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AN AREA RBI/ECOSYSTEM MAP: WHAT IS IT? HOW IS IT USED? HOW IS IT DEVELOPED?

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AN AREA RBI/ECOSYSTEM MAP: WHAT IS IT? HOW IS IT USED? HOW IS IT DEVELOPED?

By Ro Wauer

Park Superintendents are faced with the dilemma of providing for recreational and interpretive use of resources while at the same time leaving them unimpaired for the enjoyment of future generations. An acceptable resolution of this dilemma requires park planning of the highest quality. The National Park Service must therefore develop and implement a rational system of park use based on fundamental constaints of park resources and facilities.

The Resources Basic Inventory (RBI) provides the data base for intelligent development, use, management, and interpretation of National Park System areas. The RBI is a collection, synthesis, and analysis of information on the biological, physical, social, economic, and cultural environments of a park and its environs. National Park Service Standards require the establishment of a comprehensive data base before the suitability of park lands for various uses can be determined. Land classification proposals can be considered sound only when based on an adequate RBI. The planning process places on information base in its initial priorities. Such an RBI allows for objective decision-making in accordance with Congresssional mandates, in particular, special park legislation, National Environmental Policy Act of 1969 (NEPA) and Section 106 of the National Historic

Preservation Act and Executive Order 11593. The RBI provides the foundation on which to carry out procedure.

The RBI also makes it possible to estimate provisional carrying capacities for parks and to plan for their development. Such estimates form the basis to allow park managers to regulate various uses of the area and to ensure that public use will not result in unacceptable degradation.

The RBI provides an objective basis for management-related decisions. For example, it will allow managers and planners to determine whether existing park standards are appropriate and will provide data necessary for their revision.

A RBI is required for new area studies. An adequately detailed RBI provides managers and planners with a simple method of locating and evaluating various features--an essential component for accurately assessing the area's national significance. In addition, these same data are essential for drafting new and/or revised legislation.

A comprehensive RBI facilitates preparation of models that describe the relationships in time and space between components of the total park system. This system encompasses a park's living and nonliving resources, from wildlife and the park visitor through climate and development. Models allow for prediction of future events and conditions based on known interrelationships and make it possible to predict multiple effects based on established data. As such, modeling of park environments constitutes the ultimate management tool for the

proper use and conservation of the natural resources of the National Park System. The RBI in the broadest sense, then, is knowledge that makes possible wise use of the resources and their unimpaired preservation for future generations. The RBI is the scientific foundation upon which rests the great Yellowstone dream of natural preserves for the benefit of all mankind.

DESCRIPTION AND COMPILATION OF THE RBI

The RBI is more than a simple collection of facts. It also is a clear and concise evaluation of the accumulate data presented to a way that is useful to managers, interpreters, and planners. The RBI consists of three parts: files, maps, and evaluations.

FILES

The Information Files contain a bibliography, lists, photos, tables, and maps and overlays. Maps and overlays developed to display the information form the Ecosystem Map. And the Resources Evaluation is the analysis of the files and display.

The Southwest Region has divided the Information Files, or collection of facts, into two levels. Level One is that information required for basic planning documents, and Level Two includes information required.

A. Physical Characteristics of the Area
    1. Location, size, land use
    2. Topography, geology, soils
    3. Hydrology, aquatic resources
    4. Climate

B. Biological Characteristics of the Area

1. Terrestrial vegetation and flora

2. Terrestrial fauna

3. Aquatic biota

C. Environment Quality

D. Sociological Features

E. Economic Features

F. Antiquities

G. Constraints, Commitments, and Legislative History

H. Park Developments

The initial RBI gathering priorities must begin with the Level One Data, that forms the building block for Level Two Data. In essense, we design the RBI block-by-block starting with the Level One Information Base that may eventually include a complex ecosystem analysis. And the development of the Ecosystem Map display and Evaluation progresses in orderly fashion, too.

What are the necessary elements of the Level One Information Base? They include:

I. Basic Thematic Map File

A. Regional Features (Scale variable but commonly 1:250,000; dependent on a real influence on park).

1. Population Centers. Consists of cities, town, villages, strip development along highways, clustered settlements and isolated units of built-up areas, reflecting boundaries and distribution of population.

2. Political Subdivisions. Includes state, county and civil division boundaries which represent the primary political and administrative subdivisions established by state law.

3. Land Use. Includes the following categories: Urban and Built-up, Agriculture, Rangeland, Forestland, Water, Wetlands, Barren, and Marine.

4. Outdoor Recreation Facilities. Consists of facilities and sites by type set aside for outdoor recreation purposes, such as federal, state, county and private parks, designated historic and natural landmarks, etc.

5. Transportation, Communications and Utilities. Consists of roads, highways, railways, airport facilities, and facilities involved in the transport of water, gas, oil, electricity and air-way communications.

6. Overnight Accommodations. Consists of pillow-count or other overnight occupancy designator of facilities, including camping, which serve the public at large.

7. Land Ownership. Includes federal, state, and private land patterns, with headquarters location.

B. Park Specific

BASE MAP	SUGGESTED LEVEL OF DETAIL	SOURCE
Topography	Relief, Aspect, Slope	USGS 7.5' quad.
OVERLAYS (Planimetric version of standard Topo used to plot information)		
Geology	Bedrock, faults, landforms, rock types	NPS, BLM, USFS, County, State

Land Use and Ownership	Location by metes and bounds	NPS, BLM, USFS, County
Soils	Family and Series	NPS, SCS, County
Hydrology	Location of Resources	NPS, USGS, SCC, State Water Agencies
Vegetation	Community, and Endangered and Unique Species	NPS, USFS, USFWS, SCS, State
Wildlife	Migration Routes and Major Habitats, and Endangered and Unique Species	NPS, USFWS, SCS, State
Cultural	Site Locations	NPS, State
Recreation Developments and Support Facilities	Specific Type and Capacity	NPS, BOR

II. Narrative File

A. Climate. A regional and local descriptions should be prepared which summarizes the various parameters of climate affecting an area and which in turn influences the available recreational opportunities.

B. Socioeconomic Environment. A regional demographic and economic description in statistical as well as narrative terms shall comprise the socioeconomic environment. This description should include:

1. General demographic characteristics such as: general population data, ethnic composition, length of residence, percent residing in state of birth, median school years completed, style of life (urbanization), and household composition and family structure.

2. Land Use-Density. A measure of rural-metropolitan character; rural differentiated into farm versus nonfarm; metropolitan differentiated according to a size scale and suburban-city category; general land uses--agricultural, residential and industrial; past trends and future trends.

3. General economic-characteristics such as: median family income, proportion working outside county of residence, employment by occupational status, industry of employed persons, means of transportation, labor mobility, etc.

4. Interest groups. Describe the organized subgroups within the population having special concerns with the park area; non-governmental public factions whose interest is expressed by exerting power and influence in a political manner (conservation groups, motel-hotel campground associations, chambers of commerce, etc.).

C. Business and Industry. A regional description of the Region's commerce and related activities in statistical as well as narrative terms shall comprise the business and industry section.

