

Delaware River Watershed Tour

PA Dept. of Conservation
& Natural Resources

Watershed Education
Teacher Training
Workshop

Kate Schmidt, DRBC

Jacobsburg Environmental
Education Center, Nazareth, Pa.
March 25, 2015

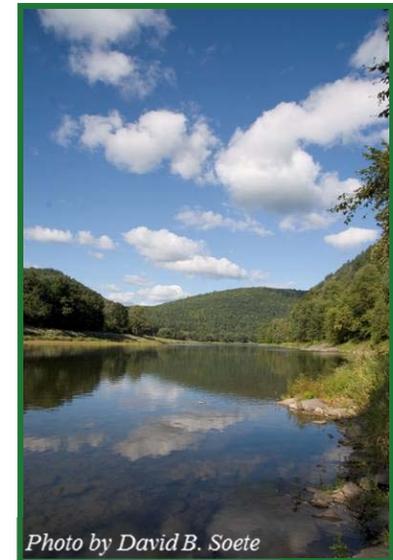


Photo by David B. Soete



What is a Watershed?



A watershed (or basin) is an area of land that catches rain/snow and drains or seeps into a marsh, stream, river, lake, or ground water.



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Delaware River Basin Facts

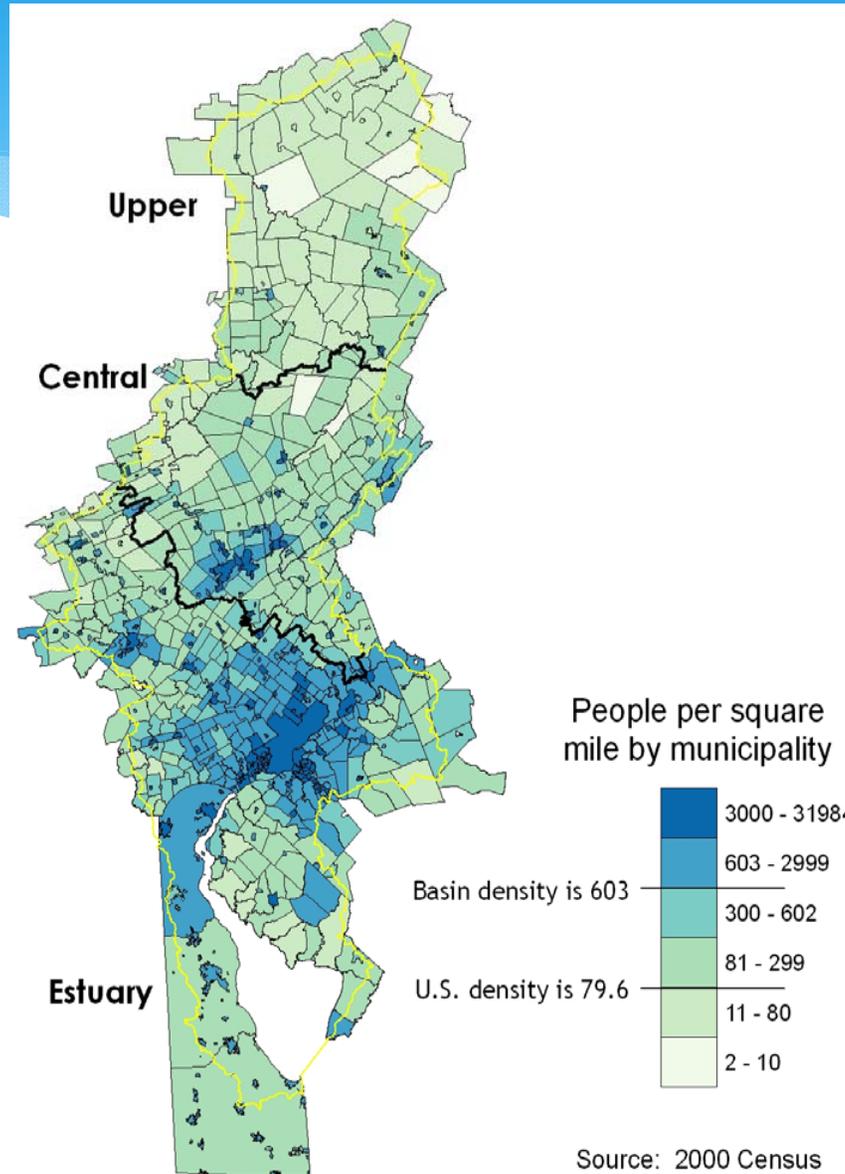
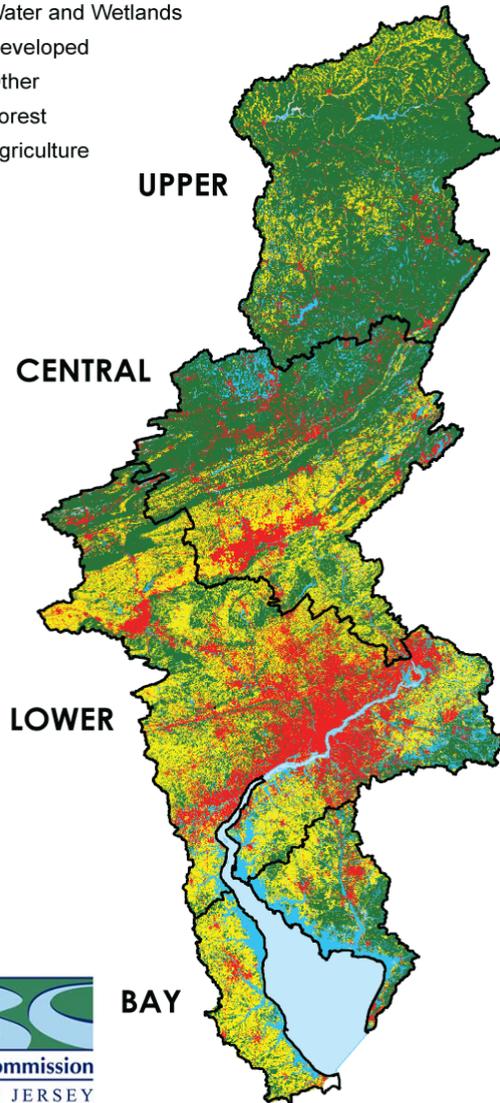
- Main stem begins near Hancock, N.Y.
- Flows 330 miles to the Delaware Bay where it meets the Atlantic Ocean
- Forms an interstate boundary its entire length; basin includes portions of NY, PA, NJ, and DE
- Drains 13, 539 mi² or 0.4 of 1% of the continental U.S. land area
- 15+ million people (about 5% of the U.S. population) rely on the waters of the basin (8+ million live in the DRB)
- 216 tributary streams
- Longest undammed U.S. river east of the Mississippi (dams are located on tributaries, not on the main stem)



