Natural Resource Challenge
Inventory & Monitoring

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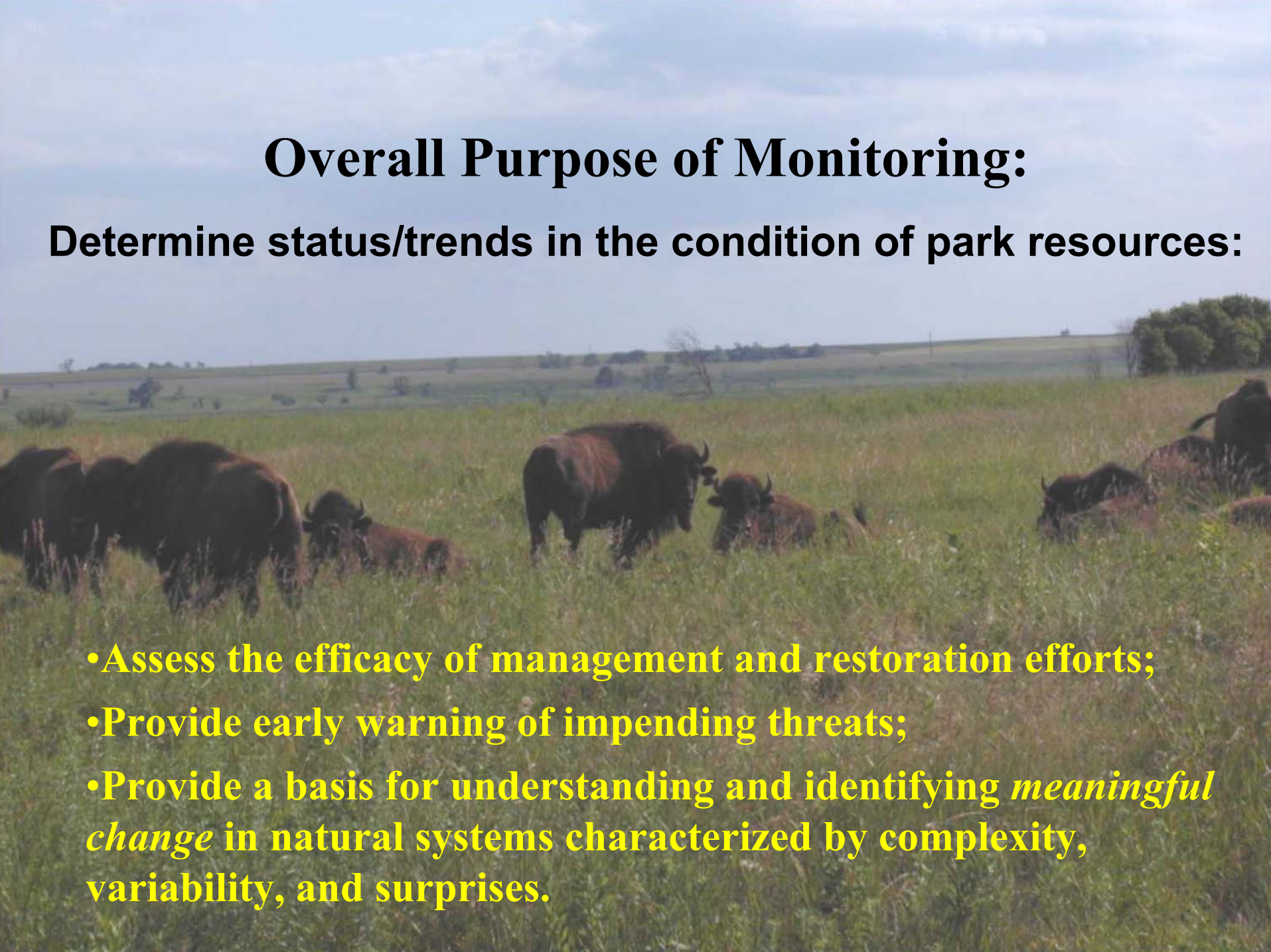
Revitalize and expand the natural resource program within the park service and improve park management through greater reliance on scientific knowledge

Organ Pipe Cactus N.M. © D. Liggett

Overall Purpose of Monitoring:

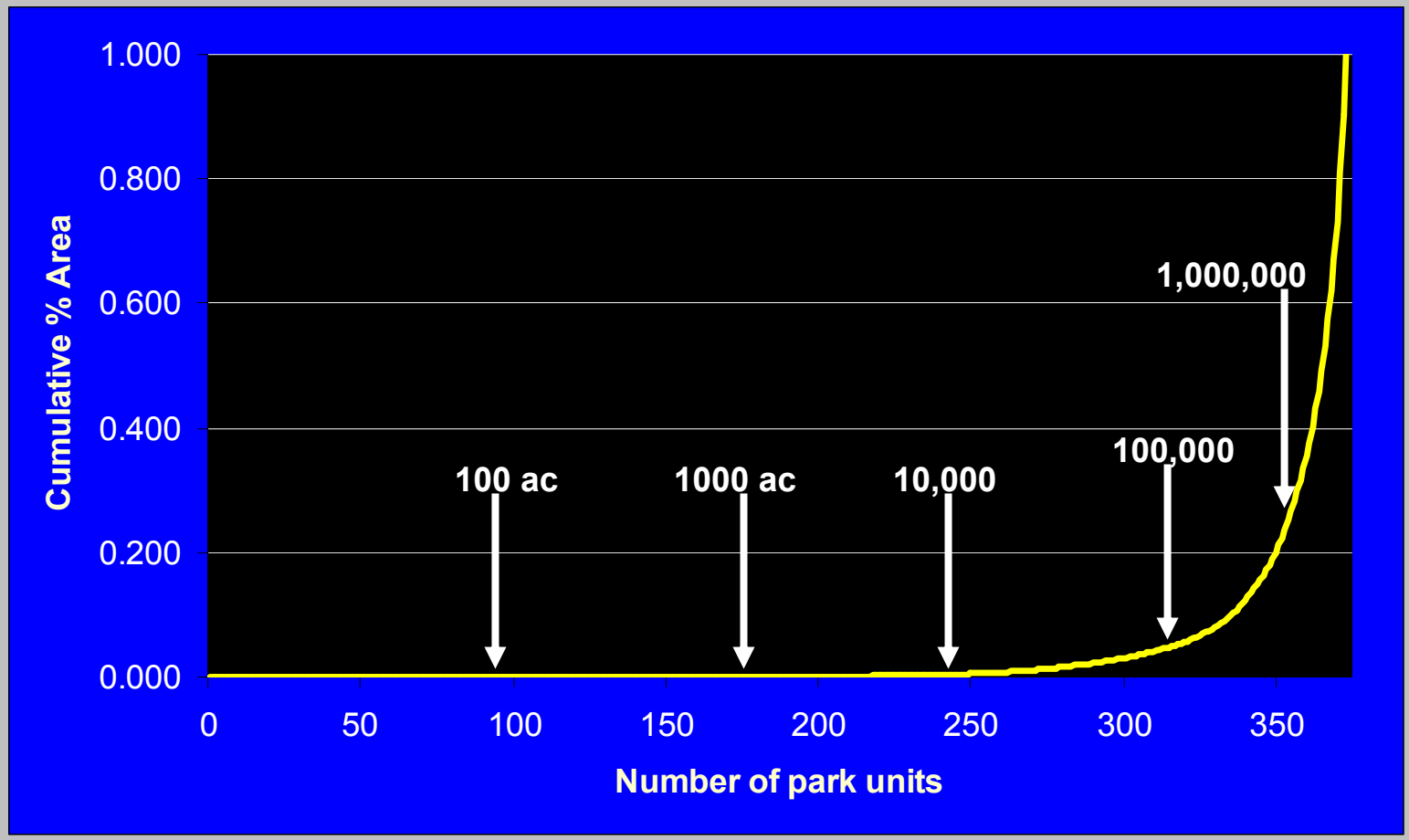
Determine status/trends in the condition of park resources:



- **Assess the efficacy of management and restoration efforts;**
- **Provide early warning of impending threats;**
- **Provide a basis for understanding and identifying *meaningful change* in natural systems characterized by complexity, variability, and surprises.**

National parks are part of larger ecosystems and must be managed in that context.

