

# Colorado Front Range Collaborative Forest Landscape Restoration Project: Pretreatment Stand Structure Report for 2011



Ben Wudtke and Tony Cheng

Colorado Forest Restoration Institute, Colorado State University  
Fort Collins, CO 80523

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Colorado State University

The Colorado Front Range Landscape Restoration (FR-CFLR) project is intended to accelerate ongoing restoration treatments that provide long-lasting ecological, social and economic benefit across a 1.5 million-acre landscape covering parts of the Arapaho and Roosevelt and Pike and San Isabel National Forests in Colorado. This project will facilitate additional treatment of approximately 32,000 high-priority acres on National Forest System (NFS) lands within the Roundtable’s designated 800,000-acre restoration zone and will be enhanced by existing and future treatments on adjacent federal and non-federal lands. A large portion of the 800,000 acre restoration zone is within the wildland urban interface and will be the focus of the 32,000 acres of treatment.

More than 70 percent of the forests (both federal and non-federal forests) within this proposed area exhibit a high to very high degree of ecological departure from historic norms and are susceptible to uncharacteristic high intensity wildfire and insects and disease. These conditions increasingly threaten human health and well-being, as well as critical ecosystem services throughout the region. Through strategic placement of treatments, the FR-CFLR project plans to restore historic fire regimes, including low intensity wildland fires, with a goal of reducing risks to the ecosystem and communities and lowering suppression costs. Much of the area is deemed critical for protecting communities and municipal watersheds (which supply drinking water to over 75 percent of Colorado’s population) from the impacts of uncharacteristic fire.

A multi-party monitoring plan for the FR-CFLR project was developed June 2011 identifying desired conditions, monitoring indicators, and methods. The desired conditions are:

- 1) Establish a complex mosaic of forest density, size and age (at stand scales)
- 2) Establish a more favorable species composition favoring lower montane over other conifers.
- 3) Establish a more characteristic fire regime
- 4) Increase coverage of native understory plant communities
- 5) Increase the occurrence of wildlife species that would be expected in a restored lower montane forest
- 6) Establish a complex mosaic of forest density, size and age (at landscape scale)

This document is intended to provide a summary of baseline, pre-treatment forest structure within areas proposed for treatment in 2011 under FR-CFLR project on the Arapaho-Roosevelt and Pike-San Isabel National Forests. Monitoring within these treatment areas is mandated and necessary for continued adaptive management strategies.

Pre-treatment data was collected on the Pike San Isabel National Forest and Arapaho Roosevelt National Forest in 2011. Data collection was performed through the implementation of common stand exams (CSEs) within each National Forest. However, specific sampling densities and measurable variables were not specified. As a result, the data collected by each forest varied along with sampling design. Diagrams and detailed information regarding CSE protocol can be found in the FSveg manual here: <http://www.fs.fed.us/nrm/fsveg/index.shtml> Below is a chart of measured variables by forest. Note: surface vegetation information collected by the Pike San Isabel national Forest is not reported within this document. Spatial information may have been collected by ARNF but was never reported.

