

Prescribed Fire Review Sparks Studies of Giant Sequoia-Fire Interactions

By David J. Parsons

Challenges to the goals and methods for prescribed burning in the giant sequoia groves of Sequoia, Kings Canyon (SEKI) and Yosemite NPs have led to a major research program on fire and vegetation history, fire effects, fire and fuel modeling, and visitor perceptions of fire. The studies are in direct response to recommendations made in a 1987 report evaluating the use of prescribed fire in those areas.

In 1986 the NPS Western Regional Office appointed an independent panel to review the status of the prescribed fire management program for the sequoia mixed-conifer forests of the Sierran NPs. Despite nearly two decades of using prescribed fire as a tool to reduce fuels accumulated during most of a century of fire suppression, many questions remained unanswered. The use of fire to create a desired effect had advanced beyond the understanding of both historical fire regimes and fire effects. Similarly, the articulation of objectives and quantification of standards by which to evaluate progress were in need of review.

Specifically, questions had been raised regarding the impact of fire suppression on fuels and forest structure, the effects of burning at different intervals and intensities, and the relative merits of managing for natural ecological processes as opposed to visual or scenic values. The latter was brought to a head when several individuals criticized the objectives of preserving ecosystem processes as compromising the protection of the giant trees for which the Sierran parks had been created. Concern was expressed that the black bark char on specimen sequoias and foliage scorch of understory trees resulting from prescribed burns were not acceptable.

The review panel appointed by the Western Regional Office included experts in vegetation and fire ecology (including specific familiarity with giant sequoia or other Sierran conifer forest types), visual resource management, and NPS policy. Individuals who had been actively involved in the development, implementation or critique of the prescribed fire program were not included on the panel. Dr. Norm Christensen, Professor of Botany at Duke University and Chairman of the Vegetation Section of the Ecological Society of America, was named panel chairman. The 7-member panel was also asked to evaluate the scientific basis for the program.

The final panel report was presented to Director Mott by Dr. Christensen in February of 1987. Along with recommendations on policy, objectives, implementation methods, monitoring and interpretation, the report identified a number of areas in need of additional study: The need for research on fire and vegetation history, life history and demography of giant sequoia and associated conifers, fuel dynamics, population and fire behavior models, user response to the burn program, and the effects of fire on pathogens, nutrient cycling, understory vegetation and fauna.

The panel felt that much basic information critical to the long term restoration of natural fire regimes was still lacking. The report, including the recommendations for additional research, was given wide coverage in the political, conservation and press arenas.

Following the attention given to the sequoia fire issue, the NPS has developed a multi-faceted research program. A combination of Washington, Regional Office and park funds, together with Forest Service and private support, has been used to address the majority of identified needs. Data being collected are expected to provide

the basis for standards to evaluate effectiveness of the prescribed fire program, both in reversing the impacts of fire suppression and in restoring a semblance of the historical fire regime. The research is a product of joint planning by Yosemite and Sequoia-Kings Canyon. Major studies undertaken to date are:

1) **Biogeography and Disturbance History of Sequoiadendron.** Dr. R. Scott Anderson (N. U/AZ) is using pollen and charcoal in meadow sediment cores to reconstruct 10,000 years of vegetation and fire history.

2) **Tree-ring Reconstruction of Giant Sequoia Fire History.** Dr. Tom Swetnam (U/AZ) is utilizing fire scars and cross-dating on sequoia stumps and logs to develop up to a 2,000 year fire history for selected groves.

3) **Age Structure of Giant Sequoia in Relation to Disturbance History.** This in-house project by David Parsons and Nate Stephenson (NPS-SEKI) investigates the effects of fire and climatic history on sequoia age structure and spatial patterning. It is closely coordinated with the previous two studies.

4) **Fuel Accumulation and Fire Modeling.** Dr. Jan van Wagtenonk (NPS-YOSE) is modeling fire and fuel dynamics in an effort to determine the natural range of fuel levels, number of prescribed fires necessary to bring fuel accumulations within that range, and intensities of those fires.

5) **Fire Effects on Forest Pathogens.** Dr. Doug Piirto (Cal Poly, San Luis Obispo) and Dr. J.R. Parmeter (UC Berkeley) are studying the effects of fire and fire suppression on pathogens associated with fire scars and roots as well as the cross-pathogenicity of decay organisms.

