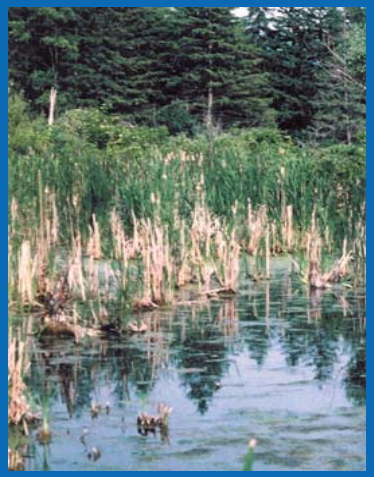
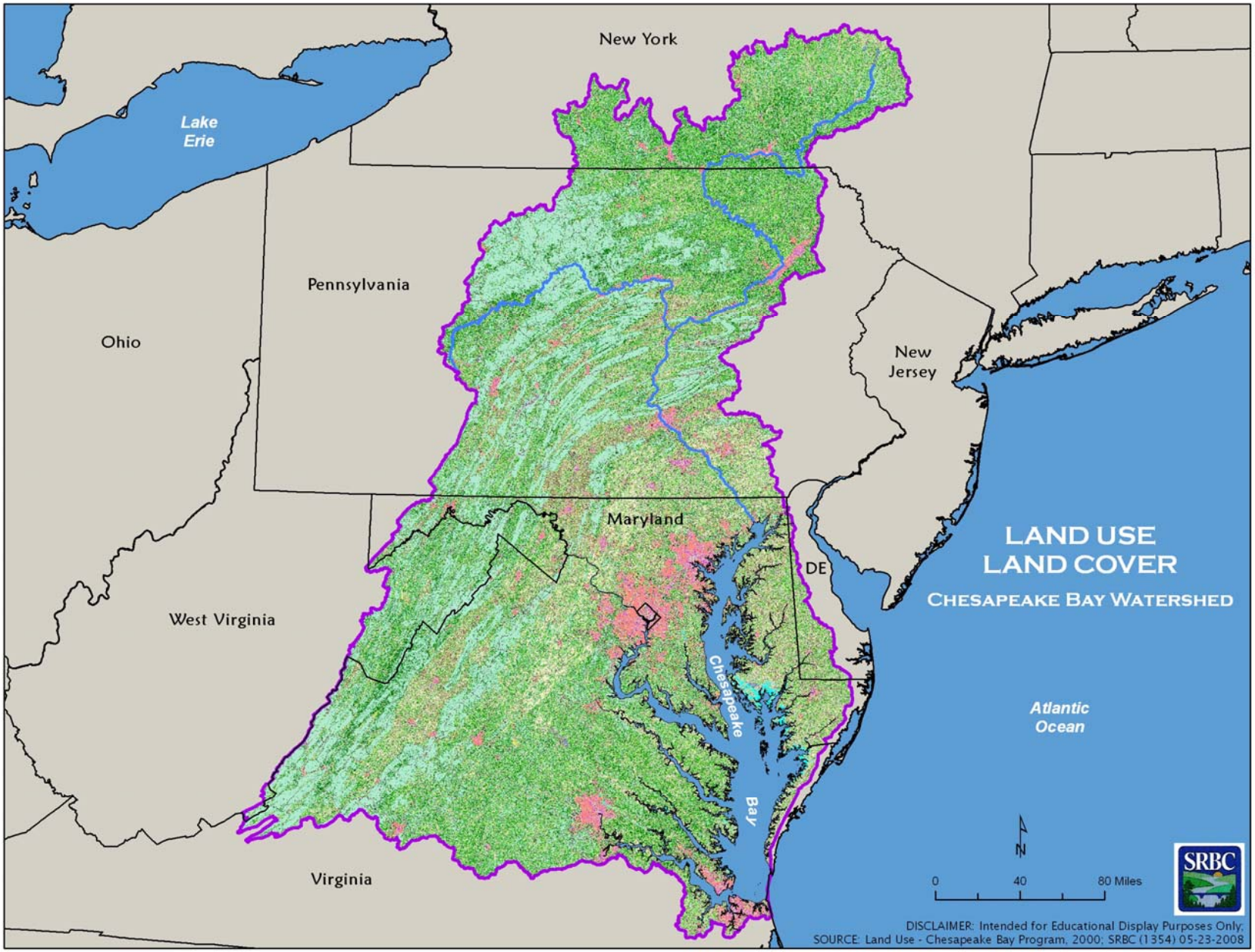
Current State of Nutrients: A Progress Report

Paul O. Swartz, Executive Director



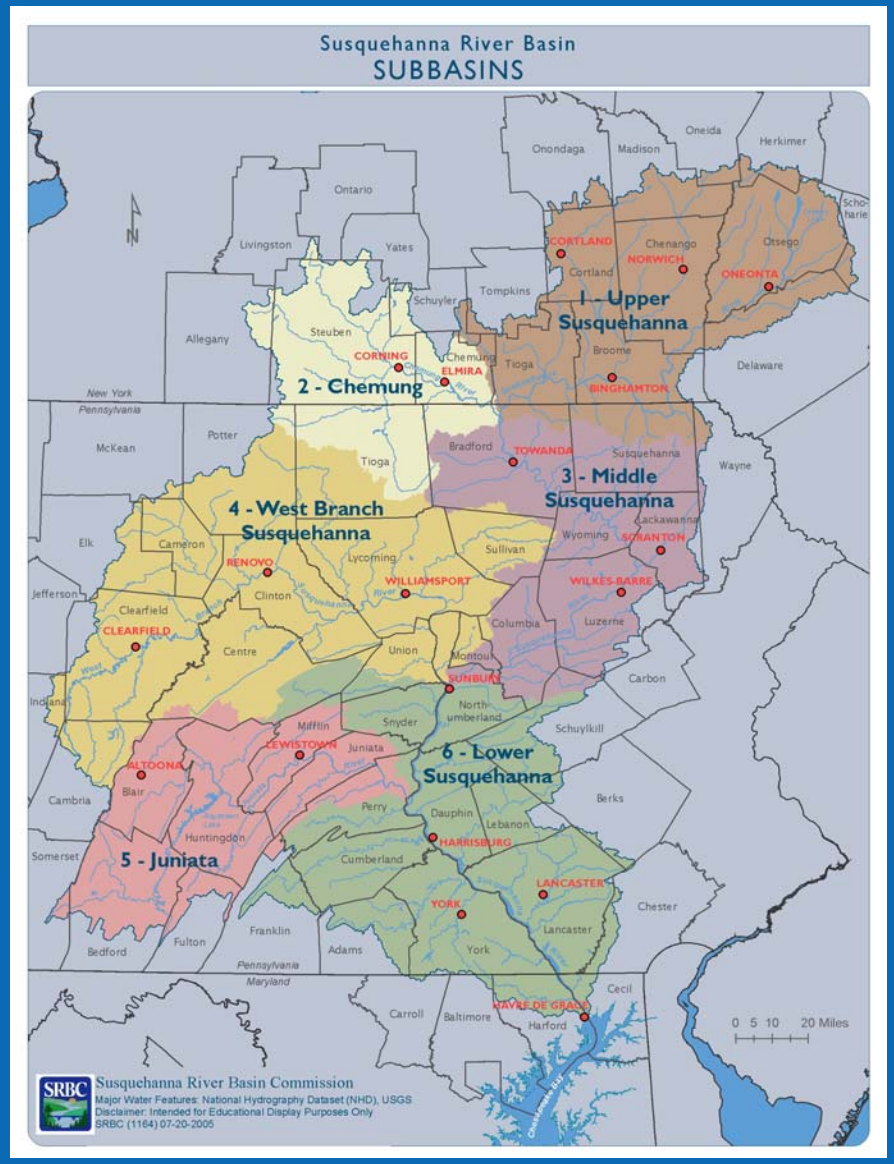

New York
Lake Erie
Pennsylvania
Ohio
New Jersey
Maryland
DE
West Virginia
Virginia
Chesapeake Bay
Atlantic Ocean
LAND USE
LAND COVER
CHESAPEAKE BAY WATERSHED
N
0
40
80 Miles
SRBC
DISCLAIMER: Intended for Educational Display Purposes Only;
SOURCE: Land Use - Chesapeake Bay Program, 2000; SRBC (1354) 05-23-2008

