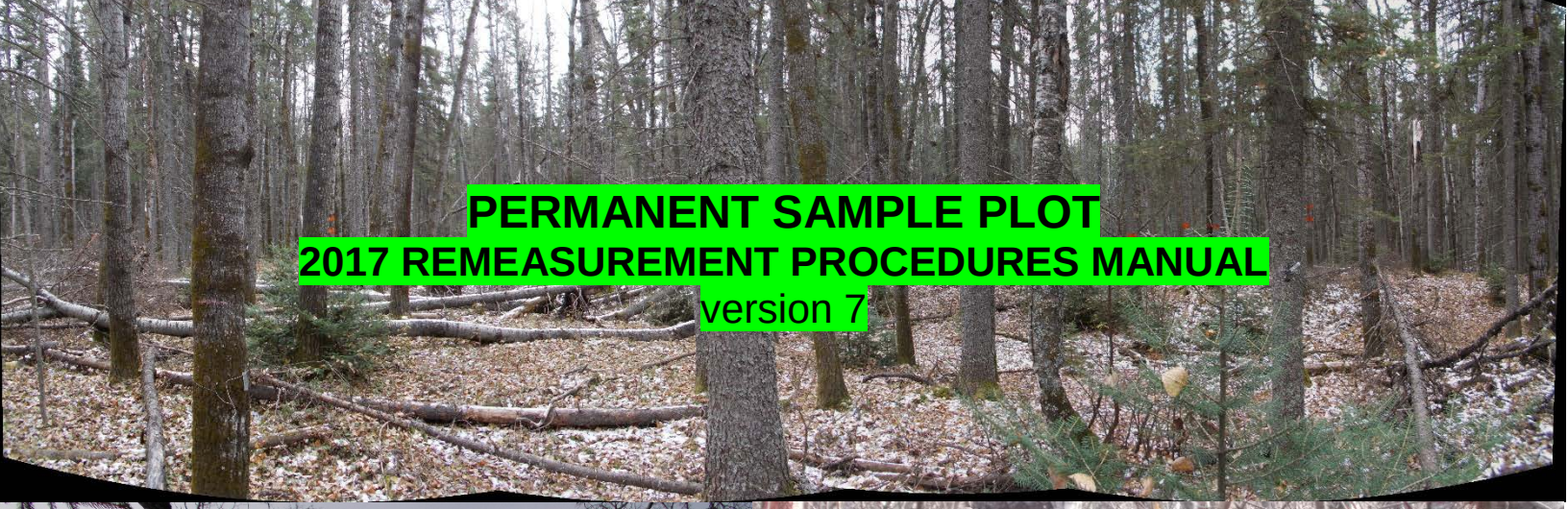
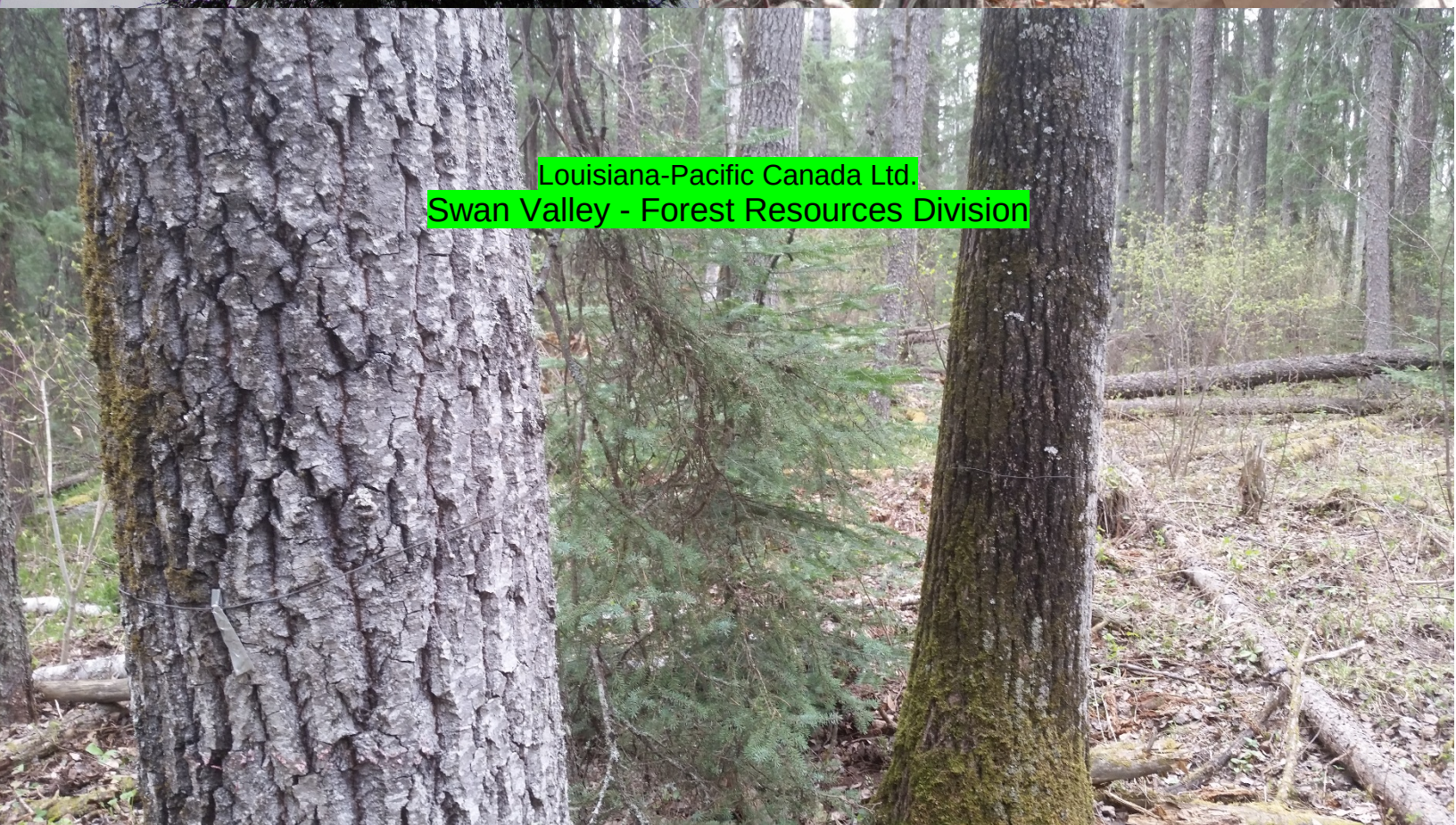


PERMANENT SAMPLE PLOT
2017 REMEASUREMENT PROCEDURES MANUAL
version 7



Louisiana-Pacific Canada Ltd.
Swan Valley - Forest Resources Division

ACKNOWLEDGEMENTS

LP established a PSP network between the years 1994 and 2000. The original version of the ecological Monitoring Permanent Sample Plot Field Procedures Manual was developed using a series of Permanent Sample Plot (PSP) protocols from across Canada. Louisiana-Pacific Canada Ltd. (LP) Swan Valley Forest Resources Division would like to acknowledge the following authors:

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- Louisiana-Pacific Canada Ltd. Swan Valley Stakeholders Advisory Committee for taking time to review the document and providing their comments and suggestions.

LP would also like to give special thanks to Swan Valley Forest Resources Division staff for the development and implementation of this ecological monitoring program. LP would also like to thank the PSP seasonal staff who have worked on the program throughout the years and who have contributed so many suggestions to the improvement and clarification of the protocol.

Remeasurement procedures have been revised as follows:

Version 5 PSP manual was revised in 2004 by LP staff and by Dr. Norm Kenkel from the University of Manitoba.

Version 6 of the PSP manual was revised in 2010, changing from 100% height measurement to 50% sub-sampling of heights.

Version 7 PSP manual (2017) measures all snags to assist with carbon calculations of dead trees.

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1.0 INTRODUCTION

Louisiana-Pacific Canada Ltd. (LP) is responsible for sustainably managing the forest resources in Forest Management License Area # 3 in west-central Manitoba. In order to manage forest resources effectively, there is a need to acquire a better understanding of stand dynamics, (*i.e.* how trees grow and stands change over time, ecosystem structure and functional relationships). This can be accomplished through the establishment of long-term ecological plots that collect standard growth and yield mensurational data along with a variety of other parameters. The growth of a stand can be measured by taking measurements of the same trees at periodic intervals.

1.1 PSP Objectives

The main objectives in the establishment of a network of ecological monitoring permanent sample plots are to quantify:

1) **Sustainability** – growth and drain. PSPs are the actual measurement of growth. Drain is the volume of wood harvested and the volume of wood lost to fires, insects, and disease.

2) **stand dynamics** – succession (changes in amounts of tree species), regeneration, in-growth, and mortality;

3) **growth curves -** provide a database that can be used to develop growth curves (i.e. actual measured growth over time, not assumed growth);

4) **monitoring -** provide data for long term ecosystem monitoring and strengthening the development of forest ecosystem classification and forest resource inventory (FRI) relationship linkages;

5) **site productivity** - describe soil characteristics and collect samples for nutrient analysis and site productivity determination; and

6) **wildlife** - collect data on wildlife habitat values to develop relationships between stand level descriptions and inherent structural attributes such as coarse woody debris, vertical structure, and snags present.

1.2 PSP Establishment History

In 1994, LP initiated its Ecological Monitoring Permanent Sample Plot Program by establishing 150 permanent sample plots (Figure 1.1) within the Mountain Forest Section of Manitoba (Duck Mountains and Porcupine Hills Provincial Forests). The data collected on these 150 PSPs were tree data only (*i.e.* no vegetation or soils), since most of the plots were established in the winter under a contract with Don Reimer.

In 1997, LP began upgrading the original 150 PSPs to include ecological information, including vegetation, soils, down woody debris, cavity assessment in snags, and stem mapping trees. LP also established 279 new PSPs (tree and ecological data) during the period of 1997 to 2000 (Figure 1.1). These plots were established in hardwood and mixedwood cover types.

2000 – experimental regen: eight PSPs were established in the Garland Grazing Trial to quantify aspen growth with grazing and no grazing treatments.

2006 – experimental regen: 18 PSPs Season of Harvest Study in two cutblocks (SLC-114 and SLC-124).

2013 and 2014 – seven PSPs were established in regenerating hardwood cutovers, typically within two years of the mature PSP being harvested (PSPs 5, 20, 34, 110, 112, 142, and 186).

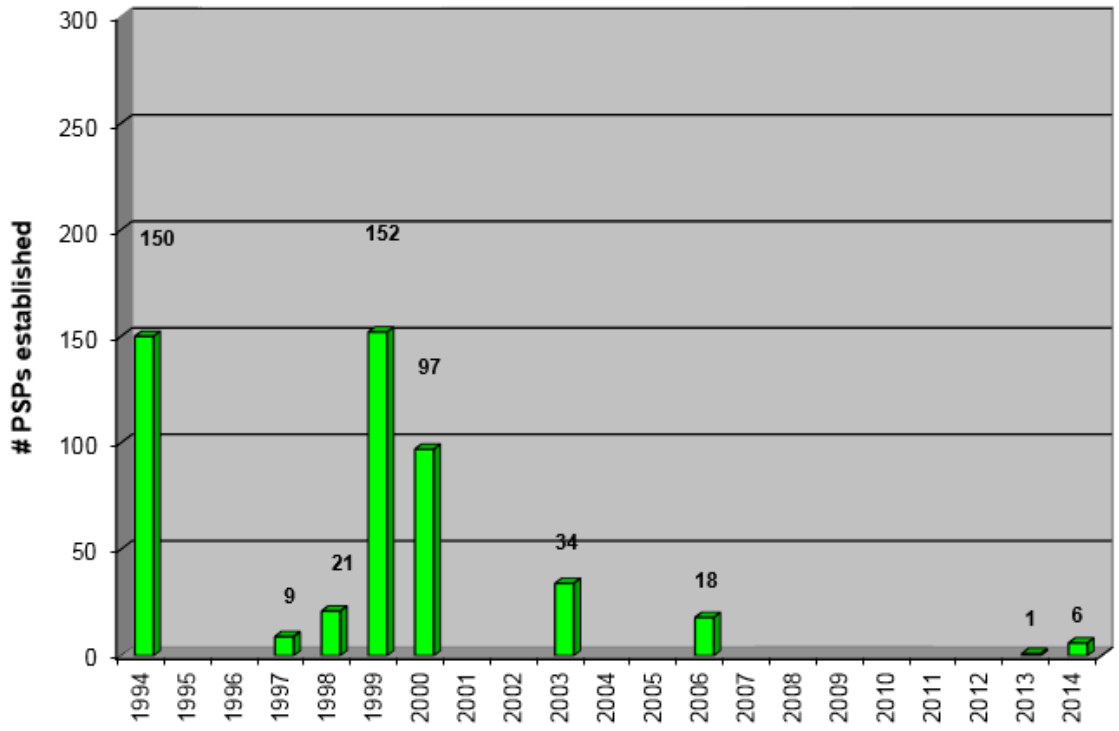


Figure 1.1 LP PSP establishment history.

1.3 PSP Remeasurement History

As of 2017, 32% of the PSP network have had two or more measures. 65% of the PSP network (280 PSPs) have never been remeasured (Table 1.1). 3% of the plots have been lost to blowdown, beavers, and other disturbances.

Table 1.1 Measurement history 1994 to 2017.

# of PSP measures	# PSPs	%
4	8	2%
3	31	7%
2	99	23%
PSPs with only 1 measurement (establishment) do not have change data	280	65%
lost to blowdown, beavers etc.	11	3%
	429	**100%**

In 1999 and 2000, a subset (26 PSPs) of the first 150 PSPs established between 1994 to 1997 were remeasured (Figure 1.2). Comparison of the original plot data to the remeasured plot data showed that the 3 to 5 years growth interval was too small. J.S. Thrower and Associates (2000) suggested to LP that they wait for a 10 year growth interval before starting PSP remeasurements.

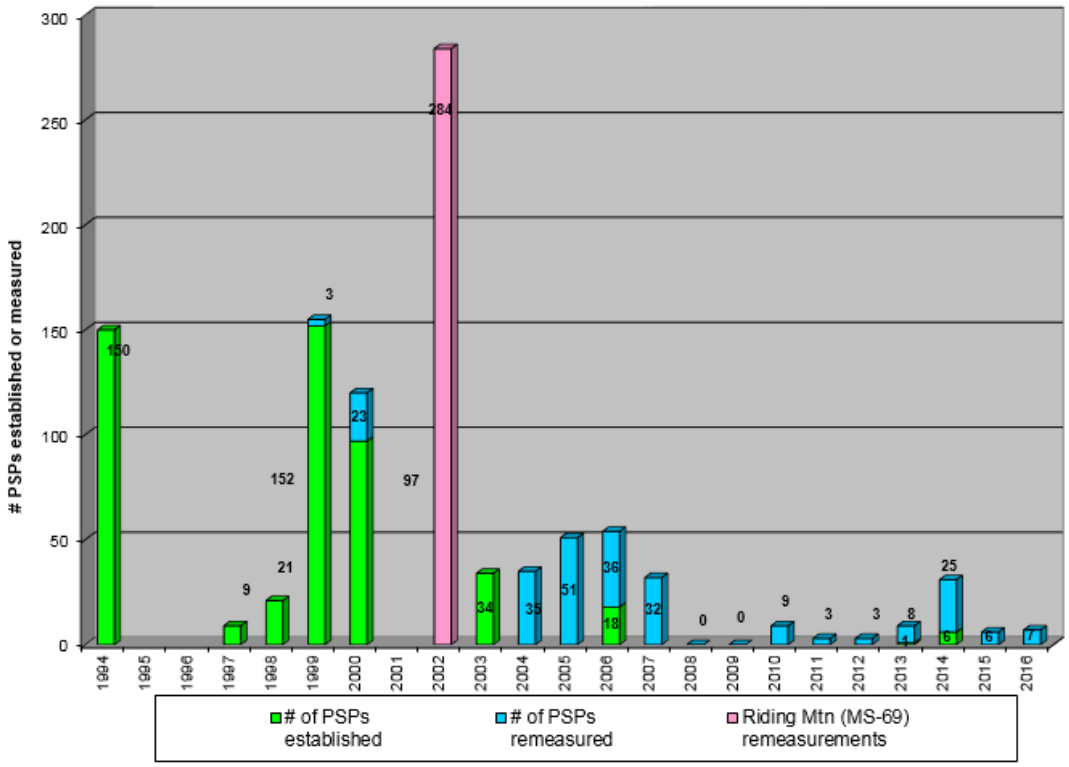


Figure 1.2 LP PSP remeasurement history.

In 2001, LP and the Canadian Forest Service (CFS) in Edmonton discovered 17 paper boxes of PSP tally sheets from the Riding Mountain Forest Experimental Station. Approximately 1,400 PSPs were established by the Federal government from 1947-1949, and remeasured two to four times between 1947 and 1966. LP then contracted the CFS to digitally enter all these data.
In 2002, LP staff remeasured 284 of approximately 1,400 PSPs in Riding Mountain National Park. The 2002 measurement yielded a remeasurement growth period of 55 years.

From 2004 to 2007, LP remeasured 10% of the PSP network on an annual basis, or a 10-year cycle. Approximately 42 PSPs were targeted for remeasurement each year, from the network of 429 PSPs. Unfortunately, we have had no PSP seasonal staff since 2008.

Today, PSP remeasurement effort is only targeted at plots that are in a proposed harvest block. Zero to three PSPs per year get measured from the network of 429 PSPs (0.0 to 0.7% remeasurement effort; or a 140 to 200 year cycle). Typically, a cluster of three PSPs will have the harvest block redesigned to buffer out one PSP, while the remaining two PSPs get harvested. These PSPs get remeasurement before harvest, and decommissioned by removing plot posts and tree tags and wires.

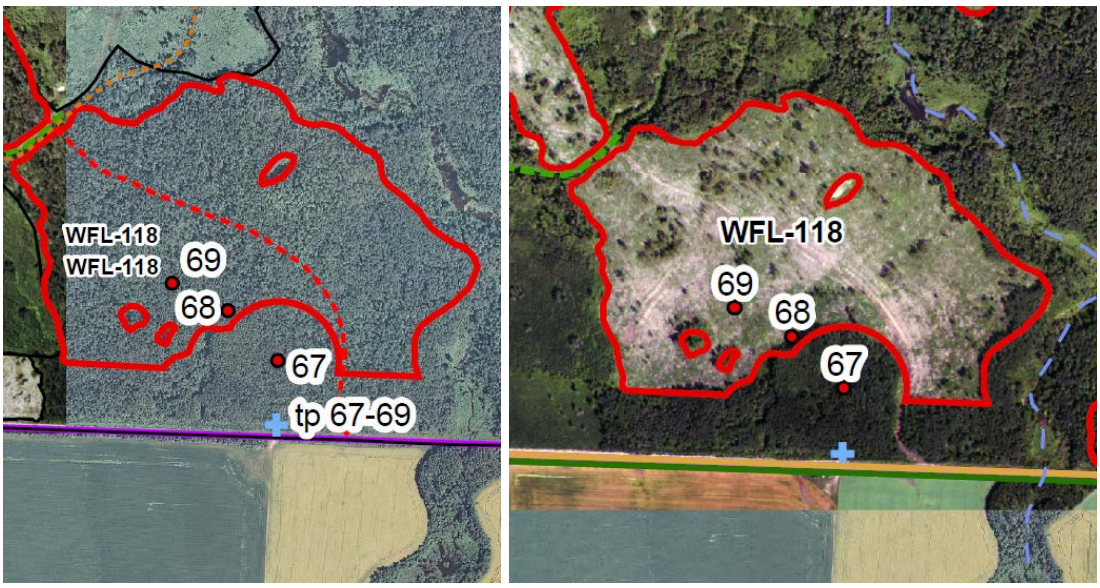


Figure 1.2 PSPs within a proposed cutblock have one PSP buffered out the block (PSP 67) while the other two PSPs get harvested.

2.0 PSP SCOUTING MAINTENANCE, AND UPGRADING

Since its inception, LP's PSP program has undergone improvements to its' protocol in an effort to make it clearer and more complete. The following procedures apply to the scouting, maintenance, and upgrading of existing PSPs.

2.1 Location Description

PSPs are in clusters of three PSPs, with a single tie point (Figure 2.1). Each PSP is 500 m^2 in size.

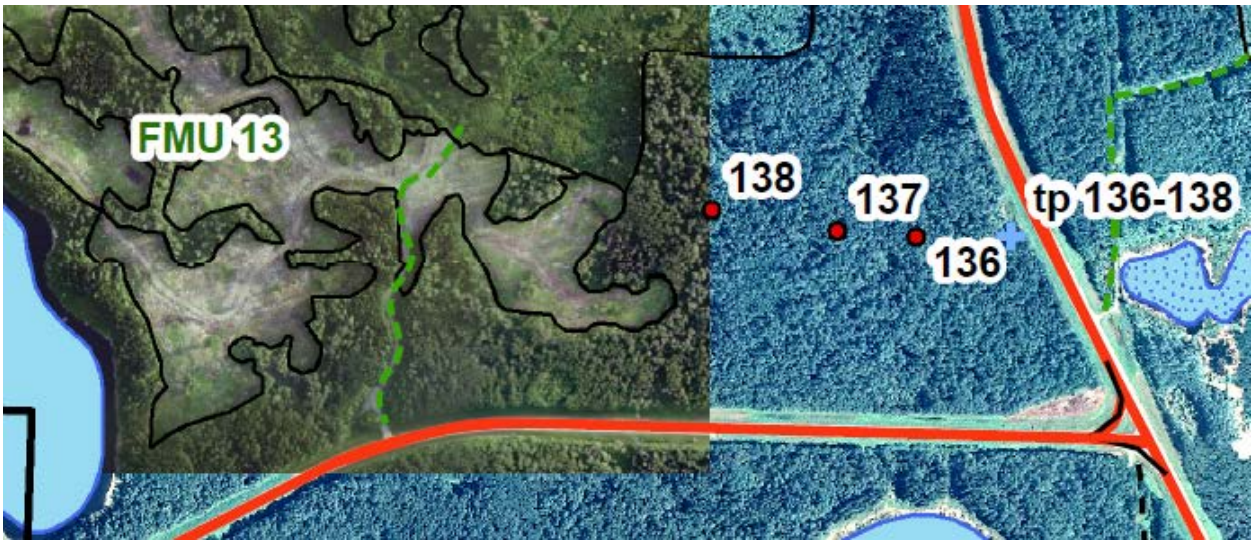


Figure 2.1 Tiepoint (blue) and cluster of three PSPs (red dots) off highway # 83.

2.2 Tie Points

There is one tie point for each cluster of three PSPs. Tie points link the PSPs to a permanent land feature, which assists in relocation of the PSPs.

2.3 GPS Information

GPS coordinates exist for all PSP centre posts and PSP tie points (Appendix 4). UTM (Universal Transverse Mercator) coordinate system is used. All PSPs are with UTM Zone 14 North.

2.4 PSP Scouting

-benefits of one person scouting PSPs makes for more efficient use of the three-person crew
-checklist, plot sheet (here or in appendix?)
-replace written on tags with better and more durable stamped tags

2.5 Tree Plot Corner Posts

Determine if all four corner posts and the centre post are present (Figure 2.2). The posts are 10 mm rebar painted orange and are tagged. Repaint and retag each post, if necessary. If the post is loose, pound it in until post is tight (you must wear safety glasses when pounding metal!). If the post is missing, replace the post and tag it. Corner posts should be located 15.81 m from plot centre and have the following azimuths:

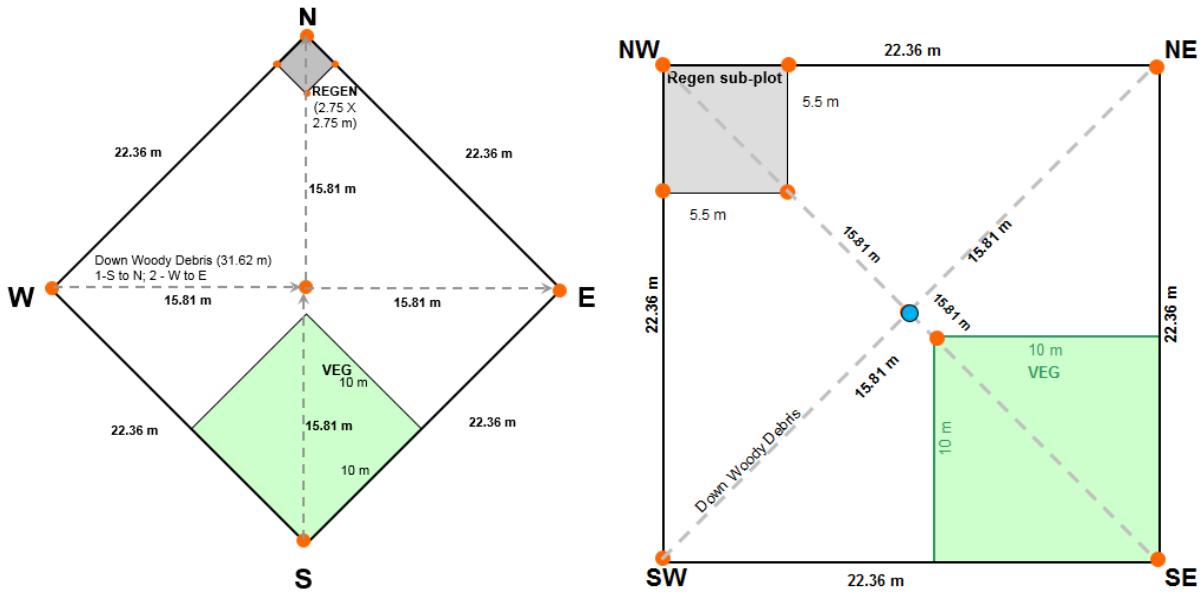


Figure 2.2 Corner posts on diamond plots (left) and corner posts on square plots (right).

Table 2.1 Corner post azimuths from plot center.

Post Corners	Diamond PSPs *(azimuth from plot center)*		Post Corners	Square PSPs *(azimuth from plot center)*
S	15.81 m at **180º**		SE	15.81 m at **135º**
W	15.81 m at **270º**		NE	15.81 m at 4**5º**
N	15.81 m at **360º**		NW	15.81 m at **315º**
E	15.81 m at **90º**		SW	15.81 m at **225º**

2.6 Regeneration Sub-Plot Posts

Determine if all regeneration sub-plot posts are present. The posts are 10 mm rebar painted orange and are tagged. Repaint each post and retag the post(s), if necessary. If posts are missing, they must be re-established.

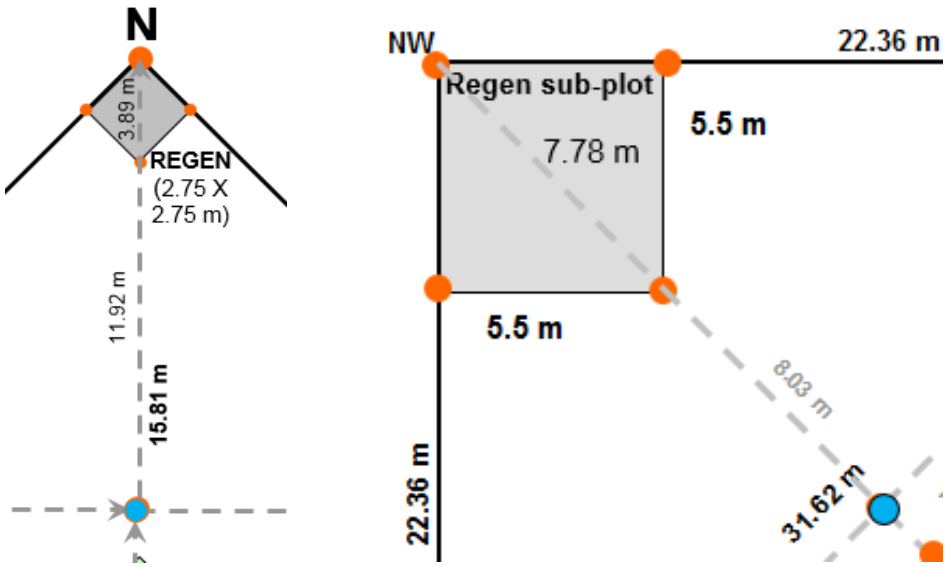


Figure 2.3 Regeneration sub-plot dimensions showing post locations for diamond (left) and square (right) plots.

2.7 Tree Tagging

Tags are important to maintain each tree's unique identity.

2.7.1 Nails

If the plot's trees were tagged using nails rather than wires, remove the nails and re-tag the tree with wire. To re-tag the trees, do the following:

1. Using a claw hammer, remove the nail from the tree.
2. Using pruning paint, fill in the nail hole.
3. Rewire the tree tag onto the tree. If the tree tag is missing, use the tree stem-mapping information to determine the tree number and write out a new tag for the tree.

2.7.2 Ingrowth

Ingrowth trees were too small to be tagged (8.9 cm dbh or smaller) at the last measurement, but now are big enough (9.0 cm dbh or larger) and must be tagged.

Use the next available number after the last tree in the plot to number the ingrowth trees. For example, a PSP has 55 trees (#1 to #55), and there is one ingrowth tree. The new ingrowth tree would become tree #56.

For each tree in the plot, indicate on the tree tally sheet whether it is the original tree (code = 1) or an ingrowth tree (code=2).

