

**FIELD INSTRUCTIONS  
FOR THE  
INVENTORY  
OF  
PACIFIC ISLANDS  
2008  
(MARSHALL ISLANDS)**



**Forest Inventory and Analysis Program  
Pacific Northwest Research Station  
USDA Forest Service**



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**INVENTORY**  
**OF**  
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**2008**  
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## TABLE OF CONTENTS

|                                                                              |           |
|------------------------------------------------------------------------------|-----------|
| <b>1. INTRODUCTION.....</b>                                                  | <b>11</b> |
| A. Purposes of this manual .....                                             | 11        |
| B. Organization of this manual.....                                          | 11        |
| UNITS OF MEASURE .....                                                       | 12        |
| 1.1    GENERAL DESCRIPTION .....                                             | 13        |
| 1.2    PLOT SETUP .....                                                      | 14        |
| 1.3    PLOT INTEGRITY .....                                                  | 15        |
| Research topics.....                                                         | 15        |
| <b>2. TRAVEL PLANNING AND LOCATING THE PLOT .....</b>                        | <b>19</b> |
| A. Landowner contact .....                                                   | 19        |
| Permission.....                                                              | 19        |
| Recording conversations with landowners .....                                | 19        |
| Data requests .....                                                          | 19        |
| B. Before leaving base camp .....                                            | 19        |
| C. Checklist of items needed on plot .....                                   | 20        |
| Data recording items .....                                                   | 20        |
| Photo interpretation items .....                                             | 20        |
| Plot measuring items .....                                                   | 20        |
| Plot referencing items.....                                                  | 20        |
| First aid items .....                                                        | 20        |
| Personal and safety gear .....                                               | 20        |
| Camping gear .....                                                           | 21        |
| D. Safety.....                                                               | 21        |
| Safety in the woods .....                                                    | 21        |
| What to do if injured.....                                                   | 24        |
| E. Plot location aids.....                                                   | 24        |
| Plots not previously visited .....                                           | 24        |
| F. Locating the plot on the ground .....                                     | 24        |
| Locating new plots.....                                                      | 24        |
| G. Plots with active logging .....                                           | 25        |
| H. Denied access plots .....                                                 | 25        |
| I. Plot location Tolerance.....                                              | 25        |
| <b>3. PLOT LAYOUT AND REFERENCING .....</b>                                  | <b>29</b> |
| A. Plot layout at the current annual inventory .....                         | 29        |
| Standard 4-subplot plot diagram .....                                        | 29        |
| B. Census water, Denied access, Hazardous, and Not in the sample areas ..... | 30        |
| C. Recognition of condition classes .....                                    | 30        |
| D. Subplot numbering .....                                                   | 30        |
| Install N# subplots .....                                                    | 30        |
| E. Referencing the plot.....                                                 | 30        |
| 1. Referencing plots not visited previously .....                            | 30        |
| 2. An exception.....                                                         | 31        |
| 3. The reference point (RP).....                                             | 31        |
| 4. Referencing the plastic stake .....                                       | 32        |
| F. Referencing the other subplots on the standard layout .....               | 33        |
| 1. Mark subplot center. ....                                                 | 33        |
| 2. Select reference trees. ....                                              | 33        |
| 3. Tag the reference trees. ....                                             | 33        |
| 4. Record data about the reference trees.....                                | 33        |

|                                                                                         |           |
|-----------------------------------------------------------------------------------------|-----------|
| G. Recording reference tree data (all subplots on the standard layout) .....            | 33        |
| 1. If a tally tree .....                                                                | 33        |
| 2. If not a tally tree .....                                                            | 33        |
| H. Plot layout and referencing MQO .....                                                | 34        |
| <b>4. PLOT LEVEL DATA .....</b>                                                         | <b>37</b> |
| 4.1 COUNTRY, and STATE OR ISLAND.....                                                   | 37        |
| 4.2 COUNTY .....                                                                        | 37        |
| 4.3 PLOT NUMBER.....                                                                    | 37        |
| 4.4 SAMPLE KIND .....                                                                   | 37        |
| 4.5 FIELD GUIDE VERSION.....                                                            | 38        |
| 4.6 CURRENT DATE .....                                                                  | 38        |
| 4.6.1 YEAR .....                                                                        | 38        |
| 4.6.2 MONTH.....                                                                        | 38        |
| 4.6.3 DAY.....                                                                          | 39        |
| 4.7 DECLINATION .....                                                                   | 39        |
| 4.8 PLOT STATUS (FORESTED).....                                                         | 39        |
| 4.9 TRAILS OR ROADS.....                                                                | 39        |
| 4.10 HORIZONTAL DISTANCE TO IMPROVED ROAD .....                                         | 40        |
| 4.11 ROAD ACCESS .....                                                                  | 40        |
| 4.12 PUBLIC USE RESTRICTIONS .....                                                      | 41        |
| 4.13 RECREATION USE 1.....                                                              | 41        |
| 4.14 RECREATION USE 2.....                                                              | 42        |
| 4.15 RECREATION USE 3.....                                                              | 42        |
| 4.16 WATER ON PLOT .....                                                                | 42        |
| 4.17 QA STATUS .....                                                                    | 42        |
| 4.18 CREW TYPE .....                                                                    | 43        |
| 4.19 GPS COORDINATES.....                                                               | 43        |
| 4.19.1 GPS UNIT SETTINGS, DATUM, and COORDINATE SYSTEM.....                             | 43        |
| 4.19.2 COLLECTING READINGS .....                                                        | 43        |
| 4.19.3 GPS UNIT .....                                                                   | 44        |
| 4.19.4 GPS SERIAL NUMBER.....                                                           | 44        |
| 4.19.5 COORDINATE SYSTEM.....                                                           | 44        |
| 4.19.6 GPS DATUM .....                                                                  | 44        |
| 4.19.7 LATITUDE .....                                                                   | 45        |
| 4.19.8 LONGITUDE.....                                                                   | 45        |
| 4.19.9 UTM ZONE .....                                                                   | 45        |
| 4.19.10 EASTING (X) UTM .....                                                           | 45        |
| 4.19.11 NORTHING (Y) UTM.....                                                           | 45        |
| 4.19.12 GPS COLLECTION LOCATION.....                                                    | 45        |
| 4.19.13 AZIMUTH TO PLOT CENTER .....                                                    | 46        |
| 4.19.14 DISTANCE TO PLOT CENTER .....                                                   | 46        |
| 4.19.15 GPS ELEVATION .....                                                             | 46        |
| 4.19.16 GPS ERROR .....                                                                 | 46        |
| 4.19.17 NUMBER OF READINGS .....                                                        | 47        |
| 4.20 PLOT-LEVEL NOTES .....                                                             | 47        |
| <b>5. CONDITION CLASS.....</b>                                                          | <b>51</b> |
| 5.1 DETERMINATION OF CONDITION CLASS.....                                               | 51        |
| 5.1.1 Step 1: Delineate the plot area by CONDITION CLASS STATUS.....                    | 51        |
| 5.1.2 Step 2: Further subdivide Accessible Forest Land by 6 delineation variables ..... | 51        |
| 5.2 CONDITION CLASS ATTRIBUTES .....                                                    | 52        |
| 5.2.1 CONDITION CLASS NUMBER .....                                                      | 53        |
| 5.2.2 CONDITION CLASS STATUS .....                                                      | 53        |
| 5.3 DELINEATING CONDITION CLASSES DIFFERING IN CONDITION STATUS:.....                   | 54        |
| 5.3.1 ACCESSIBLE FOREST LAND.....                                                       | 57        |

|           |                                                                    |           |
|-----------|--------------------------------------------------------------------|-----------|
| 5.3.2     | NONFOREST LAND.....                                                | 60        |
| 5.3.3     | NONCENSUS WATER.....                                               | 60        |
| 5.3.4     | CENSUS WATER.....                                                  | 60        |
| 5.3.5     | DENIED ACCESS .....                                                | 60        |
| 5.3.6     | HAZARDOUS .....                                                    | 60        |
| 5.3.7     | NOT IN THE SAMPLE.....                                             | 60        |
| 5.4       | DELINEATING CONDITION CLASSES WITHIN ACCESSIBLE FOREST LAND: ..... | 61        |
| 5.4.1     | RESERVED STATUS.....                                               | 62        |
| 5.4.2     | OWNER GROUP .....                                                  | 63        |
| 5.4.3     | FOREST TYPE.....                                                   | 63        |
| 5.4.5     | STAND SIZE CLASS.....                                              | 64        |
| 5.4.6     | REGENERATION STATUS.....                                           | 65        |
| 5.4.7     | TREE DENSITY.....                                                  | 66        |
| 5.5       | ANCILLARY (NON-DELINEATING) VARIABLES.....                         | 67        |
| 5.5.1     | OWNER CLASS .....                                                  | 67        |
| 5.5.2     | PRIVATE OWNER INDUSTRIAL STATUS.....                               | 68        |
| 5.5.3     | ARTIFICIAL REGENERATION SPECIES.....                               | 68        |
| 5.5.4     | STAND AGE .....                                                    | 69        |
| 5.5.5     | DOMINANT TREE SPECIES 1 .....                                      | 69        |
| 5.5.6     | DISTURBANCE 1 .....                                                | 70        |
| 5.5.7     | DISTURBANCE YEAR 1 .....                                           | 71        |
| 5.5.8     | DISTURBANCE 2 .....                                                | 71        |
| 5.5.9     | DISTURBANCE YEAR 2 .....                                           | 71        |
| 5.5.10    | DISTURBANCE 3.....                                                 | 71        |
| 5.5.11    | DISTURBANCE YEAR 3 .....                                           | 72        |
| 5.5.12    | TREATMENT 1.....                                                   | 72        |
| 5.5.13    | TREATMENT YEAR 1 .....                                             | 73        |
| 5.5.14    | TREATMENT 2.....                                                   | 73        |
| 5.5.15    | TREATMENT YEAR 2 .....                                             | 73        |
| 5.5.16    | TREATMENT 3.....                                                   | 73        |
| 5.5.17    | TREATMENT YEAR 3 .....                                             | 73        |
| 5.5.18    | CONDITION CLASS SLOPE.....                                         | 73        |
| 5.5.19    | CONDITION CLASS ASPECT .....                                       | 73        |
| 5.5.20    | PHYSIOGRAPHIC CLASS.....                                           | 74        |
| 5.5.21    | PRESENT NONFOREST / INACCESSIBLE LAND USE.....                     | 75        |
| <b>6.</b> | <b>SUBPLOT INFORMATION .....</b>                                   | <b>79</b> |
| 6.1       | SUBPLOT NUMBER .....                                               | 79        |
| 6.2       | SUBPLOT CENTER CONDITION.....                                      | 79        |
| 6.3       | MICROPLOT CENTER CONDITION .....                                   | 79        |
| 6.4       | SUBPLOT SLOPE.....                                                 | 79        |
| 6.5       | SUBPLOT ASPECT .....                                               | 80        |
| 6.6       | SLOPE SHAPE .....                                                  | 81        |
| 6.7       | SLOPE POSITION .....                                               | 81        |
| 6.8       | SNOW/WATER DEPTH .....                                             | 82        |
| 6.9       | SUBPLOT STATUS.....                                                | 82        |
|           | SEEDLING COUNT .....                                               | 83        |
| 6.10      | SEEDLING COUNT DATA ITEMS.....                                     | 83        |
| 6.11      | SUBPLOT NUMBER .....                                               | 83        |
| 6.12      | CONDITION CLASS NUMBER.....                                        | 83        |
| 6.13      | SPECIES .....                                                      | 83        |
| 6.14      | SEEDLING COUNT.....                                                | 83        |

|            |                                                                                |            |
|------------|--------------------------------------------------------------------------------|------------|
| <b>7.0</b> | <b>BOUNDARY REFERENCES .....</b>                                               | <b>87</b>  |
| 7.1        | REFERENCE PROCEDURE .....                                                      | 87         |
| 7.2        | BOUNDARY DATA.....                                                             | 89         |
| 7.2.1      | SUBPLOT NUMBER .....                                                           | 89         |
| 7.2.2      | PLOT TYPE .....                                                                | 89         |
| 7.2.4      | CONTRASTING CONDITION .....                                                    | 90         |
| 7.2.5      | LEFT AZIMUTH .....                                                             | 90         |
| 7.2.6      | CORNER AZIMUTH .....                                                           | 90         |
| 7.2.7      | CORNER DISTANCE .....                                                          | 90         |
| 7.2.8      | RIGHT AZIMUTH.....                                                             | 91         |
| <b>8.</b>  | <b>VEGETATION PROFILE .....</b>                                                | <b>95</b>  |
| A.         | Vegetation plot design .....                                                   | 95         |
| B.         | Species records .....                                                          | 95         |
|            | Is it a tree or a shrub?.....                                                  | 96         |
| 8.1        | SPECIES GROWTH HABIT .....                                                     | 96         |
| Values:8.2 | SPECIES.....                                                                   | 97         |
| 8.2        | SPECIES .....                                                                  | 98         |
| 8.3        | SPECIES HEIGHT.....                                                            | 98         |
| 8.4        | SPECIES COVER .....                                                            | 99         |
| 8.5        | STAGE OF SHRUB DEVELOPMENT.....                                                | 102        |
| C.         | Lifeform and total vegetation records .....                                    | 102        |
| 8.6        | LIFEFORM.....                                                                  | 102        |
| 8.7        | LIFEFORM COVER.....                                                            | 102        |
| 8.8        | TOTAL VEGETATION COVER .....                                                   | 103        |
| D.         | Collection and identification of unknown plants .....                          | 103        |
| <b>9.</b>  | <b>TRACKABLE TREE AND SNAG SELECTION .....</b>                                 | <b>107</b> |
| A.         | Introduction .....                                                             | 107        |
| B.         | Determining if a tree/sapling/seedling is selected on a fixed-radius plot..... | 107        |
| C.         | Trackable tree and snag selection .....                                        | 108        |
| D.         | Seedling requirements.....                                                     | 108        |
| E.         | Tree and snag selection MQO.....                                               | 109        |
| <b>10.</b> | <b>TREE AND SAPLING DATA .....</b>                                             | <b>113</b> |
| 10.1       | SUBPLOT NUMBER .....                                                           | 114        |
| 10.2       | TREE NUMBER .....                                                              | 114        |
| 10.3       | CONDITION CLASS NUMBER.....                                                    | 115        |
| 10.4       | AZIMUTH.....                                                                   | 115        |
| 10.5       | HORIZONTAL DISTANCE .....                                                      | 116        |
| 10.6       | SLOPE DISTANCE .....                                                           | 116        |
| 10.7       | TREE STATUS.....                                                               | 116        |
| 10.8       | SPECIES .....                                                                  | 117        |
| 10.9       | DIAMETER .....                                                                 | 117        |
| 10.9.1     | DIAMETER AT BREAST HEIGHT (DBH) .....                                          | 117        |
| 10.9.2     | DIAMETER CHECK.....                                                            | 123        |
| 10.9.3     | LENGTH TO DIAMETER MEASUREMENT POINT .....                                     | 123        |
| 10.9.4     | SECOND DIAMETER ON UPPER BOLE .....                                            | 123        |
| 10.9.5     | SECOND DIAMETER ON UPPER BOLE HEIGHT .....                                     | 123        |
| 10.10      | BRANCHING CHARACTERISTICS.....                                                 | 124        |
| 10.11      | ROOT MEASUREMENTS FOR TROPICAL TREES.....                                      | 125        |
| 10.11.1    | TYPE OF ROOTING SYSTEM.....                                                    | 125        |
| 10.11.2    | ROOT DIAMTER 1 .....                                                           | 125        |
| 10.11.3    | ROOT DIAMETER 2.....                                                           | 125        |
| 10.11.4    | ROOTING HEIGHT .....                                                           | 126        |
| 10.11.5    | PROP ROOT DENSITY.....                                                         | 126        |

|         |                                        |     |
|---------|----------------------------------------|-----|
| 10.11.6 | NUMBER OF BUTTRESSES .....             | 127 |
| 10.11.7 | AERIAL ROOT DENSITY .....              | 127 |
| 10.12   | LEAN ANGLE .....                       | 128 |
| 10.13   | ROTTEN/MISSING CULL .....              | 128 |
| 10.14   | RECONSTRUCTED LENGTH .....             | 129 |
| 10.15   | ACTUAL LENGTH.....                     | 129 |
| 10.16   | LENGTH METHOD .....                    | 129 |
| 10.17   | CROWN CLASS.....                       | 130 |
| 10.18   | UNCOMPACTED LIVE CROWN RATIO .....     | 131 |
| 10.19   | COMPACTED CROWN RATIO .....            | 133 |
| 10.20   | TREE DAMAGE .....                      | 136 |
|         | <i>Damage Summary</i> .....            | 137 |
| 10.20.1 | DAMAGE LOCATION 1.....                 | 141 |
| 10.20.2 | DAMAGE TYPE 1.....                     | 143 |
| 10.20.3 | DAMAGE SEVERITY 1 .....                | 145 |
| 10.20.4 | DAMAGING AGENT 1.....                  | 158 |
| 10.20.5 | DAMAGE LOCATION 2.....                 | 158 |
| 10.20.6 | DAMAGE TYPE 2.....                     | 158 |
| 10.20.7 | DAMAGE SEVERITY 2 .....                | 159 |
| 10.20.8 | DAMAGING AGENT 2.....                  | 159 |
| 10.21   | DECAY CLASS .....                      | 159 |
| 10.22   | EPIPHYTE LOADING.....                  | 160 |
| 10.23   | CLUMP CODE.....                        | 161 |
| 10.24   | PRIORITY DAMAGE .....                  | 161 |
|         | 10.24.1 PRIORITY DAMAGE SEVERITY ..... | 161 |
| 10.25   | TREE NOTES.....                        | 161 |

## 11. TREES SPECIES LISTS

|                                                                 |     |
|-----------------------------------------------------------------|-----|
| All Trees: ordered alphabetically .....                         | 165 |
| Tree Genus Codes .....                                          | 173 |
| All Island Trees: ordered by number code .....                  | 175 |
| Palau Tree Species.....                                         | 191 |
| Guam Tree Species .....                                         | 197 |
| American Samoa Tree Species .....                               | 201 |
| Federated States of Micronesia Tree Species.....                | 205 |
| Commonwealth of the Northern Mariana Islands Tree Species ..... | 209 |
| Marshall Island Tree Species.....                               | 211 |

## 12. COORDINATES (GPS)..... 215

|                                                        |     |
|--------------------------------------------------------|-----|
| A. Overview .....                                      | 215 |
| B. When and where to collect readings .....            | 215 |
| C. Recording GPS information.....                      | 215 |
| D. GPS keypad layout and commands .....                | 215 |
| GPS keypad commands.....                               | 216 |
| E. GPS setup options.....                              | 217 |
| Required data for SETUP pages.....                     | 217 |
| F. Operating the GPS on plot.....                      | 217 |
| G. Collecting coordinates away from plot center .....  | 220 |
| H. Waypoints (Advanced GPS use).....                   | 220 |
| Creating a waypoint (when coordinates are given) ..... | 220 |
| Marking (storing) your current location.....           | 220 |
| I. Navigating with the GPS unit .....                  | 221 |
| K. Batteries.....                                      | 222 |

|                                                                          |                |
|--------------------------------------------------------------------------|----------------|
| <b>13. LASER 200 INSTRUCTIONS .....</b>                                  | <b>225</b>     |
| A. Overview .....                                                        | 225            |
| B. Basic operation .....                                                 | 225            |
| C. Settings.....                                                         | 225            |
| D. Filter and Reflectors .....                                           | 226            |
| E. Distances and % slope .....                                           | 226            |
| F. Tree heights .....                                                    | 226            |
| G. Gates .....                                                           | 227            |
| H. Cumulative distances .....                                            | 228            |
| <br><b>14. APPENDICES.....</b>                                           | <br><b>229</b> |
| APPENDIX 1 -- SLOPE CORRECTION TABLE.....                                | 231            |
| APPENDIX 2 -- ESTIMATING DBH WITH RELASKOPS.....                         | 233            |
| APPENDIX 3 -- HIGH PRIORITY SPECIES.....                                 | 235            |
| APPENDIX 4 -- FIPS CODES, UTM ZONES, AND DECLINATIONS .....              | 237            |
| APPENDIX 5 -- PRIORITY DAMAGE AND SEVERITY.....                          | 240            |
| APPENDIX 6 -- MEASURING HEIGHTS USING A CLINOMETER.....                  | 241            |
| APPENDIX 7 -- CALCULATING HORIZONTAL DISTANCE .....                      | 244            |
| APPENDIX 8 -- EXAMPLE OF BANYAN TREE MEASUREMENTS.....                   | 245            |
| APPENDIX 9 -- DETERMINING SCALES AND BASELINES FROM A MAP OR PHOTO ..... | 246            |
| APPENDIX 10 -- COMPLETING AND EDITING PLOTS .....                        | 248            |
| APPENDIX 11 -- DATA SHEETS .....                                         | 251            |
| APPENDIX 12 -- METRIC EQUIVALENTS AND AIDS .....                         | 263            |
| APPENDIX 13 -- HELLO LETTER/DATA CONFIDENTIALITY .....                   | 265            |
| APPENDIX 14 -- LANDOWNER CONTACT LETTER.....                             | 267            |
| APPENDIX 15 -- VARIANCE PLOTS .....                                      | 271            |
| APPENDIX 16 -- GLOSSARY .....                                            | 273            |
| APPENDIX 17 -- INDEX .....                                               | 283            |

## 1. INTRODUCTION

This manual documents the field procedures by the Forest Inventory and Analysis Program (FIA) in the inventory of the Pacific Islands.

FIA, a program within the Pacific Northwest Research Station (PNW), USDA Forest Service, is one of five Forest Inventory and Analysis work units across the United States. PNW-FIA is responsible for inventorying the forest resources of Alaska, California, Oregon, Washington, Hawaii, Guam, American Samoa, Republic of Palau, Federated States of Micronesia, Commonwealth of Northern Mariana Islands, and Marshall Islands.

### ***A. Purposes of this manual***

This manual serves two purposes, to:

- instruct field personnel in how to locate and measure field plots.
- document the field procedures, methods, and codes used in the inventory.

### ***B. Organization of this manual***

This manual is structured primarily for use by field personnel. Each chapter corresponds either to a separate function that must be performed in locating and measuring a field plot, or to a particular aspect of data recording that must be completed.

The procedures in this manual are ordered to coincide as much as possible with the order in which field data items are collected and entered onto data sheets in the field, and the laptop data entry program. Some procedures and codes are repeated in multiple chapters of the manual to minimize the need to refer to additional chapters while collecting data in the standard order.

This manual incorporates the field data collection procedures of the Forest Inventory and Analysis National Core Field Guide with regionally specific procedures.

Information that is infrequently used or that is included only for documentation is in the appendices at the end of this manual. A glossary and an index are provided for quick reference.

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

DATA ELEMENT NAME -- <brief variable description>

When collected: <when data element is recorded>

Field width: <X digits>

Tolerance: <range of measurement that is acceptable>

MQO: <measurement quality objective>

Values: <legal values for coded variables>

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

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

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

## **UNITS OF MEASURE**

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

### **PLOT DIMENSIONS:**

Subplot - for selecting trees with diameter  $\geq$  5.0 inch (in)

Radius = 24.0 feet

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

Microplot - for counting seedlings and selecting saplings

Radius = 6.8 feet

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

The distance between subplot centers is 120.0 feet horizontal.

The minimum area needed to qualify as accessible forest land is 1.0 acre.

The minimum width to qualify as accessible forest land is 120.0 ft

### **Tree Limiting Dimensions:**

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

## 1.1 GENERAL DESCRIPTION

The CORE field plot consists of four subplots approximately 1/24 acre in size with a radius of 24.0 feet. The center subplot is subplot 1. Subplots 2, 3, and 4 are located 120.0 feet horizontal (+/- 7 feet) at azimuths of 360, 120, and 240 degrees, respectively, from the center of subplot 1 (see Figure 1). Subplots are used to collect data on trees with a diameter (at breast height "DBH", or at root collar "DRC") of 5.0 inches or greater. Throughout this field guide, use of the word "plot" refers to the entire set of four subplots. "Plot center" is defined as the center of subplot 1.

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

Data are collected on field plots at the following levels:

**Plot**                Data that describe the entire cluster of four subplots.

**Subplot**          Data that describe a single subplot of a cluster.

**Condition Class**    A discrete combination of landscape attributes that describe the environment on all or part of the plot. These attributes include CONDITION CLASS STATUS, RESERVED STATUS, OWNER GROUP, FOREST TYPE, STAND SIZE CLASS, REGENERATION STATUS, and TREE DENSITY.

**Boundary**        An approximate description of the demarcation line between two condition classes that occur on a single subplot, microplot, or annular plot. There is no boundary recorded when the demarcation occurs beyond the fixed radius plots.

**Tree**            Data describing saplings with a diameter 1.0 inch through 4.9 inches, and trees with diameter greater than or equal to 5.0 inches

**Seedling**        Data describing trees with a diameter less than 1.0 inch and greater than or equal to 0.5 foot in length (conifers) or greater than or equal to 1.0 foot in length (hardwoods).

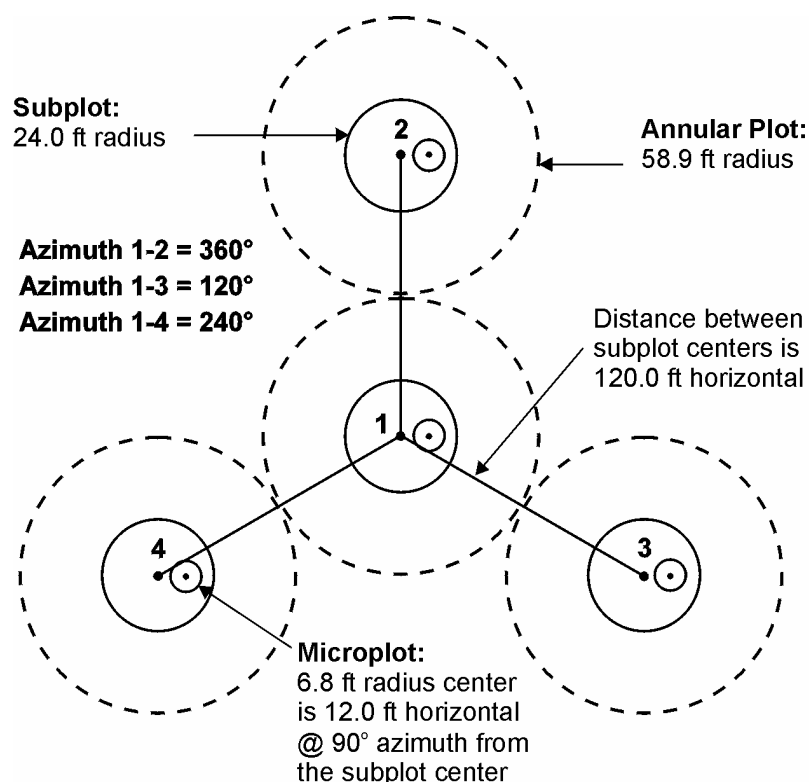


Figure 1. FIA Phase 2 plot diagram

## 1.2 PLOT SETUP

Plots will be established according to the regional guidelines of each FIA unit. When the crew cannot occupy the plot center because safety hazards exist, or the plot center is inaccessible or out of the sample, the crew should check the other subplots. If any subplot centers can be occupied and are in the sample, the subplots that can be occupied should be established and sampled following normal procedures. When a subplot center or microplot center cannot be occupied, no data will be collected from that subplot or microplot; instead, the entire subplot or microplot should be classified according to the condition preventing occupancy.

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

| Subplot<br>From | Numbers<br>To | Azimuth<br>degrees | Backsight | Distance<br>feet |
|-----------------|---------------|--------------------|-----------|------------------|
| 2               | 3             | 150                | 330       | 207.8            |
| 2               | 4             | 210                | 030       | 207.8            |
| 3               | 4             | 270                | 090       | 207.8            |

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

Assign the next TREE RECORD NUMBER.

### 1.3 PLOT INTEGRITY

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

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

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

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

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

All other potentially damaging procedures that may erode subplot integrity are prohibited.

**The following practices are specifically prohibited:**

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

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

### Products

PNW-FIA provides information needed by resource planners, policy analysts, and others involved in forest resource decision-making. Data collected in PNW-FIA inventories is summarized, interpreted, analyzed, and published in statistical and analytical reports of national, state, and subregional scope. PNW-FIA publishes information on area by forest land and owner classes, land use change; timber volume, growth, mortality, and removals; potential forest productivity; opportunities for silvicultural treatment; and kind and area of wildlife habitats. PNW-FIA also provides data to answer questions about forest resources.

### Research topics

The data collected in these inventories represent a wealth of information for both applied and basic questions concerning forest ecosystems. Topics include: the distribution of plant species and their relationship to environment, the incidence of insects and disease in relation to forest type and condition, changes in forest due to disturbance, and improved prediction of forest growth and development on different sites and in response to management.



## TABLE OF CONTENTS

|                                                      |           |
|------------------------------------------------------|-----------|
| <b>2. TRAVEL PLANNING AND LOCATING THE PLOT.....</b> | <b>19</b> |
| A. Landowner contact.....                            | 19        |
| Permission .....                                     | 19        |
| Recording conversations with landowners .....        | 19        |
| Data requests.....                                   | 19        |
| B. Before leaving base camp .....                    | 19        |
| C. Checklist of items needed on plot.....            | 20        |
| Data recording items.....                            | 20        |
| Photo interpretation items .....                     | 20        |
| Plot measuring items .....                           | 20        |
| Plot referencing items .....                         | 20        |
| First aid items.....                                 | 20        |
| Personal and safety gear.....                        | 20        |
| Camping gear .....                                   | 21        |
| D. Safety .....                                      | 21        |
| Safety in the woods.....                             | 21        |
| Safety on the road.....                              | 22        |
| What to do if injured .....                          | 24        |
| E. Plot location aids .....                          | 24        |
| Plots not previously visited .....                   | 24        |
| F. Locating the plot on the ground.....              | 24        |
| Locating new plots .....                             | 24        |
| G. Plots with active logging .....                   | 25        |
| H. Denied access plots.....                          | 25        |
| I. Plot location Tolerance .....                     | 25        |

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## **2. TRAVEL PLANNING AND LOCATING THE PLOT**

### ***A. Landowner contact***

#### **Permission**

Written or verbal landowner permission must be obtained before a plot is visited. This responsibility lies with the field coordinator who may delegate contacting the landowner to the field crew.

#### **Recording conversations with landowners**

Include a record of each conversation with a plot landowner on the Ownership Contact form. While not a part of the official plot record, this information will document that permission was obtained, assist in accessing the area for variance-plots, and possibly aid the field crew during a future inventory.

Ask landowners if they can confirm the dates of any disturbance (usually harvesting) on the plot since the previous visit; record this date on the Plot Attribute Record. Record any special circumstances about plot accessibility--such as locked gates or washed-out roads on the Plot Record.

#### **Data requests**

Plot specific data is released only to the legal owner of the plot area. Requests for photocopies of the field data sheets and plotcard, summarized plot data, and for copies of future publications based on information collected in this inventory should be noted on the plot card. Current plot data will generally be sent to the owner after the field season is completed and plots are returned to the office. If the landowner desires, the crew may provide photocopies of plot data immediately after collection.

Any additional data requests should be referred to the client request person in the Portland office:

Joseph Donnegan

Portland Forestry Sciences Lab

P.O. Box 3890

Portland, OR 97208

phone: (503) 808-2053

email: [jdonnegan@fs.fed.us](mailto:jdonnegan@fs.fed.us)

### ***B. Before leaving base camp***

1. Make sure the landowner has been contacted (see above).
2. Plan the route to the plot. Always bring two or more extra plots.
3. Leave word of plot locations and expected destinations with the crew coordinator using the arranged system (cell phone, voice mail, ...).
4. Make sure your vehicle has all of the necessary field gear and a plot map.
5. Be in agreement with your crew partner(s) on a work procedure.
6. Inspect vehicle for fuel, oil, lights, safety features, and plot supplies (stakes, tags, pins, and nails) prior to departure.

### ***C. Checklist of items needed on plot***

#### **Data recording items**

Previous plot records and photos

Plot jacket (previous and current plot records with subplot diagrams, and field photos)

Hand-held data recorder downloaded with plot records; extra AA batteries

GPS unit with fully-charged batteries

Mechanical pencils, red photo pen, black pen, eraser

Note pad(s) made of "write-in-the-rain" paper

Blank forms for plot, subplot, condition class attributes; tree tally; CWD; veg profile; and subplot diagram

Calculator(s)

Tatum

Field procedures manual

Plant ID guide(s), plant association guides, plant disease guide

#### **Photo interpretation items**

Plot (road) map

Stereoscope(s) (2x and/or 4x) with case and sharp straight pins

Photo scale (Timber Survey Aid #16)

6 inch ruler calibrated in 1/20th inches

Hand lens

#### **Plot measuring items**

Compass(es)

Clinometer(s)

Diameter tape(s)-20 foot

Increment borer(s) with sheath

100 foot tape(s) with carabiner(s)

Hand axe(s) with sheath

Laser height/rangefinder

Plant press for plant specimens and paper bags for root disease samples

#### **Plot referencing items**

Steel plot pins

Aluminum nails

Tree number tags

Square aluminum tags

Round aluminum tags

Flagging tape

#### **First aid items**

First aid kits

Bee sting and/or snake bite kits

#### **Personal and safety gear**

Canteens with water

Lunches

Utility pouch

Vest and hardhat  
Rain gear  
Gloves  
Flashlight and batteries  
Extra clothing  
Extra food

### **Camping gear**

When applicable:

Sleeping pad  
Extra water or water purifier  
Stove with fuel and matches  
Food  
Cooking/eating dishes and utensils  
Flashlight

## ***D. Safety***

Personnel working in the field are subject to many safety hazards. Each person must always be conscious of these hazards to avoid accidents:

1. **Don't take chances!**
2. **Eliminate horseplay and carelessness!**
3. **Think safety!**
4. **No task is more important than personal safety!**
5. **Always make sure that someone else knows where you plan to work each day!**

### **Safety in the woods**

**Wear protective clothing:** Long-sleeved shirts, long pants, and gloves may protect you from contact with brush and rocks, poison oak, and stinging insects. Trouser legs should be loose enough to avoid binding or cramping, and should not have cuffs. Wear a hardhat at all times in the woods. During hunting seasons, wear bright red or orange clothing.

**Wear good quality boots** that provide good support and traction. For example: 8-inch high leather work boots with lug-soles (Vibram-type soles).

**Walk, don't run in the woods.** Take your time and plan your route. Avoid plunging through the brush. The best route of travel may not be the shortest. Routes across brushy, irregular terrain with rocks and down logs can be hazardous.

**Be watchful of twigs and branches, which may cause eye injury.** Be especially alert when stepping up to trees which retain their small dead twigs. Keep a sufficient distance behind the person ahead of you to avoid being slapped by branches.

**Lift knees high to clear obstacles in heavy undergrowth or slash.** Slow down and watch your step.

**When contouring a steep slope, do not lean into the hill.** This tends to loosen footing. Erect posture or slightly leaning out gives more secure footing.

**Know how to fall to avoid hard impacts.** Keep flexible with knees slightly bent. If you feel yourself slipping, pick a landing spot. Do not stick your arms out to break a fall. Roll with the fall. Try to take the impact on the side of your body rather than your back.

**Don't take chances by walking across ravines on small logs.**

**Bee aware.** Keep an eye out for yellow jacket and hornet activity. Yellow jackets nest in the ground, often in well-decayed logs or in thick moss on trees or in snag cavities. Yellow jackets are particularly active (nasty) during late summer and early fall when forest conditions are very dry. Hornets nest above ground in "paper" nests that are suspended from branches; woe befalls those who unwittingly bump their head against a nest, or shake the sapling from which a nest is suspended. If allergic to insect stings, carry medication to counteract the effects of stings.

**Be alert to rattling or buzzing noises.** Look before putting hands or feet on or under rocks and logs. Be alert when walking in snake-infested areas.

**Avoid poison oak and other poisonous plants,** if possible. Place oil on exposed skin before going to field. After contact with poison oak, remove clothes carefully, wash exposed areas with cool, soapy water, and wash clothes before wearing them again.

**Keep someone posted as to where you plan to work each day,** particularly on long hikes into the forest, so that if you do not return in a reasonable time, someone can find you.

**Keep hatchets in their sheath** except when actually using them, and snap the sheath shut.

**First Aid.** Keep your individual first-aid kit completely supplied, and know how to use it. Treat all wounds promptly. Each vehicle is supplied with a large first-aid kit – keep it stocked.

**Carry matches and possibly a small flashlight.** On very long hikes, take extra food, clothing, and matches in case you are caught out in the woods at night. Never build fires in forest duff or leave a campfire until it is dead out.

**Check for ticks.** The beasties bite and can carry Lyme disease.

**Carry plenty of water.** Don't expect your partner to carry water for you.

**Beware of lightning.** Watch for approaching storms. Avoid prominent high exposed ground and tall/lone trees. Abandon field gear, especially that made of metal. Seek shelter in the vehicle if possible, otherwise in thick timber, large caves or in valley bottoms. Crouch on the balls of your feet with your head covered. Separate 100 feet from other crew members.

### **Safety on the road**

It all pays the same, so drive with care, with courtesy, regardless of others' actions, and with common sense. Follow these tips:

**Seat belt use is required** by all government employees, volunteers, and contractors. Do not ride in the back of pickups.

**DRIVE DEFENSIVELY!** Expect the other person, whether a vehicle operator or a pedestrian, to do the worst thing and be prepared. Observe all speed regulations and traffic signs.

**Do not drive when sleepy, taking medication, or when other personal conditions make it unsafe to drive a vehicle.** Get someone else to drive or, if alone, stop driving and nap (out of the public view).

**Always drive with your headlights on.** This practice increases the visibility of your vehicle. It is particularly important when driving in fog, on dusty roads, traveling in and out of shadows, and any other low light/visibility situations. Turn lights off when you park the vehicle.

**Do not operate a vehicle in an unsafe condition.** Check your vehicle frequently to keep it in good mechanical condition. Lights, horn, steering, and brakes should be kept in proper adjustment at all times. Make necessary repairs as soon as unsafe condition develops. Report any unsafe conditions to your supervisor.

**Keep the vehicle clean.** Windows, mirrors, and lights should be kept clean and free of obstructions to increase visibility. Keep the cab and driver area clean so material is not rolling under pedals or distracting the driver.

**Shift to a lower gear at the beginning of a grade, if the grade is a long, steep descent.**

**Adjust vehicle speed to the driving conditions.** Wet, icy, or snowy roads and decreased visibility require decreased speed. Be aware of speed when changing from one type of road to another, i.e., Freeway to secondary highway to gravel and adjust speed accordingly.

**Don't tailgate.** Allow at least three seconds of travel distance between yourself and the vehicle ahead. Under slippery road conditions and poor visibility, allow more distance.

**Be aware of your vehicle's idiosyncrasies and adjust your driving accordingly.**

**Be alert for heavily loaded trucks moving at high speeds when driving on privately-owned log-haul roads.** Observe all traffic control signs, particularly signs requiring you to drive on the left side of the road.

**Back up safely.** Walk around your vehicle to check for hazards before backing and use a spotter to guide you.

**Do not drive and navigate at the same time.** If the driver needs to look at maps and photos, stop at a safe place, then look at them.

**Watch for animals on the road.** Most hooved animals travel in groups, so where there is one, assume there are many, with all just itching to jump out in front of your vehicle. Stop and let the animal move off the road, look for others to follow, then proceed on. If you can not stop in time to avoid hitting an animal, it is generally better to hit it, than to go off the road or hit another vehicle.

**Park the vehicle so that it is not a hazard to other drivers.** Do not park where dry grass or other potential fuels can come in contact with your vehicle's hot exhaust system.

**Keep as far right as is safely possible on blind curves on logging roads.** If the curve is blind and less than two lanes wide, slow way down and be ready to take evasive action.

**Yield to uphill vehicles on roads wide enough only for one vehicle.**

### **What to do if injured**

**Treat the injury promptly.** If immediate medical attention is required, go directly to a hospital emergency room. Try to make contact with your supervisor or the office to get instructions and assistance. Make sure the doctor fills out his/her part on the CA-1 form.

**Inform your supervisor of all injuries** and ask which, if any, forms need to be filled out. Supervisors must inform the office at the earliest opportunity.

**Fill out Federal accident forms completely with signatures.** ALWAYS make a copy for your personal records. Give the completed forms to your supervisor. Have the supervisor check your entries for mistakes, fill out their section, and forward the completed forms to the appropriate person.

**Gather Information.** If you are in a multi-vehicle accident, provide the other parties with enough written information so that they can easily get in touch with you, your crew supervisor, and the office. In turn, you must get the following information from all involved parties and witnesses -- names, addresses, phone numbers, vehicle license numbers, driver's license numbers, insurance company names and policy numbers, and police report numbers. If possible, do not admit responsibility without first contacting your supervisor.

## ***E. Plot location aids***

Each field crew should have a road map with the location of the plots marked and a plot packet for each plot you may visit. The plot packet for each field plot will generally contain old and new photos, previous plot records with plot diagrams, current computer-printed Plot, Subplot, and Condition Class Attribute records, computer-printed current tree tally records, and a plot review sheet.

Use the road map, plot cards and aerial photos from the previous inventories to locate the plot. The county, plot number, and legal description (township, range, section, and forty) are printed on the Plot Attribute record. Plot locations are marked and numbered on the road map. Use the road map to reach the general vicinity of the plot by motor vehicle. Once you are within the area covered by the photos, you may use the photos to find the exact plot location on the ground.

### **Plots not previously visited**

These plots will have new aerial photos with the field grid location pinpricked on them. Some plots may also have coordinates obtained by digitizing USGS topographic maps or by some other means.

## ***F. Locating the plot on the ground***

### **Locating new plots**

1. Locating a plot by inspection: For plots not previously established (i.e. plots without field photos that were pinpricked at the time of previous inventory), use the new photos to proceed to the pinpricked location by photo interpretation. When you reach the point you believe is the pinpricked location, carefully check the pinpricked field grid location on the new photos against the surrounding terrain and pattern of tree crowns and vegetation to confirm that the pinpricked location on the photo and your location on the ground are exactly the same spot. In some cases

you may be able to navigate to the plot center using the GPS receiver then pinprick the aerial photograph after confirming your location as described above.

2. Locating a plot with an RP (Reference Point, see page 31) and baseline: You may encounter a plot that is difficult to locate using photo interpretation. In this case you may establish a baseline on the photos to determine true photo azimuth and scale. Once the baseline is established:
  - a) Select, tag, pinprick, and record a RP, preferably within 500 feet of the plot. (See page 30).
  - b) On the photos, draw a straight line between the RP and pinpricked location.
  - c) Determine the azimuth and distance from the RP to the referenced subplot.
  - d) Measure out the calculated azimuth and distance to the referenced subplot. Locate the field grid location which is the center of subplot 1 on the standard layout to begin the plot. If a new plot, carefully check the photos against the surrounding terrain and vegetation to make sure you are actually at the field grid location pinpricked on the new photo.

### ***G. Plots with active logging***

If the plot area is being logged (timber is being felled, bucked, or yarded) or is unsafe to visit because of active logging, DO NOT ESTABLISH THE PLOT. Note on the plot jacket the status of the logging operation and return the plot to the supervisor. The supervisor will hold the plot until later in the season, when the status of the logging operation will be checked again to see if the plot can be completed.

### ***H. Denied access plots***

If access is denied to the field grid location or a portion of a plot, see "Denied Access plots" on page 30.

### ***I. Plot location Tolerance***

Plot location:

Tolerance: Remeasured plot: relocated

New plot: located +/- 30.0 ft.

Aerial photograph:

Tolerance: Previous and current pinpricks in correct spot: +/- 1 mm. 100% of the time



## TABLE OF CONTENTS

### 3. PLOT LAYOUT AND REFERENCING

|                                                                              |    |
|------------------------------------------------------------------------------|----|
| A. Plot layout at the current annual inventory.....                          | 29 |
| Standard 4-subplot plot diagram .....                                        | 29 |
| B. Census water, Denied access, Hazardous, and Not in the sample areas.....  | 30 |
| C. Recognition of condition classes .....                                    | 30 |
| D. Subplot numbering .....                                                   | 30 |
| Install N# subplots .....                                                    | 30 |
| E. Referencing the plot .....                                                | 30 |
| 1. Referencing plots not visited previously .....                            | 30 |
| 2. An exception.....                                                         | 31 |
| 3. The reference point (RP) .....                                            | 31 |
| 4. Referencing the plastic stake .....                                       | 32 |
| F. Referencing the other subplots on the standard layout .....               | 33 |
| 1. Mark subplot center. ....                                                 | 33 |
| 2. Select reference trees. ....                                              | 33 |
| 3. Tag the reference trees. ....                                             | 33 |
| 4. Record data about the reference trees.....                                | 33 |
| G. Recording reference tree data (all subplots on the standard layout) ..... | 33 |
| 1. If a tally tree .....                                                     | 33 |
| 2. If not a tally tree .....                                                 | 33 |
| H. Plot layout and referencing MQO .....                                     | 34 |

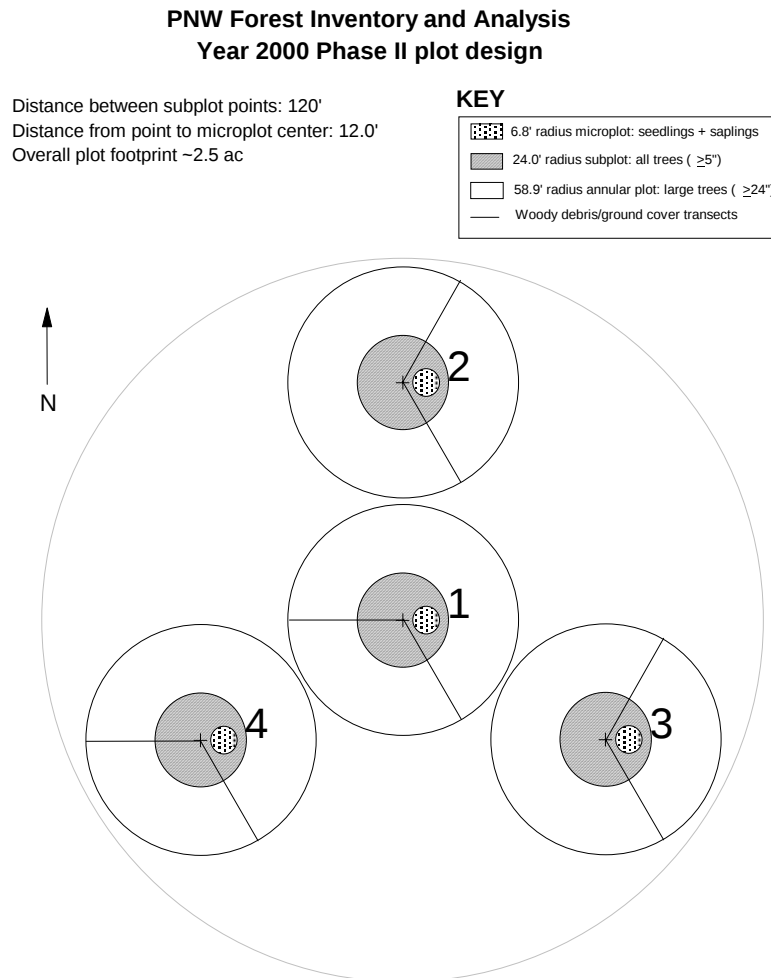


### 3. PLOT LAYOUT AND REFERENCING

#### A. Plot layout at the current annual inventory

In the current annual inventory the 4 subplots are laid out in the pattern below across condition classes. Subplots are never "substituted" or "moved" in order to keep the entire subplot within a condition class.

#### Standard 4-subplot plot diagram



| From      | To        | Horizontal Distance | Azimuth |
|-----------|-----------|---------------------|---------|
| Subplot 2 | Subplot 3 | 207.8 ft.           | 150     |
| Subplot 2 | Subplot 4 | 207.8 ft.           | 210     |
| Subplot 3 | Subplot 4 | 207.8 ft.           | 270     |
| Subplot 1 | Subplot 2 | 120 ft              | 360     |
| Subplot 1 | Subplot 3 | 120 ft              | 120     |
| Subplot 1 | Subplot 4 | 120 ft              | 240     |

## ***B. Census water, Denied access, Hazardous, and Not in the sample areas***

At the current inventory for all subplots (including subplot 1 - plot center)

1. If a subplot center **can** be physically occupied, then any Census water, Denied access, Hazardous, or Not in the sample areas are mapped as separate condition classes. Measurements are taken only in any accessible forest land condition classes.
2. If a subplot center **can not** be physically occupied (i.e. Census water, Denied access, or Hazardous) the subplot will not be installed or referenced. The entire subplot is classified as the subplot center condition, even though a portion of it may be in another condition class. Other subplots are installed using normal procedures.

See mapping Condition Status on page **51** for further instructions.

## ***C. Recognition of condition classes***

Each plot area recognized within an inventoried area is divided into condition classes. The area within each subplot's 24-foot fixed-radius plot is mapped using these condition classes. Condition classes are first defined by differences in condition status. Some of these condition classes may be further subdivided by other attributes. The condition class in which the field grid location lies (the center of subplot 1) is always condition class 1. While most subplots encompass only one condition class, some will have two or more classes within their 24-foot radius.

### **Condition classes are determined in three steps:**

1. Plot area is divided into condition classes based on differences in condition status.
2. Accessible forest land condition classes are further divided by differences in 6 mapping variables.
3. Nonforest land condition classes are further divided, in some cases, by differences in non-forest land use.

See the Condition Class Attributes chapter on page **47** for complete instructions.

## ***D. Subplot numbering***

### **Install N# subplots**

Install the four subplots in the configuration described above. The subplots are labeled N# (N1, N2, N3, and N4) subplots.

All condition classes present on the subplot (within the 24 ft. fixed-radius) are mapped on the subplot diagram. In accessible forest land and measured rangeland condition classes, trees, snags, saplings, seedlings, and understory vegetation are measured. These data are not measured or collected in any other type of mapped condition classes

## ***E. Referencing the plot***

### **1. Referencing plots not visited previously**

If the plot has not been visited previously, the field grid location was pinpricked on the new field photos prior to field visit. The pinprick is marked on the photos with a nearby red dot.

**Do the following steps:**

- a) Find this pinpricked field grid location on the ground. (The location will become the center of subplot 1 on the standard layout).
- b) Install a plastic stake at this location on the ground. Check to see that "An exception" on page 31 does not apply.
- c) Reference the new stake to nearby two trees; see "Referencing the plastic stake" on page 32.
- d) Reference the new stake to an RP; see "The reference point (RP)" on page 31.
- e) Circle the pinprick in pencil on the back of the photo and write "PC" (plot center) and the plot number near the circle.
- f) Determine and pinprick the ground location of the RP on the new photos using photointerpretation. Circle the pinprick in pencil on the back of the photo and write "RP" near the circle.

## **2. An exception**

The plastic stake is not placed at the field grid location if the 24-foot fixed-radius plot at subplot 1 on the standard layout is entirely nonforest land or either of the following situations occur:

- a) the center of subplot 1 is too hazardous to visit (examples: subplot center 1 is in the middle of a pond, or the middle of a freeway, or on the side of a cliff) **OR**
- b) placing the plastic stake at the center of subplot 1 is very apt to irritate a landowner (example: subplot center 1 is in the middle of someone's front lawn).

If the exception applies, reference the center of the lowest-numbered subplot on the standard layout that has a forest land condition class present within its 24-foot fixed-radius plot.

**Specifically, do the following steps:**

- a) Place a plastic stake at the center of this subplot,
- b) Reference the new stake to two nearby trees; see "Referencing the plastic stake" on page 32.
- c) Reference the new stake to an RP; see "The reference point (RP)" on this page.
- d) If a revisited plot, determine and pinprick the location of the field grid location on the new photos using photo interpretation. All plots: use a photo marking pen to circle the pinprick on the back of the photo and write "PC" (plot center) and the plot number near the circle.
- e) Determine and pinprick the ground location of the RP on the new photos using photo interpretation. Circle the pinprick in pencil on the back of the photo and write "RP to subplot (insert number)" near the circle (Example: "RP to subplot 3").

Keep in mind that the field grid location in this case, is not at the location of the plastic stake. The field grid location is always the center of subplot 1 on the standard layout regardless of whether it is referenced.

## **3. The reference point (RP)**

The RP references the plastic stake. It is an object (usually a tree) that is prominent, apt to be present at next visit and easily located on the ground.

**Selecting an RP:** The RP should be distinctive on both the ground and on the new photos. You may reuse an old RP tree on a previously measured plot if it is suitable. If the old RP tree is dead,

missing, or difficult to identify on the ground or on the plot photo, select a new RP. If possible, it should be a tree which is not likely to die or be cut before the next inventory. You may select a snag or other object for an RP (i.e., a distinctive fence post, building corner, telephone pole, etc.). If you use such a RP, describe it on the plot photo and in "Location Description" on the Plot Record.

**Tag the RP:** Mark the RP tree with new or reused tags. Nail aluminum square tags on two or more sides of the RP tree, 6 feet above ground line, facing directions you expect future crews to approach the RP. Also nail an aluminum square tag on the RP tree below stump height, on the side of the tree facing the plastic stake. When attaching a tag, drive the nail into the tree only enough to anchor the nail firmly into the wood; always leave at least 2 inches of nail exposed.

**Pinprick the RP location:** Pinprick the ground location of the RP on the new photos UNLESS the RP pinprick would obscure another pinprick. Circle the RP pinprick on the back of the photo and write "RP" and the plot number near the circle (but do not obscure any pinpricks).

**Record RP data:** Record the species of the RP, it's d.b.h. to the nearest inch, azimuth from RP to plastic stake, and slope distance measured to the nearest foot from RP to the plastic stake on the back of the aerial photo, under "Plot Reference" on the Plot Record, and in the Plot Attributes section of the plot data.

In "Location Description" on the Plot Record, record any information that would aid the next crew in relocating the plot. Describe prominent features present in the plot area that are unlikely to change in the next ten years; examples include details such as slope, aspect, topographic position, recognizable physiographic features ( i.e. streams, rock outcrops, benches), human-made features, and unusual or large trees. If any new roads have been built in the plot area since the date of the new field photos, sketch them on the photos if it will help the next crew to find the plot.

**Example:** "The RP is a large Douglas-fir (over 120 feet tall) in a draw that descends northeast from mainline logging road 1000. Subplot N1 is down slope from the RP and is just down slope and next to a large rock outcrop."

#### **4. Referencing the plastic stake**

To reference the plastic stake with nearby trees, **do the following steps:**

- a) Select two trees near the plastic stake that form, as closely as possible, a right angle with the stake. If the previous reference trees meet this criterion, reuse them. On a revisited plot, if you select a new reference tree, remove the square tags (if present) from the reference tree it is replacing to avoid confusing the next crew. Trees within 6 feet of the stake are preferable. If live trees are not available, use stumps or sound snags.
- b) Nail a square aluminum tag below stump height (<1 foot above the ground) on each reference tree on the side facing the stake. If the trees are also numbered tally trees, attach the tree number tags with the same nails. When attaching a tag, drive the nail into the tree only enough to anchor the nail firmly into the wood; always leave at least 2 inches of nail exposed.
- c) In two locations on each reference tree, nail a round aluminum tag 6 feet high facing likely approaches to the subplot.
- d) Record data about the reference trees; refer to "Recording reference tree data" on page 33.

## ***F. Referencing the other subplots on the standard layout***

One subplot on the standard layout, usually subplot 1, is referenced adequately by the plastic stake and its nearby reference trees and RP. Do the following steps:

### **1. Mark subplot center.**

Mark subplot center with a metal pin and round, and tie a piece of flagging to the pin.

### **2. Select reference trees.**

Select 2 trees near the pin that form, as closely as possible, a right angle with the pin. Trees within 6 feet of the pin are preferred. If trees are not available, use stumps or sound snags. On subplots established previously, reuse the previous reference trees, or if there are better trees available, use new reference trees. Renew old reference tags as needed.

### **3. Tag the reference trees.**

- a) If a tally tree: Nail an aluminum round to each reference tree, 6 feet above ground line, facing the direction you expect future crews to approach the subplot. If the tree is a trackable (tally) tree that does not require a numbered tag, attach an additional aluminum round tag below stump height facing subplot center. When attaching a round tag, drive the nail into the tree only enough to anchor the nail firmly into the wood; always leave at least 2 inches of nail exposed.
- b) If not a tally tree: Nail an aluminum round 6 feet above ground line facing the direction you expect future crews to approach the subplot, and nail one aluminum round below stump height facing the subplot center. If the reference is a live tree with a diameter 3.0 in. d.b.h. or larger, mark where diameter is measured with an aluminum nail; rules for marking diameter on page **117** apply. When attaching a round tag or marking d.b.h., drive the nail into the tree only enough to anchor the nail firmly into the wood; always leave at least 2 inches of nail exposed.

### **4. Record data about the reference trees**

Refer to "Recording reference tree data" (next section).

## ***G. Recording reference tree data (all subplots on the standard layout)***

Azimuth (subplot center to tree), slope distance to the head of the nail affixing the basal tag or tree number tag, species, and diameter are recorded for each reference tree, snag, or stump. NOTE: Reference tree distance is always slope distance from the subplot center to the head of the nail affixing the basal aluminum tag or tree number tag. This is in addition to the horizontal distance to the center of the tree collected for all tally trees.

### **1. If a tally tree**

If a reference tree or snag is a trackable tally tree, enter "REF" in REMARKS for this tree. Also enter a SLOPE DISTANCE for this tree. SLOPE DISTANCE is the measured distance from the subplot center to the head of the nail at the base of the tree.

### **2. If not a tally tree**

If the reference is not a tally tree or stump, enter a new record for the tree or stump; assign the record a TREE STATUS of 9, and record azimuth, (slope) distance, species, and diameter (diameter for a stump is the average of two width measurements across the top of the stump).

## ***H. Plot layout and referencing MQO***

RP selection:

Tolerance: No error in selection criteria

Subplot location:

Tolerance: Remeasured subplot:  $\pm 0.5$  ft. of previous location

New subplot:  $\pm 5.0$  ft.

Subplot reference (tree) selection:

Tolerance: No error in selection criteria

## TABLE OF CONTENTS

|                                                              |           |
|--------------------------------------------------------------|-----------|
| <b>4. PLOT LEVEL DATA.....</b>                               | <b>37</b> |
| 4.1 COUNTRY, and STATE OR ISLAND .....                       | 37        |
| 4.2 COUNTY .....                                             | 37        |
| 4.3 PLOT NUMBER .....                                        | 37        |
| 4.4 SAMPLE KIND .....                                        | 37        |
| 4.5 FIELD GUIDE VERSION .....                                | 38        |
| 4.6 CURRENT DATE .....                                       | 38        |
| 4.6.1 YEAR.....                                              | 38        |
| 4.6.2 MONTH .....                                            | 38        |
| 4.6.3 DAY .....                                              | 39        |
| 4.7 DECLINATION .....                                        | 39        |
| 4.8 PLOT STATUS (FORESTED).....                              | 39        |
| 4.9 TRAILS OR ROADS .....                                    | 39        |
| 4.10 HORIZONTAL DISTANCE TO IMPROVED ROAD .....              | 40        |
| 4.11 ROAD ACCESS .....                                       | 40        |
| 4.12 PUBLIC USE RESTRICTIONS .....                           | 41        |
| 4.13 RECREATION USE 1 .....                                  | 41        |
| 4.14 RECREATION USE 2 .....                                  | 42        |
| 4.15 RECREATION USE 3 .....                                  | 42        |
| 4.16 WATER ON PLOT.....                                      | 42        |
| 4.17 QA STATUS .....                                         | 42        |
| 4.18 CREW TYPE .....                                         | 43        |
| 4.19 GPS COORDINATES .....                                   | 43        |
| 4.19.1 GPS UNIT SETTINGS, DATUM, and COORDINATE SYSTEM ..... | 43        |
| 4.19.2 COLLECTING READINGS .....                             | 43        |
| 4.19.3 GPS UNIT .....                                        | 44        |
| 4.19.4 GPS SERIAL NUMBER .....                               | 44        |
| 4.19.5 COORDINATE SYSTEM .....                               | 44        |
| 4.19.6 GPS DATUM.....                                        | 44        |
| 4.19.7 LATITUDE .....                                        | 45        |
| 4.19.8 LONGITUDE .....                                       | 45        |
| 4.19.9 UTM ZONE .....                                        | 45        |
| 4.19.10 EASTING (X) UTM.....                                 | 45        |
| 4.19.11 NORTHING (Y) UTM .....                               | 45        |
| 4.19.12 GPS COLLECTION LOCATION .....                        | 45        |
| 4.19.13 AZIMUTH TO PLOT CENTER .....                         | 46        |
| 4.19.14 DISTANCE TO PLOT CENTER.....                         | 46        |
| 4.19.15 GPS ELEVATION .....                                  | 46        |
| 4.19.16 GPS ERROR.....                                       | 46        |
| 4.19.17 NUMBER OF READINGS.....                              | 47        |
| 4.20 PLOT-LEVEL NOTES .....                                  | 47        |

## Plot Level Data

## **4. PLOT LEVEL DATA**

All variables listed in this section are collected on plots with at least one accessible forested condition (PLOT STATUS = 1). For all NONFOREST/NONSAMPLED plots (PLOT STATUS = 2 or PLOT STATUS = 3), see Section 8. In general, plot level data apply to the entire plot, and they are recorded from the center of subplot 1.

### **4.1 COUNTRY, and STATE OR ISLAND**

If available, record the unique FIPS (Federal Information Processing Standard) code identifying the State where the plot center is located. Otherwise, record simply the country name and island.

When collected: All plots  
Field width:  
Tolerance: No errors  
MQO: At least 99% of the time  
Values: See Appendix 4, page 237

### **4.2 COUNTY**

If available, record the unique FIPS (Federal Information Processing Standard) code identifying the county (or unit in AK) where the plot center is located. Otherwise, record the provincial designation that will allow relocation.

When collected: All plots  
Field width: 3 digits  
Tolerance: No errors  
MQO: At least 99% of the time  
Values: See Appendix 4, page 237

### **4.3 PLOT NUMBER**

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

When collected: SAMPLE KIND = 1 or SAMPLE KIND = 2  
Field width: 4 digits  
Tolerance: No errors  
MQO: At least 99% of the time  
Values: 0001 to 9999

### **4.4 SAMPLE KIND**

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

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

- 1 Initial plot establishment - the initial establishment and sampling of a national design plot (FIA Field Guide versions 1.1 and higher). SAMPLE KIND 1 is assigned under the following circumstances:
  - Initial activation of a panel or subpanel
  - Reactivation of a panel or subpanel that was previously dropped
  - Resampling of established plots that were not sampled at the previous visit
- 2 Remeasurement – remeasurement of a national design plot that was sampled at the previous inventory.
- 3 Replacement plot - a replacement plot for a previously established plot. Assign SAMPLE KIND = 3 if a plot is installed at a location other than the previous location (i.e., plots that have been lost, moved, or otherwise replaced). Note that replacement plots require a separate plot file for the previous plot. Replaced plots are assigned PLOT STATUS = 3, SAMPLE KIND = 2, and the appropriate NONSAMPLED REASON code. The plot number for the replacement plot is assigned by NIMS.

#### 4.5 FIELD GUIDE VERSION

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

When collected: All plots  
 Field width: 2 digits (x.y)  
 Tolerance: No errors  
 MQO: At least 99% of the time  
 Values: 1.1 (Maine 1999) and higher

#### 4.6 CURRENT DATE

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

##### 4.6.1 YEAR

Record the year that the plot was completed.

When collected: All plots  
 Field width: 4 digits  
 Tolerance: No errors  
 MQO: At least 99% of the time  
 Values: Beginning with 1998, constant for a given year

##### 4.6.2 MONTH

Record the month that the plot was completed.

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

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

#### **4.6.3 DAY**

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

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

#### **4.7 DECLINATION**

Record the azimuth correction used to adjust magnetic north to true north. All azimuths are assumed to be magnetic azimuths unless otherwise designated. The PNW FIA units have historically corrected all compass readings for true north. This field is to be used only in cases where units are adjusting azimuths to correspond to true north; for units using magnetic azimuths, this field will always be set = 0 in the office. This field carries a decimal place because the USGS corrections are provided to the nearest half degree. DECLINATION is defined as:

$$\text{DECLINATION} = (\text{TRUE NORTH} - \text{MAGNETIC NORTH})$$

When collected: CORE OPTIONAL: All plots  
Field width: 5 digits including sign. (+xxx.y)  
Tolerance: No errors  
MQO: At least 99% of the time  
Values: See Appendix 4, page 237

#### **4.8 PLOT STATUS (FORESTED)**

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

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

- 0 No accessible forest land (condition class 1) or measured nonforest (present nonforest land use 16-26)
- 1 At least 1 accessible forest land condition class
- 2 No accessible forest land, but at least 1 measured nonforest (present nonforest land use 16-26)

#### **4.9 TRAILS OR ROADS**

Record the nearest trail or road to the plot. Use the plot photo, maps, or reasonable observations made while traveling to the plot to determine nearest trail or road (within 1 mile straight-line distance of the plot center). If two or more trails or roads are estimated to be equally distant, code the higher quality trail or road (lower code number). Base the coding decision on the condition of the road at the time of the visit.

When collected: All plots with at least one accessible forest land condition class  
Field width: 1 digit

Tolerance: No errors

MQO: At least 90% of the time

Values:

- |   |                                                                                       |
|---|---------------------------------------------------------------------------------------|
| 0 | None within 1 mile                                                                    |
| 1 | Paved road or highway                                                                 |
| 2 | Improved gravel road (has gravel, ditching, and/or other improvements)                |
| 3 | Improved dirt road (has ditching, culverts, signs, reflectors, or other improvements) |
| 4 | Unimproved dirt road/four-wheel drive road (has no signs of any improvements)         |
| 5 | Human access trail- clearly noticeable and primarily for recreational use             |

#### **4.10 HORIZONTAL DISTANCE TO IMPROVED ROAD**

Record the straight-line distance from plot center (subplot 1) to the nearest improved road. An improved road (TRAILS OR ROADS = 1, 2, or 3) is a road of any width that is maintained as evidenced by pavement, gravel, grading, ditching, and/or other improvements.

When collected: All plots with at least one accessible forest land condition class

Field width: 1 digit

Tolerance: No errors

MQO: At least 90% of the time

Values:

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

#### **4.11 ROAD ACCESS**

Record the first road access restrictions encountered while traveling to the plot. These restrictions limit car and truck access to the starting point for the walk to the plot, and may occur on ownerships encountered before reaching the plot area.

When collected: All plots with at least one accessible forest land condition class

Field width: 1 digit

Tolerance: No errors

MQO: At least 90% of the time

Values:

- |   |                                                                                                                                         |
|---|-----------------------------------------------------------------------------------------------------------------------------------------|
| 0 | None – no road access restrictions                                                                                                      |
| 1 | Road blocked by locked gate or cable across road                                                                                        |
| 2 | Road blocked by a human-made obstruction across road (ditch, mound, etc.)                                                               |
| 3 | Road blocked by natural occurrences (trees blown over onto road, road or bridge washed out)                                             |
| 4 | Posted no motorized vehicle signs; road present, but restricted area such as Wilderness or National Park where vehicles are not allowed |
| 9 | Other – specify in plot-level notes                                                                                                     |

#### **4.12 PUBLIC USE RESTRICTIONS**

Record, if any, the restriction posted near or on the plot area that limits public use of the plot area; if more than one restriction occurs for the plot area, record the lowest number restriction present (1-3, 9).

When collected: All plots with at least one accessible forest land condition class

Field width: 1 digit

Tolerance: No errors

MQO: At least 90% of the time

Values:

- |   |                                     |
|---|-------------------------------------|
| 0 | None – no public use restrictions   |
| 1 | Keep out / no trespassing           |
| 2 | No hunting or fishing               |
| 3 | No dumping                          |
| 9 | Other - specify in plot-level notes |

#### **4.13 RECREATION USE 1**

Record up to 3 signs of recreation use encountered within the accessible forest land portion of any of the four subplots, based on evidence such as campfire rings, compacted areas (from tents), hiking trails, bullet or shotgun casings (if you are not on a military firing range), tree stands, etc. Record the recreation use that has had the most significant impact on the plot area first, then the second and third use. For example, in general numerous four-wheel drive or ATV trails would be coded before camping, and camping before hiking, and hiking before fishing. Use the coding system provided as a hierarchy. Do not repeat codes, except codes 0 and 9. Physical recreation evidence must be present to code 1-9. Also, disregard dumping where no evidence of recreation is present. Examine the plot area for clues before spending an exorbitant amount of time trying to find evidence that normally would not be found in the area; look for the obvious signs first.

When collected: All plots with at least one accessible forest land condition class

Field width: 1 digit

Tolerance: No errors

MQO: At least 90% of the time

Values:

- |   |                                                                                                                                         |
|---|-----------------------------------------------------------------------------------------------------------------------------------------|
| 0 | No evidence of recreation use                                                                                                           |
| 1 | Motor vehicle (four wheel drive, ATV, motorcycle, snowmobile)                                                                           |
| 2 | Horse riding, dog team trails, ski trails                                                                                               |
| 3 | Camping                                                                                                                                 |
| 4 | Hiking                                                                                                                                  |
| 5 | Hunting/shooting                                                                                                                        |
| 6 | Fishing                                                                                                                                 |
| 7 | Boating – physical evidence such as launch sites or docks                                                                               |
| 9 | Other – recreation use where evidence is present, such as human litter, but purpose is not clear or does not fit into above categories. |

#### **4.14 RECREATION USE 2**

Record the second most significant recreation use impact. See RECREATION USE 1 for coding instructions.

#### **4.15 RECREATION USE 3**

Record the third most significant recreation use impact. See RECREATION USE 1 for coding instructions.

#### **4.16 WATER ON PLOT**

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

When collected: All plots with at least one accessible forest land condition class

Field width: 1 digit

Tolerance: No errors

MQO: At least 90% of the time

Values:

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

#### **4.17 QA STATUS**

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

When collected: P2 - All plots

Field width: 1 digit

Tolerance: No errors

MQO: At least 99% of the time

Values:

- 1 Standard production plot
- 2 Cold check
- 3 Reference plot (off grid)
- 4 Training/practice plot (off grid)
- 5 Botched plot file (disregard during data processing)
- 6 Blind check
- 7 Production plot (hot check)

## **4.18 CREW TYPE**

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

When collected: P2 - All plots

Field width: 1 digit

Tolerance: No errors

MQO: At least 99% of the time

Values:

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

## **4.19 GPS COORDINATES**

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

### **4.19.1 GPS UNIT SETTINGS, DATUM, and COORDINATE SYSTEM**

Consult the GPS unit operating manual or other regional instructions to ensure that the GPS unit internal settings, including Datum and Coordinate system, are correctly configured. See Chapter 12 beginning on page 215

Each FIA unit will determine the Datum to be used in that region. Coordinates collected using any appropriate datum can be converted back to a national standard for reporting purposes.

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

### **4.19.2 COLLECTING READINGS**

Collect at least 180 GPS readings or let the GPS unit average for at least 3 minutes at the plot center. These may be collected in a file for post-processing or may be averaged by the GPS unit. Each individual position should have an error of less than 70 ft if possible (the error of all the averaged readings is far less).

Soon after arriving at plot center, use the GPS unit to attempt to collect coordinates. If suitable positions (180 readings at error  $\leq$  70 ft) cannot be obtained, try again before leaving the plot center.

If it is still not possible to get suitable coordinates from plot center, attempt to obtain them from a location within 200 ft of plot center. Obtain the azimuth and horizontal distance from the "offset" location to plot center. Record the azimuth and horizontal distance as described on page 46.

Coordinates may be collected further than 200 ft away from the plot center if a laser measuring device is used to determine the horizontal distance from the "offset" location to plot center. Again, record the azimuth and horizontal distance as described on page 46

In all cases try to obtain at least 180 positions or let the unit average at least 3 minutes before recording the coordinates.

#### 4.19.3 GPS UNIT

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

When collected: All field visited plots

Field width: 1 digit

Tolerance: No errors

MQO: At least 99% of the time

Values:

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

#### 4.19.4 GPS SERIAL NUMBER

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

When collected: When GPS UNIT > 0

Field width: 6 digits

Tolerance: No errors

MQO: At least 99% of the time

Values: 000001 to 999999

#### 4.19.5 COORDINATE SYSTEM

Record a code indicating the type of coordinate system used to obtain readings.

When collected: When GPS UNIT > 0

Field width: 1 digit

Tolerance: No errors

MQO: At least 99% of the time

Values:

- 1 Geographic coordinate system (Latitude/Longitude)
- 2 UTM coordinate system**

#### 4.19.6 GPS DATUM

Record the datum used for each set of coordinates that are collected.

Values: **2 = WGS 84**

#### **4.19.7 LATITUDE**

Record the latitude of the plot center to the nearest hundredth second, as determined by GPS.

When collected: When COORDINATE SYSTEM = 1  
Field width: 8 digits (DDMMSSSS)  
Tolerance: +/- 140 ft  
MQO: At least 99% of the time

#### **4.19.8 LONGITUDE**

Record the longitude of the plot center, to the nearest hundredth second, as determined by GPS.

When collected: When COORDINATE SYSTEM = 1  
Field width: 9 digits (DDDMMSSSS)  
Tolerance: +/- 140 ft  
MQO: At least 99% of the time

#### **4.19.9 UTM ZONE**

Record a 2-digit and 1 character field UTM ZONE as determined by GPS.

When collected: When COORDINATE SYSTEM = 2  
Field width: 3 digits (##C)  
Tolerance: No errors  
MQO: At least 99% of the time  
Values: See Appendix 4 Page 237

#### **4.19.10 EASTING (X) UTM**

Record the Easting coordinate of the plot center as determined by GPS.

