



Department of
Environmental
Conservation

Upper Susquehanna Watershed Progress Dashboard Guide

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Chesapeake Bay Watershed

The Chesapeake Bay is the largest estuary in the United States. Water quality has been impaired in the Bay for decades due to excessive nutrients (nitrogen and phosphorus) and sediment. New York's portion of the Chesapeake Bay watershed is made up of the Susquehanna River and Chemung River watersheds. Together, these two watersheds form the northern headwaters of the Chesapeake Bay and cover much of New York's Southern Tier. In 2010, the United States Environmental Protection Agency (EPA) established the total maximum daily load (TMDL) or "pollution diet" for the Chesapeake Bay. A TMDL defines the maximum amount of a pollutant allowed to enter a waterbody and still meet water quality standards. Because nutrients and sediment in the Bay come from all over the watershed, all seven jurisdictions (New York, Pennsylvania, Maryland, Delaware, Washington, D.C., West Virginia and Virginia) are required to meet the goals outlined in the TMDL. Each state is required to report best management practices (BMP) implemented annually to the EPA Chesapeake Bay Program.

Accessing the Dashboard

The purpose of this dashboard is to provide stakeholders with a simple and direct platform to access data and information relevant to the Upper Susquehanna Basin and Chesapeake Bay TMDL in New York. Users can view current BMP implementation, water quality trends, locations of recent state biological monitoring results, and estimated nutrient and sediment loads delivered to the Chesapeake Bay. Currently, the dashboard can be accessed using the following [link](#). The datasets accessible through the dashboard will be updated on an annual basis.

Dashboard Data

The dashboard contains four major datasets: BMP Implementation progress, aquatic biological monitoring, non-tidal network water quality concentration trends and delivered loads for nitrogen, phosphorus, and sediment delivered to the Chesapeake Bay.

HUC 10 BMP Implementation

The Upper Susquehanna Coalition (USC) reports annual agricultural, wetland, and stream restoration BMP implementation at the county scale to EPA's Chesapeake Bay Program Office. For the dashboard, the USC sends DEC an annual summary of agricultural BMPs implemented throughout the watershed at the HUC 10 scale instead of the county scale. The dashboard includes implementation data for 22 BMP categories (Table 1).

Table 1. Best Management Practices included in the Dashboard

BMP Name	BMP Duration	Unit Reported
Cover Crops	Annual	Acres
Conservation Tillage	Annual	Acres
Manure Incorporation	Annual	Acres
Nutrient Management Plans Core for Nitrogen	Annual	Acres
Dairy Precision Feeding	Annual	Animal Units
Agriculture Land Retirement	Cumulative	Acres
Cropland Forest Buffer	Cumulative	Acres
Cropland Grass Buffer	Cumulative	Acres
Exclusion Fence Forest Buffer	Cumulative	Acres
Exclusion Fence Grass Buffer	Cumulative	Acres
Horse Pasture Management	Cumulative	Acres
Pasture Alternative Watering	Cumulative	Acres
Prescribed Grazing	Cumulative	Acres
Soil and Water Conservation Plans	Cumulative	Acres
Wetland Creation	Cumulative	Acres
Wetland Enhancement	Cumulative	Acres
Wetland Rehabilitation	Cumulative	Acres
Wetland Restoration	Cumulative	Acres
Stream Restoration	Cumulative	Feet
Barnyard Runoff Control	Cumulative	Animal Units
Animal Waste Management	Cumulative	Animal Units

Due to the scale difference, the BMP implementation reported through the dashboard may differ slightly than what is reported through the (Chesapeake Bay Assessment Scenario Tool) CAST¹. The CAST model removes BMPs that may have expired credit durations or through a back-out procedure in the model to remove land change BMPs that are estimated to be reported by land use imagery.

CAST Nutrient and Sediment Loads

CAST is webtool that allows users to access the Chesapeake Bay Phase 6 model by running scenarios of BMP implementation including scenarios of actual BMP implementation that has

¹ Chesapeake Bay Program. (2020). Estimated Nutrient Loads to the Chesapeake Bay Chesapeake Assessment and Scenario Tool (CAST) Version 2019. Chesapeake Bay Program Office. <https://cast.chesapeakebay.net/>.

occurred in the watershed. DEC and the Upper Susquehanna Coalition report annual BMP implementation that occurs in New York's portion of the watershed to EPA. DEC also reports the monthly effluent data for wastewater treatment facilities in the watershed. The BMP and wastewater data is run through the model to determine the nitrogen, phosphorus, and sediment reduction to the Chesapeake Bay. Nutrient and sediment loads to the Bay are referred to in CAST as edge of tide loads. CAST can export a report estimating the edge of tide loads for each HUC 10 watershed. This data is incorporated into the dashboard as a pie chart and popup table.

Nontidal Network Monitoring Stations and Nutrient Concentrations

Water quality is regularly monitored via the nontidal network (NTN), a program by the U.S. Geological Survey (USGS) consists of 123 monitoring stations that report monthly values of nitrogen, phosphorus, and sediment concentrations and loads throughout the entire Chesapeake Bay watershed. There are six NTN gaging stations within the Chesapeake Bay watershed in New York: Campbell, Chemung, Conklin, Rockdale, Waverly, and Towanda.

Each of the gaging stations covered a portion of the Chesapeake Bay watershed in New York and are designated as short-term monitoring stations, as they were established after 2005, with the exception of the Towanda gaging station established in 1985. Measurements from the Towanda gaging station are considered to best represent the total nutrient inputs from New York into the Chesapeake Bay, as it captures the entire Upper Susquehanna Basin though a portion of the southern catchment include small areas of Pennsylvania.


Water quality trends for loads and concentration for nontidal monitoring stations are available from [USGS Chesapeake Bay Nontidal Monitoring](#) webpage. The flow normalized mean annual concentration (mg/l) for nitrogen, phosphorus, and sediment is displayed in the database for the six NTN stations. The flow-normalized concentrations and loads were estimated using concentration and load estimates from non-Kalman WRTDs model². Flow-normalized concentration values were chosen to be presented instead of flow normalized annual loads due to the different sizes of the NTN station watersheds and to help understand local water quality conditions.

Dashboard Elements

The dashboard consists of eight elements. Figure 1 provides a key to the eight elements of the dashboard:

² Hirsch, R.M., Moyer, D.L., and Archfield, S.A., 2010, Weighted regressions on time, discharge, and season (WRTDS), with an application to Chesapeake Bay river inputs: Journal of the American Water Resources Association, v. 46, no. 5, p. 857-880.

- 1) Legend
- 2) Nontidal Network Selector
- 3) Side bar arrow
- 4) Watershed Map
- 5) HUC 10 BMP Progress Serial Charts
- 6) Nutrient Load and Concentration Serial Charts
- 7) HUC 10 selector
- 8) Biomonitoring Data Selector

The elements can be toggled to full screen by clicking on the expand button  , in the top left corner of each element on and off. The border of all the elements can be made larger or smaller by clicking on the corners and dragging.

