



ALLEGHENY PORTAGE RAILROAD NHS • BLUESTONE NSR • DELAWARE WATER GAP NRA • FORT NECESSITY NB
FRIENDSHIP HILL NHS • GAULEY RIVER NRA • JOHNSTOWN FLOOD NMEM • NEW RIVER GORGE NR • UPPER DELAWARE SRR



Vital Signs Monitoring

Park managers often face decisions that have the potential to affect national park resources for years into the future. The ongoing ability to protect and steward significant natural and cultural resources requires up-to-date knowledge of the composition, condition, and issues facing park ecosystems. To this end, the Inventory and Monitoring Program (I&M) was established to provide park managers with a broad-based understanding about the status and trends of natural resources in their parks. Across the country, national park units with substantial natural resources were organized into 32 eco-regional networks based on proximity and ecological similarity. These I&M networks collect, analyze, synthesize, and supply park managers with reliable scientific information about key park resources called “vital signs” - subsets of physical, chemical, and biological elements and processes of park ecosystems that are selected to represent the overall “health” or condition of park resources.

The Eastern Rivers & Mountains Network (ERMN) consists of nine national parks in Pennsylvania, West Virginia, New York and New Jersey, each with its own rich and varied array of natural and cultural resources. The parks generally consist of a mosaic of forested mountains and floodplains, streams and rivers, talus slopes and cliffs, vernal pools and wetlands, and open fields and agriculture. Together, these parks encompass almost 90,000 hectares of land area, more than 700 km of rivers and streams, and host 7 million visitors annually.

Read on for a brief overview of the ERMN’s six natural resource monitoring protocols and who to contact for more information.

Or visit our website:

<http://science.nature.nps.gov/im/units/ermn>



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Gauley River, West Virginia. Brian Streets photo.

Vegetation and Soil Monitoring



Collecting forest health monitoring data in New River Gorge NR. Doug Manning photo.

The dominant land cover throughout most ERMN parks, soils and vegetation are affected by many ecological and anthropogenic forces (climate, landscape dynamics, invasive species, deer browse, etc.). This protocol provides park managers with comprehensive long-term data about the status of park vegetation and soil resources and how they are changing over time, allowing them to make better informed management decisions about mitigating threats, protecting park forests, and other potential issues.

- ▶ Stephanie Perles, *Plant Ecologist*
- ▶ Doug Manning, *Biological Science Technician*

Invasive Species - Early Detection Monitoring



The exotic invasive emerald ash borer is killing thousands of ERMN park ash trees.

Early detection monitoring for invasive species of plants, animals and diseases was ranked among ERMN's top priorities because of the negative effects they can have on park ecosystems, including the loss of threatened and endangered species, altered structure and composition of terrestrial and aquatic communities, and reduction in overall species diversity. It is critical to catch new populations of exotic species early in their invasion of new and sensitive areas when chances of control are

higher. Early detection monitoring in ERMN parks begins with surveillance monitoring of invasive plant and forest pest species, focusing on educating field crews, cooperators, resource managers, and volunteers on invasive species identification, and providing a coherent framework for reporting and disseminating information on potential infestations.

- ▶ Doug Manning, *Biological Science Technician*

Rare Riparian Plant Community Monitoring



Globally rare riparian communities occur at Dingmans Ferry in Delaware Water Gap NRA. Kristina Callahan photo.

Several ERMN parks contain diverse and globally significant plant communities along their river floodplains. These communities occur in very few places around the world and provide unique habitats on which nearly 50 rare plant species depend. Regulation of river flows, invasive species, and human recreation are key stressors to these communities. The main objectives of this monitoring program are to detect trends in species composition, community structure, and invasive plant species.

- ▶ Stephanie Perles, *Plant Ecologist*
- ▶ Doug Manning, *Biological Science Technician*

Stream Benthic Macroinvertebrate Monitoring

There are over 700 kilometers of rivers and streams throughout ERMN parks that benthic macroinvertebrates (BMI) can inhabit. BMI are aquatic invertebrates that are larger than microscopic size and live on or within the stream bottom (benthos). In addition to being instrumental to nutrient and carbon dynamics in streams,



Hendrickson mayfly adult (*Ephemera subvaria*) Caleb Tzilkowski photo.

biotic communities and ecosystem processes. Because they are a vital component of stream ecosystems, their proven ability to derive ecosystem integrity, and their relatively low sampling cost, BMI are very effective for biomonitoring of wadeable stream health.

- ▶ Caleb Tzilkowski, *Aquatic Ecologist*
- ▶ Andy Weber, *Hydrologic Technician*

River Water Quality Monitoring



Water quality monitoring along the New River. Caleb Tzilkowski photo.

ERMN parks contain a large assemblage of riverine resources that can be directly and indirectly impacted by human actions. Because of the direct relationship between water chemistry and biota, ERMN monitors water quality parameters (temperature, turbidity, conductivity, pH, and dissolved oxygen) that are critical to understanding baseline conditions in rivers. ERMN cooperated

with other park stakeholders to prioritize sampling locations and installed continuous multi-parameter water quality monitoring units (multiprobes or datasondes) on large rivers throughout the network. The main goal of the program is to determine the status and trends of water quality in large, main-stem ERMN rivers by way of continuous (i.e., hourly) measurement of the core water quality parameters.

- ▶ Caleb Tzilkowski, *Aquatic Ecologist*
- ▶ Andy Weber, *Hydrologic Technician*

Streamside Bird Monitoring



Ovenbirds are frequently encountered in ERMN parks. Bill Thompson photo.

Birds are an important component of park ecosystems and exhibit numerous characteristics that support their use as cost-effective ecological indicators. Birds are also popular with the public and many parks provide information on the welfare of the park's avian community through interpretive materials and programs. As the title suggests, "streamside birds" refers specifically

to the breeding bird community surrounding streams. The typical areas sampled for this protocol are along park streams enclosed by forest with a closed canopy above them, and are largely in-line with what other monitoring programs refer to as "forest birds", "breeding birds", or "landbirds". Some goals of the program are to estimate and compare trends in occupancy, density, and abundance for select bird species, calculate the annual Bird Community Index of biotic integrity, and compare ERMN parks to regional and continental trends.

- ▶ Matt Marshall, *Program Manager and Avian Ecologist*