SCARIFYING CUTOVER JACK PINE STANDS WITH BARRELS AND ANCHOR CHAINS SASKATCHEWAN

Demonstrations MS-5 and 6

by

G.R. Hennessey

FOREST RESEARCH LABORATORY

WINNIPEG, MANITOBA

INTERNAL REPORT MS-64

FORESTRY BRANCH

FEBRUARY 1968

The treatments described in this report are being carried out by the Department of Forestry and Rural Development as operational-scale demonstrations of promising regeneration techniques for the Forestry Branch of the Saskatchewan Dept. of Natural Resources and the Prince Albert Pulp Co. of Prince Albert, Saskatchewan.

TABLE OF CONTENTS

SCARIFYING CUTOVER JACK PINE STANDS WITH BARRELS AND ANCHOR CHAINS SASKATCHEWAN

Demonstrations MS-5 and 6

by

G.R. Hennessey[1]

INTRODUCTION

Shark-finned barrel scarifiers (Figure 1) designed by the Ontario Dept. of Lands and Forests have been found to be superior to other types of scarifying equipment in seedbed preparation in recent and old jack pine (Pinus banksiana Lamb.) cutovers in northern Ontario (Brown 1966, Morawski 1966). The principle advantage of the barrel scarifier is its ability to travel over and around obstacles such as stumps, stones and heavy slash.

In recent cutovers anchor chains have been successfully used (by the Ontario Dept. of Lands and Forests) for obtaining natural jack pine regeneration by simultaneously preparing mineral soil seedbeds and distributing cone bearing slash over these seedbeds (Morawski 1966). The anchor chains used in this demonstration were made up of 25-32 pound links with two 1 inch by 2 foot rods (SPS steel) welded, in the form of an (X), to the centre of each link.

Extensive jack pine logging in Saskatchewan is expected with the establishment of a pulp mill at Prince Albert and an appraisal of barrel and anchor chain scarification in typical jack pine cutovers will be of value in planning for the regeneration of these areas.

Two demonstration areas were established near Prince Albert in the summer of 1967 (Figure 2). Area A, near Macdowall, an old cutover, will be artifically regenerated by planting and seeding in the spring of 1968 while Area B, a recent cutover near White Gull Lake, will be naturally regenerated from the cone-bearing slash.

---

[1]Forest Research Technician, Canada Department of Forestry and Rural Development, Forestry Branch, Manitoba-Saskatchewan Region, Liaison and Services Section, Winnipeg, Manitoba.

