BLM EcoSurvey
Technical Appendix

Equations, calculations, field & table definitions

Prepared For: Bureau of Land Management
Oregon State Office

Date: May 2021

Submitted By:

D.R. systems inc.
5400 Carillon Point – Builidng 5000 – 4th Floor, Kirkland, WA 98033
Toll free: 1-877-377-9786
Email: info@drsystemsinc.com www.drsystemsinc.com

Table of Contents

Report Quick Reference

Code	Title	Description
	Trees	
T Series	Except for T01, T03, T05 the T reports use only the merchantable plot data from the Tree screen (> min merch dbh)	
T01	Complete Tree List by Plot	Live, Dead, Seedlings, Saplings, Merch. Includes notes.
T01a	Complete Tree List by Plot with User-definable fields **(Report removed** – use "Print comments" checkbox in the lower right corner of the Select Reports window)	Same as above, but with user – definable fields.
T02	Statistics for Trees, Greater than or equal to Merch. Dbh	Statistics by Species for merch trees for TPA, BA, Board Feet, Cubic Feet, VBAR
T03	Plot Summary for all trees, including sub-merch.	Includes dead and live.
T04	Stand Condition Summary - Statistics included in T04s option	Includes damage and undamaged categories for merch trees.
T05	Stand Table by Species - Statistics included in T05s option	Trees included: saplings, live and dead, merch.
T06a	Cut, Leave Summary – Combined Merch - "Statistics included" T06aS option (**Report modified** - use "Print statistics" checkbox in the lower right corner of the Select Reports window)	Trees included: live and dead, merch.
T06b	Cut, Leave Summary, 1" diameter class by live/dead by cut/leave, Merchantable - "Statistics included" in T06bS option (**Report modified** - use "Print statistics" checkbox in the lower right corner of the Select Reports window)	live and dead merch trees. Summary in 1" diam. class by live/dead by cut/leave.
T06c	Cut, Leave Summary, 1" diameter class by cut/leave by live/dead, Merchantable - "Statistics included" in T06cS option (**Report modified** - use "Print statistics" checkbox in the lower right corner of the Select Reports window)	live and dead merch trees greater than or equal to min. snag dbh. Summary in 1" diameter class by cut/leave by live/dead.
T07	Merchantable Tree Plot Summary	Trees included: live and dead, merchantable
T08	Site Tree Summary	Site Trees with measurement attributes and SI determinations
T09	Snag Summary	Trees included: all dead, greater than or equal to min snag dbh. TPA by diameter
T09U	Snag Summary	Includes Unit totals for combined stratum

Code	Title	Description
T10a	Merchantable Tree Ratio Sample Summary	Summary of Height and Age Trees with Sampling Method values: Count, Target and Actual Sample Ratios: Includes Live and Dead Merch. Only Ratio Strata listed
T10b	Merchantable Tree Sample Summary	Summary of Height and Age Ratios with Sampling Method values: with Height and Age Counts.
Regeneration		
R01	Regeneration Tree List	Plot listing for seedlings and saplings by species
R02	Regeneration Stand Summary Statistics	Summary of saplings and seedlings by species and hardwood/conifer stocked/non-stocked categories.
R03	Regen by Stand by Tree Species	Seedlings and saplings by individual species and totals.
Down Woody Material		
D01	Down Woody Material List	Plot listing of down woody material
D02	Down Woody Material Statistics	Summaries and statistics by length categories
D03	Down Woody Material Summary	Per acre summary of hardwood and conifer combined: tons, pieces, volume and length. Down woody material % cover, ROD compliance
Sub Merchantable Trees		
S01	Sub Merchantable SizeTree List	Seedlings and saplings by species by plot – field data sheets
S02	Sub Merch Plot Summary by Species	Seedlings and saplings by species by plot. TPA, Average Ht & Dbh, and BA /Acre with statistics for Sapling and Seedling Totals
Vegetation		
V01	Vegetation List by Physiographic Class by Plot	Plot physiographic attributes Species and attributes by plot
V02	Vegetation Statistics	Species and attribute and % cover summary by stratum
Other		
C01	Comments	Comment Fields – notepad comments for: Unit, Stratum, Plots.
	Compliance Report	The compliance report lists missing and out of range information.

See Table of Contents for page references to more detailed report descriptions. Report Details start on page 102.

Diameter Ranges

One and Two-Inch Diameter ranges are calculated according to the Dillworth Log Scale / Cruise manual.

One Inch diameter ranges (classes)

For dbh (n) falling into range n.6 to (n+1).5, the range/class is n+1 and is a mid-point diameter class.

E.g. 8” range = 7.6 to 8.5 inclusive

9” class = 8.6 to 9.5 inclusive

Two Inch diameter ranges (classes)

For dbh (n) falling into range (n-1).0 to n.9, the range/class is n and is a mid-point diameter class.

E.g. 4” range = 3.0 to 4.9 inclusive

8” range = 7.0 to 8.9 inclusive

Four inch diameter ranges/classes

Dbh from lower range to upper range.The DBH Range/class n is defined as n.0 to (n+3).9 and is a minimum value diameter class.

E.g. 4” class = 4-7” = 4.0” to 7.9”

8” class = 8-11” = 8.0” to 11.9”

Dead Tree Height

In older versions of EcoSurvey, the program was hardwired to show an error when a dead tree was listed as having a broken top but no ht to broken top was given in the data.

The PC and Handheld programs were modified so that if a dead tree is marked with damage code 96 (broken top) then the height to broken top is not collected, and the tree height is used instead. Validations have been removed (in this specific case, no longer check for broken height, no longer validate height vs broken height). Calculations now use the tree height in place of height to broken top, if: tree is dead and damage code is 96.

Tree Volume

Handheld Volumes - EcoSurvey CE

Gross tree volume is determined by Schumacher’s equation. A user definable lookup table of Schumacher’s constants for each tree species code, young, old and “regular” trees can be used to calculate the volume. In this table the “regular” tree constants are used. The table can be modified from in the Administration Menu with in the Full PC program and downloaded to the handheld as part of a Rules.zip file update.

Handheld Volume Equations

The constants calculate Cubic Ft volume using the following Schumacher formula:

Vol = 10^(A + B*log10(dbh) + C*log10(height))

Details on Schumacher's formula can be found on Page 583 of Forestry Handbook of British Columbia, 5th edition, Part 2

The constants A, B, C originated from the Forestry Handbook of B.C. provided by Kim Iles. The default constants (-2.6, 1.8, 1.1) fall in between the known constants. The Admin program automatically appends these default constants to a new record. These constants, can be modified in the PC Program, under the Administration menu, in the "Handheld Volume Constants Table".

The Schumacher table of constants by species can be found later in this guide on page 41.

PC Volumes - BLM EcoSurvey

The EcoSurvey PC program utilizes the NVEL (National Volume Estimator Library) volume equations which were provided by the US Forest Service office in Fort Collins. This library includes equations designated for many BLM districts and regions. Additional information regarding input requirements, reports, and volume equations used in the National Cruise Program is available at the following web site administered by the USDA Forest Service Management Service Center.

E.g. USFS NVEL web site is located at:
https://www.fs.fed.us/forestmanagement/products/measurement/volume/nvel/index.php

Volume Equations Available

The EcoSurvey PC program calculates volume utilizing one volume equation per species. Available volume equations are Flewelling Westside, INGY (Inland Growth & Yield) Eastside, and Behres Hyperbola. The program default for Douglas-fir, Western Red Cedar and Western Hemlock is the Flewelling area wide equation for that species. The program default for all other species is the Behres Hyperbola area wide equation for that species. The volume equation default can only be changed within the Administration section of the PC Program for each species. The EcoSurvey program allows the user to change and save the volume equation for each species within an individual survey unit. These modifications will be used during reporting.

Behres Form Class Calculations

The EcoSurvey report program calculates Form Class for use by the Behres volume equations. The BLM provided default Bark Thickness Ratio and Form Factor for each species. The program uses these defaults for the Form Class calculation. Form Class = Form Factor X Bark Thickness Ratio. The Form Factor and Bark Thickness Ratio defaults can only be changed within the Administration section of the PC Program for each species. The EcoSurvey program allows the user to assign a different FF or BTR for each species for individual units during reporting.

Flewelling and INGY Double Bark Thickness

Flewelling and INGY equation coefficients for Double Bark Thickness (DBT) are internal to the volume equations; there is no equation adjustment for DBT at this time.

The table that describes the Volume Formulas and their coefficients is part of the PC EcoSurvey Administration menu module. A description of the table is found in "Tree Species Volume Equation Parameter Table" and "Tree Species Volume Equation Names".

Stratum Plot Weight

FOREST ECOSURVEY uses weighted plot averages to calculate Merchantable tree Basal Area, Trees per Acre, VBAR/ac and Volume/ac. Plot weight is a multiplication factor depending on the shape of the plot. Both VP and Fixed plots use this weighting for merchantable trees.

Plot Shape	Plot Weight
Full Plot	1
Half Plot	2
Quarter Plot	4

Plot weighting Example:

Assume one tree per plot and 40 BAF prism.

		Plot Averages		Tree Averages	
Plot	**Plot Shape (Weight)**	**Measured BA**	**Weighted BA**	**Measured Height**	**Weighted Height**
1	Full (1)	40	40	125	125
2	Half (2)	40	(2x40) 80	50	50
					(plt2 tree1 again) 50
		Total	**120**		**225**
		Average	**60 (120/2)**		**75 (225/3)**

For plot averages, i.e. per acre values: Multiply the plot value by the plot weight, sum up the individual plot values and divide by the plot count.

For tree averages: Count the trees in half and quarter plots as if there were actually two or four trees instead of one tree. The plot weight is applied to the total tree count. In the above example plot two is a half plot so the 50ft tree height is summed twice and the total tree count is three, although only two trees were measured.

How Plots are weighted when combining strata with different plot sizes.

Combining Stratum/Surveys that have different plot sizes

Plot size has no effect on how surveys are combined because each survey's results are calculated separately into /ac values. Once you have data in /ac the original plot sizes are irrelevant. Each stratum result is weighted by how many acres each plot represents in the stratum. See the Combining Strata section.

Stratum Tree Average Calculations

Calculations of average tree attributes such as DBH, height and height/diameter ratio are weighted by BA (or by TPA if saplings are included). The stratum sample size is the tree count instead of the plot count, i.e. the sample size is the number of trees with height in the stratum instead of the number of plots in the stratum.

Standard Error for Weighted Means within a Stratum

The standard error for weighted means is determined based on the type of weighting used to determine the means themselves. EcoSurvey uses the single-pass equation 5s described in Kevin Ford's notes:

> When calculating the standard error of a weighted mean (e.g., the standard error for the estimate of mean DBH, weighted by the trees per acre) within a stratum, use the following equation from Gatz and Smith (1995) which follows the definition in Cochran (1977):

$$S_{\bar{x}} = \sqrt{\frac{n}{(n-1)(\sum_{i=1}^{n} w_i)^2}\left[\left(\sum_{i=1}^{n}(w_i x_i - \bar{w}\bar{x})^2\right) - 2\bar{x}\left(\sum_{i=1}^{n}(w_i - \bar{w})(w_i x_i - \bar{w}\bar{x})\right) + \bar{x}^2\left(\sum_{i=1}^{n}(w_i - \bar{w})^2\right)\right]} \quad (5)$$

> Where $\bar{x}$ is the weighted mean for the attribute, $S_{\bar{x}}$ is the standard error of the weighted mean for x, x_i is the value of x for the ith measurement (e.g., one DBH measurement), w_i is the weight of the ith measurement (e.g., TPA represented by the measured tree), and n is the sample size (e.g., number of trees measured for DBH). This equation is likely to give the best estimate of the standard error of a weighted mean, though it is imperfect.

> A "single pass" version of Equation 5 (requiring only one pass through the data for any particular variable) is:

$$S_{\bar{x}} = \sqrt{\frac{n}{n-1}\left(\frac{(\sum_{i=1}^{n} w_i{}^2 x_i{}^2)}{(\sum_{i=1}^{n} w_i)^2} - \frac{2(\sum_{i=1}^{n} w_i x_i)(\sum_{i=1}^{n} w_i{}^2 x_i)}{(\sum_{i=1}^{n} w_i)^3} + \frac{(\sum_{i=1}^{n} w_i x_i)^2(\sum_{i=1}^{n} w_i{}^2)}{(\sum_{i=1}^{n} w_i)^4}\right)} \quad (5s)$$

> Equation 5 and 5s are mathematically equivalent.

Stratum per Acre (TPA, BA, Volume, VBAR)

Variable Plot

Basal Area, TPA and VBAR trees are counted by plot, the plots are averaged and statistics are performed on the plot averages.

The plot count for calculating TPA may be different from the plot count for other calculations. The following sampling methods are supported for calculating variable plot TPA:

1. VP1, all plots are measure plots -- NumberOfTpaPlots = total number of plots
2. VP1, both measure and count plots with dbh -- NumberOfTpaPlots = total number of plots
3. VP1, count plots without dbh -- NumberOfTpaPlots = number of measure plots

Dbh must be present in all count plots or it must be absent in all count plots. Having some count plots with dbh and some count plots without dbh will produce an ambiguous NumberOfPlots count due to Non-Stocked plots.

VP TPA

Variable Plot TPA calculations have to account for count trees that do not have dbh.

Note: In EcoSurvey, all merch sized trees and saplings require a DBH. Seedling counts do not and thus should not be included in the computation of birthdates and stand ages for Variable Plot surveys.

Calculate TPA for measure trees as outlined below, calculate Basal Area for all trees and for measure trees as outlined below using count BAF for both count and measure BA, then:

TPA = TPAmeasured * (BAall / BAmeasure)

The above algorithm will work for all variable plot sampling methods (vp1, vp2, ratio).

PlotBA	number of count trees * countBAF
PlotTPA	countBAF / $\pi\left(\frac{dbh}{\frac{2}{12}}\right)^2$
PlotCountWeight	total plotWeight for each count plot
CountPlots	number of count plots

BAavg	sum(plotBA * plotWeight) / plotCountWeight
BA std dev	sqrt(Weighted Standard Error[1])
BA CV%	BAstddev / Baavg
BA_{SE}	BAstddev / sqrt(CountPlots)
$BA_{SE\%}$	BA_{SE} / BAavg
BA #plots for SE 5,10,15 %	($BAcv_{\%}$ /x)^2 note: x = 0.05, 0.10, 0.15

TPAavg	sum(plotTPA * plotWeight) / plotCountWeight * [BAallTrees / BAmeasureTrees]
TPA std dev	sqrt(Weighted Standard Error[1])
TPA CV%	TPAstddev / TPAavg
TPA_{SE}	TPAstddev / sqrt(CountPlots)
TPA SE%	TPA_{SE} / TPAavg
TPA #plots for SE 5,10,15%	($TPAcv_{\%}$ /x)^2 note: x = 0.05, 0.10, 0.15

VBAR Variable Plot Statistics

For VBAR individual tree VBARs are averaged and statistics are performed on this average.

TreeVBAR	TreeVolume / $\left(\frac{dbh}{\frac{2}{12}}\right)^2$ note: area must be feet^2
SampleWeight	total plotWeight for each measure tree
Samples	Number of measure trees
VBARavg weighted	sum(treeVBAR * plotWeight) / sampleWeight

VBAR Statistics

VBARavg weighted	sum(treeVBAR * plotWeight) / sampleWeight
VBAR std dev	sqrt(Weighted Standard Error[1])
VBAR CV%	VBARstddev / VBARavg
$VBAR_{SE}$	VBARstddev / sqrt(Samples)
$VBAR_{SE\%}$	$VBAR_{SE}$ / VBARavg
VBAR #plots for SE 5,10,15%	($VBARcv_{\%}$ /x)^2 note: x = 0.05, 0.10, 0.15

Volume/Acre Variable Plot Statistics

For Volume/ac the statistics are derived from the Basal Area and the VBAR statistics.

VolAcAvg weighted	Baavg * VBARavg
VolAc$_{SE\%}$	sqrt(BA$_{SE\%}$^2 + VBAR$_{SE\%}$^2)
VolAc CV%	VolAc$_{SE\%}$ * sqrt(CountPlots)
VolAc #plots for SE 5%	(VolA$_{cv\%}$ /x)^2 note: x = 0.05, 0.10, 0.15

Fixed Plot

For VBAR, individual tree VBARs are averaged and statistics are performed on this average.

TreeVBAR	TreeVolume / $\left\lvert \left(\frac{dbh}{\frac{2}{12}} \right)^2 \right.$ note: area must be feet^2
TreeWeight	$\left\lvert \left(\frac{dbh}{\frac{2}{12}} \right)^2 \right.$ * plotWeight
SampleCount	number of measure trees
SampleWeight	sum TreeWeight
VBARavg weighted	sum(treeVBAR * treeWeight) / sampleWeight
VBAR std dev	sqrt(Weighted Standard Error[1])
VBAR CV%	VBARstddev / VBARavg
VBAR$_{SE}$	VBARstddev / sqrt(SampleCount)
VBAR$_{SE\%}$	VBAR$_{SE}$ / VBARavg
VBAR #plots for SE 5,10,15 %	(VBAR$_{CV\%}$ /x)^2 note: x = 0.05, 0.10, 0.15

BA, TPA, Vol/Ac Fixed Plot Statistics

Basal Area, TPA and Volume/Ac trees are counted by plot, the plots are averaged and statistics are performed on the plot averages.

Radius Plot Multiple	43,560 / (pi * radius^2) note: plot radius must be feet
Area PlotMultiple	1/plotArea ➔ 43,560 / (plotArea*43560) note:plotArea in acres
SampleCount	number of plots
WeightedCount	sum of plot weights

PlotBA	sum($\left\lvert \left(\frac{dbh}{\frac{2}{12}} \right)^2 \right.$ * plotMultiple)
BAavg weighted	sum(PlotBA * plotWeight) / SampleCount
BA std dev	sqrt(Weighted Standard Error[1])
BA CV%	BAstddev / BAavg
BA$_{SE}$	BAstddev / sqrt(SampleCount)
BA$_{SE\%}$	BA$_{SE}$ / BAavg
BA #plots for SE 5,10,15%	(BA$_{CV\%}$ / x) ^2 note: x = 0.05, 0.10, 0.15

PlotTPA	sum(NumberOfTreesInPlot * plotMultiple)
TPAavg weighted	sum(PlotTPA * plotWeight) / SampleCount
TPA std dev	sqrt(Weighted Standard Error[1])
TPA CV%	TPAstddev / TPAavg
TPA_{SE}	TPAstddev / sqrt(SampleCount)
$TPA_{SE\%}$	TPA_{SE} / TPAavg
TPA #plots for SE 5,10,15%	($TPA_{CV\%}$ / x) ^2 note: x = 0.05, 0.10, 0.15

PlotVolAc	sum(TreeVolume * plotMultiple)
VolAcavg weighted	sum(PlotVolAc * plotWeight) / SampleCount
VolAc std dev	sqrt(Weighted Standard Error[1])
VolAc CV%	VolAcStddev / VolAcAvg
$VolAc_{SE}$	VolAcStddev / sqrt(SampleCount)
$VolAc_{SE\%}$	$VolAc_{SE}$ / VolAcavg
VolAc #plots for SE 5,10,15%	($VolAc_{CV\%}$ / x) ^2 note: x = 0.05, 0.10, 0.15

Other Stratum Tree Calculations

Mean Annual Increment (MAI)

MAI = Net Volume/ac / (BAge +7)

BAge = average breast height age

Quadratic Mean Diameter (QMD)

The quadratic mean diameter within a stratum is estimated using the following equation:

QMD = sqrt(BA / TPA / 0.005454154)

The standard error of QMD is calculated using equation 17 as described in Kevin Ford's notes:

To calculate the standard error of $\hat{q}$, apply Equation 7:

$$S_{\hat{q}} = \sqrt{\left(\frac{\partial \hat{q}}{\partial \hat{g}}\right)^2 (S_{\hat{g}})^2 + \left(\frac{\partial \hat{q}}{\partial \hat{t}}\right)^2 (S_{\hat{t}})^2 + 2\left(\frac{\partial \hat{q}}{\partial \hat{g}}\right)\left(\frac{\partial \hat{q}}{\partial \hat{t}}\right)\left(\frac{S_{gt}}{n}\right)} \quad (16)$$

Where n is the number of plots. It is important to include the term with the covariance of g and t because the estimates of the two variables are mathematically connected and will be strongly correlated since an increase in the number of tallied trees at a plot will necessarily lead to an increase in both variables. The partial derivatives in Equation 16 can be solved as follows:

$$\frac{\partial \hat{q}}{\partial \hat{g}} = \frac{1}{2\sqrt{\hat{t}\hat{g}k}} \quad (17)$$

$$\frac{\partial \hat{q}}{\partial \hat{t}} = \frac{-\sqrt{\hat{g}}}{2\sqrt{k}(\hat{t}^{1.5})} \quad (18)$$

Where variables are as follows:

$\hat{g}$	Basal area per acre
$\hat{t}$	Trees per acre
$\hat{q}$	Quadratic mean diameter
k	A constant, $k = \pi/(24^2)$

Curtis Relative Density (RD)

RD = BA / sqrt(QMD)

Stand Density Index (SDI)[f]

SDI = TPA * $(QMD/10)^{1.605}$

To better manage uneven aged stands starting with the 2011 version of EcoSurvey the X05 report, the Micro*Storms Export, uses the SDI_{SUM}equation described in the following article:

Curtis, R.0.2010. Effects of Diameter Limits and Stand Structure on Relative Density Indices: A Case Study, *Western Journal of Applied Forestry* 25(4):169-175. Equation 3.

Maximum Stand Density Index (MaxSDI)

The SDI value is stored in the species table. Each tree species code has an associated SDI. This value can be modified through FSSPAdmin.

Relative Density Index (RDI)

For individual tree species

RDI = SDI / MaxSDI

A stratum may contain more than one tree species so there is no one Max SDI for a stratum. Therefore, the stratum total Max SDI is calculated using the proportion of each species' MaxSDI relative to the proportion of that species basal area in the stratum.

Stratum Max SDI = Sum (TreeBA / StratumBA * TreeMaxSDI) Stratum

RDI = Stratum SDI / StratumMaxSDI

To better manage uneven aged stands starting with the 2011 version of EcoSurvey the Micro*Storms export and the Stand Metrics export use Curtis RD_{sum} equation described in the following article:

Curtis, R.0.2010. Effects of Diameter Limits and Stand Structure on Relative Density Indices: A Case Study, *Western Journal of Applied Forestry* 25(4):169-175. Equation 4.

Height Diameter Ratio

- uses all "IN" trees with height and diameter values

- Height-diameter ratio $= \frac{height}{dbh/12}$

The SDI equation and the MaxSDI values in the species table were copied from "Stand Density Index" by David R. Larsen, July 11, 2001 http://www.snr.missouri.edu/natr211/pdf/maxsdi.pdf

- Average height-diameter ratio $= \frac{\sum tree.height - diameter\ ratio}{\#\ of\ .trees.with.height\ \&\ diameter}$

Average Crown Width

-uses all "IN" trees with crown with >0

$$= \frac{\sum crown..width}{\#trees.with.crown.width}$$

Total Canopy Cover Percent

Uses plots with total cover value >=0

$$= \frac{\sum plot\ cover}{\#.of.plots}$$

DRC – Diameter Root Collar

The diameter of a tree measured at the ground line or stem root collar,measured outside of the bark. For multi-stemmed western woodland species, a cumulative DRC is used to compute diameter.

DRC is computed as the square root of the sum of the squared stem diameters. For a single-stemmed DRC tree, the computed DRC is equal to the single diameter measured.

The following formula is used to compute DRC:

DRC = SQRT [SUM (stem diameter^2)]

DRC species are identified in the National Species Codes table found under the Administration Menu in the PC program. These species are denoted in the Diameter Type field of the table as "DRC". The EcoSurvey Mobile program allows collection of up to 16 diameter measurements on a multi-stemmed DRC designated tree species. It stores the measurements, computes, and records the calculated DRC in the DBH field.

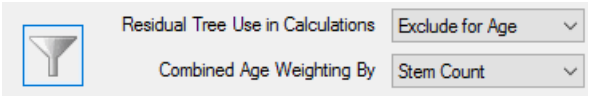
FVS Stand Age Computation details

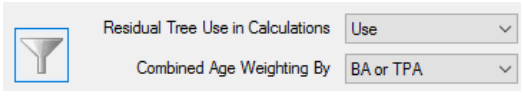
For all age calculations, the following flagged trees are used for calculating tree ages:

- IN/OUT (**Only 'IN'** trees)
- DEAD/LIVE (**Only 'LIVE'** trees)
- RESIDUAL TREE (Use/Exclude – User choice)

When exporting stems for FVS, a combined age value is calculated for the included stem types and written to the FVS_StandInit table. For the age calculation, the user is given the following two options prior to the print report/export process:

1. Use or Exclude the residual tree breast height ages in the data
2. Combine ages by Stem Count or by BA/TPA
    a. when Stem Count is selected, the average age for each stem type is weighted by the total number of stems recorded for that type. Stem Count weighting for Average Stand Age includes all stems in the count regardless of age values being recorded or not.
    b. when BA/TPA is selected, the average age for each stem type is weighted by the BA per acre for the stem type - unless seedlings are included, then each stem type is weighted by TPA. BA weighted Average Stand Age computations for trees and saplings only include stems that have age values.





It is important to note that when Stem Count weighting is selected the stem count will include stems for which no age was recorded and the count for each stem type is determined as follows:

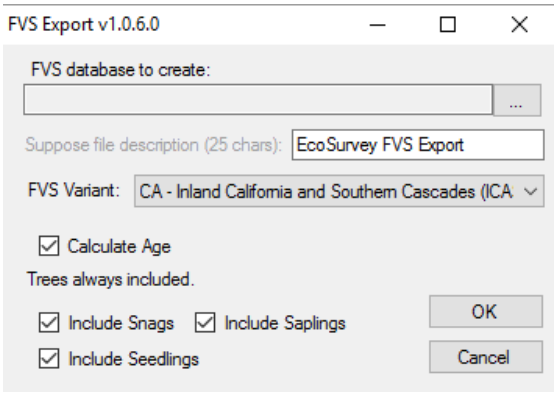
- TREES: A count of all trees marked as Alive (or all trees if report is configured to include snags). Trees flagged as a "Residual" are included unless excluded in the standard report settings.
- SAPLINGS: all saplings
- SEEDLINGS: the sum of all quantity values for all recorded seedlings

When Stem Count is selected the implication is that if the stand has a lot of saplings or seedlings, the formula will weight the age of the stand more heavily toward the younger aged stand components.

When BA/TPA is selected, the average age for each stem type is weighted by the BA per acre for each stem type. The implication is:

- With seedlings NOT included, the formula will weight the age of the stand more heavily toward the larger diameter overstory tree ages.
- With seedlings included, the formula will weight the age of the stand more heavily toward the stand components with higher stems per acre (same as the Stem Count method).

During the initial part of the FVS export, the stand data is validated. The user will need to correct any critical errors before the stand data will export. Once successful, the following dialogue box appears allowing the user to designate the desired FVS variant. It also allows the user to specify which tree/sapling/seedling types to export for the FVS TreeInit table data. This selection determines what types are used for age calculation.



The age calculation uses the following in the formula:

- Residual and Merchantable Trees: Age = breast height (BH) age + 7 years
- Saplings: Age = total age
- Seedlings: Age = total age is specified in the Unit header, a single value is used for all seedlings

The description of the age calculation is as follows:

Initially the Tree, Seedling, and Sapling average ages are determined:

- TREES: the average BH age, of all trees where age>0, the tree is marked as Alive and In.

  Residual trees are included unless excluded by the report config.
- SAPLINGS: the average total age, of all saplings with an age value
- SEEDLINGS: the single value for seedling age specified in the Unit header

Weighting selection is specified in the report configuration. This can be by stem count, or by BA (TPA when seedlings included). If by stem count, the counts are determined as such:

- TREES: all trees marked as Alive (or all trees if report is configured to include snags). Residual trees are included unless excluded by the report configuration.
- SAPLINGS: all saplings
- SEEDLINGS: the sum of all quantity values for all recorded seedlings.

This is the final resulting combined age calculation formula with the value rounded to zero decimal places. Age offset always adds a standard 7 years:

Age = (Tree Weight * (Tree Age + Age Offset) + Sapling Weight * (Sapling Age) + Seedling Weight * Seedling Age) / Sum of Tree, Sapling, and Seedling Weights

The following is an example of all the possible FVS Stand Age results which can be obtained from an individual stand based on the different user designated FVS export settings and inclusion or exclusion the of various tree/sapling/seedling types from stand age data. This demonstrates the multiple number of variations in stand age that could be produced. It is recommended that the user keep things simple when doing and using these age calculations from the exported FVS StandInit table.

Data Set Used for this Example

TreeType	Number of Sampled Trees in Stand	DBH of ALL Trees in Inches (to simplify example)	Stand BA/Ac	Stand TPA (20 BAF for Variable, 1/100 ac Sap/Seed plots)	Number of Trees Sampled or Estimated for Age in Stand	Avg Sampled Age (BH Age for Trees)	Avg Tree Age for Calculation (+7 offset for BH Ages)
Residual	1	40	4	0.5	1	200	207
Tree	40	14	156	146	5	50	57
Sapling	10	3	9.8	200	5	15	15
Seedling	15	0		300	15	5	5

FVS Stand Age Results based on the potential Report Settings and Tree/Sapling/Seedling options selected by the user (Combined weighted avg age results not rounded to see the differences).

SCENARIOS	Avg Tree Age	Avg Tree + Offset	Tree Wt	Weighted Avg Tree Age	Avg Sap Age	Sap Wt	Weighted Avg SapAge	Avg Sdng Age	Seed Wt	Weighted Avg SeedAge	Combined Weighted Avg Age
Exclude Residuals-Stem Count Tree Age Only	50.0	57.0	40.0	2280.0	0.0		0.0	0.0		0.0	57.0
Exclude Residuals-BA or TPA Tree Age Only	50.0	57.0	156.0	8892.0	0.0		0.0	0.0		0.0	57.0
With Residuals-Stem Count Tree Age Only	75.0	82.0	41.0	3362.0	0.0		0.0	0.0		0.0	82.0
With Residuals-BA or TPA Tree Age Only	75.0	82.0	160.0	13120.0	0.0		0.0	0.0		0.0	82.0
Exclude Residuals-Stem Count Tree & Sapling Ages	50.0	57.0	40.0	2280.0	15.0	10.0	150.0	0.0		0.0	48.6
Exclude Residuals-BA or TPA Tree & Sapling Ages	50.0	57.0	156.0	8892.0	15.0	9.8	147.0	0.0		0.0	54.5
With Residuals-Stem Count Tree & Sapling Ages	75.0	82.0	41.0	3362.0	15.0	10.0	150.0	0.0		0.0	68.9
With Residuals-BA or TPA Tree & Sapling Ages	75.0	82.0	160.0	13120.0	15.0	9.8	147.0	0.0		0.0	78.1
Exclude Residuals-Stem Count Tree, Sapling, Seedling Ages	50.0	57.0	40.0	2280.0	15.0	10.0	150.0	5.0	15.0	75.0	38.5
Exclude Residuals-BA or TPA Tree, Sapling, Seedling Ages	50.0	57.0	146.0	8322.0	15.0	200.0	3000.0	5.0	300.0	1500.0	19.8
With Residuals-Stem Count Tree, Sapling, Seedling Ages	75.0	82.0	41.0	3362.0	15.0	10.0	150.0	5.0	15.0	75.0	54.3
With Residuals-BA or TPA Tree, Sapling, Seedling Ages	75.0	82.0	146.5	12013.0	15.0	200.0	3000.0	5.0	300.0	1500.0	25.5

Micro*Storms Birthdate computations

The average age calculations used for birthdate computations in both the MicroStorms Export and for the Entire Stand Description (in the Standard Report Header) uses the following data selection criteria:

- **Trees:** BHAge > 0, CrownLayer not null, Residual flag check (utilize according to User selected Report settings)
- **Saplings:** Age > 0, Layer not null
- **Seedlings:** Seedling Layer not null, SeedlingTotalAge > 0

Note: the birthdate computation routine is not using the “Age Tree” flag a component of its selection criteria.

The stand level birthdate calculation is somewhat similar to the FVS Stand Age calculation and will default to 7 except for a few situations. In some cases, Total Age Adjustment to breast height can be set to a value other than 7 through the Site Index Tables where it is allowed. This adjustment will only occur when that adjusted Site Index table is selected in the unit header.

When combining layer age, it does stem weighting differently – it only uses stems with an age (of trees and saplings) instead of total stems. Additionally, the average age for Tree stem type appears to only factor in whether BHAge > 0, does not look at any tree flags (Age and Site).

In a unit with multiple strata, birthdate data and timber type label information (Entire Stand Description) is only for the first Stratum by Layer. These Stratum data are not combined for the Unit.

Site Index

Site Index is calculated for each site tree that has height and breast height age. The stratum site index is the average of individual tree site indexes. Commonly used site indices for 50- and 100-year site tables and curves are selected in the Unit header.

If the site index table requires total age as opposed to breast height age, the site tree breast height age is adjusted to total age before calculating site index. The age adjustment is located in the Site Index Table and may be customized by site class. The Site Table Reference Chart is found in the section on the following pages and in the T08 Report. The Site Index table used in the Administration program is found on page 92

Site Potential Tree Height

Site potential tree height is based on the *Oregon BLM Instruction Memorandum No. OR-95-75 Determining Site-Potential Tree Height for Initial Riparian Reserve Widths* document. The list of available site index tables for Site Potential Tree Height calculation is listed in the Site Index Table. The Reference Table used to determine Site Potential Tree Height Values is found on page 25.

Site Index Reference and Sources

Site Index is calculated for each site tree that has height and breast height age. The stratum site index is the average of individual tree site indexes. The site index curves for 50 and 100 year site indexes are made in the Unit header. The following table reference is duplicated in the T08 Report description.

The Site Tables used in this program are:

Species denoted by blue type and yellow color = formulas used (see previous pages).

Site Index Tables

			Reference			
Base Years	Age	Species	Source	BLM Invent Manual	Other	Site Potential Tree Ht Table
50	BH	Douglas-fir	King, 1966	Table C		No
50	BH	Douglas-fir	Hann – Scrivani, 1987	Table L	OSU Forest Research Lab Research Bul 59	No
50	BH	Ponderosa Pine	Hann – Scrivani, 1987	Table M	OSU Forest Research Lab Research Bul 59	No
50	Total	White Fir	Schumacher 1926	Table E	U of C, Berkley, Bul 407	Yes
50	Total	Red Fir	Schumacher 1928	None	U of C, Berkley, Bul 456	Yes
20	BH	Red Alder	Harrington & Curtis, 1986	None	USDA PNW Research Paper, PNW-358 April 1986	No
100	Total	Douglas-fir	McArdle, Meyer, Bruce [1]; (Choate, 1958)	None	USDA, Tech Bul 201	Yes
100	Total	Douglas-fir (High Elev)	Curtis, Herman, DeMars, 1974	Table B	Forest Sci. 20:307-316. PNW-378	Yes
100	Total	Ponderosa Pine	Meyer, 1961	None	USDA, Tech Bul 630	Yes
100	BH	Ponderosa Pine, Jeffrey pine, Coulter pine, Bishop pine	Barrett, 1978	None	PNW-232	Yes
100	Total	Western Hemlock	Barnes, 1962[2]	None	USDA, Tech Bul 1273	Yes
100	BH	Noble Fir	Herman, Curtis, Demars 1978	None	PNW-243	Yes
100	Total	Sitka Spruce Western Hemlock	Meyer 1937	None	PNW-544	Yes
50	BH	White Fir, Incense	Dolph 1987	None	PSW 185	No

			Reference			
Base Years	Age	Species	Source	BLM Invent Manual	Other	Site Potential Tree Ht Table
		Cedar, Red Fir, Silver Fir, Mountain Hemlock				
50	Total	Sugar Pine, Ponderosa Pine	Powers and Oliver 1978	None	PSW 128	No
50	Total	Lodgepole Pine, Knobcone Pine, Western Juniper	Dahms 1964	None	PNW 8	No
50	BH	Douglas-fir	Cochran 1979	None	PNW 251	No
50	BH	White Fir, Incense Cedar, Grand Fir, Silver Fir	Cochran 1979	None	PNW 252	No
50	BH	Western Hemlock	Flewelling 1995	None	Unpublished	No
50	Total	Red Alder	Weiskittel 2011	None	Development and Evaluation of Tree-Level Equations …in the Red Alder Plantation Version of ORGANON; David W. Hann and David E. Hibbs, Jan 2011	No
50	BH	Douglas- Fir	Bruce 1981	None	For Sci, 1981 v2 7-4	No

[1] Any version of Bul 201 can be used. Do not use Table A in the BLM Inventory Manual.

[2] Do not use Table D in BLM Inventory Manual.

