# 2018 Uncompahgre Plateau Collaborative Forest Landscape Restoration Project Forestry Internship Program (FIP) Monitoring Report

## *Introduction*

This report presents a summary of results of data collected from the Escalante and Uncompahgre Mesas project areas in the summer of 2018. In 2018, members of the Montrose High School Forestry Internship Program (FIP) crew (Figure 1), led by Lyle Motley and supported by the Colorado Forest Restoration Institute (CFRI) and the US Forest Service, collected data on overstory trees, surface fuels, forest floor and understory cover, and tree regeneration in post-mechanical and post-prescribed burn treatment areas on the Uncompahgre National Forest.

The 2018 FIP crew progress included collecting post-treatment data in the Lockhart mechanical treatment area, collecting data in post-prescribed burn areas in Cottonwood Mesa and Sawmill Mesa, and collecting 2-3 year post-mechanical treatment and <1 year post- prescribed burn tree regeneration data (Figure 2). The Lockhart mechanical treatment area had pre-treatment data collected 2013-2015, and in 2018 a total of 10 plots were resampled immediately (<6 weeks) following treatment. The Cottonwood Mesa area was previously thinned in the 1980s, and pre-burn data collection took place in 2017. Following prescribed burning in the Cottonwood Mesa area in spring 2018, post-treatment data collection occurred June and July of 2018, where a total of 8 plots were remeasured. Prescribed burning also occurred in and near the Sawmill Mesa area (Figure 2), an area that had previously been mechanically thinned 1989-2012. Pre- and post-mechanical thinning data was previously collected, and following burning in spring 2018, post-burn data collection took place in June 2018, where only 1 plot was remeasured. Prescribed burn plots were only remeasured if >50% of the plot had evidence of recent


Figure 1: The 2018 Forestry Internship Program (FIP) crew after a hard day at work. From left to right: Eric Gutierrez-Camacho, Tobin Lanford, Kylee Harris, Gavin Rojas, Lyle Motley (crew leader).

burn. For the purpose of these analyses, all post-mechanical treatment results reflect data collected in the Lockhart mechanical treatment area, whereas all post-prescribed burn results reflect data collected in both the Cottonwood Mesa and Sawmill Mesa prescribed burn areas. The FIP crew also took post-treatment and post-prescribed burn photo-points in project areas to use as an important visual tool to evaluate forest change before and after treatment to supplement data collection in these areas.

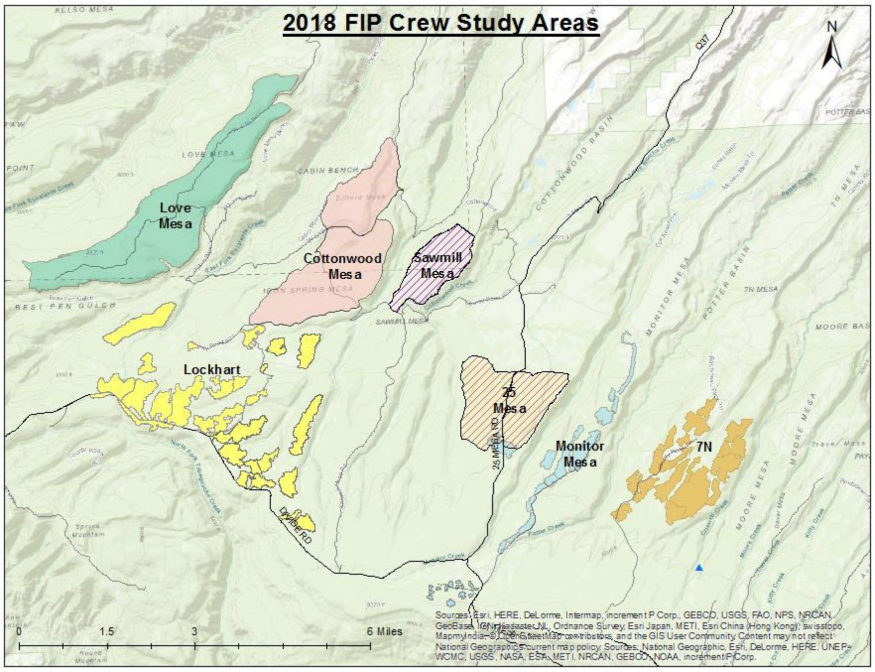


*Figure 2: Map (right) of UP-CFRLP treatment areas and 2018 data collection sites in the Unc Mesas project area, Uncompahgre National Forest, Colorado.*

