

Chattahoochee River National Recreation Area

National Park Service
U.S. Department of the Interior

Inventory & Monitoring Program
Southeast Coast Network



Inventory & Monitoring Program Status Report, 2012

Program Overview

In 1999, the National Park Service (NPS) initiated a long-term ecological Inventory & Monitoring (I&M) program to develop scientifically sound information on the current status and long-term trends in the composition, structure, and function of park ecosystems, and determine how well current management practices are sustaining those ecosystems.

To accomplish this, 32 “networks” of park system units were created to develop or acquire key baseline natural resource datasets, and to begin long-term monitoring of select measurements of resource condition (Fancy et al. 2009). The overarching purpose of natural resource monitoring in parks is to support science-based management of NPS resources by:

- Determining the status and trends in selected indicators of the condition of park ecosystems.
- Providing early warning of abnormal conditions.
- Providing data to better understand the dynamic nature and condition of park ecosystems and provide reference points for comparisons with other, altered environments.
- Providing data to meet legal and Congressional mandates.
- Providing means for measuring progress towards management goals.

The Southeast Coast Network (SECN) is one of 32 NPS Networks established to implement an integrated monitoring program under the Natural Resource Challenge. In 2001, the SECN began planning and implementing its long-term Vital Signs Monitoring Program, and completed its long-term monitoring plan in 2008 (DeVivo et al. 2008, 2011). Chattahoochee River National Recreation Area (CHAT) is one of 17 parks in the SECN (Figure 1).

About the Park

Located in north-central Georgia, CHAT extends for 48 miles (77 km) along the Chattahoochee River corridor between the city of Atlanta and Lake Lanier to the north. The upstream terminus of the park is Buford Dam, which is operated by the Corps of Engineers, and generates electricity and provides

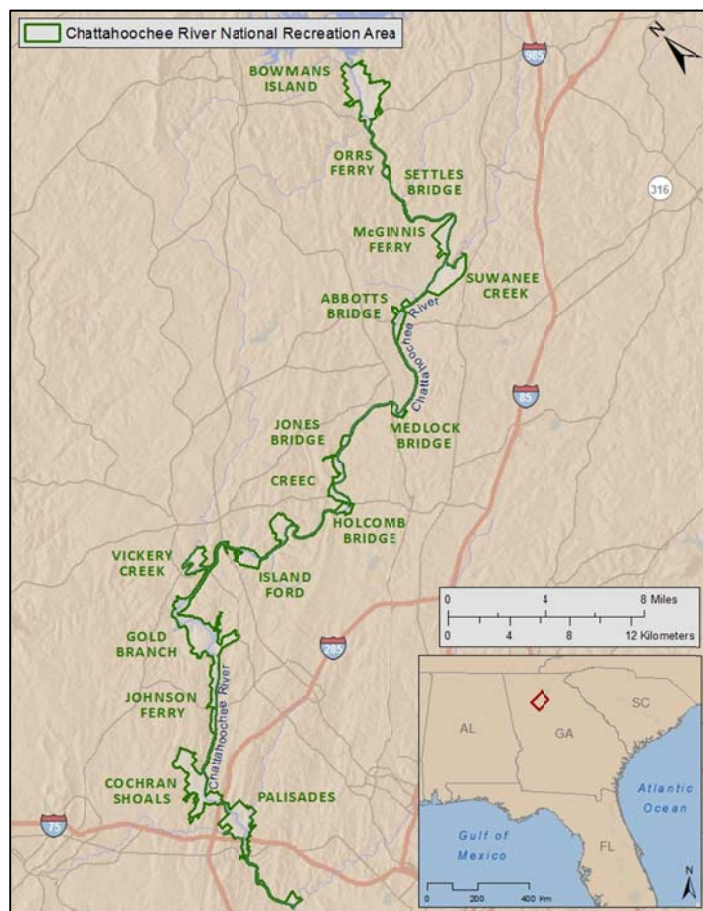


Figure 1. Location of Chattahoochee River National Recreation Area, GA.

