

HISTORICAL VEGETATION, FUEL LOADS, AND INTEGRATED
RESOURCE INFORMATION SYSTEMS FOR BRYCE CANYON
NATIONAL PARK

David W. Roberts
Michael J. Jenkins
Douglas Wight
Department of Forest Resources and Ecology Center
Utah State University
Logan

Objectives

The research has four primary objectives:

1. Map Bryce Canyon National Park to historic vegetation type by use of relocated historic photographs, inference from similar regions, and results of computer simulations using estimated fire return frequencies;
2. Map fuel loads and fuel model types throughout Bryce Canyon National Park;
3. Classify and map areas by fire groups using information on vegetation composition and response to fire; and
4. Develop a written and pictorial document to portray vegetation change in historical time.

These objectives are integrated into an overall program to determine the role of fire in maintaining the previous historical vegetation composition, to determine the potential for use of fire as a tool to reconstruct historic vegetation, and to determine fuel management opportunities and problems resulting from current conditions. All map information is to be digitized as SAGIS GIS maps and entered into a landscape simulation model for use by Park Service personnel.

Methods and Results to Date

Previous research in the Park led to the development of current and potential vegetation types which were mapped throughout the Park. Using the current vegetation types for stratification, 500 fuel load inventory plots were distributed throughout the Park during 1988. Data were collected on downed woody material, duff, small trees, shrubs, and herbaceous vegetation using the sampling protocol of Brown et al. (1982). All data were coded for computer analysis using standard fuel load analyses (Brown et al. 1982). Samples of Arctosatphylos patula

were collected from areas adjacent to the Park for calibration of biomass estimates in the fuel load calculations. Calculated fuel loads will be stratified by current vegetation type within potential vegetation types for determination of fuel load trends during successional development of different vegetation types. These fuel data will be coupled to a landscape vegetation simulation model to determine the effects of fire regime on vegetation composition and distribution.

Historic photographs of Bryce Canyon National Park will be located from archives in the western U.S. and, where possible, relocated in the field for photographing. Comparison of matched photographs will give qualitative information on the amounts and rates of vegetation change in historical time. The estimated historical vegetation will then be used as the initial conditions for the landscape simulation model, and the model will be run with known fire histories to validate the predictions of the model compared to current conditions. If successful, the model will be used to determine the effects of different fire management policies on Park vegetation composition and structure.

The landscape simulation model was developed from the vital attribute concepts of Noble and Slatyer (1980), modified where necessary to accommodate the characteristics of local taxa. The model is a spatially explicit stochastic simulation model which predicts vegetation development and response to disturbance for specified fire regimes. To date the model has simulated synthetic landscapes of up to 400 individual stands of three different vegetation types. The model predicts landscape gamma diversity, patchiness, patch diversity, and plant community composition on a 10-year time step.

Current work is focused on analysis of the distribution of fuel by fuel type within the Park. Fuel models developed from these data will be analyzed for predicted fire behavior using the program BEHAVE (Burgen and Rothermel 1984).

Literature Cited

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