FOREST INVENTORY AND ANALYSIS
NATIONAL CORE FIELD GUIDE

VOLUME I: FIELD DATA COLLECTION PROCEDURES FOR PHASE 2 PLOTS

SRS Version 3.0

BASED ON
FOREST INVENTORY AND ANALYSIS
NATIONAL CORE FIELD GUIDE
VERSION 3.0

OCTOBER 2005

This field guide is subject to revision.
Responsibility of keeping this field guide updated resides
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Changes from the Phase 2 Field Guide version 2.0 to version 3.0

Changes documented in change proposals are indicated in **bold** type. The corresponding proposal name can be seen using the comments feature in the electronic file. These change pages are intended to highlight significant changes to the field guide and does not contain all of the details or minor changes.

- **Modified: Wherever appropriate. The term "annular plot" was changed to "macroplot" wherever it was appropriate. Major changes are listed separately. See the change proposal for a complete list.**
- **Added: Field Guide Layout. Added a sentence stating that PLOT NOTES will be available on each PDR screen.**
- **Modified: Units of Measure. Modified current "annular plot" to "macroplot". Added a new definition of annular plot.**
- **Modified: 0.0 GENERAL DESCRIPTION. Added text explaining the meaning of core optional and the application to Phase 3 indicators collected on Phase 2 plots. Modified text to describe the change of "annular plot" to "macroplot"**
- **Clarified: 1.0 PLOT DATA. Added text from old section 8 Nonforest/ nonsampled Plots.**
- **Modified: 1.3 PLOT NUMBER. Changed *Field width* from 4 to 5 digits.**
- **Clarified: 1.4 PLOT STATUS. Clarified text of code 1 and the descriptive text to accommodate the elimination of old section 8 Nonforest/nonsampled Plots. Added codes 2 and 3 from old section 8 Nonforest/ nonsampled Plots.**
- **Clarified: 1.5 PLOT NONSAMPLED REASON. Clarified the codes to include the information from the old section 8 Nonforest/nonsampled Plots.**
- **Added: 1.6 SUBPLOTS EXAMINED. Added this new variable and renumbered all variables after it.**
- **Clarified: Old 1.5, new 1.7 SAMPLE KIND. Clarified code 3 to include the language from the old section 8 Nonforest/nonsampled Plots.**
- **Added: 1.16.5 GPS DATUM. Added this new variable and renumbered all variables after it.**
- **Deleted: Old 1.15.6 LATITUDE. The variable LATITUDE was deleted and this renumbered section (1.16.7) was modified to be a general introduction to three new variables that take the place of the old LATITUDE variable: LATITUDE DEGREES, LATITUDE MINUTES, and LATITUDE SECONDS.**
- **Added: 1.16.7.1 LATITUDE DEGREES. Added this new variable.**
- **Added: 1.16.7.2 LATITUDE MINUTES. Added this new variable.**
- **Added: 1.16.7.3 LATITUDE SECONDS. Added this new variable.**
- **Deleted: Old 1.15.7 LONGITUDE. The variable LONGITUDE was deleted and this renumbered section (1.16.8) was modified to be a general introduction to three new variables that take the place of the old LONGITUDE variable: LONGITUDE DEGREES, LONGITUDE MINUTES, and LONGITUDE SECONDS.**
- **Added: 1.16.8.1 LONGITUDE DEGREES. Added this new variable.**
- **Added: 1.16.8.2 LONGITUDE MINUTES. Added this new variable.**
- **Added: 1.16.8.3 LONGITUDE SECONDS. Added this new variable.**

- **Deleted: old 1.16 P3 HEXAGON NUMBER. Deleted this variable. The information is available in a cross-walk for office use.**

- **Added: 1.17 MACROPLOT BREAKPOINT DIAMETER (CORE OPTIONAL): Added this new variable and renumbered the section following it.**

- **Deleted: old 1.17 P3 PLOT NUMBER. Deleted this variable. The information is available in a cross-walk for office use**.

- **Modified: 1.8 PREVIOUS PLOT NUMBER. Change *Field width* from 4 to 5 digits.**

- **Added: 2.2 CONDITION CLASS STATUS Definitions. Added a reference to the definition for nonsampled.**

- **Modified: 2.5.1 RESERVED STATUS. Added "CORE" to the current *When collected*. Added "CORE OPTIONAL: Non-forest condition classes (CONDITION CLASS STATUS > 1)" to *When collected*.**

- **Modified: 2.5.2 OWNER GROUP. Added "CORE" to the current *When collected*. Added "CORE OPTIONAL: Non-forest condition classes (CONDITION CLASS STATUS > 1)" to *When collected*.**

- **Modified: 2.5.7 OWNER CLASS. Added "CORE" to the current *When collected*. Added "CORE OPTIONAL: Non-forest condition classes (CONDITION CLASS STATUS > 1)" to *When collected*.**

- **Modified: 2.5.8 PRIVATE OWNER INDUSTRIAL STATUS. Added "CORE" to the current *When collected*. Added "CORE OPTIONAL: Non-forest condition classes (CONDITION CLASS STATUS > 1) when the owner group is private (OWNER GROUP 40)" to *When collected*.**

- Corrected: 2.5.17 TREATMENT 1. Corrected the text in code 50 to match the codes actually listed as *Values*. "…(not covered by codes 11-40)…" was changed to "…(not covered by codes 10-40)…".

- **Modified: 3.2 SUBPLOT/ANNULAR PLOT STATUS. Modified all references to "annular plot" to "macroplot".**

- **Modified: 3.9 SUBPLOT/ANNULAR PLOT CONDITION LIST (CORE OPTIONAL). Modified all references to "annular plot" to "macroplot".**

- Clarified: 5.0 TREE AND SAPLING DATA. Added and deleted some text to clarify meaning in the introductory paragraphs.

- **Modified: 5.5 HORIZONTAL DISTANCE. Modified *Tolerance* for woodland species on microplots from "+/- 0.2 ft" to "+/- 0.4 ft". Modified *Tolerance* for woodland species on subplots from "+/-1.0 ft" to "+/- 2.0 ft". Modified *Tolerance* for woodland species on macroplots from "+/- 3.0 ft" to "+/- 6.0 ft".**

- Clarified: 5.6 PREVIOUS TREE STATUS. Clarified *When collected* by adding ">1.0 in DBH" to the current *When collected* text.

- **Modified: 5.7 PRESENT TREE STATUS. Modified the last sentence in code 0 from "Requires RECONCILE code = 5-8" to "Requires RECONCILE code = 5-9" to accommodate the new RECONCILE code.**

- **Modified: 5.7.1 RECONCILE. Modified codes 1 and 6, and added a new code 9.**

- Clarified: 5.7.2 STANDING DEAD. Added some text to the variable description for clarification.

- Clarified: 5.8 SPECIES. In the descriptive text, the use for code 0999 was clarified to "… and 0999 for other or unknown live tree."

- **Modified: 5.9 DIAMETER. Modified *Tolerance* for woodland species from:**
  "+/- 0.1 in per 20.0 in increment of measured diameter on all live trees and dead trees with DECAY CLASS = 1, 2
  +/- 1.0 in per 20.0 in increment of measured diameter on dead trees with DECAY CLASS = 3, 4, 5"
  to "+/- 0.2 in per stem".

- **Modified: 5.9.4 DIAMETER AT ROOT COLLAR (DRC). Modified descriptive text.**

- **Added: 5.9.4.1 DRC STEM DIAMETER. This new variable was added.**

- **Added: 5.9.4.2 DRC STEM STATUS. This new variable was added.**

- **Modified: Figure 35. How to measure DRC in a variety of situations. Modified the figure to match the modified text in section 5.9.4**

- **Added: 5.10 PAST NUMBER OF STEMS. This new variable was added and subsequent sections renumbered appropriately.**

- **Added: 5.11 CURRENT NUMBER OF STEMS. This new variable was added and subsequent sections renumbered appropriately.**

- **Modified: 5.18 UNCOMPACTED LIVE CROWN RATIO. Modified "height" to "length" in the text.**

- **Modified: 5.18 UNCOMPACTED LIVE CROWN RATIO. Modified figures 37 and 38 to accommodate the change to "length" in the text. Figures 39-41 did not need revision as stated in the change proposal according to the author of the change proposal.**

- **Modified: 5.22 (old 5.20) MORTALITY YEAR. Modified this variable from core to "CORE OPTIONAL".**

- **Modified: 7.1 SITE TREE SELECTION. Modified text explaining when to select a new site tree.**

- Added: 7.2.2 SPECIES. Added *Values*.

- **Moved or deleted: Section 8 Nonforest/nonsampled Plots. The information from this section was incorporated into the appropriate sections occuring earlier in the field guide. The following items were deleted in their entirety: 8.3.1 STATE; 8.3.2 COUNTY;8.3.3 PLOT NUMBER; 8.3.6 SAMPLE KIND; 8.3.7 PREVIOUS PLOT NUMBER; 8.3.8 FIELD GUIDE VERSION; 8.3.9 CURRENT DATE; 8.3.9.1 YEAR; 8.3.9.2 MONTH; 8.3.9.3 DAY; 8.3.10 DECLINATION (CORE OPTIONAL); 8.3.11 QA STATUS (CORE OPTIONAL); 8.3.12 CREW TYPE (CORE OPTIONAL); 8.3.13 GPS COORDINATES; 8.3.13.1 GPS Unit Settings, Datum, and COORDINATE SYSTEM; 8.3.13.2 Collecting Readings; 8.3.13.3 GPS UNIT; 8.3.13.4 GPS SERIAL NUMBER; 8.3.13.5 COORDINATE SYSTEM; 8.3.13.6 LATITUDE; 8.3.13.7 LONGITUDE; 8.3.13.8 UTM ZONE; 8.3.13.9 EASTING (X) UTM; 8.3.13.10 NORTHING (Y) UTM; 8.3.13.11 Correction for "Offset" Location; 8.3.13.12 AZIMUTH TO PLOT CENTER; 8.3.13.13 DISTANCE TO PLOT CENTER; 8.3.13.14 GPS ELEVATION; 8.3.13.15 GPS ERROR; 8.3.13.16 NUMBER OF READINGS; 8.3.13.17 GPS FILENAME (CORE OPTIONAL); 8.3.14 CONDITION CLASS STATUS 1; 8.3.15 CONDITION CLASS STATUS 2 (CORE OPTIONAL); 8.3.16 CONDITION CLASS STATUS 3 (CORE OPTIONAL); 8.3.17 CONDITION CLASS STATUS 4 (CORE OPTIONAL). The following items were partially incorporated into existing sections: 8.3.4 PLOT STATUS [codes 2 and 3 were added to item 1.4 PLOT STATUS. The following item was moved with code definitions modified to reflect only plots: 8.3.5 PLOT NONSAMPLED REASON [moved to section 1 with new item number 1.5].**

- **Deleted: 8.3.19 P3 HEXAGON NUMBER. Deleted this variable. The information is available in a cross-walk for office use.**

- **Deleted: 8.3.20 P3 PLOT NUMBER. Deleted this variable. The information is available in a cross-walk for office use.**

- Clarified: Appendix 3. FIA Tree Species Codes. 'Dead' added to code 0299 to read "unknown dead conifer." 'Dead' added to code 0998 to read "unknown dead hardwood." 'Live' added to code 0999 to read "other, or unknown live tree." Common name of "water locust" changed to "waterlocust".

- Modified: Appendix 7. Glossary. Modified the definition of "annular plot" and added a definition for "macroplot".

- Modified: Appendix 8. Tolerance / MQO / Value / Units Table. Modified the table to include the changes made in the main body text of the field guide.

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FOREST INVENTORY AND ANALYSIS
NATIONAL CORE FIELD GUIDE

VOLUME I: FIELD DATA COLLECTION PROCEDURES FOR PHASE 2 PLOTS

Version 3.0

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1.1: March 1999 (first version implemented, Maine, 1999)
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1.3: September 1999 (revised from Bangor, ME Data Acquisition Band meeting, Aug 1999)
1.4: February 2000 (revised from Charleston, SC Data Acquisition Band meeting, Dec 1999)
1.5: January 2001 (revised from Portland, OR Data Acquisition Band meeting, Sept 2000)
1.6: March 2002 (revised from Tucson, AZ Joint Band meeting, Jan 2002)
1.7: February 2003 (revised from Charleston, SC Joint Band Meeting, Feb 2003)
2.0: April 2003 (revised from Atlantic City, NJ, Data Acquisition Band Meeting, Mar 2003)
October 2003 (revised from Anchorage, AK, Data Acquisition Band Meeting, Aug. 2003)
January 2004 (revised from Data Acquisition Band conference calls with FIA Management Team Approval)
August 2004 (revised from Asheville, NC, Data Acquisition Band Meeting, Aug. 2004)
3.0 October 2005 (revised from change management process, change proposals approved by FIA Management Team, from Asheville, NC, Data Acquisition Meeting, Aug. 2004, and from Las Vegas, NV, Data Acquisition Meeting, Mar. 2005)

Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

INTRODUCTION

This document describes the standards, codes, methods, and definitions for Forest Inventory and Analysis (FIA) field data items. The objective is to describe CORE FIA field procedures that are consistent and uniform across all FIA units. **This CORE is the framework for regional FIA programs; individual programs may add variables, but may not change the CORE requirements.** Unless otherwise noted, the items in this field guide are considered CORE, that is, the information will be collected by all FIA Units as specified. Items or codes specified as CORE OPTIONAL are not required by individual units; however, if the item is collected or coded, it will be done as specified in this field guide. It is expected that on average all items in Volume I can be measured by a two-person field crew in less than one day, including travel time to and from the plot.

This document also describes additional regional standards, methods, and definitions for the southern FIA unit. This serves to enhance the National CORE, not change it. All regional items and clarifying text are shaded in the same manner as this paragraph.

Variables or codes not collected in the field by the Southern Research Station will appear as light gray text when printed (example text) .

The FIA program is in transition, changing in response to legislation and new customer demands. One of these demands is for increased consistency, which this field guide begins to address. Another change was the merger of the FIA program with the field plot component of the Forest Health Monitoring (FHM) program's Detection Monitoring. A systematic grid was established that includes some, but not all former FIA plots. This grid contains the Phase 2 plots, the annual survey plots that are designed for measurement on a rotation such that a portion of the plots are measured each year. The rotation length varies by region. The former FHM Detection Monitoring field plots are the Phase 3 plots, a subset of the Phase 2 plots. The same basic plot and sampling designs are used on all the plots.

The focus of Volume I is on data that are collected in the field on all Phase 2 plots in the FIA sample. The methods in Volume I are also used on Phase 3 plots except when specifically noted otherwise in the methods text. Volume II of the series describes an additional, expanded suite of data collected on the Phase 3 subset of plots. Volume II contains methods for the following

indicators: ozone bioindicator plants; lichen communities; soils (physical and chemical characteristics); crown condition; vegetation diversity and structure; and down woody material. Volume III of the series (in preparation) will document the office procedures including data elements measured in the office, data from other sources that are merged into the FIA database, and CORE compilation and analysis algorithms. When complete, the three-volume set will describe the CORE FIA program field data, all of which are measured consistently across the country.

FIELD GUIDE LAYOUT

Each section of the field guide corresponds to one of the following sections:

0 General Description
1 Plot
2 Condition
3 Subplot
4 Boundary
5 Tree Measurements
6 Seedling
7 Site Tree

Each section begins with a general overview of the data elements collected at that level and background necessary to prepare field crews for data collection. Descriptions of data elements follow in this format:

DATA ELEMENT NAME -- <brief variable description>

When collected: <when data element is recorded>
Field width: <X digits>
Tolerance: <range of measurement that is acceptable>
MQO: <measurement quality objective>
Values: <legal values for coded variables>

Data elements, descriptions of when to collect the data elements, field width, tolerances, MQO's, and values, apply to both Phase 2 plots (formerly called FIA plots) and Phase 3 plots (formerly called FHM Detection Monitoring plots) unless specifically noted. Field width designates the number of columns (or spaces) needed to properly record the data element.

Tolerances may be stated in +/- terms or number of classes for ordered categorical data elements (e.g., +/- 2 classes); in absolute terms for some continuous variables (e.g., +/- 0.2 inches); or in terms of percent of the value of the data element (e.g., +/- 10 percent of the value). For some data elements, no errors are tolerated (e.g., PLOT NUMBER).

MQO's state the percentage of time when the collected data are required to be within tolerance. Percentage of time within tolerance is generally expressed as "at least X percent of the time," meaning that crews are expected to be within tolerance at least X percent of the time.

PLOT NOTES will be available on every PDR screen for ease in recording notes.

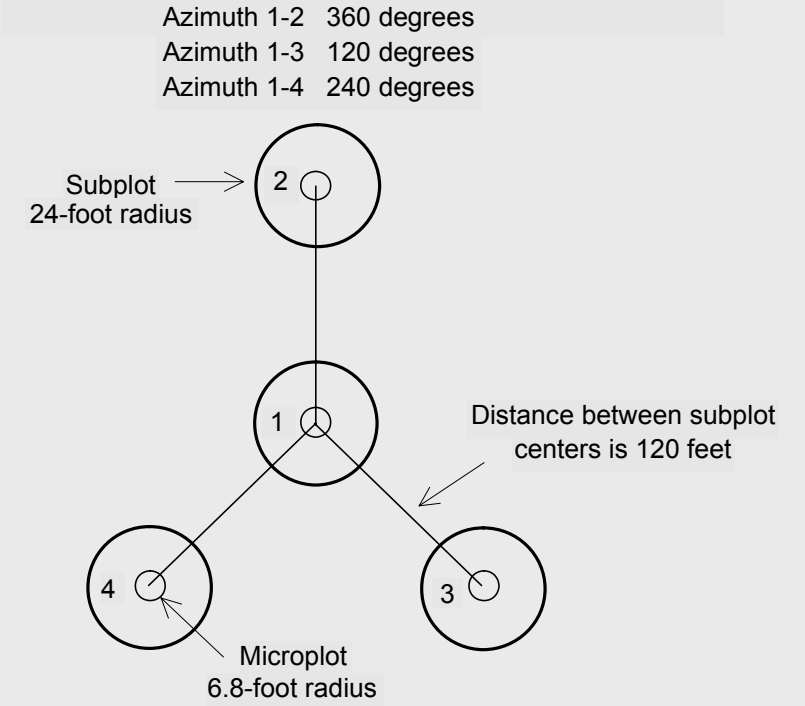
REVIEW OF FIELD SAMPLING METHODS IN PREVIOUS INVENTORIES

Texas is remeasuring the National Field Guide plot design (SAMPLE KIND 2)
Kentucky, Georgia and Tennessee are currently remeasuring both the National Field Guide and the Southern Research Station Inventory (SAMPLE KIND 8)

SOUTHERN RESEARCH STATION INVENTORY
(AL, GA, KY, NC, SC, TN, and VA)
Sample Locations

The Southern Research Station plot design consisted of four subplots approximately 1/24 acre in size with a radius of 24.0 feet. Subplots 2, 3, and 4 are located 120.0 ft. horizontal at azimuths 360, 120 and 240 degrees respectively, from the center of subplot 1. Each subplot contains a microplot of approximately 1/300 acre in size with a radius of 6.8 feet. The microplot and subplot share the same subplot/microplot center.

Plot Layout



SOUTHEASTERN RESEARCH STATION PRISM PLOT INVENTORY
(FL)

Sample Locations

Sample locations were located randomly on aerial photography. One forest plot location was a cluster of 5 points.

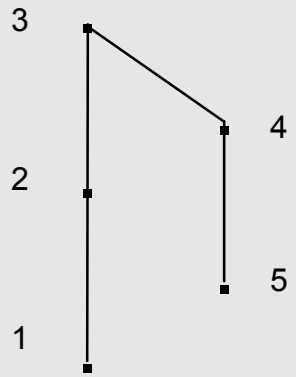
At each location determined to meet the definitions for forestland, five points were sampled using a 37.5 basal area factor to sample live trees 5.0 inches diameter at breast height (DBH) and larger. Additionally, all live trees 1.0 through 4.9 inches DBH within a 6.8 ft radius plot were measured at each sample point.

Plot Layout

The standard plot layout was:

5-POINT CLUSTER DESIGN

Azimuth	and	Distance	from	Point	to	Point
000		70 ft		1		2
000		70 ft		2		3
120		70 ft		3		4
180		70 ft		4		5



SOUTHERN RESEARCH STATION PRISM PLOT INVENTORY
(AR, LA, MS, OK)

Sample Locations

Sample locations were taken at the intersections of a 3-mile grid. At this sampling intensity, a plot location represented approximately 5,760 similar acres. One forest plot location was a cluster of ten points systematically spaced within the boundaries of an acre.

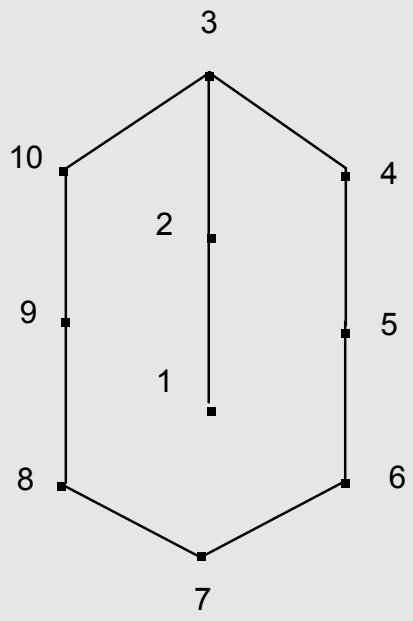
At each forested location, ten points were sampled using a 37.5 basal area factor prism to select live trees 5.0 inches DBH and larger. Additionally, all live trees 1.0 through 4.9 inches DBH within a 7.1-foot radius plot were tallied at points 1, 2, and 3. At points 4-10, up to the four most dominant 1.0 to 4.9 inch trees were tallied if fewer than two live variable plot trees were tallied at the point. If there were no live trees or live saplings on any point, then up to the four most dominant seedlings were tallied at the point.

Plot Layout

The spacing and orientation of the point cluster results in equilateral triangles, with sides 66 feet in length, between points.

10-POINT CLUSTER DESIGN

Azimuth	and	Distance	from	Point	to	Point
000		66 ft		1		2
000		66 ft		2		3
120		66 ft		3		4
180		66 ft		4		5
180		66 ft		5		6
240		66 ft		6		7
300		66 ft		7		8
000		66 ft		8		9
000		66 ft		9		10



UNITS OF MEASURE

The field guide will use ENGLISH units as the measurement system.

Plot Dimensions:

Macroplot:

Radius = 58.9 feet
Area = 10,899 square feet or 0.25 acre (ac) or 1/4 acre

Subplot:

Radius = 24.0 feet
Area = 1,809.56 square feet or approximately 0.04 acre or approximately 1/24 acre

Microplot:

Radius = 6.8 feet
Area = 145.27 square feet or approximately 0.003 acre or approximately 1/300 acre

Annular plot:

Radius = from 24.0 feet to 58.9 feet
Area = 9088.4 square feet or approximately 0.21 acre or 5/24 acre

The distance between subplot centers is 120.0 feet horizontal.
The minimum area needed to qualify as accessible forest land is 1.0 acre.
The minimum width to qualify as accessible forest land is 120.0 ft

Tree Limiting Dimensions:

breast height	4.5 ft
stump height	1.0 ft
merchantable top	4.0 in DOB
merchantable top for woodland	1.5 in DOB
minimum conifer seedling length	0.5 ft
minimum hardwood seedling length	1.0 ft
seedling/sapling DBH/DRC break	1.0 in DOB
sapling/tree DBH/DRC break	5.0 in DOB

0.0 GENERAL DESCRIPTION

The CORE field plot consists of four subplots approximately 1/24 acre in size with a radius of 24.0 feet. The center subplot is subplot 1. Subplots 2, 3, and 4 are located 120.0 feet horizontal (+/- 7 feet) at azimuths of 360, 120, and 240 degrees, respectively, from the center of subplot 1 (see Figure 1). Throughout this field guide, the use of the word 'plot' refers to the entire set of four subplots. 'Plot center' is defined as the center of subplot 1. As a CORE OPTION, the field plot may also include macroplots that are ¼ acre in size with a radius of 58.9 feet; each macroplot center coincides with the subplot's center. Macroplots are numbered in the same way as subplots.

If the macroplots are not installed, the subplots are used to collect data on trees with a diameter (at breast height, DBH, or at root collar, DRC) of 5.0 inches or greater. If the macroplots are installed, then subplots are used to collect data on trees from a diameter 5.0 inches to the breakpoint diameter and the macroplot is used to collect data on trees with diameter greater than the breakpoint diameter.

Each subplot contains a microplot of approximately 1/300 acre in size with a radius of 6.8 feet. The center of the microplot is offset 90 degrees and 12.0 feet horizontal (+/- 1 foot) from each subplot center. Microplots are numbered in the same way as subplots. Microplots are used to select and collect data on saplings (DBH/DRC of 1.0 inch through 4.9 inches) and seedlings [DBH/DRC less than 1.0 inch in diameter and greater than 0.5 foot in length (conifers) or greater than 1.0 foot in length (hardwoods)]. Longleaf pine must be at least 0.5 inches at the root collar. Planted seedlings must meet the same size requirements listed above.

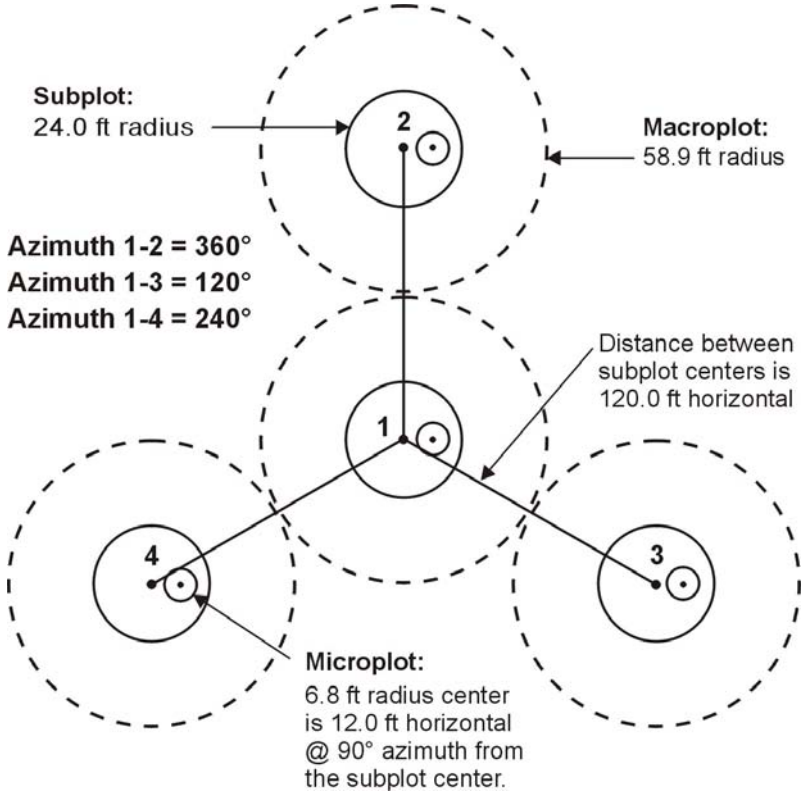


Figure 1. FIA Phase 2 plot diagram. See individual Phase 3 chapters for Phase 3 plot figures.

As a CORE OPTION for a Phase 2 plot that is not part of the Phase 3 subset, data for one or more of the Phase 3 indicators may be collected on the plot. If a region exercises the option to collect one or more Phase 3 indicator(s) on a Phase 2 only plot, the entire suite of measurements for the particular indicator(s) described in the appropriate chapter must be collected for the data for that indicator to be core optional.

Each unit may choose which Phase 3 indicators to collect as core optional on a Phase 2 plot that is not a Phase 3 plot. They may choose no indicators, all indicators or a subset. If they choose to collect data for a Phase 3 indicator, all the procedures for the indicator must be followed for that indicator to be considered core optional (data in National NIMS). If a subset of measurements for an indicator are collected, that is considered a regional enhancement and the data will be in the regional database.

Macroplots may be used to provide a better sample of rare population elements, such as very large trees.

The annular plot may be used for destructive sampling; for example soil samples. Also the term annular plot will be used for instructions in the field guide, for example, instructions on numbering trees when the macroplots are installed.

Data are collected on field plots at the following levels:

Plot	Data that describe the entire cluster of four subplots.
Subplot	Data that describe a single subplot of a cluster.
Condition Class	A discrete combination of landscape attributes that describe the environment on all or part of the plot. These attributes include CONDITION CLASS STATUS, RESERVED STATUS, OWNER GROUP, FOREST TYPE, STAND SIZE CLASS, REGENERATION STATUS, and TREE DENSITY.

Boundary	An approximate description of the demarcation line between two condition classes that occur on a single subplot, microplot, or macroplot. There is no boundary recorded when the demarcation occurs beyond the fixed radius plots.
Tree	Data describing saplings with a diameter 1.0 inch through 4.9 inches, and trees with diameter greater than or equal to 5.0 inches
Seedling	Data describing trees with a diameter less than 1.0 inch and greater than or equal to 0.5 foot in length (conifers) or greater than or equal to 1.0 foot in length (hardwoods). Longleaf pine must be at least 0.5 in at the root collar. Planted seedlings must meet the same size requirements as listed above.
Site Tree	Data describing site index trees.

0.1 PLOT SETUP

Plots will be established according to the regional guidelines of each FIA unit. Mark each subplot and microplot center with a wire pin. Bend the subplot center pin in a "horseshoe" shape. Bend the microplot pin in a "pigtail" shape. Place pins at all subplot and microplot centers that contain an accessible forest condition, even if there is no tally on the subplot or microplot. When the crew cannot occupy the plot center because safety hazards exist, or the plot center is inaccessible or out of the sample, the crew should check the other subplots. If any subplot centers can be occupied and are in the sample, the subplots that can be occupied should be established and sampled following normal procedures. **When a subplot center or microplot center cannot be occupied, no data will be collected from that subplot or microplot; instead, the entire subplot or microplot should be classified according to the condition preventing occupancy (i.e. census water, denied access, hazardous, etc.).**

The following table provided can assist in locating subplot 2-4 from a subplot other than subplot 1.

Subplot Numbers		Azimuth	Backsight	Distance
From	To	*degrees*		*feet*
2	3	150	330	207.8
2	4	210	030	207.8
3	4	270	090	207.8

If a subplot was installed incorrectly at the previous visit, the current crew should remeasure the subplot in its present location and contact the field supervisor. In cases where individual subplots are lost (cannot be relocated), use the following procedures:

- assign the appropriate present CONDITION CLASS STATUS Code(s) to the new subplot (usually CONDITION CLASS STATUS = 1 or 2)
- assign TREE STATUS = 0 to all downloaded trees (i.e., incorrectly tallied at the previous survey)
- assign RECONCILE codes 3 or 4 (i.e., missed live or missed dead) to all trees on the new subplot.
- assign the next TREE RECORD NUMBER.

0.2 PLOT INTEGRITY

Each FIA unit is responsible for minimizing damage to current or prospective sample trees and for specifying how these trees are monumented for remeasurement. The following field procedures are permitted:

- Scribing and nailing tags on witness trees so that subplot centers can be relocated.

- Boring trees for age on subplots and macroplots to determine tree age, site index, stand age, or for other reasons.

- Nailing and tagging trees on microplots, subplots, and macroplots so that these trees can be identified and relocated efficiently and positively at times of remeasurement.

- Nailing, scribing, or painting microplot, subplot, and macroplot trees so that the point of diameter measurement can be accurately relocated and remeasured.

All other potentially damaging procedures that may erode subplot integrity are prohibited. The following practices are specifically prohibited:

- Boring and scribing some specific tree species that are known to be negatively affected (i.e., the initiation of infection or callusing).

- Chopping vines from tally trees. When possible, vines should be pried off trunks to enable accurate measurement. If this is not possible, alternative tools (calipers, biltmore sticks) should be used.

0.3 OWNERSHIP INFORMATION

Ownership information is recorded on all accessible forest land conditions. Prior to actual fieldwork in a county, ownership data is collected from county courthouse records. It is important to gather as much information as possible on the initial visit to the courthouse to avoid a return visit while the fieldwork is occurring.

NOTE: If the ownership has changed either from or to National Forest, the state coordinator or field supervisor must be notified.

SURVEY SYSTEMS
There are two primary boundary surveys: metes-and-bounds and Public Land Survey (PLS). The metes-and-bounds method uses map and parcel whereas the PLS uses section, township, and range to describe boundaries. Field crews should become familiar with the method used in the state.

INITIAL COUNTY OVERVIEW
Review the county materials to determine which plots were forested on the previous survey. Also, determine if any of the plots were recorded as idle farmland, which may have reverted since the last inventory. In addition, examine the aerial photographs/imagery to determine other plot locations that may have reverted and/or partially sample forest land. Be sure to collect ownership information on these plots. Owner data is not required on nonforest plots.

COUNTY RECORDS
Record keeping systems varies both between and within states. Some counties are highly computerized, while some rely totally on paper. Some counties have up-to-date information, while others are outdated. It is always advisable to ask for help from courthouse employees. They are there to help the public and are generally eager to assist people. They can also be invaluable sources of information for local forest industries.

GENERAL OWNERSHIP PROCEDURES:

1. Determine if the plot location samples forest land. Keep in mind the plot layout. One or more of the subplots may sample forest land. This is where preliminary work is beneficial.

2. Locate the plot location on county courthouse tax maps using the aerial photograph. When available, rely primarily on the old photograph to locate the plot on the county tax maps. Also use the plot sketch from the previous survey. It may show distinguishing physical characteristics that may help delineate the ownership boundaries. If there is more than one parcel in the vicinity of the plot, record information for each possible parcel. The adjacent tract may be in another owner category or may help you gain access to the plot.

3. Record the name, address, and owner class for the owner of each parcel. Cross check the owner with the past survey to verify an actual ownership change or if either the current or previous assignment was in error.

4. Determine the total acreage of each parcel and the number of forest acres, if required. Woodland acres are broken out of the total acreage in some states and can be used to determine percent forest. In other states, however, pine plantations are included in the agriculture category. In these cases, use the aerial photograph/imagery and the field visit to estimate the percent forest of the tract. Field check the percent forest information when the plot appears to have been planted, naturally reverted, or land cleared.

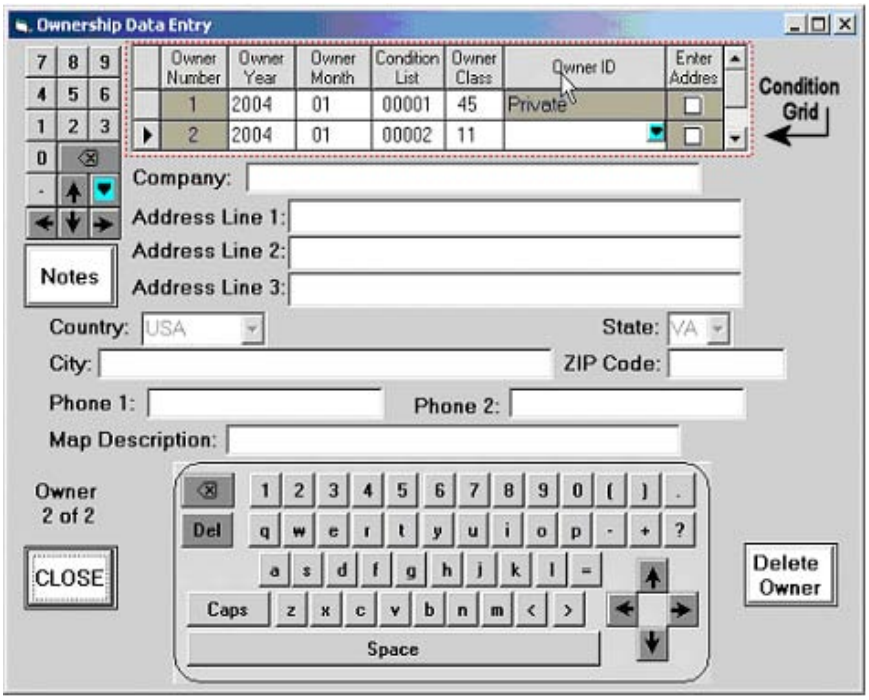
5. Record all pertinent ownership information on the "Forest Land Ownership Classification" sheets and the "Sample Location Reference Page." In addition, the ownership information must also be recorded in the data recorder program. The following provides instruction on entering the ownership data in the National Tally Program (NaTally).

0.3.1 OWNERSHIP DATA ENTRY

The ownership data entry function of the National Tally Program (NaTally) will be used to enter ownership information for all forested conditions on a plot. That data collected is no different than what cruisers have previously collected in the County Courthouse. Cruisers are still expected to collect the ownership information on paper at the courthouse. This required data will then be entered via NaTally and transmitted with the plot information. The plot will not pass the final edit unless the ownership data entry function is completed.

0.3.2 UNDERSTANDING THE OWNERSHIP DATA ENTRY WINDOW

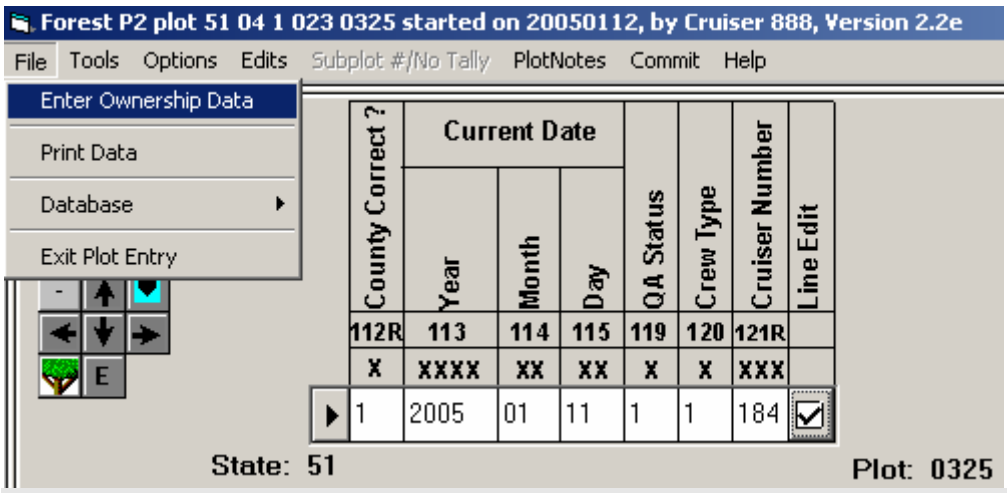
The Ownership Data Entry window is comprised of four major sections. The first two are the keyboard and numeric keypad. Both are the same as in the NaTally plot entry program. The two new sections are the Condition Grid at the top of the window and the Address Information Grid located in the middle of the window.



0.3.2 ENTERING OWNERSHIP INFORMATION

To begin entering ownership information, open the plot in NaTally.

Select “Enter Ownership Data” from the ‘File’ dropdown menu. This will open the Ownership Data entry form.

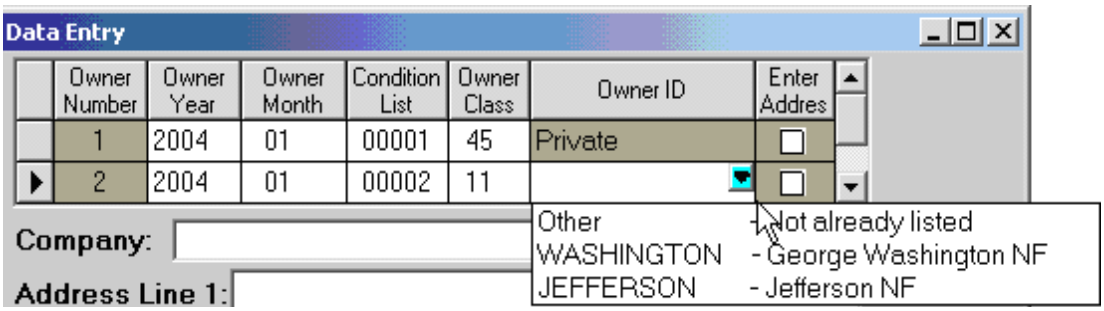


Enter the condition information one Owner Class at a time into the Condition Grid.

Required Fields:

Owner Year: The year in which the ownership information was collected.
Owner Month: The month in which the ownership information was collected.
Condition List: List of conditions owned by owner X.
Owner Class: Variable that classifies land into fine categories of ownership.
Owner ID: Delineation of owner class code.

Note: When Owner Class 45 (individual) is entered, the Owner ID is filled Private. When Owner Class other than 45 is entered a selection must be made from the dropdown menu for Owner ID.



Select the ‘Enter Address’ check box to access the Address Information Grid for that condition.

Enter data into the Address Information Grid

Once the ‘Enter Address’ check box is selected, the cursor will jump to the Company or Name box depending on which owner class is selected.

To move around the Address Information Grid:

Use the Up and Down arrows to tab between cells
Use the Left and Right arrow to move within cells

With Owner Class 45 selected:

First Name: The owner's first name. This line should include all information about the owner's name except the last name of the last ownership record listed and any suffixes attached to the last name of the last ownership record.

Last Name: The owner's last name. This field should contain the last name of the last person listed as the ownership of record and any additional suffixes that are included with that person's name.

If an Owner Class selected is other than 45 the Company will need to be filled in.

Company: Company or agency. The company, government, government agency, or other organization that is the ownership of record (i.e., is recorded in the tax office).

Regardless of Owner Class, the following information will need to be recorded.

Address Line 1: The first line of the owner's address. This line can contain a person's name if the address is "in care of" (c/o), "attention to" (attn:) or a similar situation.

Note: If a company name is entered and there is contact information for an individual within a company, then enter that person's name into Address Line 1.

Address Line 2: The second line of the owner's address.
Address Line 3: The third line of the owner's address.

If no information exists for Address Lines 2 or 3, skip these sections and move to Country and State.

Country: The country of the owner's address. USA is the default country; other countries can be selected from the dropdown menu if appropriate. Province and Country are required only for owners who reside outside of the United States.

State: The state of the owner's address. The state the plot was collected in is automatically selected. If the owner is from another state, select it from the dropdown menu.

City: The city of the owner's address.

Zip Code: The zip code of the owner's address.

Phone 1: The primary phone number that should be used to contact the owner.

Phone 2: The secondary phone number that can be used to contact the owner.

Note: If no contact information exists, Phone 1 and Phone 2 can be left blank.

Notes can be added for each Owner Number. To do so, select the owner and select the NOTES button below the numeric keypad. This will bring up the NOTES form where additional information can be added. Be sure that the owner number at the top of the notes form matches the owner number from the condition grid.

The final piece of information required in the Address Information Grid is the Map Description. Depending on the state either map and parcel data or township and range data will be entered. This field cannot be left blank or an error will be generated at the final plot edit.

The map description can be recorded in one of two formats depending on the state and county. The Township & Range format should be recorded in the following format:
Tx Rx Sx (Where x = recorded value T = Township R = Range S = Section)
The Map & Parcel format should be recorded in the following format:

Mx Px (Where x = recorded value M = Map # P = Parcel #)

If the information provided at the county courthouse does not follow one of these two formats, record the data in a logical format and comment in the notes how it was recorded.

Once the information is complete for the particular owner, go back to the Condition Grid and select the check box for the next condition. Complete the Address Information Grid for each forested condition. When completed select the CLOSE button in the lower left of the form.

Once back at the plot form, run a final plot edit. Correct errors if necessary. If there are no errors, the plot is ready for transmittal.

0.3.3 DELETING AN OWNER RECORD

If an owner is entered by mistake and needs to be removed, the owner record should be deleted. To do this, select the row selector arrow in the Condition Grid and the Delete Owner button in the lower right of the form. A message box will appear, select 'YES'.

Owner Number	Owner Year	Owner Month	Condition List	Owner Class	Owner ID	Enter Addres
1	2004	01	00001	45	Private	☐
2	2004	01	00002	31		☐

0.3.4 PRINTING OWNERSHIP INFORMATION

To print the ownership information, select print from the file menu in NaTally. Deselect "All Data" and select "Ownership". Click Print button.

Example Printout:

Forest P2 plot 51 04 1 023 0325 started on 20050112, by Cruiser 888, Version 2.2e

Date Printed: 20050119 Printed by: 034
Edited?: No Transmitted?: No

OWNERSHIP

Owner #:1 Owner Year:2004 Owner Month:01 Condition List:1 Owner Class:45 Owner ID:Private

Company:
First Name: Johnny
Last Name: Walker
Address Line 1: 1234 FIA ST.
Address Line 2:
Address Line 3:
Country: USA Province:
City: Knoxville State: TN ZIP Code: 37919
Phone 1: 865 862 2000 Phone 2:
Map description: M34 P6.01

Owner #:2 Owner Year:2004 Owner Month:01 Condition List:2 Owner Class:11 Owner ID:WASHINGTON
Company: George Washington NF
First Name:
Last Name:
Address Line 1: 1720 Peachtree St
Address Line 2: Suite 760S
Address Line 3:
Country: USA Province:
City: Atlanta State: GA ZIP Code: 30309
Phone 1: Phone 2:
Map description: T3 R5 S21

0.3.6 EDIT CONSTRAINTS

Every condition in the Condition Grid must be forested.

Every forested condition must appear in the Condition Grid.

A condition can only appear once in the Condition Grid. There can not be 2 owners for 1 condition.

A warning will be generated is there is an owner with a different tract size or percent forest.

0.4 LOCATING SAMPLE PLOTS

Each crew should always consider weather forecasts, water levels, plot access, and state and corporate cooperation when working a county. Each county should be worked in the most efficient manner possible. Always contact National Forest System (NFS) district and county forest offices, and county sheriff, as soon as you enter the county. Contact the landowner and always let local people know who you are and what you are doing when leaving an official vehicle near a residential area.

STOP AT HOUSES, KNOCK ON DOORS, ETC. DO NOT DRIVE ACROSS CROPLAND, WILDLIFE CLEARINGS, YARDS, ETC. UNLESS YOU HAVE PERMISSION FROM THE LANDOWNER. PARK THE VEHICLE AND WALK. ”POPPING” A LOCK OR USING A MASTER KEY WILL NOT BE TOLERATED. IF A ROAD HAS WATER-BARS OR A CABLE WITH A LOCK DO NOT DRIVE ON IT.

Fill out a sample location sheet (draw sheet) for all forested plots and non-forest plots whenever a non-forest plot has adjacent forestland close to the plot. This will insure that all 4 subplots are completely and totally within the non-forest condition. This will aid cruisers in the next survey to identify those plots that may have started to revert, but did not meet the required minimum stocking. In addition, this will allow check cruisers to know exactly where PC was located in relation to the adjacent forestland. A sample location sheet is not required for intensification plots, although data from intensification plots are recorded in the data recorder or on hardcopy.

Each crew will be furnished with both new and old photos (when available), plot sheets, ownership and field classification sheets, county maps, and National Forest ownership maps. All non-forest plots and possible reversions (a sample location or a portion of a sample location that was non-forest in the previous inventory but now forest) must be chained in using the old photo pinprick. Correct the pinprick on the new photo/imagery after the field visit if needed. For intensification plots, only use the new photos/imagery. Do not make any corrections to the new photo/imagery for an intensification plot.

ACCESS TO STARTING POINT (SP)

In the Sample Location Reference page section “SP Location Sketch Map” sketch the route used to access the SP. Include location of the landowners’ house, road names and numbers, obvious landmarks, and other prominent features that will aid the next field crew to locate the SP.

Starting Point
Select a permanent landmark or physical feature as the SP for locating the sample location. Intersections or sharp bends in roads, streams, or drainage ditches, field corners, prominent trees, and other features which can be readily identified both on the ground and on the photo make good starting points. The ideal starting point tree is a healthy, unique species, with unusual form, in a prominent location. At remeasurement relocations, the starting point on the old location sheet can often be used again. Scribe the SP tree with an “X” well above DBH (or well below depending on topography) and tag the tree at ground level, facing plot center.

Complete a new location sheet with the prior starting point information on land clearings, possible reversions that are chained into that do not meet minimum stocking levels, and on non-forest plots that are close to being partial plots. Copy the starting point information off the old sheets for any non-forest plots when the previous cruiser recorded the information. A starting point is not necessary if the plot center was non-forest during the past survey and all four subplots are obviously non-forest at the present time.

Note: No mark is needed on an SP if the point is permanent and readily identifiable, such as the corner of a building or a road intersection. Reference a tree when possible. **Do not scribe an SP in peoples yards, on hiking trails or elsewhere where unsuitable. In these situations scribe the backside of the SP if possible and put a note stating that the SP was either placed on the backside of the tree or not scribed at all.**

PHOTO WORK/IMAGERY

A reference azimuth, angle of intersection, and azimuth to plot center are drawn on the photograph/imagery to aid in the establishment of an accurate course to sample location, verify placement of the pinprick, and ground check the office photo interpretation.

Imagery (Digital Ortho Photos or DOQ/DOQQ) is currently being printed on paper using a color laser printer. When recording the reference azimuth, angle of intersection and azimuth to plot center a ball point pen should be used. Felt tip-type pens (such as Sharpies) may dissolve the ink on the DOQ and should be avoided.

All plots except intensification plots must be drawn up on the new photograph/imagery to verify correct plot location. Note any corrected pinpricks on the front and back of the new photo.

There may be one other instance when a plot does not need to be redrawn. To determine if the plot qualifies, the cruiser must compare the coordinates on the DOQ to the coordinates in NaTally. If the coordinates are the same and are verified (coordinates accurate to within 50' of the actual plot location on the ground), the plot does not need to be redrawn nor do new coordinates need to be collected. This is the only exception to these rules.

Reference Azimuth

For a reference azimuth, select a straight road section, drainage ditch, field edge, or draw a line between two well-spaced landmarks. Avoid standing near metal objects, e.g., railroads or power line towers, since they can influence the compass reading.

If no linear features exist on the photo/imagery, GPS coordinates of two point features can be used to obtain a reference azimuth. Prior to driving to the sample location, identify two distinct features on the photo/imagery within a reasonable distance (usually 1-2 miles) from the sample location. At each point feature, record 180 fixes in averaging mode on the GPS receiver (GPS can only be utilized when error falls below +/- 70 feet). The reference azimuth, based on magnetic north, is determined by using the distance feature in the WP menu of the PLGR.

Measure the reference azimuth with a compass to the nearest degree and record on the tally sheet under starting point notes, disregarding magnetic declination. If the reference azimuth line and the azimuth to plot center do not intersect on the photo/imagery, draw a line perpendicular to the reference azimuth line making it cross the azimuth to plot center. Use the perpendicular as the new reference azimuth line after adding or subtracting 90.

Angle of Intersection

With a protractor measure the interior angle between the reference azimuth and azimuth to plot center arrows to the nearest degree. The interior angle should be between 20 degrees and 90 degrees. Record on the tally sheet under starting point notes.

Photo/Imagery Notation

Note the following information on the **front** of the new photograph/imagery using a fine point marker (for imageries use a ball point pen) for all plots:

1. Reference azimuth line with an arrow indicating direction and azimuth noted.
2. Course to plot azimuth line with an arrow indicating direction and azimuth noted.
3. Starting Point circled and indicated as SP.
4. GPS Way Point circled and indicated as WP for completely non-forest plots only.
5. Interior angle noted with arrows drawn to the azimuth lines.
6. Note which plots have corrected pinpricks.

Note the following information on the **back** of new photographs/imagery when plot center is nonforest (e.g., partials and completely nonforest plots), if the plot is completely inaccessible, and intensification plots:

a. Plot number, if not already noted.
b. Land use code at plot center. If land use is a hayfield, record cropland land use (11) and write "hay" next to the code number. If the land use is Agricultural Land (10), developed (30-34) or Other Nonforest (40), then write a short description of the type of development, e.g., "back yard", "grocery store", "barn", etc. This will aid the next crew to ensure the same area is re-evaluated.
c. Date (mm/dd/yyyy).
d. Cruiser and assistant initials and codes.

e. Circle and note the "correct" pinprick if a correction has been made (do not move intensification pinpricks).
f. Recording GPS coordinates of non-forest plots on the back of the photo/imagery is optional.
g. Note on the back of the new photograph/imagery if plot center is reverted or landcleared.

Also, if a plot is nonforest but a draw sheet is filled out due to the proximity of forest land to one or more subplots, then record 'See Nonforest Aid' on back of photo.

Course to plot
The course to sample location can be determined by measurements from the photo/imagery for new plot locations, reversions, partials, or land clearings and lost plots when the SP has been removed. The azimuth and distance can be determined using GPS or compass and chain. Pacing to most locations is possible unless underbrush, water, or rough topography make pacing impractical. Pacing between SP and PC can be used to verify a previously reported course to sample location, but not for establishing a plot.

When old starting points are used at remeasurement locations, use the same distance and azimuth recorded in the previous survey with corrections necessary to account for declination and errant distances recorded by the previous crew. Accurate measurement of azimuth and distance from SP to PC can be by GPS navigation or by traversing on the ground.

ESTABLISHMENT OF SAMPLE KIND 1 LOCATIONS USING GPS

To begin, manually enter the plot coordinates in the GPS unit. The following list will walk you through the buttons to push to enter the coordinates:

1. WP

2. Use the right/left arrows to highlight ENTER and press the down arrow.

3. Note the WP number in the upper left corner of the screen. This will be the waypoint the coordinates are stored as and to which you will be navigating, so it is an important number. It is a good idea to change the waypoint number to coincide with the number of the plot you are installing. To do this, right arrow until the number is blinking. Hit NUM LOCK and using the keypad, enter the plot number. Hit NUM LOCK again to turn it off. Right arrow to the next line.

4. Right arrow over N to 90. Hit NUM LOCK and enter the coordinates for North/latitude. Once these numbers have been entered, hit NUM LOCK and right arrow to the next line. **Down arrow to change the E to a W. This is critical!** The GPS default is East. If you do not change this designation, you will be putting in and navigating to coordinates in the eastern hemisphere and unless you can swim really fast and really well, you don't want to do that! Once you have changed the E to a W, right arrow to the 000 and hit NUM LOCK. Enter the West/longitudinal coordinates.

5. Once the coordinates have been entered, turn off NUM LOCK and right arrow to the P. Down arrow to store the waypoint. It will be saved as the waypoint you designated earlier.

Next, click on NAV. Make sure that you are using either the CUSTOM or 2D FAST navigating method. The other word should be DIRECT. Right arrow to WP and enter the waypoint you want to navigate to. Right arrow to P and down arrow. The next screen will tell you where you need to go. The variables may not be the same for everyone, but you need to at least have AZ and RNG to tell you where you need to go and how far it is.

Using the GPS, navigate to within 100' – 150' of the plot. If possible, locate a good SP. Set the GPS down and press and hold down the POS button until the screen says AVG and the unit begins taking hits. Again, you must collect at least 180 points for the coordinates to be accurate. Once the GPS has reached at least 180, store the current position as a waypoint. Next, hit WP. Right arrow to DIST and down arrow. This screen will allow you to calculate an azimuth and horizontal distance between two waypoints. As the first waypoint, put in the coordinates you collected at the SP. The second waypoint is the plot coordinates. Once both have been entered,

the GPS calculates the RNG and AZ from the first WP to the second WP. At this point, chain the horizontal distance and azimuth to establish plot center. Once you are at PC, put the GPS down and press and hold the POS key to begin averaging. Again, take at least 180 hits. Record these coordinates as the new plot coordinates.

WITNESS TREES

Reference two witness trees to subplot 1 when at all possible. In the absence of trees, use distinct objects such as fence corners, boulders, etc. If another subplot is referenced, be sure to note which subplot is monumented with witness trees.

Witness trees should be:

a. Close to the pin and spaced approximately at right angles from the pin,
b. Not likely to die or be cut within 5-7 years, e.g., pine sawtimber,
c. A species easily located in the stand,
d. At least 5 inches DBH (At least 2 inches DBH if no 5 inch DBH trees are present).
e. If there are no witness trees, use whatever is available near the subplot center and describe its' relationship to the pin (e.g., large down log that you can tag, a large rock, etc.) and describe these on the sample location reference page.

Witness tree data:

a. Species
b. DBH to the last 0.1 inch
c. Azimuth from pin to center of tree at ground level
d. Horizontal distance to 0.1 ft from pin to center of tree

Mark the base of each witness tree with a metal tag (3 to 4 inches long) facing plot center. Scribe an "X" well above DBH facing the pin and be careful not to penetrate the cambium. **Do not scribe or place a white tag on trees in peoples yards, picnic areas, etc. Note on the draw page if you did not scribe and/or tag the trees.**

Mark one of the witness trees with a designated tag (Venetian blind material) by nailing the tag at approximately six feet facing the line of approach from the SP. Record the color of the tag on the sample location page.

0.5 COUNTY EDIT PROCEDURES

The field is the most critical place to edit data for errors. Correcting the data in the field is more precise and accurate than doing so after being submitted to the office. For this reason, a careful field edit is a vital part of data collection.

Count all county materials and complete the Office Summary Sheet. Ensure that all materials are accounted for before starting the county. If anything is missing when you receive the county materials (i.e., old maps, any photos/imagery, plots sheets, etc.) let your field coordinator know.

Make sure all items are filled in on the Sample Location record. Check for starting point notes, azimuth and slope distance to the sample location, and that the SP description and Sketch to Sample Location match. Check completeness of the plot layout diagram, Location Sketch Map, and Sketch to Sample Location. Make sure all plots have a North arrow and the Ownership is recorded. Check the witness tree information for completeness.

Check the photographs/imagery making sure that all the SP's are marked, the photographs/imagery are drawn-up, and all required information is recorded on the back of the photographs/imagery. Check math on course to plot azimuth, reference azimuth and angle of intersection.

Count all county materials and complete the Office Summary Sheet when finished. Ensure that all materials are accounted for before they are sent to the state coordinator or field supervisor for editing

1.0 PLOT LEVEL DATA

All variables listed in Section 1.0 are collected on plots with at least one accessible forested condition (PLOT STATUS = 1) and all NONFOREST/NONSAMPLED plots (PLOT STATUS = 2 or PLOT STATUS = 3). Some of the variables in Section 1.0 are collected on landcleared plots (PLOT STATUS = 4). In general, plot level data apply to the entire plot and they are recorded from the center of subplot 1. A plot is considered nonforest if no part of it is currently or previously located in forest land (CONDITION CLASS STATUS = 1). A plot is nonsampled if the entire plot is not sampled for one of the reasons listed in PLOT NONSAMPLED REASON.

If a forest plot has been converted to nonforest or becomes a nonsampled plot, the previous data are reconciled and an attempt is made to visit the plot during the next inventory. If a nonforest plot becomes forest or access is gained to a previously nonsampled plot, a new forest ground plot is installed. All nonforest and nonsampled plots are visited if there is any reasonable chance that they might include some forest land condition class.

Trees on previously forest land plots will be reconciled during data processing. There is a distinction between plots that have been clearcut, and plots that have been converted to another land use (landcleared). A clearcut plot is considered to be forest land until it is actively converted to another land use. Additional information concerning land use classifications is contained in Section 2.3.

Intensifications are additional ground checks of the photo interpretation completed in the office and are classified as PLOT STATUS = 5. Detailed plot, condition and tree data are not collected. These additional plots are used to strengthen the forest are adjustment and are numbered in the 4000 series.

The photo interpretation categories are forest, nonforest, census water and noncensus water. The land use codes recorded in the field are the same as the standard production plots (see Section 2.5). Do not move the pinprick on intensification plots or change the PI category on any plot. Photo work and GPS data are not required.

1.1 STATE

Record the unique FIPS (Federal Information Processing Standard) code identifying the State where the plot center is located. (FIPS codes are located in Appendix 1)

When collected: All plots
Field width: 2 digits
Tolerance: No errors
MQO: At least 99% of the time
Values: See Appendix 1

1.2 COUNTY

Record the unique FIPS (Federal Information Processing Standard) code identifying the county, parish, or borough (or unit in AK) where the plot center is located. (FIPS codes are located in Appendix 1)

When collected: All plots
Field width: 3 digits
Tolerance: No errors
MQO: At least 99% of the time
Values: See Appendix 1

1.3 PLOT NUMBER

Record the identification number, unique within a county, parish, or borough (survey unit in AK), for each plot. If SAMPLE KIND = 3, the plot number will be assigned by the National Information Management System (NIMS).

Plot numbers in the South adhere to the following numbering system:

00001-00999	Standard field plots
04001-04999	Intensification plots
09000-09999	Temporary and supplemental plots
RXXX	Certification plot

All other plot ranges are only used for training plots.

When collected: SAMPLE KIND = 1, 2, 8, 9
Field width: 5 digits
Tolerance: No errors
MQO: At least 99% of the time
Values: 00001 to 99999

1.4 PLOT STATUS

Record the code that describes the sampling status of the plot. In cases where a plot is inaccessible, but obviously contains no forest land, record PLOT STATUS = 2. In cases where a plot is access-denied or hazardous land use and has the possibility of forest, record PLOT STATUS = 3.

When collected: All plots
Field width: 1 digit
Tolerance: No errors
MQO: At least 99% of the time
Values:

1	Sampled – at least one accessible forest land condition present on plot
2	Sampled – no accessible forest land condition present on plot
3	Nonsampled
4	Landcleared – there was at least one accessible forest land condition at the last inventory, but the plot is now completely nonforest
5	Intensification

1.5 PLOT NONSAMPLED REASON

For entire plots that cannot be sampled, record one of the following reasons.

When collected: When PLOT STATUS = 3
Field width: 2 digits
Tolerance: No errors
MQO: At least 99% of the time
Values:

01 Outside U.S. boundary – Entire plot is outside of the U.S. border.

02 Denied access – Access to the entire plot is denied by the legal owner, or by the owner of the only reasonable route to the plot. Because a denied-access plot can become accessible in the future, it remains in the sample and is re-examined at the next occasion to determine if access is available.

03 Hazardous – Entire plot cannot be accessed because of a hazard or danger, for example cliffs, quarries, strip mines, illegal substance plantations, high water, etc. Although most hazards will not change over time, a hazardous plot remains in the sample and is re-examined at the next occasion to determine if the hazard is still present.

05 Lost data – Not field collected

06 Lost plot
07 Wrong location
08 Skipped
09 Dropped intensified
10 Other
11 Out of state boundary – any plot where PC falls outside of state boundary. Valid in state border counties only.

1.6 SUBPLOTS EXAMINED (Variable not collected in field)

1.7 SAMPLE KIND

Record the code that describes the kind of plot being installed.

When collected: All plots
Field width: 1 digit
Tolerance: No errors
MQO: At least 99% of the time
Values:

1 Initial plot establishment - the initial establishment and sampling of a national design plot (FIA Field Guide versions 1.1 and higher). SAMPLE KIND 1 is assigned under the following circumstances:
- Initial activation of a panel or subpanel
- Reactivation of a panel or subpanel that was previously dropped
- Resampling of established plots that were not sampled at the previous visit

2 Remeasurement – remeasurement of a national design plot that was sampled at the previous inventory. The previous microplot was at the offset location (previous FIELD GUIDE version = 1.x or 2.x).

3 Replacement plot - a replacement plot for a previously established plot. Assign SAMPLE KIND = 3 if a plot is re-installed at a location other than the original location (i.e., plots that have been lost, moved, or otherwise replaced). Note that replacement plots require a separate plot file for the replaced plot. Replaced plots are assigned SAMPLE KIND = 2, PLOT STATUS = 3, and the appropriate NONSAMPLED REASON code. The plot number for the new (replacement) plot is assigned by NIMS.

8 Remeasurement – remeasurement of a Southern Research Station **fixed-radius subplot** design and initial establishment of the National design plot [field visited or remotely classified] (remeasurement of the subplot center microplot).

9 Prism plot remeasurement/Initial fixed plot establishment – remeasurement of an established Southern or Southeastern Research Station **prism plot** design and initial establishment of the National design plot [field visited or remotely classified].

1.8 PREVIOUS PLOT NUMBER

1.9 FIELD GUIDE VERSION

Record the version number of the National Core Field Guide that was used to collect the data on this plot. FIELD GUIDE VERSION will be used to match collected data to the proper version of the field guide.

When collected: All plots
Field width: 2 digits (x.y)
Tolerance: No errors
MQO: At least 99% of the time
Values: 3.0

1.10 CURRENT DATE

Record the year, month, and day that the current plot visit was completed as follows:

1.10.1 YEAR

Record the year that the plot was completed.

When collected: All plots
Field width: 4 digits
Tolerance: No errors
MQO: At least 99% of the time
Values: ≥ 2003

1.10.2 MONTH

Record the month that the plot was completed.

When collected: All plots
Field width: 2 digits
Tolerance: No errors
MQO: At least 99% of the time
Values:

January	01	May	05	September	09
February	02	June	06	October	10
March	03	July	07	November	11
April	04	August	08	December	12

1.10.3 DAY

Record the day of the month that the plot was completed.

When collected: All plots
Field width: 2 digits
Tolerance: No errors
MQO: At least 99% of the time
Values: 01 to 31

1.11 DECLINATION (CORE OPTIONAL)

1.12 HORIZONTAL DISTANCE TO IMPROVED ROAD

Record the straight-line distance from plot center (subplot 1) to the nearest improved road. An improved road is a road of any width that is maintained as evidenced by pavement, gravel, grading, ditching, and/or other improvements.

When collected: All plots with at least one accessible forest land condition class (PLOT STATUS = 1)
Field width: 1 digit
Tolerance: No errors
MQO: At least 90% of the time
Values:

1	100 ft or less
2	101 to 300 ft
3	301 to 500 ft
4	501 to 1000 ft
5	1001 ft to 1/2 mile
6	1/2 to 1 mile
7	1 to 3 miles
8	3 to 5 miles
9	Greater than 5 miles

1.13 WATER ON PLOT

Record the water source that has the greatest impact on the area within the accessible forest land portion of any of the four subplots. The coding hierarchy is listed in order from large permanent water to temporary water. This variable can be used for recreation, wildlife, hydrology, and timber availability studies.

When collected: All plots with at least one accessible forest land condition class (PLOT STATUS = 1)
Field width: 1 digit
Tolerance: No errors
MQO: At least 90% of the time
Values:

0 None – no water sources within the accessible forest land CONDITON CLASS
1 Permanent streams or ponds too small to qualify as noncensus water
2 Permanent water in the form of deep swamps, bogs, marshes without standing trees present and less than 1.0 ac in size, or with standing trees
3 Ditch/canal – human-made channels used as a means of moving water, such as irrigation or drainage which are too small to qualify as noncensus water
4 Temporary streams
5 Flood zones – evidence of flooding when bodies of water exceed their natural banks
9 Other temporary water – specify in plot notes

1.14 QA STATUS

Record the code to indicate the type of plot data collected, using the following codes:

When collected: All plots
Field width: 1 digit
Tolerance: No errors
MQO: At least 99% of the time
Values:

1 Standard production plot
2 Cold check (QA reviews collected data while checking plot; may be done with or without standard field crew)
3 Reference plot (off grid – SRS QA certification plot answer key)
4 Training/practice plot (off grid – SRS field crew certification plot)
5 Botched plot file (disregard during data processing)
6 Blind check (QA crew remeasures the plot without reviewing the standard field crew's data; standard field crew is not present)
7 Hot check (production plot; QA members observing standard field crew)

1.15 CREW TYPE

Record the code to specify what type of crew is measuring the plot.

When collected: All plots
Field width: 1 digit
Tolerance: No errors
MQO: At least 99% of the time
Values:

1 Standard field crew
2 QA crew (any QA crew member present collecting data)

1.16 GPS Coordinates

Use a global positioning system (GPS) unit to determine the plot coordinates and elevation of all field-visited plot locations.

1.16.1 GPS Unit Settings, Datum, and COORDINATE SYSTEM

Consult the GPS unit operating manual or other regional instructions to ensure that the GPS unit internal settings, including Datum and Coordinate system, are correctly configured.

Each FIA unit will determine the Datum to be used in that region. Most will use the NAD 27 Datum (also known as NAS-C or NA 27 CONUS/CLK66), but coordinates collected using any appropriate datum can be converted back to a national standard (NAD 83) for reporting purposes.

Each FIA unit will also determine which coordinate system to use. Regions using a Geographic system will collect coordinates in Degrees, Minutes, and Seconds of Latitude and Longitude; the regions using the UTM coordinate system will collect UTM Easting, Northing, and Zone.

1.16.2 Collecting Readings

Collect at least 180 GPS readings at the plot center. These may be collected in a file for post-processing or may be averaged by the GPS unit. Each individual position should have an error of less than 70 feet if possible (the error of all the averaged readings is far less).

Soon after arriving at plot center, use the GPS unit to attempt to collect coordinates. If suitable positions (180 readings at error less than or equal to 70 feet) cannot be obtained, try again before leaving the plot center.

If it is still not possible to get suitable coordinates from plot center, attempt to obtain them from a location within 200 feet of plot center. Obtain the azimuth and horizontal distance from the "offset" location to plot center. If a PLGR unit is used, use the Rng-Calc function in the PLGR to compute the coordinates of the plot center. If another type of GPS unit is used, record the azimuth and horizontal distance as described in Sections 1.15.12 and 1.15.13.
Coordinates may be collected further away than 200 feet from the plot center if a laser measuring device is used to determine the horizontal distance from the "offset" location to plot center. Again, if a PLGR unit is used, use the Rng-Calc function in the PLGR to compute the coordinates of the plot center. If another type of GPS unit is used, record the azimuth and horizontal distance as described in Sections 1.16.12 and 1.16.13.

In all cases try to obtain at least 180 positions before recording the coordinates.

1.16.3 GPS UNIT

Record the kind of GPS unit used to collect coordinates. If suitable coordinates cannot be obtained, record 0.

When collected: All field visited plots when PLOT STATUS = 1 - 4
Field width: 1 digit
Tolerance: No errors
MQO: At least 99% of the time
Values:

0	GPS coordinates not collected
1	Rockwell Precision Lightweight GPS Receiver (PLGR)
2	Other brand capable of field-averaging
3	Other brands capable of producing files that can be post-processed
4	Other brands not capable of field-averaging or post-processing
8	Previously field-collected coordinates accurate; not collected again

1.16.4 GPS SERIAL NUMBER

Record the last six digits of the serial number on the GPS unit used.

When collected: When GPS UNIT not 0 or 8
Field width: 6 digits
Tolerance: No errors
MQO: At least 99% of the time
Values: 000001 to 999999

1.16.5 GPS DATUM

1.16.6 COORDINATE SYSTEM

1.16.7 Latitude

Record the latitude of the plot center to the nearest hundredth second, as determined by GPS. If the coordinates cannot be corrected and an offset point is used, record the latitude at the offset point.

NOTE: The following can be customized at the region level (e.g., decimal minutes to the nearest thousandth) as long as the final results recorded are within the specified tolerance to the nearest hundredth of a second or +/- 1.01 ft.

1.16.7.1 LATITUDE DEGREES

Record the latitude degrees of the plot center (or the offset point) as determined by GPS.

When collected: When GPS UNIT > 0
Field width: 3 digits (1st digit is + or -, last 2 digits are numeric)
Tolerance: No errors
MQO: At least 99% of the time
Values:

1.16.7.2 LATITUDE MINUTES

Record the latitude minutes of the plot center (or the offset point) as determined by GPS.

When collected: When GPS UNIT > 0
Field width: 2 digits
Tolerance: No errors
MQO: At least 99% of the time
Values: 1 – 59

1.16.7.3 LATITUDE SECONDS

Record the latitude decimal seconds of the plot center (or the offset point) to the nearest hundredth place as determined by GPS.

When collected: When GPS UNIT > 0
Field width: 4 digits
Tolerance: +/- 140 ft
MQO: At least 99% of the time
Values: 0.00 - 59.99

1.16.8 Longitude

Record the longitude of the plot center, to the nearest hundredth second, as determined by GPS. If the coordinates cannot be corrected and an offset point is used, record the longitude at the offset point.

NOTE: The following can be customized at the region level (e.g., decimal minutes to the nearest thousandth) as long as the final results recorded are within the specified tolerance to the nearest hundredth of a second or +/- 1.01 ft.

1.16.8.1 LONGITUDE DEGREES

Record the longitude degrees of the plot center (or the offset point) as determined by GPS.

When collected: When GPS UNIT > 0
Field width: 4 digits (1st digit is + or -, last 3 digits are numeric)
Tolerance: No errors
MQO: At least 99% of the time
Values:

1.16.8.2 LONGITUDE MINUTES

Record the longitude minutes of the plot center (or the offset point) as determined by GPS.

When collected: When GPS UNIT > 0
Field width: 2 digits
Tolerance: No errors
MQO: At least 99% of the time
Values: 1 – 59

1.16.8.3 LONGITUDE SECONDS

Record the longitude decimal seconds of the plot center (or the offset point) to the nearest hundredth place as determined by GPS.

When collected: When GPS UNIT > 0
Field width: 4 digits
Tolerance: +/- 140 ft
MQO: At least 99% of the time
Values: 0.00 – 59.99

1.16.9 UTM ZONE

1.16.10 EASTING (X) UTM

1.16.11 NORTHING (Y) UTM

1.16.12 Correction For "Offset" Location

As described in Section 1.14.2, coordinates may be collected at a location other than the plot center (an “offset” location). If a PLGR unit is used all offset coordinates will be "corrected" back using the Rng/Calc function. If a GPS unit other than a PLGR is used, then record items 1.16.13 and 1.16.14.

1.16.13 AZIMUTH TO PLOT CENTER

Record the azimuth from the location where coordinates were collected to actual plot center. If coordinates are collected at plot center, record 000.

When collected: When GPS UNIT = 2, 3 or 4
Field width: 3 digits
Tolerance: +/- 3 degrees
MQO: At least 99% of the time
Values: 000 when coordinates **are** collected at plot center
001 to 360 when coordinates **are not** collected at plot center

1.16.14 DISTANCE TO PLOT CENTER

Record the horizontal distance in feet from the location where coordinates were collected to the actual plot center. If coordinates are collected at plot center, record 000. As described in Section 1.16.2, if a laser range finder is used to determine DISTANCE TO PLOT CENTER, offset locations may be up to 999 feet from the plot center. If a range finder is not used, the offset location must be within 200 feet.

When collected: When GPS UNIT = 2, 3 or 4
Field width: 3 digits
Tolerance: +/- 6 ft
MQO: At least 99% of the time
Values: 000 when coordinates **are** collected at plot center
001 to 200 when a Laser range finder **is not** used to determine distance
001 to 999 when a Laser range finder **is** used to determine distance

1.16.15 GPS ELEVATION

Record the elevation above mean sea level of the plot center, in feet, as determined by GPS. If the coordinates cannot be corrected and an offset point is used, record the elevation at the offset point. If the coordinates are calculated, record 99999 because elevation cannot be calculated.

When collected: When GPS UNIT = 1, 2 , 4 or 8
Field width: 6 digits (1st digit is + or -, last 5 digits are numeric)
Tolerance:
MQO: At least 99% of the time
Values: -00100 to +20000

1.16.16 GPS ERROR

Record the error as shown on the GPS unit to the nearest foot. As described in Section 1.16.2, make every effort to collect readings only when the error less than or equal to 70 feet. However, if after trying several different times during the day, at several different locations, this is not possible, record readings with an error of up to 999 feet.

When collected: When GPS UNIT =1, 2 or 8
Field width: 3 digits
Tolerance: No errors
MQO: At least 99% of the time
Values: 000 to 070 if possible
071 to 999 if an error of less than 70 cannot be obtained

1.16.17 NUMBER OF READINGS

Record a 3-digit code indicating how many readings were averaged by the GPS unit to calculate the plot coordinates. Collect at least 180 readings if possible.

When collected: When GPS UNIT = 1 or 2
Field width: 3 digits
Tolerance: No errors
MQO: At least 99% of the time
Values: 001 to 999

1.16.18 GPS FILENAME (CORE OPTIONAL)

1.17 MACROPLOT BREAKPOINT DIAMETER (CORE OPTIONAL)

1.18 PLOT-LEVEL NOTES

Use these fields to record notes pertaining to the entire plot. If the notes apply only to a specific subplot or other specific aspect of the plot, then make that clear in the notes.

