

A Clean Water Odyssey through the Chesapeake Bay



Dr. Amy Shober, a professor and extension specialist in nutrient management at the University of Delaware, was the third speaker of the 2020 Virtual Ag BMP Summit. Dr. Shober discussed the current state of the Chesapeake Bay Watershed and the actions that are being taken to protect the Bay.

The Chesapeake Bay Watershed spans 64,000 miles across six states and DC (i.e., jurisdictions). It provides \$750 million to local economies and serves as a habitat for 3,600 species of plants and animals. However, pollution problems have led to water quality issues like nutrient fueled algal blooms result in dead zone conditions and a decline in habitat quality and quantity.

While land use in the watershed is primarily forest (59%), nutrient and sediment losses from agricultural (pasture/hay - 18% and cropland - 10%) and urban land uses (8%) contribute to water quality issues. Delaware makes up a relatively small proportion of the Chesapeake Bay watershed. Approximately 33% of Delaware's land drains into the Bay, contributing 1% of the total flow and 2% of the total nitrogen and phosphorus loads entering the Bay. Delaware's land use is dominated by agriculture (44%) and, therefore, agriculture is estimated to contribute a majority of the nutrient and sediment loads when compared to other sectors (e.g., wastewater, urban stormwater, forest). Since agriculture has such an impact on water quality in the state, farmers are required by state law to complete nutrient management certification training and follow a nutrient management plan.

Keeping the watershed healthy is achieved using a partnership approach, where regional leaders and experts unite to share resources across jurisdictions (6 states and DC). Chesapeake Program partners include federal and state agencies, local governments, academic institutions, and a variety of non-governmental organizations. The program is structured so that the executive council (governors, agencies, etc.) set the vision, and then the goal implementation teams (and their associated work groups) implement that vision.

A total maximum daily load was established for the Chesapeake Bay in 2010, which required Bay jurisdictions to have all actions to meet water quality goals in place by 2025. Watershed Implementation Plans were developed to outline what actions each jurisdiction will take to achieve the nutrient load reduction goals. In addition, each Bay jurisdiction must meet 2-year milestone goals. Progress toward these goals is assessed using load estimates that are developed using a suite of models (currently on Phase 6). Inputs to the models include land use, climate data, air quality, point source data, etc. The models are calibrated and validated using real-world water quality data.

There are over 45 best management practices (BMPs) included in the Bay models, with 275 variations. Examples of approved agriculture sector BMPs include cover cropping, grazing, manure transport, runoff control, and animal mortality management. Each of these BMPs has a load reduction tied to it, which was determined by Bay Program experts based on analysis of the scientific literature and other data sources. Jurisdictions can use an online version of the modelling suite to test different BMP options and observe how they would affect the nutrient load estimates. These scenarios help determine which actions jurisdictions will include in their Watershed Implementation Plans. When prioritizing BMPs, each jurisdiction must balance the potential load reduction of a practice with the willingness of landowners to adopt that BMP. Delaware's experience showed that land managers are more willing to adopt practices that do not take land out of production.

Due to concerns about how jurisdictions were reporting BMP data, there are now specific BMP verification requirements before adoption data can be used in the modeling suite. These verification methods include farm inventory, farm records, transect surveys, agency-sponsored surveys, and remote sensing.

In Delaware, nutrient management is a regulatory BMP that has been successful, with approximately 85% compliance with core practices. Delaware has prioritized "supplemental" nutrient management practices (e.g., targeted placement, rate, and timing) in their current Watershed Implementation Plan. Verified supplemental nutrient management practices can reduce estimated loads of nitrogen by up to 15% and phosphorus loads by up to 20%, depending on the crop being grown. Cover cropping is a voluntary practice that Delaware has also prioritized in the Watershed Implementation Plan. Depending on the cover crop and planting/termination timing and method, cover crops are estimated to reduce nitrogen loads by 11-45%, phosphorus loads by 0-15%, and sediment loads by 0-20%. Agriculture BMPs are often prioritized because they are more efficient in reducing nutrient and sediment loads than BMPs implemented in urban or forest areas.

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jurisdictions report BMP data to the EPA through the National Environmental Information Exchange Network (NEIEN). If a jurisdiction has not met their load reduction targets, the EPA will take action to ensure the goal is met. Jurisdictions have not met their water quality goals yet, but they are taking action to meet the 2025 goal. For example, there is a downward trend in both phosphorus and nitrogen loads from Delaware, but the state is much closer to reaching the phosphorus load reduction goal than nitrogen. The health of Chesapeake Bay is also being assessed by watching for qualitative indicators such as more female crabs, restoration of oyster reefs, and increased submerged aquatic vegetation.

Water quality improvement is likely to lag behind implementation because nutrient concentrations in the water often reflect past practices. Future challenges for the Chesapeake Bay Program include climate change, land use conversion due to population growth and urbanization, and changing BMPs to reflect needs and new technologies. For more information on the Chesapeake Bay and the progress on this project, please visit: www.chesapeakebay.net and www.chesapeakeprogress.com.

Watch the [recording](#) of her webinar.

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