STATE OF MINNESOTA

C. Elmer Anderson, *Governor*

Department of Conservation

Chester S. Wilson, *Commissioner*

Eleventh Biennial Report

1951 - 1952

Section II

DIVISION OF FORESTRY

Clarence Prout, *Director*

This report is published in six sections as follows:

I. Commissioner's Report, covering general departmental activities and summarizing the data and recommendations pertaining to the several divisions
II. Division of Forestry
III. Division of Game and Fish
IV. Division of Lands and Minerals
V. Division of State Parks
VI. Division of Waters

December, 1952

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LETTERS OF TRANSMITTAL

To the Honorable C. Elmer Anderson, Governor

and

To the Legislature of the State of Minnesota

I have the honor of transmitting herewith the report of the Division of Forestry of the Department of Conservation for the biennium ending June 30, 1952, being Section II of the Eleventh Biennial Report of the department.

For the convenience of those who may be interested only in the activities of one or more of the divisions of the department, the report of the commissioner and each of the five divisions are published separately in six bulletins instead of in a single volume.

Chester S. Wilson
Commissioner of Conservation

December, 1952

Hon. Chester S. Wilson

Commissioner of Conservation

St. Paul, Minnesota

Dear Sir:

I have the honor of transmitting herewith the report of the Division of Forestry for the biennium beginning July 1, 1950, and ending June 30, 1952.

Respectfully submitted,

Clarence Prout, Director
Division of Forestry

December, 1952

ADMINISTRATIVE STAFF

Clarence Prout	Director
E. L. Lawson	Deputy Director
Anson E. Pimley	Fire Control
Raymond Clement	Nurseries and Planting
Harold Ostergaard	Lands and Recreation
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Earl J. Adams	Forest Management
Emil G. Kukachka	Farm Forestry
John L. Geer	Land Exchange
Roger Williams	Civil Engineer
Lloyd G. Owen	Inventory
L. B. Ritter	Cooperative Blister Rust Control

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A Forest Road in Minnesota

Division of Forestry

INTRODUCTION AND SUMMARY

by

CLARENCE PROUT, *Director*

1. Forest Fire Prevention and Suppression

We can again report that increased progress has been made in the prevention and suppression of forest fires. First of all, public interest and cooperation in the preservation of our woodlands is continually improving. This has been gained through intensive educational efforts of the department, the Keep Minnesota Green committee and other cooperating agencies, using all of the sources available — radio, television, movies, lectures, literature and personal contacts. Secondly, the acquisition of modern mechanical fire fighting equipment has been a big factor in controlling dangerous fires by increasing the speed and efficiency of operations. However, Minnesota is still not providing sufficient means for adequate forest fire protection.

With the acquisition of more equipment, training of personnel to handle and service this equipment was a necessity. Training sessions were held in each supervisory area for the purpose of acquainting the field forces with the new equipment.

Competent radio engineers made a survey of the division's radio needs and developed a working plan for the change-over from telephone to radio. The purchase of this equipment will be made in the near future.

2. Timber Administration and Forest Management

With 4,100,000 acres of forest land in state ownership the management of this land for maximum production of forest products is of vital importance to the people of this state. During the past two years an additional 651,033 acres have been inventoried, mapped and placed under management. The inventory of an additional 302,000 acres is nearing completion. New aerial photos were obtained and the training of field personnel in this work continued. As soon as plans are completed for each management unit, a competent forester is placed in charge and the plan is put in operation. With good management the income from these forest lands will increase and thus bring to the state excellent returns. This is an investment that the state cannot afford to neglect.

The demand for timber continued to be good through the 1951-52 logging season. Mills were running to capacity. After this past logging season the demand declined. However, sales of state timber held fairly steady and good prices were obtained for all stumpage sold.

Cooperation continued with the Lake States Forest Experiment Station in the research project developed to determine better methods of managing the swamp spruce, especially black spruce.

3. Nurseries and Planting

The development of planting machines has greatly accelerated the rate of planting, resulting in calls for larger quantities of planting stock. The demand for trees, especially for reforestation and erosion control on private land, is growing steadily. To meet these demands, activities at both nurseries have been expanded and pushed to the limit of available funds and manpower. The YCC camp at the General Andrews Nursery was a great help. However, the tree planting needs of the state cannot be met without more funds for labor, equipment and other essentials.

The tree seed problem is serious. If we are to expand our production to take care of the demands for trees, appropriations for the purchase of seed will have to be increased.

Planting on state lands has been curtailed in order to provide as many trees as possible for private lands. This was necessary because the private lands needed trees worst. The state had been planting on public lands for some years, but produced none for private lands until after the new state tree planting law was passed in 1947. Now we are far behind in the state land planting program. This cannot wait much longer as each year's delay will increase the cost and difficulty of planting due to competition of useless brush which is getting a foothold on the land in need of planting.

4. Private Forest Management Service

The major effort under this activity is to assist small woodland owners to place their forest lands under good management for larger sustained yield of timber, and thus increase the income of the owners and promote the economy of the state. This the farm foresters are doing but the requests for this service are far behind their capacity to carry out. With approximately 5,000,000 acres of forest land controlled by thousands of individuals, such as farmers, summer home owners and others, the problem of getting good management on these forest lands has become a major project.

Some 733 separate owners of over 32,000 acres of woodland were given assistance in the past two years. Over 5,000,000 board feet of timber was harvested by these owners, with a valuation of $58,000 for stumpage and a gross return of over $150,000. This progress is excellent. However, there are several thousand more owners who need this service. The program should be greatly expanded. We have recommended in the biennial budget that three new positions be authorized in order that we may give better service to the public in this activity. This will not completely meet the demand for service but will substantially improve the private forest management.

5. Buildings, Administrative Sites and Communications

With the increased amount of mechanical fire fighting equipment the need for adequate storage facilities has become acute. During the biennium we were able to construct six large storage sheds. Most of the old ware-

houses and storage buildings were constructed during the CCC days and are entirely too small for the present type and quantity of equipment now used in fire suppression work.

Many of the rangers do not have adequate housing. Located as they are in small communities, private housing is generally difficult to obtain. Since these employees are subject to transfer, it is not practical for them to buy their own homes. The division is obligated to furnish these facilities.

Telephone lines are difficult to maintain in forest areas. They frequently get out of order — sometimes during serious emergencies. A gradual replacement of the telephone system by radio is planned.

Roads and trails in many forest areas are inadequate for fire suppression, timber management, and other purposes. Present forest service roads cannot be properly maintained for lack of funds and equipment.

6. Lands and Recreation

The demand for state homesite lots has increased. Practically all of the platted lots have been leased. A large portion of the unplatted state owned lakeshore property is not accessible by road. A requirement of desirable lakeshore property is accessibility. If the state is to provide more sites the big expansion will have to be made on those lakes that are not now accessible by roads. This will mean the construction of service roads to these lakes. The development should be gradual and well planned.

The campgrounds provided on state forests are used by a greater number of people each year. Since these areas are primarily provided as a fire prevention measure, no elaborate developments are planned. However, adequate funds should be provided for simple maintenance of those now developed.

7. Forest Service Roads or Truck Trails

Because much of the land owned by the state in the state forests is not serviced by regular public roads it is necessary that the division construct and maintain certain key roads or truck trails necessary for the protection of the areas against fire and the orderly harvesting of timber crops. Many of these roads are in bad shape from lack of maintenance and have reached a condition where considerable major reconstruction work is necessary. Culverts and bridges have deteriorated and will need replacement.

We were able to acquire some modern road equipment and do considerable road improvement. However, much more manpower and equipment will be needed if all the service roads, truck trails, and fireways are to be kept in passable condition by the division.

Money appropriated by the 1951 legislature for work in the special statutory Conservation Areas was mainly expended for the construction and reconstruction of key roads within these areas. These roads have been of great value to the division because they have made the adjacent areas accessible for fire protection as well as for harvesting state timber by small

operators who do not have the means to develop road systems of their own. However, these Conservation Areas cover only a small portion of the state's forest lands.

8. **Forests and Insects**

During the biennium forest insects continued to destroy valuable growth and retard forest development. Serious outbreaks of the forest tent caterpillar and the larch sawfly presented problems of control. This division in cooperation with the State Entomologist carried on an educational program, advising forest owners of the proper methods of control and assisting in engaging competent persons who could do the spraying and control work. This arrangement has worked very satisfactorily.

Spraying on state lands was confined to areas of high value, administrative sites, state campgrounds, and on state lands commingled with private lands where the owners were using approved control measures. During the earlier years, considerable spraying was done by using mechanical equipment on the ground. New techniques have been developed and better results have been obtained at less expense through the use of properly equipped airplanes. With the development of this type of spraying, many plane operators are now available to do insect control work. These men operate more or less under the general supervision of the State Entomologist. It is therefore more economical for the state to engage these operators than to buy and operate our own equipment.

A forward step was taken when the 1951 legislature provided funds for a forest entomologist on the staff of the State Entomologist. The division has been working very closely with the University of Minnesota and the State Entomologist's office in making insect and disease surveys, arranging for educational meetings to advise the public as to the danger of insect outbreaks and also in advising them in the proper methods of control.

9. **Auxiliary Forests**

Six new auxiliary forests were established, covering 41,722 acres, making a total of 202,640 acres under this program June 30, 1952. It was necessary to detail a forester to handle the work relative to auxiliary forests. This has greatly helped the proper functioning of the law and has brought uniformity to the administration of the auxiliary forest act.

Some changes in the basic law are necessary in order to make it more practical and workable.

As the cutting of timber on these forests increases, the counties will realize a substantial increase through payments of the yield tax provided by law. Tax receipts of approximately $15,000 were received from these forests by the counties during 1951.

FOREST FIRE CONTROL

A. E. PIMLEY, *In Charge*

General Fire Conditions

1950 Fire Season

In the 1950 season 651 fires occurred on which control action was taken. The area burned over was 8,127 acres, of which 4,483 acres or 51.3 per cent was non-forest land, and the major portion of the remainder or 4,100 acres was open peat land on which little or no tree growth existed.

Normally, the greater portion of the peat land burned over each year is in the big bogs of the north-central portion of the state, which is in large part a direct result of attempted land development. During the 1950 season, however, fires in this region were negligible and over 80 per cent of all the peat land burned over was in the Cambridge, Moose Lake and Brainerd areas or the south-central and southeastern portion of the intensively protected zones. Aside from the occasional burning of a wild hay meadow, few, if any of these fires were set directly for agricultural purposes. Smokers and hunters were responsible for many of them, with the remainder charged to the various miscellaneous causes.

The wide variation in weather conditions which prevailed during most of the year was mainly responsible for this unusual situation. Snow remained in the woods in the northern areas until about May 1 and there was sufficient rainfall during the remainder of the season to greatly reduce the fire danger. Only one fire occurred in the Warroad and Baudette areas during this period, which is a record for that part of the state.

In the southern area the precipitation was about normal for April and May. However, from June 1 to November 1 drought conditions prevailed in the Cambridge and Moose Lake areas and in part of the Brainerd area.

When the small game season opened, numerous fires were started in the hunting areas. Because of extreme dryness many ground and peat fires resulted, which made the job of suppression difficult and costly. Hunters were responsible for 92 fires or approximately 15 per cent of the total for the entire season and about one-half of these were the direct result of smoking out squirrels or raccoons.

Several fires were started during the latter part of the season on the Carlos Avery Game Refuge located in Anoka County, by the use of incendiary devices constructed from tin cans, candles and oil-soaked paper. These fires, which were started during the driest part of the fall season and because of the manner in which they were started, caused considerable concern. As a result several additional game wardens were assigned to fire duty on the refuge during the remainder of the fall. Three of these devices were found and given to the Bureau of Criminal Apprehension for study. However, no clues as to the identity of the perpetrators were found.

1951 Fire Season

There were 565 fires reported for the 1951 season which burned over an area of 26,073 acres. Of this total area, approximately 14,000 acres or 54 per cent occurred during two short periods in the Moose Lake and Park Rapids areas. On April 24, 25 and 26 five meadow burning fires occurred in the well developed farm territory in the northeastern portion of Wadena county and the southwestern corner of Cass county. Much of the area burned was originally wiregrass bog which has been reclaimed by drainage and which under certain conditions produces some usable wild hay. This latter fact may have been the reason the fires were set in an attempt to improve mowing conditions. Of the 8,400 acres burned by these five fires, over 94 per cent was non-forest land on which no tree growth of consequence existed.

The same situation prevailed in the Moose Lake area where 5,000 acres were burned over as the result of four meadow burning fires. Over 90 per cent of this area was in the non-forest classification and aside from the destruction of some game cover the damage was negligible.

An analysis was made of the record of these nine fires to determine if possible the reason for the unusually large area burned over. It was found that in the Park Rapids area the elapsed time from discovery until reported to a forest officer was but 9.2 minutes, the get-away time for the fire crew was 9 minutes, and the travel time 19.9 minutes. For the Moose Lake area the time was 9.1 minutes, 10.4 minutes, and 19.4 minutes, respectively. The analysis of these fires also showed that 13,480 rods or 14.12 miles of tractor trench were constructed around the fires to stop the spread to adjoining timber areas. Based on these and other facts, it was evident that the control action taken was satisfactory and that the unusual condition was brought about by the openness of the territory, the type of fuel, local drought, high wind and low relative humidity.

The total damage for the entire season was $68,805 of which $1,028 was charged to merchantable timber, $19,735 to timber reproduction, $5,227 to watersheds, $9,750 to game cover and recreation, and the remainder to miscellaneous items such as fences, hay, soil, buildings and other permanent improvements.

1952 Spring Fire Season

Normally there is a difference of ten days or two weeks between the time the fire season starts in the southern part of the protection area until it reaches the Canadian border. In most cases the fires start about April 1 in the Cambridge, Moose Lake and Brainerd areas and gradually spread northward. This year, however, the first fire did not occur until April 14 and during the following four days every district except the North Shore of Lake Superior reported one or more fires.

This unusual situation was mainly the result of abnormal weather conditions. Much of the northern part of the state had a deficiency of snow during the winter, followed by drought during the last half of April, all of May and the first week of June when light scattered showers somewhat reduced the fire hazard in parts of the protection zone.

The unusually high temperatures and high winds, coupled with the almost complete defoliation of the trees by the forest tent caterpillar in the larger hardwood belts which exposed the ground cover to the direct rays of the sun, increased the rapidity of evaporation to such an extent that the effect of the rain was soon gone and fires again started to burn in some districts. Widely scattered rains continued during the first and second weeks of June which reduced the number of fires to some extent but they were not sufficient to completely stop them.

The following tabulation shows the number of fires and area burned over for each of the three months:

Month	No. of Fires	Area Burned Over
April	294	11,193 acres
May	244	12,244 acres
June	76	451 acres

Fire Prevention Education

The fire prevention education program has been continued and expanded on a statewide basis through the Bureau of Information of the Department of Conservation, the Keep Minnesota Green committee and the administrative staff of the Division of Forestry. Each of the sixteen administrative areas has carried on a continuous program on a local level through the area supervisors and the district rangers. In addition to the usual contacts made through exhibits, posters, local news items, lectures, demonstrations and motion pictures, most of the areas in which radio stations are located have conducted radio programs during the summer as well as winter months. Much of this radio material was prepared and presented by the field men and included subjects relating to forestry and conservation as well as fire prevention.

In some cases daily and weekly programs were regularly scheduled, some of which were sponsored by local business concerns and some by the management of the radio stations. During the past two years, most of the radio stations in the state have broadcast the available recorded fire prevention programs which were put out by commercial organizations or by cooperating agencies. Among these were two series of 13 recordings each, made by the Jelly Elliott players, sponsored by the federal and state forest services and distributed through the National Advertising Council. In most cases both series were broadcast for 13 consecutive weeks and some of the recordings were re-run a second and third time.

Some new motion picture equipment and films were acquired by the division during the past two years and more purchases are contemplated for the future.

The Bureau of Information has continued to carry on the fire prevention campaign through the press, lectures, special radio programs, the free moving picture service, the state fair, and its publication, The Conservation Volunteer.

The Keep Minnesota Green committee is the oldest "Keep Green" group in the United States with the exception of Washington and Oregon and none has been more energetic in spreading the gospel of fire prevention to its citizenry. Formed in 1944, it has spearheaded the education program of fire prevention in Minnesota.

The Future Farmers of America, 10,000 strong, have joined ranks with KMG. The first forestry institute for FFA youths was held in the fall of 1951. KMG sponsored 25 scholarships of one week's duration. A thorough course of elementary forestry subjects was handled. Modern fire prevention methods were demonstrated at the U. S. Forest Service ranger station at Britt. The institute proved an outstanding success and was held again in 1952. A forestry project manual is now in the process of being written expressly for the 4-H clubs of Minnesota. The estimated cost of this publication is $1,000. The 4-H clubs have been of great help by emphasizing forest fire prevention and other conservation activities in their programs. Boy Scouts, Girl Scouts, and other organizations of youth as well as adults have also given fine cooperation.

Carlton county in 1950 and 1951 held a two-day short course in forestry and conservation. Over 100 KMG leaders attended. As in previous years, on-the-spot fire fighting demonstrations were conducted. Koochiching county conducted a "no-burning pledge" contest, in which the signer of a pledge agreed to prevent promiscuous or unnecessary fires. Thousands of pledges were signed and the county came through the year with one of the lowest

Bulldozer with a middlebuster plow, owned and operated by the Minnesota & Ontario Paper Company.

annual burns in its history. Prizes were awarded KMG junior members for the most pledges signed.

Radio, press and television stations have given freely of their services in time of extreme fire hazard.

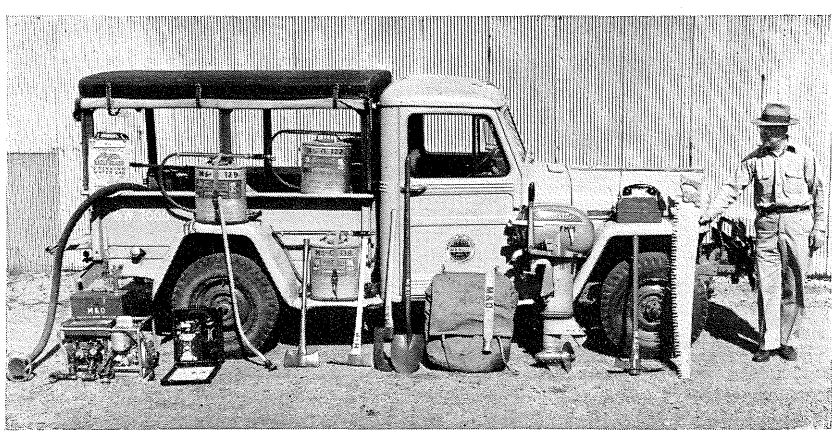
Under the banner of the Minnesota Tree Farm system, which is sponsored by KMG, the Minnesota Forest Industries Information committee and the State Conservation Department, over 200 Tree Farms were accredited.

Most of the newspapers in the northern part of the state were exceptionally cooperative and ran fire prevention articles and fire warnings when requested to do so. Several of the weekly papers devoted an entire issue to fire prevention.

Two new type reflectorized prevention signs were placed in service last year. One of these is a metal insert with a black background and white reflectorized letters for use in the standard tepee or triangular-shaped fire sign frame. The other is also of metal with a standard prevention slogan on one side and an emergency danger warning on the other. It is arranged in a frame so that the fire danger warning can be displayed during high hazard periods and reversed to show the standard slogan during normal periods. One hundred twenty-five of these have been erected at strategic points along the main highways in the northern portion of the protection area.

The Keep Minnesota Green committee assisted in financing this project and the frames and attachments were produced by the division personnel at the Grand Rapids supply depot.

In general, the interest in fire prevention education is gradually increasing in scope and effectiveness in the southern as well as the northern parts of the state. Most of the youth groups are now participating in the program



Four-wheel drive fire fighting truck owned and operated by the Minnesota & Ontario Paper Company. This equipment is available for use in and around the area in which the company operates.

in one way or another and many of the schools have included fire prevention in the regular conservation courses.

Fire Control Cooperation

The advance in fire control cooperation has been even more outstanding than that displayed in prevention cooperation. Most of the larger lumber, mining and other companies in the northern part of the state have offered the services of their personnel and facilities for emergency fire duties. A few of the lumber companies have organized protection units which include trained men and a complement of special fire equipment. Their activities are confined mainly to the territory in which they are operating but it is not uncommon for them to dispatch both men and equipment to assist in other localities. Many of the men assigned to fire duty are authorized by the companies to participate in the state protection training program. In a few cases the companies have conducted their own training courses.

The railroad companies cooperate with the protection organization in various ways. Even though many fires each year are caused by railroad operations, comparatively few of them can actually be attributed to carelessness. Experience and research projects prove that during dry periods or when other unfavorable conditions exist, sparks from coal-burning locomotives will start fires even if the spark-arresting devices are in no way defective and every other precaution is taken to prevent them.

The trains must operate regardless of fire conditions. Fires are therefore going to occur along railroads, and for this reason special measures must be taken to assure quick action in both detection and suppression if the area and damage are to be held to a minimum.

During high hazard periods each train is followed by special speeder patrols or by section crews. All train men are instructed to report all fires they observe on or near the right-of-way to the agent at the next station they pass, and the agent in turn informs the roadmaster and the nearest section crew. For these reasons most of the railroad fires are quickly controlled and are comparatively small.

During the 1950 season the average size of the railroad fires was 4.4 acres while the average for all other causes was 13.4 acres. In 1951 the averages were 7.2 acres and 46.2 acres respectively.

In 1950 all but one of the railroads had a comparatively good record. This one company was responsible for over 73 per cent of the area burned over and 91 per cent of the total damage. This is quite definitely attributed to two causes. First, the areas traversed by this road were in the driest portion of the state where the greatest number of fires of non-railroad origin occurred, and secondly, the use of an inferior grade of coal which due to improper combustion permitted molten cinders to pass through the spark arresting devices.

