

Yurok Tribe/Forest Carbon Partners CKGG Improved Forest Management Project

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Inventory Methods Update 2021

CONTENTS

Contents	i
1. Summary of Changes from Previously Approved Inventory Methods	1
2. Offset Project Boundary Description & List of Onsite Carbon Pools Included	1
Table 1. Carbon Pools/Sources That Must Be Accounted for	2
3. Stratification	4
3.1 Stratification Rules	4
Table 2. Stratification Changes	4
3.2 Map of Vegetation Strata	5
Figure 1. Inventory Strata Map	5
3.3 Tools for Application	5
3.4 Boundary Determination	6
4. Inventory Design and Sampling Process	6
5. Updating/Replacing Sample Plots & Inventory	6
6. Data Management Systems & Processes	7
7. Analytic and Calculation Methods	7
8. Quality Assurance/Quality Control (QA/QC) Procedures	8
9. Change Log of Inventory Methods or Volume & Biomass Equations	9
Addendum A. Inventory Field Manual	10
Addendum B. Inventory Field Manual Change Log	11

1. SUMMARY OF CHANGES FROM PREVIOUSLY APPROVED INVENTORY METHODS

Section	Previously Approved Inventory Method	This Document
Stratification	Nine strata	Seven strata, see Table 2
Inventory Design and Sampling Process	Two differently sized sample grids used to determine plot locations Number of plots sampled based on random selection of rows of plots	Single sample grid of 150-m x 150-m used to determine plot locations Change in number of plots to achieve approximately equal acres/plot between combined strata. Grid points sampled based on random selection
Analytic and Calculation Methods	Three decay classes were used for standing dead calculations	Five decay classes are used for standing dead calculations
Analytic and Calculation Methods	Heights derived from linear regression were used to calculate broken-topped tree volume	Volume for broken-topped trees calculated using field estimated original height
Inventory Field Manual	See Addendum B for changes to field manual	

2. OFFSET PROJECT BOUNDARY DESCRIPTION & LIST OF ONSITE CARBON POOLS INCLUDED

There are no changes to the project area.

The project is located on private fee land owned by the Yurok Tribe and includes ~7,660 acres of forestland. The following areas were not included in the project:

- Minimum 300-ft buffer either side of the Klamath River,
- 500-ft buffers around mapped Northern Spotted Owl activity centers,
- 125 feet either side of THP Class I watercourses,
- 75 feet either side of THP Class II watercourses, and
- Areas not suitable for timber management.

These areas were excluded from the project because they are either non-forested, not managed as commercial forestland, or subject to highly regulated harvest restrictions.

Table 1. Carbon Pools/Sources That Must Be Accounted for

Greenhouse Gas (GHG) Assessment Boundaries Carbon Pools/Sources That Must Be Accounted for in Quantifying Project Reductions and Removals			
Carbon Pool or Source	Included or Optional	Included in this project?	Justification/Quantification Method
Primary Effect Sources, Sinks, and Reservoirs			
IFM-1 Standing Live Carbon (living trees)	Included	Included	Mandatory pool for measurement – Baseline modeled using initial field inventory measurements; Project measured by field measurements and updating forest carbon inventory.
IFM-2 Shrubs and Herbaceous Understory	Excluded	Excluded	NA
IFM-3 Standing dead carbon (carbon in all portions of dead, standing trees)	Included	Included	Mandatory pool for measurement – Baseline modeled using initial field inventory measurements; Project measured by updating forest carbon inventory.
IFM-4 Lying dead wood carbon	Excluded	Excluded	NA
IFM-5 Litter and duff carbon (carbon in dead plant material)	Excluded	Excluded	NA
IFM-6 Soil Carbon	Included/Excluded	Excluded	It is not necessary to quantify soil carbon in this project in accordance with the Protocol, as deep ripping, furrowing, plowing, soil disturbance exceeding 25% of the project area and mechanical site preparation not on contour will not be permitted on the project area.
IFM-7 Carbon in in-use forest products	Included	Included	Baseline estimated from modeled harvesting volumes. Project estimated from measured harvest volumes.
IFM-8 Forest product carbon in landfills	Included or Excluded	Included	Excluded when project harvesting exceeds baseline. Included when project harvesting is below baseline. Baseline estimated from modeled harvesting volumes. Project estimated from measured harvest volumes.
Secondary Effect Sources, Sinks, and Reservoirs			
IFM-9 Biological Emissions from site preparation activities	Included	Included	Biological emissions from site preparation activities are not quantified separately, but rather are captured by measuring changes in included carbon reservoirs.
IFM-10 Mobil combustion emissions from site preparation activities	Excluded	Excluded	N/A

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Greenhouse Gas (GHG) Assessment Boundaries Carbon Pools/Sources That Must Be Accounted for in Quantifying Project Reductions and Removals			
Carbon Pool or Source	Included or Optional	Included in this project?	Justification/Quantification Method
Primary Effect Sources, Sinks, and Reservoirs			
IFM-11 Mobile combustion emission from ongoing project operation and maintenance	Excluded	Excluded	N/A
IFM-12 Stationary combustion emissions from ongoing project operation and maintenance	Excluded	Excluded	N/A
IFM-13 Biological emissions from clearing of forestland outside of the Project Area	Excluded	Excluded	N/A
IFM-14 Biological emission/ removals from changes in harvesting on forestland outside the project area.	Included/ Excluded	Included	Not estimated for baseline. Estimated for project by using a default 20% "leakage" factor applied to the difference in harvest volume relative to baseline.
IFM-15 Combustion emissions from production, transportation, and disposal of forest products	Excluded	Excluded	N/A
IFM-16 Combustion emission from production, transportation, and disposal of alternative materials to forest products	Excluded	Excluded	N/A
IFM-17 Biological emissions from decomposition of forest products	Included	Included	For baseline, quantified as a component of calculating carbon stored for 100 years in wood products (SSR #IFM-7) and landfills (SSR #IFM-8) For project, quantified as a component of calculating carbon stored for 100 years in wood products (SSR #IFM-7) and landfills (SSR #IFM-8)

3. STRATIFICATION

3.1 STRATIFICATION RULES

Stratification is based on the original project stratification, (please refer to the initial OPDR for details) but has been simplified by combining existing similar strata and adding a stratum to account for a wildfire that occurred in 2016. Table 2 is a summary of the stratification changes.

Table 2. Stratification Changes

Stratum 2021	Acres	Original Strata/Types
AL	216	AL, Alder2
HWD	3,319	RH, YH
KMC	1,036	KMC, KMC_2L, KMC_2S
MHC	384	MHC
RC	394	RC, RC_s
TF16 ¹	69	small portion YC, YH
YC	2,241	YC, YYC

¹ This stratum represents the area impacted by the 2016 Tulley Fire

3.2 MAP OF VEGETATION STRATA

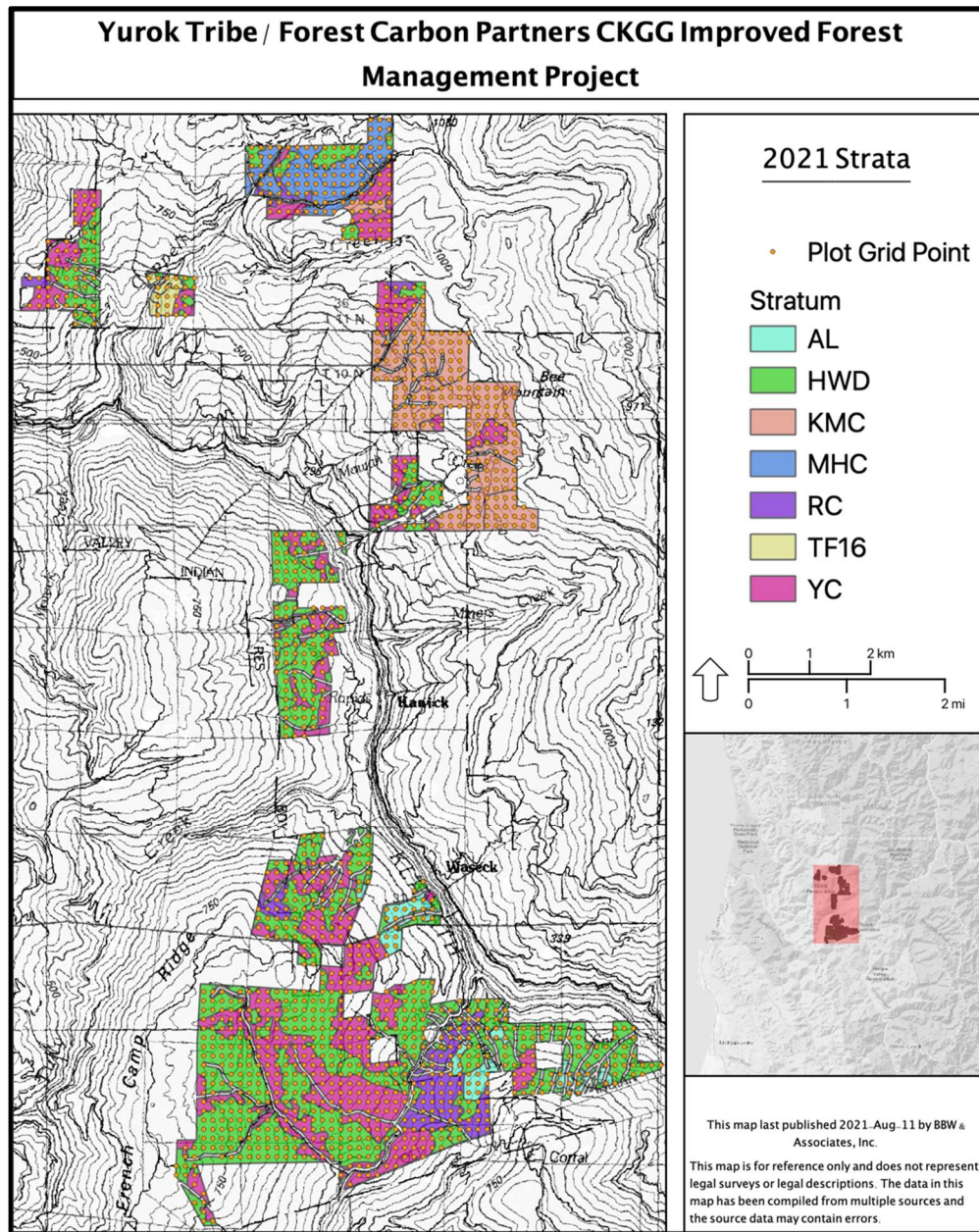


Figure 1. Inventory Strata Map

3.3 TOOLS FOR APPLICATION

Tools used in the update of the project stratification include:

- GIS software: ArcGIS Desktop, Desktop GIS Software Suite. Environmental Systems Research Institute.

- GIS software: QGIS Geographic Information System. QGIS Development Team, Open Source Geospatial Foundation Project.
- Microsoft Excel
- Initial Project Stratification and Types

3.4 BOUNDARY DETERMINATION

The boundaries for the project and strata were determined during the initial reporting period and were based on stratifying vegetation types by biomass stocking, species composition, and age. The updated 2021 strata boundaries combine existing strata, except for the stratum delineated by the Tulley Fire. The boundary for the Tulley Fire stratum (TF16) was derived from the CalFire Fire Perimeters GIS dataset. Except for the stratum representing the Tulley Fire, no polygon boundaries were changed.

4. INVENTORY DESIGN AND SAMPLING PROCESS

The sampling design is a stratified sample of permanently installed 1/20th-acre plots. A 150-m by 150-m grid of potential plot locations, matching the large grid from the initial inventory installation, was created and serves as the sampling frame for the project (hereafter referred to as the 2021 sample grid). All plots sampled for the 2016 inventory and offset project verification that fall on the 2021 sample grid will remain as sample plots for future inventories. Additional plots will be selected from the 2021 sample grid using a stratified random sample method based on the 2021 strata.

The details of the measurement methods are contained in the inventory field manual found in **Addendum A. Inventory Field Manual**. The manual is to be provided to the inventory crew, along with training and check cruising to ensure accurate and consistent data collection.

All plot locations are to be referenced on maps and GPS locations provided to the inventory crew.

5. UPDATING/REPLACING SAMPLE PLOTS & INVENTORY

Forest Offset Protocol Appendix A(b)(6)

Annual monitoring of the project is required to ensure up-to-date estimates of carbon stocks and provide assurance that GHG reductions achieved by the project have not been reversed. A re-inventory will comply with the requirement that no field inventory data will be more than 12 years old. Because the plots are permanently located, it is anticipated that any re-measurement will use existing plot locations as the basis for updating project stock estimates.

If plot density is reduced or increased at subsequent re-inventory, plots will be dropped or added randomly such that the inventory continues to meet sampling error requirements. Future re-measurements may also incorporate an updated inventory methodology and/or stratification system,

potentially using remote sensing data. Any changes will be noted in the inventory change log. For reporting stocks on an annual basis until the next inventory, the inventory update procedure will rely on growth projections from an ARB-approved growth and modelling program.

At the occasion of a disturbance event that alters the carbon stocks in the project area, *e.g.* fire or timber harvest, the plots in the affected area will be re-measured and the corresponding plots in the project carbon calculations will be replaced by the newly measured plots. If the disturbance event affects more than five (5) percent of any stratum, a new stratum will be delineated and may be delineated even when less than 5% of the acres are affected.

Any newly measured plots will be installed consistent with the inventory field manual (see Addendum A. Inventory Field Manual). Any improvements or changes to inventory methods or calculations will be documented and justified in the change log. Once the plot data has been gathered, the project's onsite carbon stocks and confidence deduction will be calculated.

6. DATA MANAGEMENT SYSTEMS & PROCESSES

Inventory data are to be collected using paper plot sheets or electronic data collectors. Electronic copies of all data will be stored on personal computers that have a local and cloud-based backup. Quality-checked and assured data will be stored in a database or databases and used to translate field measurements into volume and/or biomass and carbon estimates for each of the carbon pools included in the offset boundary.

All data, growth and yield simulation results, and carbon calculations are stored on personal computers and backed up to local and/or cloud-based drives.

7. ANALYTIC AND CALCULATION METHODS

The above-ground standing live tree portion is calculated for all trees $\geq 5''$ dbh using the approved species-specific FIA equations and methodology for cubic foot volume and biomass of tree bole, bark and branches as required by ARB (FIA Volume Equation Documentation & Regional Biomass Equations Used by FIA, Updated 9-19-2014). There are 3 different methods to calculate cubic volume, depending on the equation. Both the equations and the method vary by species. Many species require 3 calculations to get to total live biomass – tree stem, bark, and branches. All hardwoods in the inventory except alder are calculated with the Pillsbury equations according to the FIA reference, which include all portions of the tree (Method 3). Therefore, there is no need to calculate the bark and branches separately. FVS uses these same equations to produce the field 'TCuFt' in the treelist tables which equates directly to CVTS in the FIA reference. Therefore, the 'TCuFt' value from FVS is used rather than calculating the volume of these hardwoods independently.

Broken topped trees: If a tree is missing its top, then the unbroken height is estimated in the field. The treelists upon which the calculations are made contain fields for height and truncated height – [HT] and [TruncHt]. FVS calculates [TCuFt] for the broken top tree as a volume which accounts for the missing portion above the break. This works well for Pillsbury hardwoods since their FVS volume is used directly in the carbon calculations, but other species require another approach. For all other species the net volume is determined by multiplying the ratio of [TruncHt] to [Ht] by the gross biomass.

Above ground standing dead wood was estimated using the data collected in the inventory for all standing dead trees greater than or equal to 5” DBH and 15’ in height. The total and broken top heights are measured or estimated in the field for all standing dead trees. Bole defects causing missing wood on standing dead trees observed in the field are deducted when calculating carbon. Broken top trees are calculated exactly the same way as live trees, with the exception that bark biomass is only added to the above-ground tree calculations for trees in decay classes 1 and 2 and crown biomass is only added for decay class 1, due to the way that more highly decayed trees lose their bark and crown biomass. For hardwood species where bark and crown are included in the bole volumes, these components are present for all decay classes and are adjusted for missing top volume as described above for bole volume. Biomass for each standing dead tree is calculated by multiplying the net bole volume by the appropriate specific gravity value, and by the density reduction factor from Appendix D in Harmon et al. (2011).

Below-ground standing live and dead tree biomass is estimated using the protocol -stipulated equation (Cairns et al. 1997). This equation uses above ground biomass density in tonnes per hectare to predict the below ground biomass in tonnes per hectare. The Cairns equation will be applied to the sum of live and dead aboveground biomass by plot to calculate live and dead belowground biomass. This is then converted to CO₂e and subsequently divided into live and dead belowground carbon pools by applying the proportion of live or dead aboveground carbon to total aboveground carbon to total belowground carbon. Thus, the carbon pools can be represented by total live and total dead carbon independently, as required by the Protocol.

All biomass estimates are converted to carbon by multiplying by 0.5 and to CO₂e by multiplying by 3.664, which is the conversion factor specified in the 2011 Protocol used by this project.

Harvested wood products pools require an estimate of the average amount of carbon that remains stored in wood products over a 100-year period. This is done using the steps outlined in the 2011 Protocol, Appendix C.

Mill efficiency data from the ARB website is used to arrive at the total carbon transferred into wood products.

8. QUALITY ASSURANCE/QUALITY CONTROL (QA/QC) PROCEDURES

Quality is to be assessed at each step of the data collection, handling, and reporting process.

DATA COLLECTION

Inventory plot installation is to be conducted by trained inventory crews to the specifications and tolerances described in the inventory field manual Addendum A. Inventory Field Manual. Additional QA/QC procedures for field data collection are provided in the inventory field manual.

DATA PROCESSING

All inventory data undergo internal review by an individual other than the cruiser and/or data entry person. Data are spot-checked for accuracy at each transfer between plot sheet, spreadsheet, database, and output. A QA/QC checklist is used to minimize the risk of missed steps or inadvertent errors throughout data processing and transfer.

DATA MANAGEMENT

All data files used for reporting calculations within the OPDR follow standardized naming and dating conventions to allow for data tracing and version control. All digital files are stored in a digital filing system and backed up on multiple remote servers for data archiving and security. Physical files will also be maintained and stored.

9. CHANGE LOG OF INVENTORY METHODS OR VOLUME & BIOMASS EQUATIONS

Forest Offset Protocol Appendix A(b)(9)

Changes to the inventory field methods are noted in Addendum B.

Changes to volume or biomass quantification methods will be recorded in the Summary of Changes from Previously Approved Inventory Methods.

