

National Park Service
U.S. Department of the Interior
Natural Resources Program Center



Soil Survey and Ecological Site Descriptions: *A National Park Service Perspective*

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The NPS Inventory and Monitoring Program provides guidance, funding, and technical assistance for parks to complete a set of 12 "basic" natural resource inventories.

The Soil Resources Inventory is one of these basic inventories

The NPS recognizes that a thorough inventory and evaluation of soil resources within National Parks is needed for comprehensive management, interpretation, and understanding of park resources.

Inventory Brief

National Park Service
U.S. Department of the Interior
Inventory & Monitoring Program
Soil Resources Inventory



Soil Resources Inventory

Background

Soil is defined as the unconsolidated portion of the earth's crust modified through physical, chemical, and biotic processes into a medium capable of supporting plant growth. Soil properties influence the natural and the physical infrastructure of the landscape and ecosystems. The National Park Service (NPS) recognizes that a thorough inventory and evaluation of soil resources within national parks is needed for comprehensive management, interpretation, and understanding of park resources.

Soil surveys conducted throughout lands under NPS stewardship provide an orderly, on-the-ground, scientific inventory of soil resources.

The Soil Resources Inventory (SRI) includes:

- Maps of the locations and extent of soils
- Data about physical, chemical, and biological properties of those soils
- Information derived from those data about potentialities and problems of use on each kind of soil

The information is in sufficient detail for application by park managers, planners, engineers, and scientists to specific areas of concern. The Inventory & Monitoring (I&M) Program supports soils mapping and inventory based on standard terminology and techniques of the National Cooperative Soil Survey (NCSS). SRI staff assist parks with identifying needs for soil mapping, so that park objectives are met through appropriate data collection and map scale.

Products

Products of the Soil Resources Inventory include:

- Geospatial soils data meeting Soil Survey Geographic (SSURGO) standards
- Soil attributes, properties and interpretations exported from the National Soil Information System (NASIS) in a MS Access format
- Soil survey manuscript in both hardcopy and digital format
- Metadata following the Soil Survey Geographic Data Standard



A typical soil profile of Basal mucky loam from San Juan Island National Historical Park. These are poorly drained soils forming in glacial outwash material over dense glaciomarine deposits and have a seasonal high water table. Numerals on tape are in centimeters. Photo by Pete Biggam.

Status

Working in partnership with the Natural Resources Conservation Service (NRCS), the SRI has completed mapping in 207 park units. Mapping is in progress in an additional 36 units. The NRCS will continue to support soil mapping until the project is completed. Special strategies are being developed in cooperation with the NRCS and private contractors to utilize advanced soil mapping technologies to handle the large-area mapping for parks in Alaska, Arizona, California, Florida, Montana, New Mexico, North Carolina, Tennessee, Texas, Utah, and Washington.

“Parks will obtain adequate soil surveys for the management of park resources.”

“All soil surveys will follow National Cooperative Soil Survey Standards.”

Products will include soil maps, determinations of the physical, chemical and biological properties of soils, and the interpretations needed to guide resource management and development decisions.”

Excerpts from, NPS Management Policies 2006, Part 4.8.2.4 - Soil Resource Management

Management Policies 2006



Additional products will include:

- 1) **ecological site descriptions (ESD)**
- 2) **soil landscape and soil vegetation images**
- 3) **locations and documentation of all soil observations performed within or adjacent to the park.**

Management Policies 2006



“Only by having reliable scientific information can park managers take corrective actions before those impacts severely degrade ecosystem integrity or become irreversible”



EXPERIENCE YOUR AMERICA

“The Function of Soil – A NPS Perspective”

§ Sustain Plant and Animal Productivity

§ Maintain or Enhance Water and Air Quality

§ Support Ecosystem Health and Habitation

§ Protect and Preserve Our Cultural Resources and Landscapes



NPS Soil Resources Management

Our Goal.....

Promoting the use of soils and ecological site information in NPS decision making and making it accessible in a user friendly way to staff and partners.



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NPS Use and Application of Soil and Ecological Site Information

