

CALIFORNIA
PHOTO INTERPRETATION MANUAL
1990

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P.I. Manual used to photo-interpret the North Coast Unit
of California in 1991

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AN OVERVIEW: PHOTOINTERPRETATION IN THE CALIFORNIA INVENTORY

Overall design

The California inventory design is a double sample for stratification similar to the one described by Cochran (1977, 327-335), but differing in that both the primary and secondary samples are arranged on permanent grids. The primary sample is laid out on a 1.37 km (.85 mile) grid that was established on base maps or orthophotos in 1981 and transferred to aerial photos. At that time, the entire state was divided into 1.37 km squares and a grid point located randomly within each square.

The secondary or field plot grid is spaced at 5.47 km (3.4 mile) intervals, providing 1 field plot for every 16 primary PI plots. Although the secondary grid was established in 1981, about half of the plots are coincident with previously established plots.

The primary sample--the photo grid--is used to stratify the field plots into groups that are similar in characteristics such as land class, timber volume, forest condition, and wildlife habitat. When done successfully, this stratification will reduce overall variance, resulting in more precise estimates of these statistics.

Primary sample

Although the primary grid is laid out across all ownerships, the actual inventory area excludes National Forest land and reserved lands--National and State parks, Nature Conservancy areas etc. In addition, large areas of continuous nonforest--the "nonforest zone"-- such as extensive agricultural and urban areas, have been deleted from the inventory area. Thus, the inventory area is the area of the State less the area in National Forests, reserved areas, and nonforest zones.

Each PI plot that falls within the inventory area is examined on aerial photo and placed in a land class. Land classes identified include nonforest, timberland, and several classes of "other forest land". In addition, those PI plots that had changed from forest to nonforest or vice versa are identified by photo comparison with earlier inventory photos. In addition to land class, each PI plot is placed in one of 4 resource zones, indicating the degree of agricultural, residential, or commercial development in the area near the plot. Then each forest PI plot is assigned a plant community and stand condition code as an aid to wildlife habitat classification.

Timberland PI plots are further assigned a forest land stratum that indicate the presence or absence of a manageable stand of conifer, the stage of development of the stand, presence or absence of harvest activity since the previous inventory, the height of conifers in the mainstand, and separate densities for both conifer and the total mainstand. This information is used to analyze wildlife habitat and to sort conifer stands into three volume classes.

PHOTO INTERPRETATION STEPS

A number of steps are required for locating and classifying p.i. plots. This section of the manual describes these necessary steps and indicates the progression in which they should be completed.

The principal steps involved in photo interpretation are: (1) Map Preparation, (2) Aerial Photo Preparation, and (3) Photo Land Classification.

Map Preparation

At OCC2, a randomized grid of points was located on 15 minute and 7.5 minute USGS quadrangles. Each point was digitized and given a unique number.

Map preparation involves:

- 1) Obtaining OCC2 USGS 15 minute and 7.5 minute quadrangles for the counties in the unit of interest. These same maps will be used for OCC3.
- 2) Obtaining all known ownership from respective ownership maps and from digitized files.
- 3) Digitizing PI grid points (including any missing or mislocated p.i. plots) using the UTM coordinate system.

Aerial Photo Preparation (Setup)

Aerial photo setup is defined as preparing the aerial photographs for photo interpretation. All PI grid plots are transferred to the photos that will be interpreted. The transfer is made by pinpricking aerial photos so that the pinprick may be observed on a light table during the PI process. In the current California inventory, all PI plots will be transferred from OCC2 photos to OCC3 PI photography. In some areas, PI plots that are also field plots are pinpricked on two OCC2 photo projects--a PI photo and a field photo. In such cases, the field photo pinprick is considered correct and all other pinpricked photos should agree with it. New PI plots from land exchanges, and/or missed plots not pinpricked on OCC2 photography (but included in the OCC3 inventory), will be transferred directly from the USGS quads.

The photo preparation involves the following steps:

- 1) Secure all PI and field plot photos for the county being setup. For most units, the OCC3 PI photos will be 1:31,000 scale from WAC, and some of the field plot photography will be of a greater scale. OCC1 and OCC2 PI and field plot photos can be obtained from data collection.
- 2) Obtain all USGS quads for the county being setup. In most counties, maps used during the OCC2 inventory will also be used at OCC3.
- 3) Obtain a preliminary setup list which contains OCC2 photo number, map number, plot number, PI plot number, ownership code, and PI class.
- 4) Obtain national forest ownership maps for the county being setup and check for any new PI plots for OCC3, due to land exchanges. Land exchanges will be colored in on the USFS maps and should be checked with quads. Plots now included in the sample area (all areas except

national forest, reserved areas, excluded nonforest and census water) will need to be transferred from the quads to the OCC3 photos, and ownership should be changed on the preliminary setup list. PI plots that become national forest, reserved area, or census water will not need to be setup.

5) For field plot locations only, compare the pinpricked locations on OCC2 field plot photos to their quad map locations and--where they exist--to their locations on OCC1 field plot photos (approximately 50% of the plots were newly established at OCC2, and OCC1 photo coverage is half of what the OCC2 photo coverage is), and OCC2 PI photos. Map locations and OCC2 PI photo locations should be updated if mislocated relative to the OCC2 field plot location. Field plot locations should be transferred as accurately as possible, since the sample design requires that the PI plot and the field plot coincide exactly. Incorrect pinprick transfer will cause PI error and may bias survey results. All field plot transfers from the OCC2 to the OCC3 photos will be rechecked by another remote sensing specialist.

6) When discrepancies are found, record updated plot locations on most recent quad sheets, document the update on the map margins, and describe in "remarks" on the master grid list. Make note to have these plot locations re-digitized into the PI files. Do not erase incorrect locations on the maps. If PI photos and field plot photos are different, re-pinprick OCC2 PI photo plots that are mislocated. If possible, obscure the old pinprick; do so only if this action does not obscure the plot area to be photointerpreted at the correctly pinpricked location.

