

**Modified Stand Level Inventory [SLI]
Field Guide for
the Riparian Vegetation Data Collection Project**

{THIS DOCUMENT HAS BEEN MODIFIED TO CONTAIN THE FIELD PROCEDURES AND PROTOCOL FOR THE CONTRACTED ODF FOREST PRACTICES/STATE FORESTS RIPARIAN VEGETATION DATA COLLECTION PROJECT.}



FOR THE
FOREST PRACTICES AND STATE FOREST MANAGEMENT
PROGRAMS
OREGON DEPARTMENT OF FORESTRY

VERSION ODFSLI 1.00
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Stand Level Inventory Nested Sample Plot Design

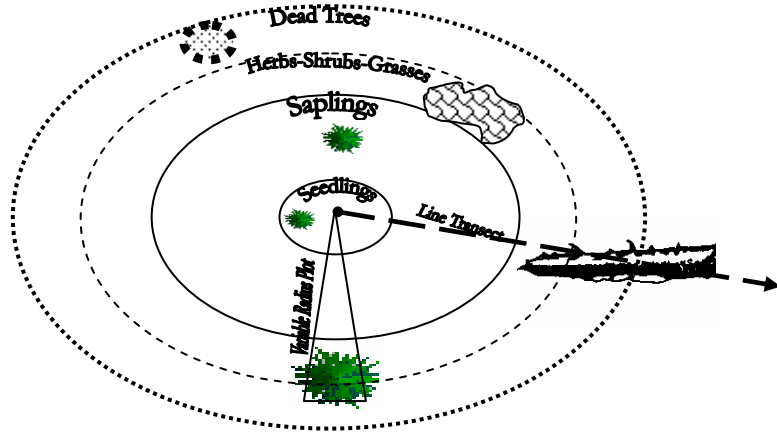


Figure 1: Standard SLI Nested Sample Plot Design

{NOTE: The primary differences between the standard SLI design above and the modified plot design used for the Riparian Vegetation Survey include:

- ❖ **Variable radius plots not used**
- ❖ **Series of embedded 1/100th acre fixed 12.0 foot radius plots are used to sample regeneration, shrubs, herbs.**
- ❖ **Line transect attributed to each fixed radius plot will be used to collect the downed wood sample, which may be post processed individually or combined and processed as entire 170 foot long transects**
- ❖ **Dead trees (snags >4.5 feet) are collected on the 2nd fixed plot along with overstory live trees (>=5.5 inches) in the 170' by 100' plot.**

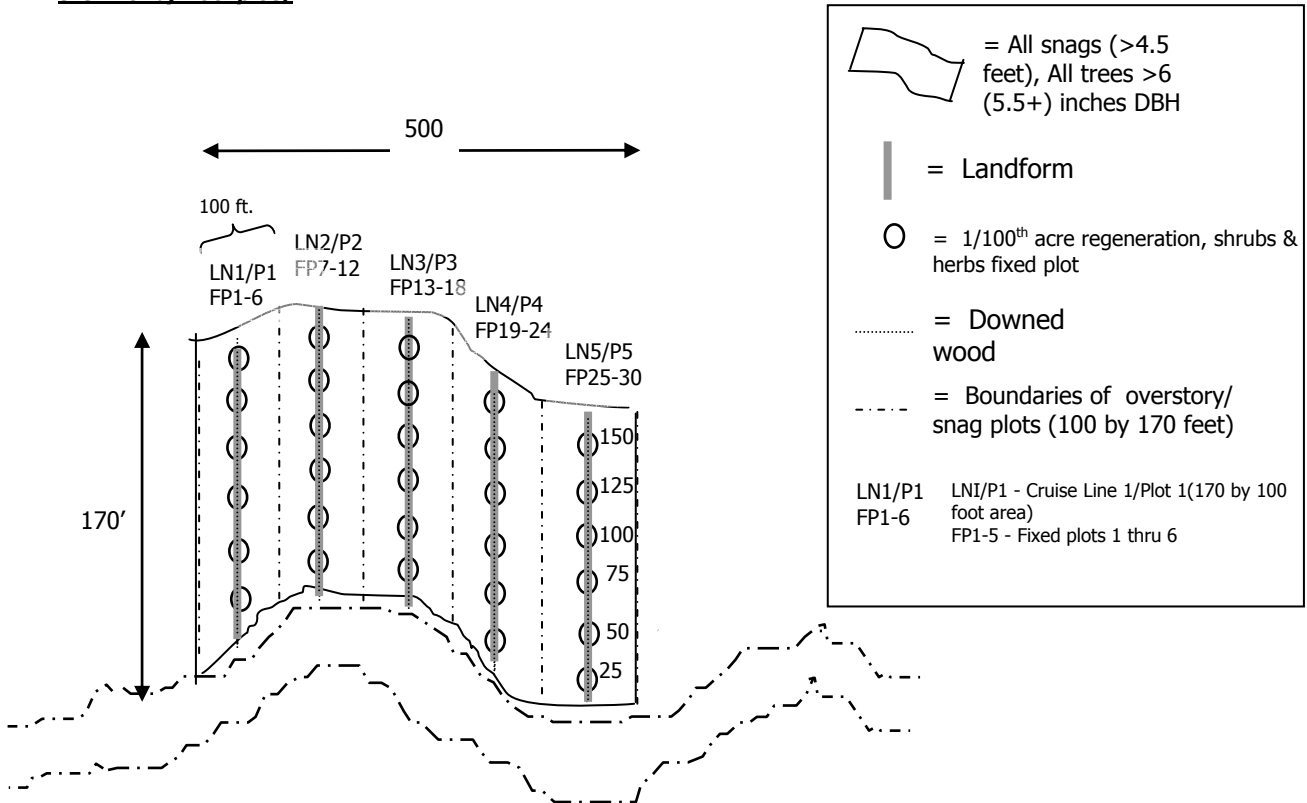


Figure 2. Riparian vegetation project plot design for landform, vegetation, and down wood measurements.

Summary of Riparian Structure Characteristics

The following measurement data will be collected by a contractor/researcher and are subject to revision. A rectangular plot (500 by 170 feet) is used to survey larger overstory trees and snags, with fixed 12 foot radius, 1/100th acre circular plots embedded along cruise lines to sample smaller trees, shrubs and herbs. Twenty-five foot transects extending from each fixed circular plot toward the stream are used to survey downed wood. Two 500 by 170 foot plots are centered in each of the control and treatment reaches, one on both sides of the stream for a total of four of these plots per site (see Figure 21, Appendix G). The Contractor will use best judgement placing each plot pair within the reach, unless directed by ODF in advance to place the plot in a specific location within the reach (for example, beginning at T800-Treatment reach 800 feet) and extending upstream 500 from that specific location within the reach. ODF desires the plot pairs to be centered within each reach as much as possible to avoid placement bias and ensure the plot is well within the intended treatment or control area. When considering plot placement some adjustment upstream or downstream from the reach center can be made to help avoid road impacts, a larger tributary, or dramatic stream meandering. Avoid plot placement on the extreme ends of the reach.

Laying out the Plots:

- Field crews should recon both the treatment and control reaches first to help determine an appropriate baseline azimuth and gain knowledge of the reach for best plot pair placement, unless plot placement specifically directed otherwise by ODF. Determine a baseline azimuth of the stream valley through the reach (read facing downstream). Set an azimuth directly perpendicular to the baseline reach azimuth that would run upslope into the rectangular plot. This azimuth will be the plot azimuth. Record both azimuths, and compass declination on the Plot Area Representation Map (see Appendix A). Moving along the determined baseline azimuth, come in 50 feet from either the upstream or downstream end of the plot to establish an initial transect cruise line (Line 1 or Line 5). Once this initial transect line is established continue moving along the baseline azimuth and flag in the remaining four transect line locations at 100 feet horizontal distance intervals. Follow the perpendicular azimuth to the high water mark at the channel edge to determine the transect line starting location. Each transect line should continue outward from the stream 170 feet using the same plot azimuth. Since each line is 170 feet horizontal from the stream the outside plot boundary should closely approximate the same shape of the streamside plot boundary.
- Permanently mark the four corners of the 500 by 170 foot plot based on horizontal distance, by marking the location with ¼" rebar, painted orange. Well placed aluminum tags should be nailed on nearest three live tree bases with site/plot number, slope distance, azimuth, along with species and dbh of reference tree, to help re-location efforts if either the upstream (500') corner or downstream (0') corner markers are difficult to find. When plots are paired and "mirror" directly across from each other, only three tags are required to reference either corner. Trees that are close (within 3 feet) to the external plot boundaries should be marked with a painted arrow, clearly showing (arrow pointing toward) whether the tree was considered in or out of the plot by the contractor.

In general, data will be collected from the start of a given line by moving away from the stream along the transect and recording downed wood, attributed to a fixed plot, collecting regeneration, shrubs, and herbs on each fixed plot moving up the transect line. Overstory trees and snags will be added to the last plot on each line (i.e. furthest plot out from stream - plots 6, 12, 18, 24, & 30) while cruising the trees/snags back down within that given 170 by 100 foot flagged plot area. The overstory tree and snag 170 by 100 foot plot boundaries between plots should be flagged in yellow/black stripe flagging to clearly indicate the boundary line between these 170 by 100 foot plots. Trees close or on these boundaries should be marked with a painted arrow, clearly showing (arrow pointing toward) which plot the tree is assigned to for check cruising purposes. Establish plot center stakes and hang white with red polka dot plot flagging at the circular plot centers (located on each transect at 25, 50, 75, 100, 125, and 150 feet from the stream channels high water level) based on horizontal distance, as described in the Sample Plot Layout section. Any plots with a Plot Status other than "YY", installed with tally, need to be identified and documented on the Plot Area Representation Map prior to submission. For the purposes of check cruising, all Status code 6 and 8 trees (see < **Trees;S**>) shall be clearly identifiable within each 170 by 100 foot plot. The cruiser shall paint the

tree number (see < **Trees;Tr**>) on each subject tree (if moss on tree, remove moss and paint on bark), using the following tree numbering protocol depending on which 170 by 100 foot overstory/snag plot the subject tree is within. All overstory trees/snags equal or greater than 5.5. inches are measured and recorded on the last plots of each line transect (i.e. Plots 6, 12, 18, 24, and 30). Transect lines are numbered 1 through 5 in an upstream direction with the following tree numbering scheme for each 170x100 overstory subplot.

Line	Overstory/Snag Plot – plot furthest away from stream on each Line.	Tree Numbering in that 170x100 overstory subplot
1 (furthest downstream)	6	100's
2	12	200's
3	18	300's
4	24	400's
5 (furthest upstream)	30	500's

1. **Landform:** While proceeding from plot to plot assess and record the predominant landform feature code that best characterizes the distance from the previous plot to the current plot. Please note the following two exceptions: when on the first plot (25 feet from stream) on a line transect, it is the predominate landform between the stream high water level and the first plot and secondly, when on the last plot (150 feet from stream) it also includes evaluating the 20 feet past the plot out to end of the line transect which is 170 feet from the stream high water level. This data will be collected in the remarks field at the Plot level. See the '**Plot;Remarks**' data field for code information and format to use.
 - **Landform feature (code)** - see table with landform feature codes and descriptions in '**Plot;Remarks**' section.
2. **Downed Wood:** Along the 5 transects established 100 feet apart and perpendicular to the reach baseline azimuth (Figure 2 above), for all downed wood meeting protocol specifications that crosses the transect measure the:
 - **Species (code):** A two-letter species code is entered for each tallied down wood piece. If species is in determinable for a tally item, there are species codes for "Unknown Conifer", "Unknown Hardwood", and "Unknown Species".
 - **Intercept Diameter (inches):** Record the diameter of the piece at the point where the line-transect crosses the central longitudinal axis of the piece. Only those down wood pieces that are at least 6" in diameter and at least 3' in length are to be tallied. Measure and record the intercept diameter to the nearest inch.
 - **Small end diameter (inches).** Record the diameter of the small end of each down wood piece tallied to the nearest inch. Do not record a small end diameter less than 1" (if the tip-top is smaller, measure the length of the piece to the 1" diameter point on the piece). The small end diameter recorded must be smaller than or equal to the large end diameter recorded.
 - **Large end diameter (inches):** Record the diamter of the large end of each down wood piece tallied to the nearest inch. The large end diameter must be equal to or greater than the small end diameter recorded. Values equal to or greater than 6" and less than or equal to 200" are acceptable.
 - **Length (feet):** Record the length of each down wood piece tallied to the nearest foot. Do not record down wood pieces shorter than 3' in length.
 - **Decay Class (value from code list):** Record the decay class that best describes the physical decomposition characteristics of the down wood piece.
 - **Presence of Root Wad:** This is to be recorded in the Wildlife Use field. Please enter the valid code "0" (default) to indicate if no rootwad present and "1" to indicate if there is a rootwad present. See instructions for '**Down Wood;U**' in Down Wood section.
 - **Distance from channel at the intersection with the transect:** This is to be recorded in the Remarks field. See instructions for '**Down Wood;Rmk**' in Down Wood section.
3. **Small Trees (less 6" (<=5.4 inches):** These measures are taken in the 12 foot radius circular plots along the 5 transects established 100 ft apart and perpendicular to the valley azimuth. Plots are 25, 50, 75,

100, 125 and 150 feet horizontal from the stream channel. Take the following measurements on all trees less than 6 (≤ 5.4) inches in DBH that are within the plot.

- Species: (code list)
 - DBH (inches): Diameter at breast height.
 - Live crown ratio: Measure the height to the base of the live crown on each tree that was measured for height.
 - Tree Height (ft): Measure tree height on all young trees as described in the 'Trees;Ht' field in the Trees section.
 - Shrubs and Herbs: These measures are taken in the 12 foot radius circular plots along the 5 transects established 100 ft apart and perpendicular to the valley azimuth. Plots are 25, 50, 75, 100, 125 and 150 feet horizontal from the stream channel. For each shrub, herb, and forb species observed record:
 - Species: (code list)
 - Coverage percentage by non-tree species.
 - Average height for that layer/species combination.
4. Overstory Trees and Snags: Take the following measurements on all trees or snags (> 4.5 feet tall) greater than 6 (≥ 5.5) inches DBH:
- Group code: (code list) Code used to identify each tally item as a standing live tree or a snag.
 - Species (code): Document the species of each tree that is measured using a the species lookup list codes.
 - DBH (inches): Diameter at breast height.
 - Tree Status: (code list) Status code assigned by cruiser per protocol that impact data recording requirements for the following data elements when processed and sent for post data collection compilation; tree height, tree breast height age, tree live crown ratio, tree crown class, snag decay class, and snag wildlife use (excavations). See summary status code summary table and individual code descriptions described in the '**Trees;S**' field section.
 - Tree Height (ft): Measure tree height according to the height recording requirements as described in the '**Trees;Ht**' field section.
 - BH Age: Recorded breast height age needed for some trees, as described in the '**Trees;Age**' field section.
 - Live crown ratio: Live Crown Ratio, which is the length of the live crown portion of the tree divided by its total height. Collect data as described in the '**Trees;CR**' field section.
 - Crown Class: (code) Live tree Crown Class, is the description of the relative position of the tree crown with respect to competing vegetation surrounding the tree. Collect data as described in the '**Trees;CC**' field section.
 - Damage: Use damage codes to record Lean and broken top codes as described in the '**Trees;Dmg1**' and '**Trees;Dmg2**' fields.
 - Defect: Use defect fields to record percentage missing or unsound in each third (lowest, middle, and top) of the tree bole as described in '**Trees;Def1**', '**Trees;Def2**', '**Trees;Def3**'.
 - Decay Class (snags): Record the decay class code that best describes the physical decomposition characteristics of snags.
 - Horizontal Distance from stream (Ft): estimated to the nearest foot. Use known fixed plot locations along transect line running down the middle of the 170 by 100 foot sub plot to help determine valid distance estimates of the tree from the stream. This should be recorded in the User2 field as described in '**Trees;User2**' for every overstory tree or snag equal or greater than 6 (≥ 5.5) inches.
 - Tree Lean and Direction (code): Should be recorded in User1 field as described in '**Trees;User1**') using the listed six categories.
 - 10-Year Radial Growth Increment Data: On site trees (Status 8) bored for age, measure (in $1/20^{\text{th}}$ of inches) the 10-year period beginning at the end of the 2nd years' spring wood and stopping at the beginning of the 10th years' fall wood. This is recorded in the User3 field, as described in '**Trees;User3**'.

THIS PAGE DESCRIBES IMPORTANT INFORMATION THE READER NEEDS TO KNOW ABOUT THE APPROACH USED TO MODIFY THE DOCUMENT BEFORE READING AND USING THE DOCUMENT FOR USE WITH THE ODF RIPARIAN VEGETATION DATA COLLECTION PROJECT.

The Forest Practices and State Forests Monitoring Program staff have decided that use of a data recording software program would be beneficial for data collection and to provide robust in-the-field error checking. With this mind, the current State Forests' *HHSLI* data collection application will be used, and its developed documentation modified for use with this riparian vegetation data collection effort. Please note, in most places the body text is left to provide background information and to describe the approach and framework that is used in the SLI process. The text in this modified SLI Field Guide has been directly modified within the body text or at the end of the paragraph or section you will see modified, added text usually within brackets **{in this bold/underlined/italicized format that states how the described SLI protocol parameters should be used or are to be modified for the riparian vegetation data collection effort.}** Some text has been "striked out" using Strikeout text to help show areas that can be ignored or do not apply for the riparian vegetation data collection project items.

The source SLI documentation was written to provide the knowledge of what has been programmed for each field and each "level" for data collection, such as the minimum and maximum field values, pre-loaded values, and what programmed acceptable value ranges are before error and warning triggers are activated.

For example, for the Lt2Radius field, the absolute minimum and maximum values are 1.0' and 150.0' respectively. A value of 17.0' is automatically pre-loaded into the field by the program and may be edited as needed. The program issues a warning message for values less than 6.1' or greater than 54.9'. **{For the riparian study this value should be set to 73.6, which is the area equivalent to 170 by 100 feet converted to a fixed plot radius, for expansion use with the SLI HHSLI application.}**

TABLE OF CONTENTS

TABLE OF CONTENTS	7
LIST OF FIGURES	9
LIST OF TABLES	10
INTRODUCTION.....	1
INVENTORY SAMPLING APPROACH	3
Why we perform SLI sampling.....	3
What is sampled in SLI	3
How SLI sampling data is used	3
How is the sampling data assembled for use in SLI	4
What is the standard sampling approach for SLI	4
What is the stand sample intensity for SLI.....	4
What sample plot sizes are utilized in SLI	4
STAND IDENTIFICATION & CRUISE DESIGN	7
CRUISE LEVEL ITEMS	7
Item by item description; CRUISE level	10
SAMPLE PLOT LOCATION & ESTABLISHMENT	23
Sample Plot Layout.....	23
LINE LEVEL ITEMS	26
Item by item description; LINE level	29
PLOT LEVEL ITEMS	32
Item by item description; PLOT level.....	35
SLI SAMPLING TALLY ITEM INFORMATION	48
TREES BRANCH LEVEL ITEMS	48
Item by item description; TREES branch level	53
VEGETATION BRANCH LEVEL ITEMS	85
Item by item description; VEGETATION branch level	88
DOWN WOOD BRANCH LEVEL ITEMS	92
Item by item description; DOWN WOOD branch level.....	94
Appendix A: Step by Step Example Cruise	100
Appendix B: Glossary	104
Appendix C: Identification Guides	107
Appendix D: Using HHSli	109
Loading HHSli into the Handheld Computer	109
Starting HHSli	110
Collecting Data.....	110
Special Function Keys	111
Uploading Data to the PC.....	112
HHSli Information Screens	113
HHSli Calculator Programs.....	116
HHSli Error Messages	119
HHSli Fields Summary.....	132
Appendix E: Codes, Misc. Procedures, Tables, & Forms	137
Non-Forest Plant Association (Ecoclass) Codes.....	137
Site Tree Selection Rules	139
Determining the Age of a Large Tree	142

Standard SLI Sample Plot Design.....	143
Crown Class Explanation: Complex Stand Structure Situations.....	143
HHSli Lookup Lists.....	145
SLI Hardcopy Field Forms	155
SLI Field Reference Cards	157
Appendix F: Tolerances & Standards	167
LOCATION OF SAMPLE PLOTS.....	167
PLOT AREA REPRESENTATION MAP.....	167
CRUISE LEVEL DATA	168
LINE LEVEL DATA	168
PLOT LEVEL DATA.....	168
TREES LEVEL DATA.....	170
VEGETATION LEVEL DATA.....	173
DOWN WOOD LEVEL DATA.....	174

LIST OF FIGURES

Figure 1: Standard SLI Nested Sample Plot Design	2
Figure 2: HHSli screen example - Cruise level, 1 st & 2 nd screen pages	8
Figure 3: New file name creation on the hand held data recorder	11
Figure 4: Defining Down Woody Material pieces - Points of Abrupt Physical Change	19
Figure 5: Defining Down Woody Material pieces – Decomposition.....	19
Figure 6: Tally/No tally determination for down wood sample.....	19
Figure 7: HHSli screen example - Line level	27
Figure 8: HHSli screen example - Plot level.....	33
Figure 9: Selection list for Trees-Vegetation-Down Wood level branches.	34
Figure 10: Slope Position code example schematic	43
Figure 11: HHSli screen examples - Trees branch level, 1st & 2nd screen pages.	50
Figure 12: HHSli screen examples - Trees branch level, 3rd & 4th screen pages.	50
Figure 13: HHSli screen examples - Trees branch level, 5 th & 6 th screen pages.	51
Figure 14: Snag Decay Classes	80
Figure 15: HHSli screen example - Vegetation branch level, 1 st & 2 nd screen pages.....	85
Figure 16: HHSli screen example – Down Wood branch level, 1 st & 2 nd screen pages	93
Figure 17: Down Wood Decay Classes.....	97
Figure 18: Determining the age of a large tree.....	142
Figure 19: ODF SLI Cruise Design Form.....	155
Figure 20: ODF SLI Vegetation Data Form	156
Figure 21. Generalized schematic of study design in relation to data logger placement.	176
Figure 22. Plot design for landform, vegetation, and down wood measurements. [Not to scale.]	178

LIST OF TABLES

Table 1: Cruise Level data items.....	7
Table 2: Stand identification number range by ODF District.....	11
Table 3: Line Level data items.....	26
Table 4: Plot Level data items.....	32
Table 5: Plot Status codes.....	36
Table 6: Root Disease codes.....	38
Table 7: Root Disease Severity Rating classes.....	39
Table 8: Swiss Needle Cast Severity Rating classes.....	40
Table 9: Slope Position codes.....	43
Table 10: Plant Association Guides for State Forests.....	45
Table 11: Trees Branch Level data items.....	49
Table 12: Damage & Severity Rating codes.....	71
Table 13: Snag Decay Class description summary.....	80
Table 14: Vegetation Branch Level data items.....	85
Table 15: Down Wood Branch Level data items.....	92
Table 16: Down Wood Decay Class description summary.....	97
Table 17: Site tree selection guidance.....	139

INTRODUCTION

The State Forests Stand Level Inventory (SLI) is the system employed to provide current or recent information about forest vegetation characteristics and where they occur on the landscape. SLI is used for information-based decision making, focusing on facilitation and assessment of operational stewardship activities. Information on vegetation elements including live and dead trees, non-tree vegetation (herbs-shrubs-grasses), and down woody material is gathered via field sampling techniques within stratified forest stands. ***{Grasses will not be gathered.}***

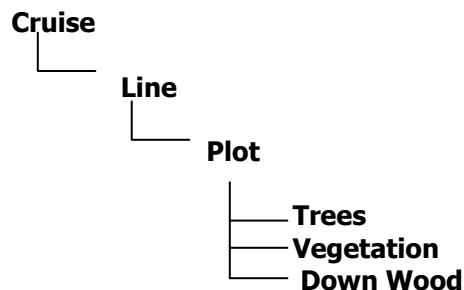
The ODF SLI Field Guide serves to describe and document the protocol for the field sampling work performed for the inventory of selected State Forest stands. A nested plot sample design is used at a series of "temporary" points established in each selected stand. ***{The use of both fixed area circular plots and rectangular area 100% plots will be used on "long term" plot areas.}*** Sample data is gathered at each plot and recorded using hand held electronic data recorders. Data files are transferred to PC's running SLI database software, where they are processed for inventory uses in the form of stand summary reports and visualization. The inventory information products are used for forest stewardship activities including operations planning, growth and yield modeling, and economic analysis.

Data standards for both sampling and non-sampling sources of error have been established for the SLI design and are the basis for the protocol presented in this guide. Measurement precision standards are included in the data item descriptions and measurement accuracy standards are summarized in Appendix F.

The subjects in this field guide are progressive, starting with description of the inventory sampling approach, moving on to stand identification & cruise design, then to sample plot location and establishment, followed by a description of each specific item of information recorded for the inventory sample: trees, non-tree vegetation, and down woody material.

Through the use of a data recording software program, referred to as ***HHSli*** (for: hand held computer - stand level inventory application), stand identification information, cruise design information, and sample data is collected and organized for use while providing robust in-the-field error checking. Instructions for use of ***HHSli*** and description of its features is included in Appendix D. Descriptions of individual sample data items are presented in this guide by their logical order of flow within that program, and according to the usual order of work employed during the field sampling. Definition of each of the inventory sampling data fields is also presented, along with acceptable standardized coding and/or data value sideboards.

HHSli display screens are arranged in various "levels" of a hierarchy as shown below:



Reference is made in this guide to each data item in terms of its arrangement in the data record. The reference is made through a combination of the level and the data field, e.g. the Stand ID number is present at the ***Cruise*** level, and is the data field named ***Std_ID***.

Syntax for describing each data item in this guide follows the convention shown below:

< Level title; data field name >

For example, for the Stand ID number the reference would be: **< Cruise; Std_ID >** and the reference to the DBH data field for trees would be: **< Trees; DBH >**, etc.

INVENTORY SAMPLING APPROACH

This section describes the rationale for the inventory sampling approach and the sampling framework utilized within SLI: why and what is sampled, what the sampling information is used for, how the sampling information is assembled for use in SLI, SLI standard sampling plot design, sampling intensity, and sampling plot sizes.

WHY WE PERFORM SLI SAMPLING

SLI is an information system that is intended to provide knowledge of forest vegetation and where it occurs on the landscape. Since the area of State forests we require information for is so extensive, nearly 780,000 acres, it is impractical to assess and describe the vegetation by direct measurement (observing every tree, shrub, down woody material, etc.). The forest area is divided into "stands", contiguous areas of vegetation that by nature are somewhat similar in composition and arrangement. Stands may range in area from as few as several acres to as large as several thousand. Knowledge of forest vegetation within a stand serves to comprehensively identify where on the landscape particular vegetation conditions exist, i.e. each acre has its vegetation described in terms of the stand within which the acre falls. ***{For the riparian vegetation survey, we are sampling designated plot "areas" rather than "stands". Through this field guide the term stand should be thought of as sample plot area.}***

WHAT IS SAMPLED IN SLI

Information about vegetation in a stand is obtained via sampling. Measurements and observations of forest vegetation in a stand are made at a series of like-measured sample plots. A sample plot is a fairly small area of a stand where observation of the vegetation occurs. The observations at each plot are combined and expanded to portray the average of vegetation characteristics for the stand. Individual observations of vegetation (single tree measurements for example) are also used in a forest growth simulation model to predict future conditions in a stand.

Measurements and observations are made on trees, herbs-shrubs-, and down wood at each of the sample plots in a stand.

HOW SLI SAMPLING DATA IS USED

Stand sampling information is used as the basis for informed decision-making with respect to stewardship of forest vegetation and landscapes. Silvicultural operations planning and strategy at the operations scale (operations area) rely upon knowledge of the vegetation conditions present in the area involved - SLI is one source for that information. Knowledge of the characteristics of forest vegetation at levels including hydrologic basin or sub-basin, State Forest tract, ODF Unit, ODF District or other administrative extents is provided by aggregation of individual stand information within the area of interest.

SLI data often serves as the first approximation of vegetation characteristics prior to further information gathering necessary to support operations decision-making. Also, as vegetation changes occur due to growth, natural disturbances, or silvicultural operations activity, SLI sampling may be performed following significant vegetation change to assess the new conditions or to monitor operations results.

HOW IS THE SAMPLING DATA ASSEMBLED FOR USE IN SLI

Each measurement or observed characteristic made on a sample plot is recorded in an organized fashion. The data recorded for each plot is compiled along with the data from all other plots using a mathematical model based computer program. Stand sample results include various reports upon vegetation characteristics. Since every stand sampled using the SLI protocols is handled the same way, vegetation metrics are comparable among and between stands.

WHAT IS THE STANDARD SAMPLING APPROACH FOR SLI

The various vegetation components (trees, herbs-shrubs-, and down wood) are each assessed by selecting individuals that are present within or on the sample area associated with each sample plot. Trees are sampled on either a variable radius plot, up to a total of four "nested" fixed radius circular plots, or on a combination of nested variable and fixed radii plots. Herbs-shrubs- are sampled on a fixed radius circular plot. Down wood is sampled using a line-transect (each down wood piece that is intersected by a sampling "plane" is included for measurement). **{For this project, grasses will not be assessed.}**

In general, the size of plots and the length of line-transect sample are user specifiable - a "flexible" plot configuration approach. Sample plot size and approach is chosen to tailor the sample rate of vegetation components so that neither too few nor too many individuals are included in the sample. If too few, then the sampling effort is confounded by sample-size induced population variation. If too many, then the excessive measurements contribute little to sample results yet greatly increase the time required for sampling and increase the possibility of measurement error (mistakenly missed or added sample items).

SLI sampling performed by ODF personnel allows the decisions for sampling configuration to be made just prior to the work (in the field where stand conditions that affect the preferred design are readily observable). SLI sampling performed under contract by professional service providers requires that the sampling configuration be established prior to the fieldwork, according to ODF requirements (specifications for each stand are included in pre-project materials furnished to the contractor by ODF). In any case, there are a few "standardized" approaches that fit most stand conditions, further detailed in Appendix E (see page 143).

WHAT IS THE STAND SAMPLE INTENSITY FOR SLI

The number of plots per stand is determined prior to the sampling work, and will generally be from 16 to 24 plots per stand. For stands less than 20 acres, no more than two plots per acre will be installed. Very uniform (low basal area per acre CV) stands may receive fewer plots - usually no fewer than 10. The minimum stand size that can be effectively cruised using the SLI procedure is five acres. **{The primary reason for this minimum with the SLI procedure is the desire to not have more than one plot per acre on average and to facilitate the a minimum plot spacing of 50 feet. For this project sampling areas smaller than five acres works appropriately.}**

WHAT SAMPLE PLOT SIZES ARE UTILIZED IN SLI

For each of the different components in the stand, plot configuration and size is user specified in SLI. Sample plot configuration and size(s) shall be determined prior to the sampling work, and shall not change - all plots in a stand shall be measured the same.

When used, variable radius plots shall be full circle sweeps, with trees sighted at DBH using a single BAF per stand. Acceptable BAFs range from 10 to 90.01 (only certain BAFs in that range are acceptable within *HHSli*). **{Variable radius plots won't be used for the riparian vegetation data collection.}**

Up to three different-sized nested fixed area circular plots for live tree sampling may be used. Three sizes are available to allow different radii for sampling across the spectrum of tree sizes (DBH's) present in the stand. For example, a small plot could be used to sample seedling size trees, and a larger plot used for sampling any sapling or pole size trees. The radius of each plot used must be at least one foot and less than or equal to 150 feet.

One fixed area circular plot is available for sampling dead trees (snags). Dead trees may either be sampled with the live trees using the same BAF variable radius plot, or may be sampled using (only) a specified fixed area plot. If used, the radius for a dead tree fixed plot must be at least one foot and less than or equal to 150 feet.

Non-tree vegetation (herbs-shrubs-) is sampled on a fixed area circular plot. The standard radius is 24.0 feet. A smaller or larger radius may be specified for a stand to accommodate specific non-tree vegetation circumstances. **{A fixed area circular plot with a twelve (12.0) foot radius will be used to sample herb and shrub cover. For this project, grasses will not be assessed.}**

Down wood is sampled on a line-transect (actually a sampling "plane") that radiates from each plot center point. The standard configuration for SLI is a single transect in the direction of the next sample plot, which is at least 100 feet long. An alternative sample layout is available to accommodate specific down wood conditions. For example, two or three transects which radiate from the plot center, whose total length is at least 100 feet. The total length of line-transect at each plot shall be less than or equal to 360 feet. **{ For the riparian project survey the down wood will be collected along the line-transect for the distance from the last plot to the current plot, with the following two exceptions, when starting the line-transect it is from the stream channel and secondly after the last plot (150' HD) out to the end of the overall line transect length which is 170'.}**

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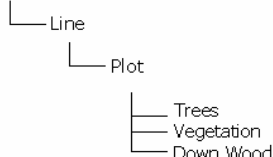
STAND IDENTIFICATION & CRUISE DESIGN

This section describes the materials and information that are generated in preparation to perform the field sampling (a.k.a. cruise or cruising) for each area to be sampled.

CRUISE LEVEL ITEMS



Cruise



The table below shows the data items that are included at the **Cruise** level in **HHSli**, and summarizes the parameters of each as they appear in the program application's screens.

Table 1: **Cruise** Level data items

CRUISE LEVEL								
Col #	Field Name	Type	Width	Required in HHSli	Column Help Message	Min	Max	Auto Pre-load
1	Std_ID	N	5	Yes	Stand ID Number (N5)	1	99999	
2	ProgVer	C	6	Yes	SLI Program Version			HHSLI
1	Std_ID	N	5	Yes	Stand ID Number (N5)	1	99999	
3	CruiseDate	C	8	Yes	Date (MM/DD/YY) (C8)			date
4	Cruiser	C	4	Yes	4 Cs max (C4)			
5	BAF	N	5	Opt.	Basal Area Factor (N5.2)	list		0.0
6	DBHcutoff	N	5	Yes	VP/FP break in inches (N5.1)	0.0	999.9	5.5
7	Lt1MinDBH	N	5	View Only.	Fixed Plt 1 Min Tree DBH			0.0
8	Lt1MaxDBH	N	5	Opt.	Fixed Plt 1 Max Tree DBH			5.4
9	Lt2MinDBH	N	5	Opt.	Fixed Plt 2 Min Tree DBH			5.5
10	Lt2MaxDBH	N	5	Opt.	Fixed Plt 2 Max Tree DBH			999.9
11	Lt3MinDBH	N	5	Opt.	Fixed Plt 3 Min Tree DBH			
12	Lt3MaxDBH	N	5	Opt.	Fixed Plt 3 Max Tree DBH			
13	Lt1Radius	N	5	Opt.	Fixed Plot 1 Radius	1	150	12.0
14	Lt2Radius	N	5	Opt.	Fixed Plot 2 Radius	1	150	17.0
15	Lt3Radius	N	5	Opt.	Fixed Plot 3 Radius	1	150	
16	DtRadius	N	5	Opt.	Dead Tree FP Radius	0	150	
17	VegRadius	N	5	Yes	Vegetation FP Radius	6	150	12.0

CRUISE LEVEL								
Col #	Field Name	Type	Width	Required in HHSli	Column Help Message	Min	Max	Auto Pre-load
18	Transect	N	5	Yes	Total length in ft (N5.1)	1	360	25.0
19	PlanPnum	N	3	Yes	Tot # Plots plan for area	1	999	
20	AvgTplt	N	4	Yes	Avg # 4"+Trees per Plot	1	99.9	
21	PlotSpace	N	4	Yes	Plot Spacing [ft] (N4)	50	9999	
22	Remarks	C	24	Opt.	Cruise Level Remarks			

The figures below are examples of the screen appearance of the **Cruise** level on the hand-held data recorder. For display screen size of 24 characters wide by 16 character lines tall, the **Cruise** level contents occupy two screen "pages" as shown in the example below.¹

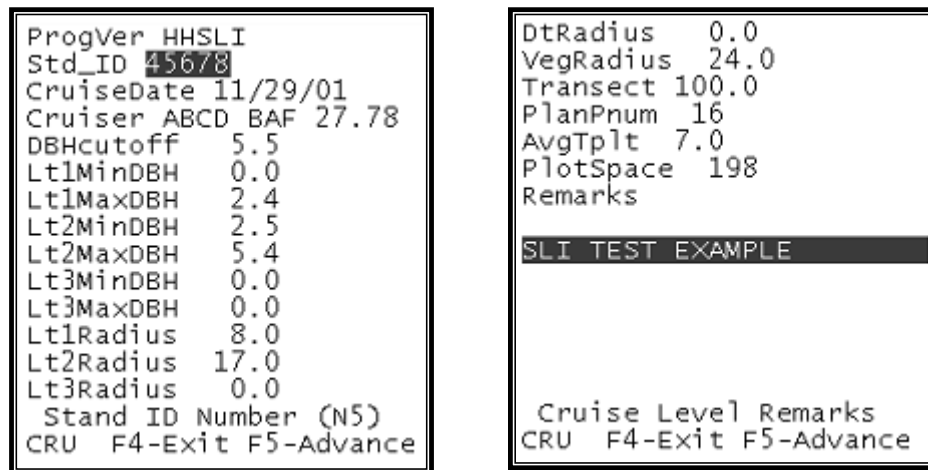


Figure 2: **HHSli** screen example - **Cruise** level, 1st & 2nd screen pages

{Riparian project example values will be BAF 0.0, DBHcutoff of 999.9, Lt1MinDBH 0.0, Lt1MaxDBH 5.4, Lt2MinDBH 5.5, Lt2MaxDBH 999.8, Lt3MinDBH 0.0, Lt3MaxDBH 0.0, Lt1Radius 12.0, Lt2Radius 73.6, Lt2Radius 0.0, DtRadius 0.0, VegRadius 12.0, Transect 25.0, PlanPnum 30, AvgTplt 4, (PlanPnum and AvgTplt values are used here to have HHSli set a height sampling frequency "flag" every 5th tree), PlotSpace 50, (this value is being set to 50 feet, the lowest valid HHSli value, since 25 can not be entered and the data will be post upload processed by ODF).}

Note: **HHSli** includes helpful features such as a quick view summary of the cruise parameters chosen, and a calculator that has several functions directly related to the fieldwork involving the plot size criteria. The features are accessed by pressing the F7 key and choosing from the options presented. See full details in

¹ Full details of **HHSli** features and instructions for use are included in Appendix D.

Appendix D.

There are two paper data forms available that are intended to provide backup to the use of *HHSli*, in case of an unavoidable malfunction of the hand held data recorder. There are both MS Excel format spreadsheets and Adobe portable document format (pdf) files that may be printed onto 8.5" x 11" write-in-the-rain stock. The Cruise Design Form has spaces for entry of the **Cruise**, **Line**, and **Plot** level data items. The Vegetation Data Form has spaces for entry of **Tree**, **Vegetation**, and **Down Wood** branch level data items. Both forms are shown in Appendix E and are available for download from the ODF Forest Practices Riparian Vegetation Documents web page at: http://www.odf.state.or.us/DIVISIONS/protection/forest_practices/fpmp/default.asp. All SLI data that is entered on the forms shall be subsequently entered into *HHSli* to ensure the integrity of the data through appropriate missing and incomplete error checking and to help facilitate importing the data into SLI databases.

ODF may use the Cruise Design Form to communicate cruise design specifications for each stand that is to be cruised by professional service contractors. Also, in cases where the cruise design is yet to be developed, the **Cruise** level portion of the form serves as a handy place to "work-up" the design for a stand prior to its entry into *HHSli*. Figure 19 in Appendix E shows the Cruise Design Form.



ITEM BY ITEM DESCRIPTION; CRUISE LEVEL

< **Cruise;ProgVer** >
Col # reference - 2

ProgVer stands for program version. **HHSli** is the default version for use in all ODF Districts except for the Klamath-Lake District. Due to the unique nature of eastside stands, provisions in **HHSli** have been made to accommodate cruising in those stands - without having to maintain two separate versions of the data recording program.

The KLSLI version makes use of certain fields that may be used differently, or not at all, in the HHSLI version:

Data field	KLSLI Version Use	HHSLI Version Use
< Plot;PctSoil >	Record percent of bare soil seedbed at the plot	Optional
< Trees;Tcl >	Record the viability of each tally tree recorded	Not used, cursor skips
< Trees;Azm >	Record the azimuth to reference trees for permanent plots	Optional
< Trees;Dist >	Record the distance to reference trees for permanent plots	Not used, cursor skips

The KLSLI version:

- uses unique lookup lists for tree and vegetation species, plant association, and snag decay class
- uses different cruise design pre-load values
- does not use the field for Swiss Needle Cast rating
- does not use a lookup list for the remarks field at the **Trees** level
- automatically pre-loads a value of "UPLAND" in the < **Plot;GrndCls** > field
- has a greater minimum value for down wood piece length
- has autocopy turned off for the < **Trees;Sp** > field

ProgVer is a required entry in **HHSli** and is automatically pre-loaded by the program with the "HHSLI" choice from the lookup list for the field. When the choice of "HHSLI" is made, the fields shown in the table above are not accessible, they are visible but the cursor skips past them. The "KLSLI" choice should only be selected for use in the Klamath-Lake District.

< **Cruise;Std_ID** >
Col # reference - 1

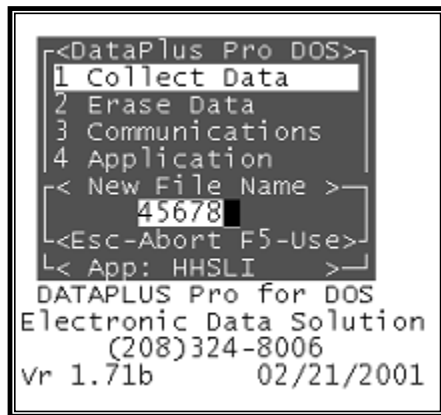
The stand identification number, or "stand number" for short, is the assigned SLI identifier for the stand. Each stand in SLI is a polygon with a unique numeric ID value that is greater than zero and less than 100,000. The stand number is generated within the SLI application database and is automatically included on the SLI stand map for each stand. Each ODF District has its own block of pre-assigned numbers available for stand identification. This is necessary to avoid duplication of stand numbers between Districts. **{For the riparian vegetation survey the Stand (Site) identification number ranges will be assigned as follows:}**

Table 2: Stand identification number range by ODF District

District	Stand number range
Coos	74001-74999
Forest Grove	53001-53999
Western Lane	78001-78999
West Oregon	55001-55999
Astoria	52001-52999
Tillamook	51001-51999

Std_ID is a required entry in **HHSII**. It must be equal to the file name first assigned at entry into data recording for a new stand (Collect Data, New Dataset menu choice from the DataPlus Pro² main menu).

Figure 3 below is an example of the point at which the file name is specified.



In this example of the main menu screen for DataPlus Pro, the user is in the process of typing in the stand number into the <New File Name> pop-up window. The stand number is **45678** and the user has entered that value correctly as the file name for the stand. By pressing the F5 function key at this point, the **Cruise** level screen will open with the cursor positioned in the **Std_ID** field. The user would then enter a value of **45678** for the stand number. Any other value than that entered for the new file name will trigger an error message and the entry will not be accepted. If a wrong stand number was used for the file name, the user must escape from the **Cruise** level (by using the Escape key) and create a new dataset with the correct value to continue.

Figure 3: New file name creation on the hand held data recorder

There may only be one stand number recorded for each DataPlus Pro dataset. If lower level data exists (i.e. **Line** level data has been entered for a stand) the stand number entry may not be edited in **HHSII**.

< **Cruise;CruiseDate** >

Col # reference - 3

The cruise date is the date of the field sampling work for the stand. If a stand is cruised over the course of more than a single day, the first day cruising was done is used.

² DataPlus Pro is a background software program on the hand held computer that makes the **HHSII** application available for the user - see Appendix D for more information.

CruiseDate is a required entry in **HHSli** and is entered using the format MM/DD/YY. Upon file creation, the date is automatically pre-loaded by the program, which reads the current date from the computer's system clock. The date may be edited at any time. MM and DD are checked to detect erroneous values. MM must be from 01 to 12 and DD must be from 01 to 31. The user must enter leading zeros for single digit months or days. Forward leaning slashes are persistent in the data field and are not user editable.

{For the riparian vegetation data collection this will be used as described.}

< **Cruise;Cruiser** >

Col # reference - 4

Cruiser is the name or initials of the cruiser performing the fieldwork. If more than one cruiser works on a plot or plots in the stand, their name(s) should be entered as well. If the width of the field does not accommodate the name(s), the **Cruise** level **Remarks** field is a convenient place to reference them. E.g. Bob, Carol, and Pete work in a stand, enter *BCP* in the < **Cruise;Cruiser** > field, and *BCP=Bob, Carol, Pete* into the < **Cruise;Remarks** > field.

Cruiser is a required entry in **HHSli** that may be up to four characters in width (letters, punctuation, spaces, or numbers may be entered).

{For the riparian vegetation data collection this will be used as described.}

< **Cruise;BAF** >

Col # reference - 5

BAF stands for basal area factor, which refers to the size of the sample plot used for variable radius plot sampling (a.k.a. angle count sampling, wedge sample, prism sampling, PPS sampling, or point sampling). SLI cruise design for a stand may (typically) include sampling trees using a variable radius plot and a BAF of a specified size.

BAF is an optional entry in **HHSli** and only values available in its associated lookup list are acceptable. A value of 0.0 is automatically pre-loaded in the field and must be edited if variable plot sampling occurs in the stand. Common BAF's available by using gauges, glass prisms, and or the American Scale Relaskop (even numbers of "bars" only) are included in the lookup list.

When used, a BAF is chosen in order to obtain an average tree count per plot of 6 to 8 trees that are equal to or larger than the DBH cutoff.

Data entered for the < **Cruise;BAF** >, < **Cruise;DBHcutoff** >, and < **Cruise;DtRadius** > fields, along with settings for fixed plots, work in concert to describe how the sampling of trees is conducted within a stand.

For live trees³, two scenarios are possible within SLI cruise design. First, and most typically, a BAF greater than zero is entered and the DBH cutoff is set to a value greater than 0. This means that a variable radius plot using the specified BAF is used to select live sample trees that are greater than or equal to the specified DBH cutoff value at each sample plot in the stand. Live trees smaller than the DBH cutoff are sampled on one or more nested fixed radius plots.

³ Live tree, dead tree, "snag", down wood definitions are found in the Glossary - Appendix B. Related discussions are located under the descriptions of < **Cruise;DtRadius** >, < **Cruise;Transect** >, < **Trees;Gp** > fields.

Example: BAF = 20.0 and DBH cutoff = 5.5. A 20 BAF prism is used to select and record all live trees that are 5.5" DBH or greater at each sample plot. Live trees 5.4" DBH and smaller are sampled and recorded at each plot using one or more fixed radius plots. Every live tree 5.5" DBH or greater is assumed to have been selected using the 20 BAF and is expanded by the SLI cruise compiler under that assumption. Every live tree 5.4" and smaller is assumed to be from a fixed plot(s) and is expanded appropriately.

Second, and usually only for sparsely stocked stands or for stands primarily comprised of seedlings and saplings, a BAF of zero is entered and the DBH cutoff is set to a value of 999.9 (the greatest possible value for the <**Cruise;DBHcutoff**> field). Settings for live tree fixed plots are made so that all live trees are sampled on fixed plots (i.e. no variable radius plot sampling occurs in such a stand). **{This second scenario will be used with the Riparian Vegetation Survey data collection.}**

Example: BAF = 0.0 and DBH cutoff = 999.9. Fixed radius plot(s) are used to select and record all live trees at each sample plot. Every live tree recorded is assumed to be from a fixed plot(s) and is expanded appropriately.

Dead trees³ are selected for inclusion in the sample by applying the same plot configuration used for the live trees unless a value greater than zero is entered in the <**Cruise;DtRadius**> field. If a value greater than zero is entered in the <**Cruise;DtRadius**> field, it is assumed that all dead trees were selected from a fixed plot of that radius and any values in the <**Cruise;BAF**> and <**Cruise;DBHcutoff**> fields do not apply to dead trees (see further details under the description of <**Cruise;DtRadius**>).

Note: **HHSII** has a calculator feature that includes functions helpful in determination of in / out trees for either a variable radius or fixed plot. It may be accessed from any point in the program by hitting the F7 key and choosing the **DoCalc.run** item. See Appendix D for more details.