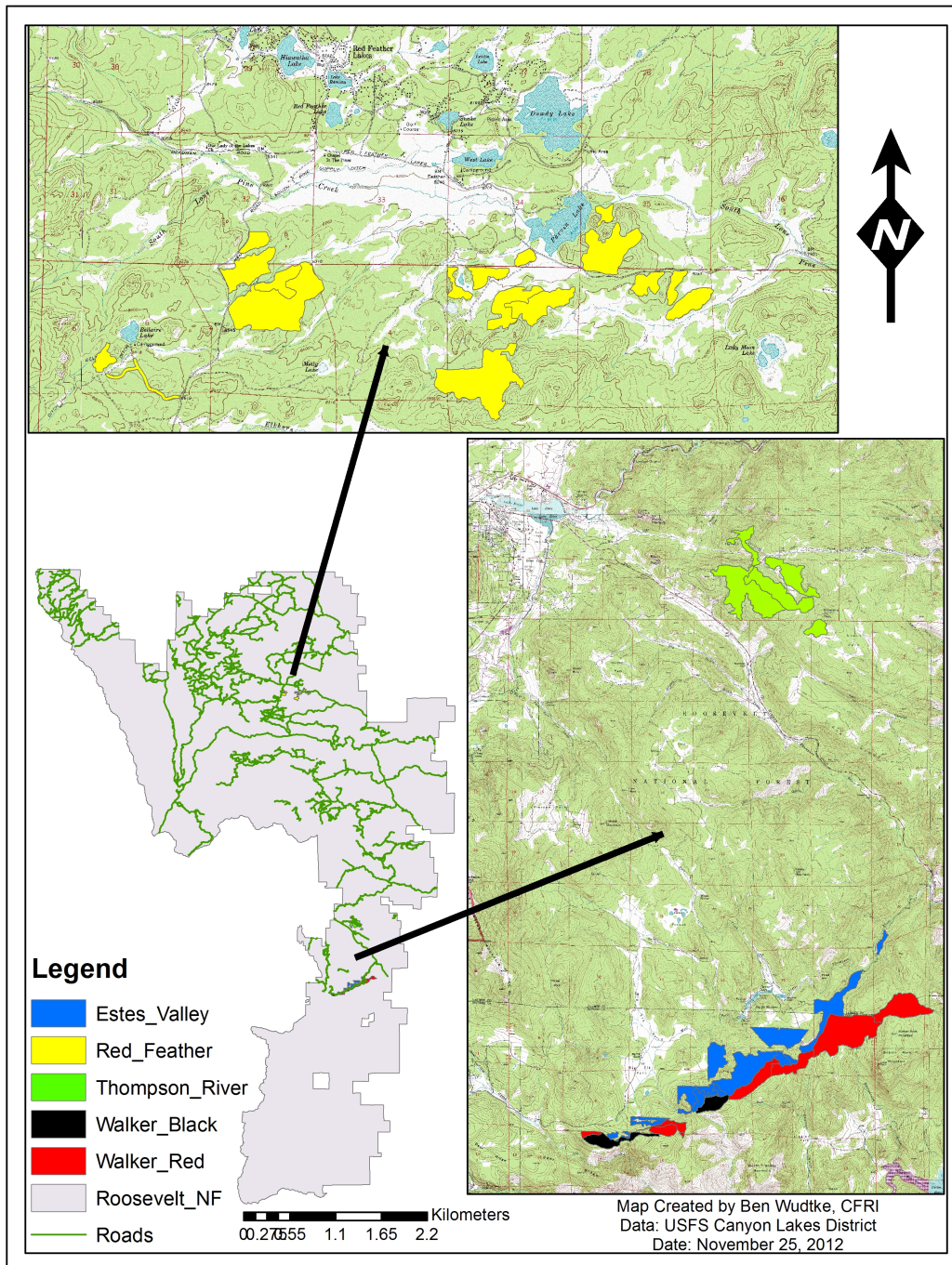
Data collected within each forest was processed separately using SAS software. Outputs from SAS included overstory stand structure (BA, TPA), and seedling densities. Processing procedures varied by forest due to different data structures. All individual stand data was also run through the Forest Vegetation Simulator (FVS). FVS was used to quantify torching and crowning indices and estimate fire behavior for environmental