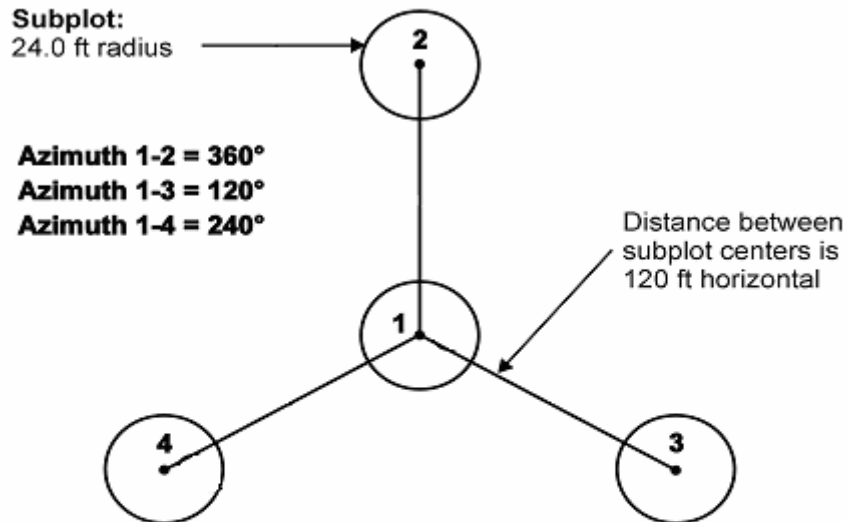


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**FIA plot diagram.**

## 13.0 INTRODUCTION

The objectives of the Phase 3 (P3) Vegetation Indicator are to measure the type, relative abundance, and vertical position of all trees, shrubs, herbs, grasses, ferns and fern allies within each P3 plot. We use this information to assess forest ecosystem health in terms of diversity and rates of change of community structure for both native and non-native vascular plant species. While individual species can be important indicators of a site's potential productivity, economic value, and wildlife forage and shelter, changes in the composition and spatial arrangement of vascular plants in a forest may indicate the presence of chronic stresses such as discrete site degradation, climate change, and pollution. These stresses can lead to decline or local eradication of sensitive species, as well as increase and dominance of opportunistic species, such as many weedy non-native plants.

Vegetation diversity and structure data can also be used to classify P3 plots by locally defined plant communities or associations, allowing extrapolation of other forest health monitoring results to broader areas.

The accepted technique used by vegetation scientists to sample plant composition and diversity is to install nested plots of different sizes within a given plant community (Mueller-Dombois and Ellenberg 1974, Barbour and others 1987). Multi-scale sampling is necessary because different communities have different spatial patterns of species richness, so a single plot size is an arbitrary sample of species diversity. Sampling at two or more scales provides information about the structure of a plant community and distribution of individual species, which allows better comparison among communities (and forest types), allows us to estimate how many additional species might occur beyond our largest plot size (i.e., were "missed") (Stohlgren and others 1995), and allows us to measure change in composition over time.

Data will be collected by crew members who have been trained and certified in the Vegetation Indicator methods. These crew members are expected to have had previous botanical training; while we can provide some refresher training in local flora, the skills needed to be an effective field vegetation specialist are beyond the scope of what we can provide during a short training period at the beginning of the field season.

Crew members who are not certified in Vegetation Indicator methods may assist the field vegetation specialist by:

1. Sharing CONDITION CLASS number information
2. Assisting with DETAILED NONFOREST LAND USE descriptions
3. Laying out transects
4. Locating quadrat corners
5. Collecting unknown specimens
6. Entering data
7. Aiding in tree identification

Note: This indicator is CORE OPTIONAL for all phase 2 plots.

## 13.1 SAMPLE DESIGN

Phase 3 sampling of vegetation is focused on accessible forest condition classes. If the total area of all accessible forest land condition classes is less than 100% on a subplot, vegetation measurements are done only on the portion that is in accessible forest land condition classes. Vegetation Indicator measurements are not done on portions of the

plot that are NOT accessible forest land condition classes. Canopy cover estimates are only made for the area within accessible forest condition(s).

Vegetation Indicator data are collected on all four subplots of P3 plots or portions of subplots that are accessible forest land. The boundaries of the subplot are 24.0 feet, horizontal distance, from the subplot center. Data are collected on two plot sizes on each subplot: three 3.28 x 3.28 feet (1 m<sup>2</sup>) “quadrats”, and the 24.0-foot radius subplot (Figure 13-1). From subplot center, the quadrats are located on the right sides of lines at azimuths of 30°, 150°, and 270°. Ideally, two corners of each quadrat are permanently marked at 15 and 18.3 feet (4.57 and 5.57m), horizontal distance, from the subplot center. (This will vary by region and landowner.)

Total cover of all vegetation foliage in four height layers (0 – 2, > 2 – 6, > 6 – 16, and >16 feet) is estimated on each subplot prior to recording species. Ground variable cover estimates are also recorded on the 24.0-foot radius subplot. Each quadrat is assigned to the dominant condition class on the quadrat, and trampling is assessed.

A species matrix is compiled for each plot as the vegetation specialist visits each sample unit – both quadrats and subplots – on the plot. A species code is recorded when a species is first encountered. When discovered on subsequent sample units within the plot, information is added to the original species record.

On the quadrats where the dominant condition class is accessible forest, species presence/absence data are collected for vascular plants rooted in the quadrat or with overhanging foliage or live material within 6 feet above the ground above the quadrat.

After the quadrats are assessed, a time-constrained search of all species on the subplot is conducted. Total canopy cover of each individual species is estimated, and then canopy cover within each of three height layers (0-6, > 6-16, and >16) are estimated on each subplot. There are no height limits for vegetation overhanging the subplot boundary; trees and shrubs that are rooted outside the subplot are included in the record if they overhang the subplot. Most species will have canopy cover in one layer only, in which case the total canopy cover and layer canopy cover will be the same. Species and canopy cover estimates are only made for the area of the subplot in accessible forest condition(s). Boundaries between multiple accessible forest conditions on a subplot are ignored during data collection.

Specimens of all measured plants that cannot be confidently identified to the species level are collected off-plot and submitted to herbaria for subsequent identification. Data are collected by certified vegetation specialists with regional knowledge to provide optimum field identification of plant species at each site.

When time restrictions limit the completeness of plot data collection, the vegetation specialist should prioritize to complete the entire suite of records for as many subplots as time allows. Quality assurance measurements should be made within 2 weeks of the original plot visit. At the time of next plot measurement cycle, plots should be revisited within 2 weeks of the calendar date of the previous measurement cycle, if at all possible.

