Identifying Coldwater Resources

Water temperature is a key factor in the distribution of animals in the environment. Coldwater streams are those that maintain cold water conditions through the course of the year. They support a unique aquatic community that has evolved to match these temperature conditions. With a restricted temperature range, the biological community in these streams can be easily threated by impacts that raise the water temperatures. If temperatures become elevated about the upper thermal limits for a species it cannot survive. Changes to watershed land use, increased impervious surface, elevated warmwater discharge, and climate change are all threats to coldwater streams.

Identifying and correctly classifying coldwater streams is important so that they can be provided the greatest degree of protection. Three types of data can be used to identify coldwater streams; water temperature, presence of coldwater obligate benthic taxa, and presence of reproducing trout populations.

Temperature

New technology has allowed for the accurate collection of large volumes of stream temperature data. Continuous data loggers can be programmed to record stream temperatures at set intervals for extended periods of time. Coldwater stream temperature criteria are met when 90% of the temperature measurements for the summer index period (June 1 – August 31) are below 20°C. Data downloaded from temperature loggers can be quickly analyzed to identify streams that meet this temperature criterion (Figure 1). Using temperature data loggers is a very cost effective way to collect information from a broad range of candidate streams.

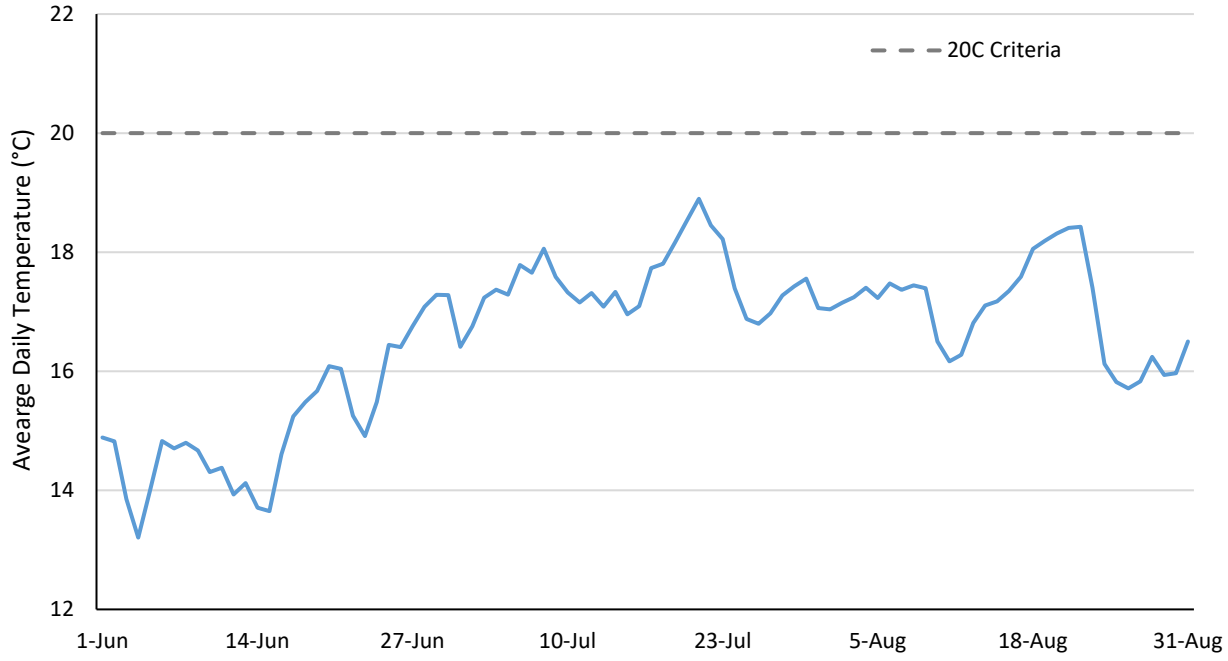

Figure 1. Example of stream temperature logger plot that meets the 20°C exceedance criteria

(L to R) Temperature data logger, coldwater stream in Frederick County

Obligate Coldwater Benthic Taxa

Benthic macroinvertebrates can also serve as indicators of coldwater conditions. Of the roughly 600 benthic macroinvertebrate taxa found in Maryland, two genera, *Tallaperla* and *Sweltsa*, have been identified as having the same thermal regime as brook trout. In addition to cold water temperatures, they are sensitive species that need good water quality to survive. Their aquatic lifestage lasts from 18-24 months making them excellent year-round indicators of coldwater conditions. In standard benthic monitoring surveys, the presence of one or both species is enough to meet the coldwater resources requirement.