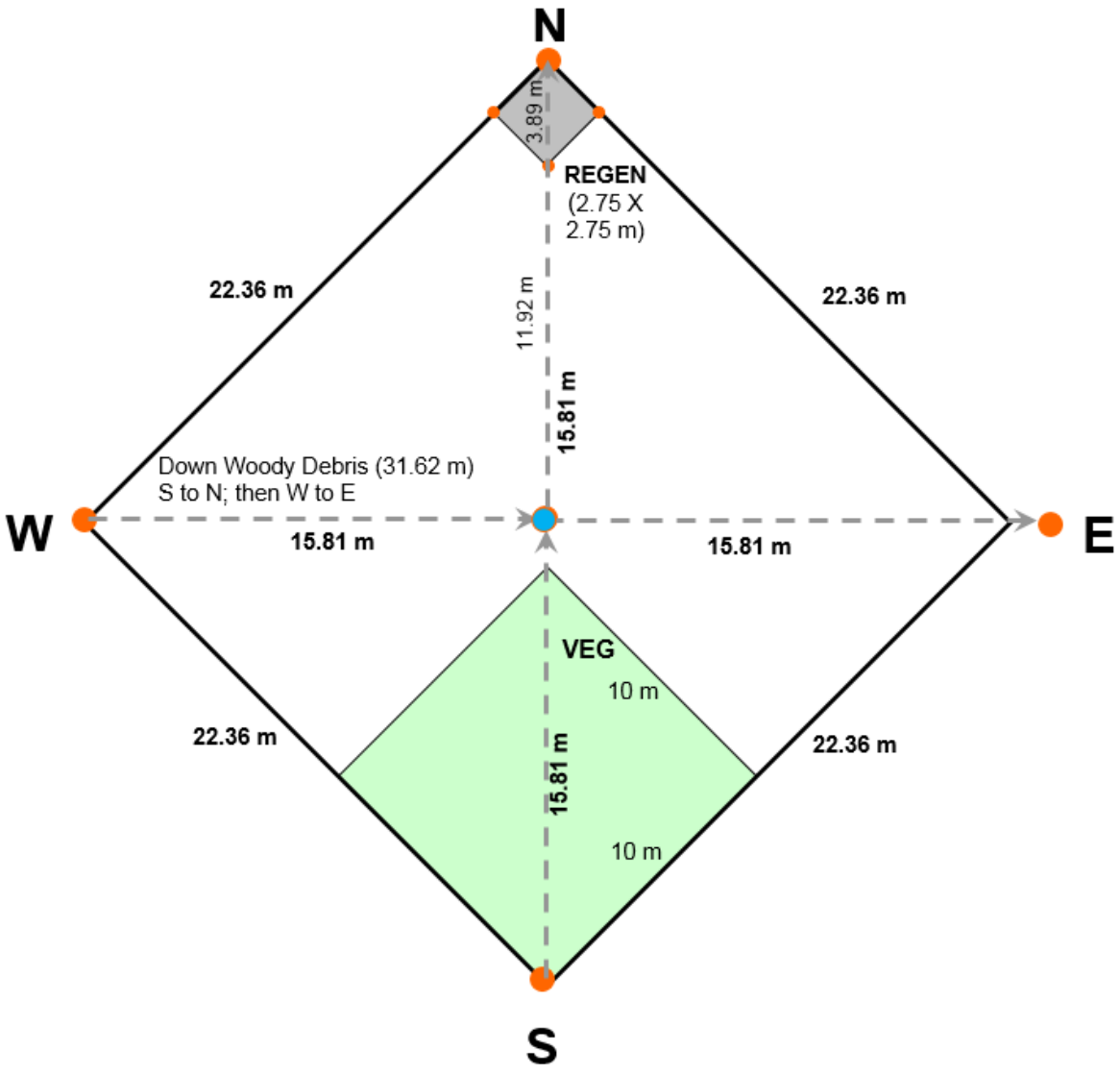


Figure 2.4 **PSP dimensions for the tree plot, vegetation sub-plot and down woody debris transect (diamond plot shape).**

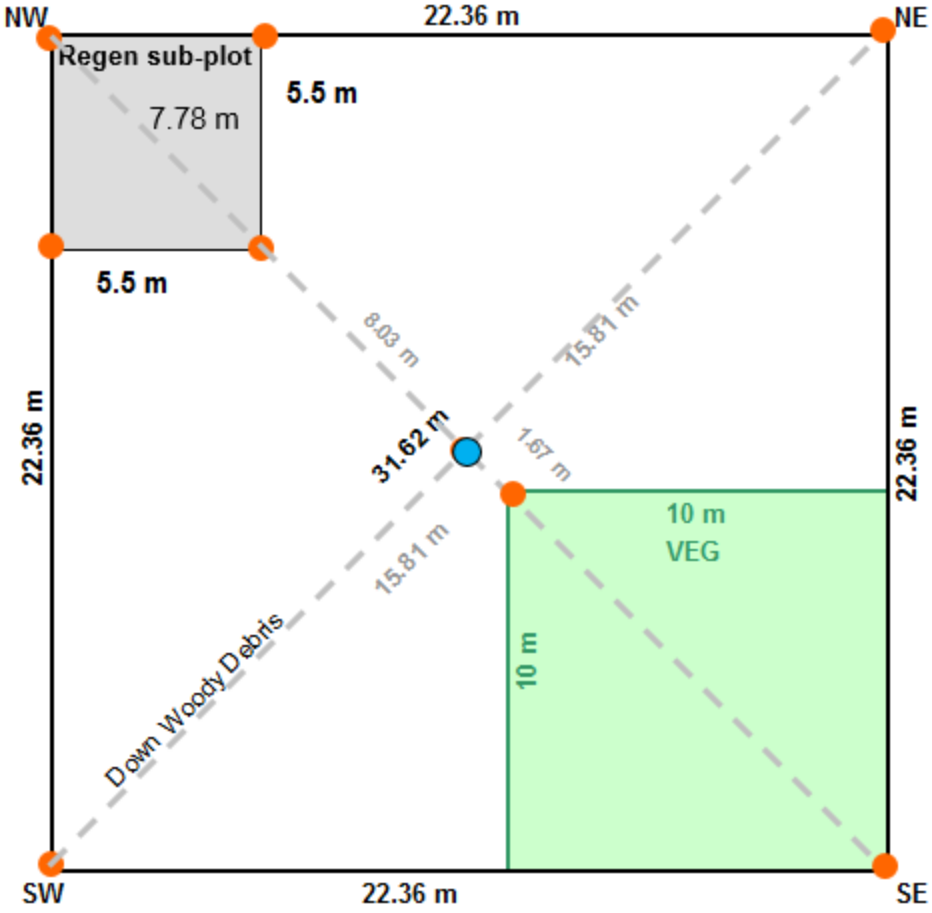


Figure 2.5 PSP dimensions for the tree plot, vegetation sub-plot and down woody debris transect (square plot shape).

Table 2.2 PSP Plot & Sub-Plot Dimensions

Tree & Sapling Plot			Regeneration Sub-Plot (North corner)			Vegetation Sub-Plot (South corner)		
Area (m^2)	Side (m)	Diagonal (m)	Area (m^2)	Side (m)	Diagonal (m)	Area (m^2)	Side (m)	Diagonal (m)
500	22.36	31.62	7.56	2.75	3.89	100	10.0	14.14

2.8 Plot Boundary Trees

Painting the boundaries of the plot helps to ensure that all trees within the plot are tagged and measured, and aids in the relocation of the plot. The plot boundary trees are outside, but adjacent to the plot, and must be re-painted orange. Safety glasses must be worn while painting!

Paint **two** orange rings (as high as you can reach) around the circumference of each tree beside each plot corner post just outside the plot boundary.

Paint a single orange ring (as high as you can reach) around the circumference of each tree just outside the plot boundary

Care must be taken with borderline trees. A tree is considered “in” if more than half of the stem, at breast height, falls inside the plot, and will have a wire and a tag. If possible, avoid painting dead trees, wind-blown trees, and trees with thick, low-hanging branches.

2.9 Plot Photographs

Using a digital camera mounted on a tripod, take 8 to 12 photographs of the PSP from plot center. Take the first photo with either a N (north) or NW (north west) plot corner. Shoot the remaining photos clockwise from the plot corner, in order to photograph the entire plot.

Download all digital PSP pictures and file them on the network in the directory:

L:\images\PSP\2017

and name the files as PSP# and the direction the photo was taken:

PSP161NW.jpg,
PSP161N.jpg,
PSP161NE.jpg,
PSP161E.jpg
PSP161SE.jpg
PSP161S.jpg
PSP161SW.jpg
PSP161W.jpg

Also from plot centre, shoot a canopy picture straight up. This helps visually describe the forest canopy.

In addition, a 360 degree panoramic photo can created by digitally stiching a series (8 to 12 photos per PSP) of photos. Mounting the camera on a tripod makes better panoramic photos.

Top: panorama stitched from photos taken by hand (no tripod)
Bottom: panorama stitched from photos taken with a camera mounted on a tripod

3.0 PSP REMEASUREMENTS

This chapter outlines the protocol used to collect data within the established permanent sample plot. All remeasurement tally sheets are in Appendix 3.

A soils assessment has already been completed for one plot in each cluster of three PSPs during plot establishment, from 1997 to 2000. Therefore, no additional soils information is required at this time.

Tree age data has previously been collected for the PSPs and is not necessary to collect age data a second time.

3.1 Vegetation Sub-Plot Measurement

The vegetation sub-plot is located in the south (S) corner of the PSP. The sub-plot should be measured prior to other work to prevent the trampling of vegetation during other work. The dimensions of the square vegetation plot are 10 m x 10 m or 100 m^2.

Percent cover of woody and herbaceous plants is estimated by floristic layer. A tree species such as black spruce could occur in layers 1, 2, 3, 4 and 5. In this example, a percent cover for black spruce would be estimated for each floristic layer.

Table 3.1 Floristic layer descriptions for vegetation data collection.

Layer	Description - Height Class
1	Dominant trees – emergent or supercanopy trees
2	Codominant trees – trees in the main canopy layer
3	Understory layer (trees and shrubs), >3 to 10 m in height
4	Tall shrubs – >0.5 to 3.0 m in height
5	Low shrubs – up to 0.5 m in height
6	All non-woody species: herbs, ferns, fern allies, grasses and sedges
7	All mosses, liverworts, and lichens

Percent cover of woody and herbaceous plants is estimated using a modified Braun-Blanquet cover-abundance scale (Mueller-Dombois and Ellenberg 1973):

Scale Value	Percent Cover
r	one plant, less than 1 % cover
+	several plants, less than 1 % cover
1	1 to 5%
2	6 to 25%
3	26 to 50%
4	51 to 75%
5	76 to 100%

Vegetation is considered to be inside of a sub-plot only if it is rooted in (*i.e.* the point of germination) the sub-plot. Do not measure vegetation which extends over the sub-plot but is not rooted in the sub-plot. Include percent cover measurements of any trees, saplings, or seedlings in addition to shrubs, forbs, herbs, mosses and lichens.
Mosses and lichens should be measured when they are located on the ground, on rocks, or on downed woody debris inside the sub-plot. Do not measure mosses and lichens located on standing trees (arboreal lichens).
All plants must be identified. If a plant cannot be identified in the field it is recorded as an UKNOWN #__ (unknowns are numbered sequentially) and its cover class estimated. A sample of the unknown plant species must be taken from outside the shrub/herb plot, and placed in a plastic bag with a label indicating the UNKNOWN #, site description and its associated plant species.

Plant species that cannot be identified but are believed to be rare or endangered are **NOT** to be sampled from the site. Use the digital camera provided to photograph the plant and use the photo to help identify the species back at the office. If a plant species is identified as a rare or endangered species, notify the District Forester, District Biologist or Area Planners immediately to ensure that the Conservation Data Centre forms are completed and additional information required is provided.

3.2 Downed Woody Debris

Using a 50 m fiberglass measuring tape, establish a downed woody debris (DWD) transect from the S plot post to the N plot post, bearing through plot centre of the PSP. The second DWD transect runs from the W plot post to the E plot post.

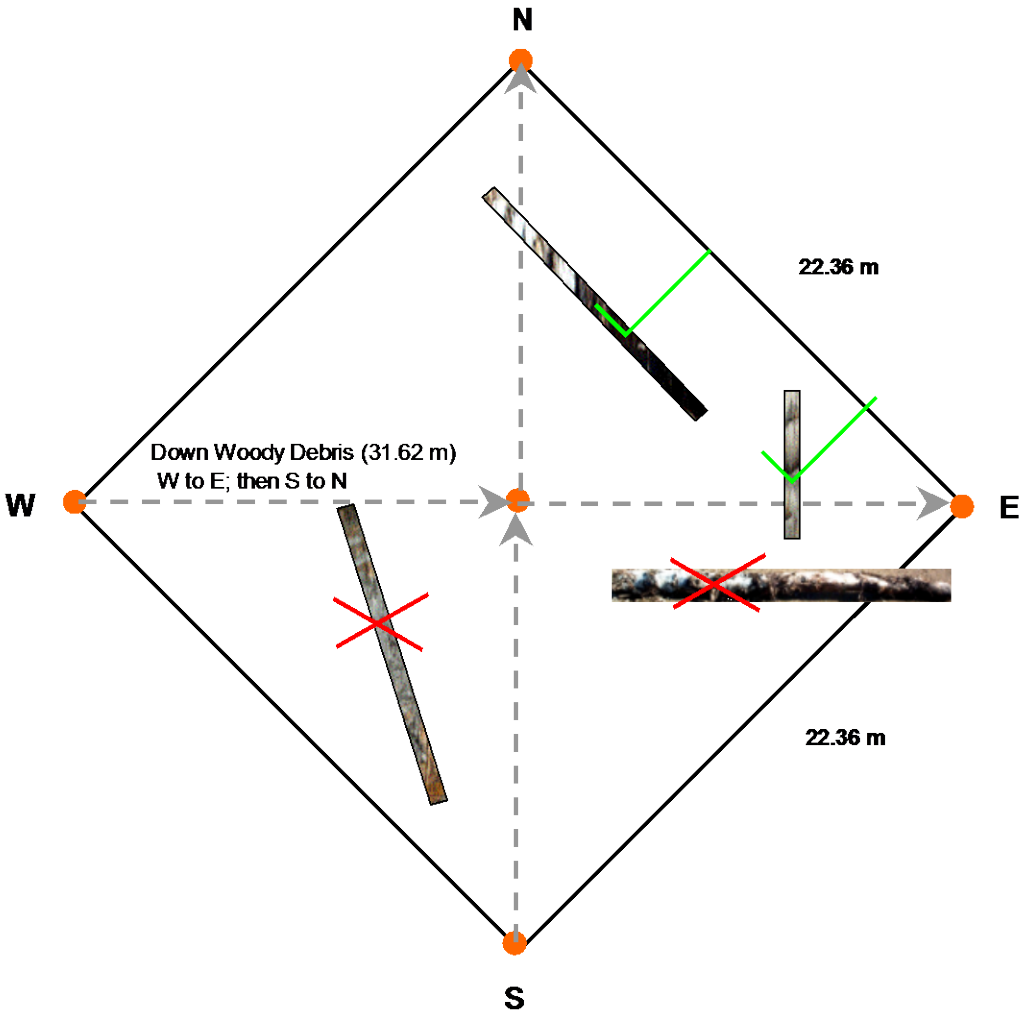


Figure 3.1 Downed woody debris (DWD) transect showing logs to tally (green check mark) and which logs are no tally (red X).

Add a square plot diagram for downed woody

Along each transect measure the distance of DWD that is greater than 7.5 cm in diameter from where the DWD first intersects the transect line to where it no longer intersects the transect line. Down woody debris (DWD) species codes are the same as live trees, except for:

UN – unknown;
HW – hardwood (individual species cannot be determined);
SW – softwood (individual species cannot be determined);
AL - alder species;
MA – Mountain Ash; and
99 – no tally (transect completed, but no DWD)

Identify DWD as either a stump (<1.3m in height) or log and assess the decomposition class (1-5) and species (or species group) of each DWD.

Measure the diameter of the DWD perpendicular to the stem (at the center point of intersection with the transect line for logs, or at the base of a stump just above the root swell). Indicate whether the diameter was measured with the DBH tape measure around the circumference of the log (C), or linearly (L) with a standard tape measure held over the log perpendicular to it (for logs which are too decomposed to obtain a diameter with the DBH tape measure). All information and any additional comments are to be recorded on the tally sheet. Once all measurements are complete, trace the transect line at the point of intersection on the piece of DWD using orange spray paint to indicate the location of the transect for future re-sampling.

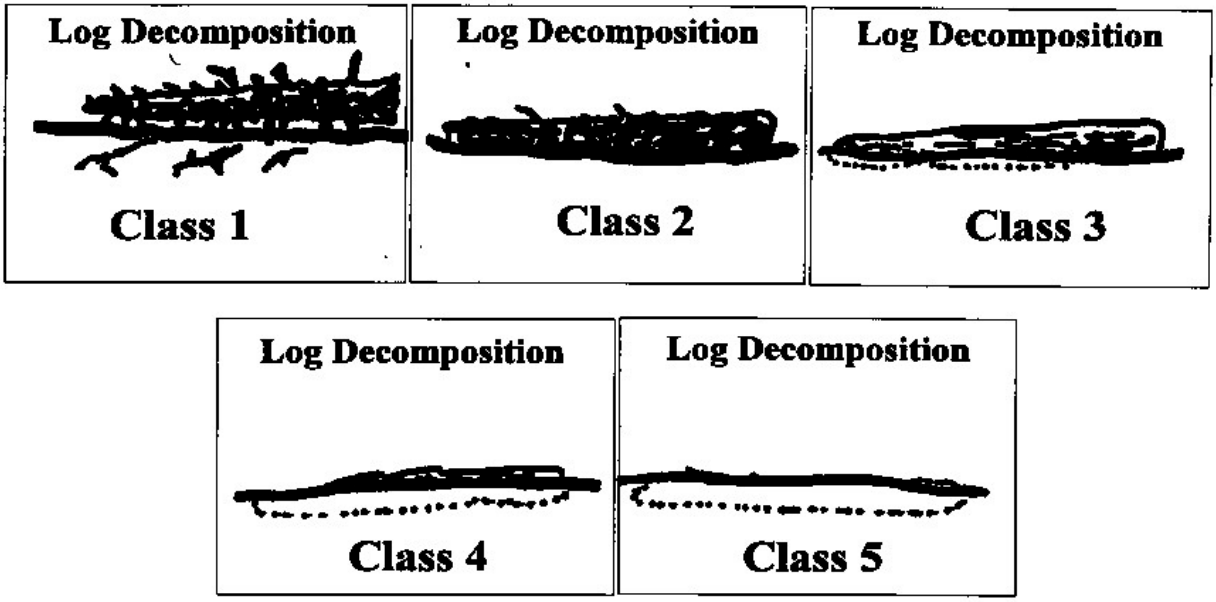


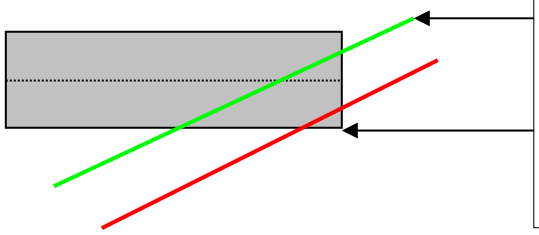
Figure 3.2 Decomposition Class of Downed Woody Debris (Hayden *et al*, 1995)

Table 3.2 Decay class characteristics.

Log Character	Log Decay Class				
	1	2	3	4	5
Bark	Intact	Intact	Trace (<10%)	Absent	Absent
Twigs < 3 cm	Present	Absent	Absent	Absent	Absent
Texture	Intact	Intact to Partially Soft	Hard Large Pieces	Small Soft Blocky Pieces	Soft and Powdery
Shape	Round	Round	Round	Round to Oval	Oval
Wood Colour	Original Colour	Original Colour	Original Colour to Faded	Light Brown to Faded Brown or Yellowish	Faded to Light Yellow or Grey
Log Elevation	Log Elevated on Support Points	Log Elevated on Support Points but Sags Slightly	Log is Sagging Near Ground	All of Log is on Ground	All of Log is on Ground

Information is to be collected on all downed woody debris that intersects the transect and has a minimum diameter of 7.5 cm using the following tally rules:

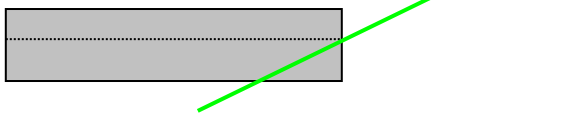
- tally only those pieces intersected above the duff layer,
- if the transect line crosses the end of the piece, tally the piece only if the central axis of the piece is crossed,



transect crosses the end of piece and the central axis of piece - **tally**

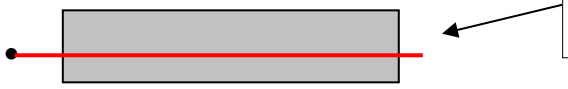
transect crosses the end of piece but not the central axis of piece - **no tally**

- if the transect line passes exactly through the end of a piece and the central axis of the piece, tally every second piece,



transect passes exactly through central axis of piece at end of piece - **tally every second log**

- ignore any piece whose central axis coincides with the transect line (is lined up with the transect line),



transect coincides with the central axis of the piece - **no tally**

- if the transect line crosses a curved piece more than once, tally each crossing.

3.3 Regeneration Measurements

Regeneration (regen) is classified as any tree species stem 0.10 m in height or taller with a maximum DBH of 1.0 cm. Regen is counted by species and height class and recorded on the regeneration tally sheet using a standard dot tally within the regen subplot.

The five height classes for regen classification are as follows:

Class **1**: 0.10 m - 0.30 m

Class **2**: 0.31 m - 0.60 m

Class **3**: 0.61 m - 0.90 m

Class **4**: 0.91 m - 1.20 m

Class **5**: 1.21 m +

Do <u>not</u> straighten leaning regen when measuring its height. To assist in determining which height class a regen stem is in, a Dbh/ Height Class Stick is used and is marked at intervals of 0.10 m, 0.30 m, 0.60 m, 0.90 m, and 1.20 m.

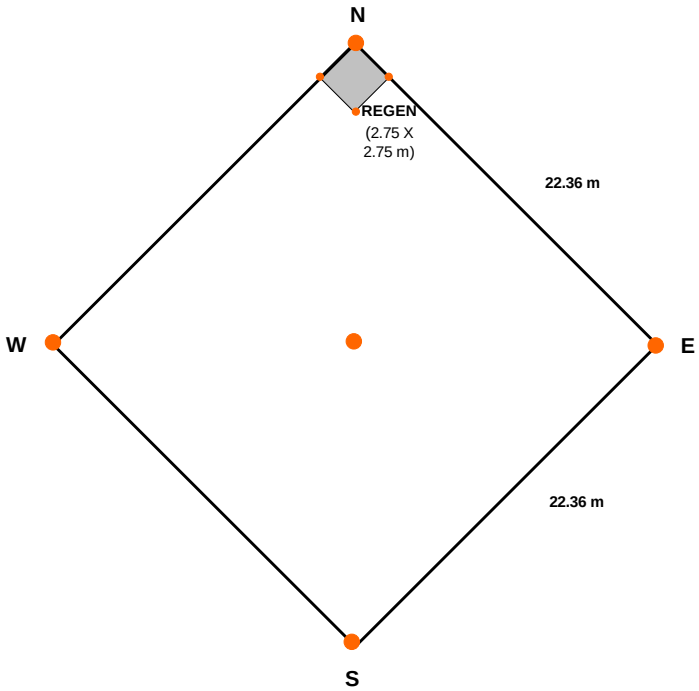


Figure 3.3 Regeneration sub-plot within PSP (grey shaded area).add square diagram

3.4 Tree Plot Measures

3.4.1 Tree Numbering

All standing trees (live and dead) ≥ 9.1 cm DBH (diameter at breast height) within the tree plot are tagged, measured, and tallied. Trees are to be numbered and tagged sequentially according to their bearing relative to plot centre. Start at a bearing of 1^{o} and rotate clockwise around the plot to 360^{o} numbering the trees sequentially from 001 to 999 as they are encountered. Numbers should be written vertically down the aluminum tags.

To attach the number tags to the trees a 17 gauge galvanized wire is used. The wire must be cut to a length large enough to allow for the formation of a 40 cm large loop of extra wire to be present once the wire has been attached to the tree. The tag should be wired to the tree so that the tag faces plot centre. The extra loop should be on the right side of the tree (when facing the tree from plot centre) and the twisted ends of the wire should be on the left side of the tree and tucked in against the tree to prevent injury. Please note: always wear protective eye-wear when wiring the trees and be very cautious to prevent injury to yourself or another crew member.

In summary, tally stems that are:

1) standing alive (living branches or buds);
2) standing dead (of a height > 1.3 m); or
3) any woody plant species with a diameter at breast height ≥ 9.1 cm.

3.4.2 Tree Species

Use the following species codes for these common tree species:

Table 3.3 Tree Species Code

Common Name	Scientific Name	Species Code
Fir Balsam fir	Abies A. balsamea	 BF
Birch White Birch	Betula B. papyrifera	 WB
Larch Tamarack	Larix L. laricina	 TL
Pine Jack pine	Pinus P. banksiana	 JP
Poplar Aspen (White Poplar) Balsam poplar (Black Poplar)	Populus P. tremuloides P. balsamifera	 TA BA
Spruce Black spruce	Picea P. mariana	 BS

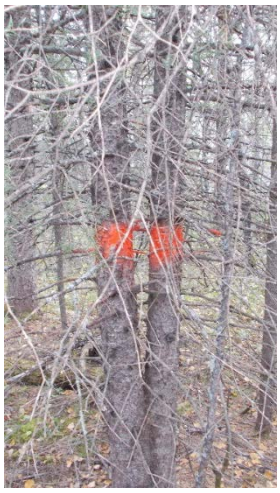
White spruce	P. glauca	WS
Oak Bur oak	Quercus Q. macrocarpa	 BO
Elm White elm	Ulmus U. americana	 WE
Maple Manitoba maple	Acer A. negundo	 MM
Ash Black ash Green ash	Fraxinus F. nigra F. pennsylvanica	 AS GA

3.4.3 DBH Measurement

Diameter at breast height (DBH) is to be measured at a height of 1.30 m from the point of germination. Use the existing painted dbh line if the paint is still visible. Consistency in diameter measurements is very important.

If there is no visible paint, measure exactly 1.30 m (DBH stick or tape) up the stem and measure DBH, then spray paint a new line.

If the previous DBH measurement was recorded at a height of 1.3 m +/- 5 cm or more, then record the height at which the previous DBH was recorded (on the PSP Plot Re-measurement Summary Sheet). Previous DBH measurements were recorded either:
(i) at a height indicated by the pink line on the tree; or
(ii) directly above the nail hole which previously held the tree's number tag.



Trees forked <u>below</u> 1.3 m are treated as two separate stems and are tagged and tallied as two separate trees with different tree numbers. Once the DBH measurement has been recorded, paint a line on the tree where DBH has been measured.

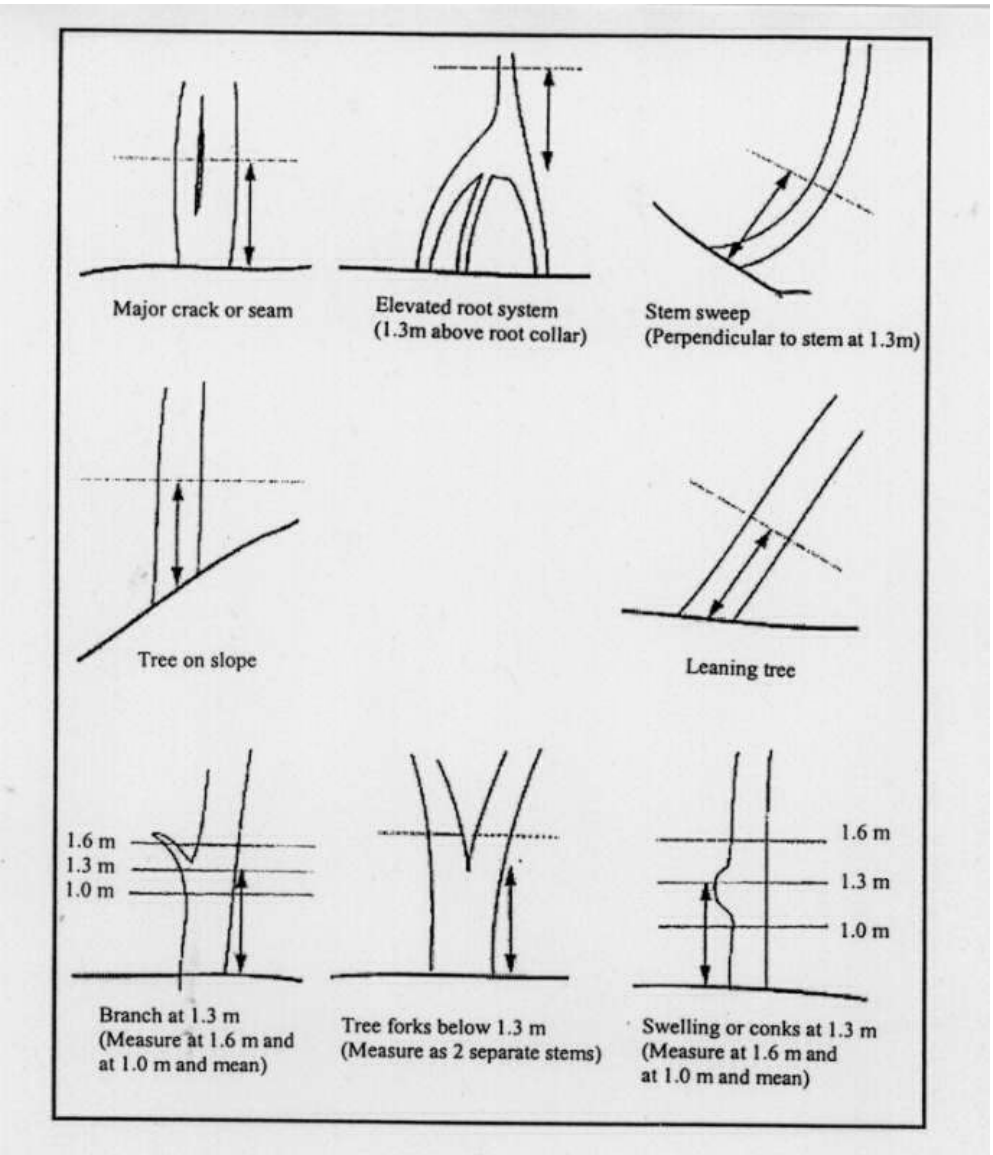


Figure 3.4 Determining Point of Germination and Breast Height (Canadian Forest Service, 1994)

3.4.4 Condition Codes

For each tree, record condition code(s) as appropriate. If the tree has no defects, insect or disease problems, then give the tree a code 000 – healthy tree.

