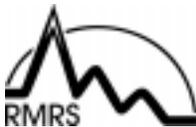


Interior West Resource Inventory,  
Monitoring, and Evaluation Program

**FOREST SURVEY  
FIELD PROCEDURES**



U.S. Department of Agriculture  
Rocky Mountain Research Station

**BASELINE**

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# TABLE OF CONTENTS

	<u>Page</u>
<b>LIST OF FIGURES</b> .....	xi
<b>CHAPTER 1 - INTRODUCTION</b> .....	1-1
A. Program Purpose .....	1-1
B. Field Organization.....	1-1
C. Quality Control.....	1-2
D. Personal Conduct and Safety .....	1-3
E. Everyday Considerations.....	1-3
F. Vehicles .....	1-4
G. Equipment and Supplies.....	1-6
<b>CHAPTER 2 - FINDING THE FIELD LOCATION CENTER</b> .....	2-1
A. Land Owner/Management Agency Verification.....	2-1
B. Planning Travel to the Vicinity of the Field Location and LC Pinprick Verification .....	2-1
C. Finding the Field Location Center - New Field Locations ....	2-2
1. Establishing LC with the GPS Receiver.....	2-2
a. Verify PLGR Settings.....	2-2
b. Enter the LC Coordinates into the PLGR.....	2-2
c. Select a Suitable RP.....	2-3
d. Find the Position of the RP.....	2-3
e. Chaining from the RP to the LC.....	2-3
f. LC Verification.....	2-3
2. Establishing a Baseline and Scale.....	2-5
a. Ground/Photo Method.....	2-5
b. Map/Photo Method.....	2-6

D. Finding the Field Location - Remeasurement	
Field Locations .....	2-11
1. RP Not Found .....	2-13
2. RP Found But Not Usable .....	2-18
3. Field Location Incorrectly Placed or Not Found .....	2-18

## CHAPTER 3 - DEFINING THE CONDITION CLASS ..... 3-1

A. Determining Condition Class: General Procedures.....	3-1
1. Tree Land vs. Non-tree Land/Water.....	3-1
a. Ground Cover .....	3-1
b. Land Use.....	3-2
2. Within Forest Land Conditions.....	3-5
a. Forest type.....	3-5
b. Stand size .....	3-5
c. Stand origin .....	3-6
d. Stand density.....	3-6
3. Within Other Tree Land Conditions.....	3-6
4. Within Non-tree Land Conditions.....	3-7
B. Condition Class Definitions .....	3-8
1. Tree land.....	3-8
Timber species.....	3-8
Woodland species.....	3-8
Other tree species.....	3-8
a. Tree Land Categories.....	3-9
Forest land.....	3-9
Other tree land.....	3-9
b. Sampled vs. nonsampled tree land.....	3-10
2. Non-tree land .....	3-11
3. Tree land and non-tree land size/width exemptions .....	3-11
a. Distinct alternating strips.....	3-11
b. Transition zones.....	3-11
c. Cultural developments.....	3-12
d. Maintained roads and rights-of-way.....	3-12
4. Water.....	3-15
a. Census water .....	3-15
b. Noncensus water.....	3-15
C. Mapping the Condition Boundary.....	3-15
1. Locating the boundary.....	3-16
2. Delineating the boundary.....	3-17
3. Referencing the boundary.....	3-18

<b>CHAPTER 4 - FIELD PROCEDURE OVERVIEW .....</b>	<b>4-1</b>
A. Circumstances Precluding Field Location Establishment	4-1
1. Potential Situations.....	4-1
2. Procedures .....	4-2
B. Field Locations with Sampled Forest Land Present .....	4-3
C. Field Locations with No Sampled Forest Land Present, but Sampled Other Tree Land Present .....	4-4
D. Field Locations within Nonsampled Tree Land Present (Non- sampled Tree Land, Non-tree Land and/or Water Only) .....	4-5
Within a Rangeland Unit.....	4-5
Not Within a Rangeland Unit .....	4-6
E. Remeasurement and Forest Health Plots .....	4-7
F. Reserved Lands .....	4-7

<b>CHAPTER 5 - FIELD LOCATION LAYOUT AND TREE SAMPLING PROCEDURES .....</b>	<b>5-1</b>
A. Field Location Layout .....	5-2
B. Sampling Procedures .....	5-3
1. Subplot Tree Tally .....	5-3
2. Microplot Sapling Tally .....	5-7
3. Seedling Counts .....	5-7
4. Other Tree Species and Shrub-form Tally Tree Species .....	5-8

# CHAPTER 6 - FIELD LOCATION

- REFERENCE ITEMS ..... 6-1
- A. Identification Items ..... 6-1
- B. Reference Point ..... 6-1
- C. Course to Location Center ..... 6-2
- D. LC Witness Trees ..... 6-3
- E. Baseline Information ..... 6-5
- F. Travel Description ..... 6-5
- G. Owner Information ..... 6-6
- H. Field Location Map ..... 6-6
- I. Field Crew ..... 6-6
- J. Photos ..... 6-6
- K. Editing ..... 6-7
- L. Map Name and Scale ..... 6-7
- M. Legal Description ..... 6-7
- N. Photographing the Field Location ..... 6-8
- O. Global Positioning System (GPS) Reference Data ..... 6-9

# CHAPTER 7 - FIELD LOCATION

DESCRIPTION ITEMS ..... 7-1

## ITEM

101	State .....	7-1
102	Map Number .....	7-1
103	Consecutive Point Number (CPN) .....	7-1
104	County .....	7-2
105	Field Location Number .....	7-2
107	Future Forest Potential.....	7-2
110	Current Ownership .....	7-3
111	Reserved Status Class .....	7-3
121	Current Date .....	7-4
122	Crew Number(s) .....	7-4
123	Crew Type .....	7-4
124	QA Status .....	7-5
129	Current Location Status .....	7-6
130	Location Access .....	7-5
131	Sample Kind .....	7-6
132	Subplot Size .....	7-6
133	Microplot Size .....	7-6
135	Microplot Location .....	7-7
140	Elevation .....	7-7
141	Size of Forested Area .....	7-7
142	Remote Sensing Cover Type (deleted) .....	7-7
143	Trails or Roads .....	7-8
144	Distance to Improve Road .....	7-8
145	Public Use Restrictions .....	7-9
146	Recreation Use .....	7-9
147	Water Proximity .....	7-10
148	Water Type .....	7-11
149	Land Use Impact (deleted).....	7-11
150	Land Use Impact Distance (deleted).....	7-11
160	Number of Tree Records .....	7-11
161	Number of Conditions .....	7-12

# CHAPTER 8 - CONDITION CLASS

DESCRIPTION ITEMS ..... 8-1

A. Condition Class Description ..... 8-1

ITEM

201 Condition Class Number ..... 8-2  
211 Current Ground Cover Class ..... 8-2  
213 Current Land Use (LU) Classification..... 8-3  
220 Size of Condition ..... 8-6  
221 Forest Type ..... 8-7  
222 Stand-size Class ..... 8-9  
223 Stand Origin ..... 8-10  
224 Stand Density ..... 8-10  
230 Stocking Condition Class (deleted)..... 8-6  
231 Stand Structure (deleted)..... 8-11  
232 Stand Age ..... 8-11  
233 Crown Cover ..... 8-12  
234 Condition Habitat Type ..... 8-13  
236 Dominant Tree Species ..... 8-14  
237 Rangeland Cover Type ..... 8-14  
240 Slope ..... 8-19  
241 Aspect Azimuth ..... 8-19  
242 Curvature Class (deleted)..... 8-19  
243 Physiographic Class ..... 8-20  
250 Soil Group (deleted)..... 8-21  
251 Soil Texture(deleted)..... 8-21  
253 Soil Erosion (deleted) ..... 8-21  
254 Litter Depth ..... 8-21  
255 Humus Depth (deleted) ..... 8-21  
260 Cutting Type ..... 8-22  
261 Cutting History ..... 8-22  
262 Burn History ..... 8-23  
263 Condition Disturbance Type ..... 8-23  
264 Condition Disturbance History ..... 8-24  
270 Vegetation Concealment (deleted)..... 8-24  
271 Wildlife Cover (deleted)..... 8-24  
272 Animal Type (deleted)..... 8-24  
273 Browsing Intensity (deleted)..... 8-24  
274 Grazing Intensity (deleted)..... 8-24  
275 Ground Cover Transects ..... 8-24

B. Condition Class Diagram and Boundary Information..... 8-26

ITEM

281	Subplot Number .....	8-26
282	Mapping Plot Type .....	8-27
284	Contrasting Condition Class Number .....	8-27
285	Azimuth Left and Right .....	8-27
287	Corner Azimuth and Distance .....	8-27

**CHAPTER 9 - SUBPLOT DESCRIPTION ITEMS** ..... 9-1

ITEM

301	Subplot Status .....	9-1
303	Subplot Center Condition Number .....	9-2
304	Condition Number List .....	9-2
305	Subplot Stocking Condition(deleted).....	9-3
321	Seed Source (deleted) .....	9-3
322	Root Disease Severity Rating .....	9-3

**CHAPTER 10 - TREE DATA ITEMS** ..... 10-1

ITEM

401	Subplot Number .....	10-1
402	Tree Number .....	10-1
404	Azimuth .....	10-2
405	Horizontal Distance .....	10-2
406	Condition Class Number .....	10-3
411	Current Tree History .....	10-3
412	Tree Lean Angle .....	10-4
414	Site Tree .....	10-5
415	Mortality .....	10-7
416	Species .....	10-9
421	Current DBH/DRC .....	10-11
422	Tree Count .....	10-26
423	DBH/DRC/Count Check .....	10-27
424	Number of Stems .....	10-27
430	Radial Growth .....	10-28
431	Tree Age .....	10-28
432	Tree Age Check .....	10-35

441	Current Tree Height .....	10-36
442	Tree Height Check .....	10-36
443	Uncompacted Crown Ratios .....	10-37
444	Compacted Crown Ratios .....	10-37
445	Crown Class .....	10-39
447	Cone Serotiny .....	10-41
450	Damage .....	10-41
455	Cause of Death .....	10-52
456	Mistletoe Class .....	10-53
460	Percent Volume Loss - Rotten and Missing .....	10-54
461	Percent Volume Loss - Sound Dead .....	10-54
462	Percent Volume Loss - Form Defect .....	10-54
463	Past Tree Class .....	10-59
464	Current Tree Class .....	10-59
470	Posts - Lines .....	10-60
471	Posts - Corners .....	10-60
472	Christmas Tree Grade .....	10-61

## CHAPTER 11 - UNDERSTORY VEGETATION

<b>DESCRIPTION</b> .....	11-1
A. Sample Subplot Size .....	11-1
B. Sample Identification .....	11-2
C. Vegetation Description .....	11-2
1. General Definitions .....	11-2
a. Plant groups .....	11-2
b. Percent cover .....	11-3
c. Layer codes .....	11-3
2. Entries to be Recorded .....	11-4
a. Understory Vegetation Description record - Part I ..	11-4
b. Understory Vegetation Description record - Part II .	11-7
D. Noxious Weeds .....	11-8
E. Instructions for Collecting Plant Sample "Unknowns" .....	11-11

**CHAPTER 12 - REMEASUREMENT PROCEDURES..... 12-1**

A. Plot Layout ..... 12-1  
    1. Variable Radius Plots ..... 12-2  
    2. Fixed-Radius Plots ..... 12-4

B. Sampling Methods ..... 12-8  
    1. Main Plot/Quadrant ..... 12-8  
    2. Sapling Microplot ..... 12-8

C. Tree Data ..... 12-9

**ITEM**

601 Point Number ..... 12-9  
602 Point History ..... 12-9  
603 Tree Number ..... 12-10  
604 Azimuth ..... 12-10  
605 Distance ..... 12-10  
610 Past Tree History ..... 12-11  
611 Current Tree History ..... 12-11  
616 Species ..... 12-12  
620 Past DBH/DRC ..... 12-12  
621 Current DBH/DRC ..... 12-12  
623 DBH/DRC Check ..... 12-13  
623 Past Number of Stems ..... 12-13  
624 Current Number of Stems ..... 12-13  
640 Past Total Tree Length ..... 12-13  
641 Current Total Tree Length ..... 12-13  
655 Cause of Death ..... 12-14  
663 Past Tree Class ..... 12-15  
664 Current Tree Class ..... 12-15

**GLOSSARY ..... 13-1**

<b>APPENDICES</b> .....	14-1
<b>APPENDIX A: FIELD FORMS</b> .....	14-3
A.1 Field Location Reference Record .....	14-4
A.2 Field Location Description and Subplot Description Record .....	14-5
A.3 Condition Class Description Record .....	14-6
A.4 Condition Class Diagram and Boundary Record .....	14-7
A.5 Tree Data Record .....	14-8
A.6 Understory Vegetation Description Record .....	14-9
A.7 Tree-Check Form .....	14-10
A.8 Multistemmed Woodland Species Tally.....	14-11
A.9 Ground Cover Supplemental Data Form .....	14-12
A.10 Remeasurement Tree Data Record .....	14-13
<b>APPENDIX B: MAP, PHOTO, AND TRAVERSING TABLES</b> ...	14-15
B.1 Slope Correction Table .....	14-16
B.2 Map/Photo Scale Ratios .....	14-17
<b>APPENDIX C: TREE DATA</b> .....	14-19
C.1 Diameter Measurement Techniques for Timber Species .....	14-20
C.2 Square-Foot Basal Area Values (DRC Calc) .....	14-22
C.3 Boring for Radial Growth and Age .....	14-23
C.4 Determining Tree Height .....	14-25
C.5 Circular Defect Deduction Table .....	14-28
<b>APPENDIX D: TREE SPECIES LIST</b> .....	14-29
<b>APPENDIX E: ITEM CODING GUIDES</b> .....	14-37
E.1 Location Reference Data .....	14-38
E.2 Location Description and Subplot Data .....	14-39
E.3 Condition Description Data .....	14-40
E.4 Tree Data .....	14-41
<b>APPENDIX F: VARIABLE NAME ABBREVIATIONS</b> .....	14-43
<b>APPENDIX G – PLGR OPERATING INSTRUCTIONS</b> .....	14-51
<b>APPENDIX H – LASER 200 INSTRUCTIONS</b> .....	14-57
<b>STATE SUPPLEMENT</b> .....	15-1

# LIST OF FIGURES

	<u>Page</u>
1. Examples for two methods of determining azimuth from RP to LC .....	2-11
2. The .001 foot scale method .....	2-16
3. The best fit method.....	2-18
4. Tree land vs. non-tree land and water classifications .....	3-3
5. Examples of tree land and non-tree land exemptions .....	3-13
6. Field location layout .....	5-2
7. Down tree limiting distance .....	5-6
8. Crown cover transects .....	8-12
9. Curvature Class (deleted).....	
10. Physiographic class .....	8-20
11. Animal tracks and scat (deleted).....	
12. Example condition class diagram and condition boundary information .....	8-28
13. Points of diameter measurement on timber species .....	10-12
14. Points of diameter measurement on woodland species .....	10-22
15. Additional woodland species diameter measurement instructions .....	10-23
16. Radial growth measurement .....	10-33
17. Uncompacted crown ratio example .....	10-38
18. Comparison of uncompacted and compacted crown ratios .....	10-38
19. Crown class as related to preharvest tree classifications .....	10-40
20. Example six-class mistletoe rating .....	10-53
21. Christmas tree grades for pinyon .....	10-62
22. Example of a completed understory vegetation description record .....	11-10
** Understory Vegetation examples .....	11-12
23. Previous variable-radius plot layout .....	12-3
24. Previous fixed-radius plot layout (all States except CO/WY).....	12-5
25. Previous fixed-radius plot layout for CO/WY.....	12-7

# CHAPTER 1 - INTRODUCTION

This manual outlines the resource inventory procedures and definitions used by the Forest Survey field crews, Interior West Resource Inventory, Monitoring, and Evaluation Program (IWRIME), Rocky Mountain Research Station. These instructions cover "Baseline" procedures used in the establishment and measurement of new and remeasurement field locations. For instructions on "Annual" procedures, see the FIA National Core Field Manual.

## A. Program Purpose

Field crews conduct continuous and comprehensive resource inventories, on a 10-year cycle, on forest lands in the Interior West.

The information obtained through the inventory is used to estimate forest land area, wood fiber, tree volume, growth, mortality, understory composition, recreation opportunities, wildlife habitat, and other related resources. This information provides periodic analysis of renewable resource situations, including current conditions, use trends, and the potential production of forest resources of the Interior West States including Arizona, Colorado, Idaho, New Mexico, Montana, Nevada, Utah, and Wyoming. In addition, data are collected and compiled on certain nonforest lands within these States. Findings of the inventories are published and available to resource planners, managers, and the public.

## B. Field Organization

Field work is administered by field supervisors and section leaders. Each field supervisor is responsible for coordinating the field effort for one or more individual field sections; duties include assigning work areas and transferring field crews between sections to meet work schedules. Field supervisors also assist the quality control staff in training field crews and in conducting periodic checks of field locations.

A section leader directs the day-to-day work for two or more field crews working in the same area. Some of the duties of a section leader include assigning field plots to crews, collecting completed field packets, and holding camp safety meetings. Other responsibilities include distribution of field equipment and supplies, and assisting the quality control staff and the field supervisor in on-the-job training of field crews.

Field work is conducted by two- or three-person field crews. The crew leader directs the work of the field crew, but all crew members are responsible for accurate and efficient work, and for ensuring that the field crew has the proper equipment, maps, aerial photographs, field forms, and supplies before beginning each day's work.

### **C. Quality Control**

The goal of the quality assurance program is to ensure that all resource inventory data are scientifically sound, of known quality, and thoroughly documented. Measurement quality objectives (MQO) are established as standards to define data quality and are specified with each data item throughout this manual.

The role of quality control is to determine if the measured data meet the quality standards and to correct measurement or procedure errors. Because each field location sample represents approximately 6,200 acres of land, it is critical that crews exercise necessary care and effort to maintain the standards of accuracy in their work. Individual measurements will be expanded to describe and classify land and vegetation; because of the importance of these data, quality is critical. In addition, because of the effort and cost associated with extensive inventories, data collection efficiency is also critical.

Quality control crews conduct periodic on-site inspections of field locations to ensure that the field work is being performed with the required accuracy and precision. Field checking is also conducted for the following reasons:

1. To obtain uniform and consistent interpretation and application of field instructions among all field crews.
2. To hold technique errors to a minimum.
3. To check the performance of each individual crew member.
4. To reveal inadequacies in the instructions and in the training program.
5. To assess and document the quality (accuracy, precision, completeness) of field data.

#### **D. Personal Conduct and Safety**

In the course of establishing and measuring field locations, there will be frequent opportunities for contacts with National Forest personnel, private landowners, and others interested in the work conducted by field crews. Field crew members, as representatives of the USDA Forest Service, are expected to act courteously and diplomatically in all their contacts with the public and other agencies. Field crews are expected to project a professional image; this includes general cleanliness and a neat appearance (t-shirts with alcohol ads, torn or "ratty" field clothing, etc., are unacceptable).

It is particularly important that field crews obtain permission to enter or pass through private land. Be careful to not cause any property damage. Also, leave all gates as they are found.

The field supervisor will contact local National Forest and BLM District offices immediately upon arrival in an area to inform them of field crew activity.

Field personnel are subject to many hazards in the course of their work. Each person is expected to use care, common sense, and judgment in their work to avoid injuries to themselves and fellow workers.

**SAFETY IS EVERYONE'S FIRST PRIORITY.**

Read and study carefully the applicable sections of the Forest Service Health and Safety Code Handbook and the Driver-Operator Handbook, and observe the precautions given.

**Regulation hard hats must be worn on all field plots and while hiking to and from field plots -- NO EXCEPTIONS.** Appropriate footwear, such as all-leather boots, and other protective clothing must be worn while on the job.

Immediately report all injuries to the field supervisor and section leader.

#### **E. Everyday Considerations**

The goal of the inventory is to collect the best quality data possible, in a safe and efficient manner. All field personnel must consider their actions with regard to what is safe, efficient, and proper. If it is not safe -- don't do it.

Follow these suggestions:

1. Before you leave camp, plan the travel route to the plot. Always take two or more extra plots each day.
2. If your plot is located far from a road, plan to camp out if necessary.
3. Record your plot destination on the location log in your trailer or attached to the outside of the door for any other housing facility.
4. Check to make sure you have all your equipment before leaving camp: field gear, plot packets, data recorder, GPS, metal stakes, nails, lunch, water, rain gear, etc.
5. Check to make sure you have all the equipment needed to conduct the field inventory when you leave your truck.
6. Perform a thorough plot edit before you leave the location. Check for missing data items as well as field gear.
7. Do not travel through the woods after dark. If you are lost, do not panic, but settle down some place and try to make radio contact with the section leader or with another agency. Know how to use the radio!
8. Keep the first aid kits supplied, and know how to use them.

## F. Vehicles

A government owned or leased vehicle will be specifically assigned to each crew supervisor. The vehicle's "green book", contains a fuel card and various documents to maintain records of mileage, utilization, fuel and oil consumption, maintenance, and repairs.

The operator must ensure that the assigned vehicle is properly used, serviced, periodically inspected, and always kept reasonably clean and in safe operating condition and that all documentation is completed as scheduled.

The crew leader (or field supervisor/section leader) may authorize other employees to use the vehicle; however, the operator of a vehicle is responsible for that vehicle and it's equipment while using it. Vehicles must be returned to the assigned driver in good condition.

The field supervisor will monitor compliance with established standards and guidelines.

The fleet manager is responsible for monitoring utilization, the production of yearly use and consumption reports, the monitoring of and arrangement for major repairs and maintenance, upkeep of repair and maintenance records, making vehicle assignments and reassignments. Direct needs and questions regarding trucks, trailers, and field equipment to the fleet manager.

The following schedule of servicing and inspection must be followed:

1. Preventive Maintenance (PM) Check. During the first week of each month, assigned users must complete the monthly PM check card to indicate any needed repairs/maintenance, and then forward the card to the section leader. Attachments such as radios, winches, and tools boxes must be inspected as well. The section leader will make repair arrangements through the fleet manager and will forward PM check forms to the fleet manager when services are complete.
2. Oil Changes/Tire Rotation. Every 4,000 miles (3,000 miles for vehicles with more than 50,000 miles), assigned users must arrange for crankcase oil change, air filter and oil filter replacement, gearbox level checks, fluid level inspections, belt and pulley inspections, front end and suspension inspections, and tire rotation at a professional garage.
3. In-Field Repairs. Repairs to WCF (Green Fleet) and GSA vehicles must be coordinated and authorized through the fleet manager. The fleet manager maintains records for warranty work and trend monitoring. Before any work is completed on the vehicle, Program Support Services personnel must authorize payment based on quotes received. Document repairs on the equipment maintenance/use records, and forward invoices and receipts to the fleet manager. Forward all repair invoices to Program Support Services at the time of completion.
4. Tires. Tire purchases must be authorized and arranged through the fleet manager and Program Support Services personnel. Tire repairs may be charged on the vehicle fuel card. For all tire repairs and replacements, complete a tire failure report and forward the report to the fleet manager.

5. Yearly Mechanical Inspection. Once a year, the fleet manager will coordinate an annual vehicle service and inspection for each vehicle; this will be conducted at a dealership or professional garage. Forward all repair invoices and records to the fleet manager.
6. Radios. Each truck and field supervisor's trailer has a mobile radio. Crews are not permitted to reprogram radios without authorization from the fleet manager. CB's are also included in most vehicles for use on move days and in logging areas.

**WEAR SEAT BELTS AT ALL TIMES** when a vehicle is in operation.

Watch for logging trucks -- they always have the rights-of-way and often use the full roadbed.

**All accidents** involving government vehicles or other property that result in injury/damage to employees, government property, private citizens, and/or private property **must be promptly reported** to the field supervisor regardless of dollar value. Accident packets are located in every vehicle and must be kept complete and up-to-date by the assigned operator.

#### G. Equipment and Supplies

Each individual will be issued the necessary field equipment and supplies and will sign two copies of an itemized list for that equipment. The individual will keep one copy while the section leader retains the other. Both copies will be kept current. Individuals will be responsible for the use and care of equipment assigned to them.

## CHAPTER 2 - FINDING THE FIELD LOCATION CENTER

This chapter provides instructions for finding the field location center (LC). The LC is based on the intersection of map grid lines and is located in the field using past inventory location reference information, global positioning system receivers, and/or photo baseline techniques. The LC is designated as subplot center 1 of the field sample.

### A. Land Owner/Management Agency Verification

Prior to the establishment of any field location, **the ownership or managing agency of the field location must be verified.** Upon arrival in each county, or prior to the field season, the field supervisor will designate a field crew to visit the county courthouse to verify the managing agency and to obtain private land ownership information (name, address, phone number). Land management agencies must be contacted to obtain lessee information. Record corrected land ownerships on the field location packet and on the Field Location Description record.

Before visiting each field location, it is particularly important that field crews contact private land owners or lessees to obtain permission to enter or pass through private land. Information about best travel route, locked gates, etc., may also be obtained. If the crew is unable to make contact (no permission letter received, unable to reach owner by phone or by visiting ranch house, etc.), the location will be classified as "access denied"; notify the supervisor immediately.

### B. Planning Travel to the Vicinity of the Field Location and LC Pinprick Verification

As an aid in planning travel and in finding a field location, field crews are supplied with forest and highway maps, a GPS Receiver, and a field location packet. Each packet contains a USGS 7.5 minute (') topographic map. On the topographic map, the LC of a field location is indicated by the intersection of designated map grid lines. Each packet also contains current aerial photographs with the LC pinpricked on one of the photographs. Remeasurement locations also have photos, a copy of the field location data, and road directions used in the previous inventory.

#### 1. Verify the Placement of the LC Pinprick.

Before going to any field location, first verify that the LC pinprick on the photo is in the same location as the map grid intersection.

If they are not the same, inform the section leader.

## 2. Determine Travel Route.

With the packet items, determine the best route of travel to the field location. As a safety precaution, the crew supervisor will maintain a daily record of planned locations to be visited and/or routes to be traveled; keep this log up to date and accessible in the crew supervisor's trailer or other housing facility.

## C. Finding the Field Location Center - New Field Locations

It is the responsibility of the field crew to physically locate the LC on the ground as indicated by the LC pinprick on the aerial photograph. The following procedures describe how to find the LC. **Use the GPS procedure as the primary method for locating the LC and the ground/photo baseline procedure as the secondary method.**

Record all baseline and reference point (RP) traverse information on the Field Location Reference record under "Course to Location Center," and "Baseline Information." Also record the traverse information on the back of the aerial photograph containing the LC pinprick. **Use a ball-point pen for all photo work** (do not use pencil or felt-tip pen), and use a ruler or other straight edge for drawing lines (protractor edges are not necessarily straight)

### 1. Establishing LC with the Precision Lightweight GPS Receiver

Use the GPS Receiver to help establish new locations whenever possible. Use Ground-Photo and Map-Photo baseline techniques if accurate readings from the PLGR cannot be obtained (eg. malfunctioning PLGR, heavy canopy cover, lost PLGR key, dead batteries, poor satellite reception, etc.). Proper planning and knowledge of basic functions will allow use of the PLGR in almost any situation encountered by crews.

**Important:** Each day in the field, set up the PLGR in an open area (e.g., campground) for at least 15 minutes to load the daily almanac. The daily almanac can also be loaded while traveling to plot with the PLGR connected to the vehicles power source. Also, check map datum in the lower left corner of the topographic map. Refer to Appendix G.

- a. **Verify PLGR Settings.** The proper initial PLGR settings are critical for positioning and navigational accuracy. Once the PLGR settings are selected, they become the default value each time the PLGR is turned on. Refer to Appendix G.
- b. **Select the LC Waypoint from the Location Waypoint List.** Obtain the LC waypoint number from the Field Location Waypoint List. If for some reason the plot is not listed, UTM coordinates are printed on the location packet label or on the topographic map inside the packet and entered manually into the PLGR.

- c. **Select a Suitable RP.** Designate a reference point (RP) readily identifiable on both the ground and the photograph. The RP should be close to the field location, but at least 100 feet from the LC, if possible. Select a landmark such as a prominent tree or large boulder, a sharp bend in a road or drainage ditch, a fence corner, etc., not likely to die or be removed within the next 10-15 years (Note: do not select an RP next to features that may affect GPS or compass readings such as metal objects like barbed-wire fences or high power transmission lines.)

The **RP selection is critical.** The more unique and obvious the RP on both the photos and the ground, the better the chance crews will be able to relocate the plot in the future should significant change occur over time. If possible, choose an RP with a view of the southern sky to allow for optimum satellite reception. Elevate the GPS receiver off of the ground and remove all obstructions that may block reception.

Pinprick the RP on the aerial photograph with the LC pinprick. Circle and label the pinpricked RP on the back of the photograph. Refer to page 6-2 for instructions on tagging the RP.

- d. **Find the Position of the RP.**

**Tolerance:**  $EHE \leq 70$  feet.

Use the **“Position”** (POS) feature of the PLGR to provide coordinates for the position of the RP on the Universal Transverse Mercator (UTM) grid system. Refer to Appendix G. If the 180 hit averaged EHE is  $> 70$  feet, check satellite strength meter, map datum, and PLGR settings, then try again. If the EHE is still  $> 70$  feet, refer to Chapter 2 **“Establishing a Baseline and Scale”** to locate the LC.

- e. **Chaining from the RP to the LC.** Employ the PLGR’s **“Navigate”** (NAV) function to determine a distance and azimuth from the RP to the LC waypoint. Use a chaining tape and compass for chaining from the RP to LC. Refer to Appendix G.

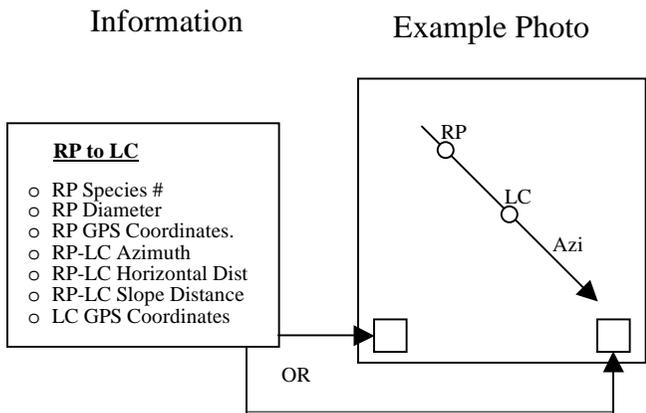
- f. **LC Verification.**

**Tolerance:**  $\pm 6$  feet per 100 feet chained.  $\pm 30$  foot maximum error.

Upon arrival at the LC, put a stake in the ground and use the **Position (POS)** function of the PLGR to collect UTM coordinates for the LC. If a 180 hit averaged EHE of  $\leq 70$  feet for the LC cannot be obtained, it will be necessary to chain to an opening and use the **RangeCalc** function of the PLGR to calculate the coordinates of the LC (the RP coordinates, distance, and azimuth can be used for the calculation.)

For correct placement of the LC, chaining error should be no more than  $\pm 6$  feet per 100 feet of chaining distance up to  $\pm 30$  feet. Check photos and topo map to verify the LC Position. If the LC pinprick and PLGR placement disagree by more than 0.1 inches, re-pinprick the photo, and begin referencing the plot. Use procedures listed on pg. 2-13, "**Moving the Pinprick.**"

Upon verification of the LC, carefully draw a line on the back of the photo, using the RP and LC as guides for your ruler. Do not draw through the pinpricks. Put an arrow at the end of the line indicating the azimuth direction and write the azimuth next to the arrow. Label and circle both the LC and RP. Record all pertinent information in the lower left or right hand corner of the photo.



## 2. Establishing a Baseline and Scale.

Use this technique in the field when an open area for running a baseline is available.

### a. **Ground/Photo Method.**

- (1) **Select Landmarks.** Select two features easily identifiable on both the ground and on the aerial photo. Trees, road intersections, or other landmarks within sight of each other are adequate. The features should be at least 600 feet apart and at the same relative elevation. Do not use railroad lines, power line poles, etc., as they will influence compass readings.

Pinprick these two landmarks on the photo that has the LC pinprick. On the back of the photo, circle and label one of the landmark pinpricks as "A" and the other as "B".

- (2) **Determine baseline azimuth.** With a compass, determine the azimuth (to the nearest degree) between the landmarks. On the back of the photo, draw a thin, straight line through the center of the two landmark pinpricks (A and B).

Place an arrow on the line, indicating the direction the azimuth was taken (i.e., from A to B, or from B to A), and label the azimuth along the line.

- (3) **Measure baseline distance.** Measure the distance between A and B on the photograph (using a .001-foot scale) and on the ground (the horizontal distance, to the nearest foot). **Note:** If the ground distance is measured on a slope of 10 percent or greater, convert the slope distance to horizontal distance with the following formula:

$$\text{Horizontal Ground Distance} = \frac{\text{Slope Ground Distance}}{\text{Slope Correction Factor}}$$

Determine the "slope correction factor" (SCF) for the angle of the slope using a clinometer with a SCF option, or determine the slope percent with a clinometer and find the associated SCF listed in appendix B.1.

- (4) **Compute baseline PSR.** Compute a baseline photo scale reciprocal (PSR) using the following formula:

$$\text{PSR} = \frac{\text{Horizontal Ground Distance}}{\text{Photo Distance}}$$

**b. Map/Photo Method.**

- (1) **Select Landmarks.** Select two baseline points that are easily identifiable on both the topographic map labeled with the field location center (LC) and on the aerial photo with the LC pinprick. The points must be located stereoscopically on the photo.

**Note:** Vegetation lines on the topographic maps are often not accurate, so select points such as road and stream intersections. Mountain tops may be used, but it is extremely important that the top is identifiable by stereoscopic viewing.

Label the points as "A" and "B" on the map, and draw a straight line between these points on the map.

- (2) **Determine baseline azimuth.** Determine the baseline azimuth (from point A to point B), to the nearest degree, on the topographic map using the following procedures:
  - i.) Use the UTM grid lines if preprinted on the map, or draw a north-south or east-west line on the topo map by using UTM "tick" marks. Make sure the selected line intersects the A-B baseline.
  - ii.) Place a photo protractor on the north-south or east-west line. If it is a north-south line, place the protractor so that the line runs through 0 and 180 degrees; use 90 and 270 degrees for an east-west line.
  - iii.) Slide the protractor along the line until the cross mark in the center of the protractor is over the intersection of the A-B baseline and the north-south or east-west line. Read the baseline azimuth from the protractor (this azimuth is called the "original map azimuth").
  - iv.) Because compasses are set at 0 degrees declination (magnetic north, not true north), the original or measured map (A to B) baseline azimuth must be adjusted to a magnetic azimuth. Use this **adjusted azimuth** for the A-B baseline azimuth on the photo. In the bottom margin, most 7 1/2' quad maps indicate declination offsets between the UTM grid north (indicated by "GN") and true north (indicated by a **star**), and between magnetic north (indicated by "MN") and true north.

Magnetic declination in the western U. S. is always clockwise from true north; The UTM grid declination may be clockwise or counterclockwise, depending on the map's location in the UTM grid zone. For the Interior West, **subtract** the **total declination offset** (between MN and GN) from the original map (A to B) baseline azimuth. **Total** declination between MN and GN is either:

- Magnetic declination **plus** grid declination, if GN is **counterclockwise** from true north, or
- Magnetic declination **minus** grid declination, if GN is **clockwise** from true north.

Adjusted Azimuth = original map azimuth –  
(MN declination ± GN declination)

*Examples of computation for both situations:*

**Example A:**

Original map baseline azimuth (A to B) = 130 degrees  
GN declination = 2 degrees (clockwise)  
MN declination = 17  
Adjusted Magnetic Azimuth =  $130 - (17 - 2)$   
= 115 degrees

Use 115 degrees as the baseline azimuth on both photo and compass.

**Example B:**

Original map baseline azimuth (A to B) = 130 degrees  
GN declination = 2 degrees (counter  
clockwise)  
MN declination = 17  
Adjusted Magnetic Azimuth =  $130 - (17 + 2)$   
= 111 degrees

Use 111 degrees as the baseline azimuth on both photo and compass.

- (3) **Label Photo.** Pinprick points A and B on the photo (with the LC pinprick), and correctly label these points on the **back** of the photo. On the back of the photo, carefully and accurately draw a line from A to B, place an arrow at the end of the line showing proper direction (this is the map baseline), and record the adjusted baseline azimuth on the back of the photo. Use a **ball-point pen** for all marking on the back of photos.
- (4) **Measure baseline distance.** Measure the distance between points A and B on the topo map and on the photo. Make all measurements using the same units (e.g., use a .001-foot scale ruler to measure the map and photo distance). The finer the divisions on the ruler being used, the better the results.
- (5) **Compute baseline PSR.** Use the formula on the following page to determine the Baseline Photo Scale Reciprocal (PSR):

$$\text{Baseline PSR} = \frac{\text{Baseline Map Distance (ft)} \times \text{Map Scale Reciprocal}}{\text{Baseline Photo Distance}}$$

**Note:** If the Map Scale is 1:24,000, then the Map Scale Reciprocal is 24,000.

For example (using a .001-foot scale for map and photo measurements):

Baseline Map Distance (from A to B) = 0.0153 ft  
 Baseline Photo Distance (from A to B) = 0.0082 ft  
 Map Scale Reciprocal = 24,000

$$\text{Baseline PSR} = \frac{(0.0153 \text{ ft} \times 24,000)}{0.0082 \text{ ft}} = 44,780$$

- c. **Selecting a Reference Point.** Once the baseline azimuth and scale have been determined (ground/photo or map/photo method), designate a reference point (RP) readily identifiable on both the ground and the photograph. Refer to page 2-3 for RP selection criteria.

d. **Adjusting the Photo Scale Reciprocal.** This adjustment to the photo scale is required when the mean elevation of the RP to LC is at least 100 feet different from the mean elevation of the calculated baseline.

- **8.25-inch focal length** (certain NHAP and resource photography - see State Supplement). If the RP to LC mean elevation is **higher** than the baseline, for each 100 feet higher in elevation **reduce** the baseline PSR by 145 units (see below for an example). If the RP to LC mean is **lower** than the baseline, for each 100 feet lower in elevation, **increase** the baseline PSR by 145 units.
- **6.0-inch focal length** (NAPP and certain resource photography - see State Supplement). If the RP to LC mean elevation is **higher** than the baseline, for each 100 feet higher in elevation, **reduce** the baseline PSR by 200 units. If the RP to LC mean is **lower** than the baseline, for each 100 feet lower in elevation, **increase** the baseline PSR by 200 units.

For example:

Baseline PSR = 38,800; baseline photo scale 1:38,800  
Baseline elevation = 6,000 feet; RP elevation = 7,400 feet

7,400 feet  
-6,000 feet  
1,400 feet difference

Focal length for photography is 8.25 inches. Change baseline 145 units for each 100 feet elevation difference:

1,400 feet / 100 feet = 14  
14 X 145 = 2,030

Therefore:

38,800 (baseline PSR)  
-2,030 (change in scale)  
36,770 adjusted RP PSR.

- e. **Calculating Azimuth and Distance.** Determine the azimuth and horizontal ground distance from the RP to the LC using the following procedure:
- (1) **Draw RP-LC line.** On the back of the photo, draw a thin, straight line through the RP and LC pinpricks. Intersect the RP-LC line with the baseline by extending the RP-LC line (figure 1, example 1). If the baseline and RP-LC line do not intersect on the photograph, draw a line (secondary baseline) that intersects the original baseline and the RP-LC line (figure 1, example 2).  
**Note:** Place arrows on these lines indicating the azimuth direction.
  - (2) **Determine RP-LC azimuth.** To obtain the RP to LC azimuth, orient a photo-scale protractor **inverted** over the line intersections (in other words, position the protractor "**wrong-side**" up because the photo work is carried out on the back of the photo). Determine the azimuth from the RP to the LC by lining up the correct azimuth over the baseline and reading the azimuth corresponding to the RP-LC line (figure 1, example 1 and example 2).

If a secondary baseline is used, first determine the azimuth of the secondary baseline by positioning the protractor (**wrong-side** up) over the intersection of the original and secondary baselines, lining up the correct azimuth for the original baseline, and reading the azimuth corresponding to the secondary baseline. After the azimuth for the secondary baseline is determined, place the protractor over the intersection of the secondary baseline and the RP-LC line to obtain the RP to LC azimuth.

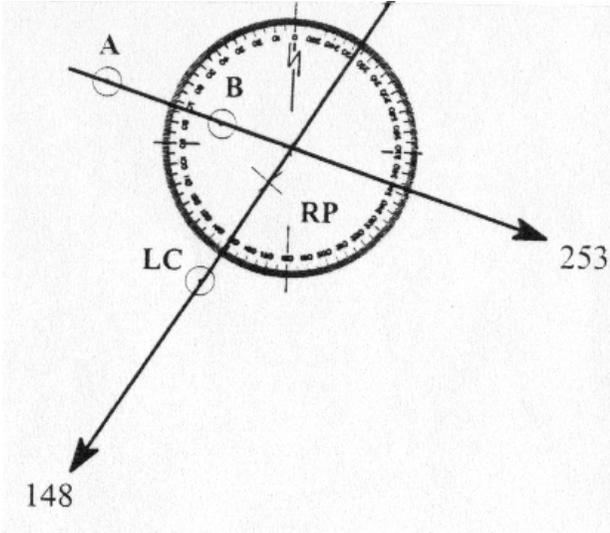
On the back of the photo, record the azimuths along each traverse line. Also record the following information on the back of the aerial photograph containing the LC pinprick in the lower left or right hand corner (depending on photo pinprick location):

<u>RP info:</u>	<u>Course to Plot:</u> <u>RP to LC</u>	<u>*Baseline info:</u> <u>A to B</u>	<u>*Baseline info:</u> <u>RP to LC</u>
Species	Azimuth	Azimuth	Azimuth
Diameter	Distance	Ground Dist.	Photo Dist.
RP Coords.	LC Coords.	Photo Dist.	PSR
		PSR	Ground Dist.
		PSR Adj.	PSR Adj.

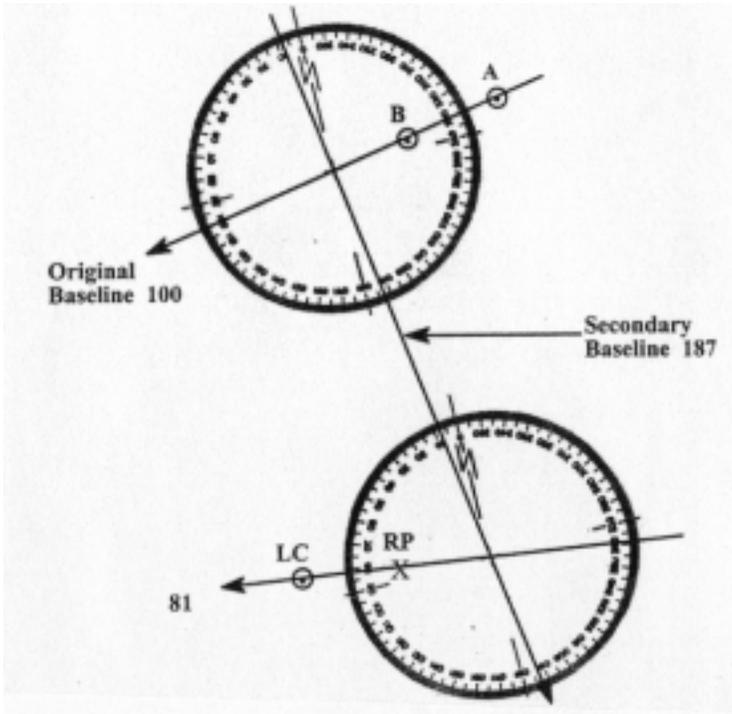
\*Record only if baseline method is used.

Figure 1. Examples for two methods of determining azimuth from RP to LC: example 1, the simple baseline; and, example 2, the secondary baseline.

Example 1:



Example 2:



(3) **Determine RP-LC horizontal distance.** To determine the horizontal distance from the RP to the LC, use one of the following methods:

- **".001-foot scale" method** (preferred method). Measure the distance on the photo from the RP pinprick to the LC pinprick to the nearest .001 foot (using a .001-foot scale). Multiply this photo distance by the baseline photo scale reciprocal (PSR as calculated previously) to obtain the RP-LC horizontal ground distance.

$$(\text{Photo Distance}) \times (\text{PSR}) = \text{Horizontal Ground Distance}$$

For example:

Photo scale between RP and LC = .012 feet

Photo PSR = 36,770 feet

Horizontal ground distance from RP-LC is

$$(.012) \times (36,770) = 441 \text{ feet}$$

- **"Photo scale" method.** If a .001-foot scale is not available, determine the horizontal ground distance by selecting the photo scale (on a photo-scale protractor) that is closest to the actual photo scale as determined from the calculated PSR, and measure the distance, on the back of the photo, between the RP and LC pinpricks (to the nearest 12.5 feet, which is half of an increment on a scale ruler).
- f. **Traversing to the LC.** Using a compass and tape, run a traverse from the RP to the LC along the calculated azimuth and horizontal ground distance. Make distance corrections for slope whenever the slope is 10 percent or greater. Use a clinometer to determine the appropriate slope correction for each distance segment traversed (or if needed, appendix B.1 provides a slope correction table for distance). Place a stake at the end of the traverse.
- g. **LC Verification.**

**Tolerance:**  $\pm 10$  feet, 95% of the time.

Upon arrival at the end of the traverse, determine if the calculated ground point is in agreement with the LC pinpricked on the photograph. Examine the ground features near the LC area that would be noticeable on the aerial photograph such as individual trees or tree groupings, openings in the crown canopy, rock outcroppings, etc.

If the calculated ground point and the photo point are clearly not in agreement,

- (1) **Recheck the azimuth and distance calculations** for possible errors.
- (2) **Determine the correct ground location** based on the photos and map, and place a second stake at the correct ground location. If the RP is visible from the corrected LC, remeasure the actual azimuth and distance directly. Otherwise, determine the azimuth and distance from the initial stake (incorrect location) to the second stake (corrected location). Remove the first stake. Record all adjusted measurements on the Field Location Reference record under "Course To Field Location," and on the Field Location Description record under "Baseline Information."

#### **h. Moving the Pinprick.**

**Tolerance:** No errors 100% of the time.

If it is determined that the ground point and the LC pinprick are not in agreement due to the LC pinprick being in the wrong location, use the following rules to move the pinprick to the correct location:

- (1) Verify that topographic map is plotted correctly. 5000 meter point labeled in the correct location; verify photo pinprick matches topographic map.
- (2) If GPS is used to establish LC and pinprick is off:
  - i.) Leave pinprick where it is if you cannot verify **EXACTLY** where you are on the photograph due to canopy, topography, etc.
  - ii.) Move pinprick if you can verify exactly where you are on the photograph and the pinprick is off by  $\geq 1/10^{\text{th}}$  inch or  $\geq 1/100^{\text{th}}$  foot on the photo.
- (3) If the Baseline method is used to establish LC and pinprick is off:
  - i.) Leave pinprick where it is if you cannot verify **EXACTLY** where you are on the photograph due to canopy, topography, etc.
  - ii.) Move pinprick if you can verify exactly where you are on the photograph and the pinprick is off by  $\geq 1/10^{\text{th}}$  inch or  $\geq 1/100^{\text{th}}$  foot on the photo.

#### **D. Finding the Field Location Center - Remeasurement Locations**

A reference point (RP) and witness trees were established in the previous inventory to aid in relocating the field location.

Find the previously established RP using directions recorded on the old Field Location Record sheet and the old photos. The RP is a landmark (usually a tree) that is identifiable on both the ground and the field location photo, and should be indicated by a pinprick on the old photos. Trees used as RPs were marked with aluminum tags: one tag nailed below stump height (1 foot) facing in the direction of the field location, and two other tags nailed approximately 6 feet above the ground on opposite sides of the tree.

If the RP is suitable for the current inventory, and visible on the new photograph, it may be re-used. If new photography is used for the location, pinprick the RP and label it on the back of the new photo.

A tree that is re-used as an RP must be re-tagged if necessary.

Run the traverse from the RP to the LC using the azimuth and horizontal distance recorded under "Course to Sample Location" on the old Field Location Record sheet and/or old photos. If the slope exceeds 10 percent, horizontal distances must be adjusted for slope (determine the slope correction factor, SCF, using a clinometer with a SCF option, or determine the slope percent with a clinometer and find the associated SCF listed in appendix B.1).

Two witness trees (designated "X" and "Y" trees) were established near the LC. The "X" tree was scribed with an X above DBH/DRC (facing the LC) and should generally be near an extension of the course followed from the RP. The "Y" tree was generally located at a right angle to this azimuth. An aluminum tag was nailed below stump height facing the LC stake on both witness trees. Azimuth and distance from the LC stake to each witness tree, plus species and diameter, were recorded under "Witness Trees" on the old Field Location Record sheet.

The crew should arrive in the **vicinity** of the field location by following the RP to LC course. Toward the end of the course, begin looking for the "X" tree. In addition to the "X" tree, look for old flagging, old plot stakes, and nails in trees at DBH/DRC. Place a new stake at the LC, at the location of the old stake; however, the old stake marking the LC may be missing. By triangulating using the witness trees, a new stake can be correctly placed. If the witness trees are missing (cut), use tally trees to triangulate.

The following discussion and instructions cover some of the situations that may occur when searching for the field location. In all situations where a new RP or RP-LC course is established, record the appropriate new information on the new Field Location Reference form, and on both the old and new photographs. Pinprick and label the new RP on the old and new photos.

### 1. **RP Not Found.**

Due to incorrect directions, inaccurate field location placement, or disturbance at the location area (clearcut, new roads, etc.), the RP may not be found on the ground. Find the location center by using one of the following methods:

- a. Follow the procedures described under "Finding the Field Location Center - New Field Location" (page 2-2), and use the ground/photo method for establishing a baseline.
- b. Locate a new RP on the ground that is discernible on both the old and new photos. Using the old photo, compute a new course from the RP to LC using one of the following techniques (**Note:** The new RP must be discernible on the new and old field location photographs):

#### **The .001-Foot Scale Method:**

(1) Calculate the **azimuth** from the new RP to the LC (figure 2 example 1):

- Pinprick the new RP on the old photo with the LC pinprick.
- On the back of the old photo, draw a line connecting the new RP pinprick with the LC pinprick.
- Orient a photo protractor **inverted (wrong-side up)** over the LC using the previously calculated azimuth from the old RP to the LC (this item is recorded on the old field forms). In example 1, the old reading is 43 degrees.
- With the protractor in place, read the azimuth from the new RP to the LC. In example 1, the reading is 320 degrees.

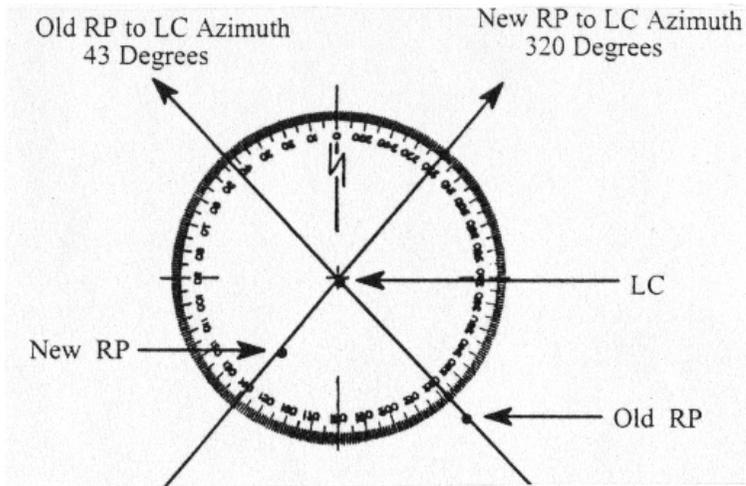
- (2) Calculate the **horizontal ground distance**, using a .001-foot scale, from the new RP to the LC (figure 2 example 2):
- Using the old RP to LC line, measure the distance between the RP and LC pinpricks (with the .001 foot scale) on the back of the old photo. In example 2, the distance is .141 foot.
  - Divide the ground distance from the old RP to the LC (this item is recorded on the old field forms) by the calculated photo distance (from old RP to LC) to obtain the photo scale reciprocal (PSR). In example 2, the ground distance of 851 feet, divided by the photo distance of .141 foot, yields a PSR of 6035. Actual photo scale is 1:6,035.

Figure 2. The .001-foot scale method.

---

Example 1. The .001-foot method, determining the new azimuth

(back of old photo)



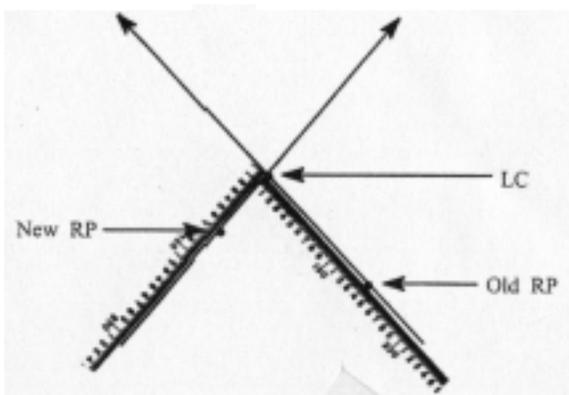
---

Example 2. The .001-foot method, determining the new horizontal ground distance.

(back of old photo)

Old RP to LC  
Ground Distance = 851 ft.  
Photo Distance = 0.141 ft.  
(PSR =  $851 / 0.141 = 6035$ )

New RP to LC  
Photo Distance = 0.069 ft.  
Ground Distance = PSR X 0.069 ft = 416 ft.



- Measure the distance between the new RP and LC pinpricks, using the .001 foot scale, on the new RP to LC line (on the back of the old photo). In example 2, the distance is .069 foot.
  - Multiply the PSR by the new RP to LC photo distance to get the new RP to LC horizontal ground distance. In example 2, the PSR of 6035 multiplied by the photo distance of .069 foot, yields a horizontal ground distance of 416 feet.
- (3) On the back of the **new photo** with the LC pinprick, pinprick the new RP, and draw a thin, straight line through the center of the two pinpricks. Record the azimuth and horizontal distance from the new RP to the LC, and place an arrow on the RP to LC line, indicating the direction that the azimuth was taken.

**Reminder:** Use a ball-point pen for all photo work.

- (4) Use the new RP to LC azimuth and horizontal distance to find and reference the remeasurement field location

### The Best-Fit Method

- (1) Calculate the **azimuth** from the new RP to the LC.
- Pinprick the new RP on the old photo with the LC pinprick.
  - Draw a line from the new RP to the LC.
  - Orient a photo protractor **inverted (wrong-side up)** over the LC using the previously calculated azimuth from the old RP to the LC (this item is recorded on the old forms). In figure 3, the old reading is 43 degrees.
  - With the protractor in place, determine the new azimuth from the new RP to the LC. In figure 3, the reading is 320 degrees.
- (2) Calculate the **horizontal ground distance** from the new RP to the LC:

Using the photo scale (on a photo-scale protractor) that is closest to the nominal photo scale (a nominal photo scale of 1:24,000 in figure 3), measure the horizontal ground distance on the back of the photo, to the nearest 12.5 feet, between the new RP and the LC pinpricks. **Note:** the nominal photo scale is often printed on the front of the aerial photograph as a two-digit number, e.g., 24, or by the normal scale reference, e.g., 1:24,000). In figure 3, the measured distance is 850.5 feet.

Figure 3. The best fit method.

---

**Aerial Photo Scale Protractor:**

In this example, the nominal photo scale on the old photo is 1:24,000. Therefore, the 1:24,000 scale on the aerial photo-scale protractor is used to measure the distance between the new RP and the LC pinpricks (to determine the horizontal ground distance) on the back of the photo.