(L to R) Obligate benthic coldwater taxa Tallaperla and Sweltsa

Reproducing Trout Population

The presence of a reproducing trout population is a clear indication that a stream has the appropriate temperature, water quality, and habitat conditions to support coldwater resources. In order to confirm natural reproduction occurring in a stream system, trout from multiple age groups need to be collected in a monitoring survey. Documenting the presence of young-of-year trout and adult trout of varying sizes would meet this requirement. Of the three trout species found in Maryland, brook trout have the coldest water temperature requirements. Brook trout are typically found in streams where summer water temperatures average 16.9 °C. Streams with wild brown trout have slightly higher average summer water temperatures at 18.9 °C.

(L to R) Wild adult brook trout and brown trout

Coldwater Stream Protection and Conservation

Maryland Department of Natural Resources Freshwater Fisheries Program has worked to compile all available temperature, benthic macroinvertebrate, and trout data collected by the department into a central database to aid in data distribution and analysis. One of the main product from this work is an online map showing the statewide distribution of coldwater resources (Figure 2). This coldwater mapping tool has been distributed to other state agencies, counties, and planning groups to try and minimize potential impacts that development and projects may have to these resources. The mapping tool is also being used to highlight areas for conservation and stream restoration activities. These can include tree plantings, cattle exclusion fencing, agricultural buffer strips, dam and stream blockage removal, and woody debris additions.

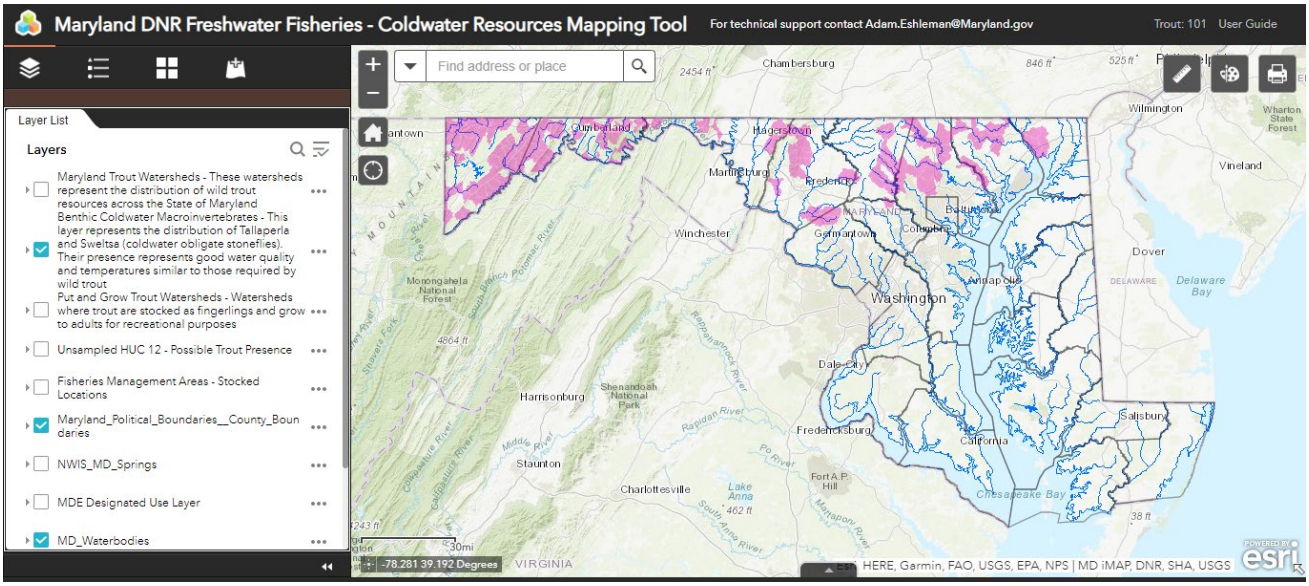

Figure 2. Coldwater mapping tool showing statewide distribution of watersheds with records of obligate coldwater benthic taxa.

For questions about identify coldwater resources in Frederick and Washington counties, please contact Michael Kashiwagi (Michael.kashiwagi@maryland.gov).