United States Environmental Protection Agency

Using Regional Monitoring Network (RMN) Data to Inform Programs and Initiatives to Protect and Restore U.S. Waters

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) for freshwater wadeable streams (EPA 2016). The objective of the RMNs is to detect potentially small, climate-related trends at a regional scale and in a decision-relevant timeframe. The RMN design calls for sampling at least 30 sites with similar environmental and biological characteristics in each region on an annual basis for 10 or more years. Biological, thermal, hydrologic, physical habitat and water chemistry data are being collected to document baseline conditions and detect long-term changes. Consistent methods are being used to increase the comparability of data and minimize biases and variability. The intent is to pool the data at a regional scale, which will enable more robust analyses and improve the ability to detect climate-related trends over shorter time periods.

RMN data can be used for many purposes, over short and long-term timeframes (Figure 1). Here we highlight some of the ways in which biomonitoring programs can use RMN data to supplement Clean Water Act (CWA) programs and initiatives, particularly under Section 303 and 305(b).

Monitoring high quality waters

Many of the RMN sites are located on high quality waters. Monitoring high quality waters fits into the long-term vision and goals for a number of CWA programs. One example is the Section 303(d) program. Historically, the 303(d) program has focused on the assessment and identification of waters that are not meeting state water quality standards, and on the development of Total Maximum Daily Loads (TMDLs) to inform restoration of those waters. Starting in 2016, protection planning priorities that target high quality sites will be incorporated into the reporting cycle for the Section 303(d) program (EPA 2013). This type of protection planning also ties into EPA's Healthy Watershed Initiative, in which state and other partners identify high quality watersheds and develop and implement watershed protection plans to maintain the integrity of those waters (EPA 2011).

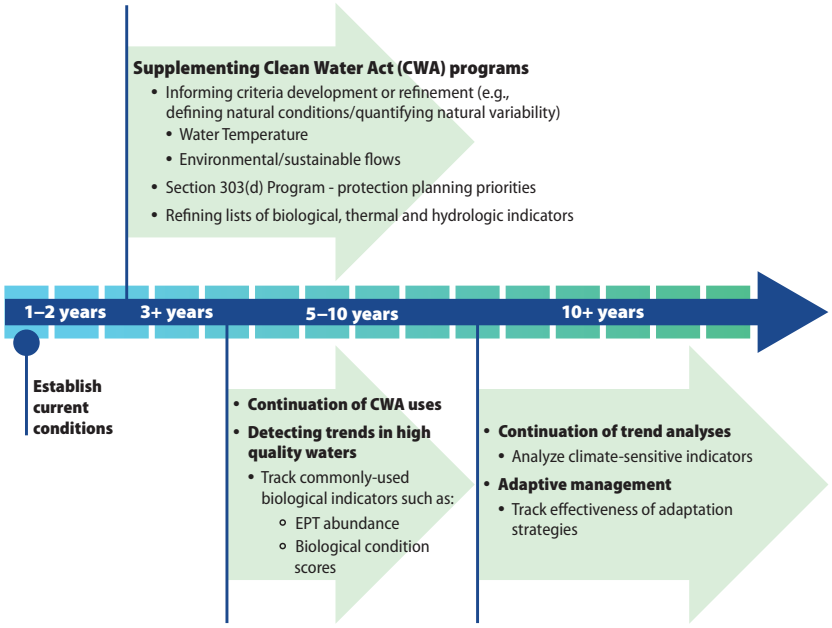

Figure 1. RMN data can be used for multiple purposes, over short and long-term timeframes.

Defining natural conditions/quantifying natural variability

The annual biological data being collected at RMN sites will enable quantification of natural variability and contribute to a better understanding of how natural variation affects the consistency of biological condition scores and metrics from year to year. In some regions, year-round thermal and hydrologic regimes in high quality wadeable streams are poorly documented. The continuous thermal and hydrologic data collected at RMN sites will provide robust data sets that capture natural temporal patterns, episodic events and spatial variability, which may be missed by limited numbers of discrete measurements (Figure 2). Quantification of natural variability is important because some water quality standards are based on comparisons with natural conditions.

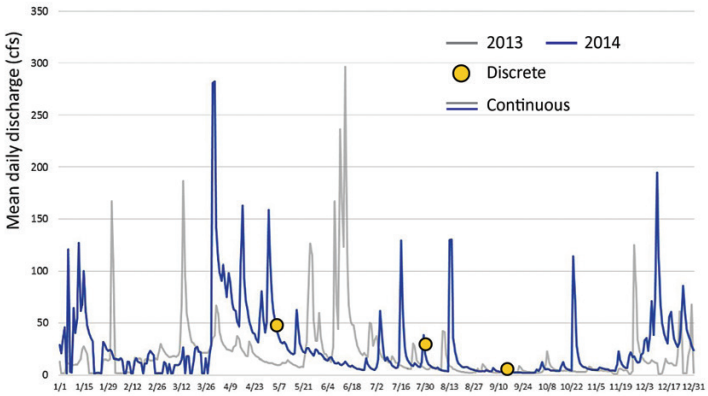

Figure 2. RMN data will help us gain a better understanding of natural variability in hydrologic conditions in small high quality streams, and will allow us to investigate relationships between biological, thermal and hydrologic conditions.

