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38

The Date Creek Silvicultural Systems Study in the Interior Cedar–Hemlock Forests of Northwestern British Columbia:

Overview and Treatment Summaries

1997

BRITISH COLUMBIA
Ministry of Forests
Research Program

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The Date Creek silvicultural systems study was initiated in 1990. Over the past seven years, there has been an extraordinary amount of work done to establish and implement the project. The overall research design resulted from a synthesis of ideas and suggestions provided by the principle researchers as well as Pierre Beaudry, Ian Cameron, Tracy Harmati, Paul Knowles, Will MacKenzie, Christian Messier, Dan Myrah, Jim Pojar, Sandra Thomson, and Rick Trowbridge. Vera Sit and Wendy Bergerud provided statistical advice throughout the development of the project. We are grateful to Norm Bilodeau, Paul Hanna, Tracy Harmati, and others from the Kispiox Forest District who administered the harvesting activities at Date Creek. Chris Clement completed the ecosystem map for the Date Creek research area with the assistance of Ministry of Forests Research staff. Anne Macadam and Bruce Colquhoun provided detailed soil descriptions for representative sites within the study area. John Parminter documented the fire history of the study area.

There were many people involved in the various components of the Date Creek silvicultural systems study. Members of the research teams responsible for individual components/experiments are listed in Section 4. Under the direction of these researchers, the following individuals are recognized for their assistance in completing the fieldwork of the different projects: Mike Classen, Solvej Patschke, Dirk Septer, and classes from the Northwest Community College Forest Technician Program (1994–97) (hydrological studies); Ken MacKenzie, Todd Mahon, Mike Force, Lisa Hartford, Jason Jones, Jeff Lemieux, Lisa Mahon, Sean Mitchell, David Patterson, Mark Perdue, and Chandra Wong (wildlife studies); Saleem Dar, Ronnie Drever, Jodi Friesen, Candace Ford, Kristi Iverson, Marcel Lavigne, Rob Meissner, Duncan Moss, Jenyfer Neumann, Jennifer Penny, Les Priest, and Tara Wylie (ecology and silviculture studies).

We would also like to thank Loretta Kent for the GIS digitization of the aerial photos and production of the study area and treatment maps. Russell Klassen is gratefully acknowledged for his valuable assistance with data entry and synthesis for all components of the project. Research Branch Production Resources were helpful in co-ordinating and editing the final publication and provided valuable advice on layout and design.

The B.C. Ministry of Forests, Silviculture Branch provided the funding for the Date Creek silvicultural systems study.

TABLES

FIGURES

The Date Creek silvicultural systems study was one of several research projects established throughout British Columbia in the early 1990s to examine alternatives to traditional clearcut harvesting. Large-scale clearcutting had been the silvicultural system of choice in the province (90% of the Crown land harvested between 1984–1994; British Columbia Ministry of Forests 1994). However, public demand and changing professional perspectives resulted in new forest policy that calls for a broader range of forest management options. British Columbia's new Forest Practices Code requires forest managers to consider a range of silvicultural systems to promote forest regeneration and maintain biodiversity.

To meet new silvicultural, ecological, and social management objectives, silvicultural systems must evolve beyond their traditional emphasis on timber production to include the broader objectives of protecting sensitive species, sustaining ecosystem function (diversity, productivity, nutrient cycling, and resilience), and identifying sustainable levels of use for a broad range of renewable resources. An understanding of forest dynamics and succession is critical to effectively manage forests for both conservation and timber production. The Date Creek silvicultural systems study comprises a multidisciplinary set of experiments that examines ecosystem processes and timber production in undisturbed, partially cut, and clearcut stands within the transitional coastal-interior forests of northwestern British Columbia.

This report provides background information on the Date Creek silvicultural systems study. This information is presented in three major sections. The first section gives an overview of the Date Creek study area; its climate, soils, vegetation; and the experimental design and treatments used in the research. The second section supplies detailed background information on the Date Creek research area (ecosystem mapping and soils) and the individual treatment units that comprise the Date Creek silvicultural systems study (ecosystems, soils, pre- and post-treatment stand structure). Finally, we briefly describe the various experiments that are under way and the names of the individual researchers involved.

The overall goal of the Date Creek silvicultural systems study is to better understand ecosystem function and to help develop silvicultural systems that maintain biological diversity, hydrological integrity of watersheds, wildlife habitat, and wood production.

2.1 Study Area

The 4000-ha Date Creek research area is located in northwestern British Columbia, Canada (55°22′N, 127°50′W), 21 km north of the town of Hazelton (Figure 1). It lies within the traditional territories of the Gitxsan First Nation and includes the House territories of Wii Eelast (Jim Angus), Delgamuukw (Earl Muldoe), Ma'uus (Jeff Harris, Jr.), and Kliiyem Lax Haa (Eva Sampson); and is part of the Kispiox Forest District of the Prince Rupert Forest Region.

The Date Creek research area is part of the Nass Basin ecoregion of the Coast and Mountains ecoprovince (Demarchi et al. 1990), and lies within the Interior Cedar–Hemlock (ICH) biogeoclimatic zone (Pojar et al. 1987, Meidinger and Pojar 1991, and Banner et al. 1993). The Hazelton variant of the moist cold subzone (ICHmc2) is the dominant biogeoclimatic unit. Where elevations greater than

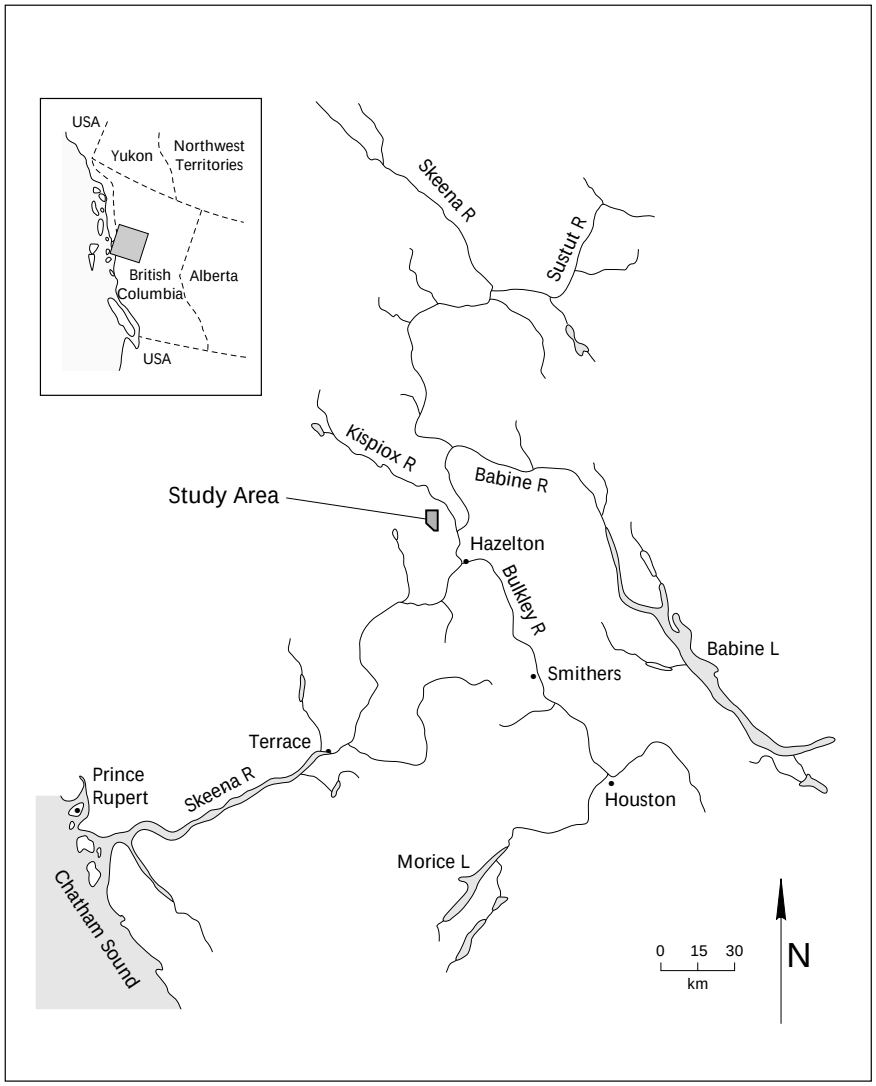


FIGURE 1 *Geographic location of the Date Creek research area.*

780 m occur, the amabilis fir phase, Nass variant, ICH moist, cold subzone (ICHmc1a) is present.

The mountainous nature of the study area results in climatic variation occurring over relatively short distances. Variations correspond to elevation and surrounding topography. The moderate to steep lower slopes of the Kispiox Range make up one half of the total area. The rest of the area is a rolling morainal landscape, dissected by many glacial meltwater channels. The total elevational gradient is 350–1100 m.

The closest long-term weather station (Temlaham: 55°12′N, 127°44′W, 122 m) is approximately 25 km to the south. Weather data from the years 1973–92 (Environment Canada 1994) are summarized as follows:

- annual precipitation is approximately 610 mm (range: 477–724 mm);
- annual snowfall averages 184 cm (range: 90–350 cm; 1 cm snow = 1 mm water);
- annual rainfall averages 426 mm (range: 302–525 mm);
- total number of days per year with precipitation is 169 (snow = 48 days, rain = 128 days).

The mean number of days with precipitation per month is shown in Figure 2, while total precipitation distribution over a year is shown in Figure 3. The mean number of frost-free days per year is 109, with the frost-free season occuring from early June to mid-September. The average, maximum, and minimum daily temperatures by month are presented in Figure 4.

Morainal parent materials dominate the area, ranging in texture from loamy sand to clay loam. Eluviated Dystric Brunisols, Orthic Dystric Brunisols, and Orthic Humo-Ferric Podzols (Agriculture Canada Expert Committee on Soil Survey 1987) are the most common soils, and Hemimors and Mormoders (Green et al. 1993) are the most common humus forms. Section 3.2 provides more information about soils.

Forests in the research area are dominated by a mixture of conifer and deciduous tree species. In mature forests, western hemlock (*Tsuga heterophylla* [Raf.] Sarg.) dominates, but is mixed with western redcedar (*Thuja plicata* Donn ex D. Don in Lamb), subalpine fir (*Abies lasiocarpa* [Hook.] Nutt.), lodgepole pine (*Pinus contorta* var. *latifolia* Engelm.), hybrid spruce—the complex of white spruce (*Picea glauca* [Moench] Voss), Sitka spruce (*P. sitchensis* [Bong.] Carr.), and occasionally Engelmann spruce (*P. engelmannii* Parry ex Engelm.), paper birch (*Betula papyrifera* Marsh.), trembling aspen (*Populus tremuloides* Michx.), and black cottonwood (*Populus balsamifera* ssp. *trichocarpa* Torr. & Gray). Amabilis fir (*Abies amabilis* [Dougl. ex Loud.] Forbes) occurs at higher elevations. Autecological characteristics of these species are found in Krajina (1969), Minore (1979), Krajina et al. (1982), Burns and Honkala (1990), and Coates

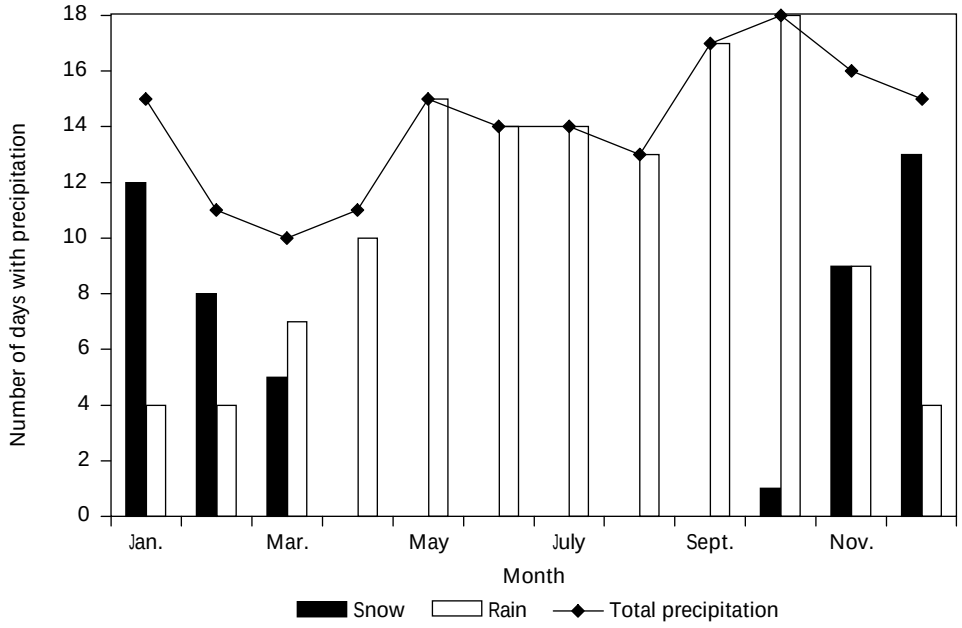


FIGURE 2 *Mean number of days per month with precipitation, 1973–1992.*

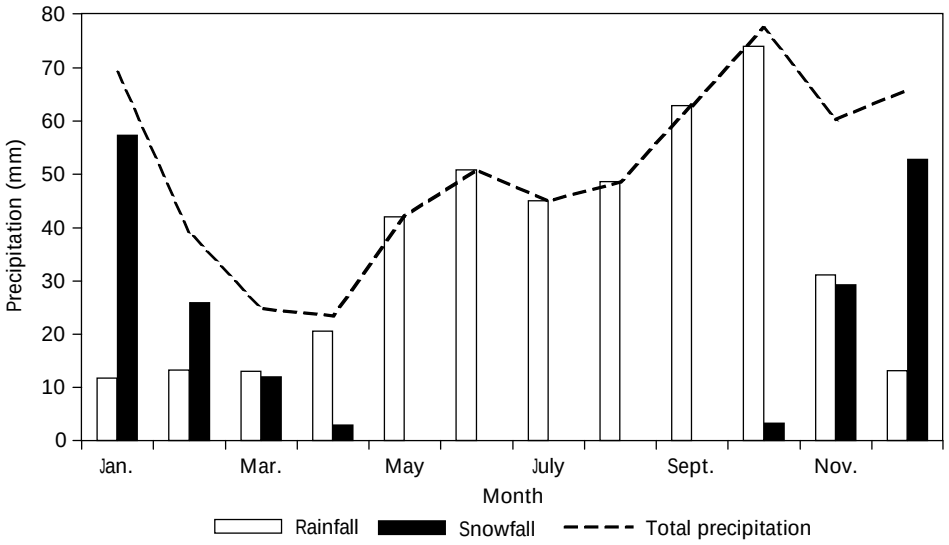


FIGURE 3 *Mean monthly precipitation, 1973–1992. Snowfall is recorded as the water equivalent (i.e., 1 cm snow = 1 mm water).*

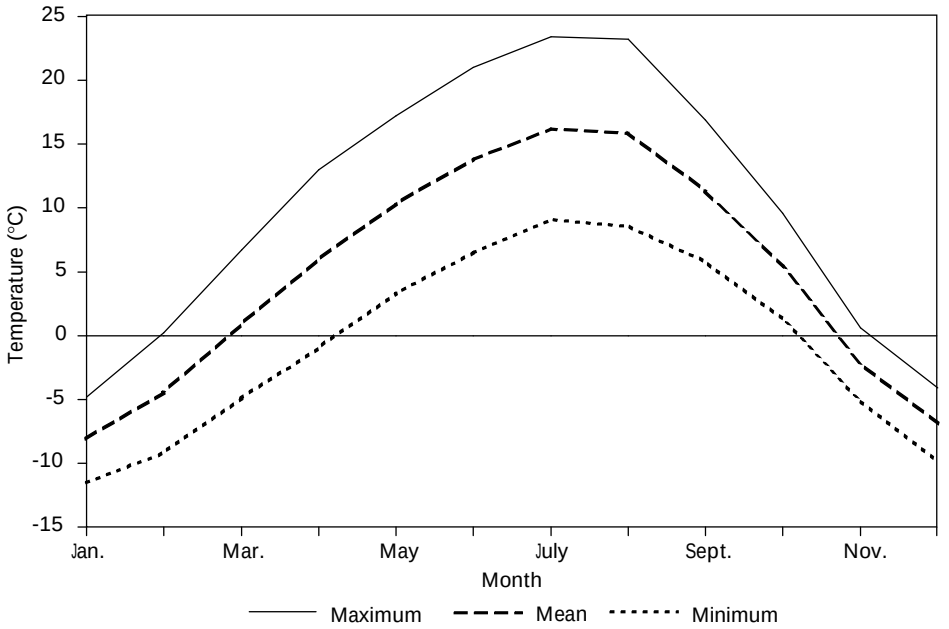


FIGURE 4 *Monthly maximum, minimum, and mean daily temperatures, 1973–1992.*

et al. (1994). Old-growth forests are dominated by western hemlock with minor components of subalpine and amabilis fir, and western redcedar.

Within the Date Creek research area, zonal ecosystems (intermediate in soil moisture and nutrients within a biogeoclimatic unit, Banner et al. 1993) have a thick layer of moss dominated by red-stemmed feathermoss (*Pleurozium schreberi*), step moss (*Hylocomium splendens*), knight's plume (*Ptilium crista-castrensis*), and electrified cat's-tail moss (*Rhytidiadelphus triquetrus*). The shrub and herb layers are poorly developed and are typified by scattered oval-leaved blueberry (*Vaccinium ovalifolium*), Alaskan blueberry (*V. alaskaense*), or black huckleberry (*V. membranaceum*), bunchberry (*Cornus canadensis*), five-leaved bramble (*Rubus pedatus*), one-sided wintergreen (*Orthilia secunda*), and prince's pine (*Chimaphila umbellata*). Wetter sites are characterized by devil's club (*Oplopanax horridus*), black gooseberry (*Ribes lacustre*), high-bush-cranberry (*Viburnum edule*), oak fern (*Gymnocarpium dryopteris*), lady fern (*Athyrium*

filix-femina), and leafy mosses (*Mnium spp.*). Areas transitional to wetlands are dominated by a combination of mountain alder (*Alnus incana* ssp. *tenuifolia*), skunk cabbage (*Lysichiton americanum*), and lady fern. Open wetlands occur throughout and are treed (with black spruce [*Picea mariana*] dominant), shrubby, or herbaceous. Wetlands exhibit considerable floristic diversity related to moisture source and state of peat decomposition. For a complete list of plant species found within the Date Creek research area, refer to Appendix 1.

Within the research area, wildfires have significantly affected the species composition and structural development of the forests. Surface or combination surface and crown fires of low to medium-high intensity are typical throughout the ICH zone. Historically, fires averaged 150–500 ha, smaller fires (<5 ha) were common, particularly in wetter areas, and occasional fires of >10 000 ha occurred. Mean fire return intervals are 150–250 years, but can be as low as 100 years or as great as 350 years (Parminter 1990).

The two major forest ages (mature and old growth) of the Date Creek research area originated from stand-destroying fires. Aging of trees showed that most stems in the mature forests became established after a catastrophic fire in 1855, with some veteran trees surviving an earlier lower-intensity fire in 1834. In both fires, most of the existing forest cover was destroyed, leaving only a few surviving individuals or patches. Approximately 85% of this mature stand became established within the first 30 years, with recruitment continuing for 90 years (Figure 5). The resulting mixed species, 135-year-old stands (as of 1990) that originated from the 1855 fire are currently near the end of the stem exclusion stage of development. LePage (1995) provides detailed information on stand structure and development pattern of the mature forests in the Date Creek research area. The old-growth forests in the area became established after a stand-destroying fire 350–370 years ago.

Small-scale disturbances caused by blowdown, insects (*Dendroctonus ponderosae*, *D. rufipennis*, *Dryocoetes confusus*), and fungi (*Phellinus pini*, *Fomitopsis pinicola*, *Phaeolus schweinitzii*, and *Inonotus tomentosus*) are found in virtually every stand within the ICH zone (Banner et al. 1993).

2.2 Methods

We undertook extensive ecosystem mapping of the Date Creek research area to help define the types of ecosystems and seral stages in which to establish the silvicultural systems study (refer to section 3.1 for further details on the ecosystem mapping procedure). We found the research area to be representative of the ICHmc2, with the mesic site series

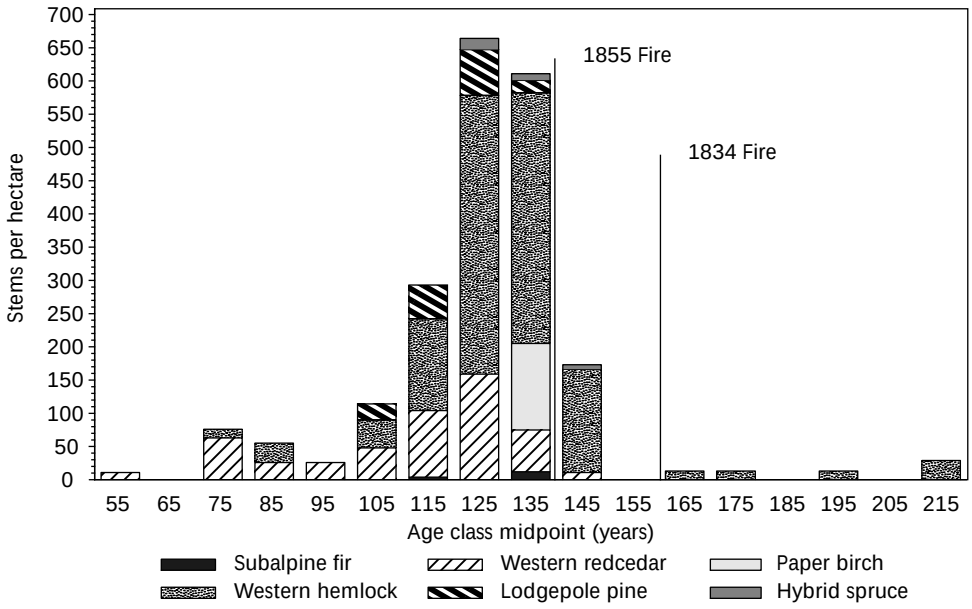


FIGURE 5 *Age distribution of mature (135 years) stands at Date Creek, by species (from LePage 1995).*

(Hw–Step moss; 01) in either the mature or old-growth successional stages the most common forest types (Tables 1 and 2).

We chose to establish a replicated experiment with the majority of replicates in mature stands dominated by the mesic site series, because the mature successional-stage stands were considered more suitable to long-term silvicultural manipulation than old-growth stands. However, there was also interest in the potential for partial cutting in old-growth forests, so these were also included in the experimental design.

TABLE 1 *Area of each ICHmc2 site series within the Date Creek research area*

Number code	Site series[a]	Area (ha)	% of total area
01[b]	Hemlock–Step moss (mesic phase)	2518.90	63.5
01(b), 51	Hemlock–Step moss (submesic phase); $Pine–Hemlock–Feathermoss (seral)[c]	17.56	0.4
03	Hemlock–Cedar–Oak fern	151.49	3.8
04, 05, 54	Cedar–Hemlock–Devil's club–Oak fern; Spruce–Devil's club–Lady fern; $Spruce–Paper birch–Devil's club (seral)	639.95	16.1
06	Cottonwood–Spruce–Dogwood (floodplain)	22.96	0.6
07	Cedar–Spruce–Horsetail–Skunk cabbage	240.61	6.1
08	Black spruce–Hybrid spruce–Scrub birch–Sedge (forested swamp)	28.76	0.7
31, 32	Non-forested bog; Non-forested fen/marsh	142.56	3.6
52	$Spruce–Paper birch–Thimbleberry–Hazelnut (seral)	168.47	4.3
Open water		36.20	0.9
Total		3967.43	

[a] The site series were often grouped during classification (e.g. site series 01(b) and 51 have a composite area).
[b] The mesic phase of 01 is also referred to as 01(a) in this report.
[c] Site series preceded by a $ denotes a seral association. Site series as described in Banner et al. (1993).

TABLE 2 *Area of each successional stage in the Date Creek research area*

Successional stage[a]	Area (ha)	% of total area
1. Non-vegetated	90.29	2.3
2. Herb	101.18	2.6
3. Shrub	224.57	5.7
4. Pole-sapling	249.73	6.3
5. Young forests	394.64	10.0
6. Mature forests	1796.72	45.3
7. Old growth	1074.10	27.1
8. Open water	36.20	0.9
Total	3967.43	

[a] See Table 6 for definitions of these stages and Figure 11 for a map showing the distribution of successional stages within the Date Creek research area.

2.2.1 Identification of treatment units and experimental blocks

A randomized block experimental design was selected to help minimize the effect of ecosystem type and forest age on treatment response variability. Treatment units were blocked primarily by the distribution of site series and sucessional stage (mature or old growth; Table 3). Four site series/age combinations were selected:

1. dominated by mesic site series, 135 years old
2. approximately 70% mesic with the remainder of the site series drier than mesic, 135 years old
3. approximately 70% mesic with the remainder of the site series wetter than mesic, 135 years old
4. dominated by mesic site series, 350 years old.

Three experimental blocks were located in mature stands (135 years old) and one in old growth (approximately 350 years old).

Using the ecosystem map of the study area, treatment units of approximately 20 ha (Table 3)

TABLE 3 *Treatment units of the Date Creek silvicultural systems study*

Block	Unit	Treatment	Elevation (m)	Area (ha)
1	D2	Clearcut	600–630	16.0
mesic,	D4	Heavy removal	470–505	18.9
old growth	D5	Light removal	610–665	17.4
	D3	No harvest	470–600	24.4
2	A1	Clearcut	420–440	11.5
mesic to submesic,	B3	Heavy removal	440–480	22.0
mature	A2	Light removal	435–450	18.5
	B1	No harvest	370–440	20.1
3	B4	Clearcut	430–460	18.5
mesic,	C2	Heavy removal	480–590	20.6
mature	B5	Light removal	400–440	17.8
	C1	No harvest	480–590	21.6
4	A3	Clearcut	400–440	25.3
mesic to subhygric,	B2	Heavy removal	410–480	25.2
mature	C3	Light removal	455–480	22.9
	A4	No harvest	400–440	38.2

were selected in mature and old-growth forest stands. This size was considered the minimum suitable for the study of populations of small mammals and birds, and for operational feasibility.

To further assist in ensuring the effectiveness of the experimental blocking in reducing variability, all proposed treatment units were assessed for eight stand characteristics using a 100 × 100 m grid. The stand characteristics were:

- conifer tree species diversity (1 = low; 3 = high)
- incidence of disease (1 = low; 3 = high)
- diversity of site series (1 = mostly one; 3 = mixture)
- diversity of terrain (1 = broken, difficult; 3 = easy)
- diversity of wildlife trees/areas (1 = little; 3 = considerable)
- deciduous component (1 = high; 3 = low)
- general heterogeneity (1 = very uniform; 3 = very mixed)

Each potential treatment unit was compared to all others using the stand characteristic data, site series map, and general impressions. The resulting similarity matrix was used to ensure reasonable uniformity within experimental blocks and to eliminate treatment units with unsuitable characteristics (e.g., high incidence of disease).

Since experimental blocks are based on successional stage and the distribution of site series, adjacent treatment units (with the same letter or geographic designation) are not necessarily in the same experimental block.

The four experimental treatments were then randomly assigned to the treatment units within each experimental block. A map of experimental block and treatment unit locations is shown in Figure 6.

2.3 Treatments

The treatments represent differing amounts and patterns of tree removal. The intent was to create four differently structured treatments that would provide a wide variety of environmental conditions both between and within treatments. In addition to creating four distinct levels of tree removal (at the treatment unit scale), we wanted to establish a range of canopy opening sizes. These ranged from the removal of single trees to approximately 0.5 ha openings in the partially cut treatment units; to single, large openings in the clear-cut treatment units; and a range of natural openings in the no-harvest treatment units. Finally, we wanted an operationally feasible harvesting design that could be administered by the Small Business Forest Enterprise Program of the Kispiox Forest District. These requirements collectively drove the design of the treatments, not a desire to establish tests of the classic silvicultural systems ("selection", "shelterwood", etc.; Matthews 1989).

The treatments were:

1. No harvest: this treatment represents the undisturbed forest (Figure 7).

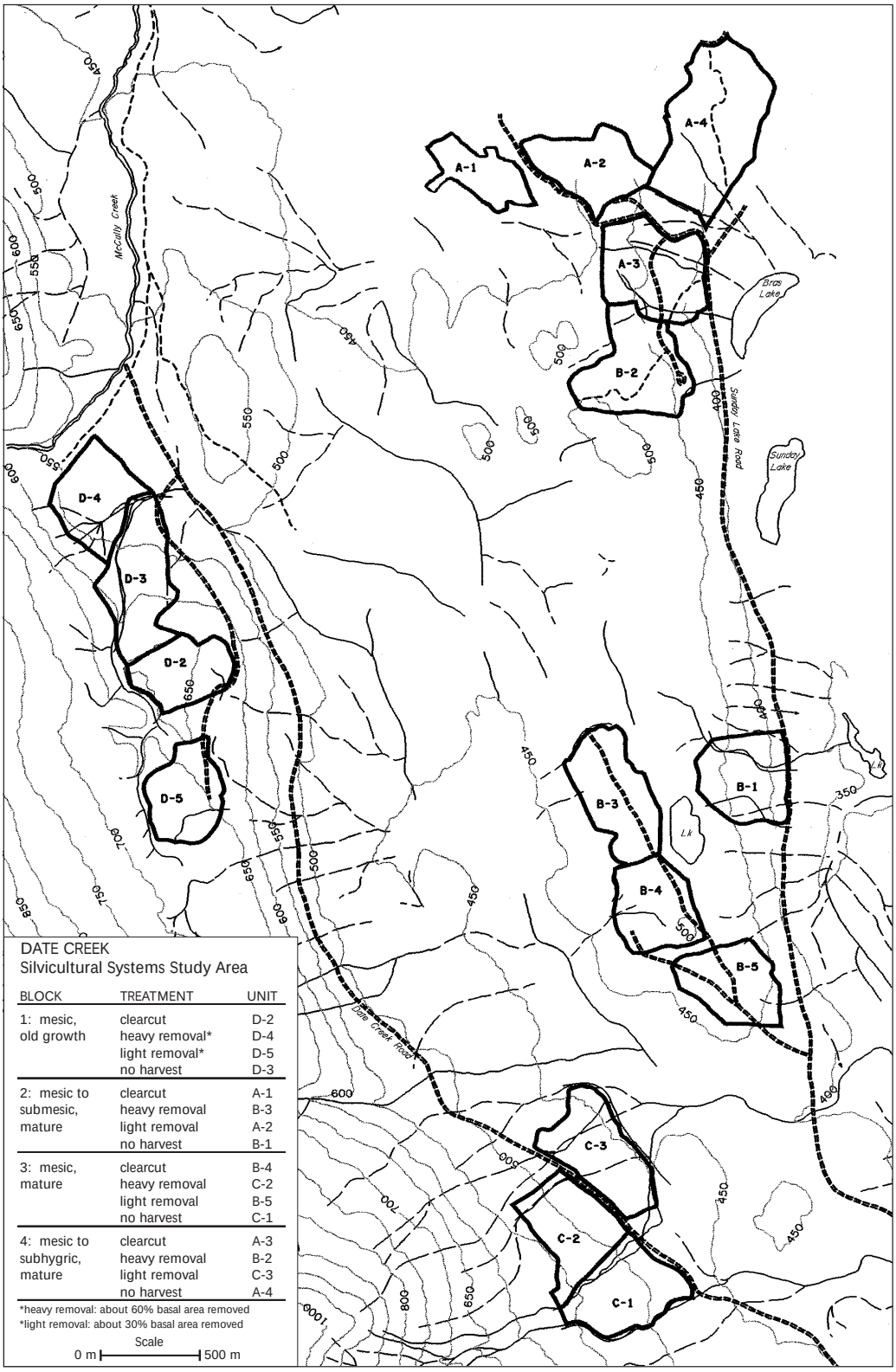


FIGURE 6 *Distribution of experimental blocks, treatments, and units within the Date Creek silvicultural systems study area.*

2. Light removal: where approximately 30% of the volume was removed in either single stems or small groups of stems (i.e., similar to single-tree or group-selection, or an initial shelterwood removal [Matthews 1989]) (Figure 8).
3. Heavy removal: where approximately 60% of the volume was removed using a combination of small patch cuts (1000–5000 m^2) and single-tree to small group-selection in the forest matrix between patch cuts (i.e., overall similar to the irregular shelterwood system [Matthews 1989])(Figure 9).
4. Clearcut (total removal): all merchantable trees were harvested; where possible, deciduous trees and conifers below the merchantable limit were left as individuals or in small clumps (Figure 10).

FIGURE 7 *Overview of the no harvest (foreground), and heavy removal treatments and a clearcut.*

FIGURE 9 *Heavy removal treatment.*

FIGURE 8 *Old-growth light removal treatment.*

FIGURE 10 *Aerial view of clearcut.*

2.4 Harvesting

All harvesting activities were administered under the Small Business Forest Enterprise Program of the Kispiox Forest District. Harvesting rights were sold competitively and the Small Business Forester specified the type and size of equipment for use in each harvesting treatment.

Field planning and layout were completed by June 1992. Before harvesting, all access roads were constructed and skid trails and landings within treatment units were marked and mapped. Trees selected for harvesting were marked with yellow ribbon at DBH and with yellow tree-marking paint on the stem at ground level.

In the light removal treatment units, approximately 30% of the volume was removed across all species and diameter classes. In the heavy removal treatment units, all trees in the small patch cuts were marked before removal. In the remaining forest matrix surrounding the patches, approximately 50% of the trees were removed across all species and diameter classes. Trees on proposed landings, skid roads, and in-block spur roads contributed to the harvest volume required by the silvicultural prescriptions.

The contractors involved in the harvesting used various harvesting techniques (Table 4), detailed in Thibodeau et al. (1996). Contractors were allowed to make minor modifications to tree marking for operational and safety concerns.

The three experimental blocks containing mature forests were harvested in the summer and fall of 1992. The old-growth experimental block was logged in winter 1992–93 to prevent damage to riparian areas within one of the treatment units.

Colour air photos (1:10 000) were taken of the 16 treatment units in the Date Creek silvicultural systems study, both before and after harvesting. These photos provide a visual record of treatment unit layout and harvesting pattern. The photos were used to map and digitize the open and forested areas of the stands. (See Table 5 for the approximate proportion of openings and forested areas in each treatment unit; and Appendix 2 for 16 maps presenting the distribution of openings within each treatment unit.)

2.5 Experimental Approach

Within the Date Creek silvicultural systems study, individual experiments were designed to operate at several scales:

- the stand scale (a treatment unit);

TABLE 4 *Summary of the licence holders, stumpage rates, and equipment used for each treatment unit*

Treatment	Unit	TSL #	Licence holder	Stumpage paid[a] ($/m^3)	Equipment used
Clearcut	A1	A36517	A. Larson	24.13	Feller-buncher/skidder
Light removal	A2	A40478	L. Montgomery	11.00	Small cat/skidder[b]
Clearcut	A3	A44413	B. Koning	21.51	Feller-buncher/skidder
Heavy removal	B2	A40474	R. Carle	13.51	Hand felling/skidder
Heavy removal	B3	A40473	Briela Logging	17.25	Feller-buncher/skidder
Clearcut	B4	A40473	Briela Logging	17.25	Feller-bunchers/skidder
Light removal	B5	A40477	C. Matheson	0.25	Hand felling/horse/skidder on designated trails
Heavy removal	C2	A40475	Briela Logging	20.06	Feller-buncher/skidder
Light removal	C3	A40476	Russ Webb	1.57	Hand felling/horse
Clearcut	D2	A40472	R. Carle	14.01	Hand felling/skidder
Heavy removal	D4	A40472	R. Carle	14.01	Hand felling/skidder
Light removal	D5	A40479	R. Carle	10.25	Hand felling/skidder

[a] Stumpage paid is based on bonus and upset. Upset stumpage rate for small business sales is determined by the Ministry of Forests and is based on the reserve rate (calculated by a formula which combines three variables: provincial base rate, value index which [calculated for each timber sale], and a mean value index [determined by averaging the value indices of stands harvested in the previous year]) and the levies (added to the reserve rate to account for operational activities [e.g., access construction] performed by the Ministry). Bonus bid is determined through competition and is the number of dollars per m^3 a small business is willing to pay for the timber, in addition to the upset stumpage rate. For further information, consult the Ministry of Forests Appraisal Manuals.

[b] Part way through harvesting, this unit was taken over by Russ Webb horse logging company.

TABLE 5 *Post-treatment area of openings and forested areas by treatment unit, based on digitized aerial photographs; openings are either natural or artificial (i.e., created by harvest activity: roads, rights-of-way, canopy gaps, landings, etc.)*

Treatment	Block	Unit	Forested areas (ha)	Openings (ha)		Total (ha)
				Natural	Artificial	
Clearcut	1	D2	0.0	0.0	16.6	16.6
	2	A1	0.0	0.0	11.5	11.5
	3	B4	1.3	0.0	19.1	20.4
	4	A3	0.6	0.0	29.1	29.7
Heavy removal	1	D4	13.3	0.0	4.8	18.1
	2	B3	16.0	0.0	6.7	22.7
	3	C2	15.2	0.0	6.6	21.8
	4	B2	18.8	0.0	6.3	25.1
Light removal	1	D5	13.7	0.0	3.3	17.0
	2	A2	16.8	0.9	3.8	21.4
	3	B5	15.4	0.0	3.4	18.8
	4	C3	21.8	0.0	2.0	23.7
No harvest	1	D3	23.0	0.0	0.6	23.7
	2	B1	20.3	0.4	0.7	21.3
	3	C1	19.3	0.0	0.0	19.3
	4	A4	48.8	2.0	0.1	50.9

- the gap scale (canopy gaps ranging from 10–5000 m^2); and
- the microsite scale (individual spots or organisms).

For example, studies such as small mammal population responses, hydrologic responses, or timber production are appropriate at the stand scale; experiments that examine natural regeneration of trees, tree seedling growth, or plant species diversity can operate at all three scales. Microsite-scale studies will generally examine individual responses, such as the success of natural regeneration on a specific microsite, or the growth of an established tree seedling under a particular level of canopy shading.

A key theme in the design of the Date Creek study was to move beyond comparisons of traditional silvicultural systems. Smith (1993), in his review of the Ministry of Forests silvicultural systems research program, suggested that silvicultural systems should not be limited to classical definitions (e.g., "group-selection" or "uniform shelterwood"), but rather the component parts of the systems (e.g., opening size, amount of tree removal, etc.) should be the object of the study. Weetman (1995) believes that European silvicultural practices cannot serve as a model for Canadian silvicultural prescriptions that are intended to meet multiple-use objectives. He suggests that when dealing with old forests that have no management history, forest stewardship must be flexible, innovative, and based on an understanding of forest dynamics. An understanding of the spatial and temporal dynamics of forest response to different kinds, sizes, frequencies, and intensities of disturbance is necessary to successfully predict the effect of a particular silvicultural practice. The Date Creek study encourages the study of the many component parts that make up silvicultural systems, whether traditional or innovative new systems. Using this approach, organisms, ecosystem processes, and timber production can be predicted under a wide range of possible silvicultural prescriptions.

3.1 Ecosystem Mapping

3.1.1 Methods

We prepared a base map of biogeoclimatic ecosystem units for the Date Creek research area before starting the silvicultural systems study. The forested and non-forested ecosystems in the area were classified and mapped in 1991 using three descriptors: site series, seral association, and successional stage. The site series describes the ecological potential of the site and is named according to the mature or climax plant community occuring on a specific moisture and nutrient combination (Banner et al. 1993). The seral association describes a seral plant community that has resulted from a disturbance such as fires or land clearing (Banner et al. 1993). Successional stage emphasizes structural and developmental differences among stands. Thus, the successional stage characterizes the present physiognomic or structural development stage of a site series, without reference to species composition. Seven successional stages were recognized and defined in Table 6.

Colour aerial photos (1:10 000) were pre-typed into preliminary ecosystem units before fieldwork began. To accomplish this, an *a priori* ecosystem classification was developed that incorporated existing classifications (Haeussler et al. 1985) and personal knowledge of the study area. Transects were overlain through the resulting polygons and 156 reconnaissance vegetation/soil plots were located and sampled (polygon sampling intensity was approximately 35%). Within each sampled polygon, the plot location was selected to characterize typical landscape and vegetation features. Information collected followed the format of Luttermerding et al. (1990) and included site data (elevation, aspect, slope, moisture regime, nutrient regime, etc.) and plant species data (complete list of vascular plants, mosses, and lichens with percent cover estimates). Soil pits were dug at each location and records made of horizons, horizon depths, texture, coarse fragment content, roots, humus form, and depth (Agriculture Canada Expert Committee on Soil Survey 1987; Green et al. 1993). (See Appendix 3 for a summary of the vegetation and soils data of each site series–successional stage combination found in the Date Creek research area).

The pre-typed polygon boundaries were modified and finalized based on field observations, and ecosystem unit classification was also revised to reflect fieldwork. Data were synthesized using standard sorting techniques (Westoff and van der Maarel 1978). For each ecosystem unit, mean cover and frequency values were calculated. The polygons were transposed to a base map and the final map was digitized. The final 1:10 000 ecosystem map is presented in Clement and Banner (1992).

3.1.2 Ecosystem Distribution in the Research Area

Most of the site series of the ICHmc2 (Banner et al. 1993) are present within the Date Creek research area (Table 1). Hemlock–step moss (01) is the dominant site series, comprising approximately 63% of the total research area. The submesic phase of the hemlock–step moss site series (01b) is always a minor component within an 01a (mesic phase) matrix and is distinguished from the mesic phase mainly on the basis of parent material. The various site series containing devil's club (composite of 04, 05, 54 site series) make up the second most commonly occurring ecosystem unit, occupying 16.1% of the landscape.

Mature and old-growth forests (successional stages 6 and 7) dominate the landscape, comprising 45% and 27%, respectively (Table 2). Mature forests of the hemlock–step moss site series are well-developed, productive and the most common in the research area. Old-growth forests of the hemlock–step moss site series are dominant on the slopes of the Kispiox Range. The pre-treatment distribution of successional stages within the research area is presented in Figure 11.

3.1.3 Ecosystem distribution within the treatment units

In addition to the base map of ecosystem units of the entire research area at 1:10 000, each treatment unit was traversed and mapped at a scale of 1:5 000. The site series found in each treatment unit and the percentage of area occupied by each site series are summarized in Table 7. (See Appendix 4 for the distribution of site series within each of the 16 treatment units.)