Site Potential Tree Height Table

Site potential tree height is based on the Oregon BLM Instruction Memorandum No. OR-95-75 Determining Site-Potential Potential Tree Height for Initial Riparian Reserve Widths document. The table below is from OR-95-75 and is all inclusive. Only those site index tables in current use are included in the BLM Eco Survey and found in the Administration portion of the PC program. See page 92.

Tree species and site index	RIPARIAN RESERVE WIDTH										
	100	120	140	160	180	200	220	240	260	280	300
	Site index	Site index	Site index	Site index	Site index	Site index	Site index	Site index	Site index	Site index	Site index
Douglas-fir (McArdle 1961; Choate 1958) low elevation, l00-yr base	< 78	79-94	94-110	111-126	127-142	143-159	160-175	176-191	192-208	n/a	n/a
Douglas-fir (Curtis 1974) high elevation, l00-yr base	< 76	77-91	92-105	106-119	120-134	135-148	149-163	164-177	178-191	192-206	207-220
Western hemlock/Western Redcedar (Barnes 1962) 100-yr base	< 76	77-92	93-106	107-121	122-137	138-151	152-167	168-183	184-198	n/a	n/a
Mountain hemlock (Means 1988) l00-yr base	<64	65-78	79-92	93-106	107-120	121-134	135-148	149-162	163-175	176-189	190-203
Sitka spruce/western hemlock (Meyer 1937) l00-yr base	<65	66-79	80-91	92-104	105-117	118-130	131-143	144-157	158-170	171-183	184-195
Engelmann spruce (Brickell 1965) 50-yr base	< 53	54-64	65-73	74-82	83-09	n/a	n/a	n/a	n/a	n/a	n/a
Ponderosa pine (Meyer 1961) l00-yr base	< 66	67-78	79-90	91-102	103-114	115-126	127-142	143-158	n/a	n/a	n/a
Ponderosa pine (Barrett 1978) l00-yr base	< 91	92-108	109-126	127-144	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Noble fir (Herman 1978) l00-yr base	< 70	71-86	87-102	103-117	118-131	132-145	146-159	160-171	172-183	184-195	196-206
Redwood (Linquist 1963) 100-yr base	< 100	101-120	121-140	141-160	161-180	181-200	201-220	221-240	n/a	n/a	n/a
White fir (Schumacher 1926) 50-yr base	< 69	70-83	84-90	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
White/grand fir (Cochran 1979) 50- yr base	< 64	65-80	81-96	97-112	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Lodgepole pine (Dahms 1975) 50-yr base	< 89	90-109	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Western white pine (Haig 1932) 50-yr base	< 41	42-49	50-58	59-66	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Western larch (Cochran 1985) 50-yr base	< 67	68-81	82-96	97-110	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Combining Merch Tree Plots and Submerch Plots

Certain reports use data from merchantable tree plots and submerch plots. The sampling method and plot size between the two data sets may be different. To calculate the combined totals and statistics first calculate them for each data type, merch and submerch. . Then:

Combined Plot Count	Sum of plots in both data sets
Combined Mean[1] (Weighted Average)	(MerchMean * MerchPlots + SubMean * SubPlots) / (MerchPlots + SubPlots)
Combined Total[2]	(MerchMean + SubMean)
Combined Std Error	Sqrt (merchStdErr^2 + subStdErr^2)
Combined StdErr%	CombinedStdErr / CombinedMean or CombinedStdErr / Combined Total
Combined CV%	CombinedStdErr% * sqrt(CombinedPlotCount)
Combined #plots for SE 5,10,15%	(CombinedCV% / x) ^2 note: x = 0.05, 0.10, 0.15

[1] Fields which are means include: Lorey's Height, Avg. DBH, Avg. 10 yr Growth, Avg. 5yr Growth, Avg. Age, Avg. Crown Ratio, Avg. Crown Width, Avg. Defect%, Height Diameter Ratio, Gross BF VBAR, Net BF VBAR, Gross CF VBAR, NET CF VBAR

[2] Fields which are totals include: TPA, Basal Area, Trees, Gross BF Vol, Not BF Vol, Gross CF Vol, Net CF Vol

Combining Strata Statistics to Unit Statistics

Units are made up of strata, so to calculate unit totals and statistics the strata totals and strata statistics must be combined.

Unit-level Totals and Means, Unit-level Standard Error

Summaries

The method used to combine stratum totals and means is dependent on attribute, as described in Kevin Ford's statistics notes which are included in this section for reference. The multitude of formulas implemented in EcoSurvey can be summarized as follows:

1. Total board foot volume: sum of stratum totals (equation 1 and 38)
2. Indices and per-acre attributes: sum of proportioned means of each stratum (equation 2 and 42)
3. Means weighted by TPA (report includes seedlings): weighted mean, weighted by # of trees in each stratum (equation 3 and 46)
4. Means by basal area (when report does not include seedlings): weighted mean, weighted by total basal area. (equation 4)
5. VBAR: a ratio of stratum volume to basal area. (eq 50)

It follows that the method used to calculate standard error for the combined totals and means also depends on the attribute:

1. For per-acre estimates, use equation 45.
2. For tree level attributes, use equation 47.
3. For VBAR, use equation 51.
4. For Volume, and any other attribute that does not have a specific equation implemented, calculate the square root of the sum of the squares of the stratum standard errors (eq 41). *In older version of ecosurvey this approach was used for error propogation for all attributes*.

The Stratum Standard error is calculated as described in the earlier section on stratum statistics.

Unit-level totals and means

Kevin's Notes follow verbatim:

Some variable definitions

Estimated variable	***Definition***
$\hat{g}$	Basal area per acre
$\hat{t}$	Trees per acre
$\hat{q}$	Quadratic mean diameter
n	Sample size
p_l	Proportion of the unit's area in stratum l
M	Number of strata in the unit
Z	Number of species in a stratum or unit
P	The number of species pairs in a stratum or unit
k	A constant, $k = \pi/(24^2)$
C	A constant, $C = (10^{-1.605})(k^{-0.8025})$

Calculating means and totals for a unit that has multiple strata

The method for combining strata statistics to calculate unit statistics depends on the type of attribute being estimated. For totals (e.g., total board foot volume in the unit), the strata values are summed:

$$\hat{X} = \sum_{l=1}^{M} \hat{X}_l \tag{1}$$

Where $\hat{X}$ is the estimated total value of the attribute for the unit, $\hat{X}_l$ is the estimated total value of the attribute for stratum l and M is the number of strata in the unit.

For unit means by area (e.g., basal area per acre), take the means of the strata weighted by area:

$$\hat{x} = \sum_{l=1}^{M} p_l \hat{x}_l \tag{2}$$

Where $\hat{x}$ is the estimated mean value of the attribute for the unit and $\hat{x}_l$ is the estimated mean value of the attribute for stratum l, and p_l is proportion of unit's area in stratum l.

For means by tree (e.g., mean DBH weighted by TPA), take the means of the strata weighted by the estimated total number of trees in each stratum:

$$\hat{x} = \frac{\sum_{l=1}^{M} \hat{T}_l \hat{x}_l}{\sum_{l=1}^{M} \hat{T}_l} \tag{3}$$

Where $\hat{T}_l$ is the estimated total number of trees in stratum l.

For means by basal area (e.g., Lorey's mean height – mean tree height weighted by basal area per acre), take the means of the strata weighted by the estimated total basal area in each stratum:

$$\hat{x} = \frac{\sum_{l=1}^{M} \hat{G}_l \hat{x}_l}{\sum_{l=1}^{M} \hat{G}_l} \tag{4}$$

Where $\hat{G}_l$ is the estimated total basal area in stratum l.

Unit-level standard errors

Kevin's notes follow verbatim; they reiterate several of the above equations:

Error propagation for unit-level estimates for units with multiple strata

Total volume for a unit composed of multiple strata

The estimated total volume of the unit is the sum of the estimated total volumes for the strata:

$$\hat{V} = \sum_{l=1}^{M} \hat{V}_l \tag{38}$$

Where $\hat{V}$ is the estimated total volume of the unit, $\hat{V}_l$ is the estimated total volume for stratum l. To calculate the standard error for $\hat{V}$, apply Equation 7:

$$S_{\hat{V}} = \sqrt{\left[\sum_{l=1}^{M} \left(\frac{\partial \hat{V}}{\partial \hat{V}_l}\right)^2 \left(S_{\hat{V}_l}\right)^2\right]} \tag{39}$$

The term with the covariance values of the variables in Equation 7 is dropped because estimates of stratum-level total volumes are independent of each other, so the covariance is always 0. The partial derivative of $\hat{V}$ with respect to the estimated total volume in any particular stratum l that is one of the M strata in the unit is:

$$\frac{\partial \hat{V}}{\partial \hat{V}_l} = \frac{\partial}{\partial \hat{V}_l}\left(\sum_{j=1}^{M} \hat{V}_j\right) = 1 \tag{40}$$

Substituting Equation 40 into Equation 39 we get:

$$S_{\hat{V}} = \sqrt{\left[\sum_{l=1}^{M} (1)^2 \left(S_{\hat{V}_l}\right)^2\right]} = \sqrt{\left[\sum_{l=1}^{M} \left(S_{\hat{V}_l}\right)^2\right]} \tag{41}$$

Per acre estimates for a unit with multiple strata

If $\hat{y}_l$ is a per acre estimate for an attribute (e.g., trees per acre, basal area per acre, volume per acre) in stratum l, then the unit-level estimate of y is:

$$\hat{y} = \sum_{l=1}^{M} p_l \hat{y}_l \tag{42}$$

To calculate the standard error of $\hat{y}$, $S_{\hat{y}}$, apply Equation 7:

$$S_{\hat{y}} = \sqrt{\left[\sum_{l=1}^{M} \left(\frac{\partial \hat{y}}{\partial \hat{y}_l}\right)^2 \left(S_{\widehat{y_l}}\right)^2\right]} \tag{43}$$

The term with the covariance values of the variables in Equation 7 is dropped because estimates of stratum-level per acre values are independent of each other, so the covariance is always 0. The partial derivative of $\hat{y}$ with respect to the estimated value of y in any particular stratum l that is one of the M strata in the unit is:

$$\frac{\partial \hat{y}}{\partial \hat{y}_l} = \frac{\partial}{\partial \hat{y}_l}\left(\sum_{j=1}^{M} p_j \hat{y}_j\right) = p_l \tag{44}$$

Substituting Equation 44 into Equation 43, we get:

$$S_{\hat{y}} = \sqrt{\left[\sum_{l=1}^{M} (p_l)^2 \left(S_{\widehat{y_l}}\right)^2\right]} \tag{45}$$

Estimates of tree-level attributes for a unit with multiple strata

If $\hat{y}_l$ is the estimate in stratum l for the mean a tree-level attribute (e.g., DBH) weighted by TPA, then the unit-level estimate for the mean of y weighted by TPA is:

$$\hat{y} = \frac{\sum_{l=1}^{M} \hat{T}_l \hat{y}_l}{\sum_{l=1}^{M} \hat{T}_l} \tag{46}$$

Where $\hat{T}_l$ is the estimated total number of trees in stratum l. The standard error of $\hat{y}$ is:

$$S_{\hat{y}} = \sqrt{\left[\sum_{l=1}^{M}\left(\frac{\partial \hat{y}}{\partial \hat{T}_l}\right)^2 \left(S_{\hat{T}_l}\right)^2 + \left(\frac{\partial \hat{y}}{\partial \hat{y}_l}\right)^2 \left(S_{\hat{y}_l}\right)^2\right]} \quad (47)$$

While T and y may covary within a stratum, I would recommend ignoring this covariance to be consistent with the method commonly used to estimate the standard error of volume per acre (see Equation 10), thus no terms with covariance are included in Equation 47.

The partial derivatives in Equation 47 can be solved as:

$$\frac{\partial \hat{y}}{\partial \hat{T}_l} = \frac{\hat{y}_l\left(\sum_{j=1}^{M}\hat{T}_j\right) - \left(\sum_{j=1}^{M}\hat{T}_j\hat{y}_j\right)}{\left(\sum_{j=1}^{M}\hat{T}_j\right)^2} \quad (48)$$

$$\frac{\partial \hat{y}}{\partial \hat{y}_l} = \frac{\hat{T}_l}{\sum_{j=1}^{M}\hat{T}_j} \quad (49)$$

Estimate of the volume to basal area ratio (VBAR) for a unit with multiple strata

For a unit with multiple strata, the unit-level estimate of VBAR ($\hat{r}$) is:

$$\hat{r} = \frac{\sum_{l=1}^{M}\hat{V}_l}{\sum_{l=1}^{M}\hat{G}_l} \quad (50)$$

Where $\hat{V}_l$and $\hat{G}_l$ are the estimates of total volume and total basal area, respectively, in stratum l.

Applying Equation 7 produces the equation for the standard error:

$$S_{\hat{r}} = \sqrt{\left[\sum_{l=1}^{M}\left(\frac{\partial \hat{r}}{\partial \hat{V}_l}\right)^2 \left(S_{\hat{V}_l}\right)^2 + \left(\frac{\partial \hat{r}}{\partial \hat{G}_l}\right)^2 \left(S_{\hat{G}_l}\right)^2 + 2\left(\frac{\partial \hat{r}}{\partial \hat{V}_l}\right)\left(\frac{\partial \hat{r}}{\partial \hat{G}_l}\right)\left(\frac{S_{V_lG_l}}{n_l}\right)\right]} \quad (51)$$

The partial derivatives in Equation 51 can be solved as:

$$\frac{\partial \hat{r}}{\partial \hat{V}_l} = \frac{1}{\sum_{j=1}^{M}\hat{G}_j} \quad (52)$$

$$\frac{\partial \hat{r}}{\partial \hat{G}_l} = \frac{-\sum_{j=1}^{M}\hat{V}_j}{\left(\sum_{j=1}^{M}\hat{G}_j\right)^2} \quad (53)$$

Estimate of quadratic mean diameter for a unit with multiple strata

For a unit with multiple strata, the estimated quadratic mean diameter for the unit ($\hat{q}$) is:

$$\hat{q} = \sqrt{\frac{\hat{g}}{\hat{t}}\frac{1}{k}} = \sqrt{\left(\frac{\sum_{l=1}^{M}p_l\hat{g}_l}{\sum_{l=1}^{M}p_l\hat{t}_l}\right)\left(\frac{1}{k}\right)} \quad (54)$$

Where $\hat{g}$ and $\hat{t}$ are the estimates of basal area per acre and trees per acre, respectively, for the unit; $\hat{g}_l$ and $\hat{t}_l$ are the estimates of basal area per acre and trees per acre, respectively, for the stratum l.

Applying Equation 7 produces the equation for the standard error:

$$S_{\hat{q}} = \sqrt{\left[\sum_{l=1}^{M}\left(\frac{\partial \hat{q}}{\partial \hat{g}_l}\right)^2 (S_{\hat{g}_l})^2 + \left(\frac{\partial \hat{q}}{\partial \hat{t}_l}\right)^2 (S_{\hat{t}_l})^2 + 2\left(\frac{\partial \hat{q}}{\partial \hat{g}_l}\right)\left(\frac{\partial \hat{q}}{\partial \hat{t}_l}\right)\left(\frac{S_{g_l t_l}}{n_l}\right)\right]} \quad (55)$$

The partial derivatives in Equation 55 can be solved as:

$$\frac{\partial \hat{q}}{\partial \hat{g}_l} = \frac{p_l}{2\sqrt{k}\sqrt{\sum_{j=1}^{M} p_j \hat{g}_j}\sqrt{\sum_{j=1}^{M} p_j \hat{t}_j}} \quad (56)$$

$$\frac{\partial \hat{q}}{\partial \hat{t}_l} = \frac{-p_l\sqrt{\sum_{j=1}^{M} p_j \hat{g}_j}}{2\sqrt{k}\left(\sum_{j=1}^{M} p_j \hat{t}_j\right)^{1.5}} \quad (57)$$

Additional Unit statistics

The CV% for multistratum may not be particularly meaningful in and of itself, however it is used to derive the values for # of plots required for improved standard error.:

Unit StdErr%	StdErr / Mean
Unit CV%	StdErr% * sqrt(PlotCount)
Unit #plots for SE 5,10,15%	(CV% / x) ^2 note: x = 0.05, 0.10, 0.15

Discrepancies between Detail and Stratum Volume

There will be times that the reported sum of the detail volume will exceed the stratum total volume[1]. This behavior is mathematically correct and will occur more often in the occurrences of rare species (species minor in quantity) or in tree groupings having few trees, such as a survey with 500 live trees and 9 dead ones.

However, the tree count for the sum of the detail should be the same as the stratum total. The Forest EcoSurvey program does not add up the individual volumes to derive the stratum totals; rather the stratum totals are derived using the mathematical algorithms as described in the Stratum per Acre section beginning on page 12.

Discrepancies between Individual Strata Statistics and Unit Statistics

Unit statistics can be significantly different from the individual stratum statistics. Unit summary statistics may be significantly different from the individual stratum statistics for the unit. This is due to the fact that unit statistics use the stratum totals as input. The unit statistics sample size is very small -- the number of strata. The small sample set will provide different statistical results compared to the larger number of samples, plots, found in the individual strata.

Ratio Sampling Methodology

How Ratio Sampling works - determination of age or height tree flags

Measure (subsample of count) trees are selected through the use of a random number generator. Measure Trees are flagged either as A (Age), H (Height, V-bar) or both.

The smaller ratio, height or age, is checked on only those trees that meet the larger ratio.

Example1:

Height 50%
Age 25%

Then 50% of trees will be height and 50% of those height trees will be age trees age ratio = ageRatio / heightRatio

So, ht=50, age = 25 then % of ht trees that are also age trees = 25/50 = .5 = 50%. 50% of height trees will be age trees. This is equivalent to 25% of all trees being age trees.

Example 2:
Age 10%
Height 30%

%of Height that is age = 10/30 = .33 = 33% of height trees will be age trees.

[1] An Excel spreadsheet program is available to use for testing data and stratum results. It was created by Dr. Kim Iles and is what D.R. systems used to verify summaries *of Volume, TPA, BA, and statistics.*

Duplication of Stems in the Handheld and PC Application

In both the PC Application and the Handheld application, Tree, Sapling, and Seedling records can be duplicated by the user. On the PC, duplicating a record will copy data from **all** fields from the source to the target, as this is considered an administrative procedure with utility primarily for testing. The Handheld behaves differently, however, as this functionality is geared more towards live field data collection (for example, recording a tree that is similar to the last tree that was just encountered). In this case, there is a restriction on the data that is copied from the source record to the target record. All fields are copied, with the following exceptions dependent on stem type:

Trees

- Site, Height, and Age flags
- Bh Age, Height, 5 and 10 year growth
- Everything from the "more" screen (Form factor, double bark thickness, Height to broken top, custom alpha and numeric)

Saplings

- Everything from the "more" screen (Interfering condition, 5 and 10 year growth, distance 1 and 2, custom alpha and numeric)

Seedlings

- Everything from the "more" screen (Average leader, interfering condition, distance 1 and 2, custom alpha and numeric)

DWM Calculations

Overview of 2020 Changes and Calculations:

In 2020 the application was modified to use a new set of calculations for DWM, which requires the collection of intercept diameter measurements only, excluding the previously required end diameters and length.

Summary of changes associated with the "Intercept Diameter Only" data collection option

- Estimation formulas were changed and the number of required measurements reduced – this Increases estimation accuracy and reduces field work time
- The "overlap" option was removed since it is not utilized by the new formulas
- The FIA algorithms are based on a 3-inch minimum piece diameter at point of transect intersection and a 3-foot minimum piece length.

It was initially recommended that the down woody material pieces and feet per acre estimates be removed, as this "simplifies the software and improves report clarity by removing uninformative metrics". After analysis, it was decided to retain these metrics: "Retain Downed Woody Material Pieces and Feet per Acre fields. They relate/originate from a former land use plan target, but they may still be used for comparison to past reports."

Estimation formulas changed and the number of required measurements reduced

Changing the formulas that EcoSurvey uses to estimate stratum-level down woody material (DWM) metrics (volume per acre, tons per acre, percent cover), gives the BLM more accurate estimates of these metrics with fewer required field measurements, i.e. better results with less field work. Under the previous EcoSurvey protocols, each piece of down woody material (DWM) required measuring intersect diameter, inclination angle, small-end diameter, large-end diameter, and piece length. EcoSurvey uses these measurements to estimate DWM volume per acre, tons per acre, and percent cover. The old equations EcoSurvey used for these metrics produced biased estimates because they assume a specific shape of DWM pieces (frustrum of a paraboloid). The volume equation for DWM pieces that EcoSurvey previously used (Smalian's formula) tends to overestimate volume, and this bias can be substantial (Fraver et al. 2007).

Theoretically, methods using end diameters and length (such as Smalian's formula) should lead to greater precision for a given length of transect sampled compared to Monte Carlo methods, but in practice these differences in precision tend to be small. In an analysis with Forest Inventory and Analysis (FIA) data from Oregon (Monleon 2009) and in an analysis with Current Vegetation Survey (CVS) data from western Oregon BLM-managed land, the extra measurements did not provide any meaningful increase in precision.

With the 2020 enhancement, DWM volume per acre and percent cover is estimated with "Monte Carlo" methods that are unbiased and only require measurement of intersect diameter and inclination angle, resulting in far less time spent on data collection in the field (Kershaw et al. 2017, pg. 403). Tons per acre are calculated based on the estimate of volume per acre from the Monte Carlo formula, as well as the species-specific density values and decay class reduction factors currently used by EcoSurvey. However, these measurements do limit the types of calculations analysts can do (for example, percent cover of pieces greater than some particular length or large-end diameter… however if these field measurements are added then these additional calculations can be made).

This change allows the EcoSurvey software to use the Monte Carlo methods to calculate volume per acre and percent cover, while treating the end diameter and length measurements as optional. This way, bias would be removed from the volume and cover estimates, and the end diameter and length measurements can be dropped for efficiency. But if those end dimeter and length measurements are required for some projects, users will have the option to collect that data and perform additional anaylsis (e.g., calculating the percent cover of DWM pieces greater than 20 feet in length, and a separate calculation for DWM pieces greater than 40 feet in length).

References:

Fraver S, Ringvall A, Jonsson BG. 2007. Refining volume estimates of down woody debris. *Canadian Journal of Forest Research* **37**: 627-633.

Kershaw Jr. JA, Ducey MJ, Beers TW, Husch B. 2017. *Forest Mensuration, 5th edition*. John Wiley & Sons, Chichester, UK, Hoboken, NJ.

Monleon, VJ. 2009. An assessment of the impact of FIA's default assumptions on the estimates of coarse woody debris volume and biomass. In: McWilliams W., Moisen G, Czaplewski R (Comps.) *Forest Inventory and Analysis (FIA) Symposium 2008*. Proceedings RMRS-P-56CD, Rocky Mountain Research Station, USDA Forest Service.

Calculations Supplied by Kevin Ford:

Required and optional measurements

All measurements are the same as the current version of EcoSurvey except that *End1*, *Len*, and *End2* have become optional instead of required, and the overlap option is removed.

Estimating volume per acre

Calculate the cross-sectional area (in square feet) of the DWM piece where the transect intersects the central longitudinal axis of the piece for each piece j at plot i (A_{ij}):

$$A_{ij} = \pi \left(\frac{\left(\frac{d_{ij}}{12}\right)}{2} \right)^2 \quad (1)$$

Where d_{ij} is the intersect diameter (in inches) of piece j at plot i and is the diameter of the DWM piece where the transect intersects the central longitudinal axis of the piece (called *Int* in the EcoSurvey Technical Appendix).

Convert the slope angle of each DWM piece from percent slope to radians:

$$\alpha_{ij} = \arctan\left(\frac{P_{ij}}{100}\right) \quad (2)$$

Where α_{ij} is the slope angle of DWM piece j at plot i in radians. P_{ij} is the percent slope of piece j at plot i and is the slope angle of the DWM piece measured from the horizontal (as a percentage). This value is called *%Slp* in the EcoSurvey Technical Appendix.

Calculate the volume factor for each DWM piece j at plot i (VF_{ij}), which is how much volume of DWM (in cubic feet) per acre that the DWM piece represents:

$$VF_{ij} = \frac{43{,}560\ A_{ij}\ \pi}{2\ T\ \cos(\alpha_{ij})} \quad (3)$$

Where T is the total transect length for a plot (in feet) and includes all segments. This value is called *DWM Transect Tot Length* in the EcoSurvey Technical Appendix. If a transect segment overlaps the stratum boundary, only the parts of the transect segment inside the stratum will be surveyed. However, the value of T will be the same as it would be if all the transect were survey. Certain DWM pieces will be double tallied according to the reflection method to account for the transect overlapping the boundary. Thus, the value of T should be the same for all plots in a stratum.

Calculate the volume of DWM (in cubic feet) per acre for each plot, where there were m_i pieces of DWM tallied in plot i (includes double tallies) and v_i is the volume per acre value for plot i:

$$v_i = \sum_{j=1}^{m_i} VF_{ij} \tag{4}$$

Calculate mean volume of DWM (in cubic feet acre) for the stratum by calculating the mean of the v_i values (unweighted). Calculate the standard error for the volume of DWM (in cubic feet per acre) for the stratum using Equation 5s from the document "EcoSurvey stats notes 2", setting the values of x_i in the equation to v_i and setting all the values of w_i in the equations to 1 (i.e., calculate the unweighted standard error for v_i across all n plots).

Estimating tons per acre

Estimate tons per acre based on the volume per acre, specific gravity, and decay class values as currently done by EcoSurvey, just use the new volume estimates (described above) in place of the current volume estimates.

Estimating percent cover

Calculate the cover factor for each DWM piece j at plot i (CF_{ij}), which is how much cover of DWM (in square feet) per acre that the DWM piece represents:

$$CF_{ij} = \frac{43{,}560\left(\frac{d_{ij}}{12}\right)\pi}{2\,T\cos(\alpha_{ij})} \tag{5}$$

Calculate the cover of DWM (in square feet) per acre for each plot, where there were m_i pieces of DWM tallied in plot i (includes double tallies) and c_i is the cover per acre value for plot i:

$$c_i = \sum_{j=1}^{m_i} CF_{ij} \tag{6}$$

Calculate mean DWM cover (in square feet per acre) for the stratum ($\bar{c}$) by calculating the mean of the c_i values (unweighted). Calculate the standard error for DWM cover (in square feet per acre) for the stratum ($S_{\bar{c}}$) using Equation 5s from the document "EcoSurvey stats notes 2", setting the values of x_i in the equation to c_i and setting all the values of w_i in the equations to 1 (i.e., calculate the unweighted standard error for c_i across all n plots).

Calculate mean percent cover of DWM for the stratum ($\overline{PC}$) as:

$$\overline{PC} = \frac{\bar{c}}{43{,}560} \times 100 \tag{7}$$

Calculate the standard error of the mean for percent cover of DWM ($S_{\overline{PC}}$) as:

$$S_{\overline{PC}} = \frac{S_{\bar{c}}}{43{,}560} \times 100 \tag{8}$$

Calculations as Implemented in EcoSurvey

Values calculated for each piece:

Volume calculation

Piece must have intersect diameter and slope angle.

Constants:

43560 = ft^2 / Acre

PI = 3.14159

62.4 / 2000 = ft^3 volume to tons conversion

SlopeAngle	(ArcTan(DWM slope/100))	
Feet / Ac.	Sqrt(DWM Slope/100 * DWM Slope/100 + 1) / Plot Transect Length * (PI/2) * 43560 note: sqrt(x^2 + 1) yields the same result as 1/cos(arctan(x))	
Pieces / Ac.	**(Feet / Ac**) / (DWM length)	
Cross Sectional Area (CSA)	**((IntersectDiameter/12.0)/2.0)^2 * PI,**	
Volume Factor	**(43560 * CSA* PI) / (2* PlotTransectLength * COS(SlopeAngle))**	
Cover Factor	**(43560 * (Intersect Diameter/12) * PI) /** **(2* PlotTransectLength * COS(SlopeAngle))**	
Vol / Ac.	**LogVolume** * **Pieces / Ac.**	
DCR Determined by decay class	CONIFER	HARDWOOD
	DC1 = 1 DC2 = 0.84 DC3 = 0.71 DC4 = 0.45 DC5 = 0.40	DC1 = 1 DC2 = 0.78 DC3 = 0.45 DC4 = 0.42 DC5 = 0.40
SG (specific gravity)	Defined by species code in the species table	
TonsPerAcreMultiplier	(62.4/2000)***DCR*SG**	
Tons / Ac.	**VolumeFactor** * **TonsPerAcreMultiplier**	

The above equations result in values for the piece as if there was only one transect in the sample.

DWM Stratum/Ac Values

To calculate stratum /ac values divide the DWM piece values by the number of transects. Percent Cover is additionally calculated from the stratum mean DWM cover using the formula shown in the previous section.

References

Guidelines for Measuring DWM:

Harmon, M. E. and J. Sexton, 1996. "Guidelines for measurements of woody detritus in forest ecosystems." U.S. LTER Publication No. 20. Can be found at the following URL –

https://andrewsforest.oregonstate.edu/sites/default/files/lter/pubs/pdf/pub2255.pdf

Values for Specific Gravity for species can be found in the reference:

"Wood Handbook: Wood as an Engineering Material", Forest Products Laboratory, US Department of Agriculture. Agriculture Handbook No.72

Revised August 1974. Library of Congress Catalog Card No. 73-600335.

Values for DCR which are used to determine Tons/Acre can be found in the reference:

Karen L. Waddell; "Sampling Course Woody Debris for Multiple Attributes in Extensive Resource Inventories. USFS Forest Service, PNW Research Station. Printed in Ecological Indicators in 2001, 2002.

Slope Correction

Slope Correction formula was supplied by Dr. Kim Iles of Nanaimo, British Columbia.

Non-Forest Plot / Is Plot / No Plot or - When is a plot not a plot?

Non-Forest Plot / Is Plot / No Plot

The following discussion is intended to describe when a user would identify a plot as either "Non-Forest", "Not Stocked" or "Plot Not Measured". The procedures described below must be followed to ensure that a particular plot is either installed and part of the tally to be used in the calculations or is not installed and not part of the tally and is not used in the calculations. An example is that a user may want to tally down logs on every third plot, therefore, it is imperative that they distinguish between when a transect was installed but nothing was tallied, as opposed to when a transect was not installed. Another example is when a user uses separate count and measure plots and only measures down logs, vegetation, etc. on the measure plots, not on the count plots. A plot will be considered installed and will be used in the calculations if there is data present for that tally item (tree, seedling/sapling, DWM, Veg.) or if one of the "Is XXXX Plot" items are checked - "Is Tree Plot", "Is Regen/Submerch Plot", "Is Vegetation Plot", "Is DWM Plot".

Non Forest Plot

The "Non Forest Plot" designation will be used in the calculations ONLY when a Regeneration Survey is being performed and one of the Regeneration Reports is selected (R01, R02, R03). Using the Non-Forest Plot designation for other survey types has no effect. In other words, none of the other reports use the "Non Forest Plot" designation in their calculations. For further clarification on Regeneration Surveys see the next discussion topic "*Regen Plots landing on non-forest ground".*

Regen Plots landing on non-forest ground

Regen Plots that land on non-forest ground (like a lake or bedrock). In this situation the plot is deemed to be non-forestable and as such the "Non-Forest Plot" checkbox on Plot Header in the handheld – Page 2/6 "Plot Use (stocking)" should be checked. This checkmark means "don't count plot" and as such will not be used in the calculations. If a Plot is marked as "Non ForestPlot", then submerch trees cannot be tallied. And conversely, if saplings or seedlings have been tallied, then a Plot cannot be designated as Non Forest.

> In Summary – Or put it in different terms:
>
> Checking "Non-Forest plot" only affects a regeneration survey. It doesn't mean you cannot check it. In regards to other surveys – it doesn't affect whether the plot is counted. It means for regeneration surveys – "Don't count or don't use plot – it was not installed".
>
> A Checkmark in the plot header "Is Regen/Submerch Plot" means - "Use this empty plot" (the plot was installed, but no data exists):

Is Tree Plot

If the merch tree plot is empty (no trees tallied) and "Is Tree Plot" flag is set, then the merch tree plot was installed but it is not stocked with trees. This plot is included for the plot count for all survey unit calculations.

If the merch tree plot is empty (no trees tallied) and "Is Tree Plot" flag is NOT set, then the merch tree plot is considered not installed. And this plot is not used for the plot count used in survey unit calculations.

Is Regen/SubMerch Plot

If the submerch (regen) tree plot is empty (no seedlings or saplings tallied) and "Is Regen/SubMerch Plot" flag is set, then the submerch tree plot was installed but it is not stocked with submerch trees. This plot is included for the plot count in all survey unit calculations.

If the submerch (regen) tree plot is empty (no seedlings or saplings tallied) and "Is Regen/SubMerch Plot" flag is NOT set, then the submerch tree plot was not installed. This plot is not included for the plot count used in the survey unit calculations.

Is DWM Plot

If the down woody material transect is empty (no logs tallied) and "Is DWM Plot" flag is set, then the down woody material transect was installed but it is not stocked with logs. This transect is included in the total transect length for all Unit and Stratum calculations.

If the down woody material transect is empty (no logs tallied) and "Is DWM Plot" flag is NOT set, then the down woody material transect was not installed. This transect is not included in the total transect length or any Unit and Stratum calculations.

Is Vegetation Plot

If the vegetation plot is empty (no vegetation tallied) and "Is Vegetation Plot" flag is set, then the vegetation plot was installed but it is not stocked with vegetation. This plot is included for the plot count and in all the survey calculations.

If the vegetation plot is empty (no vegetation tallied) and "Is Vegetation Plot" flag is NOT set, then the vegetation plot was not installed. This plot is not included for plot count or used in any of the survey calculations.

