Inventory and Monitoring

Upper Columbia Basin Network

Lisa Garrett
Network Coordinator

Legislation and Policy

- National Park Service Organic Act of 1916
  Mission of the National Park Service
  -conserve the scenery and the natural and historic objects and the wildlife within…

Legislation and Policy

- National Parks Omnibus Management Act of 1998
  -requires that park managers know the condition of natural resources under their stewardship and monitor long-term trends in those resources…

  -The Secretary shall undertake a program of inventory and monitoring of National Park System resources to establish baseline information…..

Legislation and Policy

- 2001 NPS Management Policies
  -Natural systems in the national park system, and the human influences upon them, will be monitored to detect change.

Message from Congress:

"This involves a serious commitment from the leadership of the National Park Service to insist that the superintendents carry out a systematic, consistent, professional inventory and monitoring program, along with other scientific activities, that is regularly updated to ensure that the Service makes sound resource decisions based on sound scientific data".

(FY2000 Appropriations Language)

NPS Advisory Board Report:

"A sophisticated knowledge of resources and their condition is essential. The Service must gain this knowledge through extensive collaboration with other agencies and academia, and its findings must be communicated to the public. For it is the broader public that will decide the fate of these resources."

Source: Rethinking the National Parks for the 21st Century. A Report of the National Park System Advisory Board, July 2001

Natural Resource Challenge Vital Signs Monitoring

Revitalize and expand the natural resource program within the park service and improve park management through greater reliance on scientific knowledge

NPS Natural Resource Challenge

Science for Parks - Parks for Science

- Add natural resource stewardship to NPS visitor services capability
- Learn what is in parks (inventories), and monitor the vital signs of natural systems
- Engage the scientific community and the public, and facilitate their inquiries
- Share the information widely

NRC Programs

- *Accelerate Inventories*
- *Extend Monitoring*
- Collaboration with scientists and others
- Improve Resource Planning
- Enhance Parks for Science
- Assure Fully Professional Staff
- Control Non-native Species
- Protect Native and Endangered Species
- Enhance Environmental Stewardship
- Expand Air Quality efforts
- Measure, restore, & protect Water Resources
- Use Parks for Learning

12 Basic Inventory Datasets

Natural resource bibliography
Base cartographic data
Geology map
Soils map
Weather data
Air quality
Location of air quality monitoring stations
Water body location and classification
Water quality data
Vegetation map
Species list of vertebrates and vascular plants
Species distribution and status of vertebrates and vascular plants of high priority to each park

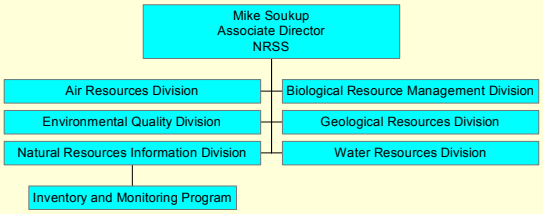
Integrate data sets and make them more available to managers using GIS Theme Manager.

Current Program Goals

- Complete Basic Resource Inventories.
- Develop Ecological Monitoring Programs.
- Implement GIS and Information Systems.
- Integrate with Park Planning and Interpretation.
- Form Partnerships.

Natural Resource Program Center

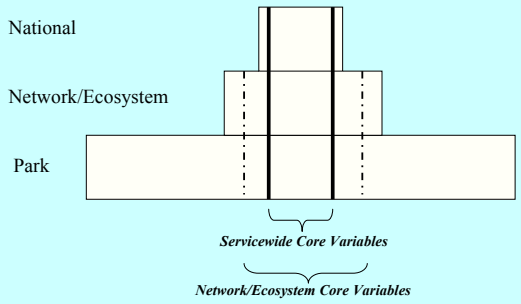
Natural Resource Stewardship and Science



Conceptual Framework

I. Program Design

- Strategic Focus
- No Competitive Funding
- Multi-level Project Implementation
  - National Level
  - Regional Level
  - Park / network Level



Conceptual Framework

II. Resource Inventories

- Basic Needs Common to All Parks
- Approximately 270 Parks
- Staged Implementation:
  - Capture Existing Information First
  - Conduct Field Inventories
- Goal: Complete in 7-8 years