Landscape & Population Density

Fig. 4.14 Map of Basin Land Use 2001

- Water and Wetlands
- Developed
- Other
- Forest
- Agriculture

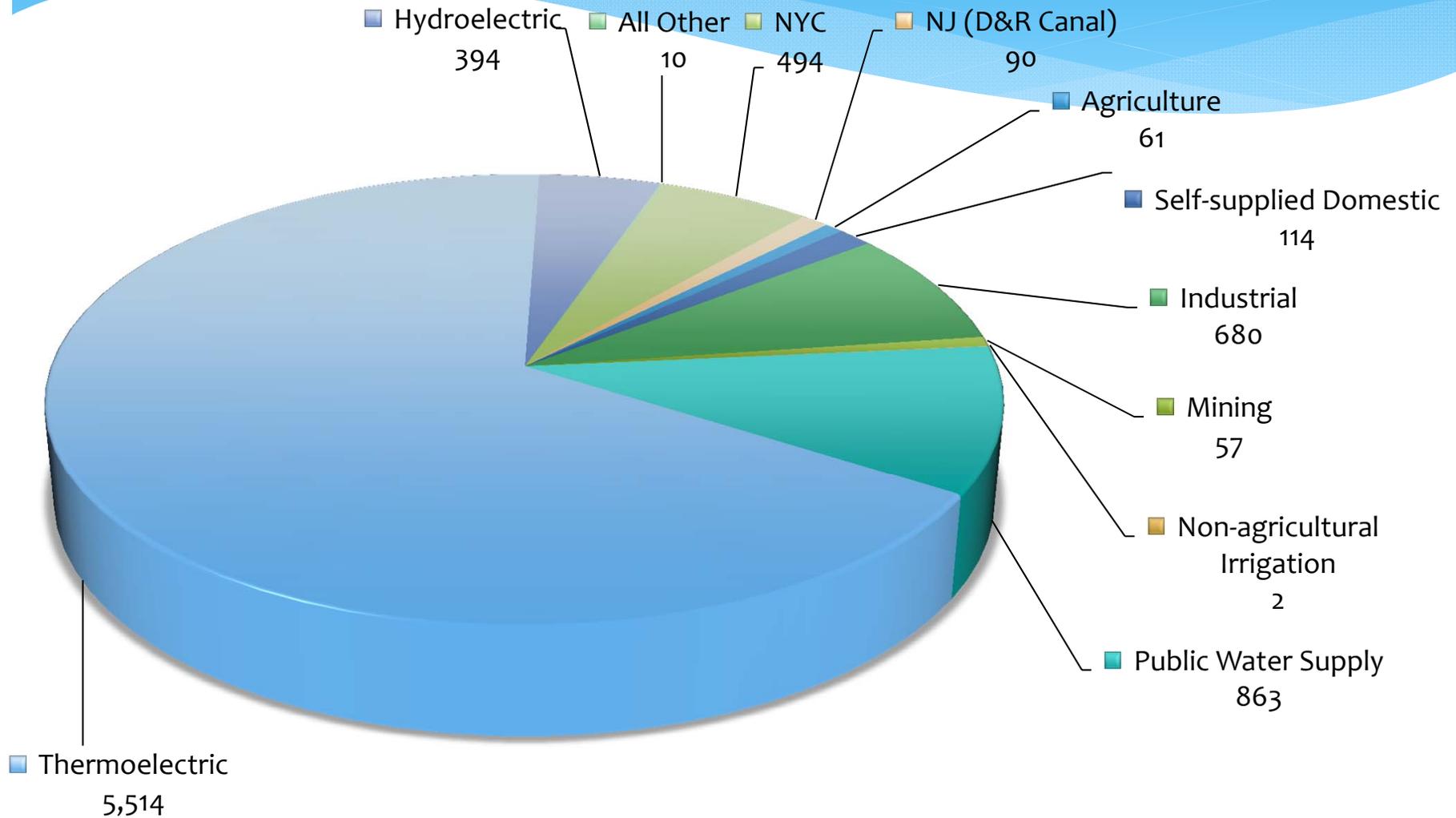


Source: 2000 Census



DRB – Total Withdrawals

8,279 Million Gallons / Day



Public Water Supply



- * The Delaware River Basin supplies water to many cities, including two of the U.S. largest cities
- * Philadelphia: All of its water supply comes from surface water – 60% Delaware River and 40% Schuylkill River
- * Can you name the other???



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New York City, which lies outside the watershed, gets roughly half its water from three reservoirs located on tributaries to the Delaware River -- Cannonsville, Pepacton, and Neversink.

Map: NYC DEP Web Site

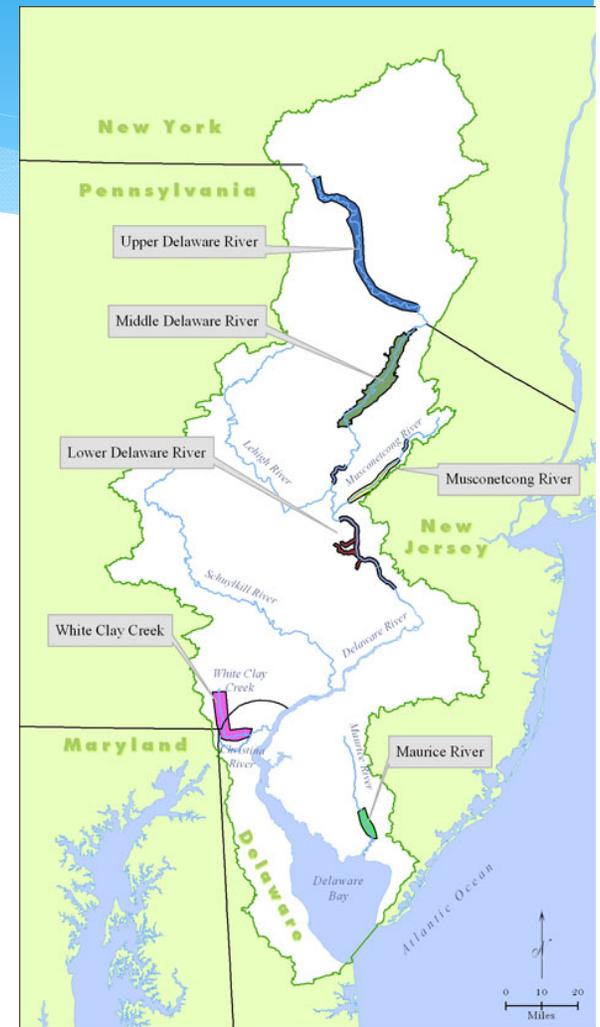
Wild and Scenic Delaware River



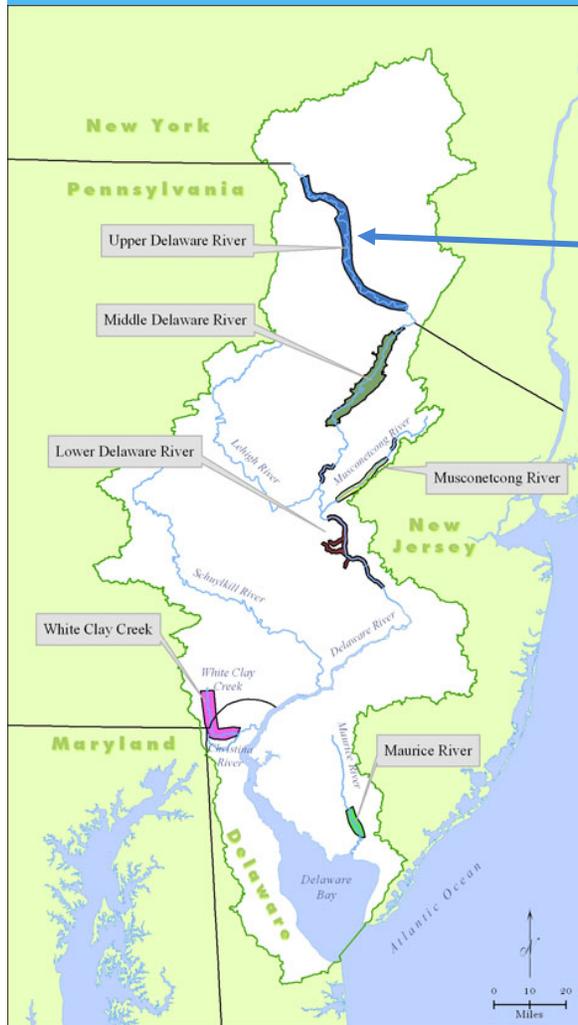
The U.S. has 3.5 million miles (5,633,000 km) of rivers. The National Wild and Scenic Rivers System includes 12,598 miles (20,275 km) of this total, or just over one-quarter of one percent.

