

Water Quality in the Octoraro Watershed

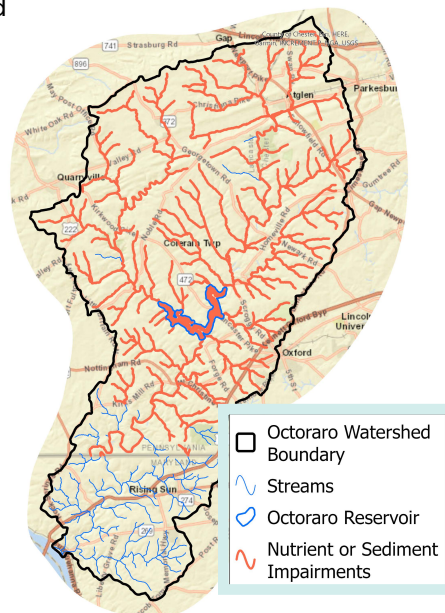
This fact sheet is for Technical Assistance (TA) providers who work with farmers on land and water conservation in the Octoraro Watershed. It is intended to equip TA providers with knowledge of local water quality issues so they can help plan best management practices (BMPs) that effectively improve and protect water quality in the Octoraro Watershed.

Impaired Waters

The Octoraro Watershed covers 208 square miles in Pennsylvania (Chester and Lancaster County) and Maryland (Cecil County). Impaired waters are prevalent in the Pennsylvania portion of the watershed. Approximately 90% of streams assessed by the Pennsylvania Department of Environmental Protection (PADEP) and the entire Octoraro Reservoir are impaired. Nutrients and sediment are the specific pollutants driving the impairments:

- **Nutrients** are nitrogen and phosphorus compounds dissolved in water or attached to sediment.
- **Sediment** includes soil particles that are suspended in the water column or settle out and accumulate on stream and lake beds.

Maryland Department of the Environment (MDE) assesses water quality in the Maryland portion of the watershed. MDE has not reported any nutrient or sediment impairments, however, this may be due to differences in assessment procedures compared to PADEP and limited data available for assessments, rather than improved water quality in the Maryland portion of the watershed.



Clean Water Act Basics

The federal **Clean Water Act** aims to prevent and reduce pollution in the nation's waters in order to restore and maintain their chemical, physical, and biological integrity. One component of the federal Clean Water Act is a directive to states to identify impaired waters.

Impaired waters do not meet surface water quality standards because of excess pollution.

Surface water quality standards are established by state regulations – they define water quality conditions in streams, lakes, and other waterbodies that are considered safe for people and wildlife.



Downstream Connections

Water and pollutants from the Octoraro Watershed ultimately drain to the Chesapeake Bay, which is also impaired by excess nutrients and sediment.

Since actions to address Octoraro Watershed impairments will benefit the Chesapeake Bay, local projects may be able to leverage resources available from larger initiatives to restore the Chesapeake Bay.



Issues Caused By Excess Nutrients and Sediment



High levels of nutrients and sediment carry several risks to **human health and well-being** and to **wildlife**:

- Ingesting drinking water with high levels of nitrate can disrupt the ability of red blood cells in the human body to carry oxygen. This can cause a **serious health condition due to lack of oxygen** known as “blue baby syndrome” in babies and at-risk children or adults. Emerging science also indicates long-term exposure to high nitrate in drinking water may be associated with increased risk of **thyroid disease, colorectal cancer, and certain birth defects**.
- Nitrogen and phosphorus are critical substances for plant growth, but too much nitrogen and phosphorus can lead to **problematic growth of algae**. Certain types of algae produce toxins that can make people and animals sick, or cause taste and odor issues in treated drinking water. Dense algae blooms block sunlight for underwater organisms, deplete oxygen levels available to aquatic life, and reduce the recreational value of waterbodies.
- Excess sediment in a waterbody creates conditions that are **unhealthy for fish and other aquatic life**. For example, sediment can reduce the ability of fish and waterfowl to see and catch food, clog fish and invertebrate gills, cause respiratory stress, and smother the eggs of fish and aquatic insects. Excess sediment in waterbodies used for water supplies can also increase costs for drinking water treatment and reduce storage capacity in reservoirs.



