

**DEMONSTRATION
FIELD GUIDE
MIXEDWOOD
HARVESTING TO PROTECT
UNDERSTORIES**

*The Manitoba Model Forest Presents:
A Workshop/Field Tour on the
Protection of Forest Understories during Harvesting Operations*

*Manitoba Model Forest
Project 95-3-11*

*Pine Falls, Manitoba
April 2nd & 3rd, 1996*

*Organizers:
Silvitech Consulting
Peacock Forestry Services
Canadian Forest Service
Pine Falls Paper Company Ltd*

Agenda:

9:30 am Manitou Lodge, Pine Falls

Welcome and Introduction

Vince Keenan, Chairperson, Advanced Forest Practices, Manitoba Model Forest

Mike Waldram, General Manager, Manitoba Model Forest

"Understory Protection in Mixedwood Forests"

Dr. Stan Navratil, Mixedwood Research Scientist, Canadian Forest Service

Questions and Discussion

Video: " *Alternative Silviculture Systems in the Northern Mixedwoods of Alberta*"

Derek Sidders, Technology Development Unit, Canadian Forest Service

11:30 am

Bus Leaves Manitou Lodge for Field Demonstration Site

12:00 pm

Lunch at Demonstration Site

12:30 pm

Tour of Active Harvesting Operations

Tour Guides:

Harold Peacock, Peacock Forestry Services

Stan Lux, Canadian Forest Service

Derek Sidders, Canadian Forest Service

William Trowell, Silvitech Consulting

16:00

Return to Manitou Lodge, Pine Falls

ACKNOWLEDGEMENTS

All data collection, presentations and coordination for this project was completed by the following individuals and organizations:

Vince Keenan, Pine Falls Paper Company

Dave Meilleur, Silvitech Consulting

William Trowell, Silvitech Consulting

Harold Peacock, Peacock Forestry Services

Stan Lux, Canadian Forest Service

Derek Sidders, Canadian Forest Service

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Canadian Forest Service, Natural Resources Canada

Introduction

Recent commercial developments and expanded demand for diverse forest products has led to an increase in the utilization of the hardwood resource across Canada. Mixedwood stands presently being harvested in western Canada are associated with mature aspen overstories and softwood understories. To mitigate the loss of the understory softwood during the aspen harvest it is necessary to design innovative harvesting systems to protect the juvenile stems in these stands. **The objective of this demonstration project is to display some of these techniques in a controlled setting in the Pine Falls area of the Manitoba Model Forest.** Both cut and skid and mechanical harvest systems have been demonstrated.

The following summarizes some of the major questions/issues related to the harvest of these mixedwood stands that need to be addressed:

Conventional Forest Resource Inventory (FRI) and volumes of the softwood understory is missing or unreliable.

There is a lack of local information on the cost and effectiveness of protection during the harvest and how to best modify and adapt current harvesting systems.

It is unknown how understory protection will relate to bio-diversity and the integration of non-fibre uses of the forest.

What is the risk of windthrow or blowdown of immature conifers after logging..

Manitoba Model Forest Project 95-3-11 was initiated to acquire data and information that will provide answers for some of the issues related to mixedwood forest management and operations. It will also demonstrate the operating parameters and feasibility of alternate harvest designs to achieve these objectives under typical Manitoba conditions.

Study Design

The trial site is located approximately 40 km north of Pine Falls, Manitoba adjacent to the main road that services Little Black River First Nation . The stands for this trial can be generally described as mature to overmature hardwood and mixedwood stands containing an established understory of balsam fir and white spruce. The two main harvesting systems to be used in this trial include conventional cut and skid and a feller buncher, grapple skidder operation. Each harvesting system will operate in a trial block of approximately 10 ha and a control block of 5 ha. General layout of the trial blocks consisted of marking the block boundaries in blue flagging, marking the center lines of each machine corridor in pink flagging and all buffers in orange and yellow flagging.

While the trial sites involve modified block layout and design, normal forest harvesting operations have been prescribed to the control blocks. This will provide the necessary baseline data to be used in comparing harvesting costs and short to long term silvicultural differences.

Preharvest Field Measurements

Preharvest field surveys were completed in the fall of 1995. At the center of each block a 5 m wide transect was established perpendicular to the tentative machine corridors. A total of 826 m and 400 m of transect was established in the trial and control blocks respectively. Measurements taken included tallying all trees greater than 1.3 meters in height by species, diameter at breast height (dbh), tree condition and relative location along the transect line. All tallied trees were then individually tagged and numbered to assist in the relocation after harvest. A number of sample height trees were taken in each block for the establishment of height and diameter curves. Local height/diameter and volume/diameter curves for trembling aspen, white spruce and balsam fir were created.

