Northern Wetbelt Silvicultural Systems Project

ESTABLISHMENT REPORT

2nd Approximation:
April, 2002

Summary of Harvest Treatments, Monitoring Installations, and Overview of Pre- and Post-Harvest Conditions

University of Northern British Columbia
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Acknowledgements

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1. INTRODUCTION AND PURPOSE OF REPORT

The Northern Wetbelt Silvicultural Systems Project is an experimental test and comparison of alternative silvicultural systems in wet-belt Interior Cedar-Hemlock (ICH) and Engelmann Spruce-subalpine fir (ESSF) forests. The study is located in the Northern Rockies and Cariboo Mountains of east-central British Columbia, and will provide short- and long-term scientific testing and comparison of alternative systems in an replicated series of controlled, operational-scale research trials in the ICHwk3, ICHvk2, ESSFwk2, and ESSFwc3 subzones.

In these subzones and forest types, forests tend to be old, and naturally complex in structure and composition; a variety of silvicultural systems need to be locally tested in this region to gain improved understanding of ecosystem response to treatment. Improved knowledge of silvicultural system options and outcomes will help forest managers meet resource and ecosystem management goals. This long-term study examines a range of post-harvest treatment response variables, including changes in stand structural attributes, coarse woody debris, conifer regeneration performance, understory vegetation response, and windthrow. A working plan to guide project establishment and data collection was prepared at the start of the project (Jull *et al*, 1998) and was recently updated (Jull *et al*, 2000).

The purpose of this second approximation of this establishment report is provide documentation relevant to the initial establishment of the Northern Wetbelt Silvicultural Systems Project. This establishment report includes detailed information on study site soil and ecological characteristics, initial harvesting and silvicultural treatments, pre- and post-harvest stand and vegetation conditions, and descriptions and locations of permanent monitoring installations for the five study areas. The study areas include three in wetbelt ICH subzone, and two in wetbelt ESSF subzones. This April 2002 second approximation succeeds and replaces the 2001 edition (first approximation), and provides additional detail on post-harvest conditions, regeneration treatments, and climate-monitoring installations for East Twin, Minnow, Lunate, and Pinkerton study areas.

Pre-treatment ecological descriptions of site attributes and understory vegetation (from Beaudry, 1999) are summarized in Appendix 3, while pre-treatment physical and chemical soil pedon descriptions (Sanborn, unpublished data) are included in Appendix 4.

Pre- and post-harvest stand attributes summarized for this report include:

- basal area by species, for both live and dead trees;
- stand structure (stems-per-hectare by species and diameter classes) for live and dead standing mature trees;
- pre-harvest canopy top height (mean height of tallest 100 sph of live trees)
- volume of coarse woody debris (CWD);
- abundance and occurrence of structural attributes associated with Wildlife Tree (WLT) and CWD Types (Keisker, 2001). And;
- stems-per-hectare by species and size class for advance regeneration (pre-harvest only).

This establishment report will be updated periodically in the first years of the project as appropriate to capture additional documentation relative to early post-harvest conditions on the various study sites. For example, additional detail will be added to fully document May-June regeneration plantings at the Lunate Creek ICH study area, and following post-harvest data collection at the Bearpaw Ridge ESSF study area (tentatively scheduled for 2003 or 2004).

2. STUDY OBJECTIVES AND KEY QUESTIONS

The objective of this established, long-term study is to improve our understanding of stand structural development and growth, and contributing processes, both in unmanaged northern Interior wetbelt stands (ICHwk3, ICHvk2, ESSFwk2, and ESSFwc3 subzones), and in wetbelt stands in which various silvicultural systems have been applied. The overall intent of this study is to improve the ability of forest managers to design and predict treatment outcomes for a range of silvicultural systems, to meet various integrated resource management goals in northern wetbelt forest types. Study areas also serve as extension and demonstration sites, and provide high-quality future research opportunities.

For Interior Wetbelt ICH and ESSF forest types, specific objectives of the study are to examine the stand-level and smaller-scale effects of different silvicultural systems on:

- short-term and long-term stand and structural development (including live, standing dead, and downed trees), stand productivity, regeneration processes, understory vegetation development, and potential damaging agents; and
- short-term and long-term processes of loss and creation of structural biodiversity attributes, specifically wildlife trees and coarse woody debris.

Key questions being addressed in the Northern Wetbelt silvicultural systems trials are:

1. What are the effects of different silvicultural systems and harvest patterns (including no harvest) on present and future late-seral (or "old-growth") forest and habitat attributes? Can these structural and habitat attributes be maintained in managed or unmanaged stands, and how?
2. What is the effect of different silvicultural systems and stand structures on the productivity of conifer regeneration and the residual stand, including species composition, vigour, growth and development, and stocking?
3. Do different silvicultural systems and stand structures mitigate or exacerbate the incidence of current or future biotic or abiotic damage to forests?
4. How do different silvicultural systems and stand structures (or lack of harvesting) influence the types of range of wildlife habitat features found in the resulting forest?
5. To what extent do biotic and abiotic damage agents contribute to specific habitat features?

The study will also examine processes contributing to experimental treatment outcomes at finer spatial scales below the stand level, including individual tree responses. The importance of individual biotic and abiotic processes on the cumulative effect of a treatment will be examined and quantified. Contributing processes will be assessed by measures of damage or mortality due

to logging activities; rate of standing mortality; wind damage and windthrow of residual growing stock (treefalls); rates and types of resulting habitat features due to wind, pathogen, and logging damage; composition and release dynamics of advance regeneration and pole layers; regeneration dynamics and growth of natural and planted trees; and spatial variation in all of the above relative to distance from edges of harvested areas.

3. STUDY AREA LOCATIONS

The northern wetbelt ICH and ESSF subzones are located in the northern Cariboo and Rocky Mountains east of the central Interior Plateau, between the communities of Prince George and McBride, British Columbia (Figure 1). This general area is located between the latitude of 53^{O} and 54^{O} 30' North, and longitude of 120 and 122^{O} West. This area includes the Rocky Mountain Trench and adjacent areas of the McGregor Mountains to the north, the Rocky Mountains to the northeast, and the northern Cariboo/Columbia Mountains to the south. This mountainous region is bisected by the upper Fraser River and Highway 16 East, which follow the northern Rocky Mountain Trench. The ICH biogeoclimatic subzones within the study area include the Goat River Wet Cool ICHwk3 and Very Wet Cool ICHvk2 between about 800 and 1200 m in the Rocky Mountain trench and adjacent side valleys. The ESSF subzones in this area include the Cariboo Wet Cool ESSFwk1, Wet Cool ESSFwk3, and Wet Cold ESSFwc3 subzones, which occur above approximately 1200 m elevation (DeLong et al, 1994; BC Ministry of Forests, 1996a; 1996b).

Within this geographical area, 5 study areas were selected. These included three ICH study areas, and two ESSF study areas. Figure 2 shows the location of all study areas. A summary description of each study area is provided in Table 1.

The East Twin Creek study area (53^{O} 30' N, 120^{O} 20' W) is located in the Rocky Mountains approximately 35 Km northwest of McBride BC on the northeastern side of the Fraser River. The East Twin drainage is a relatively narrow, generally steep-sided valley running perpendicular to the Rocky Mountain Trench. This area is located on the east (uphill) side of the East Twin Forest Service Road, between 1.0 and 3.5 Km on the East Twin Forest Service Road. The East Twin road is accessed from 7.5 Km of the Mountainview Forest Service Road.

The Minnow Creek ICH study area (53^{O} 28' N, 120^{O} 18' W) is located in the Rocky Mountain Trench south of the East Twin drainage. The Minnow Creek study area is located approximately 32 Km north-west of McBride, BC. It is accessed at 4 Km on the Minnow Creek road, branching from 5.5 Km of the Mountainview Forest Service Road.

The Lunate Creek ICH study area (53^{O} 50' N, 121^{O} 28' W) is located approximately 100 Km east of Prince George and 110 km west of McBride BC on the southern flank of the Rocky Mountain Trench just east of the Hungary Creek drainage. The study area is accessed from Highway 16 East, at 5 Km on the Hungary Creek Forest Service Road.

The two ESSF study sites include the Pinkerton Mountain site in the ESSFwc3 subzone in the Cariboo Mountains south of the Rocky Mountain Trench, and the Bearpaw Ridge site in the

ESSFwk2 subzone in the McGregor Mountains northeast of the Rocky Mountain Trench and Fraser River.

The Pinkerton Mountain ESSF silvicultural systems study area (53^{O} 37' N, 121^{O} 30' W) is located in the Cariboo Mountains 130 road kilometres southeast of Prince George, BC. The site is located at 3 Km on the CP377 Road, branching at 13 Km on the Pinkerton Forest Service Road. The Forest Licensee A18165 is Canadian Forest Products Ltd. (formerly Northwood Inc.), of Prince George. The approximately 130-ha site is approximately 90 km ESE of Prince George, BC.

The Bearpaw Ridge ESSF silvicultural systems study site (54^{O} 03' N, 121^{O} 34') is located on Canadian Forest Products Tree Farm License (TFL) 30 in the McGregor Mountains east of Prince George, BC. The site is 20 km east of McGregor, BC, and approximately 110 km east of Prince George BC. The site is adjacent to, and accessible from several recent and proposed cutblocks located between 3 and 5 Km on the Crotch Creek Road, branching from 20 Km on the Pass Lake Road on Tree Farm License 30.

TABLE 1: Descriptive Summary of Northern Wetbelt ICH and ESSF Study Areas

Study Area	BEC Subzone	Elevation range (m)	Aspect	Average slope	Slope range	Area (ha)
East Twin Creek	ICHwk3	900-1050	NW	40%	20-65%	26.0
Minnow Creek	ICHwk3	1050-1200	SW	30%	15-45%	39.2
Lunate Creek	ICHvk2	950-1200	N	35%	25-45%	72.4
Pinkerton Mountain	ESSFwc3	1300-1500	SW	25%	10-40%	130.0
Bearpaw Ridge	ESSFwk2	1200-1450	NE	40%	20-60%	140.1

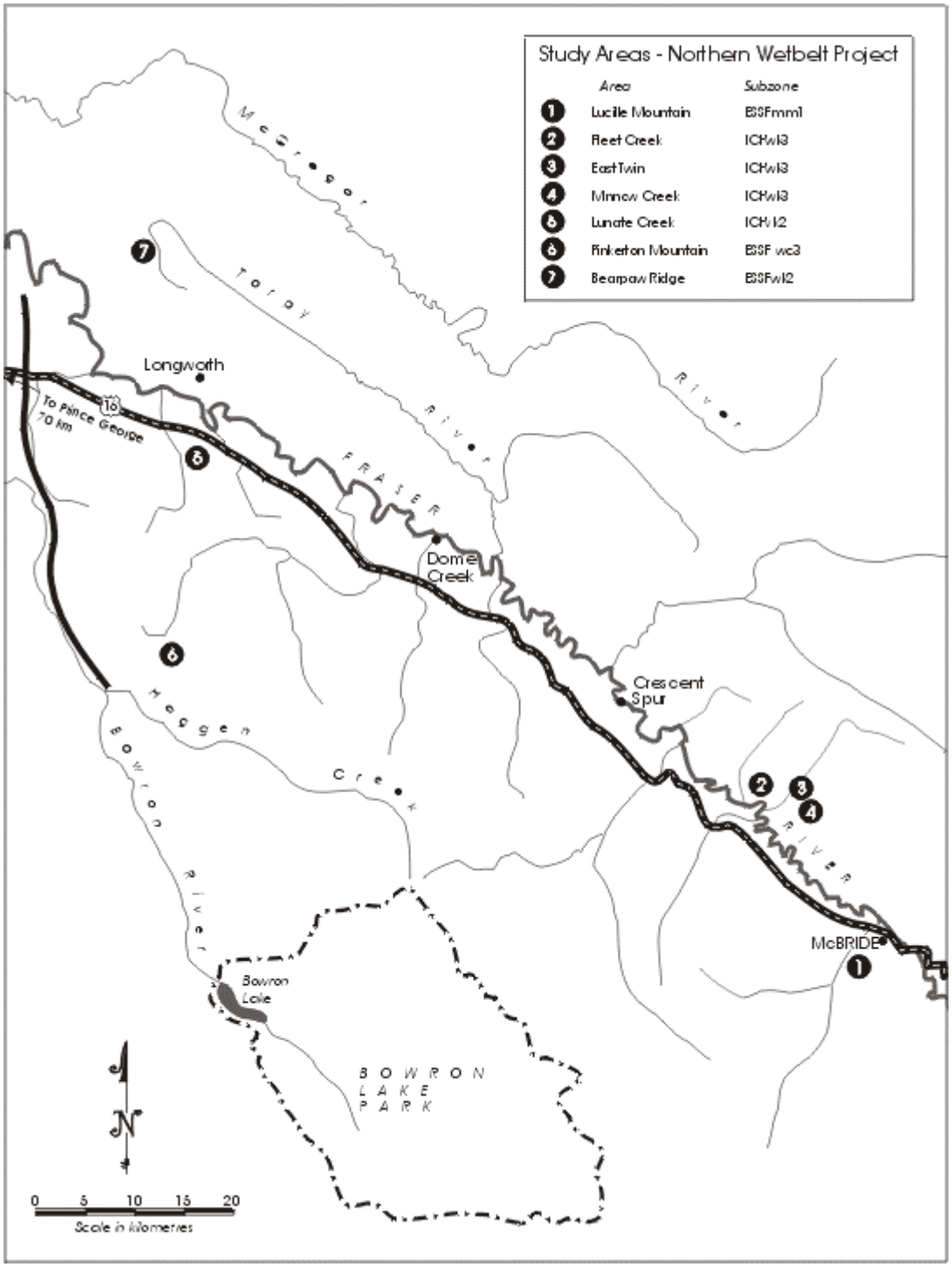

FIGURE 1: Geographic Location of Northern Wetbelt ICH and ESSF Study Areas. (Locations of the pre-existing Lucille Mountain (EP 1119.01) and Fleet Creek (EP 1119.02) silvicultural systems trials are included for reference only).

4. EXPERIMENTAL DESIGN

The intent of the experimental designs used in this study is to create differently-structured treatments that result in a range of environmental and ecological conditions, both within and between treatments.

This project includes two distinct but related long-term experimental designs. These include the:

1. Northern Wetbelt ICH silvicultural system trials (East Twin, Minnow, and Lunate study areas); and
2. Northern Wetbelt ESSF silvicultural system trials (Pinkerton and Bearpaw study areas).

Details of the experimental and treatment design, and analytical models to be used with these experimental designs are summarized in the project working plan (Jull et al, 2000).

Wherever possible, we randomly allocated treatments among available treatment units. However, in several cases, operational resource-management considerations (such as visual quality objectives) precluded a particular treatment location. As well, the uncut control units in the Minnow and Lunate study areas were located where these control areas would be least affected or (ideally) unaffected by access roads or adjacent logging.

Globally within this research project, we compensated for any practical limitations on true randomization of all treatments within a study area, by a number of measures designed to allow treatment response to be separated from pre-existing differences in site and stand characteristics within a treatment unit. Prior to, and following harvest treatments, we conducted systematic, intensive pre- and post-harvest description and mapping of initial ecological conditions, soil attributes, and stand parameters in each treatment unit and study area. Treatment response variables were defined as post-treatment changes from previously-described initial conditions.

The experimental design for the Northern Wetbelt ICH study areas is a randomized complete block design with three replicated blocks (study areas). Within each block, four treatments -- 0% post-harvest retention or "clearcut"; 30% post-harvest retention or "group retention"; 70% post-harvest retention or "group selection", and 100% retention or "uncut control" -- were allocated to treatment units. The group retention treatment is not present in the East Twin study area due to spatial constraints on treatment layout. Table 2 summarizes ICH treatment areas, while Figure 3 illustrates the physical layout and treatment configuration for the three ICH study areas.

The experimental design for the Northern Wetbelt ESSF research installations is a randomized incomplete block design with two replicated blocks (study areas). In the two experimental blocks (Bearpaw and Pinkerton), three treatments -- single-tree selection, small (0.1-0.3-ha.) groups, and uncut controls -- were allocated to treatment units within each block. The 1-hectare patch cut / clearcut treatment at Bearpaw Ridge is unreplicated within the experimental design; 20 individual approximately 1-hectare openings are pseudo-replicated within the treatment unit at this site. These patch cuts will be analysed as an unreplicated case study. Table 3 summarizes the ESSF treatment areas, while Figures 3 and 4 illustrates the physical layout and configuration of these ESSF study areas.

Table 2: Summary of treatment units in the Northern Wetbelt ICH study areas

Study area	treatment unit	treatment code	Treatment description	total area of unit (ha)
Lunate Creek	Uncut control	UN	No harvest	20.3
	Group selection	GS	30% removal, 70% retention	20.8
	Group retention	GR	70% removal, 30% retention	16.7
	Clearcut	CC	100% removal,	14.6
Minnow Creek	Uncut control	UN	No harvest	9.9
	Group selection	GS	30% removal, 70% retention	11.2
	Group retention	GR	70% removal, 30% retention	10.7
	Clearcut	CC	100% removal,	7.4
East Twin Creek	Uncut control	UN	No harvest	9.9
	Group selection	GS	30% removal, 70% retention	8.7
	Clearcut	CC	100% removal,	7.8

Table 3: Summary of treatment units in the Northern Wetbelt ESSF study areas

Study area	treatment unit	treatment code	treatment description	total area (ha)
Pinkerton Mountain	Uncut control	UN	No harvest	30.0
	Single-tree selection	ST	Individual tree harvest, 30% removal	48.0
	Group selection	GS	0.1-0.3 ha group harvest, 30% removal	59.0
Bearpaw Ridge	Uncut control	UN	No harvest	28.4
	Single-tree selection	ST	Individual tree harvest, 30% removal	25.5
	Group selection	GS	0.1-0.3 ha group harvest, 30% removal	27.0
	1-ha patch cuts	PC	0.5-1.0 ha patch cuts, 30% removal	59.2

5. HARVESTING AND SILVICULTURAL TREATMENTS

Project researchers began to identify candidate study areas in 1997, in cooperation with area forest licensees and agencies. Suitable sites were narrowed down to 5 study areas: These included three ICH study areas (East Twin, Minnow Creek, and Lunate Creek), and two ESSF study areas (Pinkerton Mountain, and Bearpaw Ridge). The Pinkerton site was harvested in 1998. Operational planning and layout for the three ICH study areas and the Bearpaw Ridge ESSF study area was completed in fall 1999. Harvesting of the East Twin Creek study area was completed in March 2000. Harvesting at the Minnow Creek and Lunate Creek study areas was delayed for one year relative to East Twin. Harvesting at the Minnow study area commenced in January 2001 and was completed in February 2001. Harvesting at the Lunate site commenced in December 2000 and was completed in late March 2001.

The licensee for TFL 30, Northwood Ltd. (now Canadian Forest Products Ltd.), completed the design and layout of the Bearpaw Ridge ESSF study area in March 1999. The site will be helicopter-logged. Harvesting of the Bearpaw ESSF study area by Canfor is scheduled for summer 2003 or 2004 pending the completion of bridge and abutment maintenance on the Crotch Creek access road, and resolution of final permitting issues..

A detailed summary of timber sale information and harvest methods for each treatment unit are provided in Tables 4 and 5a. A summary of post-harvest silvicultural and regeneration treatments is provided in Table 5b.

Harvested areas within each treatment unit in the three ICH study areas were planted to a prescribed 50-50 mix of western redcedar and hybrid white spruce throughout. Very minor amounts of other species (Douglas-fir, lodgepole pine) were planted in rows along with spruce and cedar in individual small research plots separate from the main trial area (C. Lasjerowicz, personal communication). It is also anticipated that, throughout the harvested portions of these study sites, there will be substantial "fill-in" of natural and advance regeneration of western redcedar, western hemlock, subalpine fir, and spruce over time, to naturally augment the species composition of planted stock.

Harvested areas within each treatment unit in the Pinkerton ESSF study area were planted with Engelmann spruce in September 1998. However, these Fall plantings were not very successful, and the licensee replanted the area with spruce in July 2001. Some advance and natural regeneration of subalpine fir and spruce is expected on these sites to naturally augment species composition of the planted stock. A similar approach is prescribed for the Bearpaw Ridge ESSF site, anticipated for helicopter harvest in 2003 or 2004.

Specific details of post-harvest silvicultural treatments implemented on the various study areas (to meet regeneration objectives) are summarized in Table 5b.

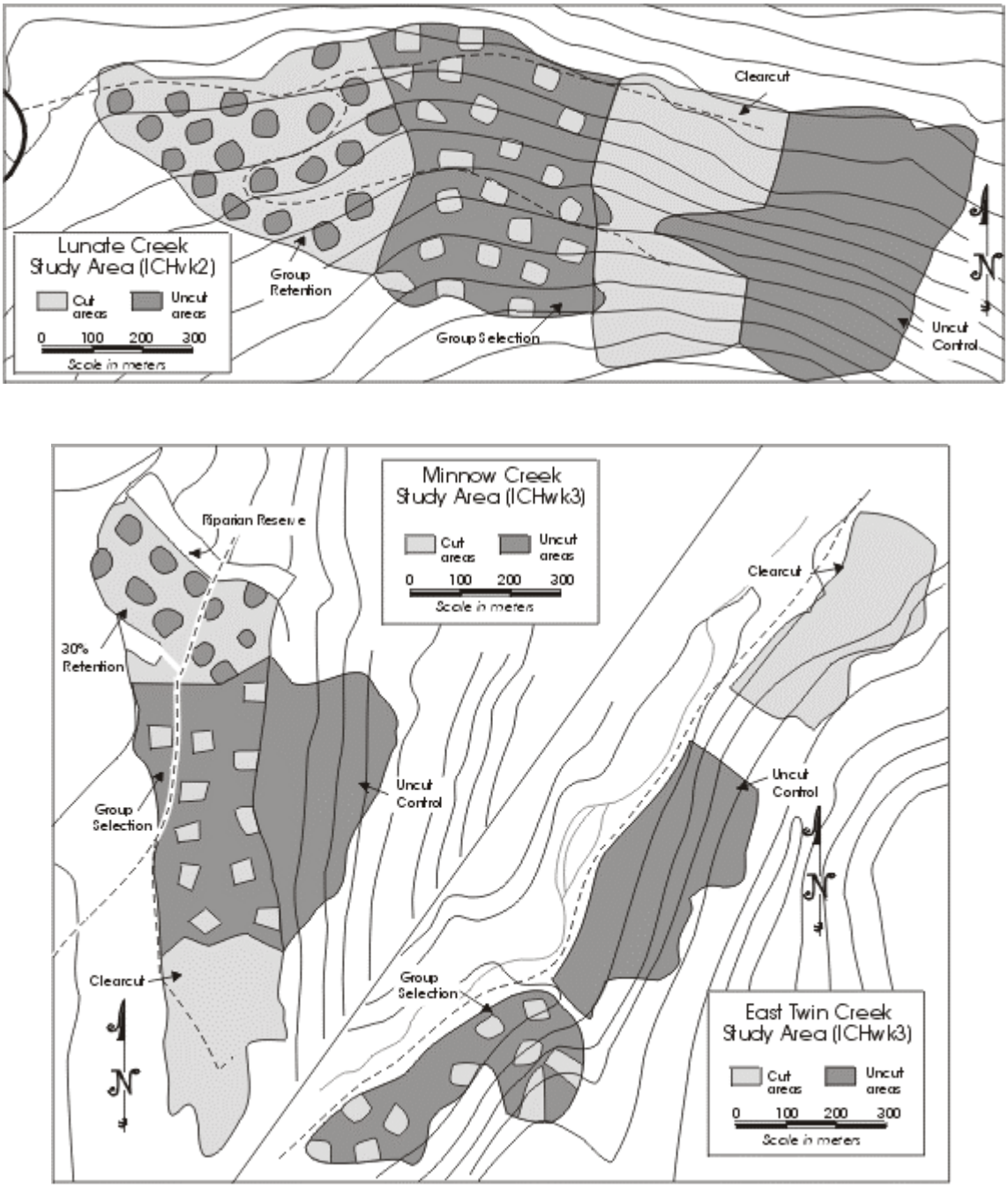

Figure 2: Layout of Northern Wetbelt ICH Silvicultural Systems Study Areas (Lunate Creek, Minnow Creek, and East Twin Study Areas, 1:10,000 scale). Treatments established 2000-2001.

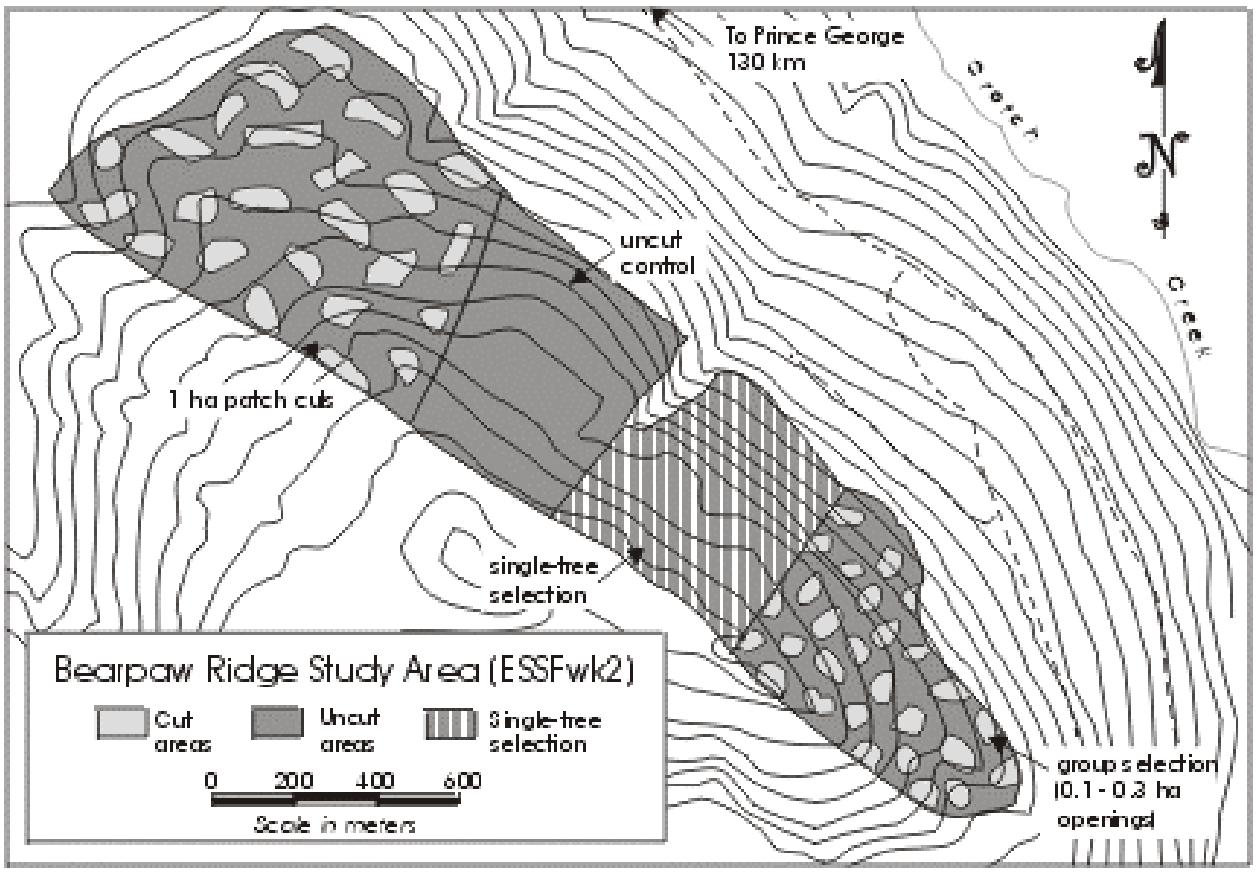

Figure 3: Experimental Design and Layout of the Bearpaw Ridge ESSF Study Area

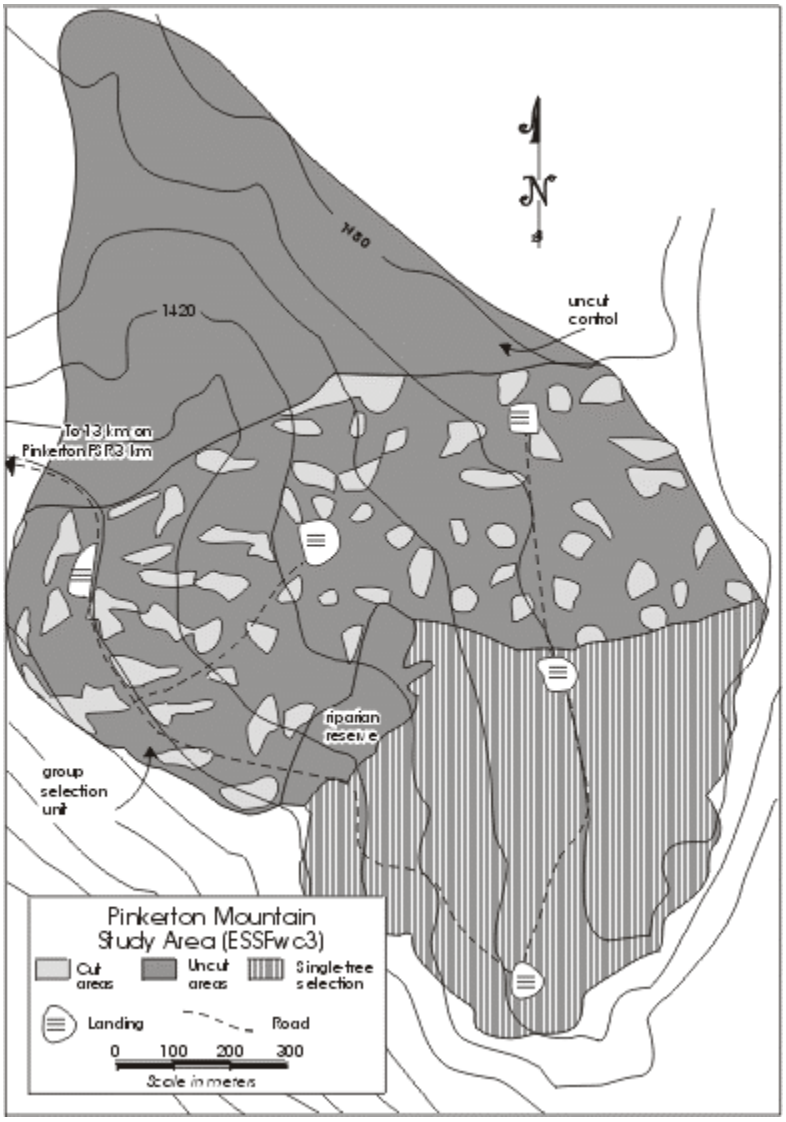

Figure 4: Experimental Design and Layout of the Pinkerton Mountain ESSF Study Area

Table 4: Summary of ICH timber sale information and harvesting methods by treatment unit.

