

**NEWFOUNDLAND AND LABRADOR GUIDELINES
FOR
CLEARING LAND ON MINERAL SOILS FOR
CULTIVATION AND PASTURE**



Land Resource Stewardship Division
Department of Forest Resources and Agrifoods
Corner Brook, NL

2003



www.gov.nl.ca/agric

NEWFOUNDLAND AND LABRADOR GUIDELINES

FOR

CLEARING LAND ON MINERAL SOILS FOR

CULTIVATION AND PASTURE

Land Resource Stewardship Division
Department of Forest Resources and Agrifoods
Corner Brook, NL

October 2003

Copies of this publication are available from:

Department of Forest Resources and Agrifoods
Land Resource Stewardship Division
Fortis Building
P.O. Box 2600
Corner Brook, NL
A2H 6J8

Department of Forest Resources and Agrifoods
Land Resource Stewardship Division
Provincial Agriculture Building
P.O. Box 8700
Brookfield Road
St. John's, NL
A1B 4J6

or

Visit our website <http://www.gov.nl.ca/agric>

This publication was originally available as
Newfoundland Land Clearing Guidelines - 1980,
C. Schryburt, et. al., Department of Rural, Agricultural
and Northern Development.

The original publication has been revised and edited
by J. van de Hulst
Soil Survey Supervisor,
Department of Forest Resources and Agrifoods, 1997
and by:
Randy Ricketts
Soils and Mapping Supervisor,
Department of Forest Resources and Agrifoods, 2003

TABLE OF CONTENTS

1. INTRODUCTION	1
2. LAND SUITABILITY - CRITERIA TO EXAMINE	1
3. LAND CLEARING STANDARDS	3
4. SUGGESTED METHODS FOR CLEARING LAND	4
4.1. FORESTED AREAS	4
4.2. CUT-OVER AREAS	5
4.3. LIGHT VEGETATION AREAS	6
5. SPECIAL NOTES ON WINDROWS	6
6. BURNING OF WINDROWS	6
7. STONE REMOVAL	8
8. QUALITY WORK STANDARDS	8
9. PREVENTION OF SURFACE WATER POLLUTION	9
APPENDIX I	10
PILING BLADE SPECIFICATIONS	11
EXCAVATOR LAND CLEARING RAKE SPECIFICATIONS	11
APPENDIX II	14
LAND CLEARING PICTURES	15, 16, 17

1. INTRODUCTION

The Province's agricultural land base on mineral soils is limited compared to other provinces, however, it is adequate to supply local markets with climatically adapted commodities, provided that it is properly used and managed. The agricultural land is considered by the Province to be a strategic commodity that will become more important in the long term as imported produce becomes more expensive, in part due to increased transportation costs. In addition, export of various commodities, including Christmas trees, blueberries, strawberries and vegetables, also require the expansion of the agricultural land base to ensure future growth.

Since potential agricultural land is limited, it is imperative that land is cleared in areas where soil conditions are favorable. The following Land Clearing Guidelines emphasize the importance of properly selecting land to be cleared, and suggest methods of clearing to ensure that high quality standards are met.

Significant areas of peatlands within the province offer opportunities for agriculture, requiring development techniques and challenges outside the scope of this report which focuses on development of mineral soils.

2. LAND SUITABILITY - CRITERIA TO EXAMINE

Land clearing for farm development should be done in areas designated as having the highest agricultural production potential. Such production potential is evaluated according to the site and soil conditions. Since topography and soil conditions vary from one area to another, guidelines for evaluation are needed to ensure that the most suitable land is cleared.

Inherent soil factors which should be examined include fertility, soil structure, drainage conditions, soil permeability and water holding capacity, stoniness, depth to bedrock and overall topography.