Table 3.4 Tree Condition Codes

CODE #	CODE DESCRIPTION
000	Healthy
001	Standing Dead with Top Intact
002	Standing Dead & Broken
003	Dead & Down
004	Dead Top / Dieback
005	Dieback with New Leader
006	Broken Top (broken in the crown)
007	Broken Stem
008	Missing
009	Cut Down
010	Forked
011	Multiple Leader
012	Leaning
013	Poor Form
014	Pronounced Crook
015	Sweep
016	Spiral Grain
017	Frost Crack
018	Windshake
019	Sucker from Old Stump
020	Cavities Present
021	Multiple Stems-
022	Foliage Insects
023	Foliage Disease
024	Stem Insects
025	Stem Disease
026	Conks
027	Open Scar
028	Closed Scar
029	Rubbing by a Fallen Tree
030	Burls and Galls
031	Limby
032	Suppression - (leader or lateral)
033	Nutrient Deficiency (Chlorotic)
034	Witches' Broom
035	Lateral Dieback
036	Calculated DBH
037	Tree was missed on previous measurement (should have been tagged)
038	Flooding
039	Fire Damage

CODE #	CODE DESCRIPTION
040	Sunscald
041	Frost
042	Hail
043	Windthrow
044	Erosion
045	Ice/Snow Accumulation
046	Climate
049	General Animal Damage (Unknown Origin)
050	Browse (Unknown Origin)
051	Porcupine Browse
052	Squirrel Cone (Branch) Clipping
053	Beaver Damage
054	Bear Scarring
055	Ungulate Debarking
056	Woodpecker Feeding
057	Yellow-Bellied Sapsucker Feeding
058	Bird's Nest (Indicate size & location in Comments section)
062	Mechanical Damage (Unknown cause)
063	Man (Describe damage in Comments section)
064	Herbicide
065	Poor Planting
066	J-Root
067	Mouldy Planting Stock
071	Snow mould
072	Needle casts of pine
073	Needle rusts
074	Cone Disease
075	Yellow Witch's Broom (rust fungus)
076	Dwarf mistletoe
080	Stem canker
030	Burls and galls (tumors)
081	Stem Rusts - General
082	Stalactiform blister rust
083	Comandra blister rust (also occurs on branches)
084	Sweet fern blister rust
085	Western gall rust (also occurs on branches)
086	Scleraderris canker
087	Butt Rot
091	Root Rot - General
092	Armillaria root rot
093	Root Rot Tomentosus
097	Leaf spot
098	Leaf/Shoot Blight
099	Shepherd's Crook
100	Leaf rust
101	Powdery mildew
102	Dutch elm disease

CODE #	CODE DESCRIPTION
105	Diplodia gall and rough-bark
106	Hypoxylon Canker
107	Fire blight
108	Black Knot
109	Nectria and Cytospora (on stem or branches)
117	Seed and cone insects
118	Jack Pine budworm
119	Spruce budworm
120	Other larvae
121	Pine needle scale
122	Pine tube moth
123	Insect Galls on conifer
124	Spruce and pine needle miners
125	Adelgid galls
126	Shoot and bud insects
127	Aphids
128	Spittle bugs
129	Pitch Moth
130	Scale Insects
131	Terminal Weevil
132	Defoliation Insects
133	White Pine Weevil
137	Beetles (bark/wood)
138	Stem/Wood Borers
139	Carpenter Ants
140	Root Collar Weevil
127	Aphids
145	Defoliator Larvae
146	Forest Tent Caterpillar
147	Mite Galls
148	Leaf Miners
149	Leaf Rollers
150	Leaf and Bud Insect Galls
151	Scale Insects
152	Twig/Shoot/Branch Borers
153	Large Aspen Tortrix
138	Stem/Wood Borers
157	Root and Basal Stem Borers
158	Elm Bark Beetle
159	Bronze Birch Borer
160	Poplar Borer
200	Data Changed by Office

3.4.5 Height Measurements

NEW as of 2010 - The heights of trees will now be systematically sub-sampled at each PSP. A 50% sampling rate has been chosen. Measure the heights of the **first 20 trees,** whether live or dead). The tally sheets have been designed to have 20 trees per page to facilitate sub-sampling of tree heights.

Tree #'s 1 – 20	Measure all heights. Live or dead
Tree #'s 21 - 40	Don't measure heights
Tree #'s 41 - 60	Measure all heights. Live or dead
Tree #'s 61 - 80	Don't measure heights
Tree #'s 81 - 100	Measure all heights. Live or dead
Tree #'s 101 - 120	Don't measure heights…

The unmeasured heights will be estimated using dbh's and the height/dbh relationship from each plot by measurement year, stratified by tree species. If unmeasured trees are within the sampled diameter range, then the PSP-specific height-diameter regression will be used (i.e. interpellation). If the unmeasured trees are outside the sampled diameter range, extrapolation will be avoided, and the global height-diameter regression (by species) for all PSPs (based on the entire PSP data set – Appendix 6) will be used.

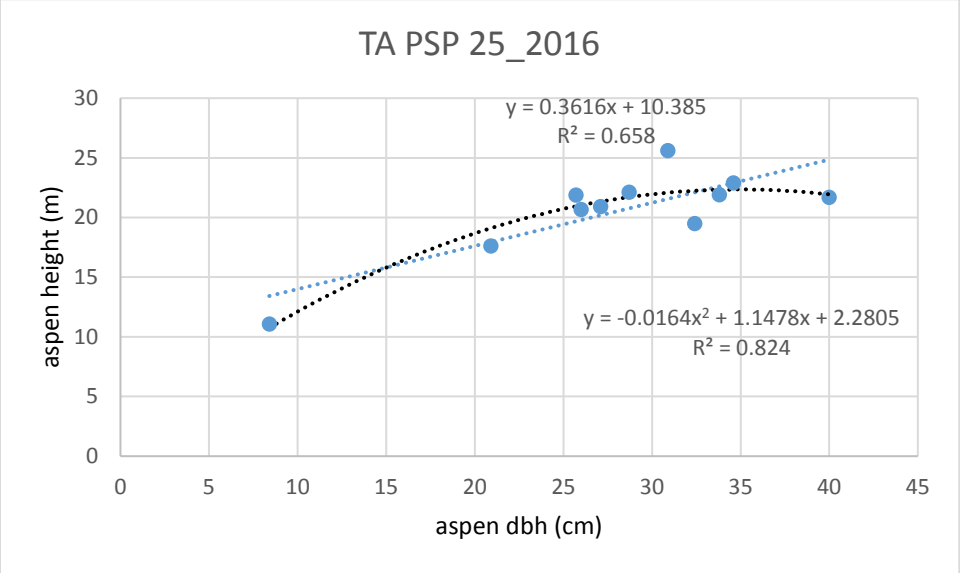
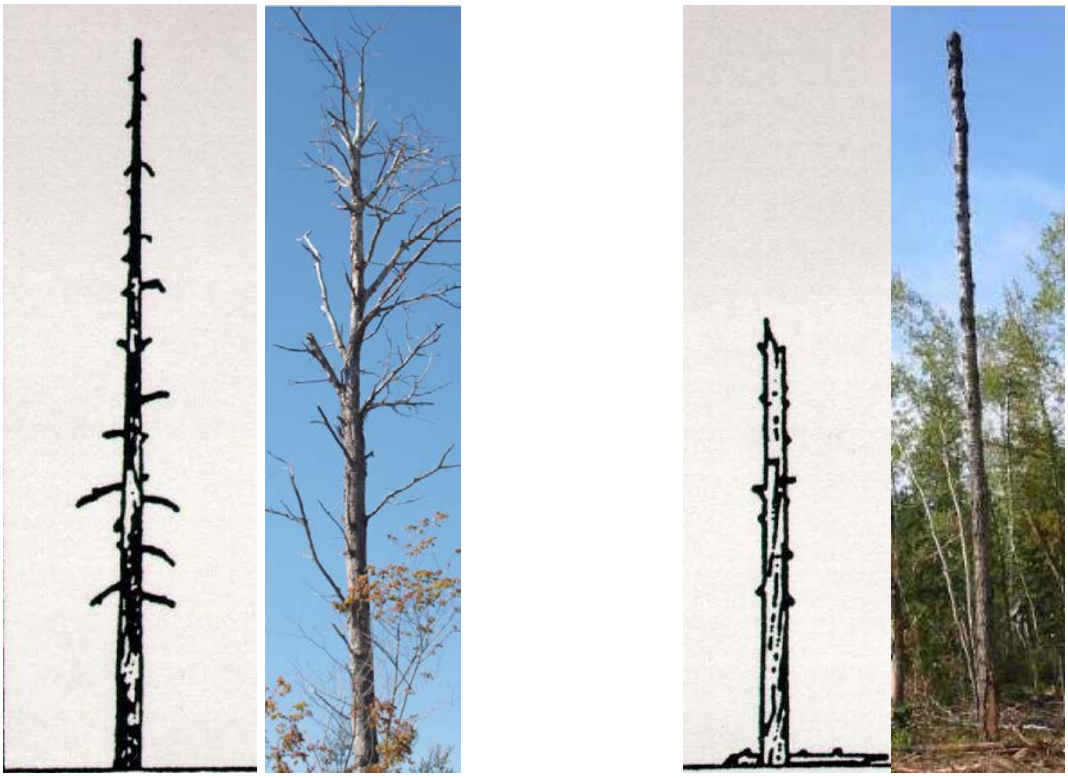


Figure 3.5 Height-diameter relationship for sub-sampled aspen heights.

NEW for 2017 measure the height of dead trees (snags), not just the live trees, subject to the 50% sub-sampling of heights described above. Heights of dead trees will assist with volume and carbon estimates of snags. Only one height is required for dead trees.



(left) Code 001 – standing dead –top intact - measure the height to the tip of the snag;
(right) Code 002 – standing dead – broken top – measure the height to the broken top.

Tree heights can be measured with one of these instruments:

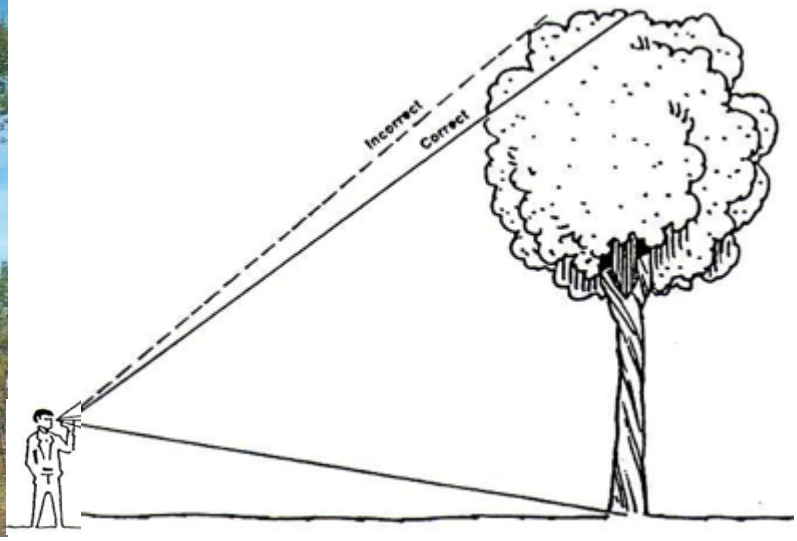
1) **Vertex**, which uses ultrasound to measure horizontal distance accurately despite dense vegetation. Note that you must calibrate the instrument for air temperature.

2) **Laser** which uses laser pulses to measure horizontal distance accurately, but cannot penetrate dense vegetation. Note that you must use a reflective target with the laser to obtain an accurate horizontal distance.

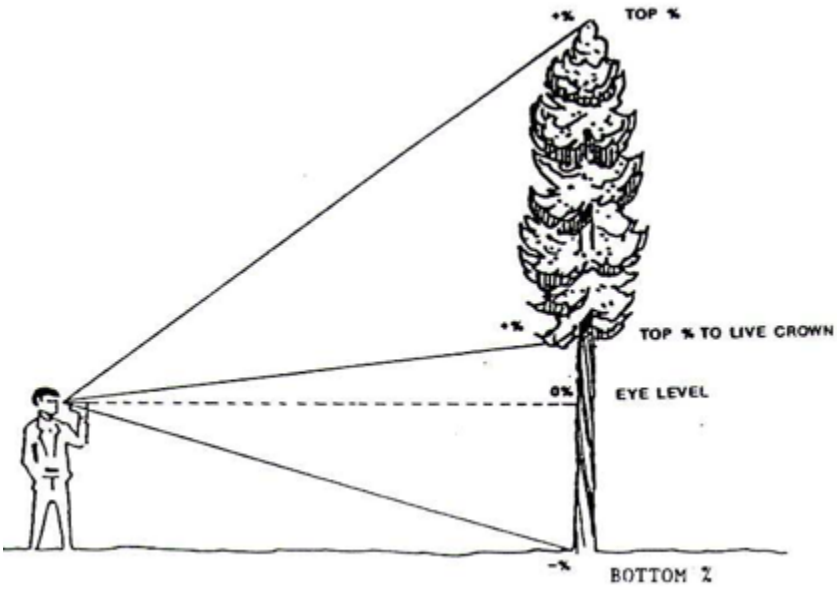
3) **% scale Suunto** clinometer (not 15/20 scale, since 0.25 m increments are too coarse for PSP height remeasurement). Note that you must write down % reading of the base, % reading of the tree top, and the horizontal distance. The tree's height would be calculated in the office, based on the three measurements.

Hardwood Heights

Hardwoods have rounded crowns, making height measurements difficult. Take two (2) height measurements for each tree in the PSP, and record both heights on the tally sheet. If the two heights differ more than 0.25 m, retake the heights.



Softwood Heights – usually have a pointed tip on the crown, facilitating accurate height measurements. Therefore, one height measurement per softwood tree is sufficient, if you have a clear sight picture of the softwood's crown.



Leaning trees

Regardless of which method of measurement is used to determine a tree's height, it is very important that a tree be inspected prior to height measurement to determine if it is leaning, even slightly, in any direction. If a tree is leaning, the height measurement must be taken from a location wherein the line of sight to the tree is perpendicular to the direction of the lean. This will allow a more accurate height measurement to be taken. When measuring tree height it is very important not to blindly trust that the laser or clinometer has given you an accurate height measurement. Take a good look at the tree and assess whether or not the height measurement makes sense. Make sure that you haven't accidentally measured the top of the tree behind yours or that the laser hasn't based its height calculation on an incorrect horizontal distance reading, etc. If you aren't sure about the height measurement, find a better location to measure the tree height from and try again.

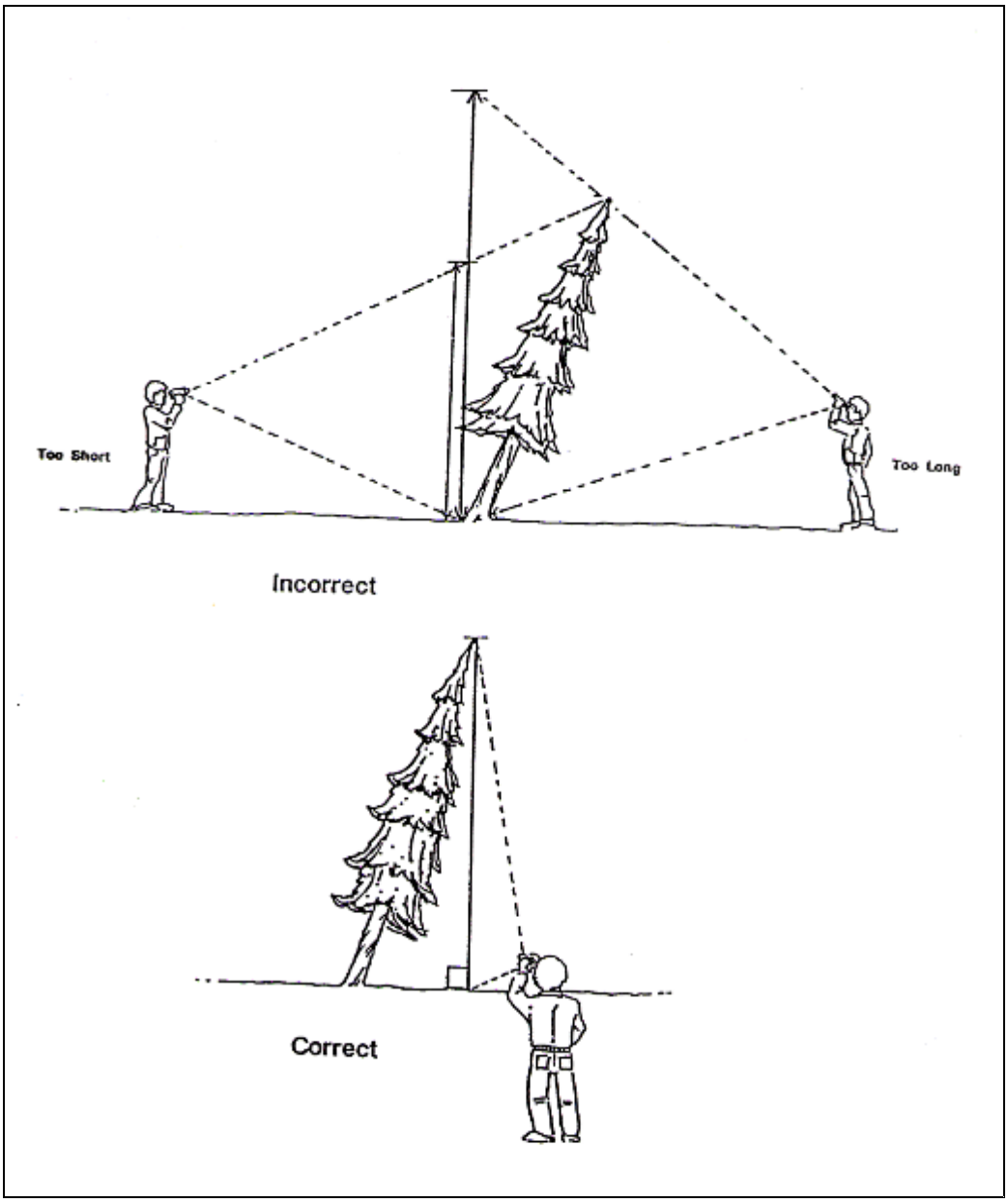


Figure 3.6 Height measurement of leaning trees (Alberta Land and Forest Service, 1997).

3.4.6 Height To Live Crown

The height from the ground to the base of the live crown (Figure 4.4) is measured on all living trees. The base of the live crown is the point that separates the continuously branched portion of the tree from the part that has sporadic or no branching. Live crowns on deciduous species start at the leaves, not at the branches. Live crowns on coniferous species start at the tip of the live branch, not at the base of the branch. The height to live crown is quite variable depending on stand maturity and density with young, open stands having low live crowns and mature, stocked stands having higher live crowns.

Height to live crown should not be measured after fall leaf-off has occurred.

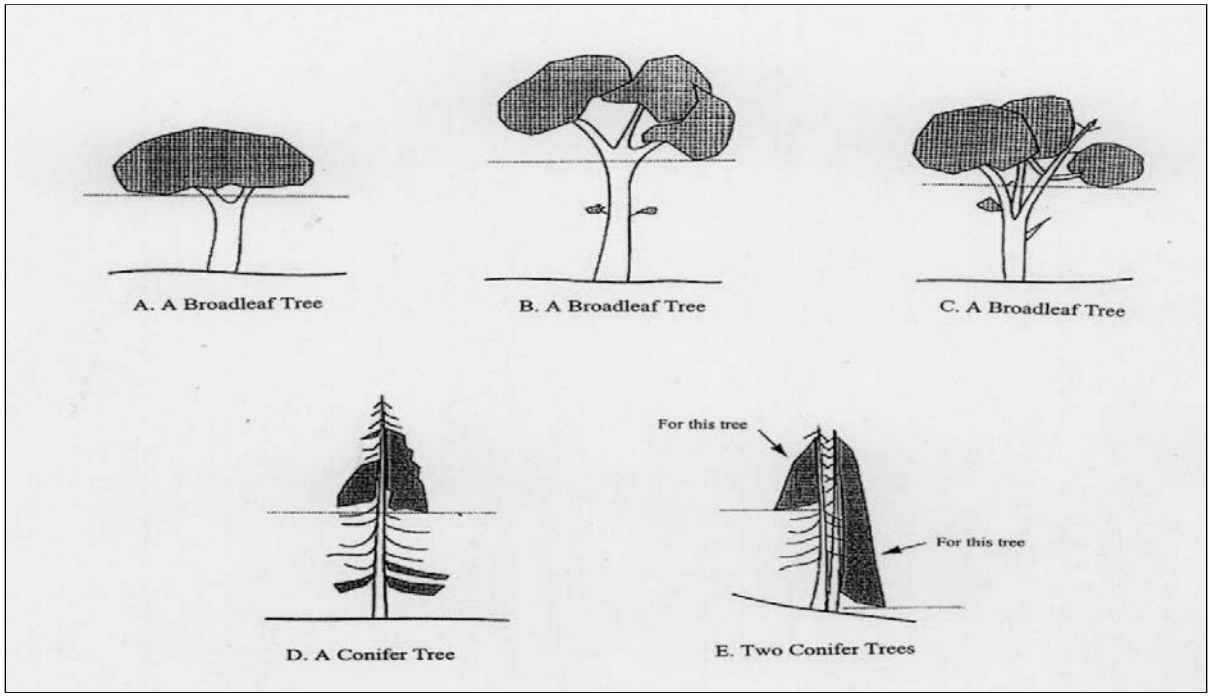


Figure 3.7 Height to Live Crown – Crown Base (Canadian Forest Service, 1994).

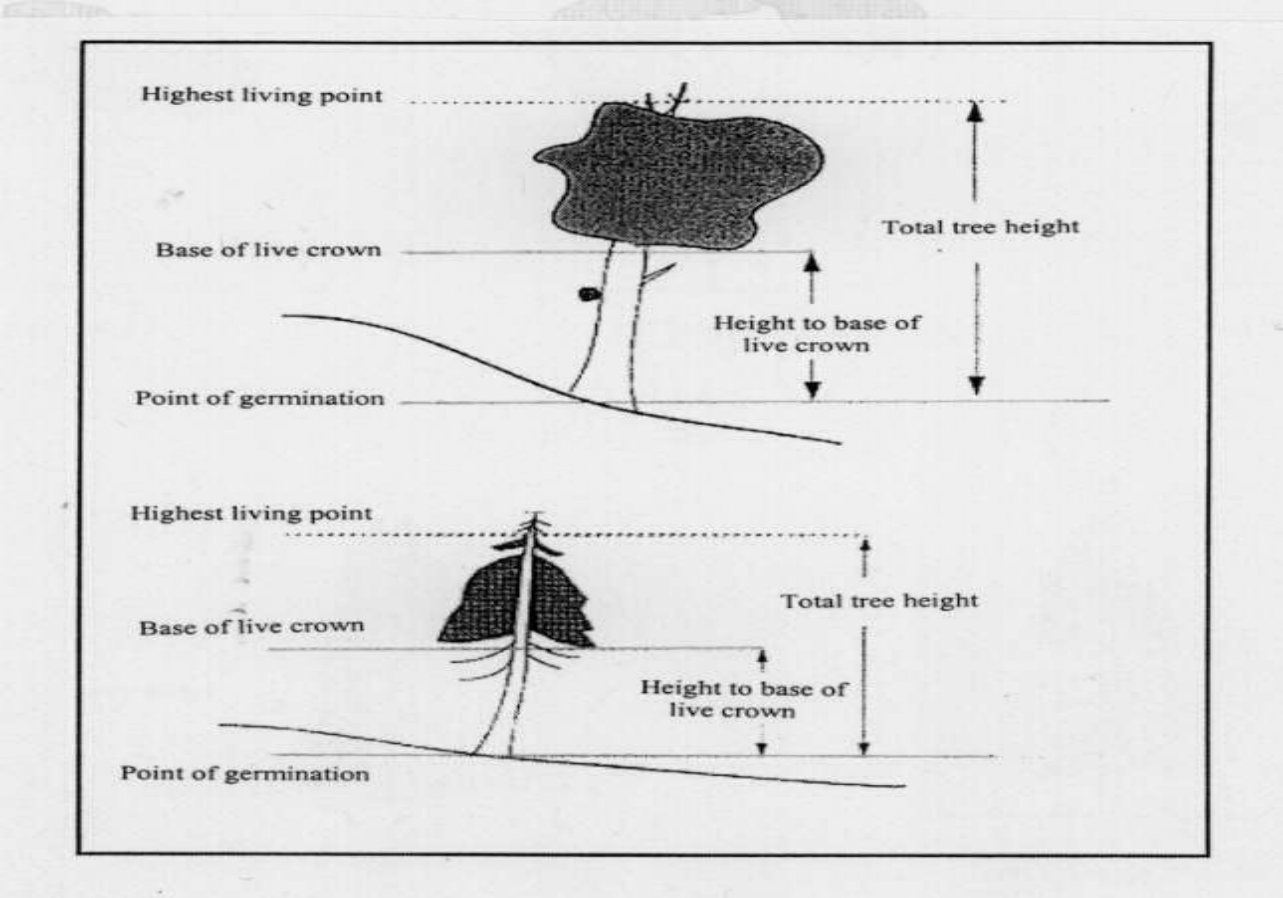


Figure 3.8 Summary of Tree Height and Height to Live Crown

3.5 Sapling Measurements

A sapling is a living stem with a DBH $\geq$ 1.1 cm and $<$ 9.1 cm. Sapling data is collected on the entire 500 m^2 plot. Saplings are counted by dbh classes (1.1 to 3.0 cm; 3.1 to 6.0 cm and 6.1 to 9.0 cm), instead of measured individually. An average height by dbh class is measured for each species.

Saplings are not tagged or numbered. Count the saplings systematically by following transect sweeps in strips, starting in the northwest corner of the plot.

3.6 Tree Cavities

Dead standing trees (snags) must have a wildlife habitat values assessment done during tree measurements. Each numbered dead tree must be examined for nesting, feeding and escape cavities that may be used by birds or small mammals.

When a cavity is discovered the following information must be recorded:

1) Tree Number — The number on the tree's tag.

2) Type of Cavity: **N** - nesting
F - feeding
E – escape

3) Location of Cavity: **S** - stump
B - bole
C - crown

4) Excavated or Natural: **E** - excavated
N - natural
B - both

5) Cavity Size: **S** - small (2.5 -7.0 cm)
M - medium (7.1 -15 cm)
L - large (> 15.1 cm)

6) Other Evidence of Wildlife: List any animals seen (*e.g.* small mammals), heard, tracks or droppings, nesting or bedding sites, dens etc.

In addition to cavity information, the decomposition class of all snags (standing dead or dead and broken trees) is to be recorded on the Wildlife Habitat Assessment data sheet, regardless of whether or not cavities are present.

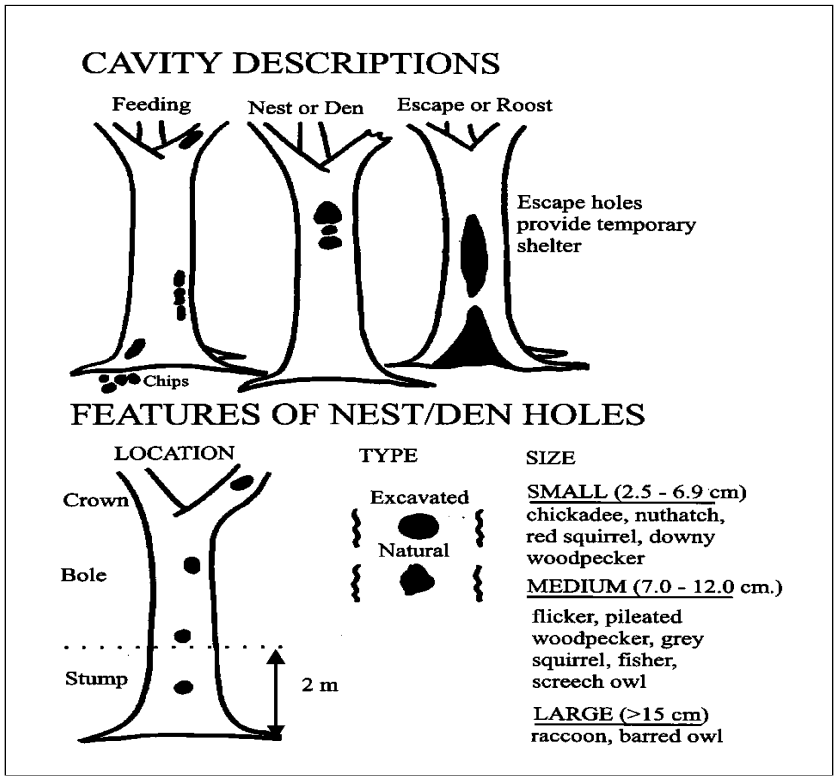


Figure 3.9 Cavity Descriptions (Hayden *et al*. 1995)

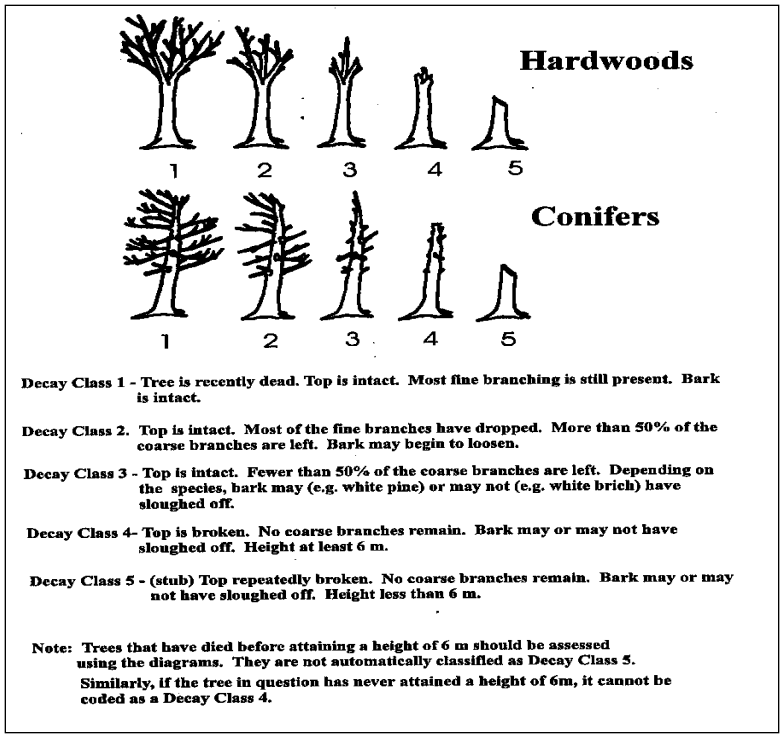


Figure 3.10 Snag Decomposition Classes

3.7 Stem Mapping Ingrowth

Only the ingrowth needs to be stem mapped, since the plot was stem mapped during the PSP establishment phase (1997 to 2000). Therefore, you must have the last tree number for each PSP, in order to assign a tree number to the ingrowth.

Stem mapping is used to identify the position of each tree with respect to other surrounding trees and can be used in distance dependent growth models and is used in plot re-measurement to locate trees. Before working on tree measurement, clearly identify the boundaries of the vegetation plot to prevent trampling. Station the laser at plot center and rotate clockwise around the plot recording the following for each ingrowth tree:

- distance (to nearest 0.01 m) from plot center to the center of the tree at breast height (1.3 m). Distances can be measured with the laser or with a tape;
- azimuth (1 - 360°) to the center of the tree at breast height (be sure to sight with the compass using only 1 eye to ensure accurate, consistent readings);

- species code; and
- condition codes.

The same person should use the laser on a PSP to stem map the entire plot to ensure consistency.

4.0 PSP ESTABLISHMENT

If new Permanent Sample Plots are to be established, the procedures to do so are in this chapter.

4.1 Re-establishing Harvested PSPs

Add info here – square PSP with 5.5 X 5.5 m regen sub plot

4.2 Establishing New PSPs

Add info here – square PSP with 5.5 X 5.5 m regen sub plot

5.0 PROCEDURAL CHANGES

This section documents all changes from the original version one PSP manual from 1998. Improvements to the PSP procedures began in the 2004 field season. Changes were timely, since the PSP network was complete, and remeasurements were beginning in 2004. Another procedural change was made for the 2010 field season, where tree heights were sub-sampled 50% instead of measuring 100% of tree heights.

5.1 Tree Plot

No change. The tree plot remains 500 m^2 in size. Changing the tree plot size is not recommended.

5.2 Sapling Sub-Plot

Originally, a 30.25 m^2 sapling plot was measured in the northwest corner of the PSP. Previous year's measurements in the Riding Mountain National Park (project MS-69) and subsequent analysis by Dr. Norm Kenkel from the University of Manitoba showed the great value of measuring sapling data over the entire plot, instead of a sub-plot.

