Cumberland Piedmont Network
Climate Change Resource Brief

Inventory & Monitoring
Southeast Region
National Park Service
U.S. Department of the Interior

Water Quality & Quantity

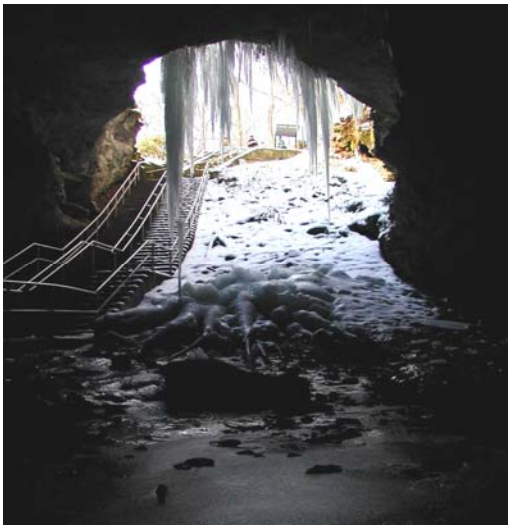
Changes in water quality may be directly linked to climate change impacts on frequency, duration, and amount of rainfall. The Network monitors water quality on all 14 parks. Sample locations vary from first-order upland streams to springs draining hundreds of square kilometers of karst terrain. We expect to document early changes in flow and associated water chemistry in small-catchment mountain streams; however, springs tend to be somewhat buffered due to their groundwater recharge, storage and transfer mechanisms.

Weather/Climate

Network staff will “mine” weather/climate data from weather stations in the parks or from stations nearby. Data will be analyzed and given to the park to provide information characterizing the weather/climate within the park boundary. These data will be important for examining and predicting impacts of climate change on park ecosystems.

Caves

Cave meteorology parameters currently being monitored are air temperature and relative humidity. Both parameters correlate with outdoor air temperature, especially cave air temperature. Generally, increases in outdoor air temperature result in increases in cave air temperature, particularly in winter. So, the increase in air temperature expected as part of climate change should impact the cave atmosphere. Cave biotic and cultural resources can be significantly impacted by changes in seasonal patterns of air temperature and relative humidity. Monitoring cave hibernating bats with narrow atmospheric tolerances and cave crickets (key nutrient suppliers for cave communities) will provide insight into climate change impacts on sensitive cave ecosystems.



Vegetation Communities

Changing patterns in precipitation and temperature have the potential to change the composition of vegetation communities, shift their geographic distribution, and threaten the persistence of particularly sensitive species on our parks. Complicating this further are the unique geological features of many parks, where species that depend upon specific soil types or rock types may not have an “escape route” for migration. The network plans to monitor structure and composition of selected vegetation communities, forest pest effects, phenology, and soil profile disturbance factors to identify long-term changes which may be correlated with climate change. In addition, early detection procedures will be implemented to identify range expansions and contractions of key invasive exotic plants.

Landscape Dynamics

Monitoring landscape dynamics can help parks understand potential migration routes of invasive species and vulnerable populations in response to rapid climate changes. Remotely-sensed data will be used to map core habitat inside and outside parks. Both “bridges” that species may use moving between habitat patches, and barriers to this movement (such as roads, housing and human population) will be mapped. The “distance to roads” metric will help identify prime locations of core habitat that should be preserved.

Forest Pests

The synergism between global climate change and exotic insects may alter the structure of southeastern ecosystems. For example, increased drought frequency would likely stress oak trees, a keystone species in our parks, and the gypsy moth’s (*Lymantria dispar*) preferred host species. Repeated or significant defoliation of stressed oaks by larvae can kill canopy oak trees and so affect the long-term dynamics of the entire forest community. Changes in exotic insects’ distribution, outbreak frequency, vegetation damage, and altered biodiversity are some of the predicted effects from climate change that the Network will be monitoring.

Contact Information

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