- | | |
|---------------------|---|
| Fertility | - Soils in Newfoundland and Labrador generally have a relatively low fertility level caused by the cool humid climate. Soils with a low p.H. level (below 5.0) and a low nutrient status will require considerable amendments to ensure adequate crop growth. |
| Soil Structure | - Soils that have dense compact subsoil layers (hardpans or cemented layers), that hinder plant root penetration and the percolation of rainfall should be rated as poor. |
| Drainage Conditions | - Imperfectly drained to poorly drained soils, characterized by darker, duller colors and finer textures are usually found in low lying areas and depressions. As the water table may be close to the surface and the removal of excess water from precipitation is slower, these soils are unfavorable to agriculture unless major drainage improvements are made. |

Soil Permeability - The sensitivity of soils to prolonged or heavy precipitation should be examined. This criteria is closely related to soil structure since soils having finer textures (silt and clay) will impede the percolation of water, resulting in the shallow rooting of crops. After a heavy rainfall in such areas, soils remain wet for more than one week.

Water Holding Capacity - Whereas finer textures might impede the percolation of water, very coarse or gravelly sands will have a low moisture holding capacity and lead to draughty conditions which are also unfavorable.

Stoniness - Degree of stoniness should be closely examined when considering land clearing. If stones are less than 1-2 meters (3.3 - 6.6 feet) apart, this condition would seriously handicap cultivation. A high level of stone removal would be required in such a case.

The amount of boulders should also be closely examined as they will require extra work to remove them.

Bedrock and Large Boulders - Depth to bedrock and amount of rock outcrops and/or large boulders should be examined. Bedrock less than one meter deep will affect internal drainage; numerous rock outcrops or large boulders would also seriously impede proper cultivation of the field.

Slope - Land having a slope of 15% or more should not be considered for land clearing. Slopes this strong would offer much difficulty in operating machinery and are prone to erosion problems.

Land within the 9% to 15% slope range should be carefully examined as it is also prone to erosion. If other soil and site conditions are favorable it may be considered for clearing.



Figure 1. One inch of topsoil removed over one acre equals 150 tons.

3. LAND CLEARING STANDARDS

1. The land owner should have clear title to all lands to be cleared.
2. All land to be cleared should be suitable for agricultural use.
3. Any contracts or arrangements made between the landowner and a contractor or private tractor owner for clearing the land will not involve the Department of Forest Resources and Agrifoods in any commitments or liabilities to the contractor or private tractor owner or the landowner.
4. The land may be cleared by any suitable means.
5. Every effort should be made to conserve topsoil. Removal of excessive topsoil may impair the use of the land for agricultural purposes.
6. Every effort should be made to conserve organic matter, especially in sandy or droughty soils.
7. The land should be sufficiently level to permit normal operation of farm equipment and allow proper seed bed preparation.
8. Land having a slope of 15% or more should not be considered for clearing or cultivation. If clearing for pasture, land with a slope of more than 15% may be considered, if the use of machinery on the land is expected to be minimal. When clearing the land extreme care should be taken to prevent accidents with machinery due to roll-over on steep slopes.
9. All trees, brush, timber and other undesirable material should be removed from the land. Material removed from the land should be free of excessive amounts of topsoil.
10. Boulders and stones which will interfere with the proper cultivation of the land should be removed but not pushed in a windrow which is intended to be pushed back over the field at a later date.
11. Windrows should not be pushed in standing timber or other places from which it will not be possible to push it back over the land at a later date.
12. Land should not be cleared within 30 meters (100 feet) of natural watercourses such as lakes, rivers or streams. This distance requirement may be greater as deemed necessary by the Department of Forest Resources and Agrifoods and/or the Department of Environment and Labour, Department of Government Services and Lands and the Federal Department of Fisheries and Oceans or any other agency.
13. The location of the land to be cleared should be within a reasonable distance of the farm base.

4. SUGGESTED METHODS FOR CLEARING LAND

4.1 FORESTED AREAS

If merchantable timber is present, lease requirements will stipulate that all merchantable timber has to be harvested before land clearing can take place. The lease holder must obtain written permission from the nearest Forest Management Unit Officer prior to land clearing.