3.2 Soils

3.2.1 Methods

To supplement the pre-treatment descriptions of the vegetation and environmental attributes of the

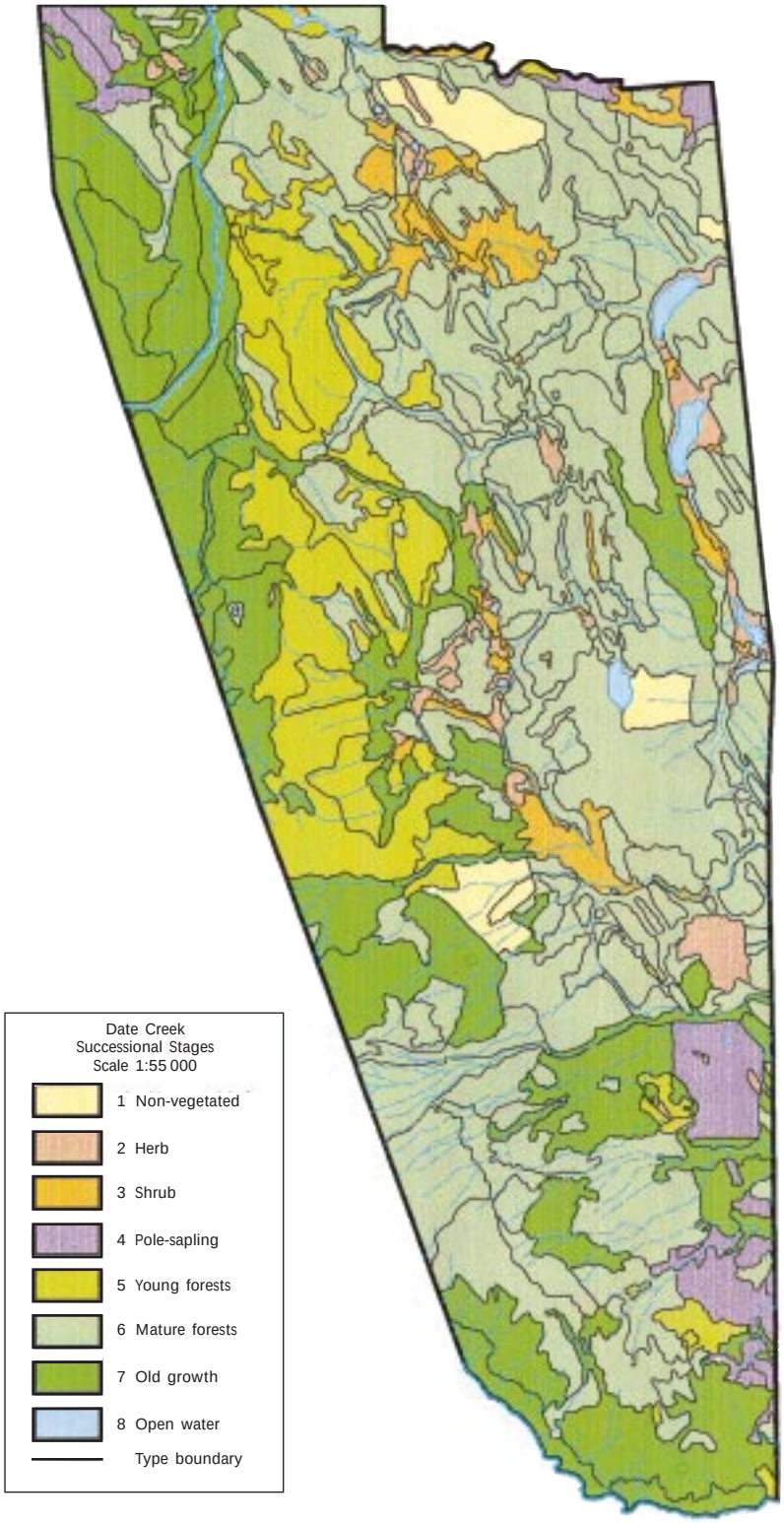


FIGURE 11 *Pre-treatment distribution of successional stages present at the Date Creek research area.*

Date Creek research area, soils information was also collected. Background information on the soils found at the Date Creek research area came from two sources:

1. generalized descriptions of soil and site features by site series (Table 8), based on a relatively large number of reconnaissance samples from the ecosystem mapping of the area (see section 3.1 and Appendices 3 and 4);
2. more detailed soil profile descriptions and a sampling of the chemical properties associated with five dominant site series within the research area (Colquhoun and Macadam 1993).

Locations representative of the five common site series were identified on the basis of vegetation and soil moisture and nutrient regimes. Detailed pedon descriptions were carried out at four locations in the hemlock–step moss site series, mesic phase (01a); one in the hemlock–step moss site series, submesic phase (01b); two in the hemlock–cedar–oak fern site series (03); three in the cedar–hemlock–devil's club–oak fern site series (04); and one in the cedar–spruce–horsetail–skunk cabbage site series (07). Humus-form descriptions and classification follow Green et al. (1993), descriptions of mineral soil and site properties follow Luttermerding et al. (1990) and mineral soil classification follows Agriculture Canada Expert Committee on Soil Survey (1987). Samples of the forest floor and each major mineral horizon were collected and sent to the Ministry of Forests Lab in Victoria. Samples were analyzed for total carbon and nitrogen; cation exchange capacity; exchangeable calcium, potassium, and magnesium; mineralizable nitrogen; available phosphorous; and pH.

3.2.2 Soil profiles

Although 11 soil profiles were completed, we present only 7 representative profiles in this report because some of the 11 profiles were classified as the same or very similar soil types. Tables 9–15 present the detailed soil descriptions of 7 common soils at the Date Creek research area. The soil descriptions are summarized by site series as follows (site series nomenclature as per Banner et al. 1993).

Hemlock–Step moss; mesic phase (ICHmc2/01a) Soils that developed in coarse-loamy morainal parent materials were classified as Orthic Humo-Ferric Podzols (Table 9) and Eluviated Dystric Brunisols (Table 10). A Brunisolic Gray Luvisol was described in finer-textured morainal till material (Table 11). In this site series, Hemimor humus forms were common and dominated by strongly matted Fm horizons.

Hemlock–Step moss; submesic phase (ICHmc2/01b) The soil was classified as an Orthic Humo-Ferric Podzol. Typical of this site series, the forest floor has a relatively shallow Hemimor (4 cm) consisting of a strongly matted Fm horizon, underlain by medium- to very coarse-textured mineral soil horizons with a high coarse fragment content.

Hemlock–Cedar–Oak fern (ICHmc2/03) Soils identified in this site series were imperfectly drained and classified as gleyed subgroups of the Gray Luvisol great group. One soil type had a thin Ah horizon underlying a relatively deep Lignomor humus form, dominated by a layer of decaying wood (Table 12). Another type had a Mormoder humus form which is indicative of activity by both fungal and faunal decomposers (Table 13).

Cedar–Hemlock–Devil's club–Oak fern (ICHmc2/04) Mineral soils were classified as Gleysols, and as the gleyed subgroup of the Humo-Ferric Podzol great group. Soils had Mormoder humus forms, suggestive of somewhat higher than average rates of nutrient cycling and nutrient availability. Table 14 presents the soil profile description and the results of the chemical analyses for one soil type in this site series (Orthic Luvic Gleysol).

Cedar–Spruce–Horsetail–Skunk cabbage (ICHmc2/07) The mineral soil profile sampled in this site series showed evidence of on-going saturation and was classified as an Orthic Gleysol (Table 15). At the time of sampling in early July, the water table was within 15 cm of the mineral soil surface.

3.2.3 Results of chemical analyses

Results of the chemical analyses carried out on the Date Creek soils are presented in Tables 9–15. Throughout the analyses, several trends were observed.

Forest floor pH was consistently lower among soils in the submesic and mesic site series (average pH of 3.7, min. 3.0, max. 4.1) compared with those in moist and wet site series (average 4.7, min. 4.2, max. 5.3). Concentrations of total and mineralizable N in the forest floor were approximately 30% higher (on average) among soils from the moist and wet site series relative to those from the mesic site series. Conversely, concentrations of forest floor exchangeable K and available P were substantially lower (on average) in the soils from moist and wet site series.

Soils in moist and wet site series frequently had Ah horizons, while these horizons were consistently absent in the soils from mesic and submesic site series. The concentrations of most nutrients (including total and mineralizable N, exchangeable Ca and Mg) in Ah horizons were 3–4 times higher than those measured in other upper mineral soil horizons that lacked significant organic matter enrichment. Concentrations of available P, however, were substantially lower in Ah horizons than in other upper mineral soil horizons.

3.3 Pre-treatment Stand Structure

3.3.1 Methods

Timber cruises were completed for the treatment units in 1992.[1] The cruises were done to Ministry of Forests standards (one measure plot and two count plots per 1.5 ha) with three utilization limits (except lodgepole pine):

1. 17.5 cm DBH and 10 cm top (standard timber cruise);
2. 17.5 cm DBH and 2 cm top;
3. 7.5 cm DBH and 2 cm top.

The utilization limit for lodgepole pine was 12.5 cm DBH instead of 17.5 cm DBH. Volume was calculated using data from the standard cruise (17.5 cm DBH and 10 cm top). Density (stems per hectare) and basal area (m^2/ha) summaries were calculated using data from the most inclusive utilization limit (7.5 cm DBH and 2 cm top). Trees classified as "live useless" were included in the live stems per hectare summaries.

In addition to the standard timber cruises, surveys were performed to estimate the abundance of trees less than 7.5 cm DBH using a 3.99 m radius regeneration plot located 5 m north of each cruise measure plot. Trees greater than 0 cm and less than 7.5 cm DBH were tallied by species and diameter class (0–2.5, 2.6–5.0, 5.1–7.5 cm). Trees greater than 0.1 m and less than 1.3 m tall were tallied by species. Seedlings less than 10 cm tall were not recorded.

Coarse woody debris volume, species, diameter, height above ground, and decay class were assessed by the line intersect technique originally described for fuel loading estimates (Van Wagner 1968; Trowbridge et al. 1986) and adapted to wildlife habitat sampling by Lofroth (1992). Coarse woody debris is defined as logs greater than or equal to 10 cm in diameter and trees leaning at an angle greater than 45 degrees. Ten randomly located transects (each transect was a 90-m long equilateral triangle) were surveyed in each treatment unit. Only logs of decay classes 1–4 (Lofroth 1992), which protruded at least 5 cm above the forest floor, were tallied.

3.3.2 Results

Trees Table 16 presents the density, basal area and volume estimates of trees (≥ 7.5 cm DBH) for each treatment unit. Stand density ranged from 500 to 2465 live stems per hectare with the mesic, old-growth experimental block having consistently lower densities. The density of dead trees ranged from 72 to 689 stems per hectare. Basal area varied little among treatments, ranging from 52 to 75 m^2/ha. Basal area of dead stems for all treatments was less than 15 m^2/ha. Net merchantable volume varied from 199 to 529 m^3/ha with the old-growth block commonly having the lowest volumes.

Table 17 shows the DBH distribution of live and dead stems per hectare by treatment unit. Tables 18 and 19 present the distribution of stems per hectare and basal area, respectively, by DBH class and species for each treatment unit.

Advance regeneration Table 20 lists the density of advance regeneration (trees ≤ 7.5 cm DBH and ≥ 10 cm tall) by size class, species (presented as a percentage of total stems per hectare), and treatment unit. Treatment units within old-growth forests generally had the highest densities. The density of dead trees by diameter class and treatment unit is shown in Table 21.

Coarse woody debris The volume of coarse woody debris by treatment unit is presented in Table 22. Table 23 presents the frequency counts of coarse woody debris by diameter class, species, and treatment unit. Frequency counts refer to the number of times that a given diameter or species of coarse woody debris was intersected by the transect line (total of 900 m of transect line per treatment unit). The old-growth block and the mesic–submesic, mature block generally had higher volumes of coarse woody debris.

3.4 Post-treatment Stand Structure

3.4.1 Methods

After harvesting, additional cruises were performed to describe the post-harvest stand conditions. This

1 Conducted by Tyhee Forestry Consultants, Smithers, B.C.

information enables direct comparisons of pre- and post-harvest stand structure to better illustrate how the stands are altered by the various treatments.

A two-phase, double-sampling procedure using prism methods (Olderwald and Jones 1992) was used to estimate the abundance of trees greater than or equal to 17.5 cm DBH. An appropriate prism basal area factor was chosen so that 10–12 trees were tallied at each point (unless in an opening). In phase one, at each random sample point, we collected data on species, DBH, crown class, and vigour/decay class as in the Wildlife Tree Assessment procedure (Wildlife Tree Committee of British Columbia 1992). Height was measured for two randomly chosen trees per prism plot. Logging damage was assessed by damage type (skidding, falling, or both skidding and falling), extent of skidding damage (number of scars, scar height, and width of largest scar), extent of crown damage (percentage crown loss, number of scars, scar location), and other damage (e.g., broken stem, dead top, fork, etc.). Thirty plots were randomly located in each of the heavy removal treatment units and 23 plots in each of the light removal and undisturbed treatment units.

In phase two of sampling, an additional 20 random sample points per treatment unit were selected for basal area measurement. Numbers and species of dead and live stems within each prism plot were recorded.

We calculated mean basal area and stems per hectare of live and dead trees (≥ 17.5 cm diameter) for each treatment unit by combining data from the two phases of sampling (Olderwald and Jones 1992). Since diameters were only measured in phase 1 sampling, to obtain a basal area and stems per hectare by diameter class, the phase 1 basal area and density proportions by diameter class were multiplied by the overall mean basal area and stems per hectare.

At the plot centre for phase 1 prism sampling, fixed radius plots (5.64 m radius; 100 m^2) were used to sample trees that were 0–17.4 cm DBH. Data were collected on species, DBH, height (on two randomly chosen trees), vigour/decay class, crown class, and damage (same as described for larger trees).

Five metres north of the prism plot centre, fixed radius plots (3.99 m radius, 50 m^2) were established to sample small trees (0.1–1.3 m tall) by species and damage class. Logging damage to small trees was assessed as: healthy (no damage), moderate (damaged by logging but not fatally), and severe (near death because of damage).

Post-treatment volume, species, diameter, and decay class of coarse woody debris were assessed by the line intersect triangle technique using the same method as described for the pre-treatment coarse woody debris surveys (Section 3.3.1).

3.4.2 Results

Trees ≥ 7.5 cm DBH Density and basal area for live and dead trees (≥ 7.5 cm DBH) are summarized by treatment unit in Table 24. For presentation, we combined trees ≥ 17.5 cm DBH with trees 7.5–17.4 cm DBH from the fixed plots to give an overall density and basal area for all trees ≥ 7.5 cm DBH, comparable to the pre-treatment stand structure results; see Table 16. After treatment, densities of live stems decrease with increasing levels of removal; the undisturbed treatment units having 706–1531 stems per hectare, the light removal having 402–1292 stems per hectare, and the heavy removal having 273–738 stems per hectare. The basal area of live stems followed the same trend; the undisturbed forests had 64–72 m^2/ha, light removal had 44–52 m^2/ha, and heavy removal had 30–36 m^2/ha. Densities of dead stems ranged from 42–317 stems per hectare across all treatment units, with the undisturbed treatment units having substantially higher densities. The basal area of dead stems ranged from 1.1 to 9.3 m^2/ha across all treatments and decreased with increasing levels of removal.

Trees ≥ 17.5 cm DBH For trees ≥ 17.5 cm DBH, basal area and density of live stems by species and treatment unit are presented in Table 25. Tables 26 and 27, respectively, present a further breakdown of basal area and density by diameter and species. The 20–30 cm diameter class had the highest densities across all treatment units. Western hemlock contributed the largest proportion to basal area and density across all treatment units, with western redcedar contributing the next largest proportion in all but one treatment unit (D5). The basal area and density of dead stems by species are presented in Table 28. Tables 29 and 30 present basal area and stems per hectare, respectively, by diameter class and species. The percentage of stems ≥ 17.5 cm DBH with logging damage from falling and skidding was higher in the heavy removal (15.1–32.7%) than in the light removal treatment (6.2–24.0%) (Table 31a). Likewise, the heavy removal treatment units had higher percentages of scarred stems (14.7–31.7%) than the light removal treatment units (5.6–19.8%) (Table 31b).

Trees 0–17.4 cm DBH Basal area and density of trees 0–17.4 cm DBH by species are presented in Table 32. The density and basal area of trees 0–17.4 cm DBH ranged from 335 to 1648 stems per hectare and 1.8–9.4 m^2 per hectare, respectively, across all treatment units (Table 33). In general, the total density and basal area decreased with increasing levels of removal. Densities of dead stems ranged from 26.7 to 261 stems per hectare, with the undisturbed treatment units generally having higher densities (Tables 34 and 35). Total basal area of dead stems ranged from 0.4 to 2.0 m^2/ha in the two partially-cut treatment units and was generally higher in the undisturbed units (0.6–3.4 m^2/ha).

The percentage of stems with logging injuries caused by skidding and falling was generally higher in the heavy removal treatment units (13.6–21.2%) than in the light removal treatment units (5.3–14.3%) (Table 36a). Likewise, the percentage of trees with logging scars was generally highest in the heavy removal treatment (Table 36b).

Seedlings Table 37 presents the density of seedlings (0.1–1.3 m tall) by species, damage class, and treatment unit.

Coarse woody debris The volume of coarse woody debris per hectare ranged from 72 to 289 m^3 per hectare across all treatment units, with the old-growth treatment units having the largest volumes (Table 38). The distribution of diameter classes and species (summarized as frequency counts) of coarse woody debris per treatment unit is shown in Table 39. The frequency counts ranged from 137 to 268 logs intersecting 900 m of transect.

TABLE 6 *Definitions of the successional stages used in the biogeoclimatic mapping of the Date Creek research area*

Successional stage	Definition
1. Non-vegetated	Initial stages in primary or secondary succession; little or no vegetation present
2. Herb	Early successional stage or disclimax, dominated by herbaceous vegetation; some invading or residual shrubs and trees may be present
3. Shrub	Early successional stage or disclimax, dominated by shrubby vegetation; tree cover less than 10%, but seedlings and advanced regeneration may be present
4. Pole-sapling	Trees overtop shrub and herb layers, stands are typically dense; younger stands are vigorous, usually 10–35 years; older pole-sapling stages, composed of dense "doghair" stands of stagnant hemlock up to 125 years of age, also occur. This stage lasts until self-thinning becomes evident.
5. Young forests	Self-thinning evident and the forest canopy has begun differentiation into distinct layers; vigorous growth and a more open stand than in the pole-sapling stage characterizes forests at this phase of development; this stage begins about age 35 and extends to 80–100 years depending on tree species
6. Mature forests	Trees that established after the last stand-level disturbance have matured and a second cycle of shade-tolerant trees may have established; trees in the lower canopy (suppressed) may be released as "gaps" form in the upper canopy; these stands are generally older than 100 years and exist for 50–100 years
7. Old-growth forests	Very old (200–350+ years), all-aged, structurally complex stands comprised mainly of old-growth tree species, although old seral remnants may still be present in the upper canopy; standing snags and rotting logs on the ground are typical, and under-storey is patchy

[a] Modified after Hamilton (1988) and Clement and Banner (1992, unpublished) by LePage (1995).

TABLE 7 *Area of each site series by treatment unit (as a percent of total treatment unit area)*

Block	Treatment	Unit	Site series[a]							
			01(a)	01(b)	03	04	05	07	08	Other
1	Clearcut	D2	77.4	2.7	2.5	6.5	0.8	0.0	0.0	10.1
mesic, old growth	Heavy removal	D4	63.8	0.0	5.6	23.3	0.0	0.0	0.0	7.3
	Light removal	D5	57.7	0.0	28.9	2.6	0.0	0.0	0.0	10.8
	No harvest	D3	61.0	1.3	16.4	9.3	1.5	0.0	0.0	10.5
2	Clearcut	A1	75.9	9.6	6.5	0.0	0.0	0.0	0.0	8.0
mesic-submesic,	Heavy removal	B3	39.8	33.3	1.5	0.0	0.0	5.4	0.0	20.0
mature forest	Light removal	A2	48.2	32.0	0.0	1.1	0.0	0.5	4.4	13.9
	No harvest	B1	56.1	34.1	0.0	0.6	2.1	0.0	0.0	7.1
3	Clearcut	B4	49.7	27.4	0.0	0.6	0.0	0.9	0.0	21.4
mesic,	Heavy removal	C2	72.5	0.0	7.5	11.3	0.0	0.0	1.0	7.7
mature forest	Light removal	B5	69.6	4.3	0.0	0.8	0.0	0.0	0.0	25.3
	No harvest	C1	80.6	11.7	0.1	6.7	0.0	0.0	0.0	1.0
4	Clearcut	A3	59.1	4.5	0.5	11.1	0.5	0.0	0.0	24.3
mesic-subhygric,	Heavy removal	B2	68.8	14.9	0.0	9.2	0.0	0.0	0.0	7.0
mature forest	Light removal	C3	68.5	0.0	12.3	8.5	1.0	0.0	0.0	9.7
	No harvest	A4	55.3	1.1	3.3	6.2	0.7	9.8	0.3	23.3

[a] Site series are described in Banner et al. (1993); Table 1.

TABLE 8 *Summary of site series and soil attributes*

Site series[a]	Landform	Soil classification	Humus form classification	Soil texture[c]	Moisture regime	Nutrient regime
Hw–Step moss[b] (mesic) (01,01a)	Morainal blanket	Eluviated Dystric Brunisol Orthic Dystric Brunisol Orthic Humo-ferric Podzol	Hemimor Mormoder	L/SCL LS/CL SL/CL	mesic	medium
Hw–Step moss (submesic) (01b), $PlHw–Feathermoss (51)	Glaciofluvial terrace	Eluviated Dystric Brunisol Orthic Dystric Brunisol	Hemimor	S/SiL	submesic	poor/ medium
$SxEp–Thimbleberry–Hazelnut (52)	Morainal blanket	Brunisolic Gray Luvisol Orthic Dystric Brunisol	Mormoder Hemimor	L/CL	mesic, subhygric	medium/ rich
HwCw–Oak fern (03)	Morainal blanket	Gleyed Dystric Brunisol Eluviated Dystric Brunisol Orthic Regosol Gleyed Brunisolic Gray Luvisol	Mormoder Hemimor	S/CL	subhygric	medium/ rich
CwHw–Devil's club–Oak fern (04), $SxEp–Devil's club (54), Sx–Devil's club–Lady fern (05)	Morainal blanket	Orthic Regosol Orthic Gleysol Gleyed Dystric Brunisol Gleyed Gray Luvisol	Mormoder Leptomoder Hydromoder Velomoder	S/CL	subhygric/ hygric	rich
CwSx–Horsetail–Skunk cabbage (07)	Gullied morainal blanket	Rego Gleysol Rego Humic Gleysol Terric Humisol Typic Mesisol	Hydromoder Saprimull Histomoder Hydromull	LS/C	hygric, subhygric	rich/ very rich
SbSx–Scrub birch–sedge (08)	Organic blanket	Typic Mesisol Typic Humisol Typic Fibrisol	Histomoder Saprimull Histomor		subhygric	very poor/ poor
Non-forested bog, Non-forested fen/ marsh (31,32)	Organic blanket	Typic Humisol Typic Mesisol Typic Fibrisol	Histomoder Histomor Saprimull		subhygric/ hydric	rich/ very rich

[a] Refer to Banner et al. (1993) for descriptions of site series.
[b] Site series abbreviations: Hw = Western hemlock, Cw = Western redcedar, Pl = Lodgepole pine, Sx = Hybrid spruce, Ep = Paper birch, Sb = Black spruce, $ denotes a seral association (see Table 1, Banner et al. 1993).
[c] Soil textures: S = sand, L = loam, SCL = sandy clay loam, LS = loamy sand, CL = clay loam, SL = sandy loam, SiL = silt loam, C = clay.

TABLE 9 *Detailed humus-form and mineral descriptions, and results of chemical analyses for a Hemimor, Orthic Humo-ferric Podzol (sampled in Hw–Step moss site series; treatment unit B3)*

Horizon	Depth (cm)	Description
Lv	2	moss, needles; moist; very dusky red (2.5YR 2.5/2); non-compact matted, loose, acerose; no apparent boundary
Fm1	5–1	moist; dark reddish brown (5YR 3/2); compact matted, tenacious, fibrous; abundant very fine and fine roots; clear smooth boundary
Fm2	1–0	moist; black (5YR 2.5/1); non-compact matted, pliable, felty; abundant very fine and fine roots; clear smooth boundary
Ae	0–4	grey (10YR 5/1); silt loam; moderate, fine-medium, subangular blocky; soft, fine, non-sticky; plentiful very fine, fine, medium, and coarse roots; plentiful very fine, few fine pores; gravel (30%), some cobbles; clear smooth boundary; 3–5 cm thick
Bf1	4–25	strong brown (7.5YR 4/6); sandy loam; weak-moderate, fine, granular; loose non-sticky; abundant medium, plentiful fine and coarse, few fine roots; few very fine and fine pores; gravel (20%); clear wavy boundary; 16–26 cm thick
Bf2	25–52	olive brown (2.5Y 4/4); sandy loam; weak-moderate, fine, granular; slightly hard, loose, slightly sticky; plentiful medium, few very fine, fine and coarse roots; few fine, plentiful medium pores; some cobbles; gradual smooth boundary; 21–30 cm thick
BC	52+	olive brown (2.5Y 4/2); sandy loam; weak-moderate, medium, subangular blocky; slightly hard, firm, sticky; no roots; no pores; stones (35%), cobbles (20%), gravel (15%)

	Results of chemical analyses									
Horizon	Total Carbon (%)	Carbon/ Nitrogen ratio	CEC[a] meq/100g	Exchangeable Calcium	Exchangeable Potassium meq/100g	Exchangeable Magnesium	Total Nitrogen (%)	Mineralizable Nitrogen (ppm)	Available Phosphorous (ppm)	pH ($CaCl_2$)
F	47.7	31	110.9	39.59	2.96	6.36	1.53	423.9	97.5	4.0
Ae	2.7	21	17.4	6.06	0.23	1.14	0.13	28.5	106.8	3.8
Bf1	2.8	17	20.1	1.93	0.23	0.42	0.17	8.1	26.9	4.9
Bf2	0.5	8	6.6	1.72	0.17	0.54	0.06	0.0	24.4	4.6
BC	0.3	7	7.1	4.18	0.15	0.95	0.05	0.0	7.5	4.9

[a] CEC denotes cation exchange capacity.

TABLE 10 *Detailed humus-form and mineral descriptions, and results of chemical analyses for a Hemimor, Eluviated Dystric Brunisol (sampled in Hw–Step moss site series; treatment unit B5)*

Horizon	Depth (cm)	Description
S/Lv	3	moss, needles; moist; reddish black (10R 2.5/1); non-compact matted friable, acerose; no roots; clear smooth boundary
Fm1	5–3.5	moist; dark reddish brown (5YR 3/3); compact matted, resilient, fibrous; abundant very fine and plentiful fine roots; mycelia common; clear smooth boundary
Fm2	3.5–0	moist; dark reddish brown (5YR 3/3); compact matted, firm, fibrous; abundant very fine roots; mycelia common; clear smooth boundary
Ae	0–3	grey (10YR 5/1); silt loam; weak-moderate, fine, subangular blocky; soft, fine, non-sticky; plentiful medium and coarse, few very fine and fine roots; plentiful very fine and few fine pores; some gravel; abrupt smooth boundary; 2–4 cm thick
Bm	3–19	dark yellowish brown (10YR 4/4); loam; loose non-sticky; plentiful medium and coarse, few fine, and very few very fine roots; few very fine pores; some gravel; clear smooth boundary; 14–18 cm thick
Btj	19–59	light olive brown (2.5Y 5/4); loam; soft, very friable, non-sticky; plentiful medium, few coarse and few fine roots; few fine pores; common moderately thick films; stones (15%); gradual wavy boundary; 35–46 cm thick
BC	59+	dark greyish brown (2.5Y 4/2); sandy loam; moderately strong, medium, subangular blocky; hard, friable, slightly sticky; no roots; no pores; stones (20%), cobbles (30%), gravel (20%)

	Results of chemical analyses									
Horizon	Total Carbon (%)	Carbon/ Nitrogen ratio	CEC[a] meq/100g	Exchangeable Calcium	Exchangeable Potassium meq/100g	Exchangeable Magnesium	Total Nitrogen (%)	Mineralizable Nitrogen (ppm)	Available Phosphorous (ppm)	pH ($CaCl_2$)
F	43.4	42	85.4	19.97	3.36	4.48	1.03	115.8	125.3	3.8
Ae	5.0	32	25.2	4.90	0.53	1.16	0.15	7.7	172.3	3.6
Bm	1.7	16	13.1	3.25	0.54	0.63	0.10	4.9	209.8	4.8
Btj	0.4	5	8.2	3.92	0.41	1.31	0.07	2.0	4.2	5.0
BC	0.4	7	9.8	6.82	0.30	1.94	0.06	0.0	2.7	5.4

[a] CEC denotes cation exchange capacity.

TABLE 11 *Detailed humus-form and mineral descriptions, and results of chemical analyses for a Hemimor, Brunisolic Gray Luvisol (sampled in the Hw–Step moss site series; treatment unit A4)*

Horizon	Depth (cm)	Description
S/Lv	2	needles, moss; dry; loose, mossy; no roots; abrupt wavy boundary
Fm	8–2	moist; very dark brown (10YR 2/2); non-compact matted, resilient, fibrous; abundant very fine roots; fungal mycelia common; clear wavy boundary
Hr	2–0	moist; very dark brown (10YR 2/2); granular, friable, slightly greasy; abundant very fine and fine roots; abrupt wavy boundary
Bm	1–16	dark yellowish brown (10YR 3/6); silt loam; weak-moderate, medium, subangular blocky; very friable, slightly sticky; abundant fine and medium roots; plentiful very fine pores; gravel (30%); clear wavy boundary; 14–17 cm thick
Bt	16–36	dark greyish brown (10YR 4/2); silty clay loam; strong, coarse, subangular blocky; firm, sticky; very few fine and medium roots; plentiful very fine pores; many moderately thick films; gravel (45%), cobbles (20%); gradual wavy boundary; 18–23 cm thick
BC	36–49+	very dark greyish brown (10YR 3/2); sandy clay loam; strong, coarse, subangular blocky; firm, sticky; no roots; no pores; gravel (55%), some cobbles

	Results of chemical analyses									
Horizon	Total Carbon (%)	Carbon/ Nitrogen ratio	CEC[a] meq/100g	Exchangeable Calcium	Exchangeable Potassium meq/100g	Exchangeable Magnesium	Total Nitrogen (%)	Mineralizable Nitrogen (ppm)	Available Phosphorous (ppm)	pH ($CaCl_2$)
F	45.6	31	92.7	30.76	3.25	2.99	1.48	828.1	94	4.1
Bm	1.9	17	19.7	8.2	0.13	0.82	0.11	29.8	174.2	4.6
Bt	0.7	8	10.5	5.46	0.18	1.11	0.09	24.6	65	5.1
BC	0.5	6	13.6	10.49	0.2	2.67	0.08	5.4	4	5.4

[a] CEC denotes cation exchange capacity.

TABLE 12 *Detailed humus-form and mineral descriptions, and results of chemical analyses for a Lignomor, Gleyed Gray Luvisol (sampled in the HwCw–Oak fern site series; treatment unit C3)*

Horizon	Depth (cm)	Description
S/Lv	5	moss, needles; moist; single particle, loose, acerose; no roots; clear smooth boundary
Fm	20–15	moist; very dusky red (2.5YR 2.5/2); weak blocky, friable, fibrous; few very fine, fine and coarse, and common medium roots; clear smooth boundary
Fw	15–6	moist; weak blocky, friable, fibrous; few very fine and coarse and common fine and medium roots; clear smooth boundary
Hh	6–0	moist; weak granular, firm, greasy; common very fine, fine and medium roots; clear smooth boundary
Ah	0–3	dark reddish brown (5YR 2.5/2); silt loam; weak, fine, granular; loose, slightly sticky; few fine and very fine roots; plentiful fine pores; some gravel; clear wavy boundary; 0–5 cm thick
Btgj	3–16	very dark grey (10YR 3/1); clay loam; moderate, medium, subangular blocky; hard, firm, sticky; very few very fine and fine roots; very few fine pores; many moderately thick clay films; gravel (30%), cobbles (20%); abrupt smooth boundary; 10–18 cm thick
BCgj	16+	olive grey (5Y 4/2); clay loam; moderate, medium, subangular blocky; hard, firm, sticky; no roots; gravel (35%), cobbles (25%), stones (15%)

	Results of chemical analyses									
Horizon	Total Carbon (%)	Carbon/ Nitrogen ratio	CEC[a] meq/100g	Exchangeable Calcium	Exchangeable Potassium meq/100g	Exchangeable Magnesium	Total Nitrogen (%)	Mineralizable Nitrogen (ppm)	Available Phosphorous (ppm)	pH ($CaCl_2$)
FH	50.4	29	125.1	64.27	1.06	8.39	1.73	504.3	21.4	4.4
Ah	28.5	25	127.2	71.44	0.37	15.55	1.15	326.5	3.4	5.3
Btgj	6.5	21	52.7	28.48	0.23	6.80	0.32	49.0	1.0	5.2
BCgj	0.7	12	11.3	6.51	0.10	1.68	0.06	13.4	5.9	5.3

[a] CEC denotes cation exchange capacity.

TABLE 13 *Detailed humus-form and mineral descriptions, and results of chemical analyses for a Mormoder, Gleyed Brunisolic Gray Luvisol (sampled in the HwCw–Oak fern site series; treatment unit C2)*

Horizon	Depth (cm)	Description
S/Lv	4	moss, needles; moist; single particle, friable, mossy/acerose; no roots; clear wavy boundary
Fa	8–4	moist; very dusky red (2YR 2.5/2); blocklike granular, friable, acerose; plentiful fine roots; clear wavy boundary
Hh	4–0	moist; black (5YR 2.5/1); single particle, friable, mushy; common fine roots; clear wavy boundary
Bm	0–22	dark yellowish brown (10YR 4/4); loam; weak-moderate, fine, granular; loose, slightly sticky; few fine, very fine, and medium roots; gravel (15%); gradual smooth boundary; 17–24 cm thick
Bmgj	22–32	dark greyish brown (2.5Y 4/2); sandy loam; moderate, fine-medium, granular; soft, loose sticky; few very fine, fine and medium roots; few very fine pores; gravel (30%), cobbles (20%), some stones; clear wavy boundary; 8–11 cm thick
Btgj	32–47	dark olive grey (5Y 3/2); silty clay loam; moderate, medium, subangular blocky; slightly hard, friable, slightly sticky; few very fine roots; very few fine pores; common moderately thick films; gravel (30%), cobbles (25%), stones (20%); abrupt wavy boundary; 8–16 cm thick
Ahb	47–58	black (7.5YR 2/0); silt clay loam/greasy; moderate, fine, granular; slightly hard, friable, sticky; gravel (30%), some cobbles; clear wavy boundary; 7–12 cm thick
IIBtg	58+	dark greyish brown (2.5Y 4/2); sandy clay loam; moderate, medium, subangular blocky; hard, friable, slightly sticky; common moderately thick films; gravel (25%), cobbles (30%), stones (20%)

	Results of chemical analyses									
Horizon	Total Carbon (%)	Carbon/ Nitrogen ratio	CEC[a] meq/100g	Exchangeable Calcium	Exchangeable Potassium meq/100g	Exchangeable Magnesium	Total Nitrogen (%)	Mineralizable Nitrogen (ppm)	Available Phosphorous (ppm)	pH ($CaCl_2$)
FH	34.0	28	100.7	39.73	1.16	4.56	1.20	364.8	40.9	4.2
Bm	2.2	17	26.7	10.56	0.18	2.65	0.13	46.0	5.2	4.7
Bmgj	1.9	14	24.3	12.50	0.17	3.10	0.13	32.2	3.0	5.2
Btgj	1.7	15	17.3	9.21	0.12	2.20	0.11	13.4	5.1	5.2
Ahb	4.5	17	34.3	15.29	0.15	3.04	0.26	16.4	5.1	5.2
IIBtg	0.6	9	9.3	5.34	0.08	1.33	0.06	6.7	4.3	5.2

[a] CEC denotes cation exchange capacity.

TABLE 14 *Detailed humus-form and mineral descriptions, and results of chemical analyses for a Mormoder, Orthic Luvic Gleysol (sampled in Cw–Hw–Devil's club–Oak fern site series; treatment unit A4)*

Horizon	Depth (cm)	Description
S/L	1.5	needles, moss; moist; single particle, loose, acerose; clear smooth boundary
Fa	7.5–5.5	moist; dark reddish brown (5YR 2.5/2); weak non-compact matted, loose, slightly fibrous; common very fine, and very few fine roots; clear smooth boundary
Hh	5.5–0	moist; black (5YR 2.5/1); moderate granular, loose, greasy; few very fine, and very few fine roots; clear smooth boundary
Ah	0–4	very dark greyish brown (10YR 3/2); loam; weak-moderate, fine, granular; loose, sticky; plentiful medium, and few fine and very fine roots; plentiful very fine and fine pores; some gravel; clear broken boundary; 0–9 cm thick
Bmgj	4–15	brown/dark brown (10YR 4/3); loam; moderate, medium, subangular blocky; slightly hard, fine, sticky; plentiful medium, few fine roots; few fine pores; common moderately thick films; gravel (25%), cobbles (15%), some stones; clear wavy boundary; 8–14 cm thick
Btjgj	15–42	brown/dark brown (10YR 4/3); loam; moderate, medium, subangular blocky; hard, firm, sticky; few medium roots; many moderately thick films; gravel (30%), cobbles (20%), some stones; clear smooth boundary
Btg	42–55+	greyish brown (2.5Y 5/2); clay loam; massive; many moderately thick films; gravel (40%), cobbles (20%), stones (20%)

	Results of chemical analyses									
Horizon	Total Carbon (%)	Carbon/ Nitrogen ratio	CEC[a] meq/100g	Exchangeable Calcium	Exchangeable Potassium meq/100g	Exchangeable Magnesium	Total Nitrogen (%)	Mineralizable Nitrogen (ppm)	Available Phosphorous (ppm)	pH ($CaCl_2$)
FH	41.2	28	57.5	22.59	0.75	6.34	1.47	642.6	45.9	4.9
Ah	6.4	21	43.5	11.86	0.40	4.55	0.30	94.9	3.0	4.7
Bmgj	2.3	15	20.0	6.33	0.25	2.48	0.15	63.2	7.8	4.6
Btgj	1.0	10	13.4	4.53	0.18	2.00	0.10	44.2	10.7	4.8
Btg	0.8	8	10.6	3.94	0.15	1.73	0.09	20.0	4.8	4.7

[a] CEC denotes cation exchange capacity.

TABLE 15 *Detailed humus-form and mineral descriptions, and results of chemical analyses for a Hydromoder, Orthic Gleysol (sampled in the CwSx–Horsetail–Skunk cabbage site series; treatment unit A4)*

Horizon	Depth (cm)	Description
S/L	4	needles; moist; non-compact matted, friable, mossy; plentiful very fine and fine; clear wavy boundary
Fm	27–22	wet; black (5YR 2.5/1); massive, firm, mushy; abundant very fine and fine, and few coarse roots; clear smooth boundary
Fa	22–10	wet; black (5YR 2.5/1); massive, firm, mushy; plentiful very fine and fine, and few coarse roots; clear smooth boundary
Hh	10–0	wet; black (10YR 2/1); massive, pliable, mucky; few very fine and fine roots; clear smooth boundary
Ah	0–4	very dark grey (10YR 3/1); clay loam; massive; hard, firm, slightly sticky; few fine roots; clear smooth boundary; 3–5 cm thick
Bgj	4–13	grey (5Y 5/1); silt clay; massive; extremely hard, extremely firm, very sticky; clear smooth boundary; 7–12 cm thick
Bg	13+	olive (5Y 4/3); silt clay; many coarse mottles; massive; extremely hard, extremely firm, very sticky

	Results of chemical analyses									
Horizon	Total Carbon (%)	Carbon/ Nitrogen ratio	CEC[a] meq/100g	Exchangeable Calcium	Exchangeable Potassium meq/100g	Exchangeable Magnesium	Total Nitrogen (%)	Mineralizable Nitrogen (ppm)	Available Phosphorous (ppm)	pH ($CaCl_2$)
FH	44.5	24	70.1	102.00	0.77	14.97	1.87	769.4	36.7	5.3
Ah	10.0	20	51.4	34.16	0.17	6.14	0.51	59.0	18.7	5.2
Bgj	1.2	11	20.6	9.89	0.09	2.45	0.11	10.7	1.5	5.3
Bg	0.4	4	13.4	10.97	0.07	2.92	0.09	0.7	0.2	5.8

[a] CEC denotes cation exchange capacity.

TABLE 16 *Estimated pre-treatment density, basal area, and volume of live and dead trees*

			Density[a] (Stems per hectare)				Basal area[b] (m^2/ha)			Volume[c] (SE) (m^3/ha)	
			All trees		Conifers		All trees		Conifers	All trees	Conifers
Treatment	Block	Unit	Live	Dead	Live	Dead	Live	Dead			
Clearcut	1	D2	1121.1	88.0	1121.1	86.9	74.5	8.0	74.5	323.2 (25.9)	323.2
	2	A1	1030.2	215.0	905.9	200.7	56.7	6.8	48.2	390.5 (42.6)	354.2
	3	B4	1183.0	230.3	1080.0	158.9	52.2	6.4	47.6	359.7 (31.8)	343.0
	4	A3	1825.1	460.5	1673.1	409.6	71.4	9.2	62.8	483.9 (28.3)	441.8
Heavy removal	1	D4	500.3	207.3	499.7	207.3	56.7	11.9	56.0	198.7 (25.4)	198.3
	2	B3	1420.8	333.5	1272.7	193.2	55.7	7.2	44.7	298.4 (31.5)	257.1
	3	C2	1446.7	463.9	1427.2	454.6	71.2	8.7	68.9	529.4 (48.7)	524.0
	4	B2	2101.5	538.1	2095.1	506.5	70.3	8.8	67.6	380.4 (23.8)	373.9
Light removal	1	D5	774.9	235.1	774.9	235.1	69.0	14.8	69.0	385.0 (55.2)	385.0
	2	A2	2465.0	688.9	2228.1	524.9	65.6	12.1	61.1	361.3 (27.5)	332.4
	3	B5	1763.5	151.8	1656.8	48.0	63.5	3.9	56.0	447.5 (28.4)	413.2
	4	C3	1374.4	618.8	1339.1	618.8	67.1	15.0	65.6	502.1 (38.7)	492.3
No harvest	1	D3	1178.2	77.0	1178.2	77.0	66.5	11.2	66.9	308.9 (34.0)	308.9
	2	B1	1232.3	288.1	1188.4	288.1	58.4	4.3	56.0	418.4 (34.1)	402.3
	3	C1	1890.5	526.0	1840.9	497.0	71.0	9.7	67.5	514.3 (58.1)	503.5
	4	A4	773.3	71.6	712.9	62.9	56.5	6.1	50.0	387.0 (31.9)	362.6

[a] Density includes all trees ≥ 7.5 cm diameter, 2 cm top.
[b] Basal area includes all trees ≥ 7.5 cm diameter, 2 cm top.
[c] Volume includes all trees ≥ 17.5 cm diameter, 10 cm top. Standard area of mean volume is in parentheses.