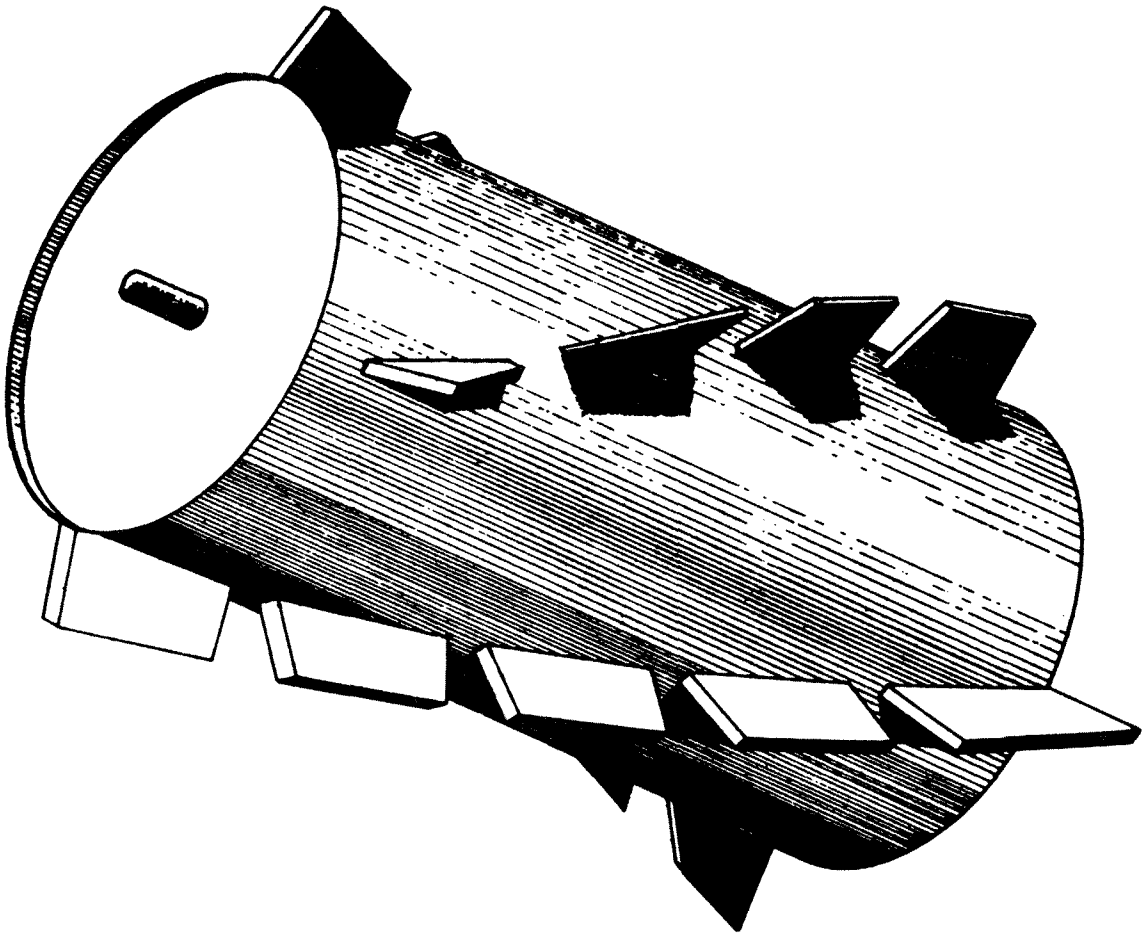
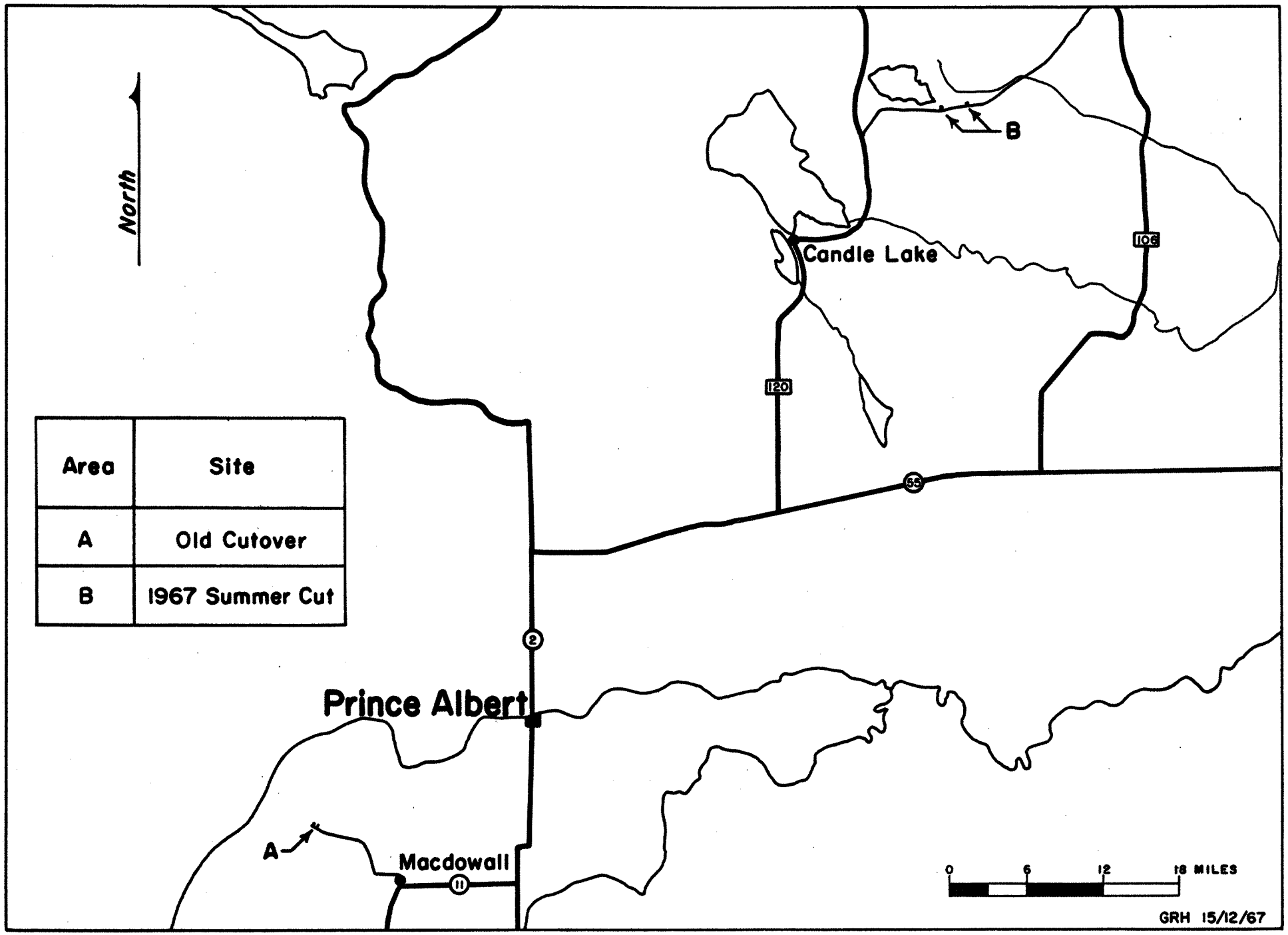