For areas where there is no merchantable timber, a method referred to as “Walkdown and Pile” seems to be the most convenient and efficient. A medium sized crawler tractor (100 h.p. or more), equipped with a standard bulldozer blade is first driven over the timber, knocking down the trees in front of it, and partly lifting the roots out of the ground. (This method is particularly suited for trees having a diameter of 5 - 25 cm (2-10 inches). As most of the trees fall parallel to each other, the operator can pile the wood by driving the tractor (now equipped with a piling blade) at right angles to the direction in which the trees were knocked down.



Figure 2. The ‘Walkdown and Pile’ method.

During the piling operation, most of the soil can be removed from the roots as the piling blade (root rake) shakes and rolls debris towards the windrow sites. However, it is suggested that when using this method, timber should not be left to dry before piling. As roots are partially exposed during the “walkdown” phase and covered with soil, a subsequent rainfall would prove negative and the drying out period would be longer.

Work should be done in dry conditions, removing as little topsoil as possible. Working in wet conditions is unfavorable since traction is poor and excessive amounts of soil are picked up.

Once tree growth has been cleared away, many operators try to get a clean field by using their dozer blades. This is when excessive topsoil is removed. It is suggested instead that a heavy breaking disk be used to cut up the remaining debris. Raking the area with a wheel rake or a drum rake will also do a good job of clearing remaining brush. This discing and raking step should be undertaken for all land clearing conditions (forested or cut-over areas).

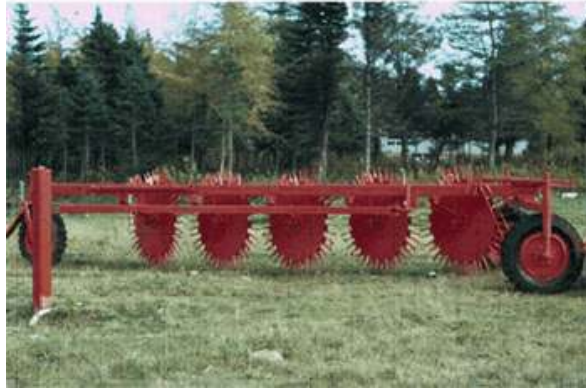


Figure 3. A wheel rake.

4.2 CUT-OVER AREAS

Where merchantable wood has been harvested, subsequent clearing will be aimed at removing remaining stumps and brush. The operator can make use of either stump extractors, backhoes, excavators with a land clearing rake or crawler tractors equipped with a piling blade (often referred to as root rakes). These piling blades with hooked or curved teeth enable the soil to pass through the blades when lifting the stumps, ensuring no excessive loss of soil. The concave shape of the blade enables the brush to “roll” in front of the blade permitting the soil to be shaken out and also reducing the power required to push it. The excavator land clearing rake consists of a set of curved teeth shaped in the form of an excavator bucket. This allows the excavator to lift the stumps and shake out the soil before placing it onto a pile. It should be noted that 2.5 cm (one inch) of topsoil removed over one hectare (2.4 acres) equals 376 tonnes (370 tons); therefore, stumps and roots should be rolled over several times to remove as much soil as possible before piling them.

The land clearing operator may wish to clear-cut the area when the ground is frozen and wait for spring before removing stumps and roots.



Figure 4. A piling blade or root rake.



Figure 5. An excavator land clearing rake.

4.3 LIGHT VEGETATION AREAS

When clearing small areas of low, brushy growth cover, the use of a piling blade would remove an excessive amount of soil. Since the brush is loose and difficult to stack compactly, subsequent burning would be extremely difficult especially with the amount of topsoil present.

The operator may therefore use heavy breaking disks, rotary brush mowers or flail type mowers to mulch the brush cover into the soil or he may choose to run a slash fire through the area before land clearing operations.