{For the riparian Vegetation Project this value is set to 0.0}

<**Cruise;DBHcutoff**>

Col # reference - 6

The DBH cutoff is a numeric value, in inches, representing a tree diameter "threshold" used for SLI sample tree selection at each plot. Depending upon a tree's DBH and its position in relation to the plot center point, it may or may not be included in the sample. Live trees of DBH greater than or equal to the DBH cutoff are cruised using the variable radius plot method. Live trees of DBH smaller than the DBH cutoff are sampled using the fixed radius plot method. See the description of <**Cruise;BAF**> above for further details.

DBHcutoff is a required entry in **HHSII** and only numbers greater than or equal to 0.1" and less than or equal to 999.9" are acceptable. If a stand's cruise design does not include a variable radius plot sample, DBH cutoff must be = 999.9. Although a DBH cutoff of as small as 0.1" is possible, it is impractical and inappropriate to sample very small trees with the variable radius plot method. Whenever the variable plot radius method is used, it is strongly recommended that trees smaller than about 5 inches DBH be sampled using the fixed plot method. **HHSII** issues a warning message if a DBH cutoff less than 5.5" or greater than 9.9" is entered. A value of 5.5" is automatically pre-loaded into the field by the program and may be edited if needed.

Note: Diameter recording is typically done to the nearest one-inch diameter class, e.g. a 5.8" DBH is (usually) recorded as a 6" tree (the 6" class has actual diameters from 5.5" to 6.4"). Therefore, whenever the variable radius plot will be used, the DBH cutoff should always be set at the "bottom" of a one-inch diameter class - so that tree diameters recorded to the nearest inch receive the proper plot expansion. For example, if 6" DBH class trees and larger are to be cruised using the variable radius plot, the DBHcutoff should be set to 5.5".

{For the riparian Vegetation Project this value is set to 999.9}

<Cruise;Lt1MinDBH>

Col # reference - 7

Lt1MinDBH stands for Live Tree fixed plot # 1; minimum DBH. This field works in combination with the **<Cruise;Lt1MaxDBH>** and **<Cruise;Lt1Radius>** fields to describe the fixed plot sampling approach for the smallest trees in the stand. Live trees at each plot that are between the Lt1 diameters specified in these fields are sampled on a fixed plot having a radius equal to the value in **<Cruise;Lt1Radius>**.

Since more than one fixed plot for live trees is accommodated in the SLI cruise design, Lt1 is considered to be the smallest fixed radius plot, Lt2 is the next larger fixed radius plot (if used), and Lt3 is the largest fixed radius plot (if used). If only one fixed radius live tree plot is used, the diameters entered for Lt1 must span from 0.0" to 999.8" (or to 0.1" less than the DBH cutoff, if used). In any case, each combination of live tree fixed plots used must span the diameter range from 0.0" to 999.8" (or to 0.1" less than the DBH cutoff, if used) with no overlaps and no gaps. **HHSli** warning messages indicate configuration conflicts and prevent advancing to lower data levels until corrected. For more detail on **HHSli** error messages see Appendix D.

Lt1MinDBH is an optional entry in **HHSli**, in that if **<Cruise;DBHcutoff>** were set to 0.1", the appropriate setting for all live tree fixed plot diameter values would be 0.0" (the default value for a number field). But, as described under **<Cruise;DBHcutoff>** above, since at least one live tree fixed plot is included with each SLI cruise design for any stand, the field is usually more accurately described as required. At the least, careful attention to setting the values is required. A value of 0.0" is automatically pre-loaded into the field by the program, and the field is set to view only – the 0.0" value may not be changed.

Note: Though the sample plot configuration for tallying trees is based upon tree DBH to the nearest one-tenth inch, in **HHSli** the recording of DBH is by one-inch diameter classes. See the descriptions for **<Trees;DBH>**, **<Trees;GT>**, and **<Trees;Ht>** for further details.

{For the riparian Vegetation Project this value is set to 0.0}

<Cruise;Lt1MaxDBH>

Col # reference - 8

Similar to Lt1MinDBH described above, Lt1MaxDBH stands for Live Tree fixed plot # 1; maximum DBH. This field works in combination with the **<Cruise;Lt1MinDBH>** and **<Cruise;Lt1Radius>** fields to describe the fixed plot sampling approach for the smallest trees in the stand. Trees at each plot that are between the Lt1 diameters specified in these fields are sampled on a fixed plot having a radius equal to the value in **<Cruise;Lt1Radius>**.

Please see the description of **<Cruise;Lt1MinDBH>** for further information about fixed plot specifications.

Lt1MaxDBH is an optional entry in **HHSli** but is usually set to a value that is 0.1" smaller than either Lt2MinDBH (if used) or DBH cutoff (if used). A value of 2.4" is automatically pre-loaded into the field by the program and may be edited if needed.

Note: Diameter recording is typically done to the nearest one-inch diameter class for SLI cruising, e.g. a 0.8" DBH is recorded as a 1" tree (the 1" class has actual diameters from 0.5" to 1.4"). Therefore, the "breaks" between fixed plots should occur at the "bottom" of a one-inch diameter class, so that tree diameters

recorded to the nearest inch receive the proper plot expansion. For example, if 3" DBH class trees are to be cruised on the Lt2 fixed plot Lt1MaxDBH should be set to 2.4".

{For the riparian Vegetation Project this value is set to 5.4}

<Cruise;Lt2MinDBH>

Col # reference - 9

Similar to Lt1MinDBH described above, Lt2MinDBH stands for Live Tree fixed plot # 2; minimum DBH. In some stands, a second live tree fixed plot that is larger than Lt1 is desirable for sampling "pole-sized" trees (trees larger than saplings but with DBH smaller than what is sampled using the variable radius plot, for example). This field works in combination with the <Cruise;Lt2MaxDBH> and <Cruise;Lt2Radius> fields to describe the fixed plot sampling approach for these "pole-sized" trees in a stand. Trees at each plot that are between the Lt2 diameters specified in these fields are sampled on a fixed plot having a radius equal to the value in <Cruise;Lt2Radius>.

Please see the description of <Cruise;Lt1MinDBH> for further information about fixed plot specifications.

Lt2MinDBH is an optional entry in *HHSli* but is usually set to a value that is 0.1" larger than Lt1MaxDBH (if used). A value of 2.5" is automatically pre-loaded into the field by the program and may be edited if needed.

Note: Diameter recording is typically done to the nearest one-inch diameter class for SLI cruising, e.g. a 2.8" DBH is recorded as a 3" tree (the 3" class has actual diameters from 2.5" to 3.4"). Therefore, the "breaks" between fixed plots should occur at the "bottom" of a one-inch diameter class, so that tree diameters recorded to the nearest inch receive the proper plot expansion. For example, if 3" DBH class trees are to be cruised on the Lt2 fixed plot Lt2MinDBH should be set to 2.5". ***{For the riparian vegetation survey data collection, all overstory trees and snags >5.5" inches in the 170 by 100 foot plot area centered around each Line will be entered on the plots (6, 12, 18, 24, & 30) furthest from the stream as the overstory and snag trees are surveyed on the way down. For the riparian study this value will be set to 5.5 inches.}***

<Cruise;Lt2MaxDBH>

Col # reference - 10

Similar to Lt2MinDBH described above, Lt2MaxDBH stands for Live Tree fixed plot # 2; maximum DBH.

Please see the description of <Cruise;Lt1MinDBH> for further information about fixed plot specifications.

Lt2MaxDBH is an optional entry in *HHSli* but is usually set to a value that is 0.1" smaller than either Lt3MinDBH (if used) or DBH cutoff (if used). A value of 5.4" is automatically pre-loaded into the field by the program and may be edited if needed. ***{For the riparian study this value will be set to an upper limit of 999.8, because this live tree fixed plot is actually being used to collect the live overstory trees and any snags (over 4.5' tall) in the 170' by 100' plot (plot 1 through 5) areas.}***

< **Cruise;Lt3MinDBH** >

Col # reference - 11

Similar to Lt1MinDBH described above, Lt3MinDBH stands for Live Tree fixed plot # 3; minimum DBH. In some stands, a variable radius plot for the larger trees is not as effective as a fixed plot. For example, if sighting of larger trees is made difficult because of heavy brush or live tree crowns that extend to the ground - a fixed radius sample plot for larger live trees may be more effective. This field works in combination with the < **Cruise;Lt3MaxDBH** > and < **Cruise;Lt3Radius** > fields to describe the fixed plot sampling approach for the largest of trees sampled in a stand. Trees at each plot that are between the Lt3 diameters specified in these fields are sampled on a fixed plot having a radius equal to the value in < **Cruise;Lt3Radius** >.

Please see the description of < **Cruise;Lt1MinDBH** > for further information about fixed plot specifications.

Lt3MinDBH is an optional field and is usually only employed when there is no variable radius plot sampling for the stand. If used, Lt3MinDBH is set to a value that is 0.1" larger than Lt2MaxDBH. Upon file creation a value of 0.0" (the default value for a number field) is present in this field and may be edited if needed. **{For the riparian vegetation data collection a third fixed plot will not be used. All trees to be sampled, are sampled with the use of the first two fixed plots.}**

< **Cruise;Lt3MaxDBH** >

Col # reference - 12

Similar to Lt3MinDBH described above, Lt3MaxDBH stands for Live Tree fixed plot # 3; maximum DBH.

Please see the description of < **Cruise;Lt1MinDBH** > for further information about fixed plot specifications.

Lt3MaxDBH is an optional field and is usually only employed when there is no variable radius plot sampling for the stand. If used, Lt3MaxDBH must be set to 999.8" - which is 0.1" smaller than the DBH cutoff of 999.9" for a cruise with no variable radius plot. Upon file creation a value of 0.0" (the default value for a number field) is present in this field and may be edited if needed. **{For the riparian vegetation data collection a third fixed plot will not be used. All trees to be sampled, are sampled with the use of the first two fixed plots.}**

< **Cruise;Lt1Radius** >

Col # reference - 13

Lt1Radius stands for Live Tree fixed plot # 1 Radius. The value entered would represent the horizontal fixed plot radius of Lt1, specified in feet and tenths of feet. Live trees having a DBH between the values specified in the < **Cruise;Lt1MinDBH** > and < **Cruise;Lt1MaxDBH** > fields that are closer than or equal to the radius from plot center, would be included as trees to record for the sample plot. Limiting distance to trees is measured from plot center to the center of the tree at ground level or to the root collar area of trees growing on nurse logs. It is strongly recommended to specify the radius to an even foot multiple, e.g. 8.0', 10.0', 12.0', etc., to help avoid potential measurement error from trying to remember various "odd" plot sizes (feet and an odd number of tenths) used in the SLI cruise.

Fixed plot radius is established to efficiently sample the trees in the stand. Similar to the goals for average tree count per variable radius plot (described under < **Cruise;BAF** >), fixed plot size(s) are chosen in order to obtain an average tree count per plot of 6 to 8 trees that are smaller than the DBH cutoff. In stands

where the variable radius plot is used, fixed plot size(s) are often a compromise between obtaining the desired average tree count and too large a radius (since stocking of trees smaller than the DBH cutoff is often sparse). Also, steep ground and dense brush may confound efforts to cruise the smallest trees on a very large fixed plot. For "average" ODF west-side conditions, a plot no larger than 12' in radius is recommended for seedlings, and no larger than 24' for sapling sized trees.

Please see the description of < **Cruise;Lt1MinDBH** > for further information about fixed plot specifications.

Lt1Radius is an optional entry in **HHSli**. As such, a value of 0.0' is acceptable by the program but, since Lt1 is usually employed (see < **Cruise;Lt1MinDBH** >), the value entered should be greater than zero and shall not exceed 150.0'. A value of 8.0' is automatically pre-loaded into the field by the program and may be edited as needed. The program issues a warning message for values less than 6.1' or greater than 32.9'.
{For the riparian study this value will be 12.0.}

Note: at any point in **HHSli**, a summary reminder about the cruise plot parameters chosen for a stand is available by pressing the F7 key and choosing the **PlotSpec.run** item from the list. Also, the **DoCalc.run** item from the same list offers a calculator that has a function to determine the limiting slope distance given horizontal plot radius and percent slope, and a function to determine the horizontal distance given slope distance and percent slope. See Appendix D for more details.

< **Cruise;Lt2Radius** >

Col # reference - 14

Similar to Lt1Radius described above, Lt2Radius stands for Live Tree fixed plot # 2 Radius. It represents the horizontal plot radius of Lt2, if Lt2 is used (has Min and Max DBH entries other than zero).

Please see the description of < **Cruise;Lt1MinDBH** > for further information about fixed plot specifications.

Lt2Radius is an optional entry in **HHSli**. If used, the absolute minimum and maximum values are 1.0' and 150.0' respectively. A value of 17.0' is automatically pre-loaded into the field by the program and may be edited as needed. The program issues a warning message for values less than 6.1' or greater than 54.9'.
{For the riparian study this value should be set to an upper limit of 73.6. This is the equivalent value needed to expand using HHSLI for the 170 by 100 foot plots.}

< **Cruise;Lt3Radius** >

Col # reference - 15

Similar to Lt1Radius and Lt2Radius described above, Lt3Radius stands for Live Tree fixed plot # 3 Radius. It represents the horizontal plot radius of Lt3, if Lt3 is used (has Min and Max DBH entries other than zero).

Please see the description of < **Cruise;Lt1MinDBH** > for further information about fixed plot specifications.

Lt3Radius is an optional entry in **HHSli**. If used, absolute minimum and maximum values are 1.0' and 150.0' respectively. The program issues a warning message for values less than 6.1' or greater than 54.9'.
{For the riparian Vegetation Project this value is set to 0.0}

< **Cruise;DtRadius** >

Col # reference - 16

DtRadius stands for Dead Tree fixed plot Radius. If the entry in this field is zero, it means that dead trees are cruised using the same plot criteria as live trees. E.g. if a dead tree that has DBH greater than or equal to the specified DBH cutoff value is recorded in the **Trees** level, it is assumed to have been cruised with the chosen BAF as part of the variable radius plot. And likewise, if a dead tree that has DBH smaller than the specified DBH cutoff is recorded, it is assumed to have been cruised on the fixed plot used for live trees of that DBH.

If the entry in the DtRadius field is greater than zero, it means that **ALL** dead trees are cruised on a fixed plot of the specified radius. E.g. if a dead tree of any DBH is recorded in the **Trees** branch level, it is assumed to have been cruised on the Dead Tree fixed plot.

In SLI parlance, dead tree³ is synonymous with "snag". A dead tree is defined as having no live foliage, no viable cambium, and is self-supporting (fully supported by its own roots, not supported by other trees, objects, or any part of the bole on the ground). All dead trees greater than 4.5' in height and greater than 5.4" DBH (taped diameter of material present at DBH point at the time of cruising) are required tally items in SLI. "Stumps", or rooted broken dead trees, that are 4.5' tall or less and that do not meet the definition of down wood (see < **Cruise;Transect** >) are not required to be tallied (optional entry only). "Stumps" that meet the definition of dead trees (above) are considered dead trees for tally purposes.

Dead tree populations typically pose challenging circumstances for effective sampling - they are often both diffuse and highly variable in number and arrangement. Standard SLI approach to cruising dead trees is to cruise and record only those that are greater than 5.4" DBH and that are "in" with the BAF chosen for use on the variable radius plot. The option to cruise dead trees in a stand using a fixed plot is intended to allow for those times when sighting using the BAF is difficult or where it is reasonable to choose a relatively large fixed area plot radius (i.e. flat to moderate slopes, good visibility, and where dead trees are infrequent).

DtRadius is an optional entry in **HHSli**. Upon file creation a value of 0.0" (the default value for a number field) is present in this field and may be edited if needed. If used, minimum and maximum values are 1.0' and 150.0' respectively. The program issues a warning message for values less than 6.1' or greater than 119.9'.

{For the riparian Vegetation Project this value is set to 0.0}

< **Cruise;VegRadius** >

Col # reference - 17

VegRadius stands for Non-Tree Vegetation fixed area plot Radius. This is the horizontal fixed plot radius for the sampling of non-tree vegetation, specified in feet and tenths of feet.

A goal of SLI is to inventory herb, shrub, and grass species that are present within each stand in "significant" amounts. The standard fixed plot size for SLI is 24.0'. Please see further description of what is required and optional entry with respect to non-tree vegetation under the descriptions of < **Plot;PIntAsc** > and < **Vegetation;Sp** >. **{For this project, grasses will not be assessed.}**

VegRadius is a required entry in **HHSli** and only numbers greater than or equal to 6.0' and less than or equal to 150.0' are acceptable. The program issues a warning message if a VegRadius less than 10.1' or greater than 54.9' is entered. A value of 24.0' is automatically pre-loaded into the field by the program and may be edited if needed. **{For the riparian study this value will be 12.0 feet.}**

< **Cruise;Transect** >

Col # reference - 18

Transect is the data field for specification of the total horizontal length of the line-transect sample for down wood at each sample plot, specified in feet and tenths of feet.

A goal of SLI is to inventory down woody material (the non-root portion(s) of trees that are not self-supporting) that is present within each stand. The line-transect sampling method used for SLI involves tallying down woody pieces whose central longitudinal axis is intersected by a vertical plane along the length of the transect line (see Figure 6 below). For the purpose of this survey the limits of a piece are defined as points of abrupt physical change or discontinuity. Breakage, advanced decomposition or branching will define the limits of a piece (see Figure 4 and Figure 5 below).

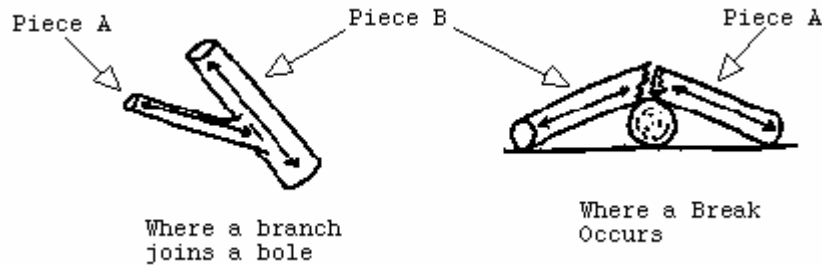


Figure 4: Defining Down Woody Material pieces - Points of Abrupt Physical Change



Figure 5: Defining Down Woody Material pieces - Decomposition

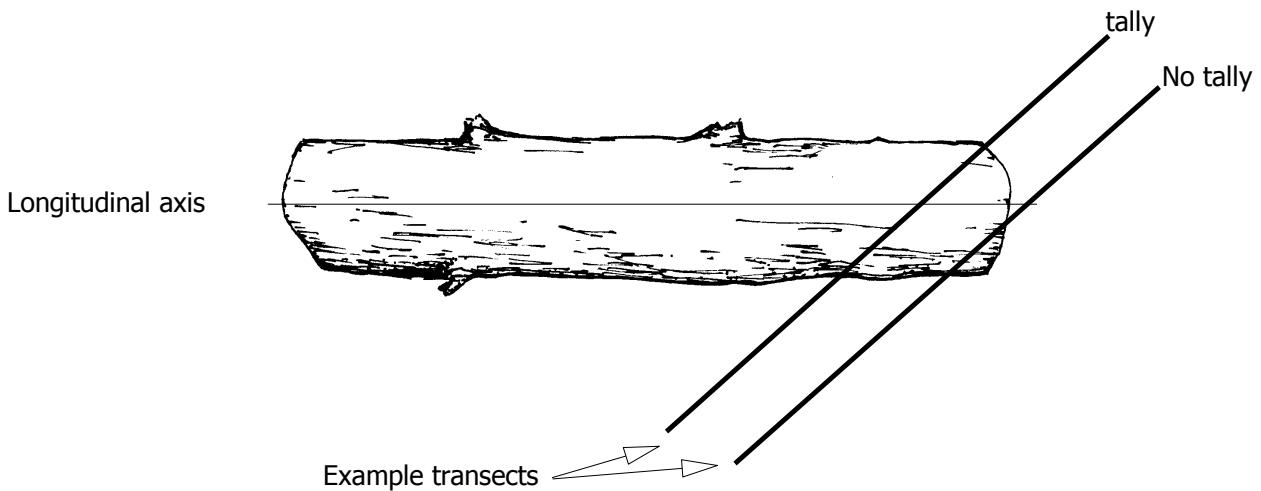


Figure 6: Tally/No tally determination for down wood sample

Down wood pieces that are at least 6" in diameter at the large end, and at least 3' long shall be considered the minimum size pieces for inclusion in the sample tally (see **<Down Wood;LgD>** and **<Down Wood;Len>** for additional specifications). In addition, in order for a piece to be included in the tally, it must have a distinct form that can be distinguished from the general surface of the forest floor (i.e. identifiable as a woody piece - not duff or litter). A curved piece that has its central longitudinal axis intersected more than once along the transect, or a piece that is intersected by more than one line-transect at a plot, shall be tallied once for each such intersection at the plot.

The standard line transect configuration for SLI is a single 100' long (horizontal) transect that radiates from the plot center in the direction of the next sample plot (i.e. the azimuth of the cruise line). If the plot is the last plot on a cruise line, the transect azimuth shall be that of the cruise line. An exception is that all transects shall be positioned entirely within the stand boundary and not be influenced by the clearings maintained along permanent rock surfaced roads. If a transect on the cruise line azimuth would extend outside the stand boundary or into a clearing maintained along a permanent rock surfaced road, the transect direction shall be adjusted by increasing it clockwise by multiples of 90°, until the transect is entirely within the stand and away from such road clearings (note the sampled azimuth under **<Plot;Remarks>**).

Another option for line transect configuration is to establish two or three shorter transects that radiate from the plot center such that the total transect length is at least 100'. These configurations may serve to more effectively sample down wood if the majority of the down wood is oriented in one direction (e.g. wind thrown or cross slope) or if steep undulating terrain and/or very dense brush make it difficult to accurately establish a longer transect. For a two transect per plot configuration, one transect will be in the direction of the cruise line azimuth, the other shall be 90° clockwise from the first. For a three transect per plot configuration, the transects shall be established 120° apart with one being oriented in the direction of the cruise line azimuth. Only one line transect configuration shall be employed within a stand.

Transect is a required entry in **HHSli** and only numbers greater than or equal to 1.0' and less than or equal to 360.0' are acceptable. The program issues a warning message if a transect value less than 50.1' or greater than 199.9' is entered. A value of 100.0' is automatically pre-loaded into the field by the program and may be edited if needed. Note: the value entered is the sum total length of line-transect(s) at each sample plot. E.g. if there are three 34' line-transects at each plot, the value to enter in the Transect field would be 102.0. **{For the riparian vegetation data collection project this value will be set to 25.0'. As a crew begins on the transect the 25' before the plot is captured for that plot. Note: The distance (20 feet) past the last plot on the cruise line will also be added to the last plot. The transect data will be post upload processed by ODF to send full 170 foot transects to the compiler.}**

<Cruise;PlanPnum>

Col # reference - 19

PlanPnum stands for Total Number of Plots Planned for the Stand. The number of plots and the average number of sample trees per plot (see **<Cruise;AvgTplt>** below) combine to provide a pre-cruise estimate of the anticipated number of trees (4" DBH or larger) that will be included in the cruise for the stand. Dividing the total number of sample trees by the number of trees per cruise that will be subsampled for height, crown ratio, and crown class (25 to 30 trees per stand for SLI) results in a sampling rate that **HHSli** uses to automatically "flag" certain sample trees as they are recorded on each plot – indicating to the cruiser which trees are to be measured for those attributes. See the descriptions of **<Trees;F>** and **<Trees;S>** for further details.

Number of plots generally will be from 16 to 24 plots per stand. For stands less than 20 acres, no more than two plots per acre will be installed. Very uniform (low basal area per acre CV) stands may receive fewer plots - usually no fewer than 10. ODF shall specify the number of plots to be installed in stands cruised by professional service contractors.

PlanPnum is a required entry in **HHSli** and only whole numbers greater than or equal to 1 and less than or equal to 999 are acceptable. The program issues a warning message for values less than 10 or greater than 39. **{For the riparian vegetation data collection this value is being set to 30 to use HHSLI ability to automatically flag and alert for height subsampling on every 5th tree. (i.e., it sets an internal sampling frequency.)}**

<Cruise;AvgTplt>

Col # reference - 20

AvgTplt stands for Average Number of 4" DBH and greater Trees per Plot. The number of plots and the average number of sample trees per plot combine to provide a pre-cruise estimate of the anticipated number of trees that will be included in the cruise for the stand (see explanation under **<Cruise;PlanPnum>** above).

The average number of 4" DBH and greater trees is used because the subsampling rate (see **<Cruise;PlanPnum>** above) is only applicable to those trees. In SLI, all tally trees less than 4" DBH are assessed for height, crown ratio, and crown class (they aren't subsampled). The AvgTplt value is usually set from 6 to 8, matching the goal for the plot size (BAF) for trees larger than seedlings or saplings.

AvgTplt is a required entry in **HHSli** and only numbers greater than or equal to 1.0 and less than or equal to 99.9 are acceptable. The program issues a warning message for values less than 5.1 or greater than 9.9. **{For the riparian vegetation data collection this value is being set to 4.0 to use HHSLI ability to automatically flag and alert for height subsampling on every 5th tree. (i.e., it sets an internal sampling frequency.)}**

<Cruise;PlotSpace>

Col # reference - 21

PlotSpace stands for the Plot Spacing Interval along the Cruise Line(s) for a stand, specified in feet (horizontal). Only one plot spacing shall be specified and used per stand. The plot spacing along with the starting point coordinates for each cruise line (see **<Line;Start Y>** and **<Line;Start X>**) are used to calculate the approximate coordinates of each sample plot within a stand. These coordinates are important for use in SLI reporting, analysis, and stand maintenance routines. Standards for plot layout are described in the section on Sample Plot Location & Establishment.

Whenever plot coordinate calculation based upon entries for the cruise line starting position and the plot spacing are complicated by challenging navigation issues, optional plot coordinate entry fields are used to record the coordinates for one or more of the plots – please see descriptions of the **<Plot;Ycoord>** and **<Plot;Xcoord>** fields for additional information.

PlotSpace is a required entry in **HHSli** and only whole numbers greater than or equal to 50' and less than or equal to 9,999' are acceptable. The program issues a warning message for a value of 50' or for a value greater than 199'. **{For the riparian vegetation data collection this value is being set to 50 feet, the lowest valid HHSLI value, since 25 can not be entered and the data will be post upload processed by ODF. As a crew begins on the transect the 25' before the plot is captured for that}**

plot. Note: The distance (20 feet) past the last plot on the cruise line will also be added to the last plot. The transect data may be post upload processed by ODF to send full 170 foot transects to the compiler.}

< ***Cruise;Remarks*** >

Col # reference - 22

The remarks field entry at the ***Cruise*** level provides recording space for stand inventory cruise design related information. Remarks should be pertinent to the level – each level in ***HHSli*** has its own data field space for remarks.

Remarks is an optional entry in ***HHSli***. Up to 24 characters may be entered. **{For the riparian vegetation data collection this will be used as described.}**

SAMPLE PLOT LOCATION & ESTABLISHMENT

This section describes the rationale and methodology for the layout, installation, and documentation of the sample plots within SLI stand polygons. All data items at the *Line* and *Plot* levels in *HHSli* are described in this section. *{This section has been modified to show approach and values associated with the riparian vegetation data collection.}*

SAMPLE PLOT LAYOUT

Sample plot layout shall be on a square or rectangular grid. One axis of the grid shall be chosen and designated as the cruise "lines" for the stand. Typically, the travel between plots is along the cruise lines. Plot spacing shall be 25' between regen-cover plots.

~~For stands with a majority of steeper slopes (avg. slope => 25%), one or more sample lines⁴ (two lines out and back works well) should be established favoring orientation so that elevation contours are crossed diagonally. Plot spacing shall be no less than 50' and should ideally be no greater than 3 chains (198') along the line(s). The number of lines to establish and their orientation and proximity to one another shall be that which provides a good representation of the stand as designed per the plot design described in Appendix G. Each cruise line shall be straight, i.e. only have one azimuth. No part of any two cruise lines in a stand shall be closer than the chosen plot spacing from each other. Each cruise line shall begin and end of the described plot boundaries. A cruise line may be worked from each end by different cruisers working towards one another, or by the same cruiser on different workdays, but such "lines" shall be considered as separate from a line numbering standpoint, and effort shall be made to avoid overlapping of cruise lines by the cruiser(s).~~

The first plot on a cruise line is established 25 feet horizontal distance in from the channel along the line azimuth (perpendicular azimuth from the general valley azimuth).

Once the first plot on a line is established, all subsequent plots shall be taken "where they fall" on the planned sample grid or cruise line at the chosen plot spacing, they shall not be moved or "offset" to keep them "in" the plot area being sampled. So, beginning at the first sample plot on a cruise line, each multiple of the plot spacing along the line is a potential sampling plot position, until the cruise line passes outside the designated plot area.

Any plot position that is not accessible to foot travel shall not be cruised⁵ - its position is skipped along the sample line and the next accessible plot (if any) is installed. Each such occurrence of inaccessibility and details of subsequent plot installation shall be documented by the cruiser on the Plot Area Representation Map for that larger plot. Any plots with a Plot Status other than "YY", installed with tally, need to be identified and documented on the Plot Area Representation Map prior to submission.

Plots shall be located so that no part of the sample is outside the designated 500 by 170 foot plot boundary⁶. ~~If a plot lands in a position such that the tree sampling is influenced by a neighboring stand (i.e. more or fewer trees than would be present if the plot were entirely within the sampled stand), the plot shall not be cruised⁵.~~

⁴ A biased systematic sample (transect method).

⁵ A plot record is created in *HHSli* but a special code is recorded to indicate that the plot was not cruised (see Table 5 on page 36).

⁶ Line-Transect for down wood is not included - there is a procedure for adjusting the azimuth so the sample is within the stand.

Any plot whose tree sampling is influenced by a clearing maintained for permanent rock-surfaced roads (i.e. potentially fewer trees included at the plot than would be if the clearing did not exist) shall not be cruised⁵ - its position is skipped along the sample line. Each such occurrence of a non-cruised plot due to a clearing maintained for a road considered to be managed for non-forest use shall be documented by the cruiser on the Plot Area Representation Map. If a plot requires a "NR" status due to road impact, this should be identified on the Plot Area Representation map in relation to the plots affected, along with an estimate of road length, width and calculated area that would need to be removed from the sampling area.

It is critical to avoid duplicate plot numbers for different plots in a stand. This is best accomplished at the time of first planning for lines and plots to be established for a stand. Regardless of the sample line, each plot established in a stand must have a unique plot number. For plot numbering and line/plot location, use the riparian vegetation plot configuration described in Appendix G. Please see the description of **<Plot;Pit>** for additional discussion. One strategy to help avoid duplicate numbers is to pre-assign "blocks" of numbers to different cruise lines and to different cruisers working in the stand. Although **HHSli** has internal checks to enforce unique plot numbers on a cruise line, there is no check possible to enforce unique plot numbers between cruise lines, or to enforce unique numbers if more than one hand held computer is used to record data for a stand. Also, once any **Trees - Vegetation - Down Wood** branch level data is created for a particular plot, it is not possible to edit the plot number entered.

Each plot position along the cruise sample lines that is accessible by foot travel, and the beginning and ending points of each cruise sample line at the stand boundary, shall be marked with red/white striped flagging. The flagging shall be hung securely, at eye level or higher if possible, with at least one end of the ribbon below the knot having at least 2' of free-hanging length. Use a waterproof black thick felt-tipped marker to label the flagging with information about the location as shown in the table below.

It is imperative for quality control purposes that others be able to navigate between and to each plot in the cruise. Hang additional red/white striped flagging, if necessary, to facilitate navigation along the cruise line. Hang flagging on each side of roads where a cruise line crosses. If vegetation makes seeing from flag to flag impossible, hang flagging more frequently. Consider using string-box and string when traveling the cruise sample line - string often persists long enough to accommodate relocation for quality control, while reducing the need for frequent flagging between plots.

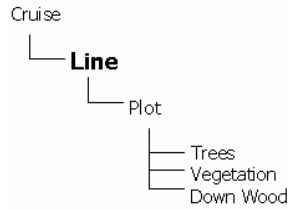
Examples of flagging labeling:	Indicates:
<i>S52013 Start L2 322° 25' to P7</i>	Start of the cruise sample line #2 in site/plot 52013. The line azimuth is 322° and plot #7 is 25' horizontal distance from this flag in that direction.
<i>L2 P10 100'</i>	Flagging and pin flag labeling near the plot center stake for plot #10 on cruise sample line #2.
<i>L1 P4 100' Not Inst.</i>	Flagging and pin flag labeling marks where plot 4 would fall on line #1 but was not installed (because it is inaccessible to foot travel due to rock outcropping for example). Non-installed plots require additional information to be documented on map/notes – see <Plot;PlotStat> .
<i>S52001 ELT</i>	End of cruise sample line #1 in stand 52001 placed at 170' horizontal distance from the channel.
(flagging with no labeling)	A flag located on the cruise sample line between plots to facilitate navigation between plots.

To facilitate future location and re-measurement, mark the center of each plot that is installed, using a stout piece of native woody material (a length of dead branch at least 1" in diameter is best) driven vertically and securely into the ground. Do not use rooted plant stems as stakes. Do not make the stake too long -

leverage against long sticks may cause them to be too easily disturbed. If the ground is impenetrable or if the stake is for any reason insecure, support the stake by placing small stones around it in a mound. Clear an area around the stake, or randomly move the stake a short distance, to enable cruisers to stand and work safely at the plot center without disturbing the stake. Tie a short length of red/white striped flagging securely to the plot center stake to help make it more visible. The point at which this stake enters the ground shall be considered the center of the plot. At this same point also insert a blue flagged push pin into the ground and write the cruise line, plot, and distance numbers on the flagging and pin flag, in format shown in table above. Pin flag wires inserted into the ground, tend to hold their position during disturbance and are easier to insert in some hard ground situations.

Mark the end of each line-transect sample by hanging a piece of red/white striped flagging at eye-level or lower. Since the flag defines the end of the transect, use a stake (as mentioned above for the plot center) to mark the spot if hanging the flag on vegetation is not possible, or would be inaccurate. Label the flag with the letters "ELT", for "end of line transect". For plot quality control inspection purposes, the line-transect location shall be from the plot center stake to the point on the ground that is plumb from the knot in the flagging that marks the end of the transect.

LINE LEVEL ITEMS



The table below shows the data items that are included at the **Line** level in *HHSli*, and summarizes the parameters of each as they appear in the program application's screens. In the file structure hierarchy, the **Line** level occurs immediately below the **Cruise** level and above the **Plot** level. There is only one set of data for a stand at the **Cruise** level, and at the **Line** level there may be from 1 to as many as 99 sets, or file records, of information - each record describing a different sample line in the cruise. At completion of cruise data recording for a stand, each **Line** level record will have one or more related **Plot** level records - each plot "belongs" to one of the sample lines in the cruise.

Table 3: **Line** Level data items

LINE LEVEL								
Col #	Field Name	Type	Width	Required in HHSli	Column Help Message	Min	Max	Auto Pre-load
1	Line	N	1	Yes	Line # [new=CTRL+Dwn]	1	99	
2	StartY	N	7	Yes	OR Lambert Northing (N7)	50000	1700000	
3	StartX	N	7	Yes	OR Lambert Easting (N7)	200000	2400000	
4	LineAz	N	3	Yes	Line Direction (1 - 360) (N3)	1	360	
5	Remarks	C	24	Opt.	Line Level Remarks (C24)			

Figure 7 on the next page is an example of the screen appearance of the **Line** level on the hand-held data recorder. For display screen size of 24 characters wide by 16 character lines tall, the **Line** level contents occupy only part of one screen "page" as shown in the example below.⁷

⁷ Full details of *HHSli* features and instructions for use are included in Appendix D.

```
Line 1 StartY 1590875
StartX 554160
LineAz 270
Remarks

HHSII LINE LEVEL EXAMPLE

Line Level Remarks (C24)
LINE F4-Back F5-Advance
```

Figure 7: **HHSII** screen example - **Line** level

The screen display of the **Line** level in **HHSII** is a "virtual screen display type", which means that one record of data is displayed on the screen at a time. As the example in Figure 7 above shows, all of the data pertaining to cruise sampling line # 1 is contained in one record of the file, and that record's contents (data items and their entered values) are displayed on a single screen.

It helps to think about the **Line** level as being similar to a "Rolodex" file - each **Line** level record is a "card" in the file, and each "card" contains all the information items required for one of the cruise sample lines in a stand. The Left / Right arrow keys act the same as the Up / Down arrow keys, moving about in the current record one data item at a time (scrolling around on one "card" in the Rolodex).

In order to view the entries for any other cruise sampling lines in the cruise, the user would use the PageUp or PageDown keys (or hold the CTRL key down and press the Up arrow or Down arrow) to "walk" through existing **Line** level records one at a time - akin to flipping through the address cards in the Rolodex.

To create a new **Line** level record⁸ (to start entering data for another cruise line) the user must have the last entered record showing on the screen, and then press the Page Down key (or hold the CTRL key down and press the Down arrow once). For a new record, the Line # entry field will contain a value of zero (the default value for an empty number field).

The user may retreat (F4 function key) to the **Cruise** level from any **Line** level record - any empty record (Line # field is 0 and no other field entries have been made) will be automatically deleted. If F4 is hit after any entries have been keyed in to a **Line** level record, the program either retreats to the **Cruise** level if all required entry fields have been completed for **Line** level records, or returns the user to any required fields that have not been completed. If a new **Line** level record was created and any data entry was made to the new record by mistake, the only way "out" of the record (without completing all required fields) is to delete it by using the F10 function key. After pressing the F10 key and answering Yes by pressing the Y key, the current record is deleted and the user is returned to the previous record of the **Line** level.

Attempting to move to another record from a new empty record at the **Line** level is not possible. F4 will work to back up to the higher level, or F10 will work to delete the new empty record. Advancing (F5 key) to the **Plot** level is only possible if all required entry fields at the **Line** level have been completed.

⁸ An empty record is automatically created when Advancing from the **Cruise** level to the **Line** level for the first time.

(This page left purposely blank)



ITEM BY ITEM DESCRIPTION; LINE LEVEL

< **Line;Line** >

Col # reference - 1

The data entry field named "Line" is for entry of the cruise sampling line number assigned by the cruiser. Just as important as preventing duplicate plot numbers within a stand (see SAMPLE PLOT LAYOUT section above), it is imperative that cruise sample line numbers be unique within a stand as well. It is possible to mistakenly duplicate line numbers whenever data is recorded using more than one hand held computer for cruising in a stand. Once data is recorded at the **Plot** level, the line number may not be edited (only deleted, along with all data in the lower levels that are associated with that cruise line). **{For the riparian vegetation survey a standardized rectangular plot and fixed plot configuration will be used, consisting from left to right (as looking from the stream uphill) of sample cruise lines 1 thru 5. See Plot Area Representation Map in Appendix A.}**

Line is a number field and is a required entry in **HHSli**. Unique values from 1 to 99 are acceptable. Please see the information following Figure 7 for help with **HHSli** function with respect to the **Line** level.

Note: **HHSli** includes automatic warnings to the user if the entry for "Line" is not sequential from previous Line number entries. For example, if the last Line # was entered as 2, and the current record entry is made as 4, the program will issue a warning message / reminder that the last entry was 2. If a 3 were entered, no warning would be issued.

< **Line;StartY** >

Col # reference - 2

StartY is the field for entering the cruise line's beginning point Oregon Lambert Northing coordinate value. The value is stated in terms of International feet to the nearest even foot. The plot spacing (see < **Cruise;PlotSpace** >) along with the starting point coordinates for each cruise line are used to calculate the approximate coordinates of each sample plot within a stand⁹. These coordinates are important for use in SLI reporting, analysis, and stand maintenance routines. Standards for plot layout are described in the section on Sample Plot Location & Establishment, which begins on page 23.

Oregon Lambert coordinates may be determined by use of map grade accuracy GPS device or by triangulation to identifiable objects on planimetric or ortho-photographic maps (SLI stand map). The positional accuracy of the coordinates desired for use in SLI is +/- 45' horizontal or less.

Given the information entered by the user at the **Line** level, the plot coordinates are automatically calculated as each cruise plot is recorded in **HHSli** (see the descriptions of the < **Plot;Ycoord** > and < **Plot;Xcoord** > fields for additional information).

⁹ The first plot on each line is always 25 feet from the line start point (see the discussion of sample plot layout on page 23).

StartY is a required entry in *HHSli*. The value must be at least 50,000 and at most 1,700,000 (the valid range of the OR Lambert Northing in Oregon). **{For the riparian vegetation data collection this will be used as described.}**

<Line;StartX>

Col # reference - 3

StartX is the field for entering the cruise line's beginning point Oregon Lambert Easting coordinate value. The value is stated in terms of International feet to the nearest even foot. The plot spacing (see **<Cruise;PlotSpace>**) along with the starting point coordinates for each cruise line are used to calculate the approximate coordinates of each sample plot within a stand¹⁰. These coordinates are important for use in SLI reporting, analysis, and stand maintenance routines. Standards for plot layout are described in the section on Sample Plot Location & Establishment, which begins on page 23.

Please see the description of **<Line;StartY>** above for important additional information.

StartX is a required entry in *HHSli*. The value must be at least 200,000 and at most 2,400,000 (the valid range of the OR Lambert Easting in Oregon). **{For the riparian vegetation data collection this will be used as described.}**

<Line;LineAz>

Col # reference - 4

LineAz stands for cruise sample line azimuth. The cruise sample line azimuth will be recorded as a perpendicular azimuth to the general valley azimuth. Each cruise sample line is laid out and documented on the PLOT AREA REPRESENTATION Map. The line azimuth, from the beginning point of field work on the line to its end, Each cruise line may have only one azimuth. The direction of the line is specified in terms of number of degrees clockwise from true north. Cruisers use a hand compass set to the line azimuth to navigate along the line.

The line azimuth is important for several reasons. First, as the mechanism to establish the plot locations in their planned positions. Second, to allow subsequent navigation to established plots in order to conduct quality control inspections. And third, the line azimuth and plot spacing information is used to calculate the approximate coordinates of each plot established on the line. Line azimuth is also employed to establish the line-transect sample for Down Wood at each plot.

Offset of a cruise line to avoid obstacles is not allowed in SLI. That is, plots are taken where they fall along the line - if inaccessible to foot travel, plots are not cruised but plot spacing is maintained (see the section on SAMPLE PLOT LAYOUT). The cruiser may of course depart from travel on the cruise line to get around obstacles but shall maintain the cruise line in its planned position and resume travel on the line beyond the obstacle when possible.

LineAz is a required entry in *HHSli* and only whole numbers greater than or equal to 1° and less than or equal to 360° are acceptable. Cardinal north is specified by entering 360° (0° is invalid). **{For the riparian**

¹⁰ The first plot on each line is always 100 feet from the line start point (see the discussion of sample plot layout on page 23).

vegetation data collection this will be used as described. The same azimuth (one perpendicular to the general valley azimuth) is to be used for all five(5) cruise transect lines.

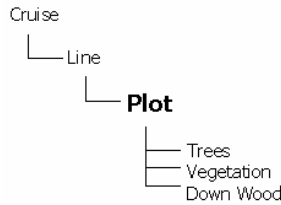
<Line;Remarks>

Col # reference - 5

The remarks field entry at the **Line** level provides recording space for cruise line related information. Remarks should be pertinent to the level – each level in **HHSli** has its own data field space for remarks.

Remarks is an optional entry in **HHSli**. Up to 24 characters may be entered. **{For the riparian vegetation data collection this will be used as described.}**

PLOT LEVEL ITEMS



The table below shows the data items that are included at the **Plot** level in **HHSli**, and summarizes the parameters of each as they appear in the program application's screens. In the file structure hierarchy, the **Plot** level occurs immediately below the **Line** level and above the **Trees-Vegetation-Down Wood** level. For each **Line** level record, there may be many **Plot** level records - each **Plot** level record describing a different sample plot in the cruise. At completion of cruise data recording for a stand, each **Line** level record may have one or more related **Plot** level records - each plot "belongs" to one of the sample lines in the cruise. Likewise, each **Plot** level record may have one or more related **Trees-Vegetation-Down Wood** level records - each recorded tree, herb-shrub-, and down wood piece "belongs" to one of the sample plots in the cruise.

Table 4: **Plot** Level data items

PLOT LEVEL								
Col #	Field Name	Type	Width	Required in HHSli	Column Help Message	Min	Max	Auto Pre-load
1	Plt	N	3	Yes	Plot # [new=CTRL+Dwn]	1	999	
2	PlotStat	C	2	Yes	Plot Status (List)	list		YY
3	RootDis	C	3	Yes	Root Disease Rating (C3)	list		
4	SwissNedl	C	1	Yes	SNC Rating (C1)	list		
5	Ycoord	N	8	Yes	OR Lambert Northing (N8)	0	1700000	*
6	Xcoord	N	8	Yes	OR Lambert Easting (N8)	0	2400000	*
7	Elev	N	4	Opt.	Plot Elevation [ft] (N4)	1	9999	
8	Aspect	N	3	Opt.	Plot Aspect [Azm] (N3)	1	360	
9	Slope	N	3	Opt.	Terrain Slope % (N3)	0	200	
10	SlopePos	C	2	Yes	Slope Position Code (C2)	list		
11	GrndClas	C	13	Yes	Ground Class (C13)	list		
12	PctSoil	N	4	Opt.	% Bare Soil	0	1.0	
13	PlntAsc	C	7	Yes	Plant Association (C7)	list		
14	Remarks	C	24	Opt.	Plot Level Remarks (C2)			

* Coordinate values are automatically calculated and pre-loaded by the program into these fields.

The figure below is an example of the screen appearance of the **Plot** level on the hand-held data recorder. For display screen size of 24 characters wide by 16 character lines tall, the **Plot** level contents occupy only part of one screen "page" as shown in the example below.¹¹

¹¹ Full details of **HHSli** features and instructions for use are included in Appendix D.

```
Std_ID 45678 Line 1
Plt 1
Plt 1 PlotStat YY
RootDis PW2 SwissNed1 2
Ycoord 1590875
Xcoord 554060
Elev 1245 Aspect 105
Slope 25 SlopePos 3
GrndClas UPLAND
PctSoil 0.00
PlntAsc CHF1-51
Remarks

HHSLI PLOT LEVEL EXAMPLE
Plot Level Remarks (C24)
PLOT F4-Back F5-Advance
```

Figure 8: *HHSli* screen example - **Plot** level

The screen display of the **Plot** level in *HHSli* is a "virtual screen display type", which means that one record of data is displayed on the screen at a time. As the example in Figure 8 above shows, all of the data pertaining to cruise plot # 1 is contained in one record of the file, and that record's contents (data items and their entered values) are displayed on a single screen.

It helps to think about the **Plot** level as being similar to a "Rolodex" file - each **Plot** level record is a "card" in the file, and each "card" contains all the information items required for one of the cruise plots in a stand. The Left / Right arrow keys act the same as the Up / Down arrow keys, moving about in the current record one data item at a time (scrolling around on one "card" in the Rolodex).

In order to view the entries for any other plots in the cruise, the user would use the PageUp or PageDown keys (or hold the CTRL key down and press the Up arrow or Down arrow) to "walk" through existing **Plot** level records one at a time - akin to flipping through the address cards in the Rolodex.

To create a new **Plot** level record¹² (to start entering data for another plot) the user must have the last entered record showing on the screen, and then press the Page Down key (or hold the CTRL key down and press the Down arrow once). Insertion (F9 function key) of a new plot between plots already recorded is not allowed. For a new record, the Plt # entry field will contain a value of zero (the default value for an empty number field).

The user may retreat (F4 function key) to the **Line** level from any **Plot** level record - any empty record (Plt# field is 0 and no other field entries have been made) will be automatically deleted. If F4 is hit after any entries have been keyed in to a **Plot** level record, the program either retreats to the **Line** level if all required entry fields have been completed for **Plot** level records, or returns the user to any required fields that have not been completed. If a new **Plot** level record was created and any data entry was made to the new record by mistake, the only way "out" of the record (without completing all required fields) is to delete it by using the F10 function key. After pressing the F10 key and answering Yes by pressing the Y key, the current record is deleted and the user is returned to the previous record of the **Plot** level.