The pinpricked location on the OCC2 field plot photos is the definitive reference for the true location of a plot unless there is substantial evidence to indicate otherwise.

7) Transfer all photo plots from OCC2 photos to OCC3 photos or in the case of new and/or missed PI plots (or OCC2 photos), transfer will be made from USGS quads. Record the corresponding grid point number from OCC2 to the OCC3 photo and write "NEW" or "MISSED" to identify as such. The new PI plot number must be placed on both OCC2 and OCC3 photos.

8) When transferring PI plots from OCC2 to OCC3 photos, note any changes within and across land classes or forest cover. Look for any changes within the entire plot area from forest to nonforest, and vice-versa. Real change is any visible difference in land class due to clearcutting, agriculture, urban development, windthrow, fire, tree plantings, etc. between OCC2 and OCC3. When change occurs in the plot area of the pinpricked location, place a "C" beside the PI plot number on the photo alerting the PI'er of the change.

9) Ten percent of the PI plots transferred during setup should be examined by another coworker involved in California setup or PI to assure accuracy of transfer and change detection. All field plot transfers will be examined by other coworkers not involved in the initial transfer.

Guidelines for Photo Marking

- 1) Use only Pilot (SC-UF) ultra-fine point, permanent, black or red pens when numbering PI plots and map numbers on aerial photos used for PI.
- 2) Number PI plots just below the pinprick and out of the area surrounding the plot. Write the PI plot number in flight line direction for ease of reading by the PI'er.
- 3) When PI plots are also field plot locations, circle the pinprick lightly on the back of the photo and label it with the 3 digit plot number. Use a hard lead pencil and press lightly to insure that PI plots will not be easily identified as field plots.
- 4) When pinpricking photos, keep all plots within the effective PI area of the photo. This area is defined as the center one-third of the photograph in flight-line direction and not closer than one inch to each photo edge.
- 5) Record the 6 digit map number in red ink on the top right-hand corner of the OCC3 photo. The map number can be found on the lower left corner of each quad.

PHOTO INTERPRETATION TRAINING

The purpose of training is to learn what is required and to achieve a high level of accuracy and consistency while interpreting.

Common training steps:

- 1) Study the Photo Interpretation Manual to gain an understanding of specific requirements. Discuss any aspect of the manual not understood. Photo- interpretation objectives, definitions and instructions change with each inventory, so do not automatically assume that you know all that is expected because of past instructions and experience.
- 2) Train by interpreting comparable conditions. Data collected on, and compiled from field plots during recent inventories are an excellent training aid. These data provide an accurate sample of the vast array of conditions that are actually encountered on the ground. By interpreting plots on PI photos and then comparing the interpretations to field-based data, one can calibrate toward more accurate and consistent results. If possible, the photos should be of the same kind--black and white, color, etc--and of similar scale of the photos to be used "on the job".
 1. Select plots from a recent inventory that sample a range and variety of land classes, vegetation types, stand conditions and change that are similar to those found within the area to be interpreted. Do not select plots in the county you are assigned to interpret. If you are interpreting Del Norte county in the North Coast unit, plots in portions of Mendocino or Humboldt counties are the best choices. The guidelines for selecting training PI plots (see "Field Reconnaissance") generally apply when selecting plots.
 2. From plot cards and plot resource files, obtain field-based information such as ground land class, cubic foot volume data, stocking percentages for conifers, stage of stand

development, plant community, management type, treatment opportunity, quadratic mean diameter, tree heights and densities, percentage of nonstockable-rocky et.al.

3. Secure PI photos on which the selected field plot locations are pinpricked.

4. Interpret the plot locations.

5. Review your interpretations for consistency and accuracy. This is done by correlating your interpretations with the defined PI classifications and with the field-based data.

3) Conduct a field reconnaissance. Interpret and then visit representative conditions within the area to be interpreted on-the-job. This is done by selecting, interpreting, and visiting "training plots". While on the ground, seek to develop a mental correlation between ground conditions and corresponding images on the photos. Upon returning, resolve any questions with other interpreters, supervisors, and techniques staff. The objective of field reconnaissance is to better understand the requirements of the PI job and to improve one's accuracy and consistency when making PI "calls".

Training plots are areas on the current PI photos that are used for training during field reconnaissance. Select areas that sample the range and variety of land class and stand conditions that will be encountered during the actual PI job. The PI plots should be easily accessible by automobile. Broad guidelines for selecting training plots follow:

- a. Select areas that sample all land classes. Include plots that mixed land classifications; a plot on an indistinct boundary between forest and nonforest is an example.
- b. Select areas in vegetative types associated only with timberland, or with other forest, or with nonforest lands.
- c. Select areas of land class or stand condition changes since last inventory.
- d. Select areas that sample the range of height and density combinations present on the ground in stands ranging from sapling stands to mature, fully-stocked sawtimber stands.
- e. Select areas that sample various stages of development: grass/forb, shrub, seedling, sapling, poletimber, small sawtimber, and large sawtimber.
- f. Select areas that represent all of the plant communities and vegetative types associated with timberland and forestland strata.

During the recon, notes should be made on the photos with a non-permanent marker. The notes should describe the conditions and true classifications present at the training plots. This information serves as a guide during the actual interpretation job.

PHOTO LAND CLASSIFICATION (PI)
reviewed and updated 2/27/92

Each PI plot is pinpricked on an aerial photo. Associated with that plot is a 5-point cluster oriented north from the pinprick. **The location of the plot area is approximated with a circle drawn on a transparent photo aid that encloses approximately 2.5 hectares--the area sampled by the plot. Most PI plots fall entirely within one land class and one forest condition. Such plots will be given appropriate codes that indicate their land class, forest condition, and timber volume (if present). Some may straddle boundaries between two or more land classes. If the timberland portion of such a plot covers ≥ 25 percent of the plot but < 75 percent, the plot will be classed as mixed (FLS =20). On plots not qualifying as mixed, the majority condition will determine the land class call, and, if needed for volume estimation, the conifer height and density. Occasionally, two-storied stands will require dual estimates of conifer height and density--one for the overstory and one for the understory. Conifer height and density are only needed for conifer stands (FLS=25) with a stage of stand development of 3-5.**

Much information is obtainable from a stereoscopic model, but the accuracy of photo interpretation and the amount of information obtained depends in part on the ability of the interpreter and quality of the aerial photographs.