During the 1951 season a similar situation existed except that two of the railroads were involved instead of one. Of the total of 181 railroad

fires, 165 were caused by these two companies, leaving but 16 charged to the other four major railroads. In one case both drought conditions and poor coal were undoubtedly responsible, while in the other case the fires were charged to high hazard conditions alone.

During this period 51 locomotives were inspected by the state and but three minor defects were found in the spark arresting equipment and none of a serious nature. One of the engines was repaired while the inspector was present and the other two before the engines were permitted to leave the roundhouse. This indicates the manner in which the railroads are cooperating in the prevention program by keeping their equipment in proper condition.

Other prevention measures employed by the railroads include the disposal of combustible materials, the mowing of grass and weeds on the rights-of-way, and the burning of tie piles and other debris during safe periods.

In addition to the extensive amount of hand tools used in maintenance work which is always available for fire fighting, most of the companies have acquired a large complement of specialized fire fighting equipment such as pack tanks, mechanical pumpers, hose, backfiring torches, power speeders, and tankers for transporting water.

The relationship between the fire control sections of the U. S. Forest Service, the Department of Indian Affairs and the state is excellent. Boundary lines are completely ignored as far as fires are concerned. The agency in the most strategic position takes initial action on all fires regardless of location and remains on the job as long as required. The expense is borne by the agency responsible for protecting the area in which the fire occurs.

Both written and oral agreements are entered into governing the policy of each agency and also covering special activities which may be beneficial to general protection. Some localities, and under certain conditions the federal agencies, assume the responsibility of protecting state and private lands outside the organized forests or reservations and the state does likewise on federal lands inside the boundaries. Manpower and equipment are exchanged as occasion demands and all three agencies function as a single fire control unit.

The U. S. Bureau of Land Management has jurisdiction over a considerable amount of public domain but has no fire organization in Minnesota. Arrangements have been made in this case whereby the bureau pays the state for protecting approximately 92,000 acres at the rate of 2.3 cents per acre.

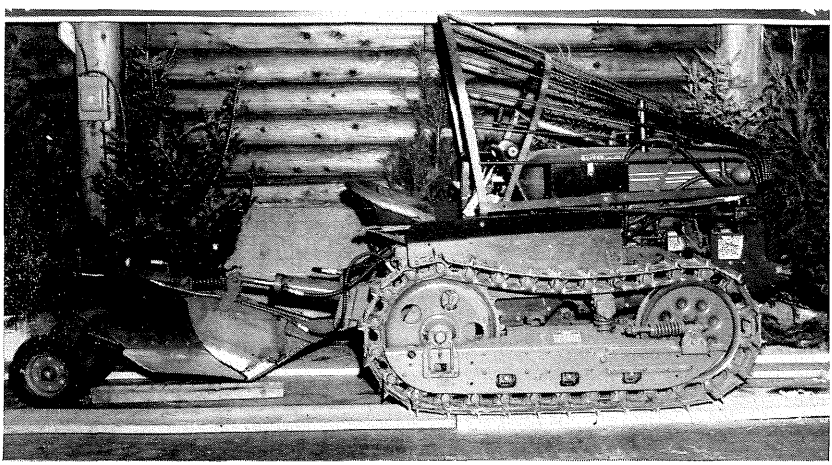
County Cooperation

Most of the timbered counties in the state are now taking an active interest in both fire prevention and suppression. In recent years many of the counties have employed professional foresters and timber cruisers to manage the timber on the tax delinquent land which is under county jurisdiction.

The county foresters and cruisers not only participate in fire suppression activities but also assist the local forest officers in conducting the regular statewide prevention campaign. In many cases the field personnel, road maintenance crews as well as equipment have been made available for emergency protection purposes. In one county the commissioners have organized fire control units, adopted a fire plan, and have issued special instructions to all employees to fully cooperate with the state and federal fire protection agencies.

Protection Area

Some degree of protection from forest, brush, grass and peat fires is required in most counties of the state. In the more highly developed farm regions and the prairie sections, the danger of a fire of extensive proportions is more or less remote. There is, however, a large amount of damage caused each year by brush, grass and ground fires which destroy the cover, year after year, on the wild pasture land and on the undeveloped non-agricultural areas. These fires are usually quite small, are in no way spectacular, and receive little or no consideration from the general public or in many cases from the land owners themselves.



Light weight tractor and plow used for constructing control lines around fires in areas accessible to power equipment.

Aside from the occasional destruction of a fence or live windbreak, the major damage is to the cover and surface litter, the loss of which interferes with the natural processes of water control. It also encourages soil erosion and destroys the breeding and feeding ground of the fur bearers and of the game birds and animals.

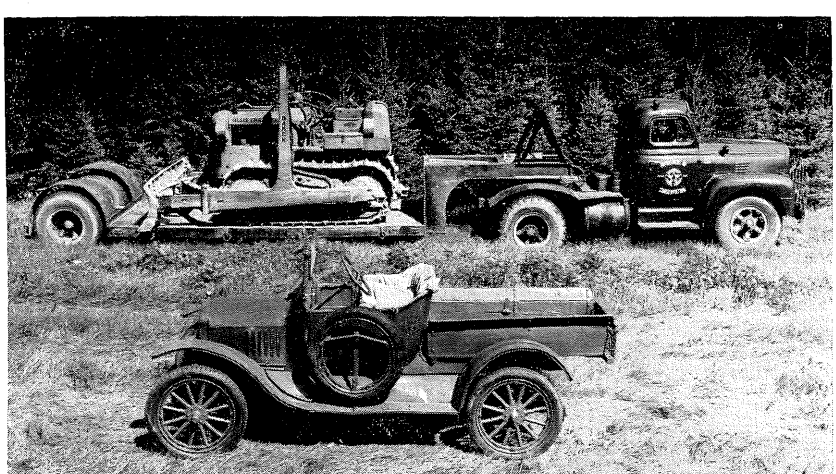
Unlike the more heavily timbered portions of the state, these agricultural areas do not require intensive protection. The ultimate goal is to provide an adequate public relations organization which could spearhead an

educational campaign in prevention and also supervise any necessary suppression activities which may be required in the various localities.

Due to the limitation of funds there is no organized protection being carried on by the state at the present time in these agricultural areas. There is, however, some very effective work being done in protection education by the farm foresters. This phase of the work is incidental to their regular duties of forest management and marketing assistance to private owners, consequently very little time can be devoted to fire problems. The extremely large areas these men are required to cover and the limited time they can give to the project make it impossible for them to begin to do the job as it should be done.

The principal objective in this case is to solicit the aid of all available agencies, organizations and individuals, and organize them into active protection units. These foresters are technically trained men and their knowledge and experience qualifies them to adequately organize and supervise a project of this nature if they were provided with a limited number of permanent experienced forest rangers and a reasonable complement of fire fighting equipment.

Past experience definitely proves that under these conditions and with the proper leadership the local people in the settled agricultural areas will, in most cases, handle their own protection problems with little or no additional expense to the state. Consequently the costs as compared with the setting up of a separate protection organization would be negligible.



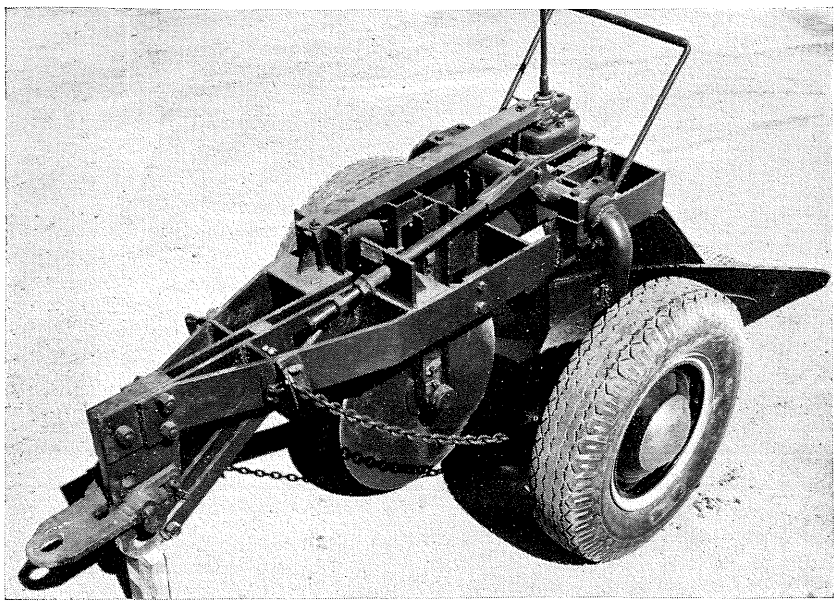
The oldest and the newest automotive fire fighting units.

An outstanding example of the increasing public interest in fire protection and of the manner in which the people respond to organized leadership, is shown by the land owners in the soil conservation districts of southeastern Minnesota. In cooperation with the Soil Conservation Service and

the Division of Forestry, and with the financial backing of the counties, these land owners with little outside assistance have organized a very efficient forest fire fighters association. They have set up various individual control units, each with its own leader, and have prepared plans for an active and comprehensive protection program.

The state has provided a limited complement of fire fighting equipment located at strategic points throughout the area, but the major portion of it is furnished by the individuals of the organization themselves. In the Winona area alone, and upon the recommendations of the district soil conservation leaders, the Division of Forestry has officially appointed over 200 of these land owners to serve as cooperative township fire wardens. They have been given full authority to take any fire control action they deem necessary within their respective townships. Justification for providing funds for expanding the protection program to southern Minnesota is quite definitely indicated by these facts.

The general public in the southern part of the state is becoming more and more interested in preserving the remaining timber and woodland, the farmers in the development of farm forests, woodlots and windbreaks, and the sportsmen and nature lovers in protecting the rapidly diminishing game cover and nesting places of the upland game and song birds. An increased interest is also shown in the conservation and control of our water supply, which has resulted in a marked reduction in the number of fires which occur annually on the wild pasture lands and in the hilly areas where cultivation is impractical.



Minnesota Middlebuster Fire Plow

At the present time there are many other organizations which have expressed their willingness to cooperate in a general fire protection program. This includes various civic organizations, many of the youth groups, the game wardens, highway patrolmen and many others. Maximum results, however, cannot be expected in the organization of all of these groups until an adequate supervisory force of men has been assigned to full time duty within the area involved.

Fire Fighting Equipment

The use of heavy fire fighting equipment is now standard practice on most fires. The introduction of new types of equipment with motor transport has been quite extensive during the past two years. Consequently bulldozers, tractors, heavy duty trailers, power pumpers and plows are now commonly used on even the smaller fires.

Assembled fire fighting kits and specially equipped truck and trailer units have greatly increased the effectiveness of initial attack on the fires which are accessible by roads and trails.

In the past the use of water was mainly confined to those fires which occurred near lakes, streams or water holes, but due to the development of better water hauling equipment and also of lighter and more efficient pumpers, water can now be used to good advantage in nearly all cases.

One of the outstanding developments has been in plows, particularly the two-way or middle-buster type. This plow, drawn by a heavy duty tractor, is capable of constructing an efficient firebreak in almost any type of soil or cover. The extensive use of this type of equipment is shown in the following table.

TABLE 1

Extent of Fire Trenches Constructed

Year	Power Equipment			Hand Tools		
	No. Fires Involved	No. Rods	No. Miles	No. Fires Involved	No. Rods	No. Miles
1947	113	40,039	125.11	80	4,830	15.06
1948	273	107,157	334.50	144	4,790	14.96
1949	227	114,255	356.85	84	4,512	14.10
1950	98	17,906	55.90	38	696	2.17
1951	71	27,304	85.40	47	667	2.11
Total	782	306,661	957.76	393	15,495	48.40

Figure 1

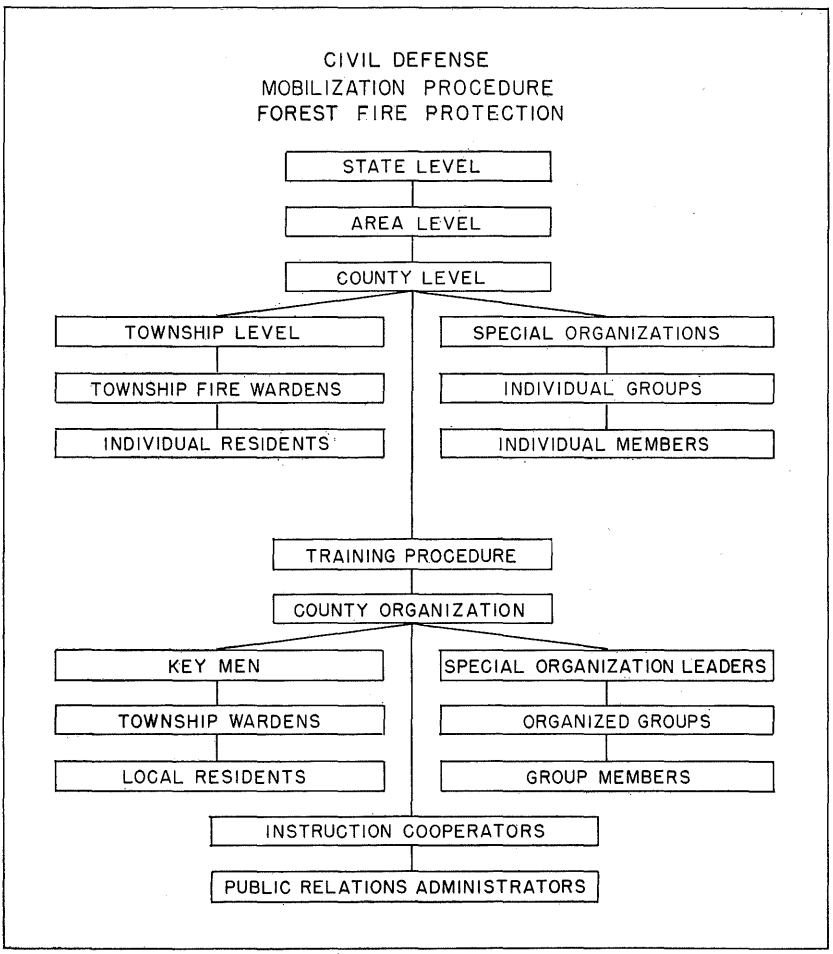

CIVIL DEFENSE
MOBILIZATION PROCEDURE
FOREST FIRE PROTECTION
STATE LEVEL
AREA LEVEL
COUNTY LEVEL
TOWNSHIP LEVEL
TOWNSHIP FIRE WARDENS
INDIVIDUAL RESIDENTS
SPECIAL ORGANIZATIONS
INDIVIDUAL GROUPS
INDIVIDUAL MEMBERS
TRAINING PROCEDURE
COUNTY ORGANIZATION
KEY MEN
TOWNSHIP WARDENS
LOCAL RESIDENTS
SPECIAL ORGANIZATION LEADERS
ORGANIZED GROUPS
GROUP MEMBERS
INSTRUCTION COOPERATORS
PUBLIC RELATIONS ADMINISTRATORS

TABLE 2

Equipment Available for Fire Control

Item	Total in Service	Increase Past Two Years
Trucks — 1½ T. - 3 T.	61	5
Trucks — ¼ T. - 1 T.	134	27
Trucks — Power Wagons	4	4
Trucks — Jeeps	5	2
Administrative Autos	11	1
Trailers — 5 - 15 T.	26	4
Trailers — Tankers	36	....
Trailers — Utility	73	13
Fire Plows — Heavy Duty	84	25
Fire Plows — Medium	18	....
Mechanical Pumpers	326	46
Power Takeoff Pumpers	60	....
Fan Belt Pumpers	19	....
Firebreak Graders	20	....
Firebreak Road Patrol	3	3
Trailers and Bulldozers	68	21
Tractors — Wheel Type	14	9
Fire Hose (Feet)	152,920	12,000
Back Pack Pump Tanks	4,226	142
Fire Axes	5,000	....
Fire Shovels	7,000	....
Pulaski Fire Tools	200	....
Radio Sets	188	173
Fire Patrol Launch	1	....
Fire Patrol Power Boats	28	8
Fire Patrol Outboard Motors	28	....
Portable Water Tanks — 50 - 150 gal.	251	45
Portable Water Tanks — 200 - 300 gal.	101	24

Civil Defense

The Division of Forestry participated in both the state and federal civil defense programs. The major project is naturally fire protection. However, several other activities are included. One of these is participation in the Ground Observer Corps which, in general, is administered by the Director of Forestry but is more or less a matter of individual cooperation between the field men and the corps headquarters. At the present time there are over 30 observation posts strategically located throughout the protection area which are supervised by division employees.

The activities on a national scale are coordinated by the U. S. Forest Service and consist mainly of the preparation of plans for emergency fire control within the various states. The plan in Minnesota consists of a detailed analysis of the factors which may be helpful in controlling fire and protecting life and property during an emergency.

All pertinent data relative to the project is recorded on maps and charts and in various compilations. It includes the location of critical areas and installations, the values involved and the location and description of all available fire fighting facilities and available manpower. Carefully worked out estimates have been prepared which show the additional funds required

for putting such an operation into practice and also for carrying on an extensive prevention campaign.

A complete master protection plan was prepared and presented to the National Defense Agency through the U. S. Forest Service and this can be put into operation upon relatively short notice in any emergency. The following are some of the highlights of the justification statement which accompanied this plan:

"The General Civil Defense Plan for Minnesota includes the entire state, or over 53 million acres. Due to location and various other factors, approximately 70 per cent or 37 million acres are considered to require some form of fire protection even during normal times. Of this total, over 24 million acres are in need of intensive protection and the remainder classed as needing only extensive control.

"In accordance with federal instructions, these estimated plans are based only on the area recognized in the 1950 Federal Clarke-McNary Area and Cost Report which amounts to only 17,996,000 acres and the estimated additional costs for carrying out this program have been reduced so as not to exceed 45 per cent of the current protection expenditures for the state.

"Few, if any, major changes in the general protection procedure should be required to carry out the plan. The requested addition in funds will be used to increase the present personnel and facilities and to inaugurate an active educational campaign in prevention and control.

"The additional manpower will make it possible to organize various groups and individuals into volunteer fire control brigades as well as to carry on a training program in prevention and suppression. The danger of possible conflagrations resulting from atomic bombing will undoubtedly require special expert instructions in the technique of combat and therefore should be made a part of the general educational program.

"The expansion of the auxiliary or volunteer organization will entail some minor changes and enlargement in the regular standard fire plan and this will be done as required.

"The overall plan provides that the administration of the entire setup be conducted insofar as possible under the direct supervision of the present trained personnel and that specific areas be definitely assigned to the various individuals who will be held responsible to their supervisors for proper conduct of the job. This could well start with regions comprising of from one-quarter to one-half of the total under protection to areas consisting of several counties, followed by townships or even smaller units.

"It is felt that with this type of administration, the usual confusion which results from volunteer service will be greatly reduced and that local action can be taken where required by the community officials without waiting for outside assistance."

A separate plan has also been prepared for carrying on the program as an independent state project. This is somewhat less elaborate than the

national plan and is designed for local or sectional emergencies rather than those which may occur on a larger or regional basis. It is almost identical to the regular proposals made by the division for adequate forest fire protection during normal conditions, except that it takes the entire state into consideration and provides for a limited increase in men and facilities.

A large part of the additional funds requested in the plan would be used for conducting a public relations program, coordinating available private facilities and organizing the various agencies and individuals into a statewide cooperative auxiliary fire control force. The administration of such an organization would, under the plan, be mainly conducted by the regular members of the conservation department personnel, assisted by the various county and community leaders.

The following is the general outline as it affects this state plan:

State Level

Administration at the state level is responsible for setting up the policy procedure, general field plans and coordinating the work of general organization and training. This program will insofar as practicable, comply with all requirements outlined by the National Defense organization and the State Civil Defense director. The field administrative force will be kept informed of all new activities initiated by the national and state agencies.

Area Level

The area supervisors will be responsible for all related activities within their respective areas, will appoint a county administrator and issue all instructions regarding the program direct to them. They will also direct the training program and assist in organizing a thorough public relations campaign in protection within each county.

County Level

The county administrators are all trained and experienced men and in most cases are regular employees of the federal or state government.

In the larger counties or where conditions otherwise justify, two or more men may be appointed. In such cases it is important that the boundary lines be definitely established and that close coordination be maintained in dealing with county officials.

It is equally important that all matters of an intercounty nature be cleared through the area supervisor.

Where counties extend into two or more areas, the administrator should be approved by the regional coordinators. In such cases the entire county will be under the jurisdiction of the area from which the administrator is chosen.

Township Level

Township appointments will be made by the county administrator with the concurrence of the area supervisor. Where two or more wardens are assigned to one township definite boundaries should be established.

Most of these men have had considerable experience in fire fighting and have received various degrees of training in fire control technique, consequently some of them are well qualified to administer a township program without such assistance from the administrator.

It must be understood that these men are volunteers and receive no pay for their services except when on active duty, and that they cannot, therefore, be expected to devote too much time to the program.

The major portion of the township training must be done by the county administrators. However, in certain cases the township wardens could be of material help in this respect if prevailed upon to do so.

Townships which are exceptionally sparsely populated can be administered with adjoining units if conditions justify.

The training of the township wardens is important to the area supervisor even during normal times and the civil defense program offers an opportunity to expand the activity with little or no extra effort.

Special Organization

There are many organizations, groups and even individuals which are interested in fire protection and especially so during a national emergency. The type and extent of such potential cooperation is so varied in the different locations that it is difficult to prescribe rules and regulations governing it. Therefore it is recommended that all possibilities be explored and full advantage taken in each case.

The greater portion of fire prevention education will be conducted through some of these organizations such as the schools, radio stations, the press, etc. Organization and training of fire brigades, youth groups and others also come within this classification.