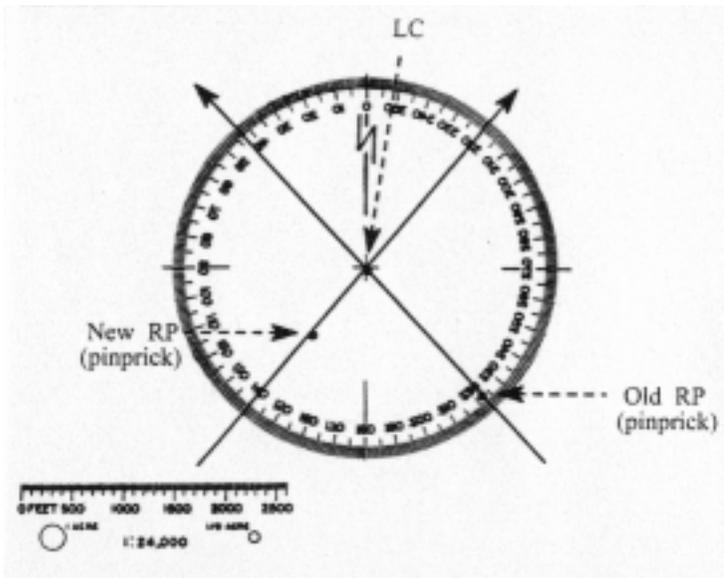
On the back of the old photo

Previously calculated

Old RP to LC:  
Azimuth 43 degrees  
Distance 1,675.5 feet

New calculation

New RP to LC:  
Azimuth 320 degrees  
Distance 850.5 feet



(1:24,000 photo scale used to measure distance; this illustration has been enlarged for the example and is therefore not to true scale.)

- (3) On the back of the **new photo** with the LC pinprick, pinprick the new RP, and draw a thin, straight line through the center of the two pinpricks. Record the azimuth and horizontal distance from the new RP to the LC, and place an arrow on the RP to LC line, indicating the direction that the azimuth was taken.  
**Reminder:** Use a ball-point pen for all photo work.
- (4) Use the new RP to LC azimuth and horizontal distance to find and reference the remeasurement field location.

## 2. **RP Found But Not Usable.**

The RP may be found and used for relocating the plot, but it is no longer suitable for re-use (e.g., dying, dead, or cut). A new RP must be established.

Select a new RP and compute a new RP to LC course. This can be accomplished by one of the following methods:

- a. Choose an RP that can be seen from the location center and is identifiable on the aerial photos. Take the azimuth and distance directly.
- b. Locate a new RP that is discernible on both the old and new photos. Using the old photo, a new course from the RP to LC can be computed. Refer to page 2-15 for examples.

### **3. Field Location Incorrectly Placed or Not Found.**

Spend at least 30 minutes (no more than 1 hour) to thoroughly search the area at the end of the RP-LC chain (within approximately 500 feet); circumstances dictate the actual amount of time to spend (e.g., stand density, site disturbance). Factors that might explain why a field location cannot be found include the following: azimuth and/or distance incorrectly calculated, compass not set at 0° declination, compass not used properly, or corrections for slope were not made while chaining.

Re-establish the old field location if any of the following apply:

- the previously established LC (point 1) is more than 500 feet from the correct location center (based on the correct GPS coordinates, photo pinprick and map grid intersection),
- the previously established LC is in a different condition from the correct location center (refer to chapter 3), or
- the previously established LC is not located in the correct ownership.

If a field location is incorrectly placed or cannot be found, do the following:

- a. Locate the correct location center on the ground and determine if a new field location should be established. Establish a new location using the current procedures.
- b. On the outside of the field location packet write "old field location not found" or "old field location incorrectly placed" and give a brief explanation. Note if a new field location was established.
- c. Cross out preprinted data forms and leave the forms in the field location packet.
- d. Inform section leader.

## CHAPTER 3 - DEFINING THE CONDITION CLASS

This chapter describes the condition class, provides guidelines for determining condition class on the field location sample (A. below), provides definitions necessary for classifying condition class (B. page 3-8), and provides guidelines for mapping condition classes (C. page 3-15).

After the location center (LC) has been established on the ground, determine the condition(s) present on the field location (encompassing the 4 subplots). A **condition** is generally defined as an area of relatively uniform ground cover, such as a homogeneous vegetation cover; a **condition class** is a categorization of the condition based on several variables, called **defining attributes** in this manual (see below). A prospective **contrasting condition class** is any condition that may be different than a previously assigned condition class based on the defining attributes.

The purpose of recognizing condition classes is to determine and map each area of the plot occupied by distinct conditions, and to define each condition by various attributes.

### A. Determining Condition Class: General Procedures

Every field plot samples at least one condition (the condition at the LC).

The area sampled on the plot is partitioned into separate condition classes first based on the defining attributes of Ground Cover Class and Land Use. Areas classified with a forest land Ground Cover Class are further subdivided into smaller separate condition classes if distinct variations occur in the additional defining attributes: forest type, stand-size, stand origin, and stand density. Areas classified as other tree land and non-tree land are further subdivided if distinct variations occur in the vegetation cover (Dominant Tree Species or Rangeland Cover Type, respectively).

#### 1. Tree land vs. Non-tree Land/Water.

- a. **Ground Cover.** The first consideration for defining a condition class is the distinction between the following broad Ground Cover Classes:
  - tree land (further subdivided into forest land and other tree land)
  - non-tree land, and
  - water.

Differences between tree land and non-tree land conditions are recognized and classified only if each of the two prospective condition classes are **at least 1 acre in size and 120 feet wide**; these size requirements apply to both tree land and non-tree land. Any area that does not meet this minimum size requirement is not considered distinct from the adjacent or encompassing Ground Cover Class (exemptions to this rule are listed on page 3-11).

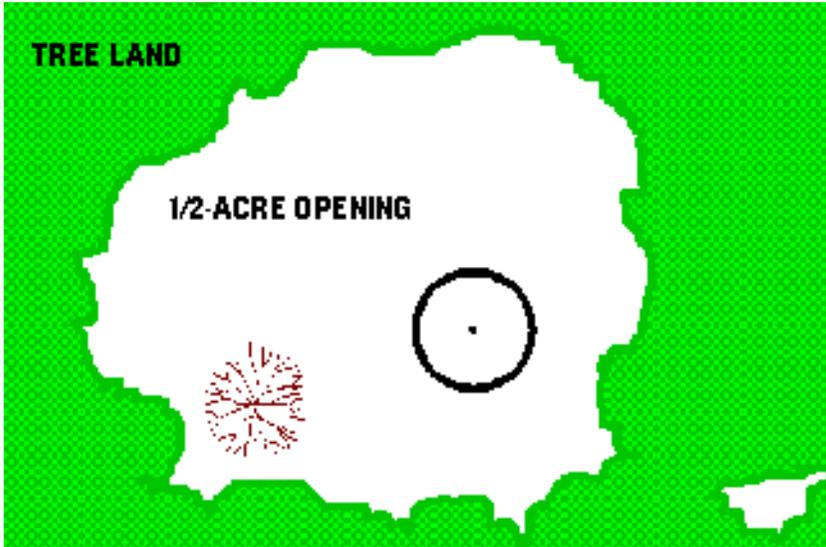
Within a non-tree land condition, tree land areas or linear strips of trees less than 1-acre in size or less than 120 feet wide at the subplot are considered part of the non-tree land condition.

For water features, a minimum size criteria is based on the Census Bureau definitions. To classify water as a condition, the water feature must be at least 1-acre in size and 30 feet in width. Linear water features, such as streams, rivers, and canals, are measured across the channel between points on either side up to which water prevents the normal establishment of trees. To determine if a linear water feature qualifies as a condition, rely on aerial photos, topographic maps, normal high water marks, and past crew classifications. Crews are not expected to measure the length of the feature to determine if it is 1 acre in size.

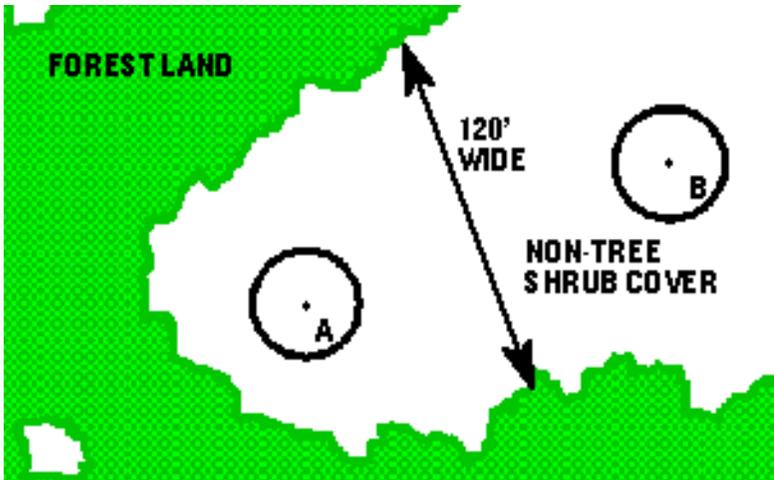
- b. Land Use.** The second consideration for defining a condition class is a further breakdown of Ground Cover Class called Land Use. Examples of Land Uses include undeveloped tree land, developed tree land, orchards, crop cover, improved pasture, etc. Within a specific Ground Cover Class, contrasting Land Uses are recognized and classified only if each of the two prospective condition classes are **at least 1 acre in size and 120 feet wide**; these size requirements apply to all Land Uses except cultural developments and maintained roads and rights-of-way (see page 3-12). Any area that does not meet this minimum size requirement is not considered distinct from the adjacent or encompassing Land Use.

Refer to figure 4 for examples.

Figure 4. Tree land vs. non-tree land and water classifications.

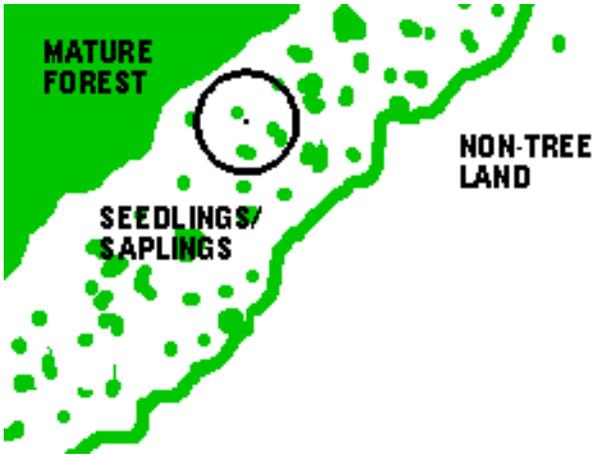


The subplot falls in an opening less than 1 acre in size; the opening does not meet the definition for non-tree land (1-acre in size, 120-foot wide). Therefore, this subplot occurs in a **TREE LAND** condition class.

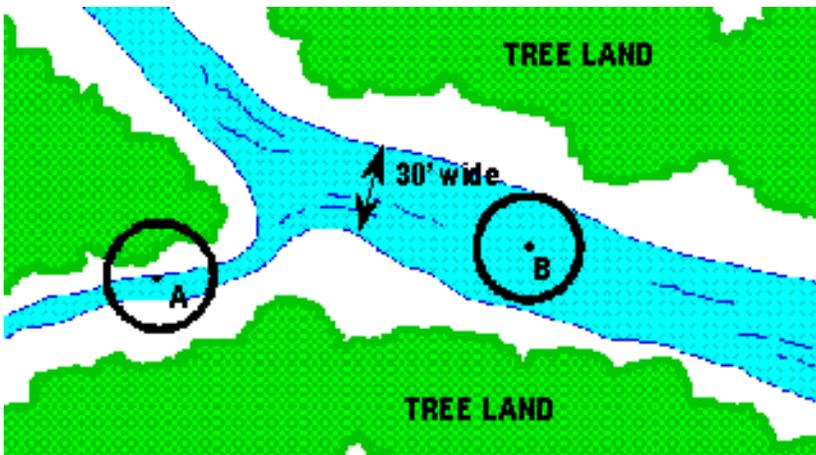


Subplot A falls in a shrub cover inclusion within tree land; even though the area of shrubland is at least 1-acre in size, subplot A occurs in **TREE LAND** because the width of the inclusion at the subplot is less than 120-feet wide. Subplot B also falls in the inclusion, but because the width of the inclusion at the subplot is greater than 120-feet wide, subplot B occurs in **NON-TREE LAND**.

Figure 4. Tree land vs. non-tree land and water classifications (contd).



The subplot falls in a strip of seedling/sapling cover less than 120-feet wide. However, the strip is adjacent to a large area of tree land (forest land), and the strip does meet the 5 percent cover and/or regeneration criteria for tree land. Therefore, the strip is combined with the tree land, and the subplot occurs in **TREE LAND**.



Subplot A falls in a stream less than 30-feet wide, and within tree land. Subplot A occurs in a **TREE LAND** condition class.

Subplot B falls in a stream at least 30-feet wide; subplot B occurs in **WATER**.

## 2. Within Forest Land Conditions.

Once an area has been classified as forest land, the area can be further subdivided into smaller separate condition classes (of relatively homogeneous tree species composition or structure) if distinct variations exist in any of the following defining attributes:

- Forest Type,
- Stand Size,
- Stand Origin, and
- Stand Density

Contrasting forest land conditions are recognized and classified only if each of the two prospective condition classes are **at least 1 acre in size and 120-feet wide**. Any forest land area that does not meet this minimum size requirement is not considered distinct from the adjacent or encompassing forest land condition class.

To qualify as a separate condition class, a change must be obvious and a boundary must be readily identified on the ground. If there is any doubt as to whether an actual boundary between contrasting forest land condition classes is present, ignore the boundary in question.

Use the following criteria to identify within-forest land condition classes:

- a. Forest type:** a distinct change in tree species composition. Do not recognize transition zones between forest types as separate condition classes. The following are examples of forest type differences that would distinguish separate condition classes given that the contrasting condition class meets the minimum 1-acre size and 120-foot width requirements.
  - An area dominated by softwood species (e.g., Douglas-fir/spruce) bordering an area dominated by hardwood species (e.g., oak/maple).
  - A pure ponderosa pine stand adjacent to a pinyon-juniper stand.
- b. Stand size:** a distinct change in the mean (average) tree diameter. Only recognize very obvious changes between stands of different stand-size class, such as a large diameter stand adjacent to a small diameter or seedling/sapling stand (refer to Glossary for definitions).

- c. **Stand origin:** an abrupt, distinct change between areas that originated by artificial methods versus those areas that have been regenerated by natural means. For a boundary to be recognized, an artificially regenerated area must show clear evidence (e.g., planting in rows or seeding) that it differs significantly from the adjacent natural stand. If it is difficult to determine whether or not a stand has been planted or seeded, or if no distinct boundary exists, ignore the boundary. 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, ignore the boundary.
- d. **Stand density:** an abrupt change in the density of tree cover, usually caused by a disturbance (e.g., fire, harvesting, insect damage) or extreme changes in aspect (e.g., ridgeline). Stand density may be characterized by number of stems per acre, basal area per acre, or by stocking (i.e., percent tree cover or vegetative space occupancy). Examples of valid differences in stand density are:
- A clearcut condition that has no tree cover adjacent to a stand with sufficient cover or adequate numbers of seedlings and saplings.
  - A partially cutover stand (20 percent crown cover) bordering an undisturbed stand (80 percent cover).

Do not recognize slight differences or gradations.

### 3. Within Other Tree Land Conditions.

Once an area has been classified as other tree land, the area can be further subdivided into smaller separate condition classes -- of relatively homogeneous vegetation - if distinct variations exist in the dominant tree species.

Contrasting other tree land conditions are recognized and classified only if each of the two prospective condition classes are **at least 1 acre in size and 120-feet wide**. Other tree land area that does not meet the minimum size requirements is not considered distinct from the adjacent or encompassing other tree land condition class.

#### 4. Within Non-tree Land Conditions.

Once an area has been classified as non-tree land, the area can be further subdivided into smaller separate condition classes -- of relatively homogeneous vegetation - if distinct variations exist in the Rangeland Cover Type.

Contrasting non-tree land conditions are recognized and classified only if each of the two prospective condition classes are **at least 1 acre in size and 120-foot wide**, with certain size exemptions listed below. Non-tree land area that does not meet the minimum size requirements is not considered distinct from the adjacent or encompassing non-tree land condition class.

To qualify as a separate condition class, a change must be obvious and a boundary must be readily identified on the ground. If there is any doubt as to whether an actual boundary between contrasting non-tree land condition classes is present, ignore the boundary in question.

## B. Condition Class Definitions

### 1. Tree land.

Tree land is any area at least 1 acre in size and 120-feet wide with at least 5 percent cover in species classified as trees. Trees are defined as those species listed in appendix D (Little, Elbert L. Jr. 1979. Checklist of United States Tree. USDA Agriculture Handbook No. 541). However, for this inventory several genus or species will not be measured: those defined in Little, 1979, as primarily shrubs (e.g., *Artemesia* spp.) and those considered hazardous to sample (the lily and cactus families).

For the purposes of this inventory, tree species are divided into 3 groups and defined as follows:

- **Timber species** -- tree species individually tallied, and measured for diameter at breast height (DBH). Timber species include all species of conifers (except pinyon and juniper) and aspen, cottonwood (Populus spp.), paper birch, and boxelder hardwood species.
- **Woodland species** -- tree species individually tallied, and measured for diameter at root collar (DRC). Woodland species include pinyon, juniper, oak, mesquite, locust, curleaf mountain-mahogany, Rocky Mountain maple, bigtooth maple, and desert ironwood.
- **Other tree species** -- tree species not individually tallied but sampled on the understory vegetation description. Other tree species include those listed in Little, 1979, as trees but not included in the tally tree species list (page 10-9 and 10).

- a. **Tree land categories.** Based on composition of tree species, tree land is classified as either (1) forest land or (2) other tree land. In addition, both forest land and other tree land are further divided into developed or undeveloped land, though both will have the same ecological characteristics.

**Developed** tree land is tree land that will probably not be managed for wood utilization because of development for recreational, residential, or other Land Uses, but where human activity on the site does not preclude natural succession of the stand.

**Undeveloped** tree land is tree land that is not developed. Refer to page 8-3 (Land Use classifications) for the categories of developed and undeveloped forest land.

(1) **Forest land.** This is tree land that

- has at least 5 percent cover of tally tree species (listed on pages 10-9 and 10),
- has at least 40 tally tree species seedlings and saplings per acre, or
- is currently without cover but formerly had at least 5 percent cover with tally tree species (i.e., the site shows evidence of former tree cover, such as cut or burned stumps, snags), and human activity on the site does not preclude natural succession.

**Note:** Classify areas as non-tree land if they show evidence of type conversion to a non-tree Land Use (e.g., fire or chaining was used to convert tree land to grass land) and do not currently have adequate crown cover or regeneration of tree species.

(2) **Other tree land.** This is land that has at least 5 percent cover in tree species (Little, 1979) but does not have at least 5 percent cover in tally tree species (timber or woodland species listed on pages 10-9 and 10). Examples would include land with at least 5 percent cover in tree species such as alder or paloverde, but less than 5 percent cover in tally tree species.

Classify and map other tree lands as a separate condition class from forest land only where both conditions are at least 1 acre in size and 120 feet wide.

b. **Sampled vs. nonsampled tree land.** In general, field sample most areas of undeveloped and developed tree land (both forest land & other tree land). However, if human activity on the site precludes the natural succession of the vegetation, do not field sample the trees and understory. The following conditions are considered tree land if they meet the tree land definition, but they will be classified as "nonsampled tree land" (both nonsampled forest land or nonsampled other tree land) for this inventory:

- **Nonsampled urban tree land areas** -- portions of cities, towns, etc., where tree cover is at least 5 percent, but human activity and development preclude natural succession. This includes areas such as city parks, picnic grounds and home yards with mowed lawns, golf courses, cemeteries, and schools.
- **Christmas tree plantations** -- land meeting the tree land definition, but consisting of various coniferous species, usually planted in rows and often pruned for shape, harvested at seedling/sapling sizes for Christmas trees. Although these plantations consist of tall tree species, natural processes of succession are restricted.
- **Orchards** -- land meeting the tree land definition, but consisting of various nontally tree species that, although they normally reach tree form, are planted and managed as crops for fruit or nut production (walnuts, apples, etc.).
- **Other nonsampled tree land** -- areas meeting the tree land definition, but where
  - (1) human activity on the site precludes natural succession, and not defined in one of the previous categories (e.g., improved pasture), or
  - (2) the tree species are not sampled for safety purposes (lily and cactus family trees).

## 2. Non-tree land.

This category includes:

- land that has never supported at least 5 percent cover of trees (e.g., barren areas, alpine tundra, desert shrub), or
- land that formerly had sufficient tree cover but has been converted to a non-tree Land Use (e.g., cropland, improved pasture land): these areas currently do not have adequate tree cover or reproduction due to a specific treatment (e.g., chaining, other land clearing) intended to eliminate trees for the purpose of enhancing or providing for non-wood commodities or uses (e.g., increasing herbage production).

If intermingled in tree land areas, **unimproved roads and openings** must be at least 120-foot wide and 1 acre in size to qualify as non-tree land. Likewise, small patches of tree covered areas or linear strips of trees less than 1 acre in size and 120-foot wide within non-tree land are considered as non-tree land. Exemptions to the non-tree land size criteria are listed below.

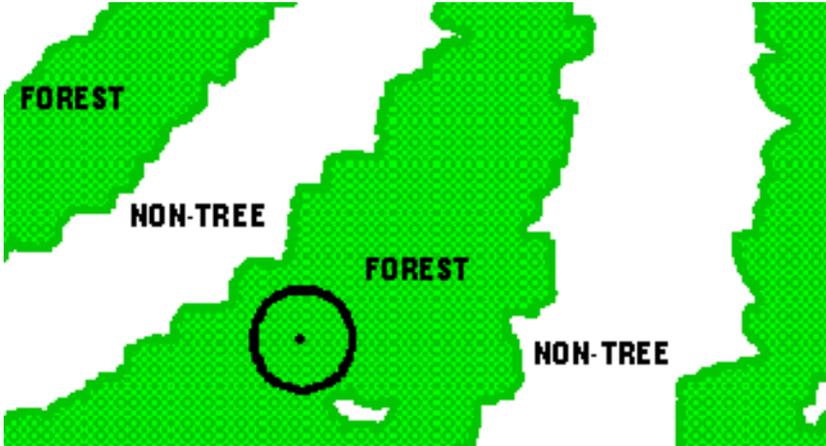
## 3. Tree land and non-tree land size/width exemptions.

The following situations necessitate exemptions to the 1-acre size and 120-foot wide requirement for tree land and non-tree land (figure 5):

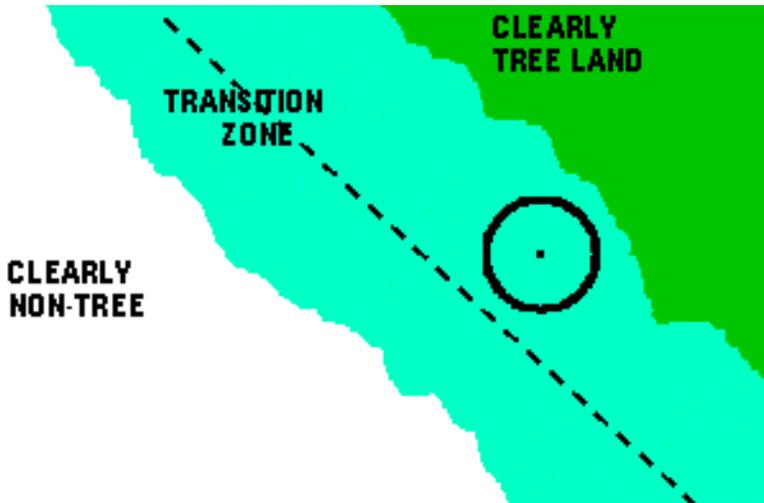
- a. Distinct alternating strips of tree land and non-tree land.** This situation occurs when the sample falls within a strip of land that meets the 1-acre minimum, but is less than 120-foot wide. The strip of land occurs in an area with parallel strips of trees and openings of which none of the strips meet the minimum width requirement. Determine the total area that the intermingled area occupies, and classify the sample according to whatever land occupies the greater area. If the area of alternating strips is so large or indistinctive as to make a total area determination impractical, then classify the sample as tree land.
- b. Transition zones or ecotones.** The border between tree land and non-tree land 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 tree land meets the minimum cover criteria and where it does not. For these cases, determine where the land clearly has 5 percent cover, and where it clearly is less than 5 percent cover; divide the zone between these points in half, and determine which side of the zone the subplot is on. Classify the condition based on this line (figure 5).

- c. **Cultural developments.** Located within tree land, these are maintained structures or the maintained area surrounding a structure. Examples of cultural developments are houses or trailers on very small lots, pump houses in a small cleared area within tree land, and maintained areas around barns, sheds, or homes. Cultural developments can be of any size and are considered either nonsampled tree land or non-tree land.
- d. **Maintained roads and rights-of-way.** Located within tree land, these areas are often less than 1 acre or 120-feet wide but are non-tree land in characteristic due to permanent human-caused development. Classify the following as non-tree land whether or not they meet the area and width requirement.
- **Maintained roads** -- improved roads that are built using road building machinery and are periodically maintained for private or public vehicular travel. A maintained road can be any width and is considered non-tree land. If intermingled in tree land, **unimproved roads** must be at least 120-feet wide and 1 acre in size to qualify as non-tree land. A road engineered for the purpose of skidding logs is not considered a maintained road.
  - **Maintained rights-of-way** -- areas such as railroads, powerlines, gas lines, and canals, and the buffer strips around them, that are periodically treated to limit vegetative growth and are currently in use for the purpose for which they are designed. A maintained right-of-way can be any width.

Figure 5. Examples of tree land and non-tree land exemptions.

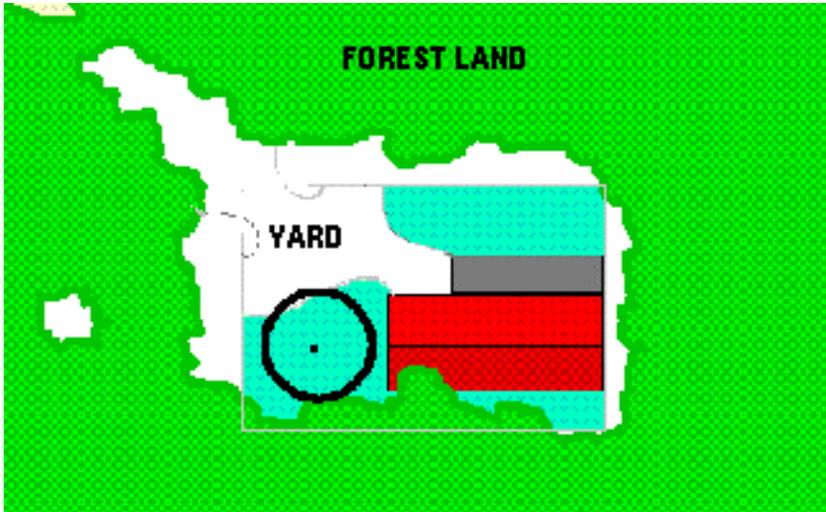


The subplot falls in an area of alternating strips of forest land and non-tree land, none of which meet the 120-foot width criteria. Examine the overall area, and classify the land according to whatever cover occupies the most area. In this example, there is more forest land, so the subplot occurs in a **FOREST LAND** condition class.

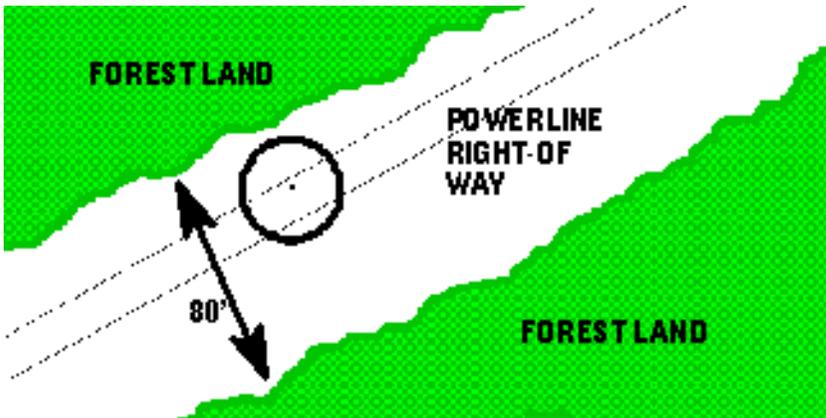


The subplot falls in a transition zone between forest land and non-tree land. Identify where the land is clearly forest land, and where the land is clearly non-tree land. Divide this zone between the defined lands in half. The subplot falls on the forest land side; therefore, the subplot occurs in a **FOREST LAND** condition class.

Figure 5. Examples of tree land and non-tree land exemptions (contd).



The subplot falls in a maintained yard next to a house; the area of the yard and house is less than 1-acre. However, the yard and house are cultural developments; these are considered non-tree land regardless of size. Therefore, the subplot occurs in **NON-TREE LAND**.



The subplot falls in a powerline right-of-way. Although the right-of-way is less than 120-feet wide, maintained roads and rights-of-way are exemptions to the size rule and are considered **NON-TREE LAND** regardless of width.

#### 4. Water.

- a. **Census water** includes inland water in ponds, lakes, reservoirs, or similar areas 4.5 acres or more in size, and streams, rivers, estuaries, and canals more than 200-feet wide at normal high water level. Portions of braided streams meeting the census water definition, comprising more than 50 percent water cover at normal high-water level, are also considered census water.
- b. **Noncensus water** includes inland water in ponds, lakes, reservoirs, or similar areas 1 to 4.5 acres in size, and streams, rivers, estuaries and canals 30-feet to 200-feet wide at normal high-water level. Portions of braided streams not meeting the census water definition, but at least 120-feet wide and comprising more than 50 percent water cover at normal high-water level, are considered noncensus water.

Ephemeral and intermittent streams are classified as land (refer to "Stream" in glossary for definitions).

#### C. Mapping the Condition Boundary

Boundary reference data are used to compute the percentage of area assigned to each condition class sampled on the plot, and they are used for remeasurement classifications.

Whenever a boundary is recognized between distinct condition classes (meeting the minimum area and width requirements), sketch the boundary on the condition class diagram. In addition, if the recognized boundary occurs on the subplot, reference the boundary by recording azimuths and distances as described below. **Only map abrupt boundaries between distinctly different condition classes** on the subplots.

## 1. Locating the Boundary.

Use the following guidelines to determine whether to map recognized condition classes on a subplot or microplot:

- **Distinct boundary on a subplot.** When a clear boundary between two or more distinct condition classes occurs within a subplot (or microplot), recognize separate condition classes on the subplot, and map and reference the boundary.
- **Indistinct boundary on a subplot.** When two or more condition classes occur on a subplot, but the boundary between the condition classes is a transition zone or not clearly an abrupt boundary, do not recognize or map separate condition classes on the subplot. Instead, only recognize the individual condition class that predominates the subplot.

**Example:** The 4 subplots all sample only 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 transition zone between a stand of large diameter trees and a stand of seedling/saplings. Within this transition zone, the large trees phase into a sapling stand. Because subplot 2 is within the transition zone, it must not be divided into two mapped condition classes. Instead, the subplot must be treated entirely as part of the large diameter tree condition class or 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, and the boundary is assumed to occur between subplot 1 and 2.

- **Condition Boundary or Transition Zone Between Subplots.** When a boundary (either distinct and abrupt or a transition zone) between two or more condition classes occurs between subplots, recognize and classify the separate condition classes, but do not map or reference a boundary on the subplot. Instead, only sketch the boundary on the condition class diagram.

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

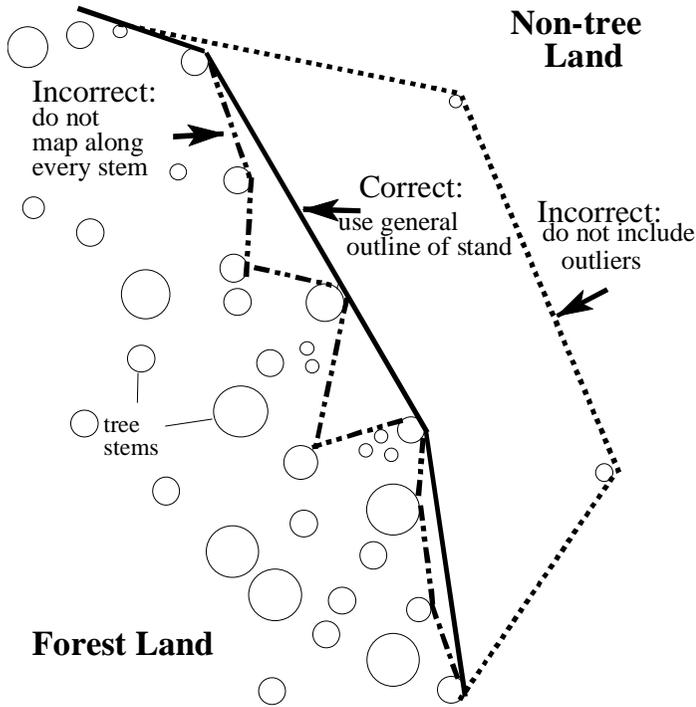
## 2. Delineating the Boundary.

Use the following guidelines for identifying where, on the ground, to map a boundary:

- When the boundary between **any two condition classes** is clearly marked, use that feature to define the boundary. Clear demarcation includes such features as a fenceline, sharp ridgeline, edge of creek channel, ditch, etc.
- When a boundary between **any two condition classes** is a transition zone, assume the boundary occurs between the subplots and not on the subplot.
- When a boundary between **forest land and non-tree land** is not marked by an obvious feature, the boundary should follow the non-tree side of the tree stems/boles at the forest land edge; in other words, map along the outermost edge of the tree stems/boles.
- When the boundary between two contrasting **forest land condition classes** is not clearly marked by a feature such as a fenceline, map along the stems/boles of the contrasting condition class (furthest from the subplot center). When the boundary between two contrasting forest land condition classes is separated by a narrow linear inclusion (creek, fireline, narrow meadow, unimproved road), establish the boundary at the far edge of the inclusion (along the stems/boles of the contrasting condition class). If the boundary between two contrasting forest land conditions is not abrupt and obvious, assume the boundary occurs between, but not on, the subplots.

To map a stand boundary, follow the general outline of the stand: as a rule of thumb, the general line should not create inclusions or fingers less than 120-feet wide, and it should not include single or small groups of outlier trees. Refer to diagram on page 3-18.

When a crew remeasures a plot, they should examine the boundaries referenced in the last inventory. If no change has occurred, retain the original boundary data from the last inventory. If the boundary has changed, a new boundary is present, or the previous crew made an obvious error, record a new or updated boundary. Delete boundaries that are no longer distinct.



### 3. Referencing the Boundary.

A condition class boundary is approximated by a straight line or by a straight line with one corner.

When a boundary between two distinct condition classes crosses through the subplot or microplot, record the azimuths and distances from the subplot center to specific reference points.

Each boundary is referenced, or marked, by a maximum of three reference points: two where the boundary intersects the circumference of the subplot or microplot, and one corner point between the two end points, if necessary. Only the corner point requires a distance, because the distance from the center point to the circumference is always equal to the fixed plot radius.

When a boundary line crosses through the subplot and the microplot, crews must ensure that the reference points provided are along the same approximate boundary line. Circumference azimuths for the subplot and microplot are rarely the same.

Because the approximated boundary is referenced as a straight line, or two straight lines with a corner, the lines will not always follow the actual condition boundaries precisely. Therefore, assign all trees sampled along a boundary to the actual condition class that they occur in, regardless of which side of the approximated "boundary line" they occur.

Crews must take extra care to ensure that boundary line references approximate the actual condition classes. If the boundary is not clear or is difficult to determine, do not map and reference the boundary within the subplot area.

## CHAPTER 4 - FIELD PROCEDURE OVERVIEW

This chapter provides a general overview of the field procedures required to conduct the inventory, depending on the field location situation and condition classes present on the location. The first part of this chapter discusses several situations where the crew may not be able to conduct the inventory; the next portion of the chapter describes the basic parts (data forms) of the inventory to be completed. The final section discusses remeasurement and Forest Health field plots, and reserved lands.

### A. Circumstances Precluding Field Location Establishment

#### 1. Potential Situations.

The following circumstances may preclude the establishment of any field location:

- **Field location currently being logged.** If the field location is currently being logged, determine when the logging will be completed (ask the foreman), and establish and measure the location only after logging is complete.
- **Inaccessible.** The crew cannot reach or measure the field location center (LC) because of permanent physical conditions (e.g., cliffs) restricting access.
- **Access denied.** The landowner denies access to the field location on private property, or obtaining permission from the owner is not possible. **Promptly leave the property!**
- **Not in Sample Area.** The LC falls outside the State currently being inventoried.

## 2. Procedures.

When a field location is inaccessible, access denied, or not in the sample area, complete the following inventory sections (it will be provided on the data recorder, or use the appropriate field form). Refer to appendix A for data forms and appendix E for specific items to record.

1. The **Field Location Reference** data (chapter 6).
2. The **Field Location Description** data (chapter 7).
3. On the **outside of the field location packet** record the appropriate Location Access code. Also record the appropriate Ground Cover and Land Use Class if the location center is visible.

Return the plot packet to the section leader and provide the section leader with the details of the situation.

## **B. Field Locations with Sampled Forest Land Present**

Establish and measure a field location if any portion of one of the four subplots occurs within a **sampled forest land** condition class. The field location layout consists of 4 subplots where the LC is the center point of subplot 1. Refer to chapter 5 for field location layout and tree sampling procedures.

Establish these locations using current inventory procedures.

For previously established locations using another sample design, re-establish the LC where it was placed before, and sample the location using current inventory procedures. In addition, remeasure the tally tree species using the layout and sampling rules from the previous inventory as described in chapter 12.

For all locations with forest land present, complete the following inventory sections (these will be provided on the data recorder, or use the appropriate field forms). Refer to appendix A for data forms and appendix E for specific items to record:

1. The **Field Location Reference** data (chapter 6).
2. The **Field Location Description** data (chapter 7).
3. The **Condition Class Description** data (chapter 8) for the condition containing the LC and for any additional conditions occurring on the subplots.
4. The **Condition Class Diagram** and **Boundary Information** data (chapter 8).
5. The **Subplot Description** data (chapter 9) for each of the four subplots.
6. The **Tree Data** (chapter 10); record all tally trees present within forest land conditions. If only a portion of a subplot occurs in forest land, only tally the trees within that portion. Refer to chapter 5 for tally tree selection and for shrub-form tally tree special procedures.
7. The **Understory Vegetation Description** data (chapter 11) for each of the four subplots.
8. If necessary, the **Remeasurement Tree** data (chapter 12).

**C. Field Locations with No Sampled Forest Land Present, but Sampled Other Tree Land Present**

If no portion of the 4 subplots occurs within a sampled forest land condition class, establish a field location if any portion of the 4 subplots occurs within a sampled other tree land condition class. The field location layout consists of 4 subplots where the LC is the center point of subplot 1. Refer to chapter 5 for field location layout and tree sampling procedures.

Establish these locations using current inventory procedures, however, do not individually tally trees. Use the procedures described in chapter 5, page 5-8 for sampling other tree species on the subplots.

For all locations with no sampled forest land condition classes present but other tree land condition classes present, complete the following inventory sections (these will be provided on the data recorder, or use the appropriate field forms). Refer to appendix A for data forms and appendix E for specific items to record:

1. The **Field Location Reference** data (chapter 6).
2. The **Field Location Description** data (chapter 7).
3. The **Condition Class Description** data (chapter 8) for the condition containing the LC and for any additional conditions occurring on the subplots.
4. The **Condition Class Diagram** and **Boundary Information** data (chapter 8).
5. The **Subplot Description** data (chapter 9) for each of the four subplots.
6. The **Understory Vegetation Description** data (chapter 11) for each of the four subplots. Include the other tree species in this section.

**D. Field Locations with No Sampled Tree Land Present (Nonsampled Tree Land, Non-tree Land, and/or Water Only)**

Field locations with no sampled tree land present will be established and measured ONLY if a rangeland inventory is part of the survey.

- **Within a Rangeland Unit (BT):** For field locations with no sampled tree land present, and located within a rangeland inventory unit, establish the plot. The field location layout consists of 4 subplots where the LC is the center point of subplot 1. Refer to chapter 5 for field location layout and tree sampling procedures, and complete the following inventory sections (these will be provided on the data recorder, or use the appropriate field forms). Refer to appendix A for data forms and appendix E for specific items to record:
  1. The **Field Location Reference** data (chapter 6).
  2. The **Field Location Description** data (chapter 7).
  3. The **Condition Class Description** data (chapter 8) for the condition containing the LC and for any additional conditions occurring on the subplots.
  4. The **Condition Class Diagram** and **Boundary Information** data (chapter 8).
  5. The **Subplot Description** data (chapter 9) for each of the four subplots.
  6. The **Understory Vegetation Description** data (chapter 11) for each of the four subplots. For subplots falling in nonsampled tree land or water condition classes, leave part I blank and record 999 for each entry in Part II.

- **Not Within a Rangeland Unit:** Do not establish and measure a field location if no portion of the four subplots occurs within sampled tree land, and the location is not within a rangeland inventory unit; the subplot layout is located completely within conditions classified as nonsampled tree land, non-tree land, census water, and/or noncensus water.

For these locations, place a plot stake in the ground at the LC, and do the following. Refer to appendix A for data forms and appendix E for specific items to record:

1. The **Field Location Reference** data (chapter 6); only the appropriate information is required.
2. The **Field Location Description** data (chapter 7). Include in the General Comments a brief description of why the field location does not meet the sampled tree land criteria (e.g., this area has been chained and currently has less than 5 percent tree cover and no regeneration).
3. The **Condition Class Description** data (chapter 8).
4. The **Subplot Description** data (chapter 9) for each of the four subplots.
5. On the outside of the field location packet, record the following information:
  - Current Date
  - Crew Number
  - Current Ground Cover Class
  - Land Use
6. Photograph the location area. If the location center can be occupied, take 4 photos in the cardinal directions (refer to page 6-8). If the location is determined to be non-tree land from a distance, photograph to provide a clear view of the area and plant species.

## E. Remeasurement and Forest Health Plots

During the course of this field inventory, crews will occasionally revisit previously established plots. Within the Interior West States, numerous field plots have been established to obtain information on forest resources and forest health. Throughout this field manual, subsections referencing remeasurement and Forest Health plots provide additional guidelines for conducting the inventory.

**Remeasurement plots** indicate a resource inventory plot was previously established at a location: crews will relocate the field plot, in many cases remeasure the trees from the previous inventory, and then establish the current plot design at that same location. Old reference and witness trees can be reused if appropriate.

**Forest Health plots** are remeasured every one to four years; some forest health plots will be revisited this year, and others in future years. These plots use the same basic layout as the current inventory (refer to chapter 5), so most subplot tree information will reflect previous measurements (e.g., tree number, azimuth, distance -- refer to chapter 10). The microplot, however, is offset for these plots, so crews will need to establish new microplots in this inventory.

## F. Reserved Lands/Wilderness Areas

Because of the legal and social aspects regarding reserved lands (National Parks, NFS and BLM wilderness areas, etc.), crews are required to take extra precautions in monumenting plots as not to "advertise" the presence of the plot. Throughout this manual, several references to reserved lands instruct crews to remove flagging, paint tree tags gray or brown, avoid blazing trees near roads and trails, and others.

However, because it is necessary to relocate field plots wherever they exist, reference trees, plot stakes, tree nails, etc., are still required for reserved plots. On occasion a particular Park or Monument may require adjustments to these guidelines, but crews should follow the procedures in this manual unless specific instructions are included with the plot packet information. Refer to the special provisions section and the index for various reserved land/wilderness area topics.

**Special Provisions:** The following are provided as minimum guidelines for conducting FIA inventories in Wilderness areas on NFS lands. These will also be used for all other reserved lands unless specific written instructions are provided to the FIA program by the managing agency.

**Location Monumentation:** It is important to be able to relocate plots, subplots, and trees measured during the inventory. In Wilderness areas, less visible markings are always appropriate. Detailed, concise sketches and notes will also make subsequent relocation easier.

1. *Identifying tags/nails* – Paint tags/nails an approved color, and face away from obvious trails and roads. Tags/nails may only be used at the base of the tree. Use marking tags/nails minimally.
2. *Flagging* – Remove any flagging used to facilitate entry and exit from the plot area upon completion of the plot measurements.
3. *Painting/Scribing* – Do not paint or scribe any trees. This includes trees used to monument the plot and witness trees. Do not paint or scribe to mark breast height.

**Sample Plot Monumentation:**

1. *Reference point trees* – Do not paint or scribe Reference Point trees. Nail a tag marked with "RP" to the base of the tree facing the direction of field location. Describe the reference point on the plot sheet notes and include reference landmarks.
2. *Subplot center* – Witness subplot centers with a metal wire/rod in the ground as a marker (not to protrude from the ground more than 1 inch). Do not attach flagging to the marker.
3. *Subplot witness trees* – Do not paint or scribe witness trees. Nail a tag to the base of the tree facing subplot center with the letter (X or Y) and the plot location number inscribed on it.
4. *Sample trees* – Do not paint or scribe sample trees. Mark each sample tree 5.0" DBH and larger with a tag/nail at ground level either facing subplot center or on the uphill side of the tree if there is a slope. If the sample tree is in view of a known path or trail, place the tag/nail away from the path or trail and note in the field tally. If only saplings are on the subplot mark a couple of them with nails at ground level and note which are so marked. Measure DBH at exactly 4.5 feet above the nail. If diameter needs to be taken at a location other than breast height, measure the distance (to the nearest inch) from the nail to the place of diameter measurement, and note it in the Tree Data Record.

**Boring trees:** Boring or drilling will be done on representative non-tally trees and only when absolutely necessary to estimate site, age, or growth. (This will generally be the case during initial establishment of permanent plots.)

**Site Condition:** All refuse associated with field operations shall be removed from Wilderness lands and the site of any data collection or encampment shall be returned to the condition in which it was found, except as authorized by the project work plan.

Temporary markers, such as flagging, may not remain in place for more than one week when study teams are not present on a site. Paint, or similar semi-permanent markers, may not be applied to rocks, plants, or other natural surfaces.

**NOTE:**

**Specimen Collection:** No personal flora or fauna collection is permitted on Wilderness lands. Collections are for scientific or educational purposes only, dedicated to public benefit, and may not be used for personal or commercial profit. All collections for scientific purposes must be approved by the RHWR Wilderness Manager.

No archeological or vertebrate paleontological materials may be collected. Upon location of any historical or archeological remains fieldwork will cease and the site shall be reported immediately to the local RHWR Wilderness Manager. No disturbance of such a site is permitted.

**Wildlife Interaction**

Problem encounters with wildlife, including any experienced or observed incidents of wildlife obtaining food or garbage from humans, shall be reported promptly to the RHWR Wilderness Manager. All food and garbage will be stored in a sealed containers approved by the local RHWR Wilderness Manager. Field personnel will make all reasonable efforts to prevent wildlife from obtaining food or garbage from humans.

## CHAPTER 5 - FIELD LOCATION LAYOUT AND TREE SAMPLING PROCEDURES

This chapter explains the field location layout and tree sampling procedures to use on all locations where tree land is sampled on any of the 4 subplots as described below. In addition, for specific Units, this layout is also used on non-tree land locations.

**Remeasurement Plots:** A portion of the field locations measured during previous inventories will be revisited during the current inventory. For remeasurement locations that cannot be found, or are mislocated, refer to chapter 2 for instructions. Remeasurement locations will be sampled using the current location layout and sampling procedures, and they will also be remeasured using the previous location layout and sampling procedures. Remeasurement locations will have a separate set of preprinted field forms located in the packet; refer to chapter 12 for remeasurement field location layout and sampling procedures. The location center (LC) will be the same point for both samples.

**Forest Health Plots:** A portion of the field locations are designated as Forest Health plots. These plots will be treated as remeasurement locations, and they were sampled on a similar layout. All subplot tally trees will be numbered, referenced, and remeasured on the same subplot layout. Seedlings and saplings will require microplot installation using current procedures.

Mark the location center (LC) and subplot centers 2-4 on the ground with a metal stake. If a metal stake cannot be placed in the ground because of bedrock, etc., build a rock cairn (rock pile) around the stake. If the subplot center cannot be monumented at all (e.g., in a river, on a paved road), place a stake where possible (e.g., off the road) and reference the azimuth and distance to the subplot center. Take all measurements from subplot center, not from the offset stake.

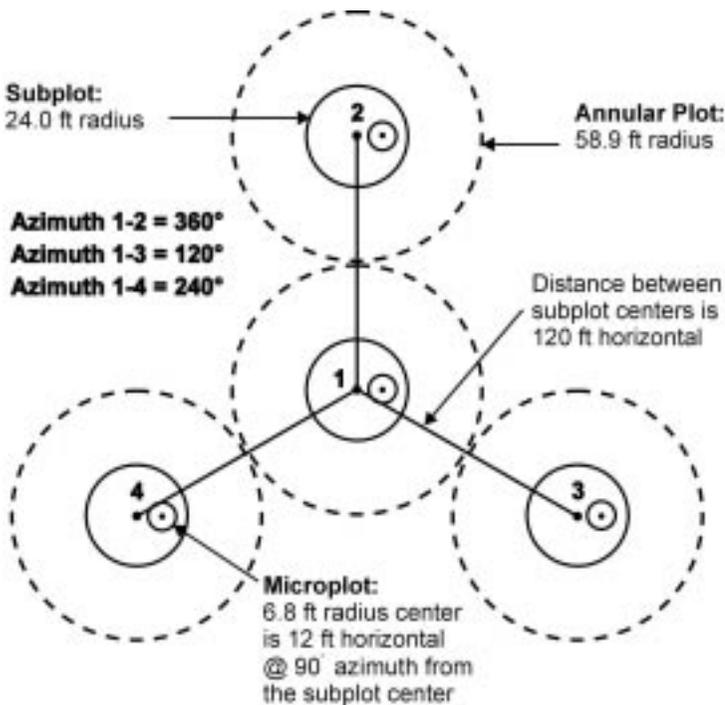
**A. Field Location Layout**

The field location layout (figure 6) consists of 4 fixed-radius subplots for tree and understory measurements and condition class mapping, 4 fixed-radius microplots for seedling and sapling tally and mapping, and 4 fixed-radius annular plots for sample intensification or sampling relatively rare events.

Once the LC has been established, it is designated as the center of subplot 1. Subplots 2-4 are established in a triangle pattern surrounding the LC as follows:

From LC (1) to	Subplot Center	Azimuth (Deg)	Distance (feet)
	2	360	120
	3	120	120
	4	240	120

Figure 6. Field location layout.



In addition, subplots 2-4 can be located from subplots centers other than the LC if necessary:

From Subplot	To Subplot	Azimuth (degrees)	Back Azimuth (degrees)	Distance (feet)
2	3	150	330	207.8
3	4	270	90	207.8
4	2	30	210	207.8

**Note:** Distance correction for slope is necessary when the slope exceeds 10 percent. Use a clinometer to determine the appropriate slope correction, or see slope correction table in appendix B.1.

## B. Sampling Procedures

For sampled forest land condition classes, inventory all subplots as described below. For sampled other tree land condition classes, or for other tree species on forest land condition classes, refer to item 4.

### 1. Subplot Tree Tally

- a. **Procedures.** The subplot is a 1/24-acre fixed-radius plot (24-foot radius) centered on the stake. At each subplot, stand directly over the center (stake), and starting at 1° azimuth, rotate clockwise and tally qualifying trees that fall within the subplot. Include only those trees within sampled forest land condition classes; do not tally and measure trees in nonsampled tree land or non-tree land condition classes. For a qualifying tree to be tallied, the horizontal distance from the subplot center stake to the geographic center of the stem(s) or the center of the bole (pith) at the base of the tree must be 24 feet or less.

Trees are tallied and numbered clockwise from the subplot center outward. Numbering is continued in the same fashion on the microplot once the subplot is complete.

**b. Qualifying trees.**

- (1) **Live timber species trees** (refer to pages 10-9 to 10-10) 5.0-inches in diameter at breast height (DBH) or larger. Live timber species trees will be classified as sound, rough, or rotten:

The **merchantable bole** on a timber species is defined as the portion of a tree, 5.0-inches DBH or larger, between a 1-foot stump and a 4.0-inch top diameter. For saplings, examine the stem from a 1-foot stump to a 1.0-inch top.

- (a) A **sound** live timber species has at least 1/3 of the merchantable volume in live and solid wood, and contains at least one solid 8-foot section now or prospectively, reasonably free of form defect.
- (b) A **rough** live timber species has less than 1/3 of the merchantable volume live and solid, with more than half of the unsound wood due to solid dead wood volume or severe form defect; or, a live tree that does not now, nor prospectively, have at least one solid 8-foot section, reasonably free of form defect, on the bole.
- (c) A **rotten** live timber species has less than 1/3 of the volume live and solid, with more than half of the unsound wood due to rotten and/or missing volume.
- (2) **Live woodland trees** (refer to pages 10-9 to 10-10) with a single stem of at least 5.0-inches diameter at root collar (DRC) or a cumulative (calculated) DRC of at least 5.0-inches for multistemmed trees. For multistemmed trees, count only those stems that are  $\geq 1.0$  inch DRC toward the cumulative (calculated) DRC.
- (3) **Standing dead timber species** 5.0-inches DBH and larger.  
To qualify as a standing timber species, the main tree stem/bole must be at least 6.0-feet tall and be self-supporting (i.e., a standing timber species cannot be broken below 6.0 feet and cannot be leaning against another tree for support).

Dead trees are classified as either hard or soft:

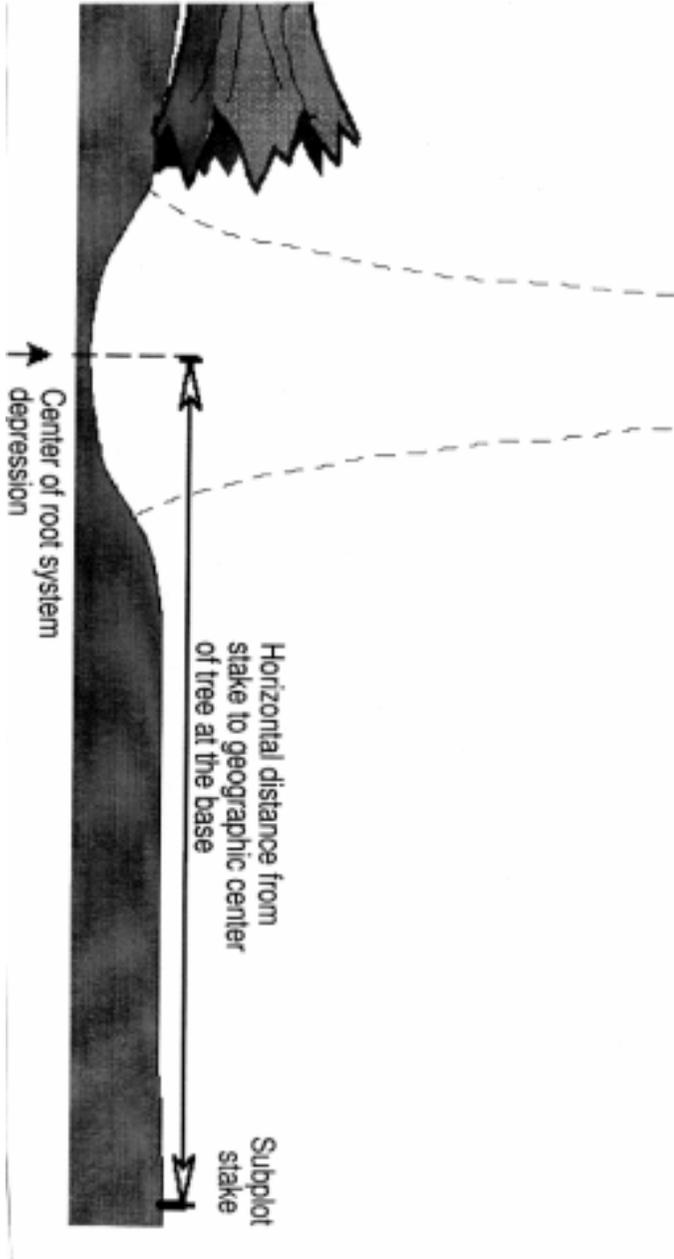
- (a) A **hard** dead timber species has a minimum of 1/3 of the original merchantable volume in solid wood (less than 67 percent rotten and/or missing).
  - (b) A **soft** dead timber species has less than 1/3 of the original merchantable volume in solid wood (more than 67 percent rotten and/or missing).
- (4) **Standing dead woodland trees** with a single stem of at least 5.0-inches DRC or a cumulative (calculated) DRC of at least 5.0-inches for multistemmed trees. For multistemmed trees, count only those stems that are  $\geq 1.0$  inch DRC toward the cumulative (calculated) DRC.