Although the PI calls of one interpreter may not agree with those of another, neither is necessarily wrong. With several people photo interpreting counties in the same unit, they will need to cross-check with one another. It is particularly important to maintain consistency within zone and on height and density estimates.

Photo Classification Steps

Photo interpretation should begin only after setup and PI training procedures have been completed. For each county, obtain (1) a current California setup file, (2) the OCC2 PI photos, and (3) the OCC3 photos prepared during setup. The photo interpretation steps are as follows:

Step 1.

Look for changes in forest zone since OCC2. Do not change zone unless real change has taken place.

Step 2.

Determine major land class (FLS) based on the definitions on p. 11. Major land classes are timberland (FLS **20,23-25**), other forest (FLS **41-49**) and nonforest (FLS 63-92). **If the plot is ≥ 25 percent timberland but < 75 percent timberland, class as timberland (FLS 20--mixed).** Otherwise, base your classification on the majority condition found in the PI plot area (approx. 2.5 ha oriented north from the pinprick). The PI plot is simulated by 2.5 ha circle inscribed on a transparent photo aid. Orient the overlay and observe the proportion of the circle that falls in each land class that meets the .4 ha minimum area classification.

To qualify as forest land, area must be at least .4 ha and meet minimum width requirements. (Minimum width usually is 35 m. See field manual for special rules).

Step 3.

Assign forest land stratum (FLS). Determine and code the current forest land stratum (FLS) for the majority condition of the sample plot area (2.5 ha).

- a) **Estimate the percent of the plot area circle that qualifies as timberland.** If timberland is ≥ 25 percent but < 75 percent, FLS=20.
- b) If FLS does not qualify as 20, determine whether the majority of the plot area circle falls in forest land (code 23-49). To qualify as forest land, area must be at least .4 ha and meet minimum width requirements. (Minimum width usually 35 m. See field manual for special rules for stringers.)
- c) If forest, determine whether majority of forested area is timberland or other forest.
- d) If timberland, class as 23 (no stand present), 24 (hardwood stand) or 25 (conifer stand). If two timberland classes are present within the plot area and each is at least 2.5 ha, class according to the majority condition.

On plots that are classed as timberland at OCC3 (FLS=23-25), determine whether two or more forest conditions occur within the 2.5 ha circle.

Layout plot circle to the north.

Determine whether two or more condition classes exist on plot area. In order for two stand conditions to exist, a distinct boundary must exist between:

- (1) Contrasting stand size--big redwood vs. small Douglas-fir, small sawtimber vs. seedling-sapling stand.
- (2) Broad forest type differences--pure conifer vs. pure hardwood vs. mixed hardwood/softwood vs. shrubs and bare ground.
- (3) Cultural differences--clearcut vs. partial cut vs. uncut.
- (4) Density differences--sparse stand vs. dense stand.

To qualify, a stand condition must cover at least 2.5 ha.

- e) If other forest, class as 41-49 depending upon stand characteristics. To qualify, class must meet .4 ha minimum area requirements.
- f) If nonforest, place in appropriate FLS (63-69, 92) depending on characteristics. Minimum area is .4 ha. Minimum width varies from 35 m to no minimum (for roads, railroads etc.).

Step 4.

If forest land stratum is 63 (rangeland), 45 (chaparral), or 68 (nonvegetated) or if any portion of the plot is one of these forest land stratum:

- a.) Check tree count from occasion 2 to determine whether change has occurred--more or less trees since OCC2.
- b.) If change has occurred, count trees on new photos.
- c.) Record percent of 2.5-ha area to which tree count applies.

note: No additional tree classifications needed, even though **a portion of the plot may fall in forest land.**

On all plots (FLS 20-92) record any portion of the plot area that qualifies for nonforest tree count **even though the FLS is not 63,45, or 68.** (see p. 18). If a nonforest tree count is made, record appropriate species and number codes.

Step 5.

If forest land, classify PI plot. If PI plot includes two or more timberland stand conditions, classify according to the predominant condition.

- a) Classify stage of stand development (timberland portion if "**mixed**", majority condition if 2 or more forest conditions present).
- b) Classify plant community (timberland portion if "**mixed**", majority condition if 2 or more forest conditions present.)
- c) If stage of stand development is 2-5, estimate density of all trees (both conifers and hardwoods) in the condition for which stage of stand development is rated.

Step 6.

If FLS is 25 and stage of stand development is 3-5, estimate conifer mainstand density and height.

Estimate conifer mainstand density and height on all PI plots with an FLS 25 and stage of stand development 3-5. If the stand is two-storied with two distinct height/density layers, code height and density for the taller fraction as stand #1 and the shorter fraction as stand #2.

INTERPRETING CHANGE OF RESOURCE ZONE BETWEEN OCC2 AND OCC3

The extent and use of wildlands in California is affected by urban or agricultural development (nonwild land resource development). All PI plots were assigned a resource zone at OCC2. Those classifications will be retained at OCC3 unless real change has occurred between inventories. Indicators of possible change are: (1) new construction, (2) new road networks, and (3) conversion of forest land to nonforest.

Determine if real change has occurred in resource zone between OCC2 and OCC3.

<u>Resource zone code</u>	<u>Description</u>
1	Main wild land resource zone - primarily timberland
4	Main wild land resource zone - other than timberland
2	Low density suburban/farm zone
3	Urban/residential/developed

RESOURCE ZONE CLASSIFICATION DEFINITIONS

Resource zone is classified on a type island that includes at least 259 ha (640 acres) surrounding the PI plot. The boundaries of the type island are drawn (at least mentally) to include those hectares that most resemble the plot area in resource mix.