Water Quality Goals

PADEP uses detailed procedures to assess monitoring data and decide if a waterbody segment is attaining water quality standards. Nutrient and sediment impairments are identified based on:

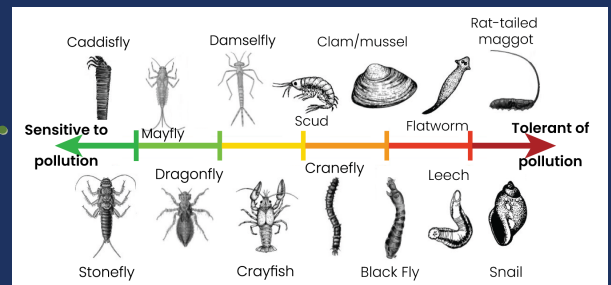
- **Nitrate and Nitrite** - two nitrogen compounds, are evaluated to determine if waterbodies can provide safe drinking water for communities. Impairments occur when concentrations are at or above 10 milligrams of nitrogen as nitrate/nitrite per liter (mg N/L).
- **Dissolved Oxygen** levels are analyzed to determine if nutrient over-enrichment is depleting the amount of oxygen available for aquatic life.
- **Physical Habitat** characteristics are scored through visual field inspections of stream reaches to determine if excess sediment build-up is degrading aquatic habitat. Example characteristics include embeddedness and the degree of infilling of deep pools with sediment.
- **Macroinvertebrate** community health is scored with results of field biological surveys to determine if sediment or nutrients have impacted aquatic life. Multiple macroinvertebrate metrics are analyzed to describe the richness and diversity of species and the relative presence of pollution-sensitive versus pollution-tolerant species. Results are compared to scores expected under local reference conditions with limited human impact.

Credit: Penn State Extension



Embeddedness evaluates the extent to which rocks (gravel, cobble, and boulders) and snags are covered or sunken into the silt, sand, or mud of the stream bottom.

Credit: Utah State University Extension

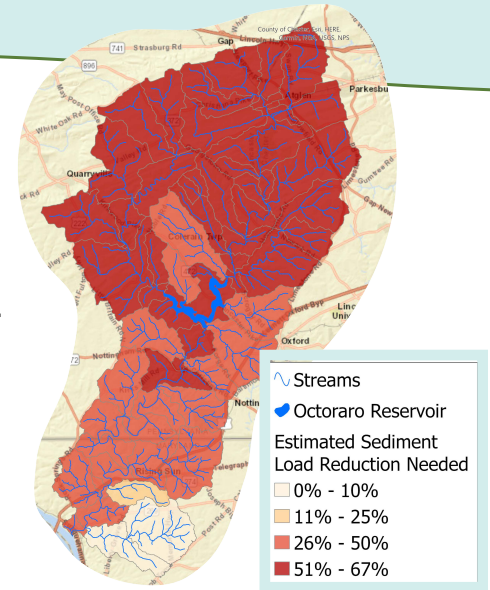


Macroinvertebrates are a critical part of the aquatic food web. Different species vary in their level of pollution tolerance. An imbalance toward pollution-tolerant species indicates water quality issues and unhealthy conditions for fish and other aquatic life.

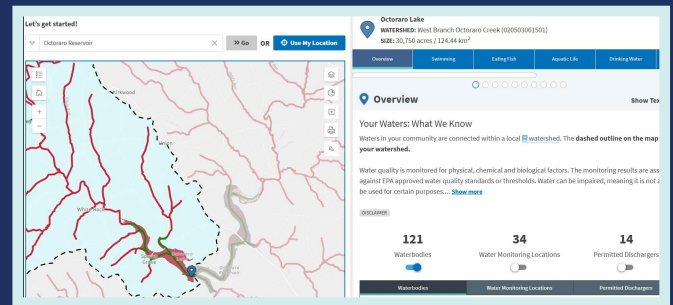
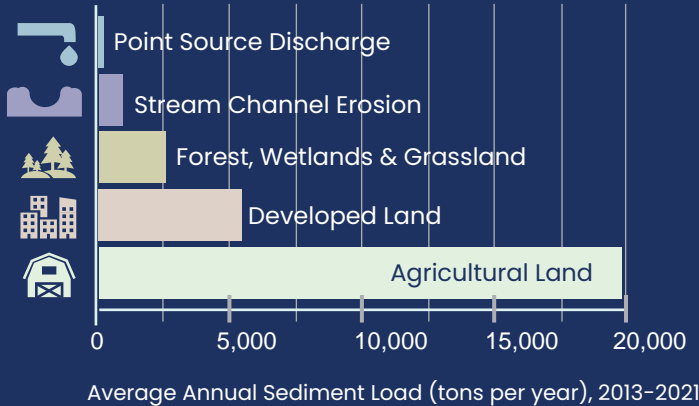
Current Conditions

