NPS Vital Sign Monitoring, Remote Sensing, and the Path to Thresholds and Assessment Points

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National Park Service

Inventory & Monitoring Program

Ft. Collins, Colorado

- NPS Inventory and Monitoring Program
- A look towards the future

Inventory & Monitoring Milestones

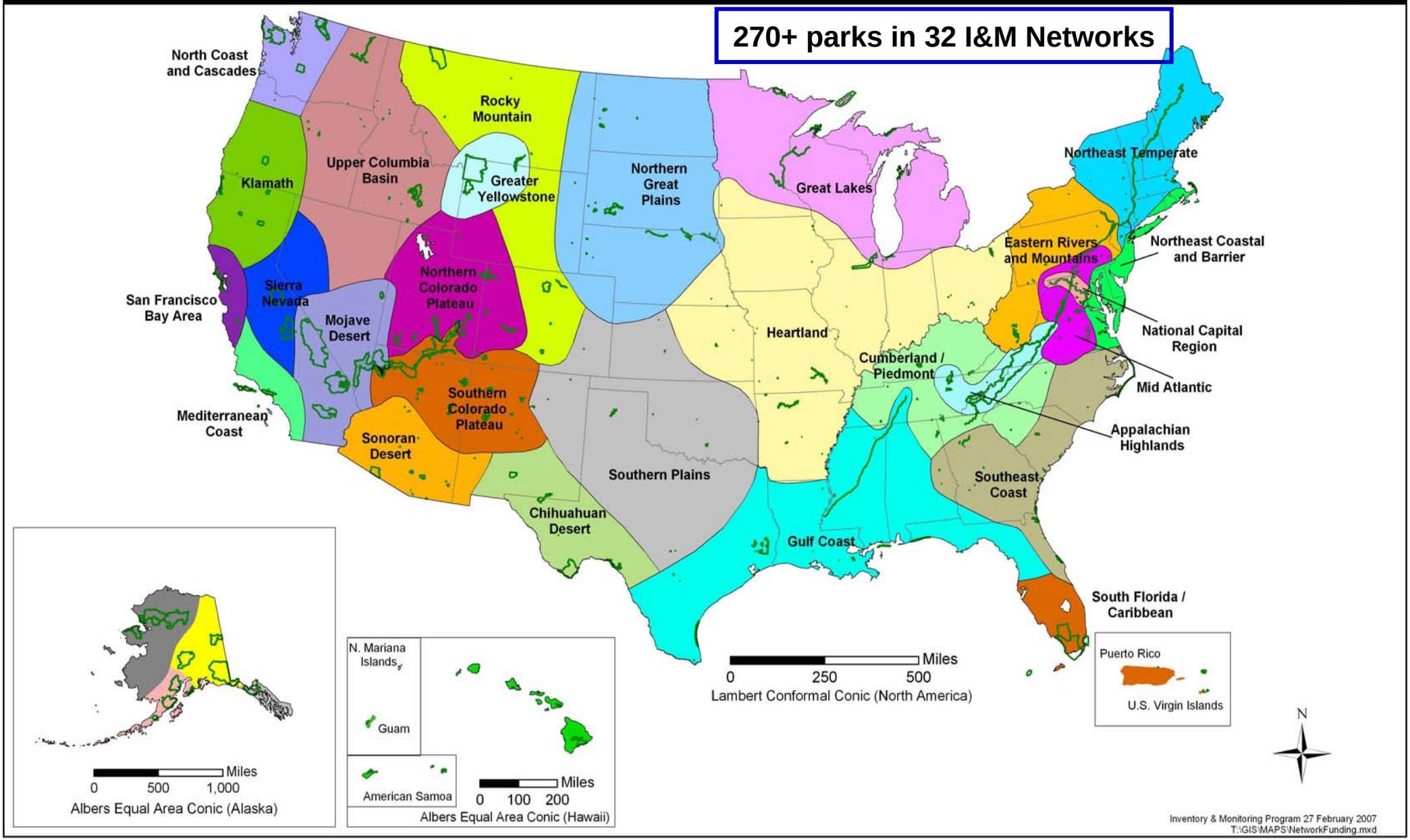
- **1992** **First "Significant" Funding**
  - » Baseline Inventories Initiated
  - » First 4 Prototype Programs Funded
- **1997** ***Preserving Nature in the National Parks*** **published**
- **1998** **NPS Omnibus Management Act**
- **2000** **Natural Resource Challenge**