To determine if a downed tree is within the subplot, visually upright the tree at its origin (e.g., base of broken tree stem or bole, root system depression) and determine if the center of the tree at its base would fall within the maximum subplot distance for tallying (refer to figure 7 for an example).

- (5) **Down dead timber species** 5.0-inches DBH and larger. Downed timber species are those with the main stem/bole broken off below 6.0 feet or those not attached for support at the base or ground level (e.g., an upright tree broken at the base, but leaning against another tree for support). For a down dead timber species to be tallied, the center of the stem at DBH must be above the duff layer. Do not tally trees that are no longer cylindrical due to severe decay. Note any questionable trees. Down dead timber species are also classified as either hard or soft (see standing dead above).
- (6) **Down dead woodland trees** with a single stem of at least 5.0-inches DRC or a cumulative (calculated) DRC of at least 5.0-inches for multistemmed trees. For multistemmed trees, count only those stems that are  $\geq 1.0$  inch DRC toward the cumulative (calculated) DRC.

**Note (regarding woodland trees):** Treat all woodland species (except maple and deciduous oak) that have several stems clumped together, with a unified crown, and appearing to be from the same root origin, as a single tree. **Treat maple and deciduous oak species that fork underground as individual trees.**

Figure 7. Down tree limiting distance.



## 2. Microplot Sapling Tally.

a. **Procedure.** The microplot is a 1/300-acre fixed-radius plot (6.8-foot radius) located 12 feet horizontal at an azimuth of 90 degrees from the subplot center (see Figure 6 Location layout). At each microplot, stand directly over the center (stake), and starting at 1° azimuth, rotate clockwise and tally qualifying trees that fall within the microplot. Include only those trees within sampled forest land condition classes. For a qualifying tree to be tallied, the horizontal distance from the subplot center stake to the geographic center of the stem(s) at the base of the tree must be 6.8 feet or less.

### b. **Qualifying trees.**

- (1) **Live and dead timber species** 1.0- to 4.9-inches DBH. Dead timber species saplings are also classified as hard or soft (see 1. above), and live timber species saplings are classified as either sound or rough; examine these trees from a 1-foot stump to a 1.0-inch top diameter.
  - (a) A **sound** live timber species sapling is one that is expected to become a sound tree 5.0-inches DBH or larger by rotation age.
  - (b) A **rough** live timber species sapling is one that is precluded from becoming a sound tree, 5.0-inches DBH or larger by rotation age due to suppression or damage.
- (2) **Live and dead woodland species**, with a single stem between 1.0 and 4.9-inches DRC or a cumulative DRC of 1.0- to 4.9-inches for multistemmed trees. For multistemmed trees, count only those stems that are  $\geq 1.0$  inch DRC toward the cumulative (calculated) DRC.

## 3. Seedling Counts.

Using the same microplot as in 2. above, record the number of live tally tree seedlings, by species and condition class. Count up to 5 individuals by species; estimate the total count if there are more than 5 individuals of any given species in any given condition class. A suggested method of estimating is to count the number of seedlings on one quarter of the microplot and multiplying by 4 (given that there is only one condition class on the microplot). Repeat for each species.

Conifer seedlings must be at least 4.0 inches in length and less than 1.0 inch at DBH in order to qualify for tallying. Hardwood seedlings must be at least 12.0 inches in length and less than 1.0 inch at DBH in order to qualify for tallying. For western woodland species, each stem on a single tree must be less than 1.0 inch at DRC.

Multiple "suckers" of aspen that originate from the same location will be considered 1 seedling.

Do not tally fir "layers" (undetached branches partially or completely covered by soil, usually at the base) as seedlings. Tally as saplings once they become established.

#### 4. Other Tree Species and Shrub-form Tally Tree Species

Use the following procedures for sampling trees classified as other tree species (those not included as tally trees on pages 10-9 and 10-10).

In addition, use these procedures in cases where the timber or woodland tally species present on the site will never reach tree form due to poor site conditions. For example, in some areas oneseed juniper or gambel oak, although hundreds of years old, never grows over 3- to 4-feet tall due to rocky sites and dry environments. Likewise, some timber species at high elevations (Krummholz zones) stay short and gnarled in form, with twisted boles and multiple forks.

a. **Qualifying tally trees.** Use these procedures for other tree species encountered on sampled tree land, and for tally tree species that **do not** meet the following tree form criteria:

- **Timber species.** One or more trees on the site has or will have at least one solid 8-foot section on the merchantable bole, reasonably free of form defect.
- **Woodland species.** One or more trees on the site has or will have at least one 8-foot section, with a minimum bottom diameter of 3.0 inches and a minimum top diameter of 1.5 inches.

**Important:** If there is any doubt whether or not the tally species will reach tree form, or if there is any evidence the site once supported tree form plants, do not use these procedures for tally trees on the location.

In general, do not use these procedures for individual shrub-form tally species if other tally species on the site reach tree form. Exceptions include shrub form woodland trees (maple, cercocarpus, yew, New Mexico locust) that may occur as a minor shrub component in a coniferous stand.

**b. Procedure.**

- (1) Classify areas with "other tree species" and shrub-form tally tree species as tree land (other tree land or forest land) if they meet the tree land criteria.
- (2) Do not individually tally trees at each subplot and do not complete the Tree Data record for the tree species. Instead, include all trees on the **Understory Vegetation** record, and include timber and woodland species trees of any size (not restricted to seedlings and saplings).

## CHAPTER 6 -FIELD LOCATION REFERENCE ITEMS

This chapter describes items for referencing and relocating the field location center (LC), and provides procedures for monumenting the location.

Procedures for monumenting locations on **reserved lands** (wilderness, parks, etc.) and **Forest Health plots** are also included. Because the information documented on the Field Location Reference record (appendix A.1) will be used to find the field location in subsequent inventories, the information must be legibly recorded in understandable terms. Procedures for photographing field locations are provided at the end of this chapter.

### A. Identification Items

Write the State, Map, CPN, County, and Field Location numbers in the spaces provided at the top of the Field Location Reference record.

### B. Reference Point

**MQO:** Identification - No errors, 100% of the time.

Diameter - 0.2 inch per 20 inches of diameter, 95% of the time.

RP selection is critical to the relocation of any field plot. Extreme care is required to select an RP that is easy to locate, is readily identifiable on the ground and the aerial photos, and will likely be identifiable in 10 years. Refer to "Selecting a Suitable RP" (page 2-3).

**Remeasurement locations and Forest Health plots:** use the reference point from the previous measurement if it meets the site tree requirements.

When a tree is used as an RP, record species and diameter at breast height (DBH) or diameter at root collar (DRC) as appropriate. If a multistemmed woodland tree is selected, measure only one stem, preferably the largest or main stem. Also give a description of the RP and its location, for example, "large ponderosa pine located on the southwest corner of the meadow" or "six-stemmed juniper with a dead top on ridgeline."

If other landmarks are used for an RP, such as a sharp bend in road, a corner of building, the intersection of two fence lines, etc., leave species and DBH/DRC blank and provide an adequate description of the RP selected.

**Tagging the RP** -- Attach to the RP, when appropriate, aluminum tags labeled "RP LOC #" (Item 105). If a tree is selected as the RP, nail aluminum tags on two sides of the tree approximately 6 feet above ground level, and with at least 1 inch of nail exposed (to allow for tree growth between inventories). Nail one of the tags facing in the general route of approach to the RP. Nail a third tag at ground level facing towards the field location. If the RP is in a place where there is a high probability that a tag at 6 feet above the ground may be vandalized, only attach the tag at ground level and make a note on the Field Location Reference record.

**Note:** Use steel nails only on woodland species, and avoid tagging aspen trees.

No RP tags are needed if the RP is permanent and readily identifiable, such as the corner of a building or a road intersection. **Never** nail a tag to a private building or other private structure.

**Reserved land:** Tag RP trees only at the base, facing towards the field location; do not tag RP trees at 6 feet above the ground. Remove all flagging before you leave the vicinity. For plots near trails or roads, metal tags must be spray painted gray or brown on both sides. The RP must be carefully selected and adequately described to provide adequate means for future relocation.

### C. Course to Location Center

**MQO:** Azimuth  $\pm 2$  degrees 95% of the time.

Distance  $\pm 6$  feet per 100 feet of transect, maximum tolerance of 30 feet.

Record the azimuth (to the nearest degree), horizontal distance (to the nearest foot), and slope distance (to the nearest foot) from the RP to the location center (LC).

Note distinct landmarks and obstructions encountered on the course to location center such as fences, streams, cliffs, etc., and the associated distances from RP on the Field Location Reference Record.

## D. LC Witness Trees

### 1. Selection.

Reference the LC with two witness trees ("X" and "Y" trees).

On **remeasurement locations**, use previous witness trees where possible. Preferably, witness trees should be as follows:

#### "X" Tree

- On the extension of the RP to LC azimuth.
- Ideally, a distance of 25-30' from LC. Blazed with an "X".
- If there are no suitable trees at 25-30', use a tree within the subplot radius (24.0' or less). Tag only, no blaze.

#### "Y" Tree

- As close to LC as possible.
- At a right angle to the RP to LC azimuth.

#### "X and Y" trees should be:

- Not likely to die within 10 years.
- A species easily located on the site (e.g., an Engelmann spruce in a lodgepole pine forest type). **Note:** Avoid aspen, if possible; if aspen is used, be sure it is off the subplot and tag only. Do not blaze.
- At least 5.0-inches DBH for timber species and 3.0-inches DRC for woodland trees if possible.

If no live trees are within the vicinity of the LC (e.g., clearcut, burn area) select alternative witness landmarks that are likely to be present in 10 years (e.g., a sound snag, large stump, prominent rock). Describe the alternative landmarks selected on the Field Location Reference record.

## 2. Recording.

Record the following data for "X" and "Y" trees under the "Witness Trees" section of the Field Location Reference record.

- a. **Species.** If the witness is not a tree, indicate what was used (e.g., large boulder). **MQO:** No errors, 100% of the time.
- b. **DBH/DRC** to the last whole 0.1 inch. If a multistemmed woodland tree is used as a witness tree, measure and record the DRC of one stem (the largest or main stem). **MQO:**  $\pm 0.2$  inch per 20 inches diameter, 95% of the time.
- c. **Azimuth** (to nearest degree) from the LC stake to the center of tree at its base. **MQO:**  $\pm 2$  degrees, 95% of the time.
- d. **Slope distance** (to the nearest 0.1 foot) from the top of the LC stake to the nailed tag (see below). If an alternative landmark is used as a witness, distance is from the top of LC stake to the face of the landmark. **MQO:**  $\pm 0.2$  feet, 95% of the time.

## 3. Marking.

For "X" trees outside the subplot radius, scribe an "X" above DBH/DRC on the side of the "X" tree facing the stake (LC); scribe the bark, but be careful not to penetrate the cambium.

For trees not scribed (tree within subplot radius), nail a witness tag (2.5" x 2.5" black, heavy aluminum, diamond shaped tag) approximately 6 feet above the ground facing the LC if appropriate.

If a small tree is used, or if the location is in close proximity to private residence, do not blaze or tag but record a note under the "Witness Trees" section of the Field Location Reference record. If a multistemmed woodland tree is used as an "X" Tree, scribe an "X" on the stem measured for DRC.

For all witness trees, scribe two aluminum tags, one labeled "X LOC #" (with the actual location number) and the other labeled "Y LOC #". Nail each tag to the appropriate witness tree, at ground level, with the tags facing the LC stake. On multistemmed woodland witness trees, nail the tag at ground level to the stem measured for DRC, or at ground level below the stem measured for DRC if the stem originates above ground level. **Note:** When driving nails into trees, leave at least 1 inch exposed to allow for tree growth.

Where the witness is not a tree (e.g., rock), tag the alternative landmarks in some manner if appropriate, with aluminum tags, to aid field crews in re-locating the LC in future remeasurement inventories.

**Reserved locations:** Witness trees will not be painted or scribed. Nail a tag (spray painted gray or brown on both sides) with the appropriate letter (X or Y) and location number inscribed on it to the base of the tree facing subplot center.

#### **E. Baseline Information**

Record the appropriate baseline information as described in chapter 2.

#### **F. Travel Description**

Record road directions from the nearest post office, Forest Service office, major highway intersection, or other prominent landmark to the vicinity of the RP. This space can also be used to record other travel information that will assist in relocating the field location (e.g., hiking distance and direction from parking location to RP, specific information about obtaining keys for locked gates).

Road directions should contain (at a minimum):

- Road names and route numbers.
- Major landmarks.
- Mileages between roads/landmarks.
- Direction of turns at intersections/forks.
- Description of parking area.

Walking directions should contain (at a minimum):

- Trail name/number if applicable.
- Drain/creek/stream/ridge etc., name if applicable.
- Major landmarks.
- Approximate distances between trails, creeks, landmarks etc.

## G. Owner Information

Record the name of the private landowner or the name of the managing agency. If a private landowner is listed, also record the address and telephone number, if known (this information is used for quality control crew access and remains confidential).

Below "Owner Information," record information about landowner contact, recommendations for 4-wheel drive and ATV use, and information about locked gates (in the boxes provided, check "yes" or "no").

## H. Field Location Map

On the field location map diagram, draw any physical features that will assist in accurately relocating the field location (e.g., the location of the RP, roads or trails, drainages, ridgelines, fence lines, changes in vegetation type).

In addition, **draw and label all condition class boundaries.**

## I. Field Crew

Record the first initial and the full last names of the cruiser(s) and the recorder.

## J. Photos

Record the aerial photography project, roll, and photo numbers. Place an asterisk (\*) immediately before the photo number with the LC pinprick. Also, record the nominal photo scale (usually printed on the photo) and year of photography.

**Remeasurement locations:** Use the newest photos if possible; however, if the old photographs are at a better scale, and no significant change in the landscape has occurred (e.g., new roads), use the old photo pair.

## **K. Editing**

### **1. Field Crew Edit.**

After measuring the field location, but before leaving the site, the crew supervisor must review the field forms to make sure the required data are correctly and legibly recorded. Examine the following checklist, as a minimum, for completeness:

- All photo work complete, with RP pinpricked.
- Witness trees referenced and data recorded.
- Location and condition class maps drawn; photos taken.
- All data records are complete; no blank spaces.
- Necessary site trees selected and bored.
- Age and radial growth data complete.
- Unknowns collected and pressed.
- Field equipment gathered (PDR, GPS, camera, borer, tatum, plot packet, etc.).

The crew supervisor will then initial and date the Field Location Reference record in the "Field Crew Edit" box.

### **2. QC Review.**

Leave blank; this item is only to be recorded by office or quality control staff.

## **L. Map Name and Scale**

If using the field forms, record the name and scale of the USGS topographic map (provided in each field location packet) that displays the location of the LC (grid line intersection).

## **M. Legal Description**

**MQO:** No errors, 100% of the time.

Record the township, range, and section where the field location is located.

Be careful when examining topographic, Forest, or BLM maps; changes in numbering often occur along State, baseline, or other boundaries.

## **N. Photographing the Field Location**

As an additional aid in describing the field location, and as a record of plot conditions at the time of the field inventory, take photographs of the field location using a digital camera.

**Procedure:** At each field location, stand over the LC stake and take four photographs in the cardinal directions (i.e., take pictures facing north, east, south, and west). Include a placard in each picture, placed in the lower right-hand corner of the view, indicating the State, county, location number, and direction faced (N, E, S, or W). Be sure the placard is legible, but do not allow the placard to obstruct the view of the site. **Note:** Field compass declination is set to 0°.

It is best to take the photographs in moderate light conditions; shade the lens from direct sunlight when necessary, and use the flash in dark conditions (dense stands, cloudy days, etc.). Also, avoid using the first or last frames of the film for photographing field locations.

In the case of an all-nonforest location, if the crew identifies the LC on the ground, Subplot 1 will be photographed in the 4 cardinal directions. If the crew does not identify the LC but determines the approximate location or conditions of the LC, the crew will photograph the LC area (e.g., crew determines LC is on a hill side, but the hill is covered with nonforest species). Crews are required to get as close as necessary to positively identify the nonforest condition. Photographs taken when crew does not occupy the LC should be representative of the sample area.

## **O. Global Positioning System (GPS) Reference Data**

Refer to the Precision Lightweight GPS Receiver (PLGR) instruction manual for detailed information on using the PLGR.

Collect GPS data at 3 sites during data collection activities on all visited field locations. Collect and record UTM Zone (11, 12, or 13), UTM Easting, UTM Northing, and error (LC only). If no data are collected, record 0's for each and explain in the plot notes why no data were collected.

**Important:** Each day in the field, set up the PLGR in an open area for at least 15 minutes to load the satellite data.

**Warning:** Do not depress the CLR/MARK and the NUM LOCK keys simultaneously as this will zeroize the PLGR unit causing it to malfunction. If the unit is zeroized, return it to the office for re-keying. Also, never remove the PLGR internal battery without having fully charged batteries in place, or without the unit being plugged in to an external power source; otherwise, removing the internal battery will zeroize the PLGR unit. The internal battery should only be removed during its replacement.

Collect GPS data at the following sites. See **Appendix G** for instructions.

- 1. Truck** - collect and record the UTM coordinates at the site where the vehicle is parked to begin hiking. This point will provide information to future crews for access and may also help the crew relocate the vehicle in an emergency.
- 2. Reference Point** - collect and record the UTM coordinates at the reference point, regardless of how near or far from the LC. If the crew parked at the RP, repeat the truck GPS data.
- 3. Location Center** - collect and record the UTM coordinates and the error value at the LC. If adequate GPS data cannot be collected at the LC due to terrain or dense tree canopy, collect the data on one of the other subplots and make GPS corrections for the azimuth and distance from the LC (if this is not possible, record in Plot Notes the azimuth and distance from the reading site to the LC).

## CHAPTER 7 - FIELD LOCATION DESCRIPTION ITEMS

This chapter presents the field location description items. Refer to appendix A.2 for the Field Location Description record.

Carefully read all instructions for each item. Record leading zeros for each item, where appropriate. When instructed to examine the location area, refer to the area encompassing the subplots, about 2.5 acres (approx. 185-foot radius) centered on the LC.

Refer to the Item Coding Guide (appendix E) for the items to record.

### ITEM

#### 101 State

**MQO:** No errors 100% of the time.

Record the code for the State where the field location is located.

<u>Code</u>	<u>State</u>	<u>Code</u>	<u>State</u>	<u>Code</u>	<u>State</u>
04	Arizona	30	Montana	49	Utah
08	Colorado	32	Nevada	56	Wyoming
16	Idaho	35	New Mexico		

#### 102 Map Number.

**MQO:** No errors 100% of the time.

Record the map number assigned to the topographic map for the field location. The map number is indicated on the field location packet. The field location center (LC) is indicated on the topographic map by the intersection of designated map grid lines.

#### 103 Consecutive Point Number (CPN).

**MQO:** No errors 100% of the time.

Record the CPN assigned to the field location. This item is indicated on the field location packet.

## ITEM

### 104 County.

**MQO:** No errors 100% of the time.

Record the code for the county where the field location is located.

This item is indicated on the field location packet. Refer to the appropriate State Supplement for a county code list.

### 105 Field Location Number.

**MQO:** No errors 100% of the time.

Record the number assigned to the field location. This item is indicated on the field location packet.

### 107 Future Forest Potential (use only on tally option 4 plots – no sampled treeland on any of the subplots)

**MQO:** No errors 100% of the time.

Indicate if the location requires a prefield examination at the time of the next inventory (10-20 years).

- 0 No, there is no chance this plot will meet the forest definition at the next cycle. It meets one or more of the following criteria:
  - Located more than ½ mile from the nearest forest land, and there are no trees present on or near the location.
  - Located in a large reservoir.
  - Located in a developed urban area (on a house, building, parking lot), but the plot does not fall in a park, undeveloped yard, etc. that may revert to natural forest
  - Located on barren rock, sand dunes, etc.
- 1 Yes, there is some chance that this plot could become forested in the next cycle; there are trees present, or forest land is present within ½ mile.

**ITEM**

**110 Current Ownership.**

**MQO:** No errors 100% of the time.

Record the code for the owner or managing agency class at the LC. If the owner class code on the packet is incorrect, based on verification at the county courthouse, managing agency office, etc., record the correct owner class code on the packet and on the Field Location Description record.

If owner class code 99 (private) is indicated on the packet label, record code 40, 60, or 70 on the Field Location Description record as appropriate.

<u>Code</u>	<u>Owner Class</u>
01	<b>Census water</b>
09	<b>National Park Service</b>
11	<b>National Forest</b>
12	<b>Bureau of Land Management</b>
13	<b>Indian tribal trust and/or allotted trust lands</b>
14	<b>Miscellaneous Federal</b> -- includes Bureau of Indian Affairs (for lands that are government-owned), Bureau of Reclamation, and all Federal agencies not covered by existing codes.
15	<b>State</b>
16	<b>County and municipal</b>
20	<b>Forest industry</b> -- land owned by a company or an individual(s) operating a primary wood-processing plant.
40	<b>Farmer/Rancher</b>
60	<b>Other private, corporate</b>
70	<b>Other private, individual</b>

**111 Reserved Status Class.**

**MQO:** No errors 100% of the time.

Record one of the following 2-digit codes:

<u>Code</u>	<u>Status</u>
01	<b>Nonreserved</b>
02	<b>Reserved</b> (see State Supplement)

**ITEM**

**121**      **Current Date.**

**MQO:** No errors 100% of the time.

Record in order the month, day, and year that the field location is inventoried. August 12, 1995 would be recorded as 08,12,1995.

Use the following codes for month:

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

**122**      **Crew Number(s).**

**MQO:** No errors 100% of the time.

Record up to 5 crew numbers as assigned to the field crew; always record the crew supervisor first (e.g., for crew supervisor 02 working with crew members 12 and 31, record 02,12,31,00,00).

**123**      **Crew Type.**

**MQO:** No errors 100% of the time.

Record one of the following codes:

<u>Code</u>	<u>Type</u>
1	Production field crew
2	QA field crew - check plot
3	Other

**ITEM**

**124      QA Status.**

**MQO:** No errors 100% of the time.

Record as appropriate: default is 1 for all valid production field plots:

<u>Code</u>	<u>Type</u>
1	<b>Standard field plot</b>
2	<b>QA field plot</b>
3	<b>QA reference plot</b>
4	<b>Training plot</b>
5	<b>Botched plot</b>
6	<b>Between-crew QA plot</b>

**130      Location Access.**

**MQO:** No errors 100% of the time.

Record one of the following codes. For codes other than 01, inform the Section Leader. If a location is temporarily inaccessible due to weather etc., return the field location packet to the Section Leader or Field Supervisor. Give details of the situation.

<u>Code</u>	<u>Type</u>
<b>01</b>	<b>Accessible.</b>
<b>10</b>	<b>Inaccessible</b> -- crew cannot access the location center (subplot 1) due to extremes in terrain, such as excessively steep slopes, cliffs, etc. Use this code if technical climbing is required to reach LC. This code must be verified and approved by the Field Supervisor or Quality Control.
<b>11</b>	<b>Sample Missed</b> -- this code is for office use only; it is used when a field location is "missed" or not inventoried, for whatever reasons, during the scheduled field season for the State.
<b>12</b>	<b>Access Denied</b> -- crew cannot access the location center because the land owner has denied access, either verbally or in writing.
<b>13</b>	<b>Not in Sample Area</b> -- this code is used for geographic or ownership areas not included in the Sample Area (e.g., outside State borders). This code is used only in the office.

**ITEM**

**129**     **Current Location Status.**

**MQO:** No errors 100% of the time.

Record one of the following codes for the location:

<u>Code</u>	<u>Type</u>
1	<b>At least one sampled tree land condition class</b> present on one or more of the subplots (Ground Cover Class 20 or 30, and Land Use 11-13).
2	<b>No sampled tree land</b> condition classes on any of the subplots; all subplots occur in non-sampled tree land (orchards, etc.), non-tree land (grasslands, etc.), or water.
3	<b>Not field sampled at all</b> ; entire location is access denied, inaccessible, or other.

**131**     **Sample Kind.**

**MQO:** No errors 100% of the time.

Record the following code for the location:

<u>Code</u>	<u>Sample kind</u>
1	<b>New field location</b>

**132**     **Subplot Radius.**

**MQO:** No errors 100% of the time.

Record the following code for the subplot radius:

<u>Code</u>	<u>Subplot Radius</u>
240	<b>24.0-foot radius (1/24-acre subplot)</b>

**133**     **Microplot Radius.**

**MQO:** No errors 100% of the time.

Record the following code for the seedling/sapling microplot radius:

<u>Code</u>	<u>Microplot Radius</u>
068	<b>6.8-foot radius (1/300-acre)</b>

**ITEM**

**135 Microplot Location.**

**MQO:** No errors, 95% of the time.  
Record the location of the microplot.

<u>Code</u>	<u>Location</u>
1	12 feet horizontal at 90 degrees east of subplot center.

**140 Elevation.**

**MQO:**  $\pm 100$  feet, 95% of the time.  
Using the topographic map provided in the location packet, determine and record the elevation of the LC as a 5-digit code. Note: some USGS maps are labeled in metric; to convert meters to feet, multiply meters by 3.28.

**141 Size of Forested Area.**

**MQO:**  $\pm 1$  class 90% of the time.  
Record the code that applies to the size of the entire **continuous** forest land area (all forest land condition classes combined) surrounding the LC. Include any forest condition in any ownership. Use the aerial photographs of the field location to aid in determining the size of the forest land area. Refer to appendix B.2 for map/photo scale ratios.

<u>Code</u>	<u>Size</u>
0	<b>No forest land on the location</b>
1	<b>1-5 acres</b>
2	<b>6-10 acres</b>
3	<b>11-20 acres</b>
4	<b>21-40 acres</b>
5	<b>41-160 acres</b>
6	<b>161-640 acres</b>
7	<b>1-5 square miles</b>
8	<b>&gt;5 square miles</b>
9	<b>Forest Stringer</b> - forest land forming a linear cover, at least 120 feet wide, with the length at least 4 times the width.

**142 Remote Sensing Cover Type.**

This item is no longer collected in the field.

**ITEM**

**143**     **Trails or Roads.**

**MQO:** No errors 90% of the time.

Record the trail or road **nearest, or on**, the field location. Consider only trails/roads for human access within 1 mile of the LC. If two or more trails/roads are equidistant, record the trail/road with the lowest number.

<u>Code</u>	<u>Trails or Roads</u>
<b>0</b>	<b>None within 1 mile</b>
<b>1</b>	<b>Paved road or highway</b>
<b>2</b>	<b>Gravel road</b>
<b>3</b>	<b>Improved dirt road</b>
<b>4</b>	<b>Unimproved dirt road</b>
<b>5</b>	<b>Jeep road -- 4-wheel drive road</b>
<b>6</b>	<b>Improved trail -- primarily for recreational use, maintained on a regular basis</b>
<b>7</b>	<b>Unimproved trail -- primarily for recreational use, not maintained on a regular basis</b>

**144**     **Distance to Improved Road.**

**MQO:** No errors 90% of the time.

Determine the distance from the LC to the **nearest improved road** and record the corresponding code. Consider only paved roads, gravel roads, or improved dirt roads regularly maintained for long-term continuing use. Measure the "**straight-line**" distance on the topographic map. If the nearest improved road is not on the topographic map, estimate the "straight-line" distance.

<u>Code</u>	<u>Distance To Improved Road</u>
<b>11</b>	<b>Less than 1/2 mile</b>
<b>12</b>	<b>1/2 to 1 mile</b>
<b>13</b>	<b>1 to 3 miles</b>
<b>14</b>	<b>3 to 5 miles</b>
<b>15</b>	<b>Greater than 5 miles</b>

**ITEM**

**145      Public Use Restrictions.**

**MQO:** No errors 90% of the time.

Record the primary and secondary public access or use restrictions encountered while traveling to the location. Record the most significant evidence as primary (first two digits) and any other evidence as secondary (last two digits). For example, a locked gate with a "no hunting" sign posted is coded 01,04. Do not repeat codes for primary and secondary (except code 00 and 09).

<u>Code</u>	<u>Evidence</u>	<u>Code</u>	<u>Evidence</u>
00	None	09	Other - specify
01	Locked gate	10	"No motorized vehicles"
02	"Keep out"	11	Water bar/kelly hump-
03	"No trespassing"		large mound of soil & rocks
04	"No hunting"		to prohibit access
05	"No fishing"		
06	"No dumping"		
07	Other posted signs		
08	Owner contact -- sign posted (e.g., "contact owner for permission to access land"), or physical contact with the landowner/manager is necessary to gain access to the field location.		

**146      Recreation Use.**

**MQO:** 1 of 2 correct, 90% of the time.

Record any sign of recreation use **on the area** encompassing the subplots, based on evidence such as campfire rings or compacted areas from tents (camping evidence), hiking trails, bullet/shotgun casings or tree stands (hunting evidence), etc. Examine the area containing the 4 subplots, and record three one-digit codes; record the recreation use that has the most significant impact on the field location first, and then the second and third. Do not code a secondary use without a primary use, or a tertiary use without a secondary. Do not repeat codes, except code 0 and 9.

<u>Code</u>	<u>Recreation Use</u>	<u>Code</u>	<u>Recreation Use</u>
0	None	5	Trail bikes
1	Hiking	6	Horse trails
2	Hunting	7	Jeep trails
3	Camping	8	Boating
4	Fishing	9	Other - specify

## ITEM

### 147 Water Proximity.

**MQO:**  $\pm 1$  class, 90% of the time.

Record a code for the distance from the LC to the nearest permanent or reliable source of surface water for any use (e.g., for wildlife, livestock, recreation). Only examine water sources within 1 mile of the LC. For example, if the location is 250 feet from an ephemeral stream, but 1/4 mile from a catchment basin, reference the basin because it will likely hold water throughout a large portion of the year. Consider Regional climate when assessing this variable.

<u>Code</u>	<u>Distance</u>
0	Adjacent (200 feet or less)
1	201-300 feet
2	301-500 feet
3	501-700 feet
4	701-900 feet
5	901-1100 feet
6	1101-1320 feet
7	1/4 - 1/2 mile (1321-2640 feet)
8	1/2 - 1 mile
9	None -- no water source within 1 mile

## ITEM

### 148 Water Type.

**MQO:** No errors 90% of the time.

Record a code for the type of water source used in determining Water Proximity (Item 131) above. If two or more water types are equidistant, record one type using the following hierarchical order: 1, 2, 5, 6, 7, 4, and 0.

<u>Code</u>	<u>Type</u>
0	<b>None</b>
1	<b>Perennial</b> -- permanent; a year-round water source
2	<b>Intermittent</b> -- seasonal; a water source that occurs throughout a large portion of the year, but is dry during certain months of the year
4	<b><i>Ephemeral</i></b> -- a water source that only occurs in direct response to rainfall or surface runoff. Use only when no more reliable source is present within the mile.
5	<b>Catchment basin</b> -- a human-made structure to catch and store surface runoff for livestock/wildlife
6	<b>Irrigation</b> -- human-made ditches or other artificial channels used as a means of supplying water to the land
7	<b>Other</b> - specify in notes/comments

### 149 Land Use Impact.

This item is no longer collected in the field.

### 150 Land Use Impact Distance.

This item is no longer collected in the field.

### 160 Number of Tree Records.

**MQO:** No errors 100% of the time.

Record the total number of data lines entered on the Tree Data Record; this item is required only when using paper field forms to collect data. Include tally trees, nontallied site trees, and seedling and sapling count data. Exclude remarks, comments, and blank lines.

## ITEM

### 161 Number of Conditions.

**MQO:** No errors 100% of the time.

Record the total number of condition classes encountered on the field location; this item is required only when using paper field forms to collect data. Include the condition class of the LC, and any additional condition classes documented on the Condition Class Record.

## CHAPTER 8 - CONDITION CLASS DESCRIPTION ITEMS

This chapter presents the Condition Class Description data (appendix A.3), the Condition Class Diagram, and Boundary Record (appendix A.4).

Carefully read all instructions for each item. Record leading zeros for each item, where appropriate. To determine a value for an item within a particular condition class, examine the condition class area, generally within 60 feet of the subplot centers.

Use the Plot Notes or the "Condition Class Comments" section to record any notes about the condition class or to record any specific notes that apply to one of the Condition Class Description items (e.g., "the condition class #1 habitat type was determined off-site due to severe burning in condition").

### A. Condition Class Description

The attributes listed below are the critical variables for recognizing and defining a condition class (refer to chapter 3). Each time a distinct change occurs in one or more of the defining attributes, based on the minimum area size criteria and definitions in chapter 3, a new condition class is recognized. If any portion of a subplot is located within a new condition, the new condition class is to be described by the variables in this chapter.

The defining attributes are:

#### ITEM

211	Ground Cover Class
213	Current Land Use
221	Forest Type (forest land)
222	Stand-size Class (forest land)
223	Stand Origin (forest land)
224	Stand Density (forest land)
236	Dominant Tree Species (other tree land)
237	Rangeland Cover Type (non-tree land)

The remaining items (aspect, slope, etc.) provide additional information about the condition class but do not define the condition class.

For each condition class recognized, record each of the following items unless otherwise noted (e.g., some are recorded only for forest land conditions classes). Refer to appendix E for the items to record based on condition classification.

**ITEM**

**201      Condition Class Number.**

**MQO:** No errors 100% of the time.

For each condition class encountered on the subplots, record a condition class number. Record the condition class encompassing the LC as condition class 1. If additional condition classes occur, number and record them consecutively. For example, the first new contrasting condition is 2, the next is 3, etc.

**211      Current Ground Cover Class.**

**MQO:** No errors 100% of the time.

For each condition class, record the code for the Current Ground Cover classification that describes the condition. Refer to chapter 3 for definitions:

<u>Code</u>	<u>Cover</u>
--	Tree land:
<b>20</b>	<b>Forest land</b>
<b>30</b>	<b>Other tree land</b>
<b>60</b>	<b>Non-tree land</b>
<b>91</b>	<b>Census Water</b>
<b>92</b>	<b>Noncensus Water</b>

## ITEM

### 213 Current Land Use (LU) Classification.

**MQO:** No errors 100% of the time.

For each condition classified as tree land or non-tree land Ground Cover Class, record one of the following Land Use classifications; definitions are listed on pages 8-4 and 5. For conditions classified as water, leave this item blank.

Code      Land Use

#### **Tree Land:**

Sampled Tree Land --

- 11      **Undeveloped tree land**
- 12      **Developed rural tree land**
- 13      **Developed urban tree land**

Nonsampled Tree Land --

- 21      **Nonsampled urban tree land**
- 22      **Christmas tree plantations**
- 23      **Orchards**
- 25      **Other nonsampled tree land**

#### **Non-tree Land:**

- 61      **Shrub cover**
- 62      **Natural herbaceous/grass cover**
- 63      **Crop cover**
- 64      **Improved pasture**
- 65      **Natural crest or alpine tundra**
- 66      **Barren**
- 71      **Cultural developments** -- sheds, yards, barns, pump-houses, trailers, houses, etc. (refer to page 3-11).
- 72      **Maintained roads and rights-of-way** -- improved roads, railroads, powerlines, pipelines, and transmission lines (refer to page 3-11)
- 73      **Other non-tree land** (urban, etc.)

## LAND USE DEFINITIONS

**Tree Land** (both forest land and other tree land):

### *Sampled Tree Land --*

Undeveloped tree land (code 11). Tree land without the development of recreation or residential homes, businesses, etc.

Developed tree land. Tree land that probably will not be managed for wood utilization because of development for recreational, residential, or other uses. **Note:** For developed sites that meet the requirements to qualify as tree land, human activity on the site must not preclude the natural succession of the vegetation.

Developed urban tree land (code 12). Tree land in or adjacent to a discernible incorporated community. These areas are identified by the presence of homes (buildings) and/or a high road density. An example is a natural or undeveloped park within urban boundaries.

Developed rural tree land (code 13). Tree land located in areas set apart from discernible incorporated communities. Some examples are resorts and recreational areas with a high road density.

### *Nonsampled Tree Land --*

Nonsampled urban tree land (code 21). Land, within cities and towns, that has at least 5 percent cover in trees but where human activity on the site prevents natural succession (e.g., school yards, city parks, cemeteries, golf courses).

Christmas tree plantations (code 22). Land meeting the tree land definition, but consisting of planted native or non-native tree species grown as crops for Christmas trees. Trees are usually planted in rows and harvested in the seedling or sapling sizes.

Orchards (code 23). Land meeting the tree land definition, but consisting of nontally tree species grown for the production of fruit or nuts. These include plantations of walnuts, pecans, peaches, apples, etc.

Other nonsampled tree land (code 25). Land meeting the tree land definition, but (1) natural succession is precluded due to understory treatment (improved pasture, etc.) or development, and not located within cities or towns (i.e., code 21), (2) tree species were eliminated from the sample (lily and cactus families), or (3) other nonsampled tree land not described in other codes.

**Non-tree land** (less than 5 percent tree cover):

Shrub cover (code 61). Land with less than 5 percent cover of trees, with the majority of vegetation cover consisting of shrubs such as snowberry, sage brush, ocean-spray, ninebark, bitterbrush, etc.

Herbaceous/grass cover (code 62). Land with less than 5 percent cover of trees, with the majority of vegetation cover consisting principally of native grasses, forbs, or cryptogams.

Crop cover (code 63). Land with less than 5 percent cover of trees, with the majority of vegetation cover consisting of planted crops that do not reach tree size such as corn, wheat, oats, etc.

Improved pasture (code 64). Land with less than 5 percent cover of trees, with the majority of cover in natural or planted grasses improved for grazing use as a result of cultivation, seeding, irrigation, or clearing of trees or brush. These areas are generally more extensively managed or maintained than herbaceous/grass cover areas; also, small areas are often fenced.

Natural crest/alpine tundra (code 65). Land with less than 5 percent cover of trees, generally occurring in high elevation areas, with cover consisting of meadow, willow, marsh, and rock fields above timberline.

Barren (code 66). Land with less than 5 percent cover of trees and generally no ground cover vegetation. This includes areas covered by rock out-crops, talus slopes, sand dunes, etc.

Other non-tree land (code 73). Land with less than 5 percent cover of trees but does not meet one of the above non-tree land definitions. Note: If this code is used, describe the situation in the notes/comments.

**ITEM**

**220      Size of Condition.**

**MQO:** ±1 class 90% of the time.

Record the code that applies to the continuous size of the condition class. Use the aerial photographs for the field location to aid in determining the size of the condition. Refer to appendix B.2 for map/photo scale ratios.

<u>Code</u>	<u>Size</u>
1	1-5 acres
2	6-10 acres
3	11-20 acres
4	21-40 acres
5	41-160 acres
6	161-640 acres (1 square mile)
7	1-5 square miles
8	>5 square miles
9	<b>Linear feature</b> (includes forest stringers at least 120- feet wide, streams at least 30-feet wide, improved roads, etc.)

**230      Stocking Condition Class.**

This item is no longer collected.

## ITEM

221

### Forest Type.

**MQO:** No errors 95% of the time.

For each **forest land** condition class, estimate and record Forest Type. Forest Type is a classification of forest land based upon and named for the tree species presently forming the majority of live tree stocking (represented by basal area; use crown cover for multistemmed woodland areas). Examine all live trees. Where a condition consists of both softwood (pine, fir, spruce, juniper, etc.) and hardwood (aspen, cottonwood, oak, etc.) species groups, determine Forest Type as follows:

- a. Sum the basal area of all hardwoods;
- b. Sum the basal area of all softwoods;
- c. Determine which of the two groups (hardwood or softwood) contains the most basal area;
- d. From the group with the most stocking, select the species with the majority of basal area.

Basal area can be estimated by using an angle gage at each subplot within the condition and counting the number of "in" trees by species; each "in" tree would represent a specific number of square feet of basal area (e.g., each tree "in" with a 20-BAF gage represents 20 square feet of basal area). Use same BAF for entire plot. Do not change BAF's between conditions or subplots.

For example, if a 10-BAF gage was used and the condition consisted of 20 ft<sup>2</sup> of ponderosa pine, 10 ft<sup>2</sup> of juniper, and 20 ft<sup>2</sup> of oak based on the "in" trees, the softwood group would contain the largest amount of basal area (20+10 ft<sup>2</sup>) and ponderosa pine would be selected as the Forest Type.

For nonstocked forest land, estimate the predominant tree species of the previous stand. To make this determination, use evidence such as stumps, downed or residual trees, and adjacent forested areas on similar aspect, slope, and soils.

For situations where the trees tallied do not represent the Forest Type evident on the condition, describe the situation in the notes on the Condition Class Description record.

Record one of the following two-digit Forest Type codes:

<u>Code</u>	<u>Forest Type</u>	<u>Code</u>	<u>Forest Type</u>
01	Douglas-fir	79	Misc. western softwoods
11	Ponderosa pine		AZ cypress, Apache pine,
12	Jeffrey pine		Chihuahua pine, SW white
14	Sugar pine		pine, pacific yew,
21	Western white pine		incense cedar, others
31	White fir	80	Misc. western hardwoods
32	Calif. and Shasta red fir		NM locust, ironwood
33	Grand fir	82	Paper birch
35	Engelmann spruce	83	Aspen
36	Engelmann spruce	85	Cottonwood
	/subalpine fir	87	Bur oak
38	Blue spruce	88	Deciduous oak -- gambel
39	White spruce	89	Riparian -- boxelder, green
41	Western redcedar		ash, hackberry
42	Eastern redcedar	90	Juniper (no pinyon present)
45	Western juniper	93	Pinyon-juniper
47	Mountain hemlock	95	Bristlecone pine
48	Western hemlock	96	Whitebark pine
54	Larch	97	Evergreen oak --
61	Lodgepole pine		AZ white, gray, Emory,
76	Maple woodland -- bigtooth,		chinkapin, Mexican blue,
	Rocky Mountain		silver leaf
77	Cercocarpus woodland	98	Limber pine
78	Mesquite woodland		

**ITEM**

222

**Stand-size Class.**

**MQO:** No errors 90% of the time.

For each **forest land** condition class, estimate and record the appropriate Stand-size Class. The Stand-size Class is a classification of forest land based on the predominant diameter size of the live tally trees presently forming the majority of live tree stocking (represented by basal area or crown cover) on the condition.

For situations where the trees tallied do not represent the Stand-size Class evident on the condition, include a note on the Condition Class Description record to verify the class recorded.

Record one of the following one-digit codes for each condition:

<u>Code</u>	<u>Size Class</u>
1	<5.0 inches DBH/DRC: all tree species
2	5.0-10.9 inches DBH: aspen, cottonwood, birch, and boxelder
2	5.0- 8.9 inches DBH/DRC: all other species not listed above
3	≥11.0 inches DBH: aspen, cottonwood, birch, and boxelder
3	≥ 9.0 inches DBH/DRC: all other species not listed above
4	Nonstocked

**ITEM**

**223 Stand Origin.**

**MQO:** No errors 90% of the time.

For each **forest land** condition class, record one of the following:

<u>Code</u>	<u>Stand Origin</u>
1	<b>Forest land</b> - natural, with no evidence of artificial regeneration.
2	<b>Forest land</b> - evidence of regeneration originating from artificial planting or seeding.
7	<b>Forest land</b> - encroachment on natural rangeland along forest edges.
4	<b>Nonstocked forest land - insufficient stocking of trees or seedlings.</b>

**224 Stand Density.**

**MQO:** No errors 90% of the time.

For each **forest land** condition class, record the appropriate code. Examine the relative differences in trees per acre (or crown cover) between contrasting conditions.

In order to recognize a contrasting condition based on stand density, differences should be very obvious and distinct, such as abrupt changes caused by thinning, beetle kill, fire, extreme changes in aspect, etc. Do not recognize subtle changes in density caused by slight variations in soils, aspect, slope, etc. Do not distinguish between low stocked stands or stands of sparse and patchy forest. Mapping on density should only be done when the less-dense condition is 50% or less as dense as the denser condition. If two conditions on a plot are similar except for stand density, explain the reason for the density difference in the notes/comments.

<u>Code</u>	<u>Stand Density</u>
1	<b>No cover</b>
2	<b>Sparse</b>
3	<b>Medium</b>
4	<b>Dense</b>

**ITEM**

**231 Stand Structure.**

This item is no longer collected.

**232 Stand Age.**

**MQO:** ±10 years 90% of the time, timber types;  
±20 years 90% of the time, woodland types.

For each **forest land** condition class, estimate and record Stand Age only where no age data were collected for trees representing the recorded Stand-size Class. Stand Age is the average total age of all live tally tree species representing the general Stand-size Class and includes both hardwoods and softwoods in the estimate. For trees measured at DBH, add the following number of years to the measured age to obtain a total age:

Years to add to DBH age:

<u>5</u>	<u>10</u>	<u>20</u>
western white pine	ponderosa pine	subalpine larch
western larch	washoe pine	whitebark pine
cottonwoods	Douglas-fir	limber pine
aspen	lodgepole pine	
	hemlock	

Add 15 years to all other species measured at DBH.

**ITEM**

**233**      **Crown Cover.**

**MOQ:**  $\pm 10\%$ , 90% of the time.

Record the percentage of crown cover, to the nearest 1 percent, of **all tally tree species** greater than 1.0" DBH/DRC (refer to the tally tree species list on page 10-9 and 10). Crown cover is the percentage of ground surface area covered by a vertical projection of the live crowns. **Do not** include seedlings.

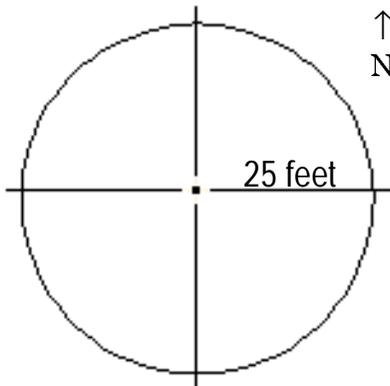
Use the following **line transect method** to determine the percentage of crown cover. Establish four 25-foot transects at each subplot, in the cardinal directions from subplot center (figure 8). Each transect begins 1 foot from the subplot stake; measure the length of live tally tree species crown intercepted (above or below) by the 4 transects at each subplot.

If a condition class boundary crosses the transect line, keep both the length of transect and the intercepted crown cover separated by condition class.

For each condition class, divide the total live tree crown length measured by the total length of transect (400-feet for single-condition class locations).

**Note:** If the slope of the transects is greater than 10 percent, measure both the transect and the crown length intercept along the slope; correct both the length of crown and the length of the transect for slope before adding to the other transects.

Figure 8. Crown cover transects.



**ITEM  
233**

**Crown Cover** (contd).

For example, the following crown length was intercepted for the 4 subplots:

<u>Subplot</u>	<u>Condition 1</u>		<u>Condition 2</u>		
	<u>length</u> <u>(feet)</u>	<u>intercept</u> <u>(feet)</u>	<u>length</u> <u>(feet)</u>	<u>intercept</u> <u>(feet)</u>	
1	100	32			
2	75	22	25	19	(total length =100 feet)
3	100	38			
4	<u>45</u>	<u>16</u>	<u>55</u>	<u>40</u>	(total length =100 feet)
TOTAL	320	108	80	59	

Dividing the total crown intercept by the total length of transect for each condition gives 34 percent ( $108/320 = .34$ ) crown cover for condition class 1 and 74 percent ( $59/80 = .74$ ) crown cover for condition class 2.

If a condition contains less than 400 feet of transect (most multi-condition class plots), or if the transects do not represent the apparent crown cover of the condition class, record the calculated crown cover for Item 233 and record an estimate of cover in the condition class comments along with an explanation.

**234** **Condition Habitat Type.**

**MQO:** Series - no errors 95% of the time  
Type - no errors 90% of the time.

Record the 7-digit code for the primary and secondary Habitat Types that best represent the condition class. Examine the area surrounding each subplot within a condition class; if several types within a condition class are evident on the subplots, record the type that is most abundant as primary.

For conditions that have had a severe or recent disturbance (e.g., burn or cut), estimate the type from a nearby similar site or use a series level type code and explain in the general comments or notes. Refer to the local Habitat Type key and manual(s).

For condition classes that do not have a defined type or series in the Habitat Type manuals, record code 9999999.

**ITEM**

**236**      **Dominant Tree Species.**

**MQO:** No errors 95% of the time.

For conditions classified as **other tree land**, record the alphanumeric code for the predominant other tree species present using the PLANTS handbook (USDA, Natural Resources Conservation Service. 1994. The PLANTS data base. Ecological Sciences Division, Washington, D.C.). Leave blank for forest land and non-tree land condition classes.

**237**      **Rangeland Cover Type**

*Collect on Bridger-Teton National Forest only*

**MQO:** No errors 95% of the time

For conditions classified as **non-tree land on the Bridger-Teton**, record the most appropriate Rangeland Cover Type. Refer to Rangeland Cover Types of the United States (Thomas N. Shiflet, Ed., 1994) for cover type descriptions. For non-tree condition classes devoid of vegetation, record 999. For non-tree conditions where shrubs are present on or near the subplots, classify the condition using the appropriate shrub-type category.

Code      Rangeland Cover Type

**Pacific Northwest Types (ID/MT):**

- 101      Bluebunch Wheatgrass
- 102      Idaho Fescue
- 103      Green Fescue
- 104      Antelope Bitterbrush-Bluebunch Wheatgrass
- 105      Antelope Bitterbrush-Idaho Fescue
- 106      Bluegrass Scabland
- 107      Western Juniper-Big Sagebrush-Bluebunch  
            Wheatgrass

**Pacific southwest Types (NV, UT, AZ):**

- 210      Bitterbrush
- 211      Creosote Bush Scrub
- 212      Blackbush

**ITEM**

**237 Rangeland Cover Type (contd)**

<u>Code</u>	<u>Rangeland Cover Type</u>
<b>Northern Rocky Mountain Types</b>	
301	Bluebunch Wheatgrass-Blue Grama
302	Bluebunch Wheatgrass-Sandberg Bluegrass
303	Bluebunch Wheatgrass-Western Wheatgrass
304	Idaho Fescue-Bluebunch Wheatgrass
305	Idaho Fescue-Richardson Needlegrass
306	Idaho Fescue-Slender Wheatgrass
307	Idaho Fescue-Threadleaf Sedge
308	Idaho Fescue-Tufted Hairgrass
309	Idaho Fescue-Western Wheatgrass
310	Needle-and-Thread - Blue Grama
311	Rough Fescue-Bluebunch Wheatgrass
312	Rough Fescue-Idaho Fescue
313	Tufted Hairgrass-Sedge
314	Big Sagebrush-Bluebunch Wheatgrass
315	Big Sagebrush-Idaho Fescue
316	Big Sagebrush-Rough Fescue
317	Bitterbrush-Bluebunch Wheatgrass
318	Bitterbrush-Idaho Fescue
319	Bitterbrush-Rough Fescue
320	Black Sagebrush-Bluebunch Wheatgrass
321	Black Sagebrush-Idaho Fescue
322	Curleaf Mountain Mahogany-Bluebunch Wheatgrass
323	Shrubby Cinquefoil-Rough Fescue
324	Threetip Sagebrush-Idaho Fescue

**ITEM****237 Rangeland Cover Type (contd)**

<u>Code</u>	<u>Rangeland Cover Type</u>
<b>Great Basin Types</b>	
401	Basin Big Sagebrush
402	Mountain Big Sagebrush
403	Wyoming Big Sagebrush
404	Threetip Sagebrush
405	Black Sagebrush
406	Low Sagebrush
407	Stiff Sagebrush
408	Other Sagebrush Types
409	Tall Forb
410	Alpine Rangeland
411	Aspen Woodland
412	Juniper-Pinyon Woodland
413	Gambel Oak
414	Salt Desert Shrub
415	Curleaf Mountain Mahogany
416	True Mountain Mahogany
417	Littleleaf Mountain Mahogany
418	Bigtooth Maple
419	Bittercherry
420	Snowbush
421	Chokecherry-Serviceberry-Rose
422	Riparian

## ITEM

237

### Rangeland Cover Type (contd)

<u>Code</u>	<u>Rangeland Cover Type</u>
<b>Southwestern Types</b>	
501	Saltbush-Greasewood
502	Grama-Galleta
503	Arizona Chapparal
504	Juniper-Pinyon Pine Woodland
505	Grama-Tobosa Shrub
506	Creosote Bush-Bursage
507	Palo Verde-Cactus
508	Creosote Bush-Tarbush
509	Oak-Juniper Woodland and Mahogany-Oak

### **Northern Great Plains Types**

(E. Interior West states and the Dakotas)

601	Bluestem Prairie
602	Bluestem-Prairie Sandreed
603	Prairie Sandreed-Needlegrass
604	Bluestem-Grama Prairie
605	Sandsage Prairie
606	Wheatgrass-Bluestem-Needlegrass
607	Wheatgrass-Needlegrass
608	Wheatgrass-Grama-Needlegrass
609	Wheatgrass-Grama
610	Wheatgrass
611	Blue Grama-Buffalograss
612	Sagebrush-Grass
613	Fescue Grassland
614	Crested Wheatgrass
615	Wheatgrass-Saltgrass-Grama

**ITEM**

**237**      **Rangeland Cover Type** (contd)

<u>Code</u>	<u>Rangeland Cover Type</u>
<b>Southern Great Plains Types (E. NM)</b>	
701	Alkali Sacaton-Tobosagrass
702	Black Grama-Alkali Sacaton
703	Black Grama-Sideoats Grama
704	Blue Grama-Western Wheatgrass
705	Blue Grama-Galleta
706	Blue Grama-Sideoats Grama
707	Blue Grama-Sideoats Grama-Black Grama
708	Bluestem-Dropseed
712	Galleta-Alkali Sacaton
713	Grama-Muhly-Threeawn
714	Grama-Bluestem
715	Grama-Buffalograss
716	Grama-Feathergrass
<b>Southern Great Plains Types (E. NM) (contd)</b>	
720	Sand Bluestem-Little Bluestem Dunes
721	Sand Bluestem-Little Bluestem Plains
722	Sand Sagebrush-Mixed Prairie
724	Sideoats Grama-New Mexico
	Feathergrass-Winterfat
725	Vine Mesquite-Alkali Sacaton
730	Sand Shinnery Oak
735	Sideoats Grama-Sumac-Juniper

## ITEM

### 240 Slope.

**MQO:**  $\pm 10\%$ , 90% of the time.

Measure and record the slope percent that best represents the condition class average (within 60 feet of the subplots). When more than one distinct slope (more than 40 percent difference) occurs over the condition class (in the vicinity of the location), record 999 for indeterminate.

### 241 Aspect Azimuth.

**MQO:**  $\pm 10$  degrees 90% of the time.

Measure and record the average direction (aspect) that the condition class is facing; examine the condition within 60 feet of the subplots. For example, if the condition generally occurs on a north aspect of  $18^\circ$ , record 018. This variable is based on  $0^\circ$  declination. **Note:** Leave this item blank for conditions on level aspects (slopes 0 to 5 percent). Record "360" for  $0^\circ$  azimuth, due north; do not record 000 as an azimuth value. Record "999" for indeterminate aspects (multiple directions).

### 242 Curvature Class.

This item is no longer collected.