- most parks are open systems, with threats such as air and water pollution, or invasive species, originating outside of the park's boundaries.
- the appropriate scale for understanding and effectively managing a resource might be at the population, species, community, or landscape level, and in some cases may require a regional, national or international effort to understand and manage the resource.
- protecting and managing a park's natural resources requires a multi-agency, ecosystem approach

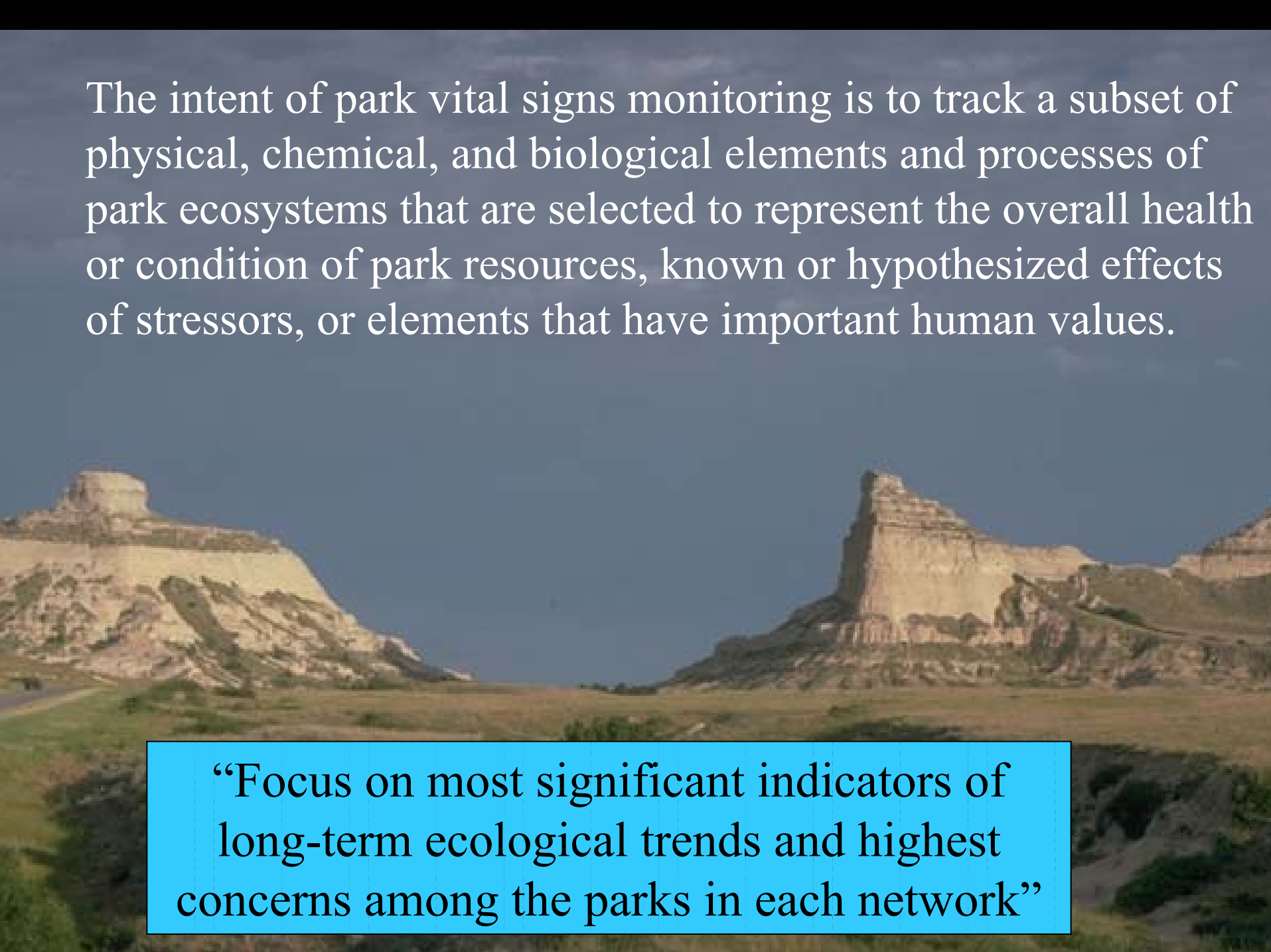


50% of parks < 1500 ac (607 ha)
65% of parks are < 10,000 ac (4,050 ha)


