

Soil Responses to the Fire and Fire Surrogate Study in the Sierra Nevada¹

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Abstract

The Fire and Fire Surrogate Study utilizes forest thinning and prescribed burning in attempt to create forest stand structures that reduce the risk of catastrophic wildfire. Replicated treatments consisting of mechanical tree harvest (commercial harvest plus mastication of sub-merchantable material), mechanical harvest followed by prescribed fire, prescribed fire alone, and no-treatment controls, were completed at the Blodgett Forest Research Station in fall 2002. We conducted pre-treatment and post-treatment assessments of soil physical, chemical, and biological characteristics. Soil bulk density measures were used to assess soil compaction. At the treatment unit level, there were no differences among treatments in soil bulk density. However, soil bulk density was significantly greater in skid trails of harvested stands compared to undisturbed ground. The presence of skid trails in all treatment units (due to current and past harvest activities) increased the heterogeneity of the soil environment, and may influence treatment effects. Skid trails generally moderated fire effects. Effects such as increased soil pH, increased base saturation, and increased exchangeable calcium were significantly greater in burned undisturbed areas than in skid trails within burned areas. Due to reduced fuels in skid trails, the amount of direct heating and combustion was greatly reduced. Following fire, skid trails had greater total soil carbon and soil carbon:nitrogen ratios than undisturbed areas. In harvested stands, skid trails may occupy ten percent or more of the stand area. Localized treatment effects, such as those within skid trails, must be considered when interpreting overall stand treatment effects.

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