The Basin

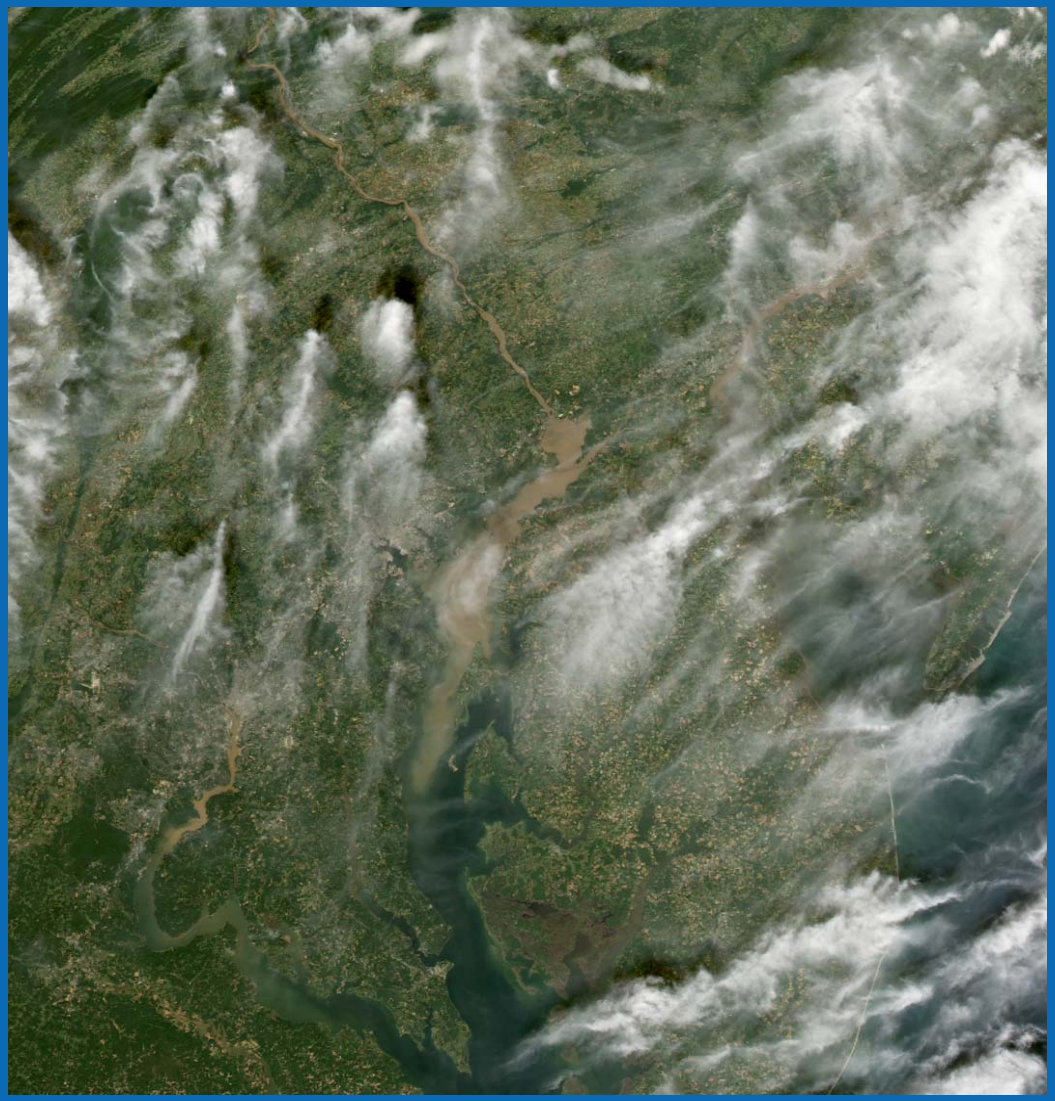
- 27,510 square miles
- 43% of Chesapeake Bay Watershed
- nearly 4 million pop.
- 69% forested
- 21% agricultural uses
- 48,000+ miles of waterways

The Susquehanna River

- largest tributary to Chesapeake Bay
- 18 million gallons of water supplied to Bay each min.



Floods Transport Sediment Loads



Major Floods in the Susquehanna Basin

1810	1936	1975
1865	1946	1996
1889	1955	2004
1894	1964	2006
1936	1972	

The Susquehanna basin is one of the most flood-prone watersheds in the entire country – experiencing major flooding every 14 years on average

Nonpoint Sources of Nutrients

Point Sources of Nutrients

Commercial & Industrial

Susquehanna River Basin Commission

A water management agency serving the Susquehanna River Watershed

Search for: GO!

- What's New
- About the Commission
- Public Information
- Programs & Activities
- Hydrologic Conditions
- Forms & Applications
- Policies, Guidances & Regulations
- Planning
- Subbasin Information

Flood Forecast & Warning System

Avoid getting caught in a flood disaster

TURN AROUND DON'T DROWN

Download the June 2006 Flood Summary

Flooded Roads - Making the Right Decision
Watch our Public Service Announcements

COMPREHENSIVE PLAN (DRAFT)