1. The economic structure of the locale and region should be available in the form of an input-output matrix to determine the impact of park induced expenditures.

2. For new area acquisition, a determination will be made as to the effect of (1) injection of funds due to acquisition, (2) activities eliminated or prohibited as a result of acquisition, and (3) effect on region's governmental revenues.

3. Visitor Expenditures. A profile of visitor preferences, activities and expenditures made while visiting an established park needs to be known to allocate benefits.

D. Map Overlays Descriptions. A discussion of specific problems illustrated within each of the map overlays, but not clearly explained by that manner. This portion of the Narrative File may include sections of geology, land use and ownership, soils, hydrology, vegetation, wildlife, archeology and history, and recreation developments and support facilities.

III. Annotated Bibliography. During the collecting of resource and land data to complete the required map overlays and narrative support material, a separate listing of references will be maintained which are pertinent to this effect. Literature searches by computer may also be appropriate.

Informational deficiencies for each park will be documented in the Resources Management Plan. The RBI content therefore is open ended and expanding; the RBI process must continue as long as the park exists to be planned, managed, and operated for the purposes for which it was established. Appendix A contains a full list of potential information as a practical guide for an inventory, but the list should not be interpreted to imply that all areas need to collect all elements. The kind of land and resource data to be collected will depend on each area's situation and individual needs.

THE ECOSYSTEM MAP

The Level One Information Base maps and narrative form the basis for

a comprehensive Park Specific Ecosystem Map. Therefore, using the Information Base as a format, a basic Ecosystem Map should include the following:

A. Physical Characteristics of the Area

1. Basic Topography and Physical Features. This is the most logical base map but not mandatory. Map sizes may vary with the area needs, but USGS 7.5' quads are most popular, and maps 5" = 1 mile are suggested for small areas or specific areas within large parks.
2. Soils. It must identify specific use-related properties, i.e., unstable soils, highly erodible soils, infertile soils, poorly drained soils, etc.
3. Geology. It must identify specific unique physiographic features, hazards, commercial and unique mineral deposits, basic patterns and history.
4. Aquatic Systems. It must include major sources of potable water, functions of fresh water such as runoff amounts and those essential to basic faunal systems, areas of sensitivity to disturbances, and seasonal characteristics.
5. Climate. It must include climatological patterns of temperature and precipitation, seasonal ranges, and short- and long-term trends and cycles.

B. Biological Characteristics of the Area

1. Terrestrial Vegetation and Flora. It must identify plant commuities, areas sentitive to disturbances, and unique areas of high scientific value and interest to visitors, including endangered species and associations.

2. Terrestrial Fauna. It must include all species of high scientific value and interest to visitors, including endandered species and habitats, and major migration routes for significant forms.

3. Aquatic Biota. It must include all species of high scientific value and interest to visitors, including endangered species and habitats, and seasonal distribution of large or important vertebrates and their migration patterns.

4. Fire History and Fuels. It must include all of the historic wildland fire burn sites, and the fire hazard classification.

C. Environmental Quality

1. Pollution. It must identify all areas of potential or actual air, water, and terrestrial pollution.

D. Antiquities

1. Archeological Sites. It must identify all of the known sites, those of high scientific value and interest to visitors, including fragile sites not appropriate for normal visitation, and associated influences.

2. Historical Sites. It must identify all of the known sites, those of high scientific value and interest to visitors, including fragile sites not appropriate for normal visitation, and associated influences.

E. Park Development

1. Recreation and Support Facilities. It must identify all area developments.

2. Management Zones. It must identify all management zones, and any sites that have served in any park development, such as long-term study areas that may be considered for future Research Natural Area sites.

In general, an Ecosystem Map may consist of a base map and 14 overlays, or a base map with the number of overlays that are most appropriate for the specific area but include all of the charactieristics described above.

RESOURCES EVALUATION

A text is an essential ingredient in the RBI. It narrates the ecosystem and the map, especially those items that cannot be conveniently illustrated on a map.

The narrative should include possible conflicts of use, concerns regarding the nature of the resources, native species that are no longer present, exotic plant and animal conitions, and concerns about the possible effects of developments and their locations. As example, the narrative may state that certain cultural resource sites cannot tolerate human impact or are suitable for heavy visitation. Considerable emphasis should be placed on facilities and development sites that would be reasonable and acceptable in relation to the natural and cultural resources.

Basic resource management and interpretive themes that appear to be of value can be pointed out at this time, as well as noting exceptionally fine scenic and inspirational areas or settings that are encountered.

While the latter would not ordinarily be considered as basic data in the scientific sense, they may be of extreme importance to the General Management Plan team members.

APPENDIX A - Potential Data Base

LOCATION, SIZE, AND LAND USE

Physical Characteristics of the Area

Resource Features to be Considered	Source of Data	Use of Data
Land Ownership Federal Non-Federal Government (State, County, local) Private	National Park Service Information USGS topographic quadrangles Information from other Federal land-managing agencies State land managing agencies Local and county governments Local regional and State planning commissions Current road maps	Places park in regional context Allows for evaluation of past and present land uses, trends. Defines regional land use patterns Allows for assessment of impacts of land acquisitions Locates areas of existing or potential incompatible uses Defines constraints on park land use and management
Existing Land Use Agricultural Rangeland Commercial Industrial Institutional (including governmental) Designated Natural Reserves Developed Parkland Undeveloped Open Space Residential Other		
Trends		
Land Classification (Park-specific) 1. Natural 2. Cultural 3. High Density 4. Special Use		

Resource Features to be Considered	Source of Data	Use of Data
TOPOGRAPHY Relief Slope Structure, feature locations landmarks, markers, etc.	USGS topographic quardanges USGS geologic maps and survey reports State geologic surveys University research ERTS and other remote imagery	Area description Constraints on development
GEOLOGY Geologic Maps Regional Reconnaissance Quadrangle Special purpose		Identification and location of present geologic features, materials and structures
Geologic Structures (Tectonic features) (Joints, folds, faults, igneous intrusions, saltdomes, dykes, volcanoes, etc.) Identification Location		Identification of geologic hazards Interpretation of geologic features, materials and structures
Geologic Materials (Analysis) Igneous Identification Location Classification Metamorphic Identification Location Classification		Interpretation of area Identification of geologic constraints on development and use Identification of research needs Assessment of the impacts of use on the geologic resource Carrying capacity analyses

- Sedimentary
  - Identification
  - Location
  - Classification
  - Sedimentary Structures

- Geologic History
  - Stratigraphy
    - Succession of strata (Paleo-history)
    - Significance of fossils (Paleontology)
    - Stratigraphic time scale
    - Absolute time scale
  - Structural Analysis
    - Mountain building (Orogenic Belts)
    - Rift valleys
    - Continental drift
  - Basin Analysis
  - Paleo-geomorphology
  - Paleo-hydrology