water to the greater Atlanta metropolitan region. The operation of the dam dramatically alters river flows and water temperatures within the park. The Park's entire length runs along the Brevard Fault Zone, which forms the Chattahoochee River channel, one of the oldest river channels in the United States. The Brevard Fault is a major 320+ mile long geological feature that, in part, delineates the Appalachian Mountains and the Piedmont Plateau physiographic provinces. The National Park Service owns 9,886 ac (4,000 ha) of land along the river. The park has one of the most prominent wildland-urban interfaces of all SECN parks, resulting in property-encroachment issues, non-native plants and animals, pesticide use, contaminated runoff (e.g., sewage, nutrients), and several other management challenges. According to the 2006 census, the five counties in which the park occurs have been some of

the fastest growing and most densely populated in Georgia since 1990.

Despite these challenges, the park hosts a diverse array of flora and fauna, ecological communities, topography, and other attributes that make this park a unique and highly prized resource by its users. The vegetation communities vary with topography and proximity to the river—uplands include mixed-hardwood communities dominated by oaks (*Quercus* sp.), tuliptree (*Liriodendron tulipifera*), and American beech (*Fagus grandiflora*); as well as pine forests, containing loblolly pine (*Pinus taeda*) and shortleaf pine (*P. echinata*). Lowlands include floodplains and riparian areas with canopy species such as water birch (*Betula nigra*), mesic oaks (e.g., *Quercus nigra*, *Q. laurifolia*), red maple (*Acer rubrum*), green ash (*Fraxinus pennsylvanica*), and hackberry (*Celtis laevigata*).

Baseline Inventories

The primary purpose of natural resource inventories is to document the presence of resources in parks, and to assess and document the current condition and knowledge of natural resources in the parks. Inventories allow comparison of existing conditions to the natural or desired state of parks and establish a solid baseline for making scientifically sound management decisions and for designing long-term monitoring plans that track the health of key park resources.

Table 1. Status of twelve baseline inventories conducted at Chattahoochee River National Recreation Area [● – Complete; ● – In Progress]

Inventory	CHAT
Air Quality Data	●
Air Quality Related Values	●
Base Cartography Data	●
Baseline Water Quality Data	●
Climate Inventory	●
Geologic Resources Inventory	×
Natural Resource Bibliography	●
Soil Resources Inventory	●
Species Lists	●
Species Occurrence and Distribution	●
Vegetation Map Inventory	●
Water Body Location and Classification	●

The NPS I&M Program developed a strategy in 1992 for developing and delivering a minimal set of products for 12 “basic” natural resource inventories that were common to all park units containing significant natural resources, all are

either complete or underway at CHAT except the Geologic Resources Inventory, which is scheduled to begin in FY 2012 (Table 1) (Tuberville et al. 2005, Webster 2010).

Watershed Condition Assessment

In addition to the twelve basic inventories, the SECN has also conducted a watershed condition assessment, designed to identify the current state of water resources within and upstream of CHAT, as well as an evaluation of factors that might affect water resources in the future.

The overall findings of the assessment indicated that the natural resources of the park are being significantly impacted by upstream and encroaching urbanization, and by the multitude of water and air pollutants and other stressors associated with rapid human population growth, land development, and natural resource degradation and destruction in the Atlanta metropolitan area (Burkholder et al. 2010). The already-high and increasing impervious surface area in the watershed has resulted in increased floodplain areas for some streams because of increased stormwater runoff, resulting in severe stream bank erosion, loss of land and vegetation, and other damage. Surrounded by this intensive urbanization which is actively favored by various powerful entities, the NPS has an especially difficult challenge to meet its charge of preserving and protecting this park for present and future generations.

Vital Signs Monitoring

In addition to the baseline inventories, the SECN has selected 17 indicators of ecosystem condition, or *Vital Signs*, to be monitored at CHAT. Long-term monitoring of twelve of these Vital Signs has been wholly or partially implemented by the Network at CHAT. These Vital Signs include a combination of field efforts being conducted by NPS and its partners as well as the analysis and interpretation of data being collected by other state and federal programs.

Air Quality

Data from various air quality monitoring programs are summarized regularly including the National Atmospheric Deposition Program – National Trends Network (NADP/NTN), the Environmental Protection Agency’s Clean Air Status and Trends Network (CASTNET), and the Interagency Monitoring of Protected Visual Environments (IMPROVE) program. Data from 2005 to 2009 show that ozone, total-N wet deposition, Total-S deposition and

visibility levels at CHAT were all considered to be of significant concern (Table 2).