Conceptual Framework

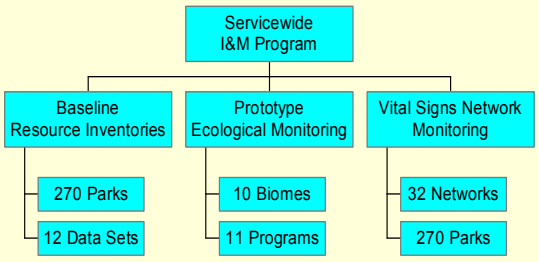
III. Prototype Monitoring

- Experimental Programs in 10 Major Biomes
- Twenty two Parks Involved
- Represent "Centers of Excellence"

IV. Vital Signs Monitoring

- 32 Networks; 270 parks
- Monitoring "critical" variables
- Implement over 5 years

I&M Program Structure



Prototype Monitoring Programs

- Channel Islands NP (*Pacific Coast*)
- Shenandoah NP (*Deciduous Forest*)
- Great Smoky Mts. NP (*Deciduous Forest*)
- Denali NP (*Arctic/Subarctic*)
- Great Plains Cluster (*Grasslands/Prairies*)
- Cape Cod NS (*Atlantic/Gulf Coast*)
- South Florida/Caribbean Park Cluster (*Tropical/Subtropical*)

Prototype Monitoring Programs

- North Cascades NP (*Lakes and Rivers*)
- Olympic NP (*Coniferous Forest*)
- Mammoth Cave NP (*Caves and Karst*)
- Northern Colorado Plateau (*Arid Lands*)

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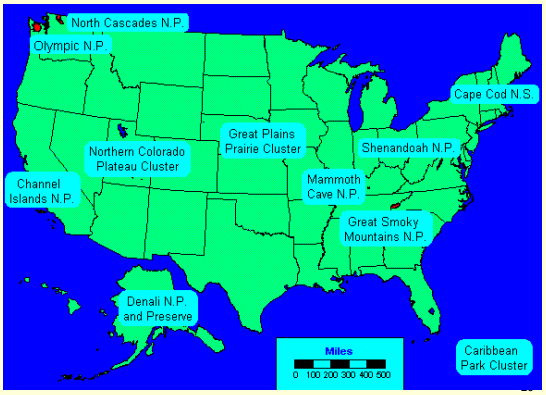

Prototype Roles and Functions

- Evaluate alternative monitoring strategies
  - Ecosystem components and processes
  - Integration with park management and planning
- Develop monitoring protocols
- Share expertise, and experience
- Develop State of Parks Report format

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Role of Prototypes in Network Monitoring Strategy

- Serve as Centers of Excellence:
  - Able to do more in-depth monitoring and monitor more resources than most parks
  - Training and Mentoring Sites
  - Expertise in Data Management and Analysis
  - Development of Monitoring Protocols
- Conduct Research

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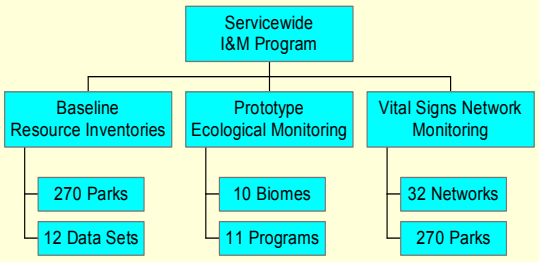
I&M Program Structure



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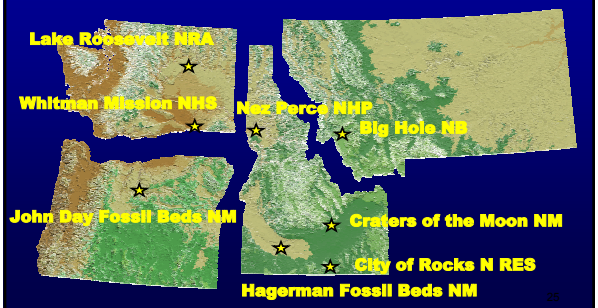
Vital Signs Monitoring Networks

