Remote Sensing Field Validation & Vegetation Monitoring

October 30 2024

This protocol was developed to efficiently provide field information to assist in the interpretation of 30 m remote sensing products used for vegetation change detection in the Regional Resource Kits and effectiveness monitoring questions. The protocol is based on the Common Stand Exam (CSE) Protocol.

CSE plots are standard Forest Service plots used to collect data on trees, vegetation, ground surface cover, and down woody material/fuels. Complete information on the protocol, use of field data recorders, and the FSVEG database, can be found at http://www.fs.fed.us/emc/nris/products/fsveg/

I. Overview

Plot shape: Circular

Plot size: To accurately assess a 30m square pixels recommended plot size is 707 sq m (16.0 radius) = 0.20 acres. Default for forested vegetation: 405 sq m (11.3 7m radius) = 0.10 acres..

Plot location: Randomly identify validation plots through a GIS exercise. The plots should be centered within the 30m remote sensing grid and stratified by vegetation type.

Permanently mark the plot locations. Flag the rebar and a few trees near the center of the plot. Attach plot tag to rebar with wire and note number for future data entry.

II. Remote Sensing Field Validation Rapid Assessment

Plot Data (0.2 acre plot)

1. Enter the plot #, date and observers initials.
2. Photos
   a. Take a photo of the plot tag.
   b. Take one photo at each cardinal direction from plot center moving clockwise (N, E, S, W). Record what camera the photos were taken on.

3. Record location of plot using a sub-centimeter accuracy GPS unit. Enter the UTM zone and easting and northing measurements (GPS). If plots are already recorded then navigate to coordinates. Does not need to be collected on already established plots.

4. Enter the slope, in %. Record the slope across the entire plot to the nearest 1 percent. Measure slope, using a clinometer, from point center in the two directions of the aspect axis to the plot edge and average these two numbers. Does not need to be collected on already established plots.

5. Enter aspect, in degrees. Record the aspect across the entire plot to the nearest 1 degree. Aspect is measured with a hand compass in the same direction as the slope. Does not need to be collected on already established plots.

6. Enter the plot horizontal and vertical shape (BR,CC,CV, etc.), see table in Cheatsheet. Does not need to be collected on already established plots (Figure A1).

7. Enter the slope position (SU,SH,BS, etc.), see table and figure in Cheatsheet. Does not need to be collected on already established plots (Figure A2).

8. Enter capable growing area (CGA), the % of the plot area capable of growing trees.

9. Make an attempt to estimate the Scott Burgan fuel model using the appendix (Scott Burgan model GTR is also on tablets) (Table A1).

10. In the existing veg box, list the top three overstory species in order of dominance (e.g., PIPO/ABCO/QUCH).

11. Enter fire severity classification for each plot. Pre-treatment should all be Not Burned. 0: Not Burned, 1: Light patchy groups of surviving shrubs/saplings, 2: Lightly burned, most shrubs/saplings dead, 3: Moderately burned, understory mostly burned to ground, 4: High severity, significant overstory kill, dead needles on tree, 5: High Severity, total morality of overstory, no needles.

12. Record the plot history and estimated year corresponding to any activities or disturbances that occurred in the plot (Table A2).

Vegetation Cover Form (0.2 acre plot)

1. Enter the plot #.
2. Estimate % cover (to nearest 5%) of the total plot and modal height (in meters) (to the nearest 0.1) for the twelve classes listed under vegetation cover. For the 0.1 acre plots, about 4 m sq is equal to 1% cover. For the 0.2 acre plots, about 8 m sq is equal to 1%.
    a. "Total vegetation" (TV) is the cover of living vegetation as a % of the plot when viewed from an airplane/satellite.
    b. Total tree (TOT), tree ≥1.8m (TOV) and tree <1.8m (TSA) refer only to live trees. Adding TOV and TSA together will probably give a value higher then TOT, due to crown overlap.
    c. Record the cover by tree species.
    d. Under shrubs, all measures refer only to live shrubs. Record percent cover for tall shrubs (ST) (≥1.8m), medium shrubs (SM) (0.5-1.7m), and short shrubs (SL) (<0.5m). Adding these together will usually give a value > than total shrubs (TOS), due to crown overlap.
    e. Record percent cover for forbs (TOF) and graminoids (TOG) (includes grasses, sedges, and rushes).
    f. Record modal height for each category.
3. If any of the above ground cover types are present in the plot but make up less than 0.5%, record the percent cover as 0.5%.

Ground Cover Form (0.2 acre plot)

1. Enter the plot #.
    a. Ground surface cover values must sum to 100% to nearest 5%. Ground cover categories include: live basal vegetation, rock, coarse woody debris, litter, cryptograms, and bare ground. These measures are of the ground cover so what the plot looks without vegetation.

