Water Resources Trends in the Delaware River Basin

Watershed Advisory Council

July 24, 2001

Presentation Overview

- Data Needs
- Data Availability
- Data Gaps and Data Quality
- Examples

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Data Needs for Comprehensive Plan

- Historical Trends
- Current Conditions
- Projections of Future Conditions
- Performance Indicators

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KRA: Manage Water Resources for Sustainable Use

- Water Supply Availability
- Water Quality
- Water Uses

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Water Supply Availability Data

- Precipitation
- Snow Pack
- Stream Flow
- Reservoir Storage & Releases
- Base Flows Under Normal & Drought Conditions
- Groundwater Levels
- Stream Flow Models
- Ground Water Models

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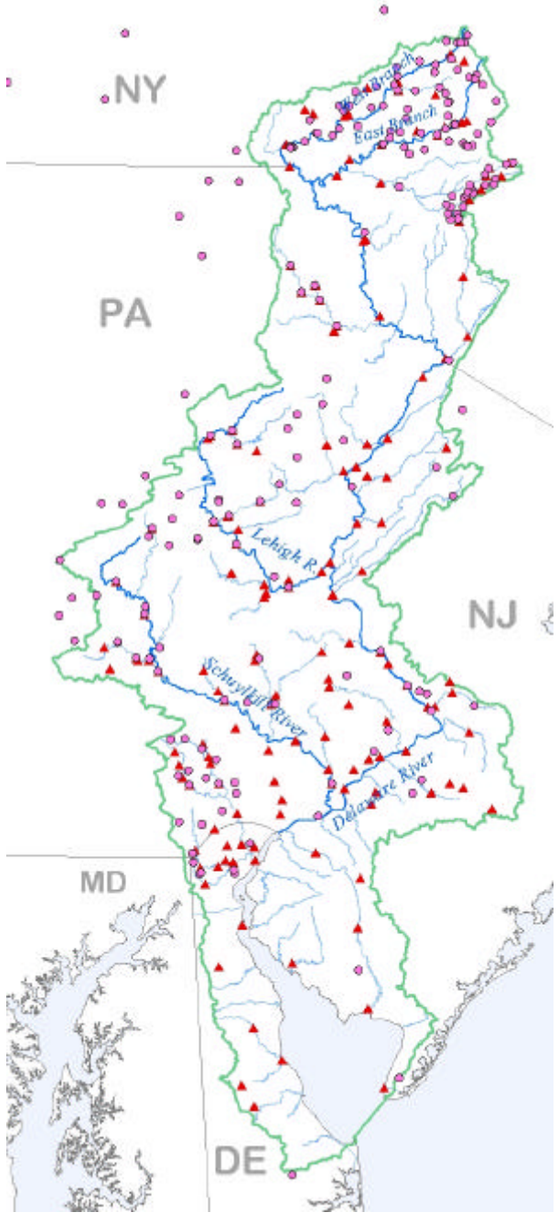
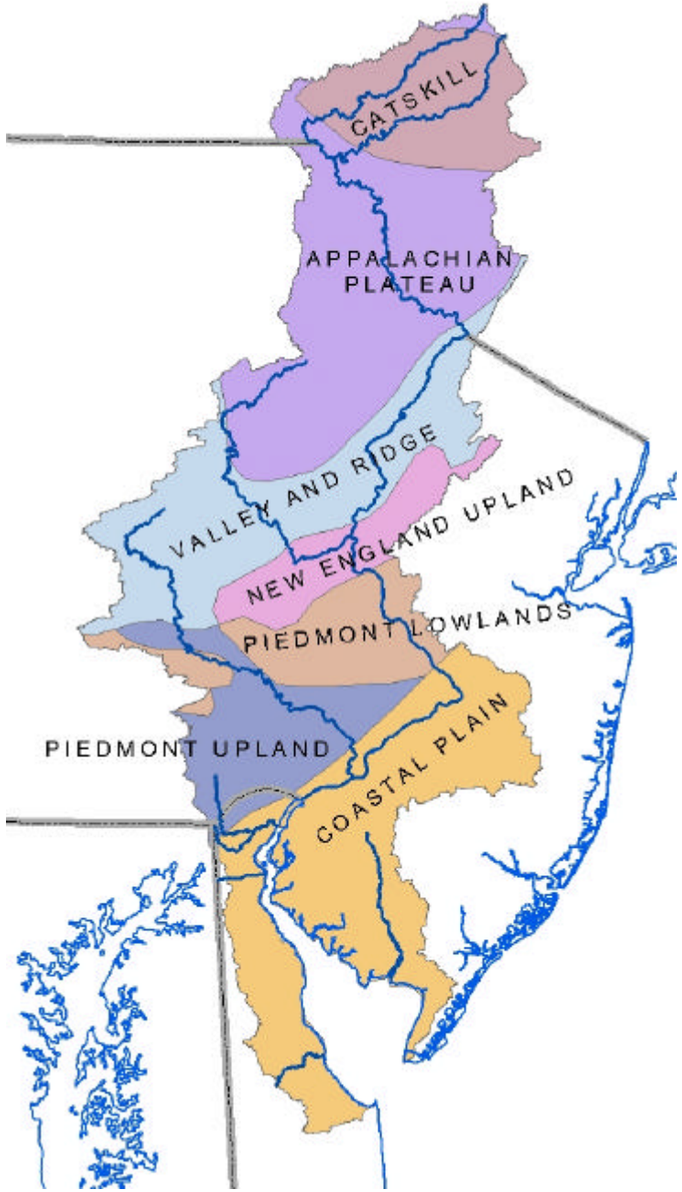


Stream and Precipitation Gage Network

▲ **Stream Gage**

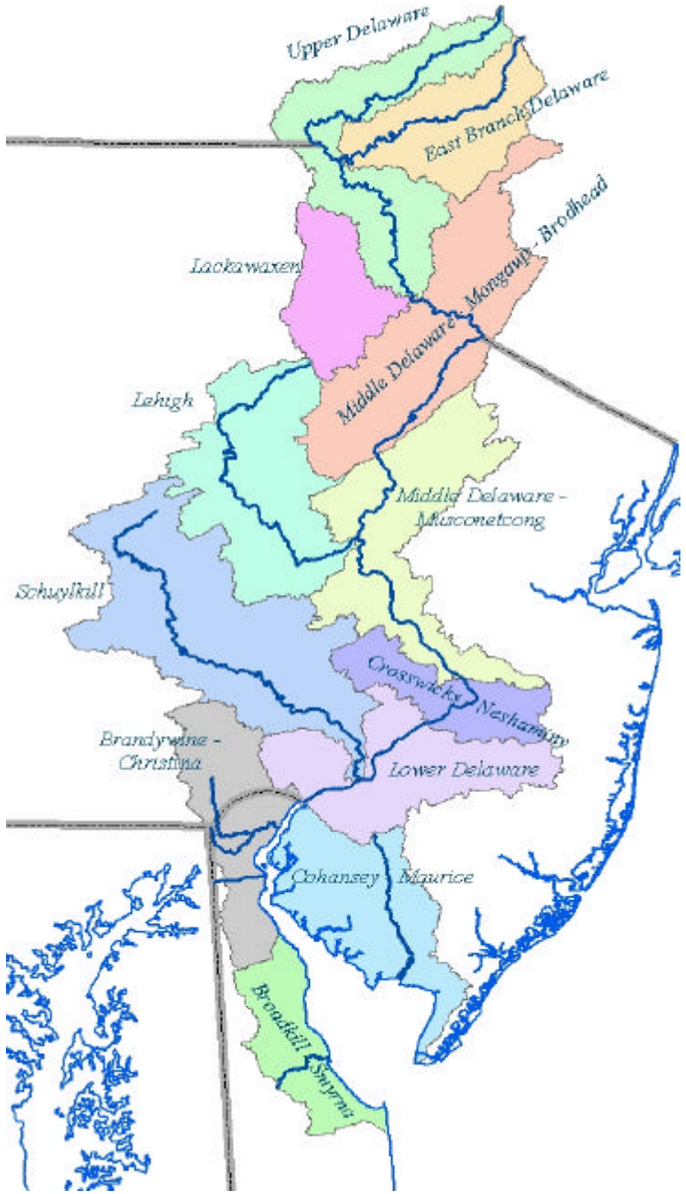
● **Precipitation Gage**



Geology of the Delaware River Basin

Baseflow values by Geology
in gallons per day per mi.^{2}

NAME	NORMAL	DROUGHT	PERCENT
APPALACHIAN PLATEAU	882,500	578,500	66%
CATSKILL	773,000	404,000	52%
COASTAL PLAIN	718,000	431,000	60%
NEW ENGLAND UPLAND	810,000	400,000	49%
PIEDMONT LOWLANDS	400,000	100,000	25%
PIEDMONT UPLAND	533,000	288,000	54%
VALLEY AND RIDGE	588,000	228,000	39%

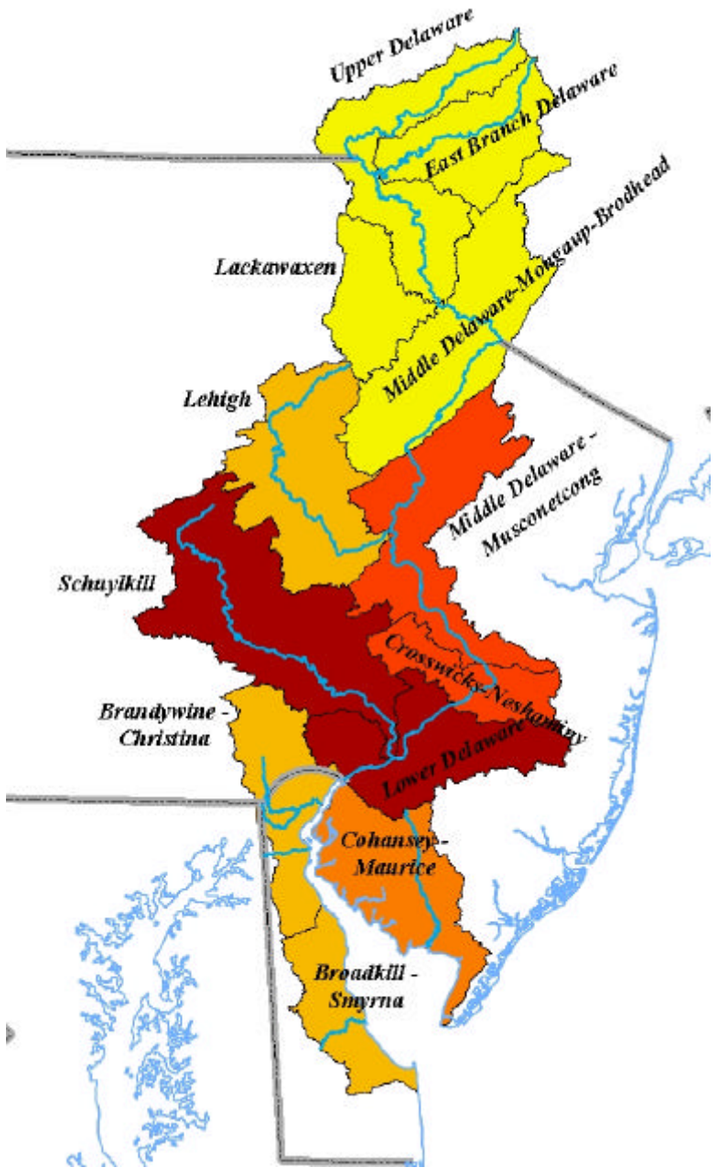


Watersheds in the Delaware River Basin

Baseflow values by Watershed in gallons per day per mi.^{2}

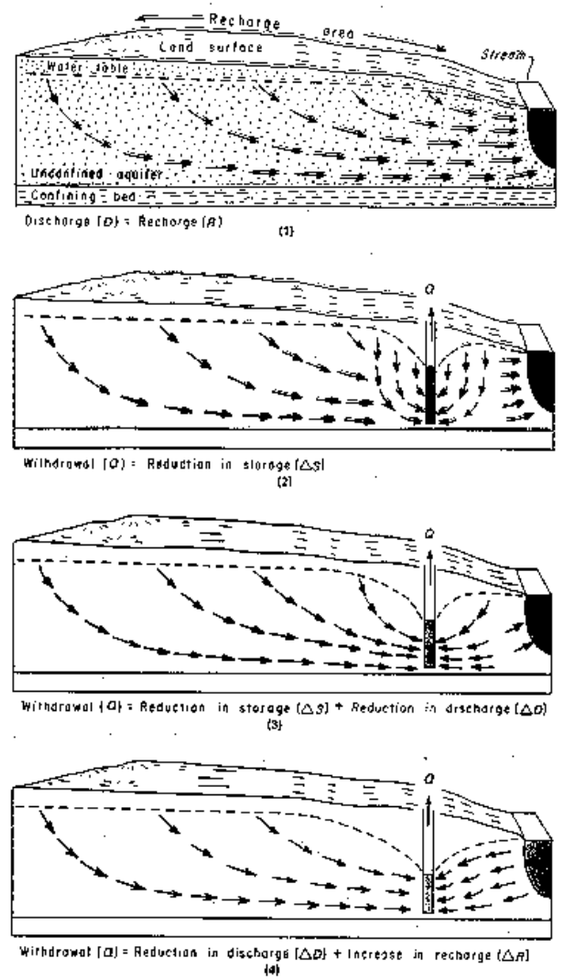
NAME	NORMAL	DROUGHT	PERCENT
Brandywine-Christina	605,795	342,396	57%
Broadkill-Smyrna	718,000	431,000	60%
Cohansey-Maurice	718,000	431,000	60%
Crosswicks-Neshaminy	601,004	311,788	52%
East Branch Delaware	789,212	421,034	53%
Lackawaxen	882,000	518,500	59%
Lehigh	731,431	361,930	49%
Lower Delaware	672,639	395,858	59%
Middle Delaware-Mongaup-Brodhead	805,603	442,722	55%
Middle Delaware-Musconetcong	611,622	258,959	42%
Schuylkill	543,963	226,943	42%
Upper Delaware	841,946	476,437	57%

