PRELIMINARY WEED EFFICACY AND CROP TOLERANCE DATA FOR A NEW BRUNSWICK

AERIAL VELPAR (HEXAZINONE) SOIL APPLIED SITE PREPARATION TREATMENT

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INTRODUCTION

On May 19th, 1984, liquid VELPAR was aerially applied to approx-
imately 24 hectares of J.D. Irving, Ltd. property at Big Brook near St.
Leonard, New Brunswick (Figures 1 and 2).

The area was clearcut in 1980-81 and is characterized by various
herbaceous, deciduous and coniferous species (Table 1). The area has
not been site prepared, is heavily covered with slash and numerous
residual snags remain. Advanced weed competition on the site precludes
planting coniferous nursery stock until competition is reduced by some
method of site preparation.

METHOD AND MATERIALS

Treatment and Spray Conditions

VELPAR L was applied at three rates (Table 2). All treatment
rates were replicated twice.

Lay-out of Treatment Plots

In August, 1984, individual treatment plots, aerial spray swaths
and sample quadrats to be used in the vegetation assessment were
marked. Following this, a preliminary vegetation assessment was com-
pleted.

Table 3 summarizes information pertaining to treatment plots and
treatment rates.

Each treatment plot measured 84 metres in width and 445 metres
in length for an area of 3.7 hectares. The treatment plots were sepa-
rated by 50 metre vegetation buffers and by 10 metre wide roads.

Figure 1. Map indicating the relative location of the 1984 VELPAR
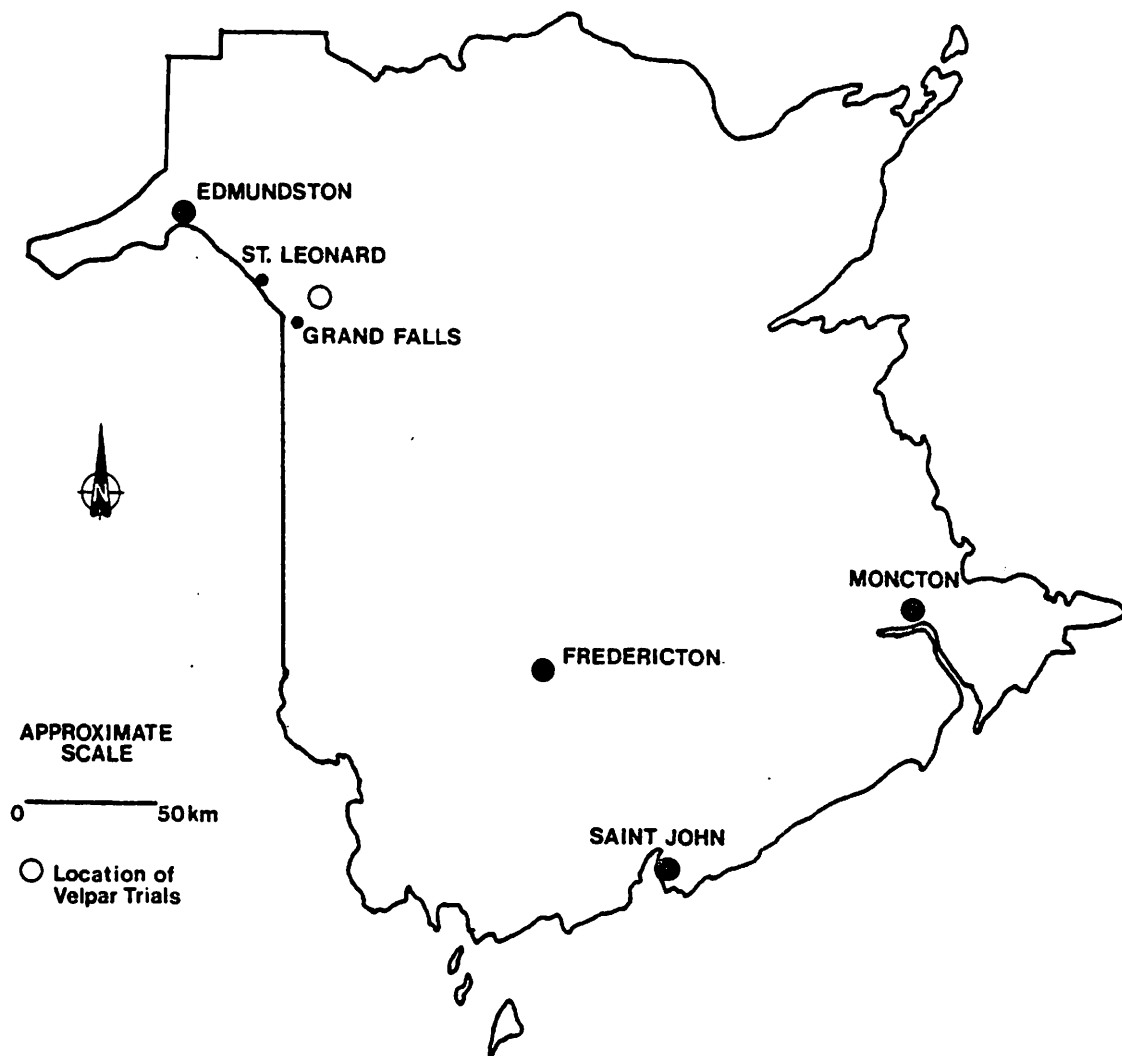experimental trials within the province of New Brunswick.