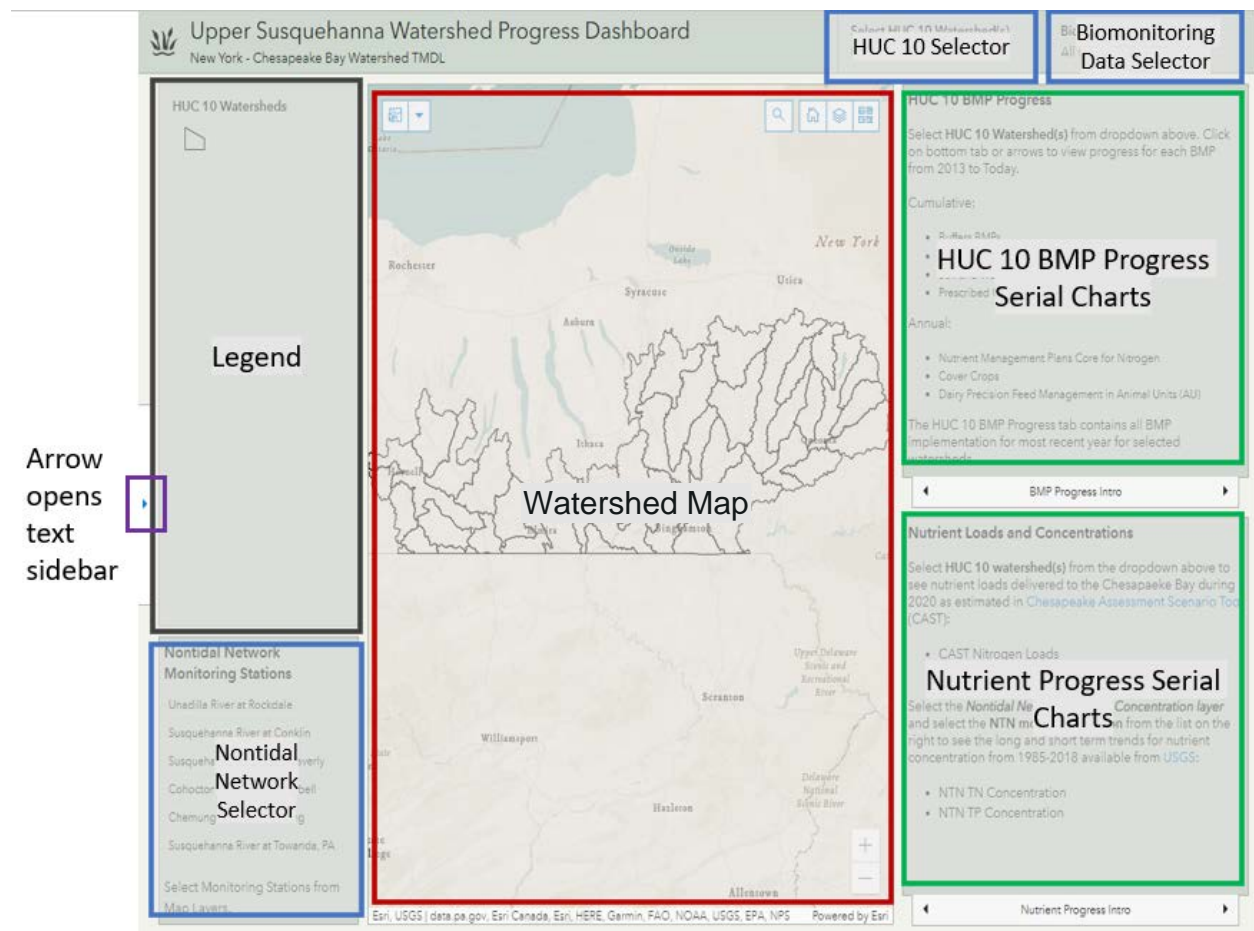



Figure 1. Dashboard Elements.

The icon  will take the user back to the DEC Chesapeake Bay homepage. Clicking on the HUC 10 selector will show a dropdown list of all the HUC 10 watersheds within the Upper Susquehanna Basin (Figure 2). The HUC 10 list can be filtered by three methods: Using the text filter, zooming into the map, or selecting HUC 10 watersheds using the “selection tool” within the map.

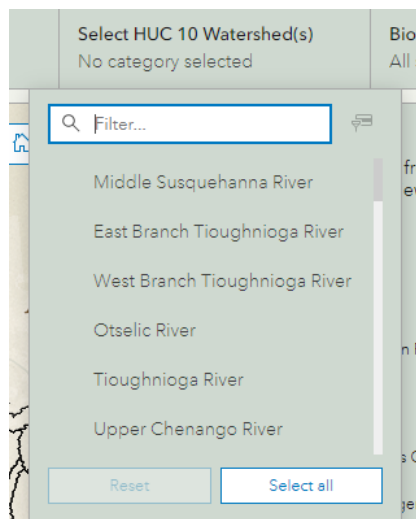


Figure 2. Filter by HUC 10 Watershed.

Biological monitoring can provide information to assess the health of a stream ecosystem by looking at the diversity and presence/absence of macroinvertebrate species. DEC’s Stream Biomonitoring Unit collects macroinvertebrate data throughout the state for each major watershed on a five-year schedule. Each biomonitoring sampling event is measured using a Biological Assessment Profile (BAP). A BAP score of 5 or better is indicative of non or slightly impacted conditions and a value below 5 indicates moderate or severely impacted conditions.³ The biomonitoring data selector will give the option to view all biomonitoring data sites from 1990-2020 or just the sites that have been visited since the beginning of TMDL Implementation in 2010 (Figure 3).

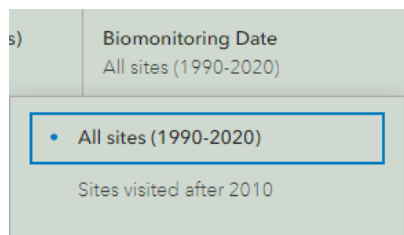


Figure 3. Biomonitoring Date Selector.






³ DEC Biomonitoring Program: <https://www.dec.ny.gov/chemical/23847.html>

In the center of the dashboard, the watershed map is displayed along with five buttons (Figure 4, Table 2).



Figure 4. Five map buttons.

Table 2. Map Buttons and Function

Icon	Button Type	Function
	Selector	Used to select HUC 10 watersheds from the map. Clicking on the arrow portion of the button will give a drop down of selection options.
	Search	Allows the user to find a locality or address on the map and will zoom into that location on the map.
	Home	Zooms the map back out to the default extent showing the whole watershed.
	Layer	Opens the list of available layers to view on the map.
	Base Map Layer	Allows the user to select a different base map such as aerial imagery or topography.

Using the selector button, the select by “Lasso” (Figure 5) is recommended as the easiest selection tool. Users can click to create any shape and double click the map to select everything within the shape created.

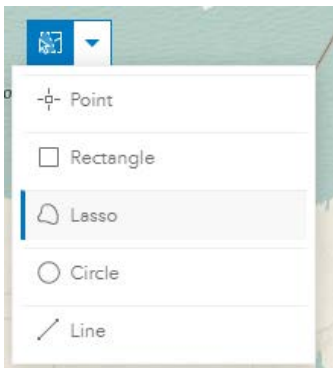




Figure 4. Select by Lasso.

The layers will be marked as currently visible, , or non-visible, , on the map. Clicking on the layer icon will change the current visibility status. The default map will open with only the HUC 10 watersheds visible. This will be especially important in navigating to certain data sets.