Vital Signs Monitoring

General Management Plans/Resource Management Plans/Grazing Management Plans

Resource Stewardship Strategies/Natural Resource Condition Assessments

DOI Land Health Goals

Disturbed Lands Program

Restoration Projects

Cultural Resources Preservation and Protection

Park Development and Maintenance

NPS Use and Application of Soil and Ecological Site Information

Fire Management Plans/Fuel Reduction Program

Burned Area Emergency Response (BAER) Teams

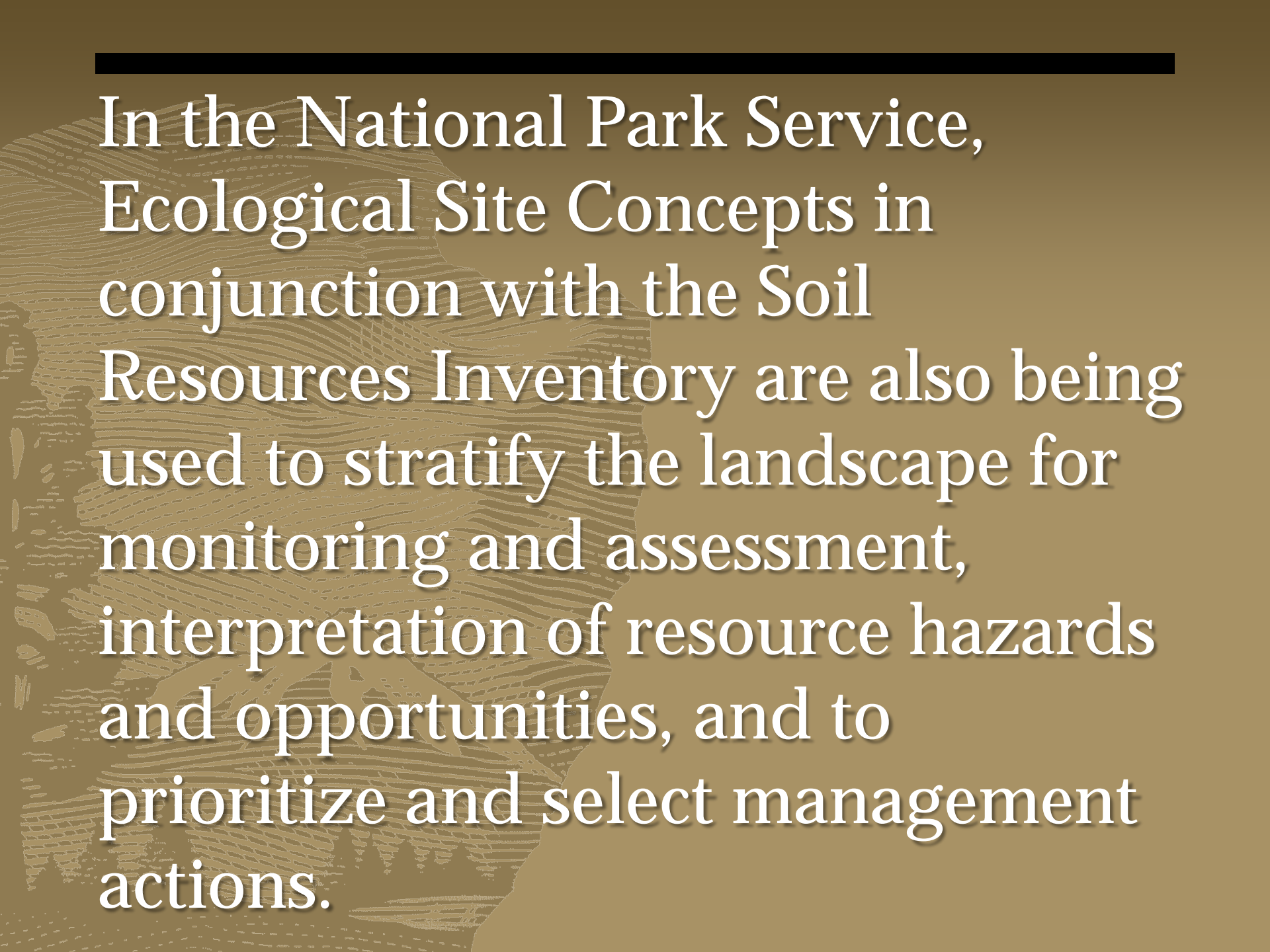
Distribution of Threatened and Endangered Species

Hydric Soils and Wetland Identification and Management

Exotic/Invasive Plants

Exotic Plant Management Teams (EPMT)

Interpretation/Information and Education




In the National Park Service, Ecological Site Concepts in conjunction with the Soil Resources Inventory are also being used to stratify the landscape for monitoring and assessment, interpretation of resource hazards and opportunities, and to prioritize and select management actions.



NPS Vital Signs Networks





Numerous Networks have identified the Soil Resources Inventory and Ecological Site Descriptions as a tool to help stratify the parks for monitoring purposes, and will also be looking at various vital sign indicators that can be found within these products.



Big Bend National Park Landscape Restoration Project



Disturbed Lands Restoration Project

Original intent by
park hydrologist
was to just
remove man
made earthen
structures and
hope the site
would “fix itself”



1. Midgrass/Shrubland State

1.1 Midgrass/Shrub Community
Historic Climax Plant Community

Tobosa and alkali sacaton dominate in large patches. Bare ground <40%, infrequent rills and gullies, water flow patterns are short (<6 feet)

* Grasses 75%, Shrubs 15%, Forbs 10%

T1A

2. Creosotebush/Tarbrush Shrubland State

2.1 Shrubs/Mid and Shortgrass Community

Creosotebush, tarbrush, and mesquite increase with fragmented tobosa, burrograss and fluffgrass.

Bare ground 40-55%, rills and gullies common and moderately active, water flow patterns are moderate (6-12 feet).

* Grasses 35%, Shrubs 50%, Forbs 15%

2.2A

2.1A

2.2 Shrub/Annual Grasses Community

Creosotebush, tarbrush, and mesquite with annual grasses, isolated burrograss and fluffgrass.

Bare ground >55%, rill formation severe, gullies common and active, water flow patterns extensive (>12 feet)

* Grasses 35%, Shrubs 50%, Forbs 15%

Legend

T1A Improper Grazing, Hydrologic alteration

2.1A Improper Grazing, Extended drought

2.2A Prescribed Grazing, Favorable rainfall

*Approximate % of weight composition by weight



Tornillo Soils

Loamy Hot Desert Shrub Ecological Site

(R042XG738TX)

10 - 13 inch precipitation zone

Calcareous alluvium parent
material

Tobosa grass – Alkali sacaton
plant community

Less than 40 percent bare ground

Borderline between
Midgrass/Shrubland State and the
Creosotebush/Tarbush Shrubland
State.