Overall Purpose of Monitoring:
Determine trends in the condition of selected park resources

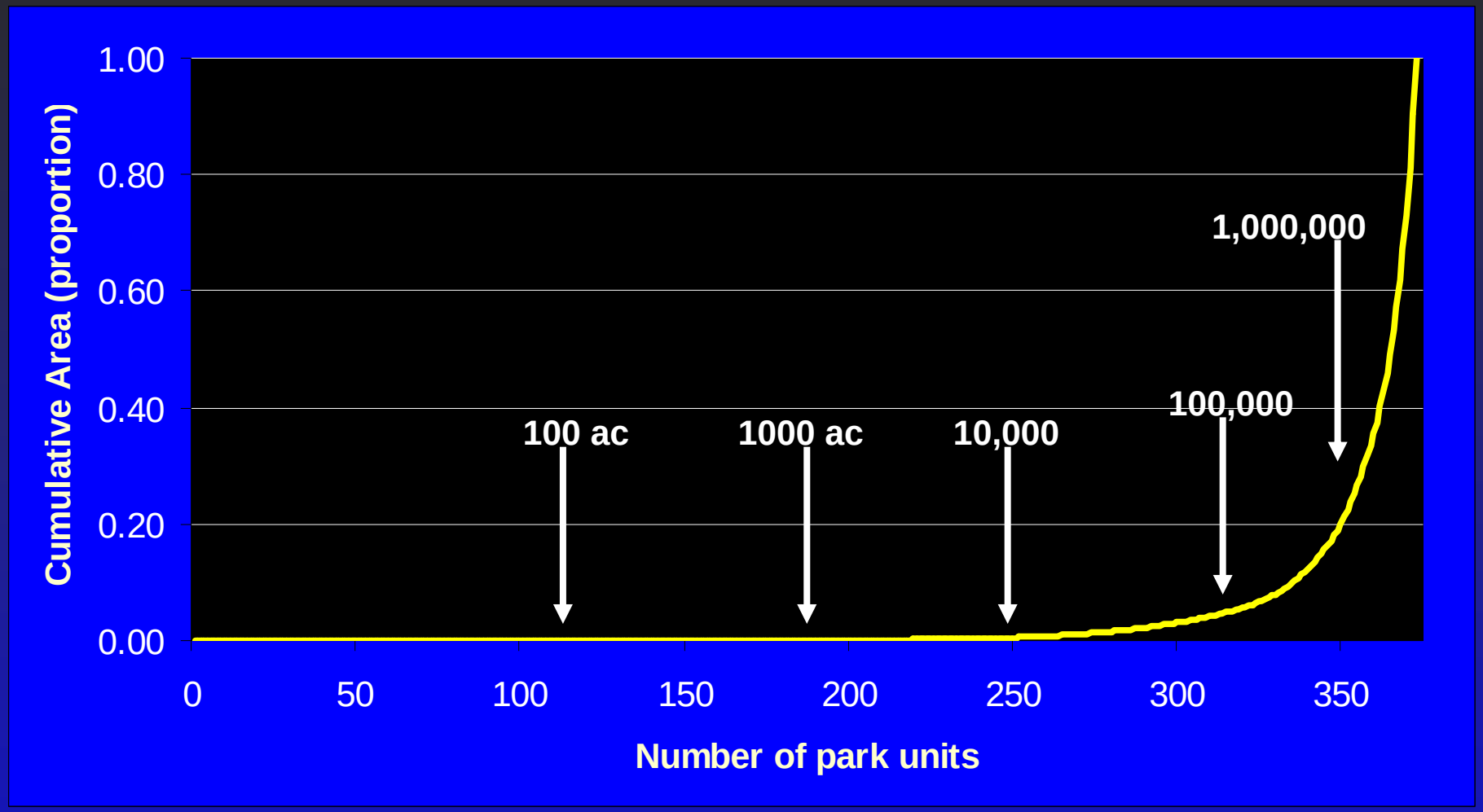
- Assess the efficacy of management and restoration efforts;
- Provide early warning of impending threats;
- Provide a basis for understanding and identifying *meaningful change* in natural systems characterized by complexity, variability, and surprises;
- Means of reporting against performance goals.