Handheld Volumes and Statistics

Handheld Coefficients for Schumacher Equations

This table can be printed from the EcoSurvey PC program via File – Print – Misc – Handheld Volume Constants

HDCP Volume Equations
(Schumacher Constants)

Code	Species Name	Schumacher Equation* Constants A	B	C	Species Type	Micro Storms
ABAM	Pacific Silver Fir	-2.71	1.66	1.20	CONIFER	Yes
ABCO	White Fir	-2.71	1.66	1.20	CONIFER	Yes
ABGR	Grand Fir	-2.71	1.66	1.20	CONIFER	Yes
ABLA	Subalpine Fir	-2.60	1.80	1.10	CONIFER	Yes
ABMA	California Red Fir	-2.71	1.66	1.20	CONIFER	Yes
ABPR	Noble Fir	-2.71	1.66	1.20	CONIFER	Yes
ACCI	Vine Maple	-2.77	1.89	1.12	HARDWOOD	Yes
ACMA3	BigleafMaple	-2.77	1.89	1.12	HARDWOOD	Yes
ALRU2	Red Alder	-2.67	1.92	1.07	HARDWOOD	Yes
ARME	Pacific Madrone	-2.60	1.80	1.10	HARDWOOD	Yes
BEPAC	Western Paper Birch	-2.76	1.91	1.11	HARDWOOD	Yes
CACH6	Golden Chinkapin	-2.60	1.80	1.10	HARDWOOD	Yes
CADE27	Incense Cedar	-2.45	1.74	1.06	CONIFER	Yes
CHLA	Port Orford Cedar	-2.46	1.70	1.07	CONIFER	Yes
CHNO	Alaska Cedar	-2.38	1.68	1.04	CONIFER	Yes
CONU4	Pacific Dogwood	-2.60	1.80	1.10	HARDWOOD	Yes
CRATA	Hawthorn	-2.60	1.80	1.10	HARDWOOD	Yes
CUBA	Modoc Cypress	-2.62	1.85	1.00	CONIFER	Yes
CUPRE	Cypress	-2.62	1.85	1.00	CONIFER	Yes
FROR3	Oregon Ash - Fraxinus	-2.60	1.80	1.10	HARDWOOD	Yes
JUOC	Western Juniper	-2.62	1.85	1.09	CONIFER	Yes
LALY	Subalpine Larch	-2.62	1.85	1.00	CONIFER	Yes
LAOC	Western Larch	-2.62	1.85	1.00	CONIFER	Yes
LIDE3	Tanoak	-2.60	1.80	1.10	HARDWOOD	Yes
LOGC	UKN CON LOG	-2.60	1.80	1.10	CONIFER	
MALUS	Apple	-2.60	1.80	1.10	HARDWOOD	Yes
PIAL	Whitebark Pine	-2.48	1.87	0.99	CONIFER	Yes
PIAT	Knobcone Pine	-2.73	1.91	1.09	CONIFER	Yes
PIBR	Brewer's Spruce	-2.70	1.75	1.65	CONIFER	Yes
PICO	Lodgepole Pine	-2.62	1.85	1.09	CONIFER	Yes
PIEN	Engelmann's Spruce	-2.54	1.84	1.03	CONIFER	Yes
PIFL2	Limber Pine	-2.62	1.85	1.09	CONIFER	Yes

Continued on next page

HDCP Volume Equations
(Schumacher Constants)

Code	Species Name	Schumacher Equation* Constants A	B	C	Species Type	Micro Storms
PIJE	Jeffrey Pine	-2.73	1.91	1.09	CONIFER	Yes
PILA	Sugar Pine	-2.48	1.87	0.99	CONIFER	Yes
PIMO	Pinyon Pine	-2.48	1.87	0.99	CONIFER	Yes
PIMO3	Western White Pine	-2.48	1.87	0.99	CONIFER	Yes
PIPO	Ponderosa Pine	-2.62	1.85	1.09	CONIFER	Yes
PISI	Sitka Spruce	-2.70	1.75	1.16	CONIFER	Yes
POTR5	Quaking Aspen	-2.64	1.95	1.02	HARDWOOD	Yes
PREM	Bitter Cherry	-2.60	1.80	1.10	HARDWOOD	Yes
PSME	Douglas Fir	-2.71	1.66	1.20	CONIFER	Yes
QUCH2	Canyon Live Oak	-2.60	1.80	1.10	HARDWOOD	Yes
QUGA4	Oregon White Oak	-2.60	1.80	1.10	HARDWOOD	Yes
QUKE	California Black Oak	-2.60	1.80	1.10	HARDWOOD	Yes
QULO	California White Oak	-2.60	1.80	1.10	HARDWOOD	Yes
SALIX	Willow	-2.60	1.80	1.10	HARDWOOD	Yes
SESE3	Redwood	-2.71	1.66	1.20	CONIFER	Yes
STUMPC	UKN CON STP	-2.60	1.80	1.10	CONIFER	
TABR2	Pacific Yew	-2.60	1.80	1.10	CONIFER	Yes
THPL	Western Redcedar	-2.38	1.68	1.04	CONIFER	Yes
TREEC	UKN CONIFER	-2.60	1.80	1.10	CONIFER	
TREEH	UKN HARDWD	-2.60	1.80	1.10	HARDWOOD	
TSHE	Western Hemlock	-2.66	1.79	1.12	CONIFER	Yes
TSME	Mountain Hemlock	-2.57	1.97	0.98	CONIFER	Yes
UMCA	California Laurel	-2.60	1.80	1.10	HARDWOOD	Yes
LOGH	UKN HWD LOG	-2.60	1.80	1.10	HARDWOOD	
STUMPH	UKN HWD STP	-2.60	1.80	1.10	HARDWOOD	

*Schumacher equation: Cuft volume= 10^[A + B*log(Dbh) + C*log(Ht)]

Handheld Statistics

BLM EcoSurvey handheld Statistical Calculations

The BLM EcoSurvey handheld performs the following calculations and estimates the total number of plots needed to achieve various levels of confidence for some common stand metrics :

	Weighted Average	***CV %***	***SE %***	***#plots to SE 5%***	***# plots to SE 10%***	***#plots to SE 15%***
Merch BA	yes	yes	yes	yes	yes	yes
Merch TPA	yes	yes	yes	yes	yes	yes
Merch VBAR	yes	yes	yes	yes	yes	yes
Merch gross Vol/ac	yes	yes	yes	yes	yes	yes
Regen TPA	yes	yes	yes	yes	yes	yes

Gross tree volume is determined by Schumacher's equation. A user definable lookup table of Schumacher's constants for each tree species code, young, old and "regular" trees is used to calculate the volume. This table can be modified from the BLM EcoSurvey PC.

The handheld uses weighted averages to calculate Merchantable tree Basal Area, Trees per Acre, VBAR/ac and Volume/ac. Plot weight is a multiplication factor depending on the shape of the plot.

Table Lookups and Codes - Discussion

Embedded Codes - definitions

The following field definitions are embedded (hard-wired) into the BLM PC and handheld software. They are not table driven.

- Canopy Layer
- Crown Class
- Decay Class
- Regeneration Interfering Condition
- Topographic Position

Table Lookup codes

The following fields have lookup tables associated with them. In the handheld and the data entry portion of the PC program the lookup tables are accessed and viewed via the [.] (Period) key when the cursor resides in the field.

The following sections and tables document the Embedded Codes used in the system.

Embedded Codes - Definitions

Canopy Layer

Code	Help	Definition
1	Upper layer	Tree in upper canopy layer
2	Middle layer	Tree in middle canopy layer
3	Lower layer	Tree in lower canopy layer

Crown Class

Code	Help	Definition
1	Open Grown	Open Grown
2	Dominant	Dominant
3	Co-dominant	Co-dominant
4	Intermediate	Intermediate
5	Overtopped	Overtopped
6	Pre-dominant	Pre-dominant (Remnant*)

*Remnant Tree is a Tree Flag independent of the Crown Class designation. Trees flagged as Remnants can readily be excluded, if desired, from Report computations. E.g. the T08 Site Index report should normally not include Remnants.

Decay Class

- for both Snags and Down Woody Material (DWM)

Code	Help	Definition
1	Limbs and Bark	Limbs, bark intact
2	No limbs	Limbs missing
3	No bark	No bark – advanced decay
4	Losing form	Losing form
5	No form	Crumbly – no form

Regeneration Interfering Condition

- used to identify interfering conditions in reforestation survey.

Code	Help	Definition
A	Animals	Animals
D	Debris/Brush	Debris and/or brush
F	Frost	Frost
H	Heat/Drought	Heat and/or draught
L	Inadequate Light	Inadequate light
M	Inadequate Soil	Inadequate soil

S	Soil Movement	Soil and or debris movement
T	High Temperature	High soil temperature
W	Excessive Water	Excessive water

Topographic Position

Code	Help	Definition
1	Top > 120 feet	Ridge or peak >120 feet wide
2	Top < 120 feet	Ridge top or peak <120 feet wide
3	Upper 1/3	Side hill – upper 1/3
4	Middle 1/3	Side hill – middle 1/3
5	Lower 1/3	Side hill – lower 1/3
6	Bottom < 660 feet	Canyon or bottom < 660 feet wide
7	Bench/Terrace	Bench or terrace
8	Broad Flat > 660 feet	Broad flat > 660 feet wide

Table Lookups/Codes

The following tables can be printed in the EcoSurvey PC program via File - Print - Misc

Damage and Severity Codes

			Allowable Severity									
Code	**Abbreviation**	**definition**	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
0	No Damage	No Damage	N	N	N	N	N	N	N	N	N	N
1	BBTL GEN BARK	BARK BEETLES GENERAL	N	Y	Y	Y	Y	Y	N	N	N	N
2	Mt. P beetle	Mountain pine beetle (All Pinus)	N	Y	Y	Y	Y	Y	N	N	N	N
3	DF beetle	Douglas-fir beetle (PSME)	N	Y	Y	Y	Y	Y	N	N	N	N
4	SP beetle	Spruce beetle (Picea spp.)	N	Y	Y	Y	Y	Y	N	N	N	N
5	WP beetle	Western pine beetle (PIPO)	N	Y	Y	Y	Y	Y	N	N	N	N
6	P Eng beetle	Pine engraver (All Pinus spp.)	N	Y	Y	Y	Y	Y	N	N	N	N
7	Fir Eng beetle	Fir engraver (Abies spp.)	N	Y	Y	Y	Y	Y	N	N	N	N
8	SF beetle	Silver fir beetle (ABAM)	N	Y	Y	Y	Y	Y	N	N	N	N
9	Red Tur beetle	Red turpentine beetle All Pinus	N	Y	Y	Y	Y	Y	N	N	N	N
10	GEN DEFOL	DEFOLIATING INSECTS GEN	Y	Y	Y	Y	N	N	N	N	N	N
11	Blk budworm	Western blackheaded budworm	Y	Y	Y	Y	N	N	N	N	N	N
12	Pine butterfly	Pine butterfly	Y	Y	Y	Y	N	N	N	N	N	N
13	DF tussock	Douglas fir tussock moth	Y	Y	Y	Y	N	N	N	N	N	N
14	WL casebearer	Larch casebearer	Y	Y	Y	Y	N	N	N	N	N	N
15	SP budworm	West spruce/Modoc budworm	Y	Y	Y	Y	N	N	N	N	N	N
16	WH looper	Western hemlock looper	Y	Y	Y	Y	N	N	N	N	N	N
17	Sawflies	Sawflies	Y	Y	Y	Y	N	N	N	N	N	N
18	Needle miners	Needle and sheath miners	Y	Y	Y	Y	N	N	N	N	N	N
19	Gypsy moth	Gypsy moth	Y	Y	Y	Y	N	N	N	N	N	N
20	GEN INSECT	INSECTS - OTHER GENERAL	N	Y	Y	N	N	N	N	N	N	N
21	Shoot moth	Shoot moths	N	Y	Y	N	N	N	N	N	N	N
22	Weevil	Weevils	N	Y	Y	N	N	N	N	N	N	N
23	Wood borers	Wood borers	N	Y	Y	N	N	N	N	N	N	N
24	Balsam Adelgid	Balsam woolly adelgid	N	Y	Y	N	N	N	N	N	N	N
25	Sitka S weevil	Sitka Spruce terminal beetle	N	Y	Y	N	N	N	N	N	N	N
26	Jeffery P beetle	Jeffery Pine beetle	N	Y	Y	Y	Y	Y	N	N	N	N
30	MISTLETOE	MISTLETOE (dwarf and leafy)	N	Y	Y	Y	Y	Y	Y	Y	Y	N
31	OAK DEATH	SUDDEN OAK DEATH	N	Y	Y	Y	N	N	N	N	N	N
32	PITCH CANKER	PITCH CANKER (Pinus)	N	Y	Y	Y	Y	N	N	N	N	N
33	DIPLODIA	DIPOLDIA BLIGHT	N	Y	Y	N	N	N	N	N	N	N
36	WP BLISTER R	WHITE PINE BLISTER RUST	N	Y	Y	Y	N	N	N	N	N	N
40	GEN CANKER	STEM CANKER - GENERAL	N	Y	Y	N	N	N	N	N	N	N
41	West gall rust	Western gall rust	N	Y	Y	N	N	N	N	N	N	N
42	Comandra rust	Comandra blister rust	N	Y	Y	N	N	N	N	N	N	N
43	Stalactiform R	Stalactiform rust	N	Y	Y	N	N	N	N	N	N	N
44	Atropellis R	Atropellis canker	N	Y	Y	N	N	N	N	N	N	N
45	Phomopsis	Cytospora/Phomopsis	N	Y	Y	N	N	N	N	N	N	N
46	GEN STEM	STEM DECAY GENERAL	N	Y	Y	Y	Y	N	N	N	N	N
47	Red ring rot	Red ring rot	N	Y	Y	Y	Y	N	N	N	N	N
48	Indian paint rot	Indian paint rot	N	Y	Y	Y	Y	N	N	N	N	N
49	Brown cube rot	Brown cubical butt rot	N	Y	Y	Y	Y	N	N	N	N	N
50	Suppression	Suppression	Y	N	N	N	N	N	N	N	N	N
51	Ex Deformed Sap	Excessively deformed sapling	Y	N	N	N	N	N	N	N	N	N
55	GEN FOLIAR	FOLIAR DISEASE GENERAL	N	Y	Y	N	N	N	N	N	N	N
56	Rhabdocline	Rhabdocline (only PSME)	N	Y	Y	N	N	N	N	N	N	N
57	Elytroderma	Elytroderma (only PIPO)	N	Y	Y	N	N	N	N	N	N	N
58	Broom rust	Broom rusts (only Abies, Picea)	N	Y	Y	N	N	N	N	N	N	N
59	Swiss needle	Swiss needle cast (only PSME)	N	Y	Y	N	N	N	N	N	N	N
60	GEN ROOT	ROOT DISEASE GENERAL	N	Y	Y	N	N	N	N	N	N	N
61	Annosus root	Annosus root disease	N	Y	Y	N	N	N	N	N	N	N
62	Armillaria root	Armillaria root disease	N	Y	Y	N	N	N	N	N	N	N
63	Black stain	Black stain root disease	N	Y	Y	N	N	N	N	N	N	N
65	Laminated rot	Laminated root rot	N	Y	Y	N	N	N	N	N	N	N
66	Port Orford	Port-Orford-cedar root disease	N	Y	Y	N	N	N	N	N	N	N
70	GEN ANIMAL	ANIMAL PHYSICAL GENERAL	N	Y	Y	N	N	N	N	N	N	N
71	Mtn beaver	Mountain beaver	N	Y	Y	N	N	N	N	N	N	N
72	Livestock	Livestock	N	Y	Y	N	N	N	N	N	N	N
73	Deer or elk	Deer or elk	N	Y	Y	N	N	N	N	N	N	N
74	Porcupines	Porcupines	N	Y	Y	N	N	N	N	N	N	N

75	Rodent/rabbit	Pocket gophers, squirrels, mice, voles, rabbits, hares	N	Y	Y	N	N	N	N	N	N	N
76	Beaver	Beaver	N	Y	Y	N	N	N	N	N	N	N
77	Bear	Bear	N	Y	Y	N	N	N	N	N	N	N
78	Human	Human (not logging)	N	Y	Y	N	N	N	N	N	N	N
80	GEN WEATHER	WEATHER PHYSICAL GEN	N	Y	Y	N	N	N	N	N	N	N
81	Wind break	Windthrow or wind breakage	N	Y	Y	N	N	N	N	N	N	N
82	Snow or ice	Snow / ice bending or breakage	N	Y	Y	N	N	N	N	N	N	N
83	Frost damage	Frost damage on shoots	N	Y	Y	N	N	N	N	N	N	N
84	Desiccation	Winter desiccation	N	Y	Y	N	N	N	N	N	N	N
85	Drought	Drought/heat moisture deficient	N	Y	Y	N	N	N	N	N	N	N
86	Sun scald	Sun scald	N	Y	Y	N	N	N	N	N	N	N
87	Lightning	Lightning strike	N	Y	Y	N	N	N	N	N	N	N
90	GEN DAMAGE	OTHER PHYSICAL DAMAGE	N	Y	Y	N	N	N	N	N	N	N
91	Logging	Logging	N	Y	Y	N	N	N	N	N	N	N
92	Fire	Fire: basal scars or heat	N	Y	Y	N	N	N	N	N	N	N
93	Bad plant	Bad stock planting	N	Y	Y	N	N	N	N	N	N	N
94	Air pollution	Air pollution or other chemicals	N	Y	Y	N	N	N	N	N	N	N
95	GEN DEFECT	OTHER PHYSICAL DEFECT	Y	N	N	N	N	N	N	N	N	N
96	Broken top	Broken/missing top	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
97	Dead top	Dead top	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
98	FrkTpCrookLeanSwp	Forked Top, Crook, Lean/Sweep	Y	N	N	N	N	N	N	N	N	N
99	Checks cracks	Checks/bole cracks	Y	N	N	N	N	N	N	N	N	N

Key/Indicator (Tree &Plant) Species Table

Symbol (TransCode)	MicroStorms Name	Common Name (SpeciesName)	Scientific Name	Species Type Id C=conifer H=hardwood blank=vegetation	Diameter @ Root Collar (DRC)
ABAB70		Mountain deathcamas	Abiryinslls abietina		
ABAM	A	Pacific silver fir	Abies amabilis (Douglas ex Loudon) Douglas ex Forbes	C	
ABBR	BF	bristlecone fir	Abies bracteata (D. Don) D. Don ex Poit.	C	
ABCO	WF	white fir	Abies concolor (Gord. & Glend.) Lindl. ex Hildebr.	C	
ABGR	GF	grand fir	Abies grandis (Douglas ex D. Don) Lindl.	C	
ABLA	AF	Subalpine Fir	Abies lasiocarpa (Hook.) Nutt.	C	
ABLA2		coastal sand verbena	Abronia latifolia Eschsch.		
ABLAA	CKF	corkbark fir	Abies lasiocarpa (Hook.) Nutt. var. arizonica (Merriam) Lemmon	C	
ABLAL	AFL	Subalpine Fir	Abies lasiocarpa var. lasiocarpa (Hook.) Nutt.	C	
ABMA	CF	California red fir	Abies magnifica A. Murray bis	C	
ABPR	NF	noble fir	Abies procera Rehder	C	
ABSH	SF	Shasta red fir	Abies magnifica A. Murray bis var. shastensis Lemmon	C	
ABUMB		pink sand verbena	Abronia umbellata Lam. ssp. breviflora (Standl.) Munz		
ACACI		Acacia spp	Acacia L.		
ACCI		vine maple	Acer circinatum Pursh		
ACDE2		larkspurlf monkshood	Aconitum delphiniifolium DC.		
ACGL		Rocky Mountain maple	Acer glabrum Torr.		X
ACGLD4		Douglas maple	Acer glabrum Torr. var. douglasii (Hook.) Dippel		
ACGR		Catclaw Acacia	Acacia greggii		
ACGR3		Bigtooth Maple	Acer grandidentatum Nutt.	H	X
ACHIL		yarrow	Achillea L.		
ACHY		Indian Ricegrass	Achnatherum hymenoides (Roemer & J.A. Schultes) Ba		
ACMA3	M	bigleaf maple	Acer macrophyllum Pursh	H	

ACMI		Western Yarrow	Achillea millefolium var. occidentalis		
ACMI2		common yarrow	Achillea millefolium L.		
ACMIB		Boreal yarrow	Achillea millefolium ssp. borealis		
ACNE2	BE	boxelder	Acer negundo L.	H	
ACONI		Monkshood Sp	Aconitum		
ACRU2		red baneberry	Actaea rubra (Aiton) Willd.		
ACTR		sweet after death	Achlys triphylla (Sm.) DC.		
ADBI		American trailplant	Adenocaulon bicolor Hook.		
ADPE		northern maidenhair	Adiantum pedatum L.		
AECA	BUC	California buckeye	Aesculus californica (Spach) Nutt.	H	
AGCA5		Colonial bentgrass	Agrostis capillaris		
AGCR		Crested Wheatgrass	Agropyron cristatum x A. desertorum		
AGEX		spike bentgrass	Agrostis exarata Trin.		
AGME3		Northern bentgrass	Agrostis mertensii		
AGROS2		Agrostis Sp	Agrostis		
AGSC5		Rough bentgrass	Agrostis scabra		
AGSM		Western Wheatgrass	Agropyron smithii Rydb.		
AGST2		Red Top	Agrostis stolonifera L.		
AIHO		Pacific hairgrass	Aira caryophyllea var. caryophyllea		
ALCR6		mountain alder	Alnus crispa (Aiton) Pursh		
ALECT3		Witch's hair lichen	Alectoria		
ALINT		thinleaf alder	Alnus incana (L.) Moench ssp. tenuifolia (Nutt.) Breitung		
ALINTT		Thinleaf alder	Alnus incana ssp. tenuifolia		
ALNUS		alder	Alnus Mill.		
ALOB2	AL	Arizona alder	Alnus oblongifolia Torr.	H	
ALPR3		pratensis meadow foxtail	Alopecurus pratensis		
ALRH2	WA	white alder	Alnus rhombifolia Nutt.	H	
ALRU2	RA	red alder	Alnus rubra Bong.	H	
ALVI5		Green Alder	Alnus viridis	H	
ALVIF		Siberian alder	Alnus viridis (Chaix) DC. ssp. fruticosa (Rupr.) Nyman		

ALVIS		Sitka alder	Alnus viridis (Chaix) DC. ssp. sinuata (Regel) Á. Löve & D. Löve		
AMAL		Prostrate Pigweed	Amaranthus albus L.		
AMAL2		Saskatoon serviceberry	Amelanchier alnifolia (Nutt.) Nutt. ex M. Roem.		
AMALA		Saskatoon serviceberry	Amelanchier alnifolia (Nutt.) Nutt. ex M. Roem. var. alnifolia		
AMAR4		European beachgrass	Ammophila arenaria (L.) Link		
AMCH4		silver bur ragweed	Ambrosia chamissonis (Less.) Greene		
AMELA		Serviceberry	Amelanchier Medik.		
AMRO		roundleaf orchid	Amerorchis rotundifolia (Banks ex Pursh) Hult,n		
AMUT		Utah Serviceberry	Amelanchier utahensis Koehne		
ANAL4		Alpine pussytoes	Antennaria alpina		
ANCH		SweetflwrRockjasmine	Androsace chamaejasme		
ANDE3		Columbian windflower	Anemone deltoidea Hook.		
ANDRO		Andromeda Sp	Andromeda		
ANEMO		anemone	Anemone L.		
ANGE2		Kneeling Angelica	Angelica genuflexa		
ANGEL		Angelica Sp	Angelica		
ANLU		seacoast angelica	Angelica lucida L.		
ANMA		W pearly everlasting	Anaphalis margaritacea		
ANME2		Rocky Mtn pussytoes	Antennaria media		
ANMO9		Pygmy Pussytoes	Antennaria monocephala		
ANMOA3		Alpine Sweetgrass	Anthoxanthum monticola ssp. alpinum		
ANNA		Narcissus Anemone	Anemone narcissiflora		
ANOR		blue windflower	Anemone oregana A. Gray		
ANPA		Narcissus Anemone	Anemone parviflora		
ANPI		Piper's anemone	Anemone piperi Britt. ex Rydb.		
ANPO		bog rosemary	Andromeda polifolia L.		
ANRI		Yellow thimbleweed	Anemone richardsonii		
ANTEN		pussytoes	Antennaria Gaertn.		
APAN2		spreading dogbane	Apocynum androsaemifolium L.		

AQFO		western columbine	Aquilegia formosa Fisch. ex DC.		
AQUIL		Columbine Sp	Aquilegia		
ARABI2		Rockcress	Arabis		
ARAL2		alpine bearberry	Arctostaphylos alpina (L.) Spreng.		
ARAL60		Alpine arthr. lichen	Arthrorhaphis alpina		
ARANA2		narrowleaf arnica	Arnica angustifolia ssp. attenuata		
ARAR2	AMA	Arizona madrone	Arbutus arizonica (A. Gray) Sarg.	H	
ARAR8		little sagebrush	Artemisia arbuscula Nutt.		
ARAR9		Boreal sagebrush	Artemisia arctica		
ARCA13		silver sagebrush	Artemisia cana Pursh		
ARCA2		California spikenard	Aralia californica S. Watson		
ARCA5		hoary manzanita	Arctostaphylos canescens Eastw.		
ARCO3		hairy manzanita	Arctostaphylos columbiana Piper		
ARCO9		heartleaf arnica	Arnica cordifolia Hook.		
ARCTA		Polargrass	Arctagrostis		
ARCTO3		manzanita	Arctostaphylos Adans.		
ARDI2		Spreadingpod rckcrss	Arabis divaricarpa		
ARDIA		Bride's feathers	Aruncus dioicus var. acuminatus		
ARFR2		snow arnica	Arnica frigida C.A. Mey. ex Iljin		
ARFR4		Prairie sagewort	Artemisia frigida		
ARFU2		Pendantgrass	Arctophila fulva		
ARKI		King's sandwort	Arenaria kingii (S. Watson) M.E. Jones		
ARLA2		Wideleaf polargrass	Arctagrostis latifolia		
ARLA8		broadleaf arnica	Arnica latifolia Bong.		
ARME	MA	Pacific madrone	Arbutus menziesii Pursh	H	
ARNE		pinemat manzanita	Arctostaphylos nevadensis A. Gray		
ARNIC		arnica	Arnica L.		
ARNU		Nuttall's rockcress	Arabis nuttallii B.L. Rob.		
ARPA6		greenleaf manzanita	Arctostaphylos patula Greene		
ARRI2		scabland sagebrush	Artemisia rigida (Nutt.) A. Gray		

ARRU		red fruit bearberry	Arctostaphylos rubra (Rehder & Wilson) Fernald		
ARTEM		sagebrush	Artemisia L.		
ARTEMF		Field sagewort	Artemisia		
ARTIT		Tilesius' wormwood	Artemisia tilesii ssp. tilesii		
ARTR2		big sagebrush	Artemisia tridentata Nutt.		
ARTRV		mountain big sagebrush	Artemisia tridentata ssp. vaseyana (Rydb.) Beetle		
ARUNC		Aruncus Sp	Aruncus		
ARUV		kinnikinnick	Arctostaphylos uva-ursi (L.) Spreng.		
ARVI4		sticky whiteleaf manzanita	Arctostaphylos viscida Parry		
ARVU		Common Wormwood	Artemisia vulgaris L.		
ASAL3		alpine aster	Aster alpinus L.		
ASAL7		Alpine milkvetch	Austragulus alpinus L.		
ASAU4		Indian milkvetch	Astragalus australis		
ASCA2		British Columbia wildginger	Asarum caudatum Lindl.		
ASCH60		Golden asahinea lich	Asahinea chrysantha		
ASDE6		Indian's dream	Aspidotis densa (Brack.) Lellinger		
ASEU2		Elegant milkvetch	Astragalus eucosmus		
ASTER		aster	Aster L.		
ASTRA		milkvetch	Astragalus L.		
ASUM2		Tundra Milkvetch	Astragalus umbellatus		
ATAM		Alpine ladyfern	Athyrium americanum		
ATCA2		Fourwing saltbush	Atriplex canescens (Pursh) Nutt.		
ATCO		Shadscale	Atriplex confertifolia		
ATFI		common ladyfern	Athyrium filix-femina (L.) Roth		
ATHYR		Lady Fern	Athyrium		
AULAC2		aulacomnm moss	Aulacomnium		
AUPA70		Aulacomnium moss	Aulacomnium palustre		
AUTU70		Turgid aulacomnm mss	Aulacomnium turgidum		
BACA3		Carey's balsamroot	Balsamorhiza careyana		
BAPI		coyotebrush	Baccharis pilularis DC.		

BASA3		arrowleaf balsamroot	Balsamorhiza sagittata (Pursh) Nutt.		
BEGL		resin birch	Betula glandulosa Michx.		
BENA		dwarf birch	Betula nana L.		
BENE4	RB	resin birch	Betula neoalaskana Sarg.	H	
BEOC2	WBI	water birch	Betula occidentalis Hook.	H	
BEPA	BI	paper birch	Betula papyrifera Marshall	H	
BEPAK		Kenai Birch	Betula papyrifera var. kenaica	H	
BEPAP	B	paper birch	Betula papyrifera Marshall var. papyrifera	H	
BEPU4		Dwarf Bog Birch	Betula pendula		
BETUL		Birch spp	Betula L.	H	
BLSP		deer fern	Blechnum spicant (L.) Sm.		
BOGR2		Blue grama	Bouteloua gracilis (Willd. ex Kunth) Lag. ex Griff		
BORI2		Richardson's brookfoam	Boykinia richardsonii (Hook.) Rothr.		
BORO		northern groundcone	Boschniakia rossica (Cham. & Schltdl.) Fedtsch.		
BOSCH		Groundcone Sp	Boschniakia		
BRAN		nodding brome	Bromus anomalus		
BRCA5		California brome	Bromus carinatus Hook. & Arn.		
BRGLP		Smooth north-rckcrss	Braya glabella ssp. purpurascens		
BRIN7		arctic brome	Bromopsis inermis		
BRMA		Big Quakinggrass	Briza maxima L.		
BRNE4		Nelson's brachythecium moss	Brachythecium nelsonii		
BROMU		brome	Bromus L.		
BRSA7		brachythecium moss	Brachythecium salebrosum		
BRSY		slender false brome	Brachypodium sylvaticum (Huds.) P. Beauv.		
BRTE		cheatgrass	Bromus tectorum L.		
BRVU		Columbia brome	Bromus vulgaris (Hook.) Shear		
BRYON2		Bryophyte	Bryonora		
BUAM2		American thorow wax	Bupleurum americanum J.M. Coult. & Rose		
BUDA2		orange eye butterflybush	Buddleja davidii Franch.		
CAAN5		seaside bittercress	Cardamine angulata Hook.		

CAAPP4		wavyleaf Indian paintbrush	Castilleja applegatei Fernald ssp. pinetorum (Fernald) T.I. Chuang & Heckard		
CAAQ		water sedge	Carex aquatilis Wahlenb.		
CAAQD		Sitka Sedge	Carex aquatilis var. dives		
CABI5		Bigelow's sedge	Carex bigelowii Torr. ex Schwein.		
CABU		fairy slipper	Calypso bulbosa (L.) Oakes		
CABU2		sheperds purse	Capsella bursa-pastoris		
CACA		Carolina Fanwort	Cabomba caroliniana Gray		
CACA12		hair-like sedge	Carex capillaris L.		
CACA13		Capitate sedge	Carex capitata		
CACA20		Pt. Cl. Ind. pntbrsh	Castilleja caudata		
CACA4		bluejoint	Calamagrostis canadensis (Michx.) P. Beauv.		
CACH8		Green Indian pntbrsh	Castilleja chrymactis		
CACO10		low northern sedge	Carex concinna		
CACO11		northwestern sedge	Carex concinnoides Mack.		
CADE27	IC	incense cedar	Calocedrus decurrens (Torr.) Florin	C	
CADE9		Dewey sedge	Carex deweyana		
CAED		American searocket	Cakile edentula (Bigelow) Hook.		
CAGE2		Geyer's sedge	Carex geyeri Boott		
CAGM		Gmelin's sedge	Carex gmelinii		
CAGY2		northern bog sedge	Carex gynocrates		
CAHO		Holm's reedgrass	Calamagrostis holmii		
CAHY6		Nrthern Ind. pntbrsh	Castilleja hyperborea		
CALA13		smoothstem sedge	Carex laeviculmis		
CALA6		lapland reedgrass	Calamagrostis lapponica		
CALA7		Mountain harebell	Campanula lasiocarpa		
CALAM		Reedgrass	Calamagrostis		
CALE4		Marsh marigold	Caltha leptosepala		
CALEL3		Kellogg's sedge	Carex lenticularis var. lipocarpa		
CALI7		mud sedge	Carex limosa L.		

CAMA		European searocket	Cakile maritima Scop.		
CAMA14		Curved sedge	Carex maritima		
CAME4		Fragile sedge	Carex membranacea		
CAME6		Mertens' sedge	Carex mertensii		
CAME7		white mountain heather	Cassiope mertensiana		
CAMI12		Gnt red Ind. pntbrsh	Castilleja miniata		
CAMI6		Fewseeded bog sedge	Carex microglochin		
CAMPA		bellflower	Campanula L.		
CANE2		Nebraska sedge	Carex nebrascensis Dewey		
CANI2		Black alpine sedge	Carex nigricans		
CANO9	YC	Alaska Cedar	Chamaecyparis nootkatensis (D. Don) Spach	C	
CANOI		Closedhead sedge	Carex norvegica ssp. inferalpina		
CANU4		Musk Thistle	Carduus nutans L.		
CAPA26		Mtn Indian paintbrsh	Castilleja parviflora		
CAPA5		yellow marsh marigold	Caltha palustris L.		
CAPE6		Pennsylvania sedge	Carex pensylvanica Lam.		
CARA3		sandcarpet	Cardionema ramosissimum (Weinm.) A. Nelson & J.F. Macbr.		
CARA7		Raup's Ind. pntbrsh	Castilleja raupii		
CARDA		Cardamine Sp	Cardamine		
CARDU		Plumeless Thistle	Carduus L.		
CAREX		sedge	Carex L.		
CARO2		bluebell bellflower	Campanula rotundifolia L.		
CARO5		Ross' sedge	Carex rossii Boott		
CARO6		beaked sedge	Carex rostrata		
CARO7		Round sedge	Carex rotundata		
CARU		pinegrass	Calamagrostis rubescens Buckley		
CARU3		Curly sedge	Carex rupestris		
CASC10		N. singlespike sedge	Carex scirpoidea		
CASC7		pale bellflower	Campanula scouleri Hook. ex A. DC.		
CASO2		seashore false bindweed	Calystegia soldanella (L.) R. Br.		