Upper Columbia Basin Network Inventory Highlights



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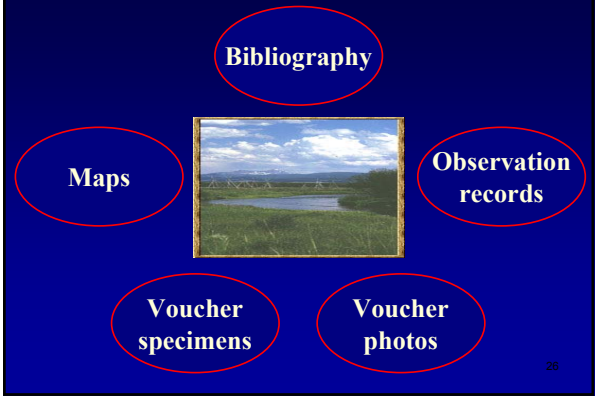
SUMMARIZE EXISTING INFORMATION



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Goal of the Upper Columbia Basin Network Inventory Program

Document 90% of the vertebrate species and vascular plants that exist in each park unit

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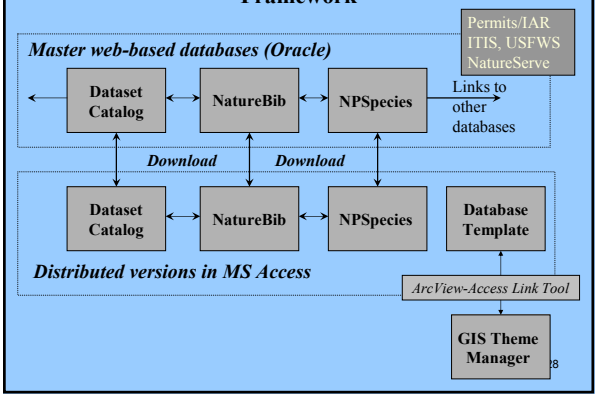
Integrated Natural Resource Data Management Framework



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Inventory of Reptiles, Amphibians, Birds, Plants, Mammals and Fish

2003 Upper Columbia Basin Network Vertebrate Inventory Personnel

Al St. John

Renee Scott

Maureen McCaffrey

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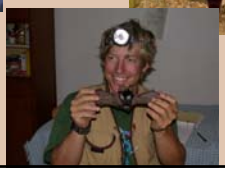
2003 Upper Columbia Basin Network Vertebrate Inventory Personnel

Katie Oelrich and Erica Madison

Sue Anderson



Tom Rodhouse

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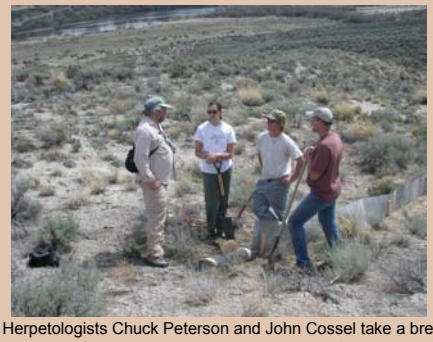
2003 Upper Columbia Basin Network Vertebrate Inventory Personnel



Herpetologists Chuck Peterson and John Cossel take a break with Katie Oelrich and Tom Rodhouse at HAFO

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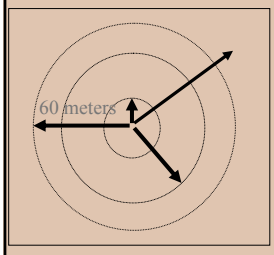
2003 Upper Columbia Basin Network Inventory Methods

Variable Circular Plot Point Counts



Herpetofauna and Bird Visual Encounter Surveys

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2003 Upper Columbia Basin Network Inventory Methods

Mammal Trapping

Bat Mist-Netting

2003 Upper Columbia Basin Network Inventory Methods

***Anabat* Bat Acoustic Detection and Recording**

Inventory biologists Tom Rodhouse and Maureen McCaffrey record a Townsend's big-eared bat's echolocation call.

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2003 Upper Columbia Basin Network Inventory Methods

Funnel and pitfall traps were used extensively at Hagerman in 2003.

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2003 Inventory Highlights
Pitfall Arrays as Potential Monitoring Tools

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Inspired by the methods, materials, and results outlined by Fisher et. al. (in press), pitfall traps are a promising multi-taxa monitoring tool.