EDMUNDSTON

ST. LEONARD

GRAND FALLS

MONCTON

FREDERICTON.

APPROXIMATE
SCALE

0   50 km

O Location of
Velpar Trials

SAINT JOHN

Figure 2. Map indicating the location of the 1984 VELPAR experimental sites within New Brunswick.

EDMUNDSTON

VENEER MILL

Salmon R.

STATE OF
MAINE

Little R.

Big Brk.

Hwy. 2

Saint John River

Hwy. 17

L. Hand
Branch
Cedar Brk.

ST. LEONARD

Rocky Brk.

Ryan Brk.

APPROXIMATE
SCALE

0   5 km

GRAND FALLS

1 Velpar Soil Application Site
2 Velpar Foliar Application Site
− − −J.D. Irving Logging Roads

3
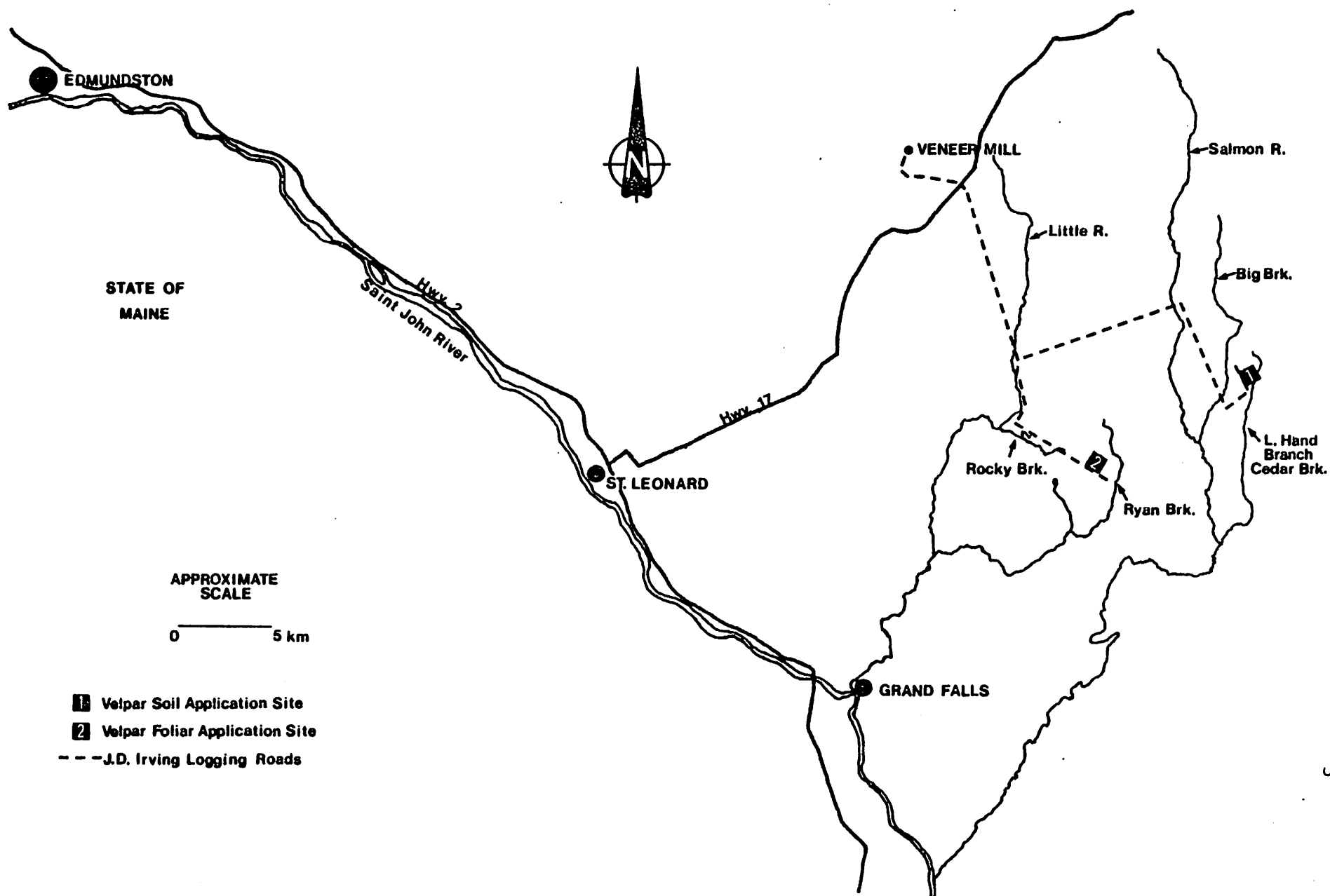
Table 1. Deciduous, herbaceous and coniferous species present on the Big Brook site.

