



Water Quality Standards of the Delaware River Basin

ABOUT RIVER NETWORK

River Network connects water-focused nonprofits, agencies, businesses, and communities for greater local impact and healthier rivers across the U.S.

We envision a future of clean and ample water for people and nature, where local caretakers are well-equipped, effective, and courageous champions for our rivers.



For details about free and paid membership levels, please visit:
www.rivernetwork.org/get-involved/join-our-network/
Together, we can do more.

Polls

1. Which Delaware River Basin state do you work in?

- New York
- New Jersey
- Pennsylvania
- Delaware
- Basin-wide
- Outside of the DRB

2. What type of organization are you affiliated with?

- NGO
- Government Agency
- Private entity
- University or academic affiliate
- Individual
- Other

PRESENTERS



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TODAY'S OBJECTIVES

- **Get acquainted with water quality standards**
 - What are they?
 - What is their role in meeting the goals of the Clean Water Act?
- **Understand how water quality standards are developed**
- **Learn about the differences in water quality standards across the regulatory agencies in the Delaware River Basin**



CLEAN WATER ACT GOALS



Objective:

To restore and maintain the chemical, physical and biological integrity of the Nation's waters

National goal:

Eliminate discharge of pollutants to surface water
All waters will be "fishable and swimmable" where attainable

"water quality which provides for the protection and propagation of fish, shellfish and wildlife and provides for recreation in and on the water"

WATER QUALITY STANDARDS

- ❖ **Designated Uses**
 - ❖ **Criteria - numeric and narrative**
 - ❖ **Antidegradation Policy**
-
- ❖ In practice, EPA often drafts proposed criteria and states review and adopt
 - ❖ Under the statute, states can be more restrictive but can't be **LESS** restrictive than the EPA criteria
 - ❖ State's are supposed to review their water quality standards every three years through a Triennial Review

“A water quality standard defines the water quality goals of a water body, or portion thereof, by designating the use or uses to be made of the water and by setting criteria necessary to protect the uses.”

40 CFR 131.2

WATER QUALITY CRITERIA

A photograph of two young boys in a stream. The boy on the left is wearing a red t-shirt with a 'CONVERSE ALL STAR' logo and is using a long-handled net to catch something in the water. The boy on the right is wearing a white t-shirt and is looking at the net. The background shows a rocky stream bed and green foliage.

Numeric:

measurable benchmarks

Narrative:

desirable conditions

Three categories:

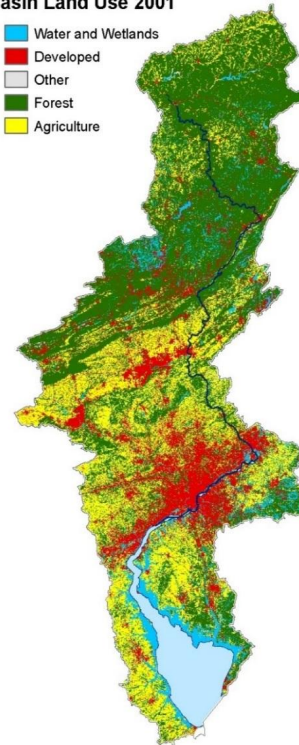
- ◆ Biological
- ◆ Chemical
- ◆ Physical

Water Quality Standards of the Delaware River Basin



Basin Land Use 2001

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



Ron MacGillivray, Ph.D.
Senior Environmental Toxicologist
Delaware River Basin Commission
October 28, 2020



Why was the DRBC created?

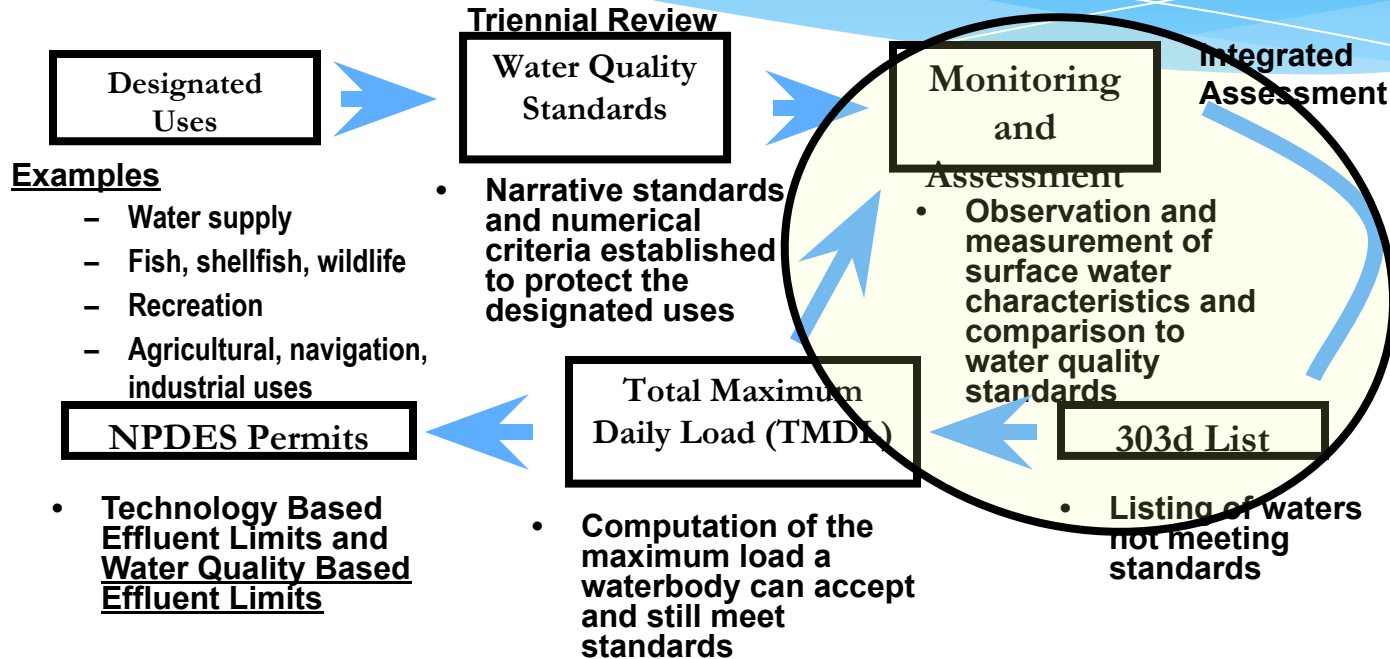


- Water supply shortages and disputes over the apportionment of the basin's waters;
- Severe pollution in the Delaware River and its major tributaries;
- Serious flooding



- Five Equal Members:
- Delaware
 - New Jersey
 - Pennsylvania
 - New York
 - Federal Government
- Integrated approach to water management
 - Uniform water quality criteria in shared interstate waters

Clean Water Act Framework for Water Quality Management



Clean Water Act Framework for Water Quality Management



**Water Quality Standards
anti-degradation policies** to
prevent deterioration of
high-quality waters



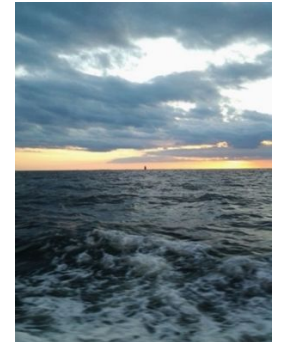
WQS Objectives:

- * protection or preservation of **uses** associated with the water body
- * protection or preservation of the **water quality** with the intent of sustaining currently existing conditions
- * preservation of the water resources for **future or intended uses**

