Plumas/Lassen Study
2004 Annual Report
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Introduction

The Pacific Southwest Region and the Pacific Southwest Research Station agreed in 2002 to jointly develop and fund an administrative study to fill management information needs concerning the relationship between management-caused changes in vegetation and their effects on spotted owl habitat and population dynamics. The original impetus for this study is in the Record of Decision (ROD), dated January 12, 2001, for the Sierra Nevada Forest Plan Amendment (SNFPA), Final Environmental Impact Statement (FEIS). In this document the Regional Forester presented his decision to amend the Pacific Southwest Regional Guide, the Intermountain Regional Guide and land and resource management plans (LRMPs) for national forests in the Sierra Nevada and Modoc Plateau. Among the elements of this decision was a commitment to develop in collaboration with PSW, a Study that would examine the relationship between management-caused changes in vegetation and their effects on spotted owl habitat and population dynamics. The Regional Forester specifically stated in the ROD:

> "Under the procedures of the adaptive management strategy in this decision, the Forest Service will cooperate with the Pacific Southwest Research Station to design and implement an administrative study to examine the relationship between management-caused changes in vegetation and their effects on spotted owl habitat and population dynamics. I would expect group selection provisions of the HFQLG pilot project as well as other treatments to be used in carrying out this study. The administrative study is intended to investigate the response of the California spotted owl and its habitat, particularly populations of prey species features of their habitats, to various silvicultural treatments."

This intent was reaffirmed in the January 2004 ROD for the Final Supplemental EIS. However, the focus of this work has changed from the original intent expressed in the 2001 ROD to what is now intended by the 2004 ROD. This is discussed below but in short, the work being done now is oriented towards understanding the response of an array of key forest elements to the set of management activities prescribed for in the HFQLG pilot project.

Purpose of the Study

This study is interdisciplinary, examining at least five groups of response variables (spotted owls, small mammals, terrestrial birds, vegetation, and fuels conditions) through collaboration between researchers of the USDA Forest Service Pacific Southwest Research Station (PSW) and cooperators from the Universities of California, Berkeley and Davis, and the Point Reyes Bird Observatory. The study addresses some of the most significant uncertainties that confound management decisions in the Sierra Nevada today, including in the HFQLG Pilot Project Area. How do old-forest-dependent species respond to vegetation management over space and time? Do fuels management approaches effectively address fuels loadings without negatively affecting species viability? How effective are landscape level fuels management strategies in modifying

fire behavior and reducing the extent and severity of wildland fire? These and related questions are the focus of the work being done in this study.

Objectives of Study

The original overarching objective of this proposed research was to address an array of related ecological questions in a coordinated, integrated effort, thereby providing empirical data to inform future management decisions. The landscape scale of this design was both the driving force addressing the key questions as well as the largest impediment to successful construction of a scientifically credible experimental design. Our research team believes that assessing many of the key elements of forest ecosystems should be done over larger spatial and temporal scales than has typically been investigated in past research. The important difference we are investigating is the response to changes in forest structure and composition over space and time rather than simply site specific and immediate response. We believe this difference is especially relevant to forest management practices that are designed for large landscapes, executed over relatively long time frames, such as landscape level fuels treatment strategies.

The proposed research program is designed to address the three principal issues described below. These issues are specifically addressed through research questions and attending hypotheses for five different research components of this research program. These specific questions, and our ability (or lack thereof) to address these questions in an experimental manner, are detailed in the individual study plans for each module. Here we simply highlight the main objectives of the integrated research program and summarize the primary research questions that we plan to pursue.

- ***Wildland Fire Behavior and Protection.*** How do landscape level fuels and silvicultural treatments affect potential fire behavior and effects? Are specific combinations of defensible fuel profile zones (DFPZs) and subsequent individual tree selection or area treatments to thin the matrix effective in reducing the extent and severity of wildland fires? Are realized fire management benefits consistent with hypothesized results in reducing fire risk and altering fire behavior?