Present Status of Plan

The following are excerpts from a memorandum of instructions which were submitted by the director to all members of the division personnel and show the portion of the plan which is at present in operation:

"The Commissioner of Conservation has instructed the Director of Forestry to assume the leadership in the civil defense fire protection program for the state. The directors of all other divisions have assured their complete cooperation in the project and have been exceptionally helpful in coordinating the work so far.

"The plan even though specifically designed for emergency conditions has been simplified as much as possible without detracting from its effective-

ness in order that it may be immediately put into effect. In fact, much of it should be incorporated into the regular program even under normal conditions if sufficient men and facilities were available for doing so.

"Experiences of the past war definitely proved that forest fire protection could not be administered by men entirely untrained in this field of activity. Consequently, an effort has been made in this plan to delegate as much of the responsibility as possible to members of the federal and state protection organizations and to other experienced men in various cooperating agencies.

"In the meantime and until additional facilities have been provided, it is urged that as much as possible of the preliminary ground work be laid for expanding and perfecting this cooperative auxiliary organization. Since many of the proposals are already a part of the standard fire plan, the first step would be to bring the plan completely up to date and to work out a practical training program covering all of the men involved.

"Aside from the limited assistance which may be rendered by the division's farm foresters and the experienced federal men in the Soil Conservation areas, the Indian Service within the territory in which they are operating, and various other agencies, the portion of the state which is outside the regular protection district must necessarily be organized by cooperators.

"It is hoped that this work can be started immediately in at least the high hazard areas and expanded to other portions of the state as time permits."

Personnel Training

Training of the regular personnel in the various methods and procedures of fire fighting is carried on continuously within the organization. One or more sessions are held each year at which all of the supervisors and their assistants discuss the problems relating to protection and make the necessary recommendations for improving the work and for maintaining, insofar as practicable, a uniform system for all administrative policies and of the various routine activities.

Each of the 16 administrative areas conducts several training sessions each year for the purpose of informing the men of any new plans which may have been developed and for exchanging ideas relating to the area problems. Each supervisor is responsible for the training of the volunteer or auxiliary force within his area. This includes the township fire wardens, keymen, high school groups and other cooperative organizations and individuals. The most important of these are the township wardens and keymen. The wardens issue most of the burning permits within their respective townships and often serve as fire foremen.

The keymen are not authorized to issue permits but are qualified to act as fire foremen or straw bosses and in many cases assume complete charge of a fire. These men receive no pay except when they are actually engaged in fire fighting and therefore cannot be expected to devote much

time to training. Most of them, however, arrange to attend at least one meeting each year at which time the more important problems affecting their localities are discussed.

In one of the areas a new idea in warden and keymen training was tried out. This consisted of a one-day school of instruction which the men and their families were invited to attend. Luncheon was provided for the entire group and appropriate moving pictures were shown. All major items of fire fighting equipment were demonstrated and a specially conducted tour made of the area headquarters. The objective was to stimulate more interest in the training program and to increase the membership of the cooperative organization. It was considered a success and will be continued next season.

Safety and first aid are also part of the regular training program and with few exceptions all members of the regular personnel have taken the standard and advanced Red Cross courses. Many of the men have completed the instructors' course and there are now enough of them so qualified within the organization to train all new men and to conduct refresher courses for the others.

In an effort to improve this program a safety committee consisting of the two regional coordinators and three area supervisors was appointed to stimulate the work in the field, coordinate all new ideas and to draft a safety manual. This manual has already been started and will be of the loose-leaf type so that additional pages may be added from time to time.

A training project was started in December, 1951, designed to bring to all of the field personnel special instructions in the use of aerial photographs. Classes were conducted in the various areas and a manual of instructions on aerial photographs was drafted. Each ranger is instructed in methods of mapping from these photographs and will be required to compile a fire plan map of each individual township in his district.

Radio

Plans are well under way for establishing a fire control radio communication system within the protection area. Eventually this will consist of a base station at the Grand Rapids Supply Depot, a fixed station at each of the 16 area headquarters and at all permanent ranger stations. Mobile units are to be provided for all fire fighting trucks, patrol boats and administrative automobiles and a sufficient number of pack type sets and walkie-talkies for emergency use in the lookout towers, on the fire line and for general field work.

Due to insufficient funds to complete the entire system at one time, a special survey was made which included detailed plans for only 10 of the 16 areas. The following table shows the type and number of the various units required to complete this part of the program and which are now on order:

TABLE 3
Radio Requirements

Type	No. Units
Area Headquarters	
Fixed Stations	10
Ranger Districts	
Fixed Stations	30
Mobile Equipment	
Trucks, Cars	16
Patrol Boats	2
Pack Type Equipment	
Towers, Aircraft, Etc.	60
Walkie-Talkie Type	
Portable Use, on Fire Line, Etc.	60

Figure 2

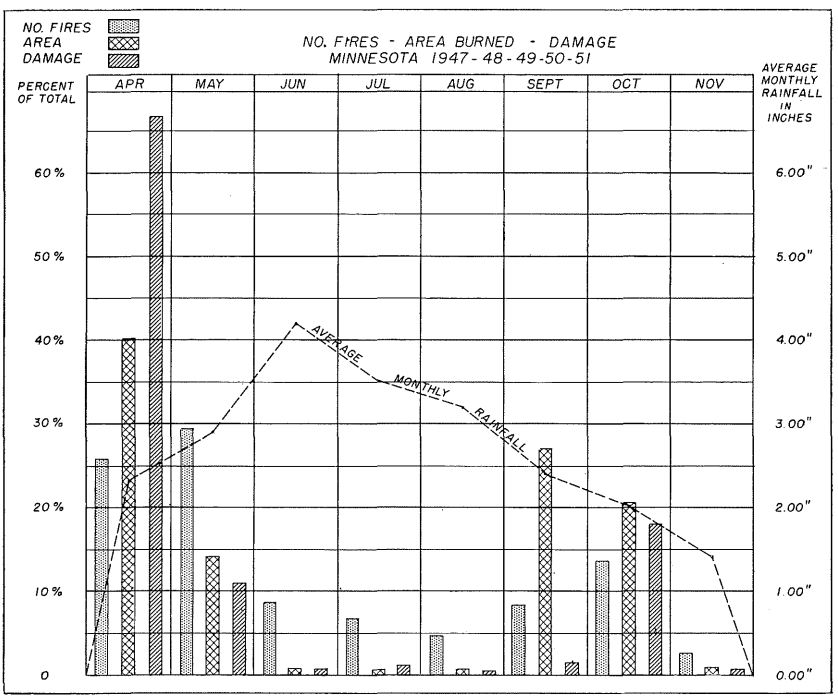


TABLE 4
Number of Fires Per Year by Causes

Cause	1947	1948	1949	1950	1951	Per Cent
Lightning	13	12	11	5	6	0.9
Railroads	232	462	171	222	181	26.4
Campfires	30	57	29	22	16	3.2
Smokers	273	305	198	144	103	21.3
Land Clearing	93	228	179	70	77	13.4
Incendiary	16	28	84	15	11	3.2
Lumbering	12	13	7	8	6	0.8
Meadow Burning	149	245	367	39	108	18.9
Miscellaneous	117	140	136	126	57	11.9
Total	935	1,490	1,182	651	565	

TABLE 5
Number of Fires Per Year by Responsibility Class

Class	1947	1948	1949	1950	1951	Total
Farmers	262	464	521	140	174	1,561
Hunters	83	133	81	92	7	396
Fishermen	56	86	51	13	29	235
Berry Pickers	36	2	2	21	40	101
Work Crews	35	42	49	37	30	193
Travelers	126	137	102	46	32	443
Miscellaneous	129	185	216	97	96	723
Locomotives	208	441	160	205	157	1,171
Total	935	1,490	1,182	651	565	4,823

TABLE 6
Area Burned Over by Causes

Cause	1947 Acres	1948 Acres	1949 Acres	1950 Acres	1951 Acres	Total Acres
Lightning	25	439	118	.....	7	589
Railroads	2,780	4,504	2,235	1,123	1,310	11,952
Campfires	1,575	204	2,033	25	405	4,242
Smokers	7,614	20,173	18,807	2,086	1,366	50,046
Land Clearing	11,161	51,858	33,099	983	4,032	101,133
Incendiary	2,734	735	14,055	1,287	408	19,219
Lumbering	217	772	88	18	55	1,150
Meadow Burning	28,480	30,347	92,980	1,200	18,034	171,041
Miscellaneous	5,428	2,479	19,881	2,005	456	30,249
Total	60,014	111,511	183,296	8,727	26,073	389,621

TABLE 7
Area Burned Over by Land Types

Year	Merchantable Timber Land Acres	Timber Reproduction Acres	Denuded Forest Land Acres	Non-Forest Land Acres	Total Area Acres
1947	1,817	24,624	12,148	21,425	60,014
1948	1,691	22,250	22,525	65,045	111,511
1949	4,983	77,235	44,664	56,414	183,296
1950	60	2,170	2,014	4,483	8,727
1951	360	3,942	5,446	16,325	26,073
Total	8,911	130,221	86,797	163,692	389,621
Per Cent Total	2.3%	33.4%	22.3%	42.0%	

TABLE 8
Area Burned Over by Land Classes

Year	Forest Land Acres	Non-Forest Land Acres	High Land Acres	Peat Land Acres
1947	38,589	21,425	39,847	20,167
1948	46,466	65,045	40,213	71,298
1949	126,882	56,414	90,791	92,505
1950	4,244	4,483	4,577	4,150
1951	9,748	16,325	10,709	15,364
Total	225,929	163,692	186,137	203,484
Per Cent	57.9%	42.1%	47.8%	52.2%

TABLE 9

Fires by Size Class

Year	Under ¼ A.	¼ A. to 10 A.	11 A. to 100 A.	101 A. to 1000 A.	Over 1000 A.	Total
1947	235	382	252	58	8	935
1948	525	532	295	120	18	1,490
1949	238	395	323	200	26	1,182
1950	232	285	119	15	....	651
1951	147	248	125	40	5	565
Total	1,377	1,842	1,114	433	57	4,823
Per Cent	28.6%	38.2%	23.1%	8.9%	1.2%	

TABLE 10

Forest Fire Damage by Cause

Cause	1947	1948	1949	1950	1951	Total
Lightning	$ 412	$ 9,224	$ 1,587	$ 52	$ 1,683	$ 12,958
Railroads	5,244	10,630	9,485	5,607	2,701	33,667
Campfires	3,364	1,570	4,932	174	994	11,034
Smokers	22,516	72,164	122,008	8,514	2,985	228,187
Land Clearing	31,970	64,196	117,969	2,841	8,468	225,444
Incendiary	4,783	1,283	81,389	2,051	1,853	91,359
Lumbering	1,150	7,421	2,502	355	733	12,161
Meadow Burning	68,386	37,539	494,036	2,650	21,259	623,870
Miscellaneous	18,481	17,218	81,461	5,752	25,127	148,039
Total	$156,306	$221,245	$915,369	$27,996	$65,803	$1,386,719

TABLE 11

Forest Fire Damage by Class of Damage

Year	Merchantable Timber	Timber Reproduction	Soil and Watershed	Wildlife and Recreation	Misc. Damage	Total Damage
1947	$11,393	$ 80,659	$12,178	$ 39,337	$ 12,739	$ 156,306
1948	13,713	92,482	22,655	42,584	49,811	221,245
1949	68,952	595,972	44,879	130,668	74,898	915,369
1950	253	9,495	1,975	12,259	4,014	27,996
1951	1,028	19,735	5,227	9,750	30,063	65,803
Total	$95,339	$798,343	$86,914	$234,598	$171,525	$1,386,719
Per Cent	6.9%	57.6%	6.3%	16.9%	12.4%	

TABLE 12

Percentage of Fires by Causes

Number — Area Burned — Damage

1947 - 1948 - 1949 - 1950 - 1951

Causes	Total Area Burned	Total Damage	Total No. Fires
Lightning	0.2%	0.9%	0.9%
Railroads	3.1	2.4	26.4
Campfires	1.1	0.9	3.2
Smokers	12.8	16.5	21.3
Land Clearing	25.9	16.3	13.4
Incendiary	4.9	6.6	3.2
Lumbering	0.3	0.8	0.8
Meadow Burning	43.9	44.9	18.9
Miscellaneous	7.8	10.7	11.9

TABLE 13

Railroad Fires

Number of Fires

Year	1947	1948	1949	1950	1951
Total Fires for State.....	935	1,490	1,182	651	656
Railroad Fires Only.....	232	462	171	222	181
Per Cent of R.R. Fires....	24.8%	31.0%	14.5%	34.0%	27.6%

Area Burned Over

Year	1947	1948	1949	1950	1951
Total Area for State.....	60,014	111,511	183,296	8,727	26,073
Area R.R. Fires Only.....	2,780	4,504	2,235	1,123	1,310
Per Cent of R.R. Fires....	4.6%	4.1%	1.2%	12.9%	5.0%

Damage

Year	1947	1948	1949	1950	1951
Total Damage for State	$156,307	$221,245	$915,369	$27,996	$65,803
Damage R.R. Fires Only	5,244	10,630	9,485	5,607	2,701
Per Cent of R.R. Fires....	3.4%	4.8%	1.0%	20.1%	4.0%

TABLE 14

Origin of Railroad Fires

Year	Locomotives	Debris Burning	Miscellaneous
1947	223	17	7
1948	469	2	23
1949	169	7	....
1950	231	10	13
1951	157	6	7

TIMBER ADMINISTRATION

J. C. GANNAWAY, *In Charge*

The State of Minnesota continues to be the largest single owner of merchantable timber within the state. The administration of this valuable resource should be the concern of all citizens and especially those of the northern half of the state where timber plays an important part in the economic welfare of the people. Many manufacturing plants are wholly or partially dependent upon state-owned timber for their continued existence. To perpetuate the existence of these industries every acre of land capable of producing timber should be kept under sound, practical forest management

The paper industry has been operating to capacity the past two years, which has created a steady market for all species of pulpwood. The logging season of 1951-52 was exceptionally good, and a large volume of pulpwood was harvested with the result that all mills in Minnesota had the largest inventories in many years at the close of the season. Because of this situation there was little demand for pulpwood during the spring and early summer of 1952 and many small operators had wood for which they could not find a market.

During 1952 the demand for lumber declined and the mill operators had more difficulty in disposing of their products, and in many instances

had to make a reduction in price. This situation was due in part to federal regulations which caused a curtailment in building operations.

State timber sales during this period held fairly steady. The usual number of auction sales was held in the northern counties and all sales were successful in that practically all of the timber offered was sold at a good price. There has been a substantial increase in the number of private sales (commonly known as Section 1 sales) made under provisions of Laws of 1939, Chapter 352 (Minnesota Statutes 1949, Section 90.13), authorizing sales of small lots of timber not over $250 in value without bids or bonds.

Good progress was made during the biennium in putting more of the state owned timber under sound forest management. There is still much work to be done to complete the timber inventory and the progress will depend upon the funds made available for the work.

It becomes more apparent as the management plans are put into effect that the state owns many thousands of cords of fully matured timber suitable for pulpwood. This timber is so widely scattered, however, that it cannot be economically logged. To encourage small operators to salvage this timber the state should make funds available to build access roads into these areas. Otherwise a large portion of this timber will go to waste.

Another serious problem in the application of management plans is the short-term timber sale and cutting permit. Under the old law still in force the original term of every permit for cutting state timber sold at regular public sales is limited to two years. The state Executive Council may grant, for good and sufficient reason, not more than four one-year extensions. Thus the total term of a permit with maximum extension is only six years. This is not time enough for timber cutters to set up extensive operations and harvest substantial stands of state timber properly, especially in less accessible areas. As a result many such stands where the timber is mature or over-mature are not being harvested, and much valuable timber is going to waste. This short-term timber law is a hang-over from the old "cut and get out" days, when the aim was to clear the forests as fast as possible, with no thought for conservation. The harvesting of timber at the right time under proper methods is an essential step to good forest management. It is practically impossible to manage the state forests to the best advantage for maximum long-range timber production under the present short-term timber law. Both the state and the timber cutters would gain in the long run as a result of increased timber production under contracts for longer terms. The legislature should amend the law so as to make it possible to enter into contracts for sale and cutting of timber for long enough terms to allow proper harvesting of timber, based on the best management requirements. Such long-term contracts are now granted by the U. S. Forest Service and other public agencies as well as by farsighted private timberland owners.

There is also need for a change in our statutes governing the sale of medium-sized lots of state-owned timber. In many areas the state does not have enough timber to warrant holding the large public auctions required under the general timber sale law. Under Laws 1939, Chapter 352, above

mentioned, small lots of timber not exceeding $250 in value may be sold without advertising for bids. However, there are many instances where the value of the timber on a tract exceeds the $250 limitation, but is not large enough to justify the trouble and expense of a regular public auction. There should be a law for such medium-sized timber stands, authorizing sales up to $1,200 in value, at public auction or upon sealed bids (with bonds), upon one week's published notice in local papers, instead of the three weeks' advertising, posted notice, and other cumbersome procedure required for the regular auction sales. The regular auction sale procedure would still be followed for all lots of timber over $1,200 in value.

The sale of state-owned timber has contributed in excess of half a million dollars annually to the permanent trust funds, and in addition has made a large contribution to the Consolidated Conservation Areas fund. Only by the application of intensified forest management practices will it be possible to sustain this income for these funds.

The timber sales division has 22 full time employees whose duties are largely governed by statute. There are 17 timber appraisers in the field who cruise the timber to be offered for sale and enforce cutting and utilization regulations on 1,200 to 1,500 permits a year. These men are also required to check the timber scales made by the Surveyor General of Logs and Lumber before any timber can be removed from the land on which it was cut. They also constantly patrol two million acres or more of state-owned lands against trespass. Without the assistance of other division personnel normally assigned to timber management and of the forest rangers during the low fire hazard periods it would be impossible for the appraisers to perform the work that is expected of them.

It is believed that the present personnel with the assistance given by the timber management division and the forest rangers is adequate to handle the normal business, except that there is great need for additional clerical assistance in the St. Paul office. The funds available for supplies and expenses are inadequate for the most efficient administration of state timber sales and cutting activities.

Tables 15, 16 and 17 are statements showing the extent of timber cut under auction sale permits, private sale permits, and trespass.

Table 15

TIMBER CUT UNDER AUCTION SALE TIMBER PERMITS
FISCAL YEARS 1951 AND 1952

SPECIES	FEET		CORDS		TIES		POLES		POSTS		TREES		VALUE	
	1951	1952	1951	1952	1951	1952	1951	1952	1951	1952	1951	1952	1951	1952
Pine, White and Norway	3,090,110	2,655,400											$ 47,223.46	$ 37,413.54
Jack Pine	1,439,105	1,095,630	23,302	28,733									62,514.86	76,978.34
Spruce	1,036,220	764,780	61,067	64,036									244,236.56	257,219.92
Tamarack	113,770	90,000	529	729	12,147	6,243							2,814.23	2,133.42
Mining Timber	*16,662	*18,640											83.31	93.20
Poplar	2,837,043	3,095,580	12,098	15,244									25,992.92	28,798.94
Balsam	106,690	50,170	10,833	17,908									25,031.31	43,527.60
Birch	90,780	222,510			10,593	7,006							2,054.14	2,629.78
Basswood	69,990	254,050											538.91	2,034.90
Cedar					16,752	15,344	46,309	70,474	112,985	132,545			17,001.97	31,024.42
Oak	12,130	44,830											97.91	407.26
Mixed Timber	343,820	331,040	381	143		528							1,325.29	1,116.75
Cedar Lagging			298	448									314.12	516.73
Mixed Bolts			5,124	9,966									15,183.51	31,148.93
Fuelwood			526	363									230.93	128.63
Christmas Trees											650,946	1,255,993	13,179.82	25,160.08
Totals	9,139,658	8,603,990	114,158	137,570	39,492	29,121	46,309	70,474	112,985	132,545	650,946	1,255,993	$457,823.25	$540,332.44

*Lineal Feet

Extension Interest	37,212.10	47,795.89
Penalty Interest	61.65	31.90
	$495,097.00	$588,160.23

	Year 1950-51		Year 1951-52	
Log Timber		9,139,658 bd. ft.		8,603,990 bd. ft.
Pulpwood	108,210 cds	54,105,000 bd. ft.	126,793 cds.	63,396,500 bd. ft.
Bolts	5,124 cds.	2,562,000 bd. ft.	9,966 cds.	4,983,000 bd. ft.
Cedar Lagging	298 cds.	149,000 bd. ft.	448 cds.	224,000 bd. ft.
Fuelwood	526 cds.	263,000 bd. ft.	363 cds.	181,500 bd. ft.
Ties, Std.	26,698 ties	667,450 bd. ft.	23,286 ties	582,150 bd. ft.
Ties, Small	12,794 ties	191,910 bd. ft.	5,835 ties	87,525 bd. ft.
Cedar Poles	46,309 poles	1,852,360 bd. ft.	70,474 poles	2,818,960 bd. ft.
Cedar Posts	112,985 posts	376,617 bd. ft.	132,545 posts	441,817 bd. ft.
		69,306,995 bd. ft.		81,319,442 bd. ft.
		16,662 Lin. ft.		18,640 Lin. ft.
		650,946 Christmas Trees		1,255,993 Christmas Trees

Table 16

TIMBER SOLD AT PRIVATE SALE
LAWS 1939, CHAPTER 352
FISCAL YEARS 1951 AND 1952

SPECIES	FEET		CORDS		TIES		POLES		POSTS		TREES		VALUE	
	1951	1952	1951	1952	1951	1952	1951	1952	1951	1952	1951	1952	1951	1952
Pine, White and Norway	1,460,903	1,382,962											$ 14,685.53	$ 16,777.37
Jack Pine	1,272,974	1,322,907	9,740	16,500									28,846.59	45,998.01
Spruce	445,775	384,760	15,775	23,896									56,970.40	96,361.55
Tamarack	380,846	123,350	439	601	870	5,809			2,600	3,223			3,831.53	3,201.06
Mining Timber	*724,522	*894,229											1,955.83	3,481.10
Poplar	3,856,730	3,578,452	23,953	14,376									39,755.04	30,731.00
Balsam	246,166	151,330	13,595	14,697									34,015.34	42,786.29
Birch	176,070	127,260			30,462	10,708							4,855.06	2,288.68
Basswood	236,830	285,260											1,537.47	2,177.88
Cedar					4,854	2,802	13,550	15,688	53,264	55,638			4,711.07	5,211.94
Oak	16,750	58,110											145.32	612.76
Mixed Timber	811,690	963,620	118	259	3,372	388							3,432.23	4,128.47
Jack Pine and Cedar Lagging			217	126									104.95	140.96
Mixed Bolts			7,111	5,605									15,211.73	15,037.94
Fuelwood			4,684	5,766									2,358.23	2,791.80
Christmas Trees											167,553	196,884	3,400.25	4,422.60
Reproduction													10.69	10.00
Totals	8,904,734	8,378,011	75,632	81,826	39,558	19,707	13,550	15,688	55,864	58,861	167,553	196,884	$215,827.26	$276,159.41

*Lineal Feet.