Table 2. Air quality interpolation values for the period 2005–2009 at Chattahoochee River National Recreation Area. Red indicates values of significant concern.

Ozone Concentration (ppb)	Total-N Wet Deposition (kg/ha/yr)	Total-S Wet Deposition (kg/ha/yr)	Group50 Visibility (dv)
83.6	4.24	4.89	12.4

A 2011 analysis of acid deposition showed CHAT to be at very high risk of pollutant exposure, and a high risk of acid deposition (Sullivan et al. 2011b). Although considered to be at a very high risk of nutrient exposure, the overall risk of atmospheric nutrient enrichment at is only moderate at CHAT. The overall moderate risk is due to the presence of a moderate amount of vegetation types expected to be sensitive to nutrient enrichment from nitrogen deposition (Sullivan et al. 2011a).

Birds

Birds are an important component of park communities and their ecological position in most food webs allows them to be good indicators of local and regional ecosystem changes. Long-term trends in the community composition, relative abundance, distribution, and occurrences of breeding-bird populations provide a measure for assessing the ecological integrity and sustainability in southeastern systems. Further, long-term patterns in community composition, relative abundance, distribution, and occurrences in relation to current management practices will improve our ability to implement effective management strategies in the future.

More than 850 birds representing 73 species were detected at Chattahoochee River National Recreation Area during surveys in 2009 (Byrne et al. 2011).

Carolina wren and tufted titmouse were the most widely distributed species at the park, detected at 97% of the sampling locations, and two non-native species were detected: European starling and house finch.

Several priority species were detected during the sampling effort including Acadian flycatcher, brown thrasher, brown-headed nuthatch, chimney swift, Cooper's hawk, Eastern kingbird, Eastern towhee, Eastern wood-pewee, hooded warbler, indigo bunting, Kentucky warbler (Figure 2),

Louisiana waterthrush, Northern flicker, Northern parula, orchard oriole, prothonotary warbler, summer tanager, wood thrush, worm-eating warbler, yellow-billed cuckoo, yellow-breasted chat, and yellow-throated vireo.



Figure 2. Kentucky warbler (*Oporornis formosus*) was a priority species detected at CHAT in 2009. Photo by Darlene J. Moore.

Weather and Climate

Weather and climate are key drivers for ecosystem patterns and processes, affecting both biotic and abiotic components alike. Continuous weather monitoring is an important factor in separating the effects of climate from the effects of human-induced disturbance on other Vital Signs (e.g., plant and animal communities and population dynamics). In support of these efforts, the SECN has compiled and analyzed data from existing sources to (1) determine status, trends, and variability of precipitation and temperature over time within and around SECN park units; (2) determine the status, trends, and variability of derived weather data (i.e., drought indices) within and around SECN park units; (3) track the location, magnitude, and frequency of extreme weather events that affect SECN park resources (Wright et al. 2011).

Average monthly temperatures at weather stations near CHAT ranged from a low of 35.4 °F to a high of 82.8 °F; temperatures were above normal at most locations during the spring, summer, and early fall months and below normal during the winter, though not outside the range of variation for the 30-year long-term average.

Total annual precipitation at Atlanta Hartsfield International Airport was 48.15 inches, 41.31 inches at Dallas 7NE, and 48.88 inches at Gainesville during 2010, which is 1.56, 11.67, and 4.28 inches below normal respectively (Figure 3).

