Delaware River Basin Commission

DRBC Water Quality Monitoring

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Presentation Topics

- * Key DRBC Monitoring Programs & Projects
 - How we use the data
 - 2. How we serve the data & interpretation to partners and stakeholders
- * Special one-time monitoring projects





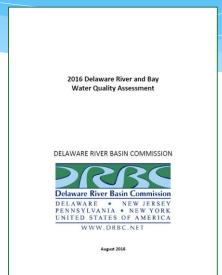
Pottstown Trenton Biles Channel Pennsylvania Florence Bend **Burlington Bristol Bridge** Zone 2 Philadelphia Torresdale Betsy Ross Bridge Benjamin Franklin Bridge Zone 3 Navy Yard Eddystone Paulsboro Marcus Hook Zone 4 Wilmington. Cherry Island New Jersey Zone 5 Pea Patch Island Reedy Point Liston Point Smyrna River O Zone 6 arylan Ship John Light _Mahon River Dover Elbow of Crossledge South of Joe Flogger Shoal South of Brown's Shoal Milford Miles Map Key Delaware DRBC Boat Run Locations Water Quality Zones UNITED STATES OF AMERICA

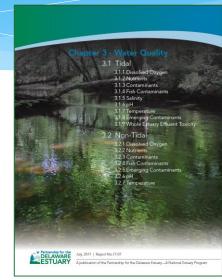
Delaware Estuary Water Quality Monitoring (Boat Run)

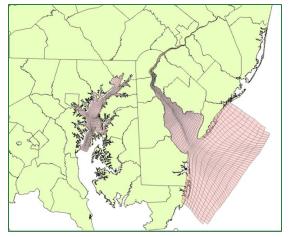
- * Since mid-1960's
- 22 Sites, once per month
- Parameter Groups
 - Routine
 - Nutrients
 - Sodium, biotic ligand model & Algal parameters
 - Bacteria
 - Metals
- Sampling & Analysis performed by DNREC under contract to DRBC

How we use the Delaware Estuary water quality data

- Delaware River & Bay Water Quality Assessment Report
 - CWA 305(b)
 - Every even numbered year
- * State of the Estuary Report
 - Cooperation with PDE
 - ~ Every 5 years
- Estuary Eutrophication Model
- * Canned database queries on DRBC web site at http://www.state.nj.us/drbc/quality/datum/
- * Estuary Water Quality Explorer at https://johnyagecic.shinyapps.io/BoatRunExplorer/









Special Protection Waters Monitoring

- * Nutrients & field measurements
- * Mainstem Delaware River stations (Interstate Control Points (ICPs))
- * Tributaries near confluence with Delaware (Boundary Control Points (BCPs)) in non-tidal Delaware
- * Number of stations flexible from year to year depending on strength of definition of Existing Water Quality