When collected: All plots
Field width: Unlimited alphanumeric character field
Tolerance: N/A
MQO: N/A
Values: English language words, phrases and numbers

1.19 CYCLE

Record the cycle number of the current plot.
When collected: All plots
Field width: 2 digits
Tolerance: No errors
MQO: At least 99% of the time
Values: 01 to 99

1.20 PANEL

Record the panel number of the plot.

When collected: All plots
Field width: 1 digit
Tolerance: No errors
MQO: At least 99% of the time
Values: 1 to 5

1.21 PHASE

Record the phase number of the plot

When collected: All plots
Field width: 1 digit
Tolerance: No errors
MQO: At least 99% of the time
Values:

2	Standard field plot (measured year-round)
3	Standard field plot with forest health variables (measured only during specified time frame)

1.22 PLOT IN CORRECT COUNTY?

Record the code that states if the plot center is in the correct county. This item will automatically default to '1' in the data recorder. If plot center lands in a county other than the county that it is assigned to, then enter code '0'. A screen will appear where the correct county is entered. This information will be automatically forwarded to FIA office staff when the plot is transmitted.

When collected: All plots
Field width: 1 digit
Tolerance: No errors
MQO: At least 99% of the time
Values:

0	Plot center is not in the county the plot is assigned to
1	Plot center is in the county the plot is assigned to

1.23 CORRECT COUNTY

Record the unique FIPS (Federal Information Processing Standard) code identifying the correct county, parish, or borough (or unit in AK) where the plot center is actually located.

When collected: All plots where PLOT IN CORRECT COUNTY = 0
Field width: 3 digits
Tolerance: No errors
MQO: At least 99% of the time
Values: See Appendix 1

1.24 PAST DATE

Record the year, month, and day that the current plot was last inventoried in the same format as CURRENT DATE:

1.24.1 PAST YEAR

Record the year that the plot was last inventoried.

When collected: SAMPLE KIND = 2,8 and 9
Field width: 4 digits
Tolerance: No errors
MQO: At least 99% of the time
Values: $\leq$ 2003

1.24.2 PAST MONTH

Record the month that the plot was last inventoried.

When collected: SAMPLE KIND = 2,8 and 9
Field width: 2 digits
Tolerance: No errors
MQO: At least 99% of the time
Values:

January	01	May	05	September	09
February	02	June	06	October	10
March	03	July	07	November	11
April	04	August	08	December	12

1.24.3 PAST DAY

Record the day of the month that the plot was last inventoried.

When collected: SAMPLE KIND = 2,8 and 9
Field width: 2 digits
Tolerance: No errors
MQO: At least 99% of the time
Values: 01 to 31

1.25 CRUISER NUMBER

Record the unique code assigned to identify individual cruisers.

When collected: All plots
Field width: 3 digits
Tolerance: No errors
MQO: At least 99% of the time
Values: 001-999

1.26 ASSISTANT CRUISER NUMBER(S)

Record the unique code assigned to identify up to two assistants on the plot. If the assistant(s) does not have a cruiser number, record 991 and/or 992.

When collected: All plots
Field width: 3 digits
Tolerance: No errors
MQO: At least 99% of the time
Values: 001-999

1.27 NUMBER OF ACCESSIBLE FOREST LAND CONDITIONS

Record the number of accessible forest land conditions that are sampled on the plot.
When collected: PLOT STATUS = 1
Field width: 1 digit
Tolerance: No errors
MQO: At least 99% of the time
Values: 1-9

1.28 NUMBER OF TREE ENTRIES

Record the total number of entries for the tree and sapling tally. This count includes entries to indicate no tally on a subplot or microplot.

When collected: PLOT STATUS = 1 or 4
Field width: 3 digits
Tolerance: No errors
MQO: At least 99% of the time
Values: 000-999

1.29 NUMBER OF PRISM POINTS REMEASURED

Record the number of prism points remeasured on subplots that were forested at the previous inventory.

When collected: SAMPLE KIND = 9 when previous PLOT STATUS = 1
Field width: 1 digit
Tolerance: no errors
MQO: At least 99% of the time
Values: 1-5

1.30 NUMBER OF SUBPLOT CENTERS REVERTED

Record the number of subplot centers that fall in a naturally reverted condition. Do not include land use changes due to procedural changes or previous cruiser errors.

When collected: SAMPLE KIND = 9, PLOT STATUS = 1 and previous PLOT STATUS = 2.
Field width: 1 digit
Tolerance: no errors
MQO: At least 99% of the time
Values: 0-4

1.31 HORIZONTAL DISTANCE TO URBAN OR BUILT-UP LAND

Record the straight-line distance from plot center (subplot 1) to the nearest evidence of urban or built-up land. Only examine the single photo that includes the plot pin-prick.

Urban or built-up land — Land that is 10 acres or more in size and comprised of areas of intensive human use with much of the land covered by manmade structures and associated clearings. Included are towns, villages, strip-developments along highways, power and communication facilities (excluding rights-of-way), industrial complexes, and institutions.
Urban or built-up land is further defined as any 10-acre area (660 x 660 feet) composed of a mixture of land uses where urban or built-up land uses comprise more than 50 percent of the land area. Included are residential or commercial strips. Residential or commercial strips are at least 100 feet wide and 10 acres in size (4400 x 100, 2200 x 200, 1500 x 300, 1100 x 400, 900 x 500, etc.) with uniform spacing of structures, often with lawns, driveways, and parking lots.
Active surface mines, active sand and gravel pits, and other areas TEMPORARILY devoid of vegetation due to man's activities are NOT considered urban or built-up land. Similarly, naturally formed talus slopes and rock outcrops, mine tailings and soil pushed aside from surface mine operations, and bare soil associated with crop tillage are not urban or built-up land. Buildings, permanent product storage bins, and equipment parking areas are considered urban or built-up land.

The presence or absence of a store in a strip development has no bearing on this classification. Where a strip development consists of a mixture of farmsteads and residences, or farmsteads or other urban or built-up land, then consider farmsteads as built-up land. (Farmstead—a tract of land, usually with a house, barn, etc., on which crops or livestock are raised.) A farmstead is otherwise considered agricultural land.

When collected: PLOT STATUS = 1
Field width: 1 digit
Tolerance: no errors
MQO: At least 90% of the time
Values:

1	100 ft or less
2	101 to 300 ft
3	301 to 500 ft
4	501 to 1000 ft
5	1001 ft to 1/2 mile
6	1/2 to 1 mile
7	1 to 3 miles
8	3 to 5 miles
9	Greater than 5 miles

1.32 HORIZONTAL DISTANCE TO AGRICULTURAL LAND

Record the straight-line distance from the plot center (subplot 1) to the nearest evidence of agricultural land. Only examine the single photo that includes the plot pin-prick.

Agricultural Land — Land that is 10 acres or more in size and used primarily for the production of crops or livestock. Evidence includes geometric field and road patterns and the traces produced by livestock or mechanized equipment. Included are cropland, idle farmland, improved pasture, and other farmland (e.g., confined feeding areas, horse farms, farmsteads, nurseries, orchards, and vineyards).

When collected: PLOT STATUS = 1
Field width: 1 digit
Tolerance: no errors
MQO: At least 90% of the time
Values:

1	100 ft or less
2	101 to 300 ft
3	301 to 500 ft
4	501 to 1000 ft
5	1001 ft to 1/2 mile
6	1/2 to 1 mile
7	1 to 3 miles
8	3 to 5 miles
9	Greater than 5 miles

1.33 PLOT ACCESSIBILITY

Record the code to describe the accessibility of the plot. The code that is most significant for the plot should be selected. For example, if the plot is located in permanent water and is accessed by boat, the most appropriate code would be “4 – Plot is accessed by boat”.
When collected: All plots
Field width: 1 digit
Tolerance: no errors
MQO: At least 90% of the time
Values:

0	Typical plot for the area
1	Plot suitable for a one-person crew
2	Plot affected by seasonal high water
3	Plot affected by permanent water (beaver pond, tidal swamp, etc.)
4	Plot is accessed by boat
5	Plot access requires long hike
6	Plot has significant permanent thick brush (rhododendron, bay, pocosin, etc.)
7	Plot has significant temporary thick brush (e.g., clearcut)
8	Plot has significant deadfall/windthrow
9	Other (describe in plot notes)

2.0 CONDITION CLASS

The Forest Inventory and Analysis (FIA) plot is cluster of four subplots in a fixed pattern. Subplots are never reconfigured or moved in order to confine them to a single condition class; a plot may straddle more than one condition class. Every plot samples at least one condition class: the condition class present at plot center (the center of subplot 1).

2.1 DETERMINATION OF CONDITION CLASS

2.1.1 Step 1: Delineate the plot area by CONDITION CLASS STATUS

The first attribute considered when defining a condition class is CONDITION CLASS STATUS. The area sampled by a plot is assigned to condition classes based upon the following differences in CONDITION CLASS STATUS:

1. Accessible forest land
2. Nonforest land
3. Noncensus water
4. Census water
5. Nonsampled

Accessible forest land defines the population of interest for FIA purposes. This is the area where most of the data collection is conducted. Only delineate between conditions 2 – 5 above on subplots that have at least one accessible forest land condition (SUBPLOT STATUS = 1). Do not delineate between nonforest conditions 2 – 5 above on completely nonforest subplots (SUBPLOT STATUS = 2 or 3).

2.1.2 Step 2: Further subdivide Accessible Forest Land by 6 delineation variables

Any condition class sampled as accessible forest land may be further subdivided, in order of listed priority, into smaller condition classes if distinct, contrasting condition classes are present because of variation in any of the following attributes within the sampled area:

1. RESERVED STATUS
2. OWNER GROUP
3. FOREST TYPE
4. STAND SIZE CLASS
5. REGENERATION STATUS
6. TREE DENSITY

No other attribute shall be the basis for recognizing contrasting accessible forest land condition classes. For each condition class recognized, several “ancillary attributes” that help describe the condition will be collected, but will not be used for delineation purposes (see Sections 2.5.7 to 2.5.23).

2.2 CONDITION CLASS STATUS DEFINITIONS

1. Accessible Forest Land
Land that is within the population of interest, is accessible, is on a subplot that can be occupied at subplot center, can safely be visited, and meets at least one of the two following criteria:

(a) the condition is at least 10-percent stocked by trees (Appendix 3) of any size or has been at least 10-percent stocked in the past. Additionally, the condition is not subject to nonforest use(s) that prevent normal tree regeneration and succession such as regular mowing, intensive grazing, or recreation activities, or managed grazing where direct human intervention is actively suppressing regeneration.

(b) in several western woodland species (Appendix 3) where stocking cannot be determined, and the condition has at least 5 percent crown cover by trees of any size, or has had at least 5 percent cover in the past. Additionally, the condition is not subject to nonforest use that

prevents normal regeneration and succession such as regular mowing, chaining, or recreation activities.

To qualify as forest land, the prospective condition must be at least 1.0 acre in size and 120.0 feet wide measured stem-to-stem from the outer-most edge. Forested strips must be 120.0 feet wide for a continuous length of at least 363.0 feet in order to meet the acre threshold. Forested strips that do not meet these requirements are classified as part of the adjacent nonforest land.

Transition zones and forest/nonforest encroachment – When an accessible forest land condition encroaches into a nonforest condition, the border between forest and nonforest is often a gradual change in tree cover or stocking with no clear and abrupt boundary. In addition, it may be difficult to determine exactly where the forested area meets the minimum stocking criteria and where it does not. For these cases, determine where the land clearly meets the 10 percent minimum forest land stocking, and where it clearly is less than required stocking; divide the zone between these points in half, and determine the side of the zone on which the subplot center is located. Classify the condition class of the subplot based on this line (Figure 2).

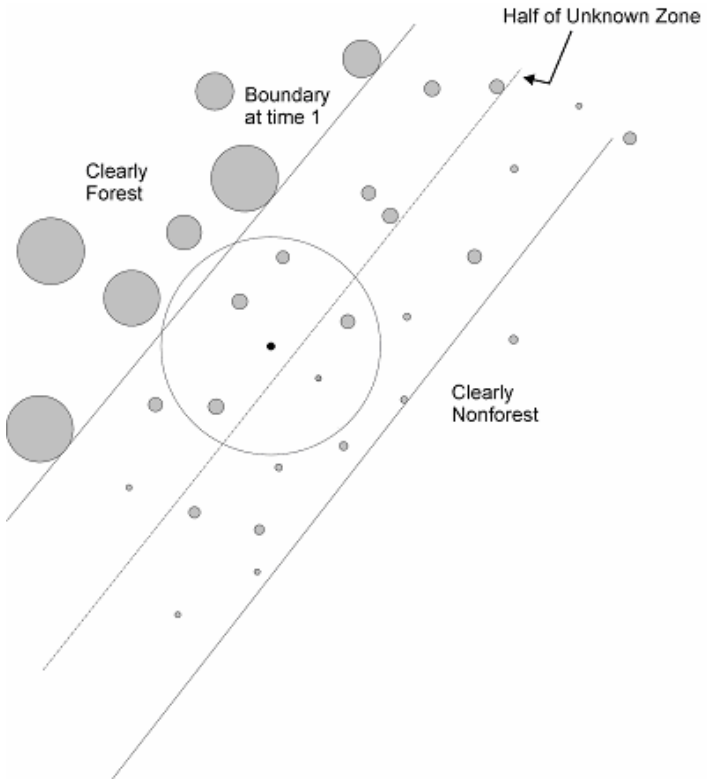


Figure 2. Example of classifying the condition class of the subplot in a transition zone with forest/nonforest encroachment.

For example, at measurement time 1, a clear and distinct boundary existed between the forest and nonforest condition classes. At time 2, however, there now exists a zone of regeneration or small diameter trees between the previous forest condition and where the nonforest clearly remains. If the zone of encroachment is clearly stocked where it meets the nonforest, classify the entire zone as forest. If the zone is clearly nonforest up to the original stand, call it all nonforest. If the encroachment or transition zone is not clearly stocked where it meets the nonforest, determine where it is clearly stocked (forest) and where it is clearly not stocked (nonforest); divide this zone in half, and classify the entire subplot based on which side of the line the subplot center falls.

Treated strips – Occasionally, crews will come across plantations of trees, in which rows of trees alternate with strips of vegetation that have been bulldozed, mowed, tilled, treated with herbicide, or crushed. Because these strip treatments are conducted to optimize growth or to release the stand, the areas are considered forest land, and the treatment is considered a

timber stand improvement operation. Do not confuse these practices with similar treatments on nonforest lands such as yards or rights-of-way. Contact with the landowner may help determine the intent of a treatment.

Indistinct boundary due to the condition minimum-width definition – Do not subdivide subplots where a condition class may change due only to the forest vs. nonforest minimum width (120.0 feet) definition. Although the point where the definition changes from forest to nonforest creates an invisible "line" between conditions, **this definitional boundary is not distinct and obvious**. See Figures 3 and 4. Where the point of the definition change occurs on the subplot, determine only if the subplot center is on the forest or nonforest side of that approximate boundary, and classify the entire subplot based on the condition of the subplot center. If the boundary crosses through the center of the subplot, classify the subplot as the condition it most resembles. If the boundary occurs between subplots, classify each subplot based on its relation to the definitional boundary.

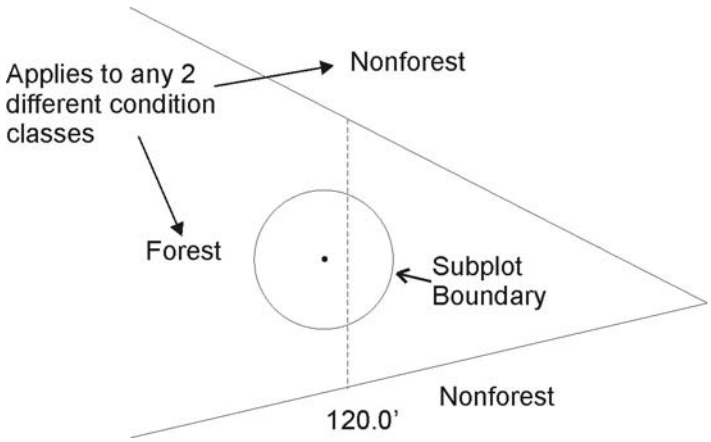


Figure 3. Forest condition narrows within a nonforest condition. Examine the location of the subplot center in reference to the approximate line where the forest narrows to 120.0 ft wide. In this example, the entire subplot is classified as forest.

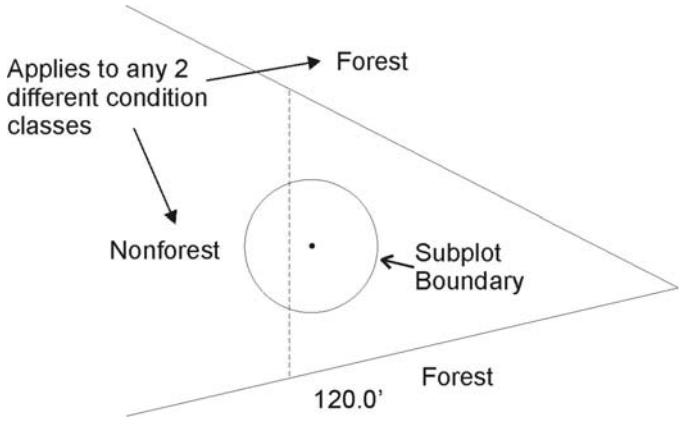


Figure 4. Nonforest condition narrows within a forest condition. Examine the location of the subplot center in reference to the approximate line where the nonforest narrows to 120.0 ft wide. In this example, the entire subplot is classified as forest.

2. Nonforest Land
Nonforest land is any land within the sample that does not meet the definition of accessible forest land or any of the CONDITION CLASS STATUS values defined in #'s 3, 4 and 5 in Section 2.2. To qualify, the area must be at least 1.0 acre in size and 120.0 feet wide; five exceptions are discussed at the beginning of Section 2.4. Do not consider evidence of "possible" or future development or conversion. A nonforest land condition will remain in the sample and will be examined at the next plot visit to see if it has become forest land.

3. Noncensus Water
Lakes, reservoirs, ponds, and similar bodies of water 1.0 acre to 4.5 acres in size. Rivers, streams, canals, etc., 30.0 feet to 200 feet wide.

4. Census Water
Lakes, reservoirs, ponds, and similar bodies of water 4.5 acres in size and larger; and rivers, streams, canals, etc., more than 200 feet wide (1990 U.S. Census definition).

5. Nonsampled
See section 2.4.3 CONDITION NONSAMPLED REASON for descriptions of land that qualifies as nonsampled.

2.3 CONDITION CLASS ATTRIBUTES

A CONDITION CLASS NUMBER and a classification for CONDITION CLASS STATUS are required for every condition class sampled on a plot. For each condition class classified as accessible forest land, a classification is required for each of the following attributes:

2.5.1	RESERVED STATUS	Attributes where a change causes a separate condition class
2.5.2	OWNER GROUP	
2.5.3	FOREST TYPE	
2.5.4	STAND SIZE CLASS	
2.5.5	REGENERATION STATUS	
2.5.6	TREE DENSITY	
2.5.7	OWNER CLASS	Ancillary - changes do not delineate a new condition class
2.5.8	PRIVATE OWNER INDUSTRIAL STATUS	
2.5.9	ARTIFICIAL REGENERATION SPECIES	
2.5.10	STAND AGE	
2.5.11	DISTURBANCE (up to 3 coded)	
2.5.12	DISTURBANCE YEAR (1 per disturbance)	
2.5.17	TREATMENT (up to 3 coded)	
2.5.18	TREATMENT YEAR (1 per treatment)	
2.5.23	PHYSIOGRAPHIC CLASS	
2.5.24	PRESENT LAND USE	SRS Regional Items
2.5.25	TRACT SIZE (TOTAL ACRES)	
2.5.26	TRACT SIZE (PERCENT FOREST)	
2.5.27	STAND STRUCTURE	
2.5.28	OPERABILITY	
2.5.29	SITE CLASS	
2.5.30	FIRE	
2.5.31	GRAZING	

When classifying CONDITION CLASS STATUS, OWNER GROUP, RESERVED STATUS, and PRESENT NONFOREST LAND USE, base the classification on what is present within the area defined by the fixed radius plot (macroplot, subplot, or microplot). When classifying all other condition class variables, base the classification on the macroplot.

2.4 DELINEATING CONDITION CLASSES DIFFERING IN CONDITION CLASS STATUS:

The first step in delineating condition classes is to recognize differences in CONDITION CLASS STATUS. The most common difference is adjacent accessible forest land and nonforest land. Adjacent accessible forest land and nonforest land condition classes are recognized only if each of the two prospective condition classes is at least 1.0 acre in size, and each is at least 120.0 feet in width. These size and width minimums apply to both accessible forest land and nonforest land.

Within an accessible forest land condition class, unimproved roads, rock outcrops, and natural nonforest openings less than 1.0 acre in size and less than 120.0 feet in width are considered forest land and are not delineated and classified as a separate nonforest condition class.

Within a nonforest land condition class, forested areas or linear strips of trees less than 1.0 acre in size and less than 120.0 feet in width are considered part of the nonforest condition class.

Five exceptions to these size and width requirements apply:

1. Developed nonforest condition: human-caused nonforest land condition classes such as homes or cabins that are less than 1.0 acre in size and 120.0 feet in width and are surrounded by forest land. There are three kinds of developed nonforest conditions that do not have to meet area or width requirements (Figures 5 and 6).

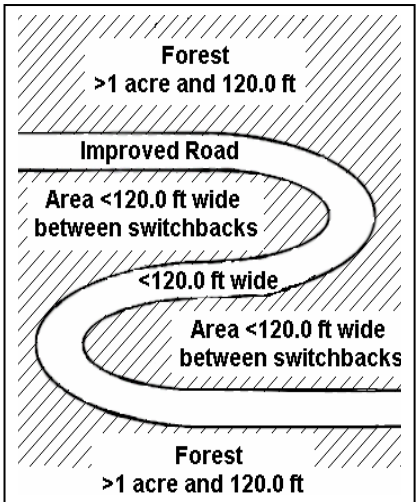


Figure 5. Example of a switchback road.

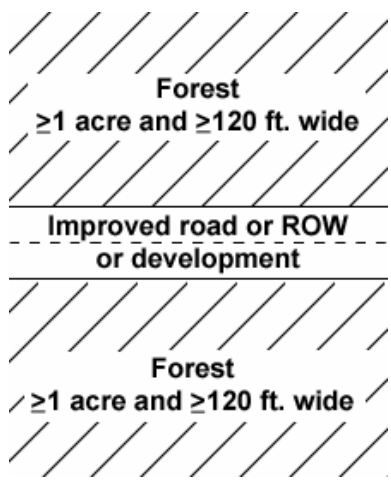


Figure 6. Example of nonforest and forest strips.

a) Improved roads: paved roads, gravel roads, or improved dirt roads regularly maintained for long-term continuing use. Unimproved traces and roads created for skidding logs are not considered improved roads.

b) Maintained rights-of-way: corridors created for railroads, power lines, gas lines, and canals that are periodically treated to limit the establishment and growth of trees and shrubs.

c) Developments: structures and the maintained area next to a structure, all less than 1.0 acre in size and surrounded by forest land. Examples of developments are houses or trailers on very small lots, communication installations in a small cleared area within forest land, and barns and sheds.

2. Distinct, alternating strips of forest and nonforest land: this situation occurs when a plot or subplot samples a condition class that is less than 1.0 acre in size and less than 120.0 feet in width. The condition class is one of a series of parallel strips of forest and nonforest land in which none of the strips meet the minimum width requirement. **This exception applies only to nonforest conditions that are not listed under #1, e.g., improved roads, maintained rights-of-way, and developments.**

For many small intermingled strips, determine the total area that the alternating strips occupy, and classify according to the CONDITION CLASS STATUS (forest land or nonforest land) that occupies the greater area. If the area of alternating strips is so large or indistinct as to make a total area determination impractical, then classify the sample as forest land.

For two alternating strips of forest and nonforest between two qualifying areas of nonforest land and forest land, see Figure 7. Figure 7 delineates the boundary between the forest and nonforest condition classes for four different examples. The plot center defines the plot condition for all strips covered by the arrow. Any subplot that falls in the alternating strips uses the rule. Any subplot that falls in assigned nonforest / forest is assigned that type.

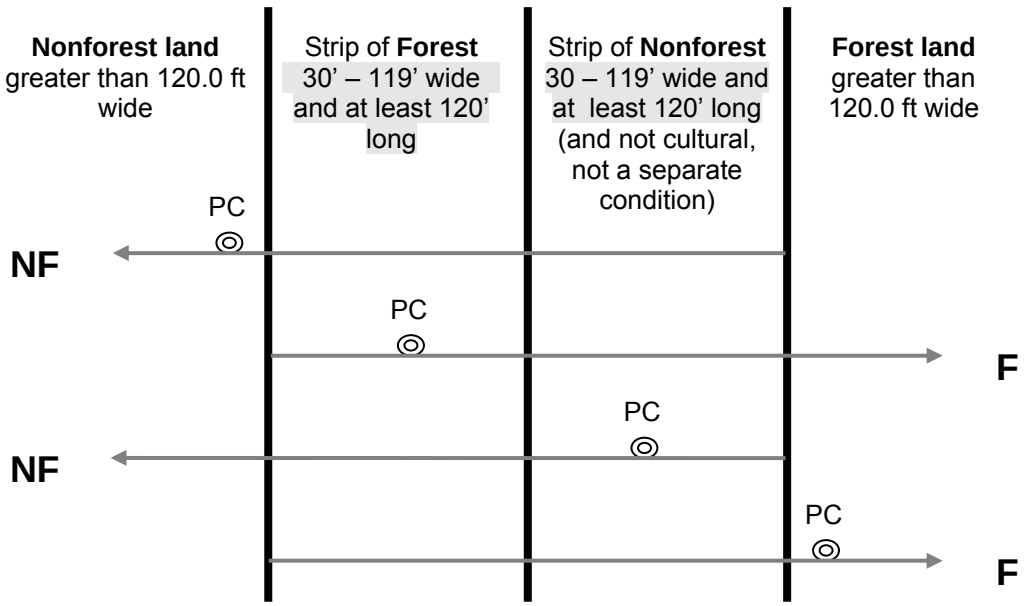


Figure 7. Example of alternating strips of forested and nonforested conditions. PC is the plot center (center of subplot 1).

3. The 120.0-foot minimum width for delineation does not apply when a corner angle is 90 degrees or greater (Figure 8).

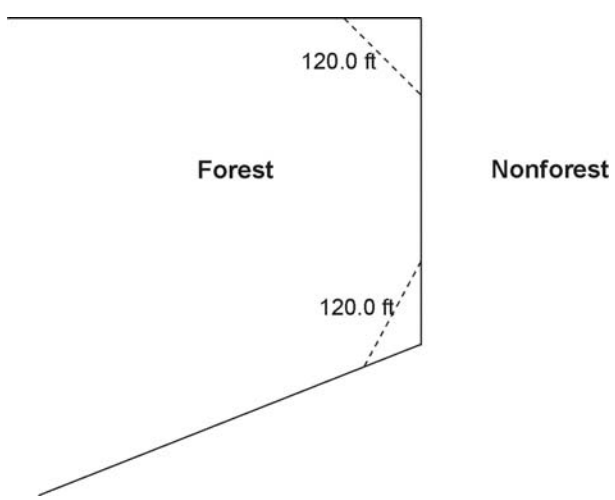


Figure 8. Illustration of the 90 degree corner rule. The dotted lines do not create nonforest conditions.

4. Linear water features: natural water features that are linear in shape such as streams and rivers. A linear water feature must meet the definition for Census or noncensus water to be nonforest area. Therefore, a linear water feature must be at least 30.0 feet wide and cover at least 1.0 acre. The width of a linear water feature is measured across its channel between points on either side up to which water prevents the establishment and survival of trees. To determine whether a linear water feature qualifies as nonforest, rely on all available information on hand such as aerial photos, topographic maps, past survey land calls, and ocular estimates at the current survey visit. Linear water features that do not meet the definition for Census or noncensus water should be classified as forest land only if bounded by forest land on both shores. Crews are NOT expected to measure the length of a linear water feature to determine if it meets the 1.0 acre requirement; use professional judgment and common sense on any linear water feature.

5. Nonsampled conditions within accessible forest land are delineated, regardless of size, as a separate condition.

2.4.1 CONDITION CLASS NUMBER

On a plot, assign and record a number for each condition class. The condition class at plot center (the center of subplot 1) is designated condition class 1. Other condition classes are assigned numbers sequentially at the time each condition class is delineated.

When collected: All condition classes
Field width: 1 digit
Tolerance: No errors
MQO: At least 99% of the time
Values: 1 to 9

2.4.2 CONDITION CLASS STATUS

Record the code that describes the sampling status of the condition class. The instructions in Sections 2.3 and 2.4 apply when delineating condition classes that differ by CONDITION CLASS STATUS.

When collected: All condition classes
Field width: 1 digit
Tolerance: No errors
MQO: At least 99% of the time
Values:

1 Accessible forest land
2 Nonforest land
3 Noncensus water
4 Census water
5 Nonsampled

2.4.3 CONDITION NONSAMPLED REASON

For portions of plots that cannot be sampled (CONDITION CLASS STATUS = 5), record one of the following reasons.

When collected: When CONDITION CLASS STATUS = 5
Field width: 2 digits
Tolerance: No errors
MQO: At least 99% of the time
Values: see next page

Nonsampled reason values:

01 Outside U.S. boundary – Assign this code to condition classes beyond the U.S. border.

02 Denied access area – Any area within the sampled area of a plot to which access is denied by the legal owner, or to which an owner of the only reasonable route to the plot denies access. There are no minimum area or width requirements for a condition class delineated by denied access. Because a denied-access condition can become accessible in the future, it remains in the sample and is re-examined at the next occasion to determine if access is available. In some regions denied access plots may be replaced; check with the field supervisor regarding regional protocols for plot replacement.

03 Hazardous situation – Any area within the sampled area on plot that cannot be accessed because of a hazard or danger, for example cliffs, quarries, strip mines, illegal substance plantations, temporary high water, etc. Although the hazard is not likely to change over time, a hazardous condition remains in the sample and is re-examined at the next occasion to determine if the hazard is still present. There are no minimum size or width requirements for a condition class delineated by a hazardous condition. In some regions hazardous plots may be replaced; check with the field supervisor regarding regional protocols for plot replacement.

10 Other – This code is used whenever a plot or condition class is not sampled due to a reason other than one of the specific reasons listed. A field note is required to describe the situation.

11 Out of state boundary (OFFICE USE ONLY – valid only when PLOT NONSAMPLED REASON = 11)

2.5 DELINEATING CONDITION CLASSES WITHIN ACCESSIBLE FOREST LAND:

Accessible forest land is subdivided into condition classes that are based on differences in RESERVED STATUS, OWNER GROUP, FOREST TYPE, STAND SIZE CLASS, REGENERATION STATUS, and TREE DENSITY. Section 2.1 applies when delineating contrasting forest condition classes. Specific criteria apply for each of the six attributes and are documented by attribute in 2.5.1 to 2.5.6. “Stands” are defined by plurality of stocking for all live trees that are not overtopped.

Additionally, each separate forest condition class recognized within accessible forest land must be at least 1.0 acre in size and at least 120.0 feet in width. If prospective contrasting forest land condition classes do not each meet these minimum size and width requirements, the most similar prospective conditions should be combined until these minimums are attained.

No other attribute shall be the basis for recognizing contrasting condition classes within accessible forest land. For each condition class recognized, many “ancillary attributes” that help describe the condition will be collected, but will not be used for delineation purposes (see Sections 2.5.7 to 2.5.23).

General instructions for delineating condition classes within accessible forest lands:

1. Distinct boundary within an macroplot (if applicable), subplot, or microplot – Separate condition classes ARE recognized if, within a subplot, two (or more) distinctly different condition classes are present and delineated by a distinct, abrupt boundary. The boundary is referenced; see Section 4.0.

2. Indistinct boundary within a subplot – Separate condition classes are NOT recognized if the prospective condition classes abut along an indistinct transition zone, rather than on an abrupt, obvious boundary. Only one condition is recognized, and the subplot is classified entirely as the condition it most resembles.

   Example: The four subplots all sample only accessible forest land. Subplots 1, 3, and 4 sample what is clearly a stand of large diameter trees. Subplot 2 falls in the

middle of a stand size transition zone. In the zone, the large diameter stand phases into a sapling stand.

Subplot 2 must not be divided into two condition classes on the basis of stand size. Instead, it is treated entirely as part of the large diameter condition class or is assigned entirely to a new condition class that is classified as a seedling-sapling stand. The latter occurs only if the crew thinks the entire subplot is more like a stand of seedlings-saplings than a stand of large diameter trees; then the boundary between the large and small diameter stands is assumed to occur between and not on the subplots.

3. A boundary or transition zone between fixed radii plots that sample distinctly different condition classes – Separate condition classes are recognized and recorded when a valid attribute obviously differs between two fixed radius plots, but a distinct boundary or indistinct transition zone exists outside the sampled (fixed-radius) area of the subplots. In such cases, a boundary, if present, is not referenced.

   Example: The northernmost subplot (2) samples entirely accessible forest land. The other three subplots, 1, 3, and 4, fall clearly in a nonforest meadow. Between subplot 1 and 2 is a transition zone; the number of trees present goes from none to what clearly represents at least 10-percent tree stocking. Two condition classes are sampled: accessible forest land sampled on subplot 2, and nonforest land sampled on the other subplots.

4. Riparian forest area – A riparian forest area is defined as a forest area between 30.0 and 120.0 feet wide, and 1.0 acre or more in size, cumulative, and adjacent to but not necessarily present on both sides of a naturally occurring or artificially created body of water or watercourse with continuous or intermittent flow. Riparian forest areas may be associated with but not limited to streams, rivers, lakes, sloughs, seeps, springs, marsh, bogs, beaver ponds, sink holes, cypress domes and ponds, man-made ditches and canals. A riparian forest area must be associated "within forest" and contain at least one distinct and obvious change in a condition class delineation attribute from its adjacent accessible forest land condition class. Figures 9-14 provide examples of when to delineate riparian forest area as a separate condition class.

   Note: When the width of forest adjacent to a stream is between 120.0 feet and 150.0 feet and the width of the riparian forest is at least 30.0 feet wide, the rules for identifying the non-riparian forest (at least 30.0 feet but less than 120.0 feet) need to be modified. The non-riparian forest can be between 30.0 feet and 120.0 feet and mapped as a separate condition as long as it meets the criteria for delineating a separate condition class, otherwise it will be an inclusion in the riparian forest condition class.

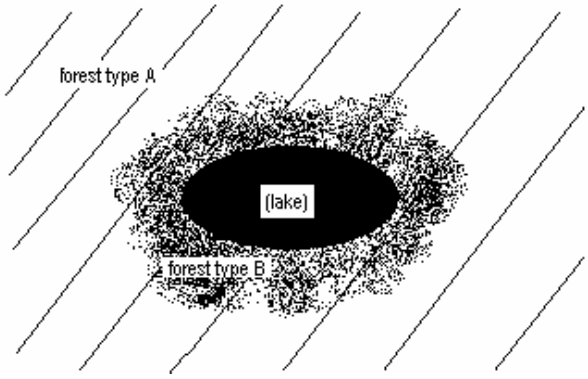


Figure 9. Forest type B is a separate condition class (riparian) if the band of it is between 30.0 feet and 120.0 feet wide, and is ≥ 1.0 acre in size.

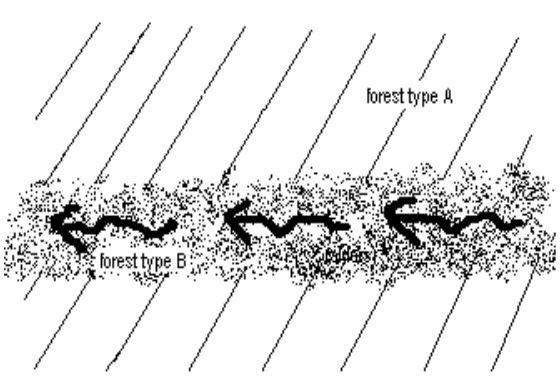


Figure 10. Forest type B is a separate condition class (riparian) if the band of it is between 30.0 feet and 120.0 feet wide, and is ≥ 1.0 acre in size.

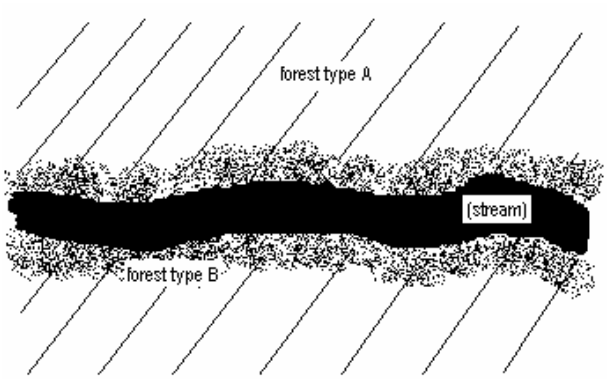


Figure 11. If the stream is < 30.0 feet wide, forest type B is a separate condition class (riparian) if the sum of the two widths of the bands falls between 30.0 feet and 120.0 feet wide, and is ≥ 1.0 acre in size.

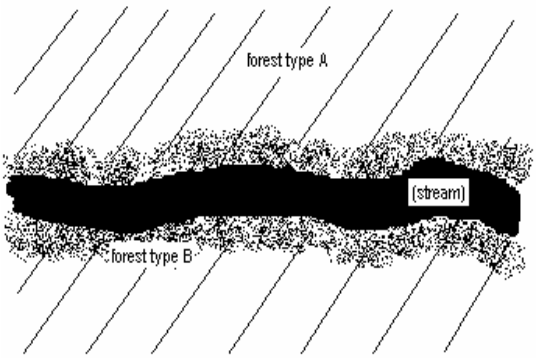


Figure 12. If the stream is > 30.0 feet wide, forest type B is a separate condition class (riparian) if either of the two widths of the bands falls between 30.0 feet and 120.0 feet wide and is ≥ 1.0 acre in size.

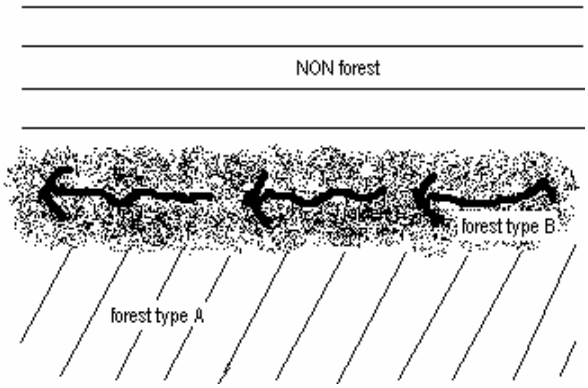


Figure 13. Forest type B is a separate condition class (riparian) if the band of it is between 30.0 feet and 120.0 feet wide, and is ≥ 1.0 acre in size.

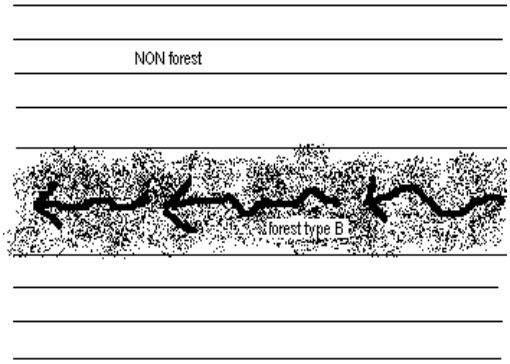


Figure 14. In a non-forested area, a band of forest type B that is < 120.0 feet wide is NOT considered a riparian area. It is not a separate condition class at all.

2.5.1 RESERVED STATUS

Record the code that identifies the reserved designation for the condition. Reserved land is withdrawn by law(s) prohibiting the management of land for the production of wood products (not merely controlling or prohibiting wood-harvesting methods). Such authority is vested in a public agency or department, and supersedes rights of ownership. The prohibition against management for wood products cannot be changed through decision of the land manager (management agency) or through a change in land management personnel, but rather is permanent in nature.

When collected: CORE: All accessible forestland condition classes (CONDITION CLASS STATUS = 1)
Field width: 1 digit
Tolerance: No errors
MQO: At least 99% of the time
Values:

0 Not reserved
1 Reserved

2.5.2 OWNER GROUP

Record the OWNER GROUP code identifying the ownership (or the managing Agency for public lands) of the land in the condition class. Conditions will be delineated based on changes in OWNER GROUP only; separate conditions due to changes in OWNER GROUP are recognized only where differences can be clearly identified on the ground when visiting the plot.

When collected: CORE: All accessible forest land condition classes (CONDITION CLASS STATUS = 1)
Field width: 2 digits
Tolerance: No errors
MQO: At least 99% of the time
Values:

10	Forest Service
20	Other Federal
30	State and Local Government
40	Private

2.5.3 FOREST TYPE

Record the code corresponding to the FOREST TYPE (from Appendix 2) that best describes the species with the plurality of stocking for all live trees in the condition class that are not overtopped.

If STAND SIZE CLASS is nonstocked, then FOREST TYPE is determined by the following hierarchy:

- For SAMPLE KIND = 2 plots, record the FOREST TYPE of the condition at the previous inventory.
- For all other plots:
  1. Evaluate any seedlings available to determine the FOREST TYPE.
  2. If no seedlings exist, use adjacent stands and your best professional judgment to determine FOREST TYPE.

When collected: All accessible forest land condition classes (CONDITION CLASS STATUS = 1)
Field width: 3 digits
Tolerance: No errors in group or type
MQO: At least 99% of the time in group; at least 95% of the time in type. No MQO when STAND SIZE CLASS = 0.
Values: See Appendix 2

The instructions in Sections 2.1 and 2.4 apply when delineating, within accessible forest land, contrasting conditions based on differences in FOREST TYPE.

2.5.4 STAND SIZE CLASS

Record the code that best describes the predominant size class of all live trees in the condition class.

When collected: All accessible forest land condition classes (CONDITION CLASS STATUS = 1)
Field width: 1 digit
Tolerance: No errors
MQO: At least 99% of the time
Values: See next page

Stand size values:

0 Nonstocked
Meeting the definition of accessible forest land, and one of the following applies:

(a) less than 10 percent stocked by trees of any size, or
(b) for several western woodland species where stocking standards are not available, less than 5 percent **crown cover** of trees of any size.

1 ≤ 4.9 inches (seedlings / saplings)
At least 10 percent stocking (or 5 percent crown cover if stocking standards are not available) in trees of any size; and at least 2/3 of the crown cover is in trees less than 5.0 inches DBH/DRC.

2 5.0 – 8.9 inches (softwoods) / 5.0 – 10.9 inches (hardwoods)
At least 10 percent stocking (or 5 percent crown cover if stocking standards are not available) in trees of any size; and at least 1/3 of the crown cover is in trees greater than 5.0 inches DBH/DRC **and** the plurality of the crown cover is in softwoods between 5.0 – 8.9 inches diameter and/or hardwoods between 5.0 – 10.9 inches DBH, and/or western woodland trees 5.0 – 8.9 inches DRC.

3 9.0 – 19.9 inches (softwoods) / 11.0 – 19.9 inches (hardwoods)
At least 10 percent stocking (or 5 percent crown cover if stocking standards are not available) in trees of any size; and at least 1/3 of the crown cover is in trees greater than 5.0 inches DBH/DRC **and** the plurality of the crown cover is in softwoods between 9.0 – 19.9 inches diameter and/or hardwoods between 11.0 – 19.9 inches DBH, and for western woodland trees 9.0 – 19.9 inches DRC.

4 20.0 – 39.9 inches
At least 10 percent stocking (or 5 percent crown cover if stocking standards are not available) in trees of any size; and at least 1/3 of the crown cover is in trees greater than 5.0 inches DBH/DRC **and** the plurality of the crown cover is in trees between 20.0 – 39.9 inches DBH.

5 40.0 + inches
At least 10 percent stocking (or 5 percent crown cover if stocking standards are not available) in trees of any size; and at least 1/3 of the crown cover is in trees greater than 5.0 inches DBH/DRC **and** the plurality of the crown cover is in trees ≥ 40.0 inches DBH.

6 Cover trees (trees not on species list, used for plots classified as nonforest)
Less than 10 percent stocking by trees of any size, and greater than 5 percent **crown cover** of species that comprise cover trees.

The instructions in Sections 2.1 and 2.4 apply when delineating, on accessible forest land, contrasting conditions based on differences in STAND SIZE CLASS.

Within the sampled area on microplot, subplot, or macroplot, recognize only very obvious contrasting stands of different mean diameter with an abrupt boundary. Example: an obvious abrupt boundary exists within the sampled (fixed-radius) area of a subplot and demarcates a STAND SIZE CLASS change. Use tree stocking of all live trees that are not overtopped to differentiate between stand-size classes; for most western woodland forest types (e.g., pinyon, juniper, gambel oak) where stocking standards are not readily available, use percent tree cover to represent stocking.

Use crown cover as the surrogate for stocking to determine STAND SIZE CLASS. View the plot from the top down and examine crown cover. The stand must have at least 5 percent of the crown cover in STAND SIZE CLASSES of 1, 2, 3, 4, or 5 or any combination of these STAND SIZE CLASSES; otherwise the STAND SIZE CLASS is 0. If 2/3 of the crown cover is STAND SIZE CLASS = 1, classify the condition as STAND SIZE CLASS = 1. If less than 2/3 of the crown cover is STAND SIZE CLASS = 1, classify the condition as STAND SIZE CLASS = 2, 3, 4, or 5, based on which of these STAND SIZE CLASSES has the most crown cover.

2.5.5 REGENERATION STATUS

Record the code that best describes the artificial regeneration that occurred in the condition.

When collected: All accessible forest land condition classes (CONDITION CLASS STATUS = 1)
Field width: 1 digit
Tolerance: No errors
MQO: At least 99% of the time
Values:

0	Natural – present stand shows no clear evidence of artificial regeneration. Includes unplanted, recently cut lands
1	Artificial – present stand shows clear evidence of artificial regeneration

The instructions in section 2.1 and 2.4 apply when delineating, within accessible forest land, contrasting conditions based on differences in REGENERATION STATUS.

For a forest land condition to be delineated and/or classified as artificially regenerated, the condition must show distinct evidence of planting or seeding. If it is difficult to determine whether or not a stand has been planted or seeded, then use code 0. If no distinct boundary exists within the sampled (fixed-radius) area on any subplot, then do not recognize separate conditions. In many regions of the West, trees are not planted in rows, and planted stands do not differ in physical appearance from natural conditions. In these cases, there is no need to differentiate conditions based on stand origin.

NOTE: Plot records or verbal evidence from landowner is acceptable for determining regeneration status.

2.5.6 TREE DENSITY

Record a code to indicate the relative tree density classification. Base the classification on the number of stems/unit area, basal area, tree cover, or stocking of all live trees in the condition that are not overtopped, compared to any previously defined condition class TREE DENSITY.

The instructions in Sections 2.1 and 2.4 apply when delineating, within accessible forest land, contrasting conditions based on differences in TREE DENSITY.
Codes 2 and higher are used ONLY when all other attributes used to delineate separate condition classes are homogenous, i.e., when a change in density is the ONLY difference within what would otherwise be treated as only one forest condition. Otherwise, code 1 for all condition classes. Codes 2 and higher are usually, but not always, used to demarcate areas that differ from an adjacent area due to forest disturbance, e.g., a partial harvest or heavy, but not total tree mortality due to a ground fire. Delineation by density should only be done when the less-dense condition is 50 percent or less as dense as the more dense condition.

Do not distinguish between low-stocked stands or stands of sparse and patchy forest.

When collected: All accessible forest land condition classes (CONDITION CLASS STATUS = 1)
Field width: 1 digit
Tolerance: No errors
MQO: At least 99% of the time
Values:

1	Initial density class
2	Density class 2 - density different than 1
3	Density class 3 - density different than 1 and 2

In order to qualify as a separate condition based on density, there MUST be a distinct, easily observed change in the density of an area's tree cover or basal area.

Examples of valid contrasting conditions defined by differences in tree density are:

- the eastern half of an otherwise homogeneous, 20-acre stand has many trees killed by a bark beetle outbreak,

- one portion of a stand is partially cut over (with 40 square feet basal area per acre) while the other portion is undisturbed (with 100 square feet basal area per acre).

NOTE: In these examples, RESERVED STATUS, OWNER GROUP, FOREST TYPE, STAND SIZE CLASS, and REGENERATION STATUS are the same.

ANCILLARY (NON-DELINEATING) VARIABLES

2.5.7 OWNER CLASS

Record the OWNER CLASS code that best corresponds to the ownership (or the managing Agency for public lands) of the land in the condition class. Conditions will **NOT** be delineated based on changes in owner class. If multiple owner classes within a group occur on a single condition class, record the owner class closest to the plot center.

When collected: CORE: All accessible forest land condition classes (CONDITION CLASS STATUS = 1)
Field width: 2 digits
Tolerance: No errors
MQO: At least 99% of the time

Values:

Owner Classes within Forest Service Lands (Owner Group 10):
11 National Forest
12 National Grassland
13 Other Forest Service

Owner Classes within Other Federal Lands (Owner Group 20)
21 National Park Service
22 Bureau of Land Management
23 Fish and Wildlife Service
24 Departments of Defense/Energy
25 Other Federal

Owner Classes within State and Local Government lands (Owner Group 30)
31 State
32 Local (County, Municipality, etc.)
33 Other Non Federal Public

Owner Classes within Private lands (Owner Group 40)
41 Corporate
42 Non Governmental Conservation / Natural Resources Organization - examples: Nature Conservancy, National Trust for Private Lands, Pacific Forest Trust, Boy Scouts of America, etc.
43 Unincorporated Partnerships / Associations / Clubs – examples: Hunting Clubs that **own, not lease** property, recreation associations, 4H, etc.
44 Native American (Indian) – within reservation boundaries
45 Individual

2.5.8 PRIVATE OWNER INDUSTRIAL STATUS

Record the code identifying the status of the owner with regard to being considered industrial as determined by whether or not they own and operate a primary wood processing plant. A primary wood processing plant is any commercial operation which originates the primary processing of wood on a regular and continuing basis. Examples include: pulp or paper mill, sawmill, panel board mill, post or pole mill, etc. Cabinet shops, “mom & pop” home-operated businesses, etc., should not be considered as industrial plants. If any doubt exists with the determination by the field crew about the owner’s industrial status due to name, commercial plant size, type plant, etc., choose code 0.

NOTE: FIA unit or State headquarters may have to maintain a list of recognized industrial owners within a State for crews to use when making these determinations.

When collected: CORE: All accessible forest land condition classes (CONDITION CLASS STATUS = 1) when the owner group is private (OWNER GROUP 40)
Field width: 1 digit
Tolerance: No errors
MQO: At least 99% of the time
Values:

0 Land **is not** owned by industrial owner with a wood processing plant
1 Land **is** owned by industrial owner with wood processing plant

2.5.9 ARTIFICIAL REGENERATION SPECIES

Record the species code of the predominant tree species for which evidence exists of artificial regeneration in the stand. This attribute is ancillary; that is, contrasting condition classes are never delineated based on variation in this attribute.

When collected: All accessible forest land condition classes (CONDITION CLASS STATUS = 1) with evidence of artificial regeneration (REGENERATION STATUS = 1)
Field width: 4 digits
Tolerance: No errors
MQO: At least 99% of the time
Values: See Appendix 3

2.5.10 STAND AGE

Record the average total age, to the nearest year, of the trees (plurality of all live trees not overtopped) in the predominant STAND SIZE CLASS of the condition, determined using local procedures. Record 000 for non-stocked stands.

An estimate of STAND AGE is required for every forest land condition class defined on a plot. Stand age is usually highly correlated with stand size and should reflect the average age of all trees that are not overtopped. Unlike the procedure for site tree age (TREE AGE AT DIAMETER), estimates of STAND AGE should estimate the time of tree establishment (e.g., not age at the point of diameter measurement). Note: For planted stands, estimate age based on the year the stand was planted (e.g., do not add in the age of the planting stock).

To estimate STAND AGE, select two or three dominant or codominant trees from the overstory. If the overstory covers a wide range of tree sizes and species, try to select the trees accordingly, but it is not necessary to core additional trees in such stands. The variance associated with mean stand age increases with stand heterogeneity, and additional cores are not likely to improve the estimate. Core each tree at the point of diameter measurement and count the rings between the outside edge and the core to the pith. Add in the number of years that passed from germination until the tree reached the point of core extraction to determine the total age of the tree. Add 2 years to all hardwood species, 7 years to longleaf pine and 3 years to all other pine species. Assign a weight to each core by visually estimating the percentage of total overstory trees it represents. Make sure the weights from all cores add up to 1.0, compute the weighted average age, and record. For example, if three trees aged 34, 62, and 59 years represent 25 percent, 60 percent, and 15 percent of the overstory, respectively, the weighted stand age should be:

(34 x 0.25) + (62 x 0.60) + (59 x 0.15) = 55 years.

In some cases, it may be possible to avoid coring trees to determine age. If a stand has not been seriously disturbed since the previous survey, simply add the number of years since the previous inventory to the previous STAND AGE. In other situations, cores collected from site trees can be used to estimate STAND AGE.

If a condition class is nonstocked, assign a STAND AGE of 000.

If all of the trees in a condition class are of a species which, by regional standards, cannot be bored for age (e.g., mountain mahogany, tupelo) record 998. This code should be used in these cases only.

If tree cores are not counted in the field, but are collected and sent to the office for the counting of rings, record 999. Note on the core the % of stand that type of core represents so that STAND AGE can be calculated later.

When collected: All accessible forest land condition classes (CONDITION CLASS STATUS = 1)
Field width: 3 digits
Tolerance: +/- 10%
MQO: At least 95% of the time
Values: 000 to 199, 998, 999

2.5.11 DISTURBANCE 1

Record the code corresponding to the presence of the following disturbances. Disturbance can connote positive or negative effects. The area affected by any natural or human-caused disturbance must be at least 1.0 acre in size. Record up to three different disturbances per condition class from most important to least important as best as can be determined. This attribute is ancillary; that is, contrasting conditions are never delineated based on variation in this attribute.

For initial forest plot establishment (initial grid activation or newly forested plots), the disturbance must be within the last 5 years. For remeasured plots recognize only those disturbances that have occurred since the previous inventory.

The following disturbance codes require "significant threshold" damage, which implies mortality and/or damage to 25 percent of all trees in a stand or 50 percent of an individual species' count. Additionally, some disturbances affect forests but initially may not affect tree growth or health (e.g., grazing, browsing, flooding, etc.). In these cases, a disturbance should be coded when at least 25 percent of the soil surface or understory vegetation has been affected.

When collected: All accessible forest land condition classes (CONDITION CLASS STATUS = 1)
Field width: 2 digits
Tolerance: No errors
MQO: At least 99% of the time
Values:

Code	Definition
00	None - no observable disturbance
10	Insect damage (to both understory vegetation and trees)
11	insect damage to understory vegetation
12	insect damage to trees, including seedlings and saplings
20	Disease damage (to both understory vegetation and trees)
21	disease damage to understory vegetation
22	disease damage to trees, including seedlings and saplings
30	Fire (from crown and ground fire, either prescribed or natural)
31	ground fire
32	crown fire
40	Animal damage (other than listed below)
41	beaver (includes flooding caused by beaver)
42	porcupine
43	deer/ungulate
44	bear (CORE OPTIONAL)
45	rabbit (CORE OPTIONAL)
46	domestic animal/livestock (includes grazing):
50	Weather damage (other than listed below)
51	ice
52	wind (includes hurricane, tornado)
53	flooding (weather induced)
54	drought
55	earth movement/avalanches
60	Vegetation (suppression, competition, vines):
70	Unknown/not sure/other (include in NOTES)
80	Human-caused damage – any significant threshold of human-caused damage not described in the DISTURBANCE codes listed or in the TREATMENT codes listed. Must include a plot-level note to describe further.

2.5.12 DISTURBANCE YEAR 1

Record the year in which DISTURBANCE 1 occurred. If the disturbance occurs continuously over a period of time, record 9999.

When collected: When DISTURBANCE 1 > 00
Field width: 4 digits
Tolerance: +/- 1 year for measurement cycles of 5 years
+/- 2 years for measurement cycles of > 5 years
MQO: At least 99% of the time
Values: Since the previous plot visit, or the past 5 years for plots visited for the first time

2.5.13 DISTURBANCE 2

If a stand has experienced more than one disturbance, record the second disturbance here. See DISTURBANCE 1 for coding instructions.

2.5.14 DISTURBANCE YEAR 2

Record the year in which DISTURBANCE 2 occurred. See DISTURBANCE YEAR 1 for coding instructions.

2.5.15 DISTURBANCE 3

If a stand has experienced more than two disturbances, record the third disturbance here. See DISTURBANCE 1 for coding instructions.

2.5.16 DISTURBANCE YEAR 3

Record the year in which DISTURBANCE 3 occurred. See DISTURBANCE YEAR 1 for coding instructions.

2.5.17 TREATMENT 1

Forestry treatments are a form of disturbance. These human disturbances are recorded separately here for ease of coding and analysis. The term treatment further implies that a silvicultural application has been prescribed. This does not include occasional stumps of unknown origin or sparse removals for firewood, Christmas trees, or other miscellaneous purposes. The area affected by any treatment must be at least 1.0 acre in size. Record up to three different treatments per condition class from most important to least important as best as can be determined. This attribute is ancillary; that is, contrasting conditions are never delineated based on variation in this attribute.

For initial forest plot establishment (initial grid activation or newly forested plots), the treatment must be within the last 5 years. For remeasured plots recognize only those treatments that have occurred since the previous inventory.

When collected: All accessible forest land condition classes (CONDITION CLASS STATUS = 1)
Field width: 2 digits
Tolerance: No errors
MQO: At least 99% of the time
Values: See next page

Treatment values:

Code	Definition
00	None - No observable treatment.
10	Cutting - The removal of one or more trees from a stand.
11	Clearcut harvest – The removal of the majority of the merchantable trees in a stand; residual stand stocking is under 50 percent.
12	Partial harvest – Removal primarily consisting of highest quality trees. Residual consists of lower quality trees because of high grading or selection harvest. (Ex. uneven aged, group selection, high grading, species selection)
13	Seed-tree/shelterwood harvest – Crop trees are harvested leaving seed source trees either in a shelterwood or seed tree. Also includes the final harvest of the seed trees.
14	Commercial thinning – The removal of trees (usually poletimber sized) from poletimber-sized stands leaving sufficient stocking of growing stock trees to feature in future stand development. Also included are thinning in sawtimber-sized stands where poletimber-sized (or log-sized) trees have been removed to improve quality of those trees featured in a final harvest.
15	Timber Stand Improvement (cut trees only) – The cleaning, release, or other stand improvement involving non-commercial cutting applied to an immature stand that leaves sufficient stocking. Use code 50 for herbicide, girdling, and other TSI treatments that **do not involve cutting**. Use code 14 for commercial thinnings.
20	Site preparation - Clearing, slash burning, chopping, disking, bedding, or other practices clearly intended to prepare a site for either natural or artificial regeneration.
30	Artificial regeneration - Following a disturbance or treatment (usually cutting), a new stand where at least 50% of the live trees present resulted from planting or direct seeding.
40	Natural regeneration - Following a disturbance or treatment (usually cutting), a new stand where at least 50% of the live trees present (of any size) were established through the growth of existing trees and/or natural seeding or sprouting.
50	Other silvicultural treatment - The use of fertilizers, herbicides, girdling, pruning, or other activities (not covered by codes 10-40) designed to improve the commercial value of the residual stand, or chaining, which is a practice used on western woodlands to encourage wildlife forage.

2.5.18 TREATMENT YEAR 1

Record the year in which TREATMENT 1 occurred.

When collected: When TREATMENT 1 > 00
Field width: 4 digits
Tolerance: +/- 1 year for measurement cycles of 5 years
+/- 2 years for measurement cycles of > 5 years
MQO: At least 99% of the time
Values: Since the previous plot visit, or the past 5 years for plots visited for the first time

2.5.19 TREATMENT 2

If a stand has experienced more than one treatment, record the second treatment here. See TREATMENT 1 for coding instructions; code 00 if none.

2.5.20 TREATMENT YEAR 2
Record the year in which TREATMENT 2 occurred. See TREATMENT YEAR 1 for coding instructions.

2.5.21 TREATMENT 3
If a stand has experienced more than two treatments, record the third treatment here. See TREATMENT 1 for coding instructions; code 00 if none.

2.5.22 TREATMENT YEAR 3
Record the year in which TREATMENT 3 occurred. See TREATMENT YEAR 1 for coding instructions.

2.5.23 PHYSIOGRAPHIC CLASS
Record the code that best describes the PHYSIOGRAPHIC CLASS of the condition within the plot area; land form, topographic position, and soil generally determine physiographic class.

When collected: All accessible forest land condition classes (CONDITION CLASS STATUS = 1)
Field width: 2 digits
Tolerance: No errors
MQO: At least 80% of the time
Values:

Xeric Sites that are normally low or deficient in moisture available to support vigorous tree growth. These areas may receive adequate precipitation, but experience a rapid loss of available moisture due to runoff, percolation, evaporation, etc.

11 Dry Tops - Ridge tops with thin rock outcrops and considerable exposure to sun and wind.

12 Dry Slopes - Slopes with thin rock outcrops and considerable exposure to sun and wind. Includes most steep slopes with a southern or western exposure.

13 Deep Sands - Sites with a deep, sandy surface subject to rapid loss of moisture following precipitation. Typical examples include sand hills, sites along the beach and shores of lakes and streams, and many deserts.

19 Other Xeric - All dry physiographic sites not already described.

Mesic Sites that have moderate but adequate moisture available to support vigorous tree growth except for periods of extended drought. These sites may be subjected to occasional flooding during periods of heavy or extended precipitation.

21 Flatwoods - Flat or fairly level sites outside flood plains. Excludes deep sands and wet, swampy sites.

22 Rolling Uplands - Hills and gently rolling, undulating terrain and associated small streams. Excludes deep sands, all hydric sites, and streams with associated flood plains.

23 Moist Slopes and Coves - Moist slopes and coves with relatively deep, fertile soils. Often these sites have a northern or eastern exposure and are partially shielded from wind and sun. Includes moist mountain tops and saddles.

24 Narrow Flood plains/Bottomlands - Flood plains and bottomlands less than 1/4-mile in width along rivers and streams. These sites are normally well drained but are subjected to occasional flooding during periods of heavy or extended precipitation. Includes associated levees, benches, and terraces within a 1/4 mile limit. Excludes swamps, sloughs, and bogs.

25 Broad Flood plains/Bottomlands - Flood plains and bottomlands 1/4 mile or wider in width along rivers and streams. These sites are normally well drained but are subjected to occasional flooding during periods of heavy or extended precipitation. Includes associated levees, benches, and terraces. Excludes swamps, sloughs, and bogs with year-round water problems.

29 Other Mesic - All moderately moist physiographic sites not already described.

Hydric Sites that generally have a year-round abundance or over-abundance of moisture. Hydric sites are very wet sites where excess water seriously limits both growth and species occurrence.

31 Swamps / Bogs - Low, wet, flat forested areas usually quite extensive that are flooded for long periods of time except during periods of extreme drought. Excludes cypress ponds and small drains.

32 Small Drains - Narrow, stream-like, wet strands of forest land often without a well-defined stream channel. These areas are poorly drained or flooded throughout most of the year and drain the adjacent higher ground.

33 Bays and wet pocosins - Low, wet, boggy sites characterized by peaty or organic soils. May be somewhat dry during periods of extended drought. Examples include sites in the Lake States with lowland swamp conifers or the Carolina bays in the southeast US.

34 Beaver ponds

35 Cypress ponds

39 Other hydric - All other hydric physiographic sites.

2.5.24 PRESENT NONFOREST LAND USE

2.5.25 PRESENT LAND USE

Record the classification that indicates the land use of the condition.
Use codes 10, 30, 40 and 99 only for land not better described by one of the more detailed codes within each category.

When collected: All condition classes
Field width: 2 digits
Tolerance: No errors
MQO: At least 99% of the time
Values:

Accessible Forestland (CONDITION CLASS STATUS = 1)
Forest land - See section 2.2 for complete definition.

01 Accessible timber land (SITE CLASS = 1- 6)
02 Accessible other forest land (SITE CLASS = 7)

10 Agricultural land (CONDITION CLASS STATUS = 2) - Land managed for crops, pasture, or other agricultural use. The area must be at least 1.0 acre in size and 120.0 feet wide. Use the 10 code only for cases not better described by one of the following:

11 Cropland
12 Pasture (improved through cultural practices)
13 Idle farmland
14 Orchard
15 Christmas tree plantation
16 Maintained wildlife openings

20 Rangeland (CONDITION CLASS STATUS = 2) - Land primarily composed of grasses, forbs, or shrubs. This includes lands vegetated naturally or artificially to provide a plant cover managed like native vegetation and does not meet the definition of pasture. The area must be at least 1.0 acre in size and 120.0 feet wide.

30 Developed (CONDITION CLASS STATUS = 2) - Land used primarily by humans for purposes other than forestry or agriculture. Use the 30 code only for land not better described by one of the following:

31 Cultural: business, residential, and other places of intense human activity.
32 Rights-of-way: improved roads, railway, power lines, maintained canal
33 Recreation: parks, skiing, golf courses
34 Mining

40 Other (CONDITION CLASS STATUS = 2) - Land parcels greater than 1.0 acre in size and greater than 120.0 feet wide, that do not fall into one of the uses described above. Examples include undeveloped beaches, barren land (rock, sand), noncensus water, marshes, bogs, ice, and snow.

41 Marsh
42 Beach

91 Census Water (CONDITION CLASS STATUS = 4) - See section 2.2

92 Noncensus water (CONDITION CLASS STATUS = 3 - See section 2.2

99 Nonsampled (CONDITION CLASS STATUS = 5) - See section 2.2

2.5.26 TRACT SIZE (TOTAL ACRES)

Tract size is recorded when the OWNER GROUP is 40 **and** the PRIVATE OWNER INDUSTRIAL STATUS is 0. Include both forest and non-forest acres of the parcel. Do not include separate parcels that the landowner may own elsewhere. If more than one private landowner owns a sample location, record the tract size information for the first forest condition for subsequent forest conditions classified as a private, non-industrial landowner, even though they may be a different owner. See Ownership Procedures in Section 0.3.

Tract size often affects whether a forest stand is likely to be managed and the likelihood of its becoming a source of timber supplies. Very small parcels of land in primarily urban settings are often perceived to be unavailable for timber harvest and many users of FIA data have requested that these areas be identified to eliminate them from the resource base when assessing timber availability. Tract size also provides the ability to track timber removals for parcels of different sizes over time.

When collected: CONDITION CLASS STATUS = 1, OWNER GROUP = 40, and PRIVATE OWNER INDUSTRIAL STATUS = 0
Field width: 5 digits
Tolerance: No errors
MQO: At least 99% of the time
Values: 00001-99999

2.5.27 TRACT SIZE (PERCENT FOREST)

Record the percentage of the tract that is forested. See Ownership Procedures in Section 0.3.

When collected: TRACT SIZE (TOTAL ACRES) is collected
Field width: 3 digits
Tolerance: No errors
MQO: At least 99% of the time
Values: 001-100

2.5.28 STAND STRUCTURE

Record the code that best describes the predominant canopy structure for the condition. When determining canopy structure, only consider the vertical position of the dominant and codominant trees in the stand. Do not consider trees that are intermediate or overtopped crown class. As a rule of thumb, a different story should comprise 25% of the stand.

When collected: If CONDITION CLASS STATUS = 1
Field width: 1 digit
Tolerance: No errors
MQO: At least 99% of the time
Values:

0	Non-stocked - The condition is less than 10% stocked.
1	Single-storied - Most of the dominant/codominant tree crowns form a single canopy (i.e., most of the trees are approximately the same height).
2	Two-storied - The dominant/codominant tree crowns form two distinct canopy layers or stories.
3	Multi-storied - More than two recognizable levels characterize the crown canopy. Dominant/codominant trees of many sizes (diameters and heights) for a multilevel canopy.

2.5.29 OPERABILITY

This variable focuses on the viability of operating logging equipment in the vicinity of the condition. Record the most limiting class code that occurs on each forest condition.

When collected: If CONDITION CLASS STATUS = 1
Field width: 1 digit
Tolerance: No errors
MQO: At least 99% of the time
Values:

0	No problems
1	Seasonal access due to water conditions in wet weather
2	Mixed wet and dry areas typical of multi-channeled streams punctuated with dry islands
3	Broken terrain, cliffs, gullies, outcroppings, etc., which would severely limit equipment, access or use
4	Year-round water problems (includes islands)
5	Slopes 20 – 40%
6	Slope greater than 40%

2.5.30 SITE CLASS

Record the site class of the condition. If a site tree is collected for the condition, then the site class will be calculated by the data recorder. If no site tree is collected, then the field crew will estimate the site class.

When collected: If CONDITION CLASS STATUS = 1
Field width: 1 digit
Tolerance: +/- 1 class
MQO: At least 99% of the time
Values: 1-7

2.5.31 FIRE

Record the presence or absence of fire on the condition since the last survey. Evidence of fire must occur within the subplot.

When collected: If CONDITION CLASS STATUS = 1
Field width: 1 digit
Tolerance: No errors
MQO: At least 99% of the time
Values:

0	No evidence of fire since last survey
1	Evidence of burning (either prescribed or wildfire)

2.5.32 GRAZING

Record the presence or absence of domestic animal grazing on the condition since the last survey. Evidence of grazing must occur within the subplot.

When collected: If CONDITION CLASS STATUS = 1
Field width: 1 digit
Tolerance: No errors
MQO: At least 99% of the time
Values:

0	No evidence of livestock use (by domestic animals)
1	Evidence of grazing (including dung, tracks, trails, etc.)

3.0 SUBPLOT INFORMATION

Each subplot is described by a series of area parameters relating to topographic features and existing cover type. These data also relate to the microplot, since the microplot is contained within the subplot perimeter.

3.1 SUBPLOT NUMBER

Record the code corresponding to the number of the subplot.

When Collected: All subplots
Field width: 1 digit
Tolerance: No errors
MQO: At least 99% of the time
Values:

1 Center subplot
2 North subplot
3 Southeast subplot
4 Southwest subplot

3.2 SUBPLOT/MACROPLOT STATUS

Indicate whether or not this subplot currently has at least one accessible forested condition class. In regions measuring the CORE OPTIONAL macroplot, indicate whether or not this macroplot currently has at least one forested condition class.

When collected: All subplots
Field width: 1 digit
Tolerance: No errors
MQO: At least 99% of the time
Values:

1 Sampled – at least one accessible forest land condition present on subplot (remeasured trees on SK = 2 and 8 are relocated)
2 Sampled – no accessible forest land condition present on subplot
3 Nonsampled
9 Replacement – SAMPLE KIND 2 and 8 only; previous subplot could not be relocated. Does not include subplots that fall in clearcuts or have no remeasurement trees. Must have at least one accessible forest land condition present on the subplot at both present and previous inventory

3.3 SUBPLOT NONSAMPLED REASON

For entire subplots that cannot be sampled, record one of the following reasons.

When collected: When SUBPLOT/MACROPLOT STATUS = 3
Field width: 2 digits
Tolerance: No errors
MQO: At least 99% of the time
Values: See next page

Subplot nonsampled reason values:

01 Outside U.S. boundary – Assign this code to condition classes beyond the U.S. border (Texas border counties only).

02 Denied access area – Any area within the sampled area of a plot to which access is denied by the legal owner, or to which an owner of the only reasonable route to the plot denies access. There are no minimum area or width requirements for a condition class delineated by denied access. Because a denied-access condition can become accessible in the future, it remains in the sample and is re-examined at the next occasion to determine if access is available. In some regions denied access plots may be replaced; check with the field supervisor regarding regional protocols for plot replacement.

03 Hazardous situation – Any area within the sampled area on plot that cannot be accessed because of a hazard or danger, for example cliffs, quarries, strip mines, illegal substance plantations, etc. Although the hazard is not likely to change over time, a hazardous condition remains in the sample and is re-examined at the next occasion to determine if the hazard is still present. There are no minimum size or width requirements for a condition class delineated by a hazardous condition. In some regions hazardous plots may be replaced; check with the field supervisor regarding regional protocols for plot replacement.

04 Time limitation
05 Lost data
10 Other
11 Out of state boundary (OFFICE USE ONLY – valid only when PLOT NONSAMPLED REASON = 11)

3.4 SUBPLOT CENTER CONDITION

Record the CONDITION CLASS NUMBER of the condition class at the subplot center.

When collected: All subplots
Field width: 1 digit
Tolerance: No errors
MQO: At least 99% of the time
Values: 1 to 9

3.5 MICROPLOT CENTER CONDITION

Record the CONDITION CLASS NUMBER of the condition class at the microplot center.

When collected: All microplots
Field width: 1 digit
Tolerance: No errors
MQO: At least 99% of the time
Values: 1 to 9

3.6 SUBPLOT SLOPE

Record the angle of slope across the subplot to the nearest 1 percent. SUBPLOT SLOPE is determined by sighting the clinometer along a line parallel to the average incline (or decline) of each subplot. This angle is measured along the shortest pathway down slope before the drainage direction changes. To measure SUBPLOT SLOPE, Observer 1 should stand at the uphill edge of the subplot and sight Observer 2, who stands at the downhill edge of the subplot. Sight Observer 2 at the same height as the eye-level of Observer 1. Read the slope directly from the percent scale of the clinometer:

- If slope changes gradually across the subplot, record an average slope.
- If slope changes across the subplot but the slope is predominantly of one direction, code the predominant slope percentage rather than the average.

- If the subplot falls directly on or straddles a canyon bottom or narrow ridge top, code the average slope of the side hill(s).
- If the subplot falls on a canyon bottom or on a narrow ridge top, but most of the area lies on one side hill, code the slope of the side hill where most of the area lies.

When collected: All subplots with at least one accessible forest land condition present on subplot (SUBPLOT/MACROPLOT STATUS = 1 or 9)
Field width: 3 digits
Tolerance: +/- 10%
MQO: At least 90% of the time
Values: 000 to 155

3.7 SUBPLOT ASPECT

Record the aspect across the subplot, to the nearest 1 degree. SUBPLOT ASPECT is determined along the direction of slope for land surfaces with at least 5 percent slope in a generally uniform direction. SUBPLOT ASPECT is measured with a hand compass along the same direction used to determine slope.

- If aspect changes gradually across the subplot, record an average aspect.
- If aspect changes across the subplot but the aspect is predominately of one direction, code the predominate direction rather than the average.
- If the subplot falls on or straddles a canyon bottom or narrow ridge top, code the aspect of the ridge line or canyon bottom.
- If the subplot falls on a canyon bottom or on a narrow ridge top, but most of the area lies on one side hill, code the aspect of the side hill.

When collected: All subplots with at least one accessible forest land condition present on subplot (SUBPLOT/MACROPLOT STATUS = 1 or 9)
Field width: 3 digits
Tolerance: +/- 10 degrees
MQO: At least 90% of the time
Values:

000	no aspect, slope < 5 percent
001	1 degree
002	2 degrees
.	.
.	.
360	360 degrees, due north

3.8 SNOW/WATER DEPTH

Record to the nearest 0.1 foot the average approximate depth of water or snow covering the subplot at the time of data collection. This variable is used to indicate subplots where some variables (e.g., seedling count, total lengths) may be measured with less certainty due to conditions at the time of measurement.

When collected: All subplots with at least one accessible forest land condition present on subplot (SUBPLOT/ANNUALR PLOT STATUS = 1 or 9)
Field width: 2 digits (x.y)
Tolerance: +/- 0.5 ft
MQO: At the time of measurement (no MQO after initial date of visit)
Values: 0.0 to 9.9

3.9 SUBPLOT/MACROPLOT CONDITION LIST (CORE OPTIONAL)

This is a listing of all condition classes located within the 24.0-foot radius around the subplot center. In regions measuring the CORE OPTIONAL macroplot, this is a listing of all condition classes located within the 58.9-foot radius around the macroplot center. A maximum of four conditions is permitted at any individual subplot / macroplot. If a condition class has already been defined at a previously completed subplot / macroplot, use the same condition class number whenever that condition is encountered. Define new condition classes as they are encountered. If more than one condition class is listed here, boundary data are required. If only one condition class is listed, this condition is automatically assigned to the subplot center and microplot center. If less than four condition classes occur on this subplot, complete the remainder of this field with zeros. For example, if condition 1 is the only condition class on a subplot, record 1000.