Groundwater Withdrawals as a Percent of Drought Base Flows



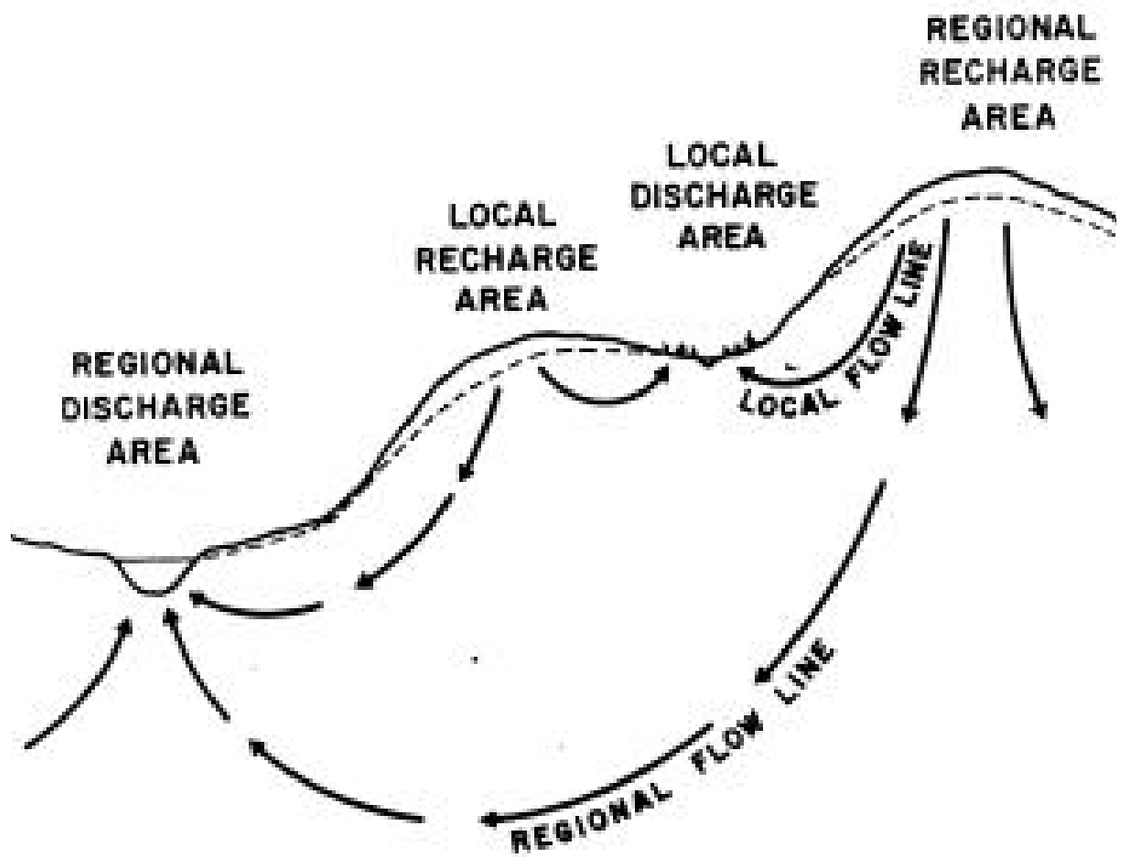
- < 5%
- 6% - 10%
- 11% - 15%
- 16% - 20%
- > 20%

Regional Flow



Source of Water Derived from Wells

Regional Flow



Southeastern Pennsylvania Ground Water Protected Area

Established in 1980 to:

•Provide for the effective management of ground water resources,

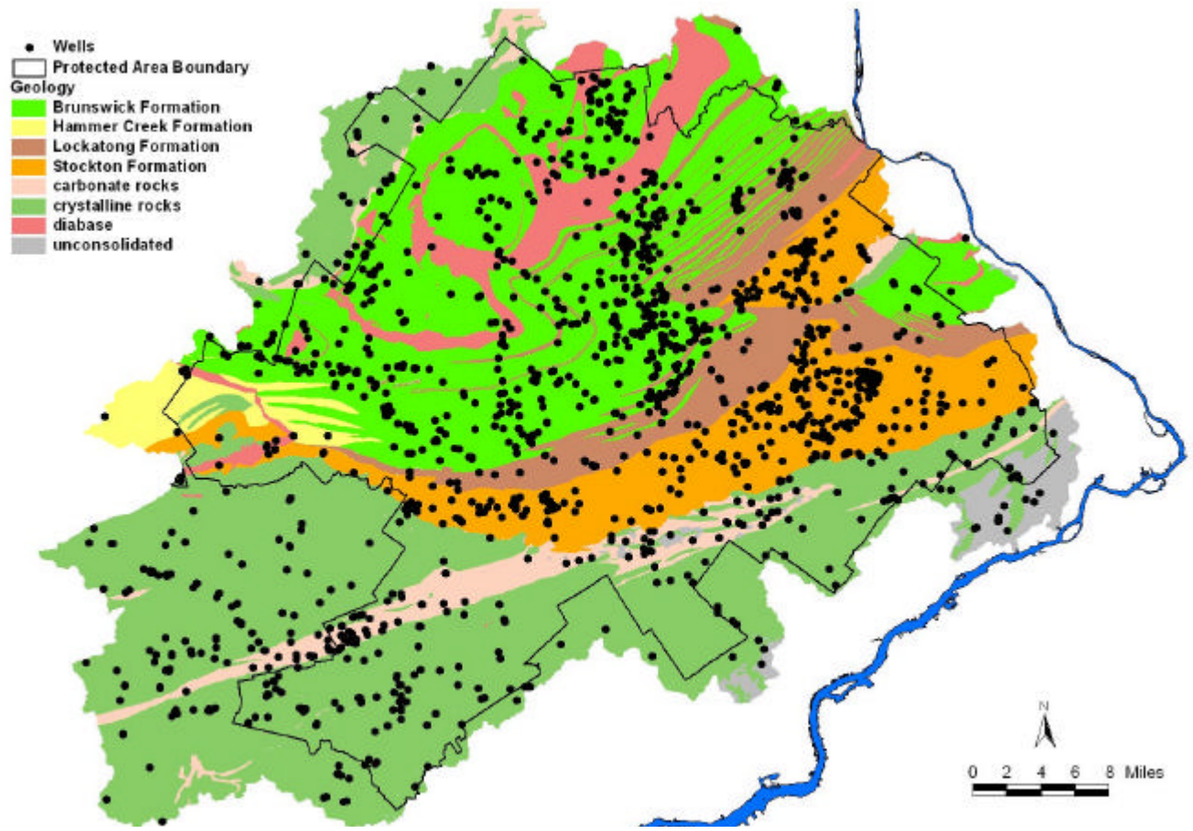
•Encourage water conservation,

•Protect the rights of present and future users of water,

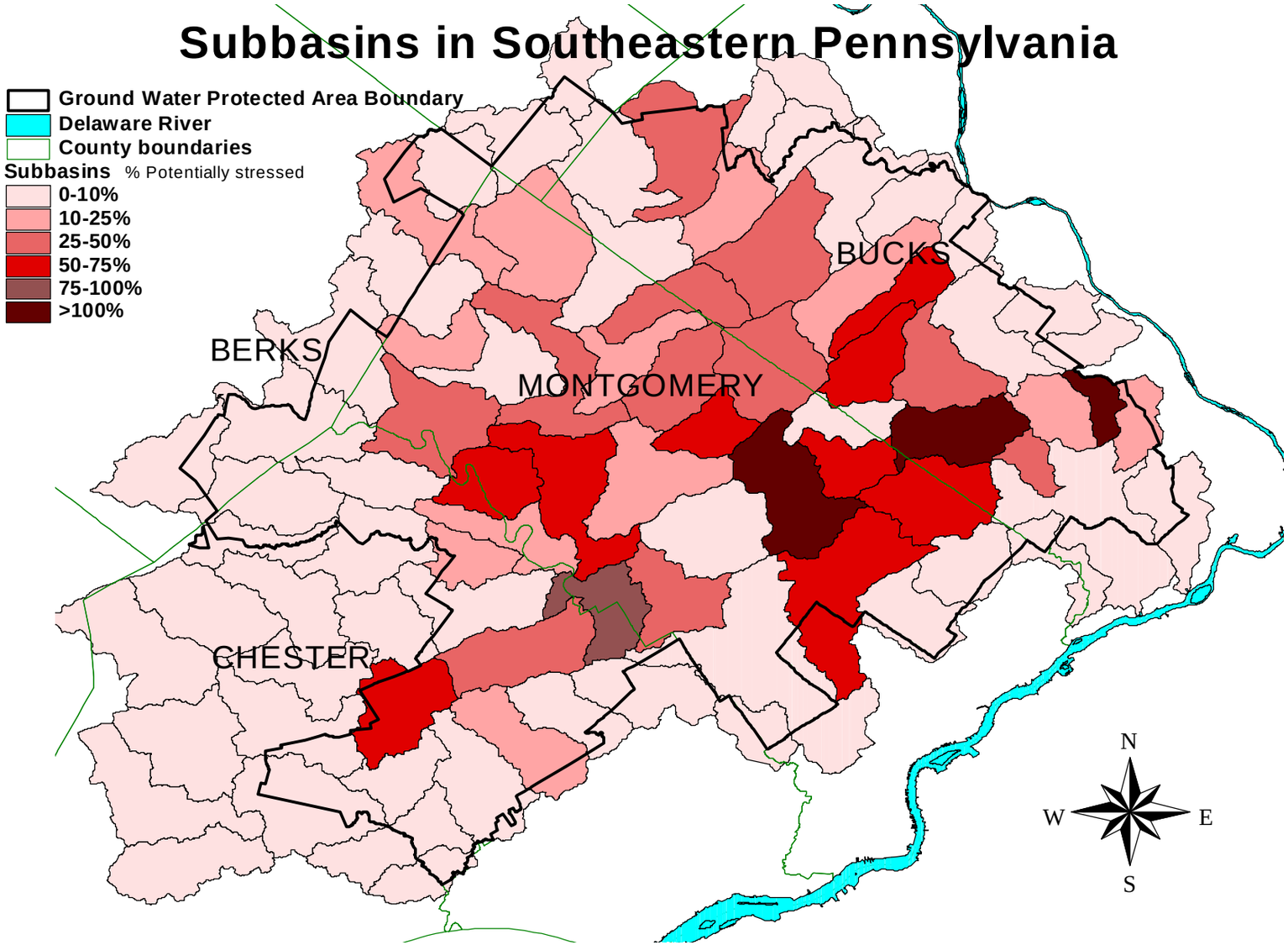
•Acquire additional information to more accurately plan and manage water resources.

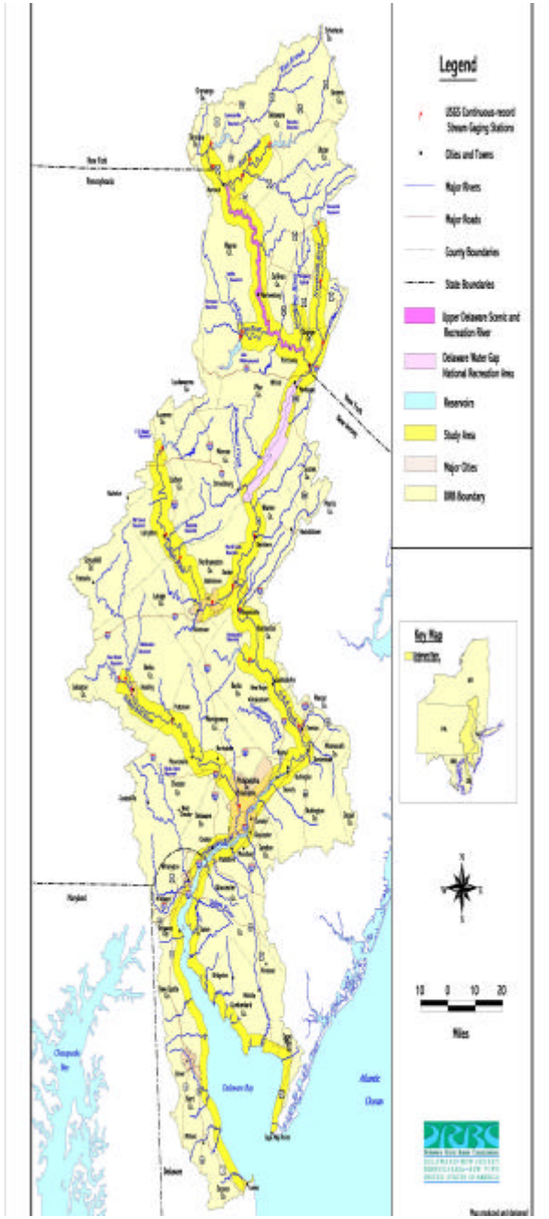
Southeastern Pennsylvania Ground Water Protected Area