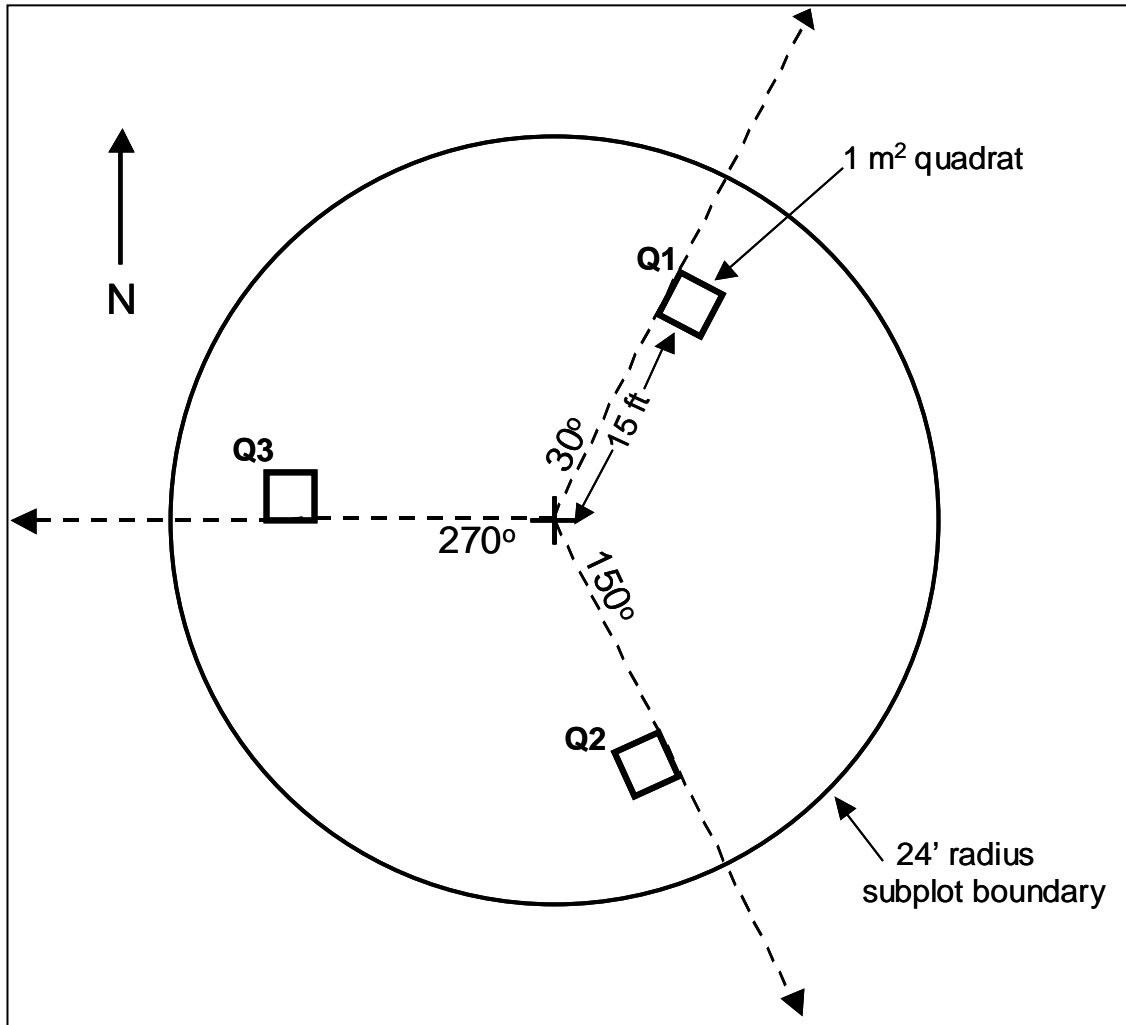


Figure 13-1. Layout of P3 subplot showing location of quadrats and subplot boundary

### 13.2 SUGGESTED FIELD GEAR UNIQUE TO VEGETATION INDICATOR

- 1-gal plastic bags for unknown plant specimens
- 1-m<sup>2</sup> quadrat frame
- Permanent pins/stakes to mark quadrat where allowed, or temporary pin flags
- Carpenters ruler (for height measurements)
- Hand lens
- Pre-numbered labels for unknown plant specimens (provided)
- Envelopes for bulky fruits or nuts
- Local flora keys and species lists
- Digging tool
- Large boxes to store and ship samples
- Newspaper and cardboard
- Plant press
- Access to dissecting scope with illuminator
- Mailing instructions for samples (Region specific)
- Diskettes for sending unknown sample information to herbaria
- PLANTS code dictionary with cross-walk plant names to accepted codes

### 13.3 PLOT AND VISIT REFERENCE INFORMATION

#### 13.3.1 STATE

Record the unique FIPS (Federal Information Processing Standard) code identifying the State where the plot center is located.

When collected: All plots currently having at least one accessible forest condition

Field width: 2 digits

Tolerance: No errors

MQO: At least 99% of the time

Values: See Appendix 1 in the P2 field guide

#### 13.3.2 COUNTY

Record the unique FIPS (Federal Information Processing Standard) code identifying the County where the plot center is located.

When collected: All plots currently having at least one accessible forest condition

Field width: 3 digits

Tolerance: No errors

MQO: At least 99% of the time

Values: See Appendix 1 in the P2 field guide

#### 13.3.3 PLOT NUMBER

Record the identification number, unique within a county, parish, or borough (survey unit in AK), for each plot. If SAMPLE KIND = 3, the plot number will be assigned by the National Information Management System (NIMS). Use 99999 while in the field for replacement plots.

When collected: All plots currently having at least one accessible forest condition

Field width: 4 digits

Tolerance: No errors

MQO: At least 99% of the time

Values: 0000(0) – 9999(9)

#### 13.3.4 QA STATUS

Record the code corresponding to the type of vegetation measurement conducted.

When collected: All plots currently having at least one accessible forest condition

Field width: 1 digit

Tolerance: No errors

MQO: At least 99% of the time

Values:

- 1 Standard field production plot
- 2 Cold Check
- 3 Reference plot (off grid)
- 4 Training/Practice plot (off grid)
- 5 Botched Plot file (disregard during data processing)
- 6 Blind Check
- 7 Hot Check (production plot)

13.3.5 VEG CREW TYPE

Record the code corresponding to the type of crew measuring the vegetation diversity and structure.

When collected: All plots currently having at least one accessible forest condition

Field width: 1 digit

Tolerance: No errors

MQO: At least 99% of the time

Values:

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

13.3.6 VEG SAMPLE KIND

Record sample kind.

