# Invited Feature

## Projecting Forest Policy and Management Effects across Ownerships in Coastal Oregon[1]

Two of the most fundamental questions in forest ecosystem management are: (1) What are the consequences of different forest management practices? and (2) How do they vary with spatial and temporal scale? The forest management controversies of the 1990s in the Pacific Northwest revolved around these questions and led to major new forest polices in the region for federal and state lands, as well as considerable modification of forest polices for private forest lands. In the Coast Range Physiographic Province in Oregon, for example, new and separate policies across all ownerships—federal, state, and private lands—have been initiated in the last 15 years. The Northwest Forest Plan for federal forests made ecosystem management the foundation of forest management and reduced timber sales there by over 90% compared to the 1980s. The new forest plans for the state forests of Oregon significantly refocused management toward a greater recognition of biodiversity values. Changes to riparian policies for private lands were also made during this period via the Oregon Forest Practices Act.

Although these policies were all based to a significant degree on the most current scientific information, no follow-up research was done to determine how well they might meet their individual goals in the future. It was even less clear whether or how any ecological or economic interactions among ownerships in this policy-diverse region would come into play. Until recently, our conceptual and quantitative scientific models have been inadequate to distinguish among different policy approaches in a rigorous way. For example, during the Forest Ecosystem Management Assessment Team (FEMAT) assessment for the federal lands, it was not possible to quantitatively project the effects of different policies on aquatic and terrestrial habitat and socioeconomic factors across an entire multi-ownership area. Without more rigorously developed conceptual and analytical models, it would remain impossible to evaluate the potential for cumulative impacts of these different policies on ecological and socioeconomic values over entire large landscapes (e.g., provinces or regions) or over multiple decades.

In response to these needs a group of scientists initiated a research project in the mid-1990s to study the effects of forest policies on ecological and socioeconomic aspects of forests at spatial and temporal extents larger than typical landscape studies. The project selected the Coast Range of Oregon, a 23 000 $km^2$ area of steep mountains, narrow valleys, and productive conifer forests. The province is also a mosaic of forest owners whose goals range from intensive timber management to wilderness protection. The research project, titled the Coastal Landscape Analysis and Modeling Study (CLAMS), was designed to develop and evaluate concepts and tools to understand pattern and dynamics of provincial or subregional ecosystems such as the Coast Range and to analyze the aggregate ecological and socioeconomic consequences of different forest policies and strategies across multiple ownerships. CLAMS was also an experiment in "anticipatory assessments" in which an independent group of scientists uses current and expected policy issues as the focus for research that could help policy makers and stakeholders to see unintended consequences of current policies to compare with consequences of new policies, and thereby possibly avoid future policy crises.

In this Invited Feature we present the major findings of this decade-long research effort. CLAMS is a highly integrated effort in the sense that all of the studies focused on the same overall question: How might current and alternative policies and forest management activities affect ecological and socioeconomic conditions within and across ownerships at multiple spatial scales? To answer this question the studies shared the same spatial databases, simulation models, spatial resolution, time frame, and measures of forest structure and composition.

In the first paper, Spies et al. provide an overview of the results related to how current policies might affect ecological and socioeconomic measures across the entire province and within ownerships. They point out that, while many of the trends over the next 100 years appear to be

[1] Reprints of this 88-page Invited Feature are available for $10.00 each, either as PDF files or as hard copy. Prepayment is required. Order reprints from the Ecological Society of America, Attention: Reprint Department, 1707 H Street, N.W., Suite 400, Washington, DC 20006 (esaHQ@esa.org).

consistent with the new policies, some components of biological diversity, such as diverse early successional stages and hardwoods, may not be well accounted for under the current policies. They also find that biodiversity goals for many of the major ownerships are too vague to determine if the plans will be successful under the assumptions that were used.

Ohmann et al. evaluate how current conditions of vegetation are related to environment, disturbance, and ownership. They find that forest composition is strongly associated with physical environment but is relatively insensitive to disturbance. However, forest structure is strongly correlated with ownership and disturbance patterns. Their spatial model of forest structure and composition also provides the starting conditions that are used by the other studies to project effects of current and alternative forest policies.

Johnson et al. simulate how land-use change and forest management might alter forest conditions, timber production, and economic indicators over 100 years under current and alternative policies. They find that under current policies, older forests will increase on public lands, hardwoods will decrease on all ownerships, and most timber production will come from private forest lands. Major increases in development were projected for the margins of the Coast Range. The contrast in pattern of forest conditions among ownerships increases. Two alternative policies were also examined: increased retention of wildlife trees on private lands at final harvest and reduced restoration thinning in plantations on federal lands.

Spies et al. use a variety of focal species habitat models and forest structure and dynamics indicators to examine how measures of terrestrial biological diversity would change over 100 years under the current and alternative policies modeled by Johnson et al. Habitat for the Northern Spotted Owl (*Strix occidentalis*) and Marbled Murrelets (*Brachyramphus marmoratus*), both listed under the Endangered Species Act, increased strongly on federal and state lands as did the area of forest with high levels of old-growth stand structural development. Conversely, the area of diverse early successional forest declined across all ownerships.

Burnett et al. evaluate the distribution of potential salmon habitat based on physical features of streams and watersheds. They also examine how riparian forest vegetation would change under current policies. They found that most of the high intrinsic potential habitat for coho salmon (*Oncorhynchus kisutch*) occurs on private forestlands while most of the high potential for steelhead (*O. mykiss*) occurs on public forestlands. Changes in riparian vegetation under current policies lead to an increase of large conifers along all streams but at much lower rates on stream reaches that have high intrinsic potential for coho.

CLAMS was an experiment in anticipatory assessment for policy makers and other stakeholders. Johnson et al. discuss the lessons learned from working at the interface of scientists, policy makers, and the public. They conclude that CLAMS was successful in developing models and understanding policy effects at multiple scales. They also find, however, that so far policy makers have shown relatively little interest in independent evaluations of existing and alternative policies at broad scales. The reasons for this are numerous. Not the least of these is the fact that policy institutions operating at this scale are generally too weak or do not exist, and that interest in environmental policy analysis stems as much from the pursuit of power as the pursuit of knowledge. Also, biodiversity problems often are framed at finer or coarser scales than a subregion or province. Nevertheless, cross-boundary issues will not go away: species and ecosystems do not respect lines on maps depicting ownership.

CLAMS clearly demonstrates that policy differences and variations in management practices across owners can result in major differences in biological diversity and that there can be unintended consequences as a result of uncoordinated policy development. Given the political constraints, policy-focused science will have to be patient, but ecological research will be better able to contribute in the future if it can develop better tools for understanding the complex mix of combined forest policy effects, both today and into the future.

—Thomas A. Spies
Guest Editor
*USDA Forest Service*
—K. Norman Johnson
Guest Editor
*Oregon State University*

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