Deciduous

(predominant)

red-berried elder	*Sambucus pubens*
beaked hazelnut	*Corylus cornuta*
red maple	*Acer rubrum*
mountain maple	*Acer spicatum*
sugar maple	*Acer saccharum*
pin cherry	*Prunus pensylvanica*
yellow birch	*Betula alleghaniensis*

(non-predominant)

trembling aspen	*Populus tremuloides*
black ash	*Fraxinus nigra*
red-osier dogwood	*Cornus stolonifera*
eastern choke cherry	*Prunus virginiana*

Herbaceous

(predominant)

red raspberry	*Rubus idaeus*
fire weed	*Epilobium angustifolium*

(non-predominant)

bristly currant	*Ribes lacustre*
bunchberry	*Cornus canadensis*
Canada thistle	*Cirsium arvense*
Canada goldenrod	*Solidago canadensis*

Coniferous

balsam fir	*Abies balsamea*
white spruce	*Picea glauca*

Table 2. List of application rates, equipment and weather conditions.

Herbicide (a.i.)	hexazinone (240 gm/L)
Treatment rates	4, 3 and 2 kg/ha
Spray volume	93.2 L/ha
Aircraft	Turbo Thrush Commander
Boom and nozzles	AIRFOIL boom with 66 conventional nozzles (WHIRLJET 1/8 B-10 #3 conetip) (32 + tips, 34 - tips)
Orientation of nozzles	180°
Airspeed	193 km/hr
Swath width and altitude	17 m; 9 to 18 m.
Weather (prior)	2.5 mm of rain two days prior; low temperatures -1 to 1°C, highs 13-15°C; mainly clear skies
(at time of spraying)	air temperature: 10°C humidity: 50% wind direction: E to W (for 2 kg, 4 kg); W to E (for 3 kg) wind speed: 3-5 km/hr precipitation: none skies: clear
(after)	2 mm of rain one day and two days after; 27 mm of rain five days after; low temperatures 3-15°C, highs 20-31°C; clear to partially overcast skies

Table 3. Application information pertaining to the treatment plots.

Treatment plot	Rate (kg/ha)	No. of swaths	Spraying direction	Time of application (a.m.)
Aa	4 (3.82)	6 *	W to E	9:00-9:15
Ba	4 (3.82)	6 *	W to E	9:00-9:15
Ab	3 (3.07)	5	W to E	9:55-10:10
Bb	3 (3.07)	6 **	W to E	9:55-10:10
Ca	2 (2.08)	5	W to E	10:50-11:05
Da	2 (2.08)	6 **	W to E	10:50-11:05
Cb	0	-	-	-

* Plots Aa and Ba received a sixth swath adjacent to their eastern boundary.

** Plots Bb and Da received a sixth swath through their centers.

The corners of each plot were marked with posts painted yellow (Figure 3) and labelled with aluminum tags which contained information identifying the treatment plot, application rate and position of the post (NE, SW, etc.). The approximate centers of each of the spray swaths in each treatment plot were marked at both the north and south ends by posts painted red and white and labelled with tags identifying the treatment plot and the swath number.

Preliminary Vegetation Assessment

In August, 1984, a preliminary vegetation assessment was completed. The sampling system was biased and designed to avoid certain areas within the treatment plots. These included: (1) areas of uneven application due to the presence of residual trees, (2) locations on the edge of spray swaths, and (3) areas which received double applications as indicated in Table 3.

A north-south transect was compassed through each treatment plot along the length of either the second or fourth spray swath (Figure 4). Circular quadrats of 10 m^2 in size were established at 75 metre intervals along each transect. The centers of the quadrats were permanently marked with posts painted fluorescent red and labelled with tags identifying the treatment plot and quadrat number (Figure 5).