ADDENDUM A. INVENTORY FIELD MANUAL

Forest Carbon Inventory Field Manual

YUOK TRIBE, CKGG

Version 2.0

August 12, 2021

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TABLE OF CONTENTS

CHAPTER 1 PLOT LAYOUT AND SAMPLING	4
SECTION 1.1 ESTABLISHMENT	4
SECTION 1.2 NAVIGATION TO PLOT CENTER	4
SECTION 1.3 SPECIAL PLOT LOCATIONS.....	4
Subsection 1.3.1 Hazardous Conditions	4
Subsection 1.3.2 Denied Access.....	4
Subsection 1.3.3 Roads and Landings	4
Subsection 1.3.4 Plot is Outside of Project Area	4
Subsection 1.3.5 Structures	4
SECTION 1.4 PLOT LAYOUT.....	4
SECTION 1.5 TREES SAMPLED	5
SECTION 1.6 UNITS OF MEASURE	5
SECTION 1.7 DATA RECORDING.....	6
SECTION 1.8 MEASUREMENT TOOLS	6
SECTION 1.9 ORDER OF MEASUREMENTS.....	6
SECTION 1.10 MONUMENTING AND REFERENCING PLOT CENTER.....	6
Subsection 1.10.1 Plot Center Monuments	6
Subsection 1.10.2 Reference Trees	6
Subsection 1.10.3 Tree Tags	7
SECTION 1.11 PLOT REESTABLISHMENT	7
SECTION 1.12 WALKTHROUGH	7
CHAPTER 2 PLOT LEVEL DATA	9
SECTION 2.1 PLOT NUMBER	10
SECTION 2.2 PLOT STATUS	10
SECTION 2.3 PLOT NON-SAMPLED REASON.....	10
SECTION 2.4 SAMPLE KIND.....	11
SECTION 2.5 FIELD GUIDE VERSION	11
SECTION 2.6 CURRENT DATE	11
SECTION 2.7 DECLINATION.....	11
SECTION 2.8 QA STATUS	12
SECTION 2.9 CREW INITIALS	12
SECTION 2.10 PLOT SLOPE.....	12
SECTION 2.11 PLOT ASPECT	13
SECTION 2.12 ELEVATION	13
SECTION 2.13 DISTANCE TO PROJECT BOUNDARY.....	13
SECTION 2.14 WATER PROTECTION CONDITION.....	14
SECTION 2.15 DISTANCE TO WATER	14
SECTION 2.16 REGENERATION STATUS	14
SECTION 2.17 ARTIFICIAL REGENERATION SPECIES.....	15
SECTION 2.18 DISTURBANCE	15
SECTION 2.19 DISTURBANCE YEAR	16
SECTION 2.20 TREATMENT.....	16
SECTION 2.21 TREATMENT YEAR.....	17
SECTION 2.22 HEADER NOTE	17
SECTION 2.23 REFERENCE TREE DATA.....	17

Subsection 2.23.1 Reference tree tag number	18
Subsection 2.23.2 Slope Distance	18
Subsection 2.23.3 Azimuth	18
CHAPTER 3 TREE DATA	18
SECTION 3.1 DEFINITIONS	18
SECTION 3.2 BORDERLINE TREES	19
SECTION 3.3 TREE TRACKING	20
Subsection 3.3.1 Tag Number	20
Subsection 3.3.2 Present Tree Status	20
Subsection 3.3.3 Reconcile	22
SECTION 3.4 SPECIES	23
SECTION 3.5 DIAMETER	23
Subsection 3.5.1 Marking Current Diameter	24
Subsection 3.5.2 Diameter at Breast Height	24
Subsection 3.5.3 Diameter Check	36
SECTION 3.6 TREE LENGTH	37
Subsection 3.6.1 Total Length	37
Subsection 3.6.2 Truncated Length	37
Subsection 3.6.3 Diameter Inside Bark	39
Subsection 3.6.4 Length Method	39
SECTION 3.7 CROWN MEASUREMENTS	39
Subsection 3.7.1 Compacted Crown Ratio	39
Subsection 3.7.2 Crown Class	42
SECTION 3.8 TREE DAMAGE	43
Subsection 3.8.1 Missing Biomass	43
Subsection 3.8.2 Cause of death	44
Subsection 3.8.3 Mortality Year	45
Subsection 3.8.4 Decay Class	45
SECTION 3.9 WALKTHROUGH TREE	47
SECTION 3.10 TREE NOTES	47
SECTION 3.11 SITE TREE INFORMATION	47
CHAPTER 4 QUALITY ASSURANCE/QUALITY CONTROL	47
APPENDIX A - TREE SPECIES CODES	49
APPENDIX B - TREE CODING GUIDE	50
APPENDIX C - GLOSSARY	51
20 TH ACRE PLOT SLOPE CORRECTION TABLE	55
APPENDIX D -	56
APPENDIX E - PLOT SHEETS	56

TABLE OF FIGURES

FIGURE 1. ILLUSTRATION OF WALKTHROUGH METHOD FROM DUCEY ET AL., 2004. FIVE SAMPLE OBJECTS (+), LYING CLOSE TO THE	9
FIGURE 2. CALCULATING HORIZONTAL DISTANCE	20
FIGURE 3. STANDING DEAD TREE EXAMPLES	22

FIGURE 4. DETERMINING DIAMETER RATIO OF FORKS. WHEN DETERMINING IF A FORK MEETS THE 1/3 DIAMETER REQUIREMENT FOR QUALIFYING AS A FORK, THE DIAMETER OF THE POTENTIAL FORK TAKEN AT LOCATIONS A1 AND A2 MUST BE 1/3 OF THE DIAMETER AT LOCATION B.	26
FIGURE 5. A SINGLE NON-QUALIFYING FORK. IF ONE OF THE FORKS DOES NOT MEET THE MINIMUM RATIO, THEN NO FORK EXISTS AND THE DIAMETER IS PLACED AT THE NORMAL LOCATION ON THE DOMINANT STEM.....	26
FIGURE 6. TWO NON-QUALIFYING STEMS. IF NEITHER STEM MEETS THE 1/3 DIAMETER REQUIREMENT, NEITHER IS TALLIED. THIS IS OFTEN ASSOCIATED WITH BROKEN TOPS AND IS CONSISTENT WITH THE POINT AT WHICH A STEM IS CONSIDERED RECOVERED FROM A BREAK.....	27
FIGURE 7. FORKING ANGLE. IN ORDER TO QUALIFY AS A FORK, THE PITHS MUST DIVERGE AT AN ANGLE NOT EXCEEDING 45 DEGREES FROM THE MAIN STEM (A). IN CASES WHERE THERE IS NO OBVIOUS MAIN STEM (B), CONSIDER THE ANGLE OF PITH SEPARATION BETWEEN THE TWO STEMS.	27
FIGURE 8. FORKS THAT HAVE BRANCH-LIKE FORM AND FUNCTION, LEADING TO THE TALLY OF A SINGLE TREE INSTEAD OF MULTIPLE TREES.....	28
FIGURE 9. FORKED BELOW 1.0 FOOT	29
FIGURE 10. FORKED BETWEEN 1.0 FOOT AND 4.5 FEET.....	29
FIGURE 11. BOTH A AND B ARE EXAMPLES OF PROLIFIC BRANCHING WHERE THE MEASURE LOW APPROACH MUST BE IMPLEMENTED CAUSING THE DIAMETER TO BE TAKEN BELOW 4.5 FEET. ALTHOUGH C HAS MANY BRANCHES, IT IS NOT A CANDIDATE FOR THE MEASURE LOW APPROACH BECAUSE THE BRANCHING IS NOT DEEMED “PROLIFIC”; TRADITIONAL DBH MEASUREMENT PROTOCOLS WOULD APPLY. D IS AN EXAMPLE OF MULTIPLE FORKS ORIGINATING FROM APPROXIMATELY THE SAME AREA. SIMILAR TO PROLIFIC BRANCHING, THE DIAMETER IS TAKEN LOW, AND D IS TREATED AS ONE TREE.	30
FIGURE 12. USING PITH SEPARATION TO DETERMINE DIAMETER LOCATIONS.	31
FIGURE 13. SUMMARY OF WHERE TO MEASURE DIAMETER, DISTANCE AND AZIMUTH ON TREES THAT FORK BELOW 1.0 FOOT (A, B, C) AND TREES THAT FORK ABOVE 1.0 FOOT (D, E, F, G, H, I).	32
FIGURE 14. ONE TREE	33
FIGURE 15. BOTTLENECK TREE.....	33
FIGURE 16. TREE WITH SWELLING	33
FIGURE 17. TREE WITH BRANCH.	33
FIGURE 18. LEANING TREE.....	34
FIGURE 19. ON A SLOPE	34
FIGURE 20. INDEPENDENT TREES GROWN TOGETHER.	34
FIGURE 21. HALF DIAMETER METHOD.....	34
FIGURE 22. TREE ON THE GROUND.....	35
FIGURE 23. DOWN TREE WITH PITH ABOVE THE DUFF.....	35
FIGURE 24. TREE WITH CURVED BOLE (PISTOL BUTT TREE).....	36
FIGURE 25. DOWN TREE WITH PITH BELOW THE DUFF.	36
FIGURE 26. BROKEN TOP SCENARIOS	38
FIGURE 27. EXAMPLES OF AND COMPARISON BETWEEN COMPACTED CROWN RATIO AND UNCOMPACTED LIVE CROWN RATIO OF CONIFERS	40
FIGURE 28. EXAMPLES OF AND COMPARISON BETWEEN COMPACTED CROWN RATIO AND UNCOMPACTED LIVE CROWN RATIO OF WOODLAND SPECIES.....	41
FIGURE 29. EXAMPLES OF CROWN CLASS BY CODE DEFINITIONS (NUMBERS ARE CROWN CLASS CODES)	42
FIGURE 30. DOUGLAS-FIR DECAY CLASS CHARACTERISTICS.....	46

TABLE OF FIGURES

TABLE 1. TYPES OF TREES SAMPLED ON EACH PLOT	5
TABLE 2. FEATURES REMOVED FROM THE PROJECT AREA.....	8
TABLE 4. USE THIS TABLE TO ESTIMATE MISSING BIOMASS.....	44
TABLE 4. DECAY CLASS	46

Chapter 1 Plot Layout and Sampling

Section 1.1 Establishment

Plot locations are assigned in a GIS and uploaded to the cruiser's GPS. The GPS is used to establish the location of plot center in the field.

Section 1.2 Navigation to Plot Center

Before navigating to the plot, cruisers must establish a good satellite connection by allowing the GPS time to connect to satellites while at a favorable location. Do not turn on the GPS under canopy or in a canyon immediately before establishing the plot. Navigate to the plot using the GPS unit. Move towards the plot location until the navigation icon overlaps the plot symbol at the 30-foot zoom level. To avoid biasing the plot location, do not look at the forest on the final approach to the plot center.

Section 1.3 Special Plot Locations

Subsection 1.3.1 HAZARDOUS CONDITIONS

Cruisers may find that the plot location is hazardous due to cliffs, aggressive bees, hostile neighbors, marijuana plantations, high water, or other reasons. Do not attempt to measure a hazardous plot unless properly equipped. Do not offset plots.

The plot header data should be filled out according to the NON-SAMPLED PLOT REASON. If possible, return to the plot when it can be safely measured (e.g. after ice has melted) or with a different crew (e.g. not allergic to bees) or with different equipment (e.g. climbing gear).

Subsection 1.3.2 DENIED ACCESS

When access to the plot is denied by the owner of the only reasonable route to the plot, the plot header data should be filled out according to the NON-SAMPLED PLOT REASON preventing access. Because a denied-access plot can become accessible in the future, it remains in the sample and is re-examined by the project leader to determine if access is available.

Describe the situation in the HEADER NOTE. Include the owner's name and contact information if known.

Subsection 1.3.3 ROADS AND LANDINGS

Plots located on roads or landings are sampled where they lie. Roads and landings are part of the project area in which they fall and are not subtracted from the project acreage. When the plot center is located on an active road surface, mark plot center with a whisker marker rather than rebar.

Subsection 1.3.4 PLOT IS OUTSIDE OF PROJECT AREA

If the plot center is located outside of the project area, rebar is not installed and no tree data is collected. The plot header data should be filled out according to the NON-SAMPLED PLOT REASON and the situation should be thoroughly documented in the HEADER NOTE.

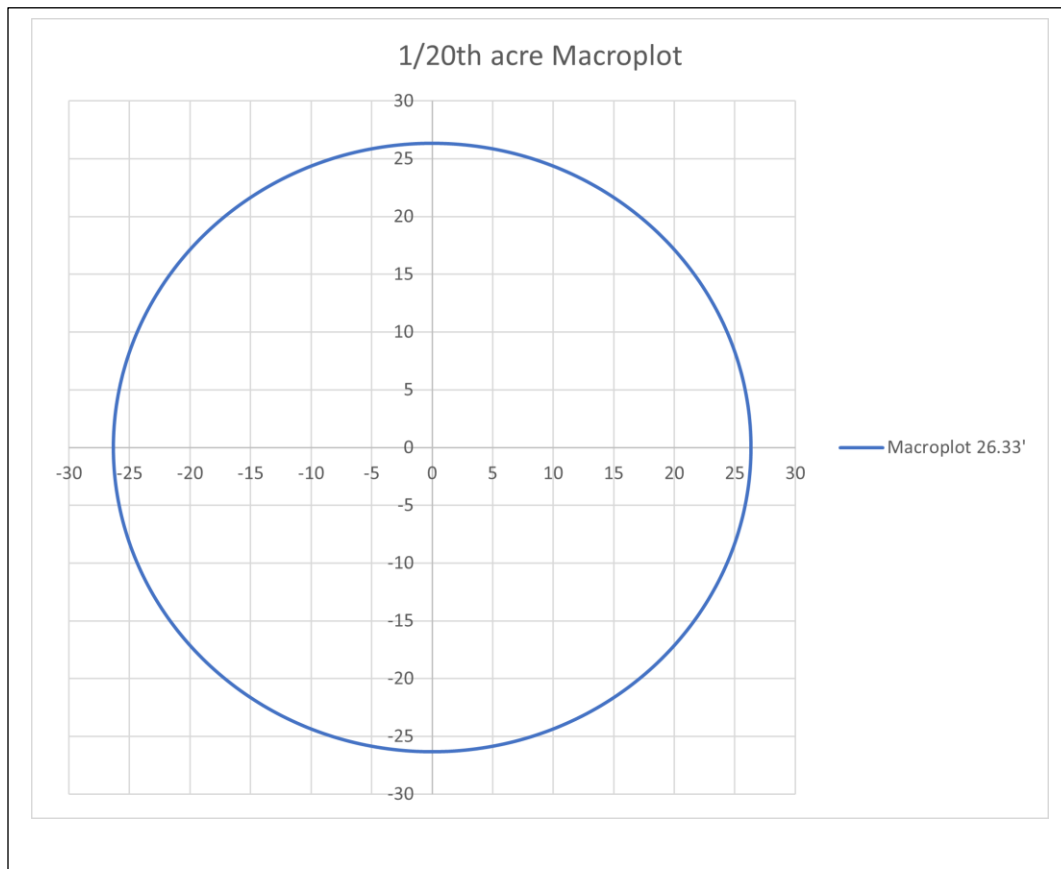
Subsection 1.3.5 STRUCTURES

If a plot center is located where human-built structure(s) are located or is otherwise non-stockable, and the structure(s) or non-stockable ground occupy less than 1 acre of contiguous area, record the plot as PLOT STATUS = 2 with no tree records (an empty or zero plot) and record in the NOTES that it is an empty plot.

Section 1.4 Plot Layout

Plot dimensions are as follows.

	Area (acres)	Area (sq. feet)	Radius (feet)
Macroplot	1/20 th	2,178.0	26.33



Section 1.5 Trees Sampled

TABLE 1. TYPES OF TREES SAMPLED ON EACH PLOT

Tally Trees	Plot		Plot radius
	Macroplot	Live trees ≥ 5.0 inches DBH, ≥ 4.5 feet length	26.33'
	Macroplot	Standing dead trees ≥ 5.0 inches DBH, ≥ 15 ft length, $\leq 45^\circ$ lean.	26.33'

Tree Limiting Dimensions:

breast height	4.5 feet
stump height	1.0 feet
sapling/tree DBH break	5.0 inches Diameter Outside Bark (DOB)

Section 1.6 Units of Measure

Unless otherwise noted, data is recorded in English units.

Section 1.7 Data Recording

Data may be recorded on paper plot sheets, digital Excel versions of the plot sheets, or on hand-held data recording devices that are set up in the same format as the plot sheets. The choice between paper plot sheets or digital recording devices will be made at the beginning of the inventory by the crew leader.

Make sure that the version of the plot sheet being used matches the version of the inventory manual that has been selected for the project. Items in the plot sheets correspond to various sections in the inventory manual and are labeled with the appropriate section numbers for reference. If a particular section does not apply to the plot being sampled, the cruiser may insert a “–” in that cell to indicate that the item was not overlooked by the inventory crew.

Section 1.8 Measurement Tools

Plot radius is measured using a Spencer tape that reads in tenths of feet. Slope is measured with a clinometer or the INC function on the laser rangefinder. DIAMETER is measured with a Spencer tape in tenths of inches. In unusual situations, DIAMETER can be estimated with a Biltmore stick, or as a last resort, visually estimated. Tree length is primarily measured using a laser rangefinder. For trees that are not leaning, the HDHT and VD functions on the laser can be used for TOTAL LENGTH. For leaning trees, the ML and SD function is preferred. Trees that cannot be measured with the laser (e.g. during foggy weather) can be measured using a tape and clinometer.

Section 1.9 Order of Measurements

Tree numbering should start with the first tree right of north and move around the plot clockwise. On remeasured plots, use the previously assigned tree numbers. Missed trees and ingrowth trees (trees that grew over the 5.0-inch threshold on the macroplot) will be assigned the next available tree number and recorded last on the plot sheet. Do not renumber plot trees in order to assign a more “correct” tag number to a missed tree. Numbers assigned to incorrectly included trees will be dropped and not reused.

Section 1.10 Monumenting and Referencing Plot Center

All visited plots are monumented at plot center and referenced by three reference trees/objects.

Decisions regarding the color of the marking paint should be made with the goal of reducing confusion with other marking techniques used on the property, such as those used to mark timber harvests. Final decisions should be made in advance of commencing the inventory in consultation with the project lead and the landowner.

Subsection 1.10.1 PLOT CENTER MONUMENTS

Plot center will be monumented with rebar approximately 30” in length. Approximately 8” shall remain above ground and be marked with a high visibility paint and a colored plastic cap. A piece of flagging with the plot number will be tied near plot center at least 5 feet off the ground (to avoid animal damage).

Subsection 1.10.2 REFERENCE TREES

All sampled plots will have three reference trees/objects referencing plot center.

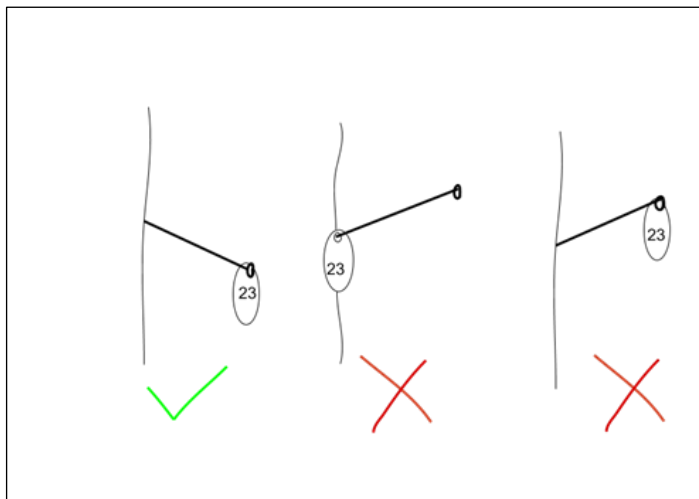
Selecting References: Select three trees/objects near the plot center which form, as closely as possible, a right angle with the plot center. Trees/objects within 20 feet of the plot center are preferable. If live trees ≥ 5.0 DBH are not available, use similarly sturdy objects that have a low likelihood of moving or rapidly decaying. On previously established plots, reuse the previous references unless better trees/objects are available.

Monumenting References: Reference trees will be marked with a nail placed at the base of the tree, facing plot center. A small circle is painted around the nail to increase its visibility. In order to make the plot more visible at a distance, a ring

is painted around the stem of each reference tree at about 6 feet. Reference objects are monumented as appropriate for the object.

Subsection 1.10.3 TREE TAGS

Each tally tree will be marked with a pre-numbered aluminum tree tag nailed at the point of diameter measurement. Tree numbers must be unique within each plot. Nails should be placed at a slight downward angle so that the tag hangs away from the bark of the tree and is not consumed by the tree as it grows.



Section 1.11 Plot Reestablishment

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

- Assign the appropriate present PLOT STATUS and SAMPLE KIND Code(s) to the new plot.
- Assign TREE STATUS = 4 to all trees (i.e., trees tallied at the previous survey).
- Assign RECONCILE codes 3 or 4 (i.e., missed live or missed dead) to all trees on the new plot.
- Assign the next TREE RECORD NUMBER in sequence, starting with the first tree on the new plot.

Search the area for at least 20 minutes before concluding that a plot is lost. It can also help to look at the plot data from the previous measurement for clues like large trees, unique species, or notes about the terrain. If reference trees are found but the rebar is missing, reinstall the rebar using the reference tree distances and azimuths from the previous measurement.

Section 1.12 Walkthrough

If a plot overlaps the project boundary or if the plot center is within a 2x the plot radius of the project boundary, the walkthrough method¹ is applied. Do not offset the plot. If the boundary overlap is greater than 50% (i.e., plot center is over the boundary), the plot is outside the project and is not sampled (PLOT STATUS = 3, NONSAMPLED PLOT REASON = 1).

¹ Ducey, Mark J.; Gove, Jeffrey H.; Valentine, Harry T. 2004. A walkthrough solution to the boundary overlap problem. *Forest Science*. 50(4): 427-435

Where the project boundary is *clearly discernable* in the field, the walkthrough method is used to determine which trees are to be double tallied (WALKTHROUGH = 1). A boundary is considered clearly discernible where;

- a) An abrupt change in vegetation exists which corresponds to a **mapped** project boundary (e.g. forest/non-forest, change in size class, distinct harvest boundary). Use the drip-line of the trees to establish the boundary. A change in tree species does not qualify.
- b) Property line markers are present, such as blazes, a fence, survey markers, or property line flagging.
- c) A feature that has been buffered and removed from the project area (e.g. watercourse buffers) is near the plot. If applicable to the project, the cruiser must identify the location of this type of project boundary in the field by measuring a prescribed distance from the feature (See table below).