- Recent Geologic Events
  - Catastrophic
    - Volcanic
    - Seismic
  - Gradual
    - Subsidence due to extraction of materials (natural gas, hydrocarbons, water, and minerals)
    - Submergence-emergence
      - Eustatic
      - Change of loading
        - Glacial
        - Tectonic
      - Isostatic

Resource Features to be Considered

Geomorphology (The changing face of the earth)
- Land Forms (types, characteristics)
  - Glacial
  - Eolian
  - Fluvial
  - Volcanic
  - Structural
  - Karst
  - Etc.
- Processes
  - Weathering
  - Erosion
  - Denudation
  - Weathering properties of materials
    - rock weathering
    - soils formation-major soil groups-soil series polygenetic soils, composite soils, fossil soils
  - Slope processes
  - Channel form and process
  - Drainage pattern evolution
  - Evolution of hillslopes

Geologic Hazards
- Earth Movements
  - Slope stability
  - Materials stability
  - Permafrost
- Chemical and weathering instabilities

Mineral Deposits
- Minerals
- Oil and gas
- Sand and gravel

Unique Geologic Values (Of special visitor interest)
(i.e., Old Faithful, Crater Lake)

HYDROLOGY AND AQUATIC RESOURCES

Resource Features to be Considered	Source of Data	Use of Data
Inventory Springs Pool size and depth Perennial flow Ephemeral flow Temperature Wells Hydraulic characteristics Specific capacitance Transmissivity Depth, size, and water levels Test pump data Lithologic log Lakes and impoundments Origin Type Oligotrophic Mesotrophic Eutrophic Size Depth Temperature distribution and stratification profiles Nutrient status and availability Currents Rivers Channel morphology Temperature Flood levels and frequency Sediment load, type Streamflow (Maximum, average, minimum; seasonality) Time of Travel Dispersion characteristics of solutes Waste assimilation capacities	Environmental Protection Agency U.S. Geological Survey U.S. Coast and Geodetic Survey U.S. Army, Corps of Engineers National Park Service studies (park files) State health boards State and local planning commissions State natural resources and environmental protection agencies Private consulting firms Private environmental clearinghouses University studies	Assist in planning a managerial decisions water resources proj involving Domestic water sup Recreational uses o water Fish and wildlife conservation Water quality cont Prevention of wa pollution Pollution abatem Drainage Flood control Irrigation Navigation Maintenance of natural flows Water conservation Determine existing chemical, bacterial and physical qualit of water as relate to present use of land to note qualit changes in the aquatic environment Determine the effects of urbanization and other land uses on the availability of water (surface and groundwater) in the area

Continued: Resource Features to be Considered	Source of Data	Use of Data
Estuaries		
Morphology of estuary		Design of sewage treatment systems in accordance with assimilation capaci of receiving waters
Salinity profile		
Sedimentation: types, distribution, rates.		
Erosion patterns		
Current characteristics		
Physical and chemical composition of materials discharged into estuary		Delineation of areas with high or low potential for water contamination due to past, existing, or proposed uses
Temperature		
Tides		
Range (mean, spring, neap)		
Flood tides (maximum, minimum, average)		
Ebb tides (maximum, minimum, average)		Assist in resolving water rights problem
Tidal prism (mean volume, spring volume, neap volume)		
Horizontal and vertical mixing of estuarine waters		Assist in establishing park's water quality standards
Length of tidal shoreline		
Number and size of entrances to estuary		
Present uses of estuary		
Navigational chart		Determination of the "safe yield" of aquifers for propose and existing development
Ground Water		
Ground water-surface water relationship		
Aquifer characteristics		
Lithologic characteristics affecting ground water resources		Delineation of potenti water sources for development
Ground water composition		
Ground Water Inventory		
Ground water increment		
Rainfall penetration to the water table		Facilitate compliance with Federal and Sta water quality standards
Natural influent seepage from streams, lakes and ponds		
		Carrying capacity analyses

Continued:

Resource Features to be Considered	Source of Data	Use of Data
Ground Water (continued)		
Artificial influent seepage from irrigation reservoirs, spreading and artificial recharge method		
Inflow of free or confined ground water from outside the area		
Ground water decrement		
Effluent seepage and spring flow of free ground water and discharge by surface flow, evaporation and transpiration, or artificial removal by drainage works.		
Effluent seepage and spring discharge of confined water along faults, or slow leakage from the lower portion of aquifers holding confined water		
Artificial pumping discharge		
Subsurface discharge of free or confined water from the aquifer		
Watershed Hydrology		
Delineation of watersheds and drainage patterns		
Water budget		
Precipitation		
Runoff		
Soil storage		
Recharge of ground water reserves		
Evapotranspiration		

Continued:

Resource Features to be Considered	Source of Data	Use of Data
Water Use		
Residential, commercial, industrial consumption		
Consumption by park visitors		
Relation between in-park use and availability		
Withdrawals for power generation		
Irrigation		
Interbasin transfers		
State water rights		
Private water rights		
Federal, State, and local laws and regulations governing water use		

Resource Features to be Considered	Source of Data	Use of Data
General Descriptive Narrative of Climate Maritime influences Continental influences Altitudinal influences Latitudinal influences	U.S. Weather Bureau Records U.S. Geological Survey technical reports U.S. Forest Service University studies Private research stations and other areas where data are collected NPS studies Private consulting firms Private institutions	Background information for planning and management Interpretation Determination of appropriate uses and seasonal distribution of uses Carrying capacity analyses Energy conservation analyses
Climatic Classification Thornthwaite (1931)* system for areas with >15 inches of precipitation per year. Meigs (1953)** system for areas with ≤15 inches of precipitation per year		
Temperature Daily maximum and minimum Monthly maximum, minimum, and mean Annual maximum, minimum, and mean Summer maximum, minimum, and mean Winter maximum, minimum, and mean Recorded temperature extremes Maximum, minimum, and dates of occurrence Number of days per year with temperature ≤ 32°F Average date of first minimum ≤ 32°F Average date of last minimum ≤ 32°F Comfort index/chill factor Isothermal overlays for region and park on an annual and seasonal basis		
Precipitation Rainfall: total by month, mean monthly, mean annual, monthly rainfall intensity.		

Resource Features to be Considered

Snowfall: storm frequency, depth of accumulation, mean monthly, mean annual.
Precipitation summary: total by month, mean monthly, total by year, mean annual.
Isohyetal overlays for region and park on an annual and seasonal basis.