Study Area	Treatment	Timber Sale License (SBFEP)	Licensee	Date Harvested	Harvest Method	Felling Method	Forwarding / Processing equipment
Lunate Creek	Group selection	TSL A57901 (PGFD)	TRC Cedar	Jan-Mar. 2001	Ground-based	Hand-felled	Rubber-tired and tracked line and grapple skidders
	Group retention	TSL A57901 (PGFD)	TRC Cedar	Jan-Mar. 2001	Ground-based	Hand-felled	Rubber-tired grapple skidders
	Clearcut	TSL A57901 (PGFD)	TRC Cedar	Jan-Mar. 2001	Ground-based	Hand-felled	Rubber-tired and tracked line and grapple skidders
Minnow Creek	Group selection	TSL 61746 (RVFD)	North Enderby Timber (R. Carter)	Jan-Feb 2001	Ground-based	Timberjack 618 Feller-buncher (hand felling of larger cedar and spruce)	Tracked grapple skidder (John Deere 748E).
	Group retention	TSL 61746 (RVFD)	North Enderby Timber (R. Carter)	Jan-Feb 2001	Ground-based	Timberjack 618 Feller-buncher (hand felling of larger cedar and spruce)	Tracked grapple skidder (John Deere 748E).
	Clearcut	TSL 61746 (RVFD)	North Enderby Timber (R. Carter)	Jan-Feb 2001	Ground-based	Timberjack 618 Feller-buncher (hand felling of larger cedar and spruce)	Tracked grapple skidder (John Deere 748E). Hoe chucking on steep pitches.
East Twin	Group selection	TSL 61743 Opening # 93H049-036	Don Beason Logging	March 2000	Ground-based	Hand-felled	Tracked grapple skidder (John Deere 640D)
	Clearcut	TSL 61743 Opening # 93H049-035 Robson Valley Forest District	Don Beason Logging	March 2000	High-lead Cable (6 ha.) Ground (2 ha.)	Hand-felled	Madill J7C tower yarder (cable portion) Grapple skidder (John Deere 640D) for ground based portion

Table 5a: Summary of ESSF cutting permit information and harvesting methods by treatment unit.

Study Area	Treatment	Tenure License	Licensee	Date Harvested	Harvest Method	Felling Method	Log Forwarding
Pinkerton Mtn.	Single-tree selection	FL A18165	Northwood Inc.	Mar.-April 1998	Ground-based with designated skid trails to roadside log decks	Timbco 455C Feller-buncher	Tree-length skidding, D6 Tracked grapple skidder (desig-nated trails)
	Group Selection	FL A18165	Northwood Inc.	Mar. - April 1998	Ground-based with designated skid trails to roadside log decks	Timbco 455C Feller-buncher	Tree-length skidding, D6 Tracked grapple skidder (desig-nated trails)
	Single-tree selection	TFL 30	Canadian Forest Products Ltd.	(summer 2002)	Aerial	Hand-falling	Helicopter
Bearpaw Ridge	Group selection	TFL 30	Canadian Forest Products Ltd.	(summer 2002)	Aerial	Hand-falling	Helicopter
	1 ha Patch Cuts	TFL 30	Canadian Forest Products Ltd.	(summer 2002)	Aerial	Hand-falling	Helicopter

Table 5b: Summary of Post-harvest Silvicultural (Regeneration) Treatments completed within the Northern Wetbelt Study Areas (treatments completed or anticipated to June 2002). Note: Uncut control units and reserve areas excluded (no treatment).

Study Area	**Treatment**	**Opening #** (SBFEP)	**Site Preparation (method, date)**	**Date Planted**	**Species and Stock Type**	**Number of Seedlings Planted**	**Seedlot # / Sowing Request Key #**
Lunate Creek	GS	93H083-046	Excavator debris piling roadside accumulations only Oct. 2002. No on-block piling	May-June 2002 (pending)	Cw PSB 412A 1+0 Sx PSB 415D 1+0	Cw 700 sph Sx 700 sph	Cw: SL 31499 / 2001DPG0026 Sx: SL 60245 /
Lunate Creek	GR	93H083-046	Excavator debris piling of on-block and roadside accumulations, Oct. 2002; spot burning Nov. 2002	May-June 2002 (pending)	Cw PSB 412A 1+0 Sx PSB 415D 1+0	Cw 700 sph Sx 700 sph	Cw: SL 31499 / 2001DPG0026 Sx: SL 60245 /
Lunate Creek	CC	93H083-046	Excavator debris piling of on-block and roadside accumulations, Oct. 2002; spot burning Nov. 2002	May-June 2002 (pending)	Cw PSB 412A 1+0 Sx PSB 415D 1+0	Cw 700 sph Sx 700 sph	Cw: SL 31499 / 2001DPG0026 Sx: SL 60245 /
Minnow Creek	GS	93H049-036	No site preparation (raw plant). Spot burning of roadside accumulations.	May 15-25th, 2001	Cw PSB 412A 1+0 Sx PSB 412A 1+0	Cw 700 sph Sx 700 sph	Cw: SL 31499 2000DRV0019 Sx: SL 60119 2000DRV0019
Minnow Creek	GR	93H049-036	No site preparation (raw plant). Spot burning of roadside accumulations.	May 15-25th, 2001	Cw PSB 412A 1+0 Sx PSB 412A 1+0	Cw 700 sph Sx 700 sph	Cw: SL 31499 2000DRV0019 Sx: SL 60119 2000DRV0019
Minnow Creek	CC	93H049-036	No site preparation (raw plant). Spot burning of roadside accumulations.	May 15-25th, 2001	Cw PSB 412A 1+0 Sx PSB 412A 1+0	Cw 700 sph Sx 700 sph	Cw: SL 31499 2000DRV0019 Sx: SL 60119 2000DRV0019
East Twin	GS	93H049-035	No site preparation (raw plant)	May 15-25th, 2001	Cw PSB 412A 1+0 Sx PSB 412A 1+0	Cw 700 sph Sx 700 sph	Cw: SL 31499 2000DRV0019 Sx: SL 60119 2000DRV0019
East Twin	CC	93H049-035	No site preparation (raw plant); 2 ha area at toe slope was excavator piled / burned.	May 15-25th, 2001	Cw PSB 412A 1+0 Sx PSB 412A 1+0	Cw 700 sph Sx 700 sph	Cw: SL 31499 2000DRV0019 Sx: SL 60119 2000DRV0019

Table 5b (continued)

Pinkerton Mtn.	STS		No site preparation other than piling and burning of roadside accumulations.	Sept. 1998 and June 2001	Se PSB 415 1+0		
	GS		No site preparation other than piling and burning of roadside accumulations.	Sept. 1998 and June 2001	Se PSB 415 1+0		

6. BASELINE PRE-HARVEST SITE DESCRIPTIONS

6.1 Ecosystem Description and Mapping

6.1.1 Methods

Baseline ecological stratification and descriptions of these study areas prior to harvest were carried out by Leisbet Beaudry RPF of Madrone Consultants of Prince George, B.C., to research standards set by the research team. Complete site series descriptions were prepared for each of the study areas and ecosystem maps were prepared at a scale of 1:5000, accompanied by a comprehensive report synthesizing all information collected (Beaudry, 1999). Raw data were also compiled and entered into standard formats.

Air photo coverage was obtained and preliminary site series boundaries were delineated for each study area. The study areas were then field sampled when the vegetation was fully extended. Transects were run 75 to 100m apart throughout the site. Changes in site series and any map or photo ties were noted along the transects. Initial site series maps were developed in the field. The site series were described at a sampling intensity of one site for every 2 hectares.

Site descriptions were recorded on MOELP Ground Inspection Forms or FS822's. For ecosystems with more than 10% of the total area 4 to 5 FS882's were completed to describe mineral soil to the subgroup level and detailed humus descriptions. On site series with less than 10% of the total area only 1 or 2 FS882's were completed. This site description information was initially compiled to provide a field description of the site series and to identify potential soil pedon reference sites. The data were then entered into Venus 4.0[1] (VENUS, 1999). Venus reports were used to create more complete site series descriptions for each of the study areas.

The transect and field mapping information was used to create the ecosystem map. Ecosystem maps were drafted at a scale of 1:5000. Legends were developed for the maps.

For each of the study areas the following is described:

- biogeoclimatic zone, subzone and variant, and rationale for the decision if it was in question;
- elevation of site;
- complete site series description including vegetation by layers and soils and environment;
- where required a description of the site phases described and mapped; and a
- comparison of the study area and site series to the other study areas in the same biogeoclimatic zone.

[1] Vegetation and Environment Nexus, the data entry and reporting tool of the BC Min. of For. and BC Envir.

6.1.2 Ecological site series and distribution by study area

The ecological site series found in the study areas, and their key attributes, are summarized in Tables 6 and 7. For more detailed descriptions, refer to Appendix 3 or Beaudry (1999).

6.2 Soils

6.2.1 Methods

Dr. Paul Sanborn selected reference pedon sites (for soil pits) for all site series occupying more than 10% of each study area; the number of pedon sites examined ranged from 4 and 6 per study area. Locations reflected representative soil, topographical, and vegetation conditions for that stratum. At each reference site, pedons were described, classified, and sampled to a depth of 1 m or the bedrock contact. Standard soil horizon and humus form descriptions were prepared for each pedon, using criteria defined by Green *et al*. (1993), Soil Classification Working Group (1998), and Ministry of Forests (1998). Samples of all described organic and mineral horizons underwent standard physical and chemical analyses at the Ministry of Forests analytical laboratory (Glyn Road).

6.2.2 Soil Pedon Descriptions

Key attributes of the soil pedons in the study areas are summarized in Tables 8 and 9. For more detailed information on soils, refer to Appendix 4.

Table 6: Summary of ecological site descriptions by study area and site series in ICH treatment units of the Northern Wetbelt silvicultural systems project.

Study Area	Site Series	Site Unit Name	No. of Plots	Successional Stage	Structural Stage
Lunate Creek	ICHvk2/04	CwHw-oakfern	16	Mature climatic climax	Mature to old forest
Lunate Creek	ICHvk2/01	CwHw-devils club – lady fern	25	Climatic climax	Old forest
Minnow Creek	ICHwk3/04	HwCw-step moss	1	Maturing edaphic climax	Mature forest
Minnow Creek	ICHwk3/01w	CwHw-oakfern: wet phase	7	Maturing climax	Mature forest
Minnow Creek	ICHwk3/01d	CwHw-oakfern: dry phase	8	Maturing climax	Mature forest
Minnow Creek	ICHwk3/05	CwHw-devil's club-lady fern	7	Maturing edaphic climax	Mature forest
Minnow Creek	ICHwk3/06	Cwsxw-devil's club-horse tail	2	Maturing edaphic climax	Mature forest and wetland realm of swamp
East Twin	ICHwk3/01d	CwHw-oakfern: dry phase	13	Maturing climax	Mature forest
East Twin	ICHwk3/01w	CwHw-oakfern: wet phase	3	Maturing climax	Mature forest
East Twin	ICHwk3/05	CwHw-devil's club-lady fern:	1	Maturing climax	Mature forest

Table 7: Summary of ecological site descriptions by study area and site series in ESSF treatment units of the Northern Wetbelt silvicultural systems project.

Study Area	Site Series	Site Unit Name	No. of Plots	Successional Stage	Structural Stage
Bearpaw Ridge	ESSFwk2/02	Bl-oakfern sarsaparilla	8	Maturing edaphic climax	Mature forest
Bearpaw Ridge	ESSFwk2/01	Bl-oakfern-knight's plume	25	Maturing climax	Mature forest
Bearpaw Ridge	ESSFwk2/04	Bl-devil's club-rhododendron	2	Maturing edaphic climax	Mature forest
Bearpaw Ridge	ESSFwk2/05	Bl-rhododendron-ladyfern	23	Maturing edaphic climax	Mature forest
Bearpaw Ridge	ESSFwk2/06	Bl-horsetail-sphagnum	2	Maturing edaphic climax	Herb forb and wetland realm of swamp
Pinkerton Mtn.	ESSFwc3/01d	Bl-rhododendron-oak fern (dry phase)	20	Maturing climax	Mature forest
Pinkerton Mtn.	ESSFwc3/01w	Bl-rhododendron-oak fern (wet phase)	21	Maturing climax	Mature forest
Pinkerton Mtn.	ESSFwc3/03d	Bl-globeflower-horsetail (dry phase)	19	Maturing climax	Mature forest
Pinkerton Mtn.	ESSFwc3/03w	Bl-globeflower-horsetail (wet phase)	2	Maturing climax	Combination of mature forest and wetland realm of swamp

Table 8: Summary of general soil pedon descriptions by study area and site series in ICH treatment units of the Northern Wetbelt silvicultural systems project.

Study Area	Pedon #	Site Series	Land Form	Humus Form	Soil Classification
Lunate Creek	1	01	Morainal veneer and blanket over fragmental phyllite bedrock	Mormoder	Gleyed Humo-Ferric Podzol
Lunate Creek	2	04	Morainal veneer over bedrock	Mormoder	Orthic Ferro-Humic Podzol
Lunate Creek	3	01	Morainal veneer over bedrock	Mormoder	Podzolic Gray Luvisol
Lunate Creek	4	04	Morainal veneer over bedrock	Humimor/hemimor	Gleyed Podzolic Gray Luvisol
Minnow Creek	9	01m	Morainal blanket	Humimor	Gleyed Humo-Ferric Podzol
Minnow Creek	10	05	Fluvial fan	Humimor (within 5m, also hemimor, mormoder)	Gleyed Humo-Ferric Podzol
Minnow Creek	11	06	Organic blanket	Saprimoder	Cumulic Humisol (associated with Histic Folisols on raised microsites)
Minnow Creek	12	01d	Morainal veneer over bedrock	Humimor	Orthic Humo-Ferric Podzol
East Twin	5	01d	Colluvial/morainal veneer and blanket over steep bedrock (phyllite or schist)	Humimor/hemimor	Gleyed Podzolic Gray Luvisol
East Twin	6	01m	Morainal blanket over steep bedrock	Mormoder	Orthic Humo-Ferric Podzol
East Twin	7	01m	Fluvial apron, perhaps overlying morainal bedrock	Pachic Humimor	Gleyed Humo-Ferric Podzol
East Twin	8	01d	Morainal blanket and veneer overlying schist bedrock	Mormoder	Ortho Humo-Ferric Podzol

Table 9: Summary of general soil pedon descriptions by study area and site series in ESSF treatment units of the Northern Wetbelt silvicultural systems project.

Study Area	Pedon #	Site Series	Land Form	Humus Form	Soil Classification
Bearpaw Ridge	19	05	Morainal blanket, modified by colluvial deposition, over bedrock controlled benches	Humimor	Orthic Humo-Ferric Podzol
Bearpaw Ridge	20	01	Morainal blanket over bedrock	Tenuic humimor	Gleyed Humo-Ferric Podzol
Bearpaw Ridge	21	05	Morainal veneer over limestone bedrock	Tenuic humimor	Ortho Ferro-Humic Podzol
Bearpaw Ridge	22	01	Morainal veneer over rolling siltstone bedrock	Tenuic humimor	Orthic Humo-Ferric Podzol
Pinkerton Mtn.	13	01(dry)	Morainal veneer over non-calcareous bedrock	Hemimor	Orthic Ferro-humic Podzol
Pinkerton Mtn.	14	01(dry_	Morainal veneer over limestone bedrock	Hemimor	Orthic Ferro-humic Podzol
Pinkerton Mtn.	15	03	Morainal blanket	Tenuic humimor	Gleyed Humo-ferric Podzol
Pinkerton Mtn.	16	01(moist)	Morainal blanket	Hemimor (associated with tenuic hemimors)	Gleyed Humo-ferric Podzol

6.2.3 Soil Charcoal Dating

In the wetbelt ICH, development of detailed forest fire chronologies is hampered by the widespread occurrence of hollow boles in the cedars. However, 1999 soil profile descriptions and soil sampling conducted by Dr. Paul Sanborn on these study areas revealed an additional type of evidence which may help to extend the historical scope of natural disturbance studies in the northern wetbelt. As part of the ecological mapping and characterization of benchmark pedons at our 5 study sites, the presence of charcoal during inspections of forest floors and soil profiles was carefully recorded.

At the wettest site (Lunate Creek in the ICHvk2), charcoal was almost entirely absent, but was observed frequently in surficial forest floors at the ICHwk3 sites (East Twin, Minnow Creek; L. Beaudry, pers. comm.). In addition, at the latter two sites, evidence of past fire-related disturbances was found deeper in the soil profile by Sanborn's sampling; this evidence was in the form of charcoal and/or charred forest floors in buried soil profiles formed on alluvial fans and in toeslope positions.

Radiocarbon dates determined at the University of Arizona on these charcoal materials are summarized in Table 10. The results indicated that charcoal ages in the modern forest floor at the East Twin and Minnow Creek study areas (of +/- 350 to 450 years before present) were consistent with estimated stand ages for these sites from living trees (A. Hoggett, U.B.C., pers. comm.). In addition, earlier dates from deeper charcoal in buried forest floors suggested that past depositional events over the last several thousand years, were associated with fires (Table 10). There were no similar complex (buried) profiles at the wettest site (Lunate Creek), where stand structure and tree size suggest that disturbances have been less frequent.

Although there was no further charcoal sampling and radiocarbon dating as part of this study, the above findings led to more extensive studies of soil charcoal dating and past fire occurrence in the ICHwk3 subzone in the adjacent Morkill River Valley (Sanborn/Geertsma/T. Jull) in 2001 and 2002 (P. Sanborn, personal communication, March, 2002)

Table 10. Radiocarbon (AMS) dates on charcoal from ICHwk3 sites near McBride, B.C (from Sanborn, 2000a, unpublished)

Site	Sample	Depth	Radiocarbon Age	Calibrated Age (1 sigma, 68% confidence)	Date No.
Minnow (Pedon 10)	M10-79: Charcoal from base of forest floor	12 cm	363 ± 73 BP	1443-1640 AD	AA-35368
Minnow (Pedon 10)	M10-86: Charcoal in charred forest floor above buried Podzolic soil profile	98-100 cm	4,735 ± 50 BP	3634-3380 BC	AA-35369
East Twin (Pedon 7)	E7-1: Charcoal from base of forest floor	15 cm	448 ± 32 BP	1435-1451 AD	AA-35370
East Twin (Pedon 7)	E7-4: Charcoal from buried forest floor	24-25 cm	2,350 ± 32 BP	410-386 BC	AA-35371
East Twin (Pedon 7)	E7-6: Charcoal from buried forest floor above buried weakly developed Podzolic soil profile	44-53 cm	4,050 ± 50 BP	2825-2475 BC	AA-35372

7. FOREST STRUCTURE, COMPOSITION, AND ATTRIBUTES

7.1 Methods

7.1.1. Pre-harvest Sampling

Full detail on sampling methods, data management, and data analyses for the following parameters is found in the project working plan (Jull et al, 2000) and in the related field data collection protocol manual (Stevenson, Jull, and Rogers, 2000). Original primary source documents include Resource Inventory Committee (1998); Forest Productivity Council (1998), and Keisker (2001).

A combined total of approximately 150 stand development plots, 600 regeneration plots, 383 coarse woody debris transects, and 150 vegetation plots were established prior to, and following harvest respectively in all study areas combined. Sample sizes for each parameter are summarized by treatment unit and study area (Tables 11 and 12).

Following harvesting in the three ICH study areas, a total of 88 stand development plots, 225 vegetation plots, and 132 vegetation plots were permanently established or (in the case of CWD transects) re-established across 11 treatment units.

Before harvest, temporary fixed-area stand ("large-tree") sample plots were systematically established in each treatment unit and study area, to a minimum sampling intensity of 5% for ICH study areas, and 2-3% for ESSF areas, based on both sampling objectives and cost considerations. Eight to ten stand development plots were established per treatment unit (24 to 40 per study area). For the Lunate, East Twin, Minnow, and Bearpaw study sites, temporary pre-harvest fixed radius plots were established. For the ICH sites, the minimum pre-harvest plot size was 1250 m^2 or 0.125 hectare (19.95 m radius), including at least 60 live trees > 4.0 cm dbh per plot. For ESSF sites, pre-harvest plot sizes were 0.10 hectare (17.84 m radius) at Pinkerton Mountain and paired 0.0625-hectare (14.11 metre radius) plots at the Bearpaw Ridge study area.

In the large-tree sample plots, tree species, tree height, diameter, and pathological characteristics for live trees greater than 4.0 cm dbh were measured. Live and dead standing trees greater than or equal to 17.5 cm dbh, were also assessed for a series of wildlife attributes, including wildlife tree classes and types (Keisker, 2001). Four regeneration plots were established within each large-tree plot to measure the abundance and vigour of regeneration less than 4.0 cm dbh. These four nested regeneration plots (*plot radius* = 3.99 m; plot size 0.005 ha) were established around the large tree plot centers, and advance regeneration less than 30 cm in height was tallied, while that greater than or equal to 30 cm in height was tallied and assessed for species, height, and vigor.

Associated with each large-tree (stand development) sample plot, were a set of three independently located 24-m line transects measured coarse woody debris (CWD) abundance and characteristics. As per Resource Inventory Committee (1998) procedures, coarse woody debris transects included all pieces of CWD greater than 7.5 cm in piece diameter where they were crossed by the transect. Crews recorded attributes of CWD pieces, including diameter, length, origin, decay class, CWD type (Keisker, 2001), and wildlife use (if evident).

Pre-harvest understory vegetation description used standard 30 m x 30 m (0.09 ha) square assessment plots divided into 4 sectors of equal size, located at the same centre points as large tree plots. In each sector, percent cover of each species of moss, lichen, herb, and shrub were recorded.

7.1.2 Post-harvest Monitoring

Stand monitoring following harvest treatments followed very similar sampling methods and protocols to the pre-harvest sampling. However, the primary differences between the pre- and post-harvest sampling were the following:

1. Post-harvest sampling locations for stand attributes, regeneration, and vegetation were established as permanent sample plots (PSP's) at new locations, which were statistically independent from the pre-harvest locations;
2. PSP plot size was set at a standard 0.1 hectare (20 m X 50 m) for all study sites. (Note: target *average* size of 0.10 ha in ICH group selection and group retention treatment units);
3. Post-harvest large-tree PSP's are rectangular (refer to Figure A and B, Appendix 1a) vs the circular temporary pre-harvest large-tree sample plots.
4. Post-harvest large-tree PSP's in the heterogenous group selection, group retention, and patch cut treatments are located systematically between harvest groups or retention patches in order to monitor the gradient of conditions created by these treatments (Figures C and D, Appendix 1a). In these treatments, additional paired vegetation and regeneration plots are located in harvested and unharvested areas.
5. Post-harvest regeneration plots are located at the centre of each of the 4 rectangular sectors in the large-tree PSP's.
6. CWD transects were re-established in the same locations as pre-harvest samples (in order to capture harvest inputs) and post-stratified based on location in relation to harvest openings.
7. All permanent monitoring installations are marked with color-coded painted angle-iron posts as per the working plan (Jull et al, 2000).

Pre- and post-harvest sample sizes for large-tree and vegetation plots, and CWD transects are summarized in Table 11 and 12.

Tables summarizing CWD transect location and bearings are provided in Appendix 1b. Locations of CWD transects were not changed pre- to post-harvest.

Detailed layout for post-harvest sample plots (large-tree, regeneration, and vegetation monitoring plots) are illustrated in Appendix 1a. The primary color codes for angle-iron plot stakes are (a) red (for PSP / vegetation plots), (b) yellow (for CWD transects), and (c) white (for regeneration sub-plots). Digitized maps of the locations of stand development PSP's (with associated vegetation and regeneration plots are provided in Appendix 1c, and a table indicating PSP locations, bearings, and plot dimensions is provided in Appendix 1d.

Table 11: Summary of ICH pre- and post-harvest sample sizes of stand development PSP / vegetation plots by treatment unit and study area.

Study Area	Treatment Unit	Stand Development PSP's		Coarse Woody Debris Transects
		Pre-harvest Temporary Plots	Post-harvest Permanent Plots (new locations)	(Permanent CWD transects established pre-harvest and remeasured post-harvest)
Lunate Creek	Uncut control	7	8	21
	Group selection	8	**8	24
	Group retention	8	**8	24
	Clearcut	8	8	24
Minnow Creek	Uncut control	6	8	18
	Group selection	8	**8	24
	Group retention	6	**8	18
	Clearcut	5	8	15
East Twin	Uncut control	7	8	21
	Group selection	6	**8	18
	Clearcut	6	8	18
TOTAL		**75**	**88**	**225**

* Number of large-tree plots per treatment unit. There are 3 replicated coarse woody debris transects and 4 advance regeneration subplots per large-tree plot.

** Group retention and group selection treatments have 2 paired vegetation plots and 2 sets of regeneration subplots per large-tree plot, to encompass both the harvested and unharvested portions of the treatment unit.

Table 12: Summary of ESSF pre- and post-harvest sample sizes large-tree / vegetation plots by treatment unit and study area.

Study Area	Treatment Unit	Stand Dev. PSP / Vegetation Plots		Coarse Woody Debris Transects
		Pre-harvest temporary plots	Post-harvest permanent plot	(Permanent transects established pre-harvest)
Bearpaw Ridge	Uncut control	10	10	28
	Single-tree selection	13	(10)	26
	Group selection	14	(10)	28
	1 ha. Patch cuts	14	(10)	28
Pinkerton Mountain	Uncut control	8	8	16
	Single-tree selection	8	8	16
	Group selection	8	8	16
TOTAL		**76**	**64**	**158**

* Number of large-tree plots per treatment unit. There are 4 advance regeneration subplots per large-tree plot.

** Group retention and group selection treatments will have 2 paired vegetation plots and 2 sets of regeneration subplots per large-tree plot, to encompass both the harvested and unharvested portions of the treatment unit.

( ) Brackets indicate independent samples yet to be established following harvest treatments.

7.2 Pre-harvest and Initial Post-harvest Forest Structure and Composition

Basal Area

Pre-harvest live and dead basal area by tree species and treatment units area are summarized in Table 13a for ICH study areas, and Table 14 for ESSF study areas. Detailed summaries by plot are included in Appendix 2a.

Post-harvest levels of live and dead standing basal area and estimated live and dead standing tree volumes in the ICH study areas are summarized in Tables 13b and 13c. Note that, as PSP's in the group retention and group selection treatment units are located in only the uncut portions of these unit (as the rest of the units are clear-felled), these values reflect only these uncut portions, not the entire treatment unit. Basal areas and volumes in the uncut control units, of course, remain essentially unchanged over the same 2000-2002 period.

For the ICH study areas in general, pre-harvest species composition of live trees (by basal area) at the Lunate and East Twin study areas are dominated by western redcedar (approximately 80-95% by basal area) with the remaining 5-20% including western hemlock, subalpine fir, and hybrid white spruce. The Minnow Creek study area has more of a mixed stand composition throughout, with percent basal area of redcedar ranging from 58-83%; at Minnow, redcedar is mixed with substantial but varying amounts of hybrid white spruce and subalpine fir (15-45% total). Very little western hemlock (<2%) is found within the Minnow study area.

Both the Bearpaw Ridge and Pinkerton Mountain study areas have extensive mixed stands of Engelmann spruce and subalpine fir. No other tree species are present at the Pinkerton Mountain study area, while only trace components (< 0.01 m^2/ha.) of western hemlock were found in the lower-elevation portions of the Bearpaw study area (and primarily in one treatment unit). Relative tree species composition (by basal area) is tilted towards spruce dominance at Bearpaw Ridge (51-64% spruce), while subalpine fir dominates over spruce at Pinkerton Mountain (63-75% subalpine fir). At Pinkerton, the post-harvest species composition is similar to the pre-harvest composition.

In general, standing live basal area in the ICH stands is 2-4 times the typical standing live basal area found in the ESSF stands, reflecting likely large differences in inherent site quality and canopy cover, and overall stand age between the two ecosystems. Based on pre-harvest data, basal area is typically 75-150 m^2 ha^{-1} in the three ICH study areas, and 30-35 m^2 ha^{-1} in the two ESSF study areas. In the ICH study areas, the post-harvest basal area within group retention patches, and in the uncut matrix of the group selection units, is very similar to pre-harvest means for these treatment units.

Interestingly, the basal area of standing dead stems is much less variable between the ICH and ESSF; in the five study areas examined, standing dead basal area typically ranged between 9-15 m^2 ha^{-1}.

Stand (Canopy) Top Height

Pre-harvest canopy top height (based on the mean height of the tallest 100 live sph in the stand) is summarized by treatment unit in Table 15 for ICH study areas, and Table 16 for ESSF study areas. Detailed summaries by plot and treatment unit area included in Appendix 2b.

Among the three ICH study areas, pre-harvest stand top height appears to be relatively homogeneous, both within and between treatment units and study areas, ranging from 33.9 - 40.6 metres. This relatively uniformity tends to suggest that the ecological similarities in site types identified by Beaudry (1999) are also reflective of inherent similar site quality at these sites. Canopy top height averages 37-38 metres at the Lunate and East Twin study area, and 34 metres at the Minnow study area.

For the ESSF study areas, stand top height of the tallest 100 sph is very uniform between treatment units within study areas, and relatively similar between the two study areas. Average canopy top height ranges from 24.3-25.0 metres at Bearpaw Ridge, and 26.1-27.6 at Pinkerton Mountain.

Stand Structure and Advance Regeneration

Pre-harvest stand tables (stems-per-hectare) of live and dead trees by species and diameter class by treatment unit for trees larger than 3.9 cm dbh are summarized in Appendix 2c.

Pre-harvest densities of advance regeneration (< 4 cm dbh) are summarized in Table 17 for ICH study areas, and Table 18 for ESSF study areas. Detailed tables of advance regeneration densities by plot and treatment unit are summarized in Appendix 2d.

In general, pre-harvest stand conditions in both the ICH and ESSF study areas display an uneven size structure of live stems, suggesting a similar broad age structure (although age data is limited for most sites to date). The broad range of diameter classes and abundance of advance regeneration of different size classes in all study areas suggests that there is sufficient recruitment of conifer regeneration in these stands to replace any mortality of large or older stems.

In the ICH study areas, advance regeneration of western redcedar of all size classes is generally very abundant in all three study areas, and may regenerate both from seed (generally on rotting wood) and by vegetative layering (and rooting) of branches that come in contact with the forest floor. Western hemlock advance regeneration and canopy trees is much less ubiquitous and more locally abundant in specific areas - for example in the western portion of the Lunate study area, and upslope portion of the East Twin study area. This suggests that western hemlock abundance may be more dependent on past prior disturbance to canopy trees or may be related to drier (i.e. - more sub-mesic) site conditions. Likewise, subalpine fir and hybrid white spruce advance regeneration likewise appear to be more locally abundant in areas of more recent gap disturbance in the stand, and also have greater relative abundance in areas of cold air drainage.