Considered “Functional” and not
in restoration project



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Big Bend Dynamic Soil Properties and Ecological Site Project

Loamy Hot Desert Shrub Ecological Site

(R042XG738TX)

Sparsely Vegetated State

10 - 13 inch precipitation zone

Calcareous alluvium parent material

Annual invasive plant community

Greater than 90 percent bare ground

Soil Function Drastically Reduced !

Not really identified in the existing State and Transition Model



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Big Bend Dynamic Soil Properties and Ecological Site Project

Dynamic Soil Properties observed on the Tornillo soil in 2 states of the Loamy Hot Desert Shrub Ecological Site

	Bulk Density (g/cc)	Surface stability	Sub-surface stability	EC	pH	Carbon	Infiltration
Historic climax PC	?	?	?	?	?	?	?
Creosote Tarbush Shrubland	1.16	4.6	3.1	0.8	7.5	low	slow
Sparsely vegetated	1.24	1.9	2.9	2.1	7.5	absent	very slow

Disturbed Lands Restoration Project

The recommended strategy was to look at what state of the ESD should be considered practical to achieve as to how a restoration approach should be directed to restore an *“acceptable level of function”*.

Banded vegetation is an indicator of the **Creosote bush/tarbush state**



Big Bend Dynamic Soil Properties and Ecological Site Project

Disturbed Lands Restoration Project

The final strategy utilized information from the Soil Resources Inventory and the ESD's to focus on restoring **soil and site stability, hydrologic function, and the biotic integrity of the sites**



Big Bend Dynamic Soil Properties and Ecological Site Project

Disturbed Lands Restoration Project

The next steps will actually look at the biotic integrity of the site, and look at soil biota (both the mega fauna and micro fauna) in treated and untreated areas



NPS Soil Resources Management

Our Challenge

We do not want to be

DATA RICH

Yet

INFORMATION POOR!!





United States
Department of
Agriculture



Natural Resources
Conservation Service



In cooperation with
United States Department
of the Interior,
National Park Service,
and Regents of the
University of California

Ecological Site Descriptions of Lassen Volcanic National Park, California



United States
Department of
Agriculture



Natural
Resources
Conservation
Service



National Park
Service

In cooperation
with the
United States
Department of
the Interior,
National Park
Service, and
Texas AgriLife
Research

Key to the Ecological Sites at Big Bend National Park, Texas



“Recently Discovered ESD’s on NPS Lands”