CASSID		Dwarf Mtn Heather Sp	Cassiope		
CASTI		castilla	Castilla Cerv.		
CASTI2		Indian paintbrush	Castilleja Mutis ex L. f.		
CASTI3		northern reedgrass	Calamagrostis stricta (Timm) Koeler ssp. inexpansa (A. Gray) C.W. Greene		
CATE11		white arctic mountain heather	Cassiope tetragona (L.) D. Don		
CAUN2		Arctic bellflower	Campanula uniflora		
CAUN4		Alaska Ind. pntbrsh	Castilleja unalaschcensis		
CAUT		Northwest Territory Sedge	Carex utriculata		
CAVA2		Sheathed sedge	Carex vaginata		
CEANO		ceanothus	Ceanothus L.		
CEAR4		field chickweed	Cerastium arvense L.		
CEAU		phantom orchid	Cephalanthera austiniae		
CEBE2		Bering chickweed	Cerastium beeringianum		
CECU		buckbrush	Ceanothus cuneatus (Hook.) Nutt.		
CEDE5		meadow knapweed	Centaurea debeauxii Gren. & Godr. [excluded]		
CEFOV2		big chickweed	Cerastium fontanum ssp. vulgare		
CEGL2		sticky chickweed	Cerastium glomeratum		
CEIN3		deerbrush	Ceanothus integerrimus Hook. & Arn.		
CEIS60		Island cetraria lich	Cetraria islandica		
CELE3	MM	Curlleaf Mountain Mahogany	Cercocarpus ledifolius Nutt.		X
CELTI		Hackberry spp	Celtis L.	H	
CEMO		Perennial Cornflower	Centaurea montana L.		
CEMOG		birchleaf mountain mahogany	Cercocarpus montanus Raf. var. glaber		
CEMOP		Hairy mountain-mahogany	Cercocarpus montanus Raf. var. paucidentatus (S. Watson) F.L. Martin	H	
CEOR9		California redbud	Cercis orbiculata Greene		
CEPR		prostrate ceanothus	Ceanothus prostratus Benth.		
CEPU		dwarf ceanothus	Ceanothus pumilus Greene		
CEPU12		ceratodon moss	Ceratodon purpureus		

CERAS		Mouse-ear chickweed	Cerastium		
CESA		redstem ceanothus	Ceanothus sanguineus Pursh		
CESTM		spotted knapweed	Centaurea stoebe L. ssp. micranthos (Gugler) Hayek		
CETH		blueblossom	Ceanothus thyrsiflorus Eschsch.		
CETRA2		Cetraria lichen	Cetraria		
CEVE		snowbrush ceanothus	Ceanothus velutinus Douglas ex Hook.		
CEVI		Squarrose Knapweed	Centaurea virgata Lam. ssp. squarrosa (Willd.) Gugler		
CEVI3		Sticky chickweed	Cetrelia		
CHALA		lambsquarters	Chenopodium album ssp. Album		
CHAN9		Fireweed	Chamerion angustifolium		
CHANA2		fireweed	Chamerion angustifolium (L.) Holub ssp. angustifolium		
CHARA		Arctic daisy	Chrysanthemum arcticum ssp. arcticum		
CHCA2		leatherleaf	Chamaedaphne calyculata (L.) Moench		
CHCH7	GC	giant chinquapin	Chrysolepis chrysophylla (Douglas ex Hook.) Hjelmqvist	H	
CHGL5		Pacific golden saxifrage	Chrysosplenium glechomifolium Nutt.		
CHLA	PC	Port Orford cedar	Chamaecyparis lawsoniana (A. Murray bis) Parl.	C	
CHLA13		dwarf fireweed	Chamerion latifolium (L.) Holub		
CHLI2		desert willow	Chilopsis linearis		
CHME		little prince's pine	Chimaphila menziesii (R. Br. ex D. Don) Spreng.		
CHNO	YC	Alaska cedar	Chamaecyparis nootkatensis (D. Don) Spach	C	
CHSE11		Bush Chinquapin	Chrysolepis sempervirens		
CHSU9		Lapland cornel	Chamaepericlymenum suecicum		
CHUM		pipsissewa	Chimaphila umbellata (L.) W.P.C. Barton		
CHVI		Douglas Rabbitbrush	Chrysothamnus viscidiflorus		
CIAL		small enchanter's nightshade	Circaea alpina L.		
CIAR4		Canada thistle	Cirsium arvense (L.) Scop.		
CICUT		Water hemlock Sp	Cicuta		
CIDO		W water hemlock	Cicuta douglasii		
CILA2		Drooping woodreed	Cinna latifolia		
CIMA2		Spotted water hemlck	Cicuta maculata		

CIVI5		Mackenzie watr hmlck	Cicuta virosa		
CIVU		bull thistle	Cirsium vulgare (Savi) Ten.		
CLADI2		cladidium lichen	Cladidium Hafellner		
CLADI3		reindeer lichen	Cladina (Nyl.) Nyl.		
CLADO3		Cup lichen	Cladonia		
CLAL60		Alaskan cup lichen	Cladonia alaskana		
CLAR60		Reindeer lichen	Cladina arbuscula		
CLAYT		springbeauty	Claytonia L.		
CLCO12		Cup lichen	Cladonia coccifera		
CLCO19		cup lichen	Cladonia cornuta		
CLCR5		Cup lichen	Cladonia crispata		
CLDO2		yerba buena	Clinopodium douglasii (Benth.) Kuntze		
CLEC		cup lichen	Cladonia ecmocyna		
CLGR13		cup lichen	Cladonia gracilis		
CLMI60		reindeer lichen	Cladina mitis		
CLPC60		cup lichen	Cladonia pleurota		
CLRA60		Grygreen reindr lich	Cladina rangiferina		
CLSA2		Alaska springbeauty	Claytonia sarmentosa		
CLSI		Ramona clarkia	Clarkia similis F.H. Lewis & Ernst		
CLSI2		Siberian springbeauty	Claytonia sibirica L.		
CLSIS		Siberian springbeauty	Claytonia sibirica L. var. sibirica		
CLSQ60		cup lichen	Cladonia squamosa		
CLST5		reindeer lichen	Cladonia stygia		
CLST60		star reindeer lichen	Cladina stellaris		
CLUN2		bride's bonnet	Clintonia uniflora (Menzies ex Schult. & Schult. f.) Kunth		
CLUN60		Cup lichen	Cladonia uncialis		
CNCN		Jakutsk snowparsley	Cnidium cnidiifolium		
COBO		asthmaweed	Conyza bonariensis (L.) Cronquist		
COCA13		bunchberry dogwood	Cornus canadensis L.		
COCA5		Canadian Horseweed	Conyza canadensis		

COCO6		beaked hazelnut	Corylus cornuta Marshall		
COCOC		California hazelnut	Corylus cornuta Marshall var. californica (A. DC.) Sharp		
COGM		Pac. hemlockparsley	Conioselinum gmelinii		
COHE2		variableleaf collomia	Collomia heterophylla Douglas ex Hook.		
COLA3		Oregon goldthread	Coptis laciniata A. Gray		
COLLO		trumpet	Collomia Nutt.		
CONU4	PD	Pacific dogwood	Cornus nuttallii Audubon ex Torr. & A. Gray	H	
COPA11		fewflower fumewort	Corydalis pauciflora		
COPA28		Purple marshlocks	Comarum palustre		
CORA		Blackbrush	Colegyne ramosissima		
CORAL5		coralroot	Corallorhiza Gagnebin, orth. cons.		
CORNU		dogwood	Cornus L.		
CORNU3		Lichen	Cornutispora		
COSE16		red osier dogwood	Cornus sericea		
COSEO		Western dogwood	Cornus sericea L. ssp Occidentalis		
COSES		redosier dogwood	Cornus sericea L. ssp. sericea		
COST19		hooded coralroot	Corallorhiza striata Lindl.		
COSU4		Lapland Cornel	Cornus suecica		
COTR18		yellow coralroot	Corallorhiza trifida		
COTR2		Threeleaf goldthread	Coptis trifolia		
CRAC2		Tapertip Hawksbeard	Crepis acuminata		
CRATA	NW	hawthorn	Crataegus L.	H	
CRTE3		narrowleaf hawksbeard	Crepis tectorum		
CUPRE	CY	cypress	Cupressus L.	C	
CUSA3	SC	Sargent's cypress	Hesperocyparis sargentii (Jeps.) Bartel	C	
CYEC		bristly dogstail grass	Cynosurus echinatus L.		
CYGR		Pacific hound's tongue	Cynoglossum grande Douglas ex Lehm.		
CYPA5		sparrowegg lady's slipper	Cypripedium passerinum Richardson		
CYPER		flat sedge	Cyperus L.		
CYSC4		Scotch broom	Cytisus scoparius (L.) Link		

CYST7		striated broom	Cytisus striatus (Hill) Rothm.		
DAAR60		Arctic dactylina lch	Dactylina arctica		
DACTY4		Dactylina lichen	Dactylina		
DAFR6		shrubby cinquefoil	Dasiphora fruticosa (L.) Rydb.		
DAFRF		Shrubby Cinquefoil	Dasiphora fruticosa ssp. floribunda		
DAGL		orchardgrass	Dactylis glomerata		
DEBE2		Bering's tftd hrgrss	Deschampsia beringensis		
DECEA5		hairgrass	Deschampsia cespitosa ssp. alpina		
DEGL3		Sierra larkspur	Delphinium glaucum		
DELPH		Delphinium Sp	Delphinium		
DESCH		Hairgrass	Deschampsia		
DIAPE		Diapensia Sp	Diapensia		
DICRA8		dicranum moss	Dicranum Hedw.		
DIFO		Pacific bleeding heart	Dicentra formosa (Haw.) Walp.		
DIFU5		Dicranum moss	Dicranum fuscescens		
DILA		Pincushion plant	Diapensia lapponica		
DIMA18		Dicranum moss	Dicranum majus		
DIPU		purple foxglove	Digitalis purpurea L.		
DIRE		Boreal carnation	Dianthus repens		
DISC71		dicranum moss	Dicranum scoparium Hedw.		
DODEC		shootingstar	Dodecatheon		
DOFR		W arctc shootingstar	Dodecatheon frigidum		
DOHE		mosquito bills	Dodecatheon hendersonii A. Gray		
DOHEC		mosquito bills	Dodecatheon hendersonii A. Gray ssp. cruciatum (Greene) H.J. Thomp.		
DOJE		Sierra shootingstar	Dodecatheon jeffreyi		
DRABA		Draba Sp	Draba		
DRAN		English sundew	Drosera anglica		
DRAR3		coastal woodfern	Dryopteris arguta (Kaulf.) Watt		
DRCA11		spinulose woodfern	Dryopteris carthusiana (Vill.) H.P. Fuchs		

DRCA3		mountain woodfern	Dryopteris campyloptera Clarkson		
DRDI2		spreading woodfern	Draba densifolia		
DRDR		Drummond's mtn-avens	Dryas drummondii		
DREPA3		Drepanocladus moss	Drepanocladus		
DREX2		spreading woodfern	Dryopteris expansa (C. Presl) Fraser-Jenkins & Jermy		
DRFR		shrubby cinquefoil	Dasiphora fruticosa (L.) Rydb. ssp. floribunda (Pursh) Kartesz		
DRIN2		Yellowstone draba	Draba incerta Payson		
DRIN4		entireleaf mountain-avens	Dryas integrifolia Vahl		
DRIN5		intermediate woodfern	Dryopteris intermedia (Muhl. ex Willd.) A. Gray		
DROB		sundew	Drosera xobovata Mert. & W. Koch (pro sp.) [anglica x rotundifolia]		
DROC		eightpetal mountain-avens	Dryas octopetala L.		
DROSE		sundew	Drosera		
DRRO		roundleaf sundew	Drosera rotundifolia L.		
DRYAS		mountain-avens	Dryas L.		
DRYASD		Mountain Avens	Dryas		
ELCO		Elacom - Silverberry	Elaeagnus commutata		
ELELB2		squirreltail	Elymus elymoides (Raf.) Swezey ssp. brevifolius (J.G. Sm.) Barkworth		
ELELE		squirreltail	Elymus elymoides (Raf.) Swezey ssp. elymoides		
ELGL		blue wildrye	Elymus glaucus Buckley		
ELMO9		Dunegrass	Elyhordeum macounii		
ELPY		Copperbush	Elliottia pyroliflora		
ELQU2		Fewflower spikerush	Eleocharis quinqueflora		
ELRE4		quackgrass	Elymus repens (L.) Gould		
ELTR7		slender wheatgrass	Elymus trachycaulus		
ELTRT		slender wheatgrass	Elymus trachycaulus ssp. trachycaulus		
ELYMU		Elymus Sp	Elymus		
EMNI		black crowberry	Empetrum nigrum L.		
EMPETD		Crowberry	Empetrum		

EPAN4		pimpernel willowherb	Epilobium anagallidifolium		
EPCIC		fringed willowherb	Epilobium ciliatum ssp. ciliatum		
EPCIG		fringed willowherb	Epilobium ciliatum ssp. glandulosum		
EPHOB		Hornemann's willwhrb	Epilobium hornemannii ssp. behringia		
EPILO		Epilobium Sp	Epilobium		
EPLA		dwarf fireweed	Epilobium latifolium CHLA13		
EPLA3		Milkflower willowhrb	Epilobium lactiflorum		
EPPA		marsh willowherb	Epilobium palustre		
EQAR		field horsetail	Equisetum arvense L.		
EQFL		water horsetail	Equisetum fluviatile		
EQHY		scouringrush hrstail	Equisetum hyemale		
EQPA		marsh horsetail	Equisetum palustre		
EQPR		meadow horsetail	Equisetum pratense		
EQSC		dwarf scouringrush	Equisetum scirpoides Michx.		
EQSY		woodland horsetail	Equisetum sylvaticum		
EQUIS		horsetail	Equisetum L.		
EQVA		Variegated scorngrsh	Equisetum variegatum		
ERACP2		bitter fleabane	Erigeron acris ssp. Politus		
ERAN6		Tall cottongrass	Eriophorum angustifolium		
ERBL2		rabbitbush	Ericameria bloomeri (A. Gray) J.F. Macbr.		
ERHE2		Wyeths Buckwheat	Eriogonum heracleoides		
ERICA		Ericacaeous Sp	Ericaceae		
ERIGE2		fleabane	Erigeron L.		
ERIOP		cottongrass	Eriophorum L.		
ERMO8		white avalanche-lily	Erythronium montanum S. Watson		
ERNA10		Rubber Rabbitbush	Ericameria nauseosa		
ERNAS2		Rubber (Gray) Rabbitbrush	NULL		
EROR4		giant white fawnlily	Erythronium oregonum Applegate		
ERPE3		subalpine fleabane	Erigeron peregrinus (Banks ex Pursh) Greene		
ERSP		Aspen or Showy Fleabane	Erigeron speciosus		

ERUM		sulphur-flower buckwheat	Eriogonum umbellatum Torr.		
ERVA4		tussock cottongrass	Eriophorum vaginatum L.		
EUCAL	E	eucalyptus	Eucalyptus L'Her.	H	
EUCO36		western showy aster	Eurybia conspicua (Lindl.) G.L. Nesom		
EUGL	EU	Tasmanian bluegum	Eucalyptus globulus Labill.	H	
EUMO3		subalpine eyebright	Euphrasia mollis		
EURA11		roughleaf aster	Eurybia radulina (A. Gray) G.L. Nesom		
EUSI13		arctic aster	Eurybia sibirica (L.) G.L. Nesom		
FABAC		Fabaceae	Evernia prunastri		
FEAL		Altai fescue	Festuca altaica		
FEAR2		Arizona fescue	Festuca arizonica Vasey		
FEID		Idaho fescue	Festuca idahoensis Elmer		
FEOC		western fescue	Festuca occidentalis Hook.		
FERU2		red fescue	Festuca rubra L.		
FESTU		fescue	Festuca L.		
FESU		bearded fescue	Festuca subulata Trin.		
FLCU		Flavocetraria lichen	Flavocetraria cucullata		
FLNI		Flavocetraria lichen	Flavocetraria nivalis		
FORAG	F	General Forage Seed Mixture	General forage seed mixture		
FRAXI		Ash spp	Fraxinus L.	H	
FRCAC5		California buckthorn	Frangula californica (Eschsch.) A. Gray ssp. californica		
FRCH		Beach strawberry	Fragaria chiloensis		
FRLA	OA	Oregon ash	Fraxinus latifolia Benth.	H	
FRPE	GA	green ash	Fraxinus pennsylvanica Marshall	H	
FRPU7		Cascara buckthorn	Frangula purshiana (DC.) A. Gray		
FRVE		woodland strawberry	Fragaria vesca L.		
FRVE2	VA	velvet ash	Fraxinus velutina Torr.	H	
FRVEB2		woodland strawberry	Fragaria vesca L. ssp. bracteata (A. Heller) Staudt		
FRVI		Virginia strawberry	Fragaria virginiana Duchesne		
GAAM2		yolla bolly bedstraw	Galium ambiguum W. Wight		

GAAP2		Stickywilly	Galium aparine L.		
GABO2		northern bedstraw	Galium boreale L.		
GABU2		dwarf silktassel	Garrya buxifolia A. Gray		
GALIU		bedstraw	Galium L.		
GAOR		Oregon bedstraw	Galium oreganum Britt.		
GAOV2		western teaberry	Gaultheria ovatifolia A. Gray		
GASH		salal	Gaultheria shallon Pursh		
GATR2		threepetal bedstraw	Galium trifidum		
GATR3		fragrant bedstraw	Galium triflorum Michx.		
GEAMA		Autumn dwarf gentian	Gentianella amarella ssp. acuta		
GECA6		calthaleaf avens	Geum calthafolium		
GEER2		Woolly geranium	Geranium erianthum		
GELI2		false toadflax	Geocaulon lividum (Richardson) Fernald		
GENTI2		Gentian Sp	Gentianella		
GEOCA		false toadflax	Geocaulon		
GEPR4		meadow geranium	Gentiana prostrata		
GERAN		Geranium Species	Geranium L.		
GERO2		Ross' avens	Geum rossii		
GEUM		avens	Geum L.		
GLLIL		American silvertop	Glehnia littoralis ssp. leiocarpa (Mathias) Hulten		
GOOB2		western rattlesnake plantain	Goodyera oblongifolia Raf.		
GORE2		lesser rattlesnake plantain	Goodyera repens (L.) R. Br.		
GRASS	GR	grass	Grass		
GUSA2		Broom snakeweed	Gutierrezia Sarothrae (Pursh) Britt & Rusby		
GYDR		western oakfern	Gymnocarpium dryopteris (L.) Newman		
GYMNO		oakfern	Gymnocarpium Newman		
HAST3		Alaska Bellheather	Harrimanella stelleriana		
HEAL		alpine sweetvetch	Hedysarum alpinum L.		
HEAR22	AC	Arizona cypress	Hesperocyparis arizonica (Greene) Bartel	C	
HEBA5	MC	Modoc cypress	Hesperocyparis bakeri (Jeps.) Bartel	C	

HEBOM		northern sweetvetch	Hedysarum boreale ssp. mackenziei		
HECOC8		needle and thread	Hesperostipa comata (Trin. & Rupr.) Barkworth ssp. comata		
HEDYS		Sweetvetch	Hedysarum		
HEHE		English ivy	Hedera helix L.		
HEMA22	CYP	Monterey cypress	Hesperocyparis macrocarpa (Hartw.) Bartel	C	
HEMA80		common cowparsnip	Heracleum maximum W. Bartram		
HERAC		Cow Parsnip	Heracleum		
HIAL2		white hawkweed	Hieracium albiflorum Hook.		
HIAL3		Alpine Holygrss	Hieracium albiflorum ANMOA3		
HIAU		orange hawkweed	Hieracium aurantiacum L.		
HICA10		meadow hawkweed	Hieracium caespitosum Dumort.		
HICY		houndstongue hawkweed	Hieracium cynoglossoides Arv.-Touv.		
HIHI		northern sweetgrass	Hierochloe hirta		
HIMO2		mountain mare's-tail	Hippuris montana		
HIPPU		mare's-tail	Hippuris		
HITR2		Wooly Hawkweed	Hieracium triste		
HIVU2		common mare's-tail	Hippuris vulgaris		
HODI		oceanspray	Holodiscus discolor (Pursh) Maxim.		
HOJU		foxtail barley	Hordeum jubatum		
HOPE		Seaside sandplant	Honckenya peploides		
HYDRO4		waterleaf	Hydrophyllum L.		
HYLOC		Feather Moss	Hypnum lindbergii		
HYPE		common St. Johnswort	Hypericum perforatum L.		
HYSP70		Splendid feathr moss	Hylocomium splendens		
ILAQ80		English holly	Ilex aquifolium L.		
IMPAT		touch-me-not	Impatiens L.		
IRCH		yellowleaf iris	Iris chrysophylla Howell		
IRIS		Iris Sp	Iris		
IRSE		beachhead iris	Iris setosa		
IRTE		toughleaf iris	Iris tenax Douglas ex Lindl.		

JUAL4		northern green rush	Juncus alpinoarticulatus		
JUAR2		Arctic Rush	Juncus arcticus		
JUCA7	CJ	California juniper	Juniperus californica CarriŠre	C	X
JUCO11	RDJ	redberry juniper	Juniperus coahuilensis (Martįnez) Gaussen ex R.P. Adams	C	
JUCO6	JU	common juniper	Juniperus communis	C	
JUDE		Alligator juniper	Juncus debilis A. Gray	C	X
JUDE2	AJ	alligator juniper	Juniperus deppeana Steud.	C	
JUEF		common rush	Juncus effusus		
JUGLA	WN	walnut	Juglans L.	H	
JUHO2		Creeping Juniper	Juniperus horizontalis		
JUME3		Mertens' rush	Juncus mertensianus		
JUMO	OJ	Oneseed juniper	Juniperus monosperma (Engelm.) Sarg.	C	X
JUNCU		Other rush	Juncus		
JUNI		Juniper spp	Juniperus L.	C	X
JUNIP		juniper	Juniperus L.		
JUNIPD		Dwarf Juniper Sp	Juniperus		
JUOC	J	western juniper	Juniperus occidentalis Hook.	C	
JUOS	UJ	Utah juniper	Juniperus osteosperma (Torr.) Little	C	X
JUSC		Rocky Mountain juniper	Juniperus scirpoides Lam.	C	X
JUSC2	RJ	Rocky Mountain juniper	Juniperus scopulorum Sarg.	C	
JUVI		Eastern redcedar	Juniperus virginiana L	C	X
KIGL		glacial kiaeria moss	Kiaeria glacialis		
KOBRE		Bog sedge	Kobresia		
KOMA		Prairie Junegrass	Koeleria macrantha		
LAAL		White deadnettle	Lamium album		
LAJA		beach pea	Lathyrus japonicus Willd.		
LAJAM		Beach pea	Lathyrus japonicus var. maritimus		
LALA		Tamarack	Larix laricina (Du Roi) K. Koch	C	
LALY	SL	subalpine larch	Larix lyallii Parl.	C	

LANEN2		Sierra pea	Lathyrus nevadensis S. Watson ssp. lanceolatus (Howell) C.L. Hitchc. var. nuttallii		
LAOC	WL	western larch	Larix occidentalis Nutt.	C	
LAPO3		leafy pea	Lathyrus polyphyllus Nutt.		
LEAR13		Rim lichen	Lecanora argopholis		
LEDA		Sierra laurel	Leucothoe davisiae Torr. ex Gray		
LEDE5L		narrowleaf lab tea	Lecidoma demissum		
LEDPAD		Marsh Labrador Tea	Ledum palustraL. Ssp.decumbens		
LEDUM		Labrador Tea	Ledum		
LEGR		bog Labrador tea	Ledum groenlandicum Oeder		
LEMO8		American dunegrass	Leymus mollis (Trin.) Pilg.		
LEMOM2		American dunegrass	Leymus mollis ssp. mollis		
LENUN		Nuttall's linanthus	Leptosiphon nuttallii (A. Gray) J.M. Porter & L.A. Johnson ssp. nuttallii		
LEPA11		marsh Labrador tea	Ledum palustre L.		
LEPAD		marsh Labrador tea	Ledum palustre L. ssp. decumbens (Aiton) Hult,n		
LEPAG		bog Labrador tea	Ledum palustre L. ssp. groenlandicum (Oeder) Hult,n		
LEPY		fireleaf leptarrhena	Leptarrhena pyrolifolia		
LEVU		Oxeye Daisy	Leucanthemum vulgare Lam.		
LIAP		celeryleaf licorice-root	Ligusticum apiifolium (Nutt. ex Torr. & A. Gray) A. Gray		
LIAQ		water mudwort	Limosella aquatica		
LIBO3		twinflower	Linnaea borealis L.		
LIBO4		northern twayblade	Listera borealis		
LIBOL2		longtube twinflower	Linnaea borealis L. ssp. longiflora (Torr.) Hulten		
LICA		California licorice-root	Ligusticum californicum J.M. Coult. & Rose		
LICA10		Northwestern twayblade	Listera caurina Piper		
LICO6		heartleaf twayblade	Listera cordata		
LINNA		Twinflower Sp	Linnaea		
LINUM		Flax Sp	Linum		
LIRE13		Limprichtia moss	Limprichtia revolvens		

LISC3		Scottish licorice-rt	Ligusticum scoticum		
LIVU2		butter and eggs	Linaria vulgaris		
LIXXC		Lichen Crust	Lichen Crust		
LIXXF		Lichen Foliose	Lichen Foliose		
LIXXS		Stereocaul Lich	Stereocaul Lich		
LOBAR2		lung lichen	Lobaria Schreb.		
LOCA6		sweetberry honeysuckle	Lonicera caerulea L.		
LOCI3		orange honeysuckle	Locinera ciliosa		
LOCO5		purpleflower honeysuckle	Lonicera conjugialis Kellogg		
LOHI2		pink honeysuckle	Lonicera hispidula (Lindl.) Douglas ex Torr. & A. Gray		
LOIN5		twinberry honeysuckle	Lonicera involucrata (Richardson) Banks ex Spreng.		
LOISED		Dwarf Loiseleuria Sp	Loiseleuria		
LONIC		Honeysuckle Sp	Lonicera		
LOPE		perennial ryegrass	Lolium perenne		
LOPR		azalea alpine	Loiseleuria procumbens (L.) Desv.		
LUAL3		sicklekeel lupine	Lupinus albicaulis Douglas		
LUAR		Yellow Bush Lupine	Lupinus arboreus Sims		
LUAR2		arctic lupine	Lupinus arcticus S. Watson		
LUAR3		silvery lupine	Lupinus argenteus Pursh		
LUCA		tailcup lupine	Lupinus caudatus Kellogg		
LUETK		Luetkea Sp	Luetkea		
LUGLH		Hitchcock's smooth woodrush	Luzula glabrata (Hoppe ex Rostk.) Desv. var. hitchcockii (Hämet-Ahti) Dorn		
LUKU		Yukon lupine	Lupinus kuschei		
LULA4		broadleaf lupine	Lupinus latifolius Lindl. ex J. Agardh		
LULE2		Pacific lupine	Lupinus lepidus Douglas ex Lindl.		
LUMU2		common woodrush	Luzula multiflora		
LUMUM2		common woodrush	Luzula multiflora (Ehrh.) Lej. ssp. multiflora var. multiflora		
LUNO		Nootka lupine	Lupinus nootkatensis		
LUPA4		smallflowered woodrush	Luzula parviflora (Ehrh.) Desv.		

LUPE		Partridgefoot	Luetkea pectinata		
LUPIN		Lupinus Sp	Lupinus		
LUPOP4		bigleaf lupine	Lupinus polyphyllus ssp. polyphyllus		
LUSE4		Silky Lupine	Lupinus sericeus		
LUZUL		woodrush	Luzula DC.		
LYAL3		Alpine clubmoss	Lycopodium alpinum		
LYAM3		American skunkcabbage	Lysichiton americanus Hulten & St. John		
LYAN2		stiff clubmoss	Lycopodium annotinum L.		
LYCL		Running clubmoss	Lycopodium clavatum		
LYCO		rose campion	Lychnis coronaria (L.) Desr.		
LYCO3		groundcedar	Lycopodium complanatum L.		
LYCOP2		clubmoss	Lycopodium L.		
LYSA2		purple loosestrife	Lythrum salicaria L.		
LYSI		Sitka clubmoss	Lycopodium sitchense		
MAAQ2		hollyleaved barberry	Mahonia aquifolium (Pursh) Nutt.		
MADI		false lily of the valley	Maianthemum dilatatum (Alph. Wood) A. Nelson & J.F. Macbr.		
MADI6		Pineappleweed	Matricaria discoidea		
MALUS	AP	apple	Malus P. Mill.	H	
MAMA		woodland madia	Madia madioides (Nutt.) Greene		
MANE2		Cascade barberry	Mahonia nervosa (Pursh) Nutt.		
MAOR3		coastal manroot	Marah oreganus (Torr. ex S. Watson) Howell		
MARA7		feathery false lily of the valley	Maianthemum racemosum (L.) Link		
MARAR		feathery false lily of the valley	Maianthemum racemosum (L.) Link ssp. racemosum		
MARCH		Marchantia Sp.	Marchantia		
MARE11		creeping barberry	Mahonia repens (Lindl.) G. Don		
MARI60		Rich. masonhalea lch	Masonhalea richardsonii		
MAST4		starry false lily of the valley	Maianthemum stellatum (L.) Link		
MEAR4		wild mint	Mentha arvensis L.		
MEFE		rusty menziesia	Menziesia ferruginea Sm.		

MEOF		white sweetclover	Melilotus alba		
MEPA		tall bluebells	Mertensia paniculata (Aiton) G. Don		
MEPAP		Tall bluebells	Mertensia paniculata ssp. paniculata		
MERTE		Bluebells Sp	Mertensia		
MESA		Alfalfa	Medicago sativa		
MESU		Alaska oniongrass	Melica subulata (Griseb.) Scribn.		
METR3		buckbean	Menyanthes trifoliata L.		
MIAR3		arctic stitchwort	Minuartia arctica		
MIDE3		coastal monkeyflower	Mimulus dentatus Nutt. ex Benth.		
MIGR		slender phlox	Microsteris gracilis		
MIGU		Seep monkeyflower	Mimulus guttatus		
MINUA		Stitchwort Sp	Minuartia		
MIST3		smallflower miterwort	Mitella stauropetala Piper		
MITR4		threeparted miterwort	Mitella trifida Graham		
MOBO		Bostock minerslettuc	Montia bostockii		
MOCA6		California wax myrtle	Morella californica (Cham.) Wilbur	H	
MOLA6		bluntleaf sandwort	Moehringia lateriflora (L.) Fenzl		
MOMA3		largeleaf sandwort	Moehringia macrophylla (Hook.) Fenzl		
MOOD		mountain monardella	Monardella odoratissima Benth.		
MOPA2		littleleaf minerslettuce	Montia parvifolia (Moc. ex DC.) Greene		
MOUN2		single delight	Moneses uniflora (L.) A. Gray		
MOUN3		Indianpipe	Monotropa uniflora L.		
MYAS2		Asian forget-me-not	Myosotis asiatica		
MYGA		sweetgale	Myrica gale L.		
MYMU		wall-lettuce	Mycelis muralis (L.) Dumort.		
MYSY		Wdland forget-me-not	Myosotis sylvatica		
NEAR60		Srctic kidney lichen	Nephroma arcticum		
NECR2		Deercabbage	Nephrophyllidium crista-galli		
NEPA		smallflower nemophila	Nemophila parviflora Douglas ex Benth.		
NEPHR3		kidney lichen	Nephroma Ach.		

NODE3	TO	tanoak	Notholithocarpus densiflorus (Hook. & Arn.) P.S. Manos, C.H. Cannon, & S.H. Oh	H	
NODEE		Tanoak	Notholithocarpus densiflorus (Hook. & Arn.) P.S. Manos, C.H. Cannon, & S.H. Oh var. echinoides		
NULL		Oregon Myrtle		H	
NULUP		Rocky Mtn pond-lily	Nuphar lutea l. Sm.ssp polysepala		
NUPHA		Pond Lily	Nuphar		
NYTE		pygmy waterlily	Nymphaea tetragona		
OCHRO3		Crabseye lichen Sp	Ochrolechia		
OECE		Indian plum	Oemleria cerasiformis (Torr. & Gray ex Hook. & Arn.) Landon		
OESA		water parsely	Oenanthe sarmentosa C. Presl ex DC.		
OLTE		Desert Ironwood	Olneya tesota A. Gray	H	
OPHO		devilsclub	Oplopanax horridus (Sm.) Miq.		
ORSE		sidebells wintergreen	Orthilia secunda (L.) House		
OSBE		Sweetcicely	Osmorhiza berteroi DC.		
OSDE		bluntseed sweetroot	Osmorhiza depauperata		
OSMOR		Sweetroot Sp	Osmorhiza		
OSPU		purple sweetroot	Osmorhiza purpurea (J.M. Coult. & Rose) Suksd.		
OTHH		Other Hardwods		H	
OXCA4		Field locoweed	Oxytropis campestris		
OXNI		blackish oxytrope	Oxytropis nigrescens		
OXNIN2		blackish oxytrope	Oxytropis nigrescens var. nigrescens		
OXOR		redwood-sorrel	Oxalis oregana Nutt.		
OXYTR		Locoweed Sp	Oxytropis		
PACKE		Ragwort Sp	Packera		
PAFI3		Fringed grss of Parn	Parnassia fimbriata		
PALA9		Lapland poppy	Papaver lapponicum (Tolm.) Nordh.		
PAMA5		Macouns poppy	Papaver macounii		
PAMY		Oregon boxleaf	Paxistima myrsinites (Pursh) Raf.		
PANU5		nakedstem wallflower	Parrya nudicaulis		
PAPA20		balsam groundsel	Packera paupercula		
PAPA8		marsh grass of Parnassus	Parnassia palustris L.		

PAPAV		poppy	Papaver L.		
PARNA		grass of Parnassus	Parnassia L.		
PASM		Western Wheatgrass	Pascopyrum smithii		
PEAP60		felt lichen	Peltigera aphthosa (L.) Willd.		
PECA2		capitate lousewort	Pedicularis capitata		
PEDIC		lousewort	Pedicularis L.		
PEEU		glaucous beardtongue	Penstemon euglaucus English		
PEFR5		arctic sweet coltsfoot	Petasites frigidus (L.) Fr.		
PEFRF		arc sweet coltsfoot	Petasites frigidus var. frigidus		
PEFRS5		arrowleaf sweet coltsfoot	Petasites frigidus (L.) Fr. var. sagittatus (Banks ex Pursh) Cherniawsky		
PEGA3		Gardners yampah	Perideridia gairdneri		
PELA		Labrador lousewort	Pedicularis labradorica Wirsing		
PELA14		woolly lousewort	Pedicularis lanata		
PELA3		Langsdorfs lousewrt	Pedicularis langsdorffii		
PELA7		mountain blue penstemon	Penstemon laetus A. Gray		
PELTI2		Felt Lichen	Peltigera		
PEMA60		felt lichen	Peltigera malacea		
PENE12		felt lichen	Peltigera neopolydactyla		
PEOR6		Oregon yampah	Perideridia oregana		
PEPA4		smallflower lousewrt	Pedicularis parviflora		
PERA		sickletop lousewort	Pedicularis racemosa Douglas ex Benth.		
PESC60		Felt Lichen	Peltigera scabrosa		
PESU		sudetic lousewort	Pedicularis sudetica Willd.		
PETAS		butterbur	Petasites Mill.		
PEVE		Whorled lousewort	Pedicularis verticillata		
PHAL2		Alpine timothy	Phleum alpinum		
PHAL4		Aleutian mtnheather	Phyllodoce aleutica		
PHAR		sanddune phacelia	Phacelia argentea A. Nelson & J.F. Macbr.		
PHAR3		reed canarygrass	Phalaris arundinacea L.		
PHCO24		Long beechfern	Phegopteris connectilis		

PHEM		pink mountainheath	Phyllodoce empetriformis (Sm.) D. Don		
PHFO6		philonotis moss	Philonotis fontana		
PHLE4		Lewis' mock orange	Philadelphus lewisii Pursh		
PHLO2		Longleaf Phlox	Phlox longifolia		
PHLO4		Longleaf Groundcherry	Physalis longifolia Nutt.		
PHLOX		Phlox Sp	Phlox		
PHMA5		mallow ninebark	Physocarpus malvaceus (Greene) Kuntze		
PHPR2		tall phacelia	Phacelia procera		
PHPR3		Timothy	Phleum pratense L.		
PIAL	WB	whitebark pine	Pinus albicaulis Engelm.	C	
PIAR	BR	bristlecone pine	Pinus aristata Engelm.	C	
PIAR5		Arizona pine	Pinus arizonica Engelm.	C	X
PIAT	KP	knobcone pine	Pinus attenuata Lemmon	C	
PIBA	FP	foxtail pine	Pinus balfouriana Balf.	C	
PIBR	BS	Brewers spruce	Picea breweriana S. Watson	C	
PICE	XP	Mexican pinyon	Pinus cembroides Zucc		X
PICO	LP	lodgepole pine	Pinus contorta Douglas ex Loudon	C	
PICO3	CP	Coulter pine	Pinus coulteri D.Don	C	
PIDI3	BDP	border pinyon	Pinus discolor D.K. Bailey & Hawksw.	C	
PIED	TPI	twoneedle pinyon	Pinus edulis Engelm.	C	X
PIEN	ES	Engelmann spruce	Picea engelmannii Parry ex Engelm.	C	
PIEN2		Apache pine	Pinus engelmannii Carrière	C	
PIFL2	LM	limber pine	Pinus flexilis James	C	
PIGL	WS	white spruce	Picea glauca (Moench) Voss	C	
PIJE	JP	Jeffrey pine	Pinus jeffreyi Balf.	C	
PILA	SP	sugar pine	Pinus lambertiana Douglas	C	
PILE	CHP	Chihuahuan pine	Pinus leiophylla Schiede & Deppe	C	
PILEC		Chihuahua pine	Pinus leiophylla Schiede & Deppe var. chihuahuana (Engelm.) Shaw	C	
PILO	GP	Great Basin bristlecone pine	Pinus longaeva D.K. Bailey	C	
PILU		Lutz Spruce	Picea x lutzii	C	

PIMA	BU	black spruce	Picea mariana (Mill.) Britton, Sterns & Poggenb.	C	
PIMO	PI	singleleaf pinyon	Pinus monophylla Torr. & Frem.	C	X
PIMO3	WP	western white pine	Pinus monticola Dougl. ex D. Don	C	
PIMOF	API	Arizona pinyon pine	Pinus monophylla Torr. & Frem. var. fallax (Little) Silba	C	
PIMU	BP	Bishop pine	Pinus muricata D. Don	C	
PINUS	SA	pine	Pinus L.	C	
PIPO	P	ponderosa pine	Pinus ponderosa Lawson & C. Lawson	C	
PIPOW2	WAP	Washoe pine	Pinus ponderosa Lawson & C. Lawson var. washoensis (H. Mason & Stockw.) J.R. Haller & Vivrette	C	
PIPU	BLS	blue spruce	Picea pungens Engelm.	C	
PIRA2	MP	Monterey pine	Pinus radiata D. Don	C	
PISA2	GYP	California foothill pine (gray pine)	Pinus sabiniana Douglas ex Douglas	C	
PISI	S	Sitka spruce	Picea sitchensis (Bong.) Carr.	C	
PIST3	SWP	southwestern white pine	Pinus strobiformis Engelm.	C	
PIVU		common butterwort	Pinguicula vulgaris L.		
PIWA		Washoe pine	Pinus washoensis H. Mason & Stockw.	C	
PLATA		Platanthera	Placynthium asperellum		
PLDI3		Scentbottle	Platanthera dilatata		
PLDIL		Sierra bog orchid	Platanthera dilatata var. leucostach		
PLMA2		common plantain	Plantago major		
PLOBO3		bluntleaved orchid	Platanthera obtusata (Banks ex Pursh) Lindl. ssp. obtusata		
PLRA	CS	California sycamore	Platanus racemosa Nutt.	H	
PLSC70		Sch. big red stm mss	Pleurozium schreberi		
POA		blugrass	Poa L.		
POAC		tall Jacob's-ladder	Polemonium acutiflorum Willd. ex Roem. & Schult.		
POAL11		Alaska wild rhubarb	Polygonum alpinum All.		
POAL5		Alaska wild rhubarb	Polygonum alaskanum W. Wight ex Hulten		
POAM11		Wild Rhubarb	Polygonum alpinum		
POAN		annual bluegrass	Poa annua L.		
POAN3	NC	narrowleaf cottonwood	Populus angustifolia James	H	
POAR2		Arctic bluegrass	Poa arctica		

POAV		prostrate knotweed	Polygonum aviculare		
POBA2	BO	balsam poplar	Populus balsamifera L.	H	
POBAT	BC	black cottonwood	Populus balsamifera L. ssp. trichocarpa (Torr. & A. Gray ex Hook.) Brayshaw	H	
POBI5		meadow bistort	Polygonum bistorta L.		
POBIP		meadow bistort	Polygonum bistorta L. var. plumosum		
POCO38		Polytrichum moss	Polytrichum commune		
POCU6		Japanese knotweed	Polygonum cuspidatum Siebold & Zucc.		
PODEM	PLC	plains cottonwood	Populus deltoides W. Bartram ex Marshall ssp. monilifera (Aiton) Eckenwalder	H	
POFE		Muttongrass	Poa fendleriana		
POFR2	FC	Fremont cottonwood	Populus fremontii S. Watson	H	
POGL		glaucous bluegrass	Poa glauca Vahl		
POGL8		licorice fern	Polypodium glycyrrhiza D.C. Eaton		
POJU70		Junpr polytrichm mss	Polytrichum juniperinum		
POLA3		looseflower bluegrass	Poa laxiflora		
POLEM		Jacob's-ladder	Polemonium L.		
POLO18		Polytrichum moss	Polytrichum longisetum		
POLY2		Lyall polytrichm mss	Polytrichum lyallii		
POLYG4		knotweed	Polygonum L.		
POLYT		Polytrichum Sp	Polysporina		
POMU		western swordfern	Polystichum munitum (Kaulf.) C. Presl		
PONE		Nevada Bluegrass	Poa nevadensis		
PONE2		Wheeler bluegrass	Poa nervosa (Hook.) Vasey		
PONU70		pohlia moss	Pohlia nutans		
POPH		poke knotweed	Polygonum phytolaccifolium Meisn. ex Small		
POPI10		Polytrichum moss	Polytrichum piliferum		
POPO5		cultivated knotweed	Polygonum polystachyum Wall. ex Meisn.		
POPR		Kentucky Bluegrass	Poa pratensis L.		
POPRP2		Kentucky bluegrass	Poa pratensis ssp. pratensis		
POPU3		Jacob's-ladder	Polemonium pulcherrimum Hook.		
POPUL	CA	cottonwood	Populus L.	H	