Fig. 1 Shark-finned Barrel Scarifier



Area	Site
A	Old Cutover
B	1967 Summer Cut

Fig.2 Barrel Scarification Demonstration Areas, Saskatchewan

DEMONSTRATION AREAS

Area A - Macdowall

Two old cutovers, Blocks 1 and 2 (Figure 3), each approximately ten years old were chosen for barrel scarification. The soil in the area is a dry to moderately fresh (moisture regimes 1 and 2) dune sand.

On August 17, 1967, barrel scarifying commenced on Block 1, an area of approximately 28 acres, using a D-4 tractor. Four barrels were arranged behind a drawbar in two rows of two barrels each, giving an approximate spacing of six feet between furrow centres. The drawbar and barrels were connected by four foot chains and swivels which allowed the barrels to rotate on their axis of travel (Figures 4 and 5). The front barrels were half-filled with water and weighed approximately 1000 pounds each, while the rear barrels were filled to weigh approximately 1300 pounds each. Two passes per furrow were necessary to produce adequate seedbeds with this arrangement of barrels. Block 1 took about 22 hours to scarify and assuming a rental rate of $12.00 per hour for a D-4 the cost per acre was $9.50.

It was obvious that a D-4 is not fully adequate for the job. A larger tractor with three barrels per row, ballasted in some degree with sand would probably produce equivalent seedbeds in one pass and accomplish the job at a much lower cost per acre. Operational difficulties encountered were generally attributable to the light duty tractor's failure to secure good footing, necessitating considerable winching on upgrades and turns at row ends.

Block 2, an area of approximately 7 acres, was scarified using three passes of the barrels which resulted in well prepared furrows that may prove to be too deep (Figures 6 and 7). The scarification took 16 hours to complete and, assuming the same rental rate, would cost $27.50 per acre. The rate of scarification was adversely affected by more frequent turns in the smaller area and greater cable breakage due to continued hard use.

Area B - White Gull Lake

Two recently cutover areas (Figure 8) were chosen for scarification to create seedbeds suitable for natural regeneration from cone-bearing slash. The cutover areas had supported dense, mature stands of jack pine on a fresh to moderately moist (moisture regimes 3 and 4) silt loam textured soil. Blocks 1, 2, and 3 were cut one week prior to scarification and Block 4 was cut 4 weeks prior to scarification.