Stand History

Origin: Wild Fire *1920*

Selective Harvest of White Spruce *1966/67*

Selective Harvest of White Spruce *1986*

Manitoba Model Forest Understory Protection Demonstration *1996*

Aspen Removal and Protection of Understory Juvenile Stems

Present Stand Description

Stand No.149 : Twp. 21 Range 09 , F.R.I. - 90154

Aspen, site class 1, cutting class 5 (overmature),
crown density 4 (80%), species composition Ta9Bf1

Forest Ecological Classification (F.E.C.):V-8

Trembling aspen mixedwood/tall, S-10 very moist/fine loamy- clay

Description of Field Demonstration Sites

Control Block 1

Conventional Cut and Skid

Hand Felled and Cable Skidded

This block contains evidence of at least two former selective cuts for softwoods in 1966-67 and 1986, indicated by old decaying stumps and two distinct ages of understory (28 years and 9 years). No special layout or training of the harvesting crew was used in order to simulate a normal operation. This block was hand felled with chain saws and delimited at the stump and along the skid trail. The wood was forwarded to the landings using a cable skidder.

Block Area: 5.3 Hectares

Control Block 1 Continued:

Preharvest Data Summaries

Species	Total Stems/ha > 1.3 metres in height	Gross Merchantable Stems/ha.	Gross Merch. Volume in cubic metres/ha.
Aspen	3760	220	77
White Spruce	320	110	17
Balsam Fir	3500	270	48

Control Block 2

Conventional Mechanical Harvesting with a Tracked Feller Buncher and Grapple Skidder

This block is similar to Control 1. No special layout or training of the harvesting crew was incorporated in order to simulate a normal operation. Feller Buncher harvested in conventional pattern followed by tramp delimiting by the grapple skidder and forwarding to the landing.

Block Area: 4.3 Hectares

Preharvest Data Summaries

Species	Total Stems/ha > 1.3 metres in height	Gross Merchantable Stems/ha.	Gross Merch. Volume in cubic metres/ha.
Aspen	2660	190	73
White Spruce	330	110	19
Balsam Fir	1800	320	45

Block A

Modified Cut and Skid Harvest Hand Felled and Cable Skidded using Designated Skid Trails

This block was subject to a pre-harvest layout of five major skid trails with buffer strips between segments. Each wind buffer strip is five meters in width and are designed to reduce blowdown. The five main skid trails were preharvested with the timberjack feller buncher and grapple skidder. All merchantable trees greater than 11 cm dbh in the skid trails were cut and salvaged. This precut facilitated the hand fell and cable skid operation. The crews received a precut briefing on the objectives of the study and training for the modified harvesting techniques. Skid trails were selectively located in a herring-bone pattern off the main skid trail. Crop trees were used as rub trees at the corners of the main skid trail to reduce damage to the understory and later harvested. Felled trees (aspen) were topped at the stump when possible or along the branch trails. The

harvest plan called for the removal of all the aspen overstory greater than 23cm dbh, with the exception of the wind buffers. White spruce and balsam fir greater than 25cm dbh, that may not last to the next harvest was also be harvested.

Block Area: 9.7 Hectares

Preharvest Data Summaries

Species	Total Stems/ha > 1.3 metres in height	Gross Merchantable Stems/ha.	Gross Merch. Volume in cubic metres/ha.
Aspen	1393	221	97
White Spruce	245	50	8
Balsam Fir	2467	348	56

Block B

**Modified Uniform Shelterwood
Using Feller Buncher and Grapple Skidder
with Designated Machine Corridors**

This block had denser, more advanced softwood growth than the other blocks. This can be attributed to the selective harvest for softwoods in 1966-67. The intensive preharvest layout involved marking centre lines on all machine corridors. Using the maximum feller reach (7 meters), the first machine corridor centre-line (feller buncher path) was flagged seven meters from the outside boundary and the second centre occurred 14 meters from the first. The third machine corridor centre line is flagged 19 meters from the second. This allows for a 5 meter wind buffer after every second machine corridor. This pattern is repeated across the block. The feller buncher cut all merchantable trees (>11 cm dbh) along the machine corridor and bunched them for grapple skidding. All merchantable aspen and softwoods within the reach of the feller buncher (7m) are harvested minimizing damage to remaining stems. Larger white spruce (>25 cm dbh) were also harvested. Delimiting was completed using skidder tramping with manual topping and trimming in the machine corridors. Forwarding was limited to the machine corridors.

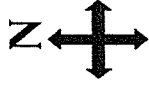
Block Area: 12.3 Hectares

Preharvest Data Summaries

Species	Total Stems/ha > 1.3 metres in height	Gross Merchantable Stems/ha.	Gross Merch. Volume in cubic metres/ha.
Aspen	853	237	130
White Spruce	376	70	9
Balsam Fir	3899	612	89