Atmospheric Moisture
Relative humidity
Vapor pressure deficit
Dew point

Wind
Direction
Velocity
Duststorm activity
Ground blizzard activity
Canyon venturi effects
Damage potential due to winds
Structural damage
Biological damage from windthrow or abrasion by airborne particulates

Evaporation
Potential evaporation
Potential evapotranspiration estimates
Actual evaporation
Actual evapotranspiration

Solar Radiation
Mean daily solar radiation
Total solar radiation
Net solar radiation

Resource Features to be Considered

- Percent cloud cover
  - Number of clear, partly cloudy, and cloudy days
- Prevailing cloud type

National Fire Danger Rating System
- Data observation points and methods of obtaining NFDRS data

Fog
- Frequency of occurrence
- Interception
- Type of fog: radiation, advective, upslope, steam fog

Lightning Patterns

Regional and Park Weather Extremes, Describing
- Frequency, Intensity, Duration, and Distribution of
  - Temperatures: maximum, minimum, range
  - Precipitation: greatest, least, variability, hail and snowfall, drought periods
  - Thunderstorm activity
  - Air pressure: maximum, minimum, variability
  - Wind speed
  - Dewpoint and humidity
  - Fog
  - Thermal inversions
  - Tornadoes and water spouts
  - Cyclones and hurricanes
  - Blizzards
  - Tidal waves

Resource Features to be Considered

Weather Station Histories
- Station name and location
- Observers
- Dates of observation
- Present and past operating organization or agency
- History of station moves
- Years of record

*Thornthwaite, C.W. 1931. "The Climates of North America According to a New Classification." Geographical Review 21: 633-65 5.

**Meigs, P. 1953. "World Distribution of Arid and Semi-arid Monoclimates." In Reviews of Research on Arid Zone Hydrology, Unesco, Paris. Arid Zone Programme 1: 203-210.

Biological Characteristics of the Area — TERRESTRIAL VEGETATION AND FLORA

Resource Features to be Considered	Source of Data	Use of Data
Vegetational Formations Associations Communities Species composition Stratification Quantitative description: density, cover, and frequency by species and growth form. Life-form analysis Successional status Topographic vegetation profile Condition of Vegetation Vigor Diseases and Infestations Susceptibility to Fire Frequency of fire Intensity of fire Relation of fire to meteorological conditions Utilization Habitat value for wildlife Use by domestic livestock Ecological carrying capactiy (productivity) Flora Floristic inventory: fungi, mosses and liverworts, ferns and fern allies, Gymnosperms, Angiosperms. Habitat affinities of species	U.S. Forest Service; NPS studies; University research; Studies by private institutions and firms; Local and state planning commissions ERTS and other remote imagery U.S. Bureau of Land Management	Wildlife management applications Protection of rare, endangered, or unusual species Control of exotics Fire protection and management Basic data for research in botanical sciences Evaluating potential for plant disease and infestations Landscaping Suitability of lands for development and use Establishment of Research Natural Areas Carrying capacity analyses Interpretation

Biological Characteristics of the Area

Range of species
Endemic species
Threatened species
Ecotypes
Special genetic conditions
Exotic species, including history of establishment and invasion
Ethnobotany
Toxic species
Phenology: dormancy/death, flowering, seed-ripening

Biotic and Abiotic Influences on Community Composition and Stability (including data on productivity)

Resource Features to be Considered	Source of Data	Use of Data
Faunal Inventory Mammals Birds Reptiles Amphibians Invertebrates	NPS studies and surveys U.S. Bureau of Sport Fisheries and wildlife U.S. Forest Service U.S. Bureau of Land Management State Fish and Game records University and institutional research Museum Collections	Identification of ecologically sensitive areas Information for interpretation and education programs Baseline information for scientific studies Basic information for environmental assessments and evaluation of impacts of existing and proposed development, management, and use Establishment of Research Natural Areas Carrying capacity analyses Land suitability analyses
Resident Species		
Migratory Species (including routes of migration)		
Ranges		
Habitat Affinities of Species		
Population Sizes and Dynamics (Trends and Stability)		
Endemic Species		
Threatened Species		
Extirpated Species		
Exotic Species, Including History of Introduction and Spread, and Effects on Natural Ecosystems		
Biotic and Abiotic influences on population components and stability (including data on productivity)		

TERRESTRIAL FAUNA (Cont.)

Resource Features to be Considered

Relation of Species to Man
- Recreational value
- Commercial value
- Effect on man's health (including hazards) and economy
- Existing of historical management program
- Sensitivity and adaptability to man's activities

Biological Characteristics of the Area — AQUATIC BIOTA

Resource Features to be Considered	Source of Data	Use of Data
Floristic Inventory Algae Plankton Zooplankton Vascular Plants	National Park Service studies Bureau of Land Management U.S. Forest Service U.S. Coast and Geodetic Survey Bureau of Sport Fisheries and Wildlife Bureau of Reclamation Atomic Energy Commission Water Resources Council National Oceanic and Atmospheric Administration Environmental Protection Agency River basin commissions State fish and wildlife departments State environmental protection agencies University and institutional research (especially oceanographic institutes) Private consulting firms	Identification of ecologically sensitive areas Information for interpretation and eduction programs Basic information for scientific studies Basic information for environmental assessments and evaluation of impact of existing and proposed management and use Carrying capacity analyses
Primary Productivity		
Faunal Inventory Mammals Fishes Amphibians Crustacea Molluscs Colenterates Echinoderms Other		
Biotic and Abiotic influences on population components and stability (including data on productivity)		
Habitat Affinities of Species		
Ranges		
Migratory Species (including routes of migration)		
Exotic Species, Including History of Introdudion, Spread and Effects on Natural Ecosystems.		
Threatened Species		
Species Protected by Law		

Resource Features to be Considered

Relation of Species to Man
- Recreational value
- Commercial value
- Effects on man's health (including hazards) and economy
- Existing and historical management programs
- Sensitivity and adaptability to man's activities

Description of Plant and Animal Communities
- Lakes and Impoundments
  - Trophogenic zone
    - Littoral subzone
    - Limnetic subzone
  - Tropholytic zone
  - Benthic communities
- Rivers and Streams
- Springs
- Estuaries
  - Non-benthic communities
  - Benthic communities
- Seas
  - Supralittorial zone
  - Littoral zone
  - Sublittoral zone
  - Pelagic zone

- Community Composition and Stability, as well as on the Productivity of Aquatic biota

Research Features to be Considered	Source of Data	Use of Data
Identification, description, and source of pollutants in each of the following classes: Nutrients Toxic metals Toxic organics Pathogens Radioactive contaminants Gases Aerosols Airborne particulates Heat Noise Architecturally or esthetically incompatible or hazardous developments, objects, or activities	Atomic Energy Commission Environmental Protection Agency NPS studies U.S. Geological Survey U.S. Forest Service State water boards State environmental protection agencies State health boards Research studies by universities, institutions, and governmental agencies Private consulting firms Private clearinghouses	Establishing benchmarks for relatively upolluted conditinns Proposing abatement programs for directly controllable pollutants Seeking abatement of pollutant that are not directly controllable
Concentration and distribution of the plllutants; frequency of occurrence of discrete events generating the pollutant		
Temporal and spatial trends in the parameters cited above (e.g., plans for abatement, proposed and imminent activities leading to increases, regulations governing pollutant-generation, pressures for abatement or increase)		
Type of pollution, chronic or acute		
Effects of the pollutant both direct and indirect		
History of the pollutant in the area		

