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SILVICULTURAL OPERATIONS RIDING MOUNTAIN FOREST EXPERIMENTAL AREA

by

R. H. M. Pratt

**FOREST RESEARCH LABORATORY
WINNIPEG, MANITOBA
INTERNAL REPORT MS-8**

**DEPARTMENT OF FORESTRY
JUNE, 1965**

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SILVICULTURAL OPERATIONS
RIDING MOUNTAIN FOREST EXPERIMENTAL AREA

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INTRODUCTION

In the 1964-65 fiscal year silvicultural operations were continued on the Riding Mountain Forest Experimental Area generally in accordance with the original program submitted in 1960. However, experience has shown that some of the treatments and techniques recommended have been unsatisfactory. For example the spraying of dense alder, hazel and other unwanted shrubs with herbicide, has not created favorable conditions in which to plant white spruce seedlings as they are soon over-topped with re-invading sucker growth. Planting will now be confined to areas which have been bulldozed. Furthermore scarification to create seedbeds for natural white spruce regeneration is now being delayed until after the first cut is made, because of the damage done to seedbeds and seedlings by heavy logging equipment.

The 1964-65 silvicultural program in the Riding Mountain Research Area included 91 acres of white spruce plantations, 10 acres of new seedbed preparation, approximately 300 acres of aerial herbicide spraying; 20 acres of thinning and releasing white spruce under an aspen overstory, and the pruning of potential crop trees on 20 acres.

About 700,000 f.b.m. of white spruce saw logs were marked for removal under the terms of one timber sale. The total revenue from this year's logging operations should amount to \$10,700.00.

REPRODUCTION AND PROPOSED TREATMENT SURVEY

In the spring of 1963 a reproduction and proposed treatment survey was carried out on 120 acres in the northeast portion of compartment 11. In 1964 the remaining 530 acres of this section were surveyed. Sampling was carried out on continuous 1/2-chain-wide strips established at 5-chain intervals. White spruce reproduction was recorded by size class shown in Table 1. The tally was divided at 2-chain intervals, and for each unit a recommendation was made as to regeneration treatment. Treatment suggestions were based mainly on the abundance of white spruce reproduction, and were as follows:

1. Bulldoze for natural seedfall.
2. Bulldoze then plant.
3. Unsuitable for treatment, usually because of wetness or stand density.

When the survey was completed, areas suitable for bulldozing or planting were mapped. Bulldozing to bare a mineral soil seedbed for natural regeneration was designated for approximately 280 acres on which white spruce advance growth ranged from 40 to 50 stems per acre. Areas to be planted, and bulldozed areas that have failed to regenerate white spruce by natural means, will be planted after the compartment has been logged.

TABLE 1

WHITE SPRUCE REPRODUCTION SIZE CLASSES.

- Class 1: Well established seedlings 1 foot to 5 feet in height
Class 2: Over 5 feet high and under 4 inches in diameter.
Class 3: Vigorous trees 4 to 7 inches d.b.h.

REGENERATION SURVEYS

In May 1964 regeneration surveys were carried out in Compartment 2, lots 2 to 14. The purpose was to evaluate white spruce regeneration on bulldozed areas. At the same time, counts were made of the white spruce survival on areas which were sprayed with herbicide to control dense hazel and small shrubs, then planted the following year with four-year-old white spruce seedlings.

(a) Bulldozed areas seeded by natural seedfall.

The survey on bulldozed areas was made in continuous strips of mil-acre quadrats run across the area at 5-chain intervals. Each quadrat was classified as productive or non-productive, scarified or not scarified and the amount of scalped seedbed on each productive quadrat was estimated. Productive quadrats were recorded as stocked or not stocked with white spruce regeneration or advance growth. The results of this survey are shown in Table 2.

TABLE 2

WHITE SPRUCE REGENERATION IN 1964 ON AREA SCALPED IN 1961

No. of quadrats examined in bulldozed area.	1020	100%
No. of quadrats productive in bulldozed area.	956	94%
No. of productive quadrats scarified in bulldozed area.	275	29%
No. of scarified quadrats stocked with w.s. seedlings.	212	77%
*No. of scarified quadrats not stocked with seedlings.	63	23%

The beneficial effects of scalping to mineral soil to prepare receptive seedbeds for white spruce regeneration is apparent in the foregoing table, where 77% of the scalped quadrats were stocked with one- and

* Disturbed by logging equipment during winter 1963-1964.

two-year-old white spruce seedlings.

(b) Bulldozed areas seeded by natural and artificial means.

Due to the periodicity of white spruce seed crops, it is quite possible that some scarified areas might not receive an adequate supply of white spruce seed for several seasons. During this period the seedbed decline in receptivity as minor vegetation re-invades making it more difficult to establish white spruce regeneration from the natural seed source. Therefore it was decided when the natural seed crop appeared inadequate, some of the scarified areas would be artificially seeded.

In July 1961, lots 12 and 13 in Compartment 2 were scarified exposing a high percentage of mineral soil. In October of the same year, lot 12 (26 acres) was sown with 11 lbs. of Captan-pelleted white spruce seed. At the same time lot 13 (6 acres) was sown with 5 lbs. of pelleted and 2 lbs. of untreated seed. These areas were also exposed to a certain amount of natural white spruce seedfall over the past three years.