SRBC REGULATIONS

MAPS & DATA ATLAS

Additional Li

Paxton Creek Stormwater P

Nutrient & Se Monitoring

Interstate Strea Monitoring Rep

Conowingo Por Management

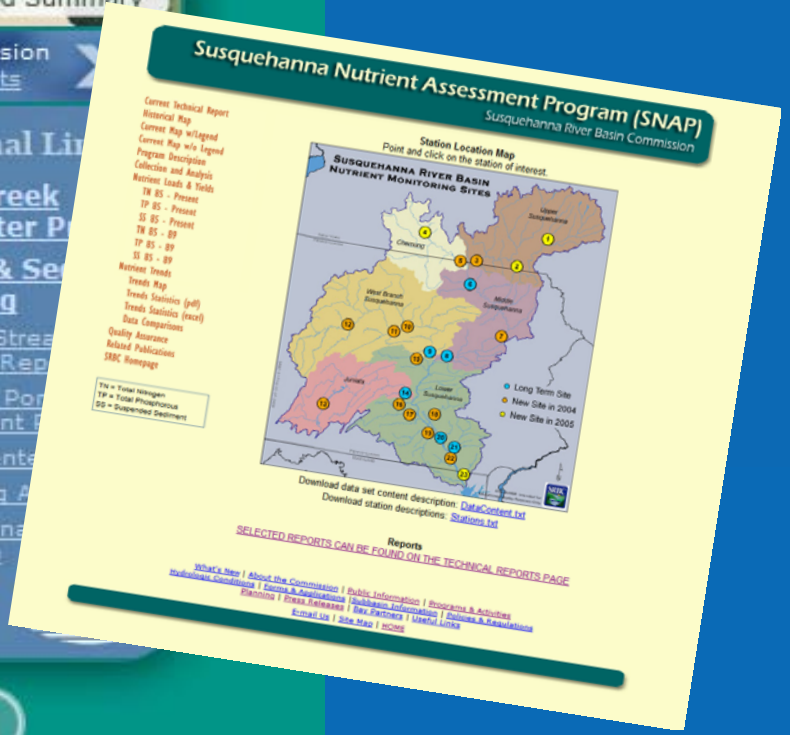
Drought Cente

PA Planning A

Susquehanna Partnership

Susquehanna River at Great Bend, Susquehanna County, PA

Press Releases | Ecotourism | Useful Links | Email Us | Site Map



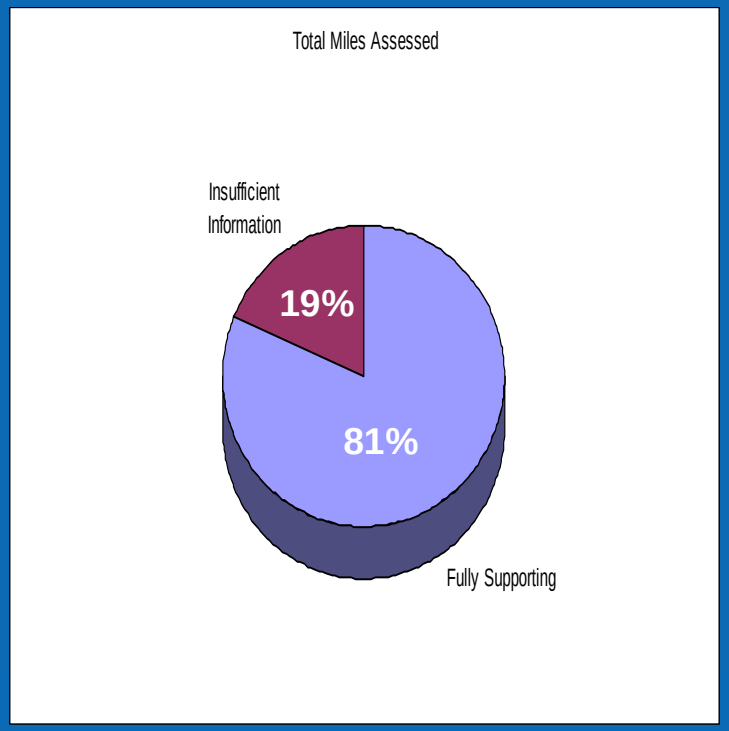
www.srbc.net

Susquehanna Nutrient Assessment Program

Other SRBC Core Monitoring Programs

Include:

- Subbasin Surveys
- Interstate Streams Monitoring Program
- Large River Assessment Program
- 305(b)



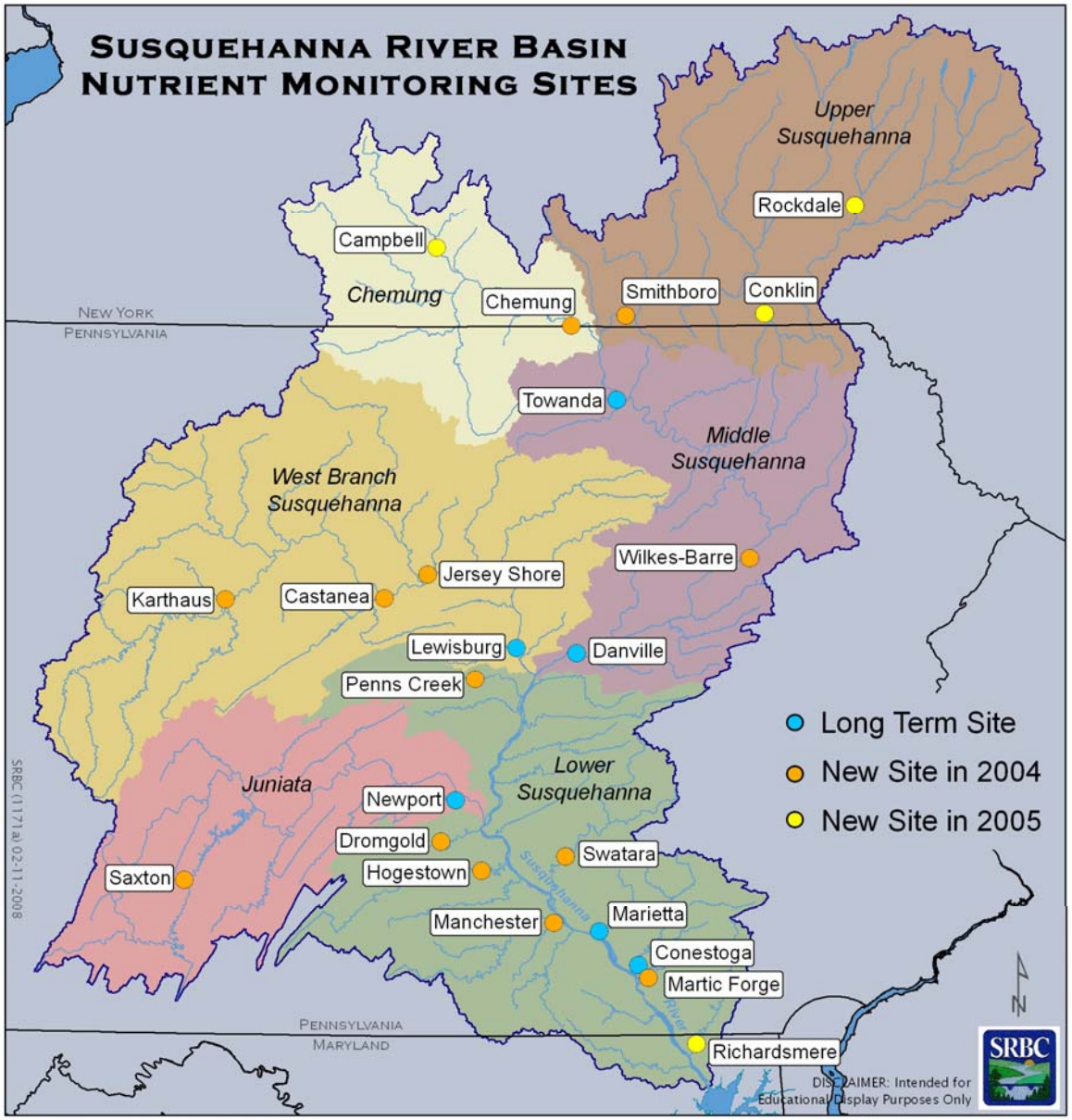
Why Is Monitoring Important?