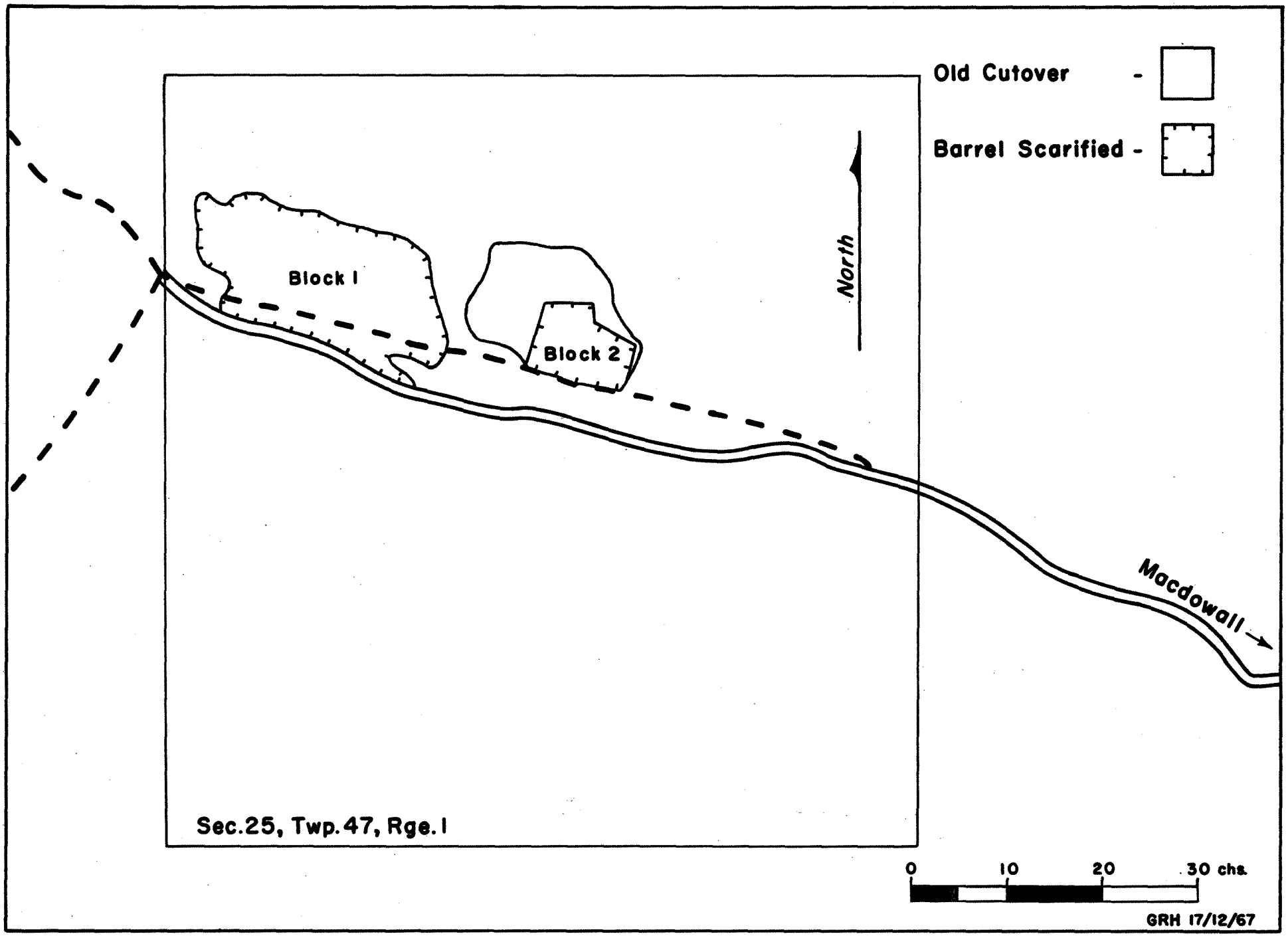


Fig. 3 Barrel Scarification Demonstration Area, Macdowall, Saskatchewan

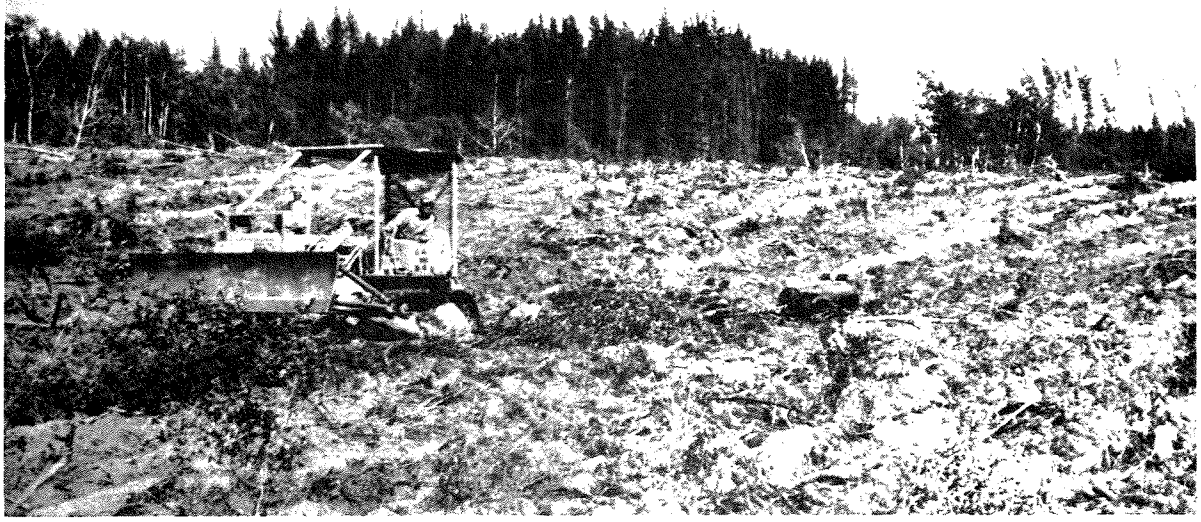