TABLE 17 *Pre-treatment a) live and b) dead stems per hectare (mean) by diameter class and treatment unit*

a) Live stems per hectare

Treatment	Clearcut				Heavy removal				Light removal				No harvest			
Unit	D2	A1	B4	A3	D4	B3	C2	B2	D5	A2	B5	C3	D3	B1	C1	A4
DBH (cm)																
7.5–12.5	525.0	51.7	380.9	464.1	80.9	422.5	516.1	691.5	215.4	1045.6	707.9	216.3	563.1	229.1	601.1	99.5
12.6–17.5	88.0	200.8	158.9	525.3	30.0	295.9	110.7	595.1	100.9	538.1	368.1	426.4	89.2	245.4	407.1	89.0
17.6–22.5	77.5	191.5	159.9	307.0	37.6	197.2	209.2	376.0	33.9	420.5	139.4	205.8	146.2	136.7	298.0	146.9
22.6–27.5	83.6	190.7	120.8	162.8	80.8	167.0	148.1	141.5	69.3	246.4	148.0	194.2	117.7	266.1	244.0	92.6
27.6–32.5	45.4	210.2	153.4	170.9	59.9	157.8	211.4	141.8	86.4	111.6	167.6	118.4	63.5	165.4	123.3	145.2
32.6–37.5	37.2	90.3	130.9	92.9	43.6	109.8	116.1	76.6	51.8	63.4	109.8	90.8	22.7	105.1	143.2	69.1
37.6–42.5	55.3	66.2	38.9	26.0	21.9	36.1	51.6	16.4	52.6	18.3	77.2	41.2	21.6	50.7	30.6	60.6
42.6–47.5	64.1	14.9	22.4	34.6	39.9	26.0	26.7	19.5	34.6	2.4	36.4	36.1	20.5	24.6	24.3	20.5
47.6–52.5	48.4	6.4	12.5	18.9	28.6	0.0	19.8	23.0	42.9	6.3	5.9	10.0	37.4	0.0	4.1	11.9
52.6–57.5	35.5	6.0	2.3	11.5	33.7	5.0	23.0	4.1	21.5	3.2	3.1	7.8	43.5	2.0	0.0	7.2
57.6–62.5	28.2	0.0	1.3	4.1	7.2	2.0	6.2	0.0	24.6	2.2		12.8	22.4	4.1	5.4	11.4
62.6–67.5	19.9	1.5	0.6	1.8	5.2	0.0	4.1	4.5	11.4	1.7		6.9	8.2	1.0	0.0	4.5
67.6–72.5	5.7			1.5	13.1	0.7	1.7	4.0	12.8	0.0		3.6	9.9	1.2	2.1	4.6
72.6–77.5	3.4			0.0	7.3	0.0	0.0	2.3	6.4	1.2		1.2	6.0	0.9	3.3	2.0
77.6–82.5	1.4			1.1	0.0	0.0	1.2	0.0	4.3	2.0		0.8	0.0		1.3	1.7
82.6–87.5	2.5			1.1	4.9	0.0	0.0	1.7	3.9	1.8		0.0	1.9		0.0	1.0
87.6–92.5				0.0	2.1	0.0	0.0	1.6	1.1	0.0		0.0	1.6		2.2	1.4
92.6–97.5				0.8	2.0	0.0	0.0	1.4	1.0	0.3		0.6	1.5		0.0	1.3
> 97.5				0.7	1.6	0.4	0.7	0.6				1.6	1.1		0.5	2.6

TABLE 17 *Continued*

b) Dead stems per hectare

Treatment	Clearcut				Heavy removal				Light removal				No harvest			
Unit	D2	A1	B4	A3	D4	B3	C2	B2	D5	A2	B5	C3	D3	B1	C1	A4
DBH (cm)																
7.5–12.5	0.0	42.8	84.1	379.7	55.0	200.6	305.2	379.7	135.7	501.0	88.1	342.8	0.0	236.3	414.6	0.0
12.6–17.5	0.0	109.2	59.3	0.0	80.2	42.3	66.7	113.3	0.0	62.7	0.0	158.2	0.0	15.8	37.3	0.0
17.6–22.5	42.1	35.1	48.0	15.9	0.0	58.5	52.0	19.4	23.9	52.9	28.5	60.0	15.9	14.7	33.1	25.3
22.6–27.5	14.3	0.0	20.8	33.5	28.2	17.3	14.9	0.0	13.0	46.2	15.6	11.1	11.0	6.3	19.8	15.7
27.6–32.5	0.0	13.7	0.0	7.4	0.0	0.0	20.1	16.2	21.9	0.0	11.2	0.0	0.0	6.2	8.0	10.9
32.6–37.5	7.0	5.1	5.2	10.0	7.3	4.8	0.0	0.0	6.7	19.2	8.3	9.7	5.7	4.8	0.0	2.6
37.6–42.5	6.4	0.0	12.9	3.6	5.6	3.2	0.0	7.7	4.2	5.5		20.3	4.7	3.9	0.0	8.9
42.6–47.5	9.3	3.4		6.6	0.0	5.4	0.0	0.0	0.0	0.0		5.9	13.9		9.2	1.6
47.6–52.5	0.0	0.0		2.8	20.2	0.0	0.0	0.0	6.8	0.0		4.8	5.6		0.0	1.4
52.6–57.5	3.0	4.1		0.0	2.8	0.0	2.9	0.0	6.1	0.0		3.7	9.7		2.7	2.1
57.6–62.5	2.8	1.7		0.0	4.7	0.0	0.0	1.8	2.5	0.0		0.0	4.1		0.0	1.0
62.6–67.5	0.0			0.0	2.0	1.3	2.0	0.0	4.1	0.0		1.2	5.0		0.0	0.8
67.6–72.5	1.8			0.0	0.0			0.0	3.6	0.0		0.0	0.0		0.0	0.0
72.6–77.5	0.0			0.0	0.0			0.0	1.6	1.4		1.1	1.3		0.0	0.0
77.6–82.5	0.0			1.0	0.0			0.0	2.8						0.0	0.6
82.6–87.5	0.0				1.1			0.0	1.2						1.0	0.0
87.6–92.5	0.0							0.0	0.0						0.0	0.0
92.6–97.5	1.1							0.0	0.9						0.0	0.0
> 97.5								0.1							0.4	0.6

TABLE 18 *Pre-treatment species distribution of stems per hectare (mean) by diameter class and treatment unit*

1. Old-growth block
Treatment unit D2 (stems per hectare)

DBH (cm)	Redcedar	Hemlock	Amabilis fir	Spruce	Pine	Cottonwood
7.5–12.5		525.0				
12.6–17.5		88.0				
17.6–22.5		49.8	27.7			
22.6–27.5	12.3	54.0	17.3			
27.6–32.5	14.6	30.8				
32.6–37.5		37.2				
37.6–42.5	8.3	47.0				
42.6–47.5	7.0	57.1				
47.6–52.5	2.7	43.2		2.5		
52.6–57.5		35.5				
57.6–62.5	3.8	24.4				
62.6–67.5		19.9				
67.6–72.5		5.7				
72.6–77.5		3.4				
77.6–82.5		1.4				
82.6–87.5		2.5				
87.6–92.5						
92.6–97.5						
> 97.5						

Treatment unit D4 (stems per hectare)

DBH (cm)	Redcedar	Hemlock	Amabilis fir	Spruce	Pine	Cottonwood
7.5–12.5			80.9			
12.6–17.5		30.0				
17.6–22.5		37.6				
22.6–27.5		54.8	25.9			
27.6–32.5		59.9				
32.6–37.5		43.6				
37.6–42.5		21.9				
42.6–47.5		37.6		2.3		
47.6–52.5	2.7	23.6	2.4			
52.6–57.5	2.0	31.7				
57.6–62.5		7.2				
62.6–67.5		4.0		1.2		
67.6–72.5	2.5	10.6				
72.6–77.5		7.3				
77.6–82.5						
82.6–87.5	2.6	2.4				
87.6–92.5		2.1				
92.6–97.5		2.0				
> 97.5	1.0					0.6

TABLE 18 *Continued*

Treatment unit D3 (stems per hectare)

DBH (cm)	Redcedar	Hemlock	Amabilis fir	Spruce
7.5–12.5	92.2	470.8		
12.6–17.5		89.2		
17.6–22.5		146.2		
22.6–27.5	21.0	73.9	22.8	
27.6–32.5		45.7	7.0	10.8
32.6–37.5		22.7		
37.6–42.5	8.8	12.9		
42.6–47.5	7.0	13.5		
47.6–52.5	13.2	21.6	2.6	
52.6–57.5	4.4	39.2		
57.6–62.5	7.0	15.4		
62.6–67.5	1.6	6.6		
67.6–72.5	1.4	8.5		
72.6–77.5		6.0		
77.6–82.5				
82.6–87.5		1.9		
87.6–92.5	0.8	0.8		
92.6–97.5	1.5			
> 97.5	0.5	0.6		

Treatment unit D5 (stems per hectare)

DBH (cm)	Redcedar	Hemlock	Amabilis fir	Spruce
7.5–12.5		104.6	110.8	
12.6–17.5		86.2		14.8
17.6–22.5		19.2	14.7	
22.6–27.5		44.8	24.5	
27.6–32.5		69.8	16.6	
32.6–37.5		30.5	21.3	
37.6–42.5	6.5	33.9	12.1	
42.6–47.5	4.8	26.6	3.3	
47.6–52.5		36.9	6.0	
52.6–57.5		21.5		
57.6–62.5	3.1	17.7	3.8	
62.6–67.5	2.6	8.8		
67.6–72.5	2.3	10.6		
72.6–77.5		6.4		
77.6–82.5		4.3		
82.6–87.5		3.9		
87.6–92.5		1.1		
92.6–97.5		1.0		
> 97.5				

TABLE 18 *Continued*

2. Mature, mesic–submesic block
Treatment unit A1 (stems per hectare)

DBH (cm)	Redcedar	Hemlock	Amabilis fir	Spruce	Pine	Cottonwood	Birch	Aspen
7.5–12.5	51.7							
12.6–17.5	54.6	121.7	24.6					
17.6–22.5	66.6	72.7			17.1		35.2	
22.6–27.5	61.9	119.6			9.1			
27.6–32.5	38.4	85.8			15.6	13.6	38.1	18.6
32.6–37.5	5.6	39.9	7.6	14.9	10.5	4.2		7.5
37.6–42.5	12.8	45.3			8.1			
42.6–47.5	3.2	3.1	2.4	3.3		2.9		
47.6–52.5		2.4	1.9			2.2		
52.6–57.5		4.0				2.0		
57.6–62.5								
62.6–67.5				1.5				
67.6–72.5								
72.6–77.5								
77.6–82.5								
82.6–87.5								
87.6–92.5								
92.6–97.5								
> 97.5								

Treatment unit B3 (stems per hectare)

DBH (cm)	Redcedar	Hemlock	Amabilis fir	Spruce	Pine	Cottonwood	Birch	Aspen	Subalpine fir
7.5–12.5	372.5	50.0							
12.6–17.5	117.2	178.7							
17.6–22.5	56.2	59.2						41.5	40.3
22.6–27.5	57.8	92.7				6.7		9.8	
27.6–32.5	31.9	70.0			8.8		13.0	26.5	7.7
32.6–37.5	5.7	66.6		3.2		3.0	27.0	4.5	
37.6–42.5	4.8	21.7		2.5			7.1		
42.6–47.5	3.5	10.7		1.8	3.8		6.3		
47.6–52.5									
52.6–57.5		2.5		1.2		1.3			
57.6–62.5		2.0							
62.6–67.5									
67.6–72.5						0.7			
72.6–77.5									
77.6–82.5									
82.6–87.5									
87.6–92.5									
92.6–97.5									
> 97.5						0.4			

TABLE 18 *Continued*

Treatment unit A2 (stems per hectare)

DBH (cm)	Redcedar	Hemlock	Amabilis fir	Spruce	Pine	Cottonwood	Birch	Aspen	Subalpine fir
7.5–12.5	511.6	534.1							
12.6–17.5	55.5	279.3					167.6		35.8
17.6–22.5	36.1	290.6			33.9		49.3	10.5	
22.6–27.5	18.6	193.9			24.6			9.2	
27.6–32.5		83.6		14.0	14.0				
32.6–37.5		42.0		3.4	12.1				5.8
37.6–42.5		4.5		5.3	8.4				
42.6–47.5				2.4					
47.6–52.5		6.3							
52.6–57.5				3.2					
57.6–62.5		2.2							
62.6–67.5		1.7							
67.6–72.5									
72.6–77.5		1.2							
77.6–82.5	2.0								
82.6–87.5	1.8								
87.6–92.5									
92.6–97.5						0.3			
> 97.5									

Treatment unit B1 (stems per hectare)

DBH (cm)	Redcedar	Hemlock	Amabilis fir	Spruce	Pine	Cottonwood	Birch	Aspen	Subalpine fir
7.5–12.5	185.4	43.6							
12.6–17.5	72.7	172.8							
17.6–22.5	59.3	66.0					11.4		
22.6–27.5	22.3	215.3		11.5			17.0		
27.6–32.5	6.0	148.3						11.1	
32.6–37.5		87.8			13.0		4.4		
37.6–42.5	3.2	28.9		3.9	9.3				5.4
42.6–47.5	2.1	13.2		9.2					
47.6–52.5									
52.6–57.5				2.0					
57.6–62.5	2.4			1.7					
62.6–67.5	1.0								
67.6–72.5				1.2					
72.6–77.5	0.9								
77.6–82.5									
82.6–87.5									
87.6–92.5									
92.6–97.5									
> 97.5									

TABLE 18 *Continued*

3. Mature, mesic block
Treatment unit B4 (stems per hectare)

DBH (cm)	Redcedar	Hemlock	Amabilis fir	Spruce	Pine	Cottonwood	Birch	Aspen	Subalpine fir
7.5–12.5	263.4	117.5							
12.6–17.5	122.8	36.2							
17.6–22.5	28.4	52.7					78.8		
22.6–27.5	43.6	65.6						11.7	
27.6–32.5	39.6	74.4		13.8	23.0	2.5			
32.6–37.5	5.7	105.0						7.0	13.2
37.6–42.5		31.8			7.1				
42.6–47.5	3.7	17.5				1.2			
47.6–52.5		8.3			4.2				
52.6–57.5		2.3							
57.6–62.5						1.3			
62.6–67.5						0.6			
67.6–72.5									
72.6–77.5									
77.6–82.5									
82.6–87.5									
87.6–92.5									
92.6–97.5									
> 97.5									

Treatment unit C2 (stems per hectare)

DBH (cm)	Redcedar	Hemlock	Amabilis fir	Spruce	Pine	Cottonwood	Birch	Aspen	Subalpine fir
7.5–12.5	186.4	329.7							
12.6–17.5	81.5	29.2							
17.6–22.5	119.2	90.0							
22.6–27.5	13.0	118.8		12.2			4.1		
27.6–32.5	52.1	109.9		8.1				3.4	37.9
32.6–37.5	23.4	68.3		18.5		5.9			
37.6–42.5	6.4	40.4		4.8					
42.6–47.5	14.5	8.4		3.9					
47.6–52.5	3.5	9.6		3.3		3.3			
52.6–57.5	6.2	5.4		2.4		2.7			6.3
57.6–62.5				6.2					
62.6–67.5	2.3			1.8					
67.6–72.5				1.7					
72.6–77.5									
77.6–82.5		1.2							
82.6–87.5									
87.6–92.5									
92.6–97.5									
> 97.5		0.7							

TABLE 18 *Continued*

Treatment unit B5 (stems per hectare)

DBH (cm)	Redcedar	Hemlock	Amabilis fir	Spruce	Pine	Cottonwood	Birch	Aspen
7.5–12.5	707.9							
12.6–17.5	331.9	36.3						
17.6–22.5	139.4							
22.6–27.5	27.3	80.6					32.8	7.2
27.6–32.5	24.4	88.5					50.1	4.6
32.6–37.5	7.9	81.7			20.2			
37.6–42.5		57.4		2.6	8.1		6.5	2.7
42.6–47.5		25.4		2.1	6.0	2.9		
47.6–52.5		4.2		1.7				
52.6–57.5		3.1						
57.6–62.5								
62.6–67.5								
67.6–72.5								
72.6–77.5								
77.6–82.5								
82.6–87.5								
87.6–92.5								
92.6–97.5								
> 97.5								

Treatment unit C1 (stems per hectare)

DBH (cm)	Redcedar	Hemlock	Amabilis fir	Spruce	Pine	Cottonwood	Birch	Aspen
7.5–12.5	86.6	514.5						
12.6–17.5	46.3	330.5					30.3	
17.6–22.5	39.3	258.7						
22.6–27.5	25.6	151.6		34.3	25.7		6.9	
27.6–32.5	13.3	110.0						
32.6–37.5	24.5	41.1	14.3	32.4	30.9			
37.6–42.5	3.8	11.7		5.7				9.3
42.6–47.5	6.1	3.0		15.2				
47.6–52.5	2.4					1.7		
52.6–57.5								
57.6–62.5		5.4						
62.6–67.5								
67.6–72.5				2.1				
72.6–77.5	2.2	1.1						
77.6–82.5						1.3		
82.6–87.5								
87.6–92.5	2.2							
92.6–97.5								
> 97.5	0.3					0.2		

TABLE 18 *Continued*

4. Mature, mesic–subhygric block
Treatment unit A3 (stems per hectare)

DBH (cm)	Redcedar	Hemlock	Amabilis fir	Spruce	Pine	Cottonwood	Birch	Aspen	Subalpine fir
7.5–12.5	218.9	245.2							
12.6–17.5	187.9	337.4							
17.6–22.5	22.4	206.5					43.5		34.6
22.6–27.5	25.2	70.7					47.9	18.9	
27.6–32.5	7.1	130.4			7.3		26.2		
32.6–37.5	29.3	31.7		14.8	11.0		6.0		
37.6–42.5	4.2	7.0		5.9	4.4		4.5		
42.6–47.5	10.5	12.2		8.3	3.6				
47.6–52.5	2.9	7.5		3.6		4.9			
52.6–57.5	7.3	4.2							
57.6–62.5		1.7		2.4					
62.6–67.5				1.8					
67.6–72.5	1.5								
72.6–77.5									
77.6–82.5	1.1								
82.6–87.5				1.1					
87.6–92.5									
92.6–97.5	0.8								
> 97.5	0.7								

Treatment unit B2 (stems per hectare)

DBH (cm)	Redcedar	Hemlock	Amabilis fir	Spruce	Pine	Cottonwood	Birch
7.5–12.5	113.2	578.3					
12.6–17.5	83.1	511.9					
17.6–22.5	32.7	343.3					
22.6–27.5	8.9	132.6					
27.6–32.5	28.8	98.4			14.6		
32.6–37.5	5.7	53.7		5.5	5.8		5.8
37.6–42.5		16.4					
42.6–47.5		16.4	3.1				
47.6–52.5	5.1	15.5	2.4				
52.6–57.5	4.1						
57.6–62.5							
62.6–67.5	2.9			1.6			
67.6–72.5	2.6	1.4					
72.6–77.5	1.2			1.1			
77.6–82.5							
82.6–87.5	1.7						
87.6–92.5	1.6						
92.6–97.5	1.4						
> 97.5						0.6	

TABLE 18 *Continued*

Treatment unit C3 (stems per hectare)

DBH (cm)	Redcedar	Hemlock	Amabilis fir	Spruce	Pine	Cottonwood	Birch	Aspen	Subalpine fir
7.5–12.5	52.5	163.8							
12.6–17.5	75.5	316.1							34.7
17.6–22.5	35.7	125.4		11.1			10.0		23.6
22.6–27.5	20.6	119.0		23.9			5.4	8.0	17.3
27.6–32.5	7.4	88.8		5.3			6.9		10.0
32.6–37.5	10.1	62.6		18.1					0.0
37.6–42.5	4.0	27.8		3.0					6.4
42.6–47.5	6.4	19.7		5.4		2.0		2.6	
47.6–52.5		7.7		2.2					
52.6–57.5	2.2	2.2		3.4					
57.6–62.5	3.6	3.6		5.6					
62.6–67.5	3.1	1.4		2.5					
67.6–72.5		2.6		1.0					
72.6–77.5	1.2								
77.6–82.5				0.8					
82.6–87.5									
87.6–92.5									
92.6–97.5				0.6					
> 97.5	1.3					0.3			

Treatment unit A4 (stems per hectare)

DBH (cm)	Redcedar	Hemlock	Amabilis fir	Spruce	Pine	Cottonwood	Birch	Aspen	Subalpine fir
7.5–12.5		99.5							
12.6–17.5	20.9	68.1							
17.6–22.5	35.9	87.7	10.1	6.9	6.4				
22.6–27.5	12.5	56.9	6.0	11.0			6.2		
27.6–32.5	35.5	64.1		14.4	6.8		24.5		
32.6–37.5	9.4	29.5	4.2	5.6		2.8	11.1	4.9	1.6
37.6–42.5	14.9	24.6	3.3	10.1	1.8	4.8			1.1
42.6–47.5	2.0	9.9		6.4			2.2		
47.6–52.5	3.2	5.8		1.4		1.5			
52.6–57.5	1.2	4.9		1.1					
57.6–62.5	1.1	7.3	1.1	0.9		1.1			
62.6–67.5	1.8	2.7							
67.6–72.5	1.5	3.1							
72.6–77.5	1.3	0.7							
77.6–82.5	0.6	0.6		0.5					
82.6–87.5	1.0								
87.6–92.5	0.9	0.5							
92.6–97.5	1.3								
> 97.5	1.5					1.1			

TABLE 19 *Pre-treatment species distribution of basal area per hectare (m^2/ha) by diameter class and treatment unit*

1. Old-growth block
Treatment unit D2 (basal area–m^2/ha)

DBH (cm)	Redcedar	Hemlock	Amabilis fir	Spruce
7.5–12.5		4.12		
12.6–17.5		1.56		
17.6–22.5		1.56	0.87	
22.6–27.5	0.60	2.65	0.85	
27.6–32.5	1.03	2.18		
32.6–37.5		3.58		
37.6–42.5	1.04	5.91		
42.6–47.5	1.11	9.08		
47.6–52.5	0.53	8.48		0.49
52.6–57.5		8.43		
57.6–62.5	1.07	6.90		
62.6–67.5		6.60		
67.6–72.5		2.19		
72.6–77.5		1.50		
77.6–82.5		0.70		
82.6–87.5		1.42		
87.6–92.5				
92.6–97.5				
> 97.5				

Treatment unit D4 (basal area–m^2/ha)

DBH (cm)	Redcedar	Hemlock	Amabilis fir	Spruce	Pine	Cottonwood
7.5–12.5			0.64			
12.6–17.5		0.53				
17.6–22.5		1.18				
22.6–27.5		2.69	1.27			
27.6–32.5		4.23				
32.6–37.5		4.19				
37.6–42.5		2.75				
42.6–47.5		5.98		0.37		
47.6–52.5	0.53	4.63	0.47			
52.6–57.5	0.48	7.53				
57.6–62.5		2.04				
62.6–67.5		1.33		0.40		
67.6–72.5	0.96	4.08				
72.6–77.5		3.23				
77.6–82.5						
82.6–87.5	1.48	1.36				
87.6–92.5		1.34				
92.6–97.5		1.42				
> 97.5	1.00					0.68

TABLE 19 *Continued*

Treatment unit D5 (basal area–m^2/ha)

DBH (cm)	Redcedar	Hemlock	Amabilis fir	Spruce
7.5–12.5		0.82	0.87	
12.6–17.5		1.52		0.26
17.6–22.5		0.60	0.46	
22.6–27.5		2.20	1.20	
27.6–32.5		4.93	1.17	
32.6–37.5		2.93	2.05	
37.6–42.5	0.82	4.26	1.52	
42.6–47.5	0.76	4.23	0.52	
47.6–52.5		7.25	1.18	
52.6–57.5		5.11		
57.6–62.5	0.88	5.00	1.07	
62.6–67.5	0.86	2.92		
67.6–72.5	0.89	4.08		
72.6–77.5		2.83		
77.6–82.5		2.16		
82.6–87.5		2.21		
87.6–92.5		0.70		
92.6–97.5		0.71		
> 97.5				

Treatment unit D3 (basal area–m^2/ha)

DBH (cm)	Redcedar	Hemlock	Amabilis fir	Spruce
7.5–12.5	0.72	3.70		
12.6–17.5		1.58		
17.6–22.5		4.59		
22.6–27.5	1.03	3.63	1.12	
27.6–32.5		3.23	0.49	0.76
32.6–37.5		2.18		
37.6–42.5	1.11	1.62		
42.6–47.5	1.11	2.15		
47.6–52.5	2.59	4.24	0.51	
52.6–57.5	1.05	9.31		
57.6–62.5	1.98	4.35		
62.6–67.5	0.53	2.19		
67.6–72.5	0.54	3.27		
72.6–77.5		2.65		
77.6–82.5				
82.6–87.5		1.08		
87.6–92.5	0.51	0.51		
92.6–97.5	1.06			
> 97.5	0.48	0.57		

TABLE 19 *Continued*

2. Mature, mesic–submesic block
Treatment unit A1 (basal area–m^2/ha)

DBH (cm)	Redcedar	Hemlock	Amabilis fir	Spruce	Pine	Cottonwood	Birch	Aspen	Subalpine fir
7.5–12.5	0.41								
12.6–17.5	0.96	2.15	0.43						
17.6–22.5	2.09	2.28			0.54		1.11		
22.6–27.5	3.04	5.87			0.45				
27.6–32.5	2.71	6.06			1.10	0.96	2.69	1.31	
32.6–37.5	0.54	3.84	0.73	1.43	1.01	0.40		0.72	
37.6–42.5	1.61	5.69			1.02				
42.6–47.5	0.51	0.49	0.38	0.52		0.46			
47.6–52.5		0.47	0.37			0.43			
52.6–57.5		0.95				0.48			
57.6–62.5									
62.6–67.5				0.50					
67.6–72.5									
72.6–77.5									
77.6–82.5									
82.6–87.5									
87.6–92.5									
92.6–97.5									
> 97.5									

Treatment unit B3 (basal area–m^2/ha)

DBH (cm)	Redcedar	Hemlock	Amabilis fir	Spruce	Pine	Cottonwood	Birch	Aspen	Subalpine fir
7.5–12.5	2.93	0.39							
12.6–17.5	2.07	3.16							
17.6–22.5	1.77	1.86						1.30	1.27
22.6–27.5	2.84	4.55				0.33		0.48	
27.6–32.5	2.25	4.95			0.62		0.92	1.87	0.54
32.6–37.5	0.55	6.41		0.31		0.29	2.60	0.43	
37.6–42.5	0.60	2.73		0.31			0.89		
42.6–47.5	0.56	1.70		0.29	0.60		1.00		
47.6–52.5									
52.6–57.5		0.59		0.29		0.31			
57.6–62.5		0.57							
62.6–67.5									
67.6–72.5						0.27			
72.6–77.5									
77.6–82.5									
82.6–87.5									
87.6–92.5									
92.6–97.5									
> 97.5						0.31			

TABLE 19 *Continued*

Treatment unit A2 (basal area–m^2/ha)

DBH (cm)	Redcedar	Hemlock	Amabilis fir	Spruce	Pine	Cottonwood	Birch	Aspen	Subalpine fir
7.5–12.5	4.02	4.19							
12.6–17.5	0.98	4.94					2.96		0.63
17.6–22.5	1.13	9.13			1.06		1.55	0.33	
22.6–27.5	0.91	9.52			1.21			0.45	
27.6–32.5		5.91		0.99	0.99				
32.6–37.5		4.04		0.33	1.16				0.56
37.6–42.5		0.57		0.67	1.06				
42.6–47.5				0.38					
47.6–52.5		1.24							
52.6–57.5				0.76					
57.6–62.5		0.62							
62.6–67.5		0.56							
67.6–72.5									
72.6–77.5		0.53							
77.6–82.5	1.01								
82.6–87.5	1.02								
87.6–92.5									
92.6–97.5						0.21			
> 97.5									

Treatment unit B1 (basal area–m^2/ha)

DBH (cm)	Redcedar	Hemlock	Amabilis fir	Spruce	Pine	Cottonwood	Birch	Aspen	Subalpine fir
7.5–12.5	1.46	0.34							
12.6–17.5	1.28	3.05							
17.6–22.5	1.86	2.07					0.36		
22.6–27.5	1.09	10.57		0.56			0.83		
27.6–32.5	0.42	10.48						0.78	
32.6–37.5		8.45			1.25		0.42		
37.6–42.5	0.40	3.63		0.49	1.17				0.68
42.6–47.5	0.33	2.10		1.46					
47.6–52.5									
52.6–57.5				0.48					
57.6–62.5	0.68			0.48					
62.6–67.5	0.33								
67.6–72.5				0.46					
72.6–77.5	0.40								
77.6–82.5									
82.6–87.5									
87.6–92.5									
92.6–97.5									
> 97.5									

TABLE 19 *Continued*

3. Mature, mesic block
Treatment unit B4 (basal area–m^2/ha)

DBH (cm)	Redcedar	Hemlock	Amabilis fir	Spruce	Pine	Cottonwood	Birch	Aspen	Subalpine fir
7.5–12.5	2.07	0.92							
12.6–17.5	2.17	0.64							
17.6–22.5	0.89	1.66					2.48		
22.6–27.5	2.14	3.22						0.57	
27.6–32.5	2.80	5.26		0.98	1.63	0.18			
32.6–37.5	0.55	10.10						0.67	1.27
37.6–42.5		4.00			0.89				
42.6–47.5	0.59	2.78				0.19			
47.6–52.5		1.63			0.82				
52.6–57.5		0.55							
57.6–62.5						0.37			
62.6–67.5						0.20			
67.6–72.5									
72.6–77.5									
77.6–82.5									
82.6–87.5									
87.6–92.5									
92.6–97.5									
> 97.5									

Treatment unit C2 (basal area–m^2/ha)

DBH (cm)	Redcedar	Hemlock	Amabilis fir	Spruce	Pine	Cottonwood	Birch	Aspen	Subalpine fir
7.5–12.5	1.46	2.59							
12.6–17.5	1.44	0.52							
17.6–22.5	3.74	2.83							
22.6–27.5	0.64	5.83		0.60			0.20		
27.6–32.5	3.68	7.77		0.57				0.24	2.68
32.6–37.5	2.25	6.57		1.78		0.57			
37.6–42.5	0.80	5.08		0.60					
42.6–47.5	2.31	1.34		0.62					
47.6–52.5	0.69	1.88		0.65		0.65			
52.6–57.5	1.47	1.28		0.57		0.64			1.50
57.6–62.5				1.75					
62.6–67.5	0.76			0.60					
67.6–72.5				0.65					
72.6–77.5									
77.6–82.5		0.60							
82.6–87.5									
87.6–92.5									
92.6–97.5									
> 97.5	0.79								

TABLE 19 *Continued*

Treatment unit B5 (basal area–m^2/ha)

DBH (cm)	Redcedar	Hemlock	Amabilis fir	Spruce	Pine	Cottonwood	Birch	Aspen
7.5–12.5	5.56							
12.6–17.5	5.87	0.64						
17.6–22.5	4.38							
22.6–27.5	1.34	3.96					1.61	0.35
27.6–32.5	1.72	6.26					3.54	0.33
32.6–37.5	0.76	7.86			1.94			
37.6–42.5		7.21		0.33	1.02		0.82	0.34
42.6–47.5		4.04		0.33	0.95	0.46		
47.6–52.5		0.82		0.33				
52.6–57.5		0.74						
57.6–62.5								
62.6–67.5								
67.6–72.5								
72.6–77.5								
77.6–82.5								
82.6–87.5								
87.6–92.5								
92.6–97.5								
> 97.5								

Treatment unit C1 (basal area–m^2/ha)

DBH (cm)	Redcedar	Hemlock	Amabilis fir	Spruce	Pine	Cottonwood	Birch	Aspen	Subalpine fir
7.5–12.5	0.68	4.04							
12.6–17.5	0.82	5.84					0.54		
17.6–22.5	1.23	8.13							
22.6–27.5	1.26	7.44		1.68	1.26		0.34		
27.6–32.5	0.94	7.78							
32.6–37.5	2.36	3.95	1.38	3.12	2.97				
37.6–42.5	0.48	1.47		0.72				1.17	
42.6–47.5	0.97	0.48		2.42					
47.6–52.5	0.47					0.33			
52.6–57.5									
57.6–62.5		1.53							
62.6–67.5									
67.6–72.5				0.81					
72.6–77.5	0.97	0.49							
77.6–82.5						0.65			
82.6–87.5									
87.6–92.5	1.40								
92.6–97.5									
> 97.5	0.40					0.48			

TABLE 19 *Continued*

4. Mature, mesic–subhygric block
Treatment unit A3 (basal area–m^2/ha)

DBH (cm)	Redcedar	Hemlock	Amabilis fir	Spruce	Pine	Cottonwood	Birch	Aspen	Subalpine fir
7.5–12.5	1.72	1.93							
12.6–17.5	3.32	5.96							
17.6–22.5	0.70	6.49					1.37		1.09
22.6–27.5	1.24	3.47					2.35	0.93	
27.6–32.5	0.50	9.22			0.52		1.85		
32.6–37.5	2.82	3.05		1.42	1.06		0.58		
37.6–42.5	0.53	0.88		0.74	0.55		0.57		
42.6–47.5	1.67	1.94		1.32	0.57				
47.6–52.5	0.57	1.47		0.71		0.96			
52.6–57.5	1.73	1.00							
57.6–62.5		0.48		0.68					
62.6–67.5				0.60					
67.6–72.5	0.58								
72.6–77.5									
77.6–82.5	0.55								
82.6–87.5				0.62					
87.6–92.5									
92.6–97.5	0.57								
> 97.5	0.55								

Treatment unit B2 (basal area–m^2/ha)

DBH (cm)	Redcedar	Hemlock	Amabilis fir	Spruce	Pine	Cottonwood	Birch	Aspen	Subalpine fir
7.5–12.5	0.89	4.54							
12.6–17.5	1.47	9.05							
17.6–22.5	1.03	10.79							
22.6–27.5	0.44	6.51							
27.6–32.5	2.04	6.96				1.03			
32.6–37.5	0.55	5.17			0.53	0.56		0.56	
37.6–42.5		2.06							
42.6–47.5		2.61		0.49					
47.6–52.5	1.00	3.04		0.47					
52.6–57.5	0.97								
57.6–62.5									
62.6–67.5	0.96				0.53				
67.6–72.5	1.00	0.54							
72.6–77.5	0.53				0.49				
77.6–82.5									
82.6–87.5	0.96								
87.6–92.5	1.02								
92.6–97.5	0.99								
> 97.5							0.52		

TABLE 19 *Continued*

Treatment unit C3 (basal area–m^2/ha)

DBH (cm)	Redcedar	Hemlock	Amabilis fir	Spruce	Pine	Cottonwood	Birch	Aspen	Subalpine fir
7.5–12.5	0.41	1.29							
12.6–17.5	1.33	5.59							0.61
17.6–22.5	1.12	3.94		0.35			0.31		0.74
22.6–27.5	1.01	5.84		1.17			0.27	0.39	0.85
27.6–32.5	0.52	6.28		0.37			0.49		0.71
32.6–37.5	0.97	6.02		1.74					
37.6–42.5	0.50	3.49		0.38					0.80
42.6–47.5	1.00	3.13		0.86	0.32			0.41	
47.6–52.5		1.51		0.43					
52.6–57.5	0.52	0.52		0.81					
57.6–62.5	1.02	1.02		1.58					
62.6–67.5	1.03	0.46		0.83					
67.6–72.5		1.00		0.38					
72.6–77.5	0.53								
77.6–82.5				0.40					
82.6–87.5									
87.6–92.5									
92.6–97.5				0.43					
> 97.5	1.02				0.34				

Treatment unit A4 (basal area–m^2/ha)

DBH (cm)	Redcedar	Hemlock	Amabilis fir	Spruce	Pine	Cottonwood	Birch	Aspen	Subalpine fir
7.5–12.5		0.78							
12.6–17.5	0.37	1.20							
17.6–22.5	1.13	2.76	0.32	0.22	0.20				
22.6–27.5	0.61	2.79	0.29	0.54			0.30		
27.6–32.5	2.51	4.53		1.02	0.48		1.73		
32.6–37.5	0.90	2.84	0.40	0.54		0.27	1.07	0.47	0.15
37.6–42.5	1.87	3.09	0.41	1.27	0.23	0.60			0.14
42.6–47.5	0.32	1.57		1.02			0.35		
47.6–52.5	0.63	1.14		0.27		0.29			
52.6–57.5	0.29	1.16		0.26					
57.6–62.5	0.31	2.06	0.31	0.25		0.31			
62.6–67.5	0.60	0.90							
67.6–72.5	0.58	1.19							
72.6–77.5	0.57	0.31							
77.6–82.5	0.30	0.30		0.25					
82.6–87.5	0.57								
87.6–92.5	0.57	0.32							
92.6–97.5	0.92								
> 97.5	1.05					1.13			

TABLE 20 *Pre-treatment density (stems per hectare) of advance regeneration by treatment unit and size class*

Treatment	Clearcut				Heavy removal				Light removal				No harvest			
Unit	D2	A1	B4	A3	D4	B3	C2	B2	D5	A2	B5	C3	D3	B1	C1	A4
0.1–1.3 m tall (sph)	20 267	1571	4127	14 179	16 975	7628	1933	14 611	19 311	1360	3020	1615	7667	2514	477	4800
Spruce (%)	0	0	0	1	1	0	3	1	0	0	0	1	0	1	3	1
Pine (%)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W. hemlock (%)	81	19	42	78	90	22	64	72	57	68	21	81	86	24	48	80
Birch (%)	0	0	8	0	0	3	3	1	0	0	13	0	0	5	6	0
Redcedar (%)	1	70	33	20	2	56	10	25	0	31	62	12	1	61	19	15
Subalpine fir (%)	0	11	17	1	1	19	2	1	0	1	5	6	0	10	0	4
Amabilis fir (%)	17	0	0	0	6	0	17	0	42	0	0	0	12	0	23	0
0.0–2.5 cm DBH (sph)	1133	314	691	571	1825	1514	167	556	467	120	500	77	467	443	108	379
Spruce (%)	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0
Pine (%)	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
W. hemlock (%)	85	9	16	31	78	8	60	0	81	50	0	20	95	6	71	50
Birch (%)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Redcedar (%)	3	86	68	69	4	81	40	100	0	50	100	80	0	87	14	25
Subalpine fir (%)	0	5	16	0	8	9	0	0	0	0	0	0	0	6	0	25
Amabilis fir (%)	12	0	0	0	7	0	0	0	19	0	0	0	5	0	14	0
2.6–5.0 cm DBH (sph)	1200	129	436	464	1000	857	267	622	311	260	880	123	600	486	77	232
Spruce (%)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pine (%)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W. hemlock (%)	92	0	8	8	80	3	50	18	50	92	2	38	89	12	60	27
Birch (%)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Redcedar (%)	0	89	79	92	0	80	50	82	7	8	98	62	11	88	40	50
Subalpine fir (%)	0	11	12	0	8	17	0	0	0	0	0	0	0	0	0	23
Amabilis fir (%)	8	0	0	0	13	0	0	0	43	0	0	0	0	0	0	0
5.1–7.5 cm DBH (sph)[a]	833	129	291	536	450	400	133	756	89	400	360	139	356	429	215	453
Spruce (%)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pine (%)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W. hemlock (%)	84	11	31	13	89	0	0	59	76	70	0	56	81	13	71	49
Birch (%)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Redcedar (%)	4	89	63	87	0	86	50	38	0	30	100	44	0	87	29	49
Subalpine fir (%)	0	0	6	0	0	14	25	3	0	0	0	0	6	0	0	2
Amabilis fir (%)	12	0	0	0	11	0	25	0	25	0	0	0	12	0	0	0
Total	23 433	2143	5545	15 750	20 250	10 399	2500	16 545	20 178	2140	4760	1954	9090	3872	877	5864

[a] Data for each species are expressed as a percent of the total stems per hectare (sph) for a given size class. For example, in treatment unit D2 there were 833 stems per hectare in the 5.1–7.5 cm diameter class; 84% of those stems were hemlock, 12% amabilis fir, and 4% redcedar.

TABLE 21 *Pre-treatment density (stems per hectare) of dead advance regeneration by treatment unit and size class*

Treatment	Clearcut				Light removal				Heavy removal				No harvest			
Unit	D2	A1	B4	A3	D5	A2	B5	C3	D4	B3	C2	B2	D3	B1	C1	A4
Tree size class																
0.1–1.3 m tall	333	0	345	143	422	0	360	31	175	686	133	389	89	300	169	53
0.0–2.5 cm DBH	767	100	73	179	0	40	560	154	225	314	233	322	333	114	185	42
2.6–5.0 cm DBH	267	114	109	786	44	280	140	415	150	314	767	467	356	329	615	116
5.1–7.5 cm DBH	33	43	109	607	67	480	120	231	0	171	533	533	267	171	277	42

TABLE 22 *Pre-treatment volume of coarse woody debris by treatment unit*

Treatment	Block	Unit	Mean volume (m^3/ha)	SE
Clearcut	1	D2	120.2	18.6
	2	A1	80.3	12.4
	3	B4	57.7	23.6
	4	A3	133.1	37.8
Heavy removal	1	D4	163.3	41.1
	2	B3	50.9	6.9
	3	C2	89.5	17.0
	4	B2	116.0	24.5
Light removal	1	D5	132.9	18.7
	2	A2	94.4	24.2
	3	B5	61.7	11.1
	4	C3	84.1	11.9
No harvest	1	D3	285.5	44.6
	2	B1	87.2	19.8
	3	C1	101.6	23.1
	4	A4	156.9	35.6

TABLE 23 *Pre-treatment a) diameter and b) species distribution of coarse woody debris by treatment unit*

a) Coarse woody debris frequency[a] by diameter class

Treatment	Clearcut				Heavy removal				Light removal				No harvest			
Unit	D2	A1	B4	A3	D4	B3	C2	B2	D5	A2	B5	C3	D3	B1	C1	A4
DBH (cm)																
10–20	39	121	63	120	42	76	116	92	45	124	103	79	49	106	166	105
20–30	27	40	26	38	33	22	27	25	38	17	29	22	30	39	43	48
30–40	24	12	7	9	21	6	8	8	23	8	6	14	36	6	12	16
40–50	10	0	2	1	23	1	5	1	9	3	0	3	24	1	1	5
50–60	3	0	0	0	3	0	3	5	5	4	0	0	3	3	0	5
60–70	2	0	0	0	1	0	0	0	0	2	0	2	4	0	1	2
70–80	0	0	1	1	0	0	0	3	1	1	0	1	2	0	0	0
80–90	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0
90–100	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0
100–110	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0
110–120	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
120–130	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
130–140	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total	105	173	99	172	124	105	159	135	121	159	138	121	154	155	223	182

[a] Frequency = number of times that a given (a) diameter or (b) species of coarse woody debris intersected the 900 m of transect line (each treatment unit contains ten 90 m line-intersect triangles; see section 3.3.1). For example, in treatment unit D2, redcedar coarse woody debris was encountered 11 times along the transect.

TABLE 23 *Continued*

b) Coarse woody debris frequency by species

Treatment	Clearcut				Heavy removal				Light removal				No harvest			
Unit	D2	A1	B4	A3	D4	B3	C2	B2	D5	A2	B5	C3	D3	B1	C1	A4
Species[b]																
Cottonwood	0	20	0	2	0	3	6	3	0	0	5	0	0	3	0	4
Aspen	0	19	18	10	0	40	16	1	0	10	17	9	0	5	37	1
Amabilis fir	0	0	0	2	0	0	5	0	0	0	0	0	0	0	0	1
Redcedar	11	10	6	15	19	4	7	18	9	7	21	6	21	41	13	13
Subalpine fir	9	7	2	2	3	3	3	2	23	12	3	10	5	1	3	0
Birch	0	16	15	39	0	6	8	4	0	52	44	4	0	16	8	36
W. hemlock	53	23	4	52	52	6	61	78	50	41	7	47	60	35	101	60
Pine	0	2	4	2	0	0	0	1	0	0	1	0	0	1	0	2
Spruce	0	6	2	14	0	11	8	0	1	9	8	7	0	2	13	16
UK	17	23	27	12	21	24	13	11	17	8	18	17	20	24	21	30
UKA	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
UKC	15	18	13	15	29	6	23	15	21	16	9	18	47	19	22	16
UKD	0	29	8	7	0	2	9	2	0	4	5	2	1	8	5	3
Total	105	173	99	172	124	105	159	135	121	159	138	121	154	155	223	182

[b] Species: UK = Unknown; UKA = Aspen or Cottonwood; UKC = Unknown Conifer; UKD = Unknown Deciduous.

TABLE 24 *Estimated post-treatment density (mean) and basal area of live and dead trees*

Treatment	Block	Unit	Density (stems per hectare)[a] Live trees	(SE, df)[c]	Dead trees	(SE, df)	Basal area (m^2/ha)[b] Live trees	(SE, df)	Dead trees	(SE, df)
Heavy removal	1	D4	273.2	(45.4, 33)	62.7	(18.1, 30)	30.2	(2.1, 25)	2.6	(0.6, 29)
	2	B3	737.7	(71.7, 43)	52.6	(15.9, 43)	31.6	(2.7, 25)	1.7	(0.4, 30)
	3	C2	586.3	(58.5, 40)	83.9	(19.5, 26)	36.2	(2.9, 23)	1.6	(0.4, 41)
	4	B2	730.8	(117.2, 30)	62.3	(19.2, 22)	35.0	(2.6, 34)	1.1	(0.3, 40)
Light removal	1	D5	402.4	(47.4, 43)	42.1	(18.2, 41)	49.4	(3.0, 23)	1.5	(0.5, 40)
	2	A2	1056.9	(94.0, 42)	86.3	(20.8, 26)	44.4	(3.4, 25)	1.6	(0.4, 37)
	3	B5	1291.7	(102.1, 35)	56.8	(18.2, 44)	48.8	(3.1, 27)	1.9	(0.6, 31)
	4	C3	1150.8	(135.3, 29)	191.9	(54.6, 25)	52.2	(3.9, 29)	4.1	(0.9, 43)
No harvest	1	D3	706.3	(56.5, 40)	103.2	(22.9, 43)	67.0	(3.3, 23)	9.3	(1.5, 23)
	2	B1	1529.0	(99.7, 43)	172.2	(30.7, 37)	64.1	(2.7, 30)	4.3	(0.8, 35)
	3	C1	1530.9	(118.8, 40)	316.6	(48.9, 39)	71.9	(3.1, 31)	5.7	(0.9, 41)
	4	A4	1085.7	(83.0, 41)	195.3	(43.0, 39)	60.0	(2.8, 24)	6.6	(1.2, 33)

[a] Density includes all stems ≥ 7.5 cm DBH.
[b] Basal area includes all stems ≥ 7.5 cm DBH.
[c] Standard error and degrees of freedom of the density and basal area estimates are in parentheses.