Wells in the Ground Water Protected Area



Subbasins in Southeastern Pennsylvania

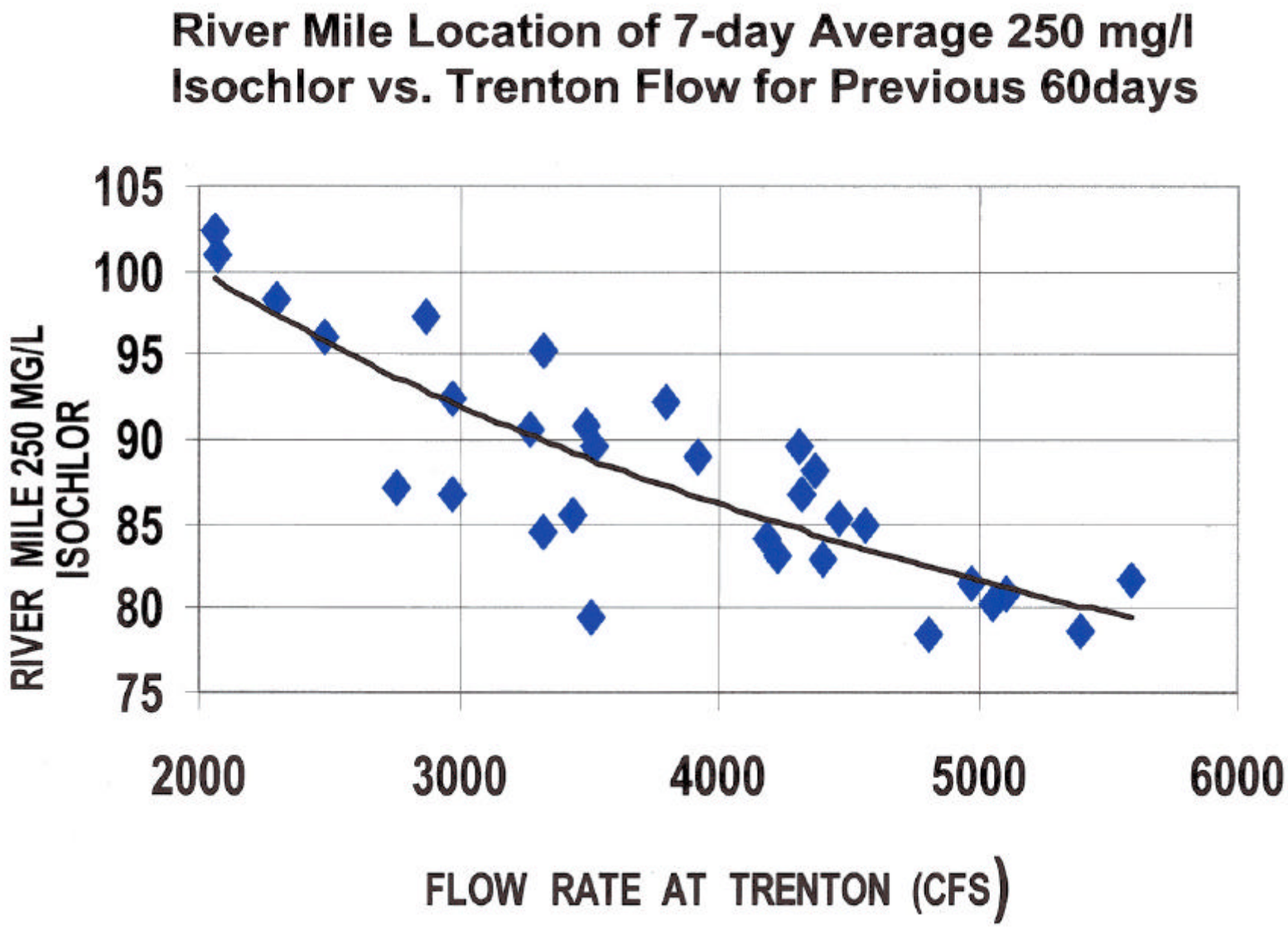




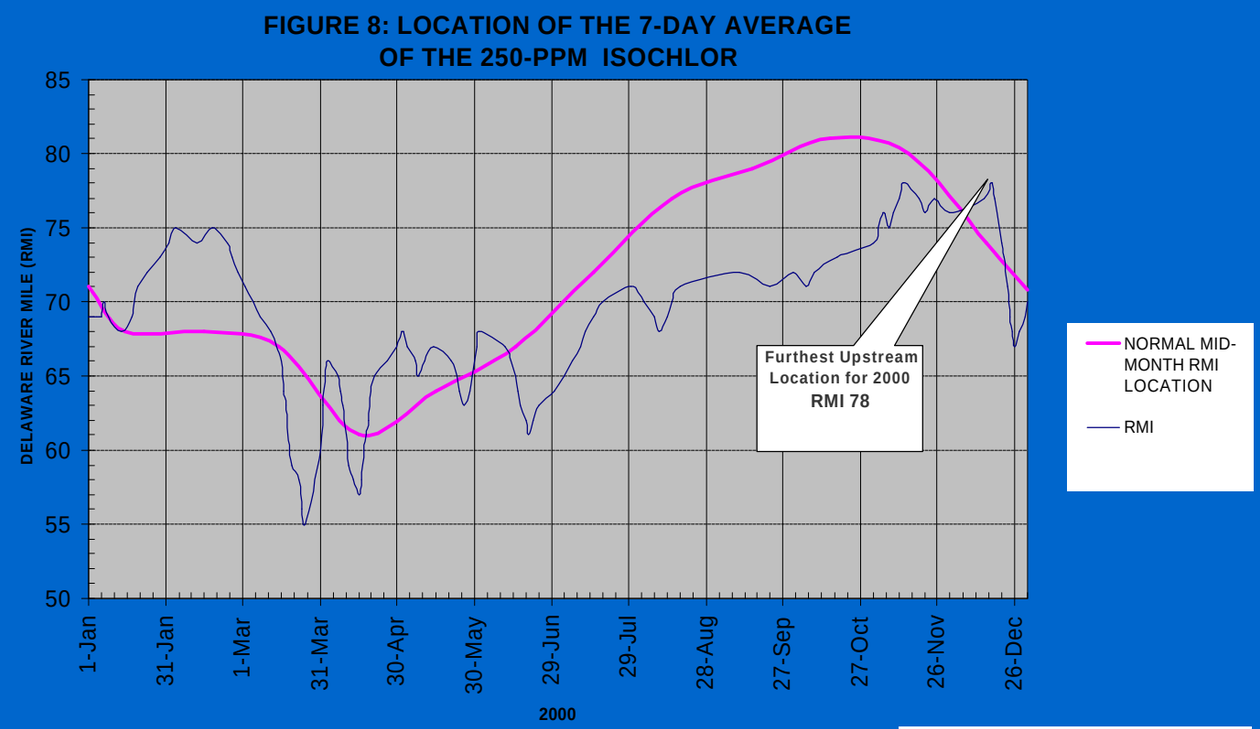
Interstate Flow Management Study Stream Segments

Legend

- USGS Continuous-record Stream Gaging Stations
- Cities and Towns
- Major Rivers
- Major Roads
- County Boundaries
- State Boundaries
- Upper Delaware Scenic and Recreation River
- Delaware Water Gap National Recreation Area
- Reservoirs
- Study Area
- Major Cities
- DRB Boundary


River Mile Location of 7-day Average 250 mg/l
Isochlor vs. Trenton Flow for Previous 60days
RIVER MILE 250 MG/L
ISOCHLOR
105
100
95
90
85
80
75
2000
3000
4000
5000
6000
FLOW RATE AT TRENTON (CFS)

250 ppm Chloride Concentration River Mile Location 2000



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Water Quality Data

- Temperature, pH, Oxygen, Dissolved Solids
- Nutrients *(e.g. nitrogen, phosphorous)*
- Bacteria *(e.g. fecal coliform)*
- Toxics *(e.g. metals, pesticides, PCBs)*
- Water Quality Models

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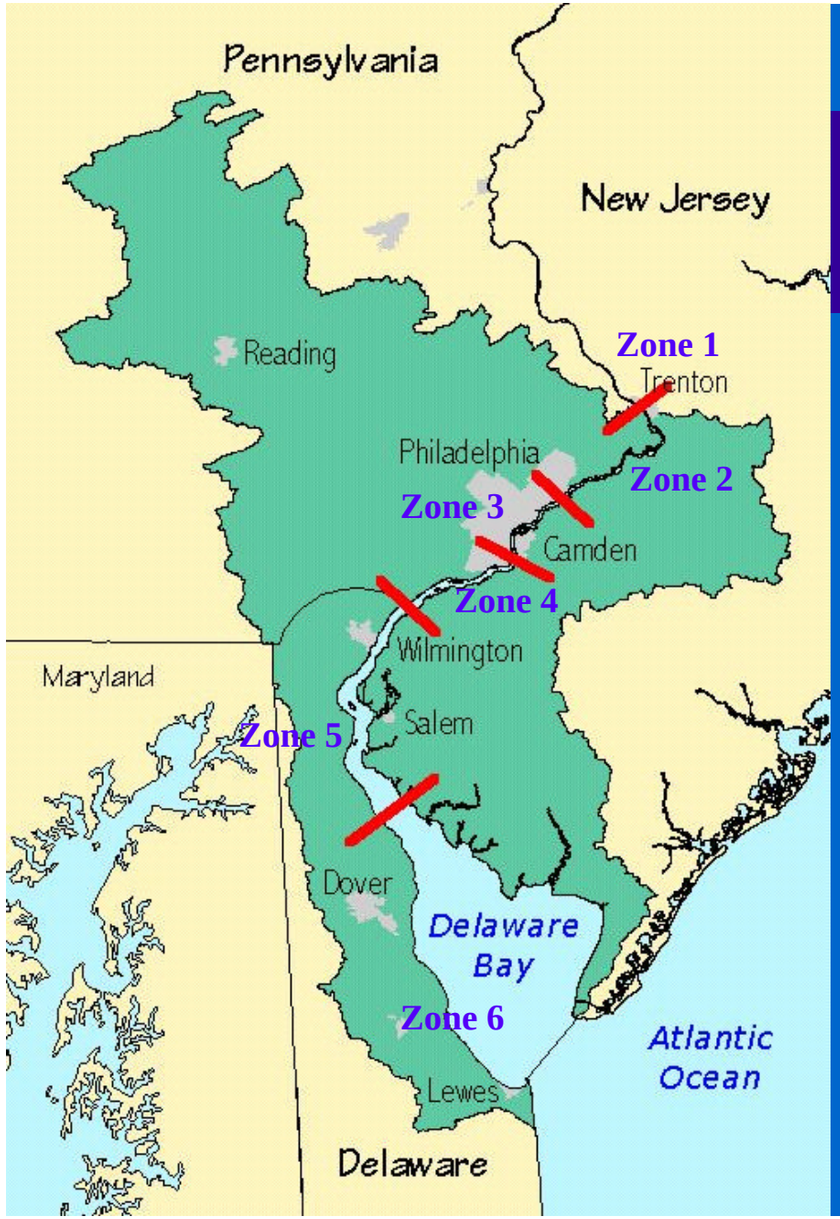
Water Quality Zones



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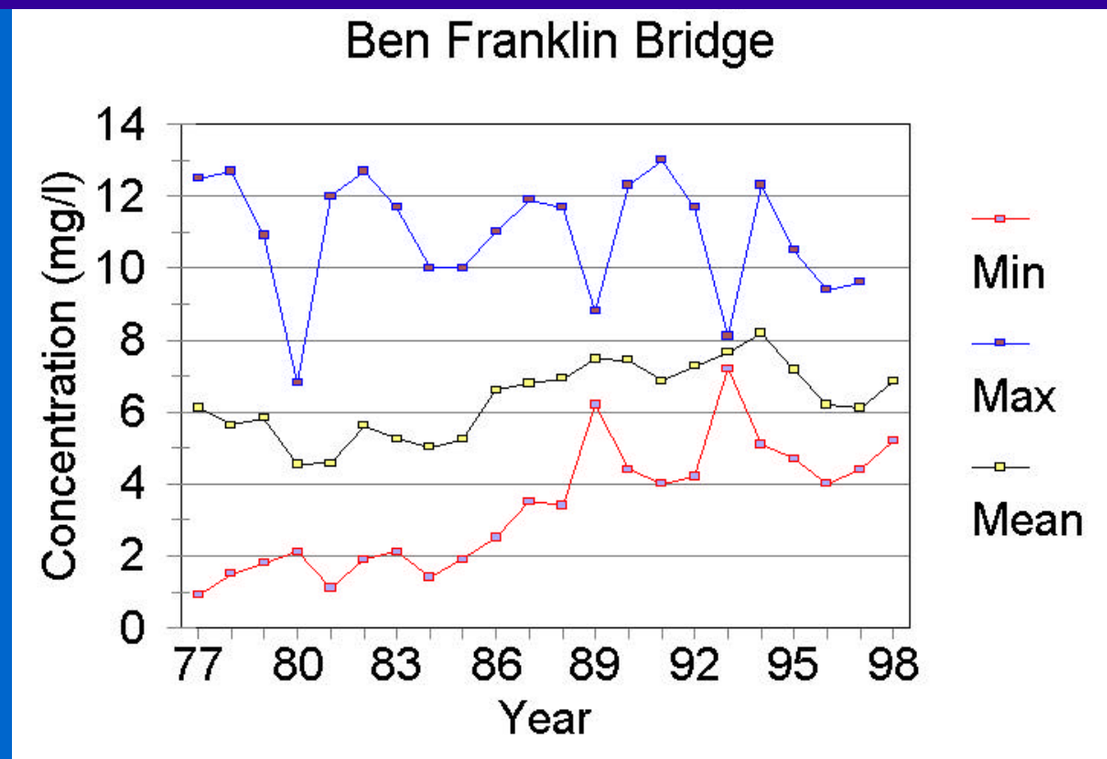
Dissolved Oxygen



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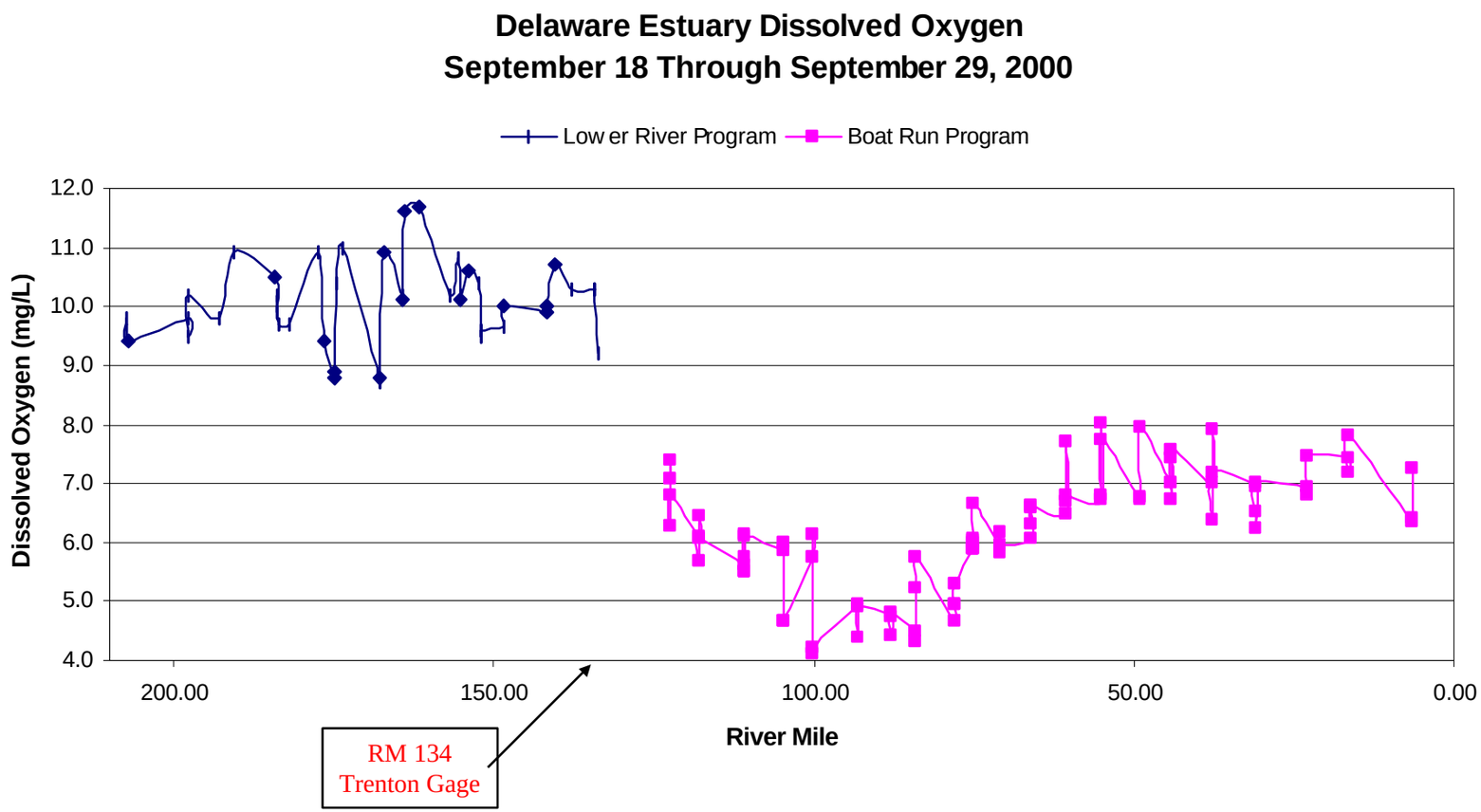
Dissolved Oxygen