conditions that remained static among all stands. Fire weather was set at a temperature of 85°F using the FVS default fuel moistures for “dry” conditions (table below). Actual measured surface fuel loads were used when available.

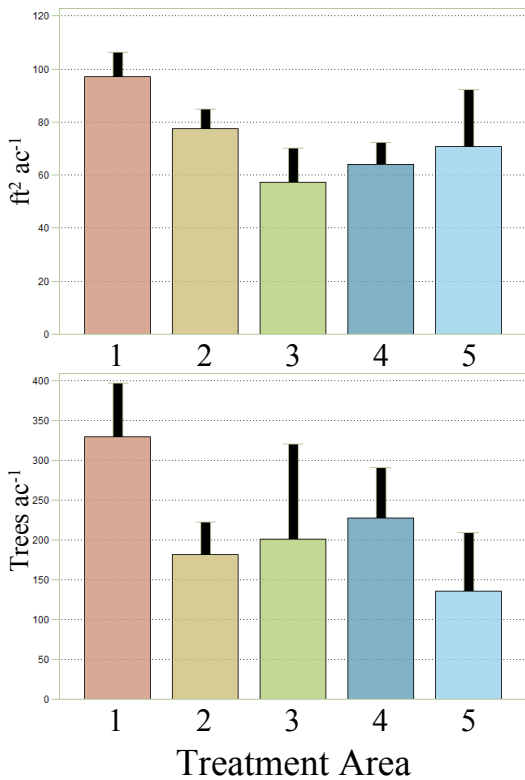
Moisture Level				
	Very Dry	Dry	Moist	Wet
0-0.25" (1hr)	4	8	12	16
0.25-1" (10hr)	4	8	12	16
1-3" (100hr)	5	10	14	18
>3" (1000hr)	10	15	25	50
Duff	15	50	125	200
Live Herb.	70	110	150	150