SOCIOLOGICAL FEATURES

Research Features to be Considered	Source of Data	Use of Data
Regional Information Demographic profile: population data (rural farm and non-farm, urban and suburban metropolitan population), population density, ethnic and racial composition, length of residence, percent residing in state of birth, median school years completed, household composition, and family structure. General socioeconomic characteristics: median family income, proportion working outside county of residence, employment by occupational status, industry of employed persons, labor mobility. Interest groups: private and public groups with interest in the park and its resources (conservation groups, chambers of commerce, county and state planning commissions, motel-hotel and campground associations, etc.), nature of interest and influence.	U.S. Census Bureau; Census of Agriculture (USDA); state, county, and local planning commissions; NPS visitor surveys and visitation statistics. Surveys by USFS, BLM, and other Federal land managing agencies.	Carrying capacity analyses Determination of appropriate development. Management to optimize visitor experience and minimize social conflict Orientation of interpretation to public served. Determination of recreational and social value of park to region and nation. Matching visitor expectations with constraints of the resource
Visitor Analysis (Region and Park) Origin and destination of visitors Length of stay in park and region Overnight and day use; kind of overnight accomodations. Kinds, schedule, and location of activities pursued in region and park. Frequency of return to park and region; reasons for return visits. Socioeconomic description of visitors (income, occupation, education). Group composition of visitors (number in group; sex; age; group type such as family, friends, organized club). Motivation for visit(s); satisfaction with visit(s) and individual activities (e.g., the degree to which expectations were filfilled). Description of sociological problems in region		

incompatible behavior and activities).
Attitudes of visitors toward various land uses in region and park.
Methods of estimating visitation to region and park.

ECONOMIC FEATURES

Research Features to be Considered	Source of Data	Use of Data
Regional Information		
Recreational facilities, visitation, and revenues	NPS visitor surveys and records County and local government records U.S. Bureau of the Census data U.S. Forest Service U.S. Geological Survey Applicable legislation State Employment Security Administrations State and local planning commissions Local boards of realtors	Assessment of economic impacts for land acquisitions development changes in recreational activities park payrolls, expenditures, and operations existing and projected levels of park visitation prohibition of land uses, as in designation of wilderness areas and establishment of new park areas Carrying capacity analyses Development of planning and management alternatives
Private facilities		
Local public facilities		
State facilities		
Federal facilities		
Lodging facilities and occupancy		
Economic input-output table		
Employment		
Job categories		
Pay scales		
Location of employment		
Number and skills of unemployed		
Housing		
Availability		
Type and occupancy		
County tax revenues		
Sources		
Amounts		
Uses of		
Park Information		
Recreational facilities, visitation, and revenues		
Lodging facilities and occupancy		
Concession services		
Type		
Revenues		
Profits		
Park operating budget		
Appropriated funds		
Land acquisition		
Capital improvements		
Other		
Inholdings		
Assessed valuation		
Tax revenues		
Use		

ECONOMIC FEATURES.....continued

Timber resources
  Type
  Market value
  Sustained yield value
Mineral resources
  Type
  Market value
Economic effect of the park on
  surrounding property.

(NOTE: much of the information required for economic analyses must be obtained from relevant portions of the Lands and Sociological Features sections of these guidelines)

ANTIQUITIES (CULTURAL RESOURCES)

Research Features to be Considered	Source of Data	Use of Data
Archeological Sites Habitation Sites Quarrying and Mining Knapping Fields Burials and Cemeteries, Mounds Rock art and Effigies Trails and Roads Reservoirs, Wells, Springs, and Irrigation Systems Animal Traps Killing and Butchering Sites Shrines and Caches Midden Deposits	Intensive Archeological Survey to Include: Artifact Collections Pollen Samples Soil Samples C14, Dendrochronology and Archeomagnetic Samples	Comply with EO 11593
	Remote Sensing Studies	Protection, Preservation, Planning
Distribution and Location of Sites Intersite Relationships Distribution of Sites in Relation to Environment	Ethnographic Research	Preparation of Environmental Analysis (EIS)
Significance of Sites and Potential of Archeological Resources for Contributing Information about Archeological Problems	Archeological Base Map Sites Plotted on 7 1/2 Minute Topographic Map	Information for Education and Interpretive Programs
Description of Prehistoric Cultures Represented	Site Descriptions Photographs Extent of Site Topography and Soils Plants Water Source Arable Land Identification of Cultures represented	Requirements of Section 106
Archeological Survey Report to Include Description of Methods, Intensity and Geographic Extent of Survey; Indication of Stabilization Needs and Recommendations for Preservation		Developing Research Designs
		Compliance with Federal Laws: 1906 Antiquities Act 1916 NPS Organic Act 1935 Historic Sites Act 1966 Historic Preservation Act 1969 National Environmental Policy Act 1971 Executive Order 11593
		Fill in gaps in Existing Knowledge

CONSTRAINTS, COMMITMENTS, AND LEGISLATIVE HISTORY

Research Features to be Considered	Source of Data	Use of Data
Copy of enabling and supplemental legislation.	Congressional Record; Code of Federal Regulations, Park files	Aid in defining the purpose and objectives for the management and use of a park.
Transcript of Congressional hearings, letters, and other documents relating to establishment.	Library of Congress	
Excerpts form the Code of Federal Regulations relating to restrictions on land uses within a park (e.g. mining, grazing, etc.)		Identification of constraints on the management and use of a park.
Memoranda of agreement, concession contracts, letters, and other documents relating to management and use of a park.		
Special use permits, scenic easements, deed restrictions, and other land use commitments.		

PARK DEVELOPMENTS

Research Features to be considered	Source of Data	Use of Data
For all developments within the park (administrative, management, and maintenance facilities; roads, trails, boardwalks, parking areas, visitor centers and visitor contact stations; sanitary facilities; utility systems; backcountry facilities; marinas and docks; research facilities): Purpose Location Size Capacity Date and cost of construction and modifications Description of maintenance and use problems Cost of operations (energy demand)	Park files, Service Center records, Regional Office files	Evaluation of the adequacy of the various developments for present or proposed uses (includes carrying capacity analyses).

RBI Committee

William Gregg - Chief Scientist - DSC
Neal Guse - Research Biologist - WASO
Garrett Smathers - Chief Scientist - PNR
Roland Wauer - Chief Scientist - SWR

Committee Participants

John Austin - Economist - DSC
Gene Balaz - Environmental Coordinator
Paul Buckley - Research Zoologist- WASO
Phillip Dittberner - Soil Scientist - DSC
Harvey Fleet - Ecologist - DSC
Eric Janes - Forest Hydrologist - DSC
Larry May - Ecologist - DSC
Gary Moore - Hydrologist - SWR
Ralph Root - Geologist - DSC
Linda VanKeuren - Sociologist - DSC
Gerald Wright - Systems Ecologist - DSC

DISCUSSION

WAUER: Let's concern our discussion now with comments on what I have said and about what we should do at Bandelier and Buffalo River the next few weeks about preparing an ecosystem map and narrative.

CHAPMAN: When you were talking about your various overlays, shouldn't there have been one that deals with historic uses, i.e., logging, lumbering, grazing, areas that have been disturbed even prior to the park's being established.