When collected: All forested subplots (SUBPLOT STATUS = 1 or 9)
Field width: 4 digits
Tolerance: No errors
MQO: At least 99% of the time
Values: 1000 to 9876

3.10 NONNATIVE INVASIVE PLANTS

Identify and code the occurrence of up to four nonnative invasive plants listed below that are found on any accessible forest portion of the subplot**.**
Do not record on nonforest conditions.

If more than four plants are found on a subplot, code in order of most cover to least. Stop at four species per subplot. If five species are found on subplot 1, record only four species, even if subplot 2 has none.

The species below are known to cause ecological problems. All are displacing native forest communities. The impact of invasive species is locally well known, but their abundance, regional impact, range and rate of spread in the environment are not well known. Nomenclature follows USDA NRCS PLANTS National Database (http://plants.usda.gov/). The most common synonyms are in parentheses.
The first digit of the code identifies the lifeform of the species in question:

0=tree	4=grass
2=shrub	5=fern
3=vine	6=forbs, herbs, and other nonwoody species

When collected: All subplots with at least one accessible forest land condition present on subplot (SUBPLOT STATUS = 1 or 9)
Field width: 4 digits
Tolerance: no errors
MQO: At least 90% of the time
Values: see below; use 0000 for none

Southern Region Nonnative Invasive Plants Choose up to four species from this list before recording species off of any applicable state species list. Species with an asterisk (*) have been recommended as prohibited from introduction on National Forest land.

CODE	COMMON NAME	SCIENTIFIC NAME
	TREES	
0341	Tree-of-heaven	Ailanthus altissima*
0345	Silktree, Mimosa	Albizia julibrissin*
0712	Princesstree, Royal Paulownia	Paulownia tomentosa*
0993	Chinaberry	Melia azedarach
0994	Tallowtree, Popcorntree	Triadica sebifera (Sapium sebiferum)*
0997	Russian Olive	Elaeagnus angustifolia
	SHRUBS	
2037	Silverthorn, Thorny Olive	Elaeagnus pungens
2038	Autumn olive	Elaeagnus umbellata
2042	Winged Burning Bush	Euonymus alata
2103	Chinese/European privet	Ligustrum sinense*/L. vulgare
2104	Japanese/glossy privet	Ligustrum japonicum*/L. lucidum
2105	Bush honeysuckles	Lonicera spp.*
2113	Sacred bamboo, Nandina	Nandina domestica
2160	Nonnative roses	Rosa spp.
	VINES	
3026	Oriential or Asian bittersweet	Celastrus orbiculatus
3030	Nonnative climbing yams – air yam/chinese yam	Dioscorea bulbifera*/ D. oppositifolia
3042	Wintercreeper	Euonymus fortunei
3071	English Ivy	Hedera helix
3101	Japanese honeysuckle	Lonicera japonica*
3123	Kudzu	Pueraria montana var. lobata (Pueraria lobata)*
3211	Nonnative Vincas, Periwinkles	Vinca minor/V. major
3251	Chinese/Japanese wisteria	Wisteria sinensis*/ W. floribunda
	GRASSES	
4008	Giant reed	Arundo donax
4051	Tall fescue	Lolium arundinaceum*
4055	Cogongrass	Imperata cylindrica*
4080	Nepalese browntop	Microstegium vimineum*
4085	Chinese silvergrass	Miscanthus sinensis*
4130	Nonnative bamboos	Phyllostachys spp. Bambusa spp
	FERNS	
5171	Japanese climbing fern	Lygodium japonicum*
	FORBS/HERBS/OTHER HERBACEOUS	
6002	Garlic mustard	Alliaria petiolata*
6052	Shrubby lespedeza	Lespedeza bicolor
6053	Chinese lespedeza	Lespedeza cuneata*
6095	Tropical soda apple	Solanum viarum*

Florida Nonnative Invasive Plants

The following nonnative invasive plants are only tallied in Florida. Use this list only after first exhausting the regional list to record four plants per subplot. For example: If there are no nonnative species from the regional list above on the subplot, then up to four species from the Florida list can be recorded.

CODE	COMMON NAME	SCIENTIFIC NAME
	TREES	
FL02	Australian pine	Casuarina equisetifolia
FL03	Camphor tree	Cinnamomum camphora
FL04	Carrotwood	Cupaniopsis anacardioides
FL06	Melaleuca	Melaleuca quinquenervia
FL08	Schefflera	Schefflera actinophylla
FL09	Java plum	Syzygium cumini
	SUBSHRUBS	
FL11	Coral ardisia	Ardisia crenata
FL15	Lantana	Lantana camara
	SHRUBS	
FL22	Surinam cherry	Eugenia uniflora
FL26	Common guava	Psidium guajava
FL27	Downy rose myrtle	Rhodomyrtus tomentosa
FL28	Brazilian pepper	Schinus terebinthifolius
FL29	Wetland nightshade	Solanum tampicense
	VINES	
FL31	Rosary pea	Abrus precatorius
FL35	Cat's-claw vine	Macfadyena ungis-cati
FL37	Skunk vine	Paederia foetida
	GRASSES	
FL46	Napier grass	Pennisetum purpureum
	FERNS	
FL54	Old World Climbing fern	Lygodium microphyllum
FL56	Sword fern	Nephrolepis cordifolia
	FORBS/HERBS/OTHER HERBACEOUS	
FL64	Hairy indigo	Indigofera hirsuta

3.11 NONNATIVE INVASIVE PERCENT COVERAGE

Record the code that best describes the abundance of each nonnative invasive plant recorded on the subplot.

Rate winter vegetation as if it were in a “leaf-on” condition.

One percent cover of the 24-foot radius subplot is equivalent to a square 4.2 feet on each side, or a circle with a radius of 2.4 feet. Ten percent cover is equivalent to a square 13.4 feet on each side, or a circle with a radius of 7.6 feet.

Only record the coverage on the forested portion of the subplot. For example, 70% of a subplot is nonforest and 30% is forested. If the entire subplot was covered by kudzu, then the NONNATIVE INVASIVE PLANT PERCENT COVERAGE is code 3 (11-50% coverage) for 30%.

When collected: NONNATIVE INVASIVE PLANTS > 0000
Field width: 1 digit
Tolerance: no errors
MQO: At least 90% of the time
Values:

1 Trace < 01%
2 01-10%
3 11-50%
4 51-90%
5 91-100%

4.0 BOUNDARY REFERENCES

Boundary reference data are used to compute the area for the condition classes sampled on a plot and to remeasure plots. Record all boundaries between condition classes that occur within the sampled (fixed-radius) area on subplots and microplots (and optionally macroplots). Boundaries outside sampled (fixed-radius) areas are not referenced.

In addition to using the recording procedures described herein, sketch maps of condition class boundaries onto the pre-printed plot diagrams on paper field tally sheets.

4.1 REFERENCE PROCEDURE

Reference, within the sampled area on each microplot, subplot, and macroplot, the approximate boundary of each condition class that differs from the condition classes at a subplot center. Trees selected on these fixed-radius plots are assigned to the actual condition in which they lie regardless of the recorded approximate boundary delineated.

Boundary referencing is done by recording azimuths and distances from subplot center to the reference points and/or from microplot center to the reference points (Figures 15 and 16). Each boundary is marked by a maximum of three points - two where the boundary intersects the subplot circumference or microplot circumference, and one "corner" point between the two end points, if necessary. Only the corner point requires a distance, since the distance from the center to the circumference is always equal to the fixed plot radius.

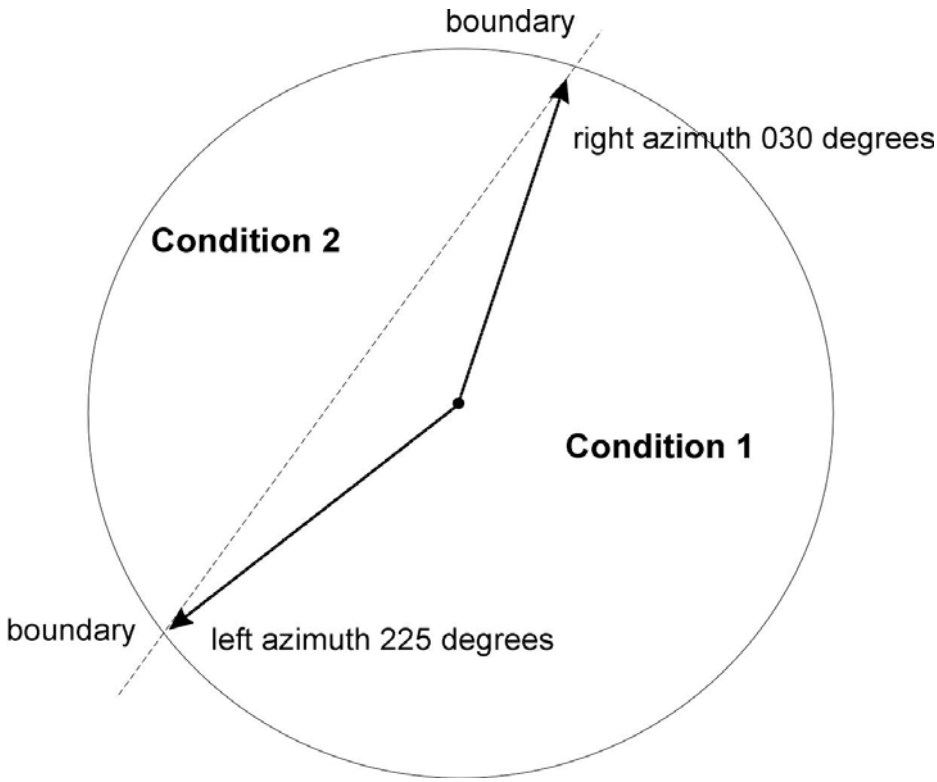


Figure 15. How to measure a straight boundary on a microplot, subplot, or macroplot.

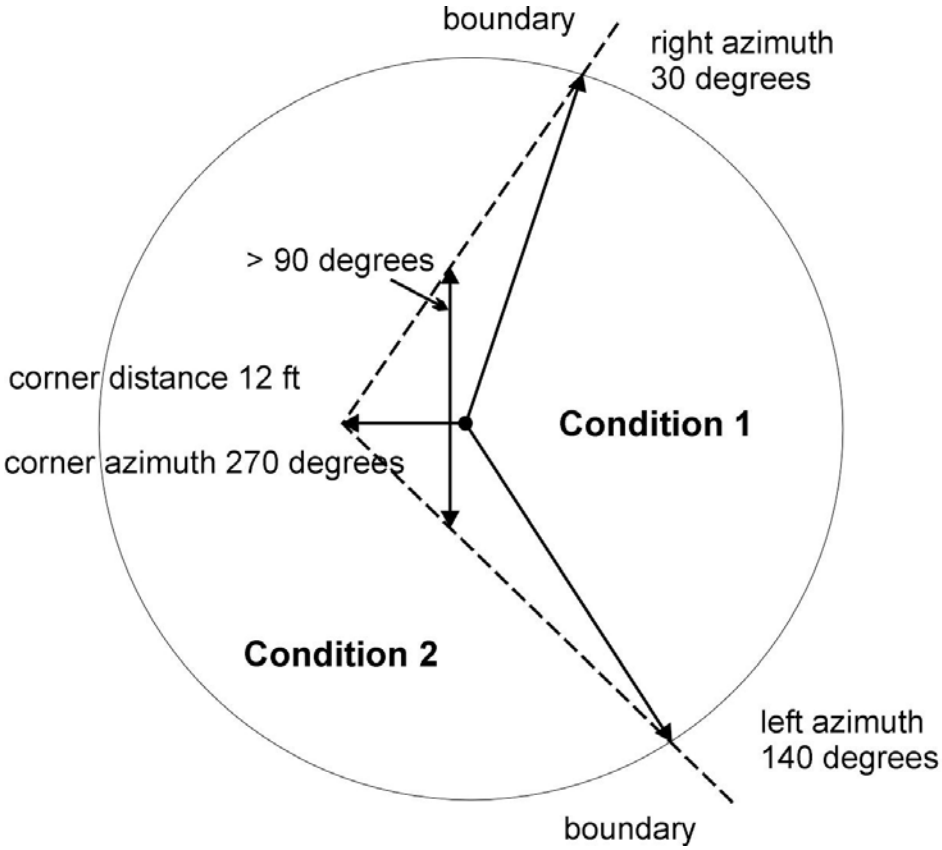


Figure 16. How to measure a boundary with a corner on a subplot or macroplot.

Microplot boundaries are referenced to the microplot center, and macroplot boundaries are referenced to the subplot center in the same manner described for subplots. Note that the larger the plot, the greater likelihood of a need for a boundary corner to record boundaries that are not straight lines.

Refer to Sections 2.1 and 2.4 for general condition class delineation guidelines. The following additional rules apply when referencing a boundary within a subplot, microplot, or macroplot:

1. When a boundary between accessible forest land and nonforest land or between two contrasting accessible forest land condition classes is clearly marked, use that feature to define the boundary. Examples of clear demarcation are a fence line, plowed field edge, sharp ridge line, and water's edge along a stream course, ditch, or canal.

2. When a boundary between forest land and nonforest land is not clearly marked by an obvious feature, the boundary should follow the nonforest side of the stems of the trees at the forest edge.

3. When a boundary between two contrasting forest land condition classes is not clearly marked, map along the stems of the contrasting condition. When the boundary between two contrasting forest land condition classes is separated by a narrow linear inclusion (creek, fire line, narrow meadow, unimproved road), establish the boundary at the far edge, relative to subplot center, of the inclusion.

4. When a plot is remeasured, the crew will examine the boundaries referenced at last inventory. If no change has occurred, the current crew will retain the boundary data that were recorded at last inventory. If a boundary has changed, or a new boundary is present, or the previous crew made an obvious error, record new or updated boundary data. Delete boundaries that are no longer distinct.
5. Although individual MQOs are specified for the azimuths and distances, in practice a crew will be considered ‘correct’ when the difference in areas as mapped by the original

crew and by the QA crew is less than 10 percent of the subplot or microplot area. This allows for slight variations in azimuths or distances due to the approximate nature of mapping procedures.

6. Define and map between nonforest land features, census and noncensus water only on subplots with at least one accessible forest land condition present (SUBPLOT STATUS = 1)

4.2 BOUNDARY DATA

Record the appropriate values for each boundary mapped on the subplot, microplot, or macroplot as follows:

4.2.1 SUBPLOT NUMBER

Record the code corresponding to the number of the subplot.

When collected: All boundaries
Field width: 1 digit
Tolerance: No errors
MQO: At least 99% of the time
Values:

1 Center subplot
2 North subplot
3 Southeast subplot
4 Southwest subplot

4.2.2 PLOT TYPE

Record the code to specify whether the boundary data are for a subplot, microplot, or macroplot.

When collected: All boundaries
Field width: 1 digit
Tolerance: No errors
MQO: At least 99% of the time
Values:

1 Subplot boundary
2 Microplot boundary
3 Macroplot boundary (coded only when macroplots are taken)

4.2.3 BOUNDARY CHANGE

Remeasurement (SAMPLE KIND = 2 and 8) locations only. Record the appropriate code to indicate the relationship between previously recorded and current boundary information.

When collected: SAMPLE KIND = 2 and 8, All boundaries
Field width: 1 digit
Tolerance: No errors
MQO: At least 99% of the time
Values:

0 No change - boundary is the same as indicated on plot map and/or data collected by a previous crew (BOUNDARY STATUS = 2).
1 Real change - new boundary, or boundary data has been changed or deleted to reflect an actual on-the-ground physical change resulting in a difference from the boundaries recorded (BOUNDARY STATUS = 0, 1, 2).
2 Cruiser error – new boundary, or boundary has been changed or deleted to correct an error from previous crew (BOUNDARY STATUS = 0, 1, 2).
3 Procedural change - new boundary, or boundary has been changed or deleted to reflect a change in variable definition (BOUNDARY STATUS = 0, 1, 2).

4.2.4 CONTRASTING CONDITION

Record the CONDITION CLASS NUMBER of the condition class that contrasts with the condition class located at the subplot center (for boundaries on the subplot or macroplot) or at the microplot center (for boundaries on the microplot), e.g., the condition class present on the other side of the boundary line. See section 3.0 for subplot data.

When collected: All boundaries
Field width: 1 digit
Tolerance: No errors
MQO: At least 99% of the time
Values: 1 to 9

4.2.5 LEFT AZIMUTH

Record the azimuth from the subplot, microplot, or macroplot center to the farthest left point (facing the contrasting condition) where the boundary intersects the subplot, microplot, or macroplot circumference.

When collected: All boundaries
Field width: 3 digits
Tolerance: +/- 5 degrees
MQO: At least 90% of the time
Values: 001 to 360

4.2.6 CORNER AZIMUTH

Record the azimuth from the subplot, microplot, or macroplt center to a corner or curve in a boundary. If a boundary is best described by a straight line between the two circumference points, then record 000 for CORNER AZIMUTH (000=none).

When collected: All boundaries
Field width: 3 digits
Tolerance: +/- 5 degrees
MQO: At least 90% of the time
Values: 000 to 360

4.2.7 CORNER DISTANCE

Record the horizontal distance, to the nearest 1 foot, from the subplot, microplot, or macroplot center to a boundary corner point.

When collected: All boundaries when CORNER AZIMUTH > 000
Field width: 2 digits
Tolerance: +/- 1 ft
MQO: At least 90% of the time
Values:

microplot	01 to 07 ft (actual limiting distance is 6.8 ft)
subplot	01 to 24 ft

4.2.8 RIGHT AZIMUTH

Record the azimuth from subplot, microplot, or macroplot center to the farthest right point (facing the contrasting condition) where the boundary intersects the subplot, microplot, or macroplot circumference.

When collected: All boundaries
Field width: 3 digits
Tolerance: +/- 5 degrees
MQO: At least 90% of the time
Values: 001 to 360

4.2.9 BOUNDARY STATUS

On SAMPLE KIND = 2 or 8 plots only, record the appropriate code indicating if the previous boundary is to be deleted, is a new boundary or is a remeasured boundary with or without change.

When collected: All boundaries on SAMPLE KIND = 2 or 8
Field width: 1 digit
Tolerance: No errors
MQO: At least 99% of the time
Values:

0	Deleted boundary record
1	New boundary record
2	Remeasured boundary record (with or without change)

5.0 TREE AND SAPLING DATA

Trees at least 5.0 inches in diameter are sampled within the subplot. 'Tally trees' are defined as all live and standing dead trees in accessible forest land condition classes encountered on the subplot the first time a subplot is established, and all trees that grow into a subplot thereafter. These data yield information on tree volume, growth, mortality, and removals; wildlife habitats; forest structure and composition; biomass; and carbon sequestration.

Trees with a diameter at least 1.0 inch but less than 5.0 inches, termed saplings, are sampled within the microplot. 'Tally saplings' are defined as all live saplings in accessible forest land condition classes encountered the first time a microplot is established, and all saplings that grow into each microplot thereafter are included until they grow to 5.0 inches or larger, at which time they are tallied on the 24.0-foot subplot and referenced (new AZIMUTH and HORIZONTAL DISTANCE taken) to the subplot center.

For multi-stemmed western woodland species, a cumulative DRC is used to compute diameter as described in Sections 5.9 and 5.9.4.

Trees are alive if they have any living parts (leaves, buds, cambium) at or above the point of diameter measurement, either diameter at breast height (DBH) or diameter at root collar (DRC). Trees that have been temporarily defoliated are still alive.

Once tallied, dead trees over 5.0 inches in diameter are tracked until they no longer qualify as standing dead. **Working around dead trees is a safety hazard - crews should exercise extreme caution! Trees that are deemed unsafe to measure should be estimated.**

To qualify as a standing dead tally tree, dead trees must be at least 5.0 inches in diameter, have a bole which has an unbroken ACTUAL LENGTH of at least 4.5 feet, and lean less than 45 degrees from vertical as measured from the base of the tree to 4.5 feet..

Portions of boles on dead trees that are separated greater than 50 percent (either above or below 4.5 feet), are considered severed and are included in Down Woody Material (DWM) if they otherwise meet DWM tally criteria.

For western woodland species (Appendix 3) with multiple stems, a tree is considered down if more than 2/3 of the volume is no longer attached or upright; do not consider cut and removed volume. For western woodland species with single stems to qualify as a standing dead tally tree, dead trees must be at least 5.0 inches in diameter, be at least 1.0 foot in unbroken ACTUAL LENGTH, and lean less than 45 degrees from vertical.

Live and dead standing tally trees, and partially separated boles of dead tally trees, do not have to be self-supported. They may be supported by other trees, branches, or their crown.

Trees that have been cut above DBH qualify as tally trees, provided they meet the size requirement. Trees cut below DBH do not qualify as tally trees. High stumps on naturally swell-butted trees (where it is normal to cut above 4.5 ft.) do not qualify as standing dead trees.

The following apply at remeasurement:

- If at the previous visit a forked tree was recorded as two separate trees but should have been recorded as one tree, delete one tree and correct the diameter for the remaining tree. Record and explanation in TREE NOTES.
- If at the previous visit a forked tree was recorded as one tree but should have been recorded as two separate trees, correct the diameter for the remeasured tree to represent one tree, and add the other fork as a new tree. Record an explanation in TREE NOTES.

If a subplot was installed incorrectly at the previous visit, the current crew should remeasure the subplot in its present location. In cases where individual subplots are lost (cannot be relocated), use the following procedures:

- assign the appropriate present CONDITION CLASS STATUS Code(s) to the new subplot (usually CONDITION CLASS STATUS = 1 or 2)

- assign TREE STATUS = 0 and RECONCILE = 7 to all downloaded trees (i.e., incorrectly tallied at the previous survey)
  assign RECONCILE codes 3 or 4 (i.e., missed live or missed dead) to all trees on the new subplot.
- assign the next TREE RECORD NUMBER.

Begin tallying trees at an azimuth of 001 degrees from subplot center and continue clockwise around the subplot. Repeat this sequence for trees on the microplot and again on the annular plot.

5.1 SUBPLOT NUMBER

Record the subplot number where the tree occurs. Also record for subplots that have no tally on the subplot or on the microplot either due to a nonforest land use or a forested land use with low stocking. This is done to indicate to the edit check program that the subplot was accounted for and that the data was not lost during the transmission.

When Collected: All live tally trees ≥ 1.0 in DBH/DRC and standing dead tally trees ≥ 5.0 in DBH/DRC
Field width: 1 digit
Tolerance: No errors
MQO: At least 99% of the time
Values:

1	Center subplot
2	North subplot
3	Southeast subplot
4	Southwest subplot

5.2 TREE RECORD NUMBER

Record a code to uniquely and permanently identify each tree on a given subplot. The TREE RECORD NUMBERS must be unique within a subplot – being unique is more important than being sequential. In general, work clockwise from azimuth 001 to 360, and work outwards from subplot center to subplot perimeter. On remeasured plots, use the previously assigned tree number. Saplings tallied on microplots will retain their initially assigned tree number if they grow to tree size. New and missed trees will be assigned the next available tree number. DO NOT renumber all plot trees in order to assign a more “correct” tree number to a missed tree. Numbers assigned to trees that are subsequently found to be extra will be dropped and not reused.

NOTE: If this is a Phase 3 plot, match the trees on this point to the hard copy list provided. Record the three-digit FHM tree number assigned to each standing tree.

When Collected: All tally trees on the four subplots, all saplings on the offset microplot, and all saplings on the old SK = 8 microplots; entry to record no tally on a subplot
Field width: 3 digits
Tolerance: No errors
MQO: At least 99% of the time
Values: 000 or 001 to 999

5.3 CONDITION CLASS NUMBER

Record the CONDITION CLASS NUMBER in which each tree is located. Often, a referenced boundary is approximate, and trees selected for tally are assigned to the actual condition in which they lie regardless of the recorded approximate boundary (Figure 17).

Also record for subplots that have no tally on the subplot or on the microplot either due to a nonforest land use or a forested land use with low stocking. This is done to indicate to the edit check program that the subplot was accounted for and that the data was not lost during the transmission.

When Collected: All tally trees on the four subplots, all saplings on the offset microplot, and all saplings on the old SK = 8 microplots; entry to record no tally on a subplot trees
Field width: 1 digit
Tolerance: No errors
MQO: At least 99% of the time
Values: 1 to 9

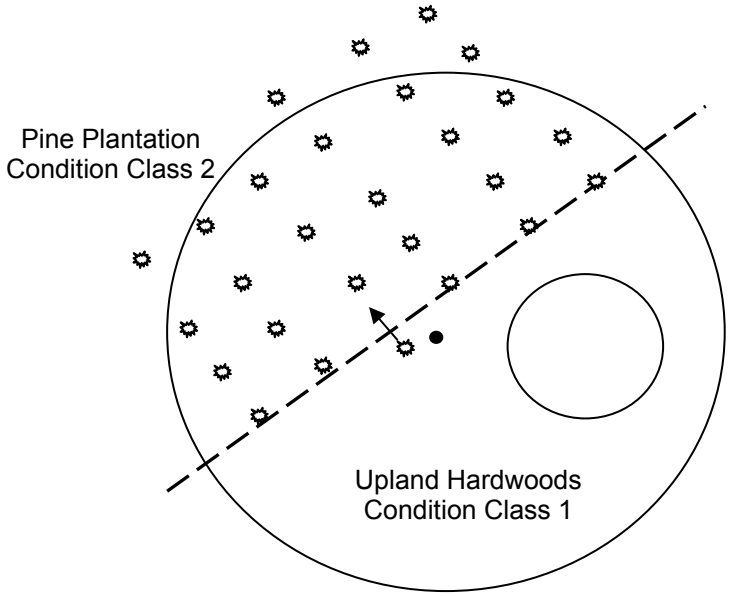


Figure 17. Ragged CONDITION CLASS boundary and tree condition class designation.

5.4 AZIMUTH

Record the AZIMUTH from the subplot center (for trees greater than or equal to 5.0 inches DBH/DRC) or the microplot center (for trees greater than or equal to 1.0 inch and less than 5.0 inches DBH/DRC), sight the center of the base of each tree with a compass. Sight to the geographic center for multi-stemmed western woodland species (Appendix 3). The geographic center is a point of equal distance between all tallied stems for a given woodland tree. Record AZIMUTH to the nearest degree. Use 360 for north.

When Collected: All live tally trees ≥ 1.0 in DBH/DRC and standing dead tally trees ≥ 5.0 in DBH/DRC
Field width: 3 digits
Tolerance: +/- 3 degrees
MQO: At least 90% of the time
Values: 001 to 360

5.5 HORIZONTAL DISTANCE

Record the measured HORIZONTAL DISTANCE, to the nearest 0.1 foot, from the subplot center (for trees greater than or equal to 5.0 inches DBH/DRC) or microplot center (for trees greater than or equal to 1.0 inch and less than 5.0 inches DBH/DRC) to the pith of the tree at the base. For all multi-stemmed western woodland trees (woodland species indicated in Appendix 3), the HORIZONTAL DISTANCE is measured from subplot or microplot center to the "geographic center" of the tree. The geographic center is a point of equal distance between all tallied stems for a given woodland tree.

When Collected: All live tally trees ≥ 1.0 in DBH/DRC and standing dead tally trees ≥ 5.0 in DBH/DRC
Field width: 3 digits (xx.y)
Tolerance: Microplot: +/- 0.2 ft
Subplot: +/- 1.0 ft
MQO: At least 90% of the time
Values: Microplot: 00.1 to 06.8
Subplot: 00.1 to 24.0

5.6 PREVIOUS TREE STATUS

If not downloaded from the previous inventory, record PREVIOUS TREE STATUS for each remeasured tally tree. This code is used to track the status of sample trees over time. This information is needed to correctly assign volume information to the proper component of volume change.

When collected: On remeasurement plots (SAMPLE KIND = 2 and 8), all previously tallied trees ≥ 1.0 in DBH
Field width: 1 digit
Tolerance: No errors
MQO: At least 95% of the time
Values:

1 Live Tree – alive at the previous inventory
2 Dead tree – standing dead tree at the previous inventory

5.7 PRESENT TREE STATUS

Record a current PRESENT TREE STATUS for each tallied tree; this code is used to track the status of sample trees over time: as they first appear, as ingrowth, as they survive, and when they die or are removed. This information is needed to correctly assign volume information to the proper component of volume change.

When Collected: All new live tally trees ≥ 1.0 in DBH/DRC
All new dead tally trees ≥ 5.0 in
On remeasurement plots, all previously tallied trees
Field width: 1 digit
Tolerance: No errors
MQO: At least 95% of the time
Values:

0 No status –- tree is not presently in the sample (remeasurement plots only). Tree was incorrectly tallied at the previous inventory, currently is not tallied due to definition or procedural change, or is not tallied due to natural causes (physically moved off plot). Requires RECONCILE code = 5-9.

1 Live tree – any live tree (new, remeasured or ingrowth)

2 Dead tree -- any dead tree (new, remeasured, or ingrowth), regardless of cause of death. Includes all previously standing dead trees that no longer qualify as standing dead, as well as trees killed by silvicultural or land clearing activity, and are assumed not to have been utilized.

3 Removed - a tree that has been cut and removed by direct human activity related to harvesting, silviculture or land clearing (remeasurement plots only). The tree is assumed to have been utilized.

Note: On remeasured plots, crews must collect new AZIMUTH and HORIZONTAL DISTANCE information from the subplot center for microplot saplings that grow to become subplot trees. For live subplot trees that shrink to become live saplings on the microplot, crews must collect new AZIMUTH and HORIZONTAL DISTANCE information from the microplot center.

5.7.1 RECONCILE

For remeasurement locations only, record a RECONCILE code for any new tally tree that was not tallied in the previous inventory, and for all no status remeasurement trees (PRESENT TREE STATUS = 0). This code is used to identify the reason a new tree appeared in the inventory, and identify the reason a remeasurement tree no longer qualifies as a tally tree. This information is needed to correctly assign volume information to the proper component of volume change.

When Collected: On SAMPLE KIND = 2 and 8: all new live tally trees ≥ 1.0 in DBH/DRC (PRESENT TREE STATUS = 1 and no PREVIOUS TREE STATUS or OLD MICROPLOT STATUS = 1), all new dead tally trees ≥ 5.0 in (PRESENT TREE STATUS = 2 and no PREVIOUS TREE STATUS), all no status trees (PRESENT TREE STATUS = 0)
On SAMPLE KIND = 9: missed prism trees ≥ 5.0 in on prism points 1 – 5, missed prism trees ≥ 1.0 in on prism points 1 – 3 and through growth prism trees ≥ 5.0 in on prism points 1 – 3.
Field width: 1 digit
Tolerance: No errors
MQO: At least 95% of the time
Values:

Codes 1-4 are valid for new trees on the plot:

0 New offset microplot sapling only (SAMPLE KIND = 8 plot)
1 Ingrowth or reversions – either a new tally tree not qualifying as through growth or a new tree on land that was formerly nonforest and now qualifies as forest land (reversion or encroachment).
2 Through growth – new tally tree 5.0 inches DBH/DRC and larger, within the microplot, which was not missed at the previous inventory (i.e. went from seedling to pole between surveys).
3 Missed live – a live tree missed at previous inventory and that is live or dead now.
4 Missed dead – a dead tree missed at previous inventory that is dead now.

Codes 5-9 are valid for remeasured trees that no longer qualify as tally:

5 Shrank – live tree that shrank below threshold diameter on microplot/subplot/ macroplot
6 Missing (moved) – tree was correctly tallied in previous inventory, but has now moved beyond the radius of the plot due to natural causes (i.e., small earth movement, hurricane). Tree must be either live before and still alive now or dead before and dead now. If tree was live before and now dead, this is a mortality tree and should have PRESENT TREE STATUS = 2 (not 0).
7 Cruiser error – erroneously tallied at previous inventory (includes lost subplots, see section 0.1 Plot Setup)
8 Procedural change – tree was tallied at the previous inventory, but is no longer tallied due to a definition or procedural change
9 Tree was sampled before, but now the area where the tree was located is nonsampled. All trees on the nonsampled area have RECONCILE = 9.

For SAMPLE KIND 8 plots, code 0 is only valid on new saplings that are only on the off-set microplot. Codes 1, 2 and 4 are valid on trees 5.0 in. DBH, 3 is valid for trees ≥ 1.0 in. DBH.

For SAMPLE KIND 9 plots, code 2 is valid on trees ≥ 1.0 in. DBH. Code 3 is valid on trees ≥ 5.0 in. DBH Codes 0,1 and 4 are not valid on SAMPLE KIND 9

Code 5 is used to indicate live trees that shrink below the diameter threshold on the microplot/subplot/macroplot. For example, if a live remeasurement tree shrinks below the 5.0 inch DBH/DRC, then record the following combination of codes: PREVIOUS TREE STATUS = 1, PRESENT TREE STATUS = 0, RECONCILE = 5. If a live measured tree shrinks below the 5.0 inch threshold on the subplot and is currently greater than or equal to 1.0 inch on the microplot, then record PREVIOUS TREE STATUS = 1, PRESENT TREE STATUS = 1. Record all required items for a tally sapling. Use the tree coding guide in Appendix 8 to determine the national coding method for remeasurement trees.

5.7.2 STANDING DEAD

Record the code that describes whether the tree qualifies as standing dead or not. To qualify as a standing dead tally tree, dead trees must be at least 5.0 inches in diameter, have a bole which has an unbroken ACTUAL LENGTH of at least 4.5 feet, and lean less than 45 degrees from vertical as measured from the base of the tree to 4.5 feet. See Figures 18-20 for examples.

“Unbroken” is defined as at least 50 percent attached to the original source of growth. The degree of lean on dead trees with partially separated (i.e., 1 to 50 percent) boles is measured from the base of the tree to the top of ACTUAL LENGTH.

Portions of boles on dead trees that are separated greater than 50 percent (either above or below 4.5 feet), are considered severed and are included in Down Woody Material (DWM) if they otherwise meet DWM tally criteria.

For western woodland species (Appendix 3) with multiple stems, a tree is considered down if more than 2/3 of the volume is no longer attached or upright; do not consider cut and removed volume. For western woodland species with single stems to qualify as a standing dead tally tree, dead trees must be at least 5.0 inches in diameter, be at least 1.0 foot in unbroken ACTUAL LENGTH, and lean less than 45 degrees from vertical.

Live and dead standing tally trees, and partially separated boles of dead tally trees, do not have to be self-supported. They may be supported by other trees, branches, or their crown.

When collected: SAMPLE KIND = 2 and 8: All dead tally trees (PRESENT TREE STATUS = 2)
Field width: 1 digit
Tolerance: No errors
MQO: At least 99% of the time
Values:

0 No – tree does not qualify as standing dead
1 Yes – tree does qualify as standing dead

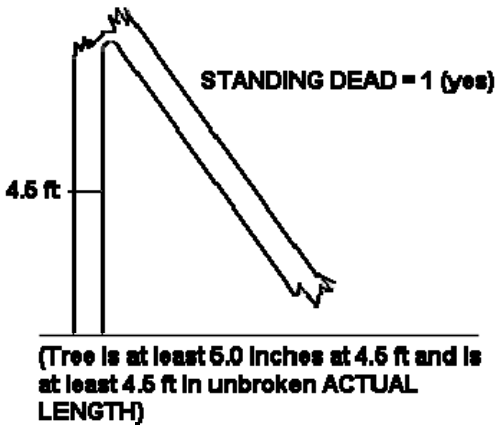


Figure 18. Example of an unbroken bole to 4.5 feet.

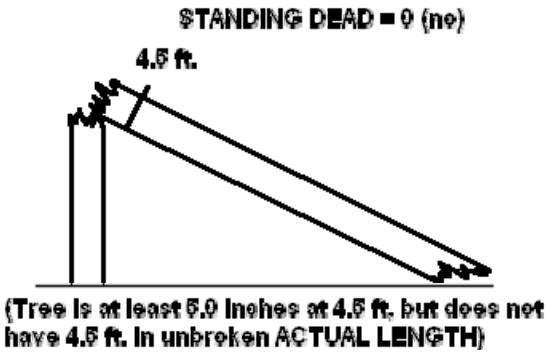


Figure 19. Example of an unbroken length of < 1.5 feet.

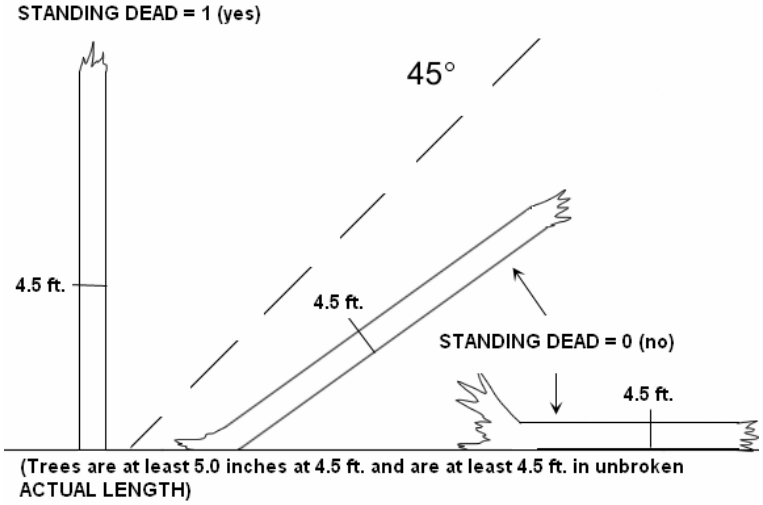


Figure 20. Other examples of dead trees.

5.7.3 MORTALITY (CORE OPTIONAL)

5.8 SPECIES

Record the appropriate SPECIES code from the list in Appendix 3. If you encounter a species not listed in Appendix 3 and are not sure if it should be tallied as a tree, consult your Field Supervisor. If the species cannot be determined in the field, tally the tree, but bring branch samples, foliage, cones, flowers, bark, etc. to your supervisor for identification. If possible, collect samples outside the subplots from similar specimens and make a note to correct the SPECIES code later. Use code 0299 for unknown dead conifer, 0998 for unknown dead hardwood when the genus or species codes cannot be used, and 0999 for other or unknown live tree. The generic code should only be used when you are sure the species is on the species list, but you cannot differentiate among acceptable species. This is often the case with standing dead trees on newly established plots. In this case use the sample collections procedures described earlier in this paragraph.

When Collected: All tally trees
Field width: 4 digits
Tolerance: No errors
MQO: At least 99% of the time for genus, at least 95% of the time for species
Values: See Appendix 3

5.9 DIAMETER

Diameters are measured at either breast height (DBH) or at the root collar (DRC). Species requiring DRC, referred to as woodland species, are denoted with a “w” in Appendix 3. Trees with diameters between 1.0- and 4.9-inches are measured on the 6.8-foot radius microplot, those with diameters of 5.0-inches and larger are measured on the 24-foot radius subplots.

In order to accurately remeasure diameter (DBH or DRC) at the same point on the tree bole at successive visits, regions have the option of measuring and recording the distance from the ground to the point of diameter measurement, or marking the point of measurement with a scribe, crayon, paint, or aluminum nail. When marking trees for the first time, measure the diameter after the mark is in place. Use caution to avoid damaging trees with scribes and nails. Do not scribe or nail trees less than 3.0-inches in diameter, or species vulnerable to introduction of pathogens (e.g., aspen). Do not penetrate the cambium when using a bark scribe.

Remeasurement trees:

When remeasuring the diameter of a tree tallied at a previous survey, always take the measurement at the location monumented by the previous crew unless it is not physically possible (e.g., tree buried by mudslide), there is an abnormality at the previous DIAMETER measurement point, or the previous location is more than 12 inches beyond where the diameter should be measured according to current protocols (either because protocols have changed or the previous crew made a mistake). Assign a DIAMETER CHECK code of 2 whenever the point of measurement is moved.

When Collected: SAMPLE KING = 1, 2, 3 and 8: All live tally trees $\geq$ 1.0 in DBH/DRC and standing dead tally trees $\geq$ 5.0 in DBH/DRC
SAMPLE KIND = 9: All live prism trees $\geq$ 1.0 in DBH
Field width: 4 digits (xxx.y)
Tolerance: +/- 0.1 in per 20.0 in increment of measured diameter on all live trees and dead trees with DECAY CLASS = 1, 2
+/- 1.0 in per 20.0 in increment of measured diameter on dead trees with DECAY CLASS = 3, 4, 5
For woodland species: +/- 0.2 in per stem
MQO: At least 95% of the time. For example: a tree with a diameter of 41.0 in would have a tolerance of plus or minus 0.3 in. (Note: the MQO for point of measurement is +/- 0.2 in when the tree is first measured and within 1 ft of the location established by the previous crew when the tree is remeasured.)
Values: 001.0 to 999.9

5.9.1 PREVIOUS DIAMETER AT BREAST HEIGHT

This is the DBH assigned at the previous survey. It has been downloaded from the previous inventory.

5.9.2 DIAMETER AT BREAST HEIGHT (DBH)

Unless one of the following special situations is encountered, measure DBH at 4.5 feet above the ground line on the uphill side of the tree. Round each measurement down to the last 0.1 inch. For example, a reading of 3.68 inches is recorded as 3.6 inches.

Special DBH situations:

1. Forked tree: In order to qualify as a fork, the stem in question must be at least 1/3 the diameter of the main stem and must branch out from the main stem at an angle of 45 degrees or less. Forks originate at the point on the bole where the piths intersect. Forked trees are handled differently depending on whether the fork originates below 1.0 foot, between 1.0 and 4.5 feet, or above 4.5 feet.

- Trees forked below 1.0 foot. Trees forked in this region are treated as distinctly separate trees (Figure 21). Distances and azimuths are measured individually to the center of each stem where it splits from the stump (Figure 24 A-C). DBH is measured for each stem at 4.5 feet above the ground. When stems originate from pith intersections below 1 foot, it is possible for some stems to be within the limiting distance of the microplot or subplot, and others to be beyond the limiting distance. If stems originating from forks that occur below 1.0 foot fork again between 1.0 and 4.5 feet (Figure 24-E), the rules in the next paragraph apply.

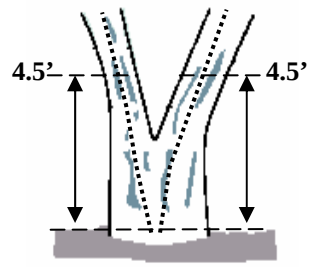


Figure 21. Forked below 1.0 ft.

- Trees forked between 1.0 foot and 4.5 feet. Trees forked in this region are also counted as separate trees (Figure 22), but only one distance and azimuth (to the central stump) is used for all (Figure 24 D-F). Although a single azimuth and distance applies to all, multiple stems should be recorded as they occur in clockwise order (from front to back when one stem is directly in front of another). The DBH of each fork is measured at a point 3.5 feet above the pith intersection. When forks originate from pith intersections between 1.0 and 4.5 feet, the limiting distance is the same for all forks--they are either all on, or all off the plot.

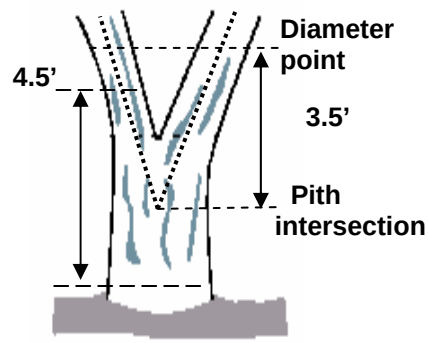


Figure 22. Forked between 1.0-4.5 ft.

Multiple forks are possible if they all originate from approximately the same point on the main stem. In such cases, measure DBH on all stems at 3.5 feet above the common pith intersection (Figure 24-F).

Once a stem is tallied as a fork that originated from a pith intersection between 1.0 and 4.5 feet, do not recognize any additional forks that may occur on that stem. Measure the diameter of such stems just below the base of stem separation as shown in Figure 24-E (i.e., do not move the point of diameter the entire 3.5 feet above the first fork).

Trees forked at or above 4.5 feet. Trees forked in this region count as one single tree (Figure 23). If a fork occurs at or immediately above 4.5 feet, measure diameter below the fork just beneath any swelling that would inflate DBH.

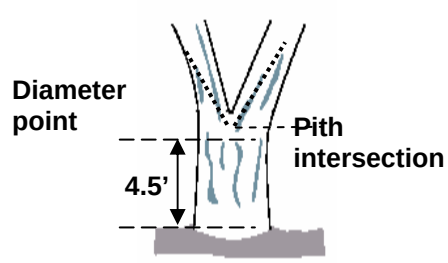


Figure 23. One tree.

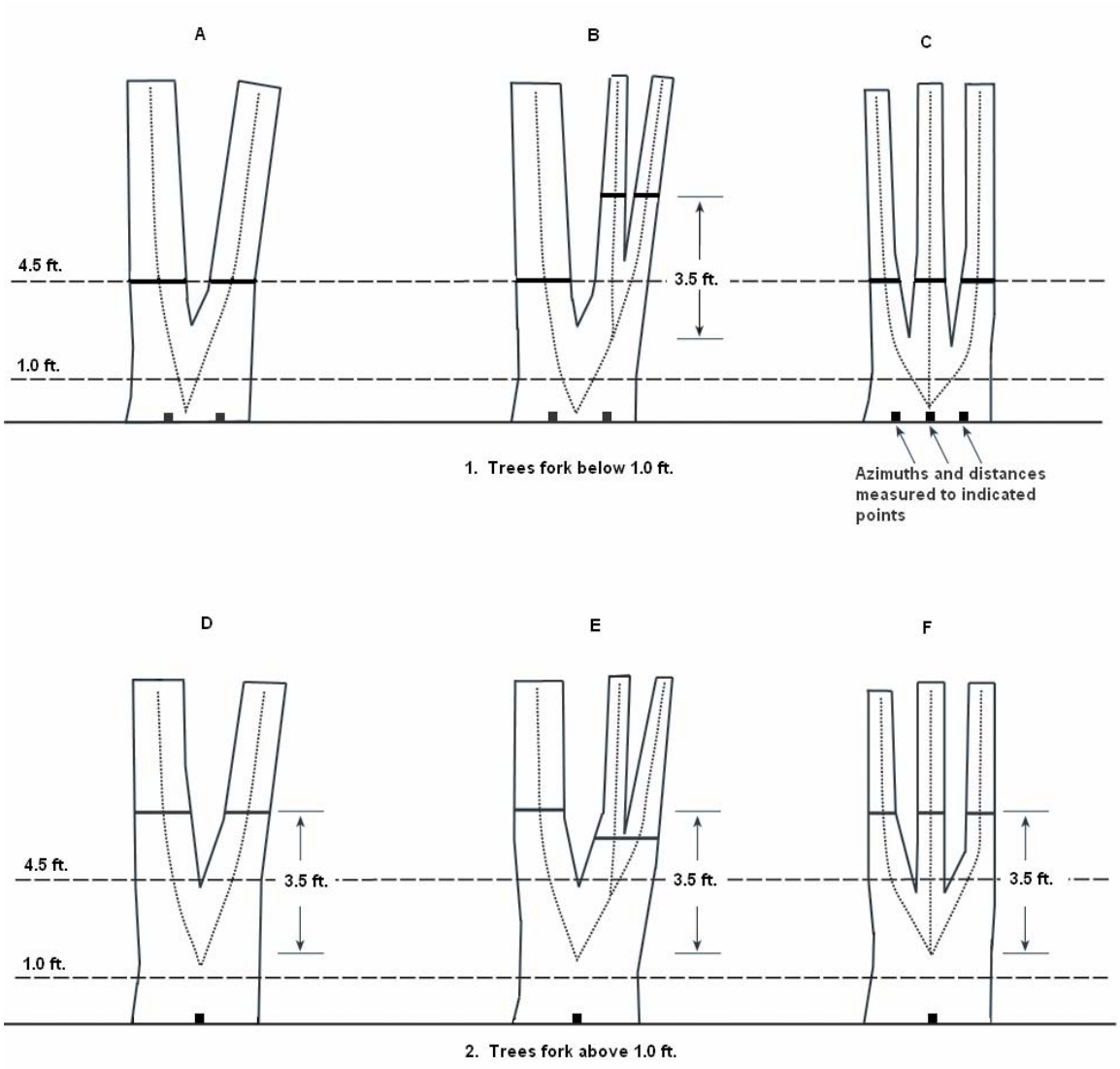


Figure 24. Summary of where to measure DBH, distance, and azimuth on forked trees.

2. Stump Sprouts. Stump sprouts originate between ground level and 4.5 feet on the boles of trees that have died or been cut. Stump sprouts are handled the same as forked trees, with the exception that stump sprouts are not required to be 1/3 the diameter of the dead bole. Stump sprouts originating below 1.0 foot are measured at 4.5 feet from ground line. Stump sprouts originating between 1.0 foot and 4.5 feet are measured at 3.5 feet above their point of occurrence. As with forks, rules for measuring distance and azimuth depend on whether the sprouts originate above or below 1.0 foot. For multi-stemmed woodland species, treat all new sprouts as part of the same new tree.

3. Tree with butt-swell or bottleneck: Measure these trees 1.5 feet above the end of the swell or bottleneck if the swell or bottleneck extends 3.0 feet or more above the ground (Figure 25). Use a prism with a known BAF to determine diameter on trees where the diameter measurement point is too high to reach. See the coding summary for complete directions.

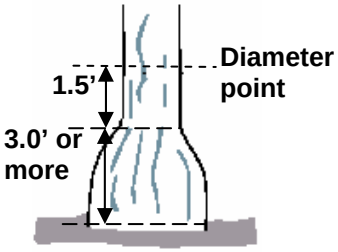


Figure 25. Bottleneck tree.

4. Tree with irregularities at DBH: On trees with swellings (Figure 26), bumps, depressions, and branches (Figure 27) at DBH, diameter will be measured immediately above the irregularity at the place it ceases to affect normal stem form.

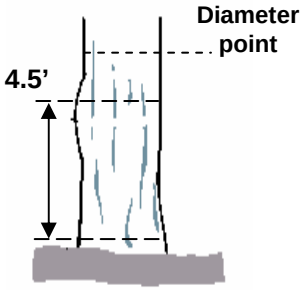


Figure 26. Tree with swelling.

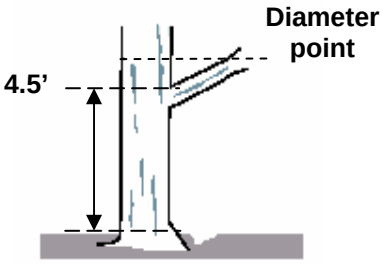


Figure 27. Tree with branch.

5. Tree on slope: Measure diameter at 4.5 feet from the ground along the bole on the uphill side of the tree (Figure 28).

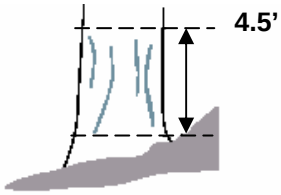


Figure 28. Tree on a slope.

6. Leaning tree: Measure diameter at 4.5 feet from the ground along the bole. The 4.5-foot distance is measured along the underside face of the bole (Figure 29).

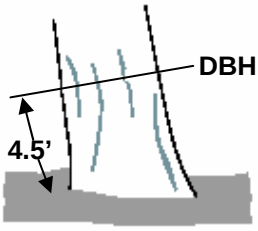


Figure 29. Leaning tree.

7. Turpentine tree: On trees with turpentine face extending above 4.5 feet, estimate the diameter at 10.0 feet above the ground and multiply by 1.1 to estimate DBH outside bark.

8. Independent trees that grow together: If two or more independent stems have grown together at or above the point of DBH, continue to treat them as separate trees. Estimate the diameter of each, set the "DIAMETER CHECK" code to 1, and explain the situation in the notes.

9. Missing wood or bark. Do not reconstruct the DBH of a tree that is missing wood or bark or at the point of measurement. Record the diameter, to the nearest 0.1 inch, of the wood and bark that is still attached to the tree (Figure 30). If a tree has a localized abnormality (gouge, depression, etc.) at the point of point of DBH, apply the procedure described for trees with irregularities at DBH (Figure 26 and 27).

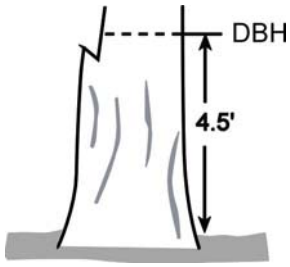


Figure 30. Tree with part of stem missing.

10. Live windthrown tree: Measure from the top of the root collar along the length to 4.5 feet (Figure 31).

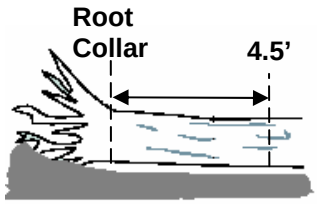


Figure 31. Tree on the ground.

11. Down live tree with tree-form branches growing vertical from main bole. When a down live tree, touching the ground, has vertical (less than 45 degrees from vertical) tree-like branches coming off the main bole, first determine whether or not the pith of the main bole (averaged along the first log of the tree) is above or below the duff layer.

- If the pith of the main bole is above the duff layer, use the same forking rules specified for a forked tree, and take all measurements accordingly (Figure 32).

- If the pith intersection of the main down bole and vertical tree-like branch occurs below 4.5 feet from the stump along the main bole, treat that branch as a separate tree, and measure DBH 3.5 feet above the pith intersection for both the main bole and the tree-like branch.

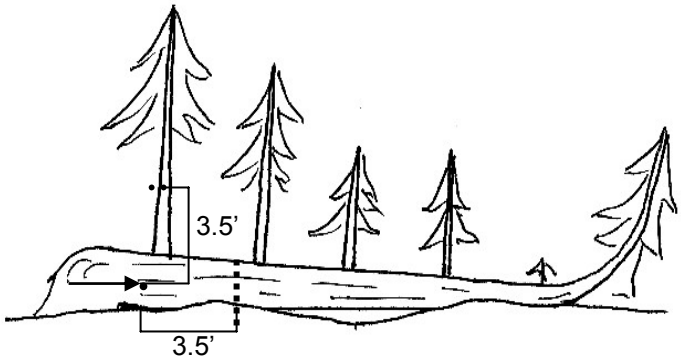


Figure 32. Down tree above duff.

- If the intersection between the main down bole and the tree-like branch occurs beyond the 4.5 feet point from the stump along the main bole, treat that branch as part of the main down bole.

- If the pith of main tree bole is below the duff layer, ignore the main bole, and treat each tree-like branch as a separate tree; take DBH and length measurements from the ground, not necessarily from the top of the down bole (Figure 33). However, if the top of the main tree bole curves out of the ground towards a vertical angle, treat that portion of that top as an individual tree originating where the pith leaves the duff layer.

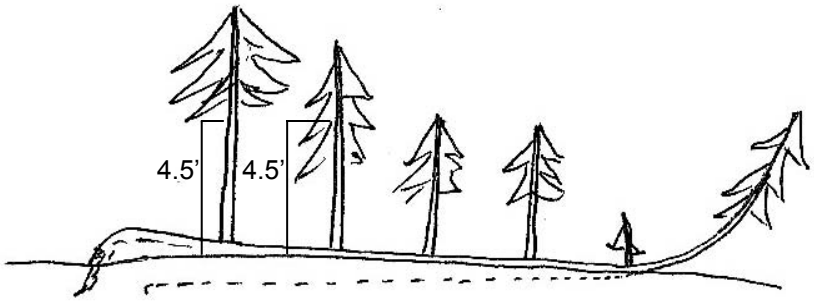


Figure 33. Down tree below duff.

12. Tree with curved bole (pistol butt tree): Measure along the bole on the uphill side (upper surface) of the tree (Figure 34).

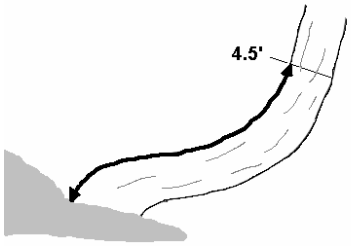


Figure 34. Tree with curved bole (pistol butt tree).

5.9.3 PREVIOUS DIAMETER AT ROOT COLLAR
5.9.4 DIAMETER AT ROOT COLLAR (DRC)
5.9.4.1 DRC STEM DIAMETER
5.9.4.2 DRC STEM STATUS
5.10 PAST NUMBER OF STEMS
5.11 CURRENT NUMBER OF STEMS

5.12 DIAMETER CHECK

Record this code to identify any irregularities in diameter measurement positions (e.g., abnormal swellings, diseases, damage, new measurement positions, etc.) that may affect use of this tree in diameter growth/change analyses.

When Collected: When PRESENT DIAMETER > 0
Field width: 1 digit
Tolerance: No errors
MQO: At least 99% of the time
Values:

- 0 Diameter measured accurately
- 1 Diameter estimated
- 2 Diameter measured at different location than previous measurement (remeasurement trees only)

Note: If both codes 1 and 2 apply, use code 2.

5.13 ROTTEN/MISSING CULL

Record the percent rotten or missing cubic-foot cull for all live tally trees greater than or equal to 5.0 inches DBH/DRC (CORE), mortality trees with a PREVIOUS DIAMETER ≥ 5.0 inches, and all new standing dead tally trees greater than or equal to 5.0 inches DBH/DRC (CORE OPTIONAL) when RECONCILE = 1 - 3.

Record the percentage of rotten and missing cubic-foot volume, to the nearest 1 percent. When estimating volume loss (tree cull), only consider the cull on the merchantable bole/portion of the tree, from a 1-foot stump to a 4-inch top. Do not include any cull estimate above ACTUAL LENGTH. For western woodland species, the merchantable portion is between the point of DRC measurement to a 1.5-inch DOB top.

For mortality trees with a PREVIOUS DIAMETER ≥ 5.0 inches that are NOT at least 5 feet in length or have ≥ 50% ROTTEN/MISSING CULL, then record ROTTEN MISSING CULL = 99.

Rotten and missing volume loss is often difficult to estimate. Refer to supplemental disease and insect pests field guides and local defect guidelines as an aid in identifying damaging agents and their impact on volume loss. Use your best judgment and be alert to such defect indicators as the following:

- Cankers or fruiting bodies.
- Swollen or punky knots.
- Dull, hollow sound of bole (use regional standards).
- Large dead limbs, especially those with frayed ends.
- Sawdust around the base of the tree.
- Metal in tree (e.g., sign, deer stands, fences, etc.).

Cull portions of the tree that contain embedded metal objects (e.g., fencing, nails) and sections between metal objects that are less than 4 feet in length, from the stump to the 4-inch top. Embedded aluminum is okay.

When Collected: All live tally trees ≥ 5.0 in DBH; all mortality trees with a PREVIOUS DIAMETER ≥ 5.0 inches; and all PRESENT TREE STATUS = 2 with RECONCILE = 1 - 3
Field width: 2 digits
Tolerance: +/- 10 %
MQO: At least 90% of the time
Values: 00 to 99

5.14 TOTAL LENGTH

Record the TOTAL LENGTH of the tree, to the nearest 1.0 foot from ground level to the top of the tree. For trees growing on a slope, measure on the uphill side of the tree. If the tree has a missing top (top is broken and completely detached from the tree), estimate what the total length would be if there were no missing top. Forked trees should be treated the same as unforked trees.

When Collected: Phase 2 CORE – SAMPLE KIND 1, 2, and 8: All live tally trees ≥ 5.0 in DBH/DRC with intact top (not broken); SAMPLE KIND 9: same as other SAMPLE KINDS, except not required on dead prism trees
Field width: 3 digits
Tolerance: +/- 10 % of true length
MQO: At least 90% of the time
Values: 005 to 400

5.15 ACTUAL LENGTH

For trees with missing tops (top on live trees is completely detached; top on dead trees is greater than 50 percent detached from the tree). If the top is intact, this item may be omitted. Record the ACTUAL LENGTH of the tree to the nearest 1.0 foot from ground level to the break. Use the length to the break for ACTUAL LENGTH until a new leader qualifies as the new top for TOTAL LENGTH; until that occurs, continue to record ACTUAL LENGTH to the break. Trees with previously broken tops are considered recovered (i.e., ACTUAL LENGTH = TOTAL LENGTH) when a new leader (dead or alive) is 1/3 the diameter of the broken top at the point where the top was broken (not where the new leader originates from the trunk). Forked trees should be treated the same as unforked trees.

When Collected: Phase 2 CORE - SAMPLE KIND 1, 2, and 8: All live and standing dead tally trees (with broken or missing tops) ≥ 5.0 in DBH/DRC; SAMPLE KIND 9: same as other SAMPLE KINDS, except not required on dead prism trees
Field width: 3 digits
Tolerance: +/- 10 % of true length
MQO: At least 90% of the time
Values: 005 to 400

5.16 LENGTH METHOD

Record the code that indicates the method used to determine tree lengths.

When Collected: When TOTAL and/or ACTUAL LENGTHS are > 0
Field width: 1 digit
Tolerance: No errors
MQO: At least 99% of the time
Values:

1 Total and actual lengths are field measured with a measurement instrument (e.g., clinometer, relascope, tape)
2 Total length is visually estimated, actual length is measured with an instrument
3 Total and actual lengths are visually estimated
4 Total is generated by office, actual is measured with an instrument (Standing dead trees with broken tops only)

5.17 CROWN CLASS

Rate tree crowns in relation to the sunlight received and proximity to neighboring trees (Figure 36). Base the assessment on the position of the crown at the time of observation. Example: a formerly overtopped tree which is now dominant due to tree removal is classified as dominant.

When Collected: All live tally trees ≥ 1.0 in DBH/DRC on the four subplots and the off-set microplots (PRESENT TREE STATUS = 1)
Field width: 1 digit
Tolerance: No errors
MQO: At least 85% of the time
Values:

1 Open Grown – trees with crowns that received full light from above and from all sides throughout most of its life, particularly during its early developmental period.
2 Dominant – trees with crown extending above the general level of the crown canopy and receiving full light from above and partly from the sides. These trees are taller than the average trees in the stand and their crowns are well developed, but they could be somewhat crowded on the sides. Also, trees whose crowns have received full light from above and from all sides during early development and most of their life. Their crown form or shape appears to be free of influence from neighboring trees.
3 Co-dominant – trees with crowns at the general level of the crown canopy. Crowns receive full light from above but little direct sunlight penetrates their sides. Usually they have medium-sized crowns and are somewhat crowded from the sides. In stagnated stands, co-dominant trees have small-sized crowns and are crowded on the sides.
4 Intermediate – trees that are shorter than dominants and co-dominant, but their crowns extend into the canopy of co-dominant and dominant trees. They receive little direct light from above and none from the sides. As a result, intermediate trees usually have small crowns and are very crowded from the sides.
5 Overtopped – trees with crowns entirely below the general level of the crown canopy that receive no direct sunlight either from above or the sides.

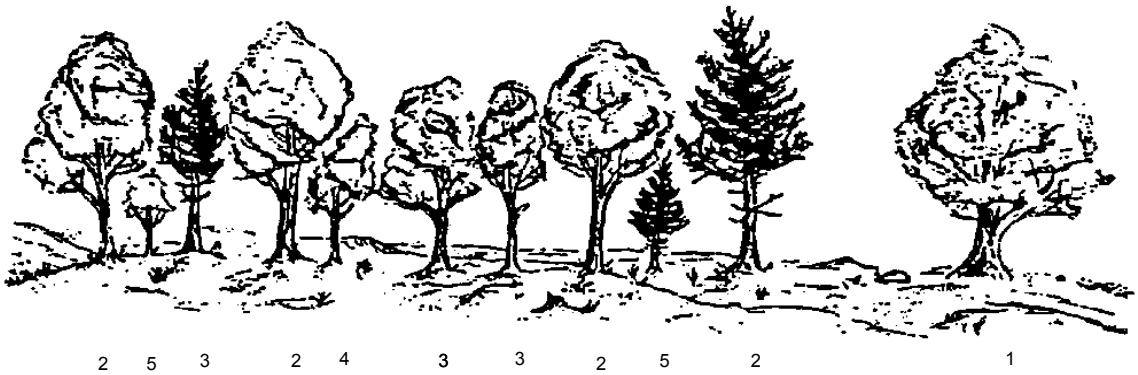


Figure 36. Examples of CROWN CLASS code definitions (numbers are the CROWN CLASS codes).

5.18 UNCOMPACTED LIVE CROWN RATIO (Phase 2 – CORE OPTIONAL, Phase 3 – CORE)
Record the UNCOMPACTED LIVE CROWN RATIO to the nearest one percent.
UNCOMPACTED LIVE CROWN RATIO is the percentage of actual tree length supporting live foliage (or in cases of extreme defoliation should be supporting live foliage) that is effectively contributing to tree growth. UNCOMPACTED LIVE CROWN RATIO is determined by the ratio of live crown length to actual tree length (Figure 37). Live crown length is determined from the last live foliage at the crown top (dieback in the upper portion of the crown is not part of the live crown) to the "base of live crown". Many times there are additional live branches below the "base of live crown". These branches are only included if they have a basal diameter greater than 1 inch and are within 5 feet of the base of the obvious live crown. The live crown base becomes that point on the main bole perpendicular to the lowest live foliage on the last branch that is included in the live crown. The live crown base is determined by the live foliage and not by the point where a branch intersects with the main bole.

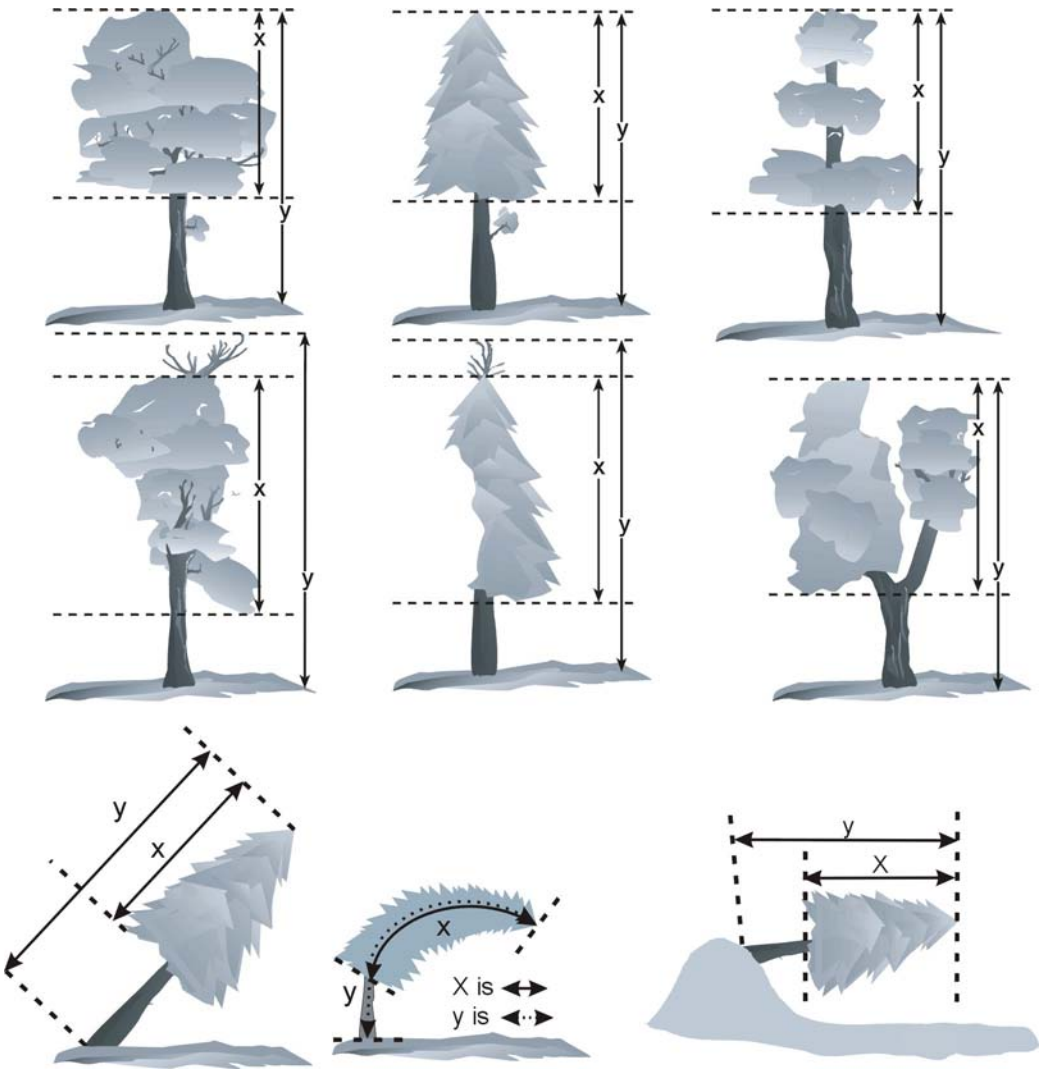


Figure 37. UNCOMPACTED LIVE CROWN RATIO examples.

Determine sapling UNCOMPACTED LIVE CROWN RATIO by dividing the live crown length by actual tree length. Live crown length is the distance between the top live foliage (dieback and dead branches are not included) and the lowest live twig for saplings. The live crown base for saplings is different from trees 5.0 inches DBH/DRC and larger; the 1-inch/5-foot rule does not apply in this case. Do not include sprigs or leaves on the main stem below the lowest live twig (Figure 38).

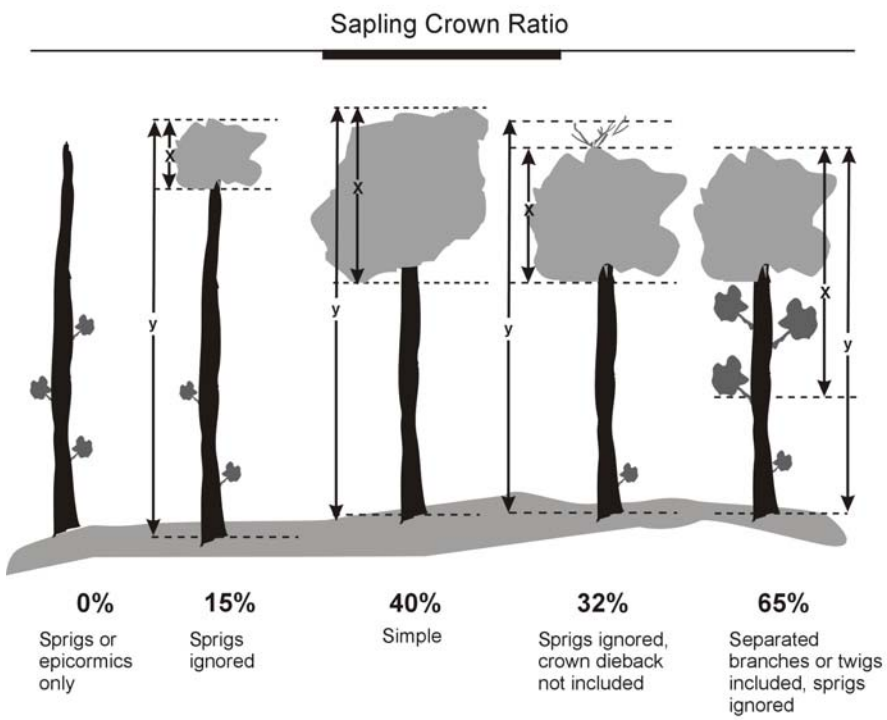


Figure 38. Sapling ratio determination examples.

When collected: Phase 3 plots (CORE) – All live tally trees ≥ 1.0 in DBH/DRC
Field width: 2 digits
Tolerance: +/- 10%
MQO: At least 90% of the time
Values: 00 to 99 percent

5.19 COMPACTED CROWN RATIO

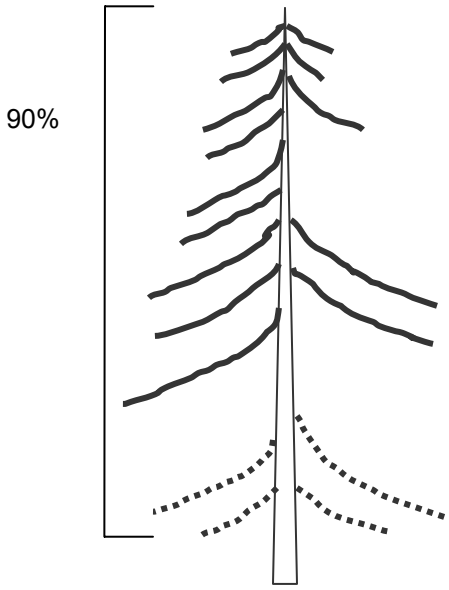
Record the COMPACTED CROWN RATIO for each live tally tree, 1.0 inch and larger, to the nearest one percent. COMPACTED CROWN RATIO is that portion of the tree supporting live foliage (or in the case of extreme defoliation should be supporting live foliage) and is expressed as a percentage of the actual tree length. To determine COMPACTED CROWN RATIO, ocularly transfer lower live branches to fill in large holes in the upper portion of the tree until a full, even crown is visualized.

Do not over-compact trees beyond their typical full crown situation. For example, if tree branches tend to average 2 feet between whorls, do not compact crowns any tighter than the 2-foot spacing (Figure 39). Figure 40 shows an example of COMPACTED CROWN RATIO on a leaning tree.

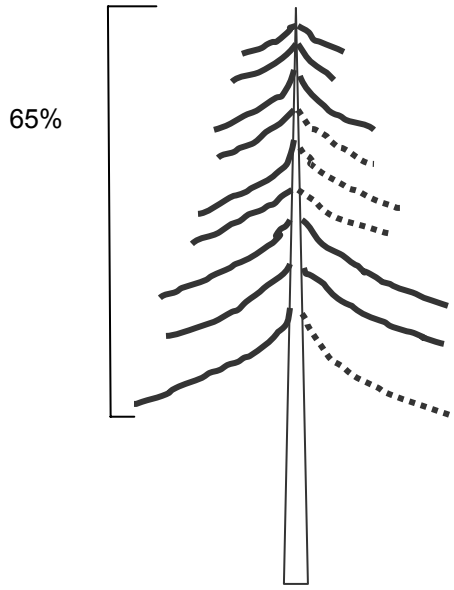
When Collected: All live tally trees ≥ 1.0 in DBH/DRC
Field width: 2 digits
Tolerance: +/- 10 %
MQO: At least 80% of the time
Values: 00 to 99

Open-crown conifer (e.g., ponderosa pine) –

Uncompacted:

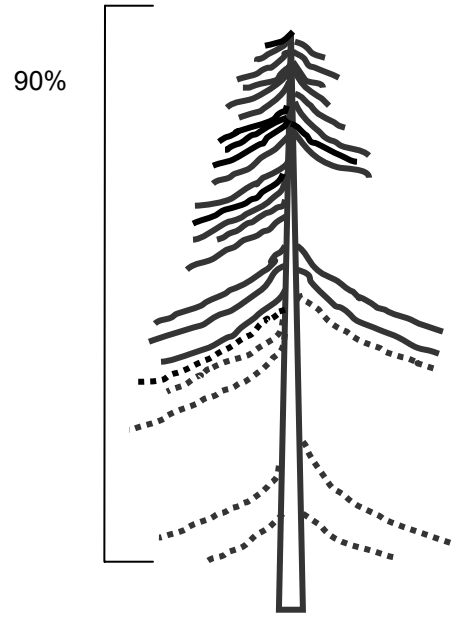


Compacted:



Dense-crown conifer (e.g., subalpine fir) –

Uncompacted:



Compacted:

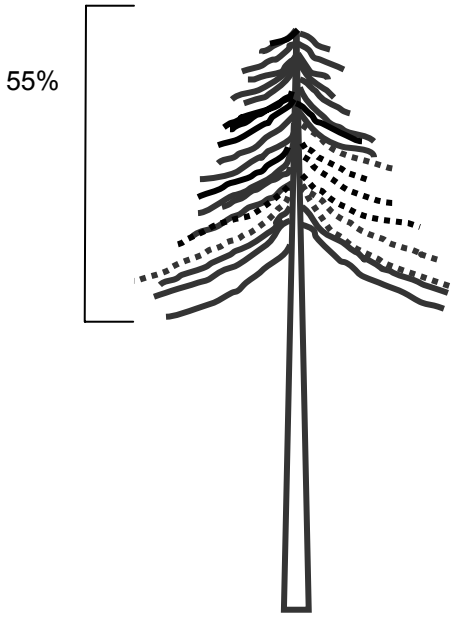


Figure 39. Examples of and comparison between COMPACTED CROWN RATIO and UNCOMPACTED LIVE CROWN RATIO of conifers.