Below is the list of layers able to be viewed on the map:

- *HUC 10 Watersheds* (polygon)
- HUC 10 Agriculture Acres:
 - *Percent Agriculture Acres in RMZ* (polygon)
 - *Percent Agriculture Acres in HUC 10* (polygon)
- Nontidal Network Monitoring (NTN) Stations:
 - *NTN Stations* (point)
 - *NTN Station Watersheds* (polygon)
- *Aquatic Biological Monitoring* (point)
- Reference Layers:
 - *HUC 12 Subwatersheds* (polygon)
 - *Lakes: Waterbody Inventory/Priority Waterbody List* (polygon)
 - *Rivers: Waterbody Inventory/Priority Waterbody List* (line)
 - Chesapeake Bay Program Office - *Most Effective Basins and Underrepresented Communities* (polygon)⁴
 - National Fish and Wildlife Foundation *Chesapeake Bay Business Plan 2018 Priority Subwatersheds for Water Quality Improvement* (polygon)⁵
 - *NYS Civil Boundaries – Cities* (polygon)
 - *NYS Civil Boundaries – Towns* (polygon)
 - *NYS Civil Boundaries – Villages* (polygon)
 - *NYS Civil Boundaries – Counties* (polygon)
 - Eastern Brook Trout Joint Venture *Brook Trout Catchment 2015* (polygon)⁶

When clicking on the map, the first layer in the list will pop-up first. For best results, only view *Nontidal Network Monitoring Stations*, *HUC 10 Watersheds*, and *HUC 10 Agriculture Acres* one at a time.

⁴ United States Environmental Protection Agency. (2021). Chesapeake Bay Program Office Most Effective Basins Funding Effectiveness Rationale. <https://www.epa.gov/chesapeake-bay-tmdl/chesapeake-bay-program-office-most-effective-basins-funding>

⁵ National Fish and Wildlife Foundation. (2018). Chesapeake Bay Business Plan: Chesapeake Bay Stewardship Fund. <https://www.nfwf.org/sites/default/files/2019-12/chesapeake-business-plan.pdf>

⁶ Eastern Brook Trout Joint Venture. (2017). New York Wild Brook Trout Patches. <https://easternbrooktrout.org/resources/state-maps-of-wild-brook-trout-patch-distribution/map-of-new-york-wild-brook-trout-wild-brook-trout-patches/view>

View HUC 10 Watershed BMP Implementation Progress

To view BMP Implementation data, the HUC 10 Selector, Map, and HUC 10 BMP Serial Chart elements must be used simultaneously (Figure 6). Serial charts of implementation progress from 2010 to current year are included for each BMP listed in Table 1. As HUC 10 watersheds are selected from the HUC 10 Selector dropdown, the graphs will be updated to include only data from selected watersheds.

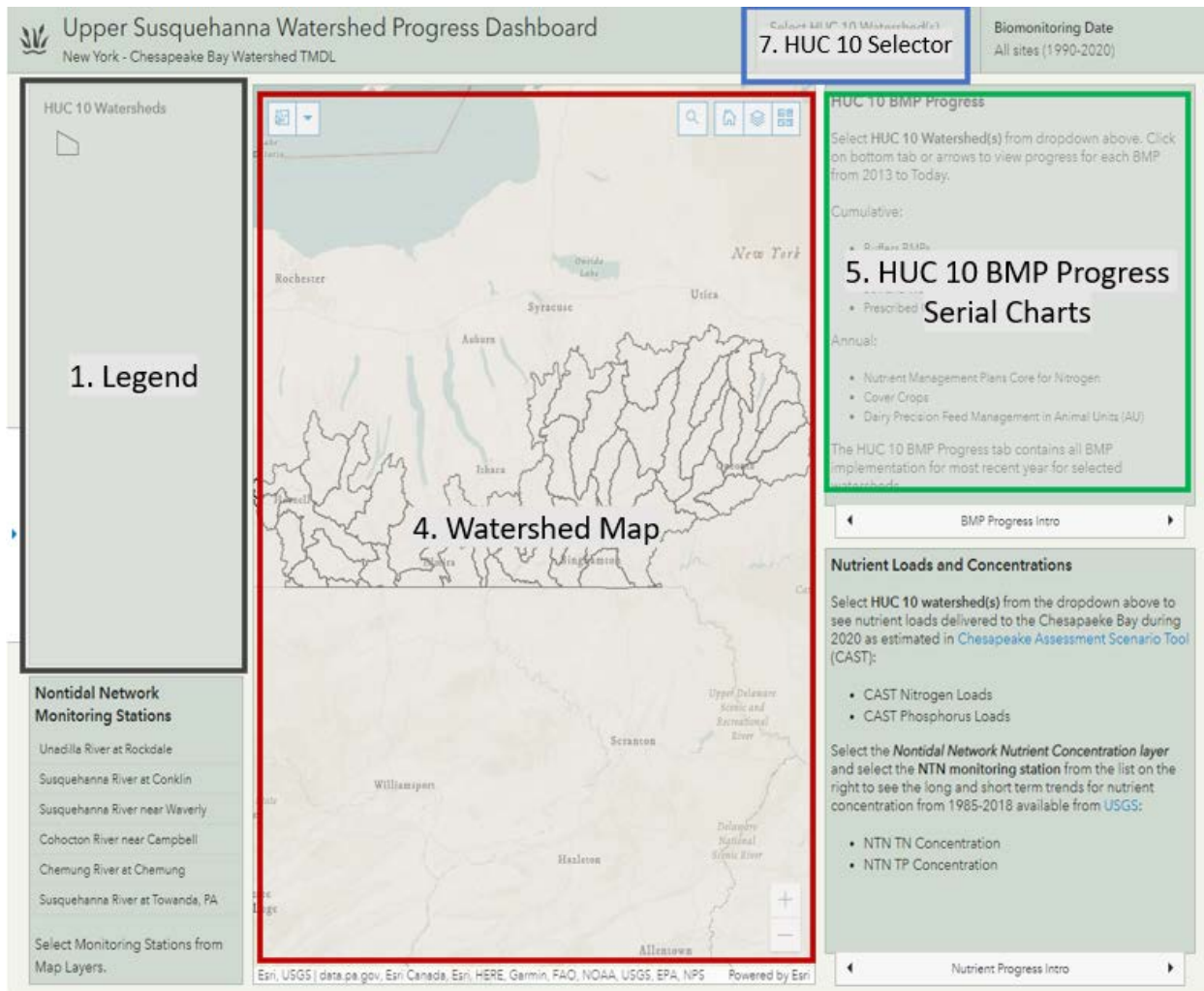


Figure 5. Elements used to view HUC 10 Implementation progress.

Watersheds can be selected by zooming in and using the dropdown, typing into the dropdown filter, or selecting on the map and then selecting on the dropdown (Figure 7).