Boundary Control Points within the Special Protection Waters Drainage Area RM 331.2 Upper Delaware SRR **NEW YORK** 331.2 West Branch Delaware River East Branch Delaware River, NY Shehawken Ck PA Equinunk Ck. PA 321.6 Delaware River at Lordville Bridge Basket Ck, NY Little Equinunk Ck. PA Delaware River at Kellams Bridge Delaware River at Callicoon Bridge Callicoon Ck, NY Upper Delaware 2984 Delaware River at Damascus Bridge Scenic & Recreational River Calkins Ck, PA 289.9 Delaware River at Narrowsburg Bridge Tenmile River, NY Masthone Ck PA 279.21 Delaware River at USGS Gage 0142850 Lackawaxen River PA Delaware River at Barryville Bridg Halfway Brook, NY 273.2 Shohola Ck, PA Mill Brook, NY Delaware River at Pond Eddy Bridge Mongaup River, NY 258.4 Delaware River at Millrift RR Bridge PENNSYLVANIA Delaware Water Gap NRA 254.75 Delaware River at Port Jervis Bridge 253.64 Neversink River, NY 250.2 Delaware River at DEWA Boundary Vandermark Ck PA Sawkill Ck. PA Shimers Brook NJ Delaware Water Gap 246.38 Delaware River at Montague, NJ Raymondskill Ck DEWA bdy PA Adams Ck DEWA boundary, PA Dingmans Ck DEWA bdy, PA Delaware River at Dingmans Access Hombecks Ck DEWA bdy, PA Toms Ck DEWA boundary, PA Delaware River at Bushkill Access NEW JERSEY Bushkill Ck DEWA bdv. PA Little Bushkill Ck DEWA bdv PA Sand Hill Ck DEWA bdv PA Delaware Water Gap TRM211.5 Big Flatbrook DEWA bdv. NJ Little Flatbrook DFWA bdv NJ Upper Delaware Van Campens Bk DEWA bdv NJ RM 207.4 Scenic & Recreational River 218.36 Delaware River at Smithfield Access Interstate Control Point Brodhead Ck, PA Marshalls Ck. PA Boundary Control Point Cherry Ck, PA Delaware Water Gap Delaware River at Kittatinny Access National Recreation Area Dunnfield Ck DEWA bdy, NJ ▲ Interstate Control Point Lower Delaware Scenic and Recreational Rive A Boundary Control Point Delaware River at Portland Foot Bridg Paulins Kill, N. 197.84 Delaware River at Belvidere Bridge Scenic & Recreational Rive Pequest River N.I. Interstate Control Point Delaware River at Martins Ck RR Bridg Boundary Control Point 190 65 Martins Ck PA Bushkill Ck. PA 53 Drainage Area for SPW 183 82 Delaware River at Northampton St Bridg 183.66 Lehigh River, PA Lopatcong Ck, NJ For those tributaries to SPV Pohatcong Ck, NJ that are either not included in Delaware River at Riegelsville Bridge Musconetcong River, NJ the Tables or do not have Cooks Ck. PA Water Quality Delaware River at Upper Black Eddy (EWO) as defined in the Nishisakawick Ck. NJ Tinicum Ck. PA tables, the regulations provide 161.6 Tohickon Ck. PA a procedure to be followed if Paunnacussing Ck. PA the need arises to have EWO 155.4 Delaware River at Bulls Island Footbridg defined. (see Water Code. Lockatong Ck. NJ 3.10.3A.2.a.3), page 57). Wickecheoke Ck, NJ Delaware River at Lambertville Bridge Delaware River at Washington Crossing

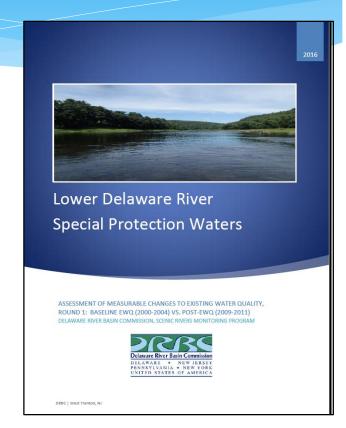
SPW Sampling Stations

- * "It is the policy of the Commission ... no measurable change in existing water quality except_towards natural conditions ..."
- * Data used to establish permit requirements
- * Monitoring to define Existing Water Quality & Assess whether or not Existing Water Quality is being preserved



SPW Data

- * Lower Delaware Measurable Change Assessment published August 2016 http://www.nj.gov/drbc/programs/quality/lower-delaware_EWQassessment2016.html
- * Canned database queries on DRBC web site at http://www.state.nj.us/drbc/quality/datum/
- * Special Protection Waters Monitoring Program Explorer https://elainepanuccio.shinyapps.io/specialprotectionwaters explorer/





Summary Matrix of Measurable Changes: 440 Within-Site Comparisons at a Glance

Good News:

