SUSTAINABLE FOREST MANAGEMENT NETWORK

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PROJECT REPORTS 2003/2004

A study to determine the effects of thinning on songbird habitat and use in fire regenerated lodgepole pine stands

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A NETWORK OF CENTRES OF EXCELLENCE
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PROJECT REPORT

A STUDY TO DETERMINE THE EFFECTS OF THINNING ON SONGBIRD HABITAT AND USE IN FIRE REGENERATED LODGEPOLE PINE STANDS

PREPARED FOR:

SUSTAINABLE FOREST MANAGEMENT NETWORK

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1. INTRODUCTION

The 2002 summer field season was the third and final year of field data collection for this project (songbird study). This project report summarizes project work completed to date and discusses remaining tasks outlined in the initial proposal presented to Millar Western Forest Products Ltd. (MWFP) in 2000. Background information, study details, project partners, and funding updates are also reviewed.

2. BACKGROUND AND FUNDING

In the spring of 2000 MWFP initiated a four-year study to determine the effects of cut-to-length (CTL) commercial thinning on migrant songbird habitat and use in fire regenerated lodgepole pine stands. The purpose of this study is to examine change in forest structure of commercially thinned pine stands and to relate this to anticipated changes in songbird species richness and species composition. MWFP initiated this research study to address data gaps in the understanding of the effects of CTL commercial thinning on wildlife habitat and use. This project is incremental to additional research studies MWFP has undertaken to examine wildlife and habitat change within commercially thinned forests.

CTL commercial thinning will have immediate, short-term, and possibly long-term effects on songbird habitat and use. This study is measuring the immediate and short-term effects (within a three year time frame). It will be possible to measure long-term effects if the study is continued as part of a monitoring system. It is anticipated that the effects of CTL thinning on songbirds will vary over these three time periods.

All funding for the project was covered by MWFP for the 2000-2001 and 2003-2004 years of the study. For the 2001-2002 and 2002-2003 years of the study SFM provided partial funding to help cover some of the field data collection in those years with MWFP picking up the remaining costs. Because this is a 4-year project that is not due to be complete till March of 2004 and data analysis is not complete, only limited information about results is possible for this report.

3. LOCATION

The study site includes land managed by MWFP and Weyerhaeuser Canada Ltd, Edson Division. All treatment blocks, historically thinned blocks, and two control blocks are located in MWFP's Tom Hill Forest License (CTL-W090008). Three additional control blocks are located on the north boundary of Weyerhaeuser's Edson FMA (Refer to Figure 1 for a provincial reference and Figure 2 for a more detailed study site location). There are 18 thinned treatment plots in four blocks, 34 control plots in nine blocks, and 16 historical treatment plots in four blocks, for a total of 56 sample plots (see Figure 2).

