
**NUTRIENTS AND SUSPENDED
SEDIMENT TRANSPORTED IN THE
SUSQUEHANNA RIVER BASIN, 2004,
AND TRENDS, JANUARY 1985
THROUGH DECEMBER 2004**

Publication No. 241

December 2005

*Kevin H. McGonigal
Water Quality Program Specialist*



Printed on recycled paper.

This report is prepared in cooperation with the Pennsylvania Department of Environmental Protection, Bureau of Water Quality Protection, Division of Conservation Districts and Nutrient Management, under Grant ME4100025873.

SUSQUEHANNA RIVER BASIN COMMISSION



Paul O. Swartz, Executive Director

Denise M. Sheehan, N.Y. Commissioner

Kenneth P. Lynch, N.Y. Alternate

Scott J. Foti, N.Y. Alternate/Advisor

Kathleen A. McGinty, Pa. Commissioner

Cathy C. Curran Myers, Pa. Alternate

William A. Gast, Pa. Alternate/Advisor

Kendl P. Philbrick, Md. Commissioner

Dr. Robert M. Summers, Md. Alternate

Matthew G. Pajerowski, Md. Alternate/Advisor

Brigadier General William T. Grisoli, U.S. Commissioner

Colonel Robert J. Davis, Jr., U.S. Alternate

Colonel Francis X. Kosich, U.S. Alternate

Daniel M. Bierly, U.S. Advisor

The Susquehanna River Basin Commission was created as an independent agency by a federal-interstate compact* among the states of Maryland, New York, Commonwealth of Pennsylvania, and the federal government. In creating the Commission, the Congress and state legislatures formally recognized the water resources of the Susquehanna River Basin as a regional asset vested with local, state, and national interests for which all the parties share responsibility. As the single federal-interstate water resources agency with basinwide authority, the Commission's goal is to coordinate the planning, conservation, management, utilization, development and control of basin water resources among the public and private sectors.

*Statutory Citations: *Federal - Pub. L. 91-575, 84 Stat. 1509 (December 1970); Maryland - Natural Resources Sec. 8-301 (Michie 1974); New York - ECL Sec. 21-1301 (McKinney 1973); and Pennsylvania - 32 P.S. 820.1 (Supp. 1976).*

TABLE OF CONTENTS

ABSTRACT	1
INTRODUCTION	1
Purpose of Report.....	2
DESCRIPTION OF THE SUSQUEHANNA RIVER BASIN.....	2
NUTRIENT MONITORING SITES	2
SAMPLE COLLECTION AND ANALYSIS	2
PRECIPITATION.....	6
WATER DISCHARGE	7
ANNUAL NUTRIENT AND SUSPENDED-SEDIMENT LOADS AND YIELDS	8
SEASONAL WATER DISCHARGES AND NUTRIENT AND SUSPENDED-SEDIMENT LOADS AND YIELDS	18
COMPARISON OF THE 2004 LOADS AND YIELDS OF TOTAL NITROGEN, TOTAL PHOSPHORUS, AND SUSPENDED SEDIMENT WITH THE BASELINES	31
Susquehanna River at Towanda, Pa.	31
Susquehanna River at Danville, Pa.....	34
West Branch Susquehanna River at Lewisburg, Pa.....	34
Juniata River at Newport, Pa.	39
Susquehanna River at Marietta, Pa.....	39
Conestoga River at Conestoga, Pa.....	44
DISCHARGE, NUTRIENT, AND SUSPENDED-SEDIMENT TRENDS	47
DISCUSSION	50
REFERENCES	55

FIGURES

Figure 1. The Susquehanna River Basin, Subbasins, and Population Centers	3
Figure 2. Locations of Sampling Sites Within the Susquehanna River Basin.....	5
Figure 3. Annual and Long-Term Discharges at Towanda, Danville, Lewisburg, Newport, Marietta, and Conestoga, Pa.	8
Figure 4A. Annual Loads of Total Nitrogen (TN) at Towanda, Danville, Lewisburg, Newport, Marietta, and Conestoga, Pa., Calendar Year 2004	13
Figure 4B. Total Nitrogen (TN) Yields at Towanda, Danville, Lewisburg, Newport, Marietta, and Conestoga, Pa., Calendar Year 2004	13
Figure 5A. Annual Loads of Total Phosphorus (TP) at Towanda, Danville, Lewisburg, Newport, Marietta, and Conestoga, Pa., Calendar Year 2004.....	14
Figure 5B. Total Phosphorus (TP) Yields at Towanda, Danville, Lewisburg, Newport, Marietta, and Conestoga, Pa., Calendar Year 2004	14
Figure 6A. Annual Loads of Suspended Sediment (SS) at Towanda, Danville, Lewisburg, Newport, Marietta, and Conestoga, Pa., Calendar Year 2004.....	15
Figure 6B. Suspended Sediment (SS) Yields at Towanda, Danville, Lewisburg, Newport, Marietta, and Conestoga, Pa., Calendar Year 2004	15
Figure 7. Seasonal Discharges and Loads of Total Nitrogen (TN), Total Phosphorus (TP), Suspended Sediment (SS) at Towanda, Pa., Calendar Year 2004	21