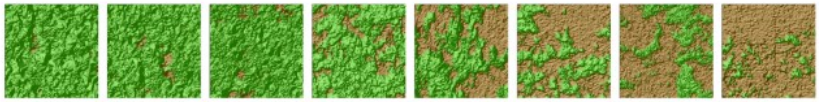
Tree Density (0.2 acre plot)

1. Tally the total number of trees by species, status (Live, Dead, Marginal), and size class based on the CWHR Tree Size classification (1—seedling <1.0", 2—Sapling 1.0—5.9", Pole—6.0—10.9", Small—11.0—23.9", Medium/large—≥24.0").

2. A key component of forest structure is the spatial heterogeneity (i.e., tree clumps and gaps), which influences vegetation growth, competition, and succession, disturbance processes, and wildlife habitat. Enter the fractal index that corresponds with the complexity of the plot (Figure 1).

3. Characterize the CWHR vegetation type, size class and canopy cover. The information gathered in the rapid validation plots can be used to answer the questions in Appendix C to identify CHWR vegetation type, size class and overstory canopy cover.

Figure 1. Fractal Dimension Index



Stand Basal Area (Variable Density Plot)

1. Record the basal area gauge used to measure basal area.

2. Use the basal area gauge to record the basal area of live and dead trees by species in the stand. Remember to have your gauge, at the end of your outstretched hand, centered over the plot center at all times; i.e. you will walk around the plot center as if it were a pivot point. If you are using a prism instead of a gauge, the protocol is different! (with a prism you stand at plot center and swing the prism around).

3. Turning in a circle while looking through the gauge, tally the number of trees that are larger than the aperture. Count live and dead trees separately.

III. Common Stand Exam Monitoring Expanded Assessment

Woody Fuels (0.1 or 0.2 acre plot)

1. Enter the plot #.
2. Fuels data will be collected from four Brown's Transects (J.K. Brown. 1974. Handbook for inventorying downed woody material). The transects are laid out at the cardinal directions, stretching from the plot center to plot edge. The ends of the transects are the starting points, i.e. they are read starting from at the edge of the plot, heading toward the middle.
3. Enter the azimuth of the transect. Since they will be in the cardinal directions, it is OK to write, N,S,E, or W for the four different transects, rather than putting the azimuth in degrees, but if you have to diverge from the cardinal directions, then write in the azimuth in degrees. There will be four transects with the same plot number
4. Use a go/no go gauge to record the following:
   a. The number of 1-hr fuels (<0.64 cm) that intersect the transect between the 3.0 and 5.0 m mark.
   b. The number of 10-hr fuels (0.64-2.54 cm) between the 3.0 and 5.0 m mark
   c. The number of 100-hr fuels (2.54-7.62 cm) between the 3.0 and 6.0 m marks
   d. Measure litter, duff and fuel depths at the transect starting point (i.e. at the outside of the plot) at 3.8 and again at 7.6 m, enter these values. If m0 is placed at the center then these measurements are taken between 11.3, 7.5, and 3.7.
5. Collect information on every piece of coarse woody debris (CWD) that intersects the transects and meets the minimum criteria:
   a. Central longitudinal axis of the CWD intersects the transect, the diameter at the point of intersection is $\geq$3" (7.6 cm) and the piece is at least 1 meter (3.3 feet) long

Figure 2

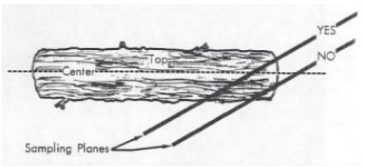
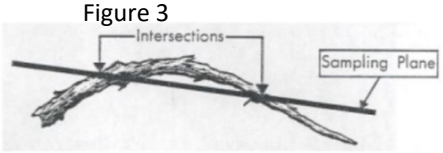


Figure 3



6. Enter the diameter of the CWD at the transect intersect, the diameter at the large end, the diameter at the small end, length and decay class

7. Notes:

   a. To qualify as fuels, particles must be severed from the original source

   b. Be sure not to count dead shrub limbs that are attached to a standing shrub, whether the standing shrub is dead or alive.

   c. Do not count needles, grass, bark, or cones

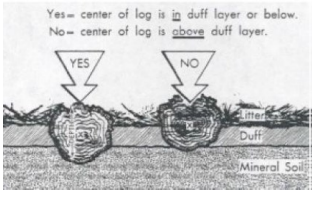
   d. If a branch or log intersects the transect at its end, the central axis must intersect the transect for the piece to be tallied (Fig. 2)

   e. Count both intersections for a curved piece (Fig. 3)

   f. Regardless of size, pieces are only tallied when their intersection with the transect lies above the litter and duff layers (Fig. 4)

   g. Do not count stumps that are still rooted in the ground

Figure 4



Trees (0.1 or 0.2 acre plot)

Tree data: Use a dbh cutoff of 7.6 cm and a height cutoff of 1.37 m. This means that within the plot, all live and dead trees at or above 7.6cm dbh and 1.37 m tall will be individually measured (although there are few measures made of dead trees). All live trees will be tagged. If a live tree is not tagged, add a new tag and note the tag number in the datasheet in notes.