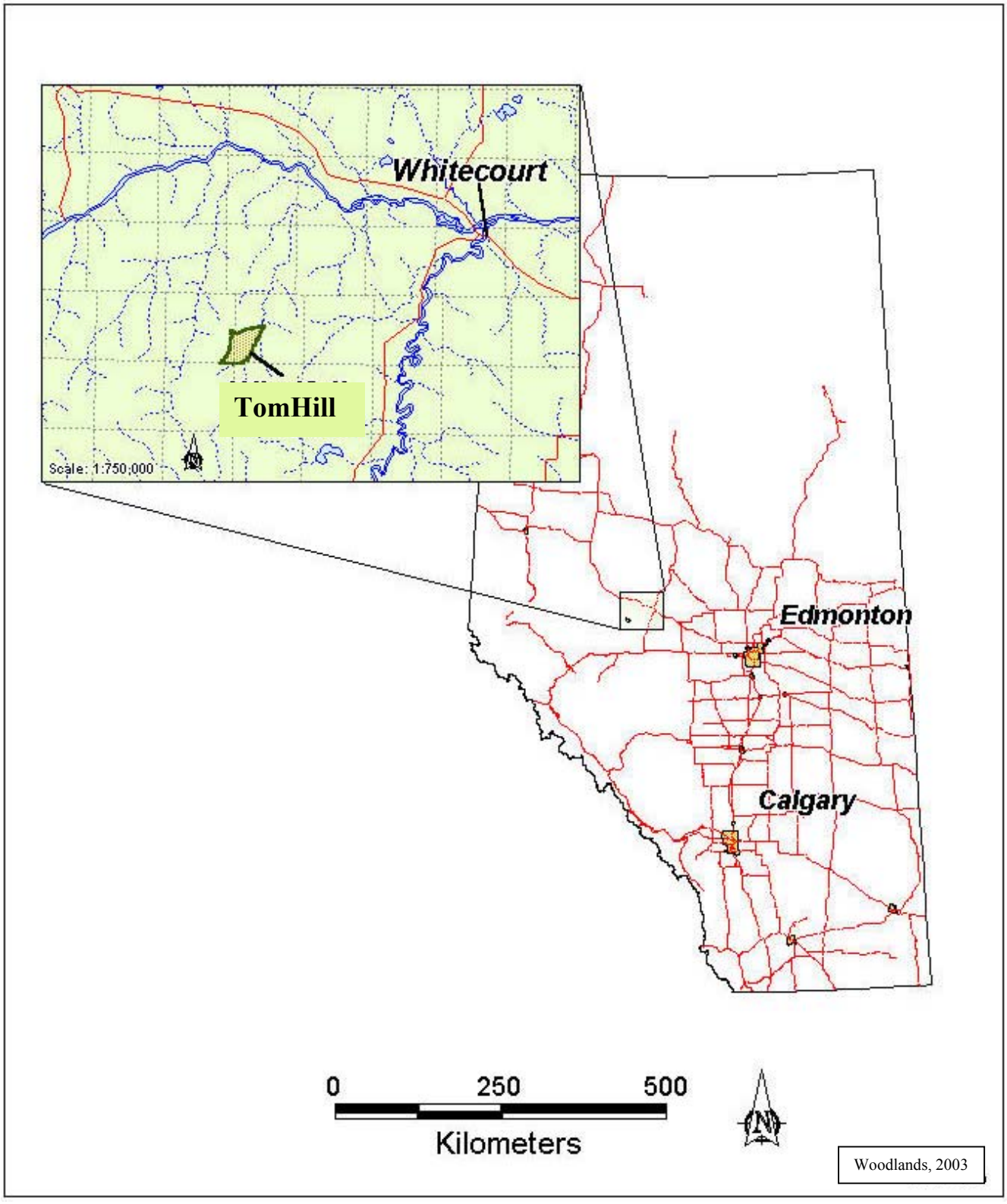

Figure 1

Provincial Map of Study Site Location

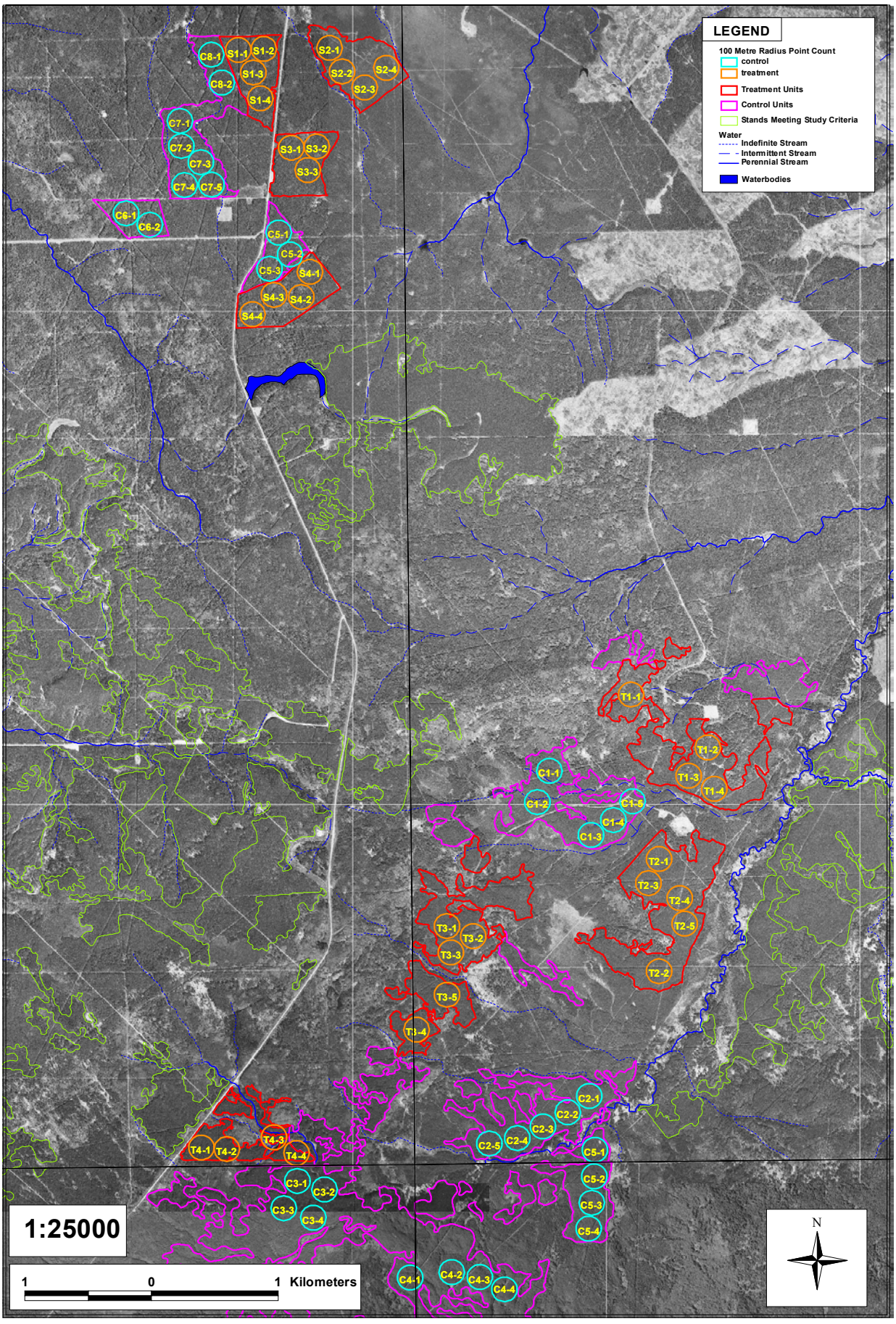

Figure 2. Map of Local Study Site and Study Design

4. STUDY DESIGN UPDATE

A salvage-thinning component was added in the spring of 2001. The rational for including this component is to add a historical aspect to the effects of thinning on songbirds. This portion of the study is designed in the same manner as the commercial thinning. Inventories of songbirds and vegetation are completed using the same criteria. This component added 15 treatment plots and 12 control plots. The two study sites (commercial thin and salvage thin) are approximately 3 kilometres apart from each other.

In addition, CTL harvesting operations were halted over the previous winter. This resulted in a mixture of pre and post-thinned survey plots within the treatment area for Year Two (table 1).