In May 1964 these two lots were sampled; 670 mil-acre quadrats were examined throughout the sample areas, of which 400 had been scarified to mineral soil. The survey showed that over 80% of the scalped quadrats were stocked with one-and two-year-old white spruce seedlings, Table 3. The number of seedlings ranged from 3105 to 8809 per acre. Possibly 100% stocking could have occurred on all scarified quadrats had this area not been disturbed the previous winter by heavy logging equipment and had not all vegetation been scraped off some productive scarified quadrats.

TABLE 3
WHITE SPRUCE REGENERATION IN 1964 ON
AREAS SCALPED AND SEEDED IN 1961

LOT 12

No. of quadrats examined	-	470	100%
No. of scalped quadrats	-	247	53%
No. of unscalped quadrats	-	146	31%
No. of unproductive quadrats	-	77	16%
No. of scalped quadrats stocked	-	203	82%
*No. of scalped quadrats not stocked	-	45	18%
Average number of w.s. seedlings per acre	-	3105	

LOT 13

No. of quadrats examined	-	200	100%
No. of scalped quadrats	-	153	76%
No. of unscalped quadrats	-	47	24%
No. of unproductive quadrats	-	0	
No. of scalped quadrats stocked	-	132	86%
*No. of scalped quadrats not stocked.	-	21	14%
Average number of w.s. seedlings per acre	-	8809	

* Disturbed by logging in the winter of 1963-64.

(c) Plantations under sprayed hazel and in lightly bulldozed areas.

Research has shown that in order to plant and establish white spruce seedlings with any degree of success in the Riding Mountain Research Area the dense hazel bush growth which dominates

much of the area, must be controlled. This can be accomplished to some degree by spraying the hazel foliage with herbicide before planting and then re-spraying two or three years later to check sucker growth. As an alternative to herbicide spraying, scalping to mineral soil which removes hazel bushes and root systems has proven to be the most satisfactory method of preparing planting sites; on scalped areas the re-invasion of hazel suckers and other small shrub growth is arrested, and this allows spruce seedlings to become firmly established. Light or very shallow scarification was found to be unsatisfactory as these areas were soon re-invaded with dense growth of aspen and hazel suckers.

In 1961 and 1962 seven small white spruce plantations were established in Compartment 2. Approximately 300 to 350 white spruce seedlings per acre were planted using various site preparation methods. These plantations were examined in May 1964 and survival counts were made. Continuous transects two-chains apart were run through each plantation. Quadrats 10 ft square were examined and recorded as being stocked or not stocked with advance growth or planted white spruce seedlings. Table 4 lists these plantations, the method of site preparation, and the survey results.

Throughout this survey it was observed that most of the white spruce plantations were well established and appeared healthy and vigorous. However, it is expected that the rapidly re-invading dense hazel and aspen sucker growth will soon cover most of the plantations causing stagnation of growth and possibly some mortality. Herbicide treatments to kill unwanted shrubs would be beneficial to these areas in the next few years.

TABLE 4

WHITE SPRUCE REPRODUCTION IN 1964 ON AREAS PLANTED IN 1961 AND 1962

Lot number	Method of site preparation	Area in acres	Number of quadrats examined	% stocking (white spruce)			Average number of well established advanced growth and planted w.s. per acre	Present condition of plantation
				Advance growth	Planted white spruce	Total		
2	Lightly scalped sprayed with herbicide then planted.	2.8	52	11.5	69.2	80.7	375	Dense growth of alder and aspen suckers.
3	Areas sprayed with herbicide then planted the following year.	1.3	36	11.1	41.6	52.7	245	Dense growth of alder and aspen suckers beginning to shade white spruce plants.
8		2.4	29	10.3	17.2	27.2	125	
9		4.4	33	15.5	33.3	48.8	222	
10		4.8	80	21.0	40.0	61.0	282	
4	Planted, then sprayed with herbicide.	10.0	230	30.0	17.0	47.0	218	A light canopy of hazel shading some white spruce
14	Lightly scalped then planted.	2.4	30	0	36.6	36.6	167	Dense growth of alder and aspen suckers.

PLANTING 1964

In 1964 approximately 14,850 white spruce seedlings purchased from the Manitoba Government Nursery at Hadashville were planted in Compartments 2, 6 and 8. 900 trees were planted in Compartment 8 on strips bulldozed to mineral soil, this plantation of approximately 4 acres forms part of M.S. 226. 4500 trees were planted in Compartment 2 in lots 6 and 7 which had been sprayed with herbicide in 1961 to prepare for planting and then resprayed in 1963 because of a heavy re-invasion of unwanted shrubs. 5100 trees were planted in lot 5 Compartment 6 in an area that had been sprayed with herbicide in 1963 to release natural white spruce regeneration and to prepare a more receptive environment for planted seedlings. The remaining 4300 trees were planted in lots 2 and 3, Compartment 6 along skid trails, in logging yards and on patches of scarified ground disturbed by heavy logging equipment which had passed over the area the previous winter.

Planting was started on May 4 and continued through to May 22. Weather and moisture conditions were favorable for the establishment of plantations. Planting was done by two-man crews using the slit planting method. Nearly 500 trees per man day were planted on bulldozed strips and from 300 to 350 trees per man day planted in areas which had been sprayed with herbicide.