Vital Signs Monitoring Networks
Inventory & Monitoring Program

National Park Service
U.S. Department of the Interior



Map reproduced on page 15 in handouts

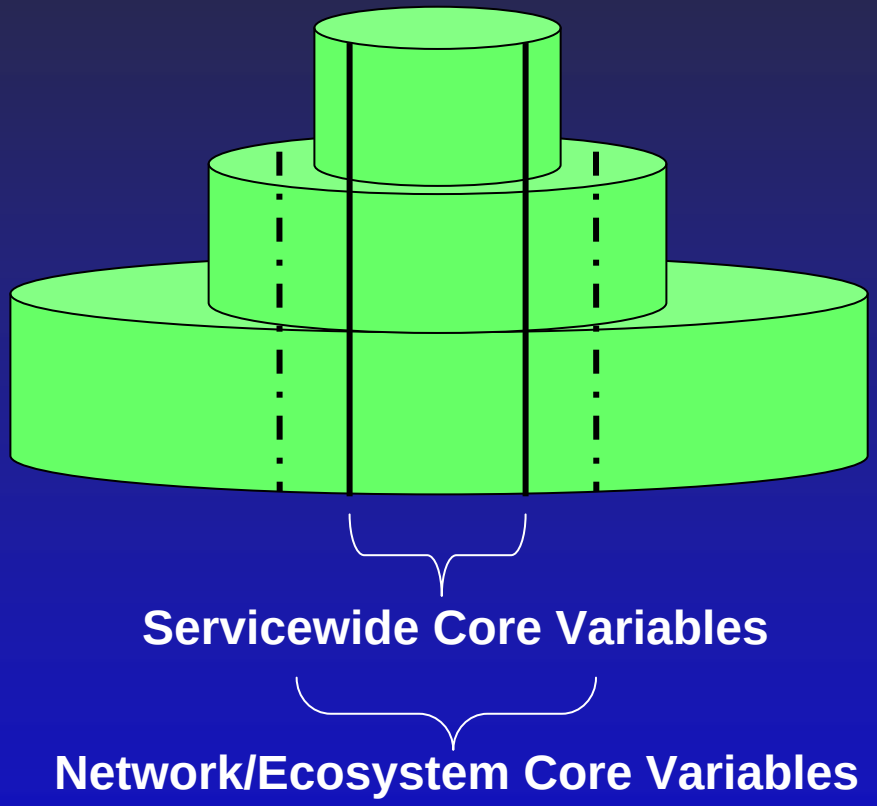


50% of parks < 1500 ac (607 ha)

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

The Wedding Cake

An alternative to “One Size Fits All”



National

Network/Ecosystem

Park

- **Primary use of data is at the local level**
- **Most relevant indicators and protocols differ between systems**