When collected: All plots

Field width: 1 digit

Tolerance: No errors

MQO: At least 99% of the time

Values:

- 1 Initial P3 VEG plot establishment
- 2 Remeasure of previously established P3 VEG plot
- 3 Replacement P3 VEG plot

13.3.7 VEG VISIT DATE

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

13.3.7.1 YEAR

Record the year that the plot was completed.

When collected: All plots

Field width: 4 digits

Tolerance: No errors

MQO: At least 99% of the time

Values:  $\geq 2005$

13.3.7.2 MONTH

Record the month that the plot was completed.

When collected: All plots

Field width: 2 digits

Tolerance: No errors

MQO: At least 99% of the time

Values:

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

13.3.7.3 DAY

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

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

13.3.8 VEGETATION SPECIALIST CREW NAME

Record the name of the crew member measuring vegetation diversity and structure.

When collected: All plots  
Field width: 20 digits  
Tolerance: No errors  
MQO: At least 99% of the time  
Values: *Lastname, firstname*

13.3.9 VEG PLOT NOTES

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

When collected: All plots  
Field width: 160 alphanumeric characters  
Tolerance: N/A  
MQO: N/A  
Values: English language words, phrases and numbers

**13.4 SUBPLOT INFORMATION**

13.4.1 SUBPLOT NUMBER

Record the code corresponding to the number of the subplot.

When collected: Every subplot on all plots with at least one accessible forest condition  
Field width: 1 digit  
Tolerance: No errors  
MQO: At least 99% of the time  
Values:

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

13.4.2 VEG SUBPLOT STATUS

Record the code corresponding to how the subplot was sampled, and if not, why not.

When collected: Each subplot  
Field width: 1 digit  
Tolerance: No errors

MQO: At least 99% of the time  
Values:

- 1 Sampled – at least one accessible forest land condition present
- 2 Sampled – no accessible forest land condition present on subplot
- 3 Nonsampled

13.4.3 VEG SUBPLOT NONSAMPLED REASON

For subplots that cannot be sampled, and are wholly or partially within the FIA sampling population (U.S. boundary), record one of the following reasons. Codes 1-4 can be assigned to entire plots or portions of plots that are not sampled. Code 5 is assigned only when the entire plot is affected.

When collected: When Subplot Status=3  
Field width: 2 digits  
Tolerance: No errors  
MQO: At least 99% of the time  
Values:

- 01 Outside U.S. boundary
- 02 Denied access area
- 03 Hazardous situation
- 04 Time Limitation
- 05 Lost data (office use only)
- 10 Other

13.4.4 PERCENT SUBPLOT AREA ACCESSIBLE FOREST LAND

Record the percent area of the subplot in an accessible forested condition.

When collected: When Subplot Status=1  
Field width: 3 digits  
Tolerance: +/- 1 class based on the following canopy cover classes: 1-5%, 6-10%, 11-20%, 21-40%, 41-60%, 61-80%, and 81-100%  
MQO: 90 % of the time  
Values: 001-100.

13.4.5 DETAILED NONFOREST LAND USE

Record the code corresponding to the NONFOREST land use of the portion of the subplot that is not forest. If more than one nonforest land use is present, record the code that best describes the land use occurring closest to subplot center.

When collected: SUBPLOT STATUS = 1, and PERCENT SUBPLOT AREA ACCESSIBLE FOREST LAND < 100%  
Field width: 2 digits  
Tolerance: No errors  
MQO: At least 99% of the time  
Values:

- 10 Agriculture
  - 11 Cropland
  - 12 Pasture
  - 13 Idle farmland
  - 14 Orchard
  - 15 Christmas tree plantation

20	Rangeland
30	Developed
31	Cultural (business, residential, urban buildup)
32	Rights-of-way (improved roads, railway, power lines, canals)
33	Recreation (parks, ski areas, golf courses, etc.)
40	Other (beach, desert, noncensus water, marsh, bog)

**13.4.6 COMMUNITY DESCRIPTION FOR SPECIMEN LABELS (CORE OPTIONAL)**

To fully automate Specimen Label, enter a brief description of the community type to aid the taxonomist in the identification of any specimens collected from this subplot. Community descriptions often describe the dominant overstory species (i.e., Open mixed conifer, closed paper birch, pinyon juniper woodland).

When collected: Optional

Field width: 40 characters

Tolerance: No errors

MQO: At least 99% of the time

Values: English words or phrases that describe plant community

**13.4.7 VEG SUBPLOT NOTES**

Use these fields to record notes pertaining to the subplot.

When collected: As needed

Field width: 40 alphanumeric characters

Tolerance: N/A

MQO: N/A

Values: English language words, phrases, and numbers

**13.5 SUBPLOT TOTAL CANOPY COVER BY LAYER**

Estimate the total canopy cover of the foliage of all vascular plants by layer above the ground surface within the accessible forested conditions on the subplot. A rapid canopy cover estimate is made, ignoring overlap among species. It may help to visualize canopy cover by collapsing each layer into a 2-dimension space and using the polygon method. Canopy cover is based on a vertically-projected polygon described by the outline of the foliage, ignoring any normal spaces occurring between the leaves of plants (Daubenmire 1959). If there is no foliage in a layer, enter 0% for that layer. Canopy cover estimates are only made for the area within accessible forest condition(s) and should not include foliage on non-forested portions of the subplot. However, record the percent cover on the forested portion as if the subplot was 100% accessible forest. For example, if cover in a layer is about equal to a circle with a radius of 5.3 ft, enter 5%, as you would for a fully forested subplot, on any partially forested subplot.

**13.5.1 SUBPLOT CANOPY COVER LAYER 1 (0 – 2 feet above ground)**

Estimate the total canopy cover of the foliage of all vascular plants in Layer 1 within the accessible forested conditions on the subplot. A rapid canopy cover estimate is made, ignoring overlap among species.

When collected: All subplots where SUBPLOT STATUS = 1

Field width: 3 digits

Tolerance: +/- 1 class based on the following canopy cover classes: 1-5%, 6-10%, 11-20%, 21-40%, 41-60%, 61-80%, and 81-100%

MQO: At least 90% of the time

Values: 000-100

13.5.2 SUBPLOT CANOPY COVER LAYER 2 (>2 – 6 ft)

Estimate the total canopy cover of the foliage of all vascular plants in Layer 2 within the accessible forested conditions on the subplot. A rapid canopy cover estimate is made, ignoring overlap among species.

When collected: All subplots where SUBPLOT STATUS = 1

Field width: 3 digits

Tolerance: +/- 1 class based on the following canopy cover classes: 1-5%, 6-10%, 11-20%, 21-40%, 41-60%, 61-80%, and 81-100%

MQO: At least 90% of the time

Values: 000-100

13.5.3 SUBPLOT CANOPY COVER LAYER 3 (>6 – 16 ft)

Estimate the total canopy cover of the foliage of all vascular plants in Layer 3 surface within the accessible forested conditions on the subplot. A rapid canopy cover estimate is made, ignoring overlap among species.

