Delaware River Basin Commission

Water Quality Improvements In the Delaware River Basin

Geological Association of New Jersey
2018 Annual Meeting

Battleship New Jersey, Camden, NJ

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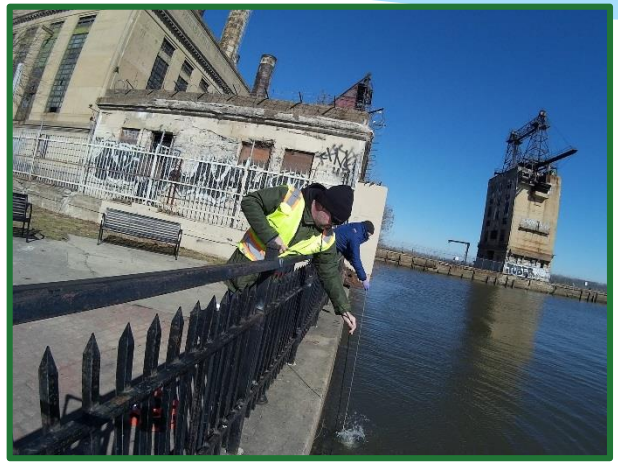

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Delaware River Basin Commission

Compact signed 1961

Equal Members:

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

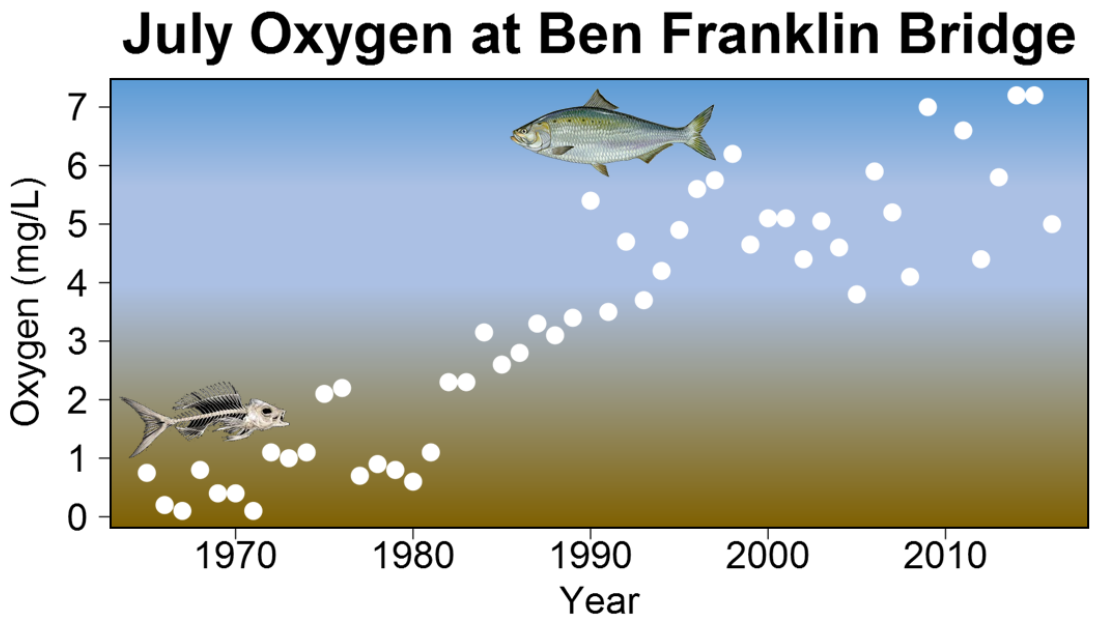
Broad Responsibilities / Authorities

* Water Supply
* Drought Management
* Flood Loss Reduction
* Water Quality
  - Establish Water Quality Standards
  - Monitoring & Assessment
  - Load Reductions
* Watershed Planning
* Regulatory Review (Permitting)
* Outreach/Education
* Recreation