88% of water quality tests showed no degradation

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	Site Color Key		Dark Blue =Interstate Control Point (ICP)				Dark Red =Pennsylvania Tributary Boundary Control Point (BCP)						Dark Green	=New Jersey Tributary Boundary Control Point (BCP)											
		Del. River at Trenton	Del. River at Washngtn	Pidcock Creek, PA	Delaware River at	Wicke- cheoke	Lockatong Creek, NJ	Delaware River at	Pauna- cussing	Tohickon Creek, PA	Tinicum Creek, PA	Nishi- sakawick	Del. River at Milford	Cooks Creek, PA	Musco- netcong	Del. River at RieglsvII	Pohat-cong Creek, NJ	Lehigh River, PA	Del. River	Bushkill Creek, PA	Martins Crook PA	Pequest River, NJ	Del. River at Belvidere	Paulins Kill River, NJ	Del. River at
		at Heilton	Crossing	Oreek, PA	Lambrtvlle	Creek, NJ	Greek, NJ	Bulls Island	Creek, PA	Oreek, FA	Cieek, PA	Creek, NJ	at williord	Oreek, PA	River, NJ	at NiegisVII	Greek, NJ	Kiver, PA	at EastOn	Creek, PA	Oleek, PA	KIVEL, NJ	Delvidere	RIVEL, NJ	Portland
	Parameter Site>																								
-	Site Number>	1343 ICP	1418 ICP	1463 BCP	1487 ICP	1525 BCP	1540 BCP	1554 ICP	1556 BCP	1570 BCP	1616 BCP	1641 BCP	1677 ICP	1737 BCP	1746 BCP	1748 ICP	1774 BCP	1837 BCP	1838 ICP	1841 BCP	1907 BCP	1978 BCP	1978 ICP	2070 BCP	2074 ICP
Field	Dissolved Oxygen (DO) mg/l											~													
	Dissolved Oxygen Saturation %											~													
	pH, units																								
	Water Temperature, degrees C																								
Nutrients	Ammonia Nitrogen as N, Total mg/l																								
	Nitrate + Nitrite as N, Total mg/l																**								
	Nitrogen as N, Total (TN) mg/l																**								
	Nitrogen, Kjeldahl, Total (TKN) mg/l																								
~	Orthophosphate as P, Total mg/l																								
	Phosphorus as P, Total (TP) mg/l																								
Bacteria	Enterococcus colonies/100 ml	~			~																				
	Escherichia coli colonies/100 ml	**	**	**	**	**	**			**	**	**													
	Fecal coliform colonies/100 ml																								
	Alkalinity as CaCO3, Total mg/l																								
als	Hardness as CaCO3, Total mg/l											~													
Conventionals	Chloride, Total mg/l			**		**	**	**	**	**		**	**	**	**	**	**	**	~	**	**	**	**		**
	Specific Conductance μmho/cm			**		**	**	~	**	**	**	**	**	**	**	~	**	**	~	~	~	**	~		
	Total Dissolved Solids (TDS) mg/l																								
	Total Suspended Solids (TSS) mg/l																								
	Turbidity NTU																								
	KEY	KEY = No indication of measurable change to EWQ								= Indication of m	= Indication of measurable water quality change toward more degraded status							= Weak indication of measurable water quality change toward more degraded status							
	•																								

Nutrient reductions corroborated by subsequent USGS assessment using different data, different methods



Biological Monitoring Program

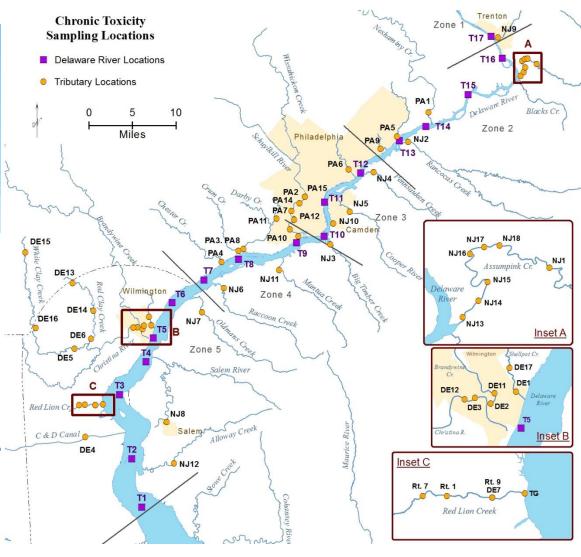
- * Macroinvertebrates
- * Periphyton
- * 25 riffle sites in non-tidal Delaware River
- * Every 2 or 3 years
- * Assessment included in Delaware River Water Quality Assessment (305(b))