Drinking Water Support

LEGEND

Degree of Support

- Full Support
- Full Support, but Threatened
- Partial Support
- No Support
- Not Assessed

Locations Approximate

Water Use Data

- Surface Withdrawals *(e.g. location, quantity)*
- Ground Water Withdrawals
- Wastewater Discharges
- Consumptive Water Use
- Water Demand Projections

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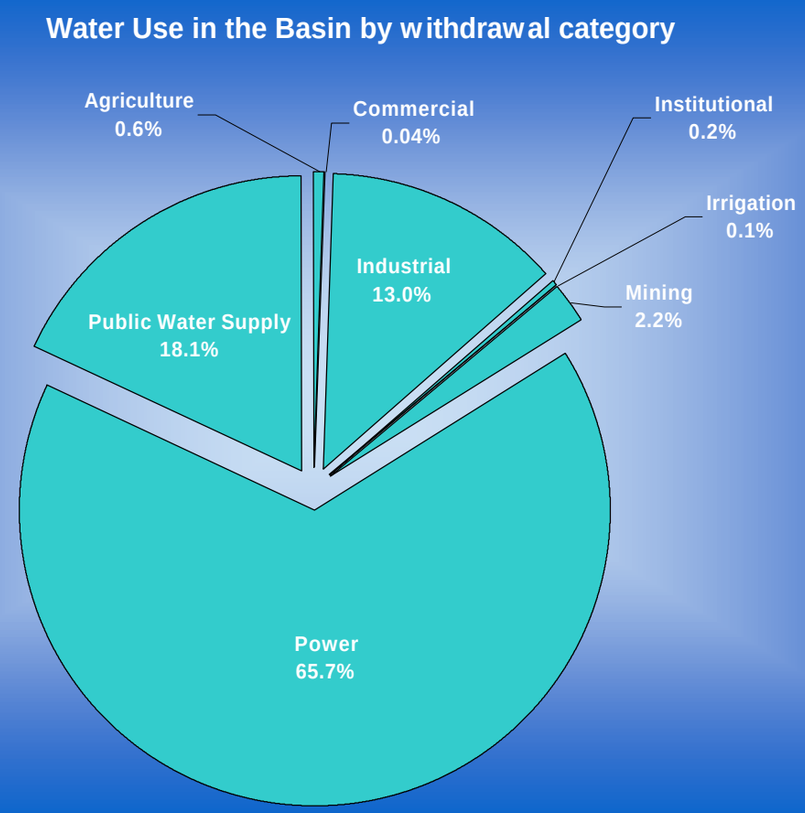
Water Use by Category



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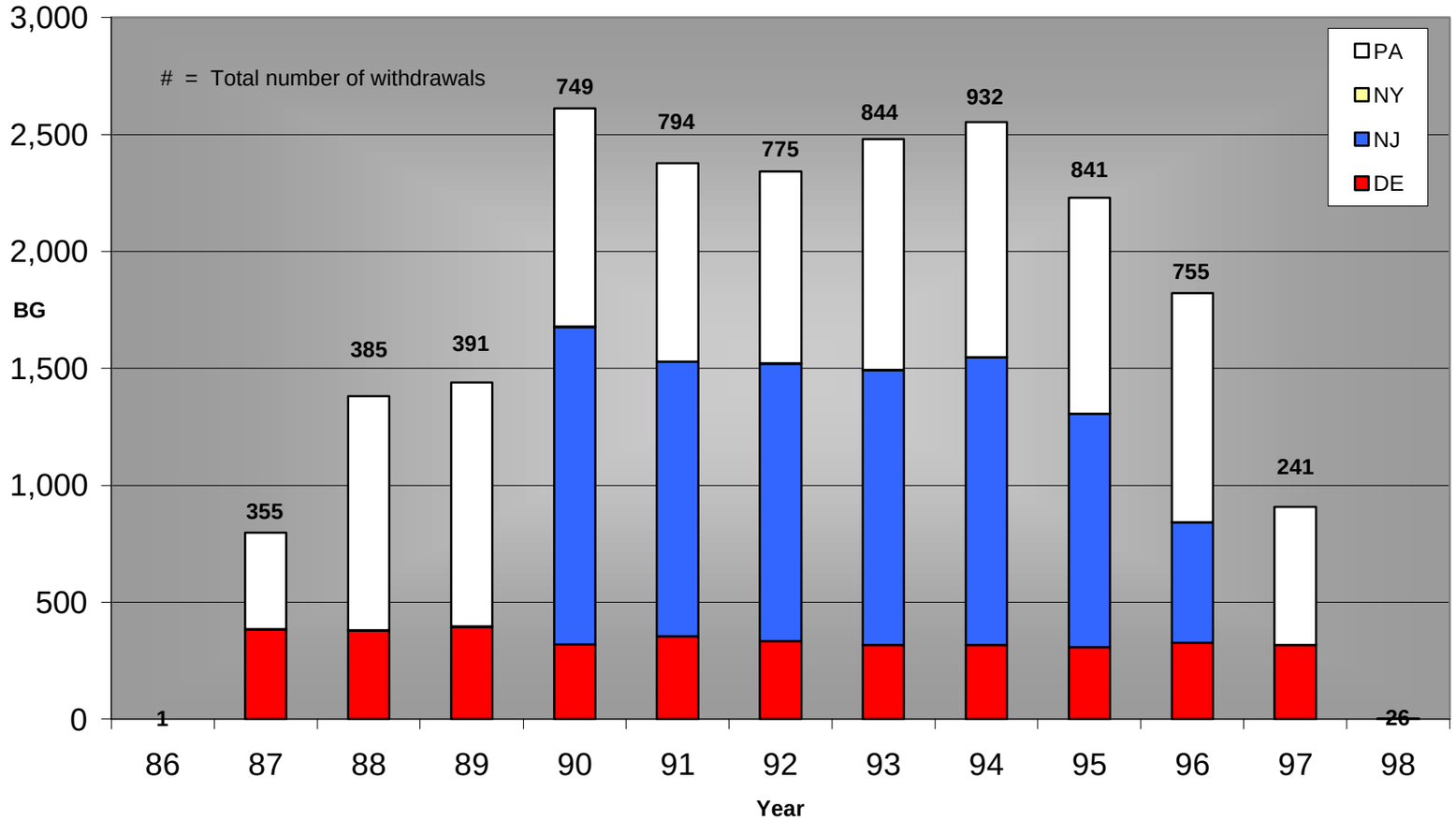
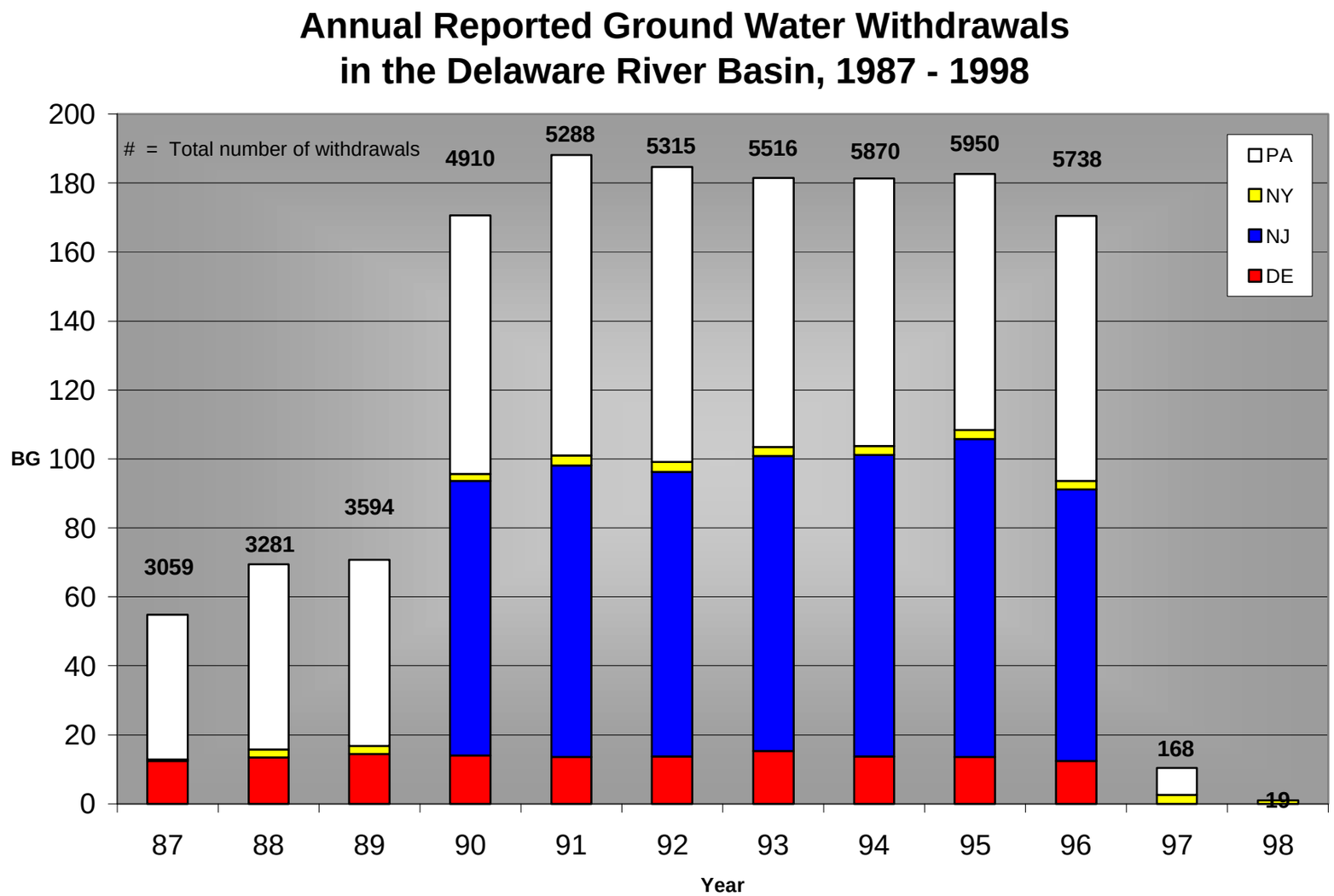
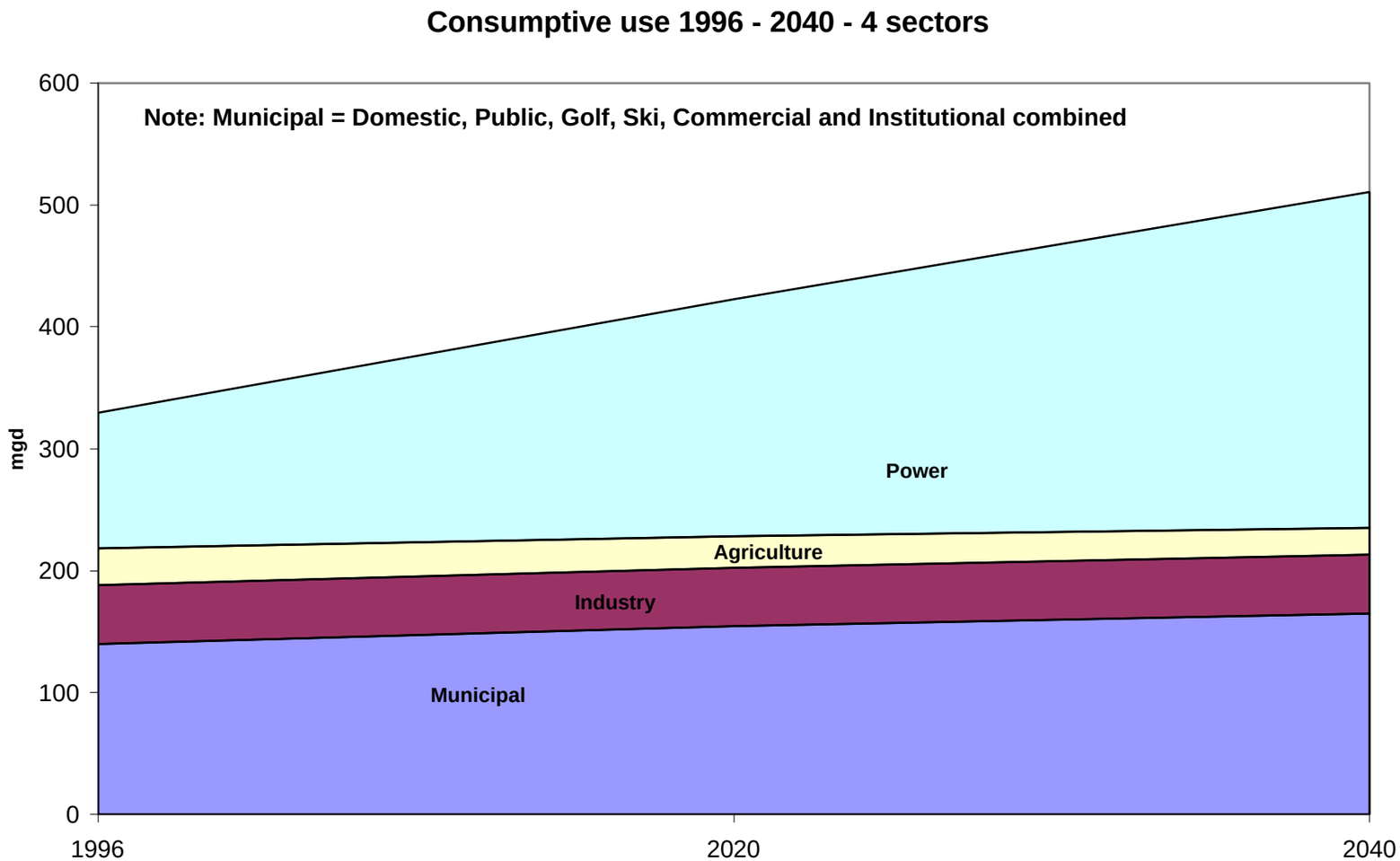
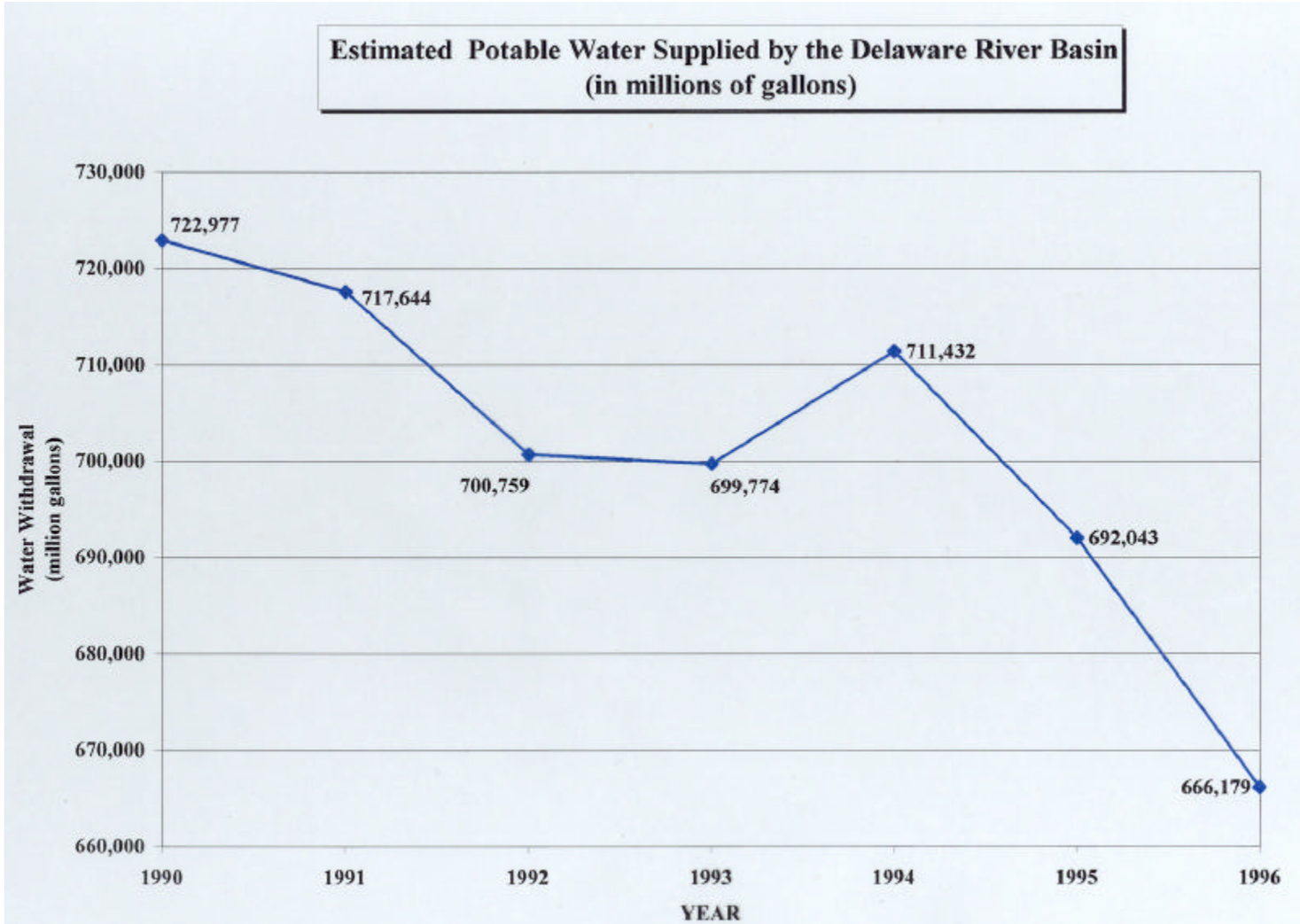
Annual Reported Surface Water withdrawals in the Delaware River Basin 1986 - 1998




