine stands as well as the investment in blister rust control measures. Being a cultivated species it is not difficult to get rid of it if the owners will co-operate in its eradication.

A definite program for the black currant eradication has been planned for the fall of 1934. Men assigned this work will work systematically through a county checking every homesite and abandoned homesites for black currants. The owner is asked to give the state his cultivated black currants and asked to sign a release for them. This work will be started in areas adjacent to and within state and national forests, thereby first securing a complete protection of white pine stands within these areas.

Blister rust control is conducted by the department in co-operation with the U. S. Department of Agriculture. Table 11-Minnesota Blister Rust Control July 1 1932 to July 1 1934

rusio il minin	biota bilister itas	e comerci, eu	J 1, 100 10 0	aij 1, 1001		
Voor	Acres W. P.	Acres	Ribes	Total Man dava		
1000	riotecteu	worked		man-uays		
1932	30	84	25,575	35		
1933	6,647	18,106	$1,\!524,\!525$	7,134		
1934	7,325	19,872	3,039,181	8,549		
Total	14,002	38,062	4,589,281	15,718		
В	lister Rust Costs	, July 1932 to	July 1934			
	Total	Per	Acre Per	Acre W. P.		
Year	Costs	Wo	rked I	Protected		
1932	\$155.75	\$1	.85			
1933	\$12.656.34		.70	\$1.92		
1934	22,504.22	1	.02	2.92		
	\$35,316.31	\$1		\$2.42 (av.)		
	Table 12—N	ursery Sanita	tion			
	Acres	Ribes	Total	Total		
	Worked	Pulled	Man-Hours	Cost		
1933-Commercial		41,567	2,029	\$593.29		
State	370.5	68.016	448	596.30		
Federal	351	17,570	270	419.72		
1934—Commercial	576	9.723	657	233.07		
State		13 673	430	114.00		
Fodorol	175	10,010	450	99 00		
rederat	170	900	90	20.00		
	terror terror t					

Timber Activities

151,449

3,930

\$1,984.38

Chapter 186, Section 4 (b). Session Laws of 1931, provides that the administration of all state forests and other state lands, acquired or set apart for forestry purposes, and the sale of all state timber, whether upon such lands or other state lands, be placed in charge of the Division of
Forestry, the director of the division to have all of the powers and perform all of the duties previously vested in or imposed upon the state auditor, acting as commissioner of the state land office, or otherwise, under then existing laws relating to the sale of state timber.

In appropriating funds for the newly created division, however, the amount requested for the timber department was inadvertently appropriated to "State Lands and Timber" in the state auditor's budget, and as a consequence the transfer of the activities of the timber department to the Department of Conservation could not be made at the beginning of the fiscal year 1932, as provided by Chapter 186.

The Legislature of 1933 authorized the transfer of the balance then available in the state auditor's State Lands and Timber fund for the fiscal year 1932-1933 and the total of such fund for 1933-1934 to the Department of Conservation. The transfer of the activities pertaining to state lands and timber to the Division of Lands and Minerals was accordingly completed April 1st, 1933.

At the time of the transfer, the personnel of the timber department, under the State Auditor, aside from the office help, consisted of twenty field men. This force was reduced by ten during the month of July and early August, and the services of the remaining ten men were divided between land appraising and timber work.

About the middle of August, 1933, the timber activities were transferred to the Director of the Division of Forestry, as provided by Chapter 186, Laws of 1931. This transfer, however, was not complete as no division of the funds as between the two divisions was made. The salaries of office and field forces together with expenses were being paid from the funds transferred from the State Auditor to the Division of Lands and Minerals and the appropriation authorized by Chapter 109, Laws of 1933.

On January 1st, 1934, the field force was again reduced, leaving only five state appraisers actively engaged in timber work. On this date a division of the funds was made and a portion of the Division of Lands and Minerals fund was transferred to the Division of Forestry for timber work. Out of the fund thus transferred the office and remaining field force were paid, together with a portion of the expenses of timber administration.

On February 5th, 1934, the timber activities were moved from the Division of Lands and Minerals to space provided in the forestry division suite of offices.

With an adequate force of regular state appraisers it became imperative to enlist the assistance of the forest rangers to properly look after timber cutting. As a result of this shortage of field men, considerable difficulty was experienced in getting necessary timber estimates and appraisals. In some districts no field men were available for this class of work as prescribed by the statutes.

The remaining five state appraisers were transferred back to the Division of Lands and Minerals on May 1st, 1934, and will remain with that division as state land appraisers until December 1st, 1934. During this period the timber field work will be carried on by the forest service men.

Timber Cutting

At the time the timber department was transferred to the forestry division, there were ninety-eight active regular timber permits, the original sale value of which represented approximately \$96,000. The extent of cutting operations under these permits during the past logging season is shown by the following figures:

1,151,000	feet	
4,843	cords	
7,470	ties	
503	poles	
4,952	posts	
Value of Timber of		11,478.74
Extension interest		2,305.10
Gross		13.783.84

These active regular permits represent some sales made as far back as 1927, but due to market conditions the permit holders have been unable to operate. The permits have been subject to extension at each annual expiration date and this privilege has been exercised by the operators. Notices of cutting on a number of the permits have been received this fall, which would indicate that the market has improved and that the operators are desirous of completing their contracts to avoid additional extension interest charges.

All regular permits are checked thoroughly each season. If the cutting has been completed on a permit, the appraiser so states in his final report for the season. If the cutting has not been completed, the appraisers report the approximate amount of timber left standing and makes recommendation as to whether the permit should be extended. In some instances the permit holder prefers to pay for the standing timber, in which case the appraiser estimates the amount of timber left standing which must be paid for in cash.

Since the Conservation Commission and the federal lumber code have restricted the sale of state and federal timber in competition with private owners, a very marked increase has been shown in the sale of dead and down fire-killed, diseased and insect-infected timber under the provisions of Section 10, Chapter 276, Laws of 1925.

The following figures show the cordage and income from such sales for the period, beginning August 15, 1933, and ending August 31st, 1934.

826,750	feet) .
82,653	cords	ĺ
11,052	ties	\$9,370.67
825	poles	İ
6,950	posts	j

There are approximately 800 of this type of permit active and while these permits require considerable work and expense on the part of the field men, the income derived therefrom is largely salvage. The removal of this timber, however, contributes to the elimination of fire hazard and is of benefit to new growth. Further it has been the means of furnishing

fuel and work for hundreds of dependent citizens in the northern part of the state. All such sales are made for cash in advance.

In addition to the actual sales made of dead and down timber, cutting of this character was also done by ECW camps, the timber so cut being used in part for improvements on state forests and the balance placed in storage for later disposition. The following approximate amounts were cut:

> 1,337,700 feet 405 cords 9,210 posts 4,931 poles

The policing of state lands for the prevention and detection of trespass is another important duty of the state appraisers. From the time the timber activities were taken over by the Division of Forestry to August 31st, 1934, inclusive, a total of 180 trespassers have been apprehended. The following figures show the amount of timber cut in trespass and the amount charged therefor:

 61,400 feet

 1,962 cords

 17,566 pieces

 1,370 ties

 2,493 posts

As indicated, the timber department work has been carried on with a greatly reduced field force and a small allotment of money from joint funds, due to adjustments between three departments. For the remainder of the fiscal year ending June 30, 1935, the expenses of operation of the timber department will be met by funds remaining from transfers from the Division of Lands and Minerals.

It is imperative that the timber activities be organized in a manner that will insure protection of the million and one-half acres of state owned timber lands and administer the duties imposed by law.

With this in mind the budget for the next biennium has been prepared and a plan set up which, briefly, contemplates a force of nine men to be employed as state appraisers the year around and a temporary force of six men to act as state appraisers part time during the cutting season.

The present office force of one secretary and one bookkeeper will remain the same, the supervision both in the office and the field to be handled by an assistant to be designated by the directory of the Division of Forestry.

STATE PARKS

Prior to 1925, all state parks with the exception of Itasca and Sibley were under the supervision of the State Auditor. Itasca State Park which had been ceded to the state by the federal government to be used as a state park was under the jurisdiction of the department of forestry. The state game and fish commissioner had jurisdiction over Sibley State Park.



SCENIC STATE PARK

Under the provisions of the re-organization act of 1925 the Department of Conservation created by that act, consisting of the State Auditor, the Commissioner of Game and Fish and the Commissioner of Forestry, was given jurisdiction over all of the state parks. The act of 1931 creating the present Conservation Commission and Department of Conservation in turn placed all parks under the immediate direction of the Division of Forestry.

Prior to the creation of the present department in 1931, the state legislature had not considered state parks and their development and management of sufficient importance to provide funds from which to defray costs of a central state park organization and a trained park supervisor. Parks had been created from time to time by the legislature and as they were being acquired were placed in the department to which the nominal care of state parks had been delegated. At no time have adequate appropriations been made to properly administer, develop and manage these parks. In many instances the parks were wholly or partly maintained by local organizations interested in them. The cost of such general supervision as the present division of forestry has been called on to extend to state parks and traveling and general expenses incurred in connection therewith have been deferred from general forestry appropriations. The last legislature went perhaps further than any of its predecessors to curtail park maintenance.

About a year ago, the National Park Service was urged to establish state park ECW camps in Minnesota. The department was at once placed on the defensive by the fact that the state had not demonstrated sufficient interest in its own parks to have selected a trained and qualified director of state parks. This matter was a continuous handicap in dealing with federal ECW park officials. The National Park Service was finally prevailed upon to place on the payroll a trained state director of parks with the understanding that the Department of Conservation would set up a budget which would provide for the continuation of such a director together with the necessary help and expenses. As a result of this arrangement the present budget contains requests for funds to complete a park set-up.

The state of Minnesota has not to date taken seriously the responsibility of providing the people with adequate facilities for outdoor recreation during leisure time. The state with its many lakes, rivers, waterfalls, rock formations and forests affords naturally many opportunities for the enjoyment of outdoor life. This is the reason perhaps why public consideration for the development and protection of such attractions has been permitted to lag.

Improvements aggregating thousands of dollars in cost have been added to our state parks without cost to the state, as a result of the establishment by the National Park Service of a number of ECW state park camps. These improvements have thrown upon the state the responsibility of maintaining and operating them for the use and enjoyment of the public. We have arrived at the cross-roads in our state park policy. Our past attitude permitting parks to drift without providing funds for their improvement and supervision must be changed to an attitude of interest and intensive supervision.

It has become increasingly apparent in recent years that our state parks are not meeting the recreational needs of all of the people, a vast majority of whom are not getting the proper outdoor recreation. Many of our parks even lack a supply of pure drinking water and proper sanitation. Those of our present parks which have received some degree of development are frequented in the main by families of comfortable means. In none of our parks have facilities been provided for mass play or adequate areas set aside for group camping on a large scale. The problem confronting the department in planning for the future is to extend facilities to the under-privileged as well as to those of more comfortable means so that our parks maintained at public expense can be truly used by all of the people.

In the planning of emergency conservation park work by federal camps the first step was the preparation of a master plan for each park. From this master plan was selected such projects as would come within the scope of approved work and plans made for each project. Only recreational facilities that are essential and those which the people will use are being proposed and projected. Obviously each camp requires separate treatment.

The first consideration is to provide pure drinking water and proper sanitation. The importance of this becomes apparent when it is recognized that the state may be made liable for disease caused by poisoned or contaminated water. The construction of shelter cabins, concession buildings, trails, paths, foot bridges and grounds where games may be played are some of the other things needed within public recreational areas. All of these improvements are being furnished within state parks where ECW camps are at work.

PARK CLASSIFICATION

State parks may be all classified as-

- a. Inspirational or visual recreations.
- b. Scenic.
- c. State Forest.
- d. State Game Preserve.
- e. Resort.
- f. Memorial or State Monument.
- g. State Wayside.

h. State Recreational.

The designation of present state parks under these headings is recommended as follows:

Scenic State Parks—Camden, Jay Cooke, Sibley and Whitewater. State Forest—Itasca and Scenic.

State Game Preserve Parks-Gooseberry Falls.

State Recreational Areas-St. Croix Sub-Marginal Tract.

Historic or Memorial Waysides—Alexander Ramsey, Birch Coulee, Camp Release, Chippewa, Lac Qui Parle, Indian Mission, Fort Ridgely,

STATE OF MINIESUIA

Horace Austin, Inspiration Peak, John Latsch, Lake Bemidji, Charles A. Lindbergh, Minneopa, Sam Brown, Sleepy Eye, Spruce Creek, Toqua Lakes, Traverse de Sioux, Acton, Brook Park, Hinckley, Lake Shetek, Milford, Moose Lake, Schwandt and Wood Lake.

DESCRIPTION OF PARKS

Acton. A Historic Monument, comprises one-tenth of an acre in Meeker County five miles southwest of Grove City and commemorates the victory of the whites over the Indians in the Indian uprising of 1862. This area should be maintained only as a memorial monument.

Alexander Ramsey. A Scenic Wayside located adjacent to the city of Redwood Falls along the Redwood River and Ramsey Creek, comprises 145 acres. Woods, winding streams and beautiful falls between tree clad slopes, make it one of the most attractive state parks, ideally located for a scenic wayside. There has been a number of small concentrated areas developed for picnic grounds which makes the maintenance problem difficult. It has fully equipped camp grounds, grand stand, animal zoo and tennis courts. The roads within the park have been developed beyond the needs of an area of this size. A study should be made as to how a portion of them may be eliminated.

With the establishment of refectories in two of the most concentrated areas and the charging for parking by picnickers a considerable amount of revenue could be obtained to meet the expense of maintenance. A study as to the most logical location for such refectory and parking areas is necessary. Consideration should also be given to the furnishing of adequate sanitation for camp areas.

Birch Coulee. A Memorial Wayside is located one and one-half miles north of Morton in Redwood County on the site of one of the hardest fought battles of the 1862 Indian uprising. It is within easy reach of state highway No. 19 and state highway No. 71, both of which pass through Morton. The park is dedicated to the pioneers who made their stand against the Sioux in this area and comprises 80 acres, 65 acres of which is partially wooded valley and the remaining 15 acres is a flat area which has recently been dedicated as a memorial cemetery for all sailors and soldiers of Minnesota. A CWA crew was employed last winter for the removal of dead and down timber. The present development comprises an area for camping and picnicking. More permanent structures should be built for the use of the public. A census of the number using this park should be made to determine the advisability of establishing a refectory.

Brook Park. A Monument is located in Pine County to memoralize those who lost their lives in the Hinckley fire. It should be maintained only as a monument site, to be revered by visitors.

Camden. A Scenic Park is a new recreational area recently acquired and dedicated as a state park and is located in the Redwood River Valley about ten miles southwest of Marshall. It is the newest state park. The tree clad slopes and spring fed streams found in the deep valley is in decided contrast to the surrounding prairie farm land and should make it an ideal recreational area for that territory. State highway No. 39 passes within a short distance of the park and makes it easily accessible from all directions.

An ECW camp was secured for this area and moved in about August 15, 1934. According to present plans this camp will remain in its present location until June 30, 1935 and perhaps longer. It is the plan to improve the recreational facilities to the fullest extent under the supervision of National Park Service.

A definite plan of improvement of this park is now in the process of preparation which provides for the development of the north half of the park for camping, picnicking, bathing and various active recreational uses.

The attendance at this park during the short period following its establishment indicates that it will be a very popular recreational area for the surrounding communities and apparently will provide recreation for more people than any other similar area thus far utilized for state park purposes in this state. The construction program contemplated by the ECW camp before the work now approved is terminated consists of a custodian cabin, a maintenance warehouse and garage, picnic shelter, refectory building, bath house, several modern sanitation buildings and two complete water systems to serve the two concentrated areas. Construction of several miles of foot trails and a general cleaning up and reforestation of cut-over areas, makes up a part of the program. Parking space and play areas have already been established and the furtherance of facilities for such uses will be important projects within the area.

The cost of maintenance of this park can be kept to a minimum by the establishment of a one way entrance as planned, thereby providing maximum control with minimum help. Provision should be made for the establishment of refectories so that revenues derived from this source can be used in the maintenance of the park. Charges for parking and picnicking can be made to add to the total.

Camp Release. A Memorial Wayside, comprising 14 acres in Lac Qui Parle County is one mile west of Montevideo on State and U. S. Highway No. 212. It is the site on which 269 prisoners mostly women and children were released from captivity on September 26, 1862 following the historic Indian uprising of that year. Investigation should be made to determine the advisability of providing additional facilities to those now found in this park.

Chippewa, Lac Qui Parle. A Historical Wayside, comprising 17 acres in Lac Qui Parle County located approximately two miles west of Watson on state trunk highway No. 73. It is the site of the first Indian Mission in Minnesota which was erected there in 1835. A census of this area should be taken to determine what additional facilities if any should be provided.

Fort Ridgely. A Historic or Memorial Wayside, comprising 155 acres is located six miles south of Fairfax on the west side of State Highway No. 4 on the banks of the Minnesota River on the site of old Fort Ridgely made famous because of the part it played in the Indian uprising of 1862. Because of its tree clad hill-sides and its historic associations, it is a favorite

recreational and picnic area for surrounding communities. A portion of one of the original fort buildings still stands and the cemetery wherein are buried a number of the pioneers who lost their lives in this battle is found within the area. The low lands along Fort Creek are being developed by a National Park Service ECW state park camp for camping and picnicking facilities and structures will be built to accommodate the public. A picnic shelter is planned in the rostrum area near the cemetery which will harmonize with the original fort buildings and provide a concession for the park. A custodian's cabin and maintenance buildings are being constructed by the ECW camp which has been assigned to the area until July 1st, 1935. These buildings will be of an architectural type similar to the original fort buildings. The restoration of one or more of these fort buildings will be a desirable project for the state to undertake, financed by revenues to be obtained from pageants which may well be staged in this park. Such a building would serve as a museum and could be made a center of a great deal of public interest. A large portion of the park is now being used as a golf course and until such time as further improvements are made there would appear to be no objection to such use.

Revenues for the maintenance of this park could be obtained partially through admission to be charged for pageants and for the use of the parking privileges, picnicking and camping, golf course fees and revenues from refectories.

Gooseberry. A Scenic Game Preserve comprising 640 acres in Lake County located along and near the outlet of Gooseberry River where it joins Lake Superior. It is owned jointly by the Highway Department and the Department of Conservation. The Conservation Commission acquired the area as a public hunting ground and game refuge but because of its many scenic attractions it was selected by the National Park Service as a park. The area contains many features of unusual beauty, the stream falling over a number of waterfalls and rapids between steep cliffs and through gorges cut through granite, all in a setting of native second growth timber. This area should be definitely established by the legislature as a state game preserve park.

An ECW camp was approved for this location and moved into the area in May, 1934. An additional camp was established there and moved in July 1st. The first camp was approved only for one enrollment period and was transferred to its old location on September 30th. It is probable that the new camp will remain until June 30, 1935. A definite plan for devolping the area has been prepared which contemplates the establishment of a tourist camp and picnic area along the shore of Lake Superior with a concentrated area along the highway at the falls for the use of short stop visitors. A cabin area has been planned on the northwest side of the bridge crossing the river. The entire area should be under the control of a custodian for whom a cabin has been planned. There are a few cabins which have been erected and operated by a concessionaire who has had a lease on this property for several years which do not fit well into the development plan especially the street car diners which are a part of this group.

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During the time the ECW camps have been operating, one mile of roadside and eight miles of trail clearing has been accomplished. There has been constructed one mile of road, four miles of foot trails and nineteen miles of fences. Thirty acres have been mapped topographically, fourteen acres of camp ground have been cleared and three acres have been landscaped. More than 2,600 feet of camp ground waste disposal, 2,276 square yards of erosion control bank protection and ten acres of water improvement projects add to the list of valuable betterments and additions secured to this park.

Hinckley. A Monument, is located in Pine County just east of Hinckley. It is a memorial to the large number of people who lost their lives in the terrific forest fires which swept the area in the late nineties. This area should be maintained as at present.

Horace Austin. A Historic Wayside Park of fifty acres in the heart of the city of Austin in Mower County is located on the Cedar River and includes a number of wooded islands within the backwater of a dam constructed across the river below the park. A bathhouse and swimming pool has been provided for public use. No doubt other special facilities could be provided if additional funds were available for operation and maintenance.

Inspiration Peak. A Scenic Wayside Park of eighty-four acres, is located twenty-five miles northwest of Alexandria in Ottertail County and has long been known locally by the name it bears. The land for the park was recently acquired by the department of conservation. Improvements which have been made include camp ground facilities, picnic tables, fire places and out buildings. A road has been constructed from the nearest county highway and some of the area has been underbrushed to make it suitable for picnic grounds. Pure water and sanitary facilities should be provided but any additional extensive improvements should be based on a census of the use which is being made of this area for recreational purposes.

Interstate Park. A Scenic Wayside Park of one hundred and fifty-four acres is located along the Minnesota banks of the St. Croix River in Chisago County adjacent to Taylors Falls. A state park of six hundred and eighty acres borders the St. Croix on the opposite side in the state of Wisconsin. The scenic grandeur of the Dalles of the St. Croix River is universally known and the ruggedness and natural beauty as exhibited in this area as well as its location within easy reach of the metropolitan centers makes it one of the most frequented of the state park areas. Considerable revenues could be realized from this park through a schedule of charges for special facilities which are sought and used by the large number of people who come to enjoy picnic shelters and use parking areas. A refectory and a percentage-of-the-profits from the operation of the excursion boat and the rental of canoes and boats could be made to provide an additional source of income for park maintenance.

During the past two years, in addition to the regular maintenance, two kitchen shelters have been provided, the old pavilion remodeled and a retaining wall constructed near the dock. Last winter a CWA crew of thirty men were employed in removing dead and down timber and converting it into salable firewood. Itasca. A State Forest Park, comprising over thirty-two thousand acres of land and water located at the headwaters of the Mississippi River contains the largest of the remaining areas of virgin Norway pine in the United States as well as enormous stands of White pine. It is composed of rolling forest land dotted with numerous lakes with a merchantable virgin pine stand of approximately 125 million board feet in addition to dense forests of other younger trees. It is located almost midway between Park Rapids and Bemidji in Clearwater, Hubbard and Becker counties. The tract is approximately seven miles square. U. S. and State Highway No. 71 follow the east boundary and State Highway No. 3 temporarily passes through the northeast corner of the park.

For many years the park has been a game refuge and is now a sanctuary for every kind of wild life frequenting this section of the state including elk, deer, bear, beaver, raccoon and the many species of birds and other mammals native to this region. The moccasin flower, our state flower, grows in abundance in the protected swampy areas.

The state owns Douglas Lodge located at the south end of Lake Itasca. It is operated on a private lease and furnishes lodge accommodations and private cabins to tourists. This park is popular to the classes of people who have the means to come and sojourn at Douglas Lodge. Those who do not know the past limitations which have surrounded the development of this area as a public park wonder why more has not been done for the benefit of the large mass of people who might enjoy spending several weeks or more here during the summer to acquaint themselves with the virgin forests but whose circumstances do not permit of them staying at the lodge.

The present program of improvement being carried on by the National Park Service through ECW camps will provide much greater opportunities for use and enjoyment by campers, picnickers and the general public.

During the past two years there has been constructed from regular state park funds and by division personnel, a bunkhouse, a kitchen and an additional cabin. An electric transmission line from headquarters to Douglas Lodge has been completed.

An ECW camp which has operated within the park during four enrollment periods has placed forty thousand cubic yards of fill to improve surroundings at the point where the Mississippi River leaves Lake Itasca and to provide suitable pageant grounds. Two log cabins have been added to Douglas Lodge. Three and one-half miles of roads, five miles of trails and five miles of telephone lines have been completed. One water tank, one pump shelter and two Imhoff tanks are among the camp projects. Forest improvements have been extended to 168 acres and blister rust control to 3,000 acres. Fifteen acres have been landscaped, 515 acres covered by topographic surveys and 18 acres have been planted. Ten miles of road bank sloping has been completed and ten miles of road sides have been cleared. In addition to these improvements a large number of others of equal importance are planned for the fourth camp period.

Itasca State Park is the most famous of all of Minnesota's beautiful parks. It is known nationally and internationally as the source of the Mississippi River. The opportunities for advertising the state through the

medium of this recreational area has not been fully appreciated. Douglas Lodge and the accommodations it offers has been about the only real convenience that has been extended in the past to visiting tourists. To those whose means enable them to take advantage of the Lodge, the park and the accommodations offered have been the best to be found anywhere. The fact remains however, that under the present plan of leasing Douglas Lodge it is being operated as a resort and the lessees find themselves compelled to meet the competition of resorts operating outside of the park. The effect of this enforced management is to afford accommodations for the well-to-do classes without holding out many advantages for those of limited means. A plan whereby Douglas Lodge might be popularized for the benefit of all would attract many more visitors to the park even though such a plan might not be self-sustaining. It would seem that the state might well adopt such a plan even though it might be found necessary to meet operating deficits from general state funds to be charged off as advertising of state parks and the state as a whole.

Historical pageants which have been shown in the park during the past three years have proven popular and suggest that this phase of entertainment may well be continued. Revenues to accrue from charges that can properly be made for parking facilities during such pageants and perhaps a small entrance fee can be made to carry a considerable cost of park maintenance. A refectory at the headwaters picnic grounds and pageant area and a combination refectory and commissary at the new camp grounds to be operated by the department can be made other sources of substantial maintenance revenues.

Jay Cooke. A State Scenic Park, consisting of approximately 3,200 acres located along the St. Louis River in Carlton County, provides a physiographic area found nowhere else in the state. It is located about one mile from U. S. Highway No. 61 between Carlton and Duluth. The rugged topography and natural beauty of this park together with its near proximity to Duluth makes it a valuable recreational area and provides an inviting side trip for people travelling in that section of the state.

An ECW camp was established in the park in June, 1933 and has continued in operation since that time and is now in the fourth enrollment period. During the time the camp has been in operation six miles of roads have been improved, five miles of horse trails and thirteen miles of foot trails have been constructed. Two modern cottages, two warehouses, and two foot bridges have been built and one well has been completed. Fourteen miles of fire breaks have been completed, blister rust control has been extended to 2,477 acres; 45 acres have been landscaped and fire hazard removal has been extended to 1,216 acres. Six miles of roadside clearing and eighteen miles of trail side clearing are among the completed projects. Forest improvement has been extended to 844 acres, general cleanup to sixty-four acres. The equivalent of 295 man days has been spent on fire fighting and forty-six thousand square yards of erosion control has been completed.

John Latsch. A Scenic Wayside Park of approximately 600 acres along the Mississippi River in Winona County is named after it donor. It is located near the village of Minneska on State Highway No. 61. It affords a beautiful view of the Mississippi River and the high bluffs bordering the stream and a commanding view of the new lock and dam which is now under construction opposite the park. The park is almost two miles in length and includes three of the highest points along the river, in addition to some beautiful sheltered valleys and benches. Three concentrated areas have been developed for campers and picnickers.

It is hoped that the Federal Emergency Conservation Work Director and the National Park Service may be prevailed on to establish and operate an ECW state park camp for at least six months for the completion of some much needed development within this recreational area.

Lake Bemidji. A Forest Wayside Park, contains, in three separate tracts, 421 acres of rolling forest land on the shores of Lake Bemidji. The new location of State and U. S. Highway 61 passes just north of the park. Facilities have been provided by the state for picnickers and campers which are being utilized considerably by tourists. During the past two years a flowing well has been completed and tables, fire places and sanitary conveniences provided. During the past winter a CWA crew assisted in removing dead and down and insect-infested timber.

Acquisitions of the intervening tracts thereby making a unit of the park, is a project much to be desired if this area is to be developed effectively for state park purposes.

Shetek. A Monument, located on the east side of the lake bearing the same name is in Murray County. This monument was established by the legislature of 1905 as a burial ground for and in reverence of twelve white persons who were massacred in the 1862 Indian uprising. The development of a new park by Murray County and a transient relief camp is now in process near this monument site. Two islands containing approximately 75 acres have been optioned by the county authorities for park purposes. The plan is to have the transients build a road connecting the islands with the mainland thereby affording access to areas valuable for recreational purposes.

Charles A. Lindbergh. A Memorial Wayside Park is located at Little Falls and comprises 100 acres, once the boyhood home of the famous aviator Charles A. Lindbergh. The residence and surrounding grounds have been placed in fine repair and a fence erected.

A wooded area joining the residence site has been utilized for camping and picnicking. Little improvement is possible and it is thought that the less development done in this area the more the site will truly represent the conditions as the world famous flyer knew them.

Milford. A Memorial Monument, is in Brown County and located two miles north of Essig. It contains one acre surrounding a monument erected to the memory of many who lost their lives in the Indian massacre near that place. The area should be maintained as a memorial site.

Minneopa. A Scenic Wayside Park is located four miles west of Mankato on State and U. S. Highway 169. The park has been improved by the acquisition of $6\frac{3}{4}$ acres of additional land adjoining it on the south. This new area has been fenced and made available for use by the erection of suitable camp facilities and clearing of underbrush.

The acquisition of one acre of land located in the center of the park is very essential in order to eliminate the possibility of the establishment of some commercial enterprise on this tract.

Moose Lake. A Memorial Monument, is located just outside of the town of Moose Lake in Carlton County and memorializes the lives of the 183 persons who perished in the area during the great forest fire of 1918. This area should be preserved and maintained only as a memorial.

Sam Brown. A Memorial Monument located in Browns Valley, Traverse County, in memory of the many white persons who lost their lives in the 1862 Indian uprising. The restoration of the Sam Jerome Brown log cabin and the monument and plaque to his memory together with the relics of pioneer days housed in the cabin make this a revered park.

Scenic. A State Forest Park, comprising approximately 1,632 acres is located in Itasca County approximately 45 miles north of Grand Rapids and 7 miles southeast of Big Fork. It is a gem of the state park system as it now exists. An ECW National Park Service state park camp was established in this park in 1933 and has been in continuous operation since that time. The work already completed by this camp has made this park the most ideal of any now under the control of the Conservation Commission.

The ECW camp has constructed 1.3 miles of telephone lines, 12 miles fire breaks, 6 miles of road improvement and construction, 7 miles roadside clearing and 16 miles of foot trails. Eight buildings including shelter pavilion, garage, warehouse, ice house and trail shelters have been erected. Fire hazard reduction has been extended to 295 acres, 6 miles of trail side have been cleared and forest improvement extended to 84 acres. Sixteen acres have been planted to trees, blister rust control extended to 1,327 acres and 35 acres have been landscaped. Bank protection has been carried on to the extent of 1,500 square yards and the equivalent of 1,147 man-days spent on forest fire fighting.