Table 1. Timelines of Actual Treatment Schedule

Commercial Thinned Stands			
Point	Harvest Season	Control Years	Treatment Years
T1-1	2001 / 02	2	1
T1-2	2001 / 02	2	1
T1-3	2001 / 02	2	1
T1-4	2001 / 02	2	1
T2-1	2000 / 01	1	2
T2-2	2000 / 01	1	2
T2-3	2000 / 01	1	2
T2-4	2000 / 01	1	2
T2-5	2000 / 01	1	2
T3-1	2001 / 02	1	2
T3-2	2001 / 02	1	2
T3-3	2001 / 02	1	2
T3-4	2000 / 01	2	1
T3-5	2000 / 01	2	1
T4-1	2000 / 01	2	1
T4-2	2000 / 01	2	1
T4-3	2000 / 01	2	1
T4-4	2000 / 01	2	1

Salvage Thinned Stands		
Point	Harvest Season	Treatment Years
S1-1	1996/7	6
S1-2	1996/7	6
S1-3	1996/7	6
S1-4	1996/7	6
S2-1	1996/7	6
S2-2	1996/7	6
S2-3	1996/7	6
S2-4	1996/7	6
S3-1	1996/7	6
S3-2	1996/7	6
S3-3	1996/7	6
S3-4	Lost	Lost
S4-1	1996/7	6
S4-2	1996/7	6
S4-3	1996/7	6
S4-4	1996/7	6

However, those treatment blocks that were not commercially thinned over the winter were brushed. This action eliminated the standing black spruce understory component of the stand. The pre-thinning brushing adds an interesting element to the research not initially considered in the study design.

5. SONGBIRD INVENTORY

Songbird inventories were conducted in a 100 metre fixed radius point counts at each permanently established sample plot. The songbird inventory took place over a 6-week period between mid May and late June. Each pointcount was visited as many times as possible during this period (an average of 6 times). Inventories began with treatment unit one and control unit one being completed in one day, then treatment unit two and control unit two the next day, and so on. The order of the visits to each pointcount within a treatment or control unit was always staggered so no inventory day would be the same for the ordering of visits.

Point counts began a half-hour before sunrise and continue until 8 a.m. each morning. After a 3-minute wait at each point to allow disturbances to settle, a listening period of 10 minutes takes place. Species noted in the first three minutes are denoted with a zero after their species code, species noted in the next three minutes are denoted with a four after their species code, and the species noted in the last four minutes are denoted with a seven after their species code. This differentiation allows for an analysis of the listening period effectiveness. Each individual will be noted on a site map and, it's distance and direction from the plot centre will be estimated. The use of a site map will help to prevent double-counting individuals.

Activities of the individual birds are broken down into broad categories, singing male, flying over, and other. All unknown birds are visually identified after the point count is complete. Field collection protocols amongst the crew are standardized prior to going afield. All inventory personnel are proficient in avian identification from songs, calls and visual sightings.

TABLE 2. SONGBIRD OBSERVATIONS BY YEAR AND TREATMENT

Year	Duration	Commercial Thin			Salvage Thin		Observations
		Pre-thin	Post thin	Control	Treatment	Control	
One (2000)	05/15 – 06/26	18	0	22	0	0	2,370
Two (2001)	05/16 – 06/27	7	11	22	16	12	4,101
Three (2002)	05/21 – 06/25	0	18	22	16	12	4,332
						TOTAL	10,803

Songbird inventories over the course of three field seasons recorded a total of 76 bird species within the treatment, control, and historical blocks. Of these 76 species detected, 50 (65.8%) were in the order *Passeriformes* (perching birds), the target order of this study. The remainder of the birds detected consisted of: woodpeckers (6), owls (6), shorebirds (5), raptors (4), migratory waterfowl (2), upland game birds (2), and one other (common nighthawk).