MIXEDWOOD HARVEST TO PROTECT UNDERSTORIES

Prevailing Winds



80 metre wide strip
with two designated
skid trails

Block A

Modified Cut
and Skid

-9.7 ha

Control 1

Hand Fell and Cable
Skidder

-5.3 ha

Control 2

Feller Buncher
Grapple Skidder

-4.3 ha

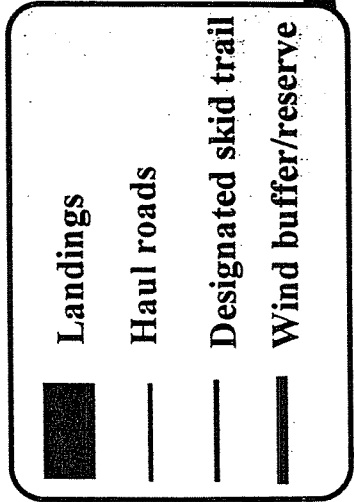
80 metre wide strip
with one designated
skid trail

28 metre wide strips with two designated
skid trails within and a 5 metre wind
buffer between each strip

Block B

Modified Uniform
Shelterwood

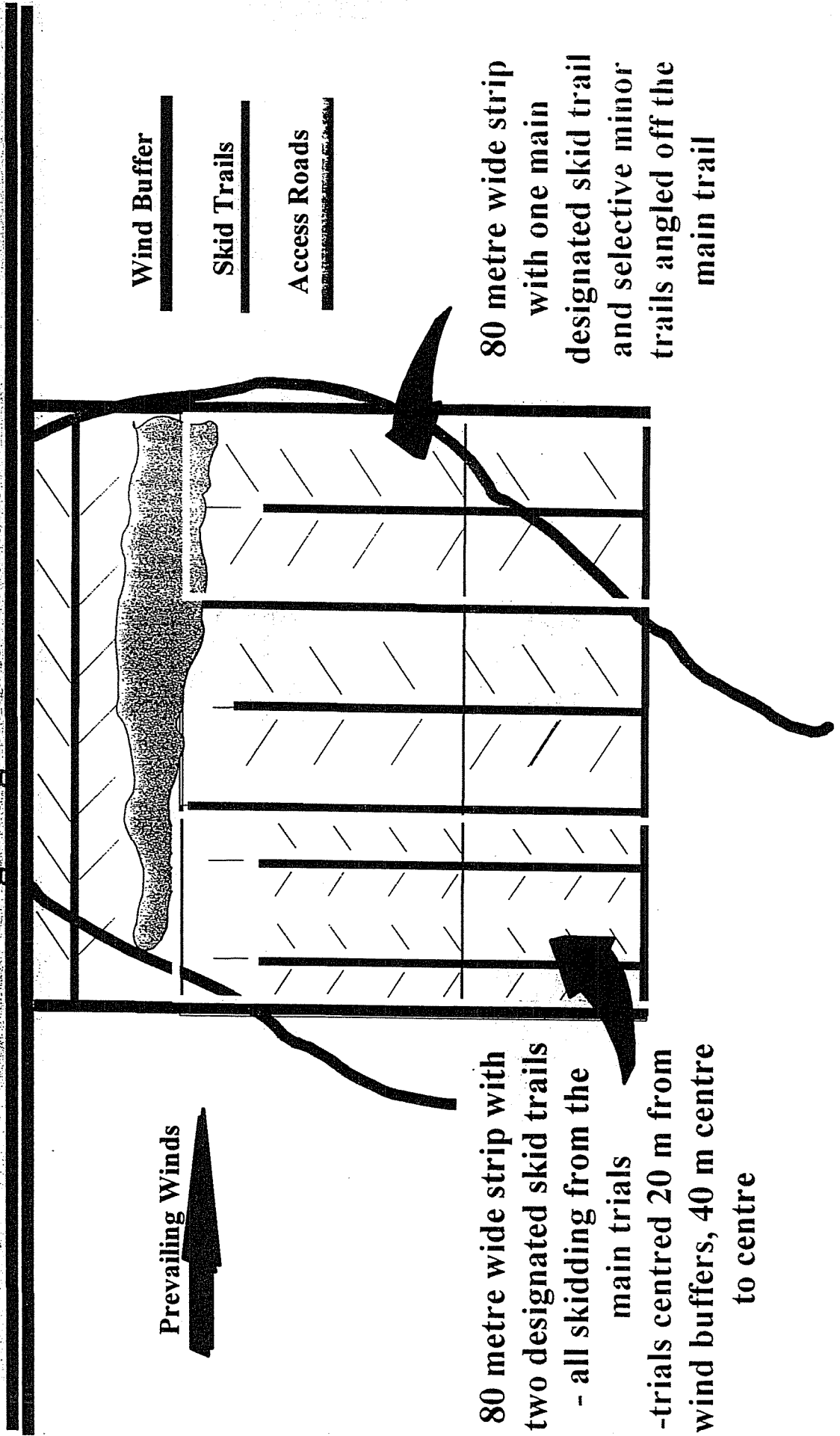
-12.3 ha



BLOCK A

MODIFIED CUT AND SKID

Hand Felled and Cable Skidded using designated skid trails



Wind Buffer

Skid Trails

Access Roads

80 metre wide strip
with one main
designated skid trail
and selective minor
trails angled off the
main trail

