The Kings River Sustainable Forest Ecosystems Project: Inception, Objectives, and Progress[1]

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Abstract

The Kings River Sustainable Forest Ecosystems Project, a formal administrative study involving extensive and intensive collaboration between Forest Service managers and researchers, is a response to changes in the agency's orientation in favor of ecosystem approaches and to recent concern over issues associated with maintenance of late successional forest attributes and species that are closely associated with them, such as the California spotted owl (*Strix occidentalis occidentalis*). Planning for the project began in mid-February, 1993. A prescribed burning program was already underway in the project area then, and the first vegetation treatments were initiated in 1997. Two additional projects involving treatment of vegetation are nearing implementation. A demographic study of the spotted owl, begun in 1990, already encompassed most of the project area, and it was enlarged in 1994 to cover the entire area. Other research projects were initiated in 1994 and 1995, and results of those are beginning to come in. An appendix lists 77 technical papers, abstracts, theses, and dissertations that were completed through 1999, based on work associated with the project, and one extensive database on the distribution and habitat associations of California's plant species, which is now available on the Internet.

Ecosystem management aligns different uses of the land with ecological parameters and goals of environmental quality. An important USDA Forest Service mission is to balance the multiple uses of its lands in an ecologically sustainable way. This challenge has been significant for National Forests of the Sierra Nevada, especially with controversies over the effects of even-aged timber harvest on old-growth forests and their associated wildlife, such as California spotted owls. Much of the concern stems from loss of habitat attributes—closed-canopied stands, very old trees, large snags and downed wood, and multiple structural layers—believed to be needed by the owl and other wildlife species. Several of these attributes are also believed to be vital for sustaining healthy, productive forests.

The Kings River Sustainable Forest Ecosystems Project involves a formal administrative study and associated research, with joint leadership and collaboration among line officers and staff of the Sierra National Forest, the Kings River Ranger District, and the Pacific Southwest Research Station (PSW). District personnel are implementing two landscape-level management options, at watershed scales, while researchers study the effects of those options on various forest resources and values. Persons involved with the project are optimistic that both options, with minimal "zonation" for special needs, will sustain all key resources (soil, water, vegetation, and wildlife) and functions of

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the ecosystems involved, while reducing risks of catastrophic fire, restoring fire as a forest ecosystem process, promoting forest health, allowing sustainable levels of commodity extraction, and supporting recreational use by the public.

Inception of the Project

On January 13, 1993, Ronald E. Stewart, Regional Forester of the Forest Service's Pacific Southwest Region, released the decision notice for an Environmental Assessment (USDA 1993) that provided interim guidelines for the California spotted owl, amending the Land and Resource Management Plans for all National Forests of the Sierra Nevada that have spotted owls. Better known as the CASPO EA (California Spotted Owl Environmental Assessment), this document markedly changed options for timber management in National Forests of the Sierra Nevada for an interim period of 2 years, effective on March 1, 1993, while longer-term plans were to be developed through a new Environmental Impact Statement covering those National Forests. It was evident from the EA that new directions were needed for managing National Forest lands in the Sierra Nevada, not just for the owl but for many other resources and values as well. In response to this new situation, and with encouragement from the Pacific Southwest Region to initiate an administrative study in ecosystem management, a small group of scientists and managers from the Sierra National Forest and PSW's Forestry Sciences Laboratory in Fresno met in mid-February, 1993, to discuss options. A coordinating group with members from the forest, the district, and PSW was formed after this meeting. This group continued to meet over the next few weeks and soon agreed on the basic features of a study plan that eventually developed into the current project.

The District has dedicated to the project two adjacent watersheds—Big Creek and Dinkey Creek—each of about 32,000 acres (*fig. 1*). The selection of these watersheds was based on their accessibility; their similarity in size; and the fact that a demographic study of the California spotted owl, begun in 1990, encompassed most of the project area. Forests in the Big Creek watershed are