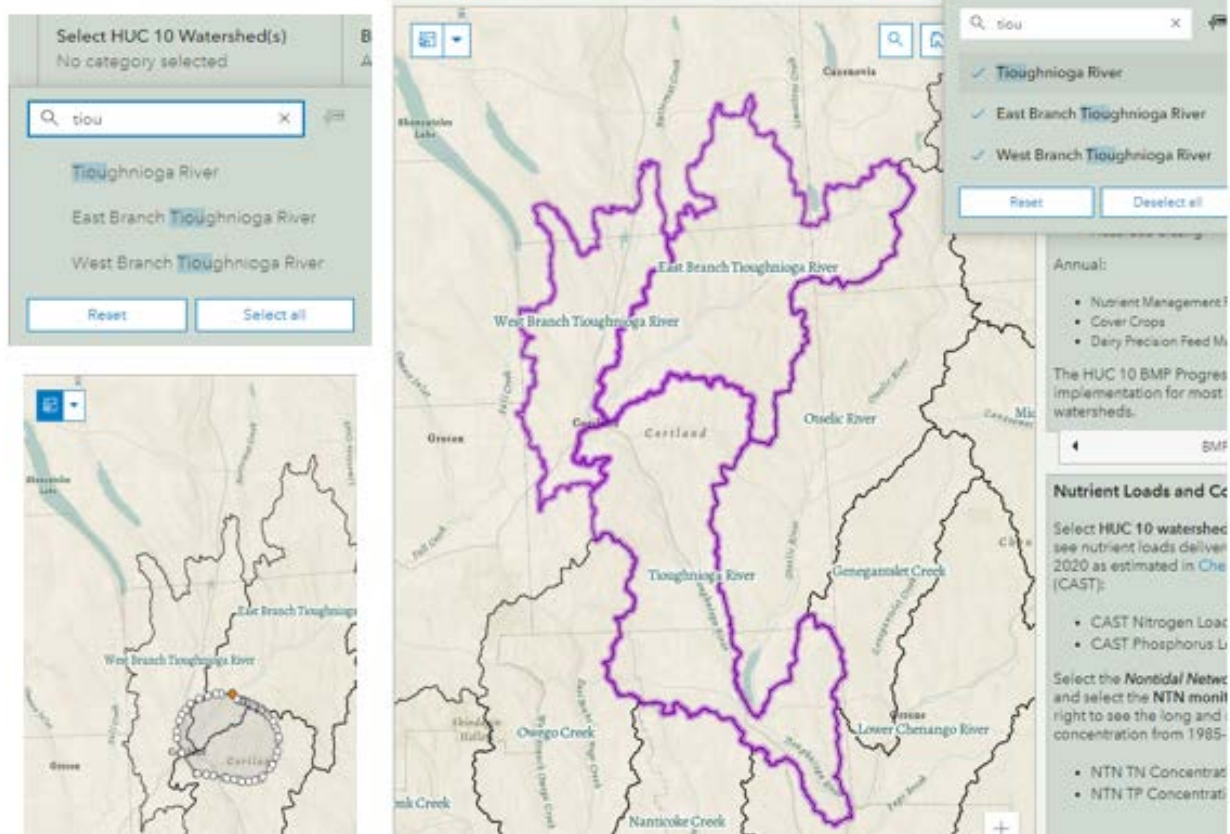


Figure 6. Three methods of selecting HUC 10 watersheds. Top left: select by typing into the dropdown filter. Bottom Left: Select by Lasso and then select using dropdown. Right: Select by zooming into the watersheds and using dropdown.

After selecting the watersheds, the BMP progress tabs will update to show the implementation progress from 2010, the establishment of the TMDL, to current year (Figure 8) within the area selected.

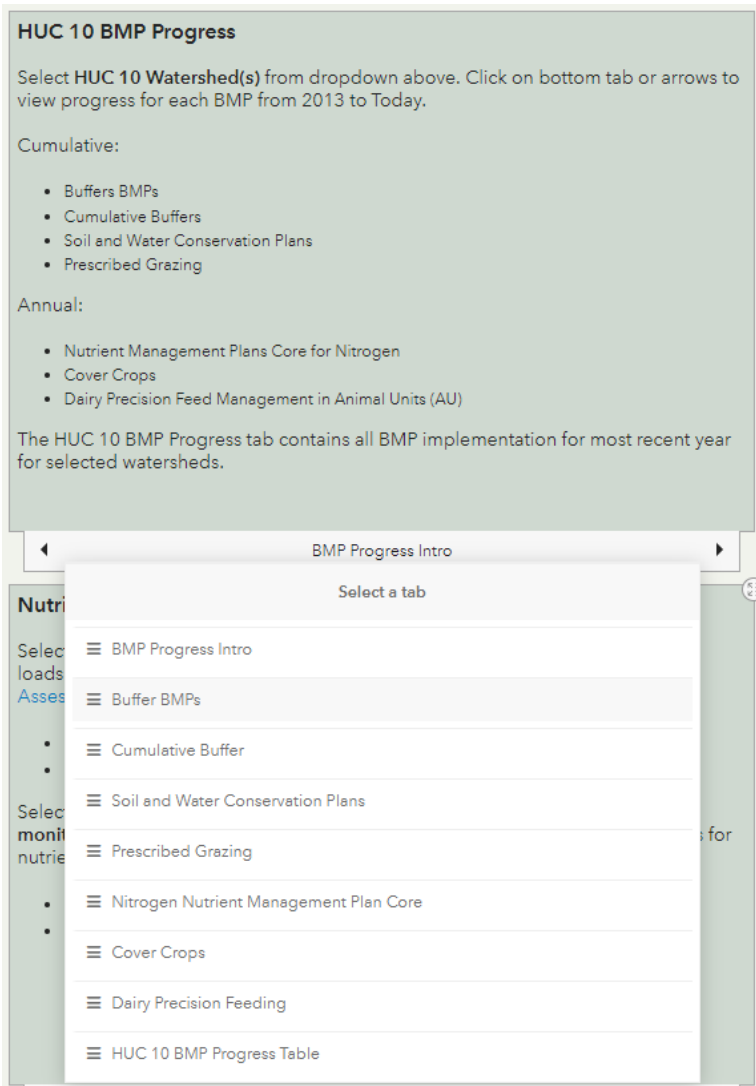


Figure 7. Select a tab for HUC 10 BMP Implementation Progress.

The individual buffer types on the Buffer BMPs and Wetland BMPs tab can be toggled on and off by clicking on the legend (Figure 9). Implementation can be viewed by hovering over the chart. To relate the HUC 10 to the total watershed implementation targets, the axis for all the charts will not change with the selected HUC 10 watershed(s) (Figure 10).

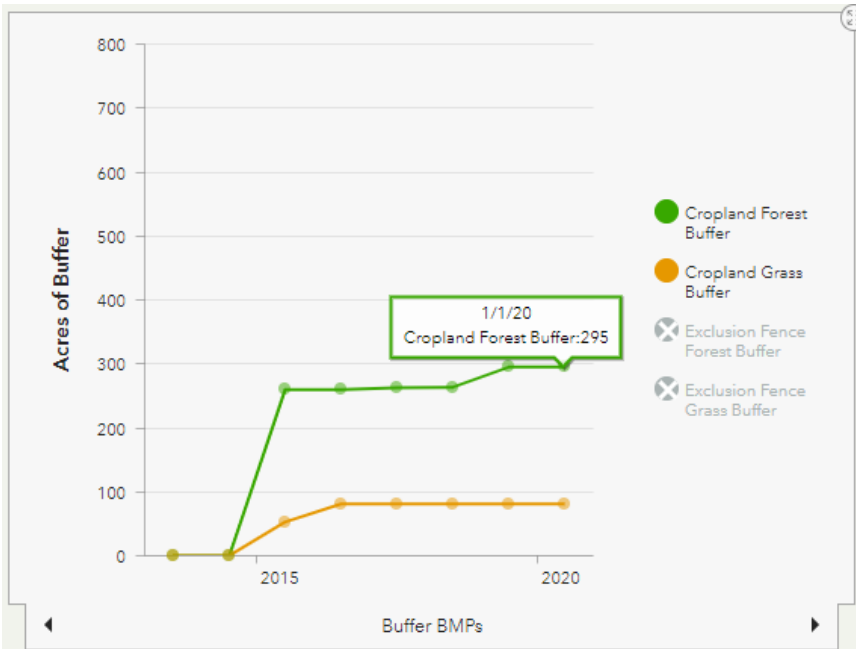


Figure 8. Buffer BMP Serial Chart for selected watersheds. BMPs can be toggled on and off by clicking on name in legend.