## Changes in basal area, trees per acre and quadratic mean diameter

Mechanical treatments have reduced basal area and trees per acre, as expected, but have also reduced the quadratic mean diameter slightly (Figure 3). Basal area and trees per acre were also reduced slightly in prescribed burn areas, while quadratic mean diameter in these areas remained the same (Figure 3). One of the goals of mechanical treatment in the Lockhart treatment area was to reduce tree density, which was achieved, while one of the goals of prescribed burning in Cottonwood and Sawmill Mesa was to introduce some tree mortality, which was also achieved as indicated by the reduction in basal area and trees per acre.

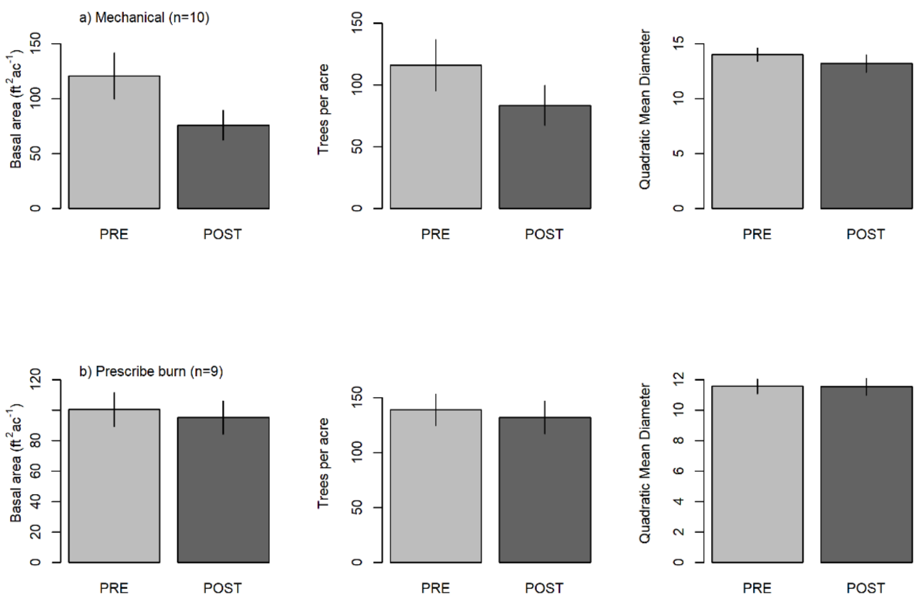


*Figure 3: Mean (± standard error) basal area, trees per acre, and quadratic mean diameter before and after treatment within a) mechanical treatment areas and b) prescribed burn areas.*

## Changes in tree species composition

Within mechanical treatment areas, stands met the objective of retaining ponderosa pine and aspen, while removing larger proportions of non-pine conifer basal area (Figure 4a). The reduction in basal area and removal of the more shade-tolerant conifers within mechanical treatment areas has led to more open stand conditions, which will provide more light for understory plants (see page 5 for data on understory conditions) and shade-intolerant tree regeneration, such as spruce and fir species. Within prescribe burn areas, ponderosa pine and aspen basal area decreased slightly, while spruce basal area remained constant (Figure 4b).

