CHANTERELLE MUSHROOM PRODUCTIVITY

RESPONSE TO YOUNG STAND THINNING

CASCADE CENTER *for* ECOSYSTEM MANAGEMENT

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ECOSYSTEM RESEARCH

EDUCATION

ADAPTIVE MANAGEMENT

background

Edible mushrooms have been widely collected from the forests of the Pacific Northwest since European settlers began hunting for mushrooms they had collected in their homelands. (Some native tribes harvested a few mushroom species, but we lack evidence of their wide-spread consumption). During the 1990s, commercial mushroom harvesting expanded dramatically as international markets developed and forest workers sought means to supplement their income. National Forest lands provide ideal habitat for many types of edible forest mushrooms and managers have developed permits and regulations that allow commercial harvesting. Chanterelles are one of the most frequently harvested mushrooms in our National Forests. The Pacific golden chanterelle, *Cantharellus formosus* (formerly *C. cibarius*), and the white chanterelle, *C. subalbidus*, are the two most common chanterelles in the low elevation forests on the west side of the Cascade Range. Both occur abundantly in young forests regenerated from earlier logging.

white chanterelle, *C. subalbidus*

C. formosus and *C. subalbidus* are mycorrhizal fungi, that is, fungi that form symbiotic relations with the roots of certain conifers, especially Douglas-fir and western hemlock. Mycorrhizal fungi form a web of "hyphae" (one cell wide threads collectively known as "mycelium") in the soil and also colonize the young root tips of their arboreal hosts. The fungus functions as an extended fine root system, absorbing water and minerals that are translocated to the tree and, in return, the trees provide the fungus with food (carbohydrates photosynthesized by the tree). The Pacific golden chanterelle and white chanterelle are the fruiting bodies of these *Cantharellus* species.

Many of the young forests where chanterelles occur are dense and scheduled for commercial thinning in the coming decades. Young stand thinning will likely affect chanterelle productivity (number and weight of mushrooms per acre) by altering a number of factors:

1. Food supplies for the fungus (density and health of host trees)
2. Environmental conditions near the forest floor that affect fruiting (temperature, humidity, and light levels)
3. Soil conditions (compaction, summer and early autumn moisture levels, distribution of rotted wood and organic matter in the soil profile, litter layer thickness, slash burning, and microbial population shifts)

The Young Stand Thinning and Diversity Study on the Blue River, McKenzie and Middle Fork Ranger Districts of the Willamette National Forest is a well-replicated, long-term, integrated ecosystem study. Understanding how chanterelles respond to thinning will benefit from long-term research because stand conditions change through time as remaining trees in the thinned forest resume vigorous growth. Cooperating with a larger integrated study lessens the work load and improves interpretation of results.

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MUSHROOM RESPONSE TO YOUNG STAND THINNING

the study

A companion handout describes the young stand thinning study in greater detail. The study design is replicated on four sites and we are monitoring chanterelle productivity in three stand treatments at each site:

1. Control ~615 original trees per hectare (250 trees per acre)
2. Light thin ~270 residual trees per hectare (110 trees per acre)
3. Heavy thin ~125 residual trees per hectare (50 trees per acre) with underplanting

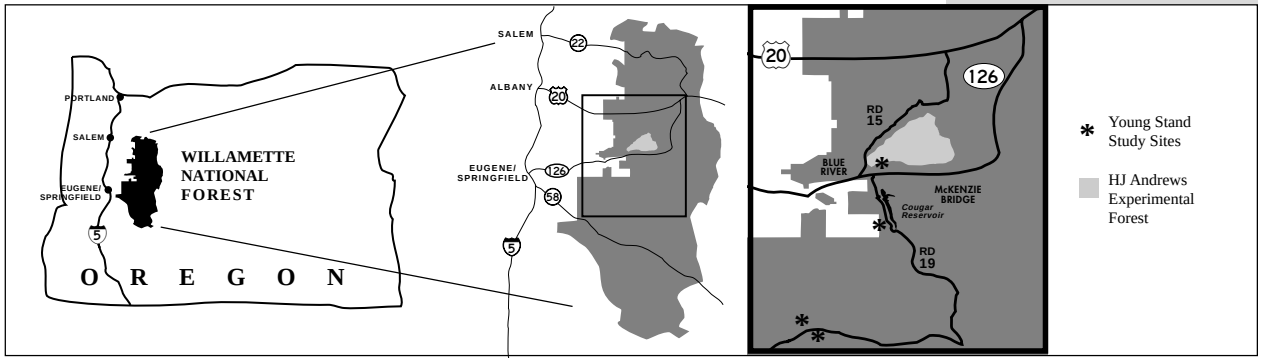
Our primary goal is to examine the response of chanterelle productivity to the thinning treatments. We hypothesized that productivity would decline immediately after thinning (more so, the more heavily thinned) and then eventually would rebound to higher than pre-thinning levels as the residual trees begin to grow more vigorously and fully occupy their habitat. Little prior work had been done on developing efficient and practical methods for sampling edible mushrooms under a variety of field conditions, hence examining sampling methodology also was a research goal. Additional goals include spatial analysis of how mapped chanterelle patches respond to removal of nearby host trees, DNA analyses of mapped fruiting bodies to determine the number and distribution of genetically unique mycelial colonies, and then combining those analyses to investigate how chanterelle populations respond to the thinning disturbances.

results

Productivity data have been collected for one year prior to logging (1994) and three years afterwards (1996, 1997, 1999). Chanterelles were found on every site (although not every year) and productivity varied widely among both sites and years. The range was 0 - 215 chanterelles per acre and 0 - 9.6 pounds per acre. As predicted, chanterelle productivity significantly ($p<0.5$) declined (but was not eliminated) immediately after thinning and the level of decline was greater in the heavily thinned stands than in those lightly thinned. Removal of host trees, drier forest floors, and layers of slash that make chanterelles difficult to find likely all contributed to the decline. A potential recovery trend in chanterelle productivity has been noted but was not yet statistically significant as of 1999 (four years after logging). Long (100-400 meters or 300-1200 feet) narrow (5 meters or 15 feet) strip plots worked well for sampling spatially clustered chanterelles while keeping track of what areas had already been searched (especially in dense brush). Total sample areas need to be large (~ 0.4 hectare or 1 acre) to derive useful estimates. Spatial and genetic analyses of chanterelle individuals and populations have revealed relatively small clonal patches (5-20 m. diameter), and a new species of yellow chanterelle to be named *C. cascadensis.*

application

Although chanterelles are only one of the many products and amenities that we derive from our forests, they are an integral part of the forest ecosystem and provide many people with pleasure and income. Forest managers will be able to better insure their continued availability if they understand the relations between management activities and chanterelle productivity. With this understanding, managers can continue to provide opportunities to harvest chanterelles in areas that have compatible management goals and convenient access.



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