5. SPECIAL NOTES ON WINDROWS

- Piles or windrows should be dirt free. This requires a good piling blade or land clearing rake and considerable shaking out during the clearing process.
- Trees, stumps and roots should be tightly packed; the ideal windrow is high and narrow. (Limiting the windrows to 9 meters (30 feet) wide will ensure proper packing of trees and stumps).
- Brush should not be pushed into standing timber. Windrows should be built in pre-cleared areas since this land is to be used when windrows have been burned.
- Windrows or piles may also be built in low lying areas (where agricultural potential is low) and left to rot, as long as material does not dam flowing water.
- Some windrows may be placed in strategic locations, serving as windbreaks, protecting open fields from high winds and also serving as snow traps.
- Material to be stacked in windrows should preferably not be pushed more than 45 meters (150 feet) to ensure a high quality of work. Therefore, if material is pushed in opposite directions from a centre point, the distance between windrows should be approximately 90 meters (300 feet). (Fewer rows are desirable but the cost will increase noticeably as the distance the brush is removed increases.)
- Windrows and piles consisting of tree growth should be stone free.

6. BURNING OF WINDROWS

Examination of some examples of land cleared shows that windrows covering potentially good land may occupy more than 20% of the land cleared. Particularly bad examples show that over 30 % of the land is covered by loosely stacked windrows and numerous stone piles. Proper measures must be taken to ensure that this unused land is put into production. Some farmers have chosen to leave the windrows for rotting over a period of years. After five years or more they flatten these windrows and spread them over the field, returning previously removed topsoil back to the land. However, this is a costly procedure to the farmer as he was deprived of part of his field (20-30%)

and his soil for five years. Windrows are also unsightly, act as a breeding ground for weeds and hold excessive **moisture** in the vicinity.

Burning of windrows is strongly recommended as it adds more available land for cultivation. Proper burning is directly related to proper piling techniques. Trees should be well stacked, and soil free windrows and piles should be left for a drying out period before burning is undertaken. However, if material is already dry and does not contain considerable green brush, it is preferable to burn it while clearing is in progress, taking full advantage of the crawler tractor or excavator available for piling the wood as it burns.

- Stumps and roots will burn quite well, provided they are piled cleanly and are soil free.
- Tight round piles may burn better than long windrows as they create a concentration of heat in the center of the pile. Burning will also be faster and more efficient if an open bottom is kept in the pile, therefore creating a better draft in the burning process.
- If windrows are built in a linear fashion, they should be placed in line with the direction of the prevailing wind for easier burning; in such a case, the fire should be started at the windward end.



Figure 6. Burning of windrows

7. STONE REMOVAL

Stone removal is an integral part of land clearing, especially in Newfoundland and Labrador.

Large rocks and boulders should be removed by pushing them to the side with the crawler tractor or picking them up and carrying them to the edge of the field with the excavator. Extensive use of stone pickers will ensure that all excessive stones that would hinder cultivation will be removed. Windrowing the stones with a wheel rake or a rotary drum type apparatus will ensure more efficient removal of stones.



Figure 7. Stone removal.

8. QUALITY WORK STANDARDS

The quality of land clearing work done is the responsibility of the farmer/contractor. The work should be carried out in a manner so as to meet the following quality standards:

1. Windrows shall be mud free (containing as little topsoil as possible).
2. Material to be piled into windrows should not be pushed more than 45 meters (150 feet).
3. No material is to be pushed into streams or gullies where such action would impede the flow of water. There shall be a buffer zone of at least 15 meters (50 feet) between streams and cleared land.
4. Windrows shall not be pushed into standing timber. Windrows and piles should be built on pre-cleared "windrow beds". This is recuperable land once windrows or piles have been burned.
5. Windrows and piles should all be burned eventually, if they occupy potentially good agricultural land.

6. Windrows shall be built as straight as possible and tightly packed to ensure proper burning {suggested maximum width of windrows is 10 meters (30 feet)}.
7. Windrows and piles should be left to dry for no longer than two years before they are burned.
8. All stones/boulders, that would interfere with the cultivation of the land, should be removed.

Note: In land clearing, it is not the machine used but the operator that makes the difference. The amount of topsoil pushed into windrows separates a good operator from the others.

9. PREVENTION OF SURFACE WATER POLLUTION.

Land should not be cleared within 30 meters (100 feet) of surface water and a vegetated buffer should be maintained.

Where overland runoff occurs and can enter the surface water, control devices such as filter fabrics, sediment traps and/or settling ponds should be used to receive all drainage from areas disturbed by clearing. Solids which accumulate in a settling pond or behind a sediment trap should be removed on a regular basis to ensure such devices remain effective.