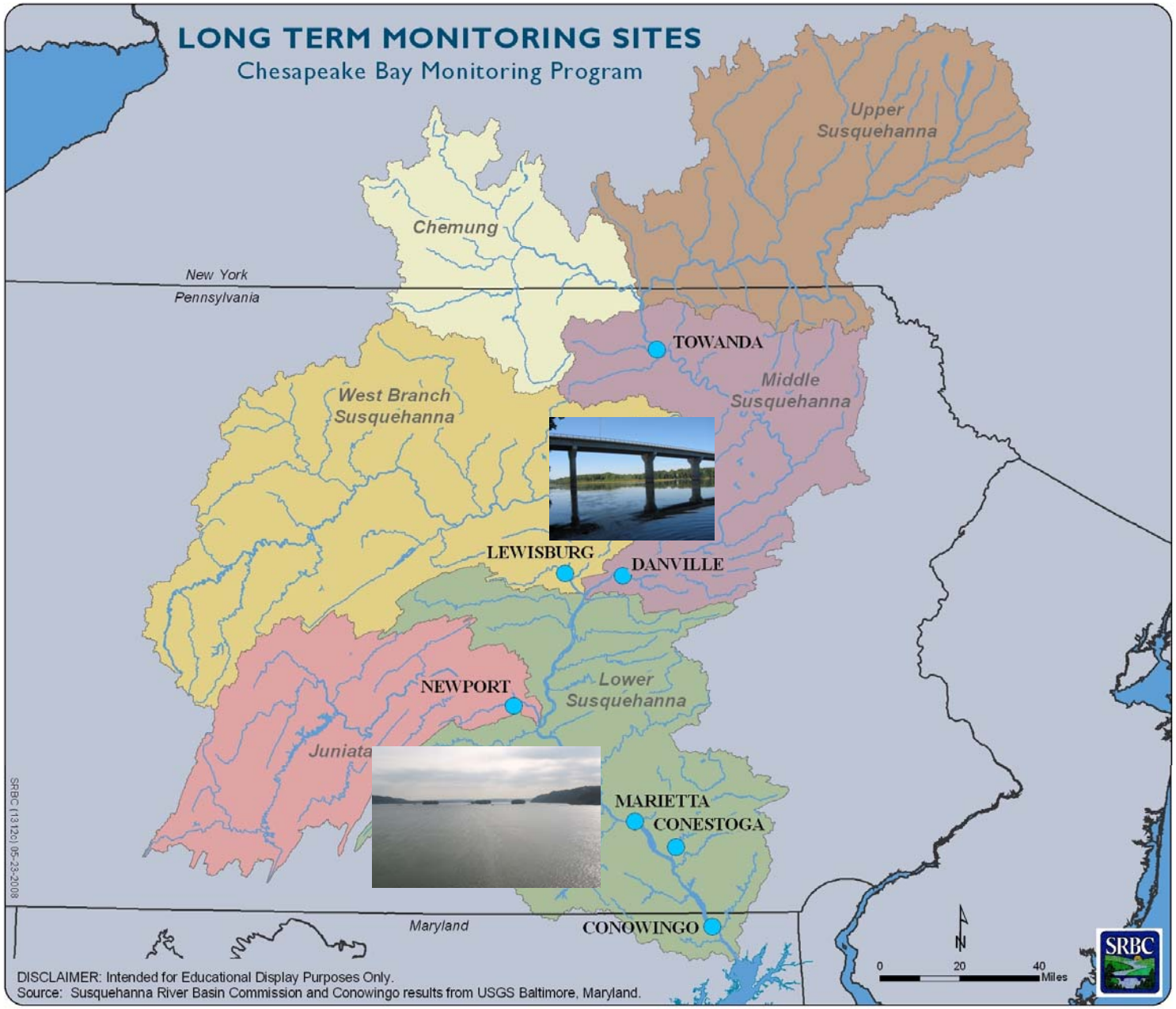
Allows mangers to make informed decisions.

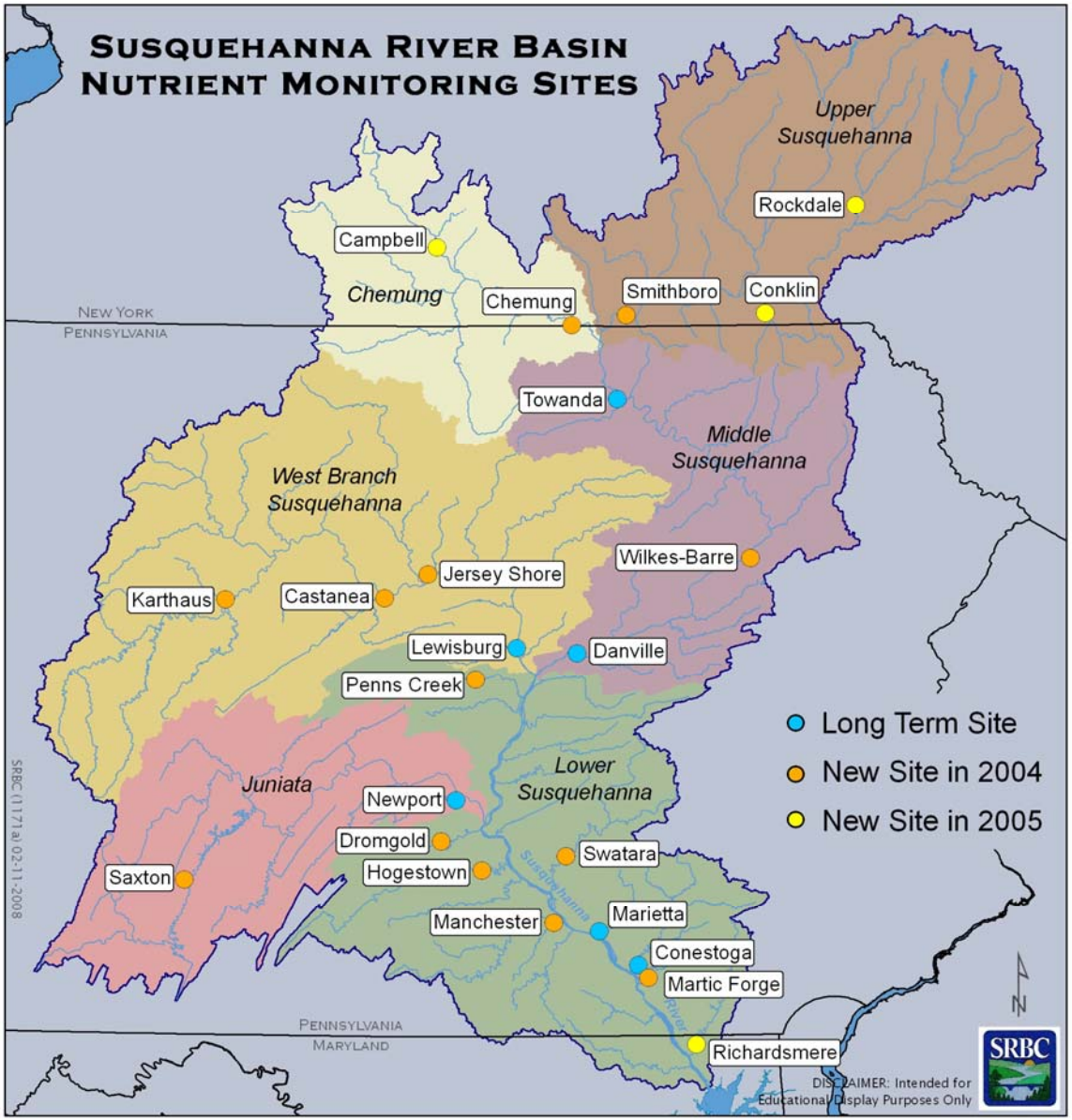
Provides baseline to determine improvement and track progress over time.

For calibrating models.

Where Do We Monitor?




LONG TERM MONITORING SITES
Chesapeake Bay Monitoring Program
Upper Susquehanna
Chemung
New York
Pennsylvania
TOWANDA
Middle Susquehanna
West Branch Susquehanna
LEWISBURG
DANVILLE
NEWPORT
Lower Susquehanna
Juniata
MARIETTA
CONESTOGA
CONOWINGO
Maryland
SRBC [13126] 05-23-2008
0
20
40
Miles
SRBC
DISCLAIMER: Intended for Educational Display Purposes Only.
Source: Susquehanna River Basin Commission and Conowingo results from USGS Baltimore, Maryland.


Susquehanna River Basin
Nutrient Monitoring Sites
Upper Susquehanna
Rockdale
Campbell
Chemung
Chemung
Smithboro
Conklin
New York
Pennsylvania
Towanda
Middle Susquehanna
West Branch Susquehanna
Wilkes-Barre
Jersey Shore
Karthaus
Castanea
Lewisburg
Danville
Penns Creek
Long Term Site
New Site in 2004
New Site in 2005
Lower Susquehanna
Juniata
Newport
Dromgold
Swatara
Hogestown
Saxton
Manchester
Marietta
Conestoga
Martic Forge
Pennsylvania
Maryland
Richardsmere
SRBC (1171a) 02-11-2008
DISCLAIMER: Intended for Educational/Display Purposes Only
SRBC

Who Does Our Monitoring?