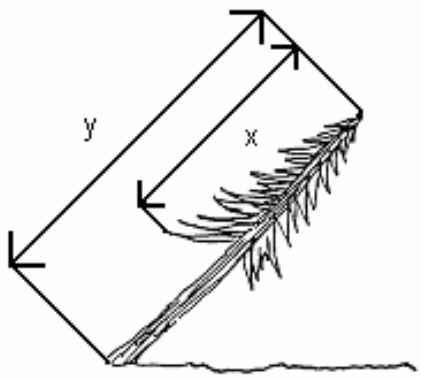


Figure 40. COMPACTED CROWN RATIO on a leaning tree. CROWN RATIO = (x/y)100.

5.20 Tree Damage
5.20.1 DAMAGE LOCATION 1 (CORE OPTIONAL)
5.20.2 DAMAGE TYPE 1 (CORE OPTIONAL)
5.20.3 DAMAGE SEVERITY 1 (CORE OPTIONAL)
5.20.4 DAMAGE LOCATION 2 (CORE OPTIONAL)
5.20.5 DAMAGE TYPE 2 (CORE OPTIONAL)
5.20.6 DAMAGE SEVERITY 2 (CORE OPTIONAL)

5.21 CAUSE OF DEATH

Record a cause of death for all trees that have died or been cut since the previous survey. If cause of death cannot be reliably estimated, record unknown/not sure/other.

When Collected: CORE: SAMPLE KIND = 2 and 8 plots: all PREVIOUS TREE STATUS = 1 and PRESENT TREE STATUS = 2 or 3; PRESENT TREE STATUS = 2 and RECONCILE = 1, 2, or 3; all PAST TREE STATUS = 1 and OLD MICROPLOT STATUS = 2 or 3; SAMPLE KIND 9 plots: all PRISM TREE STATUS = 2 or 3

Field width: 2 digits
Tolerance: No errors
MQO: At least 80% of the time
Values:

- 10 Insect
- 20 Disease
- 30 Fire
- 40 Animal
- 50 Weather
- 60 Vegetation (suppression, competition, vines/kudzu)
- 70 Unknown/not sure/other - includes death from human activity not related to silvicultural or landclearing activity (accidental, random, etc.). TREE NOTES required.
- 80 Silvicultural or landclearing activity (death caused by harvesting or other silvicultural activity, including girdling, chaining, etc., or to landclearing activity)
  - 81 Live tree in a landclearing
  - 82 Dead tree in a landclearing
  - 83 Utilized tree in a landclearing

5.22 MORTALITY YEAR (CORE OPTIONAL)

Record the estimated year that remeasured trees died or were cut. For each remeasured tree that has died or been cut since the previous inventory, record the 4-digit year in which the tree died. Mortality year is also recorded for trees on land that has been converted to a nonforest land use, if it can be determined that a tree died before the land was converted. Record the year the tree was converted to a nonforest land use or the year the tree was cut or died, whichever was first.

When Collected: When CAUSE OF DEATH > 0
Field width: 4 digits
Tolerance: +/- 1 year for remeasurement cycles of 5 years
+/- 2 years for remeasurement cycles of > 5 years
MQO: At least 70% of the time
Values: 1995 or higher

5.23 DECAY CLASS

Record for each standing dead tally tree, 5.0 inches in diameter and larger, the code indicating the tree's stage of decay.

When Collected: All standing dead tally trees ≥ 5.0 in DBH/DRC on the four subplots
Field width: 1 digit
Tolerance: +/- 1 class
MQO: At least 90% of the time
Values: Use the following table for guidelines:

Decay class stage (code)	Limbs and branches	Top	% Bark Remaining	Sapwood presence and condition*	Heartwood condition*
1	All present	Pointed	100	Intact; sound, incipient decay, hard, original color	Sound, hard, original color
2	Few limbs, no fine branches	May be broken	Variable	Sloughing; advanced decay, fibrous, firm to soft, light brown	Sound at base, incipient decay in outer edge of upper bole, hard, light to reddish brown
3	Limb stubs only	Broken	Variable	Sloughing; fibrous, soft, light to reddish brown	Incipient decay at base, advanced decay throughout upper bole, fibrous, hard to firm, reddish brown
4	Few or no stubs	Broken	Variable	Sloughing; cubical, soft, reddish to dark brown	Advanced decay at base, sloughing from upper bole, fibrous to cubical, soft, dark reddish brown
5	None	Broken	Less than 20	Gone	Sloughing, cubical, soft, dark brown, OR fibrous, very soft, dark reddish brown, encased in hardened shell

*Characteristics are for Douglas-fir. Dead trees of other species may vary somewhat. Use this only as a guide.

5.24 LENGTH TO DIAMETER MEASUREMENT POINT (CORE OPTIONAL)

Record this item when tree diameter measurement locations are not monumented. For those trees measured directly at 4.5 feet above the ground, leave this item blank. If the diameter is not measured at 4.5 feet, record the actual length from the ground, to the nearest 0.1 foot, at which the diameter was measured for each tally tree, 1.0 inch DBH and larger. Leave this item blank for western woodland species measured for diameter at root collar.

When Collected: When PRESENT DIAMETER > 0
Field width: 3 digits
Tolerance: +/- 0.2 ft
MQO: At least 90% of the time
Values: 00.1 – 15.0

5.25 ROUGH CULL (CORE OPTIONAL)
5.26 MISTLETOE CLASS (CORE OPTIONAL)

5.27 TREE NOTES

Record notes pertaining to an individual tree as called for to explain or describe another variable.

When collected: All trees
Field width: Alphanumeric character field
Tolerance: N/A
MQO: N/A
Values: English language words, phrases and numbers

5.28 OLD MICROPLOT REMEASUREMENT PROCEDURES

This describes the tree level variables that are recorded when remeasuring the old microplot on the Southern FIA unit's fixed radius subplot design (SAMPLE KIND = 8). Only account for the saplings recorded at the last inventory, missed saplings, and through growth trees. Do not tally any new ingrowth saplings.

No status

For stems that are not presently in the sample, either due to shrinkage, are moved off the microplot, previous cruiser error, definitional or procedural change, or are now in a Nonforest/Nonsampled condition class, retain the same TREE RECORD NUMBER, then do the following:

- record OLD MICROPLOT STATUS = 0
- record the appropriate RECONCILE CODE

If a live sapling has been physically moved off the old microplot, is now on the new off-set microplot, and is still less than 5.0 inches DBH, and is:

- record OLD MICROPLOT STATUS = 0
- record PRESENT TREE STATUS = 1
- record RECONCILE = 6

If a live sapling has moved off the old microplot, has grown up to 5.0 inches or greater, and is now on the subplot:

- record OLD MICROPLOT STATUS = 0
- record PRESENT TREE STATUS = 1
- record RECONCILE = 6

If a sapling has grown up to 5.0 inches or greater, has been physically moved off the old microplot, is now on the subplot, but has since died:

- record OLD MICROPLOT STATUS = 0
- record PRESENT TREE STATUS = 2
- record RECONCILE = 6.

Live stems

For live saplings on the old microplot that were recorded as saplings at the previous inventory and are currently still less than 5.0 inches DBH:

- retain the same TREE RECORD NUMBER recorded at the previous inventory
- record OLD MICROPLOT STATUS = 1

For live saplings that are on both the previous old microplots and the new off-set microplots:

- retain the same TREE RECORD NUMBER recorded at the previous inventory
- record PRESENT TREE STATUS = 1, and record OLD MICROPLOT STATUS = 1
- record the required sapling tally items
- be sure to get an azimuth and distance to the new off-set microplot

For live stems on the old microplot that were recorded as saplings at the previous inventory and have grown to 5.0 inches or greater since the previous inventory:

- retain the same TREE RECORD NUMBER recorded at the previous inventory
- record PRESENT TREE STATUS = 1, and record OLD MICROPLOT STATUS = 1
- record the required tree tally items

- be sure to get an azimuth and distance to subplot center

Through growth trees
For live stems on the old microplot that were seedlings at the previous inventory and have grown to 5.0 inches or greater since then:
- record the next available TREE RECORD NUMBER
- record PRESENT TREE STATUS = 1
- record RECONCILE = 2 (through growth)
- record the required tree tally items described in Section 5.0
- be sure to get an azimuth and distance to subplot center

Missed trees
Be wary of recording saplings as missed trees. Unless it is obvious that the previous cruiser was in error, give the benefit of the doubt. However, if it is determined that the tree definitely should have been tallied as a sapling at the previous inventory but was not tallied, then do the following:
- record the next available TREE RECORD NUMBER
- record OLD MICROPLOT STATUS = 1 if alive
- also record PRESENT TREE STATUS = 1 if alive AND $\geq$ 5.0 in DBH
- record OLD MICROPLOT STATUS = 2 if dead
- also record PRESENT TREE STATUS = 2 if dead AND $\geq$ 5.0 in DBH
- record RECONCILE = 3 (missed live)

Dead trees
For dead stems that were recorded as live saplings at the previous inventory and are currently less than 5.0 inches DBH:
- retain the same TREE RECORD NUMBER recorded at the previous inventory
- record OLD MICROPLOT STATUS = 2

For dead stems on the old microplot that were recorded as live saplings at the previous inventory but are currently 5.0 inches or greater:
- retain the same TREE RECORD NUMBER recorded at the previous inventory
- record PRESENT TREE STATUS = 2
- record OLD MICROPLOT SAPLING STATUS = 2

Utilized trees
- retain the same TREE RECORD NUMBER recorded at the previous inventory
- record OLD MICROPLOT SAPLING STATUS = 3

5.29 PRISM POINT REMEASUREMENT PROCEDURES

This describes the tree level variables that are recorded when remeasuring both the previous Southern FIA unit's 10-point variable radius plots and the previous Southeastern FIA unit's 5-point variable radius plots (SAMPLE KIND = 9).

Remeasurement tally
All trees 1.0 inch and larger on the previous inventory will be accounted for on prism points 1 through 3. Only those trees that were 5.0 inches or larger last inventory are remeasured on prism points 4 and 5. Additionally, trees within the 6.8-foot radius on prism points 1 through 3 that were less than 1.0 inch at the last inventory and have now grown to 5.0 inches or larger are recorded as through growth trees. Never remeasure trees that were less than 1.0 inch at the previous survey.

NOTE: The previous Southern station measured all saplings within a 7.1-foot radius plot at all points. Ignore all saplings on points 4 and 5. Check all previous distances on saplings that were recorded between 6.8 and 7.1 feet. Only remeasure the saplings that are within a 6.8-foot radius on prism points 1 - 3. If a sapling was recorded within 6.8 feet at the last survey and now is beyond 6.8 feet, then code PRISM TREE STATUS = 0. Ignore any sapling measured beyond 6.8 feet in both the previous and current inventory.

Trees that are on both the old prism plot and the new mapped plot are tallied as a single tree entry. Record all required items listed here as well as all required mapped tree level variables for trees that are common to both plots.

5.30 ENTRY NUMBER

The entry number is pre-printed on tally sheets and is automatically created in Data Recorder.

When collected: All tally trees and entries to label no tally on subplot
Field width: 3 digits
Tolerance: no errors
MQO: At least 99% of the time
Values: 001 to 999

5.31 PRISM POINT NUMBER(#)/TREE NUMBER(#)

Record the 1 digit point number and the unique 2-digit tree number that was recorded in the previous survey. Never change the old point number or old tree number. Record the point number and two zeros for the tree number when there are no remeasurement trees on a prism point. Use the next available tree number when assigning new numbers to missed and through growth trees. Also, record the point number/tree number, azimuth and distance of missed and through growth trees in the Tree Notes item for check cruise purposes.

When collected: Sample Kind 9, all prism tally; entry to record no tally on prism point
Field width: 3 digits
Values: 100-599

5.32 OLD MICROPLOT STATUS

Record a status code for each sapling on the old microplot.

When Collected: SAMPLE KIND 8 only: All previously tallied saplings and missed live saplings on the old microplot.
Field width: 1 digit
Values:

0 No status –- tree is not presently in the sample. Tree was incorrectly tallied at the previous inventory, currently is not tallied due to definition or procedural change, is not tallied due to natural causes (physically moved off the plot), or is no longer in accessible forest land due to landclearing or is in a nonsampled area (CONDITION STATUS = 2-5). Requires RECONCILE code = 5-9.

1 Live tree –live, remeasured or missed tree (RECONCILE =3)

2 Dead tree -- dead tree, regardless of cause of death. Includes trees killed by silvicultural activity, and are assumed not to have been utilized.

3 Utilized - a tree that has been cut and removed by direct human activity related to harvesting, or silviculture. The tree is assumed to have been utilized.

5.33 PRISM TREE STATUS

Record a status code for each prism point tree; this code is used to track the status of sample trees over time. This information is needed to correctly assign volume information to the proper component of volume change.
Note: For any prism point tree that is now on the new mapped plot, crews must collect new azimuth and distance information.

When Collected: SAMPLE KIND 9 only: All previously tallied prism trees, through growth and missed live trees
Field width: 1 digit
Values:

0	No status –- tree is not presently in the sample (remeasurement plots only). Tree was incorrectly tallied at the previous inventory, currently is not tallied due to definition or procedural change, or is not tallied due to natural causes (physically moved off plot). Requires RECONCILE code = 5-9
1	Live tree – live, remeasured or through growth tree (RECONCILE = 2 or 3)
2	Dead tree -- dead tree (remeasured), regardless of cause of death. Includes all trees killed by silvicultural activity, and are assumed not to have been utilized.
3	Utilized - a tree that has been cut and removed by direct human activity related to harvesting or silviculture. The tree is assumed to have been utilized.
9	Landcleared – live, dead or utilized tree that is no longer in an accessible forest land due to landclearing (Requires CAUSE OF DEATH = 81, 82 or 83)

5.34 TREE CLASS

Record the code that indicates the tree class. All palm species are coded TREE CLASS = 3.

When collected: All SAMPLE KINDS: All live tally trees > 1.0 in DBH;
SAMPLE KIND = 2 and 8: All TREE STATUS = 2 and RECONCILE = 1-3.
Field width: 1 digit
MQO: at least 90% of the time
Tolerance: no errors
Values: 2 – 4

2	Growing stock — Trees with one-third or more of the gross board foot volume in the entire sawlog section with commercial logs meeting grade, soundness, and size requirements or the potential to do so for poletimber-sized trees. A tree class 2 tree must have one 12-foot log or two 8-foot logs, now or prospectively, for live poletimber-sized trees to qualify as growing stock.
3	Rough cull — Trees that do not contain at least one 12-foot sawlog or two 8-foot logs now or prospectively, primarily because of roughness or poor form. Less than 1/3 of its gross board-foot volume meets size, soundness, and grade requirements and less than 1/2 of the cubic-foot cull is rotten or unsound.
4	Rotten cull — Trees that do not contain at least one 12-foot sawlog or two 8-foot logs now or prospectively and/or do not meet grade specifications for percent sound primarily because of rot. All species not having 1/3 or more of its gross board-foot volume meeting size, soundness, and grade requirements, and over 1/2 of the cubic-foot cull is rotten or unsound.

5.35 TREE GRADE

Record the code indicating the grade of the tree. See Appendix 5 for full description of procedures.

When collected: PRESENT TREE STATUS = 1 and TREE CLASS = 2; DBH > 11.0 in for hardwoods or DBH > 9.0 in for softwoods
Field width: 1 digit
Tolerance: No errors
MQO: At least 90% of the time
Values: 1 to 5

5.36 PERCENT BOARD FOOT CULL

Record the percentage of sound and unsound board-foot volume, to the nearest 1 percent. See Appendix 5 for complete procedures and board foot volume tables.

When collected: PRESENT TREE STATUS = 1 and TREE CLASS = 2; DBH > 11.0 in for hardwoods or DBH > 9.0 in for softwoods
Field width: 2 digits
Tolerance: +/- 10%
MQO: At least 90% of the time
Values: 00-67

5.37 FUSIFORM/COMANDRA RUST/ HARDWOOD DIEBACK INCIDENCE

Record the incidence of fusiform, comandra rust and dieback.

When collected: All live hardwoods and SPECIES = 111, 131 on the four subplots when DBH is > 5.0
Field width: 1 digit
Tolerance: No errors
MQO: At least 80% of the time
Values:

Code	Agent	Description/Threshold
0	None	
1	Fusiform, Comandra Rust	SPECIES 111, 131 ONLY: Record only those cankers that occur on the main stem or on a live branch within 12 inches of the stem. Many older galls appear as cankers with sunken rotten centers encircled by callus ridges. Witch's broom is common at galls. Masses of yellow-orange spores in the spring on the galls and canker margins.
2	Dieback	HARDWOODS ONLY: Record if 10% or more of the crown area is affected. Do not code for overtopped trees. Branches dieback from the tips. Just a few branches are affected at first with whole branches dying in the advanced stages. Frequently associated with stress caused by unfavorable environment, especially drought.

5.38 DIEBACK SEVERITY

Record the severity of hardwood crown dieback.

When collected: HARDWOOD Dieback Incidence = 2
Field width: 1 digit
Tolerance: +/- 1 class
MQO: At least 80% of the time
Values: 1 to 9

Code	Class in percent	Code	Class in percent	Code	Class in percent
1	10-19	4	40-49	7	70-79
2	20-29	5	50-59	8	80-89
3	30-39	6	60-69	9	90-99

5.39 UTILIZATION CLASS

Record the code to identify the utilization class of utilized trees. The default code on data recorder = 1.

When collected: PRESENT TREE STATUS, OLD MICROPLOT STATUS or PRISM TREE STATUS = 3; or CAUSE OF DEATH = 83
Field width: 1 digits
Tolerance: No errors
MQO: At least 99% of the time
Values:

1 Commercial utilization – some portion of the tree removed for commercial purposes. Commercial uses include sawlogs, pulpwood, veneer logs, poles, and other products such as firewood cut by commercial firewood operations.

2 Non-commercial utilization – some portion of the tree removed for non-commercial purposes. Non-commercial uses include domestic firewood use, barn poles, fence posts, domestic landscaping, rough slabs, etc.

6.0 SEEDLING DATA

Stocking and regeneration information are obtained by counting live seedlings within the 6.8-foot radius microplot located 90 degrees and 12.0 feet from each subplot center within each of the four subplots. Conifer seedlings must be at least 6.0 inches in length and less than 1.0 inch at DBH/DRC in order to qualify for tallying, except longleaf pine, which must be 0.5 in at the root collar. Hardwood seedlings must be at least 12.0 inches in length and less than 1.0 inch at DBH/DRC in order to qualify for tallying. For western woodland species, each stem on a single tree must be less than 1.0 inch in DRC. Seedlings are counted in groups by species and condition class, up to five individuals per species. Counts beyond five estimated. Only count seedlings occurring in accessible forest land condition classes.

6.1 SUBPLOT NUMBER

Use the procedures outlined in Section 3.1.

When Collected: All counts of seedlings

6.2 SPECIES

Use the procedures outlined in Section 5.8.

When Collected: All counts of seedlings
Field width: 4 digits
Tolerance: No errors for genus, no errors for species
MQO: At least 90% of the time for genus, at least 85% of the time for species
Values: See Appendix 3

6.3 CONDITION CLASS NUMBER

Use the procedures outlined in Section 2.0.

When Collected: All counts of seedlings

6.4 SEEDLING COUNT

On each microplot, record the number of live tally tree seedlings, by species and condition class. Count up to five individuals by species: estimate the total count if there are more than five individuals of any given species in any given condition class. When seedlings are distributed evenly on a microplot, a suggested method of estimating is to count the number of seedlings on one quarter of the microplot and multiply by four (given that there is only one condition class on the microplot). Repeat for each species. Conifer seedlings must be at least 6.0 inches in length and less than 1.0 inch at DBH to qualify for counting, except longleaf pine, which must be 0.5 in at the root collar. Hardwood seedlings must be at least 12.0 inches in length and less than 1.0 inch at DBH in order to qualify for counting.

For western woodland species, each stem on a single tree must be less than 1.0 inch at DRC.

Multiple “suckers” that originate from the same location, and stump sprouts are considered one seedling. Do not tally or count “layers” (undetached branches partially or completely covered by soil, usually at the base) as seedlings. Do not tally any seedlings that sprout from a live tally tree.

When Collected: Each accessible forest land condition class on each microplot
Field width: 3 digits
Tolerance: No errors for 5 or less per species; +/- 20% over a count of 5
MQO: At least 90% of the time
Values: 001 through 999

7.0 SITE TREE INFORMATION

Site trees are a measure of site productivity expressed by the height to age relationship of dominant and co-dominant trees. If suitable site trees are available, site tree data are required for every accessible forest land condition class defined on a plot. An individual site tree may be used for more than one condition class where differences in condition classes are not the result of differences in site productivity. For example, when different condition classes are caused solely due to differences in reserved status, owner class, and/or disturbance-related differences in density (e.g., heavily thinned vs. unthinned), a site tree may be used for more than one condition class. When in doubt, do not use a site tree for more than one condition class.

7.1 SITE TREE SELECTION

Select at least one site tree for each accessible forest land condition class where no previous site tree data exist. The absence of site tree data may occur because:

- This is the first visit to the site
- On the previous visit no suitable site tree could be found for the condition
- Since the last visit there has been a change in condition class that renders the previous data incompatible with the current conditions

If a site tree is needed; select tree from a species common to the condition class being sampled, based on the criteria listed in Appendix 4. Select trees off the subplot where possible. Use only trees that have remained in a dominant or co-dominant crown position throughout their entire life span. If possible, trees should be 5.0 inches in diameter, or larger, and at least 20 years old. Trees that are visibly damaged, trees with ring patterns that exhibit signs of suppression, and trees with rotten cores should be rejected. If there are no acceptable site trees, record that in the plot notes and leave this section blank.

7.2 SITE TREE DATA VARIABLES

7.2.1 CONDITION CLASS LIST

List all CONDITION CLASSES that the site index data from this tree represent.

When Collected: All site trees
Field width: 5 digits
Tolerance: No errors
MQO: At least 99% of the time
Values: 1 to 9 or 10000 to 98765

7.2.2 SPECIES

Use the same procedures described in Section 5.8 (Appendix 4 lists preferred site tree species by region).

When Collected: All site trees
Values: See Appendix 4

7.2.3 DIAMETER

Use the same procedures described in Section 5.9.

When Collected: All site trees

7.2.4 SITE TREE LENGTH

With a clinometer or other approved instrument, measure the total length of the site tree from the ground to the top of the tree. Record to the nearest 1.0 foot. SITE TREE LENGTH must be measured; no estimates are permitted on site trees.

When Collected: All site trees
Field width: 3 digits
Tolerance: +/- 10% of true length
MQO: At least 90% of the time
Values: 005 to 999

7.2.5 TREE AGE AT DIAMETER

Record the tree age as determined by an increment sample. Bore the tree at the point of diameter measurement (DBH) with an increment borer. Count the rings between the outside edge of the core and the pith. Do not add years to get total age.

When Collected: All site trees
Field width: 3 digits
Tolerance: +/- 5 years
MQO: At least 95% of the time
Values: 015 to 120,
013 to 120 for longleaf pine

7.2.6 SITE TREE NOTES

Record notes pertaining to an individual site tree.

When collected: All site trees as necessary
Field width: alphanumeric character field
MQO: N/A
Values: English language words, phrases and numbers

7.2.7 SUBPLOT NUMBER (CORE OPTIONAL)

Record the subplot number to which the site tree is referenced.

When Collected: All site trees
Field width: 1 digit
Tolerance: No errors
MQO: At least 99% of the time
Values:

1	Center subplot
2	North subplot
3	Southeast subplot
4	Southwest subplot

7.2.8 AZIMUTH (CORE OPTIONAL)

Record the AZIMUTH from the subplot center; sight the center of the base of each tree with a compass. Record AZIMUTH to the nearest degree. Use 360 for north.

When Collected: All site trees
Field width: 3 digits
Tolerance: +/- 10 degrees
MQO: At least 90% of the time
Values: 001 to 360

7.2.9 HORIZONTAL DISTANCE (CORE OPTIONAL)

Record the measured HORIZONTAL DISTANCE, to the nearest 0.1 foot, from the subplot center to the pith of the tree at the base.

When Collected: All site trees
Field width: 4 digits (xxx.y)
Tolerance: +/- 5 ft
MQO: At least 90% of the time
Values: 0001 to 2000

7.2.10 SITE TREE NUMBER

Record a number to uniquely identify each site tree on a plot.
The SITE TREE NUMBER is pre-printed on tally sheets and is automatically created in the data recorder.

When collected: All site trees
Field width: 1 digit
Tolerance: No errors
MQO: At least 99% of the time
Values: 1-9

7.2.11 SITE CLASS

This item will be derived by the data recorder.

When collected: All site trees
Field width: 1 digit
Values: 1-7 (calculated by the data recorder)
Site class 1-6: ACCESSIBLE FORESTLAND
Site class 7: ACCESSIBLE OTHER FORESTLAND

APPENDICES

1. State and County, Parish or Borough FIPS Codes

   These are the standard federal 2- and 3-digit codes for States and Counties, Parishes, or Boroughs, respectively.

2. FIA Forest Type Codes

   These are the codes that correspond to the National FIA forest typing algorithm. Definitions for the types will be included in a future draft. Units may choose to also add local forest type groupings.

3. FIA Tree Species Codes

   This list includes all species deemed to be tally trees with western woodland trees measured for DRC indicated.

4. Site Tree Selection Criteria and Species List

5. Cull and Tree Grading Procedures

6. Determination of Stocking Values for Land Use Classification

7. Glossary

8. Tolerance / MQO / Value / Units Table

Appendix 1. State and County, Parish, or Borough FIPS Codes

(01) Alabama
(001) Autauga
(003) Baldwin
(005) Barbour
(007) Bibb
(009) Blount
(011) Bullock
(013) Butler
(015) Calhoun
(017) Chambers
(019) Cherokee
(021) Chilton
(023) Choctaw
(025) Clarke
(027) Clay
(029) Cleburne
(031) Coffee
(033) Colbert
(035) Conecuh
(037) Coosa
(039) Covington
(041) Crenshaw
(043) Cullman
(045) Dale
(047) Dallas
(049) De Kalb
(051) Elmore
(053) Escambia
(055) Etowah
(057) Fayette
(059) Franklin
(061) Geneva
(063) Greene
(065) Hale
(067) Henry
(069) Houston
(071) Jackson
(073) Jefferson
(075) Lamar
(077) Lauderdale
(079) Lawrence
(081) Lee
(083) Limestone
(085) Lowndes
(087) Macon
(089) Madison
(091) Marengo
(093) Marion
(095) Marshall
(097) Mobile
(099) Monroe
(101) Montgomery
(103) Morgan
(105) Perry
(107) Pickens
(109) Pike
(111) Randolph
(113) Russell
(115) St Clair
(117) Shelby
(119) Sumter
(121) Talladega
(123) Tallapoosa
(125) Tuscaloosa
(127) Walker
(129) Washington
(131) Wilcox
(133) Winston

Lauderdale
Limestone
Madison
Jackson
Colbert
Franklin
Lawrence
Morgan
Marshall
De Kalb
Marion
Winston
Cullman
Cherokee
Etowah
Blount
Lamar
Fayette
Walker
St Clair
Calhoun
Jefferson
Cleburne
Talladega
Pickens
Tuscaloosa
Shelby
Clay
Randolph
Bibbs
Greene
Coosa
Tallapoosa
Chambers
Chilton
Hale
Perry
Elmore
Lee
Autauga
Sumter
Macon
Dallas
Montgomery
Russell
Marengo
Lowndes
Bullock
Choctaw
Wilcox
Barbour
Pike
Butler
Clarke
Crenshaw
Monroe
Henry
Washington
Conecuh
Coffee
Dale
Covington
Houston
Escambia
Geneva
Mobile
Baldwin

(05) Arkansas
(001) Arkansas
(003) Ashley
(005) Baxter
(007) Benton
(009) Boone
(011) Bradley
(013) Calhoun
(015) Carroll
(017) Chicot
(019) Clark
(021) Clay
(023) Cleburne
(025) Cleveland
(027) Columbia
(029) Conway
(031) Craighead
(033) Crawford
(035) Crittenden
(037) Cross
(039) Dallas
(041) Desha
(043) Drew
(045) Faulkner
(047) Franklin
(049) Fulton
(051) Garland
(053) Grant
(055) Greene
(057) Hempstead
(059) Hot Spring
(061) Howard
(063) Independence
(065) Izard
(067) Jackson
(069) Jefferson
(071) Johnson
(073) Lafayette
(075) Lawrence
(077) Lee
(079) Lincoln
(081) Little River
(083) Logan
(085) Lonoke
(087) Madison
(089) Marion
(091) Miller
(093) Mississippi
(095) Monroe
(097) Montgomery
(099) Nevada
(101) Newton
(103) Ouachita
(105) Perry
(107) Phillips
(109) Pike
(111) Poinsett
(113) Polk
(115) Pope
(117) Prairie
(119) Pulaski
(121) Randolph
(123) St. Francis
(125) Saline
(127) Scott
(129) Searcy
(131) Sebastian
(133) Sevier
(135) Sharp
(137) Stone
(139) Union
(141) Van Buren
(143) Washington
(145) White
(147) Woodruff
(149) Yell

Benton
Carroll
Boone
Marion
Baxter
Fulton
Randolph
Clay
Washington
Madison
Newton
Searcy
Izard
Sharp
Lawrence
Greene
Stone
Independence
Craighead
Mississippi
Crawford
Franklin
Johnson
Pope
Van Buren
Cleburne
Jackson
Poinsett
Sebastian
Logan
Conway
Faulkner
White
Woodruff
Cross
Crittender
Yell
Perry
St. Francis
Scott
Prairie
Pulaski
Lonoke
Lee
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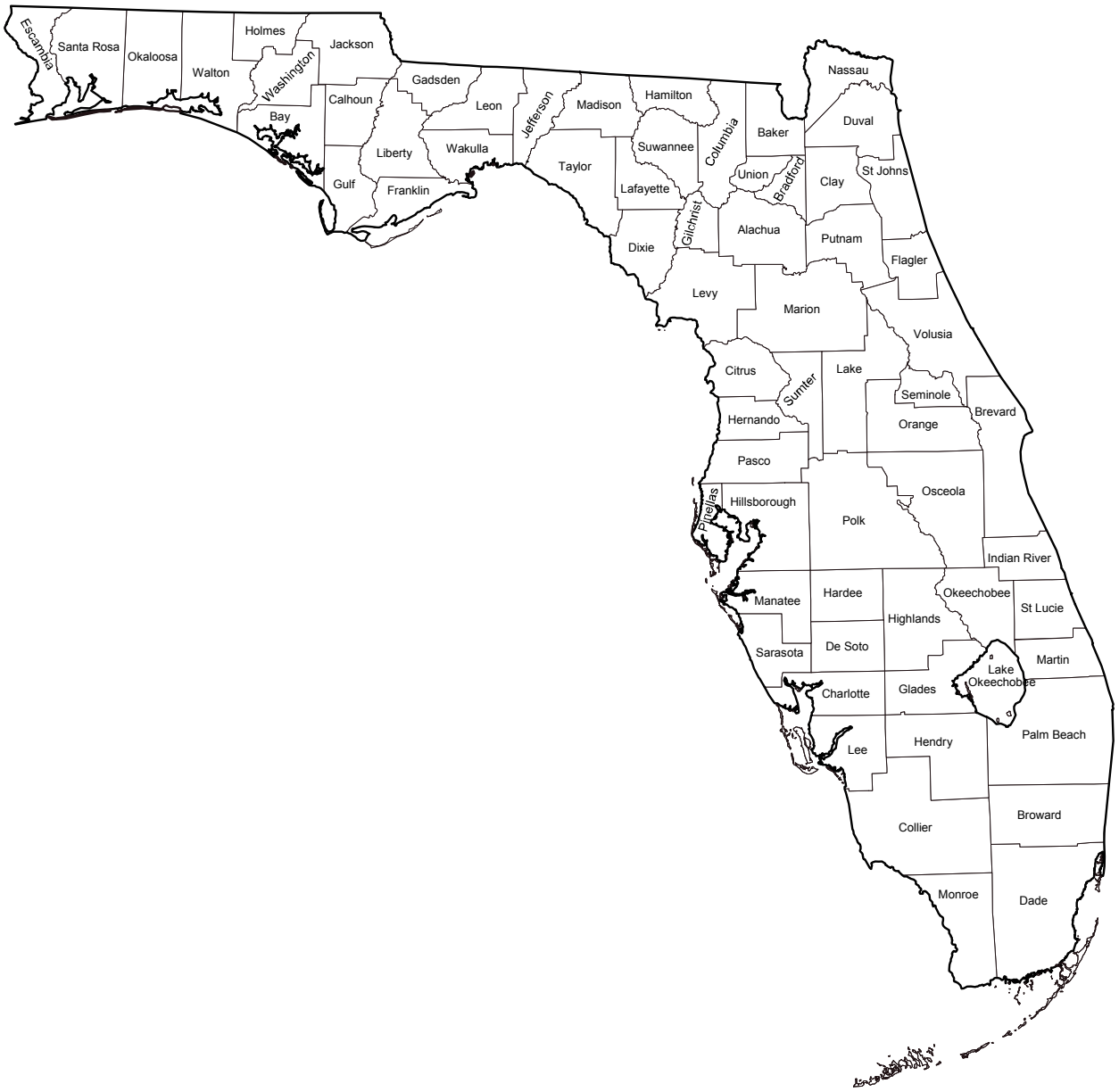
Monroe
Polk
Montgomery
Garland
Phillips
Hot Spring
Grant
Jefferson
Arkansas
Howard
Pike
Sevier
Clark
Dallas
Cleveland
Lincoln
Desha
Little River
Hempstead
Nevada
Ouachita
Calhoun
Bradley
Drew
Miller
Lafayette
Columbia
Union
Ashley
Chicot

(12) Florida

(001) Alachua
(003) Baker
(005) Bay
(007) Bradford
(009) Brevard
(011) Broward
(013) Calhoun
(015) Charlotte
(017) Citrus
(019) Clay
(021) Collier
(023) Columbia
(025) Dade
(027) De Soto
(029) Dixie
(031) Duval
(033) Escambia
(035) Flagler
(037) Franklin
(039) Gadsden
(041) Gilchrist
(043) Glades
(045) Gulf
(047) Hamilton
(049) Hardee
(051) Hendry
(053) Hernando
(055) Highlands
(057) Hillsborough
(059) Holmes
(061) Indian River
(063) Jackson
(065) Jefferson
(067) Lafayette
(069) Lake
(071) Lee
(073) Leon
(075) Levy
(077) Liberty
(079) Madison
(081) Manatee
(083) Marion
(085) Martin
(087) Monroe
(089) Nassau
(091) Okaloosa
(093) Okeechobee
(095) Orange
(097) Osceola
(099) Palm Beach
(101) Pasco
(103) Pinellas
(105) Polk
(107) Putnam
(109) St. Johns
(111) St. Lucie
(113) Santa Rosa
(115) Sarasota
(117) Seminole
(119) Sumter
(121) Suwannee
(123) Taylor
(125) Union
(127) Volusia
(129) Wakulla
(131) Walton
(133) Washington


Escambia
Santa Rosa
Okaloosa
Walton
Holmes
Washington
Jackson
Bay
Calhoun
Gadsden
Leon
Jefferson
Madison
Hamilton
Liberty
Gulf
Franklin
Wakulla
Taylor
Suwannee
Columbia
Baker
Nassau
Duval
Lafayette
Union
Bradford
Clay
St Johns
Dixie
Gilchrist
Alachua
Putnam
Flagler
Levy
Marion
Volusia
Citrus
Sumter
Lake
Seminole
Brevard
Hernando
Orange
Pasco
Pinellas
Hillsborough
Polk
Osceola
Indian River
Manatee
Hardee
Okeechobee
St Lucie
Highlands
Sarasota
De Soto
Martin
Lake Okeechobee
Charlotte
Glades
Lee
Hendry
Palm Beach
Collier
Broward
Monroe
Dade

(13) Georgia

(001) Appling
(003) Atkinston
(005) Bacon
(007) Baker
(009) Baldwin
(011) Banks
(013) Barrow
(015) Bartow
(017) Ben Hill
(019) Berrien
(021) Bibb
(023) Bleckley
(025) Brantley
(027) Brooks
(029) Bryan
(031) Bulloch
(033) Burke
(035) Butts
(037) Calhoun
(039) Camden
(043) Candler
(045) Carroll
(047) Catoosa
(049) Charlton
(051) Chatham
(053) Chattahoochee
(055) Chattooga
(057) Cherokee
(059) Clarke
(061) Clay
(063) Clayton
(065) Clinch
(067) Cobb
(069) Coffee
(071) Colquitt
(073) Columbia
(075) Cook
(077) Coweta
(079) Crawford
(081) Crisp
(083) Dade
(085) Dawson
(087) Decatur
(089) De Kalb
(091) Dodge
(093) Dooly
(095) Dougherty
(097) Douglas
(099) Early
(101) Echols
(103) Effingham
(105) Elbert
(107) Emanuel
(109) Evans
(111) Fannin
(113) Fayette
(115) Floyd
(117) Forsyth
(119) Franklin
(121) Fulton
(123) Gilmer
(125) Glascock
(127) Glynn
(129) Gordon
(131) Grady
(133) Greene
(135) Gwinnett
(137) Habersham
(139) Hall
(141) Hancock
(143) Haralson
(145) Harris
(147) Hart
(149) Heard
(151) Henry
(153) Houston
(155) Irwin
(157) Jackson
(159) Jasper
(161) Jeff Davis
(163) Jefferson
(165) Jenkins
(167) Johnson
(169) Jones
(171) Lamar
(173) Lanier
(175) Laurens
(177) Lee
(179) Liberty
(181) Lincoln
(183) Long
(185) Lowndes
(187) Lumpkin
(189) Mc Duffie
(191) Mc Intosh
(193) Macon
(195) Madison
(197) Marion
(199) Meriwether
(201) Miller
(205) Mitchell
(207) Monroe
(209) Montgomery
(211) Morgan
(213) Murray
(215) Muscogee
(217) Newton
(219) Oconee
(221) Oglethorpe
(223) Paulding
(225) Peach
(227) Pickens
(229) Pierce
(231) Pike
(233) Polk
(235) Pulaski
(237) Putnam
(239) Quitman
(241) Rabun
(243) Randolph
(245) Richmond
(247) Rockdale
(249) Schley
(251) Screven
(253) Seminole
(255) Spalding
(257) Stephens
(259) Stewart
(261) Sumter
(263) Talbot
(265) Taliaferro
(267) Tattnall
(269) Taylor
(271) Telfair
(273) Terrell
(275) Thomas
(277) Tift
(279) Toombs
(281) Towns
(283) Treutlen
(285) Troup
(287) Turner
(289) Twiggs
(291) Union
(293) Upson
(295) Walker
(297) Walton
(299) Ware
(301) Warren
(303) Washington
(305) Wayne
(307) Webster
(309) Wheeler
(311) White
(313) Whitfield
(315) Wilcox
(317) Wilkes
(319) Wilkinson
(321) Worth

Dade
Catoosa
Whitfield
Murray
Fannin
Towns
Union
Rabun
Walker
Gilmer
White
Habersham
Chattooga
Gordon
Lumpkin
Stephens
Pickens
Franklin
Dawson
Hall
Banks
Hart
Floyd
Bartow
Cherokee
Forsyth
Jackson
Madison
Elbert
Polk
Paulding
Cobb
Gwinnett
Barrow
Clarke
Oglethorpe
Haralson
Oconee
Douglas
Fulton
De Kalb
Rockdale
Walton
Wilkes
Lincoln
Carroll
Clayton
Newton
Morgan
Greene
Taliaferro
Mc Duffie
Columbia
Fayette
Henry
Warren
Heard
Coweta
Spalding
Butts
Jasper
Putnam
Hancock
Glascock
Richmond
Troupe
Meriwether
Pike
Lamar
Monroe
Jones
Baldwin
Jefferson
Burke
Washington
Upson
Bibb
Wilkinson
Jenkins
Screven
Harris
Talbot
Crawford
Twiggs
Johnson
Emanuel
Muscogee
Taylor
Peach
Laurens
Chattahoochee
Marion
Macon
Houston
Bleckley
Treutlen
Candler
Bulloch
Effingham
Schley
Pulaski
Dodge
Montgomery
Evans
Stewart
Webster
Sumter
Dooly
Wheeler
Toombs
Tattnall
Bryan
Chatham
Wilcox
Crisp
Telfair
Quitman
Terrell
Lee
Jeff Davis
Appling
Liberty
Randolph
Turner
Ben Hill
Long
Clay
Calhoun
Dougherty
Worth
Irwin
Coffee
Bacon
Wayne
McIntosh
Tift
Early
Baker
Berrien
Atkinson
Pierce
Glynn
Miller
Mitchell
Colquitt
Cook
Ware
Brantley
Seminole
Decatur
Grady
Thomas
Brooks
Lowndes
Lanier
Clinch
Charlton
Camden
Echols

(21) Kentucky

(001) Adair
(003) Allen
(005) Anderson
(007) Ballard
(009) Barren
(011) Bath
(013) Bell
(015) Boone
(017) Bourbon
(019) Boyd
(021) Boyle
(023) Bracken
(025) Breathitt
(027) Breckinridge
(029) Bullitt
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(033) Caldwell
(035) Calloway
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(039) Carlisle
(041) Carroll
(043) Carter
(045) Casey
(047) Christian
(049) Clark
(051) Clay
(053) Clinton
(055) Crittenden
(057) Cumberland
(059) Daviess
(061) Edmonson
(063) Elliott
(065) Estill
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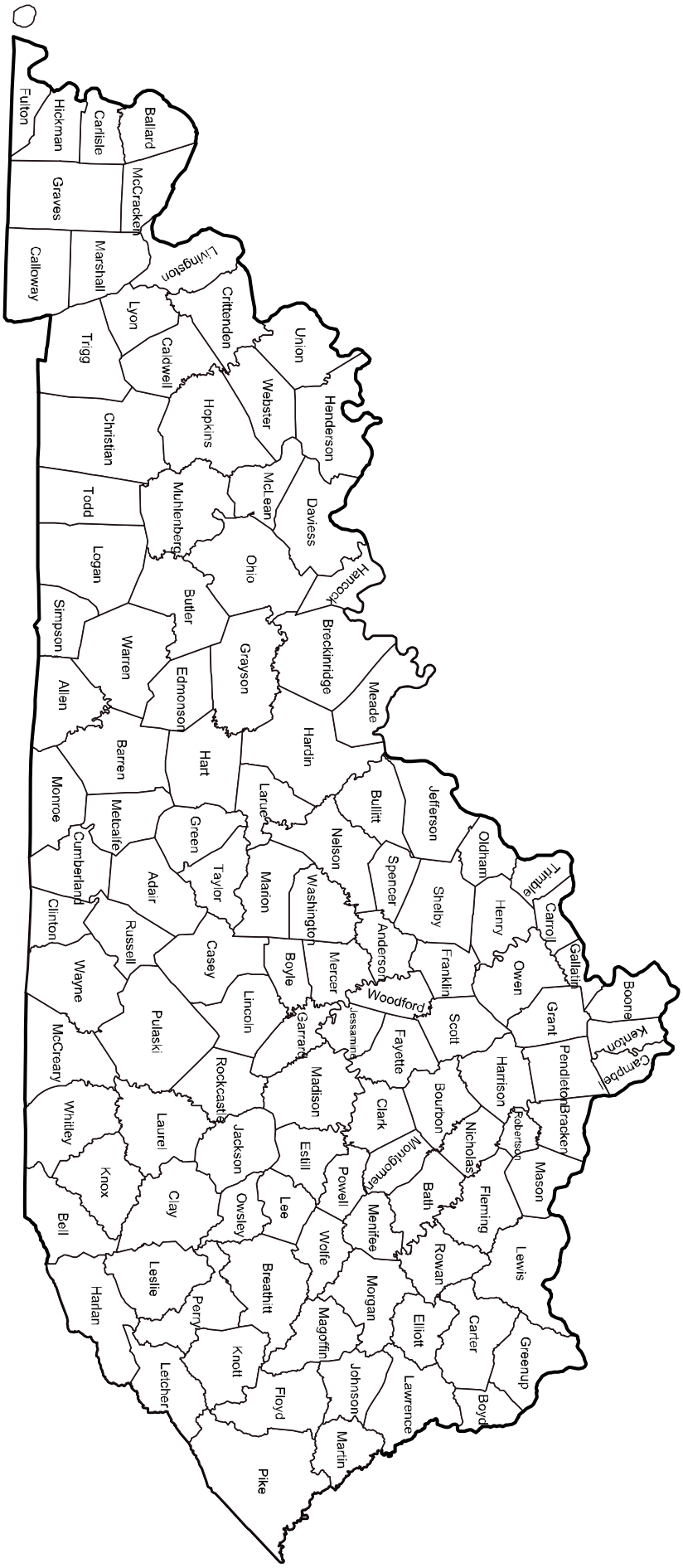
(083) Graves
(085) Grayson
(087) Green
(089) Greenup
(091) Hancock
(093) Hardin
(095) Harlan
(097) Harrison
(099) Hart
(101) Henderson
(103) Henry
(105) Hickman
(107) Hopkins
(109) Jackson
(111) Jefferson
(113) Jessamine
(115) Johnson
(117) Kenton
(119) Knott
(121) Knox
(123) Larue
(125) Laurel
(127) Lawrence
(129) Lee
(131) Leslie
(133) Letcher
(135) Lewis
(137) Lincoln
(139) Livingston
(141) Logan
(143) Lyon
(145) McCracken
(147) McCreary
(149) McLean
(151) Madison
(153) Magoffin
(155) Marion
(157) Marshall
(159) Martin
(161) Mason
(163) Meade
(165) Menifee
(167) Mercer
(169) Metcalfe
(171) Monroe
(173) Montgomery
(175) Morgan
(177) Muhlenberg
(179) Nelson
(181) Nicholas
(183) Ohio
(185) Oldham
(187) Owen
(189) Owsley
(191) Pendleton
(193) Perry
(195) Pike
(197) Powell
(199) Pulaski
(201) Robertson
(203) Rockcastle
(205) Rowan
(207) Russell
(209) Scott
(211) Shelby
(213) Simpson
(215) Spencer
(217) Taylor
(219) Todd
(221) Trigg
(223) Trimble
(225) Union
(227) Warren
(229) Washington
(231) Wayne
(233) Webster
(235) Whitley
(237) Wolfe
(239) Woodford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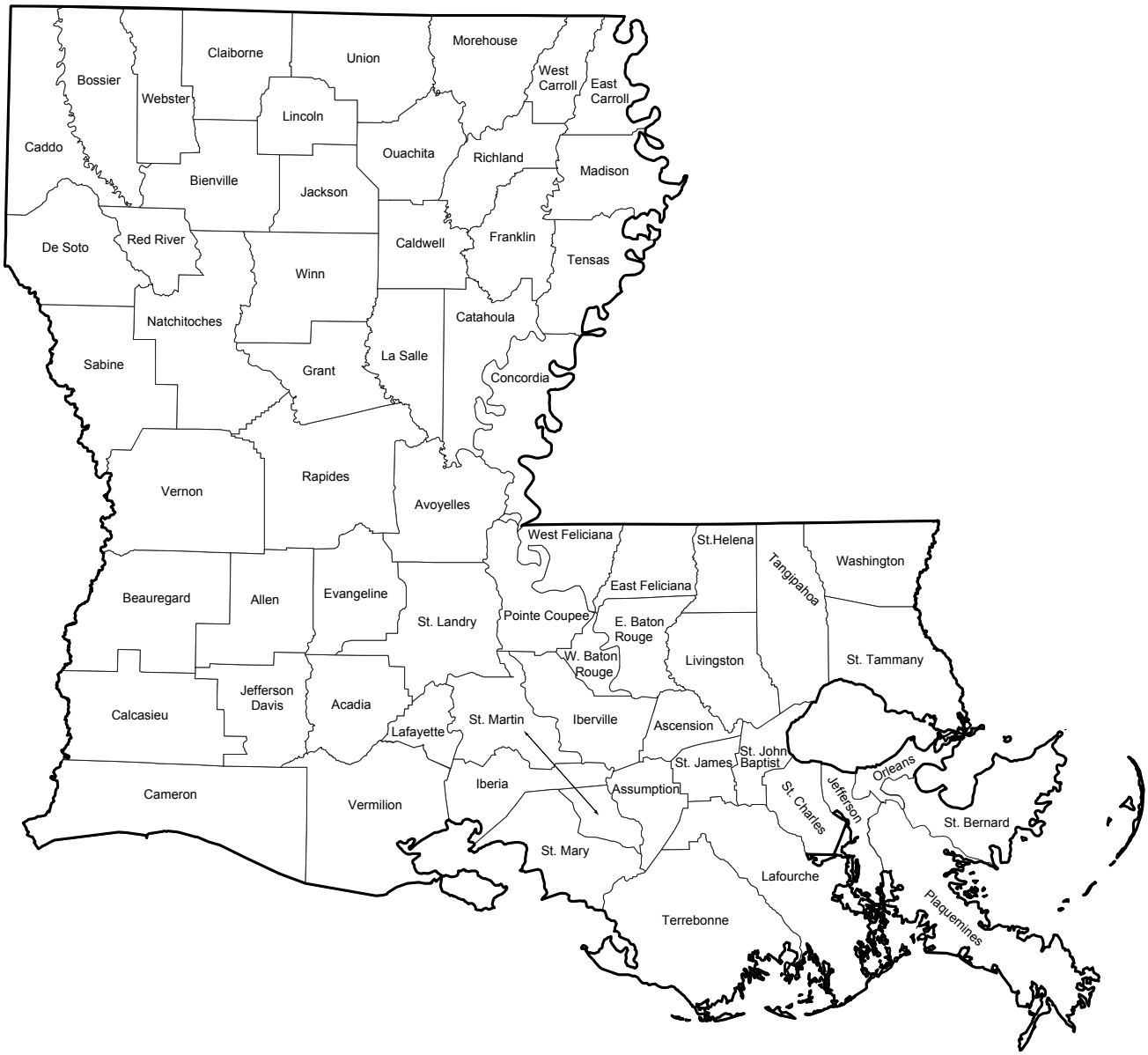
Kenton
Campbell
Gallatin
Carroll
Trimble
Grant
Pendleton
Bracken
Owen
Henry
Oldham
Mason
Robertson
Harrison
Nicholas
Fleming
Lewis
Bourbon
Montgomery
Bath
Rowan
Greenup
Boyd
Scott
Franklin
Woodford
Jessamine
Fayette
Clark
Menifee
Elliott
Carter
Lawrence
Johnson
Martin
Shelby
Anderson
Mercer
Garrard
Madison
Powell
Wolfe
Morgan
Magoffin
Floyd
Pike
Jefferson
Spencer
Washington
Boyle
Lincoln
Estill
Lee
Breathitt
Knott
Letcher
Perry
Leslie
Harlan
Bullitt
Nelson
Marion
Casey
Rockcastle
Jackson
Owsley
Clay
Laurel
Knox
Whitley
Bell
McCreary
Pulaski
Wayne
Russell
Clinton
Cumberland
Adair
Taylor
Green
Metcalfe
Monroe
Barren
Hart
Larue
Hardin
Meade
Breckinridge
Grayson
Edmonson
Butler
Warren
Allen
Simpson
Logan
Ohio
Hancock
Daviess
McLean
Muhlenberg
Todd
Christian
Hopkins
Webster
Henderson
Union
Caldwell
Crittenden
Trigg
Lyon
Livingston
Marshall
Calloway
McCracken
Graves
Ballard
Carlisle
Hickman
Fulton

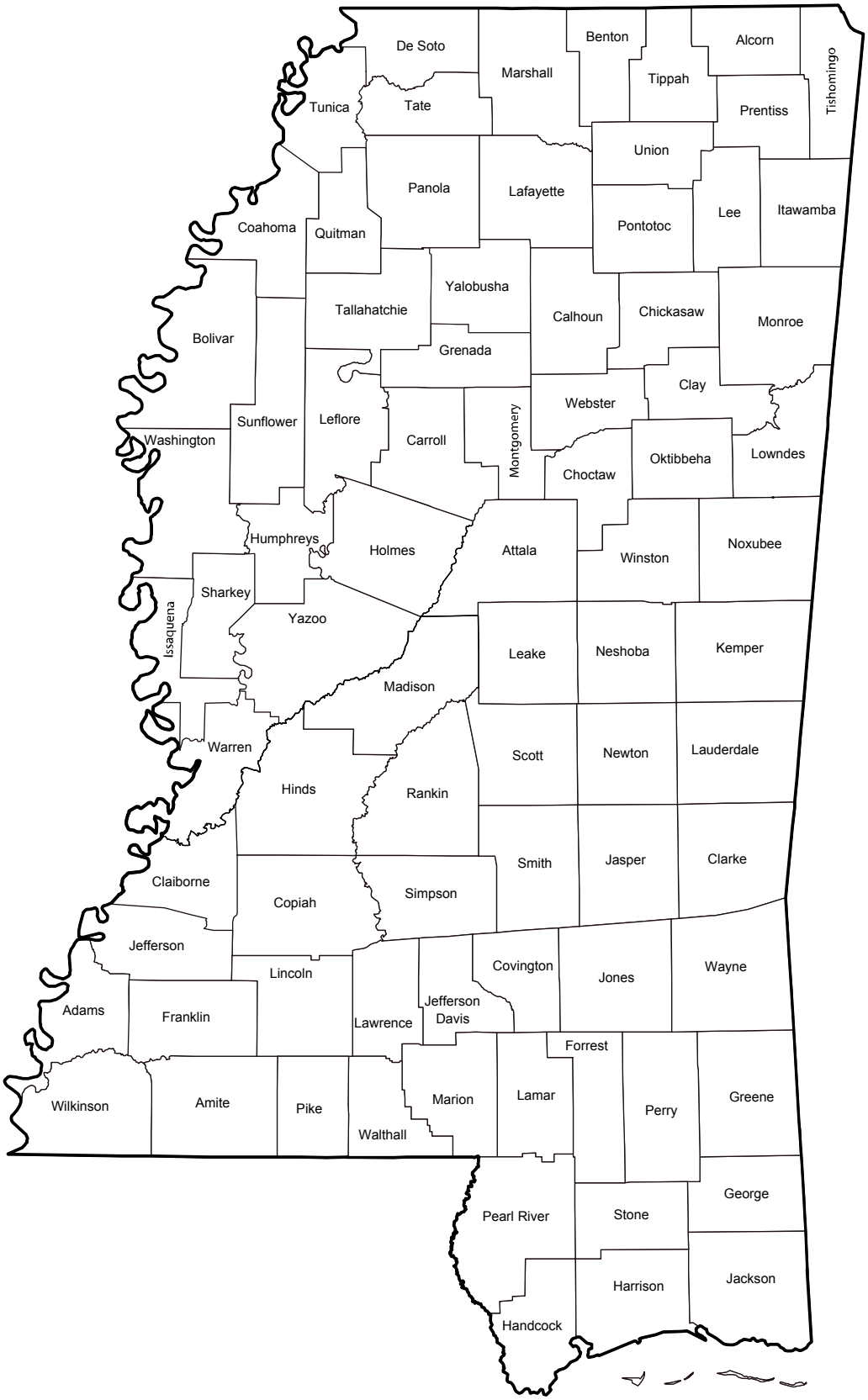
(22) Louisiana

(001) Acadia
(003) Allen
(005) Ascension
(007) Assumption
(009) Avoyelles
(011) Beauregard
(013) Bienville
(015) Bossier
(017) Caddo
(019) Calcasieu
(021) Caldwell
(023) Cameron
(025) Catahoula
(027) Claiborne
(029) Concordia
(031) De Soto
(033) East Baton Rouge
(035) East Carroll
(037) East Feliciana
(039) Evangeline
(041) Franklin
(043) Grant
(045) Iberia
(047) Iberville
(049) Jackson
(051) Jefferson
(053) Jefferson Davis
(055) Lafayette
(057) LaFourche
(059) La Salle
(061) Lincoln
(063) Livingston
(065) Madison
(067) Morehouse
(069) Natchitoches
(071) Orleans
(073) Ouachita
(075) Plaquemines
(077) Pointe Coupee
(079) Rapides
(081) Red River
(083) Richland
(085) Sabine
(087) St. Bernard
(089) St. Charles
(091) St. Helena
(093) St. James
(095) St. John the Baptist
(097) St. Landry
(099) St. Martin
(101) St. Mary
(103) St. Tammany
(105) Tangipahoa
(107) Tensas
(109) Terrebonne
(111) Union
(113) Vermilion
(115) Vernon
(117) Washington
(119) Webster
(121) West Baton Rouge
(123) West Carroll
(125) West Feliciana
(127) Winn


Bossier
Claiborne
Union
Morehouse
West Carroll
East Carroll
Webster
Lincoln
Caddo
Ouachita
Richland
Madison
Bienville
Jackson
De Soto
Red River
Caldwell
Franklin
Tensas
Winn
Natchitoches
Catahoula
Sabine
La Salle
Grant
Concordia
Vernon
Rapides
Avoyelles
West Feliciana
St.Helena
Tangipahoa
Washington
Beauregard
Allen
Evangeline
East Feliciana
St. Landry
Pointe Coupee
E. Baton Rouge
W. Baton Rouge
Livingston
St. Tammany
Calcasieu
Jefferson Davis
Acadia
Lafayette
St. Martin
Iberville
Ascension
St. James
St. John Baptist
Orleans
Cameron
Vermilion
Iberia
Assumption
St. Charles
Jefferson
St. Bernard
St. Mary
Lafourche
Terrebonne
Plaquemines

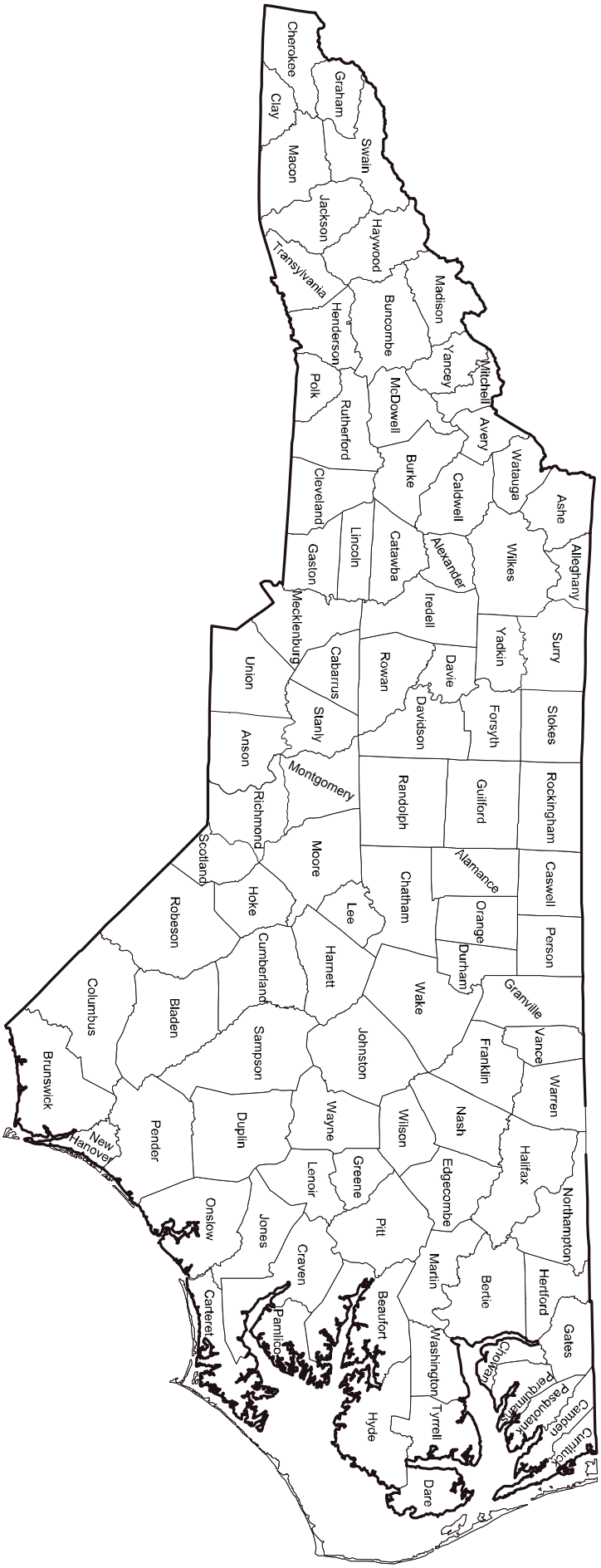
(28) Mississippi

(001) Adams
(003) Alcorn
(005) Amite
(007) Attala
(009) Benton
(011) Bolivar
(013) Calhoun
(015) Carroll
(017) Chickasaw
(019) Choctaw
(021) Claiborne
(023) Clarke
(025) Clay
(027) Coahoma
(029) Copiah
(031) Covington
(033) De Soto
(035) Forrest
(037) Franklin
(039) George
(041) Greene
(043) Grenada
(045) Hancock
(047) Harrison
(049) Hinds
(051) Holmes
(053) Humphreys
(055) Issaquena
(057) Itawamba
(059) Jackson
(061) Jasper
(063) Jefferson
(065) Jefferson Davis
(067) Jones
(069) Kemper
(071) Lafayette
(073) Lamar
(075) Lauderdale
(077) Lawrence
(079) Leake
(081) Lee
(083) Leflore
(085) Lincoln
(087) Lowndes
(089) Madison
(091) Marion
(093) Marshall
(095) Monroe
(097) Montgomery
(099) Neshoba
(101) Newton
(103) Noxubee
(105) Oktibbeha
(107) Panola
(109) Pearl River
(111) Perry
(113) Pike
(115) Pontotoc
(117) Prentiss
(119) Quitman
(121) Rankin
(123) Scott
(125) Sharkey
(127) Simpson
(129) Smith
(131) Stone
(133) Sunflower
(135) Tallahatchie
(137) Tate
(139) Tippah
(141) Tishomingo
(143) Tunica
(145) Union
(147) Walthall
(149) Warren
(151) Washington
(153) Wayne
(155) Webster
(157) Wilkinson
(159) Winston
(161) Yalobusha
(163) Yazoo


De Soto
Marshall
Benton
Tippah
Alcorn
Tishomingo
Tunica
Tate
Prentiss
Union
Panola
Lafayette
Lee
Itawamba
Coahoma
Quitman
Pontotoc
Yalobusha
Tallahatchie
Calhoun
Chickasaw
Monroe
Bolivar
Grenada
Clay
Webster
Sunflower
Leflore
Carroll
Montgomery
Washington
Choctaw
Oktibbeha
Lowndes
Humphreys
Holmes
Attala
Winston
Noxubee
Sharkey
Issaquena
Yazoo
Leake
Neshoba
Kemper
Madison
Warren
Scott
Newton
Lauderdale
Hinds
Rankin
Smith
Jasper
Clarke
Claiborne
Copiah
Simpson
Jefferson
Covington
Jones
Wayne
Lincoln
Adams
Franklin
Lawrence
Jefferson Davis
Forrest
Wilkinson
Amite
Pike
Walthall
Marion
Lamar
Perry
Greene
Pearl River
Stone
George
Harrison
Jackson
Handcock

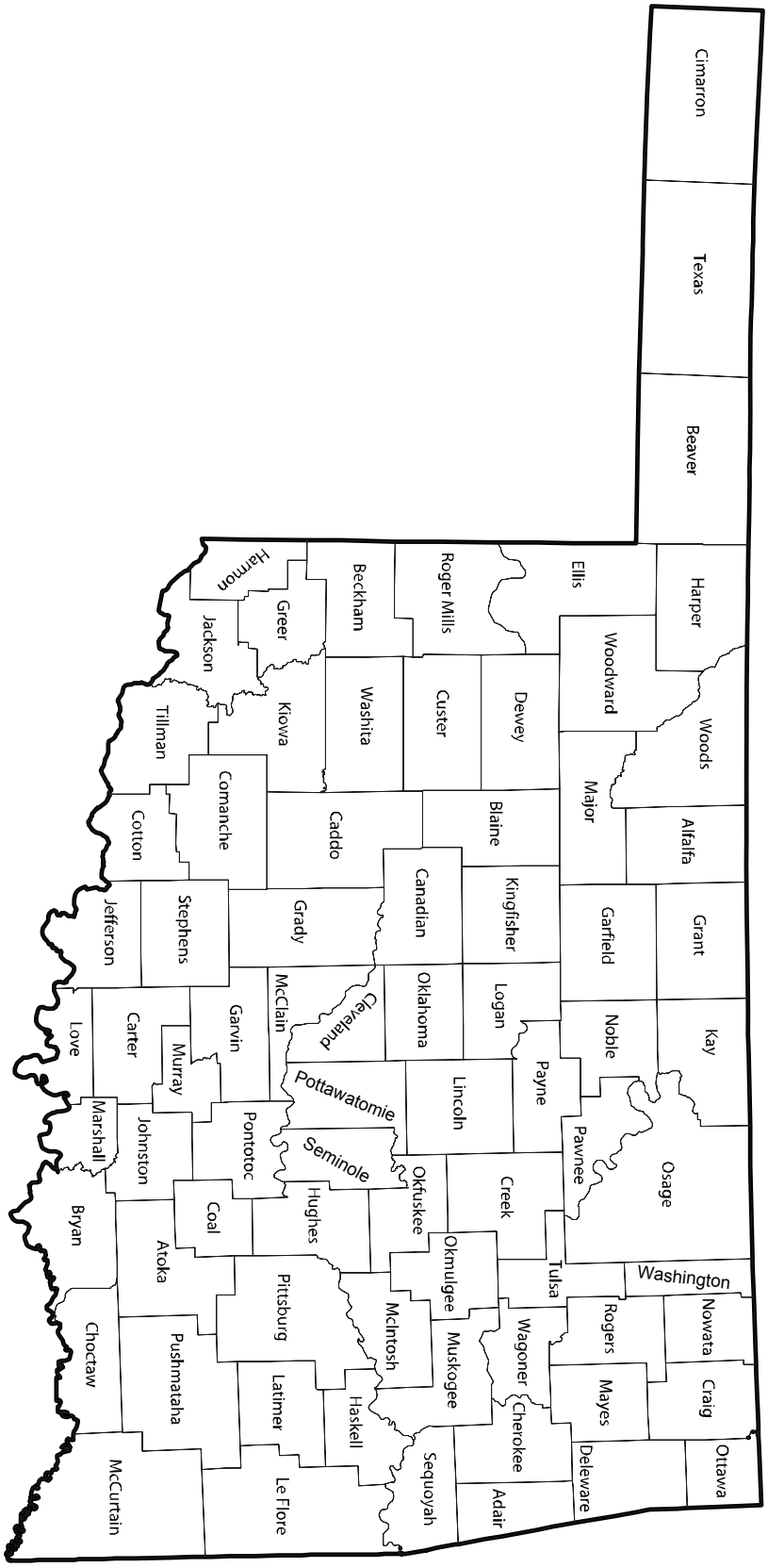
(37) North Carolina

(001) Alamance
(003) Alexander
(005) Alleghany
(007) Anson
(009) Ashe
(011) Avery
(013) Beaufort
(015) Bertie
(017) Bladen
(019) Brunswick
(021) Buncombe
(023) Burke
(025) Cabarrus
(027) Caldwell
(029) Camden
(031) Carteret
(033) Caswell
(035) Catawba
(037) Chatham
(039) Cherokee
(041) Chowan
(043) Clay
(045) Cleveland
(047) Columbus
(049) Craven
(051) Cumberland
(053) Currituck
(055) Dare
(057) Davidson
(059) Davie
(061) Duplin
(063) Durham
(065) Edgecombe
(067) Forsyth
(069) Franklin
(071) Gaston
(073) Gates
(075) Graham
(077) Granville
(079) Greene
(081) Guilford
(083) Halifax
(085) Harnett
(087) Haywood
(089) Henderson
(091) Hertford
(093) Hoke
(095) Hyde
(097) Iredell
(099) Jackson
(101) Johnston
(103 Jones
(105) Lee
(107) Lenoir
(109) Lincoln
(111) McDowell
(113) Macon
(115) Madison
(117) Martin
(119) Mecklenburg
(121) Mitchell
(123) Montgomery
(125) Moore
(127) Nash
(129) New Hanover
(131) Northhampton
(133) Onslow
(135) Orange
(137) Pamlico
(139) Pasquotank
(141) Pender
(143) Perquimans
(145) Person
(147) Pitt
(149) Polk
(151) Randolph
(153) Richmond
(155) Robeson
(157) Rockingham
(159) Rowan
(161) Rutherford
(163) Sampson
(165) Scotland
(167) Stanly
(169) Stokes
(171) Surry
(173) Swain
(175) Transylvania
(177) Tyrrell
(179) Union
(181) Vance
(183) Wake
(185) Warren
(187) Washington
(189) Watauga
(191) Wayne
(193) Wilkes
(195) Wilson
(197) Yadkin
(199) Yancey


Cherokee
Graham
Clay
Swain
Macon
Jackson
Haywood
Transylvania
Madison
Henderson
Buncombe
Yancey
Polk
Mitchell
McDowell
Rutherford
Avery
Burke
Watauga
Cleveland
Caldwell
Ashe
Lincoln
Catawba
Alexander
Wilkes
Gaston
Iredell
Allegheny
Mecklenburg
Surry
Yadkin
Union
Cabarrus
Rowan
Davie
Davidson
Stanly
Forsyth
Stokes
Anson
Montgomery
Randolph
Guilford
Rockingham
Richmond
Moore
Alamance
Caswell
Scotland
Chatham
Orange
Lee
Hoke
Robeson
Cumberland
Harnett
Durham
Person
Wake
Granville
Columbus
Bladen
Sampson
Johnston
Franklin
Vance
Brunswick
Wayne
Wilson
Nash
Warren
Pender
Duplin
New Hanover
Greene
Edgecombe
Halifax
Lenoir
Onslow
Jones
Pitt
Northampton
Craven
Martin
Bertie
Hertford
Carteret
Pamlico
Beaufort
Washington
Gates
Chowan
Perquimans
Pasquotank
Tyrrell
Camden
Hyde
Currituck
Dare

(40) Oklahoma

(001) Adair
(003) Alfalfa
(005) Atoka
(007) Beaver
(009) Beckham
(011) Blaine
(013) Bryan
(015) Caddo
(017) Canadian
(019) Carter
(021) Cherokee
(023) Choctaw
(025) Cimarron
(027) Cleveland
(029) Coal
(031) Comanche
(033) Cotton
(035) Craig
(037) Creek
(039) Custer
(041) Delaware
(043) Dewey
(045) Ellis
(047) Garfield
(049) Garvin
(051) Grady
(053) Grant
(055) Greer
(057) Harmon
(059) Harper
(061) Haskell
(063) Hughes
(065) Jackson
(067) Jefferson
(069) Johnston
(071) Kay
(073) Kingfisher
(075) Kiowa
(077) Latimer
(079) Le Flore
(081) Lincoln
(083) Logan
(085) Love
(087) McClain
(089) McCurtain
(091) McIntosh
(093) Major
(095) Marshall
(097) Mayes
(099) Murray
(101) Muskogee
(103) Noble
(105) Nowata
(107) Okfuskee
(109) Oklahoma
(111) Okmulgee
(113) Osage
(115) Ottawa
(117) Pawnee
(119) Payne
(121) Pittsburg
(123) Pontotoc
(125) Pottawatomie
(127) Pushmataha
(129) Roger Mills
(131) Rogers
(133) Seminole
(135) Sequoyah
(137) Stephens
(139) Texas
(141) Tillman
(143) Tulsa
(145) Wagoner
(147) Washington
(149) Washita
(151) Woods
(153) Woodward


Cimarron
Texas
Beaver
Harper
Woods
Alfalfa
Grant
Kay
Osage
Washington
Nowata
Craig
Ottawa
Ellis
Woodward
Major
Garfield
Noble
Pawnee
Tulsa
Rogers
Mayes
Delaware
Roger Mills
Dewey
Blaine
Kingfisher
Logan
Payne
Creek
Wagoner
Cherokee
Adair
Beckham
Custer
Canadian
Oklahoma
Lincoln
Okmulgee
Muskogee
Sequoyah
Haskell
Le Flore
Washita
Caddo
Grady
McClain
Cleveland
Pottawatomie
Seminole
Okfuskee
Hughes
McIntosh
Latimer
Pittsburg
Greer
Kiowa
Comanche
Stephens
Garvin
Pontotoc
Coal
Atoka
Pushmataha
McCurtain
Harmon
Jackson
Tillman
Cotton
Jefferson
Carter
Murray
Johnston
Bryan
Choctaw
Love
Marshall

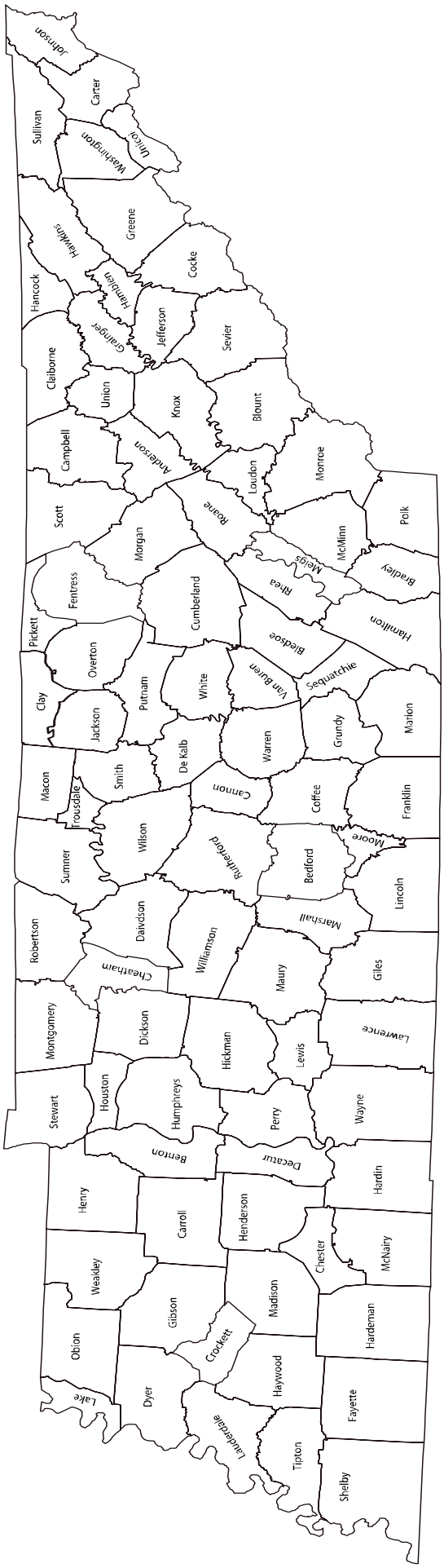
(45) South Carolina

(001) Abbeville
(003) Aiken
(005) Allendale
(007) Anderson
(009) Bamberg
(011) Barnwell
(013) Beaufort
(015) Berkeley
(017) Calhoun
(019) Charleston
(021) Cherokee
(023) Chester
(025) Chesterfield
(027) Clarendon
(029) Colleton
(031) Darlington
(033) Dillon
(035) Dorchester
(037) Edgefield
(039) Fairfield
(041) Florence
(043) Georgetown
(045) Greenville
(047) Greenwood
(049) Hampton
(051) Horry
(053) Jasper
(055) Kershaw
(057) Lancaster
(059) Laurens
(061) Lee
(063) Lexington
(065) Mc Cormick
(067) Marion
(069) Marlboro
(071) Newberry
(073) Oconee
(075) Orangeburg
(077) Pickens
(079) Richland
(081) Saluda
(083) Spartanburg
(085) Sumter
(087) Union
(089) Williamsburg
(091) York