In this presentation…

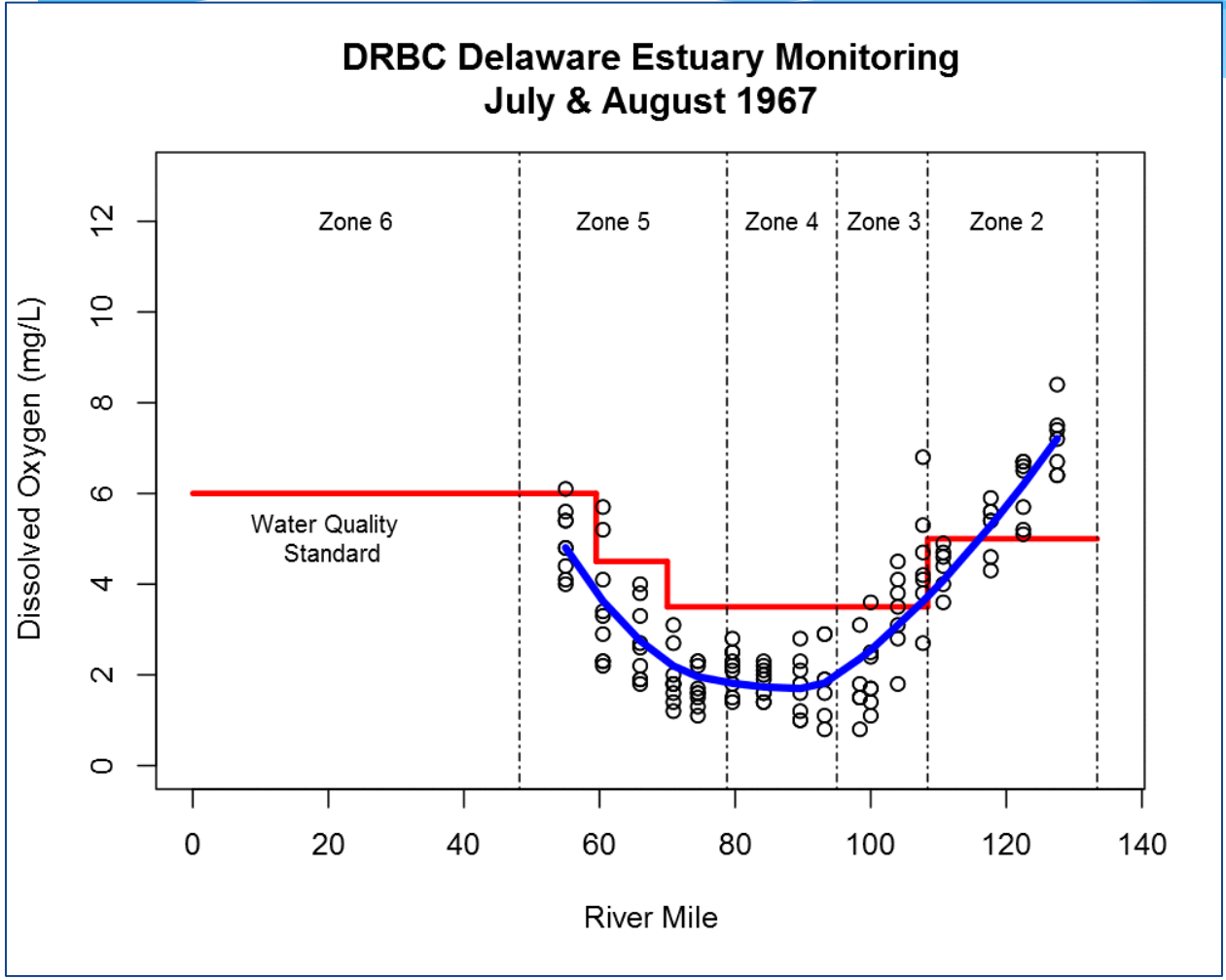
* Historic and current estuary dissolved oxygen efforts
* Polychlorinated Biphenyls
* Nutrient Management under Special Protection Waters
* Emerging Contaminants

Success No. 1 – Dissolved Oxygen



* Historically, summer DO in estuary near Philadelphia was too low for migratory fish to reach upstream to spawn
* DRBC adopted water quality standards (1967) & wasteload allocation (1968)
* Secondary treatment added at wastewater treatment plants 70's & 80's – funding CWA

