



At A Glance:

Topographic and Aerial Survey Conducted of South River

In March 2005, the South River Science Team contracted with a surveying company to complete topographic and aerial surveys of the South River from Waynesboro to Port Republic. Both surveys were performed from airplanes traveling over the river. The

topographic survey involved LIDAR (Light Detection and Ranging) technology, which uses an infrared laser beam to measure the distance from the plane to the ground. Data gathered were used to create a detailed topographic map that shows surface features of the floodplain along the river. The topographic map will be used to evaluate areas where the South River floodplain is being eroded.



An aerial photograph of Dooms, Virginia

For the aerial survey, high-resolution digital photographs were taken of the river. These most recent photos will be compared to historical aerial photos of the river that were taken

periodically from 1937 to 2000. From this comparison, the team will be able to identify changes in the river such as rates of bank erosion and changes in location of the river channel. These types of studies are useful in understanding the ways in which mercury is continuing to enter the South River system and ultimately why fish mercury levels continue to be elevated.

Topographic maps and aerial photographs are displayed in the South River Science Team office, which is located at 508 West Main Street in Waynesboro.

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About this Newsletter...

In the Fall 2000, the South River Science Team was formed to serve as a focal point for technical issues concerning mercury in the South River and downstream waterways. The Science Team is a cooperative effort between the Virginia Department of Environmental Quality, Department of Health, and the Department of Game and Inland Fisheries and representatives from academia, citizens groups, the Environmental Protection Agency, and DuPont. The Science Team provides technical direction for the mercury monitoring program and ensures that there is effective communication provided to the users of the river. The Science Team's goal is to understand why mercury in South River fish has not decreased over time and to identify potential solutions to improve the situation.

TechCorner: Sampling Fish for Mercury Analysis

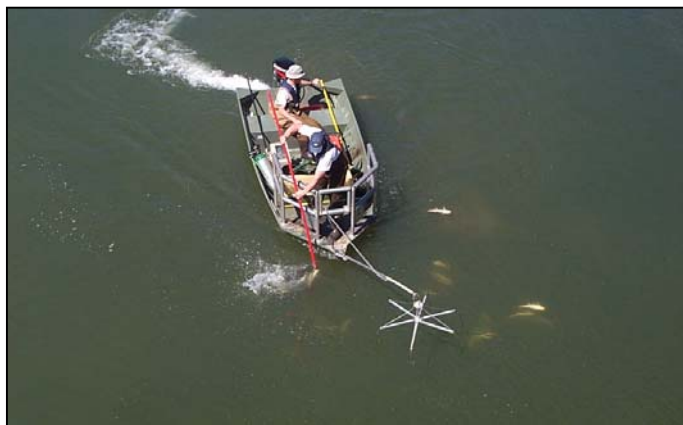
In 1990, the Virginia Department of Game and Inland Fisheries (DGIF) and the Virginia Department of Environmental Quality (VADEQ) initiated a 100-year plan to monitor fish, sediments, water, and floodplain soils in the South River and South Fork Shenandoah River. Since then, fish tissue monitoring has been completed six times, with the most recent collections in 2005. The next round of sampling will be in 2007; subsequent sampling will occur every five years for the next 85 years. The DGIF collects fish—specifically from black bass (smallmouth and largemouth), trout, suckers, sunfish, and catfish—and the VADEQ analyzes the tissue for total mercury content. The results of these collections help biologists and health officials establish guidelines for human health consumption. The long-term goal is to eventually see the mercury levels in consumable fish decline to meet the state and federal action level of 0.5 parts per million (ppm) of total mercury in fish flesh.



Fish that are typically collected from the South River (from the top: smallmouth bass, bluegill, redbreast sunfish, and rock bass; off to the side: margined madtom)

Where are fish collected?

With over 130 miles of river to examine, the South River Science Team had to decide where to collect fish. To compare results from each sampling event, it is important to be consistent and collect samples over time from the same sites. The team started by evaluating specific sampling sites that were selected by scientists during the 1990s during a study of mercury and fish on South River and South Fork Shenandoah River. The team selected some of these sites and chose others that were easy to access, represented suitable habitats for capturing target specimens, and could fill in data gaps between existing sites. With limited public boat launching access on the South River, finding easy access was a challenge.



DGIF personnel collecting fish using the electrofishing method

What types of fish are collected?

Once the sampling sites were chosen, the team determined how many of the target fish species to collect from each sampling site. An experienced statistician instructed the team to collect 10 specimens per species per site as the minimum for the data to be considered statistically sound. Laboratory costs were also considered when determining the number of fish that would be analyzed. Finally, team biologists determined that spring would be the best season to capture adult fish specimens and avoid the problems associated with maneuvering a boat during low river flows.



DGIF personnel performing a harmless technique using a pump and water to remove the stomach contents from a small-mouth bass

How are fish collected?

Electrofishing was determined to be the best method for sampling in that it provides the fastest way to net the number of fish needed and allows the return of fish that are not needed. There are a variety of electrofishing methods, but the team selected a light, 14-foot jon boat as ideal for the Shenandoah watershed. The jon boat is powered by a
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TechCorner: Sampling Fish
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20-horsepower jet drive outboard motor and is specially fitted with a 3,000-watt generator, a live well, a panel for controlling electrical output, and a railing system and electrofishing boom mounted on the bow. Most of the components of this electrofishing system can be removed if the team is launching the boat in areas that are steep, rocky, or heavily vegetated.