Attempting to move to another plot record from a new empty record at the **Plot** level is not possible. F4 will work to back up to the higher level, or F10 will work to delete the new empty record. Advancing (F5

¹² An empty record is automatically created when Advancing from the **Line** level to the **Plot** level for the first time.

key) to the **Trees-Vegetation-Down Wood** level is only possible if all required entry fields at the **Plot** level have been completed. Advancing (F5 key) from the **Plot** level to the next lower level involves choosing one of the three file branches at that level. A pop-up screen as shown in Figure 9 below allows the user to make the choice. The Up / Down arrow keys are used to highlight the choice, then the Enter key is pressed to advance to that file branch. Note: **HHSli** refers to the level above the current level as the "Parent", and the level below as the "Child". Also, file branches at the same level, such as at the **Trees-Vegetation-Down Wood** level, are referred to as "Siblings" on that level.

```
Std_ID 45678 Line 1
Plt 1
Plt 1 PlotStat YY
RootDis PW2 SwissNed1 2
Ycoord 1590875
Xcoord 554060
Ele <Select Child> 5
Slo Trees 3
Grn Vegetation
Pct DownWood
Pln <ESC to Abort>
Remarks

HHSli PLOT LEVEL EXAMPLE
Plot Level Remarks (C24)
PLOT F4-Back F5-Advance
```

Figure 9: Selection list for **Trees-Vegetation-Down Wood** level branches.



ITEM BY ITEM DESCRIPTION; PLOT LEVEL

<Plot;Plt>

Col # reference - 1

Plt stands for Plot Number and represents a unique cruise sample plot on a sample line. Each cruise plot in the stand is to be shown and documented on the PLOT AREA REPRESENTATION map and should show the standardized plot numbering as specified by plot design standardization.

It is imperative to avoid creating duplicate plot numbers within a stand (see the SAMPLE PLOT LAYOUT section above). It is possible to mistakenly duplicate plot numbers whenever data is recorded using more than one hand held computer for cruising in a stand, or by using the same plot number on different cruise sample lines in a stand. To help avoid duplication of plot numbers, use the PLOT AREA REPRESENTATION Map during the cruise planning stage to clearly communicate the plot numbers that will be used. Once data is recorded at the **Trees - Vegetation - Down Wood** level, the plot number may not be edited within **HHSli** (only deleted, along with all data in the lower level that is associated with that cruise plot)¹³.

Plt is a number field and is a required entry in **HHSli**. Unique values from 1 to 999 are acceptable. Please see the information following Figure 8 for help with **HHSli** function with respect to the **Plot** level.

Note: **HHSli** includes automatic warnings to the user if the entry for "Plt" is not sequential from previous plot number entries. For example, if the last plot # was entered as 2, and the current record entry is made as 4, the program will issue a warning message / reminder that the last entry was 2. If a 3 were entered, no warning would be issued. Although the warning message may be ignored, the user should make certain that program calculations for the plot position coordinates are not erroneous - see the descriptions of <Plot;Ycoord> and <Plot;Xcoord> for additional details. **{For the riparian vegetation data collection this will be used as described.}**

<Plot;PlotStat>

Col # reference - 2

PlotStat stands for Plot Status and is for indicating the circumstances of the plot with respect to its installation and measurement. In **HHSli** each potential plot on a cruise line shall have (some) information recorded for it (see the discussion under SAMPLE PLOT LAYOUT on page 23). A plot may either be installed or not installed. Additional information about the circumstances for each installed or non-installed plot provides for proper **HHSli** data handling, and for program error checks.

¹³ It is possible to edit the values in another environment, but it is not recommended - contact the Forest Practices Monitoring Unit in Salem for details.

Table 5: Plot Status codes

Code	HHSII Lookup List Description	Full Description
YY	Installed; has tally	Yes, the plot is installed and there are tally items cruised and recorded for it. This is the default code (that is, most plots fit this description).
YN	Installed; is blank	Yes, the plot is installed but there are no "in" tally items - the plot is blank (no trees, vegetation, or down wood pieces to tally). <i>{If encountered, label and identify any 'YN' plots on the Plot Area Representation Map.}</i>
NA	Not inst; no access	No, the plot is not installed because it is inaccessible to foot travel. <i>{For the Riparian Vegetation Data Collection Project there should be few of these, if any. For safety considerations there may be a need not to install, when this occurs the following should be done: Identifying the plot(s) on the Plot Area Representation Map and document on the map, why not installed.}</i>
NE	Not inst; stand edge	No, the plot is not installed because it is near the stand boundary and the tree count would've been influenced by the neighboring stand (more or fewer trees). <i>{For the Riparian Vegetation Data Collection Project the NE code is not applicable for use since each fixed plot is well within the area to be sampled.}</i>
NR	Not inst; road plot	No, the plot is not installed because the tree count would've been influenced (reduced) by the clearing maintained for a forest road considered as area to be managed as non-forested land. <i>{If encountered, label and identify any 'YN' plots on the Plot Area Representation Map along with the position of the road in relation to the plots and the estimated road length, width and calculated area needing to be removed from the plot sampling area – see map.}</i>

As shown in Table 5 (codes YY and YN), there are two possibilities for a plot that is installed: it has tally items that are cruised and recorded, or there are no "in" trees, no non-tree vegetation tally items, and no down wood pieces to cruise at the plot (as might be the case in a very rocky area devoid of vegetation, for example).

Whenever a potential cruise plot is not installed, its plot record shall indicate why, as shown in Table 5 (codes NA, NE, and NR). Except for Ycoord and Xcoord, the other normally required data items at the *Plot* level shall not be completed by the cruiser for plots that are not installed – they include; RootDis, SwissNedl, SlopePos, GrndClas, and PlntAsc. Entry of the Ycoord and Xcoord values is required (and is normally the result of the automated calculation – see page 37). Also, the optional data items should not have data input by the cruiser – they include; Elev, Aspect, Slope, and PctSoi.

This entry, in concert with automatic data checks within *HHSli*, helps the cruiser to avoid creating a plot record but forget to record any plot data for it. *HHSli* generates a reminder message, when moving from one *Plot* level record to another or when retreating from the *Plot* level to the *Line* level, if any one or more of the file branches at the *Trees - Vegetation - Down Wood* level is blank.

PlotStat is a required entry in *HHSli* and is automatically pre-loaded with a value of **YY** by the program and may be edited if needed. Only the values from the lookup list for the field are acceptable. **{ Any occurrences of plots with a non-"YY" Status should be identified and well documented on the Plot Area Representation Map prior to data/map submission. For the riparian vegetation data collection this will be used as described, with the exception of NE(Not inst; stand edge) which never occurs with the current fixed design since the sampling area on each plot is not influenced by a stand edge, and should not be used for this project. }**

Note: *HHSli* will, upon entry of a value of "NA", "NE", or "NR" in the PlotStat field –

- 1) automatically enter a value of "ZZZZ" into the PlntAsc field.
- 2) modify the lookup lists associated with the RootDis, SwissNedl, SlopePos, and GrndClas fields – so that only a "blank" code is acceptable for each.

< *Plot;RootDis* >

Col # reference – 3

RootDis stands for Root Disease Rating for the area around the plot center. For SLI sampling, special assessment is conducted of the area within 50' horizontal distance¹⁴ from each plot center for the presence and severity class of tree root diseases.

At each plot, determine the appropriate combination code¹⁵ that describes root disease conditions. **{For riparian project this required data field will not be collected, please enter a default entry of "ONO" (No RD pres.w/in50') which is the first lookup list item under F2, to get past this required field.}** **{For riparian project this required data field will not be collected, please enter a default entry of "ONO" (No RD pres.w/in50') which is the first lookup list item under F2, to get past this required field.}**

Table 6 and Table 7 below, show the two parts of the combination code. See the section titled "GUIDES FOR IDENTIFICATION OF ROOT DISEASES" in Appendix C for root disease identification assistance. If more than one causal fungus occurs at a plot, record the code representative of the most prevalent.

RootDis is a required entry in *HHSli*, only those codes presented in the lookup list for the field (shown in Appendix E of this guide, and accessed in *HHSli* by pressing the F2 key while the cursor is on the field) are acceptable. **{For riparian project this required data field will not be collected, please enter a default entry of "ONO" (No RD pres.w/in50') which is the first lookup list item under F2, to get past this required field.}**

¹⁴ Note that severity rating code 1 includes examining the area just beyond this distance – for an additional 50 feet.

¹⁵ Combination code is a unique combination of the causal fungus & severity. See the *HHSli* RootDis lookup list shown in Appendix E.

Table 6: Root Disease codes

Code	Causal Fungus	Root Disease
PW	Phellinus weirii	Laminated root rot
CW	Ceratocystic wagneri	Black stain root disease
FA	Heterobasidion annosus	Annosum root rot
AM	Armillaria ostoyae	Armillaria root disease
PL	Phytophthora lateralis	Port-Orford-Cedar root disease
UK	Unknown	---
NO	None present	---

Table 7: Root Disease Severity Rating classes

Severity Rating	% of Plot Area Infested	Root Disease Severity Rating Criteria
0	0	No evidence of root disease visible within the 50-ft. radius plot.
1	0	Root disease present within 50 feet of the plot boundary, but no evidence of disease on the plot.
2	1-25	Minor evidence of root disease on the 50-ft. radius plot, such as suppressed tree killed by root disease, or a minor part of the overstory showing symptoms of infection. Little or no detectable reduction in canopy closure or volume.
3	1-25	Up to 20% canopy reduction, usually as result of death of 1 codominant tree on an otherwise fully stocked site. In absence of mortality, numerous trees showing symptoms of root disease.
4	26-50	20-30% canopy reduction as a result of root disease mortality.
5	51-75	30-50% reduction as a result of root disease. At least half the ground area of 50-foot plot infested with evidence of disease killed trees.
6	76-100	50-75% reduction in canopy with most of the ground area infested with evidence of disease killed trees.
7	76-100	At least 75% canopy reduction. Few original overstory trees remaining, although ground is often stocked with susceptible species.
8	76-100	The entire plot falls within a root disease pocket with only one or very few overstory trees present.
9	76-100	Entire plot within a root disease pocket and no overstory trees of the susceptible species present.

<Plot;SwissNedI>

Col # reference - 4

SwissNedI stands for Swiss Needle Cast (*Phaeocryptopus gaeumannii*) Rating for the area visible at the plot. Rate the average plot condition for SNC damage on a scale of 1 - 6. Focus on Douglas-fir (the only host). If Douglas-fir is not present in the area, record code 1. Gauge needle retention on un-shaded secondary laterals in the upper middle crown (usually whorl 5 - 7 from top.)

Table 8 below, shows the severity rating criteria to apply. See the section titled "GUIDES FOR IDENTIFICATION OF FOLIAGE DISEASES" in Appendix C for foliar disease identification assistance.

Table 8: Swiss Needle Cast Severity Rating classes

Code	Swiss Needle Cast Severity Rating Criteria
1	Healthy, normal-appearing Doug fir stand. Stands that are dark green, growing normally, and with normal needle retention (3.5 years or more, mid crown). Doug fir and hemlock of the same size will not differ much in color. Needle cast may be present, but causing symptoms only on 3 year old and older needles.
2	Almost normal, but showing slight yellowing. Needle retention normal (3.5 or more years present on most trees). Doug fir will appear slightly more yellow than hemlock or spruce. Crown still appears full and dense. No reduction in height growth increment.
3	Yellowing obvious. Most trees retaining 2.5 to 3 years of needles. No obvious height increment reduction.
4	Yellowing obvious. Most trees retaining 1.5 to 2 years of needles. Reduction in height growth increment by 25% of normal for one or more of the last three years will not be obvious, but may occur on a few trees only.
5	Very yellow stand. Most trees retaining 1 to 1.5 years of needles. Height growth increment is reduced by at least 25% of normal for one or more of the last 3 years on at least 50% of trees, but not as much as described in "6" below.
6	Stand is extremely yellow to yellow brown, with very sparse foliage. Most trees retaining 1 year of needles or less in upper crown. Obvious height growth reduction for 4 or more years.

SwissNedl is a required entry in **HHSli**, only those codes presented in the lookup list for the field (shown in Appendix E of this guide, and accessed in **HHSli** by pressing the F2 key while the cursor is on the field) are acceptable. **{For riparian project this required data field will not be collected, please enter a default entry of "1" (Healthy) which is the first lookup list item under F2, to get past this data field.}**

<Plot;Ycoord>

Col # reference - 5

Ycoord is the field for the Oregon Lambert Northing coordinate value of the plot center. The value is stated in terms of International feet to the nearest even foot. These coordinates are important for use in SLI reporting, analysis, and stand maintenance routines.

The starting point coordinates for the cruise line (see <Line;Ycoord> and <Line;Xcoord>) and the line azimuth (see <Line;Azimuth>) are used to calculate the approximate coordinates of the first plot on the cruise line¹⁶. For subsequent plots, **HHSli** uses the plot spacing (see <Cruise;PlotSpace>) and the coordinates for the previously recorded plot to calculate coordinates. The calculated value is automatically pre-loaded into the field when the plot is created in **HHSli**. The calculated position of a plot is a result of the program extending the cruise line (on it's azimuth, a distance equal to the plot spacing) from the previous plot recorded on that cruise line. For this reason the cruiser should not "skip around" with respect to installing and recording plots, in sequence, along a cruise line.

¹⁶The first plot on each line is always 100 feet from the line start point (see the discussion of sample plot layout on page 23).

The user may edit the **HHSli** pre-loaded value, with information from a GPS measurement at the plot for example. If the cruiser has made an edit to the coordinates (either **Ycoord** or **Xcoord**) but wishes to have **HHSli** recalculate the coordinates (both **Ycoord** and **Xcoord**), enter a value of zero into the **Ycoord** and **Xcoord** fields, use the arrow key to move to the plot number (<**Plot;Plt**>) field and re-enter the plot number (strike the number key(s) to re-enter the plot number - just hitting the enter key while in the field is not sufficient to have the values recalculated).

Cruisers should carefully adhere to the cruise line azimuth and pace or measure the distance carefully between plots since position error may accumulate on long cruise lines - resulting in potentially poor plot position information.

Oregon Lambert coordinates may be determined either by use of map grade accuracy GPS device or by triangulation to identifiable objects on planimetric or ortho-photographic maps (SLI stand map e.g.). The positional accuracy of the coordinates desired for use in SLI is +/- 45' horizontal or less.

Ycoord is a required entry in **HHSli**. The value is pre-loaded by the program as mentioned above. The value should be at least 50,000 and at most 1,700,000 (the valid range of the OR Lambert Northing in Oregon). The absolute minimum is 0, in order to provide for re-calculation of the coordinate as described above. **{For the riparian vegetation data collection this will be used as described. Accept the pre-loaded values from the program to populate and pass this required field during data entry with a valid value.}**

<**Plot;Xcoord**>

Col # reference - 6

Xcoord is the field for entering the Oregon Lambert Easting coordinate value of the plot center. The value is stated in terms of International feet to the nearest even foot. These coordinates are important for use in SLI reporting, analysis, and stand maintenance routines.

Please see the description of <**Plot;Ycoord**> above for important additional information.

Oregon Lambert coordinates may be determined either by use of map grade accuracy GPS device or by triangulation to identifiable objects on planimetric or ortho-photographic maps (SLI stand map e.g.). The positional accuracy of the coordinates desired for use in SLI is +/- 45' horizontal or less.

Xcoord is a required entry in **HHSli**. The value is pre-loaded by the program as mentioned under the description of <**Plot;Ycoord**> above. The value should be at least 200,000 and at most 2,400,000 (the valid range of the OR Lambert Easting in Oregon). The absolute minimum is 0, in order to provide for re-calculation of the coordinate as described above. **{For the riparian vegetation data collection this will be used as described. Use the pre-loaded values from the program. Accept the pre-loaded values from the program to populate and pass this required field during data entry with a valid value.}**

<**Plot;Elev**>

Col # reference - 7

Elev is the field for entering the elevation above sea-level of the plot center. The value is stated in feet to the nearest even foot.

In SLI, once the X & Y coordinates are determined for each plot, the elevation is calculated using digital elevation model data in GIS. As an alternative, if the elevation is determined through field observation, it may be recorded in the Elev field.

Elev is an optional entry in **HHSli**. When entered, the value must be at least 1' and at most 9,999'. The program issues a warning message for entries of elevation less than 101' or more than 3,999'. **{For the riparian vegetation data collection this will not be collected, please enter a value of 1 foot in this field.}**

<Plot;Aspect>

Col # reference - 8

Aspect is the field for recording the compass direction representing the prevailing aspect of the plot vicinity. Record the azimuth of the aspect in degrees clockwise from true North. When variations in aspect occur on a plot, record the aspect that represents a majority of the area in the plot vicinity. When slope is flat, aspect will represent the prevailing aspect for the area of the stand.

In SLI, once the X & Y coordinates are determined for each plot, the aspect is calculated using digital elevation model data in GIS. As an alternative, if the aspect is determined through field observation, it may be recorded in the Aspect field.

Aspect is an optional entry in **HHSli** and only whole numbers greater than or equal to 1° and less than or equal to 360° are acceptable. Cardinal north is specified by entering 360° (0° is invalid). **{For the riparian vegetation data collection this will not be collected, please enter the minimum value of 1 into this field.}**

<Plot;Slope>

Col # reference – 9

Slope is the field for recording the slope of the ground surface at the plot. When variations in slope occur on a plot, record the percent slope that represents a majority of the area in the plot vicinity. Slope is expressed in terms of percent (rise/run x 100) and is the deviation from horizontal.

In SLI, once the X & Y coordinates are determined for each plot, the slope is calculated using digital elevation model data in GIS. As an alternative, if the slope is determined through field observation, it may be recorded in the Slope field.

Slope is an optional entry in **HHSli**. Only whole numbers greater than or equal to 0 and less than or equal to 200 are acceptable. The program issues a warning message for entries of 0% slope, or for slope greater than 98%. **{For the riparian vegetation data collection this field is to be used to record the percent from the plot you are on back to the previous plot (next one closer to the stream), or if you are on the first plot on the transect line, it is the percent slope between the stream high water level and the plot.}**

<Plot;SlopePos>
 Col # reference - 10

SlopePos stands for Slope Position of the Plot and is the field for recording the relationship of each plot to adjacent major land formations. A slope position code that typifies the physical geography of the plot vicinity is used to describe the plot (see Table 9 & Figure 10 below).

Table 9: Slope Position codes

Code	Slope Position Description	Code	Slope Position Description
1	Ridge top or peak >120' wide.	6	Canyon bottom <660 feet wide.
2	Ridge top or peak <120' wide.	7	Bench or terrace.
3	Sidehill - Upper 1/3.	8	Broad flat >660 feet wide.
4	Sidehill - Middle 1/3.	9	Other - describe in remarks.
5	Sidehill - Lower 1/3.	--	--

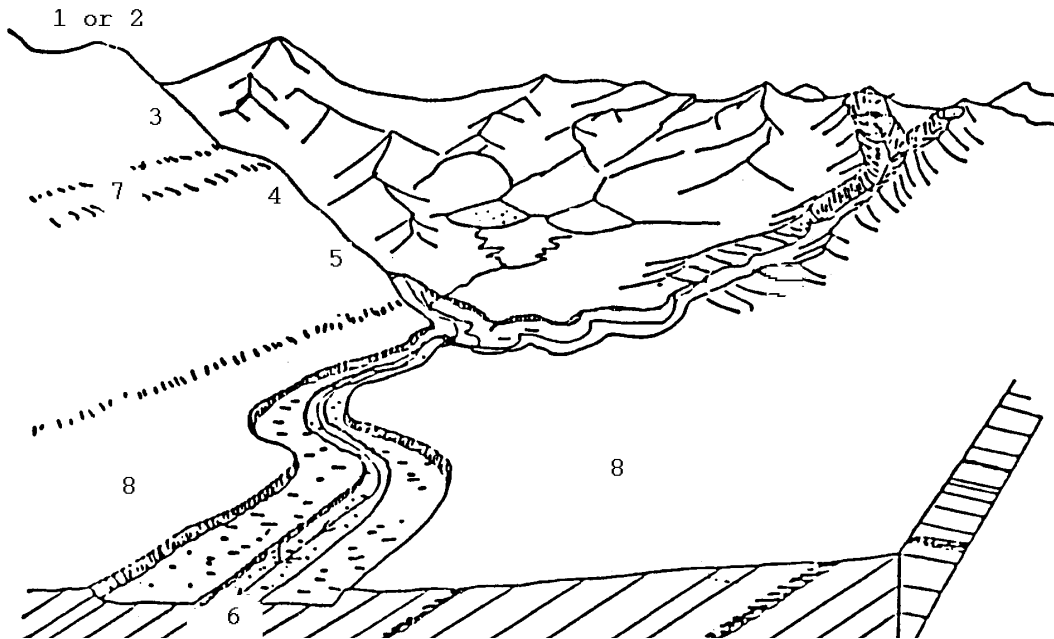


Figure 10: Slope Position code example schematic

SlopePos is a required entry in **HHSII**. Only those codes presented in the lookup list for the field (shown in Appendix E of this guide, and accessed in **HHSII** by pressing the F2 key while the cursor is on the field) are acceptable. ***{For the riparian vegetation data collection this will be used as described.}***

<Plot;GrndClas>

Col # reference - 11

GrndClas stands for Local Ground Class/Type for the area comprising the fixed plot measured for non-tree vegetation (usually 24' radius). The GIS data available for analysis of abiotic relationships to SLI plot data is often of too low a resolution to be reliable. By recording the ground class category for each plot, potential SLI data use for these analyses' is improved as well as adding to stand data interpretation ability for users.

Ground Class Category
Riparian
Rock Predominated
Talus
Upland
Wetland

The upland and the riparian ground classes are the most common. To distinguish between them, riparian is defined as the area surrounding a stream, in which ecosystem processes are within the influence of stream processes (such as relatively higher humidity, cooler air temperature, higher soil moisture). Often, the "slope break" and or the extent of adjacent moisture loving herbs typically present along stream channels indicate the transition point from riparian to upland.

GrndClas is a required entry in **HHSli**. Only those codes presented in the lookup list for the field (shown in Appendix E of this guide, and accessed in **HHSli** by pressing the F2 key while the cursor is on the field) are acceptable. ***{For the riparian vegetation data collection this will be used as described.}***

<Plot;PctSoil>

Col # reference - 12

PctSoil stands for the percentage of plot area in bare soil (open seedbed). The field is primarily only used in the KLSLI version of the program, but may be used in the HHSli version to indicate any percentage of area assessment, such as total herbaceous coverage, etc. **PctSoil** is an optional entry in **HHSli**. ***{For riparian project this field needs a value of zero(0) entered during Plot Level data entry.}***

<Plot;PlntAsc>

Col # reference - 13

PlntAsc stands for Forested Plant Association of the area on each plot. Plant Association is a finer categorization of Plant Series and is based upon the concept of potential natural vegetation.

Plant Associations as described for regionally distinct areas of Oregon by the USDA-Forest Service or USDI-Bureau of Land Management shall be used to classify the vegetation conditions at each sample plot. A Plant Association represents a relatively discrete group of plants that maintain stable populations and occur over broad areas when similar environmental conditions exist. Plant Association Guides published by the USDA-Forest Service applicable to use on State Forests include those listed in Table 10 below. Draft guides from the USDI-Bureau of Land Management are available, check with the State Forests Information Unit staff for more information.

Table 10: Plant Association Guides for State Forests

District	Plant Association Guide
Astoria	Plant Association and Management Guide—Siuslaw National Forest
Coos (ESF)	Plant Association and Management Guide—Siuslaw National Forest
Coos (scat. Curry Co.)	Forested Plant Associations of Southwestern Oregon
Clackamas-Marion (south)	Plant Association and Management Guide—Willamette National Forest
Clackamas-Marion (north)	Plant Association and Management Guide—Mt. Hood National Forest
Forest Grove	Plant Association and Management Guide—Siuslaw National Forest
Southwest Oregon	Forested Plant Associations of Southwestern Oregon
Klamath-Lake (Sun Pass)	Plant Associations of the Central Oregon Pumice Zone
Klamath-Lake (other)	Plant Association and Management Guides—Fremont NF, Winema NF
Tillamook	Plant Association and Management Guide—Siuslaw National Forest
Western Lane (coast)	Plant Association and Management Guide—Siuslaw National Forest
Western Lane (cascades)	Plant Association and Management Guide—Willamette National Forest
West Oregon	Plant Association and Management Guide—Siuslaw National Forest

To determine the predominant Plant Association on the non-tree vegetation plot (24' radius circle) use the appropriate guide and base the determination upon the plant indicators present on the plot. See Appendix E for non-forest Plant Association codes.

PlntAsc is a required entry in **HHSli**. Only those codes presented in the lookup list for the field (shown in Appendix E of this guide, and accessed in **HHSli** by pressing the F2 key while the cursor is on the field) are acceptable. **HHSli** presents the appropriate lookup list for each ODF District by reading the stand number from the **Cruise** level. See Table 2 on page 11 which shows the stand number/district relationship for SLI. **{For riparian project this type of data will not be collected, please select a standardized valid entry of "ABA1" from the lookup list item under F2 to satisfy the program required entry need.}**

<Plot;Remarks>

Col # reference - 14

The remarks field entry at the **Plot** level provides recording space for sample plot related information. Remarks should be pertinent to the level – each level in **HHSli** has its own data field space for remarks.

Remarks is an optional entry in **HHSli**. Up to 24 characters may be entered. **{For the riparian vegetation data collection this will be used specifically to only store the predominant landform feature code (1 character code – see below) that best characterizes the distance from the distance from the previous plot to the current plot, with the following two exceptions: when on the first plot (25 feet from stream) on a line transect, it is the predominate landform between the stream high water level and the first plot and secondly after the last plot (150 feet from stream) which includes evaluating past the plot out to end of the line transect which is 170 feet from the stream high water level.**

This landform data being collected and recorded at the plot level can later be related to Downwood, Vegetation and Tree tally items for further analysis based on distance from stream data.

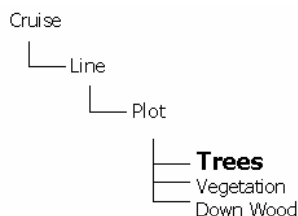
<u>LANDFORM FEATURE CODE</u> <i>*Code in {brackets} should be used on areas draining away from the study stream.</i>	<u>BASIC DEFINITION</u>
<u>A or {W}</u>	<p><u>Floodplain : Relatively flat, level land that may be submerged by floodwaters. A plain built up by stream deposition and is normally underlain by unconsolidated alluvial sediment. Usually associated with stable lower gradient channels. Formed by simultaneous processes of lateral migration and overbank flooding. A floodplain can become a terrace when channel incision prevents the river from inundating the surface annually or biannually.</u></p> <p><u>A common error is to mistake a low terrace as a floodplain. If normal bankfull width does not fall above the slope break it is a terrace. In many of the high gradient mountain streams, terraces are more commonly encountered.</u></p>
<u>B or {X}</u>	<p><u>Fluvial Terrace (Terrace) : Abandoned floodplain formed when the stream flowed at a higher level. Can be formed by deposition or erosion. Depositional terraces are formed from entrenchment of the stream after a period of valley filling. The flat surface, or tread, is formed through alluvial deposition. The tread of an erosional terrace is formed by lateral erosion followed by deposition of a thin sheet of alluvium on top.</u></p> <p><u>Terraces without a floodplain are typically found in intermediate streams between floodplain systems and higher gradient gorge systems. Floodplain systems may display older terraces between the confining wall and the floodplain. They are rarely intact along the entire length of a valley.</u></p>
<u>C or {Y}</u>	<p><u>Confining Wall : The vertical and horizontal wall feature that constrains the stream system. High in the drainage system lateral and vertical migration of the stream may be limited by the Confining Wall. Typical in steep-walled canyons or gorges. Streams constrained by this feature are typically high gradient with cascades or rapids.</u></p> <p><u>The confining wall is differentiated from the Hillslope feature in that the confining wall can and would occur close or immediately next to the stream, acting as the constraining feature to increased flow. See Hillslope feature description.</u></p>
<u>D or {Z}</u>	<p><u>Hillslope : The general upslope of the hillside. Usually begins further away from the stream if floodplains or terraces are present. If there is a definite slope break in the hillslope while continuing</u></p>

	<u>the cruise line transect, more than one hillslope feature segment can be used to characterize the hillslope landform. For example, on a stream higher up in the headwall drainage system and no floodplain or terracing present, you could have an initial hillslope segment for 120 feet at 45 percent slope and a second hillslope segment for the remaining 50 feet (of the 170 foot transect) at 70 percent. This would be entered as "D12045D05070". Remember each segment up to four (4), must be entered in this format (see above this table) with 6 characters describing each segment. The two segment example used here had a 12 character entry.</u>
<u>E or {R}</u>	<u>Side Channel : A side channel is a channel that originates from the same stream, upstream and rejoins further downstream to the stream that the transects start from. [Note: the entered distance is the distance across both slope breaks going down into the channel, the entered slope is the steepest slope of two slopes going down into the side channel].</u>
<u>F or {S}</u>	<u>New Channel : A channel encountered that is separate from the stream the transects originate from. [Note: the entered distance is the distance across both slope breaks going down into the channel, the entered slope is the steepest slope of two slopes going down into the new channel].</u>
<u>G or {T}</u>	<u>Tributary Channel : A channel encountered along the transect that connects further downstream on the stream that the transects start from. [Note: the entered distance is the distance across both slope breaks going down into the channel, the entered slope is the steepest slope of two slopes going down into the tributary channel].</u>
<u>H or {U}</u>	<u>Road : Actively used road bed surface.</u>
<u>I or {V}</u>	<u>Old Road : Older road surface that is grown over or not actively used.</u>

SLI SAMPLING TALLY ITEM INFORMATION

This section describes the observations and measurements made and recorded for each of the cruise sample tally items (trees, non-tree vegetation, and down wood pieces). All data items for each branch of the **Trees-Vegetation-Down Wood** level in **HHSli** are described in this section.

TREES BRANCH LEVEL ITEMS



The table below shows the data items that are included at the **Trees** branch level in **HHSli**, and summarizes the parameters of each as they appear in the program application's screens. In the file structure hierarchy, the **Trees** branch level is one of three "sibling" branches below the **Plot** level. Each record in the **Trees** branch level represents one or more¹⁷ individual tally trees located at a particular plot. At completion of cruise data recording for a stand, each **Plot** level record may have one or more related **Trees** branch level records - each tree or stump recorded "belongs" to one of the sample plots in the cruise.

¹⁷ Trees of identical attributes (species, size, etc.) may be group tallied together on one record in the **Trees** level for a plot.

Table 11: **Trees** Branch Level data items

TREES BRANCH LEVEL								
Col #	Field Name	Type	Width	Required in <i>HHSIi</i>	Column Help Message	Min	Max	Auto Pre-load
1	Tr	N	3	Auto	Tree Number			
2	Gp	C	2	Yes	Group Code (C2)	list		..
3	Sp	C	5	Yes	Tree, Snag, Species (C2)	list		
4	DBH	N	5	Yes	DBH of Tree, Snag, Stump	0.0	999.9	
5	Tcl	N	3	Skip ¹⁸	Tree Class Code	list		
6	GT	N	2	Yes	Group Tally # of Trees	1	99	1
7	F	C	1	Auto	HST Candidate Flag			
8	S	N	1	Yes	Tree Sample Status Code	list		
9	Ht	N	3	Some ¹⁹	Height of Tree (N3)	1	300	
10	Age	N	3	Some	BH Age of Tree (N3)	1	999	
11	CR	N	3	Some	Live Crown Ratio (N3.2)	.01	.99	
12	CC	N	1	Some	Crown Class Code (N1)	list		
13	Dmg1	C	2	Opt. (skip)	Damage Code 1 (C2)	list		
14	Sv1	C	2	Opt. (skip)	Severity Rating 1 (C2)	list		
15	Dmg2	C	2	Opt. (skip)	Damage Code 2 (C2)	list		
16	Sv2	C	2	Opt. (skip)	Severity Rating 2 (C2)	list		
17	Dmg3	C	2	Opt. (skip)	Damage Code 3 (C2)	list		
18	Sv3	C	2	Opt. (skip)	Severity Rating 3 (C2)	list		
19	Def1	N	4	Opt. (skip)	Defect in low 1/3 (N3.2)	.00	.99	
20	Def2	N	4	Opt. (skip)	Defect in mid 1/3 (N3.2)	.00	.99	
21	Def3	N	4	Opt. (skip)	Defect in top 1/3 (N3.2)	.00	.99	
22	C	C	1	Some	Decay Class Code (C1)	list		
23	U	C	1	Some	Wildlife Excav Code (C1)	list		
24	Rmk	C	3	Opt.	Coded Remarks (C3)	list		
25	Azm	N	3	Opt.	Azimuth to Tree (1-360) (time)	1	360	
26	Dist	N	5	Skip ¹⁸	H Distance to Tree (ft)	0.1	120	
27	User1	C	5	Opt.	User Defined Field (C5)			
28	User2	C	5	Opt.	User Defined Field (C5)			
29	User3	C	5	Opt.	User Defined Field (C5)			
30	ExpFac	N	7	Auto	Calc Expansion Factor	1.00	9999.99	

¹⁸ Fields with "Skip" are used only in the KLSIi version; in *HHSIi* the field is skipped (visible but not accessible).

¹⁹ "Some" indicates that the data item is required for some trees but not for others, see the description of each item for details.

Figure 11, Figure 12, and Figure 13 below, are examples of the screen appearance of the **Trees** branch level on the hand-held data recorder. For display screen size of 24 characters wide by 16 character lines tall, the **Trees** branch level contents occupy a total of six screen "pages" as shown in the examples.²⁰

Plt	1	Tr	8	Sp	RC
DBH	19.0	S	6	Ht	84
Tr	Gp	Sp	DBH	Tcl	
1	..	DF	0.0	0	
2	..	RC	0.0	0	
3	..	RA	5.0	0	
4	..	RA	15.0	0	
5	SN	DF	13.0	0	
6	..	DF	20.0	0	
7	..	DF	12.0	0	
8	..	RC	19.0	0	
9	..	DF	18.0	0	

DBH of Tree, Snag, Stump
TREE F4-Back AltF5-Swtch

Plt	1	Tr	8	Sp	RC
DBH	19.0	S	6	Ht	84
GT	F	S	Ht	Age	CR
2	5	5	0	.00	0
3	5	2	0	.00	0
1	*	6	28	0	.35
1	0	0	0	.00	0
1	3	14	0	.00	0
1	7	103	56	.40	2
1	0	0	0	.00	0
1	6	84	0	.70	3
1	*	0	0	0	.00

Height of Tree (N3)
TREE F4-Back AltF5-Swtch

Figure 11: **HHSII** screen examples - **Trees** branch level, 1st & 2nd screen pages.

Plt	1	Tr	8	Sp	RC
DBH	19.0	S	6	Ht	84
Dmg1	Sv1	Dmg2	Sv2	Dmg3	
73	1				
96	0				
90	2	46	4		
55	1				

Damage Code 2 (N3)
TREE F4-Back AltF5-Swtch

Plt	1	Tr	8	Sp	RC
DBH	19.0	S	6	Ht	84
Sv3	Def1	Def2	Def3	C	U
.00	.00	.00			
.00	.00	.00			
.00	.00	.00			
.00	.00	.00			
.50	.99	.99		2	1
.00	.00	.00			
.00	.00	.00			
.05	.00	.00			
.00	.00	.00			

Defect in low 1/3 (N4.2)
TREE F4-Back AltF5-Swtch

Figure 12: **HHSII** screen examples - **Trees** branch level, 3rd & 4th screen pages.

²⁰ Full details of **HHSII** features and instructions for use are included in Appendix D.

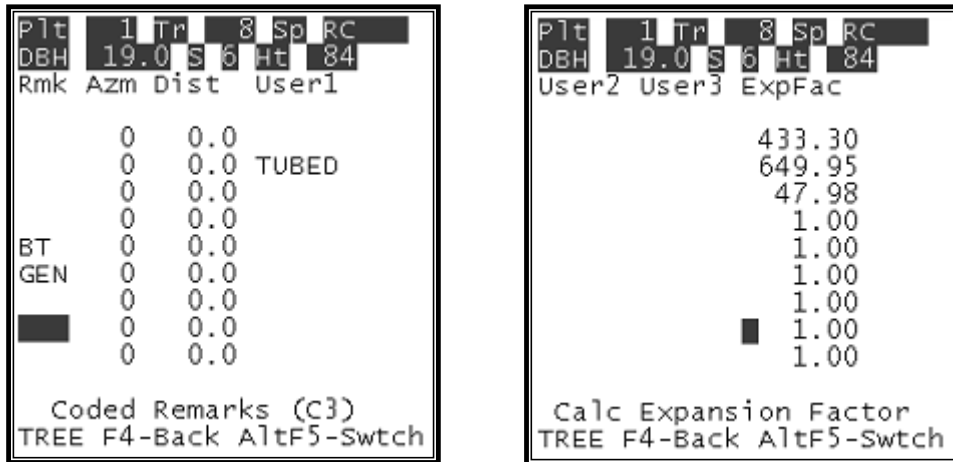


Figure 13: *HHSli* screen examples - **Trees** branch level, 5th & 6th screen pages.

The screen display of the **Trees** branch level in *HHSli* is a "line-screen display type", which means that all of the data items (fields) for a record are displayed on one line of the screen at a time.

It helps to think about the **Trees** branch level as being similar to a spreadsheet - each **Trees** branch level record is a "row" in the file, and the data items (fields) are arranged in "columns" that, from left to right, span six widths of the data recorder screen. The Left / Right arrow keys move the cursor along the "row" of data (moving across screen pages as necessary), and the Up / Down arrow keys move the cursor up and down within a "column" of data.

Each key press of the Down arrow key when the cursor is on the lowest visible row of tree data creates a new "empty" **Trees** branch level record. **Trees** branch level records may be inserted between existing records by using the F9 key – the newly inserted record appears above the current cursor position. **Trees** branch level records may be deleted one at a time by using the F10 key. "Empty" **Trees** branch level records below the last completed record are automatically deleted by the program upon retreat (F4 key) or sibling jump (Alt+F5 key). Retreat or sibling jump (switching to another of the branches at the current level) are not possible until all required data item entries are made for the existing records.

Cruisers shall cruise and record tally items by plot type/size "groups", in clockwise order beginning from the direction of the cruise line azimuth for each plot. Start work on the smallest diameter trees present (on the smallest sized plot) – recording them first and working up to the larger trees on the larger fixed or variable radius sized plot (see the description of <Trees;GT> for additional details). For example, any trees tallied from the smallest fixed area plot would be recorded as the first "group" of records – any individual tally (Group Tally = 1) items would be recorded clockwise starting from the cruise line azimuth. Tally of larger trees, from the variable radius plot for example, would come next – each tally recorded in clockwise order.

For the purposes of check cruising, all Status code 6, 7, 8, or 9 trees (see <Trees;S>) shall be clearly identifiable in each 170 by 100 foot plot. To aid check cruising, the cruiser shall paint the tree number (see <Trees;Tr>) on each subject tree, and ensure that the horizontal distance estimate between the tree and the stream high water level is recorded in the <Trees;Dist>) field.

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ITEM BY ITEM DESCRIPTION; TREES BRANCH LEVEL

< **Trees;Tr**>

Col # reference - 1

Tr stands for Tree (level) Record Number for this record on this plot. **HHSli** automatically creates the value in this field upon new record creation (as for the first record when first advancing to the **Trees** branch level, or when on the lowest [last] record line and pressing the Down arrow key). The value is not used in SLI and is only present to aid the user by "labeling" each tree as it is created. As the cursor is moved on any record of the six screen pages comprising the **Trees** branch level record display, the Tr label for the current record is persistently displayed on the top line of the screen along with other information about the tree on that record.

If a record is deleted (F10 key) the Tr number is deleted and is not reused (i.e. the trees remaining are not re-numbered).

The **Tr** value for the first record is always one –subsequent **Tr** values results from auto-incrementing by one from the **Tr** value of the last record. The field is user editable. **{For the riparian vegetation data collection this will be used as described.}** For the purposes of check cruising, all Status code 6 and 8 trees (see < **Trees;S**>) shall be clearly identifiable within each 170 by 100 foot plot. The cruiser shall paint the tree number (see < **Trees;Tr**>) on each subject tree, using the following tree numbering protocol depending on which 170 by 100 foot overstory/snag plot the subject tree is within. All overstory trees/snags equal or greater than 5.5. inches are measured and recorded on the last plots of each line transect (i.e. Plots 6, 12, 18, 24, and 30). Transect lines are numbered 1 through 5 in an upstream direction with the following tree numbering scheme for each 170x100 overstory subplot.

Line	Overstory/Snag Plot – plot furthest away from stream on each Line.	Tree Numbering in that 170x100 overstory subplot
1 (furthest downstream)	6	100's
2	12	200's
3	18	300's
4	24	400's
5 (furthest upstream)	30	500's

< **Trees;Gp**>

Col # reference - 2

Gp stands for Group Code for this record on this plot. The group code for each tally item identifies it as either a standing live tree, a snag (i.e. a standing dead tree greater than 4.5' tall), or a stump (i.e. a standing dead tree less than or equal to 4.5' tall)²¹. Each such tally item that is "in" the sample plot is recorded with the appropriate Gp code entry.

²¹ Live tree, dead tree, and "snag" definitions are found in the Glossary - Appendix B.

Group Code (Gp)	Description
.. (two decimal points)	Default Group (live trees)
SN	Snags (>4.5')
ST	Stumps (<= 4.5')

The group code entered allows the **HHSII** program to both control how the cursor moves from left to right when entering subsequent information into a **Trees** branch level record, and to perform error checks and calculations pertinent to each of the three different types of tally items.

Gp is a required entry in **HHSII**. A value of .. (two decimal points) is entered automatically by the program upon new record creation and may be edited if needed. The cursor automatically moves to the DBH field when a new record is created – to edit the Gp value, use the Left arrow key to move left to the field. Only those codes presented in the lookup list for the field (shown in Appendix E of this guide, and accessed in **HHSII** by pressing the F2 key while the cursor is on the field) are acceptable. **{For the riparian vegetation data collection only ".." live trees and "SN" snags are to be collected.}**

< **Trees:Sp** >

Col # reference - 3

Sp stands for Tree Species for this record on this plot. A two-letter tree species code is entered for each recorded tally item. If species is indeterminable for a tally item, there are species codes for "Unknown Conifer", "Unknown Hardwood", and "Unknown Species".

Since some tree species may exhibit shrub-like growth habits, and some shrub species may exhibit tree-like growth habits, the distinction (tree or shrub) shall be made by examining the **HHSII** species lists for the **Trees** level and the **Vegetation** level. If the species is in the list for the **Trees** level, it is to be considered a tree for tally purposes. If the species is present in the **Vegetation** level list, consider it as a shrub for tally purposes. For indeterminable species, or for species that are not present on either list, the cruiser must use best professional judgement to categorize the tally – using the "unknown" codes (CX, HX, XX) from the **Trees** level list, or the "other" codes (U1 – U9) from the **Vegetation** level list. Willow (*Salix spp.*) is the only species that is present on both lists – the cruiser must choose the most appropriate tally approach for the circumstances on the plot.

SLI requires conformity with respect to the two-letter species codes used. To accomplish this while providing for ease of data entry, **HHSII** employs a "translated" lookup list for the field. The user may enter any of the values shown in the left-most column of the example table shown below (a small excerpt from the species lookup list). Then, by pressing the Enter key or any arrow key, the program "translates" the value to its corresponding "Translation Code" equivalent (shown in the second column in the example).

Entry	Translation Code	Description
202	DF	Douglas-fir
D	DF	Douglas-fir
DF	DF	Douglas-fir
PSME	DF	Douglas-fir

Sp is a required entry in **HHSli**. Once a species value is entered into the lowest [last] record, the species is automatically copied down to a new record created using the Down arrow key and may be edited if needed. The cursor automatically moves to the DBH field when a new record is created – to edit the Sp value, use the Left arrow key to move left to the field. Only those codes presented in the left-most column of the lookup list for the field (shown in Appendix E of this guide, and accessed in **HHSli** by pressing the F2 key while the cursor is on the field) are acceptable [any acceptable entry value is subject to automatic translation]. ***{For the riparian vegetation data collection this will be used as described.}***

< **Trees;DBH** >

Col # reference – 4

DBH stands for Tree Diameter in inches at Breast Height. Record the DBH for each tree or group of trees represented by this record on this plot. If the record represents a stump tally, the DBH is the diameter at the top of the stump and outside the bark (if present). Tree diameter is a primary factor for the determination of the sample plot size and sample expansion factor used for particular tally records (see < **Cruise;DBHcutoff** > and < **Cruise;Lt1MinDBH** > for additional descriptions).

HHSli accommodates recording the DBH to the nearest tenth inch, but recording to the one-inch DBH class is strongly recommended for SLI cruising. Select the median tree to record the DBH for group tallied trees. Trees in the 2' or 5' tall height classes (1' through 6' tall)²² shall be assigned a DBH of 0.0".²³ Record diameters of trees less than 20' tall to the nearest one-inch DBH class (avoid recording tenths of inches for these trees). **HHSli** issues an error message if a tree with a recorded height more than 9' tall has a diameter of zero.

Height Class	Range of tree heights	DBH to Record
2'	1' – 3'	0.0" (zero inch class)
5'	4' – 6'	0.0" (zero inch class)
8'	7' – 9'	Est. actual (nearest inch)
11'	10' – 12'	Est. actual (nearest inch)
14'	13' – 15'	Est. actual (nearest inch)
17'	16' – 18'	Est. actual (nearest inch)
20'	19' - 21'	Est. actual (nearest inch)

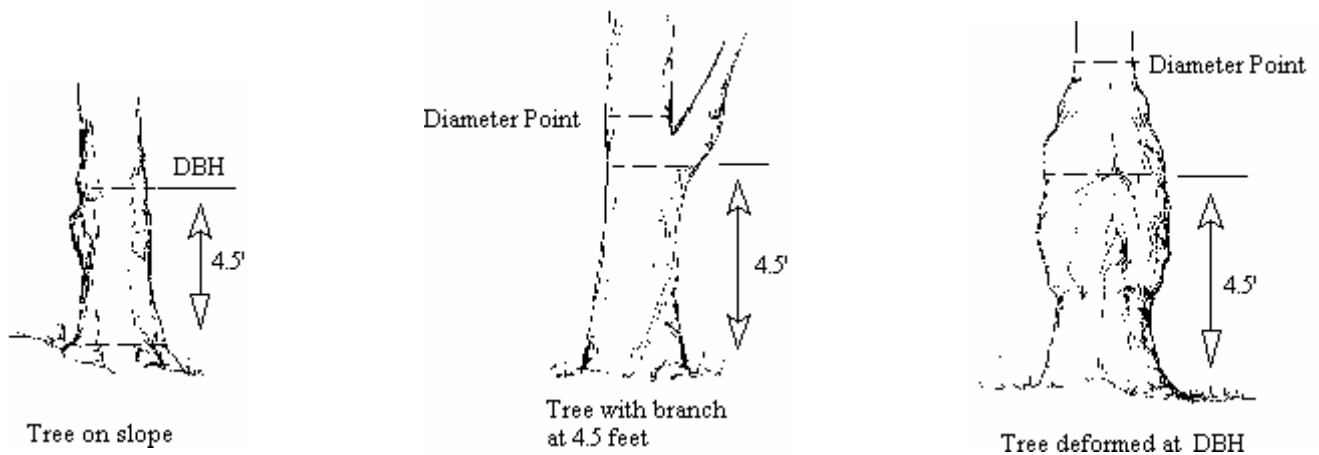
DBH is outside bark diameter at 4.5' above the forest floor on the uphill side of the tree. To determine breast height, the forest floor includes the duff layer that may be present, but does not include unincorporated woody debris that may rise above the ground line. For trees growing on nurse logs or

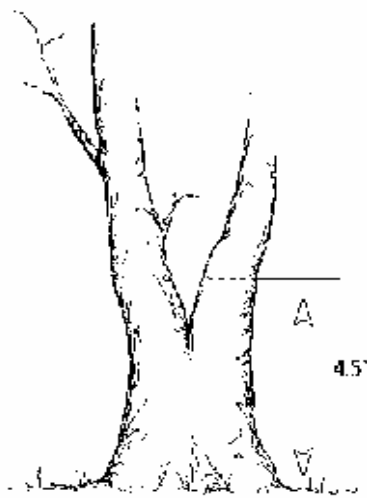
²² See the description of < **Trees;Ht** > concerning tally of trees by height classes.

²³ The cruise compiler used for SLI is built to deal with one-inch diameter classes. Trees 6' tall and less that have a recorded DBH >0" [1" is the next larger DBH recognized by the compiler] cause an error message; and the compiler assumes that the DBH is correct and that the recorded height is wrong [uses a regression height for the diameter tree recorded].