By the time the 1935 tourist season opens Scenic State Park will be well equipped to accommodate those wishing an ideal camp ground location. The buildings now occupied by the camp are grouped on a beautiful location and are ideally adapted for use as a camp for under-privileged children, Boy Scouts, Girl Scouts or similar organizations who may wish to make this park the center of their recreational activities.

Schwandt. A Memorial Monument, located in Renville County near Delhi was established to commemorate those who lost their lives in the 1862 Indian uprising. It would seem that nothing should be done in this area except to maintain this shrine in a manner befitting such a memorial.

Sibley. A State Scenic Park, comprising 355 acres is located in Kandiyohi County on the north shore of Lake Andrew. This park consists of a series of moraine hills, the highest being named Mount Tom. All of these hills are covered with a fine growth of red cedar which have survived and seem to have thrived during the extreme drouth and provides as fine an area for park development for this section of the state as can be found. This park was named after the late General Sibley, who found much pleasure in hunting and fishing in the district. Considering the location of this park and its adaptability for park development, it has been conspicuously neglected. Nothing has been done to make the area suitable for the uses for which it was created. Perhaps one reason for this apparent neglect is that the legislature of 1919, when it established this as a state park, stipulated that it was to be improved and maintained by Kandiyohi County.

This park should be made a first choice for the location of a fifth period National Park Service ECW state park camp if such a camp becomes available, as this recreational area should be developed to serve public recreational needs for this section of the state in which it is located. In anticipation of securing the approval of such a camp, plans will be prepared this winter to include an improvement program to embrace camp and picnic facilities, general park cleanup, installation of water and sanitary facilities, construction of shelter and refectory, camp kitchen and bath house and necessary landscaping.

Sleepy Eye. A Historic Wayside Park, comprises about 15 acres located in Brown County adjacent to the city of Sleepy Eye. It is a historical monument established to the memory of Old Chief Sleepy Eye, who made his headquarters on the south side of Sleepy Eye Lake, now dry, detracting immeasurably from the attractiveness of this wayside park. The improvements include facilities for campers and picnickers.

Spruce Creek. A Scenic Highway Wayside Park, is located in Cook County on the north shore of Lake Superior near Lutsen, approximately 20 miles south of Grand Marais on State and U. S. Trunk Highway 61. The property is owned by the State Highway Department and is being developed by an ECW state park camp under the supervision of the National Park Service.

The beautiful Cascade River affords an opportunity for the development of trails up along the gorge of the stream for use of those desiring to view the beauty and magnitude of this virgin area and Lake Superior. An ECW state park camp moved into this area on July 1, 1934. In the construction of the camp ten small structures have been built to serve as barracks which, upon the evacuation of the camp, can be left and utilized as tourist cabins. The entire project as planned by the Highway Department, except for the establishment of small picnic areas for the touring public, primarily beautifies the roadside by the elimination of the scars left by the construction of the highway.

St. Croix. A Scenic Recreational area in Pine County situated along the west bank of the St. Croix River has been designated by the National Park service as a sub-marginal area to be acquired by the federal government and improved to serve industrial centers with recreational facilities for the under-privileged classes. Proceedings for the final acquisition of this area by the federal government have not yet been completed. It is the plan of the National Park Service that on the establishment of this area as a recreational center it will be turned over to the state for maintenance and operation. A great portion of this tract has been either cut over or has suffered by forest fires and large areas are tax delinquent. The second growth is well developed and if properly maintained and protected can be brought back to an ideal condition for the use contemplated of this area. Options are now being taken on many of the tracts but no definite information is available at this time as to how far the federal government will proceed with its land acquisition program.

The water rights along the river are controlled by the United Power and Light Company who have indicated their willingness to give easements conveying the right to the state and federal government to use their lands for recreational purposes. The federal government has requested the department of conservation to assume on behalf of the state responsibility for administering this sub-marginal project and to maintain the area for the purposes intended and the department has assured the government of the state's willingness to comply with this request.

Toqua Lakes. A Wayside Park, of 40 acres in Big Stone County is located one mile south of Graceville. At the present time it is in an unsatisfactory condition for park purposes as both East and West Toqua Lakes are dry. Facilities are provided for picnickers and campers. During times when there is water in the two lakes this area has attractions and should serve the purpose for which it has been established as very few public recreational areas are to be found in the western part of the state.

Traverse-de-Sioux. A Historic Monument of five acres in Nicollet County is located one and one-half miles north of St. Peter. The park is situated on the site of the old Indian village of Traverse de Sioux near a ford on the Minnesota River where a treaty with the Sioux Indians was made in 1841.

One of the early log cabins and a commemorative bronze tablet memorializes the event. It should serve only as a shrine for those interested in the early history of the state of Minnesota.

Whitewater. A Scenic State Park of 668 acres is located in Winona County about eight miles north of St. Charles within the valley of the Whitewater River. Those entering the park from the relatively level farm lands found on top of the bluffs are pleasantly surprised in contrast by the unexpected beauty and primitive character of the area. The park is in a picturesque setting bounded by vertical limestone bluffs crowned by hardwoods and nestled in a beautiful green valley through which flows the Whitewater river.

The area has been used for recreational purposes by the neighboring communities for many years. It was established as a state park in 1919. The improvements to the park which were made prior to 1934 consisted of a golf course constructed by local people and local funds and the erection of several small and very plain building structures. During the past two years the regular state park personnel has replaced two bridges, two small buildings, constructed two wells and one foot bridge and tables, fire places and trails. A National Park Service ECW state park camp was approved and located in the park in April, 1934. Another similar camp was approved and moved into the park July 1st. The first camp completed the first enrollment period September 30th and moved to another location. The second camp will remain until June, 1935. In the six months during which these camps have been operating in the park one foot bridge has been erected and 7 miles of foot trails have been constructed. General cleanup has been extended to 8 acres, camp ground cleanup to 24 acres and 8 acres of water improvement has been completed. One hundred thirty-five acres of topographic surveys and 11 acres of landscaping are completed projects. More than 2,600 square yards of road and river banks have been extended erosion protection.

A number of other projects not yet completed are in the ECW program.

Wood Lake. A Monument Site in Yellow Medicine County is located eight miles southeast of Granite Falls. It is the site of a monument erected in memory of the early settlers who died in battle in the Indian uprising of 1862. This monument should be maintained as a shrine to memorialize the 41 white persons who were the victims of Chief Little Crow's warriors.

ADDITIONAL AREAS WHICH SHOULD BE ADDED TO OUR STATE PARKS

The Brule. The department recently purchased a tract of land of approximately three thousand acres bordering on both sides of the Brule River immediately above where it outlets into Lake Superior, as a public hunting ground and game refuge. Because of the many scenic attractions which this area possesses, especially that portion of it nearest to the lake, it should be developed into a public park. It is recommended that the legislature take steps to formally designate this area as a state park.

Table 13 gives pertinent information relative to all of the state park and recreational areas herein briefly described.

Table 13-Schedule "A"

Proposed Descriptions of Minnesota Park Areas Under Control of the Conservation Commission

Key to General Descriptions:

1-State Scenic Park.

2-State Forest Park.

3-State Game Preserve Park.

4-State Recreation Area.

5-Scenic, Historic or Memorial Wayside.

6-Historic or Memorial Monuments.

Name	Type	Description	Area	County	\mathbf{E} stablished
Acton	6	Monument	0.1	Meeker	
Alexander Rams	sey 5	Scenic Wayside	183.15	Redwood	
Birch Coulee	5	Memorial Wayside	80	Renville	
Brook Park	6	Monument		Pine	
Camden	1	Scenic Park	450	Lyon	1934
Camp Release .	5	Memorial Wayside	10.83	Lac Qui	Parle 1890
Chippewa-Lac G	Qui				
Parle Mission	5	Historic Wayside	17	Lac Qui	Parle . 1931

Name	Type	Description	Area	County	Established
Fort Ridgely	5	Historic & Memorial		*	
		Wayside	155	Nicollet	
Gooseberry Falls	3	Scenic—Game Pre-			
		serve Park6	350	Lake	
Hinckley	5	Monument	0.1	Pine	
Horace Austin .	5	Historic Wayside	50	Mower	1913
Inspiration Peak	5	Scenic Wayside	84	Ottertail	1931
Interstate Park .	5	Scenic Wayside	154	Chisago	
Itasca	2	State Forest Park	32.960	Hubbard,	Clear-
				water,	Becker 1891
Jay Cooke	1	Scenic Park	375	Carlton	
John A. Latsch	5	Scenic Wayside	350.2	Winona	$\dots \dots 1925$
Lake Bemidji	5	Forest Wayside2	205.3	Beltrami	
Lake Shetak	6	Monument	0.26	Murray	1905
Charles A. Lind-					
berg	5	Historic Wayside	100	Morrison	$\dots \dots 1931$
Milford	6	Monument	1.0	Brown .	
Minneopa	5	Scenic Wayside	120.24	Blue Ear	th 1905
Moose Lake	6	Monument	1.0	Carlton	
Sam Brown	5	Memorial Wayside	1.0	Traverse	1929
Scenic	2	State Forest Park 1	1821.25	Itasca	1921
Schwandt	6	Monument	0.1	Renville	
Sibley	1	State Scenic Park	365.25	Kandiyoł	i 1919
Sleepy Eye	5	Historic Wayside	40	Brown .	1921
Spruce Creek	5	Scenic Highway			
	а	Wayside	300	Cook	
St. Croix	4	State Recreational			
		Area Undeter	rmined	Pine	1934
Toqua Lakes	5	Wayside	40	Bigstone	1919
Traverse de Siou	x.5	Historic Wayside	5	Nicollet	1896
Whitewater	1	State Scenic Park 6	368	Winona	
Wood Lake	6	Monument	0.5	Yellow M	edicine 1907

Forest Fire Situation

The increasing fire hazard to forest, peat and meadow lands of the state from the effects of the present protracted drouth is a matter of great concern to the division and the department. There have been periods during the past several seasons when all human efforts to cope with the fire menace have seemed hopeless. When viewed in retrospect, however, the results are gratifying. Wide spread conflagrations with a great loss of property as well as human lives seemed imminent on several occasions but were averted. Vigilance on the part of employes of the division coupled with the generous co-operation of the personnel of federal ECW camps distributed throughout the areas as well as all local organizations, kept fires under control.



MODERN LOOKOUT TOWER

It is becoming more and more apparent that the degree of fire protection expected from the department by the public is going to be increasingly costly. The areas originally intended to be given protection from legislative funds were those included within the districts patrolled by the rangers and personnel of the division of forestry and were confined to the northern counties. During the years 1933-34 the State Forest Service acted on 300 fires outside of ranger districts. In 1933 approximately 45 fires were acted on by the division either in the form of supervision or in the organization of townships to handle the fires themselves. The expense to the division paid from state funds exclusive of salaries and expenses of the regular division personnel, to handle these fires, was approximately \$500.

During the season of 1934 there were 85 fires on areas outside of regularly patrolled districts which cost the division funds more than \$7,000.

The fires outside of ranger districts burned over a total of 38,570 acres of which 28,290 were peat fields and open bogs and the remainder highland brush and swamp and highland timber land.

Approximately 90% of the entire area outside of ranger districts was burned over before the fires were reported to the division. Over 50%of the peat land was either cultivated fields, hay or pasture land. The cost of fighting these fires was approximately \$33,833. The state's contribution was \$7,119, and \$26,714 was donated in labor and equipment by the townships and counties and private corporations and individuals.

If the department is to assume responsibility of suppressing fires in all sections of the state, the legislature should indicate definitely that this is to be a future policy. Much money can be saved if supervision is definitely centered in the division of forestry under men experienced in the suppression of fires. Township officials, no matter how desirous they are to meet the situation, have had little or no previous experience, especially in the southern and central counties, with the result that much time and money is wasted in organizing local forces to combat the fire menace.

Farmers as a class have always been in the habit of using fire freely to clear off accumulated dead grass and vegetation in pastures and on their low lands. The danger of such fires getting beyond control is always present but during the extreme dry conditions which have prevailed in recent years it has been a constant serious menace. This dry condition coupled with high winds during the early summer of 1934 resulted in an enormous area being burned over.

When the danger from running fires became apparent steps were taken to organize townships in the most hazardous areas. Township organizations were perfected in Anoka, Sherburne, Isanti, Benton, Hennepin, Ramsey, Wright, Sibley, Waseca, LeSueur and Nicollet counties. When special reports of fires came in to the department from other regions, assistance was given to the extent that the resources of the Division of Forestry would permit, especially to aid in the protection of buildings and hay and hay producing meadows.

Carlos Avery Game Refuge

Early last spring the department acquired the Carlos Avery Public Shooting Grounds and Game Refuge located in Anoka and Chisago coun-

ties near Forest Lake. The lands acquired had been used for a number of years as meadows on which had been raised wire grass for the manufacture of rugs and other grass products. After the owners of the lands had ceased to use them for this purpose the hay stumpage had been leased to farmers. Because of the nature of the cover and the degree to which the area is surrounded by settlers, the danger from fires being started and reaching damaging proportions has always been present.

A fire which swept over a considerable portion of this refuge early in the season had its origin from hundreds of small peat fires which were burning in the peat bogs surrounding the refuge. The Division of Forestry assigned a regular patrolman to have charge of the suppression work and a crew of from six to thirty-five men worked on the refuge during the greater part of the summer with three mechanical fire extinguishing units. The work was effective and by the end of the season all peat fires were extinguished.

The expense of combating the fire on this refuge alone amounted to \$5,108 of which the division spent from state funds \$590 on state owned lands and \$518 on privately owned lands.

Late in the season an ECW drouth relief camp was established on the refuge. Much valuable work was done by the recruits from this camp to prepare the refuge against future devastating fires. A complete set of fire breaks, dams and truck trails are being constructed and considerable clean up is being done. The timber which burned in the early spring fires is being salvaged. If weather conditions permit it is planned to plant from 250 to 300 acres to pine and spruce in addition to areas to be devoted to hardwoods.

As already indicated the fire hazard on this area is quite high because of extensive hay meadows within and without the refuge and the practice by owners and lessees to burn them over each spring to rid them of dead grass and weeds. An additional hazard is introduced by the large number of hunters who come from Minneapolis and St. Paul to hunt, many of whom are careless with cigarettes and matches.

Adequate fire protection to the refuge will require the erection of a lookout tower at some strategic point within the area, the completion of fire breaks, installation of a telephone system and other fire suppression appliances.

			July 1, '32-	
	1932	1933	July 1, '34	
Lumbering	17	41	59	
Railroads	48	96	179	
Hunters	159	224	374	
Road Crews	30	32	78	
Misc	137	136	422	
Land Clearing	283	576	1,185	
Lightning	17	38	52	
Camp Fires	104	119	182	

Table 14—Fires by Causes

	1000	1000	July 1, '32-	
	1932	1933	July 1, '34	
Autoists	59	63	77	
Incendiary	136	199	429	
Meadow Burning	462	. 844	1,367	
Berry Pickers	148	238	389	
Fishermen	86	99	262	
Children	39	68	120	
Smokers	347	560	949	
Unknown	34	107	202	
Employment	. 9	38	50	
Total	2,115	3,478	6,376	

Table 14—Fires by Causes—(Continued)

Table 15-Size Classification of Fires

	Season 1932	Season 1933	July, 1932 July, 1934
Under ¼ Acre	467	775	1,144
$\frac{1}{4}$ to 10 Acres	823	1,245	2,465
10 to 100 Acres	626	978	1,852
100 to 1,000 Acres	187	408	780
Over 1,000 Acres	12	72	135
Total	2,115	3,478	6,376

Table 16—Forest Fire Damage

	1932 Season	1933 Season	July, 1932 July, 1934
Timber Reproduction	\$33,401.00	\$349,224.00	\$492,485.00
Merchantable Timber	8,190.00	42,063.00	$74,\!124.00$
Cut Products	724.00	$2,\!433.00$	6,731.00
Game Cover	30,307.00	$104,\!810.00$	152,625.00
Miscellaneous	26,420.00	50,116.00	113,077.00
- Total Total damage to state lands includ	\$99,042.00 led in above	\$548,646.00 , \$72,488.00.	\$839,042.00

Table 17—Type of Area Burned Over by Forest Fires

Peat and Swamp

Season	1932				 	 	 			 		 	 	 	 	$29,\!616$	Acres
Season	1933				 	 	 		• •	 	•	 • •		 	 	72,349	Acres
July, 19	932-Ju	ly	19)34	 	 		 		 		 		 	 	$252,\!128$	Acres

Highland

Season	1932		 <i></i>	 Acres
Season	1933		 	 Acres
July, 19	932-July,	1934	 	 \mathbf{Acres}

NOTE:-These figures do not include vast areas of peat and brushland outside the forest region of the state.

Year—	Fires	Highland Area Burned Over	Peat Lowland Area Burned Over	*Total Area Burned Over	Total Damage
1929	2,392	104,881	275,718	380,599	\$290,502.00
1930	2,253	201,506	75,396	276,902	420,965.00
1931	2,778	715,199	277,732	992,931	3,490,147.00
1932	2,115	71,613	29,618	101,231	99,062.00
1933	3,478	282,376	72,349	354,728	548,646.00

Table 18—Fores	t Fire	Damage	by	Years-	-1929	-1933
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Table 19—Classification of Forest Fires as to Size—1929-1933								
	A*	В	C	D	E			
Year	Under ${}^{1}\!\!4A$	¼ to 10A	$10 \mathrm{A}$ to $100 \mathrm{A}$	100A to 1000A	Over 1000A			
1929	550	823	673	302	44			
1930	340	861	677	329	46			
1931	455	762	805	599	157			
1932	467	823	626	187	12			
1933	775	1,245	987	408	72			

Table 20—Labor Costs of Fire Suppression—1929-1933

Year—	æ	State Labor	Value Private Labor
1929		\$57,931.00	\$24,202.00
1930		171,659.00	29,583.00
1931		$151,\!681.00$	31,575.00
1932	ھر	$48,\!373.00$	8,902.00
1933		120,383.00	73,799.00

Many states do not consider the statistical record of this type of fire to be of value, therefore it is excluded. This renders comparative records of little value for the captions (area burned over) and (damage).

All of the large disastrous fires which have burned in Minnesota during the past thirty years, originated in peat and for this reason it is considered necessary to include in the statistical analysis all available records which may be useful in fire prevention education.

* The fire compilations for Minnesota include, under the caption "Total Area Burned Over," all of the peat areas, a large part of which are purposely burned each year by the farmers. The damage to soil and game cover for these fires is also shown.

Table 21-Clark-McNary Fire Data

State	1 Estimated Cost of Adequate Protection	2 Regular Federal Allotment	3 Extra Federal Allotment	4 Total Reg- ular and Extra Federal Allotment	5 State and Private Ex- penditures for Prevention	6 Total State, Private and Federal Allotment	7 Total Area Under Protection Acres	8 Total Damage	9 Total Area Burned Over Acres	10 Per Cent of Area Burned Over
1929 Michigan Wisconsin Minnesota	\$501,100 320,900 655,800	$\$42,594\ 27,276\ 55,743$	\$32,000 5,360 15,880	Ca \$74,594 32,636 71,623	alendar yr. 192 \$285,382 67,921 176,239	27 \$359,976 100,557 247,862	18,989,000 13,595,000 23,234,800	\$54,230 72,770 760,840	\$51,920 103,180 408,450	$0.27 \\ 0.76 \\ 1.76$
1930 Michigan Wisconsin Minnesota	501,100 320,900 655,800	$\begin{array}{c} 45,099\\ 28,881\\ 59,022 \end{array}$	34,281 9,106 24,776	Ca 79,380 37,987 83,798	alendar yr. 192 212,113 73,245 179,729	$\begin{array}{c} 291,493 \\ 111,232 \\ 263,527 \end{array}$	$19,947,940 \\ 13,595,540 \\ 22,489,800$	279,160 481,280 422,320	290,300 527,360 278,530	$1.46 \\ 3.88 \\ 1.24$
1931 Michigan Wisconsin Minnesota	662,000 390,000 697,000	$59,580 \\ 35,100 \\ 62,730$	68,040 10,333 36,345	Ca 127,620 45,433 99,075	alendar yr. 192 444,965 93,631 268,597	29 572,585 130,064 367,672	19,947,000 13,596,540 22,489,800	$141,240\ 515,560\ 3,521,930$	$284,940 \\ 655,440 \\ 1,008,450$	$1.43 \\ 4.89 \\ 4.48$
1932 Michigan Wisconsin Minnesota	662,000 390,000 697,000	$59,580 \\ 35,100 \\ 62,730$	$63,810 \\ 12,353 \\ 31,763$	Ca 123,390 47,453 94,493	alendar yr. 193 376,963 96,544 220,718	30 500,353 143,997 315,211	19,947,000 13,596,540 22,489,800	$\begin{array}{c} 13,300 \\ 72,660 \\ 103,710 \end{array}$	40,840 120,140 102,150	$\begin{array}{c} 0.20 \\ 0.88 \\ 0.45 \end{array}$
1933 Michigan Wisconsin Minnesota	662,000 390,000 697,000	$52,960 \\ 31,200 \\ 55,760$	57,087 34,285 34,136	Ca 111,047 65,485 89,896	alendar yr. 193 347,086 204,804 228,607	1 458,133 270,289 318,503	19,947,000 13,596,540 22,489,800	$\begin{array}{r} 145,290\\ 459,600\\ 553,750\end{array}$	205,370 277,700 ,357,332	$1.03 \\ 2.02 \\ 1.88$

Note: All columns fiscal year except Col. 5.

- Col. 1. Estimate of cost of adequate fire protection only.
 Col. 2. Regular Federal Allotment based on cost of protection.
 Col. 3. Extra Federal Allotment based on private and state expenditures for protection. Col. 4. Total of Columns 2 and 3.

- Col. 6. Total of columns 4 and 5.
 Col. 8. Total damage including game cover and soil.
 Col. 9. Total area burned over including large areas of open peat bog, part of which is burned over for agricultural uses.
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SECOND BIENNIAL REPORT

In Chapter 413, Laws 1933, the Legislature provided for the transfer of \$50,000 from the Game and Fish account of the Game and Fish Department, for the payment of fire fighting expenses. Twenty-five thousand dollars of this amount has been transferred and used in fire fighting, but on account of the shortage of available funds in the Game and Fish Department the balance has not yet been transferred. The executive Council, however, granted the extra funds needed for fire fighting.

Table 22-Statement of Expenditures for Fire Fighting Funds Transferred from Game and Fish Department

August 21, 1933	. \$10,000.00
September 18, 1933	. 15,000.00
	\$25,000,00
Funds Furnished by Executive Council	+_0,000000
1933 Expenditures	
September 12, 1932	\$25,000.00
November 30, 1932	5,000.00
December 20, 1932	. 7,000.00
May 10, 1933	. 25,000.00
· · · · · · · · · · · · · · · · · · ·	\$62,000.00
1934 Expenditures	
October 11, 1933	\$ 50,000.00
December 1, 1933	. 62,000.00
May 29, 1934	50,000.00
	\$162.000.00
Total fire fighting appropriations July, 1932—July, 1934	\$249,000.00
Total fire fighting appropriations for the season of 1934	\$165,000.00
Contributed volunteer labor (other than that received from	n
Emergency Conservation Corps and other relief agencies)	.\$ 91,764.00
Contributed time by ECW, July 1, 1933 to Sept. 1, 1934 56,72	26 man-days
Table 22 Cost of Fire Fighting Outside of Bangar Districts	Voor 1994
Table 25—Cost of The Fighting Outside of Ranger Districts—	10a1 1554
Carlos Avery Game Refuge-State land-including labor, sup	per-
vision, repairs, gas, oil, etc., but not salaries and expenses	5 OI
regular state employees	
Private Lands	518.10
Total Refuge	\$5,108.20
Private Lands outside of ranger districts, exclusive of state ga	ame
refuge	2,011.33
Total state expense for fire fighting outside of forest ranger	dis-
triata	\$7 110 5 2

Total value of co-operative labor, including the hiring of tractors, teams, pump units, and the purchase of fire pumps and equipment for the 80 fires on which state funds were expended by

Grand Total \$33,833.53

Table 24—Fires Outside Ranger Districts—1934

April 1 to September 25, 1934

Area Durned Over-	
Highland timber	2,690 acres
Swamp timber	3,172 acres
Peat fields and open bog	
Brush and open highland	4,415 acres
,	· · · · · · · · · · · · · · · · · · ·

Note: Approximately ninety per cent of the entire area was burned over before the fires were reported to the service.

Over fifty per cent of the peat land was either cultivated field or bog or pasture land.

Table 25-Slash Disposal and Logging Data

Cutting Season 1932-1933	
Number of operators	3,370
Number of 40-Acre Tracts	10,994
Number of Acres	45,760
Legal Notices—	
Number of Notices Issued	4,269
Number Complied With	4,002

Table 26

	July, 1932 to July, 1934	
Number of Arrests.	· · · · · · · · · · · · · · · · · · ·	273
Amount Imposed in 1	Fines	,000.00
Total Amount Fines]	Paid\$3	,350.00

RAILROAD FIRE PREVENTION

Previous to 1911, the year the state forest service was organized and for some time following its organization, the number of fires set by the railroads and the consequent damages were considerable. Classifications showing causes of fire at that time list seven to nine major causes of forest fires. The railroads were charged with 20 per cent of such causes. Through the co-operation of the railroads and the state forestry service the number of fires attributed to railroads and resulting losses have been greatly reduced. Factors which have contributed to the reduction of such losses are the greater use of gas and electric locomotives, larger steam

locomotives hauling greater tonnage and highways paralleling the rightof-way acting as fire breaks. The major factors, however, are (1) the improvement of the fire appliances of the locomotives themselves due to constant and rigid inspection, which not only led to immediate repairs being made, but by showing constantly recurring defects, indicating faulty design; (2) increased efficiency in railroad patrolling and improved equipment of patrolmen; (3) improvement in the condition of the rights-of-way by the cleaning up of dead and down debris but not the cutting of brush which has proven to be a measure of protection and not a hazard; (4) and the general education of railway employees as to a better appreciation of what constitutes outstanding fire hazards.

Fires caused by burning ties, right of way burning material from trains by engine men and train crews, have been reduced nearly to a minimum. The action on fires by railroad employees has been quicker and more efficient.

Patrolling

The most effective method of quick detection of fires started along the railroads as well as of immediate suppression is patrolling after trains. This is done by patrolmen using a gas speeder equipped with fire fighting tools. The patrolman usually follows ten to twenty minutes after each train, depending upon weather conditions. Patrolling is ordered on and off by the ranger through the St. Paul office. There are now in operation sixty-nine special patrol beats. Two of the roads use section crew patrol.

Locomotive Inspection

The greatest fire risk is the locomotive. No method of absolutely preventing the setting of fires by locomotives, even with the use of spark arresting screens of the smallest possible mesh consistent with proper drafting, has been found. Improved spark arrestors are constantly being invented and tried and other means are used to reduce locomotive fire hazards.

The ash pans of locomotives are being improved. Heavier material is being used and new designs of hopper bottoms and better protection of the draft openings assures greater fire protection.

Ash pans and front ends are regularly inspected at the terminals by division employes and when defects are found they are repaired. A conscientious effort has been made by railroads generally to maintain a high standard of efficiency in the use of fire protective appliances.

Cooperation From Outside the State

Co-operation with agencies in bordering states and Canada engaged in railroad fire prevention is desirable. The states of Wisconsin and Michigan have men assigned to railroad fire prevention work. The Canadian National Railways are now willing to meet our standards. Conferences should be arranged between these various groups for a mutual exchange of ideas and what is more important to arrange for the enactment of unified laws and rules and regulations to embody railroad fire prevention measures.

	Can. Nat.	C.M.St.P.&P	D. W. & P.	D. M. & N.	D. & N. E.	G. L. Co.	Gt. Nor.	M. R. L. & M.	Soo	Hill City	M. D. & W.	Nor. Pac.
		19	30									
Number of Defects Locomotives Inspected Locomotives Defective Percentage of Inspected Found Defective	$27 \\ 11 \\ 11 \\ 100$	$\begin{array}{c}14\\9\\7\\53.6\end{array}$	$\begin{array}{r} 6\\9\\4\\44.3\end{array}$	$11 \\ 29 \\ 11 \\ 37.9$	$\begin{smallmatrix}&0\\12\\0\\0\end{smallmatrix}$	$\begin{smallmatrix}&4\\12\\&4\\33.5\end{smallmatrix}$	$34 \\ 40 \\ 22 \\ 55.0$	· · · · · · ·	$16 \\ 17 \\ 14 \\ 82.3$	· · · · · · ·	· · · · · · · · · ·	$14 \\ 41 \\ 11 \\ 26.8$
		193	31									
Number of Defects Locomotives Inspected Locomotives Defective Percentage of Inspected Found Defective	$31 \\ 12 \\ 12 \\ 100$	$\begin{array}{c}2\\2\\1\\50.0\end{array}$	$26 \\ 27 \\ 15 \\ 55.5$	$15 \\ 54 \\ 14 \\ 25.9$	$\begin{array}{r}2\\11\\2\\18.1\end{array}$	0 5 0 0	$63 \\ 100 \\ 41 \\ 41.0$	0 4 0 0	$17 \\ 19 \\ 11 \\ 57.8$	$\begin{array}{c}2\\1\\1\\100\end{array}$	$\begin{array}{c}11\\15\\7\\46.6\end{array}$	28 79 23 29.1
		19	32									
Number of Defects Locomotives Inspected Locomotives Defective Percentage of Inspected Found Defective	$41 \\ 16 \\ 16 \\ 100$.9 15 8 53.3	$ \begin{array}{r} 7 \\ 18 \\ 7 \\ 38.8 \end{array} $	$24 \\ 109 \\ 20 \\ 18.3$	$\begin{array}{c}1\\6\\1\\16.6\end{array}$	0 2 0 0	$119 \\ 265 \\ 81 \\ 30.5$	0 4 0 0	24 80 16 20.0	$\begin{array}{c}2\\1\\1\\100\end{array}$	$\begin{array}{r}2\\12\\2\\16.6\end{array}$	$\begin{array}{r} 41 \\ 159 \\ 30 \\ 18.8 \end{array}$
		19	33									
Number of Defects Locomotives Inspected Locomotives Defective Percentage of Inspected Found Defective	 	$\begin{smallmatrix}1\\7\\1\\14.3\end{smallmatrix}$	$10 \\ 18 \\ 5 \\ 27.7$	$101 \\ 3 \\ 2.97$	0 2 0 None	· · · · · · · · · ·	$20 \\ 124 \\ 18 \\ 14.5$	0 2 0 None	$\begin{array}{r}2\\48\\2\\4.16\end{array}$	· · · · · · ·	$\begin{array}{r}1\\8\\1\\12.5\end{array}$	$25 \\ 115 \\ 22 \\ 19.1$
		TO SEPT	. 1, 193	4								
Number of Defects Locomotives Inspected Locomotives Defective Percentage of Inspected Found Defective	· · · · · · · · · ·	$\begin{array}{c} 11\\6\\6\\100\end{array}$	$\begin{array}{r} 6\\8\\4\\50\end{array}$	1 95 1 1	0 4 0 None	1 1 1 100	67 194 53 27.3	1 1 1 100	$\begin{array}{r} 6\\ 37\\ 6\\ 16.2\end{array}$	1 1 1 100	0 5 0 None	$15 \\ 115 \\ 12 \\ 10.4$

Table 27-Inspection Report of Fire Protection Appliances on Steam Locomotives

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SECOND BIENNIAL REPORT

Table 28-Railroad Fire Prevention

	1928		
Forest Fires Within the Protection Area, Including Railroad Fires	Railroad Fires Within Protection Area	n the	Percentage of Railroad Fires to Total
Number 1,271 Area, acres 125,526 Damage \$76,364.00	Number Area, acres Damage	201 3,397 \$1,234.00	$15.8 \\ 2.7 \\ 1.6$
	1929	-	
Number 2,392 Area, acres 380,599 Damage \$290,502.00	Number Area, acres Damage	316 3,402 \$3,132.00	$13.2\\0.9\\1.1$
	1930		
Number 2,253 Area 276,902 Damage \$420,965.00	Number Area, acres Damage	$108 \\ 2,188 \\ \$1,841.00$	$\begin{array}{c} 4.4\\ 0.79\\ 0.44\end{array}$
	1931		,
Number 2,778 Arsa, acres 992,931 Damage \$3,490,147.00	Number Area, acres Damage	103 7,521 \$12,024.00	$3.7 \\ 0.75 \\ 0.34$
	1932		
Number 2,115 Area, acres 101,231 Damage \$99,042.00	Number Area, acres Damage	52 347 \$1,054.12	$2.4 \\ 0.34 \\ 1.07$
	1933	· · ·	
Number 3,478 Area, acres 354,728 Damage \$548,646.47	Number Area, acres Damage	$106 \\ 514 \\ \$740.26$	$3.05 \\ 0.15 \\ 0.14$
	Fo October 1, 1934		· .
Number 2,700 Area, acres 350,000 Damage	Number Area, acres Damage	$142 \\ 1,000 \\ \$7,500.00$	5.2 0.28

PUBLIC RELATIONS

Public relations activities of the Division of Forestry for the biennium may be summed up briefly as follows:

Thirty-five exhibits were placed in connection with state and county fairs, sportsmen's conventions and in windows of business establishments in the large cities.