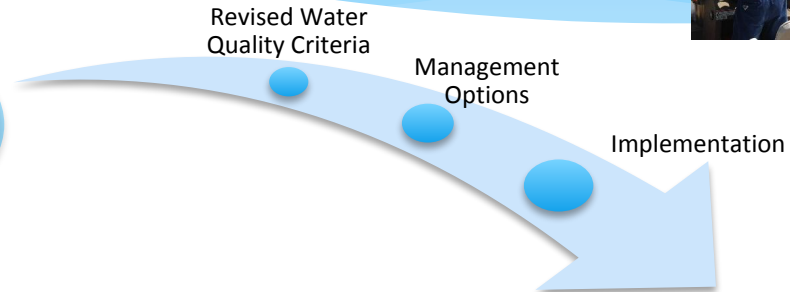
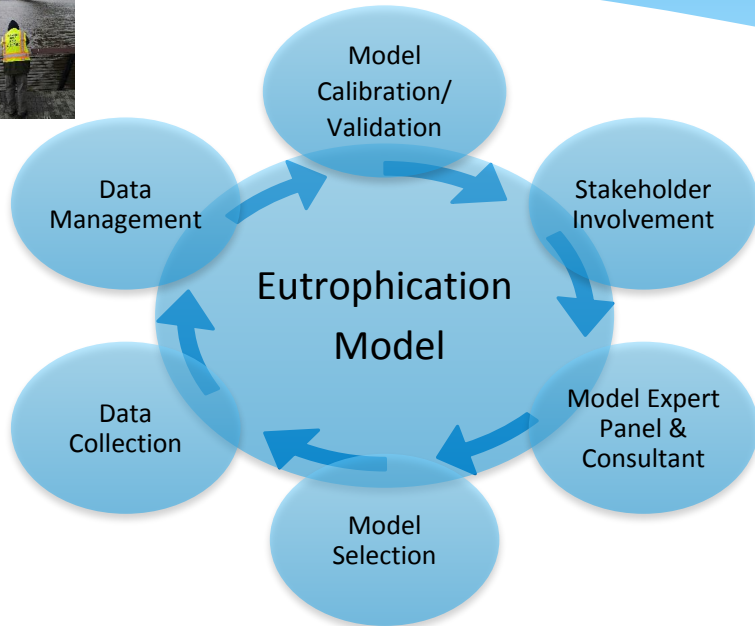
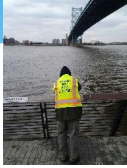
Monitoring Goals



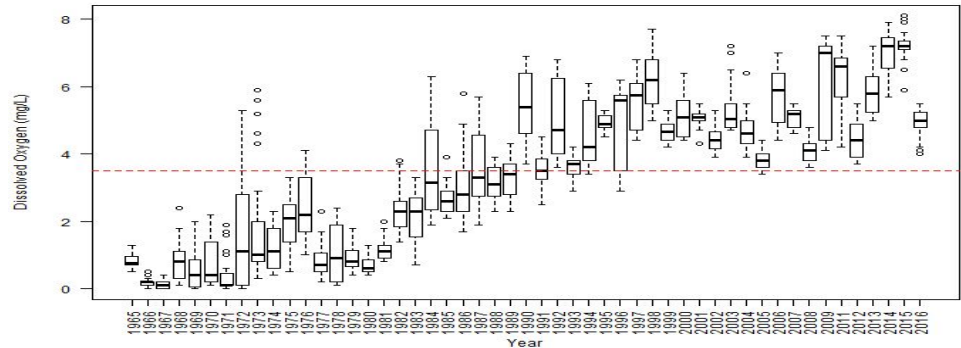
- * Use current scientific knowledge and technology
- * Measure regulatory objectives of sustainable healthy waters
- * Assessment (status and trends)
- * Inform adaptive management
- * Data coordination



Modeling Eutrophication Processes in the Delaware Estuary to Link Watershed Efforts to Control Nutrient Impacts Environmental Management



July Dissolved Oxygen Daily Mean Values
USGS 01467200 Delaware R at Ben Franklin Bridge at Philadelphia



25 Years of Science-based Metals Policy

slide courtesy of Mary Reiley, USEPA
Criteria Development



Early 1980's

Total Recoverable Metals

Not optimal but stable, reproducible, implementable (USEPA 1985)

1985

Acid Soluble Metals

An acknowledged improvement (USEPA 1985)

1993

Dissolved Metal Concentration

Base metals criteria on bioavailable metal (USEPA, 1993)

1994

Water Effect Ratios

Filled the chemistry gap between lab and ambient water (Davies, 1994)

2007

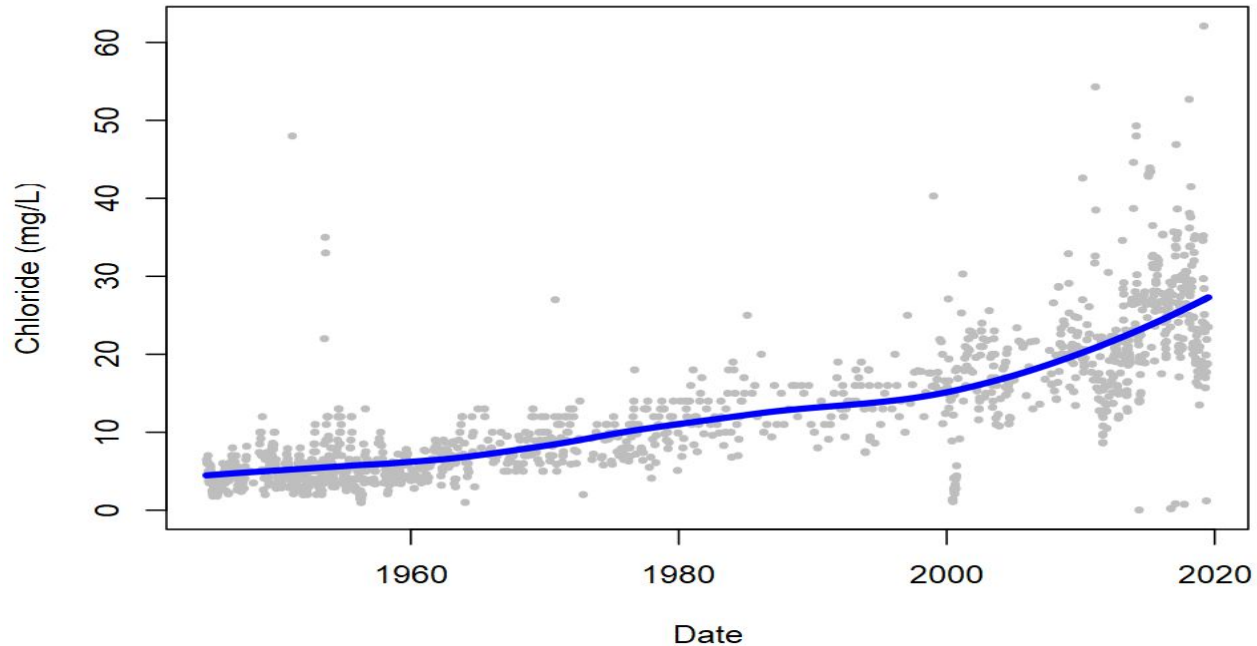
Biotic Ligand Model

Accounts for the variety of water chemistry parameters that impact metals bioavailability (USEPA, 2007)

Freshwater salinization



Chloride Time Series, Delaware River at Trenton





All DRBC Business Meetings, Public Hearings and Advisory Committee Meetings are open to the public.

The public can participate in DRBC regulatory processes for proposed rulemakings & project review by submitting written comments or providing comments in-person.

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<https://www.state.nj.us/drbc/contact/interest/index.html>

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Biological Criteria

of the Delaware Basin

Adam Griggs

Science Manager, River Network



Biological Criteria and the Clean Water Act

Cold Water Fisheries

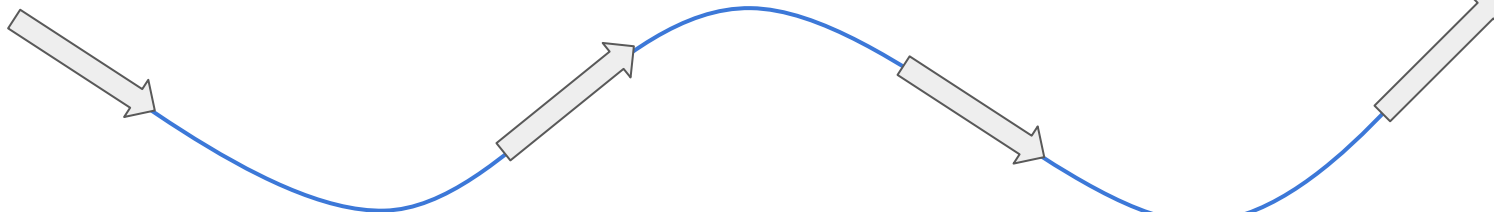
Index of Biotic Integrity

Sediment TMDL

Designated Uses

Indicators

Listing/TMDLS



Criteria

Stressor Identification

Narrative or Numeric

What's the cause??