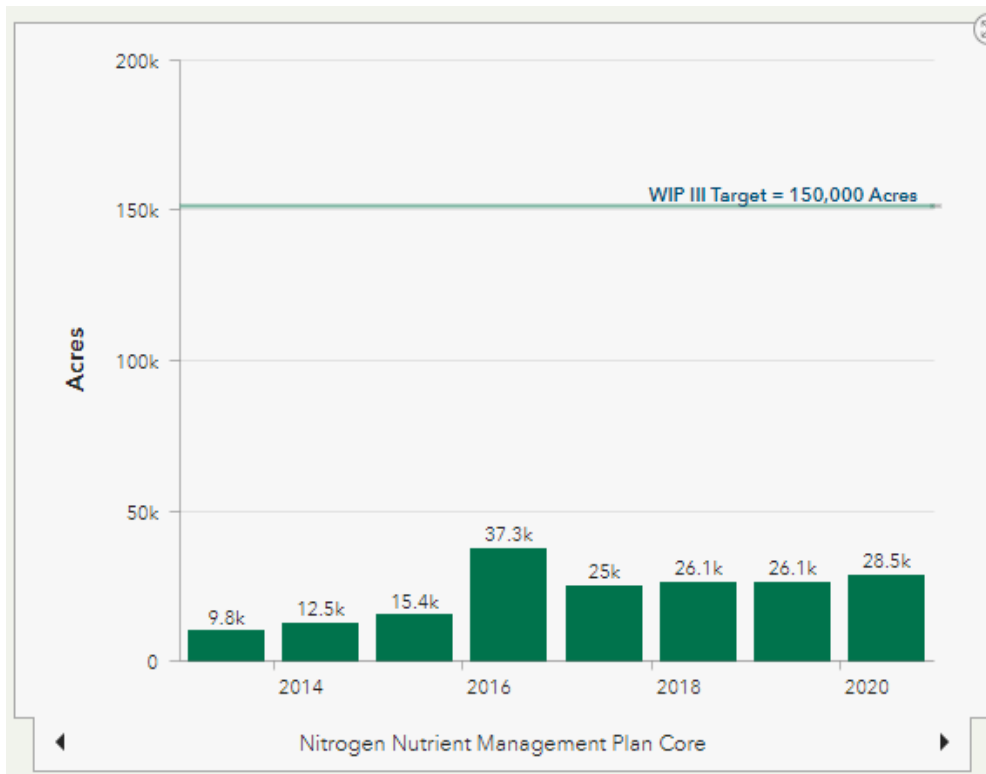


Figure 9. Nitrogen Core Nutrient Management Plan Implementation for selected watersheds with watershed WIP III Target.

The final tab named “HUC 10 BMP Progress Table” displays a table of BMP implementation for the most recent year (Figure 11). If more than one HUC 10 watershed is selected, there will be arrows above the table to toggle through the different HUC 10 watersheds selected.

◀ 1 of 3 ▶

East Branch Tioughnioga River 2020 BMP Implementation

Cropland Forest Buffer	263.14
Cropland Grass Buffer	75.70
Exclusion Fence Forest Buffer	8.47
Exclusion Fence Grass Buffer	0.00
Soil Conservation Plan	39,410.60
Prescribed Grazing	752.40
Cover Crops	829.00
Nitrogen Nutrient Management Core	15,892
Dairy Precision Feeding	133.20

◀ HUC 10 BMP Progress Table ▶

Figure 10. Table displaying current BMP implementation. Use arrows above the table to move through selected watersheds.

View Delivered Nutrient Load for HUC 10 Watersheds

To view trends in nutrient loads delivered to the Chesapeake Bay, the HUC 10 Selector, Map, and Nutrient Progress Serial Chart elements are used (Figure 12). The serial charts show the edge of tide loads for each HUC 10 watershed. This data is incorporated also included in a popup table on the watershed map.

