COLORADO FOREST RESTORATION INSTITUTE

Colorado State University

Wildfire Risk Reduction Grant Monitoring Protocol

2015 Simple Plot Protocol

Developed by CFRI Staff Brett Wolk and Chad Hoffman

for re-measurements of previously installed plots

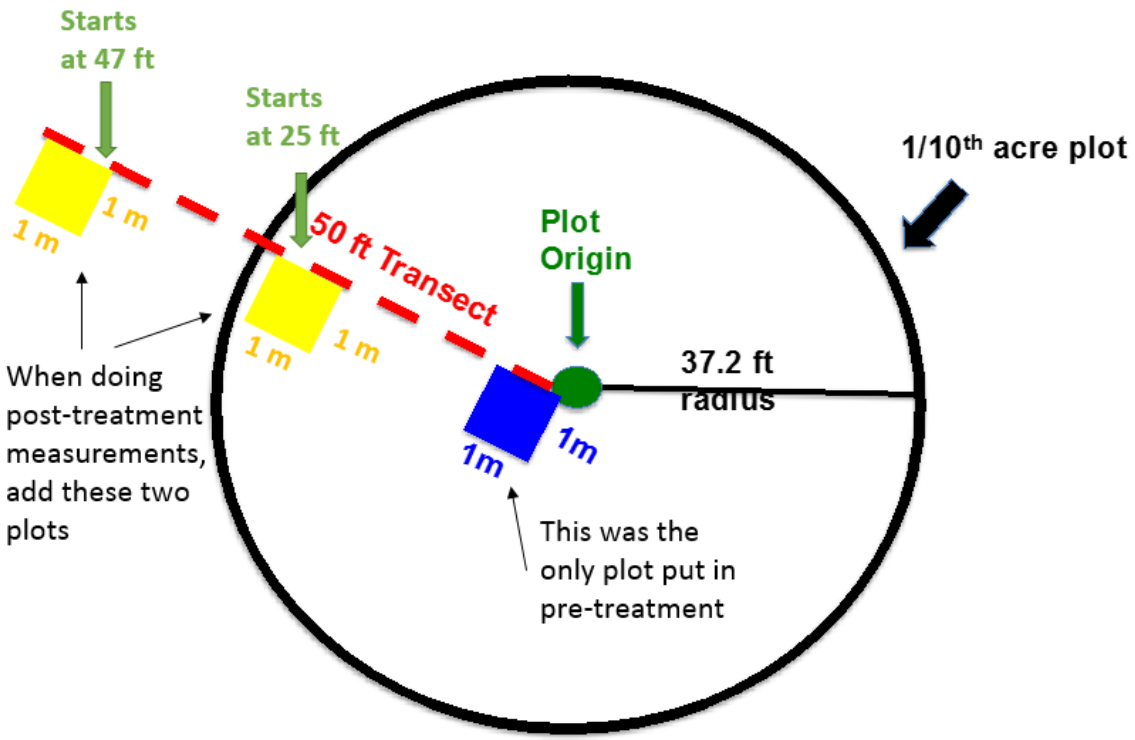
CFRI-1602

Sampling Objective:

Collect data needed for analysis with Fuels Condition Class System software in order to quantify existing fuel condition at each site.

Plot Layout

1. Randomly locate the plot origin within the desired sample area. Use GPS technology if available, or a random number table with numbers 0-359 can be used to choose a random direction and then a random distance to walk.
2. Once a plot origin is located, chose a random direction (0-359) for the plot transect orientation.
3. Beginning with 0 feet on the plot origin, stretch out a measuring tape 50 feet in the random direction chosen for the transect, being careful to place the tape as close to the soil surface as possible. Be sure that the edge of the plot is at least 30 feet from a treatment boundary.
4. While standing at the plot origin, place the 1 meter frame to the left of the 50 foot transect with one corner touching the plot origin.



Origin Sample Point

1. **Location**
    a. Using a GPS, record the location and elevation at the origin point. Leave a monument (pinflag, rebar, etc.) if desired to easily locate the origin post treatment.
    b. Using a compass, record the hillslope azimuth in degrees (0-359) within the 1/10th acre plot.
    c. Using a clinometer, record the slope to the nearest percent within the 1/10th acre plot.