When working in wildland areas where little change is taking place, classify the resource zone on OCC3 photos by comparing the OCC3 photo to the OCC2 classification. If no change has taken place, accept the OCC2 classification. If you think real change might have taken place, compare with the OCC2 photos.

When working in developed areas and areas where lots of change is taking place, draw the type boundaries on the OCC3 photos and compare with the OCC2 photos to see if change has taken place.

Main resource zone (Resource zones 1 and 4)- Areas consist of undeveloped tracts of 259 hectares (640 acres) or larger, with two or less nonwild land resource developments (crops, improved pasture, building sites) per section. Less than 10 percent of area is in nonwild land resource category.

A. Primarily timberland (Resource zone 1) - Meets requirements for main resource zone and is at least 51 percent timberland. (see p. 12 for definition of timberland.)

B. Other than timberland (Resource zone 4)- Meets requirements for main resource zone but is 50 percent or less timberland. At least 50 percent of the area is classed as nonforest, chaparral, or "other forest" including oak woodland and pinyon-juniper.

Low density suburban/farm zone (Resource zone 2)- This zone is characterized by forests intermingled with cultivated farmland, improved pasture, housing subdivisions, and other developments. Roads are typically 400 m (1/4-mile) or more apart. Strip development along roads qualifies as low density when there are 4 or more developments per mile. Strip development with undefined boundaries will extend 35 m beyond the development. Strip developments 400m+ wide will not be crossed in order to classify an area as part of the main resource zone.

Urban/residential/developed zone (Resource zone 3) - This zone includes:

1. All lands within legal boundaries of cities and towns as shown on quadrangles or orthos.

2. All lands within areas developed for residential/industrial use. Such areas are characterized by road patterns that are less than 400m (1/4-mile) or more apart, and the presence of structures or prepared industrial sites.

Land within recreational developments may qualify as zone 3.

FOREST LAND STRATUM DEFINITIONS

Nonforest (code 63,64,66-69 92) - Land not qualifying as forest land. Includes land that has never supported forest growth and land once forest land but now developed for nonforest use such as crops, pasture, residential areas, highways, airstrips, etc. Areas of water less than 16 hectares in size or less than 200 meters in width will also be classified as nonforest. Census water, areas of water larger than these, is excluded from the gross area of the inventory unit. Christmas tree farms are classed as nonforest. Minimum area is .4 ha and minimum width varies from 35 m to no minimum (for roads). (See field manual for detailed description of minimum widths for linear features such as roads and streams.)

Forest Land - Land which is, or has been, at least 10 percent stocked by trees and is not developed for nonforest use (10 percent stocking is equated with 10 percent crown cover or 10% of normal yield table values). A tree is defined as a woody plant that at maturity commonly has an erect perennial stem or trunk at least 7.5 cm in diameter at breast height (1.37 meters) and a

total height of at least 4 meters. (Ag. Handbook No. 541, 1979, ed., p. 3.) Minimum area is .4 ha and minimum width is 35 m. (See Field Manual for detailed description of minimum area for riparian strips and other forest stringers.)

Timberland (codes 20,23-25) - Forest land that can grow continuous crops of trees to industrial roundwood size, quality, and quantity. Industrial roundwood requires species that grow to size and quality adequate to produce lumber and other manufactured products (excluding fenceposts and fuelwood). Productive potential is at least 1.4 cubic meters/hectare/year (20 cubic ft/acre/year). This land class is characterized by its potential for restocking (artificially or naturally) with industrial roundwood trees.

Other Forest Land (codes 41-49)- Forest land that cannot produce successive crops of trees suitable for industrial roundwood.

Rocky (code 41) - Forest land that produces tree species of industrial roundwood quality, but is unmanageable because of steep, hazardous, or rocky conditions; or is predominantly nonstockable rock or bedrock, with trees growing in cracks and pockets.

Subalpine or Conifer Scrub (code 42) - Extreme climatic and soil conditions prevent species from reaching industrial roundwood quality. Whitebark pine in the high Sierra and shore pine along the sparkling blue Pacific are examples. Trees in these areas are often characterized by extremely slow growth or deformities. On the coast, Monterey pine, Bishop pine, and Douglas-fir are included in this type, in addition to knobcone pine found in the interior foothills.

Pinyon-Juniper (code 43) - Stocking capability indicated by live trees or stumps and snags less than 25 years dead or cut. Areas currently capable of 10 percent or more stocking with forest trees with pinyon pine and or juniper species predominating. These areas are not now, and show no evidence of ever having been, 10 percent or more stocked with trees of industrial roundwood form and quality. 10 percent juniper cover means 10 percent crown cover.

Oak woodland (including digger pine) (code 44) - Areas currently 10 percent or more stocked with forest trees, of oak, digger pine, madrone, or other hardwood species predominating, and which are not now, and show no evidence of ever having been, 10 percent or more stocked with trees of timberland species of industrial roundwood form and quality. Trees on these sites are usually short, slow growing, gnarled, poorly formed, and generally suitable only for fuelwood.

Chaparral (code 45) - Areas covered with heavily branched dwarfed trees or shrubs, usually evergreen, the crown canopy of which currently covers greater than 10% of the ground. The principal species are dwarf Quercus, Cercocarpus, Garrya, Ceanothus, Arctostaphylos, Baccharis, and Adenostoma. Areas in which the predominate cover is Artemisia, Purshia, Gutierrezia, Opuntia, or semi-desert species are considered nonforest.

Wetland (code 47) These may include both hardwood and conifer communities. They are characterized by a high water table or even standing water for all or a part of the year.

Cypress (code 48) - Forest land with forest trees with cypress predominating. Shows no evidence of having had 10 percent or more cover of trees of industrial roundwood quality and species.

Other forest, low productivity (code 49) - Forest land growing crops of trees to industrial roundwood quality not able to grow wood at a rate of 1.4 cubic meters/hectare/year. Included are areas of low tree site index, low tree stocking potential; and regeneration difficulty. Do not include harsh climate conifer scrub.