Success No. 1 – Dissolved Oxygen

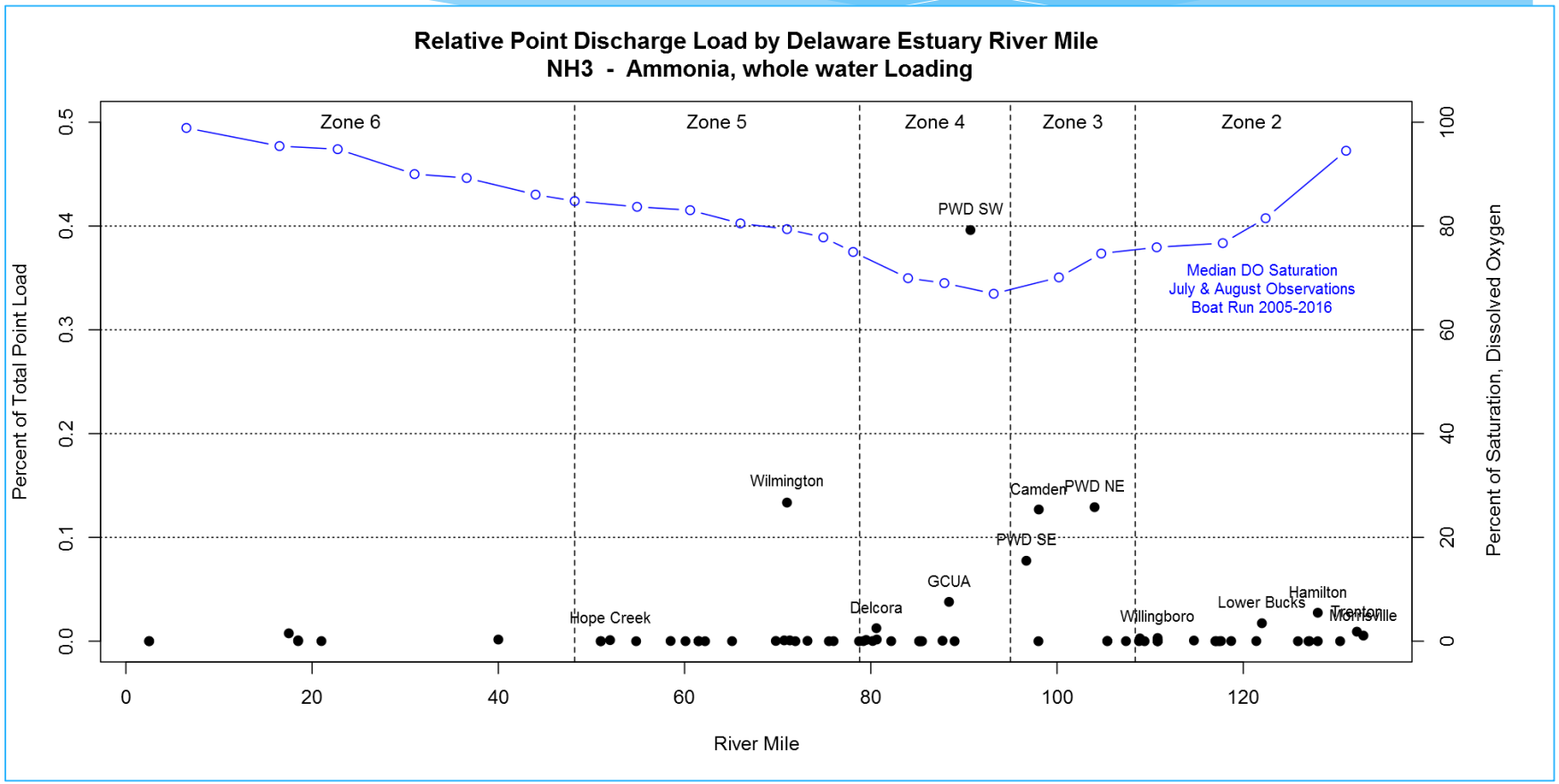


* 3.5 mg/L criteria near Philadelphia, Camden, & Wilmington protect fish migration (not propagation)
* By 2000's that criteria is nearly always met

