Section 319
NONPOINT SOURCE PROGRAM SUCCESS STORY
Maryland

Restoring Stream Improves Water Quality and Fish Community Health

Waterbodies Improved

During rainstorms, high volumes of rapidly moving stormwater flow off of impervious surfaces and into Maryland's Spring Branch, causing destructive erosion of the stream channel and contributing sediments and nutrients to a drinking water reservoir. The Maryland Department of the Environment (MDE) added Spring Branch to the state's Clean Water Act (CWA) section 303(d) list in 1996 for nutrient and sediment impairments and expanded the listing in 2002 to include biological impairments. Restoring two miles of stream has significantly reduced nutrient and sediment loads and improved fish habitat. Water quality continues to show progress toward meeting the total maximum daily load (TMDL) limits for phosphorus and sediment in the Loch Raven Reservoir, which is immediately downstream of the project area.

Problem

The 1,005-acre Spring Branch watershed drains a portion of Baltimore County in the urbanized Baltimore metropolitan region and empties into the Loch Raven Reservoir. Spring Branch is designated for water contact recreation use, aquatic life use and public water supply use.

Spring Branch was once a narrow, shallow trout stream. Fifty years of rapid urbanization created many impervious surfaces with few stormwater controls (Figure 1). Consequently, rainfall generates high volumes of runoff that quickly exceed the capacity of Spring Branch. Stormwater flows have eroded the stream channel so that it is now 30 feet deep and 15 feet wide. Erosion has exposed sewer pipes and created high sediment and nutrient loads that flow into the Loch Raven Reservoir.

MDE first added Spring Branch to the CWA section 303(d) list in 1996 for nutrient and sediment impairments. On the basis of biological monitoring results, MDE expanded the list of impairments to include a biological impairment in 2002.

In 2007 the U.S. Environmental Protection Agency approved MDE's TMDL for Loch Raven Reservoir, which includes the Spring Branch subwatershed. The TMDL requires that total phosphorus be reduced by 50 percent to meet water quality standards for dissolved oxygen and chlorophyll *a* (to prevent algae blooms in the reservoir). The TMDL also requires that suspended sediment be reduced by 25 percent to preserve the reservoir's volume. A TMDL for biological impairments has not yet been developed.

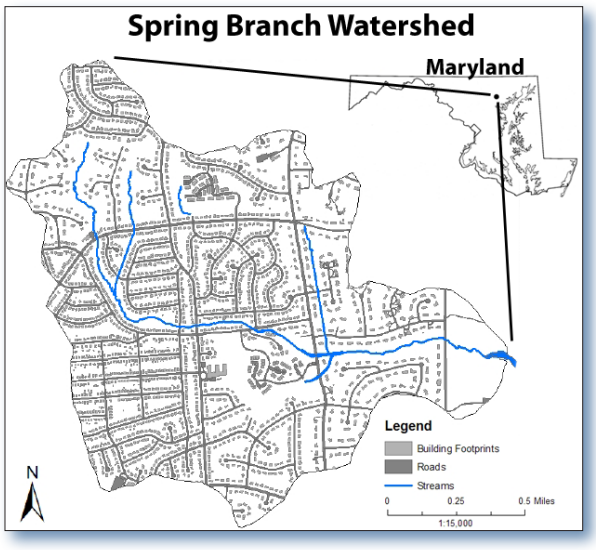

Figure 1. Impervious surfaces in northern Maryland's Spring Branch watershed.

Project Highlights

In 1997 Baltimore County developed a water quality management plan for the Loch Raven watershed. The plan identified and evaluated nonpoint sources of pollution and provided a watershed restoration and management framework. The Baltimore Metropolitan Council's Reservoir Technical Group wrote a *2005 Action Strategy for the Loch Raven Reservoir Watersheds*, which called for Baltimore County to reduce nutrient and sediment inputs to the reservoir through a variety of best management practices, including stream restoration. Baltimore County chose to focus restoration efforts on Spring Branch because of its proximity to the reservoir

and other factors, and completed a *Spring Branch Subwatershed Small Watershed Action Plan* in 2008.

