

Immediate Post-Burn Mothership Plot Protocol:

Field Data Collection to Assess Immediate Post-Burn Vegetation and Fuel Characteristics

Methods Overview

Fuel treatment effectiveness monitoring plots installed in prescribed burn units require an immediate postburn visit to collect observations of substrate and vegetation burn severity, factors affecting tree mortality, and fuels reduction. Immediate postburn monitoring should be conducted within 2-3 weeks, or up to 2 months, after fire has interacted with sampling plots.

Repeat measurements of plot photos, litter, duff, and fine woody fuel should be taken following pre-burn methods described in Colorado Forest Restoration Institute's *Mothership Plot Protocol*. Be sure that sampling crews always have with them the full protocol that was used to measure plots pre-treatment.

The Fire Monitoring Handbook (FMH) (USDI 2003) provides rational and protocols the National Park Services uses to establish and monitor fire effects. Those data are organized and served using the national FEAT and FIREMON Integrated (FFI) database system. Post-burn condition of overstory trees, saplings, substrate, and vegetation burn severity will be recorded using FMH protocols. Additional observations relating to soil burn severity will be made according to RMRS-GTR-243.

Field Protocols

Navigate to plot location

Bring sampled plot map and plot information packets to assist with relocating plots. Always have the full pre-treatment data sheets available (paper or electronic copies) to assist in plot relocation, to verify sampling methods used, and any data collection errors or anomalies encountered. The minimum plot information should include plot coordinates, elevation, slope, aspect, pre-treatment photos, and the tree and sapling list. A metal detector can assist in finding the steal monuments.

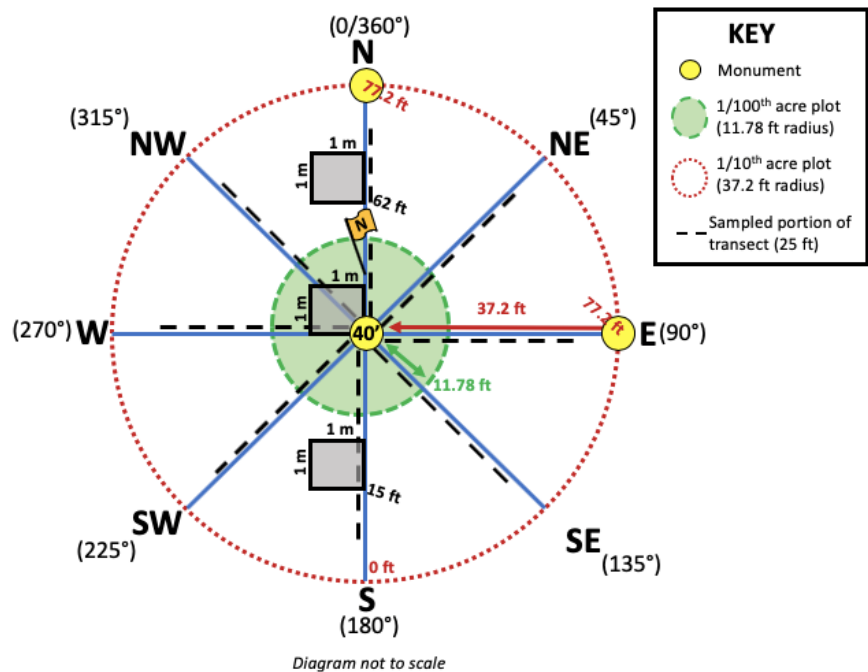


Figure 1: Mothership plot layout

Plot Center

Check that plot monuments remain in place and remain viable following fire. If necessary, replace damaged monuments. Ensure that each monument has a silver “CFRI Long-term Monitoring Plot” tag (be sure to mark monument location (North, East, or Center), the plot code, and sample date on the silver tag using a ballpoint pen). Pink flagging should be wrapped around each washer. If flagging is missing in post-treatment years, re-flag washers.

1. Standing at the plot center, take 6 photos. Fill out a white board with the plot code and date. Match the photos as best you can to the pre-treatment photo sequence and protocol. Take photos in the landscape orientation, frame photos so the white board is legible, and exclude gear and people in the shot. *For post-treatment plots, check pre-treatment photos to ensure the same view is captured.*

Soil and Vegetation Burn Severity

1. Record soil and vegetation burn severity in 12 subplots at 10, 20, and 30 ft from plot center in each direction along the N, E, S, and W transects. Place the **southwest-most corner** of a 6 in x 6 in frame at each observation point. Record the following in each observation frame:
 - a. Substrate and vegetation burn severity
Classify severity of each variable using the characteristics defined in Table 1 (FMH-21, USDI, 2003).
 - b. Ash depth
At the observation point, record the depth of ash to the nearest 0.25 in
 - c. Surface color
Note the color of the forest surface (i.e. black, grey, red, white). Unburned is NA
 - d. Comments
Notable burn severity or intensity effects

Postburn Overstory Tree and Sapling Condition

Overstory trees and saplings measured pre-treatment should be tagged with sequentially numbered steel tags. Typically, overstory trees are measured in a variable radius plot using a prism basal area factor (BAF) of 10, and saplings within a 0.01-ac fixed radius plot, but be sure to repeat the pre-treatment methods and BAF.