Next Phase – Dissolved Oxygen

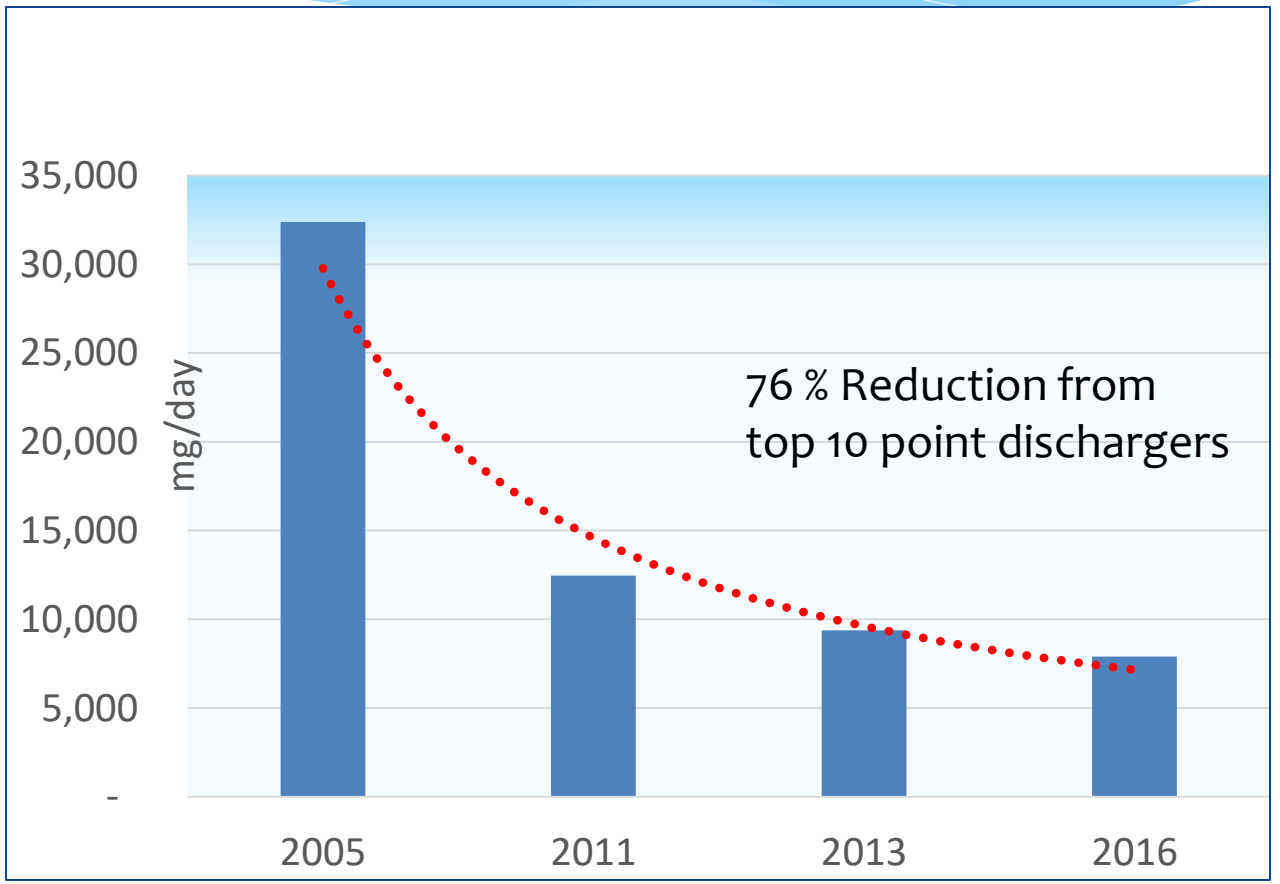
Adopt new designated use & DO criteria to support fish propagation

- Nutrient water quality model
- Engineering evaluation & cost estimate study
- Study of species DO needs



Success No. 2 - PCBs

* PCBs are probable human carcinogen
* Human exposure from fish & water consumption
* Delaware Estuary 100 to 1000X higher than criteria
* DRBC developed TMDLs 2003 & 2006
* 90+ Point dischargers perform pollutant minimization plans – DRBC reviews
* DRBC manages all the data from PMPs
* Decades long commitment
* Stage 2 TMDL refinement