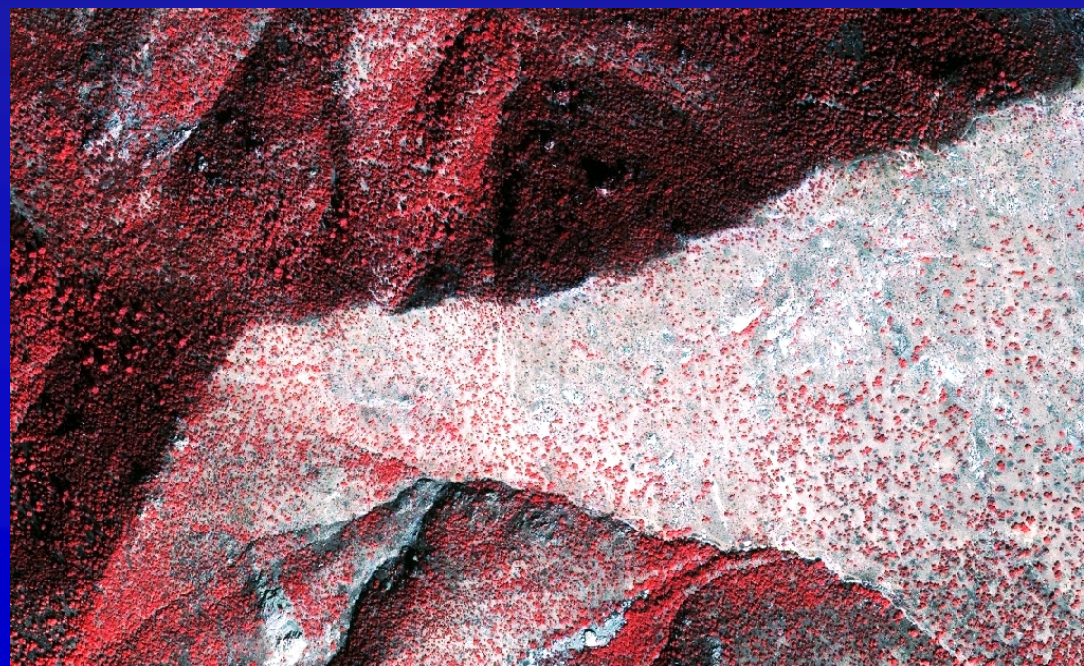
Ecological Monitoring Framework (Abbreviated)	
Level 1 Category	**Level 2 Category**
Air and Climate	Air Quality; Weather and Climate
Geology and Soils	Geomorphology
	Subsurface Geologic Processes
	Soil Quality
Water	Hydrology ; Water Quality
Biological Integrity	Invasive Species
	Infestations and Disease
	Focal Species or Communities
	At-risk Biota
Human use	Point-Source Human Effects
	Non-point Source Human Effects
	Visitor and Recreation Use
Landscapes (Ecosystem Pattern and Processes)	Fire and fuel dynamics
	Landscape Dynamics
	Nutrient Dynamics
	Productivity

More detailed version – p. 16 in NARSEC book

Generic Name	Measures
Land use	Road density, housing density, impervious surface, structures, agriculture use, viewshed composition, etc.
Forest pests	Insect damage and defoliation; dead or stressed trees; Gypsy moths density, pine beetles density
Land condition	Change in start / end of growing season, cumulative NDVI, severity of 'disturbance‘, percent bare ground
Land cover	Area and change in area of dominant land cover types
Landscape pattern	Patch size distribution, connectedness, edge-to-area, fragmentation
Primary production	Carbon fixation, aboveground biomass production

I&M projects

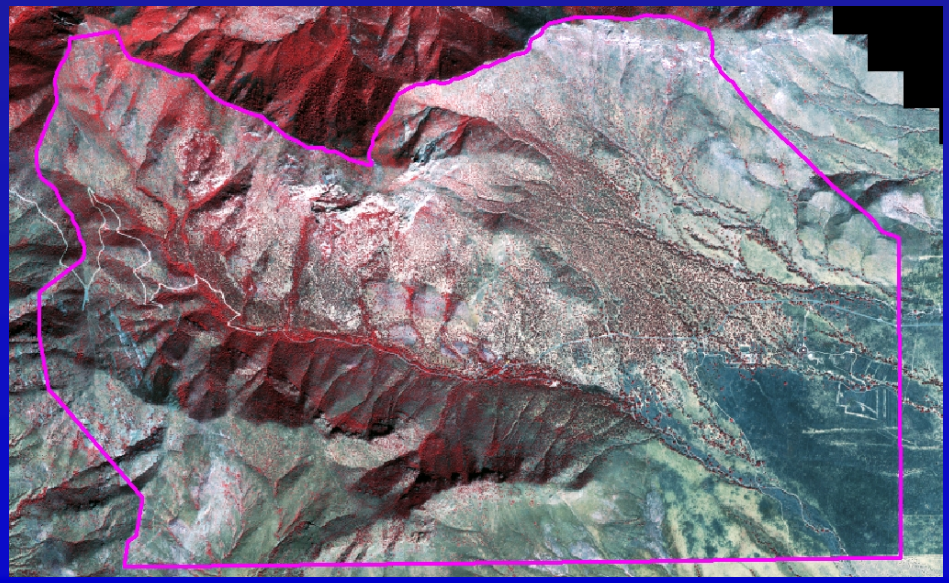
- Disturbance
- Vegetation change
- Land condition
- Phenology (plants, ice, permafrost)
- Topographic change (coasts, reefs, etc)
- Pattern and context