One hundred and twenty-two newspaper and magazine articles were published during the biennium. Twenty-four films, ninety-nine pictures, one hundred and fifty-eight cuts and ten slides were loaned to public and semi-public agencies.

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Two Boy Scout camps were sponsored by the division. The camp was held at Elbow Lake on the White Earth State Forest in 1933 and in Itasca State Park in 1934. A scout leader's course in forestry is also sponsored by the division.

A total of two hundred and ten lectures were given between January 1st, 1933, and July 1st, 1934, with an aggregate attendance of 36,696 people or an average of 184 in attendance at each meeting.

The division has distributed one hundred and forty-one thousand pieces of literature during the biennium and has published one hundred ten thousand new pamphlets.

The division holds a training school for personnel each year. This school is held at Grand Rapids.

The forestry course for the enrolled men in Emergency Conservation Camps was introduced by the division. The course was written by members of the division staff and taught by the technical forester of each camp. In addition, two men were assigned to the camps to show conservation movies. During the winter 1933-1934 one hundred eighty-one meetings were held in the camps and 24,975 men viewed these movies.

Each lookout tower maintains a register where visitors are requested to record their names. In 1933 an aggregate of 33,915 persons visited lookout towers and in 1934, 31,920 were registered.

Fire School

With increasing burdens being thrown upon the division by extreme fire hazards created by the recent drouth, a personnel especially trained in fire fighting methods is essential. In order to study methods for fighting different types of fires, as well as to try the various kinds of equipment offered for sale with which to combat fires, a fire school was conducted at the Badoura State Nursery on July 10th, 11th and 12th of this year. At the time the school was being held there were a number of fires burning in the vicinity of the nursery, furnishing a number of the normal problems encountered throughout the state.

One hundred and fifty-four employees of the division of various ratings attended the school. Instructions continued for three days. Numerous methods of fighting fires by trenching in peat and mineral soils were tried and demonstrated as well as the use of equipment. This being the first school of its kind it was largely experimental. The results obtained, however, demonstrated its value and was in all probability the best of any of the schools that the division has conducted. Plans are under way to make it a permanent annual event.

The Conservation Commission arranged its July meeting to correspond with this school and held it at the nursery where the members spent their time meeting the division personnel, viewing the nursery and acquainting themselves with the fire fighting problems of the division.

Historical Pageants

In addition to the routine public relations activities above referred to, the Division of Forestry, in co-operation with the Northwestern Historical Association, has sponsored and staged several historical pageants.

The first one was shown at Lake Itasca during the summer of 1932 when the event of the discovery of the source of the Mississippi River by Henry Rower Schoolcraft in 1832 was depicted and was known as "The Schoolcraft Centennial Pageant." A cast of fifty Indians from nearby reservations and as many whites from employes of the Division of Forestry and the University School of Forestry, made up the troupe. The cost of the pageant was shared by the Northwestern Historical Association and the Division of Forestry and Park funds. It is estimated that 48,000 people witnessed the shows.

During the summer of 1933 a second pageant, "The Diamond Jubilee" commemorating the seventy-fifth anniversary of the state's admission to the Union was staged. To help finance such events, the legislature of 1933 gave the department authority to make certain charges for parking and camping privileges made available to those in attendance. The cast was made up of practically the same Indians as took part in "The Schoolcraft Centennial" shown the year previous. The whites were recruited from employes of the division and CCC boys from nearby camps. This pageant was shown at Lake Itasca on July 2, 16, 30 and August 13, 27 and September 4th. The aggregate attendance was estimated at about 40,000.

At the urgent request of the people of southeastern Minnesota and inspired by the enthusiasm of Earle Barker of the Northwestern Historical Association, the entire cast with scenery, cook-carts, tents and equipment were moved in a caravan of forest and state park trucks to Whitewater State Park where the same "Diamond Jubilee" pageant was staged on August 20th, the caravan returning again to Itasca State Park. It was estimated that from twenty-five to forty thousand people attended this performance.

The 1934 pageant was made to commemorate the 100th anniversary of the arrival of Henry Hastings Sibley to Minnesota and was known as "The Sibley Centennial." It depicted Sibley's arrival to the state and the events in his life here in Minnesota. The cast was similar to that of previous pageants. It was shown six times at Itasca State Park, performances being shown on July 1st, 15th and 29th; August 12th and 26th and September 2nd, 1934.

The pageant moved to Fort Ridgely, where it was shown on August 21st and 22nd. The total aggregate attendance at the six Itasca State Park performances is estimated at 53,000, the attendance at Fort Ridgely on August 21st and 22nd at 18,000.

Minnesota's historical pageants have aroused national interest. Public appreciation expressed by attendance at the performances indicates that the reproduction of early state history meets with enthusiastic public approval. It is believed that the state may well make these pageants a distinct Minnesota feature. Not only do they furnish summer entertainment to visiting tourists and to our own people, but they can be made a medium through which citizens of our own and other states may be made better acquainted with our state parks.

The department and more especially the division of forestry has contributed a great deal of time and energy as well as funds to make these early pageants a success. The public response to last summer's performances would seem to be an indication that the pioneering and experimental stage has passed and that with proper leadership and the fixing of reasonable charges which will not be a burden to anyone desiring to attend, pageants can be made self-supporting.

RELIEF ACTIVITIES

Beginning in November of 1932 and since that time the Division of Forestry has participated quite actively in the various kinds of projects launched for the relief of unemployment. The first project was one carried on in co-operation with the State Board of Control and was launched in November, 1932. An old building in Itasca State Park was fixed up for sleeping quarters and a mess hall. Thirty-five men taken from the relief rolls in Bemidji were placed in this camp and provided with clothing and food. The food supplies, clothes and incidental expenses were paid by the State Board of Control. The bunking and mess facilities and tools were provided by the State Forest Service. In the fall of 1933 the Board of Control set up another relief camp in Itasca State Park on about the same plan as the first one and was operated as such until in the fall of 1934 when it was reorganized and taken over as a transient relief administration camp.

Transient relief administration camps have proved very popular with the result that at the present time there are thirteen of such camps on park and forestry areas. Of these three are in buildings erected entirely or in part from division of forestry funds, seven are in vacated ECW camps, one occupies a rebuilt lumber camp and two are in barracks built entirely from material furnished by the TRA.

More than 1,500 men in TRA camps are now engaged in forestry and park projects. The locations of present camps are:

Elk Lake—Itasca State Park.

Headquarters-Itasca State Park.

Squaw Lake-Itasca State Park (under construction).

Long Lake-White Earth State Forest.

Park Avenue-Pine Island State Forest.

Happyland—Pine Island State Forest.

Independence—(This is on the Miller's Trunk, north of Duluth and not really a forest camp.)

Brule River-Grand Portage State Forest.

Sandy Lake-Savanna State Forest.

Thistle Dew-George Washington State Forest.

Bear Lake-George Washington State Forest.

Badoura State Nursery-George Washington State Forest.

Perch Lake-George Washington State Forest.

Crystal Springs-Whitewater State Park.

St. Louis County Emergency Relief Projects

In addition to the TRA camps the St. Louis County Emergency Relief Commission in co-operation with the State Board of Control established several co-operative employment projects financed in part by funds from the Federal Reconstruction Finance Corporation. All of the projects were in the nature of forest land improvements and were placed under the supervision of the division of forestry. A summary of these projects is shown in table 29.

Name of Project—	lo. of Men Employed	Total Labor Man Hours	· Total Labor Costs	Fund Allotted	Fund Balance
Cloquet Valley	. 222	12,936	5,821.20	6,000.00	178.80
Orr	. 115	2,222	999.90	1,000.00	.10
Ray-Kabetogama	. 55	1,110	499.50	500.00	.50
Tower-Ely	. 170	3,840	1,728.00	1,750.00	22.00
Hibbing-Sturgeon Lake .	. 77	2,7431/4	1,234.46	1,250.00	15.54
Markham	. 37	804	361.80	500.00	138.20
Camp Siegal	. 17	510	229.50	500.00	270.50
Total, All Projects	693	$24,\!165\frac{1}{4}$	$10,\!874.36$	11,500.00	625.64

Table 29-Summary of St. Louis County Emergency Relief Projects

It should be emphasized that the work on administering these camps has been taken care of by the Division of Forestry in addition to its regular work with no additional funds for overhead and supervision.

Emergency Conservation Work

By an act of March, 1933, President Roosevelt's plan to establish ECW for the conservation of our natural resources all over the nation became a law. Responsibility for supervising the work within the forest areas was turned over to the U. S. Forest Service. ECW state park camps were placed under the supervision of the National Park Service.

The department of conservation at once set about preparing plans to emphasize the worth and need of this class of work and the possibilities to be accomplished within the state of Minnesota. Through efforts of the governor, the energetic co-operation of all of the department's divisions and members of its staff, 61 camps were approved for the state. They were: twenty-five state forests; twenty-four national forests; nine erosion and three state park camps.

July 1st, 1934, completes one year of emergency conservation work. During the first month or six weeks of operation, camp construction required a considerable portion of man-power. Camp construction was under the direction of the U. S. Army. The camps were sheltered in tents until permanent quarters were completed which in some instances was not until early winter.

During the months of September and October considerable time was spent on fire fighting. In fact in some camps little forest field work was being done during that period. Field work was again interrupted when the camps were being changed into winter quarters. ECW enrollees were then used on the construction of camps. More recently a general order has been issued by the National Director of ECW requiring local labor to be engaged on camp construction.

Since the first of November, 1933, however, the regular field work has been progressing steadily with a progressive increase in the total strength of man-power turned over to camp superintendents for field work. This increase in output may be illustrated by the fact that for the month of November, 1933, the average number of field man-days per camp was 73 while the average number during the month of June, 1934, was 153.

Camp administration is in charge of a camp commander while the work of forest improvements in the field is under the camp superintendent. In addition to the army personnel which in addition to the commander usually includes four or five subordinate officers, there are twenty to twenty-five ECW enrollees assigned to camp work. An additional assignment of enrollees, charged to forest projects, are used to assist camp superintendents in the camps. The following is an assignment list for a typical camp.

Table No. 30-Illustrating Typical Camp Supervisory and Enrollee Staff

Forestry-

Camp Superintendent Technical Forester Engineer Foreman 4 General Foremen Camp Commander Assistant Commander Medical Officer Educational Advisor

Enrollee---

Clerk Warehouse Man Blacksmith Mechanic Tool Dresser Truck Drivers Machine Operators Enrollee----

Army—

Clerk Senior Foreman Asst. Educational Advisor Mess Steward 4 Cooks Baker Orderly Storekeeper Hospital Attendant Light Plant Attendant Bath House Keeper Truck Drivers

		T 1 15 100	T 1 1 10 /
Projects—	Unit	July 15, '33 July 1, '34	July 1, '34 Sept. 15, '34
Telephone Lines	Viles	441 1	118
Fire Breaks	Miles	162	54
Reduction of Fire Hazards	Acros	21 816 5	7 033 7
Roadside Clearing or Clean-up	Tiles	437.1	120.8
Trailside Clearing or Clean-up	Milog	63.2	27.4
Lookout Towers	Number	49	69
Fighting Forest Fires	Van.davs	42.019	14.726
Fire Presuppression	Man-days	787	890
Fire Prevention	Man-days	88	144
General Clean-un	Acres	47	36
Forest Stand Improvement	Acres	14 675 1	2.020
Roads Truck Trails	Viles	320.6	147 1
Roads Minor	Tilog	47	11111
Trails Foot	Tiles	22.5	30
Dwellings at Permanent Stations	Jumbor	10	
Dwellings at Temporary Stations	Jumber	3	1
Tool Houses and Boyes	Jumber	- 31	2
Barna	Jumbor	8	· · · · ·
Office Puilding	Jumbor	15	1
Public Comp Cround Cleaning	Vamber	177.8	578
Public Comp Ground Duildings	Jumbon	19	01.0
Other Public Comp Cround Englisting	Jumbor	13	97
Other Public Camp Ground Facilities	Jumbor	50	19
Tanaga Other than Dange	Mumber Milog		14
Weter Grateria Dire Lines	nnes Foot	1 900	14
Water Systems, Pipe Lines	reet	1,500	1
Water Systems, wells and water Holes.	Number	1 (220 ()	4 E9477
News	Acres	1,002.9	004.7 901
Fun entry	an-days	2,840	. 521
Experimental Plots	Number	1	070
Seed Collection—Confirms (cones)	Susneis	80 10	010
Insect Pest Control (a) Tree	Acres	10	
The and Plant Diverse Centrel	Acres	14 099	9 571 6
Guine Lines	Acres	, 14,028	0,071.0
Survey, Linear	Anes	117 0/9	112.3
Survey, 11mber, estimating, forest type F	Acres	117,045	66 916
Survey, Range, special use, etc.	Lumber	97	00,510
Erosion Control—Dams	Jumber	51	
Bridges, Horse	Jumber	4	19
Bridges, venicle	Number Milog	40	12
water Improvement-Stream	unes Jumbon	1 1	
Dams—Recreational	vumper		165
riooq Control (Dams) Earth Fill	Ju. 10S.	50	109
Landscaping (a) Undifferentiated	icres	<u>ک</u> ۲ ۸	
Landing Fleids—Airplanes		14	
Searching for Missing Persons	aan-days	60	47

Table 31—Classification of State Forestry ECW Work

Fire-Fighting	Days 42.019		
Presuppression Prevention	787 88		
At a cost of \$3.00—42,894 per day 23 Steel Lookout Towers—Delivered	· · · · · · ·	\$128,682 12.642	
10 Steel Lookout Towers—Ordered		5,500	
562 Miles of Telephone Wire		3,408	•
20,810 Brackets		428	
2,610 Insulation		1,016	
Badoura Nursery Sprinkling System		812	
Wire on Badoura		584	
Wire for Gheen Plantation		90	
Wire for Side Lake Plantation		90	
Materials and Labor on Structures (estim MFS Ranger Station, Patrol Cabins, houses, Garages, Docks and ECW Bu	nated): Ware- ildings		
which may become property of MFS		25,000	
			\$178,263
ECW Expenditures within the State for Materials and Supplies which constitute a to State as a whole:	Labor, benefit		
ECW Personnel Salaries and Expenses ECW Hire, Materials, Supplies and Equip	nent	247,442 166,217	
Forestry ECW Expenditures-Total.		• • • • • • • •	413,659
CCC Expenditures within State which are a to State as a whole (estimated): CCC Personnel, allowance and cost of clothing etc	benefit food,	4 200 000	
Labor and Materials for 20 complete can State Forest Lands	1ps on	360,000	
			4,560,000
Emergency Expenditures, State Forest Camps- GRAND TOTAL	-		\$5.151.922

Outlines for work projects for each of the ECW camps originate with the director of forestry and the district forest rangers. These projects are submitted to the ECW field organizer to be incorporated in the camp work plans. Certain classes of work however, particularly those which entail an expenditure of money for materials, first have to be submitted to the Milwaukee office of the U. S. Forest Service for approval. The camp superintendents are guided entirely by the camp work plans.
Projects such as roads, dams, buildings, telephone lines, etc., which necessitate the procurement of land by purchase, lease or easement are held up until the necessary deeds, leases or easements have been secured. The forest ranger in whose district such camp projects are located assumes responsibility for the acquisition of rights to these lands.

In accordance with set-up made by the National Director of ECW and the U. S. Forest Service, the camp commander, camp superintendent and district rangers must work in close cooperation and harmony in order to secure maximum results. The U. S. Army has been given the responsibilities of operating the camp. The U. S. Forest Service is held responsible for the planning and execution of work projects and acts through the Division of Forestry of the Department of Conservation. It is obvious from this inter-relationship between different federal agencies and between federal and state departments that without the closest and most harmonious cooperation, satisfactory progress is not possible.

Table 31 enumerates in miles, number, days, acres, etc., the accomplishments of ECW in the field during the years of 1933-1934. Table 32 shows actual expenditures and equivalents of expenditures within these camps.

These tables enumerate the fiscal accomplishments of ECW camps but this picture conveys only the practical side. There is the human and more dramatic story about the thousands of boys who have been doing this work. They come from the streets of the cities and the farms in Minnesota and neighboring states. They come from families hardest hit by the four years of depression. They were given the opportunity, in the finest, cleanest and healthiest job there to earn their way, send some money back home and profit physically, mentally and spiritually.

For the ECW enrollees it has meant an opportunity for work. It has provided his family with a small amount of cash as direct relief which has lightened the burden on the local and state relief agencies.

The state as a whole has shared the benefits from direct expenditures of money for the purchase of supplies, materials and equipment. The state has benefited in particular through the expenditure of money for material and the payment of labor, funds for which would otherwise have to be provided sometime by the state. As a result of this work the forest conservation program for the state has been advanced many years and it has been possible to accomplish improvements which have been urgent for the past fifteen or twenty years. With the completion of this work without cost to the state, provision to maintain what has been done as well as to carry on that which has been started must be made if full value of the work shall be realized.

The President has already indicated a plan to continue in effect ECW. The work can be done only on publicly owned lands and because of the relatively small proportion of such lands suitable for forest management within state forests, ECW has already covered the greater portion of publicly owned tracts. Therefore in order to justify to the U. S. Forest Service and federal agencies in charge of this work, continuance of present camps or establishment of new ones, it is vitally necessary that the state secure control of considerable additional areas in each state forest. Without some assurance that such areas may be converted to public ownership in the immediate future, it is unwise to request and recommend the continuance of many of the camps now operating.

The most practicable way to make available publicly owned lands within state forests in time to meet the situation would seem to be to permit all lands which have been tax delinquent for a period of five years or longer, located within state forests, to revert to the state in the spring of 1935.

State Park ECW

During May 1933 when plans had been prepared for National Forest Service ECW forest camps, the department received word that park camps similar in general organization had been approved and were to be allotted to the various states for the management of public parks under the jurisdiction of the National Park Service of the U. S. Department of Interior.

Applications were prepared and requests made for park camps in Itasca, Jay Cooke and Scenic State Parks. They were approved and camps moved in the latter part of June 1933. A second six month camp period was authorized and applications prepared for the same three parks and several others. Only the three original camps were approved for the second period.

In February applications were sent in for eleven park camps for the third and fourth periods with the result that the three old camps were approved for the third period and Whitewater and Gooseberry were added to the list. In June 1934 it became known that drouth camps would be available and applications were submitted for ten additional camps. The state Department of Highways too submitted applications for similar camps to do roadside beautification and camp ground development.

Minnesota was allotted drouth camps for Fort Ridgley, Camden, Gooseberry Falls and Whitewater Parks and one camp for highway improvement near Lutzen.

About the same time word was received that the three original camps had been approved for a fourth period which would carry them through to March 31st, 1935. The drouth camps were approved until June 30, 1935. One camp has been reserved by the National Park Service for the improvement of a sub-marginal purchase unit in the St. Croix River east of Hinckley, now in process of being acquired.

Since the first Minnesota park camps were established the latter part of July 1933 to August 31st, 1934, the parks have had the benefit of sixty camp months. The accomplishments of National Forest State Park Camps during this time is shown in table 33.

The actual expenditures on park ECW camps up to September 1, 1934 are summarized in table 34. The improvements to each state park effected by ECW park camps are listed in the description of the parks contained under the heading "State Parks" of this report.

Telephone Lines	6.8	miles
Firebreaks	20.7	miles
Fire Hazard Reduction	2,204	acres
Roadside Clearing	24.9	miles
Trailside Clearing	32.8	miles
Lookout Towers	1	miles
Fighting Forest Fires	4,337	man days
Forest Improvement	1,106	acres
Truck Trails	16.4	miles
Foot Trails	46.2	miles
Horse Trails	5.3	miles
Tool Houses and Boxes	14	
Camp Ground Clearing	75.6	acres
Camp Ground Buildings	6	
Camp Ground Latrines	9	
Water Systems	4,530	feet
Water Systems	6	units
Waste Disposal	2,820	feet
Other Camp Ground Facilities	90	units
Minor Roads	4.8	miles
Other Camp Ground Structures	21	
Planting	271	acres
Plant Disease Control	7,312	acres
Lineal Surveys	49.2	miles
Topographic Surveys	5,465	acres
Bridges, Vehicle	1	
Bridges, Foot	.6	miles
Landscaping	109	acres
Eradication Poisonous Plants	18	acres
Seed Collection	52	bushels
Dams, Recreational	1	
General Cleanup	121	acres
Nursery Work	120	man days
Rodent Control	210	acres
Erosion Control	56,147	sq. yds.
Stream Improvement	13.2	miles
Fences	20.5	miles

Table 33—Classification of State Park ECW Work

Table 34—Total Cost of ECW Park Camps, Exclusive of Pay, Food, Shelter, Clothing, Medical Attention, Transportation and Camp Supervision

Up to and Including September 1, 1934

DROUTH RELIEF CAMPS

Camps—	Supervision	Tools	Equipment	Material	Supplies	Total
Camp No. 1, Whitewater	\$1,445.08	\$756.38	\$199.11	\$48.52	\$40.13	\$2,489.22
Camp No. 2, Gooseberry Falls	1,472.95	839.88	160.50		5.13	2,478.46
Camp No. 3, Camden Park.	780.56	156.00	144.41		18.42	1,099.39
Camp No. 4, Ft. Ridgely	1,621.13	791.37	151.52		65.98	2,630.00
Camp No. 5, Spruce Creek	. 1,062.40	363.99	249.99	34.40	76.98	1,787.76

STATE PARK CAMPS

Camps—	Supervision	Tools	Equipment	Material	Supplies	Total
Camp No. 1, Itasca	\$21,994.88	\$1,710.64	\$9,403.82	\$7,436:38	$$748.31 \\ 772.29$	\$41,294.03
Camp No. 2, Jay Cooke	23,688.10	1,151.30	4,957.24	7,912.86		38,481.79
Camp No. 3, Scenic	22,723.03	1,521.60	6,306.88	3,774.36	798.04 198.00 317.91	35,123.91
Camp No. 4, Whitewater	4,411.29	1,439.84	731.74	674.87		7,455.74
Camp No. 5, Gooseberry Falls	5.083.10	1,020.33	644.50	419.65		7,404.49
Grand Total	\$84,282.52	\$9,760.33	\$22,949.71	\$20,301.04	\$3,041.19	\$140,334.79

Summary of Expenditures on ECW Park Camps in Minnesota, Up to and Including September 1, 1934

60 camp-months at 200 men per	r camp 12,000	man-months
12,000 man-months at \$90.00 per	r month	\$1,080,000.00
Total expenditures shown under	Table 31	140,334.79
	-	
Grand Total		\$1.220.334.79



FEEDING DEER IN ITASCA PARK.

DIVISION OF GAME AND FISH

ERLING SWENSON, Director

GENERAL STATEMENT

The rapid falling off of revenues during the past two or three years because of depressed economic conditions and the very material diversions made by recent legislatures from game and fish funds for purposes not heretofore financed from this source have created a situation in the fiscal affairs of the division which deserve of special analysis and a reconsideration of some of the sources from which the division receives its support.

It will undoubtedly be conceded by all who enjoy fishing and who know of the relative opportunities offered for the enjoyment of this sport in other states that the lakes and streams of Minnesota give greater returns to the sportsmen for time and money expended than perhaps any other state. We have more lakes. It is not known how many miles of flowing streams capable of supporting fish life there actually are within Minnesota but certainly they compare in size and adaptability for fishing with the best of states.

By the same measure that these opportunities give abundant sport they also create a tremendous problem of administration. No other state has as many lakes and streams that require restocking and from which rough and predatory species of fish have to be removed. All species of game fish native to this part of the continent and a few species found nowhere else have their habitat in our waters introducing a multiplicity of regulars to prevent the complete extermination of any one of them. The staggering of the seasons on these varieties, the aggregate length of the open seasons when one or more of Minnesota's species may legally be taken and the thousands of lakes and streams to be patrolled make law enforcement a problem of enormous proportions.

If our waters are to continue to yield game fish to the sportsmen our hatchery output must be expanded to a point where the limit of its output will be measured by the supply of fish eggs that can be procured. For species that may not be artifically propagated all natural breeding and rearing grounds must eventually be closed to public fishing and artificial ponds made to supplement the supplies provided by naturally reproducing areas. Since the maintenance of our game fish supply into the future will hinge on the propagation and protection of the various species all other projects and activities of the division should be made subordinate to an unrestricted and uninterrupted support of fish propagation and employment of the necessary game wardens to enforce game laws.

Notwithstanding the recreational advantages and food supplies furnished by our fish life and the unusual administrative problems which the propagation and protection of such resources create, the fees charged for fishing licenses in Minnesota is only half of what anglers are asked to pay in state with conditions comparable to ours. Resident anglers are required to pay only fifty cents for licenses in Minnesota. Louisianna is the only other state charging this amount for the privilege of fishing. Twenty-eight

Contro

states charge from \$1.00 to \$5.00 for resident fishing licenses. Residents in Minnesota where fishing may be enjoyed from May 15 when the trout season opens until February 1st when the crappie season closes pay less than one-half for the privilege of angling charged by any of the states with comparable conditions.

Not only is the fee charged for resident fishing licenses emphasized as being inadequate but there are other adjustments in fees and charges for the privilege of hunting, trapping and taking in other ways wild animal life in Minnesota that merit consideration.

Game and Fur Breeders Activities

Fur breeding like other ventures which depend for their initial introduction on high pressure promotion has gone through a process of "debunking" and has been brought down to a level where it is being analyzed deliberately in the light of economic facts. In the early stages especially during the years of unprecedented prosperity the fabulous prices paid for brook stock, ranching fees collected from owners of breeding animals, registration fees and pelting and veterinarian fees made the fur farming business an impressive enterprise. High prices received for pelts was an inducement for people to invest in breeding stock although payment of promised profits on brood stock on pelts were rarely redeemed.

Over-speculation and fictitious values coupled later with the depression have affected disastrously a large number of fur breeding enterprises.

The fact remains however, that large volumes of furs, dressed and undressed, are being imported into the United States from foreign countries. There seems to be no reason why such a state of affairs should exist since opportunities for producing fur bearers within our own country should be ample to meet the demand for all pelts except those from animals which are not native here. It is reasonable therefore to expect that there will be a revival of the fur producing industry. In anticipation of such a revival it is proper to note that the department under present statutes is powerless to regulate promotion schemes which have for their sole purpose the inducement of people to buy stock in fur breeding ventures. The department does not now have authority to revoke or refuse to issue licenses to fur farmers. If the department is to be held responsible for the regulation of the fur breeding industry legislation should be enacted with a view to giving it effective authority to deal with the subject.

The following is a comparison of the number of fur and game breeders licenses issued by the department during the years 1931, 1932, 1933 and 1934.

1931	1932	1933	1934
1,710	1,067	835	701

The number of fur breeding farms which were discontinued or failed to secure renewal of licenses during the years 1932, 1933 and 1934 are;

1932	1933	1934
868	833	901

RECOMMENDED ORGANIZATION OF GAME MANAGEMENT ACTIVITIES

DIVISION OF GAME & FISH



The success of this Program is dependent upon the organization which will be responsible for its execution. The organization should be similar to the above and should be in charge of a competent Come management expert. SECOND BIENNIAL REPORT

The number of fur and game breeders tags sold during the years 1931, 1932, 1933 and 1934 are:

1931	1932	 1933	1934
7,488	17,887	8,270	8,366

Figure 12 is a graph showing the trend in sales of game and fur breeders licenses from 1929 to 1934.



Table 35 is a recapitulation by years of the species and number of each of animals possessed by fur breeders or as pets for the years 1931, 1932, 1933 and 1934.