Fig. 4 D-4 Tractor and Barrels scarifying in Block 1

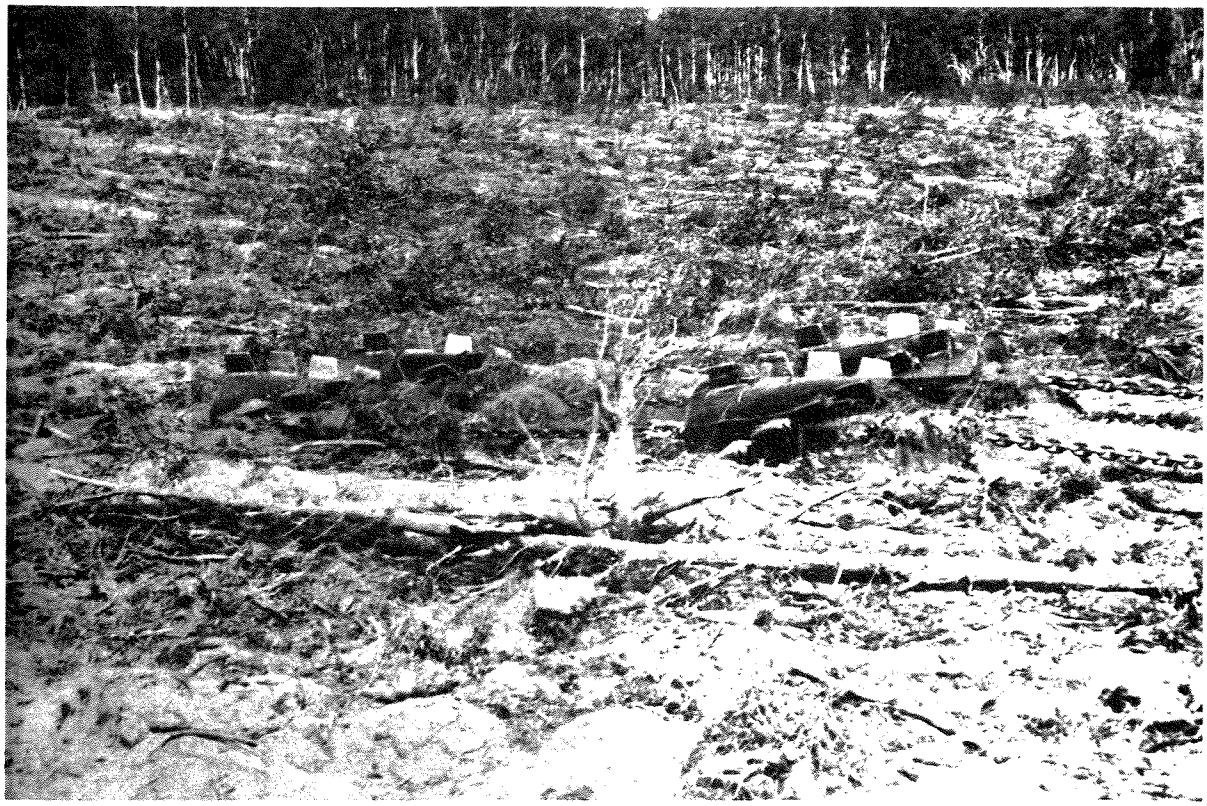


Fig. 5 Close-up of barrels making second pass in Block 1

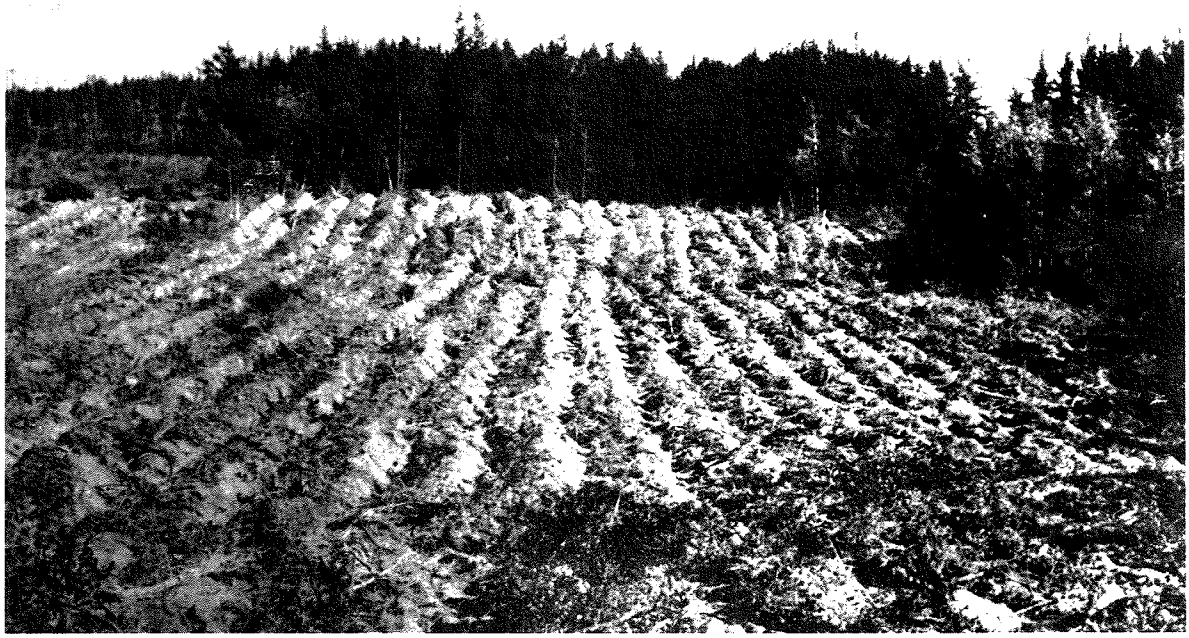


Fig. 6 Seedbed produced after three passes with the barrels in Block 2

Fig. 7 Close-up of furrows produced after three passes with the barrels in Block 2