Success No. 3 – Nutrients & Special Protection Waters

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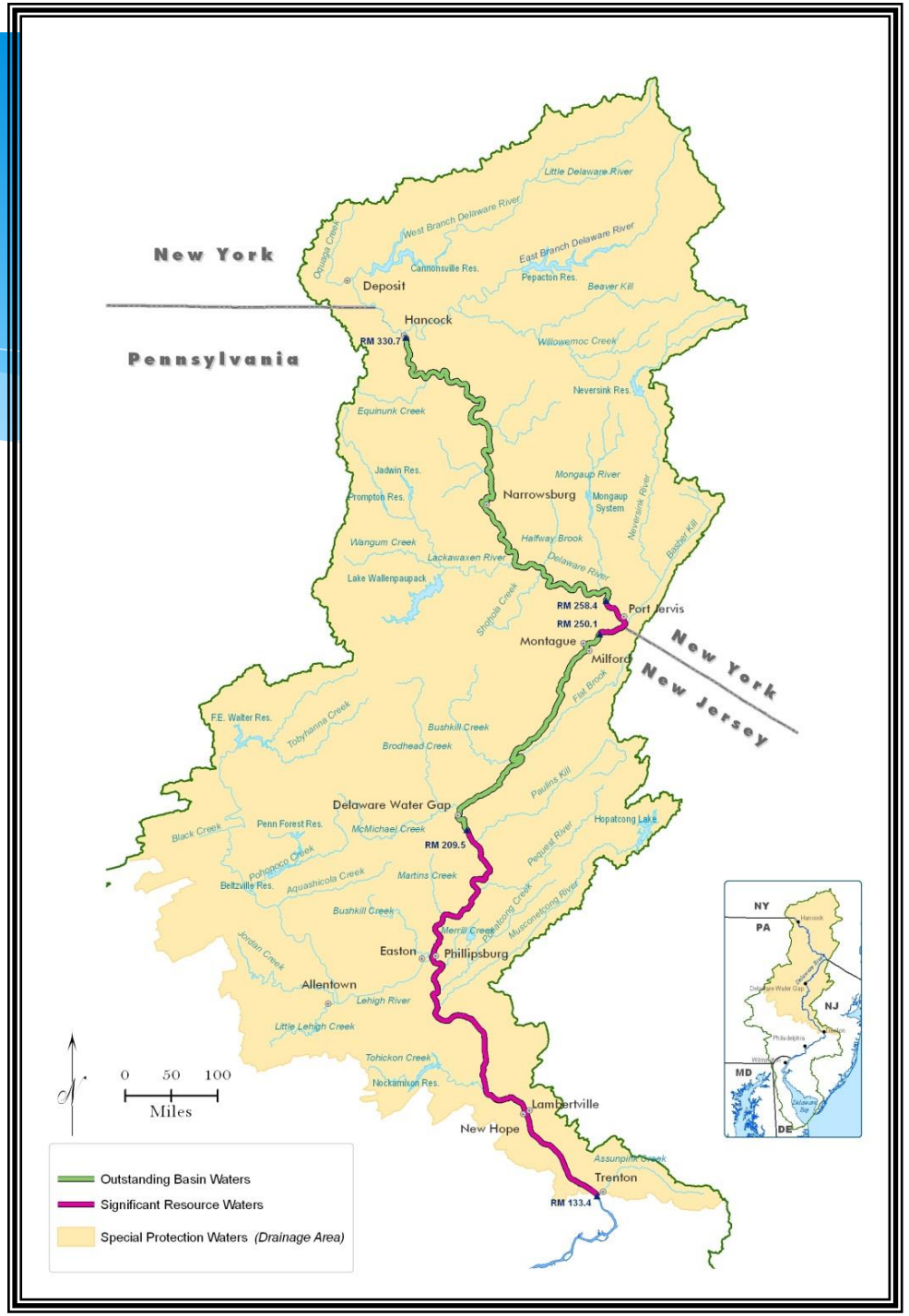
- Non-tidal River
- Keep the clean water clean
- Significant alterations, new or expanding treatment plants must demonstrate to DRBC no measurable change to existing water quality
- DRBC WQ models
- Implementing for over a decade
- 2016 DRBC Assessment showed improving nutrients since early 2000's
- USGS report corroborated

Special Protection Waters

* *It is the policy of the Commission that there be no measurable change in existing water quality except towards natural conditions in waters considered by the Commission to have exceptionally high scenic, recreational, ecological, and/or water supply values.*
  * *Sec 3.10.3A.2.*

Define this

Require Analysis to confirm this



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Monitoring & Analysis to Define Existing Water Quality

TABLE 2I. Definition of Existing Water Quality: Easton ICP

Delaware River at Northampton Street Bridge, Easton-Phillipsburg, PA/NJ, River Mile 183.82