These pitfall traps are effective in capturing invertebrates as well as reptiles, amphibians, and mammals.

2003 Inventory Highlights

Lake Roosevelt National Recreation Area

- **81% of the expected herpetofauna confirmed, including the western toad and great basin spadefoot toad.**
- **92% of expected birds confirmed, including the hooded merganser, hammond's flycatcher, red-naped sapsucker, and vesper sparrow.**
- **97% of expected mammals confirmed, including the water shrew, western jumping mouse, moose, and black bear.**

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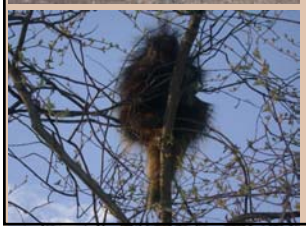
A **Racer** (Coluber constrictor) along the Kettle Arm of Lake Roosevelt



The **Northern Long-toed Salamander**, **Western Skink**, and **Porcupine** were some of the vertebrates found during the 2003 inventory of Lake Roosevelt.

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Water shrew habitat along a tributary of the Kettle Arm of Lake Roosevelt.

The Water Shrew (Sorex palustris)

Photo courtesy of the University of Washington Burke Museum of Natural History

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Whitman Mission 2002 Inventory Highlights

The great basin pocket mouse was found in the remnant bunchgrass community on top of the memorial hill.

Native bunchgrass at the Whitman Mission. photo Alan D. St. John

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2003 Inventory Highlights

John Day Fossil Beds National Monument

- 17 species of reptiles and amphibians confirmed, including the western whiptail, southern alligator lizard, and the striped whipsnake. 94% of expected herpetofauna are confirmed.
- 46 species of mammals confirmed, including the spotted skunk. 97% of expected mammals are confirmed.
- 154 species of birds, including the peregrine falcon, canvasback, northern shoveler, eastern kingbird, northern mockingbird, and wild turkey. 100% of expected birds are confirmed.

Western Spotted Skunk
(Spilogale gracilis)

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John Day Fossil Beds 2003 Inventory Highlights

Spotted Bat (Euderma maculatum)

Map showing spotted bat locations in and adjacent to the Clarno unit

The capture of a male spotted bat in the John Day Fossil Beds is only the second capture in Oregon, with the first capture occurring in 1974.

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The spotted bat was found in several new locations in the John Day Fossil Beds, as well as in City of Rocks.

Spotted bats may occur in Lake Roosevelt and other parks in the network.

2003 Inventory Highlights

City of Rocks National Reserve

- 37 species of mammals and 84% of expected species confirmed. Range extension for the pinyon mouse and documentation of the cliff chipmunk, pallid bat, and hoary bat.

Cliff Chipmunk (Tamias dorsalis)

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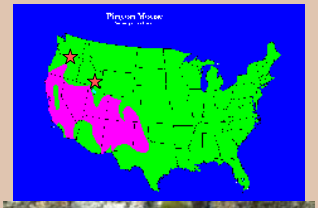
Erica Madison wrangles a striped skunk at CIRO

Northern range extensions of the **Pinyon Mouse** (Peromyscus truei) have been made in City of Rocks and the John Day Fossil Beds.



Report for Subagreement No. 20 to Cooperative Agreement No. CA9000-95-018

Mammal and Herpetological Inventories - Big Hole National Battlefield

University of Idaho and National Park Service

Columbia Cascades Support Office

In Progress

Crystal Ann Strobl, Lisa Garrett, Tom Rodhouse

Department of Fish and Wildlife Resources

University of Idaho

PO Box 441136

Moscow, Idaho 83844-1136

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2003 Bat Research in the John Day Fossil Beds

A **Hoary Bat** is inspected for parasites before being released

2003 Bat Research in the John Day Fossil Beds

Volunteer and foreign exchange student Francis Jegou explains bat echolocation to a group of summer science campers