R022BI201CA - Bedded Tephra Deposits

Lassen Volcanic National Park, California

R022BI201CA

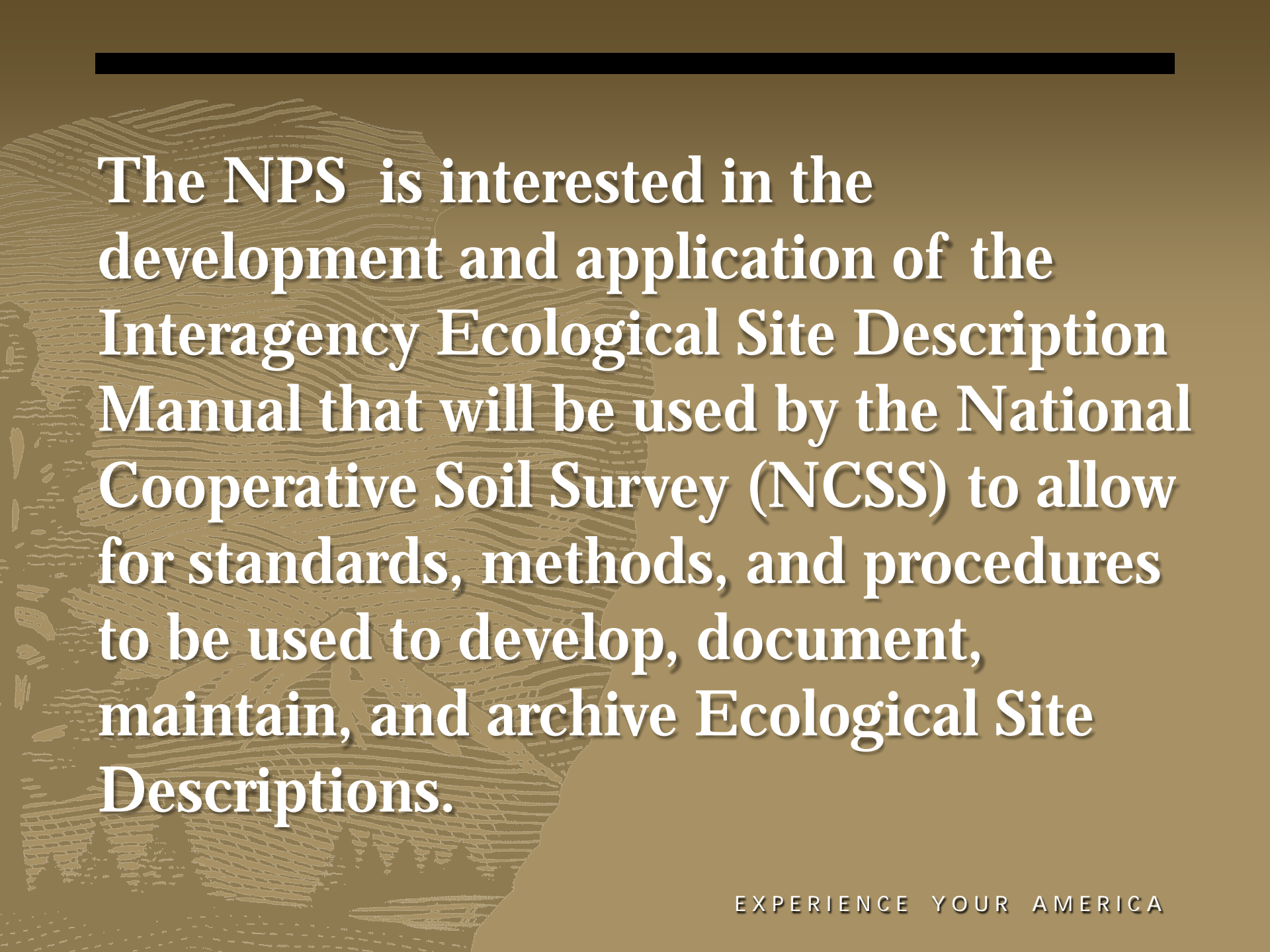
State 1

Plant community 1.1

Sand dunes made up of black, tan, and red soils, with a sparse cover of forbs and grasses.

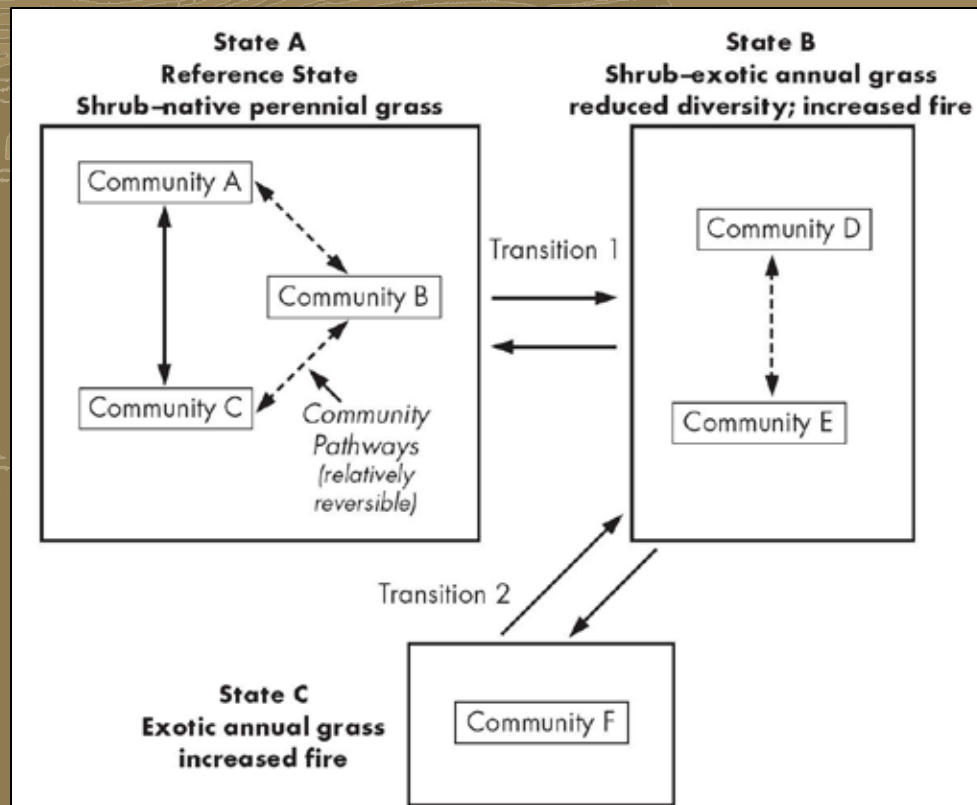
0-12% total cover





The NPS is interested in the development and application of the Interagency Ecological Site Description Manual that will be used by the National Cooperative Soil Survey (NCSS) to allow for standards, methods, and procedures to be used to develop, document, maintain, and archive Ecological Site Descriptions.