OCC3 Stratum Codes

20Plot area at least 25% but less than 75% timberland.

23Plot at least 75% timberland at OCC3, <25% all live trees crown closure present at OCC3. (Brush, grass, poorly stocked conifer stands, heavily partial cut stands, unrestocked clearcuts).

24Plot at least 75% timberland at OCC3 and density of all live trees $\geq 25\%$ but conifer density <25%. This code is **intended** for hardwood stands.

25Plot at least 75% timberland at OCC3 and $\geq 25\%$ conifer crown closure present at OCC3. (Stands varying in stage of development but adequately stocked with established conifers).

41Plot predominantly other forest, rocky.

42Plot predominantly subalpine or coastal conifer scrub.

43Plot predominantly pinon-juniper.

44Plot predominantly other forest hardwood, and/or digger pine.

45Plot predominantly chaparral.

47Plot predominantly wetland.

48Plot predominantly cypress.

- 49Plot predominantly other forest--low productivity.
- 63Plot predominantly natural rangeland, nonforest marsh, pasture, or abandoned farmland.
- 64Plot predominantly other farmland including croplands, farmsteads etc.
- 66Plot predominantly manmade nonforest stringers - constructed roads, powerlines, pipelines, canals, and railroads.
- 67Plot predominantly urban - townsites and areas of clustered suburbs, residential and industrial buildings, city streets, developed parks. (Undeveloped forest land in parcels .4 ha and larger is classified as forest land. Zone codes are used to identify urban densities. All roads and streets that are within or border on urban areas are classed as urban.)
- 68Plot predominantly nonvegetated - less than 10 percent vegetation - rock, sand, glaciers, streams 10 meters to 34 meters wide.
- 69Plot predominantly christmas tree lands, nurseries.
- 92Plot predominantly water - includes lakes .4 - 16 hectares and streams 35 meters - 200 meters wide.

OCC2 Stratum Codes

- 21Conifer volume 0-75 cubic meters/hectare. Includes mixed up messes, clearcuts, burns, brushfields.
- 22All hardwood stands growing industrial size and quality roundwood with less than 10 percent conifer sawtimber crown closure.
- 23Conifer volume 0-75 cubic meters/hectare. Obviously well-stocked stands of seedlings, saplings, or small poletimber conifer trees; obviously well stocked is 40 percent+ crown closure or evenly spaced stocking of small trees which will be 40 percent+ crown closure when they reach 17.5 cm.
- 24Conifer volume 76-150 cubic meters/hectare.
- 25Conifer volume 151-300 cubic meters/hectare.
- 26Conifer volume 301-500 cubic meters/hectare.
- 27Conifer volume 501+ cubic meters/hectare.
- 41Rocky.
- 42Subalpine or coastal conifer scrub.
- 43Pinyon-juniper.

- 44Other forest oak--other hardwood.
- 45Chaparral--10 to 49 percent cover.
- 46Chaparral--50 percent or more cover.
- 47Wetland, woodland, and bogs.
- 48Cypress.
- 49Low productivity.
- 61Cropland.
- 62Improved pasture.
- 63Natural rangeland or abandoned farmland.
- 64Other farmland including farmsteads.
- 65Marsh.
- 66Manmade nonforest stringers - 5 meters wide and wider constructed roads, powerlines, pipelines, canals, and railroads.
- 67Urban - townsites and areas of clustered suburbs, residential and industrial buildings. (Forest .4 hectare or more in urban areas are classed as forest land. Zone codes are used to identify urban densities).
- 68Nonvegetated - less than 10 percent vegetation - rock, sand, glaciers, streams 10 meters to 34 meters wide.
- 69Christmas tree lands, nurseries.
- 92Water - includes lakes .4 - 16 hectares and streams 35 meters - 200 meters wide.

INTERPRETING AND RECORDING STAGE OF STAND DEVELOPMENT

Stages of development are the result of natural growth and development of plant communities following disturbance. The progression of these stages is often altered by management activities, such as brush control, planting or seeding trees, and thinning trees. Information on stage of stand development is used to sort PI plots into land class strata, volume strata, forest condition strata, and wildlife habitat strata. These strata are used to improve estimates of: timberland area, timber volume, area available for silvicultural treatment, area of suitable habitat for selected fauna, and other statistics.

If the FLS is 20-49, determine stage of stand development for the majority forest condition on the PI plot. Examine the portion of the 2.5 hectare circle that is occupied by the majority stand condition. Determine if the total tree density for that area is less than 25 percent. If so, the PI plot is Grass-forb/shrub/seedling (code 1). If the total tree density is \geq 25 percent, estimate the average dbh of the main stand and assign the appropriate code. The stages of development are defined below:

<u>Code</u>	<u>Avg. stand Stage of development</u>	<u>diameter cm</u>
0	Nonforest (code entered automatically by Computer Program)	
1	Grass-forb/shrub/seedling	< 2.5
2	Sapling-pole	2.5 - 19.9
3	Small sawtimber	20.0 - 52.4
4	Large sawtimber	52.5 - 99.9
5	Mature and old-growth sawtimber	> 100

INTERPRETING AND RECORDING PLANT COMMUNITY

One objective of the California inventory is to estimate the area of different kinds of plant communities. These data will provide information on wildlife habitats which are determined by the structure and species composition of vegetation, and by the interspersions of plant communities across the landscape. The stage of development and percent crown cover will also be interpreted to provide information on vegetation structure. The primary sample (PI plots) will be used to stratify forest land by other forest type and by timberland hardwoods, conifers, and mixed stands. Other forest types are identified by forest land stratum. Timberland strata will be further divided into three plant community groups as follows:

Existing vegetation rule.

The classification of plant communities is based on the species composition of the dominant vegetation currently existing on the site. Consider all live trees, both hardwood and conifer. Classify the plant community based on a total percent cover of the dominant plant community for the 2.5 ha area. Communities of mixed conifer and hardwood are classified as such only if 70% or more of the existing cover is not in pure conifer stands or pure hardwood stands.

When to record plant community.