When collected: When COORDINATE SYSTEM = 2  
Field width: 7 digits  
Tolerance: +/- 140 ft  
MQO: At least 99% of the time

#### **4.19.11 NORTHING (Y) UTM**

Record the Northing coordinate of the plot center as determined by GPS.

When collected: When COORDINATE SYSTEM = 2  
Field width: 7 digits  
Tolerance: +/- 140 ft  
MQO: At least 99% of the time

#### **4.19.12 GPS COLLECTION LOCATION**

As described in Section 4.19.2, coordinates may be collected at a location other than the plot center (an "offset" location). Record items 4.19.13 and 4.19.14.

When collected: All plots  
Field width: 1 digit  
Values: Y = coordinates were collected at center of subplot 1  
N = coordinates were collected away from center of subplot 1

#### **4.19.13 AZIMUTH TO PLOT CENTER**

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

When collected: When GPS UNIT = 2, 3 or 4

Field width: 3 digits

Tolerance +/- 3 degrees

MQO: At least 99% of the time

Values: 000 when coordinates **are** collected at plot center

001 to 360 when coordinates **are not** collected at plot center

#### **4.19.14 DISTANCE TO PLOT CENTER**

Record the horizontal distance in feet from the location where coordinates were collected to the actual plot center. If coordinates are collected at plot center, record 000. As described in Section 1.18.2, if a Laser range finder is used to determine DISTANCE TO PLOT CENTER, offset locations may be up to 999 ft from the plot center. If a range finder is not used, the offset location must be within 200 ft.

When collected: When GPS UNIT = 2, 3 or 4

Field width: 3 digits

Tolerance: +/- 6 ft

MQO: At least 99% of the time

Values: 000 when coordinates **are** collected at plot center

001 to 200 when a Laser range finder **is not** used to determine distance

001 to 999 when a Laser range finder **is** used to determine distance

#### **4.19.15 GPS ELEVATION**

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

When collected: When GPS UNIT = 1, 2 or 4

Field width: 6 digits

Tolerance:

MQO: At least 99% of the time

Values: -00100 to 20000

#### **4.19.16 GPS ERROR**

Record the error as shown on the GPS unit to the nearest foot. As described in Section 4.19.2, make every effort to collect readings only when the error  $\leq 70$  ft. However, if after trying several different times during the day, at several different locations, this is not possible, record reading with an error of up to 999 ft.

When collected: When GPS UNIT =1 or 2

Field width: 3 digits

Tolerance: No errors

MQO: At least 99% of the time

Values: 0 to 70 if possible

71 to 999 if an error of less than 70 cannot be obtained

#### **4.19.17      NUMBER OF READINGS**

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

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

#### **4.20 PLOT-LEVEL NOTES**

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

Use the notes to describe irregularities in the data that are not covered under Condition Class data, Plot data, or Subplot data. For example, the entire plot may be in condition class 1 and have a condition status of 1 (accessible forest land), but there is no tree tally on subplot 2. Explain that the center of subplot 2 falls in the middle of a nonforest inclusion that is less than 1 acre in size, or it is in a river less than 30 ft wide, etc.

Plot notes can also be used to describe diseases, disturbance, treatments, weather conditions, access problems, or anything else that would help describe plot conditions.

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



## TABLE OF CONTENTS

|          |                                                                                   |    |
|----------|-----------------------------------------------------------------------------------|----|
| 5.       | CONDITION CLASS.....                                                              | 51 |
| 5.1      | DETERMINATION OF CONDITION CLASS.....                                             | 51 |
| 5.1.1    | Step 1: Delineate the plot area by CONDITION STATUS.....                          | 51 |
| 5.1.2    | Step 2: Further subdivide Accessible Forest Land by 6 delineation variables ..... | 51 |
| 5.2      | CONDITION CLASS ATTRIBUTES .....                                                  | 52 |
| 5.2.1    | CONDITION CLASS NUMBER .....                                                      | 53 |
| 5.2.2    | CONDITION CLASS STATUS .....                                                      | 53 |
| 5.3      | DELINEATING CONDITION CLASSES DIFFERING IN CONDITION STATUS: .....                | 54 |
| 5.3.1    | ACCESSIBLE FOREST LAND.....                                                       | 57 |
| 5.3.2    | NONFOREST LAND.....                                                               | 60 |
| 5.3.3    | NONCENSUS WATER.....                                                              | 60 |
| 5.3.4    | CENSUS WATER.....                                                                 | 60 |
| 5.3.5    | DENIED ACCESS .....                                                               | 60 |
| 5.3.6    | HAZARDOUS .....                                                                   | 60 |
| 5.3.7    | NOT IN THE SAMPLE.....                                                            | 60 |
| 5.4      | DELINEATING condition classes within accessible forest land: .....                | 61 |
| 5.4.1    | RESERVED STATUS.....                                                              | 62 |
| 5.4.2    | OWNER GROUP.....                                                                  | 63 |
| 5.4.3    | FOREST TYPE.....                                                                  | 63 |
| 5.4.5    | STAND SIZE CLASS.....                                                             | 64 |
| 5.4.6    | REGENERATION STATUS.....                                                          | 65 |
| 5.4.7    | TREE DENSITY.....                                                                 | 66 |
| 5.5      | ANCILLARY (NON-DELINEATING) VARIABLES.....                                        | 67 |
| 5.5.1    | OWNER CLASS .....                                                                 | 67 |
| 5.5.2    | PRIVATE OWNER INDUSTRIAL STATUS.....                                              | 68 |
| 5.5.3    | ARTIFICIAL REGENERATION SPECIES.....                                              | 68 |
| 5.5.4    | STAND AGE .....                                                                   | 69 |
| 5.5.5    | DOMINANT TREE SPECIES 1 .....                                                     | 69 |
| 5.5.5.1  | DOMINANT TREE SPECIES 2 .....                                                     | 70 |
| 5.5.5.2  | DOMINANT TREE SPECIES 3.....                                                      | 70 |
| 5.5.6    | DISTURBANCE 1 .....                                                               | 70 |
| 5.5.7    | DISTURBANCE YEAR 1 .....                                                          | 71 |
| 5.5.8    | DISTURBANCE 2 .....                                                               | 71 |
| 5.5.9    | DISTURBANCE YEAR 2 .....                                                          | 71 |
| 5.5.10   | DISTURBANCE 3.....                                                                | 71 |
| 5.5.11   | DISTURBANCE YEAR 3 .....                                                          | 72 |
| 5.5.12   | TREATMENT 1.....                                                                  | 72 |
| 5.5.13   | TREATMENT YEAR 1 .....                                                            | 73 |
| 5.5.14   | TREATMENT 2.....                                                                  | 73 |
| 5.5.15   | TREATMENT YEAR 2 .....                                                            | 73 |
| 5.5.16   | TREATMENT 3.....                                                                  | 73 |
| 5.5.17   | TREATMENT YEAR 3 .....                                                            | 73 |
| 5.5.18   | CONDITION CLASS SLOPE.....                                                        | 73 |
| 5.5.19   | CONDITION CLASS ASPECT .....                                                      | 73 |
| 5.5.20   | PHYSIOGRAPHIC CLASS.....                                                          | 74 |
| 5.5.20.1 | SLOPE SHAPE .....                                                                 | 74 |
| 5.5.20.2 | SLOPE POSITION .....                                                              | 74 |
| 5.5.21.  | PRESENT NONFOREST / INACCESSIBLE LAND USE.....                                    | 75 |

## **5. CONDITION CLASS**

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

### **5.1 DETERMINATION OF CONDITION CLASS**

#### **5.1.1 Step 1: Delineate the plot area by CONDITION CLASS STATUS**

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

1. Accessible forest land (See definition on page 57)
2. Nonforest land
3. Noncensus water
4. Census water
5. Denied access area
6. Area too hazardous to visit
7. Area that is not in the sample, e.g., in Canada or Mexico.

Accessible forest land defines the population of interest for FIA purposes. This is the area where most of the data collection is conducted.

#### **5.1.2 Step 2: Further subdivide Accessible Forest Land by 6 delineation variables**

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

1. Reserved Status
2. Owner Group
3. Forest Type
4. Stand Size Class
5. Regeneration Status
6. Tree Density

No other attribute shall be the basis for recognizing contrasting accessible forest land condition classes. For each condition class recognized, several “ancillary attributes” that help describe the condition will be collected, but will not be used for delineation purposes (see Section 5.5).

## 5.2 **CONDITION CLASS ATTRIBUTES**

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

- 5.4.1 Reserved Status
- 5.4.2 Owner Group
- 5.4.3 Forest Type
- 5.4.4 Stand Size
- 5.4.5 Regeneration Status
- 5.4.6 Tree Density

.....

- 5.5.1 Owner Class
- 5.5.2 Private Owner Industrial Status
- 5.5.3 Artificial Regeneration Species
- 5.5.4 Stand age
- 5.5.5 Dominant tree species
- 5.5.6 Disturbance (up to 3 coded)
- 5.5.7 Disturbance Year (1 per disturbance)
- 5.5.12 Treatment (up to 3 coded)
- 5.5.13 Treatment Year (1 per treatment)
- 5.5.18 Condition Class slope
- 5.5.19 Condition Class aspect
- 5.5.20 Physiographic Class
- 5.5.21 Present Nonforest land use

When classifying condition status, owner group, reserved status, and previous and present nonforest use, base the classification on what is present within the area defined by the fixed radius plot (subplot or microplot). When classifying all other condition class variables, base the classification on the entire plot area. See page **29**

Specific instructions for the classification of each attribute follow.

### 5.2.1 CONDITION CLASS NUMBER

On a plot, assign and record a unique identifying number for each condition class. At the time of the plot establishment, the condition class at plot center (the center of subplot 1) is designated condition class 1. Other condition classes are assigned numbers sequentially at the time each condition class is delineated. On a plot, each sampled condition class must have a unique number that can change at remeasurement to reflect new conditions on the plot.

CONDITION CLASS NUMBER is independent of SUBPLOT NUMBER.

When collected: All condition classes

Field width: 1 digit

Tolerance: No errors

MQO: At least 99% of the time

Values: 1 to 9

### CONDITION CLASS DEFINING (DELINEATION) VARIABLES:

### 5.2.2 CONDITION CLASS STATUS

Record the code that describes the status of the condition. Record for all condition classes sampled on a plot. The instructions in Section 5.2 and 5.3 apply when delineating condition classes that differ by CONDITION CLASS STATUS.

When collected: All condition classes

Field width: 1 digit

Tolerance: No errors

MQO: At least 99% of the time

Values:

1. Accessible forest land (see definition on page 57)
2. Nonforest land
3. Noncensus water
4. Census water
5. Denied access area
6. Area too hazardous to visit

Area that is not in the sample, e.g., in Canada or Mexico.

### **5.3 DELINEATING CONDITION CLASSES DIFFERING IN CONDITION STATUS:**

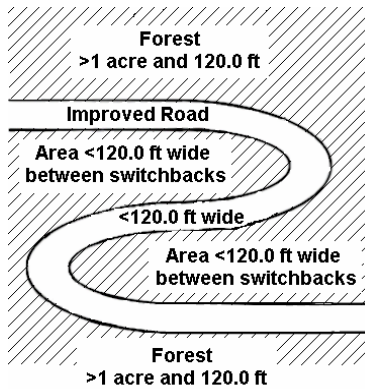
The first step in delineating condition classes is to recognize differences in CONDITION STATUS. The most common difference is adjacent accessible forest land and nonforest land. Adjacent accessible forest land and nonforest land condition classes are recognized only if each of the two prospective condition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

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

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

**Five exceptions** to these size and width requirements apply:

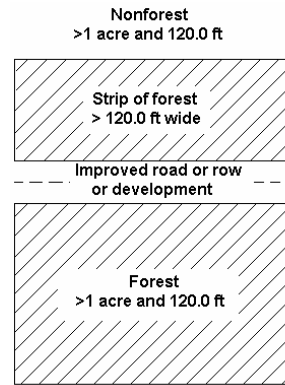
1. Developed nonforest condition: human-caused nonforest land condition classes such as homes or cabins that are less than 1.0 ac in size and 120.0 ft in width and are surrounded by forest land. There are three kinds of developed nonforest conditions that do not have to meet area or width requirements (Figures 2 and 3).
  - a) Improved roads: paved roads, gravel roads, or improved dirt roads regularly maintained for long-term continuing use. Unimproved traces and roads created for skidding logs are not considered improved roads
  - b) Maintained rights-of-way: corridors created for railroads, power lines, gas lines, and canals that are periodically treated to limit the establishment and growth of trees and shrubs.
  - c) Developments: structures and the maintained area next to a structure, all less than 1.0 ac in size and surrounded by forest land. Examples of developments are houses or trailers on very small lots, communication installations in a small cleared area within forest land, and barns and sheds.



**Figure 2. Example of a switchback road.**

The area between the switchbacks is coded as Forested Condition Class

The improved road is a Nonforest Condition Class



**Figure 3. Example of nonforest and forest strips.**

The strips of forest at the top and bottom of the diagram are coded as Forested Condition Class.

The improved road and the nonforest area >1 acre and 120 ft wide are both Nonforest Condition Classes

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

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

For two alternating strips of forest and nonforest between two qualifying areas of nonforest land and forest land, see Figure 4. Figure 4 delineates the boundary between the forest and nonforest condition classes for four different examples. The plot center defines the plot condition for all strips covered by the arrow. Any subplot that falls in the alternating strips uses the rule. Any subplot that falls in assigned nonforest / forest is assigned that type.

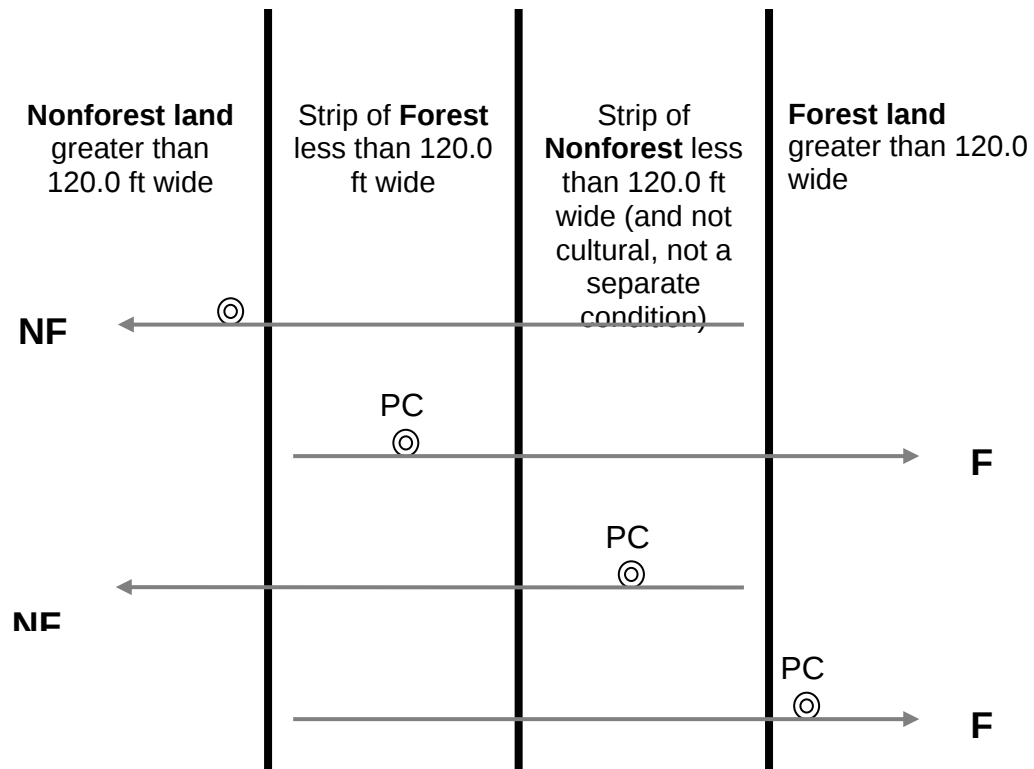


Figure 4. Example of alternating strips of forested and nonforested conditions. PC is the plot center (center of subplot 1).

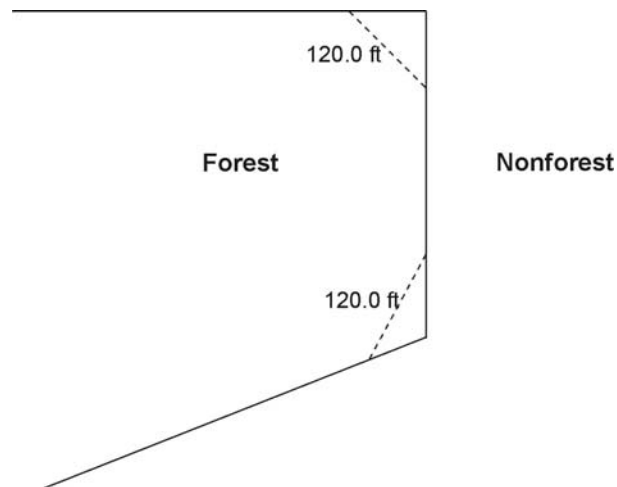


Figure 5. Illustration of the 90 degree corner rule. The dotted lines do not create nonforest conditions.

3. The 120 foot minimum width for delineation does not apply when a corner angle is 90 degrees or greater (Figure 5).
4. Linear water features: natural water features that are linear in shape such as streams and rivers. A linear water feature must meet the definition for Census or noncensus water to be nonforest area. Therefore, a linear water feature must be at least 30.0 ft wide and cover at least 1.0 ac. The width of a linear water feature is measured across its channel between points on either side up to which water prevents the establishment and survival of trees. To determine whether a linear water feature qualifies as nonforest, rely on all available information on hand such as aerial photos, topographic maps, past survey land calls, and ocular estimates at the current survey visit. Linear water features which do not meet the definition for Census or noncensus water should be classified as forest land only if bounded by forest land on both shores. Crews are NOT expected to measure the length of a linear water feature to determine if it meets the 1.0 ac requirement; use professional judgment and common sense on any linear water feature.
5. Hazardous or denied access conditions within accessible forest land are delineated, regardless of size, as a separate condition.

## **CONDITION STATUS DEFINITIONS:**

### **5.3.1 ACCESSIBLE FOREST LAND**

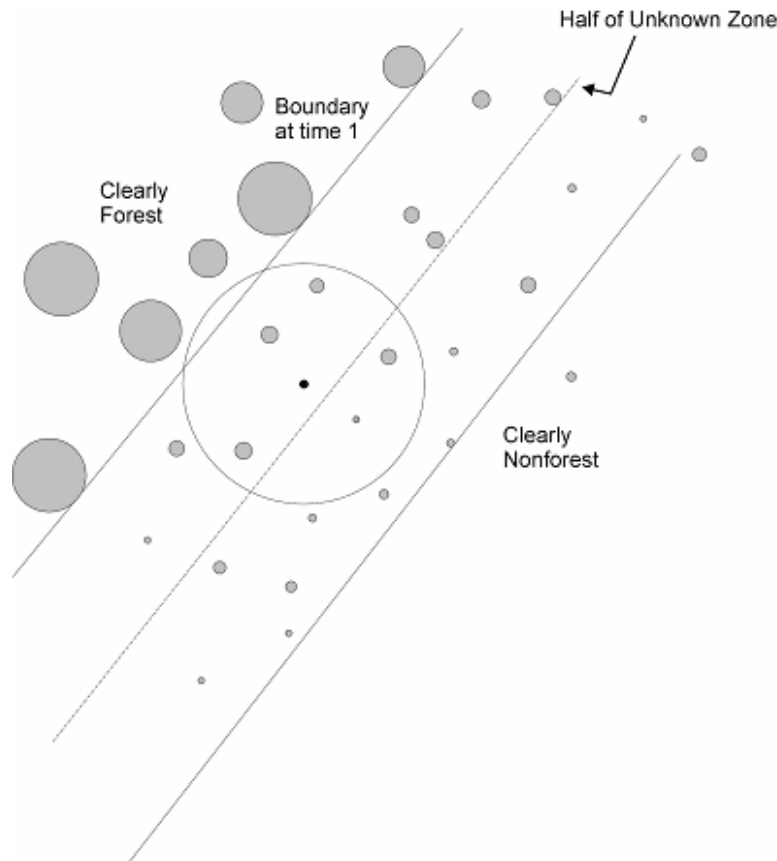
Land that is within the population of interest is accessible, is on a subplot that can be occupied at subplot center, can safely be visited, and meets the following criteria:

The condition has at least 5 percent crown cover by trees of any size, or has had at least 5 percent crown cover in the past. Additionally, the condition is not subject to nonforest use(s) that prevent normal tree regeneration and succession such as regular mowing, intensive grazing, or recreation activities.

A condition class has 5 percent crown cover if the crown area of all trees occupies 5 percent of the total area within that condition class if viewed from above.

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

*Transition zones and forest/nonforest encroachment:* When an accessible forest land condition encroaches into a nonforest condition, the border between forest and nonforest is often a gradual change in tree cover with no clear and abrupt boundary. In addition, it may be difficult to determine exactly where the forested area meets the minimum crown cover criteria and where it does not. For these cases, determine where the land clearly meets the 5 percent minimum crown cover, and where it clearly is less than required crown cover; divide the zone between these points in half, and determine the side of the zone on which the subplot center is located. Classify the condition class of the subplot based on this line (Figure 6).



**Figure 6. Example of classifying the condition class of the subplot in a transition zone with forest/nonforest encroachment.**

For example, at measurement time 1, a clear and distinct boundary existed between the forest and nonforest condition classes. At time 2, however, there now exists a zone of regeneration or small diameter trees between the previous forest condition and where the nonforest clearly remains. If the zone of encroachment clearly has 5 percent crown cover where it meets the nonforest, classify the entire zone as forest. If the zone is clearly nonforest up to the original stand, call it all nonforest. If the encroachment or transition zone does not clearly have 5 percent crown cover where it meets the nonforest, determine where it clearly has 5 percent crown cover (forest) and where it clearly does not have 5 percent crown cover (nonforest); divide this zone in half, and classify the entire subplot based on which side of the line the subplot center falls.

Treated strips – Occasionally, crews will come across plantations of trees, in which rows of trees alternate with strips of vegetation that have been bulldozed, mowed, tilled, treated with herbicide, or crushed. Because these strip treatments are conducted to optimize growth or to release the stand, the areas are considered forest land, and the treatment is considered a timber stand improvement operation. Do not confuse these practices with similar treatments on nonforest lands such as yards or rights-of-way. Contact with the land owner may help determine the intent of a treatment.

Indistinct boundary due to the condition minimum-width definition: Do not subdivide subplots where a condition class may change due only to the forest vs. nonforest minimum width (120.0 ft) definition. Although the point where the definition changes from forest to nonforest creates an invisible “line” between conditions, **this definitional boundary is not distinct and obvious**. See Figures 7 and 8. Where the point of the definition change occurs on the subplot, determine only if the subplot center is on the forest or nonforest side of that approximate boundary, and classify the entire subplot based on the condition of the subplot center. If the boundary crosses through the center of the subplot, classify the subplot as the condition it most resembles. If the boundary occurs between subplots, classify each subplot based on its relation to the definitional boundary.

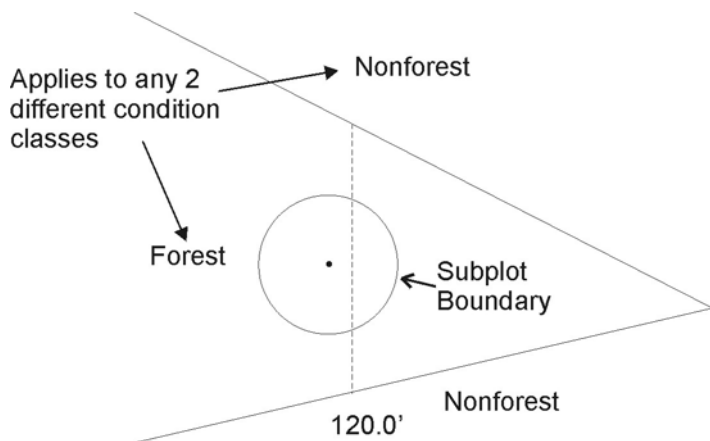


Figure 7. Forest condition narrows within a nonforest condition. Examine the location of the subplot center in reference to the approximate line where the forest narrows to 120.0 ft wide. In this example, the entire subplot is classified as forest.

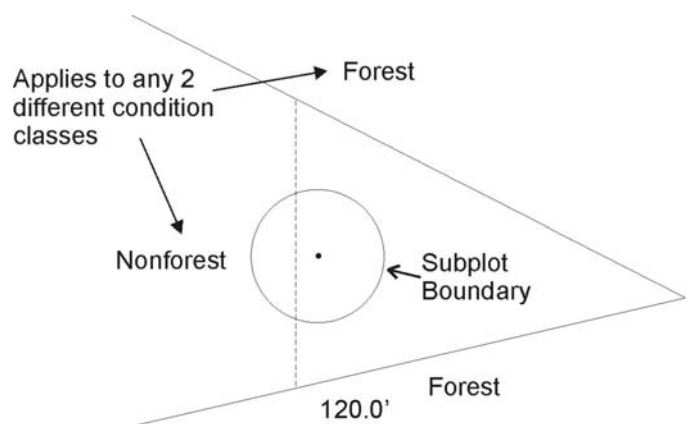


Figure 8. Nonforest condition narrows within a forest condition. Examine the location of the subplot center in reference to the approximate line where the nonforest narrows to 120.0 ft wide. In this example, the entire subplot is classified as forest.

### **5.3.2 NONFOREST LAND**

Nonforest land is any land within the sample that does not meet the definition of accessible forest land or any of the CONDITION STATUS values defined in Sections 5.3.3 through 5.3.7. To qualify, the area must be at least 1.0 ac in size and 120.0 ft wide, with 5 exceptions discussed previously at the beginning of section 5.3. Do not consider evidence of "possible" or future development or conversion. A nonforest land condition will remain in the sample and will be examined at the next occasion to see if it has become forest land.

Measurements are taken on nonforest lands if the Present Nonforest Land Use is low density agro-forest, grass land, montane grassland/savannah, montane bogs, alpine vegetation, fernlands, grasslands, or subxerophytic dry forests/sclerophyllous scrub (See definitions on page 75)

### **5.3.3 NONCENSUS WATER**

Lakes, reservoirs, ponds, and similar bodies of water 1.0 ac to 4.5 ac in size. Rivers, streams, canals, etc., 30.0 ft to 200 ft wide.

### **5.3.4 CENSUS WATER**

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

### **5.3.5 DENIED ACCESS**

Any area within the sampled area on a plot on which access is denied by the legal owner of the land the plot falls on, or by an owner of the only reasonable route to the plot. There are no minimum area or width requirements for a condition class delineated by denied access. Because a denied-access condition can become accessible in the future, it remains in the sample and is re-examined at the next occasion to determine if access is available.

### **5.3.6 HAZARDOUS**

Any area within the sampled area on plot that cannot be accessed because of a hazard or danger, for example cliffs, quarries, strip mines, illegal plantations, temporary high water, etc. Although the hazard is not likely to change over time, a hazardous condition remains in the sample and is re-examined at the next occasion to determine if the hazard is still present. There are no minimum size or width requirements for a condition class delineated by a hazardous condition.

### **5.3.7 NOT IN THE SAMPLE**

Any area within the sampled area on a plot that is not within the boundaries of the sample population of interest. Examples of areas out of the sample would be plots or portions of plots falling in Mexico or Canada. A condition outside the sample area remains in the potential population of interest and is re-examined at the next occasion to determine if it becomes part of the population of interest. There are no minimum size or width requirements for a condition class delineated as out of the sample.

## **5.4 DELINEATING CONDITION CLASSES WITHIN ACCESSIBLE FOREST LAND:**

Accessible forest land is subdivided into condition classes that are based on differences in RESERVED STATUS, OWNER GROUP, FOREST TYPE, STAND SIZE CLASS, REGENERATION STATUS, and TREE DENSITY. Section 5.1 applies when delineating contrasting forest condition classes. Specific criteria apply for each of the six attributes and are documented by attribute in subsections within 5.4.1 to 5.4.6. “Stands” are defined by plurality of crown cover for all live trees that are not overtopped.

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

No other attribute shall be the basis for recognizing contrasting condition classes. For each condition class recognized, there are many “ancillary attributes” that help describe the condition will be collected, but will not be used for delineation purposes (see Sections 5.5.1 to 5.5.20).

General instructions for delineating condition classes within accessible forest lands:

1. Distinct boundary within a subplot, or microplot: Separate condition classes ARE recognized if, within a subplot, two (or more) distinctly different condition classes are present and delineated by a distinct, abrupt boundary. The boundary is referenced; see Section 3.0.
2. Indistinct boundary within a subplot: Separate condition classes are NOT recognized if the prospective condition classes abut along an indistinct transition zone, rather than on an abrupt, obvious boundary. Only one condition is recognized, and the subplot is classified entirely as the condition it most resembles.

Example: The 4 subplots all sample only accessible forest land. Subplots 1, 3, and 4 sample what is clearly a stand of large diameter trees. Subplot 2 falls in the middle of a stand size transition zone. In the zone, the large diameter stand phases into a sapling stand.

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

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

Example: The northernmost subplot (2) samples entirely accessible forest land. The other three subplots, 1, 3, and 4, fall clearly in a nonforest meadow. Between subplot 1 and 2 is a transition zone; the number of trees present goes from none to what clearly represents at least 5 percent crown cover. Two condition classes are sampled: accessible forest land sampled on subplot 2, and nonforest land sampled on the other subplots.

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

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

#### 5.4.1 RESERVED STATUS

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

When collected: All accessible forest land (CONDITION STATUS = 1)

And all measured nonforest (CONDITION STATUS = 2 and PRESENT NONFOREST LAND USE = 16-26)

Field width: 1 digit

Tolerance: No errors

MQO: At least 99% of the time

Values:

|   |              |
|---|--------------|
| 0 | Not reserved |
| 1 | Reserved     |

#### 5.4.2 OWNER GROUP

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

When collected: All accessible forest land and grass, forb or shrub land condition classes (CONDITION STATUS = 1 or 8)

Field width: 2 digits

Tolerance: No errors

MQO: At least 99% of the time

Values:

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

#### 5.4.3 FOREST TYPE

Record the code corresponding to the FOREST TYPE that best describes the vegetation in each forested condition class. These FOREST TYPES are taken from Mueller-Dombois and Fosberg, 1998

The instructions in section 5.1 and 5.3 apply when delineating, within accessible forest land, contrasting conditions based on differences in FOREST TYPE.

When collected: All accessible forest land or condition classes (CONDITION STATUS = 1)

Field width: 3 digits

Tolerance: No errors in group or type

MQO: At least 99% of the time in group; at least 95% of the time in type

Values:

- 1 Strand or halophytic vegetation - vegetation near the shore containing species adapted to high rates of evaporation by wind and to high salt concentrations from windblown ocean spray or inundation by salt water
- 2 Mangrove swamps – trees with high salt tolerance growing on tidally inundated shores and in landlocked depressions. Many species have pneumatophores, adaptive structures for aeration of waterlogged root systems.
- 3 Lowland tropical rainforest – multistoried forest with many canopy-dwelling epiphytes, open ground, and shrub layers. This forest type can extend up the lower slopes with windward rainy exposures
- 4 Montane rainforest –the predominant type on moist hilltops and mountain slopes in many tropical islands. Forests of low stature that are rich in shrubs and epiphytes.

- 5 Cloud forest - These forests are covered with clouds or fog much of the time. The trees have low canopies and are often dripping with moisture. The trees are typically small-leaved and covered with masses of epiphytic mosses and liverworts, which also form a deep ground cover.
- 6 Mesophytic or moist forest – seasonally dry evergreen forests on leeward, drier slopes.
- 7 Xerophytic – forests found on truly dry, rain-shadow, leeward mountain slopes and lowlands
- 8 Agroforestry – tree species are included in crop or animal production agricultural ecosystems
- 9 Plantations – an area planted with tree species for the purpose of timber production. Species planted are mainly eucalypt, mahogany, and pine species that replace indigenous forests and savannas.

#### 5.4.5 STAND SIZE CLASS

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

When collected: All accessible forest land condition classes (CONDITION STATUS = 1)

Field width: 1 digit

Tolerance: No errors

MQO: At least 99% of the time

Values:

- 0 Nonstocked:  
Meeting the definition of accessible forest land, and less than 5 percent **crown cover** of trees of any size.
- 1 < 5.0 in (seedlings / saplings)  
At least 5 percent crown cover in trees of any size; and at least 2/3 of the crown cover is in trees less than 5.0 in DBH.
- 2 5.0 – 8.9 in (softwoods) / 5.0 – 10.9 in (hardwoods)  
At least 5 percent crown cover in trees of any size; and at least 1/3 of the crown cover is in trees greater than 5.0 in DBH **and** the plurality of the crown cover is in softwoods between 5.0 – 8.9 in diameter and/or hardwoods between 5.0 – 10.9 in DBH..
- 3 9.0 – 19.9 in (softwoods) / 11.0 – 19.9 in (hardwoods)  
At least 5 percent crown cover in trees of any size; and at least 1/3 of the crown cover is in trees greater than 5.0 in DBH **and** the plurality of the crown cover is in softwoods between 9.0 – 19.9 in diameter and/or hardwoods between 11.0 – 19.9 in DBH.
- 4 20.0 – 39.9 in

At least 5 percent crown cover in trees of any size; and at least 1/3 of the crown cover is in trees greater than 5.0 in DBH **and** the plurality of the crown cover is in trees between 20.0 – 39.9 in DBH.

5 40.0 + in

At least 5 percent crown cover in trees of any size; and at least 1/3 of the crown cover is in trees greater than 5.0 in DBH **and** the plurality of the crown cover is in trees  $\geq 40.0$  in DBH.

6 Cover trees (trees not on species list, used for plots classified as nonforest):

Less than 5 percent crown cover by trees of any size, and greater than 5 percent **crown cover** of species that comprise cover trees.

The instructions in Sections 5.1 and 5.3 apply when delineating, on accessible forest land, contrasting conditions based on differences in STAND SIZE CLASS.

Within the sampled area on microplot or subplot recognize only very obvious contrasting stands of different mean diameter with an abrupt boundary. Example: an obvious abrupt boundary exists within the sampled (fixed-radius) area of a subplot and demarcates a large diameter stand from a small diameter stand. Use tree crown cover of all live trees that are not overtopped to differentiate between stand-size classes.

If no other condition class defining variables are different between accessible forest conditions, delineate on differences in STAND SIZE CLASS only for the following combinations:

Between Nonstocked (STAND SIZE CLASS = 0) or cover trees (STAND SIZE CLASS = 6) and any stocked forest land (STAND SIZE CLASS = 1, 2, 3, 4, or 5);

Between STAND SIZE CLASS = 1 and STAND SIZE CLASS = 3, 4, and 5;

Between STAND SIZE CLASS = 2 and STAND SIZE CLASS = 4 and 5; or

Between STAND SIZE CLASS = 3 and STAND SIZE CLASS = 5.

Note: Differing stand size classes can be used to describe separate condition classes, while at the same time not be used to delineate separate condition classes. Example: Two adjacent forested stands of the same forest type, one with a STAND SIZE CLASS = 1 and the other with a STAND SIZE CLASS = 2 could be delineated as separated CONDITION CLASS if one of the other condition class delineation variables differs (based on the rules), i.e. OWNER GROUP differs between the two condition classes. In addition, the STAND SIZE CLASS variables for the two condition classes would be recorded and treated as an ANCILLARY variable.

#### 5.4.6 REGENERATION STATUS

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

When collected: All accessible forest land condition classes (CONDITION STATUS = 1)

Field width: 1 digit

Tolerance: No errors

MQO: At least 99% of the time

Values:

|   |            |                                                                                                           |
|---|------------|-----------------------------------------------------------------------------------------------------------|
| 0 | Natural    | Present stand shows no clear evidence of artificial regeneration. Includes unplanted, recently cut lands. |
| 1 | Artificial | Present stand shows clear evidence of artificial regeneration.                                            |

The instructions in section 5.1 and 5.3 apply when delineating, within accessible forest land, contrasting conditions based on differences in REGENERATION STATUS.

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

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

#### 5.4.7 TREE DENSITY

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

The instructions in section 5.1 and 5.3 apply when delineating, within accessible forest land, contrasting conditions based on differences in TREE DENSITY.

Codes 2 and higher are used ONLY when all other attributes used to delineate separate condition classes are homogenous, i.e. when a change in density is the ONLY difference within what would otherwise be treated only as one forest condition. Otherwise, code 1 for all condition classes. Codes 2 and higher are usually, but not always, used to demarcate areas that differ from an adjacent area due to forest disturbance, e.g., a partial harvest or heavy but not total tree mortality due to a ground fire. Delineation by density should only be done when the less-dense condition is 50% or less as dense as the denser condition.

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

When collected: All accessible forest land condition classes (CONDITION STATUS = 1)

Field width: 1 digit

Tolerance: No errors

MQO: At least 99% of the time

Values:

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

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

Examples of valid contrasting conditions defined by differences in tree density

- the eastern half of an otherwise homogeneous, 20 ac stand has many trees killed by a bark beetle outbreak,
- or
- one portion of a stand is partially cut over (with 40 sq. ft basal area per ac) while the other portion is undisturbed (with 100 sq. ft basal area per ac).

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

## **5.5 ANCILLARY (NON-DELINEATING) VARIABLES**

### **5.5.1 OWNER CLASS**

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

When collected: All accessible forest land (CONDITION STATUS = 1)

And all measured nonforest (CONDITION STATUS = 2 and PRESENT NONFOREST LAND USE = 16-26)

Field width: 2 digits

Tolerance: No errors

MQO: At least 99% of the time

Values:

Owner Classes within Forest Service Lands (Owner Group 10):

- 11 National Forest
- 12 National Grassland
- 13 Other Forest Service

Owner Classes within Other Federal Lands (Owner Group 20)

- 21 National Park Service
- 22 Bureau of Land Management
- 23 Fish and Wildlife Service
- 24 Departments of Defense/Energy
- 25 Other Federal

Owner Classes within State and Local Government lands (Owner Group 30)

- 31 State

- 32 Local (County, Municipality, etc.)
- 33 Other Non Federal Public

Owner Classes within Private lands (Owner Group 40)

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

### 5.5.2 PRIVATE OWNER INDUSTRIAL STATUS

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

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

When collected: All accessible forest land condition classes (CONDITION STATUS = 1) when the owner group is private (OWNER GROUP 40)

Field width: 1 digit

Tolerance: No errors

MQO: At least 99% of the time

Values:

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

### 5.5.3 ARTIFICIAL REGENERATION SPECIES

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

When collected: All accessible forest land condition classes (CONDITION STATUS = 1) with evidence of artificial regeneration (REGENERATION STATUS = 1)

Field width: 3 digits

Tolerance: No errors

MQO: At least 99% of the time

Values: See TREE SPECIES beginning on (page 163).

#### 5.5.4 STAND AGE

The crew botanist should be able to provide an estimate of stand age given that the trees in the stand originated at approximately the same time. In tropical forests, the continuous process of gap phase dynamics often prevails, where individuals die, form a gap, and are replaced by lower-canopy individuals. Often you cannot determine stand age in stands that are not characterized by stand replacing disturbance. The trees on typhoon-prone islands would be expected to re-initiate growth following disturbance at approximately the same time.

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

Developmental stage and known dates of disturbance are likely to be the only guides to estimating stand age. Good luck.

If continuous tree replacement by gap phase dynamics appears to characterize a stand, record code 998.

Record 999 if this appears unworkable and ludicrous, but please, do the best you can.

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

When collected: All accessible forest land condition classes (CONDITION STATUS = 1)

Field width: 3 digits

Tolerance: +/- 10%

MQO: At least 95% of the time

Values: 000 to 997, 998, 999

#### 5.5.5 DOMINANT TREE SPECIES 1

Record the code corresponding to the TREE SPECIES (page 163) with the plurality of stocking for all live trees in the condition class that are not overtopped.

For example, if a forested condition class contains 30% species A, 30% species B, and 40 % species C, then the DOMINANT TREE SPECIES will be the code for species C.

When collected: All accessible forest land condition classes (CONDITION STATUS = 1)

Field width: 3 digits

Tolerance: no errors

MQO: At least 95% of the time

Values: See Tree Species beginning on (page 163)

**5.5.5.1 DOMINANT TREE SPECIES 2**

Record the code for the second most abundant tree species in each condition class.  
See Dominant Tree Species 1 for coding instructions

**5.5.5.2 DOMINANT TREE SPECIES 3**

Record the code for the third most abundant tree species in each condition class  
See Dominant Tree Species 1 for coding instructions

**5.5.6 DISTURBANCE 1**

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

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

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

When collected: All accessible forest land (CONDITION STATUS = 1)

And all measured nonforest (CONDITION STATUS = 2 and PRESENT NONFOREST LAND USE = 16-26)

Field width: 2 digits

Tolerance: No errors

MQO: At least 99% of the time

Values:

**Code   Definition**

- 00 None - no observable disturbance
- 10 Insect damage
  - 11 insect damage to understory vegetation
  - 12 insect damage to trees, including seedlings and saplings
- 20 Disease damage
  - 21 disease damage to understory vegetation
  - 22 disease damage to trees, including seedlings and saplings
- 30 Fire (from crown and ground fire, either prescribed or natural)
  - 31 ground fire
  - 32 crown fire

- 40 Animal damage
- 41 beaver (includes flooding caused by beaver)
- 42 porcupine
- 43 deer/ungulate
- 44 bear
- 45 rabbit
- 46 domestic animal/livestock (includes grazing):
- 47 pigs, wild boars
- 50 Weather damage
- 51 ice
- 52 wind (includes typhoon, hurricane, tornado)
- 53 flooding (weather induced)
- 54 drought
- 55 earth movement/avalanches
- 56 erosion
- 60 Vegetation (suppression, competition, vines)
- 70 Unknown / not sure / other (include in NOTES)
- 80 Human-caused damage – any significant threshold of human-caused damage not described in the DISTURBANCE codes listed above or in the TREATMENT codes listed below. Must include a plot-level note to describe further.

#### **5.5.7 DISTURBANCE YEAR 1**

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

When collected: When DISTURBANCE 1 > 00

Field width: 4 digits

Tolerance: +/- 1 year for measurement cycles of 5 years

+/- 2 years for measurement cycles of > 5 years

MQO: At least 99% of the time

Values: Since the previous plot visit, or the past 5 years for plots visited for the first time

#### **5.5.8 DISTURBANCE 2**

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

#### **5.5.9 DISTURBANCE YEAR 2**

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

#### **5.5.10 DISTURBANCE 3**

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

### 5.5.11 DISTURBANCE YEAR 3

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

### 5.5.12 TREATMENT 1

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

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

When collected: All accessible forest land (CONDITION STATUS = 1)

And all measured nonforest (CONDITION STATUS = 2 and PRESENT NONFOREST LAND USE = 16-26)

Field width: 2 digits

Tolerance: No errors

MQO: At least 99% of the time

Values:

| <u>Code</u> | <u>Definition</u> |
|-------------|-------------------|
|-------------|-------------------|

|    |                                        |
|----|----------------------------------------|
| 00 | <u>None</u> - No observable treatment. |
|----|----------------------------------------|

|    |                                                                 |
|----|-----------------------------------------------------------------|
| 10 | <u>Cutting</u> - The removal of one or more trees from a stand. |
|----|-----------------------------------------------------------------|

|    |                                                                                                                                                                                     |
|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 20 | <u>Site preparation</u> - Clearing, slash burning, chopping, disking, bedding, or other practices clearly intended to prepare a site for either natural or artificial regeneration. |
|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|    |                                                                                                                                                                                             |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 30 | <u>Artificial regeneration</u> - 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 | <u>Natural regeneration</u> - 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 | <u>Other silvicultural treatment</u> - The use of fertilizers, herbicides, girdling, pruning or other activities (not already listed above) designed to improve the commercial value of the residual stand. |
|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### 5.5.13 TREATMENT YEAR 1

Record the year in which TREATMENT 1 occurred.

When collected: When TREATMENT 1 > 00

Field width: 4 digits

Tolerance: +/- 1 year for measurement cycles of 5 years  
+/- 2 years for measurement cycles of > 5 years

MQO: At least 99% of the time

Values: Since the previous plot visit, or the past 5 years for plots visited for the first time

### 5.5.14 TREATMENT 2

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

### 5.5.15 TREATMENT YEAR 2

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

### 5.5.16 TREATMENT 3

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

### 5.5.17 TREATMENT YEAR 3

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

### 5.5.18 CONDITION CLASS SLOPE

Record a 3-digit code indicating the average slope percent of the condition within the plot area. Use the slope percentages recorded by subplot as one aid to determine slope by condition class average.

When collected: All accessible forest land (CONDITION STATUS = 1) And all measured nonforest (CONDITION STATUS = 2 and PRESENT NONFOREST LAND USE = 16-26)

Field width: 3 digits

Tolerance: +/- 10%

MQO: At least 90% of the time

Values: 000 to 155

### 5.5.19 CONDITION CLASS ASPECT

Record a 3-digit azimuth indicating the direction of slope for the land surface of the condition class. Use the aspects recorded by subplot as one aid to determine aspect by condition class. If the aspect is equally SE, S, SW, code the azimuth of the S aspect. If the aspect is SE, S, SW, but 80 percent of the condition class is SE, code the azimuth of the SE aspect.

When collected: All accessible forest land (CONDITION STATUS = 1) And all measured nonforest (CONDITION STATUS = 2 and PRESENT NONFOREST LAND USE = 16-26)

Field width: 3 digits

Tolerance: +/- 10 degrees

MQO: At least 90% of the time

Values:

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

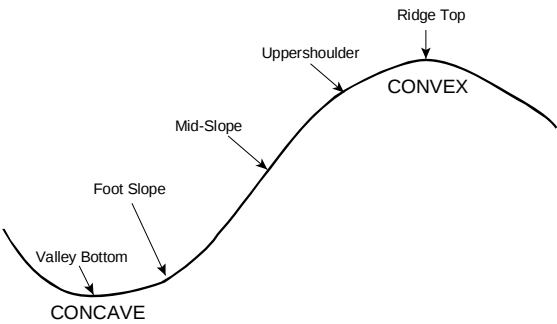
5.5.20 PHYSIOGRAPHIC CLASS

5.5.20.1 SLOPE SHAPE

Record the slope shape over the condition class under consideration. Use the slope shapes recorded by subplot as one aid to determine slope shape by condition class.

When collected: All accessible forest land (CONDITION STATUS = 1)  
And all measured nonforest (CONDITION STATUS = 2 and PRESENT NONFOREST LAND USE = 16-26)  
Field width: 2 digits  
MQO: At least 90% of the time:  
Values:

|         |   |    |
|---------|---|----|
| Flat    | = | 00 |
| Concave | = | 10 |
| Convex  | = | 20 |



5.5.20.2 SLOPE POSITION

Record the slope position over the condition class under consideration: Use the slope positions recorded by subplot as one aid to determine slope position by condition class.

When collected: All accessible forest land (CONDITION STATUS = 1)  
And all measured nonforest (CONDITION STATUS = 2 and PRESENT NONFOREST LAND USE = 16-26)  
Field width: 2 digits  
MQO: At least 90% of the time  
Values:

|    |   |               |
|----|---|---------------|
| 00 | = | Flat          |
| 10 | = | Uppershoulder |
| 20 | = | Midslope      |
| 30 | = | Footslope     |
| 40 | = | Valleybottom  |
| 50 | = | Ridgetop      |

To more accurately measure the moisture-related effects of topography on vegetation, two separate, calculated indices will be computed in the lab from data gathered in the field: 1.) an index of moisture demand and 2.) an index of moisture supply. For moisture demand, the aspect, slope and elevation at each plot is used to approximate annual moisture demand from “Potential Solar Beam Irradiation on Slopes” tables or equations (Frank and Lee 1966). Moisture supply is estimated from an additive, modified, topographic relative moisture index (TRMI; Parker 1982) constructed using slope shape, percent slope and slope position. Higher moisture supply values occur on footslopes, gentle slopes and/or sites exhibiting slope concavities.

### 5.5.21 PRESENT NONFOREST / INACCESSIBLE LAND USE

Record a code for all nonforest condition classes. Select a code that best represents the condition class within the sampled area

Gradations of agroforestry will be present on the islands. Follow the usual rules to determine whether to consider agroforests as forests and note the agricultural components.

On all visited plots with an accessible forest land and grass, forb or shrub land condition classes, map all nonforest condition classes present on the 4-subplot standard layout. Do not combine nonforest condition classes present. Example: if nonforest – urban land and nonforest – cropland are both present within a 24 ft radius subplot, map each land class as a separate condition class.

When collected: CONDITION STATUS = 2

Field width: 2 digits

Tolerance: No errors

MQO: At least 99% of the time

Values:

- 10 Agricultural land - Land managed for crops, pasture, or other agricultural use. The area must be at least 1.0 ac in size and 120.0 ft wide. Use the 10 code only for cases not better described by one of the following:

- 11 Cropland
- 12 Pasture (improved through cultural practices)
- 13 Idle farmland
- 14 Orchard
- 15 Christmas tree plantation
- 16 Low density agro-forest (agro-forest with less than 10 percent cover of tree species)

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

- 21 Grass lands – dominant vegetation is grasses, including *Miscanthus floridulus*, *Pennisetum polystachion*, *Saccharum spontaneum*, *Sporobolus diander*, *Eragrostis* spp., *Digitaria* spp, and *Cenchrus echinatus*
- 22 Montane grassland/savannah – found on mountains that reach above the heavy cloud belt. Mostly grassland mixed with xerophytic shrubs and small trees
- 23 Montane bogs – sedges, grasses and reeds growing at elevations where they are covered with clouds or fog most of the time. These bogs are on gently sloping or level areas with impeded drainage.
- 24 Alpine vegetation – dwarfed vegetation of grasses and cushion-plants growing at high altitudes

## Condition Class Attributes

- 25     Fernland – dense tangles of *Dicranopteris* growing on steep slopes usually below 600 m (1,900 ft)
- 26     Subxerophytic/sclerophyllous scrub – vegetation found on truly dry, rain-shadow, leeward mountain slopes and lowlands, consisting of primarily shrub species
- 30     Developed - Land used primarily by humans for purposes other than forestry or agriculture. Use the 30 code only for land not better described by one of the following:
  - 31     Cultural: business, residential, and other places of intense human activity.
  - 32     Rights-of-way: improved roads, railway, power lines, maintained canal
  - 33     Recreation: parks, skiing, golf courses
- 40     Other - Land parcels greater than 1.0 ac in size and greater than 120.0 ft wide, that do not fall into one of the uses described above. Examples include undeveloped beaches, barren land (rock, sand), noncensus water, marshes, bogs, ice, and snow.
  - 41     Naturally nonvegetated: Barren rock, sand, lava, glaciers
- 90     Not sampled - Land areas that are not sampled. Use the 90 code only for land not better described by Condition Status 4 through 7 on page 51



## TABLE OF CONTENTS

|                                      |    |
|--------------------------------------|----|
| 6. SUBPLOT INFORMATION .....         | 79 |
| 6.1 SUBPLOT NUMBER.....              | 79 |
| 6.2 SUBPLOT CENTER CONDITION .....   | 79 |
| 6.3 MICROPLOT CENTER CONDITION ..... | 79 |
| 6.4 SUBPLOT SLOPE .....              | 79 |
| 6.5 SUBPLOT ASPECT.....              | 80 |
| 6.6 SLOPE SHAPE.....                 | 81 |
| 6.7 SLOPE POSITION.....              | 81 |
| 6.8 SNOW/WATER DEPTH .....           | 82 |
| 6.9 SUBPLOT STATUS.....              | 82 |
| SEEDLING COUNT .....                 | 83 |
| 6.10 SEEDLING COUNT DATA ITEMS ..... | 83 |
| 6.11 SUBPLOT NUMBER.....             | 83 |
| 6.12 CONDITION CLASS NUMBER .....    | 83 |
| 6.13 SPECIES.....                    | 83 |
| 6.14 SEEDLING COUNT .....            | 83 |



## 6. SUBPLOT INFORMATION

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

### 6.1 ***SUBPLOT NUMBER***

Record the code corresponding to the number of the subplot.

When Collected: All subplots

Field width: 1 digit

Tolerance: No errors

MQO: At least 99% of the time

Values:

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

### 6.2 ***SUBPLOT CENTER CONDITION***

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

When collected: All subplots

Field width: 1 digit

Tolerance: No errors

MQO: At least 99% of the time

Values: 1 to 9

### 6.3 ***MICROPLOT CENTER CONDITION***

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

When collected: All microplots where subplot center is CONDITION STATUS = 1, 2, 3, or 7

Field width: 1 digit

Tolerance: No errors

MQO: At least 99% of the time

Values: 1 to 9

### 6.4 ***SUBPLOT SLOPE***

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

If slope changes gradually across the subplot, record an average slope. If slope changes across the subplot but the slope is predominately of one direction, code the predominate slope percentage rather than the average. If the subplot falls directly on or straddles a canyon bottom or narrow ridge top:

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

When collected: All subplots with an accessible forest land or measured non-forest condition class (CONDITION STATUS = 1 or CONDITION STATUS = 1 and PRESENT NONFOREST LAND USE = 16 through 26)

Field width: 3 digits

Tolerance: +/- 10%

MQO: At least 90% of the time

Values: 000 to 155

## 6.5 SUBPLOT ASPECT

Record the aspect across the subplot, to the nearest 1 degree. SUBPLOT ASPECT is determined along the direction of slope for land surfaces with at least 5 percent slope in a generally uniform direction. SUBPLOT ASPECT is measured with a hand compass along the same direction used to determine slope. If aspect changes gradually across the subplot, record an average aspect. If aspect changes across the subplot but the aspect is predominately of one direction, code the predominate direction rather than the average.

If the subplot falls on or straddles a canyon bottom or narrow ridge top, code aspect as follows:

- Code the aspect of the ridge line or canyon bottom.
- If the subplot falls on a canyon bottom or on a narrow ridge top, but most of the area lies on one side hill, code the aspect of the side hill.

When collected: All subplots with an accessible forest land or measured non-forest condition class (CONDITION STATUS = 1 or CONDITION STATUS = 1 and PRESENT NONFOREST LAND USE = 16 through 26)

Field width: 3 digits

Tolerance: +/- 10 degrees

MQO: At least 90% of the time

Values:

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

6.6 SLOPE SHAPE

Record the slope shape over the subplot under consideration:

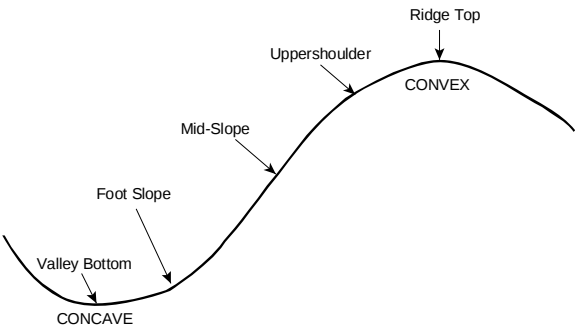
When collected: All subplots with an accessible forest land or measured nonforest condition class (CONDITION STATUS = 1 or CONDITION STATUS = 1 and PRESENT NONFOREST LAND USE = 16 through 26)

Field width: 2 digits

MQO: At least 90% of the time

Values:

|         |   |    |
|---------|---|----|
| Flat    | = | 00 |
| Concave | = | 10 |
| Convex  | = | 20 |



6.7 SLOPE POSITION

Record the slope position over the subplot under consideration.

When collected: All subplots with an accessible forest land or measured non-forest condition class (CONDITION STATUS = 1 or CONDITION STATUS = 1 and PRESENT NONFOREST LAND USE = 16 through 26)

Field width: 2 digits

MQO: At least 90% of the time

Values:

|               |   |    |
|---------------|---|----|
| No Slope      | = | 00 |
| Uppershoulder | = | 10 |
| Midslope      | = | 20 |
| Footslope     | = | 30 |
| Valleybottom  | = | 40 |
| Ridgetop      | = | 50 |

To more accurately measure the moisture-related effects of topography on vegetation, two separate, calculated indices will be computed in the lab from data gathered in the field: 1.) an index of moisture demand and 2.) an index of moisture supply. For moisture demand, the aspect, slope and elevation at each plot is used to approximate annual moisture demand from “Potential Solar Beam Irradiation on Slopes” tables or equations (Frank and Lee 1966). Moisture supply is estimated from an additive, modified, topographic relative moisture index (TRMI; Parker 1982) constructed using slope shape, percent slope and slope position. Higher

moisture supply values occur on footslopes, gentle slopes and/or sites exhibiting slope concavities.

## **6.8 SNOW/WATER DEPTH**

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

When collected: All subplots with an accessible forest land or measured nonforest condition class (CONDITION STATUS = 1 or CONDITION STATUS = 1 and PRESENT NONFOREST LAND USE = 16 through 26)

Field width: 2 digits (x.y)

Tolerance: +/- 0.5 ft

MQO: At the time of measurement (no MQO after initial date of visit)

Values: 0.0 to 9.9

## **6.9 SUBPLOT STATUS**

Indicate whether or not this subplot currently has at least one accessible forested or measured non-forest condition class

When collected: All subplots

Field width: 1 digit

Tolerance: No errors

MQO: At least 99% of the time

Values:

- 0 No accessible forest land condition class
- 1 At least one accessible forest land condition class
- 2 A measured nonforest condition class, no forested condition class

## **SEEDLING COUNT**

Stocking and regeneration information are obtained by counting live seedlings within the 6.8 ft radius microplot located 90 degrees and 12.0 ft from each subplot center within each of the four subplots. Conifer seedlings must be at least 0.5 ft in length and less than 1.0 in at d.b.h. in order to qualify for *counting*. Hardwood seedlings must be at least 1.0 ft in length and less than 1.0 in at d.b.h. in order to qualify for counting. Seedlings are counted in groups by species and condition class, up to 5 individuals per species. Counts beyond 5 coded as 6. Only count seedlings occurring in accessible forestland condition classes.

Count all live seedlings that have their base inside the microplot boundary regardless of vigor, damage, or closeness to other trees, but count only one seedling from a clump; a clump is 3 or more live stems that sprouted from a common root base (including stumps).

### **6.10 SEEDLING COUNT DATA ITEMS**

Seedlings are counted within each accessible forestland (condition status 1) and measured nonforest (present nonforest land use 16-26) condition class on each microplot. Record the following data items for each seedling count:

#### **6.11 SUBPLOT NUMBER**

Enter Subplot number associated with the microplot. Use the procedures and tolerances outlined on page 79.

#### **6.12 CONDITION CLASS NUMBER**

Enter each forested condition class containing counted seedlings. Use the procedures and tolerances outlined on page 53

#### **6.13 SPECIES**

Enter each species of seedlings eligible for counting. Use the procedures and tolerances outlined on page 117. A list of species is found in the Tree Species section beginning on page **Error! Bookmark not defined.**

#### **6.14 SEEDLING COUNT**

On each microplot, record the number of live tree seedlings of each species, by condition class. Count up to 5 individuals by species; code 6 if there are more than 5 individuals of any given species in any given condition class.

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

When collected: Each accessible forestland (Condition Status = 1) and measured nonforest (present nonforest land use 16-26) condition class on each microplot

Field width: 1 digit

Values: 0        None

1 to 5    Exact count

6        More than 5 individuals by species by condition class



## TABLE OF CONTENTS

|                                      |           |
|--------------------------------------|-----------|
| <b>7.0 BOUNDARY REFERENCES .....</b> | <b>87</b> |
| 7.1 REFERENCE PROCEDURE.....         | 87        |
| 7.2 BOUNDARY DATA.....               | 89        |
| 7.2.1 SUBPLOT NUMBER .....           | 89        |
| 7.2.2 PLOT TYPE .....                | 89        |
| 7.2.4 CONTRASTING CONDITION .....    | 90        |
| 7.2.5 LEFT AZIMUTH .....             | 90        |
| 7.2.6 CORNER AZIMUTH .....           | 90        |
| 7.2.7 CORNER DISTANCE.....           | 90        |
| 7.2.8 RIGHT AZIMUTH.....             | 91        |



## 7.0 BOUNDARY REFERENCES

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

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

### 7.1 REFERENCE PROCEDURE

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

Boundary referencing is done by recording azimuths and distances from subplot center to the reference points and/or from microplot center to the reference points (Figures 9 and 10). Each boundary is marked by a maximum of three points - two where the boundary intersects the subplot circumference or microplot circumference, and one "corner" point between the two end points, if necessary. Only the corner point requires a distance, since the distance from the center to the circumference is always equal to the fixed plot radius.

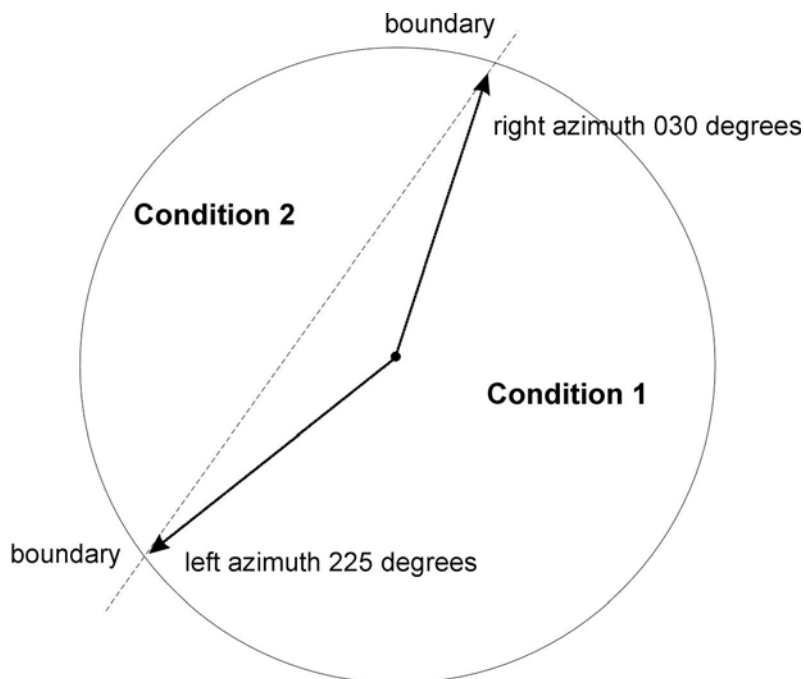
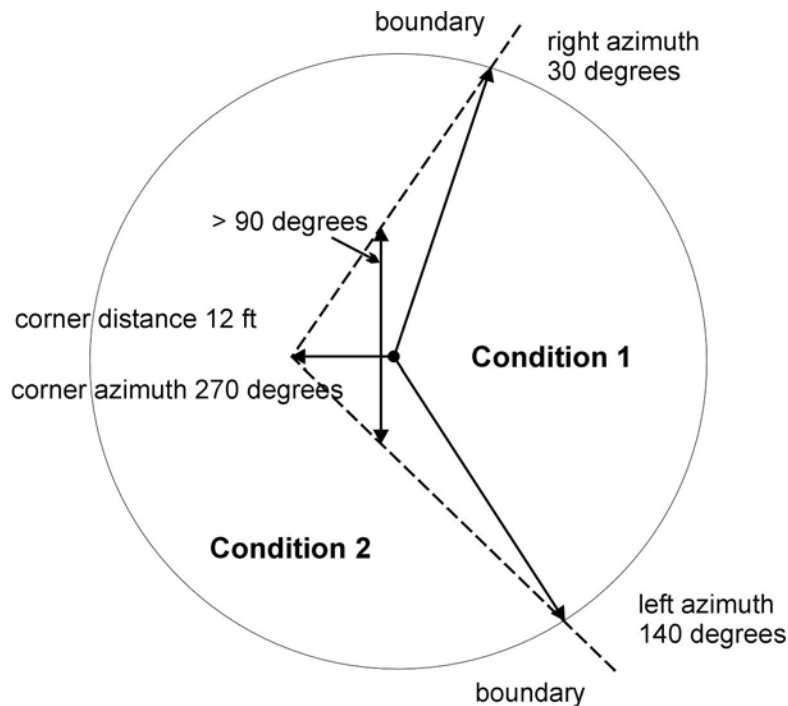


Figure 9. How to measure a straight boundary on a microplot, subplot, or annular plot.



**Figure 10. How to measure a boundary with a corner on a subplot or annular plot.**

Microplot boundaries are referenced to the microplot center. Note that the larger the plot, the greater likelihood of a need for a boundary corner to record boundaries that are not straight lines.

Refer condition class delineation guidelines starting on page 47. The following additional rules apply when referencing a boundary within a subplot or microplot:

1. When a boundary between accessible forest land and nonforest land or between two contrasting accessible forest land condition classes is clearly marked, use that feature to define the boundary. Examples of clear demarcation are a fence line, plowed field edge, sharp ridge line, and water's edge along a stream course, ditch, or canal.
2. When a boundary between forest land and nonforest land is not clearly marked by an obvious feature, the boundary should follow the nonforest side of the stems of the trees at the forest edge.
3. When a boundary between two contrasting forest land condition classes is not clearly marked, map along the stems of the contrasting condition. When the boundary between two contrasting forest land condition classes is separated by a narrow linear

inclusion (creek, fire line, narrow meadow, unimproved road), establish the boundary at the far edge, relative to subplot center, of the inclusion.

4. When a plot is remeasured, the crew will examine the boundaries referenced at last inventory. If no change has occurred, the current crew will retain the boundary data that were recorded at last inventory. If a boundary has changed, or a new boundary is present, or the previous crew made an obvious error, record new or updated boundary data. Delete boundaries that are no longer distinct.
5. Although individual MQOs are specified for the azimuths and distances, in practice a crew will be considered 'correct' when the difference in areas as mapped by the original crew and by the QA crew is less than 10% of the subplot or microplot area. This allows for slight variations in azimuths or distances due to the approximate nature of our mapping procedures.

## **7.2 BOUNDARY DATA**

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

### **7.2.1 SUBPLOT NUMBER**

Record the code corresponding to the number of the subplot.

When collected: All boundaries

Field width: 1 digit

Tolerance: No errors

MQO: At least 99% of the time

Values:

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

### **7.2.2 PLOT TYPE**

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

When collected: All boundaries

Field width: 1 digit

Tolerance: No errors

MQO: At least 99% of the time

Values:

- |   |                    |
|---|--------------------|
| 1 | Subplot boundary   |
| 2 | Microplot boundary |

#### 7.2.4 CONTRASTING CONDITION

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

When collected: All boundaries

Field width: 1 digit

Tolerance: No errors

MQO: At least 99% of the time

Values: 1 to 9

#### 7.2.5 LEFT AZIMUTH

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

When collected: All boundaries

Field width: 3 digits

Tolerance: +/- 10 degrees

MQO: At least 90% of the time

Values: 001 to 360

#### 7.2.6 CORNER AZIMUTH

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

When collected: All boundaries

Field width: 3 digits

Tolerance: +/- 10 degrees

MQO: At least 90% of the time

Values: 000 to 360

#### 7.2.7 CORNER DISTANCE

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

When collected: All boundaries when CORNER AZIMUTH > 000

Field width: 2 digits

Tolerance: +/- 1 ft

MQO: At least 90% of the time

Values:

microplot 1 to 7 ft

subplot 1 to 24 ft

### 7.2.8 RIGHT AZIMUTH

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

When collected: All boundaries

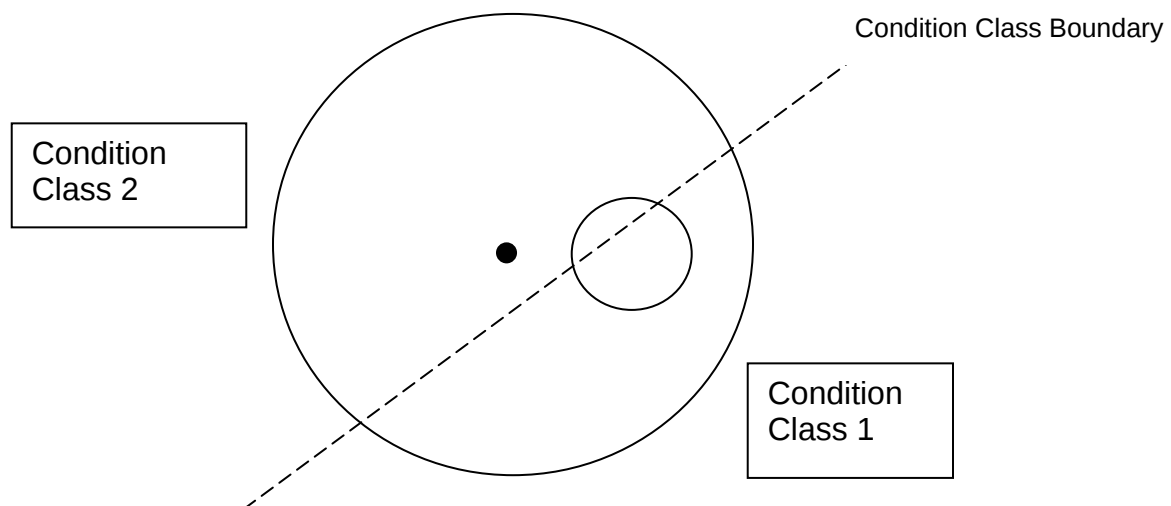
Field width: 3 digits

Tolerance: +/- 10 degrees

MQO: At least 90% of the time

Values: 001 to 360

#### Example of mapping on Subplot 3



| Subplot | Plot type | Contrasting Condition | left azimuth | corner azimuth | corner distance | right azimuth |
|---------|-----------|-----------------------|--------------|----------------|-----------------|---------------|
| 3       | 1         | 1                     | 65           | 0              | 0               | 220           |
| 3       | 2         | 2                     | 250          | 0              | 0               | 25            |



## TABLE OF CONTENTS

|                                                          |     |
|----------------------------------------------------------|-----|
| 8. VEGETATION PROFILE.....                               | 95  |
| A. Vegetation plot design .....                          | 95  |
| B. Species records.....                                  | 95  |
| Is it a tree or a shrub? .....                           | 96  |
| 8.1 SPECIES GROWTH HABIT .....                           | 96  |
| 8.2 SPECIES .....                                        | 98  |
| 8.3 SPECIES HEIGHT .....                                 | 98  |
| 8.4 SPECIES COVER .....                                  | 99  |
| 8.5 STAGE OF SHRUB DEVELOPMENT.....                      | 102 |
| C. Lifeform and total vegetation records.....            | 102 |
| 8.6 LIFEFORM.....                                        | 102 |
| 8.7 LIFEFORM COVER.....                                  | 102 |
| 8.8 TOTAL VEGETATION COVER .....                         | 103 |
| D. Collection and identification of unknown plants ..... | 103 |

## Vegetation Profile

## 8. VEGETATION PROFILE

Information on the abundance, structure, and species composition of understory plant communities has many uses. The data is used to evaluate wildlife habitat suitability, forage availability, grazing potential, species richness and abundance, fire hazard, abundance of non-timber forest products, and potential site productivity. The data also supports identification of plant community types (associations), which allows users to predict plot characteristics not actually measured by FIA. Accurately representing the species present on a site and their change in abundance in response to forest development, disturbance, or management is therefore important to a wide variety of users.

### ***A. Vegetation plot design***

Vegetation will be measured on each 24' radius subplot on which **accessible forest-land OR measured nonforest** (present nonforest land use 16-26) condition classes make up 50% of the subplot. (It is important to measure the vegetation before plants are trampled in the course of installing the rest of the plot.

Vegetation will be assessed over all portions of the subplot with forestland or measured nonforest condition classes, regardless of the presence of nonforest inclusions (nonforest inclusions are not to be confused with nonforest conditions). Do not measure the vegetation on those portions of the subplot containing non-measured nonforest condition classes.

Vegetation will be assessed over the entire subplot area, regardless of the presence of two or more condition classes or nonforest inclusions (nonforest inclusions are not to be confused with nonforest conditions). If vegetation on non-accessible condition classes cannot be examined closely (e.g. hazardous or denied access conditions), estimate vegetation on those areas from the best vantage points available.

### ***B. Species records***

Individual records are entered for vascular plant species and species groups on each subplot. Mosses and lichens are not measured. Each record is identified by growth habit, species name, height, and cover. In addition, cover of species is aggregated into four plant lifeform groups. The species of each tree, shrub, and forb lifeform group with  $\geq 3\%$  cover, are recorded individually. Any additional species on the *High Priority species list* (Appendix 3, page **235**) are also recorded by species regardless of abundance. Any additional species within a lifeform that collectively have  $\geq 3\%$  cover are recorded and overall cover and height estimated.

For tree species, only seedlings are included in the vegetation cover measurements (i.e.  $<1.0$  in d.b.h. and  $\geq 0.5$  ft in length (conifers) or  $\geq 1.0$  ft in length (hardwoods). For graminoids, plants can be lumped into annual or perennial groups if they don't occur on the *High Priority species list* and their species, or genus, is not known.

Species are classified in two ways: by “growth habit” and by “lifeform”. Growth habit identifies the form and growth characteristics of species. A single species may occur in several different growth habits, depending on conditions. For example, the growth habit of twinflower (*Linnaea borealis*, LIBO3) can be classified as a sub-shrub, a vine, or a forb, and the growth habit for dwarf Oregongrape (*Mahonia nervosa*, MANE2) can be classified as a shrub or a sub-shrub (PLANTS 2000). Lifeform, on the other hand, is an assignment (somewhat arbitrary) of each species into a single group. For example, LIBO3 is always a “forb”, and MANE2 is always a “shrub”. The plant species lists produced by FIA (since the early 1980s) identify which group each species belongs to. Without this list in the Pacific Islands, you will need to make judgment calls. Try to keep them consistent.

### **Is it a tree or a shrub?**

Cover is estimated for trees that are less than 1.0 in. d.b.h.