When collected: All subplots where SUBPLOT STATUS = 1

Field width: 3 digits

Tolerance: +/- 1 class based on the following canopy cover classes: 1-5%, 6-10%, 11-20%, 21-40%, 41-60%, 61-80%, and 81-100%

MQO: At least 90% of the time

Values: 000-100

13.5.4 SUBPLOT CANOPY COVER LAYER 4 (> 16 ft)

Estimate the total canopy cover of the foliage of all vascular plants in Layer 4 within the accessible forested conditions on the subplot. A rapid canopy cover estimate is made, ignoring overlap among species.

When collected: All subplots where SUBPLOT STATUS = 1

Field width: 3 digits

Tolerance: +/- 1 class based on the following canopy cover classes: 1-5%, 6-10%, 11-20%, 21-40%, 41-60%, 61-80%, and 81-100%

MQO: At least 90% of the time

Values: 000-100

**13.6 SUBPLOT GROUND VARIABLE RECORDS**

Assess the cover of ground variables found on the accessible forest portion of the subplot. In areas with thick vegetation, you may opt to complete this section after you have collected the species data and have a better perspective on the ground cover. These describe things in contact with the ground surface and not occupied by tree boles or other vegetation basal area. Multiple ground variables often occur on a subplot. Items must be visible from above. For example, a large rock completely covered with moss would not be coded, but the moss would be. Estimate the cover of each ground variable. Cover is estimated to the nearest 1% for each ground variable. The sum of all ground variable covers must equal the percentage entered for variable 13.4.4 PERCENT SUBPLOT AREA ACCESSIBLE FOREST LAND, above.

13.6.1 PERCENT CRYPTOBIOTIC CRUST COVER

Record the PERCENT CRYPTOBIOTIC CRUST COVER in the subplot. Cryptobiotic crust is a layer of symbiotic lichens and algae on the soil surface (common in arid regions).

When collected: All sampled subplots with SUBPLOT STATUS = 1

Field width: 3 digits

Tolerance: +/- 1 class based on the following cover classes: 1-5%, 6-10%, 11-20%, 21-40%, 41-60%, 61-80%, and 81-100%

MQO: At least 90% of the time

Values: 000-100

13.6.2 PERCENT LICHEN COVER

Record the PERCENT LICHEN COVER in the subplot.

When collected: All sampled subplots with SUBPLOT STATUS = 1

Field width: 3 digits

Tolerance: +/- 1 class based on the following cover classes: 1-5%, 6-10%, 11-20%, 21-40%, 41-60%, 61-80%, and 81-100%

MQO: At least 90% of the time

Values: 000-100

13.6.3 PERCENT LITTER/DUFF COVER

Record the PERCENT LITTER/DUFF COVER in the subplot. This is a continuous layer of accumulated organic matter over forest mineral soil (e.g., scattered leaves over mineral soil is coded mineral soil).

When collected: All sampled subplots with SUBPLOT STATUS = 1

Field width: 3 digits

Tolerance: +/- 1 class based on the following cover classes: 1-5%, 6-10%, 11-20%, 21-40%, 41-60%, 61-80%, and 81-100%

MQO: At least 90% of the time

Values: 000-100

13.6.4 PERCENT MINERAL SOIL COVER

Record the PERCENT MINERAL SOIL COVER in the subplot. This is physically weathered soil parent material that may or may not also be chemically and biologically altered.

When collected: All sampled subplots with SUBPLOT STATUS = 1

Field width: 3 digits

Tolerance: +/- 1 class based on the following cover classes: 1-5%, 6-10%, 11-20%, 21-40%, 41-60%, 61-80%, and 81-100%

MQO: At least 90% of the time

Values: 000-100

13.6.5 PERCENT MOSS COVER

Record the PERCENT MOSS COVER in the subplot. If liverworts occur on the subplot, include them here with mosses.

When collected: All sampled subplots with SUBPLOT STATUS = 1

Field width: 3 digits

Tolerance: +/- 1 class based on the following cover classes: 1-5%, 6-10%, 11-20%, 21-40%, 41-60%, 61-80%, and 81-100%  
MQO: At least 90% of the time  
Values: 000-100

**13.6.6 PERCENT ROAD/TRAIL COVER**

Record the PERCENT ROAD/TRAIL COVER in the portions of the subplot designated as accessible forest condition. Include any areas compacted and unvegetated from regular use by foot travel or small motorized vehicles.

When collected: All sampled subplots with SUBPLOT STATUS = 1

Field width: 3 digits

Tolerance: +/- 1 class based on the following cover classes: 1-5%, 6-10%, 11-20%, 21-40%, 41-60%, 61-80%, and 81-100%

MQO: At least 90% of the time

Values: 000-100

**13.6.7 PERCENT ROCK COVER**

Record the PERCENT ROCK COVER in the subplot. Include any rocks, boulders, or accumulations of gravel (> 1/4 inch diameter) or pebbles.

When collected: All sampled subplots with SUBPLOT STATUS = 1

Field width: 3 digits

Tolerance: +/- 1 class based on the following cover classes: 1-5%, 6-10%, 11-20%, 21-40%, 41-60%, 61-80%, and 81-100%

MQO: At least 90% of the time

Values: 000-100

**13.6.8 PERCENT STANDING WATER/FLOODED COVER**

Record the PERCENT STANDING WATER/FLOODED COVER in the subplot. Include any ponding or flowing water that is not contained within banks.

When collected: All sampled subplots with SUBPLOT STATUS = 1

Field width: 3 digits

Tolerance: +/- 1 class based on the following cover classes: 1-5%, 6-10%, 11-20%, 21-40%, 41-60%, 61-80%, and 81-100%

MQO: At least 90% of the time

Values: 000-100

**13.6.9 PERCENT STREAM/LAKE COVER**

Record the PERCENT STREAM/LAKE COVER in the subplot. Include any body of water contained within banks that is within a forested condition.

When collected: All sampled subplots with SUBPLOT STATUS = 1

Field width: 3 digits

Tolerance: +/- 1 class based on the following cover classes: 1-5%, 6-10%, 11-20%, 21-40%, 41-60%, 61-80%, and 81-100%

MQO: At least 90% of the time

Values: 000-100

**13.6.10 PERCENT TRASH/JUNK/OTHER COVER**

Record the PERCENT TRASH/JUNK/OTHER COVER in the subplot.