Record a 2-digit plant community code for all **PI plots with a forest land stratum of 20-25** and a stage of development 2-5. **Classify plant community for trees observed within the majority timberland stand condition on the 2.5 ha area.** The plant community for stage of development 1 will be automatically entered by computer program as a code 99. **The plant community on other forest PI plots will be indicated by the FLS code** and will automatically be entered by the computer program.

CodePlant community

00Nonforest

03Mixed hardwood

04Conifer-hardwood

08Conifer

Codes Entered by Computer Program

10 Chaparral

99Forest less than 25% stocked

Plant Community Definitions

Mixed hardwood (Code 03) -- Two-thirds or more of the visible crown cover in hardwood species.

Conifer-hardwood (Code 04) -- At least one-third of the crown cover in hardwood species and at least one-third of the crown cover in conifer species.

Conifer (Code 08) -- At least two-thirds of the crown cover in conifer species.

TOTAL STAND DENSITY (for wildlife habitat assessment)

On all PI plots where the majority condition is coded FLS 20-49 (except 45) which have a stage of stand development of 2 or greater, a total tree density will be recorded. Estimate (total stand density) for the portion of the plot that falls in the majority stand condition. If two or more conditions exist on the plot (minimum area .4 ha for land class and 2.5 ha for forest condition) make density estimate for that portion of the 2.5 ha circle that falls within the majority type. (If the plot is an FLS 20 estimate total tree density for the timberland portion.) Exclude **nonforest** roads that pass through the type.

CONIFER HEIGHT AND DENSITY ESTIMATES (for conifer volume estimation)

If the FLS is 25 and the stage of stand development of the majority condition is 3-5, record the height and density of the conifer mainstand. Both are 2-digit codes. Density = (05-99) and Height = (10-60). If the stand has two distinct stories, and each stage of stand development is 3 or larger, code the height and density of the overstory as hgt1 and dens1 and the understory as hgt2 and dens2. The sum of dens1 and dens2 must equal at least 25%--even if dens2 = 0. When estimating density, exclude roads and other nonforest areas .4 ha and larger from the area to be estimated.

Example 1: Plot is Douglas-fir FLS 25 and stage-of-development 3. Stand height is variable and ranges from 15-25 meters. Average conifer mainstand density is 55 percent. IN HGT CON1, record (20) and in DEN CON1 record (55). Leave HGT CON2 AND DEN CON2 blank.

Example 2: Plot overstory is oldgrowth redwood with an average height of 55 m and an average density of 40 percent and plot under story is Douglas-fir with an average height of 30 meters and an average density of 85 percent. Record HGT CON1 as 55, DEN CON1 as 40, HGT CON2 as 30 and DEN CON2 as 85.

Interpretation of stand height and crown coverage is performed by the same remote sensing specialist photo-interpreting the county. Height and crown coverage estimates will be used to stratify the primary sample into volume classes after fieldwork is completed.

TREE COUNTS ON NONFOREST AND CHAPARRAL PLOTS

On any PI plot that qualified at OCC2 as rangeland and pasture (63), nonvegetated (68) or chaparral (45), check for disturbance that may have changed tree count. If undisturbed, and if entire 2.5-ha circle is occupied by qualifying type at both OCC2 and OCC3, accept OCC2 count. If disturbed, recount and enter appropriate code for OCC3. If part of the 2.5-ha circle qualifies and part does not, count the trees in the portion of the circle that qualifies and expand to the 2.5-ha level. (This can be done by dividing the tree count by the proportion (percent) of the plot that fell in the qualifying type.) Determine the appropriate code and enter for both OCC2 and OCC3.

Example: .4 of 2.5 circle is nonforest--63. Tree count is 2. Expanded tree count is $2/0.4 = 5$ or code 3.

Check all PI plots, regardless of FLS for subplots that fall in qualifying nonforest. (Must be at least .4 ha in area.) If any subplots fall in a qualifying type, estimate the number of trees, using the partial plot procedure outlined above. Update OCC2 to reflect current plot layout.

For all PI plots with nonforest tree count, record appropriate codes for the number of trees and for the major species. For all partial plots, record the percent of the plot area that falls in the qualifying condition (a 1-digit code indicating the nearest 10 percent of the area.)

<u>Number trees</u>	<u>Code</u>	<u>Major Species</u>	<u>Code</u>
No trees	1	No trees	1
1 - 4 trees	2	Conifer	2
5 - 25 trees	3	Digger Pine	3
26 trees to 9 percent tree cover	4	Hardwood	4
		Pinyon Juniper	5

PERCENT OF PLOT AREA QUALIFYING FOR TREE COUNT

On PI plots that are only partially nonforest, record the percent of the plot for which trees were counted.

<u>Percent of plot</u>	<u>Code</u>	<u>Percent of plot</u>	<u>Code</u>
1 - 9	1	50 - 59	6
10 - 19	2	60 - 69	7
20 - 29	3	70 - 79	8
30 - 39	4	80 - 89	9
40 - 49	5	90 - 99	10

CALIFORNIA PHOTO INTERPRETATION

OC3 PLNT STG TOT HGT HGT DEN DEN --%P'T-- TREE TREE
 FLS COMM DEV DEN CON1 CON2 CON1 CON2 TREE CNT CNT SPC

20	99	1	0	--	--	--	--	1-8	1-4	1-5		
20	3,4,8	2-5	25-99	--	--	--	--	1-8	1-4	1-5		
23	99	1	0	--	--	--	--	1-3	1-4	1-5		
24	3,4	2-5	25-99	--	--	--	--	1-3	1-4	1-5		
25	3,4,8	2	25-99	--	--	--	--	1-3	1-4	1-5		
25	3,4,8	3-5	25-99	10-60	0,10-50	5-99	0-95	1-3	1-4	1-5		
41-44	99	1	0	--	--	--	--	1-5	1-4	1-5		
41-43	8	2-5	25-99	--	--	--	--	1-5	1-4	1-5		
44	3	2-5	25-99	--	--	--	--	1-5	1-4	1-5		
45	10	0	0	--	--	--	--	6-10	1-4	1-5		
47	99	1	0	--	--	--	--	1-5	1-4	1-5		
47	3	2-5	25-99	--	--	--	--	1-5	1-4	1-5		
48	99	1	0	--	--	--	--	1-5	1-4	1-5		
48	8	2-5	25-99	--	--	--	--	1-5	1-4	1-5		
49	99	1	0	--	--	--	--	1-5	1-4	1-5		
49	8	2-5	25-99	--	--	--	--	1-5	1-4	1-5		
64,66,67	0	0	0	--	--	--	--	1-5	1-4	1-5		
63,68	0	0	0	--	--	--	--	6-10	1-4	1-5		
92	0	0	0	--	--	--	--	1-6	1-4	1-5		