2. **Photo's**
    a. Standing at the plot origin, take 4 photos. Suggested photo sequence:
        1. Along the transect looking towards the ground (capturing 0-10ft on the transect and the 1m^2 sampling frame).
        2. Along the transect looking out at eye level.
        3. Along the transect looking towards the upper tree canopy.
        4. 180 degrees from the transect looking out at eye level.
3. **Tree Overstory**
    a. Record the basal area prism or angle gauge size and units.
    b. Standing at the plot origin, use a basal area prism or angle gauge to record the basal area of the variable radius plot for all live and dead tree's taller than 4.5ft (Diameter at Breast Height, DBH). If a tree is a 'hit' and included in the basal area count, mark that tree for further measurement.
    c. For each hit tree included in the basal area count, record:
        1. Tree species.
        2. Live or dead.
        3. Diameter at breast height (to nearest 1/10th in).
        4. Tree height (to the nearest ft).

5. Lowest height of continuous live vegetation (crown base height) (live trees only, to the nearest ft).

d. For standing dead trees taller than DBH (snags) that are included in basal area count, also record decay class on a scale of 1-3.
    1. Decay class 1 *with needles* = recently dead trees, top intact, needles/foliage and fine branches present.
    2. Decay class 1 *without needles*= recently dead trees, top intact, fine branches present.
    3. Decay class 2 = snags have coarse branches and bark present, but fine branches and foliage have fallen off.
    4. Decay class 3= snags are rotten, bark not present. Very few if any branches remain.

1m² Sample Frame

1. **Groundcover**
    a. Using the ocular estimate method, at the soil surface measure ground cover to the nearest percent within the 1m² cover frame. This includes litter, duff, rock/bare soil. If stumps or live tree trunks occur in the frame, record them separately. Total ground cover can exceed 100% with overlap of categories (e.g. 80% litter, 65% duff, 20% rock/bare soil, etc. in the same plot).
        a. When estimating ground cover, exclude live vegetation from estimates. Basal clumps of large bunchgrasses and moss should be classified as litter.
2. **Litter and Duff Depth**
    a. At the 4 corners of the frame and a point in the center, measure the depth of litter and duff to the nearest 0.1 inch.
3. **Tree Seedlings**
    a. For any trees less than 4.5 feet tall (below DBH) that are rooted within the frame, record the species and number of individuals.
4. **Herbaceous Vegetation Cover and Height**
    a. Using the ocular estimate method, measure vegetation cover to the nearest 1% within the 1m² frame. Your closed fist equals approximately 1% cover as a rough guide.
        1. Record Total Herbaceous Cover of all non-woody vegetation in the 1m² frame.
        2. Estimate the average height of herbaceous vegetation at the highest point of each plant within the 1m² frame to the nearest 1.0 inch.
        3. Identify plants to species when possible. The goal is to identify dominant plants in the plot (roughly the 3 most abundant species). If you can't identify to species, record as graminoid (grasses and grass like plants) or forbs (herbs).
5. **Herbaceous Biomass**
    a. Label an appropriate size paper bag with date, "Herb", and plot number.

b. Clip all herbaceous material at the soil surface (current year's growth and senesced/dead material that is attached to plants) for each plant *rooted* within the frame and place in labeled paper bag.
c. All herbaceous material should then be oven dried to constant mass and weighed to attain dry weight of herbaceous material (loading in tons/acre).

6. Woody Fuels

"The Photoload Sampling Technique: Estimating Surface Fuel Loadings From Downward Looking Photographs of Synthetic Fuelbeds." Robert E. Keane and Laura Dickinson. USFS General Technical Report RMRS-GTR-190, pages 15-17. April, 2007.
http://www.fs.fed.us/rm/pubs/rmrs_gtr190.pdf

a. Using the Photoload technique, estimate fuel loading for 1 hr, 10 hr, and 100 hr fuels in tons/acre within the frame. The photos on pages 15-17 are intended as guides and not absolute choices. Estimate as close to the picture as possible or chose an intermediate loading between pictures if appropriate. A go-no-go gauge can be used to help classify fuels in the frame.
    i. 1 hr fuels (0 to 0.24 inch)
    ii. 10 hr fuels (0.25 to 0.99 inch)
    iii. 100 hr fuels (1.00 to 2.99 inches)

50 foot Transect

1. Shrubs

a. Record cover of any shrubs along the 50 ft transect.
    1. Using the line intercept method, record the amount of line covered by each shrub by species to the nearest 1.0 inch. Record only the top shrub layer.
    2. Estimate the percent of live branches for each shrub clump (0-100%).
    3. For shrubs with sparse leaves, clump the shrub and record the continuous cover of shrub if any part of the live shrub intersects the tape. If a gap of more than 6 inches exists between shrubs or within the canopy of a large single shrub, record that as a break and separate shrubs.
b. For each clump of shrubs, record the average shrub height to the nearest 1.0 inch at the highest point of each plant within each clump (or several times as appropriate for large clumps). A yard stick is handy to estimate heights.