Annual Reported Ground Water Withdrawals
in the Delaware River Basin, 1987 - 1998
= Total number of withdrawals
PA
NY
NJ
DE
BG
200
180
160
140
120
100
80
60
40
20
0
3059
3281
3594
4910
5288
5315
5516
5870
5950
5738
168
19
87
88
89
90
91
92
93
94
95
96
97
98
Year


Consumptive use 1996 - 2040 - 4 sectors
Note: Municipal = Domestic, Public, Golf, Ski, Commercial and Institutional combined
mgd
600
500
400
300
200
100
0
1996
2020
2040
Power
Agriculture
Industry
Municipal

Estimated Potable Water



KRA: Waterway Corridor Management

- Flood Loss Reduction
- Recreational Facilities
- Aquatic Ecosystems

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Flood Loss Reduction Data

- Stream Flow, Stage, and Discharge
- Flood Plain Maps
- NFIP Claims
- Flood Insurance Studies
- Precipitation

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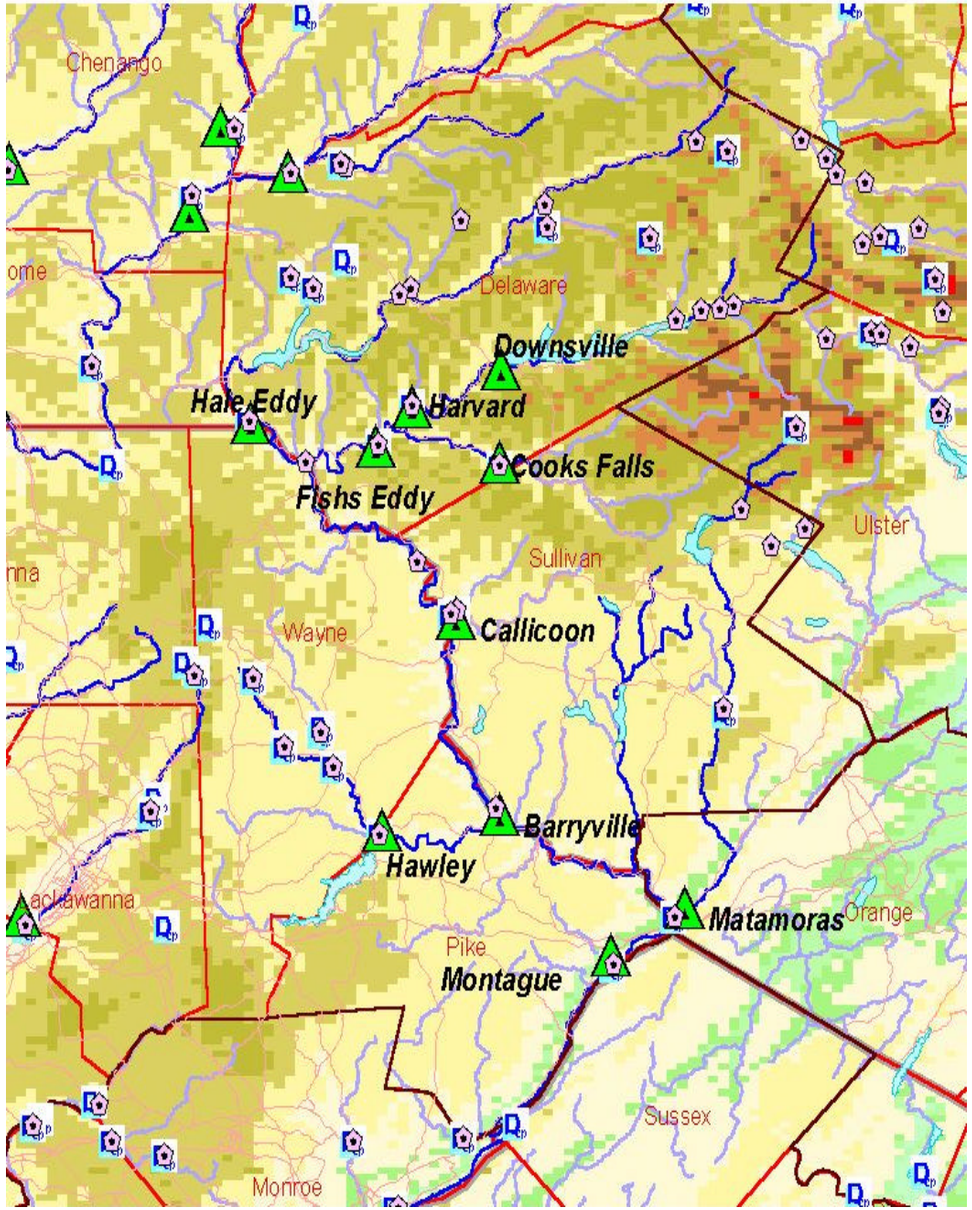
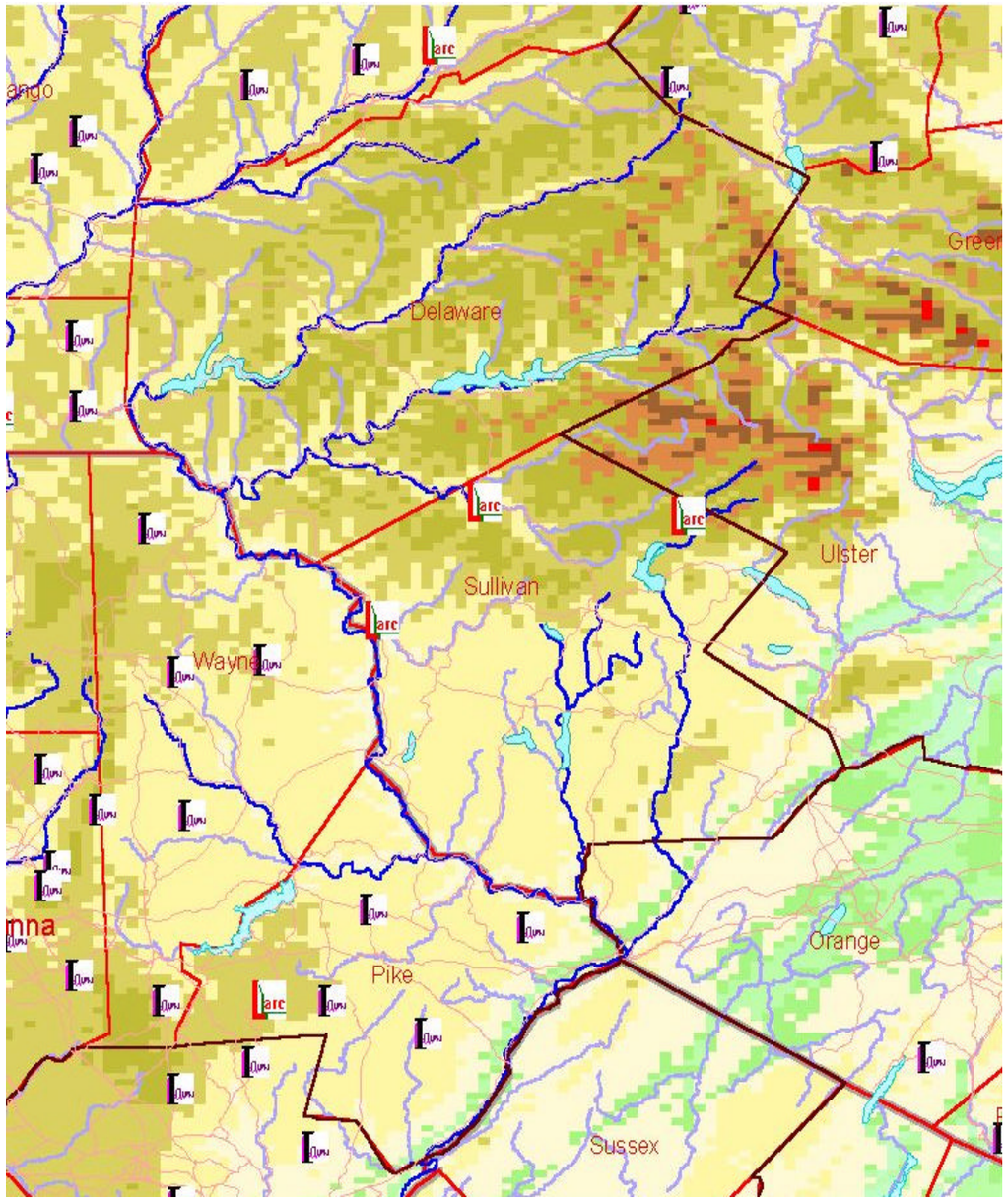
Stream Gages in the Upper Delaware Basin