1. Enter the tag #

   Enter status (L,D,S,X,Y), see Cheatsheet (live and dead trees), L = Live, I = Infested but green crown (look for fresh pitch and signs of frass and exit holes), M = Marginal crown (partially red for Pine and >50% red for incense cedar), D1 = Dead & most red needles retained, D2 = Dead, most needles lost, D3 = Snag decay class 2-5. If a tree cannot be located because it has fallen enter FT (Fallen Tree) and indicate whether the tag is visible or not.

2. Enter species (live and dead trees).
3. Enter whether the species was dead prior to the fire.
4. Enter dbh (d-tape) (live and dead trees).
5. Enter health codes. Record health code based on the codes provided on the data sheet. Ignore pitching on the bole of the tree unless it has extensive coverage on the bole. Tree health codes include: A = White pine blister rust aecia, D = Dead top, S = Split top, C = Catface, M = Mistletoe, A = Dwarf mistletoe (Arceuthobium sp.), P = Extensive pitching on bole of tree, T = Red turpentine beetle, W- Western pine beetle, M- Mountain pine beetle, J – Jeffrey pine beetle, O = Other issue – Insert in Notes section at bottom of data sheet
6. Record Live Crown Ratio. The Live Crown Ratio is the % of total tree height that supports live foliage.

7. Height to live crown base (HTLCB) to the nearest 0.1 m (only live trees)
    a. This is defined as the height to the lowest live, vertically continuous
    b. Must be a wedge of at least 30 degrees AND less than 2 m below continuous crown
    c. If a tree has a dead top, record its total height including the dead top, then under Notes record the height to the top of its live crown
    d. Measure HTLCB from the point where the lowest live branch intersects with the bole of the tree, not the tip of the branch
8. Enter decay class (1-5), see table (dead trees)
9. Enter whether the tree is a witness tree.

Tree Heights (0.1 or 0.2 acre plot)

1. Identify the tallest tree in each of the four strata (dominant, codominant, intermediate, and suppressed) as applicable for the plot. Record the tag number for each tree. In the resample, make sure to record tree heights for the same trees that were sampled in the prior time.
2. Height to the nearest 0.1 m
    a. If a tree leans, measure the height starting from the ground immediately beneath the top of the tree. You may need someone to stand directly below the top of the tree in order to measure height accurately with a hypsometer.
    b. Record the approximate angle of the tree in the Notes section (example: “leans at 45 degree angle”)
3. Enter crown width in meters to nearest 0.1. Measure the crown width at perpendicular sections and average if the crown is not a circular

Regeneration Seedling/Sapling Protocol (0.1 or 0.2 acre plot)

1. Establish a plot with a radius of 4.37 m, area = 60 sq m). Flag four places around the perimeter for reference.

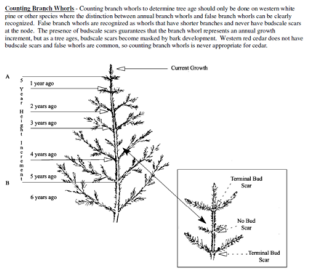
2. Tally the number of seedlings (trees less than 4.5 feet tall [1.37 m]) of each tree species (conifer and hardwood) for age class 0 and 1+ seedlings. Use a separate row for each species. Record the height, age, and last year's growth for the tallest individual seedling in each species. Determine age by counting the bud scars, subtracting the current year

3. Enter data for each individual sapling (trees >4.5 feet tall but <3 inches [7.6 cm] dbh) of each tree species (conifer and hardwood). Use a separate row for each individual entry. Measure and enter the dbh.

4. Enter data for each individual resprout (independent of size) of each tree species (these will all be hardwood/broadleaved species). If resprouts are multiple (many from a single clump), measure only the tallest resprout. Resprout clumps >1 m apart are considered separate resprouts. Use a separate row for each individual. Measure dbh if >4.5 feet tall. Determine age by counting the bud scars, subtracting the current year. Record the number of sprouts originating from each clump (Fig. 5).

5. Enter the distance (m) to the nearest regenerated tree and seed source by species grouped by shade tolerants and intolerants.

