
NUTRIENTS AND SUSPENDED SEDIMENT TRANSPORTED IN THE SUSQUEHANNA RIVER BASIN, 2006, AND TRENDS, JANUARY 1985 THROUGH DECEMBER 2006

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ABSTRACT

Nutrient and suspended-sediment (SS) samples were collected under base flow and stormflow conditions during calendar year 2006 for Group A sites listed in Table 2. Fixed date samples also were collected at these sites. Additionally, fixed date samples were collected during 2006 at Group B sites listed in Table 2. All samples were analyzed for nitrogen and phosphorus species, total organic carbon (TOC), and SS.

Precipitation for 2006 was above average for all Group A sites. Highest departures from the long-term precipitation averages were recorded at Danville, Pa., with 8.39 inches above the long-term mean (LTM). Highest departure above the LTM for discharge was 132 percent of LTM at Danville, which was mostly a result of late June flooding in New York. Lowest departure from the LTM was at Newport, Pa., for both rainfall at 2.17 inches above LTM and for flow at 81 percent of the LTM. Precipitation and flows were above LTM at several sites largely due to high flows caused by Tropical Storm Ernesto during late June and early July.

This report utilizes several methods to compare nutrient and SS loads and yields including: (1) comparison with the LTM; (2) comparison with baseline data; and (3) flow adjusted concentration trend analysis through 2006. Comparison with the LTM showed increases in total phosphorus (TP) and SS for Towanda, Pa., and Danville, and decreases at all other sites except for TP at Lewisburg, Pa., which showed a slight increase. Decreases in total nitrogen (TN) were shown at all sites when compared to the LTMs. Baseline comparisons

showed similar results, including increases in TP and SS at both Towanda and Danville and increases in TP at Lewisburg. Baseline comparisons for 2006 TN showed improvements for all sites while Newport, Marietta, and Conestoga, Pa., showed improvements in TP and SS. Comparisons to seasonal baselines indicate that high yields of TP and SS at Towanda and Danville were during the spring and summer months, specifically June and July. Improvements were indicated by winter baseline comparisons at all sites for TN, TP, and SS, except for TP at Lewisburg, which remained unchanged.

2006 trends remained relatively unchanged from 2005 trends as well. Exceptions occurred at Towanda where three trends were no longer found for TP, DP, and TOC. Another trend in DP was lost at Danville, while a downward trend in total ammonia (TNH₃) was gained. Newport lost an upward trend from 2005 to 2006 in total nitrate plus nitrite (TNO_x), while Marietta added four new downward trends in 2006, including dissolved organic nitrogen (DON), dissolved ammonia (DNH₃), TP, and dissolved phosphorus (DP). Trends in dissolved orthophosphate (DOP) continue to be degrading at Towanda, Danville, Newport, and Marietta. No significant trends were found for flow.

INTRODUCTION

Nutrients and SS entering the Chesapeake Bay (Bay) from the Susquehanna River Basin contribute to nutrient enrichment problems in the Bay (USEPA, 1982). The Pennsylvania Department of Environmental Protection (PADEP) Bureau of Laboratories, the U.S.

Environmental Protection Agency (USEPA), the U.S. Geological Survey (USGS), and the Susquehanna River Basin Commission (SRBC) conducted a 5-year intensive study at 12 sites from 1985-89 to quantify nutrient and SS transported to the Bay via the Susquehanna River Basin. In 1990, the number of sampling sites was reduced to five long-term monitoring stations. An additional site was included in 1994.

In October 2004, 13 additional sites (two in New York and 11 in Pennsylvania) were added as part of the Chesapeake Bay Program's Non-tidal Water Quality Monitoring Network. In October 2005, four more sites (three in New York and one in Maryland) were added to the existing network. This project involves effort conducted by all six Bay state jurisdictions, the USEPA, USGS, and SRBC to create a uniform non-tidal monitoring network for the entire Bay watershed.

Purpose of Report

The purpose of this report is to present basic information on annual and seasonal loads and yields of nutrients and SS measured during calendar year 2006. Comparisons are made to LTM and to various baselines, including baselines created from the initial five years of data, the first half of the dataset, the second half of the dataset, and those created from the entire dataset for each site. Additionally, seasonal baselines were created using the initial five years of data from each site. Seasonal and annual variations in loads are discussed, as well as the results of flow-adjusted trend analyses for the period January 1985 through December 2006 for various forms of nitrogen and phosphorus, SS, TOC, and water discharge.

DESCRIPTION OF THE SUSQUEHANNA RIVER BASIN

The Susquehanna River (Figure 1) drains an area of 27,510 square miles (Susquehanna River Basin Study Coordination Committee, 1970), and is the largest tributary to the Bay. The Susquehanna River originates in the Appalachian Plateau of southcentral New York, flows into the Valley and Ridge and Piedmont Provinces of Pennsylvania and Maryland, and joins the Bay at Havre de Grace, Md. The climate in the Susquehanna River Basin varies considerably from the low lands adjacent to the Bay in Maryland to the high elevations, above 2,000 feet, of the northern headwaters in central New York State. The annual mean temperature ranges from 53° F (degrees Fahrenheit) near the Pennsylvania-Maryland border to 45° F in the northern part of the basin. Annual precipitation in the basin averages 39.15 inches and is fairly well distributed throughout the year.

Land use in the Susquehanna River Basin, shown in Table 1, is predominantly rural with woodland accounting for 69 percent; agriculture, 21 percent; and urban, seven percent. Woodland occupies the higher elevations of the northern and western parts of the basin and much of the mountain and ridge land in the Juniata and Lower Susquehanna Subbasins. Woods and grasslands occupy areas in the lower part of the basin that are unsuitable for cultivation because the slopes are too steep, the soils are too stony, or the soils are poorly drained. The Lower Susquehanna Subbasin contains the highest density of agriculture operations within the watershed. However, extensive areas are cultivated along the river valleys in southern New York and along the West Branch Susquehanna River from Northumberland, Pa., to Lock Haven, Pa., including the Bald Eagle Creek Valley.