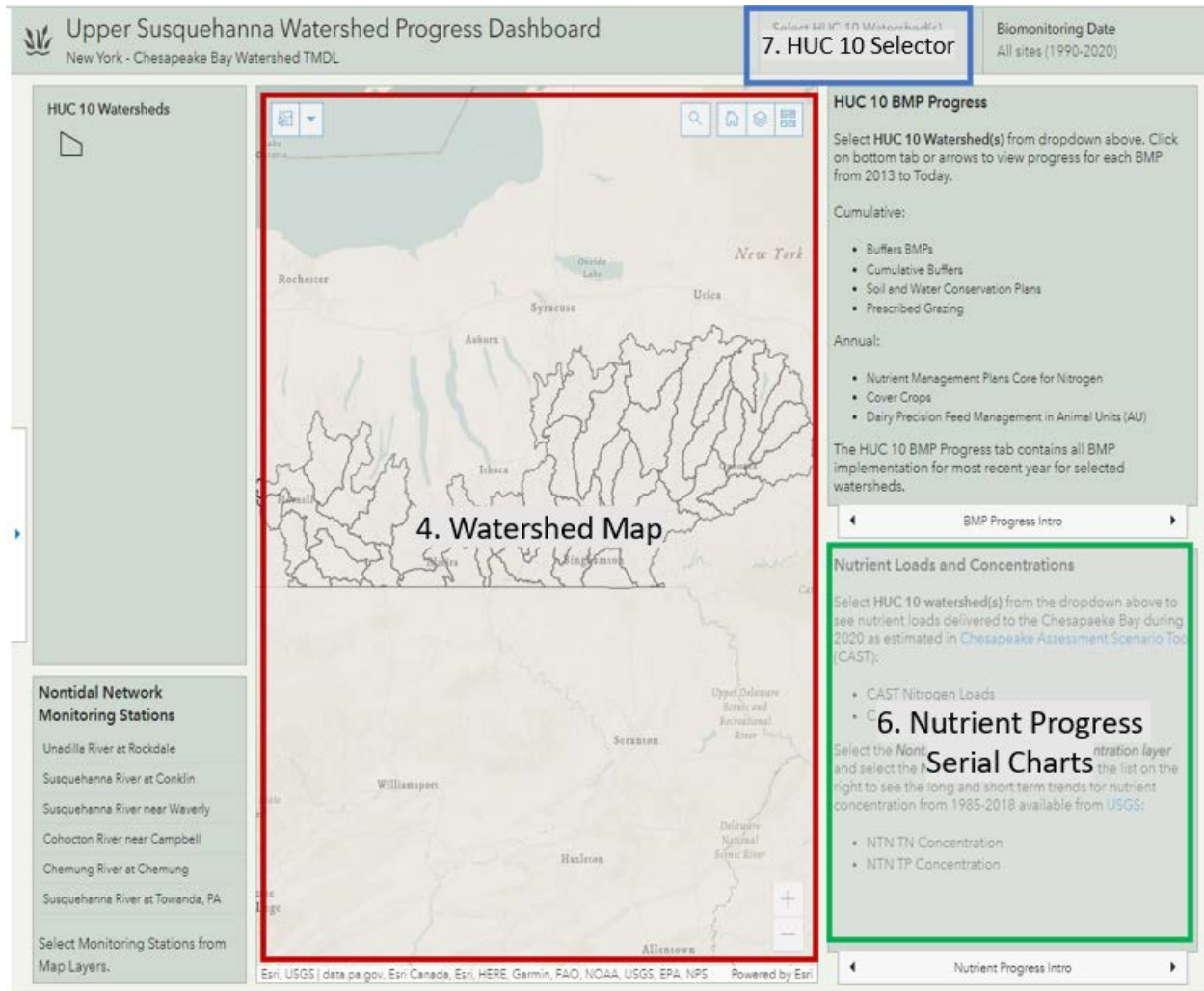



Figure 11. Elements used to view nutrient progress.

- Select watersheds on the map or using the dropdown (See Figure 7).
- The pie charts for CAST Phosphorus Load (lbs) and CAST Nitrogen Load (lbs) will update to the sum of the selected watersheds. The load is the amount of nutrients delivered to the Chesapeake Bay annually by sector: agriculture, wastewater, natural, developed, and septic (Figure 13).
- The elements can be toggled to full screen by clicking on the expand button , in the top left corner on and off (Figure 14). The border of all the elements can be made larger or smaller by clicking on the corners and dragging.

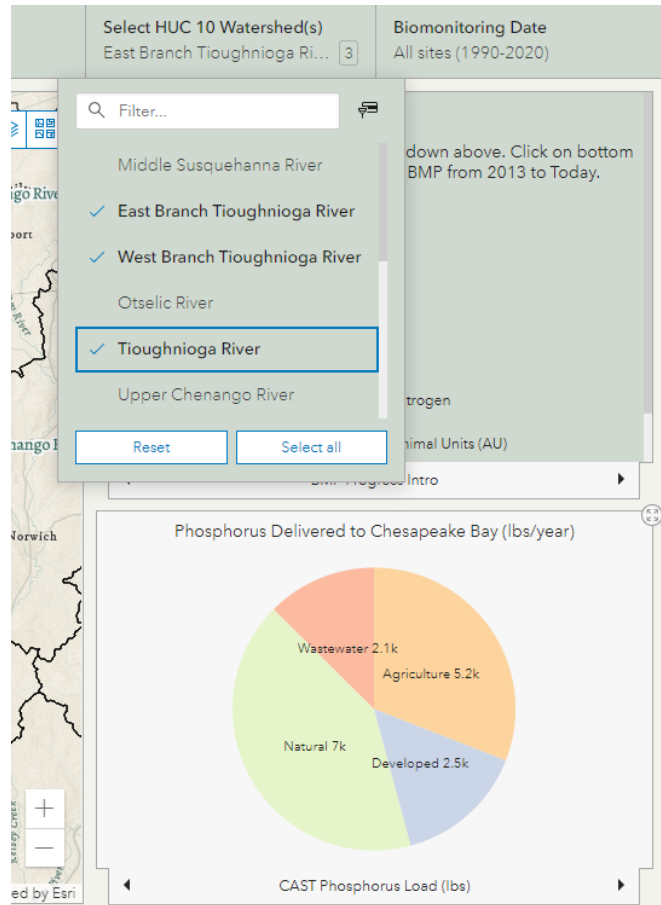


Figure 12. Selecting watersheds and view sum of nutrient load delivered to the Chesapeake Bay by sector.

View Nontidal Network Concentration Data

To view the concentration over time for nutrients at the USGS nontidal network gage stations the Nontidal Network Selector, Map, and Nutrient Progress Serial Chart elements are used (Figure 14).

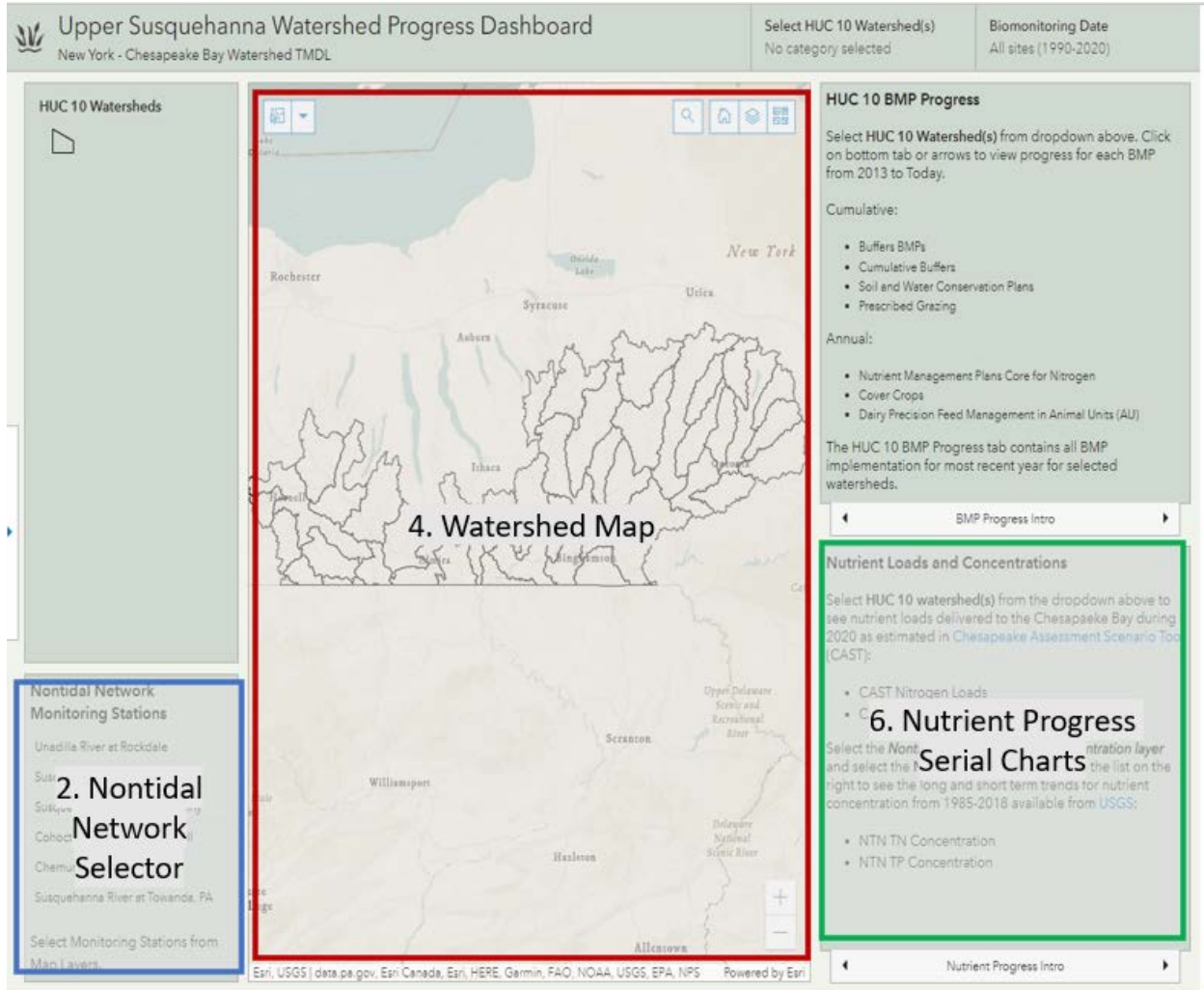



Figure 14. Elements used to view nutrient progress for nontidal network stations.

