

Long-term Impacts of Fuel Treatments on Productivity and Aboveground Biomass in Ponderosa Pine Forests of the Intermountain West

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Introduction

In the western United States, high frequency, low-intensity fire regimes have shaped structure and function in many of the dry forests. A century of fire suppression has resulted in increased densities, increased shade-tolerant species composition, decreased individual tree vigor, and increased susceptibility to insects. In mixed and pure ponderosa pine (*Pinus ponderosa*) forests, restoration efforts often hope to reinstate structure created by historic fire regimes through decreased density, increased tree size, and removal of ladder fuels. Harvesting operations are often paired with prescribed broadcast burning or mechanical removal of surface vegetation. Our study aims to evaluate long term consequences of several commonly used restoration strategies on tree productivity and aboveground biomass 25 years after treatments.

Lick Creek Demonstration Forest

The Lick Creek Demonstration/Research Forest on the Darby Ranger District of the Bitterroot National Forest offers a truly unique opportunity to assess 25-year-effects of cutting and burning restoration treatments. The site was established as a Demonstration/Research forest in 1991 in a cooperative agreement between the Rocky Mountain Research Station, the University of Montana, and the Bitterroot National Forest. Starting in 1992, silvicultural treatments encompassing commonly used restoration strategies in the region were implemented, followed by prescribed burning in 1993 and 1994, under a fully replicated experimental design involving randomization of treated units and a permanent, systematic plot sampling network.

Historical Significance



Lick Creek is the historic site from which the iconic images documenting forest change from fire exclusion were developed from a photographic series dating from 1909 to 1997. The Lick Creek timber sale of 1907-1911 was the first large National Forest timber sale in ponderosa pine, covering 2,135 acres.

Objectives

This study aims to examine the impacts of common restoration treatments on long-term residual biomass and productivity in Ponderosa pine stands of the Northern Rockies. We will compare treatment effect on:

- Aboveground biomass and distribution
- Individual tree productivity
- Stand productivity
- Regeneration density and composition
- Stand structure

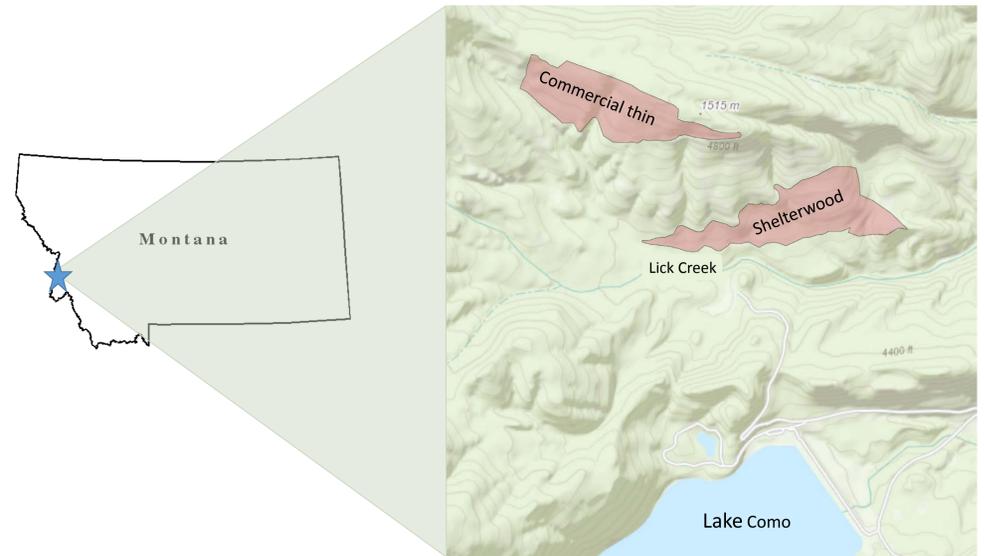
Timeline

Initial stand data was collected in 2014 and 2015. Data analysis is ongoing with an anticipated completion date of Summer 2016.

Acknowledgements

- This is a study of the Applied Forest Management Program at the University of Montana, a research and outreach unit of the Montana Forest and Conservation Experiment Station.
- Funding is provided by the Agriculture and Food Research Initiative, Biomass Research and Development Initiative, Competitive Grant no. 2010-05325 from the USDA National Institute of Food and Agriculture.

Study Site Description



Treatments	
Retention Shelterwood (Two-Age)	Commercial Thinning
Cut Only (Shelterwood w/ reserves)	Cut Only (Low thinning)
Cut and Wet Burn	Cut and Spring Burn
Cut and Dry Burn	Cut and Fall Burn
Control	Control

- Utilizing two experimental treatment stands of 80-100 acres
- 12 research units per treatment
- 1992 harvest-chainsaw felling and skidding by a crawler tractor
- Limbs were removed, piled and burned at landings
- Tree tops less than 6 inches in diameter were left on site
- Burns were conducted in the Spring and Fall of 1993 and Spring of 1994

	Retention Shelterwood			Commercial thinning	
	Pre-treatment 1992	Post-treatment 1993-1994		Pre-treatment 1992	Post-treatment 1993-1994
TPA	240	92	TPA	170	112
BA (ft ²)/acre	120	52	BA (ft ²)/acre	93	61
Species % (TPA)	72% PIPO	83% PIPO	Species % (TPA)	93% PIPO	95% PIPO