It is necessary to provide for proper transport, storage and use of substances which may be harmful to fish, such as petroleum products, fertilizers and pesticides to minimize the risk of accidental spills and to prevent these spills from entering the surface water.

Refueling and maintenance of land clearing equipment should be undertaken on level terrain, at least 100 meters (300 feet) from any surface water, to ensure oil, gasoline and hydraulic fluids do not enter surface waters. Waste oil should be disposed of in an approved manner.

It is advisable to have spill response equipment, such as absorbents and open ended barrels, available on site. Equipment operators should be knowledgeable about response procedures.

APPENDIX I

Land Clearing

PILING BLADE SPECIFICATIONS

Suggested specifications for land clearing piling blades attached to crawler tractors (see diagram):

1. Tooth length (penetration) a minimum of 300 mm (12 inches) below the bottom box beam or bottom part of the blade.
2. Tooth spacing (clear spacing) a minimum of 250 mm (10 inches) and a maximum of 20 inches (500 mm).
3. Tooth lead or curvature a minimum of 200 mm (8 inches) in the bottom 12 inches (300 mm) of the tooth.
4. Lift height a minimum of 400 mm (16 inches) from the tip of the tooth to the ground when blade is fully raised.
5. Total blade height from the tip of the tooth to the top of the blade a minimum of 40% of the blade width.

(After New Brunswick Department of Agriculture)

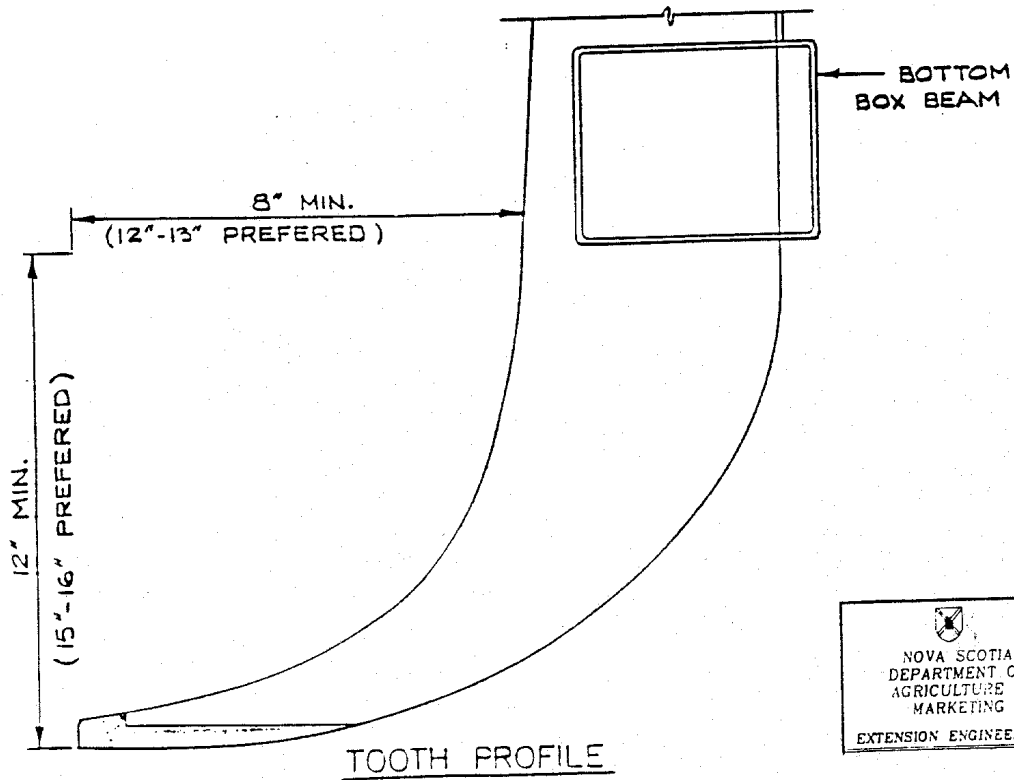
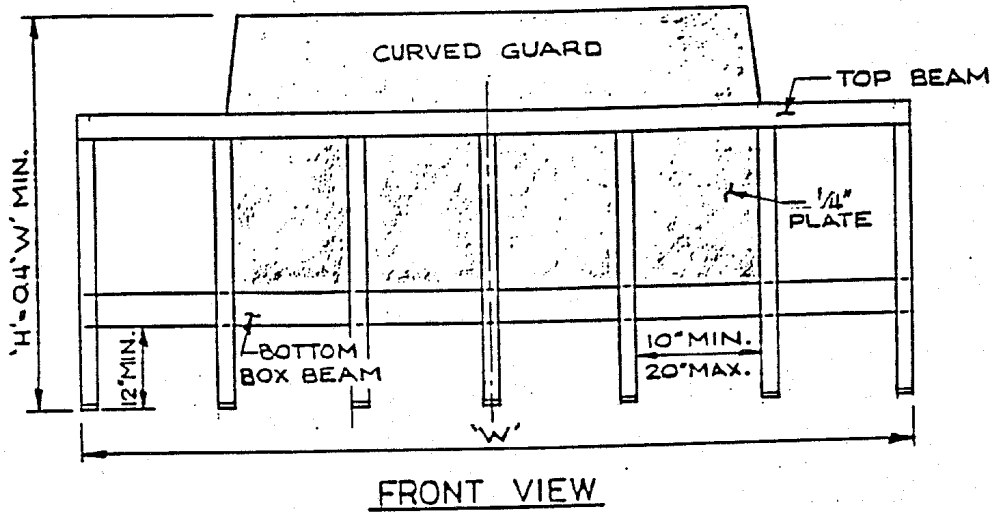
EXCAVATOR LAND CLEARING RAKE SPECIFICATIONS