## **8.1 SPECIES GROWTH HABIT**

Each individual species record must have a growth habit code recorded. If a species has more than one growth habit on the subplot, only record the predominate growth habit on the subplot for the species. Do not split species records on the sole basis of differences in growth habit. Species grouped into lifeforms do not get a growth habit code. Valid growth habit codes for the FIA inventory are derived from the PLANTS database (USDA, NRCS. 2000. The PLANTS database [http://plants.usda.gov/plants]. National Plant Data Center, Baton Rouge, LA 70874-4490).

When collected: All species > 3 percent cover of the subplot and all high priority species

Tolerance: No errors

**Values:**

| PLANTS Growth Habit Code | PLANTS description | FIA plant lifeform group | PLANTS Definition <i>(added text in italics)</i>                                                                                                                                                                                                                                                                                                                                               |
|--------------------------|--------------------|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| FB                       | Forb/herb          | Forb                     | Vascular plant without significant woody tissue above or at the ground. Forbs and herbs may be annual, biennial, or perennial but always lack significant thickening by secondary woody growth and have perennating buds borne at or below the ground surface. Federal Geographic Data Committee (FGDC) definition includes graminoids, forbs, and ferns; in PLANTS, graminoids are separated. |
| GR                       | Graminoid          | Graminoid                | Grass or grass-like plant, including grasses (Poaceae), sedges (Cyperaceae), rushes (Juncaceae), arrow-grasses (Juncaginaceae), and quillworts (Isoetes). An herb in the FGDC classification.                                                                                                                                                                                                  |
| SH                       | Shrub              | Shrub                    | Perennial, multi-stemmed woody plant that is usually less than 4 to 5 meters or 13 to 16 feet in height. Shrubs typically have several stems arising from or near the ground, but may be taller than 5 meters or single-stemmed under certain environmental conditions. <i>Includes succulents (e.g. cacti).</i>                                                                               |
| SS                       | Subshrub           | Shrub or Forb            | Low-growing shrub usually under 0.5 m or 1.5 feet tall (never exceeding 1 meter or 3 feet tall) at maturity. A dwarf-shrub in the FGDC classification. <i>Includes succulents (e.g. cacti).</i>                                                                                                                                                                                                |
| VI                       | Vine               | Shrub                    | Twining/climbing plant with relatively long stems, can be woody or herbaceous. FGDC classification considers woody vines to be shrubs and herbaceous vines to be herbs.                                                                                                                                                                                                                        |
| TR                       | Tree               | Tree or Shrub            | Perennial, woody plant with a single stem (trunk), normally greater than 4 to 5 meters or 13 to 16 feet in height; under certain environmental conditions, some tree species may develop a multi-stemmed or short growth form (less than 4 meters or 13 feet in height).                                                                                                                       |
| UN                       | Unknown            |                          | Growth form is unknown.                                                                                                                                                                                                                                                                                                                                                                        |

## 8.2 SPECIES

Each species record must have a species code recorded. Valid species codes are listed in the FIA plant guide, which is derived from the PLANTS database (USDA, NRCS. 2000. The PLANTS database [<http://plants.usda.gov/plants>]. National Plant Data Center, Baton Rouge, LA 70874-4490). Many species do not have codes. If the code is unknown, record genus and species instead. If you cannot identify a species while in the field, collect a specimen for later identification (see page 103). If the species of the plant cannot be identified, record the code for its genus if possible. If not, record one of the following generic codes:

| Unknown Species Code | Life-form         | Lumped Species Code |
|----------------------|-------------------|---------------------|
| ---                  | Trees             | <b>TREES</b>        |
| <b>SHRUB1</b>        | Shrubs            | <b>SHRUBS</b>       |
| <b>FORB1</b>         | Forbs (and ferns) | <b>FORBS</b>        |
| <b>AAGG1</b>         | Annual grasses    | <b>AAGGS</b>        |
| <b>PPGG1</b>         | Perennial grasses | <b>PAGGS</b>        |

If another species of the same life-form can not be identified, it is labeled with the life-form followed by the number 2 (SHRUB2, FORB2, etc.). Up to five unknowns of each life-form may be recorded. Note: unknown tree species is not an option.

A generic record by plant life-form is entered when a group of tree, shrub, forb, annual grass, or perennial grass species, covers 3 or more percent on a vegetation plot but, as individual species, do not **and** are not on the *High Priority species list* (Appendix 3 page **235**). Example: 6 species of forbs are present one species covers 10 percent, and the other 5 species each cover 1 percent. Two records are entered: one record for the species of 10 percent, and a second generic FORBS record for the other 5 species which collectively cover 5 percent.

When collected: All species > 3 percent cover of the subplot and all high priority species

## 8.3 SPECIES HEIGHT

Record a 2-digit height for each line entry. The entry indicates the average total height above the ground at which a species occurs. If a species occurs at substantially different heights in a subplot, plants can be grouped into two different height groups as long as the cover estimates of each are  $\geq 3\%$ . A species can be in more than one height by repeating the species code on an additional line. Heights are recorded to the nearest foot.

### Guidelines for recognizing separate heights for a species are:

- **Graminoid** canopy heights must differ by at least 2 ft.
- **Forb** canopy layers must differ by at least 2 ft.
- **Shrub** canopy layers must differ by at least 4 ft.
- **Tree seedling** layers must differ by at least 4 ft.

When collected: All species > 3 percent cover of the subplot and all high priority species

Tolerance: Grass and forbs:  $\pm 1$  ft.

Shrubs and trees:  $\pm 3$  ft. Values: 1 to 99

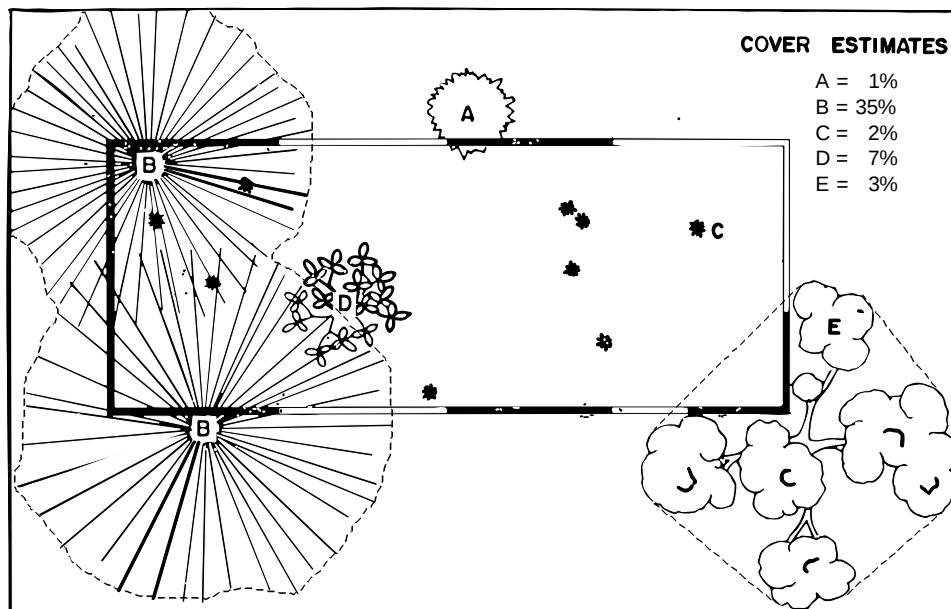
#### 8.4 SPECIES COVER

Estimate the cover of each species that occupies at least 3% of the 24 ft. subplot radius in its respective height group. Cover is estimated to the nearest 1% for each species, as the proportion of the fixed-radius plot **regardless of condition class boundaries** that would be obscured by all plants of the species if viewed from directly above. For each plant, cover is based on a vertically-projected polygon described by the outline of the live foliage of each plant (or foliage that was live during the current growing season for senescing plants), and ignoring any normal spaces occurring between the leaves of a plant (Figure 11; Daubenmire 1959). This best reflects the plant's above- and below-ground zone of dominance.

Base the percent cover estimate on the current years' growth present at the time of the plot visit. Include both living and dead material from the current year. Do not include dead branches of shrubs and trees in the cover polygons. Do not adjust the percent for the time of year during which the visit was made (i.e. if the plants are immature and small because the plot is being completed early in the growing season).

Overlap of plants of the same species is ignored. Visually group plants in a species together into a percent cover. There will often be overlap of plants of different species. Therefore, the total cover for all species summed together on a subplot may exceed 100%. Species that are on the *High Priority species list* (Appendix 3, page **235**) and that cover less than 1% is recorded as 1%. (0% cover is only used for remeasurement, to indicate that a species is no longer present.)

Several approaches can be used to improve the accuracy and repeatability of plant cover estimates. Cover can be "added up" across a plot, keeping in mind that 3% cover on a 24' radius plot = 54 ft<sup>2</sup>, or a square that is 7.4 feet on a side (Table 1). Plants can be visually aggregated into multiple 1% cover squares to arrive at a total cover. For species of moderate cover, it may be easiest to estimate cover of each quadrant of the subplot separately and then add them together, or to imagine crowding all the plants into a portion of a plot and estimate the proportion of the plot that would be covered. The cover scatterplots in Figure 12 may also be useful in developing estimates.



**Figure 11.** Examples of cover estimates

**Table 1:** Area represented by different cover estimates, and length of a square with that area.

|                                     |
|-------------------------------------|
| Subplot radius = 24 feet            |
| Subplot area = 1809 ft <sup>2</sup> |

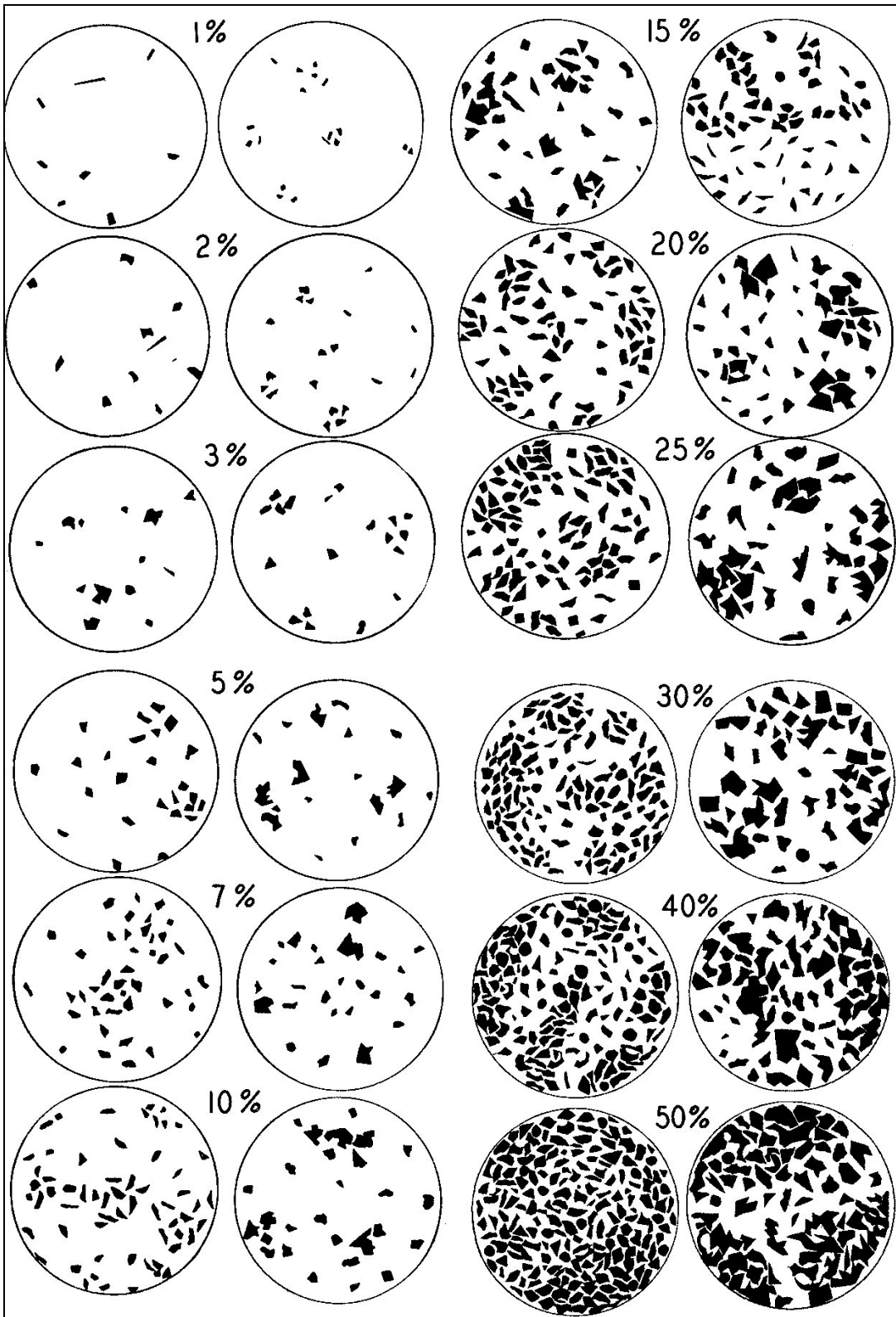
| Cover | Area (ft <sup>2</sup> ) | Length on a side (ft) | Radius (ft) | Diameter (ft) |
|-------|-------------------------|-----------------------|-------------|---------------|
| 1%    | 18                      | 4.3                   | 2.4         | 4.8           |
| 3%    | 54                      | 7.4                   | 4.2         | 8.4           |
| 5%    | 90                      | 9.5                   | 5.3         | 10.6          |
| 10%   | 181                     | 13.4                  | 7.6         | 15.2          |
| 15%   | 271                     | 16.5                  | 9.3         | 18.6          |
| 20%   | 362                     | 19.0                  | 10.5        | 21.0          |
| 25%   | 452                     | 21.3                  | 12.0        | 24.0          |

When collected: All species >3% cover and all high priority species

Tolerance: Cover estimates should be within one class of actual cover, based on the cover classes:

1-5%, 6-10%, 11-20%, 21-40%, 41-60%, 61-80%, and 81-100%

Values: 0 to 100



**Figure 12:** Reference scatterplots for cover estimation (from Terry and Chilingar 1955).

### 8.5 STAGE OF SHRUB DEVELOPMENT

For each shrub lifeform species recorded on one or more vegetation plots, enter the code below that best describes the shrub's stage of development across all vegetation plots. Do not include standing dead shrubs—only those that have some living tissue. Of all the live and dead stems and branches attached to the living shrubs, estimate the proportion that are dead, and place it in one of the classes below.

| Code | Shrub Stage of Development                                                        |
|------|-----------------------------------------------------------------------------------|
| 1    | Immature, no dead material (stems and branches) associated with the shrub record. |
| 2    | Mature, 1-24 percent dead material associated with the shrub record.              |
| 3    | Over-mature, 25-49 percent dead material associated with shrub record.            |
| 4    | Decadent, 50 percent or more dead material associated with shrub record.          |

When collected: All species >3% cover and all high priority species

Tolerance: No errors

Values: 1 to 4

### *C. Lifeform and total vegetation records*

Individual records are entered for each lifeform and for all vascular plants, and cover estimated for each. Species are defined by lifeform, although some plants can be measured as trees or shrubs depending on their form (see Section 8.2).

### 8.6 LIFEFORM

Record the lifeform of the vegetation being measured. Enter a record for each lifeform even if there are no plants in that lifeform present. Values are:

TR = tree seedlings

SH = shrubs

FB = forbs

GR = graminoids

When collected: All species >3% cover and all high priority species

Tolerance: No errors

Values: see above

### 8.7 LIFEFORM COVER

Estimate the cover for each lifeform and for all vegetation on the subplot. Cover is estimated to the nearest 1% for each lifeform, as the proportion of the fixed-radius plot, **regardless of condition class boundaries**, that would be obscured by all plants in the lifeform if viewed from directly above. Total percent cover for a plant lifeform group cannot exceed 100 percent. Total percent cover for a plant lifeform group cannot exceed the sum of percent cover recorded for all individual species

records of that plant group (item 8.4). However, total percent cover for a plant group can be, and often is, less than the sum of cover for all individual species within the group. This happens because of overlap between layers. If cover is greater than 0 but less than 1 percent, enter "01". If no plants of the lifeform are present, enter "0".

When collected: All species >3% cover and all high priority species

Tolerance: Cover estimates should be within one class of actual cover, based on the cover classes:

1-5%, 6-10%, 11-20%, 21-40%, 41-60%, 61-80%, and 81-100%

Values: 0-100

## **8.8 TOTAL VEGETATION COVER**

Estimate the total cover for all seedlings, shrubs, vines, and forbs on the subplot. Cover is estimated to the nearest 1%, as the proportion of the fixed-radius plot that would be obscured by all plants if viewed from directly above. Total vegetation cover cannot exceed 100 percent. Total percent vegetation cover can be, and often is, less than the sum of lifeform covers on a subplot. This happens because of overlap between layers of vegetation.

When collected: All subplots with at least 50% of the subplot area occupied by forested or measured non-forest condition classes

## ***D. Collection and identification of unknown plants***

To improve the quality of vegetation profile data, a formal procedure is followed to identify more of the unknown plant species that are tallied.

Each crew will be supplied with a three-ring binder containing sealable plastic bags for the collection of unidentified specimens. The binders provide some degree of protection to collected plants, and help to prevent their loss. Each bag has a label that should be filled out when a specimen is collected; the label identifies the plot and subplot from which the bagged specimen was collected.

While on the plot, the crew should not spend an inordinate amount of time trying to identify an unknown plant. If the plant can be keyed out quickly using a plant guide, identification should be attempted. If the crew is confident the plot can be completed in one day, they can spend more time trying to identify unknown plants while on the plot. In most cases, though, it will be more effective to collect unknown plants for later identification. If the plant can not be identified and qualifies for tally as a generic life-form record (shrub, forb, fern, grass), enter the record.

Gather as much of the complete plant as is feasible. Include roots, flowers, and seed-heads if possible. Write a brief description of the site from which the plant was collected, the plant community of which it was a member, and any other information which may assist in identification.

Once back at the motel/beach-front condo (with hottub), try to identify the collected specimens the same day that the plot was visited. Use whatever plant guides are available and the Polyclave program which is installed on the laptop computer. Other field team members who might be familiar with the species and/or are good at plant identification may be consulted. Twenty minutes is the recommended maximum amount of time that should be spent on one plant. If the specimen can not

be identified, contact the crew coordinator. If the same plant is collected several times and identification attempts are unsuccessful, the crew coordinator may contact a botanist for identification.

If no attempt can be made to key out a plant the same day it is collected, the specimen should be placed in a plant press (one is in each vehicle). Do not leave the specimen in the plastic bag; specimens left bagged may mildew and mold.

If a plant is successfully identified, the vegetation profile data for that plot should be updated before transferring the plot data to the laptop computer

TABLE OF CONTENTS

**9. TRACKABLE TREE AND SNAG SELECTION.....107**  
A. Introduction ..... 107  
B. Determining if a tree/sapling/seedling is selected on a fixed-radius plot..... 107  
C. Trackable tree and snag selection ..... 108  
D. Seedling requirements..... 108  
E. Tree and snag selection MQO..... 109

## Trackable Tree and Snag Selection

.

## 9. TRACKABLE TREE AND SNAG SELECTION

### ***A. Introduction***

Tree species are measured on accessible forested and measured nonforest (present nonforest land use 16-26) condition classes. See page 57 for definitions of accessible forest land

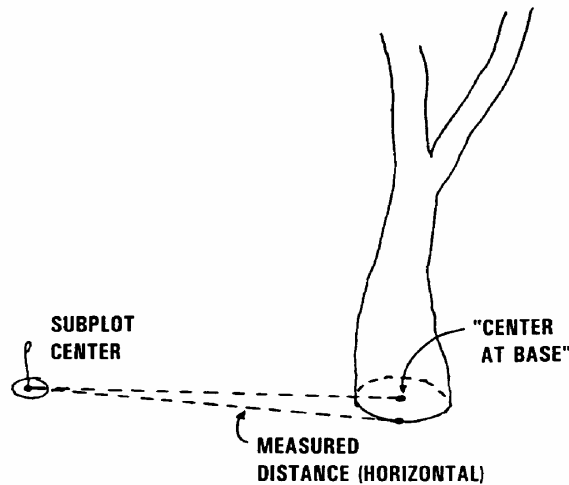
Large trees and snags ( $\geq 5.0$  in. d.b.h.) are sampled using the 1/24 acre fixed-radius subplot. Each subplot has a fixed-radius of 24.0 feet horizontal.

Saplings (1.0 in. to 4.9 in. d.b.h.) are sampled more efficiently using the small (1/300 acre) fixed-radius microplot. Each microplot has a fixed-radius of 6.8 feet horizontal. Saplings are referenced to the microplot center.

Seedlings (conifers  $< 1.0$  in. d.b.h. and  $\geq 0.5$  ft. in length; and hardwoods  $< 1.0$  in. d.b.h. and  $\geq 1.0$  ft. in length) are also sampled most efficiently using the microplot. Seedlings are counted by species and condition class (see "Seedling Count" on page 83) and in some cases, are tallied individually. Seedlings are referenced to the microplot center.

### ***B. Determining if a tree/sapling/seedling is selected on a fixed-radius plot***

Trees are selected only when the distance from their bole center at the ground to the subplot center is less than the radius of that subplot/microplot (see figure below).



### ***C. Trackable tree and snag selection***

#### **Is it a tree or a branch?**

See the rule for forked trees in tree data 10.9 DIAMETER on page 117

#### **Is it a stump?**

High stumps meeting size and lean requirements are considered standing dead tally trees and are tallied as such. Identify them as stumps in TREE NOTES

Follow the steps below:

**1.) If the condition class is accessible forest land (CONDITION STATUS = 1) or measured nonforest (present nonforest land use 16-26), do the following steps in the condition class:**

- a) Tally all trees live and  $\geq 5.0$  in. d.b.h. that are within the 24.0 ft. subplot.

Assign a TREE STATUS = 1.

- b) Tally all trees standing dead,  $\geq 5.0$  in. d.b.h.,  $\geq 4.5$  feet tall, leaning  $< 45$  degrees, that are within the 24.0 ft. subplot.

Assign a TREE STATUS = 2.

- c) Tally all live trees 1.0 to 4.9 in. d.b.h. that are within the 6.8 ft. microplot.

Assign a TREE STATUS = 1.

- d) Tally live seedlings (conifers  $< 1.0$  in. d.b.h. and  $\geq 0.5$  ft. in length; and hardwoods  $< 1.0$  in. d.b.h. and  $\geq 1.0$  ft. in length) present within the 6.8 ft. microplot if the combined tally of live trees  $\geq 1.0$  in. d.b.h. present in the condition class on the subplot is less than 4. Tally seedlings, if present, until the total tally of live trees is 4 in the condition class on the subplot. Tally a seedling only if it meets the requirements specified in the section "Seedling requirements" on page 108.

Assign these seedlings TREE STATUS = 1.

- 2.) If the condition class is NOT accessible forest land or measured nonforest (present nonforest land use 16-26):

Do not tally live trees, dead trees, or seedlings.

### ***D. Seedling requirements***

**A seedling is:** a live tree less than 1.0 in. d.b.h., a conifer at least 0.5 ft. in length or a hardwood at least 1.0 ft. in length, and established in mineral soil. (The requirements that follow differ from the requirements for "Seedling Count" on page 83).

Tally a seedling only if it meets the following requirements:

1. Select a seedling only if its bole center at the ground is within 6.8 feet (horizontal distance) of microplot center.
2. Select a seedling only if it is expected to live at least 10 more years.
3. Do not tally a suppressed seedling. A seedling is suppressed if it is overtopped by other trees and will not live 10 more years.
4. If a seedling is dominant or codominant and less than 4.5 feet tall, it must be at least 2 feet from any other tally tree. An intermediate or overtopped seedling of any height must be at least 2 feet from any other tally tree. Ignore residual overstory trees  $\geq 5.0$  in. d.b.h. when evaluating the crown class of an additional stocking seedling.
5. If a conifer, select a seedling only if it currently is not overtopped and shaded by another conifer and will not be overtopped and shaded by another conifer before reaching 9.0 in. d.b.h. This includes overtopping by other conifers that are within or outside the 6.8 foot fixed-radius plot. Ignore overtopping by conifers  $\geq 9.0$  in. d.b.h. and 50 years old (b.h. age) if the conifer seedling is of a shade tolerant species (true firs except noble fir, hemlocks, spruces, and cedars except incense cedar).

Whether or not a conifer is overtopped is estimated by using the "inverted cone" method. This method projects two straight lines along the branch tips of a tree's cone-shaped crown upward from their intersection at the tree's tip to create an imaginary cone, in the growing space above the tree. If one-third or more of the imaginary cone is occupied by the live crown(s) of other conifer(s), the tree is considered overtopped. If less than one-third of the imaginary cone is occupied, the tree is considered "free-to-grow".

6. Only one hardwood seedling in a hardwood clump can be selected. If more than one seedling in a clump is a candidate for being tallied, select the most dominant seedling candidate. Do not tally seedling-sized suckers that have sprouted from the base of a live, unsuppressed hardwood stem that is  $\geq 5.0$  in. d.b.h. A clump is defined as 3 or more live stems that sprouted from a common root system which had originated as part of a earlier tree whose above-ground bole was cut or is no longer alive.

### ***E. Tree and snag selection MQO***

Tally tree selection:

Tolerance: Live tree  $\geq 5.0$  in. on the subplot: No errors

Dead tree  $\geq 5.0$  in. on the subplot: No errors Sapling: No errors



## TABLE OF CONTENTS

|                                                                    |            |
|--------------------------------------------------------------------|------------|
| <b>10. TREE AND SAPLING DATA.....</b>                              | <b>113</b> |
| 10.1 SUBPLOT NUMBER .....                                          | 114        |
| 10.2 TREE NUMBER.....                                              | 114        |
| 10.3 CONDITION CLASS NUMBER .....                                  | 115        |
| 10.4 AZIMUTH.....                                                  | 115        |
| 10.5 HORIZONTAL DISTANCE .....                                     | 116        |
| 10.6 SLOPE DISTANCE.....                                           | 116        |
| 10.7 TREE STATUS.....                                              | 116        |
| 10.8 SPECIES .....                                                 | 117        |
| 10.9 DIAMETER .....                                                | 117        |
| 10.9.1 DIAMETER AT BREAST HEIGHT (DBH) .....                       | 117        |
| 10.9.2 DIAMETER CHECK.....                                         | 123        |
| 10.9.3 LENGTH TO DIAMETER MEASUREMENT POINT .....                  | 123        |
| 10.9.4 SECOND DIAMETER ON UPPER BOLE .....                         | 123        |
| 10.9.5 SECOND DIAMETER ON UPPER BOLE HEIGHT.....                   | 123        |
| 10.10 BRANCHING CHARACTERISTICS .....                              | 124        |
| 10.11 ROOT MEASUREMENTS FOR TROPICAL TREES .....                   | 125        |
| 10.11.1 TYPE OF ROOTING SYSTEM .....                               | 125        |
| 10.11.2 ROOT DIAMETER 1 .....                                      | 125        |
| 10.11.3 ROOT DIAMETER 2.....                                       | 125        |
| 10.11.4 ROOTING HEIGHT.....                                        | 126        |
| 10.11.5 PROP ROOT DENSITY.....                                     | 126        |
| 10.11.6 NUMBER OF BUTTRESSES .....                                 | 127        |
| 10.11.7 AERIAL ROOT DENSITY .....                                  | 127        |
| 10.12 LEAN ANGLE .....                                             | 128        |
| 10.13 ROTTEN/MISSING CULL .....                                    | 128        |
| 10.14 RECONSTRUCTED LENGTH .....                                   | 129        |
| 10.15 ACTUAL LENGTH.....                                           | 129        |
| 10.16 LENGTH METHOD.....                                           | 129        |
| 10.17 CROWN CLASS .....                                            | 130        |
| 10.18 UNCOMPACTED LIVE CROWN RATIO.....                            | 131        |
| 10.19 COMPACTED CROWN RATIO.....                                   | 133        |
| 10.20 TREE DAMAGE.....                                             | 136        |
| <i>Damage Summary</i> .....                                        | 137        |
| 10.20.1 DAMAGE LOCATION 1.....                                     | 141        |
| 10.20.2 DAMAGE TYPE 1.....                                         | 143        |
| 10.20.3 DAMAGE SEVERITY 1 .....                                    | 145        |
| Procedures to Record Multiple Occurrences of the Same Damage ..... | 158        |
| Procedures to Measure Circumference Affected .....                 | 158        |
| 10.20.4 DAMAGING AGENT 1 .....                                     | 158        |
| 10.20.5 DAMAGE LOCATION 2.....                                     | 158        |
| 10.20.6 DAMAGE TYPE 2.....                                         | 158        |
| 10.20.7 DAMAGE SEVERITY 2 .....                                    | 159        |
| 10.20.8 DAMAGING AGENT 2.....                                      | 159        |
| 10.21 DECAY CLASS.....                                             | 159        |
| 10.22 EPIPHYTE LOADING.....                                        | 160        |
| 10.23 CLUMP CODE.....                                              | 161        |
| 10.24 PRIORITY DAMAGE .....                                        | 161        |
| 10.24.1 PRIORITY DAMAGE SEVERITY .....                             | 161        |
| 10.25 TREE NOTES.....                                              | 161        |



## 10. TREE AND SAPLING DATA

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

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

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

### DEAD TREES (Snags)

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

To qualify as a standing dead tally tree, dead trees must at least 5.0 inches in diameter, have a bole which has an unbroken ACTUAL LENGTH of at least 4.5 feet, and lean less than 45 degrees from vertical. Broken portions of trees that are completely separated from their base are not treated as separate trees.

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

Portions of boles on dead trees that are separated greater than 50 percent (either above or below 4.5 feet), are considered severed and are included in Down Woody Debris (DWD) if they otherwise meet DWD tally criteria. Live and dead standing tally trees, and partially separated boles of dead tally trees, do not have to be self-supported. They may be supported by other trees, branches, or their crown.

Trees that have been cut above DBH qualify as tally trees, provided they meet the size requirement.

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

### **10.1 SUBPLOT NUMBER**

Record the subplot number where the tree occurs.

When Collected: All live and dead tally trees

Field width: 1 digit

Tolerance: No errors

MQO: At least 99% of the time

Values:

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

### **10.2 TREE NUMBER**

Record a code to uniquely and permanently identify each tree on a given subplot. The TREE NUMBERS must be unique within a subplot – being unique is more important than being sequential. In general, work clockwise from azimuth 001 to 360, and work outwards from subplot center to subplot edge. The tag is placed facing the subplot center.

If TREE RECORD NUMBERS are not assigned in the field, record 000.

When Collected: All live tally trees  $\geq 1.0$  in DBH

Field width: 3 digits

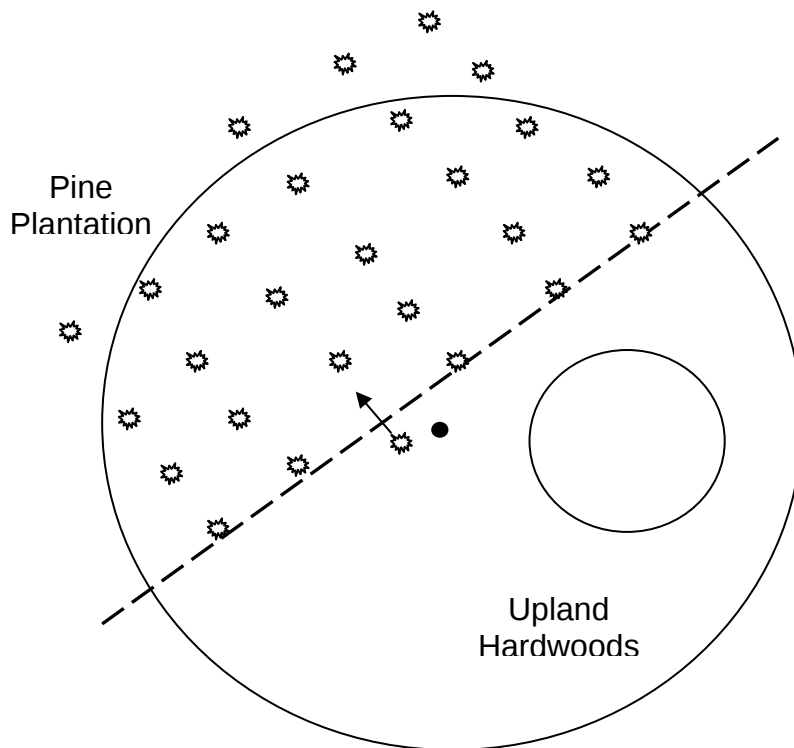
Tolerance: No errors

MQO: At least 99% of the time

Values: 000, 001 to 999

### 10.3 **CONDITION CLASS NUMBER**

Record the **CONDITION CLASS NUMBER** in which each tree is located. Often, a referenced boundary is approximate, and trees selected for tally are assigned to the actual condition in which they lie regardless of the recorded approximate boundary (Figure 13).



**Figure 13. Ragged CONDITION CLASS boundary and tree condition class designation.**

When Collected: All live and standing dead tally trees

Field width: 1 digit

Tolerance: No errors

MQO: At least 99% of the time

Values: 1 to 9

### 10.4 **AZIMUTH**

Record the **AZIMUTH** from the subplot center (for trees  $\geq 5.0$  in DBH) or the microplot center (for trees  $< 5.0$  in DBH), sight the center of the base of each tree with a compass. Record **AZIMUTH** to the nearest degree. Use 360 for north.

When Collected: All live and standing dead tally trees

Field width: 3 digits

Tolerance: +/- 2 degrees

MQO: At least 90% of the time

Values: 001 to 360

### **10.5 HORIZONTAL DISTANCE**

Record the measured HORIZONTAL DISTANCE, to the nearest 0.1 ft, from the subplot center (for trees  $\geq 5.0$  in DBH) or microplot center (for trees  $< 5.0$  in DBH) to the pith of the tree at the base

When Collected: All live and standing dead tally trees

Field width: 3 digits (xx.y)

Tolerance: Microplot: +/- 0.2 ft

Subplot: +/- 1.0 ft

MQO: At least 90% of the time

Values: Microplot: 00.1 to 6.8

Subplot: 00.1 to 24.0

### **10.6 SLOPE DISTANCE**

Record the measured SLOPE DISTANCE, to the nearest 0.1 ft, from the subplot center to the head of the nail that affixes the tree number tag, or to the front of the tree at the base if not tagged with a number.

When Collected: All reference trees

Field width: 3 digits (xx.y)

Tolerance: +/- 1.0 ft

MQO: At least 90% of the time

Values: .1 to 99.9

### **10.7 TREE STATUS**

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

When Collected: All new live tally trees

All new dead tally trees  $\geq 5.0$  in d.b.h.

All reference only trees

Field width: 1 digit

Tolerance: No errors

MQO: At least 95% of the time

Values:

- 1     Live tree – any live tally tree
- 2     Dead tree -- any dead tally tree  $> 5.0$  in d.b.h
- 9     Reference Only tree – a subplot reference tree that does not qualify as a tally tree

## **10.8 SPECIES**

Record the appropriate TREE SPECIES code from the list beginning on (page 175). If you encounter a species not listed in the Tree Species List and are not sure if it should be tallied as a tree, consult your Field Supervisor. If the species cannot be determined in the field, tally the tree, but bring branch samples, foliage, cones, flowers, bark, etc. to your supervisor for identification. If possible, collect samples outside the subplots from similar specimens and make a note to correct the SPECIES code later. Use codes 9000 and above for unknowns when the genus or species codes cannot be used. 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. In this case use the sample collections procedures described earlier in this paragraph.

When Collected: All live and standing dead tally trees

Field width: 3 digits

Tolerance: No errors

MQO: At least 99% of the time for genus, at least 95% of the time for species

Values: See TREE SPECIES LIST (pg 163)

## **10.9 DIAMETER**

Diameters are measured at breast height (DBH) which is 4.5 feet above the ground. Trees with diameters less than 4.9-inches are measured on the 6.8-ft radius microplot, those with diameters of 5.0-inches and larger are measured on the 24-ft radius subplots.

In order to accurately remeasure diameter at the same point on the tree bole at successive visits, mark the point of measurement with an aluminum nail. When marking trees for the first time, measure the diameter after the nail is in place. Use caution to avoid damaging trees with nails. Do not nail trees less than 3.0-inches in diameter, or species vulnerable to introduction of pathogens (e.g., aspen).

If the diameter cannot be physically measured for any reason, estimate the diameter using a relaskop. This procedure is described in Appendix 2, page 233

### **10.9.1 DIAMETER AT BREAST HEIGHT (DBH)**

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

Special DBH situations:

1. Forked tree: In order to qualify as a fork, the stem in question must be at least 1/3 the diameter of the main stem and must branch out from the main stem at an angle of 45 degrees or less. Forks originate at the point on the bole where the piths intersect. Forked

trees are handled differently depending on whether the fork originates below 1.0 ft, between 1.0 and 4.5 ft, or above 4.5 ft.

- Trees forked below 1.0 ft. Trees forked in this region are treated as distinctly separate trees (Figure 14). Distances and azimuths are measured individually to the center of each stem where it splits from the stump (Figure 17 A-C). DBH is measured for each stem at 4.5 ft above the ground. When stems originate from pith intersections below 1 ft, it is possible for some stems to be within the limiting distance of the microplot or subplot, and others to be beyond the limiting distance. If stems originating from forks that occur below 1.0 ft fork again between 1.0 and 4.5 ft (Figure 17-E), the rules in the next paragraph apply.

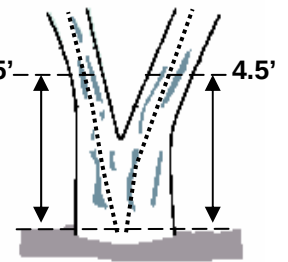


Figure 14. Forked below 1.0 ft.

- Trees forked between 1.0 ft and 4.5 ft. Trees forked in this region are also counted as separate trees (Figure 15), but only one distance and azimuth (to the central stump) is used for all (Figure 17 D-F). Although a single azimuth and distance applies to all, multiple stems should be recorded as they occur in clockwise order (from front to back when one stem is directly in front of another). The DBH of each fork is measured at a point 3.5 ft above the pith intersection. When forks originate from pith intersections between 1.0 and 4.5 ft, the limiting distance is the same for all forks--they are either all on, or all off the plot.

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 ft above the common pith intersection (Figure 17 F).

Once a stem is tallied as a fork that originated from a pith intersection between 1.0 and 4.5 ft, do not recognize any additional forks that may occur on that stem. Measure the diameter of such stems at the base of the second fork as shown in Figure 17-E (i.e., do not move the point of diameter the entire 3.5 ft above the first fork).

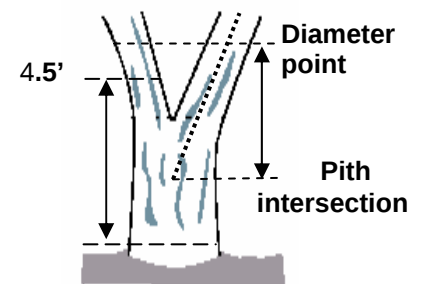


Figure 15. Forked between 1.0-4.5 ft.

- Trees forked at or above 4.5 ft. Trees forked in this region count as one single tree (Figure 16). If a fork occurs at or immediately above 4.5 ft, measure diameter below the fork just beneath any swelling that would inflate DBH.

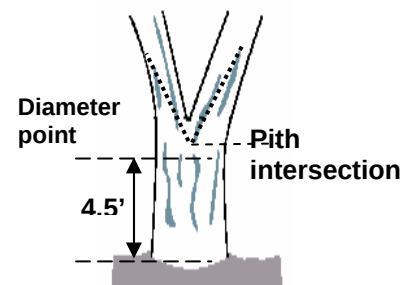


Figure 16. Tree forked above 4.5 ft

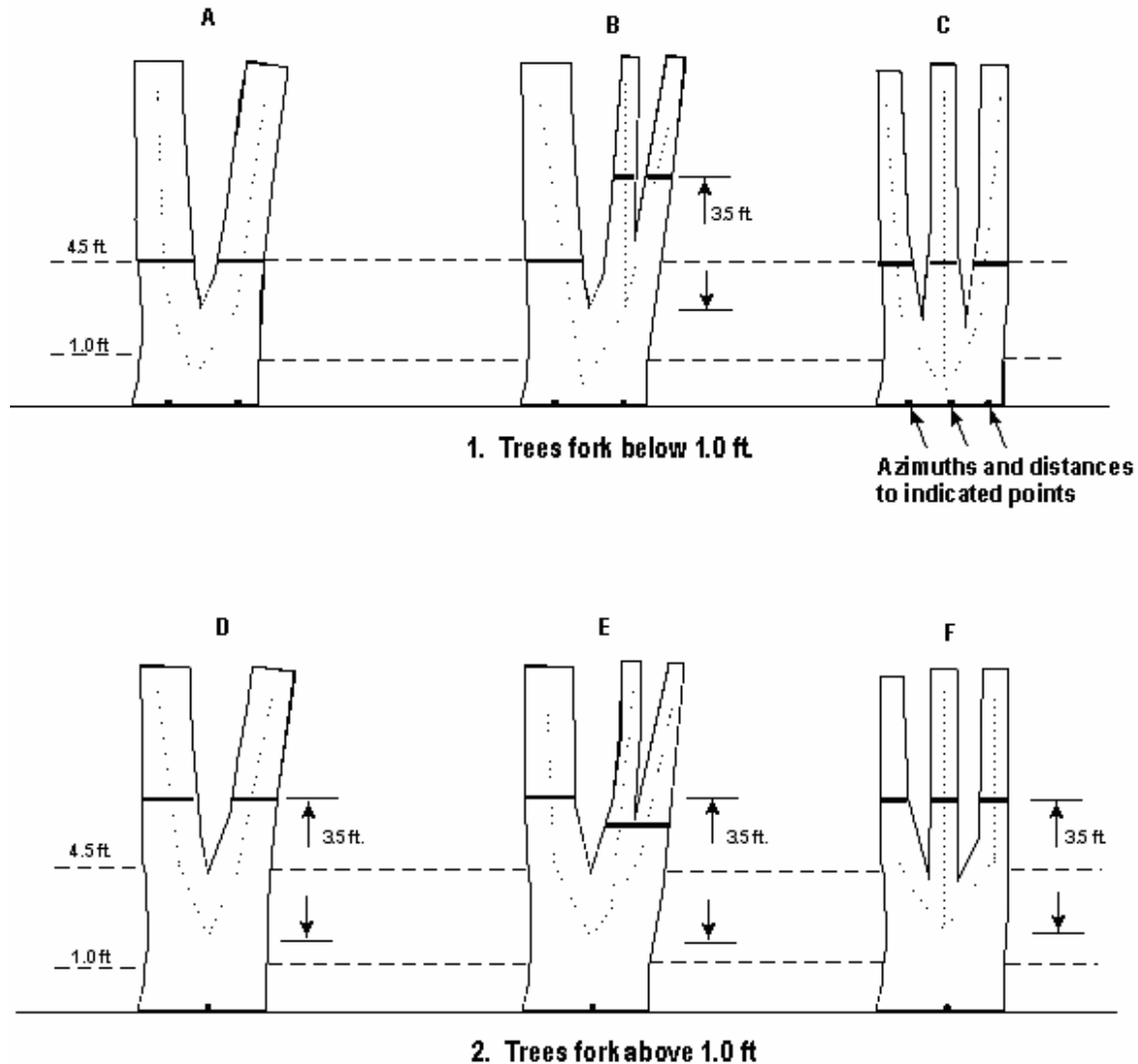


Figure 17. Summary of where to measure DBH, distance, and azimuth on forked trees.

2. Stump Sprouts. Stump sprouts originate between ground level and 4.5 ft 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 ft are measured at 4.5 ft from ground line. Stump sprouts originating between 1.0 ft and 4.5 ft are measured at 3.5 ft above their point of occurrence. As with forks, rules for measuring distance and azimuth depend on whether the sprouts originate above or below 1.0 ft. For multi-stemmed woodland species, treat all new sprouts as part of the same new tree.

3. Tree with butt-swell or bottleneck: Measure these trees 1.5 ft above the end of the swell or bottleneck if the swell or bottleneck extends 3.0 ft or more above the ground (Figure 18).

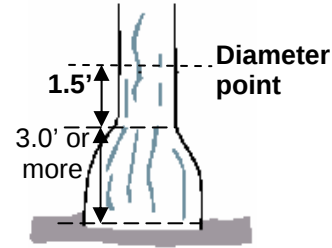


Figure 18. Bottleneck tree.

4. Tree with irregularities at DBH: On trees with swellings (Figure 19), bumps, depressions, prop roots, and branches (Figure 20) at DBH, diameter will be measured immediately above the irregularity at the place it ceases to affect normal stem form.

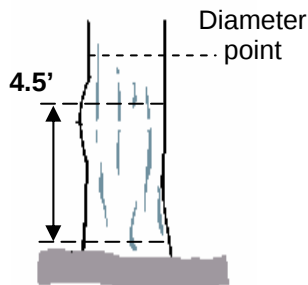


Figure 19. Tree with swelling.

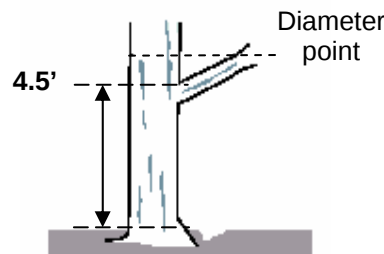


Figure 20. Tree with branch.

5. Tree on slope: Measure diameter at 4.5 ft from the ground along the bole on the uphill side of the tree (Figure 21).

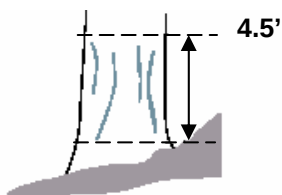


Figure 21. Tree on a slope.

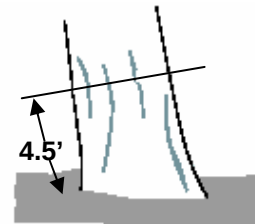


Figure 22. Leaning tree.

6. Leaning tree: Measure diameter at 4.5 ft from the ground along the bole. The 4.5 ft distance is measured along the underside face of the bole (Figure 22).
7. Turpentine tree: On trees with turpentine face extending above 4.5 ft, estimate the diameter at 10.0 ft above the ground and multiply by 1.1 to estimate DBH outside bark.

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

9. Missing wood or bark. Do not reconstruct the DBH of a tree that is missing wood or bark or at the point of measurement. Record the diameter, to the nearest 0.1, of the wood and bark that is still attached to the tree (Figure 23). If a tree has a localized abnormality (gouge, depression, etc.) at the point of point of DBH, apply the procedure described for trees with irregularities at DBH (Figure 19).

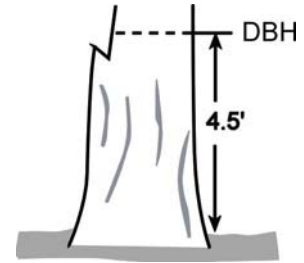


Figure 23. Tree with broken stem.

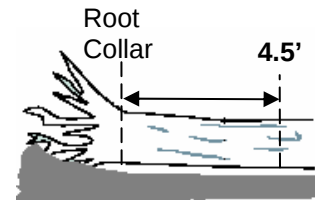


Figure 24. Tree on the ground.

10. Live windthrown tree: Measure from the top of the root collar along the length to 4.5 ft (Figure 24).
11. Down live tree with tree-form branches growing vertical from main bole. When a down live tree, touching the ground, has vertical ( $<45^\circ$  from vertical) tree-like branches coming off the main bole, first determine whether or not the pith of the main bole (averaged along the first log of the tree) is above or below the duff layer.
  - If the pith of the main bole is above the duff layer, use the same forking rules specified for a forked tree, and take all measurements accordingly (Figure 25).
  - o If the pith intersection of the main down bole and vertical tree-like branch occurs below 4.5' from the stump along the main bole, treat that branch as a separate tree, and measure DBH 3.5' above the pith intersection for both the main bole and the tree-like branch.

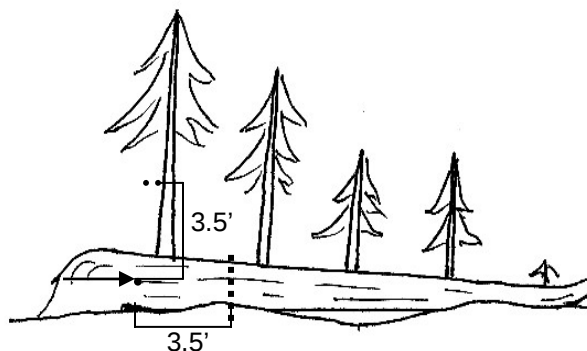


Figure 25. Down tree above duff. Use forking rules.

- o If the intersection between the main down bole and the tree-like branch occurs beyond the 4.5' point from the stump along the main bole, treat that branch as part of the main down bole.
- If the pith of main tree bole is below the duff layer, ignore the main bole, and treat each tree-like branch as a separate tree; take DBH and length measurements from the ground, not necessarily from the top of the down bole (Figure 26). However, if the top of the main tree bole curves out of the ground towards a vertical angle, treat that portion of that top as an individual tree originating where the pith leaves the duff layer.

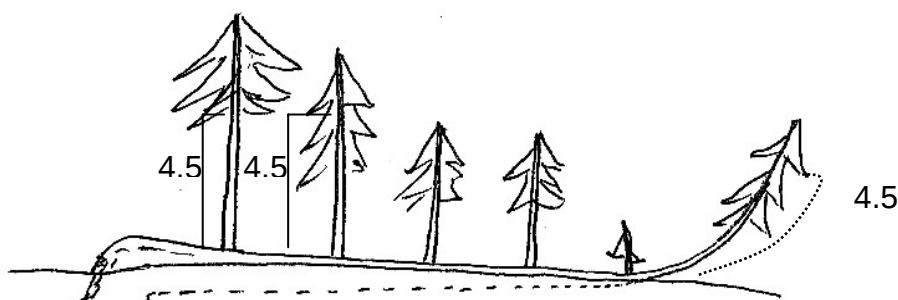


Figure 26. Down tree below duff. Treat each branch as a separate tree.

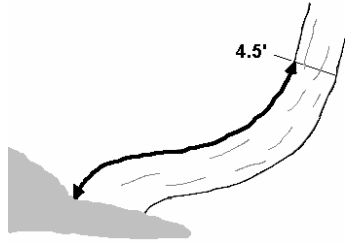


Figure 27. Tree with curved bole

### 10.9.2 DIAMETER CHECK

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

When Collected: All live and standing dead tally trees  $\geq 1.0$  in DBH

Field width: 1 digit

Tolerance: No errors

MQO: At least 99% of the time

Values:

- |   |                              |
|---|------------------------------|
| 0 | Diameter measured accurately |
| 1 | Diameter estimated           |

### 10.9.3 LENGTH TO DIAMETER MEASUREMENT POINT

Record this item when tree diameter measurement locations are not monumented. For those trees measured directly at 4.5 ft above the ground, leave this item blank. If the diameter is not measured at 4.5 ft, record the actual length from the ground, to the nearest 0.1 in, at which the diameter was measured for each tally tree, 1.0 in DBH and larger.

When Collected: All live and dead tally trees  $\geq 1.0$  in DBH

Field width: 3 digits

Tolerance: +/- 0.2 ft

MQO: At least 90% of the time

Values: 0.1 – 15.0

### 10.9.4 SECOND DIAMETER ON UPPER BOLE

Record the diameter of the main stem on the upper bole. The upper bole diameter should be measured with a relaskop at the point where the main stem tapers to 4 inches or greater. Measure to the nearest inch for all trees  $\geq 5.0$  in DBH on the 24 ft. radius subplots.

When Collected: All live and standing dead tally trees  $\geq 5.0$  in DBH

Field width: 2 digits

### 10.9.5 SECOND DIAMETER ON UPPER BOLE HEIGHT

Record the height where the main stem diameter is measured. The main stem diameter should be at least 4 in. at this height. Measure to the nearest foot.

When Collected: All live and standing dead tally trees  $\geq 5.0$  in DBH

Field width: 3 digits

Values: 4 in to 999 in

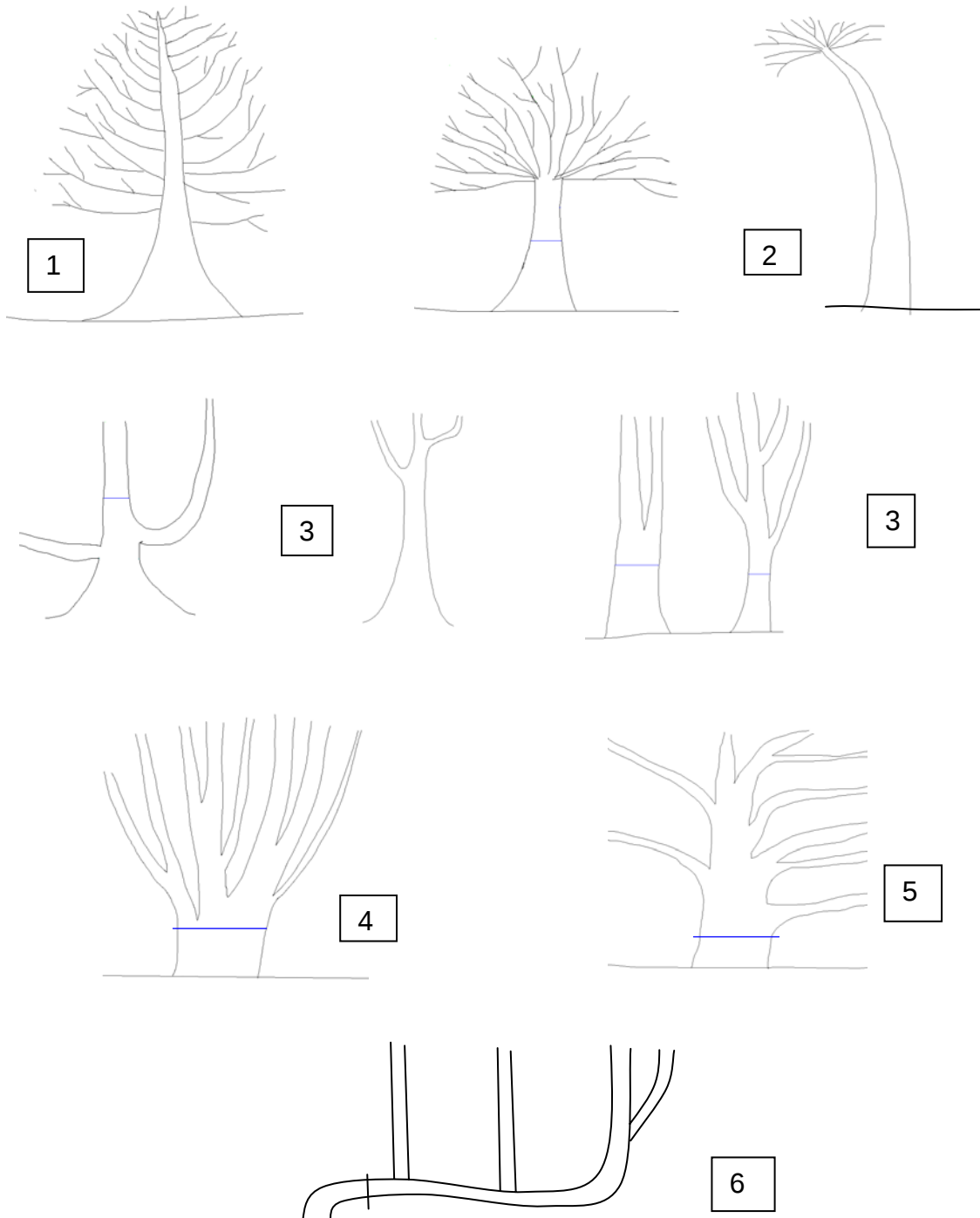
### 10.10 BRANCHING CHARACTERISTICS

Record the branching form figure number that best represents the density and structure of the branching system

When Collected: All live and standing dead tally trees  $\geq 5.0$  in d.b.h.

Field width: 1 digit

Values:



## **10.11 ROOT MEASUREMENTS FOR TROPICAL TREES**

Tropical trees can exhibit prop (or stilted roots), buttressed roots, and various forms of aerial rooting systems. To accurately account for the often significant biomass associated with these special root systems, please measure and note the following.

### **10.11.1 TYPE OF ROOTING SYSTEM**

Record the type of rooting system of tally trees and snags.

When Collected: All live and standing dead tally trees  $\geq 5.0$  in d.b.h.

Field width: 1 digit

Values:

0 = Normal roots (Default)

No other root measurements are needed

1 = Prop (Stilted) roots

Record **root diameters**, **rooting height**, and **density code**

2 = Buttressed roots

Record **number of buttresses** and **rooting height**

### **10.11.2 ROOT DIAMETER 1**

Record the largest diameter (to the nearest foot) of the entire prop root system at ground level.

When Collected: All live and standing dead tally trees  $\geq 5.0$  in d.b.h. with ROOTING SYSTEM = 1

Field width: 2 digits

Values: 1 ft. to 99 ft

### **10.11.3 ROOT DIAMETER 2**

Record the diameter of the prop root system perpendicular to the largest diameter recorded above, also at ground level and to the nearest foot.

When Collected: All live and standing dead tally trees  $\geq 5.0$  in d.b.h. with ROOTING SYSTEM = 1

Field width: 2 digits

Values: 1 ft. to 99 ft

#### 10.11.4 ROOTING HEIGHT

Record the height of the stilted or buttressed root system to the nearest foot, from ground level to the highest point where the stilts or buttresses protrude from the bole of the tree.

When Collected: All live and standing dead tally trees  $\geq 5.0$  in d.b.h with ROOTING SYSTEM = 1 or 2.

Field width: 2 digits

Values: 1 ft. to 99 ft

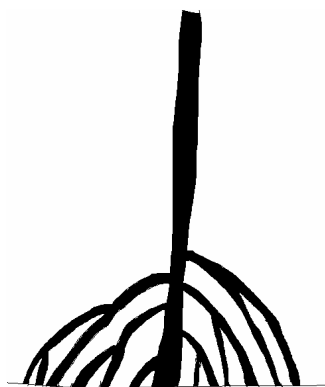
#### 10.11.5 PROP ROOT DENSITY

For prop roots, record the stilted roots figure number that best represents the density and structure of the stilted root system.

When Collected: All live and standing dead tally trees  $\geq 5.0$  in d.b.h. with ROOTING SYSTEM = 1

Field width: 2 digits

Values:



↑  
Density 1



↑  
Density 2



↑  
Density 3



2  
↑

### 10.11.6 NUMBER OF BUTTRESSES

For buttressed roots, record the number of buttresses.

When Collected: All live and standing dead tally trees  $\geq 5.0$  in d.b.h. with ROOTING SYSTEM = 2

Field width: 2 digits

Values: 1 to 99.

### 10.11.7 AERIAL ROOT DENSITY

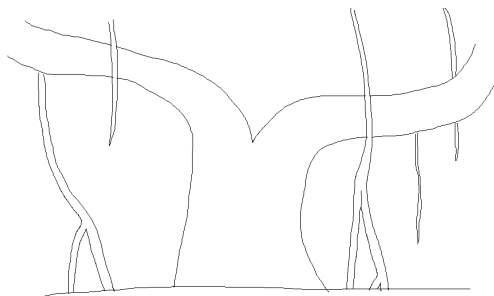
If there are aerial roots, record the aerial root figure number that best represents the density and branching structure of the aerial root system. If there are no aerial roots, record 0 for this column.

When Collected: All live and standing dead tally trees  $\geq 5.0$  in d.b.h.

Field width: 1 digit

Values:

0 = No aerial roots



Aerial roots 1



Aerial roots 2



Aerial roots 3

### **10.12 LEAN ANGLE**

Record the code that describes the angle of lean from vertical of the tree, from base to top of ACTUAL LENGTH. Trees supported by other trees or by their own branches are considered standing.

When Collected: All live and standing dead tally trees  $\geq 5.0$  in DBH

Field width: 1 digit

Tolerance: No errors

MQO: At least 99% of the time

Values:

- |   |                                                       |
|---|-------------------------------------------------------|
| 0 | Standing (less than 45 degrees of lean from vertical) |
| 1 | Down (more than 45 degrees of lean)                   |

### **10.13 ROTTEN/MISSING CULL**

Record the percent rotten or missing cubic-foot cull for all live tally trees  $\geq 5.0$  in DBH and all standing dead tally trees  $\geq 5.0$  in DBH.

Record the percentage of rotten and missing cubic-foot volume, to the nearest 1 percent.

When estimating volume loss (tree cull), only consider the cull on the merchantable bole/portion of the tree, from a 1-ft stump to a 4-inch top. Do not include any cull estimate above actual length.

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

- Cankers or fruiting bodies.
- Swollen or punky knots.
- Dull, hollow sound of bole (use regional standards).
- Large dead limbs, especially those with frayed ends.
- Sawdust around the base of the tree.

When cull is coded because of rot, then a damage must also be coded.

When Collected: All live and standing dead tally trees  $\geq 5.0$  in DBH

Field width: 2 digits

Tolerance: +/- 10 %

MQO: At least 90% of the time

Values: 0 to 99

### **10.14 RECONSTRUCTED LENGTH**

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

When Collected: - All live tally trees

All standing dead tally trees  $\geq 5.0$  in DBH

Field width: 3 digits

Tolerance: +/- 10 % of true length

MQO: At least 90% of the time

Values: 001 to 400

### **10.15 ACTUAL LENGTH**

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

When Collected: All live tally trees (with broken or missing tops)

All standing dead tally trees (with broken or missing tops)  $\geq 5.0$  in DBH

Field width: 3 digits

Tolerance: +/- 10 % of true length

MQO: At least 90% of the time

Values: 005 to 400

### **10.16 LENGTH METHOD**

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

When Collected: All live tally trees and all standing dead tally trees  $\geq 5.0$  in DBH

Field width: 1 digit

Tolerance: No errors

MQO: At least 99% of the time

Values:

- B** Total and actual lengths are field measured with a measurement instrument (e.g., clinometer, relascope, tape) *Code B = Both heights are measured*

- A** Total length is visually estimated, actual length is measured with an instrument  
*Code A = Actual height only is measured*
- N** Total and actual lengths are visually estimated. *Code N = neither is measured*

### **10.17 CROWN CLASS**

Rate tree crowns in relation to the sunlight received and proximity to neighboring trees (Figure 28). Base the assessment on the position of the crown at the time of observation. Example: a formerly suppressed tree which is now dominant due to tree removal is classified as dominant.

When Collected: All live tally trees

Field width: 1 digit

Tolerance: No errors

MQO: At least 85% of the time

Values:

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

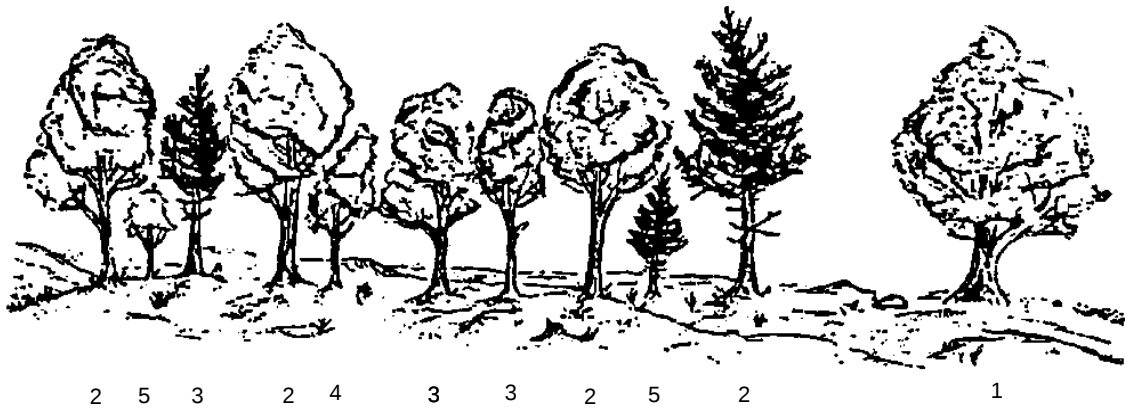


Figure 28. Examples of CROWN CLASS code definitions

### 10.18 UNCOMPACTED LIVE CROWN RATIO

Record the UNCOMPACTED CROWN RATIOS to the nearest 1%. UNCOMPACTED LIVE CROWN RATIO is the percentage of total tree height supporting live foliage (or in cases of extreme defoliation should be supporting live foliage) that is effectively contributing to tree growth. UNCOMPACTED LIVE CROWN RATIO is determined by the ratio of live crown length to top of live crown (Figure 29). Live crown length is determined from the last live foliage at the crown top (dieback in the upper portion of the crown is not part of the live crown) to the “base of live crown”. Many times there are additional live branches below the “base of live crown”. These branches are only included if they have a basal diameter greater than 1 in and are within 5 ft of the base of the obvious live crown. The live crown base becomes that point on the main bole perpendicular to the lowest live foliage on the last branch that is included in the live crown. The live crown base is determined by the live foliage and not by the point where a branch intersects with the main bole.

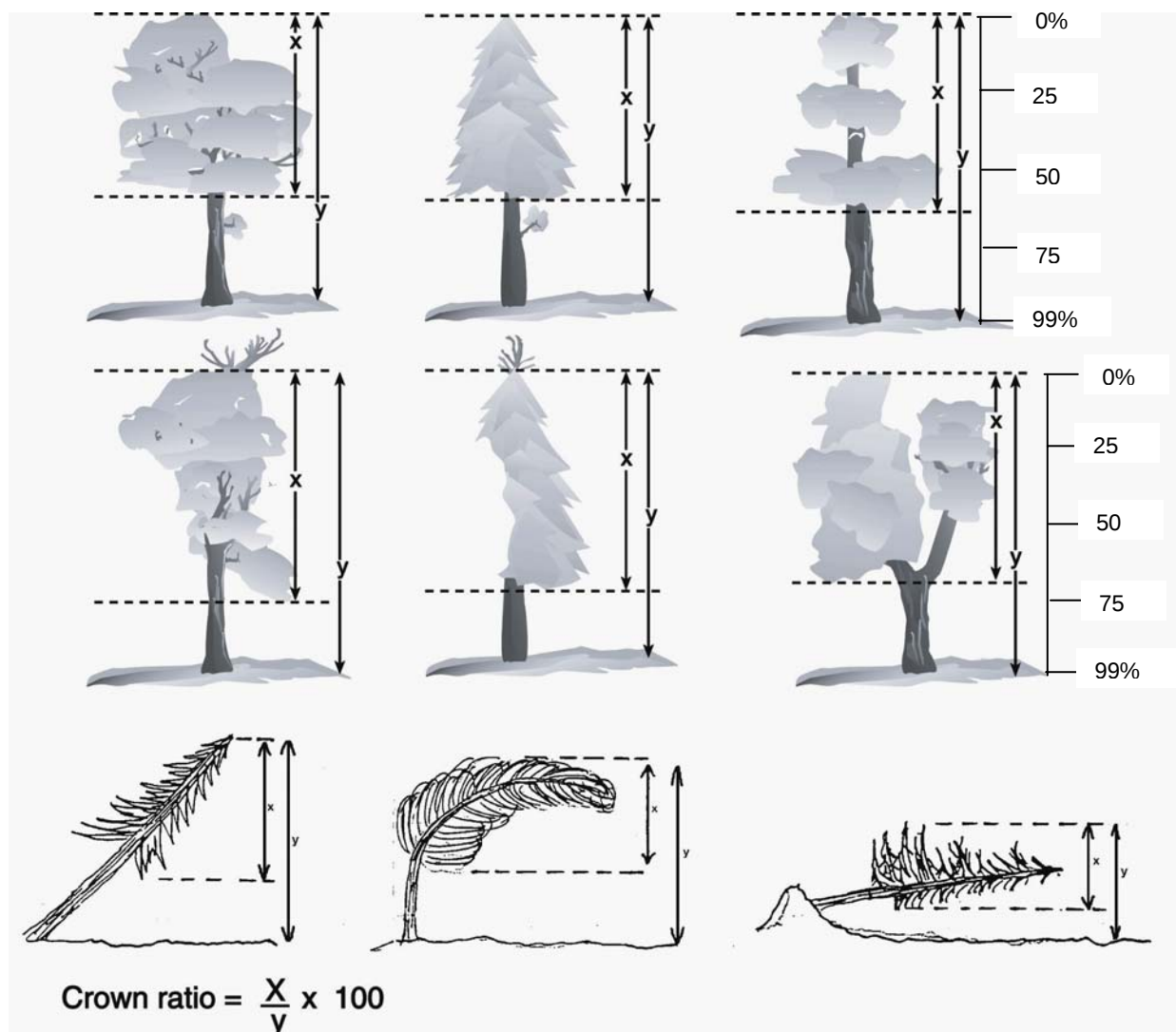
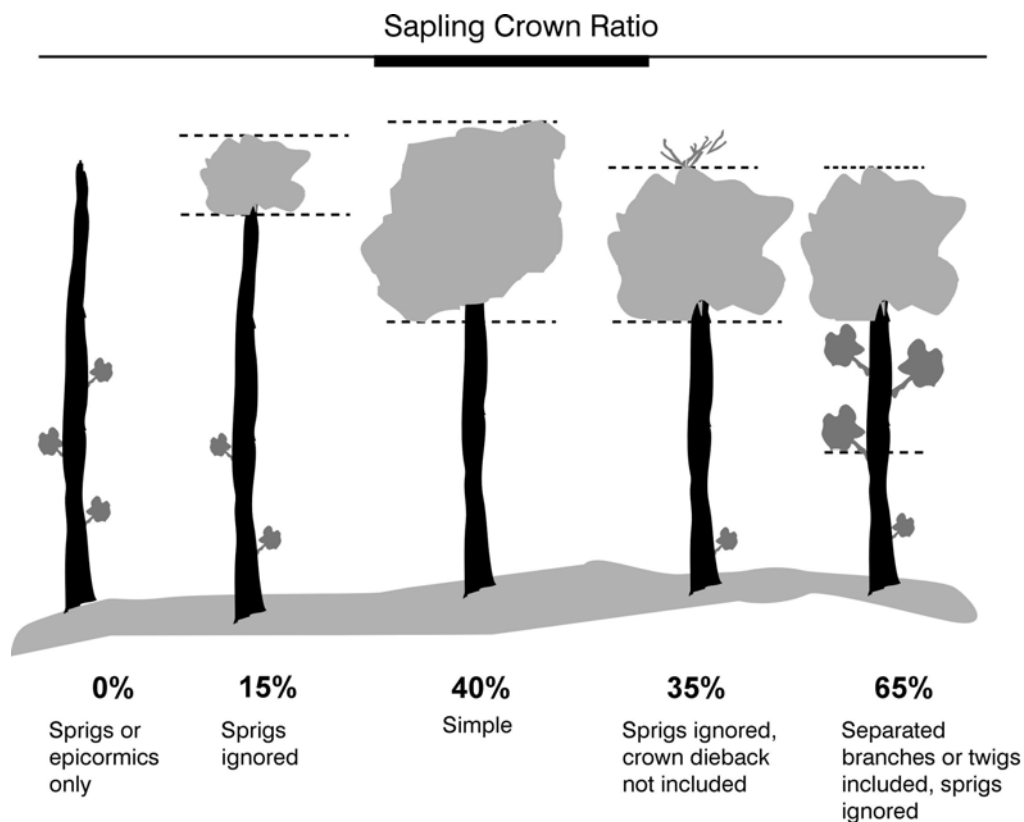


Figure 29. UNCOMPACTED LIVE CROWN RATIO examples.

Determine sapling UNCOMPACTED LIVE CROWN RATIO by dividing the live crown length by total tree height to the live crown top. Live crown length is the distance between the top live foliage (dieback and dead branches are not included) and the lowest live twig for saplings. The live crown base for saplings is different from trees 5.0 in DBH and larger; the 1 in/5 ft rule does not apply in this case. Do not include sprigs or leaves on the main stem below the lowest live twig (Figure 30).



**Figure 30. Examples of Sapling Crown Ratios**

When collected: All live tally trees

Field width: 2 digits

Tolerance: +/- 10%

MQO: At least 90% of the time

Values: 00 to 99 percent

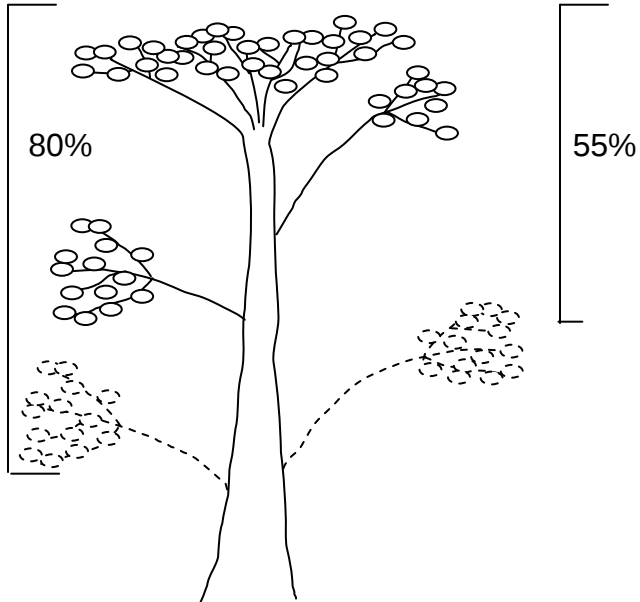
### **10.19 COMPACTED CROWN RATIO**

COMPACTED CROWN RATIO is that portion of the tree supporting live foliage (or in cases of extreme defoliation should be supporting live foliage) and is expressed as a percentage of the actual tree length. To determine COMPACTED CROWN RATIO, ocularly transfer lower live branches to fill in large holes in the upper portion of the tree until a full, even crown is visualized.