WAUER: That is included in the park development section of level two. You are saying that it should be included in an earlier stage.

CHAPMAN: I'm trying to analyze this with the soils, the geology, the current vegetation, to compare some of the differences that will appear in some of the other overlays that might correspond to some of the impacts that come from use in certain areas. It might serve as an indicator for people trying to form a management point of view.

WAUER: I agree with that. You are saying that we need it at the early level.

CHAPMAN: Historical land use.

FITCH: There are a lot of areas where that might be important.

WAUER: That fits in with the concerns we have for Buffalo River, and that's why Fletch is going down there. Lorraine needs to make some decisions fairly soon on what to do with the old fields. She's been getting pressure from farmers in the area to make decisions about the long-term use of the old fields. The question arises, which ones? We have studies going on right now to try to help us determine how much pollution we are getting from cattle using fields many feet away from the river and on drainages.

FITCH: There is one other thing you are going to have to have in some areas. That't a regional or zone overlay that shows impact at the parks. I'm specifically thinking of Chaco Canyon. We have a bad erosion problem at Chaco Canyon, but it does not start at Chaco; it starts in that area north and east of it. The problem isn't in the park but outside of the park; their basic resource management problems originates outside of the park boundaries.

FLETCHER: That's real common with aquatic problems. The mercury at Big Bend originates outside of the park.

WAUER: Several thousand acres were later added to Hot Spring park because the recharge area for the springs was outside the park.

JUDGE: On the geologic overlay, you mentioned potential hazards. Does that include hazards such as erosion?

ROGERS: The geologic information obtained on potential earthquakes, rockslides and faults at Guadalupe Moutains did not support a tramway proposal there.

FITCH: If nothing else, it would discourage as putting in a tram.

WAUER: Are 7-1/2" quads suitable size for a base map, or do we need to blow them up to 5" to the mile?

FLETCHER: I don't see that the size of the area is that significant. You can have areas like Big Bend which has really sensitive areas.

LISSOWAY: Certain pockets of vegetation or exotic species require specific attention and require more details. You could blow up the scale there.

WAUER: I think that's what I was saying. An area like the Chisos, that has so many details, the 7-1/2" topographic map just isn't going to do it. Not in most places, anyway.

LISSOWAY: Not for areas of major disturbances, such as areas you try to monitor for recovery--for example, the burro impact at Bandelier. Take the area that has been grazed by burros and you can pretty much delineate the range on both sides of the fence. You could either make this a joint venture with the Forest Service or you can blow that up itself.

FITCH: Your general overlay could be developed on a quad, and you would have to treat individual areas like we do the developed area on the Master Plan, a blow up of that area.

JUDGE: Isn't there a basic problem here? If you put Chaco Canyon on a 7-1/2" map, you would have a blur.

FLETCHER: We did, and it was a blur.

JUDGE: Isn't that the basic problem, whether you are dealing with cultural resources or not. You should start out with a base map that's large enough to accommodate whatever you anticipate in the way of overlays. Have you thought about using photos instead of the USGS map?

WAUER: I think photos of small areas like Sunset Crater or Capulin Mountain would be very suitable.

GREGORY: Photoquads are available and could be used in places.

WAUER: Can we come to an agreement on the best scales to use for every park? Because if every single area has a different size, when we eventually come to the management information system and develop a cellular model, we are going to have some problems. Whether we go to a map or a photograph depends on the resources involved.

ROGERS: You are dependent on available maps, right?

WAUER: Yes, right now we are. We already have realized we need something bigger to work with a a few areas. We are using 5" to one mile base maps at White Sands, Wupatki-Sunset Crater, and for the Chisos Mountains. I think we should do the same for Bandelier.

FLETCHER: I've got maps of Buffalo River that could cover this wall. We should use a smaller base map, and then any place where we get a couple of things such as archelogical sites or unique natural areas, we will reference that with a number and go back to the big maps. That way a guy could go back to the main map and pick out the details right there.

WAUER: What sizes are the two maps?

FLETCHER: The big blown up ones are 5" to the mile.

WAUER: If we could do that, stick with a couple of sizes, in the long run we would be better off. John, for Capulin, do you thing that would be suitable for you, 5" to the mile?

CHAPMAN: Yes, I think it would.

WAUER: Would photographs be better for you?

CHAPMAN: I don't think it would make that much difference. Either way would be acceptable. I'm kind of partial to maps myself. Sometimes overlaying a photograph can be a little harder to read.

JUDGE: Depending upon the quality of the overlay, it can be hard to read. One reason I mentioned photographs--I don't know if you are operating under sonstraints in going to the management information system, but the best way to approach a base map in any kind of a management information system would be through digitizing stereo pairs. As you pointed out, orthophotos are available. It just depends upon the cost of the acquisition and how far ahead you want to plan.

LISSOWAY: Is an orthophoto a photograph with lines of topography super-imposed on it?

JUDGE: It's a rectified photo that doesn't have a distortion.

GREGORY: You could use that as a base interchangeably with a 7-1/2 min. quad sheet. You could use either one.

LISSOWAY: What if a resource manager wants to conduct some extensive field operations, and he needs a couple overlays to take with him? If these things do come down to the point where scales are standardized and this information is laid out, is there a way to reduce them to a size workable in the field? It's something to think about. How would you reduce it to a usable size?

ROGERS: Could microfile be used there?

WAUER: We take the topographic maps to BLM and have them blown up. We have a machine here that reduces things by half or a third the size. You can take a big sheet like that and reduce it to page size. Let's go on to the overlays. In soils, I've got special use-related properties, such as unstable soils, erodable soils, poorly drained soils, etc., identified. Is that inclusive enough?

JUDGE: North of Chaco Canyon, on this forthcoming coal impacted area, BLM is using the SCS vegetative associational soils as a base map, and one reason that they are doing that is that the soil associations actually are near both vegetation variability and topographic variability, and I was wondering if you would like to use something like soils associations which would also give you information about vegetation.

WAUER: I guess what I am asking is, do we need to identify every single thing we are talking about on overlays?

ROGERS: This would help identify some of those areas, such as at Big Bend. One of the problems at Glen Canyon was that the geologists had to come in to identify certain portions of the shore line where we had particular soils after the banks were saturated and sloughing off. We should have had good maps that would identify where we shouldn't have development that would be important.

GREGORY: If one of these categories would be unimportant for some reason, would you just eliminate that map? Would you foresee having one of each of these for each area?

WAUER: What I am trying to determine is what you have to have for a complete ecosystem map. Everything else is covered in the narrative or identified in the Resources Management Plan.

GREGORY: You are saying you would have one of each of these?

WAUER: Yes. I'm not saying you have to have a separate soils overlay. Maybe your soils and geology overlays can be together. It depends upon the area and the significance. I am just trying to document the kinds of things we need on overlays.