Parameter (Y)	Definition of Existing Water Quality			
	Median	Lower 95%CI	Upper 95%CI	Flow Relationships Site specific regression equation.
Ammonia NH3-N (mg/l) *	<.05	<.05	<0.05	
Chloride (mg/l)	16	14	17	Y = -0.00022184 Q + 16.751
Chlorophyll a (mg/m^3)	1.45	1.07	2.14	
Dissolved Oxygen (mg/l) mid-day*	8.10	7.90	8.58	
Dissolved Oxygen Saturation (%)	95%	92%	96%	
E. coli (colonies/100 ml)	31	24	64	Y = antilog (0.00004425 Q + 1.273)
Enterococcus (colonies/100 ml)	145	80	250	
Fecal coliform (colonies/100 ml) *	100	64	130	
Nitrate NO3-N (mg/l) *	0.85	0.70	0.90	
Orthophosphate (mg/l)	0.02	0.01	0.02	
pH	7.55	7.41	7.70	
Specific Conductance (umhos/cm)	142	127	155	Y = -0.0024666 Q + 158.76
Total Dissolved Solids (mg/l)	110	103	120	
Total Kjeldahl Nitrogen (mg/l)	0.35	0.26	0.46	
Total Nitrogen (mg/l) *	1.19	1.01	1.35	
Total Phosphorus (mg/l) *	0.05	0.04	0.06	
Total Suspended Solids (mg/l) *	4.0	3.0	5.0	Y = 0.00177536 Q – 4.8027
Turbidity (NTU)	2.6	1.8	4.0	Y = antilog (0.00003836 Q + 0.1845)
Alkalinity (mg/l)	34	30	39	Y = -0.00073929 Q + 39.867
Hardness (mg/l)	48	45	52	

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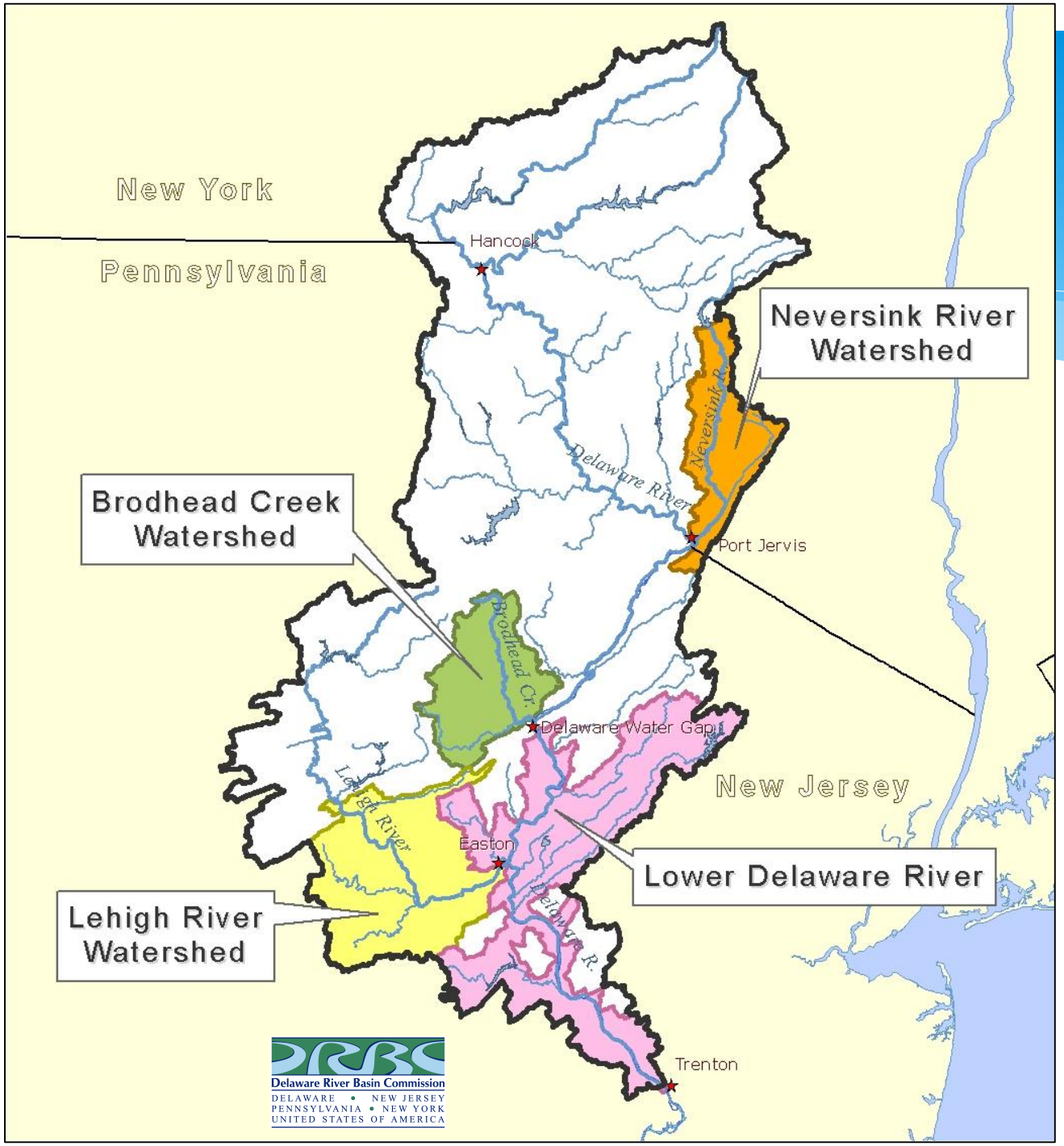
Definitions of Existing Water Quality are contained in our Water Quality Regulations