What percentage of the non-tidal Delaware River is included in this national system?

Three-quarters of the non-tidal Delaware River (about 150 miles or 240 km) has been included in the National Wild and Scenic Rivers System.

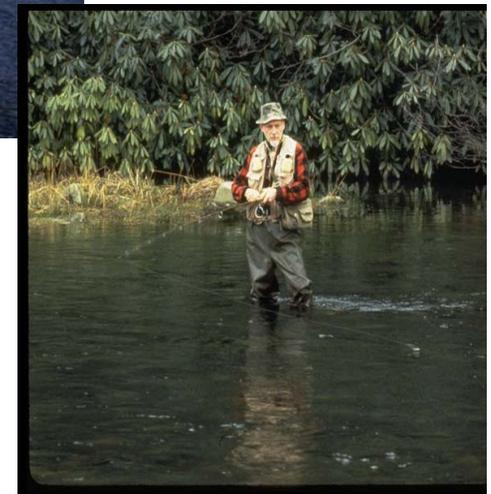


Upper Delaware River



- * This 73-mile section of the river is part of the Upper Delaware Scenic and Recreational River, a unit of the National Park Service
- * Most of the land is privately owned
- * The river corridor is managed by the Upper Delaware Council, a partnership of local, state, and federal governments and agencies

Reservoir releases have created a world-class trout fishery in the Upper Delaware River and tributaries.

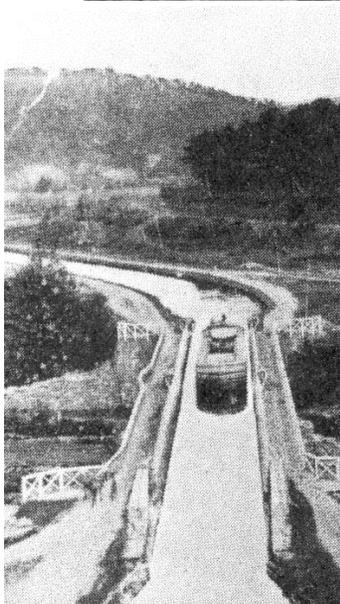
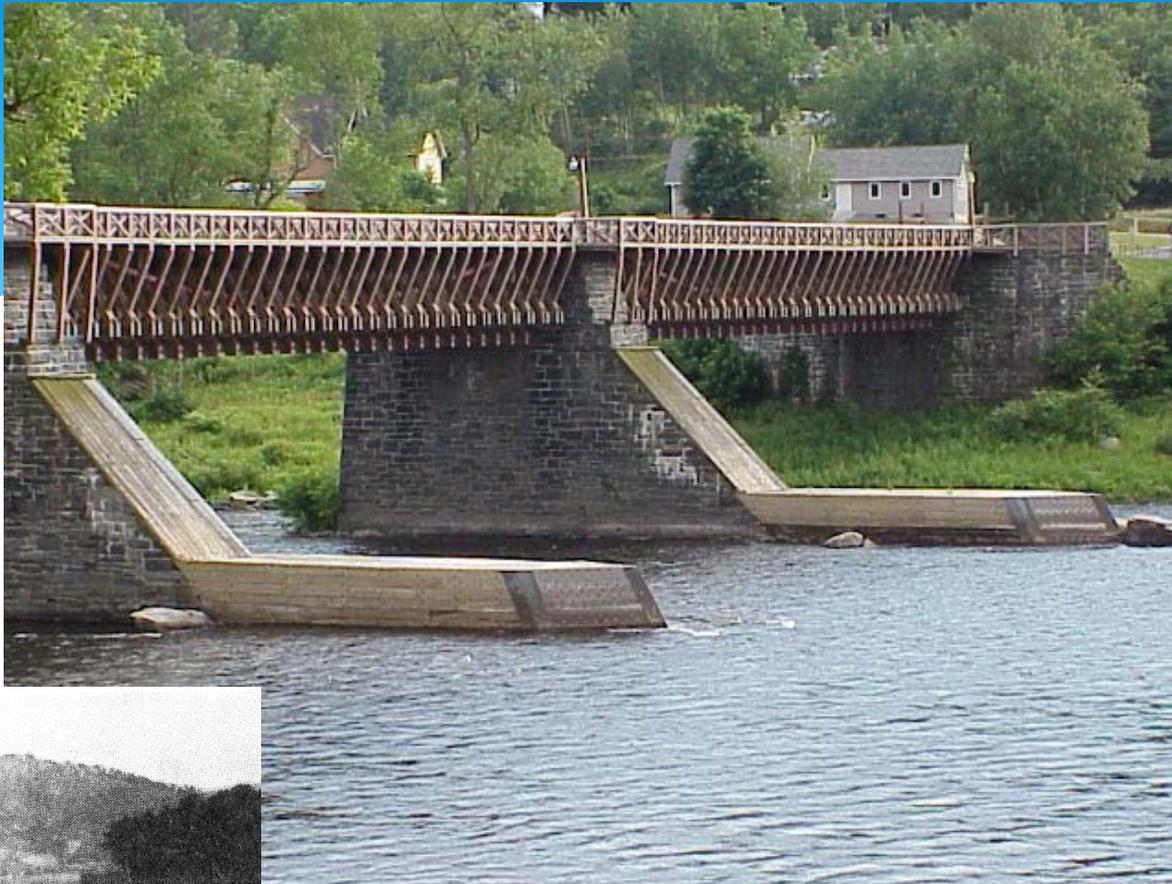




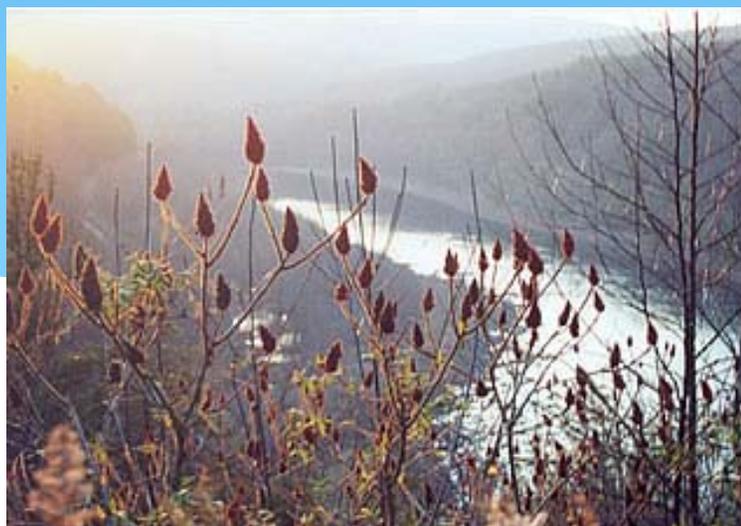
The “Big Eddy” at Narrowsburg, N.Y. --
The deepest (113 feet) and narrowest spots
on the main stem Delaware River.



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Roebling's Delaware Aqueduct --
oldest surviving wire suspension
bridge in the U.S.