SECOND BIENNIAL REPORT

Specie	1931	1932	1933	1934
Fox	9,105	8,189	10,647	9,603
Mink	21,039	$15,\!452$	9,134	6,834
Skunk	668	389	241	193
Muskrats	49,711	15,901	4,961	4,196
Raccoon	3,316	2,878	2,438	1,992
Beaver	1,088	874	503	591
Pheasants	1,335	2,936	5,520	4,130
Ducks	2,337	3,407	2,388	2,439
Geese	336	425	505	511
Quail		40	30	65
Fitch	37	190	242	269
Deer	.96	69	70	62
Badger	105	72	53	26
Elk	6			•
Weasel	7	3		••••
Ermine	2	· · · · ·		2
Bear	24	11	25	18
Squirrel	213	50	267	26
Rabbit	459	29	12	18
Opossum	13	. 9	14	2
Fisher	3		• • • • • •	4
Marten	14	16	15	5
Otter	4	11	14	13
Wolves	8	••••		13
Wild Cats	3	1	4	2
Coyote	. 3			
Turkeys	88	50	163	111
Swan	5	5	9	8
Eagle	2		2	. 3
Buffalo	4		• • • •	
Porcupine	3		• • • • •	• • • •
Monkeys	3	5	5	• • • • •
Pea Fowl	2	1	1	
Frogs	1,127	1,112	1,124	1,101
Total	.91.166	52,125	38,387	31,136

Table 35—Recapitulation Game Breeders' Reports Number of Animals on Hand as Per Licenses Issued

Division Finances

Figure 13 gives a graphic analysis of receipts and expenditures for the years 1930-1933. It will be noted that there has been a constant falling off in receipts during these years. From a high peak in 1930 of \$873,909.08 the income of the department dropped in 1933 to \$632,631.28 or a total decrease of approximately \$240,000 in two years. This decline in revenues came at a time when economic conditions called for a greater degree of protection of game and fish against violators.

The revenues received during the last few years of the pre-depression period had tended to accumulate and build up a surplus in the division funds. The Legislature of 1929 from a similar surplus which had accumulated in 1928 and prior years, appropriated \$512,540 to the general revenue fund of the state. In 1932, when a similar surplus accumulated, sportsmen and wild life conservationists generally, urged upon the Conservation Commission which had been created by the 1931 Legislature, to build up the law enforcement organization and in other ways expand operations and increase the usefulness and efficiency of the department by the use of available funds rather than to have a surplus diverted to the general revenue fund. Such an expanded program had barely been launched when the depression cut the revenues to a point where it became necessary to make drastic reductions not only in the game warden force but in other activities which depended on the so-called Game and Fish Fund for their support. Continuing decreased revenues plus the effects of very material diversions from division funds made by recent legislatures, still constitutes a matter of grave concern and has brought the division face to face with the necessity of a still further material reduction in the game warden force as well as in other items of expenditures. The present game warden force of approximately 150 men will have to be reduced to not more than 100 by January 1st, 1935 unless some relief is afforded from sources other than current revenues. A study of the graph, Figure 13, indicates the manner in which the game and fish funds have been allocated and expended during the four years noted.

Tables 36 to 44 inclusive, which follow give statistics which are self explanatory.

Table	36-	-Summary	of	Funds
July	1,	1932-July	1,	1934

	Balance July 1, 1932	Receipts	Fiscal Year 1932-33 Transfer	Transfer	Expendi- tures
Game and Fish	\$229,345.65	\$500,092.38		\$ 93,335.50	\$536,786.04
State Fish Revolving	26,699.99	1,900.96			6,662,60
Fins, Feathers & Fur	4,950.63	2,228.47	\$ 2,500.00		7,209,98
Predatory Animal Control	9,017.34				564.48
Fish Lakes Improvements	103,952.07	9,992.61			35.542.90
Public Shooting Grounds	62,962.97	144,811.79			55,746.68
Construction Mud Lake Dam	2.247.69		500.00		2,705.30
St. Paul Hatchery	1.971.51		12.000.00		12.613.67
Glenwood Hatchery	3.772.22		8,300.00		11.082.23
Detroit Hatchery	1,970.04		6,000.00		6,620,66
French River Hatchery	1.484.71		9,500.00		10,546,49
Southern Minnesota Hatchery.	1.868.03		6.000.00		7.070.57
Lanesboro Hatchery	3.219.23	95.61	19,000.00		11,993,19
Tower Field Station	192.28	5.79	2,500.00		1,965.30
Ranier Field Station	692.97		2.000.00		2.033.68
Bemidji Field Station	935.71		1.500.00		1 584 91



Graphic Analysis of Receipts and Expenditures

Division of Game and Fish

Calendar Years 1930, 1931, 1932, 1933







	Balance July 1, 1932	Receipts	Fiscal Year 1932-33 Transfer	Transfer	Expendi- tures
Park Rapids Field Station Jenkins Field Station Cut Foot Sioux Station Game Farm Maintenance	829.12 910.16 495.68 3,115.56		1,500.00 1,000.00 1,700.00	· · · · · · · · · · · · · · · · · · ·	1,712.39 1,403.94 1,823.35 3,115.56
Total Transfer to— Wolf Bounty Payments Conservation Commission A	\$460,633.56 .dministratic	\$659,127.61	\$ 74,000.00	\$ 93,335.50	\$715,668.36 \$14,335.50 5,000.00

\$19,335.50

Table 36—Summary of Funds—July 1, 1932—July 1, 1934—(Continued)

Balance July 1, 193	3 Receipts	Fiscal Year 1933-34 Transfer	Transfer	Expendi- tures	Balance July 1, 1934
Game and Fish\$ 99,316.4	9 \$501,536.15	\$ 4,463.07*	\$120,081.15	\$430,639.65	\$ 54,594.91
State Fish Revolving 21,938.3	5 644.83			3,655.57	18,927.61
Fins, Feathers & Fur. 2,469.1	2		2,469.12		
Predatory Animal Control 8,452.8	6 16.85			23.20	8,446.51
Fish Lake Improvement 78,401.7	8 12,026.73		10,000.00	17,644.93	62,783.58
Public Shooting Grounds 152,028.0	8 137,239.96		14,000.00	107,922.15	167,345.89
Const. Mud Lake Dam., 42.8	9		42.39		
St. Paul Hatchery 1,357.8	4	13,400.00		14,142.39	615.45
Glenwood Hatchery 989.9	9 55.12	8,300.00		9,093.82	251.29
Detroit Hatchery 1.349.3	8 3.45	6,000.00		6,929.27	423.56
French River Hatcherv. 438.2	2	9.400.00		9,784.17	54.05
Southern Minn. Hatcherv 797.4	6	6.400.00		7,113.70	83.76
Lanesboro Hatchery 10.321.6	5 6.30	9,900.00		20,029.17	198.78
Tower Field Station	7	1,100.00		1.745.05	87.72
Ranier Field Station 659.2	9	1,500.00		2,072.95	86.34
Bemidii Field Station 850.8	0	800.00		1,517.20	133.60
Park Banids Field Sta 616.7	3	1.100.00		1.682.04	34.69
Jenkins Field Station 506.2	2	1,000.00		1.293.42	212.80
Cut Foot Sioux Station 372.8	3	1,500.00		1.799.77	72.56
Game Farm Maintenance 3115	6		8,115,56		
Fish Fry Fund	1 125 30		-,	45.25	1.080.05
Public Hunting Grounds &	. 1,110100				-,
Game Refuge Revolving	. 1,641.15	14,000.00		9,555.37	6,085.78
Total \$384.757.8	1 \$654,295,84	\$78,863,07	\$149.708.22	\$646.689.07	\$321,518.93
Transfer to-	- +	÷··)	,,	• • • • • •	
Wolf Bounties					\$19,195.50
Conservation Commission Adu	ninistration				15,485.65
Fire Fighting					25,000.00
Pollution Survey					10.000.00
Minnesota Conservationist					1,164.00
					970 945 15
		1 13			φ10,040.10
Funds Cancelled Transferred to C	rame and Fis	sn rund			\$ 1 305 19
Fins, Feathers & Fur	• • • • • • • • • • • • •				.ψ 1,000.12 49.20
Mud Lake Dam	• • • • • • • • • • • • •	•••••	• • • • • • • • • • • • •	• • • • • • • • • • • •	. 44.07 9 115 56
Game Farm Maintenance	• • • • • • • • • • • • • • •	•••••			. 0,110.00
					\$ 4,463.07*

Table 37—Summary of Receipts by Funds Fiscal Years 1932-33 and 1933-34

	1932-33	1933-34
Game and Fish	\$500,092.38	\$501,536.15
State Fish Revolving	1,900.96	644.83
Fish Lakes Improvement Revolving	9,992.61	12,026.73
Public Shooting Grounds	144,811.79	137,239.96
Fins. Feathers & Fur	2,228.47	
Predatory Animal Control		16.85
Tower Field Station	5.79	
Lanesboro Hatchery	95.61	6.30
Detroit Hatchery		3.45
Fish Fry Fund		1,125.30
Public Hunting Grounds and Game Refuges		1,641.15
Glenwood Hatchery		55.12
Total	\$659,127.61	\$654,295.84

Table 38—Sources of ReceiptsFiscal Years 1932-33 and 1933-34

	(Fisca	l Years)
	1932-33	1933-34
Fines	¢19 450 09	\$11 984 TG
Warden's Costs	2 715 72	2.818.36
Solution S	6 552 95	9,013,71
Non-resident Fishing Licenses	96 519.90	105,166,60
Family Fishing Licenses	83,592.00	42.145.20
Individual Fishing Licenses	116,832,60	154,976,85
Fish House Licenses	11,114,00	13,564,00
Whitefish Licenses	3,428,00	3.123.00
Inland Herring	168.00	80.00
International Settlers	6.00	15.00
Lake Superior Fish Buyers		35.00
International Commercial Fishing	5,480.00	5,380.00
Fish Buvers	210.00	295.00
Interstate Licenses	288.00	231.00
Interstate Tags	27.25	24.00
Miss. Minn. Licenses	173.00	92.00
Miss. Minn. Tags	7.00	4.25
Mussel Fishing	115.00	1,400.00
Lake Superior Licenses	1,179.00	1,142.00
Resident Small Game	174.184.20	194.426.10
Non-resident Small Game	3,542.50	2,885.00
Resident Big Game	94,228.20	66,814.20
Resident Big Game Seals	13,089.75	9,274.50
Non-resident Big Game	2,030.00	585.00
Non-resident Big Game Seals	, 10.75	3.25
Resident Bear	18.00	12.60
Trapping	10,242.00	7,362.90
Special Beaver Licenses	188.06	71.00
Game Breeder's	2,615.80	2,667.75
Game Breeder Tags	172.68	156.34
Sale of Plans	17.00	23.00
Fur Buyers	1,251.00	1,769.00
Pet Permits	31.50	41.50
Taxidermist		306.00
Legalization	87.20	393.53
Fur Tanning and Dressing		40.00
Fur Farm Posters		8.50
1930 Accounts Receivable	274.26	
1929 Accounts Receivable	27.05	
Private Hatchery	20.00	30.00
Returned Check Account	Cr. 1,121.74	Dr. 1,095.02
Miscellaneous Refunds	734.15	146.01
Suspense Account	Dr. 1,133.35	Cr. 1,267.35
m (1) w	0010 011 22	
Total	\$643,644.06	\$638,333.98
² / ₂ Hunting Licenses Credited to Public Shooting Grounds	143,551.68	136,797.83
Total Come and Fish Passints	8500 000 88	
Total Game and Fish Receipts	. \$500,092.38	\$501,536.15

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Table 39—Summary of Receipts Fiscal Years 1932-33 and 1933-34

	(Fise 1932-33	eal Years) 1933-34
Fishing Licenses: Non-resident Family Individual Fish House Whitefish Inland Herring International Settlers	\$96,519.90 \$3,592.00 116,832.60 11,114.00 3,428.00 168.00 6.00	
Total Fishing Licenses	\$311,660.50	\$319,070.65
Miscellaneous Licenses: Lake Superior Fish Buyers International Commercial Fish Buyers Interstate Licenses Interstate Tags Mississippi Minnesota Licenses Mississippi Minnesota Tags Musslel Fishing Lake Superior Licenses	\$5,480.00 210.00 288.00 27.25 173.00 7.00 115.00 1,179.00	335.00 5,380.00 295.00 231.00 24.00 92.00 4.25 1,400.00 1,142.00
Total Miscellaneous Licenses	\$7,479.25	\$8,603.25
Hunting Licenses: Resident Small Game Non-Resident Small Game Resident Big Game Resident Big Game Seals Non-Resident Big Game Non-Resident Big Game Non-Resident Big Game Non-Resident Big Game Non-Resident Big Game Seals Resident Bear Hunting	\$174,184.20 3,542.50 94,228.20 13,089.75 2,030.00 10.75 18.00	$\begin{array}{c} \$194,426.10\\ 2,885.00\\ 66,814.20\\ 9,274.50\\ 585.00\\ 8.25\\ 12.60\end{array}$
Total Hunting Licenses	\$287,103.40	\$274,000.65
Trapping Licenses: Resident Trapping Special Beaver Licenses Special Beaver Tags	\$10,242.00 16.00 172.06	\$7,362.90 11.00 60.00
Iotal Trapping Licenses	\$10,430.06	\$7,433.90
Game Breeders : Game Breeders Licenses Game Breeders Tags	\$2,615.80 172.68	$$2,667.75\ 156.34$
Total Game Breeders Total License Receipts: Fines Wardens Cost Seizures	$\begin{array}{r} \$2,788.48\\ 619,461.69\\ 12,459.93\\ 2,715.72\\ 6,552.95\end{array}$	\$2,824.09 611,932.54 11,984.16 2,818.36 9,013.71
Miscellaneous Receipts: Sales of Plans. Fur Buyers Pet Permits Taxidermist Legalization Fur Tanning and Dressing. Fur Farm Posters Miscellaneous Refunds 1930 Accounts Receivable 1929 Accounts Receivable Private Hatchery	17.00 1,251.00 31.50 87.20 734.15 274.26 27.05 20.00	$\begin{array}{c} 23.00\\ 1,769.00\\ 41.50\\ 306.00\\ 393.53\\ 40.00\\ 8,50\\ 146.01\\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ $
Returned Checks	\$643,632.45 	\$638,506.31 CR. 1.095.02
Suspense Account	\$642,510.71 1,133.35	\$639,601.33 CR1,267.35
Transferred to Public Shooting Grounds	\$643,644.06	\$638,333.98
Game and Fish Receipts	\$500.092.38	\$501 536 15
	, , 2100	4001,000.10

Table 40—Expenditures Fiscal Years 1932-33 and 1933-34

Game and Fish Fund No. 5601

Game and Fish Administration		1932-33			1933-34	
Salaries Law Enforcement. Salaries Administration Travel Permanent Improvements Miscellaneous Supplies and Expenses.	$\substack{\$272,853.60\\45,497.50\\130,457.03\\411.67\\53,434.68}$		-	$\substack{\substack{\textbf{\$221,538.18}\\\textbf{42,369.03}\\102,475.47\\595.39\\32,279.51}}$		
Game Investigation		\$502,354.48			\$399,257.58	
Salaries. Travel Permanent Improvement	2,391.50 128.81			1,920.00		
Miscellaneous Supplies and Expenses	492.87 1,571.39			1,444.17		
Fish Propagation	•	\$4,584.57		<u> </u>	\$3,364.17	
Salaries. Travel. Miscellaneous Supplies and Expenses.	12,791.78 9,226.69 7,828.52			12,030.62 9,996.59 5,990 <u>.</u> 69		
		\$29,846.99			\$28,017.90	
Total Game & Fish Fund No. 5601		W	\$536,786.04			\$430,639.65
Hatchery and Field Station Funds Transfe	red from Ga	me and Fish	Fund No. 56	601		
St. Paul Hatchery Fund No. 5630			•			
Salaries Travel. Fish Food Permanent Improvements. Miscellaneous Supplies and Expenses.				7,380.00 105.10 1,965.07 2,662.25 2,029.97		-
Glenwood Hatchery Fund No. 5640	<u> </u>	\$12,613.67	÷., , , , , , , , , , , , , , , , , , ,		\$14,142.39	
Salaries. Travel. Fish Food. Permanent Improvements.				$$4,958.20 \\ 116.73 \\ 1,730.88 \\ 13.25 \\ 13.2$	L	
Miscellaneous Supplies and Expenses	3,645.83	11,082.23		2,274.76		

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\$9,093.82

Detroit Hatchery Fund No. 5645		1932-33		1933-34
Salaries Travel Fish Food Miscellaneous Supplies and Expenses	\$5,042.62 432.03 96.19 1,049.82		\$5,000.00 524.55 92.16 1,257.58	
Permanent Improvements				54.98
There is the second sec		\$6,620.66		\$6,929.27
Solonica	97 000 00		PT 500.00	
Travel. Miscellaneous Supplies and Expenses Fish Food.	\$7,926.00 282.82 2,337.67		\$7,502.00 321.63 1,739.75 220.79	
х. Х		\$10,546.49	-	\$9,784.17
Southern Minn. Hatchery Fund No. 5655				
Salaries	\$4,098.00		\$3,921.60	
Permanent Improvements. Miscellaneous Supplies and Expenses. Fish Food.	501.76 2,435.65		326.75 1,442.81 1,422.54	
		\$7.070.57	·	\$7.113.70
Lanesboro Hatchery Fund No. 5660				<i>,,,,</i> ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
Salaries. Travel Permanent Improvements Miscellaneous Supplies and Expenses. Fish Food	\$5,986.80 99.53 926.81 4,980.05		5,386.00 7,798.91 3,292.44 3,551.82	
		¢11 002 10		PRA 080 17
Tower Field Station Fund No. 5670		φ11,990.19		\$20,029.17
Salaries Travel Miscellaneous Supplies and Expenses	\$1,480.38 341.85 143.07		\$1,295.34 346.38 103.33	
		\$1,965.30		\$1,745.05
Ranier Field Station Fund No. 5671				
Salaries Travel Miscellaneous Supplies and Expenses	\$1,162.73 526.37 344.58			
		\$2,033.68	And the second second second	\$2,072.95
Bemidji Field Station Fund No. 5672 Salaries Travel Miscellaneous Supplies and Expenses		· · ·		
1	<u> </u>	\$1,584.91		\$1,517.20

Table 40—Expenditures—ContinuedFiscal Years 1932-33 and 1933-34

Park Rapids Field Station Fund No. 5673		1932-33			1933-34		
Salaries	\$1,333.42			\$1,276.81			
Travel	304.76			296.19			
Miscellaneous Supplies and Expenses	74.21			109.04			
	-	\$1,712.39			\$1,682.04		
Jenkins Field Station Fund No. 5674							
Salaries Travel	\$1,088.15			\$1,110.00 138.40			н
Miscellaneous Supplies and Expenses	25.41			45.02			Ĕ
		¢1 409 04			\$1 909 49		PA
Cut Foot Sioux Field Station Fund No. 5675		φ1,400.94			φ1,200.42		ਲਿ
Salaries	\$1,380.00			\$1,183.00			٢٦
Travel	310.21			356.98			Æ
Miscellaneous Supplies and Expenses	133.14			259.79			ž
		\$1,823.35			\$1,799.77		Ţ
Total Hatchery and Field Station			\$70.450.38			\$77.202.95	2
			,				E,
Fins Feathers and Fur Fund No. 5609							2
Salaries	\$2.275.00						Ř
Travel	235.03						2
Advertising and Publication	4,520.49						ER
Miscenaneous Supplies and Expenses	119.40					•	<
Chata Titl Theory I is The LATE FOOT			\$7,209.98				5
State Fish Revolving Fund No. 5605	P4 005 10			00 495 40			Ē
Salaries Travel	\$4,005.19 1.555.89			\$2,405.40 503.48			ž
Miscellaneous Supplies and Expenses	1,101.52			666.69			
			\$6 662 60	· · · · · · · · · · · · · · · · · · ·		\$9 695 57	
Fish Fry Fund No. 5604			φ0,002.00			ψ0,000.01	
Travel				\$44.45			
Miscellaneous Supplies and Expenses				.80			
						\$45.25	
Predatory Animal Control Fund No. 5610	F (0, 0, 0, 0)						
Salaries Travel	540.00 24.48			23.20			
110,401,,							
			\$564.48			\$23.20	

Fish Lakes Improvement General and Engineering Fund No. 5611		1932-33			1933-34	
Salaries Commercial Fishing Salaries Lakes Improvement Burial Dead Fish Transfer Game Fish Carp Removal Scientific Equipment				\$4,632.62 5,059.00 56.78 59.70 90.00		
Permanent Improvement Dams, Etc. Miscellaneous Supplies and Expenses. Travel. Claims	9,888.64 2,641.10			3,149.55 1,975.12 1,972.16 650.00		
		\$28,014.65			\$17,644.93	
Fish Lakes Improvement (Pollution Survey) Fund No. 5611	,					
Salaries. Travel Scientific Equipment. Miscellaneous Supplies and Expenses.	5,728.24 923.17 547.69 329.15					
		\$7,528.25				
Total Fish Lakes Improvement			\$35,542.90			\$17,644.93
Public Shooting Grounds Fund No. 5615						
Salaries. Travel Permanent Improvements. Miscellaneous Supplies and Expenses.	$\$1,594.75\ 87.72\ 14,700.63$		- -			
		\$16,383.10			\$4,805.19	
Engineering Fund No. 5615						
Salaries. Travel Miscellaneous Supplies and Expenses. Permanent Improvements.	\$1,530.00 341.39 113.50			\$3,749.00 696.35 152.65 451.50	у	
		\$1,984.89			\$5,049.50	
Game Farm Fund No. 5615	•					
Salaries. Travel Permanent Improvements. Miscellaneous Supplies and Expenses.				5,509.35 281.46 1,075.84 2,574.92		
		\$10,941.60			\$9,441.57	

SECOND BIENNIAL REPORT

Table 40—Expenditures—ContinuedFiscal Years 1932-33 and 1933-34

Purchase of Lands Fund No. 5615	19 A.	1932-38	and the second sec	an an tha an an t	1933-34	
Gooseberry. Itasca State Park. Whitewater Kabatogema. King Williams Narrows. Anoka and Chisago Counties (Carlos Avery Refuge)	\$16,217.00	ала (т. 1917) 1917 — Полон (т. 1917) 1917 —		\$14.85 2.25 14,241.01 21,092.86 11,084.59 42,190.33		
		\$16,217.00			\$88,625.89	
Total Public Shooting Grounds Public Hunting Grounds and Game Refuge Rev. Fund No. 5625			\$45,526.59	\$1,500.00		\$107,922.15
Claim State Law 1933, Ch. 427, Sec. 91	· · · · · · · · · · · · · · · ·				\$1,500.00	
Anoka Fund No. 5625						
Salaries. Travel Land Improvements. Miscellaneous Supplies and Expenses.				\$284.67 9.00 92.50 181.12	,	
Thief Lake Fund No. 5625			v		\$567.29	
Salaries. Travel. Buildings and Equipment. Miscellaneous Supplies and Expenses. Permanent Improvements.	\$1,505.70 530.15 \$,627.39 176.14			1,492.50 179.10 211.10 398.44		
Whitewater Fund No. 5625		\$5,839.38		· · · · · ·	\$2,281.14	
Salaries. Travel	\$2,752.00 804.48			$\$1,453.75\451.32$		
Miscellaneous Supplies and Expenses. Trout Ponds Permanent Improvements.	53.32			1,119.27 2,105.54 77.06		
		\$4,380.71			\$5,206.94	
Total Public Hunting Grounds and Game Refuges Construction Mud Lake Dam Fund No. 5620			\$10,220.09			\$9,555.37
Salaries Permanent Improvements	$$727.99 \\ 1.977.31$					

DEPARTMENT OF CONSERVATION

Table 41-Number of Licenses Sold-Calendar Years 1932-1933

	1932	1933
Non-Resident Fish Licenses	37,645	37.338
Family Fishing Licenses	109.528	64.591
Individual Fishing Licenses	246,507	290.572
Fish House Licenses	12,913	11.708
Whitefish Licenses	3,425	3,065
Inland Herring	173	80
International Settlers	13	10
International Commercial Fish	84	$\tilde{79}$
Fish Buyers	35	81
Interstate License	83	78
Interstate Tags	120	104
Miss. Minn. Licenses	31	22
Miss. Minn. Tags	44	28
Mussel Fishing	41	112
Lake Superior License	364	353
Resident Small Game	195 689	216 229
Non-Resident Small Game	159	123
Resident Big Game	52 536	36 932
Resident Big Game Seals	52,536	36 932
Non-Resident Big Game	43	13
Non-Resident Big Game Seals	43	13
Resident Bear	10	17
Traning	9 262	13 304
Shecial Beaver Licenses	31	10,001
Game Breader's	980	792
Camo Breador's Tags	9 300	9 4 81
Game Different S Tags	458	416
Pat Downits	400	61
Toxidomnist	10	83
Fur Tenning and Dressing		0
rui taiming and probling		

Table 42—Report of Small Game Taken as Indicated on Returns From Small Game Licenses—Report 1932-1933

DUCKS—	1932	1933
Mallards Bluebills Green Teal Blue Teal Canvas Backs Redheads Pintails Shoveler, Spoonbills Ringneck, Ringbill Widgeon Black Mallard Gray Ducks Mergenser, Sawbill Goldeneye, Whistler Other Ducks	$\begin{array}{c} 116,723\\ 90,929\\ 35,008\\ 36,884\\ 9,921\\ 9,939\\ 6,766\\ 5,699\\ 2,443\\ 2,139\\ 2,157\\ 1,803\\ 1,833\\ 1,358\\ 7,295 \end{array}$	$\begin{array}{c} 92,178\\ 70,129\\ 30,110\\ 29,870\\ 8,544\\ 7,402\\ 6,561\\ 5,234\\ 2,407\\ 1,877\\ 1,628\\ 1,725\\ 1,652\\ 4,825\\ \end{array}$
Total	330,897	265,399
GEESE-		
Canada Goose White-Fronted Goose Snow Goose Blue Goose	$802 \\ 57 \\ 163 \\ 78$	552 191 87 70
Total	1,100	900
SHORE BIRDS-		
Coot or Mudhen Jacksnipe Rail Gallinule Plover	26,954 3,524 25 59 54	20,654 2,510 40 37
Total	30,616	23,241

 Table 42—Report of Small Game Taken as Indicated on Returns From

 Small Game Licenses—Report 1932-1933—(Continued)

UPLAND BIRDS—	1932	1933
Ringneck Pheasants	222,562	315,326
Ruffed Grouse or Partridge	19,486	14,763
Quail	1,535	2,957
Sharp-Tail Grouse (White Breasted)		2,021
Pinnated Grouse (Prairie Chicken)		7,304
Dove	375	
Total	243.958	342.371
Rabbits	111.609	103,220
Squirrels	50,630	55,292
193	2 .	1933
Licenses Sold	· · ·	186,600
Licenses Reported	26%	49,285-26.4%

· Li	icenses	Reported Adult			Fawn	Total	Total	
County Re	ported	"No Game"	Male	Female	Male	Female	Deer	Bear
Aitkin	1,860	203	762	449	194	145	1,550	15
Becker	635	381	197	136	50	45	428	
Beltrami	1,183	352	452	261	124	76	913	1
Carlton	910	321	352	189	86	59	686	• 3
Cass	1,239	317	468	290	130	83	971	6
Clearwater	948	135	330	275	109	64	778	2
Cook	905	121	413	214	88	33	748	10
Crow Wing	222	11	99	46	29	16	190	1
Hubbard	1,176	238	414	303	147	81	945	3
Itasca	2,147	384	1,736				1,736	22
Kanabec	395	14	151	91	57	40	339	6
Kittson	109	4	58	20	10	6.	94	1
Koochiching	2,114	175	774	619	245	117	1,755	3
Lake	1,439	199	€35	363	130	56	1,184	11
Lake of the Woods	289	4	141	58	33	18	250	5
Mahnomen	62		29	· 17	5	2	53	
Marshall	220	4	92	52	26	19	189	1
Mille Lacs	516	189	182	106	62	36	386	2
Pennington	39	11	16	8	4	2	30	
Pine	2,542	498	937	605	334	175	2,051	6
Red Lake	94	4	37	21	13	9	80	
Roseau	402	32	182	83	44	27	336	5
St. Louis	7,310	1,585	2,992	1,684	726	429	5,831	32
No County designated							• • • •	• •
Totals2	6,756	5,182	$11,449 \\ 53\%$	5,890 28%	2,646 12%	1,538 7%	21,523	135
Licenses Sold					.012			
Licenses Reported Deer Killed					,756 or 5 ,523 or 8	51% 80% of Lic	enses Re	ported

Table 43-Big Game Kill-1932

Table 43-Big Game Kill-1933

1	licenses	Reported	A	dult	Fawn		Total	
County R	eported	"No Game"	Male	Female	Male	Female	Deer	
Aitkin		·/ • • • • •						
Becker								
Beltrami	701	22	331	211	79	58	679	
Carlton	341	6	157	112	47	19	335	
Cass								
Clearwater								
Cook	453	15	201	151	57	29	438	
Crow Wing								
Hubbard								
Itasca	2.179	38	1.023	705	251	162	2.141	
Kanabee	-,	00	1,010					
Kittson								
Koochiching	872	27	388	251	143	63	845	
Lako	678	18	295	222	84	59	660	
Lake of the Woods	256	27	108	72	27	22	229	

County	Licenses	Reported	A	dult Formala	Mala	awn	Total
county	Reported	No Game	male	remate	male	remaie	Deer
Mahnomen							
Marshall	•••••	• • • •	• • • •	• • • •		• • • •	• • • •
Millo Log	•••••		• • • •		• • • •	••••	
Doppingter	• • • • • •	• • • •	• • • •				
Plan Dia	••••••	••22	* : : :	· · · · · ·	· · · · ·		
Pine	1,219	50	484	385	170	130	1,169
Red Lake		• • • •					
Roseau							
St. Louis	2,888	89	1.324	920	332	223	2,799
No County designated	6,824	4,491	1,173	638	340	182	2,333
Totals	.16,411	4,783	5,484	3,667	1,530	947	11,628
Licenses Sold				36.966			
Licenses Reported		•••••		16 411 or	11 10%	1	
Deer Killed		••••	••••	11 628 or	70% of 1	licenses R	enorted
No Boar Bonortod Killod in	1099	••••••	•••••	11,020 01	10 70 01 1	JICCHSES IV	cported
The bear meported Killed II	1 1900						

Table 43-Big Game Kill-1933-(Continued)

Table 44—Report of Animals Taken by Trapping as Indicated by Returns From Trapping Licenses

TRAP	PING REPOI	RTS-1932	1	TRAPPING	REPORTS-	-1933
Species	No. of Animals	Value	Average Price	No. of Animals	Value	Average Price
Mink	5,790	\$16,023.36	\$ 2.76	8,693	\$40,522.90	\$4.66
Weasel		6,518.79	.33	26,542	10,539.08	.40
Muskrat	13.829	5.054.04	.36	41,386	17,790.78	.43
Skunk	10.858	7,910.81	.72	16,930	16,674.65	.98
Badger	331	1,516.85	4.58	308	1.535.02	4.98
Raccoon	1.951	5.058.40	2.59	2.410	8.108.75	3.36
Rabbits	7.364	104.97	.10	7.616	611.05	.08
Bobcat	48	61.50	1.28	58	120.48	2.08
Grev Fox	265	386.75	1.45	229	433.73	1.89
Red Fox	244	1.101.45	4.51	351	2.208.38	6.29
Cross Fox	12	130.50	10.88	72	446.29	6.20
Silver Fox	3	15.00	5.00	21	673.73	32.08
Lvnx		48.85	1.74	10	67.50	6.75
Timber Wolf	76	257.00	3.38	62	496.16	8.00
Brush Wolf		1.657.25	7.05	227	1.954.18	8.61
Fox Squirrel	536	No price given		708	127.24	.18
Grey Squirrel	1,121	No price given		1,141	285.05	.25
Total	64,514	\$45,845.52		106,764	\$102,594.97	
			Trapping Total Lic Trappir Trappir	Licenses Sold. enses Reported ng Licenses So ng Licenses Rep	9,262 3,060 or ld13,304 orted. 3,722	33% or 35½%

Law Enforcement

Early in March, 1934, in an effort to improve the warden service the district system which had been in effect in prior years was abolished, thereby relieving some of the best qualified wardens from a great deal of clerical and supervisory work required of them in their capacity as chief wardens and making more of their time available for actual field work. This change has proven to be highly satisfactory. By placing all wardens upon the same level and subject to the same general requirements the change has met with the approval of the wardens generally and undoubtedly has increased their efficiency. Graphic analysis of arrests made and fines levied over a period of five years, commencing January 1st, 1929, is shown on Figure 14.