NPS Recommendations for the Continued Development and Enhancement of ESD's

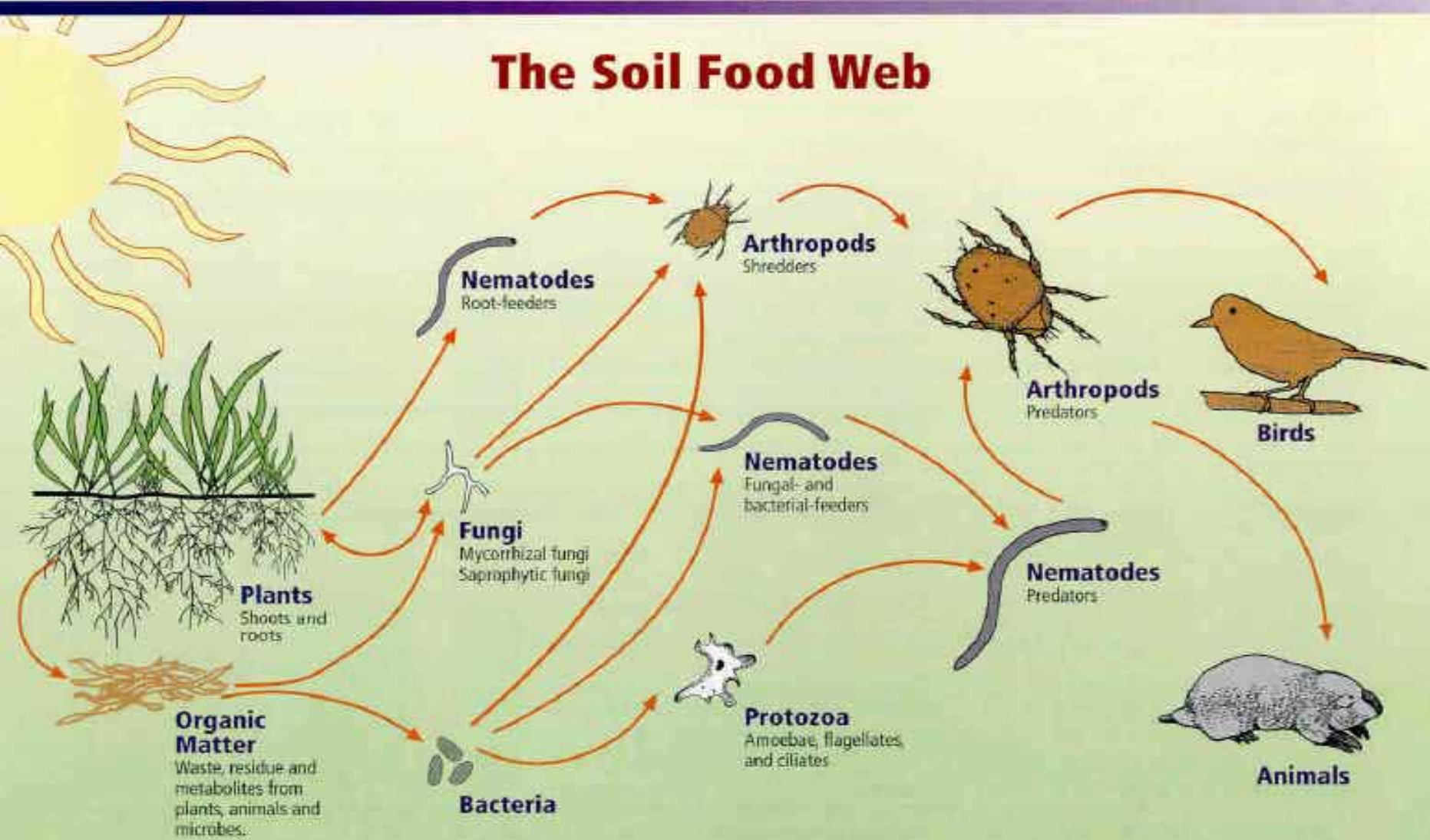


Need to add more information regarding the concepts of *soil change and dynamic soil properties* in the State and Transition Models to assist in identifying when a “*soil function threshold*” has been crossed and if new State or Ecological Site is present.

NPS Recommendations for the Continued Development and Enhancement of ESD's

Need to look enhancing the **Representative Soil Features** section to provide more information regarding the relationships of the site conditions, climatic information, soil physical, chemical, and biological properties to plant physiology and subsurface symbiotic relationships with soil macro fauna and micro fauna that are occurring