Figure 5



Witness Trees (0.1 or 0.2 acre plot)

1. Identify two witness trees (both of which have been previously tagged in the trees protocol). These two trees should be at an approximate 90 degree angle from each other through plot center. These trees should have an unobstructed "pull" to the plot center at the base of the stake.

2. Record the distance and azimuth on the tree datasheet. Distance should be to the nearest 0.1.

Species Composition (0.1 or 0.2 acre plot)

1. Enter the plot #
2. Enter the species lifeform (tree, shrub, forb, gram (graminoid), fern, etc.) (not all plots have full floristics – some only have data collected on trees and shrubs (see Cheatsheet)
3. Start with all of the tree species, then do the shrub species.
3. Enter the layer code of the plants you are measuring (see the Cheat-sheet; TOV = tree overstory [≥1.8m tall]; TSA = saplings [<1.8m tall]; ST, SM, SL are the shrub layer classes)
    a. For each tree and shrub species, there may be multiple layer classes
    b. For example, most tree species will be in the TOV layer and also in the TSA layer; there may be shrub species that are in all three shrub layer classes as well
4. Enter the species code and record percent cover to nearest 1%. If a new species is encountered enter new species in the drop down list and enter new species code. Record any notes specific to the plant .

Plot Checklist (0.1 or 0.2 acre plot)

1. Review the final plot checklist to make sure everything has been accomplished before moving on.

Appendix A. Cheatsheets for Common Stand Exam Monitoring

Figure A1. Horizontal and Vertical Cheatsheet

Code	Description
BR	**Broken**. Cliffs, knobs, and/or benches interspersed with steeper slopes generally characterized by sharp, irregular breaks. A marked variation of topography, or an irregular and rough piece of ground.
CC	**Concave.** The gradient decreases down the slope. Runoff tends to decelerate as it moves down the slope, and if it is loaded with sediment the water tends to deposit the sediment on the lower parts of the slope. The soil on the lower part of the slope also tends to dispose of water less rapidly than the soil above it.
CV	**Convex**. The gradient increases down the slope and runoff tends to accelerate as it flows down the slope. Soil on the lower part of the slope tends to dispose of water by runoff more rapidly than the soil above it. The soil on the lower part of a convex slope is subject to greater erosion than that on the higher parts.
LL	**Linear or Planar.** Substantially a straight line when seen in profile at right angles to the contours. The gradient does not increase or decrease significantly with distance (level or little relief).
PA	**Patterned**. A general term for any ground surface exhibiting a discernibly ordered, more-or-less symmetrical, morphological pattern of ground (i.e. micro relief of hummock and swales of several feet).
UN	**Undulating**. One or more low relief ridges or knolls and draws within the plot area.
UA	Unable to Assess.

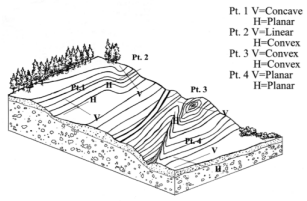
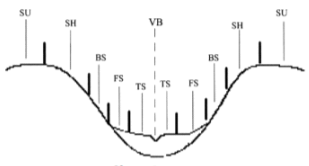


Figure A2. Slope Position Cheatsheet

Code	Description
SU	**Summit/Ridgetop/Plateau**. The topographically highest hillslope position of a hillslope profile and exhibiting a nearly level surface.
SH	**Shoulder**. The hillslope position that forms the uppermost inclined surface near the top of a hillslope. It comprises the transition zone from backslope to summit.
BS	**Backslope**. The hillslope position that forms the steepest inclined surface and principal element of many hillslopes. In profile, backslopes are commonly steep, linear, and bounded by a convex shoulder above and descending to concave footslope. They may or may not include cliff segments. Backslopes are commonly erosional forms produced by mass movement and running water.
FS	**Footslope**. The hillslope position that forms the inner, gently inclined surface at the base of a hillslope. In profile, footslopes are commonly concave. It is a transition zone between upslope sites of erosion and transport.
TS	**Toeslope**. The hillslope position that forms the gently inclined surface at the base of a hillslope. Toeslopes in profile are commonly gentle and linear, and are constructional surfaces forming the lower part of a hillslope continuum that grades to valley bottom.
VB	**Valley Bottom**. Wide valley bottom beyond influence of toeslope.