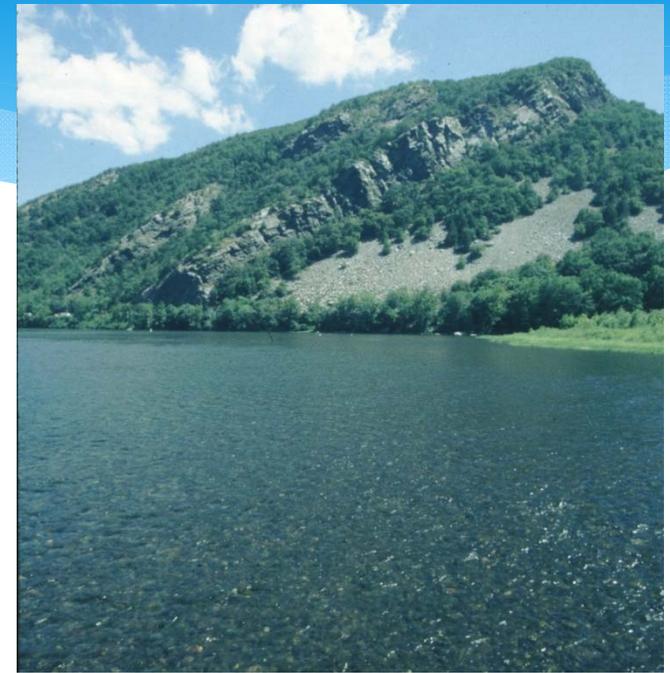
Scenic “Hawks
Nest Overlook”
near Port
Jervis, N.Y.

Middle Delaware River

The Delaware Water Gap National Recreational Area covers about 40 miles from just south of Port Jervis, N.Y. downstream to the Delaware Water Gap near Stroudsburg, Pa.



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On November 1, 2000, the Lower Delaware Wild and Scenic Rivers Act added about 39 miles of the main stem Delaware, as well as approximately 28 miles of selected tributaries, to the National Wild and Scenic Rivers System, linking the Delaware Water Gap and Washington Crossing, Pa., just upstream of Trenton, N.J.



Graves of America's First Unknown Soldiers Along the Delaware



Delaware River at Washington Crossing



Torch Photo by Kim Weimer, Buck County Courier Times

Also Included in the National Wild and Scenic Rivers System:

24.2 miles of the Musconetcong River, N.J.'s largest non-tidal tributary to the Delaware River (2006).

Approximately 199 miles of segments and tributaries of the White Clay Creek, which flows from southeastern Pa. to northwestern Del. and eventually joins the Christina River, a tributary to the Delaware (2000, 2014). It is the first wild and scenic river designation in the state of Delaware & the first National Wild and Scenic River protected in its entirety.

35-mile stretch of the Maurice River and several tributaries, including Menantico and Muskee Creeks and the Manumuskin River (1993).



The Delaware River Port Complex (including docking facilities in Pa., N.J., and Del.) is the largest freshwater port in the world.



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Philadelphia and Camden Waterfronts



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What is the Likely Origin of the
Word “Hoagie” and What Does
it Have to Do With the
Delaware River?

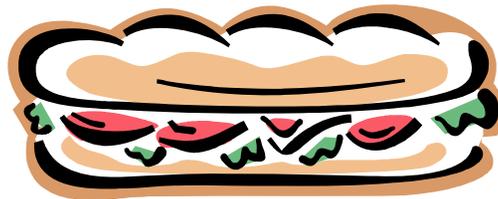




Photo courtesy of WHYY

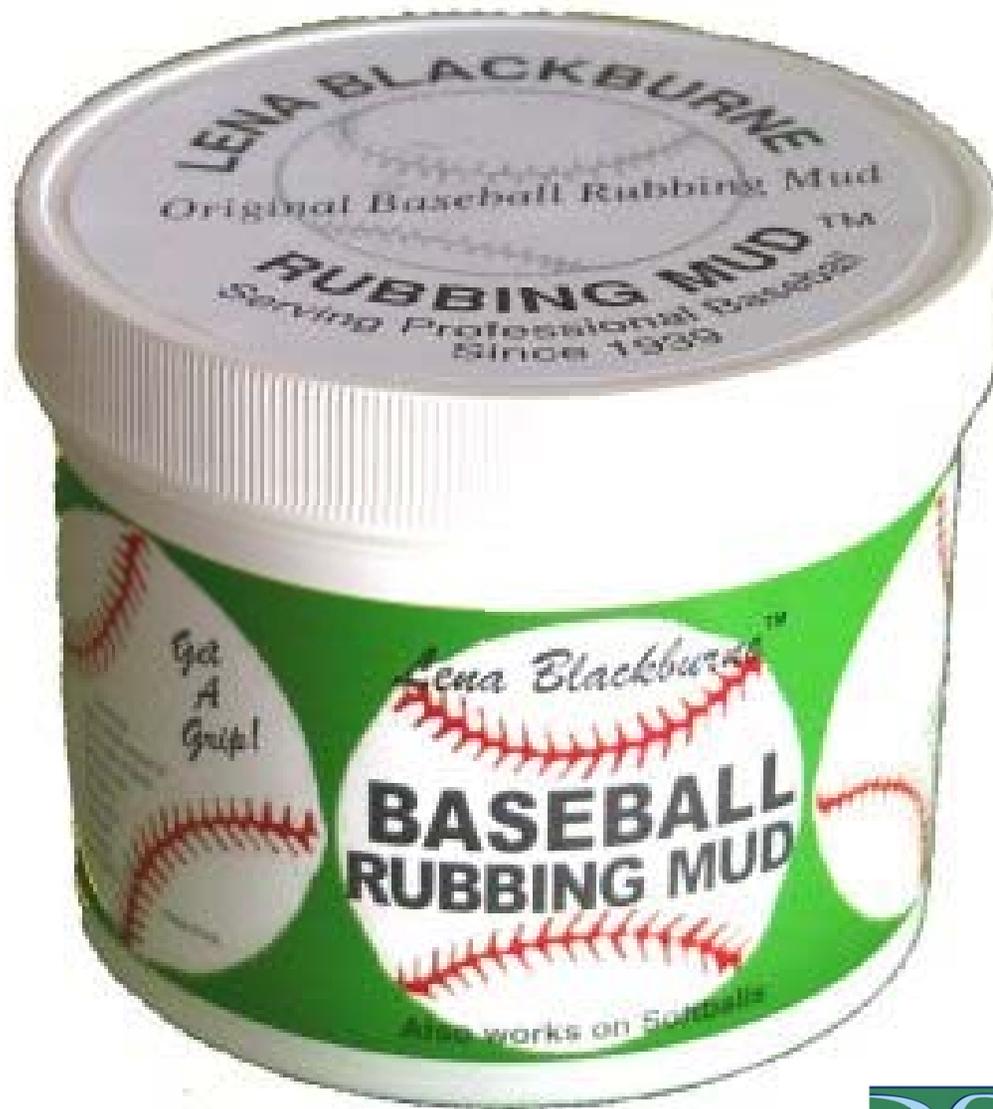
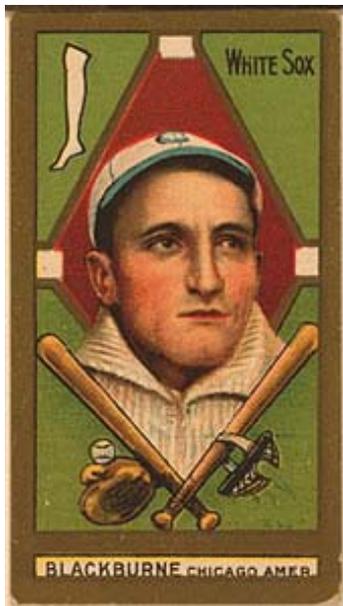
Hog Island Shipyard





Why Does Major League Baseball Depend on the Delaware River Watershed?







