

FIRE AND LANDSCAPE DYNAMICS IN YELLOWSTONE NATIONAL PARK

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Objectives

This study is an investigation of long-term patch dynamics in the mosaic of forest communities covering the subalpine plateaus of Yellowstone Park. Our specific objectives are the following:

1. We will map the present forest mosaic of a 600,000-ha area, showing the age (number of years since the last destructive fire) and successional stage of each more-or-less homogeneous patch of forest;
2. Using this map, we will measure the area of each patch created by past fires, determine the size distribution of patches, and estimate the frequency and predictability of formation of patches of each size; and
3. We will reconstruct the changes during the last 200-300 years in individual forest stands and in the entire landscape mosaic, and use these reconstructions to answer the following questions:
 - a. Has the Yellowstone landscape been characterized by quasi-equilibrium conditions, in which the proportion of the total area covered by early, middle, and late successional stages and the diversity of plant communities represented have remained more-or-less constant, or have these parameters fluctuated greatly in the last 200-300 years?
 - b. If we find that the entire landscape has been in a state of equilibrium (which we may not find), then what is the minimum land area necessary for landscape dynamics to approach this condition, i.e., to what extent could the Park be divided into isolated subunits without these subunits losing the quasi-equilibrium state?
 - c. How have the proportions of forest successional stages varied over time in units of the Park that have special ecological interest, such as elk summer range, grizzly bear habitat, or the watershed of Yellowstone Lake?

The information gained from this research hopefully will shed some light on current theoretical questions regarding the prevalence of equilibrium vs. nonequilibrium conditions in natural ecosystems (White 1979, Shugart and West

1981, Romme and Knight 1982). It may also be useful in interpreting and managing recent ecological changes in Yellowstone Park. The project has been funded by the National Science Foundation (Grant No. BSR-8408181). We collected field data in the summers of 1984 and 1985, and expect to complete the research in 1987.

Methods

Mapping of the forest mosaic is being done by two teams of four persons each (mostly undergraduate and graduate students). Fairly homogeneous patches are located in the field using cover-type maps prepared by D. G. Despain from aerial photographs. In each stand, the teams collect increment cores from dominant trees and wedges from fire-scarred relicts (where available) to be used in determining stand age and fire history (Arno and Sneck 1977). They also subjectively classify the stand into one of six successional stages (Despain 1977). The cores and fire-scar wedges are returned to the laboratory for analysis. Once the map has been completed, we will reconstruct the forest mosaics that existed at various times in the past using methods described in Romme (1982).

Results

We began our field work in August, 1984, with an intensive training session for the field workers. Each team was then assigned a specific area in which to work, and by summer's end we had sampled approximately 100 stands. In 1985 we sampled another 250 stands. We are presently analyzing the data in the laboratory.

Conclusions

No conclusions are possible at this time.

Literature Cited

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