

**Sierra Cascade Intensive Forest Management Research Cooperative Proposal 12-02
Garden of Eden II**

Principal Investigator: Jianwei Zhang

Title: Do Silvicultural Treatments Applied in a First Rotation Ponderosa Pine Plantation Affect Growth and Carbon Sequestration in the Second Rotation of the Plantation?

Year Approved: 2012

Executive Summary:

Forest plantations have been regarded as an important wood supply source to meet an increasing wood demand due to the rapid growth of the world's population along with standard of living (FAO 2009). Recently, they have been used as a tool sequestering more atmospheric carbon dioxide to offset an exponential increase in this gas caused by human beings. Concerns arise whether productivity of these plantations, often with monocultures, can be sustained with future rotations. Limited long-term studies yielded mixed results that seem related to the silvicultural practices when the first rotation plantations were harvested and to silvicultural treatments that were applied in the second rotation plantations. Based on our knowledge, no study has been established in ponderosa pine to test the biological sustainability in second rotation plantations.

The stated objective of this study is to determine the effects of fertilization and vegetation control, applied in the first rotation of a plantation, on growth and carbon sequestration in the second rotation of that plantation.

The study will have three different sites with a range of site qualities. Three Garden of Eden installations will be used in this study: Feather Falls, the most productive site, Elkhorn, the least productive site, and Whitmore, a site of intermediate productivity. Before harvesting, the original plot boundaries will be reestablished. Soil samples will be collected from each original plot using McFarlane et al sampling intensity. Whole-tree harvesting will be used and forest floor will be retained. New seedlings will be planted with power augers and seedling protection will be applied to assure full stocking. After planting, competing vegetation will be controlled with herbicides on all 24 plots (Figure 1). Including the original treatments, the experiment becomes a completely randomized design with eight treatments replicated three times. Tree height and survival and understory vegetation will be measured/recorded at the end of the first, third, and fifth growing season and at five year intervals after that. Soil samples will be collected the first year following vegetation measurements starting at age three.

2012/2013: All plot corners were remonumented and all preharvest measurements were taken. Soil samples were collected from each original plot prior to the harvesting. All three sites were

harvested and all harvested material had been removed from the sites by December, 2013. Seedlings are being grown for out-planting in spring 2014.

Figure 1. A layout of the original Garden of Eden study (3 acres) and proposed treatments to the second rotation plantation.