Derived from the guide, *The Fire and Fuels Extension to the Forest Vegetation Simulator: Updated Model Documentation.*

# Arapaho-Roosevelt Projects

Pre-treatment sampling was conducted in 280 plots within 87 stands across 6 project areas in various regions of the Arapaho-Roosevelt National Forest. However, following the initial report in February 2012, the Forest Service aggregated all stand data to the project level effectively doing away with stand boundaries within each project. The data structure was substantially changed and measurements of forest structure are reported at the project level, as a result. All data was summarized over the plots within each project area and varied from 21 to 159 plots per project. Projects Walker Red and Walker Black were combined and are displayed as “Walker”. Fire behavior was modeled at the stand level. Crowning indices ranged from 15 to 36 mph for most areas within all treatment units. Torching indices ranged from 1 mph to conditional crowning.

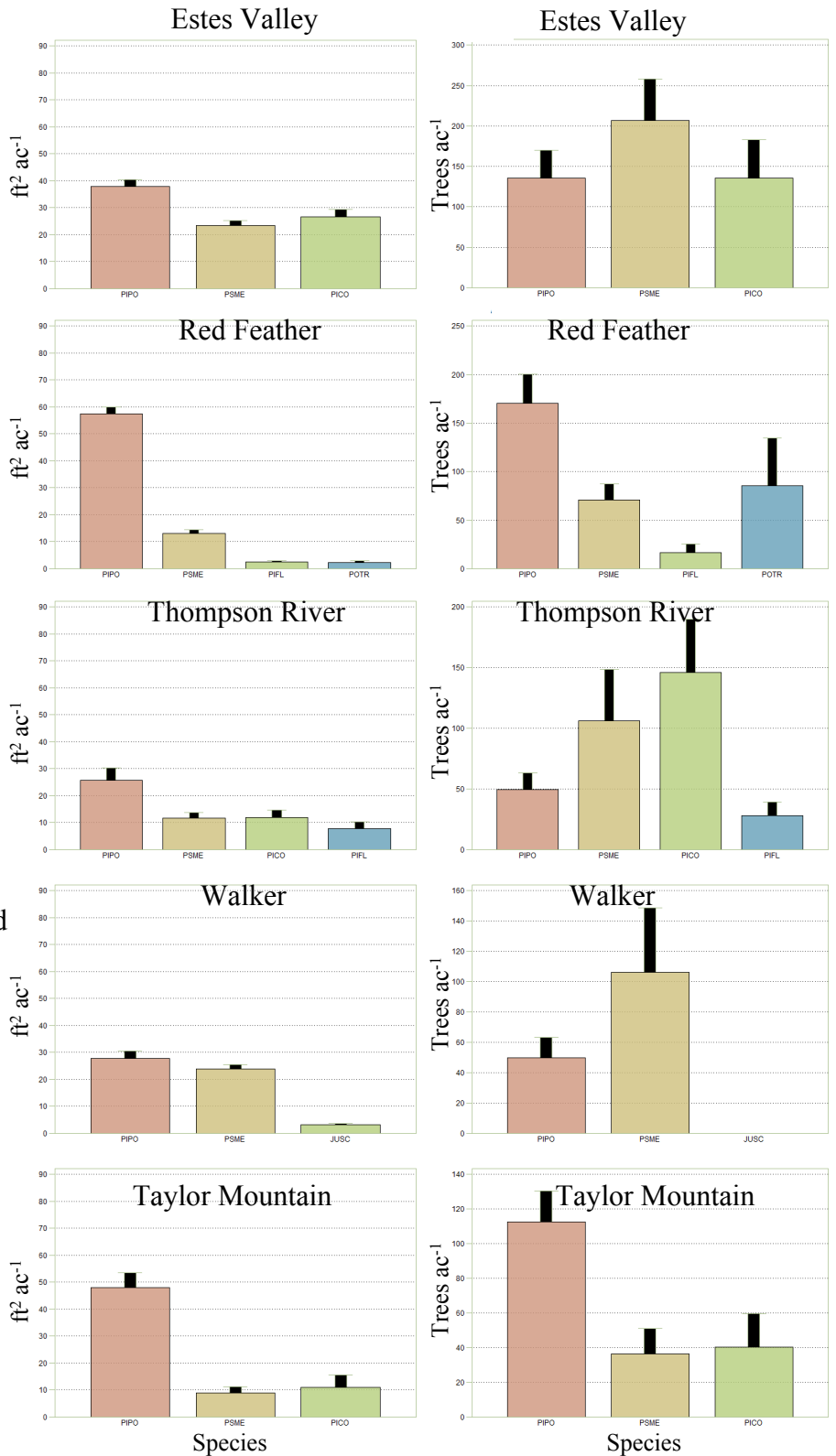