## Changes in surface fuels

Within mechanical treatment areas, fine and coarse surface fuel loadings doubled following treatment (Figure 5, Figure 6a). Prescribed fires have been planned to reduce these surface fuel loadings following mechanical treatment, and several recent prescribed burns have taken place in areas where mechanical treatments have and

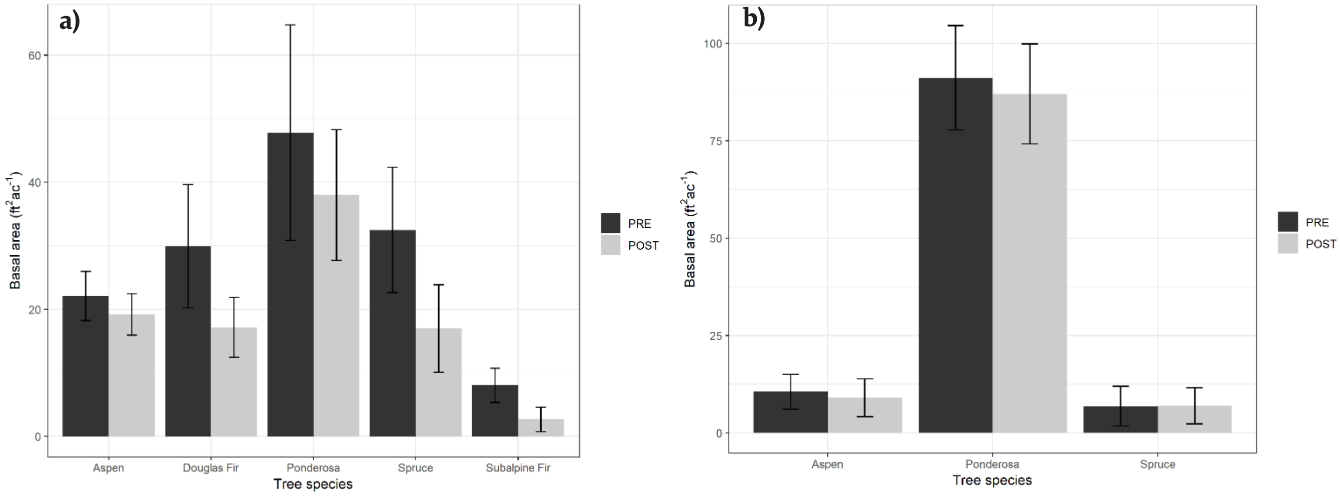


*Figure 4: Mean (± standard error) basal area by species before and after treatment within a) mechanical treatment areas and b) prescribed burn areas.*

have not taken place. Results from data collected within these recent prescribed burn areas illustrates that prescribed burning was successful in reducing surface fuels loadings by at least 30% of what loadings were before burning (Figure 8, Figure 6b).

## Changes in expected fire behavior

Due to the changes in surface and canopy fuel loadings, canopy fire hazard under 90th percentile weather conditions has been reduced in both mechanical and prescribed burn treatment areas, as illustrated by Crown Index (Figure 7a, b). Crown Index is the wind speed needed to sustain a crown fire, where fire moves from tree


*Figure 5: Comparison photo-points in the Lockhart mechanical treatment area. Pre-treatment (right), post-treatment (left). Photo illustrates the reduction of tree density, while retaining ponderosa pine and aspen, and reducing the proportion of shade tolerant and fire intolerant species such as spruce and subalpine/Douglas fir.*