Oconee
Pickens
Greenville
Spartanburg
Cherokee
York
Anderson
Laurens
Union
Chester
Lancaster
Chesterfield
Marlboro
Dillon
Abbeville
Greenwood
Newberry
Fairfield
Kershaw
Darlington
Lee
Marion
Florence
Horry
McCormick
Saluda
Lexington
Richland
Sumter
Edgefield
Aiken
Calhoun
Clarendon
Williamsburg
Georgetown
Orangeburg
Barnwell
Bamberg
Dorchester
Berkeley
Allendale
Colleton
Charleston
Hampton
Jasper
Beaufort

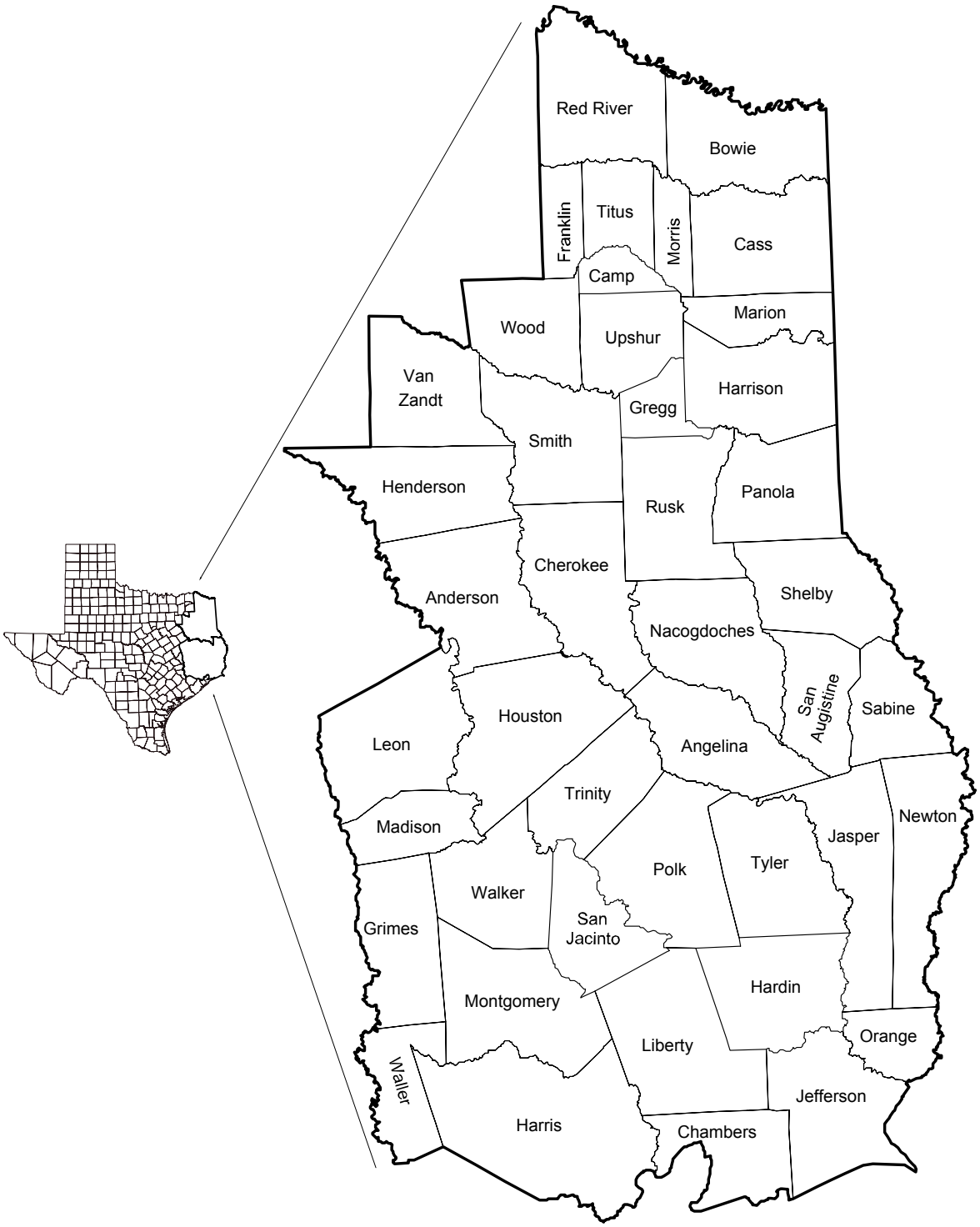
(47) Tennessee

(001) Anderson
(003) Bedford
(005) Benton
(007) Bledsoe
(009) Blount
(011) Bradley
(013) Campbell
(015) Cannon
(017) Carroll
(019) Carter
(021) Cheatham
(023) Chester
(025) Claiborne
(027) Clay
(029) Cocke
(031) Coffee
(033) Crockett
(035) Cumberland
(037) Davidson
(039) Decatur
(041) De Kalb
(043) Dickson
(045) Dyer
(047) Fayette
(049) Fentress
(051) Franklin
(053) Gibson
(055) Giles
(057) Grainger
(059) Greene
(061) Grundy
(063) Hamblen
(065) Hamilton
(067) Hancock
(069) Hardeman
(071) Hardin
(073) Hawkins
(075) Haywood
(077) Henderson
(079) Henry
(081) Hickman
(083) Houston
(085) Humphreys
(087) Jackson
(089) Jefferson
(091) Johnson
(093) Knox
(095) Lake
(097) Lauderdale
(099) Lawrence
(101) Lewis
(103) Lincoln
(105) Loudon
(107) Mc Minn
(109) Mc Nairy
(111) Macon
(113) Madison
(115) Marion
(117) Marshall
(119) Maury
(121) Meigs
(123) Monroe
(125) Montgomery
(127) Moore
(129) Morgan
(131) Obion
(133) Overton
(135) Perry
(137) Pickett
(139) Polk
(141) Putnam
(143) Rhea
(145) Roane
(147) Robertson
(149) Rutherford
(151) Scott
(153) Sequatchie
(155) Sevier
(157) Shelby
(159) Smith
(161) Stewart
(163) Sullivan
(165) Sumner
(167) Tipton
(169) Trousdale
(171) Unicoi
(173) Union
(175) Van Buren
(177) Warren
(179) Washington
(181) Wayne
(183) Weakley
(185) White
(187) Williamson
(189) Wilson

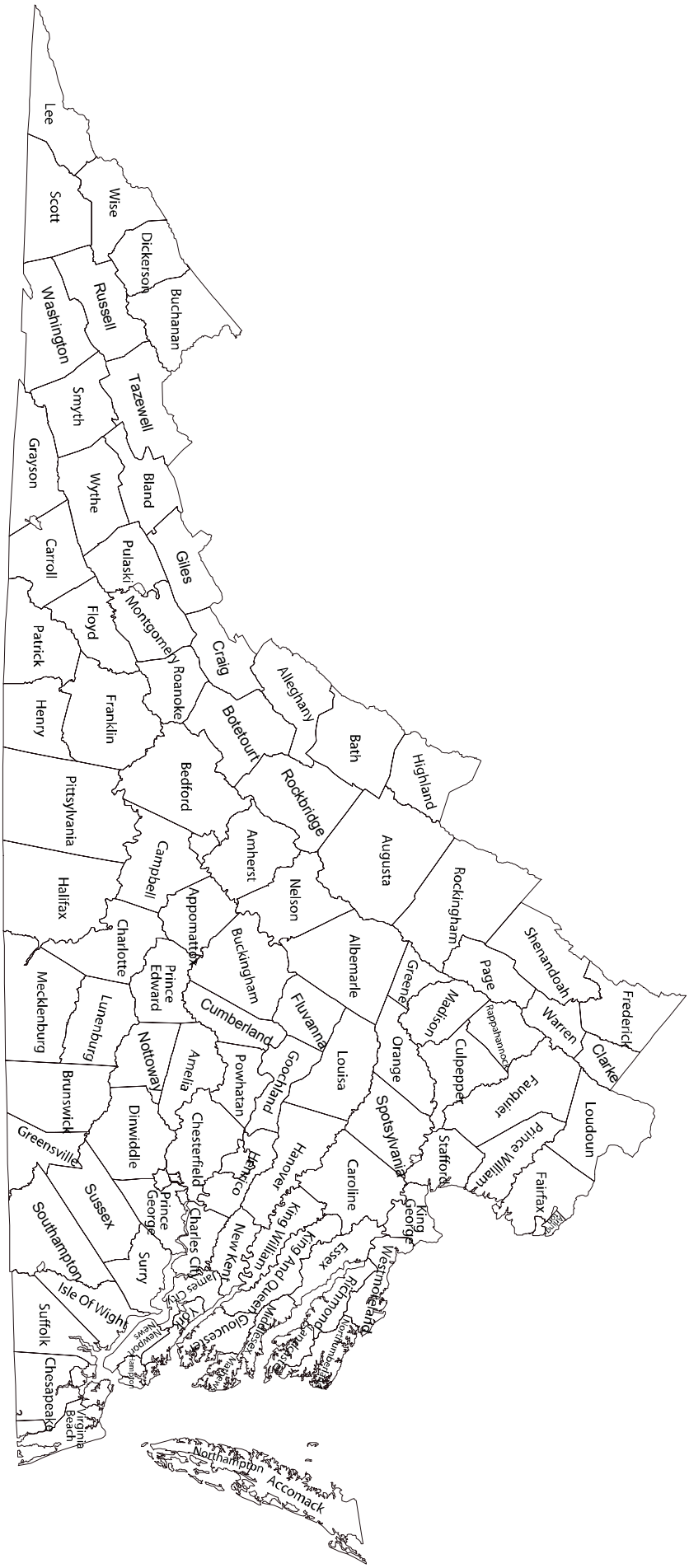

Johnson
Carter
Sullivan
Unicoi
Washington
Greene
Hawkins
Cocke
Hancock
Hamblen
Jefferson
Sevier
Grainger
Claiborne
Union
Knox
Blount
Campbell
Anderson
Loudon
Monroe
Scott
Roane
Polk
Morgan
McMinn
Meigs
Bradley
Fentress
Rhea
Cumberland
Hamilton
Pickett
Bledsoe
Overton
Sequatchie
Putnam
White
Van Buren
Clay
Jackson
Grundy
Marion
Warren
De Kalb
Macon
Smith
Cannon
Coffee
Franklin
Trousdale
Wilson
Rutherford
Moore
Sumner
Bedford
Lincoln
Davidson
Marshall
Robertson
Williamson
Cheatham
Maury
Giles
Montgomery
Dickson
Hickman
Lewis
Lawrence
Houston
Humphreys
Stewart
Perry
Wayne
Benton
Decatur
Hardin
Henry
Carroll
Henderson
Chester
McNairy
Weakley
Madison
Gibson
Hardeman
Obion
Crockett
Haywood
Fayette
Dyer
Lauderdale
Tipton
Lake
Shelby

(48) Texas (East)

(001) Anderson
(005) Angelina
(037) Bowie
(063) Camp
(067) Cass
(071) Chambers
(073) Cherokee
(159) Franklin
(183) Gregg
(185) Grimes
(199) Hardin
(201) Harris
(203) Harrison
(213) Henderson
(225) Houston
(241) Jasper
(245) Jefferson
(289) Leon
(291) Liberty
(313) Madison
(315) Marion
(339) Montgomery
(343) Morris
(347) Nacogdoches
(351) Newton
(361) Orange
(365) Panola
(373) Polk
(387) Red River
(401) Rusk
(403) Sabine
(405) San Augustine
(407) San Jacinto
(419) Shelby
(423) Smith
(449) Titus
(455) Trinity
(457) Tyler
(459) Upshur
(467) Van Zandt
(471) Walker
(473) Waller
(499) Wood


Red River
Bowie
Franklin
Titus
Morris
Cass
Camp
Wood
Upshur
Marion
Van Zandt
Harrison
Gregg
Smith
Henderson
Rusk
Panola
Cherokee
Anderson
Shelby
Nacogdoches
San Augistine
Sabine
Houston
Leon
Angelina
Trinity
Madison
Jasper
Newton
Polk
Tyler
Walker
Grimes
San Jacinto
Hardin
Montgomery
Orange
Liberty
Waller
Jefferson
Harris
Chambers

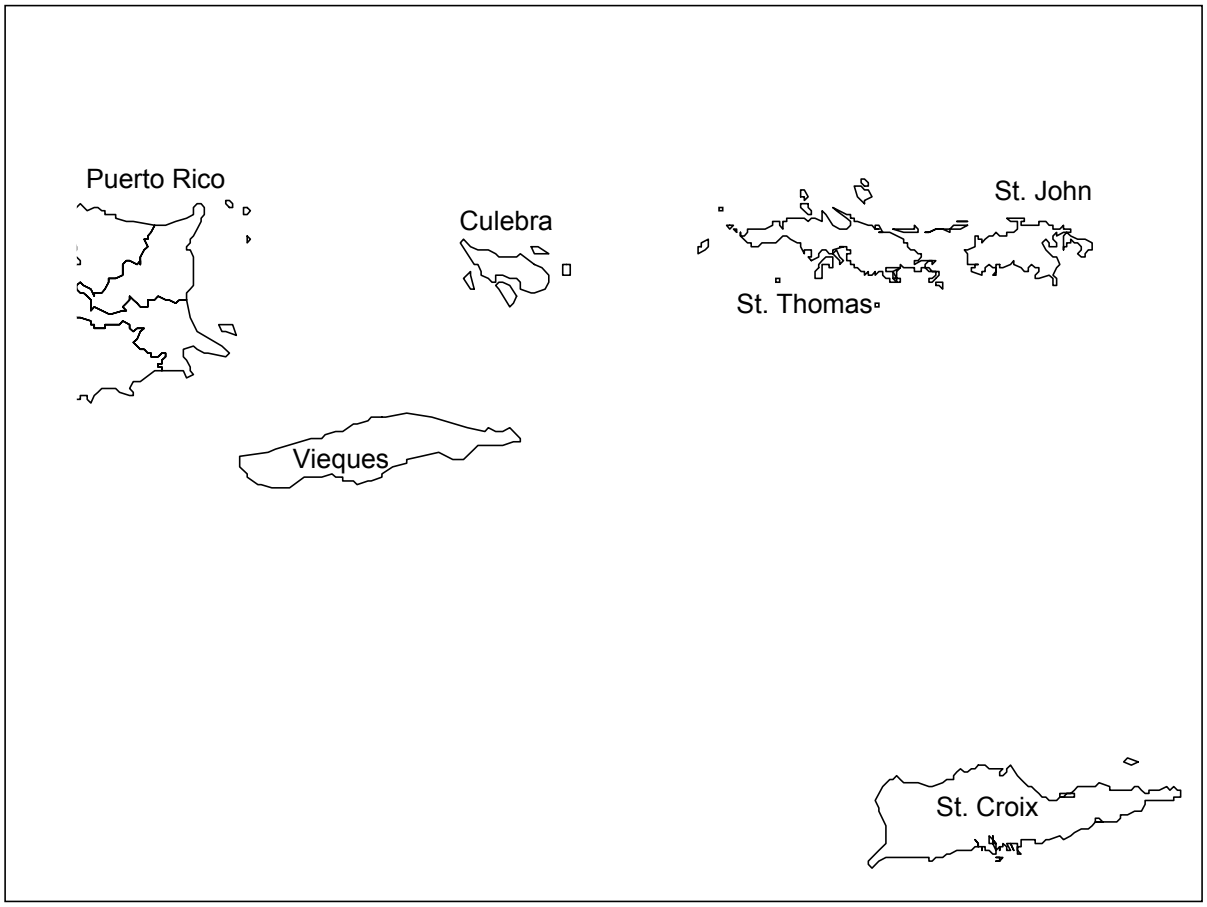
(51) Virginia
(001) Accomack
(003) Albemarle
(005) Alleghany
(007) Amelia
(009) Amherst
(011) Appomattox
(013) Arlington
(015) Augusta
(017) Bath
(019) Bedford
(021) Bland
(023) Botetourt
(025) Brunswick
(027) Buchanan
(029) Buckingham
(031) Campbell
(033) Caroline
(035) Carroll
(036) Charles City
(037) Charlotte
(041) Chesterfield
(043) Clarke
(045) Craig
(047) Culpeper
(049) Cumberland
(051) Dickenson
(053) Dinwiddie
(057) Essex
(059) Fairfax
(061) Fauquier
(063) Floyd
(065) Fluvanna
(067) Franklin
(069) Frederick
(071) Giles
(073) Gloucester
(075) Goochland
(077) Grayson
(079) Greene
(081) Greensville
(083) Halifax
(085) Hanover
(087) Henrico
(089) Henry
(091) Highland
(093) Isle of Wight
(095) James City
(097) King and Queen
(099) King George
(101) King William
(103) Lancaster
(105) Lee
(107) Loudoun
(109) Louisa
(111) Lunenberg
(113) Madison
(115) Mathews
(117) Mecklenburg
(119) Middlesex
(121) Montgomery
(125) Nelson
(127) New Kent
(131) Northampton
(133) Northumberland
(135) Nottoway
(137) Orange
(139) Page
(141) Patrick
(143) Pittsylvania
(145) Powhatan
(147) Prince Edward
(149) Prince George
(153) Prince William
(155) Pulaski
(157) Rappahannock
(159) Richmond
(161) Roanoke
(163) Rockbridge
(165) Rockingham
(167) Russell
(169) Scott
(171) Shenandoah
(173) Smyth
(175) Southampton
(177) Spotsylvania
(179) Stafford
(181) Surry
(183) Sussex
(185) Tazewell
(187) Warren
(191) Washington
(193) Westmoreland
(195) Wise
(197) Wythe
(199) York
(550) Chesapeake City
(650) Hampton City
(700) Newport News City
(800) Suffolk City
(810) Virginia Beach City


Lee
Scott
Wise
Dickerson
Buchanan
Russell
Washington
Tazewell
Smyth
Grayson
Wythe
Bland
Giles
Carroll
Pulaski
Montgomery
Floyd
Patrick
Craig
Roanoke
Franklin
Henry
Allegheny
Botetourt
Bedford
Bath
Highland
Rockbridge
Pittsylvania
Amherst
Augusta
Campbell
Halifax
Nelson
Rockingham
Appomattox
Buckingham
Albemarle
Shenandoah
Page
Charlotte
Prince Edward
Greene
Madison
Frederick
Mecklenburg
Lunenburg
Cumberland
Fluvanna
Warren
Clarke
Rappahannock
Nottoway
Amelia
Powhatan
Goochland
Louisa
Orange
Culpeper
Fauquier
Loudoun
Brunswick
Dinwiddie
Chesterfield
Hanover
Spotsylvania
Stafford
Prince William
Greensville
Henrico
Caroline
King George
Fairfax
Sussex
Prince George
Charles City
King William
New Kent
Essex
Westmoreland
Southampton
Surry
James City
King And Queen
Richmond
Isle Of Wight
York
Gloucester
Middlesex
Suffolk
Newport News
Northumberland
Chesapeake
Hampton
Virginia Beach
Northampton
Accomack

(72) Puerto Rico
(001) Adjuntas
(003) Aguada
(005) Aguadilla
(007) Aguas Buenas
(009) Aibonito
(011) Anasco
(013) Arecibo
(015) Arroyo
(017) Barceloneta
(019) Barranquitas
(021) Bayamon
(023) Cabo Rojo
(025) Caguas
(027) Camuy
(029) Canovanas
(031) Carolina
(033) Catano
(035) Cayey
(037) Ceiba
(039) Ciales
(041) Cidra
(043) Coamo
(045) Comerio
(047) Corozal
(049) Culebra
(051) Dorado
(053) Fajardo
(054) Florida
(055) Guanica
(057) Guayama
(059) Guayanilla
(061) Guaynabo
(063) Gurabo
(065) Hatillo
(067) Hormigueros
(069) Humacao
(071) Isabela Municipio
(073) Jayuya
(075) Juana Diaz
(077) Juncos
(079) Lajas
(081) Lares
(083) Las Marias
(085) Las Piedras
(087) Loiza
(089) Luquillo
(091) Manati
(093) Maricao
(095) Maunabo
(097) Mayaguez
(099) Moca
(101) Morovis
(103) Naguabo
(105) Naranjito
(107) Orocovis
(109) Patillas
(111) Penuelas
(113) Ponce
(115) Quebradillas
(117) Rincon
(119) Rio Grande
(121) Sabana Grande
(123) Salinas
(125) San German
(127) San Juan
(129) San Lorenzo
(131) San Sebastian
(133) Santa Isabel
(135) Toa Alta
(137) Toa Baja
(139) Trujillo Alto
(141) Utuado
(143) Vega Alta
(145) Vega Baja
(147) Vieques
(149) Villalba
(151) Yabucoa
(153) Yuaco

(78) U.S. Virgin Islands
(010) St. Croix Island
(020) St. John Island
(030) St. Thomas Island

Ceiba
Fajardo
Luquillo
Naguabo
Rio Grande
Humacao
Las Piedras
Canovanas
Loiza
Juncos
Yabucoa
Maunabo
Carolina
Gurabo
San Lorenzo
Trujillo Alto
Patillas
San Juan
Caguas
Arroyo
Guaynabo
Aguas Buenas
Guayama
Cataño
Bayamon
Cidra
Cayey
Toa Baja
Comerio
Toa Alta
Naranjito
Aibonito
Salinas
Dorado
Barranquitas
Vega Alta
Corozal
Coamo
Vega Baja
Santa Isabel
Morovis
Orocovis
Villalba
Juana Diaz
Manati
Ciales
Barceloneta
Jayuya
Ponce
Arecibo
Utuado
Adjuntas
Penuelas
Guayanilla
Hatillo
Camuy
Lares
Yauco
Quebradillas
Guanica
Isabela
San Sebastian
Las Marias
Maricao
Sabana Grande
San German
Lajas
Aguadilla
Moca
Anasco
Mayaguez
Hormigueros
Cabo Rojo
Aguada
Rincon


Puerto Rico
Culebra
St. John
St. Thomas
Vieques
St. Croix

Appendix 2. FIA Forest Type Codes

This following list includes all forest types in the Continental U.S. and Alaska Types designated East/West are commonly found in those regions, although types designated for one region may occasionally be found in another. The forest types in gray text (example) are not collected in the Southern Region. Forest types highlighted with gray shading (example) are regional additions.

When determining the forest type, the following guidelines should be used:

Softwood type -- The softwood species, singularly or in a combination of multiple softwood species, must comprise more than 50% of the stocking for the condition.

Mixed softwood/hardwood -- The softwood component, either singularly or in a combination of softwood species, comprises 25 -- 50% of the stocking. The physiographic class and species composition will determine whether the forest is classified as an upland or bottomland type.

Hardwood type -- The softwood component, either singularly or in a combination of softwood species, comprises less than 25% of the stocking. Again, physiographic class and species composition will determine whether the forest is classified as an upland or bottomland type.

East	West	Code	Species Type
			White / Red / Jack Pine Group
E		101	Jack pine
E		102	Red pine
E		103	Eastern white pine
E		104	Eastern white pine / Eastern hemlock
E		105	Eastern hemlock
			Spruce / Fir Group
E		121	Balsam fir
E		122	White spruce
E		123	Red spruce
E		124	Red spruce / balsam fir
E	W	125	Black spruce
E		126	Tamarack
E		127	Northern white-cedar
			Longleaf / Slash Pine Group
E		141	Longleaf pine
E		142	Slash pine
			Loblolly / Shortleaf Pine Group
E		161	Loblolly pine
E		162	Shortleaf pine
E		163	Virginia pine
E		164	Sand pine
E		165	Table-mountain pine
E		166	Pond pine
E		167	Pitch pine
E		168	Spruce pine
			Pinyon / Juniper Group
E		181	Eastern redcedar
E	W	182	Rocky Mountain juniper
	W	183	Western juniper
E	W	184	Juniper woodland
E	W	185	Pinyon juniper woodland
			Douglas-fir Group
E	W	201	Douglas-fir
	W	202	Port-Orford-cedar
			Ponderosa Pine Group
E	W	221	Ponderosa pine
	W	222	Incense cedar
	W	223	Jeffrey pine / Coulter pine / bigcone Douglas-fir

East	West	Code	Species Type
	W	224	Sugar pine
			Western White Pine Group
	W	241	Western white pine
			Fir / Spruce / Mountain Hemlock Group
	W	261	White fir
	W	262	Red fir
	W	263	Noble fir
	W	264	Pacific silver fir
	W	265	Engelmann spruce
	W	266	Engelmann spruce / subalpine fir
	W	267	Grand fir
	W	268	Subalpine fir
	W	269	Blue spruce
	W	270	Mountain hemlock
	W	271	Alaska-yellow-cedar
			Lodgepole Pine Group
	W	281	Lodgepole pine
			Hemlock / Sitka Spruce Group
	W	301	Western hemlock
	W	304	Western redcedar
	W	305	Sitka spruce
			Western Larch Group
	W	321	Western larch
			Redwood Group
	W	341	Redwood
	W	342	Giant sequoia
			Other Western Softwoods Group
	W	361	Knobcone pine
	W	362	Southwest white pine
	W	363	Bishop pine
	W	364	Monterey pine
	W	365	Foxtail pine / bristlecone pine
	W	366	Limber pine
	W	367	Whitebark pine
	W	368	Misc. western softwoods
			California Mixed Conifer Group
	W	371	California mixed conifer
			Exotic Softwoods Group
E		381	Scotch pine
E	W	382	Australian pine
E	W	383	Other exotic softwoods
E		384	Norway spruce
E		385	Introduced larch
			Oak / Pine Group
E		401	Eastern white pine / N. red oak / white ash
E		402	Eastern redcedar / hardwood
E		403	Longleaf pine / oak
E		404	Shortleaf pine / oak
E		405	Virginia pine / southern red oak
E		406	Loblolly pine / hardwood
E		407	Slash pine / hardwood

East	West	Code	Species Type
E		409	Other pine / hardwood
			Oak / Hickory Group
E		501	Post oak / blackjack oak
E		502	Chestnut oak
E		503	White oak / red oak / hickory
E		504	White oak
E		505	Northern red oak
E		506	Yellow-poplar / white oak / N. red oak
E		507	Sassafras / persimmon
E		508	Sweetgum / yellow-poplar
E		509	Bur oak
E		510	Scarlet oak
E		511	Yellow-poplar
E		512	Black walnut
E		513	Black locust
E		514	Southern scrub oak
E		515	Chestnut oak / black oak / scarlet oak
E		519	Red maple / oak
E		520	Mixed upland hardwoods
			Oak / Gum / Cypress Group
E		601	Swamp chestnut oak / cherrybark oak
E		602	Sweetgum / Nuttall oak / willow oak
E		605	Overcup oak / water hickory
E		606	Atlantic white-cedar
E		607	Baldcypress / water tupelo
E		608	Sweetbay / swamp tupelo / red maple
E		609	Cypress
			Elm / Ash / Cottonwood Group
E		701	Black ash / American elm / red maple
E		702	River birch / sycamore
E	W	703	Cottonwood
E	W	704	Willow
E		705	Sycamore / pecan / American elm
E		706	Sugarberry / hackberry / elm / green ash
E		707	Silver maple / American elm
E		708	Red maple / lowland
E	W	709	Cottonwood / willow
	W	722	Oregon ash
			Maple / Beech / Birch Group
E		801	Sugar maple / beech / yellow birch
E		802	Black cherry
E		803	Cherry / ash / yellow-poplar
E		805	Hard maple / basswood
E		807	Elm / ash / locust
E		809	Red maple / upland
			Aspen / Birch Group
E	W	901	Aspen
E	W	902	Paper birch
E	W	904	Balsam poplar
			Alder / Maple Group
	W	911	Red alder
	W	912	Bigleaf maple
			Western Oak Group
	W	921	Gray pine
	W	922	California black oak
	W	923	Oregon white oak
	W	924	Blue oak
E	W	925	Deciduous oak woodland

East	West	Code	Species Type
	W	926	Evergreen oak woodland
	W	931	Coast live oak
	W	932	Canyon live oak / interior live oak
			Tanoak / Laurel Group
	W	941	Tanoak
	W	942	Califonia laurel
	W	943	Giant chinkapin
			Other Western Hardwoods Group
	W	951	Pacific madrone
E	W	952	Mesquite woodland
	W	953	Cercocarpus woodland
	W	954	Intermountain maple woodland
E	W	955	Misc. western hardwood woodlands
			Tropical Hardwoods Group
E		981	Sabal palm
E		982	Mangrove
E		989	Other tropical
			Exotic Hardwoods Group
E		991	Paulownia
E		992	Melaluca
E	W	993	Eucalyptus
E	W	995	Other exotic hardwoods

For non-stocked stands, see section 2.5.3 for procedures to determine FOREST TYPE.

Eastern Forest Type Descriptions

WHITE/RED/JACK PINE GROUP

In pure softwood forest types, the softwood component stocking needs to be greater than 50%

101 Jack pine: Associates – red pine, northern pin oak, quaking and bigtooth aspen, paper birch, black spruce, and white spruce. Sites--generally driest, most porous sands but also on more moist, sandy soils near swamps and on rocky hills and ledges.

102 Red pine: Associates – white, jack, or pitch pine; northern pin oak; white oak; red maple; paper birch; quaking and bigtooth aspen, chestnut oak, northern red oak, and hemlock. Sites--spotty distribution in Northeast and sandy and gravelly locations or dry sandy loam soils; often in plantations.

103 Eastern white pine: Associates – pitch pine, gray birch, aspen, red maple, pin cherry, white oak, paper birch, sweet birch, yellow birch, black cherry, white ash, northern red oak, sugar maple, basswood, hemlock, northern white-cedar, yellow-poplar, white oak, chestnut oak, scarlet oak, and shortleaf pine. Sites--wide variety, but best development on well drained sands and sandy loams.

104 Eastern white pine/ Eastern hemlock: Associates – beech, sugar maple, basswood, red maple, yellow birch, black cherry, white ash, paper birch, sweet birch, northern red oak, white oak, chestnut oak, yellow-poplar, and cucumbertree. Sites--wide variety but favors cool locations, moist ravines, and north slopes.

105 Eastern hemlock: Associates – beech, sugar maple, yellow birch, basswood, red maple, black cherry, white ash, white pine, paper birch, sweet birch, northern red oak, and white oak. Sites--cool locations, moist ravines, and north slopes.

SPRUCE/FIR GROUP

121 Balsam fir: Associates – black, white, or red spruce; paper or yellow birch; quaking or bigtooth aspen, beech; red maple; hemlock; tamarack; black ash; or northern white-cedar. Sites--upland sites on low lying moist flats and in swamps.

122 White spruce: Associates – black spruce, balsam fir, quaking aspen, paper birch, jack pine, red spruce, sugar maple, beech, and yellow birch. Sites--moist, sandy loam or alluvial soils--found on many different sites but especially typical of stream banks, lake shores, and adjacent slopes.

123 Red spruce: Associates – vary widely and may include red maple, yellow birch, eastern hemlock, eastern white pine, white spruce, northern white-cedar, paper birch, pin cherry, gray birch, mountain ash, beech, striped maple, sugar maple, northern red oak, red pine, and aspen. Sites--include moderately well drained to poorly drained flats and thin-slopes and on varying acidic soils in abandoned fields and pastures. This code should be used where red spruce comprises a plurality or majority of the stand's stocking but where balsam fir is either nonexistent or has very little stocking. Otherwise the plot would be coded 124, red spruce/balsam fir.

124 Red spruce/balsam fir: Associates – red maple, paper birch, white pine, hemlock, white spruce, and northern white-cedar. Sites--moderately drained to poorly drained flats or on thin-soiled upper slopes.

125 Black spruce: Associates – white spruce, balsam fir, jack pine, quaking aspen, paper birch, tamarack, northern white-cedar, black ash, or red maple. Sites--acid peat swamps but also on moist flats and uplands.

126 Tamarack (eastern larch): Associates – northern white cedar, red maple, black ash, and quaking aspen. Sites--wet swamps.

127 Northern white-cedar: Associates – tamarack, yellow birch, paperbirch, black ash, red maple, white pine, and hemlock. Sites--slow drainage (not stagnant bogs) areas that are not strongly acid.

LONGLEAF/SLASH PINE GROUP

141 Longleaf pine: Longleaf pine occurs as a pure type or comprises a majority of the trees in the overstory. Associates-slash, loblolly and shortleaf pine, southern red oak, blackjack oak, water oak, persimmon, and sweetgum. Sites--those areas that can and do burn on a periodic basis--usually occurs on middle and upper slopes with a low severity of hardwood and brush competition. Regional distribution--coastal plain and piedmont units.

142 Slash pine: Slash pine is pure or provides a majority of the stocking. Associates--on moist sites; a wide variety of moist-site hardwoods, pond pine, and pondcypress. On dry sites; a wide variety of dry-site hardwoods, longleaf, loblolly, and sand pine. Sites--both moist and well-drained flatwoods, and bays. Regional distribution--coastal plain and piedmont units from North Carolina to Florida.

LOBLOLLY/SHORTLEAF PINE GROUP

161 Loblolly pine: Associates – sweetgum, southern red oak, post oak, blackjack oak, blackgum, yellow-poplar, and pond pine. Sites--in Delaware and Maryland both on upland soils with abundant moisture but good drainage and on poorly drained depressions.

162 Shortleaf pine: Associates – white oak, southern red oak, scarlet oak, black oak, hickory, post oak, blackjack oak, blackgum, red maple, pitch pine, and Virginia pine. Sites--low, well drained ridges to rocky, dry, south slopes and the better drained spur ridges on north slopes and also on old fields.

163 Virginia pine: Associates – shortleaf pine, white oak, chestnut oak, southern red oak, black oak, sweetgum, red maple, blackgum, and pitch pine. Sites--dry sites, often abandoned fields.

164 Sand pine: Sand pine occurs in pure stands or provides a majority of the stocking. Associates--dwarf live oak, dwarf post oak, turkey oak, persimmon, and longleaf pine. Sites--dry, acidic, infertile sands. Regional distribution--found chiefly in the central peninsula and panhandle of Florida, although planted stands extend into the sandhills of Georgia and South Carolina.

165 Table-mountain pine: Associates – chestnut oak, scarlet oak, pitch pine, pine, and black oak. Sites--poor, dry, often rocky slopes.

166 Pond pine: Associates – loblolly pine, sweetgum, baldcypress, and Atlantic white-cedar. Sites--rare, but found in southern New Jersey, Delaware, and Maryland in low, poorly drained acres, swamps, and marshes.

167 Pitch pine: Associates – chestnut oak, scarlet oak, table-mountain pine, black oak, and blackgum. Sites--relatively infertile ridges, dry flats, and slopes.

168 Spruce pine: Spruce pine comprises a majority of the stocking. Associates--any of the moist site softwood or hardwood species. Sites--moist or poorly drained areas. Regional distribution--this type is rarely encountered and is found almost exclusively in the coastal plain.

PINYON / JUNIPER GROUP

181 Eastern redcedar: Associates – gray birch, red maple, sweetbirch, Virginia Pine, shortleaf pine, oak. Sites--usually dry uplands and abandoned fields on limestone outcrops and other shallow soils but can grow well on good sites.

182 Rocky Mountain juniper

PONDEROSA PINE GROUP

221 Ponderosa pine

EXOTIC SOFTWOODS GROUP

381 Scotch pine: plantation type, not naturally occurring.

382 Australian pine:

383 Other exotic softwoods

384 Norway spruce: plantation type, not naturally occurring

385 Introduced larch: plantation type, usually Japanese larch, European larch, or a hybrid of the two (Dunkeld larch) - not naturally occurring. Sites--well-drained uplands; heavy plantation in New York.

OAK/PINE GROUP

In the hardwood/softwood forest types, the softwood component stocking needs to be 25 – 49%

401 Eastern white pine/northern red oak/white ash: Associates – red maple, basswood, yellow birch, bigtooth aspen, sugar maple, beech, paper birch, black cherry, hemlock, and sweet birch. Sites--deep, fertile, well-drained soil.

402 Eastern redcedar/hardwood: Associates – oak, hickory, walnut, ash, locust, dogwood, blackgum, hackberry, winged elm, shortleaf pine, and Virginia pine. Sites--usually dry uplands and abandoned fields.

403 Longleaf pine/oak: Longleaf pine and scrub oaks-primarily turkey, bluejack, blackjack, and dwarf post oak--comprise the type. Associates--southern scrub oaks in the understory. Sites--common on sandhills where soils are dry, infertile, and coarse textured. Regional distribution-- coastal plain and piedmont units.

404 Shortleaf pine/oak: Associates - (oaks generally include white, scarlet, blackjack, black, post, and southern red) hickory, blackgum, sweetgum, Virginia pine, and pitch pine. Sites--generally in dry, low ridges, flats, and south slopes.

405 Virginia pine/southern red oak: Associates – black oak, scarlet oak, white oak, post oak, blackjack oak, shortleaf pine, blackgum, hickory, pitch pine, table-mountain pine, chestnut oak. Sites--dry slopes and ridges.

406 Loblolly pine/hardwood: Associates – wide variety of moist and wet site hardwoods including blackgum, sweetgum, yellow-poplar, red maple, white and green ash, and American elm; on drier sites associates include southern and northern red oak, white oak, post oak, scarlet oak, persimmon, and hickory. Sites--usually moist to very moist though not wet all year but also on drier sites.

407 Slash pine/hardwood: Slash pine and a variable mixture of hardwoods comprise the type. Associates-- codominant with the slash pine component are sweetbay, blackgum, loblolly-bay, pond cypress, pond pine, Atlantic white-cedar, red maple, ash, and water oak. Sites--undrained or poorly drained depressions such as bays or pocosins and along pond margins. Regional distribution--primarily coastal plain units.

409 Other pine/hardwood:

OAK/HICKORY GROUP

In the hardwood forest types, the softwood component stocking needs to be less than 25%

501 Post oak/blackjack oak: Associates – black oak, hickory, southern red oak, white oak, scarlet oak, shingle oak, live oak, shortleaf pine, Virginia pine, blackgum, sourwood, red maple, winged elm, hackberry, chinkapin oak, shumard oak, dogwood, and eastern redcedar. Sites--dry uplands and ridges.

502 Chestnut oak: Associates – scarlet oak, white oak, black oak, post oak, pitch pine, blackgum, sweetgum, red maple, red oak, shortleaf pine, Virginia pine. Sites--rocky outcrops with thin soil, ridge tops.

503 White oak/red oak/hickory: Associates – scarlet oak, bur oak, pinoak, white ash, sugar maple, red maple, walnut, basswood, locust, beech, sweetgum, blackgum, yellow-poplar, and dogwood. Sites--wide variety of well drained upland soils.

504 White oak: Associates – black oak, northern red oak, bur oak, hickory, white ash, yellow-poplar. Sites--scattered patches on upland, loamy soils but on drier sites than type 503.

505 Northern red oak: Associates – black oak, scarlet oak, chestnut oak, and yellow-poplar. Sites--spotty distribution on ridge crests and north slopes in mountains but also found on rolling land, slopes, and benches on loamy soil.

506 Yellow-poplar/white oak/northern red oak: Associates – black oak, hemlock, blackgum, and hickory. Sites--northern slopes, coves, and moist flats.

507 Sassafras/persimmon: Associates – elm, eastern redcedar, hickory, ash, sugar maple, yellow-poplar, and oaks. Sites--abandoned farmlands and old fields.

508 Sweetgum/yellow-poplar: Associates – red maple, white ash, green ash, and other moist site hardwoods. Sites--generally occupies moist, lower slopes.

509 Bur oak: Associates—northern pin oak, black oak, chinkapin oak, and eastern redcedar in northern and dry upland sites; shagbark hickory, black walnut, eastern cottonwood, white ash, American elm, swamp white oak, honey locust, and American basswood in southern and lowland sites. Sites – drier uplands to moist bottomlands with the drier uplands more common in the northern part of the range and the moist bottomlands more common in the southern part of the range.

510 Scarlet oak: Associates – black oak, southern red oak, chestnut oak, white oak, post oak, hickory, pitch pine, blackgum, sweetgum, black locust, sourwood, dogwood, shortleaf pine, and Virginia pine. Sites--dry ridges, south- or west-facing slopes and flats but often moister situations probably as a result of logging or fire.

511 Yellow-poplar: Associates – black locust, red maple, sweet birch, cucumbertree, and other moist-site hardwoods (except sweetgum, see type 508) and white oak and northern red oak (see type 506). Sites--lower slopes, northerly slopes, moist coves, flats, and old fields.

512: Black walnut: Associates – yellow-poplar, white ash, black cherry, basswood, beech, sugar maple, oaks, and hickory. Sites--coves and well-drained bottoms.

513 Black locust: Associates – many species of hardwoods and hardpines may occur with it in mixture, either having been planted or from natural seeding. Sites--may occur on any well-drained soil but best on dry sites, often in old fields.

514 Southern scrub oak: This forest cover type consists of a mixture of scrub oaks that may include several of the following species: turkey oak, bluejack oak, blackjack oak, dwarf post oak, and dwarf live oak. Sites--dry sandy ridges-the type frequently develops on areas formerly occupied by longleaf pine. Regional distribution--common throughout all coastal plain units and into the lower Piedmont.

515 Chestnut oak/black oak/scarlet oak: Associates—northern and southern red oaks, post oak, white oak, sourwood, shagbark hickory, pignut hickory, yellow-poplar, blackgum, sweetgum, red maple, eastern white pine, pitch pine, Table Mountain pine, shortleaf pine, and Virginia pine. Sites—dry upland sites on thin-soiled rocky outcrops on dry ridges and slopes.

519 Red maple/oak: Associates – the type is dominated by red maple and some of the wide variety of central hardwood associates include upland oak, hickory, yellow-poplar, black locust, sassafras as well as some central softwoods like Virginia and shortleaf pines. Sites -- uplands.

520 Mixed upland hardwoods: Associates – Any mixture of hardwoods of species typical of the upland central hardwood region, should include at least some oak. Sites--wide variety of upland sites.

OAK/GUM/CYPRESS GROUP

601 Swamp chestnut oak/cherrybark oak: Associates – white ash, hickory, white oak, shumard oak, blackgum, sweetgum, southern red oak, post oak, American elm, winged elm, yellow-poplar, and beech. Sites--within alluvial flood plains of major rivers on all ridges in the terraces and on the best fine sandy loam soils on the highest first bottom ridges.

602 Sweetgum/Nuttall oak/willow oak: Associates – green ash, American elm, pecan, cottonwood, red maple, honeylocust, and persimmon. Sites--very wet.

605 Overcup oak/water hickory: Associates – willow oak, American elm, green ash, hackberry, persimmon, and red maple. Sites--in South within alluvial flood plains in low, poorly drained flats with clay soils; also in sloughs and lowest backwater basins and low ridges with heavy soils that are subject to late spring inundation.

606 Atlantic white-cedar: Associates – North includes gray birch, pitch pine, hemlock, blackgum, and red maple. South includes pond pine, baldcypress, and red maple. Sites--usually confined to sandy-bottomed, peaty, interior, and river swamps, wet depressions, and stream banks.

607 Baldcypress/water tupelo: Associates – willow, red maple, American elm, persimmon, overcup oak, and sweetgum. Sites--very low, poorly drained flats, deep sloughs, and swamps wet most all the year.

608 Sweetbay/swamp tupelo/red maple: Associates – blackgum, loblolly and pond pines, American elm, and other moist-site hardwoods. Sites--very moist but seldom wet all year--shallow ponds, muck swamps, along smaller creeks in Coastal Plain (rare in Northeast).

609 Cypress: >50% stocking of baldcypress and/or pond cypress. Associates: -- blackgum, willow, red maple, American elm, persimmon, overcup oak, and sweetgum. Sites – very low, poorly drained flats, deep sloughs and swamps that are wet most of the year. Also includes floodplains and stream margins.

ELM/ASH/COTTONWOOD GROUP

701 Black ash/American elm/red maple: Associates – silver maple, swamp white oak, sycamore, pin oak, blackgum, white ash, and cottonwood. Sites--moist to wet areas, swamps, gullies, and poorly drained flats.

702 River birch/sycamore: Associates – red maple, black willow, and other moist-site hardwoods. Sites--moist soils at edges of creeks and rivers.

703 Cottonwood: Associates – willow, white ash, green ash, and sycamore. Sites--streambanks where bare, moist soil is available.

704 Willow: Associates – cottonwood, green ash, sycamore, pecan, American elm, red maple, and boxelder. Sites--streambanks where bare, moist soil is available.

705 Sycamore/pecan/American elm: Associates – boxelder, green ash, hackberry, silver maple, cottonwood, willow, sweetgum, and river birch. Sites--bottomlands, alluvial flood plains of major rivers.

706 Sugarberry/hackberry/elm/green ash: Associates – pecan, blackgum, persimmon, honeylocust, red maple, hackberry, and boxelder. Sites--low ridges and flats in flood plains.

707 Siver maple/American elm: Associates – sweetgum, pin oak, swamp white oak, eastern cottonwood, sycamore, green ash, and other moist-site hardwoods (depending on region). Sites – well-drained, moist sites along river bottoms and floodplains, and beside lakes and larger streams.

708 Red maple/lowland:

709 Cottonwood/willow: Associates – white ash, green ash sycamore, American elm, red maple and boxelder. Sites – stream banks where bare, moist soil is available.

MAPLE/BEECH/BIRCH GROUP

801 Sugar maple/beech/yellow birch: Associates – basswood, red maple, hemlock, northern red oak, white ash, white pine, black cherry, sweet birch, American elm, rock elm, and eastern hophornbeam. Sites--fertile, moist, well-drained sites.

802 Black cherry: Associates – sugar maple, northern red oak, red maple, white ash, basswood, sweet birch, butternut, American elm, and hemlock. Sites--fertile, moist, well-drained sites.

803 Cherry/ash/yellow-poplar: Associates – sugar maple, American beech, northern red oak, white oak, blackgum, hickory, cucumbertree, and yellow birch. Sites -- fertile, moist, well-drained sites.

805 Hard maple/basswood: Associates – white ash, northern red oak, eastern hophornbeam, American elm, red maple, eastern white pine, eastern hemlock. Sugar maple and basswood occur in different proportions but together comprise the majority of the stocking. Sites -- fertile, moist, well-drained sites.

807 Elm/ash/locust: Associates – locust, silver maple, boxelder, elm, red maple, green ash predominate. Found in North Central region, unknown in Northeast. Sites--upland

809 Red maple/upland: Associates – the type is dominated by red maple and some of the wide variety of northern hardwood associates include sugar maple, beech, birch, aspen, as well as some northern softwoods like white pine, red pine, and hemlock; this type is often man-made and may be the result of repeated cuttings. Sites -- uplands. (See Type 519 under oak/hickory group)

ASPEN/BIRCH GROUP

901 Aspen: Associates – paper birch, pin cherry, bur oak, green ash, American elm, balsam poplar, and boxelder. Sites--all kinds of soils except very driest sands and wettest swamps; found on burns, clearcuts, and abandoned land.

902 Paper birch: Associates – aspen, white pine, yellow birch, hemlock, red maple, northern red oak, and basswood. Sites--wide range of upland site, common on burns or clearcuts.

904 Balsam poplar: Associates – balsam fir, white spruce, black spruce, tamarack, aspen, and paper birch. Sites – uplands and flood plains.

TROPICAL HARDWOODS GROUP

981 Sabal palm:

982 Mangrove: Forests in which mangrove comprises a majority of the stocking. Associates--cabbage palm on some of the higher sites in the area. Sites--predominantly salt marshes; mangrove frequently develops its own island or shoreline made up of a dense mat of root structures. Regional distribution--restricted to South Florida, the Keys, Puerto Rico, and the U.S. Virgin Islands.

989 Other tropical:

EXOTIC HARDWOODS GROUP

991 Paulownia:

992 Melaluca:

993 Eucalyptus:

995 Other exotic hardwoods:

For non-stocked stands, see sections 2.5.3 for procedures to determine FOREST TYPE.

Appendix 3. FIA Tree Species Codes

This list includes all tree species tallied in the Continental U.S. and Alaska. Species designated East/West are commonly found in those regions, although species designated for one region may occasionally be found in another. Woodland species designate species where DRC is measured instead of DBH. Species that have an "X" in the *Core* column are tallied in all regions. All other species on the list are "core optional".

Core	East	West	Woodland	FIA Code	PLANTS Code	Common Name	Genus	Species
	E	W		10	ABIES	Fir spp.	Abies	spp.
X	E	W		12	ABBA	balsam fir	Abies	balsamea
X	E			16	ABFR	Fraser fir	Abies	fraseri
X	E			43	CHTH2	Atlantic white-cedar	Chamaecyparis	thyoides
X		W		51	CUAR	Arizona cypress	Cupressus	arizonica
	E	W		57	JUNIP	redcedar, juniper spp.	Juniperus	spp.
X		W	w	59	JUCO11	redberry juniper	Juniperus	coahuilensis
X	E			61	JUAS	Ashe juniper	Juniperus	ashei
X		W	w	63	JUDE2	alligator juniper	Juniperus	deppeana
X	E	W	w	66	JUSC2	Rocky Mountain juniper	Juniperus	scopulorum
	E			67	JUVIS	southern redcedar	Juniperus	virginiana var. silicicola
X	E			68	JUVI	eastern redcedar	Juniperus	virginiana
X		W	w	69	JUMO	oneseed juniper	Juniperus	monosperma
	E	W		90	PICEA	spruce spp.	Picea	spp.
X	E			91	PIAB	Norway spruce	Picea	abies
X	E	W		94	PIGL	white spruce	Picea	glauca
X	E	W		95	PIMA	black spruce	Picea	mariana
X	E	W		96	PIPU	blue spruce	Picea	pungens
X	E			97	PIRU	red spruce	Picea	rubens
	E	W		100	PINUS	pine spp.	Pinus	spp.
X		W	w	106	PIED	Common pinyon, two-needle pinyon	Pinus	edulis
X	E			107	PICL	sand pine	Pinus	clausa
X	E			110	PIEC2	shortleaf pine	Pinus	echinata
X	E			111	PIEL	slash pine	Pinus	elliottii
X		W		113	PIFL2	limber pine	Pinus	flexilis
X		W		114	PIST3	southwestern white pine	Pinus	strobiformis
X	E			115	PIGL2	spruce pine	Pinus	glabra
X	E			121	PIPA2	longleaf pine	Pinus	palustris
X	E	W		122	PIPO	ponderosa pine	Pinus	ponderosa
X	E			123	PIPU5	Table Mountain pine	Pinus	pungens
X	E			125	PIRE	red pine	Pinus	resinosa
X	E			126	PIRI	pitch pine	Pinus	rigida
X	E			128	PISE	pond pine	Pinus	serotina
X	E			129	PIST	eastern white pine	Pinus	strobus
X	E			130	PISY	Scotch pine	Pinus	sylvestris
X	E			131	PITA	loblolly pine	Pinus	taeda
X	E			132	PIVI2	Virginia pine	Pinus	virginiana

Core	East	West	Woodland	FIA Code	PLANTS Code	Common Name	Genus	Species
X	E			136	PINI	Austrian pine	Pinus	nigra
X		W	w	140	PICE	Mexican pinyon pine	Pinus	cembroides
X	E			144	PIELE2	Carribean pine	Pinus	elliottii var. elliottii
	E			220	TAXOD	cypress spp.	Taxodium	spp.
X	E			221	TADI2	baldcypress	Taxodium	distichum
X	E			222	TAAS	pondcypress	Taxodium	ascendens
	E	W		230	TAXUS	yew spp.	Taxus	spp.
X	E			232	TAFL	Florida yew	Taxus	floridana
X	E			241	THOC2	northern white-cedar	Thuja	occidentalis
X	E			252	TOTA	Florida torreya (nutmeg)	Torreya	taxifolia
	E	W		260	TSUGA	hemlock spp.	Tsuga	spp.
X	E			261	TSCA	eastern hemlock	Tsuga	canadensis
X	E			262	TSCA2	Carolina hemlock	Tsuga	caroliniana
X	E	W		299	2TE	unknown dead conifer	Tree	evergreen
	E	W		303	ACFA	sweet acacia	Acacia	farnesiana
	E	W		310	ACER	maple spp.	Acer	spp.
X	E			311	ACBA3	Florida maple	Acer	barbatum
X	E	W		313	ACNE2	boxelder	Acer	negundo
X	E			314	ACNI5	black maple	Acer	nigrum
X	E			315	ACPE	striped maple	Acer	pensylvanicum
X	E			316	ACRU	red maple	Acer	rubrum
X	E			317	ACSA2	silver maple	Acer	saccharinum
X	E			318	ACSA3	sugar maple	Acer	saccharum
	E			319	ACSP2	mountain maple	Acer	spicatum
	E			320	ACPL	Norway maple	Acer	platanoides
X	E			323	ACLE	chalk maple	Acer	leucoderme
	E	W		330	AESCU	buckeye, horsechestnut spp.	Aesculus	spp.
X	E			331	AEGL	Ohio buckeye	Aesculus	glabra
X	E			332	AEFL	yellow buckeye	Aesculus	flava
	E			334	AEGLA	Texas buckeye	Aesculus	glabra var. arguta
X	E			341	AIAL	ailanthus	Ailanthus	altissima
X	E	W		345	ALJU	mimosa/silktree	Albizia	julibrissin
X	E			355	ALGL2	European alder	Alnus	glutinosa
	E	W		356	AMELA	serviceberry spp.	Amelanchier	spp.
X	E			367	ASTR	Pawpaw	Asimina	triloba
	E	W		370	BETUL	birch spp.	Betula	spp.
X	E			371	BEAL2	yellow birch	Betula	alleghaniensis
X	E			372	BELE	sweet birch	Betula	lenta
X	E			373	BENI	river birch	Betula	nigra
X	E			374	BEOC2	water birch	Betula	occidentalis
X	E	W		375	BEPA	paper birch	Betula	papyrifera
X	E			377	BEUB	Virginia roundleaf birch	Betula	uber
X	E			379	BEPO	gray birch	Betula	populifolia

Core	East	West	Woodland	FIA Code	PLANTS Code	Common Name	Genus	Species
	E			381	SILAL3	Chittamwood, gum bumelia	Sideroxylon	lanuginosum ssp. lanuginosum
X	E			391	CACA18	American hornbeam, musclewood	Carpinus	caroliniana
	E			400	CARYA	hickory spp.	Carya	spp.
X	E			401	CAAQ2	water hickory	Carya	aquatica
X	E			402	CACO15	bitternut hickory	Carya	cordiformis
X	E			403	CAGL8	pignut hickory	Carya	glabra
X	E			404	CAIL2	pecan	Carya	illinoinensis
X	E			405	CALA21	shellbark hickory	Carya	laciniosa
X	E			406	CAMY	nutmeg hickory	Carya	myristiciformis
X	E			407	CAOV2	shagbark hickory	Carya	ovata
X	E			408	CATE9	black hickory	Carya	texana
X	E			409	CAAL27	mockernut hickory	Carya	alba
X	E			410	CAPA24	sand hickory	Carya	pallida
X	E			411	CAFL6	scrub hickory	Carya	floridana
X	E			412	CAOV3	red hickory	Carya	ovalis
X	E			413	CACA38	southern shagbark hickory	Carya	carolinae-septentrionalis
	E	W		420	CASTA	chestnut spp.	Castanea	spp.
	E			421	CADE12	American chestnut	Castanea	dentata
X	E			422	CAPU9	Allegheny chinkapin	Castanea	pumila
	E			423	CAPUO	Ozark chinkapin	Castanea	pumila var. ozarkensis
X	E	W		424	CAMO83	Chinese chestnut	Castanea	mollissima
	E			450	CATAL	catalpa spp.	Catalpa	spp.
X	E			451	CABI8	southern catalpa	Catalpa	bignonioides
X	E			452	CASP8	northern catalpa	Catalpa	speciosa
	E	W		460	CELTI	hackberry spp.	Celtis	spp.
X	E	W		461	CELA	sugarberry	Celtis	laevigata
X	E	W		462	CEOC	hackberry	Celtis	occidentalis
	E	W		463	CELAR	netleaf hackberry	Celtis	laevigata var. reticulata
X	E			471	CECA4	eastern redbud	Cercis	canadensis
X	E			481	CLKE	yellowwood	Cladrastis	kentukea
X	E			491	COFL2	flowering dogwood	Cornus	florida
	E			500	CRATA	hawthorn spp.	Crataegus	spp.
	E			501	CRCR2	cockspur hawthorn	Crataegus	crus-galli
	E			502	CRMO2	downy hawthorn	Crataegus	mollis
	E	W		510	EUCAL	eucalyptus spp.	Eucalyptus	spp.
X	E			513	EUGR12	grand eucalyptus	Eucalyptus	grandis
X	E			514	EURO2	swamp mahogany	Eucalyptus	robusta
	E			520	DIOSP	persimmon spp.	Diospyros	spp.
X	E			521	DIVI5	common persimmon	Diospyros	virginiana
X	E			522	DITE3	Texas persimmon	Diospyros	texana
X	E			531	FAGR	American beech	Fagus	grandifolia
	E	W		540	FRAXI	ash spp.	Fraxinus	spp.

Core	East	West	Woodland	FIA Code	PLANTS Code	Common Name	Genus	Species
X	E			541	FRAM2	white ash	Fraxinus	americana
X	E			543	FRNI	black ash	Fraxinus	nigra
X	E			544	FRPE	green ash	Fraxinus	pennsylvanica
X	E			545	FRPR	pumpkin ash	Fraxinus	profunda
X	E			546	FRQU	blue ash	Fraxinus	quadrangulata
X		W		547	FRVE2	velvet ash	Fraxinus	velutina
X	E			548	FRCA3	Carolina ash	Fraxinus	caroliniana
X	E			549	FRTE	Texas ash	Fraxinus	texensis
	E			550	GLEDI	locust spp.	Gleditsia	spp.
X	E			551	GLAQ	waterlocust	Gleditsia	aquatica
X	E			552	GLTR	honeylocust	Gleditsia	triacanthos
X	E			555	GOLA	loblolly bay	Gordonia	lasianthus
X	E	W		561	GIBI2	Ginkgo, maidenhair tree	Ginkgo	biloba
X	E			571	GYDI	Kentucky coffeetree	Gymnocladus	dioicus
	E			580	HALES	silverbell spp.	Halesia	spp.
X	E			581	HACA3	Carolina silverbell	Halesia	carolina
X	E			582	HADI3	two-wing silverbell	Halesia	diptera
X	E			591	ILOP	American holly	Ilex	opaca
	E	W		600	JUGLA	walnut spp.	Juglans	spp.
X	E			601	JUCI	butternut	Juglans	cinerea
X	E	W		602	JUNI	black walnut	Juglans	nigra
	E	W		605	JUMI	Texas walnut	Juglans	microcarpa
X	E			611	LIST2	sweetgum	Liquidambar	styraciflua
X	E			621	LITU	yellow-poplar	Liriodendron	tulipifera
X	E			641	MAPO	Osage-orange	Maclura	pomifera
	E			650	MAGNO	magnolia spp.	Magnolia	spp.
X	E			651	MAAC	cucumbertree	Magnolia	acuminata
X	E			652	MAGR4	southern magnolia	Magnolia	grandiflora
X	E			653	MAVI2	sweetbay	Magnolia	virginiana
X	E			654	MAMA2	bigleaf magnolia	Magnolia	macrophylla
X	E			655	MAFR	mountain magnolia, Fraser magnolia	Magnolia	fraseri
X	E			657	MAPY	pyramid magnolia	Magnolia	pyramidata
X	E			658	MATR	umbrella magnolia	Magnolia	tripetala
	E	W		660	MALUS	apple spp.	Malus	spp.
X	E			662	MAAN3	southern crabapple	Malus	angustifolia
X	E			663	MACO5	sweet crabapple	Malus	coronaria
X	E			664	MAIO	prairie crabapple	Malus	ioensis
	E			680	MORUS	mulberry spp.	Morus	spp.
X	E			681	MOAL	white mulberry	Morus	alba
X	E			682	MORU2	red mulberry	Morus	rubra
X	E			684	MONI	black mulberry	Morus	nigra
	E			690	NYSSA	tupelo spp.	Nyssa	spp.
X	E			691	NYAQ2	water tupelo	Nyssa	aquatica

Core	East	West	Woodland	FIA Code	PLANTS Code	Common Name	Genus	Species
X	E			692	NYOG	Ogeechee tupelo	Nyssa	ogeche
X	E			693	NYSY	blackgum	Nyssa	sylvatica
X	E			694	NYBI	swamp tupelo	Nyssa	biflora
X	E			701	OSVI	eastern hophornbeam	Ostrya	virginiana
X	E			711	OXAR	sourwood	Oxydendrum	arboreum
X	E			712	PATO2	paulownia, empress-tree	Paulownia	tomentosa
	E	W		720	PERSE	bay spp.	Persea	spp.
X	E			721	PEBO	redbay	Persea	borbonia
X	E			722	PLAQ	water-elm, planertree	Planera	aquatica
	E	W		729	PLATA	sycamore spp.	Platanus	spp.
X	E			731	PLOC	American sycamore	Platanus	occidentalis
	E	W		740	POPUL	cottonwood and poplar spp.	Populus	spp.
X	E	W		741	POBA2	balsam poplar	Populus	balsamifera
X	E			742	PODE3	eastern cottonwood	Populus	deltoides
X	E			743	POGR4	bigtooth aspen	Populus	grandidentata
X	E			744	POHE4	swamp cottonwood	Populus	heterophylla
X	E	W		745	PODEM	plains cottonwood	Populus	deltoides ssp. monilifera
X	E	W		746	POTR5	quaking aspen	Populus	tremuloides
X		W		748	POFR2	Fremont's cottonwood	Populus	fremontii
X		W		749	POAN3	narrowleaf cottonwood	Populus	angustifolia
X	E			752	POAL7	silver poplar	Populus	alba
X	E			753	PONI	Lombardy poplar	Populus	nigra
	E	W	w	755	PROSO	mesquite spp.	Prosopis	spp.
X	E	W	w	757	PRVE	velvet mesquite	Prosopis	velutina
X	E	W	w	758	PRPU	screwbean mesquite	Prosopis	pubescens
	E	W		760	PRUNU	cherry and plum spp.	Prunus	spp.
	E	W		761	PRPE2	pin cherry	Prunus	pensylvanica
X	E			762	PRSE2	black cherry	Prunus	serotina
	E	W		763	PRVI	common chokecherry	Prunus	virginiana
X	E			765	PRNI	Canada plum	Prunus	nigra
X	E			766	PRAM	American plum	Prunus	americana
X	E			771	PRAV	sweet cherry (domesticated)	Prunus	avium
	E			780	PYRUS	Pear spp.	Pyrus	spp.
	E			781	PYCO	Common pear	Pyrus	communis
	E			782	PYCA80	Callery pear	Pyrus	calleryana
	E	W		800	QUERC	oak – deciduous spp.	Quercus	spp.
X	E			802	QUAL	white oak	Quercus	alba
X		W	w	803	QUAR	Arizona white oak	Quercus	arizonica
X	E			804	QUBI	swamp white oak	Quercus	bicolor
X	E			806	QUCO2	scarlet oak	Quercus	coccinea
X	E			808	QUSIS	Durand oak	Quercus	sinuata var. sinuata
X	E			809	QUEL	northern pin oak	Quercus	ellipsoidalis
X	E			812	QUFA	southern red oak	Quercus	falcata

Core	East	West	Woodland	FIA Code	PLANTS Code	Common Name	Genus	Species
X	E			813	QUPA5	cherrybark oak	Quercus	pagoda
X		W	w	814	QUGA	Gambel oak	Quercus	gambelii
X	E			816	QUIL	scrub oak	Quercus	ilicifolia
X	E			817	QUIM	shingle oak	Quercus	imbricaria
X	E			819	QULA2	turkey oak	Quercus	laevis
X	E			820	QULA3	laurel oak	Quercus	laurifolia
X	E			822	QULY	overcup oak	Quercus	lyrata
X	E			823	QUMA2	bur oak	Quercus	macrocarpa
X	E			824	QUMA3	blackjack oak	Quercus	marilandica
X	E			825	QUMI	swamp chestnut oak	Quercus	michauxii
X	E			826	QUMU	chinkapin oak	Quercus	muehlenbergii
X	E			827	QUNI	water oak	Quercus	nigra
X	E			828	QUBU2	Nuttall oak	Quercus	buckleyi
X	E			830	QUPA2	pin oak	Quercus	palustris
X	E			831	QUPH	willow oak	Quercus	phellos
X	E			832	QUPR2	chestnut oak	Quercus	prinus
X	E			833	QURU	northern red oak	Quercus	rubra
X	E			834	QUSH	Shumard's oak	Quercus	shumardii
X	E			835	QUST	post oak	Quercus	stellata
	E			836	QUSI2	Delta post oak	Quercus	similis
X	E			837	QUVE	black oak	Quercus	velutina
X	E			838	QUVI	live oak	Quercus	virginiana
X	E			840	QUMA6	dwarf post oak	Quercus	margarettiae
X	E			841	QUMI2	dwarf live oak	Quercus	minima
X	E			842	QUIN	bluejack oak	Quercus	incana
X		W	w	843	QUHY	silverleaf oak	Quercus	hypoleucoides
X	E			844	QUOG	Oglethorpe oak	Quercus	oglethorpensis
	E			845	QUPR	dwarf chinkapin oak	Quercus	prinoides
		W	w	850	QUERC	oak – evergreen spp.	Quercus	spp.
	E			852	AMEL	torchwood	Amyris	elemifera
	E			853	ANGL4	pond apple	Annona	glabra
	E			854	BUSI	gumbo limbo	Bursera	simaruba
	E			855	CASUA	sheoak spp.	Casuarina	spp.
X	E			856	CAGL11	gray sheoak	Casuarina	glauca
X	E			857	CALE28	Australian pine	Casuarina	lepidophloia
	E			858	CICA	camphor tree	Cinnamomum	camphora
	E			859	CIFR	fiddlewood	Citharexylum	fruticosum
	E			860	CITRU2	citrus spp.	Citrus	spp.
	E			863	CODI8	pigeon plum, tietongue	Coccoloba	diversifolia
	E			864	COEL2	soldierwood	Colubrina	elliptica
	E			865	COSE2	geiger tree	Cordia	sebestena
	E			866	CUAN4	carrotwood	Cupaniopsis	anacardioides
	E			873	EURH	red stopper	Eugenia	rhombea
	E			874	EXPA	Inkwood, butterbough	Exothea	paniculata

Core	East	West	Woodland	FIA Code	PLANTS Code	Common Name	Genus	Species
	E			876	FIAU	strangler fig	Ficus	aurea
	E			877	FICI	shortleaf fig, wild banyantree	Ficus	citrifolia
	E			882	GUDI	Blolly, beeftree	Guapira	discolor
	E			883	HIMA2	manchineel	Hippomane	mancinella
	E			884	LYLA3	false tamarind	Lysiloma	latisiliquum
	E			885	MAIN3	mango	Mangifera	indica
	E			886	METO3	poisonwood	Metopium	toxiferum
	E			887	PIPI3	fishpoison tree	Piscidia	piscipula
	E			888	SCAC2	schefflera, octopus tree	Schefflera	actinophylla
	E			890	SIFO	false mastic	Sideroxylon	foetidissimum
	E			891	SISA6	white bully, willow bustic	Sideroxylon	salicifolium
	E			895	SIGL3	paradise tree	Simarouba	glauca
	E			896	SYCU	Java plum	Syzygium	cumini
	E			897	TAIN2	tamarind	Tamarindus	indica
X	E	W		901	ROPS	black locust	Robinia	pseudoacacia
	E			906	ACWR4	paurotis palm	Acoelorraphe	wrightii
	E			907	COAR	silver palm	Coccothrinax	argentata
	E			908	CONU	coconut palm	Cocos	nucifera
	E			909	ROYST	royal palm spp.	Roystonea	spp.
X	E			912	SAPA	cabbage palmetto	Sabal	palmetto
	E			913	THMO4	key thatch palm	Thrinax	morrisii
	E			914	THRA2	Florida thatch palm	Thrinax	radiata
	E			915	ARECA	other palms	Family Arecaceae	not listed above
	E	W		919	SASAD	western soapberry	Sapindus	saponaria var. drummondii
	E	W		920	SALIX	willow spp.	Salix	spp.
	E	W		921	SAAM2	peachleaf willow	Salix	amygdaloides
	E	W		922	SANI	black willow	Salix	nigra
	E	W		923	SABE2	Bebb willow	Salix	bebbiana
		W		924	SABO	red willow	Salix	bonplandiana
X	E			925	SACA5	coastal plain willow	Salix	caroliniana
X	E			926	SAPY	balsam willow	Salix	pyrifolia
	E	W		927	SAAL2	white willow	Salix	alba
X	E			929	SASE10	weeping willow	Salix	sepulcralis
X	E			931	SAAL5	sassafras	Sassafras	albidum
	E			934	SORBU	mountain ash spp.	Sorbus	spp.
	E			935	SOAM3	American mountain ash	Sorbus	americana
X	E			936	SOAU	European mountain ash	Sorbus	aucuparia
X	E			937	SODE3	northern mountain ash	Sorbus	decora
	E			950	TILIA	basswood spp.	Tilia	spp.
X	E			951	TIAM	American basswood	Tilia	americana
	E			952	TIAMH	white basswood	Tilia	americana var. heterophylla
	E			953	TIAMC	Carolina basswood	Tilia	americana var. caroliniana

Core	East	West	Woodland	FIA Code	PLANTS Code	Common Name	Genus	Species
	E			970	ULMUS	elm spp.	Ulmus	spp.
X	E			971	ULAL	winged elm	Ulmus	alata
X	E			972	ULAM	American elm	Ulmus	americana
X	E			973	ULCR	cedar elm	Ulmus	crassifolia
X	E			974	ULPU	Siberian elm	Ulmus	pumila
X	E			975	ULRU	slippery elm	Ulmus	rubra
X	E			976	ULSE	September elm	Ulmus	serotina
X	E			977	ULTH	rock elm	Ulmus	thomasii
	E			986	AVGE	black mangrove	Avicennia	germinans
	E			987	COER2	buttonwood mangrove	Conocarpus	erectus
	E			988	LARA2	white mangrove	Laguncularia	racemosa
X	E			989	RHMA2	American mangrove	Rhizophora	mangle
X	E			992	MEQU	melaleuca	Melaleuca	quinquenervia
X	E			993	MEAZ	chinaberry	Melia	azedarach
X	E			994	TRSE6	Chinese tallowtree	Triadica	sebifera
X	E			995	VEFO	tungoil tree	Vernicia	fordii
X	E			996	COOB2	smoketree	Cotinus	obovatus
	E	W		997	ELAN	Russian-olive	Elaeagnus	angustifolia
X	E	W		998	2TB	unknown dead hardwood	Tree	broadleaf
X	E	W		999	2TREE	other, or unknown live tree	Tree	unknown
X		W		11	ABAM	Pacific silver fir	Abies	amabilis
X		W		14	ABBR	Santa Lucia fir, bristlecone fir	Abies	bracteata
X		W		15	ABCO	white fir	Abies	concolor
X		W		17	ABGR	grand fir	Abies	grandis
X		W		18	ABLAA	corkbark fir	Abies	lasiocarpa var. arizonica
X		W		19	ABLA	subalpine fir	Abies	lasiocarpa
X		W		20	ABMA	California red fir	Abies	magnifica
X		W		21	ABSH	Shasta red fir	Abies	shastensis
X		W		22	ABPR	noble fir	Abies	procera
	E	W		40	CHAMA4	cedar spp.	Chamaecyparis	spp.
X		W		41	CHLA	Port-Orford-cedar	Chamaecyparis	lawsoniana
X		W		42	CHNO	Alaska yellow-cedar	Chamaecyparis	nootkatensis
		W		50	CUPRE	cypress	Cupressus	spp.
X		W		52	CUBA	Baker cypress, Modoc cypress	Cupressus	bakeri
X		W		53	CUFO2	tecate cypress	Cupressus	forbesii
X		W		54	CUMA2	Monterey cypress	Cupressus	macrocarpa
		W		55	CUSA3	Sargent's cypress	Cupressus	sargentii
X		W		56	CUMA	MacNab's cypress	Cupressus	macnabiana
X		W	w	58	JUPI	Pinchot juniper	Juniperus	pinchotii
X		W	w	62	JUCA7	California juniper	Juniperus	californica
X		W		64	JUOC	western juniper	Juniperus	occidentalis
X		W	w	65	JUOS	Utah juniper	Juniperus	osteosperma

Core	East	West	Woodland	FIA Code	PLANTS Code	Common Name	Genus	Species
	E	W		70	LARIX	larch spp.	Larix	spp.
X	E	W		71	LALA	tamarack (native)	Larix	laricina
X		W		72	LALY	subalpine larch	Larix	lyallii
X		W		73	LAOC	western larch	Larix	occidentalis
X		W		81	CADE27	incense-cedar	Calocedrus	decurrens
X		W		92	PIBR	Brewer spruce	Picea	breweriana
X		W		93	PIEN	Engelmann spruce	Picea	engelmannii
X		W		98	PISI	Sitka spruce	Picea	sitchensis
X		W		101	PIAL	whitebark pine	Pinus	albicaulis
X		W		102	PIAR	Rocky Mountain bristlecone pine	Pinus	aristata
X		W		103	PIAT	knobcone pine	Pinus	attenuata
X		W		104	PIBA	foxtail pine	Pinus	balfouriana
X	E			105	PIBA2	jack pine	Pinus	banksiana
X		W		108	PICO	lodgepole pine	Pinus	contorta
X		W		109	PICO3	Coulter pine	Pinus	coulteri
X		W		112	PIEN2	Apache pine	Pinus	engelmannii
X		W		116	PIJE	Jeffrey pine	Pinus	jeffreyi
X		W		117	PILA	sugar pine	Pinus	lambertiana
X		W		118	PILE	Chihuahua pine	Pinus	leiophylla
X		W		119	PIMO3	western white pine	Pinus	monticola
X		W		120	PIMU	bishop pine	Pinus	muricata
X		W		124	PIRA2	Monterey pine	Pinus	radiata
X		W		127	PISA2	gray pine, California foothill pine	Pinus	sabiniana
X		W	w	133	PIMO	singleleaf pinyon	Pinus	monophylla
X		W	w	134	PIDI3	border pinyon	Pinus	discolor
X		W		135	PIAR5	Arizona pine	Pinus	arizonica
X		W		137	PIWA	Washoe pine	Pinus	washoensis
X		W		138	PIQU	four-leaf pine, Parry pinyon pine	Pinus	quadrifolia
X		W		139	PITO	Torrey pine	Pinus	torreyana
X		W		142	PILO	Great Basin bristlecone pine	Pinus	longaeva
X		W	w	143	PIMOF	Arizona pinyon pine	Pinus	monophylla var. fallax
		W		200	PSEUD7	Douglas-fir spp.	Pseudotsuga	spp.
X		W		201	PSMA	bigcone Douglas-fir	Pseudotsuga	macrocarpa
X		W		202	PSME	Douglas-fir	Pseudotsuga	menziesii
X		W		211	SESE3	redwood	Sequoia	sempervirens
X		W		212	SEGI2	giant sequoia	Sequoiadendron	giganteum
		W		231	TABR2	Pacific yew	Taxus	brevifolia
	E	W		240	THUJA	Thuja spp.	Thuja	spp.
X		W		242	THPL	western redcedar	Thuja	plicata
	E	W		250	TORRE	torreya (nutmeg) spp.	Torreya	spp.
X		W		251	TOCA	California torreya (nutmeg)	Torreya	californica
X		W		263	TSHE	western hemlock	Tsuga	heterophylla

Core	East	West	Woodland	FIA Code	PLANTS Code	Common Name	Genus	Species
X		W		264	TSME	mountain hemlock	Tsuga	mertensiana
	E	W	w	300	ACACI	acacia spp.	Acacia	spp.
	E	W		304	ACGR	catclaw acacia	Acacia	greggii
X		W		312	ACMA3	bigleaf maple	Acer	macrophyllum
		W	w	321	ACGL	Rocky Mountain maple	Acer	glabrum
		W	w	322	ACGR3	bigtooth maple	Acer	grandidentatum
		W		333	AECA	California buckeye	Aesculus	californica
	E			336	AEPA	red buckeye	Aesculus	pavia
X	E			337	AESY	painted buckeye	Aesculus	sylvatica
		W		350	ALNUS	alder spp.	Alnus	spp.
X		W		351	ALRU2	red alder	Alnus	rubra
X		W		352	ALRH2	white alder	Alnus	rhombifolia
X		W		353	ALOB2	Arizona alder	Alnus	oblongifolia
	E	W		357	AMAR3	common serviceberry	Amelanchier	arborea
	E	W		358	AMSA	roundleaf serviceberry	Amelanchier	sanguinea
		W		360	ARBUT	Madrone spp.	Arbutus	spp.
X		W		361	ARME	Pacific madrone	Arbutus	menziesii
X		W		362	ARAR2	Arizona madrone	Arbutus	arizonica
X		W		378	BEUT	northwestern paper birch	Betula	X utahensis
		W		431	CHCHC4	giant chinkapin, golden chinkapin	Chrysolepis	chrysophylla var. chrysophylla
		W	w	475	CELE3	curlleaf mountain-mahogany	Cercocarpus	ledifolius
	E	W		490	CORNU	dogwood spp.	Cornus	spp.
X		W		492	CONU4	Pacific dogwood	Cornus	nuttallii
	E			503	CRBR3	Brainerd hawthorn	Crataegus	brainerdii
	E			504	CRCA	pear hawthorn	Crataegus	calpodendron
	E			505	CRCH	fireberry hawthorn	Crataegus	chrysocarpa
	E			506	CRDI	broadleaf hawthorn	Crataegus	dilatata
	E			507	CRFL	fanleaf hawthorn	Crataegus	flabellata
	E			508	CRMO3	oneseed hawthorn	Crataegus	monogyna
	E			509	CRPE	scarlet hawthorn	Crataegus	pedicellata
X		W		511	EUGL	Tasmanian bluegum	Eucalyptus	globulus
X	E			512	EUCA2	river redgum	Eucalyptus	camaldulensis
X		W		542	FRLA	Oregon ash	Fraxinus	latifolia
X	E			583	HACA3	little silverbell	Halesia	parviflora
		W		603	JUHI	Northern California black walnut	Juglans	hindsii
X		W		604	JUCA	Southern California black walnut	Juglans	californica
X		W		606	JUMA	Arizona walnut	Juglans	major
X		W		631	LIDE3	tanoak	Lithocarpus	densiflorus
X		W		661	MAFU	Oregon crabapple	Malus	fusca
	E	W		683	MOMI	Texas mulberry	Morus	microphylla
X		W		730	PLRA	California sycamore	Platanus	racemosa
X		W		732	PLWR2	Arizona sycamore	Platanus	wrightii
X		W		747	POBAT	black cottonwood	Populus	balsamifera ssp.