When collected: All sampled subplots with SUBPLOT STATUS = 1

Field width: 3 digits

Tolerance: +/- 1 class based on the following cover classes: 1-5%, 6-10%, 11-20%, 21-40%, 41-60%, 61-80%, and 81-100%

MQO: At least 90% of the time

Values: 000-100

**13.6.11 PERCENT WOOD COVER**

Record the PERCENT WOOD COVER in the subplot. Wood pieces included should average greater than 3 inches in diameter and be in contact with the ground; smaller pieces should be included in Litter/ Duff Cover. Stumps, live trunks, and roots are included.

When collected: All sampled subplots with SUBPLOT STATUS = 1

Field width: 3 digits

Tolerance: +/- 1 class based on the following cover classes: 1-5%, 6-10%, 11-20%, 21-40%, 41-60%, 61-80%, and 81-100%

MQO: At least 90% of the time

Values: 000-100

**13.7 QUADRAT DATA**

Place the quadrat frame to the right side of the transect line and make sure the corners are lined up at 15 and 18.3 feet from subplot center. Level the quadrat, if necessary, by propping up the quadrat corners. When a quadrat is located on a steep slope the vegetation specialist should be positioned next to or downhill from the quadrat to prevent sliding or falling into the quadrat. In areas of thick vegetation, slide the quadrat sides through the vegetation. Quadrat frames can be made with hinging corners or detachable sections to improve maneuverability.

**13.7.1 SUBPLOT NUMBER**

Record the code corresponding to the number of the subplot.

When collected: All sampled subplots with SUBPLOT STATUS = 1

Field width: 1 digit

Tolerance: No errors

MQO: At least 99% of the time

Values:

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

**13.7.2 QUADRAT NUMBER**

Record the code corresponding to the number of the quadrat.

When collected: Each quadrat

Field width: 1 digits

Tolerance: No errors

MQO: At least 99% of the time  
Values:

- 1 Quadrat on 30°
- 2 Quadrat on 150°
- 3 Quadrat on 270°

#### 13.7.3 QUADRAT CONDITION CLASS NUMBER

A CONDITION CLASS number is assigned to each quadrat. If the quadrat straddles a CONDITION CLASS boundary, assign the number for the CONDITION CLASS that occupies the greatest area in the quadrat. Use the CONDITION CLASS number assigned during plot mapping by the mensuration crew (FIA National Core Field Guide, Ver. 4.0, section 2.4.1).

When collected: Each Quadrat on a sampled subplot with SUBPLOT STATUS = 1  
Field width: 1 digit  
Tolerance: No errors  
MQO: At least 99% of the time  
Values: 1-9

#### 13.7.4 QUADRAT STATUS

Record the code corresponding to how the quadrat was sampled. If QUADRAT STATUS is 1 or 3, continue to enter data for the quadrat. If the value entered is 2, 4, or 5, leave the remaining quadrat items blank.

When collected: Each quadrat on a sampled subplot with SUBPLOT STATUS = 1  
Field width: 1 digit  
Tolerance: No errors  
MQO: At least 99% of the time  
Values:

- 1 Quadrat sampled (most of the quadrat is in an accessible forest condition)
- 2 Quadrat not sampled because most or all of it does not fall in an accessible forested condition class
- 3 Quadrat sampled, no vascular plants rooted in or overhanging within 6 feet of the ground surface
- 4 Quadrat not sampled, hazard present on quadrat
- 5 Quadrat not sampled, other reason – enter in plot notes

#### 13.7.5 TRAMPLING

A trampling code is assigned to each quadrat at the start of vegetation diversity measurements. Trampling is defined as damage to plants or disturbance of the ground layer by humans, livestock, or wildlife.

When collected: QUADRAT STATUS = 1 or 3  
Field width: 1 digit  
Tolerance: +/- one code  
MQO: At least 90% of the time  
Values:

- 1 Low: 0-10% of quadrat trampled: pristine to relatively undisturbed.
- 2 Moderate: 10-50% of quadrat trampled: trampling by animals or field crew
- 3 Heavy: >50% of quadrat trampled: hiking trail or heavily grazed.



genus or unknown code, the next sequential number is assigned. If a recorded unidentified species is encountered again elsewhere on the plot, the vegetation specialist adds information to the species' original record.

When collected: All species records  
Field width: 2 digits  
Tolerance: No errors  
MQO: At least 99% of the time  
Values: 1-99, assigned in sequential numbers

#### 13.8.1.3 SPECIMEN OFFICIALLY COLLECTED

Record if a specimen was collected or not for each species, genus or unknown code entered as a new unique species.

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

0	No, a specimen was not collected
1	Yes, a specimen was collected

#### 13.8.1.4 SPECIMEN LABEL NUMBER

Record the label number for the collected specimen. Pre-numbered labels are provided to each vegetation specialist by the regional coordinator.

When collected: SPECIMEN OFFICIALLY COLLECTED = 1 (yes)  
Field width: 5 digits  
Tolerance: No errors  
MQO: At least 99% of the time  
Values: 1 to 99999, as pre-printed and assigned by region

#### 13.8.1.5 SPECIMEN NOT COLLECTED REASON CODE

Record the code that describes why a specimen has not been collected.

When collected: An unknown code or genus code is entered and SPECIMEN OFFICIALLY COLLECTED = 0 (no)

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

01	Species is locally sparse
02	Species has < 1% canopy cover on the subplot and no mature foliage or reproductive parts are present
03	Hazardous situation
04	Time limitation
05	Already collected with previous entry of genus or unknown code with the same unique species number
06	Specimen collected for immediate/local identification
10	Other (explain in notes)

#### 13.8.1.6 PLOT SPECIES NOTES

Notes may be entered for any species encountered, but are required for each new species that is not identified. Enter text that describes the species. This text may be used in the specimen label and unknown report.

When collected: Required for any new unidentified species encountered on a plot and when SPECIMEN NOT COLLECTED REASON = 10

Field width: Unlimited alphanumeric character field

Tolerance: N/A

MQO: N/A

Values: English language words, phrases, and numbers

#### 13.8.2 Quadrat Species Data Collection

##### 13.8.2.1 SPECIES PRESENCE/ABSENCE ON QUADRAT

At each new sampled quadrat (QUADRAT STATUS = 1), record species presence or absence. When a new species is encountered, enter it using the fields described in section 13.8.1.