SECOND BIENNIAL REPORT



Graphic Comparison of Arrests Made and Fines Collected During Years 1929-1933



Table 45—Biennial Report of Fines, Arrests and SeizuresJuly 1, 1932 to June 30, 1934

Game and Fish Violations Classified as follows:	July 1 to Dec. 31 1932	Jan. 1 to Dec. 31 1933	Jan. 1 to June 30 1934
Big Game	253	360	49
Small Game	826	971	271
Fishing	315	898	502
Netting	64	191	86
Fur	43	119	54
Gun Set Up	265	416	30
Miscellaneous	68	16	4
	1,834	2,971	996

Statement of Fines Levied-Suspended-Days Served in Jail

Total Fines Levied	\$88,273.78
Less days served and their equivalent in fines levied: Number of days	26,038.60
Net Amount of Fines Levied (July 1, 1932—June 30, 1934)	\$62,235,18

Table 46-Summary of Seizures-July 1, 1932, to June 30, 1934

CLASSIF.	IED	AS FOLLOWS:
Firearms:		Pelts:
Rifles	428	Beaver 462
Shotguns	719	Muskrats
Revolvers	6	Raccoons 119
Maxim Silencer	1	Skunk 63
Gun Cases	29	Weasel
Gun Boot	1	Otter 6
Cartridge Belts	9	Mink 39
Shotgun Rod	1	Squirrel
Shells	19	Rabbit 1
		Woodchuck 1
Fishing Equipment:		Fox 4
Rods	74	Wolf 141
Reels	74	Moose 5
Cane Poles	31	Deer 30
Lines	136	ЕЛК 2
Tackle	25	Mana and Dam Hards
Fish Stringers	2	Muchant Honda
Minnow Pails	6	Muskrat neaus 69
Tackle Boxes	12	Perishable Meats and Fish:
Fish Boxes	3	Deer 519%
Fish Case	Ţ	Moose 8
winter Angling Outht	T	Bear
Notes		Venison
Nets:		File 150
Basket	4	Duelca 1 1691/
Creel	2	Phonese 1 656
Dip	4	Partridge 809
Drag	3	Prairie Chicken 60
Frame	4	Quail 6
Fries	4	Plover 1
Gill	202	Swan 6
Hoon	200	Woodpecker 1
Landing	4	Mourning Dove 3
Minnow	6	Grouse 18
	Ŭ	Spruce Hen 1
Nets, Miscellaneous	153	Rabbit 1
Scoon	1	Snipe 3
Seines	16	Mud Hens
Trot	ĩ	Chickens, Domestic 4
Whitefish	4	Sausage Rings
	-	Unicken
Trapping Equipment:		Soup 7
Trans	282	Hame 9
Snares	.,404	Hamburger quarte 9
Trapping Hook	1	Blue Goose 1
Trapping Skiff	î	Loon 1
Muskrat Spears	2	Pelican
Stretchers	56	Fish

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Perishable Meats and Fish—Cont.	
Fish	Heaters 6 Hinge 1 Ice Chisels 3 Ice Tongs 1
Live Animals:	Jacks
Bears 9 Beaver 4 Skunk 1 Raccoon 23 Trailing Hounds 4 Fox 4	Lights 99 Model T Truck (Returned) 1 Moose Horns pair 1 Motors 2 Oars 26 Packsack 10
Miscellaneous:	Pails
Batteries 6 Boats 45 Boats pair Caps 1 Coffee Cups 2 Crock and Cover (20 gals.) 1 Decoys 16 Deer Horns pair Jynamite stick Fish Heads 3 Fish Traps 26 Hammers 2 Hasp 1	Rope 1 Scale 1 Schene 1 Shovel 6 Silage Fork 1 Silage Fork 5 Snag Hooks 5 Spears 213 Steel Bar 1 Stool 1 Stovepipe lengths Suitcases 2 Tent 1 Trailer 1 Wash Tub 1

Bureau of Fisheries

Table 47 shows rough fish removal from inland waters of the state for fish lakes improvement purposes and division of returns.

Table 47-Inland Fishing-Total Rough Fish Removed in Pounds

	Season 1932-1933 Pounds	Season 1933-1934 Pounds
Carp Buffalo Bullheads Dogfish Garfish Eelpout Redhorse Sheepshead Suckers Other Fish	2,145,350 381,868 376,134 2,875 529 188 8,418 35,465 59,397	2,104,372 162,940 124,340 1,881
Gross Sales Operating Expenses	3,010,224 Season 1932-1933 \$67,223.09 55,343.43	2,452,608 Season 1933-1934 \$68,059.96 54,372.72
Net to State	\$11,879.66	\$13,687.24

The Red Lake Fisheries

The Public Safety Commission in 1917 as a war time measure launched a project for the production and sale of fish from certain lakes within the state. In order to aid the Indians within the Red Lake Indian Reservation to handle and market fish caught in Red Lake, the Legislature of 1929 amending the law authorizing the then commissioner of game and fish to continue at Redby the industry thus started and erect the necessary buildings. Accordingly a fisheries plant including a hatchery and a small water power dam and plant were equipped and put into operation. This plant was operated by the game and fish commissioner until 1929 when the legislature authorized him to lease the plant to the "U. S. or any proper authorized agency thereof." Under the authority of this amendment the fisheries and hatchery were leased by the state to the Red Lakes Fisheries Association, an organization which was formed by the Indian fishermen operating on the Red Lakes, and the U. S. Bureau of Indian Affairs.

The state of Minnesota no longer takes any actual part in the fishing or sale of fish caught. The only interest the department has in the fisheries is the checking of the distribution of fish caught and transported outside of the Indian Reservation. As an indication of the volume of business transacted by the Red Lake Fisheries Association, Table 48 taken from the financial statement of the association, furnished the department by the Bureau of Indian Affairs, is submitted.

	IND	IANS	WH	ITES	TO	ΓAL	-	
	Po	unds	Pou	inds	Poi	ınds	VA	LUE
VARIETY	1932	1933	1932	1933	1932	1933	1932	1933
Pike	561,860	498,569	89,794	43,498	651,654	542,067	\$21,551.80	\$36,318.49
Perch	151,328	178,968	2,317	4,074	153,645	183,042	3,315.66	12,995.98
Whitefish	114,001	28,004	18,930	305	132,931	28,309	5,317.22	2,859.20
Pickerel	. 23,645	11.612	4,537	1,625	28,182	13,237	694.14	516.24
Sheepshead	. 13,442	14.505	1.057	354	14,499	14,859	144.99	386.33
Goldeyes	. 1.890	362			1,890	362	18.90	6.15
Cull (Whitefish)	. 313				313		3.13	
Bullheads	686	734			686	734	27.44	44.04
Suckers		761				761		9.89
Total	867,165	733,515	116,635	49,856	983,800	783,371	\$31,073.28	\$53,136.32

Table 48—Fish Production Season 1932 and 19

International Commercial Fishing

Table 49 represents fish production under international commercial fishing licenses issued by the department. Attention is called to the very material falling off in production for the season of 1934 as compared with the previous year and this notwithstanding an increase in the number of licenses issued.

Table 49-International Commercial Fishing Season 1932-33, 1933-34

					LA	KE
	NAMEK	AN LAKE	RAINY	LAKE	OF THE	woods
	FU	unus	F 04	mus	LO LO	unus
· - · ·	1932 - 33	1933 - 34	1932 - 33	1933 - 34	1932 - 33	1933-34
Yellow Pike	. 26,901	36,250	77,912	61,548	625,536	670,204
Pickerel	. 28,909	27,301	37,822	40,798	150,564	260,127
Whitefish	. 24,085	9,225	124,549	120,731	17,310	13,395
Bluefins	22.513	19,795	9,433	5,000	800	
Redfins	. 984	320	224	1,052	31,773	42,182
Perch	. 1.080	1.852	3.743	2.599	36,698	39,969
Suckers	76.023	12.867	27.000	11.074	85,945	125,800
Tullibees			200	13.362	1.295.667	293,229
Carp					6.851	16.655
Bullheads					9.412	32,245
Saugers					215.898	236,507
Crappies	. 781	177			229	2.266
Buffalo					19	137
Goldeves					48	71
Caviar				20	130	148
Sturgeon			502	622	508	783
Trout					688	185
Burbot	165.893	16.277	17.000	24.846	. 45	63.974
Livers						180
Totals	247 160	194 064	208 285	281 652	9 478 191	1 708 057
100415	.041,100	124,004	200,000	1022 201	2,410,121	1,190,001
Total Brody	ation no	unda		9 199 675	9 909 7	79
Total Value	action, po	unus		\$96 410 06	\$01 000	56
Number of	Tigongog				φσ1,συσ.	90 94
Number Be	norted	••••••	••••••	19		94 94
Bevenue De	porced	m Sale of L	iconsos	\$5 560 00	65 980	0.1
revenue De	erived Lic	m Date OI LI	10011000	φυ,000.00	φ υ, Δου.	00

Commercial Fishing in Lake Superior

Table 50 shows the extent of commercial fishing in Lake Superior for the biennium. Notwithstanding a decrease in the number of licenses issued during the year 1934 as compared with previous years, the production of Lake Superior herring has increased in volume with a corresponding increase in values. On the other hand cisco production has fallen off in volume.

	1932			1	933
Po	unds	Value		Pounds	Value
	1.097	\$25,382.29		226,163	\$24,072.05
Herring	1,100	55,541.61		5,202,575	78,562.76
Ciscoes 198	5,911	16,599.98		89,463	9,065.98
Whitefish 8	3,667	953.79		6,388	733.24
Miscellaneous	1,774	91.99		7,055	315.20
Total	1,549	\$98,569.66		5,531,644	\$112,749.23
Number Licenses Issued			364		353
Number Licenses Reported			317		319
Number Not Reported			47		34
Receipts for Lake Superior Licenses	Sold	\$1,2	05.00	\$1,21	5.00
EQUIPMENT:					
Skiffs, one man			364		329
Skiffs, two men			30		20
Boats, one ton or less			52		37
Boats, one to five tons			10		10
Boats, over five tons			None	-	1

Table 50—Production Lake Superior, Season 1932-1933

Interstate Fishing

Interstate fishing includes commercial fishing by residents of this state under licenses issued by this department for operations in the waters of the Mississippi River and Lake Pepin or those portions of such waters which constitute the boundary between Minnesota and Wisconsin.

Last spring conferences were held between the Conservation Commissions of Minnesota and Wisconsin with a view to formulating, adopting and putting into effect uniform or reciprocal regulations for the taking of fish in waters forming the boundary between the two states. Later in the season of 1934 an agreement was reached between the two states and joint orders issued by both states putting such regulations into effect. While these regulations have not succeeded in meeting with the wishes of all of the people interested, it is felt that it is the beginning of a movement which will ultimately result in mutual satisfaction to both states.

The removal of rough fish from the Mississippi and Lake Pepin should continue so as to keep down to a minimum these predatory species. The purpose of the present joint regulations between the two states is to give better protection to the game fish while rough fish removal is being carried on and it is believed that the results will be highly satisfactory.

Table 51 gives the volume of inter-state fishing during the years 1933-1934.

	1932		1933		
	Pounds	Value		Pounds	Value
Turtles				650	6.00
Buffalofish	15.459	\$822.26		27.686	\$1,071.00
Carp	.126,880	3,593.66		288,193	6,604.35
White Carp	. 28,672	503.73		12,952	307.80
Catfish	. 8,490	1,046.48		13,651	1,504.51
Suckers	. 16,470	402.48		9,174	534.45
Dogfish	. 4,541	45.92		493	8.32
Sheepshead	. 11,594	625.44		37,584	989.67
Bullheads	. 805	64.40		25	.50
Garfish	12,200	No Value		15,280	No Value
Eels (2)	8	.55			
Sturgeon	• • • • • • •			5,250	112.50
Total	. 225,119	\$7,104.92		410,938	\$11,139.10
Number Licenses Issued Number Licensees Reported Number Licensees Not Reported Number Licensees Not Fishing Receipts for Licenses Sold		\$354	83 49 34 4 1.35	\$286	76 65 11 6 .00
EQUIPMENT:					
Seines			90		95
Gill Nets			2		1
Hoon Nets		••••	2		•
Bait Nets		•••••	28		18
Set Lines			49		47
					- 1

Table 51-Inter-State Fishing Year 1932-33

Mussel Fishing

Mussel fishing has been pursued quite actively throughout the state during the biennium. There was an unusual increase in the number of clams taken during the year 1933. The only explanation of this abnormal increase is that a number of people out of employment have turned to clam fishing as a means of livelihood. The value of mussels produced in 1933 was \$8,000 greater than that of 1932.

In order to properly protect the remaining mussels found in the streams of Minnesota from extermination, it is believed that a closed season should be ordered. To do this the next legislature should be asked to amend the statutes so as to authorize such regulation.

Table 52 shows the volume of mussel fishing for the seasons 1932-1933.

-	SHELLS		SLUGS		PE4	ARLS	TOTAL			
	19	932	19	33	1932	1933	1932	1933	1932	1933
······································	Tons	Value	Tons	Value	Value	Value	Value	Value	Value	Value
annon River	63.597	\$1,444.56	44.833	\$ 1,497.12	\$204.50	\$ 91.87	\$18.00		\$1,667.06	\$ 1,588.9
ake Pepin	78.45	1.265.62	133.253	3,045.03	81.45	101.95	5.00	\$43.00	1,352.07	3,189.9
ississippi River	13.5	162.50	41.152	878.90	43.00	84.20		10.00	205.00	973.1
ermilion River	3.5	52.50			12.00		16.00		80.50	
ississioni & Vermilion			3.75	112.50		10 70		2.00		125.2
ake Penin & Mississippi			7.5	218.50		10.10		2.00		218.5
oot River	2 55	30 31	7.023	70 23	2.00	1.60	3 37	3 20	35.68	75.0
innegota River	5	100.00	132 535	2 046 30	2.00	124 72	0.01	75.87	100.00	2 246 8
innesota & Pomme De Terre		100.00	4.2	84.00		12 00		10.01	100.00	96.0
innesota & Chinnewo Pivors	• • • • • •		51	620.00		12.00				620.0
linnesota & Omppewa Mivers				000.00	• • • • • •					000.0
Damas Da Marra Pinara			19	00.00						00.0
Fomme De Terre Rivers	9 49	90.90	.14.	Ungold					20.59	30.0
okegama Lake	2.45	99.90	90 E7E	1 000 00	.20	48.09			09.00	1 1 477 1
row River			30.010	1,099.09	• • • • • •	48.04		• • • • •	• • • • • • • • •	1,141.1
row Wing River		• • • • • • • •	30.	371.80	• • • • • •	1.00		• • • • •		372.8
lk River			3.95	110.70			• • • • •			110.7
lk & Des Moines Rivers				222222		45.00		30.00		75.0
es Moines River	• • • • • -		31.5	507.50		29.75				537.2
es Moines & Crow Rivers			21.	435.00		30.00			•••••	465.0
es Moines & Cannon Rivers			12.	300.00		50.00		29.00		379.0
hippewa River			1.5	25.00						25.0
omme De Terre River			1.5	15.00		2.50				17.5
Croix River			.55	Unsold						
	•	•					·		+	
m ()	169.027	\$3,094,87	578.42	\$11,536.67	\$343.15	\$663.31	\$42.37	\$193.07	\$3,480.39	\$12,363.0

Table 52-Report on Mussel Fishing-Seasons 1932-1933

Game Fish Rescue Works

Through the cooperation of commercial fishermen adult game fish were rescued from shallow waters and transferred to deeper waters in lakes and streams. The following species and number of each were thus rescued:

Pickerel	. 23,849
Crappies	.586,793
Silver Bass	. 5,312
Sunfish	. 56,240
Black Bass	. 16,162
Wall-eyed Pike	. 595
Perch	. 6,849
Bullheads	. 43,775
Miscellaneous	. 27,000
•	766,575

The following game fish fingerlings were rescued from shallow bays and lagoons of Lake Minnetonka and placed in deeper waters in the main lake:

Perch	400
Sunfish	74,000
Black Bass	3,900
Crappies	500
Wall-eyed Pike	500
Bullheads	4,500
Pickerel	50
· · · · · · · · · · · · · · · · · · ·	83,850

During the season of 1934 the Division distributed gratis to relief agencies throughout the state, principally in the counties where such fish were caught, 376,258 pounds of fresh fish which had no sales value at the time owing to depressed market conditions and high grades demanded. Reaction from those who received these non-marketable supplies indicated that this method of distributing food was generally approved and appreciated.

Field Stations

Field stations, with the exception of the Redby hatchery, are operated exclusively for the propagation of wall-eyed pike. They are located so far as possible in districts where not only egg production is plenitful but where areas to be stocked with fry can be reached conveniently. Crews of men are maintained during the months of April and May and on rare occasions into the month of June. Sub-stations suitable for trapping pike on their way up stream to their natural spawning grounds are operated at practically all of the field stations.

Eggs incubated at the Ranier field station are procured at a sub-station located on Rat Root River between Ericksburg and head of Black Bay. Attempts have also been made to operate a sub-station on Rainy River below International Falls near the mouth of Little Fork River. Two sub-stations, one near the hatchery and the other on Third River are operated to supply Cut Foot Sioux hatchery with eggs.

Three sub-stations, one near Wolf Lake, one at the head of Cass Lake and another at Carr Lake, supply eggs for the Bemidji hatchery.

Several sub-stations serve the Park Rapids hatchery.

The Detroit Lakes hatchery often receives its supply from five field stations located on various lakes in Ottertail and Becker counties.

The Tower field station is operated principally to maintain wall-eyed pike fishing in Vermillion lake. Seventy-five percent or more of the fry produced by this lake go back to restock it, the remainder being distributed in lakes in the adjacent territory.

The station near Jenkins is located at the mouth of Pine River at the head of Whitefish Lake. This station produces an abundance of better quality eggs, yield an 85% hatch as compared to an average of 70% at the other stations. Surplus supplies of eggs produced at Whitefish Lake, Rat Root River and other field stations are transferred either before or after eyeing to St. Paul, Glenwood and French River where they are hatched and distributed to surrounding lakes.

The bulk of eggs which are used to fill to capacity the regular hatcheries have been yielded by Upper Red Lake. The station on the Tamerack River at Waskish on this lake has proven a most prolific source of eggs because of the large run of pike which pass up the Tamerack River to spawn during normal seasons. Successful gathering of eggs at this station however, is contingent on reasonably uniform temperatures of the water prevailing during the time the pike ascent the stream for their spawning grounds. A sudden drop in temperature will interrupt the run of fish and may drastically reduce the number of eggs procured. The egg production in the spring of 1934 was affected by such adverse conditions. As a result the 1934 yield of pike fry at this station was only 374,000,000 as compared to 617,000,000 in the spring of 1933. With operating costs being substantially the same, it is understood how the unit cost of hatchery output is materially increased by conditions which prevent the procuring of only a fraction of the capacities of the hatcheries.

Due to reduced revenues no improvements have been made at the field stations during the biennium. It will however, be necessary in the immediate future to make extensive replacements of wooden batteries at Ranier, Bemidji, Tower and Jenkins which have decayed by long continued use.

Present hatchery facilities are in excess of the department's ability to procure eggs to fill them for which reason there appears to be no immediate need for expanding field stations.

Bass Ponds

The bass ponds located at Windom and Hutchinson have been a disappointment as to production. Apparently some chemical present in the water supplied to the ponds at Hutchinson has a disastrous effect on the production of young fish. Its exposed position too subjects the water to sudden drops in temperature with damaging effects. Studies of this pond Bass
have been made by a biologist working in cooperation with a chemist but so far the cause or causes of failure have not positively been discovered.

Results at the Windom pond have been more satisfactory. Production should increase as soon as the bottom of the pond has begun to yield aquatic plant life for food supply. This pond too is exposed to sudden temperature changes especially from northwest winds which fact may seriously curtail production.

The large bass pond established under the sponsorship of the Minneapolis Chapter of the Izaak Walton League located south of Minneapolis and which has been operated by the chapter for several years is located so as to be sheltered from north and east winds. Production has steadily increased and results are gratifying beyond expectations. During the season of 1933 approximately 200,000 fingerling bass in addition to a considerable number of sunfish were produced in this pond.

Assistance has been rendered to various private organizations in the operation of small ponds established by their own initiative with the consent and approval of the department for the production of crappies. The pond at Owatonna may be cited as one of this type. The success had with these privately sponsored projects suggests a more general practice by sportmen's organizations and conservation groups to establish ponds for crappie propagation as local conservation projects.

Table 53 shows the pond production of bass, sunfish and crappies.

Table 54 is a summary of production of hatcheries, field stations and bass and crappie ponds by specie.

	1932-1933	1933-1934
Hennepin County— Bass Sunfish	128,050 500	200,850 17,750
Hutchinson— Bass Sunfish	6,775 · 126,600	19,300
Glencoe-Bass	4,600	
Windom— Bass	8,825 *	10,650
Owatonna— Crappies Sunfish	19,400 850	65,400
Gull River Dam— Bass Crappies Sunfish	9,245 1,000 7,900	3,590 13,200
Long Lake— Bass	2,035	·
Pleasant Lake- Crappies Sunfish	$19,845 \\ 4,990$	5,035
Total		335,775

Table 53—Pond Production

	1932-1933	1933-1934
Bass	186,105	289,985
Crappies	101.685	82.311
Small Mouth Bass	2.135	19.755
Sunfish	193 240	57,775
Brook Trout	1.744.647	1.641.640
Brown Trout	851 655	1.000.111
Loch Leven Trout	482 626	1 099 150
Bainbow Trout	1 645 325	1 997 462
Cisco	400,000	1,001,104
Herring	5 050 000	
Laka Trout	2 041 488	1 891 490
	2,941,400	1 969 459
Diakaral	9 950 995	1 1 4 0 0 0 0
Alking Theoret	2,200,220	1,140,000
Ailono Irout	100	974 169 000
\mathbf{r}_{1ke}	(1,000,200	314,100,990
Whitehan	54,393,360	10,714,910
Muskellunge	50,000	• • • • • • • •
,	88 179 507	205 205 071

Table 54—Summary of Production of Hatcheries, Field Stations and Bass and Crappie Ponds By Species

State Fish Hatcheries

The drouth which has prevailed generally over the state for the past many years has had a serious effect upon fish life and has complicated the work of propagation and distribution of hatchery production. Many lakes in the southern and south central parts of the state have entirely dried up. The deeper lakes have subsided so as to reduce the water areas to an extent to cause disease during seasons of open water and extermination from overcrowding and exhaustion of oxygen during the winter months. Several lakes have become entirely depleted of fish life. Even lakes of reasonable depth have suffered severely. Even in sections where snow fell to a depth of several feet during the winter of 1933-1934 lakes did not recover appreciably. Ground absorption consumed nearly all the run-off leaving a relatively small portion for lake and stream supplies.

The unusual heat which prevailed during the month of May, 1934, raised the temperature of water in streams which normally were satisfactory for trout, to a point where this species found it difficult to exist. This condition affected even the streams on the north shore of Lake Superior. The trout streams of the southeastern counties were more seriously affected. Not only did unusually high temperatures prove a menace but many of the springs which normally maintain a supply of cold water in these brooks and creeks ceased to flow or delivered such a small volume of water as not to effectively hold the water at the required low temperatures.

It is recognized in this state as all over the nation that the wall-eyed pike is Minnesota's most important game fish. It reproduces in greatest numbers in lakes which have tributaries where the fish can ascend to spawn in clear running water. The reduced flow and in some instances the complete cessation of flow in tributary streams which normally supply wall-eyed pike fry, had a disastrous effect on the volume of eggs that could be collected during the 1934 spawning season.

Disastrous as have been the effects of these dry years upon fish life, the large number of natural lakes and bodies of water found within our state has made these losses less seriously felt as the proportion of actual losses of fish life to that which remains has been so small as to have escaped the attention of the ordinary observer and fisherman. To those who have had occasion to study the real effects of the drouth however, the situation is more serious. To cite one instance, the water levels of Red Lake have receded to a point where the natural spawning beds of the whitefish are exposed to the open air and it is extremely doubtful if any natural reproduction will take place until the lake level has again attained its normal elevation. This is a serious matter because the whitefish of Red Lake is justly considered the most valuable food fish native to our waters.

The production of pike eggs was quite satisfactory in the spring of 1933 as the waters in most of the streams where eggs were gathered had not receded so as to interfere seriously with the ascending of the pike. Consequently the number of eggs obtained during the spring of 1933 compared quite favorably with the yield obtained in 1932. Low water stages which prevailed during the season of 1934 however, cut the production of pike fry last spring to half of that of 1933. This is a serious loss to the hundreds of lakes which are annually stocked with wall-eyed pike. The seriousness of this diminished supply will not be fully appreciated until perhaps the fishing seasons of 1936-1937.

The so-called nest-building fishes—bass, crappies and various species of sunfish—have the ability to adapt themselves to a change in environment so that the recession of lakes which disturbs reproduction of other species does not have the same serious effects on these varieties so far as their production is concerned. In many lakes recession of water levels however has destroyed the plant life which furnishes the natural food for nest-building varieties as well as other types of fish and this lack of food will materially reduce fish population of species in which the average angler is most interested.

Aside from the disappointing results experienced in collection of pike eggs, operations at the hatcheries and field stations have been successful and if seasonable precipitation returns within the next year or two it is not anticipated that the restoration of fish life to our waters as they again return to natural conditions will be a serious problem.

There is need however, for the removal of rough fish from a large number of our southern Minnesota lakes to relieve the over-crowded condition caused by the concentration of fish in the deeper portions of the lake. As the waters recede these areas are becoming increasingly smaller in extent. Carp and suckers in particular should be removed. There has been a very limited demand and an exceedingly poor market for these species of fish for the past two years so that the incentive to remove rough fish has been largely removed, permitting the growth in population of these species far in excess of the capacity of many of our lakes to support them.

The setting aside of natural spawning grounds in all lakes inhabited by the nest-building fish, has been so successful wherever tried, even under the adverse conditions which now prevail, as to indicate that it is the most effective solution of the problem of producing these species for restocking purposes. The output from state hatcheries of the various varieties of trout has been highly successful during the year. In fact the output of trout fingerlings was so great in 1934 as to create a problem of where to find suitable streams in which to plant them. Many thousands of brook, brown and rainbow trout reared for the restocking of streams which had disappeared from the effects of drouth, had to be released in suitable lakes with dubious results.

Wall-eyed pike have been introduced into waters in the Lake Superior region where such fish heretofore have been unknown. In certain of these lakes these fish have within a period of four years attained a weight of from six to eight pounds and apparently are reproducing of their kind in their new habitat. Likewise the introduction of Red Lake whitefish into Lake Superior appears to have been successful. Commercial fishermen are now catching considerable quantities of these desirable fish which are considered to be superior in quality to those native in Lake Superior.

Attempts by the division to propogate muskellunge may be said to have failed thus far. In the spring of 1933 a ripe male and female muskellunge were procured from which 50,000 fry were hatched and planted, the first production of muskellunge fry over a period of five years but apparently without results. Permits have been issued to private experimenters who have attempted to artificially propogate these species of fish but such efforts too appear to have failed. One exception might be noted. A natural muskellunge spawning bed in a bay on Lake Belle Taine, Hubbard County, was utilized apparently with more or less success. Attempts to rear these fish in ponds especially constructed for the purpose and at considerable expense have ended in total failure. From results had thus far it would seem that the only practical methods of reproducing muskellunge is to set aside perpetually all natural spawning beds to be found, have them carefully patrolled during the spawning season, and subsequent angling activities strictly supervised.

St. Paul Hatchery

This hatchery has for a number of years been used as a clearing house in the distribution of fish between the northern and southern sections of the state and as a headquarters for the field men operating bass ponds and field stations as well as those engaged throughout the year in distribution. The new hatchery, completed in 1932, has proven a decided improvement over the old structure. The water supply available for the old hatchery was found to be insufficient to supply the ponds for the present hatchery. To remedy this situation a deep well was driven during the fall of 1933. Trout have now been kept in water supplied by this well for a period of from six to eight months with success.

A fire of unknown origin destroyed the garage and machine shop in the spring of 1934. All tools and equipment used in maintaining the division's trucks together with one of the trucks and three private cars belonging to employes of the department were destroyed.

The cost of keeping the buildings in repair at this hatchery averages more than at the others because it is located close to the railroad yards, which makes it necessary to paint and repair the wood work on the buildings more often. Marshie

St. Peter Hatchery

Conditions which were not investigated thoroughly prior to the location of the St. Peter hatchery are making its operation and maintenance fraught with considerable difficulty and expense. A substance the nature of which has not yet been determined, having the consistency of glue, tends to obstruct water mains, requiring constant attention in order that the normal flow of water through the pipes may be maintained. Ponds had to be located in a floating bog, making it practically impossible to maintain embankments around the larger ponds without disproportionate large annual expenditures. Winter freezing raises these embankments in some places two feet. When the frost leaves they drop below the level occupied before freezing. This heaving effect by frost demolishes even the cement ponds making it necessary to reconstruct them with heavy reinforcements.