	Year 1950-51		Year 1951-52	
Log Timber		8,904,734 bd. ft.		8,378 011 bd. ft.
Pulpwood	63,620 cds.	31,810,000 bd. ft.	70,329 cds.	35,164,500 bd. ft.
Bolts	7,111 cds.	3,555,500 bd. ft.	5,605 cds.	2,802,500 bd. ft.
Jack Pine and Cedar Lagging	217 cds.	108,500 bd. ft.	126 cds.	63,000 bd. ft.
Fuelwood	4,684 cds.	2,342,000 bd. ft.	5,766 cds.	2,883,000 bd. ft.
Ties, Std.	28,094 ties	702,350 bd. ft.	13,961 ties	349,025 bd. ft.
Ties, Small	11,460 ties	171,960 bd. ft.	5,746 ties	86,190 bd. ft.
Cedar Poles	13,550 poles	542,000 bd. ft.	15,688 poles	627,520 bd. ft.
Cedar and Tamarack Posts	55,864 posts	186,214 bd. ft.	58,861 posts	196,203 bd. ft.
		48,323,258 bd. ft.		50,549,949 bd. ft.
		724,522 Lineal Feet		894,229 Lineal Feet
		167,553 Christmas Trees		196,884 Christmas Trees

Table 17

TIMBER CUT IN TRESPASS ON STATE LANDS
FISCAL YEARS 1951 AND 1952

SPECIES	FEET		CORDS		TIES		POLES		POSTS		TREES		VALUE	
	1951	1952	1951	1952	1951	1952	1951	1952	1951	1952	1951	1952	1951	1952
Pine, White and Norway	33,000	11,560											$ 452.04	$ 171.83
Jack Pine	56,055	5,350	178	22									982.01	103.60
Spruce	1,944	2,110	284	232									1,195.78	1,125.12
Tamarack	340	1,810	6	17	16	26			880				30.09	73.76
Poplar	16,280	7,390	184	151									274.47	207.80
Balsam	1,406		47	126									148.90	398.73
Birch	1,880					133							13.76	16.73
Basswood	9,380	2,280											75.04	18.24
Cedar		170			18		206	50	2,970	443			98.03	18.20
Oak													1.36	
Mixed Timber	12,730	3,040	7	3									151.06	32.95
Mixed Bolts			6	12									18.13	24.30
Fuelwood			483	6									409.90	12.00
Christmas Trees											160	822	73.80	232.30
Reproduction													77.88	5.15
Totals	133,185	33,540	1,195	569	34	159	206	50	3,850	443	160	822	$4,002.25	$2,440.71
												Penalty	1,945.50	2,342.64
													$5,947.75	$4,783.35

	Year 1950-51		Year 1951-52	
Log Timber		133,185 bd. ft.		33,540 bd. ft.
Pulpwood	706 cds.	353,000 bd. ft.	551 cds.	275,500 bd. ft.
Bolts	6 cds.	3,000 bd. ft.	12 cds.	6,000 bd. ft.
Fuelwood	483 cds.	241,500 bd. ft.	6 cds.	3,000 bd. ft.
Ties, Std.	15 ties	375 bd. ft.	109 ties	2,725 bd. ft.
Ties, Small	19 ties	285 bd. ft.	50 ties	750 bd. ft.
Cedar Poles	206 poles	8,240 bd. ft.	50 poles	2,000 bd. ft.
Tamarack and Cedar Posts	3,850 posts	12,833 bd. ft.	443 posts	1,477 bd. ft.
		752,418 bd. ft.		324,992 bd. ft.
		160 Christmas Trees		822 Christmas Trees

FOREST MANAGEMENT

EARL ADAMS, *In Charge*

Even to the casual observer, it should now be evident that forestry and in particular forest management planning is entering a new era in Minnesota.

All of the major timber producing companies as well as the public agencies in the state now have trained foresters on their staffs to develop long range management plans for their lands. Through the current programs of various conservation, civic, and youth organizations, a greater understanding of the problems and possibilities of sustained yield management for Minnesota forests is now had by the average citizen of this state than at any time in the past. The resultant growing demand for the advancement of sound forestry in Minnesota is a source of great satisfaction to foresters who have labored long to secure public support for a forestry program regardless of whether it be for state, federal, or private lands.

The State of Minnesota, owning some 4,100,000 acres of forest lands out of the estimated total of 19,700,000 acres of forest lands within the state must be prepared to assume a leading role in forest management development if it is to keep pace with this growth of forestry as well as to maintain the highest possible income from state forest lands for the future support of the people of Northern Minnesota as well as for contributions to the state's trust funds.

This is equally true for the other forest management programs supported by the state, such as private forest management service, auxiliary forests, and land exchange. The Division of Forestry, which is charged with the development and maintenance of the state's responsibility in the field of forest management, is keenly aware of the task involved and has made considerable progress to date.

The reports for the several forest management activities which follow express the progress made as well as the problems encountered in carrying on the work.

FOREST MANAGEMENT ON STATE LANDS

The division's forest management program was originally designed to develop those forest areas where state ownership was concentrated and in which there was a considerable volume of merchantable timber. For the most part, these areas were within state forests located in the northernmost portion of the state.

Prior to July 1, 1950, a total of 1,142,076 acres of state land had been inventoried and from the basic data obtained, management plans had been prepared for nine state management units. During the past biennium, forest inventories and management plans have been completed for two additional management units having a state land acreage of some 651,033 acres. Thus the total acreage of state lands now under management plans amounts to

1,793,109 acres. However, a lot of work is yet to be done in developing and applying complete management practices on all these lands.

To fully appreciate the gains that may be made in placing state lands under management, one must understand in some measure the numerous steps involved in the inventory of a forest unit and the subsequent development of the management plan. Such a plan involves the preparation of a timber type map, using aerial photographs when available, the selection of sample plots for the measurement of volume and growth of each type and finally the determination of an allowable cut and a timber management plan outlining the broad policies which are to govern the management of the forest lands in the unit.

Preparing the timber type map is the basic and most important step in the development of management plans for state owned forest lands. This is a time consuming task which with the other phases of management planning would require a considerable increase in the present forest management staff in order to complete management plans for all state lands by 1960 as is now planned. Therefore, in addition to an anticipated increase in the management staff from increased legislative appropriations, considerable assistance must be sought from other division personnel to complete the program. Fortunately, the fire plan mapping project, now under way in each ranger district, will provide much of the needed timber type map information for state forest lands. Consequently, to make this cooperation most effective, forest management personnel are assisting the fire plan mapping project by training the rangers in the technique of aerial photo interpretation, and other work to help the project progress. Another source of type map information, which is being utilized, are type maps prepared prior to the initiation of the fire plan mapping project.

Forest inventory in various stages of completion is now being conducted on some 302,000 acres of state land. At this time, timber type maps are available from all sources for about 515,000 acres of state land. The inventory is being coordinated by forest management personnel assigned to the several proposed management units involved. Foresters, rangers, and temporary labor hired for the summer months are all taking part in the forest inventory program.

Established Management Units

The ultimate goal of forest management for all state forest lands is to balance the cut with the growth and to improve the growth to the point of maximum perpetual sustained yield. This is by no means an easy task. While the management plan is a general guide to management, much additional information about the forest is needed before the goal is attained.

As forest inventories and management plans are completed for a management unit, a forester is assigned to make the plan operative. It is his duty to make a detailed study and record of all the forest types in the unit. Of first importance is the preparation of detailed cutting plans based on the silvicultural needs of the merchantable stands tempered with the limitations on cutting imposed by the allowable cut. Cutting plans will be completed on seven of the eleven established management units by the end

of the present biennium. However, timber sales on all of the units are now based on the cutting priority of stands as determined by the field work of the unit manager.

Cutting plans are of immediate importance in the management of a unit, but in gathering this information the forest manager must also keep in mind the long range management needs. Therefore, he must plan his work so that all necessary records for management are being compiled simultaneously. Records dealing with cutting must include not only the cutting plan but also the total actual annual cut, the location of this cut, and the method and time of cutting each stand. In addition, the forester must know where planting or other regenerative work is needed, and what stands should be thinned to increase their productivity.

Problems of Management

It is interesting to note that the practical application of management plans to large areas of forested lands is just emerging from the formative stage of trial and error for all agencies engaged in the management of forest lands in this state. We now know what records are necessary and how the data should be gathered and recorded.

There are, however, certain problems that must yet be solved. Of prime importance in this connection is the utilization of all the wood now being produced by the forests of Minnesota. Management has pointed out the need for adjustment by showing that the supply of the high valued spruce, for example, is limited while the demand remains high. Based on these facts, paper mills are now engaged in research in the use of other species as substitutes, and are making great strides in mill conversion to permit their

Jack pine thinning on state lands in Section 35-62-23.

use. Even with this conversion, it now appears that all of the available wood, particularly the low grade wood, cannot be utilized by our present wood using industries. Foresters, therefore, must constantly strive to encourage the development of new industries to utilize the wood located by management planning.

Another important problem to the forest manager is the practical means of securing the regeneration of stands where nature has failed or must be helped by eliminating brush and other competing vegetation. Planting, though costly, will be necessary in many instances, but more often elimination of competing vegetation will suffice. Enough research has now been done on the problem to point the way. What is now needed are the funds to carry on this work on a scale large enough to be effective.

The Division of Forestry has neither the time nor the funds to carry on detailed forest research. Our foresters, however, do take an active part in the work being done by forest research agencies in recommending problems for study and by assisting the research agencies whenever possible. At present, division personnel are giving assistance to the Lake States Forest Experiment Station on studies relating to the problems of managing black spruce and spruce balsam types. Our personnel are also engaged in brush control and non-commercial thinning projects of "pilot plant" proportions to properly assess the success of the work and the time and expense involved.

In conclusion, the Division of Forestry is justly proud of its accomplishments in the field of forest management planning to date. However, much work still remains to be done. The physical problem of inventorying and preparing management plans for the remaining acreage of state forest lands and applying and maintaining plans is a far bigger task than available personnel can handle. It is clear that more manpower and funds will be needed to complete the job. Consequently sufficient funds should be provided to support this work, which is essential to securing maximum returns from the state's forest resources. This is an investment in the creation of new wealth which will benefit the whole state. The resulting gains will be worth the cost many times over.

PRIVATE FOREST MANAGEMENT SERVICE

Today two-fifths of the land in the state, or nearly 20,000,000 acres, is in forests. Almost 5,000,000 acres of this forest land is controlled by thousands of individuals—farmers, summer home owners, investors, and others. The private forest management service program of the division is designed to assist these individuals with their forestry problems providing their woodland ownership is 1,000 acres or less.

In Minnesota, farm woods differ greatly by districts. In the western prairie belt, the woodlands cover only about 5 per cent of the total farm land, and consist mainly of narrow strips of bottomland hardwoods along streams, open groves of scrubby aspen or oak on certain uplands, and numerous (and mostly decadent) shelterbelts of cottonwood, green ash and

box elder. The farm woods of the southeast section are remnants of former solid forests of oak, maple, basswood and elm, and occupy nearly 20 per cent of the average farm. They are found primarily on steep or poorly drained lands, and as a rule, show the effects of improper cutting, pasturing and occasional burning. North of the Twin Cities area, woodlands make up nearly half of the typical farm which in most cases was developed after loggers had removed the virgin timber. Present woods embrace all types but are mainly aspen.

Comparatively large tracts of private forest lands are owned by timber using industries. Recognizing the value of forest lands, some of the larger industries now employ technically trained foresters to develop and carry out long range forest management plans for their lands. However, a larger percentage of the private forest land is owned by persons who are not in a position to engage technical assistance in managing their forest properties. Nor are these owners, in most instances, aware of the advantages of forest management. It is to these unorganized private owners of small tracts of timber lands that the division makes technical assistance available through its private forest management service program.

The major effort in the program is to provide the assistance necessary to place woodlots in good forest management. This involves the preparation of a management plan for each woodlot from the data obtained in the inventory thereof. Timber that is ready for cutting may either be marked by the forester at a nominal charge, or by the owner after receiving instructions from the forester. In addition to the direct assistance on the woodlot, the foresters also are conducting surveys of local timber stands, sawmills, and forest products markets in order to be in a position to advise woodlot owners on these matters. Other important functions of the forester are the development of desirable public relations activities and assistance in the procurement of planting stock.

The actual accomplishments and service rendered under the program from July 1, 1950, to July 1, 1952, cannot be measured entirely by the immediate returns but must also be considered in the light of the long term values which accrue as forest conditions improve through good forest management practices.

Since June 30, 1950, 733 owners of some 32,291 acres of woodland have been given management assistance. A total of 836,000 board feet and 820 cords was marked for cutting from 1,269 acres of forest lands. During this time, 25,088,000 board feet and 22,318 cords growing on 13,859 acres were inventoried for management. The records show that of those actually contacted 408 woodland owners are at present following improved practices. Forest stand improvement is practiced on 870 acres. In addition 3,036 acres of young timber have been saved from premature harvest, and 1,050 acres have been planted. Woodland placed under protection from fire and grazing aggregate 14,862 acres.

Forest products actually harvested under improved cutting practices yielded 2,171,000 board feet of sawlogs for lumber and veneer, 1,203 standard cords of pulpwood, 65 pieces of piling, 1,935 crossties, 5,580 fence posts, and

7,655 gallons of maple syrup. Converting these products to board feet, the harvest during the biennium amounted to 5,074,000 board feet, with stumpage returns of approximately $58,107 and gross returns to woodland owners of about $150,380.

It is encouraging to note that a substantial increase is shown not only in the yield of all forms of farm woodlot products but also in the number of owners served during the past two years.

This service is supported by funds appropriated by the legislature with some additional financial assistance derived from the Clarke-McNary fund of the federal government. An increase in funds effective July 1, 1950, made it possible to add two foresters to the staff. One new district was established with headquarters at Dassel (later moved to Litchfield), bringing the total number of farm forestry districts to six. A coordinator of farm forestry activities was also appointed to furnish field supervision to the farm foresters and their projects as well as advice to other division field personnel on the conduct of the state farm forestry program.

Each forester is assigned to a district of five to ten counties, depending on their size. An intensive coverage of timber lands and efficient operation is not possible when such large areas must be assigned to one forester. Planning for the adequate development of this program has been extremely difficult because of the limited number of personnel available. Experience in all states engaged in a private forest management service program has shown that farm foresters should be assigned to a district equivalent to, not over, five medium-sized counties. With only six farm foresters, it is obvious that all of the state's 87 counties cannot be effectively serviced within the program at this time. Therefore, the districts now in operation were located where it was thought that the greatest public interest could be served. Major emphasis on district establishment has been centered in the central portion and in the southeastern portion of the state where no other division personnel are located.

The demand of private woodland owners for forestry assistance is increasing and there is a definite need for more foresters in this field. A recommendation has been made to have the next biennial budget provide for three new positions which if authorized, will make it possible to reduce the area covered by each forester, thereby greatly improving our service to the public. It has been our experience that most requests for service originate from land owners living near the farm forester's headquarters. Obviously, this is a result of the closer contacts that can be maintained in the vicinity of the headquarters. The establishment of three additional districts, although wholly inadequate to meet statewide needs, will most certainly improve our private forest management service and the general welfare of the state through better forest management of existing forest lands.

THE AUXILIARY FOREST PROGRAM

Six new auxiliary forests were established during the past biennium, covering 41,772.02 acres. They are located within the counties of Koochiching, Anoka, Cass and Hubbard. Their addition to the 38 auxiliary forests

previously established brings the total number to 44. The aggregate area now under contract comprises 202,640.71 acres.

Any tract of land in this state containing not less than 35 acres, generally suitable for the planting, culture and growth of trees for the production of timber or forest products may be made an auxiliary forest. Before a contract takes effect, the application for its establishment must be approved by the county board of the county in which the land is located and by the Commissioner of Conservation, and after these preliminaries have been completed, approved by the director of the University's school of forestry and lastly by the executive council. Auxiliary forest land is taxed at the rate of six cents per acre annually during the life of the contract.

At the close of the biennium (June 30, 1952) there were pending three applications for the establishment of auxiliary forests, one each in Carlton, Hubbard and Itasca counties. The approval of these applications will add 4,882.39 acres to the area now under contract. One request to establish an auxiliary forest of 120 acres in Chisago county was not approved by the county board.

The past biennium has seen a rapid increase in the amount of timber cut on auxiliary forest lands. During the calendar year 1951 there were 31 new requests for cutting by the owners. Added to 18 requests which were on hand from 1950, there was a total of 49 requests. Of these 21 were completed, one was rejected, and 27 were on hand as of January, 1952. The total cut for 1951 amounted to 3,859.16 cords, 4,250 board feet, 1,228 poles, 2,945 posts, 2,004 ties, and 16,326 bolts. For the first half of the calendar year 1952 there were 15 new requests for cutting timber from auxiliary forest lands. These combined with the 27 requests on hand at the end of 1951 made a total of 42 requests. The total cut for the first 6-months period of 1952 amounts to the following: 1,109.47 cords, 241,090 board feet, 1,695 ties and 5,854 bolts.

As a result of these increased cuttings, many questions as to the procedures to be followed by the owners and county boards have arisen. To coordinate and supervise its field activities in connection with the auxiliary forests, the division has assigned a forester to work on this program. Meetings have been held with the various owners and county boards and standard procedures for handling requests for cutting, field examinations and appraisals, and approvals of cutting have been established. The division is also maintaining a record of all cuttings on auxiliary forest lands.

Tax receipts collected by the counties from auxiliary forest lands for 1951 have yielded $14,891.61. Of this amount $10,685.46 represents the returns from the land tax of six cents per acre, and $4,206.15 represents the yield tax assessments on timber stumpage cut. Only four counties received yield tax from timber cuttings, namely, Hubbard, Itasca, Koochiching and St. Louis.

All of the cuttings on auxiliary forest lands are being carried out under approved forest practices. The owners are also carrying out definite planting programs to meet the obligations of their contracts. Approximately

1,098,300 trees were planted on auxiliary forest lands in 1951 and 1952. Firebreaks have been constructed and some of the larger owners have established their own fire suppression crews and provided equipment. One fire occurred on auxiliary forest lands in 1951. This burned over 109 acres of lands listed under contract No. 42 in Koochiching County. Considerable beaver damage has been reported on lands covered by contracts Nos. 17 and 32 in St. Louis County and on lands covered by contracts Nos. 27, 29 and 44 in Koochiching County.

Three unauthorized cuttings have been made on auxiliary forest lands in 1952. A very small amount of timber was cut from a road right of way across auxiliary forest lands under contract No. 42. This cutting was reported by the owner and the proper assessment was made by the county concerned. State forestry personnel also discovered timber cutting trespass on auxiliary forest contracts Nos. 20 and 28, located in St. Louis and Hubbard counties, respectively. In both these cases the products were seized.

Scaling of timber cut on auxiliary forest lands has tended to create problems in connection with record keeping, especially among the county offices involved. A new system of numbering requests has been set up in cooperation with the office of the State Surveyor General of Logs and Lumber, which should solve this problem.

The auxiliary forests up to date have consisted mostly of large tracts, averaging over 4,500 acres. Efforts have been made to extend the application of the law to smaller holdings, but without much success. Twenty-four requests for information and advice regarding the auxiliary forest program and the establishment of auxiliary forests were received during the biennium from owners of small tracts of timberland. However, at the time of writing this report, none of these owners had as yet progressed to the point of requesting county board action. It is apparent that the auxiliary forest program is either not too attractive to the small owner or that the difficulties involved in entering the program are too great.

There has been good support of the auxiliary forest program in some areas where the county officials and the public have realized the benefits. However, in many counties the attitude of public officials as well as many individuals toward the auxiliary forest program has been one of indifference and even opposition. This is based in part on a lack of a clear understanding of the law and its aims, and in part on certain provisions of the law which cause complications and hamper both the establishment and administration of auxiliary forests. It is hoped that as the law is improved by amendment and as the benefits from auxiliary forests are better understood, a more favorable attitude will result.

Appraisal of the Auxiliary Forest System

Twenty-five years have now gone by since the original auxiliary forest law was enacted. Preparations for this law took a lot of work. It was necessary first to secure an amendment to the state constitution to authorize a new method of taxing timber land and standing timber. This was adopted as Article XVII of the state constitution at the general election of 1926. Then

the enabling act setting up the auxiliary forest system was adopted by the 1927 legislature, with high hopes that it would go far to promote recovery of the depleted forest resources of the state. It is in order now to review what has been accomplished under the law up to date and to estimate the prospects for the future.

The primary purpose of the auxiliary forest law was to encourage good forest conservation and timber production on private lands through a more favorable method of taxation and through state regulation of timber management and cutting practices.