POSA4		giant knotweed	Polygonum sachalinense F. Schmidt ex Maxim.		
POSE		Sandberg bluegrass	Poa secunda J. Presl		
POST		Northern bluegrass	Poa stenantha		
POTAM		Pondweed	Potamogeton		
POTEN		cinquefoil	Potentilla L.		
POTR2		Rough Bluegrass	Poa trivialis L.		
POTR5	QA	quaking aspen	Populus tremuloides Michx.	H	
POUN2		oneflower cinquefoil	Potentilla uniflora		
POVI3		alpine bistort	Polygonum viviparum L.		
PRAL		W rattlesnakeroot	Prenanthes alata		
PREM	CH	bitter cherry	Prunus emarginata (Douglas ex Hook.) D. Dietr.	H	
PRHOH		drops-of-gold	Prosartes hookeri Torr. var. hookeri		
PRHOO		Oregon drops of gold	Prosartes hookeri Torr. var. oregana (S. Watson) Kartesz		
PRO		Litter Profile	Soils		
PROSO		Mesquite spp	Prosopis L.	H	X
PRPA5		European bird cherry	Prunus padus		
PRSM		largeflower fairybells	Prosartes smithii (Hook.) Utech, Shinwari & Kawano		
PRTR4		roughfruit fairybells	Prosartes trachycarpa S. Watson		
PRUNU		Prunus spp	Prunus L.	H	
PRVI		chokecherry	Prunus virginiana		
PRVU		common selfheal	Prunella vulgaris L.		
PSJA2		tuber starwort	Pseudostellaria jamesiana (Torr.) W.A. Weber & R.L. Hartm.		
PSMA	BD	bigcone Douglas-fir	Pseudotsuga macrocarpa (Vasey) Mayr	C	
PSME	D	Douglas-fir	Pseudotsuga menziesii (Mirb.) Franco	C	
PSSP		Bluebunch Wheatgrass	Pseudoroegneria spicata spp. spicata		
PSSP6		Bluebunch Wheatgrass	Pseudoroegneria spicata		
PSSPS		bluebunch wheatgrass	Pseudoroegneria spicata (Pursh) Á. Löve ssp. spicata		
PTAQ		western brackenfern	Pteridium aquilinum (L.) Kuhn		
PTCR70		Knights plume moss	Ptilium crista-castrensis		
PTERI3		Pterigynandrum moss	Pterigynandrum		

PUKA		Alaska alkaligrass	Puccinellia kamtschatica		
PUME		Mexican cliffrose	Purshia mexicana		
PUPA5		eastern pasqueflower	Pulsatilla patens (L.) Mill.		
PUPHG		Jointed alkaligrass	Puccinellia phryganodes ssp. genicul		
PUTR2		antelope bitterbrush	Purshia tridentata (Pursh) DC.		
PYAS		liverleaf wintergreen	Pyrola asarifolia Michx.		
PYCH		greenflwrd wintergrn	Pyrola chlorantha		
PYGR		largeflowered wintergreen	Pyrola grandiflora Radius		
PYPI2		whiteveined wintergreen	Pyrola picta Sm.		
PYROL		wintergreen	Pyrola L.		
QU		Oak Species		H	
QUAG	LO	California live oak	Quercus agrifolia Nee	H	
QUAR	AWO	Arizona white oak	Quercus arizonica Sarg.	H	X
QUCH2	CL	canyon live oak	Quercus chrysolepis Liebm.	H	
QUDO	BLO	blue oak	Quercus douglasii Hook. & Arn.	H	
QUEM	EMO	Emory oak	Quercus emoryi Torr.	H	X
QUEN	EO	Engelmann oak	Quercus engelmannii Greene	H	
QUERC		Oak spp	Quercus L.		
QUGA	GO	Gambel oak	Quercus gambelii Nutt.	H	X
QUGA4	WO	Oregon white oak	Quercus garryana Douglas ex Hook.	H	
QUGR3	GRO	gray oak	Quercus grisea Liebm.	H	
QUHY	SO	silverleaf oak	Quercus hypoleucoides A. Camus	H	X
QUKE	CO	California black oak	Quercus kelloggii Newberry	H	
QULO	CW	valley oak	Quercus lobata Nee	H	
QUMA2	BUO	bur oak	Quercus macrocarpa Michx.	H	X
QUMU	CHO	chinquapin oak	Quercus muehlenbergii Engelm.	H	
QUOB	MO	Mexican blue oak	Quercus oblongifolia Torr.	H	
QURU4	NO	netleaf oak	Quercus rugosa N,e	H	
QUSA2		deer oak	Quercus sadleriana R. Br. ter		
QUTU2		Sonoran scrub oak	Quercus turbinella Greene		

QUVA		huckleberry oak	Quercus vacciniifolia Kellogg		
QUVI		Live oak	Quercus spp	H	
QUWI2	IO	interior live oak	Quercus wislizenii A.DC.	H	
RAACA3		showy buttercup	Ranunculus acris var. acris		
RACA11		Racomitrium moss	Racomitrium canescens		
RACOM		Racomitrium moss	Racomitrium		
RAES		Eschscholtz's bttrcp	Ranunculus eschscholtzii		
RAHY2		High nrthrn buttercp	Ranunculus hyperboreus		
RALA		Lapland buttercup	Ranunculus lapponicus L.		
RALA70		Racomitrium moss	Racomitrium lanuginosum		
RANUN		buttercup	Ranunculus L.		
RAOC		western buttercup	Ranunculus occidentalis Nutt.		
RAPA2		Pallas buttercup	Ranunculus pallasii		
RARE3		creeping buttercup	Ranunculus repens L.		
RAUNP		Idaho buttercup	Ranunculus uncinatus var. parvifloru		
RHAL2		Cascade azalea	Rhododendron albiflorum Hook.		
RHGL70		Rhizomnium moss	Rhizomnium glabrescens		
RHIZO2		Rhizomnium moss	Rhizomnium		
RHLA2		Lapland rosebay	Rhododendron lapponicum (L.) Wahlenb.		
RHLO70		Goose neck moss	Rhytidiadelphus loreus		
RHMA3		Pacific rhododendron	Rhododendron macrophyllum D. Don ex G. Don		
RHMI13		Little yellow rattle	Rhinanthus minor		
RHMIG		Arctic rattlebox	Rhinanthus minor ssp. groenlandicus		
RHOC		western azalea	Rhododendron occidentale (Torr. & Gray ex Torr.) Gray		
RHODO		rhododendron	Rhododendron L.		
RHRU70		rhytidium moss	Rhytidium rugosum		
RHTR		Skunkbrush Sumac	Rhus trilobata		
RHTR70		Rough goose neck mss	Rhytidiadelphus triquetrus		
RHYTI2		Goose neck moss	Rhytidiadelphus		
RIBES		currant	Ribes L.		

RIBI		ground gooseberry	Ribes binominatum A. Heller		
RIBR		stink currant	Ribes bracteosum Douglas ex Hook.		
RICE		wax currant	Ribes cereum Douglas		
RICR		shinyleaf currant	Ribes cruentum Greene		
RIHU		Nrthrn black currant	Ribes hudsonianum		
RILA		prickly currant	Ribes lacustre (Pers.) Poir.		
RILO		gummy gooseberry	Ribes lobbii A. Gray		
RIMA2		Hupa gooseberry	Ribes marshallii Greene		
RISA		redflower currant	Ribes sanguineum Pursh		
RITR		red currant	Ribes triste Pall.		
RIVI3		sticky currant	Ribes viscosissimum Pursh		
ROAC		prickly rose	Rosa acicularis		
ROGY		dwarf rose	Rosa gymnocarpa Nutt.		
RONE		New Mexico locust	Robinia neomexicana A. Gray	H	X
RONU		Nootka rose	Rosa nutkana C. Presl		
ROPAH		Hispid Yellowcress	Rorippa palustris ssp. hispida		
RORU82		sweetbriar rose	Rosa rubiginosa		
ROSA5		rose	Rosa L.		
RUAC2		garden sorrel	Rumex acetosa L.		
RUAC3		common sheep sorrel	Rumex acetosella		
RUAL6		Alaska blackberry	Rubus alaskensis		
RUAQF		Western dock	Rumex aquaticus var. fenestratus		
RUAR		arctic raspberry	Rubus arcticus L.		
RUAR6		arctic dock	Rumex arcticus Trautv.		
RUAR9		Himalayan blackberry	Rubus armeniacus Focke		
RUARA2		dwarf raspberry	Rubus arcticus L. ssp. acaulis (Michx.) Focke		
RUBUS		blackberry	Rubus L.		
RUCH		cloudberry	Rubus chamaemorus L.		
RUCR		curly dock	Rumex crispus		
RUID		American red raspbry	Rubus idaeus L.		

RULA		cutleaf blackberry	Rubus laciniatus Willd.		
RULA2		roughfruit berry	Rubus lasiococcus A. Gray		
RULE		whitebark raspberry	Rubus leucodermis Douglas ex Torr. & A. Gray		
RULO2		dooryard dock	Rumex longifolius		
RUMEX		dock	Rumex L.		
RUNI2		snow raspberry	Rubus nivalis Dougl. ex Hook.		
RUPA		thimbleberry	Rubus parviflorus Nutt.		
RUPE		strawberryleaf raspberry	Rubus pedatus Sm.		
RUSP		salmonberry	Rubus spectabilis Pursh		
RUUR		California blackberry	Rubus ursinus Cham. & Schlecht.		
SAAL		feltleaf willow	Salix alaxensis (Anderson) Coville		
SAAN3		narrowleaf saw-wort	Saussurea angustifolia (Willd.) DC.		
SAAR3		littletree willow	Salix arbusculoides Andersson		
SAAR6		northern willow	Salix arctophila Cockerell ex A. Heller		
SABA3		Barclay's willow	Salix barclayi Andersson		
SABE2		Bebb willow	Salix bebbiana Sarg.		
SABO2		Booths willow	Salix boothii		
SABR6		yellowdot saxifrage	Saxifraga bronchialis		
SACA14		Canadian burnet	Sanguisorba canadensis		
SACO2		undergreen willow	Salix commutata		
SADR		Drummonds willow	Salix drummondiana		
SAEX		Narrowleaf willow	Salix exigua		
SAFL6		Whiplash saxifrage	Saxifraga flagellaris		
SAFU		Alaska bog willow	Salix fuscescens Andersson		
SAGL		grayleaf willow	Salix glauca L.		
SAHI3		yellow marsh saxifrage	Saxifraga hirculus L.		
SAHO		Dune Willow	Salix hookeriana		
SALE		Lemmon's willow	Salix lemmonii		
SALIB		Interior Salix	Salix Spp		
SALIX	WI	willow	Salix L.	H	

SALU		shining willow	Salix lucida		
SALU2		Yellow willow	Salix lutea		
SALUL		Pacific Willow	Salix lucida ssp. lasiandra		
SAMBU		Elderberry Sp	Sambucus		
SAMY		blueberry willow	Salix myrtillifolia Andersson		
SANEN		Heartleaf saxifrage	Saxifraga nelsoniana ssp. nelsoniana		
SANGU2		burnet	Sanguisorba L.		
SANI10		barrenground willow	Salix niphoclada Rydb.		
SANIC		sanicle	Sanicula L.		
SANIC5		blue elderberry	Sambucusÿnigraÿ L. subsp.ÿcerulea		
SAOC4		Alberta saxifrage	Saxifraga occidentalis S. Watson		
SAOF3		great burnet	Sanguisorba officinalis L.		
SAOP		purple mountain saxifrage	Saxifraga oppositifolia L.		
SAOV		Oval-leaf willow	Salix ovalifolia Trautv.		
SAPH		skeletonleaf willow	Salix phlebophylla Andersson		
SAPL2		Diamondleaf willow	Salix planifolia		
SAPO		polar willow	Salix polaris Wahlenb.		
SAPRO		Saprophyte	Saprophyte		
SAPS		false mountain willow	Salix pseudomonticola C.R. Ball		
SAPU1		tealeaf willow	Salix pulchra		
SAPU15		tealeaf willow	Salix pulchra Cham.		
SAR14		Richardsons willow	Salix richardsonii Hook.		
SARA2		red elderberry	Sambucus racemosa L.		
SARE2		netleaf willow	Salix reticulata L.		
SARI4		Richardson's willow	Salix richardsonii Hook.		
SARO2		Least willow	Salix rotundifolia		
SAROR		Least willow	Salix rotundifolia ssp. rotundifolia		
SASC	SW	Scoulers Willow	Salix scouleriana Barratt ex Hook.	H	
SASI2		Sitka willow	Salix sitchensis Sanson ex Bong.		
SASI6		bract saxifrage	Saxifraga sibirica		

SATR5		Three toothd saxfrge	Saxifraga tricuspidata		
SAUN8		sanionia moss	Sanionia uncinata		
SAUSS		Saw-wort	Saussurea		
SAXIF		saxifrage	Saxifraga L.		
SCAR7		tall fescue	Schedonorus arundinaceus		
SCIRP		Bulrush	Scirpus		
SCMI2		panicled bulrush	Scirpus microcarpus J. Presl & C. Presl		
SECO2		Marsh fleabane	Senecio congestus		
SEGI2	GS	giant sequoia	Sequoiadendron giganteum (Lindl.) J. Buchholz	C	
SELU		small blacktip ragwort	Senecio lugens Richardson		
SENEC		ragwort	Senecio L.		
SERO2		Roseroot-Stonecrop	Senecio pseudoarnica		
SESE		Club spikemoss	Selaginella selaginoides		
SESE3	RY	redwood	Sequoia sempervirens (Lamb. ex D. Don) Endl.	C	
SETR		arrowleaf ragwort	Senecio triangularis Hook.		
SHCA		russet buffaloberry	Shepherdia canadensis (L.) Nutt.		
SHEPH		Buffberry Sp	Shepherdia		
SIAC		moss campion	Silene acaulis (L.) Jacq.		
SIAL2		tall tumblemustard	Sisymbrium altissimum		
SILAA3		bladder campion	Silene latifolia ssp. alba		
SILEN		catchfly	Silene L.		
SISU2		Hemlock waterparsnip	Sium suave		
SOAU		European mountain ash	Sorbus aucuparia		
SOLID		goldenrod sp	Solidago L.		
SOMU		Rocky Mountain goldenrod	Solidago multiradiata Aiton		
SORBU		mountain ash	Sorbus L.		
SOSC2		Greenes Mtn. ash	Sorbus scopulina		
SOSI2		western mountain ash	Sorbus sitchensis M. Roem.		
SOSIS2		western mountain ash	Sorbus sitchensis M. Roem.		
SOSO2		false spirea	Sorbaria sorbifolia		

SPAN2		Narrowleaf bur-reed	Sparganium angustifolium		
SPARA		Reed	Sphagnum arcticum		
SPARG		Bur-reed Sp	Sparganium		
SPBE2		white spirea	Spiraea betulifolia Pall.		
SPCR		Sand Dropseed	Sporobolus cryptandrus		
SPDO		rose spirea	Spiraea douglasii Hook.		
SPDOM		Menzies' spirea	Spiraea douglasii var. menziesii (Hook.) K. Presl		
SPHAG2		sphagnum	Sphagnum L.		
SPHY		Northern bur-reed	Sparganium hyperboreum		
SPIRA		Spirea Sp	Spiraea		
SPIRA2		lady's tresses	Spiranthes Rich.		
SPRO		Hooded lady tresses	Spiranthes romanzoffiana		
SPSPS		rose meadowsweet	Spiraea splendens Baumann ex K. Koch var. splendens		
SPST3		beauverd spirea	Spiraea stevenii (C.K. Schneid.) Rydb.		
STAM2		claspleaf twistedstalk	Streptopus amplexifolius (L.) DC.		
STBOS		Sitka starwort	Stellaria borealis ssp. sitchana		
STCA		northern starwort	Stellaria calycantha (Ledeb.) Bong.		
STCHC3		coastal hedgenettle	Stachys chamissonis Benth. var. cooleyae (A. Heller) G. Mulligan & D. Munro		
STCR		fleshy starwort	Stellaria crassifolia Ehrh.		
STCR2		Curled starwort	Stellaria crispa		
STELL		Starwort Sp	Stellaria		
STERE2		Snow lichen Sp	Stereocaulon		
STLAR		twistedstalk	Streptopus lanceolatus (Aiton) Reveal var. roseus (Michx.) Reveal		
STLO2		longstalk starwort	Stellaria longipes		
STME		Mexican hedgenettle	Stachys mexicana Benth.		
STME2		common chickweed	Stellaria media		
STOC2		western needlegrass	Achnatherum occidentale (Thurb.) Barkworth ssp. occidentale		
STPA60		snow lichen	Stereocaulon paschale		
STREP3		Twistedstalk Sp	Streptopus		
STTO60		Tomentose snow lichn	Stereocaulon tomentosum		

STVE60		Vesuvius snow lichen	Stereocaulon vesuvianum		
SYAL		common snowberry	Symphoricarpos albus (L.) S.F. Blake		
SYAS3		western aster	Symphyotrichum ascendens (Lindl.)G.L.Nesom		
SYHE		trailing snowberry	Symphoricarpos hesperius		
SYMO		creeping snowberry	Symphoricarpos mollis Nutt.		
SYOR2		mountain snowberry	Symphoricarpos oreophilus		
SYRE		snowqueen	Synthyris reniformis (Douglas ex Benth.) Benth.		
SYSUS		Douglas Aster	Symphyotrichum subspicatum var. subs		
TABR2	PY	Pacific yew	Taxus brevifolia Nutt.	C	
TACA2		camphor tansy	Tanacetum camphoratum Less.		
TACA8		medusahead	Taeniatherum caput-medusae		
TAMAR		Tamarisk spp	Tamarindus L.	C	
TANAC		tansy	Tanacetum L.		
TAOF		Dandelion	Taraxacum officinale G.H. Weber ex Wiggers		
TARAX		Dandelion Sp	Taraxacum		
TAVU		Common Tansy	Tanacetum vulgare L.		
TEATA		Arctic groudsel	Tephroseris atropurpurea ssp. atropu		
TEGR2		Bigflower tellima	Tellima grandiflora		
THALI2		meadow-rue	Thalictrum L.		
THAMN3		Whiteworm lichen	Thamnolia		
THIN6		Intermediate Wheatgrass	Thinopyrum intermedium (Host) Barkworth & D.R. Dewey		
THMO6		Mountain Goldenbanner	Thermopsis montana Nutt.		
THOC		western meadow-rue	Thalictrum occidentale A. Gray		
THPL	RC	western redcedar	Thuja plicata Donn ex D. Don	C	
THSP		fewflower meadow-rue	Thalictrum sparsiflorum		
TITR		Threeleaf foamflower	Tiarella trifoliata		
TITRT		threeleaf foamflower	Tiarella trifoliata var. trifoliata L.		
TITRU		oneleaf foamflower	Tiarella trifoliata var. unifoliata (Hook.) Kurtz		
TOAR		spreading hedgeparsley	Torilis arvensis		
TOCA	CT	California nutmeg	Torreya californica Torr.	H	

TOCO		Northern asphodel	Tofieldia coccinea		
TODI		Pacific poison oak	Toxicodendron diversilobum (Torr. & Gray) Greene		
TOFIE		tofieldia	Tofieldia Huds.		
TOME		youth on age	Tolmiea menziesii (Pursh) Torr. & Gray		
TONI70		Tomentypnum moss	Tomentypnum nitens		
TOPAP3		Pale false mannagrss	Torreyochloa pallida var. pauciflora		
TOPU		Scotch flse asphodel	Tofieldia pusilla		
TRBOL		broadleaf starflower	Trientalis borealis Raf. ssp. latifolia (Hook.) Hulten		
TRCA		Carolina bugbane	Trautvetteria caroliniensis (Walter) Vail		
TREEC		Unknown conifer	No scientific name		
TREEH		Unknown hardwood	No scientific name		
TREU		arctic starflower	Trientalis europaea L.		
TRGL5		Sticky tofieldia	Triantha glutinosa		
TRHEH		Henderson's triteleia	Triteleia hendersonii Greene var. hendersonii		
TRHY		alsike clover	Trifolium hybridum		
TRIEN		starflower	Trientalis L.		
TRMA4		Seaside arrowgrass	Triglochin maritima		
TROV2		Pacific trillium	Trillium ovatum Pursh		
TRPE21		scentless false mayweed	Tripleurospermum inodorum		
TRRE3		white clover	Trifolium repens		
TRSP2		Spike trisetum	Trisetum spicatum		
TSHE	H	western hemlock	Tsuga heterophylla (Raf.) Sarg.	C	
TSME	MH	mountain hemlock	Tsuga mertensiana (Bong.) Carr.	C	
TYLA		Broadleaf Cattail	Typha latifolia		
ULAM	ELM	American elm	Ulmus americana L.	H	
ULEX		gorse	Ulex L.		
UMBEL		Umbelliform	Umbilicaria arctica		
UMCA	MY	California laurel	Umbellularia californica (Hook. & Arn.) Nutt.	H	
UNSPEC	UN	Unspecified	Uno specifica neurosesignoramus		
URDI		stinging nettle	Urtica dioica L.		

UTMA		Common bladderwort	Utricularia macrorhiza		
UTRIC		Bladderwort	Utricularia		
VAAL3		Alaska blueberry	Vaccinium alaskaense Howell		
VAAT2		Mountain hairgrass	Vahlodea atropurpurea		
VACA3		captiate valerian	Valeriana capitata Pall. ex Link		
VACCI		blueberry	Vaccinum L.		
VACE		dwarf bilberry	Vaccinium cespitosum Michx.		
VADE		blueleaf huckleberry	Vaccinium deliciosum		
VAHE		white insideout flower	Vancouveria hexandra (Hook.) C. Morren & Decne.		
VALER		valerian	Valeriana L.		
VAME		thinleaf huckleberry	Vaccinium membranaceum Dougl. ex Torr.		
VAOV		oval-leaf blueberry	Vaccinium ovalifolium Sm.		
VAOV2		California huckleberry	Vaccinium ovatum Pursh		
VAOX		small cranberry	Vaccinium oxycoccos L.		
VAPA		red huckleberry	Vaccinium parvifolium Sm.		
VASC		grouse whortleberry	Vaccinium scoparium Leiberg ex Coville		
VASI		Sitka valerian	Valeriana sitchensis Bong.		
VAUL		bog blueberry	Vaccinium uliginosum L.		
VAVI		ligonberry	Vaccinium vitis-idaea L.		
VAVI_D		Lingonberry	Vaccinium vitis-idaea		
VECA2		California false hellebore	Veratrum californicum Durand		
VETH		Common Mullein	Verbascum thapsus L.		
VEVI		green false hellebore	Veratrum viride Aiton		
VEWO2		Amercn alp speedwell	Veronica wormskjoldii		
VIAM		American Vetch	Vicia americana		
VIBUR		Viburnum Sp	Viburnum		
VICIA		vetch	Vicia L.		
VICR		bird vetch	Vicia cracca ssp. cracca		
VIED		squashberry	Viburnum edule (Michx.) Raf.		
VIGL		pioneer violet	Viola glabella Nutt.		

VILA6		Aleutian violet	Viola langsdorffii		
VIOLA		violet	Viola L.		
VIOP		American cranbrybush	Viburnum opulus		
VIOR		darkwoods violet	Viola orbiculata Geyer ex Holz.		
VISE3		evergreen violet	Viola sempervirens Greene		
VUPI		Vulpicida pinastri	Vulpicida pinastri		
WHMO		common whipplea	Whipplea modesta Torr.		
WYAM		mule-ears	Wyethia amplexicaulis (Nutt.) Nutt.		
WYHE		whitehead mule-ears	Wyethia helenioides (DC.) Nutt.		
WYMO		woolly mule-ears	Wyethia mollis A. Gray		
XAEL60		Elegnt orng wall lch	Xanthoria elegans		
XETE		common beargrass	Xerophyllum tenax (Pursh) Nutt.		
Z_BRYO		Mosses As a Type Group	Bryophyta (Moss) Species		
Z_C	C	Cedars As A Type Group	Cedars As A Type Group	C	
Z_FM	FM	True Fir Mountain Hemlock Type	True Fir Mountain Hemlock Type	C	
Z_HD	HD	Hardwoods As A Type Group	Hardwoods As A Type Group	H	
Z_JU	JUN	Juniper Type	Juniper Type	C	
Z_NB	NB	Brush Species	Brush Species		
Z_NH	NH	Non-commercial Hardwoods	Non-commercial Hardwoods	H	
Z_OAK	OK	Oak Type	Oak Type	H	
Z_OM	OM	Oak Madrone Type	Oak Madrone Type	H	
Z_P	W	White Pine As A Type Group	White Pine As A Type Group	C	
Z_PIJU	PIJU	Pinyon-Juniper Type	Pinyon-Juniper Type	C	
Z_PJ	PJ	Ponderosa-Jeffrey Pine Group	Ponderosa-Jeffrey Pine Group	C	
Z_PY	PIY	Pinyon Pine Type	Pinyon Pine Type	C	
Z_WG	WG	White Fir-Grand Fir Type	White Fir-Grand Fir Type	C	
2TD		Other Hardwood		H	
2TE		Other Softwood		C	

Resource Management Area Table

District /State	Master Unit /State	Resource Area /Field Office	RMA Code /FO Code
Salem	Columbia	Tillamook	111
Salem	Columbia	Marys Peak	112
Salem	Alsea-Rickreall	Marys Peak	173
Salem	Clackamas-Molalla	Cascades	144
Salem	Santiam River	Cascades	185
Eugene	Upper Willamette	McKenzie	231
Eugene	Upper Willamette	South Valley	232
Eugene	Siuslaw River	South Valley	243
Eugene	Siuslaw River	Coast Range	244
Roseburg	South Umpqua	South River	344
Roseburg	Douglas	Swiftwater	351
Roseburg	Douglas	South River	354
Coos Bay	South Coast	Umpqua	453
Coos Bay	South Coast	Myrtlewood	456
Medford	Josephine	Grants Pass	511
Medford	Josephine	Glendale	513
Medford	Josephine	Ashland	515
Medford	Josephine	Butte Falls	516
Medford	Jackson	Grants Pass	521
Medford	Jackson	Glendale	523
Medford	Jackson	Ashland	525
Medford	Jackson	Butte Falls	526
Medford	Klamath	Ashland	534
Lakeview	Klamath	K. Falls West	834
Lakeview	Eastern Oregon	K. Falls East	848
Alaska	Alaska	Undefined	AK0
Alaska	Alaska	Anchorage	AK1

District /State	Master Unit /State	Resource Area /Field Office	RMA Code /FO Code
Alaska	Alaska	Glennallen	AK2
Alaska	Alaska	Fairbanks	AK3
Arizona	Arizona	Undefined	AZ0
Arizona	Arizona	Arizona Strip	AZ1
California	California	Undefined	CA0
California	California	Alturas	CA1
California	California	Eagle Lake	CA2
California	California	Folsom	CA3
California	California	Redding	CA4
California	California	Surprise	CA5
Colorado	Colorado	Undefined	CO0
Colorado	Colorado	Gunnison	CO1
Colorado	Colorado	Kremmling	CO2
Colorado	Colorado	Royal Gorge	CO3
Colorado	Colorado	Uncompahgre	CO4
Colorado	Colorado	White River	CO5
Idaho	Idaho	Undefined	ID0
Idaho	Idaho	Coeur D' Alene	ID1
Idaho	Idaho	Cottonwood	ID2
Idaho	Idaho	Four Rivers	ID3
Idaho	Idaho	Owyhee	ID4
Idaho	Idaho	Salmon	ID5
Montana	Montana	Undefined	MT0
Montana	Montana	Billings	MT1
Montana	Montana	Butte	MT2
Montana	Montana	Dillon	MT3
Montana	Montana	Lewiston	MT4
Montana	Montana	Malta	MT5
Montana	Montana	Miles City	MT6
Montana	Montana	Missoula	MT7
Montana	Montana	South Dakota	MT8

District /State	Master Unit /State	Resource Area /Field Office	RMA Code /FO Code
New Mexico	New Mexico	Undefined	NM0
New Mexico	New Mexico	Las Cruces	NM1
New Mexico	New Mexico	Rio Puerco	NM2
New Mexico	New Mexico	Socorro	NM3
New Mexico	New Mexico	Taos	NM4
Nevada	Nevada	Undefined	NV0
Nevada	Nevada	Carson City	NV1
Nevada	Nevada	Elko	NV2
Nevada	Nevada	Ely	NV3
Oregon	Oregon	Undefined	OR0
Oregon	Oregon	Andrews	OR1
Oregon	Oregon	Baker	OR2
Oregon	Oregon	Border	OR3
Oregon	Oregon	Central Oregon	OR4
Oregon	Oregon	Deschutes	OR5
Oregon	Oregon	Jordan	OR6
Oregon	Oregon	Malhuer	OR7
Oregon	Oregon	Three Rivers	OR8
Oregon	Oregon	Wenatchee	OR9
Utah	Utah	Undefined	UT0
Utah	Utah	Cedar City	UT1
Utah	Utah	Fillmore	UT2
Utah	Utah	GS Escalante	UT3
Utah	Utah	Kanab	UT4
Utah	Utah	Monticello	UT5
Utah	Utah	Richfield	UT6
Utah	Utah	St George	UT7
Utah	Utah	Vernal	UT8
Utah	Utah	Salt Lake	UT9
Wyoming	Wyoming	Undefined	WY0
Wyoming	Wyoming	Buffalo	WY1

District /State	Master Unit /State	Resource Area /Field Office	RMA Code /FO Code
Wyoming	Wyoming	Casper	WY2
Wyoming	Wyoming	Cody	WY3
Wyoming	Wyoming	Lander	WY4
Wyoming	Wyoming	Newcastle	WY5
Wyoming	Wyoming	Pinedale	WY6
Wyoming	Wyoming	Rawlins	WY7
Wyoming	Wyoming	Rock Springs	WY8
Wyoming	Wyoming	Worland	WY9

Site Index Table (found in Admin Program)

Site Index Tables (Lakeview-OR)

	Site Index Equation	Site Year	Site Pot ?	Tot.Age Adjust.	Class 7 Max SI	Age Adjust	Class 6 Max SI	Age Adjust	Class 5 Max SI	Age Adjust	Class 4 Max SI	Age Adjust	Class 3 Max SI	Age Adjust	Class 2 Max SI	Age Adjust	Class 1 Max SI	Age Adjust
WHBA	Barnes-Western Hemlock	100	☑	0					95	7	125	7	155	7	185	7	Max	7
PPBA	Barrett-Ponderosa Pine	100	☑	0														
DFBR	Bruce-Douglas Fir	50	☐	0														
DFCO	Cochran PNW251 Douglas ...	50	☐	0														
WFCO	Cochran PNW252 White Fir	50	☐	0														
DFCU	Curtis-DF - >2500'-Cascades	100	☑	0					95	7	125	7	155	7	185	7	Max	7
LPDA	Dahms PNW8 Lodgepole Pi...	50	☐	7														
WFDO	Dolph PSW 185 White Fir	50	☐	0														
WHFL	Flewelling unpublished Wes...	50	☐	0														
DFHS	Hann/Scrivani-DF SW OR '...	50	☐	0					65	7	85	7	105	7	125	7	Max	7
PPHS	Hann/Scrivani-PP SW OR '...	50	☐	0	28	7	37	7	45	7	54	7	62	7	71	7	Max	7
RAHC	Harrington/Curtis Red Alder	20	☐	7														
NFHE	Herman/Curtis/Demars-Nob...	100	☑	0														
DFKG	Kings-DF-<2500'-young-No ...	50	☐	0					75		95		115		135		Max	
DFMC	McArdle-DF- < 2500'-old sta...	100	☑	0					95	7	125	7	155	7	185	7	Max	7
PPME	Meyer-PP/JP/SP-old stands	100	☑	7														
SSME	Meyer-Sitka Spruce	100	☑	0					95	7	125	7	155	7	185	7	Max	7
RAOR	ORGANON Red Alder Weis...	20	☐	7														
SPPO	Powers-Oliver PSW 128	50	☐	7														
WFSH	Schumacher-White & Grand...	50	☑	7	15		35		45		55		75		Max			
RFSH	Schumaker-Red Fir	50	☑	7														
ASBR	Brickell, Manual Entry - Asp...	50	☐															
ESBR	Brickell, Manual Entry - Eng...	50	☐															
IDBR	Brickell, Manual Entry - Inla...	50	☐															
LPBR	Brickell, Manual Entry - Lod...	50	☐															
PPBR	Brickell, Manual Entry - Pon...	50	☐															
WLBR	Brickell, Manual Entry - Wes...	50	☐															

Site Index formulas are derived from either Total Age or Breast Height Age. The table on the previous page denotes the basis for each SI determination. The Site Index Table in the Administration Menu of the PC program allows adjustment total age from breast height age field data. Depending on the SI formula (row), the age can be corrected either in the Total Age Adjust column or in the Age Adjust columns for each Site Class. These columns are not editable if the corresponding SI formula (row) is based on Breast Height Age. Changing or editing an age adjustment is done by clicking in a cell and typing the desired number.

Site Index Table Field Definitions: (Class values shown are the maximum of the range with the minimum of the range being the value in the Class to the left plus 1.)

Site Year: The base age in years for the site curve or table. Those Site Indices with a 0 (zero) in the Tot.Age Adjust column are based on Breast Height Age.

Site Pot : Site Potential: Site Index curves recognized for NFP (Northwest Forest Plan) determination of riparian Reserve widths.

Maximum site index for 100 to 300ft riparian reserve width. See: Memorandum OR-95-75 “Determining Site-Potential Tree Height for Initial Riparian Reserve Widths”

These are not editable in the Administration portion of the program.

MaxSi: Maximum site index for given a site class. If table does not have site classes then leave that column empty.

AgeAdjust: Only applicable to Total Age Site Indices. Allows for a Breast Height Age to Total Age adjustment for a specific site class. Leave blank for site classes that don’t exist in the table. If a Total Age site index table does not have differences between the individual site class age adjustments, then use the Tot.AgeAdjust will be used.

Tot.AgeAdjust: Breast Height Age adjustment for Total Age. If the site index table does not have individual site class age adjustment then this age adjustment is used for all site index values.