The buildings are in a good state of repair. The output of trout is entirely satisfactory. On the other hand, because of the cost of maintaining embankments and surrounding ponds, our attempts at reproducing bass and crappies have ended in failure.

Glenwood Hatchery

This hatchery is restricted to the cultivation of trout alone. The territory in which it is located is in the heart of an area which has perhaps suffered most from drouth. The total water supply available for its operation during the summer of 1934 was reduced to only 150 gallons per minute. The supply ten years ago was approximately one thousand gallons per minute. By pumping the available water supply over and over again it has been possible to rear the normal number of trout fingerlings even under reduced water supplies.

Steps are under way to ascertain, by the driving of an experimental well, the possibilities of securing an augmented supply of water. Unless additional water can be had and if existing weather conditions prevail beyond the present season it will be necessary to materially curtail the output of this hatchery.

The superintendent's residence is a very much larger building than is necessary and entails a disproportionate outlay for maintenance. At the time this building was erected it was planned as the summer headquarters of the then State Game and Fish Commission. If it were practical to dismantle this building and erect a smaller one with more modern conveniences it would materially reduce the cost of future maintenance and provide more comfortable quarters for the superintendent and his family.

Detroit Lakes Hatchery

The hatchery building is used solely for the purpose of incubating walleyed pike gathered from several surrounding field stations. The annual output of pike fry is sufficient to restock several hundred lakes in the vicinity.

Primarily the site for this hatchery was selected for the rearing of bass, crappies and sunfish but due to climatic conditions, uncertainty has attended the rearing of bass and crappies. Results from hatching trout eggs and rearing trout to fingerling size has been very successful at a small tem-

porary hatchery located some six miles from the city of Detroit Lakes and operated as an auxiliary plant to the Detroit Hatchery. It is hoped that in the near future a small tract of land may be purchased at this location and a permanent, well equipped hatchery constructed thereon. Buildings and ponds are maintained in splendid condition at a minimum of expense.

French River Hatchery

Abnormal weather conditions already referred to have affected the operations of this hatchery. A short time after the construction of the dam and buildings it was found that summer temperatures under which it was impossible to maintain trout after about the first of June developed in waters supplied the hatchery at that time. To remedy this situation pumps were installed to bring water from Lake Superior. This arrangement proved satisfactory until the past few years when abnormally warm weather raised the temperature of the water in Lake Superior itself from a normal of 42 degrees to temperatures as high as sixty-five degrees, 50 feet below the surface. As a result it has been necessary to plant the trout output of the hatchery about the middle of summer for three years in succession and in some instances to release the trout in the main body of Lake Superior for want of suitable streams in which to-plant them.

The French River hatchery handles during any one season more species of fish than any other hatchery in the state. There is only a short season during middle summer or early fall when there are not some species of eggs in the course of incubation or newly hatched fry in the building. The cooperation of north shore fishermen in obtaining the annual supply of lake trout eggs continues.

The aggregate output of young fish from this hatchery during the 1933-1934 season fell far below that obtained in the previous season. This was due to the fact that no whitefish eggs were available for transfer from Redby to the hatchery in the fall of 1933.

The superintendent in addition to supervising the hatchery is in charge of the distribution of trout reared at Lanesboro and St. Paul which are transported north for distribution to the North Shore streams.

The condition of the hatchery and other buildings is satisfactory with the exception of the roof of the hatchery which is being replaced by a new one. It has not been necessary to expend anything in permanent improvements during the biennium.

Lanesboro

Two large dirt ponds and a few cement ponds were started in 1933 and completed in the late fall, upon lands acquired in 1931. The two new ponds are on opposite sides of the creek which runs through the center of the ground and are supplied from a pipe leading under the creek carrying the discharge from one of the large trout retaining ponds. One of the ponds is to be used for retaining brook trout, the other as a crappie breeding pond.

The old building found on the newly acquired land was dismantled and a modern five room house constructed on the same site to serve as a home for the fish culturist at the hatchery. This building was erected at a cost of slightly less than \$3,500.

The Lanesboro hatchery has proven a greater success for the raising of trout than perhaps any other hatchery in the state. The rate of growth of trout reared is fully twice that noted in any of the other hatcheries with the exception of perhaps the St. Paul Hatchery.

The hatchery was originally constructed to furnish fish for restocking streams in the southeastern part of the state. With a steady lowering of the flow in trout streams of this area it has become necessary to distribute much of the output in other sections. When the 1934 output has been distributed it will probably be found that from fifty to sixty carloads will have been shipped into northern waters after the streams in the southeastern counties have been supplied.

The production of eggs, particularly rainbow trout, has been far in excess of the capacity of the hatchery. The excess supply has been made the main source for other state hatcheries, in addition leaving a surplus to exchange annually for a like number of eyed lake trout eggs from the state of Michigan. In 1933, 467,000 eggs were thus exchanged and in 1934 an exchange of 559,000 eggs was affected. The eggs so obtained are used to supply inland lakes in St. Louis, Lake and Cook counties and is the only source of eggs available except a limited supply obtained from a lot of lake trout now being maintained at the hatchery.

More money has been expended on permanent improvements at this hatchery than at any other because of its greater possibilities to produce results. Such permanent improvements consist of cement and dirt ponds, new buildings and additional ponds and dykes.

Redby Hatchery

The Redby hatchery has continued to be operated in cooperation with the Red Lake Fisheries Association and the U. S. Bureau of Indian Affairs. The principal purpose of the hatchery is the maintenance of whitefish and wall-eyed pike in the Red Lakes. The field station on Upper Red Lake outside of the Red Lake Indian Reservation has furnished a considerable supply of green eggs for other hatcheries.

A limited number of trout are produced but the waters in the creek from which the hatchery receives its supply rises to a temperature during the summer which makes it inadvisable to attempt to keep it stocked with trout. As a consequence the entire output of trout is planted in nearby waters as soon as they have attained the length of about 2".

The hatchery output of pike and whitefish for the season 1932-1933 were satisfactory but owing to weather conditions which prevailed in the fall of 1933 the Indian fishermen who are relied on to procure the whitefish eggs were unable to produce but a limited supply because of prevailing storms during the spawning season. As a result the output during the season 1933-1934 fell to less than thirty million as compared with one hundred and thirty-two million in the 1932-1933 season.

Buildings including the state fisheries have been kept in splendid repair and the grounds clean, all equipment overhauled and put in good condition. The cooperative agreement now in effect between the department and the

TG STATES STATE OF LA

DISTRIBUTION, BY COUNTIES, OF FISH PRODUCED IN HATCHERIES-FISCAL YEARS 1933-1934

	WALL-	EYED	LA	KE	BRO	OK	BRO	WN	RAINE	BOW	LOCH	LEVEN	L. N	4.	s.	м.							·							
COUNTIES	PI	KE	TRO	DUT	TRO	UT	TRO	UT	TRO	UT	TRO	DUT	BAS	S	BA	ASS	CRAF	PPIES	SUN	FISH	WHIT	EFISH	PICK	EREL	SUCE	KERS	CIS	<u>co</u>	HEI	RRII
	1933	1934	1933	1934	1933	1934	1933	1934	1933	1934	1933	1934	1933	1934	1933	1934	1933	1934	1933	1934	1933	1934	1933	1934	1933	1934	1933	1934	1933	
Aitkin Anoka Becker Beltrami Benton	9,170,000 696,000 23,867,960 135,593,100 250,000	4,650,000 225,000 17,807,800 36,167,400	• • • • • • • • • • • • • • • • • • •	7,200	9,600 4,400 91,142 55,175	$3,000 \\ 4,000 \\ 55,802 \\ 12,425$	8,250	6,250 49,790	2,750 9,000 35,700 91,250 7,500	9,550 39,200 81,382 7,500		· · · · · · · · · · · · · · · · · · ·	5,600 1,700 6,365 1,000 800.	2,450 1,800 7,570 3,500	· · · · · · · · · · · · · · · · · · ·	475	2,100 12,855	1,200 4,006	10,400 865 208	200 4,750	43,893,360	8,054,910	40	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·		· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	
Blue Earth Brown Carlton Carver	360,000 771,000 648,000	235,500 330,000	· · · · · · · · · · · · · · · · · · ·		67,600	83,550 1,000	37,000	61,775	9,000 . 44,150 .		· · · · · · · · · · · · · · · · · · ·	22,500	1,200 1,200 1,075	1,000 1,500 2,100		· · · · · · · · · · · · · · · · · · ·	2,250 	125	4,500 3,950	400 1,200	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	100,000 40,000		· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·			••••••••••	
Cass Chisago Clay Clearwater Cook	$\begin{array}{r} 26,455,560\\ 2,040,000\\ 163,200\\ 14,485,000\\ 2,100,000 \end{array}$	25,111,680 727,500 203,616 5,885,410 1,650,000		879,350	81,450 4,950 15,250 21,125 49,875	35,960 3,850 3,320 21,600 145,200	21,350 8,875 11,250	14,125 4,875 17,625 28,066 19,200	2,400 7,500 25,000 27,000	26,525 1,250 21,280 28,920 172,780	· · · · · · · · · · · · · · · · · · ·	99,300	3,800 600 2,200	5,390 9,500 100 900 7,650	50 	750	2,000 975	8,400	1,275	5,675 700 500	1,725,960		· · · · · · · · · · · · · · · · · · ·	50,000	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·		· · · · · · · · · · · · · · · · · · ·	 	· · · ·
Cottonwood Crow Wing Dakota Dodge	216,000	105,000 53,170,000	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	31,850 750	1,200	9,500	6,000	14,375 6,000 7,875 1,200	5,000 7,500 600 25,825	1,000		1,500 10,445 100 	2,350 8,500 600 4,675		· · · · · · · · · · · · · · · · · · ·	1,000 700	3,750	10,450 2,450	8,400 300	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·			· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·		· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	· · · · ·
Faribault					24,350	34,615	63,600	27,675	192,204	60,150 36.260	103,926	148,800	· · · · · · · · · · · · · · · · · · ·		835	8,485	1,000	2,400	9,000			· · · · · · · · · · · · · · · · · · ·	60,000		· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · ·				· · · · · ·
Grant Hennepin Houston Hubbard	1,125,000 3,120,000 26,070,000	875,000 202,500 19,166.600			300 3,000 167,375	2,900 26,625 277,065	15,000	131,800 98,325	49,150 40,950	132,715	38,300	49,000	70,650	1,250 100,800 3,600			450 5,800	900	22,950	11,000 1,250		· · · · · · · · · · · · · · · · · · ·	1,650,000	370,000	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·			· · · · · · · · · · · · · · · · · · ·	
Isanti Itasca Jackson Kanabec	84,730,000 336,000 384,000	55,870,000		1,000	17,000 4,500	1,000 42,500 1,600	6,250	17,500	6,650	20,965		25,500	800 5,550 	2,400 1,500	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	2,100		13,850 250	300	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·		600,000	· · · · · · · · · · · · · · · · · · ·	·····		• • • • • • • • • • • • • • • • • • • •	· · · · · · · · · · · · · · · · · · ·	• • • •
Kandiyohi Kittson Koochiching Lake	3,276,000 6,669,792 1,550,000	1,550,000 40,899,187 1,023,000	625,665	587,674	10,500 291,540 1,500	408,750	15,000 120,500	12,000 216,000	114,750	$4,480 \\ 10,000 \\ 324,225$		257,600	900	5,100		· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	150	2,700	1,250	8,774,040	361,000	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	400,000	· · · · · · · · · · · · · · · · · · ·	•••••••••	
Lake of the woods. Le Sueur Lincoln Lyon McLeod	1,584,000 528,000 576,000	1,270,500				· · · · · · · · · · · · · · · · · · ·							2,000 	4,650 1,750 1,700	125	· · · · · · · · · · · · · · · · · · ·	5,850		5,500 3,000	500	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	50,000	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·		· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	• • • •
Mahnomen Martin Meeker Mille Lacs Morrison	1,517,760 1,200,000 978,000 7,350,000 1,602,440	1,119,888 911,000 4,381,000 2,233,240		· · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	2,490 3,400	2,300	· · · · · · · · · · · · · · · · · · ·	4,800	6,720	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	1,385 1,300 2,300 550	$1,200 \\ 3,200 \\ 6,200 \\ 600 \\ 1,850$	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	960 4,000 2,438	140 	750 13,400 1,000	500 600	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	160,000	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·		· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	
Mower	1,272,000 336,000	600,000 135,000	,		· · · · · · · · · · · · · · · · · · ·	2,700 	880	1,000	3,000	1,750		7,750	1,225 600	2,800 1,200 250	100	1,250	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·			· · · · · · · · · · · · · · · · · · ·			· · · · · · · · · · · · · · · · · · ·			· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	· · · · ·
Olmsted Otter Tail Pine Pipestone	26,057,384 648,000	40,260,904 1,035,000			40,590 96,125	8,125 8,300 106,550	7,000 96,000	780 2,250 35,875	$49,700 \\ 6,750 \\ 54,000$	9,840 23,520 29,375	26,100	36,500	8,600 2,800 1,000	$13,500 \\ 2,100 \\ 750$		2,500 150	14,615	10,405	1,700	4,410		· · · · · · · · · · · · · · · · · · ·	185	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	100		· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	
Polk Pope Ramsey Redwood	2,008,360 4,045,000 624,000	442,000 1,425,000 912,000		· · · · · · · · · · · · · · · · · · ·	7,812 4,100	11,288 750	3,000	· · · · · · · · · · · · · · · · · · ·	2 250	9,580 3,000	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	1,500 1,800 1,650 	2,000 360 11,400		· · · · · · · · · · · · · · · · · · ·	1,170 4,900 300	1,095 	2,700 4,250	3,500	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·			· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·		· · · · · · · · · · · · · · · · · · ·		
Rock	1,512,000	495,000	1.462.748	357,260	1,500 533,893	3,000	256,150	114,625	750.	1,250 220,215	132,000	247,550	1,000 15,700	6,900 16,350		450	7,500 500	18,000	9,500	1,900		2,299,000	120,000	·····		1,262,352		· · · · · · · · · · · · · · · · · · ·	5,050,00	
Scott Sherburne Sibley Stearns	816,000	2,315,000	· · · · · · · · · · · · · · · · · · ·		1,000 1,100	3,300 30,925	2,000	12,000 2,800	18,000 	15,000 1,000 5,150	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	$\begin{array}{r} 450 \\ 1,300 \\ 300 \\ 1,450 \end{array}$	1,500 3,070		· · · · · · · · · · · · · · · · · · ·	900 5,280 1,784		8,150 3,700	300	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·			· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·		· · · · · · · · · · · · · · · · · · ·	·····	· · · ·
Steele Stevens Todd Wabasha	1,075,000	100,000 325,000		· · · · · · · · · · · · · · · · · · ·	8,500 9,000	29,125 5,100	2,500 26,500	2,850	2,250 . 	7,800 20,900	9,850	35,500	200 	250 2,270 750	125 125	1,750	1,850	25,000	3,350	500	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	50,000	20.000	· · · · · · · · · · · · · · · · · · ·					· · · · ·
Wadena Waseca Washington Watonwan	600,000 1,920,000 216,000	711,000 1,105,500 105,000	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	41,240	25,430	· · · · · · · · · · · · · · · · · · ·		006,01	2,000	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·		$250 \\ 400 \\ 11,150 \\ \dots$		· · · · · · · · · · · · · · · · · · ·	$130 \\ 1,950 \\ 3,200 \\ \dots$	2,000	4,000 13,325	· · · · · · · · · · · · · · · · · · ·		· · · · · · · · · · · · · · · · · · ·	20,000	20,000				· · · · · · · · · · · · · · · · · · ·		· · · ·
Wilkin Winona Wright Totals	2,678,000 617,286,272	1,815,000 374,316,854	2,941,253	1,832,484	13,595 6,875 1,750 1,745,787		23,000	982,511	90,250	42,000 1,432,492	71,700 473,626	131,000 1,073,550	1,375 185,630	8,350 289,085	2,135	18,460	7,400	78,371	10,650 192,948	54,885	54,393,360	10,714,910	2,250,225	1,040,000	·····	1,262,452	400,000	· · · · · · · · · · · · · · · · · · ·	5,050,00	· · · · · · · · · · · · · · · · · · ·

DISTRIBUTION, BY COUNTIES, OF FISH PRODUCED IN HATCHERIES—FISCAL YEARS 1933-1934

														-																		
	BRO TRO		BRO TRO	WN DUT	RAIN TRO	BOW DUT	LOCH	LEVEN	L. BA	M. SS	S. I BAS	M	CRAF	PPIES	SUNF	ISH	WHIT	EFISH	PICK	EREL	SUC	KERS		sco	HER	RING	ALB	INO DUT	MUSKE	LLUNGE	TOT ALL SP	AL, ECIES
	1933	1934	1933	1934	1933	1934	1933	1934	1933	1934 .	1933	1934	1933	1934	1933	1934	1933	1934	1933	1934	1933	1934	1933	1934	1933	1934	1933	1934	1933	1934	1933	1934
,200	9,600 4 400	3,000		6,250	2,750	9,550			5,600	2,450				1 200		200	•••••														9,187,950	4,678,450
	$91,142 \\ 55,175$	55,802 12,425	8.250	49,790	$35,700 \\ 91,250$	39,200 81,382			6,365 1,000	7,570 3,500		475	12,855	4,006	865	4,750	43,893,360	8.054.910	40												24,014,927 179.642.135	17,919,603 44.369.407
					7,500	7,500			800			• • • • • • • • • • •			208 .		•••••					• • • • • • • • • • • • • • • • • • • •									258,508	7,500
					9,000	· · · · · · · · · · · ·			1,200	1,000			2,250	125	4,500 .		•••••		$100,000 \\ 40,000$					· · · · · · · · · · · · ·		· · · · · · · · · · · · · ·	••••	•••••	· · · · · · · · · · · · · · · · · · ·		476,950 40,000	1,125
	81 450	1,000 35,960	21 350	14 125	19.625	26 525			1,200	2,100 5 390		• • • • • • • • • • •	900 390	8 400	3,950 1 275	1,200 6,675	· · · · · · · · · · · · · ·	••••••••••••	· · · · · · · · · · · · · ·	· · · · · · · · · · · ·		· · · · · · · · · · · · · · · · · ·				•••••	• • • • • • • • • • • •				653,925 26 586 200	405,225 334,300 25 208 755
	4,950	3,850	8,875	4,875	2,400	1,250)		3,800	9,500			2.000	0,±00	12,125	700				50,000											2.074.150	797.675
	$15,250 \\ 21,125$	$3,320 \\ 21,600$	11,250	$17,625 \\ 28,066$	$7,500 \\ 25,000$	$21,280 \\ 28,920$			600	100 900	·					500															$185,950 \\ 14,543,950$	$246,441 \\ 5,964,896$
,350	49,875	145,200		19,200	27,000	172,780)	99,300	2,200	2,350	525	750			· · · · · · · · · · · · · · · · · · ·		1,725,960	••••••••••••••••••••••••••••••••••••••							••••	•••••	· · · · · · · · · · · ·	•••••			4,758,400 217,500	2,974,230 107,350
	31,850	1,200	9,500	6,000	$14,375 \\ 6.000$	-5,000			10,445 100	8,500			1,000	3,750	10,450	8,400										•••••					71,188,726	53,202,850
				1.200	7,875 1,200	600 25,825	1,000			4.675		1,000														•••••					8,875 6,702,360	1,600 1.356,700
														2,400												••••••	• • • • • • • • • • • •					2,400
	24,350	34,615	63,600	27,675	192,204	60,150				· · · · · · · · · · · · · · · · · · ·	835	8,485		· · · · · · · · · · · ·	9,000				60,000			· · · · · · · · · · · · · · ·	· · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · ·	• • • • • • • • • • •			384,915 70,000	279,725
	7,250	1,500	30,250	39,750	49,500	30,200	6,750	9,550	70.650	1,250		1,650	450				· · · · · · · · · · · · · ·		· · · · · · · · · · · · · · ·	· · · · · · · · · · · ·		· · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · ·	••••••••••	•••••	· · · · · · · · · · · · ·	· · · · · · · · · · · · · · ·	•••••••••••	· · · · · · · · · · · · ·	····	94,000	88,710 876,250 217,200
	3.000	2,500	15.000	131.800	49,150		38.300	49,000		100,800			5,800		22,800	11,000			•••••							•••••					105.450	207.425
	167,375	277,065 1,000	71,000	98,325	40,950	132,715	5		1,800 800	$3,600$ \ldots $2,400$ \ldots			$^{3,450}_{2,100}$	900	13,850	$1,250 \\ 300$			1,650,000	370,000									50,000		28,054,575 16,750	20,050,455 3,700
,000	17,000	42,500	6,250	17,500	6,650	20,965	5	25,500	5,550	1,500					250 .		· · · · · · · · · · · · · · · · · · ·			600,000					· · · · · · · · · · · · ·	· · · · · · · · · · · · ·	· · · · · · · · · · · · · · ·			· · · · · · · · · · · · ·	84,765,700 336,000	56,578,965
	4,500	1,600		,	1,125	2,725	5	3,000	800		••••••																				390,425	7,325
	10.500		15.000	12 000		4,480						• • • • • • • • • •		150	2,700	1,250	•••••	· · · · · · · · · · •	· · · · · · · · · · · · · ·				· · · · · · · · · · · ·	· · · · · · · · · · · · ·	· · · · · · · · · · · · · ·	· · · · · · · · · · · · · ·	•••••	••••••	•••••	· · · · · · · · · · · · · · · · · · ·	6 605 202	1,558,100 5,880 40 021 187
,674	291,540	408,750	120,500	216,000	114,*50	324,225	84,000	257,600	900	5,100							8,774,040	361,000					400,000			••••••••••	•••••	•••••			11,961,395	3,183,349
	1,500		<i>.</i>		6,000				$1,000 \\ 2,000$	4,650	125		 5,850		5,500				50,000			· · · · · · · · · · · · · ·	<i>.</i>		· · · · · · · · · · · · ·	· · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·				6,408,500 1,648,235	6,000,000 1,275,150
 				· · · · · · · · · · · ·		· · · · · · · · · · ·	·		500	1,750			 				•••••		· · · · · · · · · · · · · ·				· · · · · · · · · · · · ·		· · · · · · · · · · · · ·	· · · · · · · · · · · · · ·	· · · · · · · · · · · · · ·	•••••			528,000. 500	2,250
		2 400			4 800	6 720	· · · · · · · · · · · · · · · · · · ·		1,385	1,700		• • • • • • • • •		140	3,000 . 750	500							· • • • • • • • • • • • • • •	••••		• • • • • • • • • • • •	•••••		•••••		1 525 655	1 1 3 0 9 3 8
									1,300 2,300	3,200 6,200			4.000		13,400				160,000					••••••••		•••••					1,361,300	3,200
		3,400	2,300						550	$\begin{array}{c} 600 \ldots \\ 1,850 \ldots \end{array}$			2,438		1,000										· · · · · · · · · · · · ·				· · · · · · · · · · · ·		7,352,300 1,606,428	4,381,600 2,239,090
		2,700	880		3,000	1,750		7,750	1 995		100	1,250																			3,980	13,450
		500	[.]	1,000	· · · · · · · · · · · ·	••••••				1 200				· · · · · · · · · · · · · ·	••••••		•••••	· · · · · · · · · · · ·				· · · · · · · · · · · · · ·	· • · · · · · · · · · · ·	• • • • • • • • • • • • • • • • • • •		· · · · · · · · · · · ·	•••••	•••••			336 600	1,500
		2,490	12,440						·····	250						•••••	•••••								•••••	•••••		••••			12,440	2,740
	40,590	$^{8,125}_{8,300}$		$780 \\ 2,250$	$49,700 \\ 6,750$	9,840 23,520	26,100	36,500	8,600	13,500		$2,500 \\ 150$	14,615	10,405	1,700	 4,410			185			100				· · · · · · · · · · · ·					75,800 26,136,824	57,745 40,323,539
· · · ·	96,125	106,550	96,000	35,875 • • • • • • •	54,000	29,375	5		2,800	$2,100 \dots 750 \dots$				1.005		500	· · · · · · · · · · · · · ·		· · · · · · · · · · · · · · · · · · ·				. .	· · · · · · · · · · · · · ·	· · · · · · · · · · · · · ·	· · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·		· · · · · · · · · · · · · · ·		896,925	1,208,900 1,250
	7,812	11,288	3.000		••••	9,580 3,000)		1,500	2,000 360		•••••	1,170	1,095	2.700	5,250	• • • • • • • • • • • • •							•••••							2,018,902	471,213
		750					·		1,650	11,400			4,900 300	800	4,250	3,500							· · · · · · · · · · · · · · · · · · ·								634,800 300	927,700 750
		3,000			2,250	1,250)		275 	6,900					9,500				120,000				· • · · · · · · · · · · ·								122,525 1,649,000	524,150
					750					·············			500																		1,250	
,260	1,500 533,893 1,000	208,650	256,150	114,625	55,950 18 000	220,215 15.000	132,000	247,550	1,000	16,350		450	200 900		10,000 8,150	1,900		2,299,000	•••••	· · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · ·	1,262,352	••••••	••••	5,050,000	••••••••••••••••••••••••••••••••••••••	••••••	••••••	•••••		2,500 117,366,251 844,500	36,641,481
	1,100	3,300	2,000	12,000		1,000	j		1,300	1,500			5,280		3,700	300	•••••						••••••	••••		•••••		•••••••••	· · · · · · · · · · · · · ·		13,380	14,800
	18,225	30,925		2,800	 3,000	5,150	·		$300 \\ 1,450$				 1,784		3,000														· · · · · · · · · · · · · ·		300 3,972,959	2,356,945
					2,250	•••••			200	250	125 .		1,850 	25,000	3,350 .	· · · · · · · · · · ·	· · · · · · · · · · · · ·		50,000			· · · · · · · · · · · · · · · · · · ·									57,775	25,000 100,250 267.045
••••	8,500	5 100	2,500	2,850		20 000	0.000	35 500	000	2,270 750	125	1 750				500					-					•••••					104.275	64.500
	9,000 41,240	25,430	20,000		16,350	14,560)		100 500	$250 \dots 400 \dots$		1,700	$130 \\ 1.950$	2.000	4.000			· · · · · · · · · · · · ·		20,000						· · · · · · · · · · · · · · · · · · ·					657,820 6,450	771,240 2,400
						2,000)		4,200 300	11,150		*****	3,200		13,325				20,000												$\begin{array}{c}1,940,725\\236,300\end{array}$	$1,118,650 \\ 105,000$
	13,595	3,320		3,375	9,000																							an a			22,595	6,695
· · · · ·	$^{6,875}_{1,750}$	$\substack{\textbf{36,150}\\\textbf{4,925}}$	23,000	55,000	90,250	42,000	71,700	131,000	1,375	8,350			7,400	• • • • • • • • • • • •	10,650					•••••			· · · · · · · · · · · · · · ·		•••••		•••••	 	· · · · · · · · · · · · · · · · · · ·		2,699,175	1,828,275
,484	1,745,787	1,663,980	855,095	982,511	1,145,504	1,432,492	473,626	1,073,550	185,630	289,085	2,135	18,460	101,857	78,371	192,948	54,885	54,393,360	10,714,910	2,250,225	1,040,000		1,262,452	400,000		5,050,000		760		50,000		687,074,452	94,760,034
														1							And the second s		 	convertigation and the state of			a maarman ar strong over op start RESE State State State		and a second a second by a second		communication of the state of t	

Table 55

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Red Lake Fisheries Association is, however, not satisfactory to the department and negotiations are under way for the execution of a new lease. The cost of operating the hatchery has been shared jointly by the division and the Red Lake Fisheries Association without any material returns to the state. The cost to the state of operating the hatchery and fisheries plant is approximately \$4,400 per year, a cost entirely out of proportion to the benefit the state receives in return.

Table No. 55 indicates distribution by counties of fish produced in various hatcheries throughout the state.

Relations With the U.S. Bureau of Fisheries and Neighboring States

Past cooperative relationships with the federal hatchery at Duluth have continued during the biennium. Employes of the U. S. Bureau of Fisheries are assigned to assist the division's employes at certain field stations designated by the division for the purpose of procuring for the government hatchery a reasonable number of pike eggs from which to supply applicants in Minnesota and neighboring states. During the seasons 1933-1934 the following pike eggs were transferred to the Duluth government hatchery.

1933	15,945,000	wall-eyed	eggs
1934	7,000,000	wall-eyed	eggs

The practice of exchanging Minnesota rainbow trout eggs for a like number of lake trout eggs from the state of Michigan has continued. Michigan authorities report that the results from these exchanges have been decidedly successful. Because of our apparent inability to successfully procure lake trout eggs from our inland lakes we are fortunate, in return for the trout eggs furnished Michigan, for the maintenance of lake trout supplies.

Tables 56 and 57 are a summary of the species and number of fish produced and planted by the various state hatcheries and field stations during the biennial period.