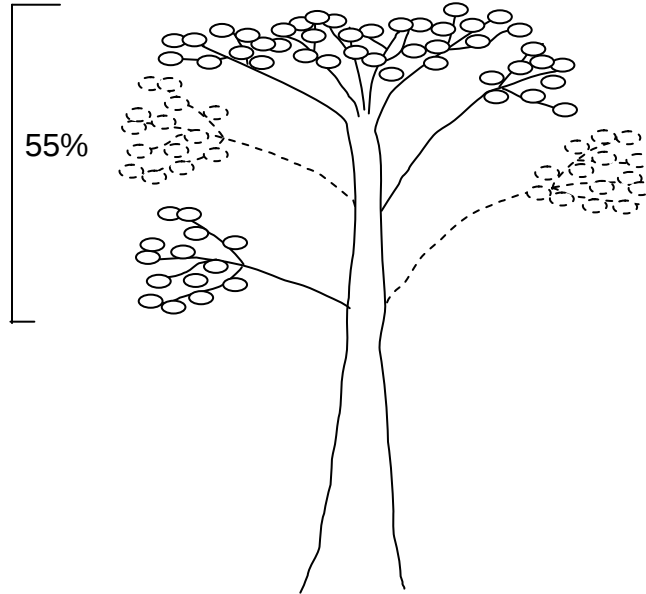
Do not over-compact trees beyond their typical full crown situation. For example, if tree branches tend to average 2-feet between whorls, do not compact crowns any tighter than the 2-foot spacing (Figure 31).

**Figure 31. Example of Crown Ratio on Open-crown tree (e.g., *Terminalia catappa*)**

Uncompacted:

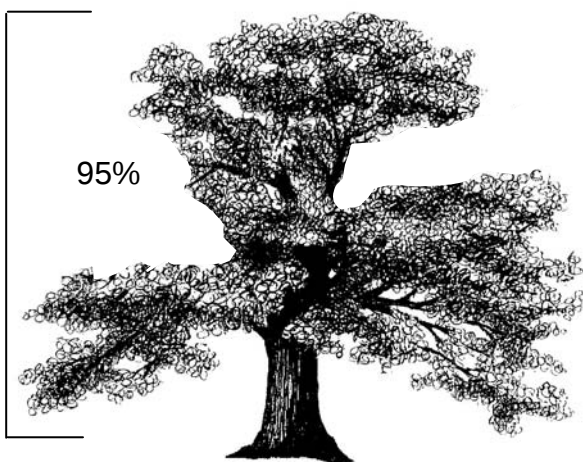


Compacted:

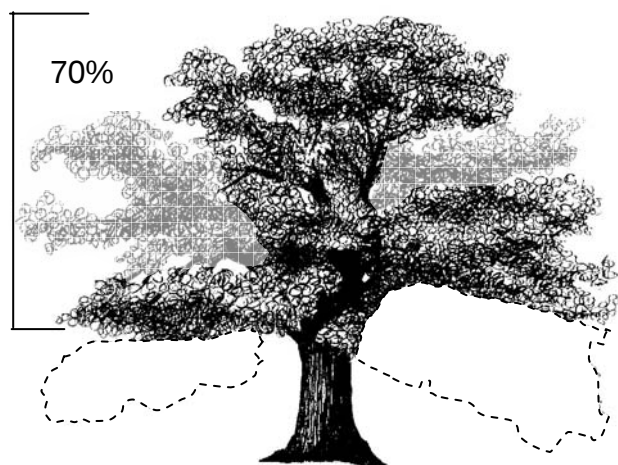


**Figure 32. Example of Crown Ratio on Dense-crown tree (e.g., *Mangifera indica*)**

Uncompacted:



Compacted:





Uncompacted Ratio = 70%  
Compacted Ratio = 70%

**Figure 33. Compacted and Uncompacted crown ratios will be the same for tree ferns and palm trees except when fronds or large parts of fronds are missing.**

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

## **10.20 TREE DAMAGE**

Record up to two different damages per tree. Record damage for all saplings and trees at least 1.0 in DBH. Damage is characterized according to four attributes: location of damage, type of damage, severity of damage, and damaging agent. Damages must meet severity thresholds (defined in section 10.20.3, DAMAGE SEVERITY) in order to be recorded.

The tree is observed from all sides starting at the roots. Damage signs and symptoms are prioritized and recorded based on location in the following order: roots, roots and lower bole, lower bole, lower and upper bole, upper bole, crownstem, and branches recorded as location code 0 (for no damage), or DAMAGE LOCATION 1-9.

Within any given location, the hierarchy of damage follows the numeric order of DAMAGE TYPE possible for that location. The numeric order denotes decreasing significance as the code number goes up, i.e., DAMAGE TYPE 01 is more significant than DAMAGE TYPE 25. A maximum of two damages are recorded for each tree. If a tree has more than two damages that meet the threshold levels, the first two that are observed starting at the roots are recorded.

When multiple damages occur in the same place, the most damaging is recorded. For example, if a canker, DAMAGE TYPE 02, meets the threshold and has a conk growing in it, record only the canker. Another example: if an open wound meets threshold and also has resinosis, record only the open wound.

## ***Damage Summary***

If a live tally tree with a DBH of 1 inch or greater has damage, you must code 4 items;

1. DAMAGE LOCATION page 141
2. DAMAGE TYPE page 143
3. DAMAGE SEVERITY page 145
4. DAMAGE AGENT page 158

### **A. Does the tree have DAMAGE in these locations?**

**1 = Roots (exposed) and Stump (12 in. in height from ground level)**

**2 = Roots, stump, and lower bole**

Then valid DAMAGE TYPE codes are:

01. Canker, gall (>20% circumference)  
Valid SEVERITY codes = 2 through 9
02. Conks, advanced decay, ROT  
Valid SEVERITY codes = 0
03. Open wounds (>20% circumference)  
Valid SEVERITY codes = 2 through 9
04. Resin flowing from bole (>20% circumference)  
Valid SEVERITY codes = 2 through 9
05. Cracks and seams  
Valid SEVERITY codes = 0
11. Broken bole or broken roots within 3 feet of the stump  
Valid SEVERITY codes = 0
12. Brooms on roots or bole  
Valid SEVERITY codes = 0
13. Broken or dead roots beyond 3 feet of the bole (>20% of roots broken or dead)  
Valid SEVERITY codes = 2 through 9
31. Other  
Valid SEVERITY codes = 0

**B. Does the tree have DAMAGE in these locations?**

**3 = Lower Bole** (lower half of the trunk between stump and base of live crown)

**4 = Lower and Upper Bole**

**5 = Upper Bole** (upper half of trunk between stump and base of live crown)

Then valid DAMAGE TYPE codes are:

1. Canker, gall (>20% circumference)  
Valid SEVERITY codes = 2 through 9
2. Conks, advanced decay, ROT  
Valid SEVERITY codes = 0
3. Open wounds (>20% circumference)  
Valid SEVERITY codes = 2 through 9
4. Resin flowing from bole (>20% circumference)  
Valid SEVERITY codes = 2 through 9
5. Cracks and seams  
Valid SEVERITY codes = 0
11. Broken bole or broken roots within 3 feet of the stump  
Valid SEVERITY codes = 0
12. Brooms on roots or bole  
Valid SEVERITY codes = 0
31. Other  
Valid SEVERITY codes = 0

**C. Does the tree have DAMAGE in these locations?**

**6 = Crownstem (main stem within the live crown area, above the base of the live crown)**

Then valid DAMAGE TYPE codes are:

1. Canker, gall (>20% circumference)  
Valid SEVERITY codes = 2 through 9
2. Conks, advanced decay, ROT  
Valid SEVERITY codes = 0
3. Open wounds (>20% circumference)  
Valid SEVERITY codes = 2 through 9
4. Resin flowing from bole (>20% circumference)  
Valid SEVERITY codes = 2 through 9
5. Cracks and seams  
Valid SEVERITY codes = 0
21. Loss of apical dominance, dead terminal (broken or dead top)  
Valid SEVERITY codes = 0 through 9
31. Other  
Valid SEVERITY codes = 0

**D. Does the tree have DAMAGE in these locations?**

**7 = Branches > 1 inch where the branch attaches to the main bole or crown stem**

Then valid DAMAGE TYPE codes are:

1. Canker, gall (>20% circumference)  
Valid SEVERITY codes = 2 through 9
2. Conks, advanced decay, ROT  
Valid SEVERITY codes = 0
3. Open wounds (>20% circumference)  
Valid SEVERITY codes = 2 through 9
4. Resin flowing from bole (>20% circumference)  
Valid SEVERITY codes = 2 through 9
5. Cracks and seams  
Valid SEVERITY codes = 0
20. Vines in the crown (>20% of crown affected)  
Valid SEVERITY codes = 2 through 9
22. Broken or dead (>20% of branches affected in the live crown area)  
Valid SEVERITY codes = 2 through 9
23. Excessive branching or brooms (>20% of branches affected)  
Valid SEVERITY codes = 2 through 9
31. Other  
Valid SEVERITY codes = 0

**E. Does the tree have DAMAGE in these locations?**

**8 = Buds and Shoots (the most recent year's growth)**

Then valid DAMAGE TYPE codes are:

- 24. Damaged buds, shoots, or foliage (>30% of buds and shoots damaged > 50%)  
Valid SEVERITY codes = 3 through 9
- 31. Other  
Valid SEVERITY codes = 0

**F. Does the tree have DAMAGE in these locations?**

**9 = Foliage**

Then valid DAMAGE TYPE codes are:

- 24. Damaged buds, shoots, or foliage (>30% of buds and shoots damaged > 50%)  
Valid SEVERITY codes = 3 through 9
- 25. Discoloration of foliage (>30% of foliage discolored > 50%)  
Valid SEVERITY codes = 3 through 9
- 31. Other  
Valid SEVERITY codes = 0

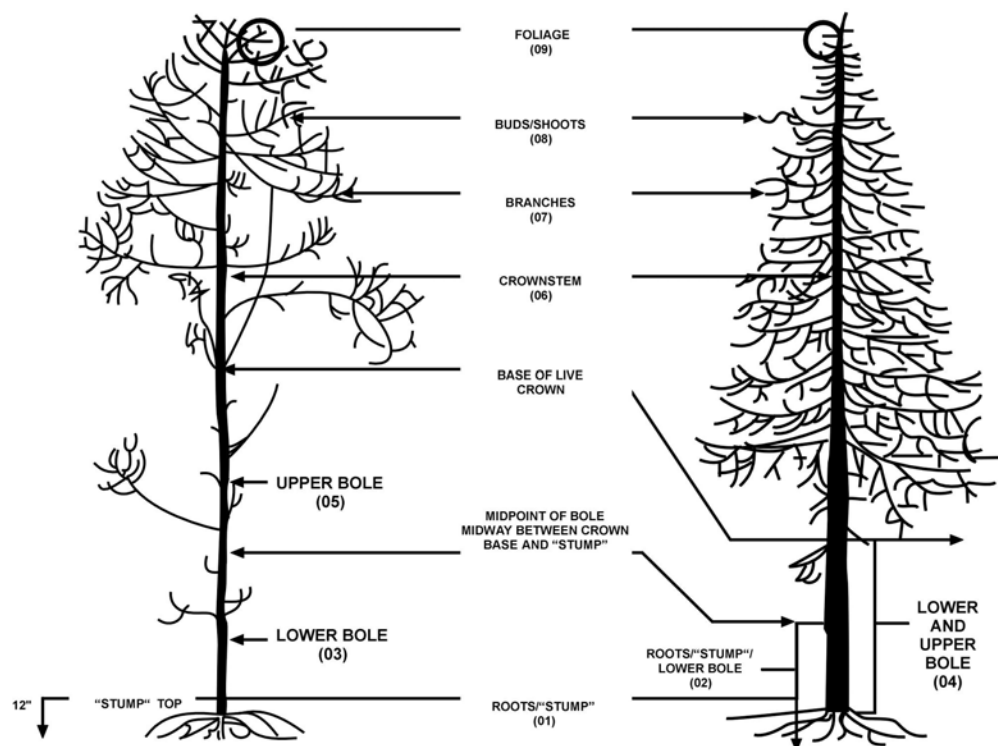
**Valid Damage agent codes for all damages:**

- 10 Insects
- 20 Disease
- 30 Fire
- 40 Animal
- 50 Weather
- 60 Vegetation (suppression, competition, vines/mile-a-minute, etc)
- 70 Unknown/not sure/other (include notes)
- 80 Human-caused (cultural, logging, accidental, etc)
- 90 Physical (hit by falling tree, rockslides, etc)

#### **10.20.1      DAMAGE LOCATION 1**

Record the location on the tree where DAMAGE TYPE 1 is found (Figure 34). If the same damage continues into two or more locations, record the appropriate code listed below, or if the combination of locations does not exist (damage extends from crownstem to roots), record the lowest location that best describes the damage (see Figure 35). Multiple damages may occur in the same location, but record the higher priority damage (lower code number) first. If the damages are coincident (a conk within a canker), record only the higher priority damage.

The “base of the live crown” is defined as the horizontal line which would touch the lowest part of the foliage, excluding branches towards the base of the tree which are less than 1.0 inch or more than 5 ft from the rest of the crown. See Section 10.16 on page **131**(UNCOMPACTED LIVE CROWN RATIO) for more details.



**Figure 34. Location codes for damage**

When Collected: All live tally trees  $\geq 1.0$  in DBH

Field width: 1 digit

Tolerance: +/- 1 location class

MQO: At least 80% of the time

Values:

- 0 No damage
- 1 Roots (exposed) and stump (12 inches in height from ground level)
- 2 Roots, stump, and lower bole
- 3 Lower bole (lower half of the trunk between the stump and base of the live crown)
- 4 Lower and upper bole
- 5 Upper bole (upper half of the trunk between stump and base of the live crown)
- 6 Crownstem (main stem within the live crown area, above the base of the live crown)
- 7 Branches (>1 in at the point of attachment to the main crown stem within the live crown area)
- 8 Buds and shoots (the most recent year's growth)
- 9 Foliage

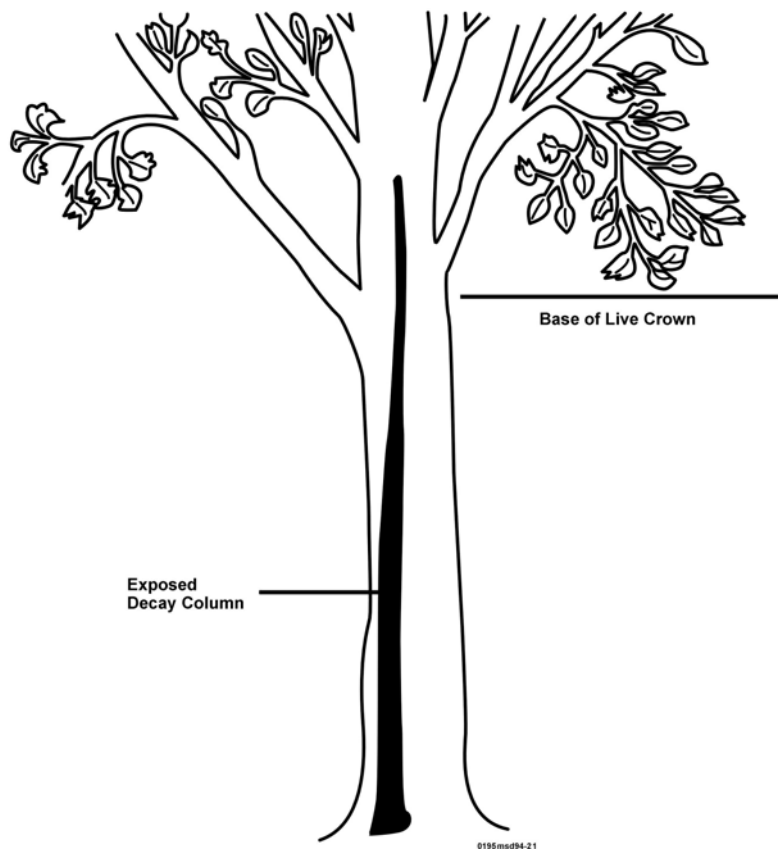


Figure 35. The damage runs from stump to crownstem. Code here should be 02 (roots and "stump" and lower bole) which represents the lowest locations of this multi-location damage.

#### 10.20.2 DAMAGE TYPE 1

Record the first damage type observed that meets the damage threshold definition in the lowest location. Damage categories are recorded based on the numeric order that denotes decreasing significance from damage 01 - 31.

When Collected: All tally trees where DAMAGE LOCATION 1 > 0

Field width: 2 digits

Tolerance: No errors

MQO: At least 80% of the time

Values:

- 1 Canker, gall: Cankers may be caused by various agents but are most often caused by fungi. The bark and cambium are killed, and this is followed by death of the underlying wood, although the causal agent may or may not penetrate the wood. This results in areas of dead tissue that become deeper and wider, or galling (including galls caused

by rusts), on roots, bole, or branches. Due to the difficulty in distinguishing some abnormal swellings (e.g., burls) from classic galls and cankers, all are recorded as damage 01. A canker may be:

**Annual** (enlarges only once and does so within an interval briefer than the growth cycle of the tree, usually less than one year),

**Diffuse** (enlarges without characteristic shape or noticeable callus formation at margins), or

**Perennial** (enlarges during more than one year - often has a target appearance).

- 2 Conks, fruiting bodies, and signs of advanced decay: Fruiting bodies on the main bole, crownstem, and at the point of the branch attachment are signs of decay. "Punky wood" is a sign of decay and is evidenced by soft, often moist, and degraded tissue.

Cavities into the main bole that are oriented in such a way that they act as catchment basins for water are signs of decay. Bird cavities are signs of decay.

Rotten branches or branches with conks are not indicators of decay unless the threshold is met (>20% of branches are affected).

Rotting stumps associated with coppice regeneration (e.g., northern pin oak, maple) are excluded from coding.

- 3 Open wounds: An opening or series of openings where bark has been removed or the inner wood has been exposed and no signs of advanced decay are present. Improper pruning wounds that cut into the wood of the main stem are coded as open wounds, if they meet the threshold; those which leave the main stemwood intact are excluded.
- 4 Resinosis or gummosis: The origin of areas of resin or gum (sap) exudation on branches and trunks.
- 5 Cracks and seams: Cracks in trees are separations along the radial plane greater than or equal to 5 ft. When they break out to the surface they often are called frost cracks. These cracks are not caused by frost or freezing temperature, though frost can be a major factor in their continued development. Cracks are most often caused by basal wounds or sprout stubs, and expand when temperatures drop rapidly. Seams develop as the tree attempts to seal the crack, although trees have no mechanism to compartmentalize this injury.

Lightning strikes are recorded as cracks when they do not meet the threshold for open wounds.

- 11 Broken bole or roots (less than 3 ft from bole): Broken roots within 3 ft from bole either from excavation or rootsprung for any reason. For example, those which have been excavated in a road cut or by animals.

Stem broken in the bole area (below the base of the live crown) and tree is still alive.

- 12 Brooms on roots or bole: Clustering of foliage about a common point on the trunk. Examples include ash yellows witches' brooms on white and green ash and eastern and western conifers infected with dwarf mistletoes.

- 13 Broken or dead roots (beyond 3 ft): Roots beyond 3 ft from bole that are broken or dead.
- 20 Vines in the crown: Kudzu, grapevine, ivy, dodder, etc. smothers tree crowns. Vines are rated as a percentage of tree crown affected.
- 21 Loss of apical dominance, dead terminal: Mortality of the terminal of the crownstem caused by frost, insect, pathogen, or other causes.
- 22 Broken or dead: Branches that are broken or dead. Branches with no twigs are ignored and not coded as dead. Dead or broken branches attached to the bole or crownstem outside the live crown area are not coded. 20% of the main, first order portion of a branch must be broken for a branch to be coded as such.
- 23 Excessive branching or brooms within the live crown area: Brooms are a dense clustering of twigs or branches arising from a common point that occur within the live crown area. Includes abnormal clustering of vegetative structures and organs. This includes witches' brooms caused by ash yellows on green and white ash and those caused by dwarf mistletoes.
- 24 Damaged buds, foliage or shoots: Insect feeding, shredded or distorted foliage, buds or shoots >50% affected, on at least 30% of foliage, buds or shoots. Also includes herbicide or frost-damaged foliage, buds or shoots.
- 25 Discoloration of foliage: At least 30% of the foliage is more than 50% affected. Affected foliage must be more of some color other than green. If the observer is unsure if the color is green, it is considered green and not discolored.
- 31 Other: Use when no other explanation is appropriate. Specify in the tree notes section. Code 31 is used to maintain consistency with the Phase 3 crown damage protocols.

### 10.20.3 DAMAGE SEVERITY 1

Record a code to indicate the amount of affected area (above threshold) in DAMAGE LOCATION 1 recorded for TREE DAMAGE 1. Severity codes vary depending on the type of damage recorded.

Field width: 2 digits

Tolerance: No errors

MQO: At least 80% of the time

Values: The codes and procedures for SEVERITY 1 values are defined for each DAMAGE TYPE 1.

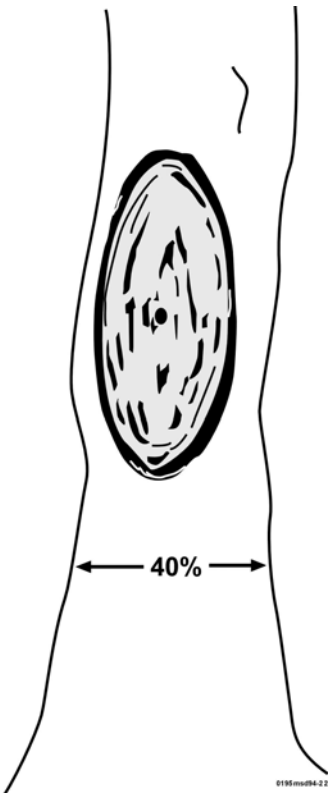
DAMAGE TYPE Code 01 -- Canker, gall

Measure the affected area from the margins (outer edges) of the canker or gall within any 3-ft vertical section in which at least 20% of circumference is affected at the point of occurrence. For location 7, and location 1, 20% of branches and roots beyond 3 ft, respectively, must be affected, then record in 10% classes. See Figure 36.

Severity classes for code 01 (percent circumference affected):

of

| <u>Classes</u> | <u>Code</u> |
|----------------|-------------|
| 20-29          | 2           |
| 30-39          | 3           |
| 40-49          | 4           |
| 50-59          | 5           |
| 60-69          | 6           |
| 70-79          | 7           |
| 80-89          | 8           |
| 90-99          | 9           |



**Figure 36. A canker which exceeds threshold. Since 40% of circumference is visible from any side, and since over half the visible side is taken up by the canker, it obviously exceeds the 20% minimum circumference threshold.**

DAMAGE TYPE Code 02 -- Conks, fruiting bodies, and signs of advanced decay

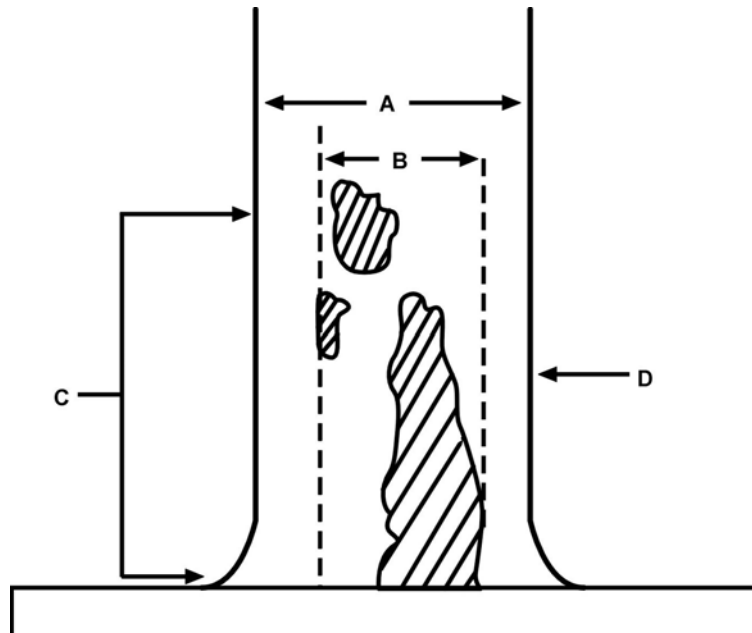
Severity classes for code 02: **None**. Enter code 0 regardless of severity, except for roots > 3 ft from the bole, or number of branches affected - 20%

DAMAGE TYPE Code 03 -- Open wounds

The damaged area is measured at the widest point between the margins of the exposed wood within any 3-ft vertical section in which at least 20% of the circumference is affected at the point of occurrence. For location 7, and location 1, 20% of branches and roots beyond 3 ft, respectively, must be affected, then record in 10% classes. See Figure 37.

Severity Classes for code 03 (percent of circumference affected):

| <u>Classes</u> | <u>Code</u> |
|----------------|-------------|
| 20-29          | 2           |
| 30-39          | 3           |
| 40-49          | 4           |
| 50-59          | 5           |
| 60-69          | 6           |
| 70-79          | 7           |
| 80-89          | 8           |
| 90-99          | 9           |



**Figure 37. Multiple damage in "stump" and lower bole. A=approximately 40% of tree circumference; B=portion of tree circumference affected by damage; C=vertical distance within one meter; D=midpoint of occurrence at which circumference is measured.**

DAMAGE TYPE Code 04 -- Resinosis or gummosis

Resinosis or gummosis is measured at the widest point of the origin of the flow width in which at least 20% of the circumference is affected at the point of occurrence. For location 7, and location 1, 20% of branches and roots beyond 3 ft, respectively, must be affected, then record in 10% classes.

Severity classes for code 04 (percent of circumference affected):

| <u>Classes</u> | <u>Code</u> |
|----------------|-------------|
| 20-29          | 2           |
| 30-39          | 3           |
| 40-49          | 4           |
| 50-59          | 5           |
| 60-69          | 6           |
| 70-79          | 7           |
| 80-89          | 8           |
| 90-99          | 9           |

DAMAGE TYPE Code 05 -- Cracks and seams greater than or equal to 5 ft

Severity class for code 05 -- Record "0" for the lowest location in which the crack occurs. For location 7, and location 1, 20% of branches and roots beyond 3 ft, respectively, must be affected, then record in 10% classes.

## Tree And Sapling Data

DAMAGE TYPE Code 11 -- Broken bole or roots less than 3 ft from bole

Severity classes for code 11: None. Enter code 0 regardless of severity.

DAMAGE TYPE Code 12 -- Brooms on roots or bole

Severity classes for code 12: None. Enter code 0 regardless of severity.

DAMAGE TYPE Code 13 -- Broken or dead roots

At least 20% of roots beyond 3 ft from bole that are broken or dead.

Severity classes for code 13 (percent of roots affected):

| <u>Classes</u> | <u>Code</u> |
|----------------|-------------|
| 20-29          | 2           |
| 30-39          | 3           |
| 40-49          | 4           |
| 50-59          | 5           |
| 60-69          | 6           |
| 70-79          | 7           |
| 80-89          | 8           |
| 90-99          | 9           |

DAMAGE TYPE Code 20 -- Vines in crown

Severity classes for code 20 (percent of live crown affected):

| <u>Classes</u> | <u>Code</u> |
|----------------|-------------|
| 20-29          | 2           |
| 30-39          | 3           |
| 40-49          | 4           |
| 50-59          | 5           |
| 60-69          | 6           |
| 70-79          | 7           |
| 80-89          | 8           |
| 90-99          | 9           |

DAMAGE TYPE Code 21 -- Loss of apical dominance, dead terminal

Any occurrence ( > 1%) is recorded in 10% classes as a percent of the crownstem affected. Use trees of the same species and general DBH class in the area or look for the detached portion of the crownstem on the ground to aid in estimating percent affected. If a lateral branch has assumed the leader and is above where the previous terminal was, then no damage is recorded.

Severity classes for code 21:

| <u>Classes</u> | <u>Code</u> |
|----------------|-------------|
| 01-09          | 0           |
| 10-19          | 1           |
| 20-29          | 2           |
| 30-39          | 3           |

## Tree And Sapling Data

|       |   |
|-------|---|
| 40-49 | 4 |
| 50-59 | 5 |
| 60-69 | 6 |
| 70-79 | 7 |
| 80-89 | 8 |
| 90-99 | 9 |

DAMAGE TYPE Code 22 -- Broken or dead branches ( > 1in above the swelling at the point of attachment to the main or crown stem within the live crown area)

At least 20% of branches are broken or dead.

Severity classes for code 22 (percent of branches affected):

| <u>Classes</u> | <u>Code</u> |
|----------------|-------------|
| 20-29          | 2           |
| 30-39          | 3           |
| 40-49          | 4           |
| 50-59          | 5           |
| 60-69          | 6           |
| 70-79          | 7           |
| 80-89          | 8           |
| 90-99          | 9           |

DAMAGE TYPE Code 23 -- Excessive branching or brooms

At least 20% of crownstem or branches affected with excessive branching or brooms.

Severity classes for code 23 (percent of area affected):

| <u>Classes</u> | <u>Code</u> |
|----------------|-------------|
| 20-29          | 2           |
| 30-39          | 3           |
| 40-49          | 4           |
| 50-59          | 5           |
| 60-69          | 6           |
| 70-79          | 7           |
| 80-89          | 8           |
| 90-99          | 9           |

DAMAGE TYPE Code 24 - Damaged buds, shoots or foliage

At least 30% of the buds, shoots or foliage (i.e., chewed or distorted) are more than 50% affected.

Severity classes for code 24:

| <u>Classes</u> | <u>Code</u> |
|----------------|-------------|
| 30-39          | 3           |
| 40-49          | 4           |
| 50-59          | 5           |
| 60-69          | 6           |
| 70-79          | 7           |
| 80-89          | 8           |

## Tree And Sapling Data

90-99            9

### DAMAGE TYPE Code 25 - Discoloration of Foliage

At least 30% of the foliage is more than 50% affected.

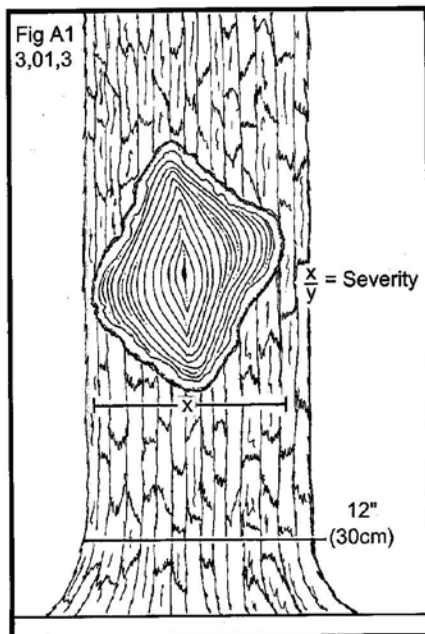
Severity classes for code 25 (percent affected):

| <u>Classes</u> | <u>Code</u> |
|----------------|-------------|
| 30-39          | 3           |
| 40-49          | 4           |
| 50-59          | 5           |
| 60-69          | 6           |
| 70-79          | 7           |
| 80-89          | 8           |
| 90-99          | 9           |

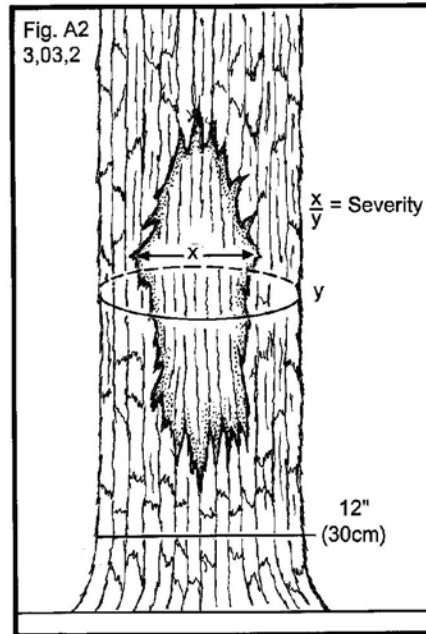
### DAMAGE TYPE Code 31 -- Other

Severity classes for code 31:

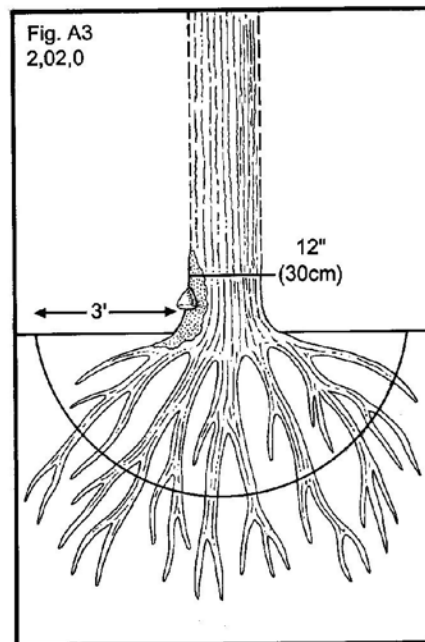
None. Enter code 0 regardless of severity. Describe condition in tree notes.  
Examples are shown in Figures 38-44.



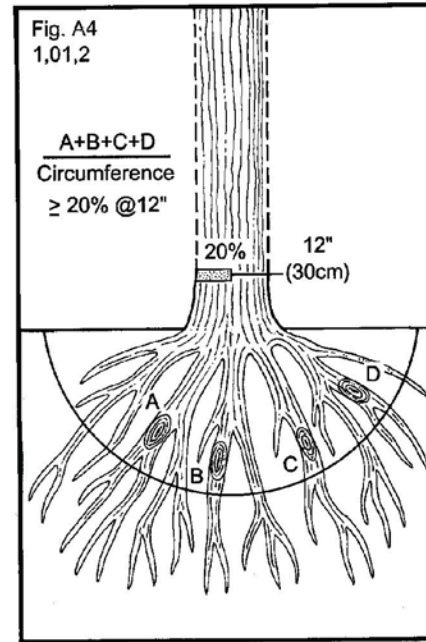
01 - Canker measured as widest distance between the outside of canker swelling (refer to Fig. 2 for y measurement)



03 - Open wound measured at widest point inside of wound margins

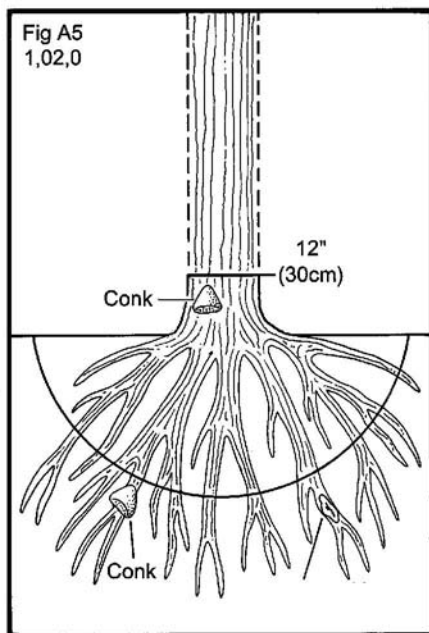


02 - Decay indicator on roots and lower bole

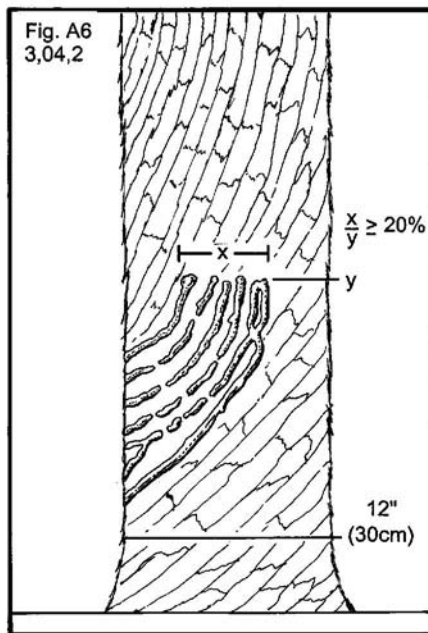


01 - Canker / gall on roots (within 3' of bole)

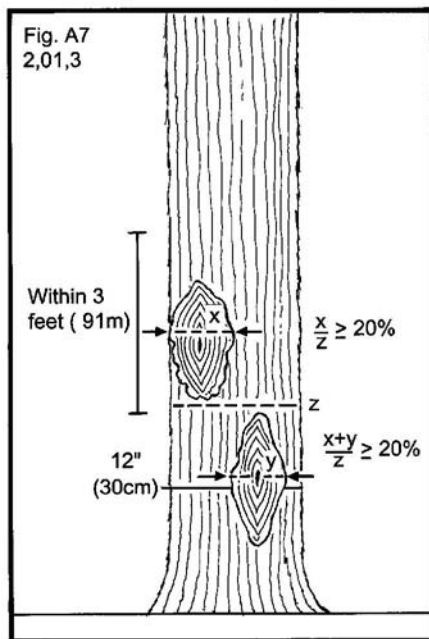
Figure 38. Examples of damage coding.



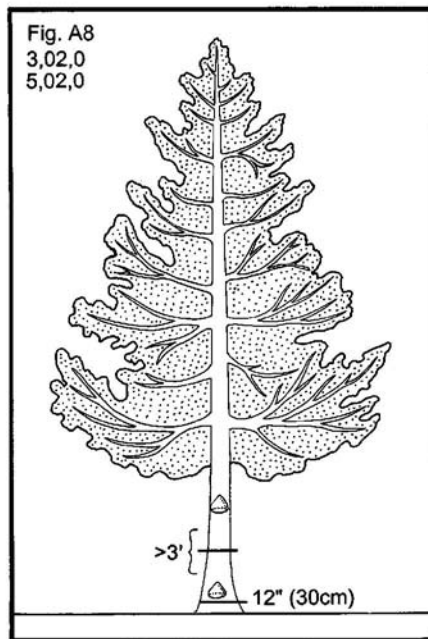
02 - Indicator of decay within 3' of bole. Beyond 3' of bole, indicators must affect  $\geq 20\%$  of roots (see fig. 12)



04 - Origin of resinosis in lower bole



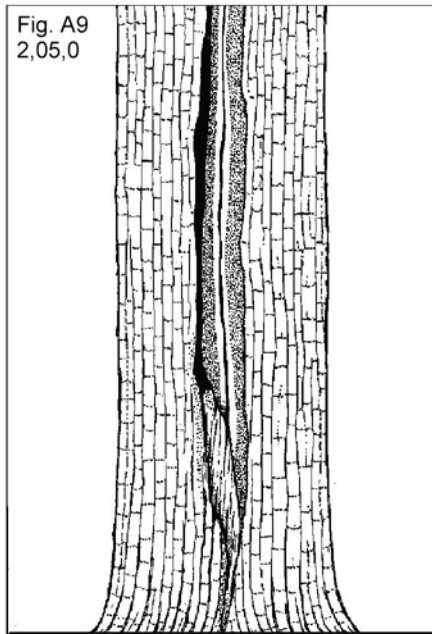
01 - Additive cankers within 3' in roots and lower bole



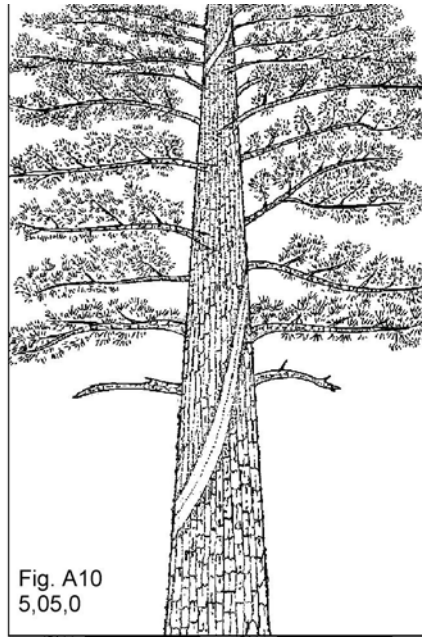
02 - Conks separated by  $>3'$ ; 2 damages

Figure 39. Examples of damage coding.

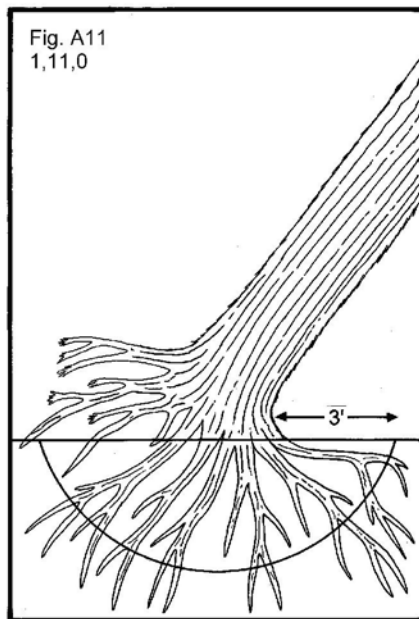
## Tree And Sapling Data



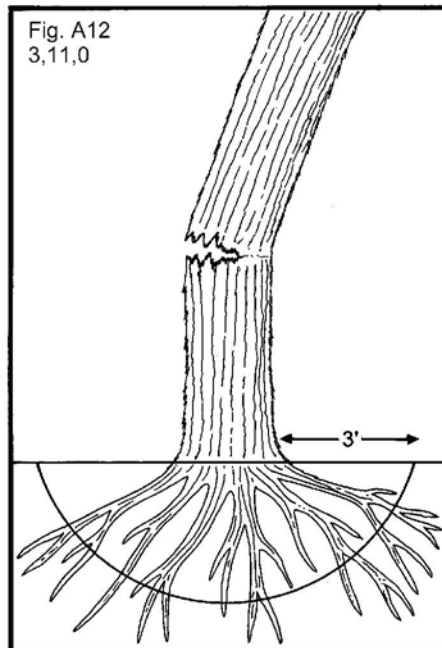
05- Cracks and seams



05 - Lightning strike



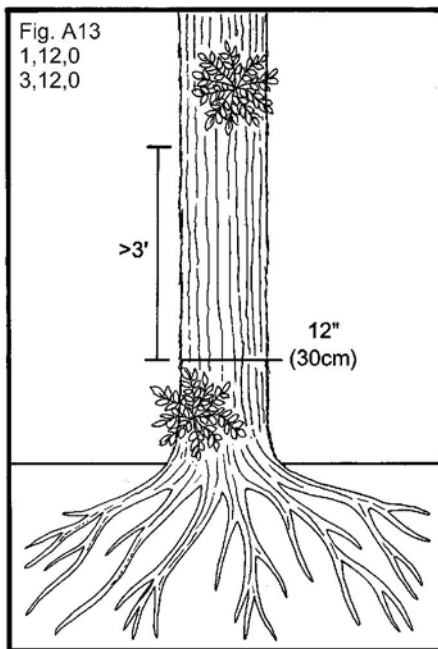
11 - Broken bole or roots <3' from bole,  
broken roots must be visible



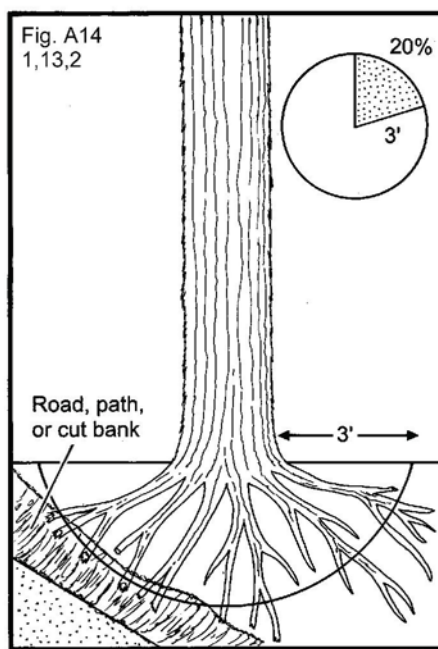
11 - Broken bole or roots <3' from bole

**Figure 40. Examples of damage coding.**

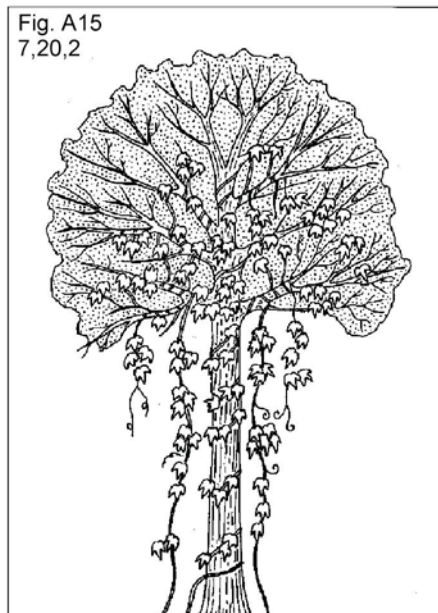
## Tree And Sapling Data



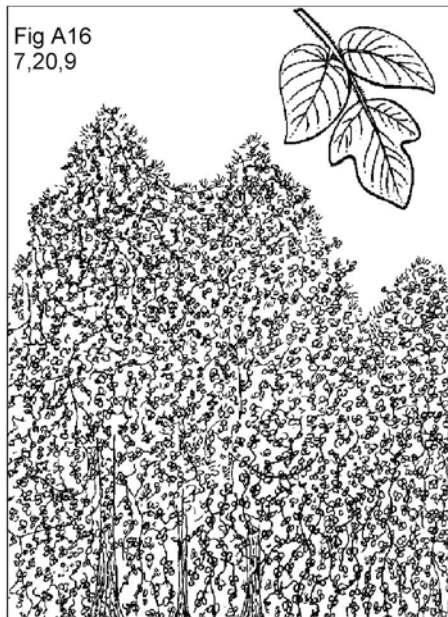
12 - Brooms on roots or bole



13 - Broken or dead roots >3' from bole

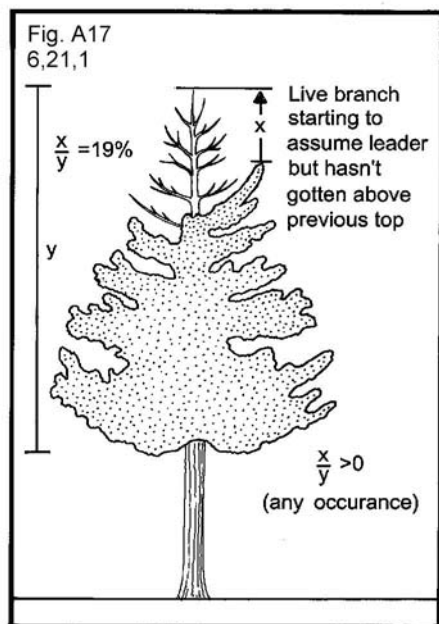


20 - Vines in crown

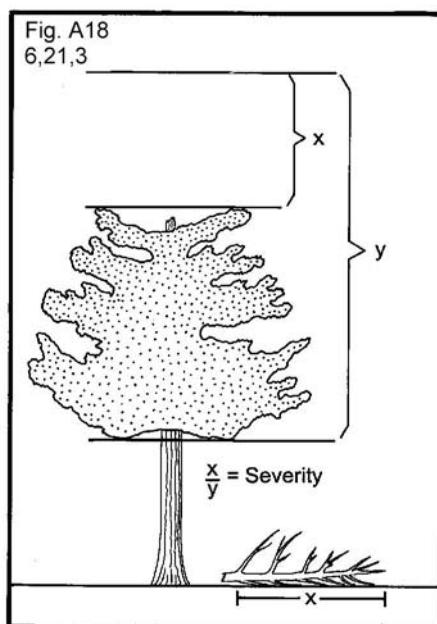


20 - Vines in crown

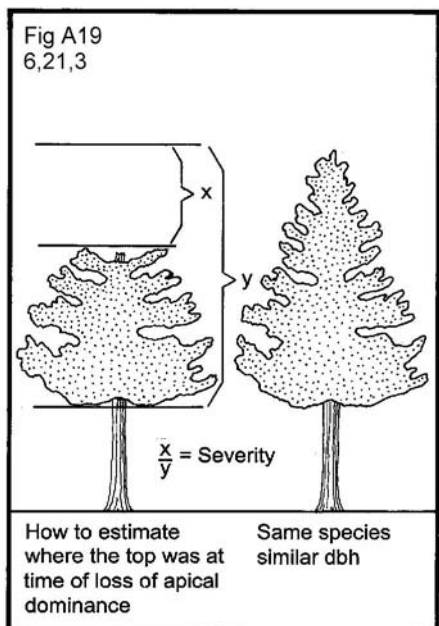
Figure 41. Examples of damage coding.



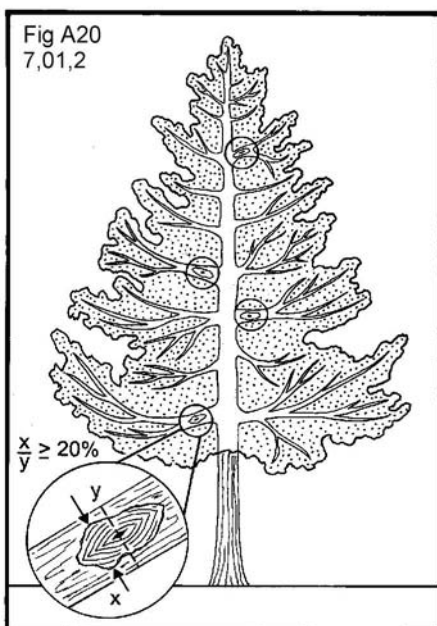
21 - Loss of apical dominance



21 - Loss of apical dominance, look for old top to estimate the top of x and y

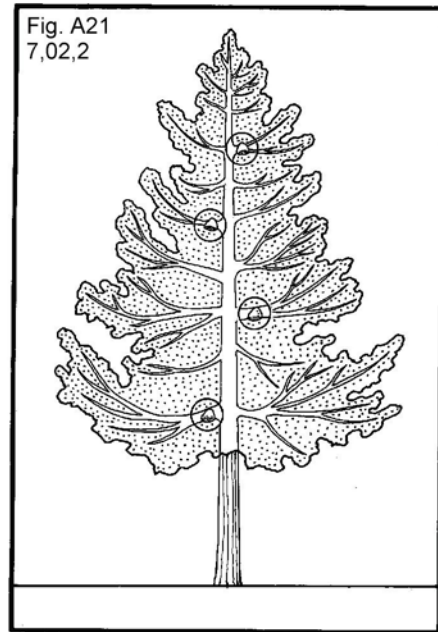


21 - Loss of apical dominance, look for same species of similar dbh

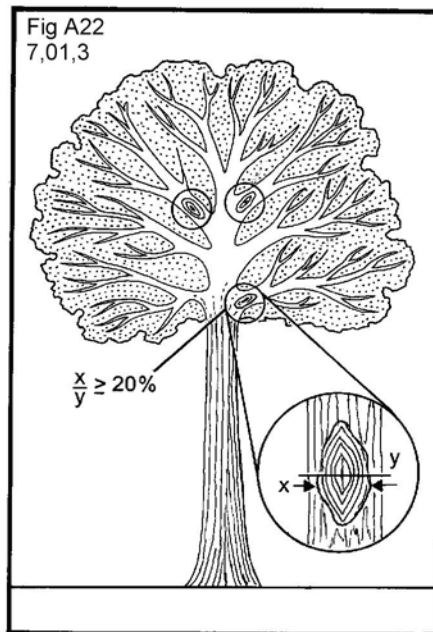


01 - Cankers above the threshold on  $\geq 20\%$  of branches

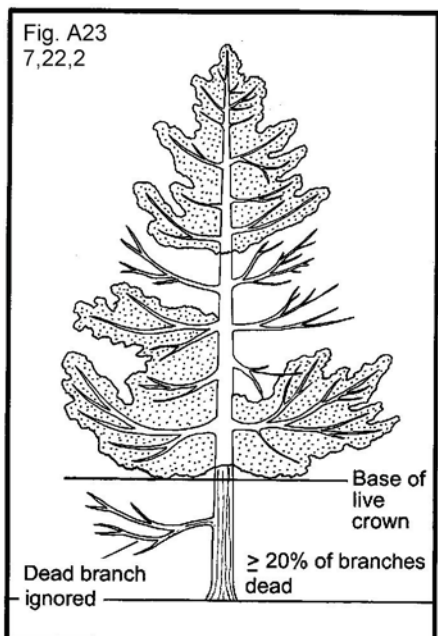
Figure 42. Examples of damage coding.



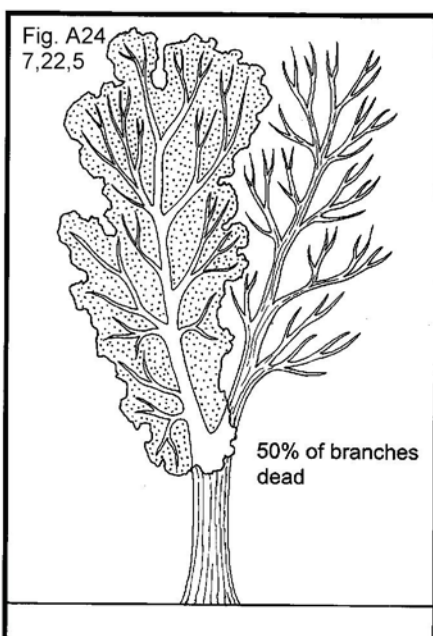
02 - Conks on  $\geq 20\%$  of branches



01 - Cankers above threshold on  $\geq 20\%$  of branches

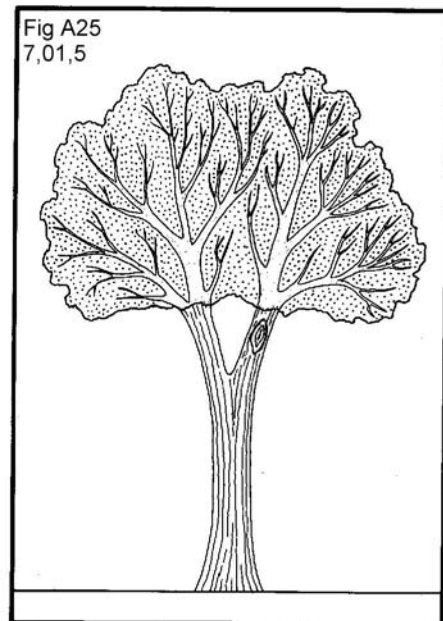


22 - Dead branches within the live crown area. If branches cannot easily be counted, estimate % area of live crown affected

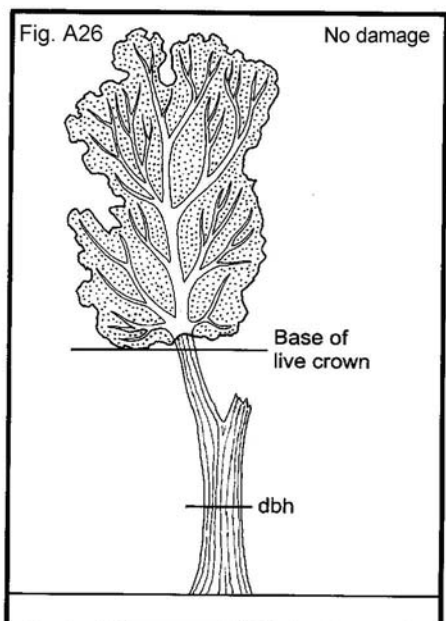


22 - Dead branches; only 2 branches present within live crown area, fines present and  $\geq 20\%$  of branch dead

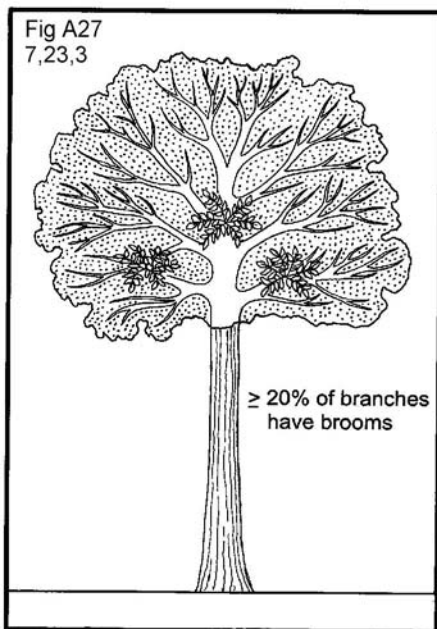
Figure 43. Examples of damage coding.



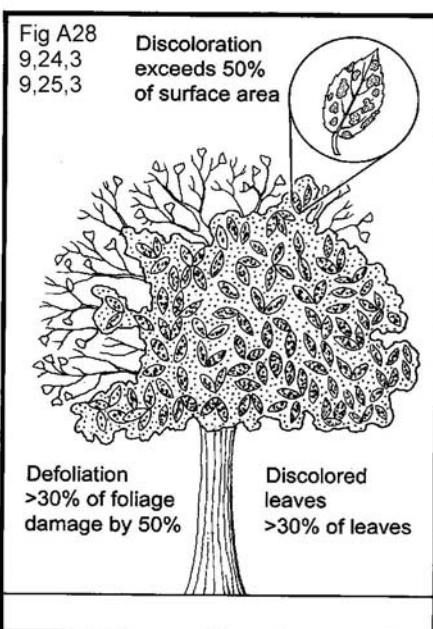
01 - Canker; no crown stem and only 2 branches present



No damage - base of live crown is above old fork, stub is a snag branch



23 - Excessive branching or brooms in crown



24 - Defoliation, 25 - Discoloration

Figure 44. Examples of damage coding.

#### **Procedures to Record Multiple Occurrences of the Same Damage**

Damage codes 01 (canker), 03 (open wounds), and 04 (resinosis/gummosis) must meet a threshold of 20 percent of the circumference at the point of occurrence, within any 3-ft section. Multiple cankers or open wounds which are directly above one another pose no more threat to long term tree survival than would a single damage incidence of the same width. However, should multiple damages be located horizontally within any 3-ft section, the translocation of water and nutrients would be significantly affected. The widths of each individual damage are added and compared as a percent, to the total circumference at the midpoint of the 3-ft section (Figure 37).

#### **Procedures to Measure Circumference Affected**

A practical approach is to observe every face of the "stump", bole, or crownstem. About 40% of the circumference of a face can be observed at any one time. The damage is measured horizontally between the margins. If the cumulative area affected within a 3-ft section exceeds 1/2 of any face, then the 20% minimum threshold has been met. The percent of the circumference affected by damage is then estimated in 10% classes. If in doubt, measure the damage and circumference at the widest point of occurrence on the bole with a linear tape, and determine the percent affected.

#### **10.20.4 DAMAGING AGENT 1**

When known, record the specific name of the damaging agent (genus and species, or common name of fungal pathogens, insects, parasites...) in tree notes. If the damaging agent is unknown record 99.

When Collected: All live tally trees  $\geq 5.0$  D.B.H.

Field width: 2 digits

Values:

- |    |                                                                 |
|----|-----------------------------------------------------------------|
| 10 | Insect                                                          |
| 20 | Disease                                                         |
| 30 | Fire                                                            |
| 40 | Animal                                                          |
| 50 | Weather                                                         |
| 60 | Vegetation (suppression, competition, vines/kudzu)              |
| 70 | Unknown/not sure/other (include notes)                          |
| 80 | Human-caused (cultural, logging, accidental, etc.)              |
| 90 | Physical (roots are undermined by erosion, hit by falling tree) |

#### **10.20.5 DAMAGE LOCATION 2**

Record the location on the tree where TREE DAMAGE 2 is found. Follow the same procedures as for DAMAGE LOCATION 1.

#### **10.20.6 DAMAGE TYPE 2**

RECORD the second damage type observed that meets the damage threshold definition in the lowest location. Describe the damage agent in tree notes. Follow the same procedures as for DAMAGE TYPE 1.

**10.20.7 DAMAGE SEVERITY 2**

Record the amount of affected area (above threshold) in DAMAGE LOCATION 2 recorded for DAMAGE TYPE 2. Follow the same procedures as for DAMAGE SEVERITY 1.

**10.20.8 DAMAGING AGENT 2**

When known, record the specific name of the damaging agent (genus and species, or common name of fungal pathogens, insects, parasites...). If the damaging agent is unknown record 999.

**10.21 DECAY CLASS**

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

When Collected: All standing dead tally trees  $\geq 5.0$  in DBH

Field width: 1 digit

Tolerance: +/- 1 class

MQO: At least 90% of the time

Values: Use the following table for guidelines:

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

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

## 10.22 EPIPHYTE LOADING

Record a code indicating the extent of epiphyte loading for all live trees  $\geq 1.0$  in. d.b.h. "Epiphyte" is defined as a plant that uses a tree for support, but does not draw nourishment from it. For our purposes, vines and lianas are considered epiphytes. Use the Hawksworth six-class rating system: divide the tree into thirds, and rate each third using the following scale.

| Code | Epiphytes            | Description                                                   |
|------|----------------------|---------------------------------------------------------------|
| 0    | No visible epiphytes | None                                                          |
| 1    | Light epiphytes      | < 50 percent of the branches or bole is loaded with epiphytes |
| 2    | Heavy epiphytes      | > 50 percent of the branches or bole is loaded with epiphytes |

Sum the three individual ratings to obtain a total epiphyte class (0 to 6) for the tree.

**Example:** A tree has no loading in top third of crown, many epiphytes in the middle third, and has a few epiphytes in the lower third.

**The total score is:  $0 + 2 + 1 = 3$ ; the code is: "3"**

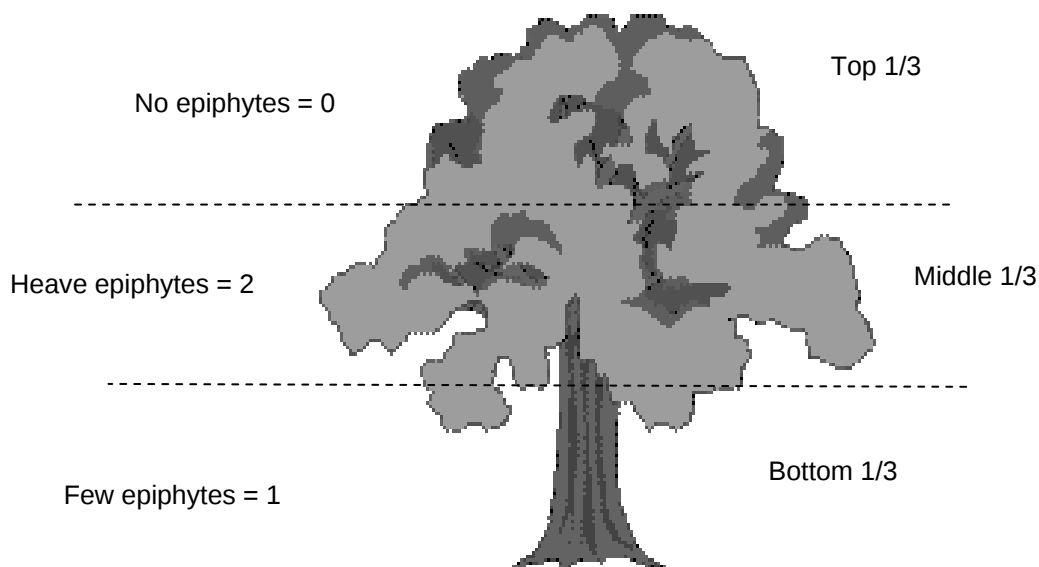


Figure 45. Example of epiphyte loading for tree crowns

When Collected: PACIFIC ISLANDS: All live trees  $\geq 1.0$  in DBH.

Field width: 1 digit

Tolerance: +/- 1 class

MQO: At least 90% of the time

Values: 0 to 6.

### **10.23 CLUMP CODE**

A clump is defined as 3 or more live stems originating from a root system. Do not tally seedling-sized suckers that have sprouted from the base of a live, unsuppressed stem that is  $\geq 5.0$  in DBH.

Clump code is a 1 digit code indicating if a tree, sapling, or seedling is part of a clump. The clump of trees is assigned a clump number, and the number is recorded for each tree tallied that is part of the clump. If a tree is not part of a clump, "0" is recorded for that tree. Clumps with tallied trees are numbered in consecutive order on a subplot starting with "1".

Example: Maple trees in three different maple clumps are tallied on a subplot. Trees tallied that are in the first clump are coded "1" for clump code. Trees tallied in the second clump are all coded "2", and each tree tallied in the third clump is coded "3" for the clump code

When collected: All live tally trees

Field width: 1 digit

### **10.24 PRIORITY DAMAGE**

Record a code to describe a damage that does not meet the national minimum thresholds for recording damage, but is of special interest in this region. For example, code any evidence of rhinoceros beetle damage on coconut trees using the instructions in Appendix 5

Field width: 1 digit

Values: See Appendix 5 On page 240

#### **10.24.1 PRIORITY DAMAGE SEVERITY**

Record the amount of area affected by the PRIORITY DAMAGE. These damages have no minimum threshold.

Field width: 2 digits

Values: See Appendix 5 On page 240

### **10.25 TREE NOTES**

Record notes pertaining to an individual tree as called for to explain or describe another variable. Record "ref" here for trees that have been tagged as reference trees.