When collected: For each unique species present on a quadrat with QUADRAT STATUS = 1

Field width: 1 digit

Tolerance: No errors

MQO: At least 90% of the time

Values: Blank or 0 (not present) or 1 (present)

#### 13.8.3 Subplot Species Data Collection

After completing the three quadrats on a sampled subplot, the vegetation specialist does a search of the entire accessible forest condition area of the subplot, ignoring any condition class boundaries within the accessible forest. **Only** species rooted in or overhanging accessible forest condition(s) are included. All species recorded on the current subplot's quadrats must be included in canopy cover assessments. The vegetation specialist records abundance for all species, searching for no more than an average of 45 minutes per subplot. Some vegetation specialists find they spend more time on the first subplot, but less time on other subplots because most plants have been identified and coded. Only emergent plants are recorded in wetland forest situations. Epiphytes (Spanish moss, ferns, orchids, mistletoes) are recorded as well as possible as seen from the ground level. Two types of canopy cover estimates are made for each species: total canopy cover and canopy cover within each of three layers. The majority of plants will have canopy cover in only one layer, in which case the total and layer canopy covers will be identical.

##### 13.8.3.1 SUBPLOT SPECIES TOTAL PERCENT CANOPY COVER

A rapid canopy cover estimate is made for each species occurring within the 24-foot radius subplot. Estimate SUBPLOT SPECIES TOTAL PERCENT CANOPY COVER over the entire forested condition portion of the subplot, ignoring any boundaries between forested condition(s). Canopy cover is based on a vertically-projected polygon described by the outline of the foliage, ignoring any normal spaces occurring between the leaves of plants (Daubenmire 1959). Canopy cover estimates are only made for the area within accessible forest condition(s) and should not include foliage on non-forested portions of the subplot. However, record the percent cover on the forested portion as if the subplot was 100% accessible forest. That is, if total cover for a given species is about equal to a circle with a radius of 5.3 ft, enter 5%, as you would for a fully forested subplot.

For species of moderate cover, it may be easiest to divide the subplots into quarters, estimate canopy cover of each quarter separately, and then add them together. Record a trace (less than 1%) of canopy cover as "t". The following area-cover sizes may be useful in developing estimates for an entirely forested subplot:

Subplot radius = 24.0 feet, Subplot area = 1809 ft <sup>2</sup>			
Cover	Area (ft <sup>2</sup> )	Length of a side of a square(ft)	Radius of circular area(ft)
1%	18	4.3	2.4
3%	54	7.4	4.1
5%	90	9.5	5.3
10%	181	13.4	7.6
20%	362	19	10.7

For any species: total cover must be less than or equal to the sum of cover assigned for all layers, but greater than or equal to the greatest cover assigned for any one layer. (Greatest Single Layer Cover ≤ Total Cover ≤ Sum of All Layers).

When collected: Each unique species present on current subplot with SUBPLOT STATUS = 1

Field width: 3 digits

Tolerance: +/- 1 class based on the following canopy cover classes: t, 1-5%, 6-10%, 11-20%, 21-40%, 41-60%, 61-80%, and 81-100%

MQO: At least 90% of the time

Values: t, 001 to 100

#### 13.8.3.2 SUBPLOT SPECIES PERCENT CANOPY COVER LAYER 1 AND 2

A rapid canopy cover estimate is made for each species in a combined Layer 1 and 2. Estimate SUBPLOT SPECIES PERCENT CANOPY COVER LAYER 1 AND 2 over the entire 24-foot radius subplot, ignoring any forested condition class boundaries present, from ground level to 6 feet above the ground. For plants rooted in the subplot, but with no foliage in the combined Layer 1 and 2, enter 0. Cover assigned to any one layer cannot be greater than the value assigned for total cover for that species. Canopy cover is based on a vertically-projected polygon described by the outline of the foliage, ignoring any normal spaces occurring between the leaves of plants (Daubenmire 1959). Canopy cover estimates are only made for the area within accessible forest condition(s) and should not include foliage on non-forested portions of the subplot. However, record the percent cover on the forested portion as if the subplot was 100% accessible forest. That is, if total cover for a given species is about equal to a circle with a radius of 5.3 ft, enter 5%, as you would for a fully forested subplot.

When collected: Each unique species present on current subplot with SUBPLOT STATUS = 1

Field width: 3 digits

Tolerance: +/- 1 class based on the following canopy cover classes: 0, t, 1-5%, 6-10%, 11-20%, 21-40%, 41-60%, 61-80%, and 81-100%

MQO: At least 90% of the time

Values: 000, t, 001 to 100

#### 13.8.3.3 SUBPLOT SPECIES PERCENT CANOPY COVER LAYER 3

A rapid canopy cover estimate is made for each species in Layer 3. Estimate SUBPLOT SPECIES PERCENT CANOPY COVER LAYER 3 (from >6-16 feet above the ground) over the entire 24-foot radius subplot, ignoring any forested condition class boundaries present. For plants rooted in the subplot, but with no foliage in layer 3, enter 0. Cover

assigned to any one layer cannot be greater than the value assigned for total cover for that species. Canopy cover is based on a vertically-projected polygon described by the outline of the foliage, ignoring any normal spaces occurring between the leaves of plants (Daubenmire 1959). Canopy cover estimates are only made for the area within accessible forest condition(s) and should not include foliage on non-forested portions of the subplot. However, record the percent cover on the forested portion as if the subplot was 100% accessible forest. That is, if total cover for a given species is about equal to a circle with a radius of 5.3 ft, enter 5%, as you would for a fully forested subplot.

When collected: Each unique species present on current subplot with SUBPLOT STATUS = 1

Field width: 3 digits

Tolerance: +/- 1 class based on the following canopy cover classes: 0, t, 1-5%, 6-10%, 11-20%, 21-40%, 41-60%, 61-80%, and 81-100%

MQO: At least 90% of the time

Values: 000, t, 001 to 100

#### 13.8.3.4 SUBPLOT SPECIES PERCENT CANOPY COVER LAYER 4

A rapid canopy cover estimate is made for each species in Layer 4. Estimate SUBPLOT SPECIES PERCENT CANOPY COVER LAYER 4 (>16 feet above the ground) over the entire 24-foot radius subplot, ignoring any forested condition class boundaries present. For plants rooted in the subplot, but with no foliage in layer 4, enter 0. Cover assigned to any one layer cannot be greater than the value assigned for total cover for that species. Canopy cover is based on a vertically-projected polygon described by the outline of the foliage, ignoring any normal spaces occurring between the leaves of plants (Daubenmire 1959). Canopy cover estimates are only made for the area within accessible forest condition(s) and should not include foliage on non-forested portions of the subplot. However, record the percent cover on the forested portion as if the subplot was 100% accessible forest. That is, if total cover for a given species is about equal to a circle with a radius of 5.3 ft, enter 5%, as you would for a fully forested subplot.