TABLE 25 *Post-treatment a) basal area and b) density (mean) by species and treatment unit*

a) basal area (m^2 per hectare)

Treatment	Heavy removal				Light removal				No harvest			
Unit	D4	B3	C2	B2	D5	A2	B5	C3	D3	B1	C1	A4
Cottonwood	0.0	1.1	2.0	1.3	0.0	0.3	0.3	0.5	0.0	0.6	3.7	1.3
Aspen	0.0	2.3	0.6	0.0	0.0	0.3	1.1	0.5	0.0	0.0	0.3	0.0
Amabilis fir	0.2	0.0	0.0	0.0	2.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subalpine fir	0.2	0.2	1.8	0.2	1.4	0.6	0.0	2.3	1.1	0.3	0.7	2.5
Redcedar	5.2	5.7	10.0	6.0	0.8	5.6	9.5	7.7	12.5	10.4	16.5	13.8
Birch	0.0	3.6	0.2	1.1	0.0	1.6	2.4	1.8	0.0	2.5	1.0	6.1
Hemlock	22.3	13.7	18.1	19.6	42.0	27.8	24.0	29.0	48.8	35.3	30.0	28.0
Pine	0.0	0.4	0.0	0.9	0.0	2.6	2.4	0.3	0.0	1.6	5.7	0.0
Spruce	0.9	1.1	1.4	1.3	0.6	1.0	1.1	4.4	1.1	4.7	6.1	3.5
Total	28.7	28.0	34.3	30.6	47.6	39.9	40.6	46.4	63.6	55.5	64.1	55.3

b) density (stems per hectare)

Treatment	Heavy removal				Light removal				No harvest			
Unit	D4	B3	C2	B2	D5	A2	B5	C3	D3	B1	C1	A4
Cottonwood	0.0	8.6	9.6	2.2	0.0	0.7	3.3	0.0	0.0	4.4	17.3	3.2
Aspen	0.0	47.1	6.7	0.0	0.0	4.4	18.4	3.0	0.0	0.0	4.1	0.0
Amabilis fir	3.9	0.0	0.0	0.0	30.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subalpine fir	0.4	1.2	20.7	0.6	11.9	7.1	0.0	29.3	16.7	6.2	4.6	28.0
Redcedar	14.3	112.0	114.5	81.2	3.4	100.5	193.3	82.0	61.5	143.0	185.0	128.9
Birch	0.0	60.4	3.7	23.1	0.0	44.5	51.7	19.9	0.0	53.7	14.1	123.5
Hemlock	133.5	198.2	236.1	281.4	235.4	484.3	297.2	454.7	331.9	581.9	592.6	368.0
Pine	0.0	2.1	0.0	18.1	0.0	32.3	28.0	3.3	0.0	16.5	89.2	0.0
Spruce	3.9	18.9	15.3	11.0	4.3	9.5	4.5	23.2	4.5	36.1	50.5	25.6
Total	156.1	448.5	406.6	417.5	285.1	683.3	596.4	616.2	414.5	841.7	957.4	677.2

TABLE 26 *Post-treatment basal area (m^2 per hectare) by diameter class, species, and treatment unit*

Treatment		Heavy removal				Light removal				No harvest			
Unit		D4	B3	C2	B2	D5	A2	B5	C3	D3	B1	C1	A4
DBH (cm)	Species												
17.5–20	Aspen	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Redcedar	0.1	0.2	0.8	0.4	0.0	0.8	1.3	0.3	0.0	1.3	1.0	0.6
	Birch	0.0	0.0	0.0	0.2	0.0	1.0	0.3	0.0	0.0	0.3	0.0	0.6
	Hemlock	0.0	0.4	1.1	0.9	0.6	1.9	0.3	1.5	0.8	1.6	2.0	1.6
	Spruce	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total	0.1	1.0	1.9	1.5	0.6	3.7	1.8	1.8	0.8	3.2	3.0	2.9
20.1–30	Cottonwood	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Aspen	0.0	1.4	0.0	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0
	Amabilis fir	0.2	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Subalpine fir	0.0	0.0	0.6	0.0	0.3	0.3	0.0	1.0	0.4	0.3	0.0	0.9
	Redcedar	0.0	4.7	2.1	2.1	0.0	2.6	5.5	1.3	0.4	3.2	4.1	2.3
	Birch	0.0	2.0	0.2	0.8	0.0	0.3	1.8	0.5	0.0	1.6	0.3	3.9
	Hemlock	1.9	4.7	5.5	7.7	2.2	14.9	7.4	11.8	3.8	16.7	19.9	8.0
	Pine	0.0	0.0	0.0	0.8	0.0	0.6	0.8	0.0	0.0	0.0	3.4	0.0
	Spruce	0.0	0.4	0.2	0.4	0.0	0.3	0.0	0.0	0.0	0.3	1.0	0.0
	Total	2.0	13.2	8.6	11.7	3.3	19.1	16.3	14.6	4.5	22.1	28.7	15.1
30.1–40	Cottonwood	0.0	0.4	0.2	0.0	0.0	0.0	0.3	0.0	0.0	0.3	0.3	0.0
	Aspen	0.0	0.7	0.4	0.0	0.0	0.3	0.3	0.0	0.0	0.0	0.3	0.0
	Amabilis fir	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Subalpine fir	0.0	0.0	0.6	0.0	0.6	0.0	0.0	0.5	0.8	0.0	0.3	0.3
	Redcedar	0.2	0.5	2.7	1.3	0.0	0.6	0.8	2.8	1.1	0.3	3.0	2.9
	Birch	0.0	1.4	0.0	0.0	0.0	0.0	0.3	0.8	0.0	0.6	0.7	1.6
	Hemlock	2.0	6.1	4.1	4.0	3.9	7.1	10.0	10.8	7.6	14.2	6.8	10.0
	Pine	0.0	0.0	0.0	0.2	0.0	1.6	0.3	0.3	0.0	1.3	2.0	0.0
	Spruce	0.0	0.2	0.6	0.0	0.3	0.3	0.0	1.0	0.0	1.3	2.0	1.3
	Total	2.2	9.3	8.6	5.5	5.3	10.0	11.9	16.2	9.5	18.0	15.5	16.1
40.1–50	Cottonwood	0.0	0.2	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.3
	Aspen	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0
	Amabilis fir	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Subalpine fir	0.0	0.2	0.6	0.0	0.0	0.3	0.0	0.8	0.0	0.0	0.0	0.9

TABLE 26 *Continued*

Treatment		Heavy removal				Light removal				No harvest			
Unit		D4	B3	C2	B2	D5	A2	B5	C3	D3	B1	C1	A4
DBH (cm)	Species												
40.1–50	Redcedar	0.0	0.4	1.8	0.8	0.3	0.3	0.3	2.1	3.4	1.6	3.0	1.0
	Birch	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0
	Hemlock	4.9	2.1	4.7	3.4	7.2	1.6	5.0	3.1	6.4	1.9	1.4	4.2
	Pine	0.0	0.2	0.0	0.0	0.0	0.3	1.3	0.0	0.0	0.3	0.3	0.0
	Spruce	0.3	0.4	0.6	0.4	0.0	0.0	0.3	0.3	0.4	1.9	1.4	1.6
	Total	5.3	3.6	8.8	4.5	8.6	2.6	6.9	6.9	10.2	5.7	7.1	8.0
50.1–60	Cottonwood	0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0
	Amabilis fir	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Subalpine fir	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.3	0.3
	Redcedar	0.7	0.0	0.4	0.2	0.0	0.3	0.5	0.5	3.0	2.5	1.7	0.3
	Birch	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.3	0.0	0.0	0.0	0.0
	Hemlock	5.6	0.4	1.0	2.5	8.9	1.9	1.3	0.8	15.9	0.6	0.0	2.6
	Pine	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Spruce	0.2	0.0	0.0	0.2	0.0	0.0	0.5	1.8	0.0	1.3	1.7	0.3
	Total	6.5	0.5	1.6	3.0	9.5	2.6	2.4	3.3	18.9	4.4	4.4	3.5
60.1–70	Cottonwood	0.0	0.4	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.0
	Amabilis fir	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Subalpine fir	0.2	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Redcedar	0.5	0.0	0.4	0.2	0.3	0.3	0.5	0.5	0.4	0.6	0.3	1.9
	Hemlock	3.6	0.0	0.6	0.8	8.9	0.0	0.0	0.5	8.7	0.3	0.0	0.3
	Spruce	0.2	0.0	0.0	0.4	0.0	0.3	0.0	1.0	0.4	0.0	0.0	0.3
	Total	4.4	0.4	1.2	1.5	9.2	0.6	0.5	2.1	9.5	1.3	0.7	2.6
70.1–80	Cottonwood	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0
	Redcedar	0.2	0.0	1.0	0.4	0.3	0.0	0.5	0.0	1.5	0.3	1.0	0.6
	Birch	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Hemlock	2.4	0.0	0.8	0.2	6.7	0.3	0.0	0.5	3.4	0.0	0.0	1.3
	Spruce	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.4	0.0	0.0	0.0
	Total	2.6	0.0	1.8	0.8	7.0	0.6	0.8	0.8	5.3	0.3	1.0	1.9

TABLE 26 *Continued*

Treatment		Heavy removal				Light removal				No harvest			
Unit		D4	B3	C2	B2	D5	A2	B5	C3	D3	B1	C1	A4
DBH (cm)	Species												
80.1–90	Cottonwood	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0
	Subalpine fir	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Redcedar	1.0	0.0	0.6	0.4	0.0	0.0	0.0	0.3	1.5	0.3	0.0	1.9
	Hemlock	0.9	0.0	0.2	0.2	1.4	0.0	0.0	0.0	0.8	0.0	0.0	0.0
	Spruce	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total	1.9	0.0	0.8	0.8	1.9	0.0	0.0	0.3	2.3	0.3	0.7	1.9
90.1–100	Cottonwood	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0
	Redcedar	1.5	0.0	0.2	0.2	0.0	0.3	0.0	0.5	1.1	0.0	0.7	1.3
	Hemlock	1.0	0.0	0.0	0.0	1.9	0.0	0.0	0.0	1.1	0.0	0.0	0.0
	Total	2.6	0.0	0.2	0.6	1.9	0.3	0.0	0.5	2.3	0.0	1.0	1.3
100.1–110	Cottonwood	0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3
	Redcedar	0.5	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.7	0.6
	Hemlock	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Spruce	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total	0.7	0.0	0.2	0.2	0.3	0.3	0.0	0.0	0.0	0.0	1.0	1.0
110.1–120	Cottonwood	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
	Redcedar	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.0
	Hemlock	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0
	Total	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.4	0.3	0.3	0.3
120.1–130	Cottonwood	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
	Redcedar	0.5	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.3
	Total	0.5	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.6
>130	Cottonwood	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total		28.7	28.0	34.3	30.6	47.6	39.9	40.6	46.4	63.6	55.5	64.1	55.4

TABLE 27 *Post-treatment density (mean stems per hectare) by diameter class, species, and treatment unit*

Treatment		Heavy removal				Light removal				No harvest			
Unit		D4	B3	C2	B2	D5	A2	B5	C3	D3	B1	C1	A4
DBH (cm)	Species												
17.5–20	Aspen	0.0	5.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Redcedar	3.3	6.3	29.0	14.8	0.0	27.4	51.5	8.7	0.0	47.5	36.4	22.8
	Birch	0.0	0.0	0.0	6.3	0.0	37.1	8.8	0.0	0.0	12.0	0.0	24.7
	Hemlock	0.0	17.3	39.9	33.2	21.6	69.1	8.7	54.0	24.7	57.6	73.1	56.6
	Spruce	0.0	6.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total	3.3	35.7	68.9	54.3	21.6	133.5	68.9	62.7	24.7	117.1	109.5	104.2
20.1–30	Cottonwood	0.0	2.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Aspen	0.0	33.7	0.0	0.0	0.0	0.0	14.9	0.0	0.0	0.0	0.0	0.0
	Amabilis fir	3.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Subalpine fir	0.0	0.0	11.1	0.0	20.3	5.3	0.0	19.4	8.8	6.2	0.0	15.7
	Redcedar	0.0	97.2	38.2	43.5	0.0	60.6	125.9	24.9	6.0	69.2	82.5	49.4
	Birch	0.0	44.4	3.7	16.4	0.0	6.2	39.9	9.5	0.0	35.5	4.9	80.2
	Hemlock	39.3	97.5	112.9	169.0	42.3	313.6	140.3	253.1	85.4	352.3	429.7	163.2
	Pine	0.0	0.0	0.0	15.9	0.0	12.3	15.4	0.0	0.0	0.0	63.3	0.0
	Spruce	0.0	8.5	4.5	6.8	0.0	6.0	0.0	0.0	0.0	5.0	16.5	0.0
	Total	43.3	284.0	170.3	251.6	62.5	404.0	336.4	306.9	100.2	468.3	596.9	308.5
30.1–40	Cottonwood	0.0	3.9	2.5	0.0	0.0	0.0	3.3	0.0	0.0	3.4	4.8	0.0
	Aspen	0.0	7.5	5.6	0.0	0.0	4.4	3.5	0.0	0.0	0.0	4.1	0.0
	Amabilis fir	0.0	0.0	0.0	0.0	4.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Subalpine fir	0.0	0.0	5.6	0.0	6.1	0.0	0.0	4.6	7.9	0.0	2.9	4.2
	Redcedar	1.4	6.2	28.6	14.6	0.0	7.3	9.1	31.5	12.2	2.8	31.8	34.1
	Birch	0.0	15.1	0.0	0.0	0.0	0.0	2.9	7.7	0.0	6.2	9.1	18.6
	Hemlock	20.1	67.2	44.4	43.1	40.9	80.9	108.3	119.7	76.4	154.3	80.0	106.1
	Pine	0.0	0.0	0.0	2.2	0.0	18.1	2.6	3.3	0.0	14.1	23.5	0.0
	Spruce	0.0	1.8	7.1	0.0	3.7	2.6	0.0	10.5	0.0	14.1	18.2	12.6
	Total	21.6	101.7	93.8	60.0	55.5	113.2	129.8	177.3	96.4	194.8	174.5	175.6
40.1–50	Cottonwood	0.0	1.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.7	2.3
	Aspen	0.0	0.0	1.1	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0
	Amabilis fir	0.0	0.0	0.0	0.0	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

TABLE 27 *Continued*

Treatment		Heavy removal				Light removal				No harvest			
Unit		D4	B3	C2	B2	D5	A2	B5	C3	D3	B1	C1	A4
DBH (cm)	Species												
40.1–50	Subalpine fir	0.0	1.2	4.1	0.0	0.0	1.9	0.0	5.3	0.0	0.0	0.0	6.8
	Redcedar	0.0	2.3	12.2	4.9	1.9	1.9	1.9	12.9	21.5	9.8	20.5	7.1
	Birch	0.0	0.9	0.0	0.0	0.0	0.0	0.0	1.5	0.0	0.0	0.0	0.0
	Hemlock	31.0	14.5	30.5	22.2	43.9	11.4	34.0	21.9	41.4	13.4	9.8	27.5
	Pine	0.0	1.2	0.0	0.0	0.0	1.9	10.0	0.0	0.0	2.4	2.5	0.0
	Spruce	2.4	2.5	3.7	2.1	0.0	0.0	1.7	1.5	2.4	11.9	8.6	10.5
	Total	33.4	23.5	56.5	29.2	53.8	17.1	47.6	46.1	65.3	37.6	47.0	54.3
50.1–60	Cottonwood	0.0	0.0	1.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	3.5	0.0
	Amabilis fir	0.0	0.0	0.0	0.0	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Subalpine fir	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.0	1.6	1.2
	Redcedar	2.8	0.0	1.7	0.9	0.0	1.5	2.1	2.2	13.1	10.3	7.7	1.3
	Birch	0.0	0.0	0.0	0.0	0.0	1.2	0.0	1.2	0.0	0.0	0.0	0.0
	Hemlock	23.9	1.7	4.1	10.6	38.0	8.5	5.9	3.2	66.2	3.1	0.0	10.5
	Pine	0.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Spruce	0.8	0.0	0.0	0.9	0.0	0.0	2.2	7.5	0.0	5.0	7.3	1.5
	Total	27.5	2.6	6.8	13.3	40.4	11.3	10.2	14.1	79.3	18.4	20.0	14.7
60.1–70	Cottonwood	0.0	1.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.1	0.0
	Amabilis fir	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Subalpine fir	0.4	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Redcedar	1.5	0.0	1.2	0.5	0.7	0.9	1.6	1.5	1.1	1.7	1.0	6.0
	Hemlock	11.0	0.0	2.0	2.4	27.5	0.0	0.0	1.6	26.4	1.1	0.0	0.9
	Spruce	0.6	0.0	0.0	1.2	0.0	0.9	0.0	3.1	1.2	0.0	0.0	0.9
	Total	13.5	1.0	3.8	4.7	28.2	1.9	1.6	6.2	28.8	3.8	2.2	7.8
70.1–80	Cottonwood	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0
	Redcedar	0.3	0.0	2.2	0.8	0.7	0.0	1.2	0.0	3.3	0.8	2.4	1.6
	Birch	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Hemlock	5.3	0.0	2.0	0.4	15.6	0.8	0.0	1.1	7.8	0.0	0.0	3.2
	Spruce	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.6	0.9	0.0	0.0	0.0
	Total	5.6	0.0	4.2	1.7	16.3	1.5	1.9	1.8	12.0	0.8	2.4	4.8

TABLE 27 *Continued*

Treatment		Heavy removal				Light removal				No harvest			
Unit		D4	B3	C2	B2	D5	A2	B5	C3	D3	B1	C1	A4
DBH (cm)	Species												
80.1–90	Cottonwood	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.0
	Subalpine fir	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Redcedar	1.8	0.0	1.1	0.7	0.0	0.0	0.0	0.4	2.7	0.6	0.0	3.5
	Hemlock	1.4	0.0	0.4	0.4	2.4	0.0	0.0	0.0	1.4	0.0	0.0	0.0
	Spruce	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total	3.2	0.0	1.4	1.4	3.5	0.0	0.0	0.4	4.1	0.6	1.3	3.5
90.1–100	Cottonwood	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.8	0.0	0.0	0.5	0.0
	Redcedar	2.1	0.0	0.3	0.3	0.0	0.5	0.0	0.0	1.6	0.0	1.0	2.0
	Hemlock	1.5	0.0	0.0	0.0	2.9	0.0	0.0	0.0	1.6	0.0	0.0	0.0
	Total	3.6	0.0	0.3	0.8	2.9	0.5	0.0	0.8	3.3	0.0	1.5	2.0
100.1–110	Cottonwood	0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.4
	Redcedar	0.6	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.8	0.8
	Hemlock	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Spruce	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total	0.8	0.0	0.2	0.2	0.3	0.4	0.0	0.0	0.0	0.0	1.2	1.1
110.1–120	Cottonwood	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
	Redcedar	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.4	0.0
	Hemlock	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0
	Total	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.4	0.3	0.4	0.3
120.1–130	Cottonwood	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
	Redcedar	0.4	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.3
	Total	0.4	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.5
>130	Cottonwood	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total		156.1	448.5	406.6	417.5	285.1	683.3	596.4	616.2	414.5	841.7	957.4	677.2

TABLE 28 *Post-treatment a) basal area and b) density (mean) of dead trees by species and treatment unit*

a) basal area (m^2 per hectare)

Treatment	Heavy removal				Light removal				No harvest			
Unit	D4	B3	C2	B2	D5	A2[a]	B5	C3	D3	B1	C1	A4
Cottonwood	0.0	0.0	0.0	0.3	0.0		0.0	0.0	0.0	0.0	0.0	0.2
Aspen	0.0	0.1	0.0	0.0	0.0		0.0	0.0	0.0	0.2	0.2	0.0
Amabilis fir	0.1	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Subalpine fir	0.1	0.4	0.4	0.0	0.2		0.2	0.3	0.9	0.7	0.2	1.3
Redcedar	0.3	0.0	0.3	0.0	0.0		0.2	0.2	0.0	0.2	0.0	0.0
Birch	0.0	0.7	0.0	0.0	0.0		0.0	0.2	0.0	0.5	0.0	1.1
Hemlock	1.5	0.0	0.0	0.0	0.8		0.7	1.3	7.8	0.5	0.8	0.9
Pine	0.0	0.0	0.0	0.0	0.0		0.2	0.2	0.0	0.0	0.7	0.2
Spruce	0.0	0.1	0.0	0.0	0.0		0.0	0.0	0.0	0.2	0.4	1.1
Unknown	0.0	0.0	0.0	0.0	0.0		0.2	0.0	0.0	0.2	0.0	0.0
Total	2.0	1.3	0.6	0.3	1.0	0.7	1.3	2.1	8.7	2.6	2.4	4.9

b) density (stems per hectare)

Treatment	Heavy removal				Light removal				No harvest			
Unit	D4	B3	C2	B2	D5	A2	B5	C3	D3	B1	C1	A4
Cottonwood	0.0	0.0	0.0	0.2	0.0		0.0	0.0	0.0	0.0	0.0	0.2
Aspen	0.0	3.2	0.0	0.0	0.0		0.0	0.0	0.0	4.8	2.9	0.0
Amabilis fir	4.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Subalpine fir	0.6	8.8	6.2	0.0	1.9		2.3	3.0	9.7	9.0	2.7	9.5
Redcedar	0.3	0.0	1.8	0.0	0.0		2.3	3.5	0.0	1.1	0.0	0.0
Birch	0.0	11.8	0.0	0.0	0.0		0.0	2.2	0.0	9.6	0.0	18.1
Hemlock	9.1	0.0	0.0	0.0	10.1		8.5	24.2	33.3	6.0	11.1	6.6
Pine	0.0	0.0	0.0	0.0	0.0		3.8	2.1	0.0	0.0	12.4	1.8
Spruce	0.0	1.3	0.0	0.0	0.0		0.0	0.0	0.0	0.5	7.9	8.8
Unknown	0.0	0.0	0.0	0.0	0.0		5.0	0.0	0.0	3.0	0.0	0.0
Total	14.0	25.0	8.0	0.2	12.0		22.0	35.0	43.0	34.0	37.0	45.0

[a] Treatment unit A2 did not have any dead trees (≥17.5 cm DBH) in the measure plots; however, a mean value of 0.7m^2/ha (SE = 0.36) was calculated from the basal area factors used in the count plots (phase 2 sampling; see section 3.4.1).

TABLE 29 *Post-treatment basal area (m^2 per hectare) of dead trees by diameter class, species, and treatment unit*

Treatment		Heavy removal				Light removal				No harvest			
Unit		D4	B3	C2	B2	D5	A2[a]	B5	C3	D3	B1	C1	A4
DBH (cm)	Species												
17.5–20	Birch	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.2	0.0	0.7
	Hemlock	0.1	0.0	0.0	0.0	0.0		0.0	0.0	0.2	0.0	0.2	0.0
	Pine	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.3	0.0
	Spruce	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.2	0.0
	Subalpine fir	0.0	0.1	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
	Unknown	0.0	0.0	0.0	0.0	0.0		0.2	0.0	0.0	0.0	0.0	0.0
	Total	0.1	0.1	0.0	0.0	0.0		0.2	0.0	0.2	0.2	0.7	0.7
20.1–30	Aspen	0.0	0.1	0.0	0.0	0.0		0.0	0.0	0.0	0.2	0.2	0.0
	Amabilis fir	0.1	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
	Subalpine fir	0.0	0.1	0.4	0.0	0.0		0.2	0.0	0.5	0.4	0.2	0.4
	Redcedar	0.0	0.0	0.0	0.0	0.0		0.2	0.2	0.0	0.0	0.0	0.0
	Birch	0.0	0.4	0.0	0.0	0.0		0.0	0.0	0.0	0.2	0.0	0.0
	Hemlock	0.0	0.0	0.0	0.0	0.3		0.2	1.0	0.0	0.5	0.4	0.2
	Pine	0.0	0.0	0.0	0.0	0.0		0.2	0.0	0.0	0.0	0.4	0.0
	Spruce	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.2	0.4
	Unknown	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.2	0.0	0.0
	Total	0.1	0.7	0.3	0.0	0.3		0.7	1.1	0.5	1.7	1.5	1.1
30.1–40	Amabilis fir	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
	Subalpine fir	0.0	0.0	0.0	0.0	0.2		0.0	0.2	0.2	0.2	0.0	0.2
	Birch	0.0	0.1	0.0	0.0	0.0		0.0	0.2	0.0	0.0	0.0	0.4
	Hemlock	0.0	0.0	0.0	0.0	0.0		0.5	0.0	0.5	0.0	0.0	0.2
	Pine	0.0	0.0	0.0	0.0	0.0		0.0	0.2	0.0	0.0	0.0	0.2
	Spruce	0.0	0.1	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.2
	Total	0.0	0.3	0.0	0.0	0.2		0.5	0.5	0.7	0.2	0.0	1.3
40.1–50	Amabilis fir	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
	Subalpine fir	0.0	0.1	0.0	0.0	0.0		0.0	0.2	0.0	0.0	0.0	0.4
	Redcedar	0.0	0.0	0.3	0.0	0.0		0.0	0.0	0.0	0.2	0.0	0.0
	Birch	0.0	0.1	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
	Hemlock	0.3	0.0	0.0	0.0	0.0		0.0	0.3	2.5	0.0	0.0	0.2
	Spruce	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.2
	Total	0.3	0.3	0.3	0.0	0.0		0.0	0.5	2.5	0.2	0.0	0.9

TABLE 29 *Continued*

Treatment		Heavy removal				Light removal				No harvest			
Unit		D4	B3	C2	B2	D5	A2	B5	C3	D3	B1	C1	A4
DBH (cm)	Species												
50.1–60	Amabilis fir	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
	Subalpine fir	0.1	0.0	0.0	0.0	0.0		0.0	0.0	0.2	0.0	0.0	0.2
	Hemlock	0.5	0.0	0.0	0.0	0.3		0.0	0.0	3.9	0.0	0.2	0.0
	Total	0.7	0.0	0.0	0.0	0.3		0.0	0.0	4.1	0.0	0.2	0.2
60.1–70	Hemlock	0.0	0.0	0.0	0.0	0.2		0.0	0.0	0.5	0.0	0.0	0.0
	Spruce	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.2	0.0	0.0
	Total	0.0	0.0	0.0	0.0	0.2		0.0	0.0	0.5	0.2	0.0	0.0
70.1–80	Hemlock	0.4	0.0	0.0	0.0	0.0		0.0	0.0	0.2	0.0	0.0	0.2
	Spruce	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.2
	Total	0.4	0.0	0.0	0.0	0.0		0.0	0.0	0.2	0.0	0.0	0.4
80.1–90													
90.1–100	Cottonwood	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.2
	Redcedar	0.1	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
	Total	0.1	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.2
100.1–110	Hemlock	0.1	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
	Total	0.1	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
110.1–120													
120.1–130	Redcedar	0.1	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
	Total	0.1	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
> 130	Cottonwood	0.0	0.0	0.0	0.3	0.0		0.0	0.0	0.0	0.0	0.0	0.0
	Total	0.0	0.0	0.0	0.3	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total		2.0	1.3	0.6	0.3	1.0	0.7	1.3	2.1	8.7	2.6	2.4	4.9

[a] Treatment unit A2 did not have any dead trees (≥17.5 cm DBH) in the measure plots; however, a mean value of 0.7m²/ha (SE = 0.36) was calculated from the basal area factors used in the count plots (phase 2 sampling; see section 3.4.1).

TABLE 30 *Post-treatment density (mean stems per hectare) of dead trees by diameter class, species, and treatment unit*

Treatment		Heavy removal				Light removal				No harvest			
Unit		D4	B3	C2	B2	D5	A2[a]	B5	C3	D3	B1	C1	A4
DBH (cm)	Species												
17.5–20	Birch	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	5.9	0.0	14.8
	Hemlock	4.4	0.0	0.0	0.0	0.0		0.0	0.0	6.3	0.0	3.9	0.0
	Pine	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	5.8	0.0
	Spruce	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	4.8	0.0
	Subalpine fir	0.0	5.3	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
	Unknown	0.0	0.0	0.0	0.0	0.0		5.0	0.0	0.0	0.0	0.0	0.0
	Total	4.4	5.3	0.0	0.0	0.0		5.0	0.0	6.3	5.9	14.5	14.8
20.1–30	Aspen	0.0	3.2	0.0	0.0	0.0		0.0	0.0	0.0	4.8	2.9	0.0
	Amabilis fir	4.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
	Subalpine fir	0.0	2.4	6.2	0.0	0.0		2.3	0.0	6.7	7.2	2.7	4.8
	Redcedar	0.0	0.0	0.0	0.0	0.0		2.3	3.5	0.0	0.0	0.0	0.0
	Birch	0.0	9.2	0.0	0.0	0.0		0.0	0.0	0.0	3.7	0.0	0.0
	Hemlock	0.0	0.0	0.0	0.0	8.1		3.1	21.7	0.0	6.0	6.7	4.0
	Pine	0.0	0.0	0.0	0.0	0.0		3.8	0.0	0.0	0.0	6.6	0.0
	Spruce	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	3.2	6.1
	Unknown	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	3.0	0.0	0.0
	Total	4.0	14.8	6.2	0.0	8.1		11.5	25.2	6.7	24.7	22.0	14.9
30.1–40	Amabilis fir	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
	Subalpine fir	0.0	0.0	0.0	0.0	1.9		0.0	2.1	2.3	1.8	0.0	1.9
	Birch	0.0	1.6	0.0	0.0	0.0		0.0	2.2	0.0	0.0	0.0	3.2
	Hemlock	0.0	0.0	0.0	0.0	0.0		5.4	0.0	3.0	0.0	0.0	1.3
	Pine	0.0	0.0	0.0	0.0	0.0		0.0	2.1	0.0	0.0	0.0	1.8
	Spruce	0.0	1.3	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	1.5
	Total	0.0	2.9	0.0	0.0	1.9		5.4	6.4	5.3	1.8	0.0	9.7
40.1–50	Amabilis fir	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
	Subalpine fir	0.0	1.0	0.0	0.0	0.0		0.0	0.8	0.0	0.0	0.0	2.1
	Redcedar	0.0	0.0	1.8	0.0	0.0		0.0	0.0	0.0	1.1	0.0	0.0
	Birch	0.0	1.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
	Hemlock	1.5	0.0	0.0	0.0	0.0		0.0	2.5	10.9	0.0	0.0	1.0
	Spruce	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	1.0
	Total	1.5	2.0	1.8	0.0	0.0		0.0	3.3	10.9	1.1	0.0	4.1

TABLE 30 *Continued*

Treatment		Heavy removal				Light removal				No harvest			
Unit		D4	B3	C2	B2	D5	A2[a]	B5	C3	D3	B1	C1	A4
DBH (cm)	Species												
50.1–60	Amabilis fir	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
	Subalpine fir	0.6	0.0	0.0	0.0	0.0		0.0	0.0	0.6	0.0	0.0	0.7
	Hemlock	2.2	0.0	0.0	0.0	1.4		0.0	0.0	11.7	0.0	0.5	0.0
	Total	2.8	0.0	0.0	0.0	1.4		0.0	0.0	12.3	0.0	0.5	0.7
60.1–70	Hemlock	0.0	0.0	0.0	0.0	0.5		0.0	0.0	1.1	0.0	0.0	0.0
	Spruce	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.5	0.0	0.0
	Total	0.0	0.0	0.0	0.0	0.5		0.0	0.0	1.1	0.5	0.0	0.0
70.1–80	Hemlock	0.8	0.0	0.0	0.0	0.0		0.0	0.0	0.4	0.0	0.0	0.3
	Spruce	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.3
	Total	0.8	0.0	0.0	0.0	0.0		0.0	0.0	0.4	0.0	0.0	0.6
80.1–90													
90.1–100	Cottonwood	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.2
	Redcedar	0.2	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
	Total	0.2	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.2
100.1–110	Hemlock	0.1	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
	Total	0.1	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
110.1–120													
120.1–130	Redcedar	0.1	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
	Total	0.1	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
> 130	Cottonwood	0.0	0.0	0.0	0.2	0.0		0.0	0.0	0.0	0.0	0.0	0.0
	Total	0.0	0.0	0.0	0.2	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total		14.0	25.0	8.0	0.2	12.0		22.0	35.0	43.0	34.0	37.0	45.0

[a] There was an absence of dead trees in treatment unit A2.

TABLE 31 *Percent of stems (≥ 17.5 cm diameter) damaged by harvesting operations*

a) Logging damage

Treatment	Heavy removal				Light removal				No harvest			
Unit	D4	B3	C2	B2	D5	A2	B5	C3	D3	B1	C1	A4
Damage type												
No Damage (%)	70.3	84.8	74.3	67.4	76.0	84.5	93.8	91.0	99.8	100.0	100.0	100.0
Falling (%)	8.0	5.1	11.5	2.7	5.3	2.0	3.4	1.5	0.2	0.0	0.0	0.0
Skidding (%)	17.2	9.6	14.2	23.1	16.6	11.2	2.5	5.6	0.0	0.0	0.0	0.0
Both falling and skidding (%)	4.5	0.4	0.0	6.9	2.1	2.3	0.3	1.9	0.0	0.0	0.0	0.0

b) Logging scars

Treatment	Heavy removal				Light removal				No harvest			
Unit	D4	B3	C2	B2	D5	A2	B5	C3	D3	B1	C1	A4
Presence of scars												
No scarring (%)	77.6	85.3	79.9	68.3	80.2	84.5	94.4	91.2	100.0	100.0	100.0	100.0
At least one scar (%)	22.4	14.7	20.1	31.7	19.8	15.5	5.6	8.8	0.0	0.0	0.0	0.0

TABLE 32 *Post-treatment a) basal area and b) mean density of trees (0–17.4 cm DBH) by species*

a) basal area (m^2/ha)

Treatment	Heavy removal				Light removal				No harvest			
Unit	D4	B3	C2	B2	D5	A2	B5	C3	D3	B1	C1	A4
Aspen	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Amabilis fir	0.2	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.4	0.0	0.0	0.0
Subalpine fir	0.1	0.2	0.0	0.0	0.0	0.0	0.1	0.5	0.1	0.0	0.0	0.3
Redcedar	0.1	2.6	0.9	0.5	0.1	1.9	7.1	1.5	0.3	6.1	1.4	1.7
Hemlock	1.3	1.5	1.6	3.6	1.2	2.9	1.8	4.7	3.0	2.5	6.8	3.4
Birch	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.0	0.0	0.5	0.1	0.3
Pine	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Spruce	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Total	1.8	4.3	2.5	4.1	1.8	5.1	9.2	6.8	3.8	9.4	8.4	5.7

b) density (stems per hectare)

Treatment	Heavy removal				Light removal				No harvest			
Unit	D4	B3	C2	B2	D5	A2	B5	C3	D3	B1	C1	A4
Aspen	0.0	0.0	0.0	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Amabilis fir	76.7	0.0	0.0	0.0	87.0	0.0	0.0	0.0	108.7	0.0	0.0	0.0
Subalpine fir	20.0	126.7	10.0	3.3	0.0	8.7	4.3	78.3	4.3	47.8	0.0	121.8
Redcedar	33.3	470.0	180.0	100.0	13.0	421.7	1404.3	326.1	69.6	1147.8	239.1	378.3
Hemlock	283.3	233.3	190.0	410.0	230.4	265.2	230.4	569.6	860.9	217.4	526.1	504.3
Birch	0.0	0.0	0.0	3.3	0.0	17.4	8.7	0.0	0.0	26.1	4.3	13.0
Pine	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.3	0.0	0.0
Spruce	0.0	3.3	0.0	0.0	4.3	4.3		4.3	0.0	8.7	4.3	8.7
Total	413.5	833.5	380.1	520.0	334.9	717.5	1647.8	978.4	1043.6	1452.2	774.1	1026.2

TABLE 33 *Post-treatment a) basal area and b) mean stems per hectare of trees (0–17.4 cm DBH) by species and diameter class*

a) basal area (m^2 per ha)

Treatment		Heavy removal				Light removal				No harvest			
Unit		D4	B3	C2	B2	D5	A2	B5	C3	D3	B1	C1	A4
Diameter	Species												
0–5 cm	Amabilis fir	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Subalpine fir	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Redcedar	0.0	0.2	0.1	0.0	0.0	0.2	0.5	0.1	0.0	0.4	0.1	0.1
	Hemlock	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.1	0.3	0.0	0.0	0.1
	Spruce	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5.1–10 cm	Amabilis fir	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0
	Subalpine fir	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1
	Redcedar	0.0	0.7	0.3	0.1	0.0	0.6	2.2	0.4	0.1	2.1	0.5	0.7
	Hemlock	0.5	0.2	0.3	0.6	0.2	0.3	0.2	1.0	1.1	0.2	0.5	0.5
	Spruce	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10.1–15 cm	Amabilis fir	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0
	Subalpine fir	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.0
	Redcedar	0.0	1.1	0.5	0.2	0.0	0.8	2.7	0.7	0.1	2.3	0.6	0.6
	Birch	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.1	0.1	0.1
	Hemlock	0.4	0.5	0.6	2.0	0.5	1.3	0.8	2.1	1.1	1.2	3.2	1.7
	Spruce	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0
15.1–17.4 cm	Aspen	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Amabilis fir	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0
	Subalpine fir	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.3	0.1	0.0	0.0	0.1
	Redcedar	0.1	0.7	0.1	0.1	0.0	0.3	1.6	0.3	0.0	1.3	0.2	0.3
	Birch	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.4	0.0	0.2
	Hemlock	0.3	0.7	0.6	0.9	0.5	1.3	0.7	1.5	0.6	1.2	3.1	1.2
	Pine	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Total		1.8	4.3	2.5	4.1	1.7	5.0	9.1	6.7	3.7	9.4	8.3	5.7

TABLE 33 *Continued*

b) density (stems per hectare)

Treatment		Heavy removal				Light removal				No harvest			
Unit		D4	B3	C2	B2	D5	A2	B5	C3	D3	B1	C1	A4
Diameter	Species												
0–5 cm	Amabilis fir	56.7	0.0	0.0	0.0	52.2	0.0	0.0	0.0	69.6	0.0	0.0	0.0
	Subalpine fir	3.3	106.7	3.3	0.0	0.0	0.0	8.7	34.3	0.0	43.5	0.0	82.4
	Redcedar	23.3	186.7	73.3	40.0	4.3	191.3	630.4	100.0	34.8	404.3	65.2	160.9
	Hemlock	123.3	116.7	40.0	76.7	113.0	34.8	78.3	134.8	495.7	39.1	39.1	217.4
	Spruce	0.0	3.3	0.0	0.0	0.0	4.3	0.0	4.3	0.0	0.0	0.0	8.7
5.1–10 cm	Amabilis fir	10.0	0.0	0.0	0.0	26.1	0.0	0.0	0.0	21.7	0.0	0.0	0.0
	Subalpine fir	10.0	16.7	6.7	3.3	0.0	8.7	0.0	17.3	0.0	4.3	0.0	34.7
	Redcedar	3.3	160.0	60.0	40.0	4.3	139.1	473.9	82.6	26.1	487.0	113.0	156.5
	Hemlock	110.0	43.3	70.0	120.0	56.5	60.9	52.2	200.0	239.1	34.8	87.0	100.0
	Spruce	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.3	0.0
10.1–15 cm	Amabilis fir	6.7	0.0	0.0	0.0	4.3	0.0	0.0	0.0	13.0	0.0	0.0	0.0
	Subalpine fir	3.3	0.0	0.0	0.0	0.0	0.0	8.6	13.0	0.0	0.0	0.0	0.0
	Redcedar	3.3	90.0	43.3	13.3	4.3	73.9	221.7	60.9	8.7	191.3	52.2	43.5
	Birch	0.0	0.0	0.0	3.3	0.0	17.4	0.0	0.0	0.0	8.7	4.3	4.3
	Hemlock	36.7	40.0	50.0	170.0	39.1	108.7	65.2	160.9	95.7	87.0	247.8	130.4
	Spruce	0.0	0.0	0.0	0.0	4.3	0.0	0.0	0.0	0.0	8.7	0.0	0.0
15.1–17.4 cm	Aspen	0.0	0.0	0.0	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Amabilis fir	3.3	0.0	0.0	0.0	4.3	0.0	0.0	0.0	4.3	0.0	0.0	0.0
	Subalpine fir	3.3	3.3	0.0	0.0	0.0	0.0	0.0	13.0	4.3	0.0	0.0	4.3
	Redcedar	3.3	33.3	3.3	6.7	0.0	17.4	78.3	13.0	0.0	65.2	8.7	17.4
	Birch	0.0	0.0	0.0	0.0	0.0	0.0	8.7	0.0	0.0	17.4	0.0	8.7
	Hemlock	13.3	33.3	30.0	43.3	21.7	60.9	34.8	73.9	30.4	56.5	152.2	56.5
	Pine	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.3	0.0	0.0
Total		413.3	833.3	380.0	520.0	334.8	717.4	1660.9	908.7	1043.5	1452.2	773.9	1026.1

TABLE 34 *Post-treatment a) basal area and b) mean stems per hectare of dead trees (0–17.4 cm DBH) by species*

a) basal area (m^2/ha)

Treatment	Heavy removal				Light removal				No harvest			
Unit	D4	B3	C2	B2	D5	A2	B5	C3	D3	B1	C1	A4
Aspen	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Amabilis fir	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0
Subalpine fir	0.0	0.1	0.2	0.1	0.0	0.0	0.1	0.3	0.0	0.1	0.1	0.1
Redcedar	0.0	0.0	0.1	0.0	0.1	0.0	0.1	0.1	0.0	0.1	0.0	0.0
Birch	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.1
Hemlock	0.6	0.1	0.7	0.6	0.4	0.7	0.4	1.6	0.2	1.2	2.7	1.3
Pine	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.4	0.0
Spruce	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1
Unknown	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	0.6	0.4	1.0	0.7	0.5	0.9	0.6	2.0	0.6	1.7	3.4	1.7

b) stems per hectare

Treatment	Heavy removal				Light removal				No harvest			
Unit	D4	B3	C2	B2	D5	A2	B5	C3	D3	B1	C1	A4
Aspen	0.0	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.3	0.0
Amabilis fir	0.0	0.0	0.0	0.0	4.3	0.0	0.0	0.0	17.4	0.0	0.0	0.0
Subalpine fir	0.0	10.0	16.7	3.3	0.0	4.3	4.3	21.7	4.3	13.0	4.3	13.0
Redcedar	0.0	3.3	10.0	0.0	4.3	4.3	4.3	4.3	4.3	8.7	4.3	0.0
Birch	0.0	3.3	0.0	0.0	0.0	8.7	0.0	0.0	0.0	4.3	0.0	8.7
Hemlock	46.7	3.3	50.0	53.3	21.7	60.9	21.7	130.4	17.4	87.0	217.4	95.7
Pine	0.0	0.0	0.0	0.0	0.0	0.0	4.3	0.0	0.0	4.3	26.1	0.0
Spruce	0.0	0.0	0.0	3.3	0.0	0.0	0.0	0.0	0.0	4.3	4.3	8.7
Unknown	0.0	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	46.7	26.7	76.7	60.0	30.4	78.3	34.8	156.5	43.5	121.7	260.9	126.1

TABLE 35 *Post-treatment a) basal area and b) mean stems per hectare of dead trees (0–17.4 cm DBH) by species and diameter class*

a) basal area (m^2/ha)

Treatment		Heavy removal				Light removal				No harvest			
Unit		D4	B3	C2	B2	D5	A2	B5	C3	D3	B1	C1	A4
Diameter	Species												
5–10 cm	Amabilis fir	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Redcedar	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Hemlock	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
10.1–15 cm	Amabilis fir	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
	Subalpine fir	0.0	0.1	0.1	0.1	0.0	0.0	0.1	0.2	0.0	0.1	0.0	0.1
	Redcedar	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
	Birch	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1
	Hemlock	0.6	0.1	0.4	0.6	0.1	0.7	0.1	1.5	0.1	0.7	2.2	1.0
	Pine	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.0
	Spruce	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
	Unknown	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15.1–17.4 cm	Aspen	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
	Amabilis fir	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0
	Subalpine fir	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
	Redcedar	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0
	Birch	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1
	Hemlock	0.0	0.0	0.3	0.0	0.3	0.0	0.3	0.1	0.1	0.4	0.4	0.3
	Pine	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.2	0.0
	Spruce	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0
Total		0.6	0.4	1.0	0.8	0.5	0.9	0.7	2.0	0.6	1.7	3.4	1.6

TABLE 35 *Continued*

b) stems per hectare

Treatment		Heavy removal				Light removal				No harvest			
Unit		D4	B3	C2	B2	D5	A2	B5	C3	D3	B1	C1	A4
Diameter	Species												
5–10 cm	Amabilis fir	0.0	0.0	0.0	0.0	4.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Redcedar	0.0	0.0	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.3	0.0
	Hemlock	0.0	0.0	0.0	3.3	0.0	4.3	0.0	0.0	0.0	0.0	21.7	0.0
10.1–15 cm	Amabilis fir	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Subalpine fir	0.0	10.0	13.3	3.3	0.0	4.3	4.3	17.4	17.3	13.0	0.0	13.0
	Redcedar	0.0	3.3	6.7	0.0	0.0	4.3	0.0	0.0	4.3	8.7	0.0	0.0
	Birch	0.0	0.0	0.0	0.0	0.0	8.7	0.0	0.0	0.0	0.0	0.0	4.3
	Hemlock	46.7	3.3	33.3	50.0	8.7	56.5	8.7	126.1	13.0	65.2	178.3	82.6
	Pine	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.3	17.4	0.0
	Spruce	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.7
	Unknown	0.0	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15.1–17.4 cm	Aspen	0.0	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.3	0.0
	Amabilis fir	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.3	0.0	4.3	0.0
	Subalpine fir	0.0	0.0	3.3	0.0	0.0	0.0	0.0	4.3	0.0	0.0	0.0	0.0
	Redcedar	0.0	0.0	0.0	0.0	4.3	0.0	4.3	4.3	0.0	0.0	0.0	0.0
	Birch	0.0	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.3	0.0	4.3
	Hemlock	0.0	0.0	16.7	0.0	13.0	0.0	13.0	4.3	4.3	21.7	17.4	13.0
	Pine	0.0	0.0	0.0	0.0	0.0	0.0	4.3	0.0	0.0	0.0	8.7	0.0
	Spruce	0.0	0.0	0.0	3.3	0.0	0.0	0.0	0.0	0.0	4.3	4.3	0.0
Total		46.7	26.7	76.7	60.0	30.4	78.2	34.7	156.5	43.4	121.7	260.9	126.0

TABLE 36 *Percent of stems (0–17.4 cm DBH) damaged by harvesting operations*

a) Percent of stems with logging damage

Treatment	Heavy removal				Light removal				No harvest			
Unit	D4	B3	C2	B2	D5	A2	B5	C3	D3	B1	C1	A4
Damage type												
No damage (%)	85.5	86.4	85.1	78.8	85.7	87.3	93.5	94.7	100.0	100.0	100.0	100.0
Falling (%)	1.6	5.2	6.1	7.1	9.1	5.5	2.4	2.4	0.0	0.0	0.0	0.0
Skidding (%)	12.1	8.0	7.0	11.5	5.2	6.1	4.2	2.9	0.0	0.0	0.0	0.0
Both falling and skidding (%)	0.8	0.4	1.8	2.6	0.0	1.2	0.0	0.0	0.0	0.0	0.0	0.0

b) Percent of stems by diameter class with logging scars

Treatment	Heavy removal				Light removal				No harvest			
Unit	D4	B3	C2	B2	D5	A2	B5	C3	D3	B1	C1	A4
Diameter class												
0–5 cm (%)	19.4	10.5	0.0	11.4	5.1	11.3	0.6	1.6	0.0	0.0	0.0	0.0
5.1–10 cm (%)	7.5	6.1	19.5	12.2	10.0	12.5	8.3	5.8	0.0	0.0	0.0	0.0
10.1–15 cm (%)	6.7	12.8	7.1	25.0	8.3	13.0	10.3	7.4	0.0	0.0	0.0	0.0
15.1–17.4 cm (%)	0.0	23.8	20.0	18.8	0.0	16.7	3.6	0.0	0.0	0.0	0.0	0.0
Total[a]	12.9	10.8	10.5	17.3	6.5	12.7	5.0	4.3	0.0	0.0	0.0	0.0

[a] Total percent of scarred trees is not an average value of the four diameter classes because of unequal sample size (i.e., it is a weighted average).