Key: 1=Estes Valley, 2=Red Feather, 3=Thompson River, 4=Walker, 5=Taylor Mountain

Graphs on this page summarize data from within treatment units. Above, the graphs illustrate total basal area (BA) and trees per acre (TPA) at the project level. Right, BA and TPA are summarized at the project level for each major species inventoried within the project boundaries. Species listed make up at least 95 percent of the BA inventoried within the project. Some projects may have contained isolated amounts of species not listed including: aspen, Rocky Mountain juniper, blue spruce, and Engelman spruce.

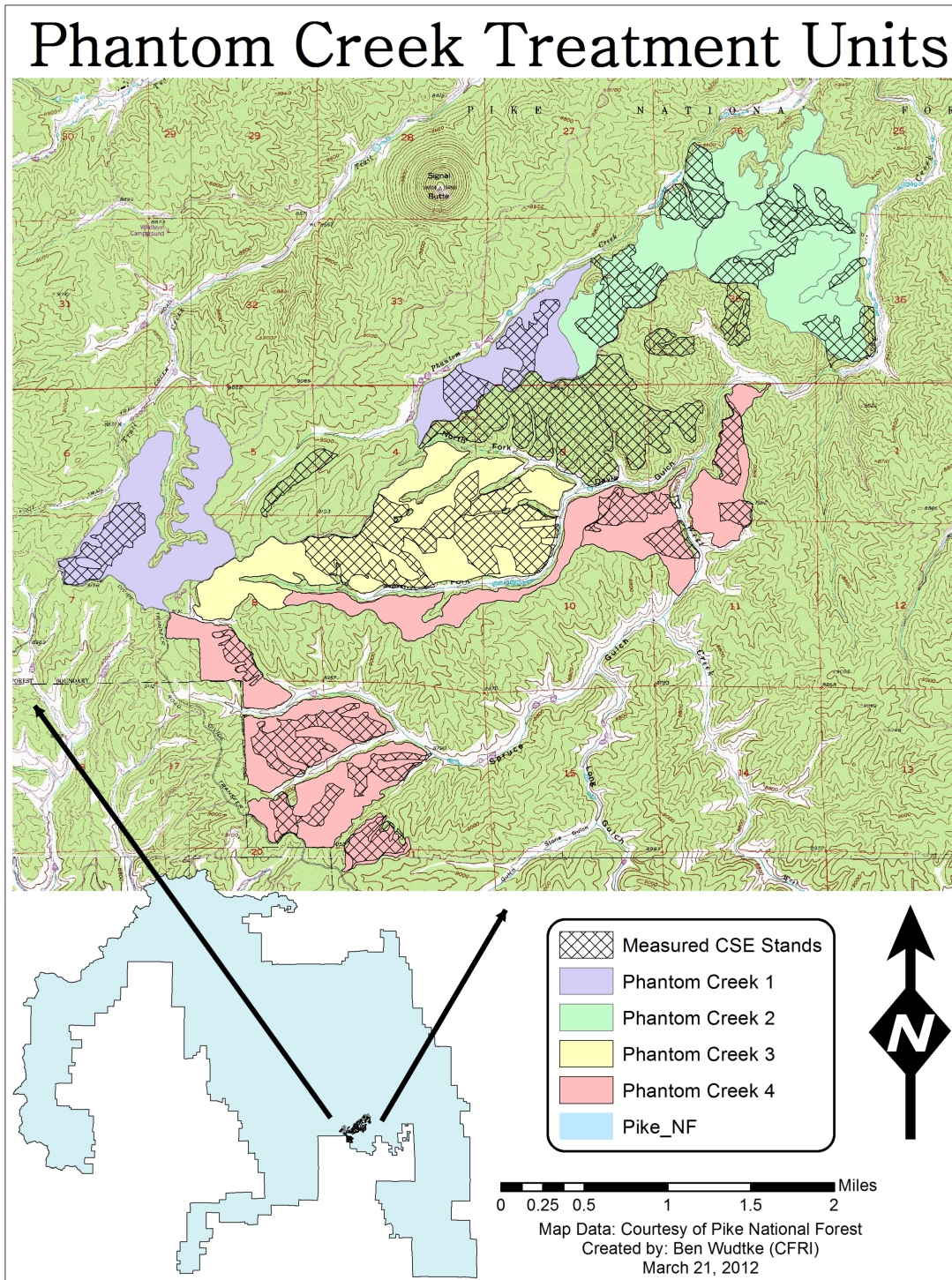
Despite variations in total BA, most projects were generally classified as ponderosa pine cover type. The primary exception was the Walker projects. Combined, the Walker projects created a mixed ponderosa pine and Douglas-fir cover type. It should also be noted that TPA did not follow the BA trend for species in all stands. That typically indicated an abundance of smaller diameter trees that may be coming in under dominant trees.