The Delaware Estuary

An estuary is where fresh water mixes with salt water. The Delaware Estuary is the tidal portion of the river including the Delaware Bay; it begins at Trenton and stretches approximately 130 miles to the Atlantic Ocean.



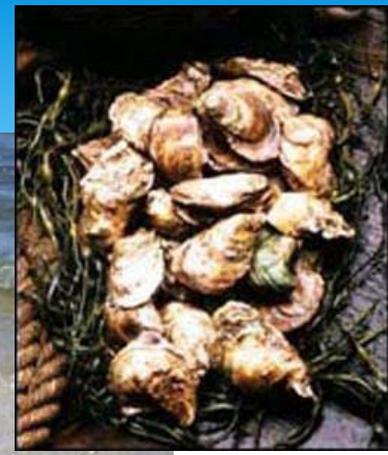
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0 5 10
Miles

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*Maurice River, a
Delaware Bay
tributary, at
Bivalve, N.J.*





Delaware Bay at Lewes

Delaware River Basin Commission Founded in 1961

Five Equal Members:

- Delaware
- New Jersey
- Pennsylvania
- New York
- Federal Government



Why was the DRBC created?

- Water supply shortages and disputes over the apportionment of the basin's waters;
- Severe pollution in the Delaware River and its major tributaries;
- Serious flooding

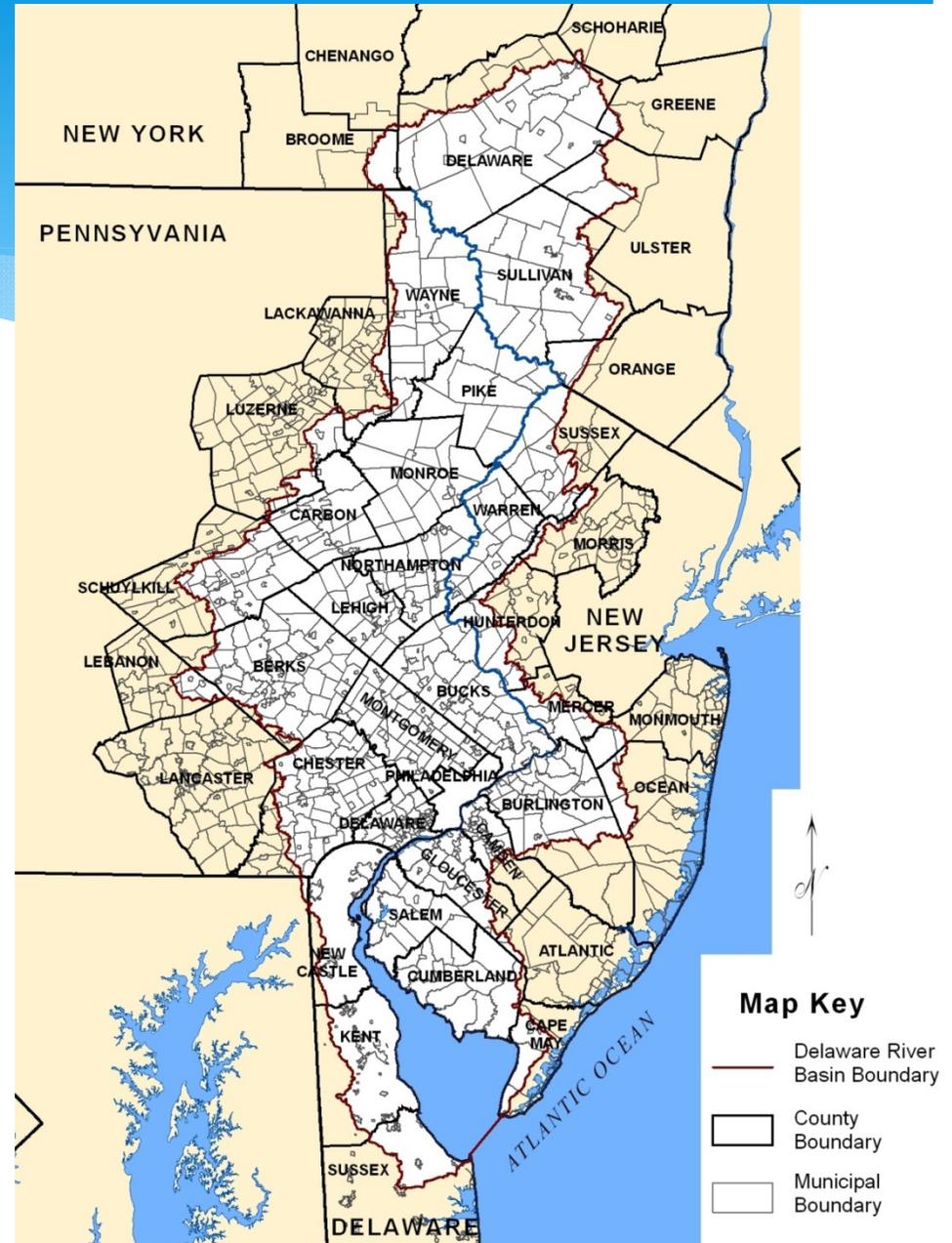


The Need for Basin-Scale Planning and Management

- 4+ States (*less than 10 square miles in Maryland*)
- 42 Counties
- 838 Municipalities



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DRBC's Charge

- Manage water resources without regard for political boundaries
- Regulate water quantity (*equitably allocate, maintain streamflow*) and water quality
- Plan and Develop (e.g., *Basin Plan 2004; State of the Basin Report 2013; stored water*)
- Coordinate between federal, state & local governments and private entities with roles in managing water resources
- Educate the basin community about water resources



DRBC Functional Responsibilities

- Water Supply
- Drought Management
- Flood Loss Reduction
- Water Quality
- Watershed Planning
- Regulatory Review (Permitting)
- Outreach/Education
- Recreation

Based upon 1961 Delaware River Basin Compact



Flow & Drought Management

- * 1954 U.S. Supreme Court Decree – settles an interstate suit over water allocation (NJ vs. NY)
 - * Required NYC to build reservoirs on the river's headwaters to use for water supply (271 BG when full)
 - * Limited the amount of water NYC could divert from the basin (800 mgd)
 - * Reservoir releases need to be made to meet specific flow targets (1,750 cfs at Montague and 3,000 cfs at Trenton)
 - * NJ can also withdrawal water from the basin (100 mgd)
 - * Decree parties do not 100% equal DRBC members
- * During the 1960s Drought there was not enough water! Additional negotiations were made, which altered the decree and formed the basis of DRBC's drought management program.