Figure 8.	Seasonal Discharges and Loads of Total Nitrogen (TN), Total Phosphorus (TP), Suspended Sediment (SS) at Danville, Pa., Calendar Year 2004	22
Figure 9.	Seasonal Discharges and Loads of Total Nitrogen (TN), Total Phosphorus (TP), Suspended Sediment (SS) at Lewisburg, Pa., Calendar Year 2004.....	23
Figure 10.	Seasonal Discharges and Loads of Total Nitrogen (TN), Total Phosphorus (TP), Suspended Sediment (SS) at Newport, Pa., Calendar Year 2004.....	24
Figure 11.	Seasonal Discharges and Loads of Total Nitrogen (TN), Total Phosphorus (TP), Suspended Sediment (SS) at Marietta, Pa., Calendar Year 2004	25
Figure 12.	Seasonal Discharges and Loads of Total Nitrogen (TN), Total Phosphorus (TP), Suspended Sediment (SS) at Conestoga, Pa., Calendar Year 2004	26
Figure 13.	Comparison of Seasonal Yields of Total Nitrogen (TN) at Towanda, Danville, Marietta, Lewisburg, Newport, and Conestoga, Pa.	27
Figure 14.	Comparison of Seasonal Yields of Total Phosphorus (TP) at Towanda, Danville, Marietta, Lewisburg, Newport, and Conestoga, Pa.	28
Figure 15.	Comparison of Seasonal Yields of Suspended Sediment (SS) at Towanda, Danville, Marietta, Lewisburg, Newport, and Conestoga, Pa.	29
Figure 16.	Seasonal Percent of Annual Load of Total Nitrogen, Total Phosphorus, and Suspended Sediment at Towanda, Danville, Marietta, Lewisburg, Newport, and Conestoga, Pa., Calendar Year 2004.	30
Figure 17.	Total Nitrogen (TN), Total Phosphorus (TP), and Suspended-Sediment (SS) Yields, Susquehanna River at Towanda, Pa., 2004 Yield Compared to 1989-1993 Baseline.....	32
Figure 18.	Total Nitrogen (TN), Total Phosphorus (TP), and Suspended-Sediment (SS) Yields, Susquehanna River at Towanda, Pa., 2004 Yield Compared to 1989-2004 Baseline.....	33
Figure 19.	Total Nitrogen (TN), Total Phosphorus (TP), and Suspended-Sediment (SS) Yields, Susquehanna River at Danville, Pa., 2004 Yield Compared to 1985-1989 Baseline.....	35
Figure 20.	Total Nitrogen (TN), Total Phosphorus (TP), and Suspended-Sediment (SS) Yields, Susquehanna River at Danville, Pa., 2004 Yield Compared to 1985-2004 Baseline.....	36
Figure 21.	Total Nitrogen (TN), Total Phosphorus (TP), and Suspended-Sediment (SS) Yields, West Branch Susquehanna River at Lewisburg, Pa., 2004 Yield Compared to 1985-1989 Baseline	37
Figure 22.	Total Nitrogen (TN), Total Phosphorus (TP), and Suspended-Sediment (SS) Yields, West Branch Susquehanna River at Lewisburg, Pa., 2004 Yield Compared to 1985-2004 Baseline	38
Figure 23.	Total Nitrogen (TN), Total Phosphorus (TP), and Suspended-Sediment (SS) Yields, Juniata River at Newport, Pa., 2004 Yield Compared to 1985-1989 Baseline.....	40
Figure 24.	Total Nitrogen (TN), Total Phosphorus (TP), and Suspended-Sediment (SS) Yields, Juniata River at Newport, Pa., 2004 Yield Compared to 1985-2004 Baseline.....	41
Figure 25.	Total Nitrogen (TN), Total Phosphorus (TP), and Suspended-Sediment (SS) Yields, Susquehanna River at Marietta, Pa., 2004 Yield Compared to 1987-1991 Baseline	42
Figure 26.	Total Nitrogen (TN), Total Phosphorus (TP), and Suspended-Sediment (SS) Yields, Susquehanna River at Marietta, Pa., 2004 Yield Compared to 1987-2004 Baseline	43
Figure 27.	Total Nitrogen (TN), Total Phosphorus (TP), and Suspended-Sediment (SS) Yields, Conestoga River at Conestoga, Pa., 2004 Yield Compared to 1985-1989 Baseline	45
Figure 28.	Total Nitrogen (TN), Total Phosphorus (TP), and Suspended-Sediment (SS) Yields, Conestoga River at Conestoga, Pa., 2004 Yield Compared to 1985-2004 Baseline	46