TABLE 37 *Stems per hectare of healthy and damaged seedlings (0.1–1.3 m tall) by species and treatment unit*

Treatment		Heavy removal				Light removal				No harvest			
Unit		D4	B3	C2	B2	D5	A2	B5	C3	D3	B1	C1	A4
Damage class	Species												
Healthy[a]	All species	2280	2616	1876	1047	2713	1091	882	904	5487	1418	676	2078
	Amabilis fir	93	0	0	0	1226	0	0	0	35	0	0	0
	Hemlock	2047	608	1483	447	1487	518	191	557	5426	309	410	1252
	Subalpine fir	33	352	7	7	0	0	9	52	9	64	0	157
	Redcedar	107	712	283	387	0	109	427	157	17	945	124	609
	Cottonwood	0	0	21	47	0	73	36	35	0	0	0	0
	Birch	0	184	0	140	0	227	27	0	0	0	0	0
	Spruce	0	16	21	0	0	0	0	17	0	0	29	9
	Aspen	0	744	7	20	0	164	191	9	0	100	114	52
Moderate damage	All species	27	48	0	0	113	0	55	0	0	0	0	0
	Amabilis fir	7	0	0	0	26	0	0	0	0	0	0	0
	Hemlock	20	0	0	0	87	0	0	0	0	0	0	0
	Subalpine fir	0	16	0	0	0	0	0	0	0	0	0	0
	Redcedar	0	32	0	0	0	0	55	0	0	0	0	0
	Cottonwood	0	0	0	0	0	0	0	0	0	0	0	0
	Birch	0	0	0	0	0	0	0	0	0	0	0	0
	Spruce	0	0	0	0	0	0	0	0	0	0	0	0
	Aspen	0	0	0	0	0	0	0	0	0	0	0	0
Severe damage	All species	7	24	0	0	35	0	9	0	0	0	0	0
	Amabilis fir	7	0	0	0	9	0	0	0	0	0	0	0
	Hemlock	0	24	0	0	26	0	0	0	0	0	0	0
	Subalpine fir	0	0	0	0	0	0	9	0	0	0	0	0
	Redcedar	0	0	0	0	0	0	0	0	0	0	0	0
	Cottonwood	0	0	0	0	0	0	0	0	0	0	0	0
	Birch	0	0	0	0	0	0	0	0	0	0	0	0
	Spruce	0	0	0	0	0	0	0	0	0	0	0	0
	Aspen	0	0	0	0	0	0	0	0	0	0	0	0

[a] Damage class: healthy = no apparent logging damage; moderate = seedlings have been damaged, but not fatally; severe = near death due to logging injury.

TABLE 38 *Post-treatment volume of coarse woody debris by treatment unit*

Treatment	Block	Unit	Mean volume (m^3/ha)	SE
Clearcut	1	D2	182.8	25.7
	2	A1	94.2	11.2
	3	B4	71.5	13.6
	4	A3	144.7	16.7
Heavy removal	1	D4	289.3	55.2
	2	B3	83.7	11.3
	3	C2	124.0	30.5
	4	B2	119.2	25.5
Light removal	1	D5	229.3	48.9
	2	A2	101.2	12.8
	3	B5	79.7	18.3
	4	C3	110.9	18.8
No harvest	1	D3	189.6	23.3
	2	B1	130.0	33.1
	3	C1	111.3	26.8
	4	A4	149.2	20.3

TABLE 39 *Post-treatment a) diameter and b) species distribution of coarse woody debris by treatment unit*

a) Coarse woody debris frequency[a] by diameter class

Treatment	Clearcut				Heavy removal				Light removal				No harvest			
Unit	D2	A1	B4	A3	D4	B3	C2	B2	D5	A2	B5	C3	D3	B1	C1	A4
DBH (cm)																
10–20	111	205	147	186	75	116	130	173	90	124	129	109	35	141	121	109
20–30	35	44	35	63	46	45	32	34	48	17	37	33	37	63	50	48
30–40	27	5	3	14	32	6	11	12	26	13	8	13	33	21	8	23
40–50	17	0	1	1	25	2	4	2	20	5	2	10	25	4	3	10
50–60	7	0	0	2	13	1	3	2	11	1	0	1	7	0	3	6
60–70	1	0	0	2	10	0	1	3	2	2	0	1	0	0	2	0
70–80	0	0	0	0	1	0	0	0	1	2	0	0	0	0	0	0
80–90	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
90–100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
100–110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
110–120	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
120–130	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Total	199	254	186	268	202	170	182	226	199	164	176	167	137	229	187	196

[a] Frequency = number of times that a given (a) diameter or (b) species of coarse woody debris intersected the 900 m of transect line (each treatment unit contains ten 90 m line-intersect triangles; see section 3.3.1). For example, in treatment unit D2, redcedar coarse woody debris was encountered 25 times along the transect.

TABLE 39 *Continued*

b) Coarse woody debris frequency by species

Treatment	Clearcut				Heavy removal				Light removal				No harvest			
Unit	D2	A1	B4	A3	D4	B3	C2	B2	D5	A2	B5	C3	D3	B1	C1	A4
Species[b]																
Cottonwood	3	0	7	6	0	2	9	0	0	2	3	2	0	0	2	0
Aspen	0	34	11	13	0	38	1	0	0	3	11	0	0	3	8	0
Amabilis fir	0	0	0	0	10	0	0	11	43	4	0	0	1	0	0	2
Subalpine fir	9	5	1	4	4	18	9	3	1	5	3	16	1	4	3	8
Redcedar	25	49	19	36	2	18	12	15	2	8	12	4	5	15	5	5
Hemlock	112	50	45	54	104	27	84	103	83	65	35	55	40	61	70	52
Birch	1	35	48	104	0	11	9	17	0	23	22	1	0	18	12	25
Pine	0	10	1	1	0	0	0	2	0	0	0	0	0	0	0	0
Spruce	11	2	0	2	5	2	7	0	0	0	0	10	0	0	6	1
UK	30	45	52	31	77	52	33	75	70	54	90	47	87	127	46	90
UKC	7	18	1	11	0	0	18	0	0	0	0	27	3	1	24	13
UKD	1	6	1	6	0	2	0	0	0	0	0	4	0	0	10	0
Total	199	254	186	268	202	170	182	226	199	164	176	166	137	229	186	196

[b] Species UK = Unknown; UKC = Unknown Conifer; UKD = Unknown Deciduous.

The Date Creek silvicultural systems study covers many subject areas under the umbrella of silviculture systems research. The following studies have been undertaken at Date Creek and are at various levels of completion. For further information on a particular study, refer to the reports and contact persons listed.

4.1 a) Costs and Productivity of Harvesting Operations
b) Post-harvest Soil Disturbance

Researchers:
- Don Thibodeau (Forest Engineering Research Institute of Canada [FERIC], Vancouver, BC)
- Ray Krag (FERIC, Vancouver, BC)
- Ingrid Hedin (FERIC, Vancouver, BC)

Key Words: costs and productivity of harvesting, harvesting operations, layout and planning, soil disturbance

Research objectives:
- to monitor productivity and costs of mechanized, conventional and horse-skidding harvesting systems on six study blocks (two clearcut, three heavy, and one light removal treatment units)
- to assess planning, falling, and harvesting productivities and costs
- to assess soil disturbance levels
- to identify ways to improve operational planning and implementation of partial cutting silvicultural systems in the ICH zone of the Prince Rupert Forest Region

Contact Persons: Ray Krag and Ingrid Hedin

Report(s):
Thibodeau, E.D., R.K. Krag, and I.B. Hedin. 1996. Date Creek silvicultural systems trial: performance and productivity of ground-based harvesting systems in the Interior Cedar–Hemlock ecosystem of the Prince Rupert Forest Region. FERIC Rep. SR-114.

4.2 Stand-level Water Balance at Date Creek

Researchers:
- Dave Maloney (Ministry of Forests, Research, Smithers, BC)
- Dave Wilford (Ministry of Forests, Research, Smithers, BC)

Key Words: canopy interception, forest hydrology, precipitation, snow accumulation, stream flow

Research objectives:
- to respond to public concern about the effects of clearcutting on stream flow (i.e., increased streamflow, decreased low flows, low water table, and altered timing of flows)
- to determine if there are seasonal differences in stand-level water balance among the four treatments: no harvest, light and heavy removal, and clearcut.
- to examine soil water availability by measuring precipitation (rainfall interception and throughfall, snowfall accumulation and melt), soil moisture (soil water tension, change in water table height), and evapotranspiration (air and ground temperature, net radiation, and soil heat flux)

Contact Person: Dave Maloney

Report(s):
Patchke, S. 1995. Comparison of soil moisture between a forested site and two silviculture treatment sites at the Date Creek research forest. B.C. Min. For., For. Sci. Sec., Smithers, B.C. Unpubl.

Loedel, M. and P. Beaudry. 1993. A study of forest interception at the Date Creek silvicultural systems study. B.C. Min. For., For. Sci. Sec., Smithers, B.C. Unpubl.

4.3 Windthrow

Researcher:
- Dave Coates (Ministry of Forests, Research, Smithers, BC)

Key Words: partial cutting, wind, windthrow

Research objectives:
- to respond to a common concern that partial cutting increases the risk of windthrow
- to assess the extent of windthrow in the heavy, light, and no removal treatments of the Date Creek study
- to record the direction of the windthrow to help design more windfirm boundaries and retention patches
- to examine individual tree/microsite susceptibility
- to document major wind events in 1993 and 1994 and assess resulting damage

Contact Person: Dave Coates

Report(s):

Coates, K.D. 1997. Windthrow damage 2 years after partial cutting at the Date Creek silvicultural systems study in the Interior Cedar–Hemlock forests of northwestern British Columbia. Can. J. For. Res. In press.

4.4 Forest Stand Dynamics

Researchers:
- Phil LePage (Ministry of Forests, Research, Smithers, BC)
- Ian Cameron (Ministry of Forests, Research, Kamloops, BC)

Key Words: development pattern, mixed-species forests, modelling stand dynamics, stand structure

Research Objectives:
- to examine stand structure and development patterns of mature, mixed-species forests in the Date Creek research area and elsewhere in the ICH zone
- to characterize the existing species, age, height, and diameter structure
- to describe and quantify the historical height development pattern
- to provide data for the development of a mixed-species growth and yield model

Contact Person: Phil LePage

Report(s):

LePage, P. 1995. The structure and development pattern of mixed-species forest stands in the Interior–Cedar Hemlock zone; Moist Cold subzone of northwestern British Columbia. M.Sc. thesis. Oreg. State Univ., Corvallis, Oreg.

4.5 Stand Structure

Researchers:
- Doug Steventon (Ministry of Forests, Research, Smithers, BC)
- Dave Coates (Ministry of Forests, Research, Smithers, BC)
- Phil LePage (Ministry of Forests, Research, Smithers, BC)

Key Words: coarse woody debris, stand structure, succession, wildlife habitat

Research objectives:
- to assess stand-level changes that result from harvesting treatments and their impact on management goals, such as reforestation, maintenance of biological diversity, and timber production
- to provide post- and pre-treatment descriptions of stand structure (e.g., diameter distribution, density, volume, basal area, etc.) and to ascertain how these variables change over time (repeat sampling will occur in 10-year intervals)
- to quantify and describe the wildlife trees and coarse woody debris dynamics in each treatment unit
- to understand the implication of managing for snags, wildlife trees, and coarse woody debris
- to interpret results of established wildlife studies

Contact Person: Doug Steventon

4.6 Attributes of Canopy Gaps

Researcher:
- Dave Coates (Ministry of Forests, Research, Smithers, BC)

Key Words: canopy gaps, gap distribution, gap position and size, light modelling, microclimate

Research objectives:
- to examine logging-created gaps within the Date Creek silvicultural systems study
- to determine the canopy gap size distribution and frequency within the treatment units

- to monitor microclimate (soil temperature, wind speed, relative humidity, air temperature) and photosynthetically active radiation in representative gaps, forested, and full open conditions
- to compare light levels at various positions in gaps and in various sizes of gaps

Contact Person: Dave Coates

4.7 Regeneration within Gaps

Researchers:
- Dave Coates (Ministry of Forests, Research, Smithers, BC)
- Elaine Wright (Ministry of Forests, Research, Smithers, BC)
- Phil LePage (Ministry of Forests, Research, Smithers, BC)

Key Words: artificial regeneration, canopy gap position and size, natural regeneration, seedling survival and growth, substrate, seedbed availability

Research objectives:

a) Natural regeneration
- to determine the effect of gap size, position, and seedbed on the abundance and diversity of natural regeneration (trees, shrubs, and herbs) in clearcuts, undisturbed forests, and the partially cut treatments
- to study the effect of substrate availability on natural regeneration by examining the distribution of substrate types in five replicates of each of four gap sizes
- to enumerate the regeneration on different substrate types along transects in 20 gaps (5 replicates of each of four gap sizes)

b) Artificial regeneration (planted seedlings)
- to determine the effect of gap position and size on the growth and survival of planted seedlings (western redcedar, western hemlock, subalpine fir, hybrid spruce, and lodgepole pine) in gaps, clearcuts, and undisturbed forests

Contact Person: Dave Coates

Report(s):

Neumann, J. and Wright, E. 1996. Regeneration mechanisms of shrubs and herbs. B.C. Min. For., For. Sci. Sec., Smithers, B.C. Unpubl. file report.

4.8 Retrospective Gap Study

Researchers:
- Dave Coates (Ministry of Forests, Research, Smithers, BC)
- Paula Bartemucci (Ministry of Forests, Research, Smithers, BC)

Key Words: canopy gaps, gap position and size, historic partial cutting, natural regeneration, tree species diversity and growth

Research Objectives:
- to examine historic partial logging to predict the success of natural regeneration within gaps at Date Creek and elsewhere in the ICH zone
- to describe species composition, density, and growth of regeneration in gaps created by old logging for particular positions in gaps over a range of gap sizes

Contact Person: Dave Coates

4.9 Development and Calibration of the Model SORTIE for ICH Forests

Researchers:
- Dave Coates (Ministry of Forests, Research, Smithers, BC)
- Charles Canham (Institute of Ecosystem Studies, Millbrook, NY)
- Rich Kobe (Michigan State University, East Lansing, MI)
- Elaine Wright (Ministry of Forests, Research, Smithers, BC)
- Phil LePage (Ministry of Forests, Research, Smithers, BC)
- Paula Bartemucci (Ministry of Forests, Research, Smithers, BC)

Key Words: community-level dynamics, individual-tree interactions, light-dependent growth, seedling recruitment, SORTIE, spatially expicit model, tree mortality

Research objectives:
- to collaborate with the developers of SORTIE to add a modelling component to the Date Creek silvicultural systems study
- to aid in making long-term projections of the consequences of various partial cutting systems

- to collect field data for SORTIE's four species-specific submodels to characterize the behaviour of individual trees in terms of: growth as a function of light availability, death as a function of recent growth, fecundity and dispersal of seedlings as functions of adult tree size, and modifications of neighbourhood light availability as a function of tree crown interception of light paths
- to provide parameters for, and run the forest dynamics simulator (SORTIE) for ICH forests

Contact Person: Dave Coates

Report(s):

Kobe, R.K. and K.D. Coates. 1997. Models of sapling mortality as a function of growth to characterize interspecific variation in shade tolerance of eight tree species of northwestern British Columbia. Can. J. For. Res. 27:227–36.

4.10 Direct Seeding Experiment

Researchers:
- Elaine Wright (Ministry of Forests, Research, Smithers, BC)
- Dave Coates (Ministry of Forests, Research, Smithers, BC)

Key Words: substrate, direct seeding, germination, gap position

Research objectives:
- to examine the effect of substrate and gap position on species germination and survival in gaps
- to determine the extent of seed predation and the abundance of seed rain at various gap positions

Contact Person: Dave Coates

4.11 Below-ground Limitations to Seedling Growth in the ICH

Researchers:
- Michael Walters (University of Northern British Columbia, Prince George, BC)
- Dave Coates (Ministry of Forests, Research, Smithers, BC)

Key Words: growth limitations, nutrient, seedling growth, water and light interactions

Research objectives:
- to determine the source (water, minerals, or both) and magnitude of below-ground limitation and its interactions with light availability/canopy cover for seedlings common to ICH forests
- to assess potential below-ground limitations to growth through measurements of nitrogen and moisture availability, and root competition to seedlings planted in the gaps of the Date Creek silvicultural systems study
- to make recommendations on the efficacy of artificial regeneration along a continuum of overstorey removal
- to aid in the below-ground growth limitation module for the forest dynamics simulator (SORTIE) model

Contact Person: Michael Walters

4.12 Secondary Succession

Researchers:
- Allen Banner (Ministry of Forests, Research, Smithers, BC)
- Will MacKenzie (Ministry of Forests, Research, Smithers, BC)
- Karen McKeown (Ministry of Forests, Research, Smithers, BC)
- Elaine Wright (Ministry of Forests, Research, Smithers, BC)

Key Words: secondary succession, understorey/overstorey interactions, vegetation dynamics

Research objectives:
- to assess the vegetation changes resulting from treatments and their effects on management goals such as reforestation, maintenance of biological diversity, and timber production
- to determine how understorey plant communities respond to different levels of overstorey canopy removal (i.e, understorey and overstorey interactions)
- to determine the effect of stand structure changes on the succession of herb, shrub, and tree species
- to monitor succession in quadrats that are randomly distributed throughout the entire silvicultural stystems study

Contact Person: Allen Banner

4.13 Chronosequence Analysis of the Structure and Function of Tree Crowns

Researchers:
- Mark Ashton (Yale University School of Forestry and Environmental Studies, New Haven, CT)
- Graeme Berlyn (Yale University School of Forestry and Environmental Studies, New Haven, CT)
- Ian Cameron (Ministry of Forests, Research, Kamloops)

Key words: chronosequence, morphology, tree crown physiology

Research objectives:
- to improve understanding of species coexistence in moist mixed-species forest stands
- to provide autecological information that will help formulate better silvicultural systems in the ICH zone
- to provide comparative autecological information on (1) seedlings of tree species in the ICH zone under controlled and field conditions, and (2) the anatomical, physiological, and morphological crown development of tree species in the ICH zone
- to investigate leaf and whole and crown morphology, physiology, and anatomy for each of the five dominant species for the ICH zone in three stand age classes (15–25 years, 50 years, and 135 years)

Contact Person: Ian Cameron

4.14 Epiphytic Macrolichen Diversity

Researchers:
- Trevor Goward (Enlichened Consulting Ltd., Clearwater, BC)
- Allen Banner (Ministry of Forests, Research, Smithers, BC)

Key Words: diversity, conservation, epiphytic macrolichens

Research objectives:
- to survey and document the epiphytic macrolichen diversity of three ages of forests at the Date Creek research area and elsewhere in the ICH zone
- to produce an inventory of epiphytic macrolichens at 21 forested sites within the Date Creek study area
- to monitor lichen diversity and species composition over time in the undisturbed, and partially cut treatments at Date Creek
- to make recommendations on the most effective silvicultural system for maintaining epiphytic macrolichen diversity

Contact Persons: Trevor Goward or Allen Banner

Report(s):

Goward, T. and Burgess, D. 1996. Epiphytic macrolichens as indicators of forest antiquity in the Kispiox Valley (ICHmc zone), with recommendations for the designation of special management areas. B.C. Min. For., For. Sci. Sec., Smithers, B.C. Contract report. Unpubl.

Goward, T. and Miege, D. 1996. Notes on the distributional ecology of epiphytic macrolichens in the Kispiox and Nass valleys, with special reference to species of old-growth forests. Part 1: The interior cedar–hemlock zone (moist cold subzone). B.C. Min. For., For. Sci. Sec., Smithers, B.C. Contract report. Unpubl.

Goward, T. and Goffinet, B. 1993. *Nephroma silvae-vetris*, a new lichen (Ascomytina) from the Pacific Northwest of North America. The Bryologist 96(2): 242–3.

Goward, T. 1995. *Nephroma occultum* and the maintenance of lichen diversity in British Columbia. Mitteilungen der Eidgenössischen Forschungsanstalt fü Wald, Schnee und Landschaft 70: 93–101.

———. 1994. Notes on oldgrowth-dependent epiphytic macrolichens in inland British Columbia, Canada. Acta Bot. Fennica 150: 31–8.

———. 1993. Date Creek study: epiphytic lichen diversity. Progress report. B.C. Min. For., For. Sci. Sec., Smithers, B.C. Contract report. Unpubl.

4.15 Ectomycorrhizal Diversity

Researchers:
- Marty Kranabetter (Ministry of Forests, Research, Smithers, BC)
- Melanie Jones (Okanagan University College, Kelowna, BC)
- Daniel M. Durall (Okanagan University College, Kelowna, BC)
- Elaine Wright (Ministry of Forests, Research, Smithers, BC)
- Tara Wylie (Consulting Biologist, Vancouver, BC)

Key Words: community structure, ectomycorrhizal diversity, ectomychorrhizal ecology, gap position, natural regeneration, planted seedlings

Research objectives:
- to study the diversity of ectomycorrhizae at Date Creek
- to enumerate, photograph, and describe the ectomycorrhizal types found in the undisturbed treatment units and in an older clearcut
- to produce an atlas comprising a photograph and description for each type of ectomycorrhiza found
- to compare the diversity of ectomycorrhizal fungi on pine and hemlock seedlings planted at different distances from the gap edge
- to compare diversity and ectomycorrhizal ecology of planted hemlock versus naturally regenerated hemlock.

Contact Person: Melanie Jones or Marty Kranabetter

Report(s):

Jones, M. 1995. The effect of gap size on the fungal community at Date Creek: ectomycorrhizae and sporocarps. B.C. Min. For., For. Sci. Sec., Smithers, B.C. Contract report. Unpubl.

———. 1994. Diversity of ectomycorrhizal fungi at Date Creek. B.C. Min. For., For. Sci. Sec., Smithers, B.C. Unpubl.

Kranabetter, M. and Wylie, T. 199_. Ectomycorhizal community structure across forest openings on naturally regenerated western hemlock seedlings. Can. J. Bot. In press.

Kroeger, P. 1997. Forest mushrooms of Date Creek: some key field characteristics of ectomycorrhizal fruitbodies documented in July and August, 1996. B.C. Min. For., For. Sci. Sec., Smithers, B.C. Unpubl.

4.16 Diversity of Mycorrhizal Fruiting Bodies

Researchers:
- Marty Kranabetter (Ministry of Forests, Research, Smithers, BC)
- Paul Kroeger (consulting mycologist, Vancouver, BC)
- Daniel M. Durall (Okanagan University College, Kelowna, BC)

Key Words: community structure, ectomycorrhizal fruiting bodies, species diversity

Research objectives:
- to study the fruiting bodies of ectomycorrhizal fungi within the undisturbed forest, and within the gaps of the light and heavy removal treatment units
- to identify the fungal sporocarps present in the unharvested and clearcut treatment units
- to determine the relationship between gap size and species richness of ectomycorrhizal epigeous sporocarps
- to deposit a collection of specimens and photographs in a fungal herbarium at Okanagan University College; the collection of specimens will allow a more precise identification of the ectomycorrhizal fungi that were described from root tips of earlier studies

Contact Person: Dan Durall

Report(s):

Durall, D. 1995. The effect of gap size on the fungal community at Date Creek: a preliminary survey of ectomycorrhizal epigeous sporocarps. B.C. Min. For., For. Sci. Sec., Smithers, B.C. Contract report. Unpubl.

———. 1996. The effect of gap size on the fungal community at Date Creek: year 2. B.C. Min. For., For. Sci. Sec., Smithers, B.C. Contract report. Unpubl.

4.17 Litter Decomposition

Researcher:
- Cindy Prescott (University of British Columbia, Vancouver, BC)

Key Words: litter decomposition

Research objectives:
- to determine the rates of litter decomposition (pine needles, aspen leaves, and forest floor material) over a range of canopy cover within the Date Creek study and elsewhere in British Columbia

Contact Person: Cindy Prescott

4.18 Decay Fungi at Date Creek

Researcher:
Eric Allen (Canadian Forest Service, Victoria, BC)

Key Words: decay fungi, fungal isolation

Research objectives:
- to investigate the decay fungi present in forest stands within the Date Creek study area
- to isolate and identify fungal decay organisms in 49 tree disc samples obtained from the Date Creek study

Contact Person: Eric Allen

Report(s):
Allen, E. 1992. Isolation and identification of decay fungi from the Date Creek study. Can. For. Ser., Victoria, B.C. Contract report. Unpubl.

4.19 Breeding Bird Community Response

Researchers:
- Ken MacKenzie (Graduate student, University of British Columbia, Vancouver, BC)
- Doug Steventon (Ministry of Forests, Research, Smithers, BC)

Key Words: breeding bird populations, diversity, habitat use, partial cutting, stand structure

Research objectives:
- to examine the effect of different treatments (clearcut, partial cutting, and undisturbed) on the diversity, abundance, and microhabitat selection of breeding birds
- to determine if maintaining mature forest habitat by partial cutting continues to support bird species typical of mid- to late-seral stands
- to examine foraging efficiency and nest predation as an indication of habitat quality
- to understand how birds respond to changes in stand structure created through treatments and succession, and to extrapolate from the stand scale to the landscape scale

Contact Person: Doug Steventon

4.20 Small Mammal Populations at Date Creek

Researchers:
- Todd Mahon (Graduate student, Simon Fraser University, Vancouver, BC)
- Doug Steventon (Ministry of Forests, Research, Smithers, BC)

Key Words: diversity, habitat use, partial cutting, small mammals, stand structure

Research objectives:
- to gain better understanding of small mammal ecology and community structure
- to understand how small mammal (mice, voles, and shrews) populations respond (in terms of species composition, abundance, and demography) to changes in stand structure created through treatments and succession
- to examine habitat use, and dispersal between habitats, of small mammals (red-backed vole and deer mice) in response to the various treatments at Date Creek

Contact Person: Doug Steventon

4.21 Bat and Amphibian Populations

Researcher:
- Doug Steventon (Ministry of Forests, Research, Smithers, BC)

Key Words: amphibians, bats, biological diversity, habitat use, partial cutting, stand structure

Research objectives:

- to determine vertebrate species occurrence and general habitat/ecosystem affinities within the Date Creek study area
- to examine bat presence and activity in 2 intensities of partial cutting compared to clearcuts and undisturbed forests at Date Creek
- to examine habitat use and abundance of amphibians in wetland fringes and coarse woody debris

Contact Person: Doug Steventon

Report(s):

Patterson, D.A. and Steventon, J.D. 1993. Amphibians of the Date Creek research area. B.C. Min. For., For. Sci. Sec., Smithers, B.C. 14 p. Unpubl. file report

Perdue, M. 1996. Comparison of bat activity in four forest management regimes. B. Sc. thesis. Univ. B.C., Vancouver, B.C.

Perdue, M., and Steventon, J.D. 1996. Partial cutting and bats: a pilot study. *In* Bats and Forest Symposium, October 19–21, 1995, Victoria, British Columbia, Canada. R.M.R. Barclay and R.M. Bingham (editors). B.C. Min. For., Res. Br., Victoria, B.C. Work. Pap. 23/1996, pp. 273–6.

4.22 Extension, Demonstration, and Publications

Researchers:

- Dave Coates (Ministry of Forests, Research, Smithers, BC)
- Sandra Thomson (Ministry of Forests, Research Branch, Victoria, BC)
- Phil LePage (Ministry of Forests, Research, Smithers, BC)

Key Words: demonstration, extension, public education and information

Research objectives:

- to demonstrate and inform operational forestry audiences about alternative silvicultural systems
- to increase general public awareness of silvicultural practices and forestry research
- to update and provide information on research being conducted and to establish permanent interpretative displays that can be updated regularly as information becomes available
- to provide public and operational information talks and field tours

Contact Person: Dave Coates or Phil LePage

Report(s):

Thomson, S., Harris, D.K., and L. Horrocks. 1996. An Extension Plan for the Date Creek Research Forest. B.C. Min. For., Res. Br., Victoria, B.C. Unpubl.

Scientific Name	Common Name
Trees	
Abies amabilis	amabilis fir
Abies lasiocarpa	subalpine fir
Betula papyrifera	paper birch
Picea glauca x sitchensis x engelmannii	hybrid white spruce
Picea mariana	black spruce
Pinus contorta	lodgepole pine
Populus tremuloides	trembling aspen
Populus balsamifera ssp. *trichocarpa*	black cottonwood
Thuja plicata	western redcedar
Tsuga heterophylla	western hemlock
Shrubs	
Acer glabrum	Douglas maple
Alnus incana ssp. *tenuifolia*	mountain alder
Alnus viridis ssp. *sinuata*	Sitka alder
Amelanchier alnifolia	saskatoon berry
Betula glandulosa	scrub birch
Cornus sericea	red-osier dogwood
Corylus cornuta	beaked hazelnut
Ledum groenlandicum	Labrador tea
Lonicera involucrata	black twinberry
Menziesia ferruginea	false azalea
Oplopanax horridus	devil's club
Ribes lacustre	black gooseberry
Ribes laxiflorum	trailing black currant
Rosa acicularis	prickly rose
Rubus idaeus	red raspberry
Rubus parviflorus	thimbleberry
Salix spp.	willow
Sambucus racemosa	red elderberry
Sorbus scopulina	western mountain ash
Spiraea betulifolia	birch-leaved spirea
Spiraea douglasii	hardhack
Vaccinium alaskaense	Alaskan blueberry
Vaccinium membranaceum	black huckleberry
Vaccinium ovalifolium	oval-leaved blueberry
Viburnum edule	highbush-cranberry
Herbs and Dwarf Shrubs	
Actaea rubra	baneberry
Andromeda polifolia	bog-rosemary
Angelica genuflexa	kneeling angelica
Aquilegia formosa	red columbine
Aralia nudicaulis	wild sarsaparilla
Arenaria sp.	sandwort

Arnica cordifolia	heart-leaved arnica
Aster borealis	rush aster
Aster ciliolatus	fringed aster
Athyrium filix-femina	lady fern
Botrychium virginianum	rattlesnake fern
Bromus sp.	brome
Calamagrostis canadensis	bluejoint
Cardamine sp.	bitter-cress
Carex diandra	lesser panicled sedge
Carex disperma	soft-leaved sedge
Carex interior	inland sedge
Carex leptalea	bristle-stalked sedge
Carex limosa	shore sedge
Carex pauciflora	few-flowered sedge
Carex rostrata	beaked sedge
Carex sitchensis	Sitka sedge
Carex vesicaria	inflated sedge
Chimaphila umbellata	prince's pine
Cinna latifolia	nodding wood-reed
Circaea alpina	enchanter's nightshade
Clintonia uniflora	queen's cup
Corallorhiza maculata	spotted coralroot
Cornus canadensis	bunchberry
Drosera anglica	long-leaved sundew
Drosera rotundifolia	round-leaved sundew
Dryopteris assimilis	spiny wood fern
Elymus glaucus	blue wildrye
Epilobium angustifolium	fireweed
Epilobium palustre	swamp willowherb
Equisetum arvense	common horsetail
Equisetum hyemale	scouring-rush
Equisetum sylvaticum	wood horsetail
Eriophorum angustifolium	narrow-leaved cotton-grass
Galium boreale	northern bedstraw
Galium trifidum	small bedstraw
Galium triflorum	sweet-scented bedstraw
Gaultheria hispidula	creeping-snowberry
Geocaulon lividum	bastard toad-flax
Geranium erianthum	northern geranium
Geum macrophyllum	large-leaved avens
Glyceria sp.	mannagrass
Goodyera oblongifolia	rattlesnake-plantain
Goodyera repens	dwarf rattlesnake orchid
Gymnocarpium dryopteris	oak fern
Hierochloe odorata	common sweetgrass
Hypopitys monotropa	pinesap
Impatiens noli-tangere	common touch-me-not
Kalmia microphylla	bog-laurel

Lathyrus nevadensis	purple peavine
Linnaea borealis	twinflower
Listera cordata	heart-leaved twayblade
Lycopodium annotinum	stiff clubmoss
Lycopodium complanatum	ground-cedar
Lycopodium obscurum	ground-pine
Lysichiton americanum	skunk cabbage
Mentha arvensis	field mint
Menyanthes trifoliata	buckbean
Mitella nuda	common mitrewort
Moneses uniflora	single delight
Orthilia secunda	one-sided wintergreen
Oryzopsis asperifolia	rough-leaved ricegrass
Osmorhiza chilensis	mountain sweet-cicely
Parnassia fimbriata	fringed grass-of-Parnassus
Petasites palmatus	palmate coltsfoot
Petasites sagittatus	arrow-leaved coltsfoot
Platanthera dilatata	white bog-orchid
Platanthera hyperborea	green-flowered bog-orchid
Platanthera orbiculata	round-leaved rein-orchid
Poa pratensis	Kentucky bluegrass
Potentilla palustris	marsh cinquefoil
Prenanthes alata	western rattlesnake-root
Pterospora andromeda	pinedrops
Pyrola asarifolia	pink wintergreen
Pyrola chlorantha	green wintergreen
Rubus arcticus	dwarf nagoonberry
Rubus chamaemorus	cloudberry
Rubus pedatus	five-leaved bramble
Rubus pubescens	trailing raspberry
Saxifraga nelsoniana	brook saxifrage
Scirpus microcarpus	small-flowered bulrush
Senecio triangularis	arrow-leaved groundsel
Smilacina racemosa	false Solomon's-seal
Smilacina stellata	star-flowered false Solomon's seal
Spiranthes romanzoffiana	ladies' tresses
Stellaria sp.	starwort
Streptopus amplexifolius	clasping twistedstalk
Streptopus roseus	rosy twistedstalk
Streptopus streptopoides	small twistedstalk
Thalictrum occidentale	western meadowrue
Thelypteris phegopteris	beech fern
Tiarella laciniata	cut-leaved foamflower
Tiarella trifoliata	three-leaved foamflower
Tiarella unifoliata	one-leaved foamflower
Tofieldia glutinosa	sticky false asphodel
Trichophorum cespitosum	tufted clubrush
Trientalis europaea	northern starflower

APPENDIX 1 *Concluded.*

Triglochin maritimum	seaside arrow-grass
Urtica dioica	stinging nettle
Vaccinium oxycoccos	bog cranberry
Vaccinium vitis-idaea	lingonberry
Veronica sp.	speedwell
Viola canadensis	Canada violet
Viola glabella	stream violet
Viola palustris	marsh violet
Viola spp.	violet

Mosses, Lichens, and Liverworts
Aulacomnium palustre
Barbilophozia sp.
Brachythecium spp.
Calliergon sp.
Cladina mitis
Cladina rangiferina
Conocephalum conicum
Dicranum scoparium
Dicranum spp.
Hylocomium splendens
Mnium spp.
Peltigera aphthosa
Plagiochila asplenioides
Plagiomnium insigne
Pleurozium schreberi
Ptilium crista-castrensis
Rhytidiadelphus loreus
Rhytidiadelphus triquetrus
Sphagnum spp.
Tomenthypnum nitens

The following 16 maps present the post-treatment distribution of openings for each treatment unit. Aerial photographs were taken of each treatment unit and digitized using GIS (scale = 1:4000).