Core	East	West	Woodland	FIA Code	PLANTS Code	Common Name	Genus	Species
								trichocarpa
X	E	W	w	756	PRGL2	honey mesquite	Prosopis	glandulosa
	E			764	PRPE3	peach	Prunus	persica
		W		768	PREM	bitter cherry	Prunus	emarginata
	E			769	PRAL5	Allegheny plum	Prunus	alleghaniensis
	E	W		770	PRAN3	Chickasaw plum	Prunus	angustifolia
	E			772	PRCE	sour cherry (domesticated)	Prunus	cerasus
	E			773	PRDO	European plum (domesticated)	Prunus	domestica
	E			774	PRMA	Mahaleb plum (domesticated)	Prunus	mahaleb
X		W		801	QUAG	California live oak	Quercus	agrifolia
		W		805	QUCH2	canyon live oak	Quercus	chrysolepis
X		W		807	QUDO	blue oak	Quercus	douglasii
X		W	w	810	QUEM	Emory oak	Quercus	emoryi
X		W		811	QUEN	Engelmann oak	Quercus	engelmannii
X		W		815	QUGA4	Oregon white oak	Quercus	garryana
X		W		818	QUKE	California black oak	Quercus	kelloggii
X		W		821	QULO	California white oak	Quercus	lobata
X		W	w	829	QUOB	Mexican blue oak	Quercus	oblongifolia
X		W		839	QUWI2	interior live oak	Quercus	wislizeni
X		W	w	846	QUGR3	gray oak	Quercus	grisea
X		W	w	847	QURU4	netleaf oak	Quercus	rugosa
		W	w	902	RONE	New Mexico locust	Robinia	neomexicana
		W		928	SASC	Scouler's willow	Salix	scouleriana
	E			940	SWMA2	mahogany	Swietenia	mahagoni
X		W		981	UMCA	California-laurel	Umbellularia	californica
		W		982	YUBR	Joshua tree	Yucca	brevifolia
		W	w	990	OLTE	desert ironwood	Olneya	tesota
	E	W		991	TAMAR2	saltcedar	Tamarix	spp.
	E			5091	CRPH	Washington hawthorn	Crataegus	phaenopyrum
	E			5092	CRSU5	fleshy hawthorn	Crataegus	succulenta
	E			5093	CRUN	dwarf hawthorn	Crataegus	uniflora
X		W		7211	PEAM3	avocado	Persea	americana

Appendix 4. Site Tree Selection Criteria and Species List

A. Eastern U.S. Site-Tree Selection Criteria

Ideally, site trees in the eastern U.S. should be between 20-70 years old. If preferred trees cannot be found in this age range, expand the age range to 15-120 years. Reject trees outside the 15-120 year age range, trees that exhibit signs of damage, trees with ring patterns that show signs of suppression, trees less than 5.0 inches DBH, trees with abnormalities at DBH, and trees with rotten cores. A list of preferred site-tree species is provided. Site trees should be selected in the following order of preference:

1st Choice: representative of the stand, on the list for your region.
2nd Choice: representative of the stand, on the list for an adjoining eastern region.
3rd Choice: not representative of the stand, on the list for your region.
4th Choice: not representative of the stand, on the list for an adjoining eastern region.

Note: NE = Northeast, NC = North Central, SO = Southern
Site trees listed in gray text are not valid in the Southern Region. Crews should select from the site trees in black text only.

Code	Common Name	Region
	---------- Softwood Species ----------	
0043	Atlantic white-cedar	NE
0107	sand pine	SO
0110	shortleaf pine	NE, NC, SO
0111	slash pine	SO
0121	longleaf pine	SO
0128	pond pine	NE, SO
0129	eastern white pine	NE, NC, SO
0131	loblolly pine	NE, NC, SO
0132	Virginia pine	NE, NC, SO
0012	balsam fir	NE, NC
0068	eastern redcedar	NE, NC
0070	larch (introduced)	NE
0071	tamarack (native)	NE, NC
0094	white spruce	NE, NC
0095	black spruce	NE, NC
0097	red spruce	NE
0105	jack pine	NE, NC
0122	Ponderosa pine	NC
0125	red pine	NE, NC
0130	Scotch pine	NE, NC
0135	Arizona pine	SO
0202	Douglas-fir	SO
0241	northern white cedar	NE, NC
0261	eastern hemlock	NE
	---------- Hardwood Species ----------	
0611	sweetgum	NE, NC, SO
0621	yellow-poplar	NE, NC, SO
0742	eastern cottonwood	NE, NC, SO
0746	quaking aspen	NE, NC, SO
0748	Fremont poplar	SO
0749	narrowleaf cottonwood	SO
0802	white oak	NE, NC, SO
0806	scarlet oak	NE, NC, SO
0812	southern red oak	NE, SO
0813	cherrybark oak	NE, NC, SO
0817	shingle oak	NE, NC, SO
0827	water oak	NE, SO

Code	Common Name	Region
0830	pin oak	NE, NC, SO
0832	chestnut oak	NE, NC, SO
0833	northern red oak	NE, NC, SO
0835	post oak	NE, NC, SO
0837	black oak	NE, NC, SO
0316	red maple	NE, NC
0317	silver maple	NE, NC
0318	sugar maple	NE, NC
0371	yellow birch	NE, NC
0375	paper birch	NE, NC
0402	bitternut hickory	NE, NC
0407	shagbark hickory	NE, NC
0462	hackberry	NC
0531	American beech	NE, NC
0541	white ash	NE, NC
0543	black ash	NE, NC
0544	green ash	NE, NC
0602	black walnut	NC
0743	bigtooth aspen	NE, NC
0745	plains cottonwood	SO
0762	black cherry	NC
0901	black locust	NE, NC
0951	American basswood	NE, NC
0972	American elm	NE, NC

B. Western U.S. Site-Tree Selection Criteria

Ideally, site trees in the western U.S. should be between 35-80 years old. If preferred trees cannot be found in this age range, expand the age range to 15-250 years. Reject trees outside the 15-250 year age range, trees that exhibit signs of damage, trees with ring patterns that show signs of suppression, trees less than 5.0 inches DBH, trees with abnormalities at DBH, trees with rotten cores, and woodland species. A list of preferred site-tree species is provided. Site trees should be selected in the following order of preference:

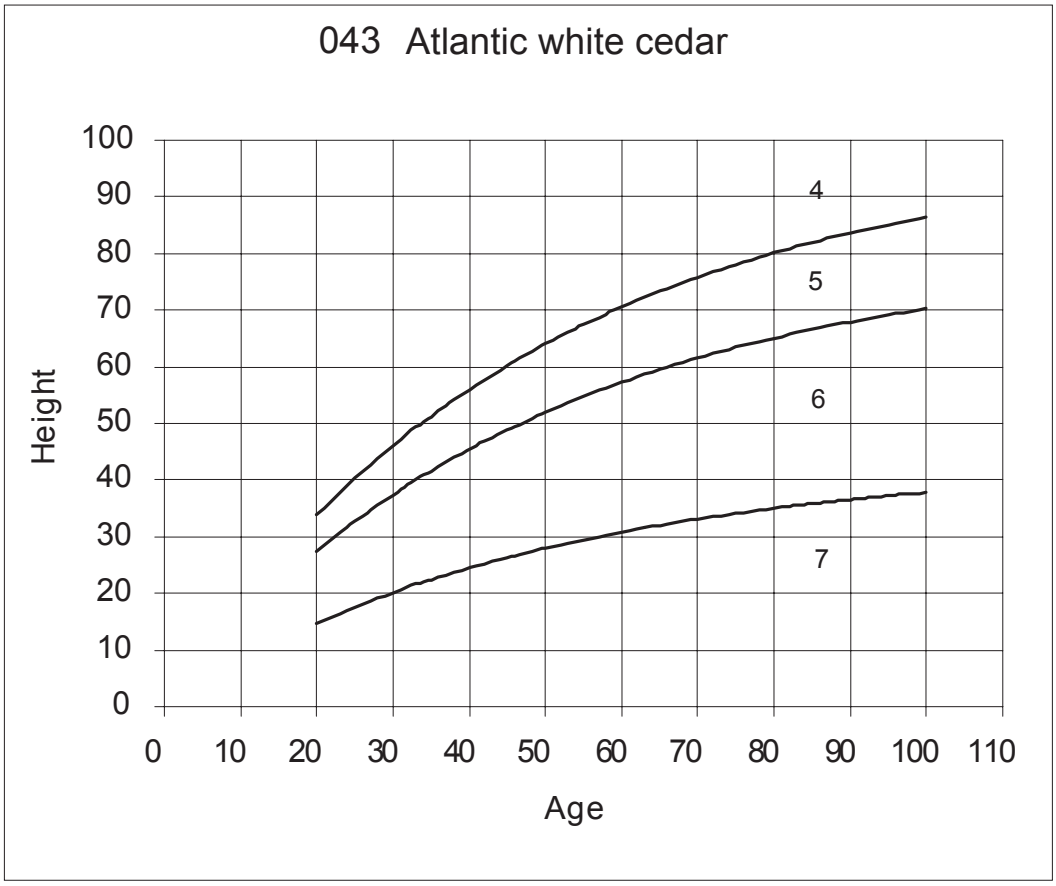
1st Choice: representative of the stand, on the list for your region.
2nd Choice: representative of the stand, on the list for an adjoining western region.
3rd Choice: not representative of the stand, on the list for your region.
4th Choice: not representative of the stand, on the list for an adjoining western region.

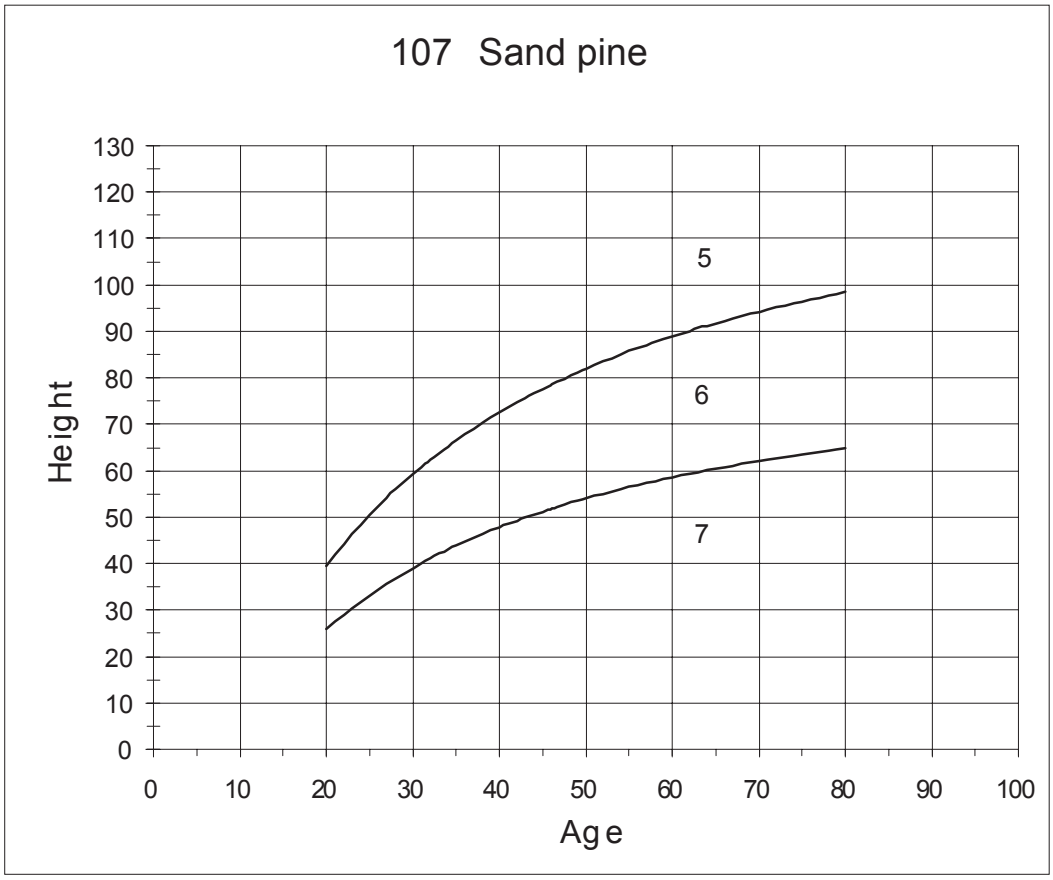
Note: PNW = Pacific Northwest FIA, RMRS = Rocky Mountain FIA

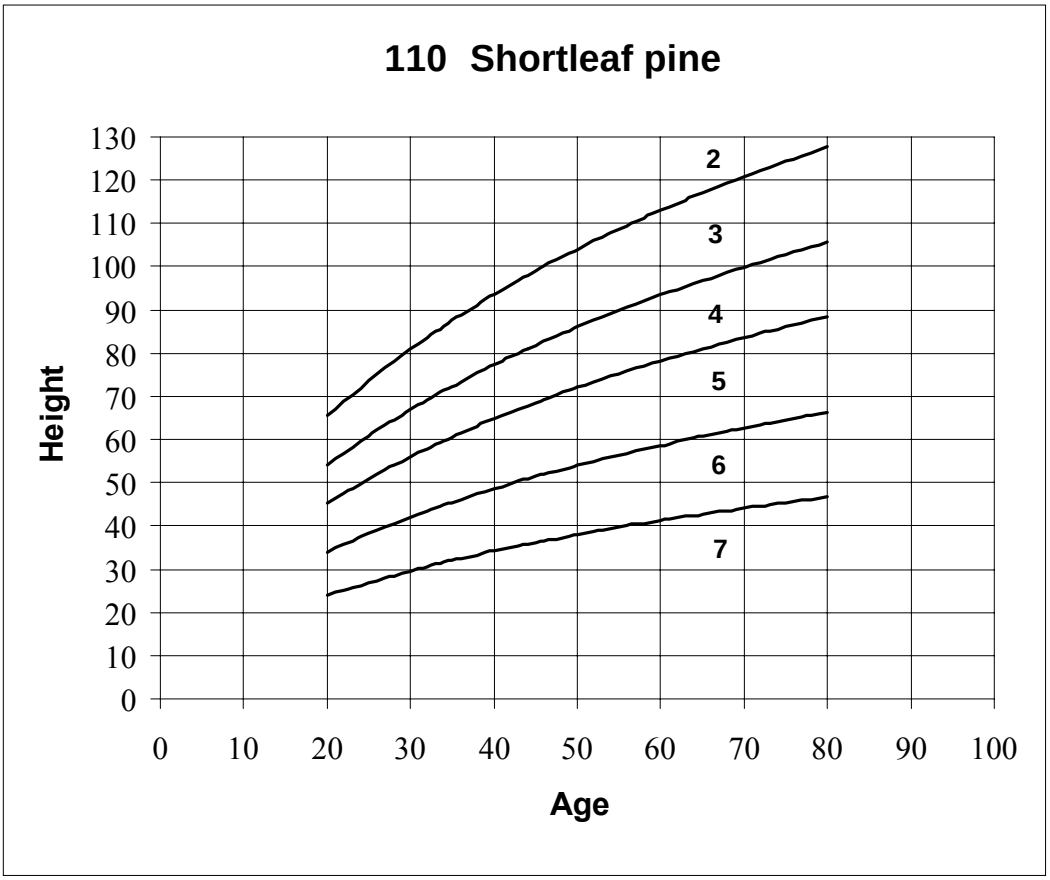
Code	Common Name	Region
	---------- Softwood Species ----------	
0011	Pacific silver fir	PNW
0015	white fir	RMRS, PNW
0017	grand fir	RMRS, PNW
0018	corkbark fir	RMRS
0019	subalpine fir	RMRS, PNW
0020	California red fir	RMRS, PNW
0021	shasta red fir	PNW
0022	noble fir	PNW
0073	western larch	RMRS, PNW
0081	incense-cedar	RMRS, PNW
0093	Engelmann spruce	RMRS, PNW
0094	white spruce	RMRS, PNW
0095	black spruce	PNW
0096	blue spruce	RMRS
0098	sitka spruce	PNW
0104	foxtail pine	RMRS
0108	lodgepole pine	RMRS, PNW
0109	Coulter pine	PNW
0112	Apache pine	RMRS
0116	Jeffrey pine	RMRS, PNW
0117	sugar pine	RMRS, PNW
0119	western white pine	RMRS, PNW
0120	bishop pine	PNW
0122	ponderosa pine	RMRS, PNW
0135	Arizona pine	RMRS
0201	bigcone Douglas-fir	PNW
0202	Douglas-fir	RMRS, PNW
0211	redwood	PNW
0231	Pacific yew	PNW
0242	western redcedar	RMRS, PNW
0263	western hemlock	RMRS, PNW
0264	mountain hemlock	RMRS, PNW
	---------- Hardwood Species ----------	
0312	bigleaf maple	PNW
0351	red alder	PNW
0375	paper birch	RMRS, PNW
0741	balsam poplar	RMRS, PNW
0745	plains cottonwood	RMRS
0746	quaking aspen	RMRS, PNW

Code	Common Name	Region
0747	black cottonwood	RMRS, PNW
0748	Fremont poplar	RMRS
0749	narrowleaf cottonwood	RMRS

SOUTHERN SITE CLASS CURVES



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Height
Age
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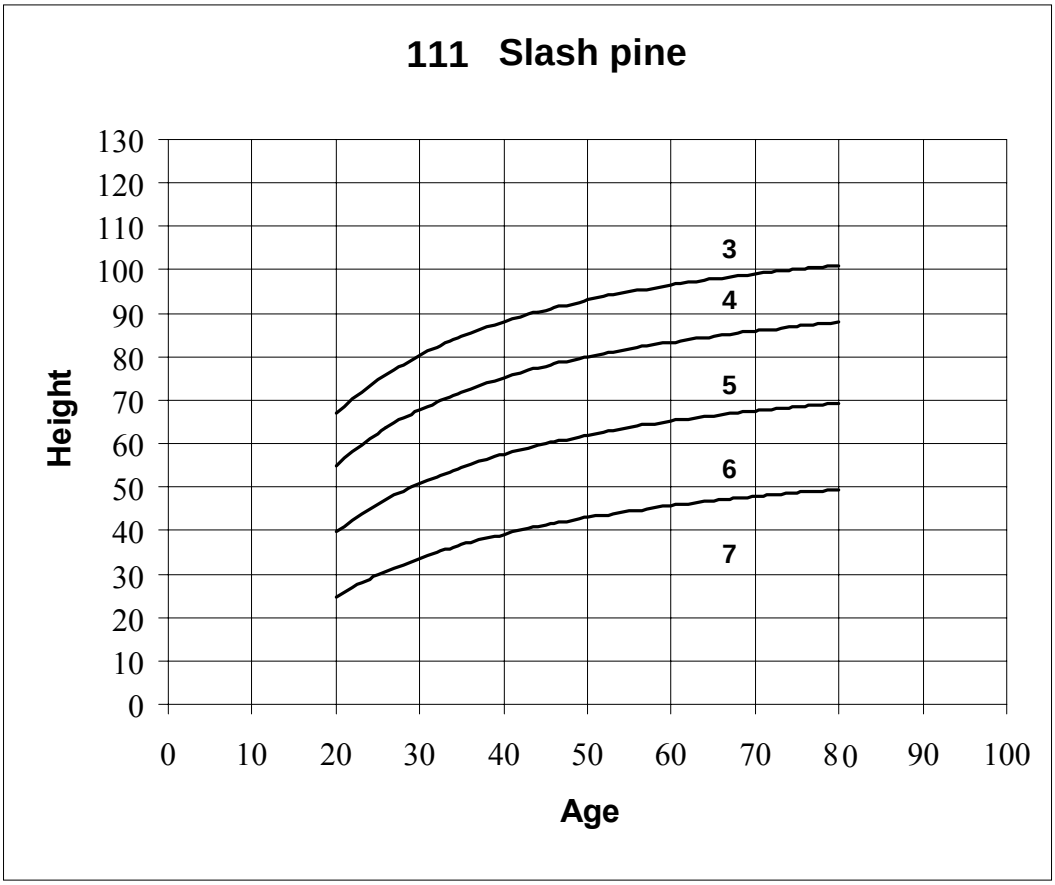
5
6
7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Height
Age
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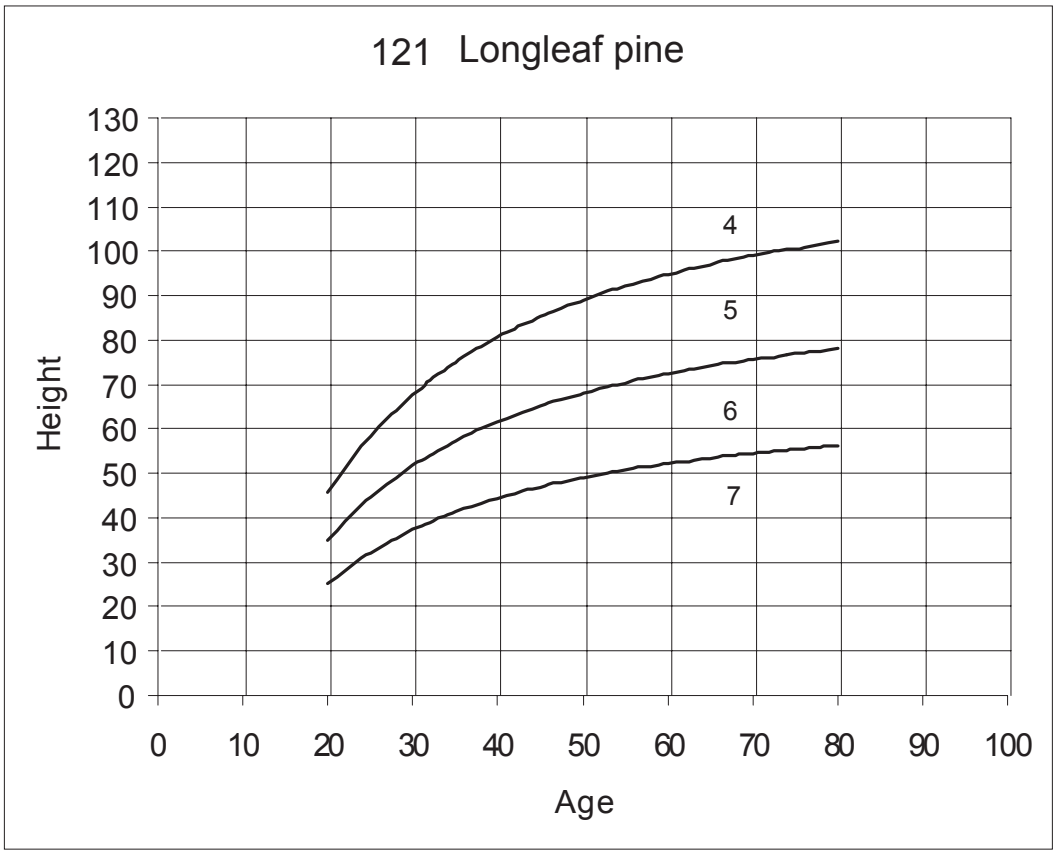
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Height
Age
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110
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130
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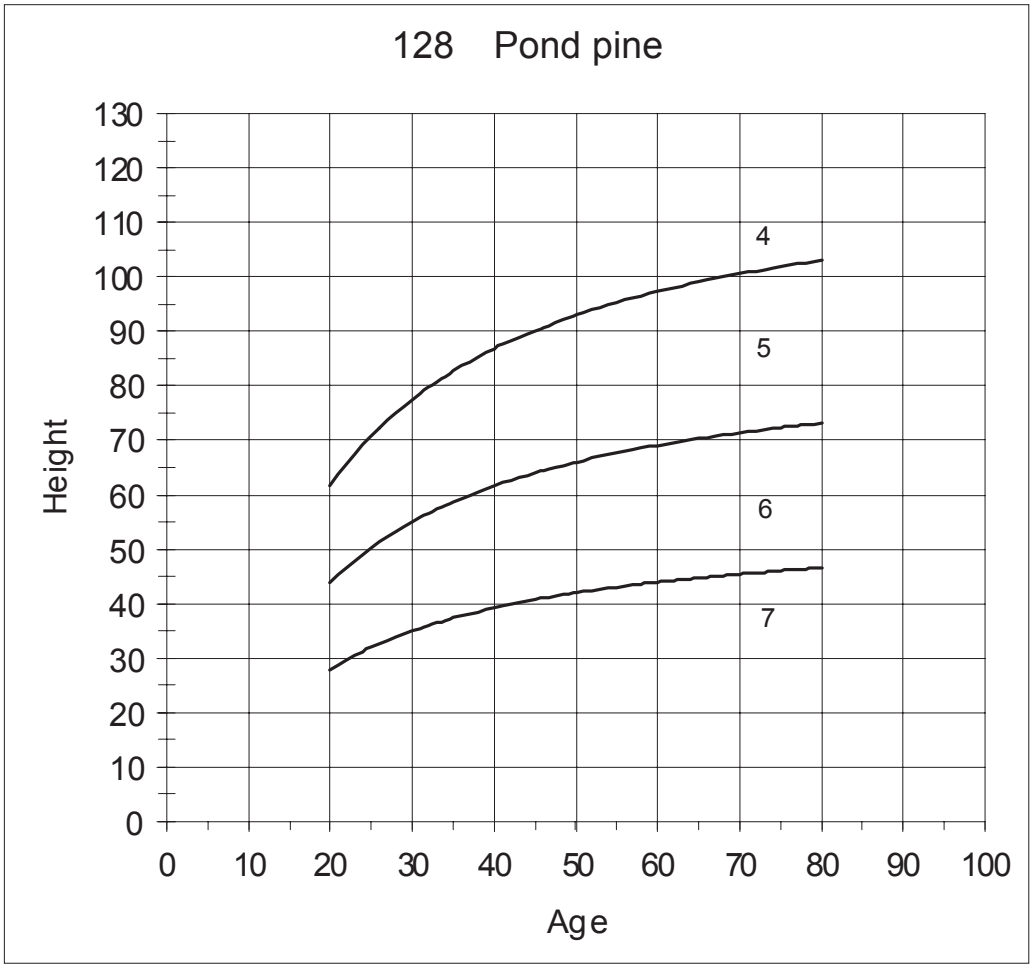
5
6
7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Height
Age
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130
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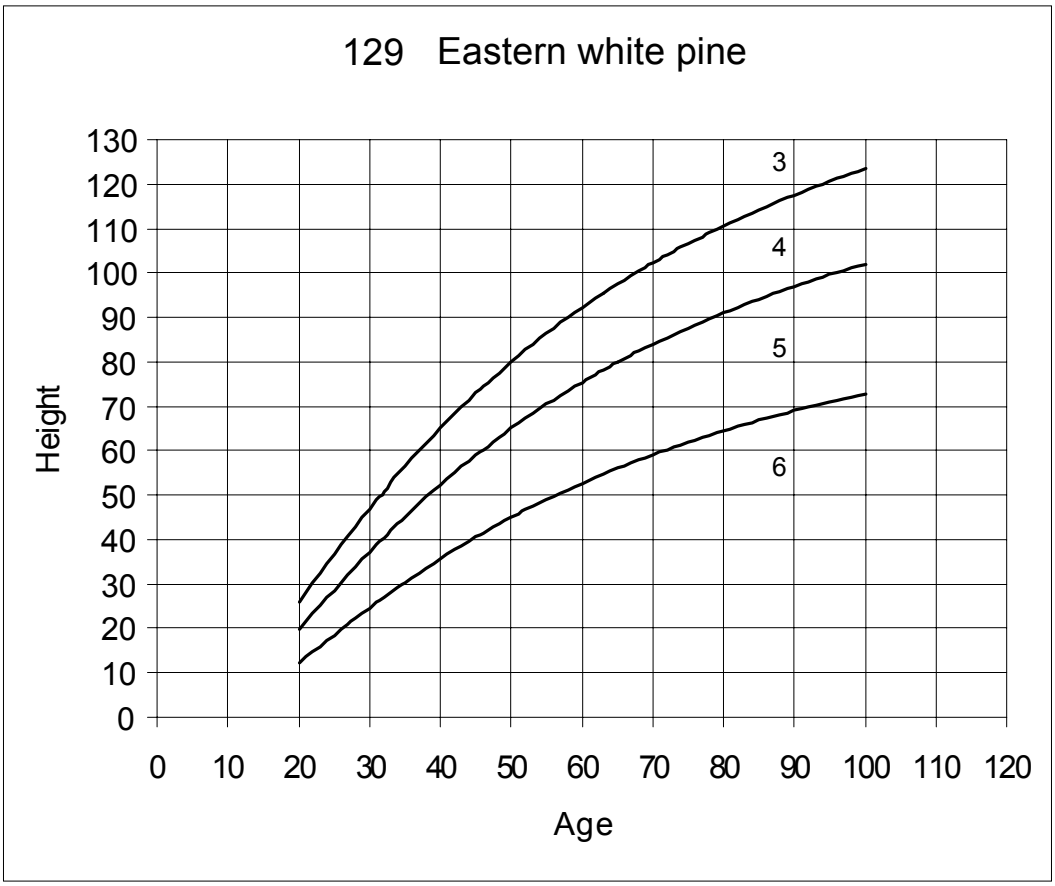
5
6
7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Height
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80
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100
110
120
130
3
4
5
6

131 Loblolly pine
Height
Age
0
10
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30
40
50
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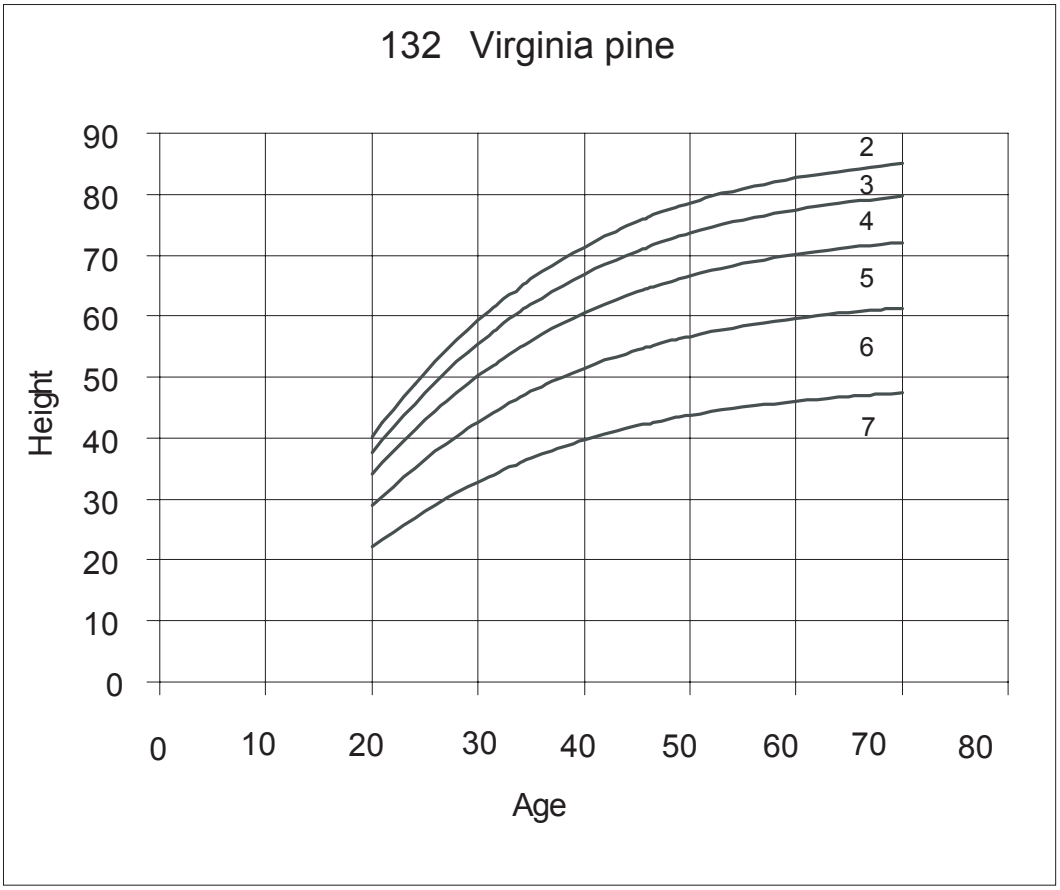
70
80
90
100
110
120
130
2
3
4
5
6
7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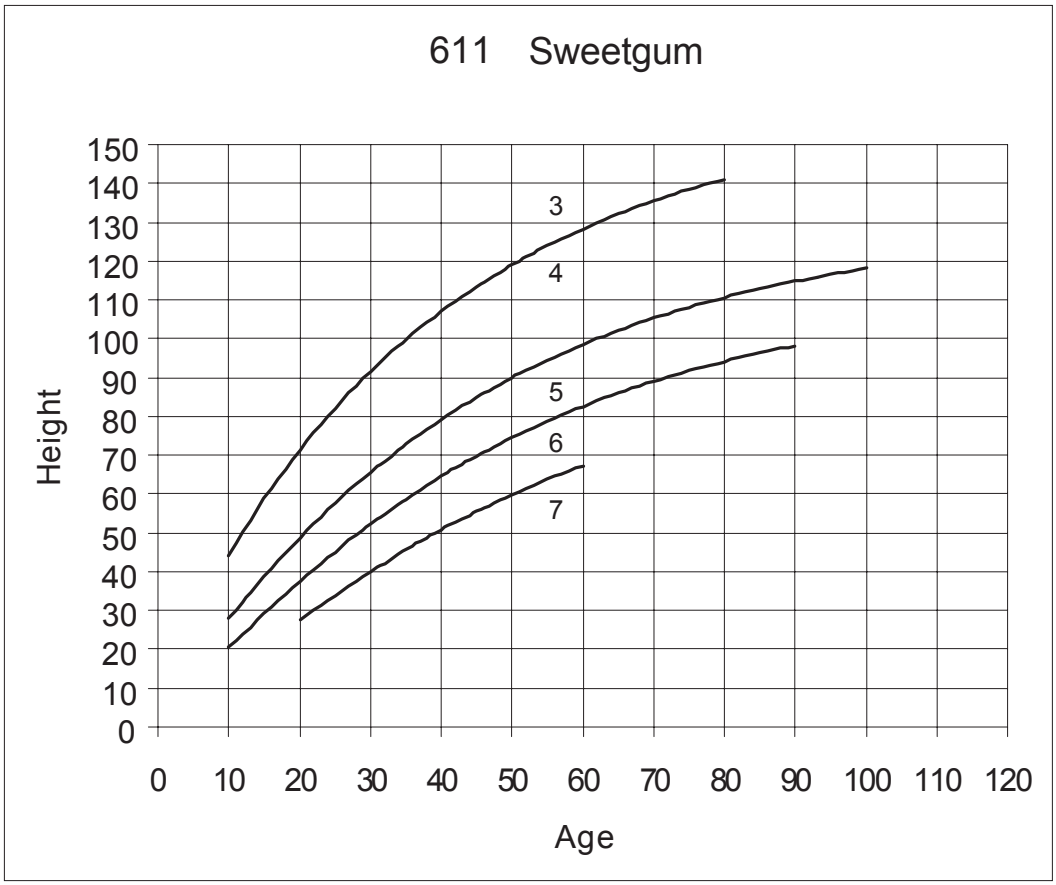
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Height
Age
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120
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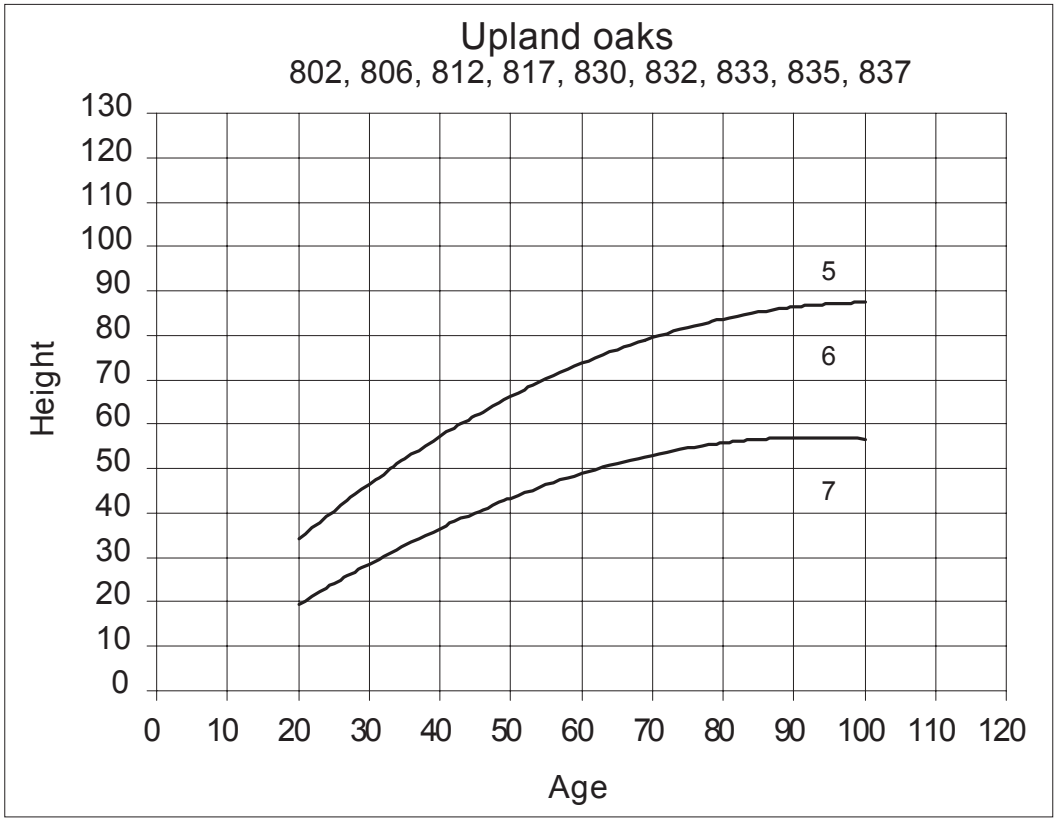
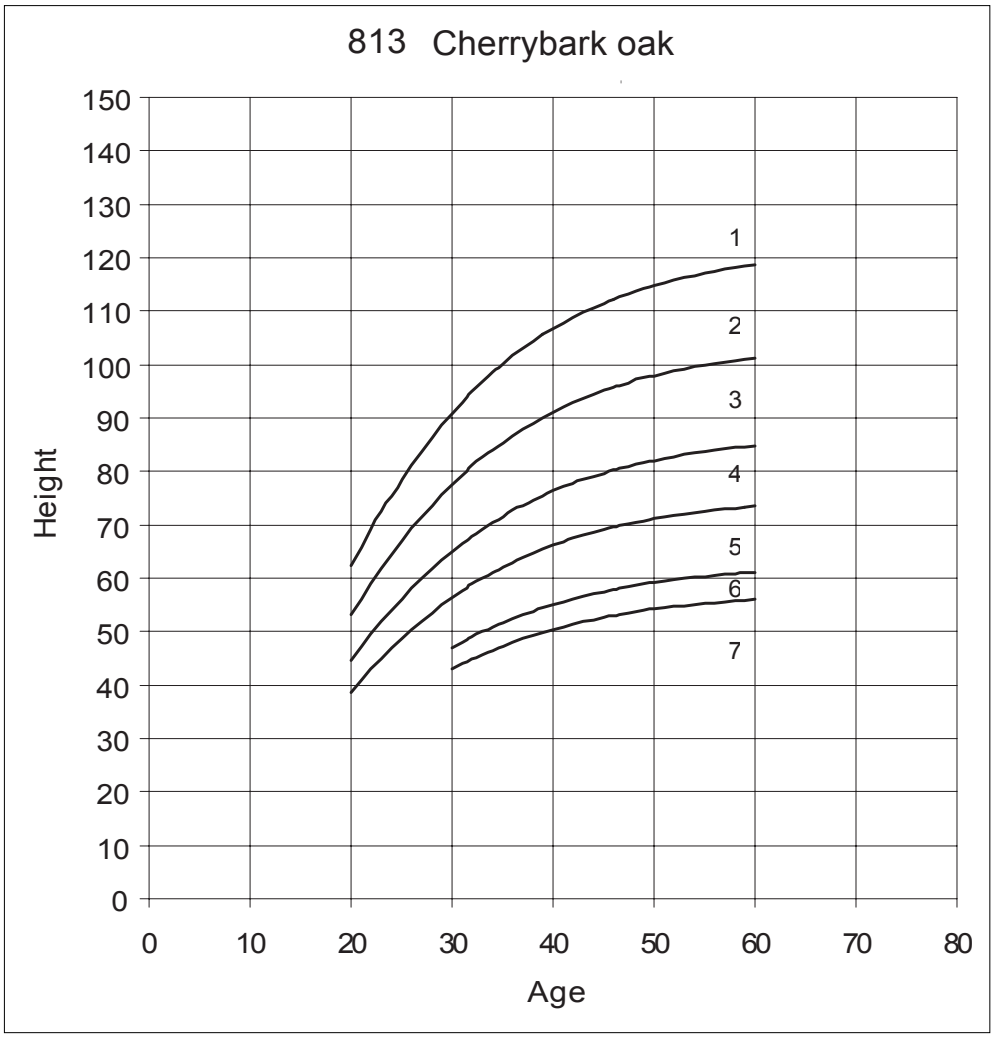
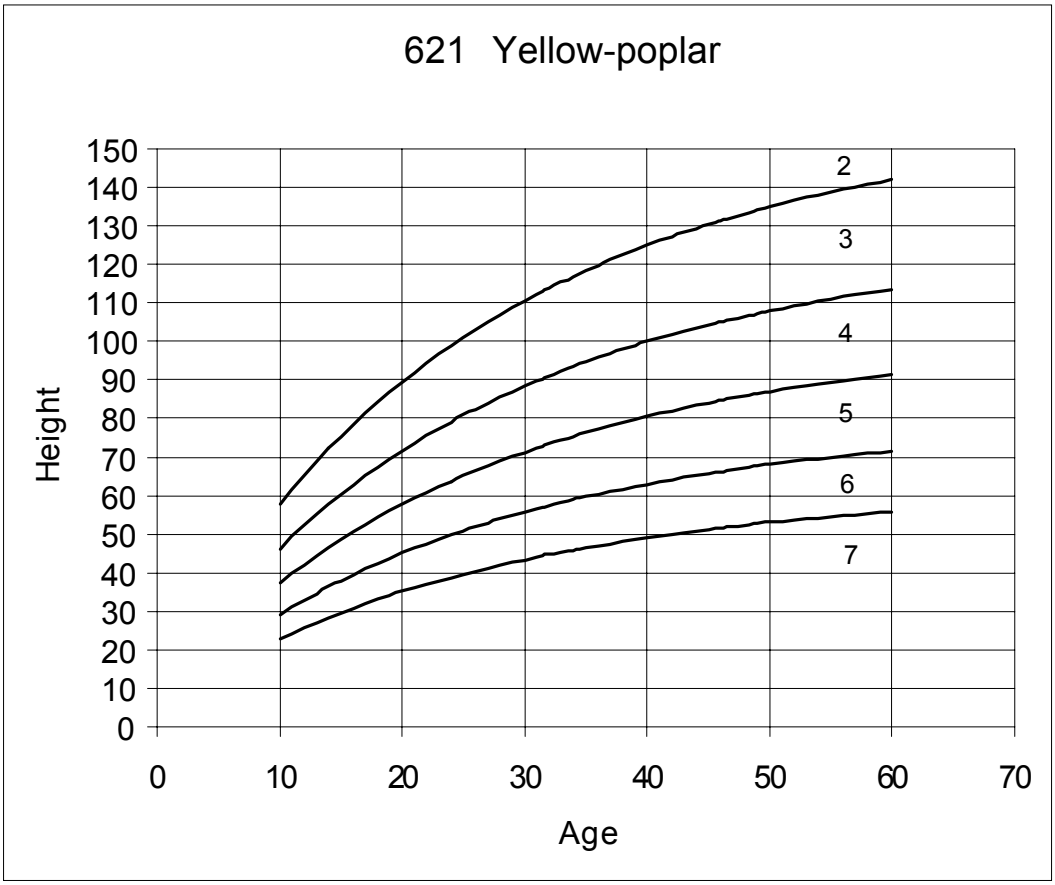
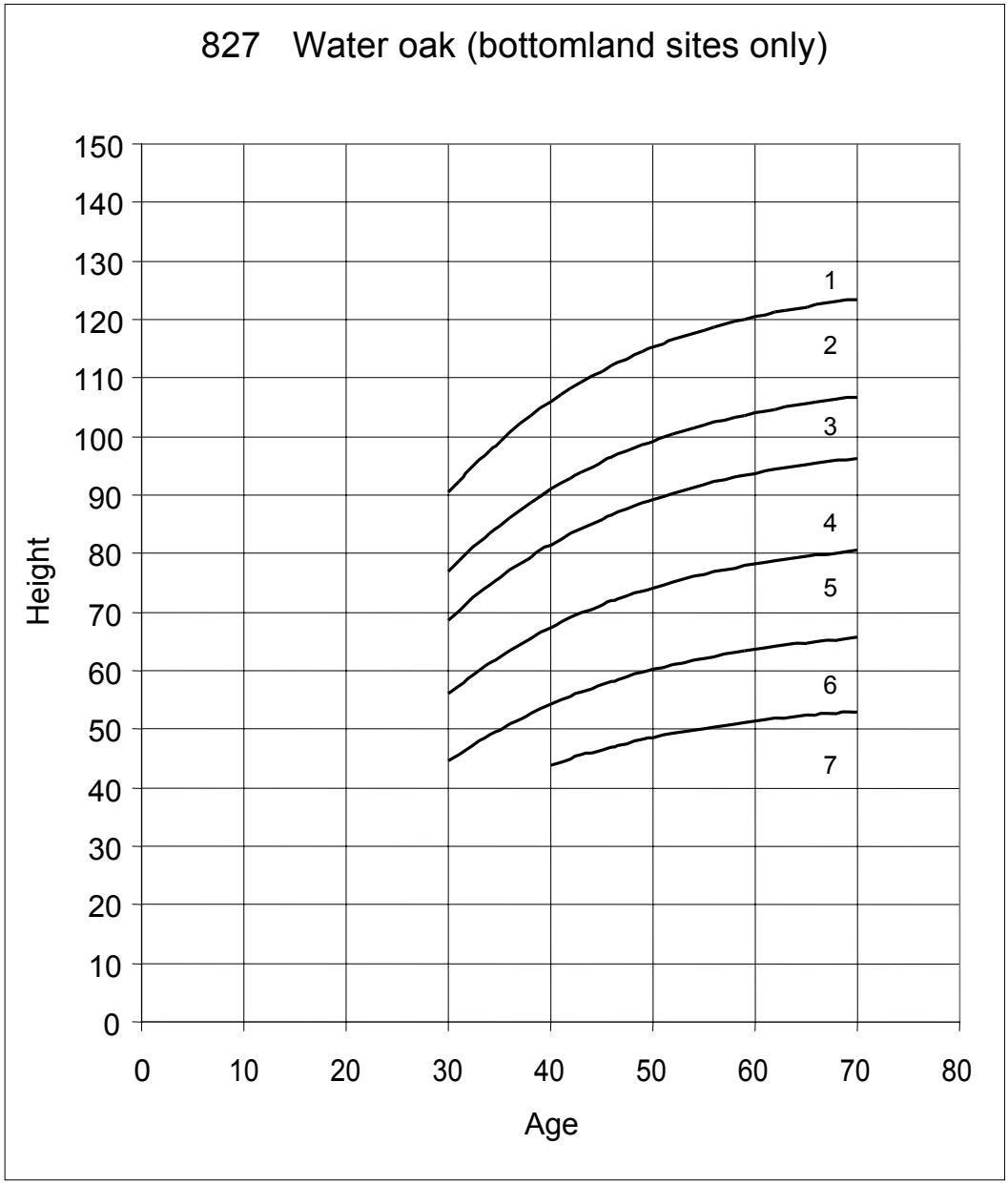
4
5
6
7


Upland oaks
802, 806, 812, 817, 830, 832, 833, 835, 837
Height
Age
5
6
7
0
10
20
30
40
50
60
70
80
90
100
110
120
130


813 Cherrybark oak
Height
Age
1
2
3
4
5
6
7
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150


621 Yellow-poplar
Height
Age
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
0
10
20
30
40
50
60
70
2
3
4
5
6
7

742 Cottonwood
Height
Age
110
100
90
80
70
60
50
40
30
20
10
0
0
10
20
30
40
50
60
1
2
3
4
5
6


827 Water oak (bottomland sites only)
Height
Age
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
0
10
20
30
40
50
60
70
80
1
2
3
4
5
6
7

Appendix 5. Cull and Tree Grading Procedures

CUBIC FOOT CULL PROCEDURES

Record the percentage of rotten and missing cubic-foot volume, to the nearest 1 percent. When estimating volume loss (tree cull), only consider the cull on the merchantable bole/portion of the tree, from a 1-ft stump to a 4-inch top. Do not include any cull estimate above actual length.

Rotten and missing volume loss is often difficult to estimate. Refer to supplemental disease and insect pests field guides and local defect guidelines as an aid in identifying damaging agents and their impact on volume loss. Use your best judgment and be alert to such defect indicators as the following:

- Cankers or fruiting bodies.
- Swollen or punky knots.
- Dull, hollow sound of bole (use regional standards).
- Large dead limbs, especially those with frayed ends.
- Sawdust around the base of the tree.
- Metal in tree (ex. signs, deerstands, fences, etc.)

Cull portions of the tree that contain embedded metal objects (e.g., fencing, nails) and sections between metal objects that are less than 4 feet in length from the stump to the 4in top, (aluminum is okay).

Cubic-Foot Volume of Short Logs

DIB	Length of log or section (feet)									
midpoint	1	2	3	4	6	8	10	12	14	16
4	0.1	0.2	0.3	0.3	0.5	--	--	--	--	--
5	0.1	0.3	0.4	0.5	0.8	1.1	1.4	1.6	1.9	2.2
6	0.2	0.4	0.6	0.8	1.2	1.6	2.0	2.4	2.7	3.1
7	0.3	0.5	0.8	1.1	1.6	2.1	2.7	3.2	3.7	4.3
8	0.3	0.7	1.0	1.4	2.1	2.8	3.5	4.2	4.9	5.6
9	0.4	0.9	1.3	1.8	2.7	3.5	4.4	5.3	6.2	7.1
10	0.5	1.1	1.6	2.2	3.3	4.4	5.5	6.5	7.6	8.7
12	0.8	1.6	2.4	3.1	4.7	6.3	7.9	9.4	11.0	13.0
14	1.1	2.1	3.2	4.3	6.4	8.6	11.0	13.0	15.0	17.0
16	1.4	2.8	4.2	5.6	8.4	11.0	14.0	17.0	20.0	22.0
18	1.8	3.5	5.3	7.1	11.0	14.0	18.0	21.0	25.0	28.0
20	2.2	4.4	6.5	8.7	13.0	18.0	22.0	26.0	30.0	35.0
22	2.6	5.3	7.9	11.0	16.0	21.0	26.0	32.0	37.0	42.0
24	3.1	6.3	9.4	13.0	19.0	25.0	31.0	38.0	44.0	50.0
26	3.7	7.4	11.0	15.0	22.0	30.0	37.0	44.0	52.0	59.0
28	4.3	8.6	13.0	17.0	26.0	34.0	43.0	51.0	60.0	68.0
30	4.9	9.8	15.0	20.0	30.0	39.0	49.0	59.0	69.0	78.0
32	5.6	11.0	17.0	22.0	34.0	45.0	56.0	67.0	78.0	89.0
34	6.3	13.0	19.0	25.0	38.0	50.0	63.0	76.0	88.0	101.0
36	7.1	14.0	21.0	28.0	42.0	56.0	71.0	85.0	99.0	113.0
38	7.9	16.0	24.0	32.0	47.0	63.0	79.0	94.0	110.0	126.0
40	8.7	18.0	26.0	35.0	52.0	70.0	87.0	105.0	122.0	140.0

BOARD FOOT CULL PROCEDURES

Record the percentage of rotten and missing board-foot volume, to the nearest 1 percent. When estimating board-foot cull, only consider the cull in the sawlog portion of the tree, from a 1-ft stump to a 7-inch top for pines, from a 1-ft stump to 9-inch top on hardwoods. Do not include any cull estimate above actual length. Board foot cull cannot be coded greater than 67 percent. If the actual amount of board foot cull is greater than 67 percent, then TREE CLASS ≠2, and board foot cull is not required.

Board-foot cull is the volume within the entire sawlog portion of all live trees that cannot be recovered for use as lumber because of rot, sweep or crook, or other defect. Cull volume includes the entire volume of sections that do not meet minimum log grade requirements. This includes all sections less than 8 feet in length and the cull volume within sawlogs. Board foot cull is assigned for those trees receiving a tree grade, according to the section length (in feet), from a 1-foot stump to a 7-inch top in softwood or 9 inch top in hardwood.

Sweep and Crook

Estimate the length, small-end DIB, and sweep or crook departure of the affected section. If the length is 6 feet or less, treat as crook. To determine board-foot deduction, see the tables for sweep and crook in the appendix. If sweep or crook is so excessive that the section is cull, record the entire volume of the section as cull. This is the area within the heavy black lines of the sweep/crook tables.

Other Board-Foot Cull

Determine the length and the small-end DIB of the section containing decay, missing wood, fork, etc. Estimate the percentage of the section that is unusable for lumber, ties, or timber, ignoring cull defect that could normally be removed in slabbing. Apply this percentage to the total volume contained in the section, as shown in the board foot cull table.

Sawlog Stoppers

Measure the main stem to the point above which no sawlog can be produced to meet log grade standards (size and soundness) and to a minimum top of 7.0 inches DOB for softwoods and 9.0 inches DOB for hardwoods.

The sawlog cannot extend above a point where taper becomes excessive as evidenced by:

(1) A fork with less than 8 foot sawlog above it (12 feet if this is the only log in the tree)

(2) A limb with a base diameter equal to one half or more of the stem diameter below the limb, or a group of smaller limbs 2.0 inches or larger within a 1 foot section with equivalent diameter which collectively influence taper to the same degree.

Sawlog length should not extend above a sawlog section that does not meet minimum grade specifications and which has less than 8 feet of sawlog length above it (12 feet if this is the only log in the tree).

Board-Foot Volume of Short Logs

DIB small end	Length of log or section (feet)									
	1	2	3	4	6	8	10	12	14	16
6	1	2	2	3	5	8	10	13	16	19
7	1	3	4	5	8	12	15	19	24	28
8	2	4	6	8	12	17	22	27	33	39
9	3	5	8	10	16	22	29	36	43	51
10	3	7	10	13	21	29	37	46	55	65
11	4	9	13	17	26	36	46	57	68	80
12	5	10	16	21	32	44	57	69	83	97
13	6	13	19	25	39	53	68	83	99	115
14	8	15	23	30	46	63	80	98	117	136
16	10	20	31	41	62	84	108	131	158	181
18	13	26	40	53	81	109	139	169	200	232
20	17	33	50	67	102	137	174	212	251	290
22	21	41	62	82	125	169	214	259	306	354
24	25	50	74	99	151	203	257	311	368	424
26	29	59	88	118	179	241	304	368	435	501
28	35	69	104	138	210	281	356	430	507	584
30	40	80	120	160	243	325	411	497	585	674
32	46	92	137	183	278	373	470	568	669	770
34	52	104	156	208	316	423	534	644	758	872
36	59	117	176	235	356	477	601	725	853	981
38	66	132	197	263	398	533	672	811	954	1096
40	73	146	220	293	443	593	747	902	1060	1218

Crook Deduction in Board Feet

Crook departure (inches)	Crook length (feet)	Scaling diameter of section with crook (inches)													
		6	7	8	9	10	12	14	16	18	20	22	24	26	28
1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	2	0	0	0	1	1	1	1	1	1	2	2	2	2	2
	3	1	1	1	1	1	1	2	2	2	2	3	3	3	4
	4	1	1	1	1	1	2	2	3	3	3	4	4	4	5
	5	1	1	1	1	2	2	3	3	4	4	5	5	6	6
	6	1	1	2	2	2	3	3	4	5	5	6	6	7	8
2	1	0	0	0	1	1	1	1	1	1	2	2	2	2	3
	2	1	1	1	1	1	2	2	2	3	3	4	4	4	5
	3	1	1	2	2	2	3	3	4	4	4	6	6	7	7
	4	1	1	2	2	3	3	4	5	6	7	8	8	9	10
	5	1	2	2	3	3	4	5	6	8	8	10	10	11	13
	6	2	2	3	4	4	5	7	8	9	10	13	13	14	15
3	1	0	0	1	1	1	1	2	2	2	3	3	3	3	4
	2	1	1	2	2	2	2	3	4	4	5	5	6	7	7
	3	1	2	2	3	3	4	5	6	7	8	8	9	10	11
	4	2	2	3	3	4	5	6	8	9	10	10	12	13	15
	5	2	3	4	4	5	6	8	10	11	13	13	16	17	19
	6	2	3	4	5	6	8	10	12	14	15	15	19	20	23
4	1	1	1	1	1	1	2	2	2	3	3	3	4	4	5
	2	1	2	2	2	3	3	4	5	6	7	7	8	9	10
	3	1	2	3	3	4	5	7	8	9	10	10	12	13	15
	4	2	3	4	3	5	7	9	10	12	13	13	17	18	20
	5	2	3	5	6	7	9	11	13	15	17	17	21	22	25
	6	3	5	6	7	8	11	13	15	18	20	20	25	27	30
5	1	-	-	1	2	2	2	3	3	4	4	4	5	6	6
	2	-	-	2	3	4	4	5	6	7	8	8	10	11	12
	3	-	-	4	4	5	7	8	10	11	12	12	16	17	19
	4	-	-	5	6	6	9	11	13	15	17	17	21	22	25
	5	-	-	6	7	8	11	13	16	19	21	21	26	28	31
	6	-	-	8	9	10	13	16	19	23	26	26	32	34	36
6	1	-	-	-	2	2	2	3	4	4	5	5	6	7	8
	2	-	-	-	3	4	5	6	7	9	10	10	13	13	15
	3	-	-	-	4	6	8	10	12	13	15	15	19	20	22
	4	-	-	-	7	8	10	13	15	18	20	20	25	27	30
	5	-	-	-	9	10	13	16	19	23	25	25	32	34	38
	6	-	-	-	11	13	16	20	23	27	31	31	38	41	45
8	1	-	-	-	-	-	3	5	5	6	7	7	8	9	10
	2	-	-	-	-	-	7	9	10	12	13	13	17	18	20
	3	-	-	-	-	-	10	13	16	18	20	20	25	27	30
	4	-	-	-	-	-	14	17	20	24	27	27	33	36	40
	5	-	-	-	-	-	17	22	26	30	34	34	42	45	50
	6	-	-	-	-	-	21	26	31	36	41	41	51	54	60
10	1	-	-	-	-	-	-	-	6	7	8	8	10	11	12
	2	-	-	-	-	-	-	-	12	14	16	16	21	23	25
	3	-	-	-	-	-	-	-	19	22	25	25	31	34	37
	4	-	-	-	-	-	-	-	26	29	34	34	41	45	49
	5	-	-	-	-	-	-	-	32	37	42	42	52	57	62
	6	-	-	-	-	-	-	-	39	45	51	51	63	69	75

In dashed (-) spaces, crook exceeds the maximum that is allowed and culls the entire section. Boxed spaces are sound for softwoods, but cull for hardwoods.

Sweep Deduction in Board Feet

Sweep departure (inches)	Sweep length (feet)	Scaling diameter of section with sweep (inches)													
		6	7	8	9	10	12	14	16	18	20	22	24	26	28
2	6	1	1	2	2	3	3	4	5	6	6	7	8	9	9
	8	1	1	2	2	3	4	5	5	6	7	8	8	9	10
	10	1	1	2	2	3	4	4	5	6	7	7	8	9	10
	12	1	1	2	2	2	3	4	4	5	6	6	6	7	8
	14	1	1	1	1	1	2	2	2	3	3	3	4	4	5
	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	6	2	3	3	5	5	6	7	9	10	11	13	14	15	17
	8	2	3	4	6	6	7	9	10	12	14	15	17	19	20
	10	2	4	5	6	6	8	10	12	13	15	17	19	20	22
	12	3	4	5	7	7	9	11	12	14	16	18	19	21	23
	14	3	4	5	7	7	9	10	12	14	16	17	19	21	23
	16	3	4	5	6	6	8	10	11	13	14	16	18	19	21
4	6	3	4	5	6	7	8	11	13	15	17	18	20	22	24
	8	4	5	6	7	9	11	14	16	18	21	23	25	28	30
	10	5	6	8	9	10	13	16	19	21	24	27	29	32	35
	12	5	7	8	10	12	14	18	20	23	26	29	32	35	38
	14	6	8	9	11	12	16	19	22	25	28	31	35	38	41
	16	6	8	10	11	13	16	19	23	26	29	32	35	39	42
5	6	-	5	6	8	9	11	14	16	19	22	24	27	29	32
	8	5	7	8	10	12	15	18	21	24	27	31	34	37	40
	10	6	8	10	12	14	18	21	25	29	33	36	40	44	48
	12	8	10	12	12	16	20	25	29	33	37	41	45	50	54
	14	9	11	13	16	18	22	27	32	36	41	45	50	54	59
	16	10	12	15	17	20	24	29	34	39	44	48	53	58	63
6	6	-	-	8	9	11	14	17	20	24	27	30	33	36	39
	8	-	-	11	12	14	18	22	26	30	34	38	42	46	50
	10	-	10	13	15	18	23	27	32	36	41	46	51	56	60
	12	-	12	15	18	21	26	32	37	42	48	53	58	64	69
	14	11	15	18	20	23	29	36	41	47	53	59	65	71	77
	16	13	16	20	23	26	32	39	45	52	58	64	71	77	83
7	6	-	-	-	11	13	16	21	24	28	32	36	39	43	47
	8	-	-	-	15	17	22	27	31	36	41	46	51	56	60
	10	-	-	-	19	21	27	33	39	44	50	56	62	67	73
	12	-	-	-	22	25	32	39	45	52	58	65	71	78	84
	14	-	-	-	25	29	36	44	51	58	66	73	81	88	95
	16	-	-	24	28	33	40	49	57	64	72	80	88	96	104
8	6	-	-	-	-	-	19	24	28	33	37	41	46	50	54
	8	-	-	-	-	-	25	31	37	42	48	54	59	65	70
	10	-	-	-	-	25	32	39	46	52	59	66	72	79	86
	12	-	-	-	-	30	37	46	53	61	69	76	84	92	100
	14	-	-	-	-	34	43	52	61	69	78	87	96	105	113
	16	-	-	-	34	39	48	58	68	77	87	97	106	116	125
9	6	-	-	-	-	-	-	27	32	37	42	47	52	57	62
	8	-	-	-	-	-	29	36	42	48	55	61	68	74	80
	10	-	-	-	-	-	37	44	52	60	67	75	83	91	99
	12	-	-	-	-	-	43	52	61	70	80	88	97	106	115
	14	-	-	-	-	-	50	61	71	81	91	101	111	121	131
	16	-	-	-	-	-	57	68	79	90	102	113	124	135	146

In dashed (-) spaces, excessive sweep culls the entire section. Boxed spaces are sound for softwoods, but cull for hardwoods.

TREE GRADE PROCEDURES

HARDWOOD TREE GRADES

HARDWOOD TREE GRADES			
GRADING FACTORS	**GRADE 1**	**GRADE 2**	**GRADE 3**
Length of grading zone (ft)	Butt 16	Butt 16	Butt 16
Length of grading section[a] (ft)	Best 12	Best 12	Best 12
Minimum DBH (in)	16[b]	13	11
Minimum DIB at the top of the grading section (in)	13[b] 16 20	11[c] 12	8
Clear cuttings on 3rd best face[d] minimum length (ft) number on face (max) yield in face length (min)*	 7 5 3 2 5/6	 3 3 2 3 4/6	 2 unlimited 3/6
Cull deduction, including crook and sweep but excluding shake, maximum w/in grading section (%)	9	9[e]	50

[a] Whenever a 14- or 16-ft section of the butt log is better than the best 12-ft section, the grade of the longer section will become the grade of the tree. This longer section, when used, is the basis for determining the grading factors, such as diameter and cull deduction.

[b] In basswood and ash, DIB at the top of the grading section may be 12-in and DBH may be15-in.

[c] Grade 2 trees can be 10-in DIB at the top of the grading section if otherwise meeting surface requirements for small grade 1's.

[d] A clear cutting is a portion of a face free of defects, extending the width of the face. A face is one-fourth of the surface of the grading section as divided lengthwise.

[e] 15% crook and sweep, or 40% total cull deduction are permitted in grade 2 if size and surface of grading section qualify as grade 1. If rot shortens the required clear cuttings to the extent of dropping the butt log to grade 2, do not drop the tree's grade to 3 unless the cull deduction for rot is greater than 40%.

*Minimum Yield in Face Length			
Face Length	Grade 1 Min. Yield	Grade 2 Min. Yield	Grade 3 Min. Yield
12-ft	10-ft	8-ft	6-ft
14-ft	11.7-ft	9.3-ft	7-ft
16-ft	13.3-ft	10.7-ft	8-ft

HARDWOOD TIE AND TIMBER GRADE 4	
GRADING FACTORS	**SPECIFICATIONS**
Length of grading zone (ft)	Butt 16
Scaling diameter (in)	8-in DIB and larger
Length, w/o trim (ft)	12-ft and longer
Clear cuttings	No requirements (not graded on cutting basis)
Maximum sweep allowance	One-fourth DIB of small end for half logs, and one-half DIB for logs 16-ft long
Sound surface defects -	
Single knots	Any number, if none has an average collar[a] diameter that is more than one-third of the log diameter at the point of occurrence.
Whorled knots	Any number, provided the sum of the collar diameters does not exceed one-third the log diameter at the point of occurrence.
Knots	Any number not exceeding knot specifica-tions, if they do not extend more than 3-in into the contained tie or timber.
Unsound surface defects[b]	Any number and size, if they do not extend into contained tie or timber. If they extend into contained tie or timber, they shall not exceed size, number, and depth of limits for sound defects.

[a] Knot collar is the average of the vertical and horizontal diameters of the limb, or knot swelling, as measured flush with the surface of the log.

[b] Interior defects are not visible in standing trees. They are considered in grading cut logs. No interior defects are permitted except one shake not more than one-third the width of the contained tie or timber, and one split not more than 5-in long.

HARDWOOD TREE GRADE 5

Record TREE GRADE 5 for hardwood species that do not meet the length of grading zone requirement for TREE GRADE 1-4, but do have either an upper 12-foot log or 2 non-contiguous 8-foot logs, and the total board foot cull deduction is less than 67%.

These logs must still meet the size, soundness and surface yield requirements for a grade 1-4 log. The only difference is that the length of the grading zone extends beyond the butt 16-foot log.

Since these logs are in the upper portion of the tree, determining the surface yield is impractical. When determining if TREE GRADE = 5, simply make sure the log appears to meet the size and soundness requirements of a TREE GRADE 4 (no internal rot). If it is clear the upper log does have internal rot, then it must be examined further to determine if it can at least meet the size, soundness and surface yield requirements of a TREE GRADE 3 (the log must be at least 8 inches DIB, with no more than 50% board foot cull in the section, at least 3/6 of the section length clear of defects, and at least 2 feet between defects.)

Log abnormalities that are defects in factory logs include the following:

Adventitious bud clusters
Bulge, butt or stem
High bumps
Burl
Butt scar
Canker
Conk
Flutes, if not superficial
Holes extending into the bole
Embedded metal (fence)
Limb
Knots
Knot overgrowths
Low bumps
Overgrowths following insect damage or bird peck*
Seams, if not superficial
Wounds extending into the bole

Bird pecks: There must be four bird pecks within a square foot to affect the tree grade. First, determine the tree grade without the bird pecks. If the tree grade is determined to be 1 or 2, then down grade the tree by one grade. If the tree graded out to be a 3 or 4 without the bird pecks, then ignore them as defects and record the initial tree grade.

Abnormalities not ordinarily limiting cuttings are butt swell, flanges and surface rise.

SOUTHERN PINE TREE GRADES

SOUTHERN PINE TREE GRADES All pines except eastern white pine. Includes eastern red cedar.			
FACE LENGTH	**GRADE 1**	**GRADE 2**	**GRADE 3**
Butt 16-ft*	3 or 4 clear faces	1 or 2 clear faces	No clear faces

After the tentative grade is established, the tree will be ***reduced one grade*** for each of the following:

Sweep - Degrade any tentative Grade 1 or 2 tree one grade if sweep in the lower 12-ft of the grading section amounts to 3 or more inches and equals or exceeds one-fourth the DBH.

Heart rot - Degrade any tentative Grade 1 or 2 tree one grade if conks, punk knots, or other evidence of advanced heart rot is found anywhere on the tree stem.

Note - No tree can be degraded below Grade 3, provided the total scaling deductions for sweep and/or rot do not exceed two-thirds the gross scale of the tree. Trees with total scaling deductions in excess of two- thirds are classified as cull (Tree Class 3 or 4).

A face is one-fourth the circumference of the 16-ft grading section and ex tends the full length of the grading section. Clear faces are those free from knots measuring more than 1/2-in in diameter, overgrown knots of any size, and holes more than 1/4-in in diameter. Faces may be rotated, if necessary, to obtain the maximum number of clear faces on the grading section.

*Note: Only grade the length of the log up to a 7-inch top DOB. The 7-inch top DOB must be between 12 and 16 feet off of the 1-ft stump to be TREE CLASS 2.

SOUTHERN PINE TREE GRADE 5

Record TREE GRADE 5 for southern pine species that do not have a 12-foot log in the butt 16-foot grading section due primarily to poor form, but do have either an upper 12-foot log or 2 non-contiguous 8-foot logs, and the total board foot cull deduction is less than 67%.

EASTERN WHITE PINE TREE GRADES

EASTERN WHITE PINE TREE GRADES				
GRADING FACTORS	**GRADE 1**	**GRADE 2**	**GRADE 3**	**GRADE 4**
Minimum DBH (in)	9	9	9	9
Maximum weevil injury in butt 16-ft section (number)	None	None	2 Injuries	No limit
Minimum face requirements on butt 16-ft section	Two full length or four 50% length good faces[1]. (In addition, knots on balance of faces shall not exceed size limitations for Grade 2 sections.)	NO GOOD FACES REQUIRED. Maximum diam-eter of knots on 3 best faces: **SOUND RED KNOTS** not to exceed 1/6 of scaling diameter or 3-in maximum[2]. **DEAD OR BLACK KNOTS**, in-cluding over-grown knots, not to exceed 1/12 scaling diameter and 1-1/2-in maximum.	NO GOOD FACES REQUIRED. Maximum diam-eter of knots on 3 best faces: **SOUND RED KNOTS** not to exceed 1/3 of scaling diameter of 5-in maximum[2]. **DEAD OR BLACK KNOTS**, in-cluding over-grown knots, not to exceed 1/6 scaling dia-meter and 2-1/2-in maximum.	Includes all trees not qualifying for Grade 3 or better and judged to have at least 1/3 of their gross volume in sound wood suitable for manufacture into standard lumber.
Maximum sweep or crook in butt 16-ft section (%)	20	30	40	No limit
Maximum total scaling deduction in 16-ft section (%)	50	50	50	No limit

After the tentative grade of the section is established from face examination, the section will be ***reduced one grade*** whenever the following defects are evident[3]:

CONKS, PUNK KNOTS AND PINE BORER DAMAGE ON THE SURFACE OF THE SECTION
Degrade one grade if present on one face.
Degrade two grades if present on two faces.
Degrade three grades if present on three to four faces.

If the final grade of the grading section is 1, 2 or 3, examine the tree for weevil injuries in the merchantable stem ***above*** 16-ft. If the total apparent weevil damage exceeds 3, de-grade the tree grade one below the section grade[3]. Otherwise the tree grade is the same as the final section grade.

[1] Trees under 16-in DBH require four full length good faces.
[2] Scaling diameter is estimated at the top of the 16-ft grading section.
[3] No tree will be designated below Grade 4 unless net tree scale is less than one-third of gross tree scale.

White Pine Collar Diameter Limits for Red & Black Knots			
Scaling Diameter (DIB in)	**Black Knots 1/12**	**Black & Red Knots 1/6**	**Red Knots 1/3**
7	7/12"	1-1/6"	2-1/3"
8	2/3"	1-1/3"	2-2/3"
9	3/4"	1-1/2"	3"
10	5/6"	1-2/3"	3-1/3"
11	11/12"	1-5/6"	3-2/3"
12	1"	2"	4"
13	1-1/12"	2-1/6"	4-1/3"
14	1-1/6"	2-1/3"	4-2/3"
15	1-1/4"	**2-1/2" Black Max**	**5" Max**
16	1-1/3"	2-2/3"	**5" Max**
17	1-5/12"	2-5/6"	**5" Max**
18	**1-1/2" Max**	**3" Red Max**	**5" Max**

EASTERN WHITE PINE TREE GRADE 5

Record TREE GRADE 5 for eastern white pine trees that do not have a 12-foot log in the butt 16-foot grading section due primarily to poor form, but do have either an upper 12-foot log or 2 non-contiguous 8-foot logs, and the total board foot cull deduction is less than 67%.

