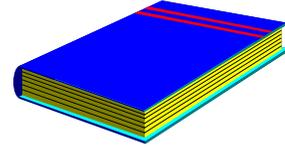


# REPORT ANNOUNCEMENT

SUSQUEHANNA RIVER BASIN COMMISSION

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## **NUTRIENTS AND SUSPENDED SEDIMENT TRANSPORTED IN THE SUSQUEHANNA RIVER BASIN, 2002 AND TRENDS, JANUARY 1985 THROUGH DECEMBER 2002**

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Pennsylvania entered into the Chesapeake Bay Agreement in 1983 with Maryland, Virginia, the District of Columbia, the U.S. Environmental Protection Agency (USEPA) and the Chesapeake Bay Commission to assist in the effort to restore the Bay. This agreement was reaffirmed in 1987 and 1992, and significant efforts were undertaken to reduce nitrogen and phosphorus loads to the Bay.

Given that the lower Susquehanna River Basin is one of the largest sources of suspended sediment to the Bay, SRBC, in cooperation with the Pa. Department of Environmental Protection (Pa. DEP), USEPA, and the U.S. Geological Survey (USGS), conducted a 5-year intensive study at 14 sites during the period 1985-89. In 1990, the number of sampling sites was reduced to five long-term monitoring stations. An additional site was included in 1994, and sampling at these six sites has continued to the present day.

Calculated annual loads and yields of nutrient and suspended sediment showed year-to-year variability that was highly correlated with the variability of the annual water discharge (Ott and others, 1991; Takita, 1996, 1998). These studies also reinforced the indications from earlier studies that the highest nutrient yields come from the lower basin.

The purpose of this report is to present basic information on annual and seasonal loads and yields of nutrients and suspended sediment measured during calendar year 2002, and to compare the total nitrogen, total phosphorus and suspended-sediment loads with the baselines established from the 1985-89 study. Seasonal variations in loads and trends for the period January 1985 through December 2002 also are discussed.

This report includes sections on:

- Nutrient monitoring sites;
- Sample collection and analysis;
- Precipitation;
- Water discharge;
- Annual nutrient and suspended-sediment loads and yields;
- Seasonal water discharges and loads;
- Comparison of the 2002 loads and yields of total nitrogen, total phosphorus, and suspended sediment with the baselines; and
- Discharge, nutrient, and suspended-sediment trends.

### **Nutrient Monitoring Sites**

Data were collected from three sites on the Susquehanna River and three sites on major tributaries in the basin. These six sites, selected for long-term monitoring of nutrient and suspended-sediment transport in the basin, are:

1. Susquehanna River at Towanda, Pa.
2. Susquehanna River at Danville, Pa.
3. Susquehanna River at Marietta, Pa.
4. West Branch Susquehanna River at Lewisburg, Pa.
5. Juniata River at Newport, Pa.
6. Conestoga River at Conestoga, Pa.

### **Sample Collection and Analysis**

Samples were collected at each of the sites to measure nutrient and suspended-sediment concentrations during baseflow and stormflow periods. Baseflow samples were collected monthly by hand with depth-integrating samplers. Stormflow samples were collected daily from the start of the storm to the time when the flow receded to near its prestorm rate. Storm samples were collected by hand with depth-integrating samplers at all but the Conestoga River site, which is equipped with an automatic pumping sampler that collects a sample every half-hour.

### **Precipitation**

Precipitation data were obtained from long-term stations operated by the U.S. Department of Commerce. Quarterly and annual precipitation data from these

sources were summarized for 2002 for the Susquehanna River Watersheds above Towanda, Danville, and Marietta, Pa., and the West Branch Susquehanna, Juniata, and Conestoga River Watersheds. Precipitation ranged from 0.58 inches below normal in the West Branch Susquehanna Subbasin to 4.25 inches above normal in the watershed above Towanda.

### **Water Discharge**

Mean water discharges for calendar year 2002 are listed, along with the long-term annual mean discharge and percent of long-term annual mean discharge for each site. The annual mean water discharge was below normal for all sites in 2002 except Towanda and Danville. Streamflow ranged from 57.0 percent of the long-term mean at Conestoga to 103.2 percent at Danville.

### **Annual Nutrient and Suspended-Sediment Loads and Yields**

Nutrient and suspended-sediment loads were computed for each site for calendar year 2002. Loads were computed for total and dissolved ammonia, total and dissolved nitrite plus nitrate, total and dissolved nitrogen, total and dissolved organic nitrogen, dissolved orthophosphate, total and dissolved phosphorus, and suspended sediment.

The greatest loads of total nitrogen, total phosphorus and suspended sediment were measured at Marietta. The smallest loads of total nitrogen, total phosphorus, and suspended sediment were at Conestoga. The annual yields, in pounds per acre per year, of total nitrogen, total phosphorus, and suspended sediment were greatest from the Conestoga River at Conestoga.

### **Seasonal Water Discharges and Nutrient and Suspended-Sediment Loads**

Seasonal mean water discharges for calendar year 2002 at Towanda, Danville, Lewisburg, Newport, and Marietta were highest in the spring (April-June), and lowest in the summer (July-September). The 2002 seasonal discharges at Conestoga were highest in the fall, resulting in all constituents having the highest loads during the fall. The most consistent pattern among the other sites was that the season highs for total and dissolved ammonia and dissolved orthophosphate did not correspond with the highest flow season for these sites. This indicates that these constituents may not be as flow dependent.

### **Comparison of the 2002 Loads and Yields of Total Nitrogen, Total Phosphorus and Suspended Sediment with the Baselines**

Comparison of the 2002 annual yields and the 5-year baselines indicated that there were decreases of total nitrogen at all sites. Total phosphorus yields were higher than the baseline yields at Marietta, Newport, and Conestoga. Comparisons of suspended-sediment yields indicated that there was an increase at Newport, slight decrease at Marietta and Conestoga, and significant decrease at Towanda, Danville, and Lewisburg.

### **Discharge, Nutrient, and Suspended-Sediment Trends**

Trends were computed for the period January 1985 through December 2002 for flow, suspended sediment, total organic carbon, and several forms of nitrogen and phosphorus. Results were reported for monthly mean flow, monthly load, monthly flow-weighted concentration, and flow-adjusted concentration.

Improving conditions in total nitrogen were apparent throughout the Susquehanna River Basin with the most pronounced trends at Towanda, Danville, Lewisburg, and Marietta. Total phosphorus showed no trend at Towanda and Marietta, while all other sites showed improving conditions for 2002. Strong increasing trends were apparent for orthophosphate at all sites except Lewisburg and Conestoga. Significant improving trends in suspended sediment occurred at Danville, Lewisburg, and Conestoga.

There also was the appearance of decreasing trends in flow at Lewisburg and Conestoga. This is the first appearance of decreasing trends in flow throughout the programs history and is likely a direct result of the multi-year drought.

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This report is available on the Susquehanna River Basin Commission website at:

<http://www.srbc.net/techreport231.htm>

It also is available on compact disc.

For a copy, please contact:

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