Cumulative analysis with Water Quality Models

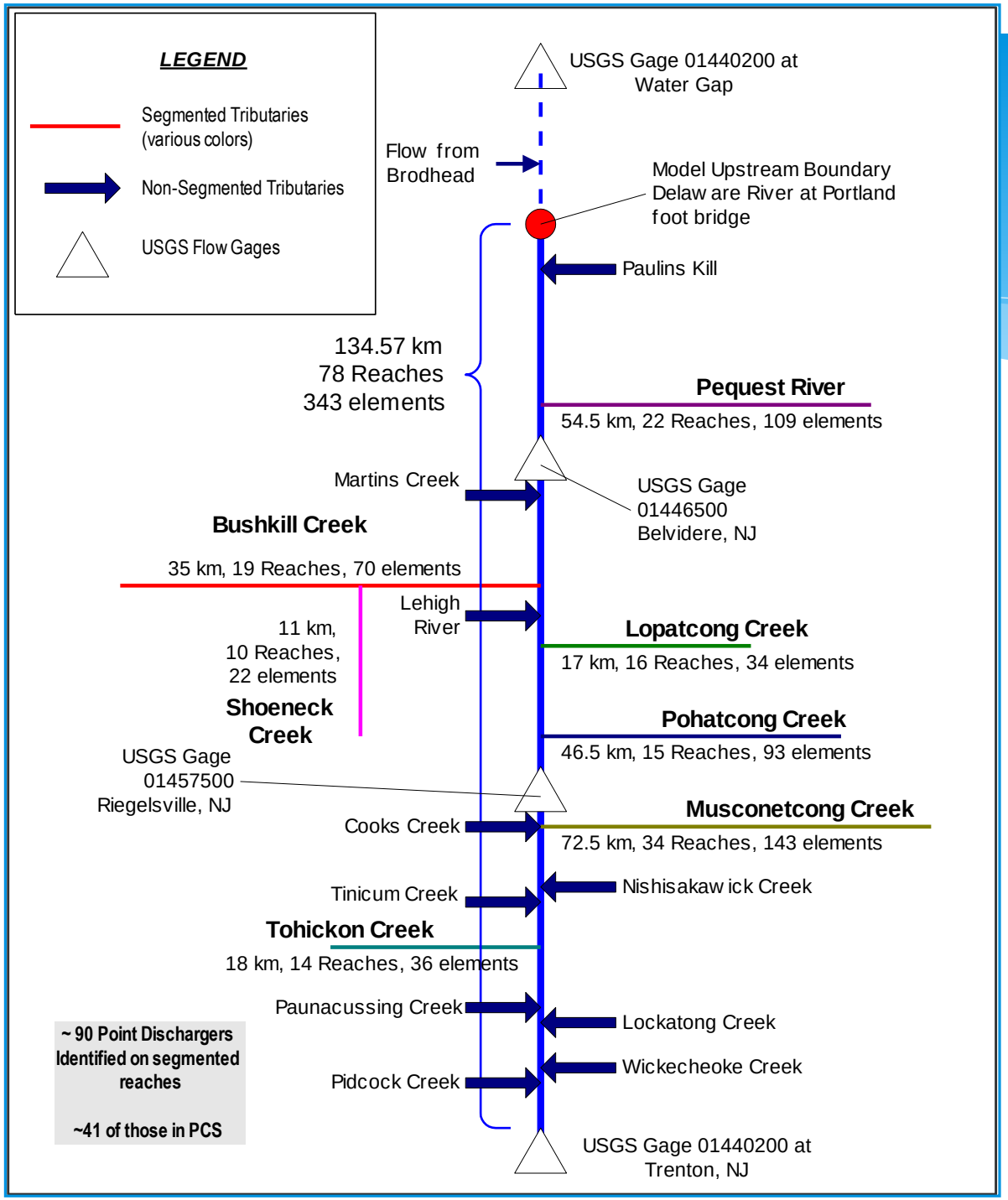
Neversink River Watershed (NY) (~ 20 dischargers)