Pennsylvania Designated Uses



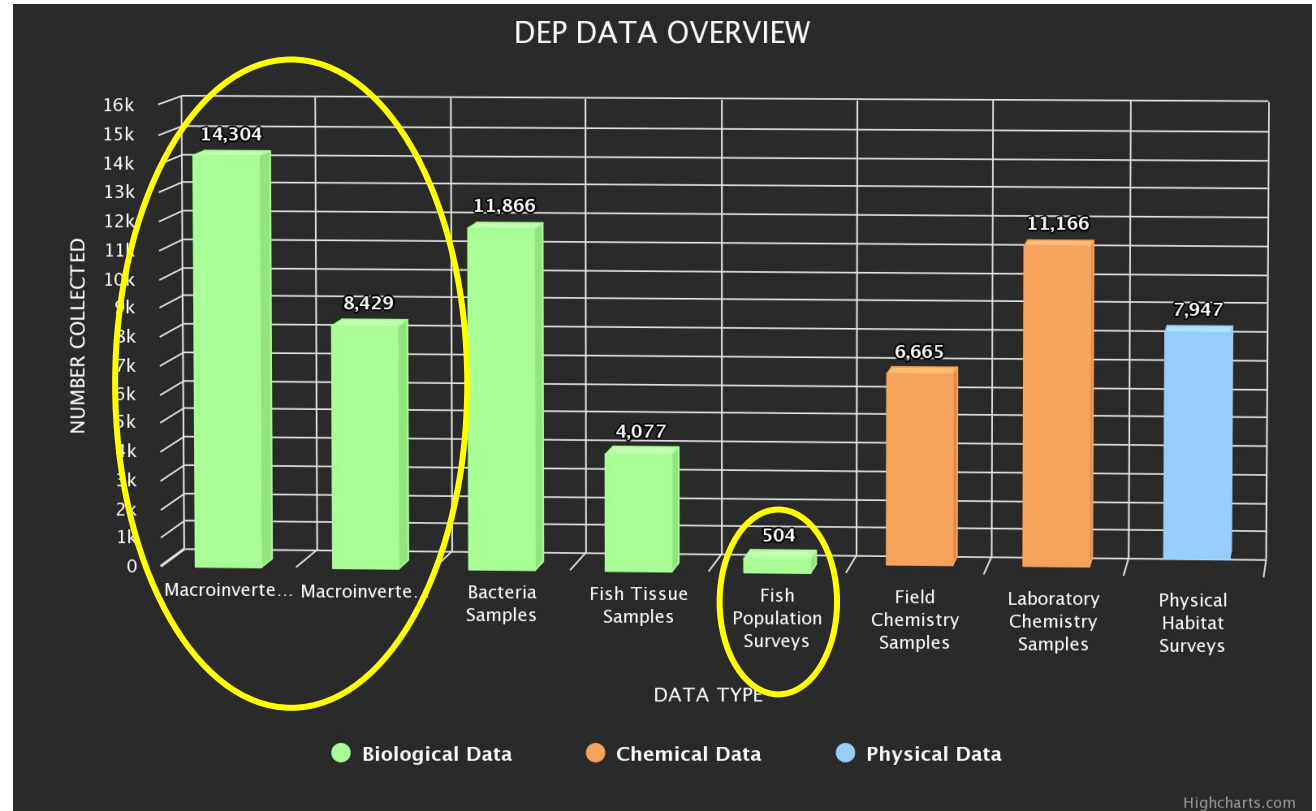
Pennsylvania Aquatic Life Designations

- EV(EXCEPTIONAL VALUE)
- HQ-CWF(HIGH QUALITY-COLD WATER FISHES)
- CWF(COLD WATER FISHES)
- TSF(TROUT STOCKING)
- HQ-TSF(HIGH QUALITY-TROUT STOCKING)
- HQ(HIGH QUALITY)
- HQ-WWF(HIGH QUALITY-WARM WATER FISHES)
- WWF(WARM WATER FISHES)

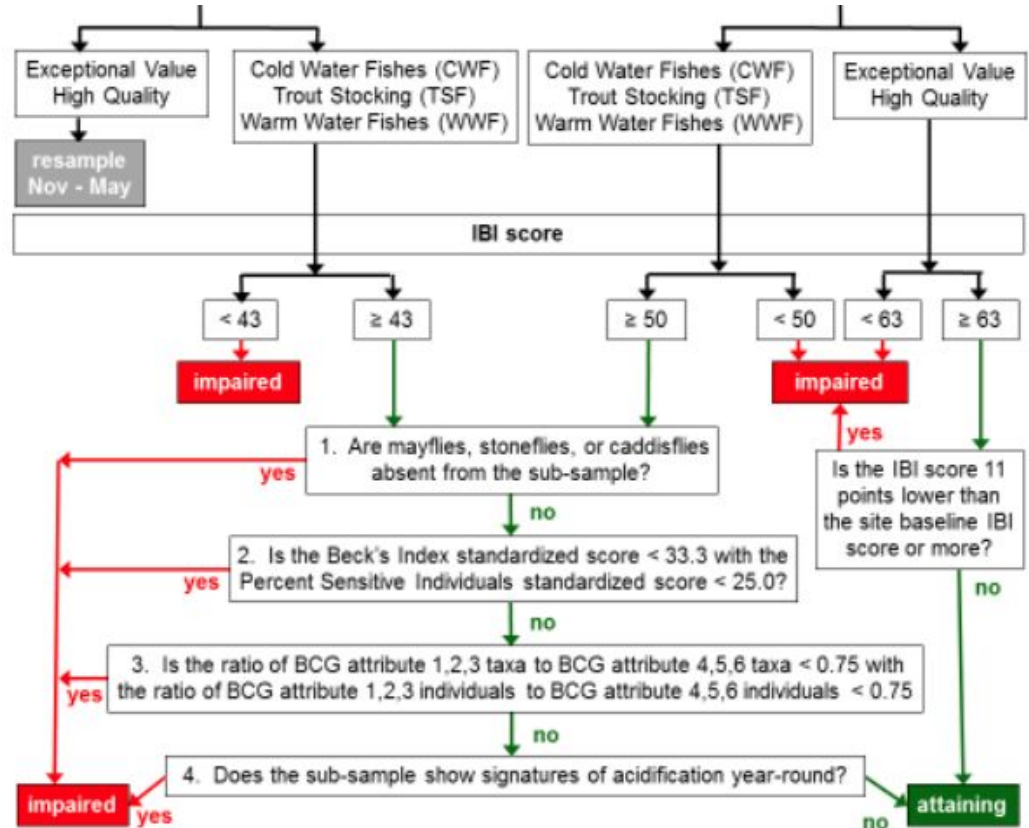
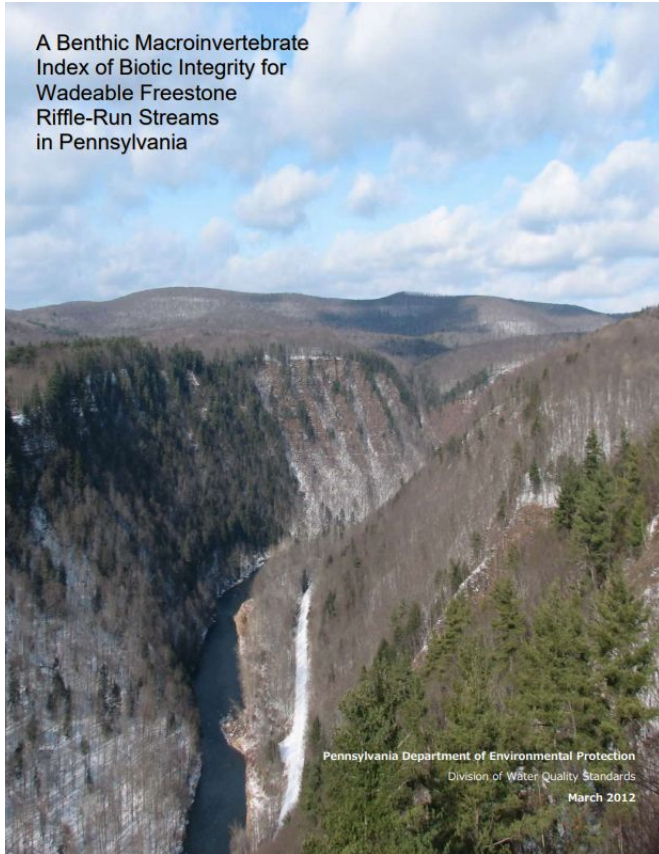
- CWF *Cold Water Fishes*—Maintenance or propagation, or both, of fish species including the family Salmonidae and additional flora and fauna which are indigenous to a cold water habitat.
- WWF *Warm Water Fishes*—Maintenance and propagation of fish species and additional flora and fauna which are indigenous to a warm water habitat.
- MF *Migratory Fishes*—Passage, maintenance and propagation of anadromous and catadromous fishes and other fishes which move to or from flowing waters to complete their life cycle in other waters.
- TSF *Trout Stocking*—Maintenance of stocked trout from February 15 to July 31 and maintenance and propagation of fish species and additional flora and fauna which are indigenous to a warm water habitat.