When collected: Each unique species present on current subplot with SUBPLOT STATUS = 1

Field width: 3 digits

Tolerance: +/- 1 class based on the following canopy cover classes: 0, t, 1-5%, 6-10%, 11-20%, 21-40%, 41-60%, 61-80%, and 81-100%

MQO: At least 90% of the time

Values: 000, t, 001 to 100

### 13.9 UNKNOWN SPECIES AND VOUCHER SPECIMEN COLLECTION

When you encounter a species you cannot identify quickly and confidently using field guides, follow these basic steps:

1. Assign a valid NRCS PLANTS Genus or Unknown CODE and appropriate UNIQUE SPECIES NUMBER.
2. Record if a specimen was collected or not in SPECIMEN COLLECTED.
3. When a specimen is collected, enter a SPECIMEN LABEL NUMBER. Place the pre-printed label with the corresponding label number in the bag with the specimen.
4. If no specimen is collected, record a NOT COLLECTED REASON CODE.
5. Describe any newly encountered unknown species in SPECIES NOTES.
6. Record the quadrat occurrence or canopy cover estimate for the sample unit where the plant was encountered, as for any identified species. (see sections 13.8 or 13.9 for more detailed instructions).

Specimen labels with complete information can be generated automatically from downloaded data if a printer is available. Documentation of the unknown on Specimen Labels and Unknown Reports (replacing Unknown spreadsheets) is explained below, along with instructions for handling specimens.

**13.9.1 Field Specimen Label**

Each vegetation specialist will be issued a set of printed, pre-numbered labels to track unknown specimens (Figure 13-2). Information to be completed by hand in the field is optional, but may include date, unknown code, unique species number and crew name.

Label Number:1 Date: 8/06/03 Unknown Code: ACANT2 Unique Species Nbr: 1 Veg Spec. crew: John Doe
--

Figure 13-2. Example of field label for unknown specimen.

**13.9.2 Official Specimen Label**

Official specimen labels are printed from plot data and accompany the unknown (or voucher) specimen as it is pressed, dried, and submitted for further identification (Figure 13.3). Information and variables included on Official Specimen Labels are listed in Table 13.1. Labels will not include sensitive plot identification data – the unique specimen label number is sufficient identification for each specimen.

<h1 style="margin: 0;">Specimen Voucher</h1>			
<b>Label Number:</b>	21	<b>Resolved Species Code:</b>	
<b>Resolved scientific name:</b>			
<b>Resolved by (name):</b>			
<b>Date Collected:</b>	6/22/2005		
<b>Unknown Code:</b>	2GRAM	<b>Unique Species Nbr:</b>	7
<b>Field collected scientific name:</b>			
<b>Collected by:</b>	John Doe		
<b>State:</b>	State name	<b>County:</b>	County name
<b>Community type(s) where found:</b>			bottomland, old stripmine
	ridgetop with atv trl, stripped yrs ago		moist bottom
<b>Species Notes:</b>	delicate, hairy joints		

Figure 13-3. Example of official specimen label for unknown specimen.

### 13.9.2 Unknown Reports

For any unknown plant species encountered, the species is recorded in an **Unknown Report** (replacing the separately maintained Unknown Spreadsheet). The Unknown Report is generated from downloaded plot data. Each Region must train the vegetation specialists if they opt for maintaining unknown spreadsheets as Excel<sup>1</sup> files. The Unknown Spreadsheet contains the fields for variables listed in Table 13.1:

Table 13.1 Summary of Variables for Official Specimen labels and Unknown Reports

Variable	Official Specimen Label	Unknown Report	Source
SPECIMEN Label NBR	X	X	13.8.1.4; Preprinted by Region for each VEG crew
Genus or Unknown code	X	X	13.8.1.1 (As assigned by VEG crew )
UNIQUE SPECIES NBR	X	X	13.8.1.2
VEG spec. crew name	X	X	13.3.8
Field collected scientific name	X	X	Scientific name of species as collected
P2 Plot Number	-	X	13.3.3
State name	(descriptor*)	(descriptor)	13.3.1
County name	(descriptor)	(descriptor)	13.3.2
Community type(s) where found	X	X	13.4.6 or text entered by VEG crew
Date (Collected)	X	X	13.3.7
Description (of plant)	X	X	13.8.1.6; PLOT SPECIES NOTES
Resolved Species Code	X	X	NRCS code entered by identifier **
Resolved Scientific Name	X	X	Scientific Name of corresponding NRCS code
Resolved by name	X	X	Name of person identifying the species

\*Descriptor used, i.e., State and County NAMES, rather than FIPS code so that information has meaning to independent botanist or herbarium making the identification.

\*\* NRCS PLANTS CODE and scientific name entry to label is highly recommended if specimen is kept for future reference.

### 13.9.3 Specimen Collection and Handling

A good rule of thumb for when to collect unknown specimens is “when in doubt, **collect!**” Specimens of all plants present in the quadrats and subplots that cannot be quickly and confidently identified to species should be collected **away from quadrats** and **off of the subplot**, if possible. If fewer than 5 of the unknown plants are present DO NOT COLLECT (see section 13.8.1).

Use a digging tool to extract the entire plant, including any underground portions, flowers, fruits, and leaves. If the plant is abundant, collection of two samples will increase the likelihood of a good specimen. All specimens must be labeled, pressed, and dried for shipping and subsequent identification by the vegetation specialist, cooperating herbarium or specialist.

<sup>1</sup> The use of trade or firm names in this publication is for reader information only and does not imply endorsement by the U.S. Department of Agriculture of any product or service.

Collected unknown specimens should be transported in the field and from the field in the 1 and/or 2 gallon zip-lock bags provided. Only one species and label may be placed in a single bag. Acceptable methods of transporting collected specimens include:

- Use a 3-hole-punch to punch holes in the bottom of your bags prior to traveling in the field. Place the punched bags into a 2-inch 3-ring binder with the zip-lock portion facing outward. Plants can then be placed with pre-printed, numbered labels into the bag directly in the binder. This method prevents crumpling, tearing, and destroying the specimen during transportation.
- Use a 1-hole-punch to punch a hole in the one upper corner of each bag. The hole should be placed in such a manner that it cannot easily be torn. Place the bags on an aluminum carabineer (available at drug stores) or on heavy twine and fasten to your field vest or backpack. Be careful to seal the plants and labels securely inside the bags to prevent accidental loss.