It became apparent long ago that the old ad valorem property tax on both land and standing timber discouraged reforestation and maximum timber production on private land. In many cases the taxes on cut-over or burned-over land were so high that the owners could not afford to pay them while waiting for a new crop of timber to grow. Very few owners would spend money on tree planting or other reforestation work in addition to paying taxes on the land at the assessed rates. They would sooner let the land forfeit to the state. Furthermore, as fast as new trees grew, more taxes were assessed on the standing timber. Hence the tendency was for owners to cut timber as fast as possible in order to escape further taxation instead of letting the timber grow to maturity and managing it for maximum yield.

On the other hand, under the auxiliary forest tax plan the old-style land tax based on assessed value is eliminated. Instead there is imposed a low annual land tax at a flat rate per acre. No tax is payable on the timber as long as it remains standing. Thus the owner's tax load is reduced while the timber is growing, but producing no cash income. When the timber is cut a yield or severance tax is imposed, based on a fair percentage of the stumpage value. This gives the owner a positive incentive to promote reforestation and manage his timber for maximum yield. In consideration of the benefits of this method of taxation, the owners of auxiliary forests are required to follow good forestry practices under state regulation. The system benefits both the land owners and the public because it promotes increased timber production as well as increased tax revenue in the long run.

In spite of these benefits the auxiliary forest system has thus far made very slow progress. Up to now it has been applied to only about 202,000 acres, or less than three per cent, out of a total of 7,600,000 acres of privately owned timber land in the state. On the great bulk of this private land the timber management is poor, and the growth of new timber for sustained yield is far below the potential.

Claims are sometimes made that timber production on private land is higher than on state or government land. These claims are misleading. When high timber yields are reported on private land, it is generally due to the fact that the owners are cutting a lot of standing timber in excess of current growth, including much that is immature. This cannot last. On the other hand, the general practice on state or government land is to regulate the cutting of timber according to current growth and maturity, so as to maintain the yield perpetually and produce more timber in the long

run. Similar practices are followed on auxiliary forests and some other tracts in the hands of far-sighted, conservation-minded private operators. However, the plain fact is that good timber management prevails on only a very small fraction of the total private timber holdings of the state.

So, when we add up the score on the auxiliary forest system for the first 25 years of its operation, the most we can say is that it is good as far as it goes, but it has not made much headway in dealing with the major problem of forest conservation on private land in Minnesota.

Why has the growth of the auxiliary forest system been so slow? One handicap in earlier years was the high land tax rate of eight cents per acre fixed by the auxiliary forest law as first enacted. Few private land owners were willing to pay this rate on land where the income from the cutting of timber would be deferred for a long period of years. The land tax rate was reduced to six cents per acre by the 1945 legislature on recommendation of a legislative interim commission. This helped encourage the establishment of auxiliary forests to some extent, but did not result in any great expansion of the system. There are some other serious obstacles yet to be overcome.

Chief among the difficulties which still obstruct the progress of the auxiliary forest system is the reduction in local tax returns that occur on the establishment of an auxiliary forest whenever the land and timber involved is paying current taxes exceeding the auxiliary forest land tax rate of six cents per acre. Obviously, in order to balance the county, town, and school district budgets this reduction in tax revenue must be made up by increasing the tax levies on other property until the harvesting of timber from the auxiliary forest produces sufficient yield tax revenue to overcome the deficiency. The local taxing bodies and tax payers are reluctant to stand for this shifting of the tax burden, even though the ultimate gain in yield tax revenue may more than make up for the loss at the outset. If some provision could be made for counteracting this temporary deficiency in local revenue, it would undoubtedly go far to encourage wider use of the auxiliary forest system.

One remedy that has been suggested is for the state to compensate the local taxing districts (counties, towns, and school districts) for the temporary loss of tax revenue that may result on establishment of an auxiliary forest. This could be handled in different ways. One way would be to establish a state revolving fund with a small initial appropriation. Out of this fund payments to compensate for loss of tax revenue could be made to the counties for the benefit of the taxing districts concerned, upon condition that such advancements should be repaid to the state out of the timber yield tax when received. These compensating payments should be allowed only in cases of actual loss of tax revenue from auxiliary forest land on which taxes had been paid in full up to the time of establishment of the forest, and should be limited to a reasonable maximum amount per acre. No compensation should be paid for tax-forfeited land which is purchased by private persons or corporations for inclusion in auxiliary forests, because such land has not been paying taxes. When that type of land is included in an auxiliary forest, it immediately starts paying the annual acreage tax, and so causes an increase instead of a decrease in current tax revenue.

The carrying cost to the state under a compensating plan as above described would not be high. Expenditures from the revolving fund would simply be an investment in promoting good forest conservation. In the long run the state would get its money back with good dividends in the form of increased timber production and tax revenue.

Under the Wisconsin forest crop law (which is similar in principle to the Minnesota auxiliary forest law, though differing in details) provision is made for payments by the state to the local agencies in lieu of taxes. This has been an effective incentive in promoting use of the law.

A different solution for the local tax revenue problem has been suggested by some of the private forest land owners. Under their proposal the owners of auxiliary forests would be required to pay a certain amount per acre annually as an advancement on the timber yield tax in addition to the six-cent acreage tax. If any such provision should be adopted, it should probably be made optional in order to avoid complications. If it were made compulsory it might discourage the establishment of auxiliary forests in some cases, as it would increase the owners' carrying costs considerably. This would tend to defeat the principal incentive of the auxiliary forest plan, which aims to encourage reforestation by reducing the amounts which owners must invest in taxes while waiting for the timber to mature. However, if the provision for payment of advancements on the yield tax were made permissive (to be incorporated in the auxiliary forest contract only by agreement between the owner and the county board), it might be helpful in some cases where the owners were willing to make the advancements in order to induce the county commissioners to approve their applications.

The conservation department is not prepared to make any recommendations at this time regarding the foregoing proposals for improving the auxiliary forest law. We merely submit them for study as offering possible remedies for some of the obstacles that have retarded progress under the law.

In addition to amending the law so as to make it more workable and acceptable, there is need for a campaign of education as to the benefits of auxiliary forests among the people of the forest areas and their public officials. If people are shown that the establishment of auxiliary forests will result in both increased timber production and tax revenue in the long run, it will help overcome opposition and promote the spread of the auxiliary forest system.

General Mandatory System of Timber Land Taxation

In spite of all that may be done as before suggested to encourage the establishment of auxiliary forests, progress is bound to be slow as long as the system remains optional. This is due to the time and labor required for the investigation and processing of individual auxiliary forest applications. Hence it will take a long time to extend the auxiliary forest system over any major part of the private forest land of the state. If we want a complete and effective solution for the problem of timber land

taxation in Minnesota, we must look forward to the adoption of a mandatory system applicable to all timber-producing land. This has been done with good effect in other states.

A quick change from the old system to the new should not be contemplated. The change-over would have to be made gradually in successive steps as follows:

(1) Promote the establishment of as many auxiliary forests as possible in all timber-producing counties of the state, to serve as demonstration projects.

(2) Develop an efficient and equitable timber land assessment and classification system under present tax laws throughout the forest areas of the state, using the experience gained in the administration of auxiliary forests as a guide.

(3) Give all timber land (including standing timber) a separate lower assessment classification by amending the present ad valorem tax laws.

(4) Finally, eliminate the ad valorem tax on all timber land and standing timber, and adopt instead a complete new mandatory system of general application, based on the same principles as the auxiliary forest system, with a low flat acreage tax on the land and a yield or severance tax on the timber.

(5) In consideration of the benefits to the owners of private timber land under either step (3) or step (4) above, provide by law that they must comply with good timber management and cutting practices under state regulations, similar to the requirements governing auxiliary forests. This would amount to an extension of our present timber cutting regulation laws, with higher standards for timber cutting and management for all land assessed and classified as timber land.

In short, the ultimate goal would be the general application of the principles of the auxiliary forest system to all private timber land in the state. When this is accomplished, it will go far to bring about better forest conservation and increased timber production on private land.

Some progress has already been made towards a better system of timber land assessment along the lines above suggested. In recent years there has been considerable improvemnt in the methods of assessing timber land and standing timber as a result of training sessions for assessors conducted by the State Department of Taxation and through the development of the county assessment system. However, there are many backward areas in the state where assessment methods are still inefficient and inequitable. It would be a paying investment for the state and the counties to provide additional funds and manpower to speed up the development of effective timber land and timber assessment methods in all the forest counties of the state. This alone would help considerably to relieve the shortcomings and inequalities of present methods, and would promote better forest conservation and timber management on private lands.

Extensive studies of improved methods of timber land and timber taxation have been made by staff members of the University School of Forestry, the U. S. Forest Service Lake States Forest Experiment Station, the State Department of Taxation, and other agencies. It is high time for the state to take advantage of this service and put it to practical use.

TABLE 18

Auxiliary Forests

County	Appli.	Not Approved by County Board No.	Not Approved by County Board Acreage	Pending No.	Pending Acreage	No. Established	Acreage Established
Anoka	1	....	.....	....	.....	1	80.00
Carlton	3	....	.....	1	80.00	2	1,597.50
Cass	1	....	.....	....	.....	1	3,837.60
Clearwater	1	....	.....	....	.....	1	160.00
Hubbard	5	....	.....	1	1,487.46	4	5,481.11
Itasca	9	1	2,268.36	1	3,314.93	7	22,771.03
Koochiching	20	....	.....	....	.....	20	128,384.31
St. Louis	7	1	7,858.50	....	.....	6	40,238.21
Stearns	2	....	.....	....	.....	2	90.95
9	49	2	10,126.86	3	4,882.39	44	202,640.71 A.

TABLE 19

Auxiliary Forest Tax Receipts for Calendar Year 1951

County	Acreage	Receipts from Yield Tax	Receipts from Land Tax	Total Receipts	Total Receipts Per Acre
Anoka	80.00	.....	$ 4.80	$ 4.80	$0.060
Carlton	1,597.50	.....	95.85	95.85	.060
Clearwater	160.00	.....	9.60	9.60	.060
Hubbard	4,742.43	$ 250.86	284.56	535.42	.112
Itasca	22,771.03	790.82	1,366.27	2,157.09	.095
Koochiching	108,508.59	2,802.27	6,501.52	9,303.79	.085
Stearns	90.95	.....	8.37*	8.37	.060
St. Louis	40,238.21	362.20	2,414.49	2,776.69	.068
Total	178,188.71	$4,206.15	$10,685.46	$14,891.61	$0.084

*Auditor assessed this amount to take care of error in previous years where land was taxed at the rate of $0.05 per acre.

LAND EXCHANGE

General Exchange Program

The Minnesota Land Exchange Commission, composed of the Governor, the Attorney General and the State Auditor, was created by Article VIII, Section 8, of the State Constitution and ratified by the people of the state in 1938.

Legislation enacted during the legislative session of 1939, authorized the commission to exchange state owned lands for lands of the United States or privately owned lands in accordance with procedures outlined in Laws of Minnesota 1939, Chapter 382. Subsequent modification and amendment of the original act has been necessary to make it operative.

The Commissioner of Conservation is charged with formulating a general exchange program designed to serve the best interests of the state. The Division of Forestry has been designated by the Land Exchange Commission as the administrative agency to process land exchange proposals. Hence, this report is incorporated as a part of the biennial report of the Division of Forestry.

Consolidation of state ownership within state forests and conservation areas to provide more effective administration and management of state lands has been the main object of the exchange program. Farmers and other private land owners also benefit by exchanging isolated tracts suitable for conservation purposes for state lands located nearer to settled communities and suitable for agriculture or other private uses.

Lands subject to exchange are classified under the act into Class "A" and Class "B" lands. All lands owned by the State of Minnesota which now are under the control of the Commissioner of Conservation are classified as Class "A" land. Class "B" lands are those which have been acquired by the state through tax-forfeiture and which are held in trust for the taxing districts, and are under control of the counties for classification, appraisal and sale.

A prescribed form of procedure is pursued in the processing of Class "A" land exchange proposals, in which each phase of the process must be recommended by the Commissioner of Conservation and unanimously approved by the Land Exchange Commission.

A field examination and appraisal is made of all lands offered the state in exchange as well as state lands selected by applicants. The values of lands, improvements, timber and reproduction are determined by state appraisers. These appraisals are not conclusive, but together with such other matters as they deem material in determining the values for the purposes of exchange, are used by the Commissioner of Conservation and the Exchange Commission as bases for land exchange negotiations.

State-Private Exchanges

During the biennium ending June 30, 1952, final action was taken on eleven Class "A" exchange proposals with private individuals. A total of 1,670.61 acres of private land valued at $9,148.53 was received by the state in exchange for 1,249.57 acres of state land valued at $7,856.30.

In addition, 1,345.95 acres of state owned land and 2,606.10 acres of privately owned land have been examined and appraised, but to date these exchange proposals have not reached their conclusion.

The land exchange business carried on by this division for the Land Exchange Commission indicates considerable interest in the program. A total of 29 inquiries requesting either information regarding the land exchange program or the initiation of exchange proposals were received. The greatest interest is being shown by persons owning land within the Beltrami Island State Forest and the Red Lake Game Preserve. The acquisition of privately

owned lands located within these areas, through the medium of exchange, is recommended in most instances by both the Division of Game and Fish and the Division of Forestry in order that they may be consolidated with present extensive publicly owned areas for more efficient management for conservation purposes.

A number of requests for exchange have been rejected where they did not fit in with the best interests of the state, but only after careful consideration was given to each proposal.

State-Federal Exchanges

One of the major objectives of the land exchange program has been to promote an extensive, long-range exchange program with the federal government. In this program the federal government benefits in the same way as the state—that is, its scattered land holdings are consolidated for better management. This does not result in any expansion of federal operations, as some people seem to think. On the contrary, it results in contracting the field of federal operations within the boundaries already recognized or approved under state law, such as the national forests, wildlife refuges, or Indian reservations.

The state-federal exchange program has made considerable progress during the biennium. Field examination and appraisal work has been completed on 18,653.04 acres of federally owned lands within the boundaries of the Finland and George Washington State Forests, and on 10,500 acres of state owned lands within the original boundaries of the Superior National Forest.

The Land Exchange Commission has directed that appraisal work begin on 8,950 acres of federally owned lands in the west half of Townships 57 and 58, Range 8 West, adjoining the Finland State Forest, for state owned lands within the original boundaries of the Superior National Forest. To date all of the federal lands have been type mapped and 3,000 acres of state cut-over lands have been examined and appraised for this exchange.

County Exchange Program

The Class "B" land exchange program has been somewhat accelerated during the past two years, resulting in the completion of three exchanges involving 5,778.37 acres of tax-forfeited county land and 2,082.21 acres of private land. Field appraisals have also been completed on 2,760 acres of tax-forfeited county land, and for 3,800 acres of private land on a fourth proposal now being processed, making a total of 6,560 acres.

The proposals of Class "B" land exchanges originate within the counties concerned, by resolution of the county board of the county in which the land is situated, and the preliminary processing of each such exchange is under the direction of such county board, the consummation and final approval of these exchanges being the responsibility of the Commissioner of Conservation and the Land Exchange Commission.

Lands to be offered and received in exchange shall be substantially of equal value, as determined by the county board with the approval of the Commissioner of Conservation and the Land Exchange Commission. For purposes of such determination, the county board appraises the state lands and the lands proposed to be offered in exchange in the same manner as tax-forfeited lands offered for sale are appraised.

Before tax-forfeited lands may be sold, the appraised value of the timber thereon must be approved by the Commissioner of Conservation. Authority for such approval has been delegated to forest officers by the commissioner. This makes it possible to avoid duplication of work and save the time and expense of separate appraisals of tax-forfeited and private land in cases where state appraisers can be assigned to work with the appraisers representing the private land owners and the county. This was done with good effect in the case involving 6,560 acres before mentioned.

Land Exchange to Create State Parks

Legislative action in 1947 and 1949 authorized two new state parks, one each in Fillmore and Wright counties. The acts invited the United States government to acquire 850 acres of private land in Fillmore County, and 1,000 acres of private land in Wright County, exchanges to be effected in the manner provided by the land exchange act. This procedure followed the pattern already used for establishment of Nerstrand Woods State Park in Rice County.

The appropriation of necessary funds for the acquisition by the federal government of the private land affected by these exchange proposals awaits the action of Congress. The present outlook is not hopeful. Until such funds are made available by Congress, no further action can be taken by the state to fulfill the provisions of the legislative acts above referred to.

Future Action Proposed

Continued efforts will be made to complete the several pending state and federal exchange proposals. In addition, tentative plans call for an expansion of this portion of the land exchange program to include other exchange proposals which will accelerate the consolidation of state owned lands, particularly within state forests and conservation areas for more efficient management.

It is apparent that state and private exchanges can serve a very worthwhile purpose by the relocation of isolated land owners in desirable agricultural areas where settlements are now established with good roads, schools and other public utilities. A number of such exchanges have been completed, and some counties, particularly Lake of the Woods, have taken a very real interest in promoting this type of exchange. This phase of the land exchange program should be expanded by encouraging county officials to guide and assist isolated land owners in initiating land exchange proposals which will be feasible and acceptable to the state.

To date, the expense of general administration and supervision of the land exchange program has been paid from Division of Forestry appropriations. However, the work entailed by the expansion of the land exchange business has assumed proportions which require the continuous attention of at least one staff member whose salary and expense should be provided for in the Land Exchange Commission budget, thus to make this program pay its own way. It is, therefore, recommended that an appropriation to pay the salary of one administrative staff member of the division be added to the items to be included in the next budget of the commission.

RECREATIONAL AND HOMESITE DEVELOPMENT IN STATE FORESTS

H. OSTERGAARD, *In Charge*

Special-Use Permits and Leases

The demand for state owned summer cabin sites continues to increase. Apparently more and more people wish to spend at least a part of their vacation in a cabin of their own in Minnesota's North Woods. The sites which are accessible by automobile are nearly all under permit at this time.

There is little demand for the sites which cannot be reached by driving to them with a car. Within the boundaries of several state forests, particularly the George Washington and the Minnesota, there is a great deal of such state owned lakeshore suitable for summer cabins and campgrounds. In order to make such sites available for summer cottages, however, it will be necessary to have not only the road building equipment but additional personnel as well.

The following tabulation shows the various leases made by the Division of Forestry for the past four-year period:

TABLE 20

Special Use Permits in Force and Revenue Collected

	No.	1949	No.	1950	No.	1951	No.	1952
Homesites	469	$4,800.00	559	$ 5,743.00	527	$ 5,435.00	578	$ 6,012.10
Hay and Farm	187	1,498.14	170	1,215.19	138	1,073.69	120	972.09
Commercial	52	1,500.00	48	1,207.00	60	1,688.25	49	1,146.00
Rights-of-Way	69	523.82	75	596.70	114	853.90	139	984.38
Gravel	5	1,081.86	5	1,282.45	6	276.09	8	809.63
Miscellaneous	2	601.00	2	54.00	2	721.80	0	0
Total	784	$10,004.82	859	$10,098.34	847	$10,048.73	894	$9,924.20

The division maintains 23 campgrounds within state forests and, with the exception of the Chief Woodenfrog campground on Lake Kabetogama, they are maintained by forestry personnel. They are used by a great number of people, mainly for daytime picnicking. Communities, schools and other groups make use of some of them every Sunday during the summer months. Water, tables and fireplaces, as well as sanitary facilities, are available at most of the campgrounds.

Ash River Campground in the Kabetogama State Forest

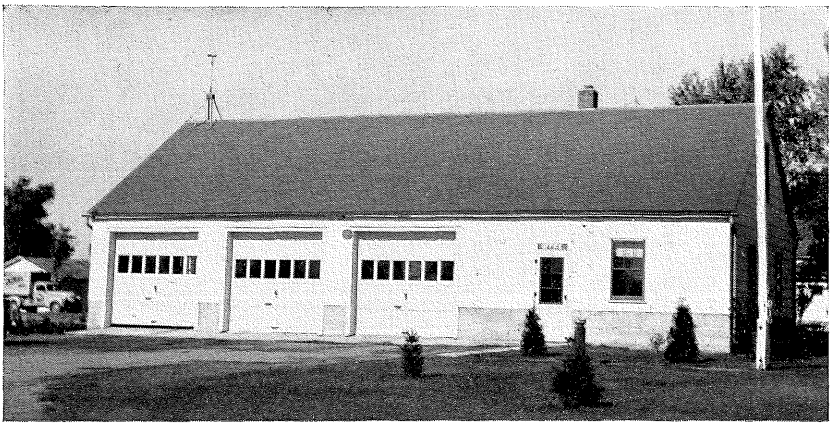
At the Chief Woodenfrog campground a refectory was built for the division by the Civilian Conservation Corps. This building is used by a caretaker who is permitted to sell soft drinks and lunches and to rent boats and motors. In return, the caretaker maintains the grounds and makes minor repairs to the tables, fireplaces, docks and other facilities.

BUILDINGS

One of the most serious problems confronting the division is the lack of modern residences for forestry personnel stationed in areas where no suitable houses can be rented, or where the rental is so high that forest rangers and guards cannot afford to pay it.

To illustrate the need for housing for employees, the ranger station just outside of Nimrod is cited as an example. Here the ranger, his wife and three children live in a small building 16′ by 24′ in size. There are no modern conveniences except electricity. There are no houses to be rented in the nearby village.

Another example is the station near Alborn where the division has no residence. The ranger and his wife live in an old house without modern conveniences. Each summer they must move out for several weeks while



Office-Warehouse Building at Cambridge Area Headquarters

the owners occupy it during their vacation. There are numerous other instances where larger, modern residences are urgently needed.

Two modern residences, one addition, and the modernization of a third were completed during the fiscal year 1951. Other buildings were moved and improved. The legislature of 1951 provided sufficient money for the normal maintenance and repair of the more than 600 buildings owned and maintained by the Division of Forestry, and a small amount for improving some existing buildings, but no funds were provided for the construction of new residences. This means that no new quarters will be built during 1952 and 1953, but it is hoped that at least one old residence can be enlarged and modernized with the funds available.