Prevailing Winds

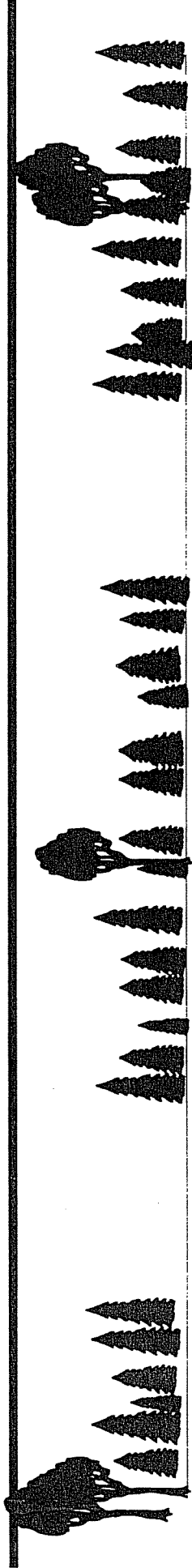
80 metre wide strip with
two designated skid trails
- all skidding from the
main trails
- trials centred 20 m from
wind buffers, 40 m centre
to centre

Block A

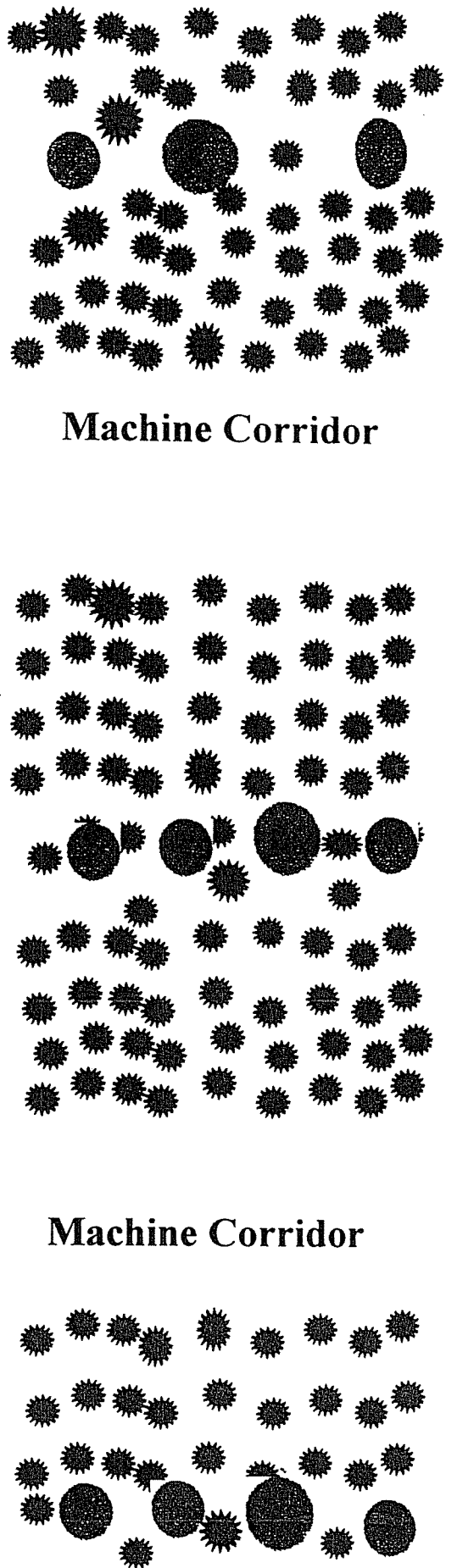
Modified Cut and Skid
Hand Felled and Cable Skidded
on designated skid trails