USGS WEB AVAILABLE GAGE DATA

NWS BGM's Stream Forecast Points

DCP GAGE DATA

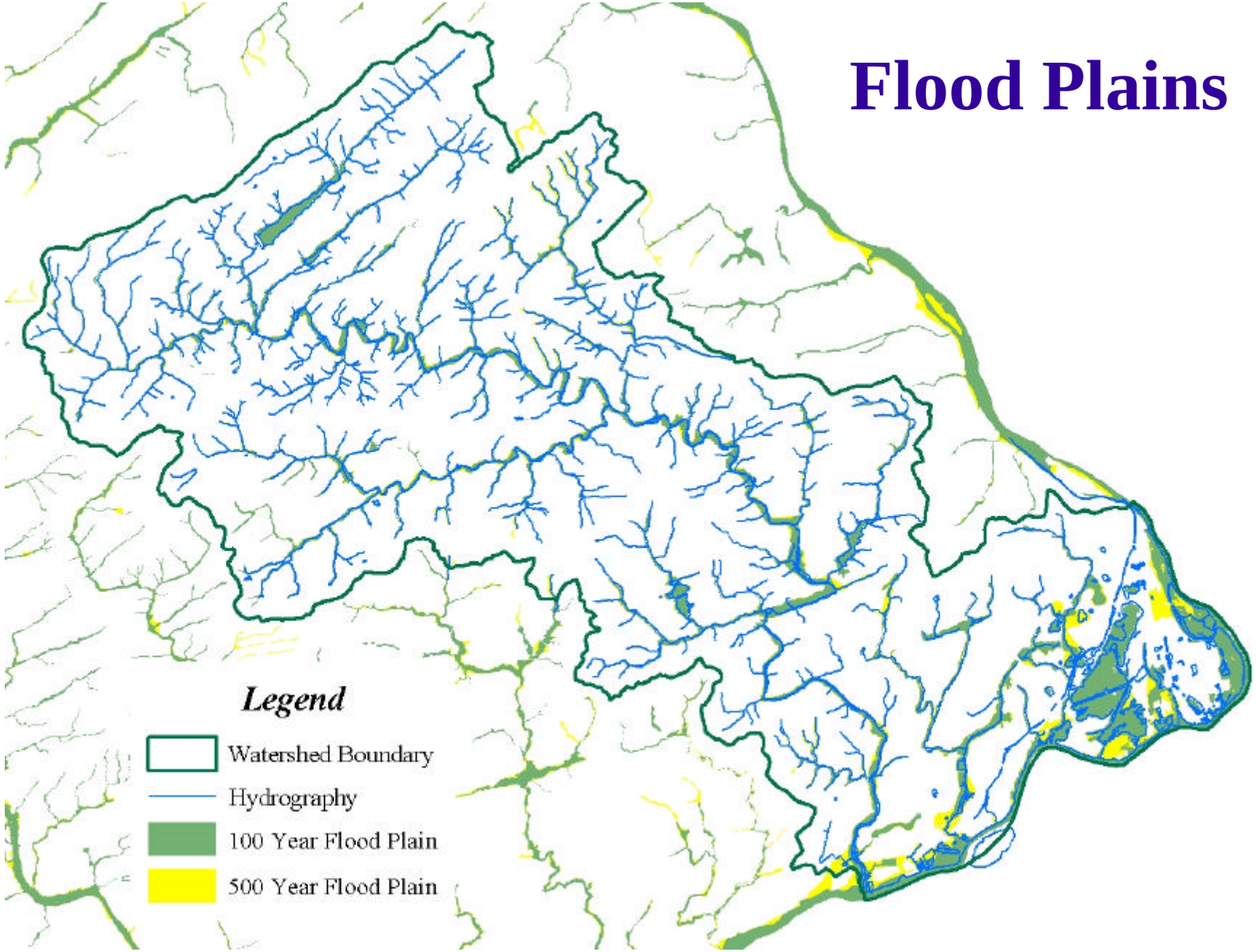


Stream Gages in the Upper Delaware Basin

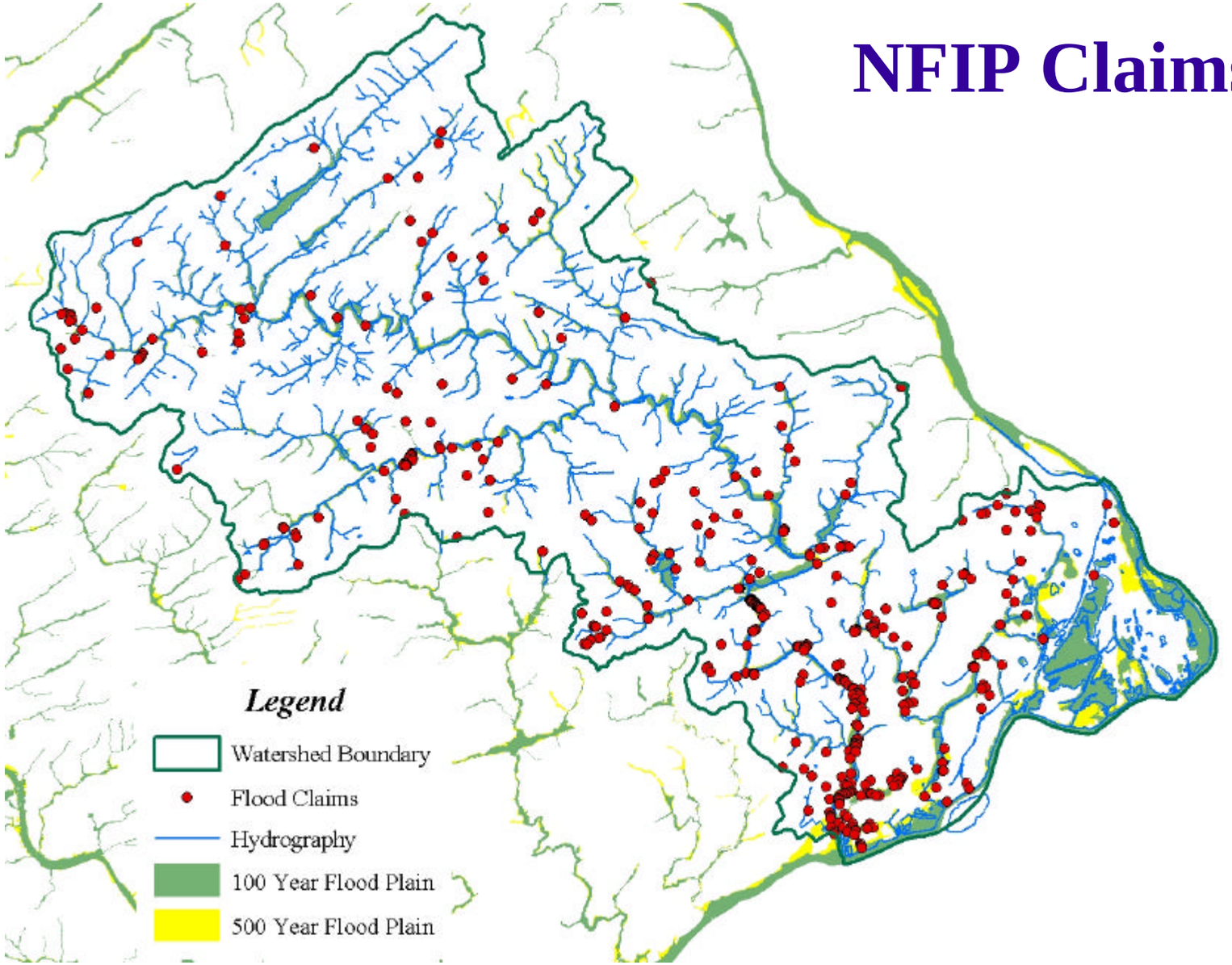
Real Time Rain Gage Locations
Used for Radar Estimated
Precipitation Verification

NWS BGM LARC RAIN GAGES
IFLOWS RAIN GAGES

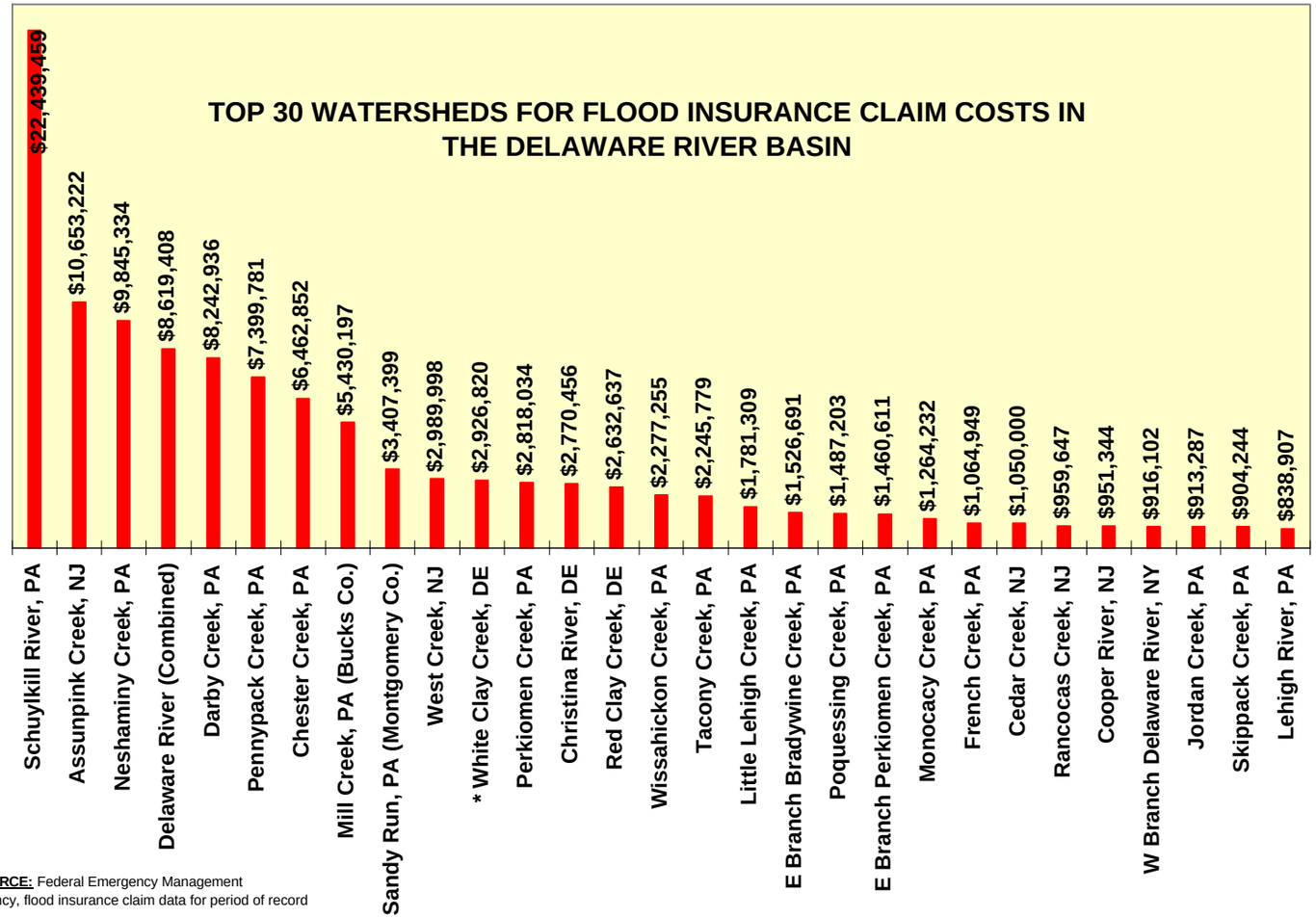
Flood Plains



NFIP Claims


Legend
Watershed Boundary
Flood Claims
Hydrography
100 Year Flood Plain
500 Year Flood Plain

NFIP Claim Costs



SOURCE: Federal Emergency Management Agency, flood insurance claim data for period of record

Flood Stage Forecast Mapping

The forecast flood stage can be electronically mapped to determine the properties and roads to be flooded.

Source: U.S. Army corps of Engineers – Philadelphia District

Recreational Facilities Data

- National Park Service Maps
- Federal, State, Local Parks
- Recreational Facility Plans

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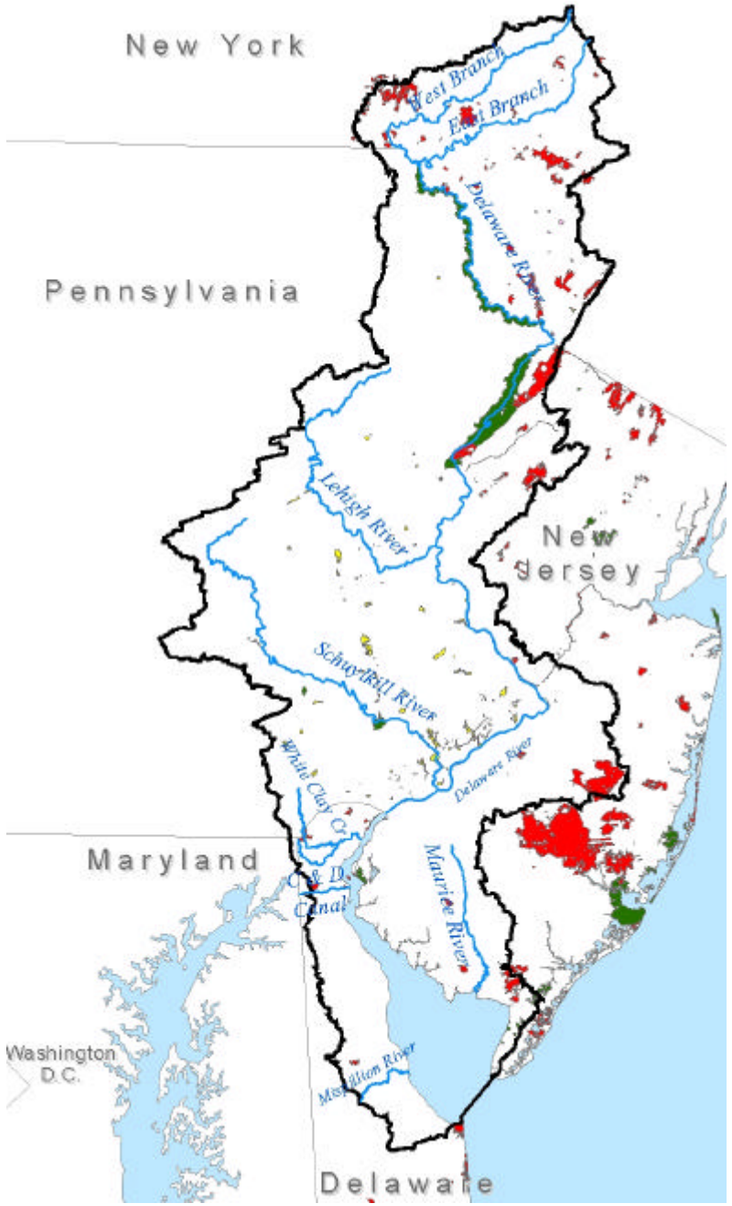
Federal, State, and Local Parks