Accuracy Standards: ± 1 Class



Slope Position

Table A1. Anderson 13 and Scott and Burgan Fuels Models

Fuel Model	Fuel Model Code	Fuel Model Name	Fuel Type	Model Set	Fuel 1-hr	Fuel 10-hr	Fuel 100-hr	Fuel Bed Depth
91	NB1	Urban/ Developed	Non-burnable	Scott and Burgan	0	0	0	0
92	NB2	Snow/Ice	Non-burnable	Scott and Burgan	0	0	0	0
93	NB3	Agricultural	Non-burnable	Scott and Burgan	0	0	0	0
98	NB4	Open Water	Non-burnable	Scott and Burgan	0	0	0	0
99	NB5	Bare Ground	Non-burnable	Scott and Burgan	0	0	0	0
101	GR1	Short, Sparse Dry Climate Grass (Dynamic)	Grass	Scott and Burgan	0.10	0	0	0.40
102	GR2	Low Load, Dry Climate (Dynamic)	Grass	Scott and Burgan	0.10	0	0	1
103	GR3	Low Load, Very Coarse, Humid Climate Grass (Dynamic)	Grass	Scott and Burgan	0.10	0.40	0	2
104	GR4	Moderate Load, Dry Climate Grass (Dynamic)	Grass	Scott and Burgan	0.25	0	0	2
105	GR5	Low Load, Humid Climate Grass (Dynamic)	Grass	Scott and Burgan	0.40	0	0	1.50
106	GR6	Moderate Load, Humid Climate Grass (Dynamic)	Grass	Scott and Burgan	0.10	0	0	1.50
107	GR7	High Load, Dry Climate Grass (Dynamic)	Grass	Scott and Burgan	1	0	0	3
108	GR8	High Load, Very Coarse, Humid Climate Grass (Dynamic)	Grass	Scott and Burgan	0.50	1	0	4
109	GR9	Very High Load, Humid Climate Grass (Dynamic)	Grass	Scott and Burgan	1	1	0	5

109	GR9	Very High Load, Humid Climate Grass (Dynamic)	Grass	Scott and Burgan	1	1	0	5
121	GS1	Low Load, Dry Climate Grass-Shrub (Dynamic)	Grass-Shrub	Scott and Burgan	0.20	0	0	0.90
122	GS2	Moderate load, Dry Climate Grass-Shrub (Dynamic)	Grass-Shrub	Scott and Burgan	0.50	0.500	0	1.50
123	GS3	Moderate Load, Humid Climate Grass-Shrub (Dynamic)	Grass-Shrub	Scott and Burgan	0.30	0.250	0	1.80
124	GS4	High Load, Humid Climate Grass-Shrub (Dynamic)	Grass-Shrub	Scott and Burgan	1.90	0.300	0.100	2.10
141	SH1	Low Load, Dry Climate Shrub (Dynamic)	Shrub	Scott and Burgan	0.25	0.250	0	1
142	SH2	Moderate Load, Dry Climate Shrub	Shrub	Scott and Burgan	1.35	2.400	0.750	1
143	SH3	Moderate Load, Humid Climate Shrub	Shrub	Scott and Burgan	0.45	3	0	2.40
144	SH4	Low Load, Humid Climate Timber-Shrub	Shrub	Scott and Burgan	0.85	1.150	0.200	3
145	SH5	High Load, Dry Climate Shrub	Shrub	Scott and Burgan	3.60	2.100	0	6
146	SH6	Low Load, Humid Climate Shrub	Shrub	Scott and Burgan	2.90	1.450	0	2
147	SH7	Very High Load, Dry Climate Shrub	Shrub	Scott and Burgan	3.5	5.300	2.200	6
148	SH8	High Load, Humid Climate Shrub	Shrub	Scott and Burgan	2.05	3.400	0.850	3

149	SH9	Very High Load, Humid Climate Shrub (Dynamic)	Shrub	Scott and Burgan	4.50	2.450	0	4.40
161	TU1	Low Load, Dry Climate Timber-Grass-Shrub (Dynamic)	Timber - Understory	Scott and Burgan	0.20	0.900	1.500	0.60
162	TU2	Moderate Load, Humid Climate Timber-Grass-Shrub (Dynamic)	Timber - Understory	Scott and Burgan	0.95	1.800	1.250	1
163	TU3	Moderate Load, Humid Climate Timber-Grass-Shrub (Dynamic)	Timber – Understory	Scott and Burgan	1.10	0.150	0.250	1.30
164	TU4	Dwarf Conifer with Understory	Timber – Understory	Scott and Burgan	4.50	0	0	0.50
165	TU5	Very High Load, Dry Climate Timber-Shrub	Timber – Understory	Scott and Burgan	4	4	3	1
181	TL1	Low Load Compact Conifer Litter	Timber Litter	Scott and Burgan	1	2.200	3.600	0.20
182	TL2	Low Load Broadleaf Litter	Timber Litter	Scott and Burgan	1.40	2.300	2.200	0.200
183	TL3	Moderate Load Conifer Litter	Timber Litter	Scott and Burgan	0.50	2.200	2.800	0.30
184	TL4	Small Downed Logs	Timber Litter	Scott and Burgan	0.50	1.500	4.200	0.40
185	TL5	High Load Conifer Litter	Timber Litter	Scott and Burgan	1.15	2.500	4.400	0.60
186	TL6	Moderate Load Broadleaf Litter	Timber Litter	Scott and Burgan	2.40	1.200	1.200	0.30
187	TL7	Large Downed Logs	Timber Litter	Scott and Burgan	0.30	1.400	8.100	0.40
188	TL8	Long-Needle Litter	Timber Litter	Scott and Burgan	5.80	1.400	1.100	0.30
189	TL9	Very High Load Broadleaf Litter	Timber Litter	Scott and Burgan	6.65	3.300	4.150	0.60
201	SB1	Low Load Activity Fuel	Slash-Blowdown	Scott and Burgan	1.50	3	11	1