TABLE 3. CODED LIST OF STUDY SONGBIRDS

1	YRWA	18	SOVI	35	VESP	51	ALFL	68	GRYE
2	PISI	19	WAVI	36	GGOW	52	WETA	69	NOHA
3	RCKI	20	VATH	37	CCSP	53	GHOW	70	Wood P?
4	DEJU	21	REVI	38	PIWO	54	WCSP	71	Gull?
5	GRJA	22	RUGR	39	NPOW	55	RBGR	72	Sparrow?
6	SWTH	23	WIWR	40	SPGR	56	CAGU	73	Vireo?
7	HETH	24	GCKI	41	WWPE	57	BTGW	74	Raptor?
8	AMRO	25	BRCR	42	SOSA	58	OCWA	75	Duck?
9	BOCH	26	PUFI	43	NTTW	59	WIWA	76	Thrush?
10	BCCH	27	CHSP	44	RTHA	60	PIGR	90	GRCA
11	WTSP	28	BOOW	45	FOSP	61	AMGO	91	NSWO
12	COSN	29	CORA	46	YBSA	62	BAOW	92	MAKE
13	NOFL	30	COYE	47	EAPH	63	BBWO	93	YBFL
14	RBNU	31	HAWO	48	CONI	64	OSFL	94	AMRE
15	CAGO	32	BHCO	49	TEWA	65	TRSW	95	MALL
16	NOWA	33	LISP	50	LEFL	66	SOSP	96	SSHA
17	YEWA	34	WWCR	51	ALFL	67	KILL		

6. VEGETATION INVENTORIES

In order to quantify the effect of CTL commercial thinning on songbird habitat, separate forest community structure attributes were measured prior and subsequent to commercial thinning operations. These attributes were chosen because they are measurable and represent important habitat requirements for songbirds such as: nest site selection, feeding and foraging habitat, escape and perching habitat, and suitable fledging habitat. All forest community structure attributes were measured in Permanent Sample Plots (PSP's), (a series of nested plots within a larger plot). See figure 3 for a structural diagram of the PSP, the measured forest community structure attributes are outlined in table 4