The division received a large appropriation for the purchase of fire fighting equipment during the past biennium, but no provision was made for housing it. To overcome this deficiency, federal Clarke-McNary money was transferred to the building fund and used for the construction of storage buildings. During the fiscal year 1953 additional storage buildings for fire fighting equipment will be constructed.

The following tabulation presents briefly what has been accomplished during the biennium in the construction and improvement of forestry buildings.

TABLE 21

New Buildings Completed

Fiscal Year 1951

Birchdale Residence — 26 x 40 — all modern.
McGrath Residence — 26 x 40 — all modern.

Buildings Improved

Effie Office — 20 x 26 — Basement, furnace, water and sewer.
Effie Cabin — 20 x 26 — Basement, electricity, water and sewer.
Effie Cabin — 18 x 26 — Basement, electricity, water and sewer.
Pinewood Cabin — 24 x 30 — Water, sewer and shower.

Cotton Office — Moved from Spirit Lake and wired.
Cotton Garage — Moved from Spirit Lake.
Residences at Elbow Lake, Guthrie—Electric wiring and electric water pump.

Fiscal Year 1952

Crane Lake Residence — 16 x 26 addition and the whole building modernized.

Machine Storage Buildings Constructed

Bagley — 25 x 52
Nimrod — 25 x 52
Littlefork — 25 x 52
Hibbing — 25 x 52
Aitkin — 25 x 52
Grand Rapids — 25 x 70

Buildings Moved

Portable Storage — 20 x 60 — from Jay Cooke Park to Cloquet.
Portable Storage — 20 x 60 — from Jay Cooke Park to Northome.
Portable Storage — 16 x 40 — from Baudette to Faunce.

Other Buildings

Office — 10 x 16 — from Birchdale to Crane Lake.
Portable Office — 12 x 15 — from Area 14 to Eaglehead Station.
Waskish — Remodel Game and Fish building for forestry equipment storage.

The most urgent need now is for a new repair shop at the Grand Rapids supply depot, additional residences, and for the moving and remodeling of some buildings which cannot be used in their present location and condition. The division's central supply depot and repair shop is located just east of Grand Rapids on Highway No. 2. The improvements consist of storage buildings, a central heating plant, a welding shop, two residences and a repair shop. The latter and some of the other buildings were constructed chiefly by WPA during the late 'thirties.

During the past 10 to 15 years the Division of Forestry, like other organizations, has acquired a considerable amount of mechanical equipment to replace manpower which is becoming continually more scarce. This mechanical equipment does, however, require some attention. After it is purchased it must be inspected and the necessary attachments added to make it satisfactory for fire control work. After it has been used it must be put in readiness for the next fire.

The repair shop which was constructed in 1937 is now entirely inadequate. The work on tractors and the welding alone, which is now housed in a wooden structure, can fully utilize all the space in the old shop. A new building to be used as a repair shop for welding, carpentry, washing and greasing, for storage of parts and sundry supplies, as well as office space, is badly needed.

All new forestry equipment passes through the Grand Rapids supply depot. All major repair work from the 16 forest areas and two forest nurseries is done here, and all repair parts are stored at this point. Occasionally new equipment, such as the first tree planters used by the division, is constructed at the shop. The work load now is such that a new shop must be built or much of the necessary work left undone. Fortunately very little equipment has been lost or damaged so far even though it has been stored out of doors, but it is inadvisable to continue this practice.

ADMINISTRATIVE SITES

During the biennium the division purchased lookout tower sites near Askov, Motley and Cass Lake, and an administrative site at Brimson. Deeds were received to a site at Deer River and for an addition to the site at Hovland at a nominal cost of one dollar each.

TRUCK TRAILS AND TELEPHONE LINES

With the aid of new equipment purchased during the past biennium it has been possible for the division to do more work on forestry trails than has been done for many years. Even so, it has been possible to maintain only those which are used the most, due to the limited manpower available.

When it is considered that there are approximately 1,180 miles of forestry trails, it is self evident that a great deal of time is required to maintain them in a satisfactory condition, and that more men and road equipment must be provided in order to make it possible for more work of this kind to be done.

During the biennium the division has used a chemical brush killer to destroy the brush under telephone lines and along some forestry trails. The result has been very satisfactory, and the cost of this method of brush control is considerably less than any other method used. It will be continued if funds are available.

Experimental work has also been done by using a heavy disk to cut down the brush under telephone lines. In other locations a bulldozer has been used for removing brush. It was demonstrated conclusively that the use of chemical brush killer is the most economical method of brush control, and cutting brush by hand the most expensive. Where disking to kill brush can be practiced, this method appears to be fairly satisfactory.

CONSERVATION AREA WORK

The legislature of 1951 made available to the Division of Forestry $150,000 from the Consolidated Conservation Areas fund for the biennium beginning July 1, 1951. Before that date plans were already under way for work projects totaling slightly more than half of the appropriation.

As forest and game protection are two of the most important conservation activities, the greatest stress was placed on improving roads and telephone lines in the conservation areas. Although the spring of 1951 was quite dry, by the time contracts had been let for graveling and grading roads, the rains had begun and for several months heavy equipment could not be used. Some of the gravel hauling was delayed until the ground was frozen enough to carry loaded trucks.

As the telephone line work consisted partly of cutting brush which interfered with the lines, this work was done during the summer. Some brush also was cut along existing old roads in preparation for widening them, or to permit the sun and wind to reach the ground to dry it.

In several instances bulldozers were used for the same type of work. Sometimes the work accomplished was very satisfactory but it was found that the terrain had to be suited for tractor and 'dozer operation in order to get the best results. Brushing by 'dozer was a great deal more economical than doing the same work by hand. A heavy disk was found more satisfactory for this work where the terrain was suitable.

Some esteron brush killer was purchased with conservation area funds. It was used during the summer and will again be used this spring. As the brush must be in full foliage when sprayed, the work was delayed in some localities because the brush was defoliated by the forest tent caterpillar.

Many bridges and culverts were replaced on abandoned roads. With re-grading and graveling they were made usable once more.

Although fire prevention and game protection are very important, timber sales and management activities also benefited. The same roads that are used for fire protection are also used for timber work. They make timber accessible which otherwise could not be sold. During the past two summers some of the funds were used in timber inventory work and in the preparation of management plans for sustained yields.

The following summary shows the work accomplished during the fiscal year ending June 30, 1952:

TABLE 22

Conservation Area Work — July 1, 1951, to June 30, 1952
Forest Road Construction and Improvement

Cons. Area	New Construction Miles	Re-construction Miles	No. Bridges	No. Culverts	Gravel			Fill		Brushing Mi.		Ditching Mi.
					Med.	Hvy.	Cu. Yds.	Mi.	Yds.	Hand	Dozer	
Aitkin Co.	8½	6½	3	37	5	.....	.....	¼	1,200	5	.....	½
Roseau Co.	.....	7½	4	5	11½	¾	3,553	¾	1,630	.....	.....	.....
Red Lake Game Pres.	.....	7	11	38	10¼	8¼	23,233	5½	6,546	27	5	1
Total.	8½	21	18	80	26¾	9	26,786	6½	9,376	32	5	1½

Telephone Lines

Cons. Area	Re-Construction Miles	Brushing—Miles		Brush Burning Miles
		Hand	Dozer	
Roseau County	4½	35	4	19
Red Lake Game Preserve	39½	70½	14½	.....
Total	44	105½	18½	19

Numerous miscellaneous jobs were also completed, such as building two large tanks and treating bridge timber and planks, repairing several large bridges, taking down a lookout tower and planting 248,500 trees on 133 acres in the Aitkin County Conservation Area and 50,000 trees on 25 acres in the Red Lake Game Preserve.

During the second fiscal year of the biennium ending June 30, 1953, it is planned to do the following work with the funds still available:

TABLE 23

Forest Road Construction and Improvement

Cons. Area	New Construction Miles	Re-construction Miles	No. Bridges	No. Culverts	Gravel—Miles		Fill Miles	Brushing—Miles			Ditching Mi.
					Med.	Hvy.		Hand	Dozer	Chemical	
Aitkin Co.	.....	16¼	.....	15	26	.....	1	.....	.....	.....	.....
Roseau Co.	1	5½	.....	1	9	.....	.....	.....	.....	.....	.....
Red Lake Game Pres.	.....	15¼	3	12	15	¼	3	9½	.....	5	.....
Total	1	37	3	28	50	¼	4	9½	.....	5	.....

Telephone Lines

Cons. Area	Re-Construction Miles	Brushing—Miles			Brush Burning Miles
		Hand	Dozer	Chemical	
Aitkin Co.	.....	.....	.....	24	4
Roseau Co.	.....	.....	.....	20	.....
Red Lake Game Preserve.	8	11	.....	32	.....
Total	8	11	.....	76	4

Local labor was used entirely for the forestry work in the conservation areas, even truck drivers, 'dozer operators and similar labor being obtained from local communities. At one time, during the month of June, 1952, about 65 men were employed. In general, however, it was found to be most practical to use small crews of four to eight men on a job at one time.

Contracts were let for hauling gravel and fill, and for grading and 'dozing roads, and even these contractors live in the general areas where they worked.

There still is a great deal of work to be done in the conservation areas, and the men in the field are planning work for the next biennium, subject to appropriation of the necessary funds by the 1953 legislature.

KABETOGAMA MOORAGE BASIN

In the last biennial report the moorage basin and the need for it were explained at length. The situation has not changed a great deal except that the dock has been closed to all use. A fence has been erected around the

basin in an effort to keep persons from leaning on the decayed railing. Some rotted steps and walks have been replaced so that a few boats can still use the basin.

It is strongly urged that an appropriation be made for the repair of the basin or for placing a dike across the small bay leading to the basin.

STATE TREE NURSERY AND PLANTING PROGRAM

RAY CLEMENT, *In Charge*

One of the major operations in the all 'round conservation program is the production and planting of trees for reforestation, watershed protection, soil and water conservation, wildlife habitat improvement, and related conservation purposes throughout the state. The tree planting program produces benefits reaching far beyond the immediate field of timber production. Yet the needs of timber production alone demand and justify the development and maintenance of the tree planting program far beyond the present scale of operations.

Look at the magnitude of the present forest industry. In 1951 the gross value of Minnesota forest products was estimated at over $150,000,000 — a substantial gain over preceding years. This industry is one of the major economic assets of the state. It cannot survive without the protection and management of forest resources provided by the state and federal forest services, or without the supply of timber from state and federal lands in addition to the supply from private lands.

Up to now the timber supply for the industry has come almost entirely from natural growth and reproduction. However, in order to meet increasing future demands for forest products and attain the maximum development of our timber industry, it is essential that large areas of potential timber lands, public and private, which are now denuded, be planted with trees and brought into production.

The provision thus far made by the state for tree planting and other forestry operations is not nearly adequate to meet the future needs and promote the growth of the great forest industry to its maximum potential. The legislative appropriation of state funds to the Division of Forestry for all purposes for the fiscal year ending June 30, 1953, was only about $1,355,000, or less than one per cent of the gross value of the forest products above mentioned, $150,000,000, for the calendar year 1951. If the state program for tree planting and other forestry operations were expanded on a really adequate scale, the sustained annual forest production could be increased to a value of at least $300,000,000 per year. An annual appropriation of $2,000,000 from state funds for all forestry purposes (in addition to federal aid) would go far to accomplish this result. It would still be a very small fraction of the income from the industry, and would be an investment in future income and prosperity for the state worth many times the cost.

In relation to other major operations of the general forestry program, tree planting is behind the procession at present because the production and

distribution of trees for planting on private land (where the need is greatest) was not authorized by the legislature until 1947, and sufficient funds have not yet been provided for adequate development of the state nurseries and other operations necessary for a full-scale, state-wide tree planting program. It is true that the nursery output of planting stock has increased every year since the private land planting program was authorized, and is expected to reach 15 million trees in 1953. However, this is far short of meeting the tree planting needs of the state. It is estimated that from two million to four million acres of land in the state (both public and private) are in need of planting. It will take over three billion trees for proper planting of the minimum of two million acres of presently denuded land. A large portion of this acreage consists of small privately owned holdings, scattered throughout the state, in farms or timber land not suitable for cultivation. The original timber has been cut or burned off on most of these holdings, and comparatively little has been done to reforest them thus far. To handle this job a goal of 50 million trees per year has been set for the state nurseries. Even at that rate it will take from 60 to 65 years to cover the minimum acreage above mentioned, and more needs for tree planting will develop as time goes on.

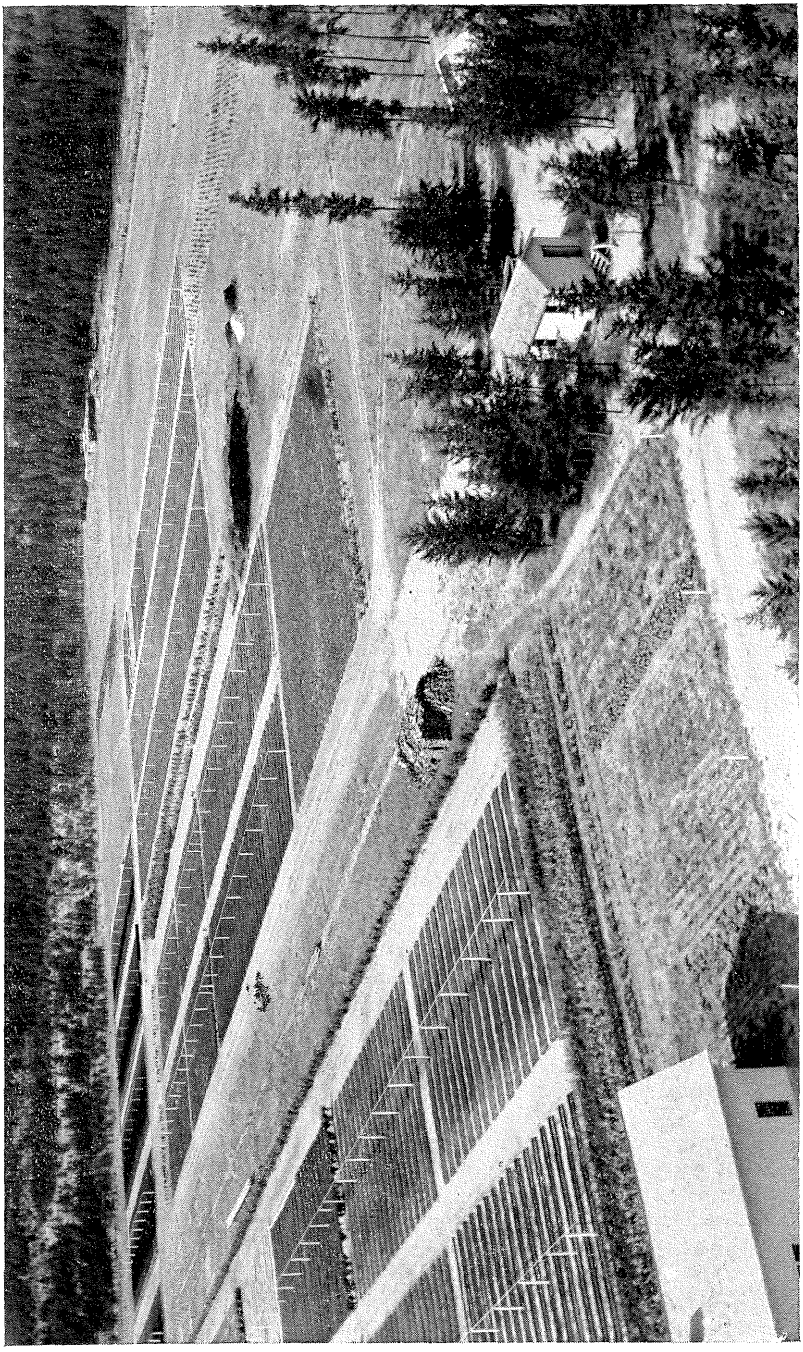
The successful execution of a full-scale tree planting program will require not only a large expansion of the state nursery production but additional means for increasing the planting of trees on public lands as well as provision for an organized, state-wide system for distribution of planting stock, supervision of planting and inspection of results on private land throughout the state.

Thus far the distribution and planting has been handled by the voluntary efforts of various local public and private agencies and organizations. These agencies and organizations have performed outstanding service in handling local tree planting operations. However, more effective organization and coordination of the distribution and planting operations will be necessary to meet the future requirements above outlined.

It is estimated that to attain the goal above indicated would require an expenditure of at least $250,000 per year for the entire tree production, distribution, and planting program for the coming biennium. Further increases may be necessary in subsequent years for some time to come as the program expands in all parts of the state.

If the necessary funds are provided, it is entirely possible to double the goal above indicated and step up the production and distribution of trees to 100 million per year within the next ten years. That would provide for doing the most needed planting (covering a minimum of two million acres) within about 30 years instead of 60 or 65 years as before stated. It would pay the state well to provide the funds for speeding up the job in this way, as the over-all cost would be much less (through saving in labor time and overhead expense), and the gains through acceleration of wood production and other benefits on land that is now bare would be much greater.

Furthermore, a large part of the cost of the program would be repaid to the state through sale of trees for planting on private land. This is shown by the experiences of the past biennium.



Partial view of Badoura Nursery

The legislative appropriation for nursery work was $43,556 for the first year of the biennium and $63,852 for the second year. Income from the sale of trees amounted to $16,104.01 for the first year and $25,534.55 the second year, or a total income of $41,638.56 from the sale of trees for planting on privately owned lands. Under the present law these receipts go into the general revenue fund. Thus the state is reimbursed for the appropriation to the extent of the receipts. These figures indicate that about 40 per cent of the direct appropriation for nurseries is now being returned to the state treasury in the form of revenue from tree sales. It may be expected that in the future, as the planting program expands, a larger percentage of the operating cost will be repaid through receipts from sales.

Under the present law no charge is made for trees planted on public land of any kind, such as state forests, parks, game preserves, conservation areas, tax-forfeited lands, county, municipal or school forests, highways, etc. Public benefits from such planting far exceed in value the relatively small cost to the state.

The combined inventory of the two present state forestry nurseries — the Badoura Nursery near Akeley and the General C. C. Andrews Nursery at Willow River — on July 1, 1952, was approximately 60 million trees. In the fall of 1952 and the spring of 1953 it is anticipated that sufficient seed will be planted to raise this total inventory to 95 million trees. Approximately 80 per cent of the production in our nurseries is coniferous trees while the balance is deciduous. This ratio should prevail during the next biennium. The deciduous trees are either one or two years old when they leave the nurseries for planting in the field, while evergreens are two to four years old, with the majority of them being in the three-year age class.

Both nurseries are being expanded as far as available means permit. Ultimate plans call for at least doubling the size of each nursery if necessary funds are provided. This will permit the improvement of the nursery soil handling program and will allow a more adequate rotation of crops and better soil maintenance and care. The unit cost of trees will be reduced as the facilities are expanded and total production increased.

Seed of desirable genetic sources will always be a problem of tree production. Improvement in seed extraction is also an important goal. An experimental rotary oven has been constructed to permit better seed handling as well as to increase the output of seed in cones gathered by the division's personnel and purchased through public channels.

TABLE 24

Summary of Tree Sales by Counties — 1952

County	No. of Trees	No. of Tree Applications	County	No. of Trees	No. of Tree Applications
Aitkin	44,900	50	Martin	500	1
Anoka	110,000	56	McLeod	12,700	17
Becker	66,730	25	Meeker	2,100	2
Beltrami	55,076	30	Mille Lacs	38,980	62
Benton	21,520	28	Morrison	39,700	42
Big Stone	23,200	34	Mower	....	....

County	No. of Trees	No. of Tree Applications	County	No. of Trees	No. of Tree Applications
Blue Earth	2,600	5	Murray	5,200	8
Brown	9,560	14	Nicollet	7,520	10
Carlton	22,700	19	Nobles	.....	....
Carver	12,300	18	Norman	15,200	18
Cass	34,700	23	Olmsted	9,450	12
Chippewa	2,300	3	Otter Tail	49,215	34
Chisago	43,900	46	Pennington	3,500	6
Clay	.....	....	Pine	55,660	61
Clearwater	410,310	19	Pipestone	9,200	12
Cook	.....	....	Polk	21,217	33
Cottonwood	.....	....	Pope	500	1
Crow Wing	178,400	51	Ramsey	71,500	46
Dakota	74,900	101	Red Lake	8,350	12
Dodge	1,600	3	Redwood	10,300	18
Douglas	24,764	33	Renville	7,760	13
Faribault	5,900	6	Rice	22,100	37
Fillmore	2,200	2	Rock	3,100	6
Freeborn	12,550	18	Roseau	10,640	10
Goodhue	28,800	39	Scott	13,900	12
Grant	3,050	4	Sherburne	122,510	130
Hennepin	70,840	48	Sibley	7,600	13
Houston	3,500	5	St. Louis	78,530	78
Hubbard	69,945	27	Stearns	28,600	40
Isanti	144,250	78	Steele	12,600	20
Itasca	49,300	53	Stevens	1,000	2
Jackson	20,100	30	Swift	.....	....
Kanabec	16,900	24	Todd	15,275	18
Kandiyohi	5,200	3	Traverse	.....	....
Kittson	11,900	15	Wabasha	14,200	14
Koochiching	215,080	15	Wadena	18,600	15
Lac qui Parle	3,500	1	Waseca	4,535	5
Lake	27,300	18	Washington	39,620	55
Lake of the Woods	10,600	15	Watonwan	13,450	11
LeSueur	7,600	11	Wilkin	1,300	2
Lincoln	7,500	11	Winona	.....	....
Lyon	7,345	7	Wright	21,630	35
Mahnomen	4,200	6	Yellow Medicine	.....	....
Marshall	17,810	20	TOTALS	2,682,572	1925

TREE PLANTING ON PUBLIC LANDS

Tree planting upon public lands has had a continued upward trend as a result of the increase in nursery production. During the biennium trees sufficient to plant 5,150 acres of denuded forest land were shipped to the various governmental subdivisions which carry on planting programs.

