

Changes in carbon and nitrogen pools and microbial communities of the forest floor and mineral soil following restoration practices in a ponderosa pine ecosystem of the Southwest.

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Joint Fire Science Project 99-01-3-13

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Objectives: We conducted an assessment of the impacts of thinning and burning on soil ecosystem properties in a ponderosa pine stand in northern Arizona. The study site was part of a larger stocking level project initiated in the early 1960's that covered both ponderosa pine subspecies and five provinces. We were funded by JFSP to investigate only the northern Arizona site, but a criticism of the study was its limited scope. To address this criticism we secured additional outside funding and adding four sites, two in California and two in Oregon from the original graduated stocking level study. The primary goal of this investigation is to determine the long-term consequences of different thinning levels on microbial communities and the associated carbon and nitrogen properties of the soil that will assist in developing fuels reduction treatments that preserve soil function.

Methods:

Overview

Forest Floor: total litter biomass, total carbon, and total nitrogen from all sites.

Mineral Soil: (0-5 cm, 5-15 cm) total carbon, total nitrogen, total phosphorus, KCl-extractable ammonium and nitrate, soil moisture, and pH from all sites.

Microorganisms

Decomposer community: Phospholipid fatty acids for structural diversity, Biolog Eco and SFN plates to determine community-level physiological profiles for both bacteria and fungi on forest floor and soil from all sites.

Mycorrhizal community: biospore volumes and identification of mycorrhizal fungi on a C3 and a C4 grass, and C3-C4 grass mix grown in intact soil cores from Taylor Woods only for four different stocking levels with and without prescribed fire.

Sampling Design: All sampling has been completed and described in previous PI reports.

Status overview of proposed measurements: All measurements have been completed with the exception of the mycorrhizal spore identification, which includes the added sites from California and Oregon. (The California and Oregon sites were sampled only once.)

Funding status: All JFSP funding has been expended as of October, 2003. Additional funds for added sites and publications secured from other sources.

Products:

Effect of thinning ponderosa pine on microbial communities.

Poster paper presentation Div. S07 - Forest & Range Soils, 2004 Annual Soil Science Society of America Proceedings, Seattle, WA.

Informal technology transfer consultations with Coconino National Forest, Apache-Sitgreaves National Forest, Tonto National Forest, Terrestrial Ecosystem Survey, and Greater Flagstaff Forest Partnership.

Anticipated Products:

Overby, S.T., Neary D.G., and S.C. Hart. *To be submitted in September of 2004.* The influence of different stocking levels and prescribed fire on total soil carbon and nitrogen in a Southwest ponderosa pine stand. *Forest Ecology and Management.*

Overby, S.T., Neary D.G., and S.C. Hart. *To be submitted in September of 2004.* Total soil carbon and nitrogen in ponderosa pine ecosystems thinned to different stocking levels. *Forest Ecology and Management.*

Overby, S.T., Erickson, D., Hart S.C., and Neary, D.G., *To be submitted in December of 2004.* Microbial community structure following thinning in ponderosa pine ecosystems. *Journal of Soil Science Society of America.*

Overby, S.T., Neal, S.M., Hart, S.C., and Neary, D.G. *To be submitted in December of 2004.* AM fungal response to prescribed fire in ponderosa pine stands of different stocking levels. *Soil Ecology.*

Technology transfer workshops with resource managers in the Southwest Region (R-3) to present current data.