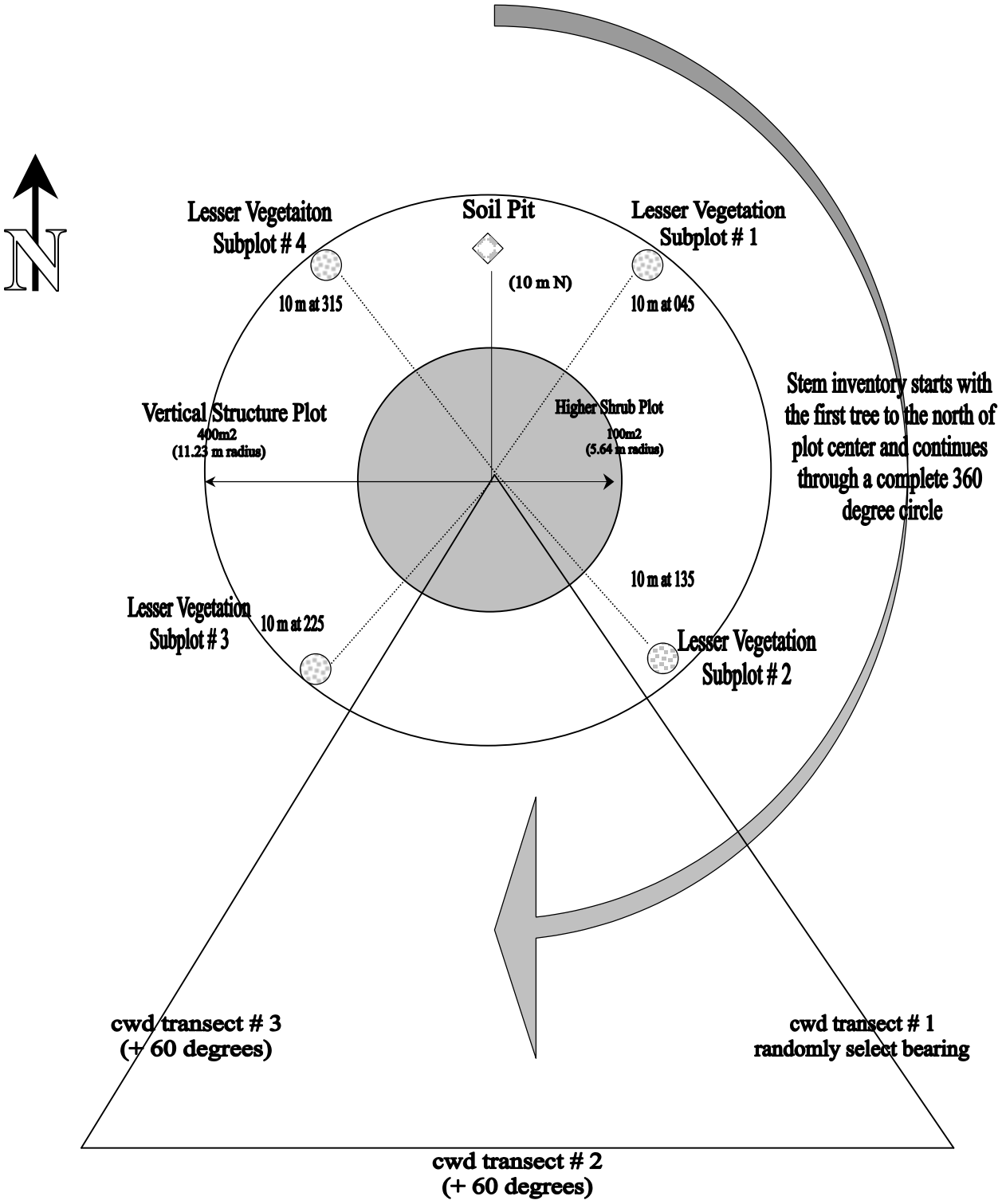

Figure 3. PSP Structure and Design

TABLE 4. MEASURED FOREST COMMUNITY STRUCTURE ATTRIBUTES

• Stand density & volume	• Shrub composition	• Herb, forb, grass composition
• Snag density	• CWD volume	• Free-to-maneuver flying space
• Ecosite classification	• Crown closure	• Soil moisture & nutrient regime

The study was designed with sufficient treatment and control plots, that even with fine-scale differences among the treatment plots, they can be suitably paired with a control plot and further matched with plots in the historical thinning treatment units.

PSP's were established at each songbird point count. Collection and analysis of data helped determine the ecological site class of the immediate plot location. This classification was taken to the series and site series level using methods outlined in Alberta Environmental Protection's Pre-harvest Ecological Assessment Handbook (1996) and the ecosite classification system of Beckingham et al. (1996). Ecosite classification of both control and historical treatment plots was conducted during the summer 2001 field season.

Plots within the treatment unit were measured prior and subsequent to harvesting operations. A total of 3,590 stems were measured in the commercial thin blocks in 2000. Diameter and condition code were assessed for each stem. Following harvesting operations in 2001 and 2002, all remaining residual stems were re-measured. In addition, height and ages were recorded for a subset of the retained trees. In the historical salvage blocks, 822 stems were measured over the course of the 2001 and 2002 field seasons.

Within each plot, smaller nested plots were established to measure the herb, forb, and shrub components in the treatment and historical thin blocks. Four plots (1 m^2) were positioned at 45-degree angles, 10 meters from plot centre. A single plot (100 m^2) was located at plot centre and used to measure higher shrub component. Percent cover and average height for each species was recorded prior to harvesting. In 2001 and 2002, all treatment plots were re-visited and re-measured to record changes in vegetation structure and composition. Historical treatment units were each measured once, either during the summer of 2001 or 2002.

Transects were established to measure coarse woody debris in 2000 in pre-harvest treatment units. At each plot, three 30 meter transects (forming an equilateral triangle) were established, starting at plot centre. Dependent upon the harvesting schedule, these transects were re-visited and re-established and measured again either in 2001 or 2002 to measure changes of this forest structure component. Within the historical salvage thin blocks, transects were established and measured either in 2001 or 2002.