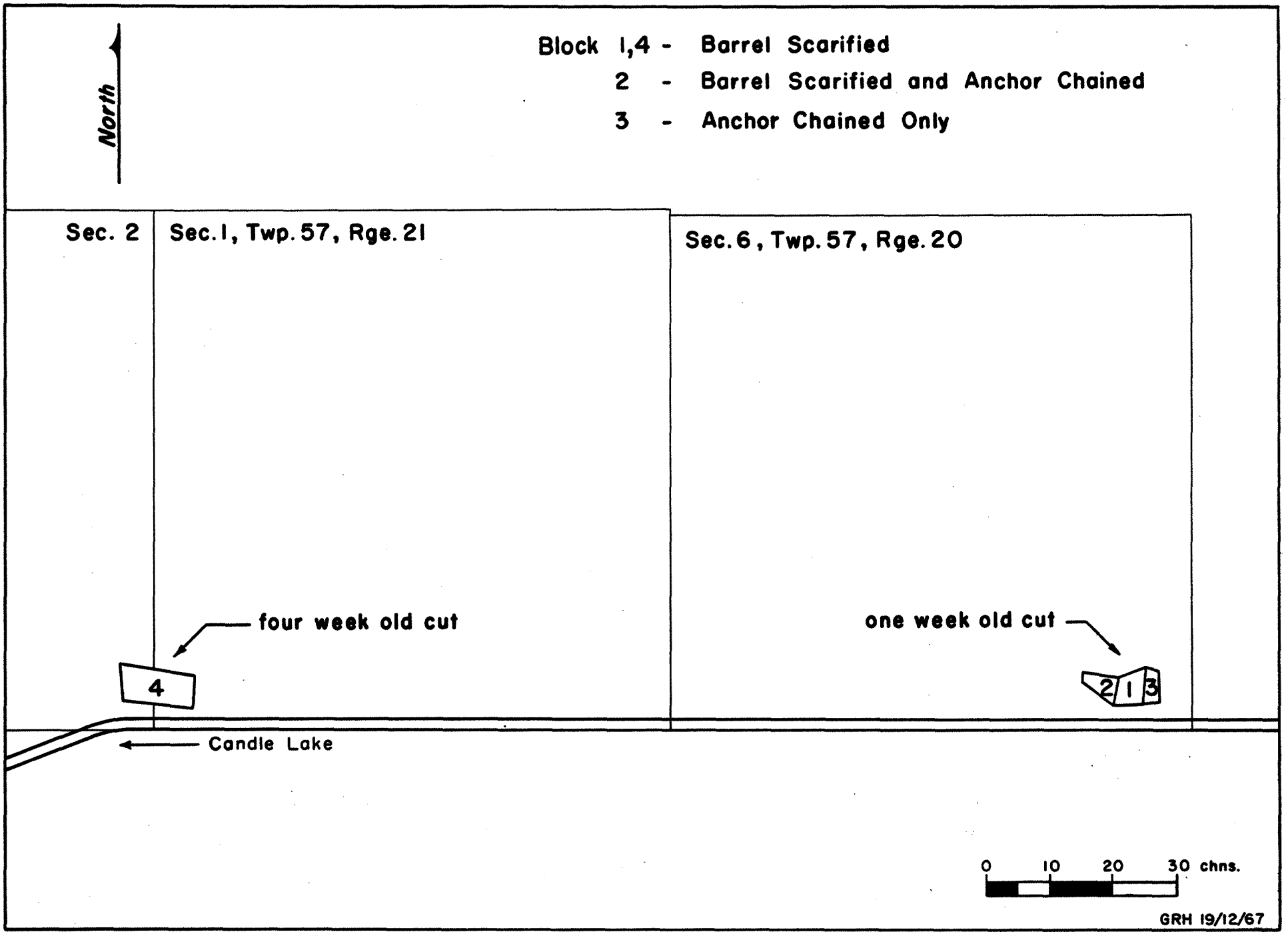


Fig. 8 Barrel Scarification Demonstration Areas, White Gull Lake, Saskatchewan

1. Barrel Scarification

Blocks 1 and 4 were barrel scarified by making three passes with the same number of barrels and ballast as at Macdowall. Barrelling commenced on Block 1 - a one-week-old cut of 2.5 acres - on August 23, 1967, and was completed in approximately 10 hours. The rate of scarification was adversely affected by the difficult shape of the area due to a small stand of large aspen near its centre and by poor traction on the heavy slash.