The 1964 planting costs are summarized as follows:

Planting stock	15000 @ \$20 per 1000	=	\$300.00
Labor	45 man days @ \$12.40 per day	=	<u>\$558.00</u>
	Total cost		\$858.00

Average cost to plant 1000 trees = \$57.00

Average cost per acre = \$12.26

Casual inspections later on in the summer indicated satisfactory initial survival of this year's plantations.

AERIAL HERBICIDE TREATMENT

One of the requirements for success in planting white spruce in much of the research area is control of the dense hazel brush and other shrubs. Similarly the heavy annual leaf fall in the mixed wood stands has a tendency to smother the one- and two-year-old germinants and is considered to be a major cause of seedling mortality on areas scarified for natural regeneration.

For the past four years plantations in the research area have been sprayed with herbicide to control re-invading and over-topping hazel bushes and aspen suckers. The herbicide treatments have been moderately successful and have caused little or no adverse effects to white spruce. Therefore it was decided in 1964 to test an aerial application of herbicide to kill the hardwoods on a 280 acre plot in the west half of Compartment 3 prior to seedbed scarification for natural regeneration.

On August 12 the west half of sec. 6, twp. 21, Rge. 18, w.p.m. (Compartment 3) was sprayed with 2,4-D by air. A 150 h.p. Super Piper Cub with a spray carrying capacity of 80 gallons was used to apply the herbicide. A mixture of 48 ozs of acid equivalent 2,4-D to five gallons of water was applied at the rate of five gallons per acre. It took seven hours to apply the spray as the landing field and reloading station were 16 miles away. Air temperatures ranged from 40°F to 55°F throughout the spraying period; wind was light and the sky was overcast most of the day; a few sunny periods occurred during the afternoon. A light

frost was recorded in the research area early the next morning.

Approximately 280 acres were sprayed at a total cost of \$1,741.60, an average of \$6.22 per acre.

On September 9th a casual inspection was made through the middle of the sprayed area. Almost 100% top kill was obtained on alders, hazel and other small shrubs. White birch, tamarack and balsam poplar and some of the trembling aspen also showed effects of the 2,4-D spray. No spray damage to this years white spruce terminal growth was apparent at the time. A thorough assessment of the aerial herbicide treatment will be made in June 1965 when the full effects should be apparent.

LOGGING

The main objectives of timber sales in the research area are, to salvage overmature, mature, dying and defective white spruce and all the hardwoods of merchantable quality, to provide adequate white spruce regeneration and in doing so increase opportunities for research.

In July 1964 an estimated volume of 708,000 f.b.m. of white spruce trees was marked for shelter wood logging on 440 acres in Compartment 6. The timber was sold by public auction in the fall and logging was carried out during the 1964-65 winter season. A total scale of 700,000 f.b.m. of white spruce logs and 50 cords of firewood were removed under timber sale 1964-1.

The cost of marking scaling and supervision of timber sales in the Research area has been estimated at less than \$1.00 per M. f.b.m. The net revenue from spruce and aspen logs, and dry cordwood should exceed \$10,700.00 for the 1964-65 logging season.

THINNING AND RELEASE

The southeast portion of the research area contains dense young mixed wood stands of fire origin. Many of these stands are now overstocked with trembling aspen, white spruce, black spruce and balsam poplar. The most desirable tree in this component - the white spruce - is now being retarded by the faster growing dense hardwood overstory. For this reason the thinning and release program initiated in 1961 has been continued.

This year approximately 17.8 acres of dense mixed wood were treated in Compartment 20, making a total of 127 acres thinned and released in Compartments 20, 21, 22 and 26. The method used was similar to that used in 1962 and 1963. Spruce was thinned to an 8-foot spacing and released from over-topping hardwoods. Large trees were girdled with an over-lapping single line of axe cuts and the small trees were felled. Rate of treatment this year was approximately 1.8 man days per acre.

CONTROL LINES

To control silviculture operations and accurately locate sample plots in the research area, all section, township and range lines are to be surveyed and staked. To date $42\frac{1}{2}$ miles of this system have been completed. These lines require a certain amount of maintenance and are periodically recleared of windfalls and are sprayed with herbicide to prevent the re-invasion of aspen suckers, alders and hazel bushes.

During the 1964 field season 14 miles of control lines were

re-cleared and sprayed with herbicide. A back-pack mist blower was used to apply the spray mixture (90 oz. 2,4-D to five gallons of water). This herbicide application will generally retard most of the invading shrubs for a period of 4 to 5 years.

PRUNING

White spruce plantations have been established on parts of the experimental area where the advance growth of spruce ranges from 5 to 25 feet in height and from 50 to 150 stems per acre. Many of these trees have or are developing very wide wolf-type crowns with heavy persistent branches and if left unpruned will interfere with the development of plantations and will produce low quality sawlog trees.

With this in mind most of the white spruce advance growth was pruned on a 12 acre plot in lot 3, Compartment 1. The rule used for pruning was to remove not more than $1/3$ of the live crown or $1/2$ the total tree height. Rate of treatment was approximately $1\frac{1}{2}$ acres per man day.

CONE COLLECTING

Because of the periodicity of white spruce seed crops and the increasing need to maintain a supply of fresh seed for research and silvicultural purposes, white spruce cones have been harvested during abundant cone crop years to provide high quality seed at the lowest possible cost.

During mid-August, 83 bushels of ripening white spruce cones which produced 82 lbs of cleared and de-winged seed were gathered in the research area. The cones were gathered at a contract price of \$4.00

per bushel, and the seed was extracted free of charge at the Manitoba Forest Service Nursery, Hadashville.