- ***Landscape Dynamics.*** How do combinations of DFPZs, subsequent individual tree selection or area treatments to thin the matrix, group selection, riparian protection standards, and species-specific protection measures affect landscape dynamics such as forest structure, composition, and succession at multiple scales of space and time?

- ***Species Viability.*** Induced by a forest management regime, how will old-forest-dependent species, particularly the California spotted owl and its prey base comprised of various species of small mammals, respond to changes in vegetation composition, structure, and distribution over space and time? How is response to

treatments manifested at the individual and population levels of biological organization?

These issues are all encompassed in a dynamic forest ecosystem that is subject to natural processes of growth and mortality as well as vegetation manipulation through management and uncontrollable forces of fire, weather, and sporadic infestations of insects and pathogens. All components of a forest respond to the dynamic nature of a forest ecosystem (both natural processes and human-induced changes) through continual adaptation across the landscape over space and time. Forest ecosystems and their component species have evolved to cope with change. The question we pose is how does contemporary forest conditions (structure, composition, etc.) combined with forest management strategies influence forest ecosystem response? Are these new combinations of change within the bounds of historical variation that forest elements are capable of coping with? Will the changes lead to re-establishment of a resilient forest?

Similarly, addressing each major issue requires addressing multiple component issues or questions. For example, the issue of DFPZ efficacy can be addressed by considering such questions as initial treatment levels, maintenance, or location in the landscape. These are constituent questions that are limited to the area directly within the DFPZs. A complete understanding of DFPZ efficacy, however, requires a larger view that encompasses fuel conditions across the broader landscape, prevalent weather conditions, potential ignition sources, and the placement of other DFPZs. Adding to the complexity is the simple fact that no two DFPZs are identical; each is an artifact of individual design requirements under which it is constructed and maintained, and the unique properties and history of its location. Thus we need to devise our work in a manner that can enable understanding of how forests respond to treatments at multiple spatial scales and over long time periods. We believe this is important to better appreciate the complete and long-term effects, both potentially positive or negative, that will result from treatments.

Below we provide brief summary statements that capture the essence of the questions we are pursuing under this new research agenda. These questions are similar to the original research agenda developed by the research team for the Plumas Lassen study; however, due to changes in management direction our work now is largely observational, oriented around examining a series of case studies where treatments are planned under the HFQLG Pilot Project. We also have included some more experimental work at smaller spatial scales, where the opportunity has presented itself. We are still interested in, and pursuing, work that allows a better understanding of ecological response at as large a spatial scale as possible, albeit with a diminished strength of inference due to necessary adjustments in study design. Nevertheless, we are confident that the results from this work will add important new scientific insights on key management questions.

The specific management questions that are being addressed within the five different research components are:

Fuels and Fire Module

1) How do current fuels conditions affect potential fire behavior and effects?
- What are current fuel loads and ladder fuel conditions prior to treatment?
- What is the range of potential fire behavior given current conditions?
- What are likely effects of fire behavior on these landscapes as determined by simulation models?

2) How will fuels treatments (i.e. DFPZs and other management applications) change fire behavior and effects?
- How does the installation of Defensible Fuel Profile Zones (DFPZs) affect fuel loading?
- How does the placement of DFPZs affect potential fire behavior? Do they reduce the risk of catastrophic fire under extreme weather conditions? What effect would DFPZs have on resulting fire effects? Would the reduction in total fire extent and intensity reduce the severity and extent of canopy fires?
- What is the spatial efficiency of DFPZs for fire suppression and how do other spatially-allocated strategies compare?

3) What are the links between changes to landscape vegetation (treatment, fire) and associated spotted owl habitat? (in collaboration with the Owl Module)

Vegetation Module

1) What are the effects of canopy reduction due to thinning treatments on understory microclimate and shrub cover? How do we accurately measure changes in canopy cover to meet management prescriptions?

2) What are the appropriate ecological conditions to induce regeneration of shade-intolerant conifer species?