2. Tree Cover

a. At every foot along the transect, record cover of any live tree taller than 4.5 ft (DHB). Stand directly over each point along the tape, look straight up through the densitometer scope and record when tree (foliage or trunk) is encountered. For each hit, record the tree species. Each transect will have 50 potential hits.

1/10th Acre Plot (37.2 ft radius)

1. 1000 hr fuels (larger than 3 in diameter)

a. Measure the end diameters and the length of every log larger than 3 inches diameter within the 1/10th acre plot to the nearest 0.1 inches.
    1. If diameter drops below 3 inches on the log, stop measuring at that point.
    2. When a log travels outside of the 1/10th acre plot boundary, stop measuring the log at the plot boundary.
    3. If the center point of the log is below the duff, stop measuring at that point.

b. Record if the fuel is rotten or sound. Consider pieces rotten when the piece at the intersection is obviously punky or can be easily kicked apart

Gear List

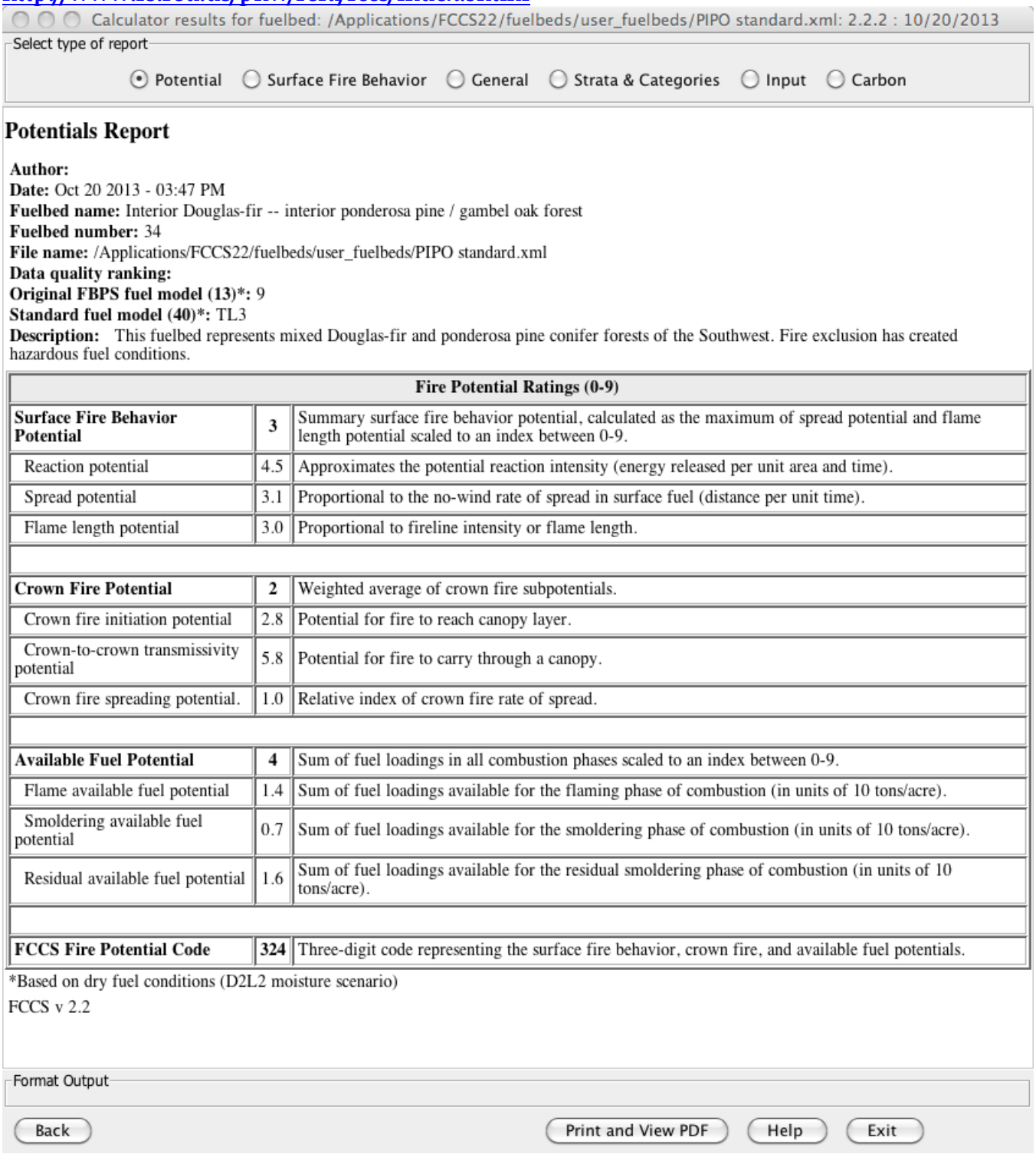
Data sheets
Random number table (0-359)
Photo load guides for 1hr, 10hr, and 100hr fuels (pages 15-17).