OWNERSHIP DATA COLLECTION

Ownership data is obtained for all the forested PI points and some nonforest points in each county. Each PI point is coded into an owner class. This procedure makes it possible to relate all the information obtained in the course of both PI and field plot measurement to ownership classes. This ownership data will be used to produce standard tables for FIA reports and to develop the capability to generate data required for supply projections and for analysis of ownership change.

Ownership classes recognized: Ownership classes to be identified are as follows:

<u>Owner</u>	<u>Code</u>
<u>A. Public Owners</u>	
1. National Forests	600
Angeles National Forest	601
Cleveland National Forest	602
Eldorado National Forest	603
Inyo National Forest	604
Klamath National Forest	605
Lassen National Forest	606
Los Padres National Forest	607
Mendocino National Forest	608
Modoc National Forest	609
Plumas National Forest	611
San Bernardino National Forest	612
Sequoia National Forest	613
Shasta-Trinity National Forest	614
Sierra National Forest	615
Six Rivers National Forest	610
Stanislaus National Forest	616
Tahoe National Forest	617
Lake Tahoe Basin Management Unit	619
2. Other Public	
a. Bureau of Land Management--reserved	10
b. Other Federal--reserved	7
c. Bureau of Land Management--available	12
d. Other Federal--available	14
e. State--available	15
f. County and Municipal--available	16
g. State--reserved	18
h. County and Municipal--reserved	19
<u>B. Forest Industry</u>	
a. Forest Industry with mills	21
b. Forest Industry without mills	71
<u>C. Farmer and Miscellaneous Private</u>	
a. Private--reserved	8
b. Native American--reserved	9
c. Farmer owned	44
d. Miscellaneous Private--available	44
e. Native American--available	13

Ownership class definitions:

- A. Available land--Land not withdrawn from timber production.
- B. Bureau of Land Management lands: Lands administered by the BLM.
- C. County and Municipal lands: Lands owned by county or other local agencies.
- D. Farmer-owned lands: Lands owned by individuals or companies that operate farms and do not meet the definition of forest industry. Farms are tracts of land used for the production of commercial crops of food or other agricultural products.
- E. Forest Industry lands:
 - a. With mills--lands owned by companies or individuals operating wood-using plants.
 - b. Without mills--lands owned by companies that manage forests for timber production but do not operate mills.
- F. Miscellaneous Private Lands--Private lands not qualifying as either forest industry lands or farmer-owned lands.
- G. Native American lands: Tribal lands held in fee by the Federal Government but administered for Indian tribal groups, and Indian trust allotments.
- H. National Forest Lands--Lands administered by the Forest Service.
- I. Other Federal Lands--Lands administered by U.S. Government agencies other than the BLM and the Forest Service.
- J. Reserved Lands--Lands withdrawn from forest management by statute, ordinance or agency policy. Includes National, State, County and municipal parks, BLM reserved areas, Native American reserved areas and land owned by the Nature Conservancy.
- K. State Lands--Lands administered by the State of California.

OWNERSHIP COLLECTION PROCEDURES

The general procedure for collecting ownership information is as follows:

1. Obtain accurate ownership maps of large public land owners, such as DNR, USFS, and State and make sure they are updated. The Supervisor's Office is the source for current USFS ownership maps.
2. Obtain current quadrangle maps plotted with PI map grid and a list of all forested PI points which require owner classification.
3. Ownership data for the remaining area will be obtained from the records in the various county assessor's offices.
4. Using the tax lot number look up the owner name for the PI grid points. Enter the owner code in the appropriate location on the portable data recorder for OCC3 owner. If the current owner is different than the OCC2 owner, check the records and correct only if it was incorrectly coded at OCC2.
5. Most reserved areas will be shaded on the USGS quads indicating their owner status. These will be identified during the setup process as previously described in setup procedures. If a PI point requiring ownership classification is determined at the assessor's office, to be reserved, then record its appropriate reserved owner code.
6. To determine if a parcel has an owner 41 or 61, check to see if the parcel is being taxed as timber or farm land and code accordingly. For field plot locations which are coded owner 61, additional research (beyond just looking at the particular parcel the point falls in) will be done to determine its "true" ownership classification, either 41 or 61.
7. For any point which falls in Census Water code the OCC3 owner as 98. Most of these points will be identified during the setup process by observing bodies of water on the orthos, quads and photos. The remainder of these points will be identified during PI.
8. After the forms have been completed for the county, the data recorder will edit them to make sure that each point has an OCC3 owner recorded.

Following are definitions, explanations and hints for coding ownership.

(a) County assessors' records will show the name of the owner, if private, but will not always show the precise owner if exempt government land (nontaxed lands). This information can usually be obtained by consulting employees in the assessor's office.

(b) BLM lands include public domain and other Federal lands administered by BLM (code 12).

(c) Indian Lands as defined by the Bureau of Indian Affairs are "all lands held in trust by the United States for individual Indians or tribes, or all lands, titles for which are held by individual Indians or tribes, subject to federal restrictions against alienation". Indian lands include tribal and trust allotments, but not patented lands owned by Indians. For Indian tribal and allotted lands, a series of codes will be used to identify the particular

tribe (plus a category for misc. allotted). Indian lands will be reported with the "appropriate" private landowner class, as required by new national standards. This approach preserves the identity of the Indian class.