Legend

- Federal
- State
- County
- Municipal

Wild and Scenic Rivers

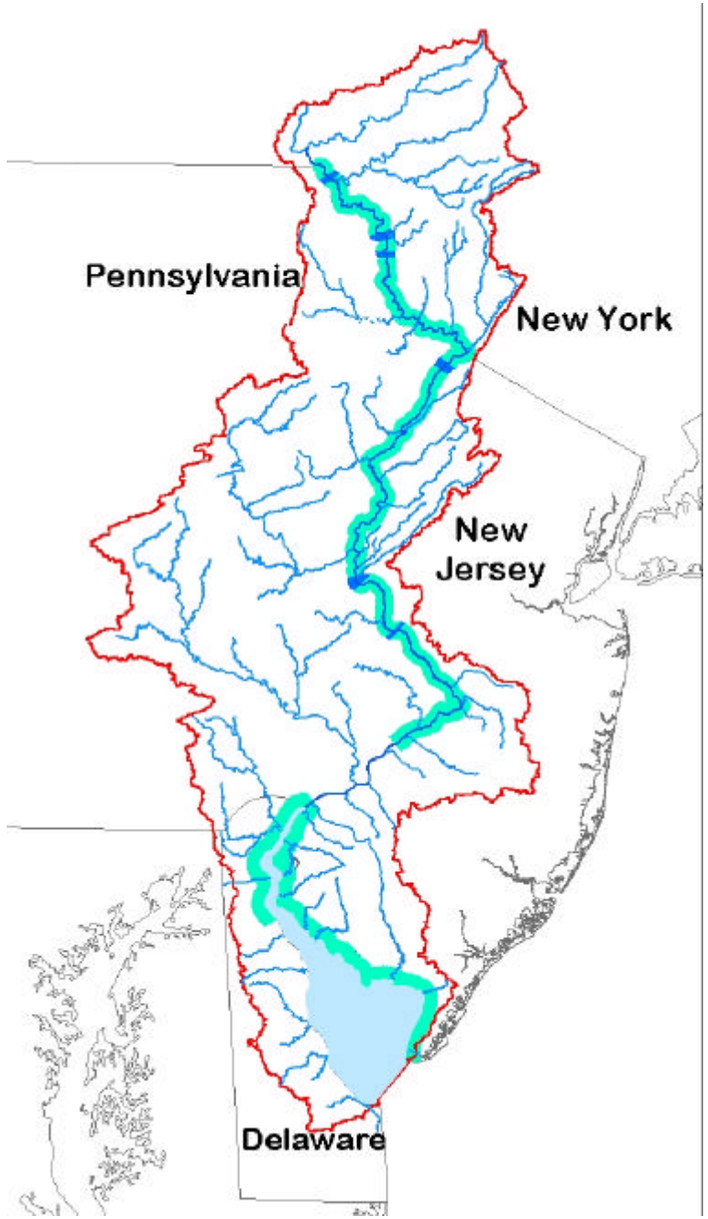
Upper Delaware
73.4 Miles

Middle Delaware
35 Miles

Lower Delaware
67.3 Miles

White Clay Creek
190 Miles

Maurice River
35.4 Miles



Swimming Support

Legend

Degree of Support

- Full Support
- Full Support, but Threatened
- No Support
- Partial Support
- Not Assesed

Secondary Contact Support

Legend

Degree of Support

- Full Support
- Full Support, but Threatened
- No Support
- Partial Support
- Not Assesed

Aquatic Ecosystems Data

- Fisheries Data
- Wetlands Inventory
- Instream Flow Studies
- Streambank Stability Studies

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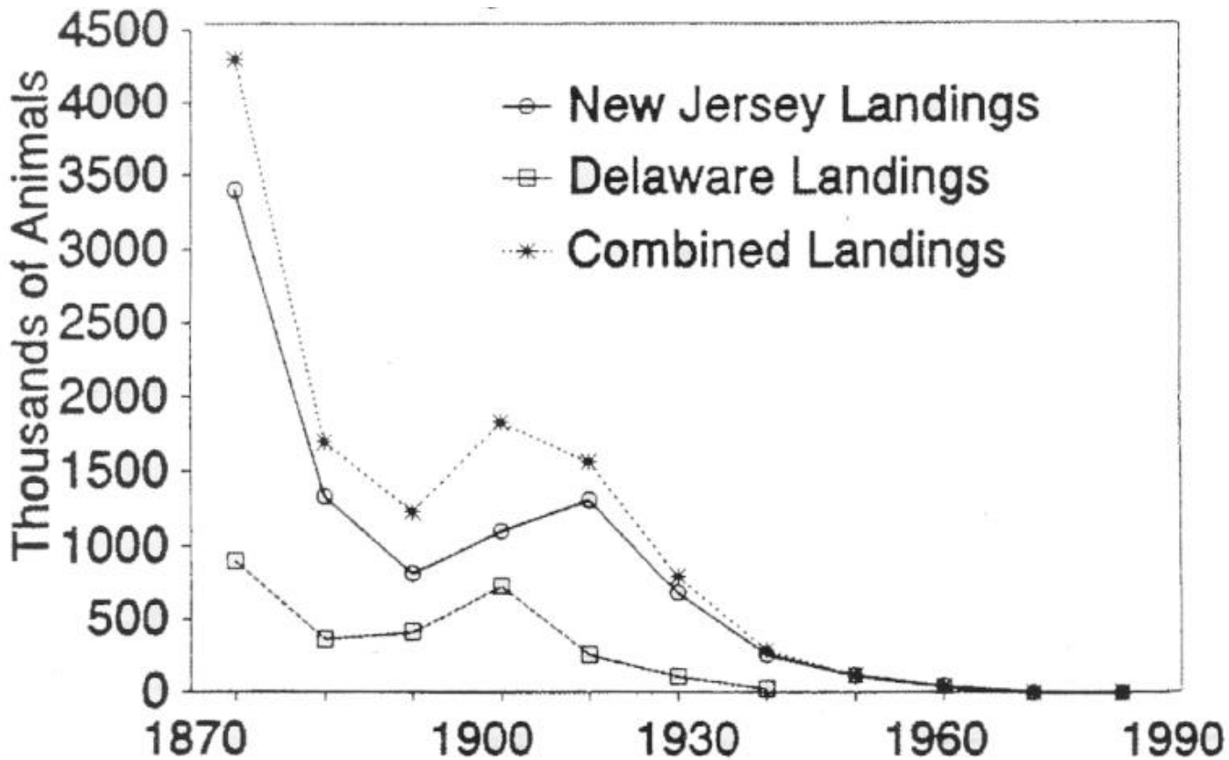
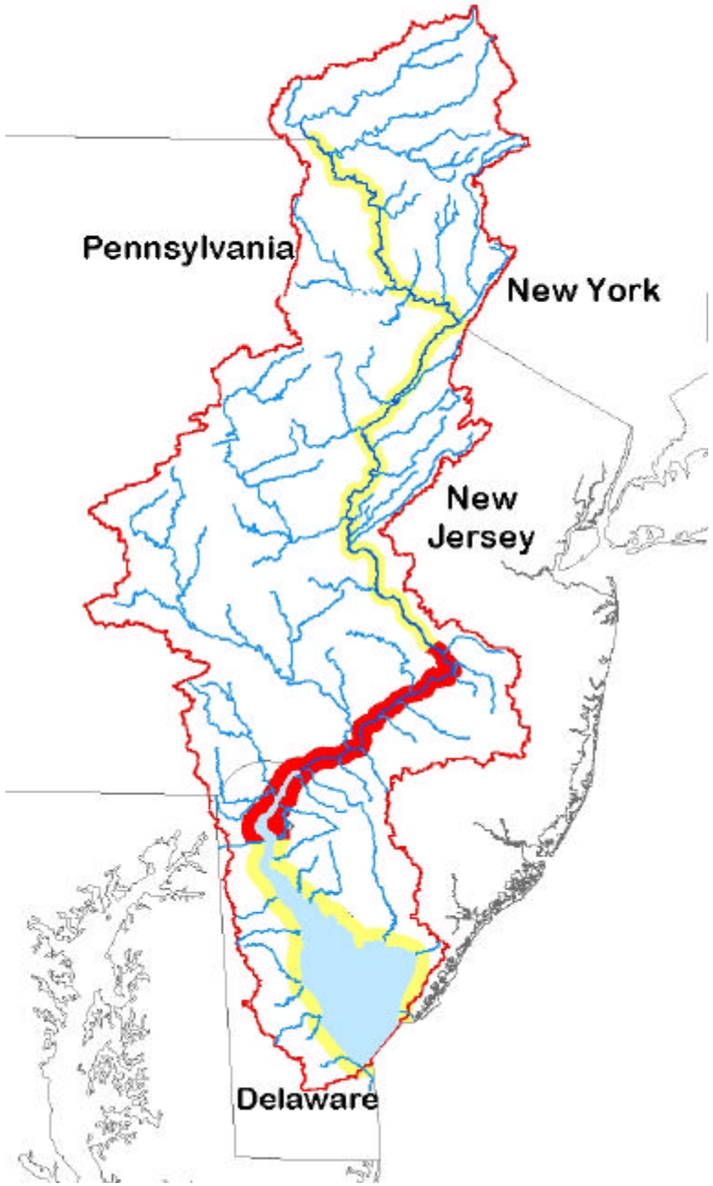
Horseshoe Crab Landings



Average Annual Harvest between 1870 and 1990 in New Jersey and Delaware. Notice the drastic decline in the number of landings over time.

Source: Shuster and Bottom 1985

Fish Consumption Support

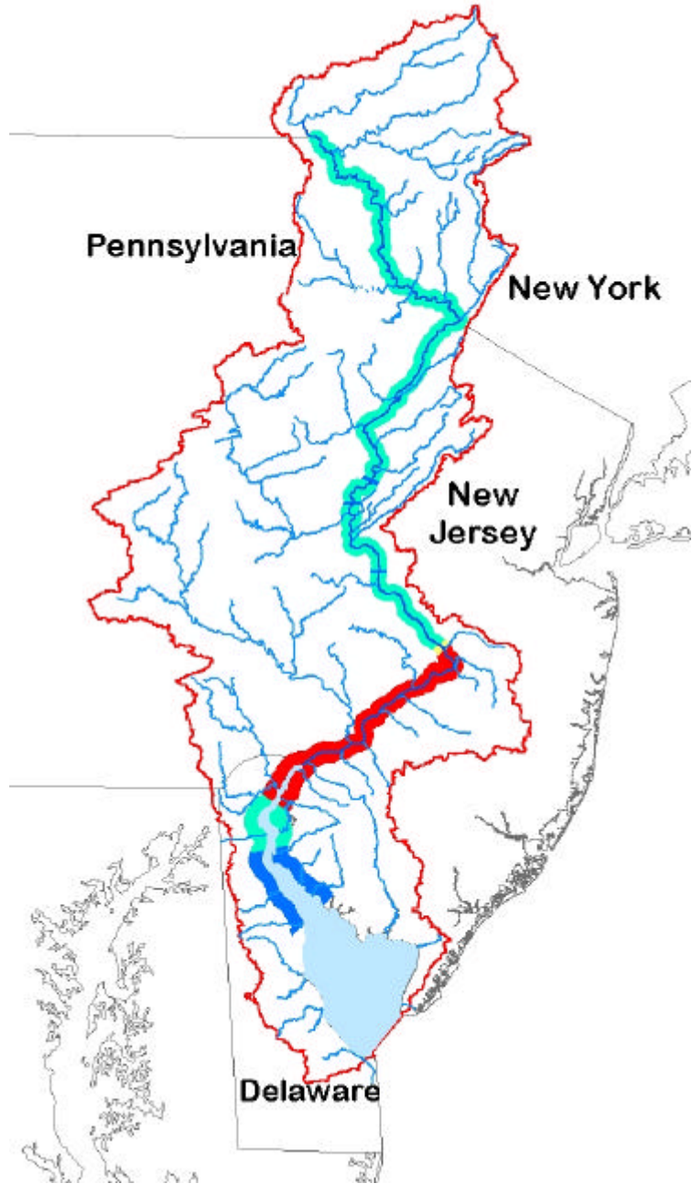


Legend

Degree of Support

- Full Support
- Full Support, but Threatened
- No Support
- Partial Support
- Not Assesed