"The Photoload Sampling Technique: Estimating Surface Fuel Loadings From Downward Looking Photographs of Synthetic Fuelbeds." By Robert E. Keane and Laura Dickinson. USFS General Technical Report RMRS-GTR-190, pages 15-17. April, 2007. http://www.fs.fed.us/rm/pubs/rmrs_gtr190.pdf

Tatum/Clipboard
Pencils, Sharpie
GPS and Batteries
Camera and Batteries
Hypsometer and Batteries (to estimate tree height, optional)
Compass
Clinometer
100 ft tape with 1 inch markings
Diameter tape and/or calipers
$1m^2$ frame
Basal area prism or angle gauge

Yard stick for plant heights
Ruler for litter/duff depths
Paper bags (for plant biomass)
Grass clippers/shears
Go no go gauge (for woody fuel class size measurement, optional)
Densitometer (for tree cover)

This is an example fire potential summary report based on field data analyzed with Fuels Condition Class System (FCCS) software. Reports will be generated with both pre and post treatment measurements to compare change in fuels condition resulting from treatment. For more info about FCCS or to download to program for free:
http://www.fs.fed.us/pnw/fera/fccs/index.shtml



Potentials Report

Author:
Date: Oct 20 2013 - 03:47 PM
Fuelbed name: Interior Douglas-fir -- interior ponderosa pine / gambel oak forest
Fuelbed number: 34
File name: /Applications/FCCS22/fuelbeds/user_fuelbeds/PIPO standard.xml
Data quality ranking:
Original FBPS fuel model (13)*: 9
Standard fuel model (40)*: TL3
Description: This fuelbed represents mixed Douglas-fir and ponderosa pine conifer forests of the Southwest. Fire exclusion has created hazardous fuel conditions.

Fire Potential Ratings (0-9)		
Surface Fire Behavior Potential	**3**	Summary surface fire behavior potential, calculated as the maximum of spread potential and flame length potential scaled to an index between 0-9.
Reaction potential	4.5	Approximates the potential reaction intensity (energy released per unit area and time).
Spread potential	3.1	Proportional to the no-wind rate of spread in surface fuel (distance per unit time).
Flame length potential	3.0	Proportional to fireline intensity or flame length.
Crown Fire Potential	**2**	Weighted average of crown fire subpotentials.
Crown fire initiation potential	2.8	Potential for fire to reach canopy layer.
Crown-to-crown transmissivity potential	5.8	Potential for fire to carry through a canopy.
Crown fire spreading potential.	1.0	Relative index of crown fire rate of spread.
Available Fuel Potential	**4**	Sum of fuel loadings in all combustion phases scaled to an index between 0-9.
Flame available fuel potential	1.4	Sum of fuel loadings available for the flaming phase of combustion (in units of 10 tons/acre).
Smoldering available fuel potential	0.7	Sum of fuel loadings available for the smoldering phase of combustion (in units of 10 tons/acre).
Residual available fuel potential	1.6	Sum of fuel loadings available for the residual smoldering phase of combustion (in units of 10 tons/acre).
FCCS Fire Potential Code	**324**	Three-digit code representing the surface fire behavior, crown fire, and available fuel potentials.

*Based on dry fuel conditions (D2L2 moisture scenario)

FCCS v 2.2