**ITEM**

243

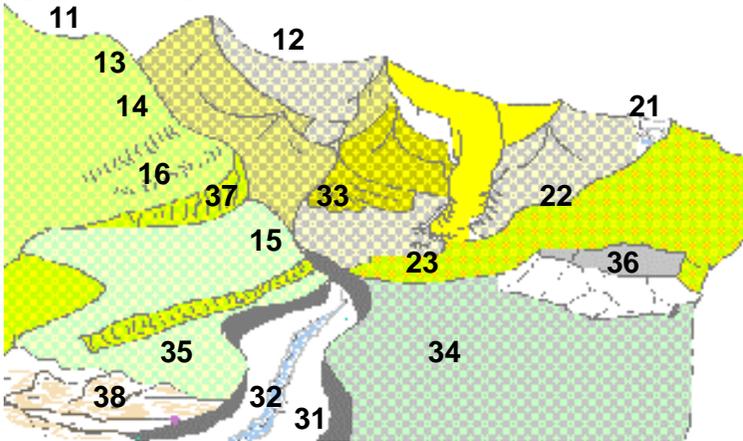
**Physiographic Class.**

**MQO:** No errors 90% of the time.

Physiographic Class is generally determined by land form and topographic position. Record a code for the physiographic class that best represents the condition (figure 10). Refer to glossary for definitions.

<u>Code</u>	<u>Land Form or Topographic Position</u>
11	Mountain ridge
12	Mountain saddle
13	Upper slope
14	Mid-slope
15	Lower slope
16	Bench (use topographic map to discern)
21	Cirque
22	Glacial lateral moraine
23	Glacial terminal moraine
31	Stream terrace -- flooded within geologic past
32	Stream bottom -- floods frequently
33	Alluvial fan
34	Flat plain
35	Bajada
36	Mesa top
37	Side of cliff
38	Arroyos, washes, and coulees
49	Other

Figure 10. Physiographic class.



**ITEM**

**250     Soil Group.**

This item is no longer collected.

**251     Soil Texture.**

This item is no longer collected.

**253     Soil Erosion.**

This item is no longer collected.

**254     Litter Depth.**

**MQO:**  $\pm 1$  inch 90% of the time.

Measure and record the average depth of litter to the nearest 0.1 inch, using a 3-digit code (e.g., record 3.2 inches as 032; record 0.3 inch as 003). Litter consists of undecomposed leaves and/or needles, together with twigs, bark, etc.

Take one measurement at each subplot center where the condition class occurs (at or near the vicinity of the stake), and record an average litter depth. If the condition doesn't occur at a subplot center, take a representative measurement as close to center as possible but within the condition.

For areas dominated by woodland species, record an average litter depth based only on the areas within the condition that have litter; woodland sites often have litter directly beneath tree crowns, but none between tree crowns.

**255     Humus Depth**

This item is no longer collected.

**ITEM**

260

**Cutting Type.**

**MQO:** No errors 90% of the time.

Record the code for the most recent type of cutting evident on the condition class.

<u>Code</u>	<u>Cutting Type</u>
0	<b>None</b>
1	<b>Fuelwood</b>
2	<b>Christmas tree cutting</b> -- removal of large seedling and various sapling-size trees; in the Southwest, generally pinyon, Douglas-fir, and true firs. Evidence may include high stumps.
3	<b>Post/pole harvest</b> -- removal of trees, generally 3 to 9-inches DBH, for the purpose of making posts and poles.
4	<b>Thinning</b> -- intermediate cuttings made to control the density, composition, or health of the stand; trees removed may be of any size, and may be removed in small groups or scattered throughout.
6	<b>Clearcut</b> -- removal of entire stand in one cutting (removed or left on the ground).
7	<b>Seed tree cut</b> -- removal of mature trees in one cutting, except for a small number of seed trees left singly or in small groups.
8	<b>Other - specify</b> -- provide information on the type or evidence.
9	<b>Salvage harvest</b> -- removal of trees that have been killed or damaged by injurious agents (insects, disease, wind, fire, etc.).

261

**Cutting History.**

**MQO:** ±3 years under 20 yrs, ±10 yrs over 20 yrs, 90% of the time.

Estimate the year that the last timber or wood harvesting occurred within the condition class. If there is no cutting evidence, record 0000; if the evidence is more than 20 years old, and an approximate date cannot be determined or even estimated, record 9999.

<u>Code</u>	<u>Cutting History</u>
0000	<b>None</b> -- no evidence
1994	<b>Cutting occurred in 1994</b>
1993	<b>Cutting occurred in 1993</b>
	etc.
9999	<b>Actual year of cutting cannot be estimated</b>

**ITEM**

**262**     **Burn History.**

**MQO:** ±3 years under 20 yrs, ±10 yrs over 20 yrs, 90% of the time. Estimate the year that the last burn occurred, if any, on the condition class. Do not include fire evidence if it did not have an impact on the overall condition area (i.e., do not include burning on an individual slash pile, a spot fire from a lightning-struck tree, or burning in a campfire ring if it did not have a direct impact on the overall condition area).

<u>Code</u>	<u>Burn History</u>
<b>0000</b>	<b>None -- no evidence</b>
<b>1994</b>	<b>Burning occurred in 1994</b>
<b>1993</b>	<b>Burning occurred in 1993</b> etc.
<b>9999</b>	<b>Actual year of burning cannot be estimated</b>

**263**     **Condition Disturbance Type.**

**MQO:** No errors 95% of the time. Record the code for the predominant human-caused influence or natural phenomenon that has had an impact on the vegetation within the condition class.

<u>Code</u>	<u>Disturbance Type</u>
<b>000</b>	<b>None</b>
<b>610</b>	<b>Animal damage</b> -- excessive browsing, girdling, etc.
<b>620</b>	<b>Insect damage</b>
<b>640</b>	<b>Disease damage</b>
<b>680</b>	<b>Weather damage</b>
<b>681</b>	<b>Wind damage</b>
<b>700</b>	<b>Other land clearing</b> -- change from tree land to non-tree land (e.g., forest land cleared for crops or improved pasture)
<b>710</b>	<b>Road building</b>
<b>730</b>	<b>Type conversion</b> -- e.g., a clearcut, previously stocked with mixed-conifer species, planted and regenerated with ponderosa pine species
<b>731</b>	<b>Chaining or other mechanical treatment</b>
<b>900</b>	<b>Other</b> - specify
<b>910</b>	<b>Mining</b>

**ITEM**

**264      Condition Disturbance History.**

**MQO:**  $\pm 3$  years under 20 yrs,  $\pm 10$  yrs over 20 yrs, 90% of the time.  
Estimate the year that the condition disturbance occurred. Record 9999 when year cannot be estimated or for ongoing disturbances such as mistletoe and root rot.

Code    Disturbance History

**0000**    **None -- no evidence**

**1994**    **Disturbance occurred in 1994**

**1993**    **Disturbance occurred in 1993**  
etc.

**9999**    **Actual year of disturbance cannot be estimated,  
or disturbance is ongoing**

**270      Vegetation Concealment.**

This item is no longer collected.

**271      Wildlife Cover.**

This item is no longer collected.

**272      Animal Type.**

This item is no longer collected.

**273      Browsing Intensity.**

This item is no longer collected.

**274      Grazing Intensity.**

This item is no longer collected.

**275      Ground Cover Transects.**

**MQO:**  $\pm 10\%$ , 90% of the time.

On each subplot, use one of the transect layouts shown below) to sample ground cover (note: one layout is exclusive to the BT.

Using a cloth tape or carpenter's tape, lay out the 25-foot transects

**Ground Cover Transects** (contd).

in the appropriate cardinal directions from the subplot center. Beginning at the 1-foot mark, place the tip of a plot stake or sharply pointed staff on the ground along the transects (against the side of the tape) at each 1-foot mark, and record each point on the Ground Cover Supplemental Data form (appendix A.9) by the appropriate ground cover category (below).

At each transect point, if multiple cover categories (e.g., litter, moss/lichens, rocks) are vertically layered, record the most obvious cover item that is protecting the bare soil. For example, if litter is on top of a large boulder, record "rocks" as the most obvious cover. However, if it is not obvious which item is serving as the primary protection (for example, litter on top of pavement), record the first cover category that the stake touches (i.e., the item at the top of the layer).

Where more than one condition class occurs on the location, separate and record the point samples by condition class.

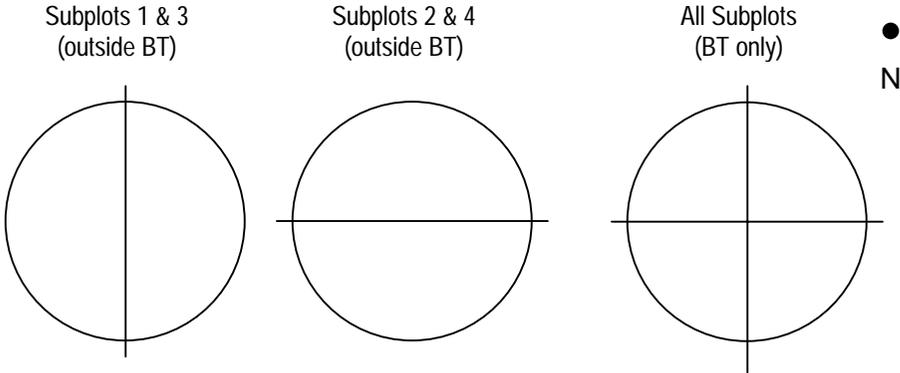
After all 8 transects - 2 per subplot - have been sampled (16 transects - 4 per subplot on BT), record the total number of "hits" by category sampled on the condition. Where transects are extremely difficult to sample (e.g., within a cholla cactus clump), provide a best estimate of ground cover. There is a total of 200 "hits" (400 on BT) combining all categories over all condition classes.

- **Fine Soils** - exposed mineral soil with particles less than 1/8-inch diameter.
- **Pavement** - rocks and pebbles between 1/8 and 3/4-inch diameter (not asphalt).
- **Rocks** - greater than 3/4-inch diameter
- **Litter** - organic debris, freshly fallen or slightly decomposed; includes dead vegetation, animal feces, etc.
- **Cryptobiotic soil crust** - cyanobacteria/algae crust. In early stages of development, soil may appear bare but with a gray sheen covering. In more developed crusts, the soil is gray with pedicellation (bumpy) and may have a well developed algae covering (gray/green).
- **Moss/Lichens**
- **Basal Vegetation** - the area outline of a plant near the ground surface; in grass this comprises the shoot system at ground level, while in trees and shrubs it comprises the stem area.

ITEM

275 Ground Cover Transects (contd).

- **Other** - water, ice, concrete, road asphalt, etc.
- **Not Sampled** - snow cover



B. Condition Class Diagram and Boundary Information

Refer to the boundary mapping instructions described in chapter 3. On the Condition Class Diagram illustrating the location area, sketch all condition class boundaries. In addition, on the individual subplot diagrams, carefully draw all condition class boundaries; be sure the boundary lines intersect the subplots at the same azimuth recorded for the boundary (below). Conditions must be labeled by Ground Cover Class, Land Use, Forest Type, or any other item used to differentiate condition classes. **This map is required even when data are entered on the data recorders.**

See figure 12 for a condition boundary example.

281 Subplot Number.

**MQO:** No errors 100% of the time.  
Record the subplot number being mapped.

**ITEM**

**282     Mapping Plot Type.**

**MQO:** No errors 100% of the time.

<u>Code</u>	<u>Type</u>
1	<b>Subplot</b>
2	<b>Microplot</b>

**284     Contrasting Condition Class Number.**

**MQO:** No errors 100% of the time.

Record the number for the condition class on the far or opposite side of the boundary from the subplot center (refer to Condition Class Description, page 8-1).

**285     Azimuth Left and Right.**

**MQO:**  $\pm 10$  degrees 90% of the time.

Facing the contrasting condition from the subplot center, record the azimuth where the condition class boundary crosses the subplot or microplot circumference.

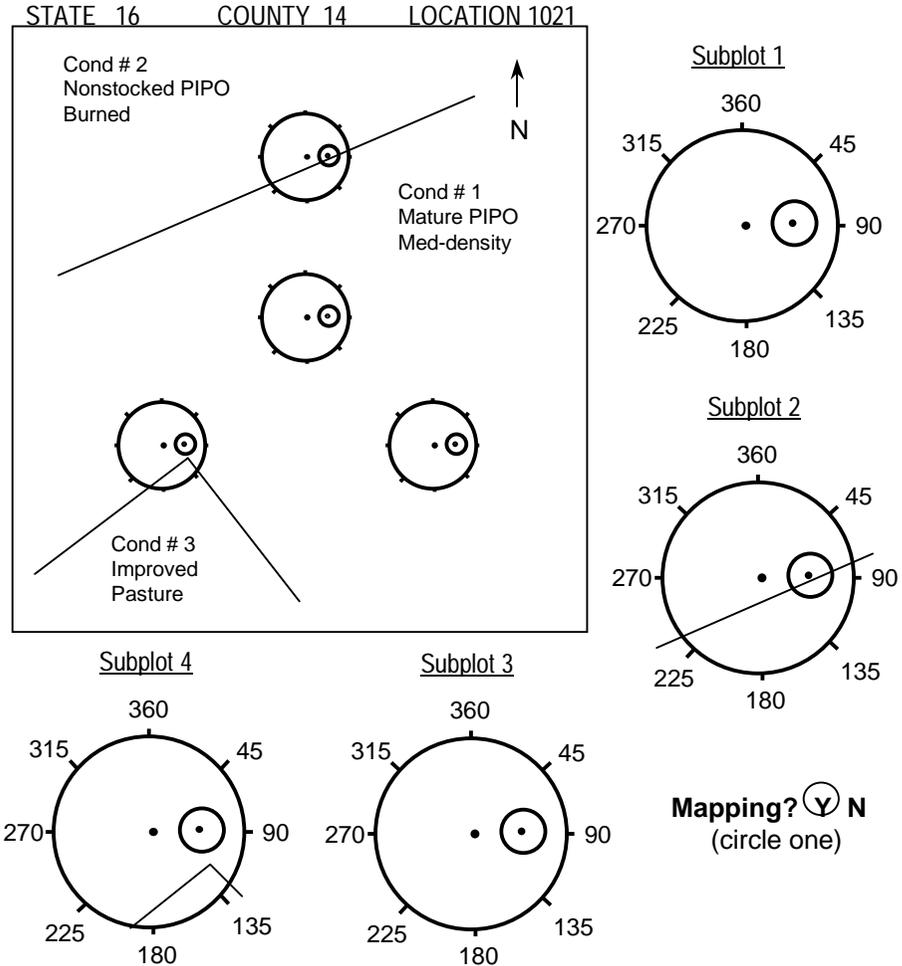
**287     Corner Azimuth and Distance.**

**MQO:** Azimuth  $\pm 10$  degrees 90% of the time,  
Distance  $\pm 5$  feet 90% of the time.

When the boundary is approximated by a line with one corner, record the azimuth and distance from the subplot center to the corner. Record 000 if no corner is present.

Figure 12. Example condition class diagram and condition boundary information.

**CONDITION CLASS DIAGRAM**



**BOUNDARY INFORMATION**

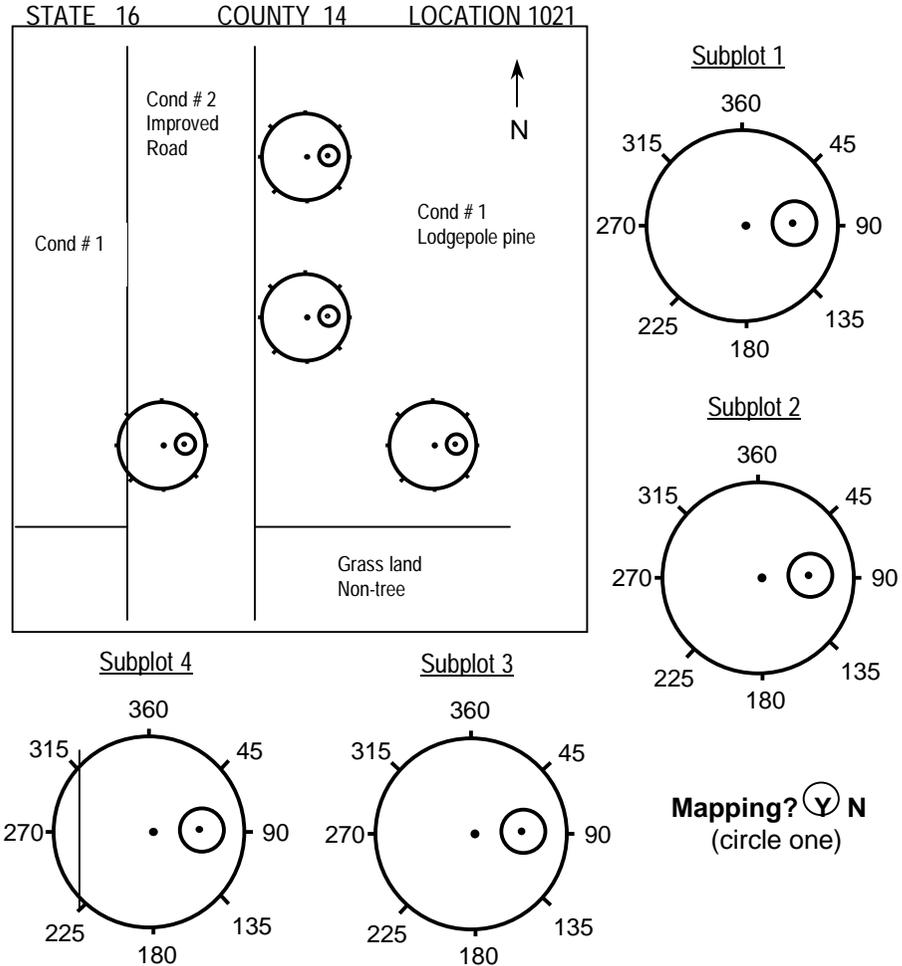
Mapping Plot Type:

1= Subplot  
2= Microplot

281	Subplot Number	X	2	2	4		
282	Mapping Plot Type	X	1	2	1		
283	Boundary Change	X	---	---	---		
284	Contrasting Condition #	X	1	1	3		
285	Azimuth Left	XXX	088	091	133		
287	Corner Azimuth	XXX	---	---	120		
	Corner Distance	XX.X	---	---	17.1		
285	Azimuth Right	XXX	235	225	201		

Figure 12. Example condition class diagram and condition boundary information.

**CONDITION CLASS DIAGRAM**



**BOUNDARY INFORMATION**

Mapping Plot Type:  
1= Subplot  
2= Microplot

281	Subplot Number	X	4			
282	Mapping Plot Type	X	1			
283	Boundary Change	X	---			
284	Contrasting Condition #	X	1			
285	Azimuth Left	XXX	226			
287	Corner Azimuth	XXX	---			
	Corner Distance	XX.X	---			
285	Azimuth Right	XXX	316 8-29			

## CHAPTER 9 - SUBPLOT DESCRIPTION ITEMS

This chapter describes the data items that will be collected on each of the 4 subplots on a field location (Subplot Description record, appendix A.2). Complete the following items at each subplot:

### ITEM

#### Subplot Establishment.

**MQO:**  $\pm 4$  feet, 95% of the time.

#### 301 Subplot Status.

**MQO:** No errors 100% of the time.

Record one code for the subplot area as follows:

<u>Code</u>	<u>Subplot Status</u>
1	<b>Sampled forest land on subplot</b> (Ground Cover Class 20 & Land Use 11-13)
2	<b>Sampled other tree land on subplot but no sampled forest land</b> (Ground Cover Class 30 & Land Use 11-13)
3	<b>No sampled tree land on subplot</b> , but nonsampled tree land (LU 21-25) or non-tree land (Ground Cover Class 60, 91, or 92) present.
6	<b>Access Denied:</b> most of the subplot cannot be adequately described because land owner denies access to subplot.
7	<b>Inaccessible:</b> most of the subplot cannot be adequately described due to extremes in terrain such as cliffs.

**ITEM**

**301      Subplot Status (contd).**

- 8      Other:** Most of the subplot is located outside the sample area (state) and therefore cannot be adequately described.

Time constraints. To use this code for time constraints, ALL of the following criteria must be met:

- a. Camping out was not an efficient option due to terrain etc.
- b. Crew worked a 10-hour plus day and was on plot at least 5 hours to conduct field work.
- c. Crew cannot complete all 4 subplots and safely return to the vehicle or base camp in one full day.
- d. Crew completed subplots 1, 2, and 3 in order.
- e. Plot is not a Phase 3 plot.

These plots will be carefully examined by a Quality Control crew, and the number of missing subplots will be reported Nationally.

Also use this code for reasons other than listed in codes 6 or 7.

**303      Subplot Center Condition Number.**

**MQO:** No errors 100% of the time.

For each subplot, record the condition class number for the subplot center. Because the condition class at the location center (LC) is always designated as condition class 1, record 1 for subplot 1. If class 1 is also encountered at other subplot centers, record 1 for those subplots as well.

**304      Condition Number List.**

**MQO:** No errors 100% of the time.

For each subplot, record the condition class number(s) for all conditions, up to 4, encountered on the subplot. For example, the subplot center condition class is 2, and condition classes 1 and 3 also occur on the subplot, record 1,2,3,0 for this item.

**ITEM**

305 **Subplot Stocking Condition.**  
This item is no longer collected.

321 **Seed Source.**  
This item is no longer collected.

322 **Root Disease Severity Rating.**

**MQO:**  $\pm 1$  class 90% of the time.

For each subplot, record a root disease severity rating for the subplot area. Apply the severity rating on the basis of the percentage of the subplot area affected by root disease; use either canopy reduction or estimate ground area of the plot impacted. Consider the total impact, not just since the last inventory. The ground area impacted is estimated by projecting the drip line of the overstory crowns onto the ground and estimating the percentage of the area occupied by symptomatic or dead trees. A more direct method is to visualize the root system of infected trees, and then estimate the total root area of the subplot affected.

Generally, the tree species most susceptible to root disease are Douglas-fir, white fir, and subalpine fir. The most tolerant are pine species, though in some areas ponderosa pine is the preferred host species for annosum root disease. It is important to determine the most susceptible species in an area in order to properly rate plots for root disease severity. When evaluating the severity of root disease for the subplot area, consider what is happening on a broader scale, such as at the stand level. Some species are susceptible at a young age, but develop tolerance with age, which needs to be considered when determining the most susceptible species in an area. A good example of this is with Armillaria root disease. All conifer species are susceptible to Armillaria at a young age, but western larch and the pines develop a tolerance to the disease at about 25 to 30 years of age.

<u>Code</u>	<u>Criteria</u>
0	<b>No evidence of root disease visible within 50 feet of the subplot perimeter.</b>
1	<b>Root disease present within 50 feet of the subplot perimeter, but no evidence of root disease on subplot.</b>

ITEM

322 Root Disease Severity Rating (contd).

- 2 **Minor evidence of root disease evident on the subplot** -- suppressed tree killed by root disease, or minor part of overstory showing symptoms of infection. Little or no reduction in canopy closure or volume.
- 3 **Up to 20 percent canopy reduction evident** -- as a result of the death of one codominant tree on an otherwise fully stocked site. In the absence of mortality, numerous trees showing symptoms of root disease infection.
- 4 **20 to 30 percent canopy reduction** -- as a result of root disease-caused mortality. The presence of snags and downed dead trees as a result of disease, leaving gaps in the tree canopy, as well as live trees with advanced symptoms of disease.
- 5 **30 to 50 percent canopy reduction** -- as a result of root disease. Almost half of ground area of subplot considered infested with evidence of root disease-killed trees. **Note:** Subplots representing mature stands with half of their volume in root disease-tolerant species usually don't go much above severity 5 because of the ameliorating effect of the disease tolerant trees.
- 6 **50 to 75 percent canopy reduction** -- most of the ground area considered infested as evidenced by symptomatic trees. Much of the canopy variation in this category results from disease-tolerant species occupying infested ground.
- 7 **75 percent or more canopy reduction** -- subplots with this severity level usually were occupied by only the most susceptible species. Very few of the original overstory trees remain, although the infested ground area is often densely stocked with regeneration of the susceptible species.

**ITEM**

**322     Root Disease Severity Rating (contd).**

- 8     Entire subplot falls within a definite root disease patch with only one or very few susceptible overstory trees present (standing/live) within the canopy.**
  
- 9     The entire subplot falls within a definite root disease patch with no overstory trees of the susceptible species present within the canopy.**

## CHAPTER 10 - TREE DATA

This chapter describes the tree data to be recorded on individual trees and seedling/sapling tree counts and covers instructions for measuring various tree attributes. These instructions apply to trees in forest land condition classes. Refer to appendix A.5 for the Tree Data record. For specific items to record, refer to appendix E.

The number preceding each variable name below refers to the Item Number of the variable used on the Tree Data record. Some items reference only the individual tree tally, some items reference only the seedling counts, and other items reference both. Use the column at the right margin of the data form (comments column), the line immediately beneath a data record, or in the notes on the data recorder, to record any comments or changes pertaining to an individual tree. For example, if a tree diameter on a timber species is taken at a place other than DBH, include a note explaining at what height the diameter was taken.

### ITEM

#### **401**      **Subplot Number.**

**MQO:** No errors 100% of the time.

Record for every line of data. Subplot Number refers to a specific place on the field location layout (refer to chapter 5 for location layout procedures).

#### **402**      **Tree Number.**

**MQO:** No errors 100% of the time.

Record Tree Number for all tally trees and nontallied site trees. Repeat the numbering procedure, described below, for each subplot.

**Remeasurement locations** (including Forest Health plots):

Number all remeasurement trees using the past tree numbers listed on the old data. For **Forest Health plots**, locate the "next available tree number" message on the preprinted form to continue numbering new subplot and microplot trees.

- a. **Subplot tally.** Standing over the subplot center stake, start at 1° azimuth and rotate clockwise numbering sequentially all tally trees 5.0-inches and greater, beginning with 01. For example, the first tally tree is coded 01, the second tree is 02, and so on.

## ITEM

### 402 Tree Number (contd)

- b. **Microplot tally.** Next, begin at 1° azimuth again and rotate clockwise to number the tallied saplings; begin numbering where the subplot tally tree numbers left off.

Assign nontallied site trees to the nearest subplot and give the tree the next available tree number following the tally tree numbers.

### 404 Azimuth and 405 Horizontal Distance.

**MQO:** Azimuth  $\pm 5$  degrees, 95% of the time. Horizontal distance on subplot:  $\pm 1$  foot for 0-22.9 feet, and  $\pm 0.1$  foot for  $> 23$  feet, 90% of the time. Horizontal distance on microplot:  $\pm 1$  foot for 0-5.8 feet,  $\pm 0.1$  foot for  $> 5.8$  feet. Record an azimuth, to the nearest degree, and a horizontal distance, to the nearest 0.1 foot, for all tally trees and all nontallied site trees. Set compass declination to 0. Do not record 0° (record 360° for due north).

Stand over the subplot center stake and take an azimuth and a horizontal distance from the top of the stake to the geographic center of the stem(s) or bole at the base of the tree:

- a. **Standing tally trees** - geographic center at the base (pith of single stem/bole).
- b. **Downed tally trees** - the point of tree origin (e.g., center of the base of tree stem or bole, root system depression) or where the tree lies if point of origin can't be determined.
- c. **Nontallied site trees** - measure directly as in a. above, or if necessary, estimate an azimuth and distance from the nearest subplot center stake (i.e., if the tree is not within view of the stake). For distances greater than 99.9 feet, record 999.

**Forest Health plots:** use the same azimuths and distances as previously recorded. If the previous crew made an obvious error, record the correct azimuth or distance and make a note on the preprinted form.

## ITEM

### 406 Condition Class Number.

**MQO:** No errors 95% of the time.

Record the appropriate Condition Class Number for the condition class where the tree or tree count occurs. For locations with no condition class boundaries, record 1 for all tally trees and tree counts.

### 411 Current Tree History.

**MQO:** No errors 100% of the time

For each tally tree and nontallied site tree, record one of the following codes:

<u>Code</u>	<u>Tree History</u>
0	Nontallied site trees
1	Live tally tree
2	Dead tally tree

**ITEM**

**412 Tree Lean Angle.**

**MQO:** No errors 100% of the time

For each tally tree and nontally site tree, record one of the following codes:

- | <u>Code</u> | <u>Tree Angle</u>  |
|-------------|--|
| <b>00</b>   | <b>Standing tree</b> -- for <b>timber species</b> 1.0-inch DBH and larger, the main tree stem/bole must be at least 6.0 feet tall and be self-supporting (i.e., a standing timber species cannot be broken below 6.0 feet and cannot be leaning against another tree for support); for <b>woodland species</b> 1.0-inch DRC and larger, there must be at least one standing stem 1.0-inch DRC or larger.   |
| <b>90</b>   | <b>Down tree</b> -- for <b>timber species</b> 1.0-inch DBH and larger, the main stem/bole is broken off below 6.0 feet or not attached for support at the base (e.g., an upright tree broken at the base, but leaning against another tree for support). For a down dead timber species to be tallied, the center of the stem at DBH must be above the duff layer. For trees that are severely decayed and no longer have the cylindrical form, do not tally but note in comments. For <b>woodland species</b> 1.0-inch DRC and larger, no stem 1.0-inch DRC and larger is standing. |

**ITEM**

**414 Site Tree.**

**MOO:** Selected as required by the condition class tally, 90% of the time.

Collect and record site tree data only for those species listed as **timber species trees** (refer to species list page 10-9 and 10).

Site trees are selected as indicators of site productivity.

Site tree requirements and selection methods are described below.

If a site tree is selected from one condition class, and can be used for additional condition classes, list these additional classes in the Site Tree Condition List on the data recorder or in the tree notes on the field form.

Record one of the following codes for each live tally tree 5.0-inches DBH/DRC and larger:

<u>Code</u>	<u>Site Tree</u>
0	<b>Not selected as a site tree</b>
1	<b>Suitable site tree</b>
2	<b>Unsuitable site tree</b>

**a. Site tree requirements.**

(1) Suitable site trees:

- live sound tree;
- 5.0-inches DBH or larger;
- open grown, dominant, or codominant throughout most of its life;
- minimum of 35 years (DBH age) for softwoods or minimum of 45 years (DBH age) for hardwoods;
- under rotation age (80 years for aspen and paper birch, 120 years for all other timber species);
- undamaged top (not dead or broken);
- vigorous, having an uncompact crown ratio of at least 50 percent, if possible, and have the best height/age ratio of all the trees on the site.

## ITEM

### 414 Site Tree (contd)

(2) Unsuitable site trees:

- relicts;
- intermediate crown class; code 4
- over rotation age but less than 200 years (DBH age);
- rough trees.
- damage 61, 73, 74; suppression, broken top, dead top respectively. Broken top and dead top must be less than 10% of TOTAL LENGTH.

- b. **Site tree selection.** Select a minimum of **two** site trees that represent the species of the condition class Forest Type. Also, select at least **two** site trees for each additional timber species representing **20 percent or more** of the live timber trees tallied or counted, and select at least **one** site tree for each species representing **less than 20 percent**. Select no more than 6 site trees per condition class. If more than three timber species are tallied (each representing 20 percent or more tally) within a condition class, select site trees from the three most dominant tallied species.

**Note:** If only dead trees of a particular species are tallied, and no seedlings of that species were counted, and that species does not represent the Forest Type, it is not necessary to obtain site trees for that species.

If not enough suitable trees can be selected from the subplot tally, then select nontallied suitable site trees (Tree History 00) off the subplots from a nearby site of a similar condition, slope, aspect, elevation, and soils. Assign each nontallied site tree selected to the nearest subplot. Obtain only suitable site trees where possible; however, if no suitable site trees are present within 60 feet of the subplots, select an unsuitable site tree. If no site trees are available within 60 feet, do not obtain the site trees **except** for those species representing the Forest Type. For burned or cut stands, go to an adjacent stand to obtain site trees representing the Forest Type if possible.

Note: Do not select aspen or birch site trees from the subplot tally; instead, when these are required site trees, select nontallied site trees.

**ITEM**

**415 Mortality.**

**MQO:** no errors, 85% of the time.

A mortality tree is a dead timber or woodland tally tree, standing or down, 1.0-inch DBH/DRC or larger, that was live at the time of previous inventory, or within the past 5 years on a new location, but has died.

Record one of the following one-digit codes for each dead tree. If code 1 is recorded, also record a Cause of Death code (refer to Item 455, page 10-47) and a Past Tree Class code (refer to Item 463, page 10-54).

<u>Code</u>	<u>Mortality</u>
0	No - tree does not qualify as mortality
1	Yes - tree does qualify as mortality

Refer to the following as a guide to time since death for various tree species:

**5-needle pines:** **Within past 5 years** - some foliage remaining, >75% twigs and > 30% branches left; bark intact.

**More than 5 years** - no foliage remaining, <75% of twigs left, many large limbs gone, much bark sloughing (except small trees).

**Ponderosa pine:** **Within past 5 years** - some foliage remaining, >50% twigs and most branches left; most bark intact.

**More than 5 years** - no foliage remaining, <50% of twigs left or branches left, most large limbs gone, much bark sloughing (except small trees).

**Spruce:** **Within past 5 years** - some foliage remaining, >30% twigs and >50% of branches left; little bark sloughing.

**More than 5 years** - no foliage remaining, <30% of twigs left or >50% branches left, most large limbs gone, bark sloughing (except small trees).

## ITEM

### 415 Mortality (contd)

- Lodgepole pine:** **Within past 5 years** - some foliage remaining, >75% twigs and most branches left.  
**More than 5 years** - no foliage remaining, <75% of twigs left or branches left, bark sloughing.
- Douglas-fir:** **Within past 5 years** - some foliage remaining, >50% twigs and > 75% of branches left; bark intact.  
**More than 5 years** - no foliage remaining, <50% of twigs and 75% or less branches left, most large limbs gone, bark sloughing.
- True firs:** **Within past 5 years** - some foliage remaining, >50% twigs and > 70% of branches left; bark unbroken, not curled away from bole.  
**More than 5 years** - no foliage remaining, <50% of twigs and <75% branches left, most large limbs gone, bark heavily checked and curled, much sloughing.
- Aspen:** **Within past 5 years** - >50% of bark attached to some degree.  
**More than 5 years** - no foliage remaining, bark <50% attached.
- Pinyon** **Within past 5 years** - some foliage remaining,  
**More than 5 years** - no foliage remaining.

In **all** cases, the presence of sporophore of sapwood rotting fungi such as Polyporus volvatus, Fomes pinicola, etc., is accepted as evidence that the tree has been dead more than 5 years.

**ITEM****416 Species.**

**MQO:** No errors genus 95% of the time, species 90% of the time.  
 Below is a species list for all timber and woodland tally tree species. Record one of the following species codes for all trees (tallied trees and nontallied site trees) and seedling counts.

<u>Code</u>	<u>Common name</u>	<u>Scientific name</u>	<u>Timber/ Woodland</u>
015	White fir	<i>Abies concolor</i>	T
017	Grand fir	<i>Abies grandis</i>	T
018	Corkbark fir	<i>Abies lasiocarpa</i> var. <i>arizonica</i>	T
019	Subalpine fir	<i>Abies lasiocarpa</i>	T
020	California red fir	<i>Abies magnifica</i>	T
051	Arizona cypress	<i>Cupressus arizonica</i>	T
058	Pinchot juniper	<i>Juniperus pinchotii</i>	W
059	Redberry juniper	<i>Juniperus erythrocarpa</i>	W
062	California juniper	<i>Juniperus californica</i>	W
063	Alligator juniper	<i>Juniperus deppeana</i>	W
064	Western juniper	<i>Juniperus occidentalis</i>	T**
065	Utah juniper	<i>Juniperus osteosperma</i>	W
066	Rocky Mountain juniper	<i>Juniperus scopulorum</i>	W
068	Eastern redcedar	<i>Juniperus virginiana</i>	T
069	Oneseed juniper	<i>Juniperus monosperma</i>	W
072	Subalpine larch	<i>Larix lyallii</i>	T
073	Western larch	<i>Larix occidentalis</i>	T
081	Incense-cedar	<i>Calocedrus decurrens</i>	T
093	Engelmann spruce	<i>Picea engelmannii</i>	T
094	White spruce	<i>Picea glauca</i>	T
096	Blue spruce	<i>Picea pungens</i>	T
101	Whitebark pine	<i>Pinus albicaulis</i>	T
102	Bristlecone pine	<i>Pinus aristata</i>	T
106	Common pinyon or twoneedle pinyon	<i>Pinus edulis</i>	W
108	Lodgepole pine	<i>Pinus contorta</i>	T
112	Apache pine	<i>Pinus engelmannii</i>	T
113	Limber pine	<i>Pinus flexilis</i>	T
114	Southwestern white pine	<i>Pinus strobiformis</i>	T
116	Jeffrey pine	<i>Pinus jeffreyi</i>	T
117	Sugar pine	<i>Pinus lambertiana</i>	T
118	Chihuahua pine	<i>Pinus leiophylla</i>	T
119	Western white pine	<i>Pinus monticola</i>	T
122	Ponderosa pine	<i>Pinus ponderosa</i>	T
130	Scotch pine	<i>Pinus sylvestris</i>	T
133	Singleleaf pinyon	<i>Pinus monophylla</i>	W
134	Border pinyon	<i>Pinus discolor</i>	W
136	Austrian (black) pine	<i>Pinus nigra</i>	T

<u>Code</u>	<u>Common name</u>	<u>Scientific name</u>	<u>Timber/ Woodland</u>
140	Mexican pinyon pine	<i>Pinus cembroides</i>	W
143	Arizona pinyon pine	<i>Pinus edulis</i> var. <i>fallax</i>	W
202	Douglas-fir	<i>Pseudotsuga menziesii</i>	T
231	Pacific yew	<i>Taxus brevifolia</i>	T**
242	Western redcedar	<i>Thuja plicata</i>	T
263	Western hemlock	<i>Tsuga heterophylla</i>	T
264	Mountain hemlock	<i>Tsuga mertensiana</i>	T
313	Boxelder	<i>Acer negundo</i>	T
321	Rocky Mountain maple	<i>Acer glabrum</i>	W
322	Bigtooth maple	<i>Acer grandidentatum</i>	W
375	Paper birch	<i>Betula papyrifera</i>	T
462	Hackberry	<i>Celtus occidentalis</i>	T
475	Curlleaf mountain-mahogany	<i>Cercocarpus ledifolius</i>	W
544	Green ash	<i>Fraxinus pennsylvanica</i>	T
*740	Cottonwood and poplar	<i>Populus</i> spp.	T
741	Balsam poplar	<i>Populus balsamifera</i>	T
745	Eastern cottonwood	<i>Populus deltoides</i>	T
746	Quaking aspen	<i>Populus tremuloides</i>	T
747	Black cottonwood	<i>Populus balsamifera</i>	T
	<i>ssp. tricarpa</i>		
748	Fremont's cottonwood	<i>Populus fremontii</i>	T
749	Narrowleaf cottonwood	<i>Populus angustifolia</i>	T
755	Mesquite	<i>Prosopis</i> spp.	W
756	W. honey mesquite	<i>Prosopis glandulosa</i> v. <i>torreyana</i>	W
757	Velvet mesquite	<i>Prosopis velutina</i>	W
758	Screwbean mesquite	<i>Prosopis pubescens</i>	W
*800	Oak--deciduous	<i>Quercus</i> spp.	W
803	Arizona white oak	<i>Quercus arizonica</i>	W
	or Gray oak	<i>Quercus grisea</i>	W
810	Emory oak	<i>Quercus emoryi</i>	W
814	Gambel oak	<i>Quercus gambelii</i>	W
823	Bur oak	<i>Quercus macrocarpa</i>	T
826	Chinkapin oak	<i>Quercus muehlenbergii</i>	T**
829	Mexican blue oak	<i>Quercus oblongifolia</i>	W
843	Silverleaf oak	<i>Quercus hypoleucoides</i>	W
*850	Oak--evergreen	<i>Quercus</i> spp.	W
902	New Mexico locust	<i>Robinia neomexicana</i> var <i>neomexicana</i>	W
990	Desert ironwood	<i>Olneya tesota</i>	W

\*These codes are only to be used when the individual code by genus and species is not listed.

\*\*Measured at DBH to match PNW; treat as timber species.

## ITEM

### 421 Current DBH/DRC.

**MQO:** Standing trees  $\pm 0.1$  inch per 20 inches of diameter, down trees  $\pm 1$  inch per 20 inches of diameter, woodland species  $\pm 0.2$  inch per stem, down dead trees  $\pm 4.0$  inches, 95% of the time. The following provides instructions for measuring and recording tree diameter for (a) timber species and (b) woodland species (page 10-9 and 10). Record diameter for all tally trees, 1.0-inch and larger in diameter, and nontallied site trees.

#### **Diameter at Breast Height (DBH) -- timber species:**

- a. **Measuring DBH.** **MQO for DBH Height:**  $\pm 0.2$  foot. Tree diameter for timber species, 1.0 inch and larger in diameter, is measured at a point 4.5 feet above ground level (referred to as diameter at breast height or DBH) on the uphill side of the tree as shown in figure 13. When measuring 4.5 feet above the ground, it is not necessary to remove litter; however, measure below any large woody debris (e.g., down logs or branches) that may be at the base of the tree. For diameter measurement techniques for timber species, refer to appendix C.1.

For downed trees where it is not possible to get a diameter tape around the tree, estimate the diameter to the nearest inch by measuring  $\frac{1}{2}$  the circumference (with diameter tape) of the tree and multiply by 2.

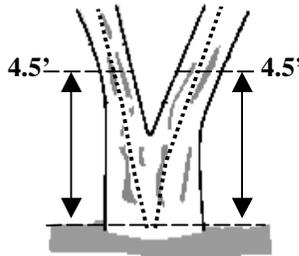
**ITEM**

**421 Current DBH/DRC (contd).**

For trees requiring diameter at breast height, measure DBH at 4.5 feet above the ground line on the uphill side of the tree unless one of the special DBH situations listed below is present; figure 13 shows the proper diameter measurement methods for these cases:

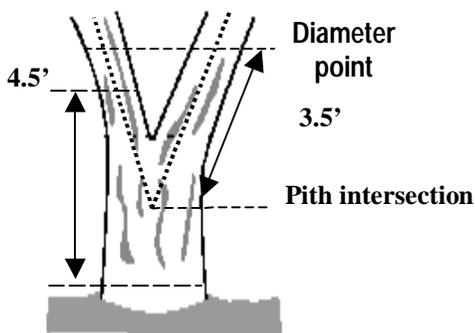
Figure 13. Points of diameter measurement on timber species.

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 13, above). Distances and azimuths are measured individually to the center of each stem where it splits from the stump (Figure 13 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 13-E), the rules in the next paragraph apply.

Figure 13. Points of diameter measurement for DBH trees (contd).

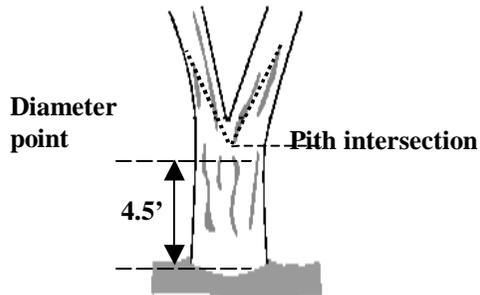


- Trees forked between 1.0 ft and 4.5 ft. Trees forked in this region are also counted as separate trees, but only one distance and azimuth (to the central stump) is used for all (Figure 13 D-F). Although a single azimuth and distance applies to all, multiple stems should be recorded as they occur in 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 13 F).

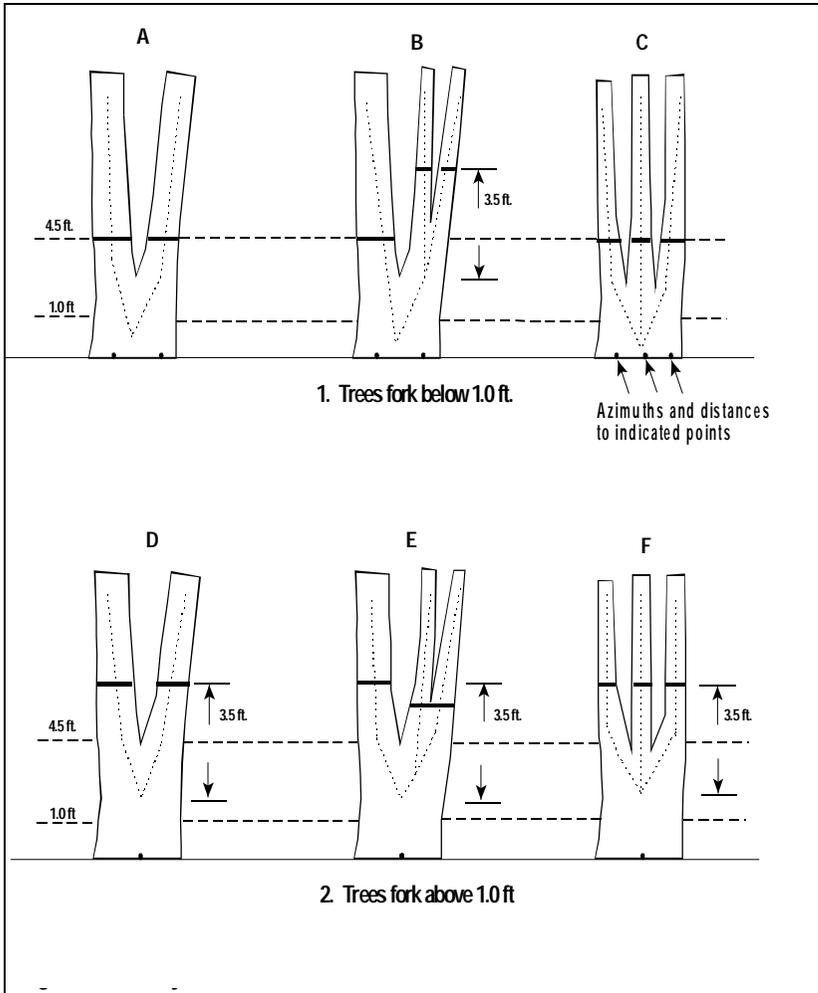
Once a stem is tallied as a fork that originated from a pith intersection between 1.0 and 4.5 ft, do not recognize any additional forks that may occur on that stem. Measure the diameter of such stems at the base of the second fork as shown in Figure 13-E (i.e., do not move the point of diameter the entire 3.5 ft above the first fork).

Figure 13. Points of diameter measurement for DBH trees (contd).



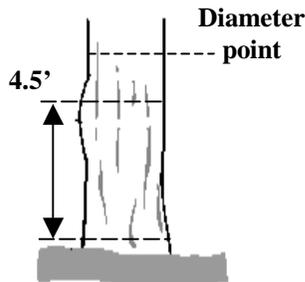
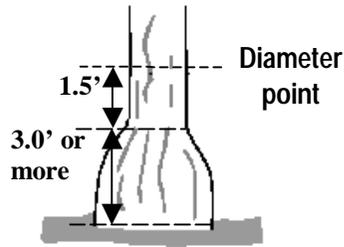
- Trees forked at or above 4.5 ft. Trees forked in this region count as one single tree. If a fork occurs at or immediately above 4.5 ft, measure diameter below the fork just beneath any swelling that would inflate DBH.

Figure 13 A-F. Summary of where to measure DBH, distance, and azimuth on forked trees.

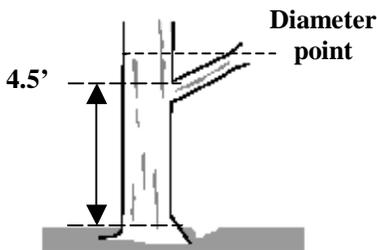


- Stump Sprouts.** Stump sprouts originate between ground level and 4.5 ft on the boles of trees that have died or been cut. Stump sprouts are handled the same as forked trees, with the exception that stump sprouts are not required to be 1/3 the diameter of the dead bole. Stump sprouts originating below 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 (moved to woodland section).~~

Figure 13. Points of diameter measurement for DBH trees (contd).

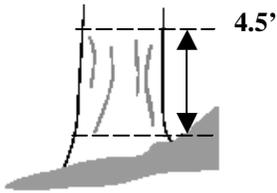


- Tree with butt-swell or bottleneck: Measure these trees 1.5 ft above the end of the swell or bottleneck if the swell or bottleneck extends 3.0 ft or more above the ground.

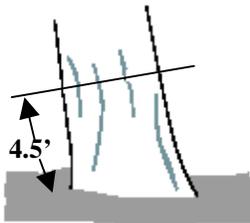


- Tree with irregularities at DBH: On trees with swellings, bumps, depressions, and branches at DBH, diameter will be measured immediately above the irregularity at the place it ceases to affect normal stem form.

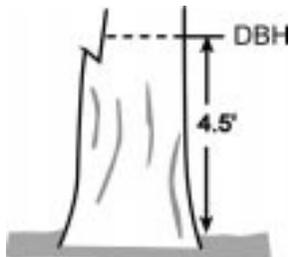
Figure 13. Points of diameter measurement for DBH trees (contd).



- Tree on slope: Measure diameter at 4.5 ft from the ground along the bole on the uphill side of the tree.

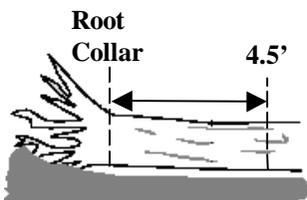


- Leaning tree: Measure diameter at 4.5 ft from the ground along the bole. The 4.5 ft distance is measured along the underside face of the bole.

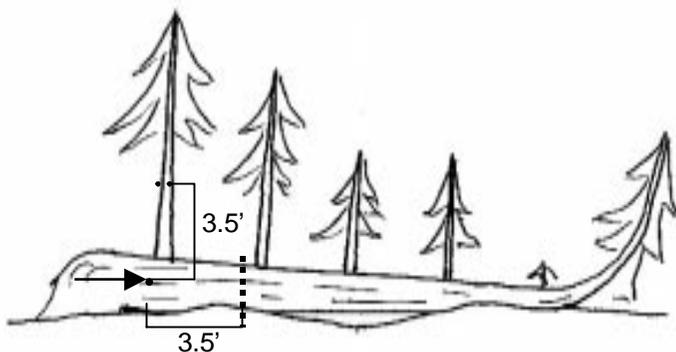


- Missing wood or bark. Do not reconstruct the DBH of a tree that is missing wood or bark or at the point of measurement. Record the diameter, to the nearest 0.1, of the wood and bark that is still attached to the tree (Figure 13). If a tree has a localized abnormality (gouge, depression, etc.) at the point of point of DBH, apply the procedure described for trees with irregularities at DBH.

Figure 13. Points of diameter measurement for DBH trees (contd).



- Live windthrown tree: Measure from the top of the root collar along the length to 4.5 ft (Figure 13).



- Down live tree with tree-form branches growing vertical from main bole. When a down live tree, touching the ground, has vertical (<math><45^\circ</math> 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.

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 13. Points of diameter measurement for DBH trees (contd).



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 13 above). 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.

- 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.
- 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.

**ITEM**

421 **Current DBH/DRC** (contd).

b. **Marking timber species.**

Avoid extraneous marking of trees on plot with lumber crayon, paint pen, etc. Large numbers on tally trees or X's on "out trees" are not acceptable.

- (1) **Standing tally trees.** Mark trees 3.0-inches DBH and larger with an aluminum nail at 4.5 feet above the ground on the uphill side of the tree, except aspen or trees with a bole irregularity at breast height (BH). **Place the nail first, then measure DBH directly above** the nail. Place the nail perpendicular to the tree bole, and etch the tree number in pencil on the nail head. Leave at least 1 inch of the nail exposed to allow for tree growth.

Mark aspen and birch 3.0-inches DBH and larger with a paint pen. Put a horizontal line approximately 1 to 2 inches in length at BH. Do not nail.

Mark trees with bole irregularities at the point of diameter measurement.

- (2) **Down tally trees.** Place a nail on top of the tree bole at the place of diameter measurement; etch the tree number on the head of the nail.

## ITEM

421

### Current DBH/DRC (contd).

**Reserved locations:** Sample trees (tally trees) will not be painted or scribed. Mark each sample tree 5.0" DBH and larger with a tag/nail at ground level either facing subplot center or on the uphill side of the tree if there is a slope. If the sample tree is in view of a known path or trail, place the tag/nail away from the path or trail and note in the field tally. If only saplings are on the subplot mark a couple of them with nails at ground level and note which are so marked. Measure DBH at exactly 4.5 feet above the nail. If diameter needs to be taken at a location other than breast height, measure the distance (to the nearest inch) from the nail to the place of diameter measurement, and note it in the Tree Data Record.

- c. **Recording diameter.** Record diameter as a three-digit code to the last whole 0.1 inch. Always **round down**. For example, record a 9.18-inch diameter as 091, and record a 38.23-inch diameter as 382.

### **Diameter at root collar (DRC) -- Woodland species**

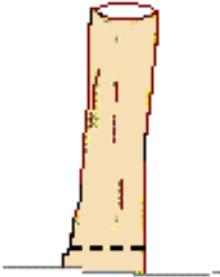
For species requiring diameter at the root collar (refer to tree species list), measure the diameter at the ground line or at the stem root collar, whichever is higher. For these trees, treat clumps of stems having a unified crown and common root stock as a single tree; examples include mesquite, juniper, and mountain mahogany. Treat stems of woodland species such as Gambel oak and Rocky Mountain Maple as individual trees if they originate below the ground. For multi-stemmed trees, compute and record a cumulative DRC (see below); record individual stem diameters and a stem status (live or dead) on a separate form or menu as required.

- a. **Measuring DRC.** Tree diameter, or DRC, for woodland species is measured at the ground line or at stem root collar, whichever is higher (figure 14).

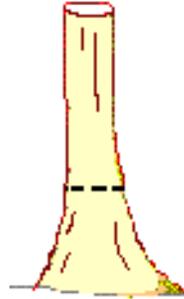
For multi-stemmed woodland species, treat all new sprouts as part of the same new tree.

Additional instructions for woodland species DRC measurements are illustrated in figure 15.

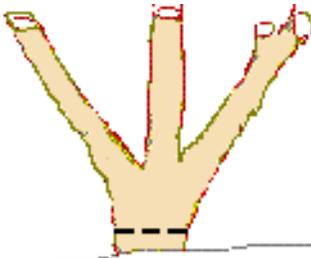
Figure 14. Points of diameter measurement on woodland species.



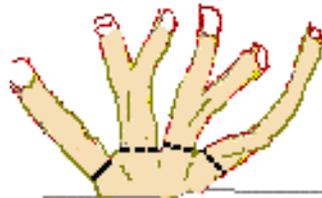
1. Measure at ground line when reasonable.



2. Measure above root collar.



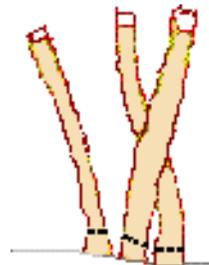
3. Measure below multi-stems at normal stem form.



4. Excessive diameter below stems; measure individual stems and compute DRC.

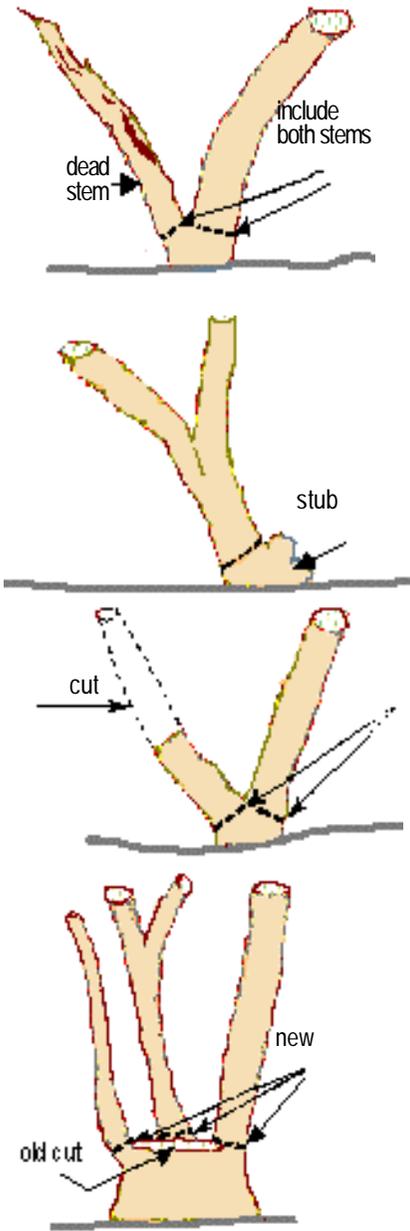


5. Measure missing stem and compute DRC.



6. Forks are at or below ground line. Compute DRC. If tree is oak/maple, each stem is a tree.

Figure 15. Additional woodland species diameter measurement instructions.