In the ESSF study areas, both spruce and subalpine fir are reasonably abundant in all tree size classes and canopy layers. Both spruce and subalpine fir advance regeneration and young pole-sized stems are found most frequently on decomposing nurse logs, although this preference is most strongly expressed in spruce. In terms of stems-per-hectare, subalpine fir generally outnumbers spruce in all but the upper canopy classes.

Standing Trees: Decay Classes and Wildlife Tree Types

As summarized in Tables 19-22, all study areas and treatment units had, prior to harvest, diverse stands possessing a wide range and abundance of tree decay classes and wildlife tree classes. ICH stands typically have > 80% of stems > 17.5 cm dbh in Class 1 (lowest decay class), while ESSF stands have about 60% of stems in equivalent classes. The most common wildlife tree types are Type 6 (loose overhanging bark or narrow crevices , used for bats and similar habitats), and Types 3 and 4 (small to large excavated or natural cavities).

The post-harvest occurrence and abundance of decay classes and wildlife tree types in standing trees in the ICH harvested treatment units are summarized in Tables 19b and 21b.

Coarse Woody Debris: Decay Classes, Volumes, and CWD Types

Pre-harvest CWD data is summarized in Tables 23-27. Both the ICH and ESSF study areas had, prior to harvest substantial CWD loadings, ranging from about 165-600 m^3/ha on ICH sites, and 125-295 m^3/ha on ESSF sites. All stands contain a wide range of decay classes of coarse woody debris (except perhaps for the oldest, most decayed Class 5), suggested consistent inputs of CWD to the forest floor over time. Different CWD types and related wildlife habitat attributes are locally abundant in different ICH or ESSF study areas.

The post-harvest occurrence and abundance of CWD types and CWD volumes in standing trees in the ICH harvested treatment units are summarized in Tables 23b, 25b, and 27b.

8. COMPARABILITY OF THE STUDY AREAS

General

Due to high precipitation and generally medium- and coarser-textured parent materials, podzolic soils tend to dominate sites on both ICH and ESSF sites in these Northern Wetbelt study areas. On more poorly-drained or finer-textured materials, soils of gleysolic character are also encountered. Within the ICH study areas, there are also some areas of finer-textured luvisolic soils. In general, forest floors are deeper in the ICH (6-15 cm) compared to the ESSF (4-6 cm), perhaps reflecting differences in productivity, litterfall, and composition rates.

The presence of a deep snowpack and upper-elevation snowmelt runoff during the growing season affects the seasonal pattern of soil water movement in both the wetbelt ICH and ESSF zones. Sub-surface seepage during the growing season indicates a relative absence of soil moisture deficits and relatively high productivity. In the ICH, soils will generally be wettest during and immediately after the spring snowmelt.

Wetbelt ICH Study Areas

The Lunate, Minnow, and East Twin study areas are in the ICHvk2, ICHwk3, and ICHwk3 subzones, respectively, and share many similar site series and ecological characteristics. At all sites, the mature forest cover is dominated by western redcedar, with variable abundance of minor species includng spruce, subalpine fir, and western hemlock. Spruce and subalpine fir are relatively more abundant (comprising an average of about 20% of the stand basal area) at the Minnow study area compared to the East Twin and Lunate study areas, which are generally >95% cedar by basal area. A relatively high proportion of western hemlock and subalpine fir stems are dead, suggesting that these two species have a high mortality rate and may have been declining in abundance over time in these stands.

Stands at both Minnow and East Twin appear to be late seral, and similar in age of stand origin; at these sites, the age of the oldest trees are estimated to be about 300-350 years of age (frequent buttrot prevents exact age determination). Carbon dating of surficial charcoal at the base of the forest floor suggests that these sites burned no more than 360-450 years before present.

At the Lunate study area there is a climax western red cedar forest which, based on stand structure and relative tree size appears to be substantially older (perhaps > 450-500 years). Basal area at the Lunate study area is also substantially higher than the other two sites, suggesting greater age since disturbance. However, no forest floor charcoal has yet been encountered in extensive soil sampling at this site.

CWD volumes on the ICH sites are very variable, ranging from as low as 165 to as high as 609 m^3/ha., depending on local stand conditions. Typical CWD volumes are in the 200-400 m^3/ha range.

In general, forest floor thicknesses are 6-12 cm in the ICHwk3 (Minnow and East Twin) and 10-15 cm thick in the ICHvk2 (Lunate); in terms of humus form, mormoder, humimors, and/or

hemimors predominate. At Lunate, plant indicators such as wild ginger (*Asarum caudatum*) and goat's beard (*Aruncus sylvestre*) are present, and there is more Douglas maple (*Acer douglasii*) than at the Minnow and East Twin sites. Similar stand top heights at the three sites (as discussed in Section 7.2) suggest that site quality in the three study areas are also broadly similar.

As summarized in Tables 19-28, all the ICH and ESSF study areas and treatment units have are well-forested, and possess abundant standing and downed trees with a wide range of decay classes, and wildlife habitat attributes.

Wetbelt ESSF Study Areas

The Pinkerton and Bearpaw study areas are broadly similar in many respects. While the Pinkerton site is classified as the ESSFwc3 subzone, the Bearpaw site is classified as the similar ESSFwk2 subzone, but is transitional to ESSFwc3 in the upper portion of the study area above 1350 m in elevation. The successional stage and stand structural classification in both areas is maturing climax or edaphic climax, and mature forest, respectively. While the relative proportions of Engelmann spruce and subalpine fir vary between the study areas (with spruce slightly predominating at Bearpaw, and subalpine fir at Pinkerton), overall stand top heights and apparent site quality appear to be generally similar. Mean top heights range from an average of 24-25 metres at the Bearpaw Ridge study area, to an average of 27-27 metres at Pinkerton.

Forests in both ESSF study areas are broadly unevenaged and uneven-sized in structure. Age of the oldest trees at Pinkerton Mountain are 200-275 years at 0.3 m in height while ages at Bearpaw Ridge are broadly similar (but need more age samples). Charcoal has been observed in surface soil horizons at both study areas, suggesting that catastrophic fires have occurred at both sites at some time in the past.

Typical CWD volume loadings on these ESSF sites range from 127 to 296 m^3/ha.

Parent materials for both these ESSF study areas are morainal blankets or morainal veneers over bedrock. Both sites include some areas of non-calcareous and calcareous (limestone) bedrock; however, surface morainal deposits are non-calcareous in nature. Soil classifications are Orthic Ferro-humic or Humo-ferric Podzols or gleyed variants of these soil types; humus forms are humus forms are tenuic humimors at Bearpaw and hemimors or tenuic hemimors at Pinkerton Mountain. Forest floor thicknesses are generally 4-8 cm. Site series are generally mesic (sub-mesic to sub-hygric) throughout, with local wet and dry phases of circum-mesic site series occurring depending on local drainage and soil conditions.

Although the Bearpaw study area is classified as the ESSFwk2 subzone, above 1350 m a.s.l., the ecosystems are transitional to the ESSFwc3 subzone with indicators that include subalpine fir dominance, presence of mountain arnica and bracted lousewort, and low percent cover of oak fern, leafy mosses and *Brachythecium sp*. None of the study area is in the SBSvk subzone, even at the lowest elevation of 1200 m a.s.l.. The Bearpaw Ridge study area generally had a forest floor thickness of 2.5-6.5 cm, dominated by Humimors.

9. BASELINE CLIMATE MONITORING

The objective of this study component, established May 2001, is to provide a baseline climate dataset for each study area. The principal investigators are Dr. Bob Sagar and project leader Mike Jull. Collection of climate data over a suitable period (minimum 5 years) is necessary to allow basic description of these study sites in terms of local and regional climatic conditions. Such data will allow researchers and forest managers to better assess the transferability of study results to other regions, subzones, and climatic conditions. As well, the availability of basic climate data for each study area will enhance these experimental sites for future research.

The basic reference climate variables are measured under open (clearcut) conditions. One climate station was installed at each study area, in the approximate centre of each clearcut treatment unit. At each climate station, standardized, automated instrumentation measures air and soil temperature, relative humidity, rainfall and solar radiation. Data will be recorded by a datalogger (Campbell Scientific, Model CR10X).

Climate stations at the East Twin and Minnow ICH study areas were installed as soon as possible following harvest and snowmelt in mid-May 2001 At the Pinkerton Mountain ESSF study area, an existing climate station in an nearby clearcut at similar elevation was upgraded in June 2001 to meet standards of the other study areas. Due to the timing of Fall 2001 site preparation activities, installation of the Lunate Creek climate station was delayed 12 months year until May 2002. All these climate stations will be run year-round until at least the end September, 2005.

10. DATA MANAGEMENT

The stand attribute data, but not the ecological and soil descriptions, are stored in an established object-oriented database (in this case, Microsoft Access 97). The storage design is linked to the format in which the data are collected in the field; this feature allows for easy extraction of data-sets in flat-files (i.e. - spreadsheets) for analyses in statistical analysis programs such as SAS, SPSS, and SYSTAT. The database was originally created and maintained at Industrial Forestry Services of Prince George BC. From 2002 onward, the database will be maintained at the University of Northern British Columbia, under the supervision of the project leaders. It is a relational database, and because all facets of data are linked by ID numbers, queries can be run for any desired relationship in the data set. The database will also provide continuity in data entry storage for subsequent re-measurements. Duplicate data files will be archived at the University of Northern BC and other storage sites in non-magnetic compact disk or similar media, in both database and equivalent flat-file spreadsheet formats.

The project leaders (Jull and Stevenson) have primary responsibility for ensuring that data collection forms, and data collection and entry conforms to project data collection protocols. Individual researchers will continue to be responsible for data collection, data entry, and delivery of data files. Pre and post-harvest field data (including large-tree, CWD, wildlife tree, regeneration, and vegetation data) were entered and uploaded in the project database following 1999-2001 field seasons, under the supervision of Bruce Rogers.

Table 13a: Pre-harvest summary of live and dead basal area (m^2/ha.) by species, and treatment unit for ICH study areas.

Note: Uncut control values are mean values of temporary and permanent sample plots (n=16 per control unit) while other treatment unit values are means of temporary pre-harvest sample plots only (n=+/-8 per treatment unit).

Study Area	**Treatment Unit**	**Live Basal Area** (m^2/ha)					**Dead Standing Basal Area (> 1.5 m height)** (m^2/ha)					**TOTAL LIVE** (m^2/ha)	**TOTAL DEAD** (m^2/ha)
		Bl	Cw	Hw	Sx	Other	Bl	Cw	Hw	Sx	Other		
Lunate Creek	UN	0.95	128.40	0.79	1.89	0.00	0.13	24.50	0.57	0.03	0.00	143.3	24.7
	GS	0.21	128.00	0.79	1.89	0.00	0.50	24.49	0.57	0.03	0.03	132.0	25.3
	GR	2.71	90.45	14.72	3.70	0.00	2.57	5.07	1.35	0.47	0.07	111.6	9.5
	CC	0.28	143.1	2.89	1.28	0.01	0.17	7.74	0.36	0.00	0.28	147.6	8.5
Minnow Creek	UN	6.60	82.86	0.00	9.31	0.00	4.07	3.04	0.00	2.39	0.63	98.8	10.1
	GS	8.49	54.54	1.07	13.39	0.00	7.27	0.74	0.92	2.84	0.00	77.5	11.8
	GR	13.20	45.35	0.71	17.74	0.98	2.4	2.07	0.00	5.49	0.50	77.8	10.1
	CC	8.64	98.60	0.33	11.72	1.33	8.27	1.47	0.00	3.62	0.06	120.6	13.4
East Twin Crk.	UN	1.77	98.00	11.73	1.44	0.00	1.47	6.20	1.17	1.76	0.00	112.9	10.6
	GS	0.07	116.8	1.37	0.42	0.00	0.90	6.08	0.26	1.31	0.00	118.7	8.6
	CC	1.18	11.70	5.30	3.28	0.00	1.77	6.14	1.59	0.74	0.00	121.4	10.2

Table 13b: Post-harvest summary of live and dead basal area (m^2/ha.) by species, and treatment unit for ICH study areas

(*Note: (1) Post-harvest basal areas in partial-cut (group retention and group selection) treatment units reflect only standing basal areas within sampled areas of uncut retention patches and uncut portions of group selection (the uncut matrix) respectively (2) All values are mean values of permanent sample plots (n=8 per treatment unit)*

Study Area	**Treatment Unit**	**Live Basal Area** (m^2/ha)					**Dead Standing Basal Area (> 1.5 m height)** (m^2/ha)					**TOTAL LIVE** (m^2/ha)	**TOTAL DEAD** (m^2/ha)
		Bl	Cw	Hw	Sx	Fd	Bl	Cw	Hw	Sx	Fd		
Lunate Creek	UN	0.28	140.84	1.13	2.24	0.0	5.07	23.92	0.0	0.64	0.0	**144.5**	**29.6**
	GS	0.52	179.03	2.39	1.18	0.0	4.32	14.25	0.18	1.37	0.0	**183.1**	**20.1**
	GR	2.84	94.41	11.49	4.62	0.0	1.05	6.29	0.72	0.73	0.0	**113.4**	**8.8**
	CC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**	**0.0**
Minnow Creek	UN	8.88	83.71	0.32	8.45	0.0	0.19	2.99	0.0	4.41	1.62	**101.4**	**9.2**
	GS	15.15	75.67	0.49	9.47	0.0	0.10	2.43	0.0	1.08	0.0	**100.8**	**3.6**
	GR	12.05	48.45	0.70	13.45	0.0	1.83	1.55	0.0	3.88	0.0	**74.7**	**7.3**
	CC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**	**0.0**
East Twin Crk.	UN	1.82	104.13	10.60	0.54	0.0	1.86	3.01	0.31	1.05	0.0	**117.1**	**6.2**
	GS	0.0	121.20	0.74	1.10	0.0	0.40	5.56	0.0	0.60	0.0	**123.0**	**6.6**
	CC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**	**0.0**

Table 13c: Post-harvest summary of live and dead estimated standing volume (m^3/ha.) by species, and treatment unit for ICH study areas.

(*Note: (1) Post-harvest volumes in partial-cut (group retention and group selection) treatment units reflect only standing volume within sampled areas of uncut retention patches and uncut portions of group selection (the uncut matrix) respectively). (2) Volumes estimated as product of basal area X height divided by 3.0. (3) All values are mean values of permanent sample plots only (n=8 per treatment unit).*

Study Area	**Treatment Unit**	**Live Standing Volume (estimated)** (m^3/ha)					**Dead Standing Volume (estimated)** (m^3/ha)					**TOTAL LIVE** (m^3/ha)	**TOTAL DEAD** ($m^2$3ha)
		Bl	Cw	Hw	Sx	Other	Bl	Cw	Hw	Sx	Other		
Lunate Creek	UN	2.15	1685.1	6.98	27.1	0.0	0.54	36.63	0.0	0.98	0.0	**1721.3**	**38.2**
	GS	4.70	2724.6	14.71	12.3	0.0	0.51	85.39	1.53	0.0	0.0	**2756.3**	**87.4**
	GR	26.51	1088.2	81.54	44.6	0.0	10.21	28.16	2.27	1.38	0.0	**1240.9**	**42.0**
	CC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**	**0.0**
Minnow Creek	UN	87.19	791.3	1.81	98.9	0.0	36.85	13.54	0.0	24.78	21.7	**976.2**	**96.9**
	GS	72.52	777.2	3.30	123.6	0.0	24.86	19.74	0.0	8.03	0.0	**976.6**	**52.63**
	GR	99.48	498.6	5.36	138.8	0.0	6.24	3.14	0.0	34.98	0.0	**742.2**	**44.4**
	CC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**	**0.0**
East Twin Crk.	UN	17.00	1076.9	80.56	5.38	0.0	10.80	10.88	0.50	0.81	0.0	**1179.8**	**23.0**
	GS	0.0	1514.6	7.64	14.4	0.0	0.15	13.37	0.0	0.21	0.0	**1536.6**	**13.7**
	CC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**	**0.0**

Table 14: Pre-harvest summary of live and dead basal area by species, and treatment unit for ESSF study areas

Study Area	Treatment Unit	Live Basal Area (m^2/ha)					Dead Standing Basal Area (> 1.5 m height) (m^2/ha)					TOTAL LIVE (m^2/ha)	TOTAL DEAD (m^2/ha)
		Bl	Cw	Hw	Sx	Other	Bl	Cw	Hw	Sx	Other		
Bearpaw Ridge	UN	14.75			21.82		9.04			1.39		36.57	10.43
	ST	16.55			16.99		7.81			2.05	0.04	33.55	9.89
	GS	12.53			22.40		8.43			3.03		34.93	11.45
	PC	13.50		0.04	22.12		10.92		0.00	1.18	0.16	35.67	12.96
Pinkerton Mtn.	UN	25.00			13.60		13.04			0.65		38.58	13.70
	ST	27.47			8.86		12.02			0.21		36.33	12.23
	GS	24.49			14.10		11.81			0.52		38.59	12.33

Table 15: Pre-harvest summary of mean canopy top height in metres (mean of tallest 100 sph) by treatment unit for ICH study areas.

Study Area	Treatment Unit	Mean Canopy Top Height	Standard Deviation	Minimum Top Height (m)	Maximum Top Height (m)
Lunate Creek	UN	38.1	0.85	34.4	44.1
	GS	40.5	1.04	36.1	44.4
	GR	33.6	0.66	29.8	35.5
	CC	38.4	0.97	34.5	42.1
Minnow Creek	UN	34.1	0.73	27.0	37.8
	GS	35.2	0.64	33.0	37.6
	GR	34.1	0.76	29.2	36.0
	CC	33.9	1.46	30.6	39.2
East Twin Crk.	UN	35.9	0.96	31.9	38.9
	GS	40.6	1.67	32.9	44.0
	CC	36.9	0.67	33.3	38.6

Table 16: Pre-harvest summary of mean canopy top height (tallest 100 sph) by treatment unit for ESSF study areas.

Study Area	Treatment Unit	Mean Canopy Top Height	Standard Deviation	Minimum Top Height (m)	Maximum Top Height (m)
Bearpaw Ridge	UN	25.0	0.74	21.9	30.3
	ST	24.3	0.90	16.8	28.9
	GS	25.3	0.90	19.4	31.3
	PC	24.7	0.50	20.9	28.3
Pinkerton Mtn.	UN	27.6	0.46	25.6	29.4
	ST	26.3	1.00	22.3	29.5
	GS	26.1	0.96	21.7	29.3

Table 17: ICH treatment-unit summary of pre-harvest advance regeneration densities (stems-pr-hectare) by species and size class

Study Area	Trmt Unit	Height Class < 30 cm					Height Class 30-130 cm					Height Class > 130 cm				
		Bl	Cw	Hw	Sx	Total of class	Bl	Cw	Hw	Sx	Total of class	Bl	Cw	Hw	Sx	Total of class
Lunate	UN	13.	778.	10.	7.	**810.**	16.	1149.	22.	33.	**1220.**	< 1	38.	1.	1.	**40.**
	GS	0.	31.	0.	0.	**31.**	24.	566.	0.	19.	**608.**	1.	16.	0.	0.	**17.**
	GR	306.	569.	231.	19.	**1125.**	295.	869.	685.	109.	**1958.**	5.	25.	14.	4.	**48.**
	CC	14.	236.	0.	7.	**257.**	36.	740.	6.	14.	**796.**	0.	18.	1.	1.	**19.**
Minnow	UN	542.	542.	0.	67.	**1150.**	405.	823.	0.	99.	**1327.**	3.	18.	0.	1.	**22.**
	GS	387.	437.	100.	94.	**1019.**	816.	859.	24.	184.	**1883.**	15.	16.	1.	3.	**35.**
	GR	275.	642.	167.	67.	**1150.**	228.	262.	33.	243.	**766.**	5.	5.	0.	7.	**17.**
	CC	1540.	440.	50.	70.	**2100.**	2168.	1633.	9.	99.	**3910.**	41.	46.	1.	1.	**89.**
				222.												
East Twin	UN	281.	466.	18.	0.	**969.**	131.	1601.	102.	6.	**1840.**	< 1.	18.	1.	0.	**19.**
	GS	54.	104.	14.	7.	**182.**	93.	654.	40.	18.	**804.**	4.	14.	3.	0.	**21.**
	CC	0.	86.		0.	**100.**	29.	1974.	69.	14.	**2086.**	0.	47.	2.	0.	**49.**

Table 18: ESSF Treatment-unit summary of pre-harvest advance regeneration densities (stems-per-hectare) by species and size class

Study Area	Trmt Unit	Height Class < 30 cm					Height Class 30-130 cm					Height Class > 130 cm				
		Bl	Cw	Hw	Sx	Total of class	Bl	Cw	Hw	Sx	Total of class	Bl	Cw	Hw	Sx	Total of class
Bearpaw	UN	700.	0.	0.	841.	**1541.**	929.	0.	5.	353.	**1287.**	36.	0.	0.	12.0	**48.**
	STS	346.	0.	0.	218.	**564.**	483.	0.	0.	133.	**616.**	20.	0.	0.	7.	**27.**
	GS	275.	0.	0.	921.	**1196.**	260.	0.	0.	341.	**601.**	12.	0.	0.	1.4	**13.**
	PC	478.	0.	0.	596.	**1074.**	639.	0.	0.	350.	**988.**	33.	0.	0.	11.	**43.**

Table 19a. Pre-harvest occurrence of decay classes of standing trees in ICH treatment units.

Study area	Treatment unit	Decay Class (stems/ha)								
		Class1	Class2	Class3	Class4	Class5	Class6	Class7	Class8	Total
L	UN	203	30	10	7	9	7	2	1	270
L	GS	211	26	4	4	7	11	0	0	263
L	GR	272	45	18	10	4	2	0	0	351
L	CC	288	28	5	5	10	2	7	0	345
M	UN	407	15	35	16	3	1	1	0	477
M	GS	352	20	42	22	6	3	0	1	446
M	GR	323	19	12	13	5	3	1	1	377
M	CC	466	38	45	42	6	0	2	0	598
ET	UN	493	63	20	24	16	0	0	0	616
ET	GS	353	16	9	21	4	3	0	1	408
ET	CC	385	14	25	10	1	0	1	1	438

Table 19b. Post-harvest occurrence of decay classes of standing trees in ICH treatment units.

Study area	Treatment unit	Decay Class (stems/ha)								
		Class1	Class2	Class3	Class4	Class5	Class6	Class7	Class8	Total
area	unit	Class1	Class2	Class3	Class4	Class5	Class6	Class7	Class8	Total
L	UN	285	13	8	10	15	5	4	1	340
L	GS	315	9	4	9	5	1	0	0	344
L	GR	335	20	13	9	6	5	0	1	390
M	UN	456	11	15	33	13	0	4	1	533
M	GS	360	9	10	25	6	4	1	1	417
M	GR	348	23	16	12	6	3	0	1	409
E	UN	566	15	9	24	6	4	1	3	628
E	GS	313	15	11	4	4	1	0	0	348

Table 20. Pre-harvest occurrence of decay classes of standing trees in ESSF treatment units.

Study area	Treatment unit	Decay Class (stems/ha)								
		Class1	Class2	Class3	Class4	Class5	Class6	Class7	Class8	Total
BP	UN	252	9	14	39	37	8	1	0	360
BP	ST	204	23	15	68	6	1	0	0	318
BP	GS	178	6	32	72	7	0	0	0	295
BP	PC	221	24	22	70	6	13	1	0	355
PI	UN	208	40	10	58	18	9	3	5	349
PI	ST	193	6	3	37	16	6	17	13	290
PI	GS	213	16	19	56	13	7	9	4	336

Table 21a. Pre-harvest occurrence of Wildlife Tree Types of standing trees in ICH treatment units.

Study area	Treatment unit	Wildlife Tree Type (stems/hectare)											
		CWD 1	CWD 3	WLT 1	WLT 2	WLT 3	WLT 4	WLT 5	WLT 6	WLT 7	WLT 8	WLT 9	WLT 10
Lunate Creek	UN	73	16	13	2	8	3	8	42	1	0	1	0
Lunate Creek	GS	80	12	6	2	22	5	7	50	1	2	1	1
Lunate Creek	GR	46	0	8	0	4	2	2	34	0	1	0	2
Lunate Creek	CC	67	7	4	0	8	0	11	41	0	0	0	0
Minnow	UN	80	1	3	0	8	5	1	31	0	0	0	5
Minnow	GS	74	0	6	1	3	2	1	49	0	0	1	0
Minnow	GR	72	0	17	3	9	7	7	31	0	1	3	3
Minnow	CC	91	6	11	0	11	5	2	80	5	2	8	3
East Twin	UN	23	0	7	1	0	0	0	12	0	3	0	0
East Twin	GS	93	2	6	3	5	8	3	45	3	0	0	3
East Twin	CC	80	5	5	1	6	1	5	19	3	9	0	3

Table 21b. Post-harvest occurrence of Wildlife Tree Types of standing trees in ICH treatment units.

Study area	Treatment unit	Wildlife Tree Type (stems/hectare)											
		CWD 1	CWD 3	WLT 1	WLT 2	WLT 3	WLT 4	WLT 5	WLT 6	WLT 7	WLT 8	WLT 9	WLT 10
Lunate Creek	UN	40	1	11	4	8	3	5	29	0	8	0	0
Lunate Creek	GS	59	4	13	3	4	3	5	36	0	7	1	9
Lunate Creek	GR	34	0	8	6	3	3	1	27	0	6	0	11
Minnow Creek	UN	80	1	21	3	11	3	3	43	0	6	0	1
Minnow Creek	GS	40	1	10	8	3	1	1	21	0	1	0	12
Minnow Creek	GR	39	0	13	9	7	3	0	7	0	3	1	3
East Twin	UN	85	0	56	3	6	3	1	16	0	8	0	0
East Twin	GS	71	1	11	0	6	0	3	30	0	0	0	4

Table 22. Pre-harvest occurrence of Wildlife Tree Types of standing trees in ESSF treatment units.

Study area	Treatment unit	CWD 1	CWD 3	WLT 1	WLT 2	WLT 3	WLT 4	WLT 5	WLT 6	WLT 7	WLT 8	WLT 9	WLT 10
Bear Paw Ridge	UN	14	1	8	10	11	4	1	25	3	2	1	12
Bear Paw Ridge	ST	14	0	11	1	2	3	0	25	0	0	2	22
Bear Paw Ridge	GS	18	0	0	0	2	2	0	34	2	0	2	18
Bear Paw Ridge	PC	18	1	10	1	7	2	2	35	2	0	2	23
Pinkerton	UN	118	15	8	4	10	5	4	80	3	1	6	13
Pinkerton	GS	112	3	29	3	24	0	10	88	0	12	17	76
Pinkerton	ST	78	9	22	16	17	7	12	83	0	17	12	29

Table 23a. Pre-harvest occurrence of decay classes of CWD in ICH treatment units.

		Decay Class (pieces per 100 m)				
		Class1	Class2	Class3	Class4	Class5
Lunate	UN	4.6	6.3	3.4	3.8	1.0
Lunate	GS	2.3	4.0	3.0	2.1	0.9
Lunate	GR	2.3	3.3	4.5	8.0	1.9
Lunate	CC	3.3	7.1	5.4	4.0	1.2
Minnow	UN	2.8	8.8	6.0	4.9	1.4
Minnow	GS	6.4	8.7	3.5	3.8	1.2
Minnow	GR	4.4	10.2	3.5	3.2	0.5
Minnow	CC	2.2	6.4	2.8	4.4	2.5
East Twin	UN	2.3	10.9	8.6	2.3	0.0
East Twin	GS	1.4	7.4	3.7	3.2	0.9
East Twin	CC	0.6	8.1	3.8	2.4	1.0

Table 23b. Post-harvest occurrence of decay classes of CWD in ICH treatment units.

		Decay Class (pieces per 100 m)				
		Class1	Class2	Class3	Class4	Class5
Lunate	UN	4.6	6.3	3.4	3.8	1.2
Lunate	GS	10.4	4.3	4.7	4.0	1.7
Lunate	GR	8.0	4.3	3.5	5.7	2.8
Lunate	CC	12.3	11.5	4.2	3.6	1.9
Minnow	UN	2.8	9.3	6.7	5.6	1.6
Minnow	GS	7.5	7.1	4.2	4.5	3.8
Minnow	GR	13.9	10.2	5.1	4.9	1.9
Minnow	CC	20.8	9.4	0.8	2.2	1.7
East Twin	UN	3.4	8.9	4.8	3.2	1.0
East Twin	GS	10.6	5.6	1.6	2.5	1.4
East Twin	CC	19.7	7.4	2.5	4.4	1.4

Table 24. Pre-harvest occurrence of decay classes of CWD in ESSF treatment units

		Decay Class (pieces per 100 m)				
		Class 1	Class 2	Class 3	Class 4	Class 5
Bearpaw	CC	0.7	8.5	4.3	3.4	1.2
Bearpaw	GS	1.2	7.0	5.1	1.2	0.1
Bearpaw	STS	1.3	7.9	3.0	1.8	0.0
Bearpaw	UN	2.4	9.4	8.2	0.4	0.0
Pinkerton	UN	1.0	11.5	12.0	5.2	4.9
Pinkerton	GS	0.5	9.1	13.3	7.0	4.2
Pinkerton	ST	2.6	7.6	9.6	6.8	0.3

Table 25a. Pre-harvest occurrence of CWD Types in ICH treatment units

Study area	Treatment unit	CWD Types (pieces per 100 m) CWD 1	CWD 2	CWD 3	CWD 4	CWD 5	CWD 6
Lunate	UN	8.7	15.3	2.8	10.5	8.5	0.0
Lunate	GS	3.0	10.2	0.9	8.3	5.2	0.0
Lunate	GR	5.9	18.2	1.6	13.4	6.6	0.0
Lunate	CC	5.6	18.6	2.1	16.0	8.3	0.0
Minnow	UN	6.0	25.0	2.1	17.6	10.9	0.2
Minnow	GS	6.6	20.5	3.1	16.1	11.8	0.3
Minnow	GR	11.1	17.1	4.6	12.7	9.0	0.2
Minnow	CC	6.7	15.8	2.5	8.1	6.9	0.0
East Twin	UN	2.5	19.2	0.5	14.1	6.9	0.2
East Twin	GS	2.5	15.3	0.9	9.3	6.7	0.0
East Twin	CC	2.4	13.1	1.6	10.3	5.2	0.0

Table 25b. Post-harvest occurrence of CWD Types in ICH treatment units

Study area	Treatment unit	CWD Types (pieces per 100 m) CWD 1	CWD 2	CWD 3	CWD 4	CWD 5	CWD 6
Lunate	UN Total	8.7	15.3	2.8	10.5	8.5	0.0
Lunate	GS Total	5.6	15.1	3.5	11.1	8.2	0.0
Lunate	GR Total	4.9	16.7	1.6	12.3	6.6	0.0
Lunate	CC Total	8.5	22.0	4.5	17.4	11.8	0.0
Minnow	UN Total	6.0	24.3	2.5	16.9	10.2	0.0
Minnow	GS Total	4.9	20.3	2.8	15.1	9.0	0.3
Minnow	GR Total	8.6	22.5	2.1	15.7	10.0	0.7
Minnow	CC Total	3.3	13.1	0.6	6.1	6.7	0.0
East Twin	UN Total	2.2	16.7	0.4	12.3	6.3	0.2
East Twin	GS Total	2.5	18.1	0.9	11.6	7.6	0.0
East Twin	CC Total	2.5	20.8	1.6	15.0	9.5	0.2

Table 26. Pre-harvest occurrence of ESSF Types in ESSF treatment units

Study area	Treatment unit	CWD Types (pieces per 100 m) CWD 1	CWD 2	CWD 3	CWD 4	CWD 5	CWD 6
Bearpaw	UN	1.0	20.7	0.4	18.2	5.4	0.1
Bearpaw	STS	2.2	12.1	0.9	10.4	7.3	0.0
Bearpaw	GS	2.1	14.1	0.3	12.3	5.1	1.1
Bearpaw	CC	2.1	13.8	0.3	11.3	4.7	0.1
Pinkerton	UN	20.1	23.7	12.5	10.4	15.4	0.5
Pinkerton	ST	8.3	25.8	3.6	13.8	5.5	1.8
Pinkerton	GS	11.5	25.5	5.2	16.1	8.3	1.6

Table 27a. Pre-harvest CWD volume in ICH treatment units.