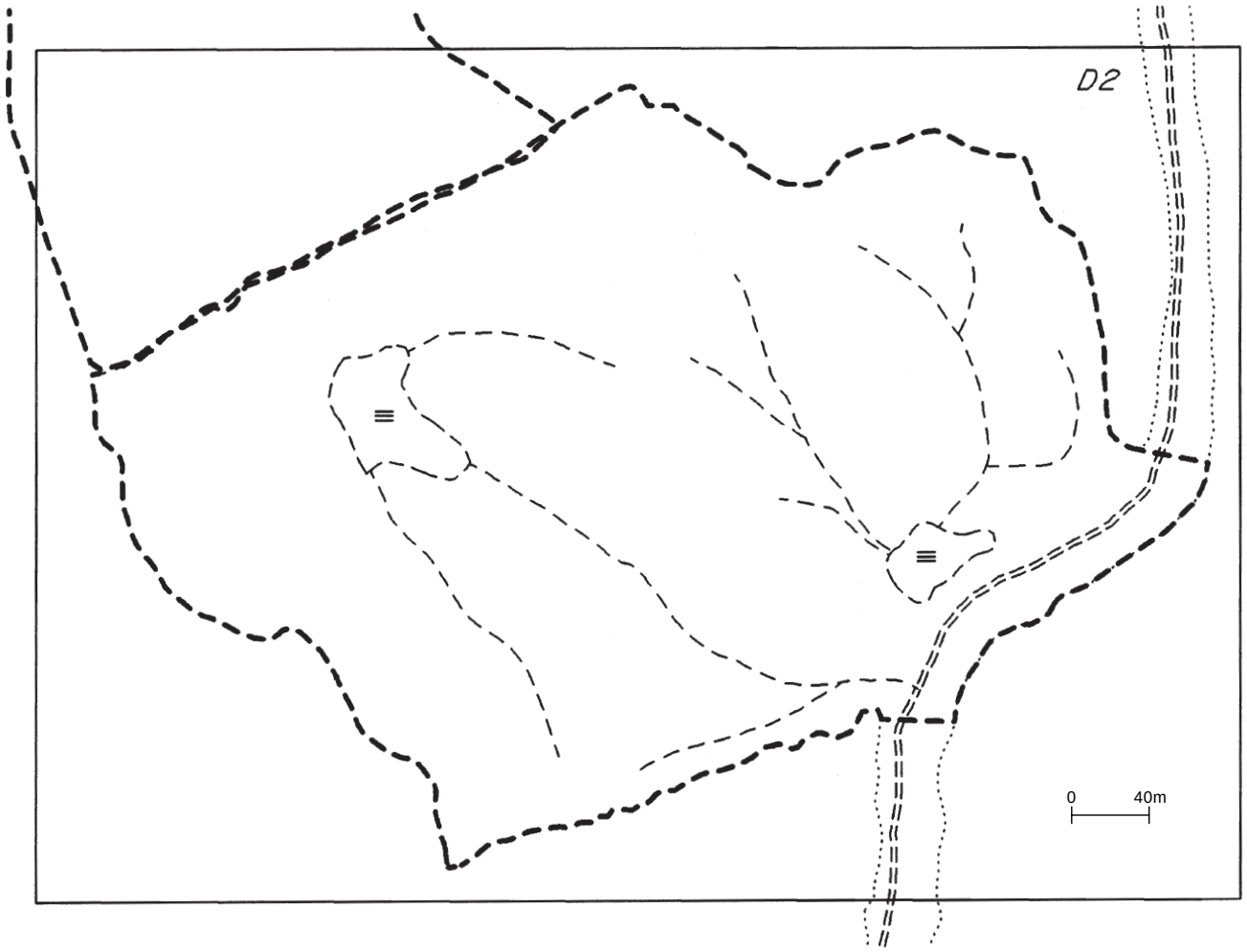
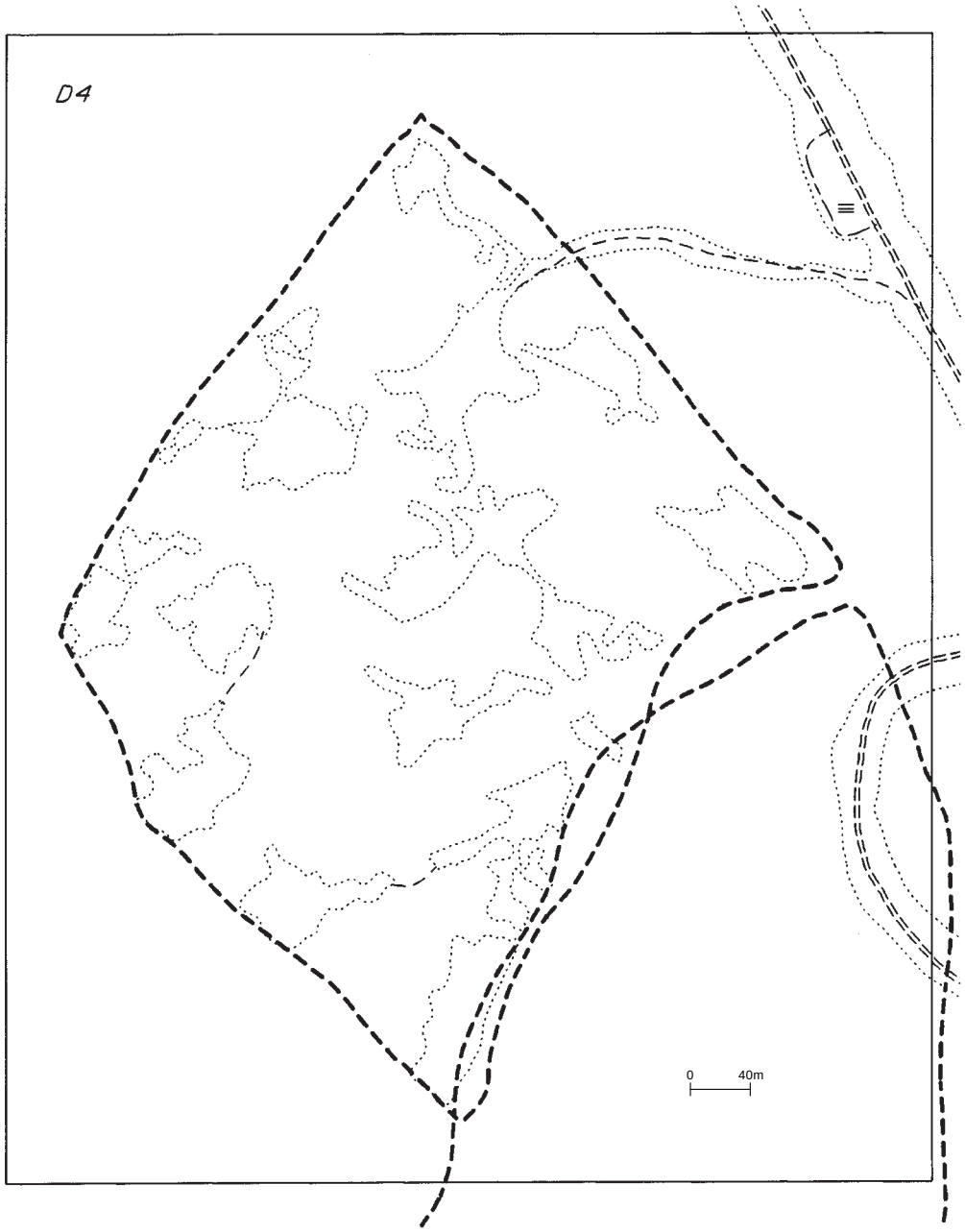


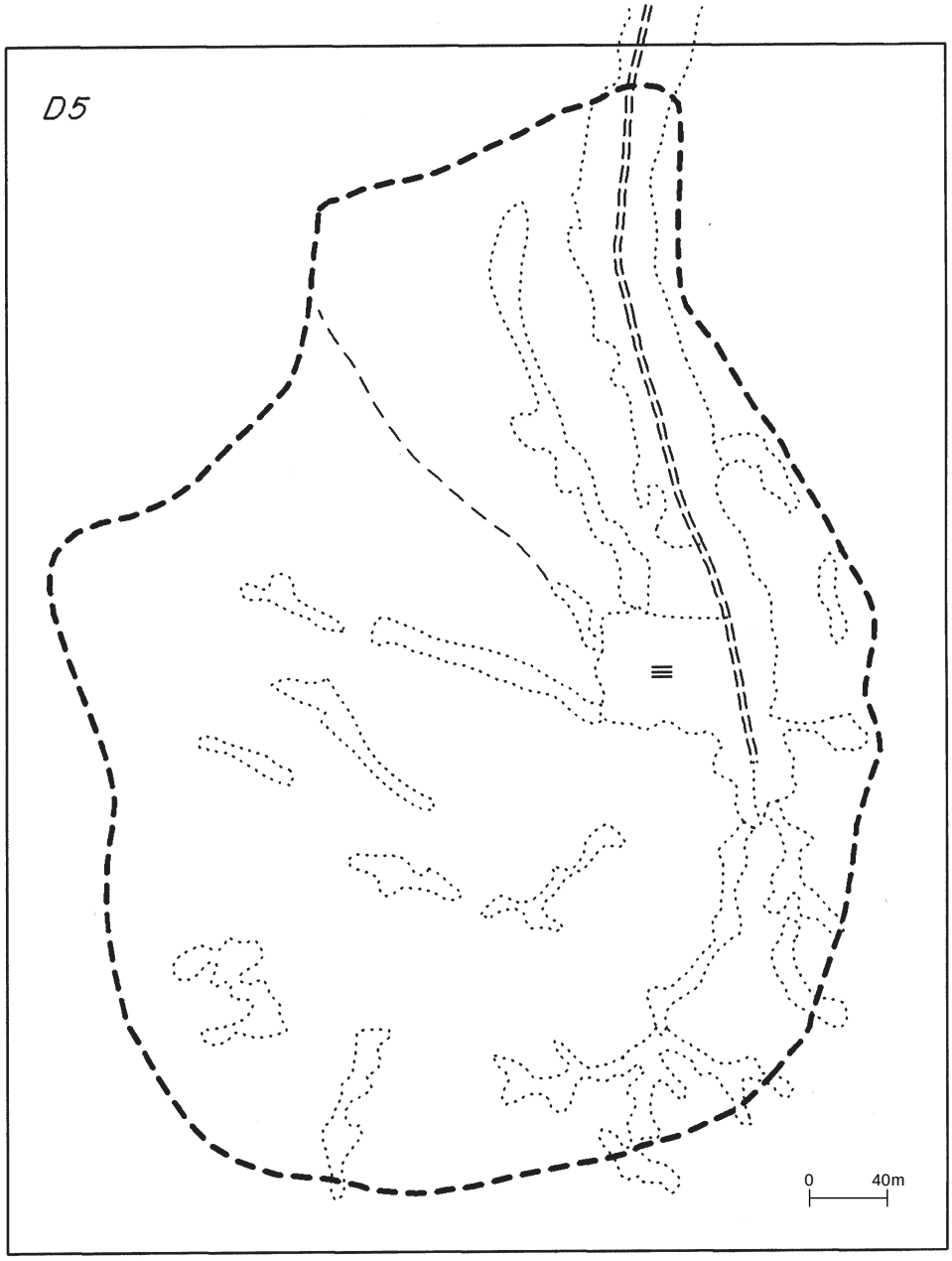
FIGURE A2.1 *Map of treatment unit D2 (clearcut).*



INDIVIDUAL TREATMENT UNIT MAP

- - - - - - - -	Treatment unit boundary
. . . . .	Openings
≡	Landings
= = = = = =	Roads
– – – – – –	Skid trails

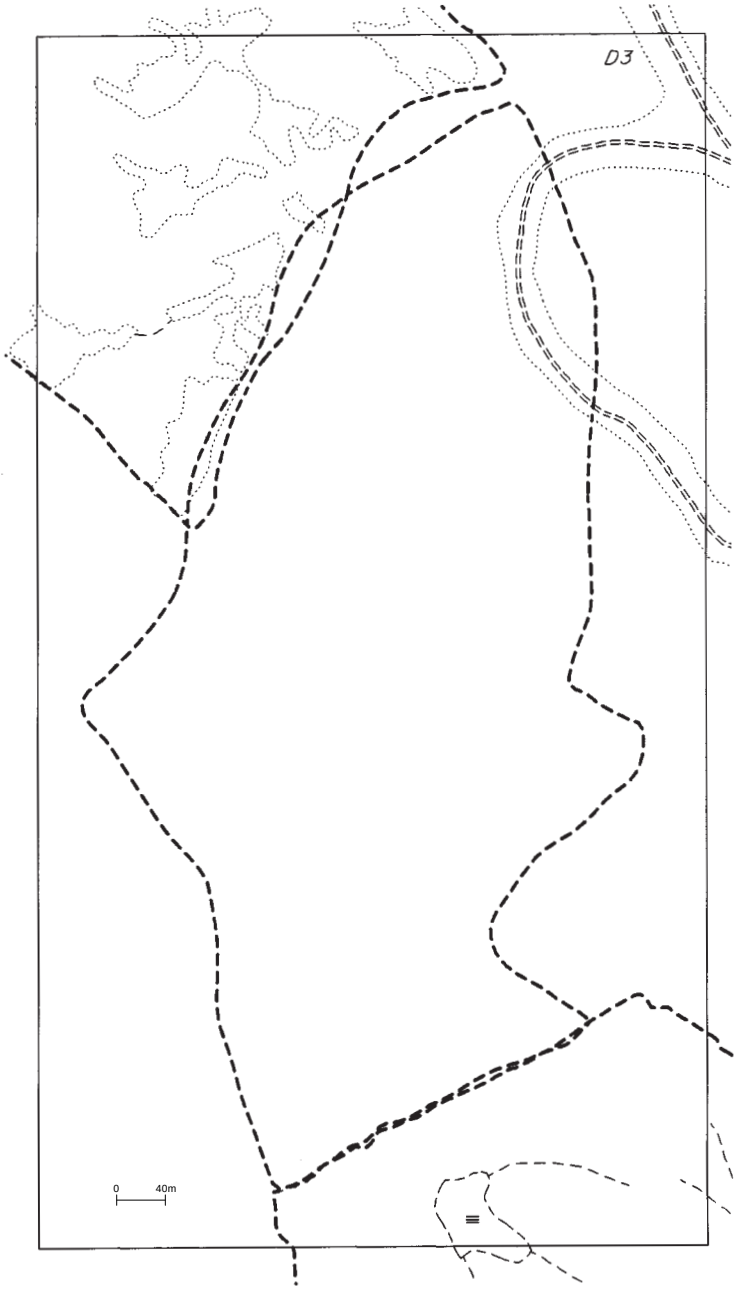
FIGURE A2.2 *Map of treatment unit D4 (heavy removal) with opening distribution.*



INDIVIDUAL TREATMENT UNIT MAP

- - - - - - - -	Treatment unit boundary
. . . . .	Openings
≡	Landings
= = = = = =	Roads
– – – – – –	Skid trails

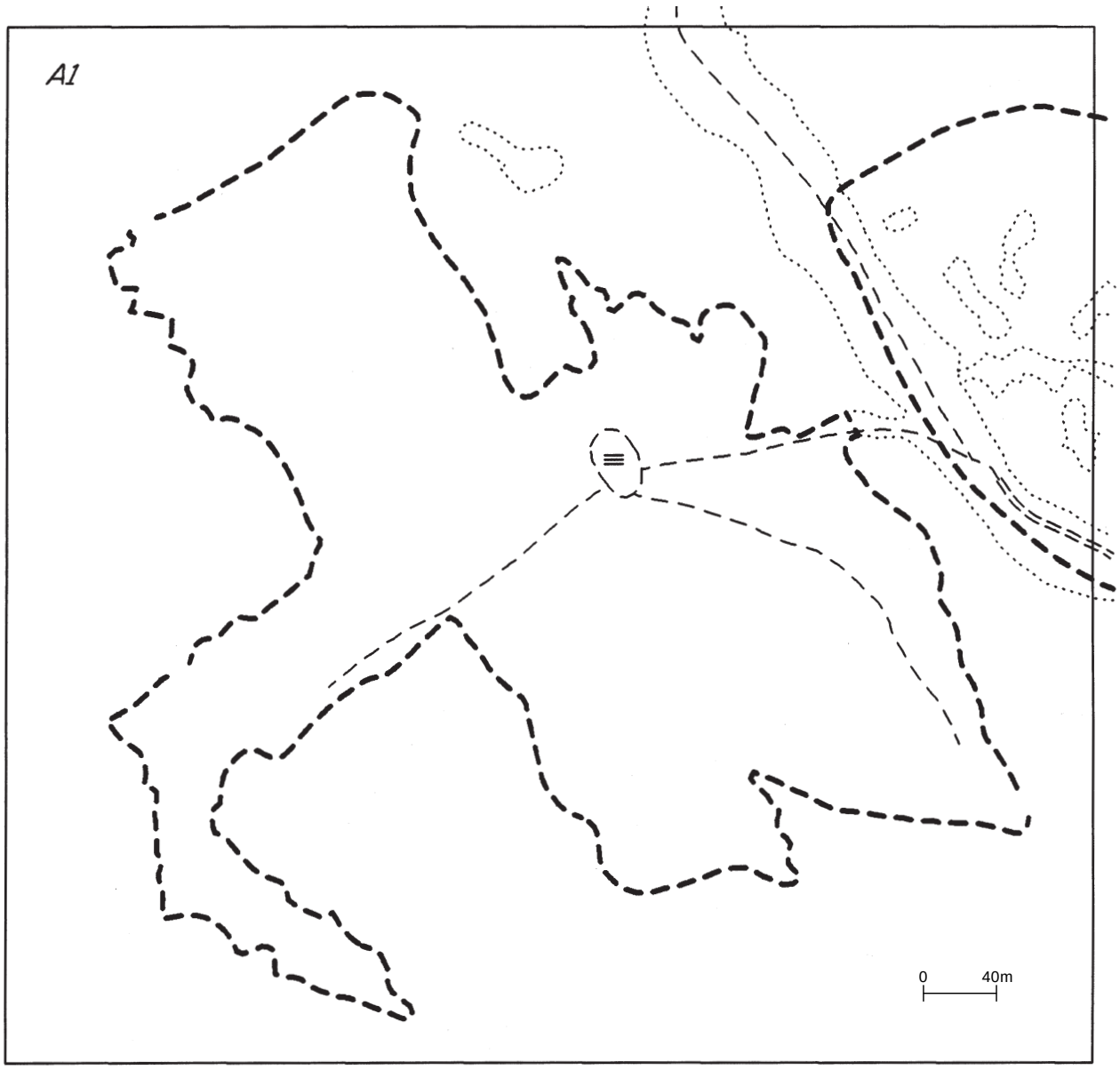
FIGURE A2.3 *Map of treatment unit D5 (light removal) with opening distribution.*



INDIVIDUAL TREATMENT UNIT MAP

- - - - - - - -	Treatment unit boundary
. . . . .	Openings
≡	Landings
= = = = = =	Roads
– – – – – –	Skid trails

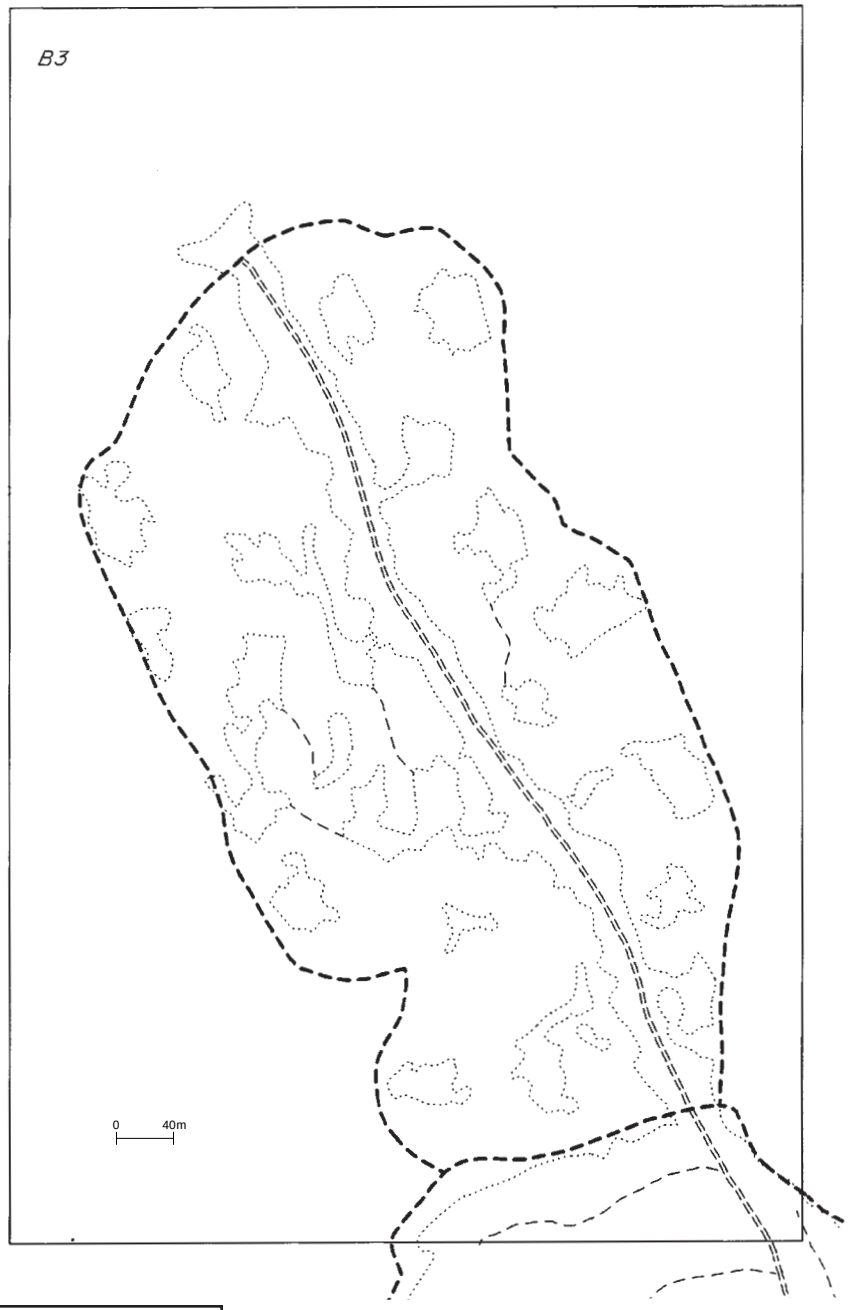
FIGURE A2.4 *Map of treatment unit D3 (no harvest).*



INDIVIDUAL TREATMENT UNIT MAP

- - - - - - - -	Treatment unit boundary
. . . . .	Openings
≡	Landings
= = = = = =	Roads
– – – – – –	Skid trails

FIGURE A2.5 *Map of treatment unit A1 (clearcut).*



INDIVIDUAL TREATMENT UNIT MAP

- - - - - - - - Treatment unit boundary
. . . . . Openings
≡ Landings
= = = = = = Roads
– – – – – – Skid trails

FIGURE A2.6 *Map of treatment unit B3 (heavy removal) with opening distribution.*

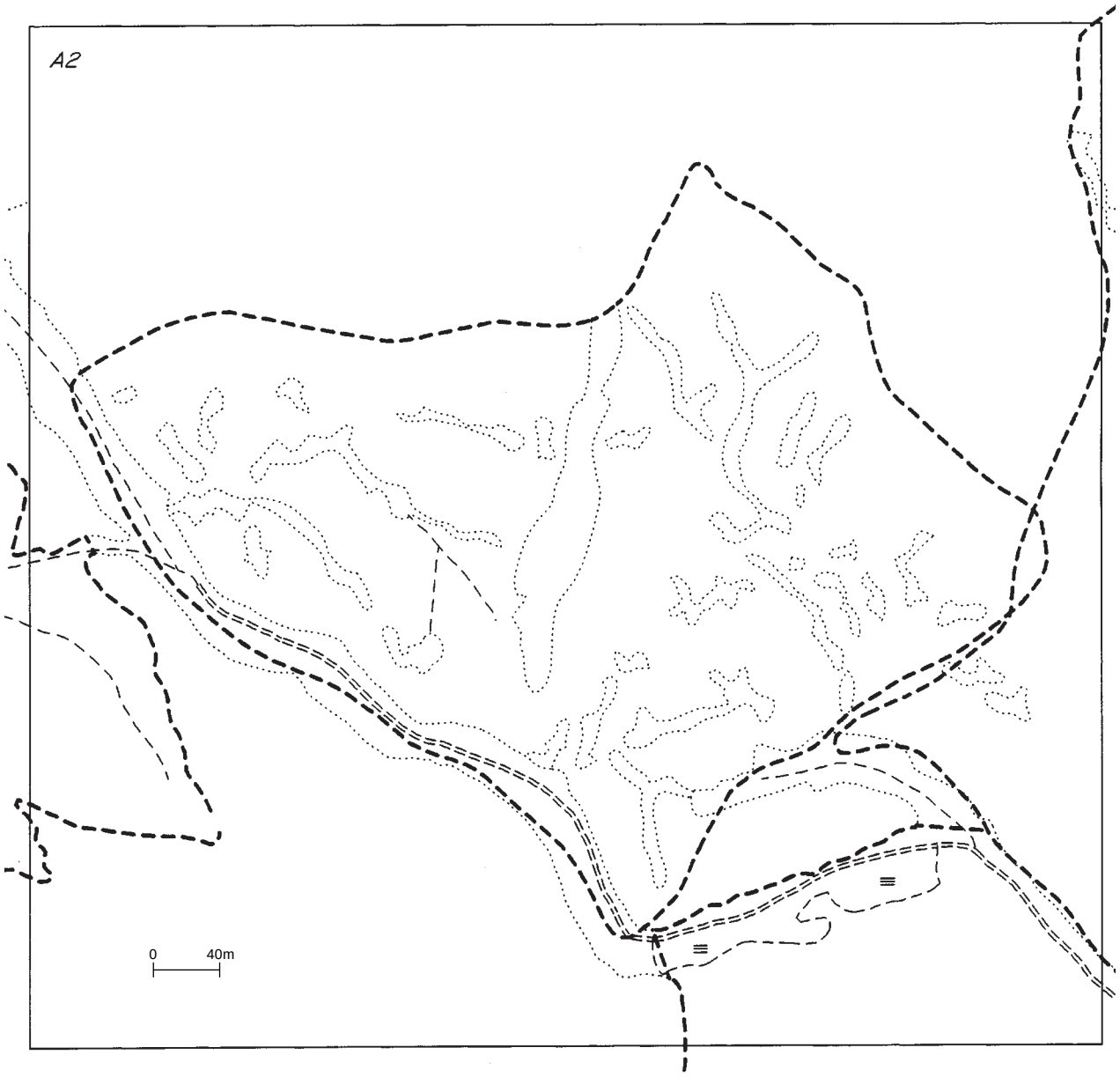


FIGURE A2.7 *Map of treatment unit A2 (light removal) with opening distribution.*

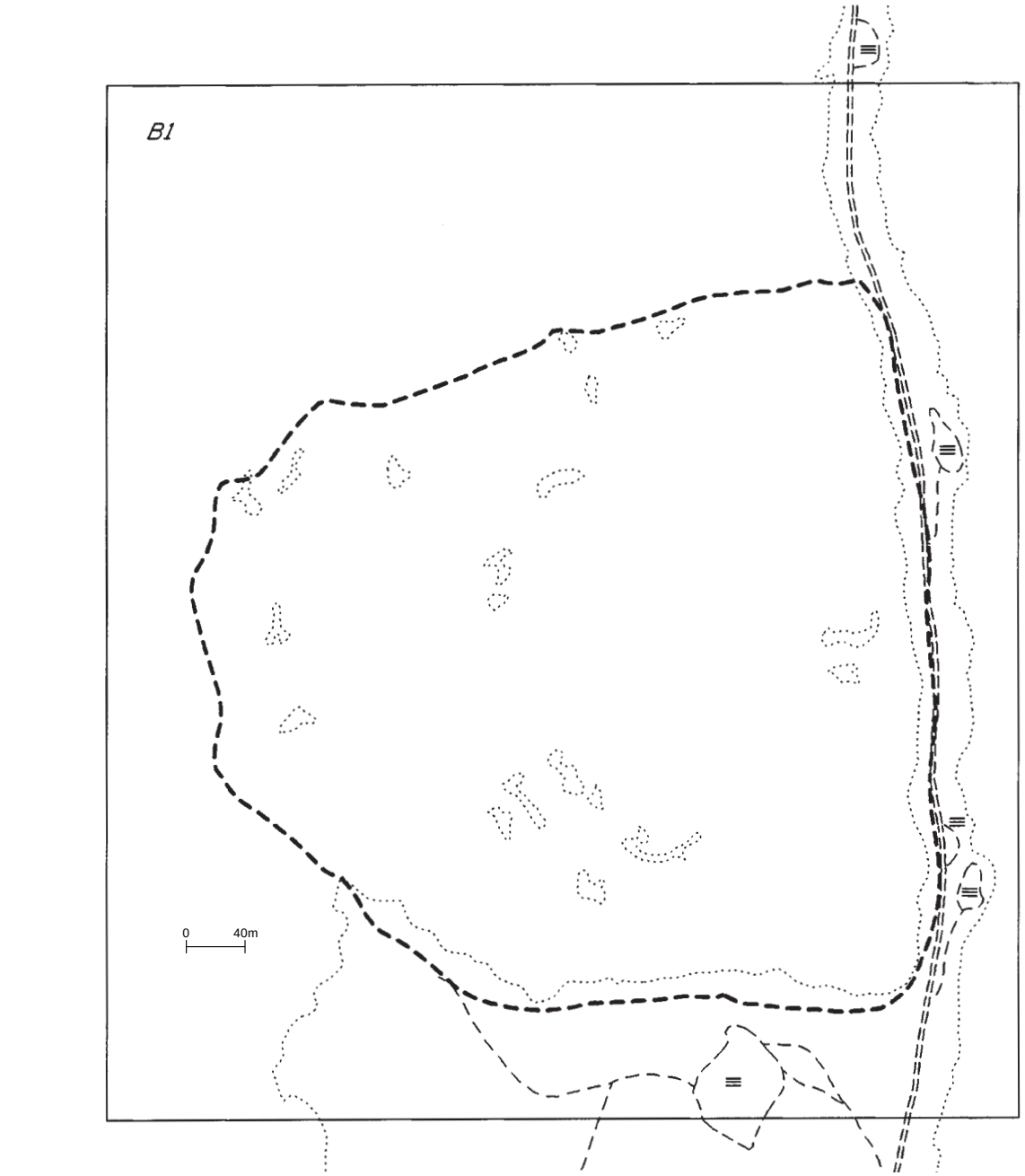


FIGURE A2.8 *Map of treatment unit B1 (no harvest).*

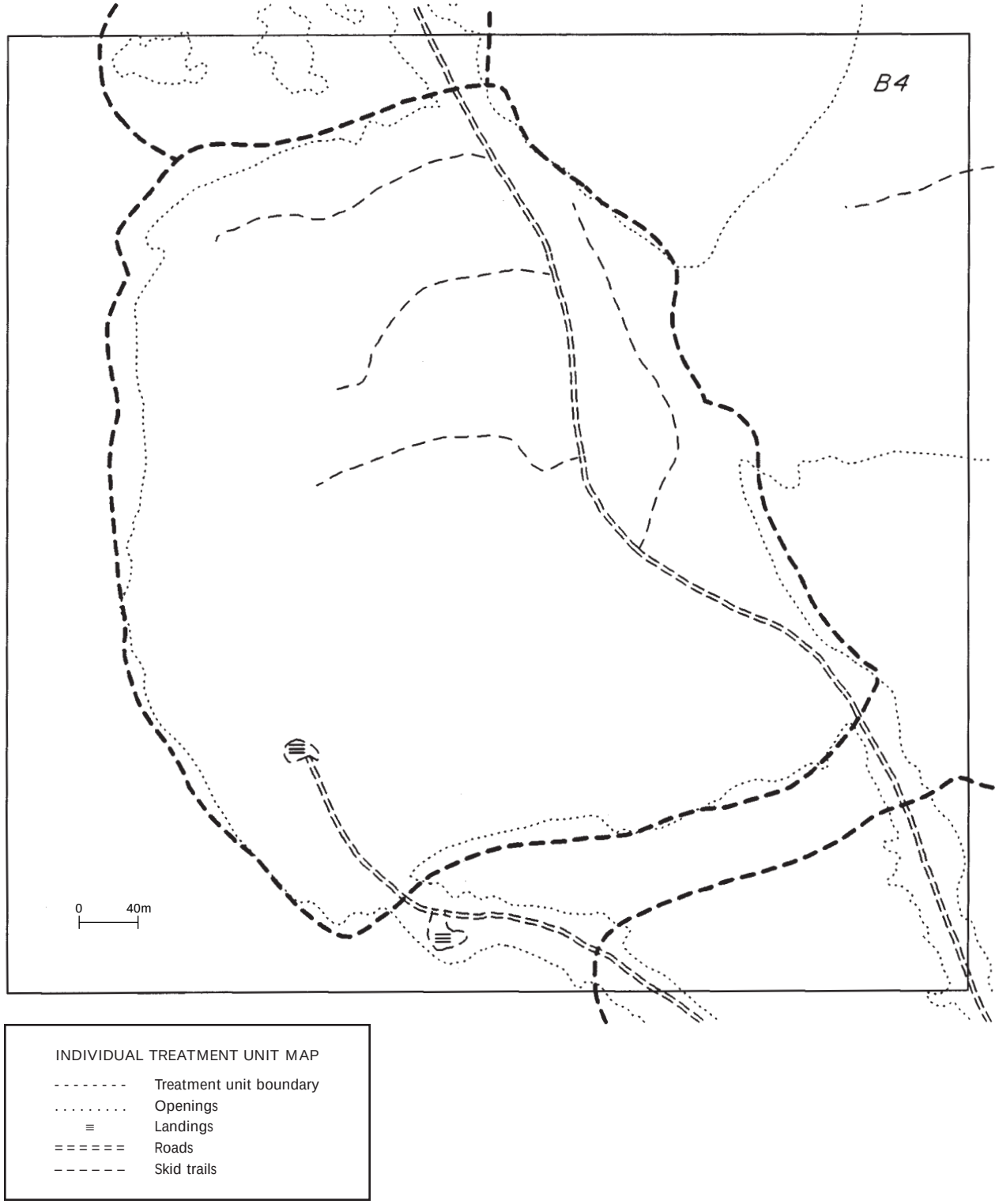


FIGURE A2.9 *Map of treatment unit B4 (clearcut).*

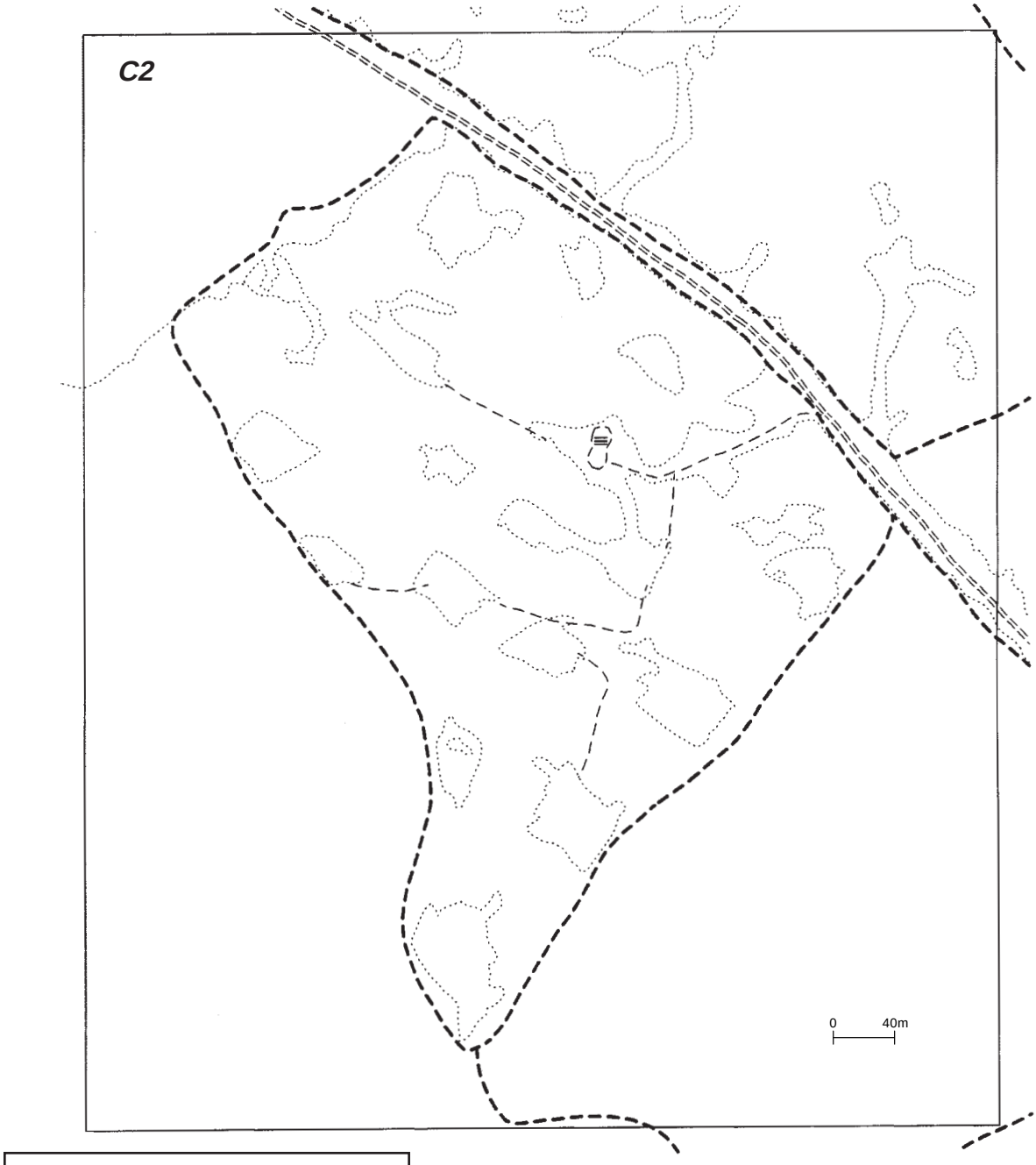
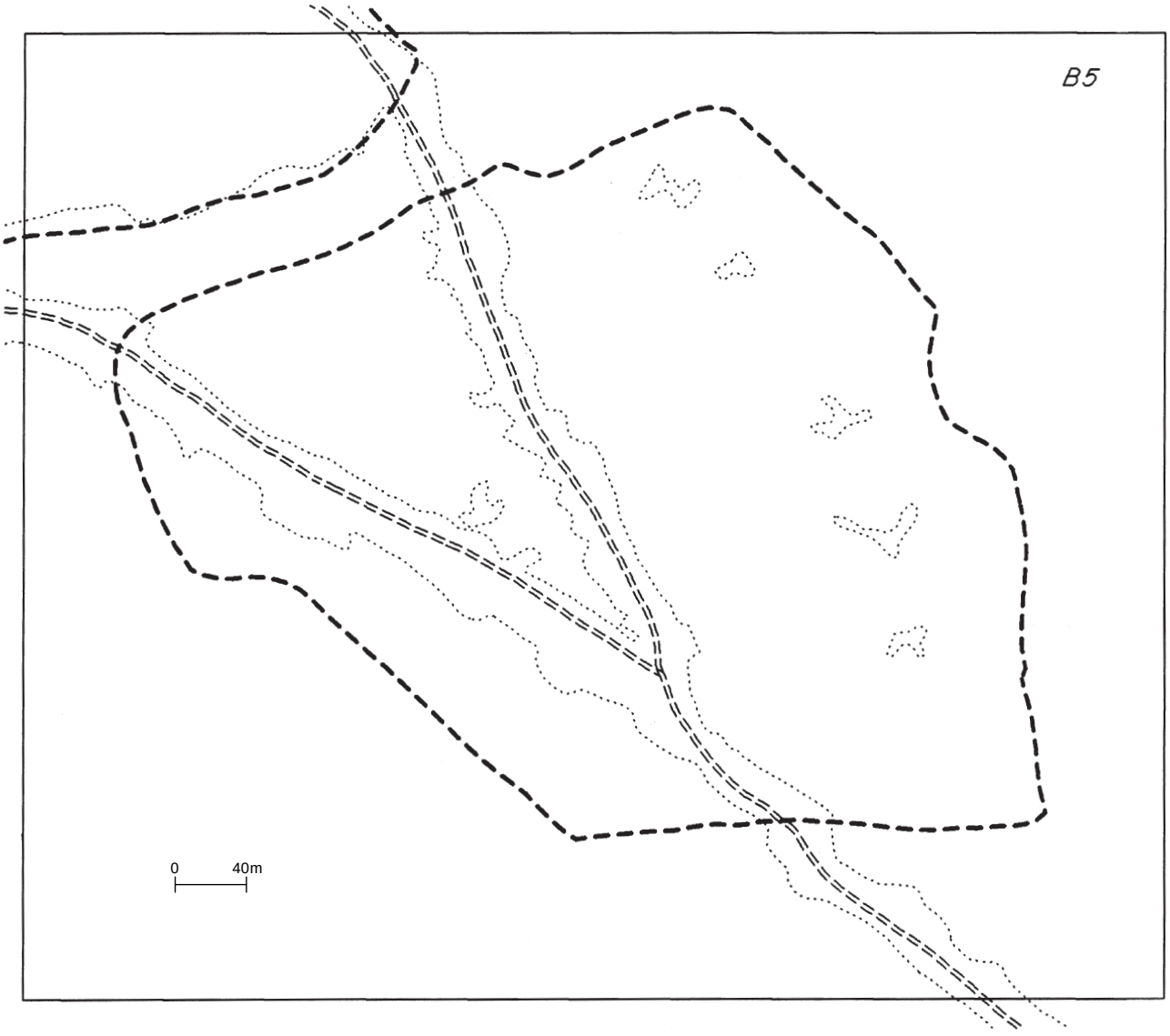


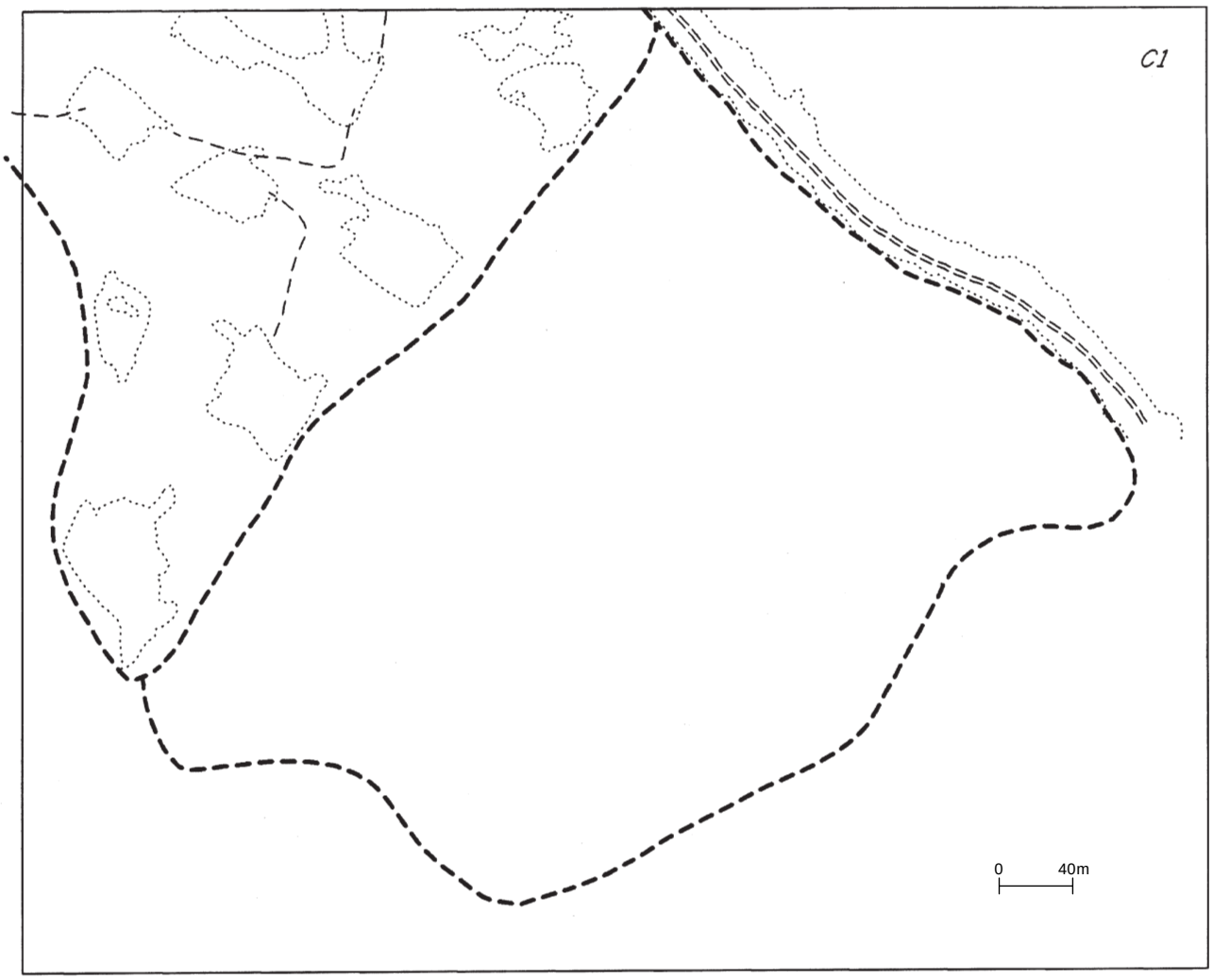
FIGURE A2.10 *Map of treatment unit C2 (heavy removal) with opening distribution.*



INDIVIDUAL TREATMENT UNIT MAP

- - - - - - - -	Treatment unit boundary
. . . . .	Openings
≡	Landings
= = = = = =	Roads
– – – – – –	Skid trails

FIGURE A2.11 *Map of treatment unit B5 (light removal) with opening distribution.*

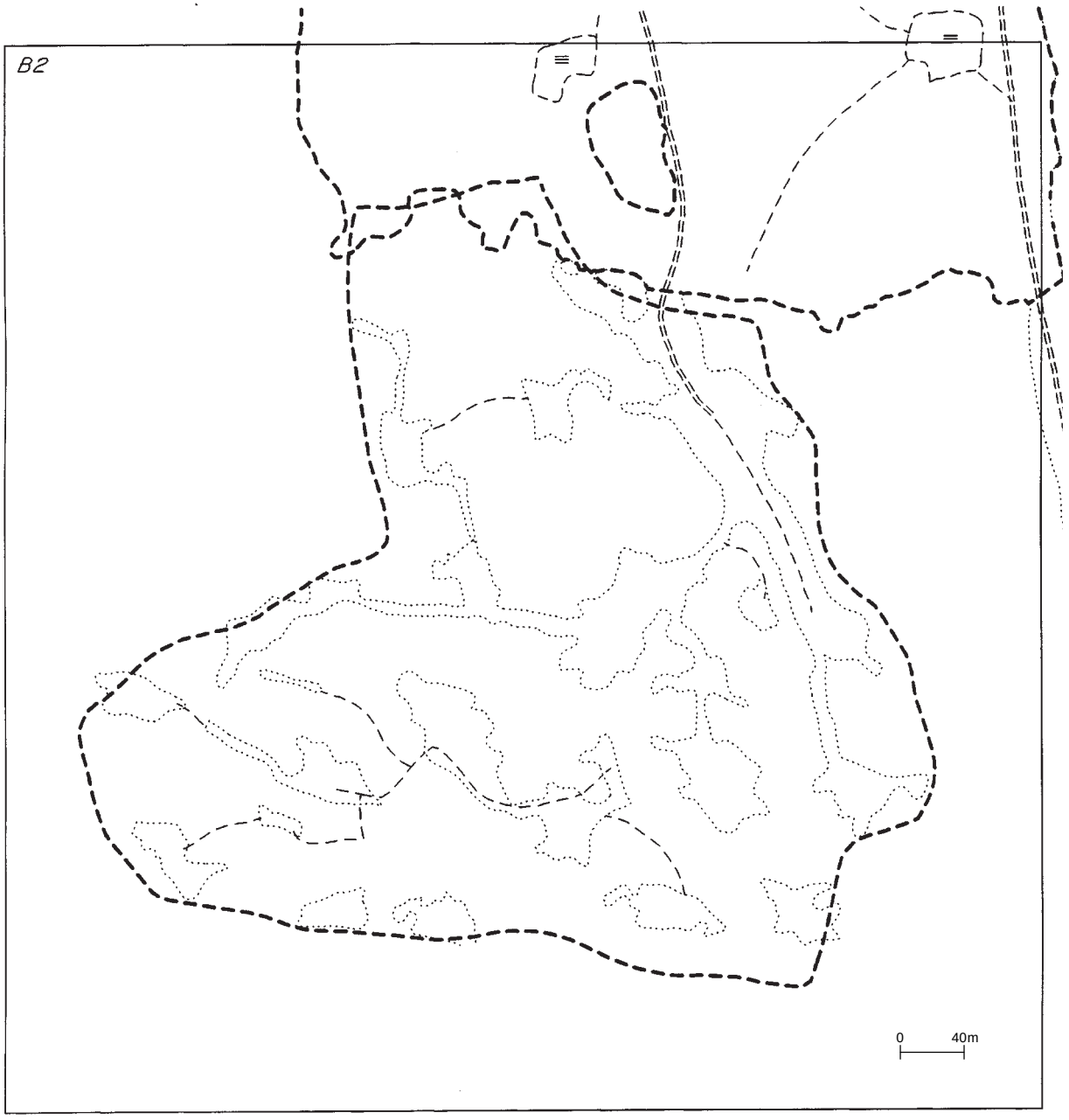


INDIVIDUAL TREATMENT UNIT MAP

- - - - - - - -	Treatment unit boundary
. . . . .	Openings
≡	Landings
= = = = = =	Roads
– – – – – –	Skid trails

FIGURE A2.12 *Map of treatment unit C1 (no harvest).*

FIGURE A2.13 *Map of treatment unit A3 (clearcut).*



INDIVIDUAL TREATMENT UNIT MAP

- - - - - - - - Treatment unit boundary
. . . . . Openings
≡ Landings
= = = = = = Roads
– – – – – – Skid trails

FIGURE A2.14 *Map of treatment unit B2 (heavy removal) with opening distribution.*

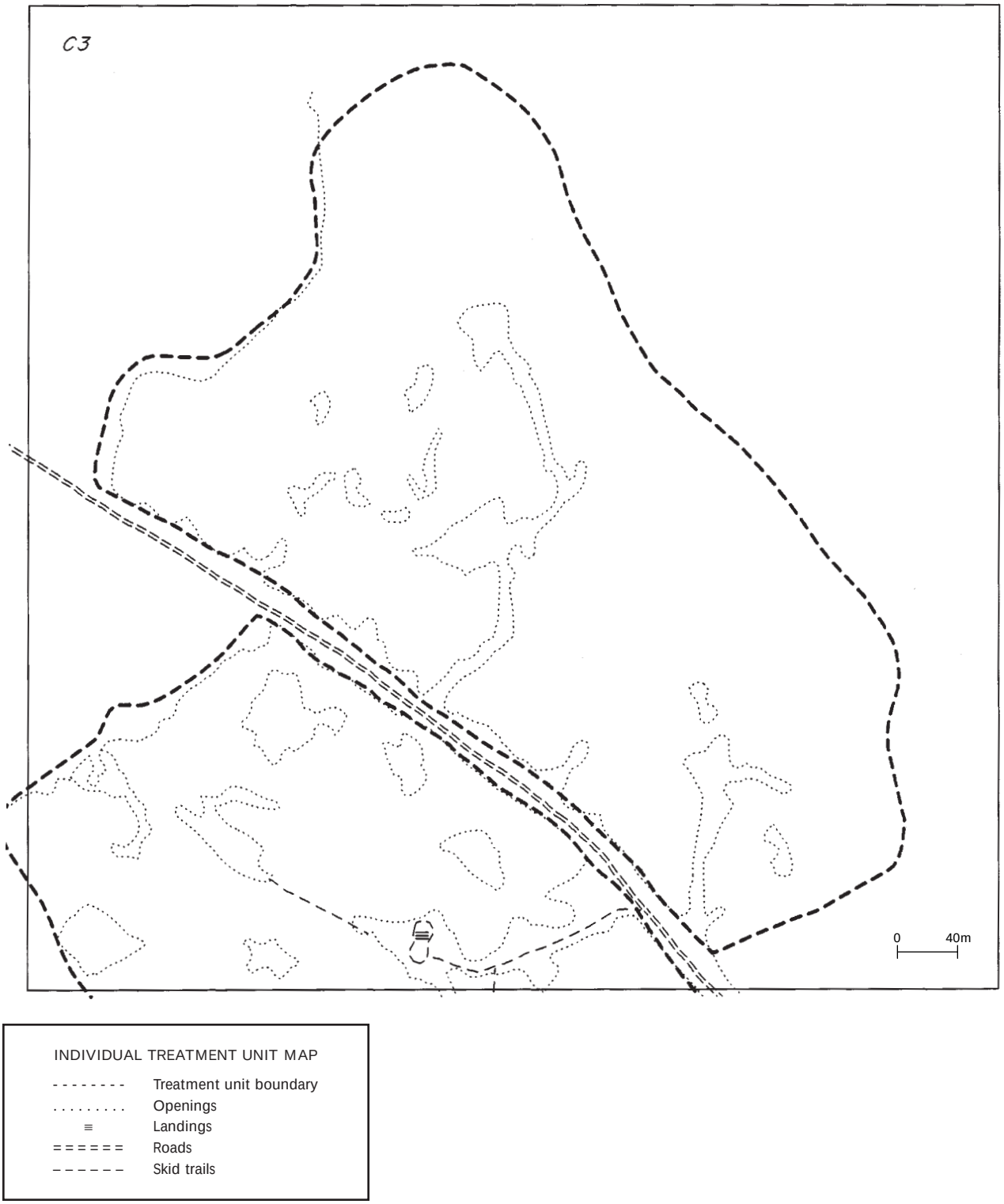


FIGURE A2.15 *Map of treatment unit C3 (light removal) with opening distribution.*

INDIVIDUAL TREATMENT UNIT MAP

- - - - - - - -	Treatment unit boundary
. . . . .	Openings
≡	Landings
= = = = = =	Roads
– – – – – –	Skid trails

FIGURE A2.16 *Map of treatment unit A4 (no harvest).*

For the purpose of ecosystem mapping of the Date Creek research area, the site series were grouped into "site units." Table A1 (below) lists the site units with their respective ICHmc2 site series.