If the project boundary is not clearly discernible, the entire plot is sampled and no WALKTHROUGH value is recorded. **Always describe the boundary conditions in the HEADER NOTE**, even if no discernable boundary was found or no walkthrough trees were recorded.

Mark discernible boundaries in the field with pin flags or flagging to facilitate future plot measurement.

Project boundaries often align with roads. Where a project boundary is mapped along a road, use the centerline of the road to identify the boundary in the field.

TABLE 2. FEATURES REMOVED FROM THE PROJECT AREA.

Feature	Buffer Distance
Mapped Class I and II watercourses were buffered and removed from the project area. See inventory maps.	Klamath River Mainstem – 300 feet slope distance Class I – 125 feet slope distance Class II – 75 feet slope distance

Walkthrough Method Implementation

A decision key for field implementation of the walkthrough method. The key is used whenever a tally tree appears close to the boundary (modified from Ducey et al., 2004).

- I. Is it possible that the tallied tree is closer to the boundary, than to the plot center?
 - Ia. NO—No action needed. Tally the tree normally (WALKTHROUGH = 0).
 - Ib. YES—Proceed to II.
- II. Measure the distance from plot center to the tree—call this distance x . Now measure the distance from the tree to the boundary, continuing on the same bearing. Call this distance y . Is y less than x ?
 - IIa NO—No action needed. Tally the tree normally.
 - IIb. YES—Proceed to III.
- III. Does the boundary curve back across the walkthrough line?
 - IIIa. NO—Walkthrough point must be outside the project. Double-tally the tree (WALKTHROUGH = 1).
 - IIIb. YES—Proceed to IV.
- IV. Move to the walkthrough point, so that the distance to the tree equals the previously measured distance x along the same bearing, or to a point where that location can be clearly identified. Is the walkthrough point inside the project area?
 - IVa. NO—Double-tally the object (WALKTHROUGH = 1).
 - IVb. YES—Tally the object normally.

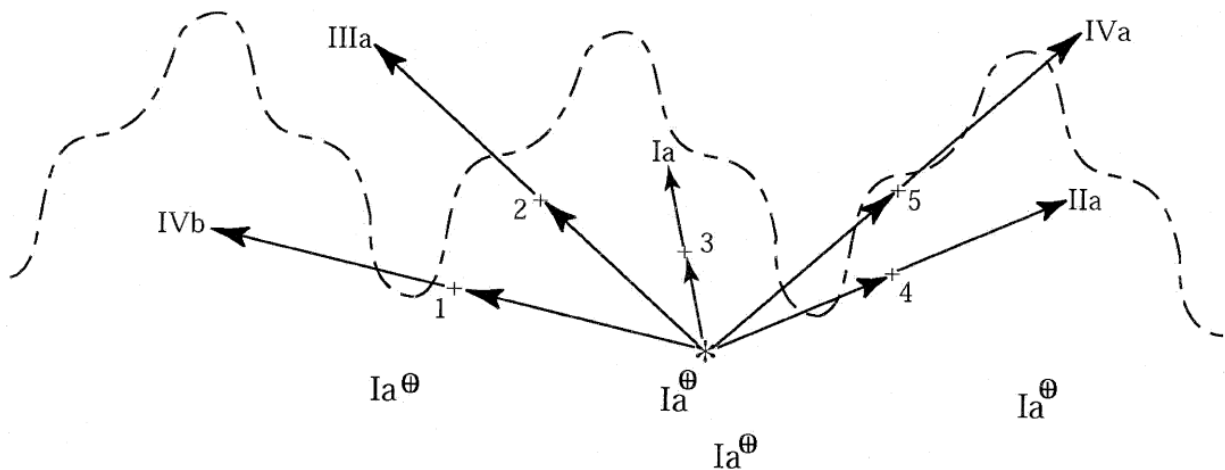


FIGURE 1. ILLUSTRATION OF WALKTHROUGH METHOD FROM DUCEY ET AL., 2004. FIVE SAMPLE OBJECTS (+), LYING CLOSE TO THE BOUNDARY HAVE BEEN TALLIED FROM PLOT CENTER (*). THE ARROWS INDICATE THE LAYOUT OF THE WALKTHROUGH POINTS FOR EACH OBJECT; THE OUTCOME ON THE DECISION KEY IS INDICATED FOR EACH WALKTHROUGH POINT. TREES 1, 3, AND 4 ARE TALLIED NORMALLY; TREES 2 AND 5 ARE DOUBLE-TALLIED (WALKTHROUGH = 1). FOUR TREES (⊕) LIE "CLOSE TO THE BOUNDARY" BUT IN POSITIONS WHERE THEY WOULD BE SINGLE-TALLIED AND NO WALKTHROUGH MEASUREMENTS WOULD BE NEEDED.

Chapter 2 Plot Level Data

Plot attributes in this chapter record information about the plot location and the field crew visit. This information aids future crews in plot relocation, sets up date and inventory cycle information, and makes it possible to analyze the relationship of plot data to other mapped data (e.g., rivers).

Section 2.1 Plot Number

Record the identification number, unique for each plot and assigned by the GIS analysis.

When collected:	All plots
Field width:	3 digits

Section 2.2 Plot Status

Record the code that describes the sampling status of the plot.

When collected:	All plots	
Field width:	1 digit	
Units:	feet	
Values:	Code	Definition
	1	Sampled – at least one tree greater than or equal to 5" DBH on plot
	2	Sampled – no trees greater than or equal to 5" DBH on plot
	3	Nonsampled –plot is not sampled for one of the reasons listed in PLOT NONSAMPLED REASON

Section 2.3 Plot Non-Sampled Reason

Applies when any part of the plot containing trees could not be sampled, record one of the following reasons.

When collected:	When PLOT STATUS = 3	
Field width:	2 digits	
Values:	Code	Definition
	1	Outside project boundary – Plot center is outside of the project boundary
	2	Denied access – Access to the plot is denied 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 by the project leader to determine if access is available.
	3	Hazardous –Plot cannot be accessed because of a hazard or danger, for example cliffs, aggressive bees, hostile neighbors, marijuana plantations, high water, etc. Although most hazards will not change over time, a hazardous plot remains in the sample and is re-examined by the project leader to determine if the hazard can be addressed.
	6	Lost plot –Plot cannot be found. Whenever this code is assigned, a replacement plot is required. The plot that is lost is assigned SAMPLE KIND = 2 and NONSAMPLED REASON = 6. The replacement plot is assigned SAMPLE KIND = 3.

	7	Wrong location – Previous plot can be found, but its placement is beyond the tolerance limits for plot location. Whenever this code is assigned, a replacement plot is required. The plot being relocated is assigned SAMPLE KIND = 2 and NONSAMPLED REASON = 7. Its replacement plot is assigned SAMPLE KIND = 3.
	9	Dropped intensified plot - Intensified plot dropped due to a change in grid density. This code is for office use only.
	10	Other –Plot not sampled due to a reason other than one of the specific reasons already listed. A field note is required to describe the situation.

Section 2.4 Sample Kind

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

When collected:	All plots	
Field width:	1 digit	
Values:	Code	Definition
	1	Initial plot establishment - the initial establishment and sampling of a project plot.
	2	Remeasurement – remeasurement of a project plot that was sampled at the previous inventory.
	3	Replacement plot - a replacement plot for a previously established plot.

Section 2.5 Field Guide Version

Record the version number of the Forest Carbon Inventory Methodology 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:	3 digits (xx.y)	
Values:	Code	Definition
		See version found on cover page.

Section 2.6 Current Date

Record the year, month, and day that the current plot visit was completed (YYYYMMDD).

When collected:	All plots	
Field width:	8 digits (YYYYMMDD)	
Values:	Code	Definition
		Date that the current plot visit was completed

Section 2.7 Declination

Record the azimuth correction used to adjust magnetic north to true north with a compass. This adjustment is made in the field by setting the declination for the plot to “East declination” on the compass. All azimuths are assumed to be true azimuths unless otherwise designated. This field carries a decimal place because the USGS corrections are provided to the nearest half degree. DECLINATION = (true north - magnetic north).

When collected:	All plots
Field width:	4 digits including sign (+xx.y)
Units:	degrees
Values:	+/- 50

Section 2.8 QA Status

Record the code to indicate the type of plot data collected.

When collected:	All plots	
Field width:	1 digit	
Values:	Code	Definition
	1	Standard production plot
	2	Check plot

Section 2.9 Crew Initials

Record crew initials, separated by commas. When more than one cruiser is listed, the first initials will be considered the crew leader and is responsible for any discrepancies identified during check cruising.

When collected:	All plots
Field width:	unlimited

Section 2.10 Plot Slope

Record the angle of slope across the plot to the nearest 1 percent. PLOT SLOPE is determined by sighting the clinometer along a line parallel to the average incline (or decline) of each plot. This angle is measured along the shortest pathway down slope before the drainage direction changes.

- If slope changes gradually across the plot, record an average slope.
- If slope changes across the plot but the slope is predominantly of one direction, code the predominant slope percentage rather than the average.
- If the plot falls directly on or straddles a canyon bottom or narrow ridge top, code the average slope of the side hill(s).
- If the plot 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 sampled plots
Field width:	3 digits
Units:	percent
Values:	000 to 155

Section 2.11 Plot Aspect

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

- If aspect changes gradually across the plot, record an average aspect.
- If aspect changes across the plot but the aspect is predominately of one direction, code the predominate direction rather than the average.
- If the plot falls on or straddles a canyon bottom or narrow ridge top, code the aspect of the ridge line or canyon bottom.
- If the plot 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 sampled plots	
Field width:	3 digits	
Units:	degrees	
Values:	Code	Definition
	000	no aspect, slope < 5 percent
	001	1 degree
	002	2 degrees
	...	
	360	360 degrees, due north

Section 2.12 Elevation

A global positioning system (GPS) unit is used to determine the elevation and GPS error of all field-visited plot locations.

Record the elevation above mean sea level of the plot center, in feet, as displayed by the GPS.

When collected:	All sampled plots
Field width:	6 digits
Units:	feet
Values:	-00100 to +20000

Section 2.13 Distance to Project Boundary

Record the horizontal distance from the plot center to the project boundary whenever the distance from plot center to the project boundary is less than or equal to 2x the plot radius, whether or not walkthrough trees were recorded on the plot.

When collected:	All plots where the distance to a project boundary in the field is less than or equal to 2x the plot radius.
Field width:	4 digits
Units:	feet
Values:	0 to 52.66

Section 2.14 Water Protection Condition

Record whether the plot center falls within 125 feet slope distance of a mapped Class I or Class II watercourse or lake. Refer to inventory maps for watercourse locations and classifications. This field is used for tracking plots that are near watercourse buffers.

When collected:	All sampled plots	
Field width:	1 digit	
Units:	feet	
Values:	Code	Definition
	NULL	Plot is not located within 125 feet of a Class I, Class II-L, or Class II-S watercourse
	1	Plot is located within 125 feet of a Class I, Class II-L, or Class II-S watercourse
	2	Not possible to determine (record reason in PLOT NOTES)

Section 2.15 Distance to Water

Where WATER PROTECTION CONDITION = 1 or 2, record the slope distance from the plot center to the watercourse or lake transition line.

When collected:	All sampled plots
Field width:	3 digits
Units:	Feet
Values:	000 to 125

Section 2.16 Regeneration Status

Record the code that best describes any artificial regeneration in the area visible from the plot. For an area to be classified as artificially regenerated, it 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 leave the field blank. Plot records or verbal evidence from landowner is acceptable for determining regeneration status.

When collected:	All sampled plots	
Field width:	1 digit	
Units:	feet	
Values:	Code	Definition
	NULL	Natural - Present stand shows no clear evidence of artificial
	1	Artificial - Present stand shows clear evidence of artificial

Section 2.17 Artificial Regeneration Species

Record the species code of the predominant tree species for which evidence exists of artificial regeneration in the stand.

When collected:	All sampled plots with evidence of artificial regeneration (REGENERATION STATUS = 1)
Field width:	3 digits
Values:	See species list at end of manual

Section 2.18 Disturbance

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 from most important to least important.

For initial plot establishment (SAMPLE KIND =1 or 3), the disturbance must be within the last 5 years. For remeasured plots (SAMPLE KIND =2) recognize only those disturbances that have occurred since the previous inventory.

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 land and/or vegetation, but initially may not affect vegetation 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.

Use the general disturbance codes (i.e., 10, 20, etc.) only if one of the more specific codes (i.e., 41, 42, etc.) does not apply. When coding fire (30), it is important to distinguish ground fire (31) from crown fire (32) where possible. Leave blank if no DISTURBANCE is observed.⁸

If more than one disturbance has occurred, record additional disturbances under HEADER NOTE.

When collected:	All sampled plots		
Field width:	2 digits		
Values:	Code	Disturbance	Definition
	NULL	None	no observable disturbance
	10	Insect	
		11	Insect damage to understory vegetation
		12	Insect damage to trees, including seedlings and saplings
	20	Disease	
		21	Disease damage to understory vegetation
		22	Disease damage to trees, including seedlings and saplings
	30	Fire	Crown or ground fire, either prescribed or natural
		31	Ground fire
		32	Crown fire
	40	Animal	
		41	Beaver (includes flooding caused by beaver)
		42	Porcupine
		43	Deer/ungulate
		44	Bear

		45	Rabbit
		46	Domestic animal/livestock (includes grazing)
	50	Weather	
		51	Ice
		52	Wind (includes hurricane, tornado)
		53	Flooding (weather induced)
		54	Drought
	60	Vegetation	Suppression, competition, vines
	70	Unknown/not sure/other	Describe in HEADER NOTE
	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 HEADER NOTE to describe further.
	90	Geologic disturbances	
		91	Landslide
		92	Avalanche track
		93	Volcanic blast zone
		94	Other geologic event
		95	Earth movement/avalanches

Section 2.19 Disturbance Year

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

When collected:	When DISTURBANCE is not NULL
Field width:	4 digits
Values:	Since the previous plot visit, or the past 5 years for plots visited for the first time; 9999

Section 2.20 Treatment

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 applied. 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 from most important to least important as best as can be determined.

For initial plot establishment (SAMPLE KIND = 1 or 3), the treatment must be within the last 5 years. For remeasured plots (SAMPLE KIND = 2) recognize only those treatments that have occurred since the previous inventory.

When collected:	All sampled plots	
Field width:	2 digits	
Values:	Code	Definition
	NULL	None - No observable treatment.
	10	Cutting - The removal of one or more trees from a stand.
	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 woodlands to encourage wildlife forage.

Section 2.21 Treatment Year

Record the year in which the TREATMENT occurred. If more than one treatment has occurred, record additional treatments under HEADER NOTE.

When collected:	When TREATMENT is not NULL
Field width:	4 digits
Values:	Within the past five years for plots visited for the first time. For remeasurement plots, any year since the previous inventory.

Section 2.22 Header Note

Use this field to record notes pertaining to the plot.

When collected:	All sampled plots
Field width:	Unlimited alphanumeric character field
Values:	English language words, phrases, and numbers

Section 2.23 Reference Tree Data

All sampled plots will have three reference trees/objects referencing plot center.

Selecting References: Select three trees/objects near the plot center which form, as closely as possible, a right angle with the plot center. Trees/objects within 20 feet of the plot center are preferable. If live trees ≥ 5.0 DBH are not available, use similarly sturdy objects that have a low likelihood of moving or rapidly decaying. On previously established plots, reuse the previous references unless better trees/objects are available.

Monumenting References: Reference trees will be marked with a nail placed at the base of the tree, facing plot center. A small circle is painted around the nail to increase its visibility. In order to make the plot more visible at a distance, a ring is painted around the stem of each reference tree at about 6 feet. Reference objects are monumented as appropriate for the object.

During plot re-measurement, if a plot center cannot be relocated, cruisers will use the reference tree azimuths and distances to reestablish plot center.

Subsection 2.23.1 REFERENCE TREE TAG NUMBER

Record TREE TAG NUMBER of reference trees. If a non-tally tree or object is used, write a short description (e.g. rock, stump, 4" white fir).

When collected:	All sampled plots
Field width:	4 digits, or short description
Values:	tree tag number or short description of tree/object

Subsection 2.23.2 SLOPE DISTANCE

Record the measured SLOPE DISTANCE, to the nearest 0.1 foot, from the plot center to the reference tree nail. If possible, move obstructions such as branches and rocks to allow a straight-line measurement. If obstructions are not movable, place the reference tree nail higher on the tree.

When collected:	All sampled plots
Field width:	3 digits (xx.y)
Units:	Feet
Values:	000 to 999

Subsection 2.23.3 AZIMUTH

For each reference tree record the AZIMUTH from the plot center to the reference tree nail. When taking the azimuth, stand behind the plot center at a sufficient distance to align plot center and the reference tree in the compass sighting notch or hole. Record AZIMUTH to the nearest degree. Use 360 for north.

When collected:	All sampled plots
Field width:	3 digits (xxx)
Units:	degrees
Values:	000 to 360

Chapter 3 Tree Data

This chapter describes how and where to tally live trees, standing dead trees (snags). Determining which measurements are required is based on tree size and tree status. Tree data yield information on tree volume, growth, mortality, and removals; wildlife habitats; forest structure and composition; biomass; and carbon sequestration.

Live and standing dead trees at least 5.0 inches in diameter are sampled within the macroplot.

Begin tallying trees at an azimuth of 001 degrees from plot center and continue clockwise around the plot. Saplings that are between 4.7" and 4.9" DBH should be marked with a paint stripe at DBH. This helps future cruisers determine whether the tree grew into the plot or was missed during the previous inventory.

Section 3.1 Definitions

Live tree: Trees are alive if they have any living parts (leaves, buds, cambium) at or above the point of diameter measurement. Trees that have been temporarily defoliated are still alive.

Tally tree: 'Tally trees' are defined as all live and standing dead trees encountered on the plot the first time a plot is established, and all trees that grow into a plot thereafter.

Standing dead: To qualify as a standing dead tally tree, dead trees must be ≥ 5.0 inches in diameter, have a bole which has an unbroken TRUNCATED LENGTH of at least 15.0 feet, and lean less than 45 degrees from vertical as measured from the base of the tree to the tip, or the highest point on the tree if it is irregularly shaped. "Unbroken" is defined as having a stem that is at least 50 percent attached to the original source of growth. Portions of boles on dead trees that are separated greater than 50 percent (either above or below 15.0 feet), are not included in the TRUNCATED LENGTH measurement.

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

Once tallied, dead trees 5.0 inches and greater 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 ocularly.

Section 3.2 Borderline Trees

Trees are selected for tally (measurement) only when the horizontal distance from the plot center to the center of the bole at ground level is less than or equal to the radius of the plot. Borderline trees should have a vertical stripe painted on the side of the tree to mark the "center at base". Cruisers have the option of adding a nail to mark the center at base. The TREE NOTE should, at a minimum, include the slope distance and slope of the tape used to measure and calculate the horizontal distance of the borderline tree. Any other notes which make the calculation repeatable should be included.

Trees must be selected for tally within the appropriate fixed-radius area without error. The measurement tolerance for the horizontal distance between the plot center and the borderline tree is ± 0.2 ft in regular measurement conditions and ± 0.5 ft in extreme/unusual situations.

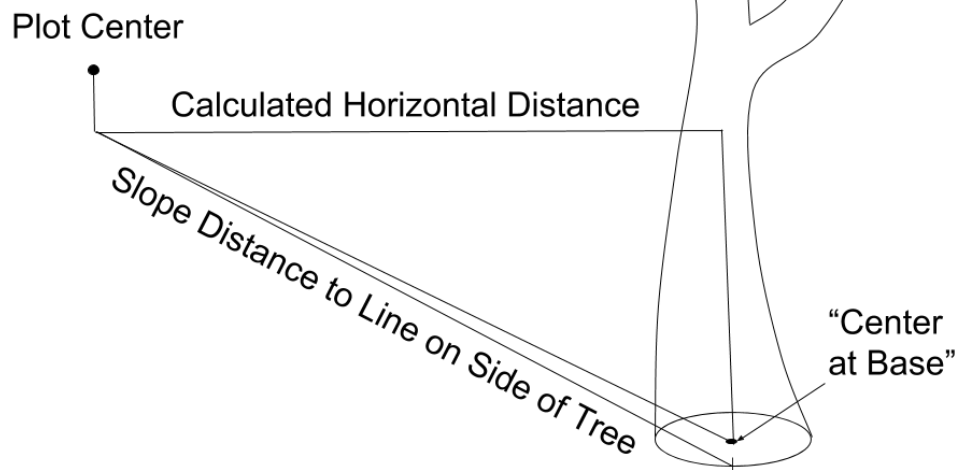


FIGURE 2. CALCULATING HORIZONTAL DISTANCE

Section 3.3 Tree Tracking

Subsection 3.3.1 TAG NUMBER

Record a code to identify each tree uniquely and permanently on a given plot. The TAG NUMBER must be unique within a plot – being unique is more important than being sequential. Work clockwise from azimuth 001 to 360 and work outwards from plot center to plot perimeter. On remeasured plots, use the previously assigned tree number. Missed trees and ingrowth trees (trees that grew over the 5.0-inch threshold on the plot) will be assigned the next available tree number and recorded last on the plot sheet. Do not renumber plot trees to assign a more “correct” tag number to a missed tree. Numbers assigned to incorrectly included trees will be dropped and not reused.

