Small Mammal Relative Abundance and Habitat Use

15 May 2008

INTRODUCTION

Research Questions:

1. How does proximity to streams affect the relative abundance or habitat use of small mammals?
2. How does vegetative cover affect the relative abundance or habitat use of small mammals?

Small mammals perform important functions in many ecosystems, due to their relatively high densities and their intermediate positions in ecological food webs. Small mammals are important dispersal agents for spores of symbiotic ectomycorrhizal fungi. As abundant herbivores and seed predators, mice and voles influence vegetation structure and composition (e.g., Brown and Heske 1990; Cadenasso and Pickett 2000). High mouse densities have been shown to suppress insect outbreaks (Jones et al. 1998). Mice and voles are important prey for many vertebrate predators, including hawks, owls, herons, weasels, bobcats, foxes, and coyotes. Mice also serve as disease reservoirs, including pathogens transmitted to humans (Glass et al. 2007; Jones et al. 1998; Ostfeld et al. 1995).

Understanding patterns in small mammal densities is important to basic and applied issues related to the diverse ecological processes listed above. Particular local and regional interest in small mammal densities concerns small mammal herbivory that impacts riparian restoration programs. Voles and other small mammals consume bark of trees and shrubs planted in restoration sites, potentially negating restoration efforts.

In this project, we will study relationships between small mammal abundances and two factors known to affect those abundances. Herbaceous and shrub cover has been found to account for small mammal abundances in several Pacific Northwest habitats (Carey and Johnson 1995; MacCracken et al. 1985). Proximity to streams also accounts for increased abundance of several small mammal species in Pacific Northwest riparian zones (Richardson et al. 2005). We will evaluate the importance of these factors in a local restoration site. We will measure relative small mammal abundances and compare those abundances with predictions derived from hypotheses relating small mammals to vegetative cover and stream proximity.

Hypotheses:

1. Shrub cover: If vole density is limited by food availability in winter, then vole abundance will be greatest in areas with greatest shrub cover, because shrub bark and buds are the most consistently available vole foods in winter.

2. Herbaceous cover: If vole density is limited by predation risk, then vole abundance will be greatest in areas with greatest herbaceous cover, because herbaceous plants provide the most effective cover from predators.

3. Stream proximity: If vole density is limited by moisture availability (directly or via plant or soil water content) or by woody debris cover, then vole abundance will increase with proximity to streams, because air, plant, and soil water content are consistently greater near streams and woody debris tends to increase near streams.

4. Random sampling. If vole density is determined by some other factor(s) uncorrelated with vegetative cover or stream proximity, then vole abundance will appear to be distributed randomly with respect to these variables.
FIELD METHODS

*Equipment Needed (per group)*:

- data sheets
- pencil/pen
- marker flags (12)
- table of random numbers
- crown densiometer
- laser rangefinder
- 30 meter measuring tape
- PVC quadrat frame (1m²)

*Locating Sampling Points*

Sample quadrats should be located systematically relative to vegetative cover and stream proximity, but randomly relative to other factors. We will use stratified random sampling, with strata defined first by distance from Padden Creek and then by vegetative cover. We will stratify by distance from the creek using transects extending perpendicularly (south) from the creek. Transects will be located randomly along the length of creek (west – east) from 24th Street to the eastern extent of restoration plantings. Each transect will consist of quadrats (1m²) located 5m, 10m, 20m, and 30m from the waterline. Additional quadrats will be located to sample the range of vegetative cover, in proximity to the four quadrats along each transect. If a given quadrat (5m, 10m, 20m, or 30m from the creek) is located in relatively high (low) shrub cover, place a second quadrat in the nearest site of low (high) shrub cover. If the given quadrat is located in relatively high (low) herbaceous cover, place a third quadrat in the nearest site of low (high) herbaceous cover. In this manner, each transect will contain four primary quadrats (at 5m, 10m, 20m, and 30m distances from the creek), four secondary quadrats with contrasting shrub cover, and four tertiary quadrats with contrasting herbaceous cover.

1. Select a random two-digit number. Walk the selected distance (in meters) east from 24th Street.
2. Extend the 30 meter tape in a perpendicular direction (south) from the edge of Padden Creek.
3. Plant flags at 5m, 10m, 20m, and 30m distances from the creek. These flags mark quadrat centers along the transect.
4. Plant flags at secondary and tertiary quadrat locations associated with each primary quadrat, as described above.
5. After sampling all 12 quadrats associated with the transect, establish the next transect by selecting another two digit random number and repeating steps 1-4.

*Sampling Vegetative Cover*

1. Center the PVC quadrat frame (1m²) at each selected location.
2. Hold the crown densitometer at the quadrat center, at the greatest height of herbaceous plants in the quadrat and below all shrub stems. Record percent shrub cover using the densitometer, following the procedure used for measuring tree canopy cover.
3. Estimate percent herbaceous cover within the 1m² quadrat. Include only cover 10cm above ground level, because plant structures below that height would provide marginal visual cover from predators.
4. Repeat steps 1–3 at each secondary quadrat location (high/low shrub cover) and each tertiary location (high/low herbaceous cover).
**Sampling Vole Abundance**

1. Identify all vole trails or tunnels within the quadrat frame.
2. Measure the linear distance of each trail or tunnel within the frame.
3. Record the summed distance of all trails or tunnels. We will use this sum as an index of relative vole abundance or habitat use. [Of course this index requires several assumptions relating trail/tunnels to vole abundance or habitat use. Validity of these assumptions could be evaluated using trapping grids (Wilson et al. 1996) or track tunnels (Drennan et al. 1998; Glennon et al. 2002).]
4. Repeat steps 1–3 at each secondary quadrat location (high/low shrub cover) and each tertiary location (high/low herbaceous cover).

**REFERENCES**


ESC 408 Wildlife Field Methods

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Date ______________________ Transect location (random no.) ________________
Recorder _____________________ Team members ____________________________

5 meters from creek

<table>
<thead>
<tr>
<th>Quadrat</th>
<th>Shrub cover</th>
<th>Herb. Cover</th>
<th>Trail length (cm)</th>
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<tbody>
<tr>
<td></td>
<td># sub-sq open (max. 96)</td>
<td>(% cover 10cm above ground)</td>
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<td>primary</td>
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10 meters from creek

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20 meters from creek

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30 meters from creek

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