



## Section 319

# NONPOINT SOURCE PROGRAM SUCCESS STORY

# Maryland

## Protecting Riparian Areas Yields In-Stream Improvement in First Year

### Waterbody Improved

Runoff from agricultural activities and urbanization contribute to sediment and nutrient impairments in the lower Monocacy River and Lake Linganore. As a result, Maryland Department of the Environment (MDE) added the waterbodies to the 1996 Clean Water Act (CWA) section 303(d) list, on which they have since remained. A landowner installed agricultural best management practices (BMPs), including cattle fencing, alternative watering facilities and riparian planting on a small, unnamed tributary of Lake Linganore. The BMPs have resulted in water quality improvements in the first year. MDE will continue monitoring progress toward meeting the total maximum daily load (TMDL) and water quality standards.

### Problem

Lake Linganore is an impoundment in eastern Frederick County, Maryland. An earthen dam was installed across Linganore Creek in 1972 to create the 216-acre lake as a water supply and for recreational use. Water from Lake Linganore empties back into Linganore Creek and then flows to the Monocacy River, the Potomac River and the Chesapeake Bay. The lake's primary inflows include Bens Branch and Linganore Creek. Many of the streams in the area were affected by agricultural land uses historically and are now also affected by suburban development. For example, grazing cattle's uncontrolled access to headwater streams caused severe sedimentation in tributaries upstream of Lake Linganore (Figure 1).

Sediment and nutrients in agriculture and suburban runoff impaired the lake, preventing it from meeting two of its designated uses—water supply and recreation. As a result, MDE added the lake to its 1996 CWA section 303(d) list of impaired waters. A TMDL for phosphorus and sediment was approved for Lake Linganore. Nutrient and sediment TMDLs are being developed for the entire watershed.

### Project Highlights

To meet the TMDL requirements, the Maryland Department of Agriculture (MDA) targeted the entire watershed for technical and financial assistance to local farmers who are willing to implement BMPs. For example, MDA worked with the owner of Hunting Lotte Farm to implement improvements along a small, unnamed headwater tributary to Bens Branch. The 450-acre crop and livestock farm produces a variety of crops and supports about 150 head of Black Angus cattle on approximately 80 acres of pasture. Before 2006, stream riparian



Figure 1. Before the 2006 fence installation, uncontrolled cattle access to an unnamed tributary of Bens Branch caused visible erosion.



Figure 2. In autumn 2007, after fence installation, the riparian area is recovering. Numerous tree tubes indicate that trees will soon dominate the area.

conditions on the tributary were poor because of cattle overgrazing and trampling the streambanks.

The landowner installed more than 8,800 feet of fencing along streambanks, developed three alternative water sources that use natural springs instead of allowing cattle to drink from the stream, and improved three heavy-use areas and two stream crossings. Trees were planted during Earth Day celebrations in 2006 and 2007 in cooperation with MDA, Natural Resources Conservation Service and the Chesapeake Bay Foundation (CBF). The landowner planted more than nine acres of cool-season grasses along the streambanks. By autumn 2007 riparian vegetation had rapidly begun to cover and stabilize the streambanks (Figure 2). The farm also participates in the cover crop program, uses no-till and minimum tillage practices, and complies with and participates in the Maryland Nutrient Management Program.

## Results

To track in-stream changes for this and other projects statewide, MDE's Targeted Watershed Project staff conducted the following: quarterly water monitoring to track nutrient changes, annual quantitative stream channel surveys to track substrate changes, and periodic sampling of stream bugs (benthic macroinvertebrates) to track changes in the local biological community.

MDE maintains monitoring sites on the unnamed tributary running through Hunting Lotte Farm. Within one year of BMP installation, the rapid return of riparian vegetation provided extensive summer stream shading and improved bank stability. The percentage of in-stream gravel substrate has increased and in-stream sand/mud substrate has decreased (Figure 3). The stream channel survey that MDE conducted in 2006 and 2007 shows that substrate quality in both stream reaches is improving, including a decrease in clay and sand and an increase in gravel and cobbles.

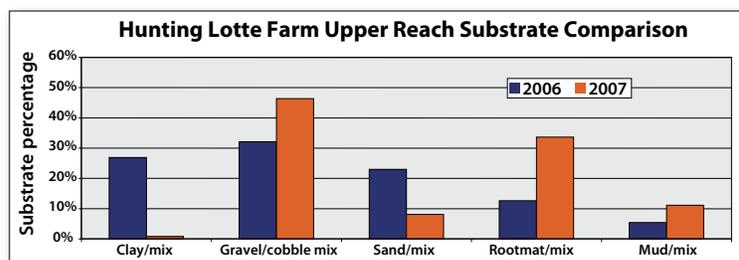


Figure 3. Monitoring conducted before (2006) and after (2007) the landowner installed BMPs shows that the in-stream gravel substrate increased, and the percentage of in-stream sand/mud substrate decreased.

Phosphorus concentrations have also decreased from a high of 0.2 milligram per liter (mg/L) in 2006 to a low of 0.025 mg/L in 2007, which indicates that erosion and sediment movement have decreased (Figure 4). Declining phosphorus concentrations can be attributed to reduced erosion in the riparian area and the streambanks as result of restricting cattle's access to the stream. More time is needed

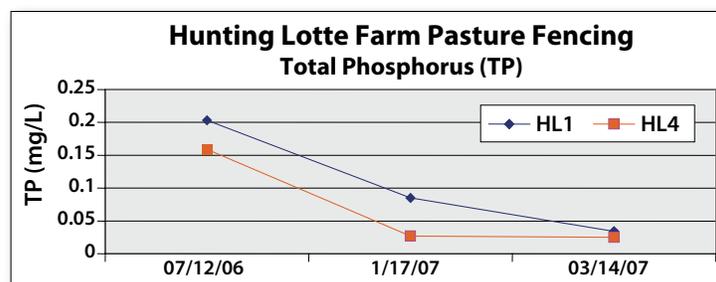


Figure 4. Installing fences to keep cattle away from streams helped reduce phosphorus levels. Data from monitoring sites HL1 and HL4 show steady phosphorus declines.

to assess the biological community change of macroinvertebrate populations. Total nitrogen data did not change significantly, which could be associated with a lag in the BMP effect—plant roots in the riparian area have not yet developed to the point where they can uptake higher amounts of nitrogen.

While sediment and phosphorus loads have been significantly reduced, Lake Linganore and the Lower Monocacy River are not yet meeting water quality standards and remain on Maryland's list of impaired waters. However, visible improvements in the unnamed tributary and elsewhere in the Lake Linganore watershed are soon expected to measurably reduce impairments in the lake.

## Partners and Funding

Mostly in 2006, the farm owner invested nearly \$100,000 in BMPs, approximately \$79,000 of which was supported by grants. The Maryland Agricultural Cost Share program provided about \$57,000; the Conservation Reserve Enhancement Program provided \$19,400; and CBF provided nearly \$2,600. To track in-stream changes for this and other projects statewide, the MDE Targeted Watershed Project is using CWA section 319 grant funds to pay for technicians and analyses, including quarterly water quality monitoring, annual stream substrate surveys and periodic biological sampling of benthic macroinvertebrates.



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