202	SB2	High Load Activity Fuel or Moderate Load Blowdown	Slash-Blowdown	Scott and Burgan	4.50	4.250	4	1
203	SB3	High Load Activity Fuel or Moderate Load Blowdown	Slash-Blowdown	Scott and Burgan	5.50	2.750	3	1.20
204	SB4	High Load Blowdown	Slash-Blowdown	Scott and Burgan	5.25	3.500	5.250	2.70

Table A2. Disturbance history codes and descriptions

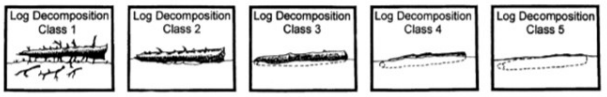
Code	Description
1	Site Preparation
2	Artificial Regeneration
3	Natural Regeneration
4	Stand Improvement
5	Tree cutting
6	Fire
7	Other Silvicultural Treatments
8	Other Human Disturbance
9	Natural Disturbance
10	Land Clearing
11	Insect/Disease outbreak
12	Animal Damage
13	Type Conversion
14	Mining
15	Clear cut
16	Heavy partial cut (≥ 20% removed)
17	Light partial cut (< 20% removed)
18	Firewood or local use cut
19	Incidental cut
20	Pre-commercial thin
21	Improvement cut
22	Planting throughout the stand
23	Planting within non-stocked holes in the stand
24	Under-planting
25	Clean and release
26	Chaining

Appendix B Cheatsheets for Common Stand Exam Monitoring

Woody Fuel Cheatsheet

Log Decay Class

Code	Bark	Twigs	Texture	Shape	Wood Color	Portion of log on ground
1	Intact	Present	Intact	Round	Original	None, elevated on supporting points
2	Intact	Absent	Intact to soft	Round	Original	Parts touch, still elevated, sagging slightly
3	Trace	Absent	Hard large pieces	Round	Original to faded	Bole on ground
4	Absent	Absent	Soft blocky pieces	Round to oval	Light brown to faded brown	Partially below ground
5	Absent	Absent	Soft, powdery	Oval	Faded light yellow or gray	Mostly below ground



Crown Class Cheatsheet

Code	Name	Description
OP	**Open-grown or Isolated**	Tree crowns receive full light from above and from all sides. In even-aged stands, these trees have their crowns well above the general canopy.
DO	**Dominant**	Tree crowns receive full light from above and partly from the sides. Crowns extend above the general level of the crown cover of others of the same stratum and are not physically restricted from above, although possibly somewhat crowded by other trees on the sides.
CO	**Codominant**	Tree crowns receive full light from above, but comparatively little from the sides. Crowns form a general level of crown stratum, are not physically restricted from above and are crowded by other trees from the sides.
IN	**Intermediate**	Tree crowns occupy a definitely subordinate position and are subject to strong lateral competition from crowns of dominants and codominants. They receive little direct light from above through small holes in the canopy, but no light from the sides.
OV	**Overtopped**	Tree crowns receive no direct light from above or from the sides and are entirely below the general level of dominant and codominant trees.
RE	**Remnant**	Trees that remain from a previous management activity or catastrophic event. The tree is significantly older than the surrounding vegetation. Remnant trees do not form a canopy layer and are usually isolated individuals or small clumps. This definition is from the Region 6 Inventory and Monitoring System field procedures for the Current Vegetation Survey.
AB	**Leader Above Brush**	The terminal leader of the tree is above the surrounding brush while the middle or lower crown may be within the brush canopy.
IB	**Leader Within Brush**	The terminal leader and upper crown of the tree is within the brush canopy.