PA DEP - Data collected for Integrated Report

Most Aquatic Life data is macroinvertebrates



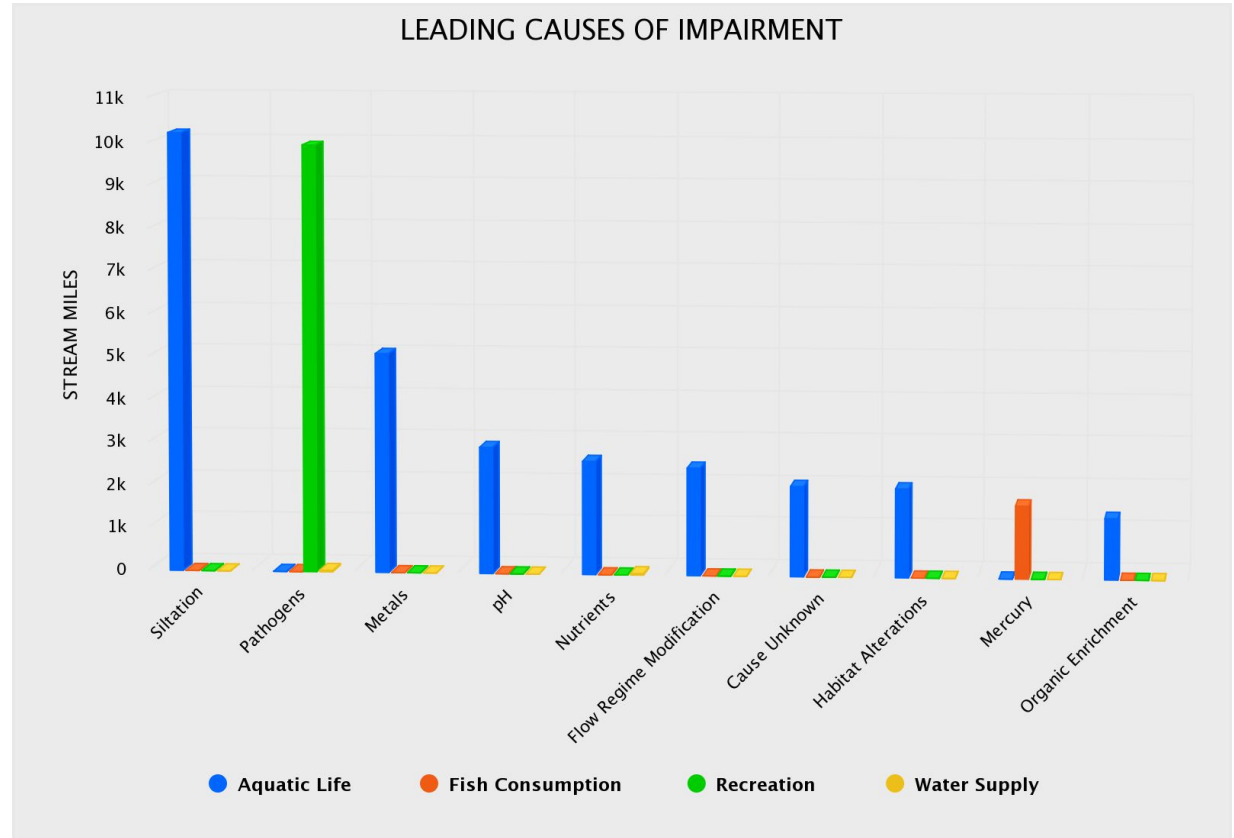
Pennsylvania Biological Indicators - IBI



Pennsylvania Biological Stressor Identification

Pennsylvania deploys an iterative weight of evidence approach based on the EPA Stressor Response Guidance Document (2000)

- Siltation and metals are commonly identified causes of impairment
- Relatively few “unknowns”



New Jersey Aquatic Life Designated Uses

Delaware Basin and the Clean Water Act: Designated Uses and Use-Support

Who needs this story map?

Explaining Existing and Designated Uses

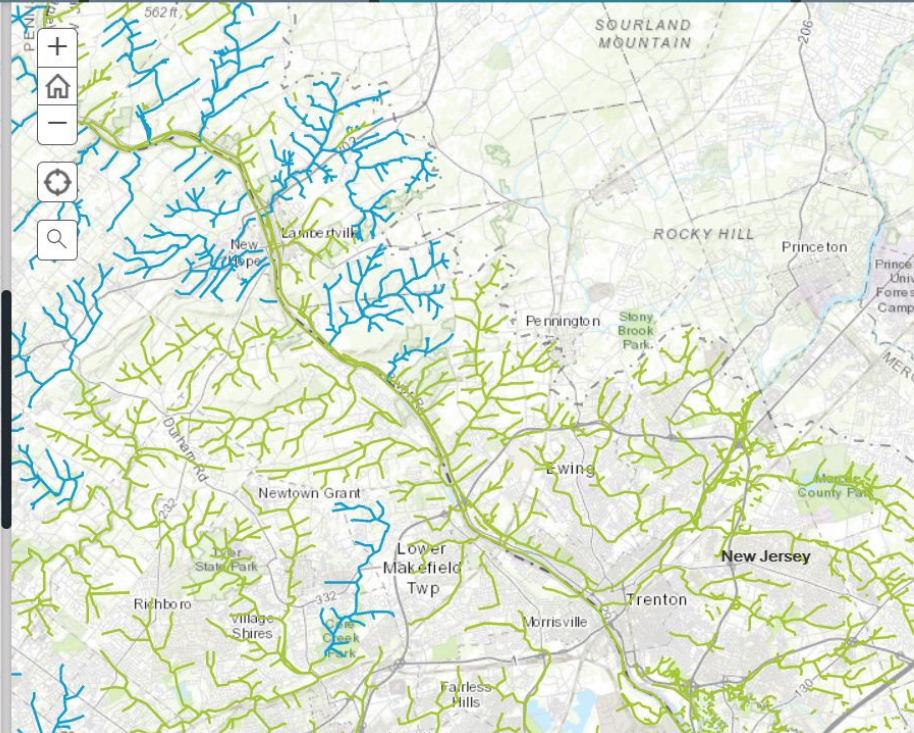
MAP: Is swimming supported?

MAP: Which Aquatic Life Uses are designated?

MAP: Are Aquatic Life Uses supported?