Suggested specifications for excavator land clearing rakes: (see diagram)

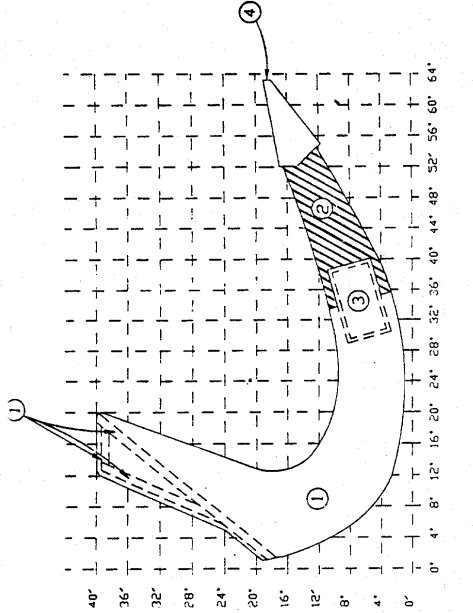
1. Rake width 1.8 meters (6 feet) for 1 meter (1 yard) machines and 1.5 meters (5 feet) for 0.7 meter ($\frac{3}{4}$ yard) machines.
2. Rake height approximately 96 cm (38 inches) and rake depth approximately 157 cm (62 inches).
3. Tooth spacing a minimum of 28 cm (11 inches) and a maximum of 41 cm (16 inches).
4. Tooth lead or curvature 30 cm (12 inches) from the tip of the tooth to the bottom of the rake over approximately 107 cm (42 inches).

(After New Brunswick Department of Agriculture)