For those deciduous species chosen for study, the closest individual to the quadrat center post was tagged. The tags identified the treatment plot, quadrat number and species (Figure 5). Each tagged individual was visually assessed (health class) using a scale 1-12 (Table 4). In addition, naturally regenerated conifers, closest to the
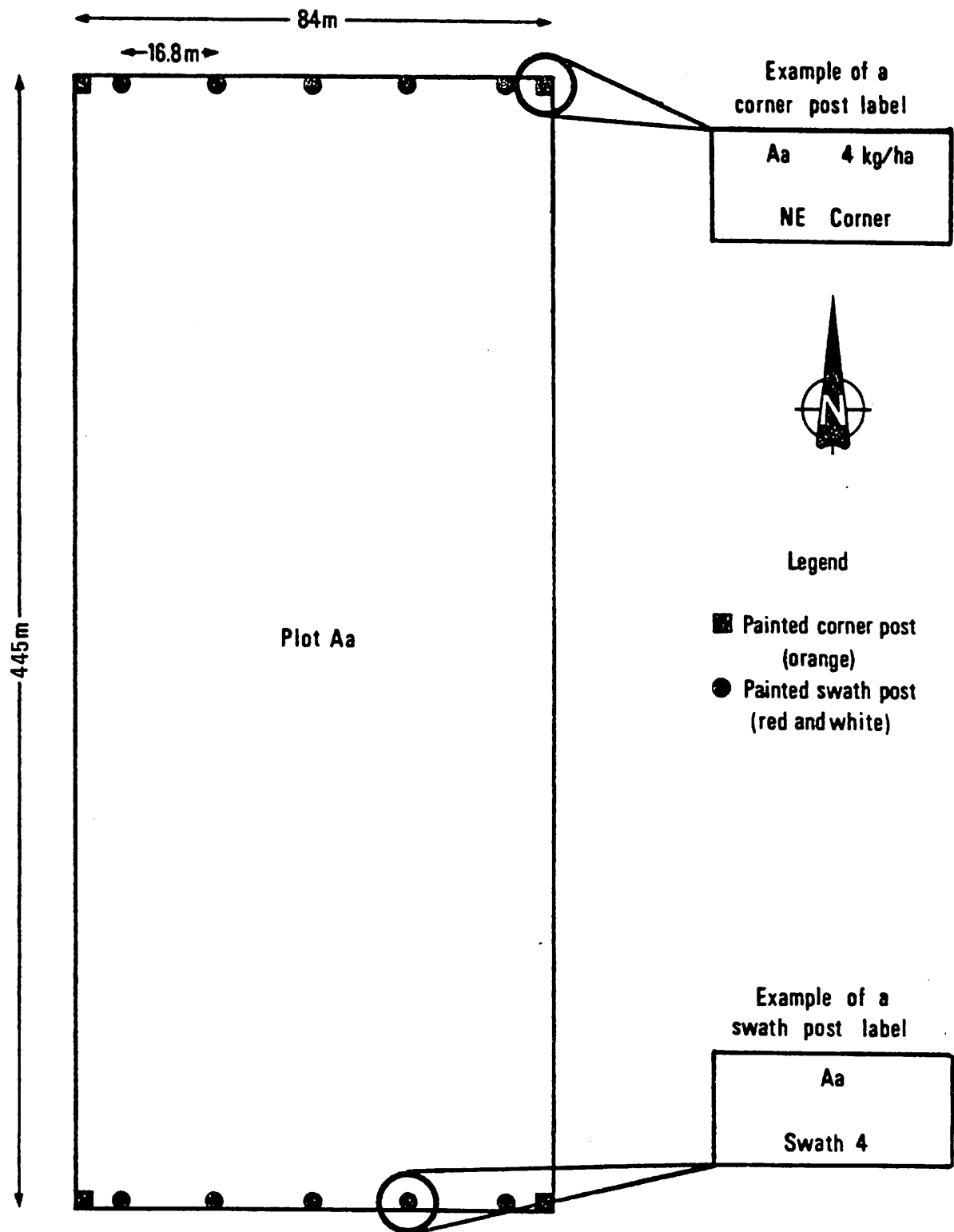
Figure 3. Plot and spray swath establishment.