New Jersey Aquatic Life Designations

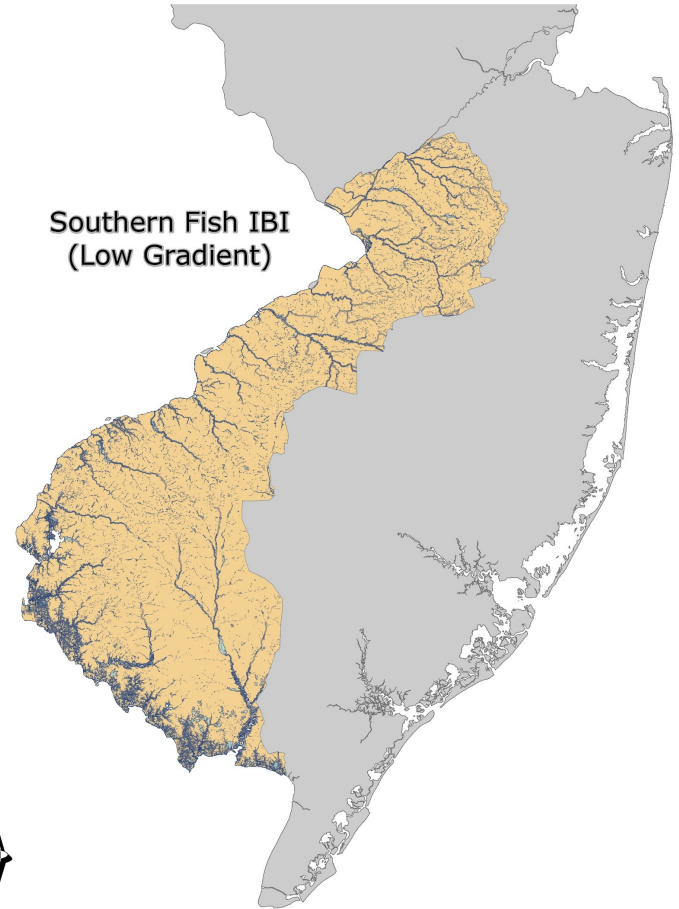
- FW1-TP (Trout Production)
- FW1-TM (Trout Management)
- FW2-TPC1 (Trout Production)
- FW2-TMC1 (Trout Management)
- FW2-TP (Trout Production)
- FW2-TM (Trout Management)
- FW1 (Non-trout)
- FW2-NTC1 (Non-trout)
- FW2-NT/SE1 (Non-trout)
- FW2-NT (Non-trout)
- FW2-NTC1/SE1 (Non-trout)
- FW2-NTC1/SE2 (Non-trout)
- FW2-NT/SE2 (Non-trout)
- SE1 (Non-trout)
- SE1C1 (Non-trout)
- PL (Non-trout)



New Jersey Biological Indicators

Low Gradient - Southern Fish IBI

“The southern fish IBI (SIBI) was developed for low gradient streams located in the Inner Coastal Plain which are greater than 2-square miles in drainage size.”



New Jersey Biological Indicators

High Gradient - Northern Fish IBI

“The northern fish IBI (NIBI) is used to assess high gradient streams north of the fall line which are greater than 4-square miles in drainage size.”



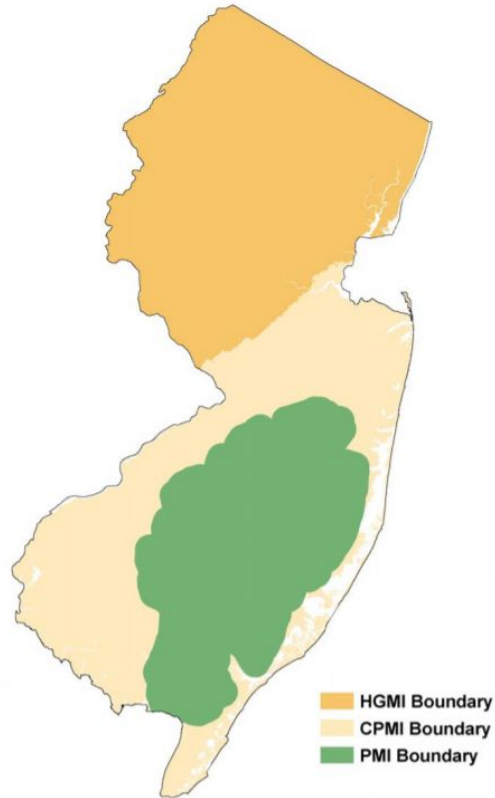
New Jersey Biological Indicators

High Gradient - Headwaters IBI

“Recently, the bureau completed the headwaters IBI (HIBI) for those small high gradient tributaries north of the fall line which are less than 4-square miles in drainage size. The headwater IBI monitors the assemblage of fish as well as crayfish, salamanders and frogs to assess aquatic life use in small headwater streams.”



New Jersey Biological Indicators



Coastal Plain Macroinvertebrate Index (CPMI)¹

Study area: southern New Jersey, below the geologic fall-line; Middle Atlantic Coastal Plain ecoregion, excluding the Pinelands National Reserve. See figure A1.

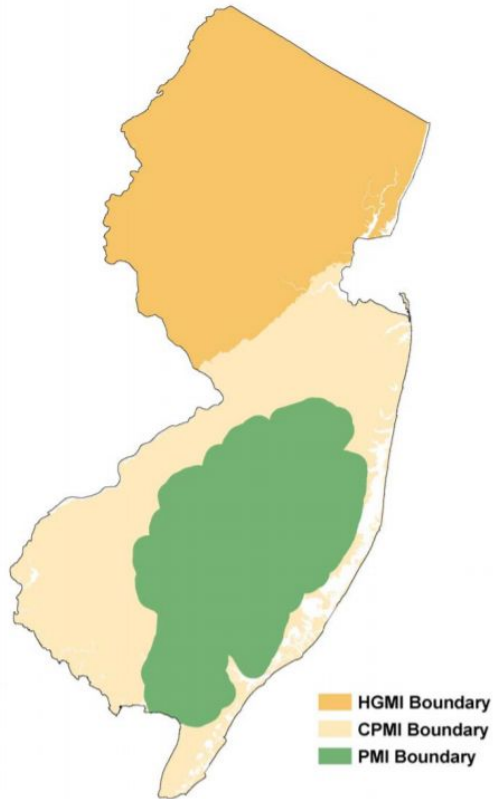
Index Metrics

1. Total number of genera
2. Total number of EPT genera
3. Percent Ephemeroptera genera
4. Hilsenhoff Biotic Index
5. Percent Clinger genera

Index Metric	Score			
	6	4	2	0
Number of genera	>25	17-25	9-16	<9
Number of EPT genera	>9	7-9	4-6	<4
% of Ephemeroptera	>29	20-29	10-19	<10
Hilsenhoff Biotic Index	<4.9	4.9-6.0	6.1-7.3	>7.3
% Clingers	>51	34-51	17-33	<17

<u>Assessment Rating</u>	<u>Score</u>
Excellent	22-30
Good	12-20
Fair	10-6
Poor	< 6