1. Measure the diameter of a dead stem if it is essentially intact, the volume is sound, and the stem represents a portion of the main tree form. Include the stem diameter in the DRC computation and record the appropriate percent of dead volume.
2. Ignore stem stubs that are deteriorated. Do not deduct missing volume for stems not measured for DRC computation.
3. Measure diameter on recently cut stems and include them in DRC computation. Record the missing volume. Evidence of a recent cut would be a clean stump, an obvious gap in the crown, and lack of sprouting.
4. When any main stem has been cut and replaced with new growth, measure the stem diameters at the point of new growth; if all stems were cut, measure height from the point of new growth. Measure any uncut stem at the usual point of measurement. If the stem is replaced with new growth, do not deduct missing volume.

ITEM

421 Current DBH/DRC (contd).

Record DRC for woodland tally trees, 1.0-inch and larger in diameter, as specified below. Before measuring the diameter on a stem, remove the loose material on the ground (e.g., litter), but not mineral soil. Measure just above any swells present, and in a location so that the diameter measurements are reflective of the volume above the stems (especially when trees are extremely deformed at the base). For example, when a single diameter measurement for a tree -- taken below several main stems originating near the root collar -- would grossly over estimate the volume for the tree, individually measure the stems qualifying for diameter measurement above the single diameter location.

Stems must be at least 1.0 foot in length to qualify for measurement; or stems missing due to cutting or damage must have previously been at least 1.0 foot in length. Refer to figure 15, page 10-23.

**Woodland species diameter groupings.**

- **Saplings** (microplot) -- single-stemmed trees between 1.0 inch and 4.9 inches in diameter, and multistemmed trees with a cumulative DRC between 1.0 inch and 4.9 inches in diameter. For multistemmed trees, measure all stems 1.0 inch in diameter and larger, and at least 1 foot in length, to compute DRC (see formula on next page).
- **Trees** (subplot) -- single-stemmed trees 5.0 inches in diameter or larger and multistemmed trees with a cumulative DRC of at least 5.0-inches or larger. For multistemmed trees, measure all stems 1.0 inches in diameter and larger, and at least 1 foot in length, to compute DRC (see formula on next page).

For trees with several small stems, use the following guidelines to help determine possible trees to tally on the subplot:

<u>Stem Size</u> <u>(inches)</u>	<u>Approx. No. Stems Needed</u> <u>to Total 5.0 inches DRC</u>
4	2
3	2-3
2	4-6
1	8-15

**ITEM**

421 **Current DBH/DRC** (contd).

- b. **Marking woodland species.** For woodland species 1.0-inch DRC and larger, mark the exact location of stem diameter measurement with a lumber crayon or paint pen. Draw a small line (at least 1.0-inch long and parallel to the diameter tape placement on the stem) on each stem measured for DRC.

In addition, for all standing woodland trees, 5.0-inches DRC and larger, place a nail at the base of one stem, preferably the largest or main stem, facing subplot center. Etch the tree number in pencil on the nail head. For down woodland trees, place the nail on top of the largest or main stem. **Note:** The purpose of the nail is to aid in tree relocation and not to mark the exact location of a stem diameter measurement.

**Reserved lands:** use low gloss gray tags or paint tags gray or brown.

- c. **Computing DRC.** For all woodland species tally trees with at least one stem 1.0 inch in diameter or larger at the root collar, DRC is computed as the square root of the sum of the squared stem diameters. For a single-stemmed woodland tree, the computed DRC is equal to the single diameter measured.

The field data recorders calculate DRC using the individual stem diameters entered. Otherwise, use the following formula to compute DRC:

$$\text{DRC} = \text{SQRT} \left[ \sum_{1}^n (\text{stem diameter})^2 \right]$$

**Round** the result to the nearest 0.1 inch. For example, a woodland tree with stems of 4.8, 5.2, 1.5, and 8.7 inches is calculated as:

$$\text{DRC} = \sqrt{(4.8^2 + 5.2^2 + 1.5^2 + 8.7^2)} = \sqrt{128.02} = 11.3''$$

## ITEM

### 421 Current DBH/DRC (contd).

- d. **Recording DRC.** Record the calculated DRC as a three-digit code to the last whole 0.1 inch. **Note:** If a calculator is not available, use appendix C.2 to compute DRC.

If using field forms, record individual stem diameters for multistemmed woodland trees on the "Multistemmed Woodland Species Tally" supplemental form (appendix A.8). **Note:** If a multistemmed woodland tree has dead stems, place a small "d" on the "Multistemmed Woodland Species Tally" form next to the individual diameter measurement of the dead stem.

Whenever DRC is impossible or extremely difficult to measure with a diameter tape (e.g., due to thorns, extreme limbiness, packrat's nest, large down stem) the stem(s) may be measured or estimated to the **last** whole inch with the measurement poles. Note which stems were estimated on the "Multistemmed Woodland Species Tally" supplemental form (appendix A.8).

### 422 Tree Count.

**MOO:** No errors, 95% of the time.

On the microplot, record the number of live tally tree seedlings, by species and condition class. Count up to 5 individuals by species: estimate the total count if there are more than 5 individuals of any given species in any given condition class. A suggested method of estimating is to count the number of seedlings on one quarter of the microplot and multiplying by 4 (given that there is only one condition class on the microplot). Repeat for each species.

Conifer seedlings must be at least 4.0 inches in length and less than 1.0 inch at DBH in order to qualify for tallying. Hardwood seedlings must be at least 12.0 inches in length and less than 1.0 inch at DBH in order to qualify for tallying. For western woodland species, each stem on a single tree must be less than 1.0 inch at DRC.

Multiple "suckers" of aspen that originate from the same location will be considered 1 seedling.

## ITEM

### 422 Tree Count (contd)

Do not tally fir "layers" (undetached braches partially or completely covered by soil, usually at the base) as seedlings. Tally as saplings once they become established.

### 423 DBH/DRC/ Count Check.

**MQO:** No errors, 100% of the time.

For each diameter measurement or seedling count, record a **0** for DBH and DRC measured normally or for seedlings counted and not estimated. Record a 1 if any of the following apply:

- DBH was estimated, or DBH not measured at 4.5 feet (e.g., diameter taken above 4.5 feet due to fork).
- DRC was estimated.
- Seedling count was estimated (more than 5 individuals tallied for the species).

If 1 is coded, explain in the notes.

### 424 Number of Stems.

**MQO:** No errors 95% of the time.

Record this item only for tallied **woodland** species with at least one stem 1.0 inches in diameter or larger. Record the total number of stems that were measured for DRC, as a two-digit code (e.g., record 1 stem as 01; record 12 stems as 12).

Count only the number of qualifying stems used to calculate DRC. Qualifying stems are those that are at least 1.0 inches in diameter and at least 1.0 foot in length.

**ITEM**

430 **Radial Growth** and  
431 **Tree Age.**

**MOQ:** Radial growth  $\pm 1/20$ -inch 80% of the time  
Age  $\pm 5\%$ , 90% of the time.

Collect tree age and radial growth information for specified tally trees, and timber species site trees. In addition, collect age information for timber species seedling counts. Refer to appendix C.3 for instructions on boring trees for radial growth and age.

**Remeasurement plots:**

Radial growth – If there is a remeasure tree that is the same species and diameter class as a new tally tree, use the formula below to estimate radial growth for the new tally tree (instead of boring the new tally tree). The remeasure tree does not have to fall on a new subplot. Based on diameter of remeasure tree:

$$\# \text{ of } 1/20^{\text{ths}} = \frac{100 \times (\text{Current diameter} - \text{Past diameter})}{\# \text{ years since last inventory}}$$

Tree age – If there is a remeasure tree that is the same species and diameter class as a new tally tree, estimate tree age for the new tally tree as follows: Use the previously recorded age of the remeasure tree and adjust for the years since the previous inventory (pre-printed forms will specify the past inventory year).

If a remeasure tree is used to determine radial growth or tree age for a new tally tree, use code 2 for “Radial Growth and Tree Age Check”. **Note:** For QA/QC purposes, be sure to make note of which previously inventoried tree is used (tree number) to determine radial growth or tree age.

**Reserved plots:** Boring or drilling will be done on representative non-tally trees and only when absolutely necessary to estimate site, age, or growth. (This will generally be the case during initial establishment of permanent plots.)

**ITEM**

**430/431 Radial Growth and Tree Age (contd).**

**a. Radial growth and age tree selection.**

**(1) Timber species**

**Radial growth** information is required for a minimum of two trees in each diameter class (starting with the 4-inch class) for each species.

**Age** information is required for a minimum of one tree in each diameter class and species, and for one timber species seedling count per species (i.e., one count for each group for the entire condition class).

For both radial growth and age, if rough or rotten trees are bored, select additional sound trees if tallied.

Ranges of diameters for each diameter class are as follows:

<u>Diam. Class</u>	<u>Class Range (DBH, inches)</u>
Seedling	0.0 - 0.9 (count whorls/scars): age only
2"	1.0 - 2.9 (age at base): age only
4"	3.0 - 4.9 (age at BH): age and radial
6"	5.0 - 6.9 ↓
etc.	(2-inch classes)

**Note:** Do not bore aspen or birch tally trees on the subplot area; these trees are highly susceptible to rot and damage. Instead, locate an aspen or birch tree of the same diameter class to bore for age and radial growth measurements within 60 feet of the subplot, if possible. Record this age and radial in the tally tree data.

Select age and radial-growth trees as they are tallied across the subplots, regardless of what order the subplots are sampled:

**ITEM**

**430/431 Radial Growth and Tree Age (contd).**

- (a) Select the first timber species tallied by diameter class and species type across the subplots. Obtain age for all trees selected, and radial growth for trees in the 4-inch diameter class and larger. For the seedling class, select the first seedling group counted in each species on the location and obtain age only.
- (b) For trees in the 4-inch diameter class and larger, also select the second timber species tallied across the subplots, by diameter class and species type, and obtain radial growth only. To help distribute trees, always select the radial growth tree from a different subplot than the age/growth tree selected in (a) above. **Note:** If a second tree is not tallied on a different subplot, the second radial growth measurement is not required.

For example (subplot 1 measured first, and subplot 2 measured second):

Subplot 1:	DBH	Species	Diameter	Bore for	
			Class	Age	Radial Growth
	8.1	Douglas-fir	8"	X	X
	7.2	Douglas-fir	8"		
	5.1	Douglas-fir	6"	X	X
	5.2	White pine	6"	X	X
	6.9	White pine	6"		
	4.1	White pine	4"	X	X
	3.2	White pine	4"		
		White pine	seedling	X	
Subplot 2:	9.3	Douglas-fir	10"	X	X
	8.6	Douglas-fir	8"		X
	7.2	Douglas-fir	8"		
	6.1	White pine	6"		X
	3.8	White pine	4"		X
	2.2	White pine	2"	X	
		White pine	seedling		

## ITEM

### 430/431 Radial Growth and Tree Age (contd).

In this example, the trees indicated with an "X" are selected to bore for age/radial growth. After measuring two subplots, all of the requirements are met for the 8-inch Douglas-fir class and the 6-inch, 4-inch, and seedling white pine classes. In addition, the age requirements are met for the 10-inch and 6-inch Douglas-fir classes, and the 2-inch pine class. However, given the types of species and diameter classes tallied so far, one more live sound Douglas-fir in the 10-inch class, and one in the 6-inch class, if tallied on subplots 3 or 4, need to be bored for radial growth.

- (2) **Woodland species.** For each woodland genus group tallied across the subplots, select one representative live tally tree within each size class tallied (refer to Stand-size class).

For each of the selected trees, bore and collect one total age core; if the age cannot be determined in the field, record code 3 (age core collected in field, sent to office) and leave age/growth blank (record 000 for age and 00 for radial growth on paper forms). Count whorls or estimate age if seedlings represent the seedling/sapling size class. **Important:** Do not bore dead trees, and do not bore cercocarpus species or desert ironwood.

If the total age and growth cannot be determined in the field, send the cores to the office for measurement. Glue cores into a core holder; for pinyon cores, glue with the resin ducts up. On the side of the core holder, place arrows indicating the outside end (bark end) of the cores, and record the appropriate codes for items listed below.

- (a) **Species groups.** Woodland genus groups for boring are as follows:
- oak (codes 800-850)
  - maple (codes 321-322)
  - juniper (codes 058-069)
  - pinyon (codes 106, 133, 134, 140, 143)
  - mesquite (codes 755-758)
  - New Mexico locust (code 902)

(2) **Woodland species** (contd).

(b) **Saving cores.** Glue the cores into a core holder and label the core holder with the following:

- State
- County
- Location Number
- Subplot Number
- Tree Number
- Species
- Total DBH/DRC of tree
- DRC of stem

**Note:** Do not place age cores from more than one State or county on a single core holder. After the cores are glued, wrap the core holder in flagging to protect the cores, and record the State, County number, Location number(s) on the flagging.

**ITEM**

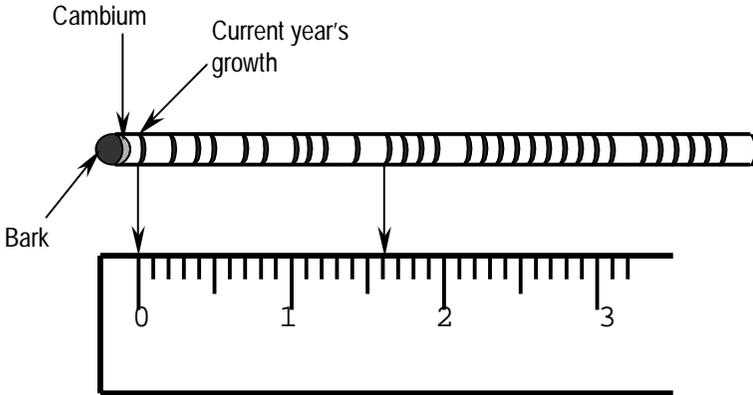
**430/431 Radial Growth and Tree Age (contd).**

- b. **Radial-growth measurement** (timber species, 4-inch diameter class and larger). Measure the last 10 years of radial growth from an increment core taken immediately below the point of diameter measurement and at a right angle to the bole. To reduce bias, bore on the side of the tree facing the subplot center, where reasonable. Using a ruler with a 1/20-inch scale, measure the length of the core from the inner edge of the last (most recent) complete summer wood ring to the inner edge of the summer wood ring 10 years previous (figure 16).

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Figure 16. Radial growth measurement.

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## ITEM

### 430/431 Radial Growth and Tree Age (contd).

c. Age tree measurement (timber species).

- **Seedling age group:** For the first timber species seedling group counted (by species) on the location, record an **average total age**. It is not necessary to age seedlings species groups for each condition class. Use the same methods for determining total tree age as for small saplings; however, do not bore seedlings.
- **2-inch diameter class (1.0- to 2.9-inches DBH) age trees:** Measure and record **total tree age**. Use the following methods:

For **small coniferous saplings**, determine total age by counting the terminal bud scars or the whorls of branches. The terminal bud scars are those that completely encircle the stem of the tree. The scar is left on the stem where the terminal bud lay dormant during the winter.

For **larger coniferous saplings**, or if an accurate tree age cannot be determined for smaller saplings by counting whorls, bore the tree as close to the base as possible to obtain total age. Be careful not to bore all the way through the tree. Count the growth rings on the increment core from the bark end to the pith (center of the tree).

For **aspen and cottonwood saplings**, determine tree age by counting the intervals between scars left on the stem by the terminal bud.

If age cannot be accurately determined by the above methods, estimate total age and note in the comments column.

**ITEM**

**430/431 Radial Growth and Tree Age (contd).**

- **4-inch diameter class and larger age trees:** Measure and record breast height (**BH**) age. Count the growth rings from an increment core taken immediately below the point of diameter measurement and at a right angle to the bole. Bore on the side of the tree facing the subplot center, where reasonable. Count every growth ring from the bark end to the pith (center of the tree). If the age is difficult to determine (e.g., due to indistinct rings, presence of rot), or if the pith was not reached (e.g., diameter too big to bore to center) estimate the age and note in the comments column.

**d. Radial-growth and age tree coding.**

- (1) **Radial growth.** Record the radial-growth measurement as a two-digit code; for example, record 6/20 as 06, and record 23/20 as 23.
- (2) **Age tree coding.** Record Tree Age as a three-digit number. For example, record 29 years as 029, and record 195 years as 195.

**432 Radial Growth and Tree Age Check.**

**MQO:** No errors 100% of the time.

<u>Code</u>	<u>Description</u>
0	Age/radial growth is accurate
1	<ul style="list-style-type: none"><li>● Age/radial growth was estimated due to rot.</li><li>● Age/radial growth was estimated because rings were difficult to count (old suppressed trees).</li><li>● Age was estimated because the increment bore could not reach to tree center.</li></ul>
2	<ul style="list-style-type: none"><li>● Age/radial growth was calculated from a similar remeasure tree (same species and diameter class).</li><li>● Age/radial growth was based on a similar tree off the subplot.</li></ul>

If 1 is coded, explain in the notes.

## ITEM

### 441 Current Tree Height.

**MQO:** Trees >20-feet,  $\pm 5\%$ , 90% of the time

Trees  $\leq 20$  feet,  $\pm 1$  foot, 90% of the time.

Determine and record total tree height (from ground level to the top of the main stem) to the nearest foot, for all tally trees and nontallied site trees 1.0-inch DBH/DRC and larger. On multistemmed woodland trees, measure height along the main or largest stem. For measurement examples, refer to appendix C.4.

For a standing tree with a **missing top**, measure the height of the standing portion and add on the estimated height of the missing top (i.e., record the total estimated height). For estimating the height of the missing top, measure any portions of the top that may be on the ground or base the estimate on similar trees nearby. Note the standing height, and that total height was estimated, in the comments column.

For all standing trees that **lean**, go out perpendicular to the lean to determine tree height. For standing trees with **excessive lean** (more than  $15^\circ$  from vertical, or 27 percent), go out perpendicular to the lean, and visually "up-right" the tree to a vertical position before determining height with a clinometer; also, in the comments column, note that tree height was estimated due to lean.

For a **downed tree**, measure total tree height directly along the ground, or if necessary, estimate the previous total height. If total height is estimated, record a note in the comments column.

If a tree bole or stem(s) is growing on an old tree stump, measure tree height from the point of new growth to the top of the tree.

### 442 Tree Height Check.

**MQO:** No errors 100% of the time.

Record a 0 for normal height measurements; record a 1 if the height was estimated due to a missing top, severe tree lean, or other reasons.

If 1 is coded, explain in the notes; if the tree had a broken top, record standing height in the notes.

**ITEM**

443

**Uncompacted and**

444

**Compacted Crown Ratios.**

**MQO:** ±10%, 85% of the time.

Record uncompacted and compacted crown ratios to the nearest percent for live tally timber species, **1.0-inch DBH or larger**, and nontallied timber-species site trees. Crown ratio is related to vigor and growth of a tree; it is that portion of the tree bole supporting live, healthy foliage and is expressed as a percent of total tree height.

Calculate crown ratio by **dividing the length of live crown by the total tree height**. Examine and measure live crown from the lowest live branch (where it meets the stem) to the uppermost live leader.

In this assessment, ignore epicormic branches (small branches well below the main crown, usually less than 1-inch in diameter).

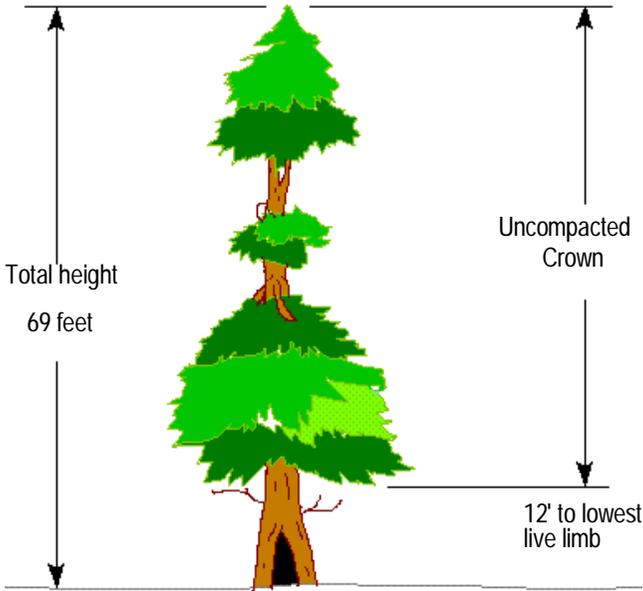
For trees with broken or missing tops, use the current length of live crown and the estimated total tree height.

- a. **Uncompacted crown ratio (71)**. To determine Uncompacted Crown Ratio (UCR), stand away from the tree about 1 to 1.5 times the tree height and use the crown ratio scale or measure the percent of total tree height supporting live crown, making no adjustment for openings or lopsided crown (figure 17).

$$\text{Calculated UCR} = \frac{(\text{total height}) - (\text{height to the lowest live limb})}{\text{Total height}}$$

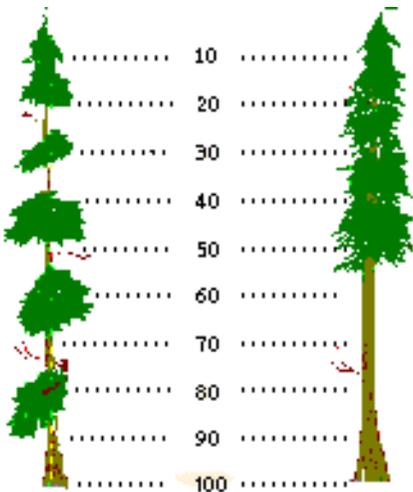
- b. **Compacted crown ratio (72)**. To determine Compacted Crown Ratio, visually transfer lower branches to fill in large holes in the upper portion until a full, even crown is visualized (figure 18). However, **do not compact branches to form an unnaturally dense crown: compact only to the typical branch spacing of that species.**

Figure 17. Uncompacted crown ratio example.



$$\text{Uncompacted Crown Ratio} = \frac{69 - 12}{69} = 83\%$$

Figure 18. Comparison of uncompacted and compacted ratios.



ITEM

445 Crown Class.

**MQO:** No errors, 80% of the time.

Record Crown Class for all live tally trees, 1.0-inch DBH and larger, and for nontallied timber-species site trees. Crown class is a categorization of a tree based on dominance in relation to adjacent trees in the stand. This dominance is indicated by crown development and amount of light received from above and the sides.

Each tree must be judged in the context of its immediate environment (that is, those trees affecting it or being affected by it in terms of crown competition). **Note:** For residual trees in recent thinnings or partial cuts, record the crown class that corresponds to the preharvest tree classification (figure 19).

Record Crown Class using one of the following one-digit codes (crown classes are defined below):

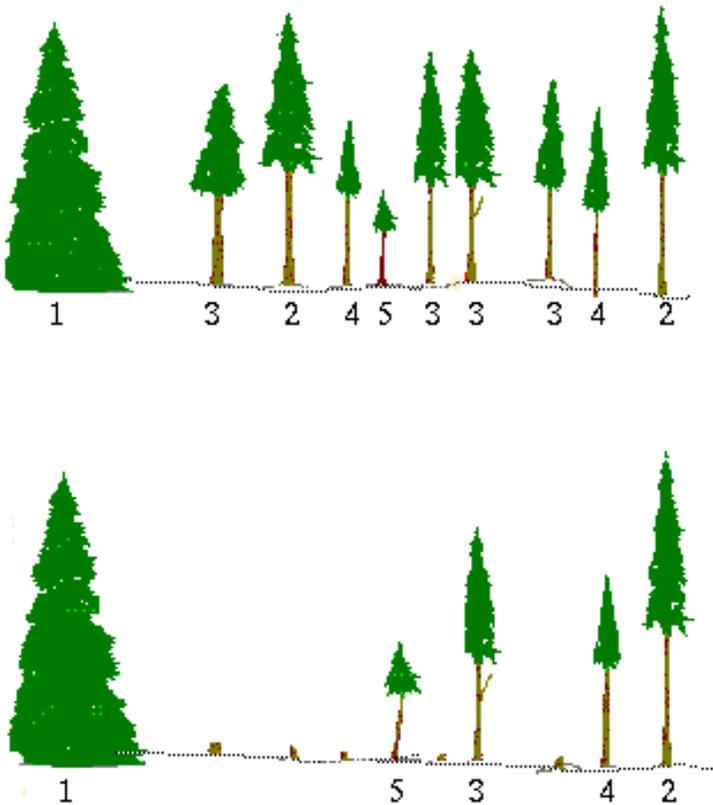
- | <u>Code</u> | <u>Crown Class</u>   |
|-------------|--|
| 1           | <b>Open grown</b> -- trees with crowns receiving full light from above and from all sides.   |
| 2           | <b>Dominant</b> -- trees with crowns extending above the general level of the canopy and receiving full light from above and partial light from the sides. These trees are generally larger than the average trees in the stand, and have well-developed crowns that may be somewhat crowded on the sides.                                     |
| 3           | <b>Codominant</b> -- trees with crowns forming the general level of the canopy and receiving full light from above, but comparatively little from the sides. In stagnated stands, this class includes trees with small-sized crowns crowded on the sides.  |
| 4           | <b>Intermediate</b> -- trees generally shorter than those in the two preceding classes, with crowns either below or extending into the canopy formed by codominant and dominant trees. The crowns of these trees receive little direct light from above and none from the sides, are usually small, and are considerably crowded on the sides. |
| 5           | <b>Overtopped</b> -- trees with crowns entirely below the general canopy level and receiving no direct light from above or the sides.  |

**ITEM**

**445** Crown Class (contd).

Crown Class definitions are most appropriate when considering a single-storied or clumpy/patchy canopy structure. However, in any type of canopy structure, classify each tree, as stated, in the context of its immediate environment. Therefore, a medium- or small-sized tree in a multistoried canopy structure that receives full light from above and partial light on the sides can be classified as a dominant tree.

Figure 19. Crown class as related to preharvest tree classifications.



**ITEM**

**447 Cone Serotiny.**

**MQO:** No errors 80% of the time.

Record the condition of the viable cones for all live lodgepole pine tally trees, 5.0-inches DBH or larger. Serotinous cones are those that mature but remain on the tree without opening for one or more years.

<u>Code</u>	<u>Cone Serotiny</u>
<b>0</b>	<b>No cones</b>
<b>1</b>	<b>Open cones</b> (less than 50% of the mature cones are closed)
<b>2</b>	<b>Closed cones</b> (more than 50% of the mature cones are closed)

**450 Damage.**

**MQO:** No errors 2 of 3, 80% of the time.

Record a primary, secondary, and tertiary damage code for all live tally trees, **5.0-inch DBH/DRC and larger**, and nontallied site trees. Only trees with serious damage, insect, or pathogen activity are to be given damage codes other than 00.

For each tallied tree and nontallied site tree, select the most significant damages present. Record the most significant damage as the primary, the next as secondary, etc. Avoid selecting one of the "other, unidentified, or unknown" categories unless a more specific category cannot be determined. For insect and disease damage, base the ordering of most significant, second most significant, etc., on the Regional priorities provided (refer to State Supplement).

A general rule is to only code a damage category when something is affecting the tree that will cause one of the following:

- **Prevent it from living to maturity, or surviving 10 more years**, if already mature.
- **Prevent it from producing marketable products.** For example, code any damage preventing a timber species from having a minimum of one merchantable bolt (see glossary).
- **Reduce (or has seriously reduced) the quality of the tree's products** (e.g., potentially resulting from lightning strike, excessive lean, tree rot).

**ITEM**

**450**      **Damage** (contd).

Examine trees carefully. Sometimes serious internal tree damage can only be determined based on external indicators (e.g., small conks on the main bole can indicate serious volume loss that may affect the tree's chance of survival). On the other hand, a minor defect, such as a small fire scar that results in some cull, would not be serious enough to qualify as damage.

It is not necessary to code as damage any form defect items common to a particular species (such as forking on a cottonwood or juniper tree).

**Note:** General symptoms listed in the damage descriptions below (such as discolored foliage, dead branches or tops, or galls) may be indicative of several damaging agents. Refer to insect pest and disease field guides for damaging insect/disease agent identification and tree damage potential.

	<u>Code</u>	<u>Damage</u>
	00	No serious damage
<b>Insects:</b>	10	Other and unidentified insects
	11	Bark beetles
	12	Defoliators
	14	Terminal weevils
	15	Mountain pine beetle
	16	Ips engraver beetle
<b>Diseases:</b>	20	Other and unidentified diseases
	21	Stem rusts
	22	Stem and butt rots (conks)
	23	Cankers
	24	True mistletoe
	26	Dwarf mistletoe -- rating of 4 to 6
	27	Broom rusts
	28	Root diseases`
	29	Foliage diseases`
<b>Fire:</b>	31	Fire

450 **Damage** (contd).

	<u>Code</u>	<u>Damage</u>
<b>Animals:</b>	40	Unidentified animal
	41	Domestic animal
	42	Porcupine girdling
	43	Other wildlife
	44	Big game
	47	Pocket gophers
	48	Sapsuckers
	<b>Atmosphere:</b>	50
51		Wind
52		Lightning
53		Snow break or bend
54		Frost crack
55		Drought
56		Sun scald
57		Winter drying or burn -- red belt
58		Air pollution
59		Flooding
<b>Misc:</b>	61	Suppression
	70	Unidentified/unknown
	71	Excessive lean -- more than 15° from vertical
	72	Forked below merchantable top; timber spp.
	73	Broken top
	74	Dead top
	75	Wolf tree: excessively limby timber spp.
	76	Unhealthy foliage
	77	Heartwood scar on bole
	78	Forked above merchantable top; timber species, under rotation age
79	Excessive crook, sweep, or taper -- timber	
<b>Human:</b>	80	Other human
	81	Logging
	82	Timber stand improvement (TSI)
	83	Land clearing
	84	Woodland cutting
	85	Chemical

Definitions for Damage codes are described as follows:

**No Serious Damage (code 00)**. Record this code when serious tree damage is not evident. Some minor damage may be evident, but it will not seriously reduce tree quality or prevent the tree from living to maturity.

**Insect Damage (codes 10-12, 14-16)**. Record only serious insect damage. Nearly any tree in the woods will have insects on it at one time or another, but this presence does not necessarily indicate serious tree damage. Serious insect damaging agents are described below.

**Other and Unidentified Insects (code 10)**: Use this code only for unidentified insect damage or for insect damage not specified in one of the categories below (e.g., wood borers). Describe in the comments column the damage and the type of insect causing the damage, if known.

**Bark Beetles (codes 11, 15, 16)**: These are phloem-feeding insects that bore through the bark and create extensive galleries between the bark and the wood. Symptoms of beetle damage include fading or discolored tree crown (yellow or red), pitch tubes or pitch streaks on the bark, extensive egg galleries in the phloem, boring dust in the bark crevices or at the base of the tree. Bark chipping by woodpeckers may be conspicuous. Examples of tree damaging bark beetles include species of the genera *Dendroctonus*, *Scolytus*, and *Phloesinus* (in juniper), such as **mountain pine beetle (code 15)**, **lps engraver beetle (code 16)**, and **others (code 11)** such as western pine beetle, Douglas-fir beetle, spruce beetle, and cedar bark beetles.

**Defoliators (code 12)**: These are foliage-feeding insects that may reduce growth and weaken the tree causing it to be more susceptible to other damaging agents. General symptoms of defoliation damage include large amounts of missing foliage (greater than 75 percent defoliated in top 10 feet or 50 percent defoliated over the entire tree), browning foliage, extensive branch mortality, or dead tree tops. Examples include spruce budworm, pine sawflies, Douglas-fir tussock moth, and gypsy moth.

**Terminal weevils (code 14)**: These are insects that feed on the meristematic portion of the tree (tips, terminal and lateral branches). Damage includes reduced tree growth, forking, and deformed crowns. Symptoms include orange to red colored or dead terminal leaders, stunted or drooping terminal or lateral branches, or galls on branches. Examples are the western pine shoot borer, and the white pine and lodgepole pine terminal weevils.

## Damage Definitions (contd).

**Disease Damage (codes 20-24, 26-29).** Record only serious disease damage. Serious disease damaging agents are described below.

**Other and Unidentified Diseases (code 20):** Use this code only for unidentified disease damage or for disease damage not specified in one of the categories below. Describe in the comments column the damage and the type of disease causing the damage, if known.

**Stem rusts (code 21):** A stem rust is a disease caused by fungi that kill or deform all or a portion of the stem or branches of a tree. Sometimes yellow or reddish-orange spores are present giving a "rusty" appearance. Damage occurs when the disease attacks the cambium of the host, girdling and eventually killing the stem above the attack. Symptoms of rusts include galls (an abnormal and pronounced swelling or deformation of plant tissue that forms on branches or stems) and cankers (a sunken lesion on the stem caused by death of the cambium which often results in the death of tree tops and branches). Examples of stem rusts include western gall rust and comandra blister rust (causing cankers and galls on lodgepole and ponderosa pines), and white pine blister rust on five-needle pines.

**Stem and Butt Rots (code 22):** A rot is a wood decay caused by fungi. Rots are characterized by a progression of symptoms in the effected wood. First, the wood stains and discolors, then it begins to lose its structural strength, and finally the wood starts to break down, forming cavities in the stem. Even early stages of wood decay can cause cull due to losses in wood strength and staining of the wood. Damage includes mortality, cull, increased susceptibility to other agents (such as insects), and wind throw and stem breakage. Any conk (a fruiting body of the causal fungus), or discoloration and decay in more than 1/2 the stem (examine increment core), is serious enough to code. Examples include Indian paint fungus on true firs (characterized by large conks with a rust colored interior), red belt fungus (characterized by a brown cubical decay and a conk-like shelf with a distinctive red band), and white trunk rot of aspen (characterized by a hoof-shaped conk).

## Damage Definitions (contd).

**Cankers (code 23):** A canker -- a sunken lesion on the stem caused by the death of cambium -- may cause tree breakage or kill the portion of the tree above the canker. If cankers occur on the lower 1/2 of the tree bole, the tree will likely be killed. Examples include *Atropellis* canker in lodgepole pine and ponderosa pine (characterized by a blue-black stain in the wood), *Cytospora* canker in spruce, fir, and aspen, *Ceratocystis* canker in aspen (forming highly irregular and blackened callous ridges around the canker), and sooty bark canker in aspen (which kills trees rapidly and causes the underside of dead bark to be blackened and "sooty"). **Note:** Record code 21 for cankers resulting from a stem rust.

**True mistletoe (code 24):** This is a parasitic plant (*Phoradendron* spp.) that grows on tree branches or stems of host trees. When it occurs in large amounts on a single tree, true mistletoe can reduce tree growth deform the tree, and increase the tree's susceptibility to other damaging agents. True mistletoes are green plants with or without well-developed leaves. Host plants include juniper, oak, mesquite, and poplars (cottonwood, etc.). Code true mistletoe as a damage only when it is present on numerous stems or branches.

**Dwarf mistletoe (code 26):** This is a parasitic plant (*Arceuthobium* spp.) that grows on tree branches or stems of host trees and can substantially reduce tree growth, deform the tree, and increase the tree's susceptibility to other damaging agents. Dwarf mistletoe occurs on larch, Douglas-fir, and pines (rarely on true fir and spruce). A mistletoe class rating of 4 to 6 is considered damaging (refer to page 10-45). Signs and symptoms include witches brooms (a massed dense clump of branches, typically with live foliage), the visual presence of the mistletoe plant (simple or branched shoots, approximately 1 to 4 inches in length), and swellings on the tree stem or branches.

**Note:** If any dwarf mistletoe occurs on the tree, whether it is coded as a damage or not, enter an appropriate code for Mistletoe Class (Item 456, page 10-45).

**Broom rusts (code 27):** Broom rusts are diseases that attack the foliage of true firs and spruce. These diseases form spores on the foliage, and also induce the plant to form growth hormones which distort the growth of the tree and form witches brooms (massed dense clumps of tree branches) often containing dead and diseased branches and needles. Code broom rust as a damage only when numerous brooms occur or when the tree has been deformed by the disease.

## **Damage Definitions** (contd).

**Root Diseases (code 28):** Root disease kills all or a portion of a tree's roots. Quite often, the pathogenic fungus girdles the tree at the root collar. Tree damage includes mortality (often occurring in groups or "centers"), reduced tree growth, and increased susceptibility to other agents (especially bark beetles). General symptoms include resin at the root collar, thin, chlorotic (faded) foliage, and decay of roots.

Examples include Armillaria root disease in all tree species (characterized by white mycelial fans - mats of the fungus - between the bark and wood at the base of the tree), Annosus root disease, primarily on true firs but also infecting pines (characterized by white spongy root rot containing black specks and fruiting bodies of the fungus)

**Foliage Diseases (code 29):** Foliage diseases are caused by fungi and result in needle shed, growth loss, and, potentially, tree mortality. This category includes needle casts, blights, and needle rusts. Examples include Rhabdocline needle cast in Douglas-fir (characterized by numerous brown bands on needles and shed needles causing thinned tree foliage), and snow mold on pines, fir, spruce, and juniper (characterized by gray or black thickly matted needles, killing branches or small trees).

**Fire Damage (code 31).** Fires may cause scarring to a tree stem or bole or may kill foliage in the lower crown without seriously damaging a tree. Record damage for basal scars due to fire only if the cambium on half or more of the bole circumference has been killed. Also code if fire-killed foliage reaches into the upper one-third of the crown.

**Animal Damage (codes 40-48).** Record one of the following codes for damage by either wild or domestic animals. Code only when half or more of the bole circumference has been girdled or stripped, or when browsing or trampling prevent a tree from living to maturity, prevent it from producing marketable products, or reduce the quality of the tree's products (trees 5.0 inches DBH/DRC and larger).

**Unidentified Animal (code 40):** Record this item only if the type of animal (domestic or wild) that caused the damage cannot be determined.

**Domestic Animal (code 41):** Record for damage (e.g., trampling, browsing) that can be attributed to domestic animals (e.g., cows, sheep, horses).

**Porcupine Girdling (code 42):** Record for porcupine damage where one-half or more of the bole diameter has been girdled.

## Damage Definitions (contd).

**Other Wildlife Damage (code 43):** Record for damage by wildlife other than big game or small rabbits and rodents. This includes damage by beavers, etc.

**Big game (code 44):** Record for serious browse damage (i.e., feeding on foliage or bark), trampling, or scraping by elk, moose, deer, or bear.

**Pocket gophers (code 47):** Record for root damage to small trees caused by gophers. Gophers often invade openings or cut-over areas and create a network of feeding tunnels just below the ground surface (these tunnels appear as channels of loosened, raised soil).

**Sapsuckers (code 48):** Sapsuckers are birds that feed on tree sap. Damage is characterized by small wounds in both horizontal and vertical rows, often with oozing resin, on the stem of live trees. Record for damage that occurs over more than 1/2 of the circumference of the stem.

**Atmosphere Damage (codes 50-59).** Record the appropriate code for weather- or pollution-related damage.

**Unidentified weather (code 50):** Record if serious damage can be attributed to a weather problem but the specific type cannot be identified. Describe in the comments column the damage present and the cause of the weather damage, if known.

**Wind (code 51):** Wind may cause serious damage to a tree by breaking numerous branches or the stem/bole, or uprooting the whole tree. Do not code wind damage if another damage (e.g., root rot) was the primary factor affecting or weakening the tree.

**Lightning (code 52):** Lightning damage often appears as long splits, cracks, or spiral scars down the tree bole; this damage may also cause top sections of the tree to be broken off.

## Damage Definitions (contd).

**Snow break or bend (code 53):** Record for snow damage, such as severe bending (primarily small trees) or breakage to the stem/bole or numerous limbs, resulting from avalanches or from the weight of snow on tree limbs.

**Frost crack (code 54):** Frost cracks are long vertical splits on the surface of the tree stem, caused by the cooling and contracting of wood. Frost cracks indicate a structure defect in the wood beneath the crack.

**Drought (code 55):** Drought damage is difficult to determine, but may be identified by widespread foliage damage (wilting, discoloration of new foliage) indicated by yellowing and needle loss.

**Sun scald (code 56):** Sun scald is the death of a portion of the tree bark caused by exposure to the sun during the winter. Sun scald occurs on young trees and on trees newly exposed to direct sun after an opening occurs in the canopy.

**Winter drying or burn (code 57):** Winter burn damage on a tree is caused by adverse weather conditions (an extreme drop in temperature) and is characterized by red and green (new needles) foliage above snow-line and green foliage below snow-line.

**Air pollution (code 58):** Air pollution results in damage to large numbers of trees in the same location. Typically these areas will be in a down-wind location from large industrial sites.

**Flooding (code 59):** Flooding damage may occur near reservoir sites, washes, streams, or rivers and might be identified by features such as water marks or lines on tree boles, exposed roots (due to soil erosion), or uprooted trees.

**Miscellaneous Damage (codes 61, 70-79).** Record one of the following codes for miscellaneous damage.

**Suppression (code 61):** Suppressed trees are characterized by short or nonexistent internodes, gnarled stems, flat crowns, or sparse foliage. For shade-intolerant species such as lodgepole pine, code any indication of suppression. For shade-tolerant species such as spruce, do not code unless the tree is extremely deformed or has no live terminal leader.

## Damage Definitions (contd).

**Unidentified/Unknown (code 70):** Record only if there is serious damage that cannot be identified; describe in the comments column the damage present.

**Excessive Lean (code 71):** Record for trees leaning more than 15° (27 percent) from vertical. Do not record if a more serious damage is present.

**Forked below merchantable top (Code 72):** Record only for timber species, 5.0-inches DBH and larger, with multiple forks below the merchantable top (4.0-inch diameter top, DOB).

**Broken Top (code 73):** Record for timber species broken above 6.0 feet and woodland species with a broken top on the main stem. Do not record if a new terminal leader is present.

**Dead Top (code 74):** Record for trees with a dead terminal leader. Do not record if a new terminal leader is present.

**Wolf Tree (code 75):** A wolf tree is a vigorous timber species with poor growth form, usually larger in diameter than the average tree in the stand, with many large and dead limbs forming a rounded crown not typical of a conifer. Wolf trees are often open grown.

**Unhealthy Foliage (code 76):** Record if a tree has unhealthy foliage or chlorosis (an abnormal yellowing of foliage) and the causal agent (e.g., disease, insect, drought) cannot be identified.

**Heartwood Scar on Bole (code 77):** Record for any scar on the bole that has penetrated the heartwood, if the actual causal agent cannot be determined.

**Forked Above Merchantable Top (code 78):** Record only for under-rotation age timber species, 5.0-inches DBH or larger. Code major forks or multiple stems above merchantable height (4.0-inch diameter top, DOB). Do not use this code for trees that are over-rotation age. Rotation age is 80 years for aspen and paper birch, and 120 years for all other timber species.

**Excessive Crook, Sweep, or Taper (code 79):** Record for timber species trees 5.0-inches DBH and larger that have abnormal diameter to height ratios, or severe sweeps and crooks that will significantly reduce the tree's quality or affect its marketable products.

## **Damage Definitions** (contd).

**Human Damage (codes 80-85)**. Record this code to indicate any tree damage due to logging operations (or related activity) or other human activity.

**Other human (code 80)**: Record this code for damage caused by a human activity not listed under another code. If this code is used, describe in the comments column the damage present.

**Logging (code 81)**: Logging is the felling and extraction of timber. Record this code for severe damage such as partial uprooting, cutting, extensive breakage, or damage to half or more of the bole circumference due to logging activities.

**TSI (code 82)**: Timber stand improvement (TSI) is a term comprising all intermediate cuttings or treatments made to improve the composition, health, and growth of the remaining trees in the stand. Trees removed are often smaller than the minimum sawtimber size. Record for damage caused by TSI activities.

**Land clearing (code 83)**: Land clearing refers to areas where tree land has been converted to non-tree land (e.g., tree land was cleared for homes or pasture). Record for damage caused by land clearing activities such as road building. Damage may be similar to logging.

**Woodland cutting (code 84)**: Record this code for woodland species that have had cutting to stems or branches for use as fuelwood, fence posts, etc.

**Chemical (code 85)**: Chemical damage may result from factors such as the use of salts on roadways, drift from herbicide usage, or spillage from large amounts of fertilizer or other chemicals. Use this code cautiously as it is difficult to determine.

**ITEM**

**455 Cause of Death.**

**MQO:** No errors, 80% of the time.

Record the primary Cause of Death (C.O.D.) for all dead tally trees that qualify as mortality (refer to page 10-7). **Use the damage item code list on pages 10-42 and 43 along with the following additional codes;** however, do not use damage code 00 (no serious damage) or codes 71 through 79. Record the item pertaining to the primary C.O.D. factor:

<u>Additional Codes</u>	<u>Cause of Death</u>
<b>90</b>	<b>Girdling</b> (death resulting from a timber stand improvement, TSI, girdling treatment - bark removed from entire circumference of a tree)
<b>91</b>	<b>Poison</b> (death resulting from TSI poison treatment)
<b>97</b>	<b>TSI - cut and left</b> (trees felled during TSI activities but not removed from the forest)
<b>98</b>	<b>Logging - cut and left</b> (trees felled during a logging operation but not removed from the forest)
<b>99</b>	<b>Logging - cut and removed</b> (trees felled during a logging operation and removed from the forest) - <b>Remeasurement trees only.</b>

**ITEM**

**456 Dwarf Mistletoe Class.**

**MOQ:** ±1 class, 90% of the time.

Rate all live timber-species and pinyon tally trees, 1.0-inch DBH/DRC or larger, for **dwarf mistletoe** (*Arceuthobium* spp.) infection. Dwarf mistletoe occurs on larch, pines (including pinyon), and Douglas-fir (rarely true fir or spruce). Signs and symptoms include witches brooms (a massed dense clump of tree branches, typically with live foliage), the visual presence of the mistletoe plant (simple or branched shoots, approximately 1 to 4 inches in length), and swellings on the tree stem or branches. Code mistletoe as damage (Item 450) for trees with a mistletoe class of 4 or more (unless more serious damages are present).

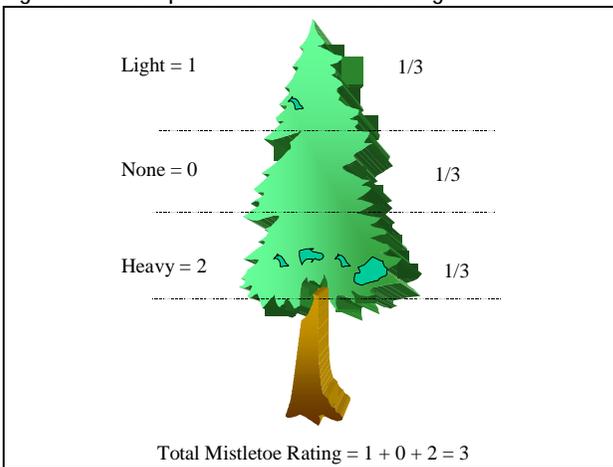
Use the following six-class mistletoe rating procedures:

- Divide live crown into thirds (figure 20);
- Rate each third separately for the amount of infection;

<u>Rating</u>	<u>Amount of Infection (within the third)</u>
<b>0</b>	<b>No visible infection</b>
<b>1</b>	<b>Light infection</b> -- one-half or fewer of the total branches infected
<b>2</b>	<b>Heavy infection</b> -- one-half or more of the total branches infected

- Add the three individual ratings of the thirds to obtain a total mistletoe rating for the tree; enter the total rating as the Mistletoe Class code.

Figure 20. Example six-class mistletoe rating.



## ITEM

### **460- Percent Volume Loss - Rotten and Missing (460),** **462 Sound Dead (461), and Form Defect (462).**

**MQO:**  $\pm 5\%$  for total deductions  $\leq 20\%$ , 90% of the time, and  $\pm 10\%$  for total deductions  $> 20\%$ , 90% of the time.

Using the general Seen Defect Guidelines provided (supplement), along with any other evidence, record the percentage of rotten and missing volume, sound dead volume, and form defect (live timber species only), to the nearest 1 percent, for all tally trees **5.0-inch DBH/DRC** and larger. When estimating volume loss (tree cull) only consider the cull on the merchantable bole/portion of the tree.

Examine the tree first for rotten and missing volume loss, then sound dead volume loss, and finally form defect. Do not "double" volume deduction for an individual section having both form defect and rotten/missing or sound dead volume. If a portion of the tree is both rotten and has form defect, categorize the section as rotten/missing volume only. Likewise, if a section is both sound dead and form defect, categorize the section as sound dead only. The total volume loss will equal 100 percent or less.

The **merchantable bole on a timber species** is defined as the portion of a tree, 5.0-inches DBH or larger, between a 1-foot stump and a 4.0-inch top diameter.

The **merchantable portion of a woodland species** is defined as the portion of a tree, with at least 1 stem 3.0-inches DRC or larger, up to a minimum top diameter of 1.5-inches, and includes all qualifying segments above the place(s) of diameter measurement; do not include sections below the place(s) of diameter measurement. Qualifying segments are stems or branches that are a minimum of 1.0 foot in length and at least 1.5 inch in diameter (at the top). Branches and stems smaller than 1.5 inches in diameter (or portions of branches and stems smaller than 1.5 inches in diameter, such as tips of branches) are **not** included when determining volume loss.

## ITEM

### **460-462 Percent Volume Loss (contd).**

Use the following guidelines to estimate tree cull:

- a. **Timber species, 5.0-inches DBH and larger.** Refer to table 2 and supplemental guidelines to compute volume loss.
- (1) **Rotten and missing volume (Item 460)** loss is often difficult to estimate. 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 when struck with an ax.
  - Large dead limbs, esp. those with frayed ends.
  - Sawdust around the base of the tree.

Regard with suspicion all trees exhibiting any of the characteristics listed above. As a general rule, when boring trees for age and radial growth data, note the presence of any yellow, yellowish brown, or light brown rot on the increment core; this may indicate the presence of butt or stem rot.

Refer to supplemental disease and insect pests field guides as an aid in identifying damaging agents and their impact on volume loss. Refer to appendix C.5 for a guide for estimating circular internal defect (defect deduction table).

- (2) **Sound dead volume (Item 461)** loss can be detected by cutting into a tree with a hatchet and examining the soundness of the wood. Sound dead wood can be caused by insect or animal girdling, lightning or fire damage, etc.
- (3) **Form defect volume (Item 462).** Only consider the form defects (e.g., crooks, sweep, forks) serious enough to reduce the usable merchantable volume of the tree, or prevent the tree from now or prospectively having an 8-foot section.

Table 2. Seen defect

**ITEM**

**460-462 Percent Volume Loss (contd).**

**b. Woodland species tally trees  $\geq$  5.0-inches DRC and at least 1 stem 3.0-inches DRC and larger.**

- (1) **Rotten volume (Item 460)** may be identified by visual evidence of cubical rot, or indirectly detected by a dull hollow sound when the segment is struck by the flat side of a hatchet. Also, if a tree segment is suspected of containing rot, bore into the segment (but only far enough to detect rot), and check the core for punky wood.
- (2) **Missing volume (Item 460)** includes the merchantable portion of the tree that has been cut (e.g., for posts or firewood) or is broken off. If cutting or other damage (fire scar) on a stem is so old that the tree stem or stub has deteriorated or has been replaced with new growth, do not deduct volume for the original loss.
- (3) **Sound dead volume (Item 461)** includes dead volume only in the merchantable portion; dead ends of branches and stems less than 1.5 inches in diameter are not part of the merchantable portion of the tree, and therefore are **not** included in determining percent dead volume. Be careful not to overestimate dead volume for trees with numerous dead branch tips.

**If Rotten and Missing defect is 10% or more, use one of the following damage codes, as appropriate:**

- |                                      |                                    |
|--------------------------------------|------------------------------------|
| 20 – Other and Unidentified diseases | 54 – Frost crack                   |
| 21 – Stem rusts                      | 70 – Unidentified/unknown damage   |
| 22 – Stem and butt rots              | 73 – Broken top                    |
| 23 – Cankers                         | 77 – Heartwood scar on bole        |
| 28 – Root diseases                   | 80 – Other Human                   |
| 31 – Fire                            | 81 – Logging                       |
| 50 – Unidentified weather            | 82 – Timber stand improvement -TSI |
| 51 – Wind                            | 83 – Land clearing                 |
| 52 – Lightning                       | 84 – Woodland cutting              |
| 53 – Snow break or bend              |                                    |

**ITEM**

**460-462 Percent Volume Loss (contd).**

**If Sound Dead defect is 10% or more, use one of the following damage Codes, as appropriate:**

- |                                      |                                  |
|--------------------------------------|----------------------------------|
| 11 – Bark beetles                    | 54 – Frost crack                 |
| 15 – Mountain pine beetle            | 55 – Drought                     |
| 16 – Ips engraver beetle             | 56 – Sun scald                   |
| 20 – Other and Unidentified diseases | 57 – Winter drying or burn       |
| 23 – Cankers                         | 58 – Air pollution               |
| 31 – Fire                            | 59 – Flooding                    |
| 40 – Unidentified Animal             | 70 – Unidentified/unknown damage |
| 41 – Domestic animal                 | 73 – Broken top                  |
| 42 – Porcupine girdling              | 74 – Dead top                    |
| 43 – Other wildlife                  | 77 – Heartwood scar on bole      |
| 44 – Big game                        | 80 – Other Human                 |
| 48 – Sapsuckers                      | 81 – Logging                     |
| 50 – Unidentified weather            | 85 – Chemical                    |
| 52 – Lightning                       |                                  |

**If Form defect is 10% or more, use one of the following damage codes, as appropriate:**

- |                                      |                                    |
|--------------------------------------|------------------------------------|
| 23 – Cankers                         | 70 – Unidentified/unknown damage   |
| 26 – Dwarf mistletoe – Rating of 4-6 | 71 – Excessive lean                |
| 31 – Fire                            | 72 – Forked below merchantable top |
| 42 – Porcupine girdling              | 75 – Wolf tree                     |
| 50 – Unidentified weather            | 78 – Forked above merchantable top |
| 51 – Wind                            | 79 – Excessive crook, sweep, taper |
| 53 – Snow break or bend              | 80 – Other Human                   |
| 59 – Flooding                        | 81 – Logging                       |
| 61 – Suppression                     |                                    |

## ITEM

### 463 Past Tree Class.

**MQO:** No errors 80% of the time.

Record only for trees qualifying as mortality. Estimate the live tree class immediately prior to death (see sound, rough, and rotten below).

### 464 Current Tree Class.

**MQO:** No errors 90% of the time.

Record a Current Tree Class code for all tally trees and nontallied site trees. Base the Tree Class code on the information collected in Items 460, 461, and 462.

#### Code Tree Class

#### 1 **Sound (live) - timber species**

- a live sapling (1.0- to 4.9-inches DBH), with minor or no evidence of form defects, insects, or disease, that is expected to become a sound tree 5.0-inches DBH or larger with good form and vigor.
- a live tree, 5.0-inches DBH or larger, that has less than 67 percent of the merchantable volume cull, and contains at least one solid 8-foot section (now or prospectively for poletimber sized trees), reasonably free of form defect, on the merchantable bole.

#### 2 **All live woodland species**

#### 3 **Rough (live) - timber species**

- a live sapling (1.0- to 4.9-inches DBH) with form defects or evidence of insects and disease that will preclude it from becoming a sound tree of good form, 5.0-inches DBH or larger.
- a live tree, 5.0-inches DBH or larger, with 67 percent or more of the merchantable volume cull, and more than half of this cull due to sound dead wood volume loss or severe form-defect volume loss.
- a live tree, 5.0-inches DBH or larger, that does not now, nor prospectively, have at least one solid 8-foot section, reasonably free of form defect, on the merchantable bole.

**ITEM**

**464**      **Current Tree Class** (contd).

Code   Tree Class

- 4    Rotten (live) - timber species**
  - a live tree, 5.0-inches DBH or larger, with 67 percent or more of the merchantable volume cull, and more than half of this cull due to rotten and/or missing volume loss.
  