Figure 4. Map of the site indicating plot, transect and quadrat location.
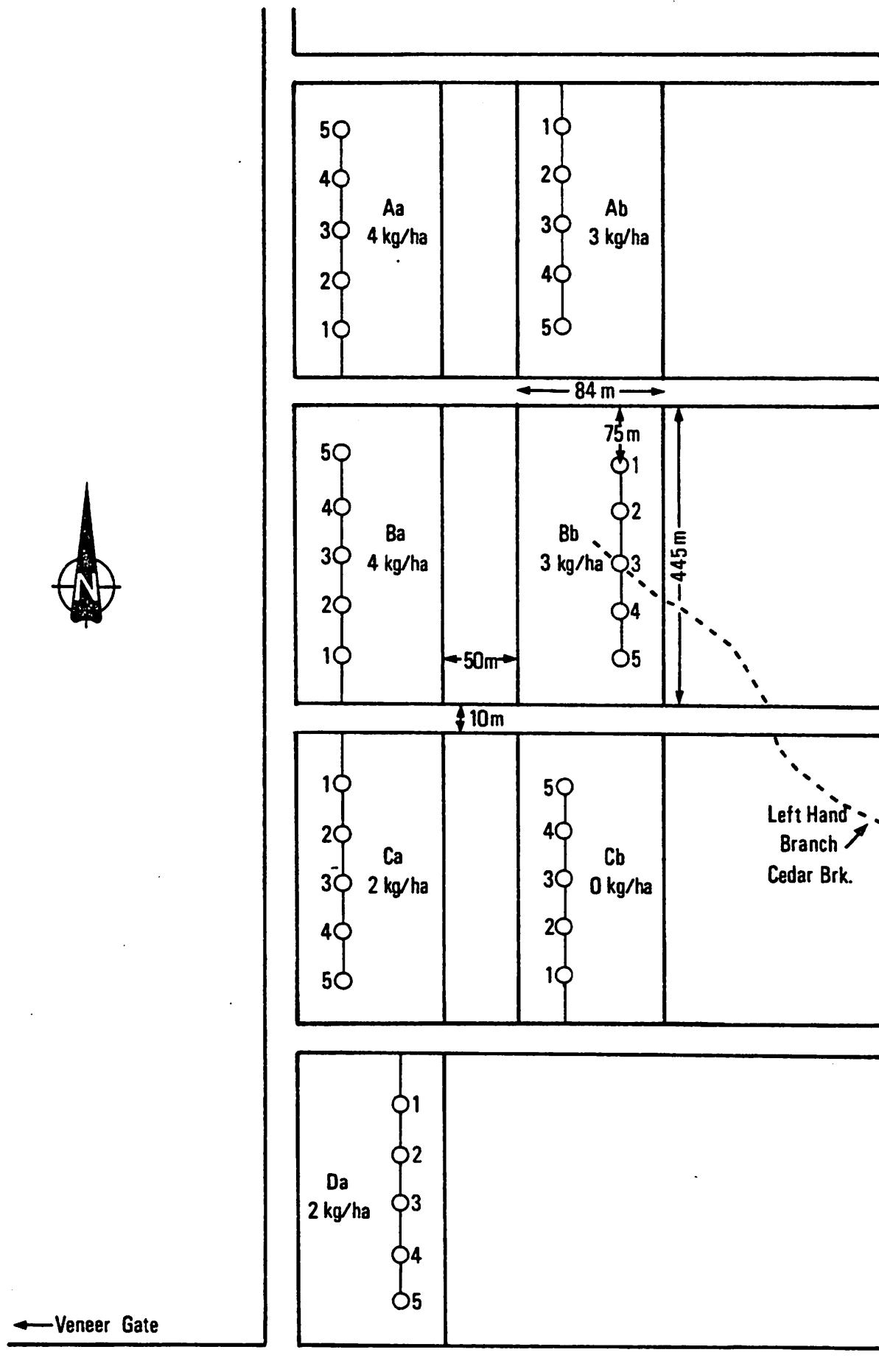
Figure 5. Quadrat establishment.

Example of a quadrat
center post label

| Aa | 4 kg/ha |
| Plot | 4 |

Plot Aa

75m

Legend

• • •Flagged transect line
(red)
O Painted quadrat center post
(flourescent red)

Example of a vegetation
assessment identification tag

Aa — 2 — rM

Plot – Aa
Quadrat – 2
Species – red maple
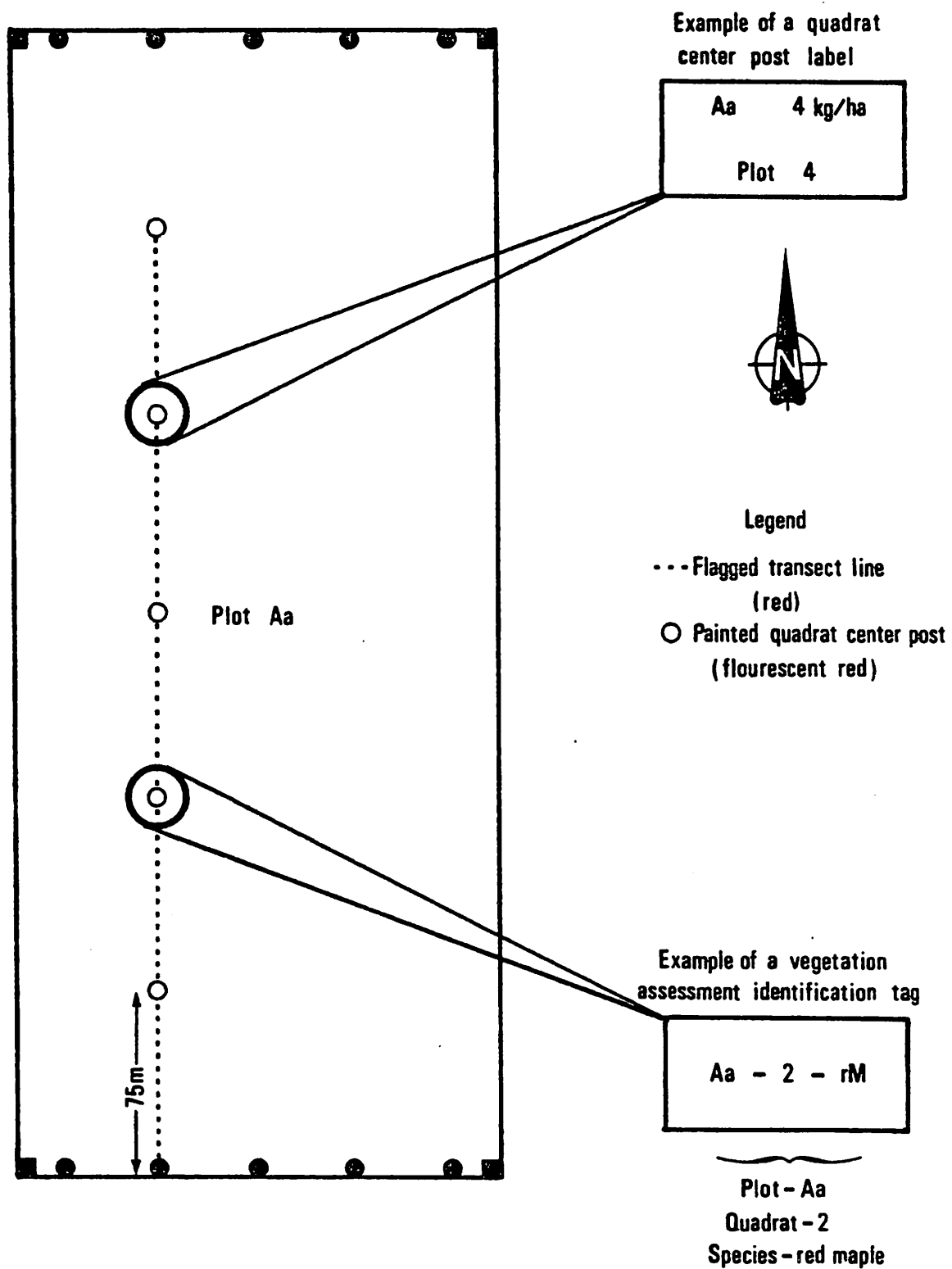
Table 4. Health class descriptions used in
deciduous vegetation assessment[1].