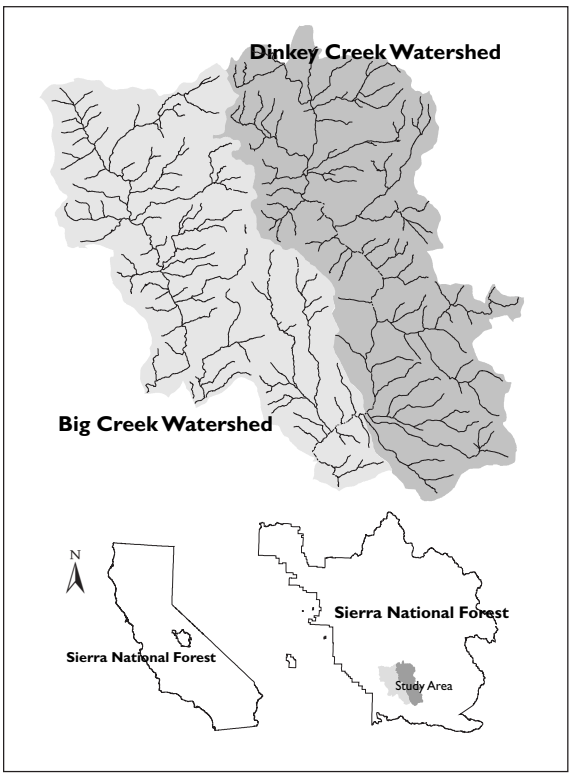

Figure 1—The Kings River administrative study area in the Sierra National Forest in central California includes the 64,000-acre Big Creek and Dinkey Creek watersheds (indicated by shading).

dominated by ponderosa pine (*Pinus ponderosa*) forest, with a small component of mixed-conifer type. Shrubs, attributable in part to natural land potential and in part to past logging and fire history, dominate much of the landscape. Proposed management in this watershed emphasizes uneven-aged, small-group selection with a 200-year rotation. An expected benefit of this strategy is reduction in the reliance on zoning to meet various resource needs and public values. Riparian values, however, will be maintained by zone-specific standards and guidelines, but the final strategy there is open to adaptation as the current debate within the Sierra Nevada Conservation Framework may point to an approach that would benefit from applied research. Fuel reduction treatments will be situated strategically to reduce the likelihood of wildfires spreading up the canyon into the community of Shaver Lake.

The Dinkey Creek watershed is dominated by mixed-conifer forests with a small component of ponderosa pine forest, and influences of past logging and fire are less extensive there than in the Big Creek watershed. The management emphasis for Dinkey Creek is to develop a three-tiered landscape with different objectives in each—a late-seral riparian area with infrequent fire and little or no timber harvest and an emphasis on habitat maintenance and/or restoration (about 20 percent of the watershed); a mid-slope transition area (about 50 percent of the watershed) with forest cover averaging at least 40 percent crown closure; and an upper-slope/ridge-top area (about 30 percent of the watershed) managed by thinning and prescribed burning to create fuelbreaks in the form of open, park-like forests of evenly spaced trees and canopy closure of about 40 percent. The management strategy for the mid-slope transition area is still pending, with approaches like uneven-aged, single-tree selection or perpetuation of a two-layered forest structure under active consideration. The Dinkey Creek watershed includes an existing furbearer management area, established in 1992 by the Sierra National Forest's Land and Resource Management Plan, which will influence the choice of an approach for sustaining the forest.

In spite of the substantial commitments of time and funding by all participating entities, it was clear from the beginning that available funds would substantially limit both the management and research activities needed to generate a worthwhile administrative study. Coincidentally, the Forest Service proposed for fiscal year 1994 a special appropriation for ecosystem research and, in March of 1993, the Washington Office issued a request for proposals from all research stations to compete for these funds, assuming that Congress would allocate them. PSW submitted a successful proposal, based on the study design developed by the coordinating group, and Congress did pass the special appropriation for ecosystem research. The result was a near doubling of PSW's operating budget available to support research in the project area. This additional funding was renewed each year through fiscal year 1998. Beginning with fiscal year 1999, it was added to the base funding for PSW's laboratory in Fresno, which provided secure funding for this research, at least for several years.

At about the same time, the Pacific Southwest Region requested proposals from all National Forests in the Sierra Nevada for support of projects in ecosystem management. Again, based on the study design being developed for the Kings River Project, the Sierra National Forest submitted a successful proposal to the Regional Office for funds to offset administrative costs of implementing its part of the collaborative study. Since that time, the forest has been successful in its yearly request for this additional funding.

Objectives

General Objectives

A primary goal of the project is to maintain nearly continuous forest cover with significant numbers of older trees, large snags, and large logs well-distributed throughout both watersheds, while restoring fire to its former role as

a dominant process in these ecosystems. A second general objective, though without the rigor of classical adaptive management, is to learn something through research and monitoring from every management action. Implementing the landscape-level silvicultural treatments, with accompanying research into the effects of those treatments on various ecosystem components and functions, provides an inherent feedback system. Results from studies can be applied in the next round of management planning, leading to modifications more likely to result in desired future conditions. Thus, the two processes advance together, each complementing the other.