- 5    Hard dead**
  - a standing or down dead tree, 1.0-inch DBH/DRC or larger, that has a minimum of 33 percent of the original merchantable volume sound (less than 67 percent rotten and/or missing).
  
- 6    Soft dead**
  - a standing or down dead tree, 1.0-inch DBH/DRC or larger, that has less than 33 percent of the original merchantable volume sound (more than 67 percent rotten and/or missing).

**470**      **Posts - Lines (470) and Corners (471).**

**471**

**MQO:** No errors 90% of the time.

Examine all **woodland juniper and woodland oak** tally trees (live or dead) for fence post products. Line posts are placed along a straight length of fence line to keep the fence strands separated. A corner post is a larger segment used to anchor the fence at selected locations along the fence line, such as a bend or corner.

The criteria for posts are as follows:

- a.   Corner posts:**
  - 8.0 feet minimum length.
  - 7.0 - 9.0 inches diameter at butt (large) end.
  - 2.5 inches minimum diameter at small end.
  - Reasonably straight and solid.
  
- b.   Line posts:**
  - 7.0 feet minimum length.
  - 5.0 - 7.0 inches diameter at butt (large) end.
  - 2.5 inches minimum diameter at small end.
  - Reasonably straight and solid.

**ITEM**

**470/471 Posts** (contd)

Record the number of corner and line posts per tally tree. Include qualifying stems and large branches. Ignore portions of butt segments larger than 9.0 inches in diameter; however, count any posts that occur above a large butt segment. Include down stem segments, from stems that have been measured for DRC, if the downed segment meets the post criteria. Consider corner posts first. Do not double record the same segment as a corner and line post. Record 0 if there are none.

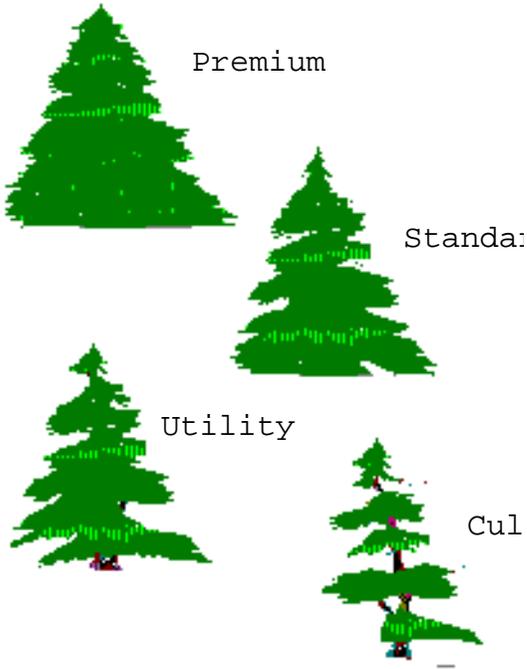
**472 Christmas Tree Grade.**

**MQO:**  $\pm 1$  class 90% of the time.

Record one of the following one-digit codes for live **pinyon** tally trees, **12 feet or shorter in height**. Refer to figure 21 for illustrations of the following grades:

<u>Code</u>	<u>Grade</u>
1	<b>Premium</b> -- excellent conical form with no gaps in branches; trees have a straight stem/bole.
2	<b>Standard</b> -- good conical form with small gaps in branches; trees are bent or slightly malformed.
3	<b>Utility</b> -- conical in form with branches missing; trees are bent or malformed.
4	<b>Cull</b> -- not meeting one of the above classifications. Poor conical form; large gaps in branches; may have more than one stem.

Figure 21. Christmas tree grades for pinyon.



## CHAPTER 11 - UNDERSTORY VEGETATION DESCRIPTION

This chapter gives instructions for the Understory Vegetation Description sample and for recording the presence of noxious weeds. The description sample provides information about the horizontal and vertical distribution, cover, diversity, and composition of the understory vegetation. Cover of the life forms is routinely summarized and tabled for standard reporting. Some other uses for the understory data include estimation of habitat, biomass, and forage availability. Refer to appendix A.6 for the Understory Vegetation Description record.

For locations in the "Range Land Pilot Unit": If the subplot center falls into a water or nonsampled tree land condition class (refer to chapter 3), leave Part I of this description blank, and record 999 for each entry in Part II.

For all other locations, no understory vegetation data will be collected if the subplot center is located in non-tree land, non-census water, census water, or non-sampled tree land.

When all or part of the vegetation sample cannot be determined due to snow cover, write "snow" in the General Comments and in the notes area on the vegetation description record. For any cover in Part II (below) that cannot be determined due to deep snow, record 999; do not record 0, which means "no cover".

**MQO:** Plant identification - genus no errors 90% of the time  
- species no errors 85% of the time  
Layer - no errors 90% of the time  
Cover  $\pm 10\%$ , 90% of the time.

### A. Sample Subplot Size

For each of the subplots, estimate and record understory vegetation data for the 1/24-acre subplot (24.0-foot radius). If a portion of one of the 1/24-acre subplots is not in the condition class of the subplot center (i.e., in a contrasting condition class), determine understory cover percentages based only on the portion of the subplot within the subplot center condition class.

## B. Sample Identification

On the Understory Vegetation Description, record the appropriate codes for the header items listed below:

1. State
2. Map Number
3. Consecutive Point Number (CPN)
4. County
5. Field Location Number
6. Subplot Number
7. Subplot Center Condition Class Number

## C. Vegetation Description

Part I is an assessment of the major species that have at least 5 percent cover. List the predominant species (a maximum of four per plant group) within each plant group heading (e.g., tree, shrub) by the appropriate plant alphanumeric code and record a percent cover and a code for vegetation layer (as described below).

Part II is an assessment of the plant groups by layer: 0-1.5 feet, 1.6-6.0 feet, and  $\geq 6.1$  feet. Assign a percent cover to each plant group that occurs within each layer.

### 1. General Definitions.

- a. **Plant groups.** The vegetation is divided into four growth forms or plant groups; these groups are trees, shrubs, forbs, and graminoids, and are defined as follows (classify each species into one category):
  - **Trees:** This category includes
    - (1) seedlings and saplings of both timber and woodland tally species (refer to page 10-9 and 10),
    - (2) tree species of any size defined as "other tree species" (those defined by Little, 1979, as trees but not listed as tally species on pages 10-9 and 10, such as ash, willow, etc.); refer to appendix D for the tree species list; and
    - (3) tally species trees exhibiting shrub growth form (refer to chapter 5).

- **Shrubs:** Woody, multiple-stemmed plants, of any size, except species designated as trees above. Most cacti are included in this category.
  - **Forbs:** Herbaceous, broad-leaved plants; includes vines, ferns (does not include mosses and cryptobiotic crusts).
  - **Graminoids:** Grasses and grass-like plants (includes rushes and sedges).
- b. **Percent cover.** Crown canopy cover is defined as the area of ground surface covered by a vertical projection of the canopy of a plant. Estimate cover to the nearest 1 percent of crown canopy by species in Part I and for entire plant groups in Part II.

To record an individual species in Part I, it must have at least 5 percent cover; a circle 5.4 feet in radius or a square 9.5 feet on a side would represent 5 percent of the total 1/24-acre subplot (24.0-foot radius). The area estimate of 5 percent will be smaller if more than one condition occurs on the subplot.

**Note regarding dead vegetation:** Do not include cover by a dead shrub, or portion of a dead shrub (that will not recover) in cover estimates. However, cover should be estimated for the current season's annual forbs and grass species that have already died. Perennial forbs and grasses may also appear dead, but are actually in an inactive or dormant stage -- these plants should also be included in the cover estimates.

- c. **Layer codes.** One of the following Layer codes will be assigned to individual plant species in Part I and to plant groups in Part II.

<u>Layer</u>	<u>Code</u>	<u>Item</u>
	1	<b>Layer 1</b> (0-1.5 feet)
	2	<b>Layer 2</b> (1.6-6.0 feet)
	3	<b>Layer 3</b> (≥ 6.1 feet)

The 1.5- and 6.0-foot boundaries should be considered approximate. For example, visualize layer 1 as graminoids, forbs, and low shrubs that occur (general height) below your knee. Layer 2 includes plants that occur between knee and eye level, possibly grasses or forbs, but usually medium shrubs. Layer 3 includes plants occurring above eye level and would usually consist of seedlings, saplings, and tall shrubs only.

**Note:** For unusual circumstances that may occur (e.g., an entry for a forb or graminoid in Layer 3), include a note at the bottom of the vegetation form to verify the entry.

## 2. Entries to be Recorded.

a. **Understory Vegetation Description record -- Part I (Species List by Cover and Layer).** For recording purposes on the Understory Vegetation Description record, start with the first space (or block) under each plant group heading. Do not leave blank spaces above or between individual species listed.

- (1) **Species.** In the appropriate plant group column, record up to four plant species (the most dominant) that have 5 percent cover or greater, occurring on the 1/24-acre subplot. Record the alphanumeric code for the plant, as listed in the PLANTS<sup>a</sup> data base. Record all alphanumeric codes in **capital letters** to avoid possible misinterpretation of a small letter. Also, record the entire alphanumeric code listed in the PLANTS handbook.

For field use, many of the plants and associated codes for a particular State or region are summarized on a "common plant" code list(s). These codes have been taken directly from the PLANTS handbook. If a plant is not listed on the "common plant" code list, first check to see if it is listed in the PLANTS handbook. If the alphanumeric code for a certain plant species is not listed in the PLANTS handbook, record an abbreviation for that plant species using the first two letters of both the genus and species followed by an asterisk (\*), and write out the abbreviation and the scientific name at the bottom of the vegetation form. For example, the hypothetical plant "Plantus exampleis" would be coded as "PLEX\*".

Use the "?" symbol for species that can be identified in the field, but the scientific name or code must be identified at camp; for example "?RedBrome."

<sup>a</sup> USDA, Natural Resources Conservation Service. 1994. The PLANTS data base. Ecological Sciences Division, Washington D.C.

Some plants require identification only to the genus level. When multiple species in one genus occur together on a subplot, but the actual species name is not known, and the genus is either a graminoid or other genus where species identification is not required, the multiple species can be lumped in one genus record.

For example, a crew encounters multiple species of the genus *Poa* but cannot confidently identify the different species. All of the species' crown canopy cover would be combined and listed under the genus *Poa*. There will be no way to determine how many individual species made up the genus during data processing.

However, field crew supervisors are responsible for identifying **indicator plants**, used for habitat typing, to the species level (even if some of the indicators are in one of the genera listed below).

Plants coded to the genus level are as follows:

#### Grasses

**All Grasses** – except habitat type indicators (these must be identified to the species level).

#### Forbs

**Allium spp. (ALLIU)** -- onion

**Aster spp. (ASTER)** -- aster

**Astragalus spp. (ASTRA)** -- locoweed, milkvetch,  
poisonweed

**Castilleja spp. (CASTI2)** -- paintbrush

**Cirsium spp. (CIRSI)** -- thistle

**Erigeron spp. (ERIGE2)** -- fleabane, daisy

**Lupinus spp. (LUPIN)** -- lupine

**Trifolium spp. (TRIFO)** -- clover

**Viola spp. (VIOLA)** -- violet

#### Shrubs

**Rosa spp. (ROSA5)** -- wild rose

In the event a qualifying plant species cannot be identified to the species level:

- Record "UNKN1" in the species column for the first unknown, "UNKN2" for the second unknown, and so forth. Each unknown on a field location will have a different unknown number, even if unknowns are from various species groups.
- Collect a sample of the unknown to be sent to the office (refer to page 11-11).

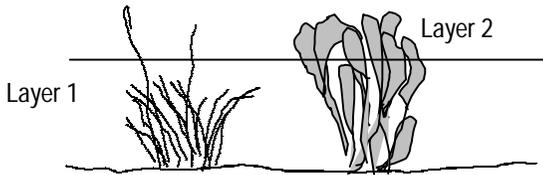
When multiple species exist for plants requiring identification to the genus level only, but the actual species is not known, the multiple species will be lumped and considered one at the genus level.

For example, a crew encounters multiple species of the genus *Poa* but cannot confidently identify the different species. All the species' crown canopy cover would be combined and listed under the genus *Poa*. However, there will be no way to determine how many individual species make up the genus.

**Note:** When the vegetation cannot be determined due to snow cover, describe the situation in notes/comments, but **do not record snow as a species in Part I.**

- (2) **Species canopy cover.** For each individual plant species that makes up at least 5 percent cover, estimate and record crown canopy coverage to the nearest 1 percent. Crown canopy cover is identified as the area of ground surface covered by, in this case, the canopy of each plant species.
- (3) **Species vegetation layer.** For each individual plant species recorded, assign one of the vegetation layers (page 11-3). These layers illustrate the vertical diversity of the 1/24-acre subplot.

In this part (Part I), a plant species can be assigned only one vegetation layer; if a plant species is found in more than one layer, assign the layer where the bulk of the species height occurs. If a plant species occurs equally in more than one layer, record the highest layer where it occurs.



- b. Understory Vegetation Description record -- Part II (Plant Group Cover by Layer).** In this part (Part II), determine a total crown canopy coverage by layer for each plant group, and record to the nearest 1 percent.

Crown canopy cover is identified as the area of ground surface area covered by, in this case, the canopy of each plant group occurring in each of the three layers. Plant groups recorded in each layer will include plants whose heights end in that layer. If a plant group does not end (top out) within a layer, record 0 for the Cover code. Record 1 for plant groups occupying a trace to 1 percent cover.

One plant species may be represented on the 1/24-acre subplot by plants growing in two layers. In Part I, because each plant species could be assigned only one layer, the layer where the bulk of the species occurs is recorded. However, in Part II, species detail is not a consideration; **different plants of the same species that occur in more than one layer can be assigned to the different layers.** For example, sagebrush plants may occur with heights ranging from 1.0 foot to 5.0 feet. Individual plants, with heights between 0 and 1.5 feet, would be assigned to layer 1; individual plants, with heights between 1.6 and 6.0 feet, would be assigned to layer 2.

**Note:** Although different plants of the same species can be divided into more than one layer, parts of an individual plant (e.g., upper half, lower half) cannot be assigned to different layers.

For the total cover, examine the total canopy cover of each lifeform as if the other lifeforms do not exist. Do not double count overlapping layers within a lifeform. The total cover for a specific lifeform must be equal to or greater than the highest cover recorded for an individual layer in that lifeform, and it must be equal to or less than the sum of the covers recorded for all the layers in that lifeform.

This portion (Part II) of the vegetation sampling procedure documents lifeform cover for plants that were too insignificant to record by species (in Part I) but contribute to vegetation cover when grouped together.

Where snow cover obscures the sample, record 999 for cover in the appropriate group layers. If 999 is recorded in any individual layer, the total cover of that group must be 999.

Refer to figure 22 for an example of a completed Understory Vegetation Description record.

#### D. Noxious Weeds

At each subplot, examine the vegetation within the subplot fixed-radius area for the presence of any designated noxious weeds. Record the species code for any identified weeds, and indicate the subplot number(s) where the plant was found. The list of designated noxious weeds for the Rocky Mountain States (Jan 1997) is as follows:

<u>Code</u>	<u>Common Name</u>	<u>Scientific Name</u>
ACRE3	Russian knapweed	Acroptilon repens
AECY	Jointed goatgrass	Aegilops cylindrica
ARAB3	Absinth wormwood	Artemisia absinthium
AMTO3	Skeletonleaf bursage	Ambrosia tomentosa
ANAR6	Scentless chamomile	Anthemis arvensis
ARM12	Common burdock	Arctium minus
AVFE	Wild oats	Avena fatua
CAAC	Plumeless thistle	Carduus acanthoides
CANU4	Musk thistle	Carduus nutans
CARDA2	Hoary cress genus	Cardaria spp.
CACH10	Cardaria	Cardaria chalapensis
CADR	Pepperweed whitetop	Cardaria draba
CADR	Heartpod hoarycress	Cardaria draba ssp. draba
CAPU6	Hairy whitetop	Cardaria pubescens
CASA3	Hemp, marijuana	Cannabis sativa
CEBI2	Spotted knapweed	Centaurea biebersteinii
CEDET	Meadow knapweed	Centaurea debeauxii spp. thuillieri
CEDI3	Diffuse knapweed	Centaurea diffusa
CESO3	Yellow starthistle	Centaurea solstitialis
CETR8	Squarrose knapweed	Centaurea triumfettii

<u>Code</u>	<u>Common Name</u>	<u>Scientific Name</u>
CHJU	Rush skeletonweed	Chondrilla juncea
CIAR4	Canada thistle	Cirsium arvense
COAR4	Field bindweed	Convolvulus arvensis
COMA2	Poison hemlock	Conium maculatum

CRVU2	Common crupina	<i>Crupina vulgaris</i>
CYDA	Bermudagrass	<i>Cynodon dactylon</i>
CYOF	Houndstongue	<i>Cynoglossum officinale</i>
CYSC4	Scotch broom	<i>Cytisus scoparius</i>
ELRER	Quackgrass	<i>Elytigia repens</i> var. <i>repens</i>
EUDE4	Toothed spurge	<i>Euphorbia dentata</i>
EUES	Leady spurge	<i>Euphorbia esula</i>
HIAU	Orange hawkweed	<i>Hieracium aurantiacum</i>
HICA10	Yellow hawkweed	<i>Hieracium caespitosum</i>
HYNI	Black henbane	<i>Hycoscyamus niger</i>
HYPE	St. Johnswort	<i>Hypericum perforatum</i>
ISTI	Dyer's woad	<i>Isatis tinctoria</i>
LELA2	Perennial pepperweed	<i>Lepidium latifolium</i>
LEVU	Oxeye daisy	<i>Leucanthemum vulgare</i>
LIDA	Dalmation toadflax	<i>Linaria dalmatica</i>
LIVU2	Toadflax	<i>Linaria vulgaris</i>
LYSA2	Purple loosestrife	<i>Lythrum salicaria</i>
MIVE3	Milium	<i>Milium vernale</i>
NAST3	Matgrass	<i>Nardus stricta</i>
ONAC	Scotch thistle	<i>Onopordum acanthium</i>
PAMI2	Wild proso millet	<i>Panicum miliaceum</i>
PORE5	Sulphur cinquefoil	<i>Potentilla recta</i>
SEJA	Tansy ragwort	<i>Senecio jacobaea</i>
SOAL	Perennial sorghum	<i>Sorghum alnum</i>
SOAR2	Perennial sowthistle	<i>Sonchus arvensis</i>
SOCA3	Horsenettle	<i>Solanum carolinense</i>
SOEL	Silverleaf nightshade	<i>Solanum elaeagnifolium</i>
SOHA	Johnsongrass	<i>Sorghum halapense</i>
SORO	Buffalobur	<i>Solanum rostratum</i>
TACA8	Medusahead	<i>Taeniatherum</i> <i>caput-medusae</i>
TAVU	Common tansy	<i>Tanacetum vulgare</i>
TRTE	Puncturevine	<i>Tribulus terrestris</i>
ZYFA	Syrian beancaper	<i>Zygophyllum fabago</i>

Figure 22. Example of a completed understory vegetation description record.

UNDERSTORY VEGETATION DESCRIPTION															Feb-00																								
STATE		04		MAP		811		CPN		147																													
COUNTY		15		LOC#		21																																	
SUBPLOT	PART I				TREES				SHRUBS				FORBS				GRASS																						
	C	O	V	E	R	L	A	Y	E	R	C	O	V	E	R	L	A	Y	E	R	C	O	V	E	R	L	A	Y	E	R	C	O	V	E	R	L	A	Y	E
	SPECIES		XXXXX	XXX	X	SPECIES		XXXXX	XXX	X	SPECIES		XXXXX	XXX	X	SPECIES		XXXXX	XXX	X	GROUP		COVER LAYER 1 (0-1.5 feet)	COVER LAYER 2 (1.5-6 feet)	COVER LAYER 3 (> 6 feet)	TOTAL COVER (AERIAL VIEW)													
1	1	PIFL2	45	3	MARE11	12	1	DESC	25	1												XXX	XXX	XXX	XXX														
		JUSC2	10	2	ROSAS	6	2	UNKN1	8	1																													
2	2	JUSC2	6	2	MARE11	6	1	DESC	7	1	UNKN2	20	1																										
					AMUT	5	2				MUEM	15	1																										
3	1	PIFL2	11	3							BOGR2	11	1																										
											MUEM	8	1																										
4	1	PIFL2	5	3	ROSAS	8	1	UNKN3	5	1																													
<p>PART I - Do not include species with &lt; 5% cover                      5% of a 1/24-acre subplot entails a circle with radius 5.4 ft.                      Part II - code 999 for snow</p> <p>NOTES:</p> <p>UNKN1 GOLDENROD?</p> <p>UNKN2 POSSIBLY BOER4</p> <p>UNKN3 LARGE HEARTSHAPED LEAVES, BASAL</p>															NOXIOUS WEEDS																								
SPECIES															PRESENT ON SUBPLOT? (Y OR N)																								
(XXXXXX)															1	2	3	4																					
EXTC															N	Y	N	N																					

## **E. Instructions for Collecting Plant Sample "Unknowns"**

If a qualifying plant species cannot be identified in the field, do the following:

1. **Collect Sample.** Collect as good a sample as possible -- include roots, leaves, flowers, more than one leaf blade and inflorescence for graminoids, etc. Also, collect more than one specimen of the plant to be identified. Place the unknown in a plastic cover, with a piece of paper for absorbency, and place the cover in a tatum or book so that the sample remains pressed. Do not place the sample in a field vest pocket or lunch bag for it is likely to be crumpled or ruined and may no longer be suitable for identification.
2. **Fill Out an Unknown Identification Document (ID slip).** These forms are located in the notebook included with the plant press. Fill out a form with the following information:
  - State code.
  - County code.
  - Field location number.
  - The subplot number(s) where the unknown was found.
  - The unknown number (e.g., UNKN1, UNKN2); each unknown on a field location must have a unique unknown number.
3. **Place Sample in Camp Plant Press.** It is important that the unknown samples be dried and pressed. After arriving back at camp, carefully take the unknown sample out of the plastic cover (do not leave the unknown samples in the plastic cover overnight). Place the unknown sample in a standard size sheet of newspaper, attach the unknown identification slip, and place the newspaper in the camp plant press.

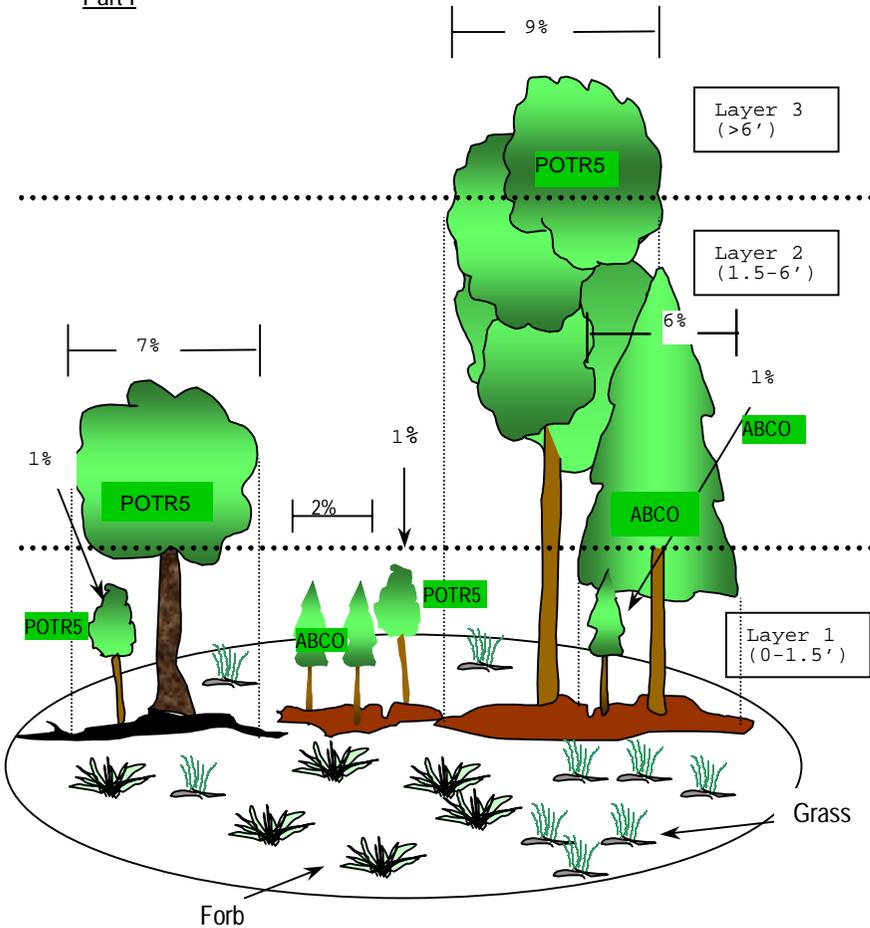
**Note:** Do not put tape directly on plant samples, and do not store plant presses outdoors or in an unprotected location.

After the camp plant press is full, the field supervisor will collect the samples and return them to the office.

**Reserved locations:** No personal flora or fauna collection is permitted on Wilderness lands. Collections are for scientific or educational purposes only, dedicated to public benefit, and may not be used for personal or commercial profit. All collections for scientific purposes must be approved by the RHWR Wilderness Manager. No archeological or vertebrate paleontological materials may be collected.

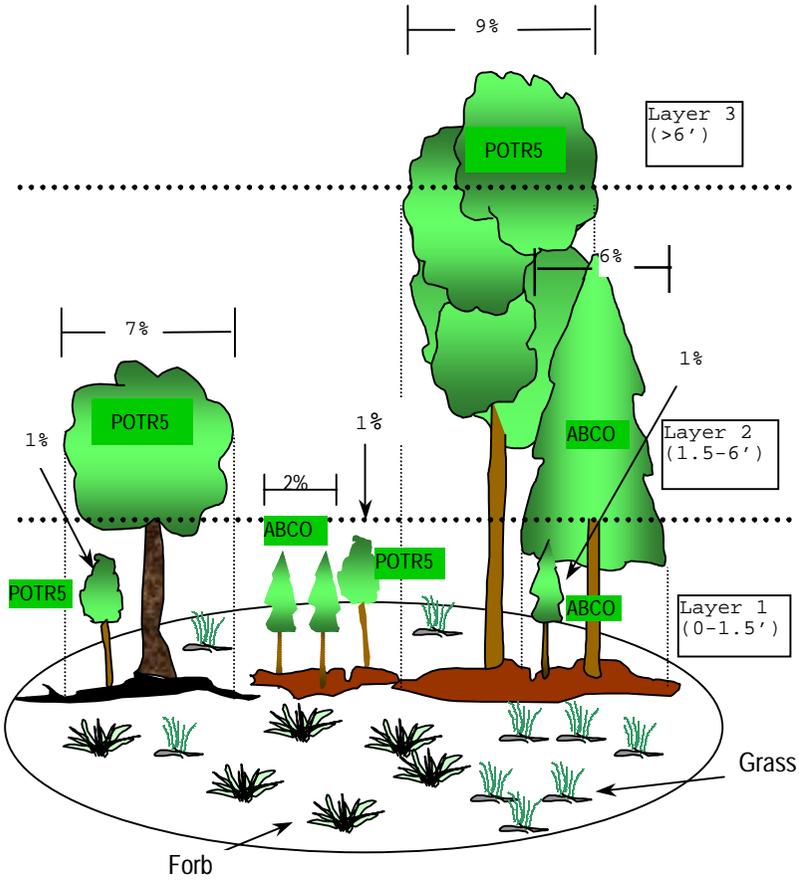
## UNDERSTORY VEG EXAMPLES

Part I



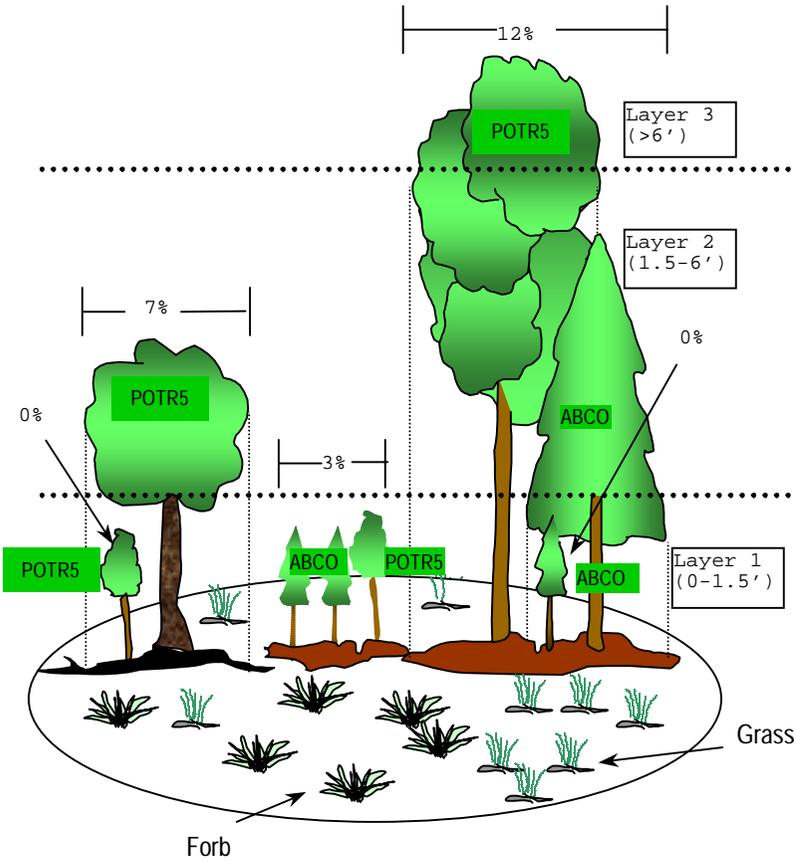
TREES			SHRUBS			FORBS			GRASS		
SPECIES	COVER	LAYER									
POTR5	18	2				ARCO9	5	1	POPR	5	1
ABCO	9	2									

Part II



Group	Layer 1 (0-1.5')	Layer 2 (1.5 - 6')	Layer 3 (>6')
Trees	5	13	9
Shrubs	0	0	0
Forbs	5	0	0
Grass	5	0	0

Part II (Total Cover / Aerial View)



Group	Total Cover (Aerial View)
Trees	22
Shrubs	0
Forbs	5
Grass	5

## CHAPTER 12 - ACCOUNTING PROCEDURES

For this inventory, a portion of the field locations measured during previous inventories may be revisited. In addition to the current location layout and sampling procedures for sampling trees, previously tallied trees on these locations will be remeasured using the original location layout and sampling procedures. The location center (LC) will be the same point for both samples.

If the field location was not established at the correct map point during the previous inventory, determine whether the location placement meets the following criteria:

- The old plot was established in the correct condition class (refer to chapter 3).
- The old plot was established within 500 feet of the correct map point.
- The plot was not a "shifted" woodland plot.

If the old location meets all of the criteria; **account** for the trees and saplings on the old location, remove the tags and nails from old plot design trees not re-tallied in the current inventory, and establish the new plot layout at the old location center.

If the old location does not meet all of the criteria, **account** for the trees and saplings on the old plot as instructed in this chapter, but establish the current plot layout in the correct location. Remove the old tags and nails in the trees, but note this re-location in the notes/comments for the current inventory. **Note:** In the first inventory, some fixed-radius plots were "shifted" away from nonforest land, moving the entire sample plot into accessible forest land. For these locations establish the current design in the correct (grid) location.

### A. Plot Layout

In the previous inventory, the Sampling Factor designated the plot layout and sampling system used. For field locations with the Sampling Factor coded as a 20 or 40, a 5-point or 10-point cluster was established, and variable-plot sampling techniques were employed. On locations with the Sampling Factor coded as 01, 02, 05, 91, 92, or 95, a fixed-radius woodland plot was established. For these fixed-radius woodland plots **DO NOT ACCOUNT FOR TREES OR SAPLINGS**. However, the new plot layout will be established at the old location center (provided the old location was established in the correct condition class, was established within 500 feet of the correct map point, and was not a "shifted" woodland plot).

1. **Variable-Radius Plots.**

The LC was designated as point 1 of 5 or 10 points on the field location. Points 2 through 5 or 10 were distributed around the LC, and within the condition of the LC, using a triangular grid pattern with 100-foot or 70-foot intervals (figure 23). The spacing and orientation of the primary point positions was as follows:

<u>5-point layout</u>	Primary Point	Azimuth (degrees)	and Distance (feet)
from LC (1) to	2	60	100
	3	120	100
	4	300	100
	5	240	100

<u>10-point layout</u>	Primary Point	Azimuth (degrees)	and Distance (feet)
from LC (1) to	2	360	70
2 to	3	360	70
3 to	4	120	70
4 to	5	180	70
5 to	6	180	70
6 to	7	240	70
7 to	8	300	70
8 to	9	360	70
9 to	10	360	70

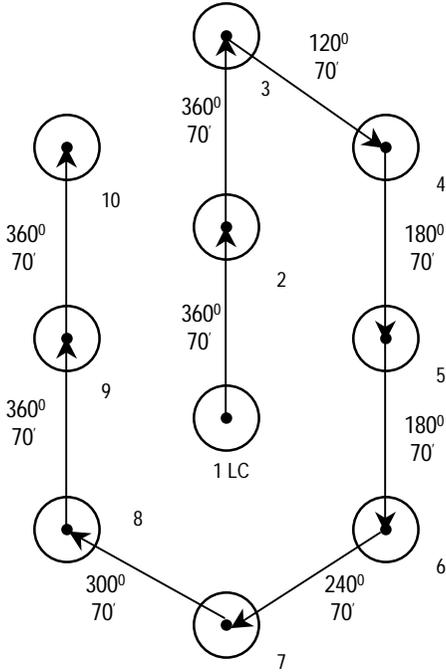
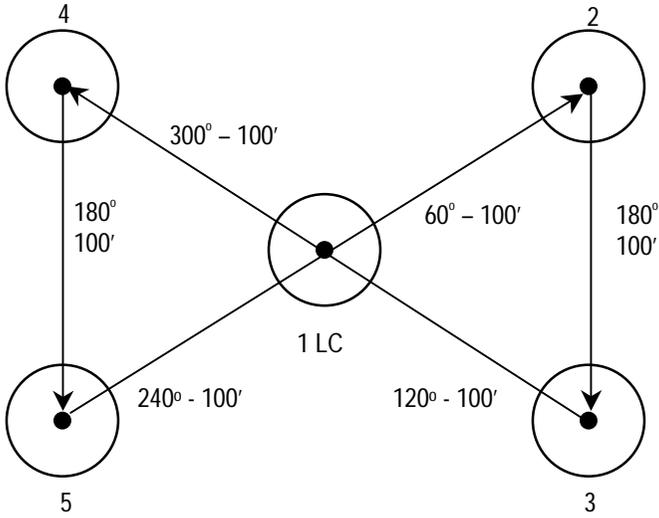
In the previous inventory, when points 2 through 5 or 10 fell into vegetation conditions different than the condition at the LC, those points were redistributed back into the LC condition. Refer to the previous field location map to determine the actual point placement established.

At each of the points, timber species trees 5.0-inches DBH and larger, and woodland species trees 3.0-inches DRC and larger, were tallied on a variable-radius main plot; a 20 or 40 basal area factor (BAF) angle gauge, depending on forest type, was used to select tally trees:

<u>Sampling Factor</u>	<u>Basal Area Factor</u>	<u>Forest Types</u>	<u>Limiting Distance to Geographic Center</u>
20	20	Ponderosa pine	DBH/DRC X 1.945
40	40	All other conifer	DBH/DRC X 1.375

In addition, saplings were tallied or counted, and seedlings were counted, on a 1/300 acre fixed-radius microplot centered on the point stake.

Figure 23. Previous variable-radius plot layout.



2. **Fixed-Radius Plots.**

**WOODLAND FIXED-RADIUS PLOTS WILL BE RELOCATED, BUT NO TREE ACCOUNTING INFORMATION WILL BE COLLECTED.** The following information on fixed-radius plots is provided to aid in relocation of the plots.

a. **All States Except Colorado and Wyoming.**

In general, fixed-radius plots were used to sample locations consisting of woodland tree species; however, some inventories used fixed-radius plots to sample locations consisting of timber species.

The LC was the center point of a fixed-radius plot. One of the following fixed-radius plots (figure 24) was used in the previous inventory to sample trees; refer to the Sampling Factor on the old form:

<u>Prev. Sample Factor</u>	<u>Plot Size (acre)</u>	<u>Plot Radius (feet)</u>	<u>General Grouping of Forest Types, Cover</u>
92	1/20	26.3	oak, $\geq$ 30% cover
91	1/10	37.2	oak, < 30% cover, or all others, $\geq$ 30% cover
95	1/5	52.7	all others, < 30% cover

The fixed-radius main plot was divided into four quadrants (points):

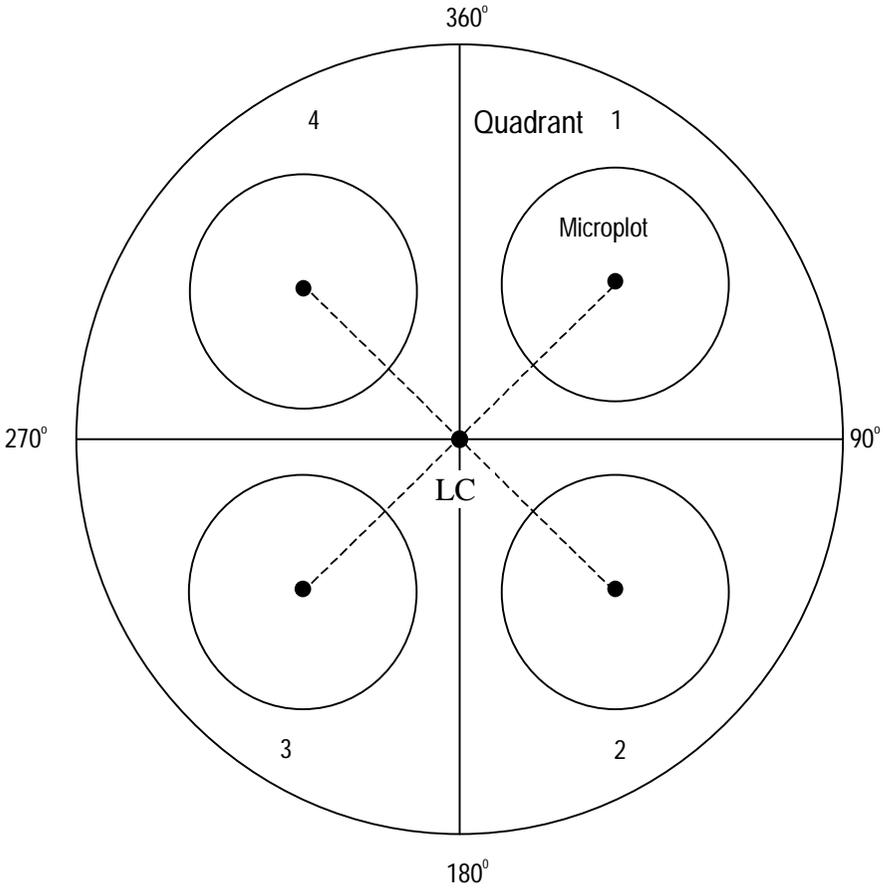
<u>Quadrant</u>	<u>Tree Azimuth Range</u>
1	1 to 90 degrees
2	91 to 180 degrees
3	181 to 270 degrees
4	271 to 360 degrees

In each quadrant a 1/300-acre (6.8-foot radius) seedling/sapling microplot was established to sample regeneration and was located in the direction and distance from the LC as follows:

<u>Quadrant</u>	<u>Azimuth (degrees)</u>	<u>Distance (feet)</u>	
		<u>1/5, 1/10-acre</u>	<u>1/20-acre</u>
1	45	25	15
2	135	25	15
3	225	25	15
4	315	25	15

Figure 24. Previous fixed-radius plot layout (all states except CO/WY).

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**b. Colorado and Wyoming Only.**

Fixed-radius plots were previously established in Colorado and Wyoming on all locations classified as Nonreserved Woodland or Developed Woodland.

One of the following fixed-radius plot sizes (figure 25) was used to sample woodland trees 3.0 inches DRC or larger and timber species 5.0 inches DBH or larger; refer to the Sampling Factor on the old form:

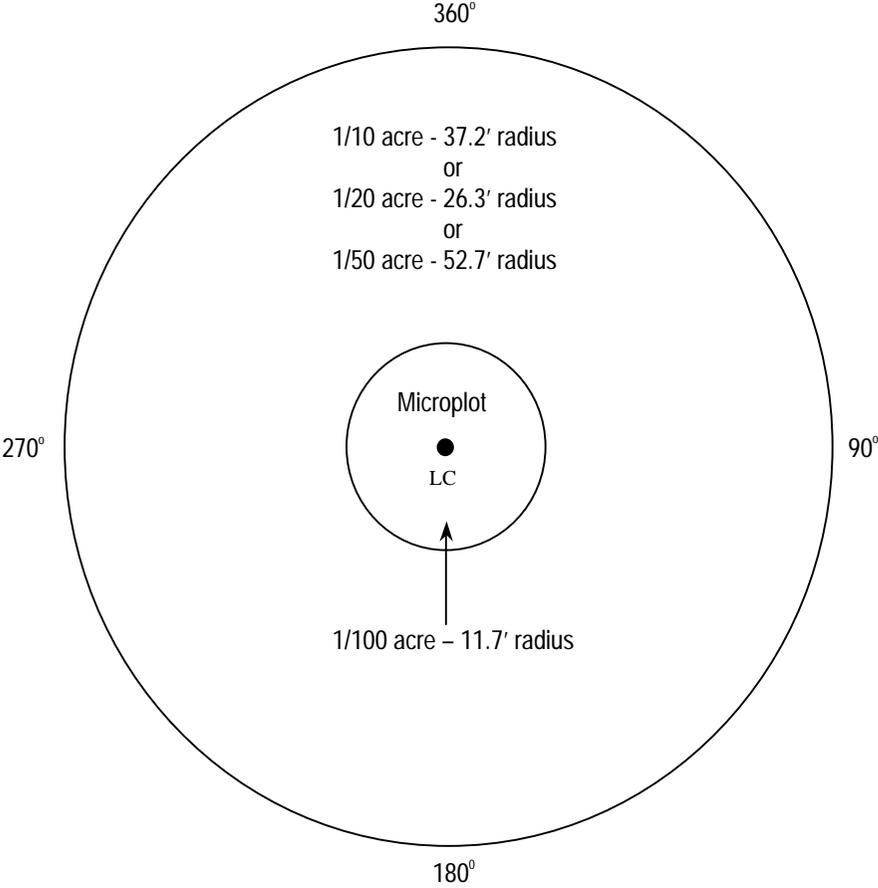
Prev. Sample Factor	Plot Size (acre)	Plot Radius (feet)
01	1/10	37.2
02	1/20	26.3
05	1/5	52.7

A 1/10-acre plot was used for woodland plots with a Forest Type classified as pinyon and or juniper. A 1/20-acre plot was used for woodland plots classified as Forest Type other than pinyon and/or juniper. A 1/5-acre plot was also used in very open types, at the discretion of the field supervisor. Measurement procedures for all fixed-radius plots (1/10, 1/20, or 1/5-acre) were the same regardless of plot size.

The LC was the center point of a fixed-radius plot (point 1). A microplot (1/100<sup>th</sup> acre, 11.7 ft radius) was also located at the LC to sample seedlings and saplings (see figure 25).

Figure 25. Previous fixed-radius plot layout for CO/WY.

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## B. Sampling Methods

Locate and account for all trees preprinted on the Accounting Tree Data record (appendix A.10) using the preprinted Sampling Factor code and the plot diagram on the old field form as a reference for the plot layout. **Note: do not account for trees or saplings on fixed-radius woodland plots.** If a preprinted tree cannot be relocated and the reason cannot be determined, code CURRENT TREE STATUS = 0 and make a note in comments.

**On the microplot:** Locate and account for all trees preprinted on the Accounting Tree Data record. **In addition measure all trees  $\geq 1.0$  inches DBH/DRC that were not tallied during the previous inventory (live or dead, standing or down).**

With variable-radius sampling (Sampling Factors 20 and 40), the limiting distance values are related to an individual tree's diameter (DBH or DRC) and its **horizontal** distance from the sample point stake.

For the microplot, the center of the tree (single-stemmed trees) or the geographic center of the trees stems (multistemmed woodland trees) must be at or within the fixed distance of 6.8 feet.

Locate individual trees by referencing the preprinted azimuth and distance, or by locating the numbered tree tag. Use the sampling procedures described on pages 12-1 to 3 to help relocate trees.

The following trees were sampled in the previous inventory:

### 1. Main Plot.

- a. **Live timber species** 5.0-inches DBH and larger.
- b. **Live woodland trees** 3.0-inches DRC and larger. For multistemmed trees, at least one stem was 3.0-inches DRC or larger.
- c. **Standing dead timber species** 5.0-inches DBH and larger.
- d. **Standing dead woodland trees** that had at least one standing qualifying stem (3.0-inches DRC or larger, 8.0 feet in length to a 1.5-inches branch diameter).

2. **Seedling/Sapling Microplot.**

After trees were tallied on the main plot, the following microplot trees were tallied:

- a. **Timber species saplings** (1.0 - 4.9 inches DBH).
- b. **Woodland species saplings** (1.0 - 2.9 inches DRC).
- c. **Established seedlings** (less than 1.0-inches DRC/DBH) to bring the total tally of main plot and microplot live trees to 4

C. **Tree Data**

**ITEM**

**601 Point Number.**

Preprinted for previously tallied trees; record for new tally trees on microplot  $\geq 1.0$  in DBH/DRC.

For preprinted trees, verify/correct if an obvious error exists. For new trees, record the point number where the tree occurs. Valid codes = 1 to 5 or 1 to 10.

**602 Point History.**

Record for previously tallied trees; record for new tally trees on microplot  $\geq 1.0$  in DBH/DRC.

Record the appropriate point history for each preprinted and new tally tree.

<u>Code</u>	<u>History</u>
01	Forest land before, forest land now
02	Forest land before, nonforest now
04	Forest land condition different from point 1 (condition of point has changed since the previous inventory)

## ITEM

### 603 Tree Number.

Preprinted for previously tallied trees; record for new tally trees on microplot  $\geq 1.0$  in DBH/DRC.

For preprinted trees, verify/correct if an obvious error exists.  
Record next available tree number for new tally trees.

### 604 Azimuth.

Preprinted for previously tallied trees; record for new tally trees on microplot  $\geq 1.0$  in DBH/DRC.

For preprinted trees, verify/correct if an obvious error exists.  
Record azimuth to the nearest degree for new tally trees. Record  $360^{\circ}$  for due north.

### 605 Distance.

Preprinted for previously tallied trees; record for new tally trees on microplot  $\geq 1.0$  in DBH/DRC.

For preprinted trees, verify/correct if an obvious error exists. This value is the **horizontal** distance from the center stake or microplot stake to the center of single-stemmed trees or to the geographic center of multistemmed trees. Record the distance to the nearest 0.1-foot for new tally trees. **Note:** Previous inventory collected slope distance from center stake to face of single-stemmed trees or to the geographic center of multistemmed trees. It is important to keep this difference in mind when accounting for previously inventoried trees. Do not consider the difference between horizontal distance and slope distances an error.

**ITEM**

**610 Past Tree History.**

Preprinted for remeasure trees. If the past Tree History appears to be incorrect (e.g., Past Tree History preprinted as "4", but tree is alive), cross through the preprinted code and record an estimated Past Tree History.

<u>Code</u>	<u>Past Tree History</u>
1	Live tree - preprinted.
2	Ingrowth - new tree $\geq 1.0$ inch DBH/DRC on microplot that was $\leq 1.0$ inch DBH/DRC at time of previous inventory.
4	Standing dead tree - preprinted.
6	Down dead tree - preprinted.
7	Missed tree - tree $\geq 1.0$ inch DBH/DRC on microplot that was $\geq 1.0$ inch DBH/DRC during previous inventory but missed by previous crew.

**611 Current Tree History.**

Record a 1-digit code for each preprinted tree and for all live/dead microplot ingrowth or missed trees on the microplot.

<u>Code</u>	<u>Current Tree History</u>
0	No status - tree is not presently in the sample (preprinted trees only). Tree was incorrectly tallied at the previous survey or currently is not tallied due to definition or procedural change.
1	Live tree.
3	Cut, down, or missing due to harvest activity.
4	Standing dead.
6	Down dead tree.
7	Missing tree - tree was tallied in previous inventory but now is missing due to natural causes such as landslide, fire, etc. (preprinted trees only).

**ITEM**

**616**     **Species.**

Preprinted for previously tallied trees; record for new tally trees on microplot  $\geq 1.0$  in DBH/DRC. For preprinted trees, verify/correct if an obvious error exists. Record for new tally trees. Refer to Item 416, page 10-9 to 10-10 for species list; delete tree records for preprinted species not listed. If preprinted species is incorrect, delete the preprinted code and record the correct species code.

**620**     **Past DBH/DRC.**

Value is preprinted.

If the preprinted past diameter appears to be incorrect (e.g., past DBH larger than current DBH, and the tree is still alive and growing) delete the preprinted value and record a past DBH/DRC estimate.

**621**     **Current DBH/DRC.**

Record for previously tallied trees; record for new tally trees on microplot  $\geq 1.0$  in DBH/DRC.

Record as directed in Item 421, starting on page 10-11, for each preprinted and new tally tree. If individual stems are nailed, measure the stems at (above) the nail. For preprinted trees that were dead during the previous inventory and currently have a smaller diameter than last time, record the new smaller diameter unless the new diameter is  $< 5.0$  inches ( $< 3.0$  inches for woodland species) for trees that were on the variable plot or the new diameter is  $< 1.0$  inch for trees that were on the microplot. Trees cannot shrink off the plot. If the tree has shrunk below the above-mentioned thresholds, record the previous diameter for the current diameter.

## ITEM

### 623 DBH/DRC Check.

For each diameter record a **0** for DBH and DRC measured normally and not estimated. Record a 1 if any of the following apply:

- DBH was estimated, or DBH not measured at 4.5 feet (e.g., diameter taken above 4.5 feet due to fork).
- DRC was estimated.

If 1 is coded, explain in the notes.

### 626 Past Number of Stems.

Value is preprinted.

If the past number of stems does not equal the current number of stems, do not change the preprinted value, but make a note in comments suggesting the possible reason for the difference.

### 624 Current Number of Stems.

Record for previously tallied trees; record for new tally trees on microplot  $\geq 1.0$  in DBH/DRC.

Record for each preprinted and new tally **woodland** species with at least one stem 1.0 inch in diameter or larger.

### 640 Past Total Tree Length.

Value is preprinted.

For preprinted trees, verify/correct if an obvious error exists.

### 641 Current Total Tree Length.

New tally trees on microplot  $\geq 1.0$  in DBH/DRC.

Determine Total Tree Length for new tally trees as directed in Item 441 (Total Tree Length), page 10-36.

**ITEM**

**655 Cause of Death.**

Record a 2-digit code that best describes the primary Cause of Death (C.O.D.) for the following preprinted trees:

- a. Trees that were alive in the first inventory but are now dead (refer to Tree History) due to natural causes; use the damage code list on page 10-42 and 43, but do not use damage code 00 (no serious damage) or codes 71 through 79.
- b. Trees that were tallied in the first inventory but are now dead, cut, or missing due to harvest activity (logging, timber stand improvement (TSI), or other human activity/damage); record one of the following codes:

Code      Cause of Death

**Logging**

- 81**      **Damage** (death caused by damage resulting from harvest activities)
- 98**      **Cut and left** (trees felled during a logging operation but not removed from the forest)
- 99**      **Cut and removed from the woods.**

**TSI**

- 82**      **Damage** (death caused by damage resulting from TSI activities)
- 97**      **Cut and left** (trees felled during TSI activities but not removed from the forest)
- 90**      **Girdling** (death resulting from a TSI girdling treatment - bark removed from entire circumference of a tree)
- 91**      **Poison** (death resulting from TSI poison treatment)

**Human**

- 80**      **Other human damage**
- 83**      **Land clearing** (roads, etc.)
- 84**      **Woodland cutting** - fuel wood, post/pole removal
- 85**      **Chemical** (road salt, herbicide spraying, etc.)

## ITEM

### **663 Past Tree Class.**

Refer to CURRENT TREE CLASS for codes. For preprinted tees, if the PAST TREE CLASS appears to be incorrect (e.g., tree was coded as rotten in first inventory, but is sound), delete the preprinted code and record an estimate of the correct PAST TREE CLASS. For new tally trees, estimate the live tree class immediately prior to death (see sound, rough, and rotten, Item 464).

### **664 Current Tree Class.**

#### Code   Tree Class

- 1   Sound (live) - timber species**
  - a live sapling (1.0- to 4.9-inches DBH), with minor or no evidence of form defects, insects, or disease, that is expected to become a sound tree 5.0-inches DBH or larger with good form and vigor.
  - a live tree, 5.0-inches DBH or larger, that has less than 67 percent of the merchantable volume cull, and contains at least one solid 8-foot section (now or prospectively for poletimber sized trees), reasonably free of form defect, on the merchantable bole.
- 2   All live woodland species**
- 3   Rough (live) - timber species**
  - a live sapling (1.0- to 4.9-inches DBH) with form defects or evidence of insects and disease that will preclude it from becoming a sound tree of good form, 5.0-inches DBH or larger.
  - a live tree, 5.0-inches DBH or larger, with 67 percent or more of the merchantable volume cull, and more than half of this cull due to sound dead wood volume loss or severe form-defect volume loss.
  - a live tree, 5.0-inches DBH or larger, that does not now, nor prospectively, have at least one solid 8-foot section, reasonably free of form defect, on the merchantable bole.

## ITEM

### 664 Current Tree Class. (contd)

#### Code Tree Class

- 4 **Rotten (live) - timber species**
  - a live tree, 5.0-inches DBH or larger, with 67 percent or more of the merchantable volume cull, and more than half of this cull due to rotten and/or missing volume loss.
  
- 5 **Hard dead**
  - a standing or down dead tree, 1.0-inch DBH/DRC or larger, that has a minimum of 33 percent of the original merchantable volume sound (less than 67 percent rotten and/or missing).
  
- 6 **Soft dead**
  - a standing or down dead tree, 1.0-inch DBH/DRC or larger, that has less than 33 percent of the original merchantable volume sound (more than 67 percent rotten and/or missing).

## **CHAPTER 13 - GLOSSARY**

**ALLUVIAL FAN:** A fan-shaped deposit of unconsolidated material and debris, forming at the point where a stream emerges from a narrow valley onto a broader, less sloping valley floor.

**ALPINE:** The zone of low arctic-type vegetation above tree line.

**AZIMUTH:** The horizontal angle or bearing of a point, measured clockwise from north. Note: The azimuth plus or minus 180 degrees is termed the **back azimuth**.

**BAJADA:** A broad, gently inclined slope formed by the lateral blending of a series of alluvial fans, and having a broadly undulating profile.

**BASAL AREA (BA):** The cross-sectional area of a tree stem at the point where diameter (DBH/DRC) is measured, inclusive of bark; BA is expressed in square feet. The BA per acre is often used to represent tree stocking.

**BASAL AREA FACTOR (BAF):** The basal area factor is an index for the sampling angle used in variable-radius plot tree cruising. The BAF is the amount of basal area each tally tree on a sample point represents per acre.

**BASELINE:** A reference line of sight, located and measured on both the aerial photo and the ground.

**BENCH:** A nearly level to gently inclined surface developed on resistant strata in areas where valleys are cut, and forming a shelf above the level of the valley bottom.

**BH:** Breast height: 4.5 feet above the ground. BH is in reference to the place of diameter measurement for timber species.

**BOLE:** The main stem of a timber species tree. For estimating tree cull, use the merchantable bole -- the section of the tree between a 1-foot stump and a 4-inch top diameter outside bark (DOB).

**Note:** Small trees (e.g., seedlings, saplings) are often characterized as having stems; for field use, a tree stem is equivalent to a tree bole.