Therefore, we are counting saplings (trees whose dbh is less than the 9.1 cm tagging limit) over the entire PSP (500 m^2). Dr. Norm Kenkel has advised us that we should count the sapling, not tag them. We are also counting saplings by three dbh classes (*i.e.* 1.0 to 3.0 cm, 3.1 to 6.0 cm, and 6.1 to 9.0 cm).

5.3 Regeneration Sub-Plot

No change. Regeneration (trees <1.0 cm dbh) are measured in a 7.56 m^2 subplot in the northwest corner of the PSP.

5.4 Shrub and Understorey Vegetation Sub-Plots

Originally, the shrub sub-plots were 4 – 1 X 1 m plots (2 m X 2 m nested hierarchically). Each 1m^2 shrub plot was measured separately. Originally, the vegetation sub-plot was a single 1 X 1 m plot in the southeast corner.

5.4.1 Plot Size

The shrub sub-plot and understorey vegetation sub-plot has been expanded in size to 100m^2. Plot size is critical with regards to a minimum sample area required to accurately describe plant communities. Larger plots will capture plant species that are missed by smaller plots. Furthermore, larger plots will have lower variability than small plots. However, there is an upper limit of 'diminishing returns' where the gain in larger plots is insignificant. Wright *et al.* 1995 quantified minimal area curves for the Duck Mountain Provincial Park near Madge Lake. Minimum area for vegetation plots is 64 m^2 (Figure 4.1).

The only concerns regarding expanding the plot size is backwards compatibility and validity of comparing shrub data from 1m^2 plots to 100 m^2. Therefore, the original shrub sub-plots and vegetation sub-plots will be measured in addition to the new 100 m^2 sub-plot.

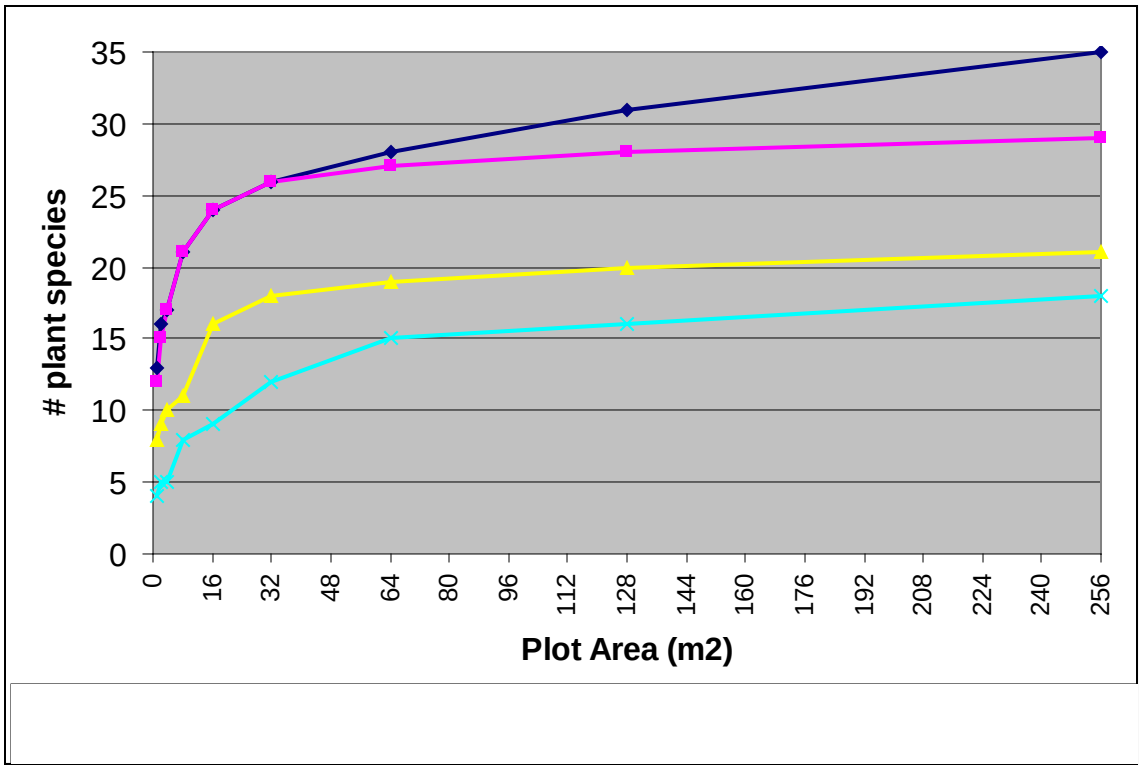


Figure 4.1 Minimal area curve by forest type in the Duck Mountain Provincial Park (Wright *et al.* 1995).

5.4.2 Plot Measurement Procedures

The original measurement procedure was to estimate the shrub or understorey vegetation species to the nearest percentage (*i.e.* beaked hazel 78%).

For the 2004 field season we will estimating percent cover of woody and herbaceous plants using a modified Braun-Blanquet cover-abundance scale (Mueller-Dombois and Ellenberg 1973):

Scale Value	Percent Cover
r	one plant, less than 1 % cover
+	several plants, less than 1 % cover
6	1 to 5%
7	5 to 25%

8 26 to 50%

9 51 to 75%

10 76 to 100%

The use of the Braun-Blanquet scale has been proven to reduce labour and inter-observer error when compared to estimating plant cover to 1%. Note that the Riding Mountain PSPs had used Braun-Blanquet scale back in 1947.

Previously, plant percent covers were not stratified by height. It is valuable to separate plants heights or 'lifeform layers ' into the following categories:

1 – tree layer

2 – sub-canopy layer

3 – understory layer

4 – tall shrub layer

5– short shrub layer

6 – herbaceous layer

7 – moss and lichen layer

For example, knowing that there is 10% black spruce in a vegetation sub-plot is good to know, but are the black spruce trees 10 m understory, 3 m understory or mere seedlings? Adding the percent species by lifeform layer gives the data better resolution and useability, especially for successional trends.

5.5 Down Woody Debris Transects

No change. The two diagonal transects remain at 31.62 m in length each.

5.6 Crown Class

Crown class (*i.e.* dominant, co-dominant, intermediate or suppressed) was previously estimated for each tree, based on the tree's height compared to other trees in the plot. However, since very accurate heights for each tree are taken with lasers, it makes more sense to use the tree heights to determine crown class, rather than visually estimate crown class and height. Therefore, crown closure will no longer be estimated in the field.

5.7 Tree Heights

Sampling 100% of all tree heights was taking more time than any other aspect of PSP remeasurement. Subsampling tree heights is a common and accepted methodology, combined with using a height-diameter curve to accurately estimate the remaining tree heights.

However, there are many different subsampling methodologies, including:

- random sampling;
- systematic sampling;
- stratified sampling across the diameter distribution; and
- sampling the first trees in each plot (*e.g.* measure first 20 trees only).

We chose the systematic sampling for simplicity and ease of use in the field. Furthermore, it was found that when applying systematic sampling to previously measured PSPs, that systematic sampling provided a representative sample across the diameter range, which is crucial when using a height-diameter curve.

In addition, there are many different sampling percentages, ranging from 10% to 75% in the literature. We wanted a simple, robust method that was operationally efficient, yet still accurate. We analyzed previously measured PSP where 100% of the heights were measured. For low, medium and high density PSPs, we analyzed 50%, 33%, and 25% sampling percentages. The 50% subsampling was found to be the most accurate at predicting tree heights. Carlson *et al*. 2009 also found that 50% systematic sampling

combined with a height-dbh regression will reduce height measurement effort without compromising accuracy.

Snag Heights – added in March 2017. Previous the heights of dead trees were not taken.

Hardwood heights – two heights per tree; previously stated if heights were more than 0.25 m apart (e.g. ht1=20.0 m and ht2=20.5 m, then you would need to take more heights until the heights were no more than 0.25 m apart. This height variation threshold has not really been adhered to in the past, and a more reasonable threshold (0.5 m? 1.0 m? 1.5 m? 2.0 m?) is being considered (changed in March 2017).

Softwood heights one height per tree (changed in March 2017).

6.0 DATA QUALITY CONTROL

It is extremely important that the data collected in permanent sample plots be accurate, consistent, and legible. To help ensure this, there are several rules to follow when collecting data during the establishment or re-measurement of a permanent sample plot:

1. The establishment or re-measurement of a PSP **must follow** the procedures described in this manual. If technicians are not clear on how to perform certain procedures, ask field supervisor or project leader for assistance.

2. Prior to leaving the PSP site, technicians must check over data forms to ensure that all data has been collected. **Data that cannot be collected must be noted as N/A** in the space provided - **do not** leave it blank, **do not** strike a line through the space provided and **do not** place a zero in the allotted space.

3. All information collected on the data forms must be **legible**. Any abbreviations used must be defined in the comment sections of the PSP data forms.

4. Additional information can be included in the comment sections such as unique site characteristics, other wildlife observations (endangered or rare species sightings and/or any problems that were encountered during PSP establishment or re-measurement

5. The “Field Check” section of a data quality control form is to be filled out and signed by the technician while in the field, after the completion of each PSP.

6. Information that needs to be filled out back at the office must be completed in addition to completing the “Office Check” section of the data quality control form, prior to the establishment or re-measurement of a new PSP cluster.

7. Once a PSP cluster has been completed and the “Field Check” and “Office Check” portions of the Data Quality Control Forms have been filled out for each of the 3 plots in the cluster, put the completed data in Trevor’s mailbox.

A sample of the LP PSP Data Quality Control Form is provided.

7.0 REFERENCES

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APPENDICES

Appendix 1: Rare Threatened and Endangered Plant Species List

Manitoba Conservation
Wildlife and Ecosystem
Protection Branch

Conservation
Data Centre

http://web2.gov.mb.ca/conservation/cdc/species/

As of April 10th, 2007 there are six rare, threatened, or endangered (RTE) vascular plant species in Manitoba (*i.e.* MBESA status = endangered or threatened). Currently there are no non-vascular plants of conservation concern in Manitoba.

Species	Global Rank	[1]SARA Status	Provincial Rank	[2]MBESA Status	[3]COSEWIC Status
SMALL WHITE LADY'S-SLIPPER *Cypripedium candidum*	G4	Endangered	S1	ENDA	ENDA
WESTERN PRAIRIE FRINGED ORCHID *Platanthera praeclara*	G2	Endangered	S1	ENDA	ENDA
GREAT PLAINS LADIES'-TRESSES *Spiranthes magnicamporum*	G4	not listed	S1?	ENDA	Not Listed
WESTERN SPIDERWORT Tradescantia occidentalis	G5	Threatened	S1	THRE	THRE
WESTERN SILVERY ASTER alternate common names: Silky Aster *Aster sericeus*	G5	not listed	S2	THRE	VULN
*WESTERN SILVERY ASTER Aster sericeus var sericeus	G5T5	not listed	S2	THRE	VULN

*no pictures available
[1]SARA: Species at Risk Act (Federal)
[2]MBESA: Manitoba Endangered Species Act (Provincial)
[3]COSEWIC: Committee on the Status of Endangered Wildlife in Canada

Pictures and descriptions for three of the six plants are on the following pages.

Plant species that cannot be identified in the field but are believed to be rare, threatened or endangered are NOT to be sampled from the site. If you suspect that an RTE species has been discovered fill out the Manitoba Conservation Data Centre RTE species form and submit it to the LP District Biologist or District Forester and they will confirm and send documentation to Manitoba Conservation Winnipeg Branch Office.

MBCDC Species of Conservation Concern

The term "species of conservation concern" includes species that are rare, disjunct, or at risk throughout their range or in Manitoba and in need of further research. The term also encompasses species that are listed under the Manitoba Endangered Species Act (MBESA), or that have a special designation by the Committee On the Status of Endangered Wildlife In Canada (COSEWIC).

Conservation Data Centre Ranks (Global and Provincial)

Species are evaluated and ranked by the Conservation Data Centre on the basis of their range-wide (global - G) status, and their province-wide (subnational - S) status according to a standardized procedure used by all Conservation Data Centres and Natural Heritage Programs. These ranks are used to determine protection and data collection priorities, and are revised as new information becomes available.

For each level of distribution—global and provincial—species are assigned a numeric rank ranging from 1 (very rare) to 5 (demonstrably secure). This reflects the species' relative endangerment and is based primarily on the number of occurrences of that species globally or within the province. However, other information, such as date of collection, degree of habitat threat, geographic distribution patterns and population size and trends, is considered when assigning a rank. The number of occurrences listed below are suggestions, not absolute criteria.

For example, the Green Frog (*Rana clamitans*) is ranked G5, S2. That is, globally the species is abundant and secure, while in Manitoba it is rare and may be vulnerable to extirpation.

Rank	Definition
1	Very rare throughout its range or in the province (5 or fewer occurrences, or very few remaining individuals). May be especially vulnerable to extirpation.
2	Rare throughout its range or in the province (6 to 20 occurrences). May be vulnerable to extirpation.
3	Uncommon throughout its range or in the province (21 to 100 occurrences).
4	Widespread, abundant, and apparently secure throughout its range or in the province, with many occurrences, but the element is of long-term concern (> 100 occurrences).
5	Demonstrably widespread, abundant, and secure throughout its range or in the province, and essentially irradicable under present conditions.
U	Possibly in peril, but status uncertain; more information needed.
H	Historically known; may be rediscovered.
X	Believed to be extinct; historical records only, continue search.

Other Heritage Codes

Code	Definition
G#G# S#S#	Numeric range rank: A range between two of the numeric ranks. Denotes range of uncertainty about the exact rarity of the species.

Subrank

Code	Definition
T	Rank for subspecific taxon (subspecies, variety, or population); appended to the global rank for the full species, e.g. G4T3.

Qualifiers

Code	Definition
B	Breeding status of a migratory species. Example: S1B,SZN - breeding occurrences for the species are ranked S1 (critically imperilled) in the province, nonbreeding occurrences are not ranked in the province.
N	Non-breeding status of a migratory species. Example: S1B,SZN - breeding occurrences for the species are ranked S1 (critically imperilled) in the province, nonbreeding occurrences are not ranked in the province.
Q	Taxonomic questions or problems involved, more information needed; appended to the global rank.
T	Rank for subspecific taxon (subspecies, variety, or population); appended to the global rank for the full species.
#	A modifier to SX or SH; the species has been reintroduced but the population is not yet established.
?	Inexact or uncertain; for numeric ranks, denotes inexactness.

SMALL WHITE LADY'S-SLIPPER
Cypripedium candidum (ORCHIDACEAE)
GENERAL DESCRIPTION

CYPRIPEDIUM CANDIDUM, is a herbaceous perennial, with pubescent stems to 40 cm tall produced from rhizomes (underground stems). Leaves 3-5, usually dark green, oval to lance-shaped, 8-16 x 1.5-4 cm, sheathing the stem. Flowers solitary (rarely two), small, subtended by green leaf-like floral bracts. Dorsal sepals oval to elliptical, greenish yellow, suffused with brown and with brown veins. Lateral sepals fused to form a single sepal located below the lip of the flower and similar in colour to the dorsal petal. Petals narrow, lance-shaped, undulate or slightly twisted, similar in colour to the sepals. The lip (or slipper) white, egg-shaped, often with faint purple veins or spots, with a rounded opening. Staminode ovate, yellow, spotted with purple. Fruit a capsule, to 3 cm long, containing very small seeds.

LIFE HISTORY

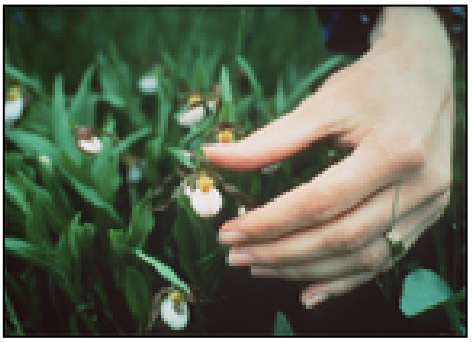
Leaves appear in late April-early May. Flowering commences from mid May to mid June. Capsules are produced by mid to late July.

HABITAT

Mesic blacksoil prairie, wet blacksoil prairie, glacial till hill prairie, sedge meadow, calcareous fen, glade. Calcareous soils.

C. CANDIDUM is found on mesic to wet calcareous soils in prairies or prairie openings in the wooded grassland. Sites are often south-facing. It requires high light intensities and is negatively impacted by fire suppression which permits the invasion of woody species.


© Gary Allen



WESTERN PRAIRIE FRINGED ORCHID

Platanthera praeclara (ORCHIDACEAE)

GENERAL DESCRIPTION

"An herbaceous perennial orchid arising from a fleshy tuber. Leaves are thickened and smooth, lance-shaped to slightly rounded, sheathing the stem and up to 5 cm wide and 26 cm long but progressively smaller toward the inflorescence. Inflorescences are large and showy with up to 20 or more flowers arranged on a spike reaching up to 75 cm in height. Flowers are creamy white and hooded; with the lower of three petals larger, three lobed and fringed, 0.75 to 1.5 inches in length and with a nectar spur 3.8 to 5 cm in length (and noticeably longer than the ovary). Fruit capsules are elongated-oval and about 2.5 cm in length; they remain green until the end of the growing season and persist on the stem in dried condition, developing vertical cracks from which seeds are dispersed." (Bowles, M.L. and A. Duxbury. 1986. Report on the status of Platanthera praeclara... U.S.F.W.S. 60181-1447-84)

LIFE HISTORY

Stems first appear in late May, the peak flowering period varies from late June to late July (K. Johnson, pers. comm.).

HABITAT

Western portions of the North American tallgrass prairie. Most commonly on moist, calcareous or subsaline prairies and sedge meadows (many flooded for a period of 1-2 weeks during the year). Platanthera praeclara is found predominantly in moist, calcareous or sub-saline prairies and sedge meadows. In Manitoba it is located in areas of relatively undisturbed parkland with numerous prairie patches. The prairie components are of wet to mesic tall grass prairie, fire- and grazing-adapted communities which are dominated by graminoid species. The forested areas are dominated by Quercus and Populus species. Soils are dark grey chernozemic or luvisolic, with imperfect drainage and are strongly to extremely calcareous. This species requires full sun and will therefore decline with the invasion of woody species. It will colonize disturbed sites, but persists only if the site reverts to prairie. Roughly half of the Manitoba occurrences are in roadside ditches.

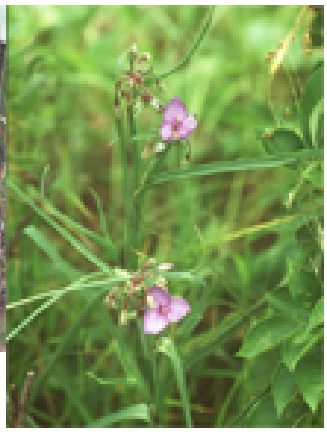
WESTERN SPIDERWORT
Tradescantia occidentalis (COMMELINACEAE)
GENERAL DESCRIPTION

Perennial, subsucculent herbaceous plant. Roots both fleshy and succulent. Stems to 60 cm in height. Leaves, green with a whitish bloom, alternate, linear-lanceolate, entire, 6-50 cm in length and 0.2-2.0 cm broad, with sheathing bases. Inflorescence umbellate, subtended by elongate bracts similar to the foliage leaves. Bracts to 60 cm long. Flower stalks, 1-2 cm long, and glandular hairy. Sepals 3, 6-12 mm long, glandular hairy, with purplish margins. Petals 3, blue to rose, broadly ovate, and 7-15 mm long. One flower in each cluster opens each day, and lasts for only a few hours. Stamens six. Fruit a capsule with three locules (sections), each locule producing 3-6 oblong seeds, 2-4 mm long, yellow to dark brown in colour.

> Perennial, subsucculent herb, with alternate linear-lanceolate leaves with basal sheaths. Inflorescence an umbellate cluster, subtended by two elongate bracts. Flowers perfect, regular, with three glandular-hairy sepals, and three blue to rose coloured petals. Stamens 6. Fruit a capsule with three locules, each locule containing 1 or more seeds. Associated with sandhill habitats.

LIFE HISTORY
Shoots appear in early May. Flower buds appear in early June. Flowers open from mid-June to mid-July but may continue to mid-August. Capsules release seed about three weeks after flowering. Seed release occurs from late July until late September (Goulet and Kenkel 1997).

HABITAT
Tradescantia occidentalis is restricted to dry dune or sand hill communities within the mixed grass prairie. Preferring partially stabilized sand, it will also colonize active dune blow outs, and is found almost exclusively on the upper slopes and crests of dunes. In Manitoba, it is found at two sites, the Lauder Sand Hills and the Routledge Sand Hills. These locations have sand or sand/silt substrates, are level to hummocky, experience imperfect drainage, and receive 400-800mm of precipitation annually. Areas with low litter accumulation and sparse vegetation appear to be best suited for Spiderwort.

WESTERN SILVERY ASTER
Aster sericeus (ASTERACEA)
GENERAL DESCRIPTION

Native erect perennial forb 8"-24" in height.

Easy to identify because of its soft silvery leaves and habitat. It is really and unmistakable plant. *A. sericeus* has quite large flowers for the overall size of the plant.

An uncommon species of sandy prairies and associated forest edge. Growth form is low and branching, reaching only to 40 cm in height. The leaves are covered in dense silvery-white hairs. The delicate looking flowers are mauve in colour.

The Western Silvery Aster occurs in central North America from Manitoba to Texas. In Canada, it is at the northern limit of its distribution and a total of about 6,500 stems occur at two major sites and a number of smaller ones in Ontario and southeastern Manitoba.

LIFE HISTORY

HABITAT

Prairie, Sand Barrens, and Savanna (partially forested sites)

FLOWERING DATES: Aug. – Oct.

GREAT PLAINS LADIES'-TRESSES
Spiranthes magnicamporum

GENERAL DESCRIPTION

The specific epithet magnicamporum is the Latin meaning "of the large plain," referring to the prairie habitat that this species is found in.

Plant pubescent above the leaves, 12-38 cm tall (including inflorescence), arising from a cluster of large, fleshy roots, appearing tuberous. Leaves 2-3, basal, oblanceolate to linear-lanceolate, 10-14 cm long and 0.8-1 cm wide, fugacious (withering at flowering), grading into reduced sheathing bracts below the inflorescence, the bracts typically overlapping. Inflorescence a downy, spicate raceme of 20-40 creamy-white to yellowish, fragrant flowers, 12-38 cm tall, dense and multi-ranked, each flower subtended by an elongate, ovate-lanceolate bract. Sepals linear-lanceolate, 6-11 mm long and about 2 mm wide, the lateral sepals with margins inrolled, and typically spreading slightly and ascending with the tips often recurved and nearly meeting above the flower, dorsal sepal connivent with petals to form a hood over the column, sepals creamy-white to yellowish-colored. Petals linear-lanceolate to linear, 7-10 mm long and 1-2 mm wide, closely appressed to the dorsal sepal, tips of dorsal sepal and petals reflexed slightly, colored as sepals. Labellum ovate to obovate and strongly arcuate-recurved, 6.5-11 mm long and 4-6 mm wide, creamy-white to yellowish-colored with the central portion typically thickened and yellowish, the central portion never constricted, the base of the labellum with two small, incurved, pubescent calli.

LIFE HISTORY

HABITAT

Typically found on dry bluff or hill prairies over limestone or dolomite.

FLOWERING DATES: September 5-October 7


Manitoba Conservation Data Centre
Box 24, 200 Saulteaux Crescent
Manitoba, Canada R3J 3W3
(204) 945-7743 fax (204) 945-3077

INSTRUCTIONS - PLEASE READ CAREFULLY:

1. Important: this form is to be COMPLETED BY THE PERSON WHO MADE THE OBSERVATION and is for reporting FIRST-HAND ON-SITE FIELD OBSERVATIONS; do NOT use this form to report second or third hand data from a letter, report, or conversation. Send us a copy of the letter, report, memo, etc. and we will process it in another manner.
2. Complete one form per species per site. Use a pen or dark pencil.
3. Very Important: attach a copy of the NTS topographic map indicating the location/boundary of the species. (see p.2).

SPECIES (scientific) NAME:
_____
COMMON NAME:
_____
OBSERVATION DATA:
LAST observed: month: _____ day: _____ yr.:_____
FIRST observed: month: _____ day: _____ yr.:_____
Name of observer(s):
_____
Telephone: ( ) _____
Fax: ( ) _____
Address:
_____
_____
_____
Prov: _____
Others knowledgeable about this occurrence (name, address, phone):
_____
_____
_____
_____
_____
_____
LOCATION INFORMATION:
ELEVATION (if known): _____ft./m (circle one)
SURVEY SITE NAME (local or place name for site) :
_____

TOPOGRAPHIC MAP NAME:

_____

TOPOGRAPHIC MAP NUMBER:

_____

MUNICIPALITY/LGD(S):

_____

TOWNSHIP(S):

_____

DIRECTIONS TO THE OCCURRENCE: Describe in detail the PRECISE LOCATION of the species occurrence. Refer to nearby topographic landmarks and street names. Include distances and mileage whenever possible. Be clear and concise.

_____
_____
_____
_____
_____
_____
_____
_____

BIOLOGY: Total number of animals (adults, juveniles, nests, etc.) or plants (flowering, fruits, stems, etc.) observed:

_____
_____
_____
_____
_____
_____
_____
_____

Photograph taken? Y N (circle one)
Specimen taken? Y N (circle one)
Collection #/ repository : _____
Identification problems? Y N (circle one)
Explain :

_____
____

Quality of this occurrence : Excellent Good Fair Poor (circle one)
Explain:

_____
_____

SURVEY SITE INFORMATION:
Habitat/site description: (plant communities / dominants / associated species / other rare species / substrates / soils / aspect / slope):

_____
_____

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
Overall quality of the site: Excellent Good Fair Poor (circle one)
Explain:
_____
_____
_____
_____
MANAGEMENT and PROTECTION:
Landowner(s) or manager(s) if known. Include name / address /phone:
_____
_____
_____
_____
Current Land Use:
_____
_____
_____
_____
Visible disturbance and possible threats :
_____
_____
_____
_____
Conservation / management needs:
_____
_____
_____
_____
Data security needed? Y N (circle one)
Explain :
_____
_____
_____
_____
***TOPOGRAPHIC MAP:** (VERY IMPORTANT) - ATTACH (staple) a PHOTOCOPY of the appropriate portion of the TOPOGRAPHIC MAP for area and indicate the precise location of each species occurrence.

See the directions below :

- If the size of the occurrence is very small, simply draw a DOT on the map indicating the location of the occurrence.
- If the occurrence is large enough, draw a boundary (using a solid line) around the known extent of the occurrence.

HABITAT MAP: On an attached piece of paper please provide a detailed SKETCH of the habitat showing fine details not shown on the topographic map. Indicate the ROUTE taken, STREETS, LANDMARKS, DISTURBANCE, SCALE, and NORTH.