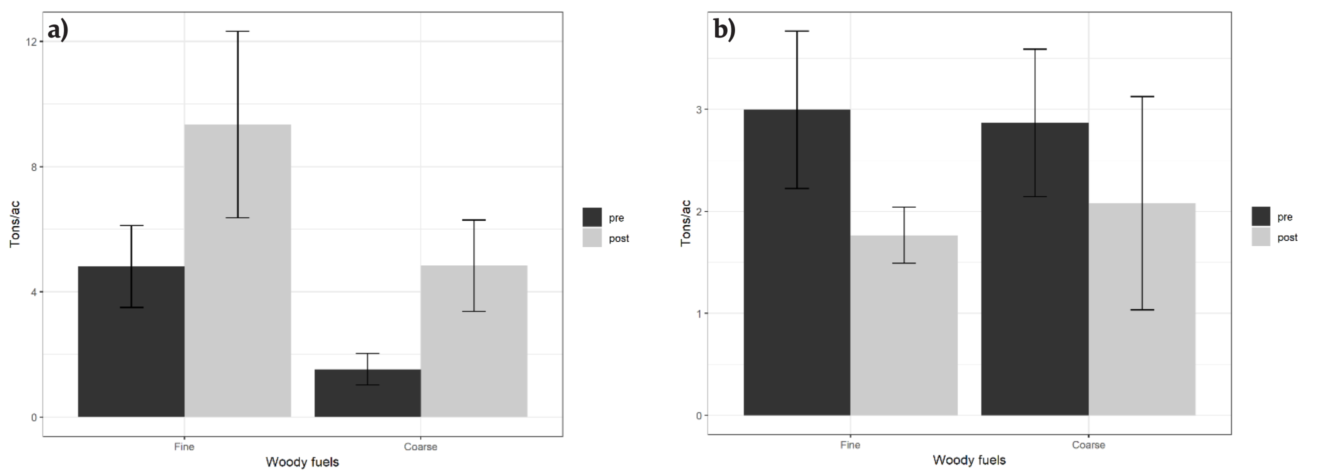


*Figure 6: Mean (± standard error) tons per acre of fine (<3 cm diameter) and coarse (>3 cm diameter) wood before and after treatment within a) mechanical treatment areas and b) prescribed burn areas.*

crown to tree crown. When evaluating Crown Index, the higher the wind speed, the less likely crown fire is to occur. Similarly, Torch Index is the wind speed needed to move fire from the surface of the forest floor into the crown of a single tree; higher Torch Index wind speeds indicate a lower likelihood that surface fire can move into the crown of a tree. Torch and Crown Index were modeled in FFE-FVS using all default options.

Within mechanical treatment areas (Figure 7a), results indicate that lower wind speeds are necessary to move a fire from the forest floor into the crown of a single tree following treatment, likely due to the increase of fine and coarse surface fuels within 1-3 years of mechanical treatment. However, wind speeds of over 40 mph are necessary to carry fire from crown to crown following mechanical treatment. Following prescribed burning, Torch and Crown Index both increased (Figure 7b), indicating that surface fuel loading had been reduced following burning, and that some tree mortality had decreased the connectivity of tree crowns following burning, resulting in a lower hazard of surface or crown fire.

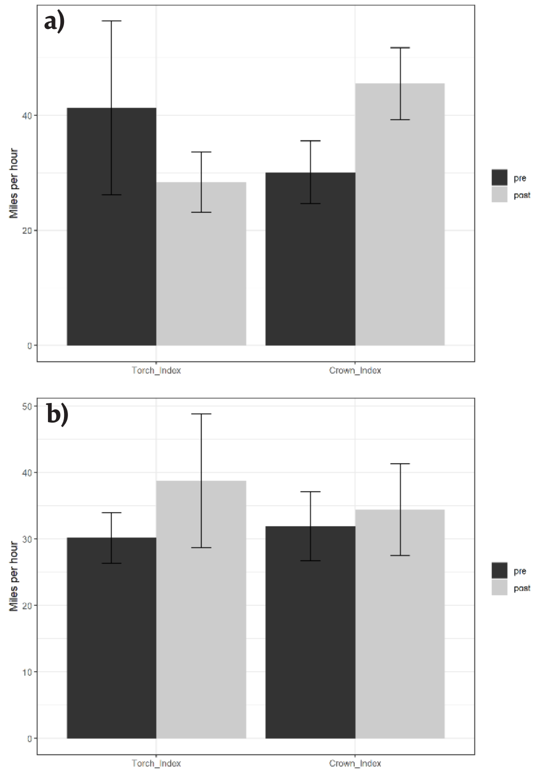


*Figure 7: Mean (+- standard error) miles per hour for torching and crowning indexes before and after treatment within a) mechanical treatment areas and b) prescribed burn areas. Torch Index is the wind speeds necessary to move a fire from the surface of a forest floor into the crown of a single tree; Crown Index is the wind speeds necessary to sustain a crown fire.*