· · · · · · · · · · · · · · · · · · ·	St.	Paul	St. 1	Peter	Gle	nwood	Detro	it Lakes	Frenc	h River	Lane	sboro	Re	dby
Species-	1932-33	1933-34	1932-33	1933-34	1932-33	1933-34	1932-33	1933-34	1932-33	1933-34	1932-33	1933-34	1932-33	1933-34
Bass	2,325	7,000	2,625	3,500	3,700	8,075	17,925	37,020						· · · · · · · · · · · ·
Crappies	31,300		2,000	125			28.140	11.751						
S. Mouth Bass	525		2,000					625			1.610	19,130		
Sunfich	49 575	6 800					3 015	20 025		•••••	1,010	10,100		
Dreels Twent	400 000	071 050	210 050	940 400	909 975	400 4775	090 914	20,020	005 000	959 400	119 950	956 765		
Brook Irout	400,110	271,890	510,050	249,400	302,879	444,470	409,014	01,100	299,200	200,400	113,300	300,700		70.000
Brown Trout		79,000	163,375	258,075	200,200	186,900			316,600	182,875	171,480	221,255		72,006
L. Leven Trout		105,700		59,250					216,000	234,850	266,626	699,350		
Rainbow Trout	358,075	221,275	78,775		43,400	169,875	97,665	149,580		321,920	487,204	464,750	112,500	110,342
Cisco							*		400.000					
Herring									5.050.000					
Lake Trout									2 941 253	1 824 230	225	7 200		
Suckers								100	2,011,200	1,021,200	200	1,200		
Dickers	600.000	150.000						100				· · · · · ·		
rickerei	600,000	150,000					220							
Albino Trout.			760											
Pike	25,608,000	10,101,000			25,995,000	10,400,000	50,373,504	58,681,128	29,960,000	8,810,000			88,037,244	21,502,940
Whitefish									10,500,000	2,660,000			43,893,360	8,054,910
					<u> </u>				·		y	<u> </u>		<u></u>
	27,133,575	10,691,625	557,585	570,350	26,545,175	11,187,325	50,759,788	58,987,979	49,679,136	14,287,275	1,040,505	1,768,450	132,043,104	29,740,198

Table 56—Summary of Production by Hatcheries

Table 57—Summary of Production by Field Stations

Species	Je	nkins	То	wer	Bem	idji	Park	Rapids	Cut Foo	ot Sioux	Ran	ier
	1932-1933	1933-1934	1932-1933	1933-1934	1932-1933	1933-1934	1932-1933	1933-1934	1932-1933	1933-1934	1932-1933	1933-1934
Pike	76,101,106	68,880,000	21,646,610	20,494,135	83,700,000	26,588,000	29,660,000	27,602,600	87,400,000	57,610,000	83,459,792	56,499,187
Suckers				1,262,352		· · · · · · · · ·		• • • • • • • •				
Muskellunge	• • • • • • • • • • •	• • • • • • • •		• • • • • • • • •	• • • • • • • •	•••••	50,000		• • • • • • • •		• • • • • • • • •	
Pickerei	··· ·····.	•••••	• • • • • • • •	• • • • • • • • •	• • • • • • • •	• • • • • • • •	1,650,000	390,000		600,000	•••••	
	76,101,106	68,880,000	21,646,610	21,756,487	83,700,000	26,588,000	31,360,000	27,992,600	87,400,000	58,210,000	83,459,792	56,499,187

Engineers Report

The same drouth which has introduced a number of complications and special problems in the administration of nearly all of the activities of the division has been reflected in increased demands for engineering assistance. The need for conserving and restoring rapidly receding lake levels has been particularly urgent and demands for this class of improvement have come from every section of the state far in excess of the division's resources to The depression and increased tax burdens have precluded meet them. municipalities and sportsmen's organizations from making much progress in undertaking projects for the conservation of water supplies as local enterprises, and until the several relief projects authorized by the federal government had been launched, about the only source from which relief was sought was the Fish Lakes Improvement Revolving Fund of the division. The large number of persistent requests for aid and dwindling returns from commercial fishing operations from which this fund receives its support, made it impossible to meet even a small fraction of the demands for fish lakes improvements.

The general policy of the division has been to allocate available funds in small sums to apply on a larger number of projects of modest proportions rather than to expend all of the funds on a few more costly ones.

In attempting to cope with the public demands for relief, the divisions of Forestry and Drainage and Waters has cooperated whole-heartedly for which aid full acknowledgment should be recorded.

Fish Lakes Improvement

More than two hundred requests for the improvement of fish lakes have been received. A number of the smaller projects for the stabilization of lake levels have been completed and others are being finished as fast as easements for sites can be obtained. Many projects for which funds have been requested have not been approved because of the fact that lake levels have not been established by the Boards of County Commissioners under the statutes granting the Boards such authority. The present law outlining proceedings for the fixing of lake levels by County Boards is not satisfactory. The enactment of adequate legislation to simplify such proceedings would be a long step in the direction of more effective lake conservation.

Fish Propagation

Opportunities for fish propagation have been increased and extended by the construction of several ponds during the biennium. Two of such ponds were constructed at the Lanesboro hatchery and an additional building was built for the caretaker's helper. Several smaller buildings have been constructed in various localities by a combination of department funds and federal relief work. Others, sponsored by the department have been built wholly by relief labor. Two ponds are being completed at Crystal Springs and it is planned to complete ten additional ones by the use of relief labor. At Redwood Falls a crappie pond of approximately one and three-quarters acres in extent was constructed by CWA labor and the material furnished by the department.

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Public Hunting Grounds and Game Refuges

The expansion of public hunting grounds and game refuges has created a number of engineering problems which have required extensive attention from the engineering division. When it is considered that most of the refuges are of recent acquisition it is anticipated that their future development and supervision will call for still greater attention in the future.

Conservation areas created by the past several legislatures have created an additional problem by placing the management of such areas in the department. The division is attempting to meet the most urgent needs for such management but because of limitations due to lack of funds and large tax delinquent areas still remaining in private ownership, much progress cannot be hoped for. Shelter and overnight cabins for wardens, the development of sanctuaries and feeding grounds, conservation of water supplies, development of trails and kindred improvements are awaiting constructive treatment and is a program that should be pursued consistently for the accomplishment of definite objectives.

During the past biennium complete re-surveys have been made of Thief Lake, Carlos Avery and a portion of the Whitewater public game refuges. Permanent monuments marking boundaries have been set and a record made of all such boundaries.

The extensive Red Lake Game Preserve has received some attention during the biennium but the work accomplished is in no wise commensurate with needs. Enough has been done, however, to demonstrate that proper patrolling, storing of water and the encouragement of the propagation of game can be made to bring highly satisfactory results. As an experiment approximately 125,000 acres have had water levels partially restored by the construction of dams in drainage ditches creating ample pools for migratory wild fowl, beaver and other fur bearers and furnishing a supply of water for fire protection. In recent years before this activity was begun there were no beaver in this area and only an occasional moose was found. Since the storage of water began to become effective, beaver and moose are reported to be numerous and on the increase and, apparently upland game including deer are likewise increasing in number. This program of extending water storage over this area has only commenced. It will take many years to complete it. The persistent pursuit of an intelligently conceived plan is necessary to bring results.

At the Thief Lake Game Refuge headquarters a number of buildings have been erected by CWA labor and negotiations are under way with the Minnesota Highway Department for the appropriation of funds to construct a first class road leading to Thief Lake dam. Refuge lines have been cleared and other improvements have been perfected with a view to bringing the area to a point of high production as soon as the water levels have reached the desired elevations.

The Carlos Avery refuge located in Anoka and Chisago counties was surveyed and carefully laid out preparatory to the establishment of the ECW camp which moved into the area in the fall of 1934. This camp engaged in the construction of fire breaks, trails and buildings and planted many varieties of shrubbery and forest trees. It is planned through the cooperation of ECW to have water control and fire prevention improvements still further extended. Additional buildings will be needed for experimental purposes and also as headquarters for the supervisor of the refuge. Shelter cabins for the patrolmen are being erected at convenient locations and it is contemplated to install a telephone system through the refuge.

The Whitewater project in Winona and Olmstead counties has received considerable attention. A number of rearing ponds are being planned and other improvements which will go to make this project a success are contemplated.

All of the engineering structures on the Turtle-Cross-Connection lakes project have been completed. As soon as an adequate water supply is made available this project should be on an operating and producing basis.

Rice Lake in Faribault county was improved by the construction of a small dam and its productivity restored, creating prolific feeding grounds for wild water fowl. A diversion channel was constructed which leads the surplus water in to Bass Lake which lies a few hundred feet directly north. This will serve to raise the water in Bass Lake approximately 4' and as thus restored this lake should become a very useful fish lake.

An earthern dyke and concrete control has been constructed on the Rum River at the outlet of Ogechie Lake just below Mille Lacs Lake in Mille Lacs County. This dam is to restore the rice beds and provide food for water fowl, also to create an extensive spawning ground for pickerel on Mille Lacs Lake. A small dam has been constructed at the outlet of Lake Onamia by local sportsmen and sponsored by the department. Plans have been completed for the construction of an additional dam at the outlet of Lake Shakopee, lying between Lake Ogechie and Lake Onamia. These three structures will create extensive feeding grounds for waterfowl for which refuge is available on the larger Mille Lacs Lake.

A dam and dyke constructed at the outlet of Mud Lake in Cass County was reinforced by the placing of additional riprap and sheet piling. The bridge over the dam was begun under a CWA project. Waters released from Leech Lake reservoir have kept the water above the Mud Lake dam at a constant level for the past two years and has encouraged an abundant growth of rice. This small area is probably one of the most valuable duck nesting grounds in northern Minnesota.

Preliminary surveys and designs of structures are completed on the Calhoun-Green Lake project and await the completion of the acquisition of the necessary land.

Preliminary surveys have been completed on the Talcott Lake development in Cottonwood county and this project too is awaiting purchase of lands.

In addition to the developments above specifically referred to and ordinary routine work, the engineering division has made investigations of twenty large projects ranging in area from 5,000 to 100,000 acres, as a part of the department's efforts to interest the U. S. Biological Survey in the acquisition and creation of migratory wild fowl breeding grounds and ref-

uges in the state. One such project, the Mud Lake area in Marshall county, comprising 50,000 acres, has been tentatively approved by the Biological Survey and proceedings for the acquisition of lands are under way.

Figure 15 is a map of the state of Minnesota showing locations of statutory game refuges, public hunting grounds and refuges, conservation districts, state fish hatcheries and fish rearing ponds.

Game Refuge and Public Hunting Grounds

Statutory game refuges on July 1st, 1933, embraced an aggregate of 3,253,419 acres distributed in 66 counties. This compares with 3,087,370 acres in 1930, 3,101,129 in 1931 and 3,332,831 in 1932.

Figure 16 is a graphic comparison of areas within statutory game refuges for the years 1915-1933.

Statutory Game Refuges 3,000,000 2,500,000 Acres 2,000,000 2. 1.504000 rea 1,000,000 389 856, 755 907.890 096'360 688,948 810,558 901.3/8 864 226 908.818 069,578 047.942 089772 500,000 1923 19/5 19/5 19/2 19/2 19/2 1924 1925 1926 1927 1928 1922 1929 1930 1931 1932 1361 1933

Fig. 16

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Fig. 15





Annual Increase in Areas Purchased From Public Hunting Grounds and Game Refuge Funds

Fig. 17

Lands within game refuges and public hunting grounds acquired by purchase from funds accruing to the Game Refuge and Public Hunting Grounds Revolving Fund have been trebled during the biennium. There are at the present time 55,510 acres within such refuges. This compares with 16,133 in 1931; 18,432 in 1932 and 51,254 in 1933. Figure 17 is a graphic representation of the growth of areas acquired by purchase. The following table indicates areas purchased.

Year	Name	Fee Acres	Easement Acres
1931	Thief Lake	14.932.85	1200.00
1932	Turtle-Cross Lakes	2.52	1692.13
	Thief Lake		
	Whitewater	524.38	
1933	Kabetogama		
	King Williams		
	Carlos Avery	8,486.73	
	Whitewater	1,180.68	
1934	Brule		
	White Earth		
	Finland Forest		
	Whitewater		<i></i>

Land Acquisition—Division of Game and Fish

In addition to the above areas, authorization has been given and proceedings are pending for the acquisition of additional game refuges and hunting grounds at and near Talcot Lakes, Cottonwood and Murray Counties; Green-Calhoun Lakes, Kandiyohi county, and Lower Rice Lake, Clearwater county.

The U. S. Biological Survey has approved of the purchase of approximately 52,000 acres in the so-called Mud Lake area in Marshall county to be developed into a federal migratory wild fowl nesting and feeding ground. The department is cooperating with the U. S. Biological Survey in proceedings for the acquisition of these lands.

DIVISION OF LANDS AND MINERALS

F. A. WILDS, Director.

Authorities.

Section 18 of the Organic Act of Minnesota passed by Congress March 3, 1849, creating a territory, ceded to the New Territory tracts of land for school purposes in the following language:

"And be it further enacted, that when the lands of said territory shall be surveyed under the direction of the Government of the United States, preparatory to bringing the same into market, Sections numbered 16 to 36 in each township in said territory shall be and the same are hereby reserved for the purpose of being applied to schools in said territory, and in the state and territories hereafter to be erected out of the same."

By an act passed February 18th, 1857, a state government was authorized. Under section 5 of that law, the new state was given:

I. "Sections 16 and 36 of every township in the state and where either of said sections or part thereof have been sold or otherwise disposed of, other lands equivalent thereto as contiguous as may be, shall be granted to the state for the use of schools."

II. "Seventy-two sections of lands for a state university."

III. "Ten sections of land to be selected by the Governor for the purpose of completing public buildings and erection of others at the seat of government."

IV. "All salt spring lands within the state not exceeding 12 in number with six sections of land adjoining as contiguous as possible to each spring."

V. "Five per cent of the net proceeds of the sale of all public lands shall be given to the state for the purpose of making roads and internal improvements."

By an act of Congress passed in 1860, all swamp and overflowed lands in the state of Minnesota not already granted were to be conveyed to the state.

A. Under the several federal land grants the state has received for the purposes and extent of areas noted as follows:

Designation:	Areas.
For School	\$2,974,454.64
For University	$91,\!524.19$
Internal Improvement	$496,\!482.29$
Swamp Land	4,777,223.76
Public Buildings	6,397.07
Agricultural College	119,986.80
Salt Springs	46,080.00

\$8,514,148.75

At the close of business on the 30th day of June 1934 the following amounts had accrued to the several trust funds:

Permanent School fund	\$64,550,076.31
Permanent University Fund	6,030,705.53
Permanent Internal Improvement Fund	. 381,823.21
Swamp Land Fund	. 11,706,768.63

Total\$82,668,535.15

The sources of accumulation are: (a) the sale of land, (b) rights-ofway, leases, etc., (c) sale of timber, (d) royalty on iron ore, (e) occupational tax on iron ore, and (f) profit on the sale of bonds.

All the land received from the federal government under the salt spring allotment, approximately 45,080 acres, was turned over to the Minnesota Natural History and Geological Survey. This fund has been administered by the Board of Regents of the State University.

State Lands

The Conservation Commission and the Department of Conservation as now constituted came into being through the enactment of laws 1931, chapter 186. It was organized as of July 1, 1931. Because of a question having been raised as to the legality of that part of the act which provided for the transfer of the administration of state trust fund lands and minerals from the State Auditor, the division did not become a part of the department before April 1st, 1933. At that time it did not take over all of the records and duties of the lands and minerals from the State Auditor's office as there was a question of the proper division of such duties and records. The state land records are still in the office of the State Auditor.

Coming into the Department of Conservation at that late date and with the records pertaining to state lands in the Auditor's office, it was found impossible to prepare land lists, advertise and hold a land sale before the first week of July 1933. During this sale 2,946.77 acres were sold in twentyseven counties.

Effects of the drouth began to manifest themselves throughout the state early in 1933 creating an unusual demand for hay and pasture wherever available, with a consequent general increased urge for the leasing of state owned hay and pasture lands. In order to make available as much of this class of state lands as possible the personnel of the squatter department of the division located at Hibbing was set to work leasing hay and pasture stumpage to farmers. A total of 56,000 acres were leased before the close of the season.

In the spring of 1934 state land sales were held in thirteen counties. The sales were held the latter part of March and early in April. There was a good demand for land resulting in the disposal of 7,905.93 acres. So far as possible to determine every acre of land disposed of in 1933 and 1934 went to persons who actually desired the land for farming purposes. No lands that were not suitable for agriculture or located within easy reach of already existing schools, roads and other governmental facilities were offered. Many of the lands placed on the sales lists were found to be delinquent in interest payments. An effort was made to determine the lands that were thus delinquent due to the effects of the depression and other lands that had been actually abandoned. Many hundreds of such tracts were appraised and offered for sale but all bids were rejected because the lands were either located in isolated portions of the counties, in forestry areas or within conservation zones.

In 1934 the effects of the drouth was being reflected by an unprecedented demand for hay and pasture lands. The entire field force of the division was turned out to scout for lands on which livestock forage was to be found to give relief to the emergency situation in southern and southwestern Minnesota. Areas that could furnish pasture and hay for cattle were located and the facts turned over to federal relief agencies. The state owned lands within such areas were leased by the division and by the end of the season between 135,000 and 140,000 acres of land had been leased at a rental of 10c per acre. Applicants for leases were required to furnish evidence that they were in need of the lands for their own stock. Efforts were made not to permit the shipment or herding of cattle from outside of the state for grazing.

The extra work involved in finding drouth relief lands and leasing of such lands was done without the employment of extra help and the expense was very little more than the ordinary expense for the squatter division.

Recent fall rains appear to have reduced the immediate need for pasture but demands for hay for the coming year continue and will in all probability continue through 1935 and until normal precipitation returns.

Surface Rights Subject to Lease

The leasing of surface rights to state trust fund lands located in mineral districts, conservation areas, etc., which for one reason or another has been thought best not to sell, is in great demand. The division is authorized to issue leases for the use of such lands for cottage sites, miners' homes, gardens, farms, pasture, hay, storage sites, rights-of-way for roads, power lines, pipe lines, railroads, drains and any other use that will not materially injure the land. Leases are also issued for the removal of sand, gravel, granite, etc. As already indicated during the first six months of 1934 the demands for hay and pasture lands exceeded all previous years. It is believed that a large income from these sources can be maintained permanently and at the same time the uses to which the state owned lands are being put be made a substantial aid to those living in the vicinity of such lands and in most instances result in an improvement to the lands themselves.

The leasing of state owned lands for the purposes indicated has been practiced for twenty years with a steadily increasing income. The aggregate total receipts from this source as of July 1, 1934, was \$251,224.41. The falling off of the demands for sand and gravel as well as rights-of-way for logging railroads and summer cottage sites has been more than wiped out by the increased income from hay and pasture leases. The sum indicated does not include rentals for lands located in state forests.

A comparison of demands for hay stumpage and pasture lands during recent years is of interest. Prior to 1933 the average area leased per year for these purposes was about fifteen thousand acres. In 1933 drouth conditions increased this area to 56,000 acres and in 1934 to approximately 140,000 acres. A total of 1,757 leases covering 139,570 acres of trust fund lands yielding an income of \$16,284.02 is the record on hay and pasture leasing for 1934.

The exact cost to the division and the state of administering and supervising this additional work, in addition to the regular routine of the office and field, as of October 1, 1934, was approximately \$1,300. Of this amount it is estimated that \$1,000 was expended on travelling expenses and \$300 on extra postage, telephone, telegraph, supplies, etc.

Land Classification and Zoning

The need for zoning existing metropolitan areas for purposes for which they are best suited as well as new areas to be planned for future development has been recognized for many years and is now an accepted practice. The need for the same kind of zoning of rural districts is being emphasized and advocated by economists and students of land use as an effective means of solving present untenable conditions which prevail over large areas especially where lands, sub-marginal for agricultural uses, have found their way into the hands of settlers and where experiences had at attempts at farming such lands have proven a failure. Tax delinquencies and abandoned areas in the northern counties and their effects on the financial, educational and social conditions call for the promulgation and application of new land policies.

The primary requisite to any future program is a classification of all the lands in the present financially distressed counties and the zoning of such lands into agriculture or non-agricultural areas. The soundness of such a policy has been emphasized and recognized by land use authorities generally and need not be argued in this report. The fact remains however, that the state of Minnesota is still lacking in laws which will permit of the practical application of such a policy.

The classification of the lands should be delegated to the department of conservation as a state-wide agency. Soil qualities are not affected by towns and county boundaries and in order that the basis of determining adaptability of lands shall be uniform, a state agency should be given the responsibility of land classification. On the other hand the Boards of County Commissioners should be required to zone their counties into agricultural and non-agricultural lands based upon the state's land classification reports. It is believed that by and with the advice of the Conservation Commission the Boards of County Commissioners will be able to allocate lands as to their uses and lay the foundation for a future sound policy of land use.

As a basis to intelligent land classification a topographic survey of the areas to be classified would furnish a much needed foundation from which to start. There are so many other uses for topographic maps in addition to furnishing a workable base map on which to classify lands that its value to the state will be many more times its cost. All of the benefits to be de-

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rived from a basic topographic map will not be referred to herein. These data however, are of utmost importance.

Until lands have been classified and counties zoned past aimless policies will continue without much hope for material improvement for the future.

Figure 18 shows the total yearly state trust fund land sales from 1925 to 1934 both years included.



TRUST FUND LAND SALES - 1925-1934

Mineral Leases

Mineral rights were reserved to the state by Chapter 22 of the Laws of 1889, when state lands were sold in Lake, Cook, St. Louis and Itasca Counties. In 1901 this reservation was extended to all counties of the state. Chapter 22, laws of 1889, placed the mineral lands on the leasing market. Leases are to run for a period of fifty years with a royalty yield to the state of 25c per ton on all ore mined and removed from the premises. The annual minimum after a railroad had been built within a mile of the property was fixed at \$1,250 per year. A prospecting permit good for one year was first granted covering not to exceed one hundred sixty acres of contiguous land. Several thousand permits were issued and on such permits application for more than eight hundred leases were received. Many of these leases were taken out for speculating purposes and were dropped from time to time or cancelled for non-payment of the minimum royalty. From 47 active leases there has been shipped up to the first day of January 1934, 120,812,928 tons of iron ore.

In 1917 the legislature made lands situated in the beds of public waters of the state subject to lease for the removal of iron ore. Two leases have

been sold and issued at public sale at 50 cents per ton royalty and with an annual minimum payment to the state of \$5,000 payable quarterly.

Laws 1929, chapter 22, originally authorizing the leasing of mineral rights was suspended in 1907. Upon the recommendation of a committee of the legislature, Chapter 412, Laws 1921, again authorized the leasing of state trust fund lands for the removal of iron ore. After being amended in some minor details the law is still in effect as Laws 1927, Chapter 389. The royalties, payable on a sliding scale, are dependent upon the iron content of the ore. No one lease is to cover more than eighty acres more or less nor yield a minimum annual payment to the state of less than \$5,000 quarterly.

Six leases have been sold at public auction under this act. Table 58 shows remaining tonnage and assessed values of merchantable ores in leases of all classes of State Owned Lands of Minnesota as of May 1, 1932.

Table 58

Remaining Tonnage and Assessed Values of Merchantable Ores in Leases of State-Owned Lands of Minnesota as of May 1, 1932 LEASES ON STATE SCHOOL LANDS

Lease N	lo. Property Name	Descripti	on	Tonnage	Assessed Value
59	Missabe Mt.	NE¼	8-58-17	20,718,720	\$6.048,242
65	Duncan	SW 1/4 SW 1/4	26-58-20)	1.454.411	91.628
	Duncan	$SE^{1/4}SE^{1/4}$	27-58-20	,,	,,
85	Pool	SE ¹ /4	36-58-21	351.996	128.127
174	Grant	NE¼NW¼.S½	NW1/4	/	
		NW ¹ /4SW ¹ /4	20-58-19	4.833.634	1.179.406
218)					, ,
219	Minnewas	$NW\frac{1}{4}SW\frac{1}{4}$	16-58-17	9,061,974	2,718,592
221	Leonidas	$NE\frac{1}{4}$	36 - 58 - 18	4,771,231	1,119,240
224	Leonidas	$SE\frac{1}{4}$	36 - 58 - 18	262,968	44,705
362	Shiras	$S\frac{1}{2}SW\frac{1}{4}$	16-58-19	295,002	21,682
363	Margaret	$SE\frac{1}{4}$	16-58-19	1,403,894	98,882
364	Hanna	$W_{2}^{1}SW_{4}^{1}$	2-58-18)		
		$N\frac{1}{2}SE\frac{1}{4}$	3-58-18 🐧	330,423	19,825
374	Hill-Annex	SE ¼	16-56-23	8,450	828
375	Hill-Annex	$SW\frac{1}{4}$	16 - 56 - 23	14,424,688	1,413,619
377	Hill-Annex	NW ¼′	16 - 56 - 23	8,939,962	1,610,778
378	Hill-Annex	NE ¹ / ₄	16 - 56 - 23	829,961	151,883
387	Wacoutah A	$SE_{4}SW_{4}$		1 - A	
		$S\frac{1}{2}SE\frac{1}{4}$	3 - 58 - 18	3,716,701	903,580
420]					
421 }		NE¼,NW¼	4		
422]	Buckeye	$SE\frac{1}{4}$	36 - 56 - 25	1,013,216	10,000
,449 <u>(</u>	•				
451 §	Prindle	$SE\frac{1}{4}, NE\frac{1}{4}$	36-59-18	1,919,886	350,765
468	Norton	SW ¹ / ₄ SW ¹ / ₄	11-57-21 (
		NW¼NW¼	14-57-21)	2,271,308	90,852
480	Neville Res.	$SE\frac{1}{4}NE\frac{1}{4}$	9-58-18	298,591	7,465
776	Martin	NW ¹ /4	16-46-29	1,201,999	40,000
1	Syracuse Lake	Parts of Lots	>		
	Bed	5 & 6	5-58-15		
		Lots 9, 10, 11,		2,380,730	$47,\!615$
÷		& 12	6-58-15		
2	Rabbit Lake	In Sections 20,	29 and (
	Bed	-	30-47-28	7,152,402	71,524
A-VI	Wheeling	SW 4N W 4	1-58-18	252,527	38,103
• T	otals			87.894.674	\$16.207.341

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Tables 59-60 give the same statistics on leases on state swamp and state university lands respectively and Table 61 a summary of all such leases.

Shipment From State Mines

At the close of the 1934 ore shipment season, 44 separate mines on state owned lands had produced ore to a total of 124,432,073 tons as follows as shown in Table 62.

Table 59

LEASES ON STATE SWAMP LANDS

No. Lea	Name se Property	Description		Tonnage	Assessed Value
389 392 443 775	Philbin Scranton Carson Lake Wearne	E½SE¼ N½NE¼,SW¼NE¼ NW¼SE¼ SW¼SE¼	$\begin{array}{r} 6-57-20\\ 12-57-21\\ 10-57-21\\ 2-46-29\end{array}$	2,286,409 13,868,857 4,255,323 1,752,302	\$ 91,456 2,060,222 229,787 105,138
	Total ore in swa	amp lands		22,162,891	\$2,486,603

Table 60

LEASES ON STATE UNIVERSITY LANDS

Leas No.	e Property Name	Description		Tonnage	Assessed Value
268	Mesabi Chief	W1/2SW1/4,NE1/4SW1/4	23-57-22	6,841,957	\$804,275
355	Mississippi				
	No. 1	$W\frac{1}{2}NE\frac{1}{4}$	23 - 57 - 22	1,859,341	145,790
356	Mississippi				
	No. 2	$S\frac{1}{2}NW\frac{1}{4}$	24 - 57 - 22	2,280,197	231,593
376	Kevin	SE¼NW¼,N½SW¼,			
		$SW\frac{1}{4}SW\frac{1}{4}$	1-56-23	5,531,775	360,593
455	Sullivan				
	No. 2	$SW\frac{1}{4}SW\frac{1}{4}$	2 - 56 - 23	74,500	7,301
456	Majorca	$S\frac{1}{2}S\frac{1}{2}$	9-56-23	223,937	40,980
46 0	Congdon-				
	Longyear Res.	$SE_{4}SW_{4}$	22 - 57 - 22	311,033	3,110
470	Gr. Nor. Res.	$E_{2}SE_{4}$	24 - 57 - 22	340,804	17,040
478	Draper	$SW\frac{1}{4}NW\frac{1}{4}$,			
		NW ¹ / ₄ SW ¹ / ₄	10-56-23	141,335	1,000
r.	Total	· · · · · · · · · · · · · · · · · · ·		17,604,879	\$1,611,682

Table 61

SUMMARY.

	Tonnage.	Assessed Value.
School Land Leases	87,894,674	\$16,207,341
Swamp Land Leases	22,162,891	2,486,603
University Land Leases	17,604,879	1,611,682
Grand Total*	127,662,444	x\$20,305,626

*There are certain non-merchantable tonnages amounting to 4,799,257 tons which are not included in this total.

xThere is an additional nominal assessed ore value of \$14,233 carried on certain properties partially drilled and showing non-merchantable tonnages.



Iron Ore Shipped From State-Owned Mines

YEARLY MINE PRODUCTION - 1934



Fig. 20

Table 62

Total Ore Shipments From State Mines.

Mine	Tons	Mine	Tons
Carson Lake	$5,\!131$	Mississippi No. 2	82,192
Cavour	177,964	Mississippi No. 3	1,072
Deacon	$347,\!512$	Morton	$205,\!452$
Duncan	87,761	Philbin	1,235,909
Draper	48,723	Pool	$3,\!428,\!539$
Eaton	3,548	Pilot	239,040
Fay	1,264,531	Prindle	47,487
Frantz	$744,\!474$	Scranton	4,441,755
Grant	3,037,905	Shiras	1,051,718
Hanna	1,661,490	Section 17	21,159
Helen	$224,\!597$	Seville	$76,\!459$
Helmer	1,369,231	Silver	174,813
Hill Annex	15,897,171	Smith	895,401
Kevin	1,433,310	Vernon	$26,\!159$
Lily	$136,\!535$	Wacoutah A	2,988,250
Leonidas	16,769,981	Wacoutah B	112,965
Maderia	195,495	Wanless	2,247,888
Majorca	1,352,069	Wearne	1,104,041
Margaret	1,361,378	Woodbridge	1,665,155
Martin	20,764	Yates	678,690
Missabe Chief	$3,\!532,\!105$	Wheeling	117,230
Missabe Mountain	50,043,567		
Minnewas	3,875,457	Total \ldots	124,432,073



SCANTON MINE PIT AT HIBBING, MINN.

Short Term Leases

Several of the largest state iron ore leases expire by limitation in 1942 and it is quite likely that operations will not exhaust the tonnages of ore by that time. Such leases have received serious attention during the past year. Facts have been assembled for planning tentative lav-outs for operation before and after such dates so that the state's best interests shall be protected. Two plans may be in readiness for consideration at the 1935 session of the legislature and not later than 1937. One is to grant the operators an extension of the term of their present leases at adjusted rates of royalty and terms. The second plan may suggest the adoption of legal machinery to permit of a new lessee succeeding at once the holder of the old lease. In either case it is of the greatest importance to have operations continue without interruption as between the two operators. Should the mine be closed down for any considerable period the cost of pumping the water from the pit or underground workings would be an item which might well make the re-opening of a closed mine economically prohibitive. In case of underground workings much damage might also be sustained by the shafts, raises, drifts and timbering.

Ore Under Public Waters.

For many years the state of Minnesota has laid claim to the iron ore and other minerals found in beds of public lakes and streams. Efforts have been made to have the state's rights definitely determined by the courts. The claim to ore under public waters is based upon a declaration by the courts that the riparian owner owns in fee down to the ordinary high water mark and a qualified fee to low water subject to the fluctuations of the water. Below the low water mark the state in its sovereign rather than in its proprietary capacity is the owner in fee of the bed of the lake.