SPRUCE, FIR, CEDAR (excluding eastern redcedar) TAMARACK AND HEMLOCK

SPRUCE, FIR, CEDAR, TAMARACK AND HEMLOCK				
Minimum Merchantability Specifications for Grade 1				
DIB (small end of log)	**Length (2-ft multiples w/o trim)**	**Total Deduction**	**Sweep Permitted**	**Other Requirements***
6" - 12"	12' - 16'	50%	25%	Not more than one sound knot or branch greater than 2" in diameter.
13" +	12' - 16'	50%	25%	Not more than one sound knot or branch greater than 3" in diameter.

If the tree does not meet the specifications for a grade 1, but does have a 12-foot log in the butt 16-foot section, then record TREE GRADE = 4.

If the tree does not meet the specifications for a grade 1, but does have a 12-foot log in the butt 16-foot section, then record TREE GRADE = 4.

SPRUCE, FIR, CEDAR (not eastern red) TAMARACK AND HEMLOCK TREE GRADE 5

Record TREE GRADE 5 for trees that do not have a 12-foot log in the butt 16-foot grading section due primarily to poor form, but do have either an upper 12-foot log or 2 non-contiguous 8-foot logs, and the total board foot cull deduction is less than 67%.

Appendix 6. Determination of Stocking Values for Land Use Classification

Stocking values are required to determine if a CONDITION CLASS STATUS = 1 (accessible forest land) exists on a plot. This will determine which data items must be recorded for the condition. When the CONDITION CLASS STATUS is in question (usually a nonforest area that is in the process of reverting to forest land or a marginal site that can only support a low number of trees), the crew must determine if there is sufficient stocking to classify the condition as forest. A minimum stocking value of 10 percent is required for accessible forest land (unless the condition was previously forested, such as a recent clear cut).

The following tables show the stocking values to assign to trees or the number of trees per acre to determine if a plot meets the minimum stocking to be considered forest land. In the determination of stocking for this purpose, the field crew should consider the condition over its entire area, not just the trees and seedlings that would be tallied on the subplots and microplots, especially when the plot straddles conditions. Also, for stocking purposes, consider a clump of trees (e.g., stump sprouts) less than 5 inches DBH to be a single tree.

The number of trees per acre needed to obtain minimum stocking depends on the DBH of the largest tree on the plot in the condition being evaluated, and the species and DBH of each of the tally trees. If the condition occurs on all four subplots and the trees are distributed fairly evenly over the entire condition area, the following steps can be used to determine if the condition has the minimum number of trees per acre for forest land.

Observe all of the trees on the plot and classify the condition, based on the tree with the largest DBH, into one of the following groups; the largest tree observed has a DBH of 5 inches or greater, 4.0-4.9 inches, 3.0-3.9 inches, 2.0-2.9 inches, 1.0-1.9 inches or less than 1.0 inch DBH. If you are using the *Stocking Values* table to determine if the condition meets minimum stocking, use table 5a, 5b, 5c, 5d, 5e, or 5f. If you are using the *Number of Trees* table to determine if the condition meets minimum stocking, use table 5g.

When using a *Stocking Values* table, begin a tally of each subplot and microplot and sum the stocking values for each tree tallied based upon its species and size class. When the stocking values for the tallied trees equals or exceeds 10, the condition meets the minimum stocking requirement for forest land.

For example, a condition that was formerly nonforest is no longer being maintained as nonforest and has begun to revert. A check of all four subplots and microplots confirms that the largest tree there is in the 3.0 – 3.9 inches DBH class. The tally of microplot 1 is one red maple (species code = 316) seedling. The sum of the stocking value (table 5a) to this point is 2.4 and the tally continues on microplot 2.

Subplot Number	Plot Type	Species	Size Class	Number Tallied	Stocking Value
1	2	316	< 1.0	1	2.4
Total					2.4

The tally at microplot 2 is two red maple seedlings. The stocking value for the two seedlings is 4.8. The cumulative stocking value to this point is 7.2. Since the minimum value of 10 percent stocking has not been reached, the tally continues to subplot 3.

Subplot Number	Plot Type	Species	Size Class	Number Tallied	Stocking Value
1	2	316	< 1.0	1	2.4
2	2	316	< 1.0	2	4.8
Total					7.2

At microplot 3 one sugar maple (species code = 318) sapling in the 1.0 – 1.9-inch DBH class is tallied. The cumulative stocking value is now 13.1 and the condition meets the minimum stocking to be considered forest land.

Subplot Number	Plot Type	Species	Size Class	Number Tallied	Stocking Value
1	2	316	< 1.0	1	2.4
2	2	316	< 1.0	2	4.8
3	2	318	1.0 – 1.9	1	5.9
Total					13.1

When trees of more than one diameter class are present, their contribution towards meeting the minimum must be combined. For example:

> In a lodgepole pine stand (species code = 108), the largest tree in the condition is 5.0+ inches DBH. If at least 20 trees that are 5.0-6.9 inches DBH are found on the four subplots, the minimum stocking of 10 percent (table 5b: 5th row, 1st column) is met. In the same condition only 5 tally trees in the 13.0-14.9-inch DBH class are needed to meet minimum stocking of 10 percent. If the tally were three 5.0-6.9-inch trees and two 13.0-14.9-inch DBH class trees (total stocking of 3 x 0.5 + 2 x 2.2 = 5.9), the combined stocking would not meet the minimum 10 percent (5.9 < 10) and the condition would be classified nonforest.

When using the *Number of Trees* table (table 5g), estimate the number of trees per acre by the diameter classes. When a condition exists on all 4 of the 24-ft radius subplots, each tally tree (DBH $\geq$ 5.0 inches) represents 6 trees per acre and each sapling (DBH $\geq$ 1.0 inch to < 5.0 inches) or seedling observed on the 4 microplots represents 75 trees per acre.

In sparse stands of smaller trees, a more accurate observation of trees per acre can be determined by observing trees < 5.0 inches DBH on the 24-ft radius subplot. In many forest types no more than 180 trees per acre of the largest diameter class are needed to meet the minimum stocking requirements, a total of 30 trees on all 4 subplots, 7 or 8 smaller trees on each subplot, will provide minimum stocking.

Other things observed on the plot will influence the determination of condition class status. In the last lodgepole pine example, evidence of a recent disturbance that reduced the stocking (cutting, fire, etc.) should be considered. Also, a very uneven distribution of the trees across the condition can greatly change the observed number of trees per acre on plots installed across the condition.

If the condition does not cover all four subplots entirely, trees per acre must be expanded using an expansion factor. The expansion factor is equal to 400/sum of the percent of subplot area (%ARE) for the condition. The trees per acre value of every diameter class is multiplied by this expansion factor.

If the trees are not uniformly distributed throughout the condition or the condition occurs on only a small portion of the plot (half the plot or less), use your best judgment in assigning status. You may place several additional temporary subplots in the condition in order to get a larger sample to base stocking on. When additional temporary subplots or judgment is used to assign land use, a note should be made on the plot sheet. Use the following procedure to establish these temporary subplots in a condition:

A. Consider locations 120.0 feet horizontal distance from the highest numbered subplot in the condition. First consider the location 0° azimuth from the subplot center. If this location is unsuitable, consider in order locations at azimuth 120°, and 240°. When a suitable location has been found, establish the temporary subplot. Temporary subplots should be entirely within the condition (locations should not be within 24.0 feet of a mapped boundary).

B. If Step A fails to yield a suitable subplot location, repeat Step A at each of the next highest-numbered regular subplots in the condition.

C. If Steps A and B have been exhausted and a suitable temporary subplot still has not been found, repeat Step A at each temporary subplot in turn, beginning with the first temporary subplot that was established.

If more than one temporary subplot is to be established, repeat Steps A and B to establish the second lowest- numbered temporary subplot next, and continue in order until you have enough temporary subplots established in the condition to get a good, representative estimate of stocking. The general rule for establishing temporary subplots is:

- Install the lowest temporary subplot off the highest established subplot, until all the established subplots have been exhausted.
- Then establish the lowest temporary subplot yet to be established off the lowest one already established (lowest off highest, then lowest off lowest).

If there is a transition zone between two conditions use your best judgment to be sure that trees tallied in the transition zone do not have too much weight in the assignment of a land use.

Table 5a. Stocking values for all tallied trees on the four subplots and microplots

	DBH of the largest tally tree in the condition																				
	5.0+						4.0-4.9					3.0-3.9				2.0-2.9			1.0-1.9		Seedling
	DBH of tally tree						DBH of tally tree					DBH of tally tree				DBH of tally tree			DBH of tally tree		
Species	**5.0-6.9**	**4.0-4.9**	**3.0-3.9**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**4.0-4.9**	**3.0-3.9**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**3.0-3.9**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**1.0-1.9**	**Seedling**	**Seedling**
10, 12, 16, 18, 19, 70, 71, 90, 91, 93, 94, 96, 97, 992	0.7	6.9	5.2	4.0	2.6	1.2	7.9	6.2	4.6	3.0	1.4	7.6	5.7	3.7	1.8	7.4	4.9	2.3	7.2	3.5	7.0
72, 73, 844	0.6	5.6	4.3	3.3	2.1	1.0	6.4	5.1	3.8	2.5	1.1	6.3	4.6	3.0	1.4	6.1	4.0	1.9	5.9	2.9	5.7
57, 61, 95	0.7	6.2	4.7	3.6	2.3	1.1	7.1	5.6	4.2	2.7	1.3	6.9	5.1	3.3	1.6	6.7	4.4	2.1	6.5	3.2	6.3
67, 68, 105, 107, 115, 123, 126, 130, 132, 230, 232, 250, 299	1.0	9.1	6.9	5.3	3.4	1.6	10.4	8.3	6.1	4.0	1.9	10.1	7.5	4.9	2.3	9.9	6.5	3.1	9.6	4.7	9.3
108	0.5	5.0	3.7	2.9	1.9	0.8	5.7	4.5	3.3	2.2	1.0	5.5	4.1	2.7	1.3	5.4	3.5	1.7	5.2	2.5	5.1
110	0.8	7.3	5.5	4.3	2.7	1.2	8.3	6.6	4.9	3.2	1.5	8.1	6.0	3.9	1.9	7.9	5.2	2.5	7.6	3.7	7.4
111	0.8	7.8	5.9	4.6	3.0	1.3	8.9	7.1	5.3	3.4	1.6	8.7	6.5	4.2	2.0	8.5	5.6	2.7	8.2	4.0	8.0
103, 104, 119	0.4	4.2	3.1	2.4	1.6	0.7	4.7	3.8	2.8	1.8	0.8	4.6	3.4	2.2	1.1	4.5	2.9	1.4	4.4	2.1	4.2
121	1.1	10.1	7.6	5.9	3.8	1.7	11.5	9.1	6.8	4.4	2.1	11.2	8.3	5.4	2.6	10.9	7.2	3.4	10.6	5.1	10.3
50, 51, 52, 53, 54, 55, 56, 58, 59, 62, 63, 64, 65, 66, 69, 100, 101, 102, 106, 109, 112, 113, 114, 116, 117, 118, 120, 122, 124, 127, 133, 134, 135, 137, 138, 139, 140, 142, 143, 144, 321, 322, 323, 475, 755, 756, 757, 758, 800, 803, 810, 811, 814, 823, 826, 829, 843, 846, 847, 850, 902, 990	0.5	5.0	3.8	2.9	1.9	0.9	5.7	4.6	3.4	2.2	1.0	5.6	4.1	2.7	1.3	5.4	3.6	1.7	5.3	2.6	5.1
125, 136	0.7	6.8	5.1	4.0	2.6	1.2	7.7	6.1	4.6	3.0	1.4	7.5	5.6	3.7	1.7	7.3	4.8	2.3	7.1	3.5	6.9
128	1.1	10.2	7.7	5.9	3.8	1.7	11.6	9.2	6.8	4.5	2.1	11.3	8.4	5.5	2.6	11.0	7.2	3.5	10.7	5.2	10.4
129	0.8	7.5	5.7	4.4	2.8	1.3	8.6	6.8	5.1	3.3	1.5	8.4	6.2	4.1	1.9	8.1	5.3	2.6	7.9	3.8	7.7
131	0.9	8.3	6.3	4.8	3.1	1.4	9.4	7.5	5.6	3.6	1.7	9.2	6.8	4.5	2.1	8.9	5.9	2.8	8.7	4.2	8.4
15, 200, 201, 202, 510, 511, 512, 513, 514	0.7	6.8	5.1	4.0	2.6	1.2	7.7	6.2	4.6	3.0	1.4	7.5	5.6	3.7	1.7	7.3	4.8	2.3	7.1	3.5	6.9

Table 5a. Stocking values for all tallied trees on the four subplots and microplots

	DBH of the largest tally tree in the condition																				
	5.0+						**4.0-4.9**					**3.0-3.9**				**2.0-2.9**			**1.0-1.9**		**Seedling**
	DBH of tally tree						**DBH of tally tree**					**DBH of tally tree**				**DBH of tally tree**			**DBH of tally tree**		
Species	**5.0-6.9**	**4.0-4.9**	**3.0-3.9**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**4.0-4.9**	**3.0-3.9**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**3.0-3.9**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**1.0-1.9**	**Seedling**	**Seedling**
43, 241	0.7	6.1	4.6	3.6	2.3	1.0	6.9	5.5	4.1	2.7	1.2	6.8	5.0	3.3	1.6	6.6	4.3	2.1	6.4	3.1	6.2
240, 260, 261, 262	0.8	7.7	5.8	4.5	2.9	1.3	8.7	7.0	5.2	3.4	1.6	8.5	6.3	4.1	2.0	8.3	5.4	2.6	8.0	3.9	7.8
11, 14, 17, 20, 21, 22, 40, 41, 42, 81, 92, 98, 231, 242, 251, 252, 263, 264	0.5	4.8	3.6	2.8	1.8	0.8	5.4	4.3	3.2	2.1	1.0	5.3	3.9	2.6	1.2	5.1	3.4	1.6	5.0	2.4	4.8
211, 212	0.4	3.8	2.9	2.2	1.4	0.6	4.3	3.4	2.5	1.7	0.8	4.2	3.1	2.0	1.0	4.1	2.7	1.3	4.0	1.9	3.8

Table 5a. Stocking values for all tallied trees on the four subplots and microplots

	DBH of the largest tally tree in the condition																				
	5.0+						4.0-4.9					3.0-3.9				2.0-2.9			1.0-1.9		Seedling
	DBH of tally tree						DBH of tally tree					DBH of tally tree				DBH of tally tree			DBH of tally tree		
Species	**5.0-6.9**	**4.0-4.9**	**3.0-3.9**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**4.0-4.9**	**3.0-3.9**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**3.0-3.9**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**1.0-1.9**	**Seedling**	**Seedling**
300, 303, 304, 310, 311, 312, 316, 317, 319, 320, 341, 356, 357, 358, 367, 381, 391, 420, 421, 424, 471, 481, 490, 491, 550, 551, 555, 561, 571, 580, 581, 582, 583, 591, 631, 653, 680, 681, 682, 683, 684, 701, 711, 760, 761, 763, 764, 765, 766, 768, 769, 770, 771, 772, 773, 774, 821, 852, 853, 854, 855, 856, 857, 858, 859, 860, 863, 864, 865, 866, 873, 874, 876, 877, 882, 883, 884, 885, 886, 887, 888, 890, 891, 895, 896, 897, 906, 907, 908, 909, 912, 913, 914, 915, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 934, 935, 936, 937, 940, 982, 986, 987, 988, 989, 991, 994, 995, 996, 997, 998, 999	1.0	9.6	7.2	5.6	3.6	1.6	10.9	8.7	6.4	4.2	2.0	10.6	7.9	5.2	2.4	10.3	6.8	3.3	10.0	4.9	9.8
350, 351, 352, 353, 355, 492	1.3	11.7	8.8	6.8	4.4	2.0	13.3	10.6	7.9	5.1	2.4	13.0	9.6	6.3	3.0	12.6	8.3	4.0	12.3	5.9	11.9

Table 5a. Stocking values for all tallied trees on the four subplots and microplots

	DBH of the largest tally tree in the condition																				
	5.0+						4.0-4.9					3.0-3.9				2.0-2.9			1.0-1.9		Seedling
	DBH of tally tree						DBH of tally tree					DBH of tally tree				DBH of tally tree			DBH of tally tree		
Species	**5.0-6.9**	**4.0-4.9**	**3.0-3.9**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**4.0-4.9**	**3.0-3.9**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**3.0-3.9**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**1.0-1.9**	**Seedling**	**Seedling**
314, 315, 318, 330, 331, 332, 333, 334, 336, 337, 370, 371, 372, 377, 450, 451, 452, 531, 552, 712	1.2	10.9	8.2	6.3	4.1	1.8	12.4	9.8	7.3	4.8	2.2	12.1	9.0	5.9	2.8	11.7	7.7	3.7	11.4	5.5	11.1
373, 374, 375, 378, 379	1.1	10.5	7.9	6.1	4.0	1.8	12.0	9.5	7.1	4.6	2.1	11.6	8.7	5.7	2.7	11.3	7.4	3.6	11.0	5.3	10.7
360, 361, 362, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 422, 423, 431, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 520, 521, 522, 549, 641, 660, 661, 662, 663, 664, 801, 802, 804, 805, 806, 807, 808, 809, 812, 813, 815, 816, 817, 818, 819, 820, 822, 824, 825, 827, 828, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 845, 901, 931, 981, 5091, 5092, 5093	1.2	11.6	8.8	6.8	4.4	2.0	13.2	10.5	7.8	5.1	2.4	12.9	9.6	6.3	3.0	12.5	8.2	3.9	12.2	5.9	11.8
600, 601, 602, 603, 604, 605, 606	1.4	12.7	9.6	7.4	4.8	2.2	14.5	11.5	8.5	5.6	2.6	14.1	10.5	6.9	3.2	13.7	9.0	4.3	13.3	6.5	12.9
220, 221, 222, 611, 690, 691, 692, 693, 694	0.7	6.8	5.2	4.0	2.6	1.2	7.8	6.2	4.6	3.0	1.4	7.6	5.6	3.7	1.7	7.4	4.9	2.3	7.2	3.5	7.0
741, 743, 746	1.2	10.9	8.3	6.4	4.1	1.9	12.5	9.9	7.3	4.8	2.2	12.1	9.0	5.9	2.8	11.8	7.8	3.7	11.5	5.6	11.1

Table 5a. Stocking values for all tallied trees on the four subplots and microplots

	DBH of the largest tally tree in the condition																				
	5.0+						**4.0-4.9**					**3.0-3.9**				**2.0-2.9**			**1.0-1.9**		**Seedling**
	DBH of tally tree						**DBH of tally tree**					**DBH of tally tree**				**DBH of tally tree**			**DBH of tally tree**		
Species	**5.0-6.9**	**4.0-4.9**	**3.0-3.9**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**4.0-4.9**	**3.0-3.9**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**3.0-3.9**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**1.0-1.9**	**Seedling**	**Seedling**
540, 541, 542, 543, 545, 546, 547, 548, 621, 650, 651, 652, 654, 655, 657, 658, 720, 721, 722, 762, 993, 7211	1.0	9.3	7.0	5.4	3.5	1.6	10.6	8.4	6.3	4.1	1.9	10.3	7.7	5.0	2.4	10.0	6.6	3.2	9.8	4.7	9.5
950, 951, 952, 953	1.0	9.2	7.0	5.4	3.5	1.6	10.5	8.4	6.2	4.0	1.9	10.2	7.6	5.0	2.3	10.0	6.5	3.1	9.7	4.7	9.4
313, 345, 460, 461, 462, 463, 544, 729, 730, 731, 732, 740, 742, 744, 745, 747, 748, 749, 752, 753, 970, 971, 972, 973, 974, 975, 976, 977	1.2	10.8	8.1	6.3	4.1	1.8	12.3	9.8	7.2	4.7	2.2	12.0	8.9	5.8	2.7	11.6	7.6	3.7	11.3	5.5	11.0

Table 5b. Stocking values for all trees tallied on the subplot only

Species	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-24.9	25.0-26.9	27.0-28.9	29.0+
10, 12, 16, 18, 19, 70, 71, 90, 91, 93, 94, 96, 97, 992	0.7	1.1	1.6	2.1	2.6	3.2	3.8	4.4	5.1	5.8	6.5	7.2	8.0
72, 73, 844	0.6	1.0	1.5	2.0	2.6	3.3	4.0	4.9	5.7	6.7	7.6	8.7	9.8
57, 61, 95	0.7	0.9	1.1	1.4	1.6	1.9	2.1	2.4	2.6	2.9	3.1	3.4	3.6
67, 68, 105, 107, 115, 123, 126, 130, 132, 230, 232, 250, 299	1.0	1.5	2.2	3.0	3.8	4.7	5.6	6.6	7.7	8.9	10.1	11.4	12.7
108	0.5	0.9	1.3	1.7	2.2	2.8	3.4	4.1	4.8	5.6	6.4	7.3	8.2
110	0.8	1.3	2.0	2.7	3.6	4.6	5.7	6.9	8.2	9.6	11.1	12.7	14.4
111	0.8	1.5	2.2	3.2	4.2	5.5	6.9	8.4	10.1	11.9	13.9	16.0	18.2
103, 104, 119	0.4	0.7	1.1	1.5	1.9	2.4	3.0	3.6	4.2	4.9	5.6	6.4	7.2
121	1.1	1.6	2.3	2.9	3.7	4.4	5.3	6.1	7.0	8.0	8.9	10.0	11.0
50, 51, 52, 53, 54, 55, 56, 58, 59, 62, 63, 64, 65, 66, 69, 100, 101, 102, 106, 109, 112, 113, 114, 116, 117, 118, 120, 122, 124, 127, 133, 134, 135, 137, 138, 139, 140, 142, 143, 144, 321, 322, 323, 475, 755, 756, 757, 758, 800, 803, 810, 811, 814, 823, 826, 829, 843, 846, 847, 850, 902, 990	0.5	1.0	1.5	2.2	2.9	3.8	4.9	6.0	7.3	8.6	10.1	11.8	13.5
125, 136	0.7	1.2	1.7	2.3	3.0	3.7	4.6	5.4	6.4	7.4	8.4	9.5	10.7
128	1.1	1.8	2.6	3.5	4.5	5.6	6.8	8.2	9.6	11.1	12.7	14.3	16.1
129	0.8	1.2	1.7	2.3	2.9	3.6	4.2	5.0	5.7	6.6	7.4	8.3	9.2
131	0.9	1.5	2.1	2.9	3.8	4.8	5.9	7.1	8.3	9.7	11.1	12.6	14.2
15, 200, 201, 202, 510, 511, 512, 513, 514	0.7	1.1	1.6	2.1	2.7	3.3	4.0	4.7	5.4	6.2	7.0	7.8	8.7
43, 241	0.7	1.1	1.6	2.3	3.0	3.8	4.7	5.7	6.8	7.9	9.2	10.5	11.8
240, 260, 261, 262	0.8	1.5	2.4	3.6	4.9	6.5	8.4	10.4	12.8	15.3	18.2	21.2	24.6
11, 14, 17, 20, 21, 22, 40, 41, 42, 81, 92, 98, 231, 242, 251, 252, 263, 264	0.5	0.8	1.2	1.6	2.1	2.6	3.2	3.8	4.5	5.2	5.9	6.7	7.5
211, 212	0.4	0.7	1.0	1.3	1.7	2.1	2.6	3.1	3.6	4.2	4.8	5.4	6.1

Table 5b. Stocking values for all trees tallied on the subplot only

Species	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-24.9	25.0-26.9	27.0-28.9	29.0+
300, 303, 304, 310, 311, 312, 316, 317, 319, 320, 341, 356, 357, 358, 367, 381, 391, 420, 421, 424, 471, 481, 490, 491, 550, 551, 555, 561, 571, 580, 581, 582, 583, 591, 631, 653, 680, 681, 682, 683, 684, 701, 711, 760, 761, 763, 764, 765, 766, 768, 769, 770, 771, 772, 773, 774, 821, 852, 853, 854, 855, 856, 857, 858, 859, 860, 863, 864, 865, 866, 873, 874, 876, 877, 882, 883, 884, 885, 886, 887, 888, 890, 891, 895, 896, 897, 906, 907, 908, 909, 912, 913, 914, 915, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 934, 935, 936, 937, 940, 982, 986, 987, 988, 989, 991, 994, 995, 996, 997, 998, 999	1.0	1.6	2.2	3.0	3.8	4.6	5.5	6.5	7.5	8.6	9.7	10.9	12.1
350, 351, 352, 353, 355, 492	1.3	1.9	2.6	3.3	4.1	5.0	5.9	6.8	7.8	8.9	9.9	11.0	12.1
314, 315, 318, 330, 331, 332, 333, 334, 336, 337, 370, 371, 372, 377, 450, 451, 452, 531, 552, 712	1.2	2.0	3.0	4.2	5.6	7.2	9.0	11.0	13.1	15.4	17.8	20.5	23.3
373, 374, 375, 378, 379	1.1	1.9	3.0	4.2	5.6	7.2	9.0	11.0	13.1	15.5	18.0	20.7	23.6
360, 361, 362, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 422, 423, 431, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 520, 521, 522, 549, 641, 660, 661, 662, 663, 664, 801, 802, 804, 805, 806, 807, 808, 809, 812, 813, 815, 816, 817, 818, 819, 820, 822, 824, 825, 827, 828, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 845, 901, 931, 981, 5091, 5092, 5093	1.2	2.0	2.9	3.9	5.0	6.2	7.5	8.9	10.4	11.9	13.6	15.3	17.2
600, 601, 602, 603, 604, 605, 606	1.4	2.1	2.9	3.9	4.9	5.9	7.1	8.3	9.6	10.9	12.3	13.7	15.2
220, 221, 222, 611, 690, 691, 692, 693, 694	0.7	1.3	1.9	2.7	3.6	4.6	5.7	7.0	8.3	9.8	11.4	13.1	14.9
741, 743, 746	1.2	1.8	2.5	3.2	4.0	4.9	5.8	6.8	7.8	8.9	10.0	11.1	12.3
540, 541, 542, 543, 545, 546, 547, 548, 621, 650, 651, 652, 654, 655, 657, 658, 720, 721, 722, 762, 993, 7211	1.0	1.4	1.8	2.2	2.6	3.0	3.5	3.9	4.3	4.8	5.2	5.7	6.2
950, 951, 952, 953	1.0	1.8	2.8	4.0	5.5	7.2	9.1	11.3	13.7	16.3	19.1	22.2	25.5
313, 345, 460, 461, 462, 463, 544, 729, 730, 731, 732, 740, 742, 744, 745, 747, 748, 749, 752, 753, 970, 971, 972, 973, 974, 975, 976, 977	1.2	2.0	3.0	4.2	5.6	7.2	8.9	10.9	13.0	15.2	17.7	20.3	23.1

Table 5c. Stocking values for all trees < 7 inches, observed on the four subplots only

	DBH of the largest tally tree in the condition																				
	5.0+						4.0-4.9					3.0-3.9				2.0-2.9			1.0-1.9		Seedling
	DBH of tally tree						DBH of tally tree					DBH of tally tree				DBH of tally tree			DBH of tally tree		
Species	**5.0-6.9**	**4.0-4.9**	**3.0-3.9**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**4.0-4.9**	**3.0-3.9**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**3.0-3.9**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**1.0-1.9**	**Seedling**	**Seedling**
10, 12, 16, 18, 19, 70, 71, 90, 91, 93, 94, 96, 97, 992	0.74	0.55	0.42	0.32	0.21	0.09	0.63	0.50	0.37	0.24	0.11	0.61	0.45	0.30	0.14	0.59	0.39	0.19	0.58	0.28	0.56
72, 73, 844	0.60	0.45	0.34	0.26	0.17	0.08	0.51	0.41	0.30	0.20	0.09	0.50	0.37	0.24	0.11	0.49	0.32	0.15	0.47	0.23	0.46
57, 61, 95	0.67	0.50	0.38	0.29	0.19	0.08	0.57	0.45	0.33	0.22	0.10	0.55	0.41	0.27	0.13	0.54	0.35	0.17	0.52	0.25	0.51
67, 68, 105, 107, 115, 123, 126, 130, 132, 230, 232, 250, 299	0.98	0.73	0.55	0.43	0.28	0.12	0.83	0.66	0.49	0.32	0.15	0.81	0.60	0.39	0.19	0.79	0.52	0.25	0.77	0.37	0.74
108	0.53	0.40	0.30	0.23	0.15	0.07	0.45	0.36	0.27	0.17	0.08	0.44	0.33	0.21	0.10	0.43	0.28	0.13	0.42	0.20	0.40
110	0.78	0.58	0.44	0.34	0.22	0.10	0.66	0.53	0.39	0.26	0.12	0.65	0.48	0.31	0.15	0.63	0.41	0.20	0.61	0.30	0.59
111	0.84	0.63	0.47	0.37	0.24	0.11	0.72	0.57	0.42	0.27	0.13	0.70	0.52	0.34	0.16	0.68	0.45	0.21	0.66	0.32	0.64
103, 104, 119	0.45	0.33	0.25	0.19	0.13	0.06	0.38	0.30	0.22	0.15	0.07	0.37	0.27	0.18	0.08	0.36	0.24	0.11	0.35	0.17	0.34
121	1.08	0.81	0.61	0.47	0.30	0.14	0.92	0.73	0.54	0.35	0.16	0.90	0.67	0.44	0.21	0.87	0.57	0.27	0.85	0.41	0.82
50, 51, 52, 53, 54, 55, 56, 58, 59, 62, 63, 64, 65, 66, 69, 100, 101, 102, 106, 109, 112, 113, 114, 116, 117, 118, 120, 122, 124, 127, 133, 134, 135, 137, 138, 139, 140, 142, 143, 144, 321, 322, 323, 475, 755, 756, 757, 758, 800, 803, 810, 811, 814, 823, 826, 829, 843, 846, 847, 850, 902, 990	0.54	0.40	0.30	0.24	0.15	0.07	0.46	0.36	0.27	0.18	0.08	0.45	0.33	0.22	0.10	0.43	0.29	0.14	0.42	0.20	0.41
125, 136	0.73	0.54	0.41	0.32	0.20	0.09	0.62	0.49	0.36	0.24	0.11	0.60	0.45	0.29	0.14	0.59	0.39	0.18	0.57	0.28	0.55
128	1.09	0.81	0.62	0.48	0.31	0.14	0.93	0.74	0.55	0.36	0.17	0.90	0.67	0.44	0.21	0.88	0.58	0.28	0.85	0.41	0.83
129	0.81	0.60	0.46	0.35	0.23	0.10	0.69	0.55	0.40	0.26	0.12	0.67	0.50	0.33	0.15	0.65	0.43	0.20	0.63	0.31	0.61
131	0.89	0.66	0.50	0.39	0.25	0.11	0.76	0.60	0.45	0.29	0.14	0.74	0.55	0.36	0.17	0.72	0.47	0.23	0.70	0.34	0.68
15, 200, 201, 202, 510, 511, 512, 513, 514	0.73	0.54	0.41	0.32	0.20	0.09	0.62	0.49	0.36	0.24	0.11	0.60	0.45	0.29	0.14	0.59	0.39	0.18	0.57	0.28	0.55

Table 5c. Stocking values for all trees < 7 inches, observed on the four subplots only

	DBH of the largest tally tree in the condition																				
	5.0+						4.0-4.9					3.0-3.9				2.0-2.9			1.0-1.9		Seedling
	DBH of tally tree						DBH of tally tree					DBH of tally tree				DBH of tally tree			DBH of tally tree		
Species	**5.0-6.9**	**4.0-4.9**	**3.0-3.9**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**4.0-4.9**	**3.0-3.9**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**3.0-3.9**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**1.0-1.9**	**Seedling**	**Seedling**
43, 241	0.65	0.49	0.37	0.28	0.18	0.08	0.56	0.44	0.33	0.21	0.10	0.54	0.40	0.26	0.12	0.53	0.35	0.17	0.51	0.25	0.50
240, 260, 261, 262	0.82	0.61	0.46	0.36	0.23	0.10	0.70	0.56	0.41	0.27	0.13	0.68	0.51	0.33	0.16	0.66	0.44	0.21	0.64	0.31	0.63
11, 14, 17, 20, 21, 22, 40, 41, 42, 81, 92, 98, 231, 242, 251, 252, 263, 264	0.51	0.38	0.29	0.22	0.14	0.06	0.43	0.34	0.26	0.17	0.08	0.42	0.31	0.21	0.10	0.41	0.27	0.13	0.40	0.19	0.39
211, 212	0.41	0.30	0.23	0.18	0.11	0.05	0.34	0.27	0.20	0.13	0.06	0.34	0.25	0.16	0.08	0.33	0.21	0.10	0.32	0.15	0.31

Table 5c. Stocking values for all trees < 7 inches, observed on the four subplots only

	DBH of the largest tally tree in the condition																				
	5.0+						4.0-4.9					3.0-3.9				2.0-2.9			1.0-1.9		Seedling
	DBH of tally tree						DBH of tally tree					DBH of tally tree				DBH of tally tree			DBH of tally tree		
Species	**5.0-6.9**	**4.0-4.9**	**3.0-3.9**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**4.0-4.9**	**3.0-3.9**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**3.0-3.9**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**1.0-1.9**	**Seedling**	**Seedling**
300, 303, 304, 310, 311, 312, 316, 317, 319, 320, 341, 356, 357, 358, 367, 381, 391, 420, 421, 424, 471, 481, 490, 491, 550, 551, 555, 561, 571, 580, 581, 582, 583, 591, 631, 653, 680, 681, 682, 683, 684, 701, 711, 760, 761, 763, 764, 765, 766, 768, 769, 770, 771, 772, 773, 774, 821, 852, 853, 854, 855, 856, 857, 858, 859, 860, 863, 864, 865, 866, 873, 874, 876, 877, 882, 883, 884, 885, 886, 887, 888, 890, 891, 895, 896, 897, 906, 907, 908, 909, 912, 913, 914, 915, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 934, 935, 936, 937, 940, 982, 986, 987, 988, 989, 991, 994, 995, 996, 997, 998, 999	1.03	0.77	0.58	0.45	0.29	0.13	0.87	0.69	0.52	0.34	0.16	0.85	0.63	0.41	0.20	0.83	0.54	0.26	0.80	0.39	0.78
350, 351, 352, 353, 355, 492	1.25	0.93	0.71	0.55	0.35	0.16	1.07	0.85	0.63	0.41	0.19	1.04	0.77	0.50	0.24	1.01	0.66	0.32	0.98	0.48	0.95

Table 5c. Stocking values for all trees < 7 inches, observed on the four subplots only

	DBH of the largest tally tree in the condition																				
	5.0+						4.0-4.9					3.0-3.9				2.0-2.9			1.0-1.9		Seedling
	DBH of tally tree						DBH of tally tree					DBH of tally tree				DBH of tally tree			DBH of tally tree		
Species	**5.0-6.9**	**4.0-4.9**	**3.0-3.9**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**4.0-4.9**	**3.0-3.9**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**3.0-3.9**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**1.0-1.9**	**Seedling**	**Seedling**
314, 315, 318, 330, 331, 332, 333, 334, 336, 337, 370, 371, 372, 377, 450, 451, 452, 531, 552, 712	1.17	0.87	0.66	0.51	0.33	0.15	0.99	0.79	0.58	0.38	0.18	0.96	0.72	0.47	0.22	0.94	0.62	0.30	0.91	0.44	0.89
373, 374, 375, 378, 379	1.13	0.84	0.63	0.49	0.32	0.14	0.96	0.76	0.56	0.37	0.17	0.93	0.69	0.45	0.21	0.91	0.60	0.28	0.88	0.43	0.85
360, 361, 362, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 422, 423, 431, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 520, 521, 522, 549, 641, 660, 661, 662, 663, 664, 801, 802, 804, 805, 806, 807, 808, 809, 812, 813, 815, 816, 817, 818, 819, 820, 822, 824, 825, 827, 828, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 845, 901, 931, 981, 5091, 5092, 5093	1.25	0.93	0.70	0.54	0.35	0.16	1.06	0.84	0.62	0.41	0.19	1.03	0.77	0.50	0.24	1.00	0.66	0.32	0.97	0.47	0.95
600, 601, 602, 603, 604, 605, 606	1.36	1.01	0.77	0.59	0.38	0.17	1.16	0.92	0.68	0.44	0.21	1.13	0.84	0.55	0.26	1.10	0.72	0.34	1.07	0.52	1.03
220, 221, 222, 611, 690, 691, 692, 693, 694	0.73	0.55	0.41	0.32	0.21	0.09	0.62	0.50	0.37	0.24	0.11	0.61	0.45	0.30	0.14	0.59	0.39	0.19	0.57	0.28	0.56
741, 743, 746	1.17	0.87	0.66	0.51	0.33	0.15	1.00	0.79	0.59	0.38	0.18	0.97	0.72	0.47	0.22	0.94	0.62	0.30	0.92	0.45	0.89

Table 5c. Stocking values for all trees < 7 inches, observed on the four subplots only

	DBH of the largest tally tree in the condition																				
	5.0+						4.0-4.9					3.0-3.9				2.0-2.9			1.0-1.9		Seedling
	DBH of tally tree						DBH of tally tree					DBH of tally tree				DBH of tally tree			DBH of tally tree		
Species	**5.0-6.9**	**4.0-4.9**	**3.0-3.9**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**4.0-4.9**	**3.0-3.9**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**3.0-3.9**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**1.0-1.9**	**Seedling**	**Seedling**
540, 541, 542, 543, 545, 546, 547, 548, 621, 650, 651, 652, 654, 655, 657, 658, 720, 721, 722, 762, 993, 7211	1.00	0.74	0.56	0.43	0.28	0.13	0.85	0.67	0.50	0.33	0.15	0.83	0.61	0.40	0.19	0.80	0.53	0.25	0.78	0.38	0.76
950, 951, 952, 953	0.99	0.74	0.56	0.43	0.28	0.13	0.84	0.67	0.50	0.32	0.15	0.82	0.61	0.40	0.19	0.80	0.52	0.25	0.77	0.38	0.75
313, 345, 460, 461, 462, 463, 544, 729, 730, 731, 732, 740, 742, 744, 745, 747, 748, 749, 752, 753, 970, 971, 972, 973, 974, 975, 976, 977	1.16	0.86	0.65	0.50	0.32	0.15	0.98	0.78	0.58	0.38	0.18	0.96	0.71	0.47	0.22	0.93	0.61	0.29	0.90	0.44	0.88

Table 5d. Stocking values for all trees 5.0 inches and greater observed on the four subplots only

Species	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-24.9	25.0-26.9	27.0-28.9	29.0+
10, 12, 16, 18, 19, 70, 71, 90, 91, 93, 94, 96, 97, 992	0.7	1.1	1.6	2.1	2.6	3.2	3.8	4.4	5.1	5.8	6.5	7.2	8.0
72, 73, 844	0.6	1.0	1.5	2.0	2.6	3.3	4.0	4.9	5.7	6.7	7.6	8.7	9.8
57, 61, 95	0.7	0.9	1.1	1.4	1.6	1.9	2.1	2.4	2.6	2.9	3.1	3.4	3.6
67, 68, 105, 107, 115, 123, 126, 130, 132, 230, 232, 250, 299	1.0	1.5	2.2	3.0	3.8	4.7	5.6	6.6	7.7	8.9	10.1	11.4	12.7
108	0.5	0.9	1.3	1.7	2.2	2.8	3.4	4.1	4.8	5.6	6.4	7.3	8.2
110	0.8	1.3	2.0	2.7	3.6	4.6	5.7	6.9	8.2	9.6	11.1	12.7	14.4
111	0.8	1.5	2.2	3.2	4.2	5.5	6.9	8.4	10.1	11.9	13.9	16.0	18.2
103, 104, 119	0.4	0.7	1.1	1.5	1.9	2.4	3.0	3.6	4.2	4.9	5.6	6.4	7.2
121	1.1	1.6	2.3	2.9	3.7	4.4	5.3	6.1	7.0	8.0	8.9	10.0	11.0
50, 51, 52, 53, 54, 55, 56, 58, 59, 62, 63, 64, 65, 66, 69, 100, 101, 102, 106, 109, 112, 113, 114, 116, 117, 118, 120, 122, 124, 127, 133, 134, 135, 137, 138, 139, 140, 142, 143, 144, 321, 322, 323, 475, 755, 756, 757, 758, 800, 803, 810, 811, 814, 823, 826, 829, 843, 846, 847, 850, 902, 990	0.5	1.0	1.5	2.2	2.9	3.8	4.9	6.0	7.3	8.6	10.1	11.8	13.5
125, 136	0.7	1.2	1.7	2.3	3.0	3.7	4.6	5.4	6.4	7.4	8.4	9.5	10.7
128	1.1	1.8	2.6	3.5	4.5	5.6	6.8	8.2	9.6	11.1	12.7	14.3	16.1
129	0.8	1.2	1.7	2.3	2.9	3.6	4.2	5.0	5.7	6.6	7.4	8.3	9.2
131	0.9	1.5	2.1	2.9	3.8	4.8	5.9	7.1	8.3	9.7	11.1	12.6	14.2
15, 200, 201, 202, 510, 511, 512, 513, 514	0.7	1.1	1.6	2.1	2.7	3.3	4.0	4.7	5.4	6.2	7.0	7.8	8.7
43, 241	0.7	1.1	1.6	2.3	3.0	3.8	4.7	5.7	6.8	7.9	9.2	10.5	11.8
240, 260, 261, 262	0.8	1.5	2.4	3.6	4.9	6.5	8.4	10.4	12.8	15.3	18.2	21.2	24.6
11, 14, 17, 20, 21, 22, 40, 41, 42, 81, 92, 98, 231, 242, 251, 252, 263, 264	0.5	0.8	1.2	1.6	2.1	2.6	3.2	3.8	4.5	5.2	5.9	6.7	7.5
211, 212	0.4	0.7	1.0	1.3	1.7	2.1	2.6	3.1	3.6	4.2	4.8	5.4	6.1

Table 5d. Stocking values for all trees 5.0 inches and greater observed on the four subplots only

Species	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-24.9	25.0-26.9	27.0-28.9	29.0+
300, 303, 304, 310, 311, 312, 316, 317, 319, 320, 341, 356, 357, 358, 367, 381, 391, 420, 421, 424, 471, 481, 490, 491, 550, 551, 555, 561, 571, 580, 581, 582, 583, 591, 631, 653, 680, 681, 682, 683, 684, 701, 711, 760, 761, 763, 764, 765, 766, 768, 769, 770, 771, 772, 773, 774, 821, 852, 853, 854, 855, 856, 857, 858, 859, 860, 863, 864, 865, 866, 873, 874, 876, 877, 882, 883, 884, 885, 886, 887, 888, 890, 891, 895, 896, 897, 906, 907, 908, 909, 912, 913, 914, 915, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 934, 935, 936, 937, 940, 982, 986, 987, 988, 989, 991, 994, 995, 996, 997, 998, 999	1.0	1.6	2.2	3.0	3.8	4.6	5.5	6.5	7.5	8.6	9.7	10.9	12.1
350, 351, 352, 353, 355, 492	1.3	1.9	2.6	3.3	4.1	5.0	5.9	6.8	7.8	8.9	9.9	11.0	12.1
314, 315, 318, 330, 331, 332, 333, 334, 336, 337, 370, 371, 372, 377, 450, 451, 452, 531, 552, 712	1.2	2.0	3.0	4.2	5.6	7.2	9.0	11.0	13.1	15.4	17.8	20.5	23.3
373, 374, 375, 378, 379	1.1	1.9	3.0	4.2	5.6	7.2	9.0	11.0	13.1	15.5	18.0	20.7	23.6
360, 361, 362, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 422, 423, 431, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 520, 521, 522, 549, 641, 660, 661, 662, 663, 664, 801, 802, 804, 805, 806, 807, 808, 809, 812, 813, 815, 816, 817, 818, 819, 820, 822, 824, 825, 827, 828, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 845, 901, 931, 981, 5091, 5092, 5093	1.2	2.0	2.9	3.9	5.0	6.2	7.5	8.9	10.4	11.9	13.6	15.3	17.2
600, 601, 602, 603, 604, 605, 606	1.4	2.1	2.9	3.9	4.9	5.9	7.1	8.3	9.6	10.9	12.3	13.7	15.2
220, 221, 222, 611, 690, 691, 692, 693, 694	0.7	1.3	1.9	2.7	3.6	4.6	5.7	7.0	8.3	9.8	11.4	13.1	14.9
741, 743, 746	1.2	1.8	2.5	3.2	4.0	4.9	5.8	6.8	7.8	8.9	10.0	11.1	12.3
540, 541, 542, 543, 545, 546, 547, 548, 621, 650, 651, 652, 654, 655, 657, 658, 720, 721, 722, 762, 993, 7211	1.0	1.4	1.8	2.2	2.6	3.0	3.5	3.9	4.3	4.8	5.2	5.7	6.2
950, 951, 952, 953	1.0	1.8	2.8	4.0	5.5	7.2	9.1	11.3	13.7	16.3	19.1	22.2	25.5
313, 345, 460, 461, 462, 463, 544, 729, 730, 731, 732, 740, 742, 744, 745, 747, 748, 749, 752, 753, 970, 971, 972, 973, 974, 975, 976, 977	1.2	2.0	3.0	4.2	5.6	7.2	8.9	10.9	13.0	15.2	17.7	20.3	23.1

Table 5e. Stocking values for all trees < 7 inches observed on one acre

	DBH of the largest tally tree in the condition																				
	5.0+						4.0-4.9					3.0-3.9				2.0-2.9			1.0-1.9		Seedling
	DBH of tally tree						DBH of tally tree					DBH of tally tree				DBH of tally tree			DBH of tally tree		
Species	**5.0-6.9**	**4.0-4.9**	**3.0-3.9**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**4.0-4.9**	**3.0-3.9**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**3.0-3.9**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**1.0-1.9**	**Seedling**	**Seedling**
10, 12, 16, 18, 19, 70, 71, 90, 91, 93, 94, 96, 97, 992	0.12	0.092	0.069	0.054	0.035	0.016	0.105	0.083	0.062	0.040	0.019	0.102	0.076	0.050	0.023	0.099	0.065	0.031	0.096	0.047	0.094
72, 73, 844	0.10	0.075	0.057	0.044	0.028	0.013	0.086	0.068	0.050	0.033	0.015	0.083	0.062	0.041	0.019	0.081	0.053	0.025	0.079	0.038	0.076
57, 61, 95	0.11	0.083	0.063	0.048	0.031	0.014	0.094	0.075	0.056	0.036	0.017	0.092	0.068	0.045	0.021	0.089	0.059	0.028	0.087	0.042	0.084
67, 68, 105, 107, 115, 123, 126, 130, 132, 230, 232, 250, 299	0.16	0.122	0.092	0.071	0.046	0.021	0.139	0.110	0.082	0.053	0.025	0.135	0.100	0.066	0.031	0.131	0.086	0.041	0.128	0.062	0.124
108	0.09	0.066	0.050	0.039	0.025	0.011	0.075	0.060	0.044	0.029	0.013	0.073	0.055	0.036	0.017	0.071	0.047	0.022	0.069	0.034	0.067
110	0.13	0.097	0.073	0.057	0.037	0.016	0.111	0.088	0.065	0.043	0.020	0.108	0.080	0.052	0.025	0.105	0.069	0.033	0.102	0.049	0.099
111	0.14	0.104	0.079	0.061	0.039	0.018	0.119	0.095	0.070	0.046	0.021	0.116	0.086	0.056	0.027	0.113	0.074	0.036	0.110	0.053	0.107
103, 104, 119	0.07	0.055	0.042	0.032	0.021	0.009	0.063	0.050	0.037	0.024	0.011	0.062	0.046	0.030	0.014	0.060	0.039	0.019	0.058	0.028	0.056
121	0.18	0.134	0.102	0.079	0.051	0.023	0.153	0.122	0.090	0.059	0.027	0.149	0.111	0.073	0.034	0.145	0.095	0.046	0.141	0.068	0.137
50, 51, 52, 53, 54, 55, 56, 58, 59, 62, 63, 64, 65, 66, 69, 100, 101, 102, 106, 109, 112, 113, 114, 116, 117, 118, 120, 122, 124, 127, 133, 134, 135, 137, 138, 139, 140, 142, 143, 144, 321, 322, 323, 475, 755, 756, 757, 758, 800, 803, 810, 811, 814, 823, 826, 829, 843, 846, 847, 850, 902, 990	0.09	0.067	0.051	0.039	0.025	0.011	0.077	0.061	0.045	0.029	0.014	0.074	0.055	0.036	0.017	0.072	0.048	0.023	0.070	0.034	0.068
125, 136	0.12	0.090	0.068	0.053	0.034	0.015	0.103	0.082	0.061	0.040	0.018	0.100	0.075	0.049	0.023	0.098	0.064	0.031	0.095	0.046	0.092
128	0.18	0.136	0.103	0.079	0.051	0.023	0.155	0.123	0.091	0.059	0.028	0.151	0.112	0.073	0.035	0.147	0.096	0.046	0.142	0.069	0.138
129	0.13	0.100	0.076	0.059	0.038	0.017	0.114	0.091	0.067	0.044	0.020	0.111	0.083	0.054	0.026	0.108	0.071	0.034	0.105	0.051	0.102
131	0.15	0.110	0.083	0.065	0.042	0.019	0.126	0.100	0.074	0.048	0.023	0.123	0.091	0.060	0.028	0.119	0.078	0.038	0.116	0.056	0.113
15, 200, 201, 202, 510, 511, 512, 513, 514	0.12	0.090	0.068	0.053	0.034	0.015	0.103	0.082	0.061	0.040	0.018	0.100	0.075	0.049	0.023	0.098	0.064	0.031	0.095	0.046	0.092

Table 5e. Stocking values for all trees < 7 inches observed on one acre

	DBH of the largest tally tree in the condition																				
	5.0+						4.0-4.9					3.0-3.9				2.0-2.9			1.0-1.9		Seedling
	DBH of tally tree						DBH of tally tree					DBH of tally tree				DBH of tally tree			DBH of tally tree		
Species	**5.0-6.9**	**4.0-4.9**	**3.0-3.9**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**4.0-4.9**	**3.0-3.9**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**3.0-3.9**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**1.0-1.9**	**Seedling**	**Seedling**
43, 241	0.11	0.081	0.061	0.047	0.031	0.014	0.093	0.074	0.055	0.036	0.017	0.090	0.067	0.044	0.021	0.088	0.058	0.028	0.085	0.041	0.083
240, 260, 261, 262	0.14	0.102	0.077	0.060	0.039	0.017	0.117	0.093	0.069	0.045	0.021	0.114	0.084	0.055	0.026	0.110	0.073	0.035	0.107	0.052	0.104
11, 14, 17, 20, 21, 22, 40, 41, 42, 81, 92, 98, 231, 242, 251, 252, 263, 264	0.09	0.063	0.048	0.037	0.024	0.011	0.072	0.057	0.043	0.028	0.013	0.070	0.052	0.034	0.016	0.068	0.045	0.022	0.067	0.032	0.065
211, 212	0.07	0.050	0.038	0.029	0.019	0.009	0.057	0.046	0.034	0.022	0.010	0.056	0.042	0.027	0.013	0.054	0.036	0.017	0.053	0.026	0.051

Table 5e. Stocking values for all trees < 7 inches observed on one acre

	DBH of the largest tally tree in the condition																				
	5.0+						4.0-4.9					3.0-3.9				2.0-2.9			1.0-1.9		Seedling
	DBH of tally tree						DBH of tally tree					DBH of tally tree				DBH of tally tree			DBH of tally tree		
Species	**5.0-6.9**	**4.0-4.9**	**3.0-3.9**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**4.0-4.9**	**3.0-3.9**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**3.0-3.9**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**1.0-1.9**	**Seedling**	**Seedling**
300, 303, 304, 310, 311, 312, 316, 317, 319, 320, 341, 356, 357, 358, 367, 381, 391, 420, 421, 424, 471, 481, 490, 491, 550, 551, 555, 561, 571, 580, 581, 582, 583, 591, 631, 653, 680, 681, 682, 683, 684, 701, 711, 760, 761, 763, 764, 765, 766, 768, 769, 770, 771, 772, 773, 774, 821, 852, 853, 854, 855, 856, 857, 858, 859, 860, 863, 864, 865, 866, 873, 874, 876, 877, 882, 883, 884, 885, 886, 887, 888, 890, 891, 895, 896, 897, 906, 907, 908, 909, 912, 913, 914, 915, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 934, 935, 936, 937, 940, 982, 986, 987, 988, 989, 991, 994, 995, 996, 997, 998, 999	0.17	0.128	0.097	0.075	0.048	0.022	0.146	0.116	0.086	0.056	0.026	0.142	0.105	0.069	0.033	0.138	0.091	0.043	0.134	0.065	0.130
350, 351, 352, 353, 355, 492	0.21	0.156	0.118	0.091	0.059	0.026	0.178	0.141	0.105	0.068	0.032	0.173	0.128	0.084	0.040	0.168	0.111	0.053	0.163	0.079	0.159

Table 5e. Stocking values for all trees < 7 inches observed on one acre

	DBH of the largest tally tree in the condition																				
	5.0+						4.0-4.9					3.0-3.9				2.0-2.9			1.0-1.9		Seedling
	DBH of tally tree						DBH of tally tree					DBH of tally tree				DBH of tally tree			DBH of tally tree		
Species	**5.0-6.9**	**4.0-4.9**	**3.0-3.9**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**4.0-4.9**	**3.0-3.9**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**3.0-3.9**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**1.0-1.9**	**Seedling**	**Seedling**
314, 315, 318, 330, 331, 332, 333, 334, 336, 337, 370, 371, 372, 377, 450, 451, 452, 531, 552, 712	0.19	0.145	0.110	0.085	0.055	0.025	0.165	0.131	0.097	0.063	0.030	0.161	0.120	0.078	0.037	0.156	0.103	0.049	0.152	0.074	0.148
373, 374, 375, 378, 379	0.19	0.140	0.106	0.082	0.053	0.024	0.160	0.127	0.094	0.061	0.028	0.155	0.115	0.076	0.036	0.151	0.099	0.047	0.147	0.071	0.142
360, 361, 362, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 422, 423, 431, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 520, 521, 522, 549, 641, 660, 661, 662, 663, 664, 801, 802, 804, 805, 806, 807, 808, 809, 812, 813, 815, 816, 817, 818, 819, 820, 822, 824, 825, 827, 828, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 845, 901, 931, 981, 5091, 5092, 5093	0.21	0.155	0.117	0.090	0.058	0.026	0.176	0.140	0.104	0.068	0.032	0.172	0.128	0.084	0.039	0.167	0.110	0.053	0.162	0.079	0.158
600, 601, 602, 603, 604, 605, 606	0.23	0.169	0.128	0.099	0.064	0.029	0.193	0.153	0.114	0.074	0.034	0.188	0.140	0.091	0.043	0.183	0.120	0.057	0.178	0.086	0.172
220, 221, 222, 611, 690, 691, 692, 693, 694	0.12	0.091	0.069	0.053	0.034	0.015	0.104	0.083	0.061	0.040	0.019	0.101	0.075	0.049	0.023	0.098	0.065	0.031	0.096	0.046	0.093
741, 743, 746	0.20	0.146	0.110	0.085	0.055	0.025	0.166	0.132	0.098	0.064	0.030	0.162	0.120	0.079	0.037	0.157	0.103	0.049	0.153	0.074	0.148

Table 5e. Stocking values for all trees < 7 inches observed on one acre

	DBH of the largest tally tree in the condition																				
	5.0+						4.0-4.9					3.0-3.9				2.0-2.9			1.0-1.9		Seedling
	DBH of tally tree						DBH of tally tree					DBH of tally tree				DBH of tally tree			DBH of tally tree		
Species	**5.0-6.9**	**4.0-4.9**	**3.0-3.9**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**4.0-4.9**	**3.0-3.9**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**3.0-3.9**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**2.0-2.9**	**1.0-1.9**	**Seed-ling**	**1.0-1.9**	**Seedling**	**Seedling**
540, 541, 542, 543, 545, 546, 547, 548, 621, 650, 651, 652, 654, 655, 657, 658, 720, 721, 722, 762, 993, 7211	0.17	0.124	0.094	0.072	0.047	0.021	0.141	0.112	0.083	0.054	0.025	0.138	0.102	0.067	0.032	0.134	0.088	0.042	0.130	0.063	0.126
950, 951, 952, 953	0.16	0.123	0.093	0.072	0.046	0.021	0.140	0.111	0.083	0.054	0.025	0.136	0.101	0.066	0.031	0.133	0.087	0.042	0.129	0.063	0.125
313, 345, 460, 461, 462, 463, 544, 729, 730, 731, 732, 740, 742, 744, 745, 747, 748, 749, 752, 753, 970, 971, 972, 973, 974, 975, 976, 977	0.19	0.143	0.109	0.084	0.054	0.024	0.164	0.130	0.097	0.063	0.029	0.159	0.118	0.078	0.037	0.155	0.102	0.049	0.151	0.073	0.146

Table 5f. Stocking values for all trees 5.0 inches and greater observed on one acre

Species	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-24.9	25.0-26.9	27.0-28.9	29.0+
10, 12, 16, 18, 19, 70, 71, 90, 91, 93, 94, 96, 97, 992	0.12	0.19	0.26	0.34	0.43	0.53	0.63	0.73	0.84	0.96	1.08	1.20	1.33
72, 73, 844	0.10	0.17	0.24	0.33	0.44	0.55	0.67	0.81	0.95	1.11	1.27	1.45	1.63
57, 61, 95	0.11	0.15	0.19	0.23	0.27	0.31	0.35	0.39	0.43	0.48	0.52	0.56	0.60
67, 68, 105, 107, 115, 123, 126, 130, 132, 230, 232, 250, 299	0.16	0.26	0.37	0.49	0.63	0.78	0.94	1.11	1.29	1.48	1.68	1.89	2.11
108	0.09	0.14	0.21	0.29	0.37	0.47	0.57	0.69	0.81	0.94	1.07	1.22	1.37
110	0.13	0.22	0.33	0.46	0.60	0.77	0.95	1.15	1.37	1.60	1.85	2.12	2.40
111	0.14	0.24	0.37	0.53	0.71	0.91	1.14	1.40	1.68	1.98	2.31	2.66	3.04
103, 104, 119	0.07	0.12	0.18	0.25	0.32	0.41	0.50	0.60	0.70	0.82	0.94	1.07	1.20
121	0.18	0.27	0.38	0.49	0.61	0.74	0.88	1.02	1.17	1.33	1.49	1.66	1.83
50, 51, 52, 53, 54, 55, 56, 58, 59, 62, 63, 64, 65, 66, 69, 100, 101, 102, 106, 109, 112, 113, 114, 116, 117, 118, 120, 122, 124, 127, 133, 134, 135, 137, 138, 139, 140, 142, 143, 144, 321, 322, 323, 475, 755, 756, 757, 758, 800, 803, 810, 811, 814, 823, 826, 829, 843, 846, 847, 850, 902, 990	0.09	0.16	0.25	0.36	0.49	0.64	0.81	1.00	1.21	1.44	1.69	1.96	2.25
125, 136	0.12	0.20	0.28	0.39	0.50	0.62	0.76	0.91	1.06	1.23	1.40	1.59	1.78
128	0.18	0.29	0.43	0.58	0.75	0.94	1.14	1.36	1.60	1.84	2.11	2.39	2.68
129	0.13	0.21	0.29	0.38	0.48	0.59	0.71	0.83	0.96	1.09	1.23	1.38	1.53
131	0.15	0.24	0.36	0.49	0.64	0.80	0.98	1.18	1.39	1.61	1.85	2.10	2.36
15, 200, 201, 202, 510, 511, 512, 513, 514	0.12	0.19	0.27	0.35	0.45	0.55	0.66	0.78	0.90	1.03	1.16	1.30	1.45
43, 241	0.11	0.18	0.27	0.38	0.50	0.64	0.79	0.95	1.13	1.32	1.53	1.74	1.97
240, 260, 261, 262	0.14	0.25	0.40	0.59	0.82	1.09	1.39	1.74	2.13	2.56	3.03	3.54	4.10
11, 14, 17, 20, 21, 22, 40, 41, 42, 81, 92, 98, 231, 242, 251, 252, 263, 264	0.09	0.14	0.20	0.27	0.35	0.44	0.53	0.64	0.75	0.86	0.98	1.11	1.25
211, 212	0.07	0.11	0.16	0.22	0.28	0.35	0.43	0.51	0.60	0.69	0.79	0.90	1.01

Table 5f. Stocking values for all trees 5.0 inches and greater observed on one acre

Species	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-24.9	25.0-26.9	27.0-28.9	29.0+
300, 303, 304, 310, 311, 312, 316, 317, 319, 320, 341, 356, 357, 358, 367, 381, 391, 420, 421, 424, 471, 481, 490, 491, 550, 551, 555, 561, 571, 580, 581, 582, 583, 591, 631, 653, 680, 681, 682, 683, 684, 701, 711, 760, 761, 763, 764, 765, 766, 768, 769, 770, 771, 772, 773, 774, 821, 852, 853, 854, 855, 856, 857, 858, 859, 860, 863, 864, 865, 866, 873, 874, 876, 877, 882, 883, 884, 885, 886, 887, 888, 890, 891, 895, 896, 897, 906, 907, 908, 909, 912, 913, 914, 915, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 934, 935, 936, 937, 940, 982, 986, 987, 988, 989, 991, 994, 995, 996, 997, 998, 999	0.17	0.27	0.37	0.49	0.63	0.77	0.92	1.08	1.25	1.43	1.62	1.81	2.01
350, 351, 352, 353, 355, 492	0.21	0.31	0.43	0.56	0.69	0.83	0.98	1.14	1.31	1.48	1.65	1.83	2.02
314, 315, 318, 330, 331, 332, 333, 334, 336, 337, 370, 371, 372, 377, 450, 451, 452, 531, 552, 712	0.19	0.33	0.50	0.71	0.94	1.21	1.50	1.83	2.18	2.56	2.97	3.41	3.88
373, 374, 375, 378, 379	0.19	0.32	0.49	0.70	0.93	1.20	1.50	1.83	2.19	2.58	3.00	3.45	3.93
360, 361, 362, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 422, 423, 431, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 520, 521, 522, 549, 641, 660, 661, 662, 663, 664, 801, 802, 804, 805, 806, 807, 808, 809, 812, 813, 815, 816, 817, 818, 819, 820, 822, 824, 825, 827, 828, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 845, 901, 931, 981, 5091, 5092, 5093	0.21	0.33	0.48	0.64	0.83	1.03	1.24	1.48	1.73	1.99	2.27	2.56	2.86
600, 601, 602, 603, 604, 605, 606	0.23	0.35	0.49	0.64	0.81	0.99	1.18	1.38	1.60	1.82	2.05	2.29	2.54
220, 221, 222, 611, 690, 691, 692, 693, 694	0.12	0.21	0.32	0.45	0.60	0.77	0.95	1.16	1.39	1.63	1.90	2.18	2.48
741, 743, 746	0.20	0.30	0.41	0.54	0.67	0.82	0.97	1.13	1.30	1.48	1.66	1.85	2.05
540, 541, 542, 543, 545, 546, 547, 548, 621, 650, 651, 652, 654, 655, 657, 658, 720, 721, 722, 762, 993, 7211	0.17	0.23	0.30	0.36	0.43	0.50	0.58	0.65	0.72	0.80	0.87	0.95	1.03
950, 951, 952, 953	0.16	0.29	0.46	0.67	0.91	1.20	1.52	1.88	2.28	2.71	3.19	3.70	4.26
313, 345, 460, 461, 462, 463, 544, 729, 730, 731, 732, 740, 742, 744, 745, 747, 748, 749, 752, 753, 970, 971, 972, 973, 974, 975, 976, 977	0.19	0.33	0.50	0.70	0.93	1.19	1.49	1.81	2.16	2.54	2.95	3.38	3.85

Table 5g. Minimum number of trees per acre for forest land based on largest tally tree

Species	DBH of largest tally tree																	
	Seed-ling	**1.0-1.9**	**2.0-2.9**	**3.0-3.9**	**4.0-4.9**	**5.0-6.9**	**7.0-8.9**	**9.0-10.9**	**11.0-12.9**	**13.0-14.9**	**15.0-16.9**	**17.0-18.9**	**19.0-20.9**	**21.0-22.9**	**23.0-24.9**	**25.0-26.9**	**27.0-28.9**	**29.0+**
10, 12, 16, 18, 19, 70, 71, 90, 91, 93, 94, 96, 97, 992	106.9	103.8	100.9	98.1	95.5	81.2	53.0	38.1	29.1	23.2	19.0	16.0	13.7	11.9	10.4	9.3	8.3	7.5
72, 73, 844	130.8	127.0	123.4	120.0	116.8	99.3	60.3	41.0	29.9	22.9	18.2	14.8	12.4	10.5	9.0	7.9	6.9	6.1
57, 61, 95	118.7	115.3	112.0	108.9	106.0	90.1	66.6	52.7	43.5	37.0	32.2	28.4	25.5	23.0	21.0	19.3	17.9	16.6
67, 68, 105, 107, 115, 123, 126, 130, 132, 230, 232, 250, 299	80.6	78.3	76.1	74.0	72.0	61.2	38.7	27.2	20.3	15.9	12.9	10.7	9.0	7.8	6.8	5.9	5.3	4.7
108	148.4	144.1	140.0	136.2	132.6	112.7	69.1	47.3	34.7	26.7	21.3	17.4	14.6	12.4	10.7	9.3	8.2	7.3
110	101.0	98.1	95.3	92.7	90.2	76.7	45.6	30.4	21.9	16.5	13.0	10.5	8.7	7.3	6.2	5.4	4.7	4.2
111	93.9	91.2	88.6	86.1	83.8	71.3	41.1	26.9	19.0	14.1	10.9	8.7	7.1	6.0	5.0	4.3	3.8	3.3
103, 104, 119	177.2	172.0	167.2	162.6	158.2	134.5	81.8	55.6	40.5	31.1	24.7	20.1	16.8	14.2	12.2	10.6	9.4	8.3
121	73.0	70.9	68.9	67.0	65.2	55.4	36.6	26.6	20.4	16.4	13.5	11.4	9.8	8.5	7.5	6.7	6.0	5.5
50, 51, 52, 53, 54, 55, 56, 58, 59, 62, 63, 64, 65, 66, 69, 100, 101, 102, 106, 109, 112, 113, 114, 116, 117, 118, 120, 122, 124, 127, 133, 134, 135, 137, 138, 139, 140, 142, 143, 144, 321, 322, 323, 475, 755, 756, 757, 758, 800, 803, 810, 811, 814, 823, 826, 829, 843, 846, 847, 850, 902, 990	146.4	142.1	138.1	134.3	130.7	111.1	62.5	40.0	27.8	20.4	15.6	12.3	10.0	8.3	6.9	5.9	5.1	4.4
125, 136	108.5	105.4	102.4	99.6	96.9	82.4	51.0	35.1	25.9	20.0	16.0	13.2	11.0	9.4	8.1	7.1	6.3	5.6
128	72.3	70.2	68.2	66.4	64.6	54.9	34.0	23.4	17.3	13.3	10.7	8.8	7.4	6.3	5.4	4.7	4.2	3.7
129	97.8	95.0	92.3	89.8	87.4	74.3	48.1	34.3	26.1	20.7	16.9	14.1	12.1	10.4	9.2	8.1	7.3	6.5
131	88.9	86.3	83.9	81.5	79.4	67.5	41.1	28.0	20.5	15.7	12.5	10.2	8.5	7.2	6.2	5.4	4.8	4.2
15, 200, 201, 202, 510, 511, 512, 513, 514	108.5	105.3	102.4	99.6	96.9	82.4	52.9	37.5	28.3	22.3	18.2	15.2	12.9	11.1	9.7	8.6	7.7	6.9
43, 241	120.9	117.4	114.1	111.0	108.0	91.8	54.7	36.6	26.4	20.0	15.7	12.7	10.5	8.9	7.6	6.6	5.7	5.1
240, 260, 261, 262	96.0	93.2	90.6	88.1	85.7	72.9	39.7	24.8	16.9	12.2	9.2	7.2	5.7	4.7	3.9	3.3	2.8	2.4
11, 14, 17, 20, 21, 22, 40, 41, 42, 81, 92, 98, 231, 242, 251, 252, 263, 264	154.8	150.3	146.1	142.0	138.2	117.5	72.7	50.1	36.9	28.5	22.8	18.8	15.7	13.4	11.6	10.2	9.0	8.0

Table 5g. Minimum number of trees per acre for forest land based on largest tally tree

Species	DBH of largest tally tree																	
	Seed-ling	**1.0-1.9**	**2.0-2.9**	**3.0-3.9**	**4.0-4.9**	**5.0-6.9**	**7.0-8.9**	**9.0-10.9**	**11.0-12.9**	**13.0-14.9**	**15.0-16.9**	**17.0-18.9**	**19.0-20.9**	**21.0-22.9**	**23.0-24.9**	**25.0-26.9**	**27.0-28.9**	**29.0+**
211, 212	195.0	189.3	184.0	178.9	174.1	148.0	91.3	62.7	46.2	35.7	28.5	23.4	19.6	16.7	14.4	12.6	11.1	9.9
300, 303, 304, 310, 311, 312, 316, 317, 319, 320, 341, 356, 357, 358, 367, 381, 391, 420, 421, 424, 471, 481, 490, 491, 550, 551, 555, 561, 571, 580, 581, 582, 583, 591, 631, 653, 680, 681, 682, 683, 684, 701, 711, 760, 761, 763, 764, 765, 766, 768, 769, 770, 771, 772, 773, 774, 821, 852, 853, 854, 855, 856, 857, 858, 859, 860, 863, 864, 865, 866, 873, 874, 876, 877, 882, 883, 884, 885, 886, 887, 888, 890, 891, 895, 896, 897, 906, 907, 908, 909, 912, 913, 914, 915, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 934, 935, 936, 937, 940, 982, 986, 987, 988, 989, 991, 994, 995, 996, 997, 998, 999	76.9	74.6	72.5	70.5	68.7	58.4	37.6	26.7	20.2	16.0	13.0	10.9	9.2	8.0	7.0	6.2	5.5	5.0
350, 351, 352, 353, 355, 492	63.0	61.2	59.5	57.8	56.3	47.8	31.9	23.3	18.0	14.5	12.0	10.2	8.8	7.7	6.8	6.1	5.5	4.9
314, 315, 318, 330, 331, 332, 333, 334, 336, 337, 370, 371, 372, 377, 450, 451, 452, 531, 552, 712	67.8	65.8	63.9	62.2	60.5	51.4	30.1	19.9	14.2	10.6	8.3	6.7	5.5	4.6	3.9	3.4	2.9	2.6
373, 374, 375, 378, 379	70.2	68.1	66.2	64.4	62.7	53.3	30.9	20.3	14.4	10.7	8.3	6.7	5.5	4.6	3.9	3.3	2.9	2.5

Table 5g. Minimum number of trees per acre for forest land based on largest tally tree

Species	DBH of largest tally tree																	
	Seed-ling	**1.0-1.9**	**2.0-2.9**	**3.0-3.9**	**4.0-4.9**	**5.0-6.9**	**7.0-8.9**	**9.0-10.9**	**11.0-12.9**	**13.0-14.9**	**15.0-16.9**	**17.0-18.9**	**19.0-20.9**	**21.0-22.9**	**23.0-24.9**	**25.0-26.9**	**27.0-28.9**	**29.0+**
360, 361, 362, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 422, 423, 431, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 520, 521, 522, 549, 641, 660, 661, 662, 663, 664, 801, 802, 804, 805, 806, 807, 808, 809, 812, 813, 815, 816, 817, 818, 819, 820, 822, 824, 825, 827, 828, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 845, 901, 931, 981, 5091, 5092, 5093	63.5	61.6	59.9	58.2	56.7	48.2	30.1	20.9	15.6	12.1	9.7	8.0	6.8	5.8	5.0	4.4	3.9	3.5
600, 601, 602, 603, 604, 605, 606	58.0	56.3	54.7	53.2	51.8	44.0	28.6	20.5	15.6	12.3	10.1	8.5	7.2	6.3	5.5	4.9	4.4	3.9
220, 221, 222, 611, 690, 691, 692, 693, 694	107.7	104.5	101.6	98.8	96.2	81.7	47.7	31.4	22.4	16.8	13.1	10.5	8.6	7.2	6.1	5.3	4.6	4.0
741, 743, 746	67.4	65.4	63.6	61.8	60.2	51.2	33.6	24.3	18.6	14.8	12.2	10.3	8.8	7.7	6.8	6.0	5.4	4.9
540, 541, 542, 543, 545, 546, 547, 548, 621, 650, 651, 652, 654, 655, 657, 658, 720, 721, 722, 762, 993, 7211	79.2	76.9	74.7	72.6	70.7	60.1	43.4	33.7	27.5	23.1	19.8	17.4	15.4	13.8	12.5	11.5	10.5	9.8
950, 951, 952, 953	79.9	77.6	75.4	73.3	71.3	60.6	33.9	21.6	14.9	10.9	8.4	6.6	5.3	4.4	3.7	3.1	2.7	2.3
313, 345, 460, 461, 462, 463, 544, 729, 730, 731, 732, 740, 742, 744, 745, 747, 748, 749, 752, 753, 970, 971, 972, 973, 974, 975, 976, 977	68.4	66.4	64.5	62.7	61.0	51.9	30.4	20.1	14.3	10.7	8.4	6.7	5.5	4.6	3.9	3.4	3.0	2.6

Appendix 7. Glossary

Accessible Forest Land – Land that is within sampled area (the population of interest), is accessible and can safely be visited, and meets at least one of the two following criteria:

(a) the condition is at least 10-percent stocked by trees (appendix 3) of any size or has been at least 10-percent stocked in the past. Additionally, the condition is not subject to nonforest use(s) that prevent normal tree regeneration and succession such as regular mowing, grazing, or recreation activities, or
b) in several western woodland types where stocking cannot be determined, and the condition has at least 5 percent crown cover by trees of any size, or has had at least 5 percent cover in the past. Additionally, the condition is not subject to nonforest use that prevent normal regeneration and succession such as regular mowing, grazing, or recreation activities.

ACTUAL LENGTH – For trees with broken or missing tops. The actual length of the tree is recorded to the nearest 1.0 foot from ground level to the highest remaining portion of the tree still present and attached to the bole. If the top is intact, this item may be omitted. Forked trees should be treated the same as unforked trees.

Agricultural Land – Land managed for crops, pasture, or other agricultural use. Evidence includes geometric field and road patterns, fencing, and the traces produced by livestock or mechanized equipment. The area must be at least 1.0 acre in size and 120.0 feet. wide at the point of occurrence.

Annular plot – a circular ring with a beginning radius of 24.0 feet from subplot center and an ending radius of 58.9 feet.

ARTIFICIAL REGENERATION SPECIES – Indicates the predominant species that is planted or seeded in an artificially regenerated condition.

Blind check – a re-installation done by a qualified inspection crew without production crew data on hand; a full re-installation of the plot for the purpose of obtaining a measure of data quality. The two data sets are maintained separately. Discrepancies between the two sets of data are not reconciled. Blind checks are done on production plots only.

Bole – The main stem of a tree, extending from one foot above the ground to the point on the tree where DOB reaches 4 inches

Boundary – The intersection of two or more conditions on a subplot or microplot. Each boundary is described by recording the azimuth and horizontal distance from the subplot or microplot center to the left and right points of where the boundary intersects the perimeter of the subplot or microplot. An azimuth and distance to a corner point may also be described, if one exists. If multiple boundaries exist at a subplot, they are recorded in the order of their occurrence on the subplot, starting from north and proceeding around the compass.

Census Water – Rivers and streams that are more than 200 feet wide and bodies of water that are greater than 4.5 acres in size.

Certification plot – a plot installed by a certification candidate. It may be a training plot or a production plot. The candidate working alone installs the plot.