Pre-Harvest



Post-Harvest



Machine Corridor

Machine Corridor

BLOCK B

MODIFIED UNIFORM SHELTERWOOD

Feller Buncher and Grapple Skidder using Designated Machine Corridors

Machine Corridor



No-Traffic Zone



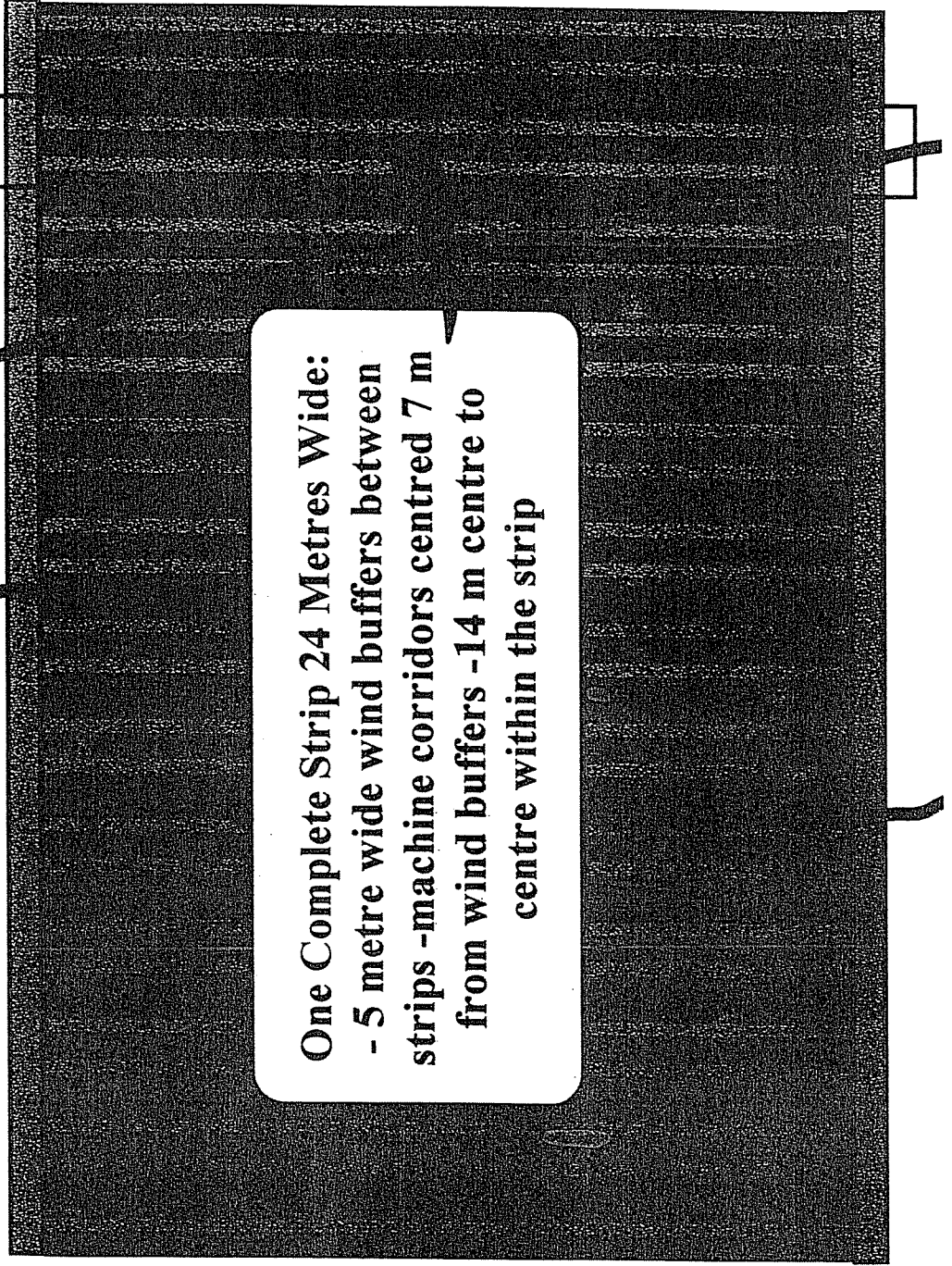
Wind Buffer



Access Road



One Complete Strip 24 Metres Wide:
- 5 metre wide wind buffers between strips - machine corridors centred 7 m from wind buffers - 14 m centre to centre within the strip