TABLES

Table 1.	2000 Land Use Percentages for the Susquehanna River Basin and Selected Tributaries	4
Table 2.	Data Collection Sites and Their Drainage Areas.....	4
Table 3.	Water Quality Parameters, Laboratory Methods, and Detection Limits	6

Table 4.	Summary for Annual Precipitation for Selected Areas in the Susquehanna River Basin, Calendar Year 2004.....	7
Table 5.	Annual Water Discharge, Calendar Year 2004	8
Table 6.	List of Analyzed Parameters, Abbreviations, and STORET Codes	9
Table 7.	Annual Water Discharges, Annual Loads, Yields, and Average Concentration of Total Nitrogen, Calendar Year 2004.....	9
Table 8.	Annual Water Discharges and Annual Loads and Yields of Total Phosphorus, Calendar Year 2004	10
Table 9.	Annual Water Discharges and Annual Loads and Yields of Total Suspended Sediment, Calendar Year 2004.....	10
Table 10.	Annual Water Discharges and Annual Loads and Yields of Total Ammonia, Calendar Year 2004	10
Table 11.	Annual Water Discharges and Annual Loads and Yields of Total NO ₂₃ Nitrogen, Calendar Year 2004.....	10
Table 12.	Annual Water Discharges and Annual Loads and Yields of Total Organic Nitrogen, Calendar Year 2004.....	11
Table 13.	Annual Water Discharges and Annual Loads and Yields of Dissolved Phosphorus, Calendar Year 2004.....	11
Table 14.	Annual Water Discharges and Annual Loads and Yields of Dissolved Orthophosphate, Calendar Year 2004.....	11
Table 15.	Annual Water Discharges and Annual Loads and Yields of Dissolved Ammonia, Calendar Year 2004.....	11
Table 16.	Annual Water Discharges and Annual Loads and Yields of Dissolved Nitrogen, Calendar Year 2004	12
Table 17.	Annual Water Discharges and Annual Loads and Yields of Dissolved NO ₂₃ Nitrogen, Calendar Year 2004.....	12
Table 18.	Annual Water Discharges and Annual Loads and Yields of Dissolved Organic Nitrogen, Calendar Year 2004.....	12
Table 19.	Annual Water Discharges and Annual Loads and Yields of Total Organic Carbon, Calendar Year 2004.....	12
Table 20.	Enhanced Monitoring Station Average Concentration Data for Fall 2004	16
Table 21.	2004 Monthly Flow (Q) in Cubic Feet per Second and TN, TP, and SS in Thousands of Pounds	17
Table 22.	Seasonal Mean Water Discharges and Loads of Nutrients and Suspended Sediment, Calendar Year 2004.....	19
Table 23.	Seasonal Mean Water Discharge and Load Percentages of Nutrients and Suspended Sediment, Calendar year 2004.....	20
Table 24.	Comparison of 2004 TN, TP, and SS Yields with Baseline Yields at Towanda, Pa.....	31
Table 25.	Comparison of 2004 TN, TP, and SS Yields with Baseline Yields at Danville, Pa.....	34
Table 26.	Comparison of 2004 Total Nitrogen, Total Phosphorus, and Suspended-Sediment Yields With Baseline Yields at Lewisburg, Pa.....	34
Table 27.	Comparison of 2004 TN, TP, and SS Yields With Baseline Yields at Newport, Pa.....	39
Table 28.	Comparison of 2004 TN, TP, and SS Yields With Baseline Yields at Marietta, Pa.....	39
Table 29.	Comparison of 2004 TN, TP, and SS Yields With Baseline Yields at Conestoga, Pa.....	44
Table 30.	Trend Statistics for the Susquehanna River at Towanda, Pa., January 1989 Through December 2004.....	47
Table 31.	Trend Statistics for the Susquehanna River at Danville, Pa., January 1985 Through December 2004.....	48
Table 32.	Trend Statistics for the West Branch Susquehanna River at Lewisburg, Pa., January 1985 Through December 2004.....	48

Table 33.	Trend Statistics for the Juniata River at Newport, Pa., January 1989 Through December 2004.....	49
Table 34.	Trend Statistics for the Susquehanna River at Marietta, Pa., January 1987 Through December 2004.....	49
Table 35.	Trend Statistics for the Conestoga River at Conestoga, Pa., January 1985 Through December 2004.....	50
Table 36.	Storm Events at Marietta with High Average Daily Flows Greater Than 400,000 cfs	52
Table 37.	Comparison of 2004 and 1993 Flows and Loads of TN, TP, and SS.....	52
Table 38.	Summary of 2004 Data Comparison to Percentage of LTM, Initial 5-Year Baseline, and Full Program Baseline, and Trends in Flow-Adjusted Concentration for TN, TP, and SS.....	53
Table 39.	Summary of 2004 Flow-Adjusted Concentration Trends at all Sites	53