

Executive Summary

The Christina Basin is a 565 sq. mi. watershed contained in the larger watershed, the Delaware River Basin. The Christina Basin spans three states, Delaware, Pennsylvania, and Maryland, and includes four subwatersheds: Brandywine, Red Clay, and White Clay Creeks, and the Christina River. On April 8, 2005, the U.S. Environmental Protection Agency (USEPA) assigned Total Maximum Daily Loads (TMDLs) to the Christina Basin. The TMDLs will require specific reductions in nonpoint sources of pollution, such as nitrogen, phosphorus, and bacteria, to restore the rivers and streams of the Christina Basin to a healthy condition for our use and recreation.

The Delaware Department of Natural Resources and Environmental Control (DNREC) and the Water Resources Agency, a unit of the University of Delaware's Institute for Public Administration (IPA-WRA), have been working together to form and facilitate a Tributary Action Team for the Delaware portion of the Christina Basin. This team has developed and is recommending a Pollution Control Strategy (PCS) to DNREC. The process of drafting the PCS strives to involve multiple stakeholders representing the community to develop feasible recommendations to reduce the nonpoint source nitrogen, phosphorus, and bacteria loads in the waters of the Delaware portion of the Christina Basin to achieve the USEPA's targeted TMDL levels. The Tributary Action Team began this process in February 2006 and has held 13 meetings and a public forum over the past 17 months.

The process of developing and recommending a PCS for the Delaware portion of the basin began with IPA-WRA identifying potential team members. IPA-WRA aimed to gather a diverse group of stakeholders in the Christina Basin so that all stakeholders in the basin were represented. Team members include representatives from nonprofit organizations, industry, water utilities, state and local government entities, private consultants, and residents of the basin.

The next course of action was to provide the steering committee with background on the Christina Basin: the value of the basin, ecologically, recreationally, and historically; the TMDLs and the assigned nitrogen, phosphorus, and bacteria limits; and the sources of pollution in the basin. After building a base of knowledge about the process and the needs for the Christina Basin, the team developed an agenda and strategy to hold a public forum. The public forum is a critical component of any PCS process. Through this public forum the team gained additional members and created an email list to keep all interested community members and organizations up-to-date on the process and activities in the basin. The forum also served to gather input on what was most important to the stakeholders in the Christina Basin to guide the development of the PCS. This input was used as the guiding principles in developing and shaping the PCS for the Delaware portion of the Christina Basin. It is the team's intent that the recommendations set forth in the Christina Basin PCS meet the guiding principles set forth at the public meeting in June 2006.

In December 2006, after ten Tributary Action Team meetings and the public forum, the group finalized 40 voluntary and regulatory recommendations grouped according to five distinct sectors: stormwater, open space, wastewater, agriculture, and education. Each group of recommendations is intended to reduce the levels of nitrogen, phosphorus, and bacteria in the nonpoint source runoff in the Delaware portion of the Christina Basin. For each of the 40 recommendations the PCS details the specific recommendation, the organization(s) responsible for implementing the recommendation, the nutrient reductions that should result from implementing the recommendation, the source(s) of funding, the priority location for

implementing the recommendation, the costs associated with implementing the recommendation, and the type of approach (regulatory or voluntary). The 40 recommendations include:

Stormwater

- Require urban tree canopy.
- Require stormwater BMPs be designed to reduce nutrients according to the TMDLs.
- Limit addition of new impervious cover to less than 20 percent of the watershed above public water supply intakes.
- Promote LID in new construction and redevelopment.
- Amend stormwater ordinances to create consistency throughout the watershed.
- Expand the role of RPTAC to create a Christina Basin group responsible for reviewing new development applications.
- Implement a stormwater utility.
 - Maintain BMPs.
 - Reduce and manage existing impervious cover.
- Identify areas where stormwater retrofits would effectively reduce sediment and nutrients.