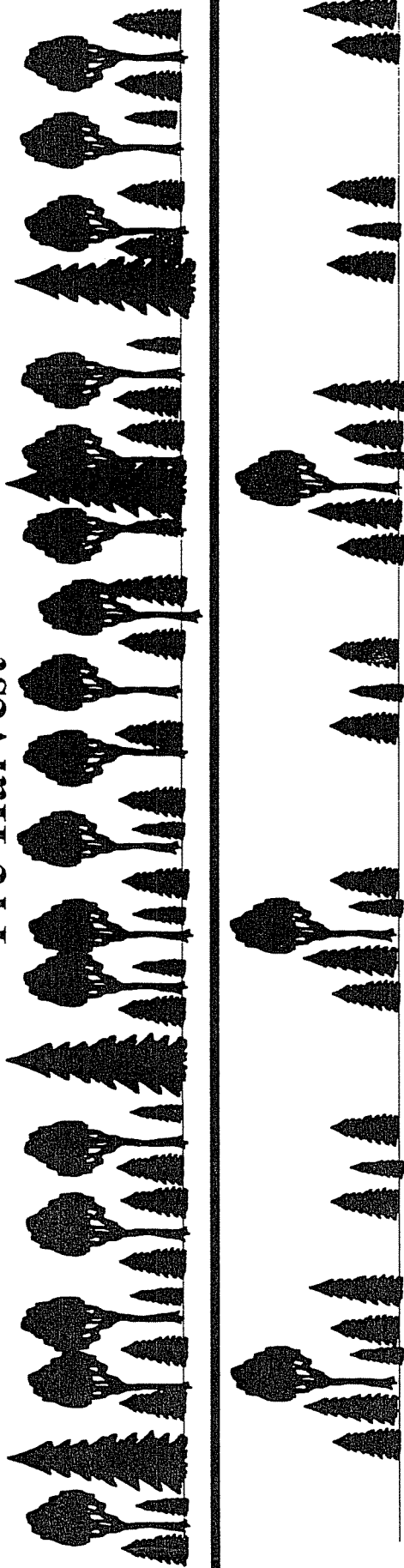


Block B

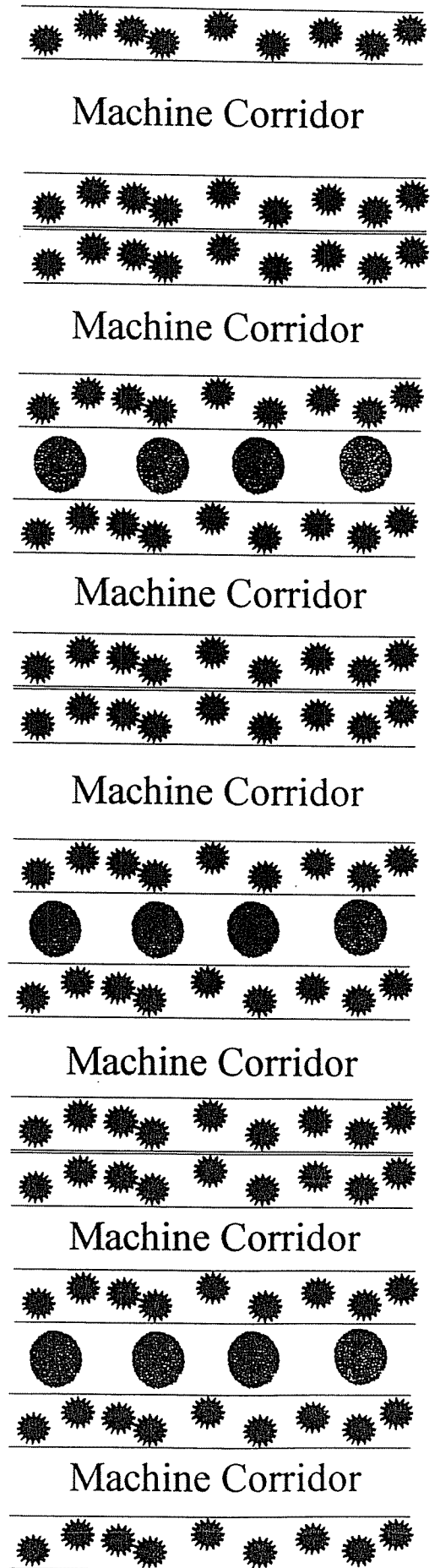
Modified Uniform Shelterwood
Feller Buncher and Grapple Skidder
with designated machine corridors