Study area	Treatment unit	Volume (m3/ha)	SE	No. of transects
Lunate	UN	424.3	85.7	19
Lunate	GS	200.8	40.5	23
Lunate	GR	233.1	30.3	24
Lunate	CC	608.9	141	24
Minnow	UN	341.9	61	18
Minnow	GS	272.1	37	24
Minnow	GR	298.5	42.2	18
Minnow	CC	183.9	28.9	15
East Twin	UN	164.9	31.3	18
East Twin	GS	200.3	48.1	17
East Twin	CC	251.2	55.6	20

Table 27b. Post-harvest CWD volume in ICH treatment units.

Study area	**Treatment unit**	**Volume (m3/ha)**	**SE**	**No. of transects**
Lunate	UN	486.2	123.9	19
Lunate	GS	642.3	124.9	23
Lunate	GR	538.8	63.5	25
Lunate	CC	1383.8	304.1	27
Minnow	UN	353.329	59.3	18
Minnow	GS	628.2	85	24
Minnow	GR	709	88.4	20
Minnow	CC	560	63.1	15
East Twin	UN	188	37	18
East Twin	GS	288.5	49.4	17
East Twin	CC	399.1	73.2	21

Table 28. Pre-harvest CWD volume in ESSF treatment units.

Study area	Treatment unit	Volume (m3/ha)	SE	No. of transects
Bearpaw	UN	181.6	34.8	30
Bearpaw	ST	127.7	13.7	25
Bearpaw	GS	136.7	18.9	28
Bearpaw	PC	135	17.4	26
Pinkerton	UN	205.2	25	16
Pinkerton	ST	295.4	33.7	18
Pinkerton	GS	270.5	48.7	18

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APPENDICES SUMMARY

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APPENDIX 1:

DETAILED PRE- AND POST-HARVEST

PERMANENT PLOT LAYOUT AND LOCATIONS

Appendix 1a:

Diagrams of Permanent Sample Plot Layout

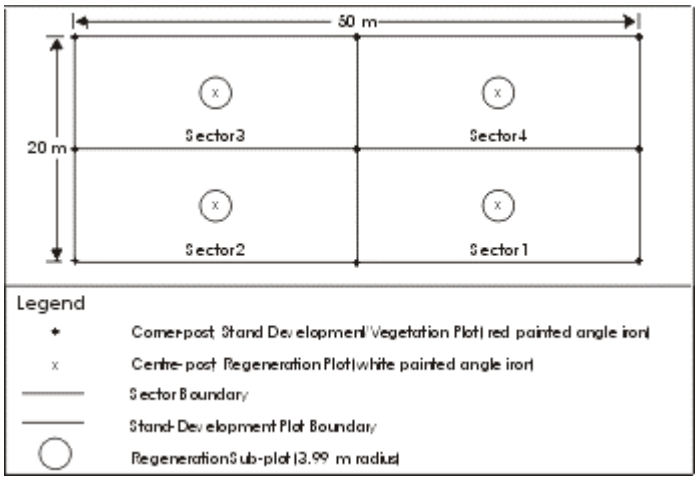

Figure 5: Diagram of layout of stand development / vegetation-monitoring permanent sample plot (PSP), Northern Wetbelt Silvicultural Systems Project.

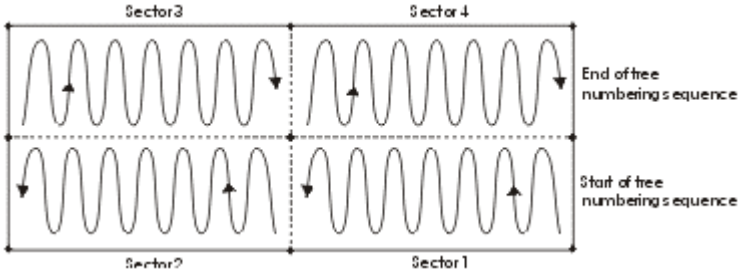

Figure 6: Sequence of tree numbering on stand development / vegetation-monitoring permanent sample plot (PSP), Northern Wetbelt Silvicultural Systems Project.

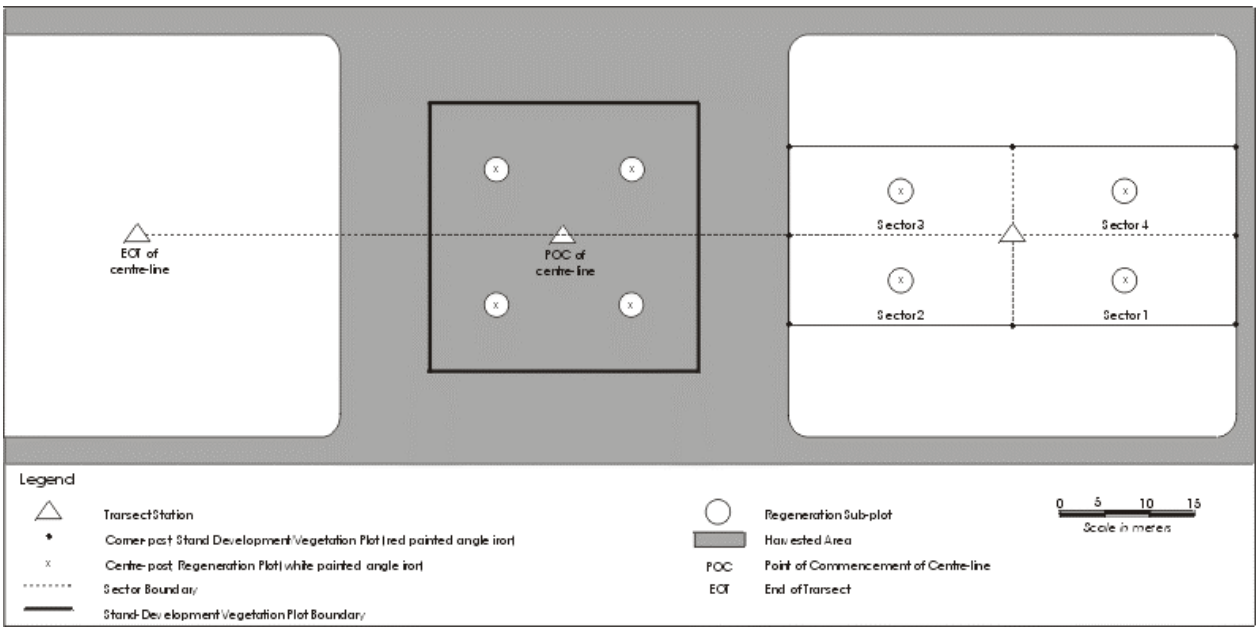

Figure 7: Post-harvest Layout of stand development PSP (within unharvested area) and associated vegetation plots in harvested and unharvested areas, within group retention treatment units.

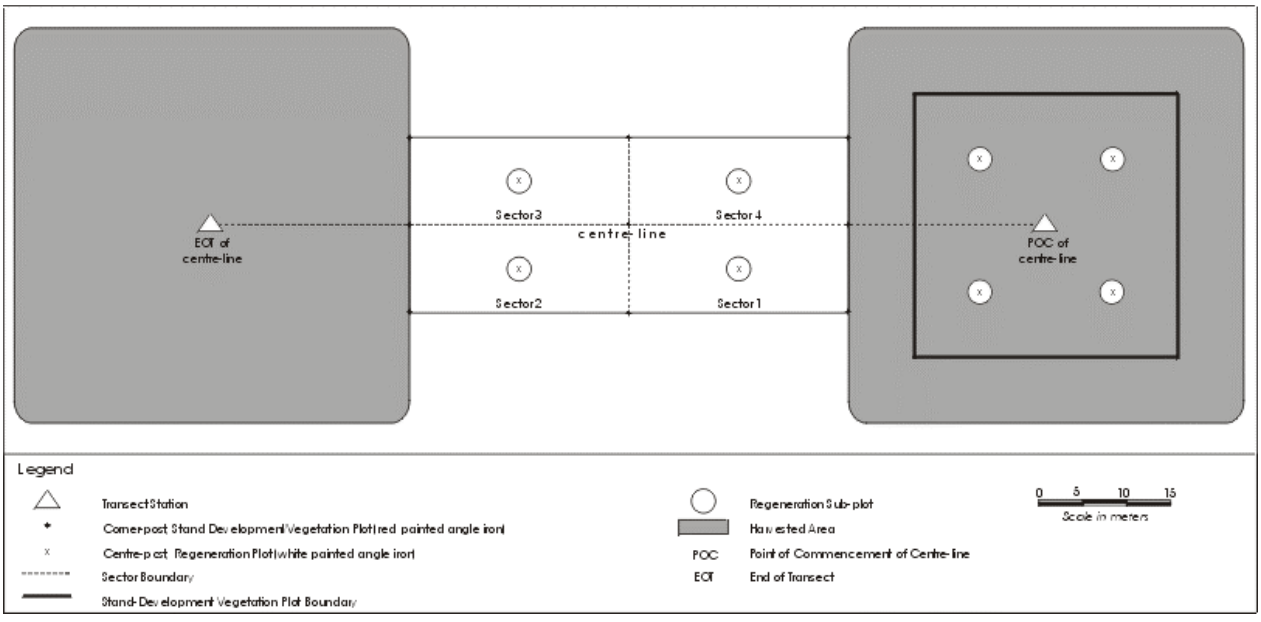

Figure 8: Post-harvest Layout of stand development PSP (within unharvested area) and associated vegetation plots in harvested and unharvested areas, within group selection or patch cut treatment units.

Appendix 1b:
Coarse Woody Debris Transects:
Locations and Bearings

Coarse Woody Debris (CWD) Transect and pre-harvest temporary sample plot Location information

Additional information relevant to relocation of plots and transects is as follows:

B/L = base line
S/L = strip line
POC = point of commencement for CWD transect
EOT = end of transect
PC = plot center for CWD and LT
T1, T2….= Transect 1, Transect 2…
CP = cruise plot

Bearpaw Ridge clear-cut patches all tie in at the north east corners. The chainage and bearings provided will direct you to the plot center.
Designations such as R7, H3, H4 etc. represent openings and are used as reference points in the Bearpaw GS treatment unit.

CWD transects were established along the "direction of travel" (direction of movement along a strip line within a treatment unit, indicated by ascending plot numbers)
All CWD transects proceed at random azimuths for 24 m from a POC to an EOT. In East Twin, Minnow and Lunate, CWD-T1-POC is at the 1999 LT-PC. T2-POC is at 50 m in the direction of travel on the S/L, and T3-POC is at 50 m in the S/L to S/L direction of travel. Bearpaw CWD-T1-POC commences from the LT-PC. T2-POC commences from a point based on a random bearing from the LT-PC 14.1 m to the LT perimeter.

An example of a LT plot location description with CWD transect azimuths is as follows:

Distance on S/L	Bearing on S/L	Strip line	Transect bearing
0+050 m	@ 250	S/L 15	T1=250…

Coarse Woody Debris (CWD) Transect Locations and Bearings

Site	Date /Status	Treatment	Plot	S/L-distance-transect bearing
Bearpaw	1999/pre-h	CC	1	0+040 m along S. bndry to transect. Then 0+060 m @235 then 0+010 m @ 325 to PC-1. POC=14.1 m @ 346 – from PC-1, T1=311, T2 = 106
Bearpaw	1999/pre-h	CC	2	0+054 m@ 325 from PC – 1. POC (T2)=14.1 m @ 56 from PC-2, T1=85, T2=82
Bearpaw	1999/pre-h	CC	3	0+017 m @ 180 to transect, then 0+045 m @268 to PC – 3. POC (T2)=14.1 m @ 283 from PC-4 T1=108, T2=98
Bearpaw	1999/pre-h	CC	4	0+123 m @ 178 from PC-3. POC (T2)=14.1 m @ 258 from PC-4 T1=258, T2=146
Bearpaw	1999/pre-h	CC	5	0+023 M @ 260 from NE corner. POC (T2)=14.1 m @ 147 from PC-5 T1=68 T2=223
Bearpaw	1999/pre-h	CC	6	0+059 m @ 168 from PC – 5. POC (T2)=14.1 m @ 314 from PC-6, T1=208, T2=84
Bearpaw	1999/pre-h	CC	7	0+045 @ 164 to transect, then 0+044 m @ 270 to PC-7. POC (T2)=14.1 m @ 167 from PC-7, T1=120 T2=007
Bearpaw	1999/pre-h	CC	8	0+109 m @ 180 from PC-7. POC (T2)=14.1 m @ 180 from PC-8, T1=307, T2=174
Bearpaw	1999/pre-h	CC	9	0+025 m@ 225 to transect, then 0+077 m @ 315 to PC-9. POC (T2)=14.1 m @ 195 from PC-8, T1=341 T2=109
Bearpaw	1999/pre-h	CC	10	0+063 @ 045 from PC-9. POC (T2)=14.1 m @ 022 from PC-10, T1=238, T2=65
Bearpaw	1999/pre-h	CC	11	0+030 m @ 193 to transect then 0+042 m @ 315 to PC-11 POC (T2)=14.1 m @ 69 from PC-11, T1=205, T2=339
Bearpaw	1999/pre-h	CC	12	0+066 m @ 225 from PC-11. POC (T2)=14.1 m @ 299 from PC-12, T1=137, T2=92
Bearpaw	1999/pre-h	CC	13	0+033 m @ 278 from NE corner. POC (T2)=14.1 m @ 050 from PC-13, T1=219, T2=319
Bearpaw	1999/pre-h	CC	14	0+070 @ 007 from PC-13. POC (T2)=14.1 m @ 125 from PC-14, T1=347, T2=206
Bearpaw	1999/pre-h	GS	1	@ R7. POC (T2)=14.1 m @ 150 from PC-GS1, T1=87, T2=300
Bearpaw	1999/pre-h	GS	2	@ 42 m West of GS1. POC (T2)=14.1 m @ 324 from PC-GS2, T1=59, T2=017
Bearpaw	1999/pre-h	GS	3	@ H4 (320 m @ 145 from center of R7. POC (T2)=14.1 m @ ? from PC-GS3, T1=349, T2=033
Bearpaw	1999/pre-h	GS	4	@ 35 m SW of GS3. POC (T2)=14.1 m @ 058 from PC-GS4, T1=79, T2=219
Bearpaw	1999/pre-h	GS	5	@ H3 (100 m @ 310 from H4). POC (T2)=14.1 m @ 280 from PC-GS5, T1=198, T2=273
Bearpaw	1999/pre-h	GS	6	@ 0+038 East from PC GS5. POC (T2)=14.1 m @ ? from PC-GS6, T1=147 T2=?
Bearpaw	1999/pre-h	GS	7	@ H7 (0+240 m @295 from GS6). POC (T2)=14.1 m @ 244 from PC-GS7, T1=188, T2=022
Bearpaw	1999/pre-h	GS	8	@ 0+045 m NE from GS7. POC (T2)=14.1 m @ 113 from PC-GS8, T1=093, T2=200
Bearpaw	1999/pre-h	GS	9	@ H9 (0+065 m @340 from GS8). POC (T2)=14.1 m @ 196 from PC-GS9, T1=141, T2=348
Bearpaw	1999/pre-h	GS	10	@ 0+045 m @ 90 from PC GS7. POC (T2)=14.1 m @ 149 from PC-GS10, T1=007, T2=145
Bearpaw	1999/pre-h	GS	11	@ R4 (0+090 m @ 357 from GS10. POC (T2)=14.1 m @ 319 from PC-GS11, T1=169 T2=032
Bearpaw	1999/pre-h	GS	12	No chainage follow yellow ribbon. POC (T2)=14.1 m @ 191 from PC-GS12, T1=181, T2=311
Bearpaw	1999/pre-h	GS	13	@ R2 (0+014 m off NE tie point, flagged yellow. POC (T2)=14.1 m @ 159 from PC-GS13, T1=089, T2=298
Bearpaw	1999/pre-h	GS	14	No chainage follow yellow ribbon. POC (T2)=14.1 m @ 012 from PC-GS14, T1=044, T2=288
Bearpaw	1999/pre-h	STS	1	@ CP 22 S/L 5. POC (T2)=14.1 m @ 152 from PC-STS1, T1=066, T2=194
Bearpaw	1999/pre-h	STS	2	@ CP 93 S/L 24. POC (T2)=14.1 m @ 045 from PC-STS2, T1=024, T2=244

Bearpaw	1999/pre-h	STS	3	@ CP 23 S/L 5 POC (T2)=14.1 m @ 138 from PC-STS3, T1=?, T2=38
Bearpaw	1999/pre-h	STS	4	@ CP 91 S/L 24. POC (T2)=14.1 m @ 351 from PC-STS4, T1=250, T2=259
Bearpaw	1999/pre-h	STS	5	@ CP 89 S/L 23. POC (T2)=14.1 m @ 019 from PC-STS5, T1=241, T2=347
Bearpaw	1999/pre-h	STS	6	@ CP 24 S/L 5. POC (T2)=14.1 m @ 044 from PC-STS6, T1=20, T2=154
Bearpaw	1999/pre-h	STS	7	@ 0+025 m @ 220 from CP 26A S/L 6. POC (T2)=14.1 m @ 235 from PC-STS7 T1=94?, T2=148
Bearpaw	1999/pre-h	STS	8	Not sampled
Bearpaw	1999/pre-h	STS	9	@ CP 99 S/L 25 . POC (T2)=14.1 m @ 068 from PC-STS068, T1=046, T2=010
Bearpaw	1999/pre-h	STS	10	@ CP 27A S/L 6. POC (T2)=14.1 m @ 327 from PC-STS10, T1=008, T2=354
Bearpaw	1999/pre-h	STS	11	@ CP 30 S/L 7. POC (T2)=14.1 m @ 167 from PC-STS167, T1=326, T2=84
Bearpaw	1999/pre-h	STS	12	@ CP 97 S/L 25. POC (T2)=14.1 m @ 273 from PC-STS12, T1=042, T2=113
Bearpaw	1999/pre-h	STS	13	@ CP 28A S/L 6. POC (T2)=14.1 m @ 159 from PC-STS13, T1=244, T2=159
Bearpaw	1999/pre-h	STS	14	@ CP 95 S/L 25. POC (T2)=14.1 m @ 070 from PC-STS14, T1=260, T2=291
Bearpaw	2000/pre-h	UN	1	0+225 @ 222 S/L9 - T1 = 332 T2 = 100 T3 = 001
Bearpaw	2000/pre-h	UN	2	0+075 @ 222 S/L 9 T1 = 034 T2 = 084 T3 = 067
Bearpaw	2000/pre-h	UN	3	0+075 @ 42 S/L 9 T1 = 308 T2 = 121 T3 = 347
Bearpaw	2000/pre-h	UN	4	0+225 @ 42 S/L9 T1 = 086 T2 = 254 T3 = 053
Bearpaw	2000/pre-h	UN	5	0+150 @ 42 S/L 8b T1 = 129 T2 = 332 T3 = 004
Bearpaw	2000/pre-h	UN	6	0+000 B/L S/L 8b T1 = 135 T2 = 105 T3 = 071
Bearpaw	2000/pre-h	UN	7	0+150 @ 222 S/L8b T1 = 294 T2 = 278 T3 = 321
Bearpaw	2000/pre-h	UN	8	0+150 @ 222 S/l 8a T1 = 048 T2 = 102 T3 = 156
Bearpaw	2000/pre-h	UN	9	0+075 @ 42 S/L 8a T1 = 112 T2 = 258 T3 = 173
Bearpaw	2000/pre-h	UN	10	0+225 @ 42 S/L 8a T1 = 025 T2 = 042 T3 = 008

Coarse Woody Debris (CWD) Transect Locations and Bearings

Site	Date /Status	Treatment	Plot	S/L-distance-transect bearing
East twin	1999/pre-h	CC	1	0+050 m @ 125 deg. S/L 1 – T1 = 156, T2 = 319, T3 = 114
East twin	1999/pre-h	CC	2	0+100 m @ 125 deg. S/L 2 – T1 = 195, T2 = 004, T3 = 001
East twin	1999/pre-h	CC	3	0+000 m @ B/L. S/L 2 – T1 = 255, T2 = 327, T3 = 165
East twin	1999/pre-h	CC	4	0+050 m @ 125 deg. S/L 3 – T1 = 123, T2 = 322, T3 = 59
East twin	1999/pre-h	CC	5	0+000 m @ B/L. S/L 4 – T1 = 176, T2 = 52, T3 = 211
East twin	1999/pre-h	CC	6	0+050 m @ 125 deg. S/L 5 – T1 = 008, T2 = 188, T3 = 329
East twin	1999/pre-h	CC	7	0+050 m @ 305 deg. S/L 5 – T1 = 322, T2 = 200, T3 = 351
East twin	1999/pre-h	GS	1	0+083 m @ 125 deg S/L 2 – T1 = 72, T2 = 278, T3 = 180
East twin	1999/pre-h	GS	2	0+000 m @ B/L S/L 2 – T1 = 140, T2 = 255, T3 = 176
East twin	1999/pre-h	GS	3	0+050 m @ 305 deg S/L 3 – T1 = 055, T2 = 274, T3 = 038
East twin	1999/pre-h	GS	4	0+000 m @ B/L S/L 5 – T1 = 195, T2 = 254, T3 = 281
East twin	1999/pre-h	GS	5	0+050 m @ 125 deg S/L 6 – T1 = 248, T2 = 317, T3 = 302
East twin	1999/pre-h	GS	6	0+050 m @ 125 deg S/L 1 – T1 = 89, T2 = 233, T3 = 240
East twin	2000/post-h	GS	9	Transect proceeds at 28 deg. from opening #1
East twin	2000/post-h	GS	10	Transect proceeds at 81 deg. from opening #2
East twin	2000/post-h	GS	11	Transect proceeds at 210 deg. from opening #3
East twin	2000/post-h	GS	12	Transect proceeds at 298 deg. from opening #4
East twin	2000/post-h	GS	13	Transect proceeds at 227 deg. from opening #5
East twin	2000/post-h	GS	14	Transect proceeds at 272 deg. from opening #6
East twin	2000/post-h	GS	15	Transect proceeds at 39 deg. from opening #7
East twin	2000/post-h	GS	16	Transect proceeds at 117 deg. from opening #8
East twin	1999/pre-h	UN	1	0+050 m @120 deg S/L 1 – T1 = 78, T2 = 005, T3 = 222
East twin	1999/pre-h	UN	2	0+000 m @B/L S/L 2 – T1 = 105, T2 = 60, T3 = 213
East twin	1999/pre-h	UN	3	0+025m @300 deg S/L 3 – T1 = 331, T2 = 172, T3 = 136
East twin	1999/pre-h	UN	4	0+050 m @120 deg S/L 3 – T1 = 298, T2 = 254, T3 = 086
East twin	1999/pre-h	UN	5	0+000 m @B/L S/L 4 – T1 = 121, T2 = 211, T3 = 76
East twin	1999/pre-h	UN	6	0+000 m @B/L S/L 5 – T1 = 123, T2 = 267, T3 = 61
East twin	2000/post-h	UN	9	0+000 m @ B/L S/L 1
East twin	2000/post-h	UN	10	0+050 m @ 120 deg. S/L 2
East twin	2000/post-h	UN	11	0+000 m @ B/L S/L 3
East twin	2000/post-h	UN	12	0+050 m @ 120 deg. S/L 4
East twin	2000/post-h	UN	13	0+050 m @ 300 deg. S/L 4
East twin	2000/post-h	UN	14	0+100 m @ 120 deg. S/L 5
East twin	2000/post-h	UN	15	0+050 m @ 120 deg. S/L 6

East twin	2000/post-h	UN	16	0+050 m @ 300 deg S/L 6

Coarse Woody Debris (CWD) Transect Locations and Bearings

Site	Date /Status	Treatment	Plot	S/L-distance-transect bearing
Lunate	1999/pre-h	CC	1	0+256 @ 360 S/L 13 T1 = 143 T2 = 031 T3 = 182
Lunate	1999/pre-h	CC	2	0+225 @ 360 S/L 12 T1 = 260 T2 = 260 T3 = 299
Lunate	1999/pre-h	CC	3	0+150 @ 180 S/L 14 T1 = 012 T2 = 285 T3 = 245
Lunate	1999/pre-h	CC	4	0+068 @ 180 S/L 13 T1 = 210 T2 = 140b T3 = 315
Lunate	1999/pre-h	CC	5	0+150 @ 360 S/L 12 T1 = 266 T2 = 132 T3 =005
Lunate	1999/pre-h	CC	6	0+100 @ 180 S/L 11 T1 = 155 T2 = 135 T3 = 122
Lunate	1999/pre-h	CC	7	0+325 @ 180 S/L 11 T1 = 026 T2 = 118 T3 = 170
Lunate	1999/pre-h	CC	8	0+500 @ 180 S/L 11 T1 = 108 T2 = 113 T3 = 275
Lunate	1999/pre-h	GR	1	0+0+000 @ B/L S/L 1 T1 = 319 T2 = 338 T3 = 237
Lunate	1999/pre-h	GR	2	0+050 @ 180 S/L 2 T1 = 284 T2 = 330 T3 = 133
Lunate	1999/pre-h	GR	3	0+000 @ B/L S/L 3 T1 = 255 T2 = 188 T3 = 324
Lunate	1999/pre-h	GR	4	0+200 @ 180 S/L 4 T1 = 029 T2 = 156 T3 = 275
Lunate	1999/pre-h	GR	5	0+450 @ 360 S/L 5 T1 = 90 T2 = 70(back ber.) T3 =262
Lunate	1999/pre-h	GR	6	0+250 @ 360 S/L 5 T1 = 256 T2 = 099 T3 = 199
Lunate	1999/pre-h	GR	7	0+200 @ 180 S/L 6 T1 = 272 T2 = 089 T3 = 239
Lunate	1999/pre-h	GR	8	0+025 @ 360 S/L 6 T1 = 218 T2 = 023 T3 = 237
Lunate	1999/pre-h	GS	1	0+350 @ 180 S/L 10 T1 = 69 T2 = 049 T3 = 345
Lunate	1999/pre-h	GS	2	0+200 @ 360S/L 9 T1 = 014 T2 = 241 T3 = 035
Lunate	1999/pre-h	GS	3	0+125 @ 180 S/L 8 T1 = 52 T2 = 206 T3 = 094
Lunate	1999/pre-h	GS	4	0+400 @ 360 S/L 7 T1 = 171 T2 = 171 T3 = 281
Lunate	1999/pre-h	GS	5	0+150 @ 180 S/L 10 T1 = 100 T2 = 319 T3 = 347
Lunate	1999/pre-h	GS	6	0+400 @ 360 S/L 9 T1 = 057 T2 = 329 T3 = 261
Lunate	1999/pre-h	GS	7	0+050@ 360 S/L 8 T1 = 262 T2 = 011 T3 = 137
Lunate	1999/pre-h	GS	8	0+116 @ 360 S/L 7 T1 = 283 T2 = 328 T3 = 209
Lunate	1999/pre-h	UN	1	0+162 @ 180 S/L 17 T1 = 061 T2 = 115 T3 = 085
Lunate	1999/pre-h	UN	2	0+250 @ 180 S/L 16 T1 = 209 T2 = 228 T3 = 261
Lunate	1999/pre-h	UN	3	0+020 @ 180 S/L 16 T1 = 338 T2 = 022 T3 = 066
Lunate	1999/pre-h	UN	4	0+400 @ 360 S/L 15 T1 = 232 T2 = 351 T3 = 080
Lunate	1999/pre-h	UN	5	0+500 @ 180 S/L 16 T1 = 004 T2 = 044 T3 = 017
Lunate	1999/pre-h	UN	6	0+000 @ S/L 15 T1 = 244 T2 = 038 T3 = 314
Lunate	1999/pre-h	UN	7	0+450 @ 180 S/L 14 T1 = 218 T2 = 021 T3 = 337
Lunate	2000/pre-h	UN	9	0+550 @ 180 S/L 16
Lunate	2000/pre-h	UN	10	0+100 @ 360 S/L 15
Lunate	2000/pre-h	UN	11	0+550 @ 180 S/L

Lunate	2000/pre-h	UN	12	0+400 @ 180 S/L 14
Lunate	2000/pre-h	UN	13	0+450 @ 360 S/L 17
Lunate	2000/pre-h	UN	14	0+300@ 360 S/L 16
Lunate	2000/pre-h	UN	15	0+200 @ 180 S/L
Lunate	2000/pre-h	UN	16	0+450 @ 360 S/L 15