When and What Do We Monitor?

Group A Stations

- Collect filtered and unfiltered base flow samples once a month.
- Collect storm runoff from at least four high flow events annually.
- Collect storm samples during rise and during peak flow.
- Analyze 21 parameters for nitrogen, phosphorus and sediment, including DO, pH, Temp.

Group A and B Stations

- Collect a "trends sample" at all stations at same time each month.

How Do We Monitor?

Collecting samples representative of river conditions is essential.

Take depth-integrated, discharge weighted samples across the cross section.

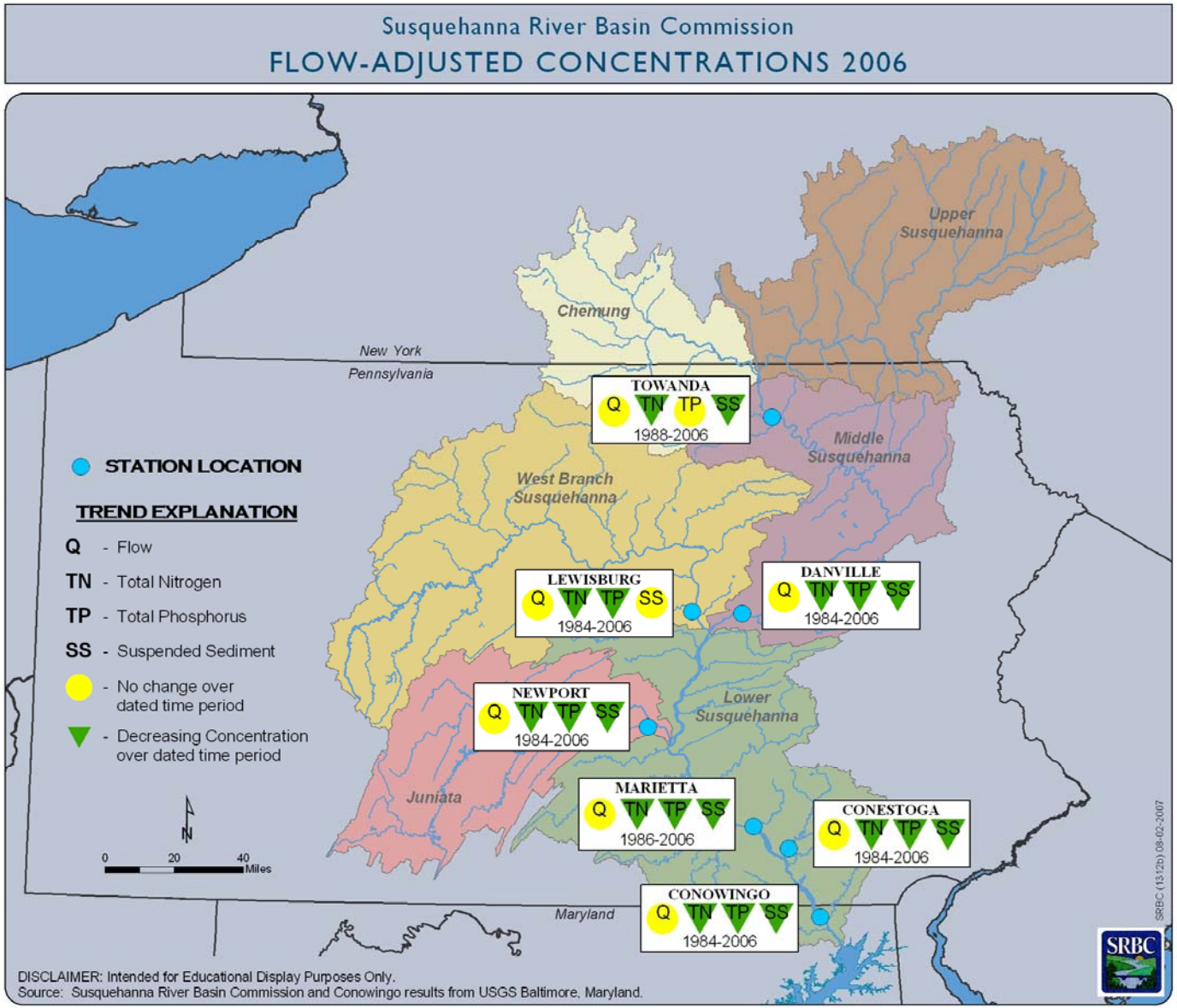
Collect data within same time frame at all locations provides representative conditions within a specified time period.

Produce QA/QC Plan that includes procedures for sampling, sample custody and documentation, calibration and maintenance of monitoring equipment.

How Do We Analyze Monitoring Data?

- Flow
  Natural changes in hydrology

- Flow-Adjusted Concentration
  - Concentration after affects of flow (high and low flows) are removed
  - An observed trend indicates that changes have occurred

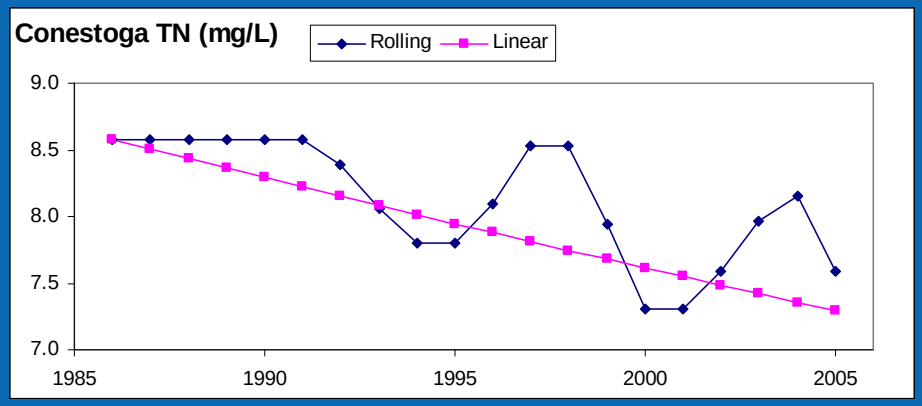

Susquehanna River Basin Commission
FLOW-ADJUSTED CONCENTRATIONS 2006
Upper Susquehanna
Chemung
New York
Pennsylvania
TOWANDA
Q TN TP SS
1988-2006
Middle Susquehanna
West Branch Susquehanna
STATION LOCATION
TREND EXPLANATION
Q - Flow
TN - Total Nitrogen
TP - Total Phosphorus
SS - Suspended Sediment
- No change over dated time period
- Decreasing Concentration over dated time period
LEWISBURG
Q TN TP SS
1984-2006
DANVILLE
Q TN TP SS
1984-2006
NEWPORT
Q TN TP SS
1984-2006
Lower Susquehanna
Juniata
MARIETTA
Q TN TP SS
1986-2006
CONESTOGA
Q TN TP SS
1984-2006
CONOWINGO
Q TN TP SS
1984-2006
Maryland
0 20 40 Miles
SRBC (13/2b) 08-02-2007
SRBC
DISCLAIMER: Intended for Educational Display Purposes Only.
Source: Susquehanna River Basin Commission and Conowingo results from USGS Baltimore, Maryland.