Once the boat is launched, the team moves along the shoreline in a downstream manner. Two people participate in the fish collection operation: one driver and one “dipper.” The driver pushes a foot

pedal to close the electrical circuit and send direct current through the boom and into the water. Stunned fish float to the water surface. A process called galvanotaxis pulls the fish toward the anode (i.e., the positive electrode off of the front of the boat), and the dipper in the front of the boat nets the fish and places it in a live well. Depending on their size, shape, and orientation to the anode in the water, fish react differently to the electricity. The advantage of electrofishing is that unwanted fish are released unharmed back into their environment.

For more information, contact Paul Bugas (DGIF) at (540) 248-9360 or Don Kain (VADEQ) at (540) 574-7815.

From the Team...

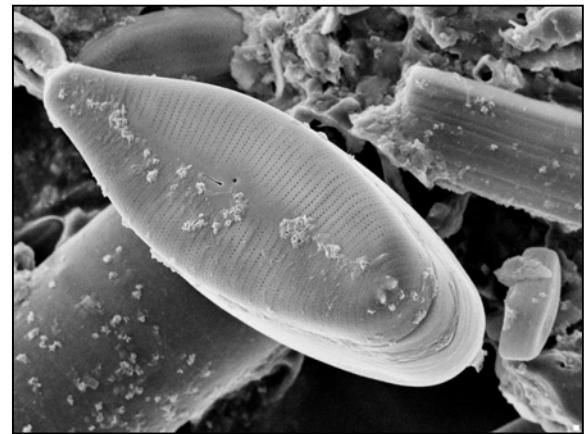
Virginia Institute of Marine Sciences Studies Periphyton

Scientists from the College of William and Mary’s Virginia Institute of Marine Sciences measured mercury and methylmercury concentrations in South River periphyton at more than 30 locations along the South River. Periphyton, otherwise known as rock slime, is the collection of microscopic plants that covers submerged rocks. These microscopic plants take up contaminants and nutrients from river water and serve as the main course for snails and many insects that, in turn, are food for fish, ducks, and other animals.

The three-year periphyton study is currently in its second year. In the first year (2005), scientists focused on quantifying mercury accumulation to determine the following:

- Mercury concentrations in periphyton
- Variations of periphyton mercury concentrations along the river
- How periphyton mercury concentrations compare to other river system components (e.g., clams, fish, sediment, and water)
- How organic content, iron, and manganese concentrations correlate with periphyton mercury concentrations within a sampling region
- If periphyton mercury concentrations and mercury concentrations in other river system components (e.g., clams and fish) correlate

Sampling results show that mercury concentration variations along the river match those of other



A photograph showing periphyton that completely enclosed itself inside an intricately shaped case of glass

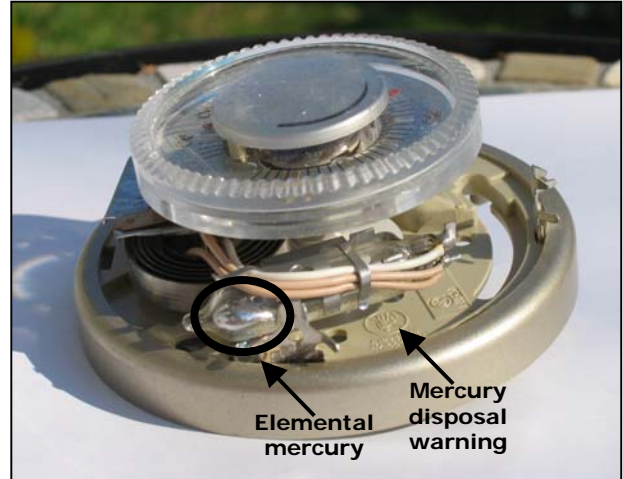
organisms such as clams and fish. This information confirmed the importance of understanding mercury in the river’s periphyton and established a sound basis to study mercury movement from periphyton to invertebrates to fish and birds. The next two years will focus on just that—the movement of mercury from these microscopic plants into the food web. Results will give the South River Science Team a clearer understanding of why different fish have different mercury levels along the river. The scientists will also apply cutting-edge nitrogen isotope methods to describe mercury movement up the food web of the South River and to predict the amount that mercury levels in fish tissue may decrease if mercury levels in water or sediment are reduced.

For more information, contact Dr. Mike Newman (VIMS) at (757) 886-0289.


Did You Know?

Mercury in Consumer Products in Your Home

Did you know that some household items could contain mercury? While some manufacturers have reduced or eliminated their use of mercury in products, there are still many items in the marketplace that contain mercury. For instance, batteries, fluorescent lamps, thermometers, paint, and thermostats are just some items in your home that could contain mercury. The proper disposal of used mercury-containing items is important to protect human health and the environment. Augusta and Rockingham Counties have initiated household hazardous waste collection events to collect used and unwanted household hazardous materials such as the mercury-containing items above. Augusta County has two hazardous waste cleanup days each year—one in the spring and one in the fall. Rockingham County holds a collection at the Fairgrounds on the last Saturday in September every year. Collections for both counties are advertised in local newspapers. If you have some of these mercury-containing items in your home, please dispose of them properly during one of the official hazardous waste cleanup days or call your county authorities for more information. To find out more about consumer products with mercury, visit www.epa.gov/mercury/consumer.htm.



A closeup showing mercury in an older household thermostat

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