This planting effort represents about a 50 per cent increase over the previous biennium. Of this total, state lands received approximately 40 per cent, while county forests received about 30 per cent. Municipalities, schools, townships, highways, as well as other classes of public lands, received the balance or about 30 per cent.

During the biennium one truck, two tractors and five planting machines were purchased to expedite the planned acceleration necessary to meet our planting program. Progress in meeting the needs of an expanded tree plant-

ing program is in no small measure due to the perfection of the tree planting machine and its greater use. During a spring season a third of a million trees can be planted by three men with a planting machine and a tractor.

Planting machines, however, are not the entire answer to all planting problems. There are thousands of acres on which a planting machine cannot be used because of stumps, brush, rock or other obstacles. The division is still confronted with the necessity of hand planting a portion of the public domain.

It is believed that with a future goal of 50 million trees to be produced in the state nurseries, about 60 per cent of this production will be available for planting on public lands.

THE WORK OF THE YOUTH CONSERVATION COMMISSION FORESTRY CAMP

The Youth Conservation Commission forestry camp at the General Andrews Nursery at Willow River was officially opened on July 1, 1951. On July 15 the first six boys reported to the camp and two days later an additional seven. By August 1 ten boys were made available for nursery work. By the middle of the following March, 36 boys were enrolled. Records indicate that from August 1 to May 7 a total of 29,996 hours of labor had been furnished by the YCC boys in the operation of the nursery and the production of trees, as well as development of the state forest wherein the camp is located. If the 29,996 hours of labor furnished by the boys had to be paid for at the going rate of labor in the nursery, it would have meant an outlay of about $30,000.

In the spring of 1952 the General Andrews Nursery shipped approximately 4,000,000 trees. On the basis of $8 per thousand as the cost of producing, digging and shipping these trees, the value of their labor would be about $32,000. In the absence of this assistance, the labor would have had to be duplicated through the hiring of outside help. In addition to their work in the production of these 4,000,000 trees, the boys also planted seed sufficient to produce 15,000,000 trees. Furthermore, they weeded, watered and cared for a total of some 30,000,000 trees in the nursery.

Their labor has also been used in an extensive soil improvement program which involved the digging, hauling and spreading of many tons of peat. They also produced many hundreds of cement blocks which will be used in a building development program by the Division of Forestry. In addition, they helped to maintain considerable tractor and automotive equipment. Numerous other types of work and accomplishments can be credited to their efforts. The following is a tabulation of jobs assigned to the personnel of the YCC camp since their arrival in July of 1951:

Forest planting
Packing and shipping trees
Nursery experimental work
Office work
Gathering hardwood and coniferous seed

Extracting, cleaning and storing tree seed valued at $8,000
Seeding operations in the nursery
Gathering moss used in packing trees
Inventorying trees
Spraying various areas of the nursery in disease control
Maintenance of equipment and implements of all types
Weeding, watering, shading, and root and top pruning of millions of trees
Soil improvement, such as peating, fertilizing and physically improving the soil
Clearing 80 acres of land for a new addition to the nursery
Forest improvement work, such as thinning and elimination of diseased and dying trees
Manufacture of cement blocks and bricks
Manufacture of mats used in tree shipment
Cutting pulp, piling, and fuelwood in a forest development program
Physical plant improvements consisting of installation of heating plant, insulating buildings, flooring, and general repairs and maintenance
Road, firebreak and park development
Snow fence construction, sign building, etc.

Future activities will not only include the projects listed above, but will also take in sawmill operation for the production of lumber and subsequent building construction, and the development of a recreational area in the forest, as well as forest fire protection and suppression. In addition, it is estimated that cement block construction during the next year will amount to 10,000 blocks. Furthermore, plans are to have at least 15,000,000 trees available for distribution in the spring of 1953, in the production of which the personnel of the YCC camp will have been employed two years. By applying an estimated cost of $8 per thousand for producing these trees, the total valuation would be $120,000.

If it were not for the labor furnished by YCC personnel the division would have required a substantially larger appropriation for necessary labor. The primary purpose of the camp, however, is the rehabilitation of the boys and young men committed to the jurisdiction of the Youth Conservation Commission. The work in the forestry camp, together with the educational opportunities and recreational facilities furnished, are designed to aid the boys in becoming useful, respected citizens. Monetary consideration aside, the benefit to the young men under the YCC program fully justifies the operation of the camp. At the same time the program is in part self-supporting in making a substantial contribution to forestry.

CHRISTMAS TREES

It has been estimated by the Forest Industries Information Committee that Minnesota's production of Christmas trees totaled 5,400,000 trees in the year 1950 and 5,500,000 in the year 1951. A unit value of $1.10 has been placed upon the Christmas trees harvested in 1951, making a total valuation of $6,050,000 for the Christmas tree products harvested in that year.

The sale of Christmas trees from state lands amounted to 818,499 trees for the fiscal year 1950-51, while sales in the following fiscal year totaled 1,452,877 trees.

Field Planting by School Children in Koochiching County

Under the Christmas tree act of 1949, 788 transportation permits were issued for the year 1950, while 1,100 were issued during the second year of the biennium. Three $200 processing permits were sold in both 1950 and 1951, for a total income of $600 from the Christmas tree act for each year of the biennium.

The over-production of Christmas trees for the Minnesota market was more evident in the year 1952 than for many years previously. It was estimated that approximately 20 per cent of the trees brought into the metropolitan markets were unsold. It is believed that some of the abuses which brought about the passage of the original Christmas tree act of 1935 are again evident in the Christmas tree areas of the state. Furthermore, thousands of trees are being used by counties and towns as snow fences, and it is believed that some changes in the law are needed in order to have better control of the cutting of Christmas trees.

AERIAL PHOTOGRAPHS, MAPPING AND SURVEYS

ROGER WILLIAMS, *In Charge*

Aerial Photographs

The use of aerial photographs in all phases of forestry work has developed rapidly during the biennium, and this development is expected to continue as more photographs become available, and as more of the division's personnel become skilled in their interpretation and use. Since 1946 these

Forest Ranger grading and checking Christmas trees on a state sale

photographs have been used by the foresters assigned to forest management work, resulting in timber type maps and acreage data for selected areas which are more accurate and complete than any before produced by ground survey methods, and with significant savings in time and labor.

Until recently aerial photographs have not, however, been generally available to rangers, supervisors and timber appraisers. Beginning in 1951 as many photographs were purchased as funds permitted and distributed chiefly to the district offices, where the rangers are finding them extremely useful in their daily work of fire prevention and suppression, mapping and surveying, and management of state lands and timber

In order to have photographs constantly available to all who need them it is necessary to have a complete set in each ranger district and a duplicate set in each area headquarters, with additional copies for special purposes. Additional purchases made in 1952 have given the division single photographic coverage of practically the entire protection area, with duplicate coverage, however, of only a small part of this area. Additional photographs are needed if each office is to be completely equipped for the work it has to do.

Beginning in 1947 a large portion of the forested region of northern Minnesota was photographed from the air, primarily for forestry purposes. The remainder of this area has not been photographed since 1939 or 1940, at which time the entire state was photographed by the U. S. Department of Agriculture. Photographs for any mapping purpose and especially for forest mapping, which is concerned with rapidly changing forest conditions, should be of recent date. After such photographs become eight or ten years old they have lost much of their value. It is highly desirable that the remaining

portions of the intensive protection area be photographed as soon as possible and that the entire forested area be re-photographed on a continuing cycle of perhaps every eight or ten years. The cost of this operation can probably be shared under cooperative agreements between the state, the counties, and private interests, such as large holders of timberland.

The Division of Forestry should be in a position to promote and encourage new aerial surveys in the areas in which it is most interested, and to see that the work is done under specifications which make it most suitable for forestry purposes. This will only be possible if funds are provided so that the division can assume its proper share of the cost.

Fire Plan Mapping

The production of new fire plan maps, made directly from aerial photographs, was begun during this biennium. These maps, each of which covers one township, are intended to provide all the geographic information needed by the ranger in the planning and execution of his fire control work. They must be complete and accurate as to roads, trails, settlements, lakes and streams, and forest types and conditions. They also furnish information that is required in the management of state owned timber lands. Under the present plan, each ranger is doing the basic work of interpretation and measurement on the photographs, and preparing the rough draft of the maps for all townships in his own district. Final drafting of the maps is completed in the St. Paul office.

A training program was begun in December of 1951, bringing to all field personnel basic instruction in the use of aerial photographs and in the methods of making maps from them. A manual of instruction was prepared covering these subjects and two-day classes were held at fifteen different locations during the winter and spring. Much of the preliminary work on the photographs has already been done and over 100 of the new maps are now completed.

Forest Protection Maps

The forest protection maps now in use by the division are becoming out of date and are urgently in need of revision and improvement. These map sheets make up the wall maps found in all ranger stations and towers, and are used for plotting the locations of all forest fires reported from the towers and for other administrative purposes. They differ in scale, content and other characteristics from the fire plan maps described above. The chief requirements are that they be accurate in scale, and that they conform closely to the true shape of that portion of the surface of the earth that they represent so that directions and distances may be accurately plotted on them. Complete re-mapping of the entire protection area is contemplated in the next few years.

The excellent topographic maps now being produced by the U. S. Geological Survey under a cooperative agreement with the State of Minnesota will probably soon cover a considerable area of the state. Where such maps are available in time, they will be re-drawn to conform to the requirements of forest protection maps and incorporated into that series. It is obvious,

however, that a large portion of the forested area in the northern part of the state will not be mapped under this program for some years to come. Planimetric maps of sufficient accuracy for forestry purposes can be produced much more economically than Class A topographic mapping. The need for such maps for fire control purposes is of such urgency that the division should proceed with its own mapping program without further delay.

These maps will be compiled from aerial photographs, but in order to maintain the required accuracy they must be built around a network of control points determined by careful ground surveys. Primary points of such a network are furnished by geodetic surveys which have been made by various agencies of the federal government, and by the triangulation survey which was begun by the division in 1947. This latter survey has been continued during the present biennium, and forms the basis for some controlled maps which already have been produced from aerial photographs. This survey should be completed in the near future, and additional supplementary surveys made in order to produce a density of control points sufficient for this type of mapping. As the work load imposed by the current fire plan mapping program decreases, it is expected that more field and office time will be spent on such control surveys and on controlled maps.

Lookout Towers

A systematic survey and investigation of tower sites has been continued throughout the present biennium for the purpose of improving the effectiveness of the fire detection system by better location of lookout towers. As a result of this survey, two towers have been moved recently to new locations, and definite plans approved for moving four more during 1952 and 1953. The survey has shown up other weak spots in the system, most of which can only be remedied by the addition of new towers. Present indications are that about ten new towers should be added to the system in the next few years, and it is hoped to purchase and erect a portion of these during each of the next three biennial periods.

An improved type of fire finder, which is a sighting device used in the towers for locating fires, was developed recently. Ten of these instruments have been completed and placed in towers, and about twenty more are partially completed. It is planned to build more of these instruments during the next year and eventually to equip all towers with them.

With better placement and distribution of lookout towers, better equipment and more accurate maps for plotting the location of fires, it is believed that our fire detection will be substantially improved.

Recommendations

Final drafting of all maps must be done in the St. Paul office for both mapping projects described above, as well as computations and plotting of the survey data and complete compilation of the controlled maps. This will impose a work load in addition to other duties which will be greater than can be handled by the present engineering personnel. Also, if adequate progress is to be made in the controlled mapping project, additional help is required to make the necessary field surveys for this and other work. Therefore the

budget request of the division for the next biennium will include provision for one additional draftsman and one civil engineer to assist with field surveys.

Adequate funds should be provided: (1) for the purchase of additional aerial photographs for duplicate coverage where needed, (2) for the purchase of new aerial photography as it becomes available, (3) to permit state participation in new aerial survey projects for forestry purposes, and (4) for the purchase of additional equipment and supplies needed for mapping from aerial photographs. An appropriation of $6,000 for the next biennium is recommended for these purposes and an appropriation of $17,600 for the purchase of four new 100-foot steel lookout towers in 1953 and 1954.

FOREST INSECTS AND FOREST TREE DISEASES

A. F. OPPEL, *In Charge*

The Division of Forestry is very much interested in pest control in the forests of the state. One of the principal responsibilities of the forester is protection. This includes protection from the devastation of forest fires and the ravages of insects and fungus diseases.

Any forest program which ignores any one of the three endangers the forests and eventually invites disaster. Insects have always been a part of the life of the forests, sometimes in small numbers, often in epidemic form. Under normal conditions, most insects are held in check by their natural enemies and by unfavorable factors in their environment. In epidemic years, the loss from insect damage is staggering.

The division has been cooperating with the State Entomologist, Department of Agriculture, and the Division of Entomology and the Division of Pathology, University of Minnesota, in working out the different insect problems.

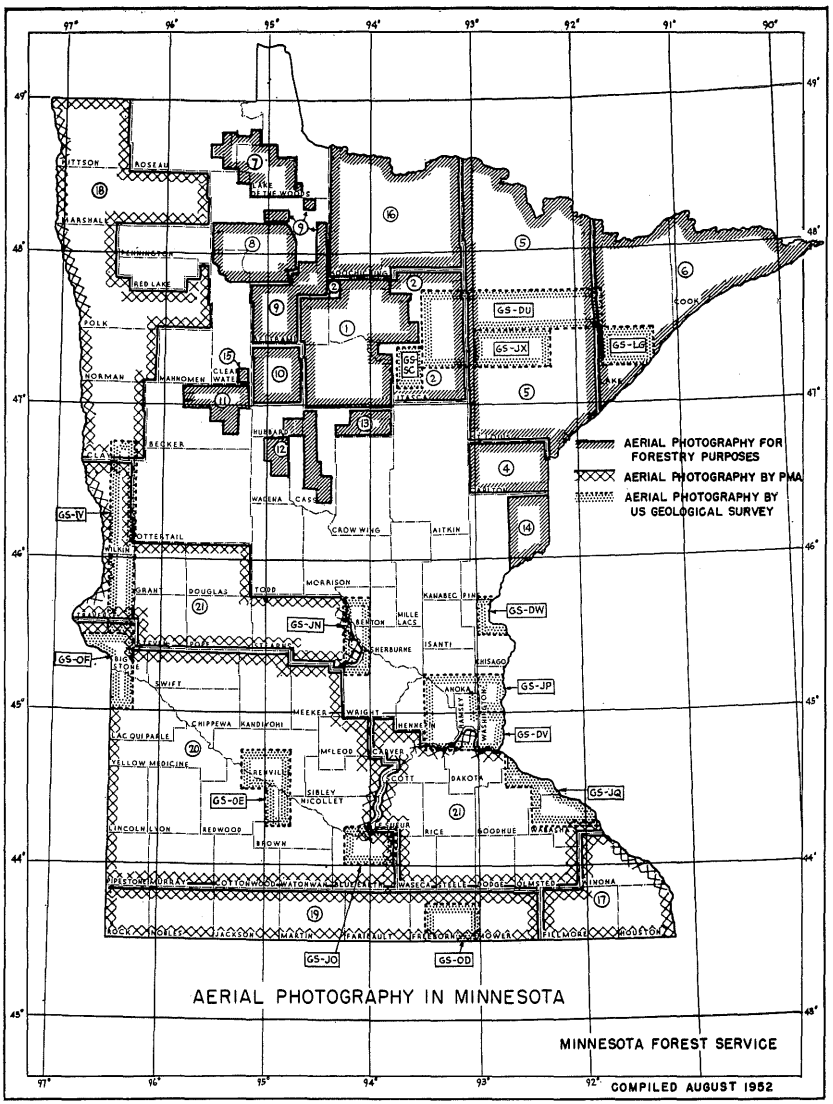
Forest supervisors and forest rangers have been trained to recognize certain types of insects by the damage done, and then report them to the proper authorities. Systematic insect surveys have been carried on at regular intervals. These surveys will be developed further as new problems arise.

Aerial spraying for the control of forest insects has been developed to a point where it is effective and costs are reasonable, but there are still many problems to be solved.

In 1952 the Division sprayed 425 acres of state owned land for control of the forest tent caterpillar. The land consisted of administrative headquarters, tower sites, state campgrounds and state land adjoining areas where community spray projects were carried on. All these projects were carried on in cooperation with the University of Minnesota and the State Entomologist's office.

The report compiled by J. W. Butcher, Forest Entomologist, Office of the State Entomologist; Dr. A. C. Hodson, Division of Entomology, University of Minnesota; and D. W. French, Division of Plant Pathology, University of Minnesota, reflects the results of this cooperative project and is incorporated herewith.

FIGURE 3. 99


AERIAL PHOTOGRAPHY FOR FORESTRY PURPOSES
AERIAL PHOTOGRAPHY BY PMA
AERIAL PHOTOGRAPHY BY US GEOLOGICAL SURVEY
GS-DU
GS-JX
GS-LG
GS-SC
GS-IV
GS-JN
GS-OF
GS-DW
GS-JP
GS-DV
GS-JQ
GS-DE
GS-JO
GS-OD
AERIAL PHOTOGRAPHY IN MINNESOTA
MINNESOTA FOREST SERVICE
COMPILED AUGUST 1952

REPORT ON FOREST INSECT AND DISEASE CONDITIONS IN MINNESOTA, 1950-1951

By J. W. Butcher, A. C. Hodson and D. W. French

General Conditions in 1950

The year 1950 as a whole was considerably cooler and somewhat wetter than is usual for Minnesota. It was the coolest year since 1917, and monthly mean temperatures (with the exception of September and October) were all below normal. Growth of vegetation was retarded by persistent, sub-normal temperatures during the first eight months of the year.

Average snowfall for the state was the second greatest on record for April, and for May the second greatest since 1924. Average snowfall for the year for the state was 77.8 inches, a new record. These phenomena undoubtedly contributed to the swollen lakes and extremely moist bog conditions that persisted in varying degree for the greater part of the summer.

Insects Reported in 1950

The two most important Minnesota forest insects in 1950 were the larch sawfly on tamarack and the forest tent caterpillar on aspen and other broad-leaved tree species.

The larch sawfly infestation was the object of an intensive aerial and ground survey by the Forest Insect Laboratory of the U. S. Department of Agriculture, in cooperation with the University of Minnesota and the Minnesota Departments of Conservation and Agriculture. The results of these surveys indicate that severe defoliation (over 50 per cent of the foliage removed) occurred in only 9 of the 21 northern counties where injury was noticeable.

A development worthy of special mention in this regard concerns the spectacular reduction of defoliation symptoms on most tamarack within the Chippewa National Forest area in 1950. In 1949, most susceptible tamarack in this area sustained defoliation in excess of 50 per cent. Tremendous larval mortality through drowning took place in 1949 at the time when the sawfly larvae were dropping to the ground to cocoon. This phenomenon did not appear uniformly important throughout the state as a whole, however, with the result that the infestation persisted at a high level in 1950 over the remainder of the limits of the 1949 infestation.

None of the stands under attack in 1949 had suffered noticeable mortality as a consequence of sawfly feeding. Where infestations had persisted at varying levels since 1947, retarded foliage and terminal development were the chief evidences of sawfly injury.

The forest tent caterpillar showed signs of a general build-up in 1950. The most disturbing symptom was the appearance of threatening new centers of infestation in St. Louis, Itasca, Hubbard and Becker counties. The infestations around Basswood Lake (Lake County) and Leech Lake (Cass County) aroused concern among property owners and resort guests, presaging a

problem of considerable magnitude in 1951 if the infestation continued to develop and expand. Even in those areas where defoliation had continued for several years prior to 1950, however, there was no evidence of serious injury to susceptible broadleafed trees. The pattern was one of continuing build-up and expansion, with parasites and starvation as yet ineffectual in restricting the epidemic.

The larch sawfly and the forest tent caterpillar were the two major forest insect problems in Minnesota in 1950. The northern walking stick, while abundant locally in 1949, was not a problem in 1950, the off-year in its two-year life cycle. Minor insects which were reported in 1950 aroused little general concern throughout the state, and gave little evidence that they constituted problems which would require anything more than local action in 1951.

General Conditions in 1951

As in 1950, Minnesota was cooler and wetter than is normal. It was the third coolest and the fourth wettest since the beginning of state-wide records in 1891. The average precipitation for the state (31.0 inches) was the greatest recorded since 1905. The average snowfall for the state (75.2 inches) has been exceeded only once in the past 61 years, and that occurred in 1950 when the average was 77.8 inches. The highest temperature for the state (98°) was the lowest maximum recorded for the state as a whole since 1915. Monthly mean temperatures were below normal for all months but February and May. These conditions resulted in most insects getting a slow start and, in the case of the forest tent caterpillar, feeding extended into the period when the forested areas began to be used intensively by vacationists. This circumstance aroused considerable interest in this insect in particular and in forest insect problems in general. Tamarack, defoliated by the larch sawfly quite late in the season, did not refoliate to the extent that it had in previous years when defoliation had taken place earlier in the growing season. The northern walking stick infestation was not as severe as in 1949 because of retardation induced by cool, wet weather.

Insects Reported in 1951

A larch sawfly appraisal survey was carried out in 1951, in cooperation with the Forest Insect Laboratory of the U. S. Department of Agriculture. The survey technique differed from the one used in 1950, however, in that an aerial strip sampling technique supplanted the random reconnaissance method employed at that time. The method involves reconnoitering systematic east-west flight lines at 12-mile north-south intervals over the entire infested area. In practice, the sum total of continuously recorded strip samples (made from each side of the plane by a separate observer) was mapped to illustrate the extent of defoliation levels designated "partial to complete" and "light to absent."

The "partial to complete" category indicates that the pattern of heavy defoliation has persisted for at least two and in much of the area, three years consecutively. Through 1951, however, there was little evidence of tamarack mortality attributable to sawfly attack. In view of the reputed

capacity of this insect for destruction, however, it seems possible that this picture can change in 1952 or shortly thereafter.