IMPORTANT - PLEASE FILL OUT THE FOLLOWING:

FORM FILLED OUT BY:

Date: _____ Name: _____

Affiliation: _____

Address: _____

Prov.: _____

Postal Code: _____

SUBMITTED BY: (if different from above) : _____

Appendix 2: PSP Equipment and Supplies

EQUIPMENT	SUPPLIES
50 m Tape (1)	Aluminum Tree Tags
Bear Spray (3)	Anti-fog Spray
Calipers (1)	Batteries - laser & GPS unit
Camera - disposable (1)	Corner Posts (36 x 3’ rebar per cluster)
Clinometer (1)	Data Quality Control Sheet
Clipboard (2)	Data Sheets
Codes Sheet (2 sets)	aged tree sheets
Compass (3)	cover sheets
Cruise Vest (3)	downed woody debris sheets
Dbh & Height Class Stick (2)	herb/shrub sheets
Dbh Tape (2)	regen/sapling sheets
Douglas Protractor (1)	soil sheets
Ecological Monitoring PSP Field Manual (3)	tree sheets
Additions/Alterations to PSP Field Manual (1)	wildlife sheets
Equipment Bag (2)	waterproof data sheets
Explanation Booklet for Tree Condition Codes (1)	Duct Tape
FEC Book (3)	Flagging Tape (pink candystripe)
Field Guide - plants (3)	Flagging Tape (biodegradeable)
Field Guide - soils (1)	Grease Pencils
Field Notebook (1)	HCl Acid
File Carrier (1)	Hip Chain String
First Aid Kit - personal (3)	Marker (thick black permanent)
Folding Pruning Saw (1)	Marker (thin black permanent)
Forest Insects and Diseases Field Sheets (3 sets)	Masking Tape
Forest Insects and Diseases Book (1)	Paint Sticks (pink)
GPS Unit (1)	Paper Plates (office)
Hammer (1)	Pencils
Hand Lens (1)	Spray Paint (orange)
Hard Hat with Face Protector and Liner (3)	Straws for Tree Age Cores
HCl Dispenser (1)	Unknown Plant Sample Tags
High Visibility Vests (3)	Wire for Tree Tagging
Hip Chain (1)	Ziploc Bags (large)
Increment Borer (1)	Ziploc Bags (small)
Lighter (1)	
Jack Knife (1)	
Laser with Tripod (1)	
Munsell Colour Chart (1)	

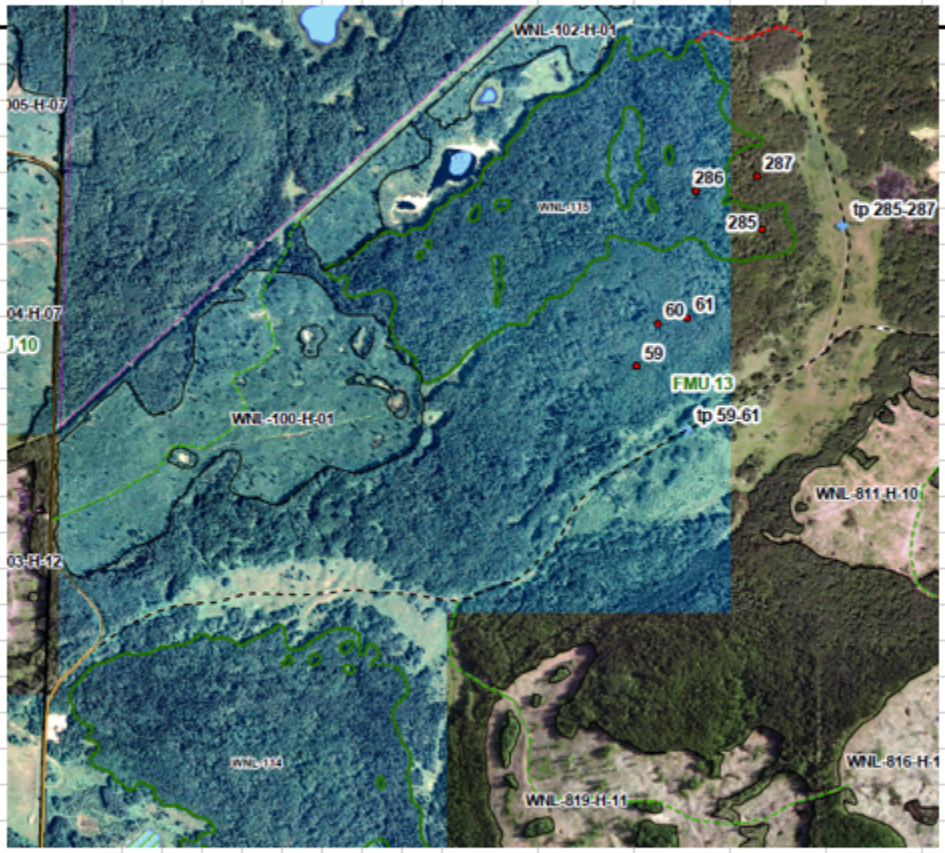
EQUIPMENT	SUPPLIES
Pencil Sharpener (1)	
Photo Case (1)	
Regen Plot Cord and Holder (1)	
Safety Glasses (3)	
Scale Ruler (3)	
Scissors (1)	
Soil Cores (4)	
Soil Core Mallet (1)	
Soil Sieve for Coarse Fragments (1)	
Spade - large size (1) - small size (1)	
Tape Measure (1)	
Tarp (1)	
Tent Pegs (8)	
Trowel (1)	
Tupperware Container (1)	
Veg. Measuring Sticks (2)	
Veg. Plot Ropes (6)	
Wire Cutters (2)	

Appendix 3: PSP Data Sheets

1 - PSP REMEASUREMENT HEADER

FMU	10, 11, 12, 13, 14	crew 1		PSP#	285
Operating Area	W N L	crew 2		page	1 of 1
UTM_Zone	14	crew 3		Measurement #	2
UTM_Easting	,	GPS taken		Year	2017
UTM_Northing	, ,			Month	
PSP Access	walk (km)_____ quad (km)_____			Day	

revised: April 12th, 2007



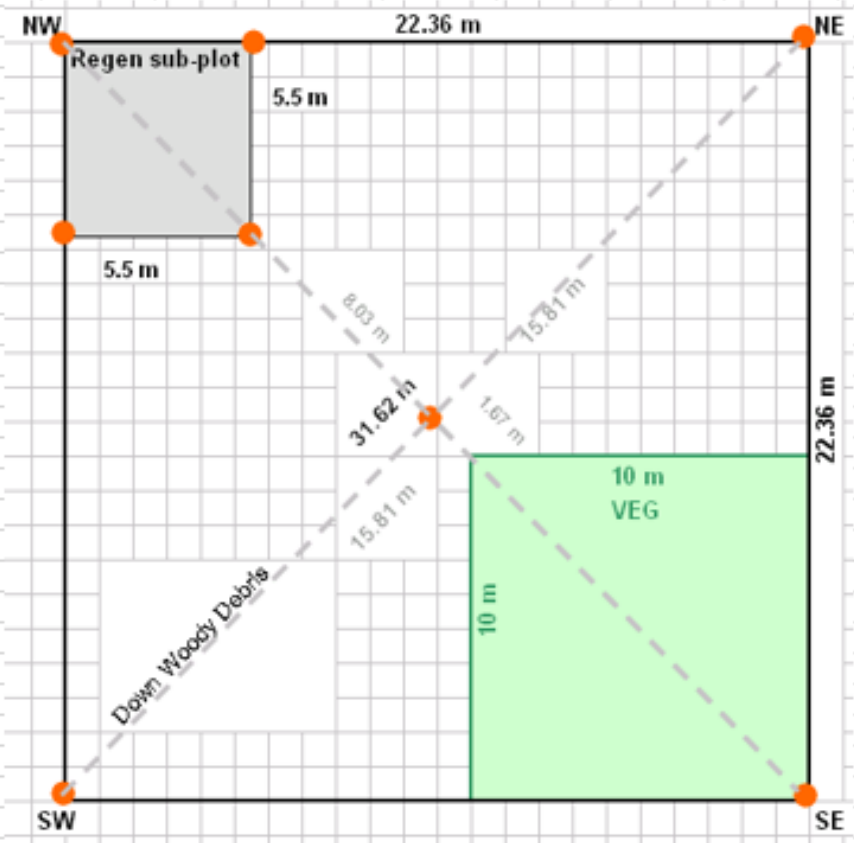
Location Instructions:

PSP Number	UTM_Easting	UTM_Northing
285	**345,478**	**5,711,806**
286	345,270	5,711,928
287	345,463	5,711,975

2 - PSP MAINTENANCE

revised Sept. 1st, 2011

PSP#	285
Year	2017



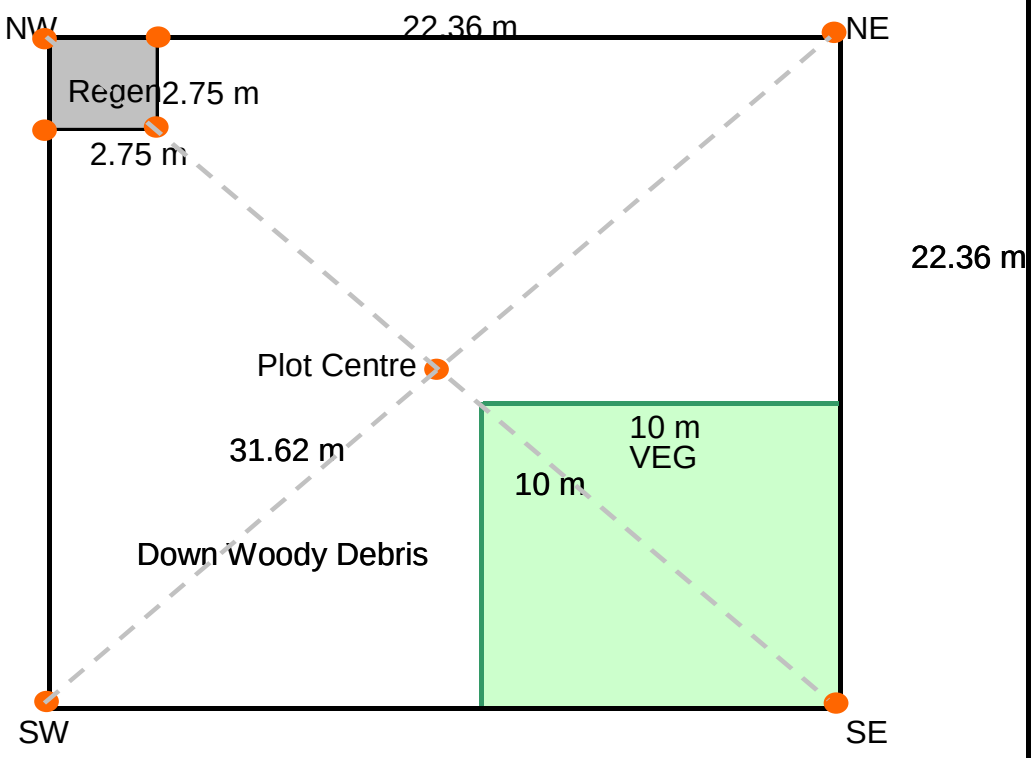
	improvements to location description?
	Tie point remarked if necessary?
	GPS tiepoint?
	GPS plot centre?
	Tree plot corner post present?
	Boundary trees painted orange?
	Regen sub-plot posts present?
	Tree tags all present?
	4 photos taken (plot centre towards S, W, N & E)?

2 - PSP MAINTENANCE

revised April 12th, 2007

PSP# _____

Year 2007



	improvements to location description?
	Tie point remarked if necessary?
	GPS tiepoint?
	GPS plot centre?
	Tree plot corner post present?
	Boundary trees painted orange?
	Regen sub-plot posts present?
	Tree tags all present?
	4 photos taken (plot centre towards S, W, N & E)?

3 - PSP VEGETATION SUB-PLOT

plot size	100 m2	Year	2017	crew 1		PSP#	285
		Month		crew 2		page	of
		Day		crew 3		Measurement #	2

(all vegetation: tree, understorey, shrub, herb, moss & lichen - % cover classes) *revised: April 12th, 2007*

Species (7 letters short-form)	Layer (1-7)	Braun-Blanquet cover	Species (7 letters short-form)	Layer (1-7)	Braun-Blanquet cover

	Percent Cover
r	one plant, < 1% cover
+	several plants, < 1% cover
1	1 to 5%
2	5 to 25%
3	26 to 50%
4	51 to 75%
5	76 to 100%

Lage	Description - Height Class
1	Dominant trees – emergent or supercanopy trees
2	Codominant trees – trees in the main canopy layer
3	Understory layer (trees and shrubs), >3 to 10 m in height
4	Tall shrubs – >0.5 to 3.0 m in height
5	Low shrubs – up to 0.5 m in height
6	non-woody spp: herbs, ferns, fern allies, grasses and sedges
7	All mosses, liverworts, and lichens

4 - PSP DOWNED WOODY DEBRIS TRANSECT

length (m)	31.62 m	crew1		PSP#	285
Year	2017	crew2		page	of
Month		crew3		Measurement #	2
Day		*(down woody material) > 7.5 cm)*		*revised Nov. 6th, 2012*	

Line# 1 S to N OR SE to NW

Distance First (0.01 m)	Distance Last (0.01 m)	Dead Tree Spp (TA, BA...)	Diameter (cm)	Measurement Type (Circ or Linear)	Decomposition Class (1-5)	Stump or Log (S / L)

Line # 2 W to E OR SW TO NE

Distance First (0.01 m)	Distance Last (0.01 m)	Dead Tree Spp (TA, BA...)	Diameter (cm)	Measurement Type (Circ or Linear)	Decomposition Class (1-5)	Stump or Log (S / L)

Downed Woody Debris: Any stump <1.3m in height, or a tree bole or large branch that is no longer free standing or leaning and is supported only by the ground, a rock, its own branches or another log.

Method: Run two transects on a SE/NW and SW/NE bearing through plot centre to form diagonal lines.

Assess downed woody debris decomposition along these two lines only.

For each stump or log that intersects the transect (diameter 7.5 or greater at the point of intersection with the transect) assess and record species, diameter, and mortality

5 - PSP REGENERATION SUB-PLOT

size	7.56 m2 or 30.25 m	crew1		PSP#	285
Year	2017	crew2		page	of
Month		crew3		Measurement #	2
Day					

(Live Trees 10 cm+ tall AND dbh 0 to 1.0 cm) *revised: Nov. 4th, 2015*

	HT Class 1 0.1 to 0.3 m	HT Class 2 0.31 to 0.6 m	HT Class 3 0.61 to 0.9 m	HT Class 4 0.91 to 1.2 m	HT Class 5 1.21 m+
Species	**count**	count	**count**	count	**count**
TA					
BA					
WB					
WS					
BS					
JP					
BF					
TL					

6 - PSP SAPLING TALLY

plot size	500 m2	crew1		PSP#	285
		crew2		page	of
		crew3		Measurement #	2
				Year	2017
				Month	
				Day	

(Live Trees 1.1 to 9.0 cm dbh) *revised: June 1st, 2016*

	3			6			9		
	1.1 – 3.0 cm DBH			3.1 – 6.0 cm DBH			6.1 – 9.0 cm DBH		
Species	count	Avg Ht (m)		count	Avg Ht (m)		count	Avg Ht (m)	
TA			.			.			.
BA			.			.			.
WB			.			.			.
			.			.			.
WS			.			.			.
BS			.			.			.
JP			.			.			.
BF			.			.			.
TL			.			.			.
			.			.			.

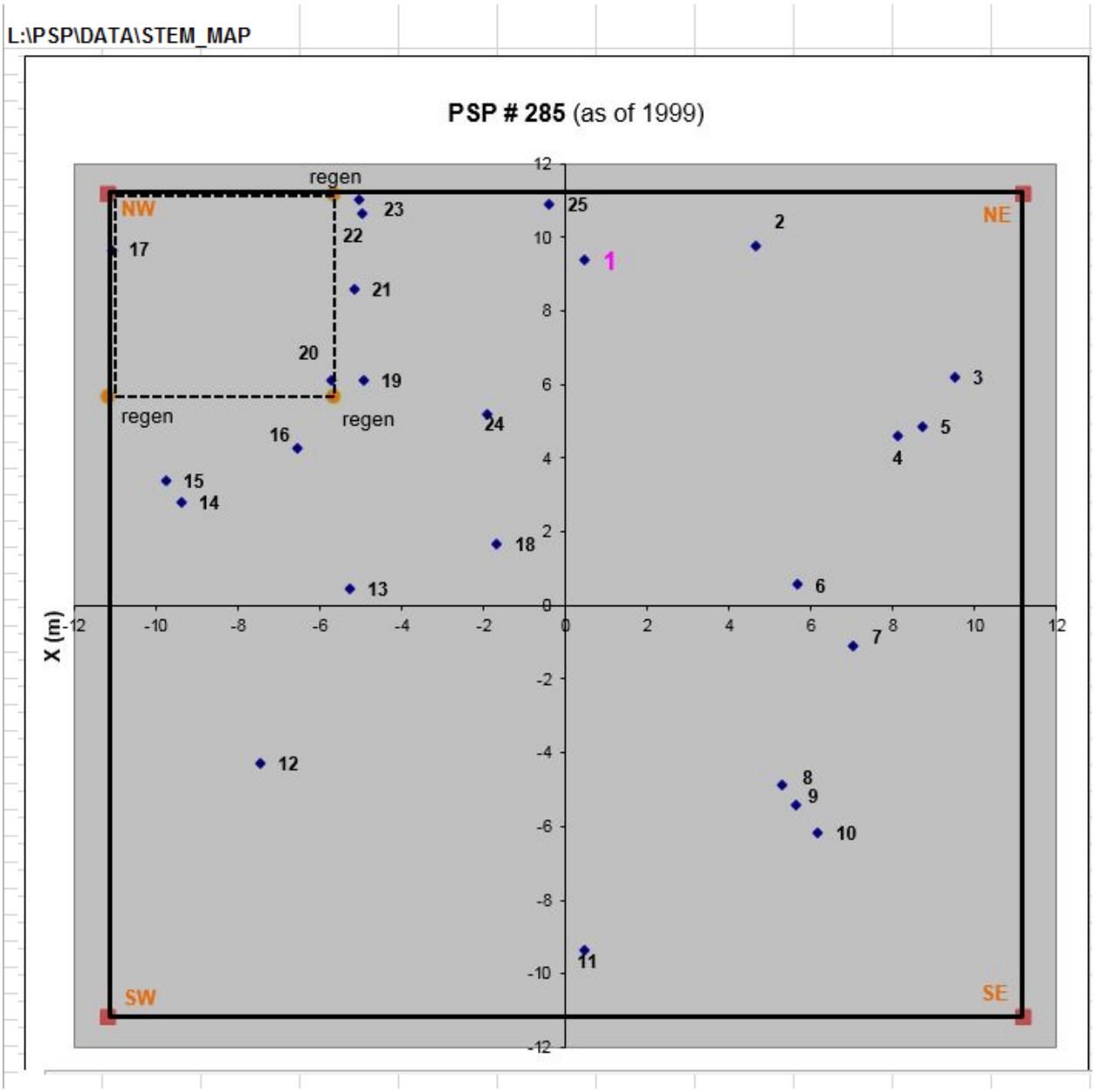
Comments:

7 - PSP TREE TALLY

plot size	500 m2	crew1		PSP#	285
tagging limit	9.1 cm +	crew2		page	1 of
Year	2017	crew3		Measurement #	2
Month				ONLY 25 trees - do all heights	
Day		(Live and Dead Trees 9.1cm or greater DBH)		revised: Apr. 12th, 2017	

Tree #	Spp	DBH (0.1 cm)	live or dead	Condition Codes			Height 1 (0.1 m)	Height 2 (0.1 m)	Height to Live Crown (0.1 m)	Original (1) Ingrowth (2)	Snag Decomp Class (1-5)	Down Woody Decomp (1-5)
1	WS	31.0	live	22	0	0	18.5		.	1		
2	TA	31.7	live	30	10	106	17.3		.	1		
3	BA	10.1	live	0	0	0	10.8		.	1		
4	WS	34.3	live	22	131	0	16.4		.	1		
5	WS	11.9	live	22	0	0	7.3		.	1		
6	WS	17.2	live	22	0	0	9.1		.	1		
7	WS	43.7	live	0	0	0	19.4		.	1		
8	TA	17.8	live	2	7	0	5.1		.	1		
9	WS	14.1	live	14	0	0	12.0		.	1		
10	WS	32.0	live	0	0	0	14.4		.	1		
11	TA	28.9	live	26	106	12	15.7		.	1		
12	TA	31.0	live	26	14	0	18.7		.	1		
13	TA	12.2	live	12	0	0	9.2		.	1		

L:\PSP\DATA\STEM_MAP



SP Numbe	eas_No_Tr	Meas Yr	Tree No	Spp	Dbh (cm)	ive or Dea	eight 1 (m	eight 2 (m	al Tree He	Crown Cl	ond Code	ond Code	ond Code	SNAG DE	COMP CLASS 1 TO 5
285	1	1999	1	WS	31.0	live	18.54		18.54	1	22	0	0		
285	1	1999	2	TA	31.7	live	17.34		17.34	1	30	10	106		
285	1	1999	3	BA	10.1	live	10.79		10.79	4	0	0	0		
285	1	1999	4	WS	34.3	live	16.43		16.43	2	22	131	0		
285	1	1999	5	WS	11.9	live	7.25		7.25	4	22	0	0		
285	1	1999	6	WS	17.2	live	9.06		9.06	3	22	0	0		
285	1	1999	7	WS	43.7	live	19.38		19.38	1	0	0	0		
285	1	1999	8	TA	17.8	live	5.06		5.06		2	7	0		
285	1	1999	9	WS	14.1	live	12.00		12.00	3	14	0	0		
285	1	1999	10	WS	32.0	live	14.37		14.37	1	0	0	0		
285	1	1999	11	TA	28.9	live	15.73		15.73	1	26	106	12		
285	1	1999	12	TA	31.0	live	18.74		18.74	1	26	14	0		
285	1	1999	13	TA	12.2	live	9.24		9.24	3	12	0	0		
285	1	1999	14	TA	31.9	live	20.94		20.94	1	26	14	0		
285	1	1999	15	TA	28.3	live	17.40		17.40	1	26	28	0		
285	1	1999	16	WS	25.9	live	13.71		13.71	2	22	0	0		
285	1	1999	17	WS	24.0	live	12.65		12.65	2	22	50	0		
285	1	1999	18	BA	16.2	dead	10.70		10.70	3	14	25	0		
285	1	1999	19	WS	35.5	live	19.46		19.46	1	22	0	0		
285	1	1999	20	TA	12.0	live	17.16		17.16	4	14	26	0		
285	1	1999	21	WS	19.3	live	13.23		13.23	3	14	22	0		
285	1	1999	22	WS	12.3	live	6.98		6.98	4	50	22	14		
285	1	1999	23	WS	9.9	live	6.98		6.98	4	22	30	0		
285	1	1999	24	WS	14.0	live	8.99		8.99	3	14	30	0		
285	1	1999	25	WS	15.4	live	11.24		11.24		1	50	0		

8 - TREE CAVITIES

plot size	500 m2	crew1		PSP#	285
		crew2		page	of
		crew3		Measurement #	2
				Year	2017
				Month	
				Day	
(trees with cavities)				*revised:April 12th, 2007*	

Tree #	Cavity Description	Location of Cavity	Cavity Type	Cavity Size	# cavities
	N - nesting	**S** - stump	**E**-excavated	**S** - small (2.5 - 7 cm)	
	F - feeding	**B** - bole	**N**-natural	**M** - med (7.1 to 15 cm)	
	E - escape	**C** - crown	**B**-both	**L** - large (>15 cm)	

Appendix 4: GPS Coordinates

PSP Number	PSP Cluster	PSP Type	Est_Year	PSP_Status	Status_Comments	Plot_Size	Plot Shape
1	1	fire-origin	1994	0	2012 BLOW DOWN	500	diamond
2	1	fire-origin	1994	0	2012 BLOW DOWN	500	diamond
3	1	fire-origin	1994	0	2012 BLOW DOWN	500	diamond
4	2	fire-origin	1994	0	WJL-034-H-09	500	diamond
5	2	REGEN	1994	1	WJL-034-H-09; re-established July 2014	500	diamond
6	2	fire-origin	1994	1	buffered out of WJL-034-H-09	500	diamond
7	3	fire-origin	1994	1		500	diamond
8	3	fire-origin	1994	1		500	diamond
9	3	fire-origin	1994	1		500	diamond
10	4	fire-origin	1994	1		500	diamond
11	4	fire-origin	1994	1		500	diamond
12	4	fire-origin	1994	1		500	diamond
13	5	fire-origin	1994	1		500	diamond
14	5	fire-origin	1994	1		500	diamond
15	5	fire-origin	1994	1		500	diamond
16	6	fire-origin	1994	1		500	diamond
17	6	fire-origin	1994	1		500	diamond
18	6	fire-origin	1994	1		500	diamond
19	7	fire-origin	1994	0	WEF-001 2012 BLOW DOWN	500	diamond
20	7	REGEN	1994	1	WEF-001 2012 BLOW DOWN, Cut, Re-established 2014	500	diamond
21	7	fire-origin	1994	0	WEF-001 2012 BLOW DOWN	500	diamond
22	8	fire-origin	1994	1		500	diamond
23	8	fire-origin	1994	0	final measure & decommissioned	500	diamond
24	8	fire-origin	1994	0	MISSING-can't find	500	diamond
25	9	fire-origin	1994	1		500	diamond
26	9	fire-origin	1994	1		500	diamond
27	10	fire-origin	1994	1		500	diamond
28	10	fire-origin	1994	1		500	diamond
29	10	fire-origin	1994	1		500	diamond

PSP Number	PSP Cluster	PSP Type	Est_Year	PSP_Status	Status_Comments	Plot_Size	Plot Shape
30	11	fire-origin	1994	1		500	diamond
31	11	fire-origin	1994	1		500	diamond
32	11	fire-origin	1994	1		500	diamond
33	12	fire-origin	1994	1	PSP SAVED	500	diamond
34	12	REGEN	1994	1	PSP re-established Nov 2013 after WNL-022 harv	500	diamond
35	12	fire-origin	1994	0	WNL-022 cut fall 2012 and summer 2013	500	diamond
36	13	fire-origin	1994	1		500	diamond
37	13	fire-origin	1994	1		500	diamond
38	13	fire-origin	1994	1		500	diamond
39	14	fire-origin	1994	1		500	diamond
40	14	fire-origin	1994	1		500	diamond
41	14	fire-origin	1994	1		500	diamond
42	15	fire-origin	1994	1	PSP SAVED	500	diamond
43	15	fire-origin	1994	0	harvested in 2014 VLR-852	500	diamond
44	15	fire-origin	1994	0	harvested in 2014 VLR-852	500	diamond
45	16	fire-origin	1994	1		500	diamond
46	16	fire-origin	1994	1		500	diamond
47	16	fire-origin	1994	1		500	diamond
48	17	fire-origin	1994	1		500	diamond
49	17	fire-origin	1994	1		500	diamond
50	18	fire-origin	1994	1		500	diamond
51	18	fire-origin	1994	1		500	diamond
52	18	fire-origin	1994	1		500	diamond
53	19	fire-origin	1994	0	CWE-001 2012 BLOW DOWN	500	diamond
54	19	fire-origin	1994	0	CWE-001 2012 BLOW DOWN	500	diamond
55	19	fire-origin	1994	0	CWE-001 2012 BLOW DOWN	500	diamond
56	20	fire-origin	1994	0	2012 BLOW DOWN	500	diamond
57	20	fire-origin	1994	0	2012 BLOW DOWN	500	diamond
58	20	fire-origin	1994	0	2012 BLOW DOWN	500	diamond
59	21	fire-origin	1994	1		500	diamond
60	21	fire-origin	1994	1		500	diamond

PSP Number	PSP Cluster	PSP Type	Est_Year	PSP_Status	Status_Comments	Plot_Size	Plot Shape
61	21	fire-origin	1994	1		500	diamond
62	22	fire-origin	1994	1		500	diamond
63	22	fire-origin	1994	1		500	diamond
64	22	fire-origin	1994	1		500	diamond
65	23	fire-origin	1994	1		500	diamond
66	23	fire-origin	1994	1		500	diamond
67	24	fire-origin	1994	1		500	diamond
68	24	fire-origin	1994	0	final measure & decommissioned	500	diamond
69	24	fire-origin	1994	0	final measure & decommissioned	500	diamond
70	25	fire-origin	1994	1		500	diamond
71	25	fire-origin	1994	1		500	diamond
72	25	fire-origin	1994	1		500	diamond
73	26	fire-origin	1994	0	harvested by Valley River FNs	500	diamond
74	26	fire-origin	1994	0	harvested by Valley River FNs	500	diamond
75	26	fire-origin	1994	0	harvested by Valley River FNs	500	diamond
76	27	fire-origin	1994	1		500	diamond
77	27	fire-origin	1994	1		500	diamond
78	27	fire-origin	1994	1		500	diamond
79	28	fire-origin	1994	0	final measure & decommissioned	500	diamond
80	28	fire-origin	1994	0	final measure & decommissioned	500	diamond
81	28	fire-origin	1994	1		500	diamond
82	29	fire-origin	1994	0	Treaty Land Entitlement in 2004	500	diamond
83	29	fire-origin	1994	0	Treaty Land Entitlement in 2004	500	diamond
84	29	fire-origin	1994	0	Treaty Land Entitlement in 2004	500	diamond
85	30	fire-origin	1994	0	Treaty Land Entitlement in 2004	500	diamond
86	30	fire-origin	1994	0	Treaty Land Entitlement in 2004	500	diamond

PSP Number	PSP Cluster	PSP Type	Est_Year	PSP_Status	Status_Comments	Plot_Size	Plot Shape
87	30	fire-origin	1994	0	Treaty Land Entitlement in 2004	500	diamond
88	31	fire-origin	1994	0	Treaty Land Entitlement in 2004	500	diamond
89	31	fire-origin	1994	0	Treaty Land Entitlement in 2004	500	diamond
90	31	fire-origin	1994	0	Treaty Land Entitlement in 2004	500	diamond
91	32	fire-origin	1994	1		500	diamond
92	32	fire-origin	1994	1		500	diamond
93	32	fire-origin	1994	1		500	diamond
94	33	fire-origin	1994	1		500	diamond
95	33	fire-origin	1994	1		500	diamond
96	33	fire-origin	1994	1		500	diamond
97	34	fire-origin	1994	1		500	diamond
98	34	fire-origin	1994	1		500	diamond
99	34	fire-origin	1994	1		500	diamond
100	35	fire-origin	1994	1		500	diamond
101	35	fire-origin	1994	1		500	diamond
102	35	fire-origin	1994	1		500	diamond
103	36	fire-origin	1994	0	MISSING - wires & posts gone	500	diamond
104	36	fire-origin	1994	0	in CWC-118 decom 2014	500	diamond
105	36	fire-origin	1994	0	in CWC-118 decom 2014	500	diamond
106	37	fire-origin	1994	1		500	diamond
107	37	fire-origin	1994	1		500	diamond
108	37	fire-origin	1994	1		500	diamond
109	38	fire-origin	1994	1		500	diamond
110	38	REGEN	1994	1	HSC-031 cut in Mar2012; re-est 2014	500	diamond
111	38	fire-origin	1994	0	HSC-031 cut in Mar2012	500	diamond
112	39	REGEN	1994	1	RCK-102 cut June 2013; re-est 2014	500	diamond
113	39	fire-origin	1994	1	PSP protected by 50 m buffer	500	diamond
114	39	fire-origin	1994	0	RCK-102 cut June 2013	500	diamond
115	40	fire-origin	1994	0	in RCK-105 decom 2014	500	diamond
116	40	fire-origin	1994	0	in RCK-105 decom 2014	500	diamond

PSP Number	PSP Cluster	PSP Type	Est_Year	PSP_Status	Status_Comments	Plot_Size	Plot Shape
117	40	fire-origin	1994	1		500	diamond
118	41	fire-origin	1994	0	cut in SRR-301 in 2016-2017 op yr	500	diamond
119	41	fire-origin	1994	0	cut in SRR-301 in 2016-2017 op yr	500	diamond
120	41	fire-origin	1994	1	PSP protected	500	diamond
121	42	fire-origin	1994	1		500	diamond
122	42	fire-origin	1994	1		500	diamond
123	42	fire-origin	1994	0	beavers???	500	diamond
124	43	fire-origin	1994	1		500	diamond
125	43	fire-origin	1994	1		500	diamond
126	43	fire-origin	1994	1		500	diamond
127	44	fire-origin	1994	1		500	diamond
128	44	fire-origin	1994	1		500	diamond
129	44	fire-origin	1994	1		500	diamond
130	45	fire-origin	1994	0	Treaty Land Entitlement	500	diamond
131	45	fire-origin	1994	0	Treaty Land Entitlement	500	diamond
132	45	fire-origin	1994	0	Treaty Land Entitlement	500	diamond
133	46	fire-origin	1994	0	cut TEL-905-H-09	500	diamond
134	46	fire-origin	1994	1		500	diamond
135	46	fire-origin	1994	1		500	diamond
136	47	fire-origin	1994	1		500	diamond
137	47	fire-origin	1994	1		500	diamond
138	47	fire-origin	1994	1		500	diamond
139	48	fire-origin	1994	1		500	diamond
140	48	fire-origin	1994	1		500	diamond
141	48	fire-origin	1994	1		500	diamond
142	49	REGEN	1994	1	Cut BSR-113 in 2013, Re-establised Oct 21 2014	500	diamond
143	49	fire-origin	1994	1		500	diamond
144	49	fire-origin	1994	1		500	diamond
145	50	fire-origin	1994	1		500	diamond
146	50	fire-origin	1994	1		500	diamond
147	50	fire-origin	1994	1		500	diamond
148	51	fire-origin	1994	1		500	diamond
149	51	fire-origin	1994	1		500	diamond
150	51	fire-origin	1994	1		500	diamond

PSP Number	PSP Cluster	PSP Type	Est_Year	PSP_Status	Status_Comments	Plot_Size	Plot Shape
151	52	fire-origin	1999	1	plot# changed to 601 (prev logging)	500	square
152	52	fire-origin	1999	1	plot# changed to 602 (prev logging)	500	square
153	52	fire-origin	1999	1	plot# changed to 603 (prev logging)	500	square
154	53	fire-origin	1997	1		500	square
155	53	fire-origin	1997	1		500	square
156	53	fire-origin	1997	1		500	square
157	54	fire-origin	1999	1		500	square
158	54	fire-origin	1999	1		500	square
159	54	fire-origin	1999	1		500	square
160	55	fire-origin	1998	0	to be cut SGL-806; plot decomissioned Oct 2013	500	square
161	55	fire-origin	1998	1	SAVED	500	square
162	55	fire-origin	1998	0	PSP162 99% windthrown in 2013	500	square
163	56	fire-origin	1998	1		500	square
164	56	fire-origin	1998	1		500	square
165	56	fire-origin	1998	1		500	square
166	57	fire-origin	1998	1		500	square
167	57	fire-origin	1998	1		500	square
168	57	fire-origin	1998	1		500	square
169	58	fire-origin	1998	1		500	square
170	58	fire-origin	1998	1		500	square
171	58	fire-origin	1998	1		500	square
172	59	fire-origin	1998	0	blowndown - 3 trees standing	500	square
173	59	fire-origin	1998	0	blowndown	500	square
174	59	fire-origin	1998	0	blowndown	500	square
175	60	fire-origin	1998	1		500	square
176	60	fire-origin	1998	1		500	square
177	60	fire-origin	1998	1		500	square
178	61	fire-origin	1998	1		500	square
179	61	fire-origin	1998	1		500	square
180	61	fire-origin	1998	1		500	square
181	62	fire-origin	1999	1		500	square
182	62	fire-origin	1999	1		500	square

