

DEQ, DGIF, and Partners Expand Spring 2007 Efforts in Shenandoah River Fish Kill Investigation

In the month of March, fish kills have begun in the Shenandoah River system during each of the last 3 years. These fish kills have occurred at seemingly low rates, but have lasted for extended periods, and in some areas have reduced adult smallmouth bass and redbreast sunfish populations by an estimated 80 percent. The DEQ and DGIF, along with partners in the Shenandoah River Fish Kill Task Force, have been seeking the causes of these fish kills since 2004.

In the fall of 2006, the DEQ contracted with Drs. Greg Garman of VCU and Don Orth of Virginia Tech, both recognized freshwater fisheries experts, to evaluate all evidence gathered during the 2004-2006 fish kills. In February 2007, Drs. Garman and Orth completed their review and provided DEQ with a report and recommendations for continued investigation. The Shenandoah River Fish Kill Task Force has used this report as a template for its 2007 action plan. Specific elements of that plan are outlined below.

Water Quality and River Sediments

- Weekly sampling for ammonia and nutrients at 12 sites (DEQ).
- Episodic storm event sampling at various sites throughout the watershed as measurable runoff events occur (DEQ, DGIF, and several citizen monitoring organizations).
- Sampling at 11 locations with passive water samplers designed to detect compounds not readily measured through conventional water sampling (DEQ)
- Parallel sampling at 2 locations with passive water samplers in the same manner outlined above (Friends of the North Fork, funded by Virginia Environmental Endowment).
- Monthly laboratory chronic toxicity tests of river water at 4 sites (USEPA)
- Continuous recording of pH, temperature, dissolved oxygen, and conductivity with water monitoring instruments at 6-8 sites (DEQ, with assistance from USEPA).
- Sediment toxicity and estrogenicity tests at 9-12 sites (USEPA).
- Sediment analyses for a wide range of contaminants (USGS)
- Contaminant profile of chemicals expected to be found in the Shenandoah Valley and those with the potential to be associated with the conditions and impairments observed in the fish kills (multiple collaborators).

Fish and other Aquatic Life

- Fish - Extensive sampling and collections of fish from the North and South Forks of the Shenandoah, the Shenandoah mainstem, and a reference stream, the Cowpasture River, during pre-spawn and post-spawn periods when no fish kills are occurring. Fish will be evaluated externally and internally within individual organs for histology, pathology, bloodwork, and parasites, viruses and bacteria (USGS, Fish Health Lab, Leetown, WV). This same work will be conducted on dead or dying fish during fish kill events that may occur in 2007.

- Fish – Viral, bacterial, parasite, and other disease evaluations (US Fish & Wildlife Service and several University researchers).
- Fish – whole body burden analyses for a wide range of contaminants, with possible analyses of selected body organs for a portion of fish sampled (DEQ)
- Benthic macroinvertebrate evaluations, combined with water quality data on nutrients and ammonia to determine associations between these variables and locations of fish kills . Study began in 2006 on 9 DEQ water sampling sites and will continue in 2007 (Virginia Tech).
- A companion benthic invertebrate study will occur in 2007 on 25 tributaries to the Shenandoah and will expand water chemical analyses to include compounds expected from agriculture runoff (VA Tech, funded by Virginia Environmental Endowment)
- Fish community-level analyses at multiple sites throughout the Shenandoah drainage (VCU).

A key to the Shenandoah River fish kill evaluation continues to be the collaborative approach DEQ and DGIF have employed throughout this investigation. In addition to the regular meetings, discussions and cooperation between the members of the Shenandoah River Fish Kill Task Force, DEQ and DGIF have gained much insight and assistance from EPA's CADDIS (Causal Analysis / Diagnosis / Decision Information System) workshop and a Chesapeake Bay Foundation's multi-state Fish Health Workshop (January 2007). Many of the experts and researchers involved in those events have continued to provide support and advice as DEQ and DGIF implement the 2007 work plan. In addition, DEQ and DGIF staff are communicating and coordinating with West Virginia officials , as they continue to investigate similar fish kills on the South Branch of the Potomac River.