Specific Objectives

Specific objectives of the project include:

- Determining the feasibility of applying small-group selection as a landscape-level silvicultural treatment in ponderosa pine and mixed-conifer forests of the western Sierra Nevada of California, following the planning and implementation procedures of a typical Forest Service Ranger District.
- Comparing two promising, landscape-level alternatives for multi-objective management to ensure long-term maintenance of California spotted owls, while retaining all other resource values, improving forest health, and developing a sustainable level of land productivity.
- Determining interrelations of various forest components and their responses to small-group selection harvests and to a three-tiered forest landscape treatment of watersheds.
- Evaluating effects of these alternate strategies on multiple forest components, wildlife species, biodiversity in general, ecosystem functions, soil/plant processes needed to sustain long-term forest productivity, and on plant species likely to become locally rare.
- Demonstrating the use of distributional data sources and geographic information systems (GIS) to identify concerns about critical plant biodiversity at the landscape level.

Progress

Management

The Kings River District has established a core interdisciplinary (ID) team that includes a planner, a forester, a biologist, and a GIS specialist to develop a Landscape Analysis Plan consistent with the existing Land Management Plan for the Sierra National Forest. Other specialists are engaged in this process as needed. In 1997, the ID team released a draft Landscape Analysis Plan for review and comment, and the plan is currently in revision based on comments received. The draft plan proposed desired future conditions for both watersheds and delineated mechanisms for using feedback from implementation of the two strategies to gauge progress toward desired future conditions. To better understand effects of the treatments on various forest resources, the district is collecting data on existing vegetation (both live and dead), comparing two approaches to watershed analysis, chronicling past fire history in each watershed, and monitoring the effects of prescribed burning.

GIS mapping layers are now in place for a variety of general elements (topoquads, CALWATERSHEDS [as designated by the California Interagency Watershed Mapping Committee], soils, roads, streams, vegetation, and fire history) and special features (Ecologic Unit Inventory study plots; District vegetation sampling plots; Protected Activity Centers for California spotted owls; spotted owl nest tree locations; forest bird study plots; deer holding areas,

migration routes, and winter ranges; and furbearer management zones). Other layers are being developed. These electronic files are essential for efficient evaluation of the effects of projects and for effective cumulative effects analyses over the full project area.

To date, progress is underway on three projects in both watersheds, using timber sales, prescribed fires, and mastication of shrubs and small trees to accomplish the work. In Dinkey Creek, the Indian Rock Upper Tier Project is under contract, but harvesting has not yet occurred. In the Big Creek watershed, the Bear Meadow project is currently in an advanced stage of planning, and the first stage of the 10S18 Fuel Reduction Project has been completed by using an uneven-aged, small-group selection strategy. This involved removal of commercial timber and treated approximately 1,000 acres near the upper end of the watershed. The project included extensive commercial thinnings to accentuate the existing uneven-aged structure and a large "defensible fuel-profile zone," essentially a shaded fuel break intended to alter the behavior of wildfire moving up the canyon from below in a way that would facilitate suppression efforts. The second stage of this project—mastication of the remaining surface fuels and standing small trees that contribute to fuel ladders—began in 1998; the first 200 acres is scheduled for completion in 1999. The final stage of this project, prescribed burning of residual fuels, will occur during the year after mastication. Substantial progress has been made with prescribed burning—a total of about 7,000 acres burned to date. More details of this activity, the uneven-aged management strategy, and project planning are covered in other chapters of this volume.

Research

The project allows scientists to work closely with professionals on the Forest and District and to foster directly the application of current scientific information for developing ecologically based management strategies, maximizing the public's investment in science, and adapting management to current information. Because the number, scope, and intensity of studies underway in the project area are limited by available funding, not all topics fundamental to a project in ecosystem research are presently under investigation. We present only a brief overview because details of the various studies form the basis of other chapters in this volume.

The largest study involves the demography of California spotted owls in the project area and in an additional 100,000 acres surrounding the 64,000-acre project area. As a further control, a demographic study of spotted owls is underway in Sequoia/Kings Canyon National Parks in unharvested forests of the same types found in the project area. These studies were initiated in 1990 and include annual efforts to locate and color band (for individual recognition in the field) all spotted owls within boundaries of the study areas. In addition, diets of the owls are sampled annually by collection and analysis of pellets (aggregations of bones, fur, feathers, etc. of captured prey, which are periodically regurgitated by the owls and can be collected from the ground beneath their roosts and nests). Productivity of the owls in relation to forest stand structure and composition, and to precipitation and temperature, are under investigation.