The Soil Food Web



First trophic level:
Photosynthesizers

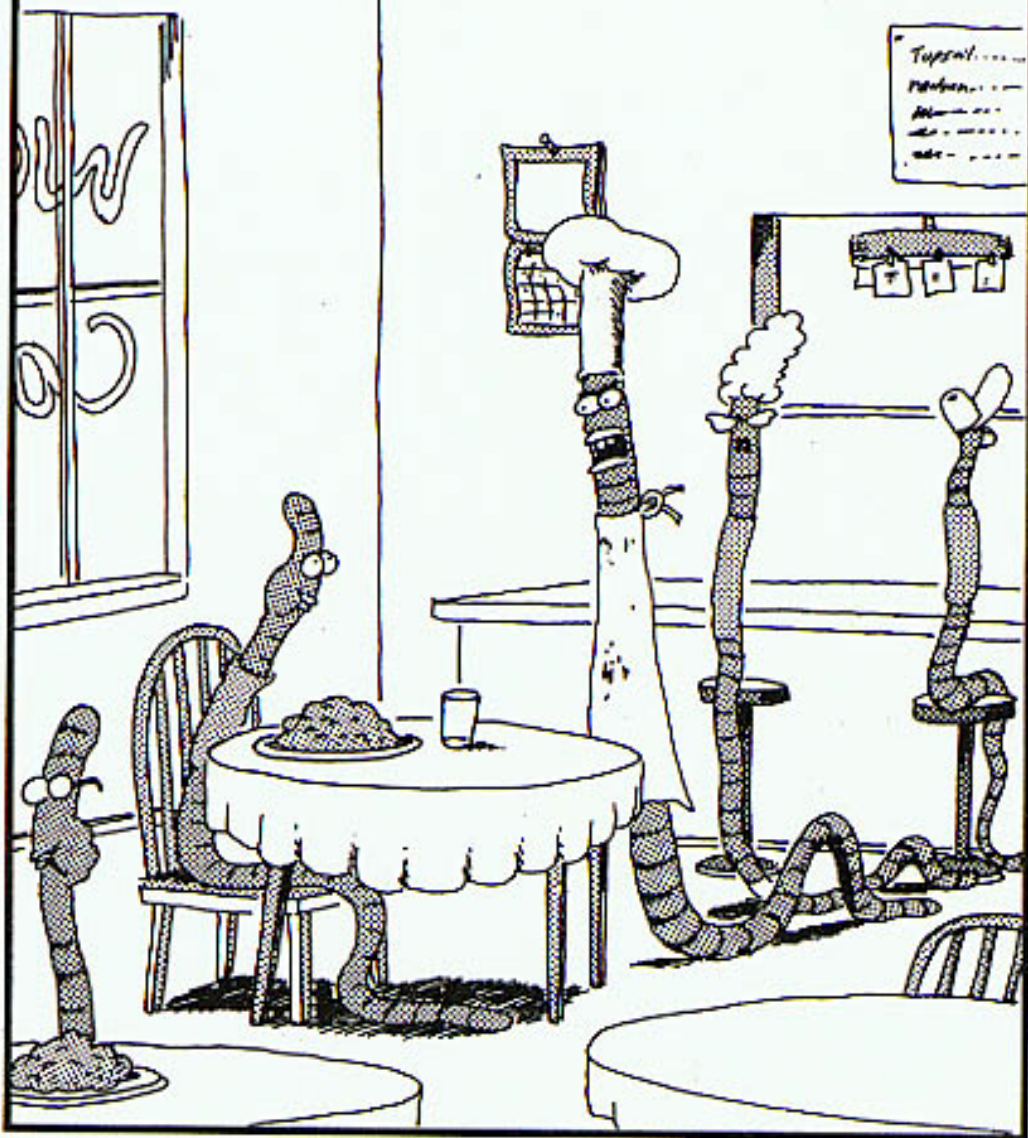
Second trophic level:
Decomposers
Mutualists
Pathogens, parasites
Root-feeders

Third trophic level:
Shredders
Predators
Grazers

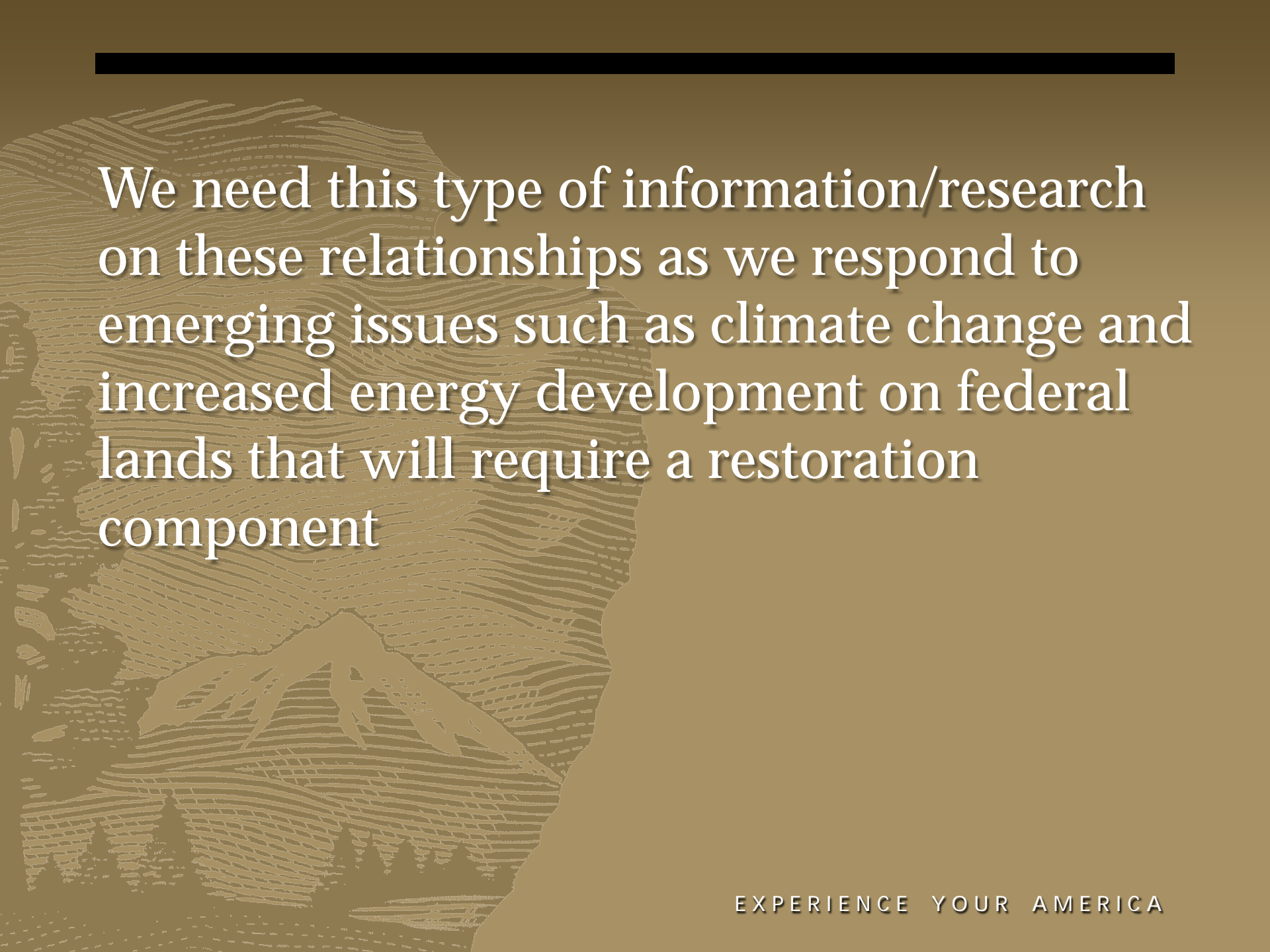
Fourth trophic level:
Higher level predators