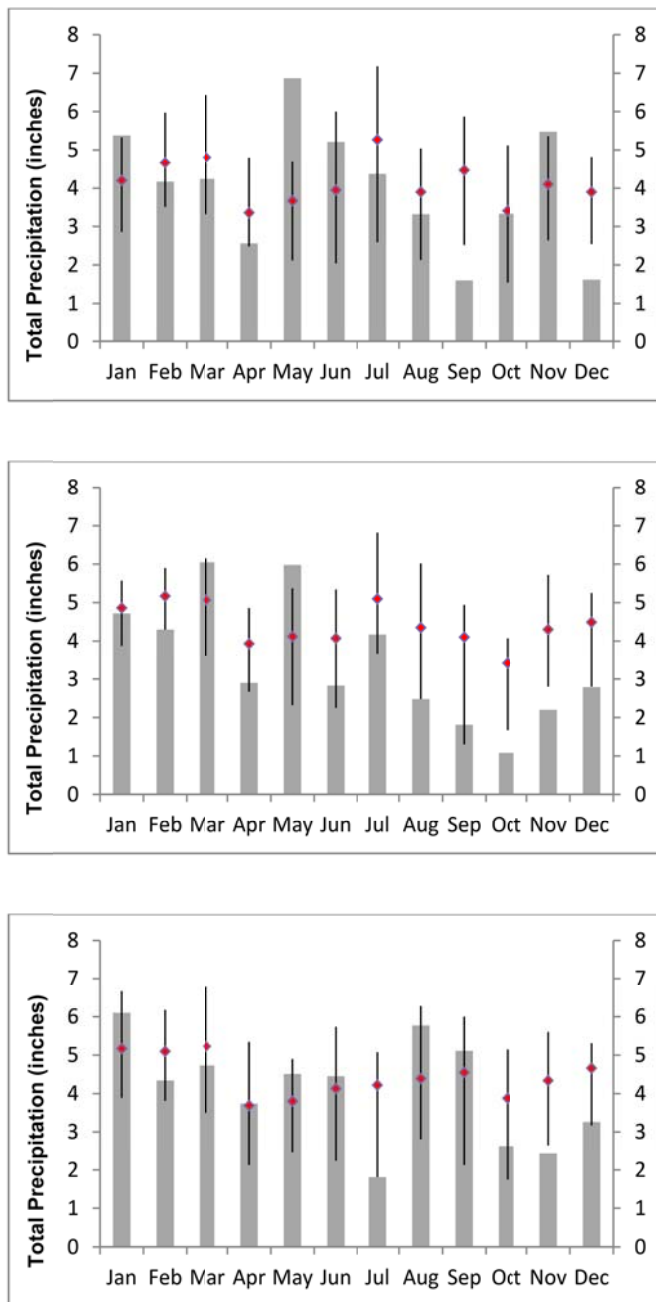


Figure 3. Total monthly precipitation during 2010 and the 30-year (1981-2010) monthly averages for Atlanta Hartsfield International Airport (top), Dallas 7NE (middle), and Gainesville (bottom) stations. The gray columns represent 2010 total monthly precipitation. The red circles represent the 30-year average; the lines indicated the 25th and 75th percentile of the 30-year normal data for each month.

Groundwater

All Southeast Coast Network (SECN) parks and ecosystems are linked to the groundwater system (i.e., aquifers). These aquifers are affected by modifications to surface waters (e.g., impoundments), long-term weather patterns (e.g., flooding and drought), and extraction (e.g., anthropogenic influences). Because aquifers serve as a water supply for industrial, commercial, residential, and agricultural needs, anthropogenic demands on this freshwater resource are high. Aggregate

influences of changes in groundwater can influence hydrologic processes, wetland function, freshwater availability for fish and wildlife, plant-community species distribution, composition, diversity, and structure, and potentially affect the integrity of park ecosystems.

An inventory of existing wells that are within or in proximity to SECN parks has been conducted and applications to retrieve and analyze existing long-term periods of record have been developed (Rasmussen et al. 2009). The SECN assesses trends in groundwater dynamics at CHAT annually using data from three wells in the vicinity of CHAT (Wright et al., *in review*). In 2010, all three wells showed a significant, negative trend in groundwater levels over the period of record (see example for the Crystalline Rocks Aquifer, Figure 4).