(d) Miscellaneous federal includes Bureau of Reclamation, military, Fish and Wildlife Service and any other federally administered lands. To determine if these lands are reserved from timber cutting, it may be necessary to contact the agency administering the lands (code 14).

(e) State lands include lands under State title or leased by the State for more than 50 years. School lands are State owned. The State Land Board is a source of ownership maps and general information (code 15).

(f) Private forest industry owners are individuals or corporations operating wood using plants producing more than 100,000 board feet per year (code 21). When land has been leased by private forest industry for more than 50 years, the owner will be coded (21).

(g) Individuals owning large tracts of timberland (over 5000 acres) will be classed as Like Forest Industry (code 71) even if they are not listed as a company. When these individuals lease lands to private forest industry for less than 50 years, the owner will be coded (71).

(h) Farmer is an individual or corporate owner, who is the operator of land which produces agricultural products.

(i) Small parcels of land which have less than 10 acres taxed as farmland will be coded as miscellaneous private (code 61). If the parcel has over 10 acres taxed as farmland the owner will be coded farmer (code 41).

(j) Miscellaneous private owners are all others not otherwise classified.

(k) Property being purchased on a contract will have the name of the person or institution holding the contract as well as the person buying the land. The latter is the appropriate owner. An example is: John Doe purchasing a piece of property from Adam Smith, the tax listing would appear as: Adam Smith c/o John Doe. The owner coded should be John Doe.

(l) In some cases, a property owner has a person (usually an attorney or accountant) or an institution such as a bank acting as an agent. An example of this might appear as: John Doe c/o Jane Smith(agent or agt). The owner coded for should be John Doe.

After all ownership data has been collected, a mailing list is set up so that letters may be sent to landowners whose land houses a field plot location.

RECONCILING FIELD PLOT OWNERSHIP

An important objective of the Washington inventory is to describe change in land ownership, and related characteristics of forest resources, over time. This requires that ownership codes assigned to field plots over three inventory occasions be consistent--codes should differ between occasions only when a parcel has truly exchanged hands. Many factors can cause changes in ownership codes that are not "real," some of which are best reconciled while in the courthouse collecting ownership data. The following outlines procedures for use in collecting and reconciling ownership data in 1989 in California.

RECONCILIATION OF PLOT LOCATIONS DURING SET-UP:

Apparent changes in ownership may be caused by changing plot locations between inventory occasions on maps and photos. We attempt to identify and reconcile these kinds of problems during the set-up process (see #7, p. 3).

RECONCILING OWNERSHIP WHILE IN COURTHOUSE:

Make sure to bring the master grid list, which lists original and updated owner and land class codes for three occasions for all 5.5-km grid points (including grid points out-of-the-inventory);

Steps to follow:

- (1) For plots whose locations were NOT adjusted during the set-up process (#7, p.3), if OC3, OC2, and OC1 owner codes are all the same continue to next field plot.
- (2) For any plot whose location WAS adjusted, OR for any plot showing a change in owner codes between any two occasions, investigate whether the change is real or the result of misclassification at a previous inventory by checking historical courthouse records to compare landowner names, and by comparing plot location on OC3 quad, OC1 quad, OC2 ortho, and OC2 plot photo.
- (3) If there is a difference in owner codes between occasion(s) and landowner name is the same at OC3 and at the previous occasion(s), and no discrepancies in map and photo locations are uncovered, the owner was misclassified at OC2 and/or OC1. Update the previous owner code(s) so they match the OC3 code. For OC2 ("updated OC2 owner"), this is done on the Husky AND on the master grid list. For OC1 ("updated OC1 owner"), this is done on the master grid list only. NEVER CHANGE THE ORIGINAL OC1 OR OC2 OWNER CODES.
- (4) If there is a difference in owner codes between occasion(s) and the landowner name recorded at the previous occasion(s) is different from the OC3 landowner name, investigate whether the change is real or the result of misclassification. The following are possible causes of change in owner classification:

- *If map and photo locations agree and previous recorded landowner name doesn't match courthouse records, previous crew misclassified owner due to error in accessing courthouse records. Update owner codes as described in step (3).
- *If map and photo locations agree and previous recorded landowner name agrees with courthouse records, there has been a real change. Courthouse records should indicate a land sale. On the master grid list indicate as real change; do NOT update the previous owner code(s).
- *An adjustment to map location(s) used in ownership collection at OC1, OC2, and/or OC3 could cause previous owner(s) to be misclassified. Plots for which map locations were adjusted were noted on the master grid list (during set-up step #7, p.3). Ownership for all three occasions should reflect the corrected location. Update owner as described in step (3).
- *Ownership maps used for large ownerships at OC3 (DNR/State, forest industry, NFS) may be inconsistent with courthouse records or map records used at OC2 and/or OC3. Determine the true owner at all three occasions.
- *If there is a difference in owner codes between occasions, which may occur in the case of state owned or managed lands. The owner coded at OC2 may have been coded 15 (other state), but the OC3 owner code is 17 (DNR), or vice versa. Determine and record the correct owner at all occasions. A source of information is Bob Reichel (206) 753-3255.

(5) On the master grid list, a remarks column has been provided to indicate whether owner change is real or the result of misclassification. If owner was misclassified at a previous occasion(s), give a detailed description including all of the information which would assist the reader in fully understanding the situation. The narrative should explain the reason for and circumstances surrounding the change. This data is important and proves useful to data collectors and users who track change over time.

Before leaving the courthouse:

Double-check the master grid list to see that any grid point having differences between the OC1 original, OC1 updated, OC2 original, OC2 updated, and OC3 owner codes has been investigated for reasons for the changes, and that explanations are recorded.

Note: The PI edit and Husky data entry programs need to check for OCC2 data items for points in-the-inventory at OCC2, as defined by OWNUP2 (OWNUP2 = 12-17,21,41,61,71). All OCC2 data items must be present in the final PI data file.