Fifth and higher trophic levels:
Higher level predators

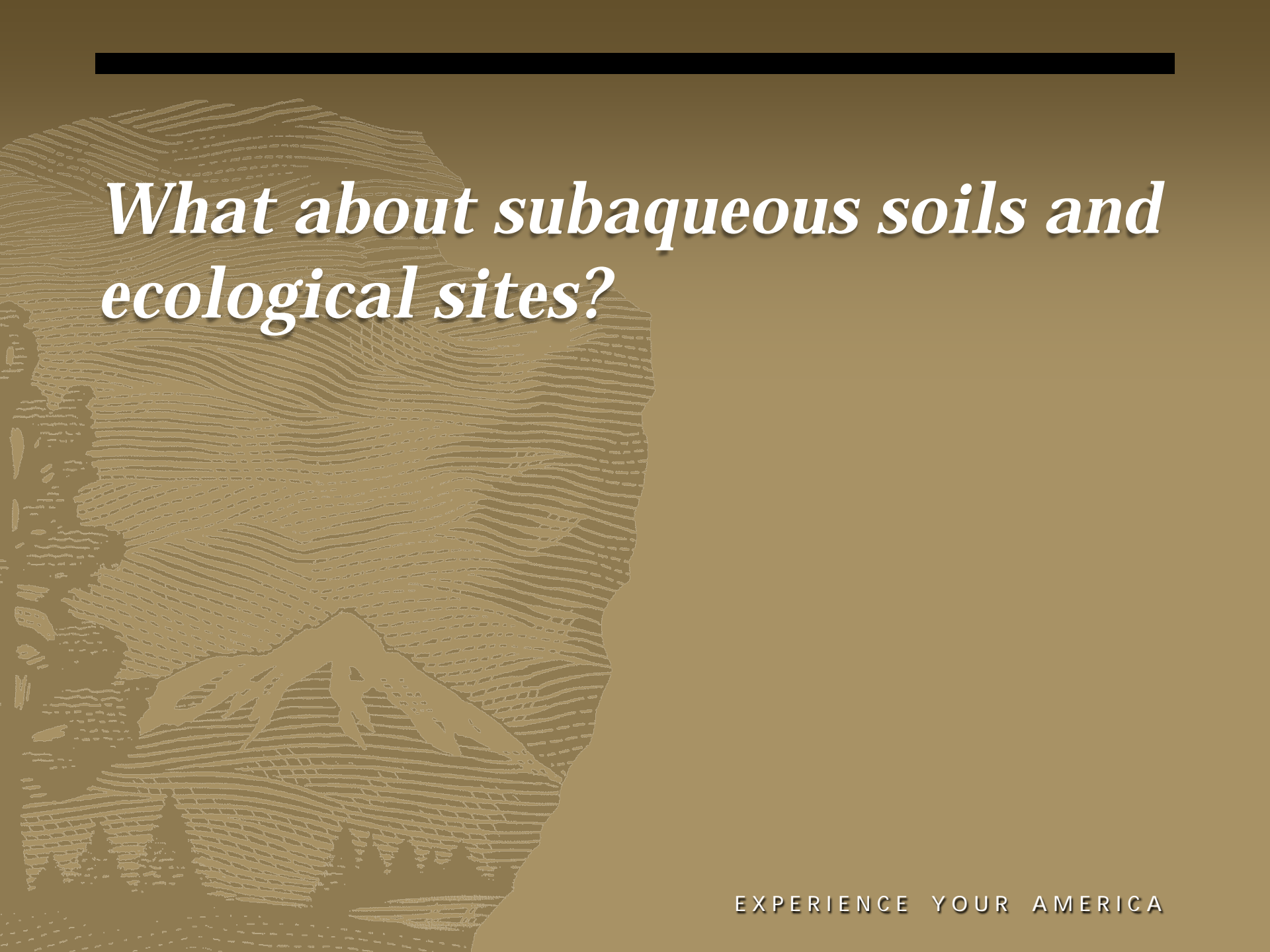
Larson



"I've been told you don't like my dirt!"