REMEASUREMENT OF M.S. 69 PLOTS

The purpose of the M.S.-69 project is to measure regeneration, rate of growth, mortality and succession throughout the experimental area. As these plots are being disturbed by logging it was decided to remeasure all plots on areas to be logged before and after cutting.

During the 1964 field season 105 M.S.-69 plots in Compartments 2 and 6 were remeasured in the prescribed manner. All standing trees were recorded by species and diameter class. Height-diameter measurements were taken on the five largest trees of each species found in the plot. Reproduction was recorded on a 3.3 foot wide strip in each plot.

The job was carried out by a four-man crew at an approximate rate of 7 to 8 plots per day.

SUMMARY TABLE
 PROGRESS OF SILVICULTURAL OPERATIONS
 RIDING MOUNTAIN FOREST EXPERIMENTAL AREA

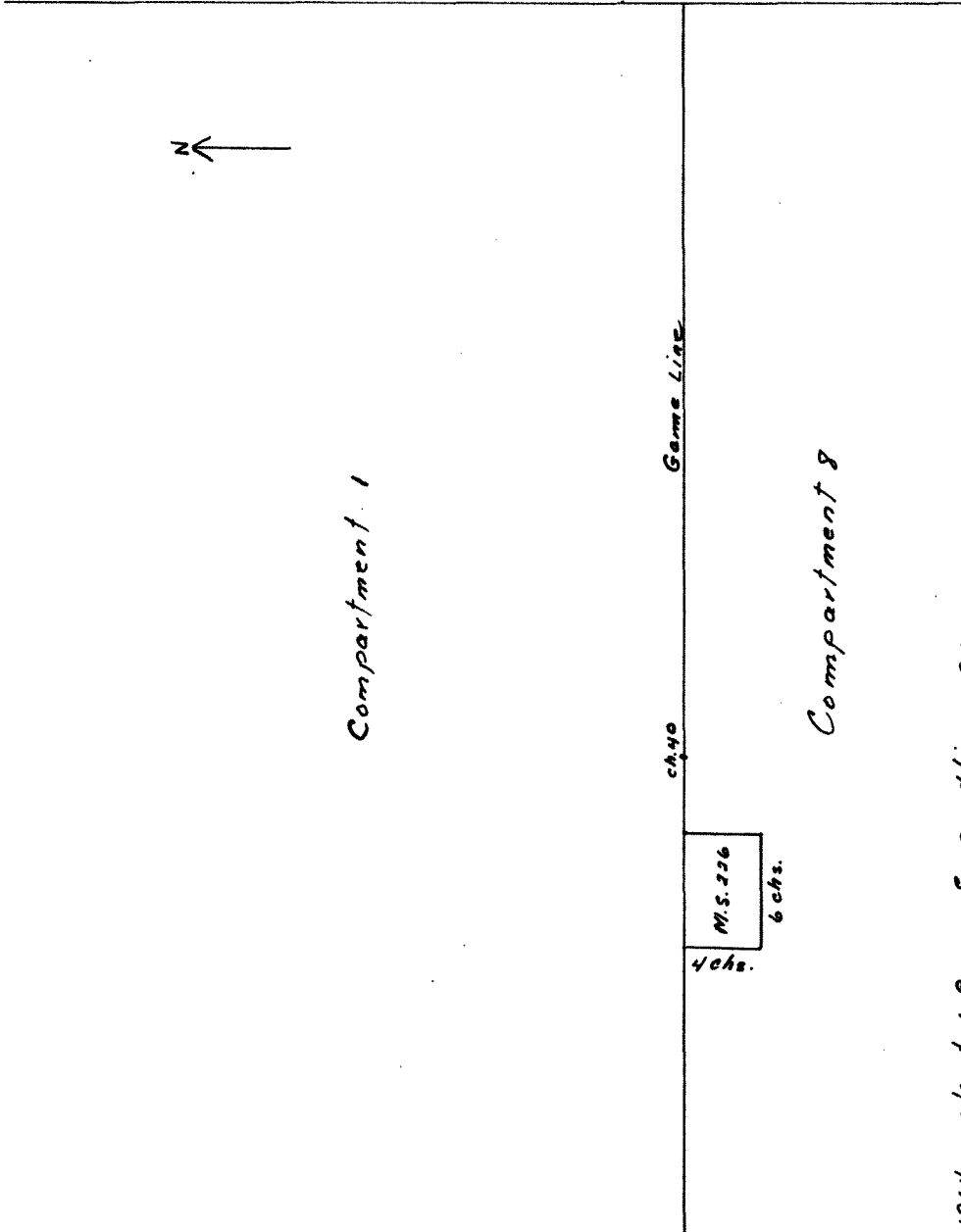
Project	Previously Reported	Since Last Report	Total to Date
Marking	928 acres	464 acres	1,392 acres
Planting	<u>159 acres</u>	<u>50 acres</u>	<u>209 acres</u>
	62,960 trees	14,850 trees	77,810 trees
Herbicide treatment	129 acres	280 acres (aerial spray)	409 acres
Seedbed treatment			
(a) for seeding	805 acres	0	805 acres
(b) for planting	28 acres	10 acres	38 acres
Speding	67 acres	0	67 acres
Girdling hardwoods	146 acres	0	146 acres
Thin and release	109 acres	17.8 acres	126.8 acres
Pruning	15 acres	12 acres	27 acres
Logging	<u>1,040</u>	<u>464</u>	<u>1,504 acres</u>
	1,943,830 f. b. m.	708,000	

GENERAL

The following table lists projects in the research area for which some assistance was provided during the 1964 field season.

<u>Project Number</u>	<u>Type of Work</u>	<u>Man Days</u>
M.S. 236 M.S. 131 M.S. 234 M.S. 187	Clearing small shrubs and aspen suckers from spruce plantations	34
M.S. 131 M.S. 229 M.S. 61	Planting areas fenced to keep out animals	30
M.S. 57A	All trees shading these plantations were removed	4
Road Construction	Approximately 2.5 miles of new access road completed this year in the research area.	6

PLANTING - 1964



Compartment 1

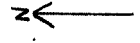
Compartment 2

Game Line

ch 40

M.S. 226
6 chs.

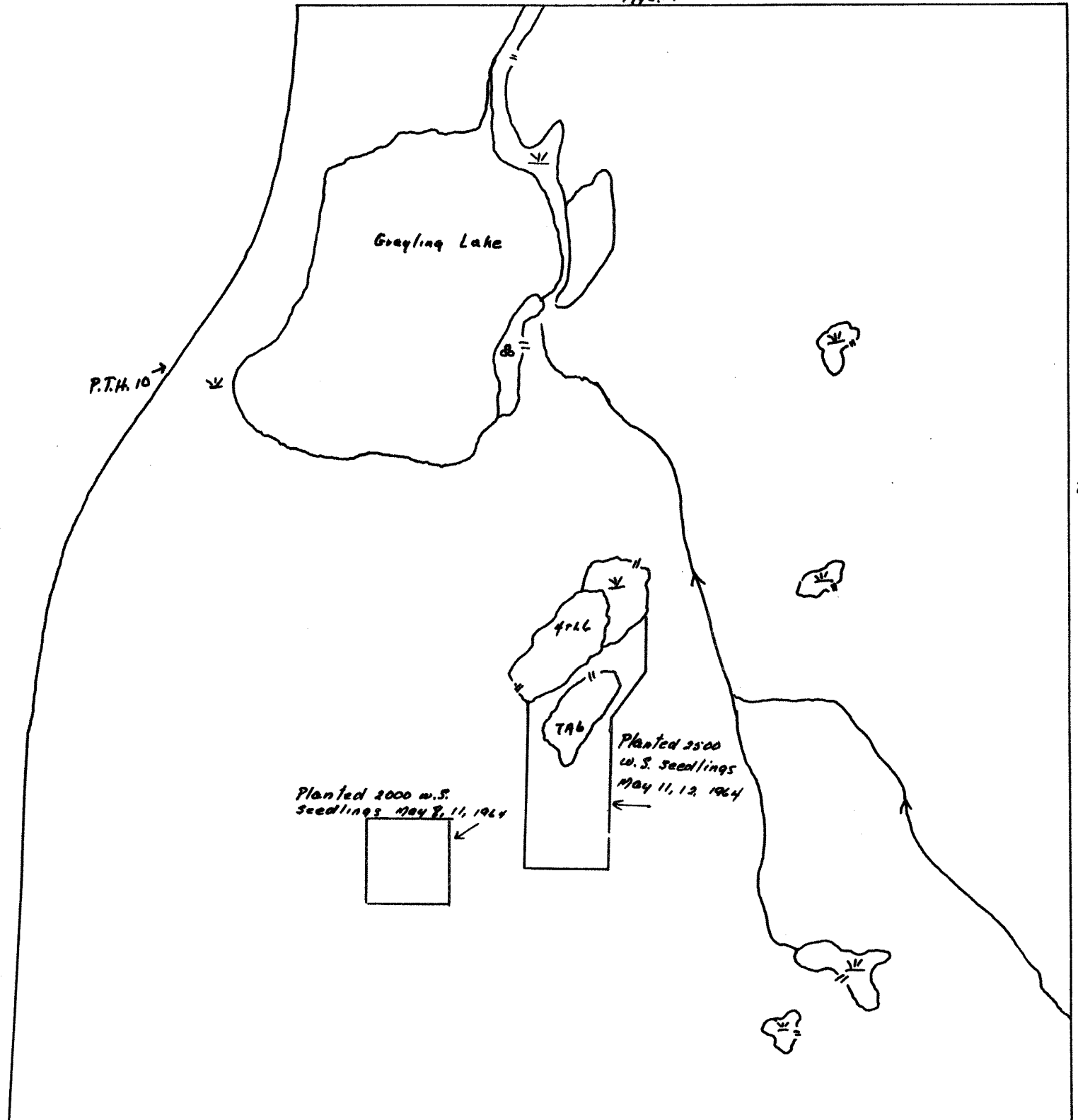
4 chs.



May 6, 1964, planted 900 w.s. seedlings on bulldoze strips in Compartment 2 (M.S. 226).

Compartment 2

Age 19

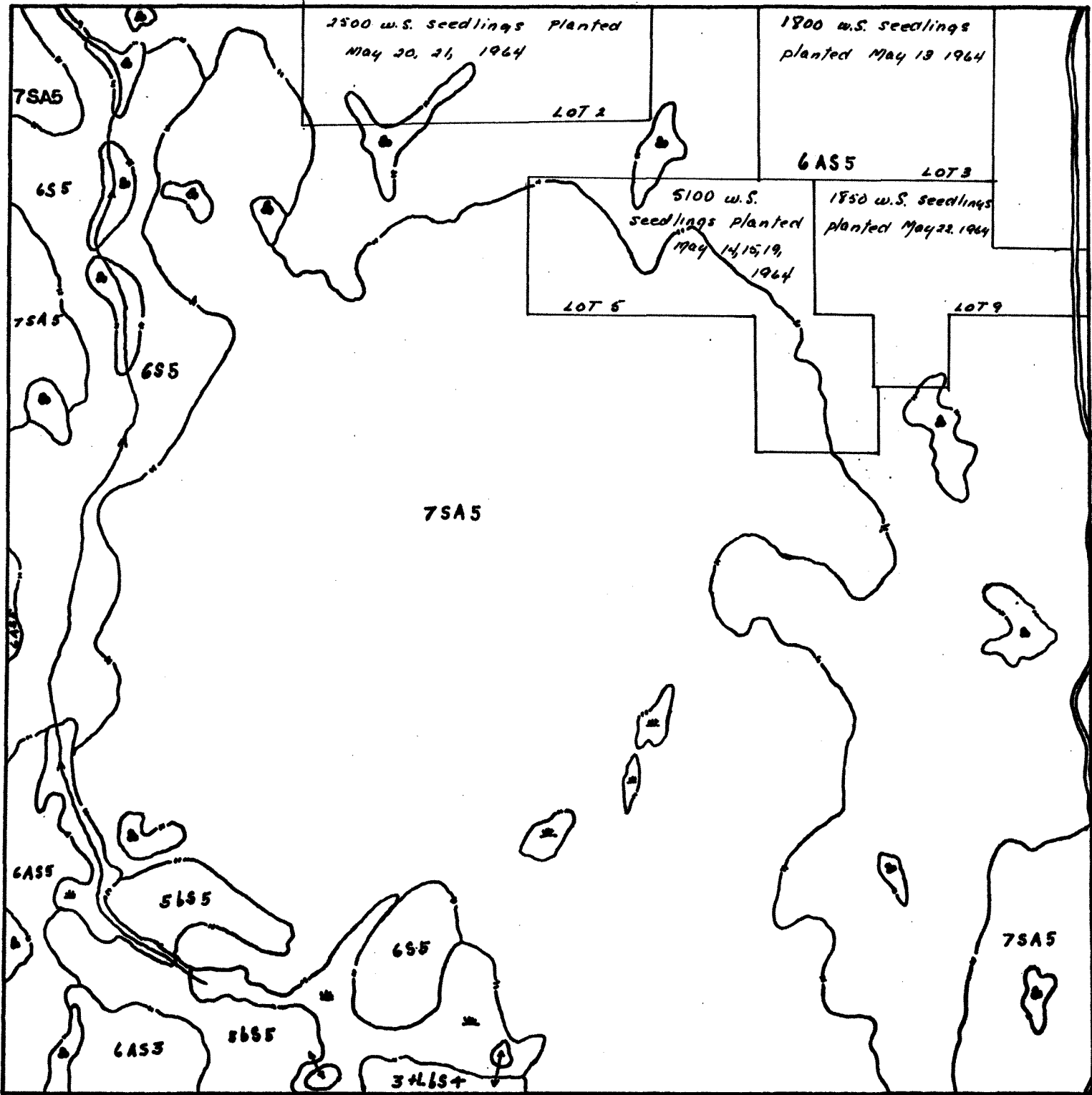


Twp 21

scale 1 in. = 10 chs.