JUDGE: May I bring up a point? This is a very practical aspect. Let's say that the ecosystem map is a goal to try to achieve, but that between now and that time the manaer would also like some information, that is, between now and the time this thing is actually generated. Let's take an area such as Bandelier, or, better yet, an area in which the cultural resources have not yet been inventoried, where there is little information about cultural resources. It would probably take a long time before (if you want to get down to the antiquities overlay) that thing is complete. It takes money and a lot of time to do such a survey. Before that time is reached where it is possible to impose a sampling design and follow it and make some general statements on the basis of, say, a 15% sampling of the area. One possible outcome of such an event might be that there is a correlation between certain soil types and certain kinds of cultural resources so that most of the soil zones within the area you could predict the placement of cultural resources. It seems to me that kind of information might be valuable to the manager, even though the antiquities overlay was not yet finished.

FLETCHER: That's a good idea.

ICE: We have changed our thinking some since we drew up the antiquities list, because I think we have to look at samples. By the time we have gotten an intensive survey done, they have all the construction done.

JUDGE: But I think the manager would like to know, if you plan a trail, for instance, whether or not that trail is going through zones that would be likely to have sites...

WAUER: What you are saying is that to help with the archeology you assume the soils map has already been done. In most archeological areas, the archeological base map is completed before the soils map. You started off with the idea that we needed some basic information. That's what the Level I stuff is for. Before we do any planning, we need to have that basic stuff done. That should include the archeology survey.

ICE: This Project Type 19--does that include cultural resources as well as natural areas?

ROGERS: No, information base Project 19 is not archeology, I am sure.

FLETCHER: Every time we go to put one together we have an archeological assessment and survey.

ROGERS: But those are not Project 19's.

ICE: Surveys are Project Type 31, but you have a separate project type for this information base.

WAUER: That's what we have done. We have separate Project 19 items and I have assumed the cultural resources surveys were in there, too.

ICE: Maybe it should be in Project 19, because we sure aren't getting a Type 31.

ROGERS: Can you use a Project Type 19 for archeological surveys? I think Bill Alford could tell us.

FLETCHER: I don't know if that's a good idea or not. We can get a pretty good vegetation map for under $5,000, but yo guys can't get 400 square yards.

ROGERS: Here are the various project types, and archeological investigations are under Project Type 31.

WAUER: Are those the ones that are identified in the OPR's?

ROGERS: Each is a separate item as it is.

ICE: Do you have a separate project type for history?

WAUER: Nineteen includes everything on natural resources. Bill Alford tells me those things are still in the computer.

JUDGE: It's a fact of life that it takes a lot more to get one of these archeological surveys done that a vegetation map. It is impractical to assume we could get an antiquities survey. I do think we would have to finalize the basis of samples.

WAUER: That's one of the problems in cultural resources, that when you talk about a site map you must consider all the data. Is there any way at all that you can develop a Level I base map for those known and significant sites?

JUDGE: I don't know how Ron feels, but it depends what you mean by Level I. It probably wouldn't be equal in detail to your vegetative map, which you can do largely on the basis of remote sensing.

WAUER: What if you had a cultural resources site map that had all the obvious sites that could be inventoried from the air? Isn't there some kind of separation you could utilize?

JUDGE: I just got through doing some personal research on that. It is a direct result of the intensity of the survey. You can do a quick and dirty thing. The point is that it hasn't been designed to be of use to the manager. I think that if you and Ron could establish the criteria necessary for the antiquities overlay it would be some kind of sample. You could come up with something that would serve management. Maybe not at the level of the map. I don't think we have done that yet.

WAUER: What do you suggest for Bandelier at this point? How would you suggest that John do that other than show actual sites?

JUDGE: That's already been done.

WAUER: That's Level I. What about Level II?

JUDGE: I would agree that Level II should be everything else.

WAUER: Let's say that Bandelier isn't developing. Everything you know right now would be Level I but Level II would be a detailed map based upon everything else that becomes known.

JUDGE: Even at the Level I level, the identification of known sites would be the first step. With the formal research design, you could do some very specific sampling and on that basis, making sure that a range of economic diversity was sampled, make some logical topographic criteria. I would say that we are staying at Level I. What kind of archeological sites would be eventually impacted.

WAUER: I think I'm with you. We known basically that there are 500 sites between Frijoles and Alamo, and we know that there are hundreds more. We know that area is full of sites. That only begins to scratch the surface.

LISSOWAY: How would a manager put the values down on paper or make something visual in regard to sites as to the impact of fire on a site or backcountry use on a remote site. If you don't have the locations of these sites in the first place, you don't have ground to stand on to find out the impact. That's the first thing.

JUDGE: If you talk about Level II, you can't really talk about cultural resources until you do have a total inventory. There is another point you broached on. I think it is ridiculous to assume all sites are the same and of equal significance. There are sites literally that are a dime a dozen. What the archeologist needs to do is establish priorities. Some sites are rare and unique. Some sites must not be mitigated at any cost. We can't really effectively evaluate each one of these archeological sites until we know where they are. That will help us evaluate the rare sites. Then the common sites would all be valuable at a certain level of significance. I think level II is the ultimate managerial document. We will never get that kind of information from samples. We have to do the inventory.

FLETCHER: I see a correlation in our natural science program and archeological surveys. If we do a quick and dirty vegetative analysis, we may find an endangered species. If we do a very thorough survey, we will almost certainly find endangered species.

WAUER: But in the meantime, the bulldozer is on the way. So if we say this is the kind of stuff we have to have before we can make a decision where a campground can be built, what do you include? We know there is no way we can look for every rare thing.

GREGORY: I think it would be valuable to the manager just to have the data that is now known. As more data is gathered, the particular overlay could be updated.

WAUER: That's the concept we followed in the Level I idea.

JUDGE: There's a lot of stuff we can put on a Level I map on any area in the Southwest. I think one fear I have is that we have known sites in Bandelier on overlays; someone will say that the ecosystem map is done, and we don't need any more information, so go ahead and build the trail.

WAUER: That's a problem, all right.

LISSOWAY: That can be done easily if a manager follows the Resource Management Plan, as he should. You are tying a lot of things up on an ecosystem map and more overlap or duplication is kind of waste of energy.

FLETCHER: I see more of a dovetail rather than an overlap. Another thing, research determines most of your data. Staff level people won't be going out and collecting these data. Another thing is Regional priority in research. The manager in a park can scream all day for money, and if it isn't in the mill at the Regional level, he isn't going to get more.

JUDGE: Do you have any time frame in mind?

WAUER: No, it's a never-ending process.

JUDGE: I mean for Level I.

WAUER: The only time frame we have is established through OPR for Level I gathered for various parks. We have to evaluate the OPR's as the planning process begins. Some Level I stuff will be done very soon. In the case of most areas, there is a bit more. That's the building block concept.

FLETCHER: One question on what you are talking about, on narrative portions of maps themselves. We are all stuck with the Freedom of Information Act. I wonder how much information we should give the public on archeological sites, for instance.

ICE: Archeological sites are exempt from that.

JUDGE: What is the public access to these ecosystem maps?

WAUER: Most will be working documents only. I visualize one at the park, one at the Region, and on at DSC.