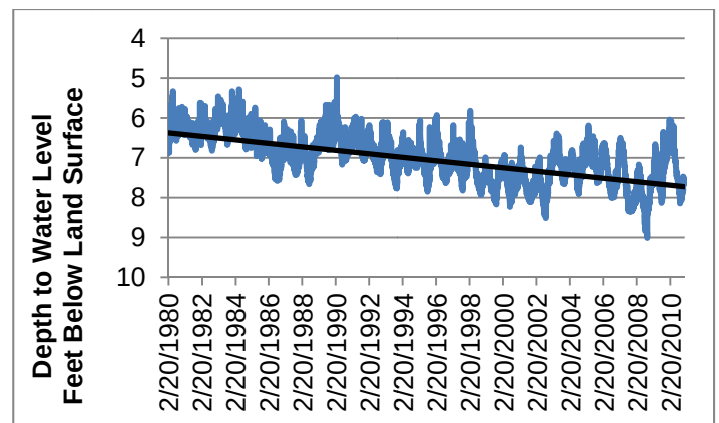


Figure 4. Water levels and calculated trend line for groundwater well 335517084164001 (Crystalline Rocks Aquifer near CHAT).

Streamflow Characteristics

The SECN evaluated stream flow variability and the magnitude and timing of specific flow events at CHAT during 2010 (Gregory et al., *in review*). Flow patterns were characterized and put in historical context using U.S. Geological Survey stream flow data, The Nature Conservancy's Indicators of Hydrologic Alteration software, and Program Flow (Dowd 2011). The data were then interpreted within the context of the number of days per year that flows met or exceeded criteria identified in the Park's Resource Stewardship Strategy (RSS). This analysis was conducted for each section of the river within the park (Figure 5).

Daily flows were never below the State threshold of 650 cfs at river mile 300.5 at Peachtree Creek during 2010. However, flows near this point were below the 750 cfs management target identified in the RSS for a total of 17 days. The most commonly observed flow conditions on all sections during