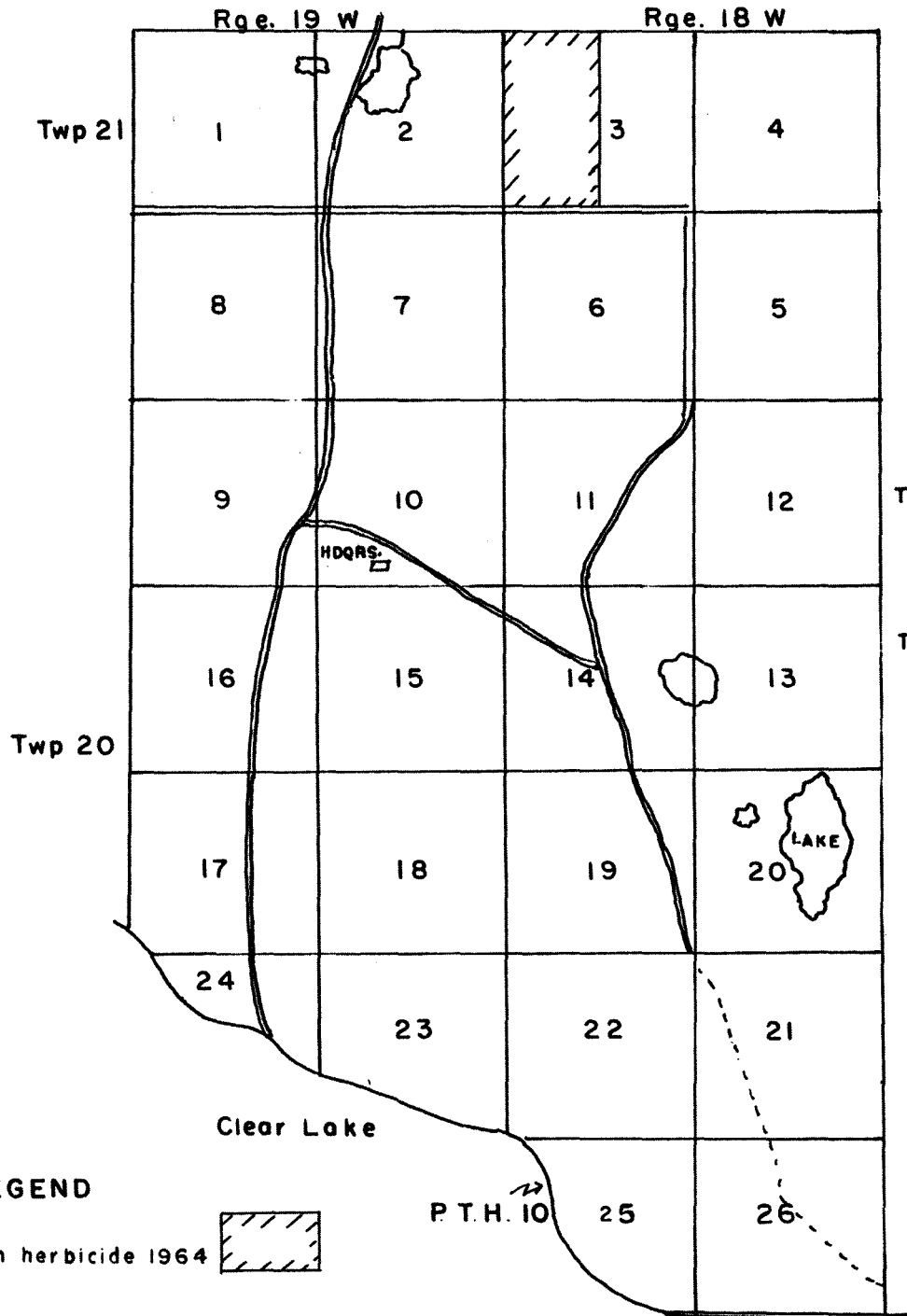
Compartment 6


(Sec. 31 Twp. 20 Rge. 18 W)



