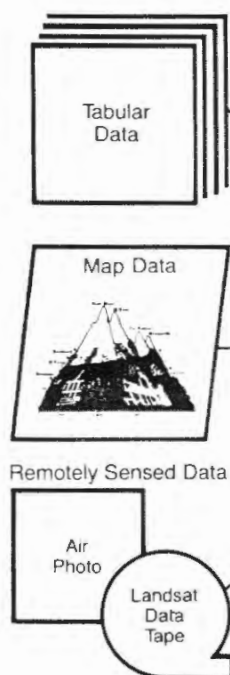


INPUTS



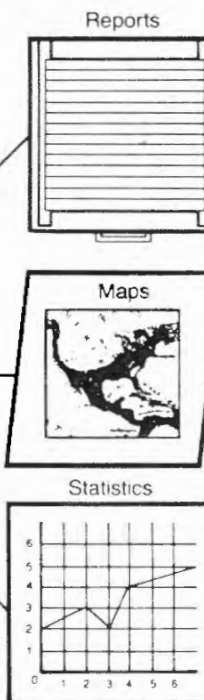
DSC Develops Natural Resources Information System (NRIS)

COMPUTER

Natural Resource
Information System

*Organization of a typical automated
information system for natural resources data*

OUTPUTS



By Maurice Nyquist

A major hindrance to efficient NPS management and planning has been lack of pertinent data. Too often the data relied on have been out of date, not site specific, incomplete, and/or gathered "after the fact" by costly contracting. Remote sensing and computerized data base management techniques for acquiring and analyzing resource data can circumvent this problem, providing accurate data in a timely, cost-effective manner.

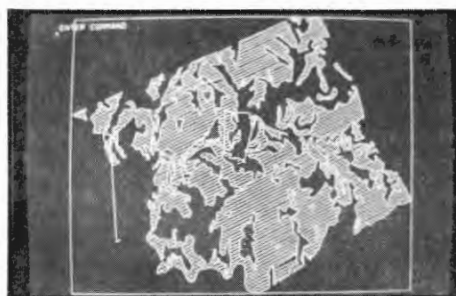
The Remote Sensing and Science Sections at the Denver Service Center have been using these techniques for five years in many projects in most regions of the Service. These sections have assembled the skills, staff, and equipment required for an operational *Natural Resources Information System*.

The basic NRIS objectives were to provide a functional management tool that could quickly and cost effectively gather and analyze information needed by the Park Service. Remote sensing technology serves these objectives by: (1) providing *relevant* and *accurate* information *quickly* and at *low cost*, e.g. most projects are completed within a few months with mapping accuracies of 90 percent or better, and depending on the techniques used, total project costs range between 5 and 50 cents per acre; (2) *flexibility*, in that it is suited for many types of application at nearly any level of detail, it can provide both regional and detailed site specific information



SIMPLE EXAMPLE of output from NRIS (above): Road network (dashed lines) overlaid by 100 year flood plain (shaded band) shown on screen of graphics display terminal.

MORE COMPLEX example (below) shows polygons of two different soil types being evaluated.



for an application such as vegetation, geology, land use, potential habitat for wildlife, fire models, etc.); and (3) the *replicability* of the technique, especially useful for *monitoring* and *change detection* studies. Computer technology is capable of handling large volumes of complex data quickly and inexpensively to give analysis not possible by other methods, it can integrate and update information which can be readily accessed from remote sites. Thus the combined attributes of remote sensing and computerized information management, functioning in concert, give the Natural Resources Information System much greater capabilities than either functioning independently.

The most immediate benefits to the Service are the NRIS responses to basic needs identified in the State of the Parks 1980 Report, such as preparation of a comprehensive natural resources inventory, establishing accurate resources baseline data for monitoring and change detection, and identifying, documenting and quantifying internal and external threats to the parks. This data can be generated and used for various levels of planning, resources management, interpretation, operations and budget formulation. In addition, for little cost (approximately \$10,000 for a graphics terminal) individual parks could directly access the data base for day-to-day management needs once the basic resource themes have been mapped and entered into the computer.

The use of remote sensing to gather information relies on many different techniques, such as Landsat

satellite computer tapes or imagery (pictures) aerial photos of various types (B/W, color, or color infrared) and scales, and such exotics as microwave or side-looking radar. The operational program of the Remote Sensing Section primarily relies on photo-interpretation of aerial photography or Landsat imagery, although several demonstration projects with NASA and the EROS Data Center, have used computer implemented processing of Landsat digital tapes to perform resource mapping and analysis at Shenandoah, Death Valley, Olympic, Big Thicket, Lake Mead and Everglades.