Seedling Key—also see Jerry Franklin GTR as additional reference

Cotyledons needle-like, isosceles triangle where they emerge from the stem, glaucous above (except PILA)

Glaucous above

3-4 (~7) cotyledons, 16-30mm.....PICO

6-10 (usu 7-8) cotyledons, 16-30mm.....PIMO

6-12 cotyledons, 25-60mm, +/- serrulate near base.....PIPO

7-13 cotyledons, 40-80mm, +/- serrulate near base,
larger, more vigorous than PIPO when co-ocurring.....PIJE

Not glaucous above

11-17 cotyledons, 30-65mm, +/- serrulate near base.....PILA

Cotyledons linear and "flat", obtuse triangle where they emerge from the stem

Cotyledons <10mm long

3-4 cotyledons, glaucous above or not .....TSME

Cotyledons >10mm long

2 cotyledons, 18-30mm, flat with rounded tip,
glaucous above.....CADE

Young needles with acute end, tiny bristle, not glaucous,
reddish scales, 5-8 (~10) cotyledons, 12-25mm.....PSME

Both of the below have glaucous young needles, very difficult to differentiate

Outer bud scales elongate, free, not resinous,
light red-brown, 6-13 cotyledons, 30-45mm.....ABMA

Outer bud scales not elongated or free, resinous,
dark brown, 5-8 cotyledons, 20-30mm.....ABCO

Cheatsheet for Tree Species

Rules for naming PIJE or PIPO

- Only change the name from previous years data if you are confident it was misidentified
- If you are changing the species name, make a note so that previous years data can be updated
- Clearly identify why you are confident it was misidentified

Key things to look at

- Bark color, although the fire can make this challenging – PIPO is more yellow, PIJE more red
- Cone prickle – PIPO prickly (prickly sticks out), PIJE gentle (prickle sticks in)
- Note scent is hard to differentiate – PIPO does have an odor
- Bract hairs? – maybe use a hand lens to check out
- Use hand lens to see if vegetative buds is a good key – will need hand lens to see resin glands
- PIJE drier higher sites and PIPO wetter lower sites, although they also grow intermixed next to each other