Lessons leaned

Many opportunities for collaboration on broad-scale analyses

- Develop core vital signs,
- Use inexpensive high-frequency, coarse-resolution RS data to target acquisition of expensive data,
- Broad scale of objectives consistent with USGS, EPA, NASA, PCA,
- Program-wide efficiencies in data processing and analysis,



Coronado National Monument

With these successes, what's next?

- Transition from RS methods to analysis, evaluation, and reporting,
- Link to habitats, biodiversity, and other resources,
- Link pattern and process,
- Connect pattern-process to management guidelines,
- Strongly growing interest in global changes, especially climate,
- Very important communication issues.

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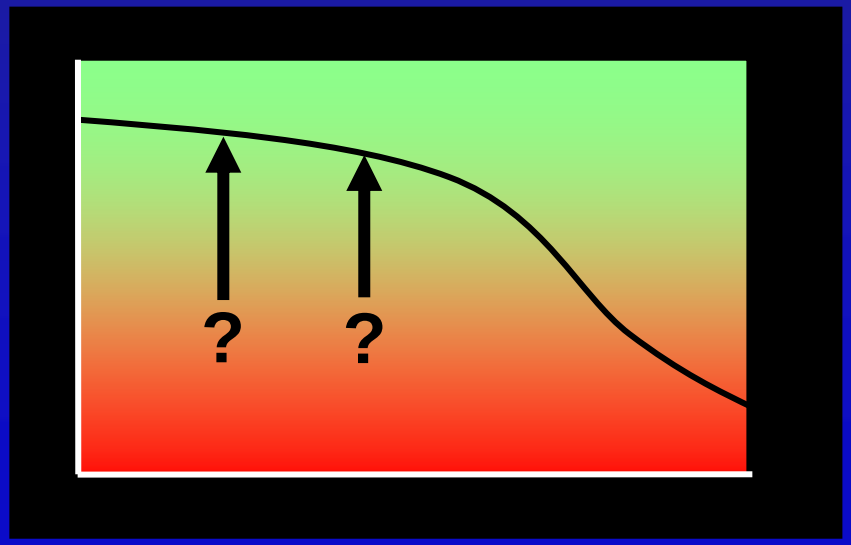
What is management context for data on landscape attributes?

NPS Discussions:

- Want defensible, quantitative evaluation – sound assessment
- Don't want to 'tell' managers what to do
- Note ecological consequences, guidelines or recommendations

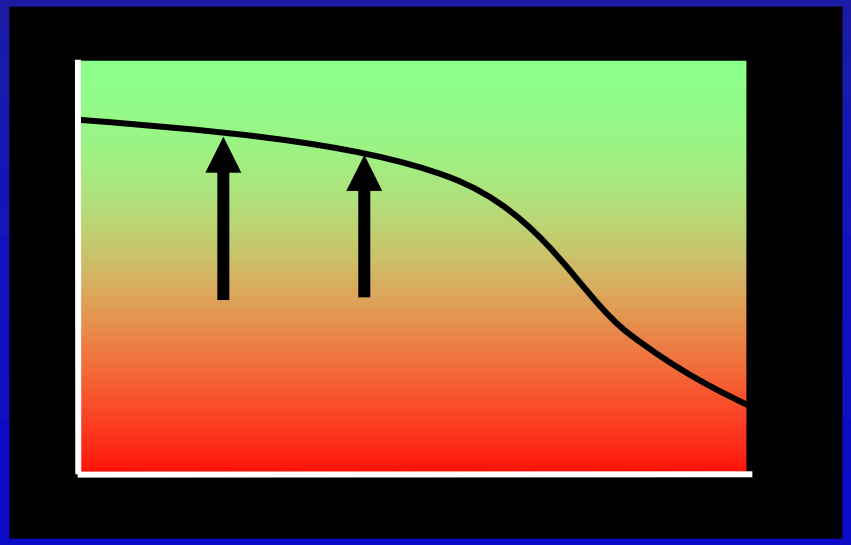
Ecological threshold – rapid, non-linear change in system.

