



At A Glance:

Six-Year Ecological Study of South River Underway

Members of the South River Science Team are conducting a six-year ecological study to identify how mercury enters the food web of the South River. The study consists of Phase I (a two-year system characterization) and



Ecological team members collecting fish after performing electroshocking

Phase II (a four-year study of potential impacts to the environment).

Phase I began in March 2006 and is aimed at fully characterizing the biological, chemical, and physical environments of the South River. Portions of the North River and South Fork of the Shenandoah River will be studied and will serve as low mercury reference areas. Phase I was designed to complement current and past Science Team studies.

Surface water, sediment, and biological tissues are collected on a monthly basis and analyzed for a variety of

chemicals to understand how concentrations vary within the South River on a seasonal basis. Phase I also characterizes the physical habitat and plant and animal communities in the rivers to identify study and reference areas that are similar, except for the mercury concentration. The end result of Phase I will be selecting study and reference areas for Phase II, which will involve measuring potential impacts on the environment. Phase II study areas will include areas where mercury enters into the river and areas within the river where methylmercury, the dominant type of mercury in fish tissue, enters the food web.

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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: Storm Water Sampling Program

Storms and flooding are part of the natural hydrological cycle of rivers, but they can also threaten water quality by introducing pollutants and nutrients from adjacent residential, agricultural, and industrial sources. Rainfall runoff to rivers can carry trash, sewage, and other pollutants from parking lots, roads, storm drains, and sewers. High water levels erode riverbanks, down trees, and inundate low-lying areas. This erosion of soil and nutrients into the river can degrade the aquatic habitat. Many pollutants, including mercury, are closely associated with soil particles, making storm events potentially important factors in the introduction, transport, and fate of mercury in the South River. The South River Science Team has developed a storm sampling program to understand the role of storms in how mercury behaves in the South River.

The storm sampling program balances safety concerns with generating data that meet the objectives of the study. The Science Team samples one storm event per season. The goals of the storm sampling program are to determine which reaches of the South River have higher mercury loads than

others and to identify the sources of mercury in those reaches. A “reach” is a defined length of the river. For the purpose of the storm sampling program, the reaches are the distances between bridge sampling locations. Samples are collected from eight bridges over the length of the South River (see map), starting in Waynesboro and extending to Port Republic. Sampling during storm events has many safety challenges because samples are usually collected over a long time period (including night time) and in the rain. Sampling from bridges



Storm sampling locations along the South River

provides a safe location for the sampling team and a consistent sample location for each storm event.

Understanding how mercury is transported by storms requires sampling multiple storms and collecting multiple samples over the course of a storm. Samples are collected as river water levels rise (known as the rising limb) and fall (falling limb) because the river undergoes significant changes during a storm. On the rising limb, low-lying areas and portions of riverbanks are inundated and soil and sediment particles are suspended by the flow and carried into the river. The amount of suspended matter increases with the discharge of the river, so samples collected at one time can be very different than those collected at other times. The size of the suspended material also changes with flow as larger particles (such as sand) are mobilized with increasing flows. Samples are collected during multiple storm events because no two storms are alike. For example, high water events resulting from a steady rain falling on the Blue Ridge are very different than one caused by an intense thunderstorm in the valley.

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Samplers lowering a pump into the river in preparation for collecting water samples

TechCorner: Storm Water Sampling Program
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The storm sampling program draws on other disciplines and Science Team studies. The work of geomorphologists, who study how rivers are formed, shows the role that storms play in eroding and depositing soil and sediment. Hydraulic modelers and hydrologists can predict which areas are inundated at certain river levels, which can be very

useful for identifying sources. Soil scientists aid in understanding how soil behaves once it is suspended and carried into the river. The Science Team incorporates all of these disciplines to understand how and where storms suspend, transport, and deposit mercury.

For more information about the storm water sampling program, contact Todd Morrison at (215) 367-2477.

From the Team...

College of William & Mary Studying Birds

Scientists from the College of William & Mary (W&M) Biological Department are now in the second year of a three-year program studying mercury in birds along the South River. This year, Professor Dan Cristol and a crew of graduate and undergraduate students collected feathers and drops



W&M undergraduate Rachel Fovargue talking to a brood of month-old kingfishers after collecting samples

of blood from birds in both mercury-impacted and nonimpacted areas along the South River. These feather and blood samples were collected using a procedure that does not harm the birds. Fish-eating kingfishers were sampled and each nest required laborious excavation to avoid

disturbing the occupants. All kingfisher nests on the South River were located and sampled, making this the biggest data set ever collected on this important species for ecotoxicological studies. In addition, all potential nest cliffs were surveyed and measured, in an attempt to explain why certain stretches of river do not host kingfisher nests.

Last year, the team installed nest boxes for bluebirds, wrens, and tree swallows. These nests were once again very effective, with nearly every box occupied. More than 50% of the swallows nesting in 2005 returned to nest again in 2006, providing a unique opportunity to look for any effects of mercury on survivorship from one year to the next. Of the 500 nestlings marked with

numbered bands in 2005, only 2% returned, which is typical for this migratory species. Almost 1,000 nestling swallows were marked in 2006.

For the first time, the bird crew collected food brought by parents back to their nestlings. Hundreds of moths, grasshoppers, spiders, caterpillars, and all matter of food items were intercepted—even a fish scale and several snail shells! Once analyzed for mercury and different forms of nitrogen, the food items (only two to three from each baby so they wouldn't be hungry!) will be an invaluable source of data to determine which species may accumulate mercury through their diet.



Maryse Leandre, W&M undergraduate research assistant, holding a goldfinch

Baby birds on the South River have very low mercury compared to their parents, which is puzzling. To solve the riddle, one graduate student placed radio transmitters on 50 baby bluebirds after they left the nest and then followed, re-captured, and collected samples from them for the next three months. Results showed that the blood level of mercury increased gradually over the summer to the adult level. These results are expected. When birds are in the nest, their blood mercury levels are held at a low level because mercury is being drawn into their rapidly growing feathers. Once feathers are grown and a bird is ready to leave the nest, the blood supply to the feathers is cut off and the mercury can no longer be stored in the growing plumage.

For more information, contact Dr. Dan Cristol (College of William and Mary) at (757) 221-2405.

Did You Know?

South River Science Team Office Opens

Did you know that the South River Science Team office is now open for business? An open house occurred earlier this year to celebrate the completion of renovations and officially open the new office at 508 Main Street in Waynesboro. The front part of the office is an exhibit area that is open to the public. It contains displays that describe the history of the mercury situation in the river, fish consumption advisories, and current and past scientific studies on the South River. Additional hands-on displays are in the works, and an educational curriculum will be developed for teachers and students visiting on school field trips. The back part of the office is used by the Science Team to support the various river studies and to store equipment and samples. The office is open weekdays from 8 A.M. until 5 P.M.; however, it may be closed when the scientists are needed in the field. Visitors are welcome at any time, but to ensure that the doors will be open, please call ahead at (540) 949-5361.



South River Science Team office

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