Health class	Description
1	completely healthy
2	0-10% top kill
3	11-20% top kill
4	21-30% top kill
5	31-40% top kill
6	41-50% top kill
7	51-60% top kill
8	61-70% top kill
9	71-80% top kill
10	81-90% top kill
11	91-100% top kill
12	100% top kill plus 100% stem kill

quadrat post, were tagged and assessed (Table 5). Percent quadrat ground coverage and control of raspberry were also estimated.

Data for treated quadrats was compared with that for an untreated area (Table 3 and Figure 4).

RESULTS

Preliminary assessment of the vegetation showed limited control for all of the deciduous species included in the sampling and at all application rates (Table 6). There was an extensive amount of chewing insect damage to the leaves of many of the individuals included in the assessment. Animal browsing damage was noted as well. However, near complete control of this year's raspberry growth was achieved less than three months after application (Table 7). There was no evidence of chemical damage to coniferous species present on the site (Table 8).

Observations and notes for individual sample quadrats for the six treatment plots and one control plot are contained in Appendix I.

DISCUSSION

All treatment rates were silviculturally successful since raspberry control was excellent and raspberry was the dominant vegetation (85-90%) occupying the site. Poor control of the deciduous species (maples and birches) was predictable since VELPAR is not the proper herbicide for use in controlling these species. GARLON (triclopyr) or TORDON (picloram) would have been more appropriate.

Very little coniferous natural regeneration was found on the site. Individuals examined for chemical damage were growing freely in

Table 5. Condition code descriptions in coniferous vegetation assessment[1].

Condition Code	Description
H	healthy
D	completely dead
G	girdled
FR	frost damage to current year's growth
BR	leader browsed off
I	insect damage
U	unhealthy for reasons other than the above

Table 6. Mean health class of deciduous vegetation by species and application rate.

Species	Application Rate (kg/ha)			
	4	3	2	0
	Number of Replications			
	2	2	2	1
	Mean Health Class/Sample Size			
elderberry	8.0/5	2.0/3	7.6/7	1.0/5
hazelnut	3.1/9	2.7/9	2.3/9	1.0/2
red maple	2.3/6	2.0/2	1.8/4	1.0/3
mountain maple	2.3/7	2.1/8	2.0/1	1.0/1
sugar maple	2.0/2	2.8/4	2.0/4	-
pin cherry	2.0/1	2.0/1	2.3/2	-
yellow birch	2.0/2	2.5/2	-	-

Table 7. Percent control of raspberry canes by application rate.

Rate (kg/ha)	% Control/Sample Size
4	99/10
3	94/10
2	100/10
0	0/5

Table 8. Condition of coniferous vegetation by species and application rate.

| Species | Rate (kg/ha) | Condition codes/sample size | | | |
		4	3	2	0
balsam fir		I/1	H, I/4	I, BR/2	-
white spruce		I/1	H/1	-	-

the open, under logging debris or under a herbaceous canopy consisting of raspberry and fireweed. Since some of the conifers were protected from direct herbicide spray, the true extent of possible conifer injury cannot be assessed.