Coarse Woody Debris (CWD) Transect Locations and Bearings

Site	Date /Status	Treatment	Plot	S/L-distance-transect bearing
Minnow	1999/pre-h	CC	1	0+025 @ 270 S/L 12 T1 = 45 T2 = 018 T3 = 107
Minnow	1999/pre-h	CC	2	0+060 @ 270 S/L 11 T1 = 064 T2 = 068 T3 =354
Minnow	1999/pre-h	CC	3	0+50@ 090 S/L 11 T1 = 271 T2 = 236 T3 = 032
Minnow	1999/pre-h	CC	4	0+000 @ B/L S/L 10 T1 = 275 T2 = 343 T3 =091
Minnow	1999/pre-h	CC	5	0+100 @ 90 S/L 10 T1 = 052 T2 = 096 T3 = 168
Minnow	1999/pre-h	GR	1	0+050 @ 270 S/L 0 T1 = 052 T2 = 201 T3 = 315
Minnow	1999/pre-h	GR	2	0+000 @ B/L S/L 1 T1 = 257 T2 = 091 T3 = 048
Minnow	1999/pre-h	GR	3	0+100 @ 270 S/L 1 T1 = 053 T2 = 221 T3 = 093
Minnow	1999/pre-h	GR	4	0+050 @ 270 S/L 270 T1 = 66 T2 = 186 T3 =?
Minnow	1999/pre-h	GR	5	0+150 @ 90 S/L 3 T1 = 076 T2 = 116 T3 = 258
Minnow	1999/pre-h	GR	6	0+100 @ 90 S/L 3 T1 = 094 T2 = 068 T3 = 061
Minnow	1999/pre-h	GS	1	0+024 @ 090 S/L 5 T1 = 043 T2 = 091 T3 = 084
Minnow	1999/pre-h	GS	2	0+100 @ 090 S/L 5 T1 = 038 T2 = 065 T3 = 096
Minnow	1999/pre-h	GS	3	0+053.3 @ 90 S/L 6 T1 = 001 T2 = 032 T3 = 075
Minnow	1999/pre-h	GS	4	0+000 @ B/L S/L 7 T1 = 168 T2 = 087 T3 = 099
Minnow	1999/pre-h	GS	5	0+075@ 090 S/L 7 T1 = 057 T2 = 133 T3 = 066
Minnow	1999/pre-h	GS	6	0+050 @ 270 S/L 8 T1 = 053 T2 =193 T3 = 236
Minnow	1999/pre-h	GS	7	0+025 @ 090 S/L 4 T1 = 093 T2 = 047 T3 = 080
Minnow	1999/pre-h	GS	8	0+137 @ 090 S/L 4 T1 = 098 T2 = 258 T3 = 247
Minnow	1999/pre-h	UN	1	0+287 @ 090 S/L 7 T1 = 212 T2 = 233 T3 = 059
Minnow	1999/pre-h	UN	2	0+250 @ 090 S/L 6 T1 = 210 T2 = 290 T3 = 351
Minnow	1999/pre-h	UN	3	0+300 @ 090 S/L 5 T1 = 115 T2 = 020 T3 = 192
Minnow	1999/pre-h	UN	4	0+200@ 090 S/L 5 T1 = 265 T2 = 103 T3 = 096
Minnow	1999/pre-h	UN	5	0+350 @ 090 S/L 4 T1 = 359 T2 = 122 T3 = 073
Minnow	1999/pre-h	UN	6	0+250 @ 090 S/L 4 T1 = 026 T2 = 215 T3 = 263
Minnow	2000/pre-h	UN	9	0+200 @ 090 S/L 8
Minnow	2000/pre-h	UN	10	0+250 @ 090 S/L 7
Minnow	2000/pre-h	UN	11	0+300 @ 090 S/L 6
Minnow	2000/pre-h	UN	12	0+200 @ 090 S/L 6
Minnow	2000/pre-h	UN	13	0+350 @ 090 S/L 5
Minnow	2000/pre-h	UN	14	0+250 @ 090 S/L 5
Minnow	2000/pre-h	UN	15	0+300 @ 090 S/L 4
Minnow	2000/pre-h	UN	16	0+200 @ 090 S/L 4

Appendix 1c:

Maps of Permanent Sample Plot (PSP) Locations
In ICH Study Areas
(E.Twin, Minnow, Lunate)

Map 1 - East Twin

Map 2 - Minnow

Map 3 - Lunate

Appendix 1d:

Post-harvest "Large-tree" Permanent Sample Plot (PSP's):
Locations and Bearings
(ICH Study Areas)

Post-harvest "Large Tree" Permanent Sample Plot (PSP) Location information (ICH Study areas)

Additional information relevant to relocation of plots and transects is as follows:

B/L = base line
S/L = strip line
POC = point of commencement for CWD transect
EOT = end of transect
PC = PSP plot center stake

Summary of Post-harvest Large-tree Permanent Sample Plots, Location, Dimensions, and Area (April 3, 2002)

Study Area	TU	Plot #	Location of Perm. Sample Plot (PSP)	Plot Orientation of CntrLine (azimuth in degrees)	Plot Length (m)	Plot Width (m)	Plot Area (sq. m))	Plot Area (ha.)	
East Twin	GS	9	Between GS harvest patch # 1 and 2	28	52.1	20	1042	0.10	Confirm plot length
East Twin	GS	10	Between GS harvest patch # 2and 3	81	72.4	20	1448	0.14	
East Twin	GS	11	Between GS harvest patch # 3 and 4	210	32.2	20	644	0.06	
East Twin	GS	12	Between GS harvest patch # 4 and 2	298	48.6	20	972	0.10	
East Twin	GS	13	Between GS harvest patch # 5 and 6	227	36.2	20	724	0.07	
East Twin	GS	14	Between GS harvest patch # 6 and 7	272	41.8	20	836	0.08	
East Twin	GS	15	Between GS harvest patch # 7 and 8	39	63.5	20	1269.6	0.13	
East Twin	GS	16	Between GS harvest patch # 8 and 5	117	47.8	20	955.2	0.10	
East Twin	UN	9		30	50.0	20	1000	0.10	
East Twin	UN	10		30	50.0	20	1000	0.10	
East Twin	UN	11		30	50.0	20	1000	0.10	
East Twin	UN	12		30	50.0	20	1000	0.10	
East Twin	UN	13		30	50.0	20	1000	0.10	
East Twin	UN	14		30	50.0	20	1000	0.10	
East Twin	UN	15		30	50.0	20	1000	0.10	
East Twin	UN	16		30	50.0	20	1000	0.10	

Study Area	TU	Plot #	Location of Perm. Sample Plot (PSP)	Plot Orientation of CntrLine (azimuth in degrees)	Plot Length (m)	Plot Width (m)	Plot Area (sq. m))	Plot Area (ha.)	
Lunate Crk	GR	9	In retention patch # 1	225	51.5	20	1030	0.10	confirm plot length
Lunate Crk	GR	10	In retention patch # 6	99	51.7	20	1034	0.10	
Lunate Crk	GR	11	In retention patch # 13	305	50.1	20	1002	0.10	
Lunate Crk	GR	12	In retention patch # 22	311	50.4	20	1008	0.10	
Lunate Crk	GR	13	In retention patch # 23	226	45.6	20	912	0.09	
Lunate Crk	GR	14	In retention patch # 19	246	40.6	20	812	0.08	
Lunate Crk	GR	15	in retention patch # 17	140	51.5	20	1030	0.10	
Lunate Crk	GR	16	In retention patch # 16	262	54.2	20	1084	0.11	
Lunate Crk	GS	9	Between GS harvest patch # 7 and 5	242	35.0	20	700	0.07	
Lunate Crk	GS	10	Between GS harvest patch # 5 and 4	120	68.6	20	1372	0.14	
Lunate Crk	GS	11	Between GS harvest patch # 10 and 11	256	31.8	20	635	0.06	
Lunate Crk	GS	12	Between GS harvest patch # 12 and 15	216	46.0	20	920	0.09	
Lunate Crk	GS	13	Between GS harvest patch # 13 and 14	316	60.5	20	1210	0.12	
Lunate Crk	GS	14	Between GS harvest patch # 20 and 19	136	45.1	20	902	0.09	
Lunate Crk	GS	15	Between GS harvest patch # 12 and 15	342	81.0	20	1620	0.16	
Lunate Crk	GS	16	Between harvest patch # 22 and 21	96	43.5	20	870	0.09	
Lunate Crk	UN	9		270	50.0	20	1000	0.10	
Lunate Crk	UN	10		270	50.0	20	1000	0.10	
Lunate Crk	UN	11		270	50.0	20	1000	0.10	
Lunate Crk	UN	12		270	50.0	20	1000	0.10	
Lunate Crk	UN	13		270	50.0	20	1000	0.10	
Lunate Crk	UN	14		270	50.0	20	1000	0.10	
Lunate Crk	UN	15		270	50.0	20	1000	0.10	
Lunate Crk	UN	16		270	50.0	20	1000	0.10	

Study Area	TU	Plot #	Location of Perm. Sample Plot (PSP)	Plot Orientation of CntrLine (azimuth in degrees)	Plot Length (m)	Plot Width (m)	Plot Area (sq. m))	Plot Area (ha.)
Minnow Crk	GR	9	In retention patch # 2	225	41.5	20	830	0.08
Minnow Crk	GR	10	In retention patch # 1	128	40.3	20	806	0.08
Minnow Crk	GR	11	In retention patch # 5	45	37.8	20	756	0.08
Minnow Crk	GR	12	In retention patch # 4	120	31.5	20	630	0.06
Minnow Crk	GR	13	In retention patch # 6	34	56.5	20	1129.8	0.11
Minnow Crk	GR	14	In retention patch # 11	30	42.4	20	847.2	0.08
Minnow Crk	GR	15	In retention patch # 9	60	53.5	20	1069.8	0.11
Minnow Crk	GR	16	In retention patch # 12	330	42.3	20	846	0.08
Minnow Crk	GS	9	Between GS harvest patch # 3 and 2	360	59.4	20	1188	0.12
Minnow Crk	GS	10	Between GS harvest patch # 2 and 11	304	14.9	20	298	0.03
Minnow Crk	GS	11	Between GS harvest patch # 11 and 10	203	50.4	20	1008	0.10
Minnow Crk	GS	12	Between GS harvest patch # 10 and 8	187	37.0	20	740	0.07
Minnow Crk	GS	13	Between GS harvest patch # 8 and 7	190	47.6	20	951.6	0.10
Minnow Crk	GS	14	Between GS harvest patch # 7 and 6	176	39.5	20	790	0.08
Minnow Crk	GS	15	Between GS harvest patch # 6 and 5	85	85.9	20	1718	0.17
Minnow Crk	GS	16	Between GS harvest patch # 5 and 4	351	49.6	20	992	0.10
Minnow Crk	UN	9		360	50.0	20	1000	0.10
Minnow Crk	UN	10		360	50.0	20	1000	0.10
Minnow Crk	UN	11		360	50.0	20	1000	0.10
Minnow Crk	UN	12		360	50.0	20	1000	0.10
Minnow Crk	UN	13		360	50.0	20	1000	0.10
Minnow Crk	UN	14		360	50.0	20	1000	0.10
Minnow Crk	UN	15		360	50.0	20	1000	0.10
Minnow Crk	UN	16		360	50.0	20	1000	0.10

APPENDIX 2:

DETAILED PRE-HARVEST MENSURATIONAL DATA SUMMARY TABLES

Appendix 2a

Pre-harvest Basal Area: Plot and Treatment Unit Summary
(units = square metres per hectare)
(Live and Dead Basal Area by Species)

Study Area	TU	Plot#	Date Meas	Live Ac	Dead Bl	Live Bl	Dead Cw	Live Cw	Dead Fd	Live Fd	Dead Hw	Live Hw	Dead Sx	Live Sx	Dead Unkn	Live Unkn		Tot Live	Tot Dead
Bearpaw	CC	1	19990719	0.00	8.51	13.35	0.00				0.00	0.04	0.00	21.84	0.00	0.00		35.23	8.51
Bearpaw	CC	2	19990719	0.00	13.51	11.84	0.00				0.00	0.00	0.00	14.12	0.00	0.00		25.96	13.51
Bearpaw	CC	3	19990720	0.00	9.45	17.17	0.00				0.00	0.00	0.00	12.78	0.00	0.00		29.95	9.45
Bearpaw	CC	4	19990720	0.00	16.37	10.77	0.00				0.00	0.00	0.00	23.08	0.00	0.00		33.85	16.37
Bearpaw	CC	5	19990726	0.00	10.14	6.70	0.00				0.00	0.00	13.18	19.63	0.00	0.00		26.33	23.32
Bearpaw	CC	6	19990626	0.00	11.61	16.87	0.00				0.00	0.56	3.24	35.20	1.16	0.00		52.62	16.01
Bearpaw	CC	7	19990726	0.00	17.79	4.54	0.00				0.00	0.00	0.93	27.63	0.00	0.00		32.17	18.72
Bearpaw	CC	8	19990804	0.00	16.83	11.68	0.00				0.00	0.00	0.00	22.86	0.00	0.00		34.54	16.83
Bearpaw	CC	9	19990804	0.00	16.83	15.13	0.00				0.00	0.00	0.00	25.36	0.00	0.00		40.49	16.83
Bearpaw	CC	10	19990806	0.00	12.96	14.91	0.00				0.00	0.00	6.10	32.96	0.00	0.00		47.86	19.06
Bearpaw	CC	11	19990806	0.00	6.33	16.67	0.00				0.00	0.00	0.00	22.94	1.06	0.00		39.60	7.39
Bearpaw	CC	12	19990806	0.00	0.46	20.05	0.00				0.00	0.00	2.88	22.12	0.00	0.00		42.16	3.35
Bearpaw	CC	13	19990807	0.00	8.24	19.30	0.00				0.00	0.00	0.00	9.60	0.00	0.00		28.89	8.24
Bearpaw	CC	14	19990807	0.00	3.88	10.08	0.00				0.00	0.00	0.00	19.57	0.00	0.00		29.65	3.88
Bearpaw	**CC**	**mean**	**1999**	**0.00**	**10.92**	**13.50**	**0.00**				**0.00**	**0.04**	**1.88**	**22.12**	**0.16**	**0.00**	**mean**	**35.67**	**12.96**
Bearpaw	GS	1	19990817	0.00	4.88	1.27	0.00				0.00		5.35	25.20	0.00	0.00		26.47	10.23
Bearpaw	GS	2	19990817	0.00	9.68	10.64	0.00				0.00		1.09	17.29	0.00	0.00		27.93	10.77
Bearpaw	GS	3	19990823	0.00	9.82	10.76	0.00				0.00		0.00	25.22	0.00	0.00		35.98	9.82
Bearpaw	GS	4	19990823	0.00	16.22	23.50	0.00				0.00		0.00	17.84	0.00	0.00		41.35	16.22
Bearpaw	GS	5	19990818	0.00	10.65	7.95	0.00				0.00		0.00	29.95	0.00	0.00		37.90	10.65
Bearpaw	GS	6	19990818	0.00	7.90	7.42	0.00				0.00		4.81	31.39	0.00	0.00		38.81	12.71
Bearpaw	GS	7	19990816	0.00	9.26	22.08	0.00				0.00		3.42	13.92	0.00	0.00		36.00	12.68
Bearpaw	GS	8	19990816	0.00	6.37	9.58	0.00				0.00		10.38	6.10	0.00	0.00		15.69	16.75
Bearpaw	GS	9	19990816	0.00	8.44	9.58	0.00				0.00		6.49	27.63	0.00	0.00		37.22	14.93
Bearpaw	GS	10	19990817	0.00	11.22	35.77	0.00				0.00		2.43	17.75	0.00	0.00		53.52	13.65
Bearpaw	GS	11	19990818	0.00	5.57	6.47	0.00				0.00		4.75	26.26	0.00	0.00		32.73	10.32
Bearpaw	GS	12	19990817	0.00	3.83	11.64	0.00				0.00		0.00	12.55	0.00	0.00		24.18	3.83
Bearpaw	GS	13	19990817	0.00	8.62	12.31	0.00				0.00		3.64	42.51	0.00	0.00		54.83	12.25
Bearpaw	GS	14	19990819	0.00	5.50	6.48	0.00				0.00		0.00	19.97	0.00	0.00		26.45	5.50
Bearpaw	**GS**	**mean**	**1999**	**0.00**	**8.43**	**12.53**	**0.00**				**0.00**		**3.03**	**22.40**	**0.00**	**0.00**	**Mean**	**34.93**	**11.45**

Study Area	TU	Plot#	Date Meas	Live Ac	Dead Bl	Live Bl	Dead Cw	Live Cw	Dead Fd	Live Fd	Dead Hw	Live Hw	Dead Sx	Live Sx	Dead Unkn	Live Unkn		Tot Live	Tot Dead
Bearpaw	STS	1	19990819	0.00	1.95	5.49	0.00				0.00		0.00	24.64	0.00	0.00		30.14	1.95
Bearpaw	STS	2	19990819	0.00	7.18	8.62	0.00				0.00		0.00	5.34	0.47	0.00		13.96	7.66
Bearpaw	STS	3	19990819	0.00	4.06	20.63	0.00				0.00		0.00	10.09	0.00	0.00		30.72	4.06
Bearpaw	STS	4	19990819	0.00	14.63	12.62	0.00				0.00		2.24	16.40	0.00	0.00		29.01	16.87
Bearpaw	STS	5	19990820	0.00	2.72	36.32	0.00				0.00		0.00	1.94	0.00	0.00		38.25	2.72
Bearpaw	STS	6	19990820	0.00	8.25	27.22	0.00				0.00		0.00	16.21	0.00	0.00		43.43	8.25
Bearpaw	STS	7	19990920	0.00	15.44	16.35	0.00				0.00		11.22	13.12	0.00	0.00		29.47	26.66
Bearpaw	STS	9	19990824	0.00	2.64	21.76	0.00				0.00		0.00	3.97	0.00	0.00		25.73	2.64
Bearpaw	STS	10	19990824	0.00	9.57	17.83	0.00				0.00		0.00	15.57	0.00	0.00		33.40	9.57
Bearpaw	STS	11	19990824	0.00	7.03	17.60	0.00				0.00		13.15	26.02	0.00	0.00		43.61	20.18
Bearpaw	STS	12	19990824	0.00	9.01	9.76	0.00				0.00		0.00	31.18	0.00	0.00		40.94	9.01
Bearpaw	STS	13	19990823	0.00	13.57	5.27	0.00				0.00		0.00	25.35	0.00	0.00		30.62	13.57
Bearpaw	STS	14	19990823	0.00	5.44	15.72	0.00				0.00		0.00	31.09	0.00	0.00		46.81	5.44
Bearpaw	**STS**	**mean**	**1999**	**0.00**	**7.81**	**16.55**	**0.00**				**0.00**		**2.05**	**16.99**	**0.04**	**0.00**	**Mean**	**33.55**	**9.89**
Bearpaw	UN	1	20000820	0.00	11.39	21.30	0.00				0.00	0.00	0.00	12.42	0.00	0.00		33.72	11.39
Bearpaw	UN	2	20000718	0.00	12.85	24.06	0.00				0.00	0.00	2.72	20.92	0.00	0.00		44.98	15.57
Bearpaw	UN	3	20000825	0.00	9.59	9.04	0.00				0.00	0.00	0.00	34.68	0.00	0.00		43.72	9.59
Bearpaw	UN	4	20000825	0.00	11.99	8.10	0.00				0.00	0.00	3.97	35.80	0.00	0.00		43.90	15.96
Bearpaw	UN	5	20000724	0.00	3.29	11.74	0.00				0.00	0.00	0.00	25.54	0.00	0.00		37.28	3.29
Bearpaw	UN	6	20000720	0.00	5.92	17.68	0.00				0.00	0.00	1.01	9.77	0.00	0.00		27.44	6.92
Bearpaw	UN	7	20000821	0.00	5.75	20.02	0.00				0.00	0.00	0.00	11.08	0.00	0.00		31.10	5.75
Bearpaw	UN	8	20000922	0.00	8.10	13.63	0.00				0.00	0.00	0.00	22.60	0.00	0.00		36.23	8.10
Bearpaw	UN	9	20000724	0.00	10.90	11.90	0.00				0.00	0.00	0.00	31.85	0.00	0.00		43.75	10.90
Bearpaw	UN	10	20000822	0.00	10.65	10.06	0.00				0.00	0.00	6.19	13.54	0.00	0.00		23.59	16.84
Bearpaw	**UN**	**mean**	**2000**	**0.00**	**9.04**	**14.75**	**0.00**				**0.00**	**0.00**	**1.39**	**21.82**	**0.00**	**0.00**	**Mean**	**36.57**	**10.43**

Study Area	TU	Plot#	Date Meas	Live Ac	Dead Bl	Live Bl	Dead Cw	Live Cw	Dead Fd	Live Fd	Dead Hw	Live Hw	Dead Sx	Live Sx	Dead Unkn	Live Unkn	Tot Live	Tot Dead
Pinkerton	**UN**	**Plot#**																
Pinkerton	UN	17G			7.80	12.10							0.18	20.13			32.23	7.98
Pinkerton	UN	18G			12.44	25.37							0.15	15.00			40.37	12.59
Pinkerton	UN	19G			17.82	17.99							0.91	20.93			38.91	18.73
Pinkerton	UN	20G			6.18	23.66							0.00	9.08			32.74	6.18
Pinkerton	UN	21G			11.45	43.31							0.00	5.56			48.87	11.45
Pinkerton	UN	22G			16.66	23.91							1.53	16.10			40.01	18.19
Pinkerton	UN	23G			10.86	34.20							0.00	6.25			40.45	10.86
Pinkerton	UN	24G			21.13	19.34							2.46	15.73			35.07	23.60
		Plot Means			13.04	24.99							0.65	13.60			38.58	13.70
		SD			5.12	9.79							0.92	5.96			5.37	5.94
	GS	***SE***			1.81	3.46							0.32	2.11			1.90	2.10
Pinkerton	GS	1T			11.51	17.64							1.22	28.58			46.21	12.73
Pinkerton	GS	2T			16.55	24.43							0.00	12.25			36.68	16.55
Pinkerton	GS	3T			6.58	24.47							0.00	15.36			39.83	6.58
Pinkerton	GS	4T			17.36	22.19							2.29	21.41			43.60	19.65
Pinkerton	GS	5T			25.09	12.28							0.62	27.97			40.25	25.70
Pinkerton	GS	6T			6.45	33.78							0.00	4.74			38.53	6.45
Pinkerton	GS	7T			7.44	30.04							0.00	1.41			31.45	7.44
Pinkerton	GS	8T			3.54	31.08							0.00	1.08			32.16	3.54
		Plot Means			11.81	24.49							0.52	14.10			38.59	12.33
		SD			7.30	7.19							0.84	11.20			5.12	7.74
	STS	***SE***			2.58	2.54							0.30	3.96			1.81	2.74
Pinkerton	STS	10T			12.41	29.30							0.00	2.91			32.21	12.41
Pinkerton	STS	11T			13.79	22.15							0.00	16.64			38.79	13.79
Pinkerton	STS	12T			12.67	23.55							0.00	12.18			35.74	12.67
Pinkerton	STS	13T			9.25	27.77							0.00	10.72			38.49	9.25
Pinkerton	STS	14T			13.14	21.48							0.00	5.34			26.82	13.14
Pinkerton	STS	15T			15.14	32.26							1.42	2.80			35.06	16.55
Pinkerton	STS	16T			13.62	19.71							0.26	17.04			36.75	13.88
Pinkerton	STS	9T			6.15	43.53							0.00	3.23			46.75	6.15
		Plot Means			12.02	27.47							0.21	8.86			36.33	12.23
		SD			2.91	7.78							0.50	6.07			5.72	3.18
		SE			1.03	2.75							0.18	2.15			2.02	1.12

Study Area	TU	Plot#	Date Meas	Live Ac	Dead Bl	Live Bl	Dead Cw	Live Cw	Dead Fd	Live Fd	Dead Hw	Live Hw	Dead Sx	Live Sx	Dead Unkn	Live Unkn		Tot Live	Tot Dead
East Twin	CC	1	19990714	0.00	4.21	1.09	11.33	135.33			0.00	1.30	0.23	7.92	0.00	0.00		145.64	15.77
East Twin	CC	2	19990721	0.00	0.51	1.90	1.99	132.85			4.98	5.89	0.36	0.00	0.00	0.00		140.64	7.83
East Twin	CC	3	19990721	0.00	5.02	5.16	2.82	59.55			0.00	1.31	0.44	14.81	0.00	0.00		80.82	8.28
East Twin	CC	4	19990721	0.00	0.00	0.04	10.35	112.81			5.87	8.20	0.00	0.24	0.00	0.00		121.29	16.22
East Twin	CC	5	19990722	0.00	0.60	0.07	3.27	150.72			0.28	3.00	0.00	0.00	0.00	0.00		153.79	4.16
East Twin	CC	6	19990722	0.00	2.05	0.00	5.05	104.76			0.00	17.16	4.13	0.00	0.00	0.00		121.93	11.23
East Twin	CC	7	19990723	0.00	0.00	0.00	8.16	85.45			0.00	0.24	0.00	0.00	0.00	0.00		85.69	8.16
East Twin	**CC**	**mean**	**1999**	**0.00**	**1.77**	**1.18**	**6.14**	**111.64**			**1.59**	**5.30**	**0.74**	**3.28**	**0.00**	**0.00**	**Mean**	**121.40**	**10.23**
East Twin	GS	1	19990712	0.00	0.00	0.00	0.00	119.16			0.00	0.63	3.92	0.01	0.00	0.00		119.81	3.92
East Twin	GS	2	19990712	0.00	0.00	0.00	11.67	123.60			0.00	0.12	3.28	0.00	0.00	0.00		123.72	14.96
East Twin	GS	3	19990713	0.00	0.00	0.00	1.23	145.94			0.00	0.00	0.00	0.00	0.00	0.00		145.94	1.23
East Twin	GS	4	19990713	0.00	0.00	0.00	6.15	141.28			0.00	0.00	0.00	0.00	0.00	0.00		141.28	6.15
East Twin	GS	5	19990713	0.00	0.00	0.00	17.44	114.02			0.00	0.00	0.00	0.00	0.00	0.00		114.02	17.44
East Twin	GS	6	19990714	0.00	5.42	0.44	0.00	56.72			1.54	7.49	0.65	2.53	0.00	0.00		67.18	7.62
East Twin	**GS**	**mean**	**1999**	**0.00**	**0.90**	**0.07**	**6.08**	**116.79**			**0.26**	**1.37**	**1.31**	**0.42**	**0.00**	**0.00**	**Mean**	**118.66**	**8.55**
East Twin	UN	1	19990723	0.00	4.58	6.91	0.00	62.62			4.86	13.97	2.89	4.24	0.00	0.00		87.75	12.33
East Twin	UN	2	19990812	0.00	0.00	0.11	2.80	98.87			0.34	11.95	3.40	2.78	0.00	0.00		113.72	6.53
East Twin	UN	3	19990813	0.00	3.01	2.80	4.49	94.04			0.00	19.06	0.00	1.36	0.00	0.00		117.27	7.50
East Twin	UN	4	19990812	0.00	0.73	0.69	5.67	92.20			0.00	9.37	0.00	0.00	0.00	0.00		102.27	6.40
East Twin	UN	5	19990813	0.00	0.00	0.00	19.05	125.52			0.25	1.61	0.00	0.00	0.00	0.00		127.13	19.31
East Twin	UN	6	19990813	0.00	0.49	0.08	5.17	114.59			1.57	14.43	4.27	0.27	0.00	0.00		129.37	11.50
East Twin	**UN**	**mean**	**1999**	**0.00**	**1.47**	**1.77**	**6.20**	**97.97**			**1.17**	**11.73**	**1.76**	**1.44**	**0.00**	**0.00**	**Mean**	**112.92**	**10.59**

Study Area	TU	Plot#	Date Meas	Live Ac	Dead Bl	Live Bl	Dead Cw	Live Cw	Dead Fd	Live Fd	Dead Hw	Live Hw	Dead Sx	Live Sx	Dead Unkn	Live Unkn		Tot Live	Tot Dead
Lunate	CC	1	19990621		0.00	0.00	1.01	214.39			0.00	0.00	0.00	0.00	0.00	0.00		214.39	1.01
Lunate	CC	2	19990622		1.36	0.48	0.00	90.24			0.00	9.10	0.00	3.07	2.26	0.00		102.89	3.62
Lunate	CC	3	19990623		0.00	0.00	19.10	174.62			0.00	0.00	0.00	0.00	0.00	0.05		174.66	19.10
Lunate	CC	4	19990623		0.00	0.00	15.29	155.49			0.00	0.00	0.00	0.00	0.00	0.00		155.49	15.29
Lunate	CC	5	19990624		0.00	0.00	0.00	111.54			0.00	0.00	0.00	0.00	0.00	0.00		111.54	0.00
Lunate	CC	6	19990624		0.00	0.00	16.69	98.04			0.00	0.00	0.00	2.16	0.00	0.00		100.20	16.69
Lunate	CC	7	19990625		0.00	1.78	2.06	134.46			2.85	6.73	0.00	0.12	0.00	0.00		143.09	4.91
Lunate	CC	8	19990625		0.00	0.00	7.74	165.90			0.00	7.30	0.00	4.89	0.00	0.00		178.09	7.74
Lunate	**CC**	**mean**	**1999**		**0.17**	**0.28**	**7.74**	**143.08**			**0.36**	**2.89**	**0.00**	**1.28**	**0.28**	**0.01**	**Mean**	**147.55**	**8.54**
Lunate	GR	1	19990614		4.77	2.56	23.25	72.35			0.28	5.96	0.00	4.07	0.00	0.00		84.95	28.30
Lunate	GR	2	19990615		0.00	5.03	9.93	96.23			0.00	7.91	1.31	2.12	0.00	0.00		111.29	11.24
Lunate	GR	3	19990615		0.00	3.45	0.26	116.89			0.00	8.26	0.00	2.00	0.00	0.00		130.60	0.26
Lunate	GR	4	19990715		5.53	3.56	0.58	87.71			1.07	22.74	0.00	4.06	0.00	0.00		118.08	7.18
Lunate	GR	5	19990715		2.57	0.98	6.55	125.85			0.00	8.07	0.00	2.52	0.00	0.00		137.42	9.12
Lunate	GR	6	19990715		6.10	3.11	0.00	87.11			3.37	9.71	0.00	2.66	0.56	0.00		102.59	10.03
Lunate	GR	7	19990705		1.58	2.81	0.00	67.94			0.00	23.43	2.48	2.20	0.00	0.00		96.39	4.05
Lunate	GR	8	19990620		0.00	0.17	0.00	69.51			6.12	31.67	0.00	9.95	0.00	0.00		111.30	6.12
Lunate	**GR**	**mean**	**1999**		**2.57**	**2.71**	**5.07**	**90.45**			**1.35**	**14.72**	**0.47**	**3.70**	**0.07**	**0.00**	**Mean**	**111.57**	**9.54**
Lunate	GS	1	19990625		0.75	0.00	10.01	197.79			0.00	0.91	0.00	2.17	0.00	0.00		200.87	10.76
Lunate	GS	2	19990628		0.00	1.40	4.74	116.40			0.00	2.61	0.00	5.09	0.00	0.00		125.50	4.74
Lunate	GS	3	19990629		2.66	0.24	6.46	139.68			1.13	2.17	0.00	0.00	0.00	0.00		142.10	10.26
Lunate	GS	4	19990629		0.00	0.00	22.12	159.34			0.00	0.21	0.00	3.22	0.00	0.00		162.77	22.12
Lunate	GS	5	19990629		0.60	0.00	1.56	225.73			0.00	0.97	0.00	0.12	0.00	0.00		226.82	2.16
Lunate	GS	6	19990629		0.00	0.00	39.82	227.65			0.00	0.00	0.00	2.79	0.00	0.00		230.45	39.82
Lunate	GS	7	19990630		0.00	0.00	15.47	177.21			0.00	0.26	0.00	0.00	0.00	0.00		177.48	15.47
Lunate	GS	8	19990630		0.00	0.00	8.21	204.44			0.00	0.22	0.00	3.56	0.00	0.00		208.22	8.21
Lunate	**GS**	**mean**	**1999**		**0.50**	**0.21**	**13.55**	**181.03**			**0.14**	**0.92**	**0.00**	**2.12**	**0.00**	**0.00**	**Mean**	**184.28**	**14.19**
Lunate	UN	1	19990616		0.25	0.00	18.96	201.33			4.00	0.00	0.00	0.00	0.00	0.00		201.33	23.21
Lunate	UN	2	19990617		0.00	1.78	56.55	127.84			0.00	0.00	0.00	0.00	0.00	0.00		129.62	56.55
Lunate	UN	3	19990617		0.00	0.96	22.23	89.16			0.00	2.40	0.01	5.94	0.24	0.00		98.46	22.48
Lunate	UN	4	19990617		0.66	3.34	17.23	114.15			0.00	1.64	0.21	0.14	0.00	0.00		119.27	18.10
Lunate	UN	5	19990618		0.00	0.47	15.04	111.84			0.00	1.44	0.00	6.32	0.00	0.00		120.07	15.04
Lunate	UN	6	19990618		0.00	0.00	12.39	151.36			0.00	0.00	0.00	0.00	0.00	0.00		151.36	12.39
Lunate	UN	7	19990621		0.00	0.07	29.03	103.21			0.00	0.04	0.00	0.80	0.00	0.00		104.13	29.03
Lunate	**UN**	**mean**	**1999**		**0.13**	**0.95**	**24.49**	**128.41**			**0.57**	**0.79**	**0.03**	**1.89**	**0.03**	**0.00**	**Mean**	**132.04**	**25.26**