New Jersey Biological Indicators

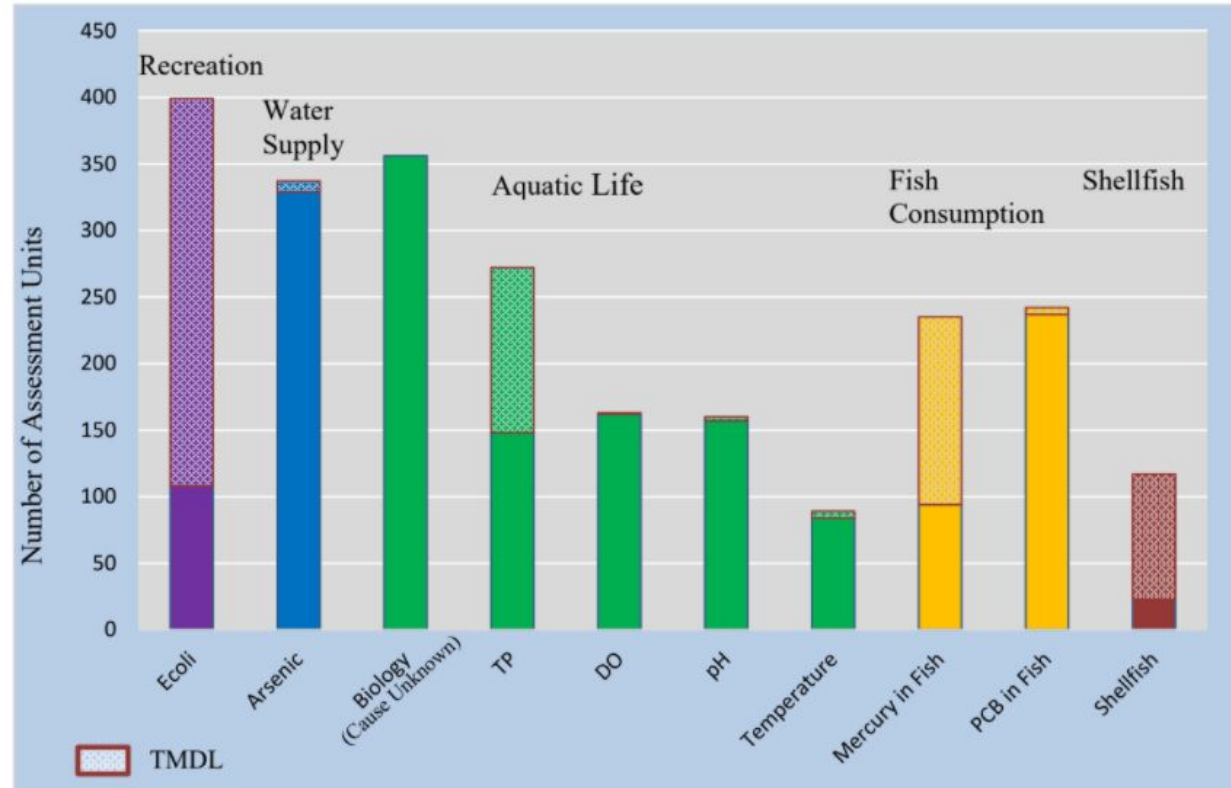


High Gradient Macroinvertebrate Index (HGMI) (Highlands, Ridge and Valley, Piedmont):		
Assessment category	Index Score	Regulatory Threshold
Excellent	63 - 100	Full Attainment
Good	<63-42	Full Attainment
Fair	<42-21	Non-Attainment
Poor	< 21	Non-Attainment
Coastal Plain Macroinvertebrate Index (CPMI)		
Assessment category	Index Score	Regulatory Threshold
Excellent	22 - 30	Full Attainment
Good	20 - 12	Full Attainment
Fair	10 - 6	Non-Attainment
Poor	< 6	Non-Attainment
Pinelands Macroinvertebrate Index (PMI)		
Assessment category	Index Score	Regulatory Threshold
Excellent	63 - 100	Full Attainment
Good	<63-56	Full Attainment
Fair	<56-34	Non-Attainment(PL) Full Attainment(FW2)
Poor	< 34	Non-Attainment

New Jersey Biological Impairments

Stressor Identification Investigations

The Stressor Identification process is based on USEPA's "[Stressor Identification Guidance Document](#)" (2000)



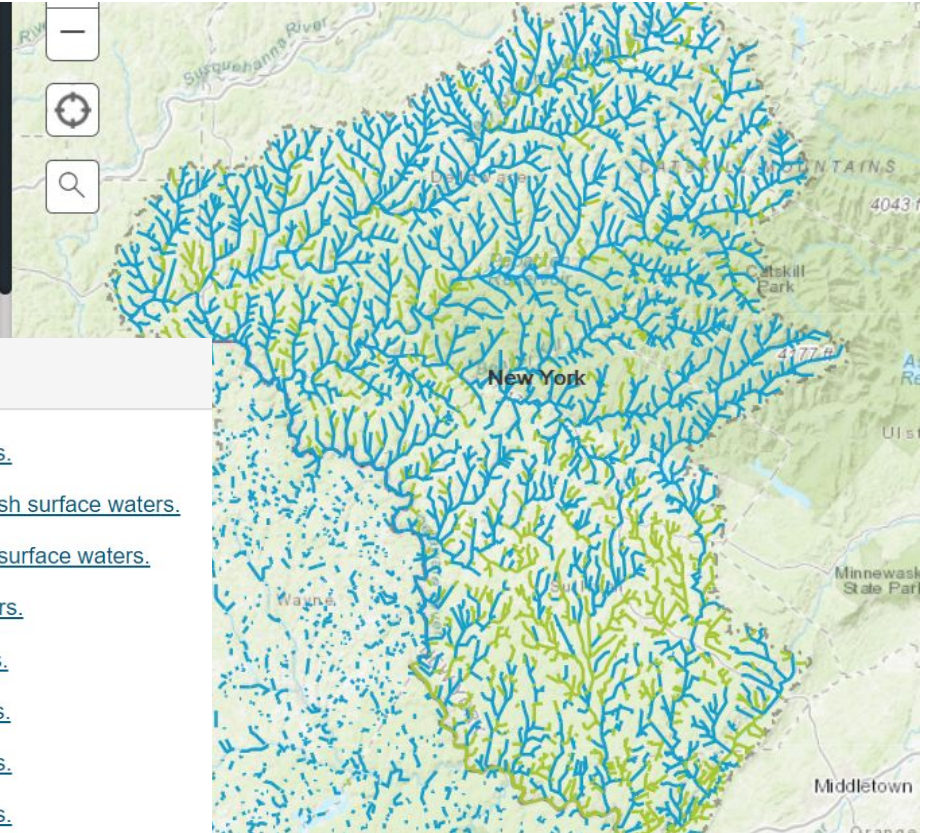
New York Aquatic Life Uses

New York Aquatic Life Designations

- AA(TS) (Trout-spawning)
- A(TS) (Trout-spawning)
- B(TS) (Trout-spawning)
- C(TS) (Trout-spawning)
- AA(T) (Trout waters)
- A(T) (Trout waters)
- B(T) (Trout waters)
- C(T) (Trout waters)
- AA (Non-trout)
- A (Non-trout)
- B (Non-trout)
- C (Non-trout)
- D (Non-trout)