## *Changes in understory and forest floor cover*

In both mechanical and prescribed burn areas, changes in understory and forest floor cover generally reduced graminoids, forbs, and shrubs (Figure 9a, b). Forb and graminoid cover was slightly higher pre-treatment in mechanically treated areas than in prescribed burn areas, while prior to treatment, shrubs were nearly double in prescribed burn areas relative to mechanically treated areas. Following both mechanical treatment and prescribed burning, graminoids, forbs, and shrubs were less than half what they were prior to treatment or burning. However, post-treatment data were collected <1 year post-burn or mechanical treatment, and many studies have illustrated that graminoids, forbs, and shrubs will fully recover within 2-5 years of treatment.

Other forest floor characteristics, such as litter and duff, rock, soil, and wood were also slightly changed by mechanical treatment or prescribed burn (Figure 9a, b). Cover of litter and duff was slightly reduced following mechanical treatment and prescribed burning, while rock cover remained relatively unchanged. Following mechanical treatment, cover of bare mineral soil decreased slightly, while cover of fine and coarse wood doubled. The decrease in soil cover following mechanical treatment is likely due to an increase of fine and coarse wood cover as a result of mechanical equipment stripping and breaking off finer and coarse fuels such as twigs


*Figure 8: Comparison photo-points in the Cottonwood prescribed burn area. Pre-burn (right), post-burn (left). Photo illustrates consumption of fine fuels and understory shrubs by fire, the likely mortality of small diameter trees, and ponderosa pine crown base height being raised.*

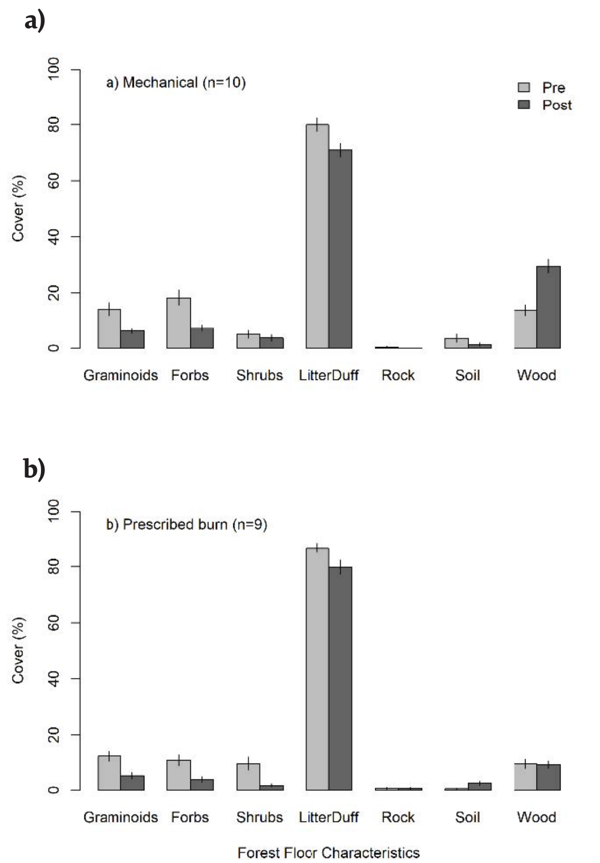


*Figure 9: Mean (± standard error) percent cover before and after treatment within a) mechanical treatment areas and b) prescribed burn areas. Cover was ocularly estimated within Daubenmire plots to the nearest 1%.*

and branches on the ground. Within prescribed burn areas, soil cover increased slightly, while cover of fine and coarse wood remained unchanged, likely due to some fine fuels being consumed during the fire, and then additional fine fuels falling from dead branches following fire.