2003 Bat Research in the John Day Fossil Beds

2003 Bat Research in the John Day Fossil Beds

- **Telemetry work on bats in 2003 resulted in the identification of critical bat roosting and foraging resources in the John Day Fossil Beds.**
- **44 Western Small-footed Myotis and 25 Pallid Bat Maternity and Post-Maternity Day Roosts were located, along with over 30 nights of foraging information for the small-footed myotis.**
- **Over 100 observations of foraging spotted bats in 6 Oregon counties were made, representing the most comprehensive collection of information on the species in the northwest.**

Special Thanks to the Staff and Volunteers of the Upper Columbia Basin Network 2003 Biological Inventories and Bat Research

Confederated Tribes of Warm Springs; Oregon Museum of Science and Industry; Dwight Morgan – Kettle Falls School Teacher; Jerry Cline – USFWS; Dana Base – USFS; Kelly McGreer - Private Landowner; Jim Kelly – Private Landowner; Peggy Bartell – BLM; Dr. Janet Rachlow – U Idaho

Why Monitor?

- Protect park resources and save money.
- Reduce the uncertainty of guessing about the status or trend of park resources and consequently reduce the costs of stewardship.
- Provide park managers with the information they need to evaluate their management strategies and practices or to confront and mitigate threats to the park in legal and political arenas.

Key Aspects of the NPS Approach to Vital Signs Monitoring

- Monitoring is a central aspect of park management, performance management, and meeting the NPS mission.
- Funding from WASO will only build a core program. Use of existing personnel, base funds, and partnerships are critical to success.
- Monitoring is done primarily to meet the information needs of the Park Managers. This necessitates a flexible program with local control to address the most critical information needs of each park and allow parks to build local partnerships.
- Clearly defining the goals and measurable objectives for monitoring at the outset is critical for success. Who is interested in the information and WHY?
- Data Management and reporting are a major, critical component of the overall program.

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Key Features of New Park/Network Monitoring Program

(moving away from the stovepipe model)

- Integrated monitoring program: physical and biological resources including weather, air, water, geoindicators, T&E species, exotic plants, other flora & fauna
- Integrate NR information with other park operations including interpretation, maintenance, law enforcement
- Emphasis on making information more useable; tools such as Synthesis, GIS Theme Manager, NR Database template, interconnected web and distributed databases

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Key Features of New Park/Network Monitoring Program

- Each network receives approx. 5-9 new positions and funding to develop a core program to monitor key components and trends.
- New positions and funding are shared by parks and augmented by existing personnel and funds
- Based on each park's priorities and needs; flexible

•Assumes that data are being collected primarily to meet the information needs of the park manager.

Park Vital Signs Monitoring

Funding from Servicewide Program will NOT allow comprehensive monitoring

"Focus on most significant indicators of long-term ecological trends and highest concerns among the parks in each network"

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Economics 101

$26.5 Million divided evenly among 270 parks
= approx. $100,000 /park
= 1 professional level position + $30-40 K operating $$

Water Quality funds: $2.9 Million = approx. $10K / park

Conclusions:

Without additional funding, parks can only monitor a few vital signs to address issues of highest concern;

Leveraging of funds and Partnerships are very important;

Efficient use of existing personnel and funds from park base and other sources are needed to build an integrated monitoring program that provides the information needed by park managers and for tracking performance towards NR goals.

An Effective Program Will:

- Enable managers to make better informed management decisions;
- Provide early warning of abnormal conditions in time to develop effective mitigation measures;
- Provide data to convince other agencies and individuals to make decisions benefiting parks;
- Satisfy certain legal mandates;
- Provide reference data for comparison with more disturbed sites.

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Initial Steps in Designing a Monitoring Program

- Clear statements of Monitoring Goals and specific Objectives
- Compile/summarize available data and understanding of park ecosystem
- Develop conceptual models
- Select indicators for monitoring and determine the appropriate sampling design and protocols

Do it Right the First Time approach

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Recommended Approach for Developing a Monitoring Strategy:

1 - Form a Board of Directors and Technical committee
2 - Summarize existing data and understanding (1 Year)
3 - Hold scoping workshop(s)
4 - Write workshop report and have it widely reviewed
5 - Decide on priorities and implementation approaches
6 - Draft the Monitoring Strategy
7 - Review and approval of Monitoring Strategy

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Recommended Approach for Developing a Monitoring Strategy:

Board of Directors

- **Led by Superintendents or their designee (must have authority to make on-the-spot decisions on personnel, funding, office space, and resource management issues.**
- **Network I&M coordinator acts as staff to the Chair.**
- **Board makes decisions on budgeting, scheduling, hiring, based on recommendations from Technical Committee.**
- **Promotes accountability for the program.**
- **Operate under a Network Charter**

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Recommended Approach for Developing a Monitoring Strategy:

Science Advisory (Technical) Committee

- **Comprised of natural resource managers and other scientists from within and outside of NPS, plus Network I&M Coordinator and Regional I&M Coordinator.**
- **Chaired by network I&M coordinator.**
- **Responsible for compiling existing information, preparing for scoping workshop, writing monitoring plan.**
- **Makes recommendations to Board of Directors for approval.**

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Recommended Approach for Developing a Monitoring Strategy:

2 - Summarize existing data and understanding

- Literature review
- Data inventory (e.g., dataset catalog)
- Interview superintendents and key managers concerning major issues
- Review GMPs and RMPs
- Evaluate existing monitoring, and learn what monitoring is being done by neighboring agencies, partners, and related parks

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Recommended Approach for Developing a Monitoring Strategy:

3 - Hold scoping workshop(s)

Before the meeting:

- Define goals and objectives for the monitoring program
- Draft lists of known stressors and other management issues
- Draft lists of important resources
- Begin drafting conceptual models
- Define criteria for indicator selection

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Recommended Approach for Developing a Monitoring Strategy:

3 - Hold scoping workshop(s)

Design the meeting:

- Purpose:
  - To review, modify, and develop additional conceptual models
  - To identify and prioritize potential indicators
  - To provide information concerning available methodologies and costs

Recommended Approach for Developing a Monitoring Strategy:

4 - Write workshop report and have it widely reviewed, including individuals who did not attend scoping workshop

Recommended Approach for Developing a Monitoring Strategy:

5 - Decide on priorities and implementation approaches

Board of Directors based on recommendations from Science Advisory Committee and NR staff:

- Select indicators to be monitored
- Address protocols
- Decide on positions to be hired and where to locate them
- Decide on data management and reporting methods for the network

Recommended Approach for Developing a Monitoring Strategy:

6 - Draft the Monitoring Strategy

- Describe the process
- Explain why some indicators were selected and others weren't:
- Describe sampling design and protocols
- Description of conceptual models
- Include staffing plan
- Include data management plan

Recommended Approach for Developing a Monitoring Strategy:

7 - Review and Approval of Monitoring Strategy

- Peer review
- WASO review and approval

Recommended Approach for Developing a Monitoring Strategy:

What WASO will be doing:

- Provide overall coordination among regions and networks to improve effectiveness of monitoring and reduce duplication of effort
- Develop guidance documents with examples of how to monitor various types of biotic and abiotic resources
- Provide technical assistance to regions and networks
- Assist regional staff in helping to coordinate scoping workshops

Importance of the I & M Program to Resource Managers

- ►Provide scientifically credible data
- ► Establish normal limits of variation
- ► Provide warning signs of resource decline
- ► Evaluate effectiveness of resource programs

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What are Vital Signs?

Vital Signs are key elements that indicate the health of an ecosystem. Vital signs may occur at any level of organization including landscape, community, population, or genetic levels. They may be compositional (referring to the variety of elements in the system), structural (referring to the organization or pattern of the system), or functional (referring to ecological processes). Vital signs can be any measurable feature of the environment that provides insights into the state of the ecosystem.

"Focus on most significant indicators of long-term ecological trends and highest concerns among the parks in each network"

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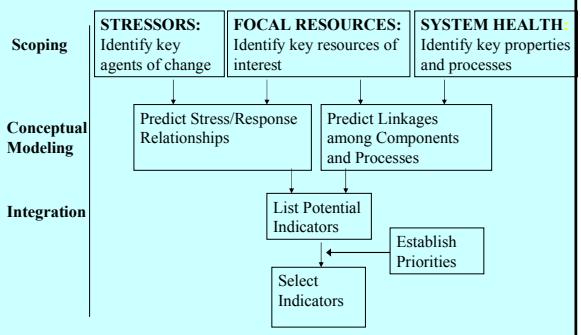
What to Monitor?