When collected:	All live and standing dead tally trees ≥ 5.0 inches DBH
Field width:	3 digits (xxx)
Values:	001 to 999

Subsection 3.3.2 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 the tree’s volume to the proper component of volume change.

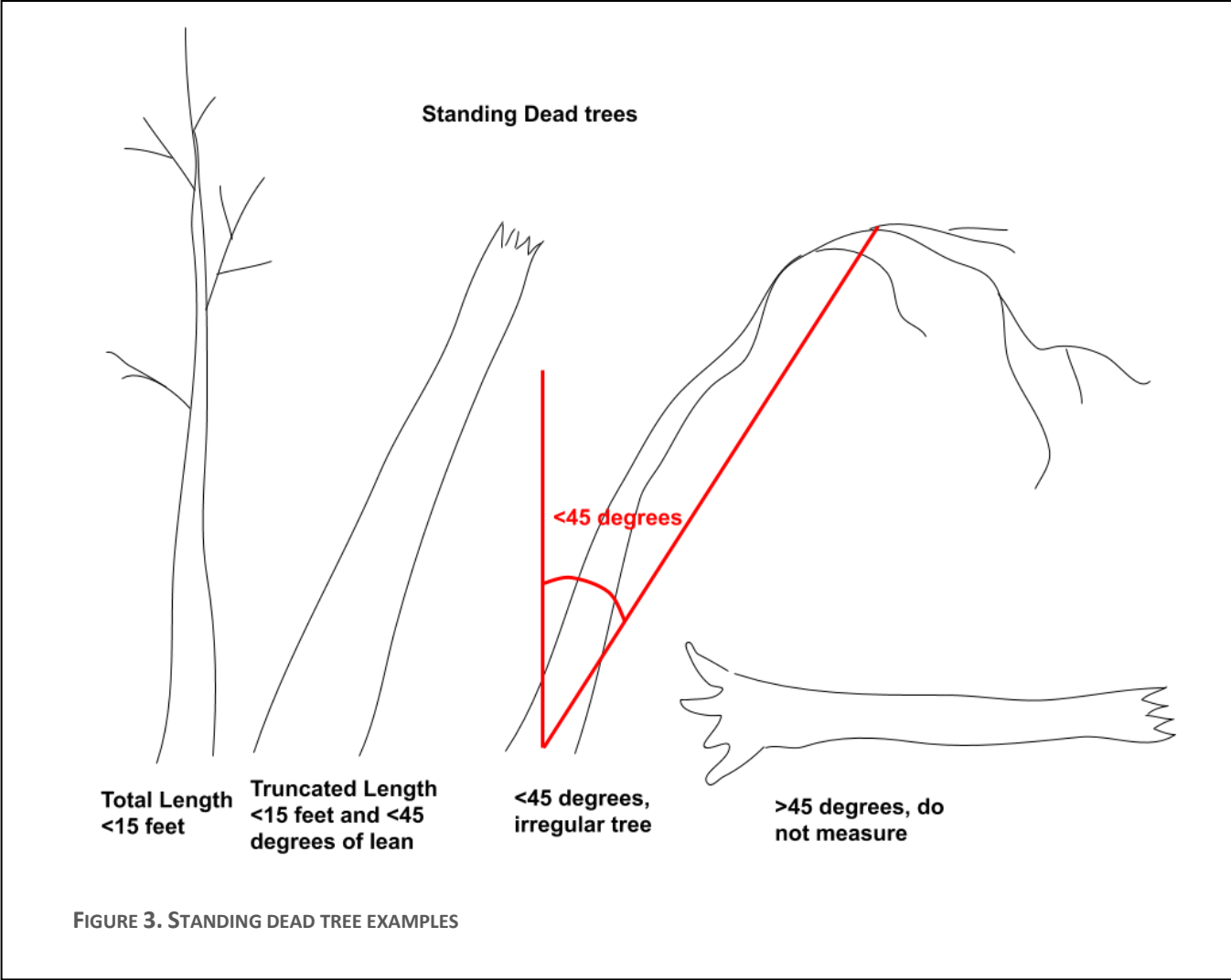
Special instructions for the 2021 inventory: Trees that are coded PRESENT TREE STATUS = 4 due to the changed plot radius (that is, trees outside the 20th acre plot) should also be coded PRESENT TREE STATUS = 2 if the tree died since the initial inventory. These data will be used to inform modeled mortality rates.

When collected:	All tallied trees.		
Field width:	1 digit		
Values:	Code	Tree Status	Definition
	1	Live Tree	Any standing live tree (new, remeasured or ingrowth)
	2	Dead Tree	Any standing dead tree (new, remeasured, or ingrowth), regardless of cause of death.
	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.
	4	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. Requires RECONCILE code = 5-9.
	5	Live - Herbicide	A live tree that has been treated with herbicide. Usually this is evident from hack marks in the trunk. Do not confuse with sudden oak death. Dead trees that have been treated with herbicide are coded as usual (PRESENT TREE STATUS = 2).

To qualify as a standing dead tally tree, dead trees must be ≥ 5.0 inches in diameter, have a bole which has an unbroken TRUNCATED LENGTH of at least 15.0 feet, and lean less than 45 degrees from vertical as measured from the base of the tree to the tip, or the highest point on the tree if it is irregularly shaped. See illustration below for example.

Note: "Unbroken" is defined as at least 50 percent attached to the original source of growth. Portions of boles on dead trees that are separated greater than 50 percent (either above or below 15.0 feet), are not included in the TRUNCATED LENGTH measurement.

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



Subsection 3.3.3 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 = 4). 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.

Code 5 is used to indicate live trees that shrink below the diameter threshold on the plot. For example, if a live remeasurement tree shrinks below 5.0 inches DBH, then record the following combination of codes: PREVIOUS TREE STATUS = 1, PRESENT TREE STATUS = 4, RECONCILE = 5.

Use the tree coding guide in Appendix B to determine the coding criteria for remeasurement trees.

When collected:	All live and standing dead tally trees ≥ 5.0 inches DBH		
Field width:	1 digit		
Values:	Code	Definition	
	1	N/A	N/A

Codes 2-4 are valid for new trees on the plot	2	Ingrowth	A new tally tree 5.0 inches DBH and larger, within the macroplot, which was not missed at the previous inventory.
	3	Missed live	A live tree missed at previous inventory and that is live or dead now. Includes currently tallied trees on previously nonsampled plots.
	4	Missed dead	A dead tree missed at previous inventory that is dead now. Includes currently tallied trees on previously nonsampled plots.
Codes 5-9 are valid for remeasured trees that no longer qualify as tally	5	Shrank	Live tree that shrank below threshold diameter.
	6	Moved	A tree was correctly tallied in previous inventory but has now moved beyond the radius of the plot due to natural causes (e.g., small earth movement, hurricane) or is now a dead tree leaning greater than 45 degrees from vertical.
	7	Cruiser error	Erroneously tallied at previous inventory.
	8	Procedural change	Tree was tallied at the previous inventory but is no longer tallied due to a definition or procedural change.
	9	Sampled before	Tree was sampled before, but now the area where the tree was located is nonsampled. All trees on the nonsampled area have RECONCILE = 9.

Section 3.4 Species

Record the appropriate SPECIES code from the list in Appendix 3. If the species cannot be determined in the field, tally the tree, but bring branch samples, foliage, cones, flowers, bark, etc. to the supervisor for identification. If possible, collect samples outside the plots 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 live and standing dead tally trees $\geq$ 5.0 inches DBH
Field width:	3 digits (xxx)
Values:	See Appendix A

Section 3.5 Diameter

Unless one of the special situations listed below is encountered, measure diameter (DBH) at 4.5 feet above the ground line (i.e. surface of the duff layer) on the uphill side of the tree. Readily movable objects such as branches should be moved to reach the ground. If obstructions cannot be moved, measure from the side of the tree or the top of the obstruction.

Round each measurement down to the last 0.1 inch. For example, a reading of 3.68 inches is recorded as 3.6 inches. Pull the diameter tape tight, but not so tight that it squeezes the bark.

Subsection 3.5.1 MARKING CURRENT DIAMETER

In order to accurately remeasure diameter at the same point on the tree bole at successive visits, cruisers shall mark the point of measurement with an aluminum nail and tag. When marking trees for the first time, measure the diameter after the nail and tag is in place. Use caution to avoid damaging trees while clearing branches. Do not nail trees less than 5.0-inches in diameter, or species vulnerable to introduction of pathogens (e.g., aspen). Do not penetrate the cambium if scribing the bark. **Moss should be removed before measuring DBH.**

Subsection 3.5.2 DIAMETER AT BREAST HEIGHT

Remeasurement

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:

- a) not physically possible (e.g., tree buried by mudslide),
- b) there is an abnormality at the previous DIAMETER measurement point that makes the diameter grossly incorrect,
- c) or the previous location is more than 6 inches beyond where the diameter should be measured according to current protocols (either because protocols have changed, or the previous crew made a mistake).

Previous diameter measurement locations should not be moved due to the loss or addition of a forked stem. Assign the appropriate DIAMETER CHECK code whenever the point of measurement is moved.

Remember we are looking for 'Growth Over Time'. When determining if the location should be moved, if there is some type of damage or abnormality in the location of the current DBH, take into consideration how the tree will grow in the future. If the location appears that it will continue to grow at the same normal rate as the rest of the bole, then it makes more sense to leave the DBH in the current location. If there is excessive swelling, potential for excessive swelling, or a major reduction of the current DBH, it might warrant the DBH to be moved.

When determining if the DBH needs to be moved on a forked tree in relation to the pith location, err on the side of giving the previous crew the benefit of the doubt. Often times, moving a DBH on a forked tree will result in a tree being added or dropped - this is a major adjustment in the estimates that get reported. If the previous crew's call was borderline and could possibly go either way, then it should be left as is. If the previous crew clearly made a mistake in applying the forking rules, make the correction to ensure future measurements are correct.

For remeasurement trees, initially attempt to measure DBH at the same location the previous crew measured. If a gross deformity is present at that location, begin to move up the bole for a suitable location that will remain normal over time and where an average-height crewmember can access. If there is not a suitable location above, then move below 4.5 feet for a suitable location. If that fails as well, the last resort is to estimate DBH at a location that will best represent the tree volume.

Record a TREE NOTE if the previous DBH location is:

- 1. poor but was left as-is for consistency.
- 2. moved because previous location was egregiously incorrect.

Remeasurement of forked trees

When remeasuring forked trees where multiple trees are recorded, attempt to measure each DBH at the same location the previous crew measured. If a gross deformity is present at that location or the crotch has fused, attempt to move the

DBH up to an accessible location. Attempt to ensure a new location will be accessible in future measurement cycles. If the location must be moved and it is predicted that the crotch will fuse within the next cycle, use the one-half diameter method ([FIGURE 21](#)) or estimate the DBH at a location that will best represent the tree volume.

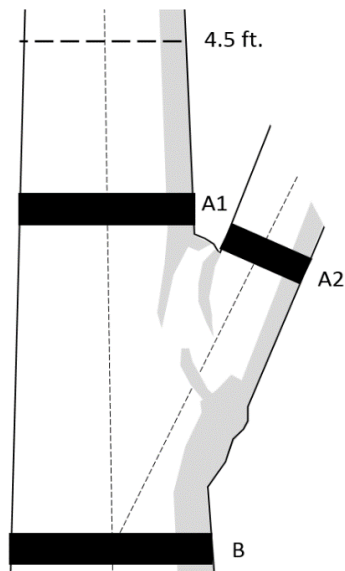
If at the previous visit a forked tree was recorded as two separate trees but should have been recorded as one tree, give one of the tree data lines a PRESENT TREE STATUS = 4, RECONCILE = 7 or 8, and a TREE NOTE. The remaining tree data line receives PRESENT TREE STATUS = 1 or 2 with DIAMETER CHECK = 2, and a TREE NOTE.

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 missed tree. Use the existing tree data line to represent one of the stems. PRESENT TREE STATUS = 1 or 2, DIAMETER CHECK = 2, and a TREE NOTE. The second stem would get PRESENT TREE STATUS = 1 or 2, RECONCILE 3 or 4, and a TREE NOTE.

Note: The current crew should not correct for subjective differences in interpretation of forked trees; i.e., only gross errors made by the previous crew should be corrected. If in doubt, use the previous crew's interpretation of the forked trees.

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 at the point of attachment, measured just above the branch collar, and must branch out from the main stem at an angle of 45 degrees or less. AND must be judged to have or have the potential to assume an obvious “tree like” form and function as opposed to an obvious “branch like” form and function. If there is any doubt as to the form and function of a potential fork, consider it a fork instead of a branch. 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. Diameter measurement is to be taken 3.5 feet above the pith intersection or as close to 3.5 feet that can be reasonably reached and remeasured by the next crew.

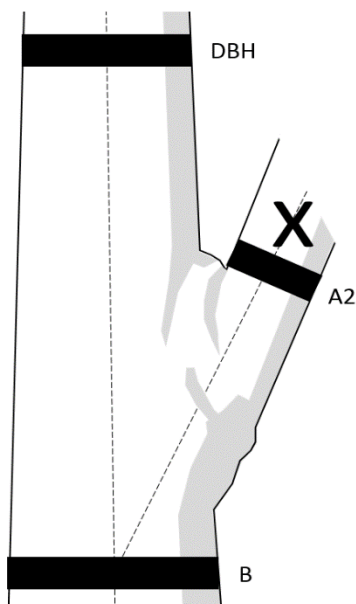


A1, A2 and B represent diameter locations for determining if minimum diameter ratios are met. Diameter ratios are met if:

$$\frac{A1}{B} \geq \frac{1}{3}$$

$$\frac{A2}{B} \geq \frac{1}{3}$$

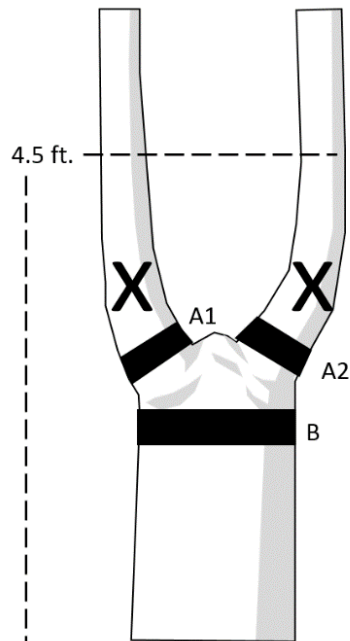
FIGURE 4. DETERMINING DIAMETER RATIO OF FORKS. WHEN DETERMINING IF A FORK MEETS THE 1/3 DIAMETER REQUIREMENT FOR QUALIFYING AS A FORK, THE DIAMETER OF THE POTENTIAL FORK TAKEN AT LOCATIONS A1 AND A2 MUST BE 1/3 OF THE DIAMETER AT LOCATION B.



If one of the potential forks is less than 1/3 the diameter at B, then no fork exists and the diameter would be placed at 4.5 feet from the ground on the qualifying stem.

$$\frac{A2}{B} < \frac{1}{3}$$

FIGURE 5. A SINGLE NON-QUALIFYING FORK. IF ONE OF THE FORKS DOES NOT MEET THE MINIMUM RATIO, THEN NO FORK EXISTS AND THE DIAMETER IS PLACED AT THE NORMAL LOCATION ON THE DOMINANT STEM.



If neither stem above a fork meets the minimum 1/3 diameter requirement, neither stem is tallied.

$$\frac{A1}{B} < \frac{1}{3}$$

$$\frac{A2}{B} < \frac{1}{3}$$

FIGURE 6. TWO NON-QUALIFYING STEMS. IF NEITHER STEM MEETS THE 1/3 DIAMETER REQUIREMENT, NEITHER IS TALLIED. THIS IS OFTEN ASSOCIATED WITH BROKEN TOPS AND IS CONSISTENT WITH THE POINT AT WHICH A STEM IS CONSIDERED RECOVERED FROM A BREAK.

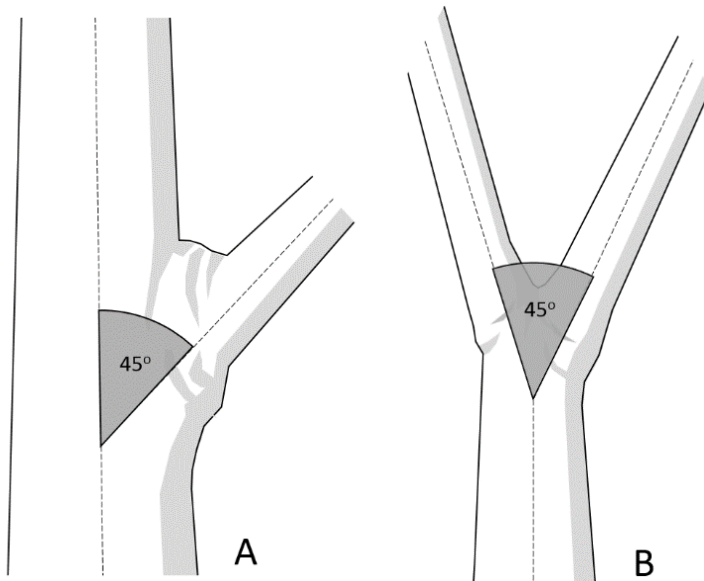


FIGURE 7. FORKING ANGLE. IN ORDER TO QUALIFY AS A FORK, THE PITHS MUST DIVERGE AT AN ANGLE NOT EXCEEDING 45 DEGREES FROM THE MAIN STEM (A). IN CASES WHERE THERE IS NO OBVIOUS MAIN STEM (B), CONSIDER THE ANGLE OF PITH SEPARATION BETWEEN THE TWO STEMS.

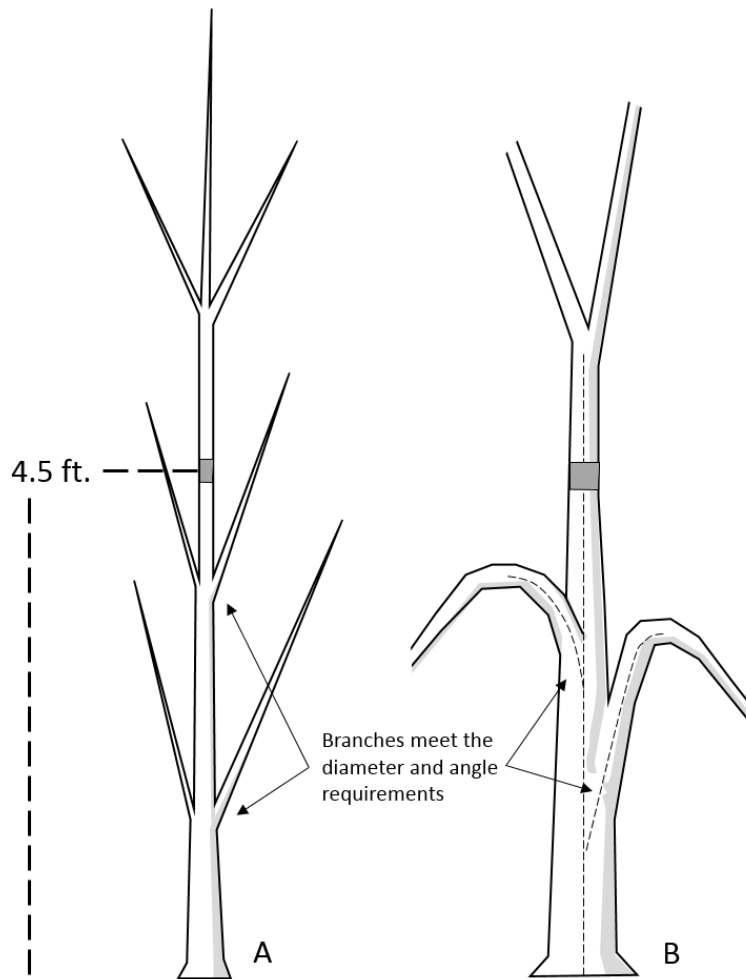
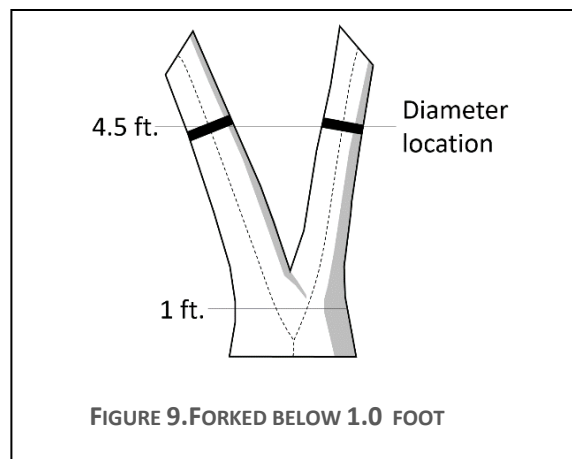


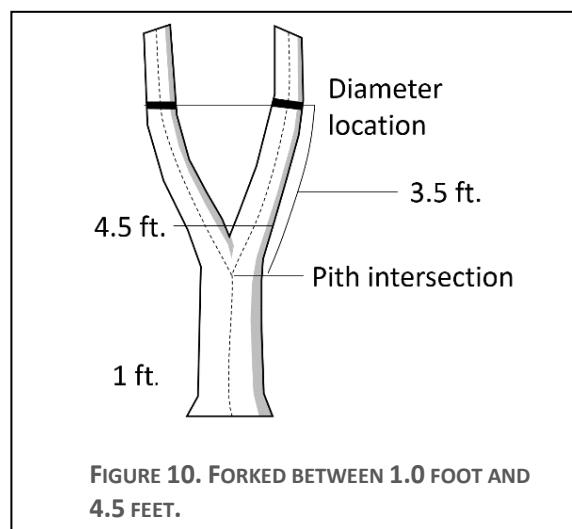
FIGURE 8. FORKS THAT HAVE BRANCH-LIKE FORM AND FUNCTION, LEADING TO THE TALLY OF A SINGLE TREE INSTEAD OF MULTIPLE TREES.