Refer to the tree lists from prior visits to verify all sampled pre-burn overstory trees are remeasured. Trees are intentionally measured and listed in clockwise order starting along the North transect. **Note if any species, height, or CBH measurements were taken incorrectly pre-burn.** Trees within the plot not measured during the pre-treatment visit should be tagged and completely measured post-treatment (note the DBH, height, and CBH if possible), and select the “New Tree” checkbox in the Kobo form.

If a tree tag is missing or melted, replace it with a new tag and record the new tag number for the given tree, along with the old tag number in Notes. Snags, trees with no green needles or leaves remaining, and trees broken or fallen below breast height do not need to be re-tagged, but leave a note if a tagged tree fell down.

Nail numbered tag into tree at breast height, oriented facing plot center, so that the nail is angled downwards and at least one inch of nail remains exposed, leaving ample space for tree growth. For trees on a slope, determine breast height while standing on the upslope side of the tree.

Record the following post-burn condition information for each tree and sapling:

Tag number	If tag is missing or melted, replace it with a new tag <i>if the tree has any green needles</i> . Record the new tag number in the Tag Number field and the old tag number in Notes.
Species	Record species of each tree.
Height to red needles	Height to the lowest scorched red needles. Note if green needles remain below the minimum scorch height. If no needles remain, record the pre-burn height of the tree. <i>Measure to the nearest foot.</i>
Max Crown Scorch Height	Height to the top of the red needles/leaves. Check that this is not taller than the pre-treatment tree height. If no needles remain, record the pre-burn height of the tree. <i>Measure to the nearest foot.</i>
Max Stem Char Height	Measure from ground to the maximum point of char on bole (1-ft). Note, this is absolute highest point of char, not continuous point. Use an ocular estimate up to 10ft and employ a range finder when height is >10ft. If the tree stem is charred to the top, record the pre-burn height of the tree. <i>Measure to the nearest foot.</i>
% Crown Volume Scorched	Estimate the percent of the entire crown that is scorched to the nearest 10%, or to the nearest 1% if under 10%. This is estimated as the proportion of red fire scorched needles in the total canopy, with red and green needles summing to 100%. This should be collected no longer than 2 months after the burn to limit needles lost to cast.

<p>Bark beetle evidence</p>	<p>Record presence or absence (Y/N) of pitch tubes or frass on each bole. To standardize for heights of observers, observation area should remain within 6' of the ground. <i>See photos below for examples of pitch tubes.</i></p>
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Forest Floor Substrate

Record forest floor substrate present at each of 25 points per transect (Figure 1). Burn evidence is tallied when it occurs to determine the amount of the area impacted by fire.

1. Burn Evidence: Record visible evidence of fire when it occurs at each point along the transect. This includes scorching, charring, or ash on the substrate, woody fuels, or vegetation. For tablet data entry, add species code "BURNED".
2. Substrate categories: litter/duff, soil/gravel (<0.5 in), rock (>0.5 inch), coarse fuels (1000hr, rotten or sound), moss/lichen, woody basal, and herbaceous vegetation basal.
 - a. If stumps or live tree trunks occur in the frame, record them as woody basal.
 - b. Do not record fresh needle cast. Plots should be measured as soon as possible post-burn to avoid scorched needle cast influencing substrate measurements.
 - c. Ash is recorded as bare ground.
 - d. If large dead plant material suppresses growing space, record as herbaceous vegetation basal (rarely found in Colorado).
 - e. When estimating ground cover, exclude live vegetation from estimates.

Fine Fuels

1. Record fine woody fuels (wood in 1hr, 10hr, or 100hr size classes) when they are encountered at each point along the eight transects. Record fine fuels with species code “1/10/100hr fuel”. Note that larger 1000hr fuels are included as a substrate, but fine fuels are not.
2. **Quadrat Photoload:** 1m² sampling frames located at 15-18ft, 40-43ft, and 62-65ft along the north-south transect (Figure 1) (Recorded in Kobo)
 - a. **Quadrat Photo:** Standing on the opposite side of the transect tape, take a downward-looking photo of the quadrat, include the whiteboard to the side of the quadrat with plot code, date, and quadrat location (e.g. “40 ft”).
 - b. Estimate fuel loading for 1hr, 10hr, and 100hr fuels in tons/acre using the photoload technique (Keane and Dickinson 2007).