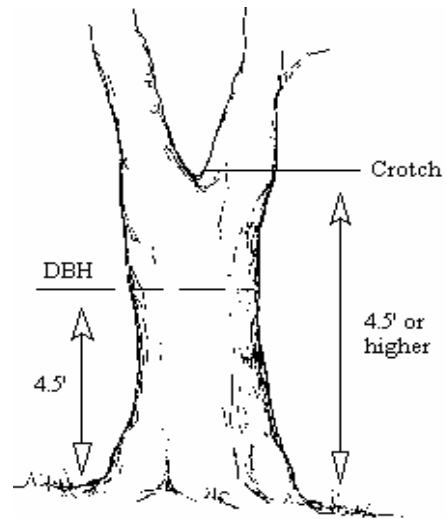
stumps, or for trees with exaggerated butt fluting extending to above ground roots, breast height shall be measured starting from the top of the root collar area of the tree.

Some trees have substantial bole irregularities at breast height such as branches, swellings, or depressions. In such cases, take the diameter measurement as close as possible to breast height, but above or below the deformity. If this is not possible, because of the vertical extent of the irregularity, then adjust the DBH measurement to better reflect the diameter of a "regular" bole. For snags, do not attempt to adjust for missing bark or voids present at the diameter measurement point – take the measurement as is.





Tree forked below 4.5' - record as two trees if each is "in" the plot. Dia. taken @ 4.5' point(s).

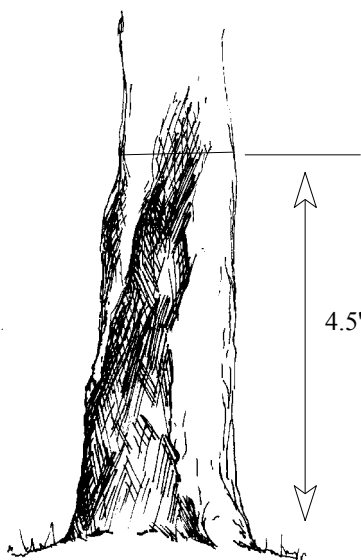


Tree forked at 4.5 feet or higher. Record as one tree and consider only the main fork

Seedlings and saplings that are forked are considered single trees. Larger trees that fork below breast height (i.e. the "open crotch" occurs below breast height) are considered as two (or more) trees, and their diameter is measured at the breast height point unless that point is substantially irregular (i.e. the measurement point or the DBH itself may be adjusted).

Trees growing together sometimes give the appearance of a forked tree. This situation can usually be recognized because of the seam that develops where the two trees have joined. This seam should extend very close to the ground. Trees that have grown together will be considered as separate stems and DBH will be determined at the normal point 4.5 feet up the stem.

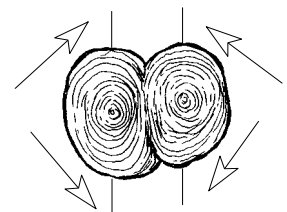
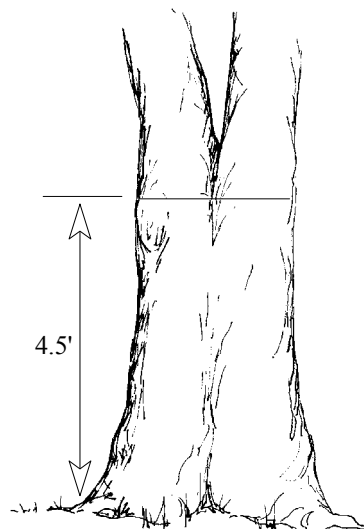
For trees that have grown together, determine DBH by making two marks opposite each other on the center line of each bole's circumference as shown in the illustration below (on the right). Measure the distance



Tree with a catface



Adjust diameter tape to a normally rounded position to allow for the missing catface portion



Make two marks opposite each other on the stem at 4.5 feet. Measure the distance between the marks with a diameter tape. Double the measurements to determine DBH

between the marks with a diameter tape and double it to determine DBH.

DBH is a required entry in **HHSli**. Numeric values equal to or greater than 0.0" and less than or equal to 999.9" are acceptable. A value more than 80" will trigger a warning message from the program. The program also includes an error check of the DBH field upon level retreat (F4 key) or sibling jump (Alt+F5 key) - if a height greater than 9' has been entered and the diameter is 0.0", the user is prompted to enter the DBH (see Appendix D for details). **{For the riparian vegetation data collection this will be used as described.}**

< Trees;Tcl >

Col # reference - 5

Tcl stands for Tree Class, and is a call made by the cruiser as to the silvicultural viability of each tree. The field is only used for the KLSLI version of the program and is visible but skipped in the HHSli version (see the description of **< Cruise;ProgVer >** on page 10).

Tcl is a skipped field in **HHSli**. **{For the riparian vegetation data collection this is skipped as described.}**

< Trees;GT >

Col # reference - 6

GT stands for Group Tally, a "count" of the number of trees or stumps represented by the **Trees** branch level record. The Group Tally is a convenient way to represent any number of tally items that share identical or near identical characteristics described for the other data item fields for a record (versus entering multiple records for each instance of like tally items). For example, seedlings of the same species and height class are counted on the plot and their count is recorded in the Group Tally field of a record containing the other entries required for the tallied items. The Group Tally value is multiplied by the expansion factor for a single item to arrive at the total number of items per acre represented by the record (the value will display in the **< Trees;ExpFac >** field, but only after the F4 key or Alt+F5 key has been used to leave the **Trees** level and then return with the F5 key or the Alt+F5 key, or after running the **Tree Level Error Check** described on page 115).

Group tally of greater than 1 is not appropriate for status code 6, 7, 8, or 9 trees. Group tally is specifically for recording convenience only – and in the case of height sample trees (status 6), top-height trees, and site index sample trees, like specimens shall be recorded as separate records. See further requirements for status code 7, 8, and 9 tree sampling under the description of Status Code 8 and Status Code 9 beginning on page 58.

For simplicity sake in cruising situations where there are greater than 20 live trees less than 21' tall on a plot, record a Group Tally value no greater than 20 (see tally tolerances under **Trees Level Data** in Appendix F). Note: this applies to the total number of tally trees less than 21' tall for the plot, but the cruiser should still tally by species and height class (in this case the group tally value for each combination of species and height need not be so rigorous).

GT is a required entry in **HHSli**. Whole numbers equal to or greater than 1 and less than or equal to 99 are acceptable. A value of 1 is automatically entered by the program upon record creation and may be edited if needed. A value more than 10 will trigger a warning message from the program. **{For the riparian vegetation data collection this will be used as described.}**

< **Trees;F**>

Col # reference - 7

F stands for Flag which is a field used to indicate to the cruiser that the tree should be considered as a candidate for measurement of certain characteristics, such as tree height, that are subsampled from among the cruise trees included in the sample. The acronym HST is commonly used to refer to trees that are subsampled (stands for Height Sample Tree). **HHSli** analyzes data entered for each tree record to determine if it should be flagged for inclusion to sample for height, crown ratio, and crown class (HST measurements are required). The program places an asterisk in the Flag field if the tree should be selected for HST measurements (**HHSli** also gives an audible beep to indicate that a flag has been set). Otherwise, an empty Flag field indicates that the tree is not specifically targeted for sample measurements of those items (the HST measurements are optional for such trees). The Flag field is always empty until the < **Trees;Gp**> and < **Trees;DBH**> entries are made for a tree - only then does the program update the Flag field (remains empty, or an asterisk appears and the audible beep is given).

SLI cruise data compilation employs species specific DBH based regression formulas for the assignment of tree height and live crown ratio to cruise trees that do not have those values from direct measurements. A goal of SLI is to select regression adjustment samples (without bias) across the range of tree diameters for each major species in the stand. Approximately 25 to 30 samples of tree height and live crown ratio for trees of the major species in a stand are considered adequate for SLI sampling purposes.

The values entered in the < **Cruise;PlanPnum**> and < **Cruise;AvgTplt**> fields are used by the program to calculate the sampling frequency necessary to obtain the 25 to 30 samples for the stand. The sampling frequency is applied to each recorded live sample tree 4.0" DBH and larger in a top down listing across all plot's tree records – every n^{th} tree is flagged by the program (where n is equal to the sampling frequency calculated for the stand). Sampling frequency used for each stand in **HHSli** is either 3, 5, 7, or 9. At most every third sample tree over 4" DBH is sampled for height and live crown ratio, or at least every ninth tree is so sampled. **{For the Riparian Vegetation project values will be provided or should be specified so that a HST sampling frequency of 5 is used by the program flagging mechanism.}**

# Plots X Avg. # Trees/Plot = Estimated # of sample trees	
If estimated # of Sample Trees is:	HHSli HST sampling frequency will be:
< 90	3
>= 90 and < 140	5
>= 140 and < 200	7
>= 200	9

While the Flag column is one mechanism to select the necessary height samples, it should not be relied upon exclusively to do so. The cruiser should monitor the height sampling occurring for the stand and supplement the sampling when needed in order to get adequate information. One notable area to monitor is in multi-species stands, carefully note whether adequate samples are taken for each species across their diameter ranges (since the sampling frequency does not examine the species in flagging sample candidates). Likewise, some flagged sample trees should not be used for the subsample. For example, broken topped trees are less than desirable samples for the purpose of regression adjustment. Note: at any point in **HHSli**, a summary count of the number of trees measured for height is available by pressing the F7

key and choosing the **TreeStat.run** item from the list. The summary also automatically appears²⁴ as the last screen prior to exiting from the data for a stand in **HHSli**. See Appendix D for more details.

F is not a user-accessible field and is for viewing only. The cursor skips the field in **HHSli**. **{For the riparian vegetation data collection this will be used as described.}**

< **Trees;S** >

Col # reference - 8

S stands for Tree Sample Status Code, which is used by the cruiser to indicate important facets of the data recorded for each tally item at the **Trees** branch level.

Each status code is unique in that it indicates:

- 1) what cruise measurement recording is required for each item, and
- 2) how the cruise data compiler program will treat each record during data processing for the stand.

Status code impacts data recording requirements for the following fields:

- < **Trees;Ht** > tree height
- < **Trees;Age** > tree breast height age
- < **Trees;CR** > tree live crown ratio
- < **Trees;CC** > tree crown class
- < **Trees;C** > snag decay class
- < **Trees;U** > snag wildlife use (excavations)

These fields are "optional" entry in **HHSli** but the status code dictates whether any of these field entries are required for a particular tree.

The table below shows the status codes used in SLI, and indicates the acceptable values of the other related measurement fields. Additional description of each status code follows.

Status Code	Description	Ht	Age	CR	CC	Data used in Regression Calculation?
0	Live Tree, no hgt.	0	0	all OK	all OK	No
1	Cut Tree, no hgt.	0	0	0	0	n.a.
2	Dead Tree, no hgt.	0	0	0	0	n.a.
3	Dead Tree, w/hgt., NR	>= 1	0	0	0	No
4	HST + Age, NR	>= 1	>=1	all OK	all OK	No
5	HST, NR	>= 1	0	all OK	all OK	No
6	HST, for Regression	>= 1	0	>0	>0	Yes
7	TopHt + Site Tree	>=1	>=1	>0	1, 2, or 3	Yes
8	Site Tree	>= 1	>=1	>0	1, 2, or 3	Yes
9	TopHt Tree	>=1	0	>0	1, 2, or 3	Yes

²⁴ Only when using the F4 key to exit, not when using the Escape key.

Status Code 0:

Status Code	Description	Ht	Age	CR	CC	Data used in Regression Calculation?
0	Live Tree, no hgt.	0	0	all OK	all OK	No

Status code 0 is the default value for each record. The tree data recorded includes: a group code of ".." (two decimal points), species, DBH, may have damage codes, and may have defect deductions. Height and age are not recorded. Crown ratio and crown class may be recorded but will only be used for this tree and will not be used for calculation of the regression for live crown ratio.

Status Code 1:

Status Code	Description	Ht	Age	CR	CC	Data used in Regression Calculation?
1	Cut Tree, no hgt.	0	0	0	0	n.a.

If a stand has been marked for partial cutting and it is desirable to cruise leave trees separately from take trees, status code 1 may be used for all take (cut) trees. Height, age, crown ratio, and crown class are not recorded. Although a status code 1 tree may receive an asterisk in the Flag column indicating it is a candidate for HST measurement, the next suitable tree for HST measurement should be used instead (no HST measurements are to be taken for status code 1 trees).

Status Code 2:

Status Code	Description	Ht	Age	CR	CC	Data used in Regression Calculation?
2	Dead Tree, no hgt.	0	0	0	0	n.a.

Status codes 2 and 3 are used for all dead trees (Group code SN) and for all tally of stumps (which themselves are optional tally in SLI). For status code 2, height, age, crown ratio, and crown class are not recorded. SLI assigns heights to dead trees having no recorded height via regression. Therefore, dead trees with "normal" intact tops (tree height is similar to the height of live trees of like species and diameter) should be coded status 2.

Status Code 3:

Status Code	Description	Ht	Age	CR	CC	Data used in Regression Calculation?
3	Dead Tree, w/hgt., NR	>= 1	0	0	0	No

Status codes 2 and 3 are used for all dead trees (Group code SN) and for all tally of stumps (which themselves are optional tally in SLI). For status code 3, height is recorded. Age, crown ratio, and crown class are not recorded. The height is not used for the calculation of the height regression. Status code 3 should always be used for dead trees that have more than 10% of their top broken out (see additional description under < **Trees;Ht**>). Dead trees with more than 10% of their top broken out shall have a 960

damage/severity code and their height to the break (disregarding small "slivers", if present) recorded. Defect deduction % for the missing top is also determined and recorded.

Status Code 4:

Status Code	Description	Ht	Age	CR	CC	Data used in Regression Calculation?
4	HST + Age, NR	>= 1	>=1	all OK	all OK	No

Status code 4 is used for live trees only, and usually only to better describe the characteristics of understory trees in multi-storied stands. Since all live trees smaller than 4.0" DBH have a field recorded height (see the description of <Trees;Ht>) regression derived heights are unnecessary for them. However, it may be beneficial to describe the age of such trees - understory trees may be older than trees of similar size in open growing conditions. For status code 4, height and age are recorded. Crown ratio and crown class are optionally recorded. The age is used in calculation of the age regression. The height (and crown ratio if recorded) is not used for regression calculation.

Another potential use of status code 4 is when an age is determined for a site index tree but later it is discovered to have top defect or pronounced radial growth suppression that precludes its use for site index. The age is valid and will be used for the age regression if coded status 4 - the height (and crown ratio if recorded) is used for the tree but not for calculation of the height (or crown ratio) regressions.

Status Code 5:

Status Code	Description	Ht	Age	CR	CC	Data used in Regression Calculation?
5	HST, NR	>= 1	0	all OK	all OK	No

Status code 5 is very similar to status code 4, but no age is recorded. This is the status code commonly used for the live trees smaller than 4.0" DBH. Height is recorded, crown ratio and crown class are optionally recorded, but the values are not used to calculate regressions, since all live trees smaller than 4.0" DBH have the height estimated or measured, and recorded during the cruise.

Status Code 6:

Status Code	Description	Ht	Age	CR	CC	Data used in Regression Calculation?
6	HST, for Regression	>= 1	0	>0	>0	Yes

Status code 6 is the most common status chosen for trees that are measured as HST's. The height, crown ratio, and crown class are recorded for these trees, and the measurements are used in calculation of the height and crown ratio regressions for the stand. Trees with broken tops shall not be selected as status code 6 sample trees.

{For the purposes of check cruising, all Status code 6 and 8 trees (see <Trees;S>) shall be clearly identifiable in each 170 by 100 foot plot. To aid check cruising, the cruiser shall paint the tree number (see <Trees;Tr>) on each subject tree.}

Status Code 7:

Status Code	Description	Ht	Age	CR	CC	Data used in Regression Calculation?
7	TopHt + Site Tree	≥ 1	≥ 1	> 0	1, 2, or 3	Yes

SLI subsampling in each stand is designed to derive estimates of the site index, stand origination date (of the largest trees), and the stand Top Height²⁵. See descriptions of status codes 8 and 9 below for details on site index sampling and Top Height sampling, respectively.

For status code 7, height, age, crown ratio, crown class, and remarks code for the site curve used are recorded. SLI cruise compilation uses the values to calculate averages for site index and Top Height, and the regressions for height, age, and crown ratio for the cruise.

For efficient cruise plot measurement, flagged trees (see ~~<Trees;F>~~ above) may serve as suitable candidates for both HST and the site index and/or Top Height sampling — choose candidate trees to take advantage of these opportunities. **{For the Riparian Vegetation Data Collection project, status 7 trees are not needed.}**

Status Code 8:

Status Code	Description	Ht	Age	CR	CC	Data used in Regression Calculation?
8	Site Tree	≥ 1	≥ 1	> 0	1, 2, or 3	Yes

SLI sampling for site index is done to arrive at an estimate that is used in growth modeling for each stand. Site index is sampled for by choosing and measuring a site index sample tree on every 170 by 100 foot overstory/snag plot (i.e. – L1, P6; L2, P12; L3, P18; L4, P24; and L5, P30)²⁶.

Each stand shall have at least five²⁶ trees of the predominant species in the stand sampled for site index. Do not include hardwoods in the selection of site index trees for mixed conifer/hardwood stands. In predominantly red alder stands only, obtain at most three alders as site index samples.

Select one tree from the trees that are in the plot to measure for site index assessment. **Follow the guidelines found in Table 17 shown in Appendix E for selecting site measurement trees.** Selection criteria are specific to the site curve to be applied - use the site curve which best represents the stand characteristics (species, elevation, region, etc.). The generic rules for all site curves are sufficient unless stand characteristics match a more specific site curve category. In general, site index sample trees shall meet the following criteria (additional details are shown in Table 17):

1. The tree must have developed free from height growth suppression.
2. Be a dominant or codominant (and not open grown) - follow specific guidance for each site curve.
3. Have no evidence of top damage, past or present.
4. Have no damage which could influence height growth.

²⁵ See the Glossary in Appendix B for definition of Top Height.

²⁶ In the unlikely event that a 170 by 100 foot overstory/snag plot did not yield an appropriate predominant site index sample tree, an additional sample for site index should be selected from an adjoining plot in the stand, to ensure a minimum of five trees per stand being sampled.

5. Have no evidence of a pronounced period of radial growth suppression.

Status code 8 trees shall have height, age, crown ratio, and crown class recorded. In addition, record the remarks code of the site curve selection rule used to choose the tree (see Table 17). SLI cruise compilation uses the values to calculate stand average site index, and the regressions for height, age, and crown ratio for the cruise.

For efficient cruise plot measurement, flagged trees (see <Trees;F> above) may serve as suitable candidates for both HST and the site index and/or Top Height sampling - choose candidate trees to take advantage of these opportunities.

{For the purposes of check cruising, all Status code 6 and 8 trees (see <Trees;S>) shall be clearly identifiable in each 170 by 100 foot plot. To aid check cruising, the cruiser shall paint the tree number (see <Trees;Tr>) on each subject tree.}

Status Code 9:

Status Code	Description	Ht	Age	CR	CC	Data used in Regression Calculation?
9	TopHt Tree	>=1	0	>0	1, 2, or 3	Yes

SLI sampling for Top Height is done to arrive at an estimate of the size and composition of the largest "crop" trees that occupy a stand. Top Height is defined as the mean height of the largest 40 (ranked by DBH) trees per acre. Trees with broken tops shall not be selected as Top Height sample trees. For well-stocked stands having a mean DBH less than 20", it is assessed by selection of the largest DBH tree on a 1/40th acre plot (18.6' radius) at a sample point (every third plot for SLI, see discussion of Status Code 8 above). For stands with larger trees, the sample may be the nearest dominant or codominant sample tree to plot center (if selection via the largest DBH tree on the 1/40th acre plot method results in no sample or an inappropriate sample). If a suitable candidate tree is not available on the plot, take one at the next plot but do not offset the every third plot sequence.

Each stand shall have at least five²⁷ Top Height sample trees recorded (status codes 7 or 9). Status code 9 trees shall have height, crown ratio, and crown class recorded. SLI cruise compilation uses the values to calculate the Top Height, and the regressions for height and crown ratio for the cruise.

For efficient cruise plot measurement, flagged trees (see <Trees;F> above) may serve as suitable candidates for both HST and the site index and/or Top Height sampling - choose candidate trees to take advantage of these opportunities.

S (status code) is a required entry in *HHSII*. A default value of 0 is set for each new *Trees* level record and may be edited if needed. Values from 0 through 9 are acceptable and a lookup list for the field may be accessed by pressing the F2 key on the hand held data recorder when the cursor is in the status code field. The cursor movement from left to right for a tree record is dictated by the value entered into the status code field. For example, when moving left to right for status code 6 the cursor moves from the status code field to the height field, then skips the age field and goes to the crown ratio field - since age is not recorded for a status code 6 tree. Any normally user-accessible skipped fields may be entered by moving into them from right to left (using the Left arrow key).

²⁷ If every third plot does not yield enough samples, additional samples for Top Height should be selected from other plots in the stand.

Note: *HHSli* includes error checking routines which prevent invalid combinations of status code and the other data recording items. See Appendix D for full details. **{For the riparian vegetation data collection tree sample status (S) will be collected as described, with the exception that Status 7 and 9 are not required.}**

< *Trees;Ht* >

Col # reference – 9

Ht stands for total Tree Height measured to the nearest foot. Tree height is recorded for all live trees less than 4.0" DBH. Live trees 4.0" DBH and larger are subsampled for height. The height subsampling occurs according to procedures described under the < *Trees;F* > and < *Trees;S* > fields, above. Tree height is measured from the ground level on the uphill side of the tree to its highest point.

To summarize the height recording requirements in SLI, heights are recorded for:

- All live trees less than 4.0" DBH
- All dead trees (and stumps) that have missing tops (960 damage/severity code)
- Live trees "flagged" by *HHSli* as height sample tree candidates (only if top is unbroken)
- A site index sample tree(status 8)- (minimum of 1 per 170 by 100 plot; thus 5 per 500 by 170 plot)
- ~~A Top Height sample tree(status 7,9) (minimum of 1 per 170 by 100 plot; thus 5 per 500 by 170 plot)~~ **{Top Height sample trees are not needed.}**

In addition to the general height recording procedure above, the cruiser uses best professional judgement to provide the most useful cruise data by:

- If feasible, recording height for at least three (status code 6, 7, 8, or 9) trees per species in the cruise.
- Striving to collect height samples representative of the range of diameters (small-medium-large) for each species
- Not recording heights for live trees 4.0" and greater that have missing tops - trees with broken tops that have regenerated sufficiently to represent the general canopy level may be selected for height sampling
- Avoiding height sampling of severely leaning trees
- Recording height for a substitute tree when a "flagged" tree is unsuitable for height subsampling (unbiased selection, e.g. the next "in" tree)

Heights recorded for trees less than 20' tall are estimated to the nearest 3' height class, and may be effectively group tallied by species and height class. All tree heights are rounded to the nearest foot. Trees less than 1' tall (true height less than 0.5' tall) are not tallied. Trees from 1' to 3' tall are represented as the 2' tall height class and shall have a DBH of 0.0" recorded. Trees from 4' to 6' tall are represented as the 5' tall height class and shall also have a DBH of 0.0" recorded. Record diameters of trees less than 20' tall to the nearest one-inch DBH class (avoid recording tenths of inches for these trees).²⁸

Height Class	Range of tree heights	DBH to Record
2'	1' – 3'	0.0" (zero-inch class)
5'	4' – 6'	0.0" (zero-inch class)

²⁸ The cruise compiler used for SLI is built to function using one-inch diameter classes. Trees 6' tall and less, that have a recorded DBH >0" [1" is the next larger DBH "category" recognized by the compiler] cause an error message - and the compiler assumes that the DBH is correct and that the recorded height is wrong [uses a regression height for the diameter tree recorded].

Height Class	Range of tree heights	DBH to Record
8'	7' – 9'	Est. actual (nearest inch)
11'	10' – 12'	Est. actual (nearest inch)
14'	13' – 15'	Est. actual (nearest inch)
17'	16' – 18'	Est. actual (nearest inch)
20'	19' - 21'	Est. actual (nearest inch)

One objective of the SLI cruise is to report the average height of snags in the stand. To accomplish this, special consideration is given to cruising dead trees for height. Dead trees that have their tops intact are not cruised for height – heights are assigned through use of the regression developed for the live trees. Dead trees with broken tops (that have more than 10% of the original height broken out) shall have their height to the break (ignoring any small "slivers") estimated and recorded. Such trees shall have a damage/severity code of 960 recorded. In addition, the Defect Deduction % for the missing top is determined and recorded for the tree.

HHSli has a tree height calculator function to assist in the height measurement work. It is accessed by pressing the F7 key and choosing the **DoCalc.run** item from the list. If the calculator is accessed while in the **Trees** branch level of the program, the height result from the calculator is automatically entered into the height field for the tree record at the cursor position. See Appendix D for more details.

Ht is an optional entry in **HHSli** item but may be required for certain status code trees. A value of 0 is entered by the program for any new **Trees** branch level record and may be edited if necessary. A height of 0 means that the height has not been assessed for the sample tree. Recorded height values equal to or greater than 1' and less than or equal to 300' are acceptable. A value of 1' will trigger a warning message from the program (remember, a 1' tall tree is recorded as a tree in the 2' tall height class). A height value of 180' or more will also trigger a warning message from the program.

Left to right cursor movement in **HHSli** is controlled depending upon the status code entry for a tree. For status codes that do not require height recording, the field will be skipped when moving left to right across the record. The Left arrow key may be used to enter the height field from the right if necessary. **{For the riparian vegetation data collection this will be used as described.}**

<Trees;Age>

Col # reference – 10

Age is the field for recording the measured breast height age for site index trees (status code 7 or 8) or for status code 4 trees. Recorded age shall always be the breast height age. Do not record age for trees younger than 1 year old at breast height (age zero at breast height is not allowed for status code 4, 7, or 8). In predominantly single-aged stands the age measurements taken for the site index sampling should suffice to describe the stand origination date. For two-aged or multi-aged stands, collect sufficient age samples to provide for the age regression calculation for the stand. See Appendix E and Figure 18 for the procedure used for determining the age of large trees.

Age is an optional entry in **HHSli** but may be required for certain status code trees. A value of 0 is entered by the program for any new **Trees** branch level record and may be edited if necessary. An age value of 0 means that the age has not been assessed for the sample tree. Recorded age values equal to or greater than 1 year and less than or equal to 999 years are acceptable. A value of 1 year or a value equal to or greater than 150 years will trigger a warning message from the program.

Left to right cursor movement in **HHSli** is controlled depending upon the status code entry for a tree. For status codes that do not require age recording, the field will be skipped when moving left to right across the record. The Left arrow key may be used to enter the age field from the right if necessary. **{For the riparian vegetation data collection this will be used as described. PLEASE NOTE: On trees bored to determine age (status 8), please measure the radial growth increment data entered in 1/20ths of inches and enter this in the <Trees;User3> field. (See <Trees;User3>.)}**

< Trees;CR >

Col # reference – 11

CR stands for Live Crown Ratio, which is the length of the live crown portion of the tree divided by its total height. As a cruise item, crown ratio is subsampled in SLI as part of the measurements taken for HST trees, Top Height trees, and Site Index trees (status codes 6, 7, 8, and 9). Crown ratio is optionally recorded for status code 0, 4, and 5 trees, but the measurements are not used for the crown ratio regression calculations for the stand. It is recommended to record crown ratio and crown class of a representative sample of status code 5 trees that are less than 4.0" DBH in stands that have significant quantities of sapling sized trees. Crown ratio is not recorded for status code 1, 2, or 3 trees.

Live crown length is assessed from the uppermost live leader or branch to the lowest live branch for trees with uniform live crown distribution (epicormic shoots are not considered branches for this definition). For trees with non-uniformly distributed live crown, visually adjust large openings in the crown or lopsided crowns by "transferring" lower branches to fill in the gaps. Compressing the live crown length because the crown appears "sparse" or contains "unhealthy" foliage is not appropriate.

CR is an optional entry in **HHSli** but may be required for certain status code trees. A value of .00 is entered by the program for any new **Trees** branch level record and may be edited if necessary. A crown ratio of .00 means that the crown ratio has not been assessed for the sample tree. Recorded crown ratio values equal to or greater than .01 (1% crown) and less than or equal to .99 (99% crown) are acceptable. A recorded **CR** value of .08 or less (less than 9% crown) will trigger a warning message from the program.

HHSli automatically enters the decimal point for the crown ratio entry. For example, to record a crown ratio of 44%, press the 4 key twice – the display will show .44 in the crown ratio field. Left to right cursor movement in **HHSli** is controlled depending upon the status code entry for a tree. For status codes that do not require crown ratio recording, the field will be skipped when moving left to right across the record. The Left arrow key may be used to enter the crown ratio field from the right if necessary. **{For the riparian vegetation data collection this will be used as described. Check and ensure no missing Live Crown Ratio (CR) when Crown Class (CC) is filled in.}**

< Trees;CC >

Col # reference - 12

CC stands for live tree Crown Class, which is the description of the relative position of the tree crown with respect to competing vegetation surrounding the tree. The crown class for a tree is determined in the context of its immediate environment, trees or shrubs that are competing for sunlight or moisture with the subject tree.

As a cruise item, crown class is subsampled in SLI as part of the measurements taken for HST trees, Top Height trees, and Site Index trees (status codes 6, 7, 8, and 9). Crown class is optionally recorded for

status code 0, 4, and 5 trees. It is recommended to record crown ratio and crown class of a representative sample of status code 5 trees that are less than 4.0" DBH, especially for stands that have significant quantities of sapling sized trees. Crown class is not recorded for status code 1, 2, or 3 trees.

There are nine crown classes (1 – 9) as shown in the table below (a code 0 is used to indicate that crown class was not determined for the tree). Codes 1 through 6 are applied to trees in stands that have attained or surpassed crown closure. Brush cover crown classes (codes 7, 8, and 9) only apply to otherwise isolated or dominant trees (such as in seedling and sapling stands) with brush competition. In other words, brush cover crown class codes are used as modifiers for open-grown or dominant trees. Competition from adjacent trees is more important than competition from shrubs if they both occur. Generally, brush cover crown codes are used in stands where overstory tree competition is absent. A description of each crown class follows below. See the discussion of crown class as it relates to stand structure conditions that could be described as complex (e.g. multi-aged, multistory), located in Appendix E.

Crown Class Code	Description
0	Crown class not determined
1	Open-grown or isolated
2	Dominant
3	Codominant
4	Intermediate
5	Overtopped
6	Remnant
7	Leader above brush
8	Leader within brush
9	Leader overtopped by brush

Open-grown or Isolated: Tree crowns receive full light from above and from all sides. There is little or no competition to the tree's crown from neighboring trees. In even-aged stands, these trees have their crown well above the general canopy. An isolated tree is generally similar in age to other trees comprising the stand.

Dominant: Tree crowns receive full light from above and partly from the sides. Crowns extend above the general level of the crown cover of others of the same stratum and are not physically restricted from above, although possibly somewhat crowded by other trees on the sides.

Codominant: Tree crowns receive full light from above, but comparatively little from the sides. Crowns form a general level of crown stratum, are not physically restricted from above, but are crowded by other trees from the sides.

Intermediate: Tree crowns occupy a definitely subordinate position and are subject to strong lateral competition from crowns of dominants and codominants. They receive little direct light from above through small holes in the canopy, but no light from the sides.

Overtopped: Tree crowns receive no direct light from above or from the sides and are entirely below the general level of dominant and codominant trees.

Remnant: Trees that remain from a previous management activity or catastrophic event. The tree is significantly older than the surrounding vegetation. Remnant trees do not form a canopy layer and are usually isolated individuals or in small clumps.

Leader Above Brush: The terminal leader of the tree is above the surrounding brush while the middle or lower crown may be within the brush canopy.

Leader Within Brush: The terminal leader and upper crown of the tree is within the brush canopy.

Leader Overtopped by Brush: The crown of the tree is completely overtopped by the surrounding brush.

CC is an optional entry in **HHSli** but may be required for certain status code trees. A value of 0 is entered by the program for any new **Trees** branch level record and may be edited if necessary. A crown class of 0 means that the crown class has not been assessed for the sample tree. Crown class codes from 0 through 9 are acceptable and a lookup list for the field may be accessed by pressing the F2 key on the hand held data recorder when the cursor is in the crown class field.

Left to right cursor movement in **HHSli** is controlled depending upon the status code entry for a tree. For status codes that do not require crown class recording, the field will be skipped when moving left to right across the record. The Left arrow key may be used to enter the crown class field from the right if necessary. ***{For the riparian vegetation data collection this will be used as described. Check and ensure no missing Crown Class (CC) values on measured height sample trees (status 6 and 8).}***

< **Trees;Dmg1** >

Col # reference - 13

Dmg1 stands for Tree Damage Code; first occurrence. Each tree recorded on the **Trees** branch level shall be assessed by the cruiser for various types of damage, based upon visible physical evidence. As many as three different kinds of damage instances may be recorded for a tree. Each is referred to as a damage occurrence, or "damage call" made by the cruiser and recorded for the tree. Each damage call made is assessed for severity as well. Please see the discussion of < **Trees;Sv1** > that follows. Group tallied trees (more than 1 tree represented by a single **Trees** branch level record) with recorded damage means that all of them share the damage indicated.

When assessing and recording damage calls for sample trees, use **Dmg1** for the entry of a single call. If two or three damage calls are made for a tree, record the second call in **Dmg2** and any third call in **Dmg3**. By leaving any of the fields blank, the cruiser indicates that those fields were not needed for recording one or more damage calls for the tree. Each kind of damage is considered either Class 1 damage or Class 2 damage. From a stand health perspective, Class 1 agents are more significant than Class 2 damage agents. Since damage recording is limited to no more than three damage calls per tree, record Class 1 damage agents before recording any Class 2 damage agents. Damage agent class is specified in Table 12 below.

Each kind or type of damage is represented by either a one or two digit number code (and is stored as a character in **HHSli**). Many, but not all, types of damage have associated codes representing the severity level or impact of the damage to the tree. A severity rating code is a single digit number and is related to the damage code to form a depiction of the damage and its severity. Table 12 below lists the damage and severity codes to be used for SLI.

In general, the damage code indicates a cause and the severity may describe its character, extent, or impact. Damage incidence is frequently associated with unsound or missing wood in the tree bole.

Unsound or missing wood volume is quantified and recorded separately from the damage code by the cruiser for each tree sampled. See the description of < **Trees; Def1**> for further details.

The following are some examples of tree damage descriptions and what their two digit Damage Code + one digit Severity would be:

- A tree with a missing top: dmg=96 severity=0
- ~~▪ A tree with conk rot (*Phellinus pini*) and multiple conks >16' apart on the bole: dmg=47 severity=3~~
- A sitka spruce with dead terminal leader from tip weevil attack: dmg=25 severity=2
- A dead tree suspected to be a victim of suppression related mortality: dmg=50 severity=0
- ~~▪ A dead tree with red needles in patch of Douglas fir with DF bark beetle kill: dmg=3 severity=2~~
- ~~▪ A tree with a butt scar from logging damage: dmg=91 severity=2~~
- ~~▪ A tree with a butt scar from windthrow: dmg=90 severity=2~~
- ~~▪ A tree with a few broken green branches from adjacent windthrow: dmg=81 severity=1~~
- A tree with damage of unknown cause: dmg=0 severity=1

The **SLI Field Reference Cards** (shown in Appendix E) are available as a handy reference to the damage and severity codes for use while cruising.

See Appendix C for information on identification of forest tree damaging insects, diseases, and tree physical injuries.

Table 12: Damage & Severity Rating codes

CODE	DAMAGE CAUSE UNKNOWN	<i>(Class 2)</i>
0	Unknown Damage	
CODE	SEVERITY	
1	Damage present but unknown cause	
INSECT CODES		
CODE	BARK BEETLE CODES	<i>(Class 1)</i>
1	General	
2	Mountain pine beetle (All Pinus spp.)	
3	Douglas fir beetle (PSME)	
4	Spruce beetle (Picea spp.)	
5	Western pine beetle (PIPO)	
6	Pine engraver (All Pinus spp.)	
7	Fir engraver (Abies spp.)	
8	Silver fir beetle (ABAM)	
9	Red turpentine beetle (All Pinus spp.)	
CODE	SEVERITY	
1	Unsuccessful current attack	
2	Successful current attack	
3	Last year's successful attack	
4	Older dead	
5	Top kill	
CODE	DEFOLIATOR CODES	<i>(Class 1)</i>
10	General	
11	Western blackheaded budworm	
13	Douglas fir tussock moth	
15	Western spruce/Modoc budworm	
16	Western hemlock looper	
17	Sawflies	
18	Needle and sheath miners	
CODE	SEVERITY	
	Divide live crown into thirds. Rate each third separately based on the following percentages of old and new foliage absent:	
	— 0 — No detectable defoliation	
	— 1 — up to 33% foliage missing	
	— 2 — 34-66% foliage missing	
	— 3 — 67-100% foliage missing	
1-9	Obtain a rating for the entire tree by adding ratings for each third of the crown. Record total as the severity code.	

Table 12: Damage & Severity Rating Codes (continued)

CODE	OTHER INSECTS CODES	<i>(Class 2)</i>
20	General	
21	Shoot moths	
22	Weevils	
23	Wood borers	
24	Balsam woolly adelgid	
25	Sitka Spruce terminal weevil	
CODE	SEVERITY	
1	Bottlebrush or shortened leaders and 0-2 forks on tree stem, OR less than 20% of branches affected, OR less than 50% of bole with visible larval galleries.	
2	3+ forks on tree stem, OR 20% or more of branches affected, OR terminal leader dead, OR \geq 50% of bole with visible larval galleries.	
PHYSICAL INJURY CODES		
CODE	ANIMAL INJURY CODES	<i>(Class 2)</i>
70	Animal-General	
71	Mountain beaver	
72	Livestock	
73	Deer or elk	
74	Porcupines	
75	Pocket gophers, squirrels, mice, voles, rabbits, hares	
76	Beaver	
77	Bear	
78	Human (not logging)	
CODE	SEVERITY	
1	Less than 20% of crown affected. Bole damage restricted to less than 1/2 of circumference.	
2	20% or more of crown affected. Bole damage to 1/2 or more of the circumference.	
CODE	WEATHER INJURY CODES	<i>(Class 2)</i>
80	Weather-General	
81	Windthrow or wind breakage	
82	Snow / ice bending or breakage	
83	Frost damage on shoots	
84	Winter desiccation	
85	Drought/heat moisture deficiency	
86	Sun scald	
87	Lightning strike	
CODE	SEVERITY	
1	Less than 20% of crown affected.	
2	20% or more of crown affected or any damage to bole.	

Table 12: Damage & Severity Rating Codes (continued)

CODE	OTHER PHYSICAL INJURY CODES	(Class 2)
90	Other/unknown	
91	Logging	
92	Fire: basal scars or heat scorch	
94	Air pollution or other chemicals	
98	Forks/lean/crooks/sweep <i>{Used to indicate "Tree Lean" }</i>	
99	Checks/bole cracks	
CODE	SEVERITY	
0	No conditions <i>{Use valid 0 code only. Direction and amount of lean will be entered elsewhere – (see Tree;User1). }</i>	
1	Less than 20% of crown affected	
2	20% or more of crown affected or any damage to bole.	
CODE	BROKEN/MISSING TOP CODE	(Class 2)
96	Broken/missing top	
CODE	SEVERITY	
0	10 + percent of the original height broken or missing	
CODE	DEAD TOP CODES	(Class 2)
97	Dead top <i>Record severity as a percentage of the normal or original tree height that is dead.</i>	
CODE	SEVERITY — PERCENTAGE DEAD	
0	01-10%	
1	11-20%	
2	21-30%	
3	31-40%	
4	41-50%	
5	51-60%	
6	61-70%	
7	71-80%	
8	81-90%	
9	91-100%	

Table 12: Damage & Severity Rating Codes (continued)

DISEASE CODES		
CODE	DWARF MISTLETOE CODES	<i>(Class 1)</i>
30	Dwarf mistletoe	
CODE	SEVERITY	
	Divide the live crown into thirds. Rate each third separately and give each third a rating based on the following cutoffs:	
	0 = No visible infections.	
	1 = 1/2 or less of total number of branches have visible infections.	
1-6	2 = More than 1/2 the branches have visible infections.	
	Obtain a rating for entire tree by adding ratings for each third. For dead trees with evidence of dwarf mistletoe such as brooms on the tree or ground, estimate rating at time of death and record.	
CODE	TRUE MISTLETOE CODES	<i>(Class 1)</i>
31	True mistletoe (hardwoods)	
CODE	SEVERITY	
1	Branch infections. Less than 50% of the crown involved	
2	Branch infections. 50% or more of crown involved. Any occurrence on the bole.	
CODE	WHITE PINE BLISTER RUST CODES	<i>(Class 1)</i>
36	White Pine Blister Rust (PIMO)	
CODE	SEVERITY	
1	Branch infections located greater than 2' from tree bole.	
2	Branch infections located between 6" and 2' from bole.	
3	Bole infections or branch infections within 6" of bole.	
CODE	STEM/BRANCH CANKER CODES	<i>(Class 2)</i>
40	General	
41	Western gall rust (PIPO, PICO)	
42	Comandra blister rust (PIPO)	
43	Stalactiform rust (PICO)	
44	Atropellis canker (Pinus Spp.)	
45	Cytospora/Phomopsis (PSME, Abies Spp.)	
CODE	SEVERITY	
1	Branch infections. Less than 50% of the crown involved.	
2	Branch infections. 50% or more of crown involved or any occurrence on the bole.	

Table 12: Damage & Severity Rating Codes (continued)

CODE	STEM DECAY CODES	<i>(Class 2)</i>
46	General	
47	Red-ring rot (Phellinus pini, white speck)	
48	Rust-red stringy rot (Indian paint fungus, E.T.)	
49	Brown cubical butt rot (Phaiolus schweinitzii)	
CODE	SEVERITY	
1	One conk on stem or at ground line	
2	Two or more conks separated by <16' on the bole	
3	Two or more conks separated by >16' or more on the bole	
4	No conks. Visible decay in interior of bole	
CODE	SPECIAL AGENTS	<i>(Class 2)</i>
50	Suppression—Tree is overtopped by other trees and won't live 10 more years, Or: will prevent a sapling from reaching 5.0 inches DBH, Or: tree is dead.	
51	Excessively Deformed Sapling—Branch infections. 50% or more of crown involved. Any occurrence on the bole.	
CODE	SEVERITY	
0	No Severity	
CODE	FOLIAR DISEASE CODES	<i>(Class 2)</i>
56	General	
55	Swiss needle cast———(PSME)	
57	Rhabdocline needle cast——(PSME)	
58	Elytroderma needle cast——(PIPO)	
59	Broom-rusts———(Abies, Picea, and Juoc-Gymnosporangium)	
CODE	SEVERITY	
1	Less than 20% of foliage affected, or less than 20% of crown in brooms. For SNC, needle retention >2 years.	
2	20% or more of foliage affected, or 20% or more of crown in brooms. For SNC, needle retention <or = 2 years.	
CODE	ROOT DISEASE CODES	<i>(Class 1)</i>
60	General	
61	Annosus root disease	
62	Armillaria root disease	
63	Black-stain root disease	
65	Laminated root rot	
66	Port Orford cedar root disease	
CODE	SEVERITY	
1	Suspect/Proximity Tree: Live tree within 30 feet of a tree, stump, snag, or blowdown with identifiable root disease OR dead tree, not diagnosed with root disease, within 30 feet of a tree, stump, snag, or blowdown with identifiable root disease.	
2	Dead tree with signs or symptoms diagnostic for root disease such as characteristic decay, stain in sapwood or cambium, ectotrophic mycelia, mycelial fans, or conks OR symptomatic live tree where positive identification for root disease can be made without destructive sampling. Example: conks are present in root crotch.	

Dmg1 is an optional entry in **HHSli**. Any entry is compared to a checklist of valid damage codes – only valid code list entries are acceptable (a blank is used to indicate “none”). *{For the riparian vegetation data collection this data the only damage code for Dmg1 will be the 98(OTHER PHYSICAL INJURY - LEAN CODE) code to indicate tree lean. During data entry as each overstory tree/snag is evaluated an assessment of its lean should be done. If the tree/snag is leaning at all (away or toward the study stream) a code of Dmg1=98 should be used and Sv1=0 and the code describing the direction and amount of the lean entered in User1 (see Trees;User1). Dmg1 and Sv1 must either both be specified (non-blank), or must both be blank.}*

< **Trees;Sv1** >

Col # reference - 14

Sv1 stands for the Severity Code directly related to the damage call made in < **Trees;Dmg1** >. In general, the damage code indicates a cause and the severity may describe its character, extent, or impact. See the description of < **Trees;Dmg1** > and Table 12 above for complete details.

There are different severity code lists in **HHSli** that are accessed depending upon the entry made in the **Dmg1** field, see Table 12 above for details on the severity codes pertinent to each type of damage.

Sv1 is an optional entry in **HHSli**. If an entry is made for < **Trees;Dmg1** > then a severity relating to it must be recorded in **Sv1**. Only those codes presented in the lookup list for the field (accessed in **HHSli** by pressing the F2 key while the cursor is on the field) are acceptable. **HHSli** issues an error message upon level retreat (F4 key) or sibling jump (Alt+F5 key) if a severity is not recorded for each damage code recorded. Using the L4LevCk.run program accessed by pressing the F8 key while in the **Trees** level also performs this error check.

{For the riparian vegetation data collection Sv1 will be used inconjunction with Dmg1 as a dedicated location to collect Lean data. Because codes 1 through 6, which are used to categorize tree lean direction and amount (see Tree;User1) exceed Sv1 values, Sv1 should be populated with the valid value '0' for each Dmg1=98. The code describing the direction and amount of the lean should be entered in User1 (see Trees;User1). Dmg1 and Sv1 must either both be specified (non-blank), or must both be blank.}

< **Trees;Dmg2** >

Col # reference - 15

Very similar to **Dmg1**, Dmg2 stands for Tree Damage & Severity Code; second occurrence. See the description of < **Trees;Dmg1** > above for complete details.

Dmg2 is an optional entry in **HHSli**. Any entry is compared to a checklist of valid combinations of damage code and severity rating – only valid code list entries are acceptable.

{For the riparian vegetation data collection Dmg2 is the dedicated location to collect broken/missing top damage data. If a tree/snag has 10+ percent of the original height broken or missing – a code of 96 (BROKEN/MISSING TOP CODE) should be entered Trees; Dmg2 field. Dmg2 and Sv2 must either both be specified (non-blank), or must both be blank.}

< **Trees;Sv2** >

Col # reference - 16

Very similar to Sv1, Sv2 stands for the Severity Code directly related to the damage call made in < **Trees;Dmg2** >. In general, the damage code indicates a cause and the severity may describe its character, extent, or impact. See the description of < **Trees;Sv1** > above for complete details.

Sv2 is an optional entry in **HHSli**. If an entry is made for < **Trees;Dmg2** > then a severity relating to it must be recorded in **Sv2**. Only those codes presented in the lookup list for the field (accessed in **HHSli** by pressing the F2 key while the cursor is on the field) are acceptable. **HHSLI** issues an error message upon level retreat (F4 key) or sibling jump (Alt+F5 key) if a severity is not recorded for each damage code recorded. Using the L4LevCk.run program accessed by pressing the F8 key while in the **Trees** level also performs this error check.

{For the riparian vegetation data collection Sv2 should only be populated with a valid '0' value for each corresponding use of Dmg2=96 (BROKEN/MISSING TOP CODE). Dmg2 and Sv2 must either both be specified (non-blank), or must both be blank.}

< **Trees;Dmg3** >

Col # reference - 17

Very similar to **Dmg1**, Dmg3 stands for Tree Damage & Severity Code; third occurrence. See the description of < **Trees;Dmg1** > above for complete details.

Dmg3 is an optional entry in **HHSli**. Any entry is compared to a checklist of valid combinations of damage code and severity rating – only valid code list entries are acceptable.

{For the riparian vegetation data collection Dmg3 should be left unused. Since only up to two damage conditions (Lean – use Dmg1=98; and Broken/missing top – use Dmg2=96) are needed for damage so a third occurrence is not needed. Dmg3 and Sv3 must either both be specified (non-blank), or must both be blank.}

< **Trees;Sv3** >

Col # reference - 18

Very similar to Sv1, Sv3 stands for the Severity Code directly related to the damage call made in < **Trees;Dmg3** >. In general, the damage code indicates a cause and the severity may describe its character, extent, or impact. See the description of < **Trees;Sv1** > above for complete details.