1. Determine most critical data needs for the park
2. Answer the question, who is interested in the information, and

Clearly defining and agreeing on the Goals and Objectives from the outset is critical to the success of the program!

Indicator Selection



Source: Kurt Jenkins, USGS/BRD Olympic Field Station

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3-Phase Monitoring Design

- Phase 1: Background work prior to selecting vital signs
  - goals and objectives for monitoring
  - identify, evaluate, synthesize existing data and understanding (identify and catalog existing data sets)
  - draft conceptual models
- Phase 2: Initial selection and prioritization of vital signs
  - update and expand upon Phase I work; select vital signs
  - (Phase 2 report satisfies GPRA Goal 1b3 "identify vital signs")
- Phase 3: Development of full monitoring plan
  - Detailed design work; protocols, spatial sampling design
  - Design database
  - Write Data Management Plan

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Monitoring Protocols?

"A key component of Quality Assurance to ensure that data meet defined standards of quality with a stated level of confidence"

- Necessary for the program to be credible, so that data stand up to external review
- Necessary to detect changes over time and for the program to survive changeovers in personnel
- Necessary to allow comparisons of data among places/agencies

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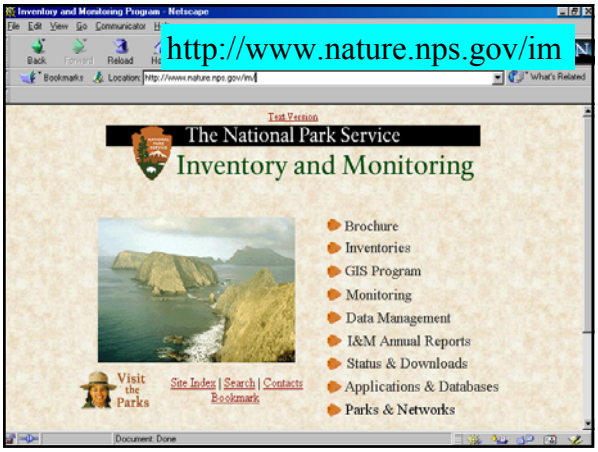
Web-based Clearinghouse of Protocols and Database Components

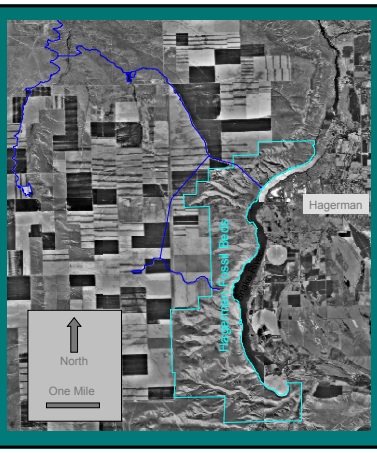
Amphibian Call Counts	Protocol	Database*	Data Analysis
Bird VCP counts	Protocol	Database	Data Analysis
Breeding Bird Survey	Protocol	Database	Data Analysis
Coral reef video sampling	Protocol	Database	Data Analysis
Rare plants	Protocol	Database	Data Analysis
Rare plants	Protocol	Database	Data Analysis
Weather	Protocol	Database	Data Analysis
Weather	Protocol	Database	Data Analysis
Weather	Protocol	Database	Data Analysis

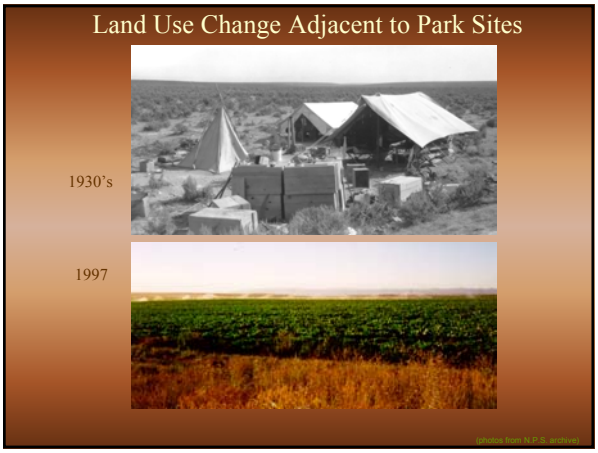
* Database is an MS Access .mdb file with tables, queries, forms, reports designed for a particular protocol.