TABLE A3.1 Summary of site units with corresponding site series

Map symbol	Site unit name	Site series[a] (ICHmc2)
HM	Hemlock–Moss	01(a)
HM(1)[b]	Hemlock–Moss; mixed wood seral association	52
SM	Submesic Moss	01(b); 51
OF	Oak fern	03
DC	Devil's club	04, 05, 54
CF	Cottonwood Floodplain	06
SL	Skunk cabbage–Lady fern	07
HW	Herb Wetland	31, 32
SW	Shrub Wetland	31, 32
FW	Forested Wetland	08

[a] Site series as described in Banner et al. (1993). Site series 02 (HwPl–kinnikinnick–Cladonia) and 53 ($AtEp–dogwood) are uncommon in the study area. There were no sites sampled within the Cottonwood Floodplain ecosystem (site series 06).
[b] HM(1) refers to a seral asssociation of the Hemlock–moss site unit.

For each site unit a summary of the vegetation and environment/soils data is presented. These summaries are derived from the 156 reconnaissance plots done throughout the study area. Dominant plant species are not in parentheses (occur with 75% or greater frequency, and a mean cover of 5% or greater), while those in parentheses occur infrequently or often with varying cover values. Species are listed in decreasing importance and Latin names are in brackets.

Some ecosystem units are divided into successional stages (refer to Table 6 of main report) and are indicated as such (e.g., HM6 refers to the mature forest successional stage). Tree layer data were recorded for three subdivisions: A1—dominant trees, A2—main canopy, A3—secondary canopy or suppressed trees. The mean cover for the entire tree layer is provided.

Within the environment and soils section of the reconnaissance plot summary, the characteristic parameters (soil development, etc.) are listed in decreasing order of dominance. Some parameters are listed as a range of conditions (e.g., soil texture).

Note that we have not provided separate site unit descriptions for the ICHmc1a portion of the research area. HM, OF, and DC site units occurring in the ICHmc1a are similar to those of the ICHmc2 except that western redcedar is lacking and amabilis fir is more abundant, both in the tree layer and as regeneration.

ICHmc2 HM4–5 Hemlock–Moss site unit, pole-sapling and young forest (11 plots)

Vegetation

Trees: continuous cover with very low diversity (mean cover 80%).
- A1 (western hemlock [*Tsuga heterophylla*])
- A2 western hemlock (subalpine fir [*Abies lasiocarpa*])
- A3 western hemlock (western redcedar [*Thuja plicata*])

Shrubs: virtually non-existent.
(western hemlock)
(false azalea [*Menziesia ferruginea*])

Herbs: very scarce, sometimes lacking.
(bunchberry [*Cornus canadensis*])
(five-leaved bramble [*Rubus pedatus*])

Moss layer: usually well developed with high cover value.
Hylocomium splendens
Ptilium crista-castrensis
Pleurozium schreberi

Environment/Soils
Parent material: morainal blanket, morainal veneer
Soil development: Eluviated Dystric Brunisol, Orthic Humo-Ferric Podzol, Orthic Dystric Brunisol, Orthic Gray Luvisol
Humus form: Hemimor, Mormoder
Humus depth (cm): 5–14
Coarse fragment (%): 5–75
Soil texture: loam to sandy clay loam

Moisture regime: mesic
Nutrient regime: medium

Slope (%): 0–75
Aspect (o): all

Comments: Pole-sapling stages are typically composed of dense "doghair" western hemlock that have developed with excessive overstocking after forest fires about 100 years ago. Trees are usually less than 15 m high and have small diameters.

ICHmc2 HM6 Hemlock–Moss site unit, mature forest (36 plots)

Vegetation
Trees: continuous unbroken cover (mean cover 74%).
A1 (western hemlock)
(hybrid white spruce [*Picea glauca x sitchensis x engelmannii*])
(subalpine fir)
A2 western hemlock
(western redcedar)
(paper birch [*Betula papyrifera*])
(subalpine fir)
A3 western hemlock
(western redcedar)

Shrubs: very sparse, primarily regenerating conifers.
western hemlock
(western redcedar)
(false azalea)

Herbs: very sparse, cover values often less than 3%.
(bunchberry)
(one-sided wintergreen [*Orthilia secunda*])
(green wintergreen [*Pyrola chlorantha*])
(round-leaved rein-orchid [*Platanthera orbiculata*])

Moss layer: continuous and well developed.
Hylocomium splendens
Ptilium crista-castrensis
Pleurozium schreberi
(*Rhytidiadelphus triquetrus*)

Environment/soils
Parent material: morainal blanket
Soil development: Eluviated Dystric Brunisol, Orthic Dystric Brunisol, Orthic Humo-Ferric Podzol, Orthic Gray Luvisol, Brunisolic Gray Luvisol
Humus form: Hemimor, Mormoder
Humus depth (cm): 4–14
Coarse fragments (%): 15–80
Soil texture: loamy sand to clay loam

Moisture regime: mesic (submesic to subhygric)
Nutrient regime: medium

Slope (%): 0–40
Aspect (o): all

Comments: Well-developed, productive forests with poorly developed shrub and herb layers. This is the most common site unit and successional stage in the study area.

ICHmc2 HM7 Hemlock–moss unit, old growth (12 plots)

Vegetation
Trees: well developed and homogenous, but sometimes patchy with stand openings (mean cover 60%).
A1 western hemlock
A2 western hemlock
(western redcedar
(amabilis fir [*Abies amabilis*])
A3 western hemlock

Shrubs: discontinuous and patchy, sometimes well developed in stand openings.
western hemlock
(oval-leaved blueberry [*Vaccinium ovalifolium*])
(false azalea)
(amabilis fir)
(western redcedar)

Herbs: patchy and sparse.
bunchberry
five-leaved bramble
(oak fern [*Gymnocarpium dryopteris*])
(one-sided wintergreen)
(twinflower [*Linnaea borealis*])

Moss layer: well developed and continuous.
Hylocomium splendens
Ptilium crista-castrensis
Pleurozium schreberi

Environment/Soils
Parent material: morainal blanket, fluvial fan, glaciofluvial and colluvial veneer over morainal blanket
Soil development: Orthic Dystric Brunisol, Orthic Humo-Ferric Podzol, Eluviated Dystric Brunisol, Orthic Gray Luvisol
Humus form: Hemimor, Mormoder, Humimor
Humus depth (cm): 3–28
Coarse fragments (%): 5–70
Soil texture: sandy loam to clay loam

Moisture regime: mesic (subhygric)
Nutrient regime: medium (rich)

Slope (%): 5–45
Aspect (o): all

Comments: This unit is predominant on the slopes of the Kispiox Range. Stands are often in excess of 200 years old; structurally and floristically more diverse than successional stages 4–6.

ICHmc2 Submesic moss site unit (6 plots)

Vegetation
Trees: well developed and continuous (mean cover 63%).
A1 (western hemlock)
(lodgepole pine [*Pinus contorta* var *latifolia*])
A2 western hemlock
(western redcedar)
A3 western hemlock

Shrubs: patchy and sometimes nearly lacking.
western hemlock
(black huckleberry [*Vaccinium membranaceum*])

Herbs: very sparse and poorly developed.
(prince's pine [*Chimaphila umbellata*])
(bunchberry)
(one-sided wintergreen)

Moss layer: well developed and continuous.
Hylocomium splendens
Pleurozium schreberi
(Ptilium crista-castrensis)

Environment/soils
Parent material: glaciofluvial terrace, glaciofluvial ridge, pebbly morainal blanket
Soil development: Eluviated Dystric Brunisol, Orthic Dystric Brunisol
Humus form: Hemimor
Humus depth (cm): 4–17
Coarse fragments (%): 80–90
Soil texture: sand to silt loam

Moisture regime: submesic (mesic)
Nutrient regime: poor

Slope (%): 0–45
Aspect (o): all

Comments: This unit always occurs as a minor component within an HM matrix, and is virtually indistinguishable from the HM unit except on the basis of parent material texture.

ICHmc2 HM(1) Hemlock–moss site unit; mixed wood seral association (11 plots)

Vegetation

Trees: patchy, discontinuous, diverse, often with large stand openings (mean cover 40%).
- A1 black cottonwood [*Populus balsamifera* ssp. *trichocarpa*]
  (hybrid white spruce)
- A2 paper birch
  (hybrid white spruce)
  (western redcedar)
  (subalpine fir)
- A3 (western redcedar)
  (subalpine fir)

Shrubs: well developed, robust, and often patchy.
- thimbleberry [*Rubus parviflorus*]
- highbush-cranberry [*Viburnum edule*]
- (western redcedar)
- (subalpine fir)
- (prickly rose [*Rosa acicularis*])
- (black twinberry [*Lonicera involucrata*])
- (alder [*Alnus* spp.])
- (hybrid white spruce)
- (red-osier dogwood [*Cornus stolonifera*])

Herbs: patchy, diverse, and often vigorous.
- bunchberry
- trailing raspberry [*Rubus pubescens*]
- (wild sarsaparilla [*Aralia nudicaulis*])
- (palmate coltsfoot [*Petasites palmatus*])
- (sweet-scented bedstraw [*Galium triflorum*])
- (oak fern)
- (queen's cup [*Clintonia uniflora*])
- (pink wintergreen [*Pyrola asarifolia*])
- (twinflower)
- (false Solomon's-seal [*Smilacina racemosa*])
- (purple peavine [*Lathyrus nevadensis*])

Moss layer: patchy and poorly developed.
- *Rhytidiadelphus triquetrus*
- *Mnium* spp.
- (*Ptilium crista-castrenis*)

Environment/Soils

Parent material: morainal blanket, glaciofluvial blanket
Soil development: Brunisolic Gray Luvisol, Orthic Dystric Brunisol
Humus form: Mormoder, Hemimor, Velomoder, Leptomoder
Humus depth (cm): 5–14
Coarse fragments (%): 10–80
Soil texture: loam to clay loam

Moisture regime: mesic to subhygric
Nutrient regime: medium to rich

Slope (%): 5–45
Aspect (o): all

Comments: The Hemlock–Moss (1) site unit occupies similar landscape positions to the Hemlock–Moss unit on rolling moraine, and yet appears to be slightly richer and moister. The soil texture is finer and Brunisolic Gray Luvisols rather than Dystric Brunisols are the dominant soils. On these sites there is no clear-cut successional movement to a climax state, rather a seral equilibrium.

ICHmc2 OF (Oak fern site unit)

Vegetation

Trees: moderately well developed with low diversity (mean cover 53%).
- A1 western hemlock
  (western redcedar)
- A2 western hemlock
  western redcedar
- A3 western hemlock
  (western redcedar)

Shrubs: patchy, with low diversity.
- devil's club [*Oplopanax horridus*]
- western hemlock
- (western redcedar)
- (amabilis fir)
- (false azalea)

Herbs: well developed, patchy to continuous, dominated by oak fern.

oak fern
bunchberry
five-leaved bramble
(one-sided wintergreen)
(queen's cup)
(clasping twistedstalk [*Streptopus amplexifolius*])
(spiny wood fern [*Dryopteris assimilis*])

Moss layer: well developed and continuous.
Hylocomium splendens
Pleurozium schreberi
Ptilium crista-castrensis
Rhytidiadelphus triquetrus

Environment/Soils
Parent materials: morainal blanket, fluvial fan, colluvial veneer over morainal blanket
Soil development: Gleyed Dystric Brunisol, Eluviated Dystric Brunisol, Orthic Regosol, Cumulic Regosol, Orthic Humo-Ferric Podzol, Orthic Gray Luvisol, Orthic Sombric Brunisol, Gleyed Brunisolic Gray Luvisol
Humus form: Mormoder, Hemimor, Leptomoder, Hemihumimor, Velomormoder, Velomor
Humus depth (cm): 2–26
Coarse fragments (%): 0–75
Soil texture: coarse sand to clay loam

Moisture regime: subhygric (mesic)
Nutrient regime: rich (medium)

Slope (%): 5–70
Aspect (o): 350–90

Comments: This unit occurs on a variety of soil developments, but primarily on fluvial fan material and fine-textured moraine. Although devil's club is always present it never achieves higher than 15% cover.

ICHmc2 DC Devil's club site unit (24 plots)

Vegetation
Trees: patchy, discontinuous, and usually very open (mean cover 34%).

A1 (hybrid white spruce)
(western redcedar)
(western hemlock)
A2 western hemlock
(western redcedar)
(hybrid white spruce)
(subalpine fir)
A3 (western hemlock)
(western redcedar)

Shrubs: patchy to continuous, robust, and always dominated by devil's club.
devil's club
western hemlock
(black gooseberry [*Ribes lacustre*])
(western redcedar)
(highbush-cranberry)
(thimbleberry)
(red-osier dogwood)

Herbs: vigorous, patchy to continuous.
oak fern
three-leaved foamflower [*Tiarella trifoliata*]
bunchberry
lady fern [*Athyrium filix-femina*]
(spiny wood fern)
(enchanter's nightshade [*Circaea alpina*])
(five-leaved bramble)
(clasping twistedstalk)

Moss layer: discontinuous and vigorous.
Hylocomium splendens
Mnium spp.
Rhytidiadelphus triquetrus
(*Ptilium crista-castrensis*)
(*Pleurozium schreberi*)

Environment/Soils
Parent material: morainal blanket, lacustrine blanket, gullied morainal blanket, fluvial fan, fluvial plain
Soil development: Orthic Regosol, Orthic Gleysol, Orthic Humic Gleysol, Gleyed Gray Luvisol, Gleyed Dystric Brunisol, Rego Gleysol, Gleyed Cumulic Regosol, Cumulic Regosol, Orthic Dystric Brunisol, Typic Humisol
Humus form: Mormoder, Leptomoder, Hydromoder, Velomoder, Hemimor

Humus depth (cm): 2–36
Coarse fragments (%): 0–80
Soil texture: loamy sand to clay

Moisture regime: subhygric to hygric
Nutrient regime: rich

Slope (%): 0–35
Aspect (o): variable

Comments: The Devil's club site unit occurs on a range of materials with varied soil development, although gleyed and regosolic soils are most common. Devil's club has a mean cover of 28%. The tree canopy is often minimal and some sites are shrub dominated.

ICHmc2 SL3 Skunk cabbage–Lady fern site unit, shrub dominated (9 plots)

Vegetation
Trees: lacking or occasional individuals (mean cover 4%).
A1, A2, A3 (hybrid white spruce)

Shrubs: robust, tall, diverse, and continuous.
mountain alder [*Alnus incana* ssp. *tenuifolia*]
devil's club
black twinberry
(red-osier dogwood)

Herbs: vigorous, tall with low diversity.
lady fern
enchanter's nightshade
oak fern
(skunk cabbage [*Lysichiton americanum*]
(three-leaved foamflower)
(violet [*Viola* sp.])

Moss layer: very low cover and diversity.
Mnium spp.

Environment/Soils
Parent material: gullied morainal blanket, glaciofluvial blanket, organic veneer over fluvial blanket, fluvial blanket, lacustrine blanket, organic blanket
Soil development: Rego Gleysol, Rego Humic Gleysol, Gleyed Cumulic Regosol, Terric Humisol, Typic Mesisol
Humus form: Leptomoder, Hydromoder, Velomoder, Hydromor, Hydromormoder, Histomoder
Humus depth (cm): 1–18
Coarse fragments (%): 0–80

Moisture regime: subhygric to subhydric
Nutrient regime: rich to very rich

Slope (%): 0
Aspect (o): not applicable

Comments: The Skunk cabbage–Lady fern site unit occurs distinctly as successional stage 3 (shrub dominated) and 6–7 (mature forest/old growth). The two forms exhibit significant differences in floristic diversity and cover values, although physical conditions do not differ.

ICHmc2 SL6–7 Skunk cabbage–Lady fern site unit, mature forest and old growth (11 plots)

Vegetation
Trees: discontinuous and very open (mean cover 28%).
A1 hybrid white spruce
A2 hybrid white spruce
western redcedar
(western hemlock)
(subalpine fir)
A3 (hybrid white spruce)
(western hemlock)

Shrubs: patchy and discontinuous, but robust.
western hemlock
western redcedar
(mountain alder)
(false azalea)
(subalpine fir)
(devil's club)
(highbush-cranberry)

Herbs: diverse, vigorous, and continuous.
skunk cabbage
horsetail [*Equisetum* spp.]
oak fern
lady fern
bunchberry

(trailing raspberry)
(soft-leaved sedge [*Carex disperma*])
(three-leaved foamflower)
(sweet-scented bedstraw)
(violet)
(common mitrewort [*Mitella nuda*])
(enchanter's nightshade)

Moss layer: patchy and discontinuous.
Mnium spp.
Hylocomium splendens
Rhytidiadelphus triquetrus

Environment/Soils
Parent material: organic blanket, lacustrine blanket, fluvial blanket, organic veneer over glaciofluvial blanket
Soil development: Rego Gleysol, Typic Humisol, Rego Humic Gleysol, Typic Mesisol, Terric Humisol
Humus form: Hydromoder, Saprimull, Histomoder, Hydromull
Humus depth (cm): 1–36
Coarse fragments (%): 0–2
Soil texture: loamy sand to heavy clay

Moisture regime: hygric to subhydric
Nutrient regime: rich to very rich

Slope (%): 0
Aspect (o): not applicable

Comments: The forested stage of the Skunk cabbage–Lady fern site unit consistently has higher cover values for skunk cabbage and horsetail than the shrub stage. A number of species such as false azalea and bunchberry grow on raised organic mounds in this unit.

ICHmc2 FW Forested Wetland site unit (7 plots)

Vegetation
Trees: open with reduced growth form (mean cover 16%).
A1 black spruce [*Picea mariana*]
A2 (black spruce)
(paper birch)
A3 (black spruce)

Shrubs: patchy and sparse, and low in stature.
Labrador tea [*Ledum groenlandicum*]
(hardhack [*Spiraea douglasii*])
(scrub birch [*Betula glandulosa*])
(mountain alder)

Herbs: continuous, with relatively low diversity.
sedge [*Carex* spp.]
(horsetail)
(marsh cinquefoil [*Potentilla palustris*])
(bog cranberry [*Vaccinium oxycoccos*])
(skunk cabbage)
(buckbean [*Menyanthes trifoliata*])
(twinflower [*Linnaea borealis*])
(dwarf nagoonberry)

Moss layer: thick, spongy peat moss.
Sphagnum spp.
(Pleurozium schreberi)
(Aulacomnium palustre)

Environment/Soils
Parent material: organic blanket
Soil development: Typic Mesisol, Typic Humisol, Typic Fibrisol
Humus form: Histomoder, Saprimull, Histomor
Humus depth (cm): 2–14

Moisture regime: subhydric
Nutrient regime: very poor to poor

Slope (%): 0
Aspect (o): not applicable

Comments: This unit, which is mapped as a forested wetland, has low cover values for the tree layer, but is treed relative to other wetlands.

ICHmc2 SW Shrub Wetland site unit (7 plots)

Vegetation
Trees: scattered individuals or not present.

Shrubs: usually continuous, sometimes patchy.
hardhack [*Spiraea douglasii*]
mountain alder
(scrub birch)

(Labrador tea [*Ledum groenlandicum*])
(hybrid white spruce)

Herbs: continuous, homogenous, usually dominated by a few species.
sedge
skunk cabbage
(violet)
(bluejoint [*Calamagrostis canadensis*])
(cloudberry [*Rubus chamaemorus*])
(marsh cinquefoil])

Moss layer: diverse and highly variable.
(*Sphagnum* spp.)
(*Pleurozium schreberi*)
(*Calliergon* sp.)
(*Tomenthypnum nitens*)
(*Mnium* spp.)

Environment/Soils
Parent material: organic blanket, fluvial veneer over lacustrine, organic veneer over lacustrine materials
Soil development: Typic Humisol, Typic Fibrisol, Typic Mesisol, Terric Mesisol, Rego Gleysol
Humus form: Histomor, Saprimull, Hydromor, Hydromoder
Humus depth (cm): 2–36
Soil texture: clay (2 samples)

Moisture regime: subhygric to hydric
Nutrient regime: rich to very rich

Slope (%): 0
Aspect (o): not applicable

Comments: The Shrub Wetland unit is variable in species composition and can be dominated by mountain alder, hardhack, or scrub birch. These sites are often transitional to and adjacent to the Herb Wetland unit.

ICHmc2 HW Herb Wetland (9 plots)

Vegetation
Trees: lacking or occasional stunted individuals.
Shrubs: patchy and discontinuous, often on perimeter.
(Labrador tea) [*Ledum groenlandicum*])
(scrub birch)
(willow [*Salix* spp.])
(lodgepole pine)
(black spruce)

Herbs: diverse and continuous, sometimes with low cover values.
sedge
bog cranberry
narrow-leaved cotton-grass [*Eriophorum angustifolium*])
(buckbean)
(bog-laurel [*Kalmia microphylla*])
(round-leaved sundew [*Drosera rotundifolia*])
(white bog-orchid [*Platanthera dilatata*])
(bog-rosemary [*Andromeda polifolia*])

Moss layer: thick, continuous, peat moss.
Sphagnum spp.
(Tomenthypnum nitens)
(Calliergon sp.*)*

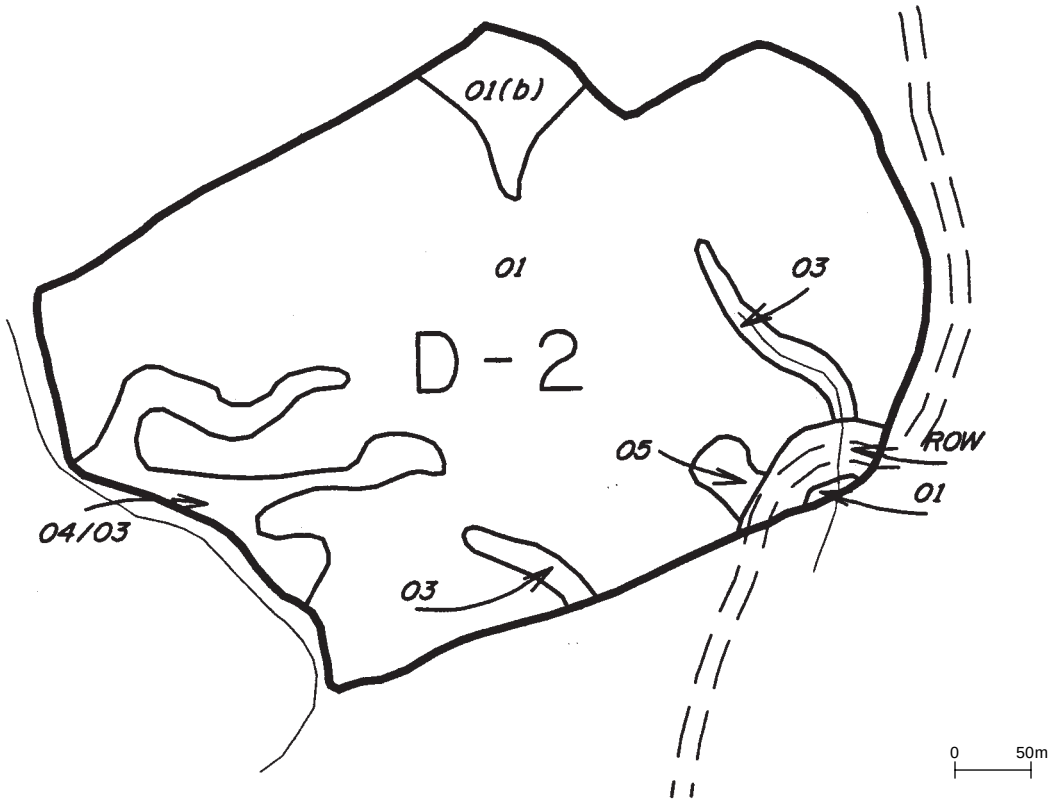
Environment/Soils
Parent material: organic blanket, organic veneer over morainal blanket
Soil development: Typic Mesisol, Typic Humisol, Mesic Humisol, Typic Fibrisol, Rego Gleysol
Humus form: Histomoder, Saprimull, Histomor, Hydromor
Humus depth (cm): 5–12
Coarse fragments (%): 30 (1 sample)
Soil texture: sandy clay loam

Moisture regime: subhydric to hydric
Nutrient regime: oligotrophic to eutrophic

Slope (%): 0
Aspect (o): not applicable

Comments: The Herb Wetland is relatively homogenous, and is often dominated by a few species, with a continuous cover of peat moss. Sedge species include *Carex diandra, C. disperma, C. interior, C. limosa, C. pauciflora,* and *C. sitchensis.*

The following maps present the site series distribution for each treatment unit (scale = 1:5000). Site series are described in Banner et al. (1993).

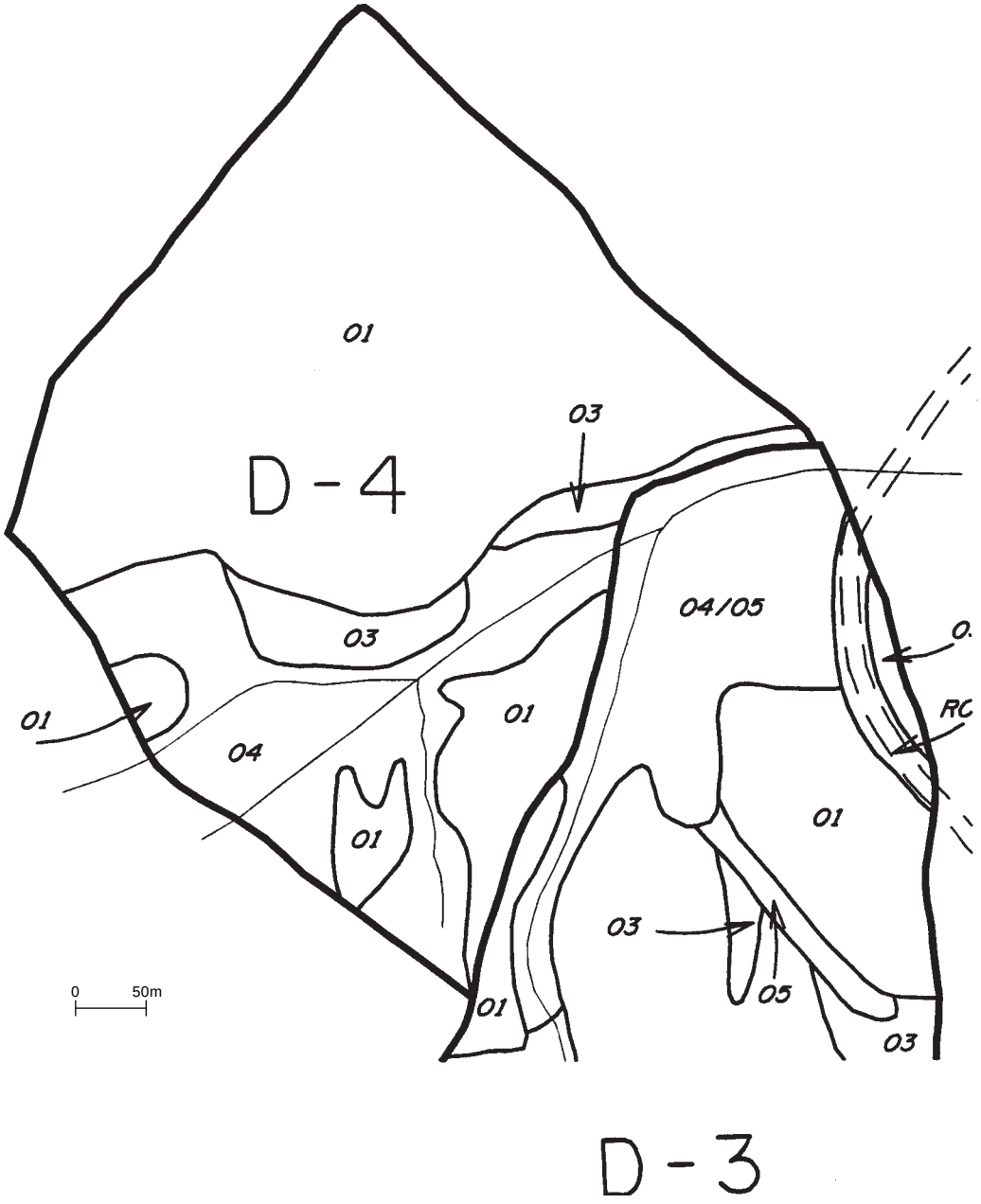


INDIVIDUAL TREATMENT UNIT MAP

MAP CODE	SITE SERIES[a]	MAP CODE	SITE SERIES
01	Hemlock–Step moss (mesic phase)	07	Cedar–Spruce–Horsetail–Skunk cabbage
01(b)	Hemlock–Step moss (submesic phase)	08	Black spruce–Hybrid spruce–Scrub birch–Sedge (forested swamp)
03	Hemlock–Cedar–Oak fern	OW	Open water
04	Cedar–Hemlock–Devil's club–Oak fern	ROW	Right-of-way
05	Spruce–Devil's club–Lady fern		

[a] Site series as described in Banner et al. 1993

FIGURE A4.1 *Map of treatment unit D2 with site series distribution.*

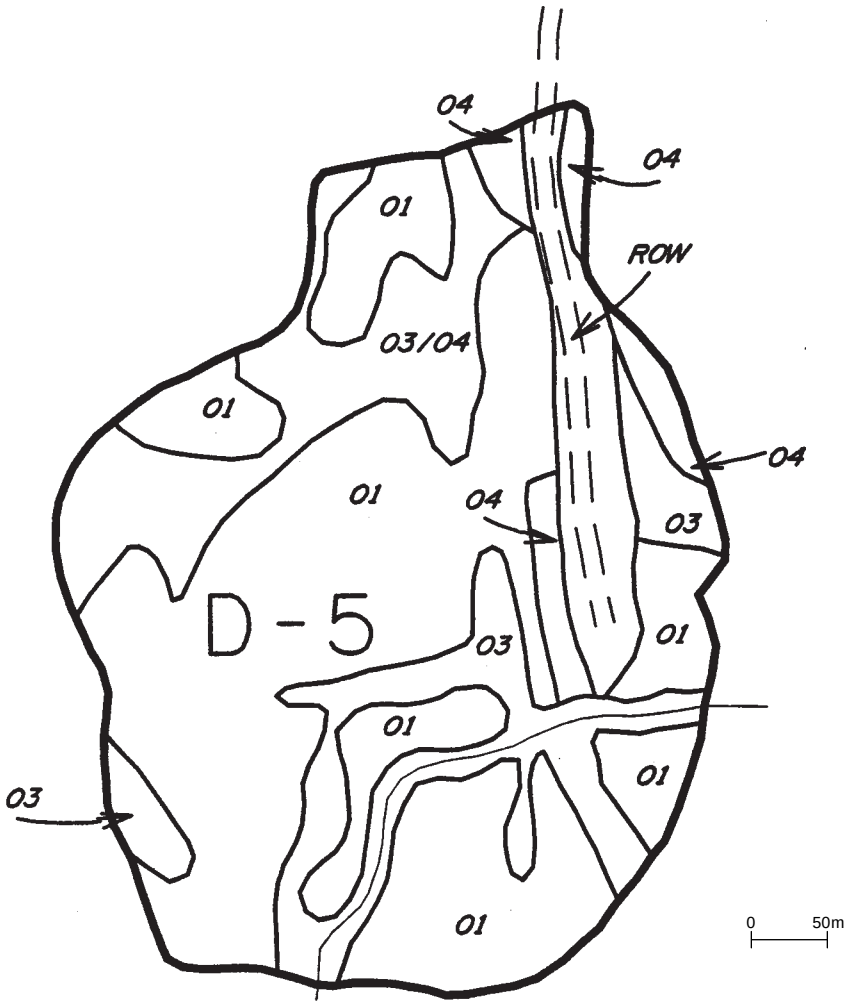


INDIVIDUAL TREATMENT UNIT MAP

MAP CODE	SITE SERIES[a]	MAP CODE	SITE SERIES
01	Hemlock–Step moss (mesic phase)	07	Cedar–Spruce–Horsetail–Skunk cabbage
01(b)	Hemlock–Step moss (submesic phase)	08	Black spruce–Hybrid spruce–Scrub birch–Sedge (forested swamp)
03	Hemlock–Cedar–Oak fern	OW	Open water
04	Cedar–Hemlock–Devil's club–Oak fern	ROW	Right-of-way
05	Spruce–Devil's club–Lady fern		

[a] Site series as described in Banner et al. 1993

FIGURE A4.2 *Map of treatment unit D4 with site series distribution.*

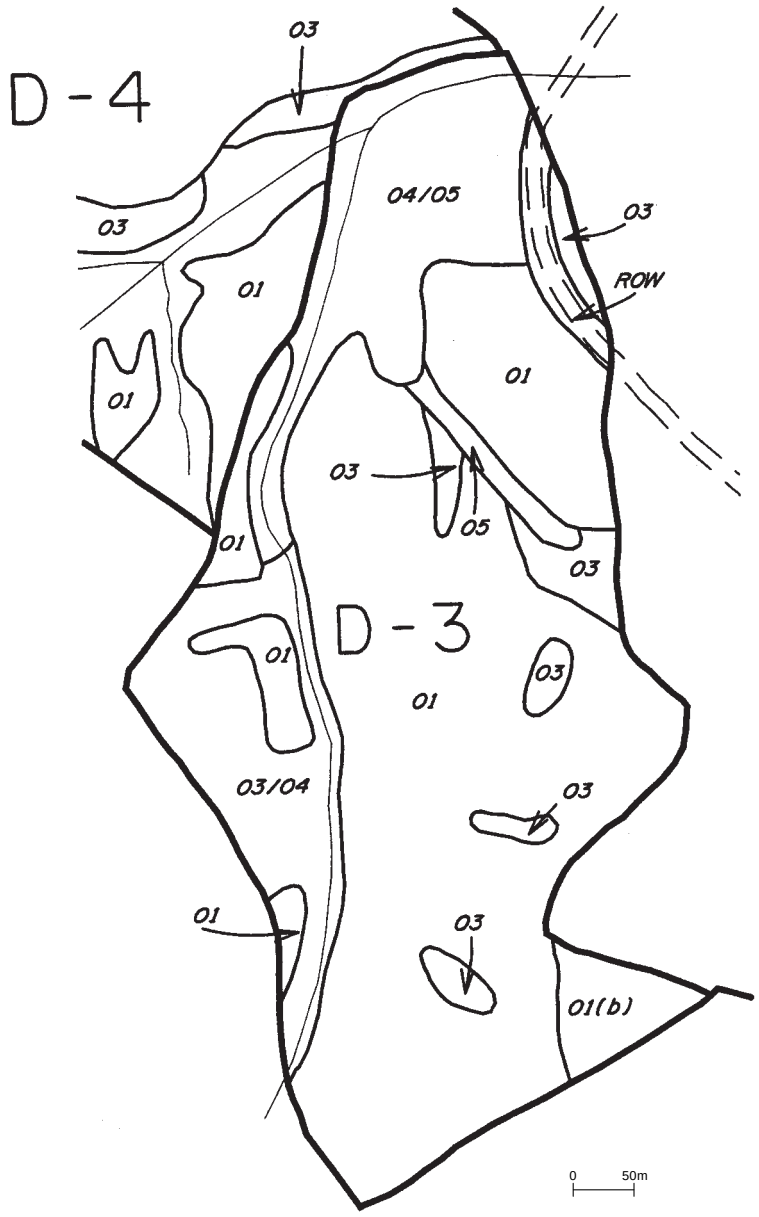


INDIVIDUAL TREATMENT UNIT MAP

MAP CODE	SITE SERIES[a]	MAP CODE	SITE SERIES
01	Hemlock–Step moss (mesic phase)	07	Cedar–Spruce–Horsetail–Skunk cabbage
01(b)	Hemlock–Step moss (submesic phase)	08	Black spruce–Hybrid spruce–Scrub birch–Sedge (forested swamp)
03	Hemlock–Cedar–Oak fern	OW	Open water
04	Cedar–Hemlock–Devil's club–Oak fern	ROW	Right-of-way
05	Spruce–Devil's club–Lady fern		

[a] Site series as described in Banner et al. 1993

FIGURE A4.3 *Map of treatment unit D5 with site series distribution.*

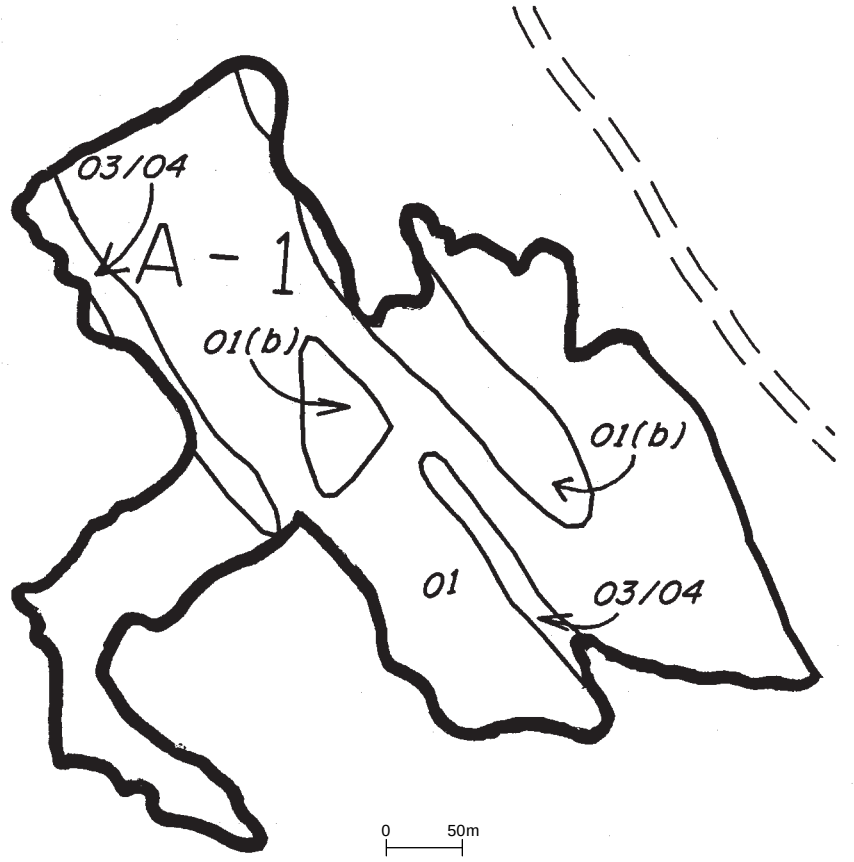


INDIVIDUAL TREATMENT UNIT MAP

MAP CODE	SITE SERIES[a]	MAP CODE	SITE SERIES
01	Hemlock–Step moss (mesic phase)	07	Cedar–Spruce–Horsetail–Skunk cabbage
01(b)	Hemlock–Step moss (submesic phase)	08	Black spruce–Hybrid spruce–Scrub birch–Sedge (forested swamp)
03	Hemlock–Cedar–Oak fern	OW	Open water
04	Cedar–Hemlock–Devil's club–Oak fern	ROW	Right-of-way
05	Spruce–Devil's club–Lady fern		