The forest tent caterpillar infestation developed as expected in 1950. The separate areas of caterpillar infestation had been joined, for the most part, by 1951. In addition, aerial reconnaissance and cocoon and egg mass surveys indicated that most of the area designated "threatening" would suffer severe defoliation in 1952. On the basis of this evidence, plans were under way in 1951 for alerting resort owners and residents in northern Minnesota counties to the seriousness of the threat.

The northern walking stick was present locally throughout the northeast-southeast limits of the hardwood belt. As has been indicated, many of the walking stick infestations failed to develop as expected because of cool, damp weather. Defoliation was not as severe as had been anticipated and the insect was slow to reach maturity. It is expected that egg production might have been curtailed as a consequence.

While primarily a pest of shade trees and woodlots, spring and fall cankerworms aroused considerable interest during the year. The concern manifested was in proportion to the value of ornamental or windbreak plantings under attack. Virtually all of the cities reported some injury by these insects and the Twin Cities in particular contributed frequent reports. Defoliation was heavy on oak groves in the northern suburbs of Minneapolis and St. Paul and in hardwoods along the St. Croix River. There were evidences also that these insects might constitute a serious problem in the northwestern prairie and Red River Valley areas where shelterbelt plantings are of considerable value. There were few cities in the south and western portions of the state where cankerworms did not cause some injury in 1951.

Of those insects reported in 1951, few were apparently serious enough that they threatened to be serious problems in the immediate future. Possible exceptions are the larch beetle, which showed indications of abundance on seed trees left in a cutting south of Floodwood, and the larch casebearer which was reported from St. Louis and Anoka counties in 1950 and 1951.

The 1950-1951 Minnesota Forest Insect Survey Report indicates certain changes in procedure over that formerly employed. Contemplated intensification of methods for reporting detection surveys was delayed until 1952 because of the need for devoting major efforts to the forest tent caterpillar and larch sawfly appraisal survey programs. Because of the need for information which would permit accurate prediction of forest tent caterpillar abundance, personnel of the Division of Forestry and the State Entomologist's office devoted considerable time to surveys for this insect. In 1951, these activities included:

1. Aerial reconnaissance of the northern half of the state.
2. Cocoon collections from the entire infested area, by Minnesota and U. S. Forest Service foresters. These cocoons were subsequently dissected by members of the State Entomologist's staff and parasite records compiled.
3. Egg mass collections were made throughout the infested area in the fall of 1951.

Using the information obtained as a result of these surveys, it was possible to predict, in advance of the 1952 season, both the location and degree of infestation in the various parts of the forested area. This information was then made available by means of State Entomologist's office circulars to interested parties throughout the state.

The larch sawfly problem was the subject of a special conference of industry and state and federal foresters on February 7, 1952, at University Farm. Appraisal surveys have been carried out since 1949 by the Forest Insect Laboratory, U. S. Department of Agriculture, in cooperation with the Minnesota State Entomologist's office and the Minnesota Forest Service.

Tree Diseases Reported in 1951

The most serious tree disease in the state during 1951 was oak wilt, which resulted in the death of numerous oaks in the southeastern part of the state. It had been established by the end of 1951 that the disease was present in at least 27 counties. More comprehensive detection surveys planned for 1952 conceivably could reveal its presence in others.

COOPERATIVE AERIAL SPRAY TESTING PROGRAM, 1951-1952

By A. C. HODSON, *Division of Entomology, U. of M.*

During the biennium the Division of Forestry, State Department of Conservation, the office of the State Entomologist and the Division of Entomology of the University of Minnesota pooled their resources and personnel to conduct aerial spray tests on two species of forest insects, the forest tent caterpillar and the northern walking stick. The following is a brief summary of the experiments and the most significant results.

Walking Stick Tests

Aerial Spraying — Gull Lake Tower

On August 3, 1951, two new insecticides, Aldrin and Dieldrin, were compared with DDT for the control of the northern walking stick. On this date about 90 per cent of the walking sticks were in the nymphal stage, and the majority were feeding in the tree crowns. A total of 40 acres was sprayed with each chemical, the acreage divided into two 20-acre replicates for each material. Spraying was started at 5:30 A.M. and completed at 7:30 A.M. The wind velocity was less than five miles per hour during the entire operation. The insecticides were applied by a Piper Cub plane at the following rates:

DDT	one pound per acre, in one gallon of spray
Aldrin	¼ pound per acre, in one gallon of spray
Dieldrin	¼ pound per acre, in one gallon of spray

Ground trays constructed by the Forest Service staff at Brainerd were placed in the sprayed and check areas before spraying. These were examined afterwards for fallen insects, frass and eggs. Insect sweep net samples of the brush were taken also to determine the abundance of walking sticks in the check and treated areas after spraying.

The results were somewhat disappointing because the walking stick population throughout the entire area dropped very strikingly during the summer, presumably because of unfavorable weather. As a result there was less difference in their abundance in check and treated areas than might have been expected. One check was made about two hours after treatment and the second 24 hours later. At the time of the first examination all dead insects in the trays were collected and sweep net samples were taken from the brush. At the second examination the trays were checked again and one tree in the vicinity of each tray was shaken to dislodge any walking sticks that might be present.

TABLE 25

Results of Aerial Spraying 2 and 24 Hours After Spraying in the Gull Lake Area

Insecticide	Replicate	Number of Dead Insects Per Tray	Number of Insects Per Sweep
		Two Hour Examination	
DDT	A	0.4	3.7
	B	0.4	1.1
Aldrin	A	0	1.1
	B	0	1.6
Dieldrin	A	0.2	3.5
	B	0.4	0.7
Check	A	0	3.2
	B	0	3.0
		Twenty-four Hour Examination	
DDT	A	0.5	1.0
	B	5.0	3.0
Aldrin	A	1.6	2.0
	B	1.0	3.0
Dieldrin	A	25.0	3.0
	B	7.0	2.0
Check	A	0	11.5
	B	0.2	9.8

Table 25 indicates a reduction in the number of walking sticks in all the treated areas with DDT and Dieldrin better than Aldrin. An additional check made in September to determine the number of eggs present in the ground trays provides a somewhat better comparison between the three treatments and the checks.

TABLE 26

Eggs Deposited in Ground Trays by the Northern Walking Stick, August to September, 1951

Insecticide	Replication	No. of Eggs Per Tray
DDT	A	0.2
	B	0.2
Check	A	23.0
	B	56.0
Aldrin	A	0.6
	B	1.4
Check	A	12.0
	B	9.0
Dieldrin	A	0.8
	B	0.4
Check	A	32.0
	B	27.0

The figures in Table 26 indicate a good control in all cases, with DDT having a slight advantage over the other two chemicals. An examination of an area sprayed with DDT by air in 1949 in the vicinity of the 1951 spray plots showed a very low population of nymphs and adults. The samples were taken on June 26, 1951, by the single sweep method. In the DDT oil solution plot there were 3.2 walking sticks per sample as compared with 20.9 in an unsprayed check area. Comparable figures for an area sprayed with a DDT emulsion (both DDT treatments made at the rate of one pound of DDT in one gallon of spray per acre) were 0.5 and 16.1 respectively. In contrast, Chlordane applied at the rate of one pound per acre showed 10.7 nymphs per sample and 18.8 for the checks, much poorer control than for either of the DDT formulations.

These tests indicate that it is possible to control the northern walking stick by aerial spraying, and that the population is reduced to such a low level that frequent spraying would not be necessary.

Roadside Ground Spraying

Spray barriers to prevent the migration of walking sticks were given a limited test in the vicinity of Agate Lake on the west side of Gull Lake. In this insecticide test four materials were used: Lead arsenate at 4 pounds per acre, DDT at 1 pound per acre, and Aldrin and Dieldrin at ¼ pound per acre. Plots about 300 feet long and 75 feet deep along the edge of an infested area were chosen. A Bean Farm Protector sprayer was used. The spray was applied at 400 pounds pressure through a No. 8 disc. Fifty gallons were sprayed on each half acre with the insecticides diluted appropriately. Ground trays were placed in the treated areas to catch eggs produced by migrating adults. The results expressed in terms of egg catches are given in Table 27.

TABLE 27

Eggs in Ground Trays in Barrier Zones Sprayed to Prevent Walking Stick Migration

Insecticide	Number of Eggs Per Tray	
	Treated Area	Check Area
Lead Arsenate	0.7	15
DDT	15	16
Aldrin	15	11
Dieldrin	4	5

Lead arsenate was the best of the materials used for barrier treatment. The long residual activity of this chemical is the most likely explanation.

Forest Tent Caterpillar

Tests of aerial spraying to control the forest tent caterpillar were made at Gull Lake near the Gull Lake tower on July 6 and 7, 1952. Four insecticides were tested: DDT, Toxaphene, Dieldrin and 269. DDT was applied at

the rate of one pound per acre, the standard recommendation followed by the spray operators. The dosages of the other materials are listed below.

Toxaphene	1.5 pounds per acre
*Toxaphene	0.75 pounds per acre
Dieldrin	0.3 pounds per acre
Dieldrin	0.15 pounds per acre
269	0.3 pounds per acre
269	0.15 pounds per acre
*DDT	0.5 pounds per acre

*These two tests are not considered because at the time they were sprayed the wind velocity was excessively high. The distribution of the chemical was poor and it was impossible to mark the swarths properly with balloon markers.

The results of these tests may be summarized as follows:

1. Excellent control was obtained in all cases. After the cocoons were found there were none or at the most only one or two found in areas checked by a standard three-minute collection made in each of the plots.

2. Dieldrin and 269, at even the lowest concentration, gave the most rapid kill.

3. Toxaphene was slow in killing the caterpillars. When this plot was checked 24 hours after spraying there were many caterpillars on the tree trunks. However, none were found when the area was visited one week later.

4. Caterpillars migrated into the sprayed areas in significant numbers for a distance of from 100 to 180 feet.

5. Check areas adjacent to the spray plots had very few cocoons. There was a very high mortality in the check plots because of starvation and parasitism.

6. The spraying was done too late to protect many of the trees. The unseasonable weather of the preceding 10 days accelerated the caterpillar development beyond all expectations.

WHITE PINE BLISTER RUST CONTROL

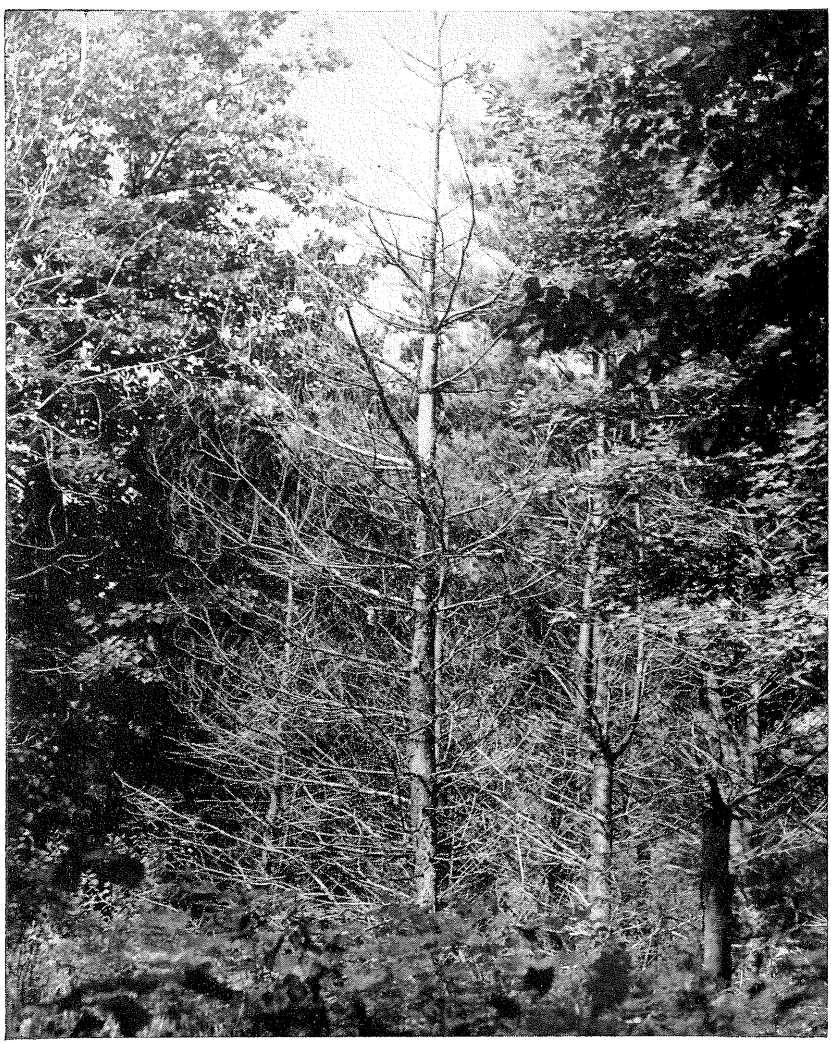
L. B. RITTER, *In Charge*

White pine blister rust control is conducted by the Division of Forestry in cooperation with the Bureau of Entomology and Plant Quarantine, United States Department of Agriculture. The responsibilities of the federal personnel assigned to the activity also include the technical direction of the work on lands managed by the United States Forest Service and the United States Indian Service. This includes the development of control procedure, the training of temporary personnel and the inspection of completed work.

White pine was the tree that gave character and distinction to the original forests of northern Minnesota. While occasionally occurring in pure stands, it usually grew in association with other upland tree species. On light sandy soils it grew in mixture with jack and Norway pine; on heavy soils with white spruce and balsam-fir. South of the coniferous forest, it grew in mixture with hardwoods.

Only fragments of the original white pine stands remain. White pine trees are found on about a million acres and in substantial numbers on about 250,000 acres. The state has passed its peak in acreage of the temporary forest types that followed the big forest fires. Now these temporary types, principally aspen and jack pine, are being slowly but gradually replaced by more permanent forest types including white pine.

Lumber is still the most important forest product of the United States. In spite of the changes that are occurring in wood utilization there are no reasons for assuming that lumber will not continue to be the major forest



Blister rust is especially destructive of young white pine growth.

product. A sound forest policy requires that Minnesota's pine stands be intensively managed for the production of saw timber and veneer logs. Considerable amounts of pulpwood and similar material will be a by-product of such intensive management.

A problem associated with the management of white pine is the protection of that tree from the European disease, blister rust. Blister rust affects two entirely different plants — white pine and the various wild and cultivated currants and gooseberries (which are collectively called ribes, their generic name). Fortunately, the disease cannot spread from one white pine tree to another and spreads only a short distance from ribes to white pine. Therefore, control of the disease can be secured by destroying the ribes growing in white pine stands and for distances up to 900 feet around those stands. Second and third workings at intervals of five to ten years are often necessary to keep ribes growth suppressed.

The first step in the application of blister rust control is the pre-eradication survey. Its purpose is locating, mapping and evaluating white pine stands and their control problems. The information secured is used in selecting white pine stands to be protected and planning the protection of those selected stands. Nearly 800,000 acres of white pine have been mapped and 196,244 acres of natural white pine and 12,382 acres of planted white pine scheduled for protection. Minnesota's pre-eradication survey was done during work relief days and is now obsolete. A complete reappraisal of the problem on the Superior National Forest was finished in 1951. A limited amount of re-survey and new survey is being done on the state forests. Surveys are made on private lands following requests for blister rust control assistance.

A number of methods are used in destroying the currants and gooseberries growing in and near white pine stands selected for protection.

There is only one place for 2,4-D (2,4-Dichlorophenoxyacetic acid) in ribes eradication in Minnesota; that is in the foliage spraying of American black currants when these bushes are found in large enough concentration to warrant special attention. The following year a large number of seedlings make their appearance. A second spraying is necessary to kill these seedlings and living parts of the original bushes. Where concentrations of American black currants are encountered, considerable savings result from the use of 2,4-D. Experimental use of 2,4,5-T (2,4,5-Trichlorophenoxyacetic acid) during the past two years indicates that it may have more value in blister rust control than 2,4-D.

Very effective killing of upright growing currants and gooseberries can be secured throughout the year by spraying the stems from the ground up about 18 inches with a kerosene or fuel oil solution of 2,4,5-T. However, upright growing bushes are not common in the northern forested areas. They are characteristic of pastured woodland in the central and southern woodlot areas.

Hand pulling still remains the best way of destroying currants and gooseberries. One, two, three, and four-man crews are now used. Since most of the work now being done is on areas where the ribes populations

have been greatly reduced by previous work, more intensive training and supervision of eradication personnel is necessary to secure efficient operations.

Table 28 sets forth local control accomplishments for the past two years. The major portion of the work now being done is re-work to maintain suppression of currant and gooseberry growth.

During the biennium work was done on the Cloquet Valley, Smoky Hills and Paul Bunyan State Forests and in Itasca State Park, through the use

Pine reproduction on Section 16, Township 62 N., Range 23 W., in the George Washington State Forest. This area is protected from blister rust.

of the state blister rust control appropriation supplemented with federal funds. St. Louis and Becker counties appropriated funds for work within county memorial forests. The Village of Akeley furnished labor for protecting pine on village owned lands. The Village of Lakeshore (on Gull Lake in Cass County) appropriated funds for protecting privately owned pine within its boundaries. Some work is done every year on private lands, the owners furnishing the labor and the state and federal cooperating agencies supervision and materials.

White pine nursery stock should be grown in blocks that are surrounded by a 1,500-foot ribes-free zone. Six nurseries, private, state and federal, that have been aided in establishing and maintaining such zones still possess active zones.

Pruning out of infected parts of white pine has little if any value as a control measure. However, it may be an advisable treatment of ornamental trees or, following ribes eradication in heavily infected young stands, for the purpose of salvaging timber-producing values. During the past two years the major portion of the canker pruning work done was on private lands. Canker pruning is still experimental. A large scale experiment is under way at the Superior-Quetico Wilderness Research Center on Basswood Lake. This project is answering some fundamental canker pruning questions.

Table 29 is a statement of the status of control by ownerships as of December 31, 1951. The figures that add up to the totals in this table are being constantly revised and as of December 31 of each year this "balance sheet" for blister rust control is compiled. In Minnesota, the 208,626 acres of white pine which have been selected as valuable enough to warrant their protection against blister rust constitute the control problem. Initial work has been done for 162,458 acres of pine. Control work is completed for all practical purposes for the 67,245 acres of white pine on maintenance.

Serious amounts of blister rust infection are present in both unprotected stands and in those stands whose re-working has been delayed too long. Stands are being removed from the control problem every year because of excessive blister rust damage. Unless blister rust control is more vigorously applied, serious losses of Minnesota white pine values will occur.

The work on federal lands is coming along fine because in recent years allotments for the work have been adequate. On state owned white pine areas blister rust control is far behind schedule because funds have not been adequate to do the necessary control work. The program is lagging the most on private lands because of character of ownership, lack of interest in forest practices and because the blister rust control organization is too small to contact those private owners who could be expected to be interested in blister rust control.

The 1951 weather was very favorable for the occurrence of pine infection. The damage effects of infection occurring in 1951 will not be apparent until 1955.

TABLE 28

White Pine Blister Rust Control

	Acres White Pine Protected	Acres Worked	Ribes Destroyed	Man-Days Expended
Initial Working				
1950	472	817	73,453	723
1951	562	1,029	62,718	637
Total for Biennium	1,034	1,846	136,171	1,360
Total to Dec. 31, 1951	173,027	404,877	62,169,775	167,000
Rework				
1950	2,973	5,243	222,448	3,450
1951	3,631	5,285	253,041	3,489
Total for Biennium	6,604	10,528	475,489	6,939
Total to Dec. 31, 1951	95,062	170,865	11,274,948	68,499

TABLE 29

Status of Blister Rust Control, by Ownerships, December 31, 1951

Ownership Class	Total Control Problem, Acres*		Acres Initially Worked		Acres on Maintenance**	
	Acres White Pine	Control Area	Acres White Pine	Control Area	Acres White Pine	Control Area
U. S. F. S.	42,243	70,361	32,879	50,598	21,453	33,527
U. S. I. S.	21,980	32,439	21,802	32,145	17,615	24,513
State Forests	45,185	86,092	29,851	53,417	11,985	21,057
State Parks	4,977	9,344	4,885	9,182	.....	.....
Other State	1,381	9,961	1,192	5,878	733	2,874
Municipal	4,643	10,362	3,770	7,699	419	717
Private	88,217	276,819	68,079	207,489	15,040	36,355
Totals	208,626	495,378	162,458	366,408	67,245	119,043

*The total control problem includes only the better stands of white pine — some area initially worked has been removed from the control problem because it did not measure up to current pine standards.

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

IN MEMORIAM

During the past biennium, death claimed two employees of the Division of Forestry:

John H. Nelson, who died June 9, 1952, was Area Supervisor of Area 8, Bemidji. He was born September 22, 1890. He had been with the division since 1916 and was one of its veterans in length of service.

Charles F. Hedberg, who died November 7, 1951, was Forest Ranger at the Gheen ranger station in Area 16. He was born April 4, 1886. Ranger Hedberg became associated with the Forest Service as a towerman in 1928.

ACKNOWLEDGMENTS

Our sincere gratitude is offered to the many individuals, organizations and agencies who contributed their time and efforts in the furtherance of forestry in Minnesota, for their cooperation in the prevention of forest fires, and in the promotion of education along forestry lines.

In particular we acknowledge the cooperation of the Keep Minnesota Green Committee, the Forest Industries Information Committee, the U. S. Forest Service, the Lake States Forest Experiment Station and the University of Minnesota School of Forestry, to mention only a few.

Grateful acknowledgment is also made to the personnel of the Division of Forestry for their loyalty and conscientious efforts in performing the work of the division and for their cooperation and devotion to duty. Without their whole-hearted efforts in the work which had to be done, the projects covered by this report could not have been satisfactorily accomplished.

Our thanks also are offered to the personnel of the other divisions and of the Bureau of Information of the Conservation Department for cooperation given.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