JUDGE: It's been a problem since the Environmental Impact Statement were distributrd to everyone.

ROGERS: The USGS doesn't indicate any of the archeological sites.

JUDGE: Can you use colors on these? Would that affect reproduction?

WAUER: I don't think we have come to any decision on how we would reproduce them. We should get one map to the park area for the staff for planning and interpretation.

WAUER: What I am thinking about right now is what Fletcher and John will do at Buffalo and Bandelier. Are the overlays enough? Are they suitable? Do we need more? Is that going to do the job with the overlays we have here?

JUDGE: You mentioned fragile sites should be plotted. Colors could rank significance of sites.

WAUER: Do you mean endangered or exotic?

JUDGE: Endangered.

WAUER: We also show endangered habitats for species. Also, what about fire history and fuels. If we have an overlay that includes all the fire history, the downed and standing fuel loads, and that fits onto a vegetation associational map, what more do we need?

GREGORY: As far as fire goes, there is a series of maps that are necessary. A risk and hazard map is important to show potential control and rate of spread. The rish map together with the hazard map pretty well shows the danger to the public and improvements. There is already fuel loading for just one part of the system. The hazard map would probably be more meaningful.

WAUER: The best thing to use would be the hazard map?

GREGORY: That would show the potential for disaster.

WAUER: Would that include a historic wildland burn site map?

GREGORY: I'm not sure that would be necessary. If it has burned in the last few years, it probably won't burn for quite some time. On the other hand, it could provide good interpretive information.

WAUER: Are there any other topics that you want to bring out for ecosystem maps. What about management zones?

LISSOWAY: Aren't we over-zoned now? Would the wilderness zone be one all by itself? There are other types of zones to consider, for example, at Bandelier where you have both historic and natural resources. You're talking about zone overlap. How do you manage an area where you have wilderness and natural resources and historical and cultural resources?

WAUER: I'm talking about the four management zones based upon the data you have used to make a determination.

ROGERS: You are talking about land classification now?

ICE: I think in your overlays for archeological sites, say you are using different colors like John suggested, having different colors for significant sites, then you have got your classification right there for your Class 6 items.

WAUER: The different colored spots for sites wouldn't tell you totally where the historic zone is because the historic zone may be a line drawn all around the historic areas.

ICE: It would tell you where your Class 6 spots are, which areas would fit in that category. In some cases, you would need them. Say you nominate a series of sites to register as a district. You would have a large block there rather than just a bunch of dots.

WAUER: I am referring to the historic, natural, special use and development Jones.-- John, do you feel from our discussions of these lists have provided a background for being able to initiate an ecosystem map?

LISSOWAY: I think I can start one. I also think that first of all, I should determine what Level I kinds of inventory data we have. If it is not mappable, what inventory would we need according to the shopping list? Starting at Level II, there are a number of reports in the file and a number of completed research projects and bunches of data that can go on a map or overlay. Each area is different. I think a problem might be running into the mechanics of getting certian kinds of transect data without

going through the clutter routine, even at a 5" to the mile scale. Just what should go onto the overlays?

WAUER: That is one of the things we are trying to point out today.

LISSOWAY: I think it depends upon the park areas. I don't know how much we can go on general guidelines other than what we have listed here. I think a lot of it is going to be dependent on what kinds of information, based upon your problem areas, you need to get down on a piece of paper on the overlay you can utilize. I am looking for material and data that is usable in terms of management problems we have now. As problems arise, you are going to get all this kind of data down in a short period of time. It is going to have to be accomplished. How close are we to the management information system approach? If we are within a couple years of the information system to digitize this information, what's going to be the trade-off in terms of making overlays now?

WAUER: They will still have to make an overlay. You still have to have a map on soils and all of the other 14 types of things. That is what goes into the computer. You still have to gather the data and make it presentable. This is the most useful route of getting it into the computer if you can come up with an understanding of the goal in mind.

JUDGE: The experience I have had in trying to deal with regional computerized systems--the problem is not with the computer. The basic problem is determining what data to record. I think that's the whole point of this session, how do you record adequate data. Wouldn't the best approach be to record those data at this time which seem to be most relevant to management? The manager can decide what he needs to know. Start with that and help the manager most. The management information system is going to have to evolve from that. Certain kinds of data will be recorded that doesn't need to be. Someone will have to get rid of those before we begin computerizing. The thing to do is get rid of the irrelevant before we waste a lot of money and time.

WAUER: There can be a lot of stuff put on an ecosystem map that is usable that may never get in the computer. You can look at a map when you need a flat place for a campground or a sewage lagoon. An ecosystem map is the most useful thing in the world for determining where to put a campground. It shows specifically where you can't put it.

FLETCHER: By the time we figure where it's supposed to be, the Denver Service Center has already built it.

WAUER: Not according to the process we are supposed to be using now. That's what it is all about. We have to have some data so we can say, that's the reason you are not supposed to build it there.

ROGERS: The (DSC) are pretty cooperative. Trying to get sufficient information to them, though, is the problem.

JUDGE: Let's say that you want to know where to put a sewage plant, presumably in a flat place downhill where most of your people are. What other kinds of information would the manager need to know that we can give him on an overlay map? We know that it's flat and downhill. Are there endangered plants in the area, critically significant sites, soil types, flood plains, fuel zone? What about potential visitor impact? Would that be on the overlay?

WAUER: It could be but it would also be in the narrative.

JUDGE: How do you get from the point on the map to the narrative.

WAUER: That is what the resource manager in the park is involved with. That's why I have split the RBI up into three parts: the files that include the library, the maps, the photos, and anything available to supply that information to extract onto the second part, the ecosystem maps. That is made up of a good solid base map and up to 14 overlays. As that stuff is developing, the narrative is beginning to come out. Sometimes it is very easy, sometimes not. The Resource Management Plan points out the deficiencies and all four items are continuously being updated and evolving.

JUDGE: It seems to me that you are recording all the right kinds of things. I can't think of anything else to be done. What about climate? Would that be necessary? I guess it would in most areas.

WAUER: I don't have anything more to bring out. Maybe the logical thing to do is to make a few copies of this and send it around to all of you for additional comments.

FLETCHER: I would like to see this in about three months when we have a beginning of some more of these things to look at. It's a lot easier for people to see what we are doing wrong after it is done. It might be valuable to follow up on this sometime to take a look and see what we do have on the narrative as well as on the map.

CHAPMAN: I think the tendency should be to make it as plain as possible because a lot of different people will have to read it and may or may not be conversant with the technical terminology which may be used. As far as the information you are trying to point out, I agree with your comment about whether it sould be on the map or the narrative. What they want to know is whether or not to build and if there is a hazard if they put something near the slope.

LISSOWAY: Hopefully, the trend is to get developments out of parks in the future. This can be used to give the manager a good idea of the health of the ecosystem in terms of natural resources.

GREGORY: You might be able to use it to show pople why the development shouldn't be here.

WAUER: Interpretive-wise, it's also valuable.

LISSOWAY: Fletcher and I will get something together.

WAUER: Thanks for sitting in!