Sv3 is an optional entry in **HHSli**. If an entry is made for < **Trees;Dmg3** > then a severity relating to it must be recorded in **Sv3**. Only those codes presented in the lookup list for the field (accessed in **HHSli** by pressing the F2 key while the cursor is on the field) are acceptable. **HHSLI** issues an error message upon level retreat (F4 key) or sibling jump (Alt+F5 key) if a severity is not recorded for each damage code recorded. Using the L4LevCk.run program accessed by pressing the F8 key while in the **Trees** level also performs this error check.

{For the riparian vegetation data collection Sv3 should be left unused since no third occurrence of damage (Trees;Dmg3) is recorded. Dmg3 and Sv3 must either both be specified (non-blank), or must both be blank.}

< Trees;Def1>

Col # reference - 19

Def1 stands for wood volume Defect Deduction; percentage missing or unsound in the lowest 1/3rd of the tree bole. Each tree recorded on the **Trees** branch level shall be assessed by the cruiser for various types of damage, based upon visible physical evidence (see the description of **< Trees;Dmg1>**). Damage incidence frequently is associated with unsound or missing wood in the tree bole. Unsound or missing wood volume is quantified and recorded in the **Def1**, **Def2**, and **Def3** fields for each tree sampled.

Quantification of volume defect for the cruise trees is used by the cruise compiler in SLI to provide information on gross and net timber volume, and for estimation of wood products economic value for the stand.

The tree bole length from ground level to the tip top is divided into thirds. For trees with missing tops, the bole length considered is that which would have existed if the top were intact. Each third is assessed for missing or unsound wood. Deductions are made considering the affected cubic foot volume content of the tree bole ("sawlog" defect based calls are not appropriate, e.g. sweep would not be considered a deductible defect). The percentage of missing or unsound wood in the lowest third of the tree bole is estimated by the cruiser and recorded in the **Def1** field.

Each deduction entry is made by recording a decimal value representing the percentage deduction. For example, .05 is entered to represent a five percent deduction for missing or unsound wood in the lowest one-third of the tree bole. To indicate a 100% defect deduction for any third of a tree bole length, a value of .99 is recorded. Since a tree bole is assessed in thirds relative to its total length, the percentage distribution of the total tree volume by log position need not be considered. That is, each third might be considered as a "log" – thereby making calculation of percent defect more direct.

Def1 is an optional entry in **HHSli**. Values from .00 through .99 are accepted by the program. The default value for the field is .00 (representing no deduction) and may be edited by the user if needed. **{For the riparian vegetation data collection this will be used as described.}**

< Trees;Def2>

Col # reference - 20

Similar to **Def1** described above, Def2 stands for wood volume Defect Deduction; percentage missing or unsound in the middle 1/3rd of the tree bole. Each tree recorded on the **Trees** branch level shall be assessed by the cruiser for various types of damage, based upon visible physical evidence (see the description of **< Trees;Dmg1>**). Damage incidence frequently is associated with unsound or missing wood in the tree bole. Unsound or missing wood volume is quantified and recorded in the **Def1**, **Def2**, and **Def3** fields for each tree sampled.

Please see the description of **< Trees;Def1>** above, for the procedural details pertinent to each of the defect deduction fields.

Def2 is an optional entry in **HHSli**. Values from .00 through .99 are accepted by the program. The default value for the field is .00 (representing no deduction) and may be edited by the user if needed. **{For the riparian vegetation data collection this will be used as described.}**

< **Trees;Def3** >

Col # reference - 21

Similar to **Dmg1** described above, Def3 stands for wood volume Defect Deduction; percentage missing or unsound in the top 1/3rd of the tree bole. Each tree recorded on the **Trees** branch level shall be assessed by the cruiser for various types of damage, based upon visible physical evidence (see the description of < **Trees;Dmg1** >). Damage incidence frequently is associated with unsound or missing wood in the tree bole. Unsound or missing wood volume is quantified and recorded in the **Def1**, **Def2**, and **Def3** fields for each tree sampled.

Please see the description of < **Trees;Def1** > above, for the procedural details pertinent to each of the defect deduction fields.

Def3 is an optional entry in **HHSli**. Values from .00 through .99 are accepted by the program. The default value for the field is .00 (representing no deduction) and may be edited by the user if needed. **{For the riparian vegetation data collection this will be used as described.}**

< **Trees;C** >

Col # reference - 22

C stands for dead tree ~~[and stump]~~ Decay Class (also referred to as "Condition" for short). The decay class is used to describe the physical decomposition characteristics of snags ~~[and stumps if recorded]~~. SLI summarizes the dead tree information by decay class. Decay class shall be recorded for each tallied snag ~~[or stump]~~.

The lookup table contents in **HHSli** appear as follows:

Decay Class Code	Description
	Blank, for not assessed
1	Limbs, Bark Intact
2	Limbs Missing
3	No Bark, Adv. Decay
4	Loosing Form
5	Crumbly, Lacks Form

Additional detail and descriptions are shown in Figure 14 and Table 13 below.

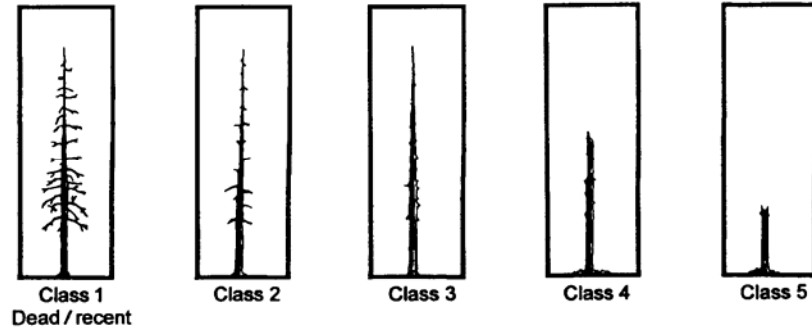


Figure 14: Snag Decay Classes

Table 13: Snag Decay Class description summary

Code	Bark	Heartwood Decay	Sapwood Decay	Limbs	Top Breakage	Time Since Death
1	Tight, intact	Minor	None to incipient	Mostly present	May be present	1-5 years
2	50% loose or missing	None to advanced	None to incipient	Small limbs missing	May be present	> 5 years
3	75% missing	Incipient to advanced	None to 25%	Few remain	Approx. 1/3	> 5 years
4	75% missing	Incipient to advanced	25% +	Few remain	Approx. 1/3 to 1/2	> 5 years
5	75% + missing	Advanced to crumbly	50% + advanced	Absent	Approx. 1/2 +	> 5 years

Left to right cursor movement in **HHSli** is controlled depending upon the group code entry for a tree. For group code .. (default, live trees), the decay class field is skipped but may be accessed from the right using the Left arrow key, if needed. Note: status codes 2 or 3 must be used for group code SN or ST tallies.

C (decay class) is an optional entry in **HHSli** since live trees are not assessed. Decay class shall be recorded for group code SN, or ST tallies (snags or stumps). A blank entry for the decay class, which is the default value for a **Trees** branch level record, means that the condition is not assessed because the tally is a live tree. If a decay class entry is made, only the code values available in its associated lookup list are acceptable. **{For the riparian vegetation data collection each snag (Trees;Gp=SN) should contain a valid decay class condition code of 1 through 5 as described above.}**

< Trees;U >

Col # reference – 23

U stands for dead tree [and stump] Wildlife Usage code (also referred to as "Use" for short). The wildlife usage code is used to describe the presence and extent of excavations of the tree bole that may be suitable for cavity nesting birds or as foraging, denning, caching, or hiding habitat for other animals. Wildlife usage code shall be recorded for each tallied snag [or stump].

Wildlife usage code 0 is used to indicate that there are no excavations on the dead tree. Presence of any excavations is reason to use code 1. If any excavation is present that is greater than 6" in height or width, code 2 is recorded. A blank entry, which is the default value for a **Trees** branch level record, means that the usage is not assessed because the tally is a live tree.

The lookup table contents in **HHSli** appear as follows:

Wildlife Usage Code	Description
	Blank, for not meas.
0	No Excavations
1	1" to 6" Excav.
2	>6" Excavations

Left to right cursor movement in **HHSli** is controlled depending upon the group code entry for a tree. For group code .. (default, live trees), the wildlife usage code field is skipped but may be accessed from the right using the Left arrow key, if needed. Note: status codes 2 or 3 must be used for group code SN or ST tallies.

U (wildlife usage) code is an optional entry in **HHSli** since live trees are not assessed. Wildlife usage code shall be recorded for group code SN, or ST tallies (snags or stumps). If a wildlife usage code entry is made, only the code values available in its associated lookup list are acceptable. **{For the riparian vegetation data collection this data is not required to be collected, however an appropriate valid code of 0, 1 or 2 should be entered as described.}**

< **Trees;Rmk**>

Col # reference - 24

Rmk stands for Remarks. The remarks field entry at the **Trees** branch level provides recording space for sample tree related information. All remarks made at the Trees branch level shall be "coded" remarks, conforming to the values in the lookup code list for the field. This is necessary to enable later query of the remarks field contents in SLI. If remarks do not conform to a standard, the query process would not be reliable. All other remarks fields (at the other levels in **HHSli**) allow free-form comments. Remarks should be pertinent to the level – each level in **HHSli** has its own data field space for remarks.

Rmk is an optional entry in **HHSli**. Only those coded remarks from the lookup list for the field are acceptable in the program.

Note: for site index sample trees (status code 7 or 8) a remarks code is required to describe the selection rule used for choosing the tree for measurement, see the description of <**Trees;S**>, ~~status code 8~~ and Table 17 in Appendix E. **{For the riparian vegetation data collection this remarks field should contain no data or only valid HHSli coded remarks in lookup list.}**

< **Trees;Azm**>

Col # reference - 25

Azm stands for Azimuth from the plot center to the tree or stump represented by the record. The field is used whenever it is necessary for the cruiser to differentiate between measured trees for the purposes of facilitating check cruising. ~~All Status code 6, 7, 8, or 9 trees shall be clearly identifiable in the recording order for each plot. If the order of such trees is not absolutely clear from a check cruising perspective, the cruiser shall either hang flagging labeled with the tree number (see <**Trees;Tr**>) on each subject tree, or record the azimuth to the tree from plot center.~~

Azm is an optional entry in **HHSli**. When recorded, only whole numbers greater than or equal to 1° and less than or equal to 360° are acceptable. Cardinal north is specified by entering 360° (0° is invalid). **{For the riparian vegetation data collection this field for each tree record should be used to record the percent slope value between the stream high water mark and the tree. For example, a slope of 30% would be entered as "30".}**

< **Trees;Dist**>

Col # reference - 26

Dist stands for Distance from the plot center to the tree or stump represented by the record. The field is only used for the KLSLI version of the program and is visible but skipped in the HHSli version (see the description of <**Cruise;ProgVer**> on page 10).

Dist is a skipped field in HHSli. **{For the riparian vegetation data collection this will be used as described.}**

< **Trees;User1**>
< **Trees;User2**>
< **Trees;User3**>

Col # reference - 27, 28, and 29 respectively

User1, User2, User3 are fields for recording user defined information. To provide flexibility in **HHSli**, these three user defined fields are present at the **Trees** branch level for use in recording data that is not otherwise accommodated in the other data fields.

For each of the fields, the field type is set to character (letters, character symbols, and numbers are allowed) and has a field width of 5.

The **User** fields are optional entry in **HHSli**. **{For the riparian vegetation data collection these fields will be used for specific uses:**

User 1 should be used to record the lean code that best describes the direction and amount of lean – see following values: 1-Toward Stream (1-9 degrees); 2- Toward Stream (10-19 degrees); 3- Toward Stream (20+ degrees); 4-Away from Stream (1-9 degrees); 5-Away from Stream (10-19 degrees); and 6-Away from Stream (20+ degrees).

User 2 - this field should be used for each tree record to record the estimated horizontal distance between the stream high water mark and the tree. Close estimates can usually be made by gauging where the tree location is in relation to the known flagged and marked circular plot locations previously determined along the cruise line running up the middle of the 170x100 foot subplot. For example, if a tree is about 6 feet downhill toward the stream from the known 125 foot plot (e.g. Line 2, Plot 11) a horizontal distance estimate of 119 (125 minus 6) feet should be recorded.

User 3 should be used to record the calculated 10 year radial growth increment data in 1/20ths of inches on Status 8 Site trees bored to determine age.)

< **Trees;ExpFac**>

Col # reference - 30

ExpFac stands for **Trees** branch level record Expansion Factor indicator. The expansion factor field is a non-editable field that **HHSli** populates after tree record data are recorded and the user invokes the retreat (F4 function key) or sibling jump (Alt + F5 function key) actions, or after running the **Tree Level Error Check** (described on page 115). The expansion factor value is used by the cruise compiler in SLI to properly expand the cruise sample data. The field result is visible to the user (after the function key actions mentioned) merely as a double check as to the sample weight of each item.

The value on each record line is automatically calculated by **HHSli** using the criteria entered at the **Cruise** level for the plot sizes, and at the **Trees** branch level for the group code, the DBH, and the group tally field values.

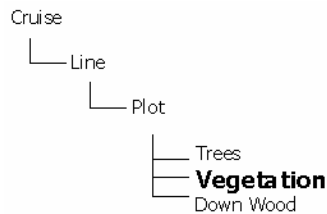
For a tally item sampled on a fixed plot, the number of trees per acre represented by the tree record is calculated. For example, if a 12' fixed radius plot is used to sample seedlings, and a record entered at the **Trees** branch level has a group code of ".." (live tree), DBH of 0.0" (for seedlings in the 2' or 5' height class, and a group tally of 4 (the record represents four such seedling on the plot), the calculated expansion factor would be 385.15 [that record represents 385.15 trees per acre in the cruise sample].

For tally items sampled using the variable radius plot, the number of trees per acre represented by the tree record is calculated. For example, if a 20 BAF variable radius plot is used to sample trees over 5.4" DBH, and a record is entered at the **Trees** branch level with a DBH of 6.0" and a group tally of 101.86, the

calculated expansion factor field value would be 1 [that record represents 101.86 trees per acre in the cruise sample].

ExpFac is automatically entered by the program, and may not be edited. If the calculated value exceeds 9999.99 (the maximum value for the field in ***HHSI***), the entry displayed will be 9999.99. ***{For the riparian vegetation data collection this will be used as described.}***

VEGETATION BRANCH LEVEL ITEMS



The table below shows the data items that are included at the **Vegetation** branch level in **HHSli**, and summarizes the parameters of each as they appear in the program application's screens. In the file structure hierarchy, the **Vegetation** branch level is one of three "sibling" branches below the **Plot** level. Each record in the **Vegetation** branch level represents one or more combinations of vegetation layer and non-tree vegetation species located at a particular plot. At completion of cruise data recording for a stand, each **Plot** level record may have one or more related **Vegetation** branch level records - each layer/species tallied "belongs" to one of the sample plots in the cruise.

Table 14: **Vegetation** Branch Level data items

VEGETATION BRANCH LEVEL								
Col #	Field Name	Type	Width	Required in HHSli	Column Help Message	Min	Max	Auto Pre-load
1	Lyr	N	1	Yes	Layer Code [3 max] (N1)	1	3	1
2	Sp	C	5	Yes	Vegetation Species (C5)	list		
3	CovPct	N	3	Yes	% of Plot Covered (N3)	list		
4	Ht	N	2	Yes	Avg Sp Hgt in Layer (N2)	1	99	
5	Rmk	C	10	Opt.	Remarks (C10)			

The figure below is an example of the screen appearance of the **Vegetation** branch level on the hand-held data recorder. For display screen size of 24 characters wide by 16 character lines tall, the **Vegetation** branch level contents occupy two screen "pages" as shown in the example below.²⁹

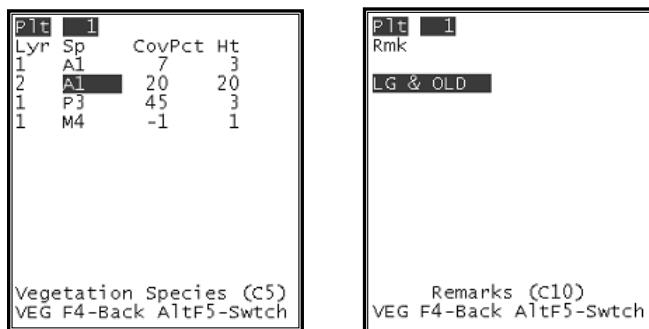


Figure 15: **HHSli** screen example - **Vegetation** branch level, 1st & 2nd screen pages

²⁹ Full details of **HHSli** features and instructions for use are included in Appendix D.

The screen display of the **Vegetation** branch level in *HHSli* is a "line-screen display type", which means that all of the data items (fields) for a record are displayed on one line of the screen at a time.

It helps to think about the **Vegetation** branch level as being similar to a spreadsheet - each **Vegetation** branch level record is a "row" in the file, and the data items (fields) are arranged in "columns" that, from left to right, span two widths of the data recorder screen. The Left / Right arrow keys move the cursor along the "row" of data (moving across screen pages as necessary), and the Up / Down arrow keys move the cursor up and down within a "column" of data.

Each key press of the Down arrow key when the cursor is on the lowest visible row of tree data creates a new "empty" **Vegetation** branch level record. **Vegetation** branch level records may be inserted between existing records by using the F9 key – the newly inserted record appears above the current cursor position. **Vegetation** branch level records may be deleted one at a time by using the F10 key. "Empty" **Vegetation** branch level records below the last completed record are automatically deleted by the program upon retreat (F4 key) or sibling jump (Alt+F5 key). Retreat or sibling jump (switching to another branch at the current level) are not possible until all required data item entries are made for the existing records.

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ITEM BY ITEM DESCRIPTION; VEGETATION BRANCH LEVEL



< **Vegetation;Lyr** >

Col # reference – 1

Lyr stands for Horizontal Layering within each species of non-tree vegetation. Each vegetation item recorded shall be assigned to a layer that helps describe the vertical arrangement of that particular species at each plot. Layer is determined only within a species. The goal of the layer call is to provide for describing each species as occurring in either one or more layers, not to describe what layer a species "belongs to". For example, when determining the layer to record for vine maple (*Acer circinatum*) at a plot, only the range of heights for all of the vine maple present would be assessed. There can be multiple layers for each species as long as the breaks are logical and consistent. If clearly recognizable species height breaks cannot be determined, do not split a species into layers for recording purposes. There must be significant cover % in each layer for a species (at least 5%) to be considered a separate layer. Do not repeat plant names (< **Vegetation;Sp** >) within a layer.

Herbs and grasses usually occur in just one [the lowest] layer, referred to as layer 1. Each shrub species may occur in one or more relative layers.

Layer level	Description
1	Lowest
2	Mid-level (next highest)
3	Highest

Lyr is a required entry in **HHSli**. Only layer codes 1, 2, or 3 are acceptable and are found in a lookup list for the field as shown above. The program automatically pre-loads a value of 1 for any newly created vegetation record and it may be edited as needed. The cursor moves to the species field for a new record, the layer field is entered from the right by pressing the Left arrow key. **{For the riparian vegetation data collection this will be used as described.}**

< **Vegetation;Sp** >

Col # reference – 2

Sp stands for non-tree vegetation Species, including shrubs, herbs, and grasses (bryophytes and fungi are not assessed). Enter the two-character species code for each **Vegetation** branch level tally item. Please see the discussion of "tree versus shrub" under the description of < **Trees;Sp** > on page 54. **{For the riparian vegetation data collection project, grasses do not need to be assessed.}**

A goal of SLI is to inventory shrub, herb, and grass species that are present within each stand in "significant" amounts. Record each shrub, herb, or grass species that constitutes 5% vegetative cover or more (see the description of < **Vegetation;CovPct** > below) on the non-tree vegetation fixed plot at each cruise plot. **{ For this project, grasses do not need to be assessed. }**

At each plot, strive to record at least the three most prevalent herb-shrub- species – even though one or more may constitute less than 5% cover. The only cause for recording fewer than three species at a plot

would be if there are only two, one, or no vegetation tally species present anywhere on the plot. By recording the significant species or the species present on sparsely vegetated plots, key information for the determination of Plant Association is gathered. Additional recording of species present in lesser amounts is optional.

The non-tree vegetation two-character species code is somewhat limiting in SLI - the large number of different species does not allow for the use of an easily understood abbreviation. SLI requires conformity with respect to the two-letter species codes used. A lookup list for the species codes, sorted alphabetically by species common name, is used in *HHSli*. A few of the species entry codes and their meanings are shown below. ***{For the riparian vegetation data collection this will be used as described.}***

Entry Code	Description (common name)
A1	vine maple
RF	salmonberry
U5	Non-listed, user specified

The syntax for the species entry code for non-tree vegetation follows a logical, albeit complicated pattern. The pattern is described in the following paragraph but, in summary, it is best to use the lookup list for the field in *HHSli*. Also, the codes for the most common (not all) shrubs and herbs are shown on the **SLI Field Reference Cards** (see Appendix E) that are handy to have when cruising.

The first character of the code is the first letter of the *symbol code* for the species as established by the Natural Resources Conservation Service, U. S. Department of Agriculture and shown in their PLANTS Database³⁰. The first character of the *symbol code* is typically the first letter of the plant's (Latin) genus name. For example, the species entry code for vine maple (*Acer circinatum*) is A1. The "A" comes from the first letter of the *symbol code* for vine maple, which is **ACCI**. The second character of the species entry code is a sequential value (1 through 9, followed by A through Z) assigned to each alphabetically sorted "group" of *symbol codes* that begin with the same letter. The "1" in the A1 code for vine maple was assigned because it is the first of the species whose *symbol code* begins with the letter A. Salmonberry (*Rubus spectabilis*) has a species entry code of RF because its symbol code (**RUSP**) is the fifteenth species on the list that begins with the letter "R".

There are nine special user entry codes available for tallying species that have no code in the list - U1 through U9 (for User1, User2, etc.). If used, the cruiser records the species name assigned to each User code on the PLOT AREA REPRESENTATION Map.

Sp is a required entry in *HHSli*. Only those codes presented in the left-most column of the lookup list for the field (shown in Appendix E of this guide, and accessed in *HHSli* by pressing the F2 key while the cursor is on the field) are acceptable.

Note: the lookup list is sorted by the right column, which contains the species common name (see the "Description" column in the example table above, or the "MEANING" column on the hand held). One way to find the acceptable entry code for a species is to navigate the list using the PageDown or PageUp keys on the hand held, looking for the common name for the species of interest. Remember that the common name may begin with words like "red", "western", "dwarf", "Pacific", etc. ***{For the riparian vegetation data collection this will be used as described. Grasses do not need to be assessed.}***

³⁰ Accessible on the World Wide Web at <http://plants.usda.gov/>

< **Vegetation;CovPct** >

Col # reference - 3

CovPct stands for non-tree vegetation canopy/foilage Coverage Percent. The value is the measure of the percent of the ground area in the non-tree vegetation fixed radius plot that is covered by the vertical projection of the foliage and stems of the plants. Envision shining a bright light down from directly above the vegetation - the "shadow" cast by the vegetation would "cover" a percentage area of the plot. The percent cover recorded shall be based upon the vegetation condition at seasonal foliage maturity (July-August). For cruises done outside the time of year when foliage is at its fullest, estimate the cover percentage as though it were at its fullest. Tree species canopy cover shall not be included in the tally.

Please see the description of < **Vegetation;Sp** > above for specification of required versus optional tally of non-tree vegetation. Estimate the coverage percent by layer per species (see the description of the < **Vegetation;Lyr** > field for layer recording procedure). Round estimates above 10% cover to the nearest five percent. Round estimates between 1% and 10% to the nearest one percent. To indicate the presence of only a trace amount, record the coverage as -1%.

Even though a plant may have dense foliage, the gaps between leaves and stems within the periphery of the plant do not count toward the covered area (again, think of the light shining from above analogy - only shade counts toward covered area). When estimating coverage percent it may be helpful to visually "rearrange" the species being assessed into a consolidated square or circular area, avoiding excessive "compaction". Then use the chart provided in the **SLI Field Reference Cards** (see Appendix E) to equate the resulting area to a percentage of the plot area. Another approach would be to divide the vegetation plot into quadrants, estimate the coverage percent for a species in each, and then record the average coverage percent of the four quadrants.

The vertical diversity of vegetation arrangement may be cause for the sum of the covered area percents to exceed 100% - that is possible and is acceptable recording practice in SLI. For example, a dense waist high patch of salal (*Gaultheria shallon*) at an estimated 80% coverage, with tall vine maple (*Acer circinatum*) with a spreading canopy overhead estimated at 30% coverage - the sum of the percentage covered by species is 110% (real conditions and acceptable tally values).

CovPct is a required entry in **HHSli**. Only those values present in the lookup list for the field are acceptable. **{For the riparian vegetation data collection this will be used as described.}**

< **Vegetation;Ht** >

Col # reference - 4

Ht stands for average Height of the layer/species combination represented by each **Vegetation** branch level record at the plot. Height of individual plants is determined as the distance from the ground at the base of the plant, vertically to the level of its highest point. Height shall be recorded to the nearest foot for each layer/species tallied. Small forbs, such as Oregon oxalis (*Oxalis oregana*), that are less than one foot tall are recorded as 1'.

Ht is a required entry in **HHSli**. Height values equal to or greater than 1' and less than 100' are acceptable. The program issues a warning message for values greater than 35'. **{For the riparian vegetation data collection this will be used as described.}**

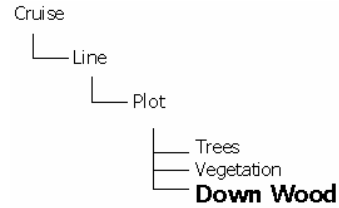
< ***Vegetation;Rmk*** >

Col # reference - 5

Rmk stands for Remarks. The remarks field entry at the ***Vegetation*** branch level provides recording space for non-tree vegetation layer/species related information. Remarks should be pertinent to the level – each level in ***HHSIi*** has its own data field space for remarks.

Rmk is an optional entry in ***HHSIi***. Up to 10 characters may be entered. ***{For the riparian vegetation data collection this will be used as described.}***

DOWN WOOD BRANCH LEVEL ITEMS



The table below shows the data items that are included at the **Down Wood** branch level in **HHSli**, and summarizes the parameters of each as they appear in the program application's screens. In the file structure hierarchy, the **Down Wood** branch level is one of three "sibling" branches below the **Plot** level. Each record in the **Down Wood** branch level represents one tally of a down wood piece located at a particular plot. At completion of cruise data recording for a stand, each **Plot** level record may have one or more related **Down Wood** branch level records - each down wood piece tallied "belongs" to one of the sample plots in the cruise.

Table 15: **Down Wood** Branch Level data items

DOWN WOOD BRANCH LEVEL								
Col #	Field Name	Type	Width	Required in HHSli	Column Help Message	Min	Max	Auto Pre-load
1	Sp	C	5	Yes	Species Code (C5)	list		
2	IntD	N	4	Yes	Intercept diam. (N3)	1	200	
3	SmD	N	3	Yes	Small end diam. (N3)	1	200	
4	LgD	N	3	Yes	Large end diam. (N3)	6	200	
5	Len	N	3	Yes	Piece Length (N3)	3	300	
6	C	C	1	Yes	Decay Class code (C1)	list		
7	W	E	1	Yes	Wildlife Excav Code (C1)	list		
8	Rmk	C	10	Opt.	Remarks (C10)			

The figure below is an example of the screen appearance of the **Down Wood** branch level on the handheld data recorder. For display screen size of 24 characters wide by 16 character lines tall, the **Down Wood** branch level contents occupy two screen "pages" as shown in the example below.³¹

³¹ Full details of **HHSli** features and instructions for use are included in Appendix D.

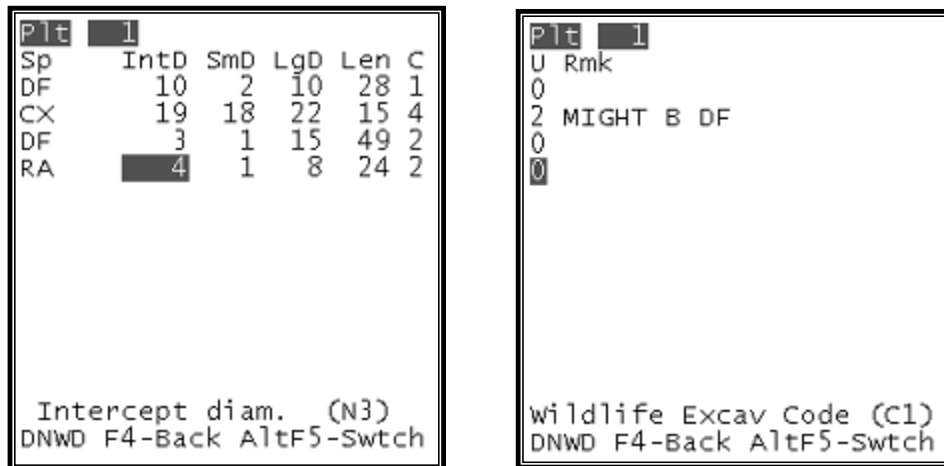


Figure 16: **HHSli** screen example – **Down Wood** branch level, 1st & 2nd screen pages

The screen display of the **Down Wood** branch level in **HHSli** is a "line-screen display type", which means that all of the data items (fields) for a record are displayed on one line of the screen at a time.

It helps to think about the **Down Wood** branch level as being similar to a spreadsheet - each **Down Wood** branch level record is a "row" in the file, and the data items (fields) are arranged in "columns" that, from left to right, span two widths of the data recorder screen. The Left / Right arrow keys move the cursor along the "row" of data (moving across screen pages as necessary), and the Up / Down arrow keys move the cursor up and down within a "column" of data.

Each key press of the Down arrow key when the cursor is on the lowest visible row of down wood data creates a new "empty" **Down Wood** branch level record. **Down Wood** branch level records may be inserted between existing records by using the F9 key – the newly inserted record appears above the current cursor position. **Down Wood** branch level records may be deleted one at a time by using the F10 key. "Empty" **Down Wood** branch level records below the last completed record are automatically deleted by the program upon retreat (F4 key) or sibling jump (Alt+F5 key). Retreat or sibling jump (switching to another of the branches at the current level) are not possible until all required data item entries are made for the existing records.

Cruisers shall cruise and record the down wood tally items in sequence. Tally them in their respective order on the transect. {For the riparian project survey the down wood will be collected along the line-transect for the distance from the last plot to the current plot, with the following two exceptions, when starting the line-transect it is from the stream channel and secondly after the last plot (150' HD) out to the end of the overall line transect length which is at 170' horizontal distance.}



ITEM BY ITEM DESCRIPTION; DOWN WOOD BRANCH LEVEL

<Down Wood;Sp>

Col # reference - 1

Sp stands for Species of the down wood piece tallied on the line-transect sample. A two-letter species code is entered for each tallied down wood piece. If species is indeterminable for a tally item, there are species codes for "Unknown Conifer", "Unknown Hardwood", and "Unknown Species".

Down wood pieces that are at least 6" in diameter at the large end, and at least 3' long shall be considered the minimum size pieces for inclusion in the sample tally (see <Cruise;Transect> for sampling instructions, and <Down Wood;LgD> and <Down Wood;Len> for additional specifications).

Species code for down wood is handled the same as species for sample trees (see the description of <Trees;Sp>). SLI requires conformity with respect to the two-letter species codes used. To accomplish this while providing for ease of data entry, *HHSli* employs a "translated" lookup list for the field. The user may enter any of the values shown in the left-most column of the example table shown below (a small excerpt from the species lookup list). Then, by pressing the Enter key or any arrow key, the program "translates" the value to its corresponding "Translation Code" equivalent (shown in the second column in the example).

Entry	Translation Code	Description
202	DF	Douglas-fir
D	DF	Douglas-fir
DF	DF	Douglas-fir
PSME	DF	Douglas-fir

Sp is a required entry in *HHSli*. The cursor automatically moves to the species field when a new record is created. Only those codes presented in the left-most column of the lookup list for the field (shown in Appendix E of this guide, and accessed in *HHSli* by pressing the F2 key while the cursor is on the field) are acceptable [any acceptable entry value is subject to automatic translation]. **{For the riparian vegetation data collection this will be used as described.}**

<Down Wood;IntD>

Col # reference - 2

IntD stands for Intercept Diameter of the down wood piece. In SLI, intercept diameter alone is used by the cruise compiler to arrive at the estimated average cubic foot volume per acre of down woody material. Small and large end diameters along with piece length are also recorded, since it is important to have an estimate of the down wood piece size distribution for the stand. Record the diameter of the piece at the point where the line-transect crosses the central longitudinal axis of the piece. Only those down wood pieces that are at least 6" in diameter at their large end and at least 3' in length are to be tallied. Measure and record the intercept diameter to the nearest inch.

The intercept diameter is measured outside bark (if present) on the piece. Do not record an intercept diameter that is smaller than the small end diameter recorded, nor larger than the large end diameter recorded. Of the three diameters recorded for each piece (small end, intercept, and large end), the accuracy of the intercept diameter is the most important. For pieces which have non-typical diameter dimensions due to decomposition or physical damage, record the intercept diameter accurately and adjust the small or large end diameter if needed to pass the edit checks as detailed in Appendix D on page 131.

IntD is a required entry in ***HHSli***. A value of 0 is present in the field on line creation and must be edited. Numeric values equal to or greater than 1" and less than or equal to 200" are acceptable. The program issues a warning message for a value of 40" or more. **{For the riparian vegetation data collection this will be used as described.}**

<Down Wood;SmD>

Col # reference - 3

SmD stands for Small end Diameter of the down wood piece. In SLI, small and large end diameters are used along with log length to arrive at an estimate of the down wood piece size distribution for the stand. Record the diameter of the small end of each down wood piece tallied to the nearest inch. Do not record a small end diameter less than 1" (if the tip-top is smaller, measure the length of the piece to the 1" diameter point on the piece). The small end diameter recorded must be smaller than or equal to the large end diameter recorded.

Down wood pieces that are at least 6" in diameter at the large end, and at least 3' long shall be considered the minimum size pieces for inclusion in the sample tally (see <***Cruise;Transect***> for instructions, and <***Down Wood;IntD***>, <***Down Wood;LgD***>, and <***Down Wood;Len***> for additional specifications).

The small end diameter is measured outside bark (if present) on the piece. The objective of the two end diameter measurements is to describe a shape (cylinder or frustum of a cone) whose cubic foot volume matches the volume of the log. For down logs that are loosing form and or have broomed or deteriorating ends, record each end diameter measurement value that best represents the size of the cylinder or frustum of a cone.

SmD is a required entry in ***HHSli***. A value of 0 is present in the field on line creation and must be edited. Numeric values equal to or greater than 1" and less than or equal to 200" are acceptable. The program issues a warning message for a value of 40" or more. **{For the riparian vegetation data collection this will be used as described.}**

<Down Wood;LgD>

Col # reference - 4

LgD stands for Large end Diameter of the down wood piece. Please see the descriptions of <***Down Wood;IntD***> and <***Down Wood;SmD***> for important information pertinent to the measurement of down wood large end diameter.

Record the diameter of the large end of each down wood piece tallied to the nearest inch. The large end diameter recorded must be equal to or larger than the small end diameter recorded.

The large end diameter is measured outside bark (if present) on the piece. The objective of the two end diameter measurements is to describe a shape (cylinder or frustum of a cone) whose cubic foot volume

matches the volume of the log. For down logs that are loosing form and or have broomed or deteriorating ends, record each diameter measurement value that best represents the size of the cylinder or frustum of a cone.

LgD is a required entry in **HHSli**. A value of 0 is present in the field on line creation and must be edited. Numeric values equal to or greater than 6" and less than or equal to 200" are acceptable. The program issues a warning message for a value of 60" or more. **{For the riparian vegetation data collection this will be used as described.}**

<Down Wood;Len>

Col # reference – 5

Len stands for Length of the down wood piece. Please see the descriptions of **<Down Wood;IntD>** and **<Down Wood;SmD>** for important information pertinent to the measurement of down wood piece length.

Record the length of each down wood piece tallied to the nearest foot. Do not record down wood pieces shorter than 3' in length.

Len is a required entry in **HHSli**. A value of 0 is present in the field on line creation and must be edited. Numeric values equal to or greater than 3' and less than or equal to 300' are acceptable. The program issues a warning message for a value of 100' or more. **{For the riparian vegetation data collection this will be used as described.}**

<Down Wood;C>

Col # reference - 6

C stands for down wood Decay Class (also referred to as "Condition" for short). The decay class is used to describe the physical decomposition characteristics of down woody material. SLI summarizes the down wood information by decay class. Decay class shall be recorded for each tallied down wood piece. Down wood decay class is very similar to the decay class described for dead trees (see the description of **<Trees;C>**).

The lookup table contents in **HHSli** appear as follows:

Decay Class Code	Description
1	Limbs, Bark Intact
2	Limbs Missing
3	No Bark, Adv. Decay
4	Loosing Form
5	Crumbly, Lacks Form

Additional detail and descriptions are shown in Figure 17 and Table 16 below.

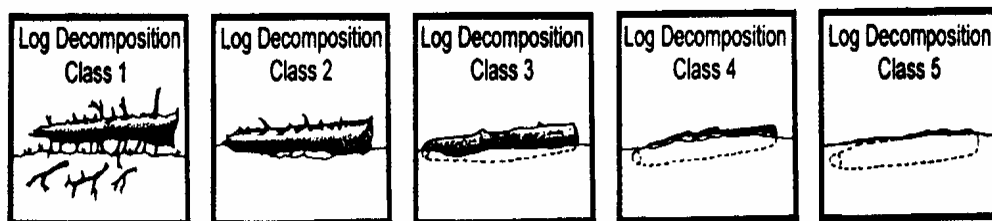


Figure 17: Down Wood Decay Classes

Table 16: Down Wood Decay Class description summary

Code	Bark	Twigs	Texture	Shape	Wood Color	Portion of Log on Ground
1	Intact	Present	Intact	Round	Original	None, elevated on supporting points
2	Intact	Absent	Intact to Soft	Round	Original	Parts touch, still elevated
3	Trace	Absent	Hard large pieces	Round	Original to faded	Bole on ground
4	Absent	Absent	Soft blocky pieces	Round to oval	Light to faded brown	Partially below ground
5	Absent	Absent	Soft, powdery	Oval	Faded light yellow or gray	Most below ground

C (decay class) is a required entry in *HHSII*. Only condition codes 1 through 5 are acceptable and are found in a lookup list for the field as shown above. **{For the riparian vegetation data collection this will be used as described.}**

<Down Wood;U>

Col # reference - 7

U stands for down wood Wildlife Usage code (also referred to as "Use" for short). The wildlife usage code is used to describe the presence and extent of excavations of the down woody piece that may be suitable for foraging, denning, caching, or hiding habitat for animals. Wildlife usage code shall be recorded for each tallied down wood piece. Down wood usage code is very similar to the usage code described for dead trees (see the description of **<Trees;U>**).

Wildlife usage code 0 is used to indicate that there are no excavations on the down wood piece. Presence of any excavations is reason to use code 1. If any excavation is present that is greater than 6" in height or width, code 2 is recorded.

The lookup table contents in *HHSli* appear as follows:

Wildlife Usage Code	Description
0	Rootwad not present No Excavations
1	Rootwad present 1" to 6" Excav.
2	>6" Excavations

U (wildlife usage) code is required entry in *HHSli*. Only usage codes 0, 1, and 2 are acceptable and are found in a lookup list for the field as shown above. **{For the riparian vegetation data collection the Wildlife Usage Code (U) will be used to record whether a piece of downwood has a rootwad or not. During data entry please enter the valid code "0" to indicate if no rootwad present and "1" to indicate if there is a rootwad present.}**

< **Down Wood;Rmk** >

Col # reference – 8

Rmk stands for Remarks. The remarks field entry at the **Down Wood** branch level provides recording space for down woody material related information. Remarks should be pertinent to the level – each level in *HHSli* has its own data field space for remarks.

Rmk is an optional entry in *HHSli*. Up to 10 characters may be entered. **{For the riparian vegetation data collection project this field will be used for the specific use of recorded the horizontal distance between the down wood piece (at intercept) and the stream channel high water level. Each record (downwood tally item) should have a horizontal distance value entered between 1 and 170 feet.}**

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APPENDIX A: STEP BY STEP EXAMPLE CRUISE

STEPS	Field Guide Page #
1. Identify and locate the site to be sampled. Use ODF supplied Vicinity and Site Map.	
2. Recon the treatment and control reaches first to help determine and establish where to center and best place the 500 by 170 foot plot pair location on the ground in the reach defined by ODF on the supplied Site Map, unless plot placement specifically directed otherwise by ODF. ODF desires the plot pairs to be centered within each reach to avoid. Some adjustment upstream or downstream (with complete documentation) from reach center can be made by the Contractor using professional judgement to help avoid road impacts, a large tributary or dramatic stream meandering. Avoid plot placement on the extreme ends of the reach. Centering is more critical in the treatment reach.	
3. Using the standard plot design and layout (see ODF supplied PLOT AREA REPRESENTATION map for the 500 by 170 plot area to be sampled) determine and document the general valley azimuth (read as looking downstream) and the perpendicular azimuth that is to be used for each cruise/transect line going away from the stream into the plot area.	23
4. Establish monument and reference point information, cruise transect lines, and fixed radius plot locations centers as described per protocol (see Appendix G).	4
5. Enter Cruise level and the first Line level items into handheld:	143
• Use standard Fixed Plot sizes used to sample small trees (12' radius).	5
• Use Vegetation Plot size (12' radius).	5
• Use Down Wood line-transect length (25' horizontal ³²).	5, 94
6. Travel into plot to the cruise line starting point and mark it with flagging.	24
7. Travel along the cruise line to the first plot. Sampling design calls for no duplicate plot or cruise line values as described per protocol (see ODF supplied Plot Area Representation Map and Appendix G).	23
8. Use flagging and labeling as described in 'Sample Plot Location & Establishment' section to mark plot center and hang flagging between plots as needed.	24
9. Enter Plot level items. <u>See Plot level field descriptions for info on how each data field element should be collected/entered.</u>	40-44
10. Measure trees, per protocol, on fixed 1/100 th acre plots as move up cruise line. Overstory and snags equal and greater than 5.5 inches for each 170 by 100 foot plot should be entered on the last plot away from the stream on the transect line (i.e. plots 6, 12, 18, 24, & 30), per protocol. Trees should be viewed closely and measured and assigned to the appropriate 170 by 100 foot plot.	14-18, 65
11. Measure tree heights (subsample), crown ratio, and crown class, per protocol. (Use F7 for calculator). Height subsample, Status 6, trees should be marked clearly in the field with the tree number painted on the tree.	65-67, 117

³² **{ For the riparian project survey the down wood will be collected along the line-transect for the distance from the last plot to the current plot, with the following two exceptions, when starting the line-transect it is from the stream channel and secondly after the last plot (150' HD) out to the end of the overall line transect length which is at 170' horizontal distance. }**

STEPS	Field Guide Page #
12. Measure a site index sample tree on every 170 by 100 foot overstory/snag plot (i.e. – L1, P6; L2, P12; L3, P18; L4, P24; and L5, P30) for a minimum of 5 samples per 500 by 170 plot. These trees should be clearly marked with the tree number painted on the tree.	63, 139
13. Periodically run F8 (L4LevCk.run) on the handheld to check for missing tree data entries while cruising the plots for trees.	111, 115
14. Measure the vegetation sample plot.	85, 88
15. Measure the down wood line-transect sample.	92, 94
16. Use F4 on handheld after completing down wood level. (Exits the plot and checks for errors/missing data).	27, 111
17. Add or edit cruise lines, reference points, plot positions, and note non-installed plots or any road impact on Plot Area Representation Map. Ensure that 500 by 170 foot plot corners are monumented to protocol for inspection and re-location purposes.	23
18. Complete cruise and upload cruise data to PC for processing and review, prior to submission.	112

ODF RIPSTREAM
Reference Point Information

Sketch

Site _____
 Reach _____
 Plot #s _____
 Declination _____

Point	Distance (hd)	Azimuth	Species	Diameter	Notes
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

**Show control and treatment reach plot pairs in relation to stream and reach. Identify closest ODF reach distance flagging above & below plot. Include N-arrow, stream flow direction, roads, waterfalls, tributaries, or other significant feature.*

Note: Point should correspond to the bottom corner, gridline 1 (0') or top corner, gridline 11 (500') as shown on front map. Azimuth is from tree to the corner rebar.

GPS Point Locations

Driving/Access Directions to Plot

General Notes

i.e. – If road impact unavailable, describe length, width, square footage of road surface and indicate Area Plot representing map which sub-plot(s) are impacted; brush conditions:

APPENDIX B: GLOSSARY

Access	A means of approaching, entering, exiting, or making use of; passage to the plot center.
Apical dominance	The inhibitory influence on the growth of lateral buds exerted by the terminal bud of a growing plant shoot.
BA	Basal area. Cross sectional area of tree stems at DBH, in terms of square feet.
Bole Length	The straight-line distance of the main stem of a tree measured from its base to its tip.
Borderline Measurement	A comparative measurement between a fixed plot radius or variable plot radius and the distance from the plot center to the center of the object to determine whether the object is IN or OUT of the fixed plot or variable plot. IN – An object whose measured distance is equal to or less than the horizontal distance of the fixed area plot or variable plot radius. OUT -An object whose measured distance is greater than the horizontal distance of the fixed plot or variable plot radius.
Borderline Tree	A tree that is difficult to judge as being IN or OUT of a plot because it is located at a distance from the plot center which is nearly equal to the maximum horizontal distance of a given fixed radius.
Breast Height	A point located on the uphill side of the main stem, by measuring 4.5 feet along the uphill side of the bole from ground level or the predominant root collar.
Cardinal Point	One of the four principal directions on a compass: 360, 90, 180, and 270 degrees azimuth (North, East, South, and West respectively).
Codominant tree	see Crown Class
Crown Class	The relative position of the tree crown with respect to competing vegetation surrounding the tree. Crown class for each tree is judged in the context of its immediate environment, that is, those trees or shrubs that are competing for sunlight with the subject tree. Classification of crown class is based on each tree crown development, amount of sunlight received from above and on the side: <i>Forested Situation:</i> <ul style="list-style-type: none"> • Remnant tree (Predominant): A tree left by previous management activity or catastrophic event that is significantly older than the surrounding vegetation. Remnant trees do not form a canopy layer and are usually isolated individuals or small clumps. • Open Grown: Tree crowns receive full light from above and from all sides. • Dominant: Tree crowns receive full light from above and partly from the side. Crowns extend above the general level of the canopy. • Codominant: Tree crowns receive full light from above, and little from the sides. Crowns usually form the general level of the canopy. • Intermediate: Tree crowns receive little direct light from above, and none from the sides. Crowns are below or extend into the general level of the canopy. • Suppressed: Tree crowns receive no direct light from above or from the side and are entirely below the general canopy level in even-aged stands. <i>Shrub situation:</i> <ul style="list-style-type: none"> • Leader above Shrub: The terminal leader of the tree is above the surrounding shrub while the middle or lower crown may be within the shrub. • Leader within Shrub: The terminal leader and upper crown of the tree is within the shrub canopy. • Leader overtopped by Shrub: The crowns of the tree are completely overtopped by the surrounding shrub.

CV	Coefficient of Variation. Statistical term expressing the standard deviation as a percentage of the mean.
Dead Tree	A tree (see Tree) that has no live foliage, no viable cambium, and is self-supporting (fully supported by its own roots, not supported by other trees, objects, or any part of the bole on the ground). Dead trees are often referred to as snags.
Diameter at Breast Height (DBH)	A measure at breast height of the tree bole, outside the bark and perpendicular to the tree bole.
Dominant tree	see Crown Class
Down Wood piece	Perennial woody pieces of trees that have been severed from their original source of growth (dead trees that are not self-supporting shall be considered severed). This includes up-rooted trees and any severed stems or branches attached to them. It does not include: Live trees, dead limbs or branches attached to a dead tree, stumps, dead foliage, bark, or designated shrub species.
GIS	Geographic Information System
GPS	Global Positioning System
Ground Level	The forest floor - made up by soil and a duff layer. It does not include unincorporated woody debris that may rise above the ground line. In reference to a point of measure it is the highest point of the ground touching the base of the object being referenced.
Group tally	Recorded as a single line entry, one or more items of the same type or species.
Herb	Any seed plant whose stem withers away to the ground after each season's growth, as distinguished from a tree or shrub whose woody stem lives from year to year. Non-woody plants such as grasses, grass-like plants, and forbs.
High water level	Also called the average yearly high flow (not the highest flood flow level). It's where trees and other year-round plants start growing. On many streams, it's the upper edge of the stream bank.
Improved road	These roads usually have one or all of the following characteristics; 1) map and sign number designations, 2) surfacing, 3) ditching and culverts, and 4) periodic maintenance. For the purposes of plot establishment the "edge" of the road will be considered to be the edge of the clearing limit where a right-of-way is maintained.
Inaccessible	Areas that are unapproachable by all forms of ground travel in a direct or indirect manner, areas that are not on ODF land.
Intermediate tree	see Crown Class
L40	Refers to the largest size trees in a stand, specifically the mean size of the largest 40 (DBH) trees per acre, assessed by selection of the largest DBH tree on a 1/40th acre plot (18.6' radius) at each sample point.
Leader above Shrub	see Crown Class
Leader overtopped by Shrub	see Crown Class
Leader within Shrub	see Crown Class
Live Tree	A tree (see Tree) that has live foliage, viable cambium, and is self-supporting (fully supported by its own roots, not supported by other trees, objects, or any part of the bole on the ground).
Normally formed tree	A tree with a central bole that exhibits physiological traits and development typical of its tree species, age, and environment. A tree that has been a Dominant or Codominant crown class its entire life.
Open grown tree	see Crown Class.