Informing criteria refinement or development

Some regulatory agencies are in the process of assessing whether their current temperature criteria are adequately protecting designated uses related to cold water fisheries. For example, in Connecticut, Beauchene et al. (2014) used year-round temperature data and fish data to develop quantitative thresholds for three major thermal classes at which there are discernible temperature-related changes in stream fish communities (Figure 3; Beauchene et al. 2014). This type of information is useful for fisheries management and can be used to help make criteria more biologically meaningful and defensible. Year-round hydrologic data are also being used to help inform management decisions. Maine adopted statewide environmental flow and lake level standards that are based on thresholds derived from principles of natural flow variation necessary to protect aquatic life and maintain important hydrological processes (Maine DEP 2007) (Figure 4; Ricupero 2009). Data from RMN sites can be used in similar ways to improve our understanding of these processes and to help develop regionally informed standards and management strategies.

Developing biological indicators for protection planning

Regulatory agencies in Maryland are assessing the accuracy of their current use designations as part of their protection planning process. As part of these efforts, Maryland Department of Natural Resources used continuous temperature data from its sentinel sites to develop a thermal indicator organism list for macroinvertebrates. Two stoneflies, *Sweltsa* and *Tallaperla*, meet obligate cold taxa requirements for Maryland streams and are being used in combination with trout to help identify and protect cold water streams (Figure 5). Other regulatory agencies can use biological data and continuous thermal and hydrologic data from RMN sites in similar ways.

More detailed information on the RMNs can be found in the two reports: "Best Practices for Continuous Monitoring of Temperature and Flow in Wadeable Streams" available at http://cfpub.epa.gov/si/si_public_record_report.cfm?dirEntryId=280013 and "Regional Monitoring Networks (RMNs) to Detect Changing Baselines in Freshwater Wadeable Streams" available at http://cfpub.epa.gov/ncea/risk/recordisplay.cfm?deid=307973.

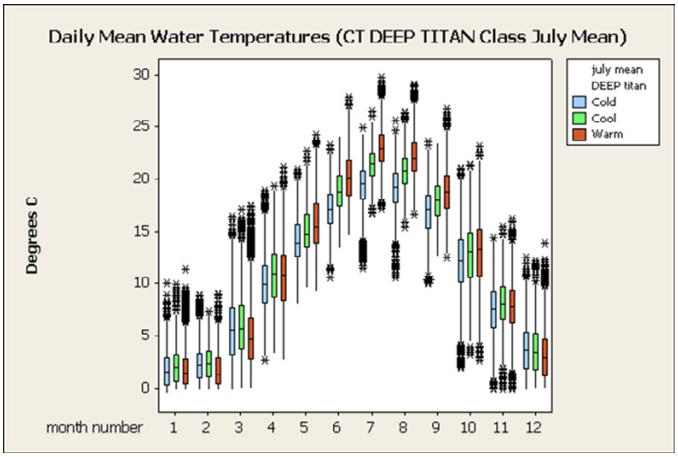

Figure 3. Box and whisker plot showing how mean daily water temperature (°C) varies by month across the 3 thermal classes that were developed by Beauchene et al. (2014): cold (blue), cool (green), and warm (red).

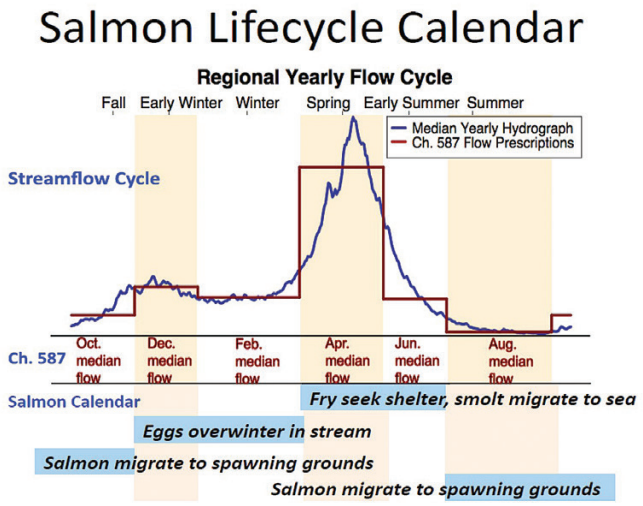

Figure 4. Salmon life cycle plotted in relation to yearly flow cycle (Ricupero 2009).

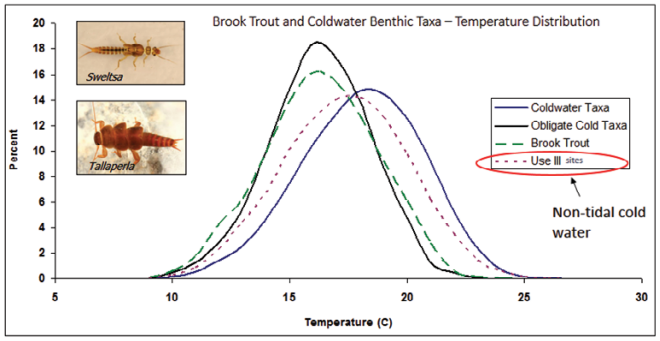

Figure 5. The thermal tolerances of *Sweltsa* and *Tallaperla* match very closely with brook trout. These two macroinvertebrate taxa are being used in combination with trout to help identify and protect cold water streams in Maryland. This figure was provided by Maryland Department of Natural Resources.

Literature cited:

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