PSP Number	PSP Cluster	PSP Type	Est_Year	PSP_Status	Status_Comments	Plot_Size	Plot Shape
183	62	fire-origin	1999	1		500	square
184	63	fire-origin	1999	0	SRL-100-H-11	500	square
185	63	fire-origin	1999	1	buffered & saved from harvest	500	square
186	63	REGEN	1999	1	SRL-100-H-11, Re-established Oct 23, 2014	500	square
187	64	fire-origin	1999	1		500	square
188	64	fire-origin	1999	1		500	square
189	65	fire-origin	1999	1		500	square
190	65	fire-origin	1999	1		500	square
191	65	fire-origin	1999	1		500	square
192	66	fire-origin	1999	1		500	square
193	66	fire-origin	1999	1		500	square
194	66	fire-origin	1999	1		500	square
195	67	fire-origin	1999	1		500	square
196	67	fire-origin	1999	1		500	square
197	67	fire-origin	1999	1		500	square
198	68	fire-origin	1999	1		500	square
199	68	fire-origin	1999	1		500	square
200	68	fire-origin	1999	1		500	square
201	69	fire-origin	1999	1		500	square
202	69	fire-origin	1999	1		500	square
203	69	fire-origin	1999	1		500	square
204	70	fire-origin	1999	1	0.3 km walk in	500	square
205	70	fire-origin	1999	1	0.3 km walk in	500	square
206	70	fire-origin	1999	1	0.3 km walk in	500	square
207	71	fire-origin	1999	1		500	square
208	71	fire-origin	1999	1		500	square
209	71	fire-origin	1999	1		500	square
210	72	fire-origin	1999	1		500	square
211	72	fire-origin	1999	1		500	square
212	72	fire-origin	1999	1		500	square
213	73	fire-origin	1999	1		500	square
214	73	fire-origin	1999	1		500	square
215	73	fire-origin	1999	1		500	square
216	74	fire-origin	1999	1		500	square
217	74	fire-origin	1999	1		500	square

PSP Number	PSP Cluster	PSP Type	Est_Year	PSP_Status	Status_Comments	Plot_Size	Plot Shape
218	74	fire-origin	1999	1		500	square
219	75	fire-origin	1999	1		500	square
220	75	fire-origin	1999	1		500	square
221	75	fire-origin	1999	1		500	square
222	76	fire-origin	1999	1		500	square
223	76	fire-origin	1999	1		500	square
224	76	fire-origin	1999	1		500	square
225	77	fire-origin	1999	1		500	square
226	77	fire-origin	1999	1		500	square
227	77	fire-origin	1999	1		500	square
228	78	fire-origin	1999	1		500	square
229	78	fire-origin	1999	1		500	square
230	78	fire-origin	1999	1		500	square
231	79	fire-origin	1999	1		500	square
232	79	fire-origin	1999	1		500	square
233	79	fire-origin	1999	1		500	square
234	80	fire-origin	1999	0	SGL-822 cut in 2016	500	square
235	80	fire-origin	1999	1		500	square
236	80	fire-origin	1999	0	SGL-822 cut in 2016	500	square
237	81	fire-origin	1999	1		500	square
238	81	fire-origin	1999	1		500	square
239	81	fire-origin	1999	1		500	square
240	82	fire-origin	1999	1		500	square
241	82	fire-origin	1999	1		500	square
242	82	fire-origin	1999	1		500	square
243	83	fire-origin	1999	1		500	square
244	83	fire-origin	1999	1		500	square
245	83	fire-origin	1999	1		500	square
246	84	fire-origin	1999	1		500	square
247	84	fire-origin	1999	1		500	square
248	84	fire-origin	1999	1		500	square
249	85	fire-origin	1999	1		500	square
250	85	fire-origin	1999	1		500	square
251	85	fire-origin	1999	1		500	square
252	86	fire-origin	1999	1		500	square
253	86	fire-origin	1999	1		500	square
254	86	fire-origin	1999	1		500	square

PSP Number	PSP Cluster	PSP Type	Est_Year	PSP_Status	Status_Comments	Plot_Size	Plot Shape
255	87	fire-origin	1999	1		500	square
256	87	fire-origin	1999	1		500	square
257	87	fire-origin	1999	1		500	square
258	88	fire-origin	1999	1		500	square
259	88	fire-origin	1999	1		500	square
260	88	fire-origin	1999	1		500	square
261	89	fire-origin	1999	1		500	square
262	89	fire-origin	1999	1		500	square
263	89	fire-origin	1999	1		500	square
264	90	fire-origin	1999	1		500	square
265	90	fire-origin	1999	1		500	square
266	90	fire-origin	1999	1		500	square
267	91	fire-origin	1999	1		500	square
268	91	fire-origin	1999	1		500	square
269	91	fire-origin	1999	1		500	square
270	92	fire-origin	1999	1		500	square
271	92	fire-origin	1999	1		500	square
272	92	fire-origin	1999	1		500	square
273	93	fire-origin	1999	1		500	square
274	93	fire-origin	1999	1		500	square
275	93	fire-origin	1999	1		500	square
276	94	fire-origin	1999	0	CWE-005 2012 BLOW DOWN	500	square
277	94	fire-origin	1999	0	CWE-005 2012 BLOW DOWN	500	square
278	94	fire-origin	1999	0	CWE-005 2012 BLOW DOWN	500	square
279	95	fire-origin	1999	1		500	square
280	95	fire-origin	1999	1		500	square
281	95	fire-origin	1999	1		500	square
282	96	fire-origin	1999	1		500	square
283	96	fire-origin	1999	1		500	square
284	96	fire-origin	1999	1		500	square
285	97	fire-origin	1999	1		500	square
286	97	fire-origin	1999	1		500	square
287	97	fire-origin	1999	1		500	square
288	98	fire-origin	1999	1		500	square

PSP Number	PSP Cluster	PSP Type	Est_Year	PSP_Status	Status_Comments	Plot_Size	Plot Shape
289	98	fire-origin	1999	1		500	square
290	98	fire-origin	1999	1		500	square
291	99	fire-origin	1999	1		500	square
292	99	fire-origin	1999	1		500	square
293	99	fire-origin	1999	1		500	square
294	100	fire-origin	1999	1		500	square
295	100	fire-origin	1999	1		500	square
296	100	fire-origin	1999	1		500	square
297	101	fire-origin	1999	1		500	square
298	101	fire-origin	1999	1		500	square
299	101	fire-origin	1999	1		500	square
300	102	fire-origin	1999	1		500	square
301	102	fire-origin	1999	1		500	square
302	102	fire-origin	1999	1		500	square
303	103	fire-origin	1999	1		500	square
304	103	fire-origin	1999	1		500	square
305	103	fire-origin	1999	1		500	square
306	104	fire-origin	1999	1		500	square
307	104	fire-origin	1999	1		500	square
308	104	fire-origin	1999	1		500	square
309	105	fire-origin	1999	1		500	square
310	105	fire-origin	1999	1		500	square
311	105	fire-origin	1999	1		500	square
312	106	fire-origin	1999	1		500	square
313	106	fire-origin	1999	1		500	square
314	106	fire-origin	1999	1		500	square
315	107	fire-origin	1999	1		500	square
316	107	fire-origin	1999	1		500	square
317	107	fire-origin	1999	1		500	square
318	108	fire-origin	1999	1		500	square
319	108	fire-origin	1999	1		500	square
320	108	fire-origin	1999	1		500	square
321	109	fire-origin	1999	1		500	square
322	109	fire-origin	1999	1		500	square
323	109	fire-origin	1999	1		500	square
324	110	fire-origin	1999	1		500	square
325	110	fire-origin	1999	1		500	square

PSP Number	PSP Cluster	PSP Type	Est_Year	PSP_Status	Status_Comments	Plot_Size	Plot Shape
326	110	fire-origin	1999	1		500	square
327	111	PLANTATION	2000	1		500	square
328	111	PLANTATION	2000	1		500	square
329	111	PLANTATION	2000	1		500	square
330	112	EXPERIMENTAL - REGEN	2000	1		500	square
331	112	EXPERIMENTAL - REGEN	2000	0	beaver flooded in 2015	500	square
332	112	EXPERIMENTAL - REGEN	2000	1		500	square
333	112	EXPERIMENTAL - REGEN	2000	0	beaver flooded in 2015	500	square
334	112	EXPERIMENTAL - REGEN	2000	1		500	square
335	112	EXPERIMENTAL - REGEN	2000	1		500	square
336	112	EXPERIMENTAL - REGEN	2000	1		500	square
337	112	EXPERIMENTAL - REGEN	2000	1		500	square
338	112	fire-origin	2000	1		500	square
339	113	fire-origin	2000	1		500	square
340	113	fire-origin	2000	1		500	square
341	113	fire-origin	2000	1		500	square
342	17	fire-origin	2000	1		500	square
343	114	fire-origin	2000	1		500	square
344	114	fire-origin	2000	1		500	square
345	114	fire-origin	2000	1		500	square
346	115	fire-origin	2000	1		500	square
347	115	fire-origin	2000	1		500	square
348	115	fire-origin	2000	1		500	square
349	116	fire-origin	2000	1		500	square
350	116	fire-origin	2000	1		500	square
351	116	fire-origin	2000	1		500	square
352	117	fire-origin	2000	1		500	square
353	117	fire-origin	2000	1		500	square
354	117	fire-origin	2000	1		500	square
355	118	fire-origin	2000	1		500	square

PSP Number	PSP Cluster	PSP Type	Est_Year	PSP_Status	Status_Comments	Plot_Size	Plot Shape
356	118	fire-origin	2000	1		500	square
357	118	fire-origin	2000	1		500	square
358	119	fire-origin	2000	1		500	square
359	119	fire-origin	2000	1		500	square
360	119	fire-origin	2000	1		500	square
361	120	fire-origin	2000	1		500	square
362	120	fire-origin	2000	1		500	square
363	120	fire-origin	2000	1		500	square
364	121	fire-origin	2000	1		500	square
365	121	fire-origin	2000	1		500	square
366	121	fire-origin	2000	1		500	square
367	122	fire-origin	2000	1		500	square
368	122	fire-origin	2000	1		500	square
369	122	fire-origin	2000	1		500	square
370	123	fire-origin	2000	1		500	square
371	123	fire-origin	2000	1		500	square
372	123	fire-origin	2000	1		500	square
373	124	fire-origin	2000	1		500	square
374	124	fire-origin	2000	1		500	square
375	124	fire-origin	2000	1		500	square
376	125	fire-origin	2000	1		500	square
377	125	fire-origin	2000	1		500	square
378	125	fire-origin	2000	1		500	square
379	126	fire-origin	2000	1		500	square
380	126	fire-origin	2000	1		500	square
381	126	fire-origin	2000	1		500	square
382	127	fire-origin	2000	1		500	square
383	127	fire-origin	2000	1		500	square
384	127	fire-origin	2000	1		500	square
385	128	fire-origin	2000	1		500	square
386	128	fire-origin	2000	1		500	square
387	128	fire-origin	2000	1		500	square
388	129	fire-origin	2000	1		500	square
389	129	fire-origin	2000	1		500	square
390	129	fire-origin	2000	1		500	square
391	130	fire-origin	2000	1		500	square
392	130	fire-origin	2000	1		500	square

PSP Number	PSP Cluster	PSP Type	Est_Year	PSP_Status	Status_Comments	Plot_Size	Plot Shape
393	130	fire-origin	2000	1		500	square
394	131	fire-origin	2000	1		500	square
395	131	fire-origin	2000	1		500	square
396	131	fire-origin	2000	1		500	square
397	132	fire-origin	2000	1		500	square
398	132	fire-origin	2000	1		500	square
399	132	fire-origin	2000	1		500	square
400	133	fire-origin	2000	1		500	square
401	133	fire-origin	2000	1		500	square
402	133	fire-origin	2000	1		500	square
403	134	fire-origin	2000	1		500	square
404	134	fire-origin	2000	1		500	square
405	134	fire-origin	2000	1		500	square
406	135	fire-origin	2000	1		500	square
407	135	fire-origin	2000	1		500	square
408	135	fire-origin	2000	1		500	square
409	136	fire-origin	2000	1		500	square
410	136	fire-origin	2000	1		500	square
411	136	fire-origin	2000	1		500	square
412	137	fire-origin	2000	1		500	square
413	137	fire-origin	2000	1		500	square
414	137	fire-origin	2000	1		500	square
415	138	fire-origin	2000	1		500	square
416	138	fire-origin	2000	1		500	square
417	138	fire-origin	2000	1		500	square
418	139	fire-origin	2000	1		500	square
419	139	fire-origin	2000	1		500	square
420	139	fire-origin	2000	1		500	square
421	140	fire-origin	2000	1		500	square
422	140	fire-origin	2000	1		500	square
423	140	fire-origin	2000	1		500	square
500	141	fire-origin YOUNG	2003	1		500	square
501	141	fire-origin YOUNG	2003	1		500	square
502	141	fire-origin YOUNG	2003	1		500	square

PSP Number	PSP Cluster	PSP Type	Est_Year	PSP_Status	Status_Comments	Plot_Size	Plot Shape
503	141	fire-origin YOUNG	2003	1		500	square
504	141	fire-origin YOUNG	2003	1		500	square
505	141	fire-origin YOUNG	2003	1		500	square
506	141	fire-origin YOUNG	2003	1		500	square
507	141	fire-origin YOUNG	2003	1		500	square
508	141	fire-origin YOUNG	2003	1		500	square
509	141	fire-origin YOUNG	2003	1		500	square
510	141	fire-origin YOUNG	2003	1		500	square
511	141	fire-origin YOUNG	2003	1		500	square
512	141	fire-origin YOUNG	2003	1		500	square
513	141	fire-origin YOUNG	2003	1		500	square
514	141	fire-origin YOUNG	2003	1		500	square
515	141	fire-origin YOUNG	2003	1		500	square
516	141	fire-origin YOUNG	2003	1		500	square
517	141	fire-origin YOUNG	2003	1		500	square
518	141	fire-origin YOUNG	2003	1		500	square
519	141	fire-origin YOUNG	2003	1		500	square
520	141	fire-origin YOUNG	2003	1		500	square
521	141	fire-origin YOUNG	2003	1		500	square
522	141	fire-origin YOUNG	2003	1		500	square

PSP Number	PSP Cluster	PSP Type	Est_Year	PSP_Status	Status_Comments	Plot_Size	Plot Shape
523	141	fire-origin YOUNG	2003	1		500	square
524	141	fire-origin YOUNG	2003	1		500	square
525	141	fire-origin YOUNG	2003	1		500	square
526	141	fire-origin YOUNG	2003	1		500	square
527	141	fire-origin YOUNG	2003	1		500	square
528	141	fire-origin YOUNG	2003	1		500	square
529	141	fire-origin YOUNG	2003	1		500	square
530	141	fire-origin YOUNG	2003	1		500	square
531	141	fire-origin YOUNG	2003	1		500	square
532	141	fire-origin YOUNG	2003	1		500	square
533	141	fire-origin YOUNG	2003	1		500	square
534		EXPERIMENTAL - REGEN	2006	1		500	square
535		EXPERIMENTAL - REGEN	2006	1		500	square
536		EXPERIMENTAL - REGEN	2006	1		500	square
537		EXPERIMENTAL - REGEN	2006	1		500	square
538		EXPERIMENTAL - REGEN	2006	1		500	square
539		EXPERIMENTAL - REGEN	2006	1		500	square
540		EXPERIMENTAL - REGEN	2006	1		500	square
541		EXPERIMENTAL - REGEN	2006	1		500	square
542		EXPERIMENTAL - REGEN	2006	1		500	square

PSP Number	PSP Cluster	PSP Type	Est_Year	PSP_Status	Status_Comments	Plot_Size	Plot Shape
543		EXPERIMENTAL - REGEN	2006	1		500	square
544		EXPERIMENTAL - REGEN	2006	1		500	square
545		EXPERIMENTAL - REGEN	2006	1		500	square
546		EXPERIMENTAL - REGEN	2006	1		500	square
547		EXPERIMENTAL - REGEN	2006	1		500	square
548		EXPERIMENTAL - REGEN	2006	1		500	square
549		EXPERIMENTAL - REGEN	2006	1		500	square
550		EXPERIMENTAL - REGEN	2006	1		500	square
551		EXPERIMENTAL - REGEN	2006	1		500	square
601		fire-origin	1997	1	originally plot# 151	500	square
602		fire-origin	1997	1	originally plot# 152	500	square
603		fire-origin	1997	1	originally plot# 153	500	square
604		fire-origin	1997	1		500	square
605		fire-origin	1997	1		500	square
606		fire-origin	1997	1		500	square

Appendix 5: Vegetation list by life form.

Reference Number	Short Form	Genus	species	Common Name
TREES				
1	Abiebal	Abies	balsamea	Balsam fir
2	Acerneg	Acer	negundo	Manitoba maple
3	Betupap	Betula	papyrifera	White birch
4	Fraxpen	Fraxinus	pennsylvanica	Green ash
5	Larilar	Larix	laricina	Larch
6	Picegla	Picea	glauca	White spruce
7	Picemar	Picea	mariana	Black spruce
8	Pinuban	Pinus	banksiana	Jack pine
9	Popubal	Populus	balsamifera	Balsam poplar
10	Poputre	Populus	tremuloides	Trembling aspen
11	Quermac	Quercus	macrocarpa	Bur oak
12	Ulmuame	Ulmus	americana	White elm
SHRUBS				
13	Acerspi	Acer	spicatum	Mountain maple
14	Alnuvir	Alnus	viridus ssp. Crispa	Green alder
15	Alnuinc	Alnus	incana ssp. Rugosa	Speckled alder
16	Amelaln	Amelanchier	alnifolia	Saskatoon berry
17	Amelhum	Amelanchier	humilis	Juneberry
18	Amelspp	Amelanchier	spp.	Serviceberry
19	Andrgla	Andromeda	glaucophylla	Bog rosemary
20	Betugla	Betula	glandulifera	Swamp birch
21	Betupum	Betula	pumila	Dwarf birch
22	Chamcal	Chamaedaphne	calyculata	Leatherleaf
23	Cornsto	Cornus	stolonifera	Red osier dogwood
24	Corycor	Corylus	cornuta	Beaked hazel
25	Dierlon	Diervilla	lonicera	Bush honeysuckle
26	Junicom	Juniperus	communis	Common juniper
27	Kalmang	Kalmia	angustifolia	Sheep laurel
28	Kalmpol	Kalmia	polifolia	Pale laurel
29	Ledugro	Ledum	groenlandicum	Labrador-tea
30	Lonican	Lonicera	canadensis	Canada honeysuckle
31	Lonidio	Lonicera	dioica var. glaucescens	Twining honeysuckle
32	Loniinv	Lonicera	involucrata	Four-lined honeysuckle
33	Loniobl	Lonicera	oblongifolia	Swamp fly honeysuckle

Reference Number	Short Form	Genus	species	Common Name
34	Lonivil	Lonicera	villosa	Northern fly honeysuckle
35	Myrigal	Myrica	gale	Sweetgale
36	Potefru	Potentilla	fruticosa	Shrubby cinquefoil
37	Prunpen	Prunus	pennsylvanica	Pin cherry
38	Prunvir	Prunus	virginiana	Choke cherry
39	Rhamaln	Rhamnus	alnifolia	Alder-leaved buckthorn
40	Ribeame	Ribes	americana	Wild black currant
41	Ribegla	Ribes	glandulosum	Skunk currant
42	Ribehud	Ribes	hudsonianus	Northern black currant
43	Ribelac	Ribes	lacustre	Bristly black currant
44	Ribeoxy	Ribes	oxyacanthoides	Northern gooseberry
45	Ribetri	Ribes	triste	Swamp red currant
46	Rosaaci	Rosa	acicularis	Bristly wild rose
47	Rosawoo	Rosa	woodsii	Common wild rose
48	Rubuaca	Rubus	acaulis	Dwarf raspberry
49	Rubustr	Rubus	strigosus var. idaeus	wild red raspberry
50	Salibeb	Salix	bebbiana	Bebb's (diamond) willow
51	Salican	Salix	candida	Hoary willow
52	Salidis	Salix	discolor	Pussy willow
53	Saliexi	Salix	exigua	Sandbar willow
54	Salilas	Salix	lasiandra	Western shining willow
55	Salimac	Salix	maccalliana	Velvet-fruited willow
56	Salimyr	Salix	myricoides	Low blueberry willow
57	Saliped	Salix	pedicellaris	Bog willow
58	Salipet	Salix	petiolaris	Basket willow
59	Salipla	Salix	planifolia	Flat-leaved willow
60	Salispp	Salix	spp	Willow spp.
61	Sambpub	Sambucus	pubens	Red-berried elder
62	Shepcan	Shepherdia	canadensis	Soapberry
63	Sorbdec	Sorbus	decora	Eastern (showy) mountain ash
64	Sorbsco	Sorbus	scopulina	Western mountain ash
65	Spiralb	Spiraea	alba	Narrow-leaved meadowsweet
66	Sympalb	Symphoricarpus	albus	Common snowberry
67	Sympocc	Symphoricarpus	occidentalis	Western snowberry
68	Vaccang	Vaccinium	angustifolium	Early low blueberry

Reference Number	Short Form	Genus	species	Common Name
69	Vacccae	Vaccinium	caespitosum	Dwarf bilberry
70	Vaccmyr	Vaccinium	myrtilloides	Velvet-leaved blueberry
71	Vibuedu	Viburnum	edule	Squashberry
72	Vibuopu	Viburnum	opulifolius	Highbush cranberry
SEMI-SHRUB				
73	Arctuva	Arctyostaphylos	uva-ursi	Bearberry
74	Corncan	Cornus	canadensis	Bunchberry
75	Empeneg	Empetrum	negrum	Crowberry
76	Gaulhis	Gaultheria	hispidula	Creeping snowberry
77	Gaulpro	Gaultheria	procumbens	Wintergreen
78	Oxycmic	Oxycoccus	microcarpus	Small cranberry
79	Rubupub	Rubus	pubescens	Dwarf raspberry
80	Vaccvit	Vaccinium	vitis-idaea	Bog cranberry
HERBS				
81	Achimil	Achillea	millefolium	Yarrow
82	Actapac	Actaea	pachypoda	White baneberry
83	Actarub	Actaea	rubra	Red baneberry
84	Agrosca	Agrostis	scabra	Ticklegrass
85	Agrospp	Agrostis	spp.	Grass
86	Agrotra	Agropyron	trachycaulum	Slender wheat-grass
87	Agrotra	Agropyron	trachycaulum var. unilaterale	Awned wheat-grass
88	Anemcan	Anemone	canadensis	Canada anemone
89	Anemmul	Anemone	multifida	Cut-leaved anemone
90	Anemqui	Anemone	quinquefolia	Wood anemone
91	Anemrip	Anemone	riparia	Tall anemone
92	Anemspp	Anemone	spp	Anemone spp.
93	Antemic	Antennaria	microphylla	Small-leaved pussytoes
94	Apocand	Apocynum	androesifolium	Spreading dogbane
95	Aquibre	Aquilegia	brevistyla	Blue columbine
96	Arabdiv	Arabis	divaricarpa	Purple rock cress
97	Aralnud	Aralia	nudicaulis	Sarsaparilla
98	Arenlat	Arenaria	lateriflora	Blunt-leaved sandwort
99	Asarcan	Asarum	canadensis	Wild ginger
100	Astebor	Aster	borealis	Marsh aster
101	Astecil	Aster	ciliolatus	Ciliolate aster

Reference Number	Short Form	Genus	species	Common Name
102	Astecon	Aster	conspicuus	Showy aster
103	Astelae	Aster	laevis	Smooth aster
104	Astelan	Aster	lanceolatus	Panicled aster
105	Astenem	Aster	nemoralis	Bog aster
106	Astepun	Aster	puniceus	Purple-stemmed aster
107	Astespp	Aster	spp.	Aster species
108	Astralp	Astralagus	alpinus	Alpine milk-vetch
109	Astrcan	Astralagus	canadensis	Canadian milk-vetch
110	Athyfil	Athyrium	filix-femina	Lady fern
111	Botrvir	Botrichyum	virginiana	Rattlesnake fern
112	Bromcil	Bromus	ciliatus	Fringed brome grass
113	Calacan	Calamagrostis	canadensis	Purple reed grass, bluejoint
114	Calaine	Calamagrostis	inexpansa	Northern reed-grass
115	Caltpal	Caltha	palustris	Marsh marigold
116	Campapa	Campanula	aparinoides	Marsh bellflower
117	Camprot	Campanula	rotundifolia	Common harebell, bluebells
118	Careaqu	Carex	aquatilis	Water sedge
119	Carebru	Carex	brunnescens	Brownish sedge
120	Carecap	Carex	capillaris	Hair-like sedge
121	Carecho	Carex	chordorrhiza	Prostrate sedge
122	Carecon	Carex	concinna	Beautiful sedge
123	Caredef	Carex	deflexa	Bent sedge
124	Caredew	Carex	deweyana	Dewey's sedge
125	Caredia	Carex	diandra	Two-stamened sedge
126	Caredis	Carex	disperma	Two-seeded sedge
127	Caregyn	Carex	gynocrates	Northern bog sedge
128	Careint	Carex	interior	Inland sedge
129	Carelas	Carex	lasiocarpa	Hairy-fruited sedge
130	Carelep	Carex	leptalea	Bristle-stalked sedge
131	Carelim	Carex	limosa	Mud sedge
132	Careoli	Carex	oligosperma	Few-seeded sedge
133	Carepau	Carex	paupercula	Poor sedge
134	Careped	Carex	pedunculata	Peduncled sedge
135	Caresar	Carex	sartwellii	Sartwell's sedge
136	Careten	Carex	tenuiflora	Thin-flowered sedge
137	Caretri	Carex	trisperma	Three-seeded sedge
138	Careutr	Carex	utriculata	Beaked sedge

Reference Number	Short Form	Genus	species	Common Name
139	Carevag	Carex	vaginata	Sheathed (virgin) sedge
140	Carevir	Carex	viridula	Green sedge
141	Carespp	Carex	spp.	Sedge spp.
142	Chimumb	Chimaphila	umbellata	Prince's pine
143	Cicumac	Cicuta	maculata	Water hemlock
144	Cinnlat	Cinna	latifolia	Drooping wood-reed
145	Circalp	Circaea	alpina	Smaller enchanter's nightshade
146	Cirsarv	Cirsium	arvense	Canada thistle
147	Cirsmut	Cirsium	muticum	Swamp thistle
148	Cirsspp	Cirsium	spp.	Thistle spp.
149	Copttri	Coptis	trifolia	Goldthread
150	Coramac	Corallorhiza	maculata	Spotted coral-root
151	Corastr	Corallorhiza	striata	Striped coral-root
152	Coratri	Corallorhiza	trifida	Pale coral-root
153	Cyprcal	Cypripedium	calceolus	Yellow ladies slipper
154	Desccae	Deschampia	caespitosa	Tufted hairgrass
155	Disptra	Disporum	trachycarpum	Fairybells
156	Dracpar	Dracocephalum	parviflorum	American dragonhead
157	Drosrot	Drosera	rotundifolia	Round-leaved sundew
158	Dryoaus	Dryopteris	austriaca	Spinulose shield fern
159	Elymcan	Elymus	canadensis	Canada wild rye
160	Elyminn	Elymus	innova	Hairy wild rye
161	Epilang	Epilobium	angustifolium	Fireweed
162	Epilgla	Epilobium	glandulosum	Purple-leaved willow-herb
163	Epilpal	Epilobium	palustre	Swamp willow-herb
164	Equiarv	Equisetum	arvense	Field horsetail
165	Equiflu	Equisetum	fluviatile	Swamp horsetail
166	Equihye	Equisetum	hyemalis	Common scouring-rush
167	Equipal	Equisetum	palustre	Marsh horsetail
168	Equipra	Equisetum	pratense	Meadow horsetail
169	Equisci	Equisetum	scirpoides	Dwarf scouring rush
170	Equisyl	Equisetum	sylvaticum	Woodland horsetail
171	Erigacr	Erigeron	acris	Northern daisy fleabane
172	Erigphi	Erigeron	philadephicus	Philadelphia fleabane
173	Eriovag	Eriophorum	vaginatum ssp. Vaginatum	Sheathed cotton-grass
174	Eriovir	Eriophorum	viridi-carinatum	Thin-leaved cotton-grass

Reference Number	Short Form	Genus	species	Common Name
175	Eupapur	Eupatorium	purpureum var. maculatum	spotted Joe-pye-weed
176	Fragves	Fragaria	vesca	Woodland strawberry
177	Fragvir	Fragaria	virginiana	Wild strawberry
178	Galibor	Galium	boreale	Northern bedstraw
179	Galilab	Galium	labradoricum	Labrador bedstraw
180	Galitri	Galium	trifidum	Small bedstraw
181	Galitri	Galium	trifolium	Fragrant bedstraw
182	Geocliv	Geocaulon	lividum	Northern comandra
183	Geummac	Geum	macrophyllum	Large-leaved avens
184	Geumriv	Geum	rivale	Purple avens
185	Glycstr	Glyceria	striata	Fowl manna grass
186	Goodpub	Goodyera	pubens	Rattlesnake plantain
187	Goodrep	Goodyera	repens	Dwarf rattlesnake plantain
188	Grasspp	Grass	spp.	Grass
189	Gymndry	Gymnocarpium	dryopteris	Oak fern
190	Habehyp	Habenaria	hyperborea	Northern green bog orchid
191	Habeobt	Habenaria	obtusata	Blunt-leaved bog-orchid
192	Habeorb	Habenaria	orbiculata	Round-leaved bog orchid
193	Haledef	Halenia	deflexa	Spurred gentian
194	Hedyalp	Hedysarum	alpinum	Alpine sweet-vetch
195	Heralan	Heracleum	lanatum	Cow-parsnip
196	Hierodo	Hierochloe	odorata	Common sweet-grass
197	Hierumb	Hieracium	umbellatum	Narrow-leaved hawkweed
198	Hypevir	Hypericum	virginicum	Marsh St-John's wort
199	Impacap	Impatiens	capensis	Spotted jewel-weed
200	Juncbal	Juncus	balticus	Wire rush
201	Lacttat	Lactuca	tatarica	Common blue lettuce
202	Lathoch	Lathyrus	ochreolucus	Creamy pea-vine
203	Lathpal	Lathyrus	palustris	Marsh pea-vine
204	Lathven	Lathyrus	venosum	Purple pea-vine
205	Liliphi	Lilium	philadelphicum	Wood lily
206	Linnbor	Linnaea	borealis	Twinflower
207	Lipaloe	Liparis	loeselii	Twayblade
208	Listbor	Listera	borealis	Northern twayblade
209	Listcor	Listera	cordata	Heart-leaved twayblade