Barrelling commenced on Block 4 - a 4 week-old cut of 7 acres - on August 27, 1967, and was completed in approximately 20 hours. A new cable and fewer turns improved the rate of scarification while extremely heavy slash, especially piles of tree tops reduced the rate of scarification in this Block.

2. Anchor Chain Scarification

Block 3, a one-week-old cut of 1 1/4 acres, was scarified using the anchor chains. Three passes were used with this equipment and fair exposure of mineral soil was obtained. The D-4 tractor had little trouble pulling the anchor chains.

3. Barrel and Anchor Chain Scarification

Block 2, a one-week-old cut of 2 acres, was barrel scarified with three passes per furrow and subsequently anchor chained with one pass to produce a superior distribution of cone-bearing slash over the mineral soil seedbeds. The value of chaining following barrelling will be assessed in future regeneration studies.

4. Cone Quantities and Distribution

Surveys were carried out to estimate the number and distribution of cones before and after scarification. Table 1 shows that on the one-week-old cut, closed cones were found on 71 percent of the plots before scarification and on an average of 85 percent of the plots after scarification. It was found that a large potential seed supply existed; an average of 120,000 closed cones per acre.

The large reduction in numbers of all classes of cones after scarification appears to have been due to crushing of some empty cones by the barrels and burying of a portion of all classes of cones in mounds of humus and slash.

TABLE 1

EFFECT OF SCARIFICATION ON THE DISTRIBUTION AND NUMBER OF JACK PINE CONES AT WHITE GULL LAKE

Slash Condition	Block No.	Treatment	Basis: 2 sq. ft. plot every 1/20 of a chain # of plots	% Stocking to Closed Cones	% Stocking to Closed and Half-Open Cones	No. of Cones per Acre Closed	Half-Open	Open	Total
	1	Before Scarification	120	70.8	81.7	124,000	60,000	98,000	281,000
One Week Old Slash	1	After Barrel Scarification	120	86.7	90.0	112,000	28,000	16,000	155,000
	3	After Anchor Chain Scarification	120	84.2	89.2	125,000	44,000	50,000	218,000
Four Week Old Slash	4	Before Scarification	80	50.0	70.0	39,000	24,000	139,000	202,000

It was apparent that during the four-week period following cutting in Block 4, drought and high temperatures caused a high proportion of the cones to open and the seed which fell to the undisturbed ground at that time may be lost for regeneration purposes following scarification. No cone counts were made on Block 2 following scarification.

5. Seedbeds Created by Barrel Scarification

A transect of 60, 1/4000-acre quadrats, at 10 link intervals, was laid out to estimate the types and distribution of seedbeds resulting from barrel scarification. Thirty-five percent of the area was exposed mineral soil seedbeds. Only 6 percent of the area was left undisturbed while 59 percent of the area was a mixture of mineral and organic soils, ground vegetation, and jack pine tops, thrown up in ridges and mounds by the barrels.

FUTURE WORK

Area A - Macdowall

1. Planting

In the spring of 1968, one half of Blocks 1 and 2 (17 acres) will be planted to jack pine at approximately 6-foot spacing along the barrelled furrows. Approximately 20,000 transplants will be required. Survival and growth plots will be established in the spring and remeasured in the autumn.

2. Seeding

In the spring of 1968, the unplanted portions of Blocks 1 and 2 (18 acres) will be seeded to jack pine using 1/2 pound of seed per acre. The seed will be pretreated with Arasan-Endrin-Aluminum flakes - to reduce bird and rodent losses. Approximately 9 pounds of seed will be required. In the autumn, germination and survival plots will be established on both blocks.

Area B - White Gull Lake

Germination and seedling survival plots will be established in the autumn of 1968 to assess the success of the scarification treatments in one and four-week-old jack pine slash.

Reports

Early results will be summarized in a progress report to be prepared in the winter of 1968-69.

REFERENCES

Brown, G. 1966. A modified barrel scarifier. Ontario Dept. of Lands and Forests, Timber Br., Silvi. Sec., Silvi Notes No. 6, 8 pp.

Morawski, J.R. 1966. Site Preparation. Ontario Dept. of Lands and Forests, Timber Br., Silvi. Sec., Silvi Notes No. 8, 28 pp.