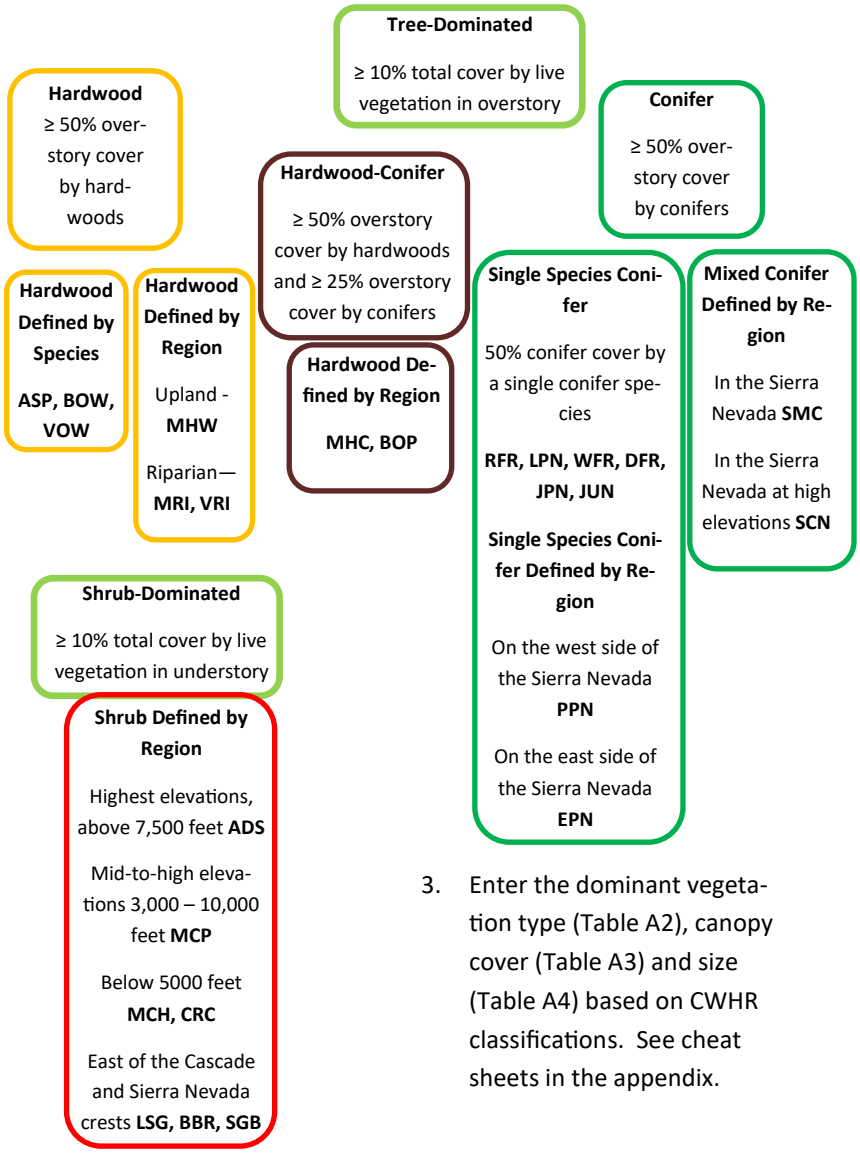
Life Form Cheatsheet

Life Form	Layer	Layer Code
	Total Vegetation	**TV**
Total Tree		**TOT**
	Trees≥1.8m	**TOV**
	Trees≤1.7m	**TSA**
Total Shrub		**TOS**
	Shrubs ≥1.8m	**ST**
	Shrubs 0.5-1.8m	**SM**
	Shrubs ≤0.4	**SL**
Total Forbs		**TOF**
Total Graminoids		**TOG**
Total Other		**Other**

Appendix C. Cheatsheet for determining CWHR

Determining CHWR Vegetation Type, Tree Size and Canopy Cover

To determine the CWHR vegetation type utilize the vegetation cover data and the flow chart.



3. Enter the dominant vegetation type (Table A2), canopy cover (Table A3) and size (Table A4) based on CWHR classifications. See cheat sheets in the appendix.

Table C2. CWHR Vegetation Type, Size Class & Canopy Classes

Tree Dominated Habitats

CWHR Code	Type Description
ASP	Aspen
BOP	Blue Oak-Foothill Pine
BOW	Blue Oak Woodland
COW	Coastal Oak Woodland
CPC	Closed-Cone Pine-Cypress
DFR	Douglas Fir
DRI	Desert Riparian
EPN	Eastside Pine
EUC	Eucalyptus
JPN	Jeffrey Pine
JST	Joshua Tree
JUN	Juniper
KMC	Klamath Mixed Conifer
LPN	Lodgepole Pine
MHC	Montane Hardwood-Conifer
MHW	Montane Hardwood
MRI	Montane Riparian
PJN	Pinyon-Juniper
POS	Palm Oasis
PPN	Ponderosa Pine
RDW	Redwood
RFR	Red fir
SCN	Subalpine Conifer
SMC	Sierran Mixed Conifer
VOW	Valley Oak Woodland
VRI	Valley Foothill Riparian
WFR	White fir

Shrub Dominated Habitats

CWHR Code	Type Description
ADS	Alpine Dwarf-Shrub
ASC	Alkali Desert Scrub
BBR	Bitterbrush
CRC	Chamise-Redshank Chaparral
CSC	Coastal Scrub
DSC	Desert Scrub
DSS	Desert Succulent Shrub
DSW	Desert Wash
LSG	Low Sage
MCH	Mixed Chaparral
MCP	Montane Chaparral
SGB	Sagebrush

Herbaceous Dominated Habitats

CWHR Code	Type Description
AGS	Annual Grass
FEW	Fresh Emergent Wetland
PAS	Pasture
PGS	Perennial Grass
SEW	Saline Emergent Wetland
WTM	Wet Meadow

CWHR Code	Type Description
EST	Estuarine
LAC	Lacustrine
MAR	Marine
RIV	Riverine

Developed Habitats

CWHR Code	Type Description
CRP	Cropland
DGR	Dryland Grain Crops
DOR	Deciduous Orchard
EOR	Evergreen Orchard
IGR	Irrigated Grain Crops
IRF	Irrigated Row and Field Crops
IRH	Irrigated Hayfield
OVN	Orchard - Vineyard
RIC	Rice
URB	Urban
VIN	Vineyard

Non-vegetated Habitats

CWHR Code	Type Description
BAR	Barren

Table C3. CWHR Canopy Classes

CWHR Code	CWHR Closure Class	Vegetation Cover (Canopy Closure)
S	Sparse Cover	10.0 - 24.9%
P	Open Cover	25.0 - 39.9%
M	Moderate Cover	40.0 - 59.9%
D	Dense Cover	≥60%
X	Not Determined / Not Applicable	

Table C4. CWHR Size Class

CWHR Code	CWHR Size Class	Conifer Crown Diameter	Hardwood Crown Diameter	DBH
1	Seedling tree	n/a	n/a	<1.0"
2	Sapling tree	n/a	<15.0'	1.0" - 5.9"
3	Pole tree	<12.0'	15.0' - 29.9'	6.0" - 10.9"
4	Small tree	12.0' - 23.9'	30.0' - 44.9'	11.0" - 23.9"
5	Medium/large tree	≥24.0'	≥45.0'	≥24.0"
6	Multi-layered tree	A distinct layer of size class 5 trees over a distinct layer of size class 4 and/or 3 trees, and total tree canopy of the layers ≥60% (layers must have ≥10.0% canopy cover and distinctive height separation).		
0	Not Determined / Not Applicable			