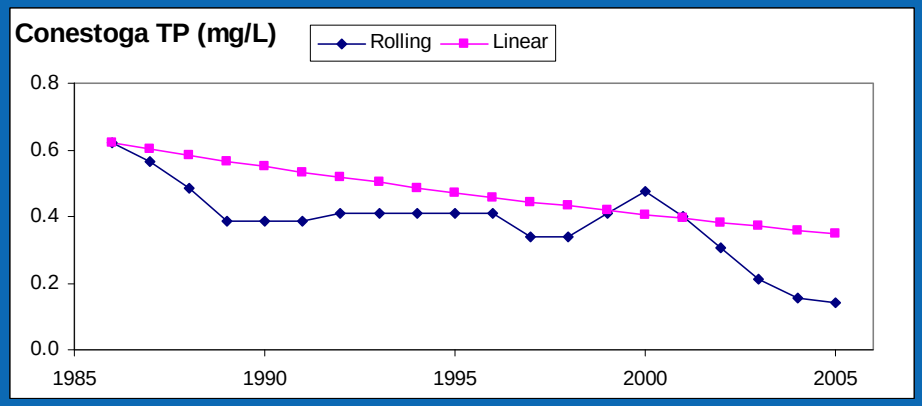
5 Year Center	TN						TP						SS					
	Con	New	Lew	Tow	Dan	Mar	Con	New	Lew	Tow	Dan	Mar	Con	New	Lew	Tow	Dan	Mar
1987	●	▼	▼		▼		▼	●	●		●		●	●	●		●	
1988	●		▼		●		▼		▼		▼		▼		●		▼	
1989	●		●		●	●	▼		▼		▼	▼	▼		●		▼	▼
1990	●		●		▲	●	●		●		●	●	▼		●		●	▼
1991	●		●	▼	▼	●	●		●	●	●	●	●		●	●	●	●
1992	▼		●	▼	▼	▼	▲		●	●	●	●	●		●	●	●	▼
1993	▼		●	▼	▼	▼	●		●	●	●	●	●		●	●	●	▼
1994	▼		●	●	▼	▼	●		●	●	●	●	●		▲	▲	●	●
1995	●	●	●	●	●	●	●	▼	●	●	▼	●	●	●	▲	▲	●	●
1996	▲	●	▼	●	●	●	●	▼	▼	▼	▼	▼	▼	●	●	●	●	▲
1997	▲	▲	●	▲	▲	▲	▼	●	●	▼	▼	●	●	●	▲	●	●	▲
1998	●	▲	●	●	●	●	●	▲	▲	▲	▲	▲	●	▲	●	●	●	●
1999	▼	●	▲	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	●	●	▲
2000	▼	●	●	▼	▼	●	▲	▲	▲	▲	▲	▲	▲	▲	●	●	●	●
2001	●	▼	●	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
2002	▲	▲	▲	●	●	●	▼	▼	▼	▼	●	▼	▼	▼	●	●	●	▼
2003	▲	▲	●	●	▼	●	▼	▼	▼	●	●	▼	▼	▼	▼	●	●	▼
2004	▲	●	▼	●	▼	●	▼	▼	▲	▲	▲	▼	▼	●	●	●	●	●
2005	▼	▼	▼	▼	▼	▼	▼	●	▲	▲	▲	▼	●	●	●	●	●	●
ALL	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	▼	▼	▼	▼	▼	▼	▼	▼
92-07	▼	▲	▼	▼	▼	▼	▼	●	●	●	●	●	▼	●	▼	▼	▼	●
97-07	▼	●	●	▼	▼	▼	▼	●	▲	▲	▲	▼	▼	▼	▼	▼	▼	▼

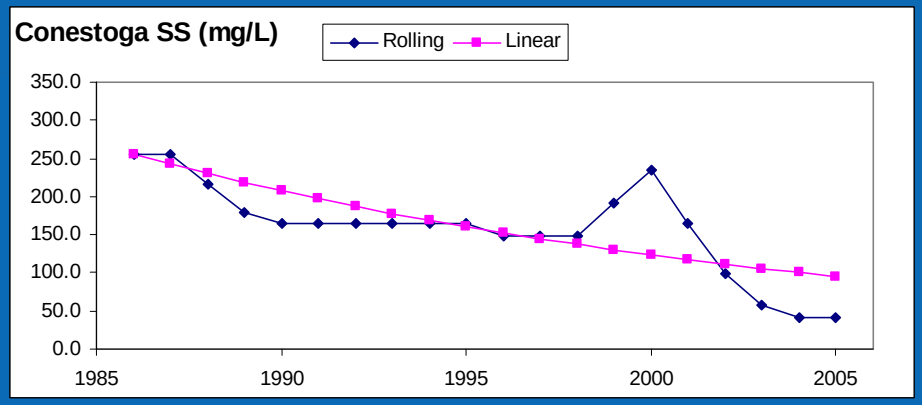
● - No trends present
X - Insufficient data for trend estimation
▲ - Increasing trends in constituent concentration
▼ - Decreasing trends in constituent concentration

ROLLING VS. LINEAR TRENDS

TN, TP, SS AT CONESTOGA STATION







Susquehanna Nutrient Assessment Program

- Concentrations -

Site	Flow		TN		TP		SS	
	LTM	2007	LTM	2007	LTM	2007	LTM	2007
Towanda	11,866	11,243	1.21	1.00	0.104	0.105	133	80
Danville	16,512	16,466	1.36	1.03	0.116	0.115	103	52
Lewisburg	10,881	8,965	1.10	0.88	0.064	0.060	60	24
Newport	4,380	3,309	1.87	1.70	0.096	0.044	59	18
Marietta	39,038	34,515	1.72	1.51	0.102	0.051	90	35
Conestoga	679	656	8.03	7.14	0.512	0.182	275	72