Cold check – an inspection done either as part of the training process, or as part of the ongoing QC program. Normally the installation crew is not present at the time of inspection. The inspector has the completed data in-hand at the time of inspection. The inspection can include the whole plot or a subset of the plot. Discrepancies between the two sets of data may be reconciled. Cold checks are done on production plots only.

CONDITION CLASS – The combination of discrete landscape and forest attributes that identify and define different strata on the plot. Examples of such attributes include condition class status, forest type, stand origin, stand size, owner group, reserve status and stand density.

Cropland – Land under cultivation within the past 24 months, including orchards and land in soil improving crops, but excluding land cultivated in developing improved pasture.

CROWN CLASS – A classification of trees based on dominance in relation to adjacent trees within the stand as indicated by crown development and the amount of sunlight received from above and sides.

Cull – Portions of a tree that are unusable for industrial wood products because of rot, form, or other defect.

Diameter at Breast Height (DBH) – The diameter of the bole of a tree at breast height (4.5 feet above the ground), measured outside of the bark.

Diameter at Root Collar (DRC) – The diameter of a tree measured at the ground line or stem root collar, measured outside of the bark.

Diameter Outside Bark (DOB) – A diameter that may be taken at various points on a tree, or log, **outside** of the bark. Diameter Outside Bark is often estimated.

Federal Information Processing Standard (FIPS) – A unique code identifying U.S. States and counties (or units in Alaska).

Forest Industry Land – Land owned by companies or individuals that operate wood-using plants.

Forest Trees – Plants having a well-developed, woody stem and usually more than 12 feet in height at maturity.

FOREST TYPE – A classification of forest land based upon the trees or tree communities that constitute the majority of stocking on the site.

GPS – Global Positioning System. Information from this system is collected and used to determine the latitude and longitude of each plot.

Hardwoods – Dicotyledonous trees, usually broad-leaved and deciduous.

Hot check – an inspection normally done as part of the training process. The inspector is present on the plot with the trainee and provides immediate feedback regarding data quality. Data errors are corrected. Hot checks can be done on training plots or production plots.

Idle Farmland -- Former cropland or pasture that has not been tended within the last 2 years and that has less than 10 percent stocking with live trees.

Improved Pasture -- Land that is currently maintained and used for grazing. Evidence of maintenance, besides the degree of grazing, includes condition of fencing, presence of stock ponds, periodic brush removal, seeding, irrigation, or mowing.

Inclusion – An area that would generally would be recognized as a separate condition, except that it is not large enough to qualify. For example, a ½ acre pond within a forested stand.

Industrial Wood – All roundwood products, except firewood.

Inspection crew – a crew of qualified QC/QA individuals whose primary responsibility is the training, certification and inspection of production crews.

Land Area – As defined by the Bureau of the Census: The area of dry land and land temporarily or partially covered by water such as marshes, swamps, and river flood plains (omitting tidal flats below mean tide); streams, sloughs, estuaries and canals less than 200 feet in width, and ponds less than 4.5 acres in area.

Macroplot – A circular, fixed area plot with a radius of 58.9 feet. Macroplots may be used for sampling relatively rare events.

Maintained Road – Any road, hard topped or other surfaces, that is plowed or graded periodically and capable of use by a large vehicle. Rights-of-way that are cut or treated to limit herbaceous growth are included in this area.

Marsh – Low, wet areas characterized by heavy growth of weeds and grasses and an absence of trees.

Measurement Quality Objective (MQO) – Describes the acceptable tolerance for each data element. MQOs consist of two parts: a statement of the tolerance and a percentage of time when the collected data are required to be within tolerance.

Merchantable Top – The point on the bole of trees above which merchantable material cannot be produced. Merchantable top is 1.5 inches for western woodland species and 4.0 inches for all other species.

Microplot – A circular, fixed-radius plot with a radius of 6.8 feet that is used to sample trees less than 5.0 inches at DBH, as well as other vegetation.

National Forest Land – Federal lands which have been legally designated as National Forests or purchase units, and other lands under the administration of the Forest Service, including experimental areas and Bankhead-Jones Title III lands.

Native American (Indian) Land – Tribal lands held in fee, or trust, by the Federal government but administered for Indian tribal groups and Indian trust allotments. This land is considered “Private Lands”, Owner Group 40.

Non-census Water – Bodies of water from 1 to 4.5 acres in size and water courses from 30 feet to 200 feet in width.

Nonforest Land -- Land that does not support, or has never supported, forests, and lands formerly forested where use for timber management is precluded by development for other uses. Includes areas used for crops, improved pasture, residential areas, city parks, improved roads of any width and adjoining rights-of-way, power line clearings of any width, and noncensus water. If intermingled in forest areas, unimproved roads and nonforest strips must be more than 120.0 feet wide, and clearings, etc., more than one acre in size, to qualify as nonforest land.

Nonstockable – Areas of forest land that are not capable of supporting trees because of the presence of rock, water, etc.

Other Federal Lands – Federal land other than National Forests. These include lands administered by the USDI Bureau of Land Management, USDI National Park Service, USDI Fish and Wildlife Service, Department of Defense, Department of Energy, Army Corps of Engineers, and military bases.

OWNER CLASS -- A variable that classifies land into fine categories of ownership.

OWNER GROUP – A variable that classifies land into broad categories of ownership; Forest Service, Other Federal Agency, State and Local Government, and Private. Differing categories of Owner Group on a plot require different conditions.

Phase 1 (P1) – FIA activities done as part of remote-sensing and/or aerial photography.

Phase 2 (P2) – FIA activities done on the network of ground plots formerly known as FIA plots.

Phase 3 (P3) – FIA activities done on a subset of Phase 2 plots formerly known as Forest Health Monitoring plots. Additional ecological indicator information is collected from Phase 3 plots.

Plot – A cluster of four subplots that samples approximately 1/6 acre. The subplots are established so that subplot 1 is centered within the sample and the centers of subplots 2, 3,and 4 are located 120.0 feet from the center of subplot 1 at azimuths of 360, 120, and 240 degrees, respectively. Each subplot has an associated microplot and macroplot.

PRIVATE OWNER INDUSTRIAL STATUS – Indicates whether Private land owners own and operate a wood processing plant.

Production crew – a crew containing at least one certified individual. The crew is involved in routine installation of plots.

Production plot – a plot that belongs to the 6000-acre grid database. It may also be used for training purposes.

REGENERATION STATUS – A stand descriptor that indicates whether a stand has been naturally or artificially regenerated.

Reserved Land – Land that is withdrawn from timber utilization by a public agency or by law.

RESERVE STATUS – An indication of whether the land in a condition has been reserved.

Saplings – Live trees 1.0 to 4.9 inches DBH.

Seedlings – Live trees less than 1.0 DBH that are at least one foot tall.

Softwoods – Coniferous trees, usually evergreen having needles or scale-like leaves.

STAND AGE – A stand descriptor that indicates the average age of the live trees not overtopped in the predominant stand size-class of a condition.

STAND DENSITY – A stand descriptor that indicates the relative tree density of a condition class. The classification is based on the number of stems/unit area, basal area, tree cover, or stocking of all live trees in the condition which are not overtopped, compared to any previously defined condition class tree density.

STAND SIZE – A stand descriptor that indicates which size-class of trees that are not overtopped constitutes the majority of stocking in the stand.

State, County and Municipal Lands – Lands owned by states, counties, and local public agencies or municipalities, or lands leased to these government units for 50 years or more.

Stocking – The relative degree of occupancy land by trees, measured as basal area or the number of trees in a stand by size or age and spacing, compared to the basal area or number of trees required to fully utilize the growth potential of the land; that is, the stocking standard.

Subplot – A circular, fixed-area plot with a radius of 24.0 feet. Each subplot represents ¼ of the fixed plot sample unit.

TOTAL LENGTH – The total length of the tree, recorded to the nearest 1.0 foot from ground level to the tip of the apical meristem. For trees growing on a slope, measure on the uphill side of the tree. If the tree has a broken or missing top, the total length is estimated to what the length would be if there were no missing or broken top. Forked trees should be treated the same as unforked trees

Training plot – a plot established for training or certification purposes only. It does NOT belong to the 6000-acre grid database.

Transition Zone – An area where a distinct boundary between two or more different conditions cannot be determined.

Appendix 8. Tolerance / MQO / Value / Units Table

Core optional variables are in italics. n/a is not applicable.

Variable Name	Tolerance	MQO	Values	Units	Factor
General Description					
New Subplot Location	+/- 7 feet	at least 95% of the time	n/a	feet	10
New Microplot Location	+/- 1 foot	at least 95% of the time	n/a	feet	10
Plot Level Data					
STATE	No errors	at least 99% of the time	Appendix 1	n/a	5
COUNTY	No errors	at least 99% of the time	Appendix 1	n/a	5
PLOT NUMBER	No errors	at least 99% of the time	00001 to 99999	n/a	5
PLOT STATUS	No errors	at least 99% of the time	1 to 3	n/a	5
PLOT NONSAMPLED REASON	No errors	at least 99% of the time	01 to 03 and 05 to 10	n/a	1
SUBPLOTS EXAMINED	No errors	at least 90% of the time	1, 4	n/a	
SAMPLE KIND	No errors	at least 99% of the time	1 to 3	n/a	5
PREVIOUS PLOT NUMBER	No errors	at least 99% of the time	00001 to 99999	n/a	
FIELD GUIDE VERSION	No errors	at least 99% of the time	3.0	n/a	1
YEAR	No errors	at least 99% of the time	≥ 2003	year	1
MONTH	No errors	at least 99% of the time	Jan – Dec (01 – 12)	month	1
DAY	No errors	at least 99% of the time	01 to 31	day	1
DECLINATION	*No errors*	*at least 99% of the time*	*-359.0 to 359.0*	*degrees*	
HORIZONTAL DISTANCE TO IMPROVED ROAD	No errors	at least 90% of the time	1 to 9	n/a	1
WATER ON PLOT	No errors	at least 90% of the time	0 to 5, 9	n/a	1
QA STATUS	No errors	at least 99% of the time	1 to 7	n/a	1
CREW TYPE	No errors	at least 99% of the time	1, 2	n/a	1
GPS UNIT	No errors	at least 99% of the time	0 to 4	n/a	1
GPS SERIAL NUMBER	No errors	at least 99% of the time	000001 to 999999	n/a	1
GPS DATUM	No errors	at least 99% of the time	NAD27, NAD83, WGS84	n/a	
COORDINATE SYSTEM	No errors	at least 99% of the time	1, 2	n/a	
LATITUDE DEGREES	No errors	at least 99% of the time		degrees	1
LATITUDE MINUTES	No errors	at least 99% of the time	1 – 59	minutes	1
LATITUDE SECONDS	+/- 140 ft	at least 99% of the time	0.00 – 59.99	seconds	1
LONGITUDE DEGREES	No errors	at least 99% of the time		degrees	1
LONGITUDE MINUTES	No errors	at least 99% of the time	1 – 59	minutes	1
LONGITUDE SECONDS	+/- 140 ft	at least 99% of the time	0.00 – 59.99	seconds	1
UTM ZONE	No errors	at least 99% of the time	03-19Q and 03-19W	n/a	
EASTING (X) UTM	+/- 140 ft	at least 99% of the time			
NORTHING (Y) UTM	+/- 140 ft	at least 99% of the time			
AZIMUTH TO PLOT CENTER	+/- 3 degrees	at least 99% of the time	000 at plot center 001 to 360 not at plot center	degrees	1
DISTANCE TO PLOT CENTER	+/- 6 ft	at least 99% of the time	000 at plot center 001 to 200 if a Laser range finder not used 001 to 999 if a Laser range finder is used	feet	1
GPS ELEVATION		at least 99% of the time	-00100 to 20000	feet	1
GPS ERROR	No errors	at least 99% of the time	000 to 070 if possible 071 to 999 if an error < 70 cannot be obtained	feet	1
NUMBER OF READINGS	No errors	at least 99% of the time	001 to 999	n/a	1
GPS FILENAME	*No errors*	*at least 99% of the time*	*Letters and numbers*	*n/a*	
MACROPLOT BREAKPOINT DIAMETER	*No errors*	*at least 99% of the time*	*21, 24, and 30*	*inches*	
PLOT-LEVEL NOTES	n/a	n/a	English, alpha-numeric	n/a	1 to 5
CYCLE	No errors	At least 99% of the time	01 to 99	n/a	1
PANEL	No errors	At least 99% of the time	1 to 5	n/a	1
PHASE	No errors	At least 99% of the time	2, 3	n/a	1
PLOT IN CORRECT COUNTY?	No errors	At least 99% of the time	0 or 1	n/a	1
CORRECT COUNTY	No errors	at least 99% of the time	Appendix 1	n/a	1
PAST YEAR	No errors	At least 99% of the time	≤ 2003	n/a	1
PAST MONTH	No errors	At least 99% of the time	01 - 12	n/a	1
PAST DAY	No errors	At least 99% of the time	01- 31	n/a	1
CRUISER NUMBER	No errors	at least 99% of the time	numeric	n/a	1
ASSISTANT CRUISER NUMBER(S)	No errors	at least 99% of the time	numeric	n/a	1
NUMBER OF ACCESSIBLE FORESTLAND CONDITIONS	No errors	at least 99% of the time	0 to 9	n/a	1

Variable Name	Tolerance	MQO	Values	Units	Factor
NUMBER OF TREE ENTRIES	No errors	at least 99% of the time	000 - 999	n/a	1
NUMBER OF PRISM POINTS REMEASURED	No errors	At least 99% of the time	1- 5	n/a	1
NUMBER OF SUBPLOT CENTERS REVERTED	No errors	At least 99% of the time	0 - 4	n/a	1
HORIZONTAL DISTANCE TO URBAN OR BUILT- UP LAND	No errors	At least 90% of the time	1- 9	n/a	1
HORIZONTAL DISTANCE TO AGRIICULTURAL LAND	No errors	At least 90% of the time	1- 9	n/a	1
PLOT ACCESSIBILITY	No errors	at least 99% of the time	1-9	n/a	1
Condition Class Information					
CONDITION CLASS NUMBER	No errors	at least 99% of the time	1 to 9	n/a	1
CONDITION CLASS STATUS	No errors	at least 99% of the time	1 to 5	n/a	5
CONDITION NONSAMPLED REASON	No errors	at least 99% of the time	01, 02, 03, 10	n/a	1
RESERVED STATUS	No errors	at least 99% of the time	0, 1	n/a	3
OWNER GROUP	No errors	at least 99% of the time	10, 20, 30, 40	n/a	3
FOREST TYPE	No errors	at least 99% of the time in group at least 95% of the time in type no MQO when STAND SIZE CLASS = 0	Appendix 2	n/a	5
STAND SIZE CLASS	No errors	at least 99% of the time	0 to 6	class	5
REGENERATION STATUS	No errors	at least 99% of the time	0, 1	n/a	5
TREE DENSITY	No errors	at least 99% of the time	1 to 3	n/a	1
OWNER CLASS	No errors	at least 99% of the time	11-13; 21-25; 31-33; 41-45	class	2
PRIVATE OWNER INDUSTRIAL STATUS	No errors	at least 99% of the time	0, 1	n/a	1
ARTIFICIAL REGENERATION SPECIES	No errors	at least 99% of the time	Appendix 3	n/a	1
STAND AGE	+/- 10%	at least 95% of the time	000 to 997, 998, 999	Year	5
DISTURBANCE 1	No errors	at least 99% of the time	00; 10-12; 20-22; 30-32;40-46; 50-55; 60; 70; 80	n/a	5
DISTURBANCE YEAR 1	+/- 1 year for 5-year measure. cycles +/ 2 years for > 5-year measure. cycles	at least 99% of the time	Since the previous plot visit, or the past 5 years for plots visited for the first time; 9999 if disturbance occurs continuously over time	year	1
DISTURBANCE 2	No errors	at least 99% of the time	00; 10-12; 20-22; 30-32;40-46; 50-55; 60; 70; 80	n/a	5
DISTURBANCE YEAR 2	+/- 1 year for 5-year measure. cycles +/ 2 years for > 5-year measure. cycles	at least 99% of the time	Since the previous plot visit, or the past 5 years for plots visited for the first time; 9999 if disturbance occurs continuously over time	year	1
DISTURBANCE 3	No errors	at least 99% of the time	00; 10-12; 20-22; 30-32;40-46; 50-55; 60; 70; 80	n/a	5
DISTURBANCE YEAR 3	+/- 1 year for 5-year measure. cycles +/ 2 years for > 5-year measure. cycles	at least 99% of the time	Since the previous plot visit, or the past 5 years for plots visited for the first time; 9999 if disturbance occurs continuously over time	year	1
TREATMENT 1	No errors	at least 99% of the time	00, 10, 20, 30, 40, 50	n/a	5
TREATMENT YEAR 1	+/- 1 year for 5-year measure. cycles +/- 2 years for >5-year measure. cycles	at least 99% of the time	Since the previous plot visit, or the past 5 years for plots visited for the first time	year	1
TREATMENT 2	No errors	at least 99% of the time	00, 10, 20, 30, 40, 50	n/a	5
TREATMENT YEAR 2	+/- 1 year for 5-year measure. cycles +/- 2 years for >5-year measure. cycles	at least 99% of the time	Since the previous plot visit, or the past 5 years for plots visited for the first time	year	1
TREATMENT 3	No errors	at least 99% of the time	00, 10, 20, 30, 40, 50	n/a	5

Variable Name	Tolerance	MQO	Values	Units	Factor
TREATMENT YEAR 3	+/- 1 year for 5-year measure. cycles +/- 2 years for >5-year measure. cycles	at least 99% of the time	Since the previous plot visit, or the past 5 years for plots visited for the first time	year	1
PHYSIOGRAPHIC CLASS	No errors	at least 80% of the time	xeric: 11, 12, 13, 19 mesic: 21, 22, 23, 24, 25, 29 hydric: 31, 32, 33, 34, 35, 39	n/a	3
PRESENT NONFOREST LAND USE	No errors	at least 99% of the time	10-15; 20; 30-33; 40	n/a	
PRESENT LAND USE	No errors	At least 99% of the time	01- 03, 10- 11 20, 30-34,40-42, 50- 53, 91,92	n/a	5
TRACT SIZE (TOTAL ACRES)	No errors	At least 99% of the time	00001- 99999	n/a	1
TRACT SIZE (PERCENT FOREST)	No errors	At least 99% of the time	001- 100	n/a	1
STAND STRUCTURE	No errors	At least 99% of the time	1 - 4	n/a	1
OPERABILITY	No errors	At least 99% of the time	0 - 5	n/a	1
SITE CLASS	+/- 1 class	At least 99% of the time	0 - 7	n/a	5
FIRE	No errors	At least 99% of the time	0,1	n/a	1
GRAZING	No errors	At least 99% of the time	0,1	n/a	1
Subplot Information					
SUBPLOT NUMBER	No errors	at least 99% of the time	1 to 4	n/a	1
SUBPLOT/ MACROPLOT STATUS	No errors	at least 99% of the time	1 to 3	n/a	5
SUBPLOT NONSAMPLED REASON	No errors	at least 99% of the time	01 to 05, 10	n/a	1
SUBPLOT CENTER CONDITION	No errors	at least 99% of the time	1 to 9	n/a	5
MICROPLOT CENTER CONDITION	No errors	at least 99% of the time	1 to 9	n/a	5
SUBPLOT SLOPE	+/- 10 %	at least 90% of the time	000 to 155	percent	1
SUBPLOT ASPECT	+/- 10 degrees	at least 90% of the time	000 to 360	degrees	1
SNOW/WATER DEPTH	+/- 0.5 ft	at the time of measurement	0.0 to 9.9	feet	1
NONNATIVE INVASIVE PEST PLANTS	No errors	At least 90% of the time	0000, see section 3.10	n/a	1
NONNATIVE INVASIVE PEST PLANT % COVER	No errors	At least 90% of the time	1 - 6	n/a	1
SUBPLOT/ MACROPLOT CONDITION LIST	*No errors*	*at least 99% of the time*	*1000 to 9876*	*n/a*	*1*
Boundary Data					
SUBPLOT NUMBER	No errors	at least 99% of the time	1 to 4	n/a	1
PLOT TYPE	No errors	at least 99% of the time	1 to 3	n/a	1
BOUNDARY CHANGE	No errors	at least 99% of the time	0 to 3	n/a	1
CONTRASTING CONDITION	No errors	at least 99% of the time	1 to 9	n/a	1
LEFT AZIMUTH	+/- 5 degrees	at least 90% of the time	001 to 360	degrees	3
CORNER AZIMUTH	+/- 5 degrees	at least 90% of the time	000 to 360	degrees	3
CORNER DISTANCE	+/- 1 ft	at least 90% of the time	microplot: 01 to 07 (6.8 ft actual limiting distance) subplot: 01 to 24 macroplot: 01 to 59 (58.9 ft actual limiting distance)	feet	3
RIGHT AZIMUTH	+/- 5 degrees	at least 90% of the time	001 to 360	degrees	3
BOUNDARY STATUS	No errors	At least 99% of the time	0 or 1	n/a	1
Tree and Sapling Data					
SUBPLOT NUMBER	No errors	at least 99% of the time	1 to 4	n/a	1
TREE RECORD NUMBER	No errors	at least 99% of the time	000, 001 to 999	n/a	1
CONDITION CLASS NUMBER	No errors	at least 99% of the time	1 to 9	n/a	1
AZIMUTH	+/- 3 degrees	at least 90% of the time	001 to 360	degrees	1

Variable Name	Tolerance	MQO	Values	Units	Factor
HORIZONTAL DISTANCE	microplot:+/- 0.2 ft microplot woodland species: +/- 0.4 ft subplot: +/- 1.0 ft subplot woodland species: +/- 2.0 ft annular plot: +/- 3.0 ft annular plot woodland species: +/- 6.0 ft	at least 90% of the time	microplot: 00.1 to 06.8 subplot: 00.1 to 24.0 annular plot: 24.1 to 58.9	feet	1
PREVIOUS TREE STATUS	No errors	at least 95% of the time	1, 2	n/a	5
PRESENT TREE STATUS	No errors	at least 95% of the time	0 to 3	n/a	5
RECONCILE	No errors	at least 95% of the time	1 to 4: valid for new trees on the plot 5 to 9: valid for remeasured trees that no longer qualify as tally	n/a	5
STANDING DEAD	No errors	At least 99% of the time	0, 1	n/a	1
MORTALITY	*No errors*	*at least 85% of the time*	*0, 1*	*n/a*	
SPECIES	No errors	at least 99% of the time for genus at least 95% of the time for species	Appendix 3	n/a	2
DIAMETER	+/- 0.1 inch per 20.0 inch increment of measured diameter on all live trees and dead trees with DECAY CLASS = 1, 2 +/-1.0 inch per 20.0 inch increment of measured diameter on dead trees with DECAY CLASS = 3, 4, 5 For woodland species: +/- 0.2 inch per stem	at least 95% of the time	001.0 to 999.9	inches	Saplings & snags = 1, pole & sawtimber =5
DRC STEM DIAMETER	+/- 0.2 inch per stem	at least 95% of the time	001.0 to 999.9	inch	
DRC STEM STATUS	No errors	at least 95% of the time	1, 2	n/a	
PAST NUMBER OF STEMS	No errors	at least 90% of the time	1 to 99	n/a	
CURRENT NUMBER OF STEMS	No errors	at least 90% of the time	1 to 99	n/a	
DIAMETER CHECK	No errors	at least 99% of the time	0 to 2	n/a	1
ROTTEN / MISSING CULL	+/- 10%	at least 90% of the time	00 to 99	percent	2
TOTAL LENGTH	+/- 10% of true length	at least 90% of the time	005 to 400	feet	Saplings & snags = 1, pole & sawtimber =5
ACTUAL LENGTH	+/- 10% of true length	at least 90% of the time	005 to 400	feet	Saplings & snags = 1, pole & sawtimber =5
LENGTH METHOD	No errors	at least 99% of the time	1 to 3	n/a	1
CROWN CLASS	No errors	at least 85% of the time	1 to 5	n/a	2
UNCOMPACTED LIVE CROWN RATIO	+/- 10%	at least 90% of the time	00 to 99	percent	
COMPACTED CROWN RATIO	+/- 10%	at least 80% of the time	00 to 99	percent	1
DAMAGE LOCATION 1	*+/- 1 location class*	*at least 80% of the time*	*0 to 9*	*class*	
DAMAGE TYPE 1	*No errors*	*at least 80% of the time*	*1-5; 11-13; 20-25; 31*	*n/a*	
DAMAGE SEVERITY 1	*+/- 1 valid class unless otherwise defined by the DAMAGE TYPE*	*at least 80% of the time*	*Defined for each DAMAGE TYPE*	*class*	
DAMAGE LOCATION 2	*+/- 1 location class*	*at least 80% of the time*	*0 to 9*	*class*	
DAMAGE TYPE 2	*No errors*	*at least 80% of the time*	*1-5; 11-13; 20-25; 31*	*n/a*	
DAMAGE SEVERITY 2	*+/- 1 valid class unless otherwise defined by the DAMAGE TYPE*	*at least 80% of the time*	*Defined for each DAMAGE TYPE*	*class*	
CAUSE OF DEATH	No errors	at least 80% of the time	10 to 80	n/a	1
MORTALITY YEAR	*+/- 1year for 5-year measure. cycles* *+/- 2years for > 5-year measure. cycles*	*at least 70% of the time*	*1995 or higher*	*year*	*1*
DECAY CLASS	+/- 1 class	at least 90% of the time	1 to 5	class	1
LENGTH TO DIAMETER MEASUREMENT POINT	*+/- 0.2 ft*	*at least 90% of the time*	*00.1 to 15.0*	*feet*	*1*
ROUGH CULL	*+/- 10 %*	*at least 90% of the time*	*00 to 99*	*percent*	

Variable Name	Tolerance	MQO	Values	Units	Factor
MISTLETOE CLASS	*+/- 1 class*	*at least 90% of the time*	*0 to 6*	*class*	
TREE NOTES	n/a	n/a	English, alpha-numeric	n/a	n/a
ENTRY NUMBER	No errors	At least 99% of the time	001 to 999	n/a	1
PRISM TREE#/TREE#	No errors	at least 99% of the time	000, 001 to 999	n/a	1
OLD MICROPLOT SAPLING STATUS	No errors	At least 99% of the time	0 to 3	n/a	5
PRISM TREE STATUS	No errors	At least 99% of the time	0 to 3	n/a	5
TREE CLASS	No errors	At least 90% of the time	2, 3, 4	n/a	5
TREE GRADE	No errors	At least 90% of the time	1 to 5	n/a	2
PERCENT BOARD FOOT CULL	+/- 10%	At least 90% of the time	00- 67	percent	2
FUSIFORM/ COMANDRA RUST/ HARDWOOD DIEBACK	No errors	At least 80% of the time	0, 1, 2	n/a	1
DIEBACK SEVERITY	+/- 1 class	At least 80% of the time	1 to 9	Class	1
UTILIZATION CLASS	No errors	At least 99% of the time	1, 2	n/a	1
Seedling Data					
SUBPLOT NUMBER	No errors	at least 99% of the time	1 to 4	n/a	1
SPECIES	No errors	at least 90% of the time for genus at least 85% of the time for species	Appendix 3	n/a	1
CONDITION CLASS NUMBER	No errors	at least 99% of the time	1-9	n/a	1
SEEDLING COUNT	No errors for 5 or less per species +/- 20% over a count of 5	at least 90% of the time	001-999	number	1
Site Tree Information					
CONDITION CLASS LIST	No errors	at least 99% of the time	1 to 9 or 10000 to 98765	n/a	1
SPECIES	No errors	at least 99% of the time for genus at least 95% of the time for species	Appendix 3	n/a	1
DIAMETER	+/- 0.1 inch per 20 inches of diameter on trees with a measured diameter	at least 95% of the time	001.0 to 999.9	inches	1
SITE TREE LENGTH	+/- 10% of true length	at least 90% of the time	005 to 999	feet	1
TREE AGE AT DIAMETER	+/- 5 years	at least 95% of the time	001 to 999	year	1
SITE TREE NOTES	n/a	n/a	English, alpha-numeric	n/a	1 to 5
SUBPLOT NUMBER	*No errors*	*at least 99% of the time*	*1 to 4*	*n/a*	*1*
AZIMUTH	*+/- 10 degrees*	*at least 90% of the time*	*001 to 360*	*degrees*	*1*
HORIZONTAL DISTANCE	*+/-5 ft*	*at least 90% of the time*	*000.1 to 200.0*	*feet*	*1*
SITE TREE NUMBER	No errors	At least 99% of the time	1to 9	n/a	1
SITE CLASS	+/- 1 class	At least 99% of the time	0 - 7	n/a	1

SUPPLEMENT B: GPS INSTRUCTIONS

INTRODUCTION

It has become necessary for the Forest Inventory and Analysis (FIA) crews to collect precise position coordinates of inventory sample plot centers. The purposes are 1) to allow FIA data to be accurately incorporated into GIS applications and other data bases and 2) to enhance plot recovery.

The purpose of this manual is to provide the operator with a brief history of the technology and with the procedures used by FIA crews to obtain position coordinates, calculate a coordinate, navigate to a coordinate, and other field applications.

THE GLOBAL POSITIONING SYSTEM

The concept for a Global Positioning System (GPS) dates back to the early days of space exploration. U.S. scientists tracking the Soviet Union's Sputnik satellite in the 1950s used the dobbler effect of the satellite's radio beacon to determine its orbit. They realized that they could use the same process to determine a position on the earth. Development of the system began in 1973. The first satellites were launched in 1978. Today's system utilizes accurate clocks and measures the time required for a radio signal to travel between the satellite and receiver.

Previously, collecting accurate positions was limited because of the bulk and inconvenience of GPS receivers. These early versions had low accuracy and could not obtain a position fix in real time. Recent developments have provided a methodology capable of accurate position estimates (± 12 meters) in a small, handheld, lightweight receiver. With the aid of a base station, accuracies of less than 0.5 centimeter are obtainable.

The Global Positioning System is a space-based radio positioning system designed to provide suitably equipped users with highly accurate positioning, velocity, and time data. It is comprised of three segments:
The space segment consists of a constellation of GPS satellites in orbit around the earth. There are 21 operational satellites. There are three or four operational satellites in each of the six orbital planes. Additionally, there are up to three spare satellites. The satellites orbit the earth twice each day at an altitude of 10,900 miles.

The control segment is comprised of a Master Control Station (MCS) and a number of monitoring stations located around the world. The MCS tracks, monitors, and manages the satellite constellation. It also updates the navigation data messages transmitted by the satellites.

The user segment consists of a variety of radio navigation receivers designed to receive, decode, and process the GPS satellite signals.

The system is managed by the Department of Defense (DOD). To prevent enemy forces from utilizing our GPS system, an intentional error is introduced, Selective Availability (SA). SA is the largest source of error within the system. SA induces up to a 100-meter error into any position estimate. To overcome SA, military GPS units have a special chip with a decoding "key" installed that removes the SA. Recently, the U.S. Department of Agriculture (USDA) and the U.S. Department of the Interior (USDI) have been granted authority to purchase GPS receivers with this chip. There are two models available to these agencies: the Trimble Centurion and the Rockwell Precise Lightweight GPS Receiver (PLGR). Receivers equipped with the decoding chip are revered to as Precise Positioning Service (PPS).

In May 2000, SA was deactivated by the DOD. All GPS units have the same ± 12 meter accuracy. The DOD has, however, reserved the right to activate SA whenever national security dictates.

SECURITY

PPS receivers because of the security module installed within them are very sensitive security items. As an operator of these receivers, you are assuming a great responsibility, one far and above that of just having signed for another piece of expensive equipment. The security and accountability of your receiver must be your first priority. **Any incident or violation of the restrictions will immediately involve the National Security Agency (NSA) and the FBI.** If they determine that the incident may have compromised key security, the Department of Defense can press for criminal prosecution. They are

serious about this. A compromise of the "key" code within your receiver could cause the changing of all keys world-wide, a very expensive and disruptive procedure.

The use of this receiver is authorized by Memorandum of Understanding (MOU) between the Department of Defense and the Department of Agriculture. The continued use of this receiver and the Precise Positioning Service is at the sole discretion of the Assistant Secretary of Defense for Command, Control, Communications, and Intelligence.

Pursuant to the MOU, the Federal Radionavigation Plan, and current guidance from the National Security Agency and the Department of Defense Space Command, **the use of PPS receivers is limited to permanent or temporary Federal employees, who are U.S. citizens, or state government employees who are U.S. citizens and are under the supervision of Federal employees.** The use of PPS receivers by others than those mentioned above is currently considered detrimental to security.

The internal security module and cryptographic keys remain the property of the National Security Agency. As such, PPS receivers must be returned to the Agency GPS-PPS Coordinator in a timely manner, upon demand. Requests for return of equipment may also come from the Federal GPS-PPS Coordinator or the controlling authority at Space Command. However, you should never surrender any PPS receiver without first checking with the Agency GPS-PPS Coordinator.

The PPS receiver is considered unclassified by the DOD. However, the receiver contains cryptographic logic which makes the receiver a DOD "High Value Item". **As such, any loss, theft, tampering, or destruction of a receiver must be reported by the custodian to the Agency GPS-PPS Coordinator immediately.** Serious infractions which may constitute sabotage, loss through negligence, theft, or espionage are punishable under various sections of the United States Code.

The custodian is responsible for all property accounting, including prompt response to the annual inventory by the Federal GPS-PPS Coordinator. The receiver cannot be processed as excess property. The receiver must be returned to the Agency GPS-PPS Coordinator for proper disposal.

When not in use, PPS receivers should be kept in a secure location such as a locked drawer, cabinet, or storage space. Receivers should never be stored in vehicles.

Shipping of PPS receivers must be via traceable mail such as FedEx, UPS, etc.

PPS equipment cannot be shipped or hand-carried outside of the United States (encrypted or not encrypted), without prior approval from the controlling authority at DOD. Outside of the United States is considered to be any other place besides the conterminous United States, Alaska, and Hawaii. The Agency GPS-PPS Coordinator must be contacted prior to any shipping or carrying of PPS receivers outside of the United States, as defined.

When traveling, receivers should be carried in carry-on luggage rather than checked luggage on commercial transport. That carry-on luggage should be in your possession at all times. The receiver cannot be inspected or handled by anyone out of your sight. Do not leave a receiver in plain sight in a locked vehicle. Do not leave a receiver in an unlocked vehicle.

All Forest Service receivers must have a property tag attached. Compliance will be checked each time the unit is sent in to be rekeyed.

THE ROCKWELL PLGR

FIA has chosen to purchase the Rockwell PLGR (pronounced "plugger"). One of the reasons for its selection was its ability to obtain a position fix under a forest canopy. The PLGR is capable of far more than simply calculating the desired position and elevation. Cruisers quickly learned it can be used to navigate to the plot, determine the course to plot, obtain a photo reference azimuth, and determine areas.

REPORTABLE INCIDENTS

If any of the following incidents happens to the PLGR, **report it immediately to the SRS GPS Coordinator or to the Missoula Technology and Development Center (MTDC):**

1. **Lost receiver**: Know where your receiver is at all times. If you lend it to someone, keep that information in a notebook.
2. **Stolen receiver**: Keep your receiver locked-up, even in the office.
3. **Appears to have been tampered with**: Do not attempt to repair or for any other reason attempt to get into the receiver case. NSA will consider that a possible compromise of the code module.
4. **Damaged**. Regardless of the extent, a damaged unit must be returned to MTDC.

If loss or damage to the unit is determined to be the result of negligence, you will be held financially responsible in addition to facing possible criminal charges.

Do not place the PLGR or other equipment on the top of your vehicle after completing a plot. Too many PLGRs and data recorders have been lost or damaged when the driver pulls away.

For future reference:

SRS GPS Coordinator:
Horace Brooks
Southern Research Station
4700 Old Kingston Pike
Knoxville, TN 37919
Phone: 865-862-2100
Fax: 828-230-0076
E-Mail: hbrooks@fs.fed.us

National GPS Coordinator:
Richard Karsky
USDA Forest Service -- MTDC
5785 Highway 10 West
Missoula, MT 59808
Phone: 406-329-3925
E-Mail: bkilroy@fs.fed.us

In addition to the property tag mentioned earlier, all SRS FIA PLGRs must have a tag instructing the finder to call 865-862-2000.

When transferring a PLGR to another person, an Acknowledgement of Receipt of PLGR GPS Unit must be completed by the receiving party and sent to the SRS GPS Coordinator. An example of this form appears at the end of this manual.

COSTS

This technology does not come cheap:

Item	Cost ($)
PLGR	2000
NiCad Battery	56
NiCad Charging Station	281
12v. Cell Phone Battery	35
3.6v. Memory Battery	5
External Antenna	188
External Antenna Cable	75
External Power Cable	26
AC/DC Power Adapter	30

CRYPTOGRAPHIC KEY

The PLGR will need to be keyed annually by the MTDC. This usually occurs during the last quarter of the calendar year. With overnight shipping, this procedure will require three business days. Therefore, cruisers need to schedule their work so as to have the use of another PLGR while theirs is being rekeyed, or be prepared to return to plots to obtain coordinates when the PLGR has been returned.

SHIPPING

The PLGR must be shipped via traceable mail. Because of the excellent service and corporate account, SRS prefers to use FedEx. The account number will be provided when required.

When shipping the PLGR to MTDC for rekeying, include a paid, return shipping label.

POWER MANAGEMENT

The PLGR requires 12 volts to operate. External power sources must be between 12 and 32 volts DC. For field operations, there are three power source options:

AA battery pack: Utilizes eight AA batteries. Cruisers report the AA batteries will power the unit for about four hours, sometimes more, usually less. The short life expectancy and cost of AA batteries makes this an expensive option.

Rechargeable NiCad battery: A good NiCad battery is rated for about fours of use. Cruisers report the NiCad battery lasts up to six hours. However, the useful life decreases as the battery develops a memory with age. An external charger is provided with the battery for overnight charging. Connecting an external power source to the PLGR recharges the NiCad battery within 36 hours. The initial cost of the battery and charger make this is a relatively expensive option.

Cell phone battery: This is a 12-volt, lead-acid battery that is used as an external power source. This battery can power the unit for 16 hours easily. The battery requires nine hours to charge. This option is relatively inexpensive and is recommended if the PLGR is used for several hours each day.

Two sources of power should be taken into the field at all times. Most cruisers use either the cell phone battery or the NiCad battery as their primary power source and the AA battery pack as a reserve.

When installing the AA battery pack or the NiCad battery, **do not drop the pack into the battery compartment.** The contacts at the bottom of the compartment can be broken. Gently slide the battery into the compartment.

The PLGR also uses a 3.6-volt lithium battery to maintain the data, setup information and cryptographic key. This battery is similar in size to a AA battery. Don't get them confused. The memory battery is replaced annually. The GPS Coordinator will provide one as needed. Instructions are provided with the replacement battery.

While operating the PLGR, you may receive one or more power warning messages:

Low Primary Power: Your AA/NiCad battery is low. Replace the battery.

Lost External Power: You have lost external power. This is most likely the result of a loose connection or low external battery power. However, a frayed power cord or a blown fuse in the external power cord is also a possibility.

Low Memory Battery: The memory battery is low. Replace the memory battery.

It is recommended that you maintain a fresh primary battery, whether for overnight or extended storage. The PLGR will attempt to operate using the memory battery if there is no other power source. The unit will begin the startup cycle when turned ON. But after a few seconds the screen goes blank. **Do not continue pressing the "ON" button when this occurs.** Continued attempts to turn the unit ON will drain the memory battery. You risk losing the key and any stored data.

You may monitor your battery's performance on the Battery Status Page.

1. Press MENU, STATUS will be blinking
2. Press the Down-arrow. The bottom line of the first STATUS page displays the source of power: Battery or Vehicle
3. Press the Down-arrow. The Battery Status page is now displayed.
4. The first line displays the type of battery installed. You will need to change this if the type battery installed is not correctly displayed. If a NiCad battery is installed, the PLGR will automatically sense it and display: "NiCad". If you are using a AA-pack, you will need to tell the PLGR the type of battery being used. Press the right-arrow. Use the up-/down-arrow to scroll between the battery options: AA-Alk, BA-5800, and AA-Lith.

5. The third line displays the elapsed time the battery has been used.
6. If you have just installed a fresh battery, you will want to reset (RST) the time used. Press the left-/right-arrow until RST is blinking. Pressing the up-/down-arrow will reset the time used to zero.
7. The fourth line displays the calculated time left on the battery. This figure is notoriously overly optimistic.

MAINTENANCE AND TESTING

With the exception of replacing batteries, the PLGR requires little maintenance. Inspect the gasket inside the battery cover for damage and dirt. Clean if necessary.

The PLGR has two tests:

The self-test is run every time the unit is turned ON. The self-test results can be seen by pressing the MENU key and selecting STATUS. If the self-test failed, press the up-arrow key to see the self-test failure page. See paragraph 2.7.1 of the Operations and Maintenance Manual for self-test messages.

A second, more comprehensive test is run at the command of the operator. Press the MENU key and select TEST. This test requires several minutes to complete. During this time, the PLGR cannot perform any navigation functions or provide any position coordinates.

Do not attempt to repair a malfunctioning PLGR. Return it to your GPS Coordinator.

OPERATION

There are two iron-clad rules for operating the PLGR. If these rules are not complied with, the receiver will be disabled.

Do not press the "CLR/MARK" and the "NUM LOCK" keys simultaneously! This will erase (zeroize) all stored data and destroy the key. This feature was incorporated for use by the military. In the event of imminent capture, soldiers can prevent the enemy from using the technology against us.

Do not remove the memory battery plug on the bottom of the unit! Removing the battery plug will disconnect the memory battery. It will zeroize the unit if there is no other power source. When replacing this battery, the unit must be connected to an outside power source.

You can easily determine if the PLGR is keyed. On the second page of MENU options, "CRYPTO" should be displayed in the lower left-hand corner. If it is not displayed, then the unit is no longer keyed and must be returned to MTDC for rekeying.

KEYPAD

Left/Right-Arrow Keys

The Left-arrow (←) and Right-arrow (→) keys move the cursor from field to field in the display. Press the right-arrow key, and the cursor moves right across the display. It then moves down to the next line as if the display were a single line. As the last field on the bottom is reached, the cursor wraps to the first selectable field on the top of the display. Pressing the left-arrow key causes the cursor to move to the left, then up to the previous display line.

Up-/Down-Arrow Keys

The Up-arrow ( ) and Down-arrow ( ) keys are used to change display pages, change number/alpha field values, and activate functions. The operation performed depends on what field is selected when the keys are depressed

When the cursor is on an option field, pressing the up-/down-arrow key scrolls through the options.

When the cursor is on a changeable value field, pressing the up-/down-arrow keys increases or decreases the field to the next higher/lower available value. When held, the key causes scrolling to speed up.

When the cursor is on the paging (P) field in the lower right-hand corner of the display, pressing the up-/down-arrow keys scrolls to additional pages.

MENU Key

The MENU key displays the system menu pages. The menu consists of display pages that allow you to monitor PLGR operation and control operating functions and interfaces with other equipment

WP Key

Pressing the WP key brings up the waypoint menu display. The waypoint functions allow you to manage waypoint data, calculate coordinates of a waypoint, and determine routes and distance data from one waypoint to another.

POS Key

Pressing the POS key brings up the position display. The position display pages display current position, time, speed, satellite tracking status, current datum, magnetic variation, operator identification, and bullseye position. Pressing the POS key while in another display displays the last-used position page.

Pressing and holding the POS key for approximately five seconds causes the operating mode to toggle between averaging and continuous tracking modes.

NAV Key

Pressing the NAV key brings up the navigation information displays. The first page selects the display mode, navigation method, and destination waypoint. More pages are available to display the various waypoint navigation information. Pressing the NAV key while in another display displays the last-used navigation page.

MARK Key

The MARK key is used to activate the MARK (marking present position) and Man Overboard (MOB) waypoint selection page. On this page, the first unused waypoint is automatically selected for storage. The waypoint may be changed to any waypoint number and can be used with either MARK or MOB selection.

NUM LOCK Key

Pressing the NUM LOCK key toggles the keypad between control mode and numeric mode. An N is displayed at the lower right of the display in the numeric mode.

0 thru 9 Keys

In the numeric mode, pressing a 0 thru 9 enters its numeric value into the selected field. If a nonnumeric field is selected, keypad operation is the same as described for the control mode.

CLR Key

The CLR key moves the cursor to the left. This allows wrong entries to be reentered.

PLGR SETUP

The first time you use the PLGR and after rekeying, you'll need to set several parameters. These parameters make the information specific to your location and needs. Once these values are set, they become the default values.

1. Turn the unit on. The PLGR goes through a self-test routine for a few seconds, briefly displays the battery status, and then displays the Position screen.
2. Press the MENU key. STATUS will be blinking.
3. Press the RIGHT-ARROW key. SETUP will be blinking
4. Press the DOWN-ARROW key. The first page of the setup menu is now displayed.
5. Press the LEFT-ARROW key so the field value for SV-TYPE is blinking. Press the DOWN-ARROW so "mixed" is displayed. Press the RIGHT-ARROW. Note the double-arrow beside the "P" in the lower right corner.
6. Press the DOWN-ARROW to move to the next page.
7. Press the RIGHT-ARROW so the field value for SETUP UNITS is blinking. Use the DOWN-ARROW to scroll between the options. Stop when "L/L-dms" is displayed. "L/L-dms" signifies latitude/longitude-degrees, minutes, seconds.
8. Press the RIGHT-ARROW to set the units for Distance and Elevation. Use the DOWN-ARROW to scroll between the options. Stop when "ENGLISH" is displayed.
9. Press the RIGHT-ARROW so the value for Elev is blinking. Use the DOWN-ARROW to toggle to "feet".
10. Press the RIGHT-ARROW. Use the DOWN-ARROW to toggle to "MSL".
11. Press the RIGHT-ARROW so the value for ANG is blinking. Scroll through the options until "DEG" is displayed.
12. Press the RIGHT-ARROW. Scroll through the options until "Mag" is displayed. This parameter is used when calculating coordinates. Since our compasses are not set for declination, we want to use magnetic North rather than true or grid North.
13. Press the RIGHT-ARROW and DOWN-ARROW to go to the next page. This is the Magnetic Variation page.
14. Press the RIGHT-ARROW. The value for TYPE should be blinking. Scroll through the options until "Calc" is displayed.
15. Press the RIGHT-ARROW. Scroll through the options until "deg" is displayed.
16. Press the RIGHT-ARROW and DOWN-ARROW to proceed to the next page.
17. Press the RIGHT-ARROW to move to the "WAGE" field. WAGE should be "on". "WAGE" signifies Wide Area GPS Enhancements. When ON, the PLGR process enhanced clock correction signals from the satellites.
18. Press the RIGHT-ARROW to move to the "ELHold" field. ELHold should be "automatic".
19. Press the RIGHT-ARROW to move to the "TIME" field. Use the DOWN-ARROW to scroll to the correct time zone correction for your locality:

EST	LOC=Z-0500	EDT	LOC=Z-0400
CST	LOC=Z-0600	CDT	LOC=Z-0500

    This parameter is not critical to PLGR operations. When set correctly, the time displayed on the second Position page will be the correct local time.
20. Move the cursor to the "ERR:" field. Use the DOWN-ARROW to scroll to "EHE" for the two-dimensional error.
21. Press the RIGHT-ARROW and DOWN-ARROW to move to the next page.
22. Press the RIGHT-ARROW and scroll through the options for "DTM:" Stop when "NAR" for North American Datum 1983 is displayed.
23. Press the RIGHT-ARROW to move to the "AUTOMATIC OFF TIMER:". Scroll to select "20 min". This function is used to save battery power. It is enabled only when battery power is being used. This function starts when a good solution is obtained and resets every time a keystroke is entered.
24. Press the RIGHT-ARROW.

Your PLGR is now set up and ready to calculate your position. Press the "POS" key.

After the PLGR has run its self-tests and displays the Position screen, the PLGR downloads the daily almanac and verifies the cryptographic key. These processes are automatic and require 12 to 25 minutes. You will get the quickest position lock and most precise solutions with the current almanac. You may get a solution before the almanac has been updated; but it will likely have a higher error estimate. Therefore, it is recommended that you turn the unit on while you are driving to your work area. You can connect the PLGR to the vehicle's electrical system using the external power cord. This will preserve

your battery power. Use the external antennae or place the unit on the dashboard (safety permitting) while driving to the work area.

OBTAINING A POSITION FIX

When the PLGR is turned on, the default screen is the Position screen. You need do nothing to get a position fix. You must track four satellites to obtain a position fix. However, if after 20 to 25 minutes you have not obtained a fix, turn the unit OFF and back ON. Sometimes the unit gets hung-up trying to track a satellite. Cycling it OFF and ON forces it to look at other satellites.

Several factors influence satellite reception. Satellite signals can be blocked by terrain, vegetation, and the human body. Although weather is not supposed to effect PLGR operations, cruisers have reported difficulty obtaining a position fix on overcast days. Orienting the PLGR's antennae vertically aids in signal reception.

The tracking mode is displayed in the upper left corner of the screen. The error estimate is displayed in the upper right corner. The Latitude and Longitude are displayed on the second and third lines. Finally, the elevation is displayed in the lower left corner.

The default operating mode for the PLGR is continuous (CONT). "CONT" is displayed in the upper left corner of the first Position screen. In this mode the PLGR continually calculates and displays the current position estimate. Once the PLGR has a fix on the position, you will note that the seconds of latitude and longitude constantly change. If you were to plot these coordinates, you would find that they are clustered around a central location. It is that central location we want to record. To determine that central location, the PLGR can calculate the running average of these coordinates.

There are two methods used to switch from continuous mode to averaging mode.

1. While the first Position screen is displayed, press and hold the POS key for five seconds. This toggles between the two modes. "AVG 00000" will replace "CONT" in the upper left corner of the screen.
2. This second method can be used to improve performance in very low signal environments, such as under dense foliage.
   a) Go to the SETUP menu.
   b) Change the SETUP MODE to "STBY",
   c) Press MENU and return to the Setup menu.
   d) Now change the SETUP MODE to "AVG".
   e) Press the POS key.

   For a brief instant, you will see "STBY" in the upper left corner before it changes to "AVG 00000".

While in averaging mode, **do not move the PLGR.** The PLGR must obtain a valid position fix for 13 seconds before averaging will begin. This may require some time. Solutions will be averaged once per second. The first position screen displays the averaged value and the sample counter. Although there is no established rule for determining the sample number required to ensure an accurate estimate, FIA has selected 180 samples as the minimum required.

The maximum allowable error estimate is ± 70 feet. The PLGR routinely has error estimates in the low-20s. The error estimate is a function of the satellites relationship to the receiver. As the satellites orbit the Earth, this relationship, or geometry, changes. Consequently, the error estimate is constantly changing.

Occasionally, you may want to reset the sample counter. For example, the satellite geometry has changed, and you are now receiving a lower error estimate.

1. Press the left-/right-arrow, and the sample counter will begin to blink.
2. Press the up-/down-arrow key to reset the counter.
3. Pressing the left-/right-arrow key a second time returns the cursor to the paging (P) field in the lower right corner.

On the rare occasion that you cannot obtain a position fix, there are two options. You can try again at a different time of day when the satellite geometry has changed. Or, you can obtain a position fix off the plot center, determine the bearing and distance to the plot center, and use the PLGR's range-calc feature (discussed later).

Once you have the required number of samples, record the error estimate and the number of samples on your form(s) or data recorder. The error estimate and number of samples are not stored electronically in the PLGR. You have the option to record the coordinate on paper or data recorder, or you can save the coordinate in the PLGR's memory for entry onto the data recorder and form(s) at a later time.

SAVING A POSITION FIX

The PLGR can store up to 999 waypoints, 1 – 999.

MARK saves the current position's coordinates. To save a position fix or waypoint (WP), press MARK. The PLGR will automatically assign the first available WP to that position. At this time you may change the WP number, by pressing the NUM LOCK key and entering the desired WP number, or using the up-/down-arrow key to scroll to the desired WP number. Once the desired WP number is displayed, pressing MARK a second time saves the entry. If you used the NUM LOCK feature, remember to press NUM LOCK again to return to the control mode before pressing MARK a second time. If the waypoint you have selected is already assigned, pressing MARK a second time overwrites the previously stored coordinate.

There is no rule for assigning waypoints. However, most cruisers assign the waypoint the same number as the plot number. Other waypoints used in association with that plot receive waypoint number(s) beginning or ending with the plot number. For example, plot 36 would be assigned WP 36. Associated waypoints, such as the SP, would be assigned WP 361, 362, 363, or 136, 236, 336….

MANUALLY ENTERING A WAYPOINT

It will be necessary to manually enter a coordinate occasionally. SRS recently adopted a hexagon design for plot locations. If there is an existing plot located in the hexagon, that plot is used to represent the hex. In the event there is no plot in the hex, an empty hex, coordinates will be provided for the new plot's location. These coordinates must be manually entered into the PLGR.

1. Press WP, select ENTER, and press NUM LOCK.
2. Press the right-arrow and enter the desired waypoint number.
3. Pressing the right-arrow once allows you to name the waypoint if you want. Otherwise, press the right-arrow a second time.
4. Press the right-arrow a third time. The PLGR defaults to North latitude. All of our coordinates are North latitude.
5. Enter the degrees, minutes, and seconds north latitude.
6. Press the up-/down-arrow to toggle the longitude to "W". All of our longitudes are West longitude.
7. Press the right-arrow and enter the degrees, minutes, and seconds west longitude.
8. There is no elevation to enter. Press the right-arrow twice.
9. Press the up-/down arrow. You will see "WAYPOINT STORED"
10. Press any control mode key: POS to go to the position screen, NAV to navigate to a waypoint, WP to work with waypoints, etc. To enter additional waypoints, press the down arrow to return to the entry screen (step 2).

CALCULATING A WAYPOINT

On occasion it will be necessary to calculate a waypoint. Rather than occupy a nonforest plot, we will calculate its coordinates. Having found the plot starting point (SP), you may want to calculate the plot center (PC) coordinate and use the PLGR to facilitate finding the plot.

Before you can calculate a waypoint, you must first have a waypoint stored in the PLGR. This waypoint may be a saved (marked) WP or a manually entered waypoint. This will usually be a marked WP that represents the SP. You must also have an azimuth and distance from the stored WP to the PC. This you will obtain from having drawn-up the photo or be provided by the previous crew.

1. Press WP and select RNG-CALC.
2. Use the right-arrow to move the cursor to the first numeric field.
3. Enter the waypoint number for the beginning point.
4. Move the cursor to the RNG field, and enter the distance and units to the desired location.
5. Move the cursor to the AZ field, and enter the azimuth to the desired location.

6. Move the cursor to the paging (P) field in the lower right corner. For our purposes, we do not need to enter an elevation.
7. Press the down-arrow to go to the next page. The calculated coordinate is now displayed. You can record the calculated coordinate on your data recorder or form(s).
8. To save the calculated coordinate as a waypoint:
    a) Press the down arrow to go to the next page. This page is similar to the MARK page. Change the waypoint assignment if you desire.
    b) Press the left-/right arrow key to move the cursor so STORE is blinking.
    c) Pressing the up-/down-arrow while STORE is blinking will save the calculated coordinate as the assigned waypoint.

NAVIGATING TO A WAYPOINT

You will want to use the PLGR to locate a point. This may be the PC of an established plot or a new plot, in the case of an empty hex.

The PLGR has several navigation scenarios pre-programmed. These navigation programs contain a number of parameters that are not needed for our application. Many of these functions require a minimum ground speed (approximately 1.5 kph) before they can be used. Also, the parameters of interest do not appear on one screen. The user must select one page to get the distance and another page to get the azimuth to plot. It is recommended that you enter a custom navigation program.

To enter a custom navigation screen, go to the CUSTOM NAV option in the MENU. You may select any parameter(s) that you feel will be useful. However, there are three parameters that are considered minimal: Waypoint and Error Estimate (WP/EHE), Azimuth to Waypoint (AZ), and Distance to Waypoint (RNG). A fourth parameter 2-Dimensional Steering (STR2d) is useful. After displaying the desired parameter, going to the next line selects that parameter. When you have selected all of the desired parameters, press any function key (MENU, POS, NAV, etc.) to exit and save your custom navigation screen.

1. Press MENU three times.
2. Select CUSTOM NAV.
3. Press the right-arrow and use the up-/down-arrow to scroll through the options until WP/EHE is displayed.
4. Press the right-arrow to go to the next line
5. Select AZ.
6. Press the right-arrow.
7. Select RNG.
8. Go to the next line.
9. Select STR2d.

These four items will be displayed on a single screen. Any other parameters you may choose would be displayed on the second and subsequent screens. Other parameters might include Ground Speed (GS), Slope Range (SR), Tracking (TRK), and Tracking and Ground Speed (TRK/GS),

To navigate to a waypoint, you first must configure the display mode and navigation method.

1. Press NAV.
2. Use the arrow keys to select CUSTOM (if you have defined a custom navigation screen) or SLOW as the display mode. SLOW navigation mode is used when traveling on foot over rough or difficult terrain.
3. Use the arrow keys to select DIRECT as the navigation method. DIRECT is used to navigate from the present position directly to the destination. Other methods require a predefined course or route.
4. Use the arrow keys to move to the second line and select the destination waypoint.
5. Move the cursor to the paging field, and go to the next page.
6. The navigation parameters are displayed on the second and subsequent screens.

You may use the PLGR to establish a plot. In the case of an empty hex, you will be provided with coordinates. Plot the location on your county map to determine the location and the appropriate photo. Use the map and photo to approach the area. Use the PLGR to direct you when you are close. When navigating to the plot, the position mode must be continuous. When you are prepared to set the plot, switch to the averaging mode. Before setting the PC, you must have the minimum 180 samples. Use a compass and tape to close the remaining bearing and distance to the plot.

DETERMINE THE COURSE TO PLOT

This feature is used to determine the bearing and distance from the SP to the PC. For distances less than 500 feet, it is recommended that you use the PDRS traverse program. The PLGR's solution may not be within the quality assurance tolerance level for these shorter distances.

1. Obtain and MARK the coordinates for the SP and PC.
2. Press WP and select DIST.
3. Enter he waypoint that represents the SP.
4. Enter the waypoint that represents the PC.
5. The distance (RNG) and azimuth (AZ) are calculated and displayed.

You may also use the NAV function. This requires either the SP or PC coordinate be marked.

1. Obtain and mark the coordinate for the SP/PC.
2. Obtain the coordinate of the SP/PC.
3. Press the NAV key and enter the waypoint representing the marked SP/PC.
4. Go to the second NAV screen and obtain the distance and azimuth to the destination waypoint. If the marked coordinate is the SP, record the reverse azimuth of the solution.

DETERMINE AREAS

One acre is the minimum size requirement for forest, nonforest, and within forest conditions. Therefore, accurately determining areas is essential. The PLGR calculates areas to the nearest 0.1 acre. If the calculated area is 1.0 acre, you may want to use the DIST function to obtain the azimuth and distances between waypoints and use the PDRS area feature to ensure the area is not 0.95 to 1.0 acres.

1. Obtain and mark coordinates around the perimeter of the area in question. Up to 26 waypoints can be used to define a single route. If you require more than 26 waypoints to define the perimeter, divide the area into two or more parcels.
2. Press WP and select ROUTE
3. Select ENTER
4. The PLGR defaults to the first unassigned route number. Assign a route number and name if desired.
5. Enter the waypoints corresponding to the perimeter.
6. To save the route, either scroll through to the end of the route list and select the SAVE option, or press one of the major function keys (MENU, POS, WP, etc.).
7. After the route has been saved, select the POLY option of the ROUTE menu. This displays the circumference and the area of the defined polygon.

DETERMINE PHOTO REFERENCE AZIMUTH

In hilly/mountainous and undeveloped areas, finding a linear feature that can be used as a reference azimuth is difficult. The PLGR can be used to obtain an azimuth between two identifiable points. However, using the PLGR to obtain a Reference Azimuth should not become an everyday practice.

1. Identify two points on the photo that you will be able to locate on the ground. These points should be widely spaced, further is better.
2. Obtain and mark coordinates of the first point. Because of the scale of the photos, it is not necessary to use averaging mode for this application.
3. Obtain coordinates for the second point.
4. Use the procedures described above to determine the azimuth between the two points.

CLEAR WAYPOINTS

Periodically, you will want to clear stored waypoints.

1. Press WP and select CLEAR.
2. Using the arrow keys, select the range of waypoints you want to delete.
3. Pressing the up-/down-arrow while "ACTIVATE" is blinking will begin the process.
4. The PLGR now needs confirmation that you want to delete the waypoints. If the range is correct, use the arrow buttons to select CONFIRM. If the range is incorrect, select CANCEL to stop the operation.

OTHER USEFULL SCREENS

Information contained on a number of screens will help you monitor the PLGR's performance.

STATUS
Page 1 displays the GPS Status, Self-Test Results, Antenna Source, and Power Source.

Page 2 displays the Battery Type, Recharge Status, Time Battery Used, and Time Battery Left.

Page 4 is the Satellite Tracking Status and shows the signal status of the satellites being tracked. Pressing the left-/right-arrow toggles the first column to display a fifth satellite.

Line 1 displays the number of the satellite (SV) being tracked/searched
Line 2 displays the signal strength (CN). 34 dB is considered nominal.
Line 3 displays the code type (CD) being transmitted by the satellite.
Line 4 displays the satellite status (ST): I=interference, R=recovery, S=search, and T=Track

Page 5 shows the satellite status information:

Line 1 displays the number of the visible satellite (SV).
Line 2 displays the satellite's health: OK or BAD.
Line 3 displays the azimuth to each satellite (AZ).
Line 4 displays the elevation angle of each satellite and whether the satellite is ascending or descending.

POSITION
Page 1 displays the current position information
Page 2 displays the Time, Date, Track, and Ground Speed.
Page 3 displays the satellite usage summary that includes the almanac age.
Page 4 displays the current datum, the magnetic variation, and the operator ID.

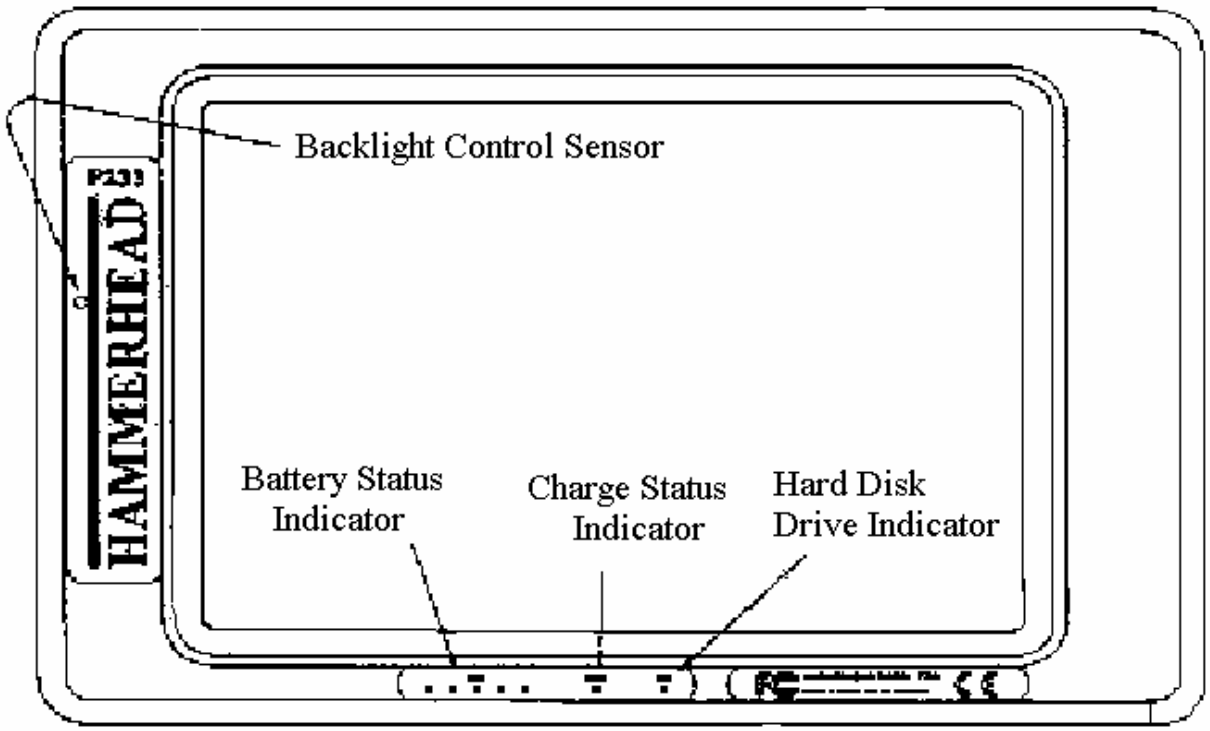
SUPPLEMENT C: DATA RECORDER INSTRUCTIONS

Basic Hammer Head User's Guide

The current Data Recorder in use in the field is the Hammer Head P-233. It is a Windows 95, ruggedized lap top computer with a Pen Based interface. We run several specialized programs that allow the field personnel to collect and transmit data. The units are built around a 233 MHz Intel Pentium processor.

Hammer Head specifications:

- minimum of 32 MB of main memory
- minimum of 3 GB of hard drive space
- two PCMCIA slots – one of which we use for a modem
- one infrared port
- pen services software
- 9.5" 640x480 backlit transflective monochrome LCD display
- one extra battery



FRONT VIEW

The front panel features include:

A battery status indicator which uses five LED's and operates like a fuel gauge showing the status of the battery charge.

A charge status indicator which is lit whenever external power is supplied. It blinks slowly when the battery is charging and remains on steady when the battery is fully charged.

A hard drive indicator which flashes as the hard drive is accessed.

A backlight control sensor which automatically turns the backlight off in bright light to save battery power.

On/Off switch:

On the right side:

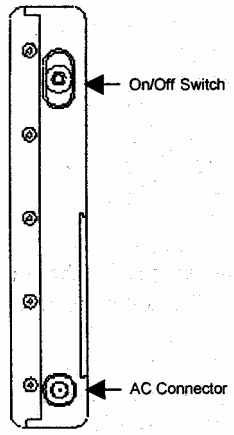
The on/off switch. It is a rubber covered push switch, when pressed once turns the machine on.

When pressed again it will power the machine down automatically following proper Windows shutdown procedures.

This switch can also be used to bring the system out of sleep mode by pressing it one time.

If the machine locks up, the on/off switch can be held in for 10-15 seconds and the machine will do hard shutdown of the machine. This should only be done when normal shutdown procedures will not work.

The newer machines come with an external power port for charging and operating the machine from another power source.



RIGHT SIDE VIEW

On the left side:

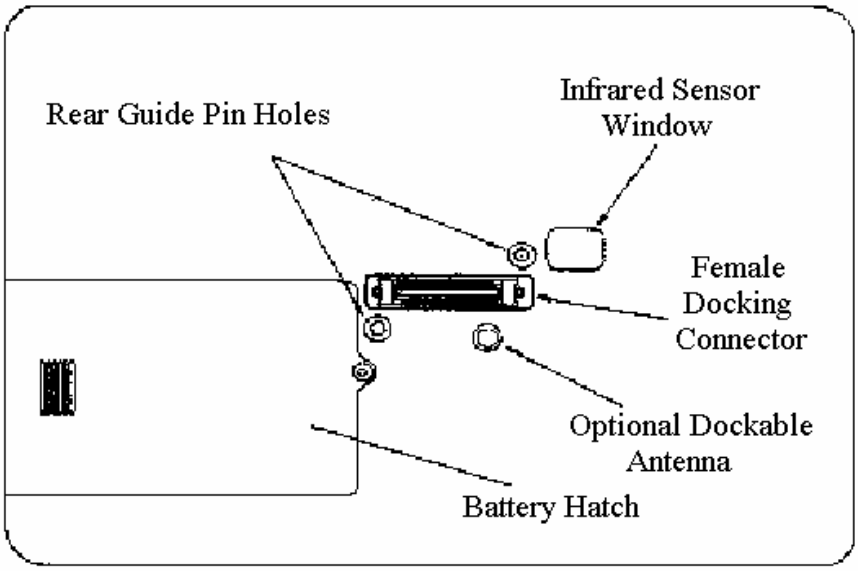
A cover for the PCMCIA slots encases a waterproof RJ11 connector for a standard phone line. This is the connection used to dial into the Starkville system to download county data and transmit field data.

On the back side:

The machine has a female docking connector. It is used to attach a port replicator. This is where all external devices are connected.

There is a small transparent port that is the infrared sensor window.

The battery hatch is also located on the rear and has a sliding cover. The battery compartment is sealed to prevent water from entering the machine even if the hatch is off.



REAR VIEW

Batteries and Charging Procedures:

The red LED's on the front panel indicate the power status of the battery. At full charge all five indicators will be lit. As battery power decreases the lights will turn off from right to left.

The last indicator will begin to flash when approximately three to five minutes of battery power remain. There is also a warning screen that will appear prompting you to change the battery.

If the battery is allowed to completely fail there could be loss of data and the machine may require scan disk to be run before it will reboot. This is a problem in the field as it requires a keyboard to initiate scandisk.

Under normal operation the batteries will last approximately four hours if power management features are turned on. Battery life is also dependent on temperature. The batteries are NOT hot swappable! You MUST shut the machine down before removing the battery!

For the P-233 models the battery indicator light will not reinitialize when a new battery is installed. You must run the reset gas gauge tool once the machine is brought back up. The HH3 models will recognize the fresh battery and reinitialize on its own.

The battery status indicators are based on time of usage and depend on the new battery being fully charged to give an accurate reading. Each unit comes with a power supply that will power the unit and also charge the battery. It is marked with Walkabout Computer's logo.

Each unit also comes with an external charger that will charge two batteries. It charges one at a time and has a light for each battery that turns green when the batteries have a full charge. This unit is made by SPAN and the power supply is also marked with their name. DO NOT plug the SPAN power supply into the Hammer Head – it will fit, but IT WILL DAMAGE THE MACHINE!!! PLEASE BE CAREFUL. Only use the SPAN power supply with the SPAN external battery charger!!!!

Port replicator:

All external devices supplied with the unit (Zip drive, printer, charger, keyboard…) are connected by means of the port replicator. The port replicator also serves as a stand for the machine when used on a desk. It uses two thumb screws to attach it to the machine. It attaches directly to the female docking connector on the back of the unit.

Pen:

The pen is attached to the case with a tether and is the primary input device for the machine. The pen functions like a two-button mouse. There are two switches, one in the tip and a pink button on the side. Regular left mouse operations are done by simply tapping or double tapping the pen to the screen as you would click a mouse. Right mouse functions are accomplished by holding down the pink button on the side of the pen and tapping the screen. The pen requires some getting used to, but once familiar it works quite well.

The small plastic tip in the pen is replaceable and several tips are included with the unit as well as a circular metal band that is used to remove the tip. Simply pull the old tip out and gently push the new one in. The pen is not totally waterproof. It will tolerate rain, but not immersion. If the pen gets too wet it will start to act erratically. If this happens you can remove the plastic tip and sling the pen to get most of the water out. This will usually get you through the day and with the tip out it will dry out overnight. There are no batteries in the pen and, other than the tip, it is not made to come apart.

Temperatures:

The units will operate in temperatures from slightly below freezing to quite high temperatures. Do NOT leave the units in the vehicle overnight when the temps are low and expect it to boot in the morning. The machine will have to warm up before the hard drive will spin up and the display can work! Battery life is also shorter in colder weather.

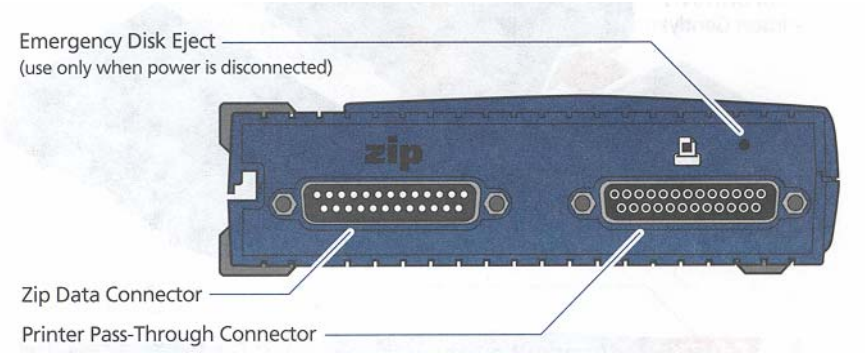
If left face up in direct sunlight in high temps the display may turn dark and be difficult to read. This condition will go away when the unit cools down. This is especially bad if left on the dash of a hot vehicle in the summer.

Zip Drive:

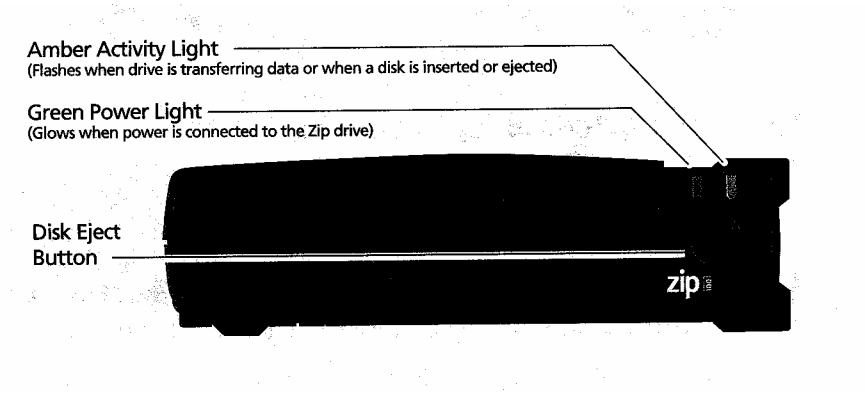
Each unit comes with a Zip drive for storing backup data. The zip drive attaches to the port replicator with a parallel or USB cable depending on the PDR and zip drive. The cable and drive are marked as to how they attach. The zip drive comes with a power supply that is marked ZIP also. Use it only with the Zip drive.

If using a parallel cable attach the Zip drive before starting the machine. If the machine is already on before the Zip drive is attached you will have to reboot the machine for it to recognize the drive.

There are two disks sent out with each unit and a tools disk. It is recommended that you alternate your backups between the two disks. The Tools disk cannot be used to write backups to.
If a disk ever becomes stuck in the drive there is a small hole in the back of the drive that you can insert a straightened out paper clip and eject the disk. Do NOT try to pry it out or physically pull it out, this will damage the drive!



NEVER insert a 3 1/2 " floppy disk into the Zip drive! It will damage the drive.



Printer:

Each unit comes with a HP deskjet 340 or deskjet 350 portable printer. These come with a battery, charger and infrared adaptor. As before, the charger is marked with HP's logo and is to be used only with the printer.

The printer can be attached to the port replicator with a parallel cable or be run through zip drive as long as the Zip drive is powered. This way both can be used.
You can also print via the infrared port on the back of the Hammer Head. The printer comes with an infrared adaptor that plugs into the same port as a cable. The infrared adaptor has a range of about three feet and must have a clear path between the port on the machine and the port on the adaptor. On the task bar at the bottom right hand corner of the screen on the Hammer Head there is a small dish shaped symbol that indicates the infrared port on the hammerhead. When the unit and the printer are aligned there will be two of these symbols shown connected. The port on the adaptor swivels to make it easier to get them to align. You may choose which printer you want to use (either the hpdeskjet340 (infrared) or cable printer) by using the dropdown menu on the print screen.

The paper feeder on the back of the printer will hold around thirty sheets. The printers have instructions printed on the inside of the front door and on the back for operation and assembly. The part number for the print cartridge is also listed there. The print cartridges are normally available at Wal-Mart and most office supply stores.

Handwriting Recognition:

The handwriting recognition system can be used in almost all programs. It can be tailored to personal preferences by clicking on the Handwriter Settings icon in the control panel. You can set the machine for right or left hand writing and for the way you make most characters. However, most people use the drop down keypad function for data entry instead of writing by hand.

For additional information you can also refer to Walkabout's users guide.

For more specific questions or problems you can contact:
Haimes Critz 662/338/3118