Tree Species Volume Equations, parameters, and Equation Names

Tree Species Volume Equation Parameter Table

To cross-reference the volume equation parameters to an equation name, use the ”vp_fk” value on this table to find same value in “Link to Equation” column on the Equation names table (see page 98).

vp_fk	Species	Area_of_Application	Bark_Thickness_Default	Form_Factor_Default	Default
45	Douglas Fir	Coast	91.5	87	No
46	Douglas Fir	Cascade	91.5	87	No
47	Douglas Fir	Southwest	91.5	86	No
48	Douglas Fir	Other	91.5	86	No
49	Redwood	Area Wide	92	85	Yes
50	Douglas Fir	Northern California	91.5	86	No
51	Ponderosa Pine /Yellow	Area Wide	90.6	85	No
52	Ponderosa Pine / Other	Area Wide	90.6	88	Yes
53	Jeffery Pine	Area Wide	90.6	88	Yes
54	Sugar Pine	Area Wide	88.3	91	Yes
55	Western White Pine	Area Wide	93.5	86	No
56	Lodgepole Pine	Area Wide	92.5	89	Yes
57	Pacific Yew	Area Wide	95.1	76	Yes
58	Tan Oak	Area Wide	91	84	Yes
59	Red Alder	Area Wide	91	88	Yes
60	Oregon Myrtle	Area Wide	93	82	Yes
61	Big Leaf Maple	Area Wide	95.1	84	Yes
62	Pacific Madrone	Area Wide	96.2	81	Yes
63	Golden Chinquapin	Area Wide	93	83	Yes
64	Oregon Ash	Area Wide	92.5	86	Yes
65	Black Cottonwood	Area Wide	92.5	86	Yes
66	California Black Oak	Area Wide	95	80	Yes
66	Canyon Live Oak	Area Wide	95	80	Yes
66	Oregon White Oak	Area Wide	95	80	Yes
66	California White Oak	Area Wide	95	80	Yes
67	White Fir	Westside	89.7	87	No

vp_fk	Species	Area_of_Application	Bark_Thickness_Default	Form_Factor_Default	Default
68	White Fir	Other	89.7	85	Yes
69	California Red Fir	Area Wide	89.3	88	Yes
69	Shasta Red Fir	Area Wide	89.3	90	Yes
70	Grand Fir	Area Wide	94.5	87	Yes
71	Pacific Silver Fir	Area Wide	93.9	85	Yes
72	Noble Fir	Area Wide	93.9	87	Yes
73	Engelmann Spruce	Area Wide	96	82	Yes
74	Sitka Spruce	Area Wide	96.2	77	Yes
75	Mountain Hemlock	Area Wide	94.4	85	Yes
75	Western Hemlock	Area Wide	94.4	89	No
76	Incense Cedar	Area Wide	83.6	86	Yes
77	Alaska Cedar	Area Wide	95.1	78	Yes
78	Port Orford Cedar	Area Wide	91.1	90	Yes
79	Western Red Cedar	Area Wide	95.1	78	No
80	Western Larch	Area Wide	91.7	85	Yes
81	Sub Alpine Fir	Area Wide	93	86	Yes
81	White Alder	Area Wide	93	86	Yes
81	Paper Birch	Area Wide	93	86	Yes
81	Dogwood	Area Wide	93	83	Yes
81	Hawthorne	Area Wide	93	77	Yes
81	Cypress	Area Wide	93	75	Yes
81	Western Juniper	Area Wide	93	75	Yes
81	Alpine Larch	Area Wide	93	82	Yes
81	Apple	Area Wide	93	75	Yes
81	White Bark Pine	Area Wide	93	84	Yes
81	Knobcone Pine	Area Wide	93	84	Yes
81	Brewer Spruce	Area Wide	93	84	Yes
81	Limber Pine	Area Wide	93	84	Yes
81	Quaking Aspen	Area Wide	92.5	89	Yes
81	Cherry	Area Wide	93	86	Yes
81	Cascara	Area Wide	93	75	Yes

vp_fk	Species	Area_of_Application	Bark_Thickness_Default	Form_Factor_Default	Default
81	Willow	Area Wide	93	75	Yes
1	Douglas Fir	Area Wide			No
2	Douglas Fir	East Cascade			No
3	Douglas Fir	Okanogan			No
4	Douglas Fir	Blue Mountains			No
5	Douglas Fir	Kootenai			No
6	Douglas Fir	Central Idaho			No
82	Western Larch	Area Wide			No
83	Western Larch	East Cascade			No
84	Western Larch	Okanogan			No
85	Western Larch	Blue Mountains			No
86	Western Larch	Kootenai			No
87	Western Larch	Central Idaho			No
89	Grand Fir	Area Wide			No
90	Grand Fir	East Cascade			No
91	Grand Fir	Okanogan			No
92	Grand Fir	Blue Mountains			No
93	Grand Fir	Kootenai			No
94	Grand Fir	Central Idaho			No
96	Ponderosa Pine	Area Wide			No
97	Ponderosa Pine	East Cascade			No
98	Ponderosa Pine	Okanogan			No
99	Ponderosa Pine	Blue Mountains			No
100	Ponderosa Pine	Kootenai			No
101	Ponderosa Pine	Central Idaho			No
103	Lodgepole Pine	Area Wide			No
104	Lodgepole Pine	East Cascade			No
105	Lodgepole Pine	Okanogan			No
106	Lodgepole Pine	Blue Mountains			No
107	Lodgepole Pine	Kootenai			No
108	Lodgepole Pine	Central Idaho			No

vp_fk	Species	Area_of_Application	Bark_Thickness_Default	Form_Factor_Default	Default
110	Western Red Cedar	Area Wide			No
111	Western Red Cedar	East Cascade			No
112	Western Red Cedar	Okanogan			No
113	Western Red Cedar	Blue Mountains			No
114	Western Red Cedar	Kootenai			No
115	Western Red Cedar	Central Idaho			No
117	Engelmann Spruce	Area Wide			No
118	Engelmann Spruce	East Cascade			No
119	Engelmann Spruce	Okanogan			No
120	Engelmann Spruce	Blue Mountains			No
121	Engelmann Spruce	Kootenai			No
122	Engelmann Spruce	Central Idaho			No
124	White Pine	Area Wide			Yes
125	White Pine	East Cascade			No
126	White Pine	Okanogan			No
127	White Pine	Blue Mountains			No
128	White Pine	Kootenai			No
129	White Pine	Central Idaho			No
131	Mountain Hemlock	Area Wide			No
34	Mountain Hemlock	East Cascade			No
35	Mountain Hemlock	Okanogan			No
36	Mountain Hemlock	Blue Mountains			No
37	Mountain Hemlock	Kootenai			No
38	Mountain Hemlock	Central Idaho			No
39	Alpine Fir	Area Wide			No
40	Alpine Fir	East Cascade			No
41	Alpine Fir	Okanogan			No
42	Alpine Fir	Blue Mountains			No
43	Alpine Fir	Kootenai			No
44	Alpine Fir	Central Idaho			No
7	Douglas Fir	Area Wide			Yes

vp_fk	Species	Area_of_Application	Bark_Thickness_Default	Form_Factor_Default	Default
8	Douglas Fir	Oregon Coast			No
9	Douglas Fir	Oregon East Valley			No
10	Douglas Fir	Washington North			No
11	Douglas Fir	Washington Rain Shadow			No
12	Douglas Fir	Washington South			No
13	Douglas Fir	Washington West			No
14	Douglas Fir	Oregon West Valley			No
15	Douglas Fir	Washington Coast			No
16	Western Red Cedar	Area Wide			Yes
17	Western Red Cedar	Oregon Coast			No
18	Western Red Cedar	Oregon East Valley			No
19	Western Red Cedar	Washington North			No
20	Western Red Cedar	Washington Rain Shadow			No
21	Western Red Cedar	Washington South			No
22	Western Red Cedar	Washington West			No
23	Western Red Cedar	Oregon West Valley			No
24	Western Red Cedar	Washington Coast			No
25	Western Hemlock	Area Wide			Yes
26	Western Hemlock	Oregon Coast			No
27	Western Hemlock	Oregon East Valley			No
28	Western Hemlock	Washington North			No
29	Western Hemlock	Washington Rain Shadow			No
30	Western Hemlock	Washington South			No
31	Western Hemlock	Washington West			No
32	Western Hemlock	Oregon West Valley			No
33	Western Hemlock	Washington Coast			No

Tree Species Volume Equation Names

This table links to volume table on previous pages.

First capital letter in Equation name refers to source of equation.

I = INGY (Inland Growth & Yield)
F = Flewelling
B = Behrs

Link to Equation	Equation Species Code	Equation Name	Description
1	01I	I00FW2W202	Douglas Fir -Area Wide
2	0111	I11FW2W202	Douglas Fir - East Cascade
3	0112	I12FW2W202	Douglas Fir - Okanogan
4	0113	I13FW2W202	Douglas Fir - Blue Mountains
5	0114	I14FW2W202	Douglas Fir - Kootenai
6	0115	I15FW2W202	Douglas Fir - Central Idaho
7	01F	F00FW2W202	Douglas Fir - Area Wide
8	0101	F01FW2W202	Douglas Fir - Oregon Coast
9	0102	F02FW2W202	Douglas Fir - Oregon East Valley
10	0103	F03FW2W202	Douglas Fir - Washington North
11	0104	F04FW2W202	Douglas Fir - Washington Rain Shadow
12	0105	F05FW2W202	Douglas Fir - Washington South
13	0106	F06FW2W202	Douglas Fir - Washington West
14	0107	F07FW2W202	Douglas Fir - Oregon West Valley
15	0108	F08FW2W202	Douglas Fir- Washington Coast
16	54F	F00FW2W242	Western Red Cedar - Area Wide
17	5401	F01FW2W242	Western Red Cedar - Oregon Coast
18	5402	F02FW2W242	Western Red Cedar - Oregon East Valley
19	5403	F03FW2W242	Western Red Cedar - Washington North
20	5404	F04FW2W242	Western Red Cedar - Washington Rain Shadow
21	5405	F05FW2W242	Western Red Cedar - Washington South
22	5406	F06FW2W242	Western Red Cedar - Washington West
23	5407	F07FW2W242	Western Red Cedar - Oregon West Valley
24	5408	F08FW2W242	Western Red Cedar - Washington Coast
25	48F	F01FW2W263	Western Hemlock - Area Wide
26	4801	F01FW2W263	Western Hemlock - Oregon Coast
27	4802	F02FW2W263	Western Hemlock - Oregon East Valley
28	4803	F03FW2W263	Western Hemlock - Washington North
29	4804	F04FW2W263	Western Hemlock - Washington Rain Shadow
30	4805	F05FW2W263	Western Hemlock - Washington South
31	4806	F06FW2W263	Western Hemlock - Washington West

Link to Equation	Equation Species Code	Equation Name	Description
32	4807	F07FW2W263	Western Hemlock - Oregon West Valley
33	4808	F08FW2W263	Western Hemlock - Washington Coast
34	4811	I11FW2W260	Mountain Hemlock - East Cascade
35	4812	I12FW2W260	Mountain Hemlock - Okanogan
36	4813	I13FW2W260	Mountain Hemlock - Blue Mountains
37	4814	I14FW2W260	Mountain Hemlock - Kootenai
38	4815	I15FW2W260	Mountain Hemlock - Central Idaho
39	19I	I00FW2W019	Alpine Fir - Area Wide
40	1911	I11FW2W019	Alpine Fir - East Cascade
41	1912	I12FW2W019	Alpine Fir - Okanogan
42	1913	I13FW2W019	Alpine Fir - Blue Mountains
43	1914	I14FW2W019	Alpine Fir - Kootenai
44	1915	I15FW2W019	Alpine Fir - Central Idaho
45	01	B01BEHW202	Douglas Fir - Coast
46	02	B02BEHW202	Douglas Fir - Cascade
47	03	B03BEHW202	Douglas Fir - Southwest
48	04	B04BEHW202	Douglas Fir - Other
49	05	B00BEHW211	Redwood
50	06	B05BEHW202	Douglas Fir - Northern California
51	10	B01BEHW122	Ponderosa Pine / Yellow
52	11	B00BEHW122	Ponderosa Pine / Other
53	12	B00BEHW116	Jeffery Pine
54	13	B00BEHW117	Sugar Pine
55	14	B00BEHW119	Western White Pine
56	15	B00BEHW108	Lodgepole Pine
57	20	B00BEHW231	Pacific Yew
58	21	B00BEHW631	Tan Oak
59	22	B00BEHW351	Red Alder
60	23	B00BEHW998	Oregon Myrtle
61	24	B00BEHW312	Big Leaf Maple
62	25	B00BEHW361	Pacific Madrone
63	26	B00BEHW431	Golden Chinquapin
64	27	B00BEHW542	Oregon Ash
65	28	B00BEHW747	Black Cottonwood
66	29	B00BEHW800	Oak Species
67	30	B00BEHW015	White Fir - Westside
68	31	B00BEHW015	White Fir - Other
69	32	B00BEHW021	Shasta Red Fir

Link to Equation	Equation Species Code	Equation Name	Description
70	33	B00BEHW017	Grand Fir
71	34	B00BEHW011	Pacific Silver Fir
72	35	B00BEHW022	Noble Fir
73	41	B00BEHW093	Engelmann Spruce
74	42	B00BEHW098	Sitka Spruce
75	48	B00BEHW260	Mountain Hemlock
76	51	B00BEHW081	Incense Cedar
77	52	B00BEHW042	Alaska Cedar
78	53	B00BEHW041	Port Orford Cedar
79	54	B00BEHW242	Western Red Cedar
80	55	B00BEHW073	Western Larch
81	56	B00BEHW999	Miscellaneous Species
82	55I	I00FW2W073	Western Larch - Area Wide
83	5511	I11FW2W073	Western Larch - East Cascade
84	5512	I12FW2W073	Western Larch - Okanogan
85	5513	I13FW2W073	Western Larch - Blue Mountains
86	5514	I14FW2W073	Western Larch - Kootenai
87	5515	I15FW2W073	Western Larch - Central Idaho
89	33I	I00FW2W017	Grand Fir - Area Wide
90	3311	I11FW2W017	Grand Fir - East Cascade
91	3312	I12FW2W017	Grand Fir - Okanogan
92	3313	I13FW2W017	Grand Fir - Blue Mountains
93	3314	I14FW2W017	Grand Fir - Kootenai
94	3315	I15FW2W017	Grand Fir - Central Idaho
96	11I	I00FW2W122	Ponderosa Pine - Area Wide
97	1111	I11FW2W122	Ponderosa Pine - East Cascade
98	1112	I12FW2W122	Ponderosa Pine - Okanogan
99	1113	I13FW2W122	Ponderosa Pine - Blue Mountains
100	1114	I14FW2W122	Ponderosa Pine - Kootenai
101	1115	I15FW2W122	Ponderosa Pine - Central Idaho
103	15I	I00FW2W108	Lodgepole Pine - Area Wide
104	1511	I11FW2W108	Lodgepole Pine - East Cascade
105	1512	I12FW2W108	Lodgepole Pine - Okanogan
106	1513	I13FW2W108	Lodgepole Pine - Blue Mountains
107	1514	I14FW2W108	Lodgepole Pine - Kootenai
108	1515	I15FW2W108	Lodgepole Pine - Central Idaho
110	54I	I00FW2W242	Western Red Cedar - Area Wide
111	5411	I11FW2W242	Western Red Cedar - East Cascade

Link to Equation	Equation Species Code	Equation Name	Description
112	5412	I12FW2W242	Western Red Cedar - Okanogan
113	5413	I13FW2W242	Western Red Cedar - Blue Mountains
114	5414	I14FW2W242	Western Red Cedar - Kootenai
115	5415	I15FW2W242	Western Red Cedar - Central Idaho
117	41I	I00FW2W093	Engelmann Spruce - Area Wide
118	4111	I11FW2W093	Engelmann Spruce - East Cascade
119	4112	I12FW2W093	Engelmann Spruce - Okanogan
120	4113	I13FW2W093	Engelmann Spruce - Blue Mountains
121	4114	I14FW2W093	Engelmann Spruce - Kootenai
122	4115	I15FW2W093	Engelmann Spruce - Central Idaho
124	14I	I00FW2W119	Alpine Fir - Area Wide
125	1411	I11FW2W119	Alpine Fir - East Cascade
126	1412	I12FW2W119	Alpine Fir - Okanogan
127	1413	I13FW2W119	Alpine Fir - Blue Mountains
128	1414	I14FW2W119	Alpine Fir - Kootenai
129	1415	I15FW2W119	Alpine Fir - Central Idaho
131	48I	I00FW2W260	Mountain Hemlock - Area Wide

Report Descriptions – Comments

Timber Type Symbol for Tree and Regeneration Reports

A **Timber Type Symbol** is displayed within the tree and regeneration report stratum headers (T02 through T09, R02 and R03)

This symbol is determined using the following rules:

- In order of abundance for each layer the species and its average DBH size class. Each species have at least 20% of the BA or at least 20% of the TPA for seedlings in that layer. Symbols used for species match the Micro*Storms species codes from the Plants Lookup Table (tblPlantsLkUp).
- For each species in each layer the average size class is determined based on the quadratic mean diameter and display asfollows:
    - 1 = 0-4.9 inches
    - 2 = 5-9.9 inches
    - 3 = 10-19.9 inches
    - 4 = 20-20.9 inches
    - 5 = 30-30.9 inches
    - 6 = 40-49.9 inches
    - 7 = 50+
- Following all species and sizes class symbols in the layer, the stocking class is displayed for the layer using the bar stocking symbols that match the percent canopy cover by layer found in the report plot header asfollows:
    - – 10-39% (1-bar)
    - = 40-69% (2-bar)
    - -= 70-100% (3-bar)
    - x no canopy data
- For regeneration surveys that record only seedlings and saplings and do not have percent canopy cover recorded, the following stocking classes are used based on total stocking percent of conifers and hardwoods from the R02 report:
    - – 10-59% of regen plots stocked (1-bar)
    - = 60-79% of regen plots stocked (2-bar)
    - -= 80-100% of regen plots stocked (3-bar)
    - x no regen plots. Highly unlikely scenario.
- Next the birthdate for each layer is shown based on the average BHAge
- For Trees, a default BH Age to Total Age adjustment of 7 years is set for all stands. This adjustment is applied to all Age and Site trees and utilized in both Layer Birthdate and Stand Age computations.
- For Saplings, the program used the Total Age data collected in the field.
- For Seedlings the program uses the indicated average seedling age designated in the Unit header. "**nd**" (no data) indicates birthday can not be calculated (no BH/seedling agecollected).
- The default Total Age Adjustment can only be changed by an Administrator from the Site Index Tables menu selection. Only Site Index Curves/Tables which require a total age can be modified. This change will however, alter stand age/birthdate computations from the default 7-years, but only if that Site Index is selected for the "Normal" Site Index field in the Unit Header.

- A list of PD and O&C species short codes (SppShortCd) are programmed into the EcoSurvey application for expressing the major tree species in a coded Timber Type description. These data derived Timber Type descriptions are displayed in Reports and used in Export files. Symbols used for tree species match the SppShortCd field from the REF SppCd table.

SppShortCd	Spp_Symbol	CommonName
AB	BENE4	Alaska birch
AC	CHNO	Alaska yellow-cedar
AF	ABLA	Subalpine fir
AL	ALOB2	Arizona alder
AL	ALRH2	white alder
AP	PIAR5	Arizona pine
AP	PIEN2	Apache pine
APL	MAFU	Oregon crab apple
AS	POTR5	Quaking aspen
ASH	FRLA	Oregon ash
ASH	FRPE	green ash
ASH	FRVE2	velvet ash
BDF	PSMA	bigcone Douglas-fir
BE	ACNE2	boxelder
BI	BEOC2	water birch
BI	BEPA	paper birch
BIP	PIMU	bishop pine
BKS	PIMA	Black spruce
BM	ACMA3	Bigleaf maple
BO	QUKE	California black oak
BP	PIAR	Rocky Mountain bristlecone pine
BP	PILO	Great Basin bristlecone pine
BRS	PIBR	Brewer spruce
BUC	AECA	California buckeye
BUS	PIPU	Blue Spruce
CF	ABLAA	corkbark fir
CHR	PREM	bitter cherry
CHR	PRVI	chokecherry

SppShortCd	Spp_Symbol	CommonName
CHR	PRUNU	cherry and plum species
CP	PICO3	Coulter pine
CW	POAN3	narrowleaf cottonwood
CW	POBAT	black cottonwood
CW	PODEM	plains cottonwood
CW	POFR2	Fremont cottonwood
CYP	CUAR	Arizona cypress
CYP	CUMA2	Monterey cypress
CYP	CUPRE	cypress
CYP	CUSA3	Sargent's cypress
D	PSME	Douglas fir
DI	OLTE	desert ironwood
ELM	ULAM	American elm
ES	PIEN	Engelmann's spruce
EUC	EUGL	Tasmanian bluegum
FTP	PIBA	foxtail pine
GC	CACH6	Golden chinkapin
GC	CHCHC4	giant chinkapin, golden chinkapin
GF	ABGR	Grand fir
GP	PISA2	gray or California foothill pine
GS	SEGI2	giant sequoia
IC	CADE27	Incense cedar
JP	PIJE	Jeffrey pine
JU	JUCA7	California juniper
JU	JUCO11	redberry juniper
JU	JUDE2	alligator juniper
JU	JUOS	Utah juniper
KP	PIAT	knobcone pine
LA	LALY	subalpine larch
LMP	PIFL2	Limber pine
LO	QUCH2	canyon live oak

SppShortCd	Spp_Symbol	CommonName
LO	QUWI2	interior live oak
LOC	RONE	New Mexico locust
LP	PICO	Lodgepole pine
LRL	UMCA	California-laurel
MA	ARAR2	Arizona madrone
MA	ARME	Pacific madrone
MAP	ACGL	Rocky Mountain maple
MAP	ACGR3	bigtooth maple
MES	PRGL2	honey mesquite
MES	PRPU	screwbean mesquite
MES	PRVE	velvet mesquite
MH	TSME	Mountain hemlock
MM	CELE3	curlleaf mountain-mahogany
MP	PIRA2	Monterey pine
NF	ABPR	noble fir
NM	TOCA	California torreya (nutmeg)
Oak	QUAG	California live oak
Oak	QUDO	blue oak
Oak	QUEM	Emory oak
Oak	QUEN	Engelmann oak
Oak	QUGA	Gambel oak
Oak	QUGR3	gray oak
Oak	QUHY	silverleaf oak
Oak	QUMA2	bur oak
Oak	QUMU	chinkapin oak
Oak	QUOB	Mexican blue oak
Oak	QURU4	netleaf oak
OJ	JUMO	oneseed juniper
PB	POBA2	balsam poplar
PD	CONU4	Pacific dogwood
PI	PICE	Mexican pinyon pine
PI	PIDI3	border pinyon

SppShortCd	Spp_Symbol	CommonName
PI	PIED	common or two-needle pinyon
PI	PIED	Pinyon pine
PI	PILE	Chihuahua pine
PI	PIMO	singleleaf pinyon
PI	PIMOF	Arizona pinyon pine
POC	CHLA	Port-Orford-cedar
PP	PIPO	Ponderosa pine
RA	ALRU2	Red alder
RF	ABMA	California red fir
RF	ABSH	Shasta red fir
RMJ	JUSC	Rocky Mountain juniper
RMJ	JUSC2	Rocky Mountain juniper
RW	SESE3	redwood
SA	SALIX	willow
SF	ABAM	Pacific silver fir
SL	LASI3	siberian larch
SP	PILA	Sugar pine
SS	PISI	Sitka spruce
SY	PLRA	California sycamore
TA	LALA	tamarack
TO	LIDE3	tanoak
UDC	2TE	Unknown dead conifer
UDH	2TB	Unknown dead hardwood
ULT	2TREE	Unknown live tree
WAP	PIWA	Washoe pine
WBP	PIAL	Whitebark pine
WF	ABCO	White fir
WH	TSHE	Western hemlock
WJ	JUOC	Western juniper
WL	LAOC	Western larch
WN	JUMA	Arizona walnut
WO	QUAR	Arizona white oak

SppShortCd	Spp_Symbol	CommonName
WO	QUGA4	Oregon white oak
WO	QULO	California white oak
WP	PIMO3	Western white pine
WP	PIST3	southwestern white pine
WRC	THPL	Western redcedar
WS	PIGL	White spruce
YEW	TABR2	Pacific yew

This procedure is followed for each layer. If the trees have not been designated by layer then all trees are assumed in layer one.

- Examples:
  - One layer stand: D4,H4-=1900
  - Two layer stand: D4=1900/H2=1950
  - Three layer stand: D4-1900/D2=1950/H1=2004

T01 - Complete Tree List by Plot

No calculations

T02 - Statistics for Trees, Greater than or equal to Merchantable Dbh

Merchantable Trees

- Data comes from the Trees Screen

Summaries and Statistics for:

- Number of SampleTrees (no stats)
- TPA
- BA/Acre
- Net Board Feet/Acre
- Net Cubic Feet/Acre
- VBAR in ft^2 BF and Ft^3

Stratum Header Timber Type Symbol

Refer to Timber Type Symbol for Tree and Regeneration Reports on page 102.

Groupings:

- Unit Totals for Dead, Live, Combined
- Stratum Totals for Dead, Live, Combined
- Stratum Species Totals for Dead, Live, Combined

Calculations and Formulas for Variable Plot:

TPA, BA, per Acre, Net Board Feet/Acre, Net Cubic Feet/Acre and VBAR can be found in the section "Stratum Per Acre (TPA, BA, Volume, VBAR)" on page 12.

Calculations and Formulas for Fixed Plot

TPA, BA, per Acre, Net Board Feet/Acre, Net Cubic Feet/Acre and VBAR can be found in the section Fixed Plot starting on page 14.

Comments: Categories having only one sample are denoted with "single sample, no statistics" statement.

T03 - Plot Summary for all Trees, including Sub-merch.

Plot Summary with Live, Dead Trees, Saplings, Seedlings

- Data comes from the Tree and Small Tree (Sapling) screen.

Stratum Header Timber Type Symbol

Refer to Timber Type Symbol for Tree and Regeneration Reports on page 102.

Calculations

- QMD
- Average Total Height
- TPA
- BA/Ac
- Ft3 Gross/Acre
- Ft3 Net/Acre
- Board Foot Gross
- Board Foot Net/Acre
- Ht/Diam Ratio
- Average Crown Width
- Total Canopy Cover %

Groupings:

By Plot with Stratum Summary

- Live Trees
- Dead Trees
- Saplings
- Seedlings

Standard Calculations

Variable plot - Calculations and Formulas for TPA, BA, per Acre, Net Board Feet/Acre, Net Cubic Feet/Acre and VBAR can be found in the section "Stratum per Acre (TPA, BA, Volume, VBAR)" on page 12.

Fixed Plot - Calculations and Formulas for TPA, BA, perAcre, Net Board Feet/Acre, Net Cubic Feet/Acre can be found in the section "Fixed Plot" on page 14.

QMD Calculation

The calculation for QMD is found in Quadratic Mean Diameter (QMD) on page 15.

Tree Height Averaging

Tree height averaging algorithm is found at "Stratum Tree Average Calculations" on page 11.

Height Diameter Ratio

Find at "Height Diameter Ratio" on page 17.

Average Crown Width

Find at "Average Crown Width" on page 17.

Total Canopy Cover Percent

Find at "Total Canopy Cover Percent" on page 17.

Comments

Plots having no trees are denoted by "no trees".

T04 & T04s - Stand Condition Summary with Statistics

- Statistics included in T04s option (activated by using the "Print statistics" checkbox at the bottom of the Select Reports screen)
- Merchantable Trees: Live, Dead, Undamaged, Damaged
- Data Comes from Tree Screens

Stratum Header Timber Type Symbol

Refer to Timber Type Symbol for Tree and Regeneration Reports on page 102.

Calculations

Summaries and Statistics for:

- TPA
- QMD (no stats)
- Gross Ft^3/Ac
- % Ft^3 Defect (no stats)
- Net Ft^3/Ac
- Gross BF/Acre
- % BF Defect (no stats)
- Net BF/Acre

Groupings:

Stratum Totals for each species by:

- Live or Dead Undamaged, and Damaged
- Live or Dead Undamaged and Damaged by Species and Damage Condition

Stratum summaries with statistics for the following Groups:

- Undamaged or Damaged Live Trees
- Dead Trees

Standard Calculations

Variable plot - Calculations and Formulas for TPA, BA per Acre, Net Board Feet/Acre, Net Cubic Feet/Ac can be found in the section "Stratum Per Acre (TPA, BA, Volume, VBAR)" on page 12.

Fixed Plot - Calculations and Formulas for TPA, BA, per Acre, Net Board Feet/Acre, Net Cubic Feet/Acre can be found in the section "Fixed Plot" on page 14.

QMD Calculation

Calculations for QMD are found in Quadratic Mean Diameter (QMD) on on page 15.

T05 and T05s - Stand Table by Species

- Statistics included in T05s option (activated by using the "Print statistics" checkbox at the bottom of the Select Reports screen)
- Merchantable Trees (Live and Dead) and Saplings
  - Data comes from Trees and Saplings Screens
  - QMD calculated for each species grouping

Stratum Header Timber Type Symbol

Refer to Timber Type Symbol for Tree and Regeneration Reports on page 102.

Calculations

- Summaries and Statistics for:
- TPA
- Average Height
- Gross Ft^3/Ac
- Net Ft^3/Ac
- Gross BF/Acre
- Net BF/Acre
- Average Crown Width

Groupings:

Stratum Listing of:

- Live or Dead Trees, by species by Dbh class

Stratum Summary with Statistics for:

- Live or Dead by Species
- All Dead Trees
- All Live Trees
- Live and Dead Trees

Unit Summary with Statistics for:

- All Live Trees
- All Dead Trees
- All Live and Dead Trees

Standard Calculations

Variable plot - Calculations and Formulas for TPA, BA, per Acre, Net Board Feet/Acre, Net Cubic Feet/Acre and VBAR can be found in the section "Stratum per Acre (TPA, BA, Volume, VBAR)" on page 12.

Fixed Plot - Calculations and Formulas for TPA, BA, per Acre, Net Board Feet/Acre, Net Cubic Feet/Acre can be found in the section "Fixed Plot" on page 14.

QMD Calculation

Calculations for QMD is found in Quadratic Mean Diameter (QMD) on page 15.

Average Height and Crown Width

Average height and crown width calculation is found in "Stratum Tree Average Calculations" on page 11.

Dbh Classes

Dbh class definitions are denoted in "Diameter Ranges" on page 9.

Comments:

Diameter range definitions are found on page 9.

Interpreting Statistics on T05S: When interpreting the statistical summaries are totals of combined plot sizes (sampling frequencies) between the Sapling Plot and the Tree Plot. The following example demonstrates how to interpret results:

Statistics	TPA
CV%	42.4
SE%	15.0
#plots for SE5%	72
# plots for SE 10%	18
# plots for SE 15%	8

The number of plots required to achieve the level of precision (SE %) is shown in the TPA column. The number of plots is a combined number (both sapling and tree plots).

Since there are two plots involved (tree plot and sapling plot), one must consider the ratio or sampling rate that was used. In the case of a sapling plot being measured on every tree plot the number of additional plots required is ½ the number shown in the TPA column. In this case, the number of sapling plots required to achieve:

SE10% = 18/2 = 9
SE15% = 8/2 = 4

The number of additional tree plots required would be the same:

SE10% = 18/2 = 9
SE15% = 8/2 = 4

T06a - Cut, Leave Summary, Combined - Merch

- "Statistics included" T06aS option" (activated by using the "Print statistics" checkbox at the bottom of the Select Reports screen)

Merchantable Trees, Live and Dead (cut leave not denoted). Comment - Down Woody Material not included.

- Listing/Summary in 1" diameter class by live/dead by cut/leave.
- Data comes from Tree Screen

All the T06 reports use tree height interpolation to estimate tree height for diameter classes not having sample trees. The reports do not create new diameter classes. If there is a tree with a diameter but no height then the height will be interpolated based on the heights of trees in bracketing diameter classes.

If the smallest diameter does not have a height then the height is interpolated using the smallest and next smallest diameter class. If the largest diameter does not have a height then the height is interpolated using the second largest and largest diameter class.

Stratum Header Timber Type Symbol

Refer to Timber Type Symbol for Tree and Regeneration Reports on page 102.

Calculations

Stratum Totals for MAI cubic and MAI Bdft.

Calculated for each species grouping:

- QMD
- Curtis Relative Density
- Stand Density Index
- Relative Density Index
- Max SDI

Summaries and Statistics for:

- TPA
- Average Total Height
- Average BH Age
- Basal Area/Ac
- Gross Ft^3/Ac
- Net Ft^3/Ac
- Gross BF/Acre
- Net BF/Acre
- Ht/Diam Ratio

Groupings:

Stratum Listing of:

- Live or Dead Trees, by species by 1" Dbh class

Stratum Summary with Statistics for:

- Live or Dead by Species
- All Dead Trees
- All Live Trees
- Live and Dead Trees
- Dead Standing Trees
- Dead Down Trees

Unit Summary with Statistics for:

- All Live Trees
- All Dead Trees
- All Live and Dead Trees
- Dead Standing Trees
- Dead Down Trees

Standard Calculations

Variable Plot - Calculations and Formulas for TPA, BA/Acre, Net Board Feet/Acre, and Net Cubic Feet/Acre can be found in the section "Stratum Per Acre (TPA, BA, Volume, VBAR)" on page 12.

Fixed Plot - Calculations and Formulas for TPA, BA/Acre, Net Board Feet/Acre, Net Cubic Feet/Acre can be found in the section "Fixed Plot" on page 14.

MAI - MAI calculation is found in "Mean Annual Increment (MAI)" on page 15.

There is a slight difference between EcoSurvey MAI calculation & calculations done manually. The difference is in the rounding for the printout. The calculation uses full floating point to derive answer, then in order to drop decimal the answer is rounded.

QMD Calculation

Calculations for QMD is found in Quadratic Mean Diameter (QMD) on page 15.

Curtis Relative Density, Stand Density Index, Relative Density Index, and Maximum Stand Density Index

Calculations are found in "Other Stratum Tree Calculations" on page 15.

Average total Height

Average total height calculation is found in Stratum Tree Average Calculations on page 11.

Dbh Classes

Dbh class definitions are denoted in "Diameter Ranges" on page 9.

Height – Diameter Ratio

Height – Diameter Ratio calculations are found in “Stratum Tree Average Calculations” on page 11.

Average breast-height age

This is a simple average of BHA

Comments

Comment 1: *Stand Density Index, Relative Density Index and Curtis Relative Density* are calculated by stratum. If there are multiple strata in the unit then these indexes will NOT be summarized for the unit. The purpose of these indexes is to get a sense of how well the area is growing. If the unit is stratified then there is a difference in the growth pattern (e.g. stocked stratum and clear cut stratum). Combining the stratum indexes for the unit will give a false impression for the unit's growth pattern.

Comment 2: Density values may appear to differ between T06 a, b, and c - the difference is due to sorting order and rounding issues. The a and b reports sort by dead/live first whereas the c report sorts by cut/leave first. The difference is not large, see example below.

Example sample density data:

Report Curtis, SDI RDI
T06a 41 249 0.42
T06b 41 249 0.42
T06c 41 247 0.41

T06b(S) - Cut, Leave Summary, 1" diameter class by live/dead by cut/leave, Merchantable

- "Statistics included" in T06b S option (activated by using the "Print statistics" checkbox at the bottom of the Select Reports screen)

Merchantable, Live and Dead trees. Comment - does not include Down Woody Material.

- Listing/Summary in 1" diameter class by live/dead by cut/leave.
- Data comes from Tree Screen

All the T06 reports use tree height interpolation to estimate tree height for diameter classes not having sample trees. The reports do not create new diameter classes. If there is a tree with a diameter but no height then the height will be interpolated based on the heights of trees in bracketing diameter classes.

If the smallest diameter does not have a height then the height is interpolated using the smallest and next smallest diameter class. If the largest diameter does not have a height then the height is interpolated using the second largest and largest diameter class.

Stratum Header Timber Type Symbol

Refer to Timber Type Symbol for Tree and Regeneration Reports on page 102.

Calculations

- Stratum Totals for MAI cubic and MAI Bdft

There is a slight difference between EcoSurvey MAI calculation & calculations done manually. The difference is in the rounding for the printout. The calculation uses full floating point to derive answer, then in order to drop decimal the answer is rounded.

Calculated for each species grouping:

- QMD
- Curtis Relative Density
- Stand Density Index
- Relative Density Index
- Max SDI

Summaries and Statistics for:

- Average Total Height
- Average BH Age
- TPA
- Basal Area/Acre
- Gross Ft^3/Ac
- Net Ft^3/Ac
- Gross BF/Acre
- Net BF/Acre
- Height Diameter Ratio

Groupings:

Stratum Summary with Statistics for:

- Live, Cut by Species
- Live Cut total
- Live Leave by Species
- Live Leave Total
- Dead Standing Leave by Species
- Dead Standing Leave Total
- Dead Down Leave by Species
- Dead Down Total
- Dead, Standing, Cut by Species
- Dead, Standing Total

Unit Summary with Statistics for:

- Live CutTrees
- Live Leave Trees
- All Live Trees
- Dead Down Cut
- Dead Down Leave
- All Dead Down
- Dead Standing Cut
- Dead Standing Leave
- All Dead Standing
- All Trees

Standard Calculations

Variable Plot - Calculations and Formulas for TPA, BA, per Acre, Net Board Feet/Acre, and Net Cubic Feet/Acre

can be found in the section "Stratum Per Acre (TPA, BA, Volume, VBAR)" on page 12.

Fixed Plot - Calculations and Formulas for TPA, BA, per Acre, Net Board Feet/Acre, Net Cubic Feet/Acre can be found in the section "Fixed Plot" on page 14.

MAI - MAI calculation is found in "Mean Annual Increment (MAI)" on page 15.

QMD Calculation

Calculations for QMD is found in Quadratic Mean Diameter (QMD) on page 15.

Curtis Relative Density, Stand Density Index, Relative Density Index, and Maximum Stand Density Index

Calculations are found in "Other Stratum Tree Calculations" on page 15.

Average total Height

Average total height calculation is found in "Stratum Tree Average Calculations" on page 11.

Dbh Classes

Dbh class definitions are denoted in "Diameter Ranges" on page 9.

Height – Diameter Ratio

Height – Diameter Ratio calculations are found in "Stratum Tree Average Calculations" on page 11.

