Community Structure of Vascular Plants, Arthropods, Amphibians, and Mollusks in Managed Forests of the Pacific Northwest (USA)

Stephanie J. Wessell-Kelly and Deanna H. Olson

Poster Abstract

Increasing global demands on forest resources are driving large-scale shifts toward plantation forestry. Simultaneously balancing resource extraction and ecological sustainability objectives in plantation forests requires the incorporation of innovative silvicultural strategies such as leave islands (green-tree retention clusters). Our primary research goal was to determine how leave islands provide refugia for low-mobility, ecologically sensitive species in managed forests of the Pacific Northwest, USA. We examined patterns in vascular plant, arthropod, amphibian, and mollusk assemblages across five types of forest sampling units: unthinned forest (approximately 600 trees per hectare [tph]), thinned forests (200 tph), and leave islands of three sizes (0.1-, 0.2-, and 0.4-ha]) embedded in the thinned forest. Our objectives were to examine gradients in community associations to measured environmental variables, to describe differences in communities among the five types of forest, and to identify species indicative of each type of forest.

We used two multivariate community analysis methods to describe the primary environmental variables and gradients driving the species composition of these communities. First, we used non-metric multi-dimensional scaling (NMS) to ordinate sample units in species space to provide a graphical representation of plant, arthropod, amphibian, and mollusk community relationships and environmental variables. Correlations between ordination axes and environmental variables also were examined to determine the important drivers of community structure and composition for each taxonomic group. Joint plots were used to overlay environmental variables on the ordination, based on the correlations of the variables with the ordination axes. Ordinations were then rigidly rotated to maximize the loading of the strongest gradients in community variation on a single axis. Next, we used indicator species analysis (ISA) to characterize plant, arthropod, amphibian, and mollusk assemblages associated with the a priori groups of interest. These a priori groups included the five types of forest, four study sites, and two mountain ranges, the Oregon Coast Range and Cascade Range. Indicator values were calculated for each species within each group by combining information about the concentration of species abundance and faithfulness of occurrence in a particular group. Indicator values ranged from 0 (no indication) to 100 (perfect indication). A perfect indicator for a particular group was present in all sampling units for that group and occurred exclusively in that group. Our NMS results indicated strong gradients shaping vascular plant, arthropod, amphibian, and mollusk communities across study sites and across mountain ranges. In particular, microclimate conditions (relative humidity, ambient temperature, and soil temperature) seemed to be especially important in shaping species assemblages in our managed forest stands. Finally, ISA identified indicator species for the a priori groups of interest.

Stephanie J. Wessell-Kelly is the zone silviculturist/research coordinator, USDA Forest Service, Umpqua National Forest, Diamond Lake Ranger District-North Umpqua Ranger District, 18782 North Umpqua Hwy., Glide, OR 97443; swessellkelly@fs.fed.us; **Deanna H. Olson** is a research ecologist, USDA Forest Service, Pacific Northwest Research Station, Forestry Sciences Laboratory, 3200 SW Jefferson Way, Corvallis, OR 97331.