

## **Post-fire Regeneration Plot Protocol**

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### **Introduction:**

This protocol was developed by the USFS Pacific Southwest Region silviculture and ecology staff and has been refined continually over the past few years. The landbase used for this survey is the forestland that burned into a “deforested condition” - see website (<http://www.fs.fed.us/r5/rsl/projects/postfirecondition/>). A grid of sample plots is created on this landbase at a 200 m (660 foot) interval - 1 plot represents 10 acres (4 ha) - see maps. Each plot is 1/70 of an acre (60 sq m). “Deforested conditions” are defined to exist where predicted basal area mortality from the fire severity maps is >50%. Where possible, we also look to sample regeneration from areas that burned at lower severity as well, including unburned controls. The ideal case is to have at least 10 plots sampled from each of the seven basal area mortality classes, including unburned, that are mapped in the fire severity maps.

### **I. Site attributes:**

- Use a GPS device to locate plot center - take care to avoid biasing the location.
- Record the date that data were collected.
- Record the crew names of the people collecting the data.
- Dominant tree spp.: enter the codes for the dominant tree species, in order of their dominance.
- Establish a plot with a radius of 14.3 feet, which ~ 1/70th acre (metric: radius = 4.37 m, area = 60 sq m). Flag four places around the perimeter for reference.
- Take a photograph from a point 15 feet (4.6 m) south of the plot center, looking north. Make sure you have something or someone at plot center so it can be relocated using the photo. Record the photo number.
- Record the average slope of the plot in percent (use clinometer).
- Record the average aspect of the plot in degrees (use compass [make sure you have the right declination!])
- Record the parent material (dominant rock type) around the plot center. Collect a representative rock if you need it for later ID.
- Estimate the cover (%) of: *basal vegetation* (i.e. the area covered by the bases of tree boles, shrub stems, herbs), *litter*, *bare ground*, *rock* (>2 mm diameter), and *woody debris* (>3 inches [7.5 cm] diameter), summing to 100% (imagine chopping off all vegetation at ground level, what do you have left?; it is rare for basal vegetation to be more than 5%, unless there are trees or many large shrubs in the plot). Record cover values to nearest 5%, using 0.5% as trace cover

### **II. Vegetation cover attributes**

- Estimate vegetation cover to nearest 5%:

- % Overstory veg cover = cover of plants >2 m in height (trees and tall shrubs; this is a snapshot of total canopy cover taken from above, i.e. it is the % of the plot that has trees/tall shrubs covering it. Tree/tall shrubs growing completely beneath other trees/tall shrubs are not counted as they cannot be seen from above) (see Figure 1)
  - Estimate cover of live trees and tall shrubs
  - Also estimate % dead cover (trace circles around the remnants of burned trees and shrubs >2 m in height; also include fire-killed portions of live trees/tall shrubs if they extend beyond the live cover). When this value is added to the live cover it should give us an estimate of the total prefire live cover
- % Understory veg cover = cover of plants <2 m in height (this is a snapshot of total understory cover taken from above, i.e. it is the % of the plot that has understory vegetation covering it. Understory plants growing completely beneath other plants are not counted, as they cannot be seen from above) (see Figure 1)

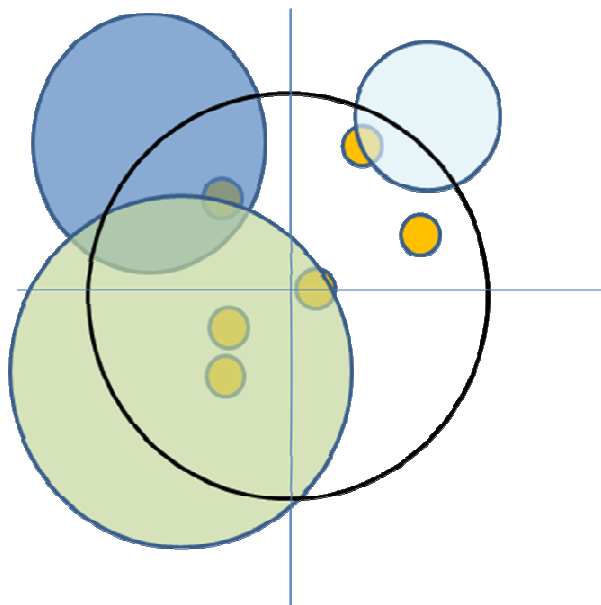


Fig. 1. Circular plot, with four species of understory plants (colored). The blue crosshairs are added to aid in estimating cover. The understory vegetation cover is about 64% (the total plot area minus the area that is not covered by live vegetation). The gray species (shrub) has 49% cover, the dark blue species (shrub) has 17% cover, the light blue species (grass) has 4%, and the orange species (forb) has 6% (each orange circle is 1% in this case). Due to plant overlap, summing the different species' cover values gives a value that is larger than the total understory vegetation cover (76% vs. 64%). Overall shrub cover in this plot is 58% (two shrub species, subtracting overlap; summed up [i.e., ignoring overlap], the two species have 66% cover between them). Herb cover is 9.5%; forb cover is 6%; grass cover is 4%. Each shrub species will have its own cover entered in the species-cover section of the datasheet. Cover is measured by drawing a line around the outside of the plant canopy, ignoring gaps that may be found within the perimeter. For plots of this size (~60 sq m), your clipboard is about 0.1% of the plot area.