- On the map layers, , activate only the nontidal network (NTN) monitoring station layers (Figure 15).
- On the nutrient progress serial charts select the tabs for NTN Nitrogen Concentration (mg/l) or NTN Phosphorus Concentration (mg/l). By default, all the watersheds will be shown for the six nontidal network stations.
- Clicking on the nontidal network selector will change the display of the map and the serial charts to show just the stations selected (Figure 16).

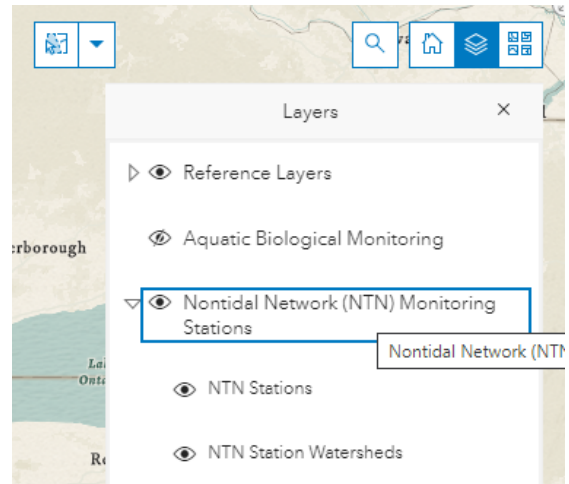


Figure 15. Nontidal Network Monitoring Station Layers.

- On the serial charts, the time slider on top of the graph can be dragged to look at a more recent selection of years.

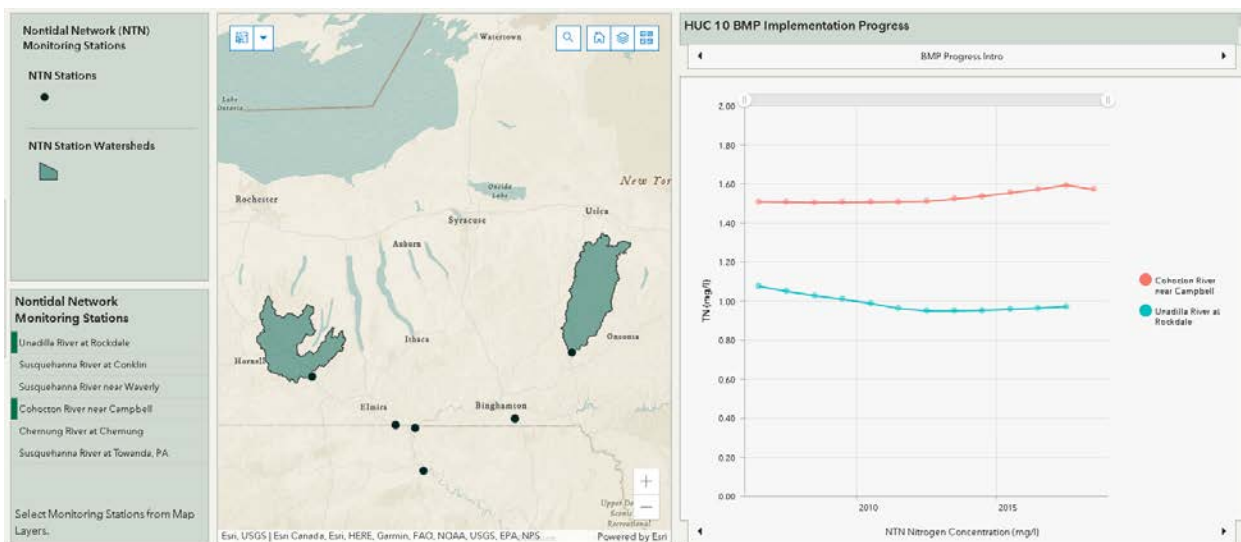


Figure 16. Select the nontidal network stations from the selector to view watersheds and progress on serial chart.


View Aquatic Biological Monitoring Sites

To view the aquatic biological monitoring data, use the biomonitoring data selector and map elements (Figure 17).

The screenshot displays the 'Upper Susquehanna Watershed Progress Dashboard' for the 'New York - Chesapeake Bay Watershed TMDL'. The dashboard is divided into several sections:

- Header:** 'Upper Susquehanna Watershed Progress Dashboard' and 'New York - Chesapeake Bay Watershed TMDL'. On the right, there is a 'Select HUC 10 Watershed(s)' dropdown with 'No category selected' and a highlighted '8. Biomonitoring Data Selector' button.
- HUC 10 Watersheds:** A sidebar on the left with a map icon and a dropdown menu.
- Watershed Map:** A central map showing the watershed network with a red border. It is labeled '4. Watershed Map'. The map includes labels for cities like Rochester, Syracuse, Utica, and Ithaca, and features like Onondaga Lake. A search bar and navigation icons are at the top of the map.
- Nontidal Network Monitoring Stations:** A sidebar on the left listing monitoring stations: 'Unadilla River at Rockdale', 'Susquehanna River at Conklin', 'Susquehanna River near Waverly', 'Cohocton River near Campbell', 'Chemung River at Chemung', and 'Susquehanna River at Towanda, PA'. Below the list is a 'Select Monitoring Stations from Map Layers.' option.
- HUC 10 BMP Progress:** A sidebar on the right with instructions: 'Select HUC 10 Watershed(s) from dropdown above. Click on bottom tab or arrows to view progress for each BMP from 2013 to Today.' It lists 'Cumulative' BMPs (Buffers BMPs, Cumulative Buffers, Soil and Water Conservation Plans, Prescribed Grazing) and 'Annual' BMPs (Nutrient Management Plans Core for Nitrogen, Cover Crops, Dairy Precision Feed Management in Animal Units (AU)). It also states: 'The HUC 10 BMP Progress tab contains all BMP implementation for most recent year for selected watersheds.' Below this is a 'BMP Progress Intro' tab with left and right arrows.
- Nutrient Loads and Concentrations:** A sidebar on the right with instructions: 'Select HUC 10 watershed(s) from the dropdown above to see nutrient loads delivered to the Chesapeake Bay during 2020 as estimated in Chesapeake Assessment Scenario Tool (CAST)'. It lists 'CAST Nitrogen Loads' and 'CAST Phosphorus Loads'. Below this, it says: 'Select the Nontidal Network Nutrient Concentration layer and select the NTN monitoring station from the list on the right to see the long and short term trends for nutrient concentration from 1985-2018 available from USGS:'. It lists 'NTN TN Concentration' and 'NTN TP Concentration'. Below this is a 'Nutrient Progress Intro' tab with left and right arrows.