**BUREAU OF LAND MANAGEMENT LANDS:** Public lands administered by the Bureau of Land Management (BLM), U.S. Department of the Interior.

**CENSUS WATER:** Rivers, streams, sloughs, estuaries, and canals, more than 200 feet wide and 4.5 acres and larger in size; only portions of rivers and streams meeting the definition criteria are considered census water. Other census water includes lakes, reservoirs, and ponds 4.5 acres and larger in size. Portions of braided streams meeting the census water definition criteria and more than 50 percent water at normal high-water level are considered census water. Ephemeral and intermittent streams are classified as land.

**CHAINING (woodland treatment method):** A mechanical method of land clearing (or possible type conversion) to reduce or eliminate undesirable vegetation (e.g., reduce the number of juniper trees to enhance herbage production for livestock use). With this method, a heavy chain is dragged between two tractors for the purpose of uprooting the undesirable vegetation.

**CIRQUE:** A semicircular, concave, bowl-like area with a steep face, primarily resulting from erosive activity of a mountain glacier. A glacial cirque appears as a amphitheater-like carving in the mountainside, with steep slopes providing headwaters for drainage.

**CLIFF:** A high, very steep to perpendicular or overhanging face of rock or earth.

**CONDITION:** An area of relatively uniform ground cover, such as a homogeneous vegetation cover

**CONDITION CLASS:** A categorization of the condition based on several defining attributes: Ground Cover Class, Land Use; forest land is further defined by Forest Type, Stand-size Class, Stand Origin, and Stand Density. Other tree land is further defined by the Dominant Tree Species, and non-tree lands are further defined by Rangeland Cover Type. A condition class is generally an area of tree land or non-tree land, at least 1 acre in size and 120-foot wide (approximately the radius of a 1-acre circle); water must be at least 30-foot wide and 1 acre in size to be considered a condition. Exceptions to these size and width requirements are described in chapter 3.

**CONTRASTING CONDITION CLASS:** Any qualifying condition class that is different than a previously assigned class based on the defining attributes.

**CONK:** The fruiting body of a wood-destroying fungus that projects from the bole, roots, or other tree parts. The size, shape, and color of conks will vary depending on the fungus species.

**CORD:** A stack of wood equivalent to 128 cubic feet of wood and air space, having standard dimensions of 4 by 4 by 8 feet.

**CROOK:** An abrupt curvature or bend in a tree bole.

**CROPLAND:** Land currently used for farm crops that are harvested on a regular basis.

**CROWN CLASS:** A classification of trees based on dominance in relation to adjacent trees in the stand as indicated by crown development and amount of light received from above and the sides.

**CROWN COVER:** The ground area covered by a plant crown, as defined by the vertical projection of its outermost perimeter. The field location Crown Cover only includes timber and woodland trees 1.0-inch DBH/DRC and larger.

**CROWN RATIO:** The portion of tree bole supporting live, healthy foliage, expressed as a percent of total tree height.

**CULL:** Portions of a tree that are unusable for wood products due to cubic-foot volume loss (e.g., rotten/missing bole sections, dead material bole sections) or severe form-defect volume loss (e.g., severe crook, sweep, forking).

**CULL TREE:** A live timber species that fails to meet the specifications for a sound tree now or prospectively (see Rotten Tree and Rough Tree).

**DBH (DIAMETER AT BREAST HEIGHT):** The diameter for timber species, located at 4.5 feet above the ground (breast height) on the uphill side of a tree. The point of diameter measurement may vary on abnormally formed trees.

**DEAD VOLUME:** That part of a tree's merchantable portion, consisting of sound dead wood (expressed as a percent).

**DEVELOPED FOREST LAND:** This is forest land that probably will not be managed for wood production because of development for recreational, residential, or other uses, but where human activity on the site does not preclude natural succession of the stand.

**DIAMETER CLASS:** A grouping of tree diameters (DBH or DRC). For the current inventory, 2-inch diameter classes are used, with the even-inch the appropriate mid-point for a class. For example, the 6-inch class includes trees 5.0- to 6.9-inches DBH inclusive.

**DIB:** Diameter inside bark.

**DOB:** Diameter outside bark.

**DOWNED TREE:** For timber species -- a tree 1.0-inch DBH or larger, broken off below 6.0 feet above ground, or not attached at the base or ground level for support (e.g., an upright tree broken at the base, but leaning against another tree for support). For a woodland species - a tree 1.0-inch DRC or larger, broken off at ground level.

**DRC (DIAMETER AT ROOT COLLAR):** The diameter for woodland trees, taken at the root collar or at the point nearest the natural ground line (whichever is higher), that represents the basal area of the tree stem or stems. The place of diameter measurement may vary for woodland trees with stems that are abnormally formed.

**EPHEMERAL STREAM:** See "Stream, Ephemeral."

**ESTABLISHED SEEDLING:** A live tree smaller than 1.0-inch DBH/DRC, having a root system in mineral soil, and at least 4.0-inches tall for softwoods (e.g., pines, firs, spruces, pinyon, juniper), or 12.0-inches tall for hardwoods (e.g., aspen, cottonwood, oak, maple, mountain-mahogany). A seedling is not considered established if it will not survive due to form defects, insect infestation, or disease.

**FARMER/RANCHER LANDS:** Land owned by a person who personally operates, or employs the services of a manager to directly supervise, the work activities on a farm or a ranch.

**FIELD LOCATION:** A reference to the sample site; an area containing the field location center and all sample points, distributed over an area approximately 2.5 acres in size. A field location consists of four fixed-radius subplots for sampling trees and understory vegetation and 4 microplots for sampling seedlings and saplings.

**FIXED-RADIUS PLOT:** A circular sample plot of a specified **horizontal** radius:

1/300 acre = 6.8-foot radius

1/24 acre = 24.0-foot radius

**FLAT PLAIN:** A level or nearly level area of land marked by little or no relief.

**FLOOD PLAIN:** The nearly level plain that borders a stream and is subject to inundation under flood stage conditions.

**FOREST INDUSTRY LAND:** Land owned by a company or an individual(s) operating a primary wood-processing plant.

**FOREST LAND:** This is tree land that

- (1) has at least 5 percent crown cover (representing 10 percent stocking) or adequate reproduction, or
- (2) currently nonstocked but formerly having such stocking, with tally tree species (timber and/or woodland), and where human activity on the site does not preclude natural succession of the forest (i.e., the site will be naturally or artificially regenerated). For field use, 5 percent tree crown cover or the presence of sufficient reproduction is used to represent stocking.

The minimum area for classification of forest land is 1 acre in size and 120-feet wide. Unimproved roads, trails, streams, and openings in forest areas are classified as forest land if they are less than 120-feet wide or 1 acre in size.

**Note:** In some instances, areas previously stocked with woodland species that have had some type of treatment (e.g., chaining or other mechanical treatment) are classified as non-tree land.

**FOREST TYPE:** A classification of forest land based upon and named for the tree species that forms the majority of live-tree stocking. A Forest type classification for a field location indicates the **predominant** live-tree species cover for the field location; hardwoods and softwoods are first grouped to determine predominant group, and Forest Type is selected from the predominant group. For nonstocked forest land, forest type is based on an estimate of the predominant tree species of the previous stand.

**GEOGRAPHIC TREE CENTER:** The physical center of a single stemmed tree or the physical center of all the stems of a multistemmed woodland tree (defined as the center of a polygon scribed by connecting the centers of the outermost stems in the tree at the DRC point; stems of any diameter are to be used).

**GLACIAL MORAINE:** An accumulation of rock material built chiefly by the direct action of glacial ice, glacial drift, or by running water emanating from the glacier. Moraines may be classified as lateral or terminal depending on their relationship to the movement of the ice mass.

Lateral Moraine -- A ridge-like moraine carried on and deposited at the side margin of a valley glacier, composed chiefly of rock fragments derived from valley walls.

Terminal Moraine -- A moraine produced at the front end of an actively flowing glacier. This moraine marks the glacier's farthest advance, and usually has the form of a massive curved ridge or complex of ridges.

**GROUND COVER CLASS:** The general classification of an area into tree land (forest land or other tree land), non-tree land, or water.

**HARD DEAD TREE:** A standing dead tally tree, 1.0-inch DBH/DRC or larger, that has a minimum of 1/3 of the original merchantable volume sound (less than 2/3 rotten and/or missing). Formerly called "salvable". Also, a down dead tally tree, 1.0-inch DBH/DRC or larger, with a minimum of 1/3 of the original merchantable volume sound and intact.

**HARDWOODS:** Trees that are usually broad-leaved and deciduous (leaves that fall off or shed at specific seasons).

**HERBACEOUS:** Of or relating to a seed-producing annual, biennial, or perennial plant that does not develop persistent woody tissue, and dies down at the end of a growing season.

**IMPROVED PASTURE:** Land currently improved for grazing use as a result of cultivation, seeding, irrigation, clearing of trees or brush. These areas are generally extensively managed or maintained, unlike natural herbaceous/grass cover. Small areas are often fenced.

**IMPROVED ROAD:** All roads graded or otherwise regularly maintained for long-term continuing use. These roads are generally paved or gravelled, and may have culverts; however, some temporary logging roads appear as improved roads; reference field maps.

**INDIAN TRIBAL TRUST AND/OR ALLOTTED TRUST LANDS:** Tribal or individual allotted lands held in trust by the Federal government.

**INHIBITING VEGETATION:** Includes all vegetation considered to repress the natural establishment of tree seedlings.

**INTERMITTENT STREAM:** See "Stream, Intermittent."

**LAND** This includes (1) areas of dry ground and ground temporarily or partly covered by water, such as marshes, swamps, and river flood plains, (2) streams, sloughs, estuaries, and canals less than 30 feet in width, and (3) lakes, reservoirs, and ponds smaller than 1 acre in size.

**LAND USE:** The classification of a land condition class by use or type.

**LIMITING DISTANCE:** The maximum horizontal distance a tree can be from the plot center and still be considered for tally. In reference to **fixed-area plots**, limiting distance is determined by the size of the sample; for a 1/24-acre sample, the limiting distance to the geographic center of the tree at the base is 24 feet; for a 1/300-acre sample, the limiting distance is 6.8 feet. In reference to **variable-radius plot** sampling, limiting distance is a function of the selected basal area factor (e.g., 20 or 40) and the diameter of the tree; the distance is measured from the plot center to the center of a single-stemmed tree (to the face of the tree if table is used) at the diameter point or to the geographic center of a multistemmed woodland tree at the average diameter height. A tally tree is one that is at or within its limiting distance from the point stake.

**LITTER:** The uppermost layer of organic debris on a forest floor; that is, essentially the freshly fallen, or only slightly decomposed material, mainly foliage, but also bark fragments, twigs, flowers, fruits, and so forth. For the ground cover transect, litter also includes any dead organic material including carcasses, feces, etc. **Note:** Litter and humus together are often termed **duff**.

**LOCATION CENTER (LC):** The LC is the intersection of map grid lines as established on the ground; it becomes the center point of the field location, and the center of subplot 1 on the location layout. On previously established locations, the LC is either point 1 of a 5-point "timberland" location layout, or the center of the 1/10-acre or 1/20-acre fixed-radius "woodland" location layout.

**LOGGING:** The felling and extraction of timber.

**MAIN PLOT:** For previously sampled "timberland" field location sample points, the main plot is the variable-radius plot. For previously sampled "woodland" field locations, the main plot is the quadrant area sample on a 1/10-acre or 1/20-acre fixed-radius plot. The quadrant area is synonymous with the term "point."

**MERCHANTABLE BOLE:** On timber species 5.0-inches DBH and larger: the portion of a tree bole between a 1-foot stump and a 4.0-inch top (DOB). For saplings, examine the stem from a 1-foot stump to a 1.0-inch top.

**MERCHANTABLE BOLT:** On timber species 5.0-inches DBH and larger: a solid 8-foot section of tree bole with a large-end diameter of at least 5.0 inches and a small-end diameter of at least 4.0 inches.

**MERCHANTABLE PORTION** (woodland species): For woodland trees, the merchantable portion includes all qualifying segments above the place(s) of diameter measurement for any tree with at least one 3.0-inch stem; sections below the place(s) of diameter measurement are not included. Qualifying segments are stems or branches that are a minimum of 1 foot in length and at least 1.5 inches in diameter; portions of stems or branches smaller than 1.5 inches in diameter, such as branch tips, are not included in the merchantable portion of the tree.

**MESA:** A broad, nearly flat-topped, and usually isolated land formation with steep sides.

**MICROPLOT:** The 1/300 acre fixed-radius plot (6.8-foot radius), located at an azimuth of 90 degrees and distance of 12 feet from subplot center, used to sample seedling and sapling trees.

**MISCELLANEOUS FEDERAL LANDS:** Public lands administered by agencies other than the USDA Forest Service and the USDI National Park Service and Bureau of Land Management (e.g., federal lands administered by the Bureau of Indian Affairs, lands administered by the Bureau of Reclamation).

**MORTALITY TREE:** A standing or downed tree, 1.0-inch DBH/DRC and larger, that was live within the past 5 years or at the last inventory.

**NATIONAL FOREST LANDS:** Public lands administered by the Forest Service, U.S. Department of Agriculture, such as National Forests, National Grasslands, and some National Recreation Areas.

**NATIONAL PARK LANDS:** Public lands administered by the Park Service, U.S. Department of the Interior, such as National Parks, National Monuments, National Historic Sites (such as National Memorials and National Battlefields), and some National Recreation Areas.

**NFS:** An abbreviation for "National Forest System."

**NONCENSUS WATER:** Portions of rivers, streams, sloughs, estuaries, and canals that are 30 to 200 feet wide and at least 1 acre in size; and lakes, reservoirs, and ponds 1 to 4.5 acres in size. Portions of rivers and streams not meeting the criteria for census water, but at least 30 feet wide and 1 acre in size, are considered noncensus water. Portions of braided streams not meeting the criteria for census water, but at least 30 feet in width and 1 acre in size and more than 50 percent water at normal high-water level are considered noncensus water. Ephemeral and intermittent streams are classified as land.

**NONSAMPLED TREE LAND:** This is land that (1) presently meets the requirements for tree land, but human activity on the site will preclude the natural succession of the stand (areas that might be included in this group are golf courses, cemeteries, picnic grounds and home yards with mowed lawns, orchards, Christmas tree plantations), or (2) land with at least 5 percent crown cover in tree species not sampled in this inventory for safety reasons (lily and cactus families) but less than 5 percent cover in tally tree species.

**NON-TREE LAND:** This is land that

- (1) has never supported forests (e.g., barren, alpine tundra), or
- (2) was formerly tree land, but has been converted to a non-tree land status (e.g., cropland, improved pasture).

Other examples of non-tree land are improved roads of any width, graded or otherwise regularly maintained for long-term continuing use, and rights-of-way of all powerlines, pipelines, other transmission lines, and operating railroads. If intermingled in forest areas, unimproved roads and nonforest strips must be at least 120-feet wide and 1 acre in size to qualify as non-tree land.

This category also includes formerly stocked woodland areas if they are currently nonstocked due to a treatment (e.g., chaining, other land clearing). These areas are treated to eliminate woodland trees for the purpose of enhancing or providing for non-wood commodities or uses (e.g., increasing herbage production).

**NONSTOCKABLE:** Inclusions within forest land not capable of supporting trees because of the presence of rock, water, roads, and so forth.

**NONSTOCKED FOREST LAND:** Formerly stocked forest land that currently has less than 10 percent stocking (as represented in the field by 5 percent crown cover or adequate reproduction) but has the potential to again become 10 percent stocked. For example, recently harvested, burned, or windthrow-damaged areas.

**OTHER TREE LAND:** Land that has at least 5 percent cover in trees defined as "other tree species," but does not have at least 5 percent cover in tally tree species. Examples would include land with at least 5 percent cover in tree species such as palo verde, tamerisk, or Russian olive, but less than 5 percent cover in tally tree species.

**OTHER TREE SPECIES:** All species classified as trees (Little, Elbert L. Jr. 1979. Checklist of United States Trees. U.S. Dep. Agric. Agriculture Handbook No. 541), excluding those species considered for individual tree tally. Other tree species include turbinella oak, Russian olive, acacia, etc.

**OUTCROP:** Surface exposure of a significant geologic strata.

**OWNERSHIP:** A classification of land based upon the status of the title holder.

**PATHOGEN:** An organism capable of causing disease.

**PERENNIAL STREAM:** See "Stream, Perennial."

**POLETIMBER TREES:** See "Tree Size Class."

**POST (FENCE):** Juniper and oak species are evaluated for fence post potential using the following criteria:

Line Post: 7-foot minimum length, 5.0 to 7.0 inches diameter at the butt (large end), 2.5-inches minimum small-end diameter, and reasonably straight and solid.

Corner Post: 8-foot minimum length, 7.0 to 9.0 inches diameter at the butt (large end), 2.5-inches minimum small-end diameter, and reasonably straight and solid.

**PRIMARY WOOD-PROCESSING PLANT:** An industrial plant that processes roundwood products such as sawlogs, pulpwood bolts, or veneer logs.

**REFERENCE POINT (RP):** A landmark readily identifiable on both ground and aerial photographs. Examples include the following: a prominent tree or rock; a sharp bend in a road or drainage ditch; a fence corner. The RP for field locations should be either a tree not likely to die, or a landmark not likely to be removed, within the next 10-15 years, and if possible, located at least 100 feet from the location center.

**REMEASUREMENT FIELD LOCATION:** A field location originally established and measured in a previous inventory.

**RESERVED LAND:** Land reserved from wood products utilization through statute or administrative designation. Reserved land is withdrawn through administrative designation, based on a written document(s), which carries the weight of legal authority, prohibiting the management of land for the production of wood products (not merely controlling wood harvesting methods). Such authority is usually vested in a public agency, department, etc., 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 is rather permanent in nature. Examples include Wilderness areas and National Parks and Monuments (refer to State Supplement).

**ROTATION:** The period of years between establishment of a stand of timber and the time when it is considered ready for cutting and regeneration.

**ROTATION AGE:** The age of a stand when it is considered ready for harvesting. Rotation age is 80 years for aspen and paper birch, and 120 years for all other timber species.

**ROTTEN TREE:** A live timber species, 5.0-inch DBH and larger, with  $\frac{2}{3}$  (67 percent) or more of the merchantable volume cull, and more than half of this cull due to rotten and/or missing cubic-foot volume loss.

**ROTTEN/MISSING VOLUME:** The part of a tree's merchantable portion that is rotten and/or missing (expressed as a percent).

**ROUGH TREE:** A live timber species, 5.0-inch DBH and larger, with 2/3 (67 percent) or more of the merchantable volume cull, and more than half of this cull due to sound dead wood cubic-foot volume loss or severe form-defect volume loss (e.g., severe sweep and crook, forks, extreme form reduction). Also, a live timber species sapling (1.0- to 4.9-inches DBH) that is not expected to become a sound tree with good form and vigor due to defect, or a timber species (5.0-inches DBH and larger) that does not now, nor prospectively, have at least one solid 8-foot section, reasonably free of form defect, on the merchantable bole.

**SAPLING:** See "Tree Size Class."

**SAWTIMBER TREES:** See "Tree Size Class."

**SEEDLING:** See "Tree Size Class" and "Established Seedling."

**SITE TREE:** A tree used to provide an index of site quality.

**SIZE CLASS:** See "Tree Size Class."

**SLASH:** Unmerchantable tree residue on the ground from logging activities or from natural breakup of trees caused by insects, disease, weather, etc. Slash includes logs, stems, heavier branch wood, stumps, etc.

**SOD:** A continuous cover of grass and/or herbaceous plants.

**SOFT DEAD TREE:** A standing dead tally tree, 1.0-inch DBH/DRC or larger, that has less than 1/3 of the original merchantable volume sound (more than 2/3 rotten/missing). Also, a down dead tree, 1.0-inch DBH/DRC or larger, with less than 1/3 of the original merchantable bole sound and intact. Formerly called "nonsalvable".

**SOFTWOODS:** Coniferous trees that are usually evergreen (retain leaves year-round), and having needle- or scale-like leaves.

**SOUND TREE:** Formerly called "growing-stock tree." A live timber species, 5.0-inches DBH or larger, that has less than 2/3 (67 percent) of the merchantable volume cull, and contains at least one solid 8-foot section, reasonably free of form defect, on the merchantable bole. Also, a live timber-species sapling (1.0- to 4.9-inches DBH) that is expected to become a sound live tree with good form and vigor, 5.0-inches DBH or larger.

**STATE, COUNTY AND MUNICIPAL LANDS:** Lands administered by States, counties, and local public agencies or municipalities, or lands leased to these governmental units for 50 years or more.

**STOCKING:** An expression of the extent to which growing space is effectively utilized by trees.

**STOCKING CONDITION CLASS:** The general classification of the potential of the subplot or condition to be fully stocked with trees given current tree, understory, or ground cover situations.

**STREAM:** A body of running water. **Note:** For purposes of this inventory, ephemeral and intermittent streams are classified as land.

Ephemeral: A stream that flows only in direct response to precipitation or surface run-off.

Intermittent: A stream that flows for protracted periods only when it receives ground water discharge or long-continued contributions from melting snow or other surface and shallow subsurface sources.

Perennial: A stream that flows year-round.

**STREAM BOTTOM:** A gently sloping stream pathway subject to frequent flooding.

**STREAM TERRACE:** A nearly level strip of land with a more or less abrupt descent along the margin of a river or stream, but not subject to frequent flooding.

**STUMP HEIGHT:** For purposes of this inventory, stump height for timber species is the height on a tree from ground level to the top of a 1.0-foot stump.

**SUBPLOT:** The 1/24-acre fixed-radius area (24-foot horizontal radius) used to sample trees 5.0-inches DBH/DRC and larger and understory vegetation.

**SUPPRESSION:** The process whereby certain trees, shrubs, etc., in a community become weakened and/or stunted, essentially due to competition by surrounding trees, shrubs, etc., in the immediate environment (natural suppression). Suppression may also be the result of human intervention (e.g., selective lopping, girdling, cutting back) or selective browsing by animals (artificial suppression).

**SWEEP:** A curve in a tree bole, not an abrupt bend (crook).

**TALLY TREE:** Tree species listed in this manual (chapter 10) as timber or woodland trees measured for volume, growth, and mortality. In some circumstances these species may be sampled on the understory vegetation description form.

**TALUS:** The accumulated mass of loose, broken rock fragment derived from and lying at the base of a cliff or steep rock slope.

**TIMBERLAND:** In previous inventories, this was forest land (including areas with mixtures of timber species and woodland trees) where timber species have 5 percent or more crown cover, or forest land with sufficient timber species reproduction (minimum of 40 saplings and/or established seedlings per acre). The timberland designation required the establishment of a 5-point variable-radius tree sample.

**TIMBER SPECIES:** Tally tree species measured at breast height; these include all species of conifers, except pinyon, juniper, or yew. In addition, hardwoods included in this category are aspen, paper birch, cottonwood (Populus spp.), and boxelder. Western juniper is measured as a timber species, though measured for age and radial growth using woodland species rules.

**TIMBER STAND IMPROVEMENT:** A term comprising all intermediate cuttings or treatments made to improve the composition, health, and growth of the remaining trees (TSI) in the stand. Trees removed are often smaller than sawtimber size.

**TRAIL:** A pathway consistently used by wildlife, domestic animals, or humans.

improved trail: used for human recreation/travel, maintained through tree removal and brush clearing, often with posted signs at a trailhead or fork, and documented on forest/recreation maps.

unimproved trail: used for human recreation/travel, sometimes documented on a forest/recreation map, but rarely cleared or posted.

wildlife/animal trail: not cleared, maintained, posted, or documented for human use.

**TREE CLASS:** A classification system based on a tree's physical characteristics, and used to classify all live timber species as sound, rough, or rotten trees, and dead timber species as either hard or soft.

**TREE LAND:** Land at least 1 acre in size and 120-feet wide with at least 5 percent cover in species classified as trees (Little, Elbert L. Jr. 1979. Checklist of United States Trees. U.S. Dep. Agric. Agriculture Handbook No. 541). However, several listed species will not be measured in this inventory: those defined in the text (Little, 1979) as primarily shrubs (e.g., Artemesia), and those which are considered hazardous to sample (the lily and cactus families).

**TREE-SIZE CLASS:** Classification of trees based on DBH for timber species and DRC for woodland trees.

Seedling: A tree smaller than 1.0-inch DBH for timber species or 1.0-inch DRC for woodland trees (**note:** to be counted, a seedling must be established and expected to survive -- see definition for established seedling).

Sapling: A timber species 1.0- to 4.9-inches DBH and a woodland tree with at least 1 stem 1.0 inch and larger and a cumulative DRC 1.0- to 4.9-inches.

Small Diameter: A woodland tree 5.0- to 8.9-inches DRC (single stem measurement or computed multistem measurement).

Large Diameter: A woodland tree 9.0-inches DRC and larger (single stem measurement or computed multistem measurement).

Poletimber tree: A timber species at least 5.0-inches DBH, but smaller than 9.0-inches DBH for a softwood and smaller than 11.0-inches DBH for a hardwood.

Sawtimber tree: A timber species that is at least 9.0-inches DBH for a softwood and at least 11.0-inches DBH for a hardwood.

**UNDEVELOPED FOREST LAND:** Forest land that does not have buildings, dwellings, or other developments.

**UNIMPROVED ROAD:** A road not regularly maintained for long-term continuing use, such as a jeep trail, old logging road, etc. These may or may not be posted with road signs.

**URBAN AREAS:** Nonsampled tree land or non-tree land within the legal boundaries of cities and towns (e.g., school yards, cemeteries, airports, golf courses).

**VARIABLE-RADIUS PLOT:** A plot, used in previous inventories, where a predetermined critical angle is projected from a central point and swept in a full circle to determine the basal area (tree count) and volume per unit of area. The radius of this plot is a function of an individual tree's size and distance from the point center.

**WATER:** In terms of a Ground Cover Classification, water is defined as streams, sloughs, estuaries, and canals more than 30 feet in width; and lakes, reservoirs, and ponds more than 1 acre in size.

For use in determining the "water proximity" or "water type" nearest the field location center, water implies any reliable source of water for wildlife, livestock, recreators, etc.

**WILDERNESS:** An area of undeveloped land currently included in the Wilderness System, managed so as to preserve its current conditions and retain its natural character and influence.

**WOODLAND:** In previous inventories, this was forest land with 10 percent or more crown cover in (1) woodland trees, or (2) timber species and woodland trees, but less than 5 percent crown cover in timber species; or forest land with sufficient woodland species reproduction (minimum of 40 saplings and/or established seedlings per acre).

**WOODLAND SPECIES:** Tally tree species measured at ground level (DRC); these include pinyon, juniper (except Western juniper), oak, mesquite, locust, yew, mountain-mahogany (Cercocarpus spp.), Rocky Mountain maple, bigtooth maple, and desert iron wood.

## **CHAPTER 14 - APPENDICES**

**APPENDIX A**  
**FIELD FORMS**

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## APPENDIX A.2 FIELD LOCATION DESCRIPTION

3/00

101	State	xx		124	QA Status	x		146	Recreation Use 1	x	
102	Map Number	4x							Recreation Use 2	x	
103	CPN	3x		130	Location Access	xx			Recreation Use 3	x	
104	County	3x		129	Location Status	x					
105	Location	4x		131	Sample Kind	x	1	147	Water Proximity	x	
107	Future Forest Poten.	x		132	Subplot Radius	3x	240	148	Water Type	x	
110	Current Owner	xx		133	Microplot Radius	3x	068				
111	Reserved Status	xx		135	Microplot Location	x	1	149	Land Use Impact 1	x	N/A
				140	Elevation	5x			Land Use Impact 2	x	N/A
121	Date - Month	xx		141	Size of Forest Area	x			Land Use Impact 3	x	N/A
	- Day	xx									
	- Year	4x		142	RS Cover Type 1	3x	N/A	150	Land Use Dist. 1	x	N/A
					RS Cover Type 2	3x	N/A		Land Use Dist. 2	x	N/A
122	Crew Spvsr	xx							Land Use Dist. 3	x	N/A
	Crew Number	xx		143	Trails or Roads	x					
	Crew Number	xx		144	Distance to Road	xx		160	#Tree Records	3x	
	Crew Number	xx						161	# Conditions	xx	
	Crew Number	xx		145	Use Restriction 1	xx					
123	Crew Type	x			Use Restriction 2	xx					

LOCATION COMMENTS:

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### SUBPLOT DESCRIPTION

SUBPLOT 1				SUBPLOT 3			
301	Subplot Status	x		301	Subplot Status	x	
304	Condition List	4x		304	Condition List	4x	
303	Center Cond #	x		303	Center Cond #	x	
305	Stocking	xx	N/A	305	Stocking	xx	N/A
321	Seed Source	x	N/A	321	Seed Source	x	N/A
322	Root Disease	x		322	Root Disease	x	
SUBPLOT 2				SUBPLOT 4			
301	Subplot Status	x		301	Subplot Status	x	
304	Condition List	4x		304	Condition List	4x	
303	Center Cond #	x		303	Center Cond #	x	
305	Stocking	xx	N/A	305	Stocking	xx	N/A
321	Seed Source	x	N/A	321	Seed Source	x	N/A
322	Root Disease	x		322	Root Disease	x	

SUBPLOT COMMENTS:

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## APPENDIX A.3 CONDITION CLASS DESCRIPTION

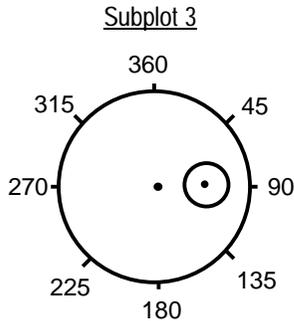
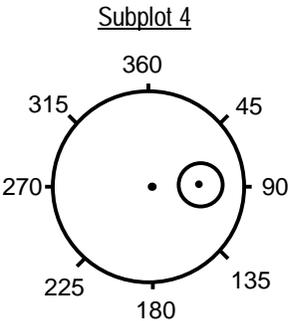
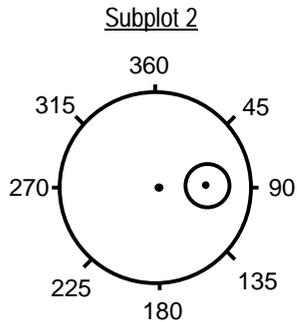
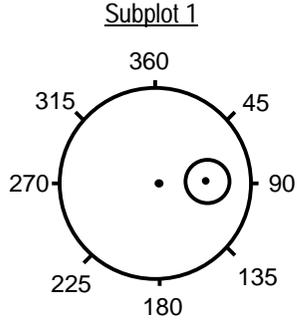
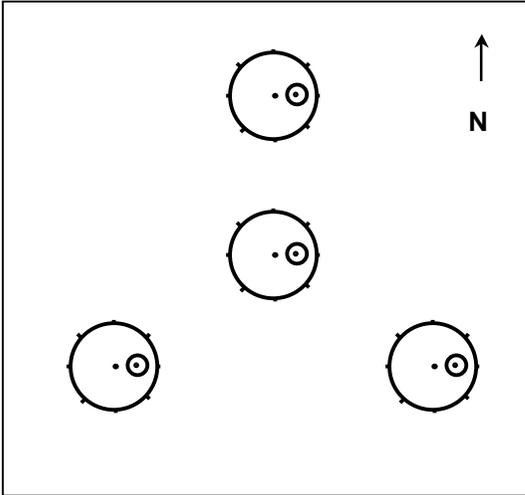
Revision 4/98

101	State	xx		250	Soil Group	x	N/A
102	County	xxx		251	Soil Texture	x	N/A
103	Location	xxxx		253	Soil Erosion	x	N/A
201	Condition Class Number	x		254	Litter Depth	xx.x	
211	Current Ground Cover	xx		255	Humus Depth	xx.x	N/A
213	Current Land Use Class	xx					
				260	Cutting Type	x	
221	Forest Type	xx		261	Cutting History (year)	xxxx	
222	Stand-Size Class	x		262	Burn History (year)	xxxx	
223	Stand Origin	x		263	Cond. Disturbance Type	xxx	
224	Stand Density	x		264	Cond. Dist. History (year)	xxxx	
236	Dominant Tree Species	7x		270	Vegetation Concealment	x	N/A
237	Rangeland Cover Type (BT)	xx		271	Wildlife Cover - Primary	xx	N/A
					Wildlife Cover - Secondary	xx	N/A
240	Slope	xxx			Wildlife Cover - Tertiary	xx	N/A
241	Aspect Azimuth	xxx		272	Animal Type - Primary	x	N/A
242	Curvature Class	x	N/A		Animal Type - Secondary	x	N/A
243	Physiographic Class	xx			Animal Type - Tertiary	x	N/A
				273	Browsing Intensity	x	N/A
230	Stocking Condition	xx	N/A	274	Grazing Intensity	x	N/A
231	Stand Structure	x	N/A				
232	Stand Age	xxx		275	Fine Soils (# hits)	xxx	
					Pavement (1/8-3/4")	xxx	
220	Size of Condition	x			Rock (>3/4")	xxx	
234	Primary Habitat Type	7x			Litter Cover	xxx	
	Secondary Habitat Type	7x			Crypto-crust Cover	xxx	
233	Crown Cover	xxx			Moss/Lichen Cover	xxx	
<b>CONDITION CLASS COMMENTS:</b>					Basal Veg. Cover	xxx	
					Other Cover (water, etc.)	xxx	
					Not Sampled (snow)	xxx	

**APPENDIX A.4 Condition Class Diagram and Boundary Record**

**CONDITION CLASS DIAGRAM**

STATE \_\_\_\_\_ COUNTY \_\_\_\_\_ LOCATION \_\_\_\_\_



Mapping? Y N  
(circle one)

**BOUNDARY INFORMATION**

Mapping Plot Type:  
1= Subplot  
2= Microplot

281	Subplot Number	X					
282	Mapping Plot Type	X					
283	Boundary Change	X					
284	Contrasting Condition #	X					
285	Azimuth Left	XXX					
287	Corner Azimuth	XXX					
	Corner Distance	XX.X					
285	Azimuth Right	XXX					









**APPENDIX A.9 GROUND COVER SUPPLEMENTAL DATA**

(NOTE: Save this record. Transfer totals to Condition Description record)

STATE \_\_\_\_\_

COUNTY \_\_\_\_\_

LOCATION \_\_\_\_\_

DIRECTION OF TRANSCECT (50 feet of transect per subplot)	N-S		E-W		TOTAL "HITS"
	SUBPLOT				
COND# _____	1	2	3	4	
Ground Cover:					
bare ground ( $\leq 3/4$ " )					
rock ( $> 3/4$ " )					
litter (incl. Branches)					
Biotic (cryptobiotic crust, moss/lichen, basal veg)					
other (water, ice, asphalt)					
not sampled (snow)					
Crown Cover					%
Litter Depth					"

DIRECTION OF TRANSCECT (50 feet of transect per subplot)	N-S		E-W		TOTAL "HITS"
	SUBPLOT				
COND# _____	1	2	3	4	
Ground Cover:					
bare ground ( $\leq 3/4$ " )					
rock ( $> 3/4$ " )					
litter (incl. Branches)					
Biotic (cryptobiotic crust, moss/lichen, basal veg)					
other (water, ice, asphalt)					
not sampled (snow)					
Crown Cover					%
Litter Depth					"



## **CHAPTER 14 - APPENDIX B**

### **MAP, PHOTO, AND TRAVERSING TABLES**

## APPENDIX B.1 Slope Correction Table

**Horizontal Distance** = Slope Distance / Slope Correction Factor

<u>Slope (%)</u>	<u>Corr. Factor</u>	<u>Slope (%)</u>	<u>Corr. Factor</u>
0-9	1.00	99-100	1.41
10-17	1.01	101	1.42
18-22	1.02	102	1.43
23-26	1.03	103-104	1.44
27-30	1.04	105	1.45
31-33	1.05	106-107	1.46
34-36	1.06	108	1.47
37-39	1.07	109	1.48
40-42	1.08	110-111	1.49
43-44	1.09	112	1.50
45-47	1.10	113	1.51
48-49	1.11	114-115	1.52
50-51	1.12	116	1.53
52-53	1.13	117	1.54
54-55	1.14	118-119	1.55
56-57	1.15	120	1.56
58-59	1.16	121	1.57
60-61	1.17	122	1.58
62-63	1.18	123-124	1.59
64-65	1.19	125	1.60
66-67	1.20	126	1.61
68-69	1.21	127-128	1.62
70	1.22	129	1.63
71-72	1.23	130	1.64
73-74	1.24	131	1.65
75	1.25	132-133	1.66
76-77	1.26	134	1.67
78-79	1.27	135	1.68
80	1.28	136	1.69
81-82	1.29	137-138	1.70
83	1.30	139	1.71
84-85	1.31	140	1.72
86	1.32	141	1.73
87-88	1.33	142-143	1.74
89	1.34	144	1.75
90-91	1.35	145	1.76
92	1.36	146	1.77
93-94	1.37	147	1.78
95	1.38	148-149	1.79
96-97	1.39	150	1.80
98	1.40		

## APPENDIX B.2 Map/Photo Scale Ratios

<u>Fractional Scale</u>	<u>Feet Per Inch</u>	<u>Miles Per Inch</u>	<u>Inches Per Mile</u>	<u>Acres Per Square Inch</u>
1:10,000	833	.158	6.34	14.69
1:11,000	917	.174	5.76	19.29
<b>1:12,000</b>	<b>1,000</b>	<b>.189</b>	<b>5.28</b>	<b>22.96</b>
1:13,000	1,083	.205	4.87	26.94
1:14,000	1,168	.221	4.53	31.25
1:15,000	1,250	.237	4.22	35.87
<b>1:15,840</b>	<b>1,320</b>	<b>.250</b>	<b>4.00</b>	<b>40.00</b>
<b>1:16,000</b>	<b>1,333</b>	<b>.253</b>	<b>3.96</b>	<b>40.81</b>
1:17,000	1,417	.268	3.73	46.07
1:18,000	1,500	.284	3.52	51.65
1:19,000	1,583	.300	3.33	57.55
1:20,000	1,667	.316	3.17	63.77
<b>1:24,000</b>	<b>2,000</b>	<b>.379</b>	<b>2.64</b>	<b>91.83</b>
1:30,000	2,500	.474	2.11	143.48
1:40,000 (NAPP)	3,334	.632	1.59	255.08
1:50,000	4,167	.789	1.27	398.56
1:60,000 (NHAP)	5,000	.948	1.06	573.99



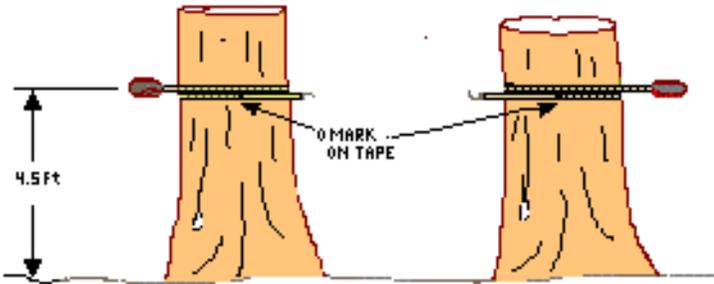
## **APPENDIX C**

### **TREE DATA**

**APPENDIX C.1 Diameter Measurement Techniques for Timber Species**

Correct method:

Alternate left-handed method:



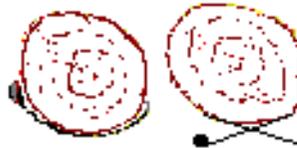
End of tape (with 0 mark) or hook crossed under

End of tape crossed under (Careful! Readings will be from an upside down d-tape)

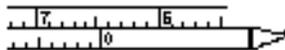
Press tape firmly against the tree; Do not pull it out at a tangent to the tree at the point of measurement.

Correct

Incorrect



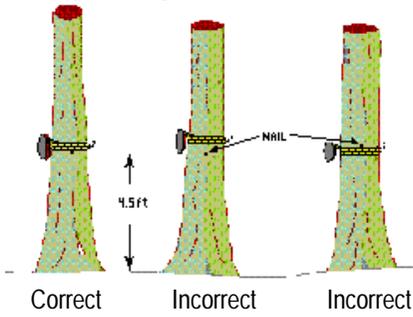
The diameter must be read at the exact point marked -- above the 0 mark. Always round down to the nearest 0.1 inch:



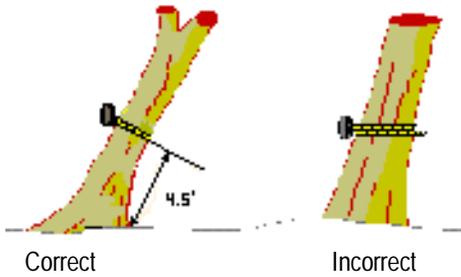
In this example, the diameter reading is 6.4-inches. Be carefull not to incorrectly read 7.5-inches. Examine the digits preceding and following the point above the 0 mark.

**APPENDIX C.1 Diameter Measurement Techniques (contd).**

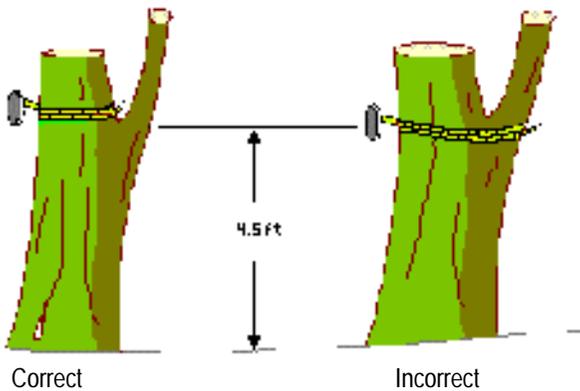
Place the diameter tape directly above the nail:



The tape must be at a right angle to the lean of the tree:



Do not place the tape at an abnormal location on the stem/bole:



**APPENDIX C.2 Square-Foot Basal Area Values for Certain Diameters (to be used in calculating DRC for woodland trees that have multiple stems)**

	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
1	0.0055	0.0066	0.0079	0.0092	0.0107	0.0123	0.0140	0.0158	0.0177	0.0197
2	.0218	.0241	.0264	.0289	.0314	.0341	.0369	.0398	.0428	.0459
3	.0491	.0524	.0559	.0594	.0631	.0668	.0707	.0747	.0788	.0830
4	.0873	.0917	.0962	.1008	.1056	.1104	.1154	.1205	.1257	.1310
5	.1364	.1419	.1475	.1532	.1590	.1650	.1710	.1772	.1835	.1899
6	.1963	.2029	.2097	.2165	.2234	.2304	.2376	.2448	.2522	.2597
7	.2673	.2749	.2827	.2907	.2987	.3068	.3150	.3234	.3318	.3404
8	.3491	.3578	.3667	.3757	.3848	.3941	.4034	.4128	.4224	.4320
9	.4418	.4517	.4616	.4717	.4819	.4922	.5027	.5132	.5238	.5346
10	.5454	.5564	.5675	.5786	.5899	.6013	.6128	.6244	.6362	.6480
11	.6600	.6720	.6842	.6964	.7088	.7213	.7339	.7466	.7594	.7724
12	.7854	.7985	.8118	.8252	.8386	.8522	.8659	.8797	.8936	.9076
13	.9218	.9360	.9503	.9648	.9793	.9940	1.0088	1.0237	1.0387	1.0538
14	1.0690	1.0843	1.0998	1.1153	1.1310	1.1467	1.1626	1.1786	1.1947	1.2109
15	1.2272	1.2436	1.2601	1.2768	1.2935	1.3104	1.3273	1.3444	1.3616	1.3789
16	1.3963	1.4138	1.4314	1.4491	1.4669	1.4849	1.5029	1.5211	1.5394	1.5578
17	1.5763	1.5948	1.6136	1.6324	1.6513	1.6703	1.6895	1.7087	1.7281	1.7476
18	1.7671	1.7868	1.8066	1.8265	1.8466	1.8667	1.8869	1.9073	1.9277	1.9483
19	1.9689	1.9897	2.0106	2.0316	2.0527	2.0739	2.0953	2.1167	2.1382	2.1599
20	2.1817	2.2035	2.2255	2.2476	2.2698	2.2921	2.3145	2.3371	2.3597	2.3824
21	2.4053	2.4282	2.4513	2.4745	2.4978	2.5212	2.5447	2.5683	2.5920	2.6159
22	2.6398	2.6639	2.6880	2.7123	2.7367	2.7612	2.7858	2.8105	2.8353	2.8602
23	2.8852	2.9104	2.9356	2.9610	2.9865	3.0121	3.0377	3.0635	3.0895	3.1155
24	3.1416	3.1678	3.1942	3.2206	3.2472	3.2739	3.3006	3.3275	3.3545	3.3816
25	3.4088	3.4362	3.4636	3.4911	3.5188	3.5466	3.5744	3.6024	3.6305	3.6587

Example: On subplot 1, a four-stemmed juniper is tallied. The diameter at root collar (DRC) for these four stems is calculated as follows:

1. Measure individual stem diameters for four stems and use table to get basal area:

Stem No. 1 - 3.3"	0.0594 basal area
Stem No. 2 - 4.3"	0.1008 basal area
Stem No. 3 - 6.1"	0.2029 basal area
Stem No. 4 - 7.9"	0.3404 basal area

2. Sum the basal area:  $0.0594 + 0.1008 + 0.2029 + 0.3404 = 0.7035$
3. Go back to the table and obtain the diameter which corresponds to a basal area of 0.7035. This value is closest to 0.7088 which is the basal area for 11.4 inches DRC.

### APPENDIX C.3 Boring for Radial Growth and Age

Despite their appearance, increment borers are **delicate and expensive** equipment items. Extreme care must be exercised in their use.

Borers consist of three parts:

- a handle,
- a bit, and
- an extractor.

The tip of the bit is made of fine, thin steel and is easily damaged. Because the bit of an increment borer narrows at the tip, the resulting wood cores are smaller than the internal tube of the borer and can be easily extracted. If the cutting edge on the bit is nicked, it is not possible to adequately sharpen the bit because of this small tapering. For this reason, the following rules must be observed:

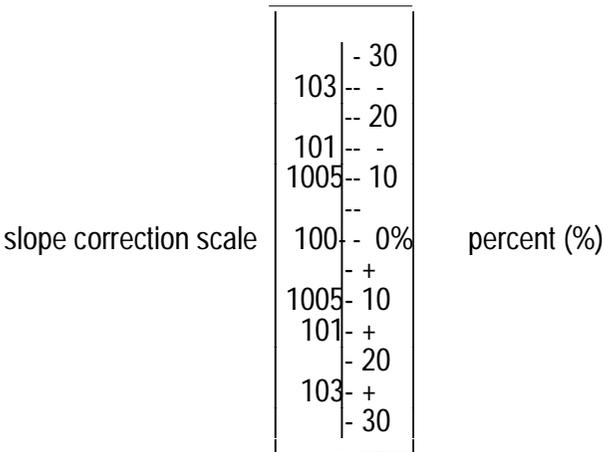
1. Keep the bit stored inside the bore handle when not in use.
2. Do not allow the tip of the bit to contact hard objects such as the ground or other field equipment.
3. If a core becomes jammed, **do not** use a nail or other hard object to attempt to push it out. Trying to push the core out through the narrowed tip will only cause further jamming. The best means for removing a severely jammed core is to place it in a low heat oven (200 degrees) for a couple of hours. This will reduce the moisture content of the wood, causing it to shrink without ruining the temper of the steel.
4. If, while boring a tree, the borer suddenly becomes very easy to turn, STOP! The bit may have contacted rotted wood, which is very difficult to remove from the bit. Extract the bit and examine it for signs of rot (dark, crumbled wood).
5. Be careful not to bore completely through small trees or the increment bore may get stuck in the tree.
6. Be careful when boring woodland trees; they are often very hard. **Do not bore cercocarpus species.**
7. Do not dull the bit by boring hard, dead wood.

**When boring for age** start the increment borer immediately below the point of diameter measurement and bore into the center of the tree. Every effort must be made to reach the pith (center). **When boring for growth**, start with the increment borer immediately below the point of diameter measurement and bore into the tree just a few turns (**note:** for timber species, bore for growth on the side of the tree facing the point center, where reasonable, to reduce bias).

## APPENDIX C.4 Determining Tree Height

Whenever possible, take tree height measurements standing on a level plane approximately even with the base of the tree or on a level above the tree base. The most important factor, however, is to be able to see both the tree base and the tree top. If the tree is leaning, stand perpendicular to the plane of the tree's lean. For trees with an excessive lean, visually "upright" the tree, and measure the top of the tree as if it were standing straight. If a tree has a missing top or has several leaders as a result of a broken top, estimate the height that the tree would have been had this loss of height not occurred. Record the estimate, and make a note on the data record indicating that tree height was estimated.

Determine tree height using a clinometer. The following examples are based on using a Suunto "percent / slope" clinometer. The clinometer wheel, as viewed internally, contains a percent (%) scale on the right side of the wheel and a "slope correction" (SC) scale on the left side of the wheel. Use the percent scale when making tree readings of the top or base of the tree (**note:** the percent scale may also be used to determine % slope on the ground). If it is necessary to determine tree height on a slope (i.e., cruiser not on a level plane with the tree base), use the slope correction scale to determine a SC factor (refer to the tree height formula below). The clinometer scales are illustrated below (internal view of clinometer):



The formula for tree height with a "percent / slope" clinometer is as follows:

$$\text{Tree Height} = \frac{[T + B(-1)] \times (D/100)}{SC}$$

where:

**T** = percent scale reading for the **top** of the tree.

**B** = percent scale reading for the **base** of the tree at ground level.

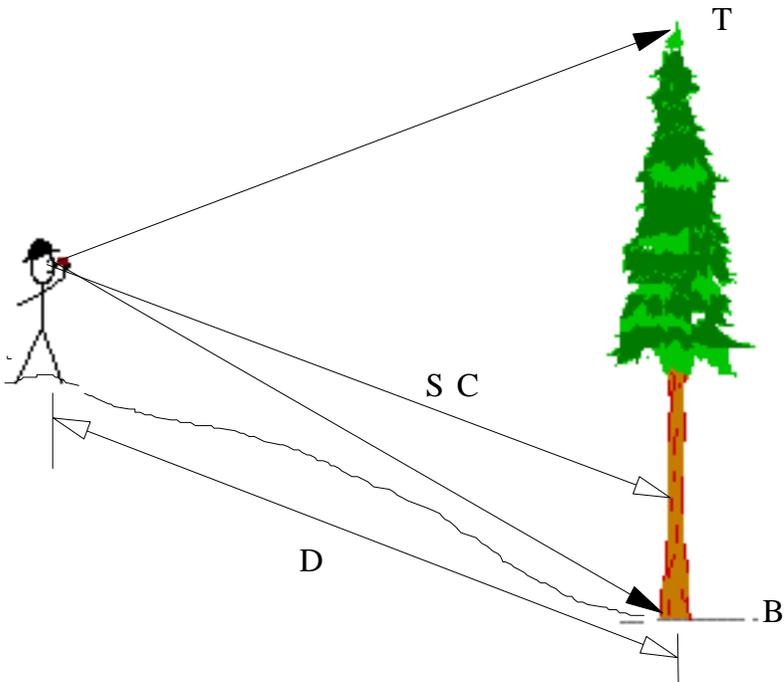
**D** = slope ground distance (between cruiser and tree, to the nearest foot).

**SC** = slope correction factor, taken to two decimal places.  
For example, a number of 103 on the SC scale (associated with 25% slope) would be converted to 1.03 for use in the formula. **Note:** The number 1005 (10% slope) on the SC scale would be converted to 1.005. Also, the SC factor is 1.00 if on a level plane (0% slope) with the tree.

Numbers or tree readings from the percent scale can be either positive (+) or negative (-). As shown by the above formula, add T and B if the two readings are opposite signs (+ and -); on the other hand, subtract T and B if both readings are the same sign (+ and +, or - and -).

To determine a SC factor, look through the clinometer at eye level on the tree along the slope and distance used to obtain tree height (e.g., if your eye level is at 5 feet, then look through the clinometer at a level of 5 feet above the ground on the tree); look at the SC scale and read the SC factor directly. This slope correction must be parallel to the slope of the measured distance.

The following example illustrates tree height calculation:



Distance (D) = 120 feet  
SC = 1.03 (25 percent slope)

$$\text{Tree Height} = \frac{[T + B(-1)] \times (D/100)}{SC}$$

$$\text{Tree Height} = \frac{[28 + 30] \times (120/100)}{1.03}$$

**Tree Height = 67 feet**

**APPENDIX C.5 Circular Defect Deduction Table**

This table presents the defect percentage for circular interior defect (for use where diameter of defect column can be determined).

DIB of 4-foot section (inches)	Diameter of defect column -- inches											
	2	4	6	8	10	12	14	16	18	20	22	24
6	Percent defect (cubic-foot basis)											
6	100											
8	100	100										
10	10	25	100	100								
12	5	20	35	100	100							
14	5	15	25	40	100	100						
16	5	10	20	30	45	100						
18	5	10	15	25	35	50	100					
20	5	5	15	20	30	40	100	100				
22	5	5	10	15	25	35	45	100	100			
24		5	10	15	20	30	40	50	100	100		
26		5	5	10	20	25	35	45	100	100	100	
28		5	5	10	15	20	30	35	45	100	100	
30		5	5	10	15	20	25	30	40	50	100	
32			5	10	10	15	20	30	35	45	50	
34			5	5	10	15	20	25	30	40	45	100
36			5	5	10	15	15	20	30	35	40	50

For example, a 13-inch DBH tree (12" DIB) is bored, and it is determined that a column of rot, 6 inches in diameter, occurs within the bole. It is then estimated, based on the type of rot identified, that the column of rot extends from the ground level to 8 feet up the tree bole. Reading from the table, a 6-inch defect column within a 12-inch DIB section yields 35 percent defect for each section. Therefore, approximately 35 percent of the first 8-foot log is cull.

**APPENDIX D**  
**TREE SPECIES LIST**

**APPENDIX D Tree Species List**

*For UTAH 2000 Annual Inventory, consider as trees only those species listed on the tree species list, pages 10-11 through 10-15.*

*Do not use Little's Tree Species List, formerly pages 14-30 to 14-36.*

Taken from:

Little, Elbert L. Jr. 1979. Checklist of United States trees (native and naturalized). U.S. Dep. Agric., Agriculture Handbook No. 541. 375 p.

List updated using USDA NRCS PLANTS database symbols and names: 7/98.