Study Area	TU	Plot#	Date Meas	Live Ac	Dead Bl	Live Bl	Dead Cw	Live Cw		Dead Fd	Live Fd	Dead Hw	Live Hw	Dead Sx	Live Sx	Dead Unkn	Live Unkn		Tot Live	Tot Dead
Lunate	UN	9	20002706		0.00	0.45	16.96	134.25				0.00	0.22	0.00	6.12	0.00	0.00		141.04	16.96
Lunate	UN	10	20000710		0.35	0.00	0.00	158.88				0.00	0.42	0.00	0.00	0.00	0.00		159.31	0.35
Lunate	UN	11	20000706		0.28	0.00	17.55	85.37				0.00	1.53	4.73	7.70	0.00	0.00		94.60	22.56
Lunate	UN	12	20000710		0.00	0.00	17.39	137.88				0.00	1.38	0.00	0.02	0.00	0.00		139.28	17.39
Lunate	UN	13	20000704		0.00	0.00	65.24	195.20				0.00	0.00	0.00	0.05	0.00	0.00		195.25	65.24
Lunate	UN	14	20000830		0.91	0.44	37.12	185.48				0.00	0.15	0.39	0.17	0.00	0.00		186.23	38.43
Lunate	UN	15	20000710		0.00	0.38	3.05	127.48				0.00	0.00	0.00	0.75	0.00	0.00		128.61	3.05
Lunate	UN	16	20000711		0.00	1.00	33.60	93.81				0.00	5.50	0.00	2.09	0.00	0.00		102.39	33.60
Lunate	**UN**	**mean**	**1999**		**0.19**	**0.28**	**23.86**	**139.79**				**0.00**	**1.15**	**0.64**	**2.11**	**0.00**	**0.00**	**Mean**	**143.34**	**24.70**
Minnow	CC	1	19990609	0.00	5.16	7.62	5.16	160.44				0.00	0.18	8.96	18.05	0.00	0.00		186.29	19.28
Minnow	CC	2	19990609	0.00	13.51	8.48	0.31	91.84				0.00	0.02	0.43	2.14	0.30	0.00		102.47	14.55
Minnow	CC	3	19990610	0.00	7.43	5.53	1.30	89.83				0.00	0.00	0.27	8.72	0.00	0.00		104.08	9.00
Minnow	CC	4	19990611	6.66	10.05	12.32	0.53	53.91				0.00	1.46	8.47	21.49	0.00	0.00		95.85	19.05
Minnow	CC	5	19990706	0.00	5.19	9.22	0.03	96.94				0.00	0.00	0.00	8.19	0.00	0.00		114.35	5.22
Minnow	**CC**	**mean**	**1999**	**1.33**	**8.27**	**8.64**	**1.47**	**98.59**				**0.00**	**0.33**	**3.62**	**11.72**	**0.06**	**0.00**	**Mean**	**120.61**	**13.42**
Minnow	GR	1	19990713		5.09	12.72	2.44	63.01	0.00	0.00		0.00	0.00	10.33	19.41	0.00	0.00		95.14	17.85
Minnow	GR	2	19990520		0.00	7.46	0.00	29.21	0.00	0.00		0.00	0.00	0.16	28.48	0.00	0.00		65.15	0.16
Minnow	GR	3	19990527		2.99	8.00	9.84	53.32	0.00	2.18		0.00	0.03	0.00	10.91	0.00	0.01		72.28	12.83
Minnow	GR	4	19990531		0.50	20.35	0.00	32.53	0.00	0.00		0.00	0.00	16.09	16.72	0.00	0.10		69.71	16.59
Minnow	GR	5	19990601		3.91	15.63	0.00	41.07	0.00	0.00		0.00	0.04	3.53	18.55	0.00	0.00		75.28	7.44
Minnow	GR	6	19990601		1.89	13.93	0.12	52.96	5.85	0.00		0.00	4.20	2.83	12.36	0.85	0.00		89.29	5.68
Minnow	**GR**	**mean**	**1999**		**2.40**	**13.02**	**2.07**	**45.35**	**0.98**	**0.36**		**0.00**	**0.71**	**5.49**	**17.74**	**0.14**	**0.02**	**Mean**	**77.81**	**10.09**
Minnow	GS	1	19990502		9.14	4.43	0.00	25.35				0.00	1.65	2.07	27.99	0.00	0.00		59.42	11.21
Minnow	GS	2	19990502		3.04	16.62	0.18	41.87				5.13	3.76	4.88	3.82	0.00	0.00		66.07	13.22
Minnow	GS	3	19990608		9.90	18.00	1.44	52.93				0.00	0.00	0.00	13.63	0.00	0.00		84.56	11.34
Minnow	GS	4	19990709		2.13	6.19	0.36	48.79				2.22	2.95	0.00	13.19	0.00	0.00		71.12	4.72
Minnow	GS	5	19990608		18.43	2.93	0.00	56.75				0.00	0.00	0.00	23.91	0.00	0.00		83.58	18.43
Minnow	GS	6	19990608		4.25	6.33	0.59	46.44				0.00	0.00	8.35	11.12	0.00	0.00		63.88	13.19
Minnow	GS	7	19990602		7.57	6.42	0.53	71.98				0.00	0.03	2.93	3.63	0.00	0.00		82.06	11.03
Minnow	GS	8	19990502		3.69	6.99	2.84	92.19				0.00	0.13	4.48	9.84	0.00	0.00		109.15	11.01
Minnow	**GS**	**mean**	**1999**		**7.27**	**8.49**	**0.74**	**54.54**				**0.92**	**1.07**	**2.84**	**13.39**	**0.00**	**0.00**	**Mean**	**77.48**	**11.77**

Study Area	TU	Plot#	Date Meas	Live Ac	Dead Bl	Live Bl	Dead Cw	Live Cw	Dead Fd	Live Fd	Dead Hw	Live Hw	Dead Sx	Live Sx	Dead Unkn	Live Unkn		Tot Live	Tot Dead
Minnow	UN	1	19990607		1.20	3.26	0.00	27.71			0.00		0.00	1.93	0.00	0.00		32.90	1.20
Minnow	UN	2	19990707		7.76	8.78	1.17	75.98			0.00		4.34	10.15	0.00	0.00		94.91	13.27
Minnow	UN	3	19990707		1.31	6.18	1.73	122.32			0.00		2.97	0.89	0.00	0.00		129.38	6.00
Minnow	UN	4	19990707		2.67	5.91	4.07	105.35			0.00		0.51	13.95	3.76	0.00		125.21	11.02
Minnow	UN	5	19990708		6.06	8.63	2.88	89.83			0.00		0.30	15.03	0.00	0.00		113.49	9.24
Minnow	UN	6	19990708		5.39	6.86	8.40	75.94			0.00		6.22	13.93	0.00	0.00		96.73	20.01
Minnow	**UN**	**mean**	**1999**		**4.07**	**6.60**	**3.04**	**82.86**			**0.00**		**2.39**	**9.31**	**0.63**	**0.00**	**Mean**	**98.77**	**10.12**

Study Area	TU	Plot#	Date Meas	Live Ac	Dead Bl	Live Bl	Dead Cw	Live Cw	Dead Fd	Live Fd	Dead Hw	Live Hw	Dead Sx	Live Sx	Dead Unkn	Live Unkn		Tot Live	Tot Dead
Minnow	UN	9	20000809		8.93	13.87	0.23	57.06		0.00	0.00	2.51	0.92	3.14	0.00	0.00		76.58	10.08
Minnow	UN	10	20000809		14.18	4.47	4.75	82.06		0.00	0.00	0.00	6.85	8.87	0.00	0.00		95.40	25.78
Minnow	UN	11	20000808		0.50	15.35	2.92	88.99		0.00	0.00	0.00	8.67	3.95	0.00	0.00		108.29	12.10
Minnow	UN	12	20000811		0.28	6.72	3.49	89.40		0.00	0.00	0.00	7.31	17.30	0.00	0.00		113.41	11.09
Minnow	UN	13	20000810		0.00	1.81	3.00	111.16		0.00	0.00	0.00	4.57	5.65	0.00	0.00		118.62	7.57
Minnow	UN	14	20000811		5.19	5.22	4.99	106.89		0.00	0.00	0.00	3.37	2.86	0.00	0.83		115.80	13.56
Minnow	UN	15	20000810		6.48	14.12	2.36	47.60		0.00	0.00	0.00	3.62	9.52	0.00	0.00		71.24	12.46
Minnow	UN	16	20000809		4.95	9.56	2.18	86.20		12.97	0.00	0.02	0.00	16.31	0.00	0.00		125.05	7.13
Minnow	**UN**	**mean**	**2000**		**5.07**	**8.89**	**2.99**	**83.67**		**1.62**	**0.00**	**0.32**	**4.41**	**8.45**	**0.00**	**0.10**	**Mean**	**103.05**	**12.47**

Appendix 2b:

Pre-harvest Top Height Plot and Treatment Unit Summary

(Tallest 100 sph of live trees)

Summary of Height (metres) of Tallest 100 sph by Plot and Treatment Unit, Northern Wetbelt Study Sites
Compiled by Mike Jull, March 25, 2000

Study Area	Trmt Unit	Plot #	Mean Top Ht (tallest 100 sph)	Stand. Dev.	n *	Standard Error	Min.	Max.
Bearpaw Ridge	UN	1	23.08	4.17	10	1.32	19.90	34.00
Bearpaw Ridge	UN	2	26.36	2.99	10	0.94	23.20	31.80
Bearpaw Ridge	UN	3	25.65	1.25	10	0.39	24.30	27.80
Bearpaw Ridge	UN	4	30.29	1.76	10	0.56	27.90	34.30
Bearpaw Ridge	UN	5	26.27	3.41	10	1.08	22.70	33.00
Bearpaw Ridge	UN	6	23.31	1.51	10	0.48	21.30	26.60
Bearpaw Ridge	UN	7	24.56	2.68	10	0.85	20.30	28.70
Bearpaw Ridge	UN	8	24.04	2.32	10	0.73	20.60	28.20
Bearpaw Ridge	UN	9	24.88	2.01	10	0.64	22.80	28.00
Bearpaw Ridge	UN	10	21.88	4.42	10	1.40	17.00	27.30
Bearpaw Ridge	CC	1	22.99	3.24	7	1.22	19.40	28.10
Bearpaw Ridge	CC	2	23.36	4.97	7	1.88	18.80	31.10
Bearpaw Ridge	CC	3	24.30	5.46	7	2.06	16.10	33.60
Bearpaw Ridge	CC	4	23.54	3.48	7	1.32	18.90	28.90
Bearpaw Ridge	CC	5	20.89	6.50	7	2.46	12.70	29.70
Bearpaw Ridge	CC	6	25.50	4.25	7	1.61	22.30	33.30
Bearpaw Ridge	CC	7	26.63	5.75	7	2.17	16.70	34.40
Bearpaw Ridge	CC	8	24.47	1.44	7	0.55	22.30	26.60
Bearpaw Ridge	CC	9	25.51	1.49	7	0.56	24.20	27.60
Bearpaw Ridge	CC	10	28.49	2.14	7	0.81	25.90	31.10
Bearpaw Ridge	CC	11	24.69	1.72	7	0.65	22.00	27.20
Bearpaw Ridge	CC	12	23.46	5.76	7	2.18	18.00	33.60
Bearpaw Ridge	CC	13	26.66	6.26	7	2.37	20.70	36.70
Bearpaw Ridge	CC	14	24.69	1.60	7	0.60	23.00	26.50

Study Area	Trmt Unit	Plot #	Mean Top Ht (tallest 100 sph)	Stand. Dev.	n	Standard Error	Min.	Max.
Bearpaw Ridge	GS	1	28.17	3.41	7	1.29	22.00	31.30
Bearpaw Ridge	GS	2	26.37	2.46	7	0.93	22.90	29.30
Bearpaw Ridge	GS	3	23.40	3.09	7	1.17	18.80	28.60
Bearpaw Ridge	GS	4	25.29	2.14	7	0.81	23.30	28.60
Bearpaw Ridge	GS	5	24.83	2.98	7	1.13	18.80	28.20
Bearpaw Ridge	GS	7	25.04	4.04	7	1.53	20.80	31.90
Bearpaw Ridge	GS	8	19.41	8.46	7	3.20	10.80	33.20
Bearpaw Ridge	GS	9	28.59	3.31	7	1.25	24.30	33.20
Bearpaw Ridge	GS	10	27.16	1.39	7	0.53	24.90	28.60
Bearpaw Ridge	GS	11	26.47	4.15	7	1.57	19.90	32.00
Bearpaw Ridge	GS	12	21.14	9.13	7	3.45	12.00	33.50
Bearpaw Ridge	GS	13	31.29	2.81	7	1.06	26.10	35.30
Bearpaw Ridge	GS	14	21.71	8.93	7	3.38	11.80	37.20
Bearpaw Ridge	STS	1	28.59	7.77	7	2.94	15.70	37.10
Bearpaw Ridge	STS	2	16.76	3.65	7	1.38	13.40	22.20
Bearpaw Ridge	STS	3	22.36	3.84	7	1.45	18.10	28.70
Bearpaw Ridge	STS	4	23.00	7.53	7	2.84	15.70	33.50
Bearpaw Ridge	STS	5	24.71	3.44	7	1.30	21.20	29.30
Bearpaw Ridge	STS	6	24.43	1.95	7	0.74	22.30	26.80
Bearpaw Ridge	STS	7	20.01	4.10	7	1.55	16.20	25.90
Bearpaw Ridge	STS	9	21.73	2.58	7	0.98	18.50	25.20
Bearpaw Ridge	STS	10	21.80	2.52	7	0.95	18.50	25.20
Bearpaw Ridge	STS	11	27.70	2.94	7	1.11	23.40	31.20
Bearpaw Ridge	STS	12	27.37	2.04	7	0.77	24.70	31.20
Bearpaw Ridge	STS	13	28.60	2.93	7	1.11	24.30	33.60
Bearpaw Ridge	STS	14	28.79	3.58	7	1.35	25.70	36.30

Study Area	Trmt Unit	Plot #	Mean Height (tallest 100 sph)	Stand. Dev.	n *	Standard Error	Min.	Max.
Pinkerton	UN	17G	28.44	2.73	10	0.73	24.80	34.00
Pinkerton	UN	18G	28.11	2.72	10	0.73	24.80	32.20
Pinkerton	UN	19G	25.56	1.75	10	0.47	24.10	29.90
Pinkerton	UN	20G	26.07	4.17	10	1.11	22.20	36.10
Pinkerton	UN	21G	27.69	1.75	10	0.47	25.60	31.20
Pinkerton	UN	22G	26.97	0.95	10	0.26	26.10	29.10
Pinkerton	UN	23G	29.44	1.36	10	0.36	27.90	32.40
Pinkerton	UN	24G	28.35	2.22	10	0.59	25.90	32.80
Pinkerton	STS	10T	22.30	2.71	10	0.73	19.60	27.80
Pinkerton	STS	11T	26.61	2.15	9	0.57	24.60	31.10
Pinkerton	STS	12T	25.96	2.46	10	0.66	22.70	30.00
Pinkerton	STS	13T	25.79	2.85	10	0.76	22.60	30.30
Pinkerton	STS	14T	22.27	1.94	10	0.52	19.40	26.70
Pinkerton	STS	15T	29.52	2.61	10	0.70	26.40	35.90
Pinkerton	STS	16T	28.95	1.87	10	0.50	25.50	32.40
Pinkerton	STS	9T	28.82	1.56	10	0.42	26.90	31.10
Pinkerton	GS	1T	28.40	2.04	10	0.55	25.70	32.00
Pinkerton	GS	2T	26.34	2.84	10	0.76	23.80	33.20
Pinkerton	GS	3T	28.74	2.28	10	0.61	25.20	32.30
Pinkerton	GS	4T	26.32	2.06	10	0.55	24.30	30.70
Pinkerton	GS	5T	29.29	1.73	10	0.46	27.70	32.90
Pinkerton	GS	6T	25.20	2.61	10	0.70	22.00	29.30
Pinkerton	GS	7T	23.17	1.99	10	0.53	21.50	26.40
Pinkerton	GS	8T	21.68	2.48	10	0.66	19.20	26.70

Study Area	Trmt Unit	Plot #	Mean Top Ht (tallest 100 sph)	Stand. Dev.	n	Standard Error	Min.	Max.
East Twin	CC	1	37.92	3.11	13	0.86	34.20	43.80
East Twin	CC	2	38.61	2.92	13	0.81	35.50	47.30
East Twin	CC	3	36.01	1.90	13	0.53	33.60	40.20
East Twin	CC	4	36.89	2.28	13	0.63	34.40	42.10
East Twin	CC	5	37.46	1.05	13	0.29	36.00	39.40
East Twin	CC	6	33.30	1.62	13	0.45	31.20	36.30
East Twin	CC	7	37.80	2.42	13	0.67	34.60	42.20
East Twin	GS	1	40.78	1.94	13	0.54	37.60	44.40
East Twin	GS	2	43.83	2.01	13	0.56	41.50	48.40
East Twin	GS	3	39.95	1.67	13	0.46	38.20	43.90
East Twin	GS	4	43.98	1.88	13	0.52	41.30	47.50
East Twin	GS	5	42.01	3.08	13	0.86	37.90	49.30
East Twin	GS	6	32.88	1.73	12	0.50	31.00	36.00
East Twin	UN	1	31.88	3.18	13	0.88	29.10	41.50
East Twin	UN	2	37.27	2.70	13	0.75	34.10	44.10
East Twin	UN	3	36.42	1.93	13	0.54	34.30	41.00
East Twin	UN	4	34.97	3.23	13	0.90	31.90	41.90
East Twin	UN	5	38.84	1.87	13	0.52	36.40	42.20
East Twin	UN	6	36.03	2.09	12	0.60	33.10	39.30

Study Area	Trmt Unit	Plot #	Mean Top Ht (tallest 100 sph)	Stand. Dev.	n	Standard Error	Min.	Max.
Lunate Creek	UN	1	43.94	2.59	13	0.72	41.20	49.30
Lunate Creek	UN	2	36.82	3.12	13	0.87	31.20	42.20
Lunate Creek	UN	3	37.87	3.60	13	1.00	33.00	44.70
Lunate Creek	UN	4	34.88	4.12	12	1.19	29.70	42.20
Lunate Creek	UN	5	37.78	2.56	13	0.71	34.70	42.80
Lunate Creek	UN	6	36.61	2.16	13	0.60	34.20	41.70
Lunate Creek	UN	7	36.23	2.49	13	0.69	32.50	39.90
Lunate Creek	UN	9	41.04	5.19	10	1.64	37.50	55.30
Lunate Creek	UN	10	36.22	1.13	10	0.36	34.90	37.90
Lunate Creek	UN	11	34.41	2.48	10	0.78	31.50	39.70
Lunate Creek	UN	12	37.34	1.97	10	0.62	35.30	41.10
Lunate Creek	UN	13	44.08	1.86	10	0.59	40.30	46.40
Lunate Creek	UN	14	40.06	3.99	10	1.26	34.00	46.40
Lunate Creek	UN	15	39.13	2.41	10	0.76	35.10	41.90
Lunate Creek	UN	16	35.28	2.54	10	0.80	31.70	39.50
Lunate Creek	CC	1	39.12	3.21	13	0.89	36.00	47.30
Lunate Creek	CC	2	34.53	2.40	13	0.66	32.20	40.60
Lunate Creek	CC	3	42.11	1.96	13	0.54	38.70	45.00
Lunate Creek	CC	4	41.92	4.13	13	1.15	37.00	51.90
Lunate Creek	CC	5	38.85	6.04	13	1.68	27.60	49.30
Lunate Creek	CC	6	38.12	3.25	13	0.90	34.70	44.70
Lunate Creek	CC	7	35.45	2.28	13	0.63	33.10	40.00
Lunate Creek	CC	8	37.12	4.22	13	1.17	33.60	45.40
Lunate Creek	GR	2	29.75	4.02	13	1.11	25.00	39.20
Lunate Creek	GR	3	35.54	4.93	13	1.37	27.90	43.00
Lunate Creek	GR	3	34.52	2.73	13	0.76	32.20	41.30
Lunate Creek	GR	4	34.43	2.16	13	0.60	31.90	38.60
Lunate Creek	GR	5	34.41	2.87	13	0.80	31.60	39.40
Lunate Creek	GR	6	34.27	3.52	13	0.98	30.90	40.70
Lunate Creek	GR	7	34.19	3.75	13	1.04	29.90	41.60
Lunate Creek	GR	8	31.91	4.13	13	1.14	27.90	39.60

Study Area	Trmt Unit	Plot #	Mean Top Ht (tallest 100 sph)	Stand. Dev.	n	Standard Error	Min.	Max.
Lunate Creek	GS	1	36.05	1.87	13	0.52	33.80	40.00
Lunate Creek	GS	2	38.58	2.00	13	0.55	35.80	41.80
Lunate Creek	GS	3	37.48	3.27	13	0.91	34.10	44.80
Lunate Creek	GS	4	40.57	0.74	13	0.20	39.20	41.70
Lunate Creek	GS	5	43.19	2.70	13	0.75	38.50	47.40
Lunate Creek	GS	6	42.95	2.10	13	0.58	40.20	46.50
Lunate Creek	GS	7	44.39	1.65	13	0.46	42.80	49.10
Lunate Creek	GS	8	40.39	4.93	13	1.37	34.40	48.90

Study Area	Trmt Unit	Plot #	Mean Top Ht (tallest 100 sph)	Stand. Dev.	n	Standard Error	Min.	Max.
Minnow Creek	CC	1	39.22	4.46	13	1.24	33.80	49.80
Minnow Creek	CC	2	31.95	2.22	12	0.64	29.70	36.60
Minnow Creek	CC	3	33.58	6.09	13	1.69	29.10	49.40
Minnow Creek	CC	4	33.97	3.49	12	1.01	30.00	41.00
Minnow Creek	CC	5	30.62	2.79	13	0.77	27.90	37.10
Minnow Creek	GR	1	34.89	1.14	12	0.33	32.90	36.70
Minnow Creek	GR	2	37.58	4.34	13	1.20	32.40	46.10
Minnow Creek	GR	3	34.12	3.41	13	0.95	30.20	40.40
Minnow Creek	GR	4	35.84	2.73	13	0.76	32.40	40.70
Minnow Creek	GR	5	35.51	2.95	13	0.82	32.20	41.20
Minnow Creek	GR	6	33.02	3.64	13	1.01	30.80	44.20
Minnow Creek	GS	1	33.61	5.10	13	1.41	23.60	39.40
Minnow Creek	GS	1	29.23	5.18	12	1.49	22.50	36.60
Minnow Creek	GS	3	36.02	3.60	13	1.00	31.60	43.50
Minnow Creek	GS	4	34.68	6.16	13	1.71	28.00	53.60
Minnow Creek	GS	5	35.78	4.06	13	1.13	28.10	41.30
Minnow Creek	GS	6	33.51	4.44	13	1.23	27.50	42.10
Minnow Creek	GS	7	35.00	2.13	12	0.61	32.60	39.50
Minnow Creek	GS	8	34.58	4.84	13	1.34	30.30	47.00

Study Area	Trmt Unit	Plot #	Mean Top Ht (tallest 100 sph)	Stand. Dev.	n	Standard Error	Min.	Max.
Minnow Creek	UN	1	26.98	4.10	13	1.14	20.80	33.00
Minnow Creek	UN	2	36.12	4.06	13	1.13	30.80	43.00
Minnow Creek	UN	3	35.11	2.98	13	0.83	31.40	40.10
Minnow Creek	UN	4	36.42	2.50	13	0.69	33.50	41.70
Minnow Creek	UN	5	37.78	2.32	13	0.64	34.80	42.00
Minnow Creek	UN	6	35.03	3.56	13	0.99	30.40	42.90
Minnow Creek	UN	9	30.42	2.20	10	0.70	28.20	34.50
Minnow Creek	UN	10	33.42	2.07	10	0.66	31.50	38.40
Minnow Creek	UN	11	34.32	1.96	10	0.62	32.20	37.60
Minnow Creek	UN	12	36.63	2.44	10	0.77	33.70	41.70
Minnow Creek	UN	13	33.86	1.82	10	0.57	32.00	38.40
Minnow Creek	UN	14	34.07	1.51	10	0.48	32.50	37.20
Minnow Creek	UN	15	33.07	4.55	10	1.44	30.20	45.20
Minnow Creek	UN	16	33.91	2.47	10	0.78	31.60	38.10

Appendix 2c:

Pre-harvest Stand Table Data Summary by Treatment Unit

(Stems-per-hectare by 10 cm DBH class and tree species)

STAND TABLE SUMMARY :

Summary of Stems-per-ha. by 10cm diam class and species

Study Area	Trmt Unit		LIVE STEMS						DEAD STEMS					
		DBH (cm)	Bl	Sx	Hw	Cw	other live	Total Live	Bl	Sx	Hw	Cw	other dead	Total Dead
Bearpaw	CC	D 4-10	309.7	88.0	1.1		0.0	398.9	0.0	0.0			0.0	0.0
		D 10-20	162.3	51.4	0.0		0.0	213.7	11.4	0.0			0.0	11.4
		D 20-30	53.7	41.1	1.1		0.0	96.0	37.7	1.1			1.1	41.1
		D 30-40	29.7	22.9	0.0		0.0	52.6	29.7	2.3			1.1	34.3
		D 40-50	17.1	19.4	0.0		0.0	36.6	21.7	1.1			0.0	22.9
		D 50-60	6.9	22.9	0.0		0.0	29.7	10.3	2.3			0.0	12.6
		D 60-70	0.0	10.3	0.0		0.0	10.3	1.1	2.3			0.0	3.4
		D 70-80	0.0	6.9	0.0		0.0	6.9	0.0	0.0			0.0	0.0
		D 80-90	0.0	2.3	0.0		0.0	2.3	0.0	0.0			0.0	0.0
		D 90-100	0.0	1.1	0.0		0.0	1.1	0.0	0.0			0.0	0.0
		D 100-110	0.0	0.0	0.0		0.0	0.0	0.0	0.0			0.0	0.0
		D 110-120	0.0	0.0	0.0		0.0	0.0	0.0	0.0			0.0	0.0

Study Area	Trmt Unit		LIVE STEMS						DEAD STEMS					
		DBH (cm)	Bl	Sx	Hw	Cw	other live	Total Live	Bl	Sx	Hw	Cw	other dead	Total Dead
Bearpaw	GS	D 4-10	104.0	35.4			0.0	139.4	0.0	0.0			0.0	0.0
		D 10-20	102.9	28.6			0.0	131.4	5.7	1.1			0.0	6.9
		D 20-30	45.7	25.1			0.0	70.9	38.9	3.4			0.0	42.3
		D 30-40	13.7	8.0			0.0	21.7	27.4	1.1			0.0	28.6
		D 40-50	20.6	18.3			0.0	38.9	13.7	2.3			0.0	16.0
		D 50-60	10.3	28.6			0.0	38.9	6.9	6.9			0.0	13.7
		D 60-70	0.0	12.6			0.0	12.6	0.0	0.0			0.0	0.0
		D 70-80	1.1	5.7			0.0	6.9	0.0	0.0			0.0	0.0
		D 80-90	0.0	3.4			0.0	3.4	0.0	0.0			0.0	0.0
		D 90-100	0.0	2.3			0.0	2.3	0.0	1.1			0.0	1.1
		D 100-110	1.1	0.0			0.0	1.1	0.0	0.0			0.0	0.0
		D 110-120	0.0	0.0			0.0	0.0	0.0	0.0			0.0	0.0
		D 120-130	0.0	0.0			0.0	0.0	0.0	0.0			0.0	0.0

Study Area	Trmt Unit	DBH (cm)	LIVE STEMS						DEAD STEMS					
			Bl	Sx	Hw	Cw	other live	Total Live	Bl	Sx	Hw	Cw	other dead	Total Dead
Bearpaw	STS	D 4-10	0.0	36.9			0.0	36.9	174.8	0.0			0.0	174.8
		D 10-20	6.2	22.2			0.0	28.3	115.7	0.0			1.2	118.2
		D 20-30	34.5	20.9			0.0	55.4	59.1	0.0			0.0	59.1
		D 30-40	30.8	18.5			0.0	49.2	38.2	0.0			0.0	38.2
		D 40-50	16.0	14.8			0.0	30.8	16.0	1.2			0.0	17.2
		D 50-60	3.7	16.0			0.0	19.7	14.8	1.2			0.0	16.0
		D 60-70	0.0	11.1			0.0	11.1	3.7	1.2			0.0	4.9
		D 70-80	0.0	4.9			0.0	4.9	1.2	1.2			0.0	2.5
		D 80-90	0.0	0.0			0.0	0.0	0.0	1.2			0.0	1.2
		D 90-100	0.0	2.5			0.0	2.5	0.0	0.0			0.0	0.0
		D 100-110	0.0	0.0			0.0	0.0	0.0	0.0			0.0	0.0
		D 110-120	0.0	0.0			0.0	0.0	0.0	0.0			0.0	0.0
		D 120-130	0.0	0.0			0.0	0.0	0.0	0.0			0.0	0.0
		D 130-140	0.0	0.0			0.0	0.0	0.0	0.0			0.0	0.0