[a] Site series as described in Banner et al. 1993

FIGURE A4.4 *Map of treatment unit D3 with site series distribution.*

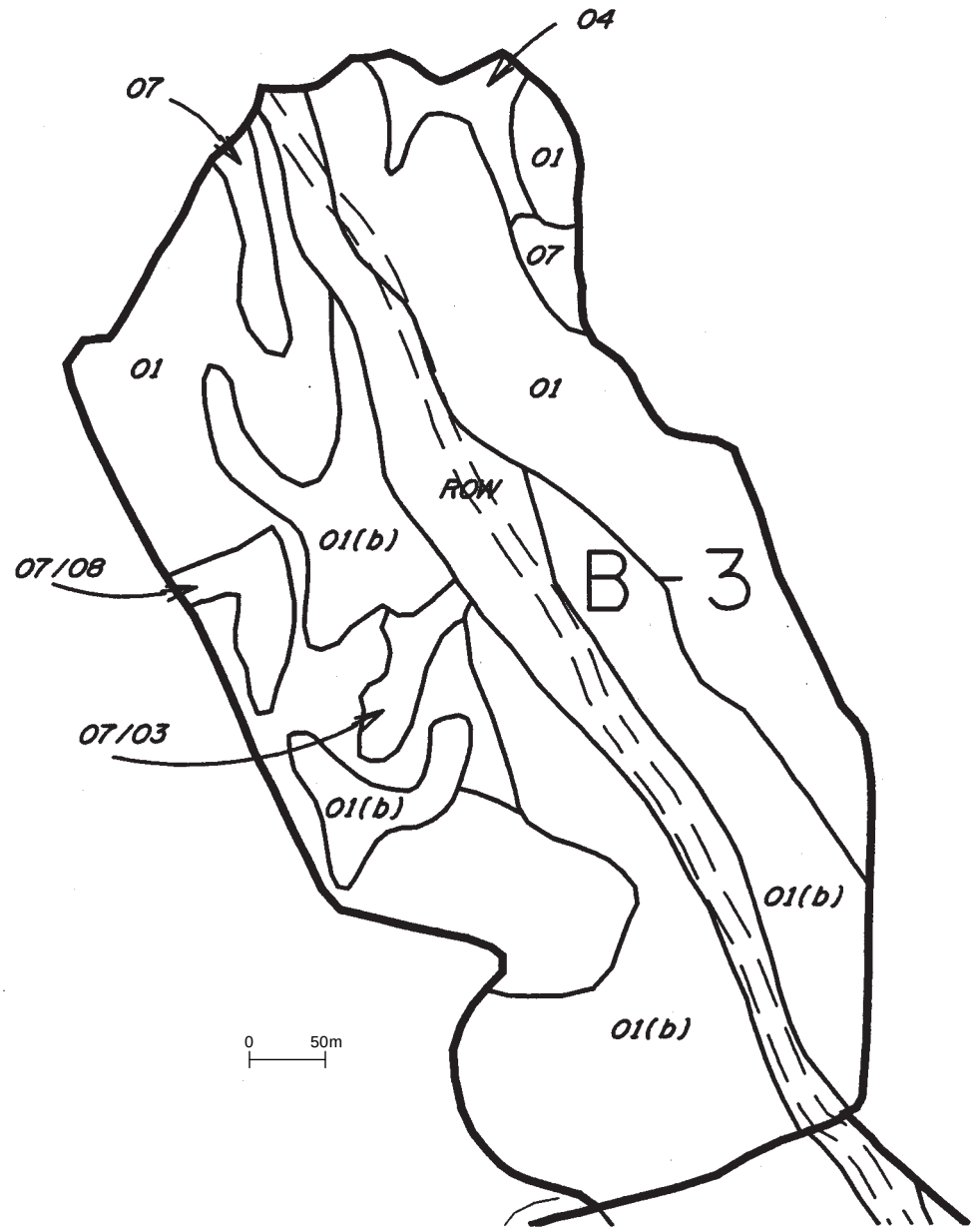


INDIVIDUAL TREATMENT UNIT MAP

MAP CODE	SITE SERIES[a]	MAP CODE	SITE SERIES
01	Hemlock–Step moss (mesic phase)	07	Cedar–Spruce–Horsetail–Skunk cabbage
01(b)	Hemlock–Step moss (submesic phase)	08	Black spruce–Hybrid spruce–Scrub birch–Sedge (forested swamp)
03	Hemlock–Cedar–Oak fern	OW	Open water
04	Cedar–Hemlock–Devil's club–Oak fern	ROW	Right-of-way
05	Spruce–Devil's club–Lady fern		

[a] Site series as described in Banner et al. 1993

FIGURE A4.5 *Map of treatment unit A1 with site series distribution.*

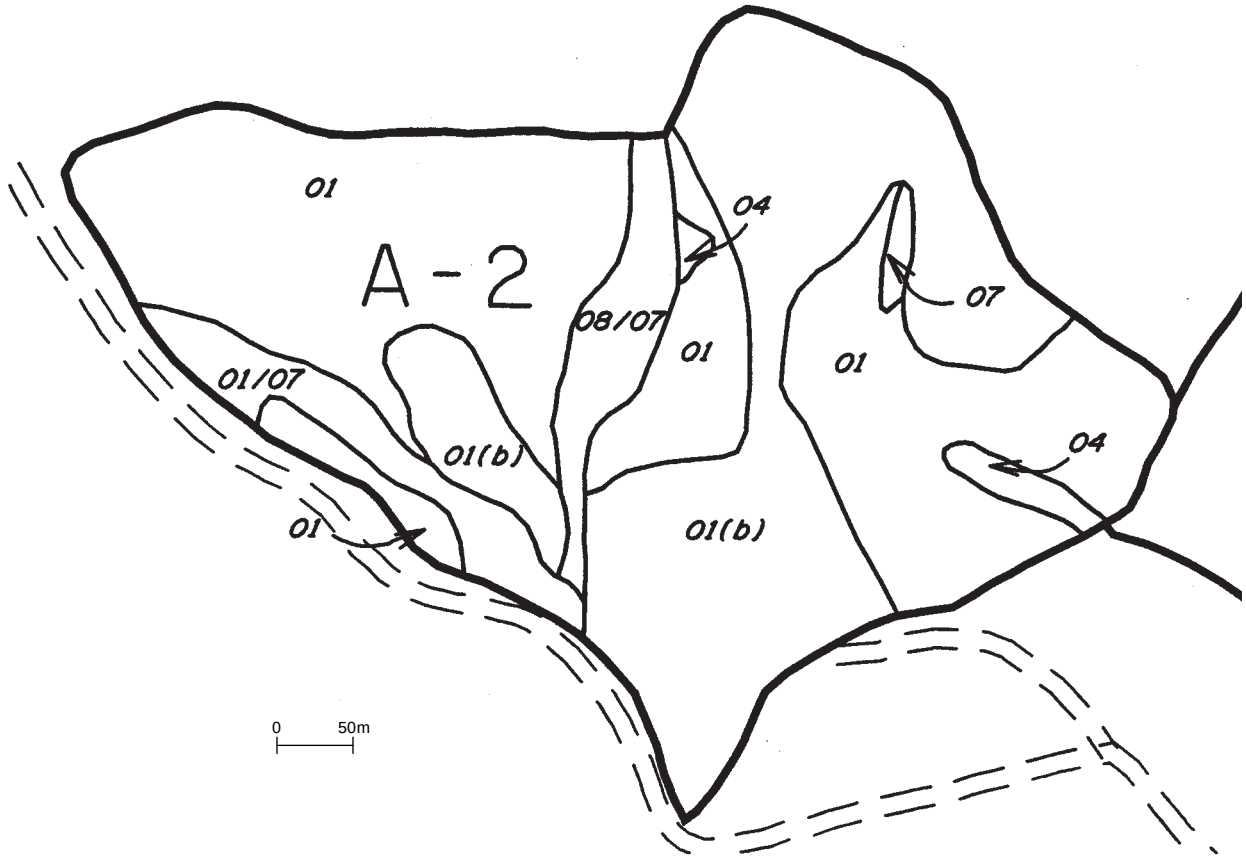


INDIVIDUAL TREATMENT UNIT MAP

MAP CODE	SITE SERIES[a]	MAP CODE	SITE SERIES
01	Hemlock–Step moss (mesic phase)	07	Cedar–Spruce–Horsetail–Skunk cabbage
01(b)	Hemlock–Step moss (submesic phase)	08	Black spruce–Hybrid spruce–Scrub birch–Sedge (forested swamp)
03	Hemlock–Cedar–Oak fern	OW	Open water
04	Cedar–Hemlock–Devil's club–Oak fern	ROW	Right-of-way
05	Spruce–Devil's club–Lady fern		

[a] Site series as described in Banner et al. 1993

FIGURE A4.6 *Map of treatment unit B3 with site series distribution.*

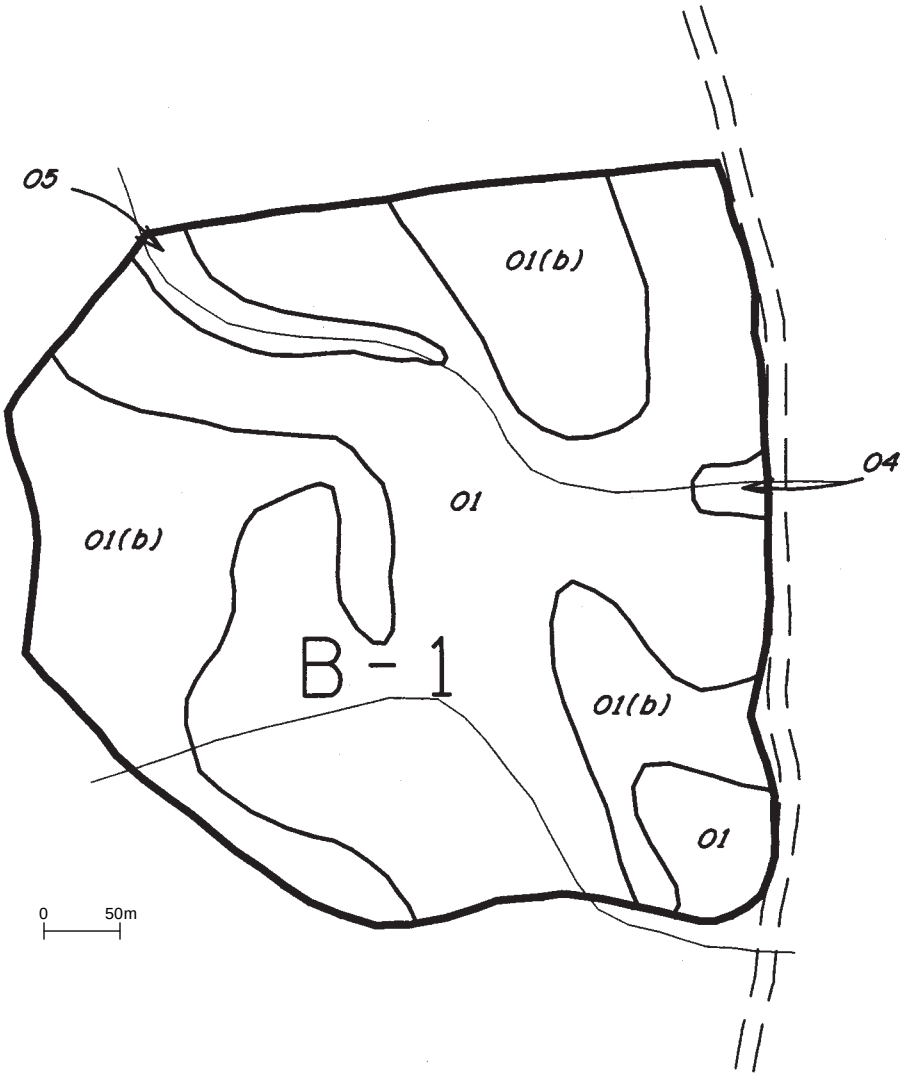


INDIVIDUAL TREATMENT UNIT MAP

MAP CODE	SITE SERIES[a]	MAP CODE	SITE SERIES
01	Hemlock–Step moss (mesic phase)	07	Cedar–Spruce–Horsetail–Skunk cabbage
01(b)	Hemlock–Step moss (submesic phase)	08	Black spruce–Hybrid spruce–Scrub birch–Sedge (forested swamp)
03	Hemlock–Cedar–Oak fern	OW	Open water
04	Cedar–Hemlock–Devil's club–Oak fern	ROW	Right-of-way
05	Spruce–Devil's club–Lady fern		

[a] Site series as described in Banner et al. 1993

FIGURE A4.7 *Map of treatment unit A2 with site series distribution.*

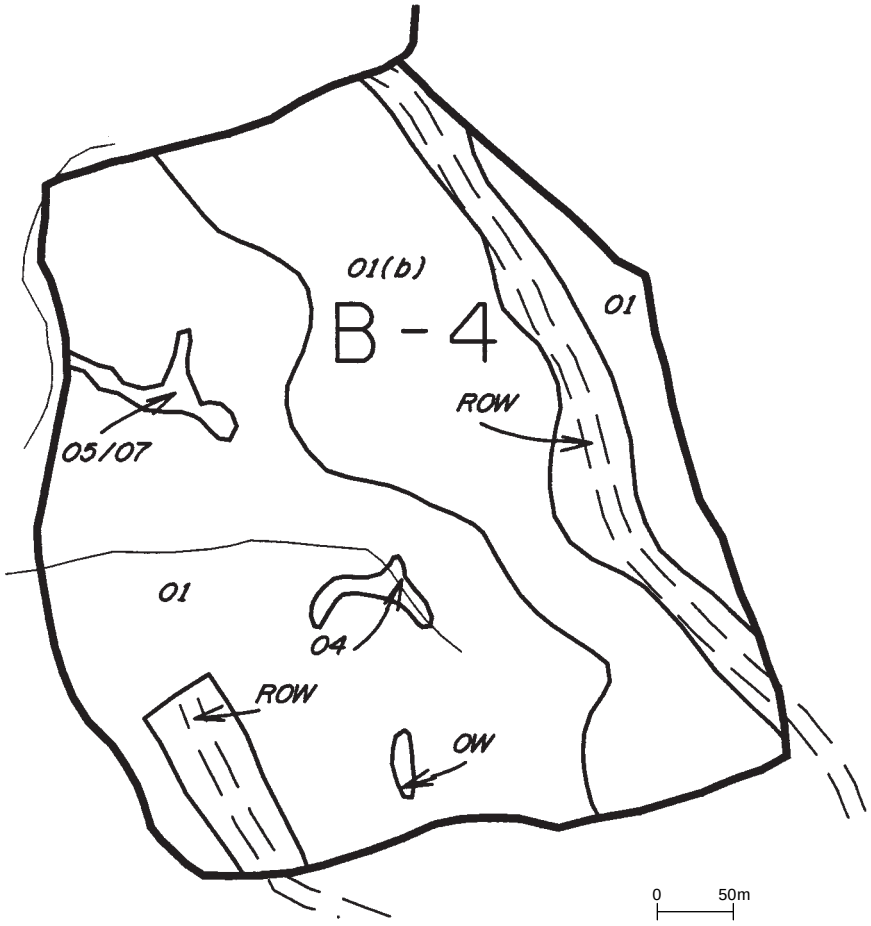


INDIVIDUAL TREATMENT UNIT MAP

MAP CODE	SITE SERIES[a]	MAP CODE	SITE SERIES
01	Hemlock–Step moss (mesic phase)	07	Cedar–Spruce–Horsetail–Skunk cabbage
01(b)	Hemlock–Step moss (submesic phase)	08	Black spruce–Hybrid spruce–Scrub birch–Sedge (forested swamp)
03	Hemlock–Cedar–Oak fern	OW	Open water
04	Cedar–Hemlock–Devil's club–Oak fern	ROW	Right-of-way
05	Spruce–Devil's club–Lady fern		

[a] Site series as described in Banner et al. 1993

FIGURE A4.8 *Map of treatment unit B1 with site series distribution.*

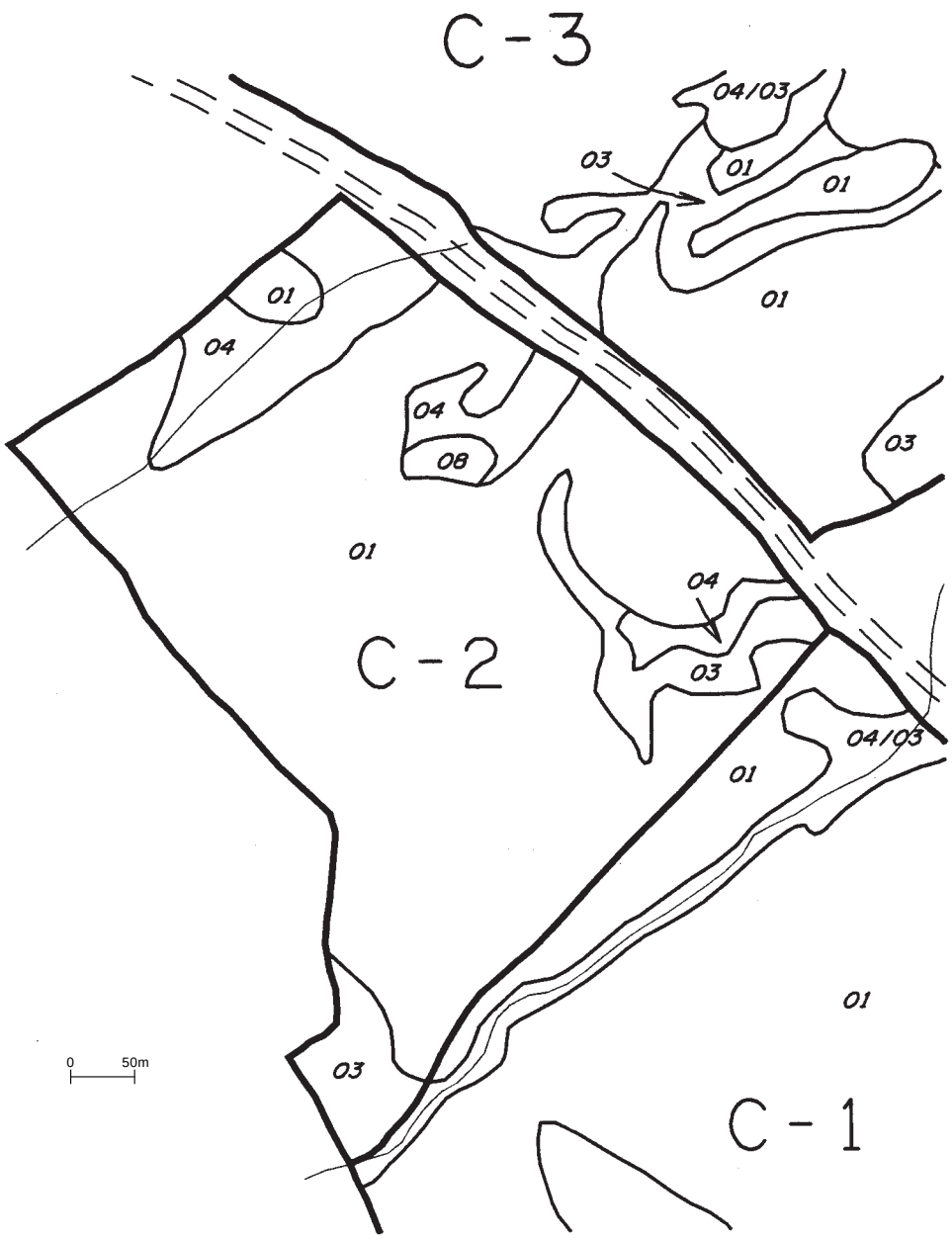


INDIVIDUAL TREATMENT UNIT MAP

MAP CODE	SITE SERIES[a]	MAP CODE	SITE SERIES
01	Hemlock–Step moss (mesic phase)	07	Cedar–Spruce–Horsetail–Skunk cabbage
01(b)	Hemlock–Step moss (submesic phase)	08	Black spruce–Hybrid spruce–Scrub birch–Sedge (forested swamp)
03	Hemlock–Cedar–Oak fern	OW	Open water
04	Cedar–Hemlock–Devil's club–Oak fern	ROW	Right-of-way
05	Spruce–Devil's club–Lady fern		

[a] Site series as described in Banner et al. 1993

FIGURE A4.9 *Map of treatment unit B4 with site series distribution.*

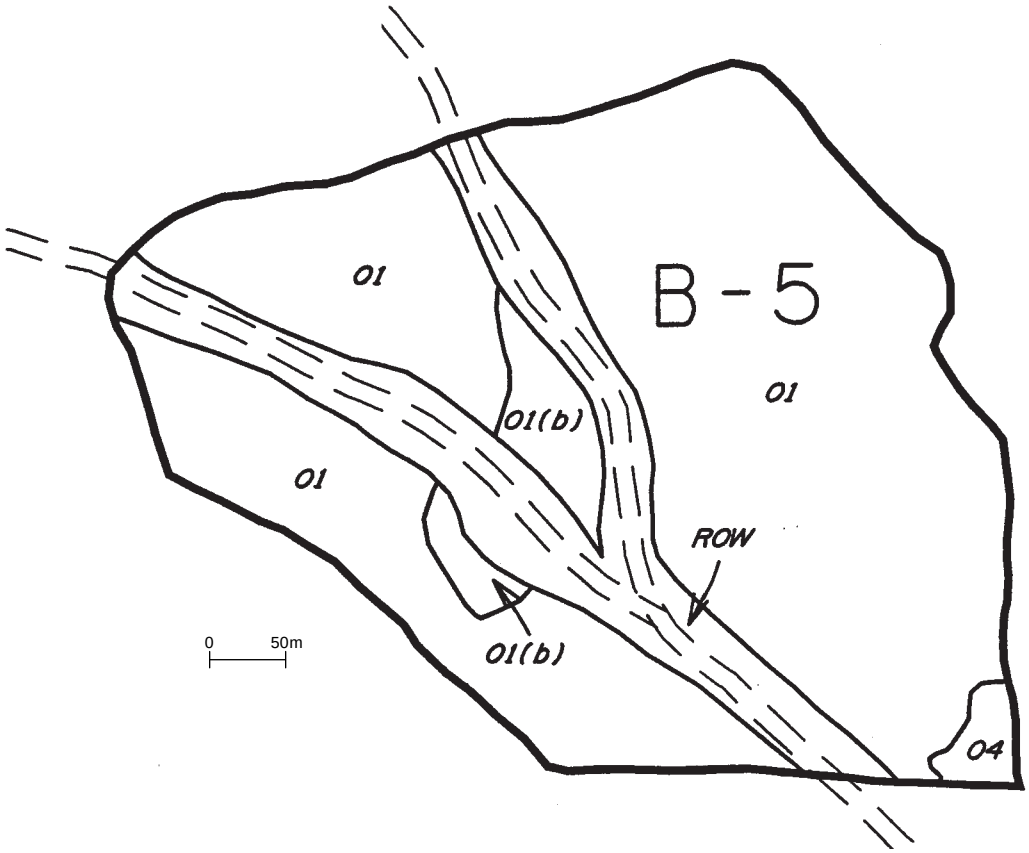


INDIVIDUAL TREATMENT UNIT MAP

MAP CODE	SITE SERIES[a]	MAP CODE	SITE SERIES
01	Hemlock–Step moss (mesic phase)	07	Cedar–Spruce–Horsetail–Skunk cabbage
01(b)	Hemlock–Step moss (submesic phase)	08	Black spruce–Hybrid spruce–Scrub birch–Sedge (forested swamp)
03	Hemlock–Cedar–Oak fern	OW	Open water
04	Cedar–Hemlock–Devil's club–Oak fern	ROW	Right-of-way
05	Spruce–Devil's club–Lady fern		

[a] Site series as described in Banner et al. 1993

FIGURE A4.10 *Map of treatment unit C2 with site series distribution.*

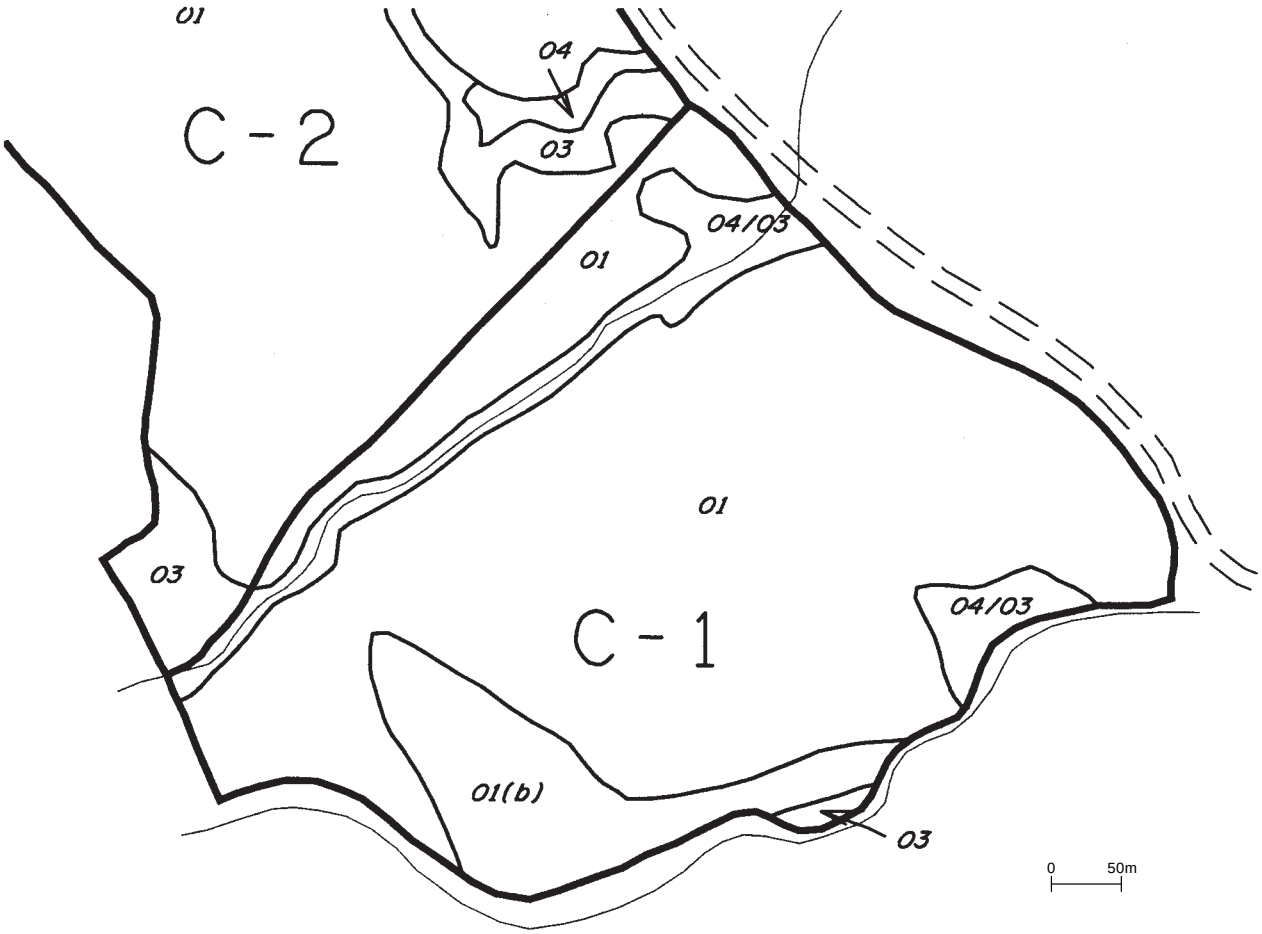


INDIVIDUAL TREATMENT UNIT MAP

MAP CODE	SITE SERIES[a]	MAP CODE	SITE SERIES
01	Hemlock–Step moss (mesic phase)	07	Cedar–Spruce–Horsetail–Skunk cabbage
01(b)	Hemlock–Step moss (submesic phase)	08	Black spruce–Hybrid spruce–Scrub birch–Sedge (forested swamp)
03	Hemlock–Cedar–Oak fern	OW	Open water
04	Cedar–Hemlock–Devil's club–Oak fern	ROW	Right-of-way
05	Spruce–Devil's club–Lady fern		

[a] Site series as described in Banner et al. 1993

FIGURE A4.11 *Map of treatment unit B5 with site series distribution.*

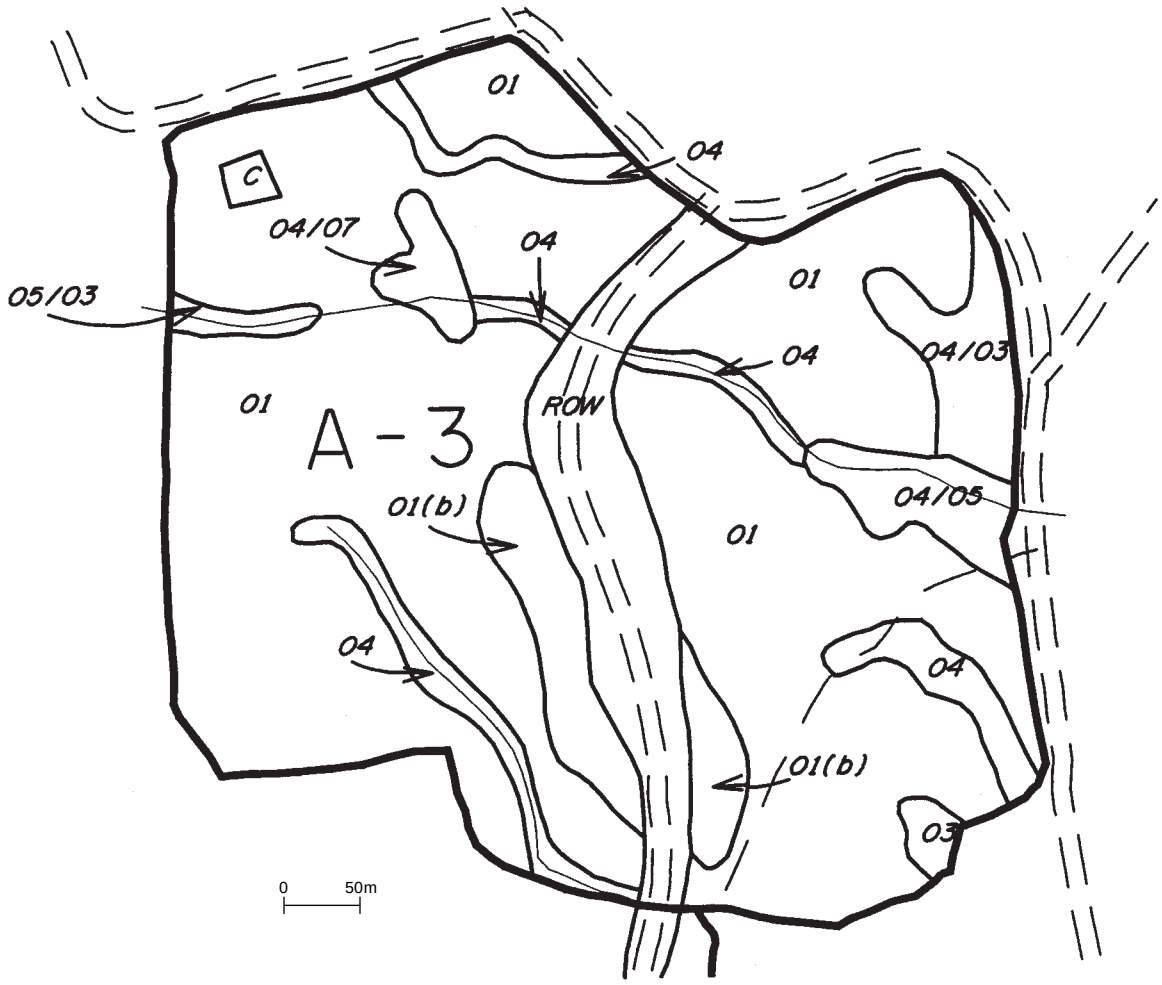


INDIVIDUAL TREATMENT UNIT MAP

MAP CODE	SITE SERIES[a]	MAP CODE	SITE SERIES
01	Hemlock–Step moss (mesic phase)	07	Cedar–Spruce–Horsetail–Skunk cabbage
01(b)	Hemlock–Step moss (submesic phase)	08	Black spruce–Hybrid spruce–Scrub birch–Sedge (forested swamp)
03	Hemlock–Cedar–Oak fern	OW	Open water
04	Cedar–Hemlock–Devil's club–Oak fern	ROW	Right-of-way
05	Spruce–Devil's club–Lady fern		

[a] Site series as described in Banner et al. 1993

FIGURE A4.12 *Map of treatment unit C1 with site series distribution.*

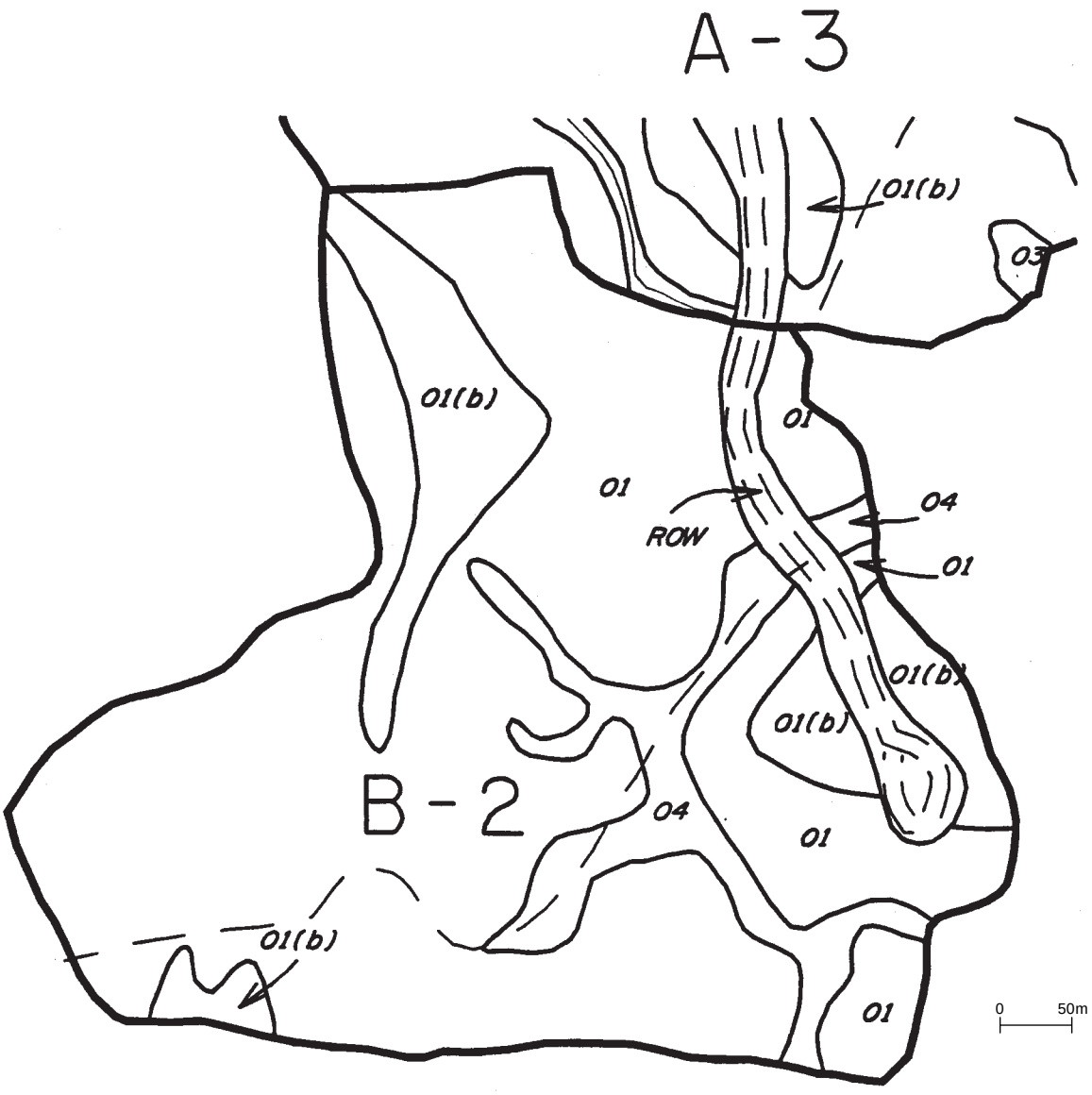


INDIVIDUAL TREATMENT UNIT MAP

MAP CODE	SITE SERIES[a]	MAP CODE	SITE SERIES
01	Hemlock–Step moss (mesic phase)	07	Cedar–Spruce–Horsetail–Skunk cabbage
01(b)	Hemlock–Step moss (submesic phase)	08	Black spruce–Hybrid spruce–Scrub birch–Sedge (forested swamp)
03	Hemlock–Cedar–Oak fern	OW	Open water
04	Cedar–Hemlock–Devil's club–Oak fern	ROW	Right-of-way
05	Spruce–Devil's club–Lady fern		

[a] Site series as described in Banner et al. 1993

FIGURE A4.13 *Map of treatment unit A3 with site series distribution.*

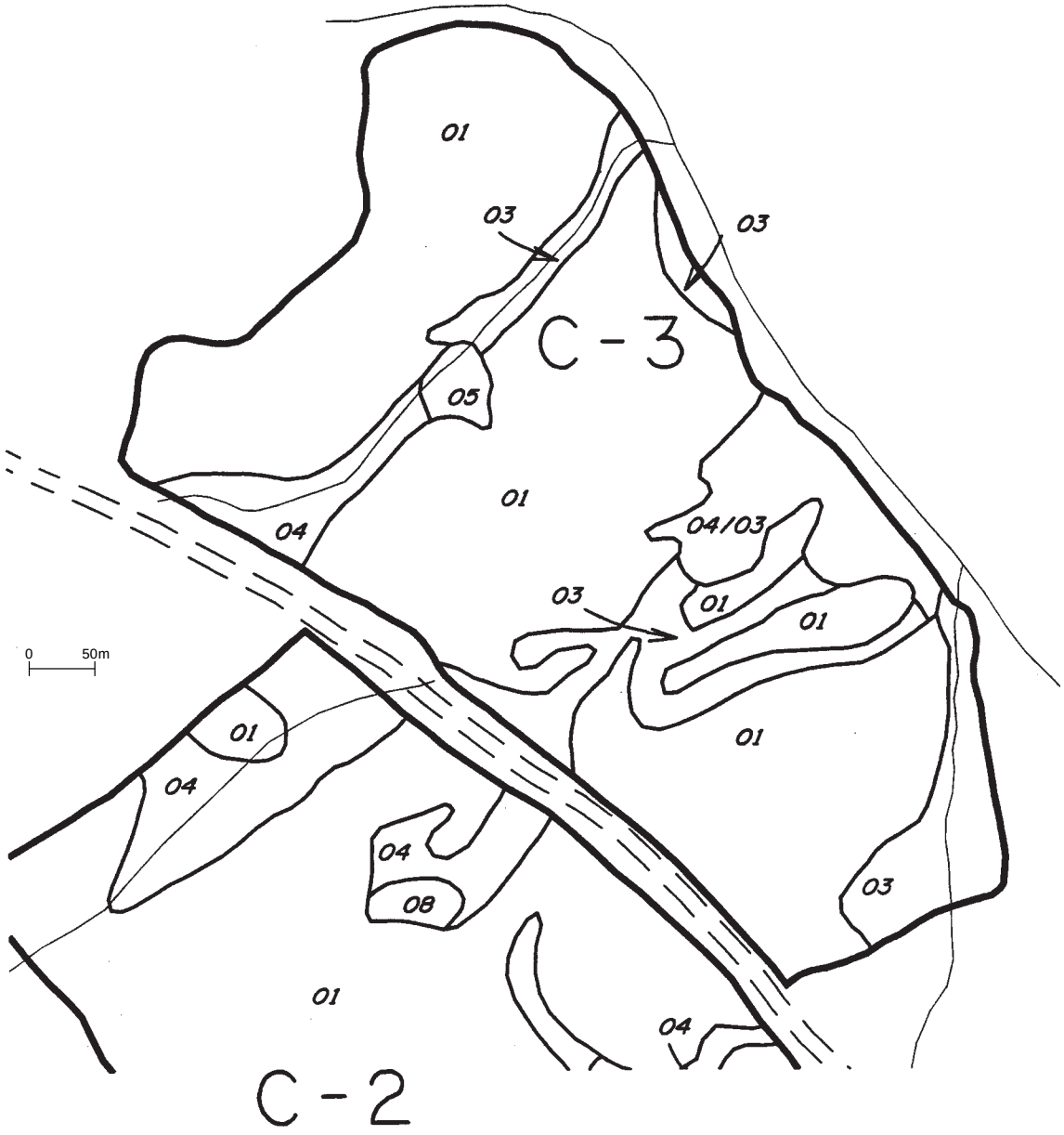


INDIVIDUAL TREATMENT UNIT MAP

MAP CODE	SITE SERIES[a]	MAP CODE	SITE SERIES
01	Hemlock–Step moss (mesic phase)	07	Cedar–Spruce–Horsetail–Skunk cabbage
01(b)	Hemlock–Step moss (submesic phase)	08	Black spruce–Hybrid spruce–Scrub birch–Sedge (forested swamp)
03	Hemlock–Cedar–Oak fern	OW	Open water
04	Cedar–Hemlock–Devil's club–Oak fern	ROW	Right-of-way
05	Spruce–Devil's club–Lady fern		

[a] Site series as described in Banner et al. 1993

FIGURE A4.14 *Map of treatment unit B2 with site series distribution.*

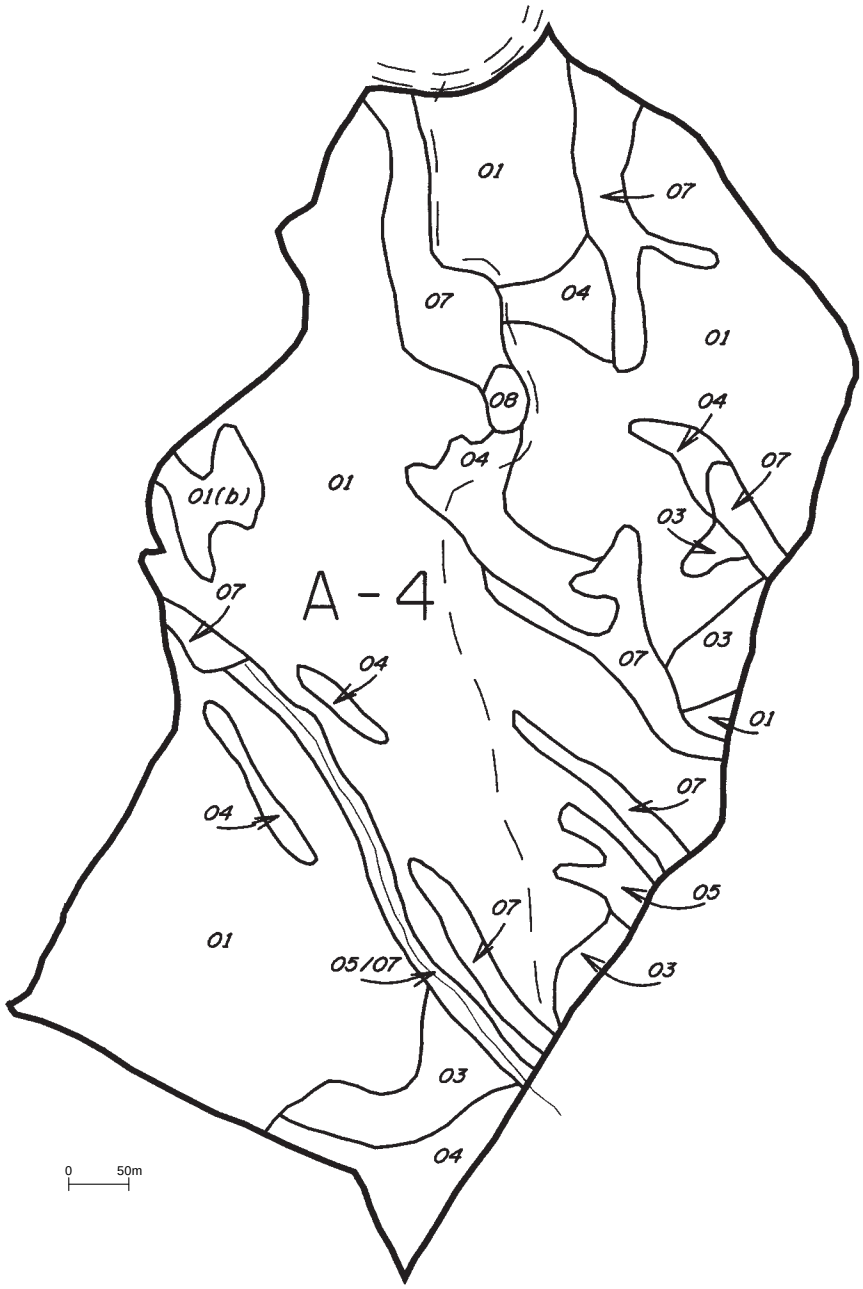


INDIVIDUAL TREATMENT UNIT MAP

MAP CODE	SITE SERIES[a]	MAP CODE	SITE SERIES
01	Hemlock–Step moss (mesic phase)	07	Cedar–Spruce–Horsetail–Skunk cabbage
01(b)	Hemlock–Step moss (submesic phase)	08	Black spruce–Hybrid spruce–Scrub birch–Sedge (forested swamp)
03	Hemlock–Cedar–Oak fern	OW	Open water
04	Cedar–Hemlock–Devil's club–Oak fern	ROW	Right-of-way
05	Spruce–Devil's club–Lady fern		

[a] Site series as described in Banner et al. 1993

FIGURE A4.15 *Map of treatment unit C3 with site series distribution.*



INDIVIDUAL TREATMENT UNIT MAP

MAP CODE	SITE SERIES[a]	MAP CODE	SITE SERIES
01	Hemlock–Step moss (mesic phase)	07	Cedar–Spruce–Horsetail–Skunk cabbage
01(b)	Hemlock–Step moss (submesic phase)	08	Black spruce–Hybrid spruce–Scrub birch–Sedge (forested swamp)
03	Hemlock–Cedar–Oak fern	OW	Open water
04	Cedar–Hemlock–Devil's club–Oak fern	ROW	Right-of-way
05	Spruce–Devil's club–Lady fern		

[a] Site series as described in Banner et al. 1993

FIGURE A4.16 *Map of treatment unit A4 with site series distribution.*

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