Aquatic Life Support

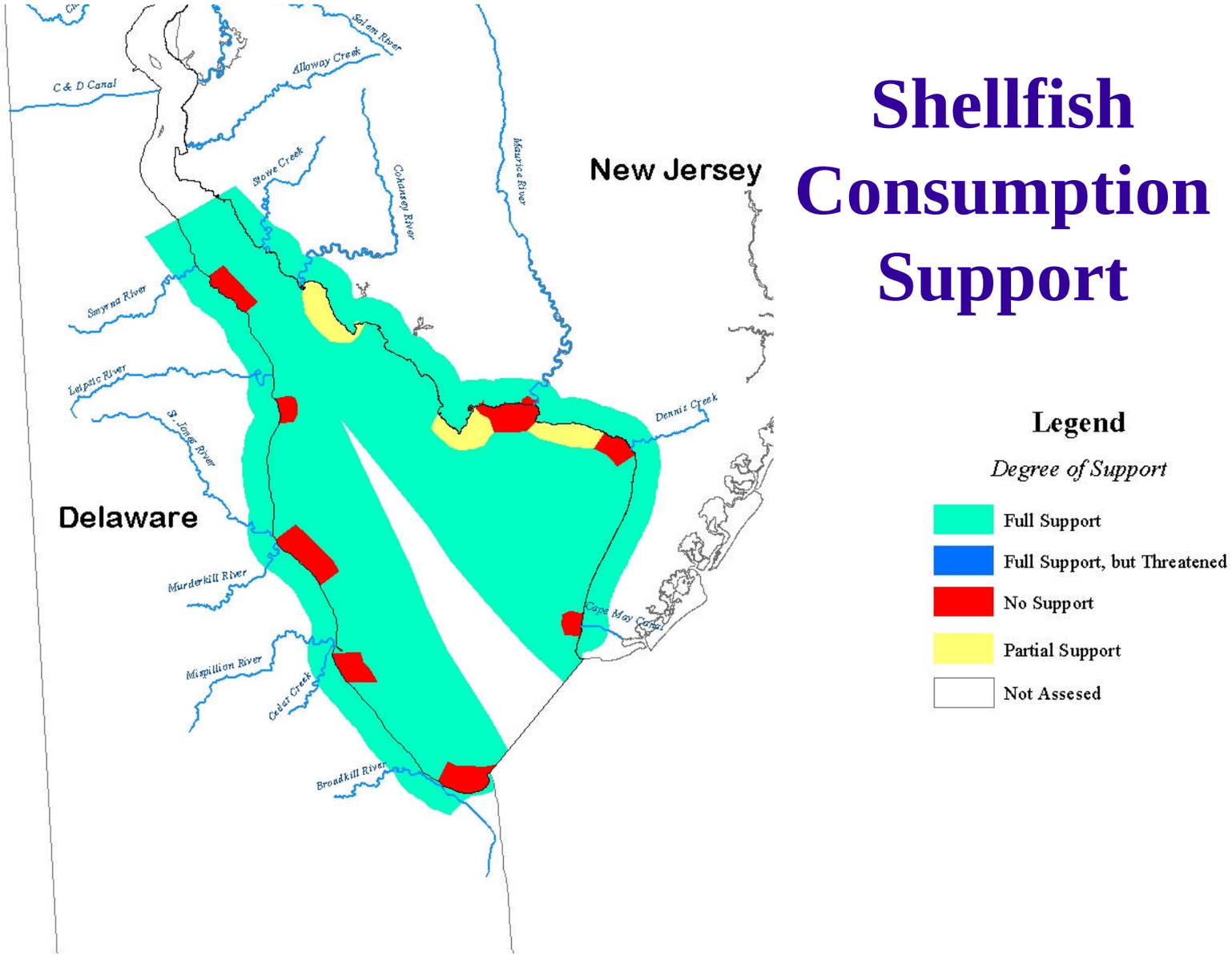


Legend

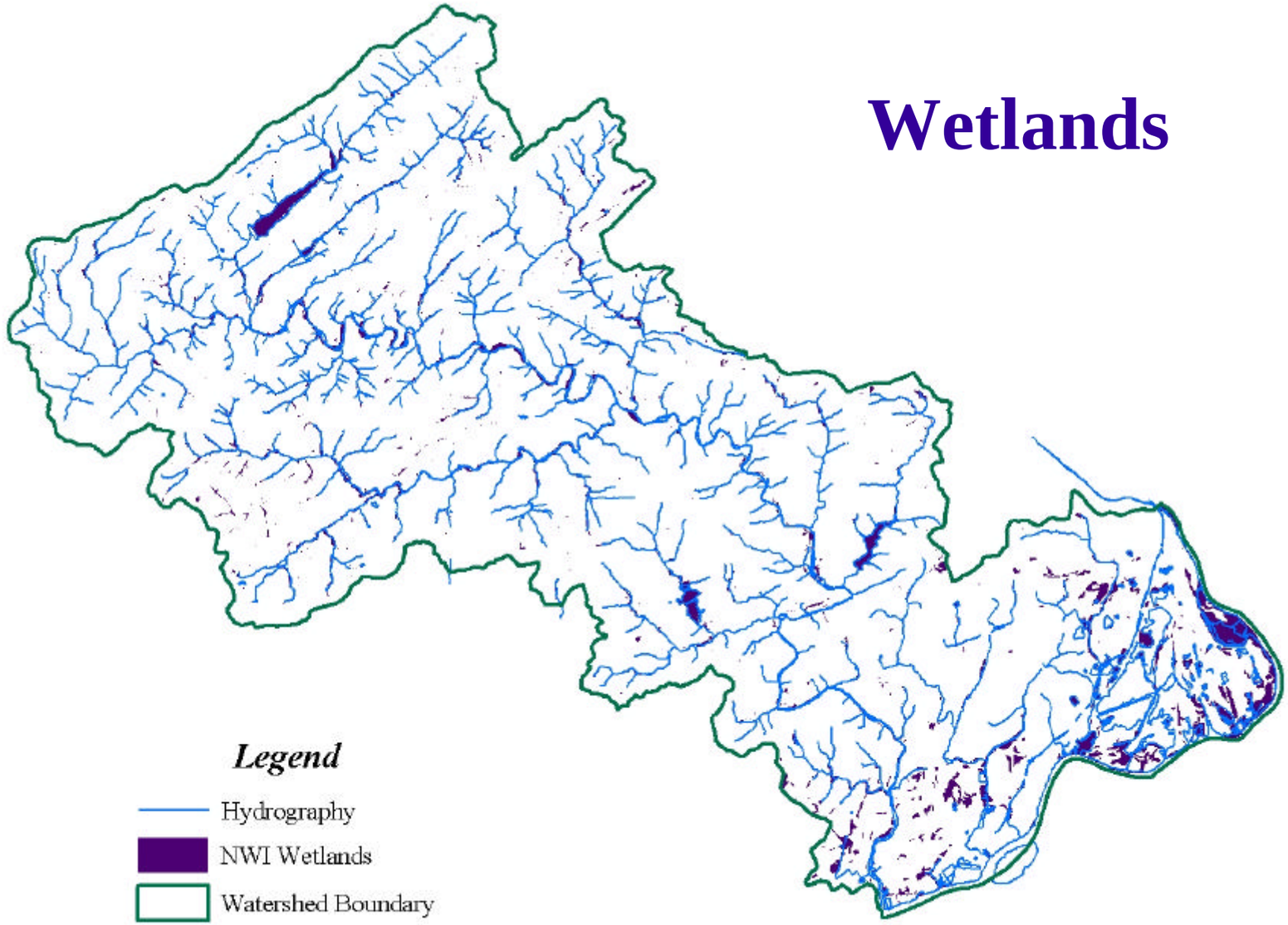
Degree of Support

- Full Support
- Full Support, but Threatened
- No Support
- Partial Support
- Not Assesed

Shellfish Consumption Support



Wetlands



KRA: Land Management

- Geology
- Vegetation
- Soils
- Topography
- Watershed Boundaries
- Land Use
- Political Boundaries
- Highways
- Population Change

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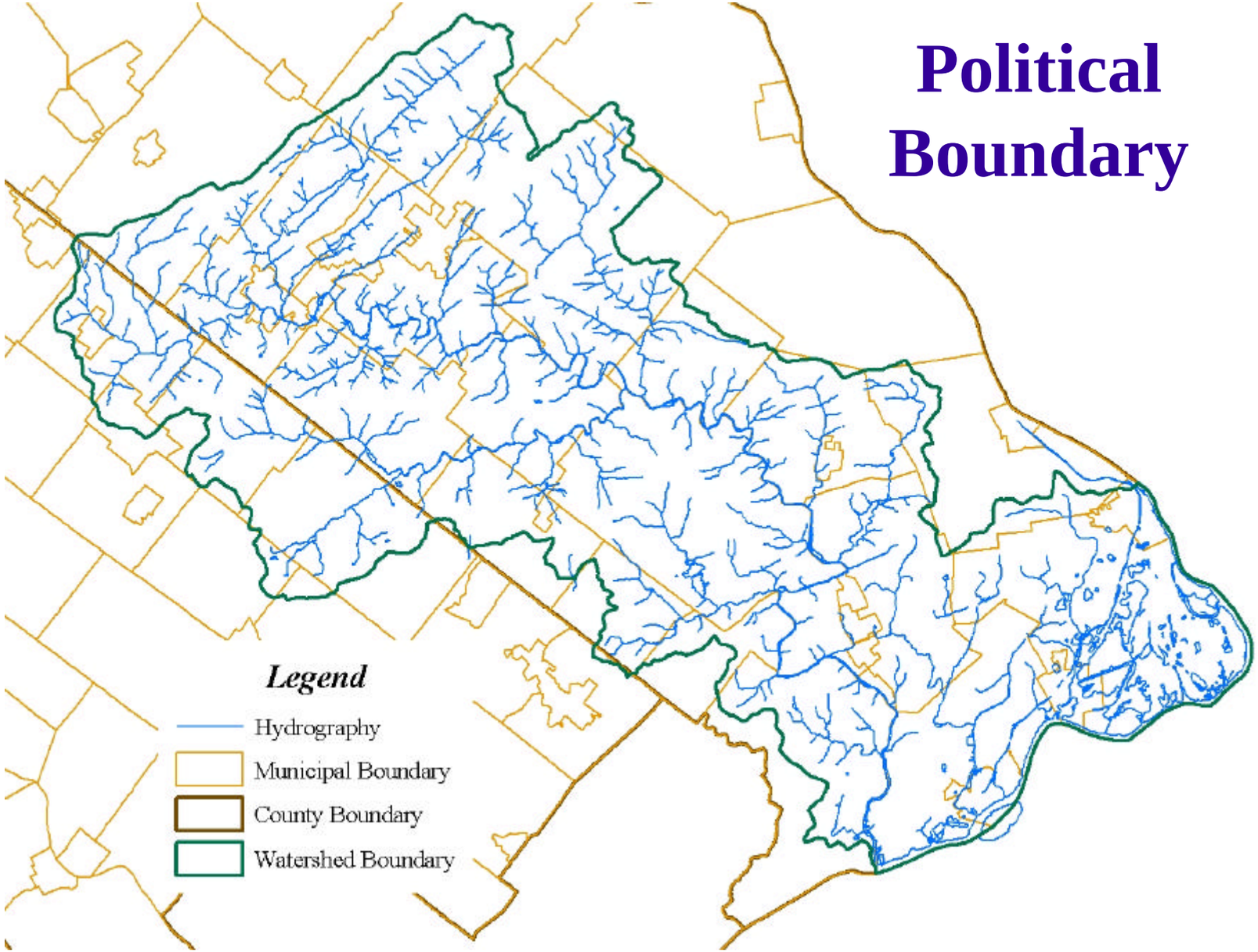
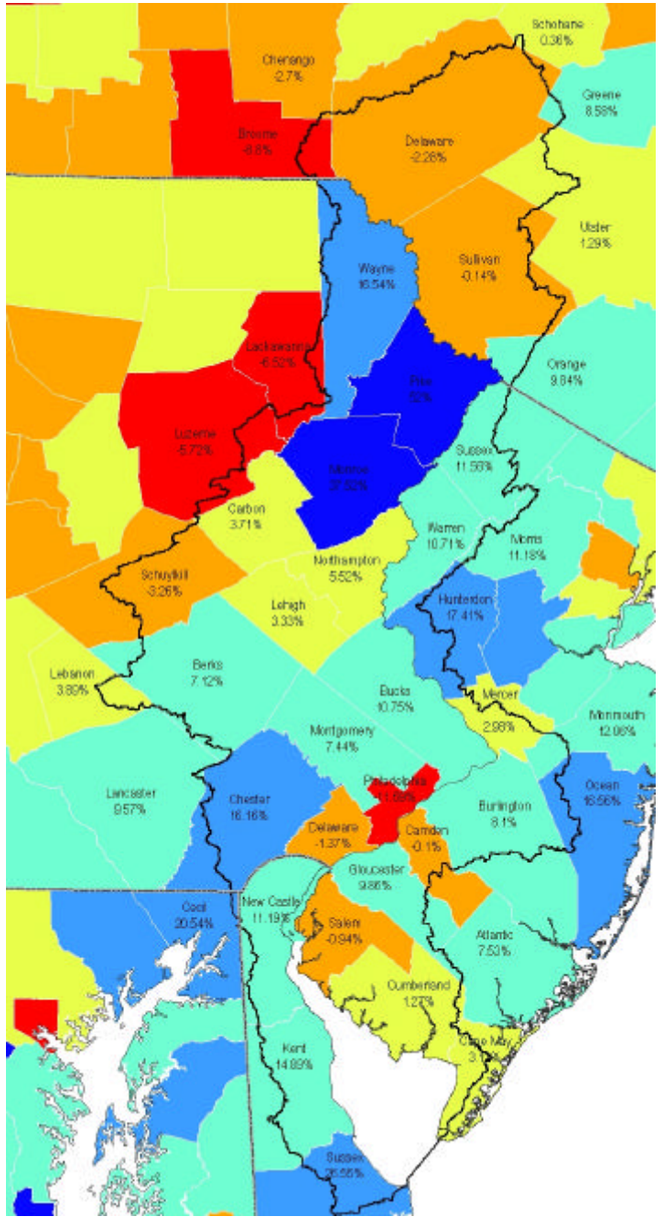
Political Boundary





Population Change
1990 - 2000

Legend

Population Change

- -15.74% - -5%
- -4.99% - -0.01%
- 0% - 7%
- 7.01% - 15%
- 15.01% - 30%
- 30.01% - 52%

KRA: Water Resources Education

- Technical Assistance
- Public Involvement
- Awareness and Understanding

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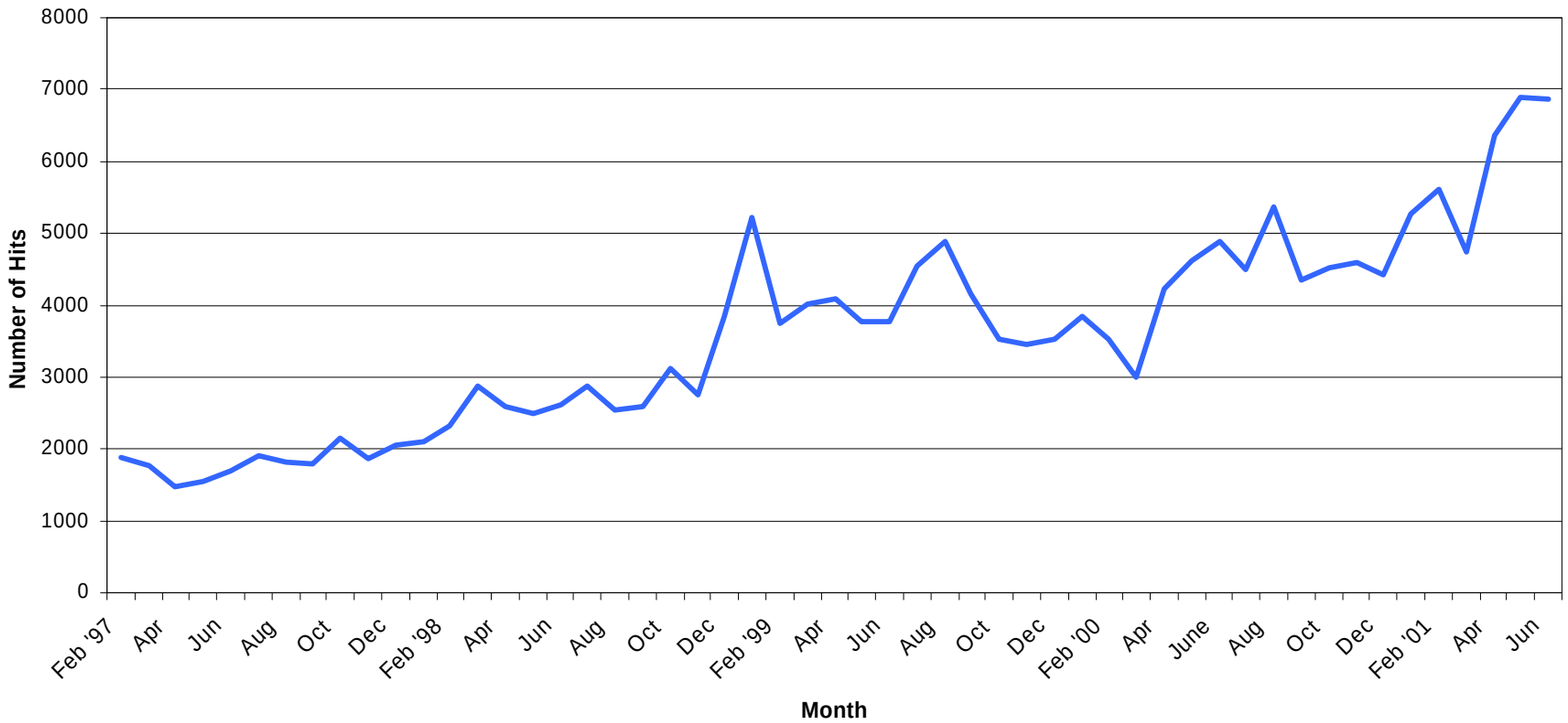
Monthly DRBC Web Hits