Brodhead Creek Watershed (PA) (~ 30 dischargers)

Lehigh River Watershed (PA) (~ 65 dischargers)

Lower Delaware River (PA/NJ) (~ 100 dischargers)

Lower Delaware QUAL2K Model



- Model to simulate nutrients and dissolved oxygen
- Steady flow, 1-D

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

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Trenton

Delaware Water Gap

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)

	Parameter / Site--->	Del. River at Trenton	Del. River at Washngtn Crossing	Pidcock Creek, PA	Delaware River at Lambrtvlle	Wicke-cheoke Creek, NJ	Lockatong Creek, NJ	Delaware River at Bulls Island	Pauna-cussing Creek, PA	Tohickon Creek, PA	Tinicum Creek, PA	Nishi-sakawick Creek, NJ	Del. River at Milford	Cooks Creek, PA	Musco-netcong River, NJ	Del. River at Rieglsvll	Pohat-cong Creek, NJ	Lehigh River, PA	Del. River at Easton	Bushkill Creek, PA	Martins Creek, PA	Pequest River, NJ	Del. River at Belvidere	Paulins Kill River, NJ	Del. River at Portland
	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																								
Conventionals	Alkalinity as CaCO3, Total mg/l																								
	Hardness as CaCO3, Total mg/l											~													
	Chloride, Total mg/l			**		**	**	**	**	**		**	**	**	**	**	**	**	~	**	**	**	**		**
	Specific Conductance µmho/cm			**		**	**	~	**	**	**	**	**	**	**	~	**	**	~	~	~	**	~		
	Total Dissolved Solids (TDS) mg/l																								
	Total Suspended Solids (TSS) mg/l																								
	Turbidity NTU																								

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

Good News:
88% of water quality tests showed no measurable change to EWQ

KEY: (blank) = No indication of measurable change to EWQ; ** = Indication of measurable water quality change toward more degraded status; ~ = Weak indication of measurable water quality change toward more degraded status

In Each Case…

* Fundamentals of mass loading rates, exposure pathways, chemical reactions, & water column response
  - water quality modeling, engineering, & technical analysis
* Intensive monitoring
* Point sources matter
* Substantial Investment
  - Governments & grants
  - Dischargers & regulated community
* Cooperation & coordination - all pulling in the same direction

Emerging Contaminants Surveys Since 2004

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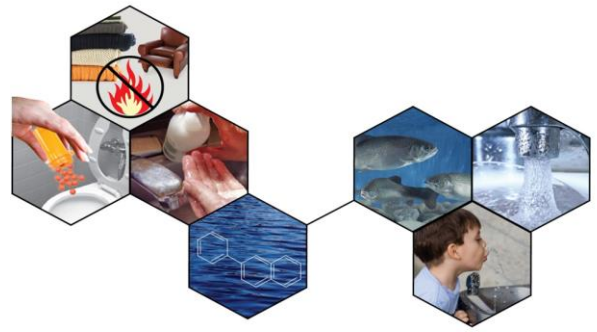
* DRBC Surveys in surface water, fish and sediment
  * Pharmaceuticals and Personal Care Products (PPCP)
  * Hormones
  * Stain repellants/non-stick surfaces/fire fighting foams [PFAS]
  * Flame Retardants [PBDE]
  * Detergents [NP]
  * Plasticizers [bis-phenol A]
* Monitor Ambient Toxicity
* Close coordination with States, TAC, & EPA
  * Seeing reductions in ambient longer chain PFAS



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Questions & Discussion?

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