When collected: All live and dead tally trees  $\geq 1.0$  in DBH

Field width: Alphanumeric character field

Tolerance: N/A

MQO: N/A

Values: English language words, phrases and numbers



## TABLE OF CONTENTS

### **11. TREES SPECIES LISTS**

|                                                                 |     |
|-----------------------------------------------------------------|-----|
| All Trees: ordered alphabetically .....                         | 165 |
| Tree Genus Codes .....                                          | 173 |
| All Island Trees: ordered by number code .....                  | 175 |
| Palau Tree Species .....                                        | 191 |
| Guam Tree Species .....                                         | 197 |
| American Samoa Tree Species .....                               | 201 |
| Federated States of Micronesia Tree Species .....               | 205 |
| Commonwealth of the Northern Mariana Islands Tree Species ..... | 209 |
| Marshall Island Tree Species .....                              | 211 |



***All Trees: ordered alphabetically***

| Code | Scientific Name          |  | Code | Scientific Name               |
|------|--------------------------|--|------|-------------------------------|
| 278  | Acacia confusa           |  | 295  | Artocarpus nobilis            |
| 281  | Acacia koa               |  | 419  | Artocarpus odoratissima       |
| 400  | Adenanthera pavonina     |  | 420  | Arytera brackenridgei         |
| 401  | Aglaia heterotricha      |  | 421  | Ascarina diffusa              |
| 100  | Aglaia mariannensis      |  | 422  | Astronidium navigatorum       |
| 800  | Aglaia palauensis        |  | 807  | Astronidium palauense         |
| 801  | Aglaia ponapensis        |  | 423  | Astronidium pickeringii       |
| 402  | Aglaia saltatorum        |  | 424  | Astronidium samoense          |
| 403  | Aglaia samoensis         |  | 425  | Astronidium subcordatum       |
| 101  | Aidia cochinchinensis    |  | 426  | Atuna racemosa                |
| 405  | Albizia chinensis        |  | 427  | Averrhoa bilimbi              |
| 802  | Albizia falcata          |  | 428  | Averrhoa carambola            |
| 102  | Albizia lebbeck          |  | 695  | Avicennia mariana             |
| 803  | Albizia retusa           |  | 429  | Baccaurea taitensis           |
| 406  | Alectryon samoensis      |  | 808  | Badusa palauensis             |
| 407  | Aleurites moluccana      |  | 430  | Barringtonia asiatica         |
| 103  | Aleurites trisperma      |  | 112  | Barringtonia racemosa         |
| 804  | Allophylus ternatus      |  | 431  | Barringtonia samoensis        |
| 408  | Allophylus timorensis    |  | 809  | Bauhinia binata               |
| 805  | Alphitonia carolinensis  |  | 113  | Bauhinia monandra             |
| 409  | Alphitonia zizpyoides    |  | 432  | Bischofia javanica            |
| 410  | Alstonia pacifica        |  | 433  | Boehmeria virgata             |
| 104  | Anacardium occidentale   |  | 434  | Broussonetia papyrifera       |
| 411  | Anacolosia insularis     |  | 435  | Bruguiera gymnorhiza          |
| 806  | Angiopteris evecta       |  | 810  | Buchanania engleriana         |
| 412  | Annona muricata          |  | 436  | Buchanania merrillii          |
| 105  | Annona reticulata        |  | 811  | Buchanania palawensis         |
| 413  | Annona squamosa          |  | 437  | Burckella richii              |
| 106  | Antidesma bunioides      |  | 114  | Caesalpinia sappan            |
| 415  | Antidesma sphaerocarpum  |  | 440  | Calophyllum inophyllum        |
| 416  | Antirhea inconspicua     |  | 439  | Calophyllum neo-ebudicum      |
| 107  | Araucaria columnaris     |  | 812  | Calophyllum pelewense         |
| 111  | Araucaria excelsa        |  | 813  | Calophyllum soulattri         |
| 108  | Araucaria heterophylla   |  | 814  | Campnosperma brevipedunculata |
| 417  | Areca catechu            |  | 441  | Cananga odorata               |
| 109  | Arenga pinnata           |  | 443  | Canarium harveyi              |
| 293  | Artocarpus altilis       |  | 815  | Canarium hirsutum             |
| 294  | Artocarpus heterophyllum |  | 816  | Canarium indicum              |
| 110  | Artocarpus mariannensis  |  | 444  | Canarium ovatum               |

Tree Species Lists

| Code | Scientific Name          |  | Code | Scientific Name           |
|------|--------------------------|--|------|---------------------------|
| 445  | Canarium samoense        |  | 464  | Citrus sinensis           |
| 446  | Canarium vitiense        |  | 827  | Claoxylon carolinianum    |
| 447  | Canthium merrillii       |  | 465  | Claoxylon echinospermum   |
| 448  | Carica papaya            |  | 828  | Claoxylon fallax          |
| 817  | Caryota mitis            |  | 829  | Claoxylon longiracemosum  |
| 115  | Caryota urens            |  | 127  | Claoxylon marianum        |
| 818  | Casearia cauliflora      |  | 830  | Cleistanthus carolinensis |
| 449  | Casearia sp. nova        |  | 831  | Cleistanthus insularis    |
| 450  | Cassia fistula           |  | 128  | Coccoloba uvifera         |
| 819  | Cassia grandis           |  | 466  | Cocos nucifera            |
| 116  | Cassia javanica          |  | 129  | Coffea arabica            |
| 820  | Cassia siamea            |  | 130  | Coffea liberica           |
| 451  | Castilla elastica        |  | 832  | Colona scabra             |
| 452  | Casuarina equisetifolia  |  | 833  | Combretum tetralophum     |
| 117  | Casuarina litorea        |  | 468  | Commersonia bartramia     |
| 118  | Catalpa longissima       |  | 469  | Coprosma savaiensis       |
| 119  | Ceiba pentandra          |  | 470  | Coprosma strigulosa       |
| 453  | Celtis harperi           |  | 471  | Cordia aspera             |
| 821  | Celtis paniculata        |  | 131  | Cordia dichotoma          |
| 120  | Cerbera dilatata         |  | 834  | Cordia micronesica        |
| 822  | Cerbera floribunda       |  | 835  | Cordia sebestena          |
| 454  | Cerbera manghas          |  | 472  | Cordia subcordata         |
| 455  | Cerbera odollam          |  | 473  | Crateva religiosa         |
| 708  | Ceriops tagal            |  | 132  | Crescentia alata          |
| 456  | Chionanthus vitiensis    |  | 474  | Crossostylis biflora      |
| 457  | Chrysophyllum cainito    |  | 475  | Cryptocarya elegans       |
| 50   | Cinnamomum camphora      |  | 476  | Cryptocarya hornei        |
| 823  | Cinnamomum carolinense   |  | 477  | Cryptocarya samoensis     |
| 824  | Cinnamomum pedatinervium |  | 478  | Cryptocarya turbinata     |
| 825  | Cinnamomum sessilifolium |  | 479  | Cryptocarya wilderi       |
| 458  | Cinnamomum verum         |  | 133  | Cryptomeria japonica      |
| 460  | Citronella samoensis     |  | 480  | Cupaniopsis samoensis     |
| 461  | Citrus aurantifolia      |  | 386  | Cyathea decurrens         |
| 121  | Citrus aurantium         |  | 691  | Cyathea lunulata          |
| 122  | Citrus grandis           |  | 387  | Cyathea medullaris        |
| 212  | Citrus hystrix           |  | 836  | Cyathea nigricans         |
| 124  | Citrus limon             |  | 837  | Cyathea ponapeana         |
| 125  | Citrus macroptera        |  | 1320 | Cyathea spp.              |
| 462  | Citrus maxima            |  | 482  | Cyathea truncata          |
| 126  | Citrus medica            |  | 134  | Cycas circinalis          |
| 826  | Citrus mitis             |  | 838  | Cycas revoluta            |
| 463  | Citrus reticulata        |  |      |                           |
|      |                          |  |      |                           |

Tree Species Lists

| Code | Scientific Name           |  | Code | Scientific Name                |
|------|---------------------------|--|------|--------------------------------|
| 483  | Cyclophyllum barbatum     |  | 509  | Erythrina subumbrans           |
| 135  | Cynometra ramiflora       |  | 510  | Erythrina variegata            |
| 136  | Cyphomandra betacea       |  | 511  | Erythrospermum acuminatissimum |
| 485  | Delonix regia             |  | 339  | Eucalyptus deglupta            |
| 486  | Dendrocnide harveyi       |  | 213  | Eucalyptus globulus            |
| 137  | Dendrocnide latifolia     |  | 340  | Eucalyptus pilularis           |
| 138  | Dictyosperma album        |  | 341  | Eucalyptus robusta             |
| 487  | Diospyros discolor        |  | 342  | Eucalyptus saligna             |
| 488  | Diospyros ebenaster       |  | 343  | Eucalyptus sideroxylon         |
| 489  | Diospyros elliptica       |  | 1400 | Eucalyptus sp.                 |
| 839  | Diospyros ferrea          |  | 848  | Eugenia aquea                  |
| 140  | Diospyros kaki            |  | 849  | Eugenia caryophyllus           |
| 490  | Diospyros major           |  | 143  | Eugenia cuminii                |
| 491  | Diospyros samoensis       |  | 144  | Eugenia javanica               |
| 492  | Dipteris conjugata        |  | 145  | Eugenia malaccensis            |
| 141  | Discocalyx ponapensis     |  | 850  | Eugenia nitida                 |
| 840  | Dolichandrone spathacea   |  | 851  | Eugenia palauensis             |
| 713  | Dracaena multiflora       |  | 214  | Eugenia palumbis               |
| 842  | Drypetes nitida           |  | 512  | Eugenia reinwardtiana          |
| 493  | Drypetes vitiensis        |  | 1410 | Eugenia sp.                    |
| 494  | Durio zibethinus          |  | 146  | Eugenia stelechantha           |
| 495  | Dysoxylum forsteri        |  | 852  | Eugenia suzukii                |
| 496  | Dysoxylum huntii          |  | 147  | Eugenia thompsonii             |
| 497  | Dysoxylum maota           |  | 513  | Eugenia uniflora               |
| 498  | Dysoxylum samoense        |  | 514  | Euphoria longana               |
| 1370 | Dysoxylum spp.            |  | 854  | Evodia hortensis               |
| 500  | Dysoxylum tongense        |  | 855  | Evodia nitida                  |
| 843  | Elaeis guineensis         |  | 856  | Evodia palawensis              |
| 844  | Elaeocarpus carolinensis  |  | 857  | Evodia ponapensis              |
| 501  | Elaeocarpus floridanus    |  | 858  | Evodia trichantha              |
| 502  | Elaeocarpus graeffei      |  | 515  | Excoecaria agallocha           |
| 503  | Elaeocarpus grandis       |  | 859  | Exorrhiza ponapensis           |
| 142  | Elaeocarpus joga          |  | 516  | Fagraea berteriana             |
| 845  | Elaeocarpus kerstingianus |  | 860  | Fagraea ksid                   |
| 846  | Elaeocarpus kusanoi       |  | 149  | Ficus carica                   |
| 705  | Elaeocarpus tongnus       |  | 150  | Ficus elastica                 |
| 504  | Elaeocarpus ulianus       |  | 517  | Ficus godeffroyi               |
| 505  | Elattostachys falcata     |  | 352  | Ficus microcarpa               |
| 506  | Eleocharis dulcis         |  | 518  | Ficus obliqua                  |
| 507  | Endiandra elaeocarpa      |  | 519  | Ficus prolixa                  |
| 329  | Eriobotrya japonica       |  | 861  | Ficus saffordii                |
| 508  | Erythrina fusca           |  |      |                                |
|      |                           |  |      |                                |

Tree Species Lists

| Code | Scientific Name                    |  | Code | Scientific Name                   |
|------|------------------------------------|--|------|-----------------------------------|
| 520  | <i>Ficus scabra</i>                |  | 547  | <i>Hernandia nymphaeifolia</i>    |
| 1440 | <i>Ficus</i> sp.                   |  | 155  | <i>Hernandia ovigera</i>          |
| 521  | <i>Ficus tinctoria</i>             |  | 156  | <i>Hernandia sonora</i>           |
| 522  | <i>Ficus uniauriculata</i>         |  | 157  | <i>Heterospathe elata</i>         |
| 215  | <i>Ficus virens</i>                |  | 361  | <i>Hevea brasiliensis</i>         |
| 863  | <i>Finischia chloroxantha</i>      |  | 548  | <i>Hibiscus tiliaceus</i>         |
| 216  | <i>Flacourtia rukam</i>            |  | 549  | <i>Homalium whitmeeanus</i>       |
| 524  | <i>Flueggea flexuosa</i>           |  | 872  | <i>Horsfieldia amklaal</i>        |
| 525  | <i>Funtumia elastica</i>           |  | 873  | <i>Horsfieldia novo-guineensi</i> |
| 526  | <i>Garcinia mangostana</i>         |  | 874  | <i>Horsfieldia palauensis</i>     |
| 864  | <i>Garcinia matudai</i>            |  | 550  | <i>Inocarpus fagifer</i>          |
| 527  | <i>Garcinia myrtifolia</i>         |  | 551  | <i>Intsia bijuga</i>              |
| 865  | <i>Garcinia ponapensis</i>         |  | 875  | <i>Kayea pacifica</i>             |
| 866  | <i>Garcinia rumiyo</i>             |  | 703  | <i>Kleinhovia hospita</i>         |
| 528  | <i>Garcinia sessilis</i>           |  | 554  | <i>Lagostromia speciosa</i>       |
| 529  | <i>Gardenia taitensis</i>          |  | 555  | <i>Lansium domesticum</i>         |
| 530  | <i>Garuga floribunda</i>           |  | 158  | <i>Latania loddigesii</i>         |
| 531  | <i>Geniostoma rupestre</i>         |  | 159  | <i>Leucaena insularum</i>         |
| 532  | <i>Gironniera celtiifolia</i>      |  | 556  | <i>Leucaena leucocephala</i>      |
| 151  | <i>Gliricida sepium</i>            |  | 558  | <i>Litchi chinensis</i>           |
| 533  | <i>Glochidion cuspidatum</i>       |  | 559  | <i>Litsea mellea</i>              |
| 706  | <i>Glochidion ramiflorum</i>       |  | 560  | <i>Litsea samoensis</i>           |
| 869  | <i>Gmelina elliptica</i>           |  | 160  | <i>Livistonia chinensis</i>       |
| 867  | <i>Gmelina palawensis</i>          |  | 561  | <i>Lucuma nervosa</i>             |
| 868  | <i>Gnetum gnemon</i>               |  | 562  | <i>Lumnitzera littorea</i>        |
| 870  | <i>Goniiothalamus carolinensis</i> |  | 161  | <i>Macadamia integrifolia</i>     |
| 358  | <i>Grevillea robusta</i>           |  | 563  | <i>Macadamia tetraphylla</i>      |
| 535  | <i>Grewia crenata</i>              |  | 876  | <i>Macaranga carolinensis</i>     |
| 152  | <i>Guaiacum officinale</i>         |  | 564  | <i>Macaranga grayana</i>          |
| 153  | <i>Guamia mariannae</i>            |  | 565  | <i>Macaranga harveyana</i>        |
| 536  | <i>Guettarda speciosa</i>          |  | 566  | <i>Macaranga reineckei</i>        |
| 537  | <i>Guioa lenticifolia</i>          |  | 567  | <i>Macaranga</i> sp. nova         |
| 538  | <i>Guioa rhoifolia</i>             |  | 568  | <i>Macaranga stipulosa</i>        |
| 871  | <i>Gulubia palauensis</i>          |  | 162  | <i>Macaranga thompsonii</i>       |
| 539  | <i>Gyrocarpus americanus</i>       |  | 877  | <i>Mallotus palauensis</i>        |
| 540  | <i>Haplolobus floribundus</i>      |  | 878  | <i>Mallotus tiliaefolius</i>      |
| 541  | <i>Harpullia arborea</i>           |  | 570  | <i>Mammea glauca</i>              |
| 542  | <i>Hedycarya denticulata</i>       |  | 163  | <i>Mammea odorata</i>             |
| 543  | <i>Hedycarya dorstenioides</i>     |  | 569  | <i>Mangifera indica</i>           |
| 544  | <i>Heritiera littoralis</i>        |  | 879  | <i>Mangifera minor</i>            |
| 154  | <i>Heritiera longipetiolata</i>    |  | 164  | <i>Mangifera odorata</i>          |
| 545  | <i>Heritiera ornithocephala</i>    |  | 165  | <i>Manihot glaziovii</i>          |
| 546  | <i>Hernandia moerenhoutiana</i>    |  | 571  | <i>Manikara dissecta</i>          |

Tree Species Lists

| Code | Scientific Name             |  | Code | Scientific Name           |
|------|-----------------------------|--|------|---------------------------|
| 880  | Manilkara hoshinoi          |  | 174  | Myrica rubra              |
| 572  | Manilkara samoensis         |  | 589  | Myristica fatua           |
| 882  | Manilkara udoido            |  | 590  | Myristica hypargyrea      |
| 166  | Manilkara zapota            |  | 897  | Myristica insularis       |
| 573  | Maniltoa grandiflora        |  | 591  | Neisosperma oppositifolia |
| 883  | Marattia fraxinea           |  | 592  | Neonauclea forsteri       |
| 715  | Maytenus palauica           |  | 593  | Nephelium lappaceum       |
| 884  | Medusanthra carolinensis    |  | 898  | Neubergia celebica        |
| 575  | Medusanthra samoensis       |  | 899  | Nypa fruticans            |
| 885  | Melaleuca quinquenervia     |  | 900  | Ochroma pyramidale        |
| 167  | Melanolepis multiglandulosa |  | 594  | Ochrosia vitiensis        |
| 993  | Melia azedarach             |  | 595  | Omalthus acuminatus       |
| 577  | Melicope retusa             |  | 596  | Omalthus nutans           |
| 578  | Melicytus samoensis         |  | 901  | Ormosia calavensis        |
| 579  | Melilope lauterbachii       |  | 716  | Osmoxylon oliveri         |
| 580  | Melochia aristata           |  | 717  | Osmoxylon pachyphyllum    |
| 168  | Merrilliodendron megacarpum |  | 718  | Osmoxylon truncatum       |
| 581  | Meryta macrophylla          |  | 902  | Pachira aquatica          |
| 886  | Meryta senffiana            |  | 597  | Palaquium stehlinii       |
| 582  | Metrosideros collina        |  | 903  | Pandanus aimiriikensis    |
| 169  | Metroxylon amicarum         |  | 905  | Pandanus cominsii         |
| 887  | Metroxylon sagu             |  | 906  | Pandanus compressus       |
| 583  | Michelia champaca           |  | 907  | Pandanus cylindricus      |
| 584  | Micromelum minutum          |  | 908  | Pandanus dilatatus        |
| 585  | Millettia pinnata           |  | 909  | Pandanus divergens        |
| 170  | Mimusops elengi             |  | 175  | Pandanus dubius           |
| 586  | Morinda citrifolia          |  | 910  | Pandanus duriocarpus      |
| 888  | Morinda latibracteata       |  | 911  | Pandanus enchabiensis     |
| 889  | Morinda pendunculata        |  | 912  | Pandanus fischerianus     |
| 171  | Moringa oleifera            |  | 176  | Pandanus fragrans         |
| 172  | Morus alba                  |  | 913  | Pandanus hosinoi          |
| 173  | Muntingia calabura          |  | 914  | Pandanus jalvitensis      |
| 890  | Musa coccinea               |  | 915  | Pandanus kanehirae        |
| 891  | Musa nana                   |  | 916  | Pandanus kororensis       |
| 892  | Musa sapientum              |  | 917  | Pandanus lakatwa          |
| 1650 | Musa spp.                   |  | 918  | Pandanus laticanalicula   |
| 893  | Musa textilis               |  | 919  | Pandanus macrocephalus    |
| 894  | Musa tikap                  |  | 920  | Pandanus macrojeanneretia |
| 895  | Musa troglodytarum          |  | 921  | Pandanus menne            |
| 896  | Mussaenda frondosa          |  | 922  | Pandanus obliquus         |
| 588  | Mussaenda raiateensis       |  | 923  | Pandanus odontoides       |

Tree Species Lists

| Code | Scientific Name                 |  | Code | Scientific Name                    |
|------|---------------------------------|--|------|------------------------------------|
| 924  | <i>Pandanus palawensis</i>      |  | 615  | <i>Planchonella torricellensis</i> |
| 925  | <i>Pandanus patina</i>          |  | 616  | <i>Pleiogynium timoriense</i>      |
| 926  | <i>Pandanus peliliuensis</i>    |  | 184  | <i>Plumeria obtusa</i>             |
| 927  | <i>Pandanus ponapensis</i>      |  | 185  | <i>Plumeria rubra</i>              |
| 928  | <i>Pandanus pulposus</i>        |  | 617  | <i>Polyathia</i> sp. nova          |
| 929  | <i>Pandanus rectangulatus</i>   |  | 719  | <i>Polyscias grandifolia</i>       |
| 598  | <i>Pandanus reineckeii</i>      |  | 618  | <i>Polyscias multijuga</i>         |
| 930  | <i>Pandanus rotundatus</i>      |  | 939  | <i>Polyscias nodosa</i>            |
| 1700 | <i>Pandanus</i> sp.             |  | 619  | <i>Polyscias samoensis</i>         |
| 692  | <i>Pandanus tectorius</i>       |  | 620  | <i>Pometia pinnata</i>             |
| 931  | <i>Pandanus tolotomensis</i>    |  | 940  | <i>Ponapea hosinoi</i>             |
| 932  | <i>Pandanus trukensis</i>       |  | 941  | <i>Ponapea ledermanniana</i>       |
| 933  | <i>Pandanus utiyamai</i>        |  | 186  | <i>Pongamia pinnata</i>            |
| 934  | <i>Pandanus variegatus</i>      |  | 621  | <i>Pouteria caimito</i>            |
| 178  | <i>Pangium edule</i>            |  | 942  | <i>Pouteria calcarea</i>           |
| 599  | <i>Paraserianthes falcata</i>   |  | 187  | <i>Pouteria campechiana</i>        |
| 600  | <i>Parasponia andersonii</i>    |  | 188  | <i>Pouteria obovata</i>            |
| 935  | <i>Parinari corymbosa</i>       |  | 189  | <i>Pouteria sapota</i>             |
| 601  | <i>Parinari insularum</i>       |  | 190  | <i>Premna obtusifolia</i>          |
| 936  | <i>Parinari laurina</i>         |  | 943  | <i>Premna pubescens</i>            |
| 937  | <i>Parkia parvifoliola</i>      |  | 622  | <i>Premna serratifolia</i>         |
| 382  | <i>Peltophorum pterocarpum</i>  |  | 623  | <i>Pritchardia pacifica</i>        |
| 602  | <i>Pemphis acidula</i>          |  | 191  | <i>Prunus persica</i>              |
| 603  | <i>Persea americana</i>         |  | 624  | <i>Psidium guajava</i>             |
| 179  | <i>Phoenix dactylifera</i>      |  | 625  | <i>Psychotria grandistipulata</i>  |
| 180  | <i>Phoenix sylvestris</i>       |  | 626  | <i>Psychotria insularum</i>        |
| 181  | <i>Phyllanthus acidus</i>       |  | 192  | <i>Psychotria mariana</i>          |
| 182  | <i>Pimenta pimentadilloica</i>  |  | 193  | <i>Psychotria rotensis</i>         |
| 183  | <i>Pimenta racemosa</i>         |  | 627  | <i>Psydrax odorata</i>             |
| 938  | <i>Pinanga insignis</i>         |  | 194  | <i>Pterocarpus indicus</i>         |
| 605  | <i>Pipturus argenteus</i>       |  | 944  | <i>Ptychosperma kusaiensis</i>     |
| 606  | <i>Pisonia grandis</i>          |  | 945  | <i>Ptychosperma palauensis</i>     |
| 607  | <i>Pisonia umbellifera</i>      |  | 628  | <i>Rapanea myricifolia</i>         |
| 385  | <i>Pithecellobium dulce</i>     |  | 946  | <i>Rauvolfia insularis</i>         |
| 608  | <i>Pittosporum arborescens</i>  |  | 947  | <i>Ravenala madagascariensis</i>   |
| 609  | <i>Pittosporum samoense</i>     |  | 629  | <i>Reynoldsia lanotoensis</i>      |
| 610  | <i>Planchonella garberi</i>     |  | 630  | <i>Reynoldsia pleiosperma</i>      |
| 611  | <i>Planchonella grayana</i>     |  | 631  | <i>Rheedula edulis</i>             |
| 612  | <i>Planchonella linggensis</i>  |  | 195  | <i>Rhizophora apiculata</i>        |
| 613  | <i>Planchonella membranacea</i> |  | 632  | <i>Rhizophora mangle</i>           |
| 614  | <i>Planchonella samoensis</i>   |  | 196  | <i>Rhizophora mucronata</i>        |

Tree Species Lists

| Code | Scientific Name            |  | Code | Scientific Name            |
|------|----------------------------|--|------|----------------------------|
| 633  | Rhizophora stylosa         |  | 657  | Syzygium corynocarpum      |
| 634  | Rhus taitensis             |  | 658  | Syzygium brevifolium       |
| 948  | Rinorea carolinensis       |  | 659  | Syzygium carolinense       |
| 635  | Rollinia deliciosa         |  | 660  | Syzygium clusiifolium      |
| 197  | Roystonea elata            |  | 661  | Syzygium dealatum          |
| 949  | Roystonea oleracea         |  | 662  | Syzygium inophylloides     |
| 950  | Samadera indica            |  | 663  | Syzygium jambos            |
| 636  | Samanea saman              |  | 664  | Syzygium richii            |
| 637  | Sandoricum koetjape        |  | 665  | Syzygium samarangense      |
| 638  | Santalum yasi              |  | 666  | Syzygium samoense          |
| 639  | Sapindus vitiensis         |  | 667  | Syzygium savaiiense        |
| 951  | Sapium indicum             |  | 202  | Tabebuia pallida           |
| 640  | Sarcopygme pacifica        |  | 960  | Tabernaemontana aurantiaca |
| 198  | Schefflera actinophylla    |  | 668  | Tabernaemontana pandacaqui |
| 642  | Schefflera samoensis       |  | 210  | Tabernaemontana rotensis   |
| 224  | Schinus terebinthifolius   |  | 203  | Tamarindus indica          |
| 643  | Schleinitzia insularum     |  | 669  | Tarenna sambucina          |
| 952  | Scyphiphora hydrophyllacea |  | 961  | Tecoma stans               |
| 644  | Securinega flexuosa        |  | 962  | Tectona grandis            |
| 953  | Semecarpus venenosus       |  | 963  | Terminalia carolinensis    |
| 645  | Semecarpus vitiensis       |  | 670  | Terminalia catappa         |
| 954  | Serianthes kanehirae       |  | 964  | Terminalia crassipes       |
| 646  | Serianthes melanesica      |  | 965  | Terminalia edulis          |
| 199  | Serianthes nelsonii        |  | 672  | Terminalia glabrata        |
| 647  | Sesbania grandiflora       |  | 966  | Terminalia kaernbachii     |
| 648  | Solanum vitiense           |  | 673  | Terminalia richii          |
| 200  | Sonneratia alba            |  | 674  | Terminalia samoensis       |
| 649  | Sophora tomentosa          |  | 675  | Theobroma cacao            |
| 650  | Spathodea campanulata      |  | 676  | Thespesia populnea         |
| 651  | Spiraeanthemum samoense    |  | 723  | Timonius corymbosus        |
| 652  | Spondias dulcis            |  | 724  | Timonius mollis            |
| 955  | Spondias mombin            |  | 726  | Timonius subauritus        |
| 956  | Spondias pinnata           |  | 727  | Timonius timon             |
| 957  | Stemonurus ammui           |  | 678  | Tournefortia argentea      |
| 653  | Sterculia fanaiho          |  | 679  | Trema cannabina            |
| 958  | Sterculia palauensis       |  | 204  | Trema orientalis           |
| 654  | Streblus anthropophagorum  |  | 967  | Trichospermum ikutai       |
| 201  | Streblus pendulinus        |  | 968  | Trichospermum ledermannii  |
| 655  | Swietenia macrophylla      |  | 680  | Trichospermum richii       |
| 959  | Swietenia mahogoni         |  | 123  | Triphasia trifolia         |
| 722  | Symplocos racemosa         |  |      |                            |
| 656  | Synsepalum dulcificum      |  |      |                            |
| 205  | Tristiropsis obtusangula   |  |      |                            |

# Tree Species Lists

| Code | Scientific Name        |  | Code | Scientific Name |
|------|------------------------|--|------|-----------------|
| 999  | Unknown, other         |  |      |                 |
| 681  | Vavaea amicorum        |  |      |                 |
| 682  | Veitchia merrillii     |  |      |                 |
| 969  | Vitex coffassus        |  |      |                 |
| 206  | Vitex parviflora       |  |      |                 |
| 683  | Wedelia biflora        |  |      |                 |
| 684  | Weinmannia affinis     |  |      |                 |
| 207  | Ximenia americana      |  |      |                 |
| 685  | Xylocarpus granatum    |  |      |                 |
| 686  | Xylocarpus moluccensis |  |      |                 |
| 208  | Xylosma nelsonii       |  |      |                 |
| 688  | Xylosma samoense       |  |      |                 |
| 689  | Xylosma smithianum     |  |      |                 |
| 690  | Zanthophyllum pinnatum |  |      |                 |
| 209  | Zizyphus mauritiana    |  |      |                 |

**Tree Genus Codes**

|      | GENUS CODES       |  |      |                   |      |                 |
|------|-------------------|--|------|-------------------|------|-----------------|
| 1000 | Acacia spp.       |  | 1400 | Eucalyptus spp.   |      |                 |
| 1010 | Albizia spp.      |  | 1410 | Eugenia spp.      |      |                 |
| 1020 | Aglaia spp.       |  | 1420 | Evodia spp.       | 1800 | Pouteria sp.    |
| 1030 | Aleurites spp.    |  | 1430 | Fagraea spp.      | 1810 | Premna sp.      |
| 1040 | Allophylus spp.   |  | 1440 | Ficus sp.         | 1820 | Psychotria sp.  |
| 1050 | Alphitonia spp.   |  | 1450 | Garcinia sp.      | 1830 | Ptychosperma sp |
| 1060 | Annona spp.       |  | 1460 | Glochidion sp.    | 1840 | Reynoldsia sp.  |
| 1070 | Antidesma spp.    |  | 1470 | Gmelina sp.       | 1850 | Rhizophora sp.  |
| 1080 | Araucaria spp.    |  | 1480 | Guioa sp.         | 1860 | Spondias sp.    |
| 1090 | Artocarpus spp.   |  | 1490 | Hedycarya sp.     | 1870 | Swietenia sp.   |
| 1100 | Astronidium spp.  |  | 1500 | Heritiera sp.     | 1880 | Terminalia sp.  |
| 1110 | Averrhoa spp.     |  | 1510 | Hernandia sp.     | 1890 | Timonius sp.    |
| 1120 | Avicennia spp.    |  | 1520 | Horsfieldia sp.   | 1900 | Trema sp.       |
| 1130 | Barringtonia spp. |  | 1530 | Leucaena sp.      | 1910 | Vitex sp.       |
| 1140 | Bauhinia spp.     |  | 1540 | Litsea sp.        | 1920 | Xylocarpus sp.  |
| 1150 | Buchanania spp.   |  | 1550 | Macadamia sp      |      |                 |
| 1160 | Calophyllum spp.  |  | 1560 | Macaranga sp.     |      |                 |
| 1170 | Canarium spp.     |  | 1570 | Mallotus sp       |      |                 |
| 1180 | Caryota spp.      |  | 1580 | Mammea sp.        |      |                 |
| 1190 | Casearia spp.     |  | 1590 | Mangifera sp.     |      |                 |
| 1200 | Cassia spp.       |  | 1600 | Manilkara sp.     |      |                 |
| 1210 | Casuarina spp.    |  | 1610 | Medusanthra sp.   |      |                 |
| 1220 | Celtis spp.       |  | 1620 | Meryta sp.        |      |                 |
| 1230 | Cerbera spp       |  | 1630 | Metroxylon sp.    |      |                 |
| 1240 | Cinnamomum spp.   |  | 1640 | Morinda sp.       |      |                 |
| 1250 | Citrus spp.       |  | 1650 | Musa spp.         |      |                 |
| 1260 | Claoxylon spp.    |  | 1660 | Mussaenda spp.    |      |                 |
| 1270 | Cleistanthus spp. |  | 1670 | Myristica spp.    |      |                 |
| 1280 | Coffea spp.       |  | 1680 | Omalthanthus spp. |      |                 |
| 1290 | Coprosma spp.     |  | 1690 | Osmoxylon spp.    |      |                 |
| 1300 | Cordia spp.       |  | 1700 | Pandanus sp.      |      |                 |
| 1310 | Cryptocarya spp.  |  | 1710 | Parinari sp.      |      |                 |
| 1320 | Cyathea spp.      |  | 1720 | Phoenix sp.       |      |                 |
| 1330 | Cycas spp.        |  | 1730 | Pimenta sp.       |      |                 |
| 1340 | Dendrocnide spp.  |  | 1740 | Pisonia sp.       |      |                 |
| 1350 | Diospyros spp.    |  | 1750 | Pittosporum sp.   |      |                 |
| 1360 | Drypetes spp.     |  | 1760 | Planchonella sp.  |      |                 |
| 1370 | Dysoxylum spp.    |  | 1770 | Plumeria sp.      |      |                 |
| 1380 | Elaeocarpus spp.  |  | 1780 | Polyscias sp.     |      |                 |
| 1390 | Erythrina spp.    |  | 1790 | Ponapea sp.       |      |                 |



***All Island Trees: ordered by number code***

| Code | Scientific Name         | Guam | Am. Samoa | Palau | Pohnpei | Kos-rae | Yap | Chuuk | CNMI | Mar Isl |
|------|-------------------------|------|-----------|-------|---------|---------|-----|-------|------|---------|
| 50   | Cinnamomum camphora     | GUM  |           |       |         |         |     |       |      |         |
| 100  | Aglaia mariannensis     | GUM  |           |       |         |         |     |       | NMI  |         |
| 101  | Aidia cochinchinensis   | GUM  | AS        | PAL   | PON     |         |     |       | NMI  | MAR     |
| 102  | Albizia lebbeck         | GUM  |           | PAL   |         |         | YAP |       | NMI  |         |
| 103  | Aleurites trisperma     | GUM  |           |       |         |         |     |       |      |         |
| 104  | Anacardium occidentale  | GUM  |           |       |         |         |     |       |      |         |
| 105  | Annona reticulata       | GUM  |           | PAL   |         |         |     |       |      |         |
| 106  | Antidesma bunius        | GUM  |           | PAL   |         |         |     |       |      |         |
| 107  | Araucaria columnaris    | GUM  |           |       |         |         |     |       | NMI  |         |
| 108  | Araucaria heterophylla  | GUM  |           | PAL   |         |         | YAP |       |      | MAR     |
| 109  | Arenga pinnata          | GUM  |           | PAL   |         |         |     |       |      |         |
| 110  | Artocarpus mariannensis | GUM  |           | PAL   | PON     |         | YAP | TRK   | NMI  |         |
| 111  | Araucaria excelsa       |      | AS        | PAL   |         |         |     |       |      |         |
| 112  | Barringtonia racemosa   | GUM  |           | PAL   | PON     | KOS     | YAP | TRK   |      |         |
| 113  | Bauhinia monandra       | GUM  |           | PAL   | PON     |         |     |       | NMI  |         |
| 114  | Caesalpinia sappan      | GUM  |           |       | PON     |         | YAP |       | NMI  |         |
| 115  | Caryota urens           | GUM  |           |       |         |         |     |       |      |         |
| 116  | Cassia javanica         | GUM  |           |       |         |         |     |       |      |         |
| 117  | Casuarina litorea       | GUM  |           | PAL   | PON     |         | YAP | TRK   | NMI  | MAR     |
| 118  | Catalpa longissima      | GUM  |           |       |         |         |     |       |      |         |
| 119  | Ceiba pentandra         | GUM  |           | PAL   | PON     | KOS     | YAP |       |      | MAR     |
| 120  | Cerbera dilatata        | GUM  |           |       |         |         |     |       | NMI  |         |
| 121  | Citrus aurantium        | GUM  |           |       |         |         |     |       |      |         |
| 122  | Citrus grandis          | GUM  |           | PAL   |         |         | YAP |       | NMI  |         |
| 123  | Triphasia trifolia      | GUM  |           |       |         |         |     |       | NMI  |         |
| 124  | Citrus limon            | GUM  |           | PAL   |         |         |     |       |      |         |
| 125  | Citrus macroptera       | GUM  |           |       |         |         | YAP |       |      |         |
| 126  | Citrus medica           | GUM  |           |       |         |         |     |       |      |         |
| 127  | Claoxylon marianum      | GUM  |           |       |         |         |     |       | NMI  |         |
| 128  | Coccoloba uvifera       | GUM  |           |       |         |         |     |       |      | MAR     |
| 129  | Coffea arabica          | GUM  |           | PAL   |         |         |     |       |      |         |
| 130  | Coffea liberica         | GUM  |           |       |         |         |     |       |      |         |
| 131  | Cordia dichotoma        | GUM  |           |       |         |         |     |       |      |         |
| 132  | Crescentia alata        | GUM  |           |       |         |         |     |       |      |         |
| 133  | Cryptomeria japonica    | GUM  |           |       |         |         |     |       |      |         |
| 134  | Cycas circinalis        | GUM  |           | PAL   | PON     | KOS     | YAP |       |      | MAR     |
| 135  | Cynometra ramiflora     | GUM  |           | PAL   | PON     |         |     |       |      |         |
| 136  | Cyphomandra betacea     | GUM  |           |       |         |         |     |       |      |         |
| 137  | Dendrocide latifolia    | GUM  |           |       |         |         |     |       | NMI  |         |

## Tree Species Lists

| Code | Scientific Name             | Guam | Am. Samoa | Palau | Pohn-pei | Kos-rae | Yap | Chuuk | CNMI | Mar Isl |
|------|-----------------------------|------|-----------|-------|----------|---------|-----|-------|------|---------|
| 138  | Dictyosperma album          | GUM  |           |       |          |         |     |       |      |         |
| 140  | Diospyros kaki              | GUM  |           |       |          |         |     |       |      |         |
| 141  | Discocalyx ponapensis       | GUM  |           |       | PON      |         |     |       |      |         |
| 142  | Elaeocarpus joga            | GUM  |           | PAL   |          |         |     |       | NMI  |         |
| 143  | Eugenia cuminii             | GUM  |           | PAL   |          |         |     |       |      |         |
| 144  | Eugenia javanica            | GUM  |           | PAL   | PON      |         | YAP |       |      |         |
| 145  | Eugenia malaccensis         | GUM  |           | PAL   | PON      |         | YAP | TRK   |      |         |
| 146  | Eugenia stelechantha        | GUM  |           |       | PON      | KOS     |     | TRK   | NMI  |         |
| 147  | Eugenia thompsonii          | GUM  |           |       |          |         |     |       | NMI  |         |
| 149  | Ficus carica                | GUM  |           | PAL   |          |         |     |       |      | MAR     |
| 150  | Ficus elastica              | GUM  |           | PAL   | PON      |         | YAP |       |      |         |
| 151  | Gliricida sepium            | GUM  |           | PAL   |          |         |     |       |      |         |
| 152  | Guaiacum officinale         | GUM  |           |       |          |         |     |       |      |         |
| 153  | Guamia mariannae            | GUM  |           |       |          |         |     |       | NMI  |         |
| 154  | Heritiera longipetiolata    | GUM  |           |       |          |         |     |       | NMI  |         |
| 155  | Hernandia ovigera           | GUM  |           |       |          |         |     |       |      |         |
| 156  | Hernandia sonora            | GUM  |           | PAL   | PON      | KOS     | YAP | TRK   | NMI  | MAR     |
| 157  | Heterospathe elata          | GUM  |           | PAL   |          |         | YAP |       |      |         |
| 158  | Latania loddigesii          | GUM  |           |       |          |         |     |       |      |         |
| 159  | Leucaena insularum          | GUM  |           |       |          |         |     |       |      |         |
| 160  | Livistonia chinensis        | GUM  |           |       |          |         |     |       |      |         |
| 161  | Macadamia integrifolia      | GUM  |           | PAL   |          |         |     |       |      |         |
| 162  | Macaranga thompsonii        | GUM  |           |       |          |         |     |       |      |         |
| 163  | Mammea odorata              | GUM  |           | PAL   | PON      |         | YAP | TRK   | NMI  |         |
| 164  | Mangifera odorata           | GUM  |           |       |          |         |     |       | NMI  |         |
| 165  | Manihot glaziovii           | GUM  |           |       |          |         |     |       |      |         |
| 166  | Manilkara zapota            | GUM  |           | PAL   |          |         |     |       |      |         |
| 167  | Melanolepis multiglandulosa | GUM  |           |       |          |         |     |       | NMI  |         |
| 168  | Merrilliodendron megacarpum | GUM  |           |       |          |         |     |       | NMI  |         |
| 169  | Metroxylon amicarum         | GUM  |           | PAL   | PON      |         |     | TRK   |      |         |
| 170  | Mimusops elengi             | GUM  |           |       |          |         |     |       |      |         |
| 171  | Moringa oleifera            | GUM  |           | PAL   |          |         |     |       |      |         |
| 172  | Morus alba                  | GUM  |           |       |          |         |     |       |      |         |
| 173  | Muntingia calabura          | GUM  |           | PAL   |          |         | YAP |       |      |         |
| 174  | Myrica rubra                | GUM  |           |       |          |         |     |       |      |         |
| 175  | Pandanus dubius             | GUM  |           | PAL   | PON      | KOS     |     | TRK   | NMI  |         |
| 176  | Pandanus fragrans           | GUM  |           |       | PON      |         | YAP |       |      |         |
| 1700 | Pandanus sp.                | GUM  |           |       | PON      | KOS     | YAP | TRK   |      | MAR     |
| 178  | Pangium edule               | GUM  |           | PAL   | PON      |         | YAP |       | NMI  |         |
| 179  | Phoenix dactylifera         | GUM  |           |       |          |         |     |       |      |         |
| 180  | Phoenix sylvestris          | GUM  |           |       |          |         |     |       |      |         |

Tree Species Lists

| Code | Scientific Name          | Guam | Am. Samoa | Palau | Pohn-pei | Kos-rae | Yap | Chuuk | CNMI | Mar Isl |
|------|--------------------------|------|-----------|-------|----------|---------|-----|-------|------|---------|
| 181  | Phyllanthus acidus       | GUM  |           |       |          |         |     |       |      |         |
| 182  | Pimenta pimentadioica    | GUM  |           |       |          |         |     |       |      |         |
| 183  | Pimenta racemosa         | GUM  |           |       |          |         |     |       | NMI  |         |
| 184  | Plumeria obtusa          | GUM  |           | PAL   |          |         | YAP |       |      | MAR     |
| 185  | Plumeria rubra           | GUM  |           | PAL   | PON      | KOS     | YAP | TRK   |      | MAR     |
| 186  | Pongamia pinnata         | GUM  |           | PAL   |          |         | YAP |       |      |         |
| 187  | Pouteria campechiana     | GUM  |           |       |          |         |     |       | NMI  |         |
| 188  | Pouteria obovata         | GUM  |           | PAL   |          |         |     |       | NMI  |         |
| 189  | Pouteria sapota          | GUM  |           |       |          |         |     |       |      |         |
| 190  | Premna obtusifolia       | GUM  |           | PAL   | PON      | KOS     | YAP | TRK   | NMI  | MAR     |
| 191  | Prunus persica           | GUM  |           |       |          |         |     |       |      |         |
| 192  | Psychotria mariana       | GUM  |           |       |          |         |     |       | NMI  |         |
| 193  | Psychotria rotensis      | GUM  |           |       |          |         |     |       |      |         |
| 194  | Pterocarpus indicus      | GUM  |           | PAL   |          |         | YAP |       |      |         |
| 195  | Rhizophora apiculata     | GUM  |           | PAL   | PON      | KOS     |     |       |      |         |
| 196  | Rhizophora mucronata     | GUM  |           | PAL   | PON      | KOS     | YAP | TRK   |      |         |
| 197  | Roystonea elata          | GUM  |           |       |          |         |     |       |      |         |
| 198  | Schefflera actinophylla  | GUM  |           |       |          |         |     |       |      |         |
| 199  | Serianthes nelsonii      | GUM  |           |       |          |         |     |       | NMI  |         |
| 200  | Sonneratia alba          | GUM  |           | PAL   | PON      | KOS     | YAP | TRK   | NMI  | MAR     |
| 201  | Streblus pendulinus      | GUM  |           |       |          |         |     |       |      |         |
| 202  | Tabebuia pallida         | GUM  |           |       |          |         |     |       |      |         |
| 203  | Tamarindus indica        | GUM  |           |       |          |         |     |       | NMI  |         |
| 204  | Trema orientalis         | GUM  |           | PAL   |          |         |     |       | NMI  |         |
| 205  | Tristiropsis obtusangula | GUM  |           | PAL   |          |         |     |       |      |         |
| 206  | Vitex parviflora         | GUM  |           |       |          |         |     |       |      |         |
| 207  | Ximenia americana        | GUM  |           | PAL   |          |         |     |       | NMI  | MAR     |
| 208  | Xylosma nelsonii         | GUM  |           |       |          |         |     |       |      |         |
| 209  | Zizyphus mauritiana      | GUM  |           |       |          |         |     |       |      |         |
| 210  | Tabernaemontana rotensis | GUM  |           |       |          |         |     |       |      |         |
| 212  | Citrus hystrix           | GUM  |           |       |          |         | YAP |       |      |         |
| 213  | Eucalyptus globulus      |      |           | PAL   |          |         |     |       |      |         |
| 214  | Eugenia palumbis         | GUM  |           |       |          |         |     |       |      |         |
| 215  | Ficus virens             | GUM  |           | PAL   | PON      | KOS     | YAP | TRK   |      |         |
| 216  | Flacourtia rukam         |      | AS        |       |          |         |     |       |      |         |
| 224  | Schinus terebinthifolius | GUM  |           |       |          |         |     |       |      |         |
| 278  | Acacia confusa           | GUM  |           | PAL   | PON      |         | YAP | TRK   | NMI  |         |
| 281  | Acacia koa               | GUM  |           |       |          |         |     |       |      |         |
| 293  | Artocarpus altilis       | GUM  | AS        | PAL   | PON      | KOS     | YAP | TRK   | NMI  | MAR     |
| 294  | Artocarpus heterophyllus | GUM  |           | PAL   |          |         |     |       |      |         |
| 295  | Artocarpus nobilis       |      |           | PAL   |          |         |     |       |      |         |
| 329  | Eriobotrya japonica      | GUM  |           |       |          |         |     |       |      |         |

Tree Species Lists

| Code | Scientific Name         | Guam | Am. Samoa | Palau | Pohnpei | Kos-rae | Yap | Chuuk | CNMI | Mar Isl |
|------|-------------------------|------|-----------|-------|---------|---------|-----|-------|------|---------|
| 339  | Eucalyptus deglupta     |      |           | PAL   |         |         |     |       |      |         |
| 340  | Eucalyptus pilularis    |      |           | PAL   |         |         |     |       |      |         |
| 341  | Eucalyptus robusta      |      |           | PAL   |         |         |     |       |      |         |
| 342  | Eucalyptus saligna      |      |           | PAL   |         |         |     |       |      |         |
| 343  | Eucalyptus sideroxylon  |      |           | PAL   |         |         |     |       |      |         |
| 352  | Ficus microcarpa        | GUM  |           | PAL   |         |         |     |       | NMI  |         |
| 358  | Grevillea robusta       | GUM  |           | PAL   |         |         |     |       |      |         |
| 361  | Hevea brasiliensis      | GUM  |           | PAL   |         |         |     |       |      |         |
| 382  | Peltophorum pterocarpum | GUM  |           |       |         |         |     |       |      |         |
| 385  | Pithecellobium dulce    | GUM  |           | PAL   |         |         |     |       | NMI  |         |
| 386  | Cyathea decurrens       |      | AS        |       |         |         |     |       |      |         |
| 387  | Cyathea medullaris      |      | AS        |       |         |         |     |       |      |         |
| 400  | Adenanthera pavonina    | GUM  | AS        | PAL   | PON     | KOS     |     |       | NMI  |         |
| 401  | Aglaia heterotricha     |      | AS        |       |         |         |     |       |      |         |
| 402  | Aglaia saltatorum       |      | AS        |       |         |         |     |       |      |         |
| 403  | Aglaia samoensis        |      | AS        |       |         |         |     |       |      |         |
| 405  | Albizia chinensis       |      | AS        |       |         |         |     |       |      |         |
| 406  | Alectryon samoensis     |      | AS        |       |         |         |     |       |      |         |
| 407  | Aleurites moluccana     | GUM  | AS        |       | PON     |         |     |       |      |         |
| 408  | Allophylus timorensis   | GUM  |           | PAL   | PON     | KOS     | YAP | TRK   |      | MAR     |
| 409  | Alphitonia zizpyoides   |      | AS        |       |         |         |     |       |      |         |
| 410  | Alstonia pacifica       |      | AS        |       |         |         |     |       |      |         |
| 411  | Anacolosia insularis    |      | AS        |       |         |         |     |       |      |         |
| 412  | Annona muricata         | GUM  | AS        | PAL   | PON     | KOS     | YAP | TRK   | NMI  | MAR     |
| 413  | Annona squamosa         | GUM  | AS        | PAL   |         |         |     |       | NMI  |         |
| 415  | Antidesma sphaerocarpum |      | AS        |       |         |         |     |       |      |         |
| 416  | Antirhea inconspicua    |      | AS        |       |         |         |     |       |      |         |
| 417  | Areca catechu           | GUM  | AS        | PAL   | PON     | KOS     | YAP | TRK   | NMI  |         |
| 419  | Artocarpus odoratissima |      | AS        |       |         |         |     |       |      |         |
| 420  | Arytera brackenridgei   |      | AS        |       |         |         |     |       |      |         |
| 421  | Ascarina diffusa        |      | AS        |       |         |         |     |       |      |         |
| 422  | Astronidium navigatorum |      | AS        |       |         |         |     |       |      |         |
| 423  | Astronidium pickeringii |      | AS        |       |         |         |     |       |      |         |
| 424  | Astronidium samoense    |      | AS        |       |         |         |     |       |      |         |
| 425  | Astronidium subcordatum |      | AS        |       |         |         |     |       |      |         |
| 426  | Atuna racemosa          |      | AS        |       |         |         |     |       |      |         |
| 427  | Averrhoa bilimbi        | GUM  | AS        | PAL   |         |         | YAP |       | NMI  |         |
| 428  | Averrhoa carambola      | GUM  | AS        | PAL   | PON     |         | YAP |       |      |         |
| 429  | Baccaurea taitensis     |      | AS        |       |         |         |     |       |      |         |
| 430  | Barringtonia asiatica   | GUM  | AS        | PAL   | PON     | KOS     | YAP | TRK   | NMI  | MAR     |
| 431  | Barringtonia samoensis  |      | AS        |       |         |         |     |       |      |         |
| 432  | Bischofia javanica      |      | AS        |       |         |         |     |       |      |         |

Tree Species Lists

| Code | Scientific Name          | Guam | Am. Samoa | Palau | Pohnpei | Kos-rae | Yap | Chuuk | CNMI | Mar Isl |
|------|--------------------------|------|-----------|-------|---------|---------|-----|-------|------|---------|
| 433  | Boehmeria virgata        |      | AS        |       |         |         |     |       |      |         |
| 434  | Broussonetia papyrifera  |      | AS        |       |         |         |     |       |      |         |
| 435  | Bruguiera gymnorhiza     | GUM  | AS        | PAL   | PON     | KOS     | YAP | TRK   |      | MAR     |
| 436  | Buchanania merrillii     |      | AS        |       |         |         |     |       |      |         |
| 437  | Burckella richii         |      | AS        |       |         |         |     |       |      |         |
| 439  | Calophyllum neo-ebudicum |      | AS        |       |         |         |     |       |      |         |
| 440  | Calophyllum inophyllum   | GUM  | AS        | PAL   | PON     | KOS     | YAP | TRK   | NMI  | MAR     |
| 441  | Cananga odorata          | GUM  | AS        | PAL   | PON     | KOS     |     | TRK   | NMI  |         |
| 443  | Canarium harveyi         |      | AS        |       |         |         |     |       |      |         |
| 444  | Canarium ovatum          |      | AS        |       |         |         |     |       |      |         |
| 445  | Canarium samoense        |      | AS        |       |         |         |     |       |      |         |
| 446  | Canarium vitiense        |      | AS        |       |         |         |     |       |      |         |
| 447  | Canthium merrillii       |      | AS        |       |         |         |     |       |      |         |
| 448  | Carica papaya            | GUM  | AS        | PAL   | PON     | KOS     | YAP | TRK   |      | MAR     |
| 449  | Casearia sp. Nova        |      | AS        |       |         |         |     |       |      |         |
| 450  | Cassia fistula           | GUM  | AS        | PAL   |         |         |     |       |      |         |
| 451  | Castilla elastica        |      | AS        |       |         |         |     |       |      |         |
| 452  | Casuarina equisetifolia  |      | AS        | PAL   |         |         |     |       |      |         |
| 453  | Celtis harperi           |      | AS        |       |         |         |     |       |      |         |
| 454  | Cerbera manghas          |      | AS        | PAL   |         | KOS     |     |       |      |         |
| 455  | Cerbera odollam          |      | AS        |       |         |         |     |       |      |         |
| 456  | Chionanthus vitiensis    |      | AS        |       |         |         |     |       |      |         |
| 457  | Chrysophyllum cainito    |      | AS        | PAL   |         |         |     |       |      |         |
| 458  | Cinnamomum verum         |      | AS        | PAL   |         |         |     |       |      |         |
| 460  | Citronella samoensis     |      | AS        |       |         |         |     |       |      |         |
| 461  | Citrus aurantifolia      | GUM  | AS        | PAL   | PON     | KOS     | YAP | TRK   |      |         |
| 462  | Citrus maxima            |      | AS        |       |         |         |     |       |      |         |
| 463  | Citrus reticulata        | GUM  | AS        | PAL   |         | KOS     | YAP |       |      |         |
| 464  | Citrus sinensis          | GUM  | AS        |       | PON     | KOS     | YAP |       |      |         |
| 465  | Claoxylon echinospermum  |      | AS        |       |         |         |     |       |      |         |
| 466  | Cocos nucifera           | GUM  | AS        | PAL   | PON     | KOS     | YAP | TRK   | NMI  | MAR     |
| 468  | Commersonia bartramia    |      | AS        | PAL   | PON     |         | YAP | TRK   |      |         |
| 469  | Coprosma savaiiensis     |      | AS        |       |         |         |     |       |      |         |
| 470  | Coprosma strigulosa      |      | AS        |       |         |         |     |       |      |         |
| 471  | Cordia aspera            |      | AS        |       |         |         |     |       |      |         |
| 472  | Cordia subcordata        | GUM  | AS        | PAL   | PON     | KOS     | YAP | TRK   | NMI  | MAR     |
| 473  | Crateva religiosa        |      | AS        |       |         |         |     |       |      |         |
| 474  | Crossostylis biflora     |      | AS        |       |         |         |     |       |      |         |
| 475  | Cryptocarya elegans      |      | AS        |       |         |         |     |       |      |         |
| 476  | Cryptocarya hornei       |      | AS        |       |         |         |     |       |      |         |
| 477  | Cryptocarya samoensis    |      | AS        |       |         |         |     |       |      |         |
| 478  | Cryptocarya turbinata    |      | AS        |       |         |         |     |       |      |         |

Tree Species Lists

| Code | Scientific Name                | Guam | Am. Samoa | Palau | Pohn-pei | Kos-rae | Yap | Chuuk | CNMI | Mar Isl |
|------|--------------------------------|------|-----------|-------|----------|---------|-----|-------|------|---------|
| 479  | Cryptocarya wilderi            |      | AS        |       |          |         |     |       |      |         |
| 480  | Cupaniopsis samoensis          |      | AS        |       |          |         |     |       |      |         |
| 1320 | Cyathea spp.                   |      | AS        | PAL   |          |         |     |       |      |         |
| 482  | Cyathea truncata               |      | AS        |       |          |         |     |       |      |         |
| 483  | Cyclophyllum barbatum          |      | AS        |       |          |         |     |       |      |         |
| 485  | Delonix regia                  | GUM  | AS        | PAL   | PON      |         | YAP |       | NMI  | MAR     |
| 486  | Dendrocide harveyi             |      | AS        |       |          |         |     |       |      |         |
| 487  | Diospyros discolor             | GUM  | AS        | PAL   |          |         |     |       |      |         |
| 488  | Diospyros ebenaster            | GUM  | AS        |       |          |         |     |       |      |         |
| 489  | Diospyros elliptica            |      | AS        |       |          |         |     |       |      |         |
| 490  | Diospyros major                |      | AS        |       |          |         |     |       |      |         |
| 491  | Diospyros samoensis            |      | AS        |       |          |         |     |       |      |         |
| 492  | Dipteris conjugata             |      | AS        |       |          |         |     |       |      |         |
| 493  | Drypetes vitiensis             |      | AS        |       |          |         |     |       |      |         |
| 494  | Durio zibethinus               |      | AS        |       |          |         |     |       |      |         |
| 495  | Dysoxylum forsteri             |      | AS        |       |          |         |     |       |      |         |
| 496  | Dysoxylum huntii               |      | AS        |       |          |         |     |       |      |         |
| 497  | Dysoxylum maota                |      | AS        |       |          |         |     |       |      |         |
| 498  | Dysoxylum samoense             |      | AS        |       |          |         |     |       |      |         |
| 1370 | Dysoxylum spp.                 |      | AS        |       |          |         |     |       |      |         |
| 500  | Dysoxylum tongense             |      | AS        |       |          |         |     |       |      |         |
| 501  | Elaeocarpus floridanus         |      | AS        |       |          |         |     |       |      |         |
| 502  | Elaeocarpus graeffei           |      | AS        |       |          |         |     |       |      |         |
| 503  | Elaeocarpus grandis            |      | AS        |       |          |         |     |       |      |         |
| 504  | Elaeocarpus ulianus            |      | AS        |       |          |         |     |       |      |         |
| 505  | Elattostachys falcata          |      | AS        |       |          |         |     |       |      |         |
| 506  | Eleocharis dulcis              |      | AS        |       |          |         |     |       |      |         |
| 507  | Endiandra elaeocarpa           |      | AS        |       |          |         |     |       |      |         |
| 508  | Erythrina fusca                |      | AS        | PAL   | PON      |         |     |       |      |         |
| 509  | Erythrina subumbrans           |      | AS        |       |          |         |     |       |      |         |
| 510  | Erythrina variegata            | GUM  | AS        | PAL   | PON      |         | YAP | TRK   | NMI  |         |
| 511  | Erythrospermum acuminatissimum |      | AS        |       |          |         |     |       |      |         |
| 512  | Eugenia reinwardtiana          | GUM  | AS        | PAL   |          |         | YAP |       |      |         |
| 513  | Eugenia uniflora               |      | AS        |       |          |         |     |       |      |         |
| 514  | Euphoria longana               |      | AS        |       |          |         |     |       |      |         |
| 515  | Excoecaria agallocha           | GUM  | AS        | PAL   |          |         | YAP | TRK   |      |         |
| 516  | Fagraea berteriana             | GUM  | AS        | PAL   | PON      |         |     | TRK   |      |         |
| 517  | Ficus godeffroyi               |      | AS        |       |          |         |     |       |      |         |
| 518  | Ficus obliqua                  |      | AS        |       |          |         |     |       |      |         |
| 519  | Ficus prolixa                  | GUM  | AS        | PAL   | PON      | KOS     | YAP | TRK   |      |         |
| 520  | Ficus scabra                   |      | AS        |       |          |         |     |       |      |         |
| 521  | Ficus tinctoria                | GUM  | AS        | PAL   | PON      | KOS     | YAP | TRK   | NMI  | MAR     |

Tree Species Lists

| Code | Scientific Name                 | Guam | Am. Samoa | Palau | Pohn-pei | Kos-rae | Yap | Chuuk | CNMI | Mar Isl |
|------|---------------------------------|------|-----------|-------|----------|---------|-----|-------|------|---------|
| 522  | <i>Ficus uniauriculata</i>      |      | AS        |       |          |         |     |       |      |         |
| 524  | <i>Flueggea flexuosa</i>        |      | AS        |       |          |         |     |       |      |         |
| 525  | <i>Funtumia elastica</i>        |      | AS        |       |          |         |     |       |      |         |
| 526  | <i>Garcinia mangostana</i>      |      | AS        | PAL   |          |         |     |       |      |         |
| 527  | <i>Garcinia myrtifolia</i>      |      | AS        |       |          |         |     |       |      |         |
| 528  | <i>Garcinia sessilis</i>        |      | AS        |       |          |         |     |       |      |         |
| 529  | <i>Gardenia taitensis</i> `     |      | AS        |       |          |         |     |       |      |         |
| 530  | <i>Garuga floribunda</i>        |      | AS        |       |          |         |     |       |      |         |
| 531  | <i>Geniostoma rupestre</i>      |      | AS        |       |          |         |     |       |      |         |
| 532  | <i>Gironniera celtiifolia</i>   |      | AS        | PAL   | PON      |         |     |       |      |         |
| 533  | <i>Glochidion cuspidatum</i>    |      | AS        |       |          |         |     |       |      |         |
| 535  | <i>Grewia crenata</i>           | GUM  | AS        |       |          |         |     |       | NMI  |         |
| 536  | <i>Guettarda speciosa</i>       | GUM  | AS        | PAL   | PON      | KOS     | YAP | TRK   | NMI  | MAR     |
| 537  | <i>Guioa lenticifolia</i>       |      | AS        |       |          |         |     |       |      |         |
| 538  | <i>Guioa rhoifolia</i>          |      | AS        |       |          |         |     |       |      |         |
| 539  | <i>Gyrocarpus americanus</i>    |      | AS        |       |          |         |     |       |      |         |
| 540  | <i>Haplolobus floribundus</i>   |      | AS        |       |          |         |     |       |      |         |
| 541  | <i>Harpullia arborea</i>        |      | AS        |       |          |         |     |       |      |         |
| 542  | <i>Hedycarya denticulate</i>    |      | AS        |       |          |         |     |       |      |         |
| 543  | <i>Hedycarya dorstenioides</i>  |      | AS        |       |          |         |     |       |      |         |
| 544  | <i>Heritiera littoralis</i>     | GUM  | AS        | PAL   | PON      | KOS     | YAP | TRK   |      |         |
| 545  | <i>Heritiera ornithocephala</i> |      | AS        |       |          |         |     |       |      |         |
| 546  | <i>Hernandia moerenhoutiana</i> |      | AS        |       |          |         |     |       |      |         |
| 547  | <i>Hernandia nymphaeifolia</i>  |      | AS        |       |          |         |     |       |      |         |
| 548  | <i>Hibiscus tiliaceus</i>       | GUM  | AS        | PAL   | PON      | KOS     | YAP | TRK   |      | MAR     |
| 549  | <i>Homalium whitmeeanus</i>     |      | AS        |       |          |         |     |       |      |         |
| 550  | <i>Inocarpus fagifer</i>        | GUM  | AS        | PAL   | PON      | KOS     | YAP | TRK   |      | MAR     |
| 551  | <i>Intsia bijuga</i>            | GUM  | AS        | PAL   | PON      |         | YAP | TRK   | NMI  | MAR     |
| 554  | <i>Lagostromia speciosa</i>     |      | AS        |       |          |         |     |       |      |         |
| 555  | <i>Lansium domesticum</i>       | GUM  | AS        |       |          |         |     |       |      |         |
| 556  | <i>Leucaena leucocephala</i>    | GUM  | AS        | PAL   |          |         | YAP |       | NMI  | MAR     |
| 558  | <i>Litchi chinensis</i>         |      | AS        | PAL   |          |         |     |       |      |         |
| 559  | <i>Litsea mellea</i>            |      | AS        |       |          |         |     |       |      |         |
| 560  | <i>Litsea samoensis</i>         |      | AS        |       |          |         |     |       |      |         |
| 561  | <i>Lucuma nervosa</i>           |      | AS        |       |          |         |     |       |      |         |
| 562  | <i>Lumnitzera littorea</i>      | GUM  | AS        | PAL   | PON      | KOS     | YAP | TRK   |      | MAR     |
| 563  | <i>Macadamia tetraphylla</i>    |      | AS        |       |          |         |     |       |      |         |
| 564  | <i>Macaranga grayana</i>        |      | AS        |       |          |         |     |       |      |         |
| 565  | <i>Macaranga harveyana</i>      |      | AS        |       |          |         |     |       |      |         |
| 566  | <i>Macaranga reineckeii</i>     |      | AS        |       |          |         |     |       |      |         |
| 567  | <i>Macaranga sp. Nova</i>       |      | AS        |       |          |         |     |       |      |         |
| 568  | <i>Macaranga stipulosa</i>      |      | AS        |       |          |         |     |       |      |         |

Tree Species Lists

| Code | Scientific Name           | Guam | Am. Samoa | Palau | Pohn-pei | Kos-rae | Yap | Chuuk | CNMI | Mar Isl |
|------|---------------------------|------|-----------|-------|----------|---------|-----|-------|------|---------|
| 569  | Mangifera indica          | GUM  | AS        | PAL   | PON      | KOS     | YAP | TRK   |      |         |
| 570  | Mammea glauca             |      | AS        |       |          |         |     |       |      |         |
| 571  | Manilkara dissecta        |      | AS        |       |          |         |     |       |      |         |
| 572  | Manilkara samoensis       |      | AS        |       |          |         |     |       |      |         |
| 573  | Maniltoa grandiflora      |      | AS        |       |          |         |     |       |      |         |
| 575  | Medusanthra samoensis     |      | AS        |       |          |         |     |       |      |         |
| 577  | Melicope retusa           |      | AS        |       |          |         |     |       |      |         |
| 578  | Melicytus samoensis       |      | AS        |       |          |         |     |       |      |         |
| 579  | Melilope lauterbachii     |      | AS        |       |          |         |     |       |      |         |
| 580  | Melochia aristata         |      | AS        |       |          |         |     |       |      |         |
| 581  | Meryta macrophylla        |      | AS        |       |          |         |     |       |      |         |
| 582  | Metrosideros collina      |      | AS        |       |          |         |     |       |      |         |
| 583  | Michelia champaca         |      | AS        |       |          |         |     |       |      |         |
| 584  | Micromelum minutum        |      | AS        |       |          |         |     |       |      |         |
| 585  | Millettia pinnata         |      | AS        | PAL   |          |         |     |       |      |         |
| 586  | Morinda citrifolia        | GUM  | AS        | PAL   | PON      | KOS     | YAP | TRK   | NMI  | MAR     |
| 588  | Mussaenda raiateensis     |      | AS        |       |          |         |     |       |      |         |
| 589  | Myristica fatua           |      | AS        |       |          |         |     |       |      |         |
| 590  | Myristica hypargyrea      |      | AS        | PAL   |          |         |     |       |      |         |
| 591  | Neisosperma oppositifolia | GUM  | AS        | PAL   | PON      |         | YAP | TRK   | NMI  | MAR     |
| 592  | Neonauclea forsteri       |      | AS        |       |          |         |     |       |      |         |
| 593  | Nephelium lappaceum       | GUM  | AS        | PAL   |          |         |     |       |      |         |
| 594  | Ochrosia vitiensis        |      | AS        |       |          |         |     |       |      |         |
| 595  | Omalanthus acuminatus     |      | AS        |       |          |         |     |       |      |         |
| 596  | Omalanthus nutans         |      | AS        |       |          |         |     |       |      |         |
| 597  | Palaquium stehlinii       |      | AS        |       |          |         |     |       |      |         |
| 598  | Pandanus reineckeii       |      | AS        |       |          |         |     |       |      |         |
| 599  | Paraserianthes falcata    |      | AS        |       |          |         |     |       |      |         |
| 600  | Parasponia andersonii     |      | AS        |       |          |         |     |       |      |         |
| 601  | Parinari insularum        |      | AS        |       |          |         |     |       |      |         |
| 602  | Pemphis acidula           |      | AS        | PAL   | PON      | KOS     | YAP | TRK   | NMI  | MAR     |
| 603  | Persea americana          | GUM  | AS        | PAL   |          |         |     |       |      |         |
| 605  | Pipturus argenteus        | GUM  | AS        | PAL   | PON      | KOS     | YAP | TRK   | NMI  | MAR     |
| 606  | Pisonia grandis           | GUM  | AS        | PAL   | PON      |         | YAP | TRK   | NMI  | MAR     |
| 607  | Pisonia umbellifera       | GUM  | AS        | PAL   |          |         |     |       | NMI  |         |
| 608  | Pittosporum arborescens   |      | AS        |       |          |         |     |       |      |         |
| 609  | Pittosporum samoense      |      | AS        |       |          |         |     |       |      |         |
| 610  | Planchonella garberi      |      | AS        |       |          |         |     |       |      |         |
| 611  | Planchonella grayana      |      | AS        |       |          |         |     |       |      |         |
| 612  | Planchonella linggensis   |      | AS        |       |          |         |     |       |      |         |
| 613  | Planchonella membranacea  |      | AS        |       |          |         |     |       |      |         |
| 614  | Planchonella samoensis    |      | AS        |       |          |         |     |       |      |         |

Tree Species Lists

| Code | Scientific Name             | Guam | Am. Samoa | Palau | Pohn-pei | Kos-rae | Yap | Chuuk | CNMI | Mar Isl |
|------|-----------------------------|------|-----------|-------|----------|---------|-----|-------|------|---------|
| 615  | Planchonella torricellensis |      | AS        |       |          |         |     |       |      |         |
| 616  | Pleiogynium timoriense      |      | AS        |       |          |         |     |       |      |         |
| 617  | Polyathia sp. Nova          |      | AS        |       |          |         |     |       |      |         |
| 618  | Polyscias multijuga         |      | AS        |       |          |         |     |       |      |         |
| 619  | Polyscias samoensis         |      | AS        |       |          |         |     |       |      |         |
| 620  | Pometia pinnata             |      | AS        |       |          |         | YAP |       |      |         |
| 621  | Pouteria caimito            |      | AS        |       |          |         |     |       |      |         |
| 622  | Premna serratifolia         |      | AS        |       |          |         |     |       |      |         |
| 623  | Pritchardia pacifica        |      | AS        |       |          |         |     |       |      |         |
| 624  | Psidium guajava             | GUM  | AS        | PAL   | PON      |         | YAP |       | NMI  |         |
| 625  | Psychotria grandistipulata  |      | AS        |       |          |         |     |       |      |         |
| 626  | Psychotria insularum        |      | AS        |       |          |         |     |       |      |         |
| 627  | Psydrax odorata             |      | AS        |       |          |         |     |       |      |         |
| 628  | Rapanea myricifolia         |      | AS        |       |          |         |     |       |      |         |
| 629  | Reynoldsia lanotoensis      |      | AS        |       |          |         |     |       |      |         |
| 630  | Reynoldsia pleiosperma      |      | AS        |       |          |         |     |       |      |         |
| 631  | Rheedula edulis             |      | AS        |       |          |         |     |       |      |         |
| 632  | Rhizophora mangle           |      | AS        |       |          |         |     |       |      |         |
| 633  | Rhizophora stylosa          |      | AS        |       |          |         |     |       |      |         |
| 634  | Rhus taitensis              | GUM  | AS        | PAL   |          |         | YAP |       |      |         |
| 635  | Rollinia deliciosa          |      | AS        |       |          |         |     |       |      |         |
| 636  | Samanea saman               | GUM  | AS        | PAL   |          | KOS     | YAP |       | NMI  |         |
| 637  | Sandoricum koetjape         | GUM  | AS        |       |          |         |     |       |      |         |
| 638  | Santalum yasi               |      | AS        |       |          |         |     |       |      |         |
| 639  | Sapindus vitiensis          |      | AS        |       |          |         |     |       |      |         |
| 640  | Sarcopygme pacifica         |      | AS        |       |          |         |     |       |      |         |
| 642  | Schefflera samoensis        |      | AS        |       |          |         |     |       |      |         |
| 643  | Schleinitzia insularum      |      | AS        |       |          |         |     |       |      |         |
| 644  | Securinega flexuosa         |      | AS        |       |          |         |     |       |      |         |
| 645  | Semecarpus vitiensis        |      | AS        |       |          |         |     |       |      |         |
| 646  | Serianthes melanesica       |      | AS        |       |          |         |     |       |      |         |
| 647  | Sesbania grandiflora        | GUM  | AS        | PAL   |          |         |     |       |      |         |
| 648  | Solanum vitiense            |      | AS        |       |          |         |     |       |      |         |
| 649  | Sophora tomentosa           |      | AS        | PAL   | PON      |         |     |       |      | MAR     |
| 650  | Spathodea campanulata       | GUM  | AS        | PAL   |          |         | YAP |       |      |         |
| 651  | Spiraeanthemum samoense     |      | AS        |       |          |         |     |       |      |         |
| 652  | Spondias dulcis             |      | AS        | PAL   |          |         |     | TRK   |      |         |
| 653  | Sterculia fanaiho           |      | AS        |       |          |         |     |       |      |         |
| 654  | Streblus anthropophagorum   |      | AS        |       |          |         |     |       |      |         |
| 655  | Swietenia macrophylla       |      | AS        | PAL   |          |         |     |       |      |         |
| 656  | Synsepalum dulcificum       |      | AS        |       |          |         |     |       |      |         |

Tree Species Lists

| Code | Scientific Name            | Guam | Am. Samoa | Palau | Pohn-pei | Kos-rae | Yap | Chuuk | CNMI | Mar Isl |
|------|----------------------------|------|-----------|-------|----------|---------|-----|-------|------|---------|
| 657  | Syzygium corynocarpum      |      | AS        |       |          |         |     |       |      |         |
| 658  | Syzygium brevifolium       |      | AS        |       |          |         |     |       |      |         |
| 659  | Syzygium carolinense       |      | AS        |       |          |         |     |       |      |         |
| 660  | Syzygium clusiifolium      |      | AS        |       |          |         |     |       |      |         |
| 661  | Syzygium dealatum          |      | AS        |       |          |         |     |       |      |         |
| 662  | Syzygium inophylloides     |      | AS        |       |          |         |     |       |      |         |
| 663  | Syzygium jambos            |      | AS        |       |          |         |     |       |      |         |
| 664  | Syzygium richii            |      | AS        |       |          |         |     |       |      |         |
| 665  | Syzygium samarangense      |      | AS        |       |          |         |     |       |      |         |
| 666  | Syzygium samoense          |      | AS        |       |          |         |     |       |      |         |
| 667  | Syzygium savaiiense        |      | AS        |       |          |         |     |       |      |         |
| 668  | Tabernaemontana pandacaqui |      | AS        |       |          |         |     |       |      |         |
| 669  | Tarenna sambucina          | GUM  | AS        |       |          |         |     |       | NMI  |         |
| 670  | Terminalia catappa         | GUM  | AS        | PAL   | PON      | KOS     | YAP | TRK   | NMI  | MAR     |
| 672  | Terminalia glabrata        |      | AS        |       |          |         |     |       |      |         |
| 673  | Terminalia richii          |      | AS        |       |          |         |     |       |      |         |
| 674  | Terminalia samoensis       | GUM  | AS        | PAL   | PON      |         | YAP | TRK   |      | MAR     |
| 675  | Theobroma cacao            | GUM  | AS        | PAL   |          |         | YAP |       |      |         |
| 676  | Thespesia populnea         | GUM  | AS        | PAL   | PON      | KOS     | YAP | TRK   | NMI  | MAR     |
| 678  | Tournefortia argentea      | GUM  | AS        | PAL   | PON      | KOS     | YAP | TRK   | NMI  | MAR     |
| 679  | Trema cannabina            |      | AS        | PAL   |          |         |     |       |      |         |
| 680  | Trichospermum richii       |      | AS        |       |          |         |     |       |      |         |
| 681  | Vavaea amicorum            |      | AS        |       |          |         |     |       |      |         |
| 682  | Veitchia merrillii         | GUM  | AS        |       |          |         |     |       |      |         |
| 683  | Wedelia biflora            |      | AS        |       |          |         |     |       |      |         |
| 684  | Weinmannia affinis         |      | AS        |       |          |         |     |       |      |         |
| 685  | Xylocarpus granatum        | GUM  | AS        | PAL   | PON      | KOS     | YAP | TRK   |      |         |
| 686  | Xylocarpus moluccensis     | GUM  | AS        | PAL   |          |         | YAP |       |      |         |
| 688  | Xylosma samoense           |      | AS        |       |          |         |     |       |      |         |
| 689  | Xylosma smithianum         |      | AS        |       |          |         |     |       |      |         |
| 690  | Zanthophyllum pinnatum     |      | AS        |       |          |         |     |       |      |         |
| 691  | Cyathea lunulata           | GUM  | AS        | PAL   |          |         |     |       |      |         |
| 692  | Pandanus tectorius         | GUM  | AS        | PAL   | PON      |         | YAP |       | NMI  |         |
| 695  | Avicennia mariana          | GUM  |           | PAL   |          |         | YAP |       |      |         |
| 701  | Polyscias grandifolia      | GUM  |           | PAL   |          |         | YAP | TRK   | NMI  |         |
| 703  | Kleinhovia hospita         | GUM  | AS        | PAL   | PON      |         |     | TRK   |      |         |
| 705  | Elaeocarpus tongnus        |      | AS        |       |          |         |     |       |      |         |
| 706  | Glochidion ramiflorum      |      | AS        |       |          |         |     |       |      |         |
| 708  | Ceriops tagal              |      |           | PAL   |          |         |     |       |      |         |
| 713  | Dracaena multiflora        |      |           | PAL   |          |         |     |       |      |         |
| 715  | Maytenus palauica          |      |           | PAL   |          |         |     |       |      |         |
| 716  | Osmoxydon oliveri          |      |           | PAL   |          |         |     |       |      |         |

Tree Species Lists

| Code | Scientific Name             | Guam | Am. Samoa | Palau | Pohn-pei | Kos-rae | Yap | Chuuk | CNMI | Mar Isl |
|------|-----------------------------|------|-----------|-------|----------|---------|-----|-------|------|---------|
| 717  | Osmoxylon pachphyllum       |      |           | PAL   |          |         |     |       |      |         |
| 718  | Osmoxylon truncatum         |      |           | PAL   |          |         |     |       |      |         |
| 720  | Rhizophora lamarkii         |      |           | PAL   |          |         |     |       |      |         |
| 722  | Symplocos racemosa          |      |           | PAL   |          |         |     |       |      |         |
| 723  | Timonius corymbosus         |      |           | PAL   |          |         |     |       |      |         |
| 724  | Timonius mollis             |      |           | PAL   |          |         |     |       |      |         |
| 726  | Timonius subauritus         |      |           | PAL   |          |         |     |       |      |         |
| 727  | Timonius timon              |      |           | PAL   |          |         |     |       |      |         |
| 800  | Aglaia palauensis           |      |           | PAL   |          |         |     |       |      |         |
| 801  | Aglaia ponapensis           |      |           |       | PON      |         |     |       |      |         |
| 802  | Albizia falcataria          |      |           | PAL   |          |         |     |       |      |         |
| 803  | Albizia retusa              |      |           | PAL   |          |         |     |       |      |         |
| 804  | Allophylus ternatus         |      |           | PAL   | PON      |         |     |       |      |         |
| 805  | Alphitonia carolinensis     |      |           | PAL   |          |         |     |       |      |         |
| 806  | Angiopteris evecta          |      |           | PAL   | PON      |         | YAP |       |      |         |
| 807  | Astronidium palauense       |      |           | PAL   |          |         |     |       |      |         |
| 808  | Badusa palauensis           |      |           | PAL   |          |         |     |       |      |         |
| 809  | Bauhinia binata             |      |           | PAL   |          |         |     |       |      |         |
| 810  | Buchanania engleriana       |      |           | PAL   |          |         |     |       |      |         |
| 811  | Buchanania palawensis       |      |           | PAL   |          |         |     |       |      |         |
| 812  | Calophyllum pelewense       |      |           | PAL   |          |         |     |       |      |         |
| 813  | Calophyllum soulattri       |      |           | PAL   |          |         |     |       |      |         |
| 814  | Camptosperma brevipetiolata |      |           | PAL   | PON      | KOS     | YAP |       |      |         |
| 815  | Canarium hirsutum           |      |           | PAL   |          |         |     |       |      |         |
| 816  | Canarium indicum            |      |           |       |          |         |     |       |      | MAR     |
| 817  | Caryota mitis               |      |           | PAL   |          |         |     |       |      |         |
| 818  | Casearia cauliflora         |      |           | PAL   |          |         |     |       |      |         |
| 819  | Cassia grandis              |      |           | PAL   |          |         |     |       |      |         |
| 820  | Cassia siamea               |      |           | PAL   |          |         | YAP |       |      |         |
| 821  | Celtis paniculata           |      |           | PAL   |          |         | YAP |       |      |         |
| 822  | Cerbera floribunda          |      |           | PAL   |          |         |     |       |      |         |
| 823  | Cinnamomum carolinense      |      |           | PAL   | PON      | KOS     |     |       |      |         |
| 824  | Cinnamomum pedatinervium    |      |           | PAL   |          |         |     |       |      |         |
| 825  | Cinnamomum sessilifolium    |      |           |       | PON      |         |     |       |      |         |
| 826  | Citrus mitis                |      |           | PAL   |          |         | YAP |       |      |         |
| 827  | Claoxylon carolinianum      |      |           |       | PON      |         |     |       |      |         |
| 828  | Claoxylon fallax            |      |           | PAL   |          |         |     |       |      |         |
| 829  | Claoxylon longiracemosum    |      |           | PAL   |          |         |     |       |      |         |
| 830  | Cleistanthus carolinensis   |      |           | PAL   |          |         |     |       |      |         |
| 831  | Cleistanthus insularis      |      |           | PAL   |          |         |     |       |      |         |