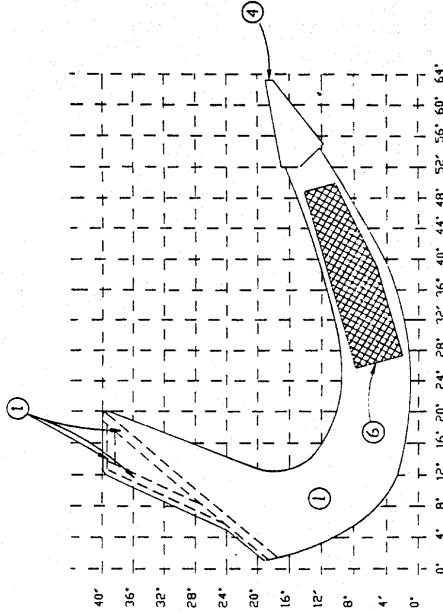
PILING. BLADE SPECIFICATION DIAGRAM



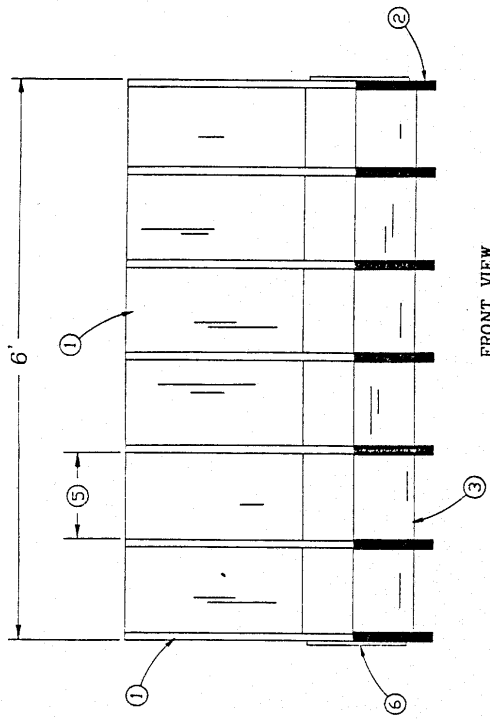

NOVA SCOTIA
DEPARTMENT OF
AGRICULTURE &
MARKETING
EXTENSION ENGINEERING



TYPICAL CROSS-SECTION



CROSS-SECTION SHOWING
OUTSIDE TOOTH REINFORCEMENT



FRONT VIEW
FOR 1 YD. MACHINE

1. 3/4" PLATE STEEL
2. MIN. 1" - 425 GRADE TEMPERED STEEL OR EQUIV.
- FROM BOX BEAM TO TIP OF TOOTH
(FOR ADDITIONAL STRENGTH)
3. 6" X 10" BOX BEAM
4. REPLACABLE TEETH
5. TOOTH SPACING - MIN. 11" (INSIDE/INSIDE)
- MAX. 16" (INSIDE/INSIDE)
6. TOOTH REINFORCEMENT - 1/2" THICK - 425 GRADE
TEMPERED STEEL OR EQUIV. - CUT TO FIT

REVISED 01-2-22 D.M.C.

 NOVA SCOTIA DEPARTMENT OF AGRICULTURE & MARKETING EXTENSION ENGINEERING	LAND CLEARING RAKE FOR EXCAVATOR -FOR 3/4 YD. & 1 YD. MACHINES		PLAN NO.
	DATE 89-02-2	SCALE N/A	89-7
	A: DETAIL NO. B: ORIGINATES C: DRAWN 		SHEET 1 OF 1
	DESIGNED	TRACED	CHECKED

APPENDIX II

Land clearing pictures

LAND CLEARING FOR AGRICULTURE

Figure 1



Good land clearing starts with cutting merchantable timber.

Figure 2



Shrub and small trees are 'walked down' with a bulldozer

Figure 3



and piled in windrows

Figure 4



using a bulldozer equipped with a piling blade

Figure 5



or an excavator equipped with a land clearing rake.

Figure 6



These windrows should ideally be free of soil and rock.

LAND CLEARING FOR AGRICULTURE

Figure 7



Burning of windrows while piling is recommended where the windrows may interfere with cultivation.

Figure 8



Raking the area with a wheel rake

Figure 9



or using attachments such as the mericrusher

Figure 10



will do a good job of clearing remaining debris and incorporating organic material.

Figure 11



Large rocks and boulders are pushed to the side of the field with a bulldozer,

Figure 12



while small rocks are windrowed

LAND CLEARING FOR AGRICULTURE

Figure 13



with a rock windrower,

Figure 14



picked up with a rock picker,

Figure 15



and dumped.

Figure 16



The land is then ready for limestone spreading

Figure 17



and cultivation.