3) What is the influence of group selection openings on abiotic factors that guide plant community development?

Small Mammal Module

1) What are the habitat associations of the different taxa of small mammals found in coniferous forests in the northern Sierra Nevada (objective of developing refined yet functional models of habitat associations)? What is the relative abundance and distribution of these taxa with respect to forest structure and composition?

2) Estimate values of the demographic parameters (for example, population size, reproductive output, survivorship, and mortality rates) of these taxa.

3) Estimate values for spatial patterns (for example, home range area and configuration) for these taxa.

Bird Community Module

1) Do current forest management practices promote an ecologically balanced forest ecosystem that supports sustainable populations of the breeding bird community over time?

2) What are the critical local-scale habitat components and landscape-scale composition elements that should be managed for in order to sustain the avian community over time (20 to 50 years)? Can we predict species composition, abundance, and distribution in response to future landscape treatments?

3) How do, or will, a suite of avian species that are associated with a wide range of forest conditions respond to fuels treatments, at the local and landscape scales in the short (one to five years) and long term (five to 20 years)?

4) Do Spotted Owl protected activity centers provide high quality habitat for the broader avian community? What are the differences in the avian community composition within owl territories compared to the surrounding landscape?

California Spotted Owl Module

1) What are the associations among landscape fuels treatments and CSO density, distribution, population trends and habitat suitability at the landscape-scale?

2) What are the associations among landscape fuels treatments and CSO reproduction, survival, and habitat fitness potential at the core area/home range scales?

3) What are the associations among landscape fuels treatments and CSO habitat use and home range configuration at the core area/home range scale?

4) What is the population trend for CSOs in the northern Sierra Nevada and what factors account for variation in population trend?

5) Are barred owls increasing in the northern Sierra Nevada, what factors are associated with their distribution and abundance, and are they associated with reduced CSO territory occupancy?

6) Does West Nile Virus affect the survival, distribution and abundance of California spotted owls in the study area?

Summary

This work represents some significant scientific study that has occurred over the last three years and is expected to continue over the next five years within the HFQLG Pilot Project area. At the conclusion of the pilot project the HFQLG Act requires the Forest Service to commission a team of scientists to evaluate the pilot project and provide the Forest Service with guidance on the efficacy of the work and what were the environmental consequences on the natural resources of the geographic region. The results of these studies are intended to provide valuable, objective scientific insights that managers will need to develop subsequent management direction for the Plumas and Lassen National Forests, as well as other National Forest lands in the northern Sierra Nevada such as the portions of the Tahoe National Forest that contain similar ecological conditions.

We cannot ignore or deny the fact that designing a credible and useful research program in this area has been challenging to say the least. We want to be clear to all interested parties that the Pacific Southwest Research Station was asked to become involved in this project and for the purposes stated in the introduction above and we responded with the intent to provide as much new scientific learning as would be possible. PSW knew that we would be entering into efforts that would have many more challenges than research projects typically encounter. Our goal was to contribute as much as we could to the better understanding of forest ecosystem response to fuels and other forest management practices as they are manifested at a landscape scale.

We understand there is some uncertainty and sometimes controversy over how various forest elements will respond to planned forest management practices. This is likely to be the case under any chosen management regime. The objective of PSW was to tackle the difficult scientific challenges derived from the salient management questions as best as we could. PSW, as a research organization, remains wholly objective in executing this charge. We have assembled an excellent team of scientists with the appropriate areas of expertise and we have done the best we can to design our work to address the important questions. Many of these questions present significant challenges to experimental design of field ecology experiments and management constraints further constrain our ability to test questions with traditional hypothesis testing approaches. Nevertheless, we have invested three years of effort to develop the research approach for this work and have moved forward in defining the scientific opportunities, as they are now described below and in the attending detailed study plans for each of the five modules. These detailed research plans are now available for anyone interested in more detail. We expect to make the most of these opportunities in advancing our scientific understanding of forest ecosystem response to management practices.