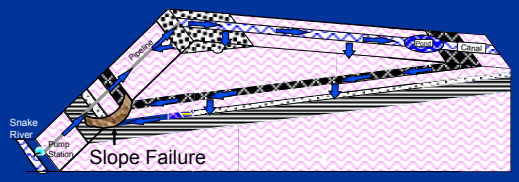
Hagerman Fossil Beds National Monument

Hagerman, Idaho





Landslides
Hagerman Fossil Beds NM



Perched Aquifers
"The Evil Dark-Side of Ground Water"

Hagerman Fossil Beds National Monument

The National Park Service

Perched Aquifer Growth Timeline

1984

(photo from N.P.S. archive)

Impacts From Land Use Change

1997

(photo by Neal Farmer, 1997)

Landscape Changes

Spalding, Idaho
1890

Spalding, Idaho
1997

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Common Characteristics of Parks in the Upper Columbia Basin Network

- Islands located in areas of highly fragmented, disturbed habitat
- Resource impacts caused by the mosaic of land uses surrounding the parks
- Almost all the parks areas are small in size and lack buffer zones

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Conceptual Models

A conceptual model is a visual or narrative summary that describes the important components of the ecosystem and the interactions among them.

- Conceptual models help us formalize our current understanding of natural processes and anthropogenic stressors affecting ecological integrity.
- They help us to expand our consideration across traditional discipline boundaries.
- Most importantly, clear, simple models facilitate communication among:
  - scientists from different disciplines;
  - researchers and managers;
  - managers and the public.

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Conceptual Models

Conceptual models define the linkages between environmental values, ecological endpoints, stressors, and important ecosystem components and processes.

Conceptual models explicitly define the framework for indicator interpretation; for example, how the response indicators relate to the assessment endpoints … and how they will be used to assess that status.

One purpose of the models is to promote an integrated program and facilitate coordination.

Conceptual models are important representations of scientific understanding of the ecological resource for monitoring purposes. They must be descriptive and should clearly demonstrate linkages between the indicators and the environmental values being monitored.

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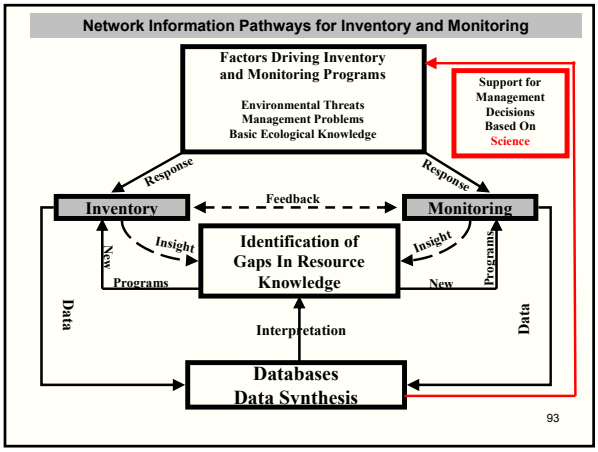

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CONCEPTUAL MODEL

Land Use Activities
Around Network Parks
and
Associated Impacts

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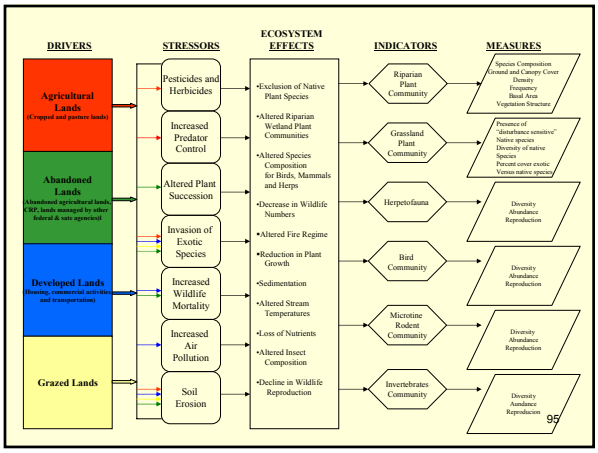

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