In example A, although the potential fork is currently $\frac{1}{3}$ the diameter of the main bole and is within 45 degrees of the main bole at the point of attachment, it appears to be serving as a branch as opposed to an additional independent tree. In addition, as the main bole continues to grow, the “branch” may reach the point where it is no longer $\frac{1}{3}$ the main bole, dropping out of the inventory based on definition. Such potential forks would be ignored and the main bole would be tallied as a single tree with diameter measured at 4.5 feet. The tree is evaluated at each future visit and tallied following standard remeasurement procedures. In example B, although the potential fork is $\frac{1}{3}$ the diameter of the main bole and is within 45 degrees of the main bole at point of attachment, it deviates drastically beyond 45 degrees about 1 inch from the main bole, taking on the form and function of a branch. This should be tallied as a single tree with diameter measured at 4.5 feet.

2. Trees forked below 1.0 foot. Trees forked below 1.0 foot are treated as distinctly separate trees (**FIGURE 9**). 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 plot 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 13 F-I**), the rules in the next paragraph apply.



3. Trees forked between 1.0 foot and 4.5 feet. Trees forked between 1.0 foot and 4.5 feet are also counted as separate trees (**FIGURE 10**), 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.



4. When forks originate from pith intersections between 1.0 and 4.5 feet, the limiting distance is the same point for all forks--they are either all on, or all off the plot.
5. 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.
6. A tree can only fork once. Following are specific procedures to secondary forking: 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 (or potential forks) that may occur on that stem. Secondary forks need only meet the 1/3 diameter and 45-degree requirements to be considered forks; they do not need to be tree-like. When such secondary forks are encountered, measure/estimate the diameter of such stems at the most repeatable location below stem separation but above the **first** pith separation (**FIGURE 13 F-I**) while attempting to avoid measuring double piths (**FIGURE 20**) where possible (i.e., do not move the point of diameter the entire 3.5 feet above the first fork).
7. **Measure Low Approach:** Crews may encounter trees of any species displaying growth forms with multiple forks that make applying traditional forking rules very difficult. In some instances, these growth forms are species specific and in others they are the result of either the immediate growing conditions or the fact that the trees have been bred, pruned, or managed in a way that promotes multiple stems resulting in a specific crown shape. In cases where such multiple forks all originate from approximately the same point on the main stem, follow the **Measure Low Approach**, where the diameter is taken at the highest, most repeatable location between the 1-foot stump and initial pith separation. This approach is applicable in instances where any of the following are present between the 1-foot stump and DBH (4.5 feet):
 - a. Multiple forks (**FIGURE 11 - D**).
 - b. Prolific branching originating from approximately the same location that prevents accurate and repeatable diameter (**FIGURE 11 - A AND B**). Prolific branching, as defined here, are those trees that often lack a defined main

stem and/or qualifying forks, and take on a bushy appearance as the lower bole splits out into multiple branches at or below 4.5 feet. This is a rare situation that should not be confused with normal branching patterns that allow for accurate diameter placement (**FIGURE 11 - C**).

- c. Any combination of multiple forks (≥ 3) and prolific branching originating at approximately the same location.
- d. The stems of a forked tree are grown together in such a fashion that an accurate DBH cannot be measured or estimated due to deformation resulting from the presence of the above mentioned criteria (**FIGURE 20**).



FIGURE 11. BOTH A AND B ARE EXAMPLES OF PROLIFIC BRANCHING WHERE THE MEASURE LOW APPROACH MUST BE IMPLEMENTED CAUSING THE DIAMETER TO BE TAKEN BELOW 4.5 FEET. ALTHOUGH C HAS MANY BRANCHES, IT IS NOT A CANDIDATE FOR THE MEASURE LOW APPROACH BECAUSE THE BRANCHING IS NOT DEEMED "PROLIFIC"; TRADITIONAL DBH MEASUREMENT PROTOCOLS WOULD APPLY. D IS AN EXAMPLE OF MULTIPLE FORKS ORIGINATING FROM APPROXIMATELY THE SAME AREA. SIMILAR TO PROLIFIC BRANCHING, THE DIAMETER IS TAKEN LOW, AND D IS TREATED AS ONE TREE.

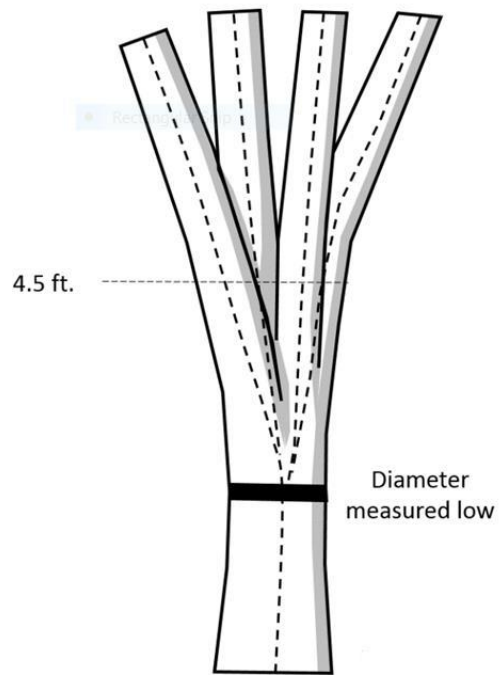


FIGURE 12. USING PITH SEPARATION TO DETERMINE DIAMETER LOCATIONS.

In this example all piths separate from approximately the same location; this triggers the **“Measure Low Approach”**. In cases where the piths do NOT originate within approximately the same location, normal forking rules are applied as demonstrated in [FIGURE 13 A, B, C, AND D, AND F, G, H, AND I.](#)

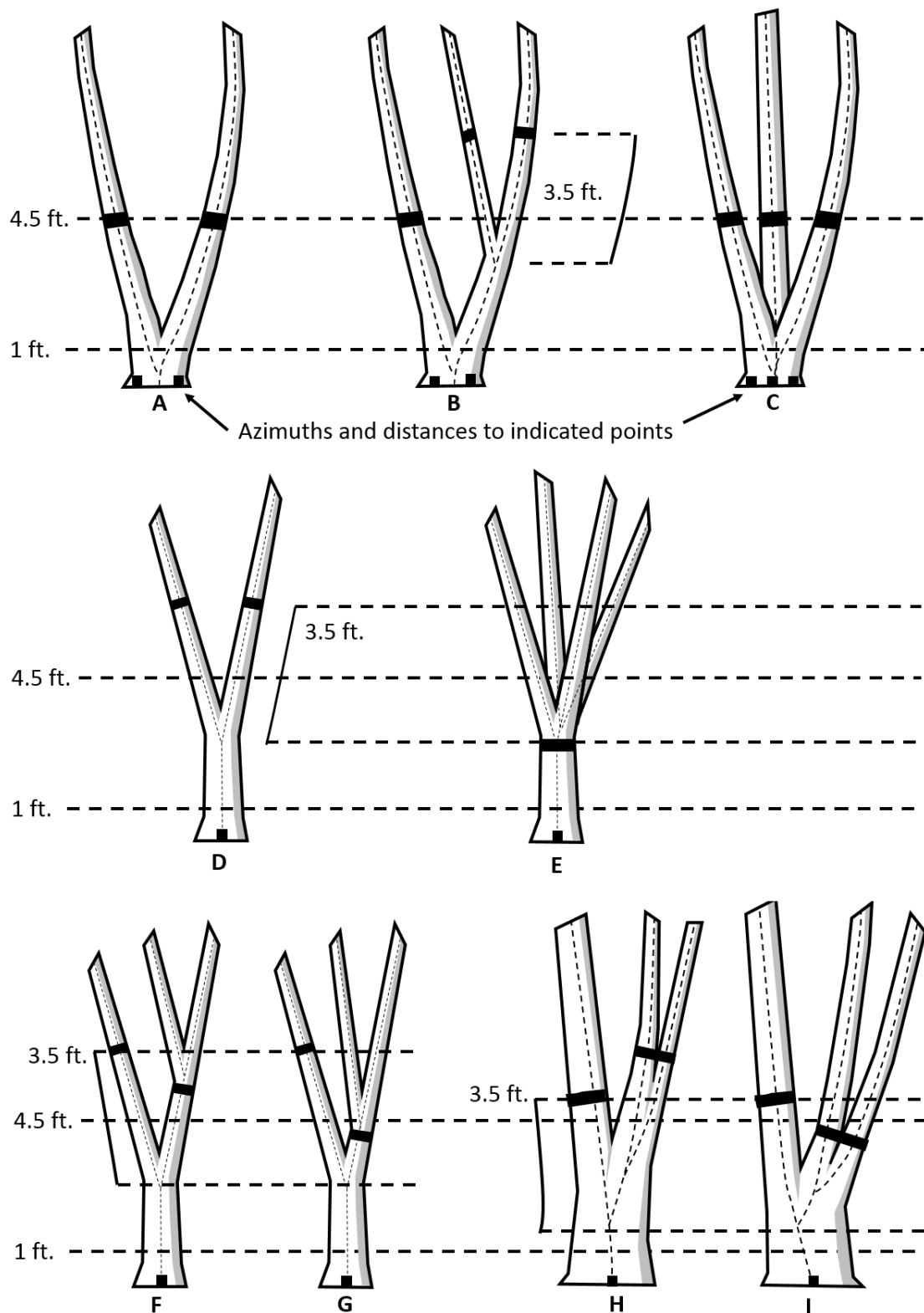
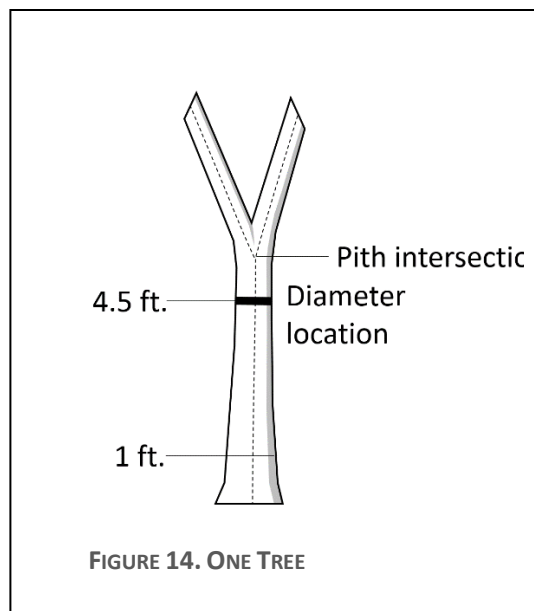


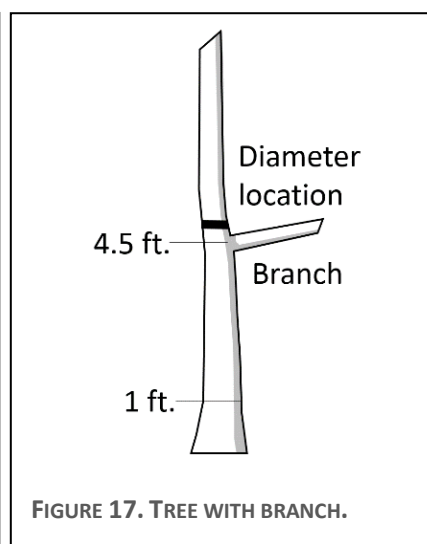
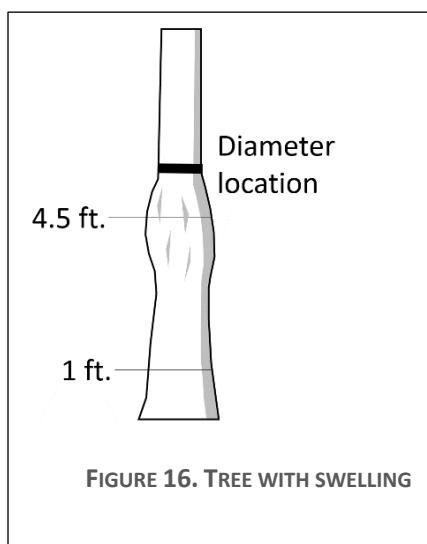
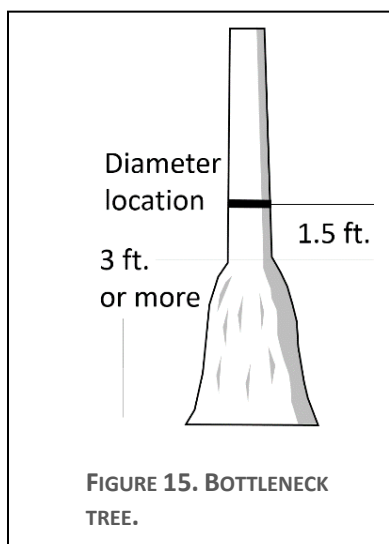
FIGURE 13. SUMMARY OF WHERE TO MEASURE DIAMETER, DISTANCE AND AZIMUTH ON TREES THAT FORK BELOW 1.0 FOOT (A, B, C) AND TREES THAT FORK ABOVE 1.0 FOOT (D, E, F, G, H, I).

E represents the “**Measure Low Approach**”. F and G represent secondary forks with abnormal diameters at stem separation. H and I represent secondary forks with normal diameters at stem separation.

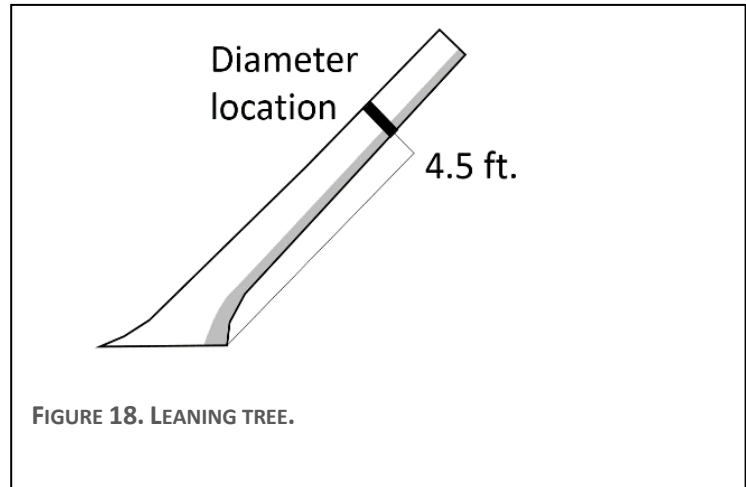
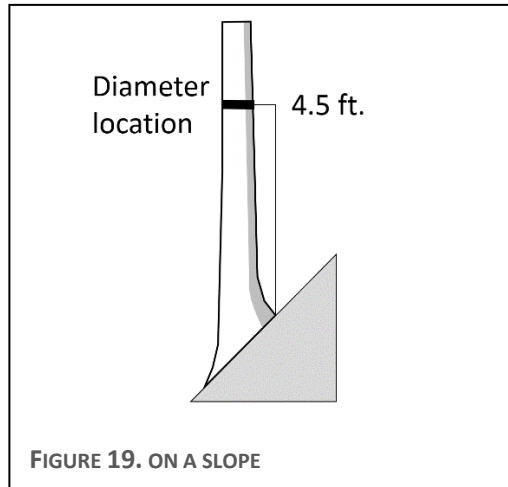
8. Trees forked at or above 4.5 feet. Trees forked at or above 4.5 feet count as one single tree (**FIGURE 14**). If a fork occurs at or immediately above 4.5 feet, measure diameter below the fork just beneath any swelling that would inflate DBH.
9. Stump sprouts: Stump sprouts originate between ground 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.
10. 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 15**).



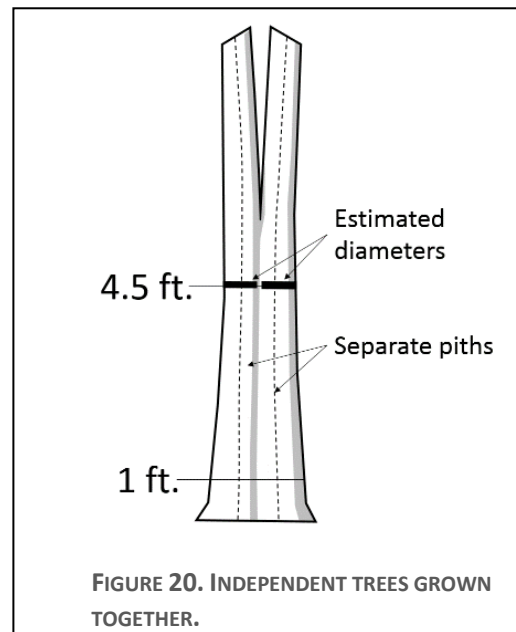
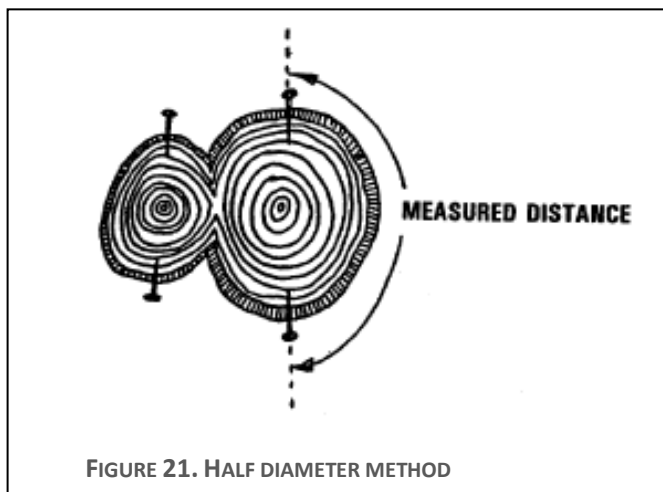
11. Tree with irregularities at DBH: On trees with swellings, bumps, and branches (**FIGURE 16**. Tree with swelling), or other irregularities at DBH that inflate the diameter of the tree, diameter will be measured with the approach that most accurately represents DBH. Generally, this will be immediately above the irregularity at the place where it ceases to affect normal stem form. When measuring above the irregularity is not feasible (e.g., too high to reach by an average-height crewmember), diameter may be measured below the irregularity. The last resort is to estimate DBH at a location that will best represent the tree volume.
12. Basal hollows (cat-faces) and depressions do not count as irregularities. If raising the diameter above the irregularity makes the tree's diameter too small to qualify as a tally tree, paint a stripe at the point of measurement and do not tag or record the tree.
13. Where DBH is obstructed (e.g., a fallen trunk leaning against the tree), tag the tree as close to DBH as possible and use a Biltmore stick or one-half diameter method (**FIGURE 21**) to estimate diameter.



