USGS
science for a changing world

Groundwater and Streamflow Information Program

Next Generation Water Observing System—Delaware River Basin

Emergency managers and water resource managers rely on the Nation's principal water monitoring system – the USGS streamgage network, and the associated water data delivery and instrument testing infrastructure – to provide monitoring data to address complex water challenges involving too much, too little, or poor-quality water. Each year, floods, droughts, and water quality issues remind us of the vulnerability of our physical and socioeconomic well-being and the importance of monitoring our Nation's water. This monitoring system is currently functioning, but it was designed many decades ago to address 20th century challenges and needs major upgrades to meet the increasingly complex water challenges facing communities across the Nation. In fiscal year 2018, the USGS selected the Delaware River Basin as a pilot for implementing the Nation's Next-Generation Water Observing System (NGWOS) to provide high-fidelity, real-time data on water quantity and quality necessary to support modern water prediction and decision support systems for water emergencies and daily water operations.

Substantial advances in water science, together with breakthroughs in technological and computational capabilities, have resulted in sophisticated new capabilities that can provide managers and decision support systems with the information, insights and data needed to address today's water challenges. Modern models require high-density data describing all of the major hydrologic characteristics that the models represent, such as streamflow, evapotranspiration, water storage in snowpack, soil moisture, and groundwater, and many others. However, these models and tools require more extensive observational data than the current streamgage network can provide.

When fully implemented, the USGS NextGen integrated water observing system will provide quantitative information on streamflow, evapotranspiration, snowpack, soil moisture, a broad suite of water quality constituents (nutrients, salinity, turbidity, and wastewater indicators), connections between groundwater and surface water, and water use. It will be directly coupled with the National Water Model and other advanced modeling tools to provide state-of-the-art flood and drought forecasts, drive emergency- and water-management decision support systems, and to address difficult questions such as:

- What are the near-term and long-term risks of floods and droughts, and what scenarios change these risks?
- Are we in the early stages of a drought? How long will drought recovery take?
- How much water is stored in seasonal snow packs, and how will changes affect water supplies?
- How much water is lost to evapotranspiration?
- What is the quality of water and how will it change during wet/dry periods?
- How much does groundwater contribute to streamflow, or vice-versa?

Delaware River Basin Pilot

The Delaware River is rich in history, ecologically diverse, and critical to the regional economy. Water managers in this region have a long history applying innovative, regional solutions to insure the long-term sustainability of this treasured resource which provides drinking water to over 15 million people in the region. Piloting the NextGen water observing system in the Delaware River Basin provides an opportunity to develop an integrated water observing system to support innovative modern water prediction and decision support systems in a nationally important, complex interstate river system.

In 2020, the USGS is continuing to implement the pilot of the NextGen water observing system in the Delaware River Basin. The 2018-20 implementation investments represents about 50-percent of the monitoring infrastructure needed to fully implement the NextGen observing system that can be used to test, validate, and drive water forecasts and inform water management decisions. The 2020 activities focus on the addition of new streamgages to address critical data gaps, water monitoring network modernization, increased temperature and specific conductance monitoring, build-out of sub-basin monitoring networks and modernization of USGS data management and delivery. Additional resources will be needed in 2021 to fully implement integrated monitoring of water quantity, quality, and use in the Delaware River Basin pilot.

2018-2020 Pilot of the Next Generation Water Observing System in the Delaware River Basin

Expansion of Monitoring Networks

The water-monitoring networks continued to expand, filling critical gaps in water data. Over the first three years of the Delaware Pilot, the following investments have been made:

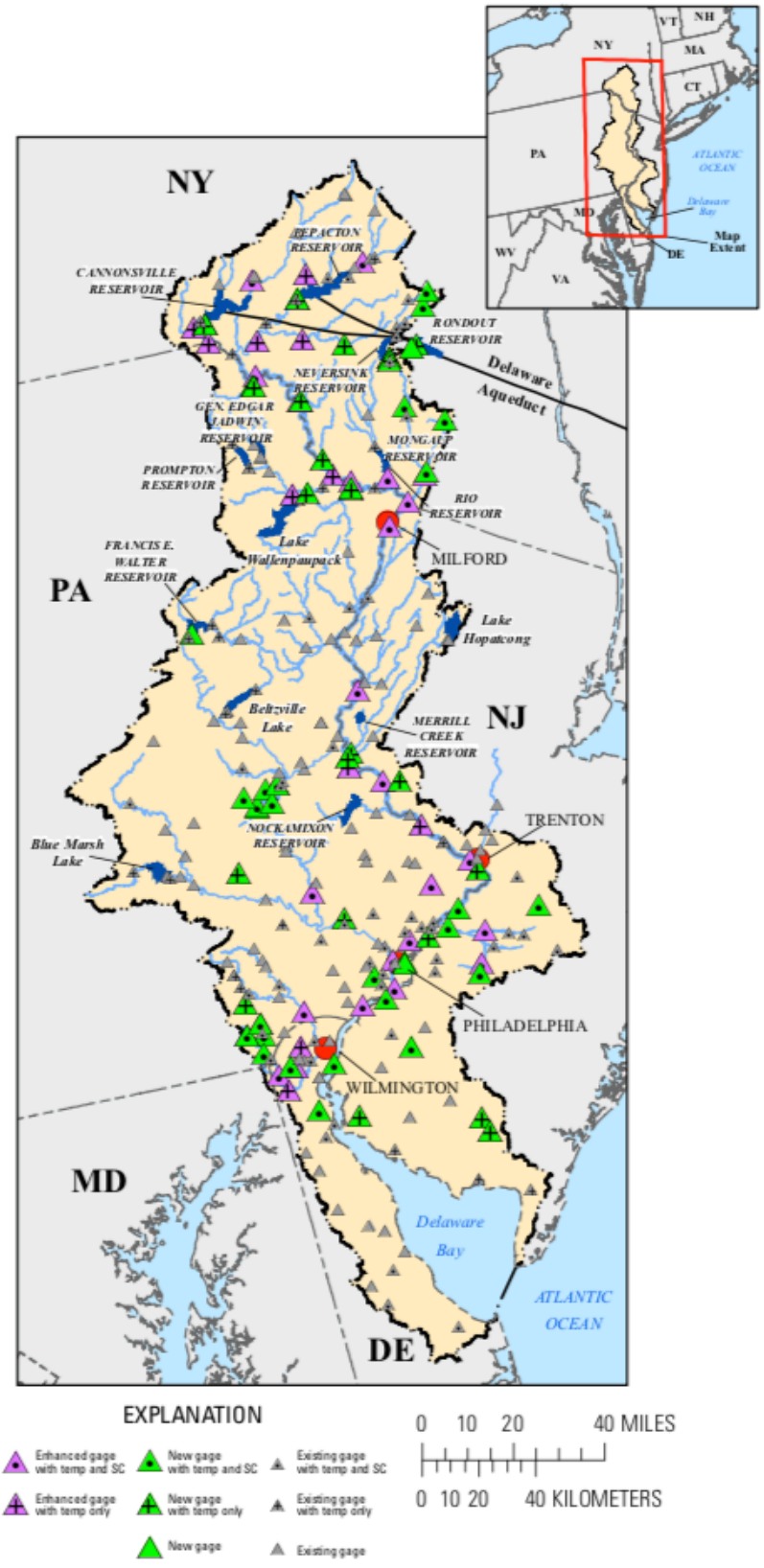
- 45 new or reactivated streamgages
- Doubled the size of the water temperature network to nearly 200 sites
- Added approximately 50 salinity sites, including, including two locations with multiple depths in the Bays
- 5 Meteorological sites
- 3 enhanced reservoir monitoring stations
- 2 coastal sites with temperature and salinity
- 1 new gage on the Chesapeake and Delaware Canal
- 1 new evapotranspiration tower
- Instrumented 4 sub-basins to provide data at a dense spatial scale; these include the Neversink River, Little Lehigh River, Coastal Plain Tributaries, and White Clay Creek.

Autonomous Underwater Vehicles

Mapping the salt front and characterizing mixing in the Delaware Estuary is a critical need for water management along the lower Delaware River. In 2019, two Ecomapper autonomous underwater vehicles (AUVs) were used to collected water-quality and bathymetry data across portions of Delaware Estuary. The successful mission provided valuable information will be utilized by the USGS and local stakeholders to enhance the understanding of water-quality dynamics in the Delaware Estuary. In August 2020, these AUVs will be use to map a region of low dissolved oxygen in the river.

New Methods and Instrument Testing

- Cameras are being tests as non-contact sensors to monitor streamflow, water level, ice cover, suspened-sediment concentration, harmful algal blooms, channel erosion, and general conditions at streamgages.
- Methods to quantify groundwater contributions to streamflow are being refined.
- Environmental DNA sample collection methods are being tested.
- Resin bags are being testing for collecting toxins from algal blooms and PFAS.
- Low power wireless communications equipment is being tested.



The USGS will continue installing new streamgages and enhancing existing streamgages throughout the Delaware River Basin in 2020 as part of the activities for the NextGen water observing system.

For Additional Information

Delaware—John Dillow, jjdillow@usgs.gov
New Jersey—Heidi Hoppe, hhoppe@usgs.gov
New York—Jerry Butch, gkbutch@usgs.gov
Pennsylvania—Marla Stuckey, mstuckey@usgs.gov
USGS Delaware River Master—Kendra Russell, klrussell@usgs.gov
USGS Basin Coordinator—Doug Burns, daburns@usgs.gov