

# *Pacific Southwest Research Station*

## Sierra Nevada Research Center

### Plumas Lassen Administrative Study: Study Module on Small Mammal Distribution, Abundance, and Habitat Relations

#### **The Research:**

Small mammals play pivotal roles as seed, fruit and fungi consumers and dispersers and as prey for many mammalian and avian predators, including many species of concern in the Sierra Nevada, such as the marten, fisher, northern goshawk, and California spotted owl. As such, their dynamics may have cascading effects through ecosystems, and knowledge of small mammal demographics and habitat requirements, for example, would provide important feedback for the management of predator species as well as their prey. Thus, understanding small mammal community dynamics and demography is central to holistic management of natural systems.

Alteration of habitat structure and quality through forest management should have direct effects on the demography of small mammal populations. Specifically, improvement in habitat quality should be reflected in enhanced demographic performance (higher density, greater reproduction and survival) and changes in spatial distribution (leading to higher densities and possibly to spatially predictable levels of clumping), with consequent influences on social structure. This module aims to provide information on how small mammals, and especially important prey taxa such as woodrats, flying squirrels, and deer mice, respond to forest management practices. Importantly, these data will allow for integration of datasets on predator dynamics, vegetation and fire dynamics, weather and climate.

#### **Objectives:**

The primary objective of this study module is to evaluate small mammal responses to different forest management practices, and to model these responses in terms of demography, spatial distribution, and habitat associations at local and landscape scales.

To meet the primary objective, this study module will address the following:

- Determine small mammal habitat associations at macro- and microhabitat scales.
- Develop demographic profiles of small mammal populations inhabiting a variety of habitat types.
- Develop predictive small mammal habitat models, based on the results of objectives 1-2, to forecast how individual species will respond to forest management treatments.
- Quantitatively assess the impacts of forest management treatments on small mammal abundance and species diversity.
- Determine small mammal population trends, evaluate how populations are changing temporally, and assess the factors responsible for the observed trends.
- Evaluate the spatial distribution (e.g., home range), spatial organization (e.g., overlap), and habitat selection (e.g., den use) of principle taxa.



Photo: Sean Bogle





Photo: Robin Innes

### **Collaborators:**

This study is being conducted by UC Davis in collaboration with staff of the Sierra Nevada Research Center of PSW. We value these opportunities for collaboration that enables a broader understanding of key questions addressed by the Sierra Nevada Research Center.



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### **Application of Research Results:**

Small mammals are not randomly distributed across the environment, and it is understood that many species generally favor areas with suitable cover. Our objective is to develop quantitative models that relate both presence/absence and relative abundance of small mammal species to a suite of habitat features. This will allow us to document species-specific associations but also to predict the response of these species in terms of population size, reproductive success, and survivorship to forest treatments. These data can be combined with data on predator dynamics to relate climatic variation to vegetation, in turn to prey populations, and ultimately to predator populations.

Animals may use their environment in very different ways depending on features of the habitat and availability of resources. We intend to characterize home ranges (e.g., area, configuration, overlap) and movement patterns for focal species (e.g., flying squirrels, woodrats) in order to evaluate how these vary across forest treatments. Such work is important to quantifying the underlying mechanisms by which these treatments influence small mammals, and it relates to reproductive strategies and temporal/spatial variability in such strategies.

### **Future Direction:**

This module is one of five integrated study modules intended to evaluate land management strategies within the area covered by the HFQLG Pilot Project. In order to maximize the value of what is learned through our research efforts, it is imperative that we continue to maintain and improve collaborative efforts with other study modules and examine small mammal responses to forest management treatments at appropriate scales. A majority of ecological studies have occurred on a short temporal scale. Our module has been very successful at studying short-term trends in small mammal distribution and abundance and habitat relations at both microhabitat (den-level) and macrohabitat (home range, stand-level) scales. Long-term studies provide opportunities to examine ecological processes at various temporal scales, and without such data, it is difficult to assess the significance of changes in abundance of small mammals that may experience long-interval oscillations or experience a lag effect to forest management treatments. Thus, future directions of this module should include an emphasis on long-term data (>10 years) obtained at a variety of spatial scales. Particular emphasis should be placed at the landscape scale, a scale at which some of the important National Forest management activities today are carried out and a scale at which predator population response (e.g., density of spotted owls) is typically investigated.

### **Location:**

The location for this study is on portions of the Plumas National Forest, including much of the land base for the HFQLG Pilot Project within the westside coniferous forests. The HFQLG Pilot Project includes approximately 2.5 million acres within the Lassen, Plumas, and Tahoe National Forests.

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