We need this type of information/research on these relationships as we respond to emerging issues such as climate change and increased energy development on federal lands that will require a restoration component

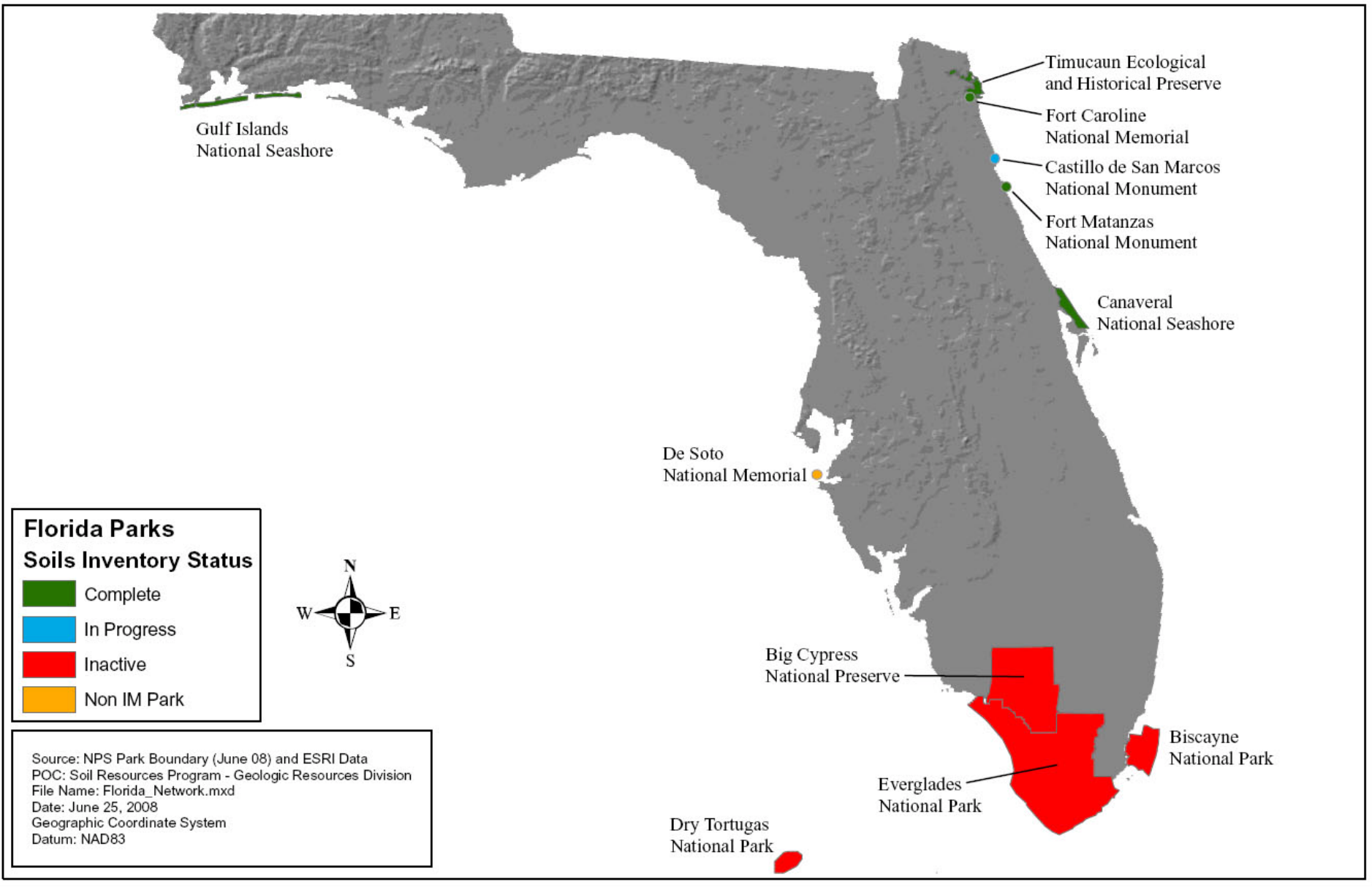


What about subaqueous soils and ecological sites?

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I&M Soil Resources Inventory Florida I&M Park Status

National Park Service
U.S. Department of the Interior



Everglades National Park



The largest subtropical wilderness in the United States, it contains the southern 25 percent of the original Everglades marshland region of southwestern Florida. It is visited by one million people each year, and it is the third-largest national park in the lower 48 states. It has been declared an International Biosphere Reserve, a World Heritage Site, and a Wetland of International Importance, only one of three locations in the world to appear on all three lists.

Everglades National Park



§137 miles (220 km) of coastline

§484,200 acres (196,000 hectares) in Florida Bay and the Gulf of Mexico

§572,200 acres (231,500 hectares) of sawgrass/freshwater marsh

§230,100 acres (93,100 hectares) of mangrove forest

§220,000 acres (89,000 hectares) of coastal areas (Cape Sable, river headwaters, etc.)



Everglades National Park



6,600 acre soil restoration project underway to mitigate impacts from past agricultural activities and ultimately return it to a marl prairie wetland

Issues to Be Addressed for Florida Parks

✓ Ability to properly identify, describe, classify, and delineate subaqueous soils and provide applicable, meaningful interpretations on their potential use and management for over 1 million acres or more.

✓ This is not an issue unique to NPS



Issues to Be Addressed for Florida Parks

§ Ecological Site Descriptions and issues with exotics and invasive plants, and anthropogenic impacts need to be considered in the state and transition models



Issues to Be Addressed for Florida Parks

Dynamic Soil Properties and concepts on “Soil Thresholds and Soil Change” need to be considered to meet management needs



Questions ?????



National Park Service
U.S. Department of the Interior

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