## Tree regeneration

In 2016, the FIP interns established 240 plots across the Escalante and Uncompahgre Mesas treatment area, where mechanical and prescribed burning was planned to occur. In 2018, the FIP interns remeasured a subset of these plots (n=96) across uncut, cut, and cut and burned areas.

The result of the 2018 data collection demonstrates that tree regeneration is occurring and is dominated by Gambel oak. Other species regenerating included aspen, ponderosa pine, Engelmann and blue spruce, and subalpine and Douglas fir.

Gambel oak dominated tree regeneration across all treatment types, and was very high within cut and burned areas relative to cut or uncut areas. Ponderosa pine, a focal species for regeneration in these areas, is regenerating, and had nearly double the regeneration within cut areas as uncut areas. Also notable, within cut and burned areas, subalpine or Douglas fir regeneration was not present.

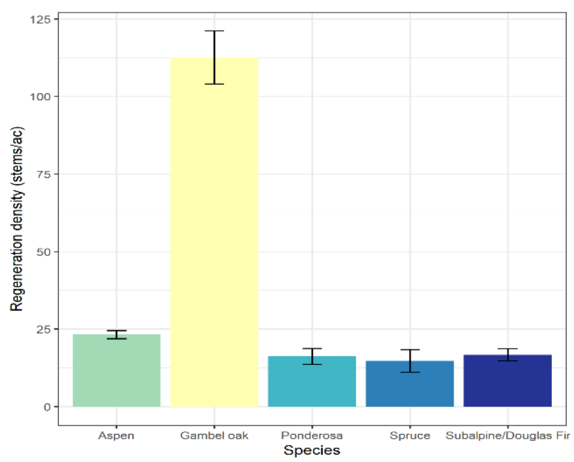


*Figure 10: Mean (± standard error) density (stems/ac) of tree regeneration occurring across the entire Escalanted and Unc Mesas treatment areas in uncut, cut, and cut and burned plots.*

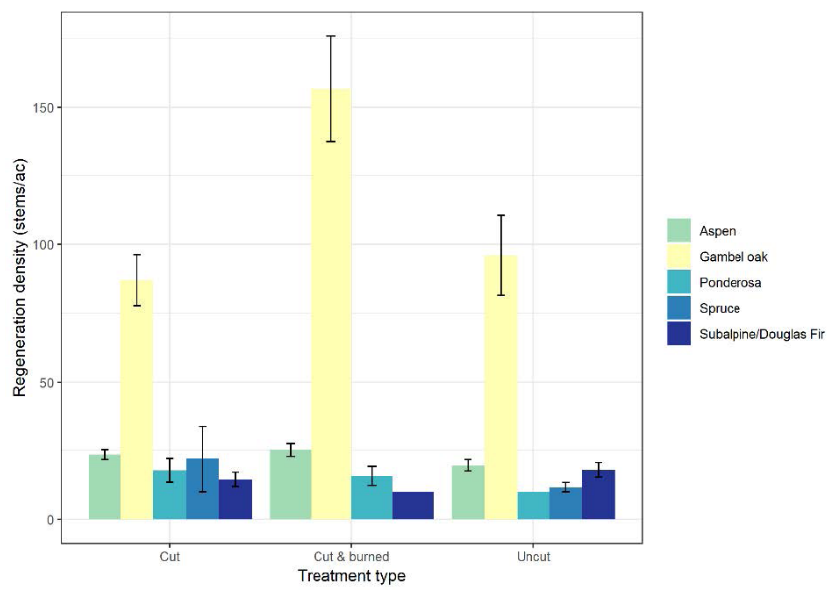


*Figure 11: Mean (± standard error) density (stems/ac) of tree regeneration within uncut, cut, and cut and burned plots in the Unc Mesas treatment areas.*



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