Overtopped leader	see Crown Class.
Remnant tree	see Crown Class
Sample plane	An imaginary vertical planar surface identified by a transect line for down woody material. The sample plane extends vertically from the surface of the ground.
Seedling	A tree species that is at least six inches in height, has a DBH less than 1.0 inch and has its root system in contact with mineral soil.
Shrub	Woody plants with several permanent stems instead of a single trunk. Any shrub species included in the <i>Vegetation</i> level list in <i>HHSLI</i> is to be considered a shrub for tally purposes (see the glossary definition of Tree).
SLI	State Forests Stand Level Inventory System. SLI includes stand data, stand sampling procedures, data collection software, and the software application used for storage access and maintenance of the information (FPS).
Snag	A dead tree that is self supporting and is greater than 4.5 feet tall.
Stem Void	The main stem area of a tree not occupied by sound wood fiber, when the main stem is contiguous and defined as inside bark circumference.
Stump	The basal portion of a tree remaining in contact with the soil after the trunk or main stem has been severed at a point less than or equal to 4.5 feet above ground height (measured on the uphill side).
Stump diameter	It is the average of two horizontal measurements, perpendicular to each other, across the top of the stump, through its geometric center and outside bark (dob), if bark is present.
Stump Height	The point at which the main stem was severed (≤ 4.5 feet above the ground).
Suppressed tree	A tree having its crown in the lower layer of the canopy, the leading shoot is not free to grow. The crown receives no direct sunlight. Height growth is reduced significantly due to lack of light.
Talus	The accumulation of broken rocks that occurs at the base of cliffs or other steep slopes.
Top height	The mean height of the largest 40 (DBH) trees per acre, assessed by selection of the largest DBH tree on a 1/40th acre plot (18.6' radius) at each sample point. See L40.
Tree	A woody perennial plant with one main stem or trunk which develops many branches, usually at some height above the ground. Dead trees are often referred to as snags. Every species on the <i>Trees</i> level list in <i>HHSLI</i> is to be considered a tree for tally purposes (see the glossary definition of Shrub).

Appendix C: Identification Guides

Guide To Identification of Insects, Diseases and Physical Injury

{For the riparian vegetation project Insect data, Disease data, and Physical Injury data will not be collected. This page is left in only to serve as an appendix "placeholder". Please use the designated F2 lookup values as described for that field.}

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APPENDIX D: USING HHSII

Introduction

The Handheld Stand Level Inventory program (*HHSII*) is an MSDOS program developed by the ODF State Forests Information Unit. *HHSII* was written using the DataPlus Professional Application Generator.

HHSII contains many features designed to assist the user in accurate and efficient data collection activities. These features include numerous error checks for missing or incorrect data, warnings of possible out-of-range data, some pre-loaded data elements, several helper programs, and a calculator with functions for computing limiting distance, tree heights, diameters, and horizontal distance.

This document is the User's Manual for *HHSII*. It gives the user information on how to load the *HHSII* program onto the handheld computer, start the program, enter data, and upload the data into the SLI database. It also provides information on accessing several information screens and running the *HHSII* Calculator. All error messages generated by *HHSII* are described and a summary of all of the fields in *HHSII* is provided. *{The Forest Practices and State Forests Monitoring Units are using the HHSII program and SLI procedures with some modifications and a modified version of the documentation to help collect the riparian vegetation survey data for this project.}*

LOADING HHSII INTO THE HANDHELD COMPUTER

HHSII requires the DataPlus Professional (DPP) program to operate. Components of DPP must be installed on the handheld computer and on a PC. DataPlus Professional is available from Electronic Data Solutions (<http://www.elecdata.com/>). *HHSII* is available on the ODF computer network at <\\salem3a\SLIhome\HHSII>. There are two versions of *HHSII* – the standard version, and a wide screen version. The standard version is for handheld computers with a screen size of at least 16 characters high by 24 characters wide. The wide screen version is for handheld computers with a screen size of at least 16 characters high by 40 characters wide.

The handheld computer must have the following minimum configuration:

- IBM compatible with an 8088 or greater processor
- DOS 3.1 or greater
- 540k of free RAM³³
- 500k of free disk space
- A display size of 16 characters high by 24 characters wide or greater

Steps:

1. Install DPP on the PC.
2. Connect the hand held to the PC using a serial communications cable.
3. Install DPP on the hand held computer and set up a configuration file using the instructions on pages 2 - 4 of the DataPlus Professional Hand Held User's Manual. This manual comes with DPP.
4. If DPP is not already running on the hand held at this point. Type "DPP" on the hand held at the DOS prompt from the installed directory.
5. Install *HHSII* on the handheld using the Receive App option of the Communications menu. See pages 18 and 19 of DataPlus Professional Hand Held User's Manual.

³³ Note to Juniper Systems Pro 2000 users: it may be necessary to free RAM space necessary for *HHSII* by not loading the driver for the PCMCIA card port during the boot up.

STARTING HHSII

Steps:

1. Type "DPP" on the hand held at the DOS prompt from the installed directory.
2. Select the Applications menu choice.
3. Select **HHSII**. The active application (**HHSII**) is shown at the bottom of the screen.

COLLECTING DATA

1. With **HHSII** as the active application, select the Collect Data menu option.
2. For a new data collection project, select the "New Dataset" option. To continue collecting data for a project, select the "Old Dataset" option.
3. For a new data collection project the user will be asked to specify a new filename (see Figure 3 on page 11). Enter the stand number of the stand that you will be collecting data for as the filename. Example: if you are collecting data for stand number 3421, then enter 3421 as the file name. If the user selects the "Old Dataset" option, a list of datasets currently on the handheld will be presented. Select the stand that you wish to continue collecting data for.
4. The user will be presented with the first **HHSII** data screen. Begin or continue with the data collection process, as the case may be. Additional information about data collection using a program developed in DPP may be found on pages 6 - 11 of the DataPlus Professional Hand Held User's Manual.
5. When data collection is completed for the day, back out of the **HHSII** program using the F4 function key repeatedly until you get to the main menu, then select the Exit Program menu choice.

SPECIAL FUNCTION KEYS

Special function keys are used for various tasks in *HHSii*. A list of these functions can be viewed by pressing the F1 special function key while in *HHSii*. The more commonly used functions are shown in bold on the following list.

Key or Key Combination	Function
[Page Up] or [Ctrl] + [↑]	Move up one screen
[Page Down] or [Ctrl] + [↓]	Move down one screen
[Ctrl] + [Page Up]	Move to line 1
[Ctrl] + [Page Down]	Move to last line
[↑]	Move up one line
[↓]	Move down one line
[←]	Move to previous column
[→]	Move to next column
[Ctrl] + [Enter]	Copy data from line above
[Tab] + [Ctrl] + [→]	Right one screen
[Shift] + [Tab] + [Ctrl] + [←]	Left one screen
[Home]	Move to first col on display. If on first display column move to first column.
[End]	Move to last col on display. If on last display column move to last column.
[Ctrl] + [Home]	Move to first line and first column
[Ctrl] + [End]	Move to last line and last column
[Ctrl] + [D]	Read date from clock on date column
[Ctrl] + [T]	Activate / deactivate timers and read time from clock on time columns
[Alt] + [A]	Set auto entry type
[Alt] + [P]	Poll serial port when auto or manual poll type
[Alt] + [S]	Serial input only talk to sensor
[F1] or [Alt] + [H]	Keystroke help
[F2]	View data validation checks
[Ctrl] + [F2]	Field edit for character columns
[F3]	Search column
[F4]	Check file for missing data and back up one level
[F5]	Advance to child data level
[Alt] + [F5]	Sibling jump
[F6]	Go to line number ...
[F7]	Global program list
[F8]	File level program list
[F9]	Insert line
[F10]	Delete line
[Esc]	Back up one level without error checks

UPLOADING DATA TO THE PC

Steps:

1. Connect the hand held to the PC using a serial communications cable.
2. Start the DPP program on the hand held.
3. With **HHSII** as the active application on the hand held, select the Communications, Transmit Data menu choice. Start the DataPlus Host program on the PC. Follow the instructions on pages 14 - 16 of the DataPlus Professional Hand Held User's Manual.
4. The data will be written to a newly created subdirectory on the User's PC. The subdirectory name will be the current date in mmddyyyy format. For instance, data downloaded on 6/1/01 would be stored in a subdirectory named ..\Data\HHSLI\06012001.
5. For ODF users with the SLI Program (**SLIP**), open the SLIP.mdb Microsoft Access™ database. Select the "Import Stand Data From Handheld" menu choice on the SLI Main Menu and answer the questions asked by the program.

HHSLI INFORMATION SCREENS

Plot Specifications Screen

This information is accessed by pressing **F7**, and selecting the **PlotSpec.run** choice. The information is on two screens and provides a reference to the fixed and variable plot cruise specifications entered at the **Cruise** level.

About HHSLI Screen

This information screen provides basic information about HHSLI. Pressing the F7 key, and choosing the "AboutSli.run" choice from the pop up menu accesses it.

About HHSLI

Version 05/01/02

Oregon Dept. of Forestry
2600 State St.
Salem, OR 97304
503-945-7357

Mike DeLaune
Dave Enck

Continue...

Plot Specifications First Screen:

This screen shows the plot radii and tree DBH range for each of up to 3 fixed plots.

FIXED AND VAR PLOT SPECS

Sml Fxd Plt Rad = 12.0
(Tree DBH 0.0 – 5.4)

Med Fxd Plt Rad = 73.6
(Tree DBH 5.5 – 999.98)

Lrg Fxd Plt Rad = 0.0
(Tree DBH 0.0 – 0.0)

Continue...

Plot Specifications Second Screen:

This screen shows the DBH break point between the largest tree DBH fixed plot and the variable plot; the variable plot BAF; the plot radii for the dead tree and vegetation sample plots; and the down wood sample transect length.

```
Var Plt Cutoff = 999.9
(VP Cruise This DBH Tree
And Larger)

VP Cruise BAF = 0.00

Dead Tr Plot Rad = 0.0

Veg Plot Radius = 12.0

DWD Transect Ln = 25.0

Press any key to return!
```

Site, Top Height, and Height Sample Tree Status Screen

This information is accessed by pressing **F7**, and selecting the **TreeStat.run** choice. The screen provides information on how many site, top height and height sample trees have been measured so far in this data collection project. It also give information on the target number of trees in each of these categories, and which trees count towards the totals.

This screen will also automatically come up as a reminder when the user exits the **HHSli** program using the **F4** special function key.

Note: If the user is at the **Trees** Level when this screen is called up, the totals shown will not include any trees in the current plot, and a warning message will inform the user of that fact.

Site, Top Height, and Height Sample Tree Status Screen Example:

```
MEASURED HEIGHTS TALLY

Site Tree Tally = XXX
Target = *3* or more
(Counts Status 7 & 8)

Top Ht Tree Tally = XXX
Target = *5* or more
(Counts Status 7 & 9)

Ht Sample Tr Tally = XXX
Target = *20* or more
(Counts Status 6)

Press any key to return!
```

Run Tree Level Error Check

This function may be accessed when the user is in the *Trees* level by pressing **F8** and selecting the **L4LevCk.run** choice.

The *Trees* level contains a number of error checks that occur automatically when the user leaves the level by using either **F4** (back up one level) or **Alt F5** (sibling jump to *Vegetation* or *Down Wood* levels). This function (**L4LevCk.run**) allows the user to run the error check without leaving the *Trees* level.

See the **Trees Level Error Messages** section later in this document for information about the error checks that are done by **L4LevCk.run**.

HHSLI CALCULATOR PROGRAMS

Overview

The calculator function is accessed by pressing **F7** and selecting the **DoCalc.run** selection. The following screen will appear:

```
HHSLI CALCULATOR

1. VP Limiting Distance
2. FP Limiting Distance
3. Tree Height
4. Relaskop Diameter
5. Horizontal Distance

Enter Function Number: _

(Press ESC key to Exit)
```

Within each calculator function, use the **Enter** key to move to each input area. After all data has been entered and the results have been displayed, use the **Enter** or **ESC** key to return to the *HHSii* Calculator main menu.

The available functions are as follows:

1. VP Limiting Distance uses the BAF, tree DBH, and percent slope to help determine which trees are in or out in a variable plot cruise. The limiting distance is the distance from the plot center to either the face or the center of the tree, at the sighting point (DBH). The numbers calculated are the limiting slope distance to the face of the tree, the limiting horizontal distance to the face of the tree, the limiting slope distance to the center of the tree, and the limiting horizontal distance to the center of the tree. The program will initially load the BAF specified at the *Cruise* level. If the program is run while the user is in the *Trees* level, the program will initially load the DBH from the current line in the Trees file. The user may change either of the initially loaded numbers if needed.

```
VP LIMITING DISTANCE

BAF:
XXX.XX
Diameter (inches):
XXX.X
% Slope to Sight Point:
XX

Limit SD to face :XXX.X
Limit HD to face :XXX.X
Limit SD to center:XXX.X
Limit HD to center:XXX.X
```

2. FP Limiting Distance uses the fixed plot radius (horizontal distance) and the percent slope to help determine which trees are in or out in a fixed plot cruise. The calculated value is the limiting slope distance for the plot from the plot center to the center of the tree.

FP LIMITING DISTANCE
Fixed Plot Radius (HD'): XXX.X
% Slope: XXX
Limiting Slope Distance (ft): XXX.X

3. Tree Height calculates the height of a tree using the slope distance in feet from the user location to the site point, the percent slope from the user location to the sight point, the percent slope from the user location to the top of the tree, and the percent slope from the user location to the base of the tree. The number calculated is the total height of the tree. If this calculation is done while the user is in the *Trees* level, the calculated tree height will be added to the Ht column of the current line.

TREE HEIGHT
Slope Distance (ft): XXX.X
% Slope to Sight Point: XXX
% Top Shot: XXX
% Bottom Shot (enter - for minus shot) XXX
Tree Ht = XXX feet

4. Relaskop Diameter calculates the Diameter of the tree in inches using the slope distance from the user location to the center of the tree at the sight point, and the width of the tree in Relaskop bars.

RELASKOP DIAMETER
Slope Distance (ft): XXX.X
Number of Bars: XX.X
Rel Diam = XXX.X inches

5. Horizontal Distance calculates the horizontal distance in feet from the user location to a tree using the slope distance in feet from the user location to the tree and the percent slope from the user location to the tree.

HORIZONTAL DISTANCE
Slope Distance (ft): XXX.X
% Slope to Sight Point: XXX
Horizontal Dist. to Sight Point (ft): XXX.X

HHSLI ERROR MESSAGES

Cruise Level Error Messages

Overview

The *Cruise* level error checks include one check of the Stand ID number and a series of checks for consistency of the cruise specifications.

The plot configuration used to sample a stand may include 0 - 3 nested fixed plots and 0 or 1 variable plot. The plot that a specific tree belongs to depends on the size (DBH) of the tree and the plot specifications made at this level. The purpose of these error checks is to ensure that the plot specifications are consistent with each other.

The Stand ID check occurs when the STD-ID field entry occurs. The remainder of the checks occur when advancing from the *Cruise* level to the *Line* level. The Level advance will not occur until all errors are fixed.

Error Messages

Invalid Stand# Filename is XXXXX

Explanation: This error occurs when the value entered in the STD_ID field is different from the file name entered for "Collect Data / New Dataset / New File Name" menu choice on the main menu.

Action: STD_ID and the file name must be the same, and must be equal to the stand number being sampled. Make appropriate changes.

Inconsistent Cruising Specs Checks:

The program checks for consistency between the **BAF**, **DBHcutoff**, and fixed plot specification fields. Valid combinations are shown in the following table.

Plot Design	BAF	DBHcutoff	Fixed Plot Specs
Fixed Plots Only	0.0	999.9	Yes
Variable Plots Only	> 0.0	0.1	None
Both Variable and Fixed Plots	> 0.0	> 0.1 and <999.9	Yes

Invalid combinations trigger one of the following 4 error messages.

Inconsistent Cruz Specs

BAF = XX.XX

DBHcutoff = XXX.X

If BAF = 0, DBHcutoff must = 999.9 and there must be fixed plot specs.

Explanation: Error occurs if the **BAF** field is set to 0.0 and either there are no fixed plot specs (**LtxMaxDBH**, **LtxMinDBH** and **LtxRadius**) or **DBHcutoff** is not = 999.9. If **BAF** is = 0.0, then **DBHcutoff** must equal 999.9 and there must be specs for at least one fixed plot.

Action: If your data collection project does not include a variable plot component, set **DBHcutoff** = 999.9 and set specifications for at least one fixed plot. If it does include a variable plot component, set **DBHcutoff** to the smallest DBH tree that will be included in the variable plot portion of the cruise and **BAF** to the Basal Area factor that will be used for the variable plot component of the data collection project.

Inconsistent Cruz Specs

BAF = XX.XX

DBHcutoff = XXX.X

If BAF>0, then DBHcutoff must not be equal to 999.9

Explanation: Error occurs if the **BAF** field is greater than 0.0 and **DBHcutoff** = 999.9. If **BAF** is greater than 0, then that means that there is a variable plot component to the project. If this is true, then **DBHcutoff** must be less than 999.9.

Action: If your data collection project does include a variable plot component, set **DBHcutoff** to the smallest DBH tree that will be included in the variable plot portion of the cruise. If it does not include a variable plot component, set **DBHcutoff** = 999.9, set specifications for at least one fixed plot, and set **BAF** = 0.0.

Inconsistent Cruz Specs

BAF = XX.XX

DBHcutoff = XXX.X

If BAF>0, and DBHcutoff = 0.1, then there must be no fixed plot specs.

Explanation: Error occurs if the **BAF** field is greater than 0.0, and **DBHcutoff** = 0.1, and there are specs for at least one fixed plot. If **BAF** is greater than 0 and **DBHcutoff** = 0.1, then there should be no fixed plot component to the project.

Action: If your data collection project does not include a fixed plot component set **DBHcutoff** = 0.1, set **BAF** to an appropriate number>0, and include no fixed plot specs (**LtxMaxDBH**, **LtxMinDBH** and **LtxRadius**). If your data collection project does include a fixed plot component, set **DBHcutoff** to the smallest DBH tree that will be included in the variable plot portion of the cruise or to 999.9 if there is no variable plot component.

Inconsistent Cruz Specs**BAF = XX.XX****DBHcutoff = XXX.X****If BAF>0, and DBHcutoff>0.1, and DBHcutoff <999.9, then there must be fixed plot specs.**

Explanation: Error occurs if the **BAF** field is greater than 0.0, and **DBHcutoff** is **between** 0.2 and 999.8, and there are not any fixed plot specs (**LtxMaxDBH**, **LtxMinDBH** and **LtxRadius**).

Action: If your data collection project includes both fixed and variable plots, set BAF to an appropriate number greater than 0, set **DBHcutoff** to the smallest DBH tree that will be included in the variable plot portion of the cruise, and include fixed plot specs (**LtxMaxDBH**, **LtxMinDBH** and **LtxRadius**).

Lt1MaxDBH <Lt1MinDBH!

Explanation: Error occurs if the smallest fixed plot (LT1) maximum plot DBH is smaller than the smallest plot minimum DBH. This check guards against accidental entry errors.

Action: Either set both **Lt1MinDBH** and **Lt1MaxDBH** to 0, or set **Lt1MaxDBH** to a number larger than **Lt1MinDBH**.

Lt1Radius Not Set!

Explanation: Error occurs if **Lt1MinDBH** has been set to 0 or greater and **Lt1MaxDBH** has been set a number greater than **Lt1MinDBH**, but no plot radius has been specified in the **Lt1Radius** field.

Action: If you wish to use this fixed plot (LT1) in your data collection process, then set **Lt1Radius** to the desired plot radius. If you do not wish to use this fixed plot, then set both **Lt1MinDBH** and **Lt1MaxDBH** = 0.

**Lt1MinDBH Not Set or
Lt1MaxDBH Not Set**

Explanation: Error occurs when **Lt1Radius** has been set to a number greater than 0, but **Lt1MaxDBH** has not been set to a number greater than **Lt1MinDBH**.

Action: If you wish to use this fixed plot (LT1) in your data collection process, then set **Lt1MaxDBH** to a number greater than **Lt1MinDBH**. If you do not wish to use this fixed plot, then set both **Lt1MinDBH** and **Lt1MaxDBH** = 0 and **Lt1Radius** to 0.

Lt2MaxDBH <Lt2MinDBH!

Explanation: Error occurs if the medium fixed plot (LT2) maximum plot DBH is smaller than the medium plot minimum DBH. This check guards against accidental entry errors.

Action: Either set both **Lt2MinDBH** and **Lt2MaxDBH** to 0, or set **Lt2MaxDBH** to a number larger than **Lt2MinDBH**.

Lt2Radius Not Set!

Explanation: Error occurs if **Lt2MinDBH** has been set to 0 or greater and **Lt2MaxDBH** has been set a number greater than **Lt2MinDBH**, but no plot radius has been specified in the **Lt2Radius** field.

Action: If you wish to use this fixed plot (LT2) in your data collection process, then set **Lt2Radius** to the desired plot radius. If you do not wish to use this fixed plot, then set both **Lt2MinDBH** and **Lt2MaxDBH** = 0.

**Lt2MinDBH Not Set or
Lt2MaxDBH Not Set**

Explanation: Error occurs when **Lt2Radius** has been set to a number greater than 0, but **Lt2MaxDBH** has not been set to a number greater than **Lt2MinDBH**.

Action: If you wish to use this fixed plot (LT2) in your data collection process, then set **Lt2MaxDBH** to a number greater than **Lt2MinDBH**. If you do not wish to use this fixed plot, then set both **Lt2MinDBH** and **Lt2MaxDBH** = 0 and **Lt2Radius** to 0.

Lt3MaxDBH <Lt3MinDBH!

Explanation: Error occurs if the largest fixed plot (LT3) maximum plot DBH is smaller than the largest plot minimum DBH. This check guards against accidental entry errors.

Action: Either set both **Lt3MinDBH** and **Lt3MaxDBH** to 0, or set **Lt3MaxDBH** to a number larger than **Lt3MinDBH**.

Lt3Radius Not Set!

Explanation: Error occurs if **Lt3MinDBH** has been set to 0 or greater and **Lt3MaxDBH** has been set a number greater than **Lt3MinDBH**, but no plot radius has been specified in the **Lt3Radius** field.

Action: If you wish to use this fixed plot (LT3) in your data collection process, then set **Lt3Radius** to the desired plot radius. If you do not wish to use this fixed plot, then set both **Lt3MinDBH** and **Lt3MaxDBH** = 0.

**Lt3MinDBH Not Set or
Lt3MaxDBH Not Set**

Explanation: Error occurs when **Lt3Radius** has been set to a number greater than 0, but **Lt3MaxDBH** has not been set to a number greater than **Lt3MinDBH**.

Action: If you wish to use this fixed plot (LT3) in your data collection process, then set **Lt3MaxDBH** to a number greater than **Lt3MinDBH**. If you do not wish to use this fixed plot, then set both **Lt3MinDBH** and **Lt3MaxDBH** = 0 and **Lt3Radius** to 0.

**Lt2MinDBH Not Equal
To Lt1MaxDBH + 0.1!**

Explanation: When specifying two nested fixed plots, the minimum DBH of the larger of the two (**Lt2MinDBH**) must be 0.1 inches larger than the maximum DBH of the smaller of the two (**Lt1MaxDBH**).

Action: To use two nested fixed plots, make **Lt2MinDBH** exactly 0.1" larger than **Lt1MaxDBH**.

**Lt3MinDBH Not Equal
To Lt2MaxDBH + 0.1!**

Explanation: When specifying three nested fixed plots, the minimum DBH of the largest of the three (**Lt3MinDBH**) must be 0.1 inches larger than the maximum DBH of the middle sized plot of the three (**Lt2MaxDBH**).

Action: To use three nested fixed plots, make **Lt3MinDBH** exactly 0.1" larger than **Lt2MaxDBH**.

DBHcutoff Not Equal To MaxUpperBound + 0.1!

Explanation: When specifying a data collection project that includes both fixed plots and variable plots, the break point between fixed and variable plots (**DBHcutoff**) must be exactly 0.1" larger than the largest fixed plot specified. If there are no fixed plots used, set **DBHcutoff** to 0.1". If there is one fixed plot, **DBHcutoff** must be 0.1" larger than **Lt1MaxDBH**. If there are two fixed plots, **DBHcutoff** must be 0.1" larger than **Lt2MaxDBH**. If there are three fixed plots, **DBHcutoff** must be 0.1" larger than **Lt3MaxDBH**.

Action: Adjust either **DBHcutoff**, or the largest fixed plot upper boundary so that **DBHcutoff** is exactly 0.1" larger than the largest fixed plot specified.

Line Level Error Message

Overview

The **Line** level contains one error check. This check occurs when attempting to add a new cruise line. The line will still be added, but the user is warned that it may be incorrect.

Error Message

Line Number Warning

Previous line = X (*where X is the last line number entered.*)

Explanation: Cruise lines should usually (but not always) be numbered sequentially. This warning message allows the user to correct a potentially incorrect line number.

Action: If necessary, correct the line number before proceeding to the **Plot** level.

Plot Level Error Messages

Overview

There are five checks at this level - three related to the **PlotStat** field, one warning for out of sequence plot numbering, and one warning for potentially missing records.

Error Messages

PlotStat not YY. Can't add recs to a blank plot

Explanation: When the **PlotStat** field is set to anything but YY (for Installed; has tally), this means that the plot is either installed but there are no tally items to record, or that the plot is not installed. In either case, no measurements of trees, vegetation, or down wood will be made. The error message is triggered if the user incorrectly attempts to advance to one of those branches using the F5 key.

Action: If there are measurements to be made on the plot, then change the **PlotStat** field to YY.

Plot has no records. PlotStat cannot = YY

Explanation: When the **PlotStat** field is set to YY, this means that the plot is installed and there are tally items to record. Error occurs when the user attempts to retreat to the **Line** level, or create another new plot without having entered measurements of trees, vegetation, or down wood.

Action: If there are no measurements to be made on the plot, then change the **PlotStat** field to something other than YY. If there are measurements to be made, advance to the **Trees, Vegetation, or Down Wood** level to make them.

Plot has records. PlotStat Must = YY

Explanation: When the **PlotStat** field is set to anything but YY (for Installed; has tally), this means that the plot is either installed but there are no tally items to record, or that the plot is not installed. In either case, no measurements of trees, vegetation, or down wood will be made. Error occurs when the user attempts to change the **PlotStat** field to anything but YY after adding records to any of the trees, vegetation, or down wood branches.

Action: Leave **PlotStat** as YY, unless the plot should really be a blank or non-installed plot. If the plot should be a blank or non-installed plot, first delete all of the records in the trees, vegetation, or down wood branches and then return to the **Plot** level and change the **PlotStat** field to an appropriate code other than YY.

Plot Number Warning

Previous plot = X (where X is the last plot number entered.)

Explanation: Plots should usually (but not always) be numbered sequentially. This warning message allows the user to correct a potentially incorrect plot number.

Action: If necessary, correct the plot number before proceeding to the **Trees, Vegetation, or Down Wood** level.

Records Check Warning!
(Line XX, Plot XX)

Explanation: This check is done when the user moves from one plot to another, and when the user moves from the **Plot** level to the **Line** level. The check is bypassed if the Plots **PlotStat** field has been set to anything but YY (for Installed; has tally). A warning message appears if one or more of the following are true: no tree records, no vegetation records, or no down wood records.

Action: This message is a reminder to the user to ensure that all required data has been collected. The user should check to see if all required data has been collected. If all required data has been collected, then proceed to the next plot. If all required data has not been collected, then collect the data and continue on to the next plot.

Example Screen:

```
Records Check Warning!  
(Line XX, Plot XX)  
  
No Tree Records!  
No Vegetation Records!  
No Down Wood Records!  
  
Press any key to return!
```

Note: Only those branches (Trees, Vegetation, or Down Wood) with no records will be listed on the screen.

PlotStat is YY or YN.
PlntAsc cannot = ZZZZ

Explanation: The plant association code ZZZZ stands for "Not Called", which is only appropriate if the plot is not installed. Note that this message is only received when retreating from the **Plot** level to the **Line** level, or on line change (attempting to move to another plot record), and not when advancing to the **TREES-VEG-DOWNWOOD** level.

Action: Record a plant association code other than ZZZZ for a plot that is installed.

Trees Level Error Messages

Overview

These checks ensure that the **Status** code assigned to a tree is consistent with the measurements that are made of the tree. Certain **Status** codes imply that certain measurements do or do not occur. The following table summarizes these relationships.

Status	Description	Ht	Age	CR	CC
0	Live Tree, no hgt.	0	0	all OK	all OK
1	Cut Tree, no hgt.	0	0	0	0
2	Dead Tree, no hgt.	0	0	0	0
3	Dead Tree, w/hgt., NR	>= 1	0	0	0
4	HST + Age, NR	>= 1	>=1	all OK	all OK
5	HST, NR	>= 1	0	all OK	all OK
6	HST, for Regression	>= 1	0	>0	>0
7	TopHt + Site Tree	>= 1	>=1	>0	1, 2, or 3
8	Site Tree	>= 1	>=1	>0	1, 2, or 3
9	TopHt Tree	>= 1	0	>0	1, 2, or 3

The following checks occur when attempting to move from the **Trees** level to any of the **Plot**, **Vegetation**, or **Down Wood** levels. The Level change will not occur until all errors are fixed.

Error Messages

Missing Height!

Explanation: Error occurs when the **Status** code is greater than 2 and height (**Ht**) = 0. Status codes 3 - 9 all require height measurements.

Action: Either measure the height of the tree or change the **Status** to 0, 1, or 2.

Hgt>0; Chg Status!

Explanation: Error occurs when there is a measured height (**Ht**) and the **Status** code is less than or equal to 2. **Status** codes 0, 1, and 2 are only for trees without a measured height.

Action: Change to an appropriate **Status** code in the 3 - 9 range.

DBH=0 & Hgt>9. Enter DBH!

Explanation: Error occurs when there is a measured height (**Ht**) greater than 9' and the **DBH** has not been recorded (is 0.0"). A **DBH** of zero is only acceptable for shorter trees (from 1' through 9' tall).

Action: Enter the **DBH** of the tree.

Missing Age!

Explanation: Error occurs when the **Status** code is 4, 7, or 8 and Age is 0.

Action: Either measure the age of the tree or change the **Status** to a code other than 4, 7, or 8.

Age>0; Chg Status!

Explanation: Error occurs when there is a measured **Age** and **Status** is not 4, 7, or 8.

Action: Set the **Status** code to 4, 7, or 8 (as appropriate), or delete the **Age** measurement.

Status 4 or 5 required!

Explanation: Error occurs when the tree **DBH** is less than 4 inches, the **Group** code is ".." (a live tree), and the **Status** code is not either 4 or 5. The error occurs because the inventory design requires that heights be entered for all live trees that are less than 4" DBH. This makes all such trees height sample trees (HST). The heights of such trees are not used in the FPS height regression. This means that all such trees must have **Status** code 4 or 5.

Action: Change the **Status** code to 4 (if an age measurement was made) or 5 (if an age measurement was not made), as appropriate.

C.Ratio>0; Chg Status!

Explanation: Error occurs if the **Status** code is 1, 2, or 3, and there is a measured crown ratio (**CR**). Trees with **Status** codes of 2 or 3 do not have live crowns. Crowns of **Status** code 1 trees are not assessed.

Action: Change the **Status** code to something other than 1, 2, or 3 or delete the **CR** measurement, as appropriate.

C.Class>0; Chg Status!

Explanation: Error occurs if the **Status** code is 1, 2, or 3, and there is a measured crown class (**CC**). Trees with **Status** codes of 2 or 3 do not have live crowns and, therefore, do not have a crown class. Crowns of **Status** Code 1 trees are not assessed.

Action: Change the **Status** code to something other than 1, 2, or 3 or delete the **CC** measurement, as appropriate.

Missing Crown Ratio!

Explanation: Error occurs either when the **Status** code is 6, 7, 8, or 9 or when there is a measured crown class (**CC**). **Status** codes 6 - 9 always require crown ratio (**CR**) measurements. **Status** codes 0, 4, and 5 allow crown ratio measurements, but do not require them. However, if a crown class measurement is made, then a crown ratio measurement must also be made.

Action: If the **Status** code has correctly been specified as 6, 7, 8, or 9, then enter a **CR** measurement. If the **Status** code has correctly been specified as 0, 4, or 5 then either enter a **CR** measurement, or delete the **CC** measurement. If the **Status** code is incorrect, then change it.

Missing Crown Class!

Explanation: Error occurs either when the **Status** code is 6, 7, 8, or 9 or when there is a measured crown ratio (**CR**). **Status** codes 6 - 9 always require crown class (**CC**) measurements. **Status** codes 0, 4, and 5 allow crown class measurements, but do not require them. However, if a crown ratio measurement is made, then a crown class measurement must also be made.

Action: If the **Status** code has correctly been specified as 6, 7, 8, or 9, then enter a **CC** measurement. If the **Status** code has correctly been specified as 0, 4, or 5 then either enter a **CC** measurement, or delete the **CR** measurement. If the **Status** code is incorrect, then change it.

Error: C. Class Problem!

Explanation: Error occurs when the **Status** code is 7, 8, or 9 (Top Height and/or Site trees) and the crown class (**CC**) is not 1, 2, or 3 (Open Grown, Dominant, or Codominant).

Action: Change either the **Status** code or the **CC**, whichever change is most appropriate.

Status 2 or 3 required!

Explanation: Error occurs when the **Group** code is "SN" (snag) and the **Status** code is not either 2 or 3. Snags can only be assigned a **Status** code of 2 or 3.

Action: Change the **Status** code to 2 or 3 (as appropriate), or change the **Group** code to ".." if the tally is really for a live tree.

Error:>1 TopHt Sample!

Explanation: Error occurs when there is more than one tree on a plot with **Status** code 7 or 9 (TopHt tree). There can be only 1!

Action: Keep the best top height tree as **Status** code 7 or 9. Change the rest of them to **Status** code 4, 5, 6, or 8 (as appropriate).

Missing TopHt Sample!

Explanation: Error occurs when there are no designated **Status** code 7 or 9 trees (TopHt trees) on a plot when the plot number is evenly divisible by 3.

Action: There may be times when there are no suitable TopHt trees on the plot, so this is a warning message only and does not prevent the user from exiting the plot. If there is a suitable TopHt tree, then measure and record its **Ht**. If there are no suitable TopHt trees, then ignore the warning and proceed.

Fill in C and U fields!

Explanation: Error occurs when the **Group** code is "SN" (snag) or "ST" (stump), and either the decay class (**C**) field is not filled in or the wildlife use (**U**) field is not filled in.

Action: Fill in both the **C** and **U** fields when **Group** is "SN" or "ST".

**If Height <= 6',
DBH must = 0!**

Explanation: Error occurs when the **STATUS** code is greater than 3 (**height** should be measured), the tree **height** is less than or equal to 6 feet, and the **DBH** is not 0.

Action: Set the **DBH** to 0.

Dmg1 or Sv1 blank!

Explanation: **Dmg1** and **Sv1** must either both be specified (non-blank), or must both be blank.

Action: Set **Dmg1** or **Sv1** to an appropriate value.

Dmg2 or Sv2 blank!

Explanation: **Dmg2** and **Sv2** must either both be specified (non-blank), or must both be blank.
Action: Set **Dmg2** or **Sv2** to an appropriate value.

Dmg3 or Sv3 blank!

Explanation: **Dmg3** and **Sv3** must either both be specified (non-blank), or must both be blank.
Action: Set **Dmg3** or **Sv3** to an appropriate value.

**DBH=XXX.X H=XXX h/d=XXX
Change DBH or Ht? (Y/N)**

Explanation: This check looks for possible errors in entering **DBH** and **height** data. The height (**Ht** field) is divided by the **DBH** in feet (DBH/12) and the resulting ratio is compared to acceptable h/d ranges for specific tree species.

Action: This is a warning only. The user should check to see if the **DBH** and **height** shown in the error message were entered correctly. Press "N" to proceed if the data were entered correctly. Press "Y" to stop and correct an entry. If "Y" is pressed, the cursor will go to the **DBH** field of the record that generated the warning.

**Status 2 and 3 invalid!!
For GP = ..**

Explanation: Leave trees (Group Code) "..") must not have Status 2 or 3 recorded for them.
Action: Record a status other than 2 or 3 for live tree tally.

**GT > 1 invalid
For Status Code 6-9!**

Explanation: Status 6, 7, 8 & 9 trees must be tallied as separate records (group tally = 1).
Action: Record a group tally of 1 for each status 6, 7, 8, or 9 tree.

**Status 3 required
For Gp – ST!!**

Explanation: Status 3 is the only valid code for stump tally.
Action: Change the status to 3.

Gp = ST and height > 4'
Max ST height = 4'

Explanation: Height of stumps must be recorded as 1, 2, 3, or 5' tall. "Stumps" that are taller are "snags" by definition in SLI.

Action: Record a height of 1, 2, 3, or 4' for a stump, or if taller, change the Group Code to "SN" for snag and record a taller height.

Gp = ST needs dmg = 96!!

Explanation: Stump tally must include a damage code of 96 to indicate the "missing top". Note that defect % should also be entered (usually at least 90% missing or more).

Action: Record a 96 damage code in dmg1, dmg2, or dmg3.

Down Wood Level Error Message

Overview

The **Down Wood** level contains two error checks.

These checks occur when attempting to leave the level. The level change does not occur until the error is fixed.

Error Messages

LgD < SmD!

Explanation: The large end diameter (**LgD**) must be greater than or equal to the small end diameter (**SmD**).

Action: Correct the value in either **LgD** or **SmD** to ensure that **LgD** is greater than or equal to **SmD**.

Intercept Dia. Problem

Explanation: This error is triggered if the intercept diameter is not equal to or between the values entered for small end diameter (**SmD**) and large end diameter (**LgD**).

Action: Correct the values in either **IntD**, **SmD**, or **LgD** so that the intercept diameter is equal to or between the small end and large end diameter.

HHSLI FIELDS SUMMARY

Required means that a value must be entered into the field either by the user or by Preload.

Preload shows the value, if any, that is preloaded into a field when a new record is created. The user may overwrite a Preload value.

Min is the smallest value allowed in a field.

Max is the largest value allowed in a field.

Warn Min generates a warning if the user enters a value that is smaller than or equal to the value shown.

Warn Max generates a warning if the user enters a value that is larger than or equal to the value shown.

Lookup indicates that there is a lookup table associated with the field. Only values contained in the lookup table may be entered. Tables that are shown with "(rel.)" are related tables – the table used depends upon the value entered into a related data field.

Autocopy in the Preload field indicates that, when a new record is created, the value for that column will be copied from the previous record. The user may overwrite the Autocopy value.

Autonumber in the Preload field indicates that, when a new record is created, the value for that column is an integer that is one higher than the number in the previous record.

Hidden fields are not visible to the *HHSli* user and are indicated by italics.

Cruise Level										
Field	Type	Width	Decimals	Required	Preload	Min	Max	Warn Min	Warn Max	Lookup
Std_ID	Numeric	5	0	YES		1	99999	1	42000	
ProgVer	Character	6	0	YES	HHSLI					ProgVer.cl
CruiseDate	Character	8	0	YES	MMDDYY					
Cruiser	Character	4	0	YES						
BAF	Numeric	5	2							BAF.cl
DBHcutoff	Numeric	5	1	YES	5.5	0.1	999.9	5.4	10	
Lt1MinDBH	Numeric	5	1		0					
Lt1MaxDBH	Numeric	5	1		2.4					
Lt2MinDBH	Numeric	5	1		2.5					
Lt2MaxDBH	Numeric	5	1		5.4					
Lt3MinDBH	Numeric	5	1							
Lt3MaxDBH	Numeric	5	1							
Lt1Radius	Numeric	5	1		8	1.0	150	6	33	
Lt2Radius	Numeric	5	1		17	1.0	150	6	55	
Lt3Radius	Numeric	5	1			1.0	150	6	55	
DtRadius	Numeric	5	1			0.0	150	0	120	
VegRadius	Numeric	5	1	YES	24	6.0	150	10	55	
Transect	Numeric	5	1		100	1.0	360	50	200	
PlanPnum	Numeric	3	0	YES		1	999	9	40	
AvgTplt	Numeric	4	1	YES		1.0	99.9	5	10	
PlotSpace	Numeric	4	0	YES		50	9999	50	200	
Remarks	Character	24	0							
<i>SiteCnt</i>	<i>Numeric</i>	<i>3</i>	<i>0</i>							
<i>ThtCnt</i>	<i>Numeric</i>	<i>3</i>	<i>0</i>							
<i>HstCnt</i>	<i>Numeric</i>	<i>3</i>	<i>0</i>							
<i>TrCnt</i>	<i>Numeric</i>	<i>3</i>	<i>0</i>							
<i>HstInt</i>	<i>Numeric</i>	<i>1</i>	<i>0</i>							
<i>Version</i>	<i>Character</i>	<i>8</i>	<i>8</i>		<i>Ver. Date</i>					
<i>Editable</i>	<i>Character</i>	<i>1</i>	<i>0</i>							

Line Level										
Field	Type	Width	Decimals	Required	Preload	Min	Max	Warn Min	Warn Max	Lookup
<i>Std_ID</i>	<i>Numeric</i>	<i>5</i>	<i>0</i>							
Line	Numeric	2	0	YES		1	99			
StartY	Numeric	7	0	YES		50000	1700000			
StartX	Numeric	7	0	YES		200000	2400000			
LineAz	Numeric	3	0	YES		1	360			
Remarks	Character	24	0							
Plot Level										
Field	Type	Width	Decimals	Required	Preload	Min	Max	Warn Min	Warn Max	Lookup
<i>Std_ID</i>	<i>Numeric</i>	<i>5</i>	<i>0</i>							
<i>Line</i>	<i>Numeric</i>	<i>1</i>	<i>0</i>							
Plt	Numeric	3	0	YES		1	999			
PlotStat	Character	2	0	YES	YY					PlotStat.cl
<i>PltRecCnt</i>	<i>Numeric</i>	<i>3</i>	<i>0</i>							
RootDis	Character	3	0	YES						RootDis.cl
SwissNedl	Character	1	0	YES						SwissNC.cl
Ycoord	Numeric	8	0	YES		0	1700000	50000	1700000	
Xcoord	Numeric	8	0	YES		0	2400000	200000	2400000	
Elev	Numeric	4	0			1	9999	100	6000	
Aspect	Numeric	3	0			1	360			
Slope	Numeric	3	0			0	200	0	99	
SlopePos	Character	2	0	YES						SlopePos.cl
GrndClas	Character	13	0	YES						GrndClas.cl
PctSoil	Numeric	4	2			0	1.0			
PlntAsc	Character	7	0	YES						Plnta____.cl (rel.)
Remarks	Character	24	0							
<i>TrCnt</i>	<i>Numeric</i>	<i>3</i>	<i>0</i>							
<i>L4S1</i>	<i>Numeric</i>	<i>1</i>	<i>0</i>							
<i>L4S2</i>	<i>Numeric</i>	<i>1</i>	<i>0</i>							
<i>L4S3</i>	<i>Numeric</i>	<i>1</i>	<i>0</i>							

Trees Level										
Field	Type	Width	Decimals	Required	Preload	Min	Max	Warn Min	Warn Max	Lookup
<i>Std_ID</i>	<i>Numeric</i>	5	0							
<i>Line</i>	<i>Numeric</i>	1	0							
<i>Plt</i>	<i>Numeric</i>	3	0							
Tr	Numeric	3	0		Autonumber					
Gp	Character	2	0	YES	..					GroupLt.cl
Sp	Character	5	0	YES	Autocopy					TreeSP.cl
DBH	Numeric	5	1	YES		0	999.9			
Tcl	Numeric	3	0							TrClsKL.cl
GT	Numeric	2	0	YES	1	1	99	1	11	
F	Character	1	0							
S	Numeric	1	0	YES						Status.cl
Ht	Numeric	3	0			1	300	1	180	
Age	Numeric	3	0			1	999	1	150	
CR	Numeric	3	2			.01	.99	.08	.99	
CC	Numeric	1	0							CrnClass.cl
Dmg1	Character	2	0							Dmg.cl
Sv1	Character	2	0							Sev_.cl (rel.)
Dmg2	Character	2	0							Dmg.cl
Sv2	Character	2	0							Sev_.cl (rel.)
Dmg3	Character	2	0							Dmg.cl
Sv3	Character	2	0							Sev_.cl (rel.)
Def1	Numeric	3	2			.00	.99			
Def2	Numeric	3	2			.00	.99			
Def3	Numeric	3	2			.00	.99			
C	Character	1	0							DecaySN.cl
U	Character	1	0							WuseSN.cl
Rmk	Character	3	0							Remarks.cl
Azm	Numeric	3	0			1	360			
Dist	Numeric	5	1			0.1	120			
User1	Character	5	0							
User2	Character	5	0							
User3	Character	5	0							
ExpFac	Numeric	7	2			1.00	9999.99			

Vegetation Level										
Field	Type	Width	Decimals	Required	Preload	Min	Max	Warn Min	Warn Max	Lookup
<i>Std_ID</i>	<i>Numeric</i>	5	0							
<i>Line</i>	<i>Numeric</i>	1	0							
<i>Plt</i>	<i>Numeric</i>	3	0							
Lyr	Numeric	1	0	YES	1	1	3			Lyr.cl
Sp	Character	5	0	YES						VegSp.cl
CovPct	Numeric	3	0	YES						CovPct.cl
Ht	Numeric	2	0	YES		1	99			
Rmk	Character	10	0							

Down Wood Level										
Field	Type	Width	Decimals	Required	Preload	Min	Max	Warn Min	Warn Max	Lookup
<i>Std_ID</i>	<i>Numeric</i>	<i>5</i>	<i>0</i>							
<i>Line</i>	<i>Numeric</i>	<i>1</i>	<i>0</i>							
<i>Plt</i>	<i>Numeric</i>	<i>3</i>	<i>0</i>							
Sp	Character	5	0	YES						TreeSP.cl
IntD	Numeric	4	0	YES		1	200			
SmD	Numeric	3	0	YES		1	200			
LgD	Numeric	3	0	YES		6	200			
Len	Numeric	3	0	YES		3	300	3	99	
C	Character	1	0	YES						DecayDW.cl
U	Character	1	0	YES						WuseDW.cl
Rmk	Character	10	0							

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APPENDIX E: CODES, MISC. PROCEDURES, TABLES, & FORMS

NON-FOREST PLANT ASSOCIATION (ECOCLASS) CODES

Non-vegetated land: less than 10% cover of vegetation:

Human caused lack of vegetation (usually cause to not install the cruise plot):

Heliport	ABA1
Runway, landing strip	ABA2
Parking area	ABP9
Road	ABR8
Rock, gravel storage area	ABS1
Open storage area	ABS9
Cultivated land	ACXX
Garbage dump	ADG9
Land fill, sanitary landfill	ADL9
Trash dump, refuse dump (open)	ADT9
Mine tailings, dredging piles	NMXX
Rock pit, quarry	NRQ0

Naturally non-vegetated land:

Avalanche path with:	
Scattered conifers	NAC0
Scattered shrubs	NAS0
Subalpine with:	
Cinders, lava, mud, glacial wash	NCA0
Rocks > 50% cover	NRA0
Talus slopes	NTA0
Ice fields, snow, glaciers	NIXX
Below subalpine with:	
Cinders, mud, lava flow	NCXX
Denuded floodplain	NFXX
Sand, sand dunes	NSXX
Talus slopes	NTXX
Ledge, cliff, rock face (> 200%)	NRL0
Landform failure (slumps, avalanches)	NLXX

Water-covered areas:

Estuary— interface between fresh and saline water	WEXX
Ocean, seas, saline water bodies	WOXX
Running water— stream, river, creek, ditch	WRXX
Intermittent streams, rivers	WR90
Lake, pond, impoundment	WLXX
Intermittent lake, pond, impoundment	WL90

Forbland:

Forbland	FXXX
Moist (mesic) forblands in forest zone	FMXX
Wet forblands, forb meadows	FWXX

Grassland:

Grassland	GXXX
Annual grass vegetation	GAXX
Bunchgrass vegetation	GBXX
Moist (mesic) grassland in forest zone	GMXX
Coastal grassland	GM80
Rhizomatous grass or sedge vegetation	GRXX
Subalpine or alpine grassland	GSXX

Meadow, grass-sedge: _____

Meadow, grass-sedge	MXXX
Dry meadow	MDXX
Moist meadow	MMXX
Subalpine/alpine moist meadow	MSXX
Wet meadow	MWXX
Any of the above with scattered conifers (X=D,M,S,W)	MXC0

Shrubland: _____

Shrubland	SXXX
Dry shrubland	SDXX
Moist (mesic) shrubland	SMXX
Subalpine/alpine shrubland	SSXX
Shrub wetlands	SWXX

SITE TREE SELECTION RULES

The selection of the site trees is based upon rules specific to site index curves applicable to the stand's characteristics.

