

Spring Run Study Design

The Spring Run Study will establish baseline conditions and then monitor water quality, benthic and periphyton communities and habitat conditions over approximately a **five-year** time period beginning in the spring of 2005. The study was initiated through concerns expressed by the landowners, the local watershed association "Friends of Spring Run Wild Trout (FSR)" and local fishermen as to the causes of the decline in the **wild rainbow trout** fishery downstream of the WV Department of Natural Resources (WVDNR) hatchery. Recent NPDES violations and conversations with the above-mentioned groups have resulted in a plan to upgrade the hatchery that will address effluent concerns. The study will provide a unique opportunity to address issues of both regional and national significance:

1. Will the hatchery effluent treatment process significantly reduce nutrient discharge? Fish hatcheries throughout the country produce nutrient-rich effluents of concern to receiving waters. This study will evaluate the downstream result of effluent reduction of BOD and TSS, as well as nutrients, from a small but high throughput point source. The results of renovation at SRH and this study will provide important information to the WV Potomac Tributary Strategy point source innovation process.
2. What are the biological impacts of Spring Run's high nutrient levels, and how is the biota affected by reductions in nutrients, TSS and BOD following hatchery upgrades? This issue is of importance to the nutrient criteria development process that WV and the other 49 states are currently struggling through, as one of the key questions is: "what does nutrient impairment look like?"
3. Is the wild trout population in Spring Run being harmed by hatchery effluent, and does improvement in that effluent improve the trout fishery?
4. Is the benthic invertebrate population in Spring Run being harmed by hatchery effluent, and does improvement in that effluent improve diversity? Spring Run fishermen have noted the loss in recent years of a certain family of mayflies, the Ephemerellidae that used to emerge regularly in the springtime. Also, Save Our Stream's collected benthics from Spring Run in the summer of 2002, and found the lower part of the fly fishing section to be dominated by Chironomidae (midge) larvae, a group often indicative of pollution by organic waste.
5. Why do trout, especially larger fish, favor the upper part of the fly-fishing section? Why has the density-center of the trout population moved upstream in recent years? Is there a relationship between distribution of benthic invertebrates in the stream and trout distribution? If the Ephemerellidae mayfly rebound after the hatchery effluent is treated, will the trout population improve also? In particular, are trout avoiding areas they used to frequent that are now dominated by midge larvae? If upgrades to the hatchery reduce organics in the stream and also the midge populations, will trout return to those areas? If that turns out to be true, and we could demonstrate that it is true, that would buttress public acceptance of benthic invertebrate stream assessments.

Methods

The project has two experimental components, an upstream/downstream design in Spring Run, and a control/experimental design that includes Dumpling Run, another spring fed stream nearby. Both streams have their origins in the same geology: limestone (Helderberg and Tonoloway/Wills Creek) and sandstone (Oriskany, McKenzie) formations. Spring Run flows off the ridge to the northwest into South Mill Creek, a tributary of the South Branch of the Potomac River. Dumpling Run flows east into the South Fork of the South Branch of the Potomac River.

The upstream/downstream part includes three sites in Spring Run: the first site is near the spring upstream of the hatchery; the second site is in the upper part of the $\frac{3}{4}$ mile fly fishing section; and the third is in the lower part of the fly fishing section. There are two sites on Dumpling Run, one just below the spring, the other some distance downstream. Overall, this design allows within stream and between stream comparisons. Under most conditions of flow the springs constitute the main source of water in both streams, but both streams also have periodic surface flow entering the main channel upstream of the spring.

Water chemistries and flow measurements are collected monthly from April through September, typically on mid-week days. Water quality parameters include nitrogen in the forms of ammonia-nitrogen, nitrate/nitrite, total Kjeldahl nitrogen, total nitrogen (the sum of nitrate/nitrite and TKN), soluble reactive phosphorus, total phosphorus, total suspended solids (TSS), biochemical oxygen demand (BOD₅), and basic field parameters (pH, temperature, conductivity). Flow measurements are collected at the same time as water samples at one site in each stream. Primarily the WV Department of Agriculture (WVDA) and WV Conservation Agency (WVCA) complete these tasks.

Benthic invertebrate and periphyton samples are collected twice each year at all sites, in May and August, according to the standard procedures in use by the WV Department of Environmental Protection (WVDEP). A modified Rapid Bioassessment Protocol (RBP) habitat condition assessment focusing on sediment will be conducted once each year in addition to cross-section surveys and pebble count collections. Primarily a WVDEP representative (Save Our Streams Coordinator) and Cacapon Institute (CI) will complete the fieldwork for this component.

Additional components of this study include collecting information regarding fish populations, stream bank restoration and volunteer monitoring. WVDNR will conduct periodic electro-shock fish surveys and FSR will report on size and location of trout caught and released as documented by permitted fly fisherman. WVDOH and the WVCA are working on a stream bank restoration project above the spring to reduce sediment and stabilize portions of the stream upstream from the spring, and WVDOH will repair culverts and drainage ditches downstream from the hatchery. Finally, a volunteer monitoring group known as the “Potomac Highland Christian Home Educators (PHCE)” is using Level One WV Save Our Streams procedures to assess the lower portion of Spring Run.

The following agency documents and other guidance manuals will be used as the standards of procedures throughout the duration of the study. These documents are available upon request.

1. WVDA (Regulatory and Environmental Affairs Division) SOP's for Stream Discharge Measurement. November 2006 Revision
2. WVDA (Regulatory and Environmental Affairs Division) SOP's for the Collection of Water Quality Samples. November 2006 Revision
3. WVDEP (Watershed Assessment Section) SOP-G. Benthic Macroinvertebrate Collection Protocols. 2005 (will adopt 2006 revisions)
4. WVDEP (Watershed Assessment Section) SOP-H. Benthic Macroinvertebrate Sample Processing. 2005 (will adopt 2006 revisions)
5. WVDEP (Watershed Assessment Section) SOP-J. Periphyton. 2005 (will adopt 2006 revisions)
6. WVDEP (West Virginia Save Our Streams Program) Advanced Manual. June 2004
7. Bain, N.B. and N.J. Stevenson, editors, 1999. Aquatic Habitat Assessment: Common Methods. American Fisheries Society, Bethesda, Maryland

Reporting

Reports of the information collected will be produced on an annual basis and will be made available on Cacapon Institute's web page at: <http://www.cacaponinstitute.org/>. Hard copies of the report will also be sent to grantees and other interested stakeholders. These reports will be available late winter or early spring following each season (collection period). Parts of the report may be appended as information becomes available from out-sources (i.e. benthic and periphyton analysis etc.).

Researchers and Partners

FSR, CI, WVCA, WVDA, WVDNR, WVDEP, FI, WVDOH and PHCE are partnering in this study. A contact list of the primary researchers is provided in Table 1 on the next page.

Funding and other contributions

This study is funded primarily by WVCA's participation through the Chesapeake Bay Program. The sediment reduction (stream bank restoration) project is funded in part through a FSR 2005 Stream Partners Grant. Available agency staff from the WVCA, WVDA, WVDEP and WVDNR are contributing in-kind services to the project. FI is acting in an advisory role for the project team and is assisting in the planning phases for the hatchery upgrades. WVDEP in addition to being an active partner is also paying for the analysis of the benthic invertebrate and periphyton collections.

Table 1. Primary Contacts for the Spring Run Study

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