Tree Species Lists

| Code | Scientific Name             | Guam | Am. Samoa | Palau | Pohn-pei | Kos-rae | Yap | Chuuk | CNMI | Mar Isl |
|------|-----------------------------|------|-----------|-------|----------|---------|-----|-------|------|---------|
| 832  | Colona scabra               |      |           | PAL   |          |         |     |       |      |         |
| 833  | Combretum tetralophum       |      |           | PAL   |          |         |     |       |      |         |
| 834  | Cordia micronesica          |      |           | PAL   |          |         |     |       |      |         |
| 835  | Cordia sebestena            |      |           | PAL   |          |         |     |       |      |         |
| 836  | Cyathea nigricans           |      |           | PAL   | PON      |         |     |       |      |         |
| 837  | Cyathea ponapeana           |      |           |       | PON      | KOS     |     |       |      |         |
| 838  | Cycas revoluta              |      |           | PAL   |          |         |     |       |      |         |
| 839  | Diospyros ferrea            |      |           | PAL   |          |         | YAP |       |      |         |
| 840  | Dolichandrone spathacea     |      |           | PAL   |          |         | YAP |       |      |         |
| 842  | Drypetes nitida             |      |           | PAL   |          |         |     |       |      |         |
| 843  | Elaeis guineensis           |      |           | PAL   | PON      |         |     |       |      |         |
| 844  | Elaeocarpus carolinensis    |      |           | PAL   | PON      | KOS     |     |       |      |         |
| 845  | Elaeocarpus kerstingianus   |      |           |       | PON      |         |     |       |      |         |
| 846  | Elaeocarpus kusanoi         |      |           |       | PON      |         |     |       |      |         |
| 1400 | Eucalyptus sp.              |      |           | PAL   |          |         |     |       |      |         |
| 848  | Eugenia aquea               |      |           | PAL   |          |         |     |       |      |         |
| 849  | Eugenia caryophyllus        |      |           | PAL   |          |         |     |       |      |         |
| 850  | Eugenia nitida              |      |           | PAL   |          |         |     |       |      |         |
| 851  | Eugenia palauensis          |      |           | PAL   |          |         |     |       |      |         |
| 852  | Eugenia suzukii             |      |           | PAL   |          |         |     |       |      |         |
| 854  | Evodia hortensis            |      |           |       | PON      |         |     |       |      |         |
| 855  | Evodia nitida               |      |           | PAL   |          |         |     |       |      |         |
| 856  | Evodia palawensis           |      |           | PAL   |          |         |     |       |      |         |
| 857  | Evodia ponapensis           |      |           |       | PON      |         |     |       |      |         |
| 858  | Evodia trichantha           |      |           | PAL   |          |         |     |       |      |         |
| 859  | Exorrhiza ponapensis        |      |           |       | PON      |         |     |       |      |         |
| 860  | Fagraea ksid                |      |           | PAL   |          |         |     |       |      |         |
| 861  | Ficus saffordii             |      |           | PAL   |          |         |     |       |      |         |
| 863  | Finischia chloroxantha      |      |           | PAL   |          |         |     |       |      |         |
| 864  | Garcinia matudai            |      |           | PAL   |          |         |     |       |      |         |
| 865  | Garcinia ponapensis         |      |           |       | PON      |         |     |       |      |         |
| 866  | Garcinia rumiyo             |      |           | PAL   |          |         | YAP |       |      |         |
| 867  | Gmelina palawensis          |      |           | PAL   |          |         |     |       |      |         |
| 868  | Gnetum gnemon               |      |           | PAL   |          |         |     |       |      |         |
| 869  | Gmelina elliptica           |      |           | PAL   |          |         |     |       |      |         |
| 870  | Goniiothalamus carolinensis |      |           | PAL   |          |         |     |       |      |         |
| 871  | Gulubia palauensis          |      |           | PAL   |          |         |     |       |      |         |
| 872  | Horsfieldia amklaal         |      |           | PAL   |          |         |     |       |      |         |
| 873  | Horsfieldia novo-guineensi  |      |           | PAL   |          |         |     |       |      |         |
| 874  | Horsfieldia palauensis      |      |           | PAL   |          |         |     |       |      |         |
| 875  | Kayea pacifica              |      |           | PAL   |          |         |     |       |      |         |
| 876  | Macaranga carolinensis      |      |           | PAL   | PON      | KOS     | YAP | TRK   |      |         |

Tree Species Lists

| Code | Scientific Name          | Guam | Am. Samoa | Palau | Pohn-pei | Kos-rae | Yap | Chuuk | CNMI | Mar Isl |
|------|--------------------------|------|-----------|-------|----------|---------|-----|-------|------|---------|
| 877  | Mallotus palauensis      |      |           | PAL   |          |         |     |       |      |         |
| 878  | Mallotus tiliaefolius    |      |           | PAL   |          |         |     |       |      |         |
| 879  | Mangifera minor          |      |           |       | PON      |         |     |       |      |         |
| 880  | Manilkara hoshinoi       |      |           |       | PON      |         |     |       |      |         |
| 882  | Manilkara udoido         |      |           | PAL   |          |         |     |       |      |         |
| 883  | Marattia fraxinea        |      |           | PAL   |          |         |     |       |      |         |
| 884  | Medusanthra carolinensis |      |           | PAL   |          |         |     |       |      |         |
| 885  | Melaleuca quinquenervia  |      |           | PAL   |          |         |     |       |      |         |
| 886  | Meryta senftiana         |      |           | PAL   |          |         |     |       |      |         |
| 887  | Metroxylon sagu          |      |           | PAL   |          |         |     |       |      |         |
| 888  | Morinda latibracteata    |      |           | PAL   |          |         |     |       |      |         |
| 889  | Morinda pendunculata     |      |           | PAL   |          |         |     |       |      |         |
| 890  | Musa coccinea            |      |           | PAL   |          |         |     |       |      |         |
| 891  | Musa nana                |      |           |       | PON      |         |     |       |      |         |
| 892  | Musa sapientum           |      |           | PAL   | PON      |         |     |       |      | MAR     |
| 893  | Musa textilis            |      |           | PAL   | PON      |         |     |       |      |         |
| 894  | Musa tikap               |      |           |       | PON      |         |     |       |      |         |
| 895  | Musa troglodytarum       |      |           |       |          |         | YAP |       |      |         |
| 896  | Mussaenda frondosa       |      |           |       |          |         | YAP |       |      |         |
| 897  | Myristica insularis      |      |           | PAL   | PON      |         |     |       |      |         |
| 898  | Neubergia celebica       |      |           | PAL   |          | KOS     |     |       |      |         |
| 899  | Nypa fruticans           |      |           | PAL   | PON      | KOS     | YAP | TRK   |      |         |
| 900  | Ochroma pyramidale       |      |           | PAL   |          |         |     |       |      |         |
| 901  | Ormosia calavensis       |      |           | PAL   |          |         |     |       |      |         |
| 902  | Pachira aquatica         |      |           | PAL   |          |         |     |       |      |         |
| 903  | Pandanus aimiriikensis   |      |           | PAL   |          |         |     |       |      |         |
| 905  | Pandanus cominsii        |      |           |       | PON      |         |     |       |      |         |
| 906  | Pandanus compressus      |      |           | PAL   | PON      |         |     |       |      |         |
| 907  | Pandanus cylindricus     |      |           |       | PON      |         |     | TRK   |      |         |
| 908  | Pandanus dilatatus       |      |           |       | PON      |         |     |       |      |         |
| 909  | Pandanus divergens       |      |           | PAL   |          |         |     |       |      |         |
| 910  | Pandanus duriocarpus     |      |           | PAL   |          |         |     |       |      |         |
| 911  | Pandanus enchabiensis    |      |           |       |          |         |     |       |      | MAR     |
| 912  | Pandanus fischerianus    |      |           |       | PON      |         |     |       |      |         |
| 913  | Pandanus hosinoi         |      |           |       | PON      |         |     |       |      |         |
| 914  | Pandanus jalvitensis     |      |           |       | PON      | KOS     |     |       |      | MAR     |
| 915  | Pandanus kanehirae       |      |           | PAL   |          |         |     |       |      |         |
| 916  | Pandanus kororensis      |      |           | PAL   |          |         |     |       |      |         |
| 917  | Pandanus lakatwa         |      |           |       |          |         |     |       |      | MAR     |
| 918  | Pandanus laticanalicula  |      |           |       |          |         |     |       |      | MAR     |
| 919  | Pandanus macrocephalus   |      |           |       | PON      |         |     |       |      | MAR     |
| 920  | Pandanus                 |      |           | PAL   |          |         |     |       |      |         |

Tree Species Lists

| Code | Scientific Name               | Guam | Am. Samoa | Palau | Pohn-pei | Kos-rae | Yap | Chuuk | CNMI | Mar Isl |
|------|-------------------------------|------|-----------|-------|----------|---------|-----|-------|------|---------|
|      | macrojeanneretia              |      |           |       |          |         |     |       |      |         |
| 921  | Pandanus menne                |      |           |       |          |         |     |       |      | MAR     |
| 922  | Pandanus obliquus             |      |           |       |          |         |     |       |      | MAR     |
| 923  | Pandanus odontoides           |      |           |       | PON      |         |     |       |      |         |
| 924  | Pandanus palawensis           |      |           | PAL   |          |         |     |       |      |         |
| 925  | Pandanus patina               |      |           |       | PON      |         |     |       |      |         |
| 926  | Pandanus peliliuensis         |      |           | PAL   |          |         |     |       |      |         |
| 927  | Pandanus ponapensis           |      |           |       | PON      |         |     |       |      |         |
| 928  | Pandanus pulposus             |      |           |       | PON      |         |     |       |      | MAR     |
| 929  | Pandanus rectangulatus        |      |           |       |          |         |     |       |      | MAR     |
| 930  | Pandanus rotundatus           |      |           |       | PON      |         |     |       |      |         |
| 931  | Pandanus tolotomensis         |      |           |       | PON      |         |     |       |      |         |
| 932  | Pandanus trukensis            |      |           |       |          |         |     |       |      | MAR     |
| 933  | Pandanus utiyamai             |      |           |       | PON      |         |     |       |      |         |
| 934  | Pandanus variegatus           |      |           | PAL   |          |         |     |       |      |         |
| 935  | Parinari corymbosa            |      |           | PAL   |          |         |     |       |      |         |
| 936  | Parinari laurina              |      |           | PAL   | PON      | KOS     | YAP | TRK   |      |         |
| 937  | Parkia parvifoliola           |      |           | PAL   |          |         |     |       |      |         |
| 938  | Pinanga insignis              |      |           | PAL   |          |         |     |       |      |         |
| 939  | Polyscias nodosa              |      |           | PAL   |          |         |     |       |      |         |
| 940  | Ponapea hosinoi               |      |           |       | PON      |         |     |       |      |         |
| 941  | Ponapea ledermanniana         |      |           |       |          | KOS     |     |       |      |         |
| 942  | Pouteria calcarea             |      |           | PAL   |          |         |     |       |      |         |
| 943  | Premna pubescens              |      |           | PAL   |          |         |     |       |      |         |
| 944  | Ptychosperma kusaiensis       |      |           |       |          | KOS     |     |       |      |         |
| 945  | Ptychosperma palauensis       |      |           | PAL   |          |         |     |       |      |         |
| 946  | Rauvolfia insularis           |      |           | PAL   |          |         |     |       |      |         |
| 947  | Ravenala<br>madagascariensis  |      |           | PAL   |          |         |     |       |      |         |
| 948  | Rinorea carolinensis          |      |           | PAL   |          |         |     |       |      |         |
| 949  | Roystonea oleracea            |      |           | PAL   |          |         |     |       |      |         |
| 950  | Samadera indica               |      |           | PAL   |          |         |     |       |      |         |
| 951  | Sapium indicum                |      |           | PAL   |          |         |     |       |      |         |
| 952  | Scyphiphora<br>hydrophyllacea |      |           | PAL   |          |         | YAP |       |      |         |
| 953  | Semecarpus venenosus          |      |           | PAL   |          |         | YAP |       |      |         |
| 954  | Serianthes kanehirae          |      |           | PAL   |          |         | YAP |       |      |         |
| 955  | Spondias mombin               |      |           | PAL   |          |         |     |       |      |         |
| 956  | Spondias pinnata              |      |           | PAL   |          |         |     |       |      |         |
| 957  | Stemonurus ammui              |      |           | PAL   |          |         |     |       |      |         |
| 958  | Sterculia palauensis          |      |           | PAL   |          |         |     |       |      |         |
| 959  | Swietenia mahogoni            |      |           | PAL   |          | KOS     | YAP |       |      |         |
| 960  | Tabernaemontana               |      |           | PAL   |          |         |     |       |      |         |

Tree Species Lists

| Code | Scientific Name              | Guam | Am.<br>Samoa | Palau | Pohn-<br>pei | Kos-<br>rae | Yap | Chuuk | CNMI | Mar<br>Isl |
|------|------------------------------|------|--------------|-------|--------------|-------------|-----|-------|------|------------|
|      | aurantiaca                   |      |              |       |              |             |     |       |      |            |
| 961  | Tecoma stans                 |      |              | PAL   |              |             |     |       |      |            |
| 962  | Tectona grandis              |      |              | PAL   |              | KOS         |     |       |      |            |
| 963  | Terminalia carolinensis      |      |              |       | PON          | KOS         |     |       |      |            |
| 964  | Terminalia crassipes         |      |              | PAL   |              |             |     |       |      |            |
| 965  | Terminalia edulis            |      |              | PAL   |              |             |     |       |      |            |
| 966  | Terminalia kaernbachii       |      |              | PAL   |              |             |     |       |      |            |
| 967  | Trichospermum ikutai         |      |              |       |              |             | YAP |       |      |            |
| 968  | Trichospermum<br>ledermannii |      |              | PAL   |              |             |     |       |      |            |
| 969  | Vitex coffassus              |      |              | PAL   |              |             |     |       |      |            |
| 993  | Melia azedarach              | GUM  |              |       | PON          |             | YAP |       |      |            |
| 999  | Unknown, other               | GUM  | AS           | PAL   | PON          | KOS         | YAP | TRK   | NMI  | MAR        |
|      |                              |      |              |       |              |             |     |       |      |            |
| >999 | see GENUS CODES              |      |              |       |              |             |     |       |      |            |
|      |                              |      |              |       |              |             |     |       |      |            |
| 9000 | to 9999 Unknowns             |      |              |       |              |             |     |       |      |            |



***Palau Tree Species***

| Code | Scientific Name         | Palau Common name    | Code | Scientific Name          | Palau Common name         |
|------|-------------------------|----------------------|------|--------------------------|---------------------------|
| 278  | Acacia confusa          | ianangi              | 293  | Artocarpus altilis       | arandu, meduu, breadfruit |
| 1011 | Acacia spp.             |                      | 294  | Artocarpus heterophyllus | baramits                  |
| 400  | Adenanthera pavonina    | telentundalel        | 110  | Artocarpus mariannensis  | chebiei, mediuu liou      |
| 800  | Aglaia palauensis       | mesecheues           | 295  | Artocarpus nobilis       |                           |
| 1010 | Aglaia spp.             |                      | 1080 | Artocarpus spp.          | meduu                     |
| 101  | Aidia racemosa          | kerumes, omail       | 807  | Astronidium palauense    | meskui                    |
| 802  | Albizia falcataria      | ukall ra ngebard     | 1090 | Astronidium spp.         |                           |
| 102  | Albizia lebbeck         |                      | 427  | Averrhoa bilimbi         | imukurs, oterebekii       |
| 803  | Albizia retusa          | ukall ra ngebard     | 428  | Averrhoa carambola       | kemim, ourderteboteb      |
| 1000 | Albizia spp.            |                      | 1100 | Averrhoa spp.            |                           |
| 1030 | Allophylus spp.         |                      | 695  | Avicennia mariana        | dadaait                   |
| 804  | Allophylus ternatus     | chebeludes           | 1110 | Avicennia spp.           |                           |
| 408  | Allophylus timorensis   | ebeludes, chebeludes | 808  | Badusa palauensis        | ralm                      |
| 805  | Alphitonia carolinensis | chelebiob, elebiong  | 430  | Barringtonia asiatica    | bdull                     |
| 1040 | Alphitonia spp.         |                      | 112  | Barringtonia racemosa    | koranges                  |
| 806  | Angiopteris evecta      | dermarm              | 1120 | Barringtonia spp.        |                           |
| 412  | Annona muricata         | sausab               | 809  | Bauhinia binata          |                           |
| 105  | Annona reticulata       | ngel ra ngebard      | 113  | Bauhinia monandra        | Orchid tree               |
| 1050 | Annona spp.             |                      | 1130 | Bauhinia spp.            |                           |
| 413  | Annona squamosa         | ngel ra ngebard      | 435  | Bruguiera gymnorhiza     | kodenges, denges          |
| 106  | Antidesma buniis        | jiam, siam           | 810  | Buchanania engleriana    | omail                     |
| 1060 | Antidesma spp.          |                      | 811  | Buchanania palawensis    | omail, deuachel           |
| 111  | Araucaria excelsa       |                      | 1140 | Buchanania spp.          |                           |
| 108  | Araucaria heterophylla  | norfolk island pine  | 440  | Calophyllum inophyllum   | btaches                   |
| 1070 | Araucaria spp.          |                      | 812  | Calophyllum pelewense    | chesemolech               |
| 417  | Areca catechu           | buuch, betel nut     | 813  | Calophyllum soulattri    | olebtaches, chesemolech   |
| 109  | Arenga pinnata          |                      | 1150 | Calophyllum spp.         |                           |
|      |                         |                      |      |                          |                           |
|      |                         |                      |      |                          |                           |
|      |                         |                      |      |                          |                           |
|      |                         |                      |      |                          |                           |
|      |                         |                      |      |                          |                           |

# Tree Species Lists

| Code | Scientific Name               | Palau Common name              |  | Code | Scientific Name           | Palau Common name             |
|------|-------------------------------|--------------------------------|--|------|---------------------------|-------------------------------|
| 814  | Camptosperma brevipedunculata | kelela charm, kiu              |  | 122  | Citrus grandis            | siabong                       |
| 441  | Cananga odorata               | irang, chirang                 |  | 124  | Citrus limon              | lemon, malchianged, debechel  |
| 815  | Canarium hirsutum             | mesecheues                     |  | 826  | Citrus mitis              | calamondin, kingkang          |
| 1160 | Canarium spp.                 |                                |  | 463  | Citrus reticulata         | kerekur                       |
| 448  | Carica papaya                 | bobai, chebingel               |  | 1240 | Citrus spp.               | bekersiu, cheritel            |
| 817  | Caryota mitis                 | fish tail palm                 |  | 828  | Claoxylon fallax          |                               |
| 1170 | Caryota spp.                  |                                |  | 829  | Claoxylon longiracemosum  |                               |
| 818  | Casuarina cauliflora          | keuert                         |  | 1250 | Claoxylon spp.            |                               |
| 1180 | Casuarina spp.                |                                |  | 830  | Cleistanthus carolinensis |                               |
| 450  | Cassia fistula                | shower tree                    |  | 831  | Cleistanthus insularis    |                               |
| 819  | Cassia grandis                | pink shower                    |  | 1260 | Cleistanthus spp.         |                               |
| 820  | Cassia siamea                 | kassod tree                    |  | 466  | Cocos nucifera            | lius, coconut                 |
| 1190 | Cassia spp.                   |                                |  | 129  | Coffea arabica            | kohi, coffee                  |
| 452  | Casuarina equisetifolia       | ngas, ironwood                 |  | 1270 | Coffea spp.               |                               |
| 117  | Casuarina litorea             | gagu, australian pine          |  | 832  | Colona scabra             | uab, chuchab                  |
| 1200 | Casuarina spp.                |                                |  | 833  | Combretum tetralophum     | ochaol                        |
| 119  | Ceiba pentandra               | kalngebard                     |  | 468  | Commersonia bartramia     | eremallueang, chermallucheang |
| 821  | Celtis paniculata             |                                |  | 834  | Cordia micronesica        |                               |
| 1210 | Celtis spp.                   |                                |  | 835  | Cordia sebestena          | kalau, kelau                  |
| 822  | Cerbera floribunda            | emeridech                      |  | 1290 | Cordia spp.               |                               |
| 454  | Cerbera manghas               | emeridech                      |  | 472  | Cordia subcordata         | baderirt, badrirs             |
| 1220 | Cerbera spp.                  |                                |  | 1300 | Cryptocarya spp.          |                               |
| 708  | Cerriops tagal                | biut                           |  | 691  | Cyathea lunulata          | eluu, tree fern, cheluu       |
| 457  | Chrysophyllum cainito         | kaimito, kemim, star apple     |  | 836  | Cyathea nigricans         |                               |
| 823  | Cinnamomum carolinense        | ochod                          |  | 1310 | Cyathea spp.              |                               |
| 824  | Cinnamomum pedatinervium      | ochod                          |  | 134  | Cycas circinalis          | kokeal, remiang               |
| 1230 | Cinnamomum spp.               |                                |  | 838  | Cycas revoluta            | remiang                       |
| 458  | Cinnamomum verum              | ochod ra ngebard, cinnamontree |  | 1311 | Cycas spp.                |                               |
| 461  | Citrus aurantifolia           | malchianged                    |  | 135  | Cynometra ramiflora       | kalengui, ketenguit           |
|      |                               |                                |  |      |                           |                               |
|      |                               |                                |  |      |                           |                               |
|      |                               |                                |  |      |                           |                               |

# Tree Species Lists

| Code | Scientific Name                    | Palau Common name        | Code | Scientific Name                   | Palau Common name      |
|------|------------------------------------|--------------------------|------|-----------------------------------|------------------------|
| 485  | <i>Delonix regia</i>               | nangyo, nangiosikura     | 852  | <i>Eugenia suzukii</i>            | rebotel                |
| 487  | <i>Diospyros discolor</i>          | matib, velvet apple      | 855  | <i>Evodia nitida</i>              | kertub                 |
| 839  | <i>Diospyros ferrea</i>            |                          | 856  | <i>Evodia palawensis</i>          | beror                  |
| 1330 | <i>Diospyros</i> spp.              |                          | 1400 | <i>Evodia</i> spp.                |                        |
| 712  | <i>Dodonaea viscosa</i>            |                          | 858  | <i>Evodia trichantha</i>          |                        |
| 840  | <i>Dolichandrone<br/>spathacea</i> | rríu                     | 515  | <i>Excoecaria agallocha</i>       | las, blinding tree     |
| 713  | <i>Dracaena multiflora</i>         | orredakel                | 516  | <i>Fagraea berteriana</i>         | chelilai               |
| 842  | <i>Drypetes nitida</i>             | kevert                   | 860  | <i>Fagraea ksid</i>               | ksid                   |
| 1340 | <i>Drypetes</i> spp.               |                          | 1410 | <i>Fagraea</i> spp.               |                        |
| 1350 | <i>Dysoxylum</i> spp.              |                          | 149  | <i>Ficus carica</i>               | uosech (kall)          |
| 843  | <i>Elaeis guineensis</i>           | oil nut palm             | 150  | <i>Ficus elastica</i>             | komunokí, rubber plant |
| 844  | <i>Elaeocarpus carolinensis</i>    |                          | 352  | <i>Ficus microcarpa</i>           | lulk, chinese banyan   |
| 142  | <i>Elaeocarpus joga</i>            | dekemerír                | 519  | <i>Ficus prolixa</i>              | lulk, banyan           |
| 1360 | <i>Elaeocarpus</i> spp.            |                          | 861  | <i>Ficus saffordii</i>            | lulk, banyan           |
| 508  | <i>Erythrina fusca</i>             | roro                     | 1420 | <i>Ficus</i> sp.                  |                        |
| 1370 | <i>Erythrina</i> spp.              |                          | 521  | <i>Ficus tinctoria</i>            | oseked                 |
| 510  | <i>Erythrina variegata</i>         | roro                     | 215  | <i>Ficus virens</i>               | lulu, banyan           |
| 339  | <i>Eucalyptus deglupta</i>         | eucalyptus               | 863  | <i>Finischia chloroxantha</i>     |                        |
| 213  | <i>Eucalyptus globulus</i>         |                          | 216  | <i>Flacourtia rukam</i>           |                        |
| 340  | <i>Eucalyptus pilularis</i>        |                          | 526  | <i>Garcinia mangostana</i>        | mangostin              |
| 341  | <i>Eucalyptus robusta</i>          | swampy mahogany          | 864  | <i>Garcinia matudai</i>           | tilol                  |
| 342  | <i>Eucalyptus saligna</i>          |                          | 866  | <i>Garcinia rumiyo</i>            | tilol                  |
| 343  | <i>Eucalyptus sideroxylon</i>      |                          | 1430 | <i>Garcinia</i> sp.               |                        |
| 1380 | <i>Eucalyptus</i> spp.             |                          | 532  | <i>Gironniera celtiifolia</i>     |                        |
| 848  | <i>Eugenia aquea</i>               | edebaschel, chedebaschel | 151  | <i>Gliricida sepium</i>           |                        |
| 849  | <i>Eugenia caryophyllus</i>        | cloves                   | 706  | <i>Glochidion ramiflorum</i>      |                        |
| 143  | <i>Eugenia cuminii</i>             | mesekerrak, java plum    | 1440 | <i>Glochidion</i> sp.             |                        |
| 144  | <i>Eugenia javanica</i>            | rebotel                  | 869  | <i>Gmelina elliptica</i>          | belau                  |
| 145  | <i>Eugenia malaccensis</i>         | kidel                    | 867  | <i>Gmelina palawensis</i>         | blacheos               |
| 850  | <i>Eugenia nitida</i>              |                          | 1450 | <i>Gmelina</i> sp.                |                        |
| 851  | <i>Eugenia palauensis</i>          | orenged                  | 868  | <i>Gnetum gnemon</i>              |                        |
| 512  | <i>Eugenia reinwardtiana</i>       | kesiil                   | 870  | <i>Goniothalamus carolinensis</i> |                        |
| 1390 | <i>Eugenia</i> spp.                |                          | 358  | <i>Grevillea robusta</i>          |                        |
|      |                                    |                          |      |                                   |                        |

Tree Species Lists

| Code | Scientific Name            | Palau Common name         | Code | Scientific Name           | Palau Common name         |
|------|----------------------------|---------------------------|------|---------------------------|---------------------------|
| 536  | Guettarda speciosa         | belau                     | 1570 | Mangifera sp.             |                           |
| 871  | Gulubia palauensis         | bochela uchererak, uch    | 1580 | Manilkara sp.             |                           |
| 544  | Heritiera littoralis       | ebibech, chebibech        | 882  | Manilkara udoido          | udeuid                    |
| 1480 | Heritiera sp.              |                           | 166  | Manilkara zapota          | sapodilla                 |
| 156  | Hernandia sonora           | doko                      | 883  | Marattia fraxinea         | dermarm                   |
| 1490 | Hernandia sp.              |                           | 715  | Maytenus palauica         |                           |
| 157  | Heterospathe elata         | demailei, ebouch          | 884  | Medusanthera carolinensis |                           |
| 361  | Hevea brasiliensis         |                           | 1590 | Medusanthera sp.          |                           |
| 548  | Hibiscus tiliaceus         | cheramall                 | 885  | Melaleuca quinquenervia   | paperbark guava           |
| 872  | Horsfieldia amklaal        | chemeklachel, eumail      | 886  | Meryta senfftiana         | omechidel                 |
| 873  | Horsfieldia novo-guineensi | chersachel                | 1600 | Meryta sp.                |                           |
| 874  | Horsfieldia palauensis     | chersachel                | 169  | Metroxylon amicarum       | ivory-nut palm            |
| 1500 | Horsfieldia sp.            |                           | 887  | Metroxylon sagu           | sago palm                 |
| 550  | Inocarpus fagifer          | keam                      | 1610 | Metroxylon sp.            |                           |
| 551  | Intsia bijuga              | dort                      | 585  | Millettia pinnata         |                           |
| 875  | Kayea pacifica             | ketoguit                  | 586  | Morinda citrifolia        | ngel, kesengelngel        |
| 703  | Kleinhovia hospita         | madudiu                   | 888  | Morinda latibracteata     | ngel                      |
| 556  | Leucaena leucocephala      | telengtund                | 889  | Morinda pendunculata      | kesengelengel, ngel       |
| 1510 | Leucaena sp.               |                           | 1620 | Morinda sp.               |                           |
| 558  | Litchi chinensis           | litchi                    | 171  | Moringa oleifera          | malungkai, drumstick tree |
| 562  | Lumnitzera littorea        | ngemoel, mekekad          | 173  | Muntingia calabura        | budo                      |
| 161  | Macadamia integrifolia     |                           | 890  | Musa coccinea             | bungeltu                  |
| 1530 | Macadamia sp               |                           | 892  | Musa sapientum            | tuu, banana               |
| 876  | Macaranga carolinensis     | bedel                     | 1630 | Musa spp.                 |                           |
| 1540 | Macaranga sp.              |                           | 893  | Musa textilis             | blantalos                 |
| 877  | Mallotus palauensis        |                           | 590  | Myristica hypargyrea      |                           |
| 1550 | Mallotus sp                |                           | 897  | Myristica insularis       | adepurot                  |
| 878  | Mallotus tiliaefolius      |                           | 1650 | Myristica spp.            |                           |
| 163  | Mammea odorata             | ongolbeosachel, odebisech | 591  | Neisosperma oppositifolia | uaoch                     |
| 1560 | Mammea sp.                 |                           | 593  | Nephelium lappaceum       | rambotang                 |
| 569  | Mangifera indica           | ledel, mango              | 898  | Neubergia celebica        | kalm, aralm               |
|      |                            |                           |      |                           |                           |
|      |                            |                           |      |                           |                           |

Tree Species Lists

| Code | Scientific Name                       | Palau Common name                          | Code | Scientific Name                          | Palau Common name                    |
|------|---------------------------------------|--------------------------------------------|------|------------------------------------------|--------------------------------------|
| 899  | <i>Nypa fruticans</i>                 | toechel, teuechel                          | 938  | <i>Pinanga insignis</i>                  | chebouch, demailei                   |
| 900  | <i>Ochroma pyramidale</i>             | balsa                                      | 605  | <i>Pipturus argenteus</i>                | oliulakerasus                        |
| 1660 | <i>Omalanthus</i> spp.                |                                            | 606  | <i>Pisonia grandis</i>                   | mesbesibech, chimoi                  |
| 901  | <i>Ormosia calavensis</i>             | amansis, edebsungelked, necklace bead tree | 1720 | <i>Pisonia</i> sp.                       |                                      |
| 716  | <i>Osmoxylon oliveri</i>              | kesiamel                                   | 607  | <i>Pisonia umbellifera</i>               | udeuidar bekai                       |
| 717  | <i>Osmoxylon pachphyllum</i>          | kesiamel                                   | 385  | <i>Pithecellobium dulce</i>              | kamatsiri                            |
| 1670 | <i>Osmoxylon</i> spp.                 |                                            | 184  | <i>Plumeria obtusa</i>                   | elilai ra ngebard                    |
| 718  | <i>Osmoxylon truncatum</i>            | kesiamel                                   | 185  | <i>Plumeria rubra</i>                    | elilai ra ngebard, chelilairangebard |
| 902  | <i>Pachira aquatica</i>               | miich era ngebard, guiana chestnut         | 1721 | <i>Plumeria</i> sp.                      |                                      |
| 903  | <i>Pandanus aimiriikensis</i>         | chertochet                                 | 701  | <i>Polyscias grandifolia</i>             | bungaruau                            |
| 906  | <i>Pandanus compressus</i>            | ongor                                      | 939  | <i>Polyscias nodosa</i>                  | bngei                                |
| 909  | <i>Pandanus divergens</i>             | ongor                                      | 1750 | <i>Polyscias</i> sp.                     |                                      |
| 175  | <i>Pandanus dubius</i>                | beku, ongor                                | 186  | <i>Pongamia pinnata</i>                  | kisaks                               |
| 910  | <i>Pandanus duriocarpus</i>           | ongor                                      | 942  | <i>Pouteria calcarea</i>                 | elangel, chelangel                   |
| 915  | <i>Pandanus kanehirae</i>             | buuk                                       | 188  | <i>Pouteria obovata</i>                  | elangel, chelangel                   |
| 916  | <i>Pandanus kororensis</i>            | siu                                        | 1770 | <i>Pouteria</i> sp.                      |                                      |
| 920  | <i>Pandanus macrojeanneretia</i>      | ongor, ertochet                            | 190  | <i>Premna obtusifolia</i> (serratifolia) | osem, chosm                          |
| 924  | <i>Pandanus palawensis</i>            | ongor, ertochet                            | 943  | <i>Premna pubescens</i>                  |                                      |
| 926  | <i>Pandanus peliliuensis</i>          | ongor                                      | 1780 | <i>Premna</i> sp.                        |                                      |
| 1680 | <i>Pandanus</i> sp.                   |                                            | 624  | <i>Psidium guajava</i>                   | kuabang, guava                       |
| 692  | <i>Pandanus tectorius</i>             | ongor                                      | 194  | <i>Pterocarpus indicus</i>               | las                                  |
| 934  | <i>Pandanus variegatus</i>            | berrakelongor                              | 945  | <i>Ptychosperma palauensis</i>           | chesdbuuch                           |
| 178  | <i>Pangium edule</i>                  | riamel                                     | 1800 | <i>Ptychosperma</i> sp                   |                                      |
| 935  | <i>Parinari corymbosa</i> (Maranthes) | bkau                                       | 946  | <i>Rauvolfia insularis</i>               | omechidel                            |
| 936  | <i>Parinari laurina</i> (Atuna)       | eritem, cheritim                           | 947  | <i>Ravenala madagascariensis</i>         | travelers palm                       |
| 1690 | <i>Parinari</i> sp.                   |                                            | 195  | <i>Rhizophora apiculata</i>              | bngaol                               |
| 937  | <i>Parkia parvifoliola</i>            | kmekumer                                   | 720  | <i>Rhizophora lamarkii</i>               |                                      |
| 602  | <i>Pemphis acidula</i>                | ngis                                       | 196  | <i>Rhizophora mucronata</i>              | tebechel                             |
| 603  | <i>Persea americana</i>               | bata, avacado                              | 1820 | <i>Rhizophora</i> sp.                    |                                      |
|      |                                       |                                            |      |                                          |                                      |
|      |                                       |                                            |      |                                          |                                      |

Tree Species Lists

| Code | Scientific Name                   | Palau Common name            | Code | Scientific Name                  | Palau Common name     |
|------|-----------------------------------|------------------------------|------|----------------------------------|-----------------------|
| 633  | <i>Rhizophora stylosa</i>         |                              | 965  | <i>Terminalia edulis</i>         | esemiich, chesemiich  |
| 634  | <i>Rhus taitensis</i>             | eues, choes                  | 966  | <i>Terminalia kaernbachii</i>    | tropical almond       |
| 948  | <i>Rinorea carolinensis</i>       |                              | 674  | <i>Terminalia samoensis</i>      | esemiich              |
| 949  | <i>Roystonea oleracea</i>         | royal palm                   | 1850 | <i>Terminalia</i> sp.            |                       |
| 950  | <i>Samadera indica</i>            | etkeam, cheskeam             | 675  | <i>Theobroma cacao</i>           | suklatei, cocoa       |
| 636  | <i>Samanea saman</i>              |                              | 676  | <i>Thespesia populnea</i>        | badrerirt             |
| 951  | <i>Sapium indicum</i>             | maskerekur                   | 723  | <i>Timonius corymbosus</i>       |                       |
| 952  | <i>Scyphiphora hydrophyllacea</i> | kuat                         | 724  | <i>Timonius mollis</i>           |                       |
| 953  | <i>Semecarpus venenosus</i>       | tonget                       | 1860 | <i>Timonius</i> sp.              |                       |
| 954  | <i>Serianthes kanehirae</i>       | ukall                        | 726  | <i>Timonius subauritus</i>       |                       |
| 647  | <i>Sesbania grandiflora</i>       | katurai                      | 727  | <i>Timonius timon</i>            |                       |
| 200  | <i>Sonneratia alba</i>            | churur, urur                 | 678  | <i>Tournefortia argentea</i>     | rirs, tree heliotrope |
| 649  | <i>Sophora tomentosa</i>          | dudurs, silver bush          | 679  | <i>Trema cannabina</i>           | chelodechoel          |
| 650  | <i>Spathodea campanulata</i>      | african tulip tree           | 204  | <i>Trema orientalis</i>          | chelodechoel          |
| 652  | <i>Spondias dulcis</i>            | meseiedel, mesechoes         | 1870 | <i>Trema</i> sp.                 |                       |
| 955  | <i>Spondias mombin</i>            | meseheol                     | 968  | <i>Trichospermum ledermannii</i> | elsau, oleiulakersus  |
| 956  | <i>Spondias pinnata</i>           | titimel                      | 205  | <i>Tristiropsis obtusangula</i>  |                       |
| 1830 | <i>Spondias</i> sp.               |                              | 999  | Unknown, other                   |                       |
| 957  | <i>Stemonurus ammui</i>           | ngmui                        | 969  | <i>Vitex coffassus</i>           | bars, bekl            |
| 958  | <i>Sterculia palauensis</i>       |                              | 1880 | <i>Vitex</i> sp.                 |                       |
| 655  | <i>Swietenia macrophylla</i>      | mahogany, honduras mahogany  | 207  | <i>Ximenia americana</i>         | kerekurlechol         |
| 959  | <i>Swietenia mahogoni</i>         | mahogany                     | 685  | <i>Xylocarpus granatum</i>       | meduulokebong         |
| 1840 | <i>Swietenia</i> sp.              |                              | 686  | <i>Xylocarpus moluccensis</i>    | puzzlenut             |
| 722  | <i>Symplocos racemosa</i>         | chebtui, ebtui               | 1890 | <i>Xylocarpus</i> sp.            |                       |
| 960  | <i>Tabernaemontana aurantiaca</i> |                              |      |                                  |                       |
| 961  | <i>Tecoma stans</i>               |                              |      |                                  |                       |
| 962  | <i>Tectona grandis</i>            | tsik, teak                   |      |                                  |                       |
| 670  | <i>Terminalia catappa</i>         | beach almond, miich, otochel |      |                                  |                       |
| 964  | <i>Terminalia crassipes</i>       | esemiich, chesemiich         |      |                                  |                       |

### ***Guam Tree Species***

| <b>Code</b> | <b>Scientific Name</b>          | <b>GUM Common name</b>      | <b>Code</b> | <b>Scientific Name</b>         | <b>Common name</b>               |
|-------------|---------------------------------|-----------------------------|-------------|--------------------------------|----------------------------------|
| 278         | <i>Acacia confusa</i>           | formosa acacia              | 441         | <i>Cananga odorata</i>         | ilang-ilang                      |
| 281         | <i>Acacia koa</i>               | trokon boforeng             | 448         | <i>Carica papaya</i>           | papaya                           |
| 400         | <i>Adenantha pavonina</i>       | kulalis                     | 115         | <i>Caryota urens</i>           | fishtail palm                    |
| 100         | <i>Aglaia mariannensis</i>      | mapuñao                     | 450         | <i>Cassia fistula</i>          | canafistula, golden shower       |
| 101         | <i>Aidia cochinchinensis</i>    | smak, sumac                 | 116         | <i>Cassia javanica</i>         | pinkshower                       |
| 102         | <i>Albizia lebbbeck</i>         | mamis                       | 452         | <i>Casuarina equisetifolia</i> | ngas, ironwood                   |
| 407         | <i>Aleurites moluccana</i>      | raguar                      | 118         | <i>Catalpa longissima</i>      | yokewood                         |
| 103         | <i>Aleurites trisperma</i>      | lumbang                     | 119         | <i>Ceiba pentandra</i>         | algodon de manila                |
| 408         | <i>Allophylus timorensis</i>    |                             | 120         | <i>Cerbera dilatata</i>        | chuti                            |
| 104         | <i>Anacardium occidentale</i>   | casue, cashew nut           | 50          | <i>Cinnamomum camphora</i>     | camphor                          |
| 412         | <i>Annona muricata</i>          | laguaná, kasoy, soursop     | 461         | <i>Citrus aurantifolia</i>     | lemon                            |
| 105         | <i>Annona reticulata</i>        | annonas                     | 121         | <i>Citrus aurantium</i>        | kahel, sour orange               |
| 413         | <i>Annona squamosa</i>          | ates, sugar apple           | 122         | <i>Citrus grandis</i>          | grapefruit, kahet magas          |
| 106         | <i>Antidesma bunius</i>         | biknai                      | 212         | <i>Citrus hystrix</i>          | limon china                      |
| 107         | <i>Araucaria columnaris</i>     | cook pine                   | 124         | <i>Citrus limon</i>            | lemon reat                       |
| 108         | <i>Araucaria heterophylla</i>   | Norfolk island pine         | 125         | <i>Citrus macroptera</i>       | kahet, wild orange               |
| 417         | <i>Areca catechu</i>            | puguá                       | 126         | <i>Citrus medica</i>           | limon real, citron               |
| 109         | <i>Arenga pinnata</i>           | cabo-negro                  | 463         | <i>Citrus reticulata</i>       | kahenakikiki, tangerine mandarin |
| 293         | <i>Artocarpus altilis</i>       | lemai, breadfruit           | 464         | <i>Citrus sinensis</i>         | cahet, sweet orange              |
| 294         | <i>Artocarpus heterophyllus</i> | jack fruit                  | 127         | <i>Claoxylon marianum</i>      | kattekna, katot                  |
| 110         | <i>Artocarpus mariannensis</i>  | dugdug, Marianas breadfruit | 128         | <i>Coccoloba uvifera</i>       | sea-grape                        |
| 427         | <i>Averrhoa bilimbi</i>         | bilimbi, pikue              | 466         | <i>Cocos nucifera</i>          | niyok, coconut palm              |
| 428         | <i>Averrhoa carambola</i>       | bilembines, star fruit      | 129         | <i>Coffea arabica</i>          | arabian coffee, café             |
| 695         | <i>Avicennia mariana</i>        |                             | 130         | <i>Coffea liberica</i>         | liberian coffee                  |
| 430         | <i>Barringtonia asiatica</i>    | puting                      | 131         | <i>Cordia dichotoma</i>        |                                  |
| 112         | <i>Barringtonia racemosa</i>    | langaasag                   | 472         | <i>Cordia subcordata</i>       | niyoron                          |
| 113         | <i>Bauhinia monandra</i>        | Saint Thomas tree, mariposa | 132         | <i>Crescentia alata</i>        | houka, calabash                  |
| 435         | <i>Bruguiera gymnorhiza</i>     |                             | 133         | <i>Cryptomeria japonica</i>    | sugi                             |
| 114         | <i>Caesalpinia sappan</i>       | paeao, sappan               | 691         | <i>Cyathea lunulata</i>        | chacha, tree fern                |
| 440         | <i>Calophyllum inophyllum</i>   | daok, alexandrian laurel    | 134         | <i>Cycas circinalis</i>        | fandan                           |

Tree Species Lists

| Code | Scientific Name              | GUM Common name             | Code | Scientific Name                 | Common name                  |
|------|------------------------------|-----------------------------|------|---------------------------------|------------------------------|
| 135  | <i>Cynometra ramiflora</i>   | gulos                       | 358  | <i>Grevillea robusta</i>        | silky-oak                    |
| 136  | <i>Cyphomandra betacea</i>   | tree-tomato                 | 535  | <i>Grewia crenata</i>           | angilao                      |
| 485  | <i>Delonix regia</i>         | flame tree, arbol del fuego | 152  | <i>Guaiacum officinale</i>      | lignum-vitae, guayacan       |
| 137  | <i>Dendrocnide latifolia</i> | kahtat                      | 153  | <i>Guamia mariannae</i>         | paipai                       |
| 138  | <i>Dictyosperma album</i>    | redpalm                     | 536  | <i>Guettarda speciosa</i>       | pano                         |
| 487  | <i>Diospyros discolor</i>    | mabolo, butter fruit        | 544  | <i>Heritiera littoralis</i>     | ufa                          |
| 488  | <i>Diospyros ebenaster</i>   | black sapote                | 154  | <i>Heritiera longipetiolata</i> | ufa halemtno                 |
| 140  | <i>Diospyros kaki</i>        | persimmon                   | 155  | <i>Hernandia ovigera</i>        |                              |
| 141  | <i>Discocalyx ponapensis</i> | otot                        | 156  | <i>Hernandia sonora</i>         | nonak                        |
| 142  | <i>Elaeocarpus joga</i>      | joga                        | 157  | <i>Heterospathe elata</i>       | palma brava                  |
| 329  | <i>Eriobotrya japonica</i>   | loquat                      | 361  | <i>Hevea brasiliensis</i>       | para rubber tree             |
| 510  | <i>Erythrina variegata</i>   | gabgab, coral tree          | 548  | <i>Hibiscus tiliaceus</i>       | sea-hibiscus, pago           |
| 143  | <i>Eugenia cuminii</i>       | duhat                       | 550  | <i>Inocarpus fagifer</i>        | budo buoy, tahitian chestnut |
| 144  | <i>Eugenia javanica</i>      | macupa, wax apple           | 551  | <i>Intsia bijuga</i>            | ifil                         |
| 145  | <i>Eugenia malaccensis</i>   | makupa, malay apple         | 703  | <i>Kleinhovia hospita</i>       |                              |
| 214  | <i>Eugenia palumbis</i>      | agatelang                   | 555  | <i>Lansium domesticum</i>       | langsang                     |
| 512  | <i>Eugenia reinwardtiana</i> | a'abang                     | 158  | <i>Latania loddigesii</i>       | bluelatan                    |
| 146  | <i>Eugenia stelechantha</i>  | luluhut                     | 159  | <i>Leucaena insularum</i>       |                              |
| 147  | <i>Eugenia thompsonii</i>    | atoto                       | 556  | <i>Leucaena leucocephala</i>    | tantangan                    |
| 515  | <i>Excoecaria agallocha</i>  | blinding tree               | 160  | <i>Livistonia chinensis</i>     | chinese fan palm             |
| 516  | <i>Fagraea berteriana</i>    |                             | 562  | <i>Lumnitzera littorea</i>      | bakauaine, nana              |
| 149  | <i>Ficus carica</i>          | figs, higos                 | 161  | <i>Macadamia integrifolia</i>   | macadamia nut tree, pengua   |
| 150  | <i>Ficus elastica</i>        | india-rubbertree            | 162  | <i>Macaranga thompsonii</i>     |                              |
| 352  | <i>Ficus microcarpa</i>      | nunu                        | 163  | <i>Mammea odorata</i>           | chopak                       |
| 519  | <i>Ficus prolixa</i>         | nunu                        | 569  | <i>Mangifera indica</i>         | mango                        |
| 521  | <i>Ficus tinctoria</i>       | hoda, tagete                | 164  | <i>Mangifera odorata</i>        | saipan mango                 |
| 215  | <i>Ficus virens</i>          | higo                        | 165  | <i>Manihot glaziovii</i>        | ceara rubber                 |
| 151  | <i>Gliricida sepium</i>      | Madre de cacao              | 166  | <i>Manilkara zapota</i>         | chicle                       |

# Tree Species Lists

| Code | Scientific Name             | GUM Common name                    | Code | Scientific Name          | Common name                |
|------|-----------------------------|------------------------------------|------|--------------------------|----------------------------|
| 167  | Melanolepis multiglandulosa | alom                               | 607  | Pisonia umbellifera      | langsar                    |
| 993  | Melia azedarach             | para'isu, chinaberry               | 385  | Pithecellobium dulce     | Kamachiles                 |
| 168  | Merrilliodendron megacarpum | faniok                             | 184  | Plumeria obtuse          | Kalachucha                 |
| 169  | Metroxylon amicarum         | ivory-nut palm                     | 185  | Plumeria rubra           | frangipani, flores Mayu    |
| 170  | Mimusops elengi             | bulletwood, elengi                 | 701  | Polyscias grandifolia    |                            |
| 586  | Morinda citrifolia          | lada, indian mulberry              | 186  | Pongamia pinnata         |                            |
| 171  | Moringa oleifera            | malongay, katdes, horseradish tree | 187  | Pouteria campechiana     | eggfruit                   |
| 172  | Morus alba                  | seda                               | 188  | Pouteria obovata         | lalahag                    |
| 173  | Muntingia calabura          | calabura, manzanita                | 189  | Pouteria sapota          | sapota                     |
| 587  | Musa spp.                   | Banana                             | 190  | Premna obtusifolia       | ahgao                      |
| 174  | Myrica rubra                | yamamomo, strawberry tree          | 191  | Prunus persica           | peach                      |
| 591  | Neisosperma oppositifolia   | faag                               | 624  | Psidium guajava          | guava, abas                |
| 593  | Nephelium lappaceum         | logan                              | 192  | Psychotria mariana       | aplohkateng                |
| 175  | Pandanus dubius             | pahong                             | 193  | Psychotria rotensis      |                            |
| 176  | Pandanus fragrans           | aggag                              | 194  | Pterocarpus indicus      | narra                      |
| 177  | Pandanus sp.                | kafo                               | 195  | Rhizophora apiculata     | mangle                     |
| 692  | Pandanus tectorius          | kafu                               | 196  | Rhizophora mucronata     | mangle hembra              |
| 178  | Pangium edule               | rauel                              | 634  | Rhus taitensis           | lamahu                     |
| 382  | Peltophorum pterocarpum     | copperpod                          | 197  | Roystonea elata          | florida royal palm         |
| 603  | Persea americana            | avocado, alageta                   | 636  | Samanea saman            | raintree, monkeypod        |
| 179  | Phoenix dactylifera         | datepalm                           | 637  | Sandoricum koetjape      | santol                     |
| 180  | Phoenix sylvestris          | datepalm                           | 198  | Schefflera actinophylla  | ivy palm                   |
| 181  | Phyllanthus acidus          | tahitian gooseberry, iba           | 224  | Schinus terebinthifolius | christmas berry            |
| 182  | Pimenta pimentadiorica      | allspice                           | 199  | Serianthes nelsonii      | hayun lago, trongkon guafi |
| 183  | Pimenta racemosa            | bay rum                            | 647  | Sesbania grandiflora     | katurai, hummingbird tree  |
| 605  | Pipturus argenteus          | amahazan                           | 200  | Sonneratia alba          | mangrove                   |
| 606  | Pisonia grandis             | amumo                              | 650  | Spathodea campanulata    | african tulip tree         |
|      |                             |                                    | 201  | Streblus pendulinus      |                            |

Tree Species Lists

| Code | Scientific Name          | GUM Common name      |  | Code | Scientific Name | Common name |
|------|--------------------------|----------------------|--|------|-----------------|-------------|
| 202  | Tabebuia pallida         | pink tabebuia        |  |      |                 |             |
| 210  | Tabernaemontana rotensis |                      |  |      |                 |             |
| 203  | Tamarindus indica        | tamarind, kalamendo  |  |      |                 |             |
| 669  | Tarennia sambucina       | sumac-lada           |  |      |                 |             |
| 670  | Terminalia catappa       | talisai              |  |      |                 |             |
| 674  | Terminalia samoensis     | talisai ganu         |  |      |                 |             |
| 675  | Theobroma cacao          | cacao                |  |      |                 |             |
| 676  | Thespesia populnea       | kilulo, milo         |  |      |                 |             |
| 678  | Tournefortia argentea    | hunig                |  |      |                 |             |
| 204  | Trema orientalis         | agaunai              |  |      |                 |             |
| 123  | Triphasia trifolia       |                      |  |      |                 |             |
| 205  | Tristiropsis obtusangula | fai'a                |  |      |                 |             |
| 682  | Veitchia merrillii       |                      |  |      |                 |             |
| 206  | Vitex parviflora         |                      |  |      |                 |             |
| 207  | Ximenia americana        | sour plum, piut      |  |      |                 |             |
| 685  | Xylocarpus granatum      | lalanyog             |  |      |                 |             |
| 686  | Xylocarpus moluccensis   | puzzlenut, lamlamyok |  |      |                 |             |
| 208  | Xylosma nelsonii         |                      |  |      |                 |             |
| 209  | Zizyphus mauritiana      | manzanita, jujube    |  |      |                 |             |
| 999  | Unknown/ other           |                      |  |      |                 |             |
| 9000 | to 9999 Unknown          |                      |  |      |                 |             |

### ***American Samoa Tree Species***

| Code | Scientific Name         | Samoa common name   | Code | Scientific Name          | Samoa common name    |
|------|-------------------------|---------------------|------|--------------------------|----------------------|
| 400  | Adenanthera pavonina    | lopa                | 436  | Buchanania merrillii     |                      |
| 401  | Aglaia heterotricha     |                     | 437  | Burckella richii         |                      |
| 402  | Aglaia saltatorum       |                     | 440  | Calophyllum inophyllum   | fetau                |
| 403  | Aglaia samoensis        |                     | 439  | Calophyllum neo-ebudicum | tamanu               |
| 101  | Aidia cochinchinensis   |                     | 441  | Cananga odorata          | moso'oi              |
| 405  | Albizia chinensis       | tamalini            | 443  | Canarium harveyi         |                      |
| 406  | Alectryon samoensis     |                     | 444  | Canarium ovatum          | Pili Nut             |
| 407  | Aleurites moluccana     |                     | 445  | Canarium samoense        |                      |
| 409  | Alphitonia zizpyoides   | toi                 | 446  | Canarium vitiense        | ma'ali               |
| 410  | Alstonia pacifica       |                     | 447  | Canthium merrillii       |                      |
| 411  | Anacolosia insularis    |                     | 448  | Carica papaya            | esi, papaya          |
| 412  | Annona muricata         | Soursop             | 449  | Casearia sp. nova        |                      |
| 413  | Annona squamosa         | Sugar Apple         | 450  | Cassia fistula           |                      |
| 415  | Antidesma sphaerocarpum |                     | 451  | Castilla elastica        | pulu mamoe           |
| 416  | Antirhea inconspicua    |                     | 452  | Casuarina equisetifolia  | Casuarina            |
| 111  | Araucaria excelsa       | Norfolk Island Pine | 453  | Celtis harperi           |                      |
| 417  | Areca catechu           | betelnut            | 454  | Cerbera manghas          | leva                 |
| 293  | Artocarpus altilis      |                     | 455  | Cerbera odollam          |                      |
| 419  | Artocarpus odoratissima | Marang              | 456  | Chionanthus vitiensis    |                      |
| 420  | Arytera brackenridgei   |                     | 457  | Chrysophyllum cainito    | Cainito / Star apple |
| 421  | Ascarina diffusa        | afia                | 458  | Cinnamomum verum         | tinamoni             |
| 422  | Astronidium navigatorum |                     | 460  | Citronella samoensis     |                      |
| 423  | Astronidium pickeringii |                     | 461  | Citrus aurantifolia      | Lime (Tipolo)        |
| 424  | Astronidium samoense    |                     | 462  | Citrus maxima            | Pommelo (Moli suka)  |
| 425  | Astronidium subcordatum |                     | 463  | Citrus reticulata        | Tangerine            |
| 426  | Atuna racemosa          |                     | 464  | Citrus sinensis          | orange tree          |
| 427  | Averrhoa bilimbi        | Bilimbi             | 465  | Claoxylon echinospermum  |                      |
| 428  | Averrhoa carambola      | Star fruit (Vineka) | 466  | Cocos nucifera           | niu                  |
| 429  | Baccaurea taitensis     |                     | 468  | Commersonia bartramia    |                      |
| 430  | Barringtonia asiatica   | futu                | 469  | Coprosma savaiensis      |                      |
| 431  | Barringtonia samoensis  | futu                | 470  | Coprosma strigulosa      |                      |
| 432  | Bischofia javanica      | 'o'a                | 471  | Cordia aspera            |                      |
| 433  | Boehmeria virgata       |                     | 472  | Cordia subcordata        | tauanave             |
| 434  | Broussonetia papyrifera | paper mulberry      | 473  | Crateva religiosa        |                      |
| 435  | Bruguiera gymnorhiza    | togo                | 474  | Crossostylis biflora     |                      |

Tree Species Lists

| Code | Scientific Name               | Samoa common name |  | Code | Scientific Name                       | Samoa common name          |
|------|-------------------------------|-------------------|--|------|---------------------------------------|----------------------------|
| 475  | <i>Cryptocarya elegans</i>    |                   |  | 510  | <i>Erythrina variegata</i>            | gatae                      |
| 476  | <i>Cryptocarya hornei</i>     |                   |  | 511  | <i>Erythrospermum acuminatissimum</i> |                            |
| 477  | <i>Cryptocarya samoensis</i>  |                   |  | 512  | <i>Eugenia reinwardtiana</i>          |                            |
| 478  | <i>Cryptocarya turbinata</i>  |                   |  | 513  | <i>Eugenia uniflora</i>               | Surinam Cherry             |
| 479  | <i>Cryptocarya wilderi</i>    |                   |  | 514  | <i>Euphoria longana</i>               | Longan                     |
| 480  | <i>Cupaniopsis samoensis</i>  |                   |  | 515  | <i>Excoecaria agallocha</i>           |                            |
| 386  | <i>Cyathea decurrens</i>      | olioli            |  | 516  | <i>Fagraea berteriana</i>             | pualulu                    |
| 691  | <i>Cyathea lunulata</i>       | olioli            |  | 517  | <i>Ficus godeffroyi</i>               | mati                       |
| 387  | <i>Cyathea medullaris</i>     | olioli            |  | 518  | <i>Ficus obliqua</i>                  | aoa                        |
| 481  | <i>Cyathea</i> spp.           |                   |  | 519  | <i>Ficus prolixa</i>                  | aoa                        |
| 482  | <i>Cyathea truncata</i>       |                   |  | 520  | <i>Ficus scabra</i>                   |                            |
| 483  | <i>Cyclophyllum barbatum</i>  |                   |  | 521  | <i>Ficus tinctoria</i>                |                            |
| 485  | <i>Delonix regia</i>          | flame tree        |  | 522  | <i>Ficus uniauriculata</i>            |                            |
| 486  | <i>Dendrocnide harveyi</i>    | salato            |  | 216  | <i>Flacourtia rukam</i>               | filimoto                   |
| 487  | <i>Diospyros discolor</i>     | Mabolo            |  | 524  | <i>Flueggea flexuosa</i>              | poumuli                    |
| 488  | <i>Diospyros ebenaster</i>    |                   |  | 525  | <i>Funtumia elastica</i>              | pulu vao                   |
| 489  | <i>Diospyros elliptica</i>    | 'anume            |  | 526  | <i>Garcinia mangostana</i>            | Mangosteen                 |
| 490  | <i>Diospyros major</i>        |                   |  | 527  | <i>Garcinia myrtifolia</i>            |                            |
| 491  | <i>Diospyros samoensis</i>    | auli              |  | 528  | <i>Garcinia sessilis</i>              |                            |
| 492  | <i>Dipteris conjugata</i>     |                   |  | 529  | <i>Gardenia taitensis</i>             |                            |
| 493  | <i>Drypetes vitiensis</i>     |                   |  | 530  | <i>Garuga floribunda</i>              | manuai, vivao              |
| 494  | <i>Durio zibethinus</i>       | Durian            |  | 531  | <i>Geniostoma rupestre</i>            | taipoipo                   |
| 495  | <i>Dysoxylum forsteri</i>     |                   |  | 532  | <i>Gironniera celtifolia</i>          |                            |
| 496  | <i>Dysoxylum huntii</i>       | maota mea         |  | 533  | <i>Glochidion cuspidatum</i>          | masame                     |
| 497  | <i>Dysoxylum maota</i>        | maota             |  | 706  | <i>Glochidion ramiflorum</i>          | masame                     |
| 498  | <i>Dysoxylum samoense</i>     | mamala            |  | 535  | <i>Grewia crenata</i>                 |                            |
| 499  | <i>Dysoxylum</i> spp.         |                   |  | 536  | <i>Guettarda speciosa</i>             | puapua                     |
| 500  | <i>Dysoxylum tongense</i>     |                   |  | 537  | <i>Guioa lenticifolia</i>             |                            |
| 501  | <i>Elaeocarpus floridanus</i> |                   |  | 538  | <i>Guioa rhoifolia</i>                |                            |
| 502  | <i>Elaeocarpus graeffei</i>   |                   |  | 539  | <i>Gyrocarpus americanus</i>          |                            |
| 503  | <i>Elaeocarpus grandis</i>    | sapatua           |  | 540  | <i>Haplolobus floribundus</i>         |                            |
| 705  | <i>Elaeocarpus tongnus</i>    | a'amati'e         |  | 541  | <i>Harpullia arborea</i>              |                            |
| 504  | <i>Elaeocarpus ulianus</i>    |                   |  | 542  | <i>Hedycarya denticulata</i>          |                            |
| 505  | <i>Elattostachys falcata</i>  | taputo'i          |  | 543  | <i>Hedycarya dorstenioides</i>        |                            |
| 506  | <i>Eleocharis dulcis</i>      |                   |  | 544  | <i>Heritiera littoralis</i>           |                            |
| 507  | <i>Endiandra elaeocarpa</i>   |                   |  | 545  | <i>Heritiera ornithocephala</i>       |                            |
| 508  | <i>Erythrina fusca</i>        | lalapa            |  | 546  | <i>Hernandia moerenhoutiana</i>       | pipi                       |
| 509  | <i>Erythrina subumbrans</i>   | gatae palagi      |  | 547  | <i>Hernandia nymphaeifolia</i>        | pu'a, Chinese lantern tree |

Tree Species Lists

| Code | Scientific Name       | Samoa common name    | Code | Scientific Name             | Samoa common name |
|------|-----------------------|----------------------|------|-----------------------------|-------------------|
| 548  | Hibiscus tiliaceus    | fau                  | 591  | Neisosperma oppositifolia   | fao               |
| 549  | Homalium whitmeeanus  |                      | 592  | Neonauclea forsteri         | afa               |
| 550  | Inocarpus fagifer     | ifi                  | 593  | Nephelium lappaceum         | Rambutan          |
| 551  | Intsia bijuga         | ifilele              | 594  | Ochrosia vitiensis          |                   |
| 703  | Kleinhovia hospita    | fu'afu'a             | 595  | Omalanthus acuminatus       |                   |
| 554  | Lagostromia speciosa  | pride of India       | 596  | Omalanthus nutans           | fanuamamala       |
| 555  | Lansium domesticum    | Langsat              | 597  | Palaquium stehlinii         | gasu              |
| 556  | Leucaena leucocephala | lusina               | 598  | Pandanus reineckeii         | gsds              |
| 558  | Litchi chinensis      | Lychee               | 692  | Pandanus tectorius          | fasa              |
| 559  | Litsea mellea         |                      | 599  | Paraserianthes falcata      | tamalini          |
| 560  | Litsea samoensis      | papaono              | 600  | Parasponia andersonii       |                   |
| 561  | Lucuma nervosa        | Egg Fruit / Canistel | 601  | Parinari insularum          |                   |
| 562  | Lumnitzera littorea   |                      | 602  | Pemphis acidula             |                   |
| 563  | Macadamia tetraphylla | Macadamia Nut        | 603  | Persea americana            | avacado           |
| 564  | Macaranga grayana     |                      | 605  | Pipturus argenteus          | soga              |
| 565  | Macaranga harveyana   | lau pata             | 606  | Pisonia grandis             | pu'avai           |
| 566  | Macaranga reineckeii  |                      | 607  | Pisonia umbellifera         |                   |
| 567  | Macaranga sp. nova    |                      | 608  | Pittosporum arborescens     |                   |
| 568  | Macaranga stipulosa   | lau fatu             | 609  | Pittosporum samoense        |                   |
| 570  | Mammea glauca         |                      | 610  | Planchonella garberi        | 'ala'a            |
| 569  | Mangifera indica      |                      | 611  | Planchonella grayana        |                   |
| 571  | Manilkara dissecta    |                      | 612  | Planchonella linggensis     |                   |
| 572  | Manilkara samoensis   |                      | 613  | Planchonella membranacea    |                   |
| 573  | Maniltoa grandiflora  |                      | 614  | Planchonella samoensis      | mamalava          |
| 575  | Medusanthra samoensis | matamo               | 615  | Planchonella torricellensis |                   |
| 577  | Melicope retusa       |                      | 616  | Pleiogynium timoriense      |                   |
| 578  | Melicytus samoensis   |                      | 617  | Polyathia sp. nova          |                   |
| 579  | Melilope lauterbachii |                      | 618  | Polyscias multijuga         |                   |
| 580  | Melochia aristata     | ma'o                 | 619  | Polyscias samoensis         |                   |
| 581  | Meryta macrophylla    | fagufagu             | 620  | Pometia pinnata             | tava              |
| 582  | Metrosideros collina  |                      | 621  | Pouteria caimito            | Abiu              |
| 583  | Michelia champaca     | Orange Champak       | 622  | Premna serratifolia         |                   |
| 584  | Micromelum minutum    |                      | 623  | Pritchardia pacifica        | fau palm          |
| 585  | Millettia pinnata     |                      | 624  | Psidium guajava             | ku'ava            |
| 586  | Morinda citrifolia    | nonu                 | 625  | Psychotria grandistipulata  |                   |
| 587  | Musa spp.             |                      | 626  | Psychotria insularum        | matalafi          |
| 588  | Mussaenda raiateensis | aloalo vao           | 627  | Psydrax odorata             |                   |
| 589  | Myristica fatua       | 'atone               | 628  | Rapanea myricifolia         | togo vao          |
| 590  | Myristica hypargyrea  | 'atone 'ulu          | 629  | Reynoldsia lanotoensis      | vi vao            |

Tree Species Lists

| Code | Scientific Name            | Samoa common name |  | Code | Scientific Name        | Samoa common name |
|------|----------------------------|-------------------|--|------|------------------------|-------------------|
| 630  | Reynoldsia pleiosperma     | vi vao            |  | 669  | Tarennia sambucina     |                   |
| 631  | Rheedula edulis            | Rheedula          |  | 670  | Terminalia catappa     | talie             |
| 632  | Rhizophora mangle          | togo              |  | 672  | Terminalia glabrata    |                   |
| 633  | Rhizophora stylosa         |                   |  | 673  | Terminalia richii      | malili            |
| 634  | Rhus taitensis             | tavai             |  | 674  | Terminalia samoensis   | talie             |
| 635  | Rollinia deliciosa         | Rollinia          |  | 675  | Theobroma cacao        | cacao             |
| 636  | Samanea saman              |                   |  | 676  | Thespesia populnea     | milo              |
| 637  | Sandoricum koetjape        | Santol            |  | 678  | Tournefortia argentea  | tausuni           |
| 638  | Santalum yasi              |                   |  | 679  | Trema cannabina        | magele            |
| 639  | Sapindus vitiensis         |                   |  | 680  | Trichospermum richii   |                   |
| 640  | Sarcopygme pacifica        | u'unu             |  | 681  | Vavaea amicorum        |                   |
| 642  | Schefflera samoensis       |                   |  | 682  | Veitchia merrillii     | Manila palm       |
| 643  | Schleinitzia insularum     |                   |  | 683  | Wedelia biflora        |                   |
| 644  | Securinea flexuosa         | poumuli           |  | 684  | Weinmannia affinis     |                   |
| 645  | Semecarpus vitiensis       |                   |  | 685  | Xylocarpus granatum    |                   |
| 646  | Serianthes melanesica      |                   |  | 686  | Xylocarpus moluccensis | le'ile'i          |
| 647  | Sesbania grandiflora       |                   |  | 688  | Xylosma samoense       |                   |
| 648  | Solanum vitiense           |                   |  | 689  | Xylosma smithianum     |                   |
| 649  | Sophora tomentosa          | silver bush       |  | 690  | Zanthophyllum pinnatum |                   |
| 650  | Spathodea campanulata      | fa'apisi          |  |      |                        |                   |
| 651  | Spiraeanthemum samoense    |                   |  |      |                        |                   |
| 652  | Spondias dulcis            |                   |  |      |                        |                   |
| 653  | Sterculia fanaiho          | fana'io           |  |      |                        |                   |
| 654  | Streblus anthropophagorum  |                   |  |      |                        |                   |
| 655  | Swietenia macrophylla      |                   |  |      |                        |                   |
| 656  | Synsepalum dulcificum      | Miracle Berry     |  |      |                        |                   |
| 657  | Syzygium corynocarpum      | seasea            |  |      |                        |                   |
| 658  | Syzygium brevifolium       |                   |  |      |                        |                   |
| 659  | Syzygium carolinense       |                   |  |      |                        |                   |
| 660  | Syzygium clusiifolium      | asi vai           |  |      |                        |                   |
| 661  | Syzygium dealatum          | asi vai           |  |      |                        |                   |
| 662  | Syzygium inophylloides     | asi               |  |      |                        |                   |
| 663  | Syzygium jambos            | Rose Apple        |  |      |                        |                   |
| 664  | Syzygium richii            |                   |  |      |                        |                   |
| 665  | Syzygium samarangense      | nonu vao          |  |      |                        |                   |
| 666  | Syzygium samoense          | fena vao          |  |      |                        |                   |
| 667  | Syzygium savaiense         |                   |  |      |                        |                   |
| 668  | Tabernaemontana pandacaqui |                   |  |      |                        |                   |

### ***Federated States of Micronesia Tree Species***

| <b>Code</b> | <b>Species</b>              | <b>Pohnpei common name</b> | <b>Yap Common Name</b> | <b>Kosrae common name</b> | <b>Chuuk common name</b> |
|-------------|-----------------------------|----------------------------|------------------------|---------------------------|--------------------------|
| 278         | Acacia confusa              | pilampwoia, formosan koa   | formosan koa           |                           | formosan koa             |
| 400         | Adenantha pavonina          |                            |                        |                           |                          |
| 801         | Aglaia ponapensis           | karasyu, marasau           |                        |                           |                          |
| 101         | Aidia cochinchinensis       | kahmant                    |                        |                           |                          |
| 102         | Albizia lebbbeck            |                            |                        |                           |                          |
| 407         | Aleurites moluccana         | sakan                      |                        |                           |                          |
| 804         | Allophylus ternatus         | ungeh                      |                        |                           |                          |
| 408         | Allophylus timorensis       | kitak, nguh                | ngu, angel             |                           | ngo                      |
| 806         | Angiopteris evecta          | payuit, umpai              | mongmong               |                           |                          |
| 412         | Annona muricata             | sae, truka shai            | sausau                 |                           | sasaf                    |
| 108         | Araucaria heterophylla      |                            |                        |                           |                          |
| 417         | Areca catechu               | pu                         | pu                     |                           | pu                       |
| 293         | Artocarpus altilis          | mai, kuru                  | sou, maouli            |                           | mai                      |
| 110         | Artocarpus mariannensis     | maipah                     | maifai, maisilog       |                           | breadfruit               |
| 427         | Averrhoa bilimbi            |                            |                        |                           |                          |
| 428         | Averrhoa carambola          | ansu                       | arfath                 |                           |                          |
| 695         | Avicennia mariana           |                            |                        |                           |                          |
| 430         | Barringtonia asiatica       | wi, kawausu                | gul                    |                           | kun                      |
| 112         | Barringtonia racemosa       | wihnmoar, kange            | waathul                |                           | son                      |
| 113         | Bauhinia monandra           | flamboyant                 |                        |                           |                          |
| 435         | Bruguiera gymnorhiza        | lom, tongo                 | song                   |                           | ong                      |
| 114         | Caesalpinia sappan          | kasapal                    | sibukao                |                           |                          |
| 440         | Calophyllum inophyllum      | tetau, isho, voi           | ragich, biyuch         |                           | rekich                   |
| 814         | Camptosperma brevipetiolata | thong                      | ramluw                 |                           |                          |
| 441         | Cananga odorata             | pwurenwai                  |                        |                           | rekich                   |
| 448         | Carica papaya               | mohmiyap                   | bweibwai               |                           | kippwau                  |
| 820         | Cassia siamea               |                            |                        |                           |                          |
| 452         | Casuarina equisetifolia     | weku                       | nach                   |                           | weku                     |
| 119         | Ceiba pentandra             | cottin                     | batte ni gan' ken      |                           |                          |
| 821         | Celtis paniculata           |                            |                        |                           |                          |
| 454         | Cerbera manghas             |                            |                        |                           |                          |
| 823         | Cinnamomum carolinense      | mattieu                    |                        |                           |                          |
| 825         | Cinnamomum sessilifolium    | matieu                     |                        |                           |                          |
| 461         | Citrus aurantifolia         | karer, laim                | remong                 |                           | naimis, limes            |
| 122         | Citrus grandis              |                            |                        |                           |                          |
| 212         | Citrus hystrix              |                            |                        |                           |                          |
| 125         | Citrus macroptera           |                            |                        |                           |                          |
| 826         | Citrus mitis                |                            |                        |                           |                          |
| 463         | Citrus reticulata           |                            |                        |                           |                          |
| 464         | Citrus sinensis             | orens                      | gurgur                 |                           |                          |
| 827         | Claoxylon carolinianum      | koe                        |                        |                           |                          |

Tree Species Lists

|     |                                  |                      |                    |  |                        |
|-----|----------------------------------|----------------------|--------------------|--|------------------------|
| 466 | <i>Cocos nucifera</i>            | niu                  | lu                 |  | nu                     |
| 468 | <i>Commersonia bartramia</i>     | acarido, kahil       | gagu, wapof        |  | oun, tupuchol          |
| 472 | <i>Cordia subcordata</i>         | ikoh-ik, kanaw       | gulu               |  | anno, alau             |
| 836 | <i>Cyathea nigrans</i>           | kattar               |                    |  |                        |
| 837 | <i>Cyathea ponapeana</i>         | kattar               |                    |  |                        |
| 134 | <i>Cycas circinalis</i>          | manu atapapo         | faltir, frotel     |  |                        |
| 135 | <i>Cynometra ramiflora</i>       | kameu                |                    |  |                        |
| 485 | <i>Delonix regia</i>             | pilampwoia weitahta  | sakuranirow        |  |                        |
| 839 | <i>Diospyros ferrea</i>          |                      |                    |  |                        |
| 141 | <i>Discocalyx ponapensis</i>     | kachiel              |                    |  |                        |
| 840 | <i>Dolichandrone spathacea</i>   |                      |                    |  |                        |
| 843 | <i>Elaeis guineensis</i>         |                      |                    |  |                        |
| 844 | <i>Elaeocarpus carolinensis</i>  | syatak               |                    |  |                        |
| 845 | <i>Elaeocarpus kerstingianus</i> |                      |                    |  |                        |
| 846 | <i>Elaeocarpus kusanoi</i>       | maratte, opop        |                    |  |                        |
| 508 | <i>Erythrina fusca</i>           | pahr                 |                    |  |                        |
| 510 | <i>Erythrina variegata</i>       | pahr                 | rar, lolo          |  | par                    |
| 144 | <i>Eugenia javanica</i>          | murop                | faliap             |  |                        |
| 145 | <i>Eugenia malaccensis</i>       | apel                 | arfath             |  | faniap                 |
| 512 | <i>Eugenia reinwardtiana</i>     |                      |                    |  |                        |
| 146 | <i>Eugenia stelechantha</i>      | kirekinwel, kahkarak |                    |  | attieu                 |
| 854 | <i>Evodia hortensis</i>          |                      |                    |  |                        |
| 857 | <i>Evodia ponapensis</i>         |                      |                    |  |                        |
| 515 | <i>Excoecaria agallocha</i>      |                      |                    |  | ousus                  |
| 859 | <i>Exorrhiza ponapensis</i>      | kotop                |                    |  |                        |
| 516 | <i>Fagraea berteriana</i>        | sair                 |                    |  | seir                   |
| 150 | <i>Ficus elastica</i>            | rapah                | gak'iynigoma       |  |                        |
| 519 | <i>Ficus prolixa</i>             | aoa                  | giliau, aow au     |  | au                     |
| 521 | <i>Ficus tinctoria</i>           | ahwahn, neen         | guwan,<br>wach'guy |  | auwon                  |
| 215 | <i>Ficus virens</i>              | kilee-ant, ayau      | aou, ifaluk        |  | kiliau, yaawo<br>yewan |
| 865 | <i>Garcinia ponapensis</i>       | konpuil              |                    |  |                        |
| 866 | <i>Garcinia rumiyo</i>           |                      |                    |  |                        |
| 532 | <i>Gironniera celtifolia</i>     |                      |                    |  |                        |
| 536 | <i>Guettarda speciosa</i>        | eet, pua             | wut, blow          |  | mosor                  |
| 544 | <i>Heritiera littoralis</i>      | marapinset           | rung               |  | zwobott                |
| 156 | <i>Hernandia sonora</i>          | pingapin             | gochal             |  | akurang                |
| 157 | <i>Heterospathe elata</i>        |                      |                    |  |                        |
| 548 | <i>Hibiscus tiliaceus</i>        | hau, kalau           | hulifui, gaal      |  | sinifo                 |
| 550 | <i>Inocarpus fagifer</i>         | marrup               | buoy               |  | anilla, kurrak         |
| 551 | <i>Intsia bijuga</i>             | choyo                | zort               |  | kuren, tuamis          |
| 703 | <i>Kleinhovia hospita</i>        | kalau-n-ant          |                    |  | monou                  |
| 556 | <i>Leucaena leucocephala</i>     |                      |                    |  |                        |
| 562 | <i>Lumnitzera littorea</i>       | weingal              | wei                |  | wei, achoro            |
| 876 | <i>Macaranga carolinensis</i>    | apwid                | bith               |  | aput                   |
| 163 | <i>Mammea odorata</i>            | luas                 | lifos, lubodal     |  | lifaus                 |