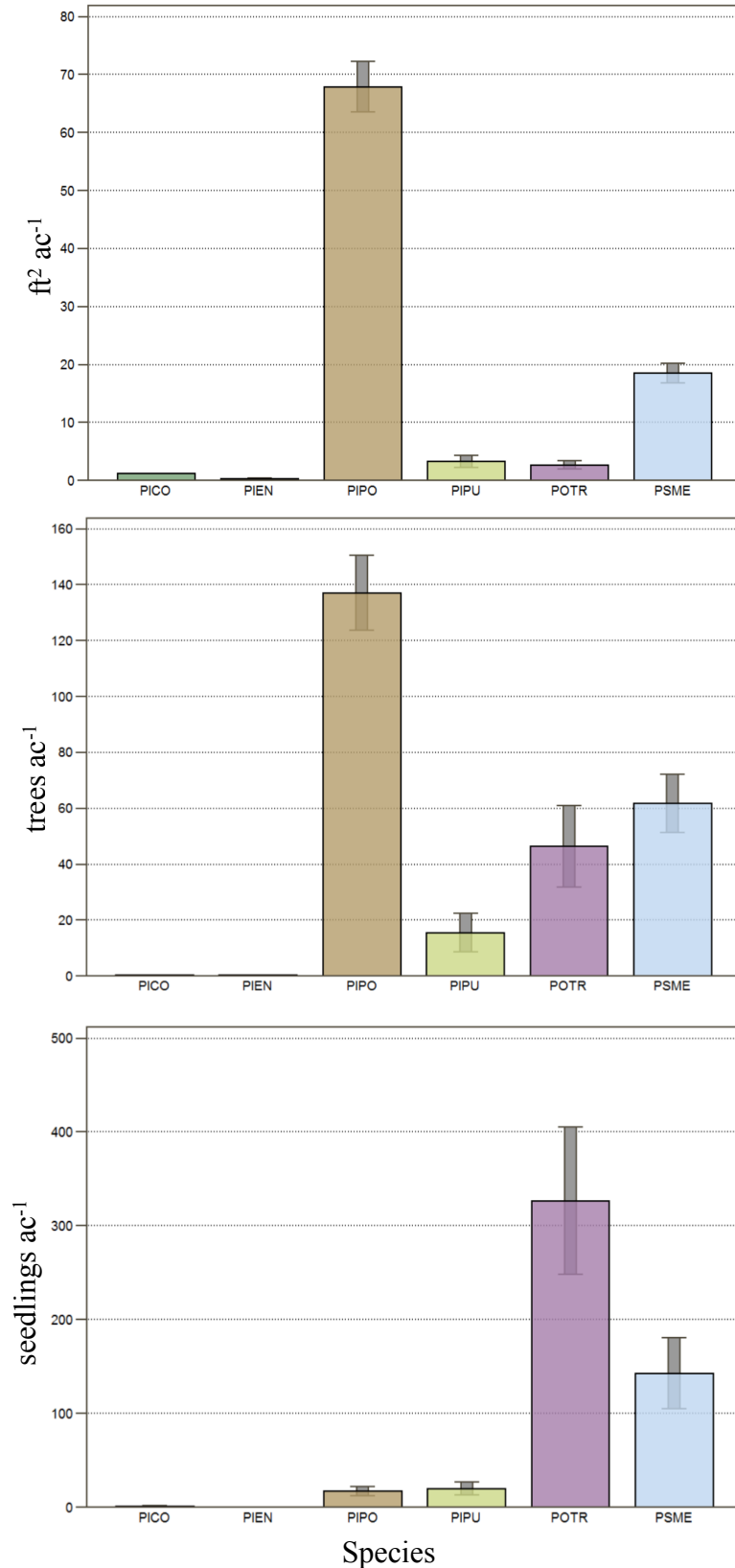


# Pike San-Isabel Projects

Sampling was conducted on the Pike San-Isabel National Forest using 221 plots within 36 stands distributed among 4 projects. Dominant cover types generally fell into one of three classifications: ponderosa pine (n=16), Douglas-fir (n=6), and mixed ponderosa pine/Douglas-fir (n=11). Basal areas did not vary significantly among cover types. Stands that did not fall into the three dominant cover types were each classified as blue spruce, Engelmann spruce, or previously harvested.

Predicted fire behavior did not vary substantially between cover types. Crowning indices ranged from 16 to 45 mph. Torching indices ranged from 1 mph to conditional crowning.