SCI_NAME	SYMBOL	COM_NAME
<i>Abies concolor</i>	ABCO	white fir
<i>Abies concolor</i> var. <i>concolor</i>	ABCOC	white fir
<i>Abies concolor</i> var. <i>lowiana</i>	ABCOL	white fir
<i>Abies grandis</i>	ABGR	grand fir
<i>Abies lasiocarpa</i>	ABLA	subalpine fir
<i>Abies lasiocarpa</i> var. <i>arizonica</i>	ABLAA	corkbark fir
<i>Abies lasiocarpa</i> var. <i>lasiocarpa</i>	ABLAL	subalpine fir
<i>Abies magnifica</i>	ABMA	California red fir
<i>Acacia farnesiana</i>	ACFA	sweet acacia
<i>Acer glabrum</i>	ACGL	Rocky Mountain maple
<i>Acer glabrum</i> var. <i>diffusum</i>	ACGLD3	Rocky Mountain maple
<i>Acer glabrum</i> var. <i>douglasii</i>	ACGLD4	Douglas maple
<i>Acer glabrum</i> var. <i>glabrum</i>	ACGLG2	Rocky Mountain maple
<i>Acer glabrum</i> var. <i>neomexicanum</i>	ACGLN2	New Mexico maple
<i>Acer glabrum</i> var. <i>torreyi</i>	ACGLT2	Torrey maple
<i>Acacia greggii</i>	ACGR	catclaw acacia
<i>Acer grandidentatum</i>	ACGR3	bigtooth maple
<i>Acer grandidentatum</i> var. <i>grandidentatum</i>	ACGRG	bigtooth maple
<i>Acacia greggii</i> var. <i>greggii</i>	ACGRG3	catclaw acacia
<i>Acer grandidentatum</i> var. <i>sinuosum</i>	ACGRS	canyon maple
<i>Acer negundo</i>	ACNE2	boxelder
<i>Acer negundo</i> var. <i>arizonicum</i>	ACNEA	Arizona boxelder
<i>Acer negundo</i> var. <i>interius</i>	ACNEI2	boxelder maple
<i>Acer negundo</i> var. <i>negundo</i>	ACNEN	boxelder
<i>Acer negundo</i> var. <i>texanum</i>	ACNET	ashleaf maple
<i>Acer negundo</i> var. <i>violaceum</i>	ACNEV	boxelder
<i>Aesculus glabra</i>	A EGL	Ohio buckeye
<i>Ailanthus altissima</i>	AIAL	tree of heaven
<i>Alnus incana</i>	ALIN2	mountain alder
<i>Alnus incana</i> ssp. <i>tenuifolia</i>	ALINT	thinleaf alder
<i>Albizia julibrissin</i>	ALJU	silk tree
<i>Alnus oblongifolia</i>	ALOB2	Arizona alder
<i>Alnus rhombifolia</i>	ALRH2	white alder
<i>Alnus rubra</i>	ALRU2	red alder
<i>Alnus viridis</i>	ALVI5	sitka alder
<i>Alnus viridis</i> ssp. <i>crispa</i>	ALVIC	American green alder
<i>Alnus viridis</i> ssp. <i>sinuata</i>	ALVIS	Sitka alder
<i>Amelanchier alnifolia</i>	AMAL2	Saskatoon serviceberry
<i>Amelanchier alnifolia</i> var. <i>alnifolia</i>	AMALA	Saskatoon serviceberry
<i>Amelanchier alnifolia</i> var. <i>cusickii</i>	AMALC	Cusick's serviceberry
<i>Amelanchier pallida</i>	AMPA2	pale serviceberry
<i>Amelanchier utahensis</i>	AMUT	Utah serviceberry
<i>Amelanchier utahensis</i> ssp. <i>covillei</i>	AMUTC	Coville's serviceberry
<i>Amelanchier utahensis</i> ssp. <i>utahensis</i>	AMUTU	Utah serviceberry
<i>Arbutus arizonica</i>	ARAR2	Arizona madrone
<i>Arbutus xalapensis</i>	ARXA80	Texas madrone

## **APPENDIX D Tree Species List (contd.)**

<i>Betula X eastwoodiae</i>	BEEA	Eastwood's birch
<i>Betula occidentalis</i>	BEOC2	water birch
<i>Betula papyrifera</i>	BEPA	paper birch
<i>Betula papyrifera var. commutata</i>	BEPAC	western paper birch
<i>Betula papyrifera var. papyrifera</i>	BEPAP	paper birch
<i>Betula pendula</i>	BEPE3	European white birch
<i>Betula X utahensis</i>	BEUT	northwestern paper birch
<i>Bursera fagaroides</i>	BUFA	fragrant bursera
<i>Bursera fagaroides var. elongata</i>	BUFAE	fragrant bursera
<i>Bursera microphylla</i>	BUMI	elephanttree
<i>Catalpa bignonioides</i>	CABI8	southern catalpa
<i>Calocedrus decurrens</i>	CADE27	incense cedar
<i>Castela emoryi</i>	CAEM4	thorn of christ
<i>Caesalpinia gilliesii</i>	CAGI	bird-of-paradise shrub
<i>Carnegia gigantea</i>	CAGI7	saguaro
<i>Canotia holacantha</i>	CAHO3	crucifixion thorn
<i>Catalpa speciosa</i>	CASP8	northern catalpa
<i>Cercis canadensis</i>	CECA4	eastern redbud
<i>Celtis laevigata</i>	CELA	sugarberry
<i>Celtis laevigata var. brevipes</i>	CELAB	sugarberry
<i>Celtis laevigata var. reticulata</i>	CELAR	netleaf hackberry
<i>Celtis laevigata var. texana</i>	CELAT8	Texan sugarberry
<i>Cercocarpus ledifolius</i>	CELE3	curleaf mountain mahogany
<i>Cercocarpus ledifolius var. intercedens</i>	CELEI	curleaf mountain mahogany
<i>Cercocarpus ledifolius var. intermontanus</i>	CELEI4	curleaf mountain mahogany
<i>Cercocarpus ledifolius var. ledifolius</i>	CELEL	curleaf mountain mahogany
<i>Celtis occidentalis</i>	CEOC	common hackberry
<i>Cephalanthus occidentalis</i>	CEOC2	common buttonbush
<i>Celtis occidentalis var. occidentalis</i>	CEOC02	western hackberry
<i>Cercis orbiculata</i>	CEOR9	Fabaceae
<i>Chilopsis linearis</i>	CHLI2	desert willow
<i>Chilopsis linearis ssp. arcuata</i>	CHLIA	desert willow
<i>Chilopsis linearis ssp. linearis</i>	CHLIL2	desert willow
<i>Condalia globosa</i>	COGL	bitter snakewood
<i>Condalia globosa var. pubescens</i>	COGLP	bitter snakewood
<i>Cornus nuttallii</i>	CONU4	Pacific dogwood
<i>Cornus sericea</i>	COSE16	redosier dogwood
<i>Cornus sericea ssp. occidentalis</i>	COSE0	western dogwood
<i>Cornus sericea ssp. sericea</i>	COSES	redosier dogwood
<i>Crataegus chrysocarpa</i>	CRCH	fireberry hawthorn
<i>Crataegus columbiana var. columbiana</i>	CRCO4	Columbian hawthorn
<i>Crataegus douglasii</i>	CRDO2	black hawthorn
<i>Crataegus douglasii var. douglasii</i>	CRDOD	Douglas' hawthorn
<i>Crataegus douglasii var. duchesnensis</i>	CRDOD2	Duchesne black hawthorn
<i>Crataegus erythropoda</i>	CRER	cerro hawthorn
<i>Crataegus monogyna</i>	CRMO3	oneseed hawthorn
<i>Crataegus rivularis</i>	CRRI	river hawthorn
<i>Crataegus saligna</i>	CRSA2	willow hawthorn
<i>Crataegus succulenta</i>	CRSU5	fleshy hawthorn
<i>Crataegus wootoniana</i>	CRWO	Wooton's hawthorn
<i>Cupressus arizonica</i>	CUAR	Arizona cypress

## **APPENDIX D Tree Species List (contd.)**

Cupressus arizonica ssp. arizonica	CUARA	Cupressaceae
Cupressus glabra	CUGL6	Arizona smooth cypress
Diospyros virginiana	DIVI5	common persimmon
Dodonaea viscosa	DOVI	Florida hopbush
Elaeagnus angustifolia	ELAN	Russian olive
Euonymus atropurpurea	EUAT3	eastern wahoo
Eysenhardtia polystachya	EYPO	kidneywood
Fagus grandifolia	FAGR	American beech
Forestiera shrevei	FOSH	desert olive
Frangula alnus	FRAL4	buckthorn
Fraxinus americana	FRAM2	white ash
Fraxinus anomala	FRAN2	singleleaf ash
Fraxinus anomala var. anomala	FRANA	singleleaf ash
Fraxinus anomala var. lowellii	FRANL	singleleaf ash
Fraxinus berlandieriana	FRBE	Mexican ash
Frangula betulifolia ssp. betulifolia	FRBEB	beechleaf frangula
Fremontodendron californicum	FRCA6	California flannelbush
Fraxinus cuspidata	FRCU	fragrant ash
Fraxinus dipetala	FRDI2	two petal ash
Fraxinus gooddingii	FRGO	Goodding's ash
Fraxinus greggii	FRGR2	Gregg's ash
Fraxinus papillosa	FRPA4	Chihuahuan ash
Fraxinus pennsylvanica	FRPE	green ash
Frangula purshiana	FRPU7	Pursh's buckthorn
Fraxinus velutina	FRVE2	velvet ash
Gleditsia triacanthos	GLTR	honeylocust
Juniperus ashei	JUAS	Ashe's juniper
Juniperus californica	JUCA7	California juniper
Juniperus deppeana	JUDE2	alligator juniper
Juniperus coahuilensis	JUCO11	redberry juniper
Juglans major	JUMA	Arizona walnut
Juglans microcarpa	JUMI	little walnut
Juglans microcarpa var. microcarpa	JUMIM	little walnut
Juniperus monosperma	JUMO	oneseed juniper
Juglans nigra	JUNI	black walnut
Juniperus occidentalis	JUOC	western juniper
Juniperus occidentalis var. australis	JUOCA	western juniper
Juniperus occidentalis var. occidentalis	JUOCO	western juniper
Juniperus osteosperma	JUOS	Utah juniper
Juniperus pinchotii	JUPI	Pinchot's juniper
Juniperus scopulorum	JUSC2	Rocky Mountain juniper
Koerberlinia spinosa	KOSP	crown of thorns
Koerberlinia spinosa var. spinosa	KOSPS	crown of thorns
Koerberlinia spinosa var. tenuispina	KOSPT	crown of thorns
Larix lyallii	LALY	subalpine larch
Larix occidentalis	LAOC	western larch
Leucaena leucocephala	LELE10	white leadtree
Leucaena retusa	LERE5	littleleaf leadtree
Malus coronaria	MACO5	sweet crabapple
Maclura pomifera	MAPO	osageorange
Malus pumila	MAPU	cultivated apple
Malus sylvestris	MASY2	apple
Melia azedarach	MEAZ	Chinaberrytree
Morus alba	MOAL	white mulberry
Morus microphylla	MOMI	Texas mulberry
Nicotiana glauca	NIGL	tree tobacco

## **APPENDIX D Tree Species List (contd.)**

<i>Olneya tesota</i>	OLTE	desert ironwood
<i>Ostrya knowltonii</i>	OSKN	Knowlton's hophornbeam
<i>Ostrya virginiana</i>	OSVI	eastern hophornbeam
<i>Ostrya virginiana</i> var. <i>virginiana</i>	OSVIV	Virginia hophornbeam
<i>Parkinsonia aculeata</i>	PAAC3	Jerusalem thorn
<i>Parkinsonia florida</i>	PAFL6	blue paloverde
<i>Parkinsonia microphylla</i>	PAMI5	yellow paloverde
<i>Pinus albicaulis</i>	PIAL	whitebark pine
<i>Pinus aristata</i>	PIAR	bristlecone pine
<i>Pinus arizonica</i>	PIAR5	Arizona pine
<i>Pinus arizonica</i> var. <i>arizonica</i>	PIARA	Arizona pine
<i>Pinus arizonica</i> var. <i>stormiae</i>	PIARS2	Arizona pine
<i>Pinus cembroides</i>	PICE	Mexican pinyon
<i>Pinus contorta</i>	PICO	lodgepole pine
<i>Pinus contorta</i> var. <i>latifolia</i>	PICOL	tall lodgepole pine
<i>Pinus contorta</i> var. <i>murrayana</i>	PICOM	Murray lodgepole pine
<i>Pinus discolor</i>	PIDI3	border pinyon
<i>Pinus edulis</i>	PIED	twoneedle pinyon
<i>Pinus edulis</i> var. <i>edulis</i>	PIEDE	twoneedle pinyon
<i>Picea engelmannii</i>	PIEN	Engelmann's spruce
<i>Pinus engelmannii</i>	PIEN2	Apache pine
<i>Pinus flexilis</i>	PIFL2	limber pine
<i>Picea glauca</i>	PIGL	white spruce
<i>Pinus jeffreyi</i>	PIJE	Jeffrey pine
<i>Pinus lambertiana</i>	PILA	sugar pine
<i>Pinus leiophylla</i>	PILE	Chihuahuan pine
<i>Pinus leiophylla</i> var. <i>chihuahuana</i>	PILEC	Chihuahuan pine
<i>Pinus longaeva</i>	PILO	Great Basin bristlecone pine
<i>Pinus monophylla</i>	PIMO	singleleaf pinyon
<i>Pinus monticola</i>	PIMO3	western white pine
<i>Pinus monophylla</i> var. <i>fallax</i>	PIMOF	Pinaceae
<i>Pinus ponderosa</i>	PIPO	ponderosa pine
<i>Pinus ponderosa</i> var. <i>ponderosa</i>	PIPOP	ponderosa pine
<i>Pinus ponderosa</i> var. <i>scopulorum</i>	PIPOS	ponderosa pine
<i>Picea pungens</i>	PIPU	blue spruce
<i>Pinus strobiformis</i>	PIST3	southwestern white pine
<i>Pinus washoensis</i>	PIWA	Washoe pine
<i>Platanus wrightii</i>	PLWR2	Arizona sycamore
<i>Populus X acuminata</i>	POAC5	lanceleaf cottonwood
<i>Populus alba</i>	POAL7	white poplar
<i>Populus angustifolia</i>	POAN3	narrowleaf cottonwood
<i>Populus balsamifera</i>	POBA2	balsam poplar
<i>Populus balsamifera</i> ssp. <i>balsamifera</i>	POBAB2	balsam poplar
<i>Populus balsamifera</i> ssp. <i>trichocarpa</i>	POBAT	black cottonwood
<i>Populus X brayshawii</i>	POBR7	Brayshaw's poplar
<i>Populus X canadensis</i>	POCA19	Canada poplar
<i>Populus deltoides</i>	PODE3	eastern cottonwood
<i>Populus deltoides</i> ssp. <i>deltoides</i>	PODED	eastern cottonwood
<i>Populus deltoides</i> ssp. <i>monilifera</i>	PODEM	plains cottonwood
<i>Populus deltoides</i> ssp. <i>wislizeni</i>	PODEW	Rio Grande cottonwood
<i>Populus fremontii</i>	POFR2	Fremont's cottonwood
<i>Populus fremontii</i> ssp. <i>fremontii</i>	POFRF3	Fremont's cottonwood
<i>Populus fremontii</i> ssp. <i>mesetae</i>	POFRM	Fremont's cottonwood
<i>Populus X hinckleyana</i>	POHI8	Hinckley poplar
<i>Populus X jackii</i>	POJA2	Jack's poplar

## **APPENDIX D Tree Species List (contd.)**

Populus nigra	PONI	Lombardy poplar
Populus tremuloides	POTR5	quaking aspen
Prunus americana	PRAM	American plum
Prunus angustifolia	PRAN3	Chickasaw plum
Prunus angustifolia var. angustifolia	PRANA	Chickasaw plum
Prunus angustifolia var. watsonii	PRANW	Watson's plum
Prunus armeniaca	PRAR3	apricot
Prunus avium	PRAV	sweet cherry
Prunus cerasus	PRCE	sour cherry
Prunus domestica	PRDO	European plum
Prunus emarginata	PREM	bitter cherry
Prunus emarginata var. emarginata	PREME	bitter cherry
Prosopis glandulosa	PRGL2	honey mesquite
Prosopis glandulosa var. glandulosa	PRGLG	honey mesquite
Prosopis glandulosa var. torreyana	PRGLT	western honey mesquite
Prunus mahaleb	PRMA	Mahaleb cherry
Prunus pensylvanica	PRPE2	pin cherry
Prunus persica	PRPE3	peach
Prunus pensylvanica var. pensylvanica	PRPEP	fire cherry
Prunus pensylvanica var. saximontana	PRPES	fire cherry
Prosopis pubescens	PRPU	screwbean mesquite
Prunus serotina	PRSE2	black cherry
Prunus serotina var. rufula	PRSER2	black cherry
Prunus serotina var. virens	PRSEV	black cherry
Prunus spinosa	PRSP	blackthorn
Prosopis velutina	PRVE	velvet mesquite
Prunus virginiana	PRVI	common chokecherry
Prunus virginiana var. demissa	PRVID	western chokecherry
Prunus virginiana var. melanocarpa	PRVIM	black chokecherry
Pseudotsuga menziesii	PSME	Douglas fir
Pseudotsuga menziesii var. glauca	PSMEG	Rocky Mountain Douglas fir
Pseudotsuga menziesii var. menziesii	PSMEM	Douglas fir
Psoralea argemone	PSSP3	smoketree
Ptelea trifoliata	PTTR	common hoptree
Ptelea trifoliata ssp. angustifolia	PTTRA	common hoptree
Ptelea trifoliata ssp. angustifolia var. angustifolia	PTTRA2	common hoptree
Ptelea trifoliata ssp. pallida var. cognata	PTTRC	common hoptree
Ptelea trifoliata ssp. pallida var. confinis	PTTRC2	common hoptree
Ptelea trifoliata ssp. pallida var. lutescens	PTTRL	common hoptree
Ptelea trifoliata ssp. pallida	PTTRP	common hoptree
Ptelea trifoliata ssp. polyadenia	PTTRP2	common hoptree
Ptelea trifoliata ssp. pallida var. pallida	PTTRP4	pallid hoptree
Ptelea trifoliata ssp. trifoliata	PTTRT	common hoptree
Purshia mexicana	PUME	Mexican cliffrose
Purshia stansburiana	PUST	Stansbury cliffrose
Pyrus communis	PYCO	common pear
Quercus arizonica	QUAR	Arizona white oak
Quercus chrysolepis	QUCH2	canyon live oak
Quercus chrysolepis var. chrysolepis	QUCHC	canyon live oak
Quercus dumii	QUDU3	Palmer oak
Quercus emoryi	QUEM	Emory's oak
Quercus gambelii	QUGA	Gambel's oak
Quercus gambelii var. bonina	QUGAB2	Gambel's oak
Quercus gambelii var. gambelii	QUGAG	Gambel's oak
Quercus grisea	QUGR3	gray oak
Quercus hypoleucoides	QUHY	silverleaf oak

## APPENDIX D Tree Species List (contd.)

<i>Quercus macrocarpa</i>	QUMA2	bur oak
<i>Quercus macrocarpa</i> var. <i>macrocarpa</i>	QUMAM	bur oak
<i>Quercus mohriana</i>	QUMO	Mohr's oak
<i>Quercus muehlenbergii</i>	QUMU	chinkapin oak
<i>Quercus oblongifolia</i>	QUOB	Mexican blue oak
<i>Quercus X organensis</i>	QUOR	oak
<i>Quercus X palmeriana</i>	QUPA3	Palmer's oak
<i>Quercus X pauciloba</i>	QUPA4	wavyleaf oak
<i>Quercus pungens</i>	QUPU	pungent oak
<i>Quercus pungens</i> var. <i>pungens</i>	QUPUP	pungent oak
<i>Quercus rugosa</i>	QURU4	netleaf oak
<i>Quercus toumeyi</i>	QUTO2	Toumey's oak
<i>Quercus turbinella</i>	QUTU2	shrub live oak
<i>Quercus turbinella</i> var. <i>ajoensis</i>	QUTUA	shrub live oak
<i>Quercus turbinella</i> var. <i>turbinella</i>	QUTUT	shrub live oak
<i>Rhamnus cathartica</i>	RHCA3	common buckthorn
<i>Rhus glabra</i>	RHGL	smooth sumac
<i>Rhus hirta</i>	RHHI2	staghorn sumac
<i>Rhus kearneyi</i>	RHKE	Kearney's sumac
<i>Rhus lanceolata</i>	RHLA3	prairie sumac
<i>Rhus ovata</i>	RHOV	sugar sumac
<i>Rhus virens</i> var. <i>choriophylla</i>	RHVIC	evergreen sumac
<i>Ricinus communis</i>	RICO3	castorbean
<i>Robinia X holdtii</i>	ROHO	Holdt's locust
<i>Robinia neomexicana</i>	RONE	New Mexico locust
<i>Robinia neomexicana</i> var. <i>neomexicana</i>	RONEN	New Mexico locust
<i>Robinia neomexicana</i> var. <i>rusbyi</i>	RONER	Rusby's locust
<i>Robinia pseudoacacia</i>	ROPS	black locust
<i>Salix X alba</i>	SAAL17	Salicaceae
<i>Salix alba</i>	SAAL2	white willow
<i>Salix alba</i> var. <i>vitellina</i>	SAALV	golden willow
<i>Salix amygdaloides</i>	SAAM2	peachleaf willow
<i>Salix babylonica</i>	SABA2	weeping willow
<i>Salix bebbiana</i>	SABE2	Bebb willow
<i>Sapium biloculare</i>	SABI4	Mexican jumpingbean
<i>Salix bonplandiana</i>	SABO	red willow
<i>Sambucus cerulea</i> var. <i>cerulea</i>	SACEC	blue elderberry
<i>Salix discolor</i>	SADI	pussy willow
<i>Salix exigua</i>	SAEX	sandbar willow
<i>Salix fragilis</i>	SAFR	crack willow
<i>Salix geyeriana</i>	SAGE2	Geyer's willow
<i>Salix gooddingii</i>	SAGO	Goodding's willow
<i>Salix lasiolepis</i>	SALA6	arroyo willow
<i>Salix lasiolepis</i> var. <i>lasiolepis</i>	SALAL2	Tracy willow
<i>Salix ligulifolia</i>	SALI	strapleaf willow
<i>Salix lucida</i>	SALU	shining willow
<i>Salix lucida</i> ssp. <i>caudata</i>	SALUC	greenleaf willow
<i>Salix lucida</i> ssp. <i>lasiandra</i>	SALUL	Pacific willow
<i>Salix melanopsis</i>	SAME2	dusky willow
<i>Salix monticola</i>	SAMO2	park willow
<i>Sambucus nigra</i> ssp. <i>canadensis</i>	SANIC4	Caprifoliaceae
<i>Sambucus nigra</i> ssp. <i>cerulea</i>	SANIC5	Caprifoliaceae
<i>Salix petiolaris</i>	SAPE5	meadow willow
<i>Salix prolixa</i>	SAPR3	MacKenzie's willow
<i>Sambucus racemosa</i> var. <i>racemosa</i>	SARAR3	Caprifoliaceae
<i>Salix X rubens</i>	SARU3	rubens willow

## **APPENDIX D Tree Species List (contd.)**

<i>Sapindus saponaria</i>	SASA4	wingleaf soapberry
<i>Sapindus saponaria</i> var. <i>drummondii</i>	SASAD	western soapberry
<i>Salix scouleriana</i>	SASC	Scouler's willow
<i>Salix X sepulcralis</i>	SASE10	sepulcral willow
<i>Salix sitchensis</i>	SASI2	Sitka willow
<i>Salix taxifolia</i>	SATA	yewleaf willow
<i>Shepherdia argentea</i>	SHAR	silver buffaloberry
<i>Sorbus aucuparia</i>	SOAU	European mountainash
<i>Sophora secundiflora</i>	SOSE3	mescal bean
<i>Sorbus sitchensis</i>	SOSI2	western mountainash
<i>Sorbus sitchensis</i> var. <i>sitchensis</i>	SOSIS2	Sitka mountainash
<i>Tamarix africana</i>	TAAF	African tamarisk
<i>Tamarix aphylla</i>	TAAP	Athel tamarisk
<i>Taxus brevifolia</i>	TABR2	Pacific yew
<i>Tamarix canariensis</i>	TACA9	Canary Island tamarisk
<i>Tamarix chinensis</i>	TACH2	five-stamen tamarisk
<i>Tamarix gallica</i>	TAGA	French tamarisk
<i>Tamarix parviflora</i>	TAPA4	smallflower tamarisk
<i>Tamarix ramosissima</i>	TARA	saltcedar
<i>Tecoma stans</i>	TEST	yellow trumpetbush
<i>Thuja plicata</i>	THPL	western redcedar
<i>Tsuga heterophylla</i>	TSHE	western hemlock
<i>Tsuga mertensiana</i>	TSME	mountain hemlock
<i>Ulmus americana</i>	ULAM	American elm
<i>Ulmus pumila</i>	ULPU	Siberian elm
<i>Ungnadia speciosa</i>	UNSP	Mexican buckeye
<i>Vauquelinia californica</i>	VACA5	Arizona rosewood
<i>Vauquelinia californica</i> ssp. <i>californica</i>	VACAC	California rosewood
<i>Vauquelinia californica</i> ssp. <i>pauciflora</i>	VACAP	Arizona rosewood
<i>Vauquelinia californica</i> ssp. <i>sonorensis</i>	VACAS	Sonora rosewood
<i>Viburnum lantana</i>	VILA	wayfaringtree
<i>Viburnum lentago</i>	VILE	nannyberry
<i>Washingtonia filifera</i>	WAFI	California fan palm



**APPENDIX E.2 Item Coding Guide: Location Description and Subplot Data**

## ITEM CODING GUIDE

FIELD LOCATION DESCRIPTION				SUBPLOT DATA			
		Sampled Tree Land Present	NO Sampled Tree Land Present			Sampled Tree Land Present on Subplot	NO Sampled Tree Land Present On subplot
101	State	X	X				
102	Map Number	X	X	301	Subplot Status	X	X
103	CPN	X	X	304	Condition List	X	X
104	County	X	X	303	Center Cond #	X	X
105	Location	X	X	322	Root Disease	X	
107	Future Forest Potential		X				
110	Current Owner	X	X				
111	Reserved Status	X	X				
121	Date - Month	X	X				
	- Day	X	X				
	- Year	X	X				
122	Crew Spvsr	X	X				
	Crew Number	X	X				
	Crew Number	X	X				
123	Crew type	X	X				
124	QA Status	X	X				
130	Location Access	X	X				
129	Location Status	X	X				
131	Sample Kind	1	1				
132	Subplot Radius	240	240				
133	Microplot Radius	068	068				
135	Microplot Location	1	1				
140	Elevation	X	R				
141	Size of Forest Area	X	R				
143	Trails or Roads	X	R				
144	Distance to Road	X	R				
145	Use Restriction 1	X	R				
	Use Restriction 2	X	R				
146	Recreation Use 1	X	R				
	Recreation Use 2	X	R				
	Recreation Use 3	X	R				
147	Water Proximity	X	R				
148	Water Type	X	R				
160	#Tree Records (forms)	X	R				
161	# Conditions (forms)	X	R				

Key: X = Always record  
R = Record only for locations  
in Rangeland Units

## APPENDIX E.3 Item Coding Guide: Condition Description Data

### ITEM CODING GUIDE CONDITION CLASS DESCRIPTION

X = ALWAYS RECORD

R = RECORD ONLY FOR LOCATIONS WITHIN A RANGELAND UNIT (BRIDEGR-TETON NF)

		Sampled Forest Land	Sampled Other Tree Land	Nonsampled Forest Land	Nonsampled Other Tree Land	Non-Tree Land	Water
State	101	X	X	X	X	X	X
County	102	X	X	X	X	X	X
Location	103	X	X	X	X	X	X
Condition Class Number	201	X	X	X	X	X	X
Current Ground Cover	211	X	X	X	X	X	X
Current Land Use Class	213	X	X	X	X	X	
<b>Forest Type</b>							
Forest Type	221	X		X			
Stand-Size Class	222	X					
Stand Origin	223	X					
Stand Density	224	X					
<b>Dominant Tree Species</b>							
Dominant Tree Species	236		X		R		
Rangeland Cover Type	237					R	
<b>Slope</b>							
Slope	240	X	X	R	R	R	
Aspect Azimuth	241	X	X	R	R	R	
<b>Physiographic Class</b>							
Physiographic Class	243	X	X	R	R	R	
<b>Stand Age</b>							
Stand Age	232	X					
<b>Size of Condition</b>							
Size of Condition	220	X	X	X	R	R	X
<b>Habitat Type</b>							
Primary Habitat Type	234	X	X	R	R	R	
Secondary Habitat Type		X	X	R	R	R	
<b>Crown Cover</b>							
Crown Cover	233	X	X	R	R	R	
<b>Litter Depth</b>							
Litter Depth	254	X	X	R	R	R	
<b>Cutting History</b>							
Cutting Type	260	X	X	R	R	R	
Cutting History (year)	261	X	X	R	R	R	
Burn History (year)	262	X	X	R	R	R	
<b>Disturbance Type</b>							
Cond. Disturbance Type	263	X	X	X	X	R	
Cond. Dist. History (year)	264	X	X	X	X	R	
<b>Soil and Ground Cover</b>							
Fine soils (<1/8") (# hits)	275	X	X	R	R	R	R
Pavement (1/8-3/4")		X	X	R	R	R	R
Rock (>3/4")		X	X	R	R	R	R
Litter Cover		X	X	R	R	R	R
Crypto-crust Cover		X	X	R	R	R	R
Moss/Lichen Cover		X	X	R	R	R	R
Basal Veg. Cover		X	X	R	R	R	R
Other Cover (water, etc.)		X	X	R	R	R	R

ITEM CODING GUIDE: TREE DATA

STATE X COUNTY X LOCATION# X

	Subplot Number	Tree Number	Horizontal Distance	Azimuth	Condition Class	Tree History	Lean Angle	Species	Current DBH/DRC	DBH/DRC Check	Number of Stems	Tree Height	Height Check	Uncompacted Crown	Compacted Crown	Crown Class	Cone Serotiny	Damage 1	Damage 2	Damage 3	Mistletoe	% Rotten/Missing	% Sound Dead	% Form Defect	Current Tree Class	Corner Posts	Line Posts	Christmas Tree	Radial Growth	Tree Age	Growth/Age Check	Site Tree **	Mortality	Cause of Death	Past Tree Class
Live Tally 5.0" DBH/DRC	X	X	X	X	X	1	X	X	X*	X	W	X	X	T	T	X	L	X	X	X	X	X	X	T	X	J	J	P	A	A	A	X			
Live Sapling 1.0-4.9" DBH/DRC	X	X	X	X	X	1	X	X	X*	X	W	X	X	T	T	X	L				X				X		J	P	A	A	A				
Dead Tally 5.0"+ DBH/DRC	X	X	X	X	X	2	X	X	X*	X	W	X	X									X	X		X	J	J					X	M	M	
Dead Tally 5.0"+ DBH/DRC	X	X	X	X	X	2	X	X	X*	X	W	X	X												X						X	M	M		
Nontallied Site Tree (Timber only)	X	X	X	X	X	0	X	X	X*	X		X	X	X	X	X		X	X	X					X			X	X	X	X				

Subplot Number	Condition Class	Species	Count	Total Age
Tally spp. <1.0" DBH/DRC	X	X	X	X

A = Age and Radial trees as directed  
 J = Juniper and oak species only  
 L = Lodgepole pine only  
 M = Mortality trees only  
 P = Pinyon trees 12" and shorter

T = Timber species only  
 W = Woodland spp. Only  
 X = Always record

\* Record individual stems and live/dead for woodland trees on the data recorder or on the multistem woodland supplemental form.  
 \*\* If a site tree is used for other condition classes, record the classes on the data recorder or in tree comments.

**CHAPTER 14 - APPENDIX F VARIABLE NAME ABBREVIATIONS**

**APPENDIX F Variable Name Abbreviations** (*Italics – no longer collected*)

<u>Variable Name</u>	<u>Item Number</u>	<u>PDR Prompt Name</u>	<u>SAS Data Table Abbr.</u>	<u>Westwide Data Base Abbr.</u>
<b>Location Description:</b>				
State	101	State	STATE	STATE
Map Number	102	Map	MAP	
Cons. Point Number	103	CPN	CPN	
County	104	Co	CO	COUNTY
Sample Area				UNIT
Field Location Number	105	Loc	LOC	PLTNUM
UTM Zone	106	UtmZ	GRIDZONE	
UTM Easting	107	UtmE	EASTING	
UTM Northing	108	UtmN	NORTHING	
Past Ownership	109	P_Owner	P_OWNER	
Current Ownership	110	Owner	OWNER	OWNER
Reserved Status	111	RsStat	RESSTAT	RESERVCL
Past Date - Month	120	P_Mo	P_MONTH	
Past Date - Day	NA	P_Day	P_DAY	
Past Date - Year	NA	P_Yr	P_YEAR	
Current Date - Month	121	Month	MONTH	MDATE
Current Date - Day	121	Day	DAY	
Current Date - Year	121	Year	YEAR	MDATE
Crew Number(s) 1	122	Crew1	CREWNO1	
Crew Numbers 2-5	122	Crew2...5	CREWNO2..5	
Crew Type	123	CrewTyp	CREWTYP	
QA Status	124	QASat	QASTAT	
Location Status - Past	NA	OldStat	P_STAT	
Location Status - Current	129	CurStat	CURSTAT	
Location Access	130	LocAcc	LOCACC	
Sample Kind	131	SampKnd	SAMPKND	
Subplot Radius	132	SubRd	SUBRD	
Microplot Radius	133	MicRd	MICRD	
Elevation	140	Elev	ELEV	ELEV
Size of Forested Area	141	SzFor	SZFOR	
<i>Remote Sensing</i>				
<i>Cover Type 1</i>	<i>142</i>	<i>RsCv1</i>	<i>RSCOV1</i>	
<i>Cover Type 2</i>	<i>142</i>	<i>RsCv2</i>	<i>RSCOV2</i>	
Trails or Roads	143	Roads	ROADS	
Distance to				
Improved Road	144	DsRoad	DISROAD	
Public Use Restriction 1	145	PusRs1	PUR1	
Public Use Restriction 2	145	PusRs2	PUR2	

**APPENDIX F Variable Name Abbreviations**

<u>Variable Name</u>	<u>Item Number</u>	<u>PDR Prompt Name</u>	<u>SAS Data Table Abbr.</u>	<u>Westwide Data Base Abbr.</u>
<b>Location Description (contd):</b>				
Recreation Use 2	146	RecUse2	RECUSE2	
Recreation Use 3	146	RecUse3	RECUSE3	
Water Proximity	147	WaterPr	WATERPRO	
Water Type	148	WaterTy	WATERTYP	
<i>Land Use Impact 1</i>	<i>149</i>	<i>LndUse1</i>	<i>LNDUSE1</i>	
<i>Land Use Impact 2</i>	<i>149</i>	<i>LndUse2</i>	<i>LNDUSE2</i>	
<i>Land Use Impact 3</i>	<i>149</i>	<i>LndUse3</i>	<i>LNDUSE3</i>	
<i>Land Use Impact Dist. 1</i>	<i>150</i>	<i>UseDis1</i>	<i>LNDDIST1</i>	
<i>Land Use Impact Dist. 2</i>	<i>150</i>	<i>UseDis2</i>	<i>LNDDIST2</i>	
<i>Land Use Impact Dist. 3</i>	<i>150</i>	<i>UseDis3</i>	<i>LNDDIST3</i>	
Number of Tree Records	160	NA		
Number of Conditions	161	NA		
Tally File Line Number/ Screen		LINENO		
Tally File Record Number		RECNO		
Tally File Number of Records/Screen		NORECS		
Tally File Screen Number		SCREEN		
Tally File Menu Status		MENUDONE		
Tally File Record Status		RECDONE		
<b>Condition Class Description:</b>				
Condition Class Number	201	CndCl	CNDCL	COND
Past Ground Cover	210	P_GndC	P_GRDCOV	LCOLD
Current Ground Cover	211	GndCv	GRDCOV	LCCUR
Past Land Use Class	212	PLUCI	P_LNDUSE	
Current Land Use Class	213	LU Cl	LNDUSE	
Size of Condition	220	SzCnd	SZCND	
<i>Stocking Condition Class</i>	<i>230</i>	<i>Stock</i>	<i>COVCLCND</i>	
Forest Type	221	ForTyp	R_FORTYP	TYPCUR
Forest Type Group	221	T/W Fty		
Stand-size Class	222	StdSize	R_STSZCL	STDSIZE
Stand Origin	223	StdOrig	STNDORG	
Stand Density	224	StdDens	STNDDEN	
<i>Stand Structure</i>	<i>231</i>	<i>StdStru</i>	<i>STNDSTRC</i>	
Stand Age	232	StAge	R_STAGE	STDAGE
Lower Age	232	StAg2	R_STAGE2	
Crown Cover	233	CrCov	CRCOV	
Condition Habitat Type 1	234	HabTyp1	HABTYP1	
Type 2		HabTyp2	HABTYP2	

## APPENDIX F Variable Name Abbreviations

<u>Variable Name</u>	<u>Item Number</u>	<u>PDR Prompt Name</u>	<u>SAS Data Table Abbr.</u>	<u>Westwide Data Base Abbr.</u>
<b>Condition Class Description: (contd)</b>				
Dominant Tree Species	236	DomTrSp	DOMTRSP	PNC
<i>Rangeland Cover Type</i>	237	<i>RngTy</i>	<i>Only for BT</i>	
Slope	240	Slope	SLOPE	SLOPE
Aspect Azimuth	241	Aspct	ASPECTAZ	ASPECT
<i>Curvature Class</i>	242	<i>CurveCl</i>	<i>CURVECL</i>	
Physiographic Class	243	PhysCl	PHYSCL	
<i>Soil Group</i>	250	<i>SoilGrp</i>	<i>SOILGRP</i>	<i>SOILGRP</i>
<i>Soil Texture</i>	251	<i>SoilTex</i>	<i>SOILTEX</i>	
Percent Bare Ground	252	%Bare	PCTBARE	
<i>Soil Erosion</i>	253	<i>SoilEro</i>	<i>SOILERO</i>	
Litter Depth	254	Littr	LITTER	
<i>Humus Depth</i>	255	<i>Humus</i>	<i>HUMUS</i>	
Cutting Type	260	CutTyp	CUTTYP	
Cutting History	261	CtYr	CUTYR	
Burn History	262	BrYr	BURNYR	
Condition Disturbance Type	263	Dstrb	DSTRB	
Condition Disturbance History	264	DsYr	DSTRBYR	
<i>Vegetation Concealment</i>	270	<i>VegConc</i>	<i>VEGCONC</i>	
<i>Wildlife Cover – Primary</i>	271	<i>WldCv1</i>	<i>WLDCOV1</i>	
<i>Wildlife Cover – Second.</i>	271	<i>WldCv2</i>	<i>WLDCOV2</i>	
<i>Wildlife Cover – Tert.</i>	271	<i>WldCv3</i>	<i>WLDCOV3</i>	
<i>Animal Type - Primary</i>	272	<i>Animal1</i>	<i>ANIMAL1</i>	
<i>Animal Type - Secondary</i>	272	<i>Animal2</i>	<i>ANIMAL2</i>	
<i>Animal Type - Tertiary</i>	272	<i>Animal3</i>	<i>ANIMAL3</i>	
<i>Browsing Intensity</i>	273	<i>Browse</i>	<i>BROWINT</i>	
<i>Grazing Intensity</i>	274	<i>Graze</i>	<i>GRAZEINT</i>	
Condition Class Change	NA	CC Chng	CNDCLCHG	
Ground Cover Transects	275	<i>Only 50' of transect (outside of BT)</i>		
Bare Gorund	NA	Bare	TRANBARE	
Pavement	NA	Pave	TRANPAVE	
Rocks	NA	Rock	TRANROCK	
Litter	NA	Lit	TRANLIT	
Cryptobiotic Crusts	NA	Cryp	TRANCryp	
Moss/Lichens	NA	Ms/Lc	TRANMSLC	
Basal Vegetation	NA	Veg	TRANVEG	
Other	NA	Other	TRANOTH	

## APPENDIX F Variable Name Abbreviations

<u>Variable Name</u>	<u>Item Number</u>	<u>PDR Prompt Name</u>	<u>SAS Data Table Abbr.</u>	<u>Westwide Data Base Abbr.</u>
<b>Boundary Data:</b>				
Subplot Number	281	NA		
Mapping Plot Type	282	PlotTyp	PLOTTYP	
Contrasting Condition				
Class Number	284	ContCnd	CONTCOND	
Offset Point Number	283	OffstPt	OFFSTPT	
Azimuth Left	285	LftAz	LFTAZ	
and Right	285	RgtAz	RGTAZ	
Corner Azimuth	287	CnrAz	CNRAZ	
and Distance	287	CnrDs	CNRDIST	
Offset Distance Left	286	LftDs	LFTDIST	
and Right	286	RgtDs	RGTDIST	
Boundary Change	NA	Bd Chng	BNDCHG	
<b>Subplot Data:</b>				
Subplot Number	NA	SubPlt#	SUBPLTNO	POINT
Past Subplot Status	NA	P_SubSt	P_SUBSTA	
Subplot Status	301	SubStat	SUBSTAT	
Offset Point Used -Subpl	302	SbOffst	SUBOFFST	
Offset Point Used -Micro	NA	MpOffst	MICOFFST	
Subplot Condition List 1	304	SbCdList:	SUBCND1	
Subplot Condition List 2-4	304	"	SUBCND2..4	
Subplot Center Cond.	303	SbCtrCd	SUBCTCND	
Microplot Center Cond.	(N/A)	MpCtrCd	MICCTCND	
<i>Subplot Stocking Cond.</i>	305	<i>Stocking</i>	<i>COVCLSUB</i>	
Habitat Type	320	HabTyp	HABSUB	
<i>Seed Source</i>	321	<i>SeedSrc</i>	<i>SEEDSORC</i>	
Root Disease Severity				
Rating	322	RootDis	ROOTSEV	

## APPENDIX F Variable Name Abbreviations

<u>Variable Name</u>	<u>Item Number</u>	<u>PDR Prompt Name</u>	<u>SAS Data Table Abbr.</u>	<u>Westwide Data Base Abbr.</u>
<b>Subplot/Microplot Tree Tally Data:</b>				
Subplot Number	401	SubPlt#	SUBPLTNO	POINT
Tree Number	402	Tree#	TRNO	TREE
Offset Point Number	403	OffstPt	OFFSTPT	
Azimuth	404	Azi	AZIMUTH	
Horizontal Distance	405	HDist	HDIST	
Past Condition Class	NA	P_CndCl	P_CNDCL	
Condition Class	406	CndCl	CNDCL	
Past Tree History	410	P_THist	P_TRHIS	
Current Tree History	411	TrHist	TRHIS	STATUS
Tree Lean Angle	412	LeanAn	LEANANGL	
Site Tree	414	SiteTr	SITETRCd	
Site Tree Cond. List 1	NA	SiCndLs:	SITRCND1	
Site Tree Cond. List 2-3	NA	"	SITRCND2..3	
Mortality	415	Mort	MORTCD	
Species	416	Speci	SPP	SPP
Past DBH	420	P_DBH	P_DBH	DIAOLD
Current DBH	421	DBH	DBH	DIACUR
Past DRC	420	P_DRC	P_DRC	DIAOLD
Current DRC	421	DRC	DRC	DIACUR
DBH/DRC Check	423	Dia Chk	DIACHK	
Past Number of Stems	NA	P#Stem	P_NOSTEM	
Number of Stems	424	#Stems	NOSTEM	
Radial/Age Tree?	NA	RadAge?	RADAGECD	
Radial Growth	430	RadGro	R_RADGRW	
Tree Age - Total	431	ToAge	TOTAGE	
Tree Age - Breast Height	431	BhAge	BHAGE	
Tree Age Check	432	Age Chk	AGECHK	
Past Tree Height	440	P_Ht	P_HT	
Current Tree Height	441	Ht	HT	HT
Tree Height Check	442	Ht Chk	HTCHK	
Uncompacted Crown Ratio	443	CRatU	UCRRAT	
Compacted Crown Ratio	444	CRatC	CCRRAT	CRATIO
Crown Class	445	CrownCl	CRCL	CRCLS
Relative Crown Position	446	RCP	RCP	

## APPENDIX F Variable Name Abbreviations

<u>Variable Name</u>	<u>Item Number</u>	<u>PDR Prompt Name</u>	<u>SAS Data Table Abbr.</u>	<u>Westwide Data Base Abbr.</u>
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### **Subplot/Microplot Tree Tally Data (contd):**

Damage - *(for trees  $\geq 5.0"$  DBH/DRC only)*

Damage - Primary	450	Damag1	DAMAGE1	DAMAGE
Damage - Secondary	450	Damag2	DAMAGE2	DAMAGE
Damage Tertiary	450	Damag3	DAMAGE3	DAMAGE

Cause of Death 455 Cause CAUSE

Mistletoe Class 456 MistCl MISTCL

Percent Volume Loss - *(for trees  $\geq 5.0"$  DBH/DRC only)*

Rotten and Missing 460 RotMs ROTMSPCT

Sound Dead 461 SDead DEADPCT

Form Defect 462 FormD FORMPCT

Past Tree Class 463 P\_TrCl P\_TRCL

Current Tree Class 464 TrCl TRCL TCLASS

Posts - Lines 470 PostLn LINE

Posts - Corners 471 PostCR CORNER

Christmas Tree Grade 472 XmasTr XMAS

(Comments, yes or no) NA Notes? NOTESCD

Notes Description NA Desc. NOTEDESC

Woodland Stem Live/Dead NA Live/Dead

Code Stem 1 NA L or D LD01

Code Stems 2-30 NA L or D LD02..30

Woodland Stem Diameter Stem 01 #01 STMDIA01

Woodland Stem Diameter Stems 2-30 #02..30 STMDIA01..30

## APPENDIX F Variable Name Abbreviations

<u>Variable Name</u>	<u>Item Number</u>	<u>PDR Prompt Name</u>	<u>SAS Data Table Abbr.</u>	<u>Westwide Data Base Abbr.</u>
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### **Microplot Tree Count Data:**

Seedling/Sapling				
Count Type	413	CntTyp	CNTTYP	
Condition Class	406	CndCl	CNDCL	
Species	416	Speci	SPP	
DRC Class	421	AvDRC	DRC	
Tree Count	422	Count	TRCOUNT	
<i>Count Check</i>	<i>423</i>	<i>Cnt Chk</i>	<i>CNTCHK</i>	
Age?	NA	Age?		
Age	431	ToAge	AGECD	
Average Height	441	AvHt	HT	
Notes?	NA	Notes?	NOTESCD	
Notes Description	NA	Desc.	NOTEDESC	

### **Understory Vegetation Description:**

#### Part 1

Vegetation Life Form	NA		LIFEFORM
Species	NA	Speci	SPECIES
Cover (percent)	NA	Cover	COVPCT
Layer code	NA	Layer	LAYER

#### Part 2

Tree Cover, Layer 1	NA	TCvLr1	TCOVLYR1
Tree Cover, Layers 2-3	NA	TCvLr2..3	TCOVLYR2..3
Shrub Cover, Layer 1	NA	SCvLr1	SCOVLYR1
Shrub Cover, Layers 2-3	NA	SCvLr2..3	SCOVLYR2..3
Forb Cover, Layer 1	NA	FCvLr1	FCOVLYR1
Forb Cover, Layers 2-3	NA	SCvLr2..3	FCOVLYR2..3
Grass Cover, Layer 1	NA	GCvLr1	GCOVLYR1
Grass Cover, Layers 2-3	NA	GCvLr2..3	GCOVLYR2..3

### **Plot Notes:**

Plot Note Year	NA	Year	NOTEYR
Plot Notes,			
Remarks Line 1	NA	Rem1	REM1
Remarks Lines 2-8	NA	Rem2..8	REM2..8

**CHAPTER 14 - APPENDIX G**

**PLGR Operating Instructions**

Use the instructions below for setting up and operating the Precision Lightweight GPS Receiver. Each section below corresponds to its counterpart in Chapter 2.c.2, **“Finding the Field Location Center – New Field Locations.”**

- a. **Verify PLGR Settings.** The proper initial PLGR settings are critical for positioning and navigational accuracy. Once the PLGR settings are selected, they become the default value each time the PLGR is turned on.

**PLGR: Setup.** To enter the **Setup Menu**, insert the PLGR batteries and turn the unit on. Push the **Menu** button, then use the right arrow key to highlight **Setup**. Use the down arrow key to select **Setup**.

<u>Position</u>	<u>Line Heading</u>	<u>Setting</u>
SCREEN 1		
Line 1, Field 1	Setup Mode	: <b>Cont</b>
Line 2 and 3		: na
Line 4, Field 1	SV-Type	: <b>Mixed</b>
SCREEN 2		
Line 1	Setup Units	: na
Line 2, Field 1		: <b>UTM/UPS</b>
Line 2, Field 2		: <b>English</b>
Line 3, Field 1	Elev.	: <b>Feet</b>
Line 3, Field 2	Elev.	: <b>MSL (Mean Sea Level)</b>
Line 4, Field 1	ANG.	: <b>DEG</b>
Line 4, Field 2	ANG.	: <b>Mag</b>
SCREEN 3		
Line 1	Setup MAGVAR	: na
Line 2, Field 1	Type	: <b>Calc</b>
Line 2, Field 2	Type	: <b>deg</b>
Line 3	WM 1995	: na
SCREEN 4		
Line 1, Field 1	Setup Wage	: <b>ON</b>
Line 2, Field 1	ELHold	: <b>automatic</b>
Line 3, Field 1	TIME	: <b>Z-600 (Mountain Standard)</b> <b>Z-700 (Daylight Savings)</b>
Line 4, Field 1	ERR	: <b>EHE</b>
SCREEN 5		
Line 1, Field 1	Setup DTM	: <b>NAS-C</b>
Line 2	NA27CONUS/CLK66	(see note below)
Line 3	Automatic Off	: na
Line 4, Field 1	Timer	: <b>Off</b>

**Note:** Examine each topographic map to identify the UTM datum, located in the bottom left hand corner of the map. Most USGS maps in the West use the 1927 (NAS-C) datum. Notify the field

supervisor if maps with the 1983 (NAR) datum are encountered because the UTM plot grid system used for the Program is based on the 1927 system.

- b. **Verify that your PLGR has a Current Cryptographic Key.** Press the menu button twice. The word **CRYPTO** displays in the lower left corner of the screen if you have a current key. If this field is blank you do not have a cryptographic key installed. Inform your supervisor and obtain another PLGR or use baseline procedures to locate the LC.
- c. **Verify WAGE Activation.** WAGE stands for Wide Area GPS Enhancements. WAGE allows the PLGR to use enhanced clock signals from the Precise Positioning Service Satellites. Approximately 15 minutes after the initial start up of the PLGR, a “**W**” will appear to the right of the Elevation Hold (**EIh**) field on the first page of the Positioning menu. A “**W**” indicates that the PLGR has an updated WAGE. If possible, do not record UTM coordinates at the RP or LC until the PLGR has an updated WAGE.
- d. **Enter the LC coordinates into the PLGR.** All potential LC coordinates for a given work area should be uploaded to the PLGR prior to moving to a new work area. LC coordinates for a given work area will begin at waypoint number 101 in the PLGR leaving the first 100 waypoints empty for user waypoint entry. If the LC coordinates are not preloaded or are missing, obtain the coordinates from the location packet label or from the topographic map inside the packet and enter them manually.

**PLGR: Way Points.** A Way Point is a specific location marked in the PLGR for future reference. Examples of a potential Way Points include the location of the truck, a trailhead, a critical junction on a travel route to the plot, the reference tree, or the plot center location. There are three methods of setting Way Points in the PLGR: by uploading waypoints from a PC, by using the **Mark** Key, or by a manual input of the coordinates using the **WP** Key.

- **PC to PLGR Upload.** All potential LC coordinates for a given work area should be preloaded into the PLGR before moving to a new work area using this method. LC waypoints will be named using the following naming convention. State letter – County number – Location Number (e.g., A-029-0123.)

Refer to the **Waypoint Number– Location Center Cross Referencing List** to determine the waypoint number of the location you wish to visit. Use the **NAV** key to enter the navigation menu. Scroll to the first field on the second line and press the **NUMLOCK** key. Enter the desired waypoint number. Press the **NUMLOCK** key again to display the page turn icon (**P**). Verify that the waypoint name and coordinates match those listed on the packet label.

- **Marking a Way Point.** Use the **Mark** key when currently at the desired Way Point position. After determining position coordinates at a given location (e.g., the trailhead), the crew may decide to use this location as a reference or Way Point to return to on their way out of the plot.

Once the coordinates for the location (e.g., trailhead) are on the screen --using the Positioning feature described above -- simply push the **Mark** button twice. This action automatically sets the current screen coordinates as the last Way Point in the list.

- **Setting a Way Point.** Use the manual Way Point (WP) when it is necessary to navigate to a location that has not been marked. To get into the Way Point menu, push the **WP** key. Now the **ENTER** field should be flashing; use the down arrow key to select the **ENTER** field. The WP### in the upper left hand corner indicates the Way Point number to be saved (note this number for future reference). Scroll to the 1st field on the 3rd line using the right or left arrow key, and enter the desired Easting coordinates. Then highlight the northing field and enter the desired northing coordinates. The Easting information is usually located along the top or bottom margin of the topographic map, and the northing is located along the left or right margins. Entering the elevation information is useful but not necessary. Scroll to the end of the page and exit. The Way Point is stored, and the PLGR is prepared to navigate to that point.
- **Naming a Way Point.** To name a Way Point as something other than a number, push the WP key and select edit. Highlight the WP in the upper left hand corner and scroll to the Way Point number to name. Push the right arrow twice to highlight the field to the right (entire field should be flashing), then use the down arrow to highlight the first letter (1st character should be flashing). Depress the down/up arrow until the desired number or letter appears. Use the right arrow to select the next character. Up to 10 characters can be used to name a Way Point.

- e. **Find the Position of the RP.** The Position (POS) feature of the PLGR provides coordinates for the present position on either the Universal Transverse Mercator (UTM) or on the Latitude/Longitude (Lat/Long) grid system.

### ***PLGR: Positioning***

Push the **POS** button for approximately 5 seconds until the field in the upper left hand corner reads **AVG**. At this point the PLGR begins to acquire satellites. After sufficient satellites are acquired, the PLGR begins to average the satellite hits, indicated by numbers just to the right of the **AVG** symbol. Allow the PLGR to average at least 180 hits. In areas receiving poor satellite reception, it may be necessary to let the PLGR average more hits.

Record the UTM coordinates from the 3rd line on the screen. Do not move the PLGR while it is in the averaging mode.

In a situation where the RP itself blocks signal reception, measure from the RP into an open area and place a stake. Use this as your base-point (RP stake) for collecting the RP's coordinates and locating the LC. Record azimuth and distance from the RP to the RP stake in plot notes, and explain why you chose not to take the GPS coordinates at the RP tree (e.g., heavy crown cover at RP center). Record the RP coordinates in the PDR.

**Note:** The continuous mode can also be used for positioning; however, the reading is not as accurate. The continuous mode provides an instantaneous or continuous reading of position when a quick position fix is needed, but should not be used to collect GPS data for the RP.

- f. **Chaining from the RP to LC.** Employ the PLGR's Navigate function to determine a distance and azimuth to LC from the RP. Use a chaining tape and compass for chaining from RP to LC.

**PLGR: Navigation.** To enter into the navigation menu, push the **NAV** key. There are several modes of operation for navigating; for the purposes of this inventory work, use either the **Custom**, **Slow**, or **2d Fast** mode; these fields are located on the first screen after pushing the **NAV** key.

**Slow direct mode.** Leave the PLGR in the **Averaging** mode and set **NAV** to **slow direct** for determining the course to location center.

**Screen 1 procedure:**

1. Using the right arrow key, highlight the first field on the first line of the navigation menu. Select **Custom**, **Slow**, or **2D Fast** using the down arrow.
2. Using the right arrow key, select the 2nd field on line one. Select **direct** by pushing the down arrow.
3. Using the right arrow key, highlight the **WP** field. Select the Way Point number desired using the down arrow key.
4. Using the right arrow, scroll to the **P** at the bottom of the page. Use the down arrow key to change the page.

**Screen 2** in **Custom** mode displays the azimuth (**AZ**) in degrees, range (**RNG**) or horizontal distance, and navigational steering arrows to the selected Waypoint. In **Slow** mode, "**RNG**" and "**AZ**" are displayed. **2dFast** mode displays track (**TRK**), azimuth, and steering arrows (**STR**).

**Screen 3** in **Custom** mode is blank. In **Slow mode**, elevation difference (**ELD**), slant range (**SR**), "**AZ**", and elevation angle (**ELA**) are displayed. **2dFast** mode displays the "**RNG**", Time To Go (**TTG2**), "**ELD**", and minimum miss distance (**MMD2**). Make slope corrections as necessary when chaining to the LC.

Use the up or down arrow while the page icon is highlighted to select the desired navigation screens.

## **APPENDIX H**

### **LASER 200 INSTRUCTIONS**

## TABLE OF CONTENTS

A. Overview.....	3
B. Basic operation.....	3
C. Settings.....	4
D. Filters and Reflectors.....	5
E. Distances and % slope.....	5
F. Tree heights.....	6
G. Gates.....	6
H. Cumulative distances.....	7

## LASER 200 INSTRUCTIONS

### A. Overview

Accurate heights are necessary in our inventory in order to determine volume. 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 deg. F 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 it's 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.