Tree Species Lists

|      |                           |                    |                     |  |            |
|------|---------------------------|--------------------|---------------------|--|------------|
| 569  | Mangifera indica          | kangit             | manga               |  | manko      |
| 879  | Mangifera minor           | kanit              |                     |  |            |
| 880  | Manilkara hoshinoi        | kohle              |                     |  |            |
| 993  | Melia azedarach           | lelah              | prais, indian lilac |  |            |
| 169  | Metroxylon amicarum       | oahs               |                     |  | abe, hibun |
| 586  | Morinda citrifolia        | weipwul, nonu      | lel, mangalueg      |  | nen, nopur |
| 173  | Muntingia calabura        |                    |                     |  |            |
| 891  | Musa nana                 | tama               |                     |  |            |
| 892  | Musa sapientum            | tihus              |                     |  |            |
| 1650 | Musa spp.                 |                    | wir                 |  |            |
| 893  | Musa textilis             | utisel             |                     |  |            |
| 894  | Musa tikap                | tikap              |                     |  |            |
| 895  | Musa troglodytarum        |                    |                     |  |            |
| 896  | Mussaenda frondosa        |                    |                     |  |            |
| 897  | Myristica insularis       | karara             |                     |  |            |
| 591  | Neisosperma oppositifolia | kitee, oomah       | umwa, mo            |  | umwa       |
| 898  | Neubergia celebica        |                    |                     |  |            |
| 899  | Nypa fruticans            | parem              | ayeng               |  | kua        |
| 905  | Pandanus cominsii         | matal              |                     |  |            |
| 906  | Pandanus compressus       | paho               |                     |  |            |
| 907  | Pandanus cylindricus      | silau              |                     |  | sinnau     |
| 908  | Pandanus dilatatus        | kienpel            |                     |  |            |
| 175  | Pandanus dubius           | pakoa, kipar-n-ai  |                     |  | poak       |
| 912  | Pandanus fischerianus     | hara               |                     |  |            |
| 176  | Pandanus fragrans         | pakua              | pogo                |  |            |
| 913  | Pandanus hosinoi          | nenketak           |                     |  |            |
| 914  | Pandanus jalvitensis      | pacheren           |                     |  |            |
| 919  | Pandanus macrocephalus    | intekul, pasyure   |                     |  |            |
| 923  | Pandanus odontoides       |                    |                     |  |            |
| 925  | Pandanus patina           | peet               |                     |  |            |
| 927  | Pandanus ponapensis       | alwan, kupal, taip |                     |  |            |
| 928  | Pandanus pulposus         | deipw, jomineia    |                     |  |            |
| 930  | Pandanus rotundatus       | magojokojok        |                     |  |            |
| 1700 | Pandanus sp.              |                    |                     |  |            |
| 692  | Pandanus tectorius        | hara               | fach, choi          |  |            |
| 931  | Pandanus tolotomensis     | kiparenwel         |                     |  |            |
| 933  | Pandanus utiyamai         | lajaperik          |                     |  |            |
| 178  | Pangium edule             | durien             | rowal               |  |            |
| 936  | Parinari laurina          | ais                | adidi, gritin       |  | ais        |
| 602  | Pemphis acidula           | ngi                | hang                |  | chekis     |
| 605  | Pipturus argenteus        | oromah             | yaroma              |  | aroma      |
| 606  | Pisonia grandis           | puka               | mwog                |  | mok        |
| 184  | Plumeria obtusa           |                    |                     |  |            |
| 185  | Plumeria rubra            | pomaria            | sauer               |  | sour       |
| 701  | Polyscias grandifolia     |                    |                     |  |            |
| 620  | Pometia pinnata           |                    |                     |  |            |

Tree Species Lists

|     |                            |                                      |             |  |                          |
|-----|----------------------------|--------------------------------------|-------------|--|--------------------------|
| 940 | Ponapea hosinoi            | kattai                               |             |  |                          |
| 941 | Ponapea ledermanniana      |                                      |             |  |                          |
| 186 | Pongamia pinnata           |                                      |             |  |                          |
| 190 | Premna obtusifolia         | sobuk, orr, varovaro                 | yar         |  | umukau, nior             |
| 624 | Psidium guajava            | guahva                               | abas        |  |                          |
| 194 | Pterocarpus indicus        |                                      |             |  |                          |
| 944 | Ptychosperma kusaiensis    |                                      |             |  |                          |
| 195 | Rhizophora apiculata       | aak, akapa                           |             |  |                          |
| 196 | Rhizophora mucronata       | akelel                               | chia, roway |  | chia                     |
| 634 | Rhus taitensis             |                                      |             |  |                          |
| 636 | Samanea saman              |                                      |             |  |                          |
| 952 | Scyphiphora hydrophyllacea |                                      |             |  |                          |
| 953 | Semecarpus venenosus       |                                      |             |  |                          |
| 954 | Serianthes kanehirae       |                                      |             |  |                          |
| 200 | Sonneratia alba            | kwat, kotoh                          | abruk       |  | sales                    |
| 649 | Sophora tomentosa          | hakapini, rakau haiko, ti rakauhaiko |             |  |                          |
| 650 | Spathodea campanulata      |                                      |             |  |                          |
| 652 | Spondias dulcis            |                                      |             |  | mon                      |
| 959 | Swietenia mahogoni         |                                      |             |  |                          |
| 962 | Tectona grandis            |                                      |             |  |                          |
| 963 | Terminalia carolinensis    | kehma                                |             |  |                          |
| 670 | Terminalia catappa         | tipop, kekepin                       | kel         |  | asas                     |
| 674 | Terminalia samoensis       | win, pua rakau                       | kil         |  | sin                      |
| 675 | Theobroma cacao            |                                      |             |  |                          |
| 676 | Thespesia populnea         | miro, pone                           | bangbeng    |  | pona, okuran,<br>likokon |
| 678 | Tournefortia argentea      | titin, sisin, amunusut               | chel        |  | amoneset                 |
| 967 | Trichospermum ikutai       |                                      |             |  |                          |
| 999 | Unknown, other             |                                      |             |  |                          |
| 685 | Xylocarpus granatum        | brok, pwulok, ploek<br>brok          | yamgur      |  | punopun                  |
| 686 | Xylocarpus moluccensis     |                                      |             |  |                          |

***Commonwealth of the Northern Mariana Islands Tree Species***

| <b>Code</b> | <b>Scientific Name</b>          | <b>CNMI Common name</b>     |
|-------------|---------------------------------|-----------------------------|
| 278         | <i>Acacia confusa</i>           | formosa acacia              |
| 400         | <i>Adenanthera pavonina</i>     | kulalis                     |
| 100         | <i>Aglaiia mariannensis</i>     | mapuñao                     |
| 101         | <i>Aidia cochinchinensis</i>    | smak, sumac                 |
| 102         | <i>Albizia lebbbeck</i>         | mamis                       |
| 412         | <i>Annona muricata</i>          | laguaná, kasoy, soursop     |
| 413         | <i>Annona squamosa</i>          | ates, sugar apple           |
| 107         | <i>Araucaria columnaris</i>     | cook pine                   |
| 417         | <i>Areca catechu</i>            | puguá                       |
| 293         | <i>Artocarpus altilis</i>       | lemai, breadfruit           |
| 110         | <i>Artocarpus mariannensis</i>  | dugdug, Marianas breadfruit |
| 427         | <i>Averrhoa bilimbi</i>         | bilimbi, pikue              |
| 430         | <i>Barringtonia asiatica</i>    | puting                      |
| 113         | <i>Bauhinia monandra</i>        | Saint Thomas tree, mariposa |
| 114         | <i>Caesalpinia sappan</i>       | paeao, sappan               |
| 440         | <i>Calophyllum inophyllum</i>   | daok, alexandrian laurel    |
| 441         | <i>Cananga odorata</i>          | ilang-ilang                 |
| 452         | <i>Casuarina equisetifolia</i>  | gagu, australian pine       |
| 120         | <i>Cerbera dilatata</i>         | chuti                       |
| 122         | <i>Citrus grandis</i>           | grapefruit, kahet magas     |
| 127         | <i>Claoxylon marianum</i>       | katteknau, katot            |
| 466         | <i>Cocos nucifera</i>           | niyok, coconut palm         |
| 472         | <i>Cordia subcordata</i>        | niyoron                     |
| 485         | <i>Delonix regia</i>            | flame tree, arbol del fuego |
| 137         | <i>Dendrocnide latifolia</i>    | kahtat                      |
| 142         | <i>Elaeocarpus joga</i>         | joga                        |
| 510         | <i>Erythrina variegata</i>      | gabgab, coral tree          |
| 146         | <i>Eugenia stelechantha</i>     | luluhut                     |
| 147         | <i>Eugenia thompsonii</i>       | atoto                       |
| 352         | <i>Ficus microcarpa</i>         | nunu                        |
| 521         | <i>Ficus tinctoria</i>          | hoda, tagete                |
| 535         | <i>Grewia crenata</i>           | angilao                     |
| 153         | <i>Guamia mariannae</i>         | paipai                      |
| 536         | <i>Guettarda speciosa</i>       | pano                        |
| 154         | <i>Heritiera longipetiolata</i> | ufa halemtano               |
| 156         | <i>Hernandia sonora</i>         | nonak                       |
| 551         | <i>Intsia bijuga</i>            | ifil                        |
| 556         | <i>Leucaena leucocephala</i>    | tantangan                   |
| 163         | <i>Mammea odorata</i>           | chopak                      |
| 164         | <i>Mangifera odorata</i>        | saipan mango                |

Tree Species Lists

| Code | Scientific Name             | CNMI Common name           |
|------|-----------------------------|----------------------------|
| 167  | Melanolepis multiglandulosa | alom                       |
| 168  | Merrilliodendron megacarpum | faniok                     |
| 586  | Morinda citrifolia          | lada, indian mulberry      |
| 591  | Neisosperma oppositifolia   | faag                       |
| 175  | Pandanus dubius             | pahong                     |
| 692  | Pandanus tectorius          | kafu                       |
| 178  | Pangium edule               | rauel                      |
| 602  | Pemphis acidula             | Nigasi                     |
| 183  | Pimenta racemosa            | bay rum                    |
| 605  | Pipturus argenteus          | amahazan                   |
| 606  | Pisonia grandis             | amumo                      |
| 607  | Pisonia umbellifera         | langsats                   |
| 385  | Pithecellobium dulce        | kamachiles                 |
| 701  | Polyscias grandifolia       |                            |
| 187  | Pouteria campechiana        | eggfruit                   |
| 188  | Pouteria obovata            | lalahag                    |
| 190  | Premna obtusifolia          | ahgao                      |
| 624  | Psidium guajava             | guava, abas                |
| 192  | Psychotria mariana          | aplohkateng                |
| 636  | Samanea saman               | raintree, monkeypod        |
| 199  | Serianthes nelsonii         | hayun lago, trongkon guafi |
| 200  | Sonneratia alba             | mangrove                   |
| 203  | Tamarindus indica           | tamarind, kalamendo        |
| 669  | Tarenna sambucina           | sumac-lada                 |
| 670  | Terminalia catappa          | talisai                    |
| 676  | Thespesia populnea          | kilulo, milo               |
| 678  | Tournefortia argentea       | hunig                      |
| 204  | Trema orientalis            | agaunai                    |
| 123  | Triphasia trifolia          | Lemon de China             |
| 999  | Unknown, other              |                            |
| 207  | Ximenia americana           | sour plum, piut            |
| 9000 | to 9999 Unknown             |                            |
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***Marshall Island Tree Species***

| <b>Code</b> | <b>Scientific Name</b>          | <b>CNMI Common name</b>     |
|-------------|---------------------------------|-----------------------------|
| 278         | <i>Acacia confusa</i>           | formosa acacia              |
| 400         | <i>Adenanthera pavonina</i>     | kulalis                     |
| 100         | <i>Aglaiia mariannensis</i>     | mapuñao                     |
| 101         | <i>Aidia cochinchinensis</i>    | smak, sumac                 |
| 102         | <i>Albizia lebbbeck</i>         | mamis                       |
| 412         | <i>Annona muricata</i>          | laguaná, kasoy, soursop     |
| 413         | <i>Annona squamosa</i>          | ates, sugar apple           |
| 107         | <i>Araucaria columnaris</i>     | cook pine                   |
| 417         | <i>Areca catechu</i>            | puguá                       |
| 293         | <i>Artocarpus altilis</i>       | lemai, breadfruit           |
| 110         | <i>Artocarpus mariannensis</i>  | dugdug, Marianas breadfruit |
| 427         | <i>Averrhoa bilimbi</i>         | bilimbi, pikue              |
| 430         | <i>Barringtonia asiatica</i>    | puting                      |
| 113         | <i>Bauhinia monandra</i>        | Saint Thomas tree, mariposa |
| 114         | <i>Caesalpinia sappan</i>       | paeao, sappan               |
| 440         | <i>Calophyllum inophyllum</i>   | daok, alexandrian laurel    |
| 441         | <i>Cananga odorata</i>          | ilang-ilang                 |
| 452         | <i>Casuarina equisetifolia</i>  | gagu,australian pine        |
| 120         | <i>Cerbera dilatata</i>         | chuti                       |
| 122         | <i>Citrus grandis</i>           | grapefruit, kahet magas     |
| 127         | <i>Claoxylon marianum</i>       | katteknau, katot            |
| 466         | <i>Cocos nucifera</i>           | niyok, coconut palm         |
| 472         | <i>Cordia subcordata</i>        | niyoron                     |
| 485         | <i>Delonix regia</i>            | flame tree, arbol del fuego |
| 137         | <i>Dendrocnide latifolia</i>    | kahtat                      |
| 142         | <i>Elaeocarpus joga</i>         | joga                        |
| 510         | <i>Erythrina variegata</i>      | gabgab, coral tree          |
| 146         | <i>Eugenia stelechantha</i>     | luluhut                     |
| 147         | <i>Eugenia thompsonii</i>       | atoto                       |
| 352         | <i>Ficus microcarpa</i>         | nunu                        |
| 521         | <i>Ficus tinctoria</i>          | hoda, tagete                |
| 535         | <i>Grewia crenata</i>           | angilao                     |
| 153         | <i>Guamia mariannae</i>         | paipai                      |
| 536         | <i>Guettarda speciosa</i>       | pano                        |
| 154         | <i>Heritiera longipetiolata</i> | ufa halemtano               |
| 156         | <i>Hernandia sonora</i>         | nonak                       |
| 551         | <i>Intsia bijuga</i>            | ifil                        |
| 556         | <i>Leucaena leucocephala</i>    | tantangan                   |
| 163         | <i>Mammea odorata</i>           | chopak                      |
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Tree Species Lists

| Code | Scientific Name             | CNMI Common name           |
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| 183  | Pimenta racemosa            | bay rum                    |
| 605  | Pipturus argenteus          | amahazan                   |
| 606  | Pisonia grandis             | amumo                      |
| 607  | Pisonia umbellifera         | langsats                   |
| 385  | Pithecellobium dulce        | kamachiles                 |
| 701  | Polyscias grandifolia       |                            |
| 187  | Pouteria campechiana        | eggfruit                   |
| 188  | Pouteria obovata            | lalahag                    |
| 190  | Premna obtusifolia          | ahgao                      |
| 624  | Psidium guajava             | guava, abas                |
| 192  | Psychotria mariana          | aplohkateng                |
| 636  | Samanea saman               | raintree, monkeypod        |
| 199  | Serianthes nelsonii         | hayun lago, trongkon guafi |
| 200  | Sonneratia alba             | mangrove                   |
| 203  | Tamarindus indica           | tamarind, kalamendo        |
| 669  | Tarenna sambucina           | sumac-lada                 |
| 670  | Terminalia catappa          | talisai                    |
| 676  | Thespesia populnea          | kilulo, milo               |
| 678  | Tournefortia argentea       | hunig                      |
| 204  | Trema orientalis            | agaunai                    |
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| 999  | Unknown, other              |                            |
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| 9000 | to 9999 Unknown             |                            |
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## TABLE OF CONTENTS

|                                                        |            |
|--------------------------------------------------------|------------|
| <b>12. COORDINATES (GPS)</b> .....                     | <b>215</b> |
| A. Overview .....                                      | 215        |
| B. When and where to collect readings .....            | 215        |
| C. Recording GPS information .....                     | 215        |
| D. GPS keypad layout and commands .....                | 215        |
| GPS keypad commands .....                              | 216        |
| E. GPS setup options .....                             | 217        |
| Required data for SETUP pages .....                    | 217        |
| F. Operating the GPS on plot .....                     | 217        |
| G. Collecting coordinates away from plot center .....  | 220        |
| H. Waypoints (Advanced GPS use) .....                  | 220        |
| Creating a waypoint (when coordinates are given) ..... | 220        |
| Marking (storing) your current location .....          | 220        |
| I. Navigating with the PLGR (Advanced GPS use) .....   | 221        |
| K. Batteries .....                                     | 222        |



## 12. COORDINATES (GPS)

### A. Overview

An objective of the inventory is to obtain accurate coordinates for each field grid location. Coordinates are used to correlate plot information with remotely sensed imagery and data and in relocating the plot at future inventories. On each visited plot, coordinates are collected using GPS recorders when possible. GPS stands for Global Positioning System, a technology that uses signals from satellites to triangulate and compute the coordinates of locations on the ground.

This chapter is written so that the first 7 Sections (A-G) and the final Section (K), are essential for plot coordinate collection. The other Sections (H-J) demonstrates some of the more advanced features of the GPS. Although these advanced features are not entirely necessary for plot work, they can be of much value and save a lot of time if used properly. The procedures are written in a simple, step by step fashion (which makes them appear lengthy at first glance). But after using the GPS a few times, a person will be able to maneuver through the various menus with relative ease and confidence.

### B. When and where to collect readings

For each plot visited, attempt to collect a GPS reading that has averaged for at least 3 minutes with 70 feet of error or less. Always start GPS procedures on a plot by trying to collect an adequate set of readings at the center of subplot 1 on the standard layout; the objective is to obtain coordinates at this subplot center, the field grid location. A good plan is to try to collect an adequate set of readings as soon as the center of subplot 1 is located, and, if unsuccessful, to try again shortly before going to the next subplot. **Success** is GPS-generated coordinates for the field grid location (subplot 1) that are based on a reading that has averaged for at least 3 minutes.

If unsuccessful at the field grid location, try to obtain coordinates at a different location. **NOTE:** Allow at least 45 min to an hour between readings to allow for different or new satellites to come into clear view of the receiver. If more than one coordinate is collected, record the coordinate that is closest to subplot 1 center and has averaged for at least 3 minutes. Write any other collected GPS coordinates or any notes regarding GPS use on the front of the plot card. Record the azimuth and distance from the GPS reading location to the center of subplot 1.

### C. Recording GPS information

When using the GPS, record the Unit Number of the machine, UTM zone number, the **Easting** and **Northing** (X and Y) coordinates, the amount of time that readings that were averaged, the error statistic (the error displayed while the machine was averaging readings), the elevation of the reading, and the other items listed under Plot Data in the Husky Data recorder as necessary.

### D. GPS keypad layout and commands

The recreational GPS units FIA uses are PPS (Precise Positioning Service) receivers. This means that they can read the encoded information from the satellites that contains the corrections to remove the intentionally introduced errors. Thus, the coordinates that it computes, do not have to be differentially corrected.

## GPS keypad commands

**PWR:** power key turns the unit on and off. To turn the unit on, hit the PWR key, then the ENTER key

**ENTER:** confirms data entry or menu selections

**MENU:** provides access to waypoint and setup functions

**ESC:** cancels the operation of the last button pressed

**NAV:** accesses the various navigation screens

**GOTO:** creates a direct route to any waypoint stored in memory, and is used to MARK a position

**IN:** zooms in the display of the map screen

**OUT:** zooms out the display of the map screen

**LEFT/RIGHT** arrow keys move the cursor left or right while entering data

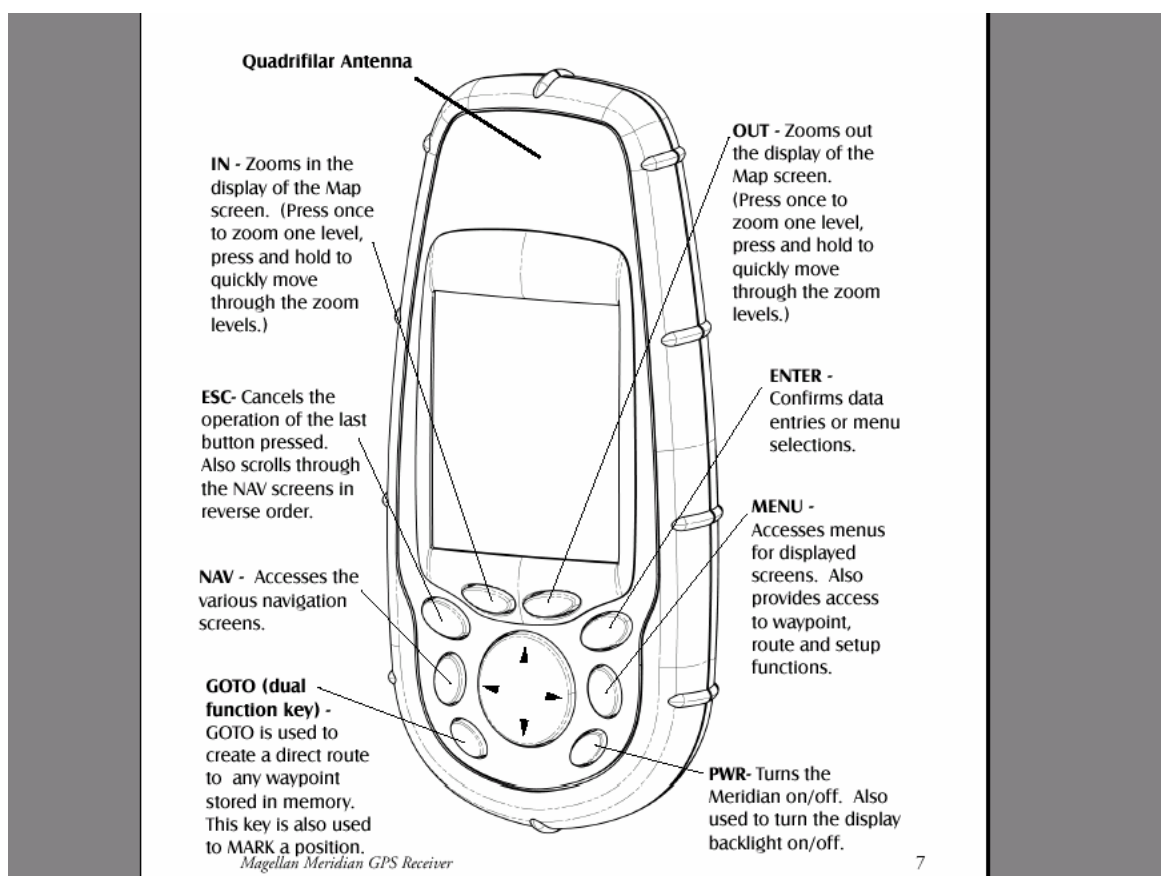
**UP/DOWN** arrow keys move the cursor up and down while entering data or selecting menu options

**Initiate screen backlight:** press and hold the PWR key for 2 seconds

The backlight quickly drains the batteries, so avoid accidentally turning on the backlight.

**Adjust screen backlight:** after turning the screen backlight on, press and hold the PWR key for 2 seconds. Press and hold the PWR key for 2 seconds again to turn the backlight off.

**Figure 46. Location of GPS Buttons**



### ***E. GPS setup options***

Listed below are the parameters to be setup before collecting satellite readings. Once these parameters are set up for the first time they will not need to be reset. Periodically (at least weekly) the unit should be checked to see that the settings have not been inadvertently changed.

**IMPORTANT: Make sure that the MAP DATUM being used is the correct DATUM specified for your area. This is set on the SETUP page. Using a different datum will alter the coordinates significantly. Valid datums are:**

#### **WGS 84**

Press MENU key, use up or down arrow to select **SETUP** option, then press the return key to enter the SETUP pages. To scroll through the following pages use the up/down arrows. Once the desired SETUP menu option is highlighted, press the return key to select it.

#### **Required data for SETUP pages**

##### **SETUP UNITS**

**COORDINATE SYSTEM:** Primary = UTM

**MAP DATUM:** Primary = WGS84

**ELEV MODE:** 3D

**TIME FORMAT:** Local AM/PM

**NAV UNITS:** Miles/Ft/MPH

**NORTH REFERENCE:** True

**DAYLIGHT SAVINGS:** Disable

**POWER OFF TIMER:** On/Time/30 minutes

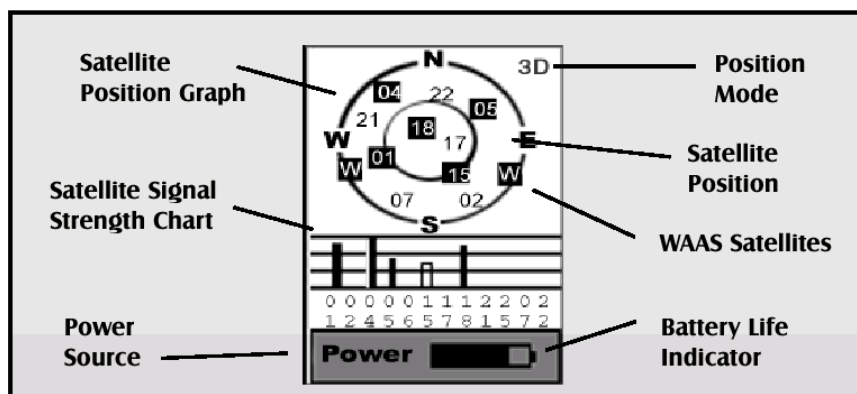
Other options within the setup pages are not used in GPS data collection for standard PNW-FIA inventories. See the Operations and Maintenance Manual for specific information.

### ***F. Operating the GPS on plot***

Carry extra batteries at all times. The two AA-alkaline batteries begin to lose power after approximately four hours of use. See Section K. Batteries, for more details.

1. Turn on the GPS unit
2. Check to see if the unit is receiving satellite readings by pressing the NAV key until the satellite status screen is visible. The satellite status screen shows 2 circles at the top of the screen, and the horizontal battery status bar at the bottom. If there are 4 vertical black bars below the 2 circles and above the battery status bar, then the unit is receiving enough satellites to calculate your position.

Figure. 47 GPS Satellite Status Screen

**Satellite Status Screen****Satellite Position Graph**

The two circles indicate satellite elevation as seen from your current position; the outer circle represents the horizon and the inner circle represents 45° from the horizon. The center of the circle is 90° from the horizon, or directly overhead.

**Satellite Signal Strength Chart**

Clear bar indicates that the Meridian is starting to get information from the satellite. Satellites that are being used to compute your position are shown with solid bars. The height of the bar indicates the relative signal strength.

**Power Source**

Indicates the source of power being used — POWER (Internal Battery) or POWER EXTERNAL.

**Position Mode**

3D - position computed is 3-dimensional (elevation is being computed).

2D - position computed is 2-dimensional (elevation is not being computed).

Blank - Meridian is not computing a position fix.

**Satellite Position**

Where the satellite is located relative to your position.

- When the unit has locked onto 4 satellites, push the NAV key until the Position Screen is displayed. The Position Screen shows the current UTM coordinates and elevation at the top of the screen. The date, time, and position error are shown in the center of the screen. If the GPS unit is not receiving satellites, the position error will show "Search", and the UTM coordinates shown at the top of the screen will be the last location where the unit was able to lock onto 4 satellites.

4. In the Position Screen, look below the date and time to find out the position error, or GPS status. You must wait until the GPS status indicates that it is “Averaging” before recording the GPS coordinates. Do not move the GPS while it is in “Averaging” mode. Record the coordinates and elevation after the unit has averaged for at least 3 minutes. The longer the unit averages the coordinates, the more accurate your location will be.

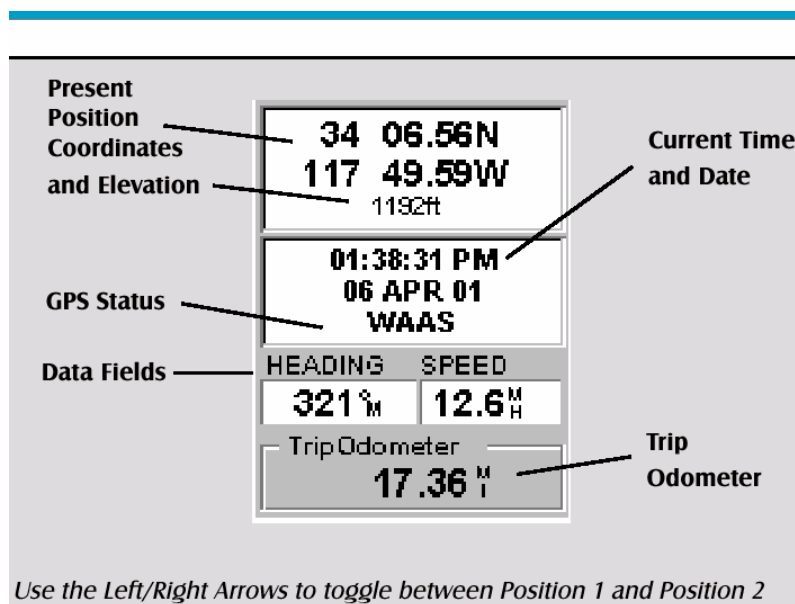


Figure 48. GPS Position Screen

| Message             | Description                                                                              |
|---------------------|------------------------------------------------------------------------------------------|
| Searching - 1st sat | Searching for 1st satellite.                                                             |
| Searching - 2nd sat | 1st satellite found; searching for 2nd satellite                                         |
| Searching - 3rd sat | Two satellites are being tracked and searching for a third.                              |
| Searching - 4th sat | Three satellites are being tracked and searching for the fourth.                         |
| Collecting Data     | All satellites needed for position fix are being tracked and position is being computed. |
| Averaging           | Meridian is computing fixes; speed is near 0.0 so position is being averaged.            |
| EPE xxft            | Estimated Position Error in feet. Meridian is computing fixes while moving.              |
| DGPS                | Computed fixes are being differentially corrected.                                       |

- If the GPS unit is moving, it will not average the coordinates, but will give an EPE (estimated position error) instead. The EPE tells how accurate the GPS readings are to the nearest foot.
5. Record the coordinates, elevation, time of averaging, datum, UTM zone, etc under Plot Data in the Husky data recorder. If the coordinates are recorded at plot center, then azimuth and distance to plot center will be recorded as zero.

### ***G. Collecting coordinates away from plot center***

GPS coordinates should always be recorded at plot center when possible.

If for some reason you can't get an adequate set of readings at plot center, you may take readings at another location, and then record the azimuth and distance to plot center so that someone in the office can calculate the coordinates at plot center. Take the GPS unit to a location where you will be able to collect 3 minutes of averaged readings at  $\pm 70$ ft accuracy, and where you will be able to accurately measure the horizontal distance, azimuth and slope in degrees to plot center. Do not move to a distance more than 200ft away if you don't have a laser range finder.

Record the coordinates, elevation, time coordinates are averaged, UTM zone, azimuth, and distance to plot center under Plot Data in the Husky data recorder.

### ***H. Waypoints (Advanced GPS use)***

#### **Creating a waypoint (when coordinates are given)**

A waypoint is a fairly precise location (on the ground, for our purposes), that a GPS user may assign a number and/or label to identify. For the purposes of PNW-FIA the location format of choice is called UTM/UPS (Universal Transverse Mercator/Universal Polar Stereographic). This format allows for the following required information: **Zone**- a 2 digit number (01-60) with a letter (C-X) attached. For our purposes, all zones in the western U.S. will be any combination of the numbers **10,11** and letters **U, T, or S**. **Easting**- a seven digit number (usually the first digit will be a zero) that represents distance from the eastern boundary of the particular zone. **Northing**- also a seven digit number that represents distance north of the equator (Northing numbers are usually instrumental in determining what zone the coordinates are in).

To create a new waypoint when the UTM coordinates are given with the plot data, turn on the GPS and then hold down the GOTO button. This will bring up the MARK screen with **SAVE** highlighted. Push either the up or down arrow until the Location field is highlighted. Press ENTER. Edit line 1 of the location field and press ENTER. Edit line 2 of the location field, and press ENTER. Edit the Elevation field, and press ENTER. If you need to edit the icon, name, or message for a waypoint, use the UP/DOWN arrows to highlight the field you wish to change and press ENTER. You are then placed in the edit mode. Use the arrow and ENTER keys to select the icons or letters you wish to use. After you are finished changing the name or message, highlight the OK button and press ENTER to return to the MARK screen.

When you have entered all the necessary data, highlight the Save button, and press ENTER.

#### **Marking (storing) your current location**

This feature is used to mark/store a current location as a waypoint in the PLGR's internal memory bank. Storing the location of a vehicle, RP, campsite, or starting point is a good example on how you

can use this feature in the field. Stored waypoints can be useful in approaching locations in a different way, taking a different route back to the vehicle, or if you should get lost (see navigating to a waypoint).

To start, make sure the unit is on and you are receiving good signals. Check the Position screen (see Section F. Operating the GPS) and be sure that you are getting readings from at least 4 satellites. If you are moving, the GPS status should have EPE of less than 70 feet. If you are standing still, the GPS status should show that the unit is averaging your position.

Once you have confirmed good signal reception push on the GOTO button and hold it down until the **MARK** screen appears. You can now select a name to assign as a waypoint for your current location. Push the UP/DOWN arrows until “name” is highlighted, then press ENTER. Use the arrow and ENTER keys to select the letters or symbols you wish to use. After you are finished changing the name highlight the OK button and press ENTER to return to the MARK screen. The GPS’s current location (under the assigned name), is now stored in it’s memory and can be used to navigate with.

## ***I. Navigating with the GPS unit***

To begin navigation, you must first have a waypoint stored in the GPS unit (see Section G. Waypoints). Also, unless you have a good sense of azimuth (to the nearest few degrees), a compass will be needed. (**NOTE:** keep the compass away from the body of the GPS to keep it from affecting the magnetic accuracy). Once you know which waypoint number you are going to travel towards, turn the GPS on and then, after the unit has locked onto 4 satellites, push the GOTO button. Highlight “**User**” in the menu, and press the right or left arrow buttons until “Alphabetical” shows in the field under FIND BY at the bottom of the screen. Press the ENTER button. A screen with a keyboard will pop up.

Using the arrow keys to navigate the displayed keyboard, begin typing in the name of the waypoint (destination) you are looking for. For example, suppose your destination was to be the Airport in Saipan. Use the keypad to highlight the letter “A” and press [ENTER]. Notice how the name is changed to the first waypoint stored in the Meridian’s memory that begins with the letter “A” and that the cursor has moved to the next letter in the waypoint name. (You can move the cursor back if you made a mistake by highlighting the “<-” button on the keyboard and press [ENTER].) Since we are looking for the Airport, we need to highlight the “I” next and press [ENTER]. Then the “R” and press [ENTER]. To add a space, highlight the “space bar” and press [ENTER]. (Also, you can use the “->” button to move the cursor to the right if you want to skip the letter the cursor is indicating.) You don’t need to spell out the entire word. The attempt here is to get close to the name so you won’t need to scroll very far during the next step. As a guide, entering the first five letters should be sufficient. When you are satisfied with what you have entered, highlight “OK” and press [ENTER]. The list of all the waypoints for the category you selected, in this case cities, is displayed with the waypoint that was previously selected at the top of the list. Now just use the Up/Down arrows to highlight the waypoint you are looking for and press [ENTER]. For this example, you would highlight Airport Saipan and press [ENTER]. The Map screen is displayed and the Meridian will begin computing all of the necessary information needed to get you to your destination.

If you are not getting satellite signals then you will get the bearing and distance to the waypoint you selected from the last position the GPS unit obtained satellite signals. You may want to move in the general direction of the waypoint and hope that satellites will come into better view, or you may want to let the GPS sit for a few minutes to lock on to some signals.

Once you are sure you are receiving satellites you can press the NAV button to find several screens where you can see the azimuth (Bearing) and distance from your current location to the waypoint. Follow the bearing as you walk towards the waypoint and the distance should steadily decrease. Eventually, as you get closer to the waypoint, the distance will get very small (about 10-30ft), and the bearing will begin to jump around dramatically. This means that you are very close to your destination (so look for the stake and witness trees if the waypoint is subplot 1).

Other data you might see on the navigation screens:

*Bearing* This is the direction to your destination from your present position, in degrees, from North.

*Distance* This is distance (measured in the Nav Units selected in Setup) to your destination.

*Speed* This is the rate that you are travelling. The unit of measure is selected in Setup - Nav Units.

*Heading* This is the direction you are moving (measured in degrees). When the heading and bearing are the same, you are travelling on a direct line to your destination.

*VMG (Velocity Made Good)*. This is the speed that you are getting closer to your destination. If the heading and bearing are the same, then VMG will be the same as Speed since all of the speed that you are travelling is being applied to arriving to your destination. However, if you are off course, your VMG will be less than the speed that you are travelling.

*CTS (Course To Steer)*. This is the angle that you need to turn to put you back on course.

*ETA (Estimated Time of Arrival)*. This the local time that you will arrive at your destination based on the rate of speed that you are moving to your destination. (See VMG.)

*ETE (Estimated Time Enroute)*. This is how long, in time, that it will take you to arrive at your destination based upon your present speed to the destination.

*XTE (Cross Track Error)*. XTE is the perpendicular distance from your present position to the course line you should be on to go to your destination.

*Turn* This is the direction you need to turn to put you on the shortest distance to your destination from your present position.

*Elevation* This is the distance above sea level that you are presently at.

*Time* Local time.

*Date* Current date.

## **K. Batteries**

GPS machines use two AA batteries, which usually last for about four hours of use. Replace the batteries when the Power Indicator (found on the bottom of the satellite locatory screen) is low. The GPS may have trouble locating satellites if the battery is low.

TABLE OF CONTENTS

**13. LASER 200 INSTRUCTIONS.....225**  
A. Overview .....225  
B. Basic operation .....225  
C. Settings .....225  
D. Filter and Reflectors.....226  
E. Distances and % slope.....226  
F. Tree heights .....226  
G. Gates.. .....227  
H. Cumulative distances.....228

.

## 13. LASER 200 INSTRUCTIONS

### **A. Overview**

Accurate heights are necessary in our inventory in order to determine volume and for other uses. The Laser can be used to get fast and accurate tree heights. It can also be used to measure distances and % slope. This instrument is more fragile than the GPS units. Some precautions must be taken with the Lasers to keep them working properly. These are:

1. Never look at the sun through the scope. Looking directly at the sun can permanently damage your eyes.
2. Never point the Laser directly at the sun. Exposing the lens system to direct sunlight, even for a brief period, may permanently damage the laser transmitter.
3. Do not expose the Laser to extreme temperatures. It is rated for a temperature range of -22 to +140 deg. F. Don't leave the instrument in the vehicle during the heat of the day.
4. Do not use batteries with "voltage check" features built on the batteries. The battery case of the Laser is too narrow for these batteries, and they could get stuck in the instrument.
5. Do not drop the Laser. Immediately return it to its case when you get back to the vehicle. There is usually more danger of damaging the instrument in the vehicle than out in the woods.

### **B. Basic operation**

All directions for using the Laser buttons are given assuming you are holding the instrument with the LCD display screen facing you and the 2 round lenses are facing the object you want to measure.

The buttons will be referred to as:

- L1 the left button closest to you
- L2 the left button in the middle
- L3 the left button furthest away from you
- R1 the right button closest to you
- R2 the right button in the middle
- R3 the right button furthest away from you

Turn the Laser on by pushing L1 or R1

Turn it off by pushing L2 and L3 at the same time. The Laser may turn itself off after a period of inactivity. Once the instrument is on, push the R1 button to make the red dot appear in the sighting scope. If there is no red sighting dot, repeatedly push the L2 button until the red dot appears and is the correct brightness.

To light up the display screen, press L3. Press L3 again to turn off the light.

### **C. Settings**

Make sure the settings are correct before using the Laser. To set the correct measurement units, go into the main menu and:

1. Press R2 or R3 to scroll through the menu until SYS is displayed in the upper right hand corner of the screen.
2. Press R1. ON or OFF will show in the center of the screen. FILTER will flash at the bottom.
3. Press R2 until OFFSET is flashing. The number displayed should be 0000.00.

4. Press R2 until PIVOT is flashing. The number displayed should be 0000.59. When this number is set at 0.00, the Laser is set to calculate heights using a tripod attached to the center of the instrument. The pivot point is the center of the Laser. We use the pivot value at 0.59 because this sets the pivot point at the rear of the instrument, and this allows you to shoot a height while using your head as the pivot point. To change this number, press L1 until the number you want to change is flashing. Press L2 or L3 until the correct number is showing. When the number is set at 0000.59, press R1.
5. Press R2 until UNITS is flashing. Select F (feet) using the R1 button.
6. Press R2 again and D (degrees) should be flashing. If not, press R1 to toggle on D.
7. Press R2 again and % should be flashing. It should say ON. If not, press R1.
8. Press R3 twice to accept the new settings and back out to the main display.

### ***D. Filter and Reflectors***

When you are working in areas of dense brush, you need to make sure the Laser is giving you the distance to the correct target. The best way to do this is to use a reflector as a target and use the filter option on the Laser. The Laser will only lock onto the highly reflective targets and ignore the less reflective brush. To use the filter option:

1. Place a reflector (or have someone hold it) on the tree where it can be seen from the required distance. The Laser will not work in the filter mode without a reflector as a target.
2. Go to the main menu on the Laser and push R2 or R3 until SYS is displayed on the screen.
3. Press R1 to select the SYS option. The FILTER option will blink, and it will say the FILTER is OFF or ON.
4. Push R1 to toggle FILTER between ON and OFF.
5. Press R3 to save the desired setting and to back out into the main display. When the FILTER is on, FILTER will appear at the bottom of the screen when the Laser is measuring distances.

### ***E. Distances and % slope***

**Horizontal distance (HD):** Turn the Laser on. The top-middle of the LCD screen will say HD.

Point the red sighting dot at the target. Press R1 and hold it down until the Laser locks on the target, then release. You can tell when the instrument locks onto its target by sound. It buzzes while it is searching for the target, then beeps when it locks on to a target or there is an error. If you get an error message, simply aim again and press R1.

**Slope distance (SD) and Vertical distance (VD):** Push R2 or R3 until the correct display is shown. Then aim and press R1 until the Laser locks on target. Or, measure a horizontal distance, then push R2 until the correct display is shown.

**% slope:** Press R2 or R3 until INC is displayed. Then aim and press R1.

### ***F. Tree heights***

The best way to measure a tree height is to make sure you have a clear shot at the leader or a clear shot of the tree trunk. Make sure you are getting a distance to the tree trunk, and not some branches in front of it. If you can't get a clear shot at the leader or the tree trunk, use a reflector (see section D). Once you are in position with your target in sight, go to the main menu:

1. Push R2 or R3 until HT is displayed in the upper left of the screen.
2. Push R1 once, aim at the target, then push R1 until the Laser locks on target. This will measure the horizontal distance.
3. The down arrow will flash. Aim at the base of the tree and push R1 to get the % slope.
4. The up arrow will flash. Aim at the top of the tree and push R1 again to get another % slope.
5. Press R1 once more and the Laser will display the height. Make sure this height is reasonable before recording it in the Husky.

## **G. Gates**

The gate option can extend the Laser's minimum range or restrict its maximum range. It is most often used to help you make sure you are hitting the right target when objects near you or just beyond your target might give you false readings. You don't have to set both gates. You will probably only need to set the short gate because of brush or fog between you and your target. You can set a gate by shooting a target or by entering distances into the instrument. To set a short gate by laser, go to the main menu and:

1. Press R2 or R3 until GATE is shown on the display.
2. Push R1 to select the gate option.
3. Press R1 to toggle the gate between ON and OFF.
4. Push R2. The S indicator will flash.
5. Aim at a target that is at the distance you want to set as the short gate and press R1.
6. Now you can either set a long gate, or press R3 to go back to save the short gate and return to the main menu. The S will be displayed when you are measuring distances to show the short gate is on.

### **To set a long gate:**

7. Push R2. The L indicator will flash.
8. Aim at an appropriate target and press R1
9. Press R3 to save the gate and go back to the main display. The L will be displayed when measuring distances.

The gates are reset to OFF when the Laser is turned off, but gate values are saved in memory. This means that if you have saved a gate and turn off the instrument, when you turn it back on the gate will be set to OFF. If you go back into the gate option and turn the gate ON, it will remember the last distances you shot for the long and short gates.

**To clear out a gate value:** Display the gate values by following the instructions in this section (section G). When the desired gate value is displayed, press and hold down R3 until the number is deleted.

## ***H. Cumulative distances***

A cumulative distance measurement allows you to move from one target point to the next, stopping at each one to measure the distance to the next target point. The Laser accumulates the measured distances in both slope and horizontal distances (SD and HD) to give you a running total.

To take a cumulative distance, go to the main menu and:

1. Press R2 or R3 until MULTI is displayed on the screen.
2. Press R1 to enter the MULTI option. DIFF will be displayed.
3. Press R2 once. CUM will be displayed.
4. Press R1. Either SEL or a number will be displayed. If SEL is displayed, HD will flash on and off. Press R1 to toggle between HD and SD. Press R2 when the correct indicator is flashing. If a number is displayed, that means there is already a cumulative distance saved on this instrument. You can either clear out this distance by holding down R3 until 0.00 appears, or continue to add to the distance by going to step 5.
5. Aim at the target and press R1 to fire the laser.
6. If you are not satisfied with the measurement, repeat step 5 to retake the measurement. If you are satisfied with the measurement, and wish to add it to your total, press R2. The new total will be displayed.
7. Repeat steps 5 and 6 to add more measurements to the total.

You can choose whether you want horizontal or slope distances at any time. If a distance has been measured, you can change from slope or horizontal distance by pressing R3 twice. SEL will be displayed. Push R1 to toggle between SD and HD. Press R2 twice to get back to the total distance. Go to step 5 to add more distances.

The cumulative measurement total is saved in memory even if the instrument is turned off. Turn the instrument on and scroll back to the MULTI-CUM option and resume the procedure with step 5. To clear out the current total and begin another series of measurements, hold down R3 while the cumulative distance is showing until the number is deleted.

## APPENDICES

|                                                                         |     |
|-------------------------------------------------------------------------|-----|
| APPENDIX 1 -- SLOPE CORRECTION TABLE.....                               | 231 |
| APPENDIX 2 -- ESTIMATING DBH WITH RELASKOPS.....                        | 233 |
| APPENDIX 3 -- HIGH PRIORITY SPECIES.....                                | 235 |
| APPENDIX 4 -- FIPS CODES, UTM ZONES, AND DECLINATIONS.....              | 237 |
| APPENDIX 5 -- PRIORITY DAMAGE AND SEVERITY.....                         | 240 |
| APPENDIX 6 -- MEASURING HEIGHTS USING A CLINOMETER.....                 | 241 |
| APPENDIX 7 -- CALCULATING HORIZONTAL DISTANCE.....                      | 244 |
| APPENDIX 8 -- EXAMPLE OF BANYAN TREE MEASUREMENTS.....                  | 245 |
| APPENDIX 9 -- DETERMINING SCALES AND BASELINES FROM A MAP OR PHOTO..... | 246 |
| APPENDIX 10 -- COMPLETING AND EDITING PLOTS.....                        | 248 |
| APPENDIX 11 -- DATA SHEETS.....                                         | 251 |
| APPENDIX 12 -- METRIC EQUIVALENTS AND AIDS.....                         | 263 |
| APPENDIX 13 -- HELLO LETTER/DATA CONFIDENTIALITY.....                   | 265 |
| APPENDIX 14 -- LANDOWNER CONTACT LETTER.....                            | 267 |
| APPENDIX 15 -- VARIANCE PLOTS.....                                      | 271 |
| APPENDIX 16 -- GLOSSARY.....                                            | 273 |
| APPENDIX 17 -- INDEX.....                                               | 283 |

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| APPENDIX 1 -- SLOPE CORRECTION TABLE |                  |            |                    |          |         |           |
|--------------------------------------|------------------|------------|--------------------|----------|---------|-----------|
| PERCENT EXPANSION                    | EXPANSION FACTOR |            | --SLOPE DISTANCE-- |          |         |           |
|                                      | FACTOR           | RECIPROCAL | 12.0 ft.           | 24.0 ft. | 100 ft. | 120.0 ft. |
| 10                                   | 1.005            | 0.995      | 12.06              | 24.1     | 100.5   | 120.6     |
| 15                                   | 1.01             | 0.99       | 12.12              | 24.3     | 101.1   | 121.2     |
| 20                                   | 1.02             | 0.98       | 12.24              | 24.5     | 102     | 122.4     |
| 25                                   | 1.03             | 0.97       | 12.36              | 24.7     | 103.1   | 123.6     |
| 30                                   | 1.04             | 0.96       | 12.48              | 25.1     | 104.4   | 124.8     |
| 35                                   | 1.06             | 0.94       | 12.72              | 25.4     | 105.9   | 127.2     |
| 40                                   | 1.08             | 0.93       | 12.96              | 25.8     | 107.7   | 129.6     |
| 45                                   | 1.1              | 0.91       | 13.2               | 26.3     | 109.7   | 132       |
| 50                                   | 1.12             | 0.89       | 13.44              | 26.8     | 111.8   | 134.4     |
| 55                                   | 1.14             | 0.88       | 13.68              | 27.4     | 114.1   | 136.8     |
| 60                                   | 1.17             | 0.86       | 14.04              | 28       | 116.6   | 140.4     |
| 65                                   | 1.19             | 0.84       | 14.28              | 28.6     | 119.3   | 142.8     |
| 70                                   | 1.22             | 0.82       | 14.64              | 29.3     | 122.1   | 146.4     |
| 75                                   | 1.25             | 0.8        | 15                 | 30       | 125     | 150       |
| 80                                   | 1.28             | 0.78       | 15.36              | 30.7     | 128.1   | 153.6     |
| 85                                   | 1.31             | 0.76       | 15.72              | 31.5     | 131.2   | 157.2     |
| 90                                   | 1.35             | 0.74       | 16.2               | 32.3     | 134.5   | 162       |
| 95                                   | 1.38             | 0.72       | 16.56              | 33.1     | 137.9   | 165.6     |
| 100                                  | 1.41             | 0.71       | 16.92              | 33.9     | 141.4   | 169.2     |
| 105                                  | 1.45             | 0.69       | 17.4               | 34.8     | 145     | 174       |
| 110                                  | 1.49             | 0.67       | 17.88              | 35.7     | 148.7   | 178.8     |
| 115                                  | 1.52             | 0.66       | 18.24              | 36.6     | 152.4   | 182.4     |
| 120                                  | 1.56             | 0.64       | 18.72              | 37.5     | 156.2   | 187.2     |
| 125                                  | 1.6              | 0.62       | 19.2               | 38.4     | 160.1   | 192       |
| 130                                  | 1.64             | 0.61       | 19.68              | 39.4     | 164     | 196.8     |
| 135                                  | 1.68             | 0.6        | 20.16              | 40.3     | 168     | 201.6     |
| 140                                  | 1.72             | 0.58       | 20.64              | 41.3     | 172     | 206.4     |
| 145                                  | 1.76             | 0.57       | 21.12              | 42.3     | 176.1   | 211.2     |
| 150                                  | 1.8              | 0.55       | 21.6               | 43.3     | 180.3   | 216       |
| 155                                  | 1.84             | 0.54       | 22.08              | 44.3     | 184.5   | 220.8     |



## APPENDIX 2 -- ESTIMATING DBH WITH RELASKOPS

The relaskop can be used to estimate diameters. The relaskop is only accurate if you are at a known horizontal distance of 33 ft., 66 ft, or 99 ft.

To accurately estimate a diameter, measure out to a horizontal distance of 33, 66, or 99 feet from the tree you want to measure. Look through the small window. The field of vision is divided into 2 halves, upper and lower, by a horizontal line that is the measuring edge. No other point of reading is accurate (see figure 49).

**Figure 49**



View the point on the tree where you want to estimate the diameter in the upper half. In the lower half you will see a series of bars and scales measuring up the edge (see Figure 49)

To take a reading, press the brake release button. The scale automatically rotates to the angle the instrument is tilted when sighting at the point of measurement. Partially release the brake button to help bring the scale to a faster stop.

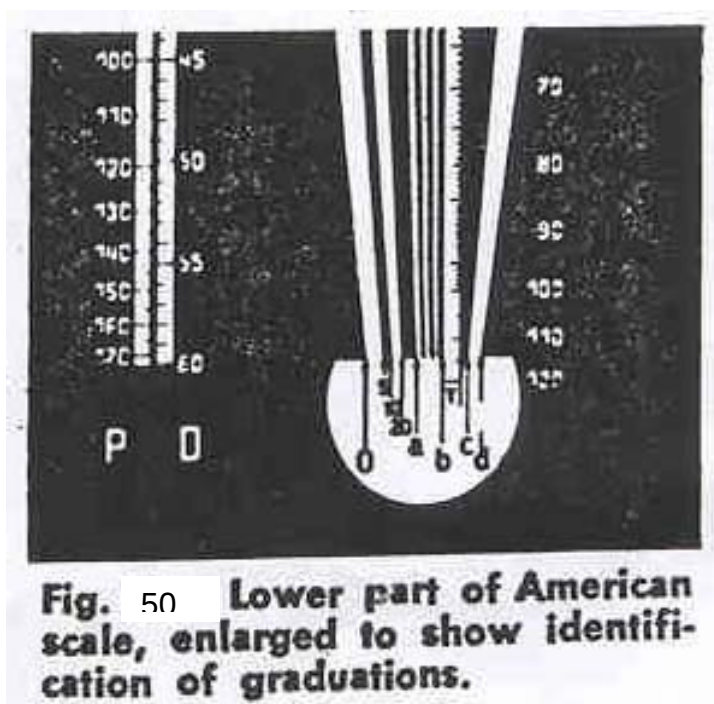
The scale between “a” and “b” on Figure 50 is divided into 6 equal width bars (3 light and 3 dark).

The bars between “a” and “b” on the scale are equal to different diameters at different distances from the tree:

Each bar equals 2 inches at a horizontal distance of 33 feet

Each bar equals 4 inches at a horizontal distance of 66 feet

Each bar equals 6 inches at a horizontal distance of 99 feet



The distance between “0” and “10” on the scale equals the distance between “a” and “b”. At 33 feet, “a” to “b” represents 12 inches of diameter.

To measure a diameter of a tree with DBH of 34 inches, position the relaskop 33 feet from the tree and set the “0” edge of the scale on the left bark edge of the tree.

Distance “0” to “10” will represent 12 inches of diameter; distance “10” to “a” will represent another 12 inches of diameter, , and the right bark edge will align with the right edge of the fifth bar between “a” and “b” for 10 more inches of diameter.

Total  $12 + 12 + 10 = 34$  inches DBH.

In this case the diameter can be read to the nearest 2 inches (and estimated to the nearest 1 inch)

By positioning the relaskop at other distances, such as 66 or 99 feet, different values apply

Since the instrument is self-adjusting for changes in slope, it follows that the diameter at any height above the ground can be estimated without correcting for slope. You still must correct for slope when measuring distance from the tree because all distances must be horizontal.

## APPENDIX 3 -- HIGH PRIORITY SPECIES

The following list of species has been identified as high priority for genetic resource operations and activities. These species will be recorded wherever they are found, either on or off of FIA inventory plots. For each species found, record the species name or code, location, size, and abundance code.

## 1. HIGH PRIORITY SPECIES LIST

**PALAU**

| Species                      | Common name           | Code   |
|------------------------------|-----------------------|--------|
| <i>Antigonon leptopus</i>    | chain-of-love (D)     | ANLE4  |
| <i>Clidemia hirta</i> (D)    | Koster's curse        | CLHI3  |
| <i>Imperata cylindrical</i>  | Cogon grass(D)        | IMCY   |
| <i>Mikania micrantha</i>     | mile-a-minute vine(D) | MIMI5  |
| <i>Psidium cattleianum</i>   | strawberry guava      | PSCA   |
| <i>Spathodea campanulata</i> | African tulip(D)      | 650    |
| <i>Timonius timon</i>        | liberal               | TIMTIM |

**GUAM**

| SPECIES                                         | Common name               | Code   |
|-------------------------------------------------|---------------------------|--------|
| <i>Artocarpus mariannensis</i>                  | Marianas breadfruit       | 110    |
| <i>Calicarpa candicans</i>                      | hamlag                    | CALCAN |
| <i>Cerbera dilatata</i>                         | chuti                     | 120    |
| <i>Cyathea lunulata</i>                         | chacha                    | 691    |
| <i>Cyacas circinalis</i>                        | fadan, fading             | 134    |
| <i>Elaeocarpus joga</i>                         | joga, yoga                | 142    |
| <i>Eugenia palumbis</i>                         | agatelang                 | EUGPAL |
| <i>Eugenia thompsonii</i>                       | atoto                     | EUGTHO |
| <i>Heritiera longipetiolata</i>                 | ufa                       | 154    |
| <i>Intsia bijuga</i>                            | ifet, ifil, ifit          | 551    |
| <i>Leucaena insularum</i> var. <i>guamensis</i> |                           | 159    |
| <i>Merrilliodendron megacarpum</i>              | faniok                    | 168    |
| <i>Pandanus tectorius</i>                       | katu, aggag, aggak, caffo | 692    |
| <i>Serianthes nelsonii</i>                      | hagon, lagu               | 199    |
| <i>Tabernaemontana rotensis</i>                 |                           | 210    |
| <i>Tristiropsis obtusangula</i>                 | faia                      | 205    |

## 2. LOCATION

Record the location of the priority species. If the priority species is found within a subplot, record the species on the standard FIA vegetation tally sheet.

If the priority species is found outside a subplot, record the species on the High Priority Species data sheet. Get GPS coordinates if possible. If coordinates cannot be obtained, describe the location in as much detail as possible, and mark the location on photography and/ or maps

When collected: all high priority species, wherever they are found

3. ABUNDANCE

Record a code for abundance of the species.

When collected: all high priority species, wherever they are found  
Values:

- 1 = Less than 5 plants
- 2 = 5 to 15 plants
- 3 = more than 15 plants

4. SIZE

Record a code that best describes the size class of the majority of the priority species

When collected: all high priority species, wherever they are found  
Values:

- 1 < 1.0 in DBH (seedlings)
- 2 1.0 - 4.9 in (saplings)
- 3 5.0 – 8.9 in
- 4 9.0 – 19.9 in
- 5 20.0 – 39.9 in
- 6 40.0 + in

## APPENDIX 4 -- FIPS CODES, UTM ZONES, AND DECLINATIONS

| (FIP Code) State or Territory<br>Island               | Latitude<br>° ' " | Longitude<br>° ' " | UTM Zone | declination  |
|-------------------------------------------------------|-------------------|--------------------|----------|--------------|
| <b>(66) Guam</b>                                      |                   |                    |          |              |
| (66) Guam                                             | 13° 26' 40" N     | 144° 44' 12" E     | 55       | 2 deg. East  |
| <b>(60) American Samoa</b>                            |                   |                    | 2        |              |
| (20) Manu'a                                           | 14° 15' 00" S     | 167° 28' 12" W     |          | 11 deg. East |
| (30) Rose                                             | 14° 31' 48" S     | 175° 52' 12" W     |          | 11 deg East  |
| (40) Swains                                           | 11° 03' 36" S     | 171° 04' 48" W     |          | 11 deg East  |
| (10) Tutuila East                                     | 14° 18' 00" S     | 169° 4' 50" W      |          | 12 deg. East |
| (50) Tutuila West                                     | 14° 20' 00" S     | 170° 00' 00" W     |          | 12 deg. East |
| <b>(69) Commonwealth of the<br/>Northern Marianas</b> |                   |                    | 55       |              |
| Agrihan                                               | 18 46 03 N        | 145 40 02 E        |          | 0 deg.       |
| Alamagan                                              | 17 36 06 N        | 145 50 18 E        |          | 1 deg. East  |
| Anatahan                                              | 16 21 28 N        | 145 39 58 E        |          | 1 deg. East  |
| Asuncion                                              | 19 40 04 N        | 145 24 16 E        |          | 0 deg.       |
| Farallon de Medinilla                                 | 16 01 09 N        | 146 04 39 E        |          | 1 deg. East  |
| Farallon de Pajaros                                   | 20 32 17 N        | 144 53 53 E        |          | 1 deg. West  |
| Guguan                                                | 17 18 54 N        | 145 50 52 E        |          | 1 deg. East  |
| Maug                                                  | 20 01 24 N        | 145 13 21 E        |          | 0 deg.       |
| Pagan                                                 | 18 06 39 N        | 145 46 20 E        |          | 0 deg.       |
| Rota                                                  | 14 09 13 N        | 145 12 11 E        |          | 2 deg. East  |
| Saipan                                                | 15 11 33 N        | 145 44 53 E        |          | 1 deg. East  |
| Sarigan                                               | 16 42 35 N        | 145 47 01 E        |          | 1 deg. East  |
| Tinian                                                | 15 00 48 N        | 145 37 27 E        |          | 1 deg. East  |
| <b>(64) Federated States<br/>of Micronesia</b>        |                   |                    |          |              |
| <b>(002) Chuuk</b>                                    |                   |                    |          |              |
| Etal                                                  | 05 34 05 N        | 153 35 10 E        | 56       | 6 deg. East  |
| Losap                                                 | 06 53 44 N        | 152 44 01 E        |          | 5 deg. East  |
| Lukunor                                               | 05 30 22 N        | 153 47 58 E        |          | 6 deg. East  |
| Murilo                                                | 08 41 16 N        | 152 20 26 E        |          | 5 deg. East  |
| Nama                                                  | 06 59 48 N        | 152 34 39 E        |          | 5 deg. East  |
| Namoluk                                               | 05 55 34 N        | 153 06 41 E        |          | 5 deg. East  |
| Namonuito                                             | 08 59 27 N        | 150 07 22 E        | 56       | 4 deg. East  |
| Nomwin                                                | 08 25 47 N        | 151 44 28 E        |          | 5 deg. East  |
| Pulap                                                 | 07 38 41 N        | 149 25 15 E        |          | 4 deg. East  |
| Pulusuk                                               | 06 41 31 N        | 149 18 51 E        |          | 4 deg. East  |
| Puluwat                                               | 07 21 26 N        | 149 12 01 E        | 55       | 4 deg. East  |
| Satawan                                               | 05 19 30 N        | 153 44 12 E        |          | 6 deg. East  |

## Appendices

|                              |            |             |    |             |
|------------------------------|------------|-------------|----|-------------|
| Truk                         | 07 25 08 N | 151 43 55 E | 56 | 5 deg. East |
| <b>(005) Kosrae</b>          |            |             |    |             |
| Kosrae                       | 05 18 58 N | 162 59 02 E | 58 | 8 deg. East |
| <b>(040) Pohnpei</b>         |            |             |    |             |
| Nukuoro                      | 03 50 42 N | 155 00 04 E | 56 | 6 deg. East |
| Oroluk                       | 07 37 44 N | 155 09 41 E |    | 6 deg. East |
| Pakin                        | 07 04 53 N | 157 48 20 E |    | 6 deg. East |
| Pingelap                     | 06 12 47 N | 160 41 56 E | 57 | 7 deg. East |
| Pohnpei                      | 06 57 45 N | 158 13 58 E | 57 | 6 deg. East |
| <b>(060) Yap</b>             |            |             |    |             |
| Eauripik                     | 06 41 14 N | 143 04 55 E |    | 3 deg. East |
| Elato                        | 07 31 00 N | 146 11 08 E | 55 | 3 deg. East |
| Fais                         | 09 45 54 N | 140 31 20 E |    | 2 deg. East |
| Faraulep                     | 08 35 52 N | 144 33 25 E |    | 3 deg. East |
| Gaferut                      | 09 13 58 N | 145 22 59 E |    | 3 deg. East |
| Ifilik                       | 07 15 23 N | 144 27 03 E |    | 3 deg. East |
| Lamotrek                     | 07 27 40 N | 146 23 33 E |    | 4 deg. East |
| Ngulu                        | 08 29 37 N | 137 21 48 E |    | 1 deg. East |
| Olimarao                     | 07 42 09 N | 145 52 46 E |    | 3 deg. East |
| Satawal                      | 07 21 29 N | 147 02 08 E |    | 4 deg. East |
| Pikelot                      | 08 05 16 N | 147 38 08 E | 55 | 4 deg. East |
| Sorol                        | 08 08 00 N | 140 24 39 E | 54 | 2 deg. East |
| Uliithi                      | 09 57 41 N | 139 36 13 E |    | 1 deg. East |
| West Fayu                    | 08 05 21 N | 146 44 28 E |    | 3 deg. East |
| Woleai                       | 07 22 32 N | 143 54 50 E |    | 3 deg. East |
| Yap                          | 09 31 46 N | 134 36 00 E | 53 | 1 deg. East |
| <b>(68) Marshall Islands</b> |            |             |    |             |
| Ailinginae                   | 11 08 00 N | 166 24 00 E | 58 | 8 deg. East |
| Ailinglaplap                 | 07 17 00 N | 168 47 00 E |    | 9 deg. East |
| Ailuk                        | 10 12 40 N | 169 59 02 E |    | 8 deg. East |
| Arno                         | 07 04 00 N | 171 33 00 E |    | 9 deg. East |
| Aur                          | 08 16 00 N | 171 06 00 E | 59 | 9 deg. East |
| Bikar                        | 12 12 00 N | 170 06 00 E |    | 8 deg. East |
| Bikini                       | 11 37 00 N | 165 33 00 E |    | 7 deg. East |
| Ebon                         | 04 35 00 N | 168 44 00 E |    | 9 deg. East |
| Enewetak                     | 11 21 00 N | 162 20 00 E |    | 7 deg. East |
| Erikub                       | 09 01 00 N | 170 03 00 E |    | 9 deg. East |
| Jabwot                       | 07 47 00 N | 168 59 00 E |    | 8 deg. East |
| Jaluit                       | 05 51 00 N | 169 38 00 E |    | 9 deg. East |
| Jemo                         | 10 07 00 N | 169 33 00 E |    | 8 deg. East |
| Kili                         | 05 39 00 N | 169 04 00 E |    | 9 deg. East |
| Kwajalein                    | 08 43 00 N | 167 44 00 E | 58 | 8 deg. East |

## Appendices

|          |            |             |                |
|----------|------------|-------------|----------------|
| Knox     | 11 07 00 N | 166 32 00 E | 8 deg. East    |
| Lae      | 08 55 00 N | 166 16 00 E | 8 deg. East    |
| Lib      | 08 19 00 N | 167 25 00 E | 8 deg. East    |
| Likiep   | 09 49 00 N | 169 18 00 E | 8 deg. East    |
| Majuro   | 07 05 00 N | 171 08 00 E | 9 deg. East    |
| Maloelap | 08 45 00 N | 171 03 00 E | 9 deg. East    |
| Mejit    | 10 17 00 N | 170 54 00 E | 8 deg. East    |
| Mili     | 06 05 00 N | 171 44 00 E | 9 deg. East    |
| Namorik  | 05 36 00 N | 168 07 00 E | 9 deg. East    |
| Namu     | 07 32 00 N | 168 53 00 E | 9 deg. East    |
| Rongelap | 11 09 00 N | 166 52 00 E | 58 8 deg. East |
| Rongrik  | unknown    |             |                |
| Taka     | 11 07 00 N | 169 40 00 E | 8 deg. East    |
| Ujelang  | 09 46 00 N | 160 58 00 E | 7 deg. East    |
| Ujae     | 08 56 00 N | 165 45 00 E | 8 deg. East    |
| Utrik    | 11 14 00 N | 169 51 00 E | 8 deg. East    |
| Wotho    | 10 11 00 N | 166 00 00 E | 8 deg. East    |
| Wotje    | 09 28 00 N | 170 15 00 E | 8 deg. East    |

### (70) Palau

|           |            |             |             |
|-----------|------------|-------------|-------------|
| Angaur    | 06 54 00 N | 134 09 00 E | 1 deg. East |
| Babeldaob | 07 30 00 N | 134 36 00 E | 1 deg. East |
| Eil Malk  | 07 09 09 N | 134 21 25 E | 1 deg. East |
| Ngercheu  | 07 05 20 N | 134 16 20 E | 1 deg. East |
| Peleliu   | 07 00 30 N | 134 14 40 E | 1 deg. East |
| Sonsorol  | 05 19 30 N | 132 13 15 E | 1 deg. East |

### (15) Hawaii

|            |   |
|------------|---|
| 003 Oahu   | 4 |
| 001 Hawaii | 5 |
| 007 Kauai  | 4 |
| 009 Maui   | 4 |
| Kahoolawe  | 4 |
| Molokai    | 4 |
| Lanai      | 4 |
| Niihau     | 4 |

## APPENDIX 5 – PRIORITY DAMAGE AND SEVERITY

### Priority Damage codes

*These damages are always coded regardless of the severity:*

- 1 Rhinoceros beetle
- 2 Brown root rot
- 3 Tinangaha
- 4 Banana nematodes

### Priority Severity codes

#### **1) Rhinoceros beetle:**

- 1. Draw an imaginary horizontal line just above the coconuts (or where they should be)
- 2. Count the number of fronds that grow above that line
- 3. Count the number of fronds in #2 that have been damaged by rhinoceros beetles
- 4. Divide the number of damaged fronds by the number of fronds counted in # 2.
- 5. Multiply by 100

Record this number as the severity of rhinoceros beetle damage

#### **2) Brown root rot:**

Record 0 for the severity of brown root rot.

#### **3) Tinangaha:**

Record 0 for the severity of tinangaha

#### **4) Banana nematodes:**

Record 0 for the severity of banana nematodes

## APPENDIX 6 -- MEASURING HEIGHTS USING A CLINOMETER

Tree heights can be measured using a clinometer and a measuring tape. The clinometer is only accurate if you use the HORIZONTAL DISTANCE from you to the tree when measuring a tree height.

To calculate a tree height, walk away from the tree and find a spot at least 1 tree length away where you can see both the top and bottom of the tree. If the tree is 50 feet tall, then you need to be at least 50 feet away from the tree when you measure the height.

Walk uphill of the tree when measuring a height if possible. It is easier to see both the top and bottom of the tree if you are up hill of it. Also, you do not have to walk as far away from the tree if you go uphill.

Look through your clinometer with one eye, and keep the other eye open. Keep both eyes open, and look up until the top of the tree is even with the horizontal line in the center of the clinometer. When the horizontal line in the clinometer is even with the top of the tree, read the number on the % (percent) scale of the clinometer that is touching the horizontal line in the clinometer. The % scale is usually on the right side on the inside of the clinometer. If you are unsure which scale to use, look into the clinometer and then tilt the clinometer up or down until the % symbol is visible on the scale.

Make sure you are far enough away from the tree so that your reading is not over 120%. The clinometer is not accurate when readings above 120% are used.

Now look through the clinometer with both eyes open and tilt the clinometer down until the horizontal line in the clinometer is even with the base of the tree. Read the number on the % scale that is touching the horizontal line in the clinometer.

The % scale of the clinometer is divided into 1% increments from 0 to + or – 70%. The distance between each small tic mark on the scale is equal to 1%. From + or – 70% and greater, the scale is divided into 2% increments. The distance between each small tic mark on this part of the scale is equal to 2%.

Most of the time you will read a positive number (+) while looking at the top of the tree, and a negative number (-) while looking at the base of the tree. ADD the number you observed while looking at the top of the tree with the number you observed while looking at the base of the tree. This gives you Total Percent.