## *Ponderosa Pine*

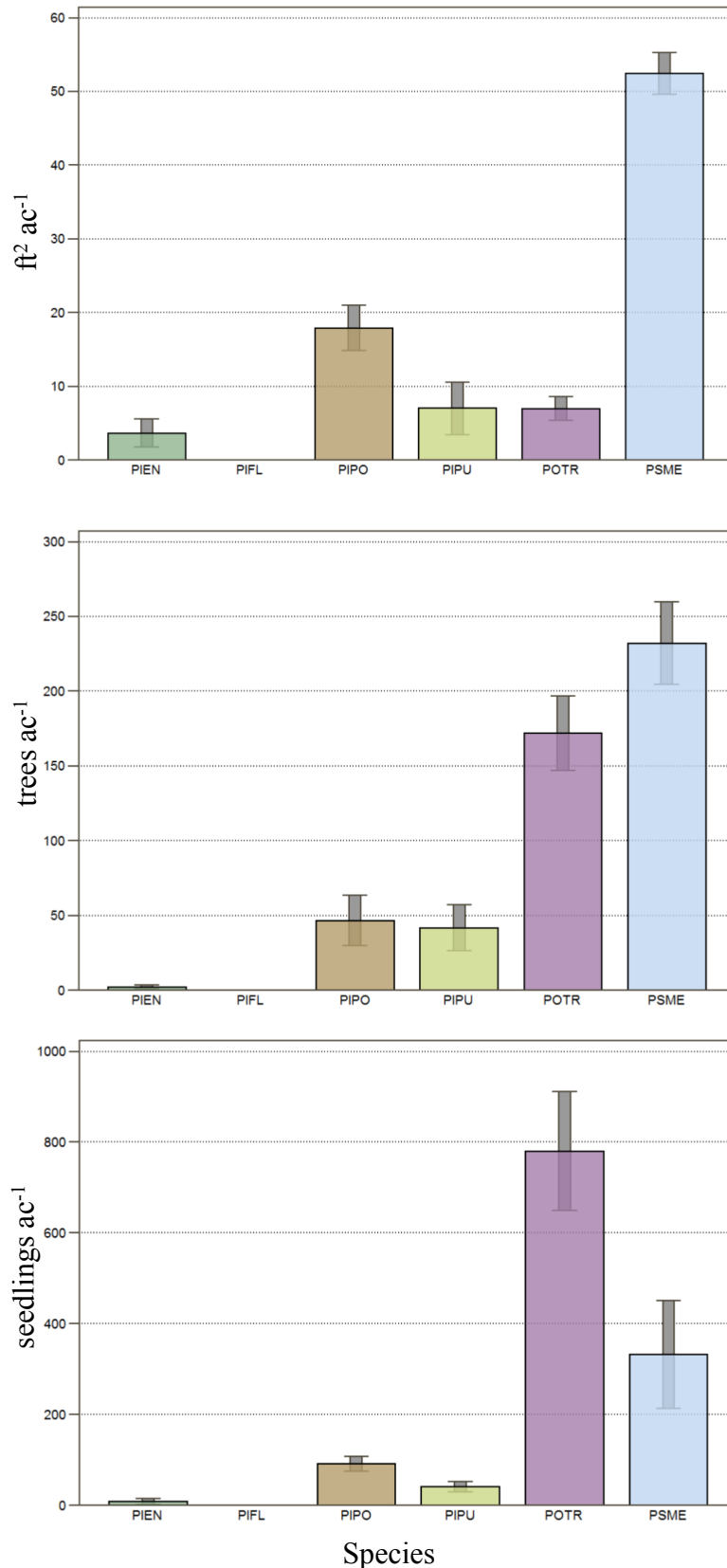
Sixteen stands were classified as ponderosa pine dominated although only one stand contained only ponderosa pine in the overstory. All other ponderosa pine stands had a component of Douglas-fir present. Total BA averaged 92.74 ft<sup>2</sup> (SE±4.57) with ponderosa pine accounting for 73 percent of the total. Average TPA was 261 ac<sup>-1</sup> (SE±37.9) with 53 percent as ponderosa pine.

Although ponderosa pine is currently the dominant species in terms of BA and TPA, forest structure and composition change with diameter. A substantial component of aspen and Douglas-fir existed within the sampled stands. Ponderosa pine was generally abundant in larger diameter classes while Douglas-fir and aspen retained a size distribution of smaller diameter classes. This effect was exaggerated when seedling regeneration was evaluated as Douglas-fir and aspen each contained significantly greater numbers of seedlings ac<sup>-1</sup> than ponderosa pine ( $p < .0001$ ). Although variability existed with regeneration of Douglas-fir and aspen, ponderosa pine regeneration was consistently lower.

## *Douglas-fir*

Douglas-fir was the dominant overstory species in six of the sampled stands. Ponderosa pine accompanied Douglas-fir in all these stands with minimal and varying additions to basal area from other tree species. A significant component of Douglas-fir was present within all diameter classes while aspen was more prevalent in smaller diameter classes. On average, basal area was 86.6 ft<sup>2</sup> (SE ±8.33) and Douglas-fir comprised 66 percent of the total. Trees per acre averaged 495 (SE ±30.1) with Douglas-fir and aspen accounting for the majority of the TPA with 47 and 35 percent, respectively.

