Development of Multiresource Inventory Techniques and Analysis Methodology Using Remote Sensing and a Geographic Information System for Planning, Monitoring and Management of Wilderness Areas

Significance and Importance of Project.

Wilderness is truly our resource for the future and just since the passage of the Wilderness Act of 1964, more than 89 million acres have been congressionally designated such. But even in that time, many of these areas have been severely impacted through either overuse or lack of management due to want of knowledge of the resource and want of funding. Yet much legislation has mandated the U.S. Forest Service, Bureau of Land Management, National Park Service, and the U.S. Fish and Wildlife Service to do appropriate planning, monitoring and management of these areas or resources within them: The National Environmental Policy Act of 1969 (PL91-190); the Endangered Species Act of 1973 (PL93-205); the Sikes Act of 1960; National Forest Management Act of 1976 (PL94-588); Clean Air Act Amendments of 1977 (PL95-95); and Water Quality Criteria established by the EPA Committee in 1972.

Too much has been invested in the Wilderness resource to allow degradation of the very naturalness these preserves were created to protect. Management is required to minimize and modify these impacts to preserve the natural conditions. However, it is difficult to do this without basic knowledge of the total resource and its condition and a means of analysis and planning for effective management (Stankey et al., 1985). We know of no effort utilizing cost-effective and state-of-the-art techniques to inventory, monitor and analyze the wilderness ecosystem to gain a true understanding of this natural system.

Objectives

We propose a project wherein we will develop multiresource inventory techniques (Lund, 1986; McClure et al., 1979) using remote sensing, and analysis methodology using a geographic information system to portray the developmental dynamics and interrelationships of terrestrial and acquatic ecosystems within a wilderness area. The techniques and methodology would provide the manager a means by which basic information may be gathered and subsequently analyzed at reasonable expense for planning and management to maintain or enhance natural diversity and protect wilderness values (Bell and Atterbury, 1983; Hart et al., 1985; Abula and Nyquist, 1987). Such would be applicable to any wilderness area or natural preserve in the world.

Methodology

Specifically we propose to:

1. Establish a panel of interdisciplinary resource personnel to define needs. Within the college we have most all the discipline specialists represented: ecology, sociology, forestry, fisheries, wildlife, soils, hydrology, range, water quality, wilderness, fire, pathology, entomology, statistics and sampling, planning, and remote sensing. The following specialties from other colleges will also be represented: geomorphology, geographic information systems, and archeology.
2. Derive the following specifics from the panel:
   a. The inventory attributes needed in each of the above specialty areas (e.g. Merigliano and Krumpe, 1985).
   b. The resolution or cell level for the attributes.
   c. The format for multilevel disciplinary data.
   d. The grid system to which the multiple planes will be registered in the GIS system.

e. The output products desired from analysis of the data by GIS manipulation.

3. A wilderness normally presents many more operational and practical problems for inventory than other lands, problems which have not been thoroughly investigated before. The panel will also assist in defining multistage inventory and sampling techniques which are statistically valid but also practical and cost-effective for rugged, inaccessible terrain. This will include defining the type of remote sensing imagery.

4. Using existing and acquired remote sensing, map, survey and descriptive data, do a multistage inventory of the Cabin, Cliff, Cougar, and Goat Creek watersheds (~33,000 ac or one 7½' quadrangle) around the Wilderness Center field station at Taylor Ranch.

5. Interpret remote sensing data for many of the desired attributes and gather ground truth data through subsamples. Transfer the results to 1:24,000 scale, 7½' quadrangles.

6. Digitize each plane of data for entry into the GIS. Existing data, including Digital Elevation Model topographic data will be entered also.

7. Develop combinations of attributes and analyze data for possible alternatives of strategy in wilderness management.

8. Publish the results of this development through the RFF or the College Experiment Station as deemed most appropriate.

The college has a remote sensing center with personnel and equipment for obtaining and analyzing remote sensing imagery. There are two GIS systems on campus and a proposal for obtaining another one for the college.

Facilities

The University of Idaho is in a unique position to do this, having in its possession the only wilderness research center in the country, with a field station the Taylor Ranch located in the heart of the Frank Church-River of No Return Wilderness and operated by the College of Forestry, Wildlife and Range Sciences. There are 3.8 million acres of wilderness extant around this area within Idaho. The Taylor Ranch consists of living quarters, a field laboratory, an airstrip to augment aerial reconnaissance and provide access, pack horses and mules to support on-ground logistics, and professional staff to carry out field investigations. The laboratory is equipped with a U.S. Weather Service station, an IBM lap top computer, a herbarium and small mammal collection.

The Taylor Ranch has functioned as the field headquarters for a variety of ecological investigations, providing a solid foundation for producing the interdisciplinary resource matrics applicable to the proposed study. Past research has been conducted on owl habitat partitioning (Hayward, 1983), big game utilization of different habitat types on winter range ( ), ecological studies of Bobcat and Cougar ( ), behavioral relationships of deer, elk and bighorn sheep in winter, and settlement and subsistence patterns of indigenous peoples ( ). Many more studies would develop if basic resource data were available.