Mine operators of the Euclid Mine located on the shores of Long-Year Lake in the village of Chisholm attempted to remove the ore below the low water mark. The Attorney General in 1910 enjoined the company from interfering with the lake and the Supreme Court declared the state the owner of the soil which constitutes the beds of public waters and granted the state the injunction prayed for.

Except for Little Rabbit Lake on the Cuyuna Range and Armstrong Lake, opposite McComber Mine on the Vermillion Range, the lake shores on the iron ranges have not been materially interfered with. In order to determine the location of the ordinary low water mark on all public lakes, all lake elevations in the mining districts have been carefully recorded for a period of twenty years or more. Where operations have interfered with the shores of a lake a careful survey of the original shore line has been made so as to establish and protect the state's title to any ore that may be found up to that line.

Manganese.

The sustained use of manganiferous ores from the mines of Minnesota is a matter of utmost importance to the state and nation especially in times of war. The Cuyuna Range has many millions of tons ore carrying a good percentage of manganese.



MAGNATIZING PLANT SCHOOL OF MINES

During the World War many of the mines were opened up for the purpose of furnishing a supply of this important element. When the war closed importation of foreign ores began with the result that all of the mines with the exception of one or two were compelled to close down. The University of Minnesota Mines Experiment Station has carried on a great deal of research on this important element. With the limited funds at its disposal and at the disposal of the department sufficient progress has been made to indicate that the manganese can be commercially separated from the ores. The degree to which research will find a way for the successful separation of manganese from the iron ores on a large commercial scale will measure the future success of this grade of iron mining on the Cuyuna Range.

Research on Low Grade Iron Ores.

No function within the department of conservation has greater possibilities than that of carrying on a sustained research to discover methods whereby so-called low grade iron ores found within the state may be made marketable. The work has been carried on in a limited way at the University School of Mines and at the department's laboratory at Hibbing. The tests and experiments made with the crude and inadequate equipment available indicate the needs of more elaborate means and an enlarged field research laboratory at Hibbing.

An intensive study of the cretaceous ores at the Hill Annex Mine indicates a strong possibility that this ore can be made merchantable in a plant using a re-arrangement of concentration means now in use. The mines experiment station at the University will be asked to make a pilot mill test on this ore to determine the commercial possibilities of such treatment.

A full report of the work done thus far at our research laboratory at Hibbing on this grade of ore is on file.

Tests made on ore stocked many years ago indicate that some of these ores may be made to respond to treatment in modified installations already in use. More field work to determine the possibilities in this respect should be done.

Several new devices are being tried out. The state as a fee owner of iron ore lands must keep abreast of all moves for converting the present ore material of no commercial value to a merchantable product. The state has too much at stake to permit any of its iron ore resources to remain undeveloped while the merchantable ore is being removed from the state.

Table 63 indicates that beginning in 1906 the amount of ore beneficiated each year has tended to increase the total tonnage of merchantable ore yielded by Minnesota mines and at the same time has brought upon the tax rolls an enormous tonnage of ore which prior to 1907 was considered non-merchantable. In this manner the life of the iron mines in Minnesota has already been materially extended by beneficiation processes. From 1906 to 1933 a tonnage of 891,900,994 was shipped from the state of Minnesota. Of this enormous tonnage 165,062,756 has been beneficiated or a little better than 18½ per cent of the total. From this same table it will be

Tab	le 1	No.	63
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Shipments of Beneficiated Iron Ore From Minnesota and Their Percentage of Total Shipments From Minnesota.

	Tota	l Iron Ore Shipments		
Year.	f	rom Minnesota in Gross Tons.	Total Beneficiated.	Total Beneficiated.
1906		25.613.401	146.503	0.6
1907	• • • • • • • • • • • • • • • • • • • •	29 177 420	112,793	04
1908		18,100,006	57,513	0.3
1909		29.286.876	118.347	0.4
1910		30 403 712	685 903	23
1911		23 336 127	2 070,613	8.9
1912		34 195 682	3 299 577	9.6
1912		36 339 962	2 440 269	67
1914		23 352 360	2 144 518	92
1915	• • • • • • • • • • • • • • • • • • • •	32 618 653	3 163 625	97
1916		46 189 617	4 444 267	96
1917		45 393 882	5 078 661	11.2
1918		44.070.710	5.477.634	12.4
1919		34,791,866	5,236,751	15.1
1920		40.348.663	5,852,120	14.5
1921		17.708.789	3.243.861	18.3
1922		30.772.162	5.787.509	18.8
1923		45.305.647	8.913.446	19.7
1924		31.589.464	7.765.692	24.6
1925		38.841.968	13.711.311	35.3
1926		41.919.575	15.221.229	36.3
1927		36,504,854	13.591.081	37.2
1928		39.167.842	14.525.379	37.1
1929		47.478.167	16.141.106	34.0
1930		34.881.010	14.031.943	40.2
1931		17,309,211	6,291,610	36.3
1932		2,250,200	532,742	23.7
1933		14,953,168	4,982,753	33.3
Total		891,900,994	165,068,756	

By beneficiation is meant washing, jigging, crushing, screening, drying, sintering or any process by which the grade or structure of the crude ore is improved. By concentration is meant all of the processes of beneficiation except crushing and screening. The above figures represent the tonnage of the beneficiated iron ore and beneficiated manganiferous iron ore (i. e., shipping product) and not the crude ore. Authority: Compiled by the Mines Experiment Station. There were no shipments of beneficiated ore prior to 1906 except crushed ore from the Soudan Mine. The tonnages of beneficiated ore shipped from some of the plants prior to 1923 are estimates since accurate figures are not available. noted that the percentage of total beneficiated ores has progressively increased from 1906 when only six-tenths of one per cent of total shipments was supplied from low grade ores reaching its maximum in 1930 when better than 40% of the total was treated by one process or another.

Many iron ore leases on state owned lands have been made, the ore removed and the leases cancelled or surrendered. In some of the mines are left small tonnages of merchantable ore and larger tonnages of ore too low in iron content to be mined at a profit while operations were in progress. All such remaining tonnages have been left in such a condition that they may be recovered when needed if means for beneficiating them can be discovered.

Many state properties not under lease have good tonnages of substandard iron ores and rich iron bearing taconites. The work of testing such ores is undoubtedly the most important duty of the division. The Mines Experiment Station of the University of Minnesota is cooperating in field research with the division of research laboratory at Hibbing in order to avoid duplications of effort.

Experiences demonstrate that some provision should be made for a short term lease to permit the removal of small tonnages of iron ore left on state owned lands after a former or original lease has been surrendered. There are several of such properties known to have tonnages of merchantable ore of fifty thousand tons or more. The minimum annual carrying charge under the present law is \$5,000 payable quarterly. The outlay necessary to get into production on such a property plus a cash burden of \$5,000 chargeable to relatively small tonnage make such ventures unprofitable.

A modified lease law which will enable and encourage small operators to remove the tonnages thus left would seem a step in the direction of not only utilizing ores that might otherwise not be removed but to increase the income to the state trust funds as well.

Beginning in 1903 agencies of the state have insisted that all low grade ore of about a certain percentage of iron, necessarily removed in mining the better grades, shall be stocked on state owned lands or if state owned lands are not available upon other lands deeded to the state for that purpose. A total of perhaps twenty-two million tons of lean ores have thus been stocked on state owned lands.

Table 64 gives estimated ore reserves on Mesabi, Vermillion and Cuyuna Ranges.

Gold Prospecting

In 1925 permits were issued allowing prospecting for gold on state owned lands on the Vermillion River in northern St. Louis County. More than 50 such permits have been issued and upwards of a dozen twenty-five year mining leases executed. In lots 7 and 8, Section 36, Township 67N, R18W, an exploratory shaft 200 feet has been sunk and opened up on two levels, a 100 foot level and a 200 foot level. Approximately 1,800 feet of
SECOND BIENNIAL REPORT

drifting has been done and the lessee, the Vermillion River Mines, Inc., have assayed many samplers and have reported encouraging results.

During the last days of October 1934 a fifteen ton pilot mill was erected on the property prepared to make a test run on the material from the workings.

Table 64

Estimated Reserve Tonnage (Including Stock-piles) Vermilion Mesabi Cayuna Date Range Range Total Range May 1, 1924 1,275,347,126 13,169,953 46,121,021 1,334,638,100 May 1, 1925 1,250,086,347 13,539,256 52,124,561 1,315,750,164 May 1, 1926 1,233,079,351 12,382,725 51,090,529 1,297,452,605 May 1, 1927 1,201,054,119 12,126,490 49,652,592 1,262,833,201 May 1, 1928 14,483,285 53,268,438 1,258,232,624 1,190,480,901 1,242,059,884 1,178,855,601 May 1, 1929 14,939,704 48,264,579 1,235,227,510 May 1, 1930 1,154,434,031 14.250.540 66,542,939 1,244,322,726 May 1, 1931 1,162,776,979 14,789,137 66,756,610 1,190,295,183 14.237.637 69,699,960 1,274,232,780 May 1, 1932 1,289,245,511 1,205,213,398 14,007,192 70.024.921 May 1, 1933

IRON ORE RESERVES OF MINNESOTA

Note: The above figures do not include the tonnage of low-grade nonmerchantable ore which is carried on the tax records and which on May 1, 1933, was approximately 200,000,000 tons.

Authority: Minnesota Tax Commission.

Iron Ore Prices

There are five principal grades of iron ore that the mines of Minnesota are primarily interested in, viz: "Old Range Bessemer," "Old Range Non-Bessemer," "Mesabi Bessemer," "Mesabi Non-Bessemer," and "High Phosphorus ores." The other grades have no fixed or base price, being dependent upon contract.

The prices of all the above named ores are based on the "Natural iron" content of the ore. This means that the moisture content is taken into consideration in determining its grade. For example, an ore dried at 212 degrees F. having 59.56% iron with 12.52% moisture when mined, will have a Natural iron content of 52.10% iron.

All iron ore prices are based on a natural iron content of 51.50% delivered at Lake Erie ports.

For 1934 and for several years the base prices of the above grades of ore have been as follows:

Old Range Bessemer
Old Range Non-Bessemer \$4.65
Mesabi Bessemer\$4.65
Mesabi Non-Bessemer\$4.50
High Phosphorus Ores\$4.40

In order to encourage the search for gold on state owned lands a form of permit good for one year on easy terms, authorizes the holder to ex_{+-}

STATL U. MINISLUDTA



Graphic Chart Showing Total Tonnage Shipped From Mesabi Range

Fig. 21

plore the land not exceeding 80 acres. To the permit is attached a twentyfive year gold ore mining lease. At any time during the life of the permit the holder thereof may ask and receive a twenty-five year lease for mining gold. The royalty and carrying terms of this lease are made reasonable so as to encourage the development of a gold mining industry in Minnesota. Several attempts at profitable gold mining have been made in this section of the state during the past many years but have been abandoned because the gold bearing formations have been found to be of low grade.

Mines Office Building at Hibbing

The division office building and laboratory at Hibbing is becoming too crowded for the volume of work that should be done there. In addition it is situated too near the great open mine pits. Blasting in the winter seriously interferes with the delicate weighing devices being used in the laboratory. It would therefore seem opportune to consider and plan for the erection of a new building and laboratory. The present building has been occupied and in use by the state for twenty-one years. The office and storage vault buildings are well constructed and adapted to such purposes but the demands on the division and the encroachment of mining operations upon its location call for larger quarters at a place more remotely removed from the mines. The present buildings are in good state of repair.

In connection with the planning of a new building the advisability of providing space for all the field activities carried on by the department of conservation in the northern part of the state should be given careful consideration. Such a building will perhaps cost \$100,000.

DEPARTMENT OF CONSERVATION

TOURIST BUREAU

George H. Bradley, Director

Minnesota, with its wealth of natural assets, is in reality a vast corporation whose property is held in common ownership by its 2,563,000 citizens. Our 10,000 lakes, millions of acres of forest land with their game and fish, our agricultural wealth, industrial and residential opportunities, constitute natural resources unequalled perhaps in any one of the other forty-seven states. An investment of \$250,000,000 in highways has placed within easy reach all of the state's attractions to those in quest of rest and recreation, as well as permanent residence. It is necessary, however, to inform the touring public, through the medium of advertising, of what we have to offer in competition with other states if we are to share equitably the income that comes from tourist trade. No corporation, no matter how attractive and useful its stock in trade, can long endure without displaying the quality or attractiveness of its commodities before the class of people from whom it expects its customers. Minnesota, with its vacations, farm and timber land, industrial opportunities, its lakeshore and resort property to sell, is no exception.

Functioning as an immigration office as well as a state chamber of commerce, the Bureau consistently advances the causes of agriculture and industry along with Minnesota's recreational opportunities. Every effort is made to attract the possible home owner or business man to invest his money within the State.

There is a distinct line of demarcation distinguishing modern community advertising from that of earlier days in that today the direct appeal is to the tourist because of the immediate returns realized on tourist trade, whereas formerly it was made to the settler. The importance, however, of attracting settlers is by no means less of a factor in the permanent development of the state than it has been in the past. In the case of the visitor who comes to Minnesota and becomes a farmer, business man or home owner, his value to the state will be measured by what he will contribute in the future rather than immediate cash returns. The tourist on the other hand may be in a community but a few hours but he must spend several dollars while there and thus immediately adds to the wealth of the community. The ease with which people may travel long distances by use of the automobile and good roads appeals to vacationists who are becoming more and more inquisitive as to where they shall go to best enjoy leisure time or find more desirable residential environments. Advertising is bringing people to places which would otherwise remain unknown and is making available tourist dollars and prosperity to many out-of-the-way retreats in former years unknown to a single out-of-state visitor.

Minnesota must advertise or sacrifice a lucrative income to those of the other states with perhaps fewer physical attractions and lesser industrial and agricultural facilities, but with greater energy and appreciation for the value of selling what they do have. The Tourist Bureau functions as an advertising and publicity agent for the corporation that is Minnesota. A business concern that does not expend an average of 5% of its gross income on advertising is rare. Minnesota has an average annual gross income, paid directly to the State, from gasoline taxes and non-resident hunting and fishing licenses alone by out-of-state visitors of some \$1,100,000. This amount does not include the vast sums accruing to the State from tax levies on resort and lakeshore properties contributed by owners who are enabled to pay such taxes by virtue of business brought to them by tourists.

In 1933 it is estimated that Minnesota collected some \$32,000,000 from 800,000 tourists. Although this represented a sharp drop in revenue from previous years from tourist sources as a result of competition from the Century of Progress Exposition and depressed economic conditions, this income nevertheless provided added dollars for labor and for the products of Minnesota's factories and farms and constituted a source of business stimulus at a time when most sorely needed. It is estimated that 15,000 citizens of Minnesota find direct employment because of tourist trade. This figure does not take into account employment opportunities indirectly created in hotels, garages, cafes and places where tourist business makes necessary the employment of additional help.

The Tourist Bureau has not been able to do justice to advertising Minnesota from the meager appropriation made available by the legislature of 1933. An annual appropriation of \$12,500 was made available for the Bureau for the biennium. Unable to purchase newspaper and magazine space or to buy any substantial radio time outside of the State, the Bureau's activities were directed toward making as complete a use of all the advertising outlets as it could obtain without great expense. Chief of these outlets were:

- (1) The Bureau's A Century of Progress exhibit.
- (2) Convention publicity.
- (3) Gratis radio time within the State, and
- (4) The whole-hearted cooperation of newspapers and magazines in allotting space for pictures and articles on Minnesota.

A Century of Progress Exhibit

With respect to the Century of Progress exhibit, the Tourist Bureau wishes to gratefully acknowledge its appreciation of the cooperation extended to it by the Minnesota Century of Progress Commission and the individual members thereof for permitting the Bureau to play so large a part in the Commission's effort which accomplished so much on behalf of advertising the State and its assets. The legislature likewise deserves credit for appropriating \$65,000 for the use of the Commission which made possible the advertising of the many attributes Minnesota possesses before some 3,500,000 people. The exhibit shown at the Century of Progress played no small part in bringing to Minnesota a tourist income of \$42,800,000 in 1934.

Convention Publicity

Convention publicity was utilized because it was ready-made for Tourist Bureau purposes, the prospect already having been given the incentive to come to Minnesota because of his organization's annual meeting. All that was necessary was to plant the ideas: "Stay and play after you get here;" "Convention fun and vacation, too." With this objective in mind, the Bureau prepared a letter designed to induce the reader to spend his vacation in Minnesota by "selling" him on the attractions which abound here. Such a letter, with a Minnesota pictorial map, was mailed to each and every delegate so contacted. During January, 1934, the Bureau mailed to 200 Shrine temples throughout North America 1,600 folded maps and 500 mounted maps, inviting the Shriners attending the national convention in Minneapolis to spend their vacations here after the convention business was concluded. Also during January, 12,500 of these pictorial maps were sent via express to auto clubs and tourist agencies throughout the United States.

Six hundred letters, maps and prospect cards to be filled in and mailed to the Bureau as a business reply card, were mailed during February to delegates of the Physical Education Instructors' convention, meeting in St. Paul, in April, 1934.

In April, 2,000 maps, letters and cards were mailed to the National Association of Real Estate Boards delegates convening in Minneapolis in June, 1934.

Offices of the guilds in 61 towns and cities throughout the United States were contacted with maps, letters and cards during May for the American Newspaper Guild National convention, held in St. Paul, June 5-8, 1934.

In June, the Bureau sent out 1,000 maps, letters and cards to delegates of the Craftsmen convention (federal employees), held in St. Paul during August. Also in June, and spread over part of July, the Bureau mailed out a total of 3,000 maps, letters and cards (also literature in reply to direct inquiries) to delegates of the American Dental Association convention, which met in St. Paul during August.

In July, two important conventions were contacted. Maps, cards and letters were sent to 2,300 Y's Men's convention delegates, who met in St. Paul August 20-24; and the same kind of publicity was sent to 1,325 members of the International Phi Delta Delta legal fraternity, which convened in Minneapolis during the same month.

At the following conventions and expositions, the Tourist Bureau maintained an exhibit, distributed literature and generally contacted visitors to these shows:

Home Beautiful Exposition and Auto Show, Minneapolis Auditorium, March 27-April 1, 1933; estimated attendance, 25,000.

National Junior Chamber of Commerce convention, Hotel Lowry, St. Paul, June, 1933.

American Legion Little World's Fair, Minneapolis Auditorium, March 10-17, 1934; attendance, 30,000.

Northwest Sportsmen's show, Minneapolis Auditorium, March 31-April. 7, 1934; attendance, 80,000.

Northwest Drug show, Minneapolis Auditorium, February 18-24, 1934. National Outdoor and Boat show, Navy Pier, Chicago, May 6-13, 1934.

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National Shrine convention, Minneapolis Auditorium, June 17-23, 1934. Minnesota Week, Rock Island Railway exhibit, Travel and Transport Building, A Century of Progress, Chicago, August 26-September 3, 1934.

Minnesota exhibit, Court of States, A Century of Progress, Chicago, May 27-November 12, 1933.

Twelve tanks of Minnesota fish were exhibited at the International Motorboat and Sportsmen's show, Travel and Transport Building, A Century of Progress, Chicago, June 1-November 1, 1934.

American Dental Association convention, St. Paul Auditorium, August 6-10, 1934.

Physical Educators' Association convention, April, 1934.

National Association of Real Estate Boards, Nicollet Hotel, Minneapolis, July, 1934.

The special projects above enumerated were in addition to the regular, routine mailings made daily throughout the year in answer to direct queries for vacation, tourist and general information.



This exhibit of Minnesota attractions is typical of those sponsored by the Minnesota Tourist Bureau at fairs and conventions throughout the year to encourage vacation and tourist travel within the State. The above photograph shows the Minnesota Tourist Bureau exhibit in the Rock Island Railroad's space during Minnesota week at the Travel and Transport Building, A Century of Progress, 1934.

DEPARTMENT OF CONSERVATION

Publicity Through Cooperation of Newspapers and Magazines

In addition to the above and in order to make the job of attracting tourists more complete, the Bureau followed up the convention mailings with pertinent publicity on various current events and attractions in Minnesota. From January 1, 1933, through September, 1934, 269 newspaper columns of free "white space" pertaining to the Tourist Bureau and its activities were obtained.

For one series of special events—the Itasca State Park Historical pageants—the Tourist Bureau, from July 2 to September 4, 1933, obtained a total of 94 newspaper columns of publicity material featuring seven performances of the spectacle.

During the time from January 1, 1933, to October 1, 1934, 175 publicity releases and more than 300 photographs were sent out by the Tourist Bureau.

In addition to publicity appearing in newspapers throughout the State, articles on Minnesota prepared by the Tourist Bureau staff have appeared in the following magazines: Ace, Chicagoan, Golfer and Sportsman, Highway Traveler, Minnesota Conservationist, and Variety.

Display Publicity

During the summer of 1933, displays were placed in the show windows of the various railroads' Chicago downtown ticket offices.

The Tourist Bureau assisted the Minnesota Century of Progress Exposition Commission in editing and titling 8,000 feet of film which finally emerged as a six-reel picture, "Minnesota—Land of Sky Blue Waters," and was shown at A Century of Progress, Chicago, in 1933, ten shows a day for five months. At the closing of the Fair in the fall of 1933, the Tourist Bureau accepted stewardship of the Minnesota exhibit material and at that time re-edited the films from an hour and ten minutes running time to a 45-minute show, so the film could be shown advantageously before school children, luncheon clubs and the like.

During the first nine months of 1934, one hundred and seventy-nine movie showings were made in sixty-seven different communities throughout Minnesota, before audiences totaling 69,849. At every appearance the Bureau emphasized the importance of practicing conservation on the part of everyone in the State as a vital necessity in perpetuating the State's tourist industry.

Radio Publicity

In addition to making addresses before various groups in most of the sixty-seven communities visited, the Tourist Bureau director spoke twentyone times over the radio during 1934. Fourteen broadcasts were given on WCCO, six over KSTP and one over WRHM (now WTCN). These radio addresses were of fifteen minutes' duration and were designed to emphasize to listeners-in the various attractions which Minnesota holds for the prospective vacationist. That these talks reached large audiences was attested to in January, 1934, when to determine radio "pulling power," the director of the Bureau offered Minnesota pictorial maps to all who had heard the broadcast and who would write to the Bureau. A total of three hundred and twelve individuals from seven states asked for the map after the broadcast, which was made over WCCO.

All radio time was furnished by the broadcasters free of cost to the Bureau. This generous contribution of advertising time by the radio stations gave the Bureau a channel of advertising the State of inestimable value. The Bureau wishes to make public acknowledgment of this generous cooperation.

Following the close of the World's Fair, the Tourist Bureau late in 1933 took complete charge of the Minnesota exhibit equipment and finally superintended its installation in the new Conservation building on the State Fair grounds, where it will remain a permanent exhibit.

Cooperation With Other Organizations

The Tourist Bureau, following its announced intention of cooperating to the fullest extent with any group organized to further the best interests of Minnesota as a means of attracting tourists, has worked with the Minnesota Arrowhead Association, Inc., S. Valentine Saxby, Duluth, executive secretary; the newly-organized Paul Bunyan's Playground, Inc., F. N. Russell, Brainerd, president; and the Northwestern Minnesota Historical association, Earle A. Barker, Bemidji, president. The Bureau also aided the 10,000 Lakes and National Skating meet held in Minneapolis during December, 1933. This aid was in the form of radio talks promoting the current projects of each group, and the preparation of newspaper publicity material and general dissemination of good will.

The Tourist Bureau arranged for the formal dedication of the Minnesota exhibit at the Century of Progress Exposition in 1933, the director personally escorting to Chicago by airplane an eighty-year-old Indian chief and his interpreter, directing the ceremonies at the Fair and later escorting the pair back to their homes. The chief speaker on the occasion of this dedication was John R. Foley, chairman of the Conservation Commission, who spoke for Governor Floyd B. Olson at the latter's request.

The Bureau also assisted in directing ceremonies in connection with Minnesota Day at the Century of Progress Exposition, September 21, 1933. Extensive publicity was given this event in Chicago and Minnesota newspapers, the day being declared one of the most successful special days of the Fair.

Apart from publicizing Minnesota to convention delegates, from March 10 to July 6, 1934, a total of 6,699 letters was sent to definite prospects. This publicity matter was sent out under a postoffice permit, enabling the Bureau to mail each letter for one cent, instead of the usual one and one-half cents for that class of mail.

At the various exhibits supervised by the Tourist Bureau, 11,401 contacts were made directly with vacation prospects. Some of these prospects were immediately routed to their vacation destinations; others, asking that literature and other information be sent them, were included in prospect list mailings. In January, 1933, a circularization of resort owners throughout the State was made by the Bureau. At that time, 1,276 questionnaires were distributed. To resort owners answering this questionnaire was sent a weekly service bulletin carrying the names of live prospects interested in vacations, hunting and fishing trips and lakeshore and agricultural property. These bulletins sent out during both 1933 and 1934, carried a total of approximately 5,000 names per year. Every commercial and community club in the State, as well as real estate men who requested it, received this service gratis.

In the spring of 1933, the Tourist Bureau designed a new and original pictorial map of Minnesota on which were cited many important statistics relating to agriculture, recreation and industry. A press run of 150,000 was ordered, more than 90% of which has now been distributed to prospective tourists through the Bureau office and at exhibits maintained by the Bureau at various shows and conventions.

Several hundred of these pictorial maps mounted on cardboard were also distributed to schools and organizations throughout the State.

Greater stress has been placed by the Tourist Bureau on publicizing the state to vacationists and tourists in quest of recreation during the biennium than because of the state's agricultural opportunities. Present trends affecting agriculture tend to support such a policy. With economists and federal and state agencies advocating reduced farm production and the retirement of large areas of land on which farming has already been attempted, in an effort to bring agriculture back to a self sustaining basis, advertising farm lands under these conditions can hardly be expected to carry much of an appeal. The future permanent prosperity of the people of Minnesota however, hinges on its agriculture and when prosperity again returns to the farmer the products of the soil will continue to be the state's permanent and dependable asset. The impressions gained by the visiting tourists of today of Minnesota's agricultural possibilities as he sees them, followed by sound aggressive agricultural promotion when farming and farm lands have again assumed their normal place in the economic scales, may well prove a factor of inestimable value.

PUBLIC RELATIONS

A. I. Harris, Administrative Assistant

Conservationists appreciate that the conservation movement will never achieve its ultimate goal unless and until the people are made conservation minded. Public support for conservation is essential. Such support must be directed through educational channels. Conservation education has made definite strides during the past two years. As this report is being written information comes to us from the Commissioner of Education of a decision to make conservation education and nature studies a part of our public school work.

The department has done everything possible within its available resources to aid in the introduction of conservation studies in the schools. Special pamphlets are mailed out to school teachers on request. Since April

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20th there have been three hundred and twenty requests for literature which were supplied, many of these from the schools and 4-H Club leaders. In many instances single requests were made for as many as one hundred pieces of each kind of literature. As a means of aiding conservation education in the schools, an employe of the Division of Game and Fish has been devoting all of his time to lecture work. Letters on hand from school teachers and school principals speak highly of the work he is doing. He also speaks before 4-H Clubs and boys' and girls' organizations.

Scores of teachers have instituted nature study classes and are using The Minnesota Conservationist, the department's official publication, extensively in their work.

A very important phase of conservation education among the youth during the past year has been the wild life and nature study project inaugurated by state farm extension leaders with 4-H Clubs. This important work was made possible through financial assistance from Mr. C. L. Horn, one of Minnesota's outstanding wild life conservationists. The Department of Conservation has been actively cooperating in this project by assigning its lecturer to fill speaking engagements. During the spring and summer of 1934 he appeared before forty-four thousand farm boys and girls engaged in 4-H Club work.



Ah-Je-Dum-O, 80 year old chief of northern Minnesota Chippewas, is here shown pouring water from the source of the Mississippi into the miniature Lake Itasca at the Minnesota exhibit, A Century of Progress, Chicago, on Minnesota Day, 1933. Standing by is John R. Foley, Chairman, Minnesota Conservation, who made the dedicatory address.

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DEPARTMENT OF CONSERVATION

The new conservation building on the state fair grounds, "The William D. Stewart Memorial Building," erected the past year, gives conservation a well merited setting and will provide a center from which the message of conservation can be extended to our people during each state fair. This building, a beautiful log structure, is ideally located in the center of the fair activities. It was built under the direction of the State Emergency Relief Administration.

Splendid cooperation has been received from the Twin City radio broadcasting stations, all of whom, without charge, have assigned liberally of time for broadcasts on conservation topics. Broadcasting stations WCCO and KSTP assigned free periods for special broadcasts during the hunting seasons in addition to regular periods for conservation broadcasts to emphasize the natural attractiveness of the state.

Directors of divisions and other employees of the department have been filling numerous speaking engagements during the biennium, appearing in particular before conservation and sportsmen's groups. Conservation films showing game and fish and forestry activities were shown at many of these meetings.

Since January 1st, 1933, department representatives have addressed and shown motion picture films at two hundred and twenty-five meetings before an aggregate attendance of forty thousand persons.

Each week a state conservation news letter has been mailed to every newspaper in Minnesota including daily, weekly and foreign language papers. Newspapers have given generously of valuable space for the dissemination of conservation news. The first item released was used in two hundred and four newspapers.

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THE MINNESOTA CONSERVATIONIST

A. I. Harris, Editor

The last legislature on recommendation of the Conservation Commission, created "The Minnesota Conservationist." It is in reality the successor to "Fins, Feathers and Furs," a publication formerly published by the Department of Game and Fish. The new magazine, larger in body and broader in scope, deals with subjects relating to all phases of conservation. It is the official publication of the department. The editor has attempted to make this a magazine of conservation opinion and conservation education, its pages being open to constructive discussions and expressions of views on all matters relating to our natural resources.

Statutes require that free copies of the magazine be sent to all libraries and schools of the state. This requirement places a considerable burden of expense on the publication. A law which declares that the magazine must be self-sustaining and in the same breath imposes on the publication a fixed heavy charge for which it receives no returns but on the contrary increases considerably its cost has in it an element of injustice which must be apparent to anyone who senses the situation to be met. Free copies should by all means continue to be mailed to public schools and libraries as provided by law. To the extent however, that this gratis distribution is of interest and benefit to the state at large and not to the magazine on which it imposes a hardship, the state legislature ought not to hesitate to pay for this free circulation.

While the records of the magazine show that it has succeeded thus far in complying with the legislative mandate that it be made self-sustaining, it can use the funds which are being required to sustain the free circulation required by law for improving and expanding the publication. The magazine has made good and has attained a national standing as attested by correspondence from national leaders in conservation.