Study Area	Trmt Unit	DBH (cm)	LIVE STEMS						DEAD STEMS					
			Bl	Sx	Hw	Cw	other live	Total Live	Bl	Sx	Hw	Cw	other dead	Total Dead
Bearpaw	UN	D 4-10	217.0	26.0	1.0		0.0	244.0	2.0	0.0			0.0	2.0
		D 10-20	116.0	36.0	0.0		0.0	152.0	9.0	0.0			0.0	9.0
		D 20-30	55.0	21.0	0.0		0.0	76.0	36.0	2.0			0.0	38.0
		D 30-40	40.0	26.0	0.0		0.0	66.0	29.0	3.0			0.0	32.0
		D 40-50	18.0	26.0	0.0		0.0	44.0	15.0	0.0			0.0	15.0
		D 50-60	10.0	33.0	0.0		0.0	43.0	5.0	4.0			0.0	9.0
		D 60-70	1.0	5.0	0.0		0.0	6.0	1.0	0.0			0.0	1.0
		D 70-80	1.0	4.0	0.0		0.0	5.0	0.0	0.0			0.0	0.0
		D 80-90	0.0	3.0	0.0		0.0	3.0	1.0	0.0			0.0	1.0
		D 90-100	0.0	0.0	0.0		0.0	0.0	0.0	0.0			0.0	0.0
		D 100-110	0.0	1.0	0.0		0.0	1.0	0.0	0.0			0.0	0.0
		D 110-120	0.0	0.0	0.0		0.0	0.0	0.0	0.0			0.0	0.0
		D 120-130	0.0	0.0	0.0		0.0	0.0	0.0	0.0			0.0	0.0

Study Area	Trmt Unit		LIVE STEMS						DEAD STEMS					
		DBH (cm)	Bl	Sx	Hw	Cw	other live	Total Live	Bl	Sx	Hw	Cw	other dead	Total Dead
Pinkerton	GS	D 4-10	310.0	41.3					0.0	0.0				
		D 10-20	166.3	35.0					57.5	2.5				
		D 20-30	102.5	27.5					63.8	1.3				
		D 30-40	62.5	23.8					42.5	1.3				
		D 40-50	32.5	31.3					16.3	0.0				
		D 50-60	16.3	8.8					3.8	1.3				
		D 60-70	3.8	5.0					0.0	0.0				
		D 70-80	0.0	2.5					0.0	0.0				
		D 80-90												
		D 90-100												

Study Area	Trmt Unit	DBH (cm)	LIVE STEMS Bl	Sx	Hw	Cw	other live	Total Live	DEAD STEMS Bl	Sx	Hw	Cw	other dead	Total Dead
Pinkerton	STS	D 4-10	7.5	52.5					282.5	0.0				
		D 10-20	32.5	38.8					158.8	1.3				
		D 20-30	25.0	18.8					81.3	0.0				
		D 30-40	42.5	21.3					70.0	0.0				
		D 40-50	20.0	15.0					37.5	1.3				
		D 50-60	10.0	5.0					20.0	0.0				
		D 60-70	0.0	5.0					5.0	0.0				
		D 70-80	1.3	0.0					2.5	0.0				
		D 80-90												
		D 90-100												

Study Area	Trmt Unit	DBH (cm)	LIVE STEMS Bl	Sx	Hw	Cw	other live	Total Live	DEAD STEMS Bl	Sx	Hw	Cw	other dead	Total Dead
Pinkerton	UN	D 4-10	181.3	45.0					3.8	0.0				
		D 10-20	160.0	35.0					70.0	2.5				
		D 20-30	113.8	30.0					50.0	0.0				
		D 30-40	85.0	16.3					50.0	3.8				
		D 40-50	23.8	28.8					15.0	0.0				
		D 50-60	16.3	15.0					8.8	1.3				
		D 60-70	1.3	3.8					0.0	0.0				
		D 70-80	0.0	1.3					0.0	0.0				
		D 80-90												
		D 90-100												

Study Area	Trmt Unit	DBH (cm)	LIVE STEMS						DEAD STEMS					
			Bl	Sx	Hw	Cw	other live	Total Live	Bl	Sx	Hw	Cw	other dead	Total Dead
East Twin	Clearcut	D 4-10	9.0	2.0	18.0	151.0	0.0	180.0	0.0	0.0	2.0	1.0	0.0	3.0
		D 10-20	5.0	6.0	34.0	66.0	0.0	111.0	0.0	1.0	0.0	0.0	0.0	1.0
		D 20-30	4.0	3.0	14.0	37.0	0.0	58.0	4.0	2.0	2.0	3.0	0.0	11.0
		D 30-40	2.0	6.0	1.0	32.0	0.0	41.0	2.0	0.0	0.0	0.0	0.0	2.0
		D 40-50	2.0	2.0	5.0	31.0	0.0	40.0	2.0	0.0	0.0	0.0	0.0	2.0
		D 50-60	1.0	2.0	3.0	50.0	0.0	56.0	2.0	0.0	1.0	2.0	0.0	5.0
		D 60-70	0.0	4.0	1.0	39.0	0.0	44.0	1.0	0.0	0.0	6.0	0.0	7.0
		D 70-80	0.0	0.0	0.0	33.0	0.0	33.0	0.0	0.0	1.0	3.0	0.0	4.0
		D 80-90	0.0	0.0	1.0	20.0	0.0	21.0	0.0	1.0	1.0	1.0	0.0	3.0
		D 90-100	0.0	0.0	0.0	18.0	0.0	18.0	0.0	0.0	0.0	0.0	0.0	0.0
		D 100-110	0.0	0.0	1.0	10.0	0.0	11.0	0.0	0.0	0.0	0.0	0.0	0.0
		D 110-120	0.0	0.0	0.0	5.0	0.0	5.0	0.0	0.0	0.0	1.0	0.0	1.0
		D 120-130	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		D 130-140	0.0	0.0	0.0	2.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
		D 140-150	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		D 150-160	0.0	0.0	0.0	2.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
		D 160-170	0.0	0.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
		D 170-180	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		D 180-190	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		D 190-200	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Study Area	Trmt Unit	DBH (cm)	LIVE STEMS						DEAD STEMS					
			Bl	Sx	Hw	Cw	other live	Total Live	Bl	Sx	Hw	Cw	other dead	Total Dead
East Twin	GS	D 4-10	0.0	1.3	17.3	77.3	0.0	96.0	0.0	0.0	0.0	0.0	0.0	0.0
		D 10-20	0.0	1.3	25.3	72.0	0.0	98.7	1.3	0.0	0.0	1.3	0.0	2.7
		D 20-30	1.3	0.0	6.7	33.3	0.0	41.3	4.0	2.7	0.0	8.0	0.0	14.7
		D 30-40	0.0	1.3	4.0	26.7	0.0	32.0	5.3	1.3	0.0	4.0	0.0	10.7
		D 40-50	0.0	0.0	1.3	45.3	0.0	46.7	1.3	0.0	1.3	1.3	0.0	4.0
		D 50-60	0.0	1.3	0.0	48.0	0.0	49.3	0.0	0.0	0.0	4.0	0.0	4.0
		D 60-70	0.0	0.0	0.0	57.3	0.0	57.3	0.0	1.3	0.0	2.7	0.0	4.0
		D 70-80	0.0	0.0	0.0	56.0	0.0	56.0	0.0	1.3	0.0	2.7	0.0	4.0
		D 80-90	0.0	0.0	0.0	37.3	0.0	37.3	0.0	0.0	0.0	1.3	0.0	1.3
		D 90-100	0.0	0.0	0.0	17.3	0.0	17.3	0.0	0.0	0.0	0.0	0.0	0.0
		D 100-110	0.0	0.0	0.0	9.3	0.0	9.3	0.0	0.0	0.0	1.3	0.0	1.3
		D 110-120	0.0	0.0	0.0	5.3	0.0	5.3	0.0	0.0	0.0	0.0	0.0	0.0
		D 120-130	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		D 130-140	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		D 140-150	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		D 150-160	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		D 160-170	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		D 170-180	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		D 180-190	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		D 190-200	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Study Area	Trmt Unit	DBH (cm)	LIVE STEMS						DEAD STEMS					
			Bl	Sx	Hw	Cw	other live	Total Live	Bl	Sx	Hw	Cw	other dead	Total Dead
East Twin	UN	D 4-10	4.8	0.0	68.8	145.6	0.0	219.2	0.0	0.0	0.0	0.0	0.0	0.0
		D 10-20	8.0	0.0	153.6	128.0	0.0	289.6	4.8	0.0	3.2	0.0	0.0	8.0
		D 20-30	9.6	3.2	65.6	30.4	0.0	108.8	11.2	0.0	4.8	6.4	0.0	22.4
		D 30-40	1.6	1.6	17.6	65.6	0.0	86.4	6.4	1.6	0.0	3.2	0.0	11.2
		D 40-50	6.4	3.2	9.6	92.8	0.0	112.0	0.0	1.6	4.8	8.0	0.0	14.4
		D 50-60	1.6	1.6	1.6	99.2	0.0	104.0	1.6	1.6	1.6	1.6	0.0	6.4
		D 60-70	0.0	1.6	3.2	78.4	0.0	83.2	0.0	1.6	0.0	1.6	0.0	3.2
		D 70-80	0.0	0.0	1.6	46.4	0.0	48.0	0.0	1.6	0.0	1.6	0.0	3.2
		D 80-90	0.0	0.0	3.2	22.4	0.0	25.6	0.0	0.0	0.0	3.2	0.0	3.2
		D 90-100	0.0	0.0	1.6	6.4	0.0	8.0	0.0	0.0	0.0	3.2	0.0	3.2
		D 100-110	0.0	0.0	0.0	3.2	0.0	3.2	0.0	0.0	0.0	0.0	0.0	0.0
		D 110-120	0.0	0.0	0.0	3.2	0.0	3.2	0.0	0.0	0.0	0.0	0.0	0.0
		D 120-130	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		D 130-140	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		D 140-150	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		D 150-160	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		D 160-170	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		D 170-180	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		D 180-190	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		D 190-200	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Study Area	Trmt Unit		LIVE STEMS						DEAD STEMS					
		DBH (cm)	Bl	Sx	Hw	Cw	other live	Total Live	Bl	Sx	Hw	Cw	other dead	Total Dead
Lunate	CC	D 4-10	1.0	7.0	13.0	66.0	0.0	87.0	0.0		0.0	0.0	0.0	0.0
		D 10-20	0.0	4.0	28.0	43.0	0.0	75.0	0.0		0.0	2.0	0.0	2.0
		D 20-30	2.0	0.0	18.0	33.0	0.0	53.0	0.0		1.0	2.0	0.0	3.0
		D 30-40	2.0	1.0	5.0	21.0	0.0	29.0	0.0		0.0	1.0	0.0	1.0
		D 40-50	0.0	1.0	3.0	25.0	0.0	29.0	1.0		0.0	1.0	0.0	2.0
		D 50-60	0.0	1.0	0.0	20.0	0.0	21.0	0.0		0.0	2.0	0.0	2.0
		D 60-70	0.0	2.0	0.0	28.0	0.0	30.0	0.0		1.0	1.0	1.0	4.0
		D 70-80	0.0	0.0	1.0	32.0	0.0	33.0	0.0		0.0	1.0	0.0	1.0
		D 80-90	0.0	0.0	0.0	26.0	0.0	26.0	0.0		0.0	3.0	0.0	3.0
		D 90-100	0.0	0.0	0.0	16.0	0.0	16.0	0.0		0.0	0.0	0.0	0.0
		D 100-110	0.0	0.0	0.0	16.0	0.0	16.0	0.0		0.0	0.0	0.0	0.0
		D 110-120	0.0	0.0	0.0	15.0	0.0	15.0	0.0		0.0	3.0	0.0	3.0
		D 120-130	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
		D 130-140	0.0	0.0	0.0	13.0	0.0	13.0	0.0		0.0	0.0	0.0	0.0
		D 140-150	0.0	0.0	0.0	2.0	0.0	2.0	0.0		0.0	0.0	0.0	0.0
		D 150-160	0.0	0.0	0.0	4.0	0.0	4.0	0.0		0.0	0.0	0.0	0.0
		D 160-170	0.0	0.0	0.0	2.0	0.0	2.0	0.0		0.0	0.0	0.0	0.0
		D 170-180	0.0	0.0	0.0	3.0	0.0	3.0	0.0		0.0	0.0	0.0	0.0
		D 180-190	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
		D 190-200	0.0	0.0	0.0	1.0	0.0	1.0	0.0		0.0	0.0	0.0	0.0
		D 200-210	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0

Study Area	Trmt Unit	DBH (cm)	LIVE STEMS						DEAD STEMS					
			Bl	Sx	Hw	Cw	other live	Total Live	Bl	Sx	Hw	Cw	other dead	Total Dead
Lunate	GR	D 4-10	25.0	17.0	90.0	62.0	0.0	194.0	0.0	0.0	3.0	1.0	0.0	4.0
		D 10-20	12.0	6.0	90.0	26.0	0.0	134.0	0.0	0.0	3.0	1.0	0.0	4.0
		D 20-30	6.0	4.0	47.0	17.0	0.0	74.0	5.0	0.0	1.0	2.0	1.0	10.0
		D 30-40	10.0	0.0	36.0	14.0	0.0	60.0	3.0	0.0	1.0	2.0	0.0	6.0
		D 40-50	6.0	3.0	14.0	6.0	0.0	29.0	8.0	1.0	0.0	0.0	0.0	9.0
		D 50-60	1.0	4.0	6.0	12.0	0.0	23.0	3.0	0.0	2.0	0.0	0.0	5.0
		D 60-70	0.0	2.0	3.0	6.0	0.0	11.0	0.0	1.0	0.0	1.0	0.0	2.0
		D 70-80	0.0	1.0	1.0	17.0	0.0	19.0	0.0	0.0	0.0	1.0	0.0	1.0
		D 80-90	0.0	0.0	1.0	15.0	0.0	16.0	0.0	0.0	0.0	2.0	0.0	2.0
		D 90-100	0.0	1.0	0.0	15.0	0.0	16.0	0.0	0.0	1.0	0.0	0.0	1.0
		D 100-110	0.0	0.0	0.0	14.0	0.0	14.0	0.0	0.0	0.0	1.0	0.0	1.0
		D 110-120	0.0	0.0	0.0	8.0	0.0	8.0	0.0	0.0	0.0	0.0	0.0	0.0
		D 120-130	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		D 130-140	0.0	0.0	0.0	11.0	0.0	11.0	0.0	0.0	0.0	0.0	0.0	0.0
		D 140-150	0.0	0.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
		D 150-160	0.0	0.0	0.0	4.0	0.0	4.0	0.0	0.0	0.0	1.0	0.0	1.0
		D 160-170	0.0	0.0	1.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
		D 170-180	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		D 180-190	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		D 190-200	0.0	0.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
		D 200-210	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		D 210-220	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		D 220-230	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		> 230												

Study Area	Trmt Unit	DBH (cm)	LIVE STEMS						DEAD STEMS					
			Bl	Sx	Hw	Cw	other live	Total Live	Bl	Sx	Hw	Cw	other dead	Total Dead
Lunate	GS	D 4-10	2.0	4.0	6.0	24.0	0.0	36.0	0.0	0.0	0.0	0.0	0.0	0.0
		D 10-20	1.0	1.0	13.0	24.0	0.0	39.0	0.0	0.0	0.0	1.0	0.0	1.0
		D 20-30	0.0	1.0	8.0	17.0	0.0	26.0	0.0	0.0	0.0	2.0	0.0	2.0
		D 30-40	2.0	0.0	3.0	11.0	0.0	16.0	2.0	0.0	0.0	1.0	0.0	3.0
		D 40-50	0.0	0.0	0.0	11.0	0.0	11.0	2.0	0.0	1.0	1.0	0.0	4.0
		D 50-60	0.0	2.0	0.0	10.0	0.0	12.0	0.0	0.0	0.0	0.0	0.0	0.0
		D 60-70	0.0	1.0	0.0	9.0	0.0	10.0	0.0	0.0	0.0	2.0	0.0	2.0
		D 70-80	0.0	3.0	0.0	22.0	0.0	25.0	0.0	0.0	0.0	1.0	0.0	1.0
		D 80-90	0.0	0.0	0.0	23.0	0.0	23.0	0.0	0.0	0.0	1.0	0.0	1.0
		D 90-100	0.0	0.0	0.0	30.0	0.0	30.0	0.0	0.0	0.0	1.0	0.0	1.0
		D 100-110	0.0	0.0	0.0	11.0	0.0	11.0	0.0	0.0	0.0	2.0	0.0	2.0
		D 110-120	0.0	0.0	0.0	12.0	0.0	12.0	0.0	0.0	0.0	5.0	0.0	5.0
		D 120-130	0.0	0.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
		D 130-140	0.0	0.0	0.0	13.0	0.0	13.0	0.0	0.0	0.0	0.0	0.0	0.0
		D 140-150	0.0	0.0	0.0	13.0	0.0	13.0	0.0	0.0	0.0	0.0	0.0	0.0
		D 150-160	0.0	0.0	0.0	5.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0
		D 160-170	0.0	0.0	0.0	2.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
		D 170-180	0.0	0.0	0.0	4.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0
		D 180-190	0.0	0.0	0.0	5.0	0.0	5.0	0.0	0.0	0.0	1.0	0.0	1.0
		D 190-200	0.0	0.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
		D 200-210	0.0	0.0	0.0	3.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0
		D 210-220	0.0	0.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
		D 220-230	0.0	0.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
		> 230												

Study Area	Trmt Unit	DBH (cm)	LIVE STEMS						DEAD STEMS					
			Bl	Sx	Hw	Cw	other live	Total Live	Bl	Sx	Hw	Cw	other dead	Total Dead
Lunate	UN	D 4-10	0.0	6.6	10.7	62.7	1.2	82.4	0.0	0.6	0.0	1.2	0.0	1.8
		D 10-20	3.6	2.4	12.5	41.2	0.0	59.7	0.6	1.2	0.0	0.0	0.6	3.0
		D 20-30	3.6	1.8	4.8	28.7	0.0	38.8	1.2	0.6	0.0	3.6	0.0	5.4
		D 30-40	1.8	1.2	2.4	22.1	0.0	27.5	1.2	0.0	0.0	1.2	0.0	2.4
		D 40-50	0.6	0.0	1.2	21.5	0.0	23.3	0.0	0.0	0.0	1.2	0.0	1.2
		D 50-60	0.6	1.2	0.0	16.7	0.0	18.5	0.0	0.0	0.0	2.4	0.0	2.4
		D 60-70	0.0	2.4	0.0	23.3	0.0	25.7	0.0	0.0	0.0	2.4	0.0	2.4
		D 70-80	0.0	0.6	0.0	31.6	0.0	32.2	0.0	0.6	0.6	3.6	0.0	4.8
		D 80-90	0.0	0.6	0.0	18.5	0.0	19.1	0.0	0.0	0.0	1.8	0.0	1.8
		D 90-100	0.0	0.0	0.0	13.7	0.0	13.7	0.0	0.0	0.0	3.0	0.0	3.0
		D 100-110	0.0	0.0	0.0	11.3	0.0	11.3	0.0	0.0	0.0	4.8	0.0	4.8
		D 110-120	0.0	0.0	0.0	7.2	0.0	7.2	0.0	0.0	0.0	2.4	0.0	2.4
		D 120-130	0.0	0.0	0.0	0.6	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0
		D 130-140	0.0	0.0	0.0	5.4	0.0	5.4	0.0	0.0	0.0	1.2	0.0	1.2
		D 140-150	0.0	0.0	0.0	1.2	0.0	1.2	0.0	0.0	0.0	0.0	0.0	0.0
		D 150-160	0.0	0.0	0.0	4.8	0.0	4.8	0.0	0.0	0.0	1.8	0.0	1.8
		D 160-170	0.0	0.0	0.0	4.2	0.0	4.2	0.0	0.0	0.0	0.6	0.0	0.6
		D 170-180	0.0	0.0	0.0	0.6	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0
		D 180-190	0.0	0.0	0.0	1.8	0.0	1.8	0.0	0.0	0.0	0.6	0.0	0.6
		D 190-200	0.0	0.0	0.0	0.6	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0
		D 200-210	0.0	0.0	0.0	1.2	0.0	1.2	0.0	0.0	0.0	0.0	0.0	0.0
		D 210-220	0.0	0.0	0.0	1.2	0.0	1.2	0.0	0.0	0.0	0.0	0.0	0.0
		D 220-230	0.0	0.0	0.0	0.6	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0
		> 230	0.0	0.0	0.0	0.6	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0

Study Area	Trmt Unit	DBH (cm)	LIVE STEMS						DEAD STEMS					
			Bl	Sx	Hw	Cw	other live	Total Live	Bl	Sx	Hw	Cw	other dead	Total Dead
Minnow	CC	D 4-10	94.4	22.4	3.2	228.8	0.0	348.8	0.0	0.0		3.2	0.0	3.2
		D 10-20	43.2	14.4	3.2	145.6	0.0	206.4	1.6	0.0		8.0	0.0	9.6
		D 20-30	14.4	12.8	0.0	86.4	0.0	113.6	17.6	6.4		6.4	1.6	33.6
		D 30-40	25.6	3.2	0.0	54.4	0.0	83.2	17.6	0.0		1.6	0.0	19.2
		D 40-50	9.6	16.0	1.6	38.4	0.0	65.6	16.0	0.0		0.0	0.0	16.0
		D 50-60	6.4	4.8	0.0	44.8	0.0	56.0	9.6	0.0		0.0	0.0	9.6
		D 60-70	4.8	4.8	0.0	49.6	0.0	59.2	3.2	1.6		0.0	0.0	4.8
		D 70-80	0.0	4.8	0.0	25.6	0.0	30.4	0.0	1.6		0.0	0.0	1.6
		D 80-90	0.0	4.8	0.0	17.6	0.0	22.4	0.0	1.6		1.6	0.0	3.2
		D 90-100	0.0	0.0	0.0	17.6	0.0	17.6	0.0	1.6		0.0	0.0	1.6
		D 100-110	0.0	0.0	0.0	9.6	0.0	9.6	0.0	0.0		0.0	1.6	3.2
		D 110-120	0.0	0.0	0.0	8.0	0.0	8.0	0.0	0.0		0.0	0.0	0.0
		D 120-130	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
		D 130-140	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
		D 140-150	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
		D 150-160	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
		D 160-170	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
		D 170-180	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0

Study Area	Trmt Unit	DBH (cm)	LIVE STEMS						DEAD STEMS					
			Bl	Sx	Hw	Cw	other live	Total Live	Bl	Sx	Hw	Cw	other dead	Total Dead
Minnow	GR	D 4-10	37.3	14.7	2.7	72.0	8.0	142.7	0.0	0.0		0.0	0.0	0.0
		D 10-20	38.7	16.0	0.0	44.0	0.0	98.7	4.0	4.0		1.3	0.0	9.3
		D 20-30	25.3	10.7	1.3	30.7	0.0	68.0	6.7	0.0		0.0	0.0	6.7
		D 30-40	22.7	17.3	1.3	22.7	1.3	66.7	0.0	4.0		0.0	1.3	6.7
		D 40-50	17.3	16.0	1.3	28.0	0.0	62.7	5.3	0.0		0.0	0.0	5.3
		D 50-60	10.7	16.0	1.3	10.7	0.0	38.7	2.7	0.0		0.0	1.3	5.3
		D 60-70	2.7	9.3	0.0	13.3	0.0	25.3	1.3	2.7		1.3	0.0	5.3
		D 70-80	5.3	4.0	0.0	16.0	0.0	25.3	0.0	0.0		0.0	0.0	0.0
		D 80-90	0.0	4.0	0.0	2.7	0.0	6.7	0.0	5.3		0.0	0.0	5.3
		D 90-100	0.0	1.3	0.0	2.7	0.0	4.0	0.0	0.0		0.0	0.0	0.0
		D 100-110	0.0	1.3	0.0	12.0	0.0	13.3	0.0	1.3		0.0	0.0	1.3
		D 110-120	0.0	0.0	0.0	5.3	0.0	5.3	0.0	0.0		1.3	0.0	1.3
		D 120-130	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
		D 130-140	0.0	0.0	0.0	2.7	0.0	2.7	0.0	0.0		0.0	0.0	0.0
		D 140-150	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
		D 150-160	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
		D 160-170	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
		D 170-180	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0

Study Area	Trmt Unit	DBH (cm)	LIVE STEMS						DEAD STEMS					
			Bl	Sx	Hw	Cw	other live	Total Live	Bl	Sx	Hw	Cw	other dead	Total Dead
Minnow	GS	D 4-10	61.0	11.0	2.0	169.0	0.0	243.0	0.0	0.0	0.0	2.0	0.0	2.0
		D 10-20	52.0	17.0	2.0	111.0	0.0	182.0	8.0	0.0	0.0	2.0	0.0	10.0
		D 20-30	25.0	14.0	4.0	55.0	0.0	98.0	17.0	1.0	0.0	3.0	0.0	21.0
		D 30-40	16.0	8.0	0.0	38.0	0.0	62.0	16.0	0.0	0.0	1.0	0.0	17.0
		D 40-50	14.0	11.0	1.0	28.0	0.0	54.0	16.0	0.0	0.0	1.0	0.0	17.0
		D 50-60	5.0	7.0	1.0	20.0	0.0	33.0	5.0	1.0	1.0	1.0	0.0	8.0
		D 60-70	3.0	10.0	0.0	14.0	0.0	27.0	0.0	2.0	2.0	0.0	0.0	4.0
		D 70-80	1.0	6.0	1.0	12.0	0.0	20.0	1.0	0.0	0.0	0.0	0.0	1.0
		D 80-90	0.0	2.0	0.0	15.0	0.0	17.0	0.0	2.0	0.0	0.0	0.0	2.0
		D 90-100	0.0	0.0	0.0	9.0	0.0	9.0	1.0	1.0	0.0	0.0	0.0	2.0
		D 100-110	0.0	1.0	0.0	6.0	0.0	7.0	0.0	0.0	0.0	0.0	0.0	0.0
		D 110-120	0.0	0.0	0.0	3.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0
		D 120-130	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		D 130-140	0.0	0.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
		D 140-150	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		D 150-160	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		D 160-170	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		D 170-180	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Study Area	Trmt Unit	DBH (cm)	LIVE STEMS						DEAD STEMS					
			Bl	Sx	Hw	Cw	other live	Total Live	Bl	Sx	Hw	Cw	other dead	Total Dead
Minnow	UN	D 4-10	20.0	3.9	1.3	120.0	0.0	145.2	0.0	0.0		1.3	0.0	1.3
		D 10-20	20.6	9.7	1.9	116.8	0.0	149.0	4.5	0.0		3.2	0.0	7.7
		D 20-30	14.2	8.4	1.3	72.9	0.0	96.8	6.5	3.2		5.8	0.0	15.5
		D 30-40	12.3	9.7	0.6	54.8	0.6	78.7	8.4	0.0		5.2	0.0	13.5
		D 40-50	17.4	7.1	0.0	38.1	0.0	62.6	7.1	0.0		3.2	0.0	10.3
		D 50-60	8.4	4.5	0.0	38.1	0.0	51.0	4.5	0.0		4.5	0.0	9.0
		D 60-70	2.6	5.8	0.0	34.8	0.0	43.2	1.9	1.9		0.6	0.0	4.5
		D 70-80	0.0	3.2	0.0	31.0	0.0	34.2	0.0	0.6		0.0	0.6	1.9
		D 80-90	0.0	1.9	0.0	19.4	0.0	21.3	0.0	0.6		0.6	0.0	1.3
		D 90-100	0.0	1.3	0.0	13.5	0.0	14.8	0.6	1.9		0.0	0.0	2.6
		D 100-110	0.0	0.0	0.0	7.7	0.0	7.7	0.0	0.6		0.0	0.0	0.6
		D 110-120	0.0	0.0	0.0	1.9	0.0	1.9	0.0	0.0		0.0	0.0	0.0
		D 120-130	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
		D 130-140	0.0	0.0	0.0	0.6	0.0	0.6	0.0	0.0		0.0	0.0	0.0
		D 140-150	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
		D 150-160	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
		D 160-170	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
		D 170-180	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0

Appendix 2d:

Pre-harvest Advance Regeneration Plot and Treatment Unit Summary

(Stems-per-hectare by species and size class)

Wetbelt Phase III Pre-harvest Summary of Advance Regen SPH (stems-per-ha.)
April 04-2001