Litter and Duff Depths

1. At regularly spaced intervals along N, E, S, and W transects, measure ash, litter and duff depths to the nearest 0.25 in. Measurements are at 10 ft, 20 ft, and 30 ft in each direction from plot center (e.g. 10 ft, 20 ft, 30 ft, 50 ft, 60 ft, and 70 ft on each transect tape).
 - a. ***Do not include ash as litter or duff. Record ash depth with the soil burn severity measurements***

Soil and Vegetation Burn Severity

2. Record soil and vegetation burn severity observed at the 12 ash, litter, and duff depth locations along the N, E, S, and W transects. Place the **southwest most corner** of a 6 in x 6 in frame at each observation point. Record the following in each observation frame:
 - a. Observers initials
 - b. Substrate and vegetation burn severity
Classify severity of each variable using the characteristics defined in Table 1 (FMH-21, USDI, 2003).
 - c. Ash depth
Measure depth from top of ash to substrate to the nearest 0.25 in
 - d. Ash color
Note the color of ash (i.e. black, grey, red, white)
 - e. Comments
Notable burn severity or intensity effects

FMH-21

	Unburned (5)	Scorched (4)	Lightly Burned (3)	Moderately Burned (2)	Heavily Burned (1)	Not Applicable (0)
Substrate (S)	not burned	litter partially blackened; duff nearly unchanged; wood/leaf structures unchanged	litter charred to partially consumed; upper duff layer may be charred but the duff layer is not altered over the entire depth; surface appears black; woody debris is partially burned; logs are scorched or blackened but not charred; rotten wood is scorched to partially burned	litter mostly to entirely consumed, leaving coarse, light colored ash; duff deeply charred, but underlying mineral soil is not visibly altered; woody debris is mostly consumed; logs are deeply charred, burned-out stump holes are common	litter and duff completely consumed, leaving fine white ash; mineral soil visibly altered, often reddish; sound logs are deeply charred, and rotten logs are completely consumed. This code generally applies to less than 10% of natural or slash burned areas	inorganic preburn
Vegetation (V)	not burned	foliage scorched and attached to supporting twigs	foliage and smaller twigs partially to completely consumed; branches mostly intact	foliage, twigs, and small stems consumed; some branches still present	all plant parts consumed, leaving some or no major stems/trunks; any left are deeply charred	none present preburn

Table 1: Substrate and Vegetation Burn Severity Codes, FMH-21, USDI 2003

References

- Keane, R.E., and L. Dickinson. 2007. The Photoload Sampling Technique: Estimating Surface Fuel Loadings From Downward Looking Photographs of Synthetic Fuelbeds. USFS General Technical Report RMRS-GTR-190, pages 15-17.
http://www.fs.fed.us/rm/pubs/rmrs_gtr190.pdf
- Parsons, A., P.R. Robichaud, S.A. Lewis, C. Napper, and J.T. Clark. 2010. Field Guide for Mapping Post-Fire Soil Burn Severity. Gen. Tech. Rep. RMRS-GTR-243. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.
- USDI. 2003. Fire Monitoring Handbook. Fire Management Program Center, National Interagency Fire Center, Boise, ID.

Gear List

Plot Layout

- 4 — 100ft reel tape
- 1 — 1m² sampling frame
- 1— 6 in² sample frame
- 9 — Chaining pins
- 1 — Compass
- 1 — GPS and Batteries
- Pink flagging
- Plot tags and washers

Fine Fuels

- 2 — Go no go fuels gauge
- 2 — Litter/duff ruler

Overstory Trees and Saplings

- 1 — 10 BAF basal area prism
- 1 — Clinometer
- 1 — Hammer
- 1 — Hypsometer
- 2 — Loggers tape
- 20 — Pin flags 2 color
- Numbered tree tags and aluminum nails

Miscellaneous

- Batteries: AAA (4), AA (3), 9V (1)
- Data sheets
- Fire effects monitoring protocol
- Mothership protocol
- Photoload template for 1hr, 10hr, and 100hr fuels
- Fuel Model Key
- Maps of site
- Pencils, Dry erase markers, Pens, Sharpies
- 1 — Walkie-talkie
- 1 — White board
- 1 — Yard stick