- Take cover measurements of the plant lifeform categories (live only).
  - Tree cover
    - ✓ Conifer cover
    - ✓ Hardwood cover
    - ✓ Note: summing conifer and hardwood can give a higher value than overall tree cover due to overlap (see. Fig. 1).
  - Shrub cover
  - Herb cover
    - ✓ Forb cover
    - ✓ Graminoid cover
    - ✓ Note: summing forb and graminoid cover can give a higher value than overall herb cover due to overlap (see Fig. 1).

### **III. Surviving tree attributes**

- List the species and measure the diameter at breast height (dbh: 1.37 m above ground) of any living tree >1" (2.5 cm) dbh that survived the fire.
- For control (unburned) plots, measure all living trees >1" dbh in the plot

### **IV. Tree regeneration attributes**

- Tally the number of seedlings (trees less than 4.5 feet tall [1.37 m]) of each tree species (conifer and hardwood) for each age class
  - Use a separate row for each species
  - Determine age by counting the bud scars, subtracting the current year
  - Note whether the seedling recruited naturally or was planted (species that have both natural and planted recruitment will have two rows, one for natural, one for planted)
  - Record the height, age, and last year's growth for the tallest individual seedling in each species (species with natural and planted seedlings will have two sets of measurements)
- 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
  - Measure and enter the dbh
  - Determine age by counting the bud scars, subtracting the current year
  - Note whether the sapling recruited naturally or was planted
  - Record the height, age, and last year's growth for the tallest individual sapling in each species (species with natural and planted saplings will have two sets of measurements)
- 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 resprout clump

#### **V. Shrub attributes**

- Measure the overall cover and modal height for each shrub species in the plot
  - Use a separate row in the spreadsheet for each species
  - Measure cover to nearest 5%, 0.5% = trace cover
  - Modal height is the most common height

#### **VI. Nearest regenerating individual to the plot**

- If there are no seedlings or saplings within the plot, search for seedlings or saplings outside the plot, up to 50 feet (15.2 m) away (OK to search farther if there is time)
  - Record the species, the distance, and the azimuth to the individual
- If there are no resprouts in the plot, do the same for resprouts

#### **VII. Distance to nearest seed source.**

- Measure the distance to the nearest living mature tree (capable of producing seed) of each tree species in the plot
  - Use the rangefinder to measure distance to the nearest meter, estimate the distance if too far for the laser
  - Measure the distance even if the tree is in the plot
  - Measure the azimuth to the nearest 5 degrees

#### **VIII. Snag density**

- Using the laser rangefinder, do a swing around the plot center and estimate the dbh class for each dead standing tree that is within 8 meters of the plot center (this makes a 200 sq m [1/20<sup>th</sup> acre] plot)
  - Only record snags that are >4.5 feet (1.37 m) tall
  - Make a rapid ocular estimate of the dbh, and bin each tree into the 15 cm size classes provided on the data sheet (tally the trees)

#### **IX. Litter and duff depth**

- Measure litter and duff depth at three representative places in the plots, i.e. at three places that appear to have “average” litter and duff. Take the average of these three measurements and enter in the appropriate place on the datasheet
- Litter is the fresh needle and leaf cast on the surface; duff is darker material under the litter that has begun to decompose. Duff is usually held together to an extent by moisture and fungal hyphae.

#### **X. Stand basal area**

- Use the basal area gauge (20 factor) to record the basal area of live and dead trees in the stand
  - Turning in a circle while looking through the gauge, tally the number of trees that are larger than the 20 factor aperture. Count live and dead trees separately.

- 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).

## **XI. Fire severity**

- Use the categories in table 1 to estimate fire severity in the plots. Circle the appropriate class.

<b>Fire severity</b>	<b>Description</b>
0	unburned
1	light patchy burn pattern, very little overstory mortality, groups of surviving shrubs/saplings
2	lightly burned, isolated overstory mortality, most saplings/shrubs dead,
3	moderately burned, mixed overstory mortality, understory mostly burned to ground
4	high severity, significant proportion (75-100%) of overstory killed, dead needles remaining on trees 1 year later
5	high severity burn, total/near total mortality of overstory, most needles consumed in fire

## **XII. Notes section**

Items of interest to record in the notes section:

- If plot and area around it is not forestland (land that grows trees)
- If plot has been treated in some way - specify
- If non-native species are on plot - specify
- If non-fire mortality is present - specify
- If plot was not burned
- If conifer stumps are present from trees that may have parented seedlings before they were cut
- Other?