Management threshold – point at which an action is necessary.



Assessment points and NARSEC 2007

- For each indicator discussed, can we identify defensible, quantitative values that should trigger an action?
- For these values, or assessment points, what associated ecological attributes and/or consequences need to be communicated?
- How can we best communicate these attributes?

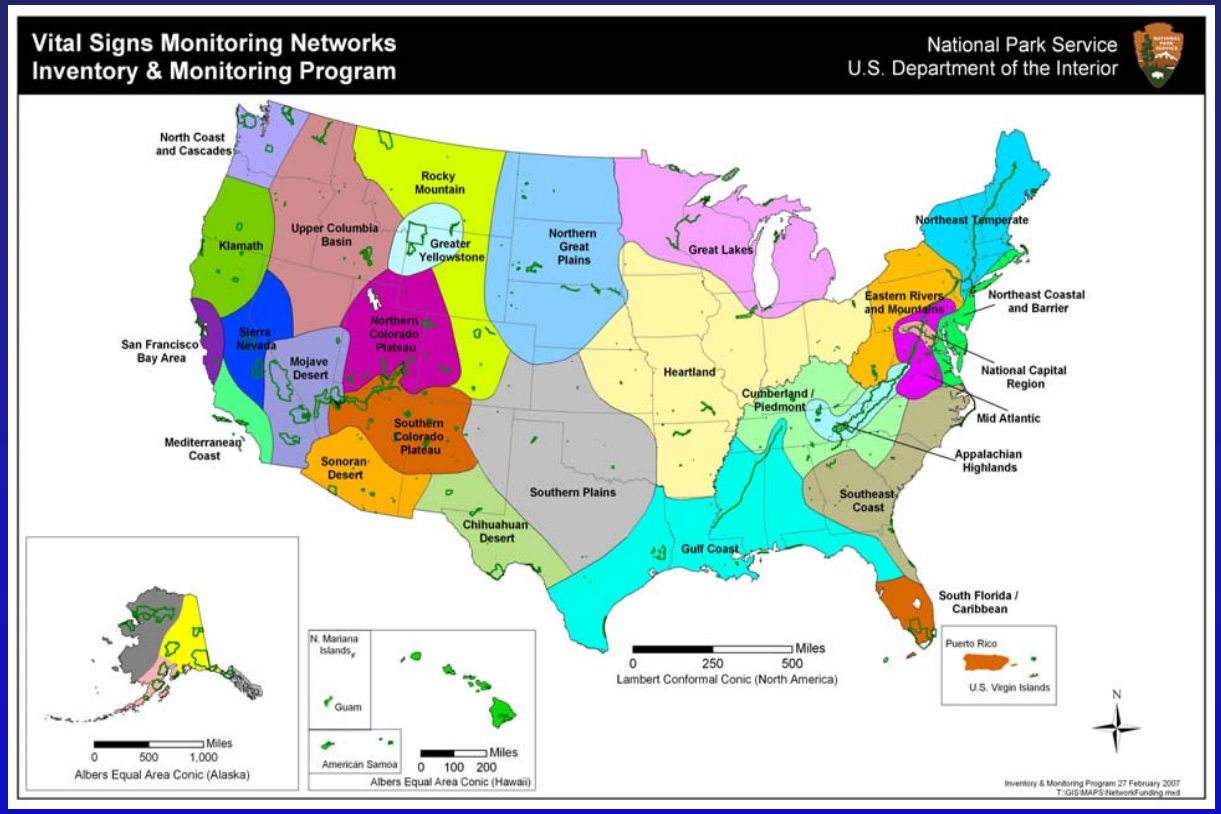


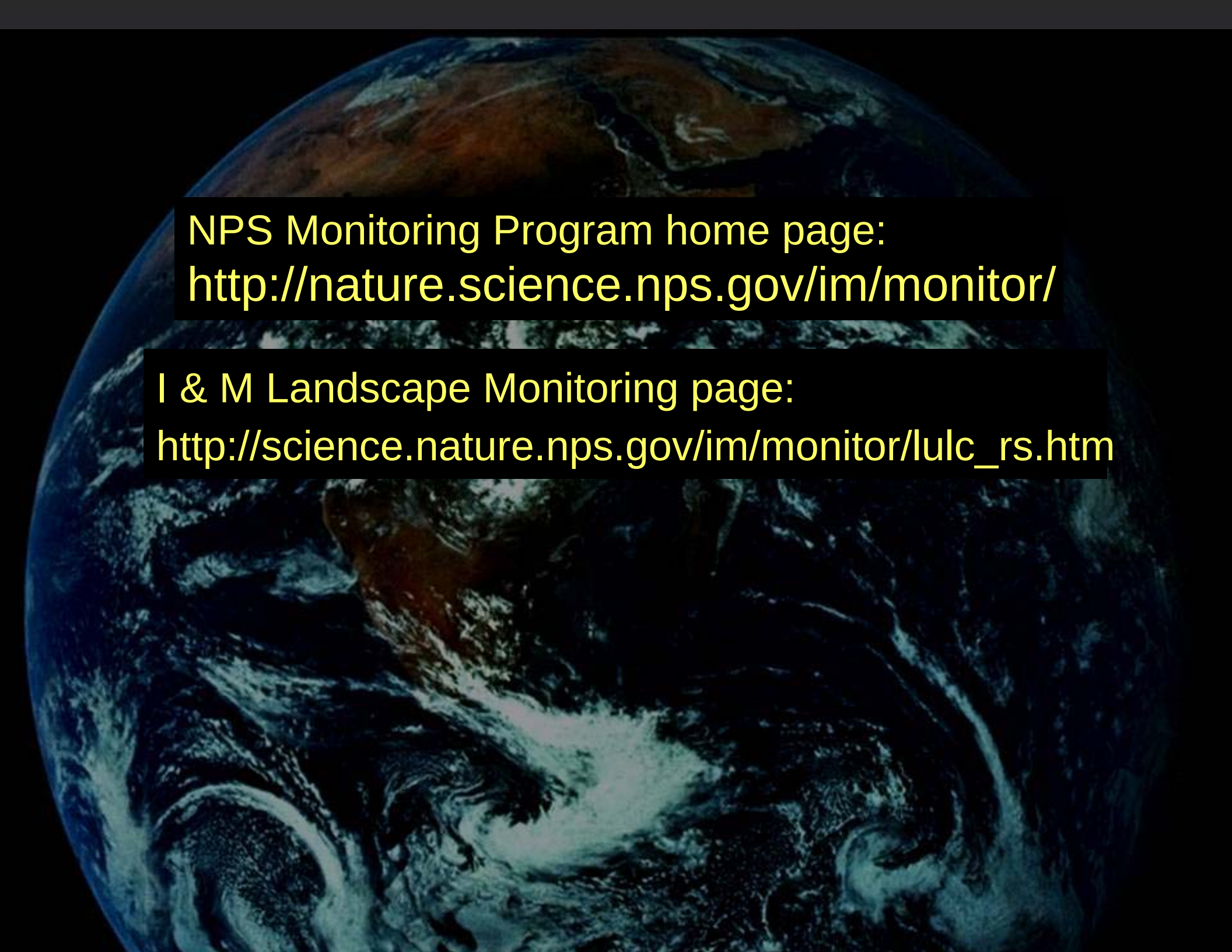
A critical, common monitoring need is to identify when to take action, and what actions are warranted.

We've made great progress towards measuring important park ecosystem attributes. A pressing challenge is to make the data relevant to decisions on park management.

Summary

- Many parks in 32 networks, from Pacific islands to arctic
- Diversity of vital signs that remote sensing can address
- Critical need for interpretation and evaluation of results

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