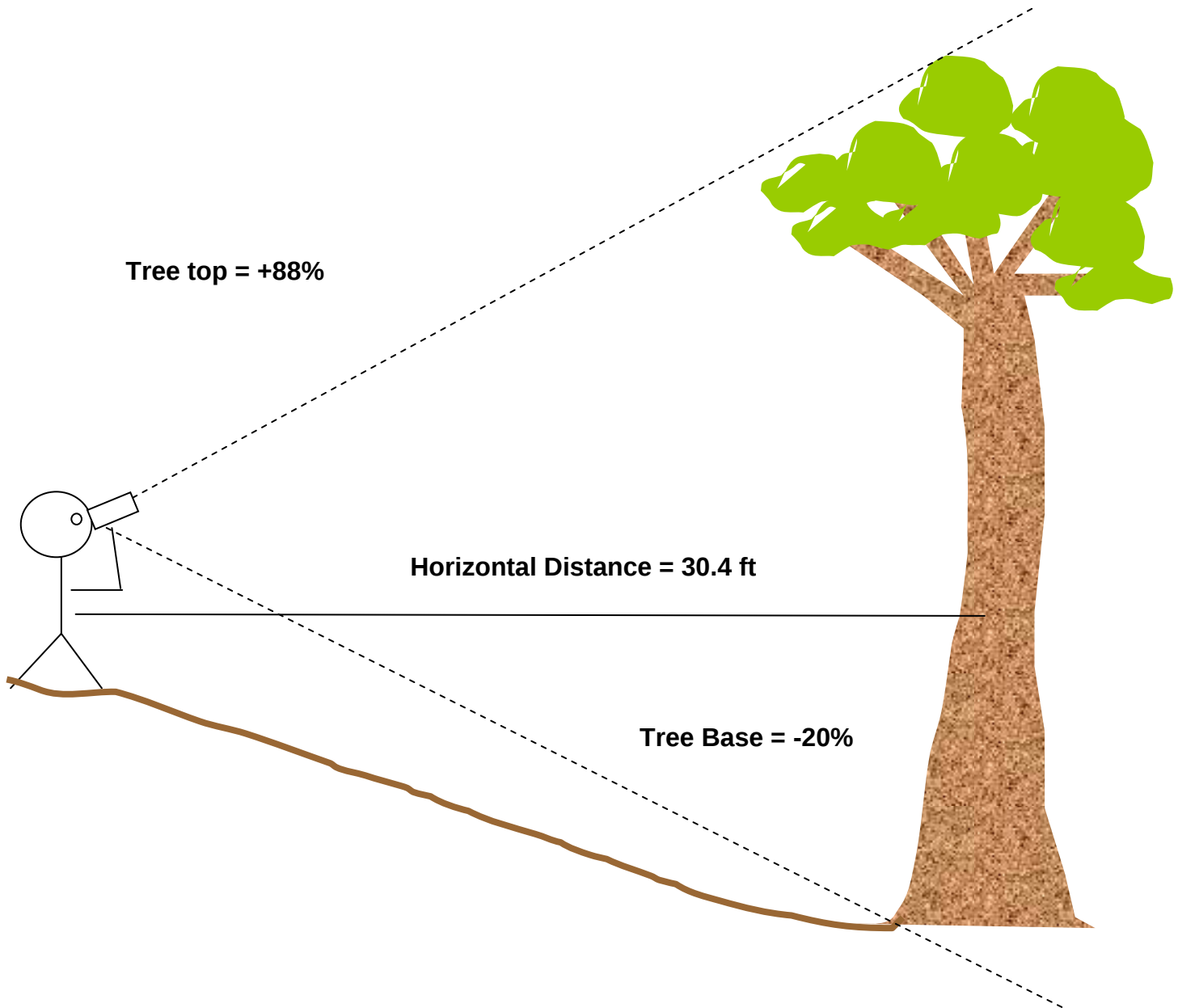
### Special Case:

If you have to go down hill or very far uphill, you may read in your clinometer that both the top and base of the tree are positive numbers on the % scale. Or you may have both the top and base of the tree are negative numbers. If the top and base of the tree are the same sign (either both are positive or both are negative) on the clinometer % scale, then SUBTRACT the tree top number and the tree base number. This gives Total Percent.

Measure the horizontal distance between where you took the readings with the clinometer and the tree. If you went up or down a hill to measure the height, then you must calculate the horizontal distance (see page 244)

Multiply the Total Percent for your tree times the horizontal distance you just measured or calculated. Then divide this number by 100. This number is the height of your tree.

Example:



To calculate the height of this tree:

$$\frac{(\% \text{ Tree top}) + \text{or} - (\% \text{ Tree base}) * (\text{Horizontal Distance})}{100\%}$$

88% + 20% = 108% (these 2 numbers are added, since tree top % is positive and tree base % is negative)

$$108\% * 30.4 \text{ feet} = 3283.2$$

$$3283.2 / 100\% = \mathbf{32.8 \text{ feet is the height of this tree}}$$

## APPENDIX 7 – CALCULATING HORIZONTAL DISTANCE

When horizontal distance cannot be accurately measured it can be calculated by using percent slope, slope distance, and a slope correction table.

To calculate horizontal distance, first measure the slope distance.

Then use your clinometer to get a % slope. You should measure the % slope of the measuring tape. The clinometer should be at the level of your slope distance measuring tape.

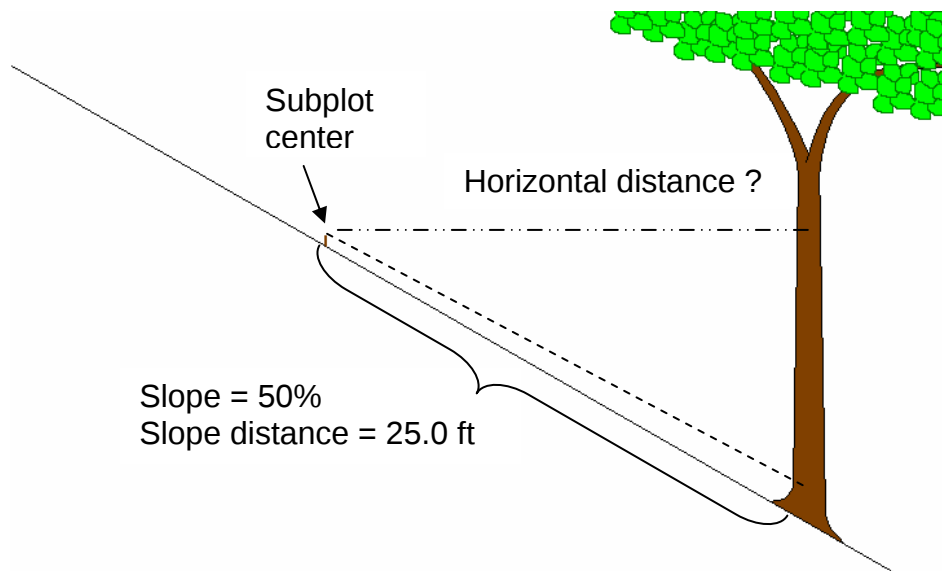
Use the Slope Correction Table (see page 231) to look up the expansion factor reciprocal for the % slope of the measuring tape.

Multiply the expansion factor reciprocal by the slope distance you measured.

This gives you the horizontal distance.

The horizontal distance will always be less than the slope distance.

Example:



What is the horizontal distance from subplot center to this tree?

Expansion Factor Reciprocal for 50% slope = .89

$$.89 * 25.0 = 22.25 \text{ feet}$$

The horizontal distance is 22.25 feet. This tree is within 24.0 feet of subplot center and is over 5.0 inches dbh, so it will qualify as a tally tree.

Slope distance = Horizontal distance when % Slope = 0

## APPENDIX 8 – EXAMPLE OF BANYAN TREE MEASUREMENTS

For trees with roots tall enough where it is unreasonable to measure dbh:

Estimate one dbh, even if the tree is forked below 4.5 feet above the roots

Height to dbh = 19 feet.

Diameter is estimated with a relaskop, so Diameter Check = 1

Rooting height is 15 feet.

Type of rooting system = 1

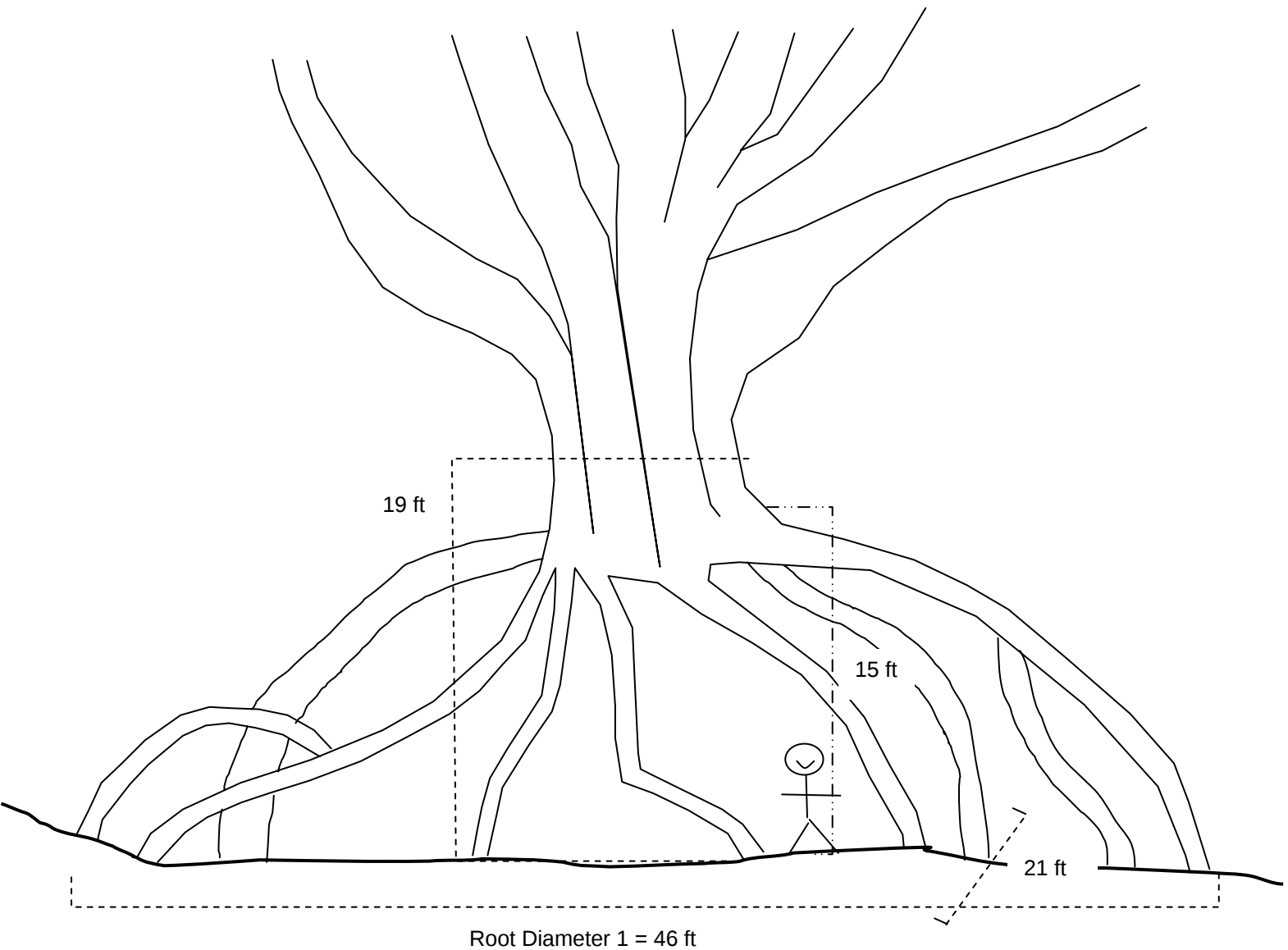
Root diameter 1 = 46 feet

Root diameter 2 = 21 feet

Prop root density = 1

Aerial root density = 0

Branching characteristics = 4



## APPENDIX 9 – DETERMINING SCALES AND BASELINES FROM A MAP OR PHOTO

### Determining scale measuring object of known size on map or photo

First you must measure the length of an object on the map or photo whose actual length you know. This might be a football field, a city block, or a section of a road. You need to go out to the location mapped or pictured and measure the distance between two identifiable objects. Once you have the two distances, you can find the scale

For example, suppose you have a photo and you need to determine the scale of the photo. Find 2 points on the ground that are visible on the photo and are easy to identify on the ground. Road intersections usually work well because they are usually easy to find on the photos and on the ground. Measure the horizontal distance between these 2 points on the ground (ground distance). Then measure the distance between the 2 points on the photo (photo distance).

If the distance between the 2 points is **1,200 feet** ground distance, and **.4 inches** photo distance, then the scale of the photos is calculated:

$$\frac{1,300 \text{ feet ground distance}}{.4 \text{ inches photo distance}} * \frac{12 \text{ inches}}{1 \text{ foot}} = \frac{(1,300 * 12)}{.4} = \frac{15,600 \text{ ground}}{.4 \text{ map}} = \mathbf{1:39,000}$$

This means that 1 inch on the photo is equal to 39,000 inches on the ground. Since 1 foot = 12 inches, then 39,000 inches/ 12 feet = 3,250 feet. Therefore, each inch on the photo is equal to 3,250 feet on the ground.

One exception for aerial photos is that this method assumes the two locations are at the same elevation--or that the terrain is flat. If you are using aerial photos, the terrain may not be flat. If there are hills, even moderate ones, the calculations can be thrown off. Try to measure the distance between 2 points on the ground that are similar in elevation.

### Determining scale by comparing with another map or photo of known scale

Another way to calculate scale on an unknown map or photo is to compare it to a map with a known scale. For example, suppose you have an aerial photo where the distance between two hills is **3.12 inches**. You have a map of the same area at **1:24,000**, and on the map the distance between the hills is **1.3 inches**. The answer involves a little algebra. Since the ground distance is the same on both photo and map, we can create an expression for this ground distance for both, and then put them on either side of an equation. The ground distance can be found by multiplying the map/photo distance by the scale (in this case, by the inverse of the scale--notice how this makes the units cancel correctly). We need to find, for the photo, how many ground units are represented by one unit on the photo, so we use an x for this unknown quantity and solve for it:

$$3.12 \text{ in photo} * \frac{x \text{ ground}}{1 \text{ photo}} = 1.3 \text{ in map} * \frac{24,000 \text{ ground}}{1 \text{ map}} ; \text{ and}$$

$$3.12 \text{ in} * x \text{ ground} = 1.3 \text{ in} * 24,000 \text{ ground}$$

$$x = \frac{1.3 \text{ in} * 24,000}{3.12 \text{ in}} = 10,000$$

The scale for the photo is 1:10,000

### Calculating a baseline on a map or photo

A baseline is often used in thick jungle where gps coordinates are difficult to obtain and/or navigation by using maps and aerial photography is difficult. A baseline is used to measure an azimuth and distance from a known point to the plot center. To calculate a baseline:

1. Determine the scale of the map or photo.
2. Measure the photo or map distance from a point of departure to the plot center. The point of departure is a known location that can be identified on the map or photo and can also be identified on the ground (a tree, intersection, house, etc)..
3. Calculate the ground distance using the photo or map scale and the photo or map distance.

For example:

The photo scale is 1:12,000

The photo distance from the corner of a house to the plot center is 1.13 inches. The house must be visible on the photo and identified on the ground.

$$1.13 \text{ inches photo} * \frac{12,000 \text{ ground}}{1 \text{ photo}} = 13,560 \text{ inches ground distance}$$

$$13,560 \text{ inches} * \frac{1 \text{ foot}}{12 \text{ inches}} = 1,130 \text{ feet ground distance}$$

Therefore, you must measure 1,130 feet from the corner of the house to arrive at plot center.

The azimuth from the house to the plot center can be calculated by:

- 1) Measure the azimuth between two points that are visible on the photos and the ground. Straight-line sections of road or powerlines often work well for determining baselines. Shoot the azimuth down one side of the road.
- 2) Draw a line in pencil on the photo between the 2 points you just measured the azimuth between. Extend this line as far as necessary.
- 3) Find a place that can be identified on the ground and the photo from which you can measure azimuth and distance to find plot center. This is your point of departure. Draw a line between plot center and the point of departure. This is your baseline. Extend this line as far as necessary so that it intersects the line drawn previously in number 2.
- 4) Calculate the azimuth from the known point of departure and the plot center using a protractor and the line drawn in number 2.

Adapted from Bryan Baker, Sonoma State University, Principles of map scale,  
[www.sonoma.edu/GIC/Geographica/Mapinterp/Scale.htm](http://www.sonoma.edu/GIC/Geographica/Mapinterp/Scale.htm), January, 1999

## APPENDIX 10 -- COMPLETING AND EDITING PLOTS

### Completed plots

A plot is considered “complete” when all data items have been collected and entered into an electronic format, the data has been printed out, edited, and corrected. The field crew and the crew supervisor must edit the data. Members of the field crew must make the editing corrections.

Plot data should be electronically entered within 48 hours of collecting field data. Plot data should be edited, corrected and turned in to the crew supervisor within 1 week of completing field data collection for each plot.

### Editing for completeness:

1. Is there at least 10% tree cover over an area of at least 1 acre that is at least 120 ft wide somewhere on the plot?

Plot Status = 1 (Accessible Forest Land). Fill out all of these forms:

- a. Condition Class Data
- b. Subplot Data
- c. Plot Data, including GPS
- d. Tree Tally
- e. Vegetation Profile
- f. Seedling Count
- g. Vegetation Data

2. Is there less than 10% tree cover and the at least part of the plot can be classified as Measured Nonforest (Present Nonforest Land Use 16 – 26)? Fill out all of these forms:

- a. Condition Class
- b. Subplot
- c. Plot Data, including GPS
- d. Tree tally
- e. Vegetation Profile
- f. Seedling Count
- g. Vegetation Data

3. Is the Plot Status 2,3,4,5,6,7 (nonforest) and Present Nonforest Land Use is not 16 through 26? Then fill out all of these forms

- a. Condition Class Data
- b. Boundary Data (if mapping needed)
- c. Plot Data, including GPS

### Plot edits

Plot data should be thoroughly checked for data errors and omissions. The data entry program will catch many data errors, but the plots still need to be edited. The following list will aid in checking for valid data:

## **Tree Data**

Trees are in correct condition class according to subplot boundary mapping

Tree Status is correct

Lean angle makes sense (0=not leaning)

Diameter has 1 decimal place (example: 14.9, 7.0)

Diameter check makes sense (0=measured, 1=estimated)

Ht to diameter has 1 decimal place (example: 4.5)

If root system > 0, appropriate diameters and hts filled out

Root system = 1, all root measurements needed

Root system = 2, fill out # buttresses, rooting height

Root diameters and ht have no decimal places (example: 2 feet)

Rot/cull corresponds to damages (if there is a rot coded in damage, then code a % rot/cull)

If total length different than actual length, damage is coded (6/21/severity/damage agent)

Damages make sense and codes are valid

Damage agent is filled out if there is a damage

Upper diameter ht has no decimal places (example: 44 feet)

Reference trees are marked (need at least 2 reference trees for each subplot)

Diameters and heights are reasonable

If status = 2 (dead tree), then need code for snag decay class and rot/cull

Tree notes make sense

Tree Tally and Vegetation data is recorded for accessible forest land and grass land plots

## **Vegetation Data**

Vegetation is in correct growth form

All veg species have heights

All veg species have scientific names

Each tree species has the correct number code

### **Plot Data**

Plotcard with map and descriptions are filled out

Can someone pick up this plotcard and find the plot just going by your directions?

Can they tell what each condition class is?

Can they tell where the condition class boundaries are?

Is the plot described in enough detail?

Plot diagram matches subplot attributes

GPS coordinates are recorded. Complete directions to plot are recorded if GPS coordinates were not taken at plot center.

### **Condition Class Data**

Condition class attributes match plot diagram, subplot attributes

Condition class attributes are complete, all condition classes are described

## APPENDIX 11 – DATA SHEETS

Plot

Guam Tree Tally 2002

Date

| Subplot | tree # | CC # | Azimuth | Horiz Dist | Slope Dist | Status | Species                      | DBH  | DBH check | Ht to DBH | Upper Diam | Up Diam Ht | Branch Form | Root Syst | Root Diam 1 | Root Diam 2 | Root Den/# | Root Ht | Aerial Root | Rot | Lean Angle | Tot Length | Act Length | Length Meth | Crown Class | Unc Cwn R | Comp Ratio | Dam Loc 1 | Dam Typ 1 | Severity 1 | Dam Agent <sup>1</sup> | Dam Typ 2 | Severity 2 | Dam Agent <sup>2</sup> | Snag DC | Epiphyte |   |
|---------|--------|------|---------|------------|------------|--------|------------------------------|------|-----------|-----------|------------|------------|-------------|-----------|-------------|-------------|------------|---------|-------------|-----|------------|------------|------------|-------------|-------------|-----------|------------|-----------|-----------|------------|------------------------|-----------|------------|------------------------|---------|----------|---|
| 114     | 114    | 115  | 115     | 116.       | 116.       | 116    | Error! Bookmark not defined. | 117. |           | .         |            |            | 124         | 125       |             |             |            |         | 127         | 128 | 128        | 129        | 129        | 129         | 130         | 131       | 133        | 136       | 143       | 145        | 158                    |           |            |                        | 159     | 160      | 1 |
|         |        |      |         | .          | .          |        |                              | .    |           | .         |            |            |             |           |             |             |            |         |             |     |            |            |            |             |             |           |            |           |           |            |                        |           |            |                        |         |          |   |
|         |        |      |         | .          | .          |        |                              | .    |           | .         |            |            |             |           |             |             |            |         |             |     |            |            |            |             |             |           |            |           |           |            |                        |           |            |                        |         |          |   |
|         |        |      |         | .          | .          |        |                              | .    |           | .         |            |            |             |           |             |             |            |         |             |     |            |            |            |             |             |           |            |           |           |            |                        |           |            |                        |         |          |   |
|         |        |      |         | .          | .          |        |                              | .    |           | .         |            |            |             |           |             |             |            |         |             |     |            |            |            |             |             |           |            |           |           |            |                        |           |            |                        |         |          |   |
|         |        |      |         | .          | .          |        |                              | .    |           | .         |            |            |             |           |             |             |            |         |             |     |            |            |            |             |             |           |            |           |           |            |                        |           |            |                        |         |          |   |
|         |        |      |         | .          | .          |        |                              | .    |           | .         |            |            |             |           |             |             |            |         |             |     |            |            |            |             |             |           |            |           |           |            |                        |           |            |                        |         |          |   |
|         |        |      |         | .          | .          |        |                              | .    |           | .         |            |            |             |           |             |             |            |         |             |     |            |            |            |             |             |           |            |           |           |            |                        |           |            |                        |         |          |   |
|         |        |      |         | .          | .          |        |                              | .    |           | .         |            |            |             |           |             |             |            |         |             |     |            |            |            |             |             |           |            |           |           |            |                        |           |            |                        |         |          |   |
|         |        |      |         | .          | .          |        |                              | .    |           | .         |            |            |             |           |             |             |            |         |             |     |            |            |            |             |             |           |            |           |           |            |                        |           |            |                        |         |          |   |
|         |        |      |         | .          | .          |        |                              | .    |           | .         |            |            |             |           |             |             |            |         |             |     |            |            |            |             |             |           |            |           |           |            |                        |           |            |                        |         |          |   |
|         |        |      |         | .          | .          |        |                              | .    |           | .         |            |            |             |           |             |             |            |         |             |     |            |            |            |             |             |           |            |           |           |            |                        |           |            |                        |         |          |   |
|         |        |      |         | .          | .          |        |                              | .    |           | .         |            |            |             |           |             |             |            |         |             |     |            |            |            |             |             |           |            |           |           |            |                        |           |            |                        |         |          |   |
|         |        |      |         | .          | .          |        |                              | .    |           | .         |            |            |             |           |             |             |            |         |             |     |            |            |            |             |             |           |            |           |           |            |                        |           |            |                        |         |          |   |
|         |        |      |         | .          | .          |        |                              | .    |           | .         |            |            |             |           |             |             |            |         |             |     |            |            |            |             |             |           |            |           |           |            |                        |           |            |                        |         |          |   |

CONDITON CLASS DATA      descriptions begin on page **51**

|                                 |   |   |   |   |   |
|---------------------------------|---|---|---|---|---|
| Plot                            |   |   |   |   |   |
| Condition Class                 | 1 | 2 | 3 | 4 | 5 |
| Condition Status                |   |   |   |   |   |
| Reserved Status                 |   |   |   |   |   |
| Owner Group                     |   |   |   |   |   |
| Forest Type                     |   |   |   |   |   |
| Stand Size Class                |   |   |   |   |   |
| Regeneration Status             |   |   |   |   |   |
| Tree Density                    |   |   |   |   |   |
| Owner Class                     |   |   |   |   |   |
| Private Owner Industrial Status |   |   |   |   |   |
| Artificial Regeneration Species |   |   |   |   |   |
| Stand Age                       |   |   |   |   |   |
| Dominant Tree Species 1         |   |   |   |   |   |
| Dominant Tree Species 2         |   |   |   |   |   |
| Dominant Tree Species 3         |   |   |   |   |   |
| Disturbance 1                   |   |   |   |   |   |
| Disturbance Year 1              |   |   |   |   |   |
| Disturbance 2                   |   |   |   |   |   |
| Disturbance Year 2              |   |   |   |   |   |
| Disturbance 3                   |   |   |   |   |   |
| Disturbance Year 3              |   |   |   |   |   |
| Treatment 1                     |   |   |   |   |   |
| Treatment year 1                |   |   |   |   |   |
| Treatment 2                     |   |   |   |   |   |
| Treatment Year 2                |   |   |   |   |   |
| Treatment 3                     |   |   |   |   |   |
| Treatment Year 3                |   |   |   |   |   |
| CC Aspect                       |   |   |   |   |   |
| CC % Slope                      |   |   |   |   |   |
| CC Slope Shape                  |   |   |   |   |   |
| CC Slope Position               |   |   |   |   |   |
| Present Nonforest Land Use      |   |   |   |   |   |

PLOT DATA            descriptions begin on page **29**

|                                           |  |  |
|-------------------------------------------|--|--|
| Island                                    |  |  |
| County                                    |  |  |
| Plot                                      |  |  |
| Sample Kind                               |  |  |
| Year                                      |  |  |
| Month                                     |  |  |
| Day                                       |  |  |
| Declination                               |  |  |
| Forested                                  |  |  |
| Trails or Roads                           |  |  |
| Horizontal Dist to Improved Road          |  |  |
| Road access                               |  |  |
| Public Use Restrictions                   |  |  |
| Recreation use 1                          |  |  |
| Recreation use 2                          |  |  |
| Recreation use 3                          |  |  |
| Water on plot                             |  |  |
| QA status                                 |  |  |
| Crew type                                 |  |  |
| GPS unit                                  |  |  |
| GPS serial #                              |  |  |
| Coordinate System                         |  |  |
| UTM zone                                  |  |  |
| Easting (x)                               |  |  |
| Northing (y)                              |  |  |
| GPS elevation                             |  |  |
| GPS error                                 |  |  |
| Number of readings                        |  |  |
| GPS datum                                 |  |  |
| GPS filename                              |  |  |
| Was GPS collected at center of subplot 1? |  |  |
| Azimuth to plot center                    |  |  |
| Distance to plot center                   |  |  |
| Description                               |  |  |

## SUBPLOT DATA

| Plot                           |   |   |   |   |
|--------------------------------|---|---|---|---|
| Subplot                        | 1 | 2 | 3 | 4 |
| Subplot center condition Class |   |   |   |   |
| Microplot Center Condition     |   |   |   |   |
| Subplot Status                 |   |   |   |   |
| Slope                          |   |   |   |   |
| Aspect                         |   |   |   |   |
| Slope Shape                    |   |   |   |   |
| Slope Position                 |   |   |   |   |
| Water Depth                    |   |   |   |   |

Slope shape: 00 = Flat  
 10 = Concave  
 20 = Convex

Slope Position: 00 = no slope  
 10 = upper shoulder  
 20 = midslope  
 30 = footslope  
 40 = valley bottom  
 50 = ridgetop

## MAPPING/BOUNDARY DATA

| Subplot | Plot type | Contrasting Condition | Left Azimuth | Corner Azimuth | Corner Distance | Right Azimuth |
|---------|-----------|-----------------------|--------------|----------------|-----------------|---------------|
|         |           |                       |              |                |                 |               |
|         |           |                       |              |                |                 |               |
|         |           |                       |              |                |                 |               |
|         |           |                       |              |                |                 |               |
|         |           |                       |              |                |                 |               |
|         |           |                       |              |                |                 |               |
|         |           |                       |              |                |                 |               |
|         |           |                       |              |                |                 |               |
|         |           |                       |              |                |                 |               |
|         |           |                       |              |                |                 |               |
|         |           |                       |              |                |                 |               |
|         |           |                       |              |                |                 |               |
|         |           |                       |              |                |                 |               |
|         |           |                       |              |                |                 |               |
|         |           |                       |              |                |                 |               |

Plot type: 1 = Subplot  
 2 = Microplot

## Appendices

Plot Number \_\_\_\_\_ Date \_\_\_\_\_

## LIFEFORM COVER

| Subplot | Total Seedling Cover | Total Shrub Cover | Total Forb Cover | Total Grass Cover | Total Veg Cover |
|---------|----------------------|-------------------|------------------|-------------------|-----------------|
| 1       |                      |                   |                  |                   |                 |
| 2       |                      |                   |                  |                   |                 |
| 3       |                      |                   |                  |                   |                 |
| 4       |                      |                   |                  |                   |                 |

SEEDLING COUNT      count up to 6 seedlings of each species on the microplot

[illegible]

## SEEDLING VEGETATION COVER

Plot # \_\_\_\_\_

[illegible]

## Appendices

FORB VEGETATION COVER

Plot # \_\_\_\_\_

[illegible]

## SHRUB VEGETATION COVER

Plot # \_\_\_\_\_

[illegible]

## GRASS VEGETATION COVER

Plot # \_\_\_\_\_

[illegible]

## PRIORITY SPECIES

Date \_\_\_\_\_

A list of species is found on page **235**

[illegible]

Abundance:

1 = less than 5 plants

2 = 5 to 15 plants

3 = more than 15 plants

Size:

1 = < 1.0 in dbh (seedlings)

2 = 1.0 – 4.9 in dbh (saplings)

3 = 5.0 – 8.9 in dbh

4 = 9.0 – 19.9 in dbh

5 = 20.0 – 39.9 in dbh

$$6 = 40.0 + \ln \text{dbh}$$



## APPENDIX 12 -- METRIC EQUIVALENTS AND AIDS

### Length

1 inch = 2.54 centimeters (cm.)  
0.1 feet = 3.048 centimeters (cm.)  
1 foot = 0.3048 meter (m.)  
1 mile = 1.609 kilometers (km.)

1 centimeter (cm.) = .03 foot (ft.)  
1 meter (m.) = 3.2808 feet (ft.)

### Area

1 acre = 0.4 hectare (ha.) (approximately)  
5 acres = 2 hectares (ha.) (approximately)  
1,000 acres = 404.7 hectares (ha.)  
1 hectare = 2.471 acres (ac.)  
2.5 hectares = 6 acres (ac.) (approximately)

### Volume

1,000 cubic feet = 28.3 meters (m<sup>3</sup>)  
1 cubic foot per acre = 0.07 cubic meter per hectare (m<sup>3</sup>/ha)

### Condition class minimum area

0.4 hectares (1 acre) = 4,000 square meters  
= 40 meters x 100 meters  
= 35 meter radius circle  
  
1 acre = 118 foot radius circle  
= 209 feet x 209 feet  
= 43,560 square feet

### **Metric System-length**

1 meter = 10 decimeters (dm.)  
 1 meter = 100 centimeters (cm.)  
 1 meter = 1,000 millimeters (mm.)

and:

.001 meters = 1 millimeter  
 .01 meters = 1 centimeter  
 .1 meters = 1 decimeter  
 1 meter = 1 meter  
 10 meters = 1 decameter  
 100 meters = 1 hectometer  
 1,000 meters = 1 kilometer

### **Photo Scales**

| <u>Scale</u> | <u>Length on Photo</u> | <u>Length on Ground</u> |
|--------------|------------------------|-------------------------|
| 1:15,840     | 1 mm.                  | 15.8 meters             |
| 1:24,000     | 1 mm.                  | 24.0 meters             |
| 1:31,680     | 1 mm.                  | 31.7 meters             |
| 1:40,000     | 1 mm.                  | 40.0 meters             |
| 1:15,840     | 1 inch                 | 1,320 feet              |
|              | 0.1 inch               | 132 feet                |
|              | .05 inch (1/20)        | 66 feet                 |
| 1:24,000     | 1 inch                 | 2,000 feet              |
|              | 0.1 inch               | 200 feet                |
|              | .05 inch (1/20)        | 100 feet                |
| 1:31,680     | 1 inch                 | 2,640 feet              |
|              | 0.1 inch               | 264 feet                |
|              | .05 inch (1/20)        | 132 feet                |
| 1:40,000     | 1 inch                 | 3,333 feet              |
|              | 0.1 inch               | 333 feet                |
|              | .05 inch (1/20)        | 166 feet                |

APPENDIX 13 -- HELLO LETTER/DATA CONFIDENTIALITY

|                                                                       |                           |                                                       |                                                                                          |
|-----------------------------------------------------------------------|---------------------------|-------------------------------------------------------|------------------------------------------------------------------------------------------|
| <b>United States<br/>Laboratory<br/>Department of<br/>Agriculture</b> | <b>Forest<br/>Service</b> | <b>Pacific<br/>Northwest<br/>Research<br/>Station</b> | <b>Forestry Sciences<br/>P.O. Box 3890<br/>Portland, Oregon 97208<br/>(503) 808-2000</b> |
|-----------------------------------------------------------------------|---------------------------|-------------------------------------------------------|------------------------------------------------------------------------------------------|

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File Code: 4810

Date: Summer 2001

To Whom It May Concern:

Hello, we are researchers from the USDA Forest Service, Pacific Northwest Research Station. We are obtaining information on the forest resources of the Pacific Northwest from measurements taken on a large number of randomly located sample plots on forestland. We are visiting one of these plots in this general vicinity today.

We locate each plot from a sample selected on an aerial photograph. While at the site we record information pertaining to the type of terrain; tree species, heights, and diameters; insect and disease damage; mortality and regeneration; and the amount and kind of understory vegetation. Many of our field plots were first established in the early 1960's and have been revisited on a 10-year cycle.

With the measurements we take, analysts will develop basic information about the amount, condition, and change in the area's forest resource. Published reports contain data on forest land area and ownership, timber volume, forest growth, mortality and cut, potential productivity, and opportunities for silvicultural treatment.

If you are interested in learning more about our research plans, or care to see publications from previous inventories similar to this one, please contact Otha Terry at (503) 808-2044 or Bob Rhoads at (503) 808-2022 by telephone or by writing to:

Portland Forestry Sciences Laboratory  
Forest Inventory and Analysis Program  
P. O. Box 3890  
Portland, OR 97208-3890

Sincerely,

## Appendices

BOB RHOADS  
Team Leader  
Forest Inventory and Analysis

APPENDIX 14 -- LANDOWNER CONTACT LETTER

|                                                                       |                                |                                                            |                                                                                               |
|-----------------------------------------------------------------------|--------------------------------|------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| <b>United States<br/>Laboratory<br/>Department of<br/>Agriculture</b> | <b>Forest<br/><br/>Service</b> | <b>Pacific<br/><br/>Northwest<br/>Research<br/>Station</b> | <b>Forestry Sciences<br/><br/>P.O. Box 3890<br/>Portland, Oregon 97208<br/>(503) 808-2000</b> |
|-----------------------------------------------------------------------|--------------------------------|------------------------------------------------------------|-----------------------------------------------------------------------------------------------|

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File Code: 4810

Date:

«OWN\_NAME»

«ADDRESS\_LINE\_1»

«ADDRESS\_LINE\_2»

«ADDRESS\_LINE\_3»

Dear«OWN\_NAME»

The Pacific Northwest Research Station is continuing to collect basic information about forest resources in Oregon. The Forest Inventory and Analysis (FIA) Program at the station participates in a national effort to evaluate the status and condition of our nations forest ecosystems. Data is collected on FIA field plots so that we can determine the amount, condition and trends of Oregon's forested resources. The data will also allow us to detect and understand changes in local and regional forest health.

A grid of permanent plots were established in the 1960's and have been re-measured in the 1970's, 80's and 90's on a 10-year cycle. Recently our program has undergone changes, affecting how the inventory will be conducted. Starting in 2000, a percent of the FIA plots in will be sampled across each state each year on a 5- or 10- year cycle.

Data we collect from the field plot(s) on your property are combined with other plot data from adjoining areas and counties to provide information about resource conditions in the state of Oregon. The data will not be identified in any way with your name or property and will have no bearing on your property taxes. Collected data are summarized, analyzed, and published in statistical and analytical reports for the United States, for Oregon alone, and for various geographic areas within Oregon and are available to the public.

Our records show that this year there is a field plot(s) that falls on your land. The legal description of the location of this plot is Township «TWN», Range«RANGE», Section «SEC», «FORTY». We request your permission to access your land to measure the trees and the vegetation on this plot. We only request your permission to access your land. We do not ask you to change your management practices, nor will our measurements affect any ongoing or planned activities for this site.

Our field staff will be in your area between April 16<sup>th</sup> and October 30<sup>th</sup>, 2001. If you wish, they will contact you before entering your land. We realize that working on your land is a privilege and we will respect your landowner rights at all times. We are prepared to honor any special conditions that you may require of us. Enclosed is a reply postcard for

your response and any concerns , such as locked gates or other access problems. If you have any questions regarding this letter or pertaining to this inventory, please feel free to contact Bob Rhoads at 503-808-2022 or Otha Terry at 503-808-2044

We will be happy to share the resource information we gather from your property should you be interested.

Thankyou again for your cooperation in this study. Your participation is greatly appreciated.

SUSAN A. WILLITS  
Program Manager  
Forest inventory and Analysis

Enclosure

«COUNTY» County («CNTY\_CODE») Plot «SECDRY\_PLT\_ID\_IN\_CNTY»

|                                                                       |                           |                                                       |                                                                                          |
|-----------------------------------------------------------------------|---------------------------|-------------------------------------------------------|------------------------------------------------------------------------------------------|
| <b>United States<br/>Laboratory<br/>Department of<br/>Agriculture</b> | <b>Forest<br/>Service</b> | <b>Pacific<br/>Northwest<br/>Research<br/>Station</b> | <b>Forestry Sciences<br/>P.O. Box 3890<br/>Portland, Oregon 97208<br/>(503) 808-2000</b> |
|-----------------------------------------------------------------------|---------------------------|-------------------------------------------------------|------------------------------------------------------------------------------------------|

---

File Code: 4810

Date:

## **R E L E A S E**

The USDA FOREST SERVICE assumes liability, pursuant to the Federal Tort Claims Act, for any damages caused by negligence of Forest Service personnel while upon the landowner's property in connection with the inventory of forest resources in the State of Oregon, and the landowner shall not be liable for injuries occurring to Forest Service personnel for any reason except the negligent or wrongful acts of the landowner while they are on the property owned or controlled by the landowner.

County \_\_\_\_\_

Plot Number \_\_\_\_\_

Landowner \_\_\_\_\_

SUSAN A. WILLITS  
Program Manager  
Forest Inventory and Analysis  
Pacific Northwest Research Station  
US Department of Agriculture



## APPENDIX 15 -- VARIANCE PLOTS

**A. Objectives:** Variance plots are performed for several purposes:

1. To assess the range of values for collected data;
2. To ensure that documented field plot instructions and accuracy standards are uniformly understood and consistently followed;
3. To assess the ability of individual crew members.

**B. Variance plot policies:** The following policies for conducting variance plots will be followed:

1. Each person will be checked within the first two weeks of field work and will accompany the variance-plotter to the variance plot.
2. Variance plots will continue during the entire season; each person is assessed multiple times throughout the field season.
3. All variance plot items count equally for each person who did the plot.

**C. Types of variance plots:**

Hot Variance - an informal inspection 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 variances can be done on test plots or production plots.

Cold Variance - a formal or informal inspection done either as part of the training process, or as part of an ongoing QC program. The inspector re-measures completed work after a crew has turned it in. Data errors are corrected. Cold variances are done on production plots only.

Blind Variance - a formal inspection done without crew data on hand; a full re-installation of the plot for the purpose of obtaining a measure of data variance. The two data sets are maintained separately. Data are NOT corrected. Blind variances are done on production plots only.

**D. Variance plot procedures:**

1. In the field, the variance plotter checks all tree classifications and measurements. The variance plotter or one of the crew members who originally did the plot makes all of the tree measurements during the variance plot visit. These variance measurements are compared to the original measurements recorded on the data recorder hardcopy for hot and cold variance plots. Items that do not meet accuracy standards are rechecked. Final decisions on accuracy rest with the variance plotter. Errors are circled in red on the original tally sheet, and the correct value written near the circle.

Blind variance plots are recorded as a new plot without any reference to prior measurement. New data sheets are used and the plots are designated as blind variance

2. Completing the variance plot form. Field plot items on the variance plot form are organized into categories based on what the items are related to. Each category is given a percentage rating based on the amount of items correct. The grading procedures give weights differently to items depending on the item's importance.

## APPENDIX 16 – GLOSSARY

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ACCESSIBLE FOREST LAND   | LAND THAT IS WITHIN SAMPLED AREA (THE POPULATION OF INTEREST), IS ACCESSIBLE AND CAN SAFELY BE VISITED, AND MEETS THE FOLLOWING CRITERIA: THE CONDITION HAS AT LEAST 5 PERCENT CROWN COVER BY TREES OF ANY SIZE, OR HAS HAD AT LEAST 5 PERCENT COVER IN THE PAST. ADDITIONALLY, THE CONDITION IS NOT SUBJECT TO NONFOREST USE THAT PREVENTS NORMAL REGENERATION AND SUCCESSION SUCH AS REGULAR MOWING, GRAZING, OR RECREATION ACTIVITIES |
| ACRE:                    | A UNIT OF LAND CONTAINING 43,560 SQUARE FEET OF AREA.                                                                                                                                                                                                                                                                                                                                                                                    |
| AGE AT BREAST-HIGH       | THE NUMBER OF ANNUAL GROWTH RINGS BETWEEN THE BARK AND THE CENTER OF THE TREE AT 4.5 FEET ABOVE THE ROOT COLLAR ON THE BOLE OF A TREE.                                                                                                                                                                                                                                                                                                   |
| AGRICULTURAL LAND        | LAND MANAGED FOR CROPS, PASTURE, OR OTHER AGRICULTURAL USE. EVIDENCE INCLUDES GEOMETRIC FIELD AND ROAD PATTERNS, FENCING, AND THE TRACES PRODUCED BY LIVESTOCK OR MECHANIZED EQUIPMENT. THE AREA MUST BE AT LEAST 1.0 ACRE IN SIZE AND 120.0 FT WIDE AT THE POINT OF OCCURRENCE                                                                                                                                                          |
| ASPECT                   | THE DIRECTION A SLOPE FACES.                                                                                                                                                                                                                                                                                                                                                                                                             |
| AZIMUTH:                 | ANGLE OR DIRECTION FROM 1 TO 360 DEGREES. THE AZIMUTH PLUS 180 DEGREES IS THE BACK AZIMUTH.                                                                                                                                                                                                                                                                                                                                              |
| BASAL AREA:              | (A) OF A TREE: THE CROSS SECTIONAL AREA OF A TREE AT BREAST HEIGHT ON THE STEM. (B) OF A FOREST OR STAND: THE CROSS-SECTIONAL AREA AT BREAST HEIGHT OF ALL TREES WITHIN A UNIT OF AREA.                                                                                                                                                                                                                                                  |
| BASAL AREA FACTOR (BAF): | THE BASAL AREA PER UNIT OF AREA CORRESPONDING WITH A GIVEN CRITICAL ANGLE IN VARIABLE-RADIUS PLOT SAMPLING.                                                                                                                                                                                                                                                                                                                              |
| BLIND VARIANCE           | A RE-INSTALLATION DONE BY A QUALIFIED INSPECTION CREW WITHOUT PRODUCTION CREW DATA ON HAND; A FULL RE-INSTALLATION OF THE PLOT FOR THE PURPOSE OF OBTAINING A MEASURE OF DATA QUALITY. THE TWO DATA SETS ARE MAINTAINED SEPARATELY. DISCREPANCIES BETWEEN THE TWO SETS OF DATA ARE NOT RECONCILED. BLIND VARIANCES ARE DONE ON PRODUCTION PLOTS ONLY.                                                                                    |
| BOLE:                    | TRUNK OR MAIN STEM OF A TREE.                                                                                                                                                                                                                                                                                                                                                                                                            |

|                    |                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| BORDERLINE TREE:   | A TREE THAT IS AT OR NEARLY AT THE LIMITING DISTANCE ASSOCIATED WITH A GIVEN BASAL AREA FACTOR. BORDERLINE TREES REQUIRED PRECISE CHECKING TO DETERMINE IF THEY ARE TO BE SAMPLED.                                                                                                                                                                                                                |
| BREAST HEIGHT:     | THE STANDARD HEIGHT, 4.5 FEET ABOVE GROUND LEVEL, AT WHICH DIAMETER OF A STANDING TREE OR SNAG IS MEASURED. ON SLOPING GROUND, BREAST HEIGHT IS MEASURED ON THE UPHILL SIDE OF THE BOLE.                                                                                                                                                                                                          |
| CANKER:            | LOCALIZED INJURY TO STEM, BRANCH OR ROOT; CAUSED BY DISEASE OR INSECTS.                                                                                                                                                                                                                                                                                                                           |
| CANOPY:            | THE COVER OF FOLIAGE FORMED BY TREE CROWNS.                                                                                                                                                                                                                                                                                                                                                       |
| CANOPY CLOSURE     | THE PERCENTAGE OF GROUND AREA COVERED BY THE VERTICALLY PROJECTED CROSS-SECTIONS OF TREE CROWNS                                                                                                                                                                                                                                                                                                   |
| CENSUS WATER:      | PERMANENT AREAS OF WATER MORE THAN 4.5 ACRES OR WIDER THAN 200 FEET.                                                                                                                                                                                                                                                                                                                              |
| CERTIFICATION PLOT | A PLOT INSTALLED BY A CERTIFICATION CANDIDATE. IT MAY BE A TRAINING PLOT OR A PRODUCTION PLOT. THE CANDIDATE WORKING ALONE INSTALLS THE PLOT.                                                                                                                                                                                                                                                     |
| COLD VARIANCE      | AN INSPECTION DONE EITHER AS PART OF THE TRAINING PROCESS, OR AS PART OF THE ONGOING QC PROGRAM. NORMALLY THE INSTALLATION CREW IS NOT PRESENT AT THE TIME OF INSPECTION. THE INSPECTOR HAS THE COMPLETED DATA IN-HAND AT THE TIME OF INSPECTION. THE INSPECTION CAN INCLUDE THE WHOLE PLOT OR A SUBSET OF THE PLOT. DATA ERRORS ARE CORRECTED. COLD VARIANCES ARE DONE ON PRODUCTION PLOTS ONLY. |
| CLINOMETER         | AN INSTRUMENT USED TO MEASURE PER CENT SLOPE                                                                                                                                                                                                                                                                                                                                                      |
| CONDITION CLASS    | CONDITION CLASS IS DEFINED BY DIFFERENCES IN CONDITION STATUS, OR IN ONE OF THE SIX MAPPING VARIABLES: RESERVED STATUS, FOREST TYPE, OWNER GROUP, STAND SIZE, REGENERATION STATUS, AND TREE DENSITY.                                                                                                                                                                                              |
| CONIFER:           | CONE-BEARING TREES, MOSTLY EVERGREENS, WITH NEEDLE OR SCALE-LIKE LEAVES BELONGING TO THE BOTANICAL GROUP GYMNOSPERMAE. ALSO REFERRED TO AS SOFTWOODS.                                                                                                                                                                                                                                             |
| CONK:              | THE FRUITING BODY OF A WOOD-DESTROYING FUNGUS WHICH PROJECTS FROM THE TRUNK, ROOTS OR OTHER TREE PARTS.                                                                                                                                                                                                                                                                                           |

|                              |                                                                                                                                                                                                                                                                                                                                                    |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CROOK:                       | ABRUPT BEND OR CURVATURE IN THE BOLE OF A TREE; A CROOK IS A SOUND CULL DEDUCTION FROM GROSS MERCHANTABLE VOLUME.                                                                                                                                                                                                                                  |
| CROWN:                       | THE PORTION OF A TREE CARRYING THE MAIN BRANCH SYSTEM AND FOLIAGE.                                                                                                                                                                                                                                                                                 |
| CROWN CLASS:                 | THE SOCIAL POSITION OF A TREE RELATIVE TO ITS ABILITY TO RECEIVE DIRECT SUNLIGHT.                                                                                                                                                                                                                                                                  |
| CROWN RATIO:                 | THE PERCENT OF A TREE'S TOTAL HEIGHT WHICH HAS A LIVE CROWN.                                                                                                                                                                                                                                                                                       |
| CULL:                        | (A) TREES OR LOGS, OR PORTIONS OF LOGS THAT ARE OF MERCHANTABLE SIZE BUT ARE UNUSABLE FOR INDUSTRIAL WOOD PRODUCTS DUE TO DEFECTS (ROT OR FORM). (B) TO CULL A LOG OR PORTION OF A LOG WITH RESPECT TO GROSS MERCHANTABLE VOLUME (C) THE DEDUCTION MADE FROM GROSS VOLUME OF A TREE OR LOG TO ADJUST FOR SOUND OR ROTTEN DEFECTS.                  |
| ROUGH CULL:                  | PERCENTAGE DEDUCTION OF VOLUME LOST DUE TO BROKEN OR MISSING PARTS, FORKS OR CROOKS.                                                                                                                                                                                                                                                               |
| CULL ROT:                    | LOSS OF GROSS MERCHANTABLE VOLUME DUE TO ROT. VISUALLY INDICATED BY CONKS, ROTTEN SEAMS, ETC., CODED AS A CATEGORY OF PERCENTAGE OF VOLUME AFFECTED BY THE ROT.                                                                                                                                                                                    |
| CULTURAL NONFOREST STRINGER: | NONFOREST AREA OF CONSTRUCTED ROADS, RAILROADS, POWER-LINES, PIPELINES, AND CANALS WHICH ARE 1.0 ACRES OR LARGER WITH NO MINIMUM WIDTH REQUIREMENT.                                                                                                                                                                                                |
| CULTURALLY-KILLED TREE:      | A TREE TALLIED OR RECONSTRUCTED AS LIVE AT OC3 BUT SINCE KILLED BY DIRECT HUMAN ACTIVITY AND NOT UTILIZED. THE TREE CAN BE STANDING, DOWNED, OR FELLED. INCLUDED ARE TREES KILLED BY LOGGING INJURY AND STILL STANDING. A TREE IS CULTURALLY-KILLED ONLY IF IT SHOWS NO SIGN OF LIFE OR IS PARTIALLY UPROOTED , LIVE, AND LEANS $\geq 45$ DEGREES. |
| D.B.H.:                      | DIAMETER BREAST HEIGHT: THE TREE DIAMETER MEASURED AT BREAST HEIGHT--4.5 FEET ABOVE GROUND LEVEL.                                                                                                                                                                                                                                                  |
| DEAD TREE:                   | A TREE TALLIED OR RECONSTRUCTED AS LIVE AT OC3 BUT NOW DEAD. DEATH WAS NATURAL AND NOT DUE TO DIRECT HUMAN ACTIVITY. A TREE IS DEAD ONLY IF IT SHOWS NO SIGH OF LIFE OR IS PARTIALLY UPROOTED, LIVE, AND LEANS $\geq 45$ DEGREES.                                                                                                                  |
| DEFOLIATOR:                  | AN INSECT, WHICH FEEDS UPON, OR STRIPS LEAVES AND NEEDLES FROM TREES.                                                                                                                                                                                                                                                                              |

|                       |                                                                                                                                                                                                                                                                                                        |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DIAMETER              | THE LENGTH OF A STRAIGHT LINE THROUGH THE CENTER OF AN OBJECT                                                                                                                                                                                                                                          |
| DOMINANT TREE SPECIES | THE TREE SPECIES THAT IS THE MOST ABUNDANT AND NOT OVERTOPPED IN A CONDITION CLASS                                                                                                                                                                                                                     |
| EPIPHYTE:             | A PLANT THAT USES A TREE FOR PHYSICAL SUPPORT, BUT WHICH DOES NOT DRAW NOURISHMENT FROM THE TREE                                                                                                                                                                                                       |
| EVEN-AGED STAND:      | A STAND IN WHICH INDIVIDUAL TREES ORIGINATED AT APPROXIMATELY THE SAME TIME. SPECIFICALLY, THE STAND MUST NOT BE CLASSIFIED AS NONSTOCKED, AND AT LEAST 70 PERCENT OF THE LIVE TREES PRESENT MUST BE WITHIN 30 YEARS OF ONE ANOTHER IN TOTAL AGE.                                                      |
| FIELD GRID LOCATION:  | THE CENTER OF SUBPLOT 1 ON THE STANDARD PLOT LAYOUT. THE FIELD GRID LOCATION IS PINPRICKED ON PLOT PHOTOS IF THE PLOT WAS PREVIOUSLY VISITED; THIS INCLUDES ESTABLISHED PLOTS THAT CAN'T BE FOUND. THE FIELD GRID LOCATION IS PINPRICKED ON THE NEW PHOTOS FOR PLOTS THAT WERE NOT VISITED PREVIOUSLY. |
| 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.                                                                                                                                                                                |
| FORB:                 | A BROAD-LEAVED HERBACEOUS PLANT AS DISTINGUISHED FROM GRASSES, SHRUBS AND TREES.                                                                                                                                                                                                                       |
| FOREST TYPE:          | CLASSIFICATION OF A FOREST SITE BASED ON THE TREE SPECIES PRESENT THAT MOST DOMINANTS THE GROWING SPACE OF THE SITE.                                                                                                                                                                                   |
| GLC:                  | GROUND LAND CLASS.                                                                                                                                                                                                                                                                                     |
| GROUND LAND CLASS:    | A CLASSIFICATION OF LAND BY USE. THE MINIMUM AREA FOR CLASSIFICATION IS 1.0 ACRE. EACH MAPPED CONDITION CLASS REQUIRES A GROUND LAND CLASS.                                                                                                                                                            |
| HARDWOODS:            | BROAD-LEAVED AND DECIDUOUS TREES AS OPPOSED TO HAVING NEEDLES. TREES BELONGING TO THE BOTANICAL GROUP ANGIOSPERMAE.                                                                                                                                                                                    |
| HARVESTED TREE:       | A TREE TALLIED OR RECONSTRUCTED AS LIVE AND >5.0 IN. D.B.H. AT A PREVIOUS INVENTORY, BUT SINCE HARVESTED FOR INDUSTRIAL SUPPLY, FIREWOOD, LOCAL USE, OR INCIDENTAL REASONS.                                                                                                                            |

|                     |                                                                                                                                                                                                                                                                        |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| HEARTWOOD:          | THE INNER, NONLIVING CORE OF WOOD IN A TREE BOLE, GENERALLY DARKER THAN SAPWOOD.                                                                                                                                                                                       |
| HECTARE:            | A METRIC UNIT OF AREA EQUAL TO 10,000 SQUARE METERS. 2.47 ACRES.                                                                                                                                                                                                       |
| HORIZONTAL DISTANCE | THE AMOUNT OF SEPARATION BETWEEN TWO POINTS THAT IS MEASURED AS IF BOTH POINTS ARE ON THE SAME PLANE; HORIZONTAL DISTANCE MUST BE CALCULATED FROM SLOPE DISTANCE IF THE 2 POINTS CANNOT BE MEASURED ALONG THE SAME PLANE                                               |
| HOT VARIANCE        | 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 VARIANCES CAN BE DONE ON TRAINING PLOTS OR PRODUCTION PLOTS. |
| IMPROVED PASTURE    | LAND THAT IS CURRENTLY MAINTAINED AND USED FOR GRAZING. EVIDENCE OF MAINTENANCE, BESIDES THE DEGREE OF GRAZING, INCLUDES CONDITION OF FENCING, PRESENCE OF STOCK PONDS, PERIODIC BRUSH REMOVAL, SEEDING, IRRIGATION, OR MOWING.                                        |
| INCLUSION           | AN AREA THAT WOULD GENERALLY WOULD BE RECOGNIZED AS A SEPARATE CONDION, EXCEPTH THAT IT IS NOT LARGE ENOUGH TO QUALIFY. FOR EXAMPLE, A ½ ACRE POND WITHIN A FORESTED STAND.                                                                                            |
| INCREMENT:          | THE INCREMENT IN D.B.H. OF A TREE IN A SPECIFIED PERIOD OF TIME.                                                                                                                                                                                                       |
| INGROWTH TREE:      | A TREE THAT HAS GROWN PAST A DIAMETER THRESHOLD ON A FIXED-RADIUS PLOT SINCE PREVIOUS INVENTORY.                                                                                                                                                                       |
| INSPECTION CREW     | A CREW OF QUALIFIED QC/QA INDIVIDUALS WHOSE PRIMARY RESPONSIBILITY IS THE TRAINING, CERTIFICATION AND INSPECTION OF PRODUCTION CREWS.                                                                                                                                  |
| 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.                                                      |
| MORTALITY TREE:     | SEE DEAD TREE.                                                                                                                                                                                                                                                         |
| MQO                 | MEASUREMENT QUALITY OBJECTIVE – DESCRIBES THE ACCEPTABLE TOLERANCE FOR EACH DATA ELEMENT. MQOs CONSIST OF TWO PARTS: A STATEMENT OF THE TOLERANCE AND A                                                                                                                |

PERCENTAGE OF TIME WHEN THE COLLECTED DATA ARE REQUIRED TO BE WITHIN TOLERANCE.

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MYCELIUM:            | THE VEGETATIVE PART OF A FUNGUS; A MASS OF THREAD-LIKE FILAMENTS.                                                                                                                                                                                                                                                                                                                                                                                       |
| NONFOREST INCLUSION: | AN AREA THAT IS NONFOREST BUT LESS THAN 1.0 ACRE IN SIZE. WHEN PART OR ALL OF A FIXED OR VARIABLE-RADIUS PLOT FALLS WITHIN A NONFOREST INCLUSION, THE INCLUSION IS SAMPLED AS PART OF THE SURROUNDING FOREST LAND.                                                                                                                                                                                                                                      |
| NONSTOCKABLE:        | A FOREST LAND CONDITION CLASS IS NONSTOCKED IF: 1) THE AVERAGE DIAMETER OF LIVE TREES IN THE CONDITION CLASS IS <5.0 IN. D.B.H. AND <100 FREE-TO-GROW SEEDLINGS AND SAPLINGS PER ACRE ARE DISTRIBUTED BROADLY ACROSS THE CONDITION CLASS. OR: 2) THE AVERAGE DIAMETER OF LIVE TREES IN THE CONDITION CLASS IS $\geq$ 5.0 IN. D.B.H. AND TREE CANOPY COVER IS < 10 PERCENT. OR: 3) THE CONDITION CLASS WAS RECENTLY CLEARCUT AND HAS NOT BEEN REPLANTED. |
| PASTURE:             | PASTURE IS RANGELAND THAT HAS BE PLOWED AND ARTIFICIALLY SEEDED TO GRASS OR OTHER FORAGE SPECIES LIKE CLOVER TO FEED DOMESTIC LIVESTOCK. OFTEN, IT IS IRRIGATED AND FENCED.                                                                                                                                                                                                                                                                             |
| PC:                  | PLOT CENTER. THE FIELD GRID LOCATION ON THE GROUND FOR EACH FIELD PLOT. ON ESTABLISHED PLOTS VISITED AT OC3, PLOT CENTER IS AT THE OC3 CEDAR STAKE. ON MISSING OR LOST PLOTS, PLOT CENTER IS THE PINPRICKED LOCATION ON THE OC3 PLOT PHOTOS. ON NEW PLOTS, PLOT CENTER IS THE PINPRICKED LOCATION ON THE OC4 PLOT PHOTOS.                                                                                                                               |
| PI:                  | PHOTO INTERPRETATION.                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| POLETIMBER:          | A TREE 5.0 TO 8.9 IN. D.B.H.                                                                                                                                                                                                                                                                                                                                                                                                                            |
| POLETIMBER STAND     | A STAND IN WHICH THE AVERAGE DIAMETER OF THE TREES PRESENT IS 5.0 TO 8.9 in. D.B.H.                                                                                                                                                                                                                                                                                                                                                                     |
| PRODUCTION CREW      | A CREW CONTAINING AT LEAST ONE CERTIFIED INDIVIDUAL. THE CREW IS INVOLVED IN ROUTINE INSTALLATION OF PLOTS.                                                                                                                                                                                                                                                                                                                                             |
| PRODUCTION PLOT      | A PLOT THAT BELONGS TO THE 6000-ACRE GRID DATABASE. IT MAY ALSO BE USED FOR TRAINING PURPOSES.                                                                                                                                                                                                                                                                                                                                                          |
| RANGELAND:           | LAND DOMINATED BY NATURAL PLANT COVER COMPOSED PRINCIPALLY OF NATIVE OR EXOTIC GRASSES, FORBS, OR SHRUBS. NATURAL RANGELAND IS UNIMPROVED, I.E., IT IS NOT IRRIGATED, AND HAS NOT BEEN SEEDED ARTIFICIALLY.                                                                                                                                                                                                                                             |

|                        |                                                                                                                                                                                                              |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| REGENERATION STATUS    | A STAND DESCRIPTOR THAT INDICATES WHETHER A STAND HAS BEEN NATURALLY OR ARTIFICIALLY REGENERATED.                                                                                                            |
| REGIONAL DRIFT         | THE TENDENCY FOR STANDARDS, METHODS AND INTERPRETATIONS TO DRIFT APART OVER TIME AS EACH UNIT IMPLEMENTS THE FIA CORE PROTOCOL.                                                                              |
| REGENERATION:          | A YOUNG, PRECOMMERCIAL-SIZED STAND, OR THE UNDERSTORY TREE COMPONENT OF A MULTISTORIED STAND.                                                                                                                |
| RELASKOP               | AN INSTRUMENT USED TO ESTIMATE TREE DIAMETERS FROM A DISTANCE                                                                                                                                                |
| RELEASE:               | FREEING A TREE FROM IMMEDIATE COMPETITION BY REMOVING OTHER TREE OR NONTREE COMPETITION.                                                                                                                     |
| RESIDUAL OVERSTORY:    | A TREE THAT HAS SURVIVED FROM THE PREVIOUS STAND AND IS USUALLY LARGER OR OLDER THAN TREES WHICH ORIGINATED AS PART OF THE PRESENT STAND.                                                                    |
| ROT:                   | DECAY. DECOMPOSITION OF WOOD BY FUNGI OR BACTERIA.                                                                                                                                                           |
| ROUNDWOOD:             | SECTIONS OF TREE STEMS, WITH OR WITHOUT BARK. INCLUDES LOGS, BOLTS, POSTS, PILINGS AND OTHER PRODUCTS STILL "IN THE ROUND".                                                                                  |
| RP:                    | REFERENCE POINT. AN OBJECT (USUALLY A TREE), WHICH CAN BE LOCATED ON THE GROUND AND IDENTIFIED ON THE PHOTO. IT WILL BE TAGGED AND REFERENCED TO THE CEDAR STAKE IN ORDER TO FACILITATE RELOCATING THE PLOT. |
| SAPLING:               | A TREE 1.0 TO 4.9 IN. D.B.H.                                                                                                                                                                                 |
| SAPWOOD:               | THE OUTER LAYERS OF WOOD BETWEEN THE HEARTWOOD AND INNER BARK. GENERALLY LIGHTER IN COLOR THAN HEARTWOOD.                                                                                                    |
| SAWTIMBER STAND, SMALL | A STAND IN WHICH THE AVERAGE DIAMETER OF THE LIVE TREES PRESENT IS 9.0 TO 21.0 IN. D.B.H.                                                                                                                    |
| SAWTIMBER STAND, LARGE | A STAND IN WHICH THE AVERAGE DIAMETER OF THE LIVE TREES PRESENT IS GREATER THAN 21.0 IN. D.B.H.                                                                                                              |
| SDI                    | STAND DENSITY INDEX.                                                                                                                                                                                         |
| SEEDLING:              | A LIVE TREE LESS THAN 1.0 IN. D.B.H. THAT IS AT LEAST 0.5 FEET IN HEIGHT (CONIFERS) OR 1.0 FEET IN HEIGHT (HARDWOODS) AND ESTABLISHED IN MINERAL SOIL.                                                       |

|                        |                                                                                                                                                                                                                                                                                                               |
|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SEEDLING-SAPLING STAND | A STAND IN WHICH THE AVERAGE DIAMETER OF THE LIVE TREES PRESENT IS LESS THAN 5.0 IN. D.B.H.                                                                                                                                                                                                                   |
| SILVICULTURE:          | THE SCIENCE AND PRACTICE OF GROWING AND TENDING FOREST CROPS FOR SPECIFIED OBJECTIVES.                                                                                                                                                                                                                        |
| SITE:                  | THE AGGREGATE OF ALL ENVIRONMENTAL CONDITIONS AFFECTING THE SURVIVAL AND GROWTH OF A PLANT COMMUNITY ON A SPECIFIC AREA.                                                                                                                                                                                      |
| SITE CLASS:            | A CLASSIFICATION OF POTENTIAL AVERAGE ANNUAL ABILITY OF A FOREST LAND SITE TO PRODUCE WOOD--FOR THE PERIOD BETWEEN THE TIME OF STAND ESTABLISHMENT AND THE TIME WHEN AVERAGE ANNUAL WOOD PRODUCTION PEAKS-- WERE THE SITE FULLY STOCKED WITH DESIRABLE TREES.                                                 |
| SITE INDEX:            | A MEASURE OF PRODUCTIVITY INHERENT ON A FOREST SITE THAT IS SIMPLE NUMERICAL VALUE BASED UPON TREE HEIGHT AT A SPECIFIED AGE.                                                                                                                                                                                 |
| SLOPE DISTANCE         | THE AMOUNT OF SEPARATION BETWEEN 2 POINTS AS MEASURED ALONG AN INCLINE. SLOPE DISTANCE = HORIZONTAL DISTANCE WHEN THE % SLOPE BETWEEN THE 2 POINTS IS ZERO. WHEN MEASURING SLOPE DISTANCE FOR REFERENCE TREES, SLOPE DISTANCE IS MEASURED FROM THE HEAD OF THE NAIL AT THE BASE OF THE TREE TO SUBPLOT CENTER |
| SNAG:                  | A STANDING DEAD TREE. IN THE CURRENT INVENTORY, A SNAG MUST BE $\geq 5.0$ IN. DBH AND $\geq 4.5$ FEET TALL, AND HAVE A BOLE WHICH DOES NOT TOUCH THE GROUND. A SNAG MAY BE EITHER SELF-SUPPORTED BY ITS ROOTS, OR SUPPORTED BY ANOTHER TREE OR SNAG.                                                          |
| SOFTWOODS:             | CONIFEROUS TREES, USUALLY EVERGREEN, HAVING NEEDLE OR SCALE-LIKE LEAVES.                                                                                                                                                                                                                                      |
| STAND AGE:             | THE TOTAL AGE OF A FOREST STAND THAT BEST CHARACTERIZED THE STAND. STANDS ARE EVEN- OR UNEVEN-AGED.                                                                                                                                                                                                           |
| STANDING DEAD TREE:    | SEE SNAG.                                                                                                                                                                                                                                                                                                     |
| STAND DENSITY INDEX:   | THE MAXIMUM NUMBER OF TREES PER UNIT AREA A FOREST SITE WILL SUPPORT WHEN THE STAND D.B.H. IS 10 INCHES RELATIVE TO THE MAXIMUM EXPECTED NUMBER IF THE SITE WERE CAPABLE OF SUPPORTING A NORMAL STAND.                                                                                                        |

|                    |                                                                                                                                                                                                                               |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| STAND SIZE:        | A CLASSIFICATION OF STANDS BASED ON TREE SIZE. STAND SIZES ARE LARGE SAWTIMBER, SMALL SAWTIMBER, POLETIMBER, AND SEEDLING-SAPLING STANDS. IF LESS THAN 10 PERCENT STOCKED WITH LIVE TREES, THE SITE IS CALLED NONSTOCKED.     |
| STOCKING:          | A QUALITATIVE EXPRESSION BASED ON COMPARING THE EXISTING NUMBER OF TREES PRESENT ON A FOREST SITE TO THE NUMBER NEEDED TO ACHIEVE THE MOST OPTIMAL GROWTH, VOLUME, OR VALUE POSSIBLE ON THE SITE.                             |
| SUNSCALD:          | DAMAGE TO THE CAMBIUM CAUSED BY OVEREXPOSURE TO SUN .                                                                                                                                                                         |
| SWEEP:             | A BROAD ARC IN A BOLE OR LOG. A SOUND CULL DEFECT.                                                                                                                                                                            |
| TALLY TREE         | A TREE, SAPLING, OR SEEDLING THAT IS SELECTED TO BE MEASURED ACCORDING TO THE RULES IN THIS MANUAL.                                                                                                                           |
| TERMINAL LEADER:   | THE TOPMOST SHOOT OF A TREE.                                                                                                                                                                                                  |
| TRACHEID:          | PART OF WOOD STRUCTURE: A LONG, TUBELIKE CELL IN WOOD TISSUE.                                                                                                                                                                 |
| TRACKABLE TREE:    | A SAMPLED TREE THAT IS REFERENCED AND REMEASURED IN SUCCESSIVE INVENTORIES ON PERMANENT PLOTS.                                                                                                                                |
| TRAINING PLOT      | A PLOT ESTABLISHED FOR TRAINING OR CERTIFICATION PURPOSES ONLY. IT DOES NOT BELONG TO THE 6000-ACRE GRID DATABASE.                                                                                                            |
| TREE               | A TREE IS A WOODY PLANT THAT HAS AN ERRECT PERENNIAL STEM OR TRUNK AT MATURITY THAT IS AT LEAST 3.0 IN. DIAMETER AT BREAST HEIGHT (4.5 FEET) AND A TOTAL HEIGHT OF AT LEAST 12 FEET. (Ag. Handbook No. 541, 1979, ed., p. 3). |
| UNEVEN-AGED STAND: | A STAND THAT IS NOT CLASSIFIED AS NONSTOCKED AND THAT HAS LESS THAN 70 PERCENT OF THE TREES PRESENT WITHIN 30 YEARS OF ONE ANOTHER IN TOTAL AGE.                                                                              |
| WILT:              | DROOPING OF FOLIAGE; OFTEN A DISEASE SYMPTOM.                                                                                                                                                                                 |



## APPENDIX 17 – INDEX

- ACCESSIBLE FOREST LAND, 57. SEE FOREST  
 ACTIVE LOGGING, 25  
 BANYAN TREE, 245  
 BASELINE, 25  
 BASELINES, 246  
 BOUNDARY DATA, 85  
 BRANCHING CHARACTERISTICS, 124  
 CALCULATING HORIZONTAL DISTANCE, 244  
 CENSUS WATER, 60  
 CHECKLIST OF ITEMS NEEDED ON PLOT, 20  
 CLINOMETER, 241  
 CLUMP CODE, 161  
 COMPLETED PLOTS, 248  
 CONDITION CLASS, 51  
 CROWN CLASS, 130  
 CROWN RATIO, 131  
 DAMAGE, 137  
 DATA SHEETS, 251  
 DBH, 117  
 DEAD TREES, 113  
 DECLINATIONS, 237  
 DENIED ACCESS, 60  
 DIAMETER, 117  
 DIAMETER CHECK, 123  
 DIAMETER ON UPPER BOLE, 123  
 EPIPHYTE, 160  
 FIPS CODES, 237  
 FIRST AID, 22  
 FIXED-RADIUS PLOT, 107  
 FOREST, 39  
 FORKED TREES  
 SUBPLOT TREES, 117  
 GPS, 213, 215  
 BATTERIES, 222  
 GPS UNIT, 216  
 GROWTH HABIT, 96  
 HAZARDOUS AREAS, 60  
 HIGH PRIORITY SPECIES, 235  
 LANDOWNER CONTACT, 19  
 LASER INSTRUCTIONS, 223  
 LEAN ANGLE, 128  
 LENGTH, 129  
 LIFEFORM, 96  
 LOCATING THE PLOT, 24  
 LOCATION DESCRIPTION, 32  
 MAPPING, 85  
 METRIC CONVERSIONS, 263  
 NONCENSUS WATER, 60  
 NONFOREST LAND, 60  
 PERMISSION, 19  
 PLOT EDITS, 248  
 PLOT LAYOUT, 27  
 POISON OAK, 22  
 PRIORITY DAMAGE AND SEVERITY, 240  
 REFERENCE TREES, 33  
 REFERENCING A PLOT  
 NOT VISITED PREVIOUSLY, 30  
 RELASKOP, 233  
 ROOT MEASUREMENTS, 125  
 ROT, 128  
 RP, 31  
 AZIMUTH, 32  
 SAFETY, 21  
 SCALE, 246  
 SEEDLING COUNT, 83  
 SLOPE CORRECTION TABLE, 231  
 SNAG DECAY CLASS, 159  
 SNAGS, 113  
 STAGE OF DEVELOPMENT, 102  
 TREE DAMAGE, 136  
 TREE SELECTION RULES, 108  
 TREE SPECIES, 163  
 TREE STATUS, 116  
 TREE TALLY  
 SEEDLING SELECTION RULES, 108  
 TREE AND SNAG SELECTION, 108  
 UPPER BOLE DIAMETER HEIGHT, 123  
 UTM ZONES, 237  
 VARIANCE PLOTS, 271  
 VEGETATION PROFILE, 95

## Appendices

### APPENDIX 17 -- BLANK PAGES FOR NOTES

Appendices

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