Other studies are investigating the abundance, nest success, and productivity of all species of forest birds; ecology and population status of small mammals; ecological relations of below-ground fungi (truffles); plant species diversity in relation to stand treatments; effects of treatments on soil structure and productivity; and distribution and relative abundance of martens and fishers. Plans are underway to initiate studies of aquatic ecology in the project area.

Coordination

The collaborative nature of the project, and the shared leadership between Forest Service research and management branches, has required continual dialogue among all parties. To facilitate this activity, representatives of the Sierra National Forest, the District's ID team and District Ranger, and one or more scientists from PSW's Forestry Sciences Laboratory in Fresno have bimonthly coordination meetings. In addition, we meet in the intervening months for "brown bag lunch" sessions with the same group and any others from these administrative units who wish to participate. These meetings have proven to be invaluable and may be a primary reason why the project has run so smoothly.

Public Involvement

Some members of the public have taken an active interest in the project and participate regularly in field trips, comment on project plans, suggest alternate management scenarios, and in other ways contribute significantly and positively to the planning and implementation of the project. In addition to the usual procedure of soliciting public comments on planning documents, we have actively sought public input through direct experience with the project area via field trips during periods when weather and road conditions permit. The first of these occurred on August 4, 1994. Since then, we have hosted 23 additional field trips involving congressional staffers; academicians; representatives from the timber industry and the environmental community; scientists with specialties in forestry, botany, wildlife biology, fire and fuels, silviculture, atmospheric pollution, hydrology, soils, and others; top line and staff officers from the Forest Service's Pacific Southwest Region and PSW; interested citizens; and even a reporter from the *Fresno Bee*, which resulted in a complimentary article in the 1 December 1997 issue of the *Bee*.

Technology Transfer

The application of new information to management planning and applications is typically a slow process. In the present case, however, relevant new information can be shared immediately among members of the team, undergo scrutiny and discussion, and be evaluated in relation to our existing plans. This is the starting point for adaptive management. Plans typically identify desired future conditions and set forth procedures for attaining those conditions. If implementation of the plans fails to produce the desired conditions, feedback of that information into later planning should result in adapting management accordingly in the hope of doing a better job the next time. In the beginning, we anticipated a marked lag between implementation of a project and any realization that we might do it better, and in what ways. Certainly this will be true for much of what we learn during the life of this project. On the other hand, we've come to realize that the field trips—when various specialists have an opportunity to walk through and directly assimilate the results of a project in relation to their special knowledge—generate lively discussions and a surprising number of concerns, insights, and constructive suggestions. Already, initial visions have undergone some changes, even without results from formal studies. These have involved such items as crown volume as a structural attribute of forests important for various wildlife species, implications of different methods for estimating canopy cover, and ways to sustain some number of trees that can become very old and decadent and eventually die as a result of some natural agent.

Even though most of the project's studies are relatively young, several technical papers have reported on results (*appendix A*), and several talks have been presented at workshops, symposia, and meetings of professional societies. The small group of persons who initially proposed the Kings River Sustainable Forest Ecosystems Project, in mid-February of 1993, envisioned a very long-term effort to get answers to some of the critical questions—on the order of 50 to 100

years! Obviously, this will outlive most or all persons presently engaged. The longer the project survives, however, the more likely it is to produce important, and unequivocal, findings. We believe this is a role that the Forest Service can serve, probably better than any other entity. This agency not only manages an extraordinarily large landbase but also has the potential to sustain individual projects well beyond the lifespan of any one person. As we move forward with an emphasis on ecosystem management and ecosystem research, the Forest Service might profitably emphasize its truly unique position to carry on large-scale, long-term projects and studies. Finally, we re-emphasize the experimental nature of the Kings River Project. It is envisioned as continuing for decades, and its directions are expected to change with time as we learn from studies along the way. The work is intentionally manipulative so that responses can be gauged and new directions crafted accordingly, in the spirit of adaptive management.

Acknowledgments

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Appendix A

This appendix lists products resulting from research associated with the Kings River Sustainable Forest Ecosystems Project. This list is current through 1999, with citations updated for "In press" papers that were published by the end of 2001.

Publications, Papers In Press, and Papers Submitted

Bidartondo, M. I.; Kretzer, A. M.; Pine, E. M.; Bruns, T. D. [In press]. **High root concentration and uneven ectomycorrhizal diversity near *Sarcodes sanguinea* (Ericaceae): a cheater that stimulates its victims?** American Journal of Botany.

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