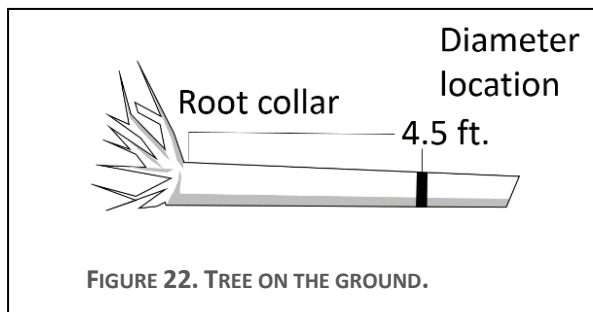
14. Tree on slope: Measure diameter at 4.5 feet from the ground along the bole on the uphill side of the tree ([FIGURE 19](#)).
15. Leaning tree on flat ground: Measure diameter at 4.5 feet from the ground along the bole. The 4.5-foot distance is measured along the underside face of the bole ([FIGURE 18](#)).



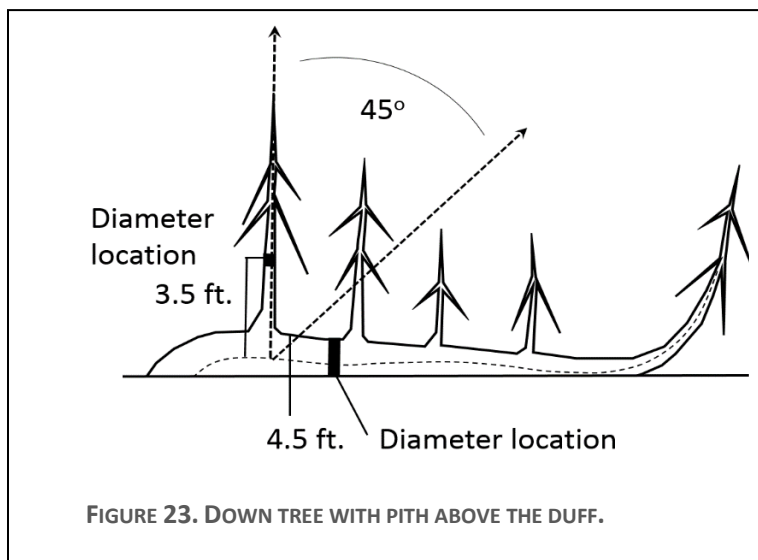
16. Independent trees that grow together: If two or more independent stems have grown together at or above the point of DBH, continue to treat them as separate trees. Set two diameter nails at DBH halfway around the tree's circumference from each other (after placing 1st nail, stand back from bole; take azimuth to nail; on opposite side of bole, place nail where the back azimuth of the first nail lines up). Measure the distance between the nails with a diameter tape making sure zero is aligned and not the hook at the end of the diameter tape with one diameter nail ([FIGURE 21](#)). Multiply the measurement by 2 and record the result as the current diameter. Example: Distance measured = 12.8 inches (12.8×2) = 25.6 inches, set the "DIAMETER CHECK" code to 1, and explain the situation in the notes.
17. Missing wood or bark: Do not reconstruct the DBH of a tree that is missing wood or bark at the point of measurement. Record the diameter of the wood and bark that is still attached to the tree.



18. Live windthrown tree: Measure from the top of the root collar along the length to 4.5 feet ([FIGURE 22](#)).

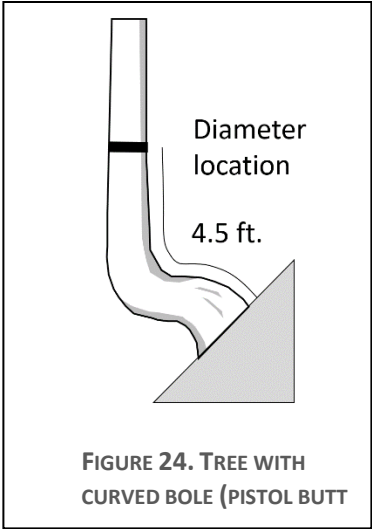
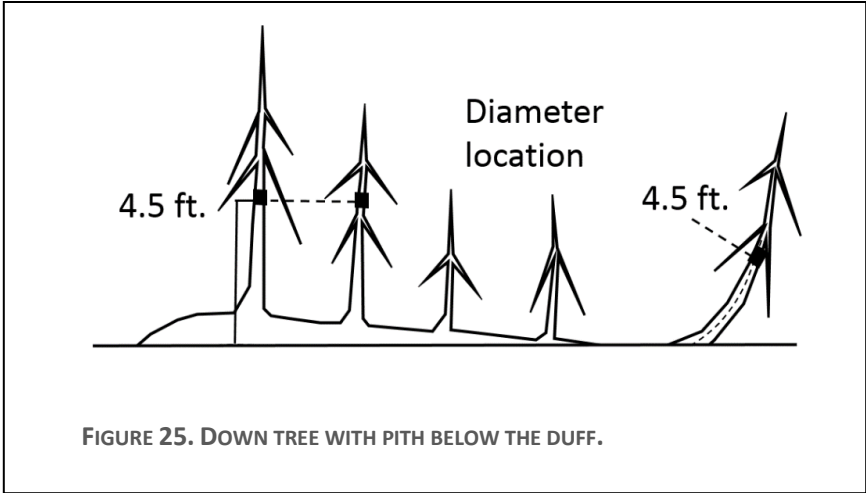


19. Down live tree with tree-form branches growing vertical from main bole: When a down live tree, touching the ground, has vertical (less than 45 degrees from vertical) tree-like branches coming off the main bole, first determine whether the pith of the main bole (averaged along the first log of the tree) is above or below the duff layer.
20. 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 23](#)).



21. 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 23](#)).
22. 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.

23. 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 25). 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. If the general pith line of a remeasurement tally tree is now below the duff layer, code PRESENT TREE STATUS as 0 and RECONCILE as 6 and measure each tree-like branch as a new tree with a RECONCILE=1. Record a TREE NOTE to explain the situation.



24. Tree with curved bole (pistol butt tree): Measure along the bole on the uphill side (upper surface) of the tree (FIGURE 24).
25. Trees with stilted roots or growing on nurse logs: On trees with stilted roots (e.g., redwood), growing on nurse logs or on top of stumps (not stump sprouts), DBH should be taken at 4.5 feet above the highest point of the root collar of the new tree.

When collected:	All live and standing dead tally trees ≥ 5.0 inches DBH	
Field width:	4 digits (xxx.y)	
Units:	Inches	
Values:	001.0 to 999.9	

Subsection 3.5.3 DIAMETER CHECK

Record this code to identify the accuracy of the current diameter measurement (due to factors such as abnormal swellings, diseases, damage, new measurement positions, etc.) that may affect use of this tree in diameter growth/change analyses.

When collected:	All live and standing dead tally trees ≥ 5.0 inches DBH	
Field width:	1 digit	
Values:	Code	Definition
	NULL	Diameter measured accurately.
	1	Diameter measured at different location than previous measurement (remeasurement trees only).

	2	Evidence suggests that the previous measurement was not measured accurately (e.g. moss was not removed, there is a broken branch at DBH that the cruiser may not have noticed, or DBH was not measured perpendicular to lean). This code denotes that the growth is not accurate, and the tree should be excluded from growth calculations for the current period (remeasurement trees only).
	3	Diameter estimated. Includes trees measured using the half-wrap method or a Biltmore stick.

Section 3.6 Tree Length

Subsection 3.6.1 TOTAL LENGTH

TOTAL LENGTH is the total length of the bole, recorded to the nearest 1.0 foot from the base of the tree to the tip of the apical meristem. If the tree has a detached top, the total length is an estimate of what the length would be if the tree was not broken. For trees with broken, but still attached tops, total length is simply the sum of each piece of the bole, above and below the break. For all other broken top tree scenarios, the total length must be estimated. Forked trees should be treated the same as unforked trees. Total length is always recorded, even for trees where TRUNCATED LENGTH is also recorded.

The goal of the inventory is to record tree length measurements that reflects the actual length of the bole. However, due to terrain, brush etc., it is not always efficient or practical to adjust every tree height where height $\neq$ length. The most desirable procedure is where TOTAL LENGTH is measured with a laser and any lean ≥ 15 degrees is corrected using trigonometry, slope correction, or the missing line function on the laser. These methods are strongly preferred for leaning trees over 14" DBH. For leaning trees less than 14" DBH, TOTAL length can be measured with the laser's Vertical Distance or HD HT function, measured in sections (within reason), or estimated entirely. Estimation is considered a last resort for trees ≥ 14 " DBH and acceptable for trees <14 " DBH but should only be used if the cruiser has calibrated their estimate by measuring at least four similar sized trees on the plot with an instrument.

Uncommon species should always be measured with an instrument. A species is deemed to be uncommon if it occurs on less than 10 percent of plots (1 in 10 plots).

When using the laser's height routine function (HD HT), stand far enough away from the tree such that the angle to the top of the tree is < 45 degrees.

When collected:	All live and standing dead tally trees ≥ 5.0 inches DBH
Field width:	3 digits (xxx)
Units:	Feet
Values:	005 to 400

Subsection 3.6.2 TRUNCATED LENGTH

The truncated length of the bole is the distance between the base of the tree and the point where the top is broken or severed and depends on whether the tree is live or standing dead, and how much of the top is still attached.

Always record TOTAL LENGTH, even for trees where TRUNCATED LENGTH is recorded.

Trees with detached tops are considered recovered 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). The new leader must be <45 degrees from vertical to qualify as a recovered top.

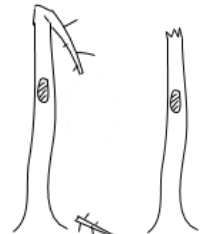
Live trees	 Top completely detached	record the bole length to the severed point on the bole in TRUNCATED LENGTH
	 Top broken, but still attached (1-100% attached)	leave TRUNCATED LENGTH blank
Standing dead trees	 Top completely detached	record the bole length to the severed point on the bole in TRUNCATED LENGTH
	 Top broken, mostly attached (50% to 100% attached)	leave TRUNCATED LENGTH blank
	 Top broken, mostly detached (1% to 49% attached)	record the bole length to the break in TRUNCATED LENGTH

FIGURE 26. BROKEN TOP SCENARIOS

When collected:	All live and standing dead tally trees with broken or missing tops ≥ 5.0 in DBH
Field width:	3 digits (xxx)
Units:	Feet
Values:	005 to 400

Subsection 3.6.3 DIAMETER INSIDE BARK

Record an estimate of diameter inside bark at break for trees where TRUNCATED LENGTH is recorded. This provides more options for data analysis.

When collected:	All live and standing dead tally trees with broken or missing tops ≥ 5.0 in DBH
Field width:	3 digits (xx.x)
Units:	Inches
Values:	005 to 400

Subsection 3.6.4 LENGTH METHOD

Record the code that indicates the method used to determine tree TOTAL LENGTH or TRUNCATED LENGTH. If a combination of methods were applied, record the primary method used and make any clarifications in TREE NOTE if needed.

When collected:	All live and standing dead tally trees ≥ 5.0 inches DBH	
Field width:	2 digits	
Values	Code	Definition
	HT	Laser, HDHT (height routine) function
	ML	Laser, Missing Line function
	VD	Laser, Vertical Distance function
	SD	Laser,
	ES	Estimated
	OT	Other, describe in notes

Section 3.7 Crown Measurements

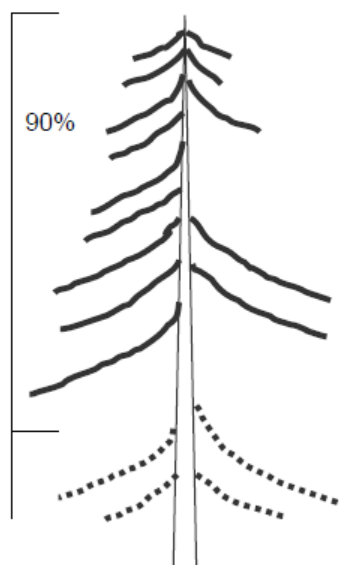
Subsection 3.7.1 COMPACTED CROWN RATIO

Record the COMPACTED CROWN RATIO for each live tally tree, 5.0 inches and larger, to the nearest five 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 tree length (or TRUNCATED LENGTH if the tree is broken). 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.

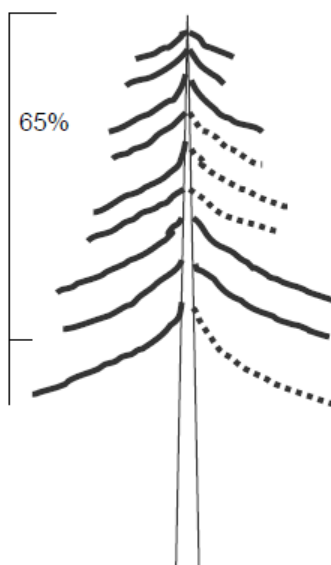
Do not over-compact trees beyond their typical full crown situation. For example, if tree branches tend to average 2 feet between whorls, do not compact crowns any tighter than the 2-foot spacing.

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

Uncompacted:

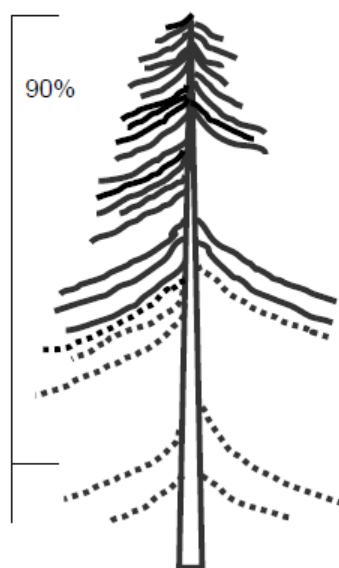


Compacted:



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

Uncompacted:



Compacted:

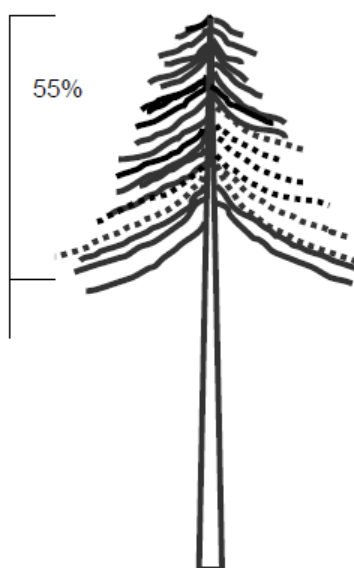


FIGURE 27. EXAMPLES OF AND COMPARISON BETWEEN COMPACTED CROWN RATIO AND UNCOMPACTED LIVE CROWN RATIO OF CONIFERS

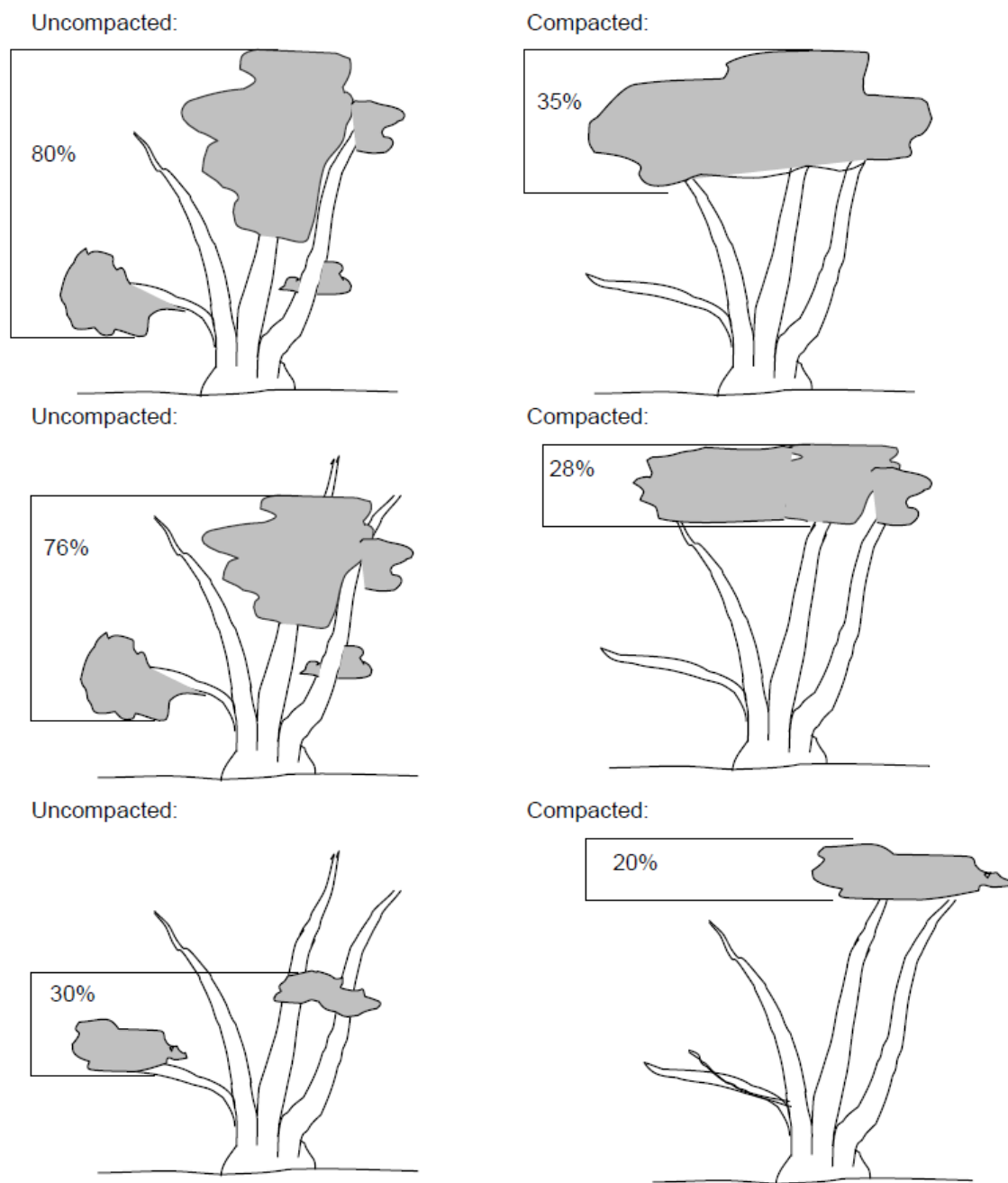


FIGURE 28. EXAMPLES OF AND COMPARISON BETWEEN COMPACTED CROWN RATIO AND UNCOMPACTED LIVE CROWN RATIO OF WOODLAND SPECIES.

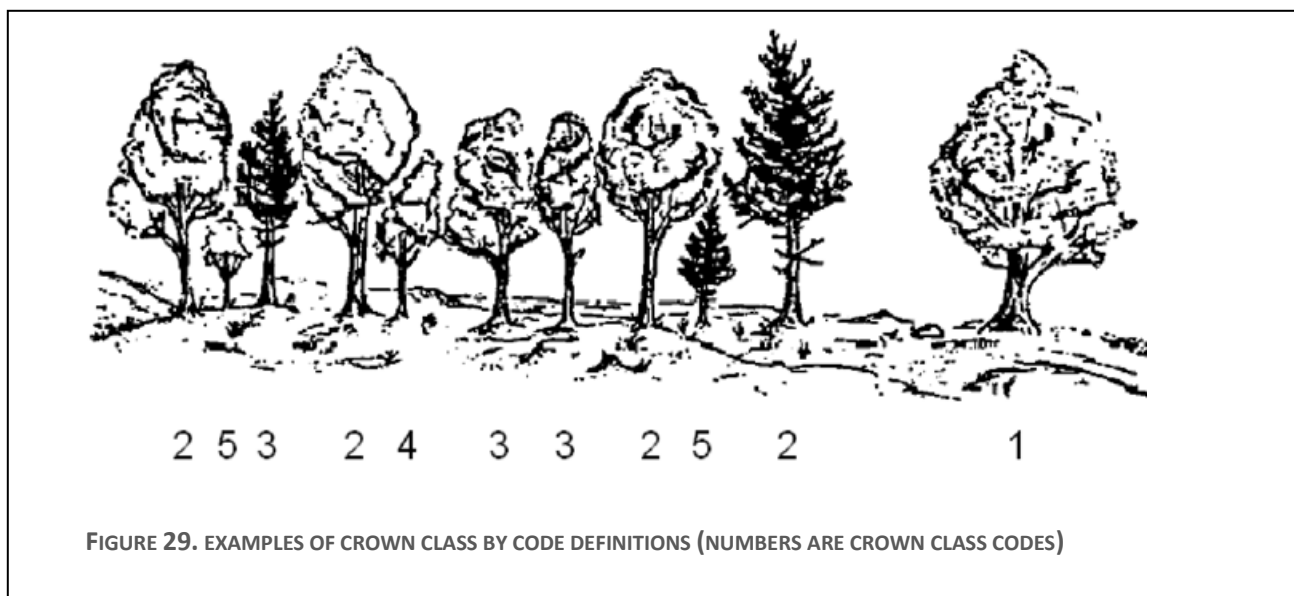
When collected:	All live tally trees ≥ 5.0 in DBH
Field width:	2 digits
Values:	0 to 95

Subsection 3.7.2 CROWN CLASS

Rate tree crowns in relation to the sunlight received and proximity to neighboring trees (fig. 38). Base the assessment on the position of the crown at the time of observation. Example: a formerly overtopped tree that is now dominant due to tree removal is classified as dominant.