Landsat project results have been highly successful. For example, a very useful and accurate 21 class vegetation and landcover map was developed for the Olympic peninsula. And, because the data were in computerized format the vegetation map was easily converted to a fire hazard/behavior map, to be used for fire management planning. These same data were again manipulated to produce a map of potential habitat for the Spotted Owl, a threatened species.

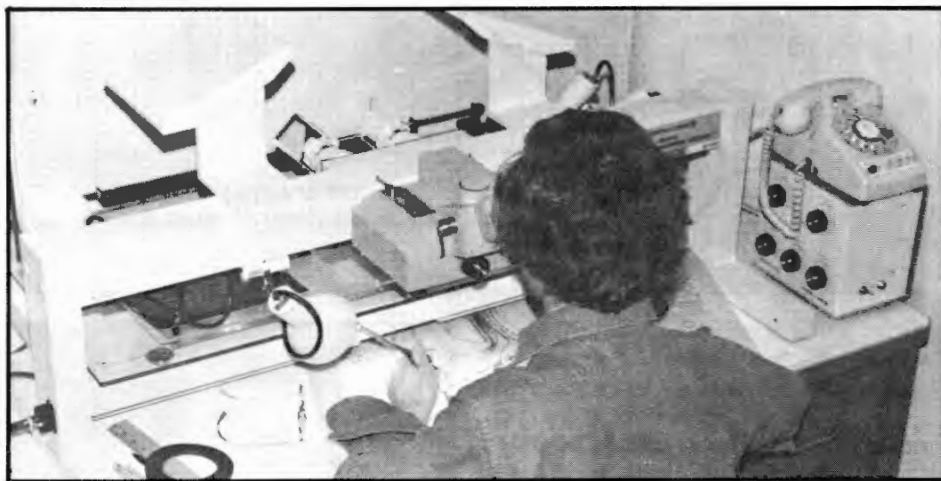
More typically, the Remote Sensing Section photo-interprets aerial photos and transfers the desired themes (e.g., vegetation, landuse, geology, etc.) to a controlled map base. This can be used as it stands for the desired resources management, planning, or interpretation activity. In many instances, however, the Science Section enters the other sources of data into the computer to form a digital data base for additional analyses.

A recent example is the work for Acadia NP. The Remote Sensing Section is preparing detailed vegetation and landuse maps which the Science Section is digitizing for computer analysis in fire and wildlife management and planning. On a much larger scale, the Science and Remote Sensing Sections are developing a computerized data base for the entire Upper Delaware River Study which includes vegetation, geology, landuse, soils, land ownership, roads, utilities, political boundaries, flood plains and other themes. The analysis performed such as compositing, proximity searches, length or area calculations and several other types of analysis will be used to aid in developing planning alternatives, feasibility/suitability determinations, and impact assessment.

The comparison between an artist's pallet and the NRIS forms an appropriate analogy. The artist's pallet has a few basic colors which the artist can use to paint nearly any type of picture. Remote sensing can provide the basic resource themes (i.e., the basic colors on the pallet) and these themes can be manipulated many different ways to produce the desired new maps or analysis (the artist's picture). Just as the quality of the artist's picture is dependent on the artist's skill, the quality of the NRIS products is dependent upon the skill of the people working with the NRIS (i.e., knowing the correct types of data to bring together and asking the right questions) as well as the quality of the data (i.e., colors) put into the system.



DIGITIZER tablet and graphics display terminal (by which data is digitized to form a digital data base for various kinds of analysis.)



STEREO ZOOM transfer scope, whereby photointerpreted themes are transferred to controlled map base.

If you have questions about the use of the DSC NRIS for your individual management needs, please call me (Dr. Maurice Nyquist, Chief, Remote Sensing Section) for information about resource mapping and Dr. Harvey Fleet, Chief, Science Section, for information about digital data management, at the Denver Service Center. (303-234-4527, or FTS 234-4527).

*Editor's Note: In an excellent article, "Remote Sensing: Tool for the Park Manager," in **The Courier** (NPS Newsletter) October 1980, Mary V. Maruca of the WASO Anthropology Division wrote:*

"Remote sensing is not a panacea for resource management problems, but it is an essential element through which to gain an understanding of just what resources a park actually protects. It is a tool for the superintendent, the archeologist, the natural resource manager, the interpreter. The park manager, the researcher, and the remote sensing specialist must work hand in hand as a team to develop a solid resources basic inventory on which to preserve the parks of the future."



PHOTOINTERPRETER does his job on the zoom stereoscope.