6) **Effects of Prescribed Fire on Forest Fuels and Soil and Cambium Temperatures.** Steve Sackett and Sally Haase (USFS Riverside Fire Lab) are studying nutrient cycling and temperature penetration in soil and cambium under different burning conditions.

7) **Conditions Influencing Seedling Establishment and Survival.** Stephanie Gebauer (Duke Univ.) is attempting to provide an understanding of the spatial heterogeneity of forest resources critical to conifer seedling establishment and survival.

8) **Visual Resource Management.** Dr. Kerry Dawson and Steve Greco (UC Davis) have applied principles of visual resource management to recommend that more heavily used areas be divided into relatively small units to prescribe burn on a rotating basis, thus assuring that park visitors are provided a full range of successional views.

9) **Visitor Perception of the Fire Management Program.** Dr. Joyce Quinn (Cal/State/U, Fresno) surveyed 1,000 park visitors to determine the understanding and level of support for the use of fire in giant sequoia management. The survey showed a high awareness and understanding of the prescribed fire program.

In addition to these major undertakings in direct response to the Christensen Report, a number of other studies are either underway or have been carried out in the past year relating the broad question of fire history and effects in the sequoia mixed-conifer forests of the Sierra Nevada. These include the use of micro-probe analysis to detect possible chemical signals of past fires in tree-rings, climate reconstruction from tree rings, Native American use of fire, size structure analysis of giant sequoia, fire induced mortality of conifers, impacts of fire suppression on forest aggregations, soil solution chemistry and nutrient cycling, ozone stress on conifers, and watershed biogeochimistry. Several additional

studies have been proposed for coming years.

Given a continuity of funding (already threatened due to budget restrictions) and opportunities to interact and apply the findings of these studies to the very real management problems of whether, when, where, how often and how hot to burn, this program has the potential to be one of the shining examples of applying science to everyday management challenges. The future promises clearer articulation of objectives and standards, which in turn, promises improved results in the struggle to preserve as near naturally functioning ecosystems as possible in this day of ever-increasing pressures from a modern technological society.

Parsons is a Research Scientist at Sequoia/Kings Canyon NPs.

Douglas-fir Old-Growth Posters Solicited

A symposium based on the results of research conducted by the USDA Forest Service Old-Growth Forest Wildlife Habitat Research program and cooperators will be held in Portland, Ore., March 29-31, 1989, based at the Portland Hilton hotel.

Scientific findings of wildlife and plant community studies conducted from 1983-86 in Douglas-fir forests of Washington, Oregon, and northern California will be presented. Patterns of vertebrate abundance, habitat use, and community structure will be reported from data collected in more than 150 stands occurring along an age gradient from young to old growth.

Posters are being solicited for related topics and will be presented at the Arlene Schnitzer Concert Hall in the Center for the Performing Arts. Poster abstracts will be published as part of the proceedings. Two copies of a 200-word abstract should be submitted by Jan. 31, 1989, to Dr. Mark Huff, USDA Forest Service, Forestry Sciences Lab, 3625 93rd Ave. S.W., Olympia, WA 98502; (206) 753-9494. Include title, all authors' names and affiliations, complete mailing addresses and telephone numbers.

Hawaii Book Covers Conservation Biology

Conservation Biology in Hawai'i, a collection of essays edited by Charles P. and Danielle B. Stone, is a 252-page book about Hawaii, by 32 authors, dedicated to recently deceased Hawaii Conservationist Wayne C. Gagne and to the premise that:

"Conservation biology is the combination of art and science, compromise and stubbornness, judgment and serendipity necessary to perpetuate some semblance of natural biological diversity on Planet Earth."

The book begins with Hawai'i's uniqueness, from origin to soils and biota, and describes in detail the plant and animal life - including alien plant and animal organisms and means for preserving and controlling the various species. Biological diversity and special communities, problems and planning, tourism, vegetation mapping, land use priorities, protection of natural habitats, and gene pool conservation are among the topics covered. Five essays look at conservation education - perspectives, history and problems, techniques and targets, classroom needs, and public media. Three essays on values and ethics wind up the volume.

The Stones, a husband/wife team, both work at Hawaii Volcanoes NP. Word from Research Scientist Chuck Stone is that the book will be on sale through the University of Hawaii Press by the time this issue of *Park Science* appears. Cost is \$16.