Study Area	TU	Plot	< 30 cm Ht				Total SPH	30-130 cm Ht.				Total SPH	> 130 cm Height				Total SPH
			Bl	Cw	Hw	Sx	< 30 cm HT	Bl	Cw	Hw	Sx	30-130 cm HT	Bl	Cw	Hw	Sx	> 130 cm HT
Bearpaw	CC	1	249.9			199.9	**449.9**	899.7	0.0	0.0	45.0	**944.7**	50.0	0.0	0.0	5.0	**55.0**
Bearpaw	CC	2	1849.5			2499.3	**4348.7**	194.9	0.0	0.0	349.9	**544.8**	5.0	0.0	0.0	0.0	**5.0**
Bearpaw	CC	3	50.0			949.7	**999.7**	299.9	0.0	0.0	599.8	**899.7**	0.0	0.0	0.0	0.0	**0.0**
Bearpaw	CC	4	199.9			299.9	**499.9**	1014.7	0.0	0.0	429.9	**1444.6**	85.0	0.0	0.0	20.0	**105.0**
Bearpaw	CC	5	249.9			150.0	**399.9**	1159.7	0.0	0.0	199.9	**1359.6**	40.0	0.0	0.0	0.0	**40.0**
Bearpaw	CC	6	1349.6			449.9	**1799.5**	814.8	0.0	0.0	284.9	**1099.7**	35.0	0.0	0.0	15.0	**50.0**
Bearpaw	CC	7	599.8			1049.7	**1649.5**	344.9	0.0	0.0	829.8	**1174.7**	5.0	0.0	0.0	20.0	**25.0**
Bearpaw	CC	8	150.0			50.0	**199.9**	934.7	0.0	0.0	669.8	**1604.5**	65.0	0.0	0.0	30.0	**95.0**
Bearpaw	CC	9	449.9			199.9	**649.8**	724.8	0.0	0.0	274.9	**999.7**	25.0	0.0	0.0	25.0	**50.0**
Bearpaw	CC	10	699.8			1199.7	**1899.5**	145.0	0.0	0.0	239.9	**384.9**	5.0	0.0	0.0	10.0	**15.0**
Bearpaw	CC	11	399.9			199.9	**599.8**	474.9	0.0	0.0	334.9	**809.8**	25.0	0.0	0.0	15.0	**40.0**
Bearpaw	CC	12	199.9			299.9	**499.9**	1414.6	0.0	0.0	534.8	**1949.4**	85.0	0.0	0.0	15.0	**100.0**
Bearpaw	CC	13	249.9			799.8	**1049.7**	95.0	0.0	0.0	100.0	**194.9**	5.0	0.0	0.0	0.0	**5.0**
Bearpaw	CC	14	0.0			0.0	**0.0**	424.9	0.0	0.0	0.0	**424.9**	25.0	0.0	0.0	0.0	**25.0**
		Mean	**478.4**	**0.0**	**0.0**	**596.3**	**1074.7**	**638.7**	**0.0**	**0.0**	**349.5**	**988.3**	**32.5**	**0.0**	**0.0**	**11.1**	**43.6**
Bearpaw	GS	1	100.0			249.9	**349.9**	50.0	0.0	0.0	399.9	**449.9**	0.0	0.0	0.0	0.0	**0.0**
Bearpaw	GS	2	299.9			1449.6	**1749.5**	50.0	0.0	0.0	50.0	**100.0**	0.0	0.0	0.0	0.0	**0.0**
Bearpaw	GS	3	299.9			899.7	**1199.7**	294.9	0.0	0.0	399.9	**694.8**	5.0	0.0	0.0	0.0	**5.0**
Bearpaw	GS	4	50.0			100.0	**150.0**	519.8	0.0	0.0	344.9	**864.7**	30.0	0.0	0.0	5.0	**35.0**
Bearpaw	GS	5	0.0			50.0	**50.0**	229.9	0.0	0.0	50.0	**279.9**	20.0	0.0	0.0	0.0	**20.0**
Bearpaw	GS	6	0.0			0.0	**0.0**	279.9	0.0	0.0	0.0	**279.9**	20.0	0.0	0.0	0.0	**20.0**
Bearpaw	GS	7	0.0			150.0	**150.0**	95.0	0.0	0.0	50.0	**145.0**	5.0	0.0	0.0	0.0	**5.0**
Bearpaw	GS	8	599.8			1349.6	**1949.4**	794.8	0.0	0.0	1889.5	**2684.2**	5.0	0.0	0.0	10.0	**15.0**
Bearpaw	GS	9	549.8			50.0	**599.8**	569.8	0.0	0.0	0.0	**569.8**	30.0	0.0	0.0	0.0	**30.0**
Bearpaw	GS	10	150.0			100.0	**249.9**	324.9	0.0	0.0	0.0	**324.9**	25.0	0.0	0.0	0.0	**25.0**
Bearpaw	GS	11	749.8			2799.2	**3549.0**	100.0	0.0	0.0	299.9	**399.9**	0.0	0.0	0.0	0.0	**0.0**
Bearpaw	GS	12	199.9			3449.0	**3648.9**	0.0	0.0	0.0	150.0	**150.0**	0.0	0.0	0.0	0.0	**0.0**
Bearpaw	GS	13	299.9			699.8	**999.7**	45.0	0.0	0.0	549.8	**594.8**	5.0	0.0	0.0	0.0	**5.0**
Bearpaw	GS	14	549.8			1549.6	**2099.4**	279.9	0.0	0.0	594.8	**874.7**	20.0	0.0	0.0	5.0	**25.0**
		Mean	**274.9**	**0.0**	**0.0**	**921.2**	**1196.1**	**259.6**	**0.0**	**0.0**	**341.3**	**600.9**	**11.8**	**0.0**	**0.0**	**1.4**	**13.2**

Study Area	TU	Plot	< 30 cm Ht				Total SPH	30-130 cm Ht.				Total SPH	> 130 cm Height				Total SPH
			Bl	Cw	Hw	Sx	< 30 cm HT	Bl	Cw	Hw	Sx	30-130 cm HT	Bl	Cw	Hw	Sx	> 130 cm HT
Bearpaw	STS	1	249.9			150.0	**399.9**	145.0	0.0	0.0	189.9	**334.9**	5.0	0.0	0.0	10.0	**15.0**
Bearpaw	STS	2	0.0			0.0	**0.0**	179.9	0.0	0.0	184.9	**364.9**	20.0	0.0	0.0	15.0	**35.0**
Bearpaw	STS	3	0.0			0.0	**0.0**	194.9	0.0	0.0	0.0	**194.9**	5.0	0.0	0.0	0.0	**5.0**
Bearpaw	STS	4	0.0			0.0	**0.0**	814.8	0.0	0.0	45.0	**859.7**	35.0	0.0	0.0	5.0	**40.0**
Bearpaw	STS	5	0.0			0.0	**0.0**	45.0	0.0	0.0	45.0	**90.0**	5.0	0.0	0.0	5.0	**10.0**
Bearpaw	STS	6	349.9			150.0	**499.9**	194.9	0.0	0.0	189.9	**384.9**	5.0	0.0	0.0	10.0	**15.0**
Bearpaw	STS	7	100.0			199.9	**299.9**	929.7	0.0	0.0	95.0	**1024.7**	20.0	0.0	0.0	5.0	**25.0**
Bearpaw	STS	8	2249.3			1149.7	**3399.0**	719.8	0.0	0.0	384.9	**1104.7**	30.0	0.0	0.0	15.0	**45.0**
Bearpaw	STS	9	449.9			449.9	**899.7**	414.9	0.0	0.0	239.9	**654.8**	35.0	0.0	0.0	10.0	**45.0**
Bearpaw	STS	10	100.0			150.0	**249.9**	1309.6	0.0	0.0	0.0	**1309.6**	90.0	0.0	0.0	0.0	**90.0**
Bearpaw	STS	11	749.8			249.9	**999.7**	529.8	0.0	0.0	279.9	**809.8**	20.0	0.0	0.0	20.0	**40.0**
Bearpaw	STS	12	0.0			50.0	**50.0**	45.0	0.0	0.0	0.0	**45.0**	5.0	0.0	0.0	0.0	**5.0**
Bearpaw	STS	13	449.9			499.9	**949.7**	994.7	0.0	0.0	199.9	**1194.7**	5.0	0.0	0.0	0.0	**5.0**
Bearpaw	STS	14	150.0			0.0	**150.0**	244.9	0.0	0.0	0.0	**244.9**	5.0	0.0	0.0	0.0	**5.0**
		Mean	**346.3**	**0.0**	**0.0**	**217.8**	**564.1**	**483.1**	**0.0**	**0.0**	**132.5**	**615.5**	**20.4**	**0.0**	**0.0**	**6.8**	**27.1**
Bearpaw	UN	1	849.8			349.9	**1199.7**	899.7	0.0	0.0	294.9	**1194.6**	50.0	0.0	0.0	5.0	**55.0**
Bearpaw	UN	2	1949.4			3349.0	**5298.5**	669.8	0.0	50.0	664.8	**1384.6**	30.0	0.0	0.0	35.0	**65.0**
Bearpaw	UN	3	0.0			0.0	**0.0**	849.7	0.0	0.0	0.0	**849.7**	50.0	0.0	0.0	0.0	**50.0**
Bearpaw	UN	4	0.0			0.0	**0.0**	194.9	0.0	0.0	0.0	**194.9**	5.0	0.0	0.0	0.0	**5.0**
Bearpaw	UN	5	0.0			0.0	**0.0**	479.9	0.0	0.0	299.9	**779.8**	20.0	0.0	0.0	0.0	**20.0**
Bearpaw	UN	6	399.9			649.8	**1049.7**	1729.5	0.0	0.0	424.9	**2154.3**	70.0	0.0	0.0	25.0	**95.0**
Bearpaw	UN	7	249.9			999.7	**1249.6**	679.8	0.0	0.0	709.8	**1389.6**	20.0	0.0	0.0	40.0	**60.0**
Bearpaw	UN	8	1799.5			1799.5	**3599.0**	2899.1	0.0	0.0	444.9	**3344.0**	50.0	0.0	0.0	5.0	**55.0**
Bearpaw	UN	9	2299.3			1249.6	**3549.0**	789.8	0.0	0.0	0.0	**789.8**	60.0	0.0	0.0	0.0	**60.0**
Bearpaw	UN	10	50.0			249.9	**299.9**	95.0	0.0	0.0	689.8	**784.8**	5.0	0.0	0.0	10.0	**15.0**
			100.0			599.8	**699.8**										
		Mean	**699.8**	**0.0**	**0.0**	**840.7**	**1540.5**	**928.7**	**0.0**	**5.0**	**352.9**	**1286.6**	**36.0**	**0.0**	**0.0**	**12.0**	**48.0**

Study Area	TU	Plot	< 30 cm Ht				Total SPH	30-130 cm Ht.				Total SPH	> 130 cm Height				Total SPH
			Bl	Cw	Hw	Sx	< 30 cm HT	Bl	Cw	Hw	Sx	30-130 cm HT	Bl	Cw	Hw	Sx	> 130 cm HT
East Twin	CC	1		0.0	0.0	0.0	**0.0**	0.0	229.9	0.0	0.0	**229.9**	0.0	20.0	0.0	0.0	**20.0**
East Twin	CC	2		0.0	50.0	0.0	**50.0**	50.0	1244.6	95.0	100.0	**1489.6**	0.0	55.0	5.0	0.0	**60.0**
East Twin	CC	3		0.0	0.0	0.0	**0.0**	0.0	0.0	0.0	0.0	**0.0**	0.0	0.0	0.0	0.0	**0.0**
East Twin	CC	4		50.0	50.0	0.0	**100.0**	0.0	1319.6	0.0	0.0	**1319.6**	0.0	30.0	0.0	0.0	**30.0**
East Twin	CC	5		199.9	0.0	0.0	**199.9**	100.0	3179.1	0.0	0.0	**3279.0**	0.0	70.0	0.0	0.0	**70.0**
East Twin	CC	6		299.9	0.0	0.0	**299.9**	50.0	4918.6	389.9	0.0	**5358.4**	0.0	80.0	10.0	0.0	**90.0**
East Twin	CC	7		50.0	0.0	0.0	**50.0**	0.0	2924.1	0.0	0.0	**2924.1**	0.0	75.0	0.0	0.0	**75.0**
		Mean		**85.7**	**14.3**	**0.0**	**100.0**	**28.6**	**1973.7**	**69.3**	**14.3**	**2085.8**	**0.0**	**47.1**	**2.1**	**0.0**	**49.3**
East Twin	GS	1	0.0	0.0	0.0	0.0	**0.0**	0.0	1039.7	0.0	50.0	**1089.7**	0.0	10.0	0.0	0.0	**10.0**
East Twin	GS	2	0.0	50.0	0.0	0.0	**50.0**	0.0	909.7	0.0	0.0	**909.7**	0.0	40.0	0.0	0.0	**40.0**
East Twin	GS	3	0.0	50.0	0.0	0.0	**50.0**	0.0	449.9	0.0	0.0	**449.9**	0.0	0.0	0.0	0.0	**0.0**
East Twin	GS	4	0.0	150.0	0.0	0.0	**150.0**	0.0	150.0	0.0	0.0	**150.0**	0.0	0.0	0.0	0.0	**0.0**
East Twin	GS	5	0.0	0.0	0.0	0.0	**0.0**	0.0	0.0	0.0	0.0	**0.0**	0.0	0.0	0.0	0.0	**0.0**
East Twin	GS	6	449.9	199.9	150.0	0.0	**799.8**	904.7	1359.6	369.9	50.0	**2684.2**	45.0	40.0	30.0	0.0	**115.0**
East Twin	GS	9	100.0	0.0	0.0	0.0	**100.0**	194.9	719.8	189.9	0.0	**1104.7**	5.0	30.0	10.0	0.0	**45.0**
East Twin	GS	10	0.0	0.0	0.0	0.0	**0.0**	0.0	344.9	0.0	150.0	**494.9**	0.0	5.0	0.0	0.0	**5.0**
East Twin	GS	11	100.0	199.9	0.0	0.0	**299.9**	145.0	1144.7	0.0	0.0	**1289.6**	5.0	5.0	0.0	0.0	**10.0**
East Twin	GS	12	100.0	199.9	0.0	0.0	**299.9**	0.0	794.8	0.0	0.0	**794.8**	0.0	5.0	0.0	0.0	**5.0**
East Twin	GS	13	0.0	50.0	0.0	0.0	**50.0**	0.0	289.9	0.0	0.0	**289.9**	0.0	10.0	0.0	0.0	**10.0**
East Twin	GS	14	0.0	0.0	0.0	0.0	**0.0**	0.0	1464.6	0.0	0.0	**1464.6**	0.0	35.0	0.0	0.0	**35.0**
East Twin	GS	15	0.0	449.9	0.0	0.0	**449.9**	0.0	199.9	0.0	0.0	**199.9**	0.0	0.0	0.0	0.0	**0.0**
East Twin	GS	16	0.0	100.0	100.0	100.0	**299.9**	50.0	284.9	0.0	0.0	**334.9**	0.0	15.0	0.0	0.0	**15.0**
		Mean	**53.6**	**103.5**	**17.9**	**7.1**	**182.1**	**92.5**	**653.7**	**40.0**	**17.9**	**804.0**	**3.9**	**13.9**	**2.9**	**0.0**	**20.7**

Study Area	TU	Plot	< 30 cm Ht				Total SPH	30-130 cm Ht.				Total SPH	> 130 cm Height				Total SPH
			Bl	Cw	Hw	Sx	< 30 cm HT	Bl	Cw	Hw	Sx	30-130 cm HT	Bl	Cw	Hw	Sx	> 130 cm HT
East Twin	UN	1	249.9	399.9	150.0	0.0	**799.8**	249.9	3259.0	194.9	0.0	**3703.9**	0.0	40.0	5.0	0.0	**45.0**
East Twin	UN	2	150.0	1649.5	50.0	0.0	**1849.5**	0.0	2454.3	95.0	0.0	**2549.2**	0.0	45.0	5.0	0.0	**50.0**
East Twin	UN	3	50.0	249.9	100.0	0.0	**399.9**	50.0	939.7	0.0	0.0	**989.7**	0.0	10.0	0.0	0.0	**10.0**
East Twin	UN	4	50.0	199.9	0.0	0.0	**249.9**	0.0	499.9	0.0	0.0	**499.9**	0.0	0.0	0.0	0.0	**0.0**
East Twin	UN	5	0.0	0.0	0.0	0.0	**0.0**	50.0	1539.5	0.0	0.0	**1589.5**	0.0	60.0	0.0	0.0	**60.0**
East Twin	UN	6	100.0	499.9	0.0	0.0	**599.8**	0.0	749.8	50.0	0.0	**799.8**	0.0	0.0	0.0	0.0	**0.0**
East Twin	UN	7	0.0	0.0	0.0	0.0	**0.0**	0.0	0.0	0.0	0.0	**0.0**	0.0	0.0	0.0	0.0	**0.0**
East Twin	UN	8	0.0	0.0	0.0	0.0	**0.0**	0.0	0.0	0.0	0.0	**0.0**	0.0	0.0	0.0	0.0	**0.0**
East Twin	UN	9	299.9	249.9	0.0	0.0	**549.8**	494.9	1719.5	140.0	0.0	**2354.3**	5.0	30.0	10.0	0.0	**45.0**
East Twin	UN	10	1049.7	949.7	2799.2	0.0	**4798.6**	150.0	150.0	199.9	0.0	**499.9**	0.0	0.0	0.0	0.0	**0.0**
East Twin	UN	11	0.0	0.0	0.0	0.0	**0.0**	0.0	0.0	0.0	0.0	**0.0**	0.0	0.0	0.0	0.0	**0.0**
East Twin	UN	12	0.0	0.0	0.0	0.0	**0.0**	0.0	0.0	0.0	0.0	**0.0**	0.0	0.0	0.0	0.0	**0.0**
East Twin	UN	13	0.0	0.0	0.0	0.0	**0.0**	0.0	0.0	0.0	0.0	**0.0**	0.0	0.0	0.0	0.0	**0.0**
East Twin	UN	14	1999.4	1649.5	399.9	0.0	**4048.8**	499.9	6428.1	249.9	50.0	**7227.9**	0.0	20.0	0.0	0.0	**20.0**
East Twin	UN	15	399.9	1149.7	0.0	0.0	**1549.6**	349.9	3229.1	449.9	50.0	**4078.8**	0.0	20.0	0.0	0.0	**20.0**
East Twin	UN	16	150.0	449.9	50.0	0.0	**649.8**	249.9	4643.6	249.9	0.0	**5143.5**	0.0	55.0	0.0	0.0	**55.0**
		Mean	**281.2**	**465.5**	**221.8**	**0.0**	**968.5**	**130.9**	**1600.8**	**101.8**	**6.2**	**1839.8**	**0.3**	**17.5**	**1.3**	**0.0**	**19.1**

Study Area	TU	Plot	< 30 cm Ht				Total SPH	30-130 cm Ht.				Total SPH	> 130 cm Height				Total SPH
			Bl	Cw	Hw	Sx	< 30 cm HT	Bl	Cw	Hw	Sx	30-130 cm HT	Bl	Cw	Hw	Sx	> 130 cm HT
Lunate	CC	1	0.0	0.0		0.0	**0.0**	0.0	284.9	0.0	0.0	**284.9**	0.0	15.0	0.0	0.0	**15.0**
Lunate	CC	2	100.0	349.9		0.0	**449.9**	150.0	924.7	0.0	95.0	**1169.7**	0.0	25.0	0.0	5.0	**30.0**
Lunate	CC	3	0.0	50.0		0.0	**50.0**	0.0	484.9	0.0	0.0	**484.9**	0.0	15.0	0.0	0.0	**15.0**
Lunate	CC	4	0.0	249.9		0.0	**249.9**	0.0	834.8	0.0	0.0	**834.8**	0.0	15.0	0.0	0.0	**15.0**
Lunate	CC	5	0.0	0.0	0.0	0.	**0.0**	0.0	424.9	0.0	0.0	**424.9**	0.0	25.0	0.0	0.0	**25.0**
Lunate	CC	6	0.0	50.0		0.0	**50.0**	0.0	1034.7	0.0	0.0	**1034.7**	0.0	15.0	0.0	0.0	**15.0**
Lunate	CC	7	0.0	799.8		50.0	**849.8**	100.0	1189.7	45.0	0.0	**1334.6**	0.0	10.0	5.0	0.0	**15.0**
Lunate	CC	8	0.0	150.0		0.0	**150.0**						0.0	25.0	0.0	0.0	**25.0**
		Mean	**14.3**	**235.6**	**0.0**	**7.1**	**257.1**	**35.7**	**739.8**	**6.4**	**13.6**	**795.5**	**0.0**	**18.1**	**0.6**	**0.6**	**19.4**
Lunate	GR	1	0.0	0.0	50.0	0.0	**50.0**	294.9	239.9	50.0	0.0	**584.8**	5.0	10.0	0.0	0.0	**15.0**
Lunate	GR	2	499.9	2399.3	899.7	100.0	**3898.9**	100.0	579.8	2114.4	434.9	**3229.0**	0.0	20.0	35.0	15.0	**70.0**
Lunate	GR	3	299.9	0.0	249.9	0.0	**549.8**	189.9	769.8	244.9	0.0	**1204.6**	10.0	30.0	5.0	0.0	**45.0**
Lunate	GR	4	349.9	199.9	199.9	0.0	**749.8**	0.0	349.9	599.8	0.0	**949.7**	0.0	0.0	0.0	0.0	**0.0**
Lunate	GR	5	699.8	1049.7	0.0	0.0	**1749.5**	1329.6	1819.5	819.8	0.0	**3968.8**	20.0	80.0	30.0	0.0	**130.0**
Lunate	GR	6	599.8	100.0	249.9	0.0	**949.7**	344.9	779.8	829.8	384.9	**2339.3**	5.0	20.0	20.0	15.0	**60.0**
Lunate	GR	7	0.0	449.9	199.9	0.0	**649.8**	50.0	939.7	484.9	0.0	**1474.6**	0.0	10.0	15.0	0.0	**25.0**
Lunate	GR	8	0.0	349.9	0.0	50.0	**399.9**	50.0	1469.6	339.9	50.0	**1909.4**	0.0	30.0	10.0	0.0	**40.0**
		Mean	**306.2**	**568.6**	**231.2**	**18.7**	**1124.7**	**294.9**	**868.5**	**685.4**	**108.7**	**1957.5**	**5.0**	**25.0**	**14.4**	**3.8**	**48.1**
Lunate	GS	1	0.0	0.0		0.0	**0.0**	0.0	934.7	0.0	0.0	**934.7**	0.0	15.0	0.0	0.0	**15.0**
Lunate	GS	2	0.0	50.0		0.0	**50.0**	0.0	689.8	0.0	0.0	**689.8**	0.0	10.0	0.0	0.0	**10.0**
Lunate	GS	3	0.0	0.0		0.0	**0.0**	189.9	644.8	0.0	0.0	**834.7**	10.0	55.0	0.0	0.0	**65.0**
Lunate	GS	4	0.0	0.0		0.0	**0.0**	0.0	194.9	0.0	100.0	**294.9**	0.0	5.0	0.0	0.0	**5.0**
Lunate	GS	5	0.0	150.0		0.0	**150.0**	0.0	589.8	0.0	50.0	**639.8**	0.0	10.0	0.0	0.0	**10.0**
Lunate	GS	6	0.0	50.0		0.0	**50.0**	0.0	544.8	0.0	0.0	**544.8**	0.0	5.0	0.0	0.0	**5.0**
Lunate	GS	7	0.0	0.0		0.0	**0.0**	0.0	639.8	0.0	0.0	**639.8**	0.0	10.0	0.0	0.0	**10.0**
Lunate	GS	8	0.0	0.0		0.0	**0.0**	0.0	284.9	0.0	0.0	**284.9**	0.0	15.0	0.0	0.0	**15.0**
		Mean	**0.0**	**31.2**	**0.0**	**0.0**	**31.2**	**23.7**	**565.5**	**0.0**	**18.7**	**607.9**	**1.3**	**15.6**	**0.0**	**0.0**	**16.9**

Study Area	TU	Plot	< 30 cm Ht				Total SPH	30-130 cm Ht.				Total SPH	> 130 cm Height				Total SPH
			Bl	Cw	Hw	Sx	< 30 cm HT	Bl	Cw	Hw	Sx	30-130 cm HT	Bl	Cw	Hw	Sx	> 130 cm HT
Lunate	UN	1	0.0	150.0	0.0	0.0	**150.0**	0.0	1629.5	0.0	0.0	**1629.5**	0.0	70.0	0.0	0.0	**70.0**
Lunate	UN	2	0.0	0.0	0.0	0.0	**0.0**	0.0	419.9	0.0	0.0	**419.9**	0.0	30.0	0.0	0.0	**30.0**
Lunate	UN	3	199.9	1499.6	150.0	50.0	**1899.5**	0.0	334.9	194.9	150.0	**679.8**	0.0	15.0	5.0	0.0	**20.0**
Lunate	UN	4	0.0	5698.4	0.0	0.0	**5698.4**	95.0	1079.7	90.0	0.0	**1264.6**	5.0	20.0	10.0	0.0	**35.0**
Lunate	UN	5	0.0	0.0	0.0	0.0	**0.0**	0.0	2084.4	45.0	0.0	**2129.4**	0.0	65.0	5.0	0.0	**70.0**
Lunate	UN	6	0.0	0.0	0.0	0.0	**0.0**	0.0	684.8	0.0	0.0	**684.8**	0.0	15.0	0.0	0.0	**15.0**
Lunate	UN	7	0.0	0.0	0.0	0.0	**0.0**	100.0	2754.2	0.0	45.0	**2899.1**	0.0	145.0	0.0	5.0	**150.0**
Lunate	UN	9	0.0	1399.6	0.0	0.0	**1399.6**	0.0	724.8	0.0	50.0	**774.8**	0.0	25.0	0.0	0.0	**25.0**
Lunate	UN	10	0.0	349.9	0.0	0.0	**349.9**	50.0	1619.5	0.0	95.0	**1764.5**	0.0	30.0	0.0	5.0	**35.0**
Lunate	UN	11	0.0	399.9	0.0	0.0	**399.9**	0.0	1869.5	0.0	0.0	**1869.5**	0.0	30.0	0.0	0.0	**30.0**
Lunate	UN	12	0.0	100.0	0.0	0.0	**100.0**	0.0	564.8	0.0	0.0	**564.8**	0.0	35.0	0.0	0.0	**35.0**
Lunate	UN	13	0.0	499.9	0.0	0.0	**499.9**	0.0	684.8	0.0	50.0	**734.8**	0.0	15.0	0.0	0.0	**15.0**
Lunate	UN	14	0.0	199.9	0.0	0.0	**199.9**	0.0	789.8	0.0	0.0	**789.8**	0.0	10.0	0.0	0.0	**10.0**
Lunate	UN	15	0.0	249.9	0.0	50.0	**299.9**	0.0	859.7	0.0	50.0	**909.7**	0.0	40.0	0.0	0.0	**40.0**
Lunate	UN	16	0.0	1149.7	0.0	0.0	**1149.7**	0.0	1129.7	0.0	50.0	**1179.7**	0.0	20.0	0.0	0.0	**20.0**
		Mean	**13.3**	**779.8**	**10.0**	**6.7**	**809.8**	**16.3**	**1148.7**	**22.0**	**32.7**	**1219.6**	**0.3**	**37.7**	**1.3**	**0.7**	**40.0**

Study Area	TU	Plot	< 30 cm Ht				Total SPH	30-130 cm Ht.				Total SPH	> 130 cm Height				Total SPH
			Bl	Cw	Hw	Sx	< 30 cm HT	Bl	Cw	Hw	Sx	30-130 cm HT	Bl	Cw	Hw	Sx	> 130 cm HT
Minnow	CC	1	2499.3	549.8	0.0	100.0	**3149.1**	2484.3	989.7	0.0	0.0	**3474.0**	15.0	10.0	0.0	0.0	**25.0**
Minnow	CC	2	150.0	150.0	0.0	0.0	**299.9**	3189.0	2064.4	0.0	0.0	**5253.4**	110.0	85.0	0.0	0.0	**195.0**
Minnow	CC	3	1249.6	150.0	0.0	0.0	**1399.6**	1574.5	1704.5	0.0	199.9	**3479.0**	25.0	45.0	0.0	0.0	**70.0**
Minnow	CC	4	249.9	50.0	100.0	0.0	**399.9**	779.8	869.7	45.0	0.0	**1694.5**	20.0	30.0	5.0	0.0	**55.0**
Minnow	CC	5	3549.0	1299.6	150.0	249.9	**5248.5**	2814.2	2539.2	0.0	294.9	**5648.3**	35.0	60.0	0.0	5.0	**100.0**
		Mean	**1539.6**	**439.9**	**50.0**	**70.0**	**2099.4**	**2168.4**	**1633.5**	**9.0**	**99.0**	**3909.8**	**41.0**	**46.0**	**1.0**	**1.0**	**89.0**
Minnow	GR	1	0.0	0.0	0.0	0.0	**0.0**	90.0	45.0	0.0	50.0	**184.9**	10.0	5.0	0.0	0.0	**15.0**
Minnow	GR	2	50.0	0.0	0.0	0.0	**50.0**	0.0	90.0	0.0	50.0	**140.0**	0.0	10.0	0.0	0.0	**10.0**
Minnow	GR	3	0.0	0.0	0.0	50.0	**50.0**	0.0	0.0	0.0	249.9	**249.9**	0.0	0.0	0.0	0.0	**0.0**
Minnow	GR	4	399.9	2749.2	0.0	100.0	**3249.1**	349.9	50.0	0.0	969.7	**1369.6**	0.0	0.0	0.0	30.0	**30.0**
Minnow	GR	5	449.9	949.7	50.0	100.0	**1549.6**	145.0	145.0	50.0	140.0	**479.9**	5.0	5.0	0.0	10.0	**20.0**
Minnow	GR	6	749.8	150.0	949.7	150.0	**1999.4**	784.8	1239.6	150.0	0.0	**2174.4**	15.0	10.0	0.0	0.0	**25.0**
		Mean	**274.9**	**641.5**	**166.6**	**66.6**	**1149.7**	**228.3**	**261.6**	**33.3**	**243.3**	**766.4**	**5.0**	**5.0**	**0.0**	**6.7**	**16.7**
Minnow	GS	1	50.0	0.0	0.0	0.0	**50.0**	100.0	0.0	0.0	50.0	**150.0**	0.0	0.0	0.0	0.0	**0.0**
Minnow	GS	2	749.8	199.9	299.9	0.0	**1249.6**	449.9	479.9	100.0	95.0	**1124.7**	0.0	20.0	0.0	5.0	**25.0**
Minnow	GS	3	249.9	999.7	0.0	100.0	**1349.6**	1134.7	1429.6	0.0	0.0	**2564.2**	15.0	20.0	0.0	0.0	**35.0**
Minnow	GS	4	150.0	150.0	0.0	0.0	**299.9**	634.8	1279.6	0.0	150.0	**2064.4**	15.0	20.0	0.0	0.0	**35.0**
Minnow	GS	5	499.9	549.8	0.0	150.0	**1199.7**	734.8	484.9	0.0	399.9	**1619.5**	15.0	15.0	0.0	0.0	**30.0**
Minnow	GS	6	649.8	1149.7	499.9	449.9	**2749.2**	1169.7	784.8	50.0	479.9	**2484.3**	30.0	15.0	0.0	20.0	**65.0**
Minnow	GS	7	649.8	299.9	0.0	0.0	**949.7**	1034.7	189.9	45.0	150.0	**1419.6**	15.0	10.0	5.0	0.0	**30.0**
Minnow	GS	8	100.0	150.0	0.0	50.0	**299.9**	1269.6	2219.3	0.0	150.0	**3638.9**	30.0	30.0	0.0	0.0	**60.0**
		Mean	**387.4**	**437.4**	**100.0**	**93.7**	**1018.5**	**816.0**	**858.5**	**24.4**	**184.3**	**1883.2**	**15.0**	**16.3**	**0.6**	**3.1**	**35.0**
Minnow	UN	1	249.9	299.9	0.0	100.0	**649.8**	244.9	734.8	0.0	100.0	**1079.7**	5.0	15.0	0.0	0.0	**20.0**
Minnow	UN	2	0.0	150.0	0.0	0.0	**150.0**	145.0	674.8	0.0	0.0	**819.8**	5.0	25.0	0.0	0.0	**30.0**
Minnow	UN	3	1449.6	150.0	0.0	150.0	**1749.5**	944.7	589.8	0.0	199.9	**1734.5**	5.0	10.0	0.0	0.0	**15.0**
Minnow	UN	4	150.0	100.0	0.0	0.0	**249.9**	100.0	629.8	0.0	0.0	**729.8**	0.0	20.0	0.0	0.0	**20.0**
Minnow	UN	5	1099.7	150.0	0.0	150.0	**1399.6**	799.8	984.7	0.0	0.0	**1784.5**	0.0	15.0	0.0	0.0	**15.0**
Minnow	UN	6	299.9	2399.3	0.0	0.0	**2699.2**	194.9	1324.6	0.0	294.9	**1814.5**	5.0	25.0	0.0	5.0	**35.0**
		Mean	**541.5**	**541.5**	**0.0**	**66.6**	**1149.7**	**404.9**	**823.1**	**0.0**	**99.1**	**1327.1**	**3.3**	**18.3**	**0.0**	**0.8**	**22.5**