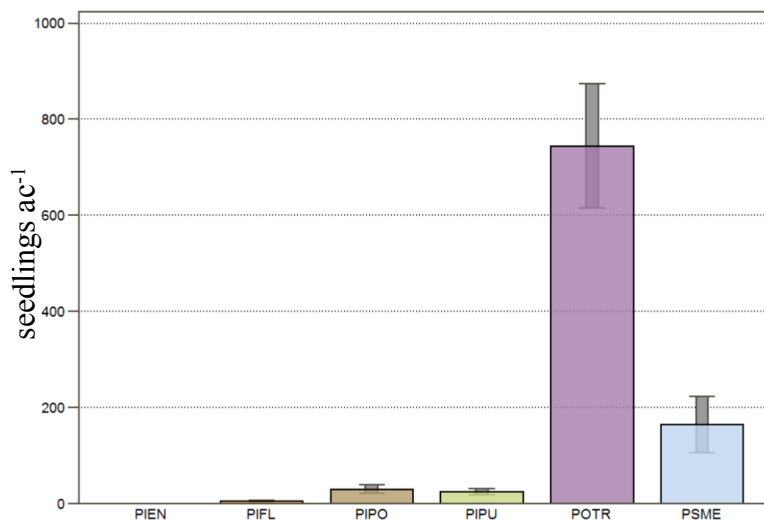
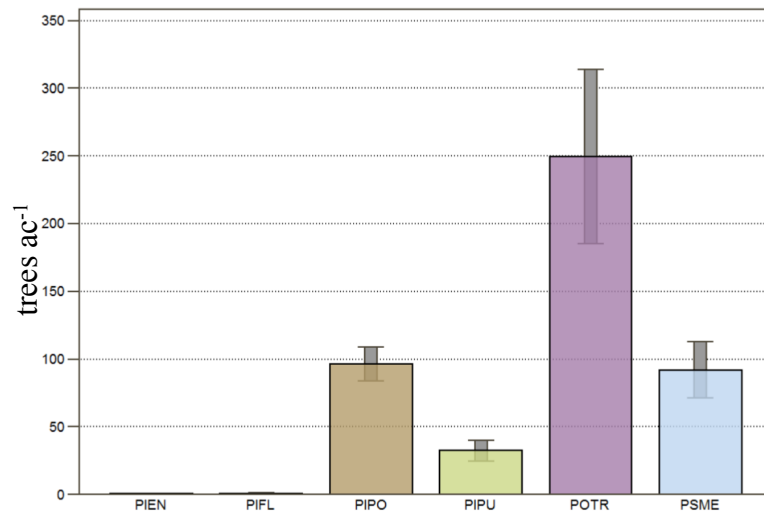
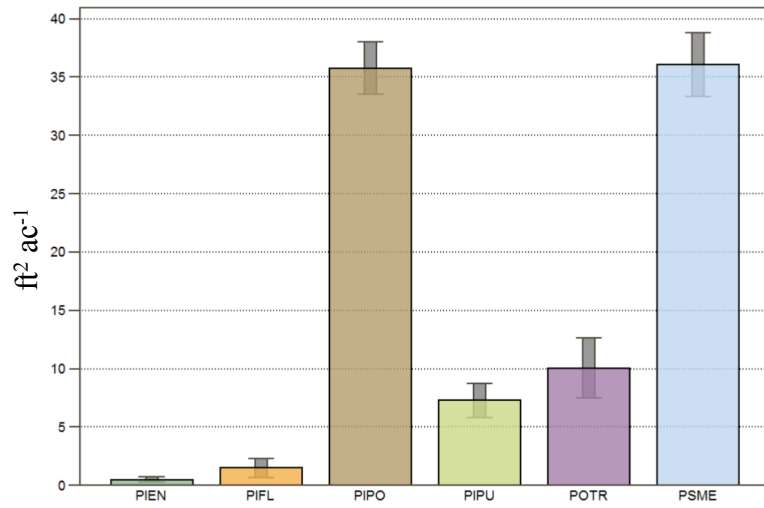
Similar to sampled ponderosa pine stands, aspen accounted for the majority of tree regeneration with some Douglas-fir while ponderosa pine was consistently lower in all sampled plots. Current stand structure will continue to promote further success of Douglas-fir while suppressing recruitment of ponderosa pine into the overstory.



## *Ponderosa Pine / Douglas-fir mix*

Eleven stands were identified as ponderosa pine and Douglas-fir mix. These stands were characterized by neither ponderosa pine nor Douglas-fir containing fifty percent or more of the total basal area within the stand. Total basal area and TPA averaged 90.6 ft<sup>2</sup> ac<sup>-1</sup> (SE±9.33) and 472 ac<sup>-1</sup> (SE± 93.6), respectively. These stands were typically located in areas without a southern aspect.

Ponderosa pine and Douglas-fir were the prevalent species in larger size classes. Aspen comprised a substantial component within these stands with the majority of the stems falling into smaller diameter classes. Aspen was also the dominant regenerating species with >700 stems ac<sup>-1</sup>.



Species