scale 1 inch = 10 chains

RIDING MOUNTAIN FOREST EXPERIMENTAL AREA



LEGEND
 Sprayed with herbicide 1964 

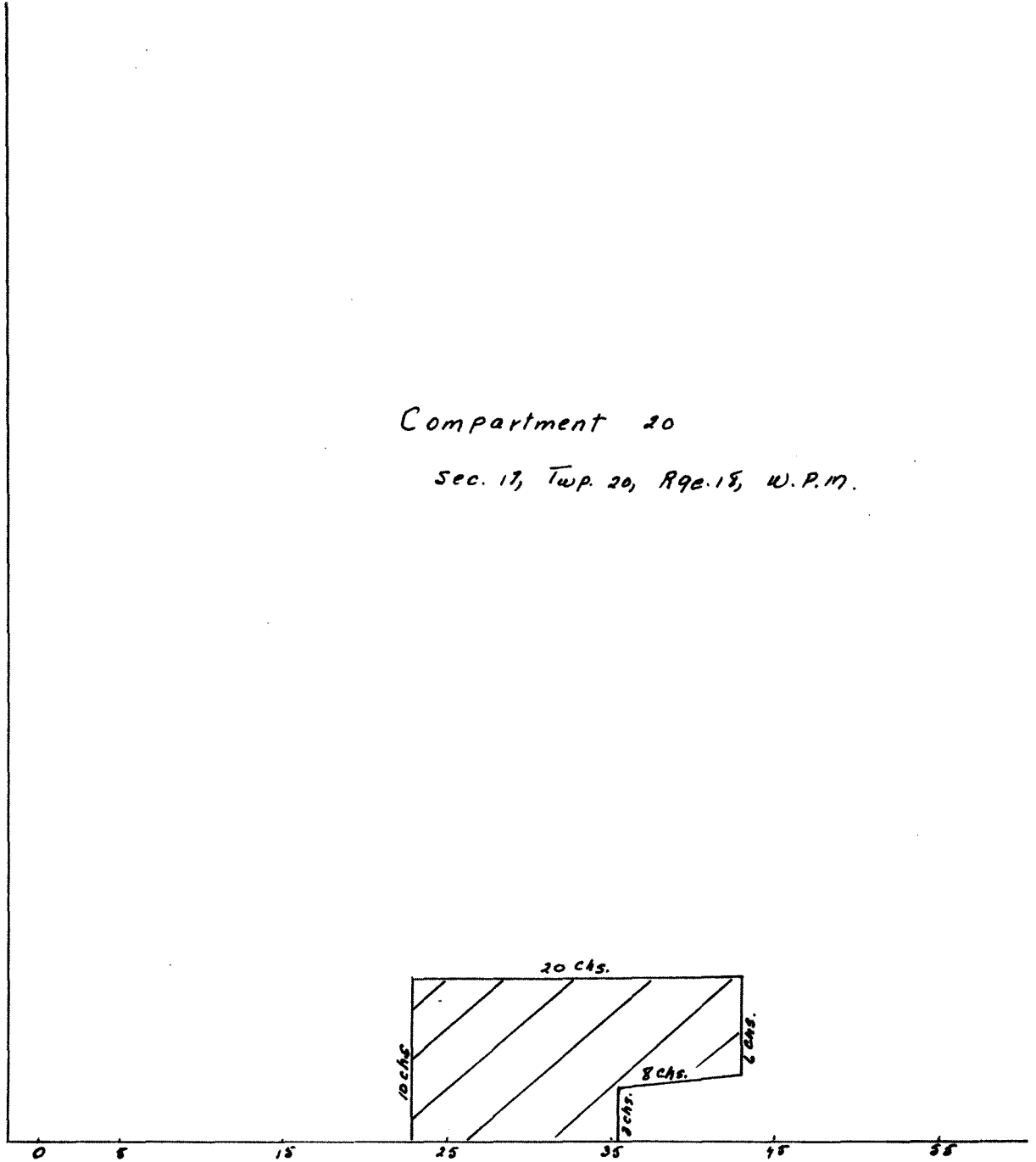
KEY MAP

	Rge. 19		Rge. 18	
Twp. 21	2	1	6	5
	35	36	31	32
	26	25	30	29
Twp 20	23	24	19	20
	14	13	18	17
		12	7	8
		1	6	5

Scale 1 inch = 1 mile

Compartment 20


Sec. 17, Twp. 20, R9e.18, W.P.17.



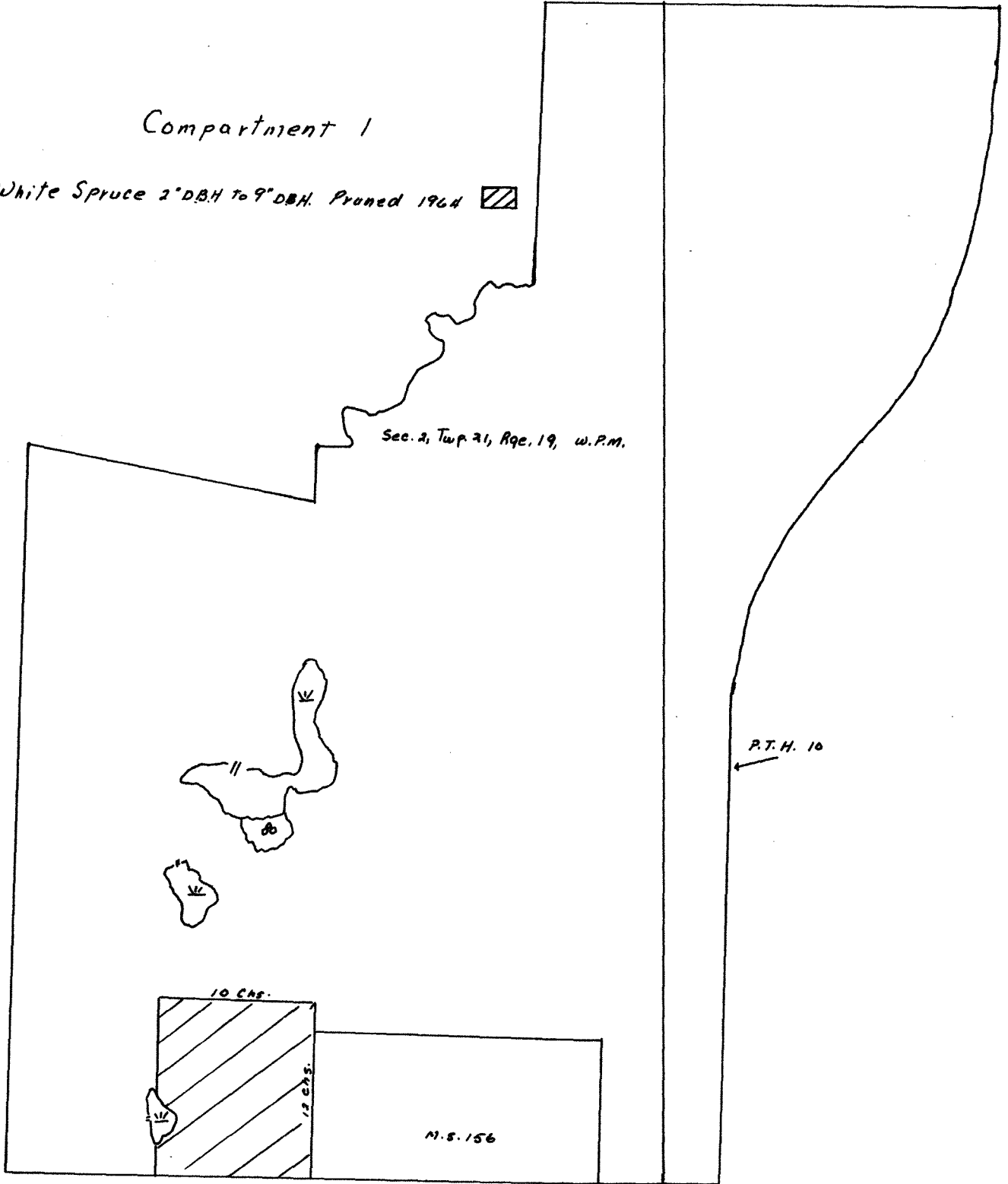
Spruce thin and release from aspen 1964



Compartment 1

White Spruce 2" DBH to 9" DBH. Pruned 1964 

Sec. 2, Twp. 21, Rge. 19, W.P.M.



scale 1" = 100 ft.

Pruning