DRBC Drought Operating Plans

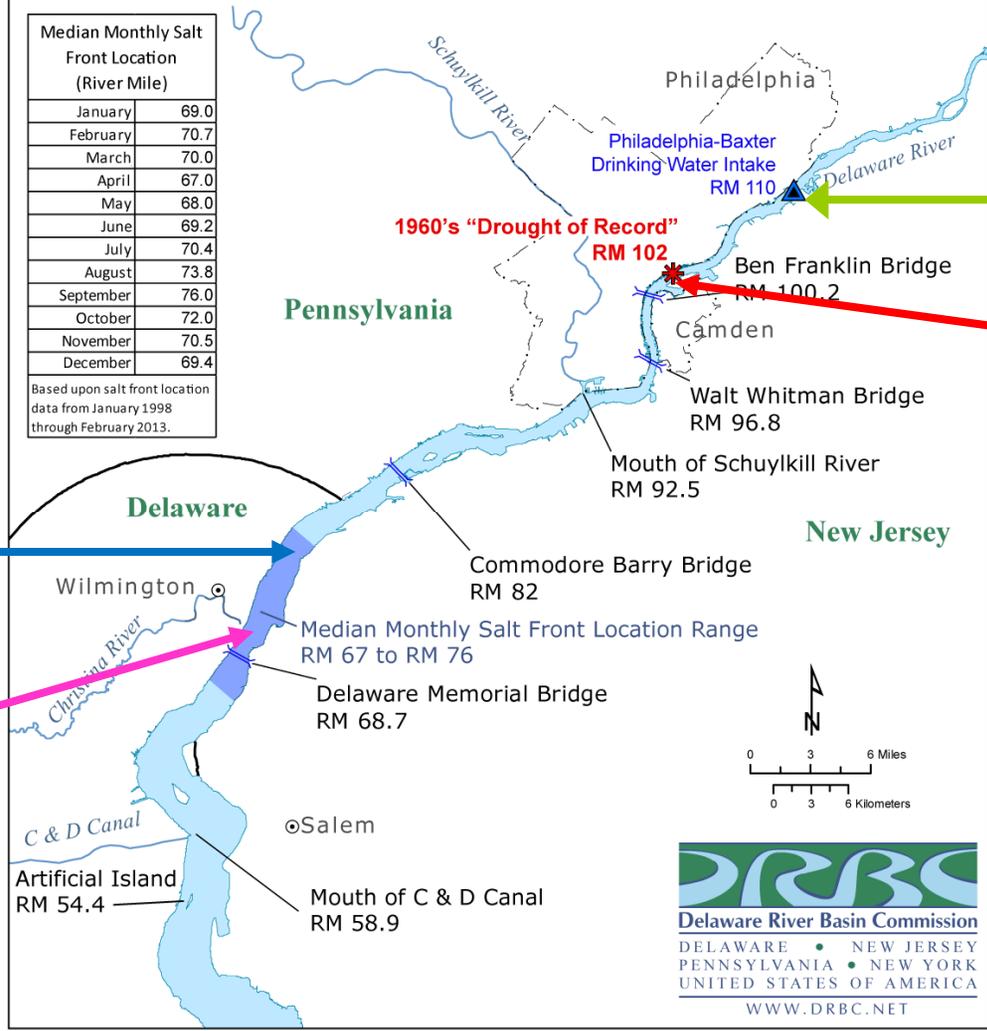


- Storage levels in the NYC Delaware Basin Reservoirs drive the Basinwide Operating Plan
 - * Cannonsville
 - * Pepacton
 - * Neversink
- Storage levels in Two U.S. Army Corps of Engineers Reservoirs drive the Lower Basin Operating Plan
 - * Beltzville
 - * Blue Marsh
- Merrill Creek Reservoir
- If certain thresholds are crossed, phased reductions of out-of-basin transfers and flow targets are automatically invoked and releases of water can be required from several basin reservoirs.

Farthest Recorded Upstream Salt Front Location in the Delaware River - November 1964

Median Monthly Salt Front Location (River Mile)	
January	69.0
February	70.7
March	70.0
April	67.0
May	68.0
June	69.2
July	70.4
August	73.8
September	76.0
October	72.0
November	70.5
December	69.4

Based upon salt front location data from January 1998 through February 2013.



Water Supply Intakes: RM 110

1960's Maximum RM 102

3/19/2015 RM 75

Normal Mar. Location: RM 70

Reservoir releases are made to help control salinity intrusion, or the upstream migration of salty water from the Delaware Bay during low-flow conditions.

The salt front or salt line is defined as the 250 parts-per-million (or milligram-per-liter) chloride concentration. The seven-day average location of the salt front is used by DRBC as an indicator of salinity intrusion in the Delaware Estuary. The salt front's location fluctuates along the Delaware River as streamflow increases or decreases in response to changing inflows, diluting or concentrating chlorides in the river. River Mile (RM) 0 is located at the mouth of the Delaware Bay (i.e., where the bay meets the Atlantic Ocean).

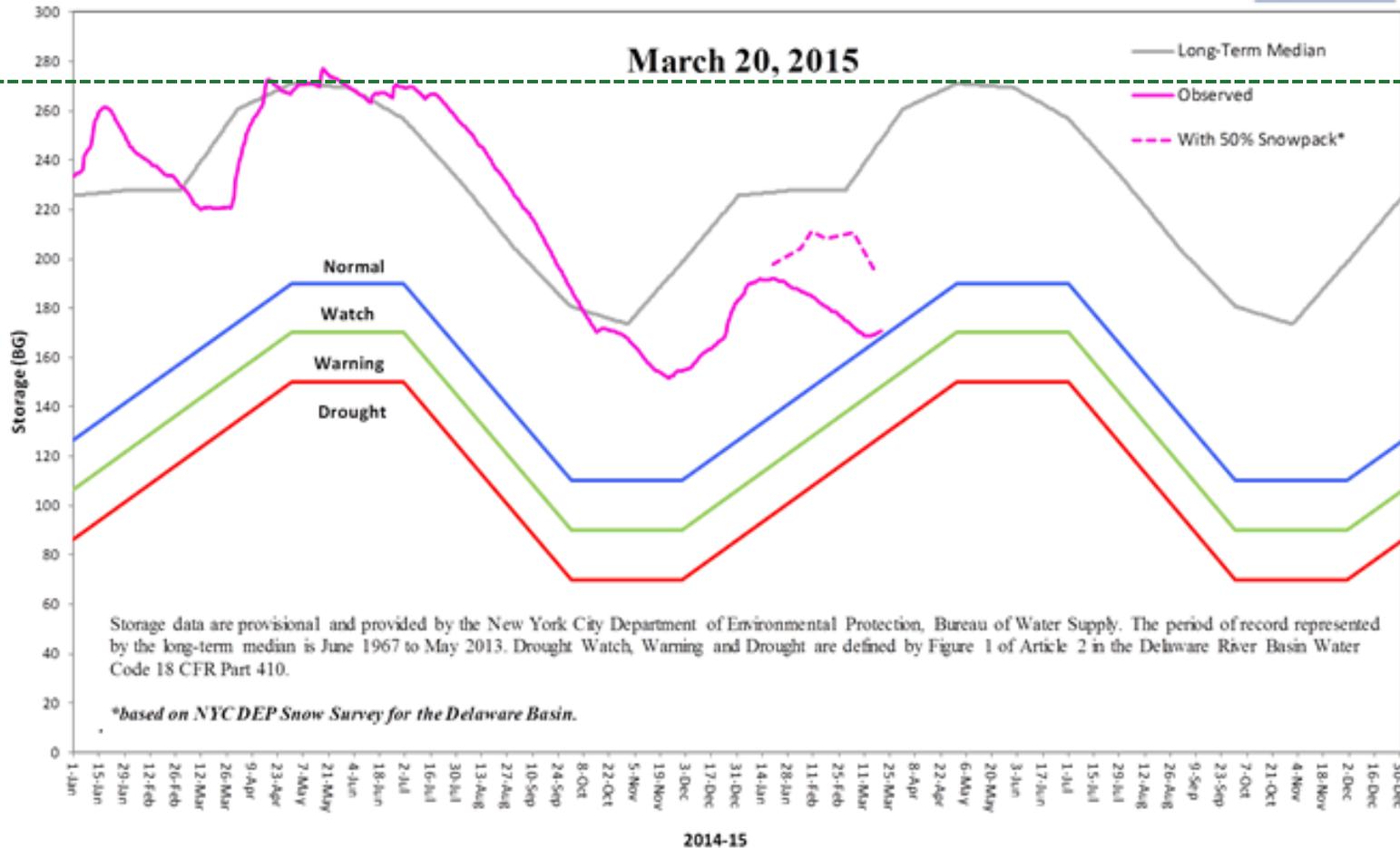
Data for determination provided by the U.S. Geological Survey and Kimberly Clark Corp.