Figure 17. Elements needed to view aquatic biomonitoring sites.

- Select the aquatic biomonitoring data from the layers, , to display the point data on the map (Figure 18).
- On the top right corner, select the biomonitoring date to show either all sites from (1990-2020) or only the sites visited after 2010 (Figure 19).

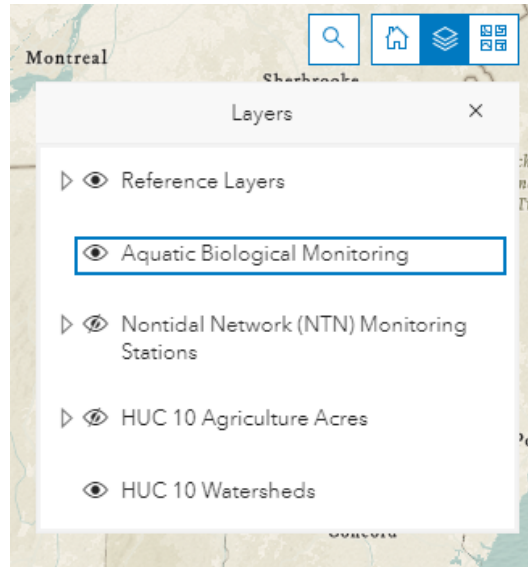


Figure 18. Aquatic biological monitoring layer.

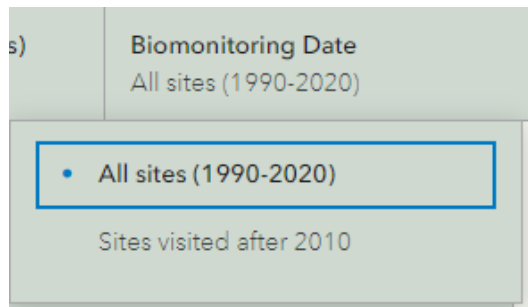


Figure 19. Click on the top right to view data from all sites or only sites visited after 2010.

Opportunities for implementation

The dashboard includes two additional layers for comparing opportunities for implementation at the HUC 10 watershed scale. An analysis was completed to determine the amount of buffer area within 100 feet of the stream that are agricultural land. The riparian management zone (RMZ) helps to identify important areas in each HUC 10 watersheds for BMP implementation. In the layer selection, under HUC 10 Agriculture Acres, view either *Percent Agriculture Acres in RMZ* or *Percent Agriculture Acres in HUC 10* (Figure 20). For both layers, clicking on a watershed will open a pop-up containing information on the acres and percent of the RMZ that is agricultural land (Figure 21).

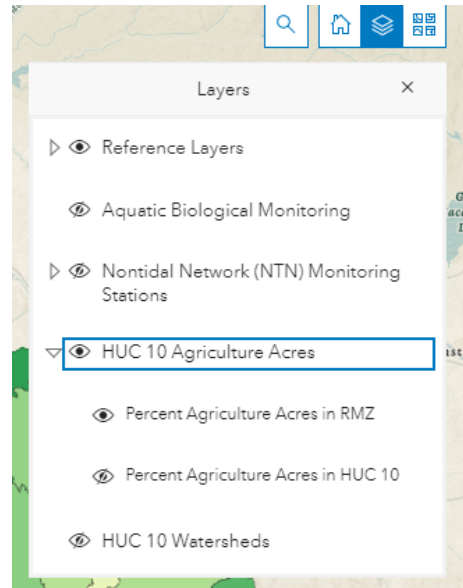


Figure 20. HUC 10 Agriculture Acres Layers.

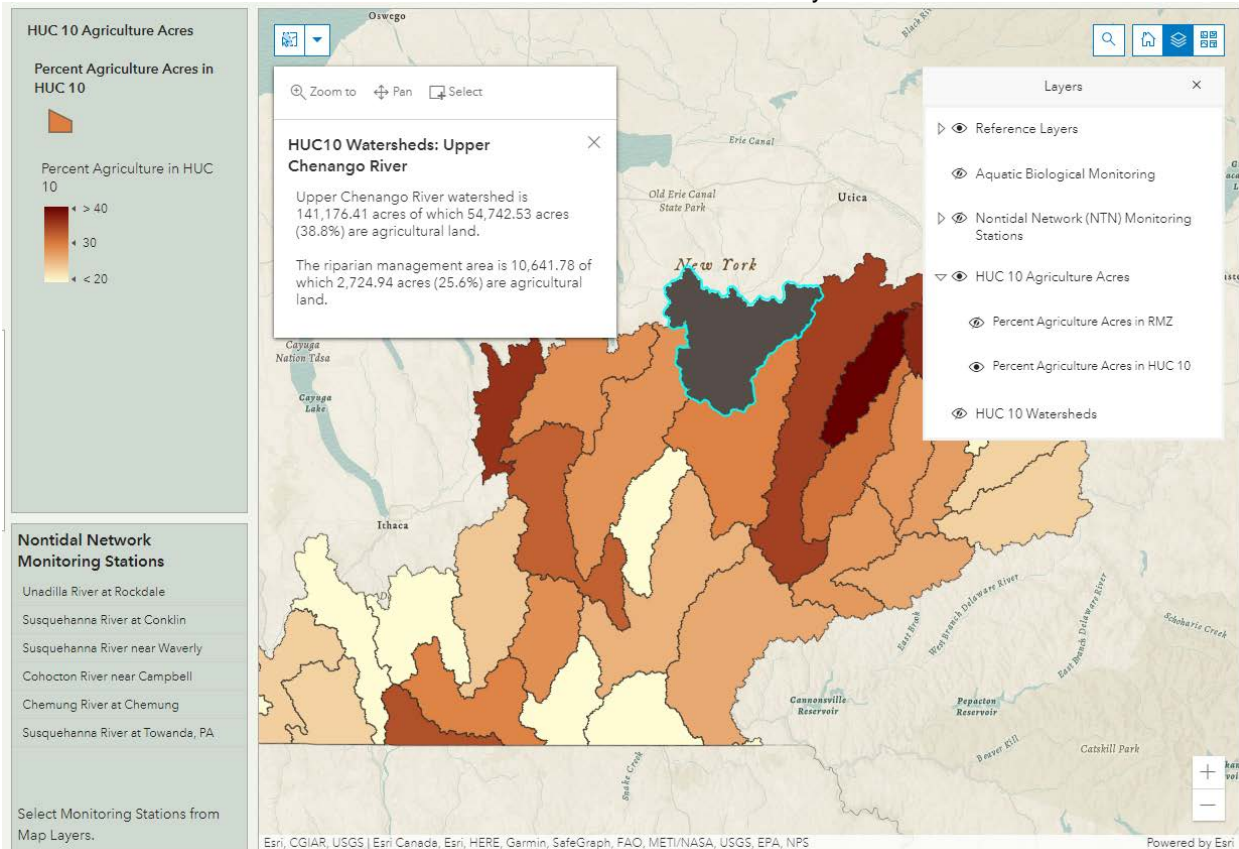


Figure 21. Opportunities for Agricultural BMP Implementation by HUC 10.