Crown classifications are easily applied in even-aged stands. Classifications are more difficult to assign in uneven-aged stands or in plots where more than one age/size class is present. In these situations, classify the tree based on its immediate environment. In other words, base your classification on how much light the tree's crown is receiving, not its position in the canopy. This data item is used to predict tree growth. The intermediate and overtopped crown classes are meant to include trees seriously affected by direct competition with adjacent trees.

Crown class describes a tree's "social" position in the stand and may indicate how well the tree is competing for light. For example, a young, vigorous tree that is considerably shorter than other trees in the stand – but that is not overtopped by other trees and that receives full light from above and partly from the side – is classified as dominant. The same principle applies to two-storied stands: understory trees should only be assigned subordinate crown classes if they are adjacent to overtopping trees. In plots with scattered residual overstory trees over younger trees, a considerable portion of the understory trees will be classified as dominant or codominant.



When collected:	All live tally trees ≥ 5.0 in DBH		
Field width:	1 digit		
Values	Code	Crown Class	Definition
	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.

Section 3.8 Tree Damage

Subsection 3.8.1 MISSING BIOMASS

Record to the nearest 5 percent. When estimating volume loss only consider missing wood on the stem of the tree. Do not include missing wood above TRUNCATED LENGTH in the MISSING BIOMASS estimate. Do not deduct volume that would have existed but for a deformity such as crook or a recovered broken top, or apply any other deductions based on board foot cull. Do not deduct volume for missing branches.

Live Tally Trees

Record the percentage of **missing and rotten** cubic-foot volume for all live tally trees ≥ 5.0 inches DBH. Record the percentage of missing and rotten cubic-foot volume to the nearest 1 percent. Deduct only rotten wood and missing wood. Wood is considered rotten when it would no longer be used for firewood. Do not deduct sound dead wood. Deduct only rotten and missing wood that is visible.

Standing Dead Tally Trees

Record the percentage of **missing** cubic-foot volume on all standing dead tally trees ≥ 5.0 inches DBH. Standing dead trees are given a decay class that accounts for rotten wood; therefore, only missing wood is estimated. Deduct only missing wood that is visible.

Use the following table as a guideline to estimate the missing and rotten portions of trees. It shows the percentage of volume in typical trees of varying number of logs and heights. Use the measured TOTAL LENGTH to estimate what

percentage of volume is estimated in each 16-foot log. Multiply each percentage in that log section times the percentage of missing volume. Then sum the values to get the total percentage of the tree that is missing.

- Example: A 9-log tree (measured at 160 feet TOTAL LENGTH) has a missing section that is about 1/3 of both the second and third logs. The table shows the second log has about 18 percent of the volume in the tree, and the third log has about 16 percent of the volume in the tree.
 - Calculate the percentage of cull in each log and sum to estimate the total percentage of cull for the tree (about 11 percent):
 - $(0.18 \times 0.33) + (0.16 \times 0.33) = 0.06 + 0.05 = 0.11$

TABLE 3. USE THIS TABLE TO ESTIMATE MISSING BIOMASS

Percentage of tree cubic foot volume distribution by 16-foot logs from tree total length or tree height in logs for a tree of average dimensions

Average Total Length	Tree Height in LOGS	Log1	Log2	Log3	Log4	Log5	Log6	Log7	Log8	Log9	Log10	Log11	Log12
28	1	100											
48	2	70	30										
64	3	54	32	14									
80	4	43	30	19	8								
96	5	36	27	20	12	5							
111	6	31	24	20	14	8	3						
127	7	28	22	18	14	10	6	2					
143	8	25	20	17	14	11	8	4	1				
158	9	24	18	16	13	11	8	6	3	1			
176	10	22	17	15	13	11	9	7	4	1	1		
194	11	20	15	14	12	11	9	7	5	4	2	1	
212	12	20	14	13	12	11	9	8	6	4	2	1	0

When collected:	All live and standing dead tally trees ≥ 5.0 in DBH
Field width:	2 digits (xx)
Units:	percent cubic foot volume
Values:	0 to 99

Subsection 3.8.2 CAUSE OF DEATH

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

When collected:	All standing dead or cut tally trees ≥ 5.0 in DBH	
Field width:	2 digits	
Values	Code	Definition
	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 land clearing activity (accidental, random, etc.). TREE NOTES required.
	80	Silvicultural or land clearing activity (death caused by harvesting or other silvicultural activity, including girdling, chaining, etc., or to land clearing activity)

Subsection 3.8.3 MORTALITY YEAR

Applies to remeasurement plots only.

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. The older the dead tree the less accurate this estimate will be. Unless specific information is available on when a harvest occurred, this estimate will be to the nearest 5-year category.

When collected:	Plots where SAMPLE KIND = 2: all PREVIOUS TREE STATUS = 1 and PRESENT TREE STATUS = 2 or 3; or PRESENT TREE STATUS = 2 and RECONCILE = 1, 2, or 3.
Field width:	4 digits (xxxx)
Values:	Year of previous inventory, or higher

Subsection 3.8.4 DECAY CLASS

Record for each standing dead tally tree, 5.0 inches in diameter and larger and 15 feet in length or larger, the code indicating the tree's stage of decay.

TABLE 4. DECAY CLASS

Snag characteristics are for Douglas-fir. Snags of other species may vary; use this table as a guide. Rate the overall snag					
DECAY CLASS stage (code)	Limbs and branches	Top	Percent 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	Incipient decay at base, advanced decay throughout upper bole, fibrous, hard to firm, 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

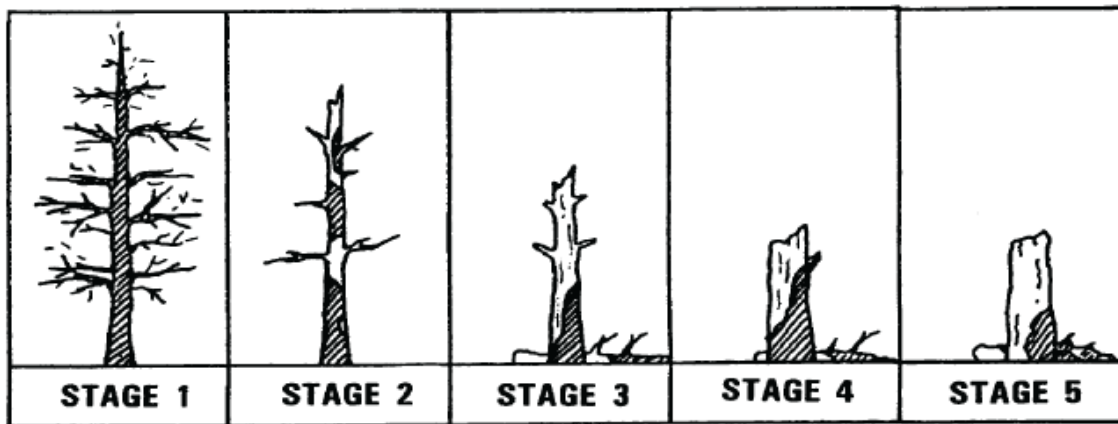


FIGURE 30. DOUGLAS-FIR DECAY CLASS CHARACTERISTICS

When collected:	All standing dead tally trees ≥ 5.0 in DBH
Field width:	1 digit
Values	1 to 5

Section 3.9 Walkthrough Tree

Record the appropriate code on the tree data sheet for each tally tree. See walkthrough method in [ERROR! REFERENCE SOURCE NOT FOUND](#). *Plots Near Project Boundaries*.

When collected:	All plots where the distance to a project boundary is less than or equal to 2x the plot radius	
Field width:	3 digits	
Units:	feet	
Values:	Code	Definition
	NULL	The tree does not qualify for being double tallied
	1	The tree qualifies for being double tallied

Section 3.10 Tree Notes

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

When collected:	All trees, as needed. Fields requiring a TREE NOTE must have one.
Field width:	2000 characters
Values:	English language words, phrases, and numbers

Section 3.11 Site Tree Information

Site tree information is collected on the initial inventory only.

For reference, here are the site tree instructions from the initial inventory in 2013:

The goal is to obtain about 30 site trees in each of the large strata and about 10 in each of the small strata (excluding KMC2). Site tree plots will be denoted on the paper maps. If a site tree is unavailable on the designated plot, the cruiser should find one nearby or on the following plot and record age at breast height and tree height. Douglas-fir trees over 30 years of age are preferable, but pine is also acceptable if it is a pine site. Assign a Group code = 'S' to Site Trees. Off-plot site trees must be assigned a group code of 'F'.

Chapter 4 Quality Assurance/Quality Control

The ultimate quality control for forest project inventory plots occurs during verification. However, as the inventory is being conducted, plots are also checked internally to ensure standard operating procedures are being followed. At least 5% percent of the plots measured will be visited and remeasured. The overall level of checking will depend on how much experience the inventory crew has with this plot methodology. If a cruiser fails a plot or has other problems, follow up checking will focus on their plots. The cruising contractor will provide the check cruising. The check cruiser may participate in the installation of cruise plots but may not check their own plots.

Results will be compared to the original cruise data. At least 90% of the diameter and height measurements per plot must fall within the range of tolerance for the plot to pass.

Checked plots are deprecated and only the corrected version is used in modeling and analysis.

Tolerances for various measurement elements are shown in the table below.

Measurement Standards

Measurement Element	Tolerance
Species identification	Exact
Tree Count	Exact
Borderline Tree Horizontal Distance	± 0.2 ft in regular measurement conditions and ± 0.5 ft in extreme/unusual situations.
Diameter at breast height - trees < 11"	± 0.2 in.
DBH – trees 11" – 24"	± 0.3 in.
DBH – trees > 24"	± 0.6 in.
Total tree height	10%

Appendix A - Tree Species Codes

FIA Western Tree Species Codes in Numeric Order

11	Pacific silver fir	Abies	amabilis	139	Torrey pine	Pinus	torreya
14	Santa Lucia fir	Abies	bracteata	201	bigcone Douglas-fir	Pseudotsuga	macrocarpa
15	white fir	Abies	concolor	202	Douglas-fir	Pseudotsuga	menziesii
17	grand fir	Abies	grandis	211	redwood	Sequoia	sempervirens
19	subalpine fir	Abies	lasiocarpa	212	giant sequoia	Sequoiadendron	giganteum
20	California/Shasta red	Abies	magnifica	231	Pacific yew	Taxus	brevifolia
22	noble fir	Abies	procera	242	western redcedar	Thuja	plicata
41	Port-Orford-cedar	Chamaecyparis	lawsoniana	251	Nutmeg	Torreya	Californica
42	Alaska yellow-cedar	Chamaecyparis	nootkatensis	263	western hemlock	Tsuga	heterophylla
50	cypress spp.	Cupressus	spp.	264	mountain hemlock	Tsuga	mertensiana
51	Arizona cypress	Cupressus	arizonica	299	unknown dead conifer		
52	Baker cypress,	Cupressus	bakeri	304	catclaw acacia	Acacia	greggii
53	tecate cypress	Cupressus	forbesii	312	bigleaf maple	Acer	macrophyllum
54	Monterey cypress	Cupressus	macrocarp	313	boxelder	Acer	negundo
55	Sargent's cypress	Cupressus	sargentii	330	California buckeye	Aesculus	californica
56	MacNab's cypress	Cupressus	macnabian	351	red alder	Alnus	rubra
60	Juniper, spp.	Juniperus	spp.	352	white alder	Alnus	rhombifolia
62	California juniper (w)	Juniperus	californica	361	Pacific madrone	Arbutus	menziesii
63	alligator juniper	Juniperus	deppeana	431	golden chinkapin	Castanopsis	chrysophylla
64	western juniper	Juniperus	occidentali	492	Pacific dogwood	Cornus	nuttallii
65	Utah juniper	Juniperus	osteosperm	500	hawthorn spp.	Crataegus	spp.
66	Rocky mountain juniper	Juniperus	scopulorem	510	eucalyptus spp.	Eucalyptus	spp.
69	oneseed juniper	Juniperus	monosperm	542	Oregon ash	Fraxinus	latifolia
81	incense-cedar	Calocedrus	decurrens	631	tanoak	Notholithos	densiflorus
90	spruce spp.	Picea	spp.	730	California sycamore	Platanus	racemosa
92	Brewer spruce	Picea	breweriana	740	black cottonwood	Populus	tricocarpa
93	Engelmann spruce	Picea	engelmann	746	quaking aspen	Populus	tremuloides
98	Sitka spruce	Picea	sitchensis	748	Fremont cottonwood	Populus	fremontii
100	pine spp.	Pinus	spp.	800	oak spp.	Quercus	spp.
101	whitebark pine	Pinus	albicaulis	801	coast live oak	Quercus	agricola
103	knobcone pine	Pinus	attenuata	805	canyon live oak	Quercus	chrysolepis
104	foxtail pine	Pinus	balfouriana	807	blue oak	Quercus	douglasii
108	lodgepole pine	Pinus	contorta	811	Engelmann oak	Quercus	engelmannii
109	Coulter pine	Pinus	coulteri	815	Oregon white oak	Quercus	garryana
116	Jeffrey pine	Pinus	jeffreyi	818	California black oak	Quercus	kelloggii
117	sugar pine	Pinus	lambertiana	821	valley oak	Quercus	lobata
119	western white	Pinus	monticola	839	interior live oak	Quercus	wislizeni
120	bishop pine	Pinus	muricata	901	black locust	Robinia	pseudoacacia
122	ponderosa pine	Pinus	ponderosa	920	willow spp.	Salix	spp.
124	Monterey pine	Pinus	radiata	981	California bay laurel	Umbellularia	californica
127	gray pine	Pinus	sabiniana	998	unknown dead hardwood		
133	singleleaf pinyon	Pinus	monophylla	999	other, or unknown live tree		
137	Washoe pine	Pinus	washoensis				

Appendix B - Tree Coding Guide

Previous Measurement	Present Measurement	PREVIOUS TREE STATUS	PRESENT TREE STATUS	RECONCILE	CAUSE OF DEATH
SAMPLE KIND 1 or 3 (Initial install or replacement plot)					
	Standing dead 5.0+ DBH	Null	2	Null	
SAMPLE KIND 2 (Remeasure)					
Live 5.0+ DBH	Live 5.0+ DBH	1	1	Null	
Live <5.0 DBH	Live 5.0+ DBH ingrowth	1 or no status	1	1	
Live 5.0+ DBH	Live but shrank < 5.0 and on. Note: Pull the tag.	1	0	Null	
Live 5.0+ DBH	Standing dead 5.0+ DBH	1	2	1	10-80
Live 5.0+ DBH	Down dead 5.0+ DBH	1	0	Null	10-80
Dead 5.0+ DBH	Dead standing 5.0 DBH	2	2	Null	
Dead 5.0+ DBH	Dead down 5.0+ DBH	2	0	Null	
Dead 5.0+ DBH	Cruiser is unable to locate tree due to a weather, geologic (such as landslide), or fire event	2	2	6	
Dead 5.0+ DBH	Tree removed (cut and hauled away)	2	3	Null	
Dead 5.0+ DBH	Tree shrank <5.0 (e.g., bark loss) and is standing dead	2	0	Null	
Live 5.0+ DBH	Live 5.0+ DBH, should not have been tallied –beyond plot radius—cruiser error	1	0	7	
Dead 5.0+ DBH	No longer a tally species	2	0	8	
Dead 5.0+ DBH	Nonsampled area now	2	0	9	
Missed live	Live 5.0+ DBH	-	1	3	
Nonsampled area before	Live 5.0 + DBH	-	1	3	
Missed dead	Dead 5.0+ DBH	-	2	4	
Missed live	Dead 5.0+ DBH	-	2	3	10-80
< 5.0 live DBH	5.0+ DBH dead	1	2	1	10-80
Nonsampled area before	Standing Dead 5.0+ DBH	-	2	3 or 4	0-80

Appendix C - Glossary

Accessible Forest Land – Land that is within the population of interest, is accessible, is on a plot that can be occupied at plot center, can safely be visited.

ARTIFICIAL REGENERATION SPECIES – Indicates the predominant species that is planted or seeded in an artificially regenerated condition.

Azimuth - is a determination of a direction with the use of a compass. The reference is North, which is 0 or 360 degrees. The compass user's direction is then measured in degrees, clockwise from zero or North.

Blind check – a re-installation of a production plot done by a qualified crew without production crew data on hand. A full re-installation of the plot is recommended for the purpose of obtaining a measure of uncertainty in the data. All plot-level information (e.g., boundary and condition information) will be collected on each blind check plot. 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.

Crown—The part of a tree or woody plant bearing live branches or foliage.

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.

Crook - Abrupt bend in a tree or log (Helms 1998).

Cull – Portions of a tree that are unusable for industrial wood products because of rot, form, or another defect.

Declination - The azimuth correction used to adjust magnetic north to true north with a compass, measured in degrees.

Diameter at Breast Height (DBH) – The diameter for tree stem, located at 4.5 feet above the ground (breast height) on the uphill side of a tree. The point of diameter measurement may vary on abnormally formed trees.

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.

Disturbance—Natural or human-caused disruption that is ≥ 1.0 acre in size and results in mortality and/or damage to 25 percent of all trees in a stand or 50 percent of an individual species' count or, in the case when the disturbance does not initially affect tree growth or health (e.g. grazing, browsing, flooding, etc.), affects 25 percent of the soil surface or understory vegetation. For initial forest plot establishment, the disturbance must be within the last 5 years. For remeasured plots only those disturbances that have occurred since the previous inventory are recognized.

Fixed-radius plot—A circular sampled area with a specified radius in which all trees of a given size, shrubs, or other items are tallied.

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.

Improved road - Paved roads, gravel roads, or improved dirt roads regularly maintained for long-term continuing use by normal passenger vehicles. Generally constructed using machinery. The area where the original topography has been disturbed by cutbanks and fill is considered part of the road if that area is maintained. Unimproved traces and roads created for skidding logs are not considered improved roads.

Inclusion – An area that would generally 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.

Inspection crew – a crew of qualified QC/QA individuals whose primary responsibility is the training, certification, and inspection of production crews.

Ingrowth – A tree that grows over the 5.0" DBH threshold on the macroplot.

Live Tree - Trees are alive if they have any living parts (leaves, buds, cambium) at or above the point of diameter measurement. Trees that have been temporarily defoliated are still alive.

Macroplot - A circular, fixed-radius plot with a defined radius that is used to sample trees greater than or equal to 5.0 inches at DBH.

Main stem—The central portion of the tree extending from the ground level to the tip for timber species. For woodland species, the main stem extends from the ground level to the tips of all branches of qualifying stems. For timber species trees that fork, the main stem follows the fork that would yield the most merchantable volume.

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.

Merchantable Top – The point on the bole of trees above which merchantable material cannot be produced. Merchantable top is 1.5 inches for woodland species and 4.0 inches for all other species.

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.

Plot – A reference to the sample site.

Plot Center – the location where the rebar meets the ground at the geographic center of the plot.

Plurality - An amount or group (as of stocking points) that is greater than any other amount or group within a total but that is not necessarily a majority (more than half).

Production crew – a crew containing at least one individual. The crew is involved in routine installation of plots.

Production plot – A plot measured by a production crew. These plots may also be used for training purposes.

REGENERATION STATUS – A stand descriptor that indicates whether a stand has been naturally or artificially regenerated.

Saplings – Live trees 1.0 to 4.9 inches DBH.

Seedlings – Conifer seedlings must be at least 6.0 inches in length and less than 1.0 inch at DBH in order to qualify for tallying. Hardwood seedlings must be at least 12.0 inches in length and less than 1.0 inch at DBH in order to qualify for tallying.

Site index - The average total height that dominant and codominant trees in fully-stocked, even-aged stands will obtain at key ages (usually 25 or 50 years).

Slope - Measure of change in surface value over distance, expressed as a percentage (Helms 1998).

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.