Current Graph

New York City Delaware River Basin Storage



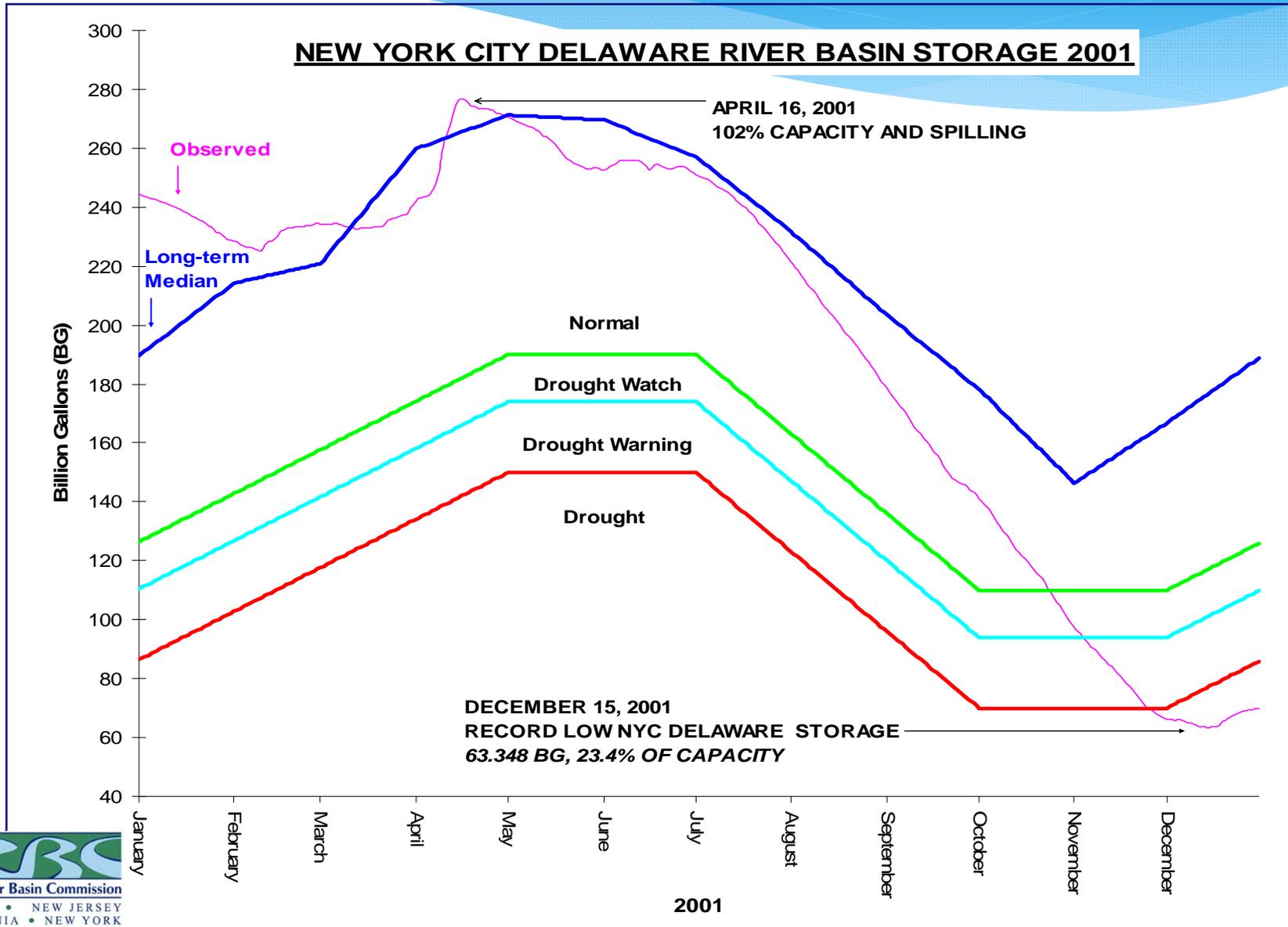
100%
(271 bg)



Useable

Storage	Cannonsville	Pepacton	Neversink	Total	BG Above Drought Watch =	BG Below Daily Storage Median =
BG	55.2	93.2	22.2	170.5	3	77
%	57.7%	66.5%	63.5%	63.0%	23	50
					43	

Most Recent Basinwide Drought (2001-2002)





View of full reservoir

Cannonsville Reservoir holds about 96 bg when full. In late-Nov. 2001, storage dropped to just over 3 bg, a record low.



December 20, 2001 at 6.5% of capacity – photo by NYCDEP



Fall 2001



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September 2004

April 2005

June 2006



**Third Major Flood along the Main Stem
Delaware River in less than Two Years**

Need To Consider Flood Mitigation!



Delaware River Basin Flood Mitigation Task Force

- Four basin state governors asked DRBC to convene an interstate flood mitigation task force after the 2006 flood.
- 31-member task force was created and included government officials, agency members, non-profit representatives, and individual stakeholders.
- Task force final report was issued in July 2007 and highlighted 45 recommendations in 6 management areas:
 - reservoir operations
 - structural and non-structural mitigation
 - stormwater management
 - floodplain mapping
 - floodplain regulation
 - flood warning
- Since 2007, there has been movement on many of these recommendations

Water Quality



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Water Quality Standards

- Designated Uses: e.g., water supply, protection and propagation of aquatic life, recreation in and on the water.