Reference Number	Short Form	Genus	species	Common Name
210	Lobekal	Lobelia	kalmii	Kalm's lobelia
211	Luzupar	Luzula	parviflora	Small-flowered wood rush
212	Lycoann	Lycopodium	annotinum	Interrupted club-moss
213	Lycocla	Lycopodium	clavatum	Wolf's claw club-moss
214	Lycocom	Lycopodium	complanatum	Ground cedar
215	Lycoluc	Lycopodium	lucidulum	Shining club-moss
216	Lycoobs	Lycopodium	obscurum	Ground pine club-moss
217	Lycouni	Lycopus	uniflorus	Bugleweed
218	Lysicil	Lysimachia	ciliata	Fringed loosestrife
219	Lysithy	Lysimachia	thyrsiflora	Tufted loosestrife
220	Maiacan	Maianthemum	canadense	Wild lily-of-the-valley
221	Maiatri	Maianthemum	trifolia	Three-leaved FALSE Solomon's seal
222	Malamon	Malaxis	monophylla	White adder's-mouth
223	Malvneg	Malva	neglecta	Cheeses
224	Mattstr	Matteucia	struthiopteris	Royal fern
225	Melalin	Melampyrum	lineare	Cow-wheat
226	Melioff	Melilotus	officinalis	Yellow sweet-clover
227	Mentarv	Mentha	arvensis	Wild mint
228	Menytri	Menyanthes	trifolia	Buckbean
229	Mertpan	Mertensia	paniculata	Bluebells/northern bluebells
230	Mitenud	Mitella	nuda	Naked mitrewort
231	Moneuni	Monesis	uniflora	One-flowered wintergreen
232	Monouni	Monotropa	uniflora	Indian pipe
233	Muhlglo	Muhlenbergia	glomerata	Bog muhly
234	Oryzasp	Oryzopsis	asperifolia	Rough-leaved rice grass
235	Oryzpun	Oryzopsis	pungens	Northern rice-grass
236	Osmodep	Osmorhiza	depauperata	Spreading sweet-cicely
237	Osmolon	Osmorhiza	longistyla	Smooth sweet-cicely
238	Oxytspl	Oxytropis	splendens	Showy locoweed
239	Parnpal	Parnassia	palustris	Northern grass-of-Parnassus
240	Petafri	Petasites	frigidus	Arctic coltsfoot
241	Petafri	Petasites	frigidus ssp. Palmatus	Palmate-leaved coltsfoot
242	Petasag	Petasites	sagitatus	Arrow-leaved coltsfoot
243	Phalaru	Phalaris	arundinacea	Reed canary-grass
244	Poapal	Poa	palustre	Fowl bluegrass

Reference Number	Short Form	Genus	species	Common Name
245	Poapra	Poa	pratensis	Kentucky bluegrass
246	Polycil	Polygonum	cilinode	Bindweed
247	Polyviv	Polygonum	viviparium	Alpine bistort
248	Poteans	Potentilla	anserina	Silverweed
249	Potegra	Potentilla	gracilis	Graceful cinquefoil
250	Potepal	Potentilla	palustris	Marsh cinquefoil
251	Prenalb	Prenanthes	alba	White lettuce
252	Pteraqu	Pteridium	aquilinum	Bracken fern
253	Pyroasa	Pyrola	asarifolia	Common pink (kidney-leaved) wintergreen
254	Pyromin	Pyrola	minor	Lesser pyrola
255	Pyrosec	Pyrola	secunda (cf. chlorantha)	One-sided wintergreen
256	Pyrospp	Pyrola	spp	Pyrola spp.
257	Pyrouli	Pyrola	uliginosa	Bog wintergreen
258	Pyrovir	Pyrola	virens	Green wintergreen
259	Ranuabo	Ranunculus	abortivus	Small-flowered buttercup
260	Ranucym	Ranunculus	cymbalaria	Shore buttercup
261	Ranulap	Ranunculus	lapponicus	Swamp buttercup
262	Rubucha	Rubus	chamaemorus	Cloudberry
263	Rumeocc	Rumex	occidentalis	Western dock
264	Sagirig	Sagittaria	rigida	Stiff arrowhead
265	Sanimar	Sanicula	marilandica	Snakeroot
266	Schipur	Schizachne	purpurescens	Purple oat-grass
267	Scircae	Scirpus	caespitosus	Tufted bulrush
268	Scutgal	Scutellaria	galericulata	March skullcap
269	Seneere	Senecio	eremophilus	Cut-leaved ragwort
270	Senepau	Senecio	pauperculus	Balsam groundsel
271	Smilrac	Smilacina	racemosa	FALSE Solomon's-seal
272	Smilste	Smilacina	stellaris	Star-flowered FALSE Solomon's-seal
273	Smilspp	Smilax	spp	Cat-brier
274	Solican	Solidago	canadensis	Canada goldenrod
275	Soligra	Solidago	graminifolia	Flat-topped goldenrod
276	Solirug	Solidago	rugosa	Rough-stemmed goldenrod
277	Solispa	Solidago	spathulata	Spike-like goldenrod
278	Stelcal	Stellaria	calycantha	Fleshy stitchwort
279	Stellon	Stellaria	longipes	Long-stalked stitchwort
280	Streamp	Streptopus	amplexifolius	Twisted-stalk

Reference Number	Short Form	Genus	species	Common Name
281	Taraoff	Taraxacum	officinale	Dandelion
282	Thaldas	Thalyctrum	dasycarpum	Tall meadow-rue
283	Thalven	Thalyctrum	venulosum	Veiny meadow-rue
284	Triebor	Trientalis	borealis	Starflower
285	Trifhyb	Trifolium	hybridum	Alsike clover
286	Trifpra	Trifolium	pratense	Red clover
287	Trigmar	Triglochin	maritima	Seaside arrow-grass
288	Trilcer	Trillium	cernuum	Nodding trillium
289	Urtidio	Urtica	dioica	Stinging nettle
290	Viciame	Vicia	americana	Purple vetch
291	Violadu	Viola	adunca	Early blue violet
292	Violcan	Viola	canadensis	Canada violet
293	Violnep	Viola	nephrophylla	Bog violet
294	Violren	Viola	renifolia	Kidney-leaved violet
295	Violspe	Viola	species	Violet spp.
MOSSES & LIVERWORTS				
296	Amblser	Amblystegium	serpens	Moss spp.
297	Amblvar	Amblystegium	varium	Moss spp.
298	Anasmin	Anastrophyllum	minutum	liverwort
299	Aulopal	Aulocomium	palustre	Ribbed bog moss
300	Bracref	Bracythecium	reflexum	Moss spp.
301	Bracspp	Bracythecium	spp	Moss spp.
302	Bracvel	Bracythecium	velutinum	Moss spp.
303	Callgig	Calliergon	giganteum	Giant water moss
304	Callric	Calliergon	richardsonii	Richardson's water moss
305	Callspp	Calliergon	spp	Calliergon spp.
306	Callstr	Calliergon	stramineum	Straw-colored water moss
307	Campste	Campyllium	stellatum	Yellow star moss
308	Cerapur	Ceratodon	purpureus	Purple horn-toothed moss
309	Climden	Climacium	dendroides	Common tree moss
310	Conocon	Conocephalum	conicum	Snake liverwort
311	Cratfil	Cratoneuron	filicinum	Fern moss
312	Dicrdru	Dicranum	drummondii	Moss spp.
313	Dicrfla	Dicranum	flagellare	Whip fork moss
314	Dicrfus	Dicranum	fuscescens	Curly heron's-bill moss
315	Dicrmon	Dicranum	montanum	Lawn moss

Reference Number	Short Form	Genus	species	Common Name
316	Dicrpol	Dicranum	polysetum	Wavy-leaved moss
317	Dicrsco	Dicranum	scoparium	Broom moss
318	Dicrspp	Dicranum	spp	Dicranum spp.
319	Dicrund	Dicranum	undulatum	Wavy bog Dicranum
320	Distcap	Distichium	capillaceum	Erect-fruited iris moss
321	Drepadu	Drepanocladus	aduncus	Common hook moss
322	Drepflu	Drepanocladus	fluitans	Water hook moss
323	Drepspp	Drepanocladus	spp	Hook moss spp.
324	Drepunc	Drepanocladus	uncinatus	Sickle moss
325	Eurhhia	Eurhyncium	hians	Moss spp.
326	Eurhpul	Eurhyncium	pulchellum	Common beaked moss
327	Evermes	Evernia	mesomorpha	Spruce lichen
328	Haplmic	Haplocladium	microphyllum	Moss spp.
329	Hylospl	Hylocomium	splendens	Stair-step moss
330	Hypnlin	Hypnum	lindbergii	Clay pigtail moss
331	Hypnpal	Hypnum	pallescens	Stump pigtail moss
332	Jameaut	Jamesoniella	autumnalis	Liverwort spp.
333	Livespp	Liverwort	spp	Misc. liverworts
334	Marcpol	Marchantia	polymorhpa	Green-tongued liverwort
335	Meestri	Meesia	triquetra	Three-angled thread moss
336	Mniuspi	Mnium	spinulosum	Red-mouthed Mnium
337	Mniuspp	Mnium	spp	Misc. mosses Mnium family
338	Philfon	Philonotis	fontana	Aquatic apple-moss
339	Plagcav	Plagiothecium	cavifolium	Moss spp.
340	Plagcil	Plagiomnium	ciliare	Toothed mnium
341	Plagcus	Plagiomnium	cuspidatum	Woodsy leafy moss
342	Plagden	Plagiothecium	denticulatum	Moss spp.
343	Plagell	Plagiomnium	ellipticum	Marsh magnificent moss
344	Plaglae	Plagiothecium	laetum	Moss spp.
345	Plagmed	Plagiomnium	medium	Common leafy moss
346	Platjun	Platygerium	juniperinum	Juniper flat-brocade moss
347	Platsub	Platygerium	subtile	Common flat-brocade moss
348	Platspp	Platygerium	spp.	Flat-brocade moss spp.
349	Pleusch	Pleurozium	schreberi	Red-stemmed feathermoss
350	Pohlcru	Pohlia	cruda	Moss spp.

Reference Number	Short Form	Genus	species	Common Name
351	Pohlnut	Pohlia	nutans	Copper wire moss
352	Polycom	Polytrichum	commune	Common hair-cap moss
353	Polyjun	Polytrichum	juniperinum	Juniper hair-cap moss
354	Polystr	Polytrichum	strictum	Swamp hair-cap moss
355	Ptilcil	Ptilidium	ciliare	Liverwort spp.
356	Ptilcri	Ptilium	crista-castrensis	Knight's plume moss
357	Ptilpul	Ptilidium	pulcherrimum	Liverwort spp.
358	Pylapol	Pylasiella	polyantha	Aspen moss
359	Rhizpse	Rhizomnium	pseudopunctatum	Felt round moss
360	Rhizpun	Rhizomnium	punctatum	? round moss
361	Rhizste	Rhizomnium	stellare	? round moss
362	Rhodros	Rhodobryum	roseum	Rose moss
363	Rhynser	Rhynchostegium	serrulatum	Moss spp.
364	Rhytrug	Rhytidium	rugosum	Pipecleaner moss
365	Rhyttri	Rhytidiadelphus	triquetrus	Electrified cat's-tail moss
366	Sphaang	Sphagnum	angustifolium	Yellow-green peat moss
367	Sphacap	Sphagnum	capillifolium	Small red peat moss
368	Sphafus	Sphagnum	fuscum	Common brown peat moss
369	Sphagir	Sphagnum	girgensohnii	White-toothed (green star-shaped) peat moss
370	Sphamag	Sphagnum	magellanicum	Midway (red fat-leaved) sphagnum
371	Spharub	Sphagnum	rubellum	Red bog peat moss
372	Spharus	Sphagnum	russowii	Wide-tongued peat moss
373	Sphawul	Sphagnum	wulfianum	Wulf's peat moss
374	Tetrpel	Tetraphis	pellucida	Common four-tooth moss
375	Thuiabi	Thuidium	abietinum	Wiry fern moss
376	Thuirec	Thuidium	recognitum	Hook-leaf fern moss
377	Tomenit	Tomenthypnum	nitens	Golden fuzzy fen moss
378	Tortfra	Tortella	fragilis	Fragile screw moss
LICHENS				
379	Cladmit	Cladina	mitis	Yellow-green lichen
380	Cladran	Cladina	rangiferina	Reindeer lichen
381	Cladste	Cladina	stellaris	Coral lichen
382	Cladcen	Cladonia	cenotea	Misc. small lichens

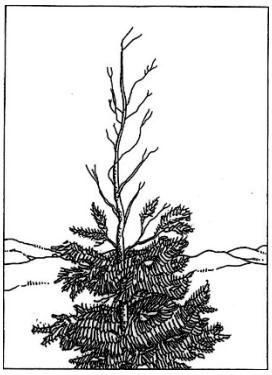
Reference Number	Short Form	Genus	species	Common Name
383	Cladchl	Cladonia	chlorophea	Misc. small lichens
384	Cladcon	Cladonia	coniocrea	Misc. small lichens
385	Cladcor	Cladonia	cornuta	Misc. small lichens
386	Cladspp	Cladonia	spp	Misc. small lichens
387	Cladsul	Cladonia	sulphurina	Misc. small lichens
388	Hypophy	Hypogymnia	physodes	Monk's-hood lichen
389	Parmsul	Parmelia	sulcata	Wax paper lichen
390	Peltaph	Peltigera	aphthosa	Freckle pelt lichen
391	Peltcan	Peltigera	canina	Dog's tooth lichen
392	Peltneo	Peltigera	neopolydactyla	Frog pelt lichen
393	Peltspp	Peltigera	spp	Misc. leafy lichens

Appendix 6: Tree Condition Code Explanations

Further information on codes which are not explained can be found in the following sources:

- A Field Guide to Forest Insects and Diseases of the Prairie Provinces (by Y. Hiratsuka, D.W. Langor, and P.E. Crane).
- Forest Tree Diseases of the Prairie Provinces (by Y. Hiratsuka, 1987).
- Tree and Shrub Insects of the Prairie Provinces (by W.G.H. Ives and H.R. Wong).

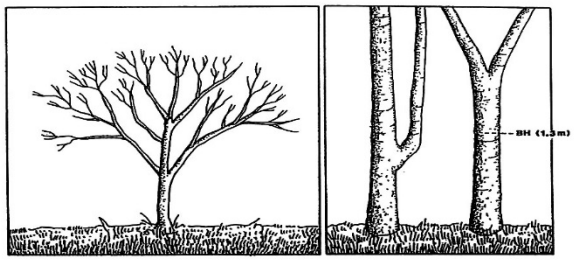
000	HEALTHY – No noticeable defects.
001	STANDING DEAD WITH TOP INTACT – Tree shows no signs of being alive – no green foliage or buds are present. The tree is <u>not</u> broken in the crown or bole. Fill out Wildlife Habitat Values information for this tree.
002	STANDING DEAD AND BROKEN – Tree shows no signs of being alive – no green foliage or buds are present. The tree is broken in the crown or bole (indicate which using the appropriate code). Fill out Wildlife Habitat Values information for this tree.
003	DEAD & DOWN – Tree was previously tagged and measured in the PSP plot but at the present time is now dead and no longer standing. The cause of death must be by natural causes (i.e. windfall, beavers, insects, disease, etc.) rather than cut down.
004	DEAD TOP / DIEBACK – Top is dead (dieback) without any indication of insect or climate (frost) damage.



DEAD TOP / DIEBACK
(Alberta Land & Forest Service, 1997)

005	DIEBACK WITH NEW LEADER – Trees with previous leader damage where a new leader has formed
006	BROKEN TOP – Tree stem has broken off within the crown.
007	BROKEN STEM – Tree stem has broken off below the crown and above breast height (1.3 m).

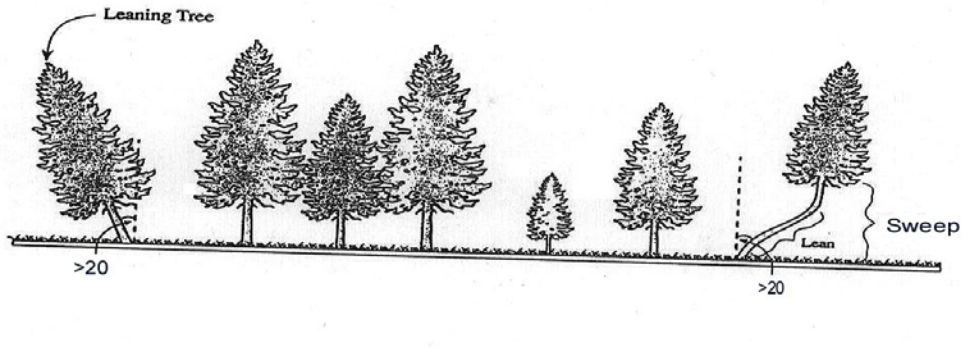
008	MISSING – Tree was previously tagged and measured in the PSP plot but at the present time cannot be located.
009	CUT DOWN – Tree shows evidence of having been cut down by humans.
010	FORKED – Forks usually develop when there is malformation, injury, or death of the terminal leader which results in the presence of two leaders. Forks tend to be V-shaped and will only be recorded when above 1.3 m (DBH level). Forks below this point are recorded as multiple stems (code 021). Natural branching on deciduous trees is not to be recorded.



Natural Branching Fork

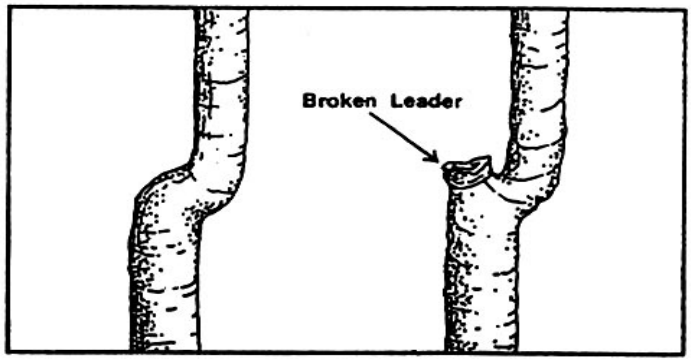
(Alberta Land & Forest Service, 1997)

011	MULTIPLE LEADERS – Tree has more than two leaders present. Only recorded when above 1.3 m (DBH level). Below this point the code "multiple stems" (code 021) is used. Natural branching on deciduous trees is not to be recorded.
012	LEANING – A tree is considered leaning if it is standing greater than 20^{o} off of vertical. If the angle is greater than 45^{o} off of vertical, the tree has a severe lean. Make a note of severe lean in the Comments section when it is present.



LEANING TREE
SWEEP (Alberta Land & Forest Service, 1997)

013	POOR FORM – Tree exhibits a general poor form generally due to previous damage of an indeterminable cause. In the Comments section, describe the tree's appearance.
014	PRONOUNCED CROOK – This condition develops from the death of the terminal leader or the breaking off of a forked leader. When this occurs, a lateral branch takes over apical dominance and results in the formation of a crook.



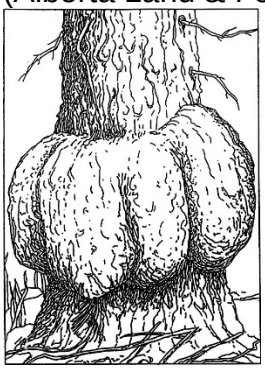
CROOK FORMATION OF CROOk
(Alberta Land & Forest Service, 1997)

015	SWEEP – A sweep or bend is the gradual bowing or curving of the main tree stem.
016	SPIRAL GRAIN – Spiral grain is the twisting of the grain see in exposed wood or in the direction of the bark fissures. Spiralling frost cracks and scars also indicate the presence of spiral grain.
017	FROST CRACK – A frost crack is a deep radial splitting of the trunk caused by uneven shrinkage of the wood after a sudden drop in temperature. The cracks usually start at the base and extend up the trunk. They may be reopened repeatedly by wind stresses or low temperatures.
018	WINDSHAKE – Windshake is a splitting in the wood along the grain or less frequently within an annual growth layer. It is caused by wind or snow stresses and is also known as ringshake.
019	SUCKER FROM OLD STUMP – Refers to stems that fallen down or have been cut-down and have started to sucker. Do not re-use the previous stem number, but assign a new number to each sucker.
020	CAVITIES PRESENT – Tree may be alive or dead but has cavities present which are 2.5 cm in diameter or greater. Fill out Wildlife Habitat Values information for this tree.

021	MULTIPLE STEMS – Used when 2 or more tree stems arise from the same base and can be distinguished above ground level but below DBH.
022	FOLIAGE INSECTS – Used when there is evidence of an insect infestation attacking the foliage of the tree but it cannot be determined what insect is responsible for the damage. If the type of insect attack can be determined more specifically, use the appropriate code to indicate it (Refer to descriptions of codes 117-133 for conifers, 144-153 for broadleafs).
023	FOLIAGE DISEASE – All diseases that infect the foliage of a tree and cannot be narrowed down to a more specific disease code, are documented using this code. Refer to the explanations of codes 71-76 for conifers and 144-153 for broadleafs to determine if a more specific disease code can be determined.
024	STEM INSECTS – Used when there is evidence of an insect infestation attacking the bole of the tree but it cannot be determined what insect is responsible for the damage. If the type of insect attack can be determined more specifically, use the appropriate code to indicate it. (Refer to descriptions of codes 137-140 for conifers, and 138, 157-160 for broadleafs)
025	STEM DISEASE – All diseases that infect the main stem of a tree and cannot be narrowed down to a more specific disease code, are documented using this code. Refer to the explanations of codes 026, 030, 079-086, and 105-110 to determine if a more specific disease code can be determined.
026	CONKS – Conks are woody, shelf-like basidiocarps (fruiting bodies) of wood-rotting fungi. Conks appear most frequently on the underside of dead branch stubs or on the underside of live branches in the crown.
027	OPEN SCAR – Open scars are wounds which have been penetrated through to the cambium. These wounds must not be healed over and may be caused by a variety of reasons such as fire, lightning, old blazing, machinery, animals, etc. Scars are considered to be entry points for decay fungi. Open scars include any scar which has not been healed over and re-covered with bark, regardless of whether the wound is still seeping or not. If the cause of the open scar can be determined, specify the cause using the appropriate code. Be sure not to mistake a stem disease such as atropellis canker for an open scar.
028	CLOSED SCAR – Wounds that had penetrated the cambium but have now healed over and been covered with bark are considered closed scars. A closed scar is characterized by an irregular indentation in the bole of the tree. Before healing over, the scar provided an entry point for disease. If the cause of the closed scar can be determined, specify the cause using the appropriate code.
029	RUBBING BY A FALLEN TREE – Use this code when there is evidence of the tree being rubbed by a fallen neighbouring tree as it was falling to the ground. The tree being documented must have had branches torn

	off or have an open or closed scar present (refer to codes 027 & 028) resulting from the rubbing. Indicate whether an open or closed scar is present using the appropriate code.
030	BURLS & GALLS – Burls are abnormal swellings of the main stem or branches resulting from abnormal wood cell development following disturbance to the cambial layer. Galls are localized trunk and branch swellings of mainly tissue. There is little or no damage to the underlying wood in the formation of a gall. Do not mistake western gall aphid for a gall; it is a foliar insect.

BURL ON A MAIN STEM
(Alberta Land & Forest Services, 1997)



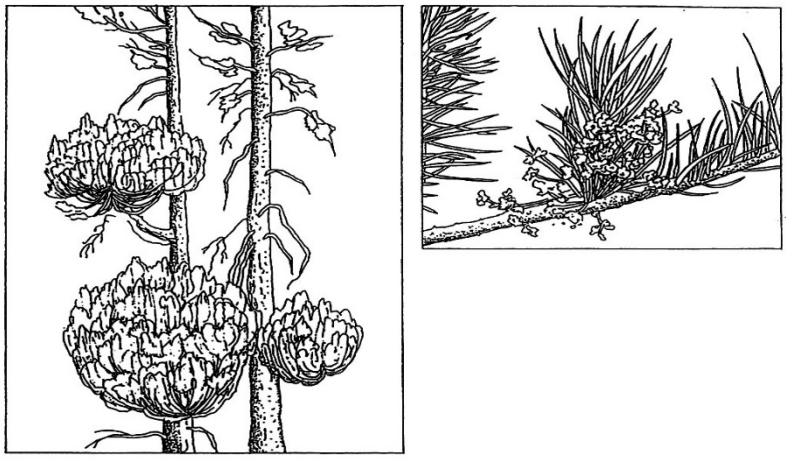
031	LIMBY – A tree is recorded as limby if more than 75% of the tree has live, low sweeping branches.
032	SUPPRESSION – Trees which have been suppressed by the surrounding vegetation for a period of time long enough to damage or kill them. Suppression may result from a severe lack of light, water, nutrients (removed by the competition) or by physical smothering (i.e. heavy grasses the case of seedlings, or very close neighbouring trees or shrubs resulting in the suppression of a sapling's or tree's lateral branches.)
033	NUTRIENT DEFICIENCY – Used when a tree is not receiving sufficient nutrients to remain vigorous, and results in a chlorotic appearance. May be confused with flooding damage.
034	WITCHES' BROOM – A witches' broom is an abnormally bushy, local growth of plant shoots on a tree, characterized by a shortening of the internodes and prolific branching. This code is used to indicate the presence of witches' broom(s) when it is difficult to determine the cause of the broom. Causes of the formation of witches' brooms include dwarf mistletoe, rust infection, and abiotic stress (Use a more specific code if the cause of the witches' broom can be determined – refer to codes 75 & 76).

035	LATERAL DIEBACK – Lateral branches have dieback.

038	FLOODING – Trees damaged or killed by drowning. Look for evidence of high water marks on the tree, or in the immediate area.
039	FIRE DAMAGE – Mortality or damage due to actual burning of the tree or scorching by nearby flames. This code is not to be used when the tree has been damaged by sunscald.
040	SUNSCALD – Sunscald produces a localized injury to the bark and cambium of a tree due to a sudden increase in exposure of a stem or branch to intense sunlight (insolation) and high temperatures.
041	FROST – Frost damage may result in the dieback, browning, reddening, or yellowing of conifer foliage, especially of the young foliage. It can also result in patchy foliage of broadleaf trees.
042	HAIL – Hail damage apparent.
043	WINDTHROW – This code is applied to trees which have been uprooted and have fallen or are in the process of falling to the ground.
044	EROSION – Damage or mortality due to the removal of the trees soil-bed, by the forces of water, wind, or soil slumping.
045	ICE/SNOW ACCUMULATION – This code is applied to trees whose branches have been warped or broken off due to an accumulation of ice or snow.
049	GENERAL ANIMAL DAMAGE – Damage or mortality due to animal activity not specified in codes 50-57. Record a description of the damage in the Comments section.
050	BROWSE – Damage or mortality due to browsing by ungulates, rabbits or other animals. If possible, be more specific in the Comments section (describe the damage). This code excludes damage caused by porcupines, beavers, and squirrels.
051	PORCUPINE BROWSE – Porcupines browse on and debark both softwood and hardwood trees to feed on the inner cambium layer of the bark. Incisor marks do not usually show when they de-bark softwoods, but when they feed on hardwood trees, incisor mark usually run across, or in most cases, at a slight angle to the branch or trunk.
052	SQUIRREL CONE (BRANCH) CLIPPING – The presence of nip twigs below conifer trees often indicates the presence of squirrel activity. The squirrels nip off the tips of conifer branches (4-7” long) to feed on the terminal buds or the cones, and then drop the twigs to the ground.
053	BEAVER DAMAGE - Includes beaver browse and trees felled by beavers. Beavers eat the cambium of trees such as alders, willows, aspens, and cottonwoods, as well as their leaves, buds, and twigs. A standing tree with beaver browse will show signs of gnawing around its base. A tree felled by a beaver may have stout branches and even the trunk completely stripped of bar, with wide incisor marks up to a quarter inch wide.
054	BEAR SCARRING – There are 3 types of bear scarring on trees: (1) Conifer trees with the bark stripped for the cambium and sap underneath. The strip marks are usually low on the tree. (2) Trees used for rubbing which may be either deciduous or coniferous. Rubbing trees

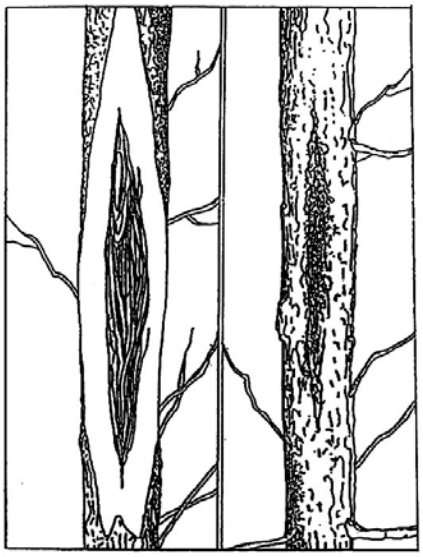
	may be used to relieve itching or to mark scent. Bears will stretch as high as they can to claw and bite the tree, possibly marking their height and dominance. Look for claw marks, with teeth marks just below them. Most markings will be 4 ½ to 6 ½ feet from the ground. (3) Trees that bears climb repeatedly for food. Look for claw marks up the sides of aspens, mountain ash and the smooth bark of some conifers.
055	UNGULATE DEBARKING – May be of 2 types: (1) Incisor scrapes indicated by individual teeth marks scraped in an upward motion or at a slight angle. (2) Antler rubs which have a smoother appearance than incisor scrapes and shows evidence of having been performed in both an upwards and downwards direction.
056	WOODPECKER FEEDING – This code is designed to record feeding cavities made by woodpeckers which are smaller than those that the wildlife cavity codes capture (i.e. <2.5 cm diameter). Do not confuse woodpecker feeding with sapsucker feeding (see below) or with insect feeding which is indicated by the presence of sawdust in, around, or below the hole.
057	YELLOW-BELLIED SAPSUCKER FEEDING – These birds drill rows of holes on the bark of young trees through to the sapwood and visit these trees periodically to lap up the sap that has oozed out of the holes. Holes drilled by the sapsuckers are always arranged in regular patterns.
058	BIRD'S NEST – Indicates that there is a bird's nest located in or on the tree/snag. Include a description of the size and location of the nest in the Comments section. Bald eagle nests are usually by lakes, or on large rivers. The nest is a large, conspicuous structure on a site with a wide view, in a large tree, or on a rocky outcrop. The nest is a massive structure of sticks and branches from 5 – 8 ½ feet across and up to 12 feet high. The great blue heron's nest is found near water and is usually built in tall trees, or sometimes in bushes, on cliff ledges or rock outcrops. The nest is a large flat platform of twigs, thin and small when newly built, added to annually, with a 25-40" diameter.
062	MECHANICAL DAMAGE – Tree has been damaged by some type of physical activity but it cannot be determined whether it was caused by humans, other animals, fallen trees, or some other means. Describe the damage and its location on the tree in the Comments section.
063	MAN – Trees damaged by people either through machinery, tools, or gunshot, etc. Describe the damage and its location on the tree in the Comments section.
064	HERBICIDE – Used when the area has received a recent herbicide treatment. Spruce seedlings exhibit needle loss and/or reddish brown colouration of stems and foliage. Deciduous species exhibit yellowish/brown leaf mottling and dieback of terminal growth. Hexazinone causes reddish brown colouration of conifer foliage and needle loss. Deciduous foliage turns red to black. Glyphosate causes chlorosis especially in new growing shoots. 2,4-D causes rapid growth and spiralling and twisting. If applied during conifer flush, dieback

	similar to frost damage may occur. Often chemical damage will also be indicated by phytotoxicity spotting on exposed foliage.
065	POOR PLANTING – Damage or mortality due to improper placement of nursery stock (hand or mechanical planting). Trees may have been planted too deep, too shallow, too loosely, at too acute of an angle, or in an improper microsite. Specify the source of the problem in the Comments section.
066	J-ROOT – A root that is bent into a J-shape because the seedling was improperly planted in a hole or slit that was too shallow or narrow.
067	MOULDY PLANTING STOCK – Grey mould is found around the root collar and lower branches. This is most commonly found on bare root stock.
071	SNOW MOULD – Snow mould diseases develop during the winter on lower branches of the host trees that are covered by snow for a long time. Affected needles become discoloured and die. The brown to black, felt-like mats of mycelium covering the lower branches of conifers are conspicuous and easily recognized.
76	DWARF MISTLETOE – Refer to pages 84-87 (Hiratsuka *et.al*, 1995).