Olympic NP
North Cascades NP
Prairie Cluster
North Coast and Cascades
Rocky Mountain
Northern Semi-Arid
Klamath
Greater Yellowstone
Northern Great Plains
Great Lakes
Northeast Temperate
Cape Cod NS
Eastern Rivers and Mountains
Northeast Coastal and Barrier
San Francisco Bay
Sierra
Northern Colorado Plateau
Heartland
Mammoth Cave NP
National Capital
Mojave Desert
Northern Colorado Plateau Cluster
Shenandoah NP
Channel Islands NP
Southern Colorado Plateau
Cumberland/ Piedmont
Mid-Atlantic
Mediterranean Coast
Southern Plains
Appalachian Highlands
Sonoran Desert
Southeast Coast
Great Smoky Mountains NP
Chihuahuan Desert
Gulf Coast
Denali NPP
Northwest Alaska
Central Alaska
South Florida/Caribbean
Southwest Alaska
Pacific Islands
South Florida / Caribbean Cluster

The Network Strategy

- Strategic approach to allow all parks to identify most critical data needs and begin monitoring planning/design work now; minimum infrastructure
- Group of parks share consistent funding and professional staff to plan/design/implement integrated monitoring. Provide core professional staff that parks can build on.
- Networks augment work already being done by park staff.
- Administrative tool for greater efficiency by sharing staff & funding; monitoring must be responsive to park-level issues, data needs, and managerial interests.
- Start with modest program, but be optimistic! Build a strong foundation. Demonstrate the value of scientific data for park stewardship, and the funding & staffing will grow.