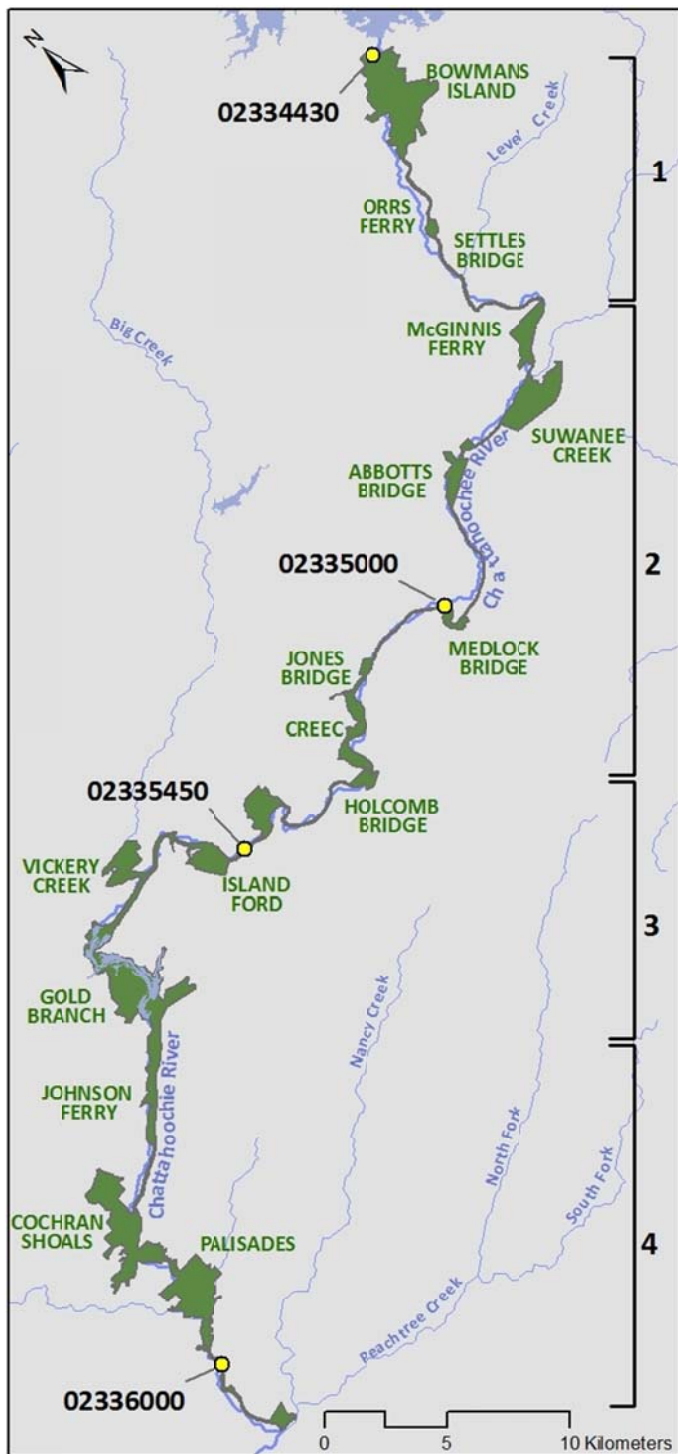


Figure 5. USGS gaging stations and management segments along Chattahoochee River National Recreation Area in Atlanta, Georgia.

2010 ranged from 1,000 to 1,500 cfs – flows generally considered optimal for wade and tube fishing, novice rafting, canoeing and other social activities. River flows along the sections of the Chattahoochee were less than ideal (below 750 cfs) 0–20% of the time; low flows were more common on section 3 than on sections 2 and 4 and indicate a section where water withdrawals may have impacted recreational uses during the late summer and fall. High flows (greater than

2,000 cfs), which potentially impaired some fishing activities and allowed only midlevel paddling activities, occurred approximately 28% of the time on section 1, 33% of the time on sections 2 and 3, and 42% of the time on section 4.

Stream Habitat

Beginning in FY 2012, stream habitat monitoring will be conducted at CHAT. The monitoring protocol is being developed by the USGS National Water Quality Assessment (NAWQA) program and is an extension of existing NAWQA and USDA protocols. A combination of reach- and transect-level flow, geomorphic, and physical instream and riparian habitat measurements will be included in the protocol. Watershed-scale monitoring efforts have been eliminated since the landscape dynamics vital sign currently addresses these issues.

In addition, panoramic 360° still photography will be conducted on timed intervals along the length of major park riverine waterbodies and will be synced with both GPS and core water quality parameters (temp, DO, pH, conductivity). This will allow the generation of a full-river map of potential sites of management concern (such as erosion features). This dataset also has many potential outreach uses such as virtual river tours. A video surveillance component is planned to augment data collected by traditional means and will consist of simultaneous filming of both banks with geotagged footage.

Amphibians

CHAT has 23 known amphibian species and subspecies (NPS 2012). The SECN conducted amphibian surveys during the summer of 2011 and the data are currently being processed. Reports are expected summer 2012.

The SECN also conducted surveys for chytrid fungus (a pathogen linked to amphibian population declines around the world [Byrne and Moore 2011]). Evidence of the fungus was found in several larval and post-metamorphic frogs (*Lithobates sp.*). None of the individuals showed clinical signs of the disease, however.

Plant Communities

Plant communities are the primary drivers for a range of ecological processes and are integral to the proper function of park ecosystems. They serve as the foundation for food webs and wildlife habitat for many species, and function as a carbon sink, produce oxygen, cycle nutrients and energy through an ecosystem, influence the local climate, improve water quality, and moderate flooding and erosion. Given the widespread

anthropogenic influences in SECN parks and the importance of vegetation communities, determining trends in vegetation communities is vital to understanding the ecological processes and identifying stressors and their impacts.

CHAT has 948 known vascular-plant species, subspecies, and varieties (NPSpecies 2012). The SECN conducted plant surveys during the summer of 2011 and the data are currently being processed. The data summary report is expected to be complete in summer 2012.

Fire Fuels and Dynamics

The SECN conducted fire fuel surveys during the summer of 2011 and the data are currently being processed, and a summary data report is expected summer 2012.

Other Monitoring Efforts

NPScape is a landscape dynamics monitoring project that produces and delivers to parks a suite of landscape-scale data sets, maps, reports, and other products to inform resource management and planning at local, regional, and national scales. Changes in the composition and configuration of different land cover types within and adjacent to national parks has been shown to greatly affect biological and physical processes within those parks, such as habitat availability, animal movements, potential for invasion by non-native plants, water quality, and in-stream habitat for fish and other aquatic organisms. Information about changes and trends in landscape-scale indicators in and around parks can help park managers anticipate, plan for, and manage associated effects to park resources.