DWARF MISTLETOE
(Alberta Land & Forest Service, 1997)

080	STEM CANKER – Refer to page 91 (Hiratsuka *et. al*, 1995).



STEM CANKER
(Alberta Land & Forest Service, 1997)

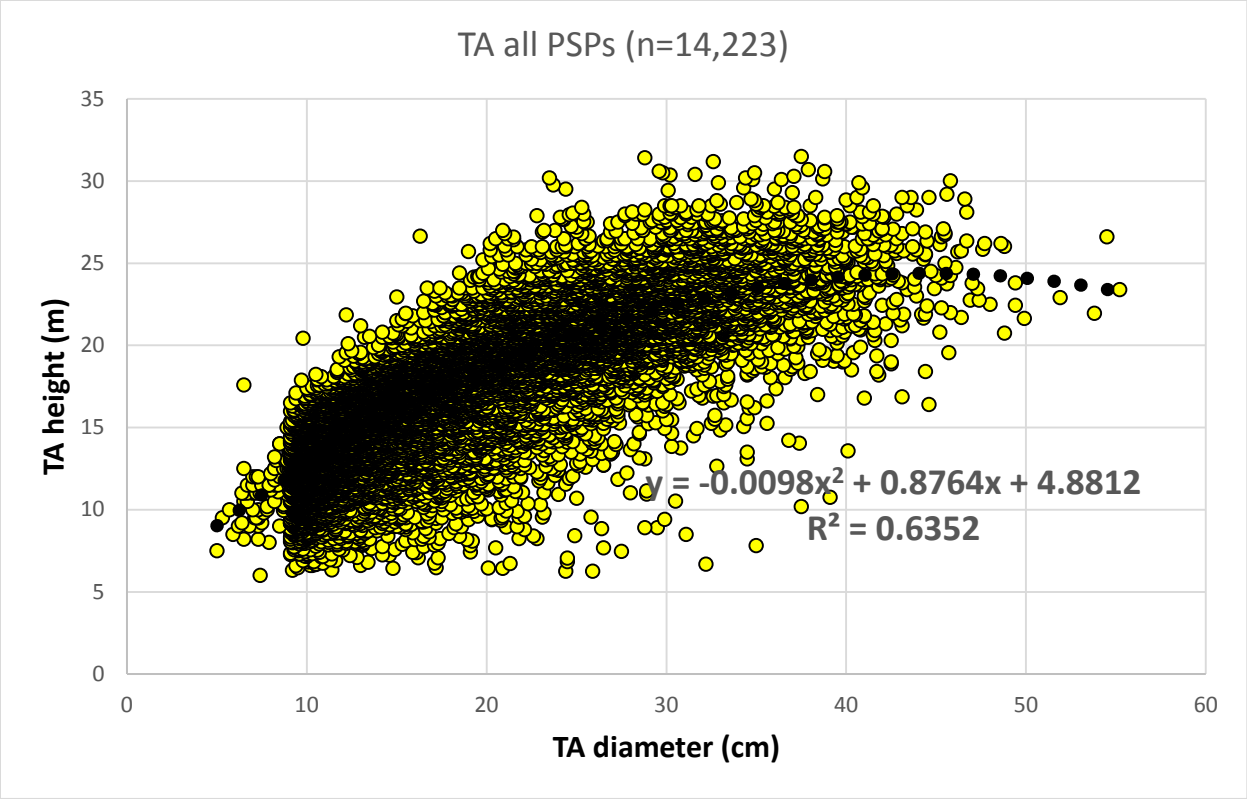
Appendix 7: Height-diameter relationships by species

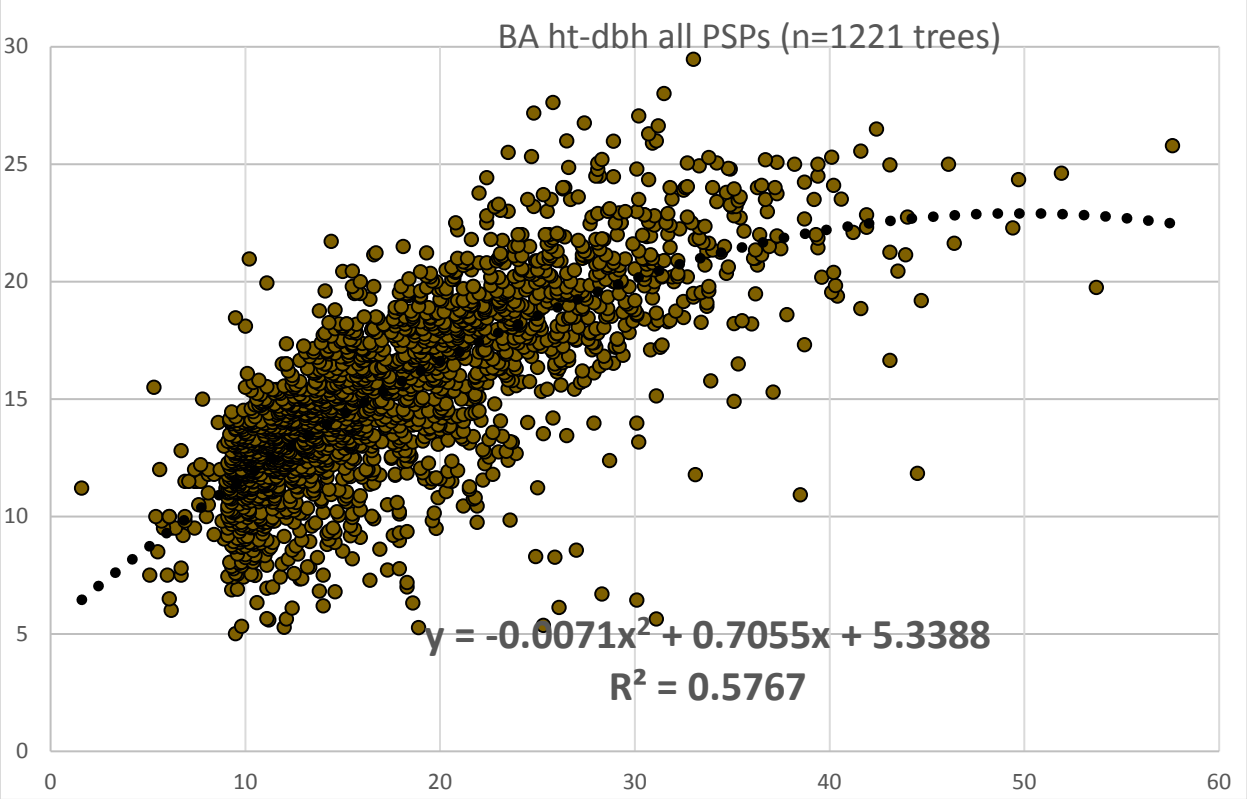
The following is the procedure to calculate the estimated heights for trees not receiving a height measurement (i.e. trees 21 to 40, 61 to 80, etc.). height is estimated based on DBH measurements.

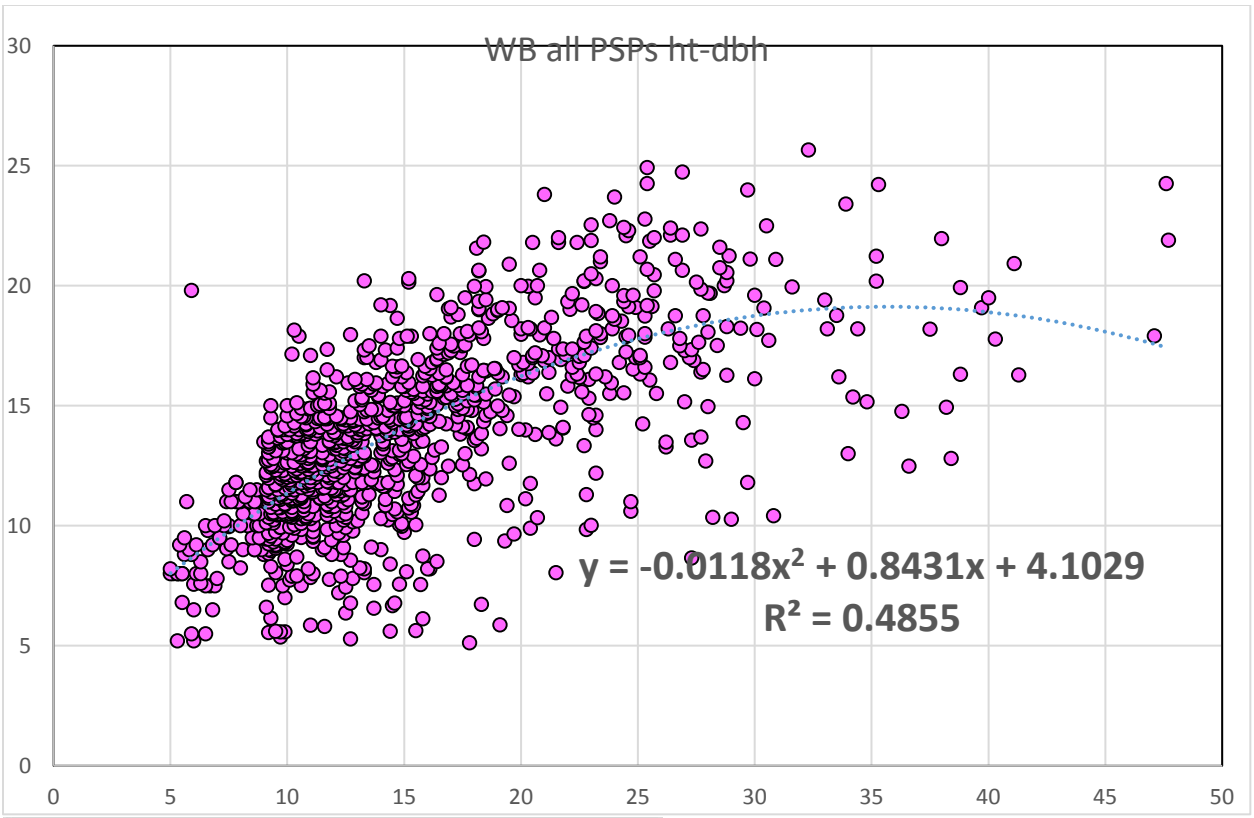
2nd-order polynomial height-diameter for all species

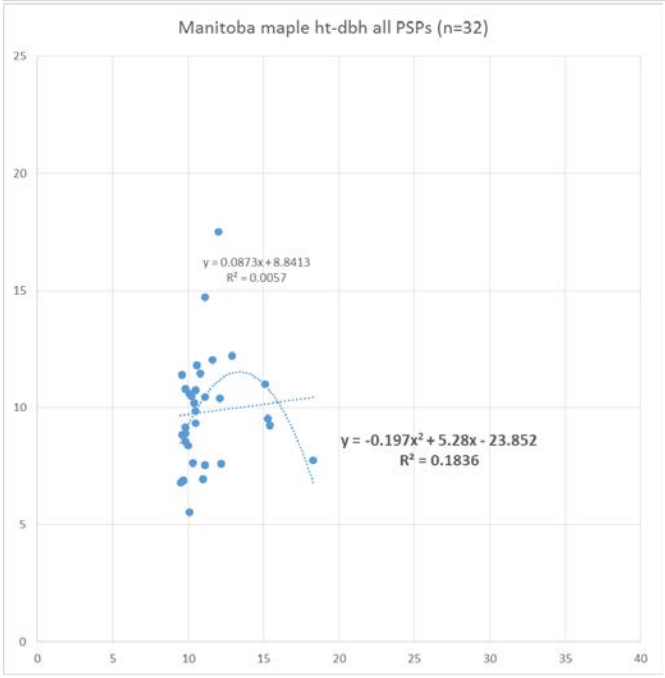
Estimated Height (m) = parameter1 X $(dbh)^2$ + parameter2 X dbh + parameter3

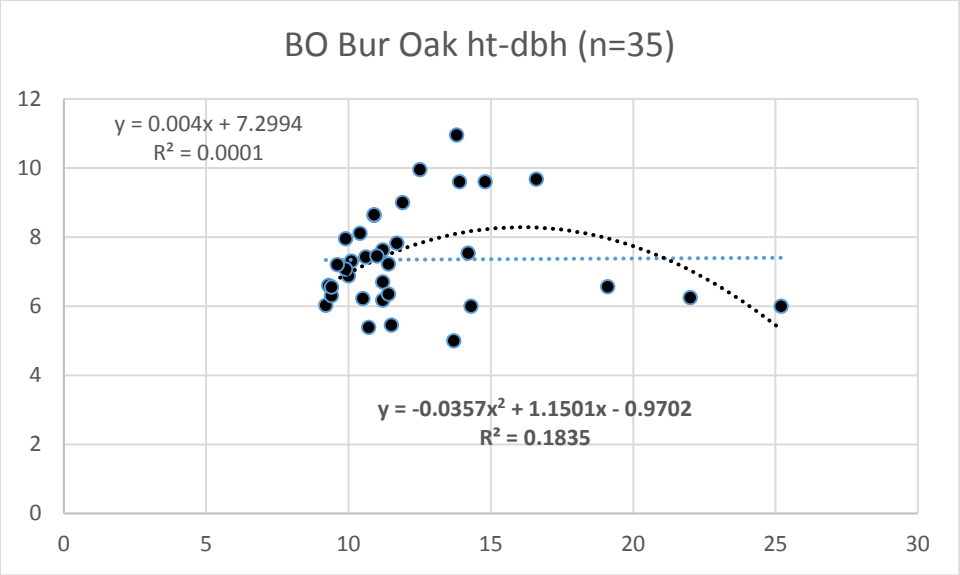
Species	Parameter 1	Parameter 2	Parameter 3	R^2	Sample size (# trees)
TA –trembling aspen	-0.0098	0.8764	4.8812	0.6352	14,223
BA – balsam poplar	-0.0071	0.7055	5.3388	0.5767	1,221
WB – white birch	-0.0118	0.8431	4.1029	0.4855	1,073
MM – Manitoba maple	-0.1970	-5.280	23.852	0.1836	32
BO – bur oak	-0.0357	1.1501	-0.9702	0.1835	35
GA – green ash	-0.0278	1.6914	-6.4840	0.8184	30
WE – white (American) elm	-0.1279	3.1789x	-9.3587	0.8577	7
WS – white spruce	-0.0056	0.7361	2.4803	0.7247	1,904
BS – black spruce	-0.0180	1.2136	-0.7643	0.5716	1,116
JP - jack pine	-0.0111	0.9533	1.4609	0.5703	1,207
BF – balsam fir	-0.0080	0.8351	1.9455	0.6182	389
TL –tamarack/larch	-0.0244	1.4670	- 1.9222	0.6668	100

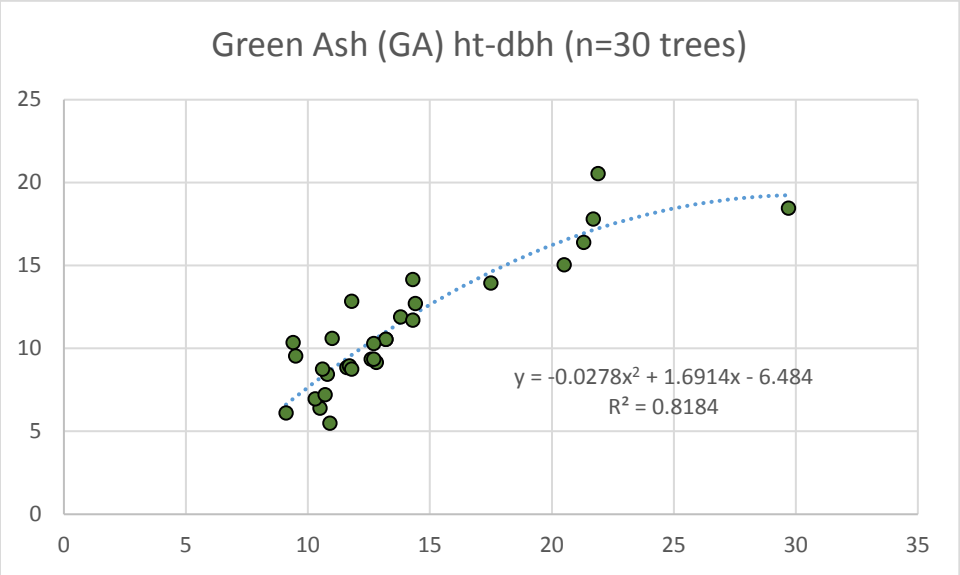

TA all PSPs (n=14,223)
TA height (m)
TA diameter (cm)
y = -0.0098x² + 0.8764x + 4.8812
R² = 0.6352
0
5
10
15
20
25
30
35
0
10
20
30
40
50
60

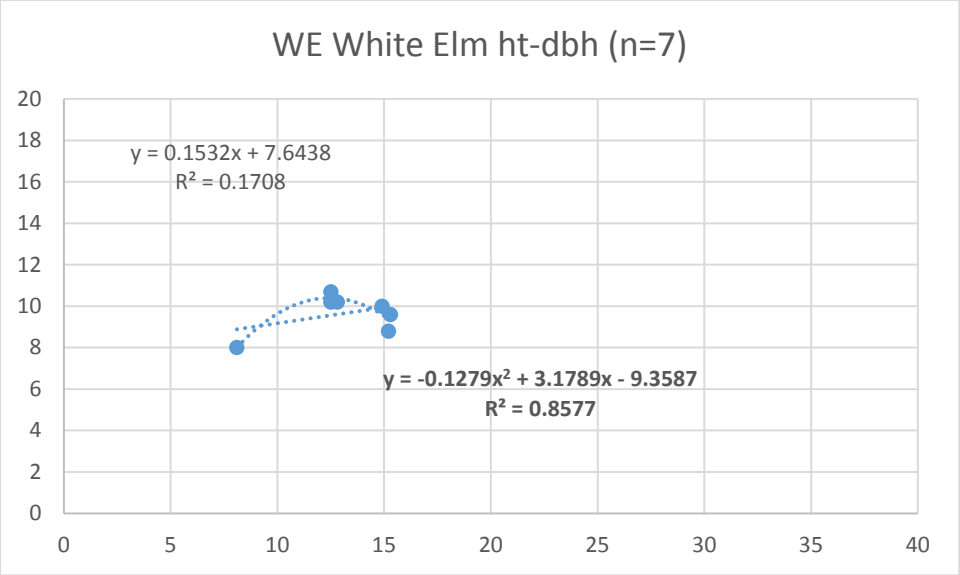

BA ht-dbh all PSPs (n=1221 trees)
y = -0.0071x² + 0.7055x + 5.3388
R² = 0.5767
0
5
10
15
20
25
30
0
10
20
30
40
50
60

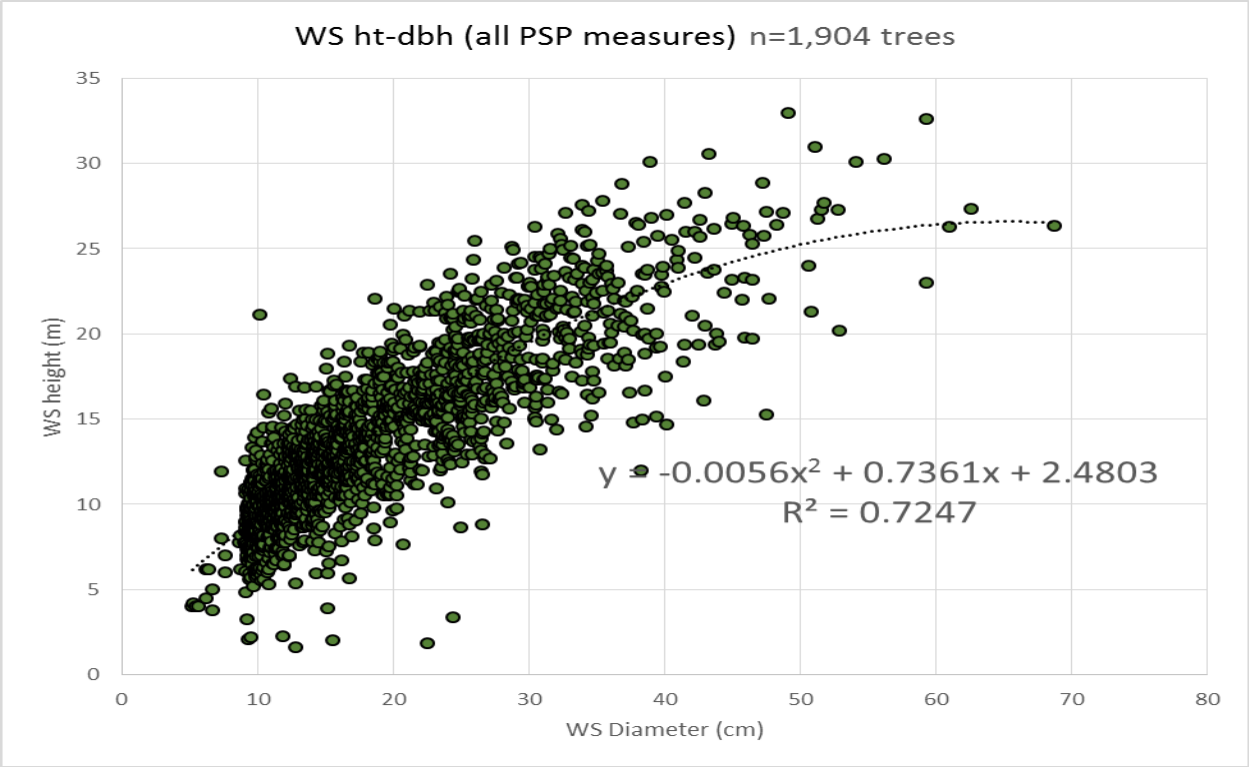

WB all PSPs ht-dbh
y = -0.0118x² + 0.8431x + 4.1029
R² = 0.4855

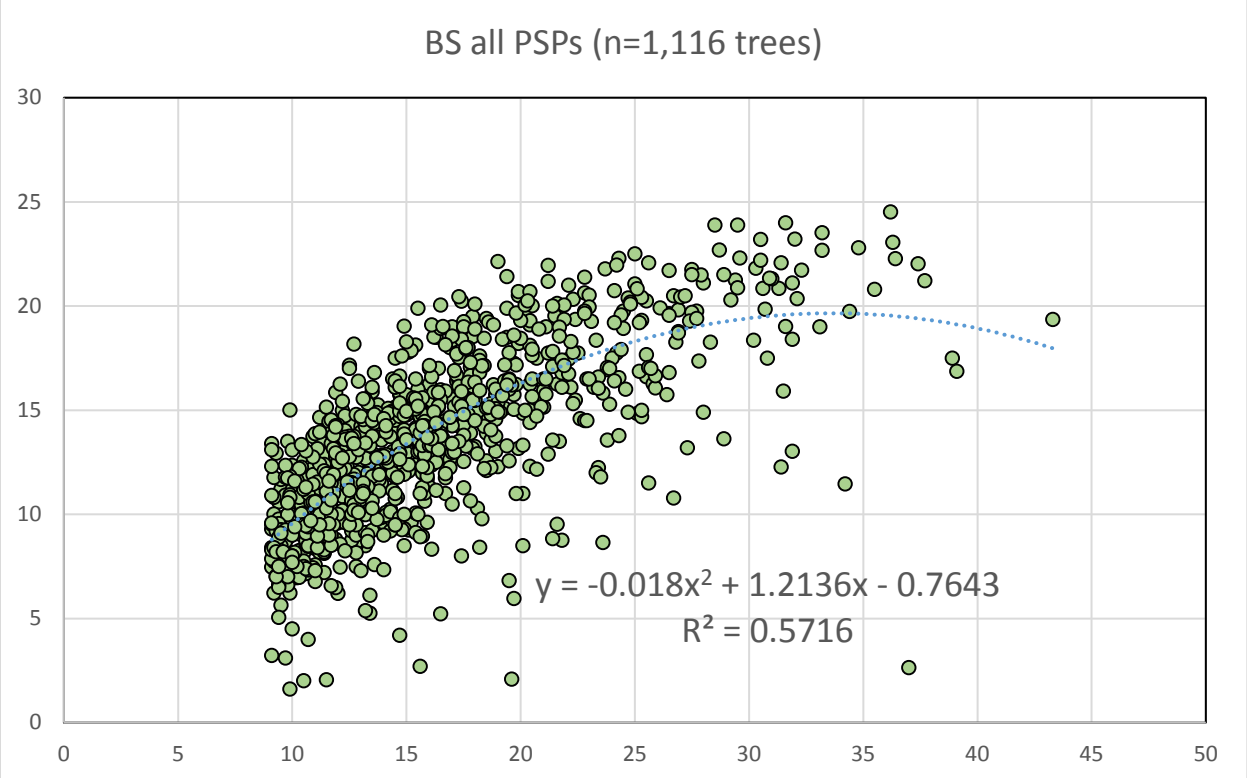

Manitoba maple ht-dbh all PSPs (n=32)
y = 0.0873x + 8.8413
R² = 0.0057
y = -0.197x² + 5.28x - 23.852
R² = 0.1836

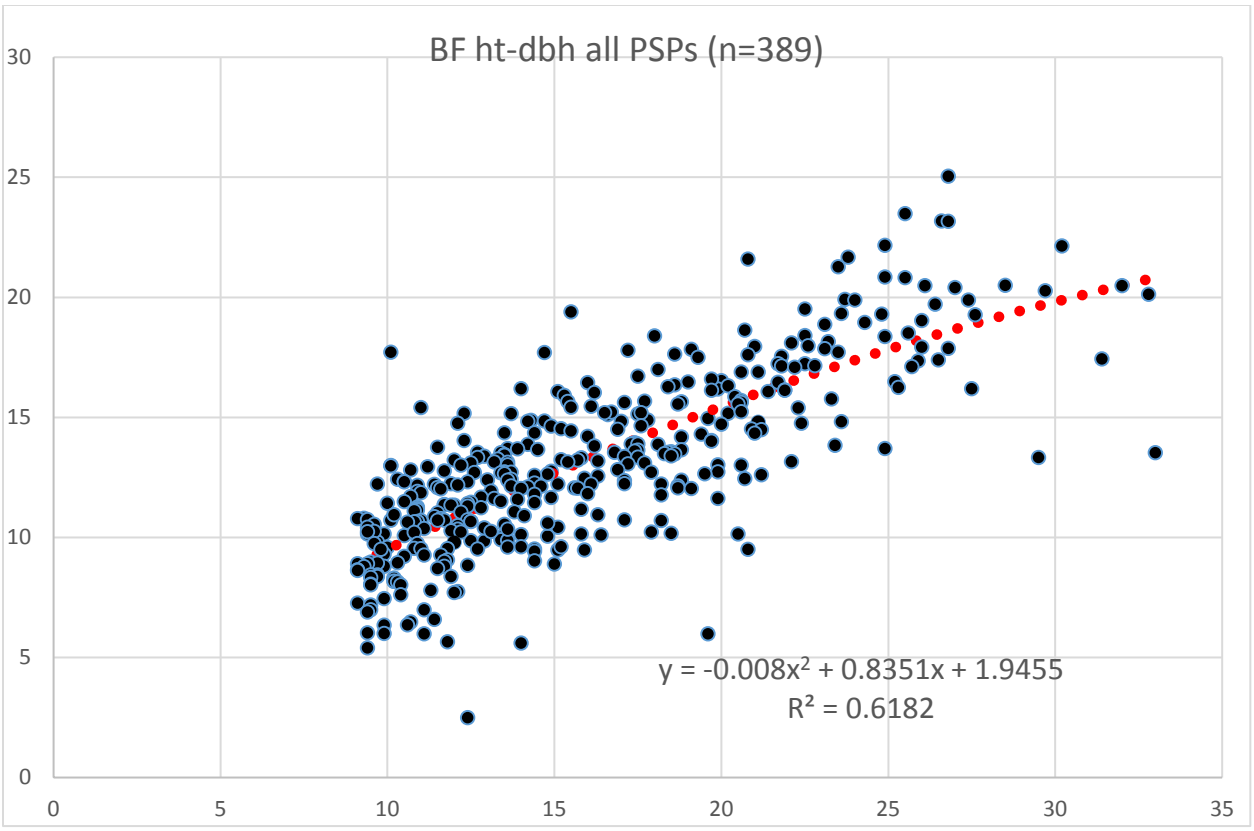

BO Bur Oak ht-dbh (n=35)
y = 0.004x + 7.2994
R² = 0.0001
y = -0.0357x² + 1.1501x - 0.9702
R² = 0.1835
0
2
4
6
8
10
12
0
5
10
15
20
25
30


Green Ash (GA) ht-dbh (n=30 trees)
y = -0.0278x² + 1.6914x - 6.484
R² = 0.8184
0
5
10
15
20
25
0
5
10
15
20
25
30
35


WE White Elm ht-dbh (n=7)
y = 0.1532x + 7.6438
R² = 0.1708
y = -0.1279x² + 3.1789x - 9.3587
R² = 0.8577
20
18
16
14
12
10
8
6
4
2
0
0
5
10
15
20
25
30
35
40


WS ht-dbh (all PSP measures) n=1,904 trees
WS height (m)
WS Diameter (cm)
y = -0.0056x² + 0.7361x + 2.4803
R² = 0.7247


BS all PSPs (n=1,116 trees)
y = -0.018x² + 1.2136x - 0.7643
R² = 0.5716


BF ht-dbh all PSPs (n=389)
y = -0.008x² + 0.8351x + 1.9455
R² = 0.6182
0
5
10
15
20
25
30
35