#### Pressing specimens

1. Each specimen representing a unique species should be placed individually inside a single layer of folded newsprint. Each specimen is to be accompanied by its corresponding unknown specimen label. Even small plant specimens are to be pressed individually. Large plant specimens may be folded in a “v”, “z”, or “w” arrangement to fit on a single newsprint page. Arrange the specimen so that at least one upper and one lower leaf surface is exposed. Plants may be trimmed to reduce bulk, so long as all diagnostic parts are included. Diagnostic portions include stem sections, petioles, leaves, roots, flowers, and fruits. Bulky fruits or nuts may be stored separately in a paper envelope that is taped to the newsprint and is accompanied by an identical copy of the specimen’s unknown label. Unknown codes can be written on the outside of the folded newspaper to aid sorting as specimens are processed.
2. Stack the specimens in their individual newsprint sleeves between two pieces of cardboard. Bind the cardboard and plants together using a piece of twine or flat cloth ribbon wrapped around the length and width of the cardboard bundle. For mailing numerous specimens, several bundles may be used. Place all bundles inside a cardboard box for shipping.

Unknown specimens are to be packaged and shipped at the end of every work week. Exceptions will be made when extended field excursions prevent the vegetation specialist from reaching a post office.

All packaged specimens are to be accompanied by the following:

- Name and address to which final identifications are to be mailed
- One paper and one digital copy of the Unknown Spreadsheet

### **13.10 REFERENCES**

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<sup>7</sup>USDA Forest Service Interior West Research Station

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**13.12 CODES FOR UNKNOWN PLANTS**

<b>Code</b>	<b>Common Name</b>
<b>2FERN</b>	Fern or Fern Ally
<b>2FORB</b>	Forb (herbaceous, not grass nor grasslike)
2FA	Forb, annual
2FB	Forb, biennial
2FD	Forb, dicot
2FDA	Forb, dicot, annual
2FDB	Forb, dicot, biennial
2FDP	Forb, dicot, perennial
2FM	Forb, monocot
2FMA	Forb, monocot, annual
2FMB	Forb, monocot, biennial
2FMP	Forb, monocot, perennial
2FP	Forb, perennial
2FS	Forb, succulent
2FSA	Forb, succulent, annual
2FSB	Forb, succulent, biennial
2FSP	Forb, succulent, perennial
<b>2GRAM</b>	Graminoid (grass or grasslike)
2GA	Grass, annual
2GB	Grass, biennial
2GP	Grass, perennial
2GW	Grass, woody (bamboo, etc.)
2GL	Grasslike (not a true grass)
2GLA	Grasslike, annual
2GLB	Grasslike, biennial
2GLP	Grasslike, perennial
<b>2PLANT</b>	Plant
<b>2SHRUB</b>	Shrub (>.5m)
2SB	Shrub, broadleaf
2SD	Shrub, deciduous
2SDB	Shrub, deciduous, broadleaf
2SDBD	Shrub, deciduous, broadleaf, dicot
2SDBM	Shrub, deciduous, broadleaf, monocot
2SDN	Shrub, deciduous, needleleaf
2SE	Shrub, evergreen
2SEB	Shrub, evergreen, broadleaf
2SEBD	Shrub, evergreen, broadleaf, dicot
2SEBM	Shrub, evergreen, broadleaf, monocot
2SEN	Shrub, evergreen, needleleaf
2SN	Shrub, needleleaf (coniferous)
2SS	Shrub, succulent
2SSL	Shrub, succulent, leaf
2SSS	Shrub, succulent, stem
<b>2SUBS</b>	Subshrub (<.5m)
2SSB	Subshrub, broadleaf
2SSD	Subshrub, deciduous
2SSDB	Subshrub, deciduous, broadleaf

2SSDBD	Subshrub, deciduous, broadleaf, dicot
2SSDBM	Subshrub, deciduous, broadleaf, monocot
2SSDN	Subshrub, deciduous, needleleaf
2SSE	Subshrub, evergreen
2SSEB	Subshrub, evergreen, broadleaf
2SSEBD	Subshrub, evergreen, broadleaf, dicot
2SSEBM	Subshrub, evergreen, broadleaf, monocot
2SSEN	Subshrub, evergreen, needleleaf
2SSN	Subshrub, needleleaf (coniferous)
2SSS2	Subshrub, succulent
2SSSL	Subshrub, succulent, leaf
2SSSS	Subshrub, succulent, stem
<b>2TREE</b>	Tree
2TB	Tree, broadleaf
2TD	Tree, deciduous
2TDB	Tree, deciduous, broadleaf
2TDBD	Tree, deciduous, broadleaf, dicot
2TDBM	Tree, deciduous, broadleaf, monocot
2TDN	Tree, deciduous, needleleaf
2TE	Tree, evergreen
2TEB	Tree, evergreen, broadleaf
2TEBD	Tree, evergreen, broadleaf, dicot
2TEBM	Tree, evergreen, broadleaf, monocot
2TEN	Tree, evergreen, needleleaf
2TN	Tree, needleleaf (coniferous)
2TS	Tree, succulent
2TSL	Tree, succulent, leaf
2TSS	Tree, succulent, stem
<b>2VH</b>	Vine, herbaceous
2VHA	Vine, herbaceous, annual
2VHD	Vine, herbaceous, dicot
2VHDA	Vine, herbaceous, dicot, annual
2VHDP	Vine, herbaceous, dicot, perennial
2VHM	Vine, herbaceous, monocot
2VHMA	Vine, herbaceous, monocot, annual
2VHMP	Vine, herbaceous, monocot, perennial
2VHP	Vine, herbaceous, perennial
2VHS	Vine, herbaceous, succulent
2VHSA	Vine, herbaceous, succulent, annual
2VHSP	Vine, herbaceous, succulent, perennial
<b>2VW</b>	Vine, woody
2VWD	Vine, woody, deciduous
2VWDD	Vine, woody, deciduous, dicot
2VWDM	Vine, woody, deciduous, monocot
2VWE	Vine, woody, evergreen
2VWED	Vine, woody, evergreen, dicot
2VWEM	Vine, woody, evergreen, monocot

**P3 VEG DATA SHEETS: Plot and Subplot Information**

State:	Year:	VEG Plot Notes:		
County:	Month			
Plot Number:	Day:			
VEG Sample Kind:				
VEG Crew Name:				
VEG QA Status:				
VEG Crew Type:				
	<b>Subplot 1</b>	<b>Subplot 2</b>	<b>Subplot 3</b>	<b>Subplot 4</b>
VEG Subplot status				
VEG Subplot Non-sample reason				
Percent Subplot Area in Accessible Forest Condition(s)				
Nonforest Land Use				
Total Canopy Cover by Layer in Accessible Forest Condition(s)				
1 (0-2)				
2 (>2-6)				
3 (>6-16)				
4 (>16+)				
Subplot Ground Variable Cover in Accessible Forest Condition(s)				
Cryptobiotic crust				
Lichen				
Litter/Duff				
Mineral Soil				
Moss				
Road/Trail				
Rock				
Water				
Stream/Lake				
Trash/Junk/Other				
Wood				