At its core, NPScape delivers a suite of products that focus on a set of information-rich, landscape-scale indicators for 270+ parks with significant natural resources. The initial analyses summarized and delivered measures in six major categories (population, housing, roads, land cover, pattern, and conservation status) that broadly address the environmental drivers, natural attributes, and conservation context of NPS units (Figure 6). In aggregate, these measures contribute to assessments of current natural resource status, potential threats, and conservation vulnerability and opportunity.

Example products for the landscape surrounding CHAT include:

- Source and processed GIS data and associated metadata,
- An interpretive guide report (under review) describing the ecological relevance of NPScape data and measures as

they relate to our understanding of current and anticipated landscape dynamics,

- An example draft report demonstrating the applicability of NPScape to management and planning ,
- A Standard Operating Procedure (SOP) for each metric consistent with I&M protocols, as well as data processing scripts and tools for parks and networks to efficiently generate new customized products,
- Park-based maps of each measure in multiple formats for non-GIS specialists, including interactive kml files for Google Earth and geo-pdf files for Adobe Acrobat, and
- Graphical summaries of the measures to enable parks and networks to understand their results in a comparative context.

Further information on NPScape, including access to all products, is available through the NPScape website (<http://science.nature.nps.gov/im/monitor/npscape/>) and the NPS Integrated Resource Management Applications (IRMA) data system (see below).

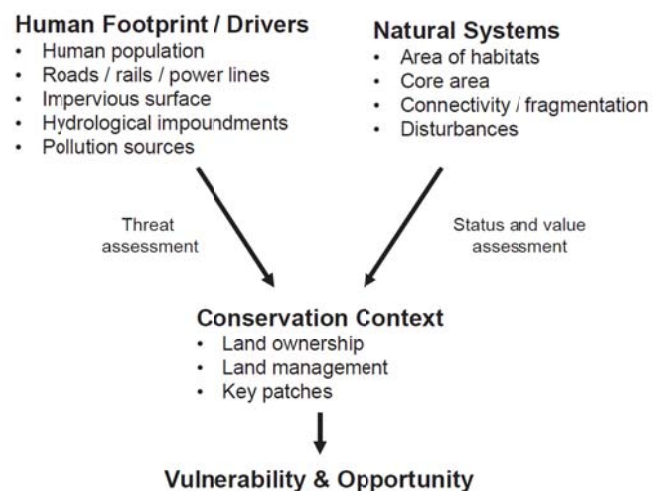


Figure 6. Example measures of landscape dynamics included in the NPScape program (<http://science.nature.nps.gov/im/monitor/npscape/>).

Where to Find Information

The NPS I&M Program was created as part of the National Park Service's effort to "improve park management through greater reliance on scientific knowledge." A primary role of the I&M Program is to collect, organize, and make available natural resource data and to contribute to the Service's institutional knowledge by facilitating the transformation of data into information through analysis, synthesis, and modeling. Information about the program can be found at <http://science.nature.nps.gov/im/index.cfm>.

About the Southeast Coast Network

The SECN includes twenty parks, seventeen of which contain significant and diverse natural resources. In total, SECN parks encompass more than 184,000 acres of federally-managed land across North Carolina, South Carolina, Georgia, Alabama, and Florida. The parks span a wide diversity of cultural missions also, including four national seashores, two national historic sites, two national memorials, seven national monuments, two national military parks, as well as a national recreation area, national battlefield and an ecological and historic preserve. The parks range in size from slightly more than 20 to nearly 60,000 acres, and when considered with non-federal lands jointly managed with NPS, the Network encompasses more than 253,000 acres.

Information on activities of the SECN can be found at <http://science.nature.nps.gov/im/units/secn/>, including the Network's monitoring plan, descriptions of inventory and monitoring efforts, and links to data and final project reports.

Get Data

The NPS Integrated Resource Management Applications (IRMA) portal (<http://irma.nps.gov>) is the start of a web-based "one-stop" for data and information related to National Park Service natural and cultural resources. IRMA allows users to search, view, download, and print information from multiple sources and systems, all from a consistent user interface. No logins or passwords are required.

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