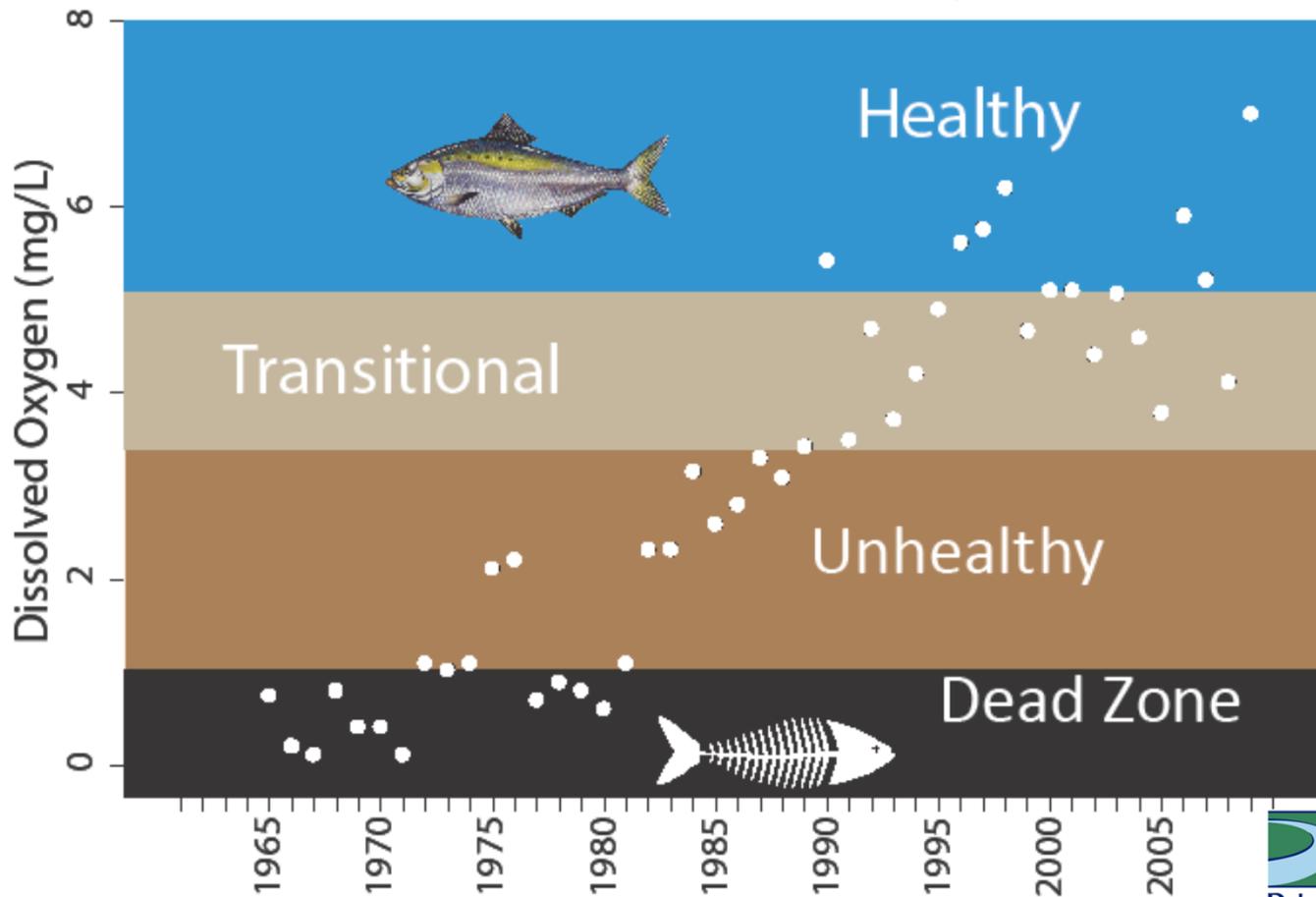


- Criteria: numeric and/or narrative parameters to protect the designated uses.

- Antidegradation Policy and Procedures: to maintain and protect existing water quality.

Dissolved Oxygen

Ben Franklin Bridge - July Data



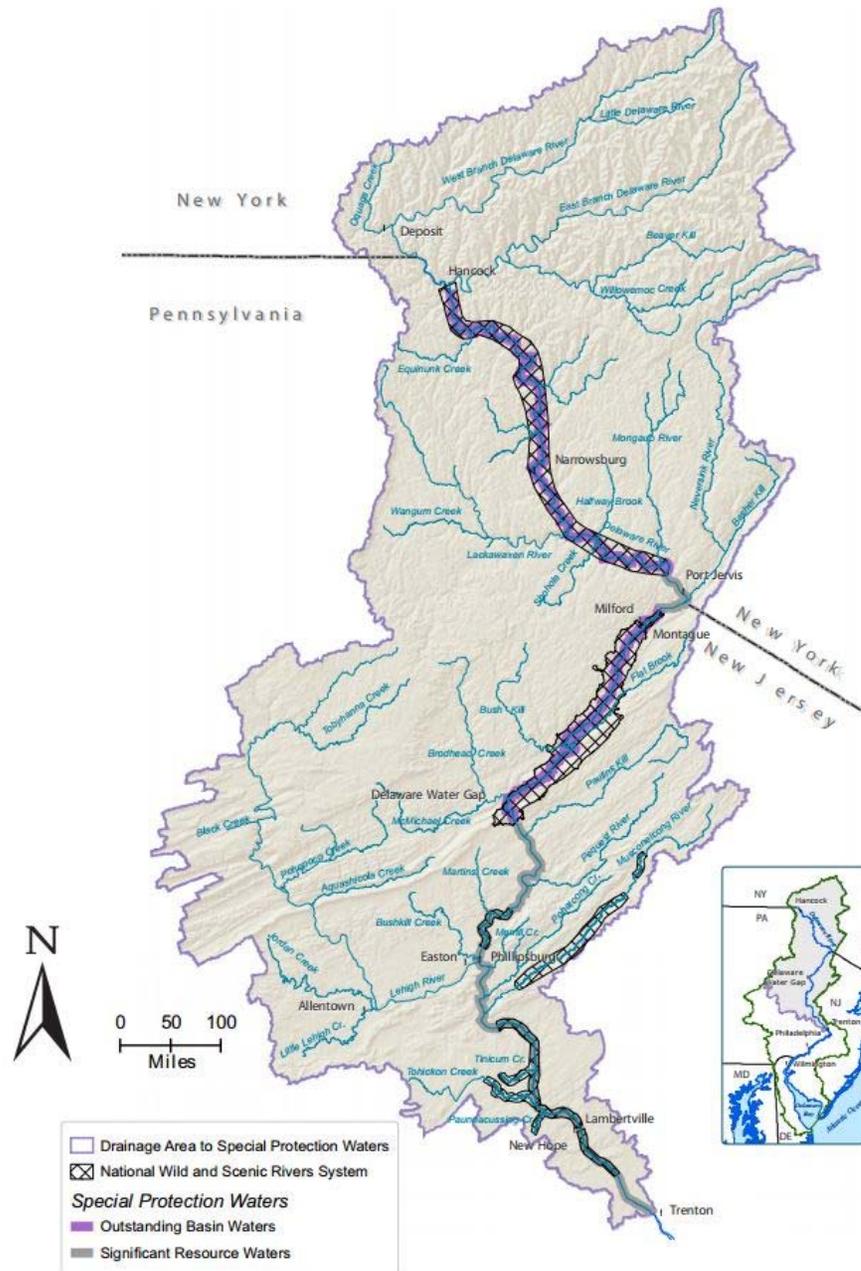
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Special Protection Waters Program “Keeping Clean Water Clean”

- Anti-degradation regulatory program initially developed to protect existing high quality water in the Upper Delaware River Basin.
- Policy of “no measurable change” in existing water quality except toward natural conditions.



The entire 197-mile non-tidal Delaware River is now protected by the DRBC's Special Protection Waters anti-degradation regulations.



Fish Consumption Advisories - PCBs



Reductions in PCB Point Source Loadings

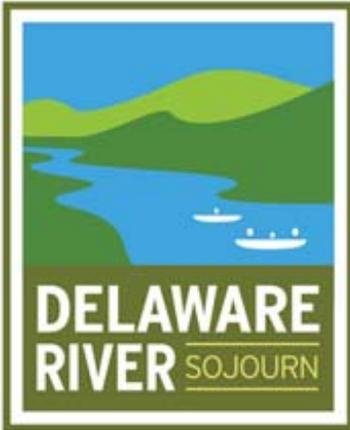
- DRBC coordinates efforts to reduce PCB loadings on behalf of the U.S. EPA and the basin states
- DRBC requires point source discharges to develop and implement Pollution Minimization Plans (PMPs) to:
 - Perform trackdown studies to identify sources
 - Remove PCB transformers and capacitors
 - Control and/or remove contaminated sediment
- PCB reductions were observed in municipal and industrial discharges across the entire Estuary
- The 10 largest point sources reduced loadings by 71% between 2005-2013
- All point sources reduced loadings by 64% 2005-2013

Outreach/Education



*Attention Teachers & Students of
All Ages!*

Did you know there is an Internet resource to help you learn about the Delaware River Watershed and general water issues?



2015 Delaware River Sojourn: Saturday, June 20 – Saturday, June 27

- Guided river trip that combines paddling, camping, and educational programming
- 2015 Theme: Birthplace of America
- For new to experienced paddlers
- Join for one or all eight days



DRBC participates on the steering committee that plans this not-for-profit event.

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www.drbc.net

www.drbc-edweb.net



Courtesy of David B. Soete

Thank you.



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