Bay Grasses (2007): Upper, Middle and Lower Bay

Upper Bay:
19,000 acres achieving 88% of goal

Middle Bay:
30,000 acres achieving 26% of goal

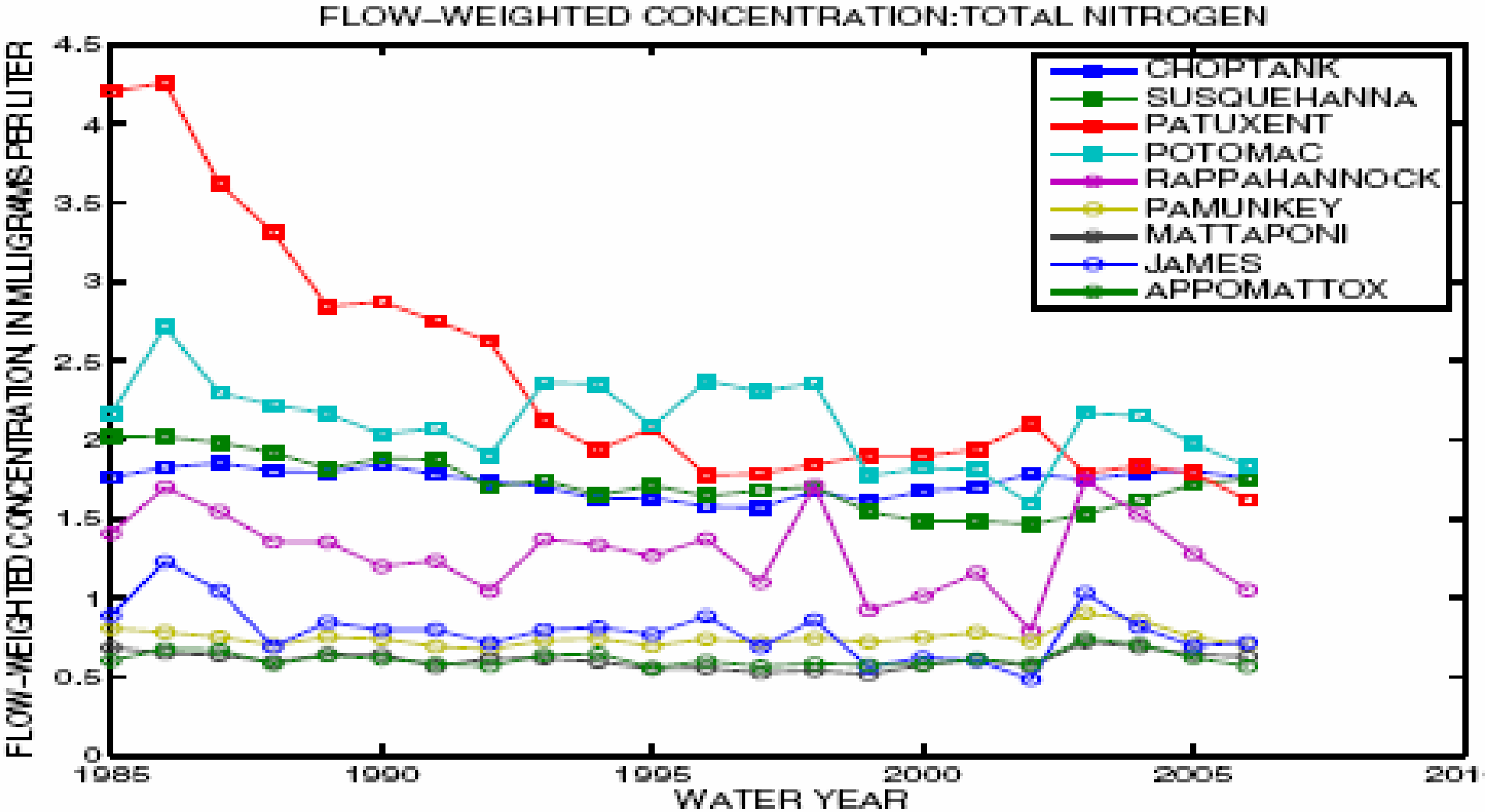
Lower Bay:
16,000 achieving 35% of goal

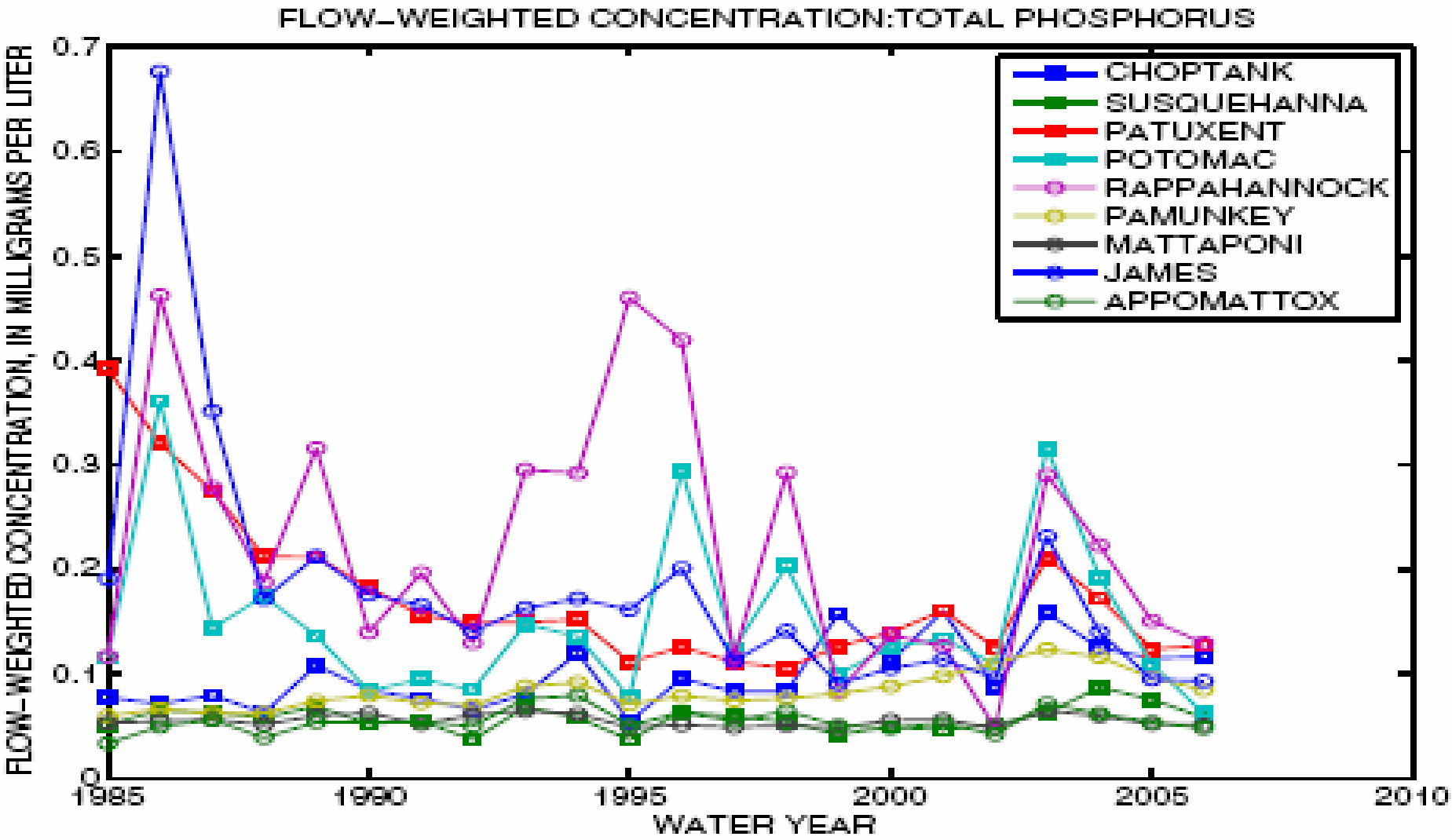
Comparison of Susquehanna River Water Quality to Bay

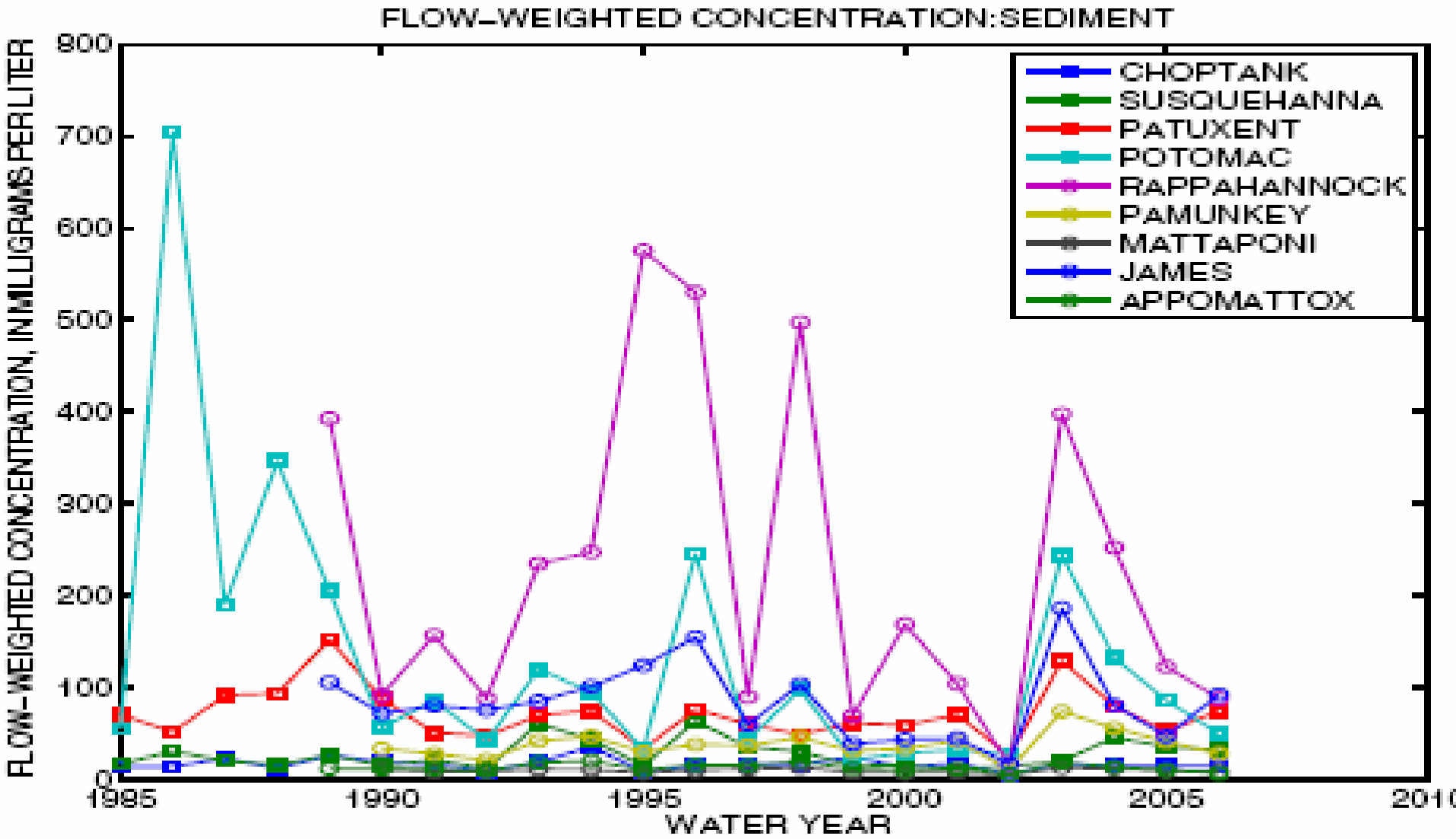
2007 Chesapeake Bay Health and Restoration Assessment Report