This section contains the working definition of dominant and codominant trees, generic selection rules for applicable to all site index curves, and additional selection rules specific to the most common site index curves for ODF lands. If stand conditions are not well matched to a specific site curve, use the generic rules for all site index curves and select dominant and codominant trees as your site index trees.

Dominant: Tree crowns receive full light from above and at least partial sunlight from the sides. Crowns extend above the general level of the canopy.

Codominant: Tree crowns receive full light from above and little from the side. Crowns usually form the general level of the canopy.

Table 17: Site tree selection guidance

Stand characteristics	Rmk code	Selection rules	Reference
Generic Rules for all Site Index Curves	GEN	<ol style="list-style-type: none"> 1. Normally formed bole and crown. A tree with a central bole exhibiting physiological traits and development that is typical for that tree species, age, and local environment. 2. A site tree may have minor damage that does not effect height growth but cannot have any visible defect, evidence of suppression, or symptoms of interior rot. 3. A site tree candidate must not be an open-grown tree, a "remnant tree" from a previous stand, or a tree joined at the base. 	None.
Douglas-fir & Ponderosa Pine - Southwest Oregon	HS	<ol style="list-style-type: none"> 1. Dominant crown class only. 2. Breast Height Age (BHA) Between 20 and 250 for either Douglas-fir or ponderosa pine. 	Hann, David W., and John A. Scrivani. <i>Dominant-Height-Growth and Site-Index Equations for Douglas-fir and Ponderosa Pine in Southwest Oregon.</i> Oregon State University, Research Bulletin 59, February 1987.
Douglas-fir - Younger Stands, low elevation not in SW Oregon	KG	<ol style="list-style-type: none"> 1. Select trees within the category of trees that have the largest 20 percent DBH measurements on the plot. 2. BHA between 30 and 130 years. 	King, James, E. <i>Site Index Curves for Douglas-fir in the Pacific Northwest.</i> Weyerhaeuser Forestry Paper, No. 8 July 1966.

Stand characteristics	Rmk code	Selection rules	Reference
Douglas-fir - high elevation	CU	<ol style="list-style-type: none"> 1. Elevation greater than 3,000 feet 2. Tallest dominant trees on the plot 	<p>Curtis, Robert O., Francis R. Herman, Donald J. DeMars. <i>Height Growth and Site Index for Douglas-fir in High-Elevation Forests of the Oregon-Washington Cascades</i>. Forest Science, Vol. 20. No 4. pp. 307-315.</p>
Douglas-fir - Older stands, low elevation	MC	<ol style="list-style-type: none"> 1. Unmanaged stands 2. Dominant codominant and trees. 3. BHA older than the appropriate the site curve at your location for younger stands. 	<p>McArdle, Richard, Walter H. Meyer, and Donald Bruce. <i>The Yield of Douglas Fir in the Pacific Northwest</i>. Technical bulletin No. 201. Revised October 1949, Slightly revised May 1961.</p>
Ponderosa Pine - Older stands	PP	<ol style="list-style-type: none"> 1. Stands that are predominately ponderosa pine and or have Douglas-fir, white fir, or Sugar Pine as minor species. 2. Managed or unmanaged even-aged stands 3. Dominant and codominant trees. 4. BHA older than 250 years. 	<p>Meyer, Walter. <i>Yield of Even-Aged Stands of Ponderosa Pine</i>. USDA Technical Bulletin No. 630. October 1938, Slightly revised April 1961.</p>
White & Grand Fir	WF	<ol style="list-style-type: none"> 1. Unmanaged even-aged stands 2. Dominant Trees. 3. BHA between 50 -150 years. 	<p>Schumacher, Francis X. <i>Yield, Stand, and Volume Tables for White Fir in the California Pine Region</i>. October, 1926. University of California College of Agriculture Agricultural Experiment station, Berkeley, California. Bulletin 407.</p>
California & Shasta Red Fir	RF	<ol style="list-style-type: none"> 1. Stands with at least 20 percent red fir. 2. Dominant trees. 3. BHA between 10 - 160. 	<p>Dolph, K. Leroy. <i>Polymorphic Site Index Curves for Red Fir in California and Southern Oregon</i>. USDA Pacific Southwest Research Station Research Paper PSW-206.</p>

Stand characteristics	Rmk code	Selection rules	Reference
Red Alder	RA	Dominant and codominant trees.	Harrington, Constance A., and Robert O. Curtis. <i>Height Growth and Site Index Curves for Red Alder</i> . USDA FS Pacific Northwest Research Station, Research Paper PNW-358 , April 1986.

DETERMINING THE AGE OF A LARGE TREE

The following example and diagram explain how to determine the age of a large tree.

Given a tree: 58.6 inches DBH, 2.0 inch bark thickness, 14.0 inch increment core with 110 total rings and 10 rings on the interior two inches of the core.

Solve for age:

- Determine the radius of the tree at DBH ($58.6''/2 = 29.3''$).
- subtract bark thickness to get wood radius at DBH ($29.3'' - 2.0'' = 27.3''$).
- Find the remaining distance to the center of the tree ($27.3'' - 14.0'' = 13.3''$).
- Calculate the average rings per inch ($10 \text{ rings}/2'' = 5 \text{ rings/inch}$).
- Extrapolate the average rings per inch of missing core ($5 \text{ rings/inch} \times 13.3'' = 66.5 \text{ rings}$, round to 67).
- Add the actual ring count and the extrapolated ring total together to determine age ($110 + 67 = 177$ years age).

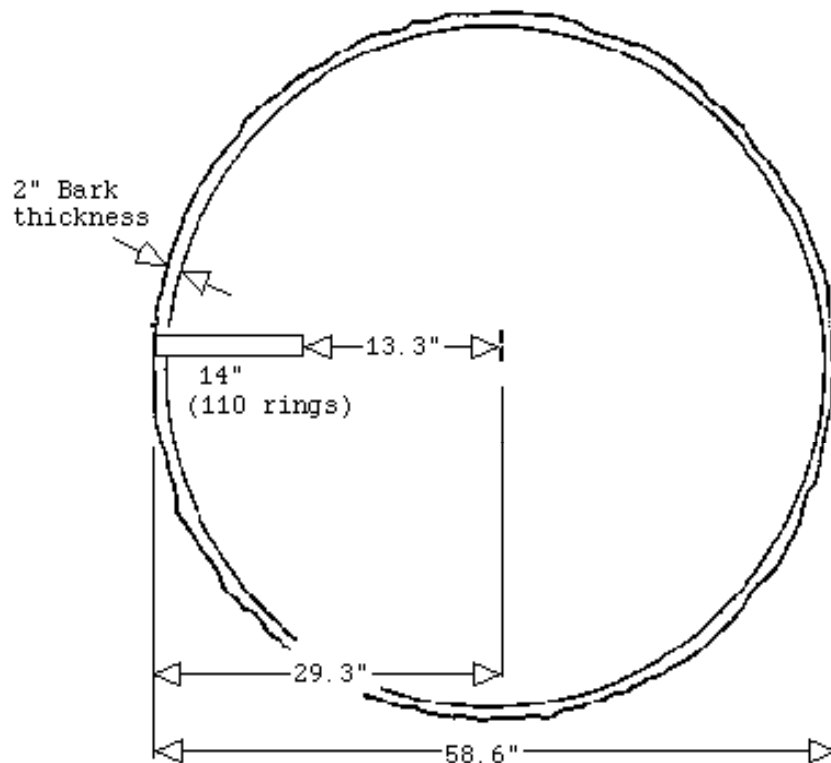


Figure 18: Determining the age of a large tree

STANDARD SLI SAMPLE PLOT DESIGN

{Riparian Data Collection project plot design values are represented as values within brackets.}

Stand Component	Standard SLI Design	<u>{Plot design for Riparian Vegetation Project}</u>
Seedlings <u>{<=5.4"}</u>	8' fixed plot	<u>{12' fixed plot}</u>
Saplings <u>{<=5.4"}</u>	17' fixed plot	<u>{12' fixed plot}</u>
Live Trees <u>{>=5.5"}</u>	Variable Plot	<u>{Entered on plots 6, 12, 18, 24, & 30 for 170 by 100 plot}</u>
Dead Trees	Variable or Fixed ³⁴	<u>{Entered on plots 6, 12, 18, 24, & 30 for 170 by 100 plot}</u>
Herbs-Shrubs-Grasses	24' fixed plot	<u>{12' fixed plot}</u>
Down Wood	100-ft. transect	<u>{25-ft. transect}</u> ³⁵

CROWN CLASS EXPLANATION: COMPLEX STAND STRUCTURE SITUATIONS

The following three examples were taken from the USFS's Interim Resource Inventory Glossary in order to provide a better understanding of crown class for uneven-age stands.

"In uneven-aged stands of tolerant species (in which the trees are not in small even-aged groups), trees in the intermediate crown position in the stand and with medium-sized crowns will be considered comparable to codominants of even-aged stands and coded as such."

"As a general rule, in multistory stands crown class for each tree must be judged in the context of its immediate environment, that is, those trees affecting it or being affected by it in terms of crown competition. In cases where the overstory consists of scattered veterans standing above greater

³⁴ One fixed area circular plot is available for sampling dead trees (snags). Dead trees may either be sampled with the live trees using the same BAF variable radius plot, or may be sampled using (only) a specified fixed area plot. If used, the radius for a dead tree fixed plot must be at least one foot and less than or equal to 150 feet.

³⁵ **{ For the riparian project survey the down wood will be collected along the line-transect for the distance from the last plot to the current plot, with the following two exceptions, when starting the line-transect it is from the stream channel and secondly after the last plot (150' HD) out to the end of the overall line transect length which is 170'. This data is collected with HHSLI but will need to be post processed to analyze and report the downwood data. }**

numbers of younger trees, a considerable portion of the understory trees will undoubtedly be classified as dominant or codominant.”

“A dominant tree is one which generally stands head and shoulders above all other trees in its vicinity. However, there may be a young, vigorous tree nearby, but not overtopped by a dominant tree. This smaller tree may be considerable shorter than the dominant, but still be receiving full light from above and partly from the side. In its own immediate environment, it is dominant and should be recorded as such. Only understory trees immediately adjacent to the overstory tree will be assigned subordinate crown classes.”

HHSLI LOOKUP LISTS

< Cruise;BAF >

NUMBER	MEANING	NUMBER	MEANING
0.0	Not a VP-Cruise	30.0	N.A.
10.0	6-Relaskop Bars	33.6	11-Relaskop Bars
13.6	7-Relaskop Bars	40.0	12-Relaskop Bars
15.0	N.A.	47.0	13-Relaskop Bars
17.8	8-Relaskop Bars	54.5	14-Relaskop Bars
20.0	N.A.	62.5	15-Relaskop Bars
22.5	9-Relaskop Bars	71.1	16-Relaskop Bars
25.0	N.A.	80.3	17-Relaskop Bars
27.8	10-Relaskop Bars	90.0	18-Relaskop Bars

< Plot;RootDis >

STRING	MEANING	STRING	MEANING
0N0	No RD Pres.w/in50'	PL1	P.lateralis(Poc)S1
AM1	A.ostoyae(Armil)S1	PL2	PortOrfordCdrRD S2
AM2	Armillaria S2	PL3	PocRD Severity3
AM3	Armil Severity3	PL4	PocRD Severity4
AM4	Armil Severity4	PL5	PocRD Severity5
AM5	Armil Severity5	PL6	PocRD Severity6
AM6	Armil Severity6	PL7	PocRD Severity7
AM7	Armil Severity7	PL8	PocRD Severity8
AM8	Armil Severity8	PL9	PocRD Severity9
AM9	Armil Severity9	PW1	P.weirii(Lam.RR)S1
CW1	C.wagneri(BlkSt)S1	PW2	Lam.RRot Severity2
CW2	Black Stain S2	PW3	Lam.RRot Severity3
CW3	BlkSt Severity3	PW4	Lam.RRot Severity4
CW4	BlkSt Severity4	PW5	Lam.RRot Severity5
CW5	BlkSt Severity5	PW6	Lam.RRot Severity6
CW6	BlkSt Severity6	PW7	Lam.RRot Severity7
CW7	BlkSt Severity7	PW8	Lam.RRot Severity8
CW8	BlkSt Severity8	PW9	Lam.RRot Severity9
CW9	BlkSt Severity9	UK1	UnKnown RootDis S1
FA1	H.annosus(AnRR) S1	UK2	UnKnown RootDis S2
FA2	Annosum RootRot S2	UK3	UnKnown RootDis S3
FA3	AnRR Severity3	UK4	UnKnown RootDis S4
FA4	AnRR Severity4	UK5	UnKnown RootDis S5
FA5	AnRR Severity5	UK6	UnKnown RootDis S6
FA6	AnRR Severity6	UK7	UnKnown RootDis S7
FA7	AnRR Severity7	UK8	UnKnown RootDis S8
FA8	AnRR Severity8	UK9	UnKnown RootDis S9
FA9	AnRR Severity9		

< Plot;PlotStat >

STRING	MEANING
YY	Installed; has tally
YN	Installed; is blank
NA	Not inst; no access
NE	Not inst; stand edge
NR	Not inst; road plot

< Plot;SwissNed >

STRING	MEANING
1	Hlthy;sy.on3+yrOnly
2	Some Yllw;3+yr ret.
3	Yllw Obv; 2.5-3yr r.
4	Yllw Obv; 1.5-2yr r.
5	Very Yllw;1-1.5yr r.
6	Extrm Yllw; <=1yr r.

< Plot;SlopePos >

STRING	MEANING
1	Rdg. Top peak >120'
2	Rdg. Top peak <120'
3	Sidehill upper 1/3
4	Sidehill mid 1/3
5	Sidehill lower 1/3
6	Canyon btm <660'
7	Bench or terrace
8	Broad flat >660'
9	Other, desc.in rmk

< Plot;GrndClas >

STRING
RIPARIAN
ROCK PREDOM.
TALUS
UPLAND
WETLAND

<Plot;PlantAsc> (Note: this table shows all of the codes possible from the ODF District specific lists.)

STRING	MEANING	STRING	MEANING	STRING	MEANING
ABAM-1	ABAM SERIES	CFS5-52	PS/CAZAL/QBEAD	CHS6-10	TSHE/VAOV2
ABAM-10	TSHE/VAME/ACTR	CFS6-51	PS/MP/CWART F	CHS6-11	WH/AHUC/DEVIL
ABAM-6	TSME/VAME/ACTR	CFS6-52	PS/RDY/DORGRAP	CHS6-12	WH/BHUC/BEARGR
ABAM-8	ROGY/ACTR	CFS6-53	PS/RODY/BEARGR	CHS6-13	WH/AHUC/OXALIS
ABCO-1	ABCO SERIES	CFS6-54	PS/RDY/AHUC/DG	CHS6-14	WH/AHUC/SALAL
ABCO-12	ABMAS/QUSA2	CHC2-12	WH/DF/OCEANSPR	CHS6-15	WH/AHUC/DG/BUN
ABCO-14	ABMAS/ACTR	CHF1-11	WH/OR OXALIS	CMG2-11	MH/LUZULA
ABCO-16	XETE	CHF1-21	TSHE/OXOR	CMS1-14	MH/GROUSE HUC
ABCO-18	ABMAS/CHUM AND	CHF1-22	TSHE/POMU	CMS2-16	MH/BHUC/BEARGR
ABCO-20	QUVA	CHF1-23	WH/DORGRAP/SWD	CMS6-12	MH/RODY
ABCO-22	PIBR/CHUM PYPI	CHF1-24	WH/SWORD/OXALS	CSF1-21	PISI/POMU
ABCO-24	ARNE	CHF1-51	WH/SWORDFERN	CSF3-21	PISI/OXOR
ABCO-26	LIDE3/CHUM	CHF2-21	WH/VANILLALEAF	GSS2-21	PISI/MEFE VAPA
ABCO-28	RHMA3-BENE2	CHF3-21	WH/TWINFLOWER	GSS3-21	PISI/GASH
ABCO-30	RHMA3-QUSA2	CHLA-1	CHLA SERIES	GSS5-21	PISI/RUSP
ABCO-32	GASH-BENE2	CHLA-10	VAOV2/POMUM	CSS5-22	PISI/RUSP-GASH
ABCO-34	ACCI/OXOR	CHLA-12	RHMA3-GASH	GSS6-21	PISI/OPHO
ABCO-36	TSHE/BENE2/LIB	CHLA-14	LIDE3/GASH	CWF2-11	GF/PRINCESPINE
ABCO-38	BENE2/ACTR	CHLA-16	ABCO/BENE2	CWS5-21	GF/BEARBERRY
ABCO-40	BENE2/LIBOL	CHLA-18	TSHE/POMU	CWS5-22	GF/DORGRAPE
ABCO-42	PSME/ROGY	CHLA-20	TSHE/LEDA	FMXX	MOIST FORBLAND
ABCO-44	CADE27/TRLA6	CHLA-6	QUVA/XETE	FWXX	WET FORBLANDS
ABCO-46	BENE2	CHLA-8	LOHI2/FESTU	FXXX	FORBLAND
ABCO-48	SYMO	CHM1-21	WH/SKUNKGABAGE	GAXX	ANNUAL GRASS-V
ABMAS1	ABMAS SERIES	CHS1-11	WHK/SALAL	GBXX	BUNCHGRASS VEG
ABMAS10	ABCO/ROGY/PYSE	CHS1-13	WH/DORGRP/OROX	GM80	COASTAL GRSLND
ABMAS12	ABCO/QUSA2/CHU	CHS1-14	WH/DORGRP/VANI	GMZZ	MOIST GRASSLAN
ABMAS14	ABCO/QUSA2/PYS	CHS1-21	TSHE/BENE	GRXX	RHIZ GRASS/SED
ABMAS16	ABCO/SYMO/CHUM	CHS1-22	TSHE/BENE-GASH	GSXX	SUBALPINE/ALP
ABMAS18	VAME/CHUM	CHS1-23	WH/SALAL	GXXX	GRASSLAND
ABMAS20	PICO/ARNE/CHUM	CHS1-24	WH/DORGRP/SAL	HAMO	ALDER WETLAND
ABMAS22	TSME/ARNE/CHUM	CHS1-25	WH/DORGRAPE	LIDE-1	LIDE3 SERIES
ABMAS24	PAMY/PYSE	CHS2-21	TSHE/ACCI-GASH	LIDE-10	PIMO3/QUVA/XET
ABMAS5	OSGH	CHS2-22	TSHE/ACCI/POMU	LIDE-12	ARCTO3/XETE
CDC7-11	DF-WH/DORGRAPE	CHS2-23	WH/VINEMPA/VANI	LIDE-14	GACH6 PILA
CDC7-12	DF-WH/RODY	CHS3-21	THSE/RHMA-BENE	LIDE-16	ACMA3-QUCH2/PO
CDC7-13	DF-WH/SALAL	CHS3-22	THSE/RHMA-GASH	LIDE-18	PSME/QUSA2-BEN
CDS2-11	DG/OCNSP/DORGP	CHS3-23	THSE/RHMA/POMU	LIDE-20	ABCO/BENE2
CDS2-12	DF/OCEANSP/GRS	CHS3-24	THSE/RHMA-VAOV	LIDE-22	PSMI-QUCH2/BEN
CDS2-13	DF/OCNSP/WHIPV	CHS3-25	WH/RODY/BEARGR	LIDE-26	CHLA/GASH
CDS6-41	DF/SNOWBERRY	CHS3-26	WH/RDY/AHUC/DG	LIDE-30	PSME/GASH-RHMA
CFC2-51	PS-WH/RODY/SAL	CHS3-27	WH/RODY/SALAL	LIDE-32	PSME/GASH-BENE
CFC3-11	PS/FLS SOLOMON	CHS3-28	WH/RODY/DORGRA	LIDE-34	PSME/GASH-VAOV
CFF1-52	PS/CWORT FOAM	CHS3-51	WH/RODY/SALAL	LIDE-36	VAOV2-RHMA3-GA
CFF1-53	PS/OR OXALIS	CHS3-52	WH/RDY/DORGRAP	LIDE-38	TSHE/VAOV2-RHD
CFF5-51	PS/CAZAL/BEARG	CHS3-53	WH/RODY/BEARGR	LIDE-40	TSHE/VAOV2/POM
CFS1-51	PS/DORGRAPE	CHS3-54	WHK/RDY/OXALIS	LIDE-42	TSHE/VAOV2/POM
CFS2-51	PS/BHUC/BEARGR	CHS3-55	WH/RDY/TWINFLO	LIDE24	PSMI-QUCH2/RHD
CFS2-53	PS/AHUC/DG/BUN	CHS4-21	TSHE/RUSP	MDXX	DRY MEADOW
CFS2-54	PS/FOOLSHUC	CHS4-22	TSHE/RUSP-ACCI	MMXX	MOIST MEADOW
CFS2-55	PS/AHUC/SALAL	CHS4-23	TSHE/RUSP-GASH	MSXX	SUB/ALPINE MEA
CFS2-56	PS/BHUC/QCPBED	CHS5-11	WH/DEVILS CLUB	MWXX	WET MEADOW
CFS3-51	PS/DEVILSCLUB	CHS5-21	TSHE/OPHP	MXC0	ANY OF ABOVE
CFS5-51	PS/CAZAL/BEARG	CHS5-22	WH/DEVIL/OXALS	MXXX	MEADOW/GRASS-S
		CHS5-23	WH/DEVIL/SOLOM	NAC0	SCATRD CONIFER

<Plot;PlantAsc> Continued

STRING	MEANING	STRING	MEANING
NAS0	SCATRD-SHRUBS	PSME-50	ABCO
NCA0	CINDRS/LAVA/MU	PSME-52	HODI/WHMO-SW0
NCXX	CINDRS/LAVA-FL	PSME-54	DRY-SHRUB
NFXX	DENUD-FLDPLAIN	QUGA-1	QUGA1-SERIES
NIXX	ICE-FIELDS/GLA	QUGA-4	PSME/RHDI6
NLXX	LANDFORM-FAILU	QUGA-6	CYEC
NMXX	MINE-TAIL/DRED	SDXX	DRY-SHRUBLAND
NRA0	ROCKS>50% COVE	SMXX	MOIST-SHRUBLAN
NRL0	LDG/CLF/ROCKFA	SSXX	SUB/ALPINE-SHR
NRQ0	ROCK-PIT/QUARR	SWXX	SHRUB-WETLANDS
NSXX	SAND/SAND-DUNE	SXXX	SHRUBLAND
NTA0	TALUS-SLOPES	THPL-1	THPL-SERIES
NTXX	TALUS-SLOPES	THPL-2	BENE2/POMU
PICO-1	PICO-SERIES	TSHE-1	TSHE-SERIES
PICO-4	ABCO-PSME	TSHE-12	RUSP
PICO-6	VAME-VASC	TSHE-14	ROMU-SW0
PICO-8	TSME/DEP	TSHE-16	LIDE3-UMCA
PIJE-1	PIJE-SERIES	TSHE-18	VAOV2/POMU
PIJE-10	CECU/FEID	TSHE-20	LIDE3/VAOV2-RH
PIJE-12	FEID	TSHE-22	RHMA3-BENE2-SW
PIJE-14	CADE27/QUVA	TSHE-24	PSME/GASH-SW0
PIJE-16	QUVA-ARNE	TSHE-26	GASH-RHMA-SW0
PIJE-18	QUVA-ARNE-GABU	TSHE-28	ABAM
PIJE-20	CADE27/ARV14	TSHE-30	CACH6/GASH-RHM
PIJE-22	CADE27-PSME	TSHE-32	LIDE3/RHMA3
PIJE-8	ARCA5/FEID	TSHE-34	THPL/RHMA3
PIMO-1	PIMO-SERIES	TSHE-36	RHMA3-GASH-SW0
PIMO-4	XETE	TSHE-38	QUSA2-GASH-RHM
PIMO-6	LIDE3/QUVA/XET	TSHE-40	CADE27/GASH
PIMO-8	PIJE/QUVA/XETE	TSHE-42	GASH-BENE2-SW0
PIPO-1	PIPO-SERIES	TSHE-44	GASH/POMU-SW0
PIPO-4	PSME	TSHE-46	ACCI-GASH-SW0
PIPO-6	QUKE	TSHE-48	ACCI-RHMA3
PISI-1	PISI-SERIES	TSHE-50	ABCO/BENE2
PISI-4	ABCO/RUSP	TSHE-52	ABCO/ACCI-BENE
PISI-6	GASH-VAOV2	TSME-1	TSME-SERIES
PSME-1	PSME-SERIES	TSME-10	ABMAS/RULA2/PY
PSME-14	RUSP/POMU	TSME-12	VAME/PYSE
PSME-16	QUVA-ARNE/XETE	TSME-14	VASC/CHUM
PSME-18	QUVA	TSME-16	ARNE/CHUM
PSME-20	CADE27-PIJE	TSME-18	HERB
PSME-22	CADE27	TSME-6	RHMA3/XETE
PSME-24	ARNE-SW0	TSME-8	ABMAS/VAME/CHU
PSME-26	ACCI-BENE2	ZZZZ	NOT-CALLED
PSME-28	CACH6/BENE2		
PSME-30	GASH-RHMA3		
PSME-32	GASH-BENE2		
PSME-34	BENE2/POMU		
PSME-36	QUCH2-LIDE3		
PSME-38	QUCH2/RHDI6		
PSME-40	QUKE/RHDI6		
PSME-42	QUCH2/BENE2		
PSME-44	PIPO/RHDI6		
PSME-46	CADE27/BEPI2		
PSME-48	ABCO-SYMO		

< Trees; Sp >

STRING	TRANSLATE	MEANING	STRING	TRANSLATE	MEANING	STRING	TRANSLATE	MEANING
108	LP	LP/SHR PN	CHLA	PC	P.ORF CDR	R4	R4	CASCARA BK
11	SF	P.SILV FR	CHNO	AC	AK YELCDR	RA	RA	RED ALDER
116	JP	JEFFRY PN	CL	CL	OR MYRTLE	RC	RC	W.RED CDR
117	SP	SUGAR PIN	CO	BO	CA BLKOAK	RF	RF	SHST REDF
119	WP	W.WHT PIN	CONU	PD	DOGWOOD	RHPU	R4	CASCARA BK
122	PP	POND.PINE	CX	CX	UNK CONFR	RW	RW	REDWOOD
15	WF	WHITE FIR	D	DF	DOUG FIR	S	SS	SITKA SPR
17	GF	GRAND FIR	DF	DF	DOUG FIR	SAF	AF	S.ALP FIR
19	AF	S.ALP FIR	DW	PD	DOGWOOD	SALIX	WI	WILLOW
202	DF	DOUG FIR	ES	ES	ENG SPRCE	SESE2	RW	REDWOOD
21	RF	SHST REDF	FROR	OA	OREGN ASH	SF	SF	P.SILV FR
211	RW	REDWOOD	FRPU7	R4	CASCARA BK	SP	SP	SUGAR PIN
22	NF	NOBLE FIR	GC	GC	G.CHINKPN	SRF	RF	SHST REDF
231	PY	PACIF YEW	GF	GF	GRAND FIR	SS	SS	SITKA SPR
242	RC	W.RED CDR	H	WH	W.HEMLOCK	TABR	PY	PACIF YEW
263	WH	W.HEMLOCK	HX	HX	UNK HWOOD	THPL	RC	W.RED CDR
264	MH	MTN HMLCK	IC	IC	INCEN CDR	TO	TO	TANOAK
312	BM	BGLF MPLE	J	WJ	W.JUNIPER	TREE	XX	UNK SPEC
351	RA	RED ALDER	JP	JP	JEFFRY PN	TREEC	CX	UNK CONFR
361	PM	PAC MDRNE	JU	WJ	W.JUNIPER	TREEH	HX	UNK HWOOD
41	PC	P.ORF CDR	JUOC	WJ	W.JUNIPER	TSHE	WH	W.HEMLOCK
42	AC	AK YELCDR	L	WL	W. LARCH	TSME	MH	MTN HMLCK
431	GC	G.CHINKPN	LAOC	WL	W. LARCH	UC	CX	UNK CONFR
492	PD	DOGWOOD	LIDE3	TO	TANOAK	UH	HX	UNK HWOOD
542	OA	OREGN ASH	LO	LO	C LIVE OAK	UMCA	CL	OR MYRTLE
60	WJ	W.JUNIPER	LP	LP	LP/SHR PN	US	XX	UNK SPEC
631	TO	TANOAK	M	BM	BGLF MPLE	W	WI	WILLOW
73	WL	W. LARCH	MA	PM	PAC MDRNE	WF	WF	WHITE FIR
746	QA	QUAK.ASPN	MH	MH	MTN HMLCK	WH	WH	W.HEMLOCK
747	BC	BLK CTNWD	MY	CL	OR MYRTLE	WI	WI	WILLOW
81	IC	INCEN CDR	NF	NF	NOBLE FIR	WJ	WJ	W.JUNIPER
815	WO	OR WHTOAK	OA	OA	OREGN ASH	WL	WL	W. LARCH
818	BO	CA BLKOAK	P	PP	POND.PINE	WO	WO	OR WHTOAK
920	WI	WILLOW	PC	PC	P.ORF CDR	WP	WP	W.WHT PIN
93	ES	ENG SPRCE	PD	PD	DOGWOOD	WRC	RC	W.RED CDR
98	SS	SITKA SPR	PICO	LP	LP/SHR PN	WWP	WP	W.WHT PIN
981	CL	OR MYRTLE	PIEN	ES	ENG SPRCE	XX	XX	UNK SPEC
A	RA	RED ALDER	PIJE	JP	JEFFRY PN	Y	PY	PACIF YEW
ABAM	SF	P.SILV FR	PILA	SP	SUGAR PIN	YC	AC	AK YELCDR
ABCO	WF	WHITE FIR	PIMO	WP	W.WHT PIN	760	CH	CHERRY
ABGR	GF	GRAND FIR	PIPO	PP	POND.PINE	CH	CH	CHERRY
ABLA2	AF	S.ALP FIR	PISI	SS	SITKA SPR	PREM	CH	CHERRY
ABMAS	RF	SHST REDF	PM	PM	PAC MDRNE	GS	GS	G. SEQUOIA
ABPR	NF	NOBLE FIR	POC	PC	P.ORF CDR	SEG12	GS	G. SEQUOIA
AC	AC	AK YELCDR	POTR	QA	QUAK.ASPN	805	LO	C LIVE OAK
ACMA	BM	BGLF MPLE	POTR2	BC	BLK CTNWD			
AF	AF	S.ALP FIR	PP	PP	POND.PINE			
ALRU	RA	RED ALDER	PSF	SF	P.SILV FR			
ARME	PM	PAC MDRNE	PSME	DF	DOUG FIR			
BC	BC	BLK CTNWD	PY	PY	PACIF YEW			
BM	BM	BGLF MPLE	QA	QA	QUAK.ASPN			
BO	BO	CA BLKOAK	QUCH2	LO	C LIVE OAK			
C	RC	W.RED CDR	QUGA	WO	OR WHTOAK			
CACH	GC	G.CHINKPN	QUKE	BO	CA BLKOAK			
CADE3	IC	INCEN CDR	R	RW	REDWOOD			

< Trees; GP >

STRING	MEANING
..	Default Group
SN	Snag (>4.5')
ST	Stump (<=4.5')

< Trees; Dmg1,2,&3 >

STRING	MEANING
	NOT DAMAGED
0	UNKNOWN DAMAGE
1	GEN BARK BEETLE
2	MTN PINE BEETLE
3	DF BARK BEETLE
4	SPRUCE BEETLE
5	WESTERN PINE BTL
6	PINE ENGRAVER
7	FIR ENGRAVER
8	SILVER FIR BTL
9	RED TURPNTIN BTL
10	GEN DEFOLIATOR
11	W BLKHD BUDWORM
13	DF TUSSOCK MOTH
15	W SPRUCEMODOC BW
16	W HEMLOCK LOOPER
17	SAWFLIES
18	NDL/SHTH MINER
20	GEN OTHER INSECT
21	SHOOT MOTH
22	WEEVILS
23	WOOD BORER
24	BALSMWOOLYADELGID
25	SS TIP WEEVIL
30	DWARF MISTLETOE
31	TRUE MISTLETOE
36	W PINE BLSTR RUST
40	GEN ST/BRNHCANKER
41	WESTRN GALL RUST
42	COMANDRA BLSTR R
43	STALACTIFORM RUST
44	ATROPELLIS CANKER
45	CYTOSPORA/PHOMOPS
46	GEN STEM DECAY
47	RED RING ROT
48	E.T. FUNGUS
49	BRWN CBCL BUTT R

< Trees; S >

NUMBER	MEANING
0	Live Tree, no hgt.
1	Cut Tree, no hgt.
2	Dead Tree, no hgt.
3	Dead Tree, w/hgt.,NR
4	HST+Age, NR
5	HST, NR
6	HST, for Regression
7	TopHt+Site Tree
8	Site Tree
9	TopHt Tree

STRING	MEANING
50	SUPPRESSION STATE
51	DEFORMED SAPLING
55	SWISS NDL CAST
56	GEN FOLIAR DISEASE
57	RHABDOCLINE NC
58	ELYTRODERMA NC
59	BROOM RUSTS
60	GEN ROOT DISEASE
61	ANNOSUS R DISEASE
62	ARMILLARIA R DIS
63	BLACK STAIN R DIS
65	LAMINTD ROOT ROT
66	PO CEDAR R DIS
70	GEN ANIMAL DAMAGE
71	BOOMER DMG
72	LIVESTOCK DMG
73	DEER / ELK DMG
74	PORCUPINE DMG
75	RODENTS / HARES
76	BEAVER DMG
77	BEAR DMG
78	HUMAN (NOT LOGNG)
80	GEN WEATHER DMG
81	WIND DMG
82	SNOW/ICE BEND BRK
83	FROST FOLIAR DMG
84	WINTER DESICATN
85	HEAT/DROUGHT DMG
86	SUN SCALD
87	LIGHTNING
90	OTHR PHYS INJURY
91	LOGGING
92	FIRE SCAR/SCORCH
94	AIR POLLUTION
96	MISNG OR BROKN TOP
97	DEAD TOP
98	BOLE FK LN CRK SWP
99	BOLE CRACK / CHECK

< **Trees; Sv1,2,&3** >

Note: the list is dependent upon the type of damage called. The code list name and type of damage is shown for each of the unique lists below.

(SevA.cl) Severity for Damage cause unknown

STRING	MEANING
1	Non-specific/Unknown

(SevE.cl) Severity for Animal Injury codes

STRING	MEANING
1	<20%cr/<.5bcircumf
2	>20%cr/>.5bcircumf

(SevB.cl) Severity for Bark Beetle codes

STRING	MEANING
1	Unsuc. CurrentAtck
2	Suc. CurrentAttack
3	Last yrs Suc. Atck
4	Older Dead
5	Top Kill

(SevF.cl) Severity for Weather Injury codes, and for Other Physical Injury codes 90, 91, 92 & 94

STRING	MEANING
1	<20% crwn affctd
2	>20%crwn/any2bole

(SevC.cl) Severity for Defoliator codes

STRING	MEANING
1	-Defoliator Svrtty-
2	RankCrown in 1/3's
3	Sum of ranks is
4	the severity entry
5	Rank by foliage:
6	0= no defoliation
7	1= up to 33% msg
8	2= 34%-66% missing
9	3= >66% missing

(SevG.cl) Severity for Broken/Missing Top code

STRING	MEANING
0	>=10% orig. brk/ms

(SevD.cl) Severity for Other Insects codes

STRING	MEANING
1	0-2fk/<20%br/<50%b
2	3+fk/>20%br/deadld

(SevH.cl) Severity for Dead Top code

STRING	MEANING
0	1-10% is dead
1	11-20% is dead
2	21-30% is dead
3	31-40% is dead
4	41-50% is dead
5	51-60% is dead
6	61-70% is dead
7	71-80% is dead
8	81-90% is dead
9	91-100% is dead

(SevI.c) Severity for Dwarf Mistletoe code

STRING	MEANING
1	Divide into 1/3's
2	Sum rates each 1/3
3	Result is Svrtty
4	0= No visbl infctn
5	1=.5 or fwr br inf
6	2=>.5 brnch infctd

(SevJ.c) Severity for True Mistletoe code, and for Stem/Branch Canker codes

STRING	MEANING
1	Br Infctn/<50%crwn
2	Br Infctn/>50/bole

(SevK.c) Severity for White Pine Blister Rust code

STRING	MEANING
1	Brnch inf->2' bole
2	Br inf 6"-2'to bole
3	Bole inf/<6"to bole

(SevL.c) Severity for Stem Decay codes

STRING	MEANING
1	1 conk/stm or gl
2	>=2 conks/<16'sped
3	>=2 conks/>16'sped
4	No conks/vsbl rot

< Trees; CC >

NUMBER	MEANING
0	Zero for not meas.
1	Open Grown
2	Dominant
3	Codominant
4	Intermediate
5	Suppressed
6	Remnant
7	Leader above shrub
8	Leader within shrub
9	Leader overtopped

(SevM.c) Severity for Foliar Disease codes (except SNC)

STRING	MEANING
1	<20% folg affctd
2	>=20% fol affctd

(SevN.c) Severity for Swiss Needle Cast code

STRING	MEANING
1	Ndl retn. > 2 yrs
2	Ndl retn. <=2 yrs

(SevP.c) Severity for Root Disease codes

STRING	MEANING
1	Suspect/Proximity
2	Definite diagnosis

(SevX.c) Severity for damages where no severity rating is used (98 & 99)

STRING	MEANING
0	No Svrtty Applies

(SevZ.cl) Blank for undamaged trees

STRING	MEANING
	Not Dmgd & No Svrtv

< **Trees; C** >

STRING	MEANING
	Blank for not meas.
1	Limbs Bark Intact
2	Limbs Missing
3	NoBark Adv. Decay
4	Loosing Form
5	Crumbly Lacks Form

Note: the lookup list for < **Down Wood;C** > is not shown, but differs only in that there is no "blank" code since a value of 1-5 is required.

< **Trees; U** >

STRING	MEANING
	Blank for not meas.
0	No Excavations
1	1" to 6" Excav.
2	>6" Excavations

Note: the lookup list for < **Down Wood;U** > is not shown, but differs only in that there is no "blank" code since a value of 0-2 is required.

< **Trees; Rmk** >

STRING	MEANING
	BLANK FOR NO RMKS
BCT	BARBER CHAIRED TRE
BS	BUTT SWELL
BT	BROKEN TOP TREE
CAL	AGE CALC-LARGE TRE
CU	CURTIS SITE TABLE
D10	DBH IRREG-CRACKS
D11	DBH IRREG-SWELLING
D12	DBH IRREG-SEAMS
D13	DBH IRREG-LOGGINGS
D3	DBH TAKEN AT 3' HG
D4	DBH TAKEN AT 4' HG
D5	DBH TAKEN AT 5' HG
D6	DBH TAKEN AT 6' HG
D7	DBH IRREG-LIMBS
D8	DBH IRREG-BURLS
D9	DBH IRREG-LIGHTING
DEB	DEBRIS ACCUM ABOVE
EST	ESTIMATED TREE AGE
FK1	TREE FORKD BELOW B
FK2	TREE FORKD ABOVE B
FK3	"CONIFER FORK >5""DB"
FK4	FORK W/LARGEST DBH

STRING	MEANING
GEN	GENERIC (SITE)
HD	HORIZONTAL DISTANC
HOL	HOLLOW TREE
HS	HANN-SCRIVANI SITE
HWL	HEADWALL
KG	KING'S SITE TABLE
LE	LEANING TREE
LIT	LITTER ACCUM ABOVE
MC	MCARDLE'S SITE TBL
NAG	AGE INDETERMINABLE
OOO	OTH OUTFORDER TRE
PP	PPINE BULL-630
PT	PAINT MKD TREE
RA	RE
	D ALDER PNW-358
RF	RED FIR PSW-206
TGT	TREES GROWIN TOGET
WF	WHITE FIR BULL-407
WTN	WINDTHROWN TREE

< *Vegetation; Sp* >

STRING	MEANING	STRING	MEANING	STRING	MEANING
A8	3 LEAF ANE	M4	MINER LETT	L3	TWINFLOWER
V1	AL HUCKLE	P2	MOCKORANGE	A3	VANLA LEAF
P5	ALP PYROLA	G4	OAK FERN	A1	VINE MAPLE
E3	AVAL LILY	H2	OCEANSPRAY	R3	W AZALEA
R7	BALD ROSE	P1	OR BOXWOOD	T3	W STARFLWR
C7	BEAD LILY	O3	OR OXALIS	P3	W SWORDFER
G1	BEDSTRAW	U1	OTHER 1	M2	WDLND TARW
AE	BGLF SNDWT	U2	OTHER 2	S4	WFSOL SEAL
V3	BIG HUCKLE	U3	OTHER 3	T5	WH TRILLIU
RK	BLACK CAP	U4	OTHER 4	H1	WHFLHAWKWD
D1	BLEEDHEART	U5	OTHER 5	V2	WHINOUTFLW
AM	BLF ARNICA	U6	OTHER 6	W1	WHIPPLEVN
P4	BRACK FERN	U7	OTHER 7	AI	WHT L MANZ
B5	BROME GRS	U8	OTHER 8	P6	WHTVINE PY
C2	BUCKBRUSH	U9	OTHER 9	E1	WILD RYE
AS	CA ARALIA	V4	OVAL HUKL	F2	WILD STRWB
C9	CA HAZEL	L2	PARS LIC	S2	WILLOW SP.
S6	CLEAFSTALK	A4	PATHFINDER	AJ	WLD GINGER
X1	CMN BEARGR	T4	PIGGYBACKP	T1	WMEADOWRUE
C6	CMN PRPINE	AT	PINEMAT MZ	D4	WOODFERN
A2	CMN YARROW	B3	PIPERS ORG	L5	WOODRUSH
T2	COOLWFLLWR	R1	POISON OAK	S1	YERBABUENA
SA	CREEP SNOW	R5	PR CURRANT	R9	STINK CRNT
B4	DEER FERN	M5	PWAX MYRTL		
C3	DEERBRUSH	P7	PYROLA SP.		
O1	DEVILSCLUB	S3	RED ELDERB		
C8	DOGWDBBRY	V6	RED HUCKLB		
B2	DWARF ORGR	R6	REDFCURANT		
RB	DWF BRAMBL	V9	REDWDVIOLE		
V5	EVERG HUCK	R2	RHODY		
RJ	EVGRN BK B	S8	ROSY TW ST		
M1	F LILY VAL	G3	RTLSNPLNTN		
D2	FAIRYBELLS	AK	RUFFLVASTR		
M3	FALS HUCKL	Q1	SADLER OAK		
F1	FESCUE SP.	G2	SALAL		
CK	FIREWEED	RL	SALMONBERR		
D3	FOX GLOVE	CE	SCOTCH BRM		
CA	GOLDTHREAD	C1	SEDGE SP.		
V7	GR H BERRY	S5	SF SOL SEA		
G5	GRASS SP.	L1	SIERRA LAR		
AG	GRN L MANZ	A6	SITKA ALDR		
L4	HAIRY HONE	AA	SITKA COL		
AD	HAIRY MANZ	L6	SKUNK CAB		
CC	HDGHOGDOGT	RD	SNOW BRAM		
R8	HIM BLK BR	S9	SNOWBERRY		
AB	HOARY MANZ	C4	SNOWBRUSH		
E2	HORSETAIL	SB	SNOWQUEEN		
CD	HOUND TONG	A9	SPRD DOGBN		
Q2	HUCK OAK	A7	SRVCBERRY		
I1	IRIS	V8	STREAM VIO		
AH	KINNICK2	O2	SWTCICELY		
AL	LADY FERN	B1	T OR GRAPE		
C5	LTL PRPINE	RE	THBL BERRY		
A5	MADNHR FRN	CM	THISTLE SP		
S7	MEXBETONY	RG	TRLNG BK B		

SLI FIELD REFERENCE CARDS

TREE STATUS CODES

STATUS	DESCRIPTION
0	LIVE TREE, NO HEIGHT
1	CUT TREE, NO HEIGHT
2	DEAD TREE, NO HEIGHT
3	DEAD TREE, W / HEIGHT, NR
4	HST + AGE, NR
5	HST, NR
6	HST, FOR REGRESSION
7	TOP HEIGHT + SITE TREE
8	SITE TREE
9	TOP HEIGHT TREE

CROWN CLASS CODES

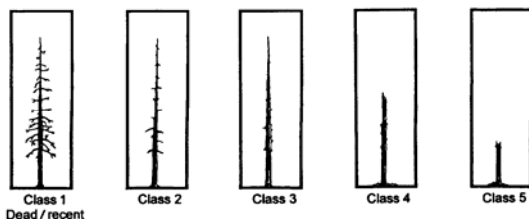
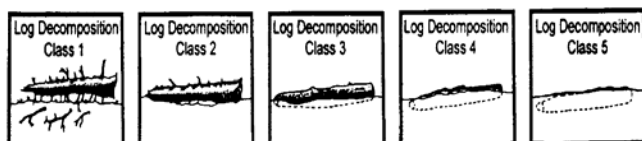
CLASS #	CROWN CLASS
0	ZERO FOR NOT MEASURED
1	OPEN GROWN
2	DOMINANT
3	CODOMINANT
4	INTERMEDIATE
5	OVERTOPPED
6	REMNANT
7	LEADER ABOVE SHRUB
8	LEADER WITHIN SHRUB
9	LEADER OVERTOPPED BY SHRUB

LOG DECAY

CODE	BARK	TWIGS	TEXTURE	SHAPE	WOOD COLOR	PORTION OF LOG ON GROUND
1	Intact	Present	Intact	Round	Original	None, elevated on supporting points
2	Intact	Absent	Intact to Soft	Round	Original	Parts touch, still elevated
3	Trace	Absent	Hard large pieces	Round	Original to faded	Bole on ground
4	Absent	Absent	Soft blocky pieces	Round to oval	Light to faded brown	Partially below ground
5	Absent	Absent	Soft, powdery	Oval	Faded light yellow or gray	Most below ground

SNAG DECAY

CODE	BARK	HEARTWOOD DECAY	SAPWOOD DECAY	LIMBS	TOP BREAKAGE	TIME SINCE DEATH
1	Tight, intact	Minor	None to incipient	Mostly present	May be present	1-5 years
2	50% loose or missing	None to advanced	None to incipient	Small limbs missing	May be present	> 5 years
3	75% missing	Incipient to advanced	None to 25%	Few rem air	Approx. 1/3	> 5 years
4	75% missing	Incipient to advanced	25% +	Few rem air	Approx. 1/3 to 1/2	> 5 years
5	75% + missing	Advanced to crumbly	50% + advanced	Absent	Approx. 1/2 +	> 5 years



SLI SAMPLING TARGETS

- Get at least 3 heights for each species (trees ≥ 4.0 " DBH). Choose only trees with unbroken live tops or broken tops that have regenerated sufficiently to represent the general canopy level.
- All broken top tally snags are measured for height.
- Get at least 5 site trees (status 8)- (minimum of 1 per 170 by 100 plot; thus 5 per 500 by 170 plot).
- Get at least 5 top-height trees.
- Record estimated height to the nearest class for trees <20 feet tall*. Cruiser may group tally same species trees based on height classes shown below.