Pre-Harvest

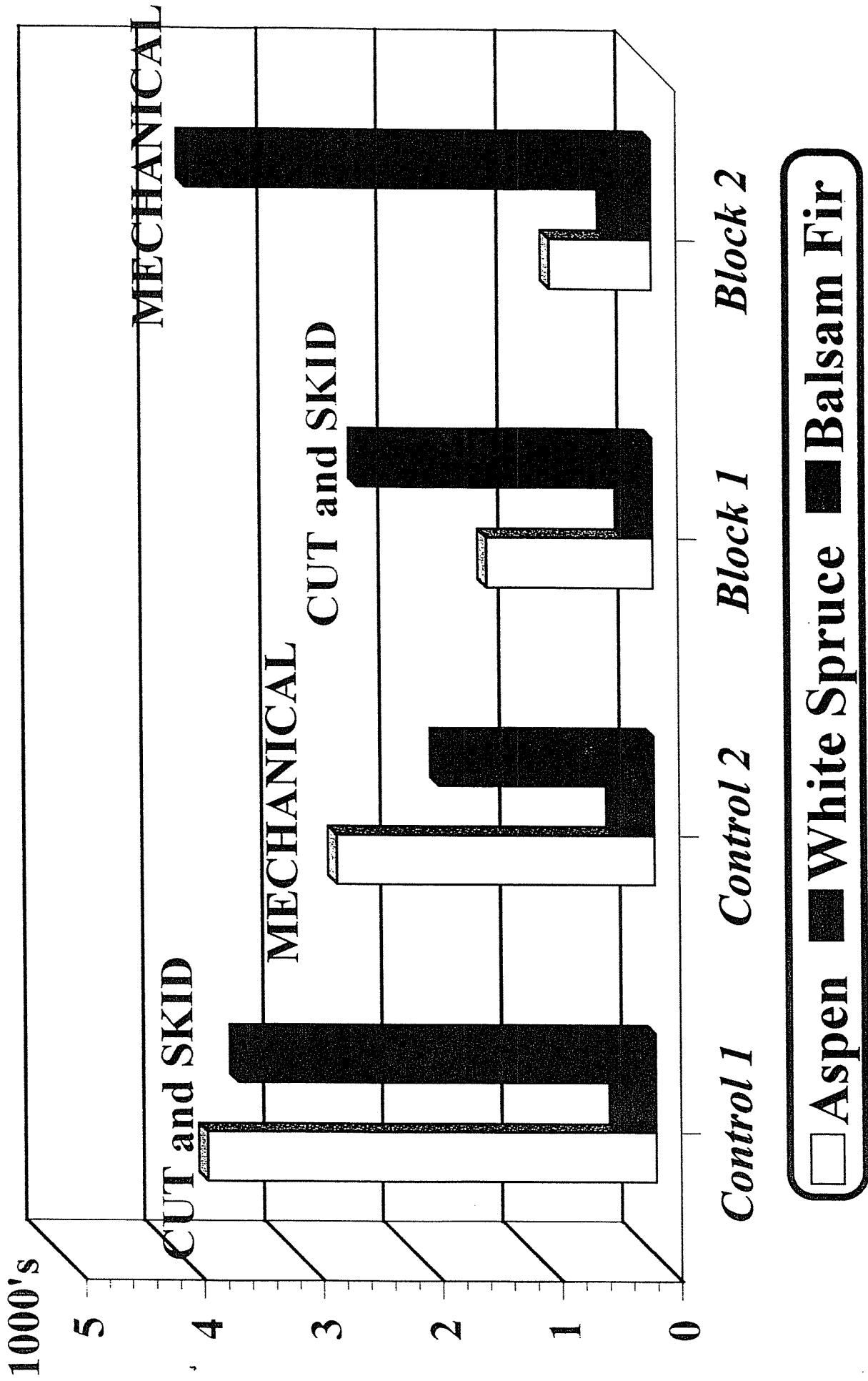


Post-Harvest



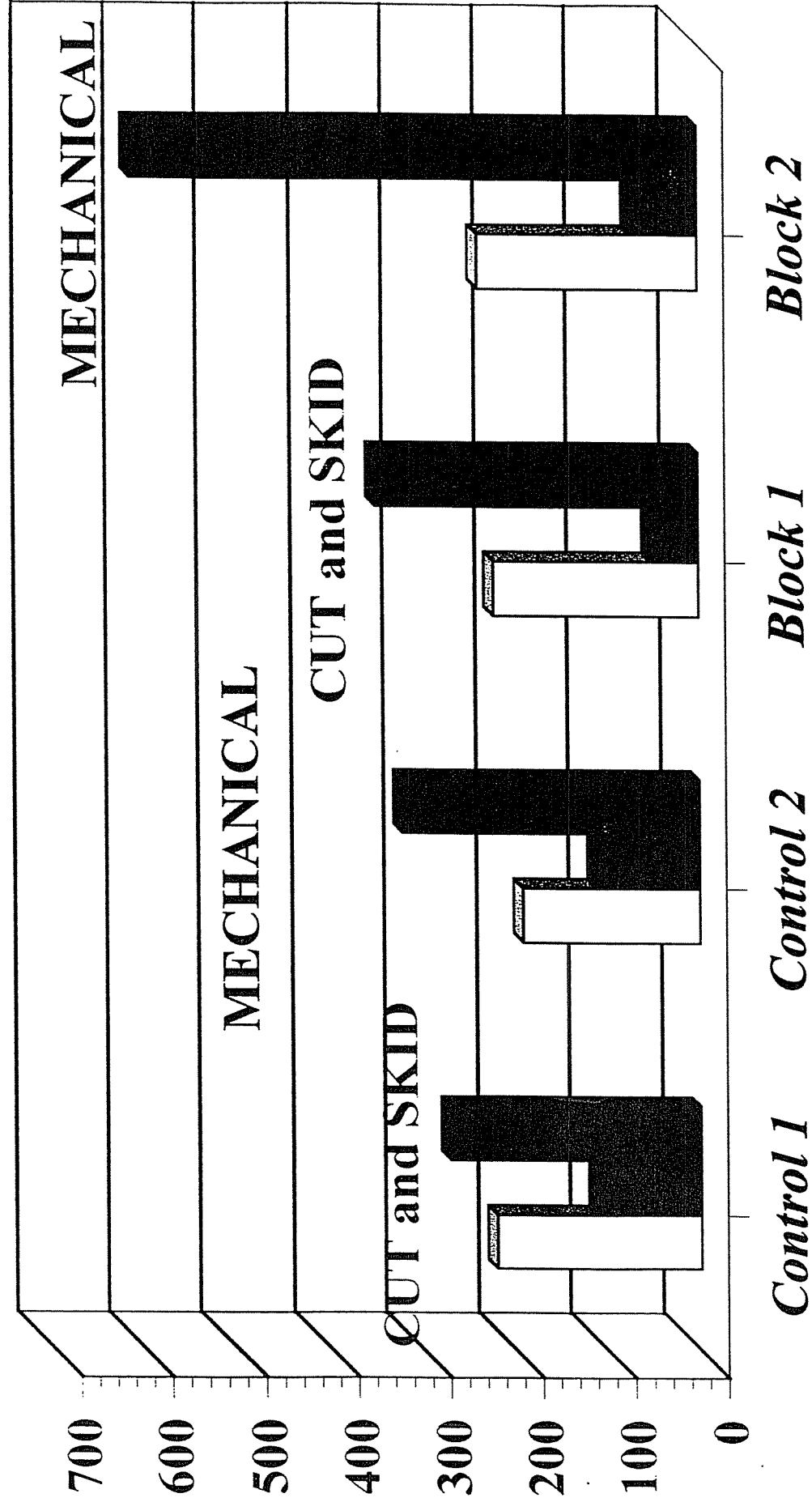
TOTAL STEMS PER HECTARE

GREATER THAN 1.3 METRES TALL



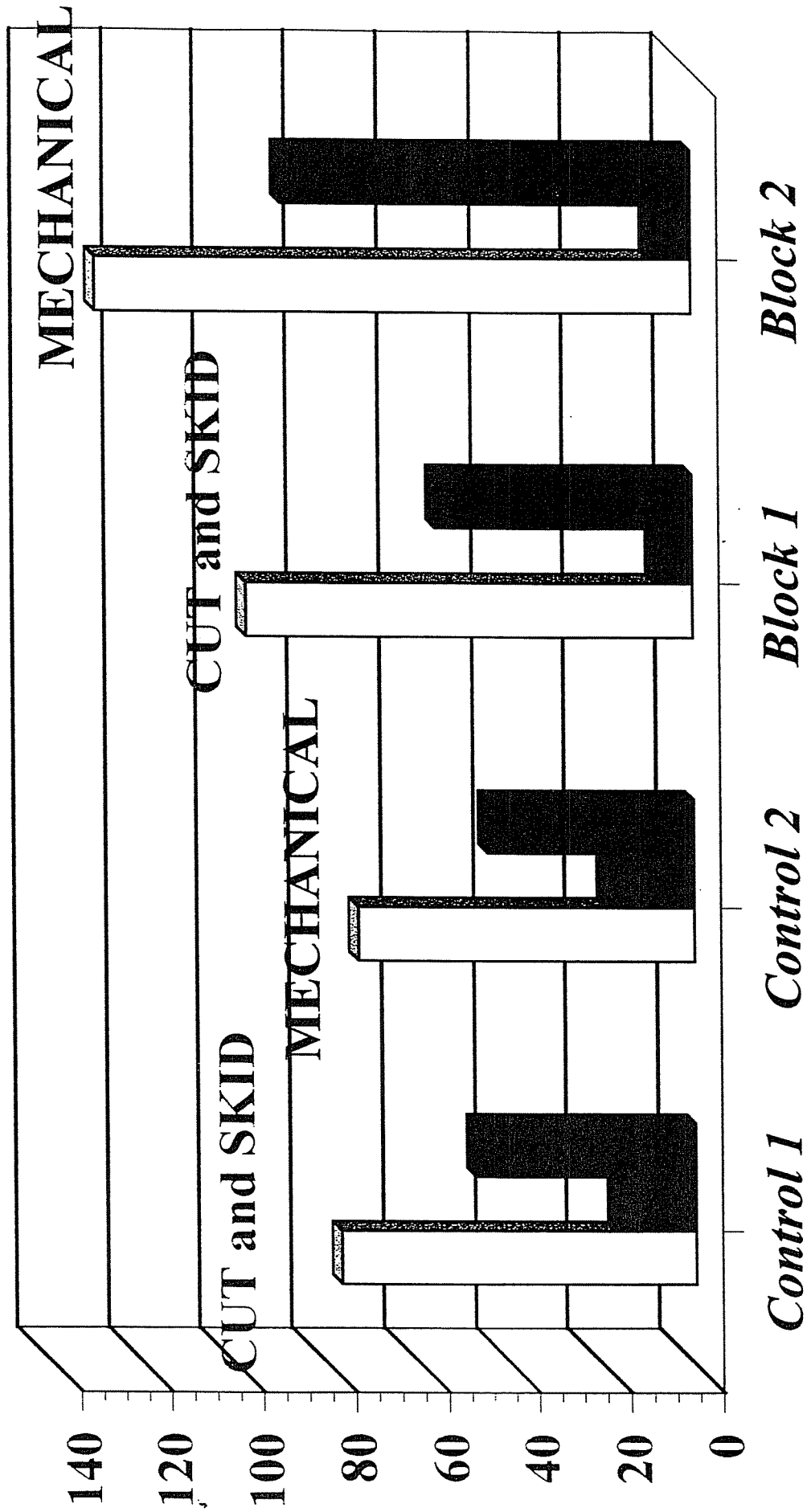
Aspen
 White Spruce
 Balsam Fir

MERCHANTABLE STEMS PER HECTARE



Aspen
 White Spruce
 Balsam Fir

GROSS MERCHANTABLE VOLUME CUBIC METRES PER HECTARE



Aspen
 Balsam Fir