Water quality monitoring data and models can be used to estimate existing levels of pollution in a watershed and reductions needed to achieve water quality standards. These are commonly expressed as pollutant loads – the mass of the pollutant that flows into, through, or out of a waterbody segment. A 2022 modeling study of the Octoraro Watershed included a preliminary analysis of nitrogen, phosphorus, and sediment load reductions to attain water quality standards. **Reductions of up to 70% from existing loads were found to be needed in some parts of the watershed for all three pollutants to achieve water quality standards.** The study also analyzed the relative contribution of nitrogen, phosphorus, and sediment sources to total loading in the watershed and found that **agriculture is the predominant source of nutrient and sediment pollution.**

Results of the modeling study indicate that **significant effort is needed to reduce nutrient and sediment loading from agricultural lands** to address water quality issues in the Octoraro Watershed. TA providers are critical for such efforts since they help farmers understand and implement Best Management Practices (BMPs) by connecting them with the **right resources, practical solutions, and expert guidance** to protect both their farm and water quality.



Estimated percentage of sediment load reduction needed



Screenshot of How's My Waterway. EPA.

Water Quality Tools and Data

Several tools are available for learning more about water quality in the Octoraro Watershed:

- The Susquehanna River Basin Commission (SRBC) maintains the [State of the Octoraro Creek Watershed](#) webpage, a **reader-friendly Story Map** summarizing watershed conditions and water quality data.
- [How's My Waterway](#) is a **mapping and data exploration tool** published by the U.S. Environmental Protection Agency. It displays information from states on impaired waters and related water quality monitoring data. The tool can be used to explore impairment information and available monitoring data for individual water body segments in the Octoraro Watershed.
- PADEP and MDE also publish **mapping tools** that display information on impaired waters. These can be accessed from the [PADEP Integrated Water Quality Report](#) webpage and the [MDE Water Quality Maps](#) webpage.
- A desktop application called the Scenario Application Manager (SAM) Tool was developed for the Octoraro Watershed in 2022 to support subwatershed scale BMP planning. More information is available on the [EPA Region 3 website](#).

Organizations conducting water quality monitoring in the Octoraro Watershed include PADEP, MDE, SRBC, and the citizen-based Octoraro Watershed Association. They conduct ongoing sampling of water chemistry and conduct surveys of physical habitat and macroinvertebrates in streams. Monitoring occurs in the Octoraro Reservoir and at dozens of points along the stream network. The U.S. Geological Survey (USGS) maintains a streamflow gage on Octoraro Creek at the watershed outlet and has historical samples of water chemistry.

Transform Knowledge Into Action

This section contains general tips on how TA providers can use the information from this fact sheet to help address water quality issues in the Octoraro Watershed.

1. Build Farmer Awareness of Local Water Quality Issues

TA providers can engage farmers in conversations about local water quality conditions and how degraded water quality impacts their farm, family, and community. Using plain language ensures that farmers recognize the public health and environmental risks of nutrient and sediment pollution and the link between agricultural practices and excess nutrient and sediment pollution.

A pamphlet developed to support farmer engagement is available for farmers to build their awareness of water quality issues in the Octoraro Watershed. Contact the Octoraro Source Water Collaborative Planning Committee to request a copy of the pamphlet.

2. Encourage Adoption of Effective BMPs for Controlling Nutrient and Sediment

Many structural and non-structural BMPs are available to reduce nutrient and sediment pollution from manure, commercial fertilizers, and erosion. Examples include streambank fencing, conservation tillage, riparian buffers, and grass filter strips.

TA providers can apply their expert insight to diagnose site-specific problems at individual farms and identify suitable BMPs. To encourage farmer adoption of BMPs, TA providers can highlight the potential health, well-being, and economic benefits that BMPs offer. For example:

- No-till farming and cover crops increase soil health, which increases crop yield and farm sustainability.
- Managing manure and nutrients for application of the right source, at the right rate, the right time, and the right place increases soil health and economic viability, and reduces drinking water contamination.
- Streambank fencing and stream crossings keep livestock and manure out of the water, keeping the nutrients where they are most needed on the land and out of drinking water supplies. Livestock and people stay healthier when manure is kept out of the streams.
- Planting trees and other vegetation on streambanks reduces erosion, filters nutrients out of water, and can produce income from nuts, berries, and other plants.



Visit the Octoraro Source Water Collaborative Website to learn more:

<https://octoraroswc.org/>

PADEP and MDE conduct water quality monitoring, complete assessments of water quality, develop restoration plans for impaired waters, provide technical assistance and funding to address nonpoint sources of pollution, and issue permits for point sources of pollution. For more information visit the [PADEP Bureau of Clean Water](#) website or [MDE Water Quality Programs](#) website

EPA Region 3 oversees the activities of PADEP and MDE, and helps coordinate efforts across government and non-government organizations to restore and protect water quality. For more information visit the [EPA website](#).