

## Regional Monitoring Networks (RMNs) to Detect Changing Baselines in Freshwater Wadeable Streams

### General Information

The United States Environmental Protection Agency (U.S. EPA) is working with its regional offices, states, tribes, and other entities to establish Regional Monitoring Networks (RMNs). The RMNs will help EPA and their partners collect current, baseline biological, thermal, and hydrologic data from freshwater wadeable streams. This information will be used to help quantify and detect long-term changes in conditions of high-quality streams. Detection of such changes can inform water quality criteria and indicator development, as well as responses to climate change effects. This EPA report provides technical information describing how current RMNs have been developed, including the selection of sites for monitoring and expectations for data collection. The report also provides examples of how RMN data can be used and analyzed to help inform decision-making and scientific research. RMNs have been established in the Northeast, Mid-Atlantic, and Southeast, and efforts are underway to expand RMNs into other regions.

### Why are RMNs Needed?

The lack of continuous water quality data is an impediment to the identification and analyses of long-term trends in biological, thermal, and hydrologic conditions of minimally disturbed, unregulated freshwater wadeable streams. Information gathered by RMNs builds upon current efforts to collect biological data and assess the condition of freshwater streams. RMNs supplement current data with the use of sensors to collect continuous stream temperature and flow data. This information will help facilitate the collection of comparable water quality data that can be more

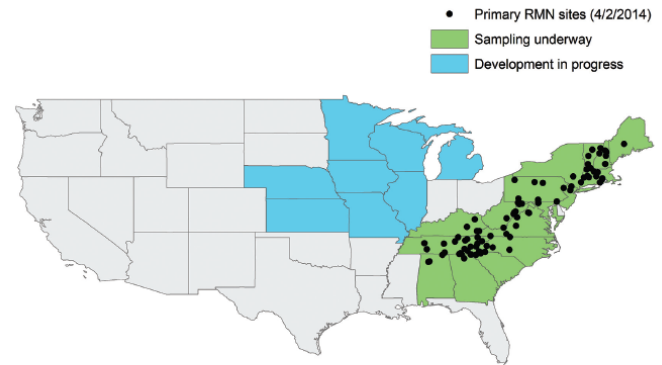


Figure 1. Sampling has been underway at the Northeast, Mid-Atlantic and Southeast RMNs for several years. RMNs are currently being developed in the Midwest.

efficiently used regionally. Pooling these kinds of

The data can then be used for many purposes, including:

- **Monitoring** baseline condition of high quality waters to detect trends over time
- **Supplementing** Clean Water Act (CWA) programs and initiatives by:
  - Defining natural conditions and quantifying natural variability
  - Informing criteria refinement or development
  - Developing biological indicators for protection planning
- **Gaining** a better understanding of relationships between biological, thermal, and hydrologic data
- **Gaining** a better understanding of ecosystem responses and recovery from extreme weather events
- **Gaining** insights into effects of regional phenomena such as drought, pollutant/nutrient deposition and riparian forest infestations on aquatic ecosystems and bioassessment programs.

## How can RMN data be used to support future decision-making?

RMN data can be used for many purposes. State and regional biomonitoring programs can use RMN data to supplement water quality programs and initiatives, which are highlighted below:

- **Monitoring high quality waters** - Detecting trends in freshwater wadeable streams to help inform protection planning priorities as required by the Clean Water Act.
- **Defining natural conditions and quantifying natural variability** - Understanding and quantifying how natural variations affect the aquatic ecosystems can enable state monitoring systems to better separate natural variations from human-induced changes.
- **Informing criteria refinement or development** - Improving understanding of hydrologic processes, such as changes in temperature and flow, can help to inform the development of regional standards and management strategies.
- **Developing biological indicators for protection planning** - Increasing accuracy of designations used in the protection planning process to better identify and protect biological life in cold water streams.

## How can the data collected by the RMNs help to better understand and respond to a changing climate?

Climate change requires managers to consider increasingly complex and uncertain futures. As a result, RMN data take on added importance by providing decision makers with information that can be used to understand the current conditions of freshwater wadeable streams, as well as information to respond to the effects of a changing climate in the future. Examples of how RMN data can be used are highlighted below.

- **Monitoring** changes in spatial distributions of biological indicators (e.g., aquatic species) and

evaluating whether these changes are associated with changing temperature and flow conditions.

- **Informing** climate change vulnerability assessments and developing hypotheses about which organisms, community types, watersheds or stream classes are more likely to be affected by climate change. If certain types of streams show greater resilience to climate change effects than others, this information could inform adaptation strategies and protection planning.
- **Developing** statistical models to predict climate change effects on stream temperature and flow to project future changes in stream conditions.
- **Providing** insights on how organisms respond to and recover from extreme weather events, such as droughts and floods. If an extreme event occurs at a RMN site, the data collected prior to the event can be used to characterize pre-event conditions, and the continuous data will capture the magnitude, frequency and duration of the event. This will allow impacts to be evaluated through comparative analyses on the pre- and post-event data.

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