The site chosen was unsuitable for any herbicide treatment. In the future, careful site selection could eliminate a reoccurrence of this problem. This was a poor site to carry out an aerial VELPAR application where efficacy data was to be collected for registration purposes. The site was unsuitable for two reasons: (1) it had not been properly site prepared in advance of a chemical site preparation and (2) weed species present on the site were not suitable candidates for a VELPAR treatment. The height and density of the existing vegetation, residual trees left standing after harvesting and a heavy accumulation of logging slash on the site would have made planting very difficult if not impossible even after a completely successful herbicide treatment. In certain instances, a successful chemical site preparation is not a substitute for other methods of site preparation (i.e., mechanical, fire). The residuals should have been felled and the entire area site prepared using mechanical means and/or prescribed fire to eliminate excessive logging slash. The presence of residual trees on the site also lessened the possibility of an even aerial herbicide application, and may have affected herbicide efficacy. The site was also unsuitable for a VELPAR treatment because of the species composition of the target vegetation. Prior to harvesting, the forest on the site was a northern hardwoods type (i.e. Acadian), composed of sugar maple, mountain maple,

red maple, yellow birch, balsam fir and to a much lesser extent white birch, aspen and spruce. To convert this site to one on which conifers can be established, a stronger herbicide than VELPAR (e.g., TORDON, GARLON) must be used to control deciduous regrowth from seed and coppice/sprout activity.

It is hoped that this study area will be left untouched for at least a period of one year so post-treatment evaluation can be properly completed. At one point, during the summer, the area was scheduled to be mechanically site prepared during the autumn months.

REFERENCE

Lehela, A. and R.A. Campbell. 1982. Instructions for Assessment of Glyphosate Forest Management Trials. Research Note, Ontario Ministry of Natural Resources. Pest Control Section, Maple, Ontario. 11 p.

APPENDIX I

Plot Cb (CONTROL): 0 Kg/ha

Quadrat No.	Species	Health Class	% Coverage/Control	Notes
1	elderberry	1		— browsing damage
	red maple	1		— a group of stump sprouts of which a few are completely killed
	raspberry		100/0	— 1 m in height (avg.)
				— some scattered goldenrod and fireweed
2	elderberry	1		— there is yellowing and browning of some outer leaves — possibly natural
	hazelnut	1		— there is browning of some leaves and evidence of chewing insect damage
	mountain maple	1		— insect damage; browsed; some brownout — possibly drift
	raspberry		100/0	— 10% canes dead — natural
3	elderberry	1		
	red maple	1		— some browsing and insect damage
	raspberry		100/0	— fireweed present but few
4	elderberry	1		
	red maple	1		— insect damage; brown mottling on leaves
	hazelnut	1		— overtopped by raspberry
	raspberry		100/0	— 10% canes dead — natural
5	elderberry	1		— minimal insect damage and browning
	raspberry		25/0	— 20% fireweed cover

Plot Ca: 2 Kg/ha (Swath 2)

Quadrat No.	Species	Health Class	% Coverage/Control	Notes
1	elderberry	3		- browning and curling of leaves
	red maple	2		- insect damage; brown mottling
	sugar maple	2		- insect damage; brown mottling
	mountain maple	2		- 9 to 10 m tall HW residuals
	hazelnut	2		- leaves browning; insect damage
	raspberry		85/100	
2	elderberry	11		- browsed; points of new growth flushing visible
	hazelnut	2		- insect damage; brown mottling
	sugar maple	2		- insect damage; mottling
	raspberry		100/100	
3	elderberry	3		- browning of leaves; browsing
	hazelnut	2		- insect damage; slight browning
	sugar maple	2		- browning of lower, outer leaves; some insect damage
	raspberry		90/100	- 1.5 m tall canes; one HW residual (12 m); scattered fireweed
4	elderberry	11		- browsing; leafy sprouts - flushed growth visible
	hazelnut	2		- insect damage; slight browning of outer leaves
	red maple	1		- insect damage; mottling
	raspberry		100/100	- 2 m tall canes; HW residuals (7-12 m)
5	elderberry	11		- new leafy growth flushing
	hazelnut	2		- severe insect damage
	sugar maple	2		- browning, curling of leaves; insect damage
	balsam fir	BR, I		- needles curled on ends of lateral
	raspberry		100/100	- HW residuals (10 m)

Plot Da: 2 Kg/ha (Swath 4)

Quadrat No.	Species	Health Class	% Coverage/Control	Notes
1	hazelnut	2		- insect damage; browning and curling of leaves
	raspberry		60/100	bunchberry - no damage; scattered HW residuals (10-13 m)
2	pin cherry	3		- insect damage
	hazelnut	3		- yellowing, browning of leaves; insect damage
	red maple	2		- stump sprouts (most are dead); browsing, insect damage
	raspberry		70/100	- scattered HW residuals (<10 m)
3	hazelnut	3		- yellowing of leaves; insect damage
	pin cherry	2		
	red maple	2		- stump sprouts; insect damage
	balsam fir	I, BR		
	raspberry		30/100	- yellowed ground pine; healthy bunchberry
4	elderberry	3		
	pin cherry	2		- browsing
	red maple	2		- stump sprouts - approx. 35% of them are dead; insect damage; mottling of leaves
	raspberry		30/100	- HW residuals (8-10 m) form a single row across swath between subplot 4 and 5.
5	elderberry	11		- browning of leafy flushed growth
	hazelnut	3		- browning; slight insect damage
	raspberry		25/100	- goldenrod browned out