Average breast-height age

This is a simple average of BHA

Comments

Comment 1: Stand Density Index, Relative Density Index and Curtis Relative Density are calculated by stratum. If there are multiple strata in the unit then these indexes will NOT be summarized for the unit. The purpose of these indexes is to get a sense of how well the area is growing. If the unit is stratified then there is a difference in the growth pattern (e.g. stocked stratum and clear cut stratum). Combining the stratum indexes for the unit will give a false impression for the unit's growth pattern.

Comment 2: Density values may appear to differ between T06 a, b, and c The difference is due to sorting order and rounding issues. The a and b reports sort by dead/live first whereas the c report sorts by cut/leave first. The difference is not large, see example below.

Example sample density data: Report Curtis, SDI RDI

T06a 41 249 0.42
T06b 41 249 0.42
T06c 41 247 0.41

T06c(S) - Cut, Leave Summary, 1" diameter class by cut/leave by live/dead, Merchantable

- "Statistics included" in T06b S option (activated by using the "Print statistics" checkbox at the bottom of the Select Reports screen)
- Listing/Summary in 1" diam. class by cut/leave by live/dead
- Data comes from Tree Screen

All the T06 reports use tree height interpolation to estimate tree height for diameter classes not having sample trees. The reports do not create new diameter classes. If there is a tree with a diameter but no height then the height will be interpolated based on the heights of trees in bracketing diameter classes.

If the smallest diameter does not have a height then the height is interpolated using the smallest and next smallest diameter class. If the largest diameter does not have a height then the height is interpolated using the second largest and largest diameter class.

Stratum Header Timber Type Symbol

Refer to Timber Type Symbol for Tree and Regeneration Reports on page 102.

Calculations

- Stratum Totals for MAI cubic and MAI Bdft.

There is a slight difference between EcoSurvey MAI calculation & calculations done manually. The difference is in the rounding for the printout. The calculation uses full floating point to derive answer, then in order to drop decimal the answer is rounded.

Calculated for each species grouping:

- QMD
- Curtis Relative Density
- Stand Density Index
- Relative Density Index
- Max SDI

Summaries and Statistics for:

- Average Total Height
- Average BH Age
- TPA
- Basal Area/Acre
- Gross Ft^3/Ac
- Net Ft^3/Ac
- Gross BF/Acre
- Net BF/Acre
- Height Diameter Ratio

Groupings:

Stratum Summary with Statistics for:

- Cut Live by Species
- Cut Live Total
- Cut Dead Standing by Species
- Cut Dead Standing Total
- Cut Total
- Leave Live by Species
- Leave Live Total
- Leave Dead Standing by Species
- Leave Dead Standing Total
- Leave Dead Down by Species
- Leave Dead Down Total
- All Leave

Unit Summary with Statistics for:

- Cut LiveTrees
- Cut Dead Down Trees
- Cut Dead Standing
- Total Cut
- Leave Live Trees
- Leave Dead Down Trees
- Leave Dead Standing
- All Leave Trees

Standard Calculations

Variable Plot - Calculations and Formulas for TPA, BA, per Acre, Net Board Feet/Acre, and Net Cubic Feet/Acre can be found in the section "Stratum Per Acre (TPA, BA, Volume, VBAR)" on page 12.

Fixed Plot - Calculations and Formulas for TPA, BA, perAcre, Net Board Feet/Acre, Net Cubic Feet/Acre can be found in the section "Fixed Plot" on page 14.

MAI - MAI calculation is found in "Mean Annual Increment (MAI)" on page 15.

QMD Calculation

Calculations for QMD is found in Quadratic Mean Diameter (QMD) on page 15.

Curtis Relative Density, Stand Density Index, Relative Density Index, and Maximum Stand Density Index

Calculations are found in "Other Stratum Tree Calculations" on page 15.

Average Total Height

Average total height calculation is found in "Stratum Tree Average Calculations" on page 11.

Dbh Classes

Dbh class definitions are denoted in "Diameter Ranges" on page 9.

Height – Diameter Ratio

Height – Diameter Ratio calculations are found in "Stratum Tree Average Calculations" on page 11.

Average breast-height age

This is a simple average of BHA

Comments

Comment 1: Stand Density Index, Relative Density Index and Curtis Relative Density are calculated by stratum. If there are multiple strata in the unit then these indexes will NOT be summarized for the unit. The purpose of these indexes is to get a sense of how well the area is growing. If the unit is stratified then there is a difference in the growth pattern (e.g. stocked stratum and clear cut stratum). Combining the stratum indexes for the unit will give a false impression for the unit's growth pattern.

Comment 2: Density values may appear to differ between T06 a, b, and c The difference is due to sorting order and rounding issues. The a and b reports sort by dead/live first whereas the c report sorts by cut/leave first. The difference is not large, see example below.

Example sample density data: Report Curtis, SDI RDI

T06a 41 249 0.42
T06b 41 249 0.42
T06c 41 247 0.41

T07 - Merchantable Tree Plot Summary

- Trees included: live and dead combined, merchantable
- Plots listed by Stratum
- "In" Trees Listed in each Plot

Stratum Header Timber Type Symbol

Refer to Timber Type Symbol for Tree and Regeneration Reports on page 102.

Calculations

Calculated for each tree and plot:

Item	Tree	Plot Totals
Dbh	List	Average
Total Height	List	Average
Cubic Feet (Ft^3), Gross	Calc	Total
Cubic Feet (Ft^3), Net	Calc	Total
BF, Gross	Calc	Total
BF, Net	Calc	Total
VBAR, Cubic Gross (Ft^3)	Calc	Total
VBAR, Cubic Net (Ft^3)	Calc	Total
VBAR, BF, Gross	Calc	Total
VBAR, BF, Net	Calc	Total

Each plot is treated as if it was the only plot in the survey.

Groupings

- Trees in each plot in each stratum with
- Plot Summary

Standard Calculations

Variable Plot

Calculations and Formulas for TPA, BA/Acre, Net Board Feet/Acre, and Net Cubic Feet/Acre can be found in the section "Stratum Per Acre (TPA, BA, Volume, VBAR)" on page 12.

Fixed Plot

Calculations and Formulas for TPA, BA/Acre, Net Board Feet/Acre, Net Cubic Feet/Acre can be found in the section "Fixed Plot" on page 14.

Average total Height

Average total height calculation is found in "Stratum Tree Average Calculations" on page 11.

Average Dbh

Calculation is found in "Stratum Tree Average Calculations" on page 11.

T08 – Site Tree Summary

- Site Trees with measurement attributes and SI determinations
- Listing of Site Trees by Plot

Stratum Header Timber Type Symbol

Refer to Timber Type Symbol for Tree and Regeneration Reports on page 102.

Calculations

Calculated for each Site Tree:

- 20 Yr, 50 Yr, or 100 Yr Site Index and/or Site Potential Tree Height

Statistics for Site Index Trees for Average:

- Dbh
- Total Height
- 5 yr growth
- 10 yr growth
- Breast Height Age
- Total Age
- 50 Yr SI
- 100 yr SI

Standard Calculations

Average total Height

Average total height calculation is found in "Stratum Tree Average Calculations" on page 11.

Site Index

Site Index calculation for a tree and stratum is found in "Other Stratum Tree Calculations" on page 15, and by using the table shown on page 92.

Site Potential Tree Height

Site Potential Tree Height is derived from the table shown on page 54, reference can also be found in "Site Potential Tree Height" on page 25.

A reference of Site Index formulas used is found in "Site Index Reference and Sources" on page 22.

Site Index Formulas and Tables

There are two methods Forest EcoSurvey uses to calculate Site Index: Formulas and Tables. 6 Formulae are used for four species with tables being utilized for the remaining species.

Site Index Formulas:

The following formulas can be found at the Publications section of the USFS Pacific Northwest Research Station web site (https://www.fs.usda.gov/pnw/). The Research Note is: *"Site Index Equations and Mean Annual Increment Equations for Pacific Northwest",* Research Station Forest Inventory and Analysis

Inventories, 1985-2001; Erica J. Hanson, David L. Azuma, Bruce A. Hiserote, Research Note: PNW-RN-533, December 2002.

Douglas-fir and Grand fir in Western Oregon. King, 1966

$$SI_k = \left[\left\{\frac{2500}{\left[\frac{A^2}{(H-4.5)+0.954038-0.0558178A+0.000733819A^2}\right]}\right\}\right]+4.5,$$

$$\frac{A^2}{0.109757+0.00792236A+0.000197693A^2}$$

H = height in feet
EXP = natural exponent
Ln = natural log

SI_k = King's site index in feet for breast height age 50 years
A = breast-height age.

Noble Fir and Shasta Red Fir in Oregon. Herman and others, 1978

<=100 years[1]

$$SI = \left[4.5+0.2145(100-A)+0.0089(100-A)^2\right]$$

$$+\left[1.0+0.00386(100-A)+\left[\frac{1.2518(100-A)^5}{10^{10}}\right]\right](H-4.5)$$

SI = site index in feet for breast-height age of 100 years
A = breast-height age

For Site trees > 100 years

$$SI = \left[-62.755+672.55\left(\frac{1}{A}\right)^{0.5}\right]+\left[0.9484+516.49\left(\frac{1}{A}\right)^{2}\right](H-4.5)$$

$$+\left[-0.00144+0.1442\left(\frac{1}{A}\right)\right](H-4.5)^2$$

SI = site index in feet for breast-height age of 100 years
A = breast-height age

[1] The formula in the reference was found to be incorrect. The corrected formula is shown.

Ponderosa pine, Jeffrey pine, Coulter pine . Barrett, 1978)

For site trees < 130 years old breast-height age

$$SI = 100.43 - \left[1.198632 - 0.00283073A + \frac{844441}{A}\right]\left\{128.8952205\left[1 - EXP(-0.016959A)\right]^{1.23114}\right\}$$

$$+\left[\left(1.198632 - 0.00283073A + \frac{8.4441}{A}\right)(H - 4.5)\right] + 4.5$$

SI = site index in feet for breast-height age of 100 years
A = breast-height age

For site trees >= 130 years old breast-height age

$$SI = \left[\left(5.328A^{-0.1} - 2.378\right)(H - 4.5)\right] + 4.5$$

SI = site index in feet for breast-height age of 100 years
A = breast-height age

Red Alder: Harrington and Curtis, 1986

The following formula can be found in "Height Growth and Site Index Curves for Red Alder, Constance A. Harrington and Robert O. Curtis. USFS Pacific Northwest Research Station; Research Paper, PNW-358, April 1986

for English units use:

a = 54.1850 - 4.61694 (Age) + 0.11065 $(Age)^2$ – 0.0007633 $(Age)^3$, and

b = 1.25934 – 0.012989 (age) + 3.5220 $(1/Age)^3$

S20 = a + bH

Douglas-Fir and Ponderosa Pine, Hann and Scrivani, February 1987

The algorithm used for determining site index is not a formula; rather is an algorithm written in FORTRAN code. The algorithm is published in: "Dominant-Height-Growth and Site-Index Equations for Douglas-fir and Ponderosa Pine in Southwest Oregon, David W. Hann and John A. Scrivani; Oregon State University, College of Forestry, Forest Research Lab: Research Bulletin 59, February 1987.

Site Index Tables and References

The following reference table is duplicated on page 22. The Site Tables used in this program are:

Species denoted by yellow color = formulas used (see previous pages)

Site Index Tables

			Reference			
Base Years	Age	Species	Source	BLM Invent Manual	Other	Site Potential Tree Ht Table
50	BH	Douglas-fir	King, 1966	Table C		No
50	BH	Douglas-fir	Hann – Scrivani, 1987	Table L	OSU Forest Research Lab Research Bul 59	No
50	BH	Ponderosa Pine	Hann – Scrivani, 1987	Table M	OSU Forest Research Lab Research Bul 59	No
50	Total	White Fir	Schumacher 1926	Table E	U of C, Berkley, Bul 407	Yes
50	Total	Red Fir	Schumacher 1928	None	U of C, Berkley, Bul 456	Yes
20	BH	Red Alder	Harrington & Curtis, 1986	None	USDA PNW Research Paper, PNW-358 April 1986	No
100	Total	Douglas-fir	McArdle, Meyer, Bruce [1]; (Choate, 1958)	None	USDA, Tech Bul 201	Yes
100	Total	Douglas-fir (High Elev)	Curtis, Herman, DeMars, 1974	Table B	Forest Sci. 20:307-316. PNW-378	Yes
100	Total	Ponderosa Pine	Meyer, 1961	None	USDA, Tech Bul 630	Yes
100	BH	Ponderosa Pine, Jeffrey pine, Coulter pine, Bishop pine	Barrett, 1978	None	PNW-232	Yes
100	Total	Western Hemlock	Barnes, 1962[2]	None	USDA, Tech Bul 1273	Yes
100	BH	Noble Fir	Herman, Curtis, Demars 1978	None	PNW-243	Yes
100	Total	Sitka Spruce Western Hemlock	Meyer 1937	None	PNW-544	Yes
50	BH	White Fir, Incense Cedar, Red Fir, Silver Fir, Mountain Hemlock	Dolph	?	PSW 185	No

			Reference			
Base Years	Age	Species	Source	BLM Invent Manual	Other	Site Potential Tree Ht Table
50	Total	Sugar Pine, Ponderosa Pine	Powers and Oliver	?	PSW 128	No
50	Total	Lodgepole Pine, Knobcone Pine, Western Juniper	Dahms	?	PNW 8	No
50	BH	Douglas-fir	Cochran	?	PNW 251	No
50	BH	White Fir, Incense Cedar, Grand Fir, Silver Fir	Cochran	?	PNW 252	No
50	BH	Western Hemlock	Flewelling	?	Unpublished	No
50	Total	Red Alder	Weiskittel	?	Development and Evaluation of Tree-Level Equations …in the Red Alder Plantation Version of ORGANON; David W. Hann and David E. Hibbs, Jan 2011	No
50	BH	Doug Fir	Bruce	?	For Sci, 1981 v2 7-4	No

[1] *Any version of Bul 201 can be used. Do not use Table A in the BLM Inventory Manual.*

[2] *Do not use Table D in BLM Inventory Manual.*

Site Index Tables found in Administration Program

Site Index Tables (Lakeview-OR)

	Site Index Equation	Site Year	Site Pot ?	Tot.Age Adjust.	Class 7 Max SI	Age Adjust	Class 6 Max SI	Age Adjust	Class 5 Max SI	Age Adjust	Class 4 Max SI	Age Adjust	Class 3 Max SI	Age Adjust	Class 2 Max SI	Age Adjust	Class 1 Max SI	Age Adjust
WHBA	Barnes-Western Hemlock	100	☑	0					95	7	125	7	155	7	185	7	Max	7
PPBA	Barrett-Ponderosa Pine	100	☑	0														
DFBR	Bruce-Douglas Fir	50	☐	0														
DFCO	Cochran PNW251 Douglas ...	50	☐	0														
WFCO	Cochran PNW252 White Fir	50	☐	0														
DFCU	Curtis-DF - >2500'-Cascades	100	☑	0					95	7	125	7	155	7	185	7	Max	7
LPDA	Dahms PNW8 Lodgepole Pi...	50	☐	7														
WFDO	Dolph PSW 185 White Fir	50	☐	0														
WHFL	Flewelling unpublished 'Wes...	50	☐	0														
DFHS	Hann/Scrivani-DF SW OR '...	50	☐	0					65	7	85	7	105	7	125	7	Max	7
PPHS	Hann/Scrivani-PP SW OR '...	50	☐	0	28	7	37	7	45	7	54	7	62	7	71	7	Max	7
RAHC	Harrington/Curtis Red Alder	20	☐	7														
NFHE	Herman/Curtis/Demars-Nob...	100	☑	0														
DFKG	Kings-DF-<2500'-young-No ...	50	☐	0					75		95		115		135		Max	
DFMC	McArdle-DF- < 2500'-old sta...	100	☑	0					95	7	125	7	155	7	185	7	Max	7
PPME	Meyer-PP/JP/SP-old stands	100	☑	7														
SSME	Meyer-Sitka Spruce	100	☑	0					95	7	125	7	155	7	185	7	Max	7
RAOR	ORGANON Red Alder Weis...	20	☐	7														
SPPO	Powers-Oliver PSW 128	50	☐	7														
WFSH	Schumacher-White & Grand...	50	☑	7	15		35		45		55		75		Max			
RFSH	Schumaker-Red Fir	50	☑	7														
ASBR	Brickell, Manual Entry - Asp...	50	☐															
ESBR	Brickell, Manual Entry - Eng...	50	☐															
IDBR	Brickell, Manual Entry - Inla...	50	☐															
LPBR	Brickell, Manual Entry - Lod...	50	☐															
PPBR	Brickell, Manual Entry - Pon...	50	☐															
WLBR	Brickell, Manual Entry - Wes...	50	☐															

Site Index formulas are derived from either Total Age or Breast Height Age. The table on the previous page denotes the basis for each SI determination. The Site Index Table in the Administration Menu of the PC program allows adjustment total age from breast height age field data. Depending on the SI formula (row), the age can be corrected either in the Total Age Adjust column or in the Age Adjust columns for each Site Class. These columns are not editable if the corresponding SI formula (row) is based on Breast Height Age. Changing or editing an age adjustment is done by clicking in a cell and typing the desired number. Entries in a Breast Height Age - based SI row are prohibited with a message.

Site Index Table Field Definitions:

(Class values shown are the maximum of the range with the minimum of the range being the value in the Class to the left plus 1.)

Site Year:

The base age in years for a site curve or table. Those Site Indices with a 0 (zero) in the Tot.Age Adjust column are based on Breast Height Age.

Site Pot – Site Potential: Site Index curves recognized for NFP (Northwest Forest Plan) determination of riparian Reserve widths.

Maximum site index for 100 to 300ft riparian reserve width. See: Memorandum OR-95-75 “Determining Site-Potential Tree Height for Initial Riparian Reserve Widths”

These are not editable in the Administration portion of the program.

MaxSi:

Maximum site index for given site class. If table does not have site classes then leave that column empty.

AgeAdjust:

Only applicable to Total Age Site Indices. Allows for input of a Breast Height Age to Total Age adjustment for a specific site class. Leave blank for site classes that don’t exist in the table. If a Total Age site index table does not have differences in individual site class age adjustments, then use the Tot.AgeAdjust will be used. (This last statement does not appear to be accurate. The default of 7 years is used unless the single value Total Age Adjustment field designates something different.)

Tot.AgeAdjust:

Breast Height Age adjustment for Total Age. If the site index table does not have individual site class age adjustment then this age adjustment is used for all site index values. (Table was modified to not allow input of a Total Age adjustment for Site Indices which utilize BH Age. A default of 7 years is used.)

T09 – Snag Summary

- Trees included: all dead, greater than or equal to min snag Dbh. (Fallen, Dead not included)
- Data comes from Trees Screen (not DWM) and consists of Dead Trees

Stratum Header Timber Type Symbol

Refer to Timber Type Symbol for Tree and Regeneration Reports on page 102.

Calculations

TPA for each grouping

Groupings

- All Trees are combined into eleven 4" diameter classes from <4" to 40+"
    - by Groupings of:
        - Conifer
        - Hardwood
    - by Decay Class (1 thru 5)
    - by 4 (total) Height categories:
        - < 15'
        - 15 – 49'
        - 50 -99'
        - 100'+

Comment - no species breakdown.

Summary and Statistics for:

- TPA for all snag trees >= 20" Dbh and higher than 50', Decay Class 1 & 2

Standard Calculations

Variable Plot - Calculations and Formulas for TPA can be found in the section "Stratum Per Acre (TPA, BA, Volume, VBAR)" on page 12.

Fixed Plot - Calculations and Formulas for TPA can be found in the section "Fixed Plot" on page 14.

T10a Merchantable Tree Ratio Sample Summary

Only Ratio Strata listed.

Unit level summary for live and dead merch trees in Ratio Method surveys. Provides list of:

- Total trees
- Total plots
- Average Trees/plot
- Height Tree count
- Height Tree Sampling Ratio
- Actual Height Ratio (Height Tree Count / TotalTrees)
- Age Tree Count
- Age Tree Sampling Ratio
- Actual Age Ratio (Age Tree Count / TotalTrees)

Groupings:

- By Unit

Report summary consists of:

- Total trees
- Total plots
- Average Trees/plot
- Height Tree count
- Actual Height Ratio (Height Tree Count / TotalTrees)
- Age Tree Count
- Actual Age Ratio (Age Tree Count / TotalTrees)

T10b Merchantable Tree Sample Summary

Unit level summary for live and dead merch trees in any survey method. Provides list of:

- Sampling Method
- Total trees
- Total plots
- Average Trees/plot
- Number of height trees in the unit
- Actual Height Ratio (Height Tree Count / TotalTrees)
- Number of Age trees in the unit
- Actual Age Ratio (Age Tree Count / TotalTrees)

Groupings:

- By Unit

Report summary consists of:

- Stratum Count
- Total trees
- Total plots
- Average Trees/plot
- Total number of height trees
- Actual Height Ratio (Height Tree Count / TotalTrees)
- Total number of Age trees
- Actual Age Ratio (Age Tree Count / TotalTrees)

R01 – Regeneration Tree List by Plot

Field Card - No statistics or calculations

R02 – Regeneration - Stand Summary - Statistics

Summary of saplings and seedlings by species and hardwood/conifer stocked/non-stocked categories. (Stratum Totals - no unit totals).

- Data comes from Seedling and Sapling Screens

Stratum Header Timber Type Symbol

Refer to Timber Type Symbol for Tree and Regeneration Reports on page 102.

Calculations

- Calculated for each Stocked grouping:
- Number of Plots
- Trees per Plot
- Stocking %
- Well-Spaced TPA
- Total TPA

Groupings

- Stocked and Non-Stocked by:
    - Conifer
    - Hardwood
    - Conifer & Hardwood

Stratum Summary (by stratum)

- Species list for stratum with:
    - Number of Sample Trees (by species and total)
    - TPA (by species and stratum total)

Stand (stratum) Summary with Statistics for each species:

- Total Trees TPA (Well Spaced and Not Well Spaced)
- Well Spaced TPA with the following statistics:

  Statistics used:

    - CV%
    - SE%
    - # of plots required for 5%, 10%, 15%

Standard Calculations

Variable Plot - Calculations and Formulas for TPA can be found in the section "Stratum Per Acre (TPA, BA, Volume, VBAR)" on page 12.

Fixed Plot - Calculations and Formulas for TPA can be found in the section "Fixed Plot" on page 14.

Non-Forest Plots - A discussion of how "Non Forest" Plots affect regeneration surveys is found in" Non-Forest Plot / Is Plot / No Plot or - When is a plot not a plot? " on page 39.

% Stocking Calculations:

Ps = Number of stocked plots, i.e. plots with regen data.
Pn = number of non-stocked plots, i.e. plots with no regen data.
Psn = Ps +Pn

Note: Where the plot is marked as "non-forest" the plot will not be used in the calculations (plot wasn't installed).

Units: whole%

% Stocking Stocked = Ps/Psn * 100
% Stocking Non-Stocked = 100-%Stocking Stocked
% Stocking Forestable = 100

Average Trees/Plot = Tpp
Units: non
N = number of conifer stems in stocked plots Tpp Stocked = N/Ps
Tpp Forestable = N/Psn

Comments:

The *"Non-Forest Plot Count"* in the Stratum Header of the Regen Reports is derived from the "Non-Forest Plot" checkbox in page 2/6 of the handheld Plot Header (the Plot use (Stocking) screen). It has no effect on the "Total Forestable" sum in the body of the report.

Stocked Plots = # of plots with a seedling or sapling.

Non-stocked Plots = # of plots with no seedlings/saplings that are checked "Submerch/Regen Not Stocked"

Well Spaced TPA = count 1 stem per stocked plot

Total Forestable = sum of stocked and non-stocked plots (excluding Non-Forest Plots)

Plot Size Determination = There are 4 possible plot sizes that can be used in the R02 Report calculations - the three sapling plot sizes and the seedling plot size. The largest plot size used of these four in the survey is the one used in the calculations. For example, if no sapling plot sizes are entered, then the seedling plot size is used.

R03 – Regen by Stand by Tree Species

Seedlings and saplings by individual species and totals

- (Stratum totals - no unit totals)
- Data from Seedling and Sapling Screens

Stratum Header Timber Type Symbol

Refer to Timber Type Symbol for Tree and Regeneration Reports on page 102.

Calculations

- TPA
- BA/Ac
- QMD
- Ave Dbh
- Avg Height
- Avg Crown Ratio
- Avg Leader Growth

Groupings

- Seedlings by
    - Species list for stratum with:
        - TPA
        - Average Height
        - Average Crown Ratio
        - Average Leader Growth
    - With Stratum Summary of:
        - TPA
        - Average Height (average)
        - Average Crown Ratio (average)
        - Average Leader Growth (average)
- Saplings
    - Species list for stratum with:
        - TPA
        - BA/Acre
        - QMD
        - Average Dbh
        - Average Height
        - Average Crown Ratio
        - Average Leader Growth
    - With Stratum Summary of:
        - TPA
        - BA/Acre

- QMD (based on Total Sapling BA and TPA)
- Average Dbh (average)
- Average Height (average)
- Average Crown Ratio (average)
- Average Leader Growth (average)

Standard Calculations

Variable Plot - Calculations and Formulas for TPA and BA can be found in the section "Stratum Per Acre (TPA, BA, Volume, VBAR)" on page 12.

Fixed Plot - Calculations and Formulas for TPA and BA can be found in the section "Fixed Plot" on page 14.

QMD – formula is found in "Other Stratum Tree Calculations" on page 15.

Average Dbh, Height, Crown Ratio, Leader Growth are simple averages and are not weighted.

Comments:

Non-Forest Plots

A discussion of how "Non Forest" Plots affect regeneration surveys is found in" Non-Forest Plot / Plot Not Stocked / No Plot or - When is a plot not a plot? " on page 39.

D01 – Down Woody Material List by Plot

Field Cards – no calculations or statistics

2020 DWM Report changes resulting from adoption of FIA algorithms

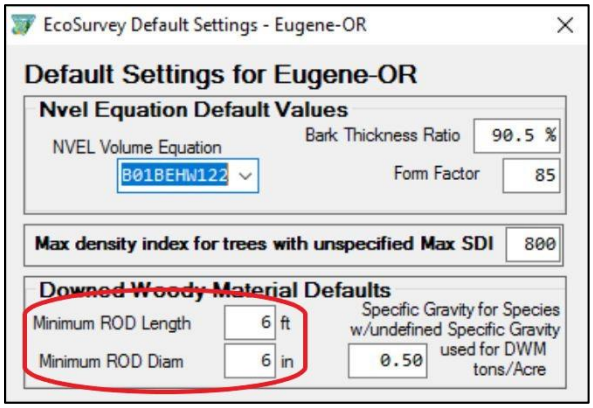
With the 2020 updates to EcoSurvey, the Down Woody Material (DWM) sampling method and algorithms were dramatically altered with the adoption of the new FIA protocol. Sampling is still completed using a transect intercept plot design, but the required data elements have been reduced and no longer require three time-consuming field measurements: Log (piece) Length, Large-end Diameter, and Small-end Diameter.

It should also be noted that this new FIA sampling protocol is based on using a 3-inch Minimum Intersect Diameter and a 3-foot Minimum Log (piece) Length.

As a result of these required data collections changes, the output from the standard D02 and D03 Reports (DWM Statistics and DWM Summary) are both reduced and slightly modified. The details of these report summary reductions and changes are detailed in the sections below. It should be noted that if the old, expanded report's summaries are desired, they can still be obtained simply by collection of some of the old and "no longer required" data elements. But, before discussing those report generation details, it is prudent to recognize and understand the linkage within these two standard reports to the minimums set in the District/State Default settings under the Administration Menu.

District Default Settings for DWM Minimum ROD measurements

Within the District/State Default settings, the DWM Minimum ROD Length and Diam(eter) fields are intimately connected to the "ROD Compliance" summaries within the D02 and D03 Standard DWM reports. These ROD Compliance settings can be varied by District (in western Oregon) or State (in the PD). These minimum settings allowed for DWM data to be filtered by district specific Length and Large-end Diameter criteria in addition to a "hard-wired" Northwest Forest Plan ROD requirement of including only Decay Class 1 and 2 logs.



If, under the new FIA sampling protocol, Log (piece) Length and Large-end diameter data are also collected, then the ROD Compliance summaries will be automatically generated using whatever Minimum settings appear here.

Note: These Minimum settings can only be edited by an Administrator. Contact your Disrtict/State Administrator if you have cause to utilize this feature.

D02 – Down Woody Material Statistics

Summaries and statistics by length categories

- Stratum totals - no unit totals
- All data is derived from DWM data entry

Calculations

- Tons/Acre
- Volume/Acre (ft^3)
- Pieces/Acre
- Feet/Acre
- % Cover

Major Groupings

- Conifer by either 16' or 20' length categories
    - <= X Length Category (15 or 19)
    - >= X Length Category (16 or 20)
- Hardwood by either 16' or 20' length categories
    - <= X Length Category (15 or 19)
    - >= X Length Category (16 or 20)
- All Conifer (combined)
- All Hardwood (combined)
- All Down Wood

Special Groupings

- ROD Totals for Conifer = (DC 1 or 2, >= 16" (or 20") large end diam, and >= 16' (or 20') length.
- ROD Totals for Hardwood = (DC 1 or 2, >= 16" (or 20") large end diam, and >= 16' (or 20') length.
- All ROD (combined Hardwood and Confier)

Totals for Major Grouping:

- Tons/Acre
- Volume/Acre (ft^3)
- Pieces/Acre
- Feet/Acre
- % Cover

Totals for Special Groupings (ROD)

- Pieces/Acre
- Feet/Acre

Statistics for Totals Above

- SE%
- CV%
- 1,000 ft. for SE 5% ○ 1,000 ft. for SE 10% ○ 1,000 ft. for SE 15%

Standard Calculations

DWM calculations for Volume/Acre, Tons/Acre, Pieces/Acre, Feet/Acre, % Cover are found in "DWM Calculations" on page 33.

Comments:

ROD Compliance – Length Settings

The 16' and 20' length and large end diameter categories are values that are set in the Forest EcoSurvey Admin Program in the "Default Settings Tab".

Transect Length

- The 1000's of feet indicate how many thousands of feet or transect you need to meet your standard error% (5, 10, 15). This is similar to the tree reports showing how many plots you need to have SE%5, 10, 15. To find actual number of transects divide the 1000's of feet by your transect length.
- The transect length in the handheld plot header is the total length of the transect on that plot. If a transect on a plot is configured in the field to be two 25' lengths of an "L" shape, the transect length to be entered into the header is 50. All the pieces should be entered into the one data entry screen.

Total Transect Length

The Total Transect Length found in the Report Header is the sum of all the transect lengths found in the handheld plot header having DWM data.

2020 Changes to the D02 Report - DWM Statistics

Under the new FIA sampling protocol, this report is generated in a slightly abbreviated form. In the original report, DWM statistics were summarized in four primary categories:

1. Conifer Logs less than or equal to 19 feet in Length
2. Conifer Logs greater than or equal to 20 feet in Length
3. All Conifer Logs
4. All Down Wood

In the new sampling protocol, with Log (Piece) Length no longer a required data element, only summaries #3 and #4 can be generated.

The only statistics section missing from the stand-level D02 Report with the new FIA sampling protocol are all the **Pieces/Acre** estimates. If these stand metrics are desired, it can be obtained by adding the Log (Piece) Length to the field data collection requirements.

If **Log (piece) Length and Large-end Diameter** data is collected, then statistics for all four groupings are generated. And a secondary set of statistics for both **Pieces/Acre and Feet/Acre** are added to each of the four categories based on the Minimum ROD requirements for length and diameter set on the District Default screen (see above section for details).

D03 – Down Woody Material Summary

- Per acre summary of tons, pieces, percent cover, volume and length, Down Woody Material % cover, ROD compliance.
- Stratum Totals only – no unit totals.
- All data is derived from DWM data entry screen

Calculations

- Tons Per Acre
- Pieces Per Acre
- Percent Cover by DWM
- Volume Per Acre
- Total Length Per Acre
- Rod Compliance (Total only)

Summaries for each Report Group (except ROD compliance):

- Six 4" (large end) Diameter Classes from 8" to 60"+ by,
- 5 Decay Classes, with
- Totals for each:
  - Diameter Group
  - Decay Class

ROD Compliance Summary

- total length and number of pieces that are ≥ designated length and diameter standards. (Pieces/Acre, Feet/Acre.

Standard Calculations

DWM calculations for Volume/Acre, Tons/Acre, Pieces/Acre, Feet/Acre, % Cover are found in "DWM Calculations" on page 33.

Comments:

ROD Compliance – Length Settings

The 16' and 20' length and large end diameter categories are values that are set in the Forest EcoSurvey Administration Menu within the PC program in the "District Default Settings screen".

ROD Compliance Summary – total length and number of pieces that are ≥ designated length and diameter standards.

Transect Length

The transect length in the handheld Plot header is the **total length of the transect(s)** on that plot. If a transect on a plot is configured in the field to be two 25 ' lengths of an "L" shape, the transect length to be entered into the header is 50. All the pieces for each plot are entered into the one data entry screen.

Total Transect Length

The Total Transect Length found in the Report Header is the sum of all the transect lengths found in the handheld Plot header having DWM data.

2020 Changes to the D03 Report - DWM Summary

This report maintains the same general format as the original D03 Report, but the data groupings are no longer based on the **Large-end Diameter**. With Large-end Diameter no longer a required data element, the groupings are now based on **Intersect Diameter** data. The only missing data analysis with the new sampling protocol is the Pieces Per Acre summary. Without Log Length data these metrics are not computed. See note below for adding this stand metric.

If **Log (piece) Length and Large-end Diameter** data are collected, then a single set of ROD Compliance summary metrics are displayed for both **Pieces/Acre and Feet/Acre**. These are based on the District Default Minimum ROD requirements (see above section for details) for length and diameter set under the Administration Menu.

The only set of stand metrics missing from the standard D03 Report with the new FIA sampling protocol are all the **Pieces/Acre** estimates by diameter class. If these stand metrics are desired, they can be obtained by simply adding the Log (Piece) Length to the field data collection requirements.

S01 – Sub Merchantable Size Tree List by Plot

Field Cards – no calculations or statistics

S02 – Sub Merch Plot Summary by Species with statistics

Seedlings and saplings by species by plot. TPA, Average Ht & Dbh, and BA /Acre with statistics for Sapling and Seedling Totals.

- Trees included: Seedlings and Saplings – data comes from these data entry screens.
- Plots listed by Stratum
- Stratum Totals – no unit totals
- Tree Species listed for each plot
- Statistics for totals

A report section combines the data for all the strata in the unit.

Calculations

Calculated for each species:

- TPA
- Average Height
- Average Dbh
- BA/Acre

Groupings

- Tree Species in each Plot by:

  - Seedlings
  - Saplings
- Plot totals for Saplings and Seedling Groups (all submerch) combined
- Stratum Totals with the above calculations and statistics for all submerch combined

Stratum Recap - for each stratum calculations for:

- Individual tree Species by
  - Seedlings
  - Saplings
- Stratum summary with Statistics for:
  - Seedlings total
  - Saplings total

Standard Calculations

Average total Height

Average total height calculation is a simple average (not weighted by BA).

Calculations and Formulas for Variable Plot:

TPA, BA/Acre can be found in the section "Stratum Per Acre (TPA, BA, Volume, VBAR)" on page 12.

Calculations and Formulas for Fixed Plot

TPA, BA/Acre, can be found in the section Fixed Plot starting on page 14.

V01 – Vegetation List and Physiographic Class by plot

Field Cards – no calculations or statistics

V02 – Vegetation Statistics

Species, attribute and % cover summary by stratum.

- species listed by stratum

A report section combines the data for all the strata in the unit.

Vegetation is sorted in descending order by % cover

Calculated for each species:

- % Cover
- Average Height
- % Occurrence

Statistics for:

- % Cover

Calculations:

Average Cover % for each unique species code

Units: whole %

N = number of plots in the survey

X = sum of the % cover on each plot for the given species Avg. Cover% = x/N * 100

% Occurrence - for every unique species code

Units: whole%

N = number of plots where the given species occurs

T = total number of plots

% Occurrence = N/T * 100

Average Height - for every unique species code

Units: whole feet

N = number of plots where the given species occurs

X = sum of the Average Height on each plot for the given species

Average Height

Average Height = x/N

Comments:

Statistics

Statistics are calculated for Average Cover% using standard statistical methods.

No data in plot

If a plot is denoted in handheld plot header as “no vegetation” and there is no vegetation the plot is used in calculations.

If the vegetation plot is empty (no vegetation tallied) and "Is Vegetation Plot" flag is NOT set, then the vegetation plot was not installed. This plot is not used for plot count in thecalculations.

For a discussion on “when is a plot not a plot” go to “Non-Forest Plot / Plot Not Stocked / No Plot or - When is a plot not a plot?” on page 39.

