NORTHWEST OREGON ECOLOGY GROUP NEWSLETTER

Version 14.0
April 2015

The Northwest Oregon Ecology Group is an association of ecologists with a wide range of interests from the Mt. Hood, Siuslaw and Willamette National Forests, the Columbia River Gorge National Scenic Area, and the Eugene and Salem Bureau of Land Management Districts. The group works from local to regional scales to provide tools, assessments, and analyses for ecological issues for planning, managing and monitoring forest ecosystems in Northwest Oregon. Through their own efforts, and affiliation with ecologists with Oregon State University, University of Oregon, Oregon Department of Fish and Wildlife, University of Washington, and private consultants, they have developed products most resource managers use every day.

A trait based approach to understanding meadow species abundance over a conifer encroachment gradient

Jessica Celis, MS Student, School of Forestry, Oregon State University

Meadows in the Oregon Cascades occupy a small fraction of an otherwise forested landscape. Nevertheless, they contribute disproportionately to the plant, insect, and wildlife diversity of the region. In portions the western Cascades, conifer encroachment has reduced meadow extent by as much as 50% since the mid-1940s. Various factors have contributed to meadow contraction: cessation of sheep grazing, changes in climate (snow pack and length of the growing season), suppression of fire, and strong positive interactions among established and newly establishing trees. As trees establish and canopies close, meadow forbs and grasses are gradually replaced by forest understory plants. Yet, they do so at very different rates: some disappear in one or two decades; others can persist for more than a century. My Master's research explores whether this variation in survival can be explained by differences in trait plasticity (i.e., the ability of plants to adjust resource-acquiring structures to adapt to changes in their environments).

One of the largest meadows at the Bunchgrass Ridge study site (photo by Jessica Celis)

During summer 2014, I measured the morphological traits of 13 meadow species that vary in their sensitivities to encroachment (i.e., increased shading). I expressed this sensitivity using a quantitative index expressing the rate of decline in cover with declining light. For each species, I sampled the above- and below-ground traits of 15-17 individuals distributed across a wide range of light levels in conifer-invaded meadows at Bunchgrass Ridge (Willamette National Forest – see website for more information: http://depts.washington.edu/bgridge/). I chose traits that are known to respond to changes in light - the most limiting resource for these species. These include specific leaf area (SLA; leaf area divided by leaf dry mass) and ratio of above- to below-ground mass (A/B ratio). In shaded environments, plants tend to develop larger, thinner leaves to enhance light capture, resulting in greater SLA. Plants should also adjust allocation of biomass to structures that acquire the most limiting resource (here, light rather than soil water or nutrients). As such, I predicted that sensitivity to encroachment (reduced light) would vary inversely with species ability to adjust SLA and A/B ratio.

The author excavating one of the study species, *Erigeron aliceae* (photo by Chris Parson).

Although some species showed plastic responses to light for SLA and A/B ratio, others showed little or no change in these traits. Although SLA increased in the shade for all species - consistent with expectation - species with greater plasticity in this trait were not less sensitive to light. Rather, change in leaf area (not the ratio of leaf area to mass) was a stronger predictor of sensitivity: leaf area increased in the shade for less sensitive species, but declined for more sensitive species. For the latter, leaf area may become too small to support survival in the shade.

Few species showed significant adjustment of A/B ratio, thus plasticity in biomass allocation explained little of the variation in sensitivity to encroachment. Interestingly, two species considered least sensitive to encroachment - *Iris chrysophylla* (Iridaceae) and *Achillea millefolium* (Asteraceae) - showed contrasting responses to increasing shade. Iris allocated more to shoots/leaves (consistent with expectation) but *Achillea* allocated more to root systems. Allocation to leaves in *Achillea* may hinge on the production of reproductive shoots, which are not formed in shade. Thus, morphological or developmental constraints may limit the ability of some species to respond adaptively to changes in light.

My results suggest that differences in morphological plasticity explain little of the variation in species' sensitivity to encroachment. Physiological plasticity (e.g., the ability to adjust photosynthetic systems) may be more important. It is also likely that survival hinges on the abilities of species to respond to other, tree-induced changes in the environment, including those below ground.

Contact Information for the Northwest Oregon Ecology Group:

Steve Acker, Northwest Oregon Ecologist,
Siuslaw, Willamette and Mt. Hood National Forests
E-mail: stevenaacker@fs.fed.us
Phone: 541-225-6447

Guenther Castillon, Forest Silviculturist,
Siuslaw National Forest,
E-mail: gcastillon@fs.fed.us
Phone: 541-750-7184

Robin Dobson, Botanist/Ecologist,
Columbia River Gorge National Scenic Area,
Hood River, OR
E-mail: rdobson@fs.fed.us
Phone: 541-308-1706

Cheryl Ann Friesen, Science Liaison,
Willamette National Forest and
Central Cascades Adaptive Management Partnership
E-mail:cfriesen@fs.fed.us
Phone: 541-822-7226

Doug Glavich, Northwest Oregon Ecologist/Botanist,
Siuslaw and Willamette National Forests
E-mail: dglavich@fs.fed.us
Phone: 541-750-7048

Lisa Helmig, Forest Silviculturist,
Willamette National Forest.
E-mail: lhelmig@fs.fed.us
Phone: 541-225-6323

Patricia Johnston, Plant Ecologist
Eugene District BLM,
E-mail: pjohnston@blm.gov
Phone: 541-683-6181

Jane Kertis, Northwest Oregon Ecologist,
Siuslaw, Willamette and Mt. Hood National Forests
E-mail: jkertis@fs.fed.us
Phone: 541-750-7192

Christopher Landgon, Wildlife Biologist,
Upper Willamette Resource Area, Eugene BLM
E-mail: clangdon@blm.gov
541-683-6693

Jennifer Lippert, Forest Botanist,
Willamette National Forest
E-mail: jlippert@fs.fed.us
Phone: 541-465-6440

Hugh Snook, District Silviculturist,
Salem District BLM
E-mail: hugh_snook@or.blm.gov
Phone: 503-315-5964

Stephanie Wessell, Silviculturist,
Marys Peak Resource Area, Salem District BLM
E-mail: swessell@blm.gov
Phone: 503-315-5954

Wesley Wong, Northwest Oregon Ecologist,
Mt. Hood, Siuslaw and Willamette National Forests
E-mail: wwong@fs.fed.us
Phone: 503-630-8836

The Northwest Oregon Ecology Group relies on a variety of professionals throughout the area to support their activities. The following ecologists and biologists also contribute to the program.

Brett Blundon, District Fisheries Biologist,
Eugene BLM.
Specialities: Stream Ecology.

John Christy, Ecologist,
Oregon Natural Heritage Information Center.
Specialties: Wetland ecology and mosses.

Corbin Murphy, Wildlife Biologist,
Cascades Resource Area, Salem District BLM

Tom O'Neil, Ecologist,
Northwest Habitat Institute.
Specialties: Oak restoration, wildlife habitat, and biodiversity data management.

Allison Reger, Analyst,
Willamette National Forest.
Specialties: VDDT modeling, and landscape analysis.

Program Design: Alan Work, Mountain Hawk LLC, Graphic Design and Interpretive Services, www.mountainhawk.org