Forest Restoration on the Exposed Sediments along the Elwha River: Assessing Riverbank Lupine's (*Lupinus rivularis*) Influence on Conifer Growth, Vegetation, and Mycorrhizal Fungi[1]

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Abstract: Until recently, much of the Elwha River was inaccessible to anadromous fish species due to the Elwha and Glines Canyon Dams. Dam deconstruction resulted in approximately 325 hectares of formerly inundated lake beds in place of forested and riparian corridors. Revegetation has been met with varying results; fine sediments along the valley walls quickly recovered via forest succession, while coarser substrate formed novel terraces that were more difficult to revegetate. One seeded species, riverbank lupine (*Lupinus rivularis*), quickly established on the coarse textured terraces. Riverbank lupine is a pioneering species that assimilates nitrogen through nitrogen-fixing bacteria in a form that is readily available to plants. The purpose of this study was to investigate lupine's influence on conifer establishment regarding seedling growth, nitrogen acquisition, mycorrhizal colonization, and plant community composition. To test this, the growth of three-year-old restoration conifers were measured, foliar nitrogen was quantified, mycorrhizal fungi were sampled from seedling roots, and plant communities surrounding conifers were surveyed under three lupine abundances: sparse, medium, and dense. Conifers in the medium lupine cover plots were larger (height and root collar diameter; $P=0.001$) than conifers in the sparse plots. Also, conifers growing in both medium and dense cover plots had significantly greater foliar nitrogen concentrations ($P<0.001$), which correlated to distance to neighboring lupine ($P= 0.004$). Plant community composition differed among sites ($P=0.003$); higher lupine coverage resulted in lower species richness, however, excluded exotic species, which were more abundant in sparse plots. Regarding mycorrhizal fungi, conifers in dense and medium lupine plots had significantly lower root fungi than seedlings growing in the sparse plots ($P=0.03$). Greenhouse studies are currently being conducted to better understand the decrease in mycorrhizal fungi and these results will be presented during this oral presentation. These data will be synthesized into best management practices for future revegetation projects where dam removal, coupled with active revegetation, restores forest and river processes vital to salmonid habitat.

Additional Key Words: legumes, nitrogen-fixing plants, herbaceous facilitation

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3. Work reported here was conducted near 48° 00' 07" N; 123° 36' 00" W.