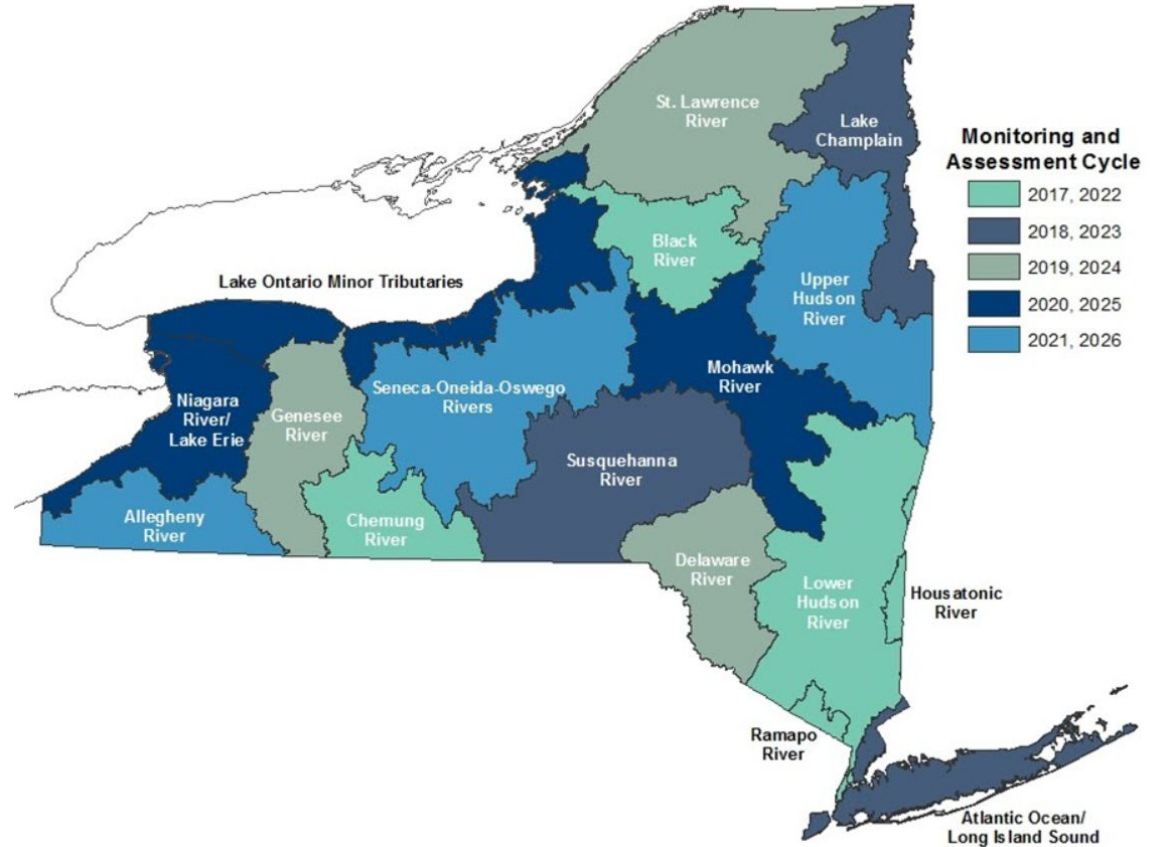
Fresh Surface Waters

- [s 701.2 Class N fresh surface waters.](#)
- [s 701.3 Class AA-Special \(AA-S\) fresh surface waters.](#)
- [s 701.4 Class A-Special \(A-S\) fresh surface waters.](#)
- [s 701.5 Class AA fresh surface waters.](#)
- [s 701.6 Class A fresh surface waters.](#)
- [s 701.7 Class B fresh surface waters.](#)
- [s 701.8 Class C fresh surface waters.](#)
- [s 701.9 Class D fresh surface waters.](#)



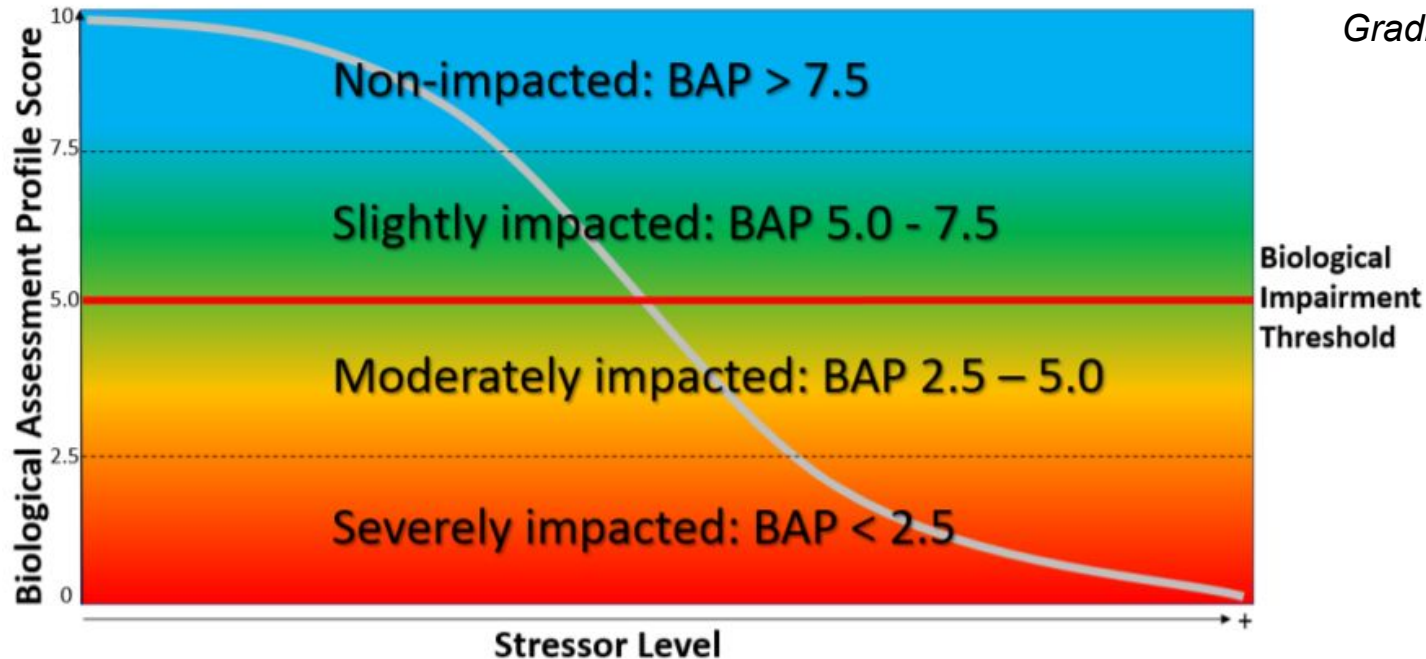
New York Biological Monitoring

Macroinvertebrates, fish, and algae are all widely used in biomonitoring. Although DEC collects information on all of these aquatic organisms, macroinvertebrates are collected and analyzed the most.



New York Biological Indicators

Biological Assessment Profile (BAP)



This indicator is based on the Biological Condition Gradient concept

New York Biological Indicators

Example: Non-Impacted Category (BAP \geq 7.5)

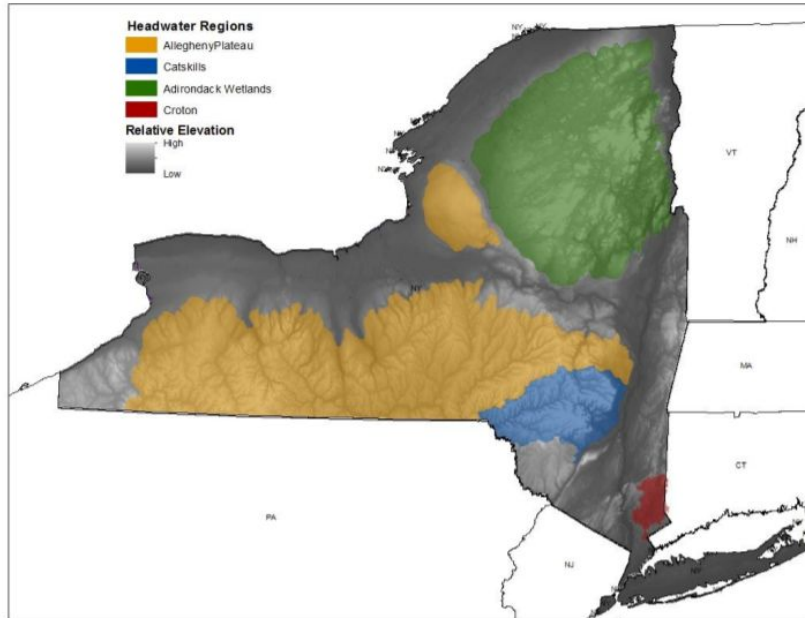


Figure 13. Boundaries for Allegheny, Catskills, Croton, and Adirondack Wetland headwater regions for application of geographic specific assessment methods.

Riffle Habitats:

- Species Richness is ≥ 26
- Hilsenhoff Biotic Index is ≤ 4.5
- EPT (Ephemeroptera, Plecoptera and Trichoptera) Richness is ≥ 15
- Percent Model Affinity is ≥ 64
- Nutrient Biotic Index is ≤ 5.0

Multiplate Samples from Navigable Waters:

- Species Richness is ≥ 21
- Hilsenhoff Biotic Index is ≤ 7.0
- EPT (Ephemeroptera, Plecoptera and Trichoptera) Richness is ≥ 5
- Species Diversity is ≥ 3.0

Multiplate Samples from Non-Navigable Waters

- Species Richness is ≥ 26
- Hilsenhoff Biotic Index is ≤ 4.5
- EPT (Ephemeroptera, Plecoptera and Trichoptera) Richness is ≥ 10
- Species Diversity is ≥ 4.0

Low Gradient Streams:

- Species Richness is ≥ 21
- Hilsenhoff Biotic Index is ≤ 5.5
- EPT (Ephemeroptera, Plecoptera and Trichoptera) Richness is ≥ 5
- Non-Chironomidae and Oligochaeta Richness is ≥ 10

Delaware Aquatic Life Uses

Public Water Supply	Industrial Water Supply	Primary Contact Recreation (Swimming)
Secondary Contact Recreation (Wading)	Fish Aquatic Life and Wildlife	Cold Water Fish
Agricultural Water Supply	ERES Waters (Waters of Exceptional Recreational or Ecological Significance)	Harvestable Shellfish Waters

In waters of the Delaware,
DNREC defers to the DRBC Draft
Macroinvertebrate Assessment
Method

Final Score
6-Metric IBI
99.3

Metric Scores					
Shannon Diversity	Biotic Index	Richness (200-bug rarefaction)	EPT Rich (200-bug rarefaction)	Intolerant % Rich	Scraper Rich
3.23	3.82	35.9	23.5	31.9%	16

Delaware Biological Monitoring

During FY 2018, Delaware DNREC is not conducting any new habitat/biological survey. Instead, it will be reviewing the results of surveys conducted over the past several years to evaluate the lessons learned and to identify the areas that data gap exists and additional monitoring is needed. Future habitat/biological monitoring will be based on the findings of this study.

During FY 2019, Delaware DNREC is not conducting any new habitat/biological survey. Instead, it will be reviewing the results of surveys conducted over the past several years to evaluate the lessons learned and to identify the areas that data gap exists and additional monitoring is needed. Future habitat/biological monitoring will be based on the findings of this study.

During FY 2020, Delaware DNREC is not conducting any new habitat/biological survey. Instead, it will review the results of surveys conducted over the past several years to evaluate the condition of habitat/biota and to identify any areas where data gap exist and where additional monitoring is needed. Future habitat/biological monitoring will be based on the findings of this data review and analysis.

Water Quality Standards of the Delaware River Basin

Erin Stretz

The Watershed Institute





NY DEP

PA DEP

DRBC

NJ DEP

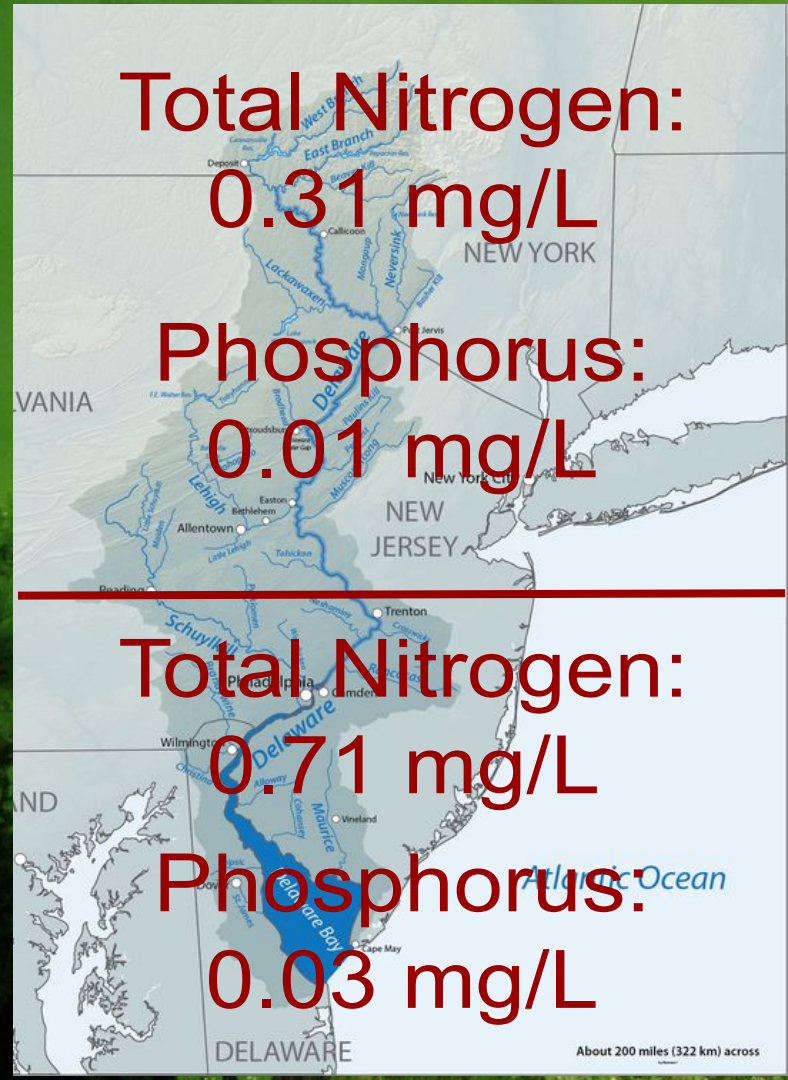
DE DNREC

About 200 miles (322 km) across

Nutrients

Nitrogen and Phosphorus

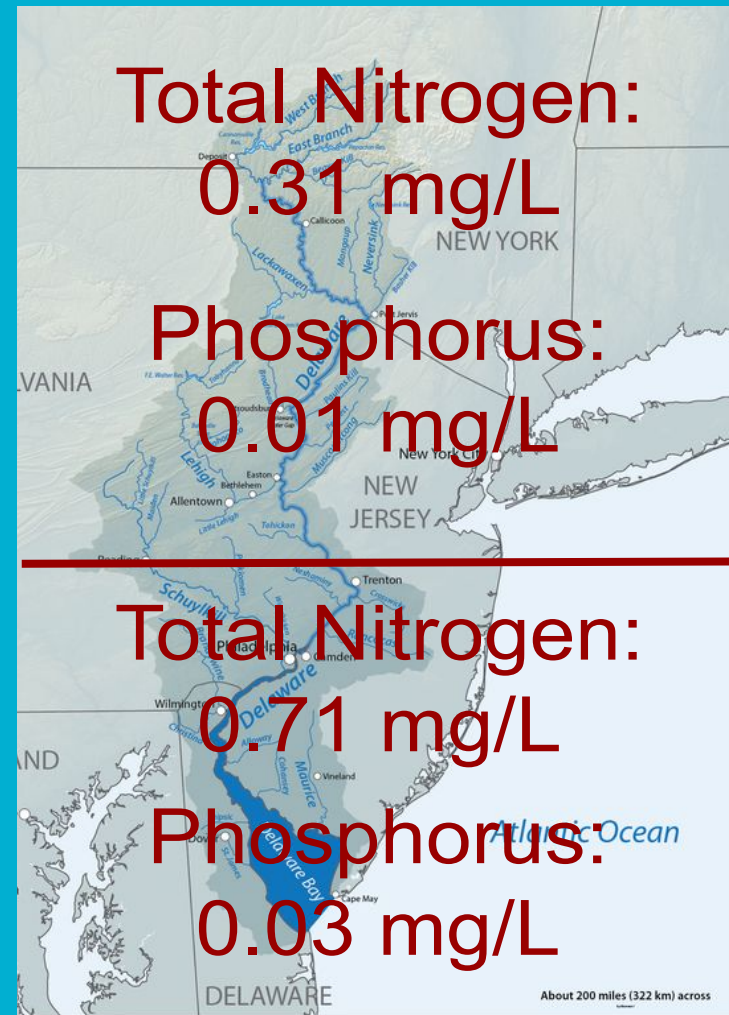
Primarily Narrative Criteria, that can focus on cumulative impacts of eutrophication



Narrative Nutrient Water Quality Standards

NY	“None in amounts that will result in growths of algae, weeds and slimes that will impair the waters for their best usages.”
PA	“The general criterion is that these substances may not be inimical or injurious to the existing or designated water uses.”
NJ	“Except as due to natural conditions, nutrients shall not be allowed in concentrations that render the waters unsuitable for the existing or designated uses...”
DE	“Nutrient overenrichment is recognized as a significant problem in some surface waters of the State. It shall be the policy of this Department to minimize nutrient input to surface waters from point and human induced non-point sources.”
DRBC	“The waters shall be substantially free from unsightly or malodorous nuisances due to ... substances in concentrations or combinations which are toxic or harmful to human, animal, plant, or aquatic life...”

	Numerical Nitrate Standard	Numerical Phosphorus Standard
NY	X	X
PA	X	X
NJ	2 mg/L In Pinelands waters	0.1 mg/L in streams 0.05 mg/L in lakes
DE	0.14 mg/L In Indian River, Rehoboth Bay, Little Assawoman Bay	0.01 mg/L In Indian River, Rehoboth Bay, Little Assawoman Bay
DRBC	X*	X*





Freshwater

Tidal


Brackish




Bacterial Indicators