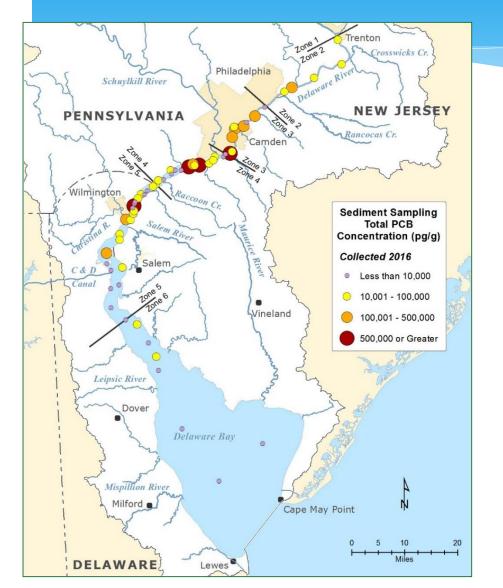
Ambient Toxicity

- Surface Water Samples
- Laboratory Tests using USEPA Short-Term Chronic Methods
- Freshwater and Estuarine species
- 1990 to present
- 2015 & 2016 in cooperation with DNREC WATAR program
- Next sampling proposed for main stem in 2018 following Ambient Toxicity Workgroup recommendation of main stem monitoring every 3 to 5 yrs





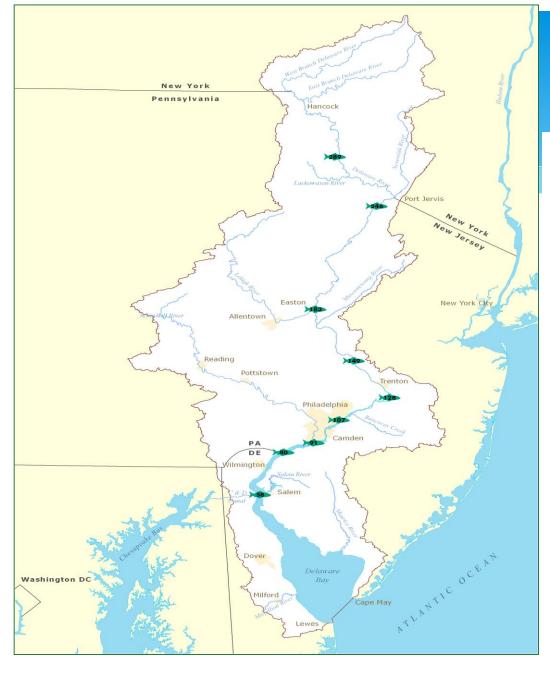
Sediment Monitoring





- * Periodic
- * PCBs, PAHs, perflourinated compounds, emerging contaminants
- * Monitoring recovery under PCB TMDL, special studies in support of states





Fish Tissue Monitoring

- * 8 or 9 sites in both tidal (5 sites) and non-tidal (3 4 sites)
 Delaware River.
- * Frequency: Yearly 2000 2007, 2010, 2012, 2015, 2016 (Delaware Bay), 2018 (planned)
- * Two fish species at each site representing benthic and pelagic trophic levels.
 - Tidal: white perch, channel catfish
 - Non-tidal: smallmouth bass, white sucker
- PCBs, Mercury, Methylmercury, Chlorinated pesticides, Dioxins/Furans, Perfluorinated Compounds, Metals
- bata used for fish consumption advisories by NJ



Special Projects

- Natural Gas Baseline Monitoring
 - Biological Monitoring
 - Conductivity Loggers
 - Radiochemistry
 - Archived samples, barium & strontium
- * SPW Model Calibration Monitoring
 - Brodhead, Neversink, & Lehigh Watersheds
- * Response Monitoring
 - Vinyl Chloride spill response monitoring
 - Estuary tritium, gross alpha, gross beta emitters









Special Projects (continued)



- * Aquatic Life Studies
 - Lower non-tidal Delaware Mussel Survey
 - Didymo Survey
 - Matlock Periphytometer Study
 - Winter Estuary Ammonia monitoring
- * Support for other organizations
 - PWD dye study support
 - Support to Shad young-of-year survey
 - Periodic Emerging Contaminant monitoring







Supplemental Material: Interesting ways DRBC uses data generated by others - <u>Dashboards</u>

- * Near Real-Time Water Quality & Flow Dashboards
- * Pulls data from USGS and NOAA via the internet
- * Automated scripted processing and plotting of data
- Comparisons to criteria and thresholds
 - http://drbc.net/Sky/waterq.htm
 - http://drbc.net/Sky/flows.htm



Supplemental Material: Interesting ways DRBC uses data generated by others – Overnight Model

- * Pulls data from NOAA, USGS, and AHPS overnight via internet
- * Automated scripts formulate the data into an input file for existing model
- Runs existing DYNYD5 model using new data
- * Automated comparisons of model output to observations
- * In the event of a spill, manually feed the output to WASP water quality model to simulate concentration, duration, and movement of plume





Questions & Discussion