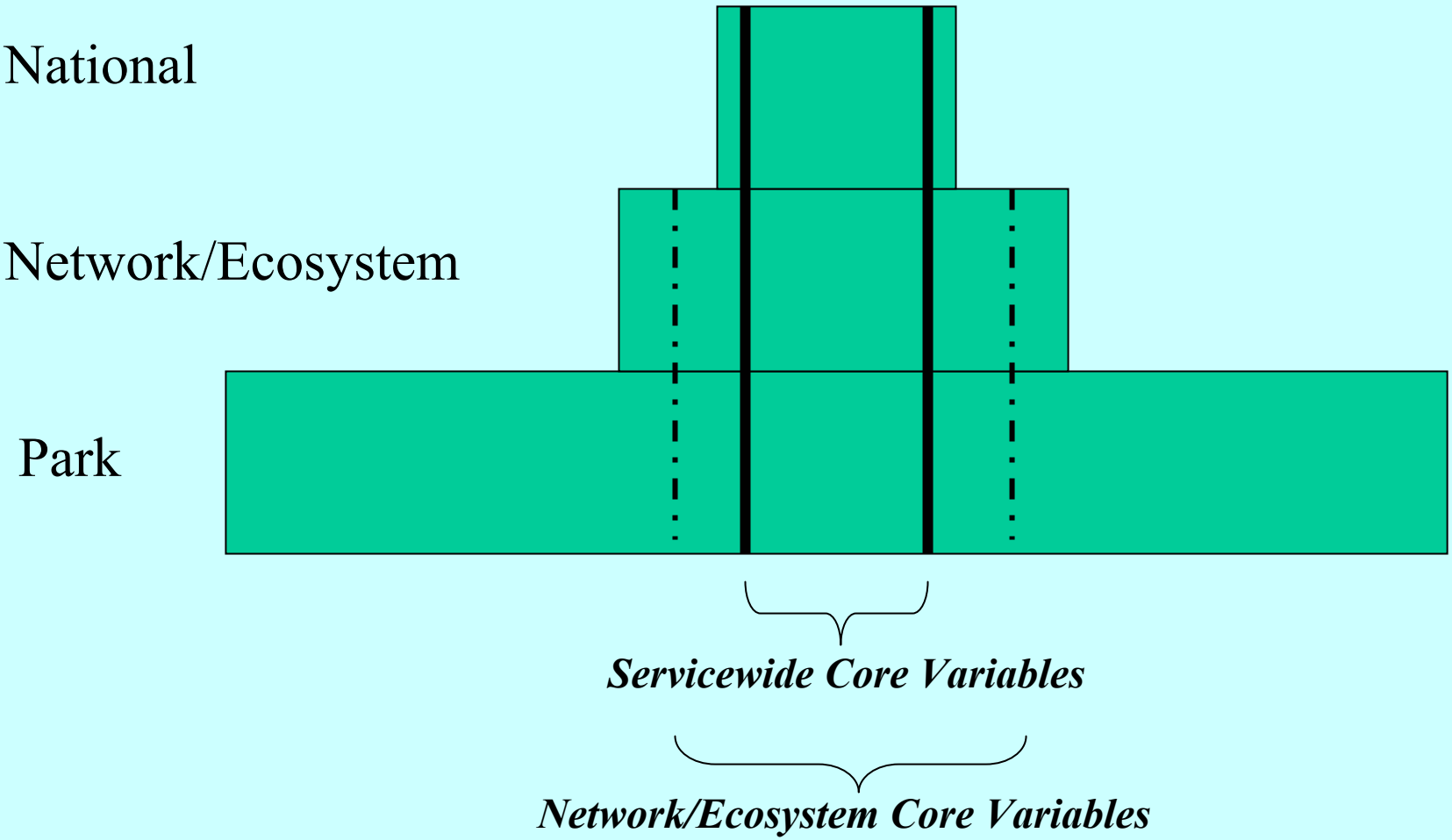


The intent of park vital signs monitoring is to track a subset of physical, chemical, and biological elements and processes of park ecosystems that are selected to represent the overall health or condition of park resources, known or hypothesized effects of stressors, or elements that have important human values.

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

Current Approach

1. Parks and network identify their most critical data needs, and determine partnership opportunities (maximize the use and relevance of data; get the most for your monitoring dollar).
2. Once that is done, identify common ground and additional opportunities for collaboration and consistency among approaches and protocols.
3. Promote sharing/comparing of protocols and datasets via data management and protocol clearinghouse.
4. At the national level, use qualitative measures and in a few cases, standardized quantitative measures, to report on the condition of natural resources and important highlights and trends Servicewide.


National
Network/Ecosystem
Park
Servicewide Core Variables
Network/Ecosystem Core Variables

Outline for a Network Vital Signs Monitoring Plan

Note: Chapter headings are fixed, but networks are free to organize material within each chapter as appropriate to make the plan more easily understood and organized.

Executive Summary

Chapter 1	**Introduction and Background**
Chapter 2	**Conceptual Models**
Chapter 3	**Prioritization and Selection of Vital Signs**
Chapter 4	**Sampling Design**
Chapter 5	**Sampling Protocols**
Chapter 6	**Data Management**
Chapter 7	**Data Analysis and Reporting**
Chapter 8	**Admin./Implementation of Monitoring Program**
Chapter 9	**Schedule**
Chapter 10	**Budget**
Chapter 11	**Literature Cited**

Glossary

Appendices

Phase 1 = Draft Chapters 1 and 2
Phase 2 = Updated Chapters 1 and 2, plus Chapter 3

Designing a Monitoring Program requires a large up-front investment that should be represented in the protocol document

- Clear statement of questions being asked, including Measurable Objectives
- Sampling framework/design
- Step-by-step procedures for collecting, managing and analyzing the resulting data
- Expectations/examples for presenting the data in graphs, tables, reports
- Personnel requirements and training
- Operation requirements: scheduling, equipment needs, startup costs and budget requirements

Table 1. Guidelines for long-term monitoring protocols: recommended content of the protocol narrative.

1. Background and Objectives
    a. Background/history; describe resource issue being addressed
    b. Rationale for selecting this resource to monitor
    c. Measurable objectives
2. Sampling Design
    a. Rationale for selecting this sampling design over others
    b. Site selection
        i. Criteria for site selection; define the boundaries or "population" being sampled
        ii. Procedures for selecting sampling locations; stratification, spatial design
    c. Sampling Frequency and Replication
    d. Recommended number and location of sampling sites
    e. Recommended frequency and timing of sampling
    f. Level of change that can be detected for the amount/type of sampling being instituted.
3. Field Methods
    a. Field season preparations and equipment setup (including permitting/compliance procedures)
    b. Sequence of events during field season
    c. Details of taking measurements, with example field forms
    d. Post-collection processing of samples (e.g., lab analysis, preparing voucher specimens)
    e. End-of-season procedures

4. Data Handling, Analysis and Reporting
    a. Metadata procedures
    b. Overview of database design
    c. Data entry, verification and editing
    d. Recommendations for routine data summaries and statistical analyses to detect change
    e. Recommended reporting schedule
    f. Recommended report format with examples of summary tables and figures
    g. Recommended methods for long-term trend analysis (e.g., every 5 or 10 years)
    h. Data archival procedures
5. Personnel Requirements and Training
    a. Roles and responsibilities
    b. Qualifications
    c. Training procedures
6. Operational Requirements
    a. Annual workload and field schedule
    b. Facility and equipment needs
    c. Startup costs and budget considerations
7. References