Compliance Report

The compliance report lists missing and out of range information. **There are two versions of the compliance report**, each utilizing the same validation criteria:

1. **Main PC**
2. **PC Lite**

The compliance report is generated from criteria found in the following tables, grids, or rules:

Report Criteria Table

			Report Functionality	
Required Fields -Categories	**Name of grid or table**	**Locations of grid or table**	**Main PC**	**PC Lite**
Missing Header Items	Header Custom Required Fields	Tools – Data Entry Configuration – Edit Configuration Set Grid also appears for editing during Printing procedure.	X	X
Out of Range Data	Maximum Range Checks		X	X
Missing Fields on Plot Detail	TreeSapSeed Required Fields		X	X
Missing Fields on Plot Detail	Tree Data Entry Rules	Administrator's Program – Tree Data Entry Rules Table	X	X
Errors Listed in Special Rules	Embedded in report engine – not in a grid	Embedded in report engine – not in a grid	X	X
Other - example: Out of Range Height to DBH ratio	Embedded in report engine – not in a grid	Embedded in report engine – not in a grid	X	X

Summary

How the Compliance Report is generated

The compliance report found in the main PC and PC Lite programs uses the following to generate the report list of missing (blank) fields and out of range values:

1. The active data entry configuration, which contains criteria defined in:
   - **Header Custom Required Fields** grid
   - **Maximum Range Checks**
   - **TreeSapSeed Required Fields** (for the HH), provided the Custom Report is selected in the Reports of the Unit Header. The TreeSapSeed Required Fields grid is found in the main PC program under Administration – Data Entry Configurations.
2. All fields required by Selected (checked) Reports in the Unit Header. Report required fields are defined by the **Tree Data Entry Rules** table found in the Administrators' program.
3. Errors based on **Special Rules** (see "Special Rules" list below).
4. Errors based on **embedded algorithms** or logic – example is Dbh to Height ratio algorithm.

Compliance Report Generation Process

The compliance report generation engine is an accumulative hierarchical selection process where fields and validations are compiled from the above six categories in the above table. Then, once the list is generated it is applied to all the unit reports selected in the Print Manager for processing. The Report Generation is involved: For example, missing header items are derived from the "**Header Custom Required Fields**" grid; then required tree fields and special rules validation are added. The list is built using the contributions of all six categories. The required field selection process is somewhat complex and involves selecting fields that may be in conflict between categories; thus a hierarchy exists with some categories dominating the selection process. For example, part of the process of selecting "required fields for trees" may involve:

1. Finding all the required tree fields for each selected report (in the unit header) then;
2. Adding more fields as dictated in the "TreeSapSeed Requird Fields", then;
3. Reducing or subtracting those fields marked as excluded, "E" flag, in the Tree Data Entry Rules table found in the Administration program (normally Excludes only appear in the "D"ead tree row.

The resulting "missing field" list may not make sense based on all the fields that were originally identified in the Configuration Setup, but should reflect the logic based on all the categories combined which is, hopefully and by design, based on operational field data collection requirements.

Special Rules used in Compliance Report

The report lists the following by unit, stratum, plot and piece unless otherwise noted:

- List any trees on the merchantable tree plot that have a DBH less than the minimum merch DBH as defined in the current stratum.
- List any DWM piece that has an intersect diameter less than the minimum as defined in the current stratum.
- List any DWM piece that has a length less than the minimum as defined in the current stratum.
- List any snag that has a DBH less than the minimum as defined in the current stratum.
- List any snag that has a height less than the minimum as defined in the current stratum.
- List any dead standing trees that do not have a height.
- List any fields that do not match the tree rules triggered by the current unit header selected reports, including TreeSapSeed Required Fields in the active data entry configuration.
- List any flagged site trees that do not match the site tree table selected in the Unit Header. If no site tree table is selected list plots within a unit that have different site tree species for the unit.
- List any trees that have a rejected age flag and no replacement forced age flag of the same species within the same plot.
  The error text is:
  Tree N (spp) is rejected without a matching forced species in the plot.
- List any plots where tree layers are entered and the corresponding "% Canopy Cover by Layer" field is missing.
  The error text is:
  Layer N has trees but no % Canopy Cover.
- List any plots within a stratum that have inconsistent completion of "% Canopy Cover by Layer" fields. For example if the "Lower Story" field is completed for any plot it needs to be completed for all plots in the stratum.

The error text is:
Layer N is missing % Canopy Cover. (Some plots in the stratum have Layer N % Canopy Cover)

- List any stratum that does not have at least one BH age recorded for each tree layer recorded.
  Layer N has trees but no % Canopy Cover.

Compliance Report - PC Lite version

The Compliance Report in the PC Lite program **can generate the same results as that of the main PC program.** The Lite program uses the same validation library. So, as long as the PC Lite program is loaded with and using the same DEC set as that activated for report generation on the PC, then the compliance reports for the same surveys should produce identical results.

The caveat is: the PC Lite program can **only use one DEC set**, and you cannot directly configure this, or see which DEC is currently loaded and in use.

The PC Lite program installs a new DEC only when a XXXX_rules.zip file is sent to the handheld. At that time, the PC Lite program updates itself to use that specific configuration set.

Micro*Storms

The following table describes the EcoSurvey program's Micro*Storms Export report. This report completes the required calculations then sends the data to an Access database. The data in the Access database is then imported into the new Micro*Storms database. Validation Rules done by Forest EcoSurvey for Micro*Storms exporting are defined in the pages following the Export Report Description.

The EcoSurvey program allows the user to select the individual M*S reports listed below to set the required data entry edit checks for the handheld data collection program. The EcoSurvey PC program will prompt the user to select individual M*S reports as listed below to determine which M*S export reports will be created.

For additional clarification of the Micro*Storms Export report calculations, see the Micro*Storms program Help. The data below is subject to change.

Export Report Description

Report Name	Description of Data Reported and Calculated
X05 **Micro*Storms Export** Note: All of the reports that follow require this data.	Micro*Storms OI Number "Key Number"
	Date of survey
	Name of Surveyor
MS1 **Stand Attributes** Note: Trees, saplings and seedlings are used in these calculations. **MS1 and MS2** reports are always exported together.	**Stand Tree Attributes** - For the stand, list Quadratic Mean Diameter, total trees per acre, total canopy cover %, net green (live) board foot volume per acre, Reineke's Stand Density Index, Relative Density Index, Curtis Relative Density, site index table , site index, site class if site table includes site class. **Tree Species Attributes** - For each species above the specified minimum merchantable diameter at breast height; list and Summarize total trees per acre, basal area per acre, cubic foot volume per acre, and board foot volume per acre.

Report Name	Description of Data Reported and Calculated
MS2 **Layer Statistics** Note: Trees, saplings, seedlings and vegetation are used in these calculations. MS1 and MS2 reports are always exported together.	**Tree Layer Attributes** - For each of the top, middle and bottom tree layers; list average canopy cover % expressed as decimal, average layer height, total trees per acre, and birth-date. **Tree Species Attributes** - For each tree species within a layer; list by size class the basal area per acre and the average crown ratio. Trees versus Seedlings: For layers with trees basal area is exported to calculate relative abundance. For layers with seedlings, either layer 1 or layer 3, the TPA instead of basal area is exported. The TPA/TPA is used in Micro*Storms to calculate *relative abundance*. TPA is a better indicator of abundance for seedlings since seedling basal area is very small. If trees and seedlings are in the same layer, then TPA is exported to be used for *relative abundance*. The BA or TPA value is multiplied by 100 in order to export less than 0.5 BA/TPA. The M*S data field, TblSpeciesLayer.SL_BA is a whole number so it does not accept decimal points. A value of less than 0.5 will not export because it is rounded to zero. By multiplying the value by 100 these small, sub 0.5 values will be exported. **Indicator Species Attributes** (shrubs, forbs, grass) - For each vegetation species; list the average height and percent cover.
MS3 **Regeneration** Note: This report is for a regeneration survey.	**Seedling/Sapling Regeneration Survey** - For the stands seedlings and saplings; list the survey unit acres, trees per acre, stocking percent and sampling error percent.
MS4 **Down Woody Material**	**Stand Down Log Attributes** - For the stand; list the minimum measured intersect diameter and the minimum measured length. **Down Log Decay** - For each decay class; list the tons per acre, Pieces per acre, length per acre, cubic feet per acre and cover percent per acre.
MS5 **Snags**	**Stand Snag Attributes** - For the stand; list the minimum measured diameter at breast height and the minimum measured height. **Snag Decay** - For each decay class, list the number of snags per acre.

Note: Area is required for Micro*Storms DWM export due to the fact that M*S only allows one set of values for the entire unit. When the unit is stratified, a combined result is created using stratum area for weighting.

MS 2 Layer Statistics Timber Type 20% Filter

The MS2 reports export layer information compatible with the standard, as of 2009, timber type label. For layers that only contain trees and saplings only species that have 20% or more of the total layer basal area are exported. For layers that contain seedlings, maybe combined with saplings and trees, only species that have 20% or more of the total TPA are exported.

Example:

Layer 1: All PSME in that layer has a BA of 45 (45%); all TSHE in that layer has a BA of 40 (40%); and all ALRU2 in that layer has a BA of 15 (15%). (Total Layer BA = 100)

Only PSME and TSHE would be included in this layer since they pass the 20% rule.

Layer 2: All PSME in that layer has a BA of 9 (90%), and all TSHE in that layer has a BA of 1 (10%). (Total Layer BA = 10)

Only PSME would be included in this layer.

MicroStorms Export Rules/Validation, Overview

Only 1st stratum is exported

Volume formula:

Just like any other report. The user selects the volume equation.

General:

Only M*S species are exported

Will use all tree/sapling/seedling/dwm records that have the required data (dbh, height, crown class, age, etc. as appropriate). Records that don't have the required data will not be used for the exported calculations.

MS1 Stand Attributes Checks:

Tree is live, in plot
Tree and Sapling min dbh >= Stratum min merch dbh
The minimum DBH for calculating QMD, SDI, RDI and Curtis RDI is 1.5”

MS2 Layer

Checks:

Tree is live, in plot
Tree has layer code
Sapling has layer code
Includes seedlings if have Unit seedling layer

MS3 Regen

Sapling and Seedling is M*S species code

MS 4 Dwm

Checks:

Stratum must have min DWM diameter and min DWM length set
If any DWM MS Import Database constraints fail then the specific DWM group is not created (see the MS specs for constraints).

MS 5 Snag

Checks: Trees are

In plot dead trees
Valid decay class
>= minimum unit snag height
>= minimum unit snag dbh

*Micro*Storms Export Edit Checks, Detail*

There are three major types of errors.

- Errors of omission in the FSSP data set e.g.: Decay Class is missing in a DWM piece or the Layer is missing in a tree record.
- Out of range errors. The calculations produce a value that is out of range of the Micro*Storms acceptable values.
- Missing Calculations errors. The calculations produced a zero value whereas Micro*Storms requires the value. e.g.: the birthday year for MS2 Layer export.

The validations can have several effects during the export:

- The unit is not exported. E.g. if OI key is missing.
- A sub report is not exported. E.g.: if a tree is missing the layer assignment then MS2 is not exported.
- Part of sub report is not exported. E.g. if a layer does not have birthdate then that particular layer is not exported although the rest of MS2 is.
- An exported value is set to the minimum or maximum acceptable Micro*Storms value. E.g. If site index is greater than 250 it is set to 250.

Error messages are accumulated during the export process and displayed in a report. Each error type will result in an error message. Sometimes not all errors can be detected due to the order of validation. E.g. If OI key is missing then the export stops for the unit therefore no more validations are done on the unit or if the layer code is missing from a tree then the Birthdate is not calculated therefore the Birthdate validation is not checked.

The following table describes the validations that will be performed during the M*S Export. Only those fields that have validations are listed in the table.

Table Key

Check When column (for which export is the validation done)

All = applies to all exports
Never = no validation, data is a default or guaranteed to be correct (spp code) or to be within range (% values).
MS1 = Stand Attributes
MS2 = Layer Attributes
MS2 T = Layer Attributes for tree layers 1,2,3
MS2 V = Layer Attributes for understory layer 4
MS3 = Regen
MS4 = Down Wood
MS5 = Snags

Error Type column

Critical – either the entire unit or the sub report (M1, MS2,…) for the unit is not exported if this validation fails. Warning – the specific item, row, is not exported, or the output is not the real result (i.e. set to max value).

Field	Check When	Error Type	M*S Table (or FSSP table)	M*S Field	Description of validation and/or action
OI Key	All	Critical	tblStandExam	fkOI_Key	OI key is required. If it is missing then will not export the unit.
Date(s)	All	Critical	tblStandExam	SE_Date	Survey Date is required. If it is missing then will not export the unit.
	Never	None	tblStandExam	SE_Status	Always set by FSSP to 'Completed'
QMD	MS1	Warning	tblStandAttributes	SA_QMD	If < 1 set to 1 If > 0.1 set to 99.9 and give warning
SDI	MS1	Warning	tblStandAttributes	SA_SDI	If < 1 set to 1 and warn If > 1000 set to 1000 and warn (Must be between 1 and 1000)
RDI	MS1	Warning	tblStandAttributes	SA_RDI	If < 0.01 set to 0.01 and warn If > 1.0 set to 1.0 and warn Must be between 1 an d100 (% expressed as decimal)
Curtis Rel Density	MS1	Warning	tblStandAttributes	SA_Curtis_RD	If no data then set to 0 and warn If > 1.5 set to 1.5 and warn Must be between 0 and 150
Canopy Cover %	MS1	None	tblStandAttributes	SA_TTCC	Percent value guaranteed to be between 0.0 and 1.0 (% expressed as decimal)
TPA	MS1	Warning	TblStandAttributes	SA_TTPA	Valid range is 0-9999. The range is adequate to not need checking.
Classificatio n Source	MS1	None	TblStandAttributes	SA_CS	Always = 3
100yr SI name	MS1	Critical	TblStandAttributes	SA_SIT100	Can't be blank. If empty then don't export MS1. Must select a 100yr site index in the EcoSurvey unit header. Error says "100 year site index table (table code included) is missing"
100 Year Site Index	MS1	Warning	TblStandAttributes	SA_SNdx100	If >250 set to 250 and warn. Must be between 1 and 250.

Field	Check When	Error Type	M*S Table (or FSSP table)	M*S Field	Description of validation and/or action
50yr SI name	MS1	Critical	TblStandAttributes	SA_SIT50	Can't be blank. If empty then don't export MS1. Must select a 50yr site index table in the EcoSurvey unit header. Error report says "50 yr Site Index table (table code included) is missing."
50 Yr Site Index	MS1	Warning	tblStandAttributes	SA_SNdx50	If >250 set to 250 and warn. Must be between 1 and 250.
Tree Spp	MS1	None	tblSASpecies	SASP_Sp	No check, assumed correct See error check for FSSP Tables
TPA	MS1	None	tblSASpecies	SASP_TPA	Range is 1 and less than or equal to 5000. The range is adequate to not need checking.
BA/ac	MS1	None	tblSASpecies	SASP_BA	Range is 1 and less than or equal to 999, no action. The range is adequate to not need checking.
Cubic Ft/Ac	MS1	None	tblSASpecies	SASP_CFVPA	Range is 0 to and including 600 no action. The range is adequate to not need checking.
BF Volume Per Acre	MS1	None	tblSASpecies	SASP_BFVPA	Range is 0 to 300. The range is adequate to not need checking.
Layer Canopy Cover	MS2	None	tblLayerStats	LRS_CC	Percent value guaranteed to be between 0.0 and 1.0. 1 and less than or equal to 100 (expressed as decimal)
FSSP Trees	MS2T	Critical	FSSP tables Tree	T_crownLayer	All live tree records require the layer code 1, 2 or 3. List all trees that have incorrect or missing layer code. Can't export when any records are missing the layer code. Trees with no error results in Critical error and report of Tree, Strat, Plot#. Result is no MS2 export. Error message – "Critical: Stratum X, Plot Y, tree/sapling assigned invalid layer. No layer data will be exported for the entire unit."
Tree Species	MS2	Warning	FSSP Tables Tree	t_species	Invalid tree species reported. Warn user when M*S species not = Yes. Result is no export of unknown species.
FSSP Trees	MS2	Warning	FSSP tables Tree	t_dbh	Trees with no DBH – add warning and Unit, Strat#, Plot# location of trees with no dbh.

≥

Field	Check When	Error Type	M*S Table (or FSSP table)	M*S Field	Description of validation and/or action
FSSP Sapling	MS2T	Critical	FSSP tables Sapling	Sa_layer	All sapling records require the layer code 1, 2 or 3. List all saplings that have incorrect or missing layer code. Can't export when any records are missing the layer code. Critical error and report of stratum, plot#. Result is no export. Error message – "Critical: Stratum X, Plot Y, tree/sapling assigned invalid layer. No layer data will be exported for the entire unit."
FSSP Sapling	MS2	Warning	FSSP tables Sapling	Sa_species	Warn when M*S species not = Yes. Result is no export of unknown species.
FSSP Sapling	MS2	Warning	FSSP tables Sapling	sa_dbh	Warn when saplings with no DBH. Include Unit, Strat, Plot#, Tree#.
FSSP Seedling	MS2T	Critical	FSSP tables Unit	U_seedAge	If seedlings are present then the unit "Seed Age" field is required. Can't export when this field is empty. When no seedling Age results in critical error.
FSSP Seedling	MS2T	Critical	FSSP tables Unit	U_seedLayer	If seedlings are present then the unit "Seed Layer" field is required. Can't export when this field is empty.
Seedling Species	MS2	Warning	FSSP tables Seedling	sd_species	Warn user when M*S species not = Yes. Result is no export of unknown species.
Layer Id	MS2	None	tblLayerStats	LRS_Layer	Assumed correct. See the tree, sapling and seedling entries above.
Layer Birthday	MS2T	Critical	tblLayerStats	LRS_BD	M*S Import will fail to load any Layer Stats for layer 1,2,3 if this is blank. If a layer has no birthday then the layer will not be exported. If none of the layers are exported then the MS2 is not exported. Error description for other layers with no BHA (birthdate.)
Layer TPA	MS2T	Warning	tblLayerStats	LRS_TPA	If the layer TPA is empty then the layer is not exported. If the layer TPA > 3000 then the layer is not exported. If none of the layers is exported then the MS2 is not exported. When > 3000 TPA in layer 3, export Layer 3 with TPA = 3000 and give Warning message
Layer Avg Height	MS2	Warning	tblLayerStats	Lrs_height	If the layer Height is empty then the layer is not exported. If the layer Height > 500 then the layer is not exported. If none of the layers is exported then the MS2 is not exported.
Crown Cover %	MS2	None	tblLayerStats	Lrs_cc	Percent value is assumed to be within range. Range is 0.0 and 1.0 l

≥

Field	Check When	Error Type	M*S Table (or FSSP table)	M*S Field	Description of validation and/or action
Species	MS2	None	tblSpeciesLayer	SL_Species	Species code is assumed to be correct. See error check for FSSP Tables
Layer Basal Area	MS2T	Critical	tblSpeciesLayer	SL_BA	If the layer Basal Area is empty then the layer is not exported. If none of the layers is exported then the MS2 is not exported. Warn that BA is missing for the particular species and dbh size class.
Dbh Size Class	MS2T	None	tblSpeciesLayer	SL_DBH_SC	Assumed correct
Species Name	MS2T	None	tblSpeciesLayer	SL_Species	Assumed correct. See error check for FSSP Tables
Understory Species	MS2	Warning	FSSP tables Veg	v_species	Warn when M*S species not = Yes. Result is no export of unknown species.
Understory Species Height	MS2U	Warning	tblSpeciesLayer	SL_US_Sp_Ht	If > 50 then set to 50 and warn. Warning that height will be set to maximum value and export maximum value.
Understory Species Percent	MS2U	None	tblSpeciesLayer	SL_US_Pct	Percent assumed correct. If zero then leave empty (null). Understory species with no% cover results in no export of understory species.
Survey Acres	MS3	Critical	tblSurvey	SU_Acres	Unit area is required. If missing then MS3 is not exported.
Total Trees/Acre	MS3	Warning	tblSurvey	SU_T_TPA	If > 9999 set to 9999 and warn. Warning that TPA will be set to 9999 for MS3 and complete export
Stocking Percent	MS3	Warning	tblSurvey	SU_Stk_Pct	Required. If it is zero or empty then the MS3 is not exported.
Total Trees Sampling Error %	MS3	None	tblSurvey	SU_SERR	No action.
	MS3	None	tblSurvey	SU_Status	Always set by FSSP to 'Completed'
DWM Species	MS4	Warning	FSSP tables DWM	d_species	Warn when M*S species not = yes.

≥

Field	Check When	Error Type	M*S Table (or FSSP table)	M*S Field	Description of validation and/or action
Min Dwm Diameter	MS4	Critical	FSSP Stratum (tblDownLog)	S_minDwmDiam (DL_MMD)	Required in FSSP Stratum setup. If missing then don't export MS4. Export Min. DWM Diameter when transect is installed but no tally of DWM (Plot "DWM not Present", checked)
Min DWM Length	MS4	Critical	FSSP Stratum (tblDownLog)	S_minDwmlEN (DL_MML)	Required in FSSP Stratum setup. If missing then don't export MS4. Export Min.DWM Length when transect is installed but no tally of DWM (Plot "DWM not Present" checked).
Dwm Decay Class	MS4	Warning	FSSP Dwm	D_decayClass	Each DWM record in FSSP must have a valid Decay Class. List all DWM pieces that do not have a valid DC. Don't export MS4. Warning – Cannot export piece due to missing decay class with Stratum and Plot# of no DC piece.
Decay Class	MS4	None	tblDownLog	DDC_DC	Assumed correct.
Tot Tons/ac	MS4	Warning	tblDownLDecay	DDC_TTPA	Required. If < 1 then don't export this DC and warn the user.
Tot Pieces / ac	MS4	Warning	tblDownLDecay	DDC_TPPA	Required. If < 1 then don't export this DC and warn the user.
Tot Len/ac	MS4	Warning	tblDownLDecay	DDC_TLPA	Required. If < 1 then don't export this DC and warn the user.
Tot cubic ft/ac	MS4	Warning	tblDownLDecay	DDC_TCFPA	Required. If < 1 then don't export this DC and warn the user.
Tot %cover/ ac	MS4	Warning	tblDownLDecay	DDC_TCPPA	Required. If < 1 then don't export this DC and warn the user.
Stratum Acres	MS4	Critical	FSSP Table Stratum	s_acres	Unit with no stratum acres results in no DWM calculation. Critical Error - Stratum "X" is missing area.
Min. snag Len./Ht.	MS5	Warning	tblSnag	SD_MMH	Required. If FSSP stratum minimum snag height = 0 then warn user and don't export MS5.
FSSP Trees	MS5	Warning	FSSP Tree	T_dc	List all dead trees that don't have Decay Class. Don't export MS5. Report Dead Trees missing DC, Stratum, Plot#, Tree#.
FSSP Stratum	MS5	Critical	FSSP Stratum	S_minDeadDiam	Required. If missing then warn and don't export MS5. Missing Min Snag BBH result is Critical error
FSSP Stratum	MS5	Critical	FSSP Stratum	S_minDeadLen	Required. If missing then warn and don't export MS5. Missing Min Height BBH result is Critical error

≥

Field	Check When	Error Type	M*S Table (or FSSP table)	M*S Field	Description of validation and/or action
Min Meas DBH	MS5	Warning	tblSnag	SD_MMD	Required. If FSSP stratum minimum snag Dbh = 0 then warn user and don't export MS5. Report Dead Trees missing DC – Report Stratum, Plot#, Tree#.
Min Meas Height	MS5	Warning	tblSnag	SG_MMH	
Decay Class	MS5	None	tblSnag	SDC_DC	No action, assumed correct
Snags/ac	MS5	Warning	tblSnag	SDC_TSPA	Required. If TPA < 1 then warn user and don't export MS5. Warning if snag TPA <1

≥

Land Management System (LMS)

The following is an excerpt from the LMS model documentation:

LMS Inputs

LMS operates on tree inventory information to simulate landscapes as the aggregate of the individual stands. The tree inventory information is moved between various components to simulate treatments and growth. In addition, subsets of this information can be viewed in a variety of ways: tables, charts, visualization.

LMS Portfolios

LMS portfolios consist of a series of ASCII text files. The main file is the portfolio configuration file (.lms). This file is an old style Windows configuration file (.ini). It is organized in a series of sections defined by the section header. Each section contains one or more keywords followed by text or numeric values following an equal sign.

```
[Section]
Keyword=Parameter

[Section2]
Keyword=5
```

Information about the portfolio is stored in the .lms file in this format. This information includes filename for various information, growth models used, visualization details, stand names in the portfolio, and other configuration information.

The minimum information required for a valid LMS portfolio is a portfolio configuration file (.lms), stand table file (.sdb), and inventory file (.inv). Information on site index by species can be stored in the site index file (.si). Snag and down log information can be store in the snag file (.sng).

Stand Level Information

Stand level information for the portfolio is located in the StandTable file. This file is comma delimited. The file contains the following fields:

Stand name	name of stand (alphanumeric, no spaces)
Plots	always 1
Location	FVS Forest code (3 digit integer, only needed when using FVS)
Site Index	Site Index for default species (species and basis ismodel dependent)
Habitat Code	FVS habitat code (alphanumeric, slashallowed)
Age	Calculate (use by models to “dub” missing height and crown information)
Slope	Mean slope for stand
Aspect	Mean aspect for stand
Elevation	Mean elevation of stand (in feet)
LatitudeLatitude	(used by at least one FVSvariant)
Acres	(should be stand size allowing for metricunits)

Inventory Information

The inventory file contains tree list information for stands in the portfolio. The inventory file is comma delimited, with the following fields:

Year	Year (integer)
Stand name	Stand name (alpha numeric, no spaces)
Tree number	Tree number (long integer)
Species code	(alpha numeric, FVS alpha or numeric)
Diameter	Diameter in inches (float)
Height	Height in feet (float)
Crown ratio	Crown ration (float, decimal percent)
TPA	Expansion factor (float, Tree per acre)
Volume, BF	Board foot volume (per inventory record)
Volume, MC	Merch Cubit foot volume (per inventory record)
Volume, CU	Cubic foot volume (per inventory record)
MCW	Maximum crown width
Diameter Inc	Optional Diameter increment (for model calibration)
	* the formula for LMS diameter increment: 5yr growth taken in 1/20” Diam Increment = growth/20*2 20 = convert from 1/20” to inches *2 = convert from diameter to diameter increment
Height Inc	Optional Height increment (for model calibration)

EcoSurvey Outputs

The EcoSurvey programs "Export to LMS" file contents follow:

Stand Level - EcoSurvey file name is stand.csv		
LMS Field Name	EcoSurvey Export Field?	Comment
Stand name	YES	
Plots	YES	
Location	NO	Not provided by EcoSurvey
Site Index	YES	
Habitat Code	YES	
Age	YES	
Slope	YES	
Aspect	YES	
Elevation	YES	
Latitude	NO	Not provided by EcoSurvey
Acres	YES	
Inventory Information - EcoSurvey file name is inv.csv		
LMS Field Name	EcoSurvey Export Field?	Comment
Year	YES	
Stand name	YES	
Tree number	YES	
Species	YES	
Diameter	YES	
Height	YES	
Crown ratio	YES	
Trees Per Acre	YES	
Volume, BF	YES	
Volume, MC	YES	
Volume, CU	YES	
Maximum Crown Width	YES	
Diameter Increment	YES	
Height Increment	NO	Not provided by EcoSurvey

Stand Projection System (SPS)

SPS Export Logic Issues

Multiple Strata

Units with multiple strata are exported with the proper weighted ac/plot values. The output TPA will be close to the T05 unit total TPA. There may be a small discrepancy due to rounding the SPS output. The output site index will match the T08 site index.

SPS 500 row limit file generation options

SPS has a limit of 500 tree rows it can read from a text file. The

EcoSurvey SPS export attempts to keep to this row limit. A field is available to change the line limit size of the file generated. It is defaulted to the current SPS line limitation of 500. There are two export methods -- Stand Table and Tree List.

Stand Table Option

The Stand Table option will export by species, type (conifer/hardwood, cut/leave) in one inch diameter classes. There is no row check limit. It is assumed that there will be less than 500 combinations of species+1" diameter, conifer, cut/leave.

Tree List Option

The Tree List option attempts to stay within the 500 row limit. If the stem count (trees + saplings) is less than 500 then stems are exported individually. If there are more than 500 measure stems then the user is told to export using the Stand Table option. If there are more than 500

Total stems, measure + count, then measure trees are exported individually and count trees are exported in exact dbh classes (e.g. all the DF 20.5" dbh count trees are grouped together). If there are still more than 500 rows then the measure trees are still exported individually but the count trees are exported in one inch dbh classes. If there are still more than 500 rows then the user is told export using the Stand Table option.

Trees and Saplings

The file can be completed from the data to include only merch trees, submerch trees (saplings), or both.

Missing Tree Heights

SPS does not produce good or reliable results using data where some of the trees are missing heights. The best data includes dbh – height pairs for all trees. In the case of VP ratio sampling count trees (Species and dbh) are included in the same plot as VBAR trees (Species, dbh, ht). In these situations EcoSurvey creates height estimates for those trees without heights. The height estimates are generated using ratios of existing dbh/height pairs and the site index table (formula) for that species.

If the age range straddles the site index by less than 20% the missing heights are established from dbh/height ratios of similar trees in the stand. They are first matched by species, then type (conifer versus deciduous) second, and lastly stand dbh/ht ratio. If the age range straddles the site index age by more than 20%, an algorithm derived from the SPS top height estimator is used.

Forest Vegetation Simulator (FVS)

FVS Export creates two files:

- Suppose.loc
- *.MDB (Access database)

Not exported:

- Out of plot trees

FVS Export Options:

- Select the FVS Variant to apply to all exported units. The Variant determines the site index species and site index equation (as shown in tables below).
- Optionally include any combination of snags, saplings or seedlings.

Multiple units can be exported into the .mdb file.

- Info on FVS can be found at: https://www.fs.fed.us/fvs/
- FVS Database Table Format: https://www.fs.fed.us/fmsc/ftp/fvs/docs/gtr/DBSUserGuide.pdf

Crosswalk table determines the Site Index Equation/Table used based on BLM RMA code. For this reason the RMA code must be present in the data. This table runs internally during the FVS Export process. The site index species is determined by the species tree count: the most frequent Species (based on tree count) becomes the Species selected. In cases of equal numbers the Species used is determined randomly.. In other words, in the case of equal tree counts for two species, then a different species could be selected when the export function is re-run (between the two species).

The exported Diameter Growth Increment is calculated thus: FVS Diameter Growth = growth increment / 2. The /2 is due to the growth increment being collected in 1/20th inch whereas FVS expects the Diameter Growth to be in 1/10th inch.

Tree species codes exported are the USDA PLANTS codes – the Trans species codes from the BLM Veg Codes found in the Administration Menu section of the PC program. Species that don't have a Trans code will be exported as "OT" (other).

For variants used outside of western Oregon: The large tree diameter growth model used in most FVS variants is described in section 7.2.1 in Dixon (2002 Essential FVS: A user's guide to the Forest Vegetation Simulator). For most variants, instead of predicting diameter increment directly, the natural log of the periodic change in squared inside-bark. For variants predicting diameter increment directly, diameter increment is converted to the DDS scale to keep the FVS system consistent across all variants.

FVS Variants as available EcoSurvey Export by BLM State/District

Variant Description and notes	Variant Code	AK	AZ	CA	CO	ID	MT	NM	NV	Western OR O&C Districts	Eastern OR-WA	UT	WY
Blue Mountains (upgraded to 18 species in 2009)	BM										X		
Central Idaho (upgraded to 19 species in 2011)	CI					X							
Central Rockies (upgraded to 38 species in 2009)	CR		X	X	X			X					X
East Cascades (upgraded to 32 species in 2012)	EC										X		
Eastern Montana (upgraded to 19 species in 2009)	EM						X						
Klamath Mountains	NC			X						X			
Inland Empire	IE					X	X				X		
Inland California / Southern Cascades	CA			X						X	X		
ORGANON Red Alder	RA			X						X			
ORGANON Southwest -CA	OC			X						X			
ORGANON Pacific Northwest	OP									X			
ORGANON Stand Management Coop	SM									X			
Pacific Northwest Coast	PN									X			
Southeast Alaska / Coastal British Columbia	AK	X											
South Central Oregon & Northeast California	SO			X						X	X		
Tetons (upgraded to 18 species in 2010)	TT					X						X	X
Utah (upgraded to 24 species in 2010)	UT								X			X	X
West Cascades	WC									X			
Western Sierras (upgraded to 43 species in 2011)	WS			X					X				

FVS Variants and the Default Associated Western OR BLM District Location Codes

Variant Code	Variant Description	BLM District Location Codes						
		Salem 708	Eugene 709	Roseburg 710	Medford 711	Coos Bay 712	Lakeview 701	DG Increment
PN	Pacific Northwest Coast	X	X	X		X		10
WC	Westside Cascades	X	X	X	X		X	10
NC	Klamath Mountains				X	X	X	5
CA	Inland California and Southern Cascades (ICASCA)				X		X	10
SO	South Central Oregon and Northeastern California (SORNEC)				X		X	10
SW	Southwest Oregon ORGANON			X	X	X	X	5
NW	Northwest Oregon ORGANON	X	X	X		X		5
SM	Stand Management Coop ORGANON	X	X			X		5
AL	Alder ORGANON	X	X	X		X		5

FVS Site Index Species and Tables

For each FVS Variant, the following species codes and its associated site index table is used during the FVS export file creation.

FVS Variant Codes	Variant Description	Species	Site Table	Age Type	Base Age
NC	Klamath Mountains	DF	King	BHA	50
		WF, IC, RF	Dolph PSW 185	BHA	50
		SP, PP	Powers and Oliver PSW 128*	TTA	50
CA	Inland California and Southern Cascades (ICASCA)	DF, PP	Hann & Scrivani	BHA	50
		RF, SF, MH	Dolph PSW 185	BHA	50
		KP, LP, WJ	Dahms PNW 8	TTA	50

FVS Variant Codes	Variant Description	Species	Site Table	Age Type	Base Age
SO	South Central Oregon and Northeastern California (SORNEC)	DF	Cochran PNW 251	BHA	50
		WF, IC, GF, SF	Cochran PNW 252	BHA	50
		SP, PP	Barrett PNW 8	BHA	100
		LP	Dahms PNW 8	TTA	50
SW	Southwest Oregon ORGANON	DF	Hann & Scrivani	BHA	50
		PP	Hann & Scrivani	BHA	50
NW	Northwest Oregon ORGANON	DF	King	BHA	50
		WH	Flewelling unpublished	BHA	50
SM	Stand Management Coop ORGANON	DF	Bruce	BHA	50
		WH	Flewelling unpublished	BHA	50
RA	Alder ORGANON (in beta testing)	RA	Weiskittel	TTA	20

Although both EcoSurvey and FVS have additional site index tables available, the tables listed above are the only ones that are present within both EcoSurvey and FVS. When entering Site Index values manually, refer to the FVS manual for the appropriate Site Index Table and base age used within FVS.

Stand Metrics Export (X06)

This export creates an MS Access database providing stratum and tree level stand metrics for merch and saplings (trees with dbh >= 1.6" DBH). There are species, layer and minimum diameter options:

- Export species individually, by conifer/hardwood, conifer only or total (all species)
- Export layers individually or by layer
- Provide minimum conifer DBH Class – from 2" class (>= 1.6") and up Provide minimum hardwood DBH Class – from 2" class (>= 1.6") and up

The following data is exported:

- General Stand Exam Attributes
    - Project
    - Unit Id
    - OI key
    - RMA
    - Township, Range, Section
    - Exam Date
    - Stratum Code
    - Stratum Area
    - Stand Description (Timber type label)
    - Stratum Site Index
    - Stratum canopy closure
    - Layer
    - Tree Species Name
    - Breast Height Age
    - Age Class
    - QMD
    - TPA
    - Basal Area/ac
    - Volume – board feet
    - Volume – cubic feet
    - SDI_{sum}
    - Curtis Rd_{sum}
    - RDI
    - Basal Area CV (coefficient of variance)
    - Board feet volume CV
    - Cubic feet volume CV

Access Import and Export

EcoSurvey support import from and export to an access database. This database can contain any number of projects and units, as long as they are for the same district/state. The Access schema for this database is aligned with those of the SQL Server backend database and the SQL Compact (.sdf) databases for a sense of uniformity. However, due to differences in data type support among these three database types, some fields may have slightly different type names or sizes from schema to schema.

The PC Application provides utilities for importing from and exporting to Access. It also provides a "Schema Tools" utility which allows the user to create a new empty Access database, and to generate a text file containing a DDL describing the Access Database Schema. This DDL generated by any particular program version will always provide the most up to date information about the schema supported by that program version. For more information regarding the Access import, export, and schema tools, refer to the PC User's Guide.