Open Space

- Map, inventory, and prioritize existing wooded open space areas.
- Protect existing wooded/vegetated open space areas.
- Require management plans for community and HOA open space areas.
- Require forested riparian buffers of adequate and proper widths sufficient to reduce or eliminate nonpoint source pollution for all new development abutting all waters of the state—including private/state/county land. Encourage establishing and restoring forested riparian buffers on existing development abutting all waters of the state—including private/state/county land.
- Implement stream restoration projects.
- Acquire/conservate additional open space and retain conservation easements.
- Reforest watersheds and headwaters.

Wastewater

- Require OWTS performance standards, and conduct inspections and pump-outs.
- Eliminate cesspools and seepage pits.
- Remove OWTS through connection to centralized WWTP.
- Prohibit new OWTS drainfields within 100 feet of wetlands, tidal waters, perennial streams, perennial ditches, and ponds in-line with perennial watercourses.
- Abate combined sewer overflows.
- Continue sewer repair projects and conduct regular inspections.
- Remediate contaminated substance sites.

Agriculture

- Implement agriculture BMPs including, but not limited to:
 - Nutrient management plans.
 - Cover crops.
 - Pasture stream fencing.

- Grassed filter strips.
- Grassed waterways.
- Forested riparian buffers.
- Pasture and hay planting.

Education

- Educate Christina Basin stakeholders on nonpoint source pollution and their role in reducing it, specifically targeting behavior change.
- Encourage nutrient management plans for turf fields at education facilities.
- Encourage golf course managers to decrease nutrient application, stormwater runoff, and erosion.
- Educate pet owners on cleaning up pet waste.
- Educate homeowners on residential stormwater BMPs and BMP maintenance.
- Integrate education into state and local permitting processes.
- Encourage corporate environmental stewardship programs.
- Coordinate nonprofit organizations throughout the basin.
- Support and encourage water conservation and water quality measures to reduce nutrients leaving a site.
- Work with organizations to provide education programs on lawn and garden BMPs.
- Advise DNREC to research nutrient reductions related to bacteria counts and BMPs.

The PCS emphasizes the importance of water quality monitoring pre- and post-BMP implementation. The Christina Basin is a highly monitored watershed with water quality records dating as far back as 30 years. Currently the waters of the Christina Basin contain 24 DNREC General Assessment Monitoring Network (GAMN) stations where sampling is conducted for numerous water quality parameters including nitrogen, phosphorus, and bacteria, once per month. Eight of these 24 monitoring stations are also USGS gage stations where real-time flow monitoring occurs. In addition to the importance of DNREC and USGS monitoring stations, the citizen monitoring program, a volunteer program whereby citizens monitor specific stream segments, is encouraged throughout the Christina Basin and is an important supplement to the DNREC and USGS monitoring that occurs in the Christina Basin upon the implementation of the Christina Basin PCS.

Currently the streams in the Christina Basin are potable and fishable, which means they have significant economic value to the residents of the state and the basin. The streams do not meet the USEPA's swimming criteria. The objective of the Christina Basin PCS is to improve the water quality to meet the federal Clean Water Act goals of fishable and swimming by implementing the 40 recommendations outlined in the strategy. Implementing the recommendations laid out in the Christina Basin PCS is a costly endeavor and is estimated at \$31.28 million dollars per year but the Christina Basin provides numerous benefits through its water supply, ecology, and recreation. The PCS quantifies the economic value of the Christina Basin through a present value analysis. This analysis calculates that per year the total present value of the Christina Basin is \$51.4 million per year.

The final stage prior to implementation of the PCS is for the Christina Basin Tributary Action Team to propose the Christina Basin PCS to DNREC. This document will then be reviewed by DNREC and once accepted by DNREC the regulatory recommendations will be promulgated into law. Throughout the process the Tributary Action Team has been updating Pennsylvania on its activities and recommendations. Once the document has been accepted by DNREC, the PCS

for the Delaware portion of the basin will be implemented through the work of numerous organizations and individuals in the Delaware portion of the basin and will be joined with the ongoing pollution reduction efforts in the Pennsylvania portion of the Christina Basin.