22

Plot Ab: 3 Kg/ha (Swath 2)

Quadrat No.	Species	Health Class	% Coverage/Control	Notes
1	elderberry	2		
	hazelnut	3		
	mountain maple	2		– 35% of sprouts dead (condition 12)
	yellow birch	3		
	pin cherry	2		– browsing and insect damage
	balsam fir	I		– needles browning
	raspberry		75/100	– HW residuals (12–14 m)
2	elderberry	2		– browsed
	hazelnut	4		– browning and curling of leaves
	mountain maple	2		– 40–50% of sprouts dead
	balsam fir	H		– overtopped by hazelnut
	raspberry		<10/100	– HW and SW residuals (6 m)
3	hazelnut	2		
	red maple	2		
	mountain maple	2		
	sugar maple	4		– browsed; insect damage
	balsam fir	I		– needles brown on end of laterals – drooping – possible insect damage
	raspberry		20/40	– HW residual (5 m)
4	elderberry	2		
	hazelnut	3		– chewing insect damage
	mountain maple	3		– insect damage
	sugar maple	3		– insect damage
	raspberry		100/100	– HW residuals (12 m)
5	hazelnut	2		– insect damage
	mountain maple	5		– insect damage; yellowing and browning
	sugar maple	2		– 50% of sprouts are dead
	raspberry		100/100	– HW residuals (10–16 m)

Plot Bb: 3 Kg/ha (Swath 4)

Quadrat No.	Species	Health Class	% Coverage/Control	Notes
1	hazelnut	3		- insect damage; brown mottling
	mountain maple	1		- new sprouts; older sprouts dead
	sugar maple	2		- brown mottling
	raspberry		50/100	- HW residuals (8-10 m)
2	raspberry		25/100	- very wet; currant and thistle not damaged
3	hazelnut	3		- insect damage; brown spotting
	mountain maple	1		
	white spruce	H		
	balsam fir	H		
	raspberry		10/100	- HW and SW residuals (10-12 m)
				- very wet; dogwood and currant abundant
				- black ash - insect damage and wilting leaves
4	hazelnut	2		- some dead sprouts; insect damage
	yellow birch	2		- chewing insect damage
	mountain maple	1		- stump sprouts; black ash yellowed (2-3); dogwood (1); chokecherry; currant present
	raspberry		< 10/100	
5	hazelnut	2		- insect damage; brown spotting
	red maple	2		- insect damage; 40% of stump sprouts dead
	raspberry		90/100	- HW residuals (12 m)

Plot Aa: 4 Kg/ha (Swath 2)

Quadrat No.	Species	Health Class	% Coverage/Control	Notes
1	elderberry	2		
	hazelnut	4		– yellowing and browning
	red maple	2		– 60% sprouts are dead; browsed; insect damage
	raspberry		60/100	– HW residuals (5 m) – no foliage
2	elderberry	11		– browsed
	hazelnut	4		– insect damage
	mountain maple	2		
	raspberry		80/100	
3	hazelnut	2		– browsed; insect damage
	mountain maple	1		
	yellow birch	2		
	raspberry		75/100	
4	balsam fir	I		– insect damage to the leader; very wet site; heavy slash
	raspberry		< 10/100	
5	hazelnut	4		– browning and curling of leaves; possible mech. damage from felled residual
	red maple	2		
	raspberry		< 10/100	

Plot Ba: 4 Kg/ha (Swath 2)

Quadrat No.	Species	Health Class	% Coverage/Control	Notes
1	elderberry	11		
	hazelnut	3		- new leafy growth flushing; insect damage
	mountain maple	3		- yellowing; insect damage
	sugar maple	2		- browsed; 30% of sprouts are dead (12)
	red maple	3		- insect damage
	white spruce	I		- insect damage
	raspberry		10/100	- new growth browning at terminal buds
2	elderberry	10		
	hazelnut	2		
	red maple	2		- brown mottling
	mountain maple	2		- insect damage
	raspberry		40/100	- slight browning
3	hazelnut	2		- insect damage
	red maple	3		- extensive chewing insect damage; brown mottling
	mountain maple	3		- insect damage
	yellow birch	2		- insect damage
	raspberry		50/100	- 1.5 m in height; trembling aspen (condition 3)
4	elderberry	6		- possible mech. damage due to falling residual
	hazelnut	4		- insect damage
	mountain maple	2		- insect damage
	sugar maple	2		- insect damage
	pin cherry	2		
	raspberry		100/90	- live canes under protection of felled residual
5	hazelnut	3		- browning; browsed
	red maple	2		- insect damage
	mountain maple	3		- older sprouts dead (12)
	raspberry		20/100	- nearby trembling aspen (condition 10-11); bristly currant