- nitrogen loads reaching Bay (318 million pounds) were similar to average load for 1990-2007.
- phosphorus load to Bay (15 million pounds) was below that average.
- sediment load to Bay (2.8 million tons) was below the average load for 1990-2007.

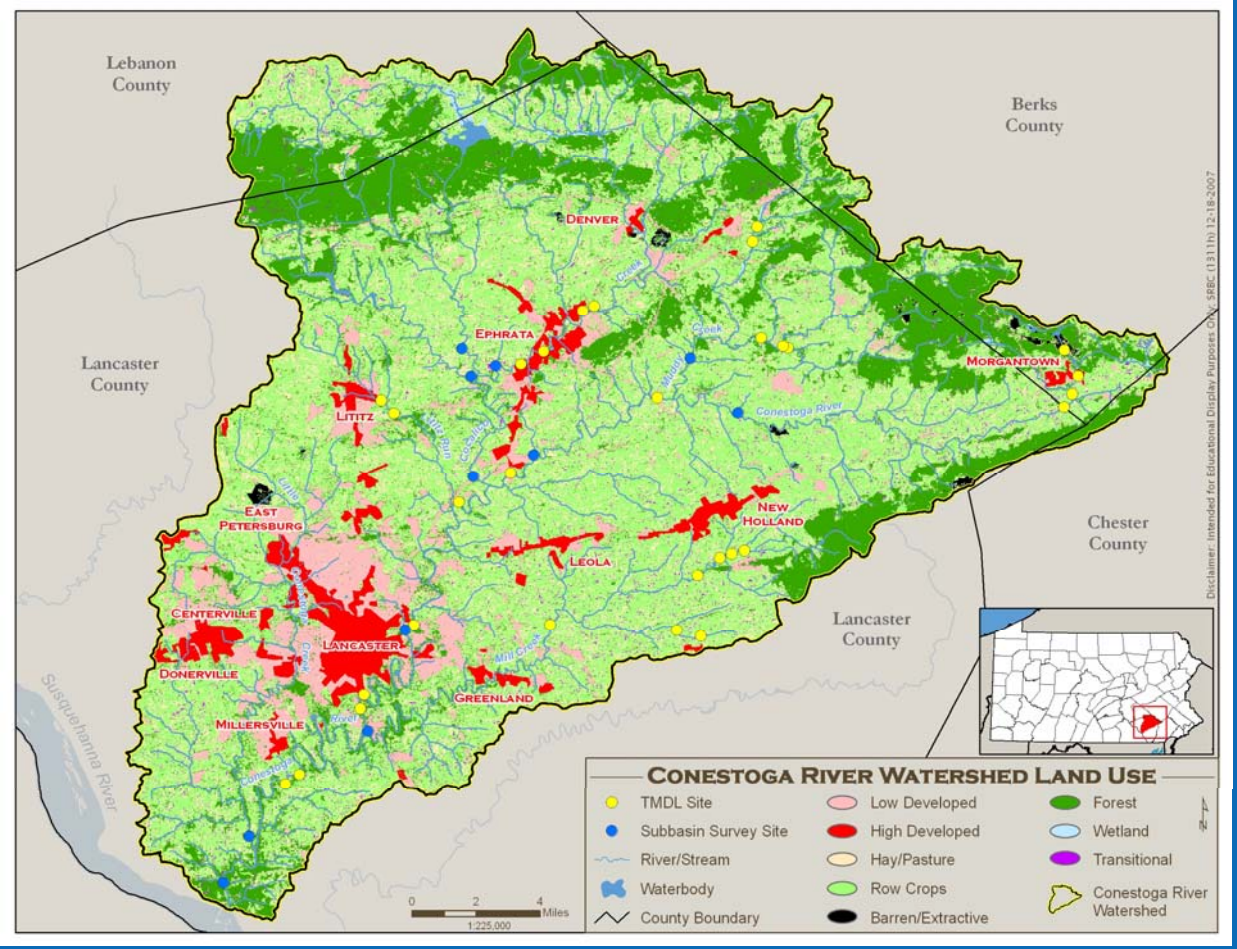
Overall – "*21 percent of the way toward meeting Bay water quality goals, a drop from 23 percent in 2006.*"


FLOW-WEIGHTED CONCENTRATION:TOTAL NITROGEN
FLOW-WEIGHTED CONCENTRATION, IN MILLIGRAMS PER LITER
WATER YEAR
CHOPTANK
SUSQUEHANNA
PATUXENT
POTOMAC
RAPPAHANNOCK
PAMUNKEY
MATTAPONI
JAMES
APPOMATTOX
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
1985
1990
1995
2000
2005


FLOW-WEIGHTED CONCENTRATION:TOTAL PHOSPHORUS
FLOW-WEIGHTED CONCENTRATION, IN MILLIGRAMS PER LITER
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1985
1990
1995
2000
2005
2010
WATER YEAR
CHOPTANK
SUSQUEHANNA
PATUXENT
POTOMAC
RAPPAHANNOCK
PAMUNKEY
MATTAPONI
JAMES
APPOMATTOX


FLOW-WEIGHTED CONCENTRATION:SEDIMENT
FLOW-WEIGHTED CONCENTRATION, IN MILLIGRAMS PER LITER
800
700
600
500
400
300
200
100
0
1985
1990
1995
2000
2005
2010
WATER YEAR
CHOPTANK
SUSQUEHANNA
PATUXENT
POTOMAC
RAPPAHANNOCK
PAMUNKEY
MATTAPONI
JAMES
APPOMATTOX

TMDL Development: A Focus on Conestoga River Watershed



TMDL Development: A Focus on Conestoga River Watershed

- Baseflow sampling for nutrients and sediment.
- Calculated nutrient and sediment contributions for the entire watershed and subwatersheds.
- In some places, during baseflow conditions, over 50% of stream flow is comprised of effluent from discharges.
- Next phase of monitoring will target normal and high flow conditions to document nonpoint source contributions.