7. DATA MANAGEMENT AND ANALYSIS

Two distinct sets of data have been collected for this study:

1. songbird richness and abundance in fire-regenerated lodgepole pine stands, and
2. forest community habitat attributes within these stands.

These data sets have been measured before and after CTL commercial thinning has taken place to assess changes in songbird communities and vegetative characteristics.

Microsoft Excel databases were developed to accommodate entry and storage of all field data. Four databases were developed for the vegetation component of the study:

- stems,
- herbs and forbs,
- higher shrubs, and
- coarse woody debris.

A separate database was developed for the songbird inventory that is sub-divided based on year of collection. All inventory data (songbird and vegetation) was entered in Year Two (2001) and Year Three (2002), generally subsequent to collection in the field. A 100% quality check was performed following initial entry to capture manual entry errors in the database. Analysis of the songbird and vegetation data will be performed in Year Four (2003/04) using a statistical computer program.

7.1. Analysis of Songbird Habitat and Use

Individual songbird species will be chosen to represent habitat use by guild. For example, the Dark-eyed Junco may be chosen to represent ground gleaning songbirds, and the Yellow-rumped Warbler to represent arboreal gleaning songbirds. These representative species, or indicator species will have their abundance calculated for each individual point count, each treatment unit, and each control unit.

The abundance of a songbird species at a given point in time and set of habitat conditions will help to determine the species use of the habitat. A type of Resource Selection Function (RSF) will be used to determine an effect of thinning. The RSF can determine the effects of thinning by calculating the amount of used habitat to the amount of available habitat. If the use of habitat changes with a thinning treatment in relation to the amount of habitat available, an effect of thinning may be implied (positive, negative, or neutral effects).

7.2. Analysis of Vegetation and Forest Community Structure

Calculation of the change in forest community structure will determine the change in songbird habitat. Pre and Post measures of the community structure variables permit the following change variables to be examined and used in the analysis:

- Difference in stems per hectare
- Difference in volume per hectare
- Difference in shrub species composition and percent cover
- Difference in herb, forb, and grass species composition and percent cover
- Difference in horizontal structure (cwd volume)
- Difference in vertical structure (snag volume)

8. PARTNERS

This project will require the expertise and coordination of several partners to ensure it is conducted in a scientifically sound manner and has operational relevance. The partners included in this study and their contributions include:

- **Millar Western Forest Products Ltd**., contact Tim McCready, RPF, Growth and Yield Forester.
    - MWFP has provided the land base on which this project will take place. MWFP conducted the CTL commercial thinning of the study site between the winters of 2000 - 2002. MWFP will also provide digital data on the study site and GIS expertise. MWFP has provided the significant financial contributions to the study.
- **University of Alberta, Department of Renewable Resources**, contact: Dr. James Beck, RPF, Professor in the Department of Renewable Resources, University of Alberta.
    - Dr. Beck has been the Co-supervisor for this project.
- **National Centres of Excellence for Sustainable Forest Management**, contact: Dr. Ellen MacDonald, Intensive Forest Management Program Leader.
    - NCE-SFM provided partial funding for two of the three years of the operational field aspect of the vegetation and songbird inventories.
- **Weyerhaeuser Canada Ltd., Edson Division**, contact: Dave Linfield, Contract Administrator.
    - Weyerhaeuser approved locations within their FMA where control blocks have been set up. Three of the five CTL thinning control blocks reside in Weyerhaeuser's FMA.
- **Woodlands Forest Management Inc.,** contact: Bruce Nielsen, R.P.F., Forest Biologist.
    - Mr. Nielsen will be completing this study as the requirements for a Master of Science Degree in Forest Biology and Management from the Department of Renewable Resources.

9. REFERENCES

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Beckingham, J., I. Corns & J. Archibald, 1996, Field Guide to Ecosites of West-Central Alberta, Special Report 9, Canadian Forest Service, Northwest Region, Northern Forestry Centre.