The Baltimore County Department of Environmental Protection and Resource Management (DEPRM) conducted two phases of restoration activities on Spring Branch—one beginning in 1997 and the second in 2008. Both phases addressed effects of urbanization, including the flashy (quick-to-flood) flow regime, erosion, declining ecological function, failing infrastructure, poor water quality and property damage.

In phase I, DEPRM created a new channel of Spring Branch and added step pools, meander patterns and flood plains. That and other parts of the stream channel were stabilized using natural materials such as boulders, tree root wads, brush mattresses and live branch layers. In addition, DEPRM removed 1,740 feet of concrete channel (Figure 2), stabilized or removed sanitary sewer lines, added rock-lined step pools below storm drain pipes to dissipate energy from the flow, and constructed a stormwater wet pond to treat runoff from the headwaters. Replanting 12 acres with native trees and shrubs restored 10,000 linear feet of stream (Figure 3).

In phase II, DEPRM removed another 524 feet of concrete channel and restored 3.23 acres of native riparian buffer using 219 trees; 547 shrubs; 2,133 live stakes; 295 linear feet of live branch layering and 102 pounds of native riparian seed. Phase II restored 2,814 linear feet of stream.

Figure 2. At this site (looking toward Pot Spring Road) before restoration efforts, Spring Branch flowed through a concrete channel. The concrete step seen here obstructed fish passage.

Figure 3. After restoration, the concrete channel seen in Figure 2 has been removed. Sewer lines running along both sides of the stream prevented partners from restoring a natural meandering pattern.

Results

The phase I work reduced phosphorus loads by 27 percent, nitrogen loads by more than 30 percent and sediment loads by 45 percent. In 2003 and 2004, monitoring at station SB-2 (downstream end of the phase I portion of the project) showed that few or no fish were present, and the fish index of biotic integrity score (IBI) was classified as *very poor* (score of less than 1.9). However, the fish community responded to phase II restoration efforts. Fish monitoring in 2009 (less than one year after phase I was completed) showed significant increases in fish biomass and fish IBI at stations SB-2 and SB-8 (headwaters). Removing the concrete channel (see Figure 2) allowed the fish to swim upstream and colonize the area. As seen in Figure 4, Fish IBI scores at both stations improved to a classification of *poor* (scores between 2.0 and 2.9).

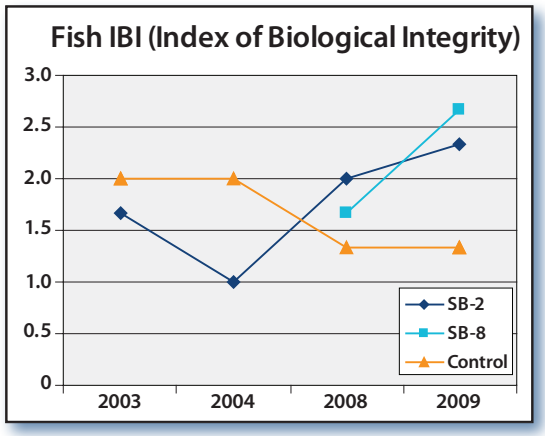

Figure 4. After phase II of the restoration (2008), fish IBI levels increased above (SB-8) and below (SB-2) the project area.

Although Spring Branch does not yet meet water quality standards, reduced pollutant loads and improving biological data indicate that progress is being made.

Partners and Funding

Project costs included $276,473 for a new wet pond serving 47 acres, $1.9 million for phase I work and $1.1 million for phase II work. Most of the funding came from Baltimore County bonds, MDE Small Creeks and Estuaries Grant and MDE stormwater cost share funds. A developer fee, required in lieu of mitigation funds, helped fund plantings. CWA section 319(h) funds contributed $240,000 for phase II work. Baltimore City, which owns and operates the Loch Raven Reservoir, was also a project partner.

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