CLASS	TREE HEIGHT
2'	1' - 3'
5'	4' - 6'
8'	7' - 9'
11'	10' - 12'

CLASS	TREE HEIGHT
14'	13' - 15'
17'	16' - 18'
20'	19' - 21'

***NOTE: DBH IS LESS IMPORTANT THAN HEIGHT FOR THESE TREES.**

DAMAGE CODES *(Class 2)*

CODE	CAUSE
0	Unknown
CODE	SEVERITY
1	Unknown

INSECT CODES *(Class 1)*

CODE	BARK-BEETLE CODES
1	General
2	Mountain pine beetle (All Pinus spp.)
3	Douglas fir beetle (PSME)
4	Spruce beetle (Picea spp.)
5	Western pine beetle (PIPO)
6	Pine engraver (All Pinus spp.)
7	Fir engraver (Abies spp.)
8	Silver fir beetle (ABAM)
9	Red turpentine beetle (All Pinus spp.)
CODE	SEVERITY
1	Unsuccessful current attack
2	Successful current attack
3	Last year's successful attack
4	Older dead
5	Top-kill

CODE	DEFOLIATOR CODES
10	General
11	Western blackheaded budworm
13	Douglas fir tussock moth
15	Western spruce/Modoc budworm
16	Western hemlock looper
17	Sawflies
18	Needle and sheath miners
CODE	SEVERITY
1-9	<p>Divide live crown into thirds. Rate each third separately based on the following percentages of old and new foliage absent:</p> <p>— 0 — No detectable defoliation</p> <p>— 1 — up to 33% foliage missing</p> <p>— 2 — 34-66% foliage missing</p> <p>— 3 — 67-100% foliage missing</p> <p>Obtain a rating for the entire tree by adding ratings for each third of the crown. Record total in condition column.</p>

CODE	OTHER INSECTS CODES <i>(Class 2)</i>
20	General
21	Shoot moths
22	Weevils
23	Wood borers
24	Balsam woolly adelgid
25	Sitka Spruce terminal weevil
CODE	SEVERITY
1	Bottlebrush or shortened leaders and 0-2 forks on tree stem, OR less than 20% of branches affected, OR less than 50% of bole with visible larval galleries.
2	3+ forks on tree stem, OR 20% or more of branches affected, OR terminal leader dead, OR \geq 50% of bole with visible larval galleries.

PHYSICAL INJURY CODES (Class 2)

CODE	ANIMAL INJURY CODES
70	Animal-General
71	Mountain-beaver
72	Livestock
73	Deer-or-elk
74	Porcupines
75	Pocket-gophers, squirrels, mice, voles, rabbits, hares
76	Beaver
77	Bear
78	Human (not logging)
CODE	SEVERITY
1	Less than 20% of crown affected. Bole damage restricted to less than 1/2 of circumference.
2	20% or more of crown affected. Bole damage to 1/2 or more of the circumference.

CODE	WEATHER INJURY CODES
80	Weather-General
81	Windthrow or wind breakage
82	Snow / ice bending or breakage
83	Frost damage on shoots
84	Winter desiccation
85	Drought/heat moisture deficiency
86	Sun scald
87	Lightning strike
CODE	SEVERITY
1	Less than 20% of crown affected
2	20% or more of crown affected or any damage to bole.

CODE	OTHER PHYSICAL INJURY CODES
90	Other/unknown
91	Logging
92	Fire: basal scars or heat scorch
94	Air pollution or other chemicals
98	Forks/lean/crooks/sweep
99	Checks/bole cracks
CODE	SEVERITY
0	No conditions
1	Less than 20% of crown affected.
2	20% or more of crown affected or any damage to bole.

CODE	BROKEN/MISSING TOP CODE
96	Broken/missing top
CODE	SEVERITY
0	10 + percent of the original height broken or missing

CODE	DEAD TOP CODES		
97	Dead top Record condition as a percentage of the normal or original tree height that is dead.		
CODE	PERCENTAGE	CODE	PERCENTAGE
0	01-10%	5	51-60%
1	11-20%	6	61-70%
2	21-30%	7	71-80%
3	31-40%	8	81-90%
4	41-50%	9	91-100%

DISEASE CODES

CODE	DWARF MISTLETOE CODES <i>(Class 1)</i>
30	Dwarf mistletoe
CODE	SEVERITY
1-6	Divide the live crown into thirds. Rate each third separately and give each third a rating based on the following cutoffs: 0 = No visible infections. 1 = 1/2 or less of total number of branches have visible infections. 2 = More than 1/2 the branches have visible infections.
	Obtain a rating for entire tree by adding ratings for each third. For dead trees with evidence of dwarf mistletoe such as brooms on the tree or ground, estimate rating at time of death and record.

CODE	TRUE MISTLETOE CODES <i>(Class 1)</i>
31	True mistletoe (hardwoods)
CODE	SEVERITY
1	Branch infections. Less than 50% of the crown involved
2	Branch infections. 50% or more of crown involved. Any occurrence on the bole.

CODE	WHITE PINE BLISTER RUST CODES <i>(Class 1)</i>
36	White Pine Blister Rust (PIMO)
CODE	SEVERITY
1	Branch infections located greater than 2' from tree bole.
2	Branch infections located between 6" and 2' from bole.
3	Bole infections or branch infections within 6" of bole.

CODE	STEM/BRANCH CANKER CODES <i>(Class 2)</i>
40	General
41	Western gall rust (PIPO, PICO)
42	Comandra blister rust (PIPO)
43	Stalactiform rust (PICO)
44	Atropellis canker (Pinus Spp.)
45	Cytospora/Phomopsis (PSME, Abies Spp.)
CODE	SEVERITY
1	Branch infections. Less than 50% of the crown involved.
2	Branch infections. 50% or more of crown involved or any occurrence on the bole.

CODE	STEM DECAY CODES <i>(Class 2)</i>
46	General
47	Red ring rot (Phellinus pini, white speck)
48	Rust red stringy rot (Indian paint fungus, E.T.)
49	Brown cubical butt rot (Phaiolus schweinitzii)
CODE	SEVERITY
1	One conk on stem or at ground line
2	Two or more conks separated by <16' on the bole.
3	Two or more conks separated by >16' or more on the bole.
4	No conks. Visible decay in interior of bole

CODE	SPECIAL AGENTS <i>(Class 2)</i>
	Suppression
50	Tree is overtopped by other trees and won't live 10 more years; Or: will prevent a sapling from reaching 5.0 inches d.b.h./d.r.c.
	Excessively Deformed Sapling
51	Branch infections. 50% or more of crown involved. Any occurrence on the bole.
CODE	SEVERITY
0	No Severity

CODE	FOLIAR DISEASE CODES <i>(Class 2)</i>
56	General
55	Swiss needle cast (PSME)
57	Rhabdochline needle cast (PSME)
58	Elytroderma needle cast (PIPO)
59	Broom rusts (Abies, Picea, and Juno- Gymnosporangium)
CODE	SEVERITY
1	Less than 20% of foliage affected, or less than 20% of crown in brooms. For SNC, needle retention > 2 years.
2	20% or more of foliage affected, or 20% or more of crown in brooms. For SNC, needle retention < or = 2 years

CODE	ROOT DISEASE CODES <i>(Class 1)</i>
60	General
61	Annosus root disease
62	Armillaria root disease
63	Black stain root disease
65	Laminated root rot
66	Port Orford cedar root disease
CODE	SEVERITY
1	Suspect/Proximity Tree: Live tree within 30 feet of a tree, stump, snag, or blowdown with identifiable root disease OR dead tree, not diagnosed with root disease, within 30 feet of a tree, stump, snag, or blowdown with identifiable root disease
2	Dead tree with signs or symptoms diagnostic for root disease such as characteristic decay, stain in sapwood or cambium, ectotrophic mycelia, mycelial fans, or conks OR symptomatic live tree where positive identification for root disease can be made without destructive sampling. Example: conks are present in root crotch.

Landform Feature Rating

<p><u>Landform Feature Code</u> <u>*Code in {brackets} should be used on areas draining away from the study stream.</u></p>	<p><u>Basic Definition</u></p>
<p><u>A or {W}</u></p>	<p><u>Floodplain : Relatively flat, level land that may be submerged by floodwaters. A plain built up by stream deposition and is normally underlain by unconsolidated alluvial sediment. Usually associated with stable lower gradient channels. Formed by simultaneous processes of lateral migration and overbank flooding. A floodplain can become a terrace when channel incision prevents the river from inundating the surface annually or biannually.</u></p> <p><u>A common error is to mistake a low terrace as a floodplain. If normal bankfull width does not fall above the slope break it is a terrace. In many of the high gradient mountain streams, terraces are more commonly encountered.</u></p>
<p><u>B or {X}</u></p>	<p><u>Fluvial Terrace (Terrace) : Abandoned floodplain formed when the stream flowed at a higher level. Can be formed by deposition or erosion. Depositional terraces are formed from entrenchment of the stream after a period of valley filling. The flat surface, or tread, is formed through alluvial deposition. The tread of an erosional terrace is formed by lateral erosion followed by deposition of a thin sheet of alluvium on top.</u></p> <p><u>Terraces without a floodplain are typically found in intermediate streams between floodplain systems and higher gradient gorge systems. Floodplain systems may display older terraces between the confining wall and the floodplain. They are rarely intact along the entire length of a valley.</u></p>
<p><u>C or {Y}</u></p>	<p><u>Confining Wall : The vertical and horizontal wall feature that constrains the stream system. High in the drainage system lateral and vertical migration of the stream may be limited by the Confining Wall. Typical in steep-walled canyons or gorges. Streams constrained by this feature are typically high gradient with cascades or rapids.</u></p> <p><u>The confining wall is differentiated from the Hillslope feature in that the confining wall can and would occur close or immediately next to the stream, acting as the constraining feature to increased flow. See Hillslope feature description.</u></p>
<p><u>D or {Z}</u></p>	<p><u>Hillslope : The general upslope of the hillside. Usually begins further away from the stream if floodplains or terraces are present. If there is a definite slope break in the hillslope while continuing the cruise line transect, more than one hillslope feature segment can be used to characterize the hillslope landform. For example, on a stream higher up in the headwall drainage system and no floodplain or terracing present, you could have an initial hillslope</u></p>

	<i>segment for 120 feet at 45 percent slope and a second hillslope segment for the remaining 50 feet (of the 170 foot transect) at 70 percent. This would be entered as "D12045D05070". Remember each segment up to four (4), must be entered in this format (see above this table) with 6 characters describing each segment. The two segment example used here had a 12 character entry.</i>
<i>E or {R}</i>	<i>Side Channel : A side channel is a channel that originates from the same stream, upstream and rejoins further downstream to the stream that the transects start from. [Note: the entered distance is the distance across both slope breaks going down into the channel, the entered slope is the steepest slope of two slopes going down into the side channel].</i>
<i>F or {S}</i>	<i>New Channel : A channel encountered that is separate from the stream the transects originate from. [Note: the entered distance is the distance across both slope breaks going down into the channel, the entered slope is the steepest slope of two slopes going down into the new channel].</i>
<i>G or {T}</i>	<i>Tributary Channel : A channel encountered along the transect that connects further downstream on the stream that the transects start from. [Note: the entered distance is the distance across both slope breaks going down into the channel, the entered slope is the steepest slope of two slopes going down into the tributary channel].</i>
<i>H or {U}</i>	<i>Road : Actively used road bed surface.</i>
<i>I or {V}</i>	<i>Old Road : Older road surface that is grown over or not actively used.</i>

Swiss Needle-Cast Plot Rating

Rate the average Douglas-fir condition for SNC damage on a scale of 1–6. Gauge needle retention on un-shaded secondary laterals in the upper-middle crown (usually whorl 5–7 from top.)

SEVERITY

- 1** Healthy, normal-appearing Doug-fir stand. Stands with normal needle retention (3.5 years or more, mid-crown). Needle cast may be present, but causing symptoms only on 3-year-old and older needles.
- 2** Almost normal, but showing slight yellowing. Needle retention normal (3.5 or more years present on most trees). Crown still appears full and dense. No reduction in height-growth increment.
- 3** Yellowing obvious. Most trees retaining 2.5 to 3-years of needles. No obvious height increment reduction.
- 4** Yellowing obvious. Most trees retaining 1.5 to 2-years of needles. Reduction in height-growth will not be obvious, but may occur on a few trees only.

- 5 ~~Very yellow stand.~~ Most trees retaining 1 to 1.5 years of needles. For the last 1 to 3 years, height growth increment is reduced by at least 25% of normal on at least 50% of trees.
- 6 ~~Stand is extremely yellow to yellow brown, with very sparse foliage.~~ Most trees retaining 1 year of needles or less in upper crown. Obvious height growth reduction for 4 or more years.

CODE	Causal Fungus	Root Disease
0N0	None present	---
AM	Armillaria-ostoyae	Armillaria root disease
CW	Ceratocystic wagneri	Black stain root disease
FA	Heterobasidion-Annosus	Annosum root rot
PL	Phytophthora-lateralis	Port-Orford-Cedar root disease
PW	Phellinus-weirii	Laminated root rot
UK	Unknown	---

SEVERITY	% PLOT INFESTED	Root Disease Severity Rating Criteria
0	0	No evidence of root disease visible within the 50 ft. radius plot.
1	0	Root disease present within 50 feet of the plot boundary, but no evidence of disease on the plot.
2	1-25	Minor evidence of root disease on the 50 ft. radius plot, such as suppressed tree killed by root disease, or a minor part of the overstory showing symptoms of infection. Little or no detectable reduction in canopy closure or volume.
3	1-25	Up to 20% canopy reduction, usually as result of death of 1 codominant tree on an otherwise fully stocked site. In absence of mortality, numerous trees showing symptoms of root disease.
4	26-50	20-30% canopy reduction as a result of root disease mortality.
5	51-75	30-50% reduction as a result of root disease. At least half the ground area of 50-foot plot infested with evidence of disease killed trees.
6	76-100	50-75% reduction in canopy with most of the ground area infested with evidence of disease killed trees.
7	76-100	At least 75% canopy reduction. Few original overstory trees remaining, although ground is often stocked with susceptible species.
8	76-100	The entire plot falls within a root disease pocket with only one or very few overstory trees present.
9	76-100	Entire plot within a root disease pocket and no overstory trees of the susceptible species present.

CODE	COMMON SHRUBS
V1	ALASKA HUCKLEBERRY
R7	BALDHIP ROSE
V3	BIG HUCKLEBERRY
RK	BLACK CAP
C9	CALIFORNIA HAZEL
O1	DEVIL'S CLUB
RB	DWARF BRAMBLE
B2	DWARF OREGON GRAPE
V5	EVERGREEN HUCKLEBERRY
RJ	EVERGREEN/CUTLEAF BLACKBERRY
M3	FALSE HUCKLEBERRY
R8	HIMALAYAN/BIG BLACKBERRY
AH	KINNIKINNICK / PINEMAT MANZANITA
H2	OCEAN-SPRAY
P1	OREGON BOXWOOD
V4	OVAL-LEAF HUCKLEBERRY
M5	PACIFIC WAX MYRTLE
R1	POISON OAK
R5	PRICKLY CURRANT
R6	RED FLOWERING CURRANT
V6	RED HUCKLEBERRY
R2	RHODODENDRON
G2	SALAL
RL	SALMONBERRY
CE	SCOTCH BROOM
A7	SERVICEBERRY
S9	SNOWBERRY
C4	SNOWBRUSH
P3	SWORDFERN
B1	TALL OREGON GRAPE
RE	THIMBLEBERRY
RG	TRAILING BLACKBERRY
A1	VINE MAPLE
S2	WILLOW SP.
U1 thru U9	OTHER/USER SPECIFIED

CODE	COMMON HERBS
X1	BEARGRASS
G1	BEDSTRAW
AE	BIGLEAF SANDWORT
D1	BLEEDING HEART
P4	BRACKEN FERN
AM	BROADLEAF ARNICA
C8	BUNCHBERRY DOGWOOD
T2	COOLWORT FOAMFLOWER
B4	DEERFERN
D2	FAIRYBELLS
M1	FALSE LILY OF THE VALLEY
S4	FALSE SOLOMONPLUME
CK	FIREWEED SP.
D3	FOXGLOVE
G5	GRASS SP.
E2	HORSETAIL
V2	INSIDE-OUT FLOWER
AL	LADYFERN
A5	MAIDENHAIR FERN
M4	MINER'S LETTUCE
G4	OAKFERN
O3	OREGON OXALIS
A4	PATHFINDER/TRAILPLANT
T4	PIGGYBACK PLANT
V9	REDWOOD VIOLET
L6	SKUNK CABBAGE
SB	SNOW QUEEN
S5	STARRY SOLOMONPLUME
O2	SWEET CICELY
CM	THISTLE SP.
T5	TRILLIUM
L3	TWINFLOWER
A3	VANILLA LEAF
T1	WESTERN MEADOWRUE
T3	WESTERN STARFLOWER
AJ	WILD GINGER
F2	WILD STRAWBERRY
D4	WOODFERN
U1 thru U9	OTHER/USER SPECIFIED

**"Percent of Area" for a 12' Radius Plot
(.0103 acres)**

% COVER	Equates to this Circular plot diameter (FEET)	Equates to a Square of this size:	
		(FEET)	(FEET)
1	2.4	2.1	x 2.1
2	3.4	3.0	x 3.0
3	4.2	3.7	x 3.7
4	4.8	4.3	x 4.3
5	5.4	4.8	x 4.8
6	5.9	5.2	x 5.2
7	6.3	5.6	x 5.6
8	6.8	6.0	x 6.0
9	7.2	6.4	x 6.4
10	7.6	6.7	x 6.7
15	9.3	8.2	x 8.2
20	10.7	9.5	x 9.5
25	12.0	10.6	x 10.6
30	13.1	11.6	x 11.6

% COVER	Equates to this Circular plot diameter (FEET)	Equates to a Square of this size:	
		(FEET)	(FEET)
35	14.2	12.6	x 12.6
40	15.2	13.5	x 13.5
45	16.1	14.3	x 14.3
50	17.0	15.0	x 15.0
55	17.8	15.8	x 15.8
60	18.6	16.5	x 16.5
65	19.3	17.1	x 17.1
70	20.1	17.8	x 17.8
75	20.8	18.4	x 18.4
80	21.5	19.0	x 19.0
85	22.1	19.6	x 19.6
90	22.8	20.2	x 20.2
95	23.4	20.7	x 20.7
100	24.0	21.3	x 21.3

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APPENDIX F: TOLERANCES & STANDARDS

SLI data gatherers shall diligently employ best professional cruising practices common to the trade as practiced in the Pacific Northwest. Appropriate tools and techniques are to be applied to all tasks comprising the inventory sampling work. Assessments, measurements and estimates of physical traits of inventory items shall be made carefully and recorded accurately. Tolerances for cruise items are explicitly stated when applicable. Otherwise no tolerance applies. Exceeding the stated tolerance is considered an error and may be cause for rejection of work or contribute to reduction in payment according to contract terms.

Items without an explicit tolerance will be evaluated in accordance with the instructions found elsewhere within this document. This type of evaluation is referenced in ODF's contracts for SLI field work. These are called procedural errors and may also be cause for rejection of work or contribute to reduction in payment according to contract terms.

LOCATION OF SAMPLE PLOTS

See Line Level data requirements below

First Sample Plot on each Cruise Line

The first sample plot on each cruise line shall be within plus or minus 15% of the plot spacing linear distance it should be along the line transect azimuth, which is twenty five (25) feet from the stream channel.

Distance & Direction Between the First Sample Plot on each Cruise Line and the Other Sample Plots on the Line

Distance from the first sample plot on each cruise line and subsequent sample plots (plot spacing) shall be within plus or minus 15% of the plot spacing linear distance between plots along the line azimuth and plus or minus 15% of the plot spacing lateral distance perpendicular to the line azimuth. Location beyond this tolerance may be grounds for rejection of the work on a plot by plot basis.

PLOT AREA REPRESENTATION MAP

PLOT AREA REPRESENTATION Map

The PLOT AREA REPRESENTATION map shall accurately depict the cruise lines and plot positions established during the cruise work. The standardized plot design should be used. This map will serve to document the location of plots in each site file for future location or re-measurement needs. Plots that were not installed (PlotStat = NA, NE, or NR) shall be clearly indicated as such on the map.

CRUISE LEVEL DATA

Sampling design specification

The plot configuration shall be as shown in Appendix G: Plot Design for Riparian Vegetation Survey. Choosing plot size(s) different from those as described in Appendix G is unacceptable and may be grounds for rejection of the work. Application of the plot design detailed in Appendix E and G shall be considered as having met the plot design standards.

LINE LEVEL DATA

Line starting point coordinates <StartY> <StartX>

The submitted coordinates (Oregon Lambert Northing and Easting) recorded for the starting point of each cruise sample line at the stand boundary shall be within $\pm 100'$ of the true coordinates of the flagged field position. Location beyond this tolerance may be grounds for rejection of the work or overall payment reduction.

PLOT LEVEL DATA

Root Disease Rating <RootDis>

~~Failure to recognize and properly record the presence of root disease is an error. Within the categories associated with the presence of root disease, the severity code shall be within ± 1 of ODF check cruiser's estimate.~~

Swiss Needle Cast Rating <SwissNedI>

~~Failure to recognize and properly record the presence of Swiss Needle Cast is an error. Within the categories associated with the presence of root disease, the severity code shall be within ± 1 of ODF check cruiser's estimate.~~

Plot Status coding <PlotStat>

Plots which are not installed or that are installed but have no tally items shall be correctly recorded using the PlotStat field. Each omitted tally item at an installed plot that is incorrectly called a plot with no tally items (PlotStat = YN) is considered an error.

Slope Position <SlopePos>

The correct slope position code shall be recorded.

Ground Class <GrndClas>

The correct ground class shall be recorded.

Plant Association <PlntAsc>

The correct value requested for plant association code shall be recorded.

TREES LEVEL DATA

Tally

Seedlings and Saplings (trees less than or equal to 20' tall)

Evaluated for each sample plot. The number of seedlings and saplings tallied by species shall be within the tolerances listed below:

Tally of Seedling/Sapling Trees on Sample Plot	Missed/Added Tree Tolerance
1 - 8	±1 tree
9 - 20	± 20% (rounded to next highest even number of trees)
>20	Record "20" (tolerance does not apply)

Larger Trees (greater than or equal to 4.0" DBH and/or greater than 20' tall)

Both added trees (those which should not have been tallied) and missed trees (those which should have been tallied but were not) are counted as errors. The average tree count per plot for a stand shall be within 1.0 tree of the ODF check cruiser's average tree count. The tree count on a plot shall be within ± 1 tree at least 80% of the time and shall not be more than 3 trees off the rest of the time.

Group <Gp>

The correct group code shall be recorded.

Species <Sp>

The correct species code for live trees shall be recorded at least 95% of the time. For dead trees, the correct species code shall be recorded at least 95% of the time or, if decay and or absence of bark and foliage makes the call infeasible, the correct species category (conifer, hardwood, unknown) shall be recorded.

Diameter <DBH>

For seedling or sapling tally items, the following values shall be entered in the DBH column:

- Height class 2' (1'-3' actual height) - Record 0.0" DBH
- Height class 5' (4'-6' actual height) - Record 0.0" DBH
- Height class 8', 11', 14', 17' and 20' (7'-21' actual height) - Record actual estimated diameter to the nearest whole inch. It is seldom necessary to tape trees this size. Only obvious blows shall be considered errors for the seedling and sapling sized trees, such as entering 22.0" for a tree that's really 2.2".

For larger tree tally items, the following values shall be entered in the DBH column:

- Trees (>21' tall up to 20.9" DBH): record the diameter to the nearest one inch diameter class. The diameter tolerance is plus or minus one class. Diameters shall be within the tolerance at least 80% of the time and not more than two diameter classes off the rest

of the time. Cruisers are encouraged to tape all trees and record to the tenth of an inch. These diameters are check cruised using a diameter tape.

- Trees (21.0" DBH and larger): record the diameter to the nearest one inch diameter class. The diameter tolerance is plus or minus two classes. Diameters shall be within the tolerance at least 80% of the time and not more than four diameter classes off the rest of the time. Cruisers are encouraged to use a tape, Biltmore stick, or Relaskop to obtain diameter. When using a Biltmore stick or Relaskop, average two readings taken 90° apart. These diameters are checked using a Biltmore stick - questionable diameters may be taped by the check cruiser. Reasonable allowance for greater error is made in large timber on steep slopes, or for trees with bole irregularities at the measurement point.

For stump tally items, if recorded, the following values shall be entered in the DBH column:

- The average of two measurements taken at 90° to each other, generally across the narrowest and the widest dimension if the cross-section is out-of-round, at the top of the stump and outside the bark if present. Record the diameter to the nearest one inch diameter class. The diameter tolerance is plus or minus four classes. Diameters shall be within the tolerance at least 80% of the time and not more than six diameter classes off the rest of the time.

Height <Ht>

For trees less than or equal to 20' tall and / or less than 4.0" DBH (status 4 or 5), height class recorded shall be within plus or minus one class at least 80% of the time and not more than two height classes off the rest of the time.

For trees greater than 20' tall and / or greater than 4.0" DBH, that are not used for height regression calculations (status 3, 4, or 5), height shall be within $\pm 10\%$ of the tree height as determined by the ODF check cruiser at least 80% of the time.

For individual tree height measurements for Top Height (status 9), Height Sample trees requiring tree heights (status 6), height shall be within $\pm 10\%$ of the tree height as determined by the ODF check cruiser.

For individual tree height measurements for site index (status 7 or 8), height shall be within $\pm 5\%$ of the tree height as determined by the ODF check cruiser.

Age <Age>

Each individual determination of age (at DBH) for site index sample trees (status 7 or 8) shall be taken in accordance with the instruction found in this SLI Field Guide, Version ODFSLI_1.0 (Modified May 2003), and within $\pm 10\%$ of the ODF check cruiser's determination.

Crown Ratio <CR>

An individual crown ratio estimate shall be within ± 15 percent live crown of the ODF check cruiser's estimate at least 80% of the time.

Crown Class <CC>

Crown class rating shall be within one class of the ODF check cruiser's determination at least 80% of the time. Crown class 6 (Remnant) will be considered within tolerance if coded either 1 (Open Grown) or 2 (Dominant).

Damage/Severity <Dmg1> <Sv1> <Dmg2> <Sv2> <Dmg3> <Sv3>

~~Class I damaging agents: The cruiser shall identify the correct group³⁶ code for Class I damaging agents. Class I damaging agents shall be recorded prior to recording Class II agents when present. Class II damaging agents: The cruiser shall identify the correct group code for Class II damaging agents.~~

Damage and Severity shall be recorded as described in the SLI Field Guide, under the Trees Branch level items that describe **Damage/Severity <Dmg1> <Sv1> <Dmg2> <Sv2> <Dmg3> <Sv3>**.

Defect Deduction <Def1> <Def2> <Def3>

Evaluated for each third of each tree. The allowable tolerance is ± 10 percent of the ODF check cruiser's determination. The defect deduction recorded shall be within the tolerance at least 80% of the time.

Decay Class <C>

Evaluated for each dead tree - Codes 1 through 5 acceptable if within plus or minus 1 classification of the ODF check cruiser's determination. The decay class recorded shall be within the tolerance at least 80% of the time.

Wildlife Excavation Code <U>

Evaluated for each dead tree - Codes 0, 1, or 2 acceptable if within plus or minus 1 classification of the ODF check cruiser's determination. The code recorded shall be within the tolerance at least 80% of the time. ***{For the riparian vegetation data collection this data is not required to be collected, however an appropriate valid code of 0, 1 or 2 should be entered as described.}***

³⁶ Each damage agent "group" consists of all of the individual damage agents listed per "box" or section of the SLI Field Reference Cards shown in Appendix E.

VEGETATION LEVEL DATA

Tally

Each species comprising at least 5% cover shall be recorded. Except for the circumstances described in the following paragraph, species comprising less than 5% cover may be recorded but shall not be considered in error if not.

For plots that have fewer than three species comprising 5% or more cover each, the three species present (if any) that have the highest relative cover percent shall be recorded. Vegetation tally per plot shall be within ± 1 species that comprises 5% cover or more, at least 90% of the time. Failure to tally a species that comprises more than 25% cover at a plot is cause for rejection of the work on a plot by plot basis.

Layer Code <Lyr>

Significant layer differences (within a species) shall be noted by using the layer code - layer coding shall be accurate at least 80% of the time.

Non-tree vegetation Species <Sp>

The correct species code for herb-shrub-grasses shall be recorded at least 95% of the time. Non listed species shall be coded using the user defined codes (U1 - U9), the species assigned to a user code shall be documented in remarks. ODF check cruisers shall not count mis-identified species as errors when the cruising is performed during times of the year when species identification is difficult due to lack of foliage (e.g. the winter season). ***{ For this project, grasses will not be assessed. }***

Cover Percent <CovPct>

Evaluated for each non-tree vegetation species tally each time it is correctly identified on a sample plot. An individual determination of cover percent is acceptable if within the following tolerances:

Cover Percentage	Tolerance
<5%	Not subject to tolerance
5-9%	$\pm 3\%$
10-25%	$\pm 5\%$
30-50%	$\pm 10\%$
55-100%	$\pm 20\%$

Cover percent shall be within the stated tolerance at least 80% of the time.

Height <Ht>

Average height for each tallied species is acceptable if within ± 5 feet of the ODF check cruiser's determination. Height shall be within the stated tolerance at least 80% of the time.

DOWN WOOD LEVEL DATA

Tally

The tally of down wood pieces shall be within $\pm 15\%$ of the ODF check cruiser's tally. In addition, the tally at each plot shall be within ± 3 pieces of the ODF check cruiser's tally at least 90% of the time. ODF may not count decay class 5 down wood pieces as "missed" tally (usually not, but the cruiser shall not by rule exclude them from the tally).

Omission of required tally (missed tally) of more than two large down wood pieces at a plot is cause for rejection of the work on a plot by plot basis. For the purposes of this determination, a large down wood piece is a log measuring 12" in diameter by 20' long, or larger, and that is decay class 1, 2, or 3.

Reasonable allowance for greater error is made in the case of logs obscured in any way (except for aboveground logs hidden by thick brush) at the point of intersection by the line-transect. For example, in difficult to measure situations such as logs in decks or slash piles, or logs buried in soil, greater latitude will be given the cruiser.

Species <Sp>

The correct species code for down wood pieces shall be recorded at least 95% of the time. If decay and or absence of bark make the call infeasible, the correct species category (conifer, hardwood, or unknown) shall be recorded.

Line-transect Intercept Diameter <IntD>, Small End Diameter <SmD>, Large End Diameter <LgD>

Down wood pieces up to 20" diameter: record the diameter to the nearest one-inch diameter class. The diameter tolerance is plus or minus one class. Diameters shall be within the tolerance at least 80% of the time and not more than two diameter classes off the rest of the time.

Down wood pieces with greater than 20" diameter: record the diameter to the nearest one-inch diameter class. The diameter tolerance is plus or minus two classes. Diameters shall be within the tolerance at least 80% of the time and not more than four diameter classes off the rest of the time.

Reasonable allowance for greater error is made in the case of decaying, out-of-round, broomed ends, or for pieces with other irregularities at the measurement point.

Length <Len>

Length on down wood tally pieces: An individual length measurement shall be within the following tolerances:

Piece length	Tolerance
<10'	2'
$\geq 10'$	$\pm 20\%$ (rounded to next highest even number of feet)

Pieces that at some point "disappear" below the ground shall have their length measured to that point. Length shall be within the stated tolerance at least 80% of the time.

Decay Class <C>

Evaluated for each piece - Codes 1 through 5 acceptable if within plus or minus 1 classification of the ODF check cruiser's determination. The decay class recorded shall be within the tolerance at least 80% of the time.

Wildlife Excavation Code <U>

~~Evaluated for each piece - Codes 0, 1, or 3 acceptable if within plus or minus 1 classification of the ODF check cruiser's determination. The code recorded shall be within the tolerance at least 80% of the time.~~

{For the riparian vegetation data collection this data is not required to be collected, however an appropriate valid code of "0" should be recorded to satisfy the need for this required entry.}

APPENDIX G
Riparian Vegetation Data Collection Project
Design Layout, collected data elements, and protocol needs

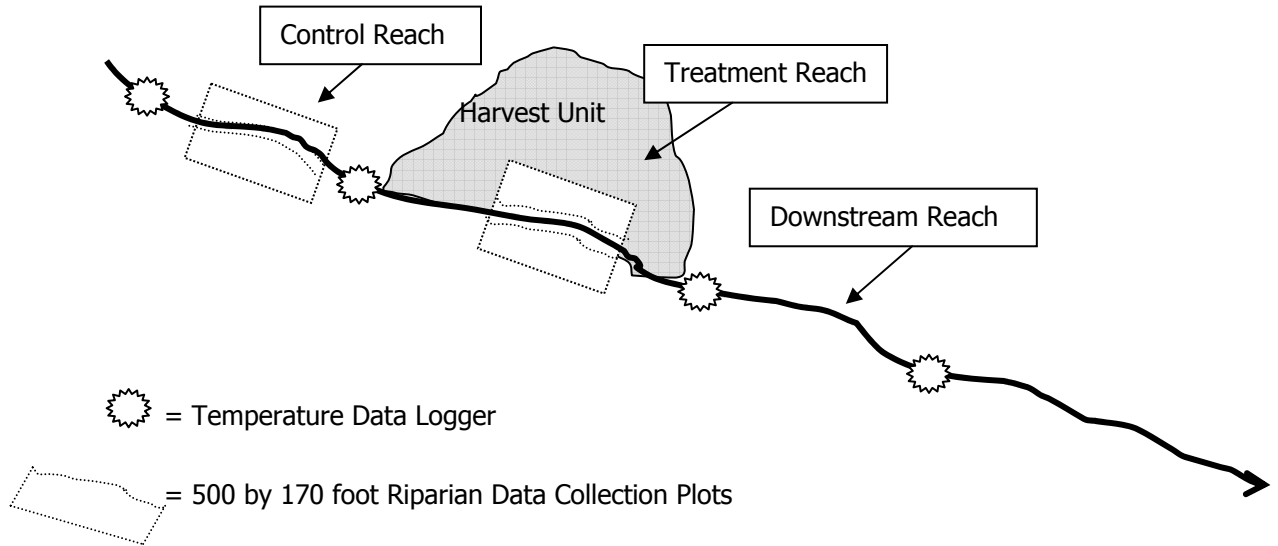


Figure 21. Generalized schematic of study design in relation to data logger placement.

Summary of Riparian Structure Characteristics

The following measurement data will be collected by a contractor/researcher and are subject to revision. A rectangular plot (500 by 170 feet) is used to survey larger overstory trees and snags, with fixed 12 foot radius, 1/100th acre circular plots embedded along cruise lines to sample smaller trees, shrubs and herbs. Twenty-five foot transects extending from each fixed circular plot toward the stream are used to survey downed wood. Two 500 by 170 foot plots are centered in each of the control and treatment reaches, one on both sides of the stream for a total of four of these plots per site (see Figure 21, Appendix G). The Contractor will use best judgement placing each plot pair within the reach, unless directed by ODF in advance to place the plot in a specific location within the reach (for example, beginning at T800-Treatment reach 800 feet) and extending upstream 500 from that specific location within the reach. ODF desires the plot pairs to be centered within each reach as much as possible to avoid placement bias and ensure the plot is well within the intended treatment or control area. When considering plot placement some adjustment upstream or downstream from the reach center can be made to help avoid road impacts, a larger tributary, or dramatic stream meandering. Avoid plot placement on the extreme ends of the reach.

Laying out the Plots:

- Field crews should recon both the treatment and control reaches first to help determine an appropriate baseline azimuth and gain knowledge of the reach for best plot pair placement, unless plot placement specifically directed otherwise by ODF. Determine a baseline azimuth of the stream valley through the reach (read facing downstream). Set an azimuth directly perpendicular to the baseline reach azimuth that would run upslope into the rectangular plot. This azimuth will be the plot azimuth. Record both azimuths, and compass declination on the

Plot Area Representation Map (see Appendix A). Moving along the determined baseline azimuth, come in 50 feet from either the upstream or downstream end of the plot to establish an initial transect cruise line (Line 1 or Line 5). Once this initial transect line is established continue moving along the baseline azimuth and flag in the remaining four transect line locations at 100 feet horizontal distance intervals. Follow the perpendicular azimuth to the high water mark at the channel edge to determine the transect line starting location. Each transect line should continue outward from the stream 170 feet using the same plot azimuth. Since each line is 170 feet horizontal from the stream the outside plot boundary should closely approximate the same shape of the streamside plot boundary.

- Permanently mark the four corners of the 500 by 170 foot plot based on horizontal distance, by marking the location with ¼" rebar, painted orange. Well placed aluminum tags should be nailed on nearest three live tree bases with site/plot number, slope distance, azimuth, along with species and dbh of reference tree, to help re-location efforts if either the upstream (500') corner or downstream (0') corner markers are difficult to find. When plots are paired and "mirror" directly across from each other, only three tags are required to reference either corner. Trees that are close (within 3 feet) to the external plot boundaries should be marked with a painted arrow, clearly showing (arrow pointing toward) whether the tree was considered in or out of the plot by the contractor.

In general, data will be collected from the start of a given line by moving away from the stream along the transect and recording downed wood, attributed to a fixed plot, collecting regeneration, shrubs, and herbs on each fixed plot moving up the transect line. Overstory trees and snags will be added to the last plot on each line (i.e. furthest plot out from stream - plots 6, 12, 18, 24, & 30) while cruising the trees/snags back down within that given 170 by 100 foot flagged plot area. The overstory tree and snag 170 by 100 foot plot boundaries between plots should be flagged in yellow/black stripe flagging to clearly indicate the boundary line between these 170 by 100 foot plots. Trees close or on these boundaries should be marked with a painted arrow, clearly showing (arrow pointing toward) which plot the tree is assigned to for check cruising purposes. Establish plot center stakes and hang white with red polka dot plot flagging at the circular plot centers (located on each transect at 25, 50, 75, 100, 125, and 150 feet from the stream channels high water level) based on horizontal distance, as described in the Sample Plot Layout section. Any plots with a Plot Status other than "YY", installed with tally, need to be identified and documented on the Plot Area Representation Map prior to submission. For the purposes of check cruising, all Status code 6 and 8 trees (see < **Trees;S**>) shall be clearly identifiable within each 170 by 100 foot plot. The cruiser shall paint the tree number (see < **Trees;Tr**>) on each subject tree (if moss on tree, remove moss and paint on bark), using the following tree numbering protocol depending on which 170 by 100 foot overstory/snag plot the subject tree is within. All overstory trees/snags equal or greater than 5.5. inches are measured and recorded on the last plots of each line transect (i.e. Plots 6, 12, 18, 24, and 30). Transect lines are numbered 1 through 5 in an upstream direction with the following tree numbering scheme for each 170x100 overstory subplot.

Line	Overstory/Snag Plot – plot furthest away from stream on each Line.	Tree Numbering in that 170x100 overstory subplot
1 (furthest downstream)	6	100's
2	12	200's
3	18	300's
4	24	400's
5 (furthest upstream)	30	500's

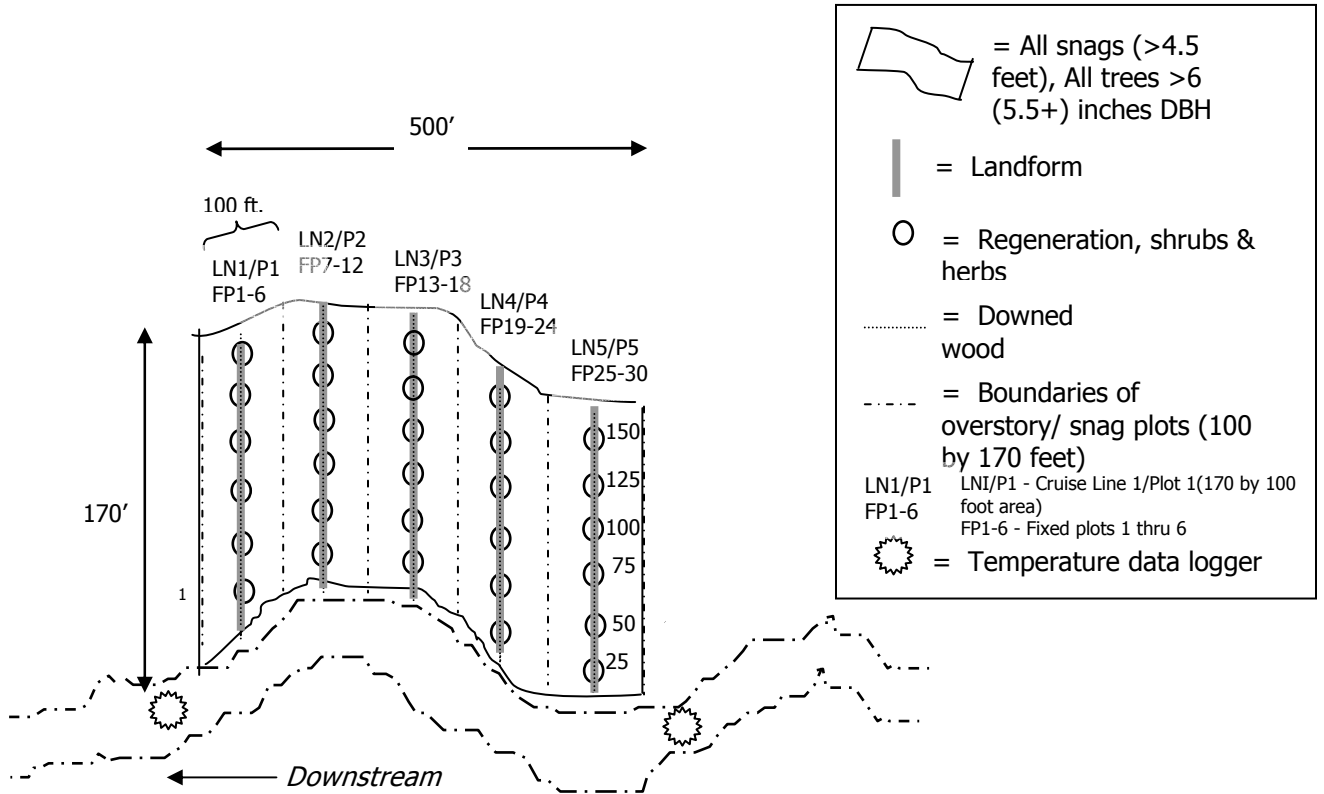


Figure 22. Plot design for landform, vegetation, and down wood measurements. [Not to scale.]

1. **Landform:** While proceeding from plot to plot assess and record the predominant landform feature code that best characterizes the distance from the previous plot to the current plot. Please note the following two exceptions: when on the first plot (25 feet from stream) on a line transect, it is the predominate landform between the stream high water level and the first plot and secondly, when on the last plot (150 feet from stream) it also includes evaluating the 20 feet past the plot out to end of the line transect which is 170 feet from the stream high water level. This data will be collected in the remarks field at the Plot level. See the ***'Plot;Remarks'*** data field for code information and format to use.
 - **Landform feature (code)** - see table with landform feature codes and descriptions in ***'Plot;Remarks'*** section.
2. **Downed Wood:** Along the 5 transects established 100 feet apart and perpendicular to the reach baseline azimuth (Figure 2 above), for all downed wood meeting protocol specifications that crosses the transect measure the:
 - **Species (code):** A two-letter species code is entered for each tallied down wood piece. If species is in determinable for a tally item, there are species codes for "Unknown Conifer", "Unknown Hardwood", and "Unknown Species".
 - **Intercept Diameter (inches):** Record the diameter of the piece at the point where the line-transect crosses the central longitudinal axis of the piece. Only those down wood pieces that are at least 6" in diameter and at least 3' in length are to be tallied. Measure and record the intercept diameter to the nearest inch.

- Small end diameter (inches). Record the diameter of the small end of each down wood piece tallied to the nearest inch. Do not record a small end diameter less than 1" (if the tip-top is smaller, measure the length of the piece to the 1" diameter point on the piece). The small end diameter recorded must be smaller than or equal to the large end diameter recorded.
 - Large end diameter (inches): Record the diameter of the large end of each down wood piece tallied to the nearest inch. The large end diameter must be equal to or greater than the small end diameter recorded. Values equal to or greater than 6" and less than or equal to 200" are acceptable.
 - Length (feet): Record the length of each down wood piece tallied to the nearest foot. Do not record down wood pieces shorter than 3' in length.
 - Decay Class (value from code list): Record the decay class that best describes the physical decomposition characteristics of the down wood piece.
 - Presence of Root Wad: This is to be recorded in the Wildlife Use field. Please enter the valid code "0" (default) to indicate if no rootwad present and "1" to indicate if there is a rootwad present. See instructions for '**Down Wood;U**' in Down Wood section.
 - Distance from channel at the intersection with the transect: This is to be recorded in the Remarks field. See instructions for '**Down Wood;Rmk**' in Down Wood section.
3. Small Trees (less 6" (<=5.4 inches)): These measures are taken in the 12 foot radius circular plots along the 5 transects established 100 ft apart and perpendicular to the valley azimuth. Plots are 25, 50, 75, 100, 125 and 150 feet horizontal from the stream channel. Take the following measurements on all trees less than 6 (<=5.4) inches in DBH that are within the plot.
- Species: (code list)
 - DBH (inches): Diameter at breast height.
 - Live crown ratio: Measure the height to the base of the live crown on each tree that was measured for height.
 - Tree Height (ft): Measure tree height on all young trees as described in the 'Trees;Ht' field in the Trees section.
 - Shrubs and Herbs: These measures are taken in the 12 foot radius circular plots along the 5 transects established 100 ft apart and perpendicular to the valley azimuth. Plots are 25, 50, 75, 100, 125 and 150 feet horizontal from the stream channel. For each shrub, herb, and forb species observed record:
 - Species: (code list)
 - Coverage percentage by non-tree species.
 - Average height for that layer/species combination.
4. Overstory Trees and Snags: Take the following measurements on all trees or snags(>4.5 feet tall) greater than 6 (>=5.5) inches DBH:
- Group code: (code list) Code used to identify each tally item as a standing live tree or a snag.
 - Species (code): Document the species of each tree that is measured using a the species lookup list codes.
 - DBH (inches): Diameter at breast height.
 - Tree Status: (code list) Status code assigned by cruiser per protocol that impact data recording requirements for the following data elements when processed and sent for post data collection compilation; tree height, tree breast height age, tree live crown ratio, tree crown class, snag decay class, and snag wildlife use (excavations). See summary status code summary table and individual code descriptions described in the '**Trees;S**' field section.
 - Tree Height (ft): Measure tree height according to the height recording requirements as described in the '**Trees;Ht**' field section.
 - BH Age: Recorded breast height age needed for some trees, as described in the '**Trees;Age**' field section.
 - Live crown ratio: Live Crown Ratio, which is the length of the live crown portion of the tree divided by its total height. Collect data as described in the '**Trees;CR**' field section.

- Crown Class: (code) Live tree Crown Class, is the description of the relative position of the tree crown with respect to competing vegetation surrounding the tree. Collect data as described in the '**Trees;CC**' field section.
- Damage: Use damage codes to record Lean and broken top codes as described in the '**Trees;Dmg1**' and '**Trees;Dmg2**' fields.
- Defect: Use defect fields to record percentage missing or unsound in each third (lowest, middle, and top) of the tree bole as described in '**Trees;Def1**', '**Trees;Def2**', '**Trees;Def3**'.
- Decay Class (snags): Record the decay class code that best describes the physical decomposition characteristics of snags.
- Horizontal Distance from stream (Ft): estimated to the nearest foot. Use known fixed plot locations along transect line running down the middle of the 170 by 100 foot sub plot to help determine valid distance estimates of the tree from the stream. This should be recorded in the User2 field as described in '**Trees;User2**' for every overstory tree or snag equal or greater than 6 (≥ 5.5) inches.
- Tree Lean and Direction (code): Should be recorded in User1 field as described in '**Trees;User1**' using the listed six categories.
- 10-Year Radial Growth Increment Data: On site trees (Status 8) bored for age, measure (in 1/20th of inches) the 10-year period beginning at the end of the 2nd years' spring wood and stopping at the beginning of the 10th years' fall wood. This is recorded in the User3 field, as described in '**Trees;User3**'.

NOTES