Standing dead tree - A dead tree that must be at least 5.0 inches in diameter, have a bole which has an unbroken TRUNCATED LENGTH of at least 15 feet, and lean less than 45 degrees from vertical as measured from the base to tip of the tree (or the highest point on the tree if abnormally shaped).

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.

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.

Tally Tree - Tally trees are all live and standing dead trees encountered on the plot the first time a plot is established, and all trees that grow into a plot thereafter.

TOTAL LENGTH – The total length of the tree, measured along the bole, from the base of the tree on the uphill side to the tip of the apical meristem. Recorded to the nearest 1.0 foot. If the tree has a missing top, the total length is an estimate of what the length would be if the top were not missing. For trees with broken, but still attached full-length tops, total length is simply the sum of each piece of the bole, above and below the break. Forked trees should be treated the same as unforked trees.

Tree height - the vertical distance between the highest and lowest point of the tree, and not necessarily the length of the oblique/curved stem. (FAO)

Truncated length - The truncated length of the bole is the distance between the base of the tree and the point where the top is broken. The truncated length may or may not be recorded depending on if the tree is live, standing dead, and how much of the top is still attached.

Watercourse Transition Line - for a watercourse without a Channel Migration Zone, means the line defined by one or more the following features: 1) a change of vegetation from bare surfaces or annual water tolerant species to perennial water tolerant or upland species at least 25 years in age at breast height, 2) physical indicators of scour such as undercut banks, moss lines on rocks, the top of exposed roots along the channels, and 3) a change in the size distribution of surface sediments from gravel to fine sand. (Source: 2017 California Forest Practice Rules)

Appendix D - 20th Acre Plot Slope Correction Table

Use the following table to correct for slope. Horizontal distance = slope distance / correction factor.

Percent			Degrees		
Slope %	Correction Factor	1/20th acre	Degrees	Correction Factor	1/20th acre
1	1.000	26.33	1	1.000	26.33
2	1.000	26.34	2	1.001	26.35
3	1.000	26.34	3	1.001	26.37
4	1.001	26.35	4	1.002	26.39
5	1.001	26.36	5	1.004	26.43
6	1.002	26.38	6	1.006	26.48
7	1.002	26.39	7	1.008	26.53
8	1.003	26.41	8	1.010	26.59
9	1.004	26.44	9	1.012	26.66
10	1.005	26.46	10	1.015	26.74
11	1.006	26.49	11	1.019	26.82
12	1.007	26.52	12	1.022	26.92
13	1.008	26.55	13	1.026	27.02
14	1.010	26.59	14	1.031	27.14
15	1.011	26.62	15	1.035	27.26
16	1.013	26.66	16	1.040	27.39
17	1.014	26.71	17	1.046	27.53
18	1.016	26.75	18	1.051	27.69
19	1.018	26.80	19	1.058	27.85
20	1.020	26.85	20	1.064	28.02
21	1.02	26.90	21	1.07	28.20
22	1.02	26.96	22	1.08	28.40
23	1.03	27.02	23	1.09	28.60
24	1.03	27.08	24	1.09	28.82
25	1.03	27.14	25	1.10	29.05
26	1.03	27.21	26	1.11	29.29
27	1.04	27.27	27	1.12	29.55
28	1.04	27.34	28	1.13	29.82
29	1.04	27.41	29	1.14	30.10
30	1.04	27.49	30	1.15	30.40
31	1.05	27.57	31	1.17	30.72
32	1.05	27.65	32	1.18	31.05
33	1.05	27.73	33	1.19	31.39
34	1.06	27.81	34	1.21	31.76
35	1.06	27.90	35	1.22	32.14
36	1.06	27.98	36	1.24	32.55
37	1.07	28.07	37	1.25	32.97
38	1.07	28.17	38	1.27	33.41
39	1.07	28.26	39	1.29	33.88
40	1.08	28.36	40	1.31	34.37
41	1.08	28.46	41	1.33	34.89
42	1.08	28.56	42	1.35	35.43
43	1.09	28.66	43	1.37	36.00
44	1.09	28.77	44	1.39	36.60
45	1.10	28.87	45	1.41	37.24
46	1.10	28.98	46	1.44	37.90
47	1.10	29.09	47	1.47	38.61
48	1.11	29.21	48	1.49	39.35
49	1.11	29.32	49	1.52	40.13
50	1.12	29.44	50	1.56	40.96
51	1.12	29.56	51	1.59	41.84
52	1.13	29.68	52	1.62	42.77
53	1.13	29.80	53	1.66	43.75
54	1.14	29.92	54	1.70	44.80
55	1.14	30.05	55	1.74	45.90
56	1.15	30.18	56	1.79	47.09
57	1.15	30.31	57	1.84	48.34
58	1.16	30.44	58	1.89	49.69
59	1.16	30.57	59	1.94	51.12
60	1.17	30.71	60	2.00	52.66
61	1.17	30.84	61	2.06	54.31
62	1.18	30.98	62	2.13	56.08
63	1.18	31.12	63	2.20	58.00
64	1.19	31.26	64	2.28	60.06
65	1.19	31.40	65	2.37	62.30
66	1.20	31.55	66	2.46	64.73
67	1.20	31.69	67	2.56	67.39
68	1.21	31.84	68	2.67	70.29
69	1.21	31.99	69	2.79	73.47
70	1.22	32.14	70	2.92	76.98
71	1.23	32.29	71	3.07	80.87
72	1.23	32.44	72	3.24	85.21
73	1.24	32.60	73	3.42	90.06
74	1.24	32.76	74	3.63	95.52
75	1.25	32.91	75	3.86	101.7
76	1.26	33.07	76	4.13	108.8
77	1.26	33.23	77	4.45	117.0
78	1.27	33.39	78	4.81	126.6
79	1.27	33.55	79	5.24	137.9
80	1.28	33.72	80	5.76	151.6
81	1.29	33.88	81	6.39	168.3
82	1.29	34.05	82	7.19	189.1
83	1.30	34.22	83	8.21	216.0
84	1.31	34.39	84	9.57	251.8
85	1.31	34.56	85	11.47	302.1
86	1.32	34.73	86	14.34	377.4
87	1.33	34.90	87	19.11	503.1
88	1.33	35.07	88	28.65	754.4
89	1.34	35.25	89	57.30	1508.
90	1.35	35.42			
91	1.35	35.60			
92	1.36	35.78			
93	1.37	35.96			
94	1.37	36.14			
95	1.38	36.32			
96	1.39	36.50			
97	1.39	36.68			
98	1.40	36.87			
99	1.41	37.05			
100	1.41	37.24			
101	1.42	37.42			
102	1.43	37.61			
103	1.44	37.80			
104	1.44	37.99			
105	1.45	38.18			
106	1.46	38.37			
107	1.46	38.56			
108	1.47	38.75			

Appendix E - Plot Sheets

YUROC TRIBE - CKGG CARBON								
Item Name	Section	Format	Data		Item Name	Section	Format	Data
PLOT NUMBER	2.1	XXXX			REF. TREE 1 TAG #	2.23.1	XXX	
PLOT RADIUS	1.5	XX.XX			REF. TREE 2 TAG #	2.23.1	XXX	
PLOT STATUS	2.2	X			REF. TREE 3 TAG #	2.23.1	XXX	
PLOT NONSAMPLED REASON	2.3	XX			REF. TREE 1 SLOPE DIST.	2.23.2	XX.X	
SAMPLE KIND	2.4	X			REF. TREE 2 SLOPE DIST.	2.23.2	XX.X	
FIELD GUIDE VERSION	2.5	XX.Y			REF. TREE 3 SLOPE DIST.	2.23.2	XX.X	
Date (Yr,Mo,Day)	2.6	XXXXXXXX			REF. TREE 1 AZ FROM PC	2.23.3	XXX	
DECLINATION	2.7	+XX.Y			REF. TREE 2 AZ FROM PC	2.23.3	XXX	
QA STATUS	2.8	X			REF. TREE 3 AZ FROM PC	2.23.3	XXX	
CREW INITIALS	2.9	XX, XX, XX			HEADER NOTES:			
ELEVATION	2.12	XXXX						
PLOT SLOPE	2.1	XXX						
PLOT ASPECT	2.11	XXX						
DISTANCE TO BOUNDARY	2.13	XX.X						
WATER PROTECTION COND.	2.14	X						
DISTANCE TO WATER	2.15	XXX						
REGENERATION STATUS	2.16	X						
ARTIFICIAL REGEN SPECIES	2.17	XXX						
DISTURBANCE	2.18	XX						
DISTURBANCE YEAR	2.19	XXXX						
TREATMENT	2.20	XX						
TREATMENT YEAR	2.21	XXXX						

CKGG TREE DATA																				v2.0	PLOT #				CREW INITIALS						Page ____ of ____	
RECORD #	TAG #	SPECIES	TREE STATUS	RECONCILE	DIAMETER	DIAMETER CHECK	TOTAL LENGTH	TRUNCATED LENGTH	DIA. AT BREAK	LENGTH METH.	CROWN CLASS	CROWN RATIO	MISSING BIOMASS %	DECAY CLASS	CAUSE OF DEATH	MORTALITY YEAR	WALKTHROUGH TREE	TREE NOTES														
	3.3.1	3.4	3.3.2	3.3.3	3.5	3.5.3	3.6.1	3.6.2	3.5.2	3.6.4	3.7.2	3.7.1	3.8.1	3.8.4	3.8.2	3.8.3	3.9	3.10														
	XXX	XXX	X	X	XX.Y	X	XXX	XXX	XX	X	X	XX	XX	X	XX	XXXX	X	TEXT														
1																																
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ADDENDUM B. INVENTORY FIELD MANUAL CHANGE LOG

The first version of the manual, **Inventory Sampling Summary January-April 2012**, was used for the initial inventory in 2012. This version included a supplement on broken top trees, site trees, and an excerpt from the Forest Inventory and Analysis National Core Field Guide, Volume I, Version 5.0 that covers DBH, Special DBH Situations, and Crown Ratio. When the plots were remeasured in 2016, the manual was updated to include instructions related to remeasurement. Items relevant in initial installation were deleted (e.g. radial growth measurement, site trees). The 2016 manual was titled **Inventory Re-measure Methodology February-April 2016**.

Version	Editor Name	Date	Section	Change	File Name
February - April 2016	Unknown	February-May 2016		Replaced fiberglass poles at plot center with rebar stakes to increase permanence of plot center locations.	Yurok_CKGG_Inventory Manual_v_2_20171011
February - April 2016	Unknown	February-May 2016		Established reference trees to allow plots to be more accurately remeasured in the future if the plot center stake cannot be relocated.	Yurok_CKGG_Inventory Manual_v_2_20171011
February - April 2016	Unknown	February-May 2016		Added aluminum tags to all trees in the remeasured plots to facilitate accurate remeasurement in the future.	Yurok_CKGG_Inventory Manual_v_2_20171011
February - April 2016	Unknown	February-May 2016		Measured all heights on all plots rather than just a subset of the plots as was done in the initial inventory.	Yurok_CKGG_Inventory Manual_v_2_20171011
February - April 2016	Unknown	February-May 2016		Check cruised 5% of plots rather than 10% due to being a remeasurement rather than initial inventory establishment, and due to using the same experienced cruisers that established the initial inventory. Changed the DBH tolerance from a single number to once that is graduated by tree size.	Yurok_CKGG_Inventory Manual_v_2_20171011
February - April 2016	Unknown	February-May 2016		Added Group codes for Ingrowth tree and Incorrectly included tree, and added damage codes for Dead top and Bear damage.	
Version 2.0	Lindsey Holm	06/17/2021	Section 1.1 Establishment	Expanded and updated. No substantive changes. Refined procedure for establishing new plots and for re-establishing lost plots.	Inventory Manual CKGG 20210701_01

Version 2.0	Lindsey Holm	06/17/2021	Section 1.2 Navigation to Plot Center	Edited for clarity. No substantive changes.	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Section 1.3 Special Plot Locations	Edited for clarity. No substantive changes.	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Subsection 1.3.1 Hazardous Conditions	Removed previous instructions to offset plots. Any newly installed plot will be NULL if it is too hazardous to measure. This is consistent with recent ARB guidance.	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Subsection 1.3.2 Denied Access	New	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Subsection 1.3.3 Roads and Landings	Edited for clarity. No substantive changes.	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Subsection 1.3.4 Plot is Outside of Project Area	New	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Subsection 1.3.5 Structures	New. Follows recent ARB guidance.	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Section 1.4 Plot Reestablishment	Edited for clarity. No substantive changes. Based on current FIA methods.	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Section 1.5 Plot Layout	Substantive change. Changed plots radius from three nested fixed radius plots to a single fixed radius 1/20th acre plot. The nested plot design is being abandoned because as trees move from one nested plot to another, the expansion factors change. This can result in major discrepancies in total plot carbon if it occurs in the elapsed time between plot measurement and sequential sampling. A single fixed radius plot is an equally valid sampling design and while it is less efficient, it is not susceptible to expansion factor changes. This change should achieve equal or greater accuracy relative to the original sampling design.	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Section 1.6 Trees Sampled	See above.	Inventory Manual CKGG 20210701_01

Version 2.0	Lindsey Holm	06/17/2021	Section 1.7 Units of Measure	No change.	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Section 1.8 Data Recording	Edited for clarity. No substantive changes.	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Section 1.9 Measurement Tools	New	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Section 1.10 Order of Measurements	Edited for clarity. No substantive changes.	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Section 1.11 Monumenting and Referencing Plot Center	Edited for clarity. No substantive changes.	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Subsection 1.11.1 Plot Center Monuments	Edited for clarity. No substantive changes.	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Subsection 1.11.2 Reference Trees	Edited for clarity. No substantive changes.	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Subsection 1.11.3 Tree Tags	Edited for clarity. No substantive changes.	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Section 1.12 Walkthrough	New - substantive change . The walkthrough method changes the number of sampled trees and their tree count. Accounting for edge effects where a plot overlaps a boundary is a common best practice in forest sampling. This change is intended to achieve greater accuracy relative to the original sampling design (which had no protocol for boundary overlap) . The walkthrough method will be applied to all new and remeasured plots in the current 2021 inventory.	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Section 2.1 Plot Number	Edited for clarity. No substantive changes.	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Section 2.2 Plot Status	New	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Section 2.3 Plot Non-Sampled Reason	New	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Section 2.4 Sample Kind	New	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Section 2.5 Field Guide Version	New	Inventory Manual CKGG 20210701_01

Version 2.0	Lindsey Holm	06/17/2021	Section 2.6 Current Date	Edited for clarity. No substantive changes.	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Section 2.7 Declination	New	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Section 2.8 QA Status	New	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Section 2.9 Crew Initials	Edited for clarity. No substantive changes.	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Section 2.10 Plot Slope	New	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Section 2.11 Plot Aspect	New	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Section 2.12 Elevation	New	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Section 2.13 Distance to Project Boundary	New	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Section 2.14 Water Protection Condition	New	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Section 2.15 Distance to Water	New	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Section 2.16 Regeneration Status	New	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Section 2.17 Artificial Regeneration Species	New	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Section 2.18 Disturbance	New	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Section 2.19 Disturbance Year	New	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Section 2.20 Treatment	New	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Section 2.21 Treatment Year	New	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Section 2.22 Header Note	New	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Section 2.23 Reference Tree Data	Edited for clarity. No substantive changes. New instructions are more specific about how to select and mark reference trees.	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Subsection 2.23.1 Reference tree tag number	No substantive changes.	Inventory Manual CKGG 20210701_01

Version 2.0	Lindsey Holm	06/17/2021	Subsection 2.23.2 Slope Distance	No substantive changes.	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Subsection 2.23.3 Azimuth	No substantive changes.	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Section 3.1 Definitions	New	Inventory Manual CKGG 20210701_01
				Expanded directions for measuring borderline trees. Removed the part about painting "out" on trees. We no longer do this. Instead we put a stripe on the side of the tree where distance was measured from. These changes make checking and remeasuring borderline trees more consistent and accurate, but do not change the measurement standard.	
Version 2.0	Lindsey Holm	06/17/2021	Section 3.2 Borderline Trees		Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Subsection 3.3.1 Tag Number	Edited for clarity. No substantive changes.	Inventory Manual CKGG 20210701_01
				New. Based on FIA coding system. Replaces some of the group codes in the old manual. Note that the old manual instructs cruisers to exclude trees that are blown down but alive. While it is true that these trees often die within a few years, this approach is too subjective. We now count these trees as per standard FIA procedure and have clarified when trees transition from the live/standing dead pool to the downed-dead pool.	
Version 2.0	Lindsey Holm	06/17/2021	Subsection 3.3.2 Present Tree Status		Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Subsection 3.3.3 Reconcile	New. Based on FIA coding system. Replaces some of the group codes in the old manual.	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Section 3.4 Species	Changed from two-letter species codes to the FIA's numeric species codes. No change to which species are included in the inventory.	Inventory Manual CKGG 20210701_01

				Expanded and updated based on FIA standard procedures. In the old manual DBH was rounded to the nearest 1/10th inch. This is now rounded down to the last 1/10th inch. Rounding DBH down is consistent with FIA and should not affect the accuracy of the sampling design since it is universally applied to the whole inventory. The old manual instructed cruisers to reconstruct the original diameter of dead trees with missing wood at DBH. This has been changed in the new manual to be consistent with FIA, which measures DBH as-is. We think the FIA method will more accurately reflect diameter growth over time and avoids introducing a subjective assessment of original diameter.	
Version 2.0	Lindsey Holm	06/17/2021	Section 3.5 Diameter		Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Subsection 3.5.1 Marking Current Diameter	See above	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Subsection 3.5.2 Diameter at Breast Height	See above	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Subsection 3.5.3 Diameter Check	New	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Subsection 3.6.1 Total Length	Updated with material from the current version of FIA. No substantive changes.	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Subsection 3.6.2 Truncated Length	Updated with material from the current version of FIA. No substantive changes.	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Subsection 3.6.3 Diameter Inside Bark	Updated with material from the current version of FIA. No substantive changes.	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Subsection 3.6.4 Length Method	New	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Subsection 3.7.1 Compacted Crown Ratio	Updated with material from the current version of FIA. We no longer use the code system from the old manual and now record Crown Ratio to the nearest 5%. This is more precise.	Inventory Manual CKGG 20210701_01

Version 2.0	Lindsey Holm	06/17/2021	Subsection 3.7.2 Crown Class	New	Inventory Manual CKGG 20210701_01
				Expanded, based on FIA standard procedures and modified for carbon quantification. The Damage Codes from the 2016 inventory are no longer collected because they are incorporated elsewhere in the new manual. For example, the leaning tree code is no longer applicable because the new method for measuring 5.7 TOTAL LENGTH accounts for lean. Dead top and broken top are captured in 5.8 TRUNCATED LENGTH and 5.8.1 DIAMETER INSIDE BARK AT BREAK.	
Version 2.0	Lindsey Holm	06/17/2021	Section 3.8 Tree Damage	Bear damage is captured by 5.13 CAUSE OF DEATH.	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Subsection 3.8.1 Missing Biomass	Expanded and updated based on current FIA methods and ARB guidance.	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Subsection 3.8.2 Cause of death	New	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Subsection 3.8.3 Mortality Year	New	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Subsection 3.8.4 Decay Class	Expanded. Changed to the FIA system that uses 5 classes instead of three.	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Section 3.9 Walkthrough Tree	New	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Section 3.10 Tree Notes	New	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Section 3.11 Site Tree Information	The 2016 version of the manual that was used to remeasure the plots removed the 'Site Trees' section since site trees are not remeasured after the initial plot installation. We added the Site Tree instructions back to the manual to maintain a record of how they were measured. Site trees are still not measured after the initial inventory.	Inventory Manual CKGG 20210701_01

Version 2.0	Lindsey Holm	06/17/2021	Chapter 4 Quality Assurance/Quality Control	Changed to allow experienced cruisers who participated in the inventory to also participate in the check cruise. However, no check cruiser is allowed to check their own plots. Added tolerance for borderline tree measurement.	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	QAQC Species Identification	No change.	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	QAQC Tree Count	No change.	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	QAQC Borderline Tree Horizontal Distance	New. Defines the tolerance for borderline tree measurement. This was previously undefined.	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	QAQC Diameter at Breast Height	No change.	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	QAQC Total Tree Height	No change.	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	QAQC Percent Live Crown	No change.	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Appendix A - Tree Species Codes	New	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Appendix B - Tree Coding Guide	New	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Appendix C - Glossary	New	Inventory Manual CKGG 20210701_01
Version 2.0	Lindsey Holm	06/17/2021	Appendix D - 20th Acre Plot Slope Correction Table	New. A slope correction table was used in previous inventories but this one uses 1 degree/percent slope increments and is more precise.	Inventory Manual CKGG 20210701_01