Jackson Demonstration State Forest Resource Inventory Field Instructions V. 3.0

May 10, 2004

Equipment

Plot cards. Supplied by CDF.
Clip board.
Copy of these field instructions. CDF will provide one copy to the contractor.
Map of sample area with plot grid layer showing line and plot numbers, coordinates. Supplied by CDF.
Flagging: red or orange.
Compass.
Relascope or prisms (20 and 40 BAF).
Increment borer, at least 16 inches long.
GPS unit.
Logger's tape.
Diameter tape..
Calculator with trigonometric functions.
Aluminum take-off-point tags, with wires.
Wire stake flags, red.
At least two pencils.
Fine point permanent marker.
Clinometer.
Hip chain or electronic measuring device approved by CDF.
Six-inch engineer's scale.

Plot Layout

The forest inventory design consists of a variable radius plot with a concentric 1/100th acre fixed area sub-plot on the same plot center. The variable radius plot includes trees 5.0 inches DBH and greater. The sub-plot includes a tally by species and two-inch diameter class of saplings, which are greater than 4.5 feet in height but less than 5.0 inches DBH.

Plot Cards

The front page contains data for the main variable radius plot. The back page contains the sub-plot, site tree and reference information. Each field on the plot sheet is numbered. This document contains reference information for each field on the plot sheet. If there are not enough rows on the plot card for all measurements, use additional plot cards as necessary to accommodate all the observations.

Plot and Take-off Point Location

Resource Inventory (RI) plots are located on a systematic grid across the Forest. Plots are spaced 5 chains (330 feet) apart on lines going North-South, and there are 20 chains (1,320 feet) between lines. Measure the distance to and between plots using a hip-chain or an electronic measuring device approved by CDF. Do not use plots on a different line to locate the current plot. Take-off points mark the beginnings of lines and where lines cross roads. Mark take-off points with flagging and an aluminum tag attached to a tree or sturdy bush visible from the road. Scribe the plot number, distance and direction to the next plot on the tag. If a reliable reading can be obtained (four satellites), GPS all take-off points using position averaging with at least five readings. Use the datum and coordinate system described for Field 10.

Plot Offset

Offset RI plots that are within 50 feet of the road prism of Highway 20 or any other two-lane paved road. Offset one chain back or ahead from the grid intersection point along the line, or perpendicular to the line such that the offset plot is at least 50 feet from the road. Do not offset plots for any other reason. If the plot falls on a partly or non-forested area (opening, meadow, landing), record any trees present and describe the situation in the remarks section, including the estimated percentage of the plot that falls in each type. If the plot is physically inaccessible (e.g. a lake or a cliff) skip the plot and note the reason.

Establishing the Plot

To mark the plot center, place a wire stake flag in the ground at plot center. Tie two long stringers of flagging to nearby vegetation. Write the plot number on the flagging and the wire stake flag with a permanent marker.

Variable Radius Plot

Either relascopes or prisms can be used to establish the variable plots. Make a visual determination on each tree. Measure borderline trees from plot center to the centerline of the tree at breast height and make a determination for each borderline tree as to whether it is in or out of the plot. Do not alternate every other borderline tree as in or out. Do not designate trees as "borderline".

The critical distance for a borderline tree equals the plot radius factor times the DBH of the tree. Plot radius factors for common basal area factors are:

BAF	Plot Radius Factor
20	1.944
30	1.588
40	1.375
60	1.123

Field 2 - Plot Number

Record the number of the plot being measured. The numbering convention consists of the 3-digit line number followed by the 3-digit number of the plot within the line. For example, plot "051-033" denotes plot 33 on line 51.

Field 3 - Card Number

Record the number of the card and the total number of cards used on a the plot. For example, "Card 2 of 3".

Field 4 - BAF

Record the basal area factor used on the plot. Unless instructed otherwise, use a 40 BAF.

Field 5 - Date

Record the date of the inventory of the plot, month, day, and year. For example, "05/25/01".

Field 6 - Cruisers

Record the full last name of all cruisers measuring the plot.

Fields 7, 8, and 9 - Township, Range and Section

Record the Public Land Survey Township, Range and Section information from the map for the location of the plot.

Field 10 - GPS Location

Record the coordinates (latitude, longitude in decimal degrees) of the plot center using position averaging with at least 50 readings, provided you can obtain reliable data (4 or more satellites). Set the GPS unit to the NAD 27 CONUS datum and the degrees decimal minutes coordinate system.

If a reliable GPS reading (4 satellites) cannot be obtained within 25 feet of plot center do not record a GPS reading for the plot; instead record “NA” in Field 10. Save the GPS location for each plot as a waypoint in the GPS unit. Use the six-digit plot number from field 2 as the waypoint name. For example, the waypoint for plot 33 on line 18 (18-33) would be named ”018033”

Every two or three days, let the JDSF GIS Specialist download the waypoints stored in the GPS unit. Do not delete any waypoints until after they have been downloaded.

Field 11 - Estimated Position Error

Record the estimated position error (EPE) if reported on the GPS unit.

Field 12 – Position Dilution of Precision

Record the Position Dilution of Precision (PDOP) if reported on the GPS unit.

Field 13 - Slope Percent

Measure and record the percent slope to the nearest 10 percent at plot center. Average two readings at 100 feet distance up slope and down slope.

Field 14 - Aspect

Record the aspect where the plot is located, as one of the eight inter-cardinal directions N, NE, E, SE, S, SW, W, NW.

Field 15 - Tree Number

Record each “in” tree greater than or equal to 5.0 inches DBH in sequence starting at the north and proceeding clockwise. It can be helpful to group redwood sprouts growing in the same clump by drawing a bracket in the left margin of the plot card, or some similar method. Measure each borderline tree and make a determination whether it is in or out of the plot.

Forked trees: if a tree forks above the DBH point at 4.5 feet above ground on the uphill side of the tree, count it as one tree. If it forks below the DBH point, count it as two trees.

Field 16 - Species

Record the species of the tree using the following codes:

YR	Young-growth redwood
OR	Old-growth redwood
YD	Young-growth Douglas-fir
OD	Old-growth Douglas-fir
G	Grand fir
H	Western hemlock
B	Bishop Pine
S	Sitka spruce
Y	Cypress
OC	Other conifers
T	Tanoak
M	Madrone
C	Chinquapin
A	Alder
L	Live oak
P	Maple
OH	Other hardwoods

Old-growth redwood and Douglas-fir can be distinguished by the following characteristics: tree at one time or currently present in an unmanaged stand that also exhibits old-growth characteristics, including but not limited to plated and deeply fissured bark, large and often down-turning branches, surface fire scarring or large basal fire scars, dead or multiple tops, broken tops, and often, but not always, of larger diameter than most trees within a second-growth stand. This is not to be confused with second-growth, whether fire-scarred or not. If recording an "OC" or "OH", record the actual species name in the Remarks column.

Field 17 - Diameter at Breast Height (DBH)

Measure DBH at 4.5 feet above the ground on the uphill side of the tree. On leaning or pistol butt trees, measure 4.5 feet along the stem, not vertical distance. For redwood sprouts growing on top of stumps, and for other trees where there is no good ground level to measure from, figure where a faller would cut the tree, and measure DBH 3.5 feet above stump height. For trees with abnormal butt swell, project the taper above the swell downwards and estimate DBH.

For trees not measured for height, record the diameter at breast height by even-numbered two-inch diameter class. Diameter class ranges run from 1.0" below the midpoint to 0.9" above. For example, the 10" class is from 9.0" to 10.9":

Class	Boundaries	Class	Boundaries	Class	Boundaries	Class	Boundaries
2	0 – 2.9	22	21.0 – 22.9	42	41.0 – 42.9	62	61.0 – 62.9
4	3.0 – 4.9	24	23.0 – 24.9	44	43.0 – 44.9	64	63.0 – 64.9
6	5.0 – 6.9	26	25.0 – 26.9	46	45.0 – 46.9	66	65.0 – 66.9
8	7.0 – 8.9	28	27.0 – 28.9	48	47.0 – 48.9	68	67.0 – 68.9
10	9.0 – 10.9	30	29.0 – 30.9	50	49.0 – 50.9	70	69.0 – 70.9
12	11.0 – 12.9	32	31.0 – 32.9	52	51.0 – 52.9	72	71.0 – 72.9
14	13.0 – 14.9	34	33.0 – 34.9	54	53.0 – 54.9	74	73.0 – 74.9
16	15.0 – 16.9	36	35.0 – 36.9	56	55.0 – 56.9	76	75.0 – 76.9
18	17.0 – 18.9	38	37.0 – 38.9	58	57.0 – 58.9	78	77.0 – 78.9
20	19.0 – 20.9	40	39.0 – 40.9	60	59.0 – 60.9	80	79.0 – 80.9

Use a diameter tape or Biltmore stick for diameters greater than 20 inches. Smaller diameters can be estimated, but must still meet the accuracy standards. On all height trees and site trees, always measure and record DBH to the nearest one-tenth of an inch using a diameter tape.

Field 18 Crown Position

Record the crown position of each tree as:

Code	Definition
P	Predominant: Trees with crowns completely above the general level of the main canopy receiving full light from above and from all sides.
D	Dominant: Trees with crowns extending above the general level of the main canopy of even-aged stands or, in uneven-aged stands, above the crowns of the tree's immediate neighbors, and receiving full light from above and partly from the sides.
C	Codominant: Trees with crowns forming the general level of the main canopy in even-aged stands or, in uneven-aged stands, the main canopy of the tree's immediate neighbors, receiving full light from above and comparatively little from the sides.
I	Intermediate: Trees with crowns extending into the lower portion of the main canopy of even-aged stands or, in uneven-aged stands, into the lower portion of the canopy formed by the tree's immediate neighbors, but shorter in height than the codominants. They receive little direct light from above and none from the sides.
S	Suppressed: Trees of varying levels of vigor that have their crowns completely overtopped by the crowns of one or more neighboring trees.

Field 19 - Live Crown Ratio

Estimate live crown ratio, in percent, on all trees on the plot. Visually estimate the percentage of the total length of the tree bole that is covered by live crown, to the nearest 10 percent. In trees with uneven crown length, average the two most different sides of the tree.

Field 20 - Defect

Estimate visible defect on all trees 10 inches DBH and larger, in terms of percentage of the total board foot volume of the tree that is lost. Use the following log volume distribution table as a guide to estimate the defect percentage contribution of individual logs depending on their position on the bole.

	Number of 16-foot logs										
Log #	1	2	3	4	5	6	7	8	9	10	11
11											3
10										3	4
9									4	5	6
8								4	6	7	7
7							5	7	8	8	8
6						5	8	9	10	10	10
5					6	11	12	12	11	11	11
4				8	14	15	15	14	13	12	11
3			10	20	21	19	17	16	15	13	13
2		15	35	31	27	23	20	18	16	15	13
1	100	85	55	41	32	27	23	20	17	16	14

Example: If in a 5-log tree, half the butt log and one-third of the second log are defective, the deduction is half of 32% for log #1 (16%) plus one third of 27% for log #2 (9%) for a total for the tree of 16% + 9% = 25%.

Use the following defect deduction guidelines:

Catface: 1/3 to 1/2 of the bole for the length of the catface, plus swell

Crook: length of crook, plus allowance for abnormal diameter reduction

Crotch: length of bole from swelling to point of separation, plus allowance for diameter reduction - disregard any volume in smaller fork

Fire scar: 1/2 to full diameter for length of open scar plus healed-over seam - for large scars, continue 8+ feet, allowing for tapering of defect

Large knots: (over 4" diameter with <2' between) - 1/2 cylinder for length

Knot clusters: 1/3 to 1/2 cylinder for each face, for length affected

Burls: often not in scaling cylinder - 1/4 of bole for length of severe burls

Lightning scar: 1/8 to 1/2 of each log, depends on depth and spiraling

Sweep: deduct the portion that is outside the scaling cylinder

Broken top: missing portion, plus up to 8' for rot depending on size and age of break, species

Spike top: (YD, OD, G, H only) - length of severe swelling

Spur: 1/3 of cylinder for length of spur projected to center of tree

Butt rot: (velvet top fungus - mostly YD, OD) - 4' to 8' of butt log

Conk rot: for one face, 6' above and 6' below for 1/2 cylinder - for multiple faces, 6' above and 6' below for full cylinder

Field 21 - Height

Measure total height of two conifer trees on each plot to the nearest foot. Randomly select one redwood and one Douglas-fir on each plot as height trees, using a random number table supplied by CDF staff. Also measure the height of the first tree each day of each minor conifer species (grand fir, hemlock, bishop pine, sitka spruce, cypress). Random selection of height trees is important because height trees, unlike site trees, must be selected from all crown position classes.

Do not use trees that are leaning heavily, have a broken top, are forked, where an accurate diameter cannot be measured, or where the top or bottom of the tree cannot be clearly seen. If a selected height tree does not meet these criteria, substitute the next tree of the same species clockwise on the plot that does meet the criteria.

Field 22 - Status

Use the status code **L** for live trees. Record conifer and hardwood snags (dead trees 4.5 feet tall or greater) that are "in" on the variable radius plot using a status code of **S**. Record 2" diameter class and visually estimate height to the nearest 10 feet on all snags. Also note other features such as cavities and wildlife use in the remarks column.

Field 23 - Remarks

Record descriptive information for a particular tree, notes about measurements, or other observations.

Fields 24 to 27 – 1/100th Acre Sub-Plot

Count the number of conifer and hardwood saplings (greater than 4.5 feet tall, less than 5.0 inches DBH) by two-inch diameter class and species.

Fields 30 to 36 - Site Trees

Measure one young-growth redwood and one young-growth Douglas-fir site tree at or near each plot whose number ends with five or zero. A suitable site tree is free of stem deformities such as a forked or broken top or a crook, and it is a dominant or co-dominant tree that appears to have been free to grow throughout its life. A site tree does not need to be the tallest tree around. Attempt to locate a suitable site tree within about 100 feet of the plot. If that is not possible, select a site tree on either side of the line as you walk toward the next plot. Do not use the same tree as a height tree and a site tree.

If the tree is on the plot, record the tree number in **Field 31**. Record species in **Field 32**. Measure DBH to the nearest 1/10 inch and record in **Field 33**. Measure total height to the nearest foot and record in **Field 34**. Increment core the tree at breast height on the uphill side of the tree to obtain the total breast-height age to the nearest year and record in **Field 35**. Because breast-height age is used record the "raw" ring count; do not add estimated years it took the tree to reach breast height to the ring count age.

If the site tree is off the plot, flag it for location, and record the distance and bearing from the plot center to the site tree in the Remarks column in **Field 36**.

Fields 40 to 42 – Reference Point, Distance and Azimuth to Plot

Record a logical reference point to aid in relocating the plot. This will most often be the previous plot on the line or the marked take-off point on a road. Record the distance and azimuth from the reference point to the plot center. For example: for a hypothetical plot 30 located five chains south of plot 29 the reference point could be plot 29, the distance 330 feet and the azimuth 180 degrees.

Field 43 - Remarks / Diagram

Use this space to 1) record general observations about the plot such as unusual features like campgrounds, roads, trails, streams, forest type boundaries near or on the plot, 2) expand on remarks for specific fields on the plot card, and 3) draw a map of the location of the plot relative to known landmarks such as roads and streams, and directions to the plot.

JACKSON DEMONSTRATION STATE FOREST
Forest Inventory Plot Card - Version 3.0

[1] VARIABLE RADIUS PLOT:									
[2] Plot -			[3] Card of		[4] BAF		[5] Date		
[6] Cruisers					[7] T N		[8] R W	[9] Sec.	
[10] GPS LOC.	E -			[11] EPE			[13] % Slope		
	N -			[12] DOP			[14] Aspect		

[15] Tree No.	[16] Species	[17] DBH (2")	[18] Crown Pos.	[19] LCR %	[20] Defect %	[21] Height (1')	[22] Status	[23] Remarks
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								

[15] Tree No.	[16] Species	[17] DBH (2")	[18] Crown Pos.	[19] LCR %	[20] Defect %	[21] Height (1')	[22] Status	[23] Remarks
22								
23								
24								
25								
26								
27								
28								
29								
30								

[24] 1/100-ACRE SUB-PLOT (11.78 FEET RADIUS):

[25] Species	[26]2" (0-2.9)	[27]4" (3-4.9)	[25] Species	[26]2" (0-2.9)	[27]4" (3-4.9)

[30] SITE TREES:

[31] Tree No.	[32] Spp	[33] DBH	[34] Total Height	[35] Age	[36] Remarks (dist. & azimuth to off-plot trees)

[40] Ref. Pt	[41]Dist.	[42]Azm.

[43] Remarks/Diagram: