III. Small Mammals - Steve Garman (Oregon State University)

Ground-dwelling vertebrates are key components of forest ecosystems. They serve as prey for larger vertebrates and play an important role in the dispersal of hypogeous fungi. Understanding how they response to changes in forest conditions is thus critical. Objectives of this study were to determine effects of the three thinning treatments on the relative abundance and diversity of ground-dwelling vertebrates.

Ground-dwelling vertebrates were sampled in the Fall of 1991-92 (pre-treatment) and 1998-99 (post-treatment) using live-traps. Each stand had 100 trapping stations. During a 6-8 consecutive trapping period, 100 Sherman live-traps and 25-50 pitfall traps were employed to record species. Each capture was identified to species and sexed, weighed, and tagged for future recognition.

Eleven small mammal and nine amphibian species were recorded during the four years of this study. Two additional species of voles and two species of shrews were recorded, but identification of these is questionable. The Pacific and fog shrew also were recorded, but positive identification is difficult in the field; these species were recorded as brown shrews.
Only eight species of small mammal and one species of amphibian had sufficient captures for further analyses.

1. Are there treatment effects on relative density of species?

A mixed-effects, repeated measures analysis of variance was used to determine treatment effects on capture rates. Statistically significant trends between the pre- and post-treatment periods include:

* increase in relative density of the deer mouse in the two lightly thinned treatments in 1998 (increase in heavy thin treatment but not statistically significant),

* increase in relative density of Ensatina in the two lightly thinned treatments in 1998,

* decrease in relative density of Trowbridge's shrew in the heavy thin in both 1998 and 1999 (same numerical trend was evident for the Pacific & fog shrew aggregate but it was not statistically significant).

* increase in mammalian species' diversity in the light-thin with gap treatment.

Interesting trends in capture rates between pre- and post-treatment periods that were not statistically significant include:

* decrease in western red-backed vole captures in the post-treatment period across all treatment types,

* no captures of the northern flying squirrel in the heavy-thin treatments after thinning,

* a slight decrease in capture rate of Townsend's chipmunk in the light-thin with gaps treatments

2. What habitat features are associated with changes in species capture rates?

Regression analysis was used to determine the key habitat features associated with capture rates of a species. Key associations include:

deer mouse - percent herbaceous cover
shrew species - percent moss cover, overstory tree density
Townsend's chipmunk - density of saplings and percent moss cover
flying squirrel - density of trees >50-cm dbh
Oregon vole - log volume
shrew-mole - density of trees <30-cm dbh
western red-backed vole - log volume
Ensatina - basal area of stumps

3. Is the variability of habitat features within a treatment more or less than that among treatments?

An assumption of the analysis of variance assessment was that all stands of a treatment were in fact representative replicates. The degree of variability in capture rates within a treatment suggested otherwise. Using principal component ordination, variability of habitat features within treatments was found to be slightly less than the variability among treatments. Separate ordinations of habitat features for each species indicated that the most variable stands within a treatment were not necessarily the same among species. Thus, there wasn't a consistent stand or set of stands that differed from corresponding replicates in terms of stand structure and composition. These results simply go to support the use of the analysis of variance model to analyze treatment effects on capture rates of species.

4. What are the microhabitat characteristics of species? Is there evidence of structural niche segregation?

Using data from only 5 of the 16 stands, principal component ordination indicated extensive overlap in microhabitat-use among small mammal species. Only the two shrew species exhibited some degree of separation in microhabitat-use.

Summary

Thinning young Douglas-fir stands had little effect on the ground-dwelling community. Deer mice and Ensatina exhibited a statistically significant numerical increase to the light-thin treatments, at least in 1 of the 2 post-treatment years. Trowbridge's shrew exhibited a significant decline in the heavy thin treatment in both post-treatment years. However on average, no species was eliminated from a treatment type compared to pre-treatment conditions. An exception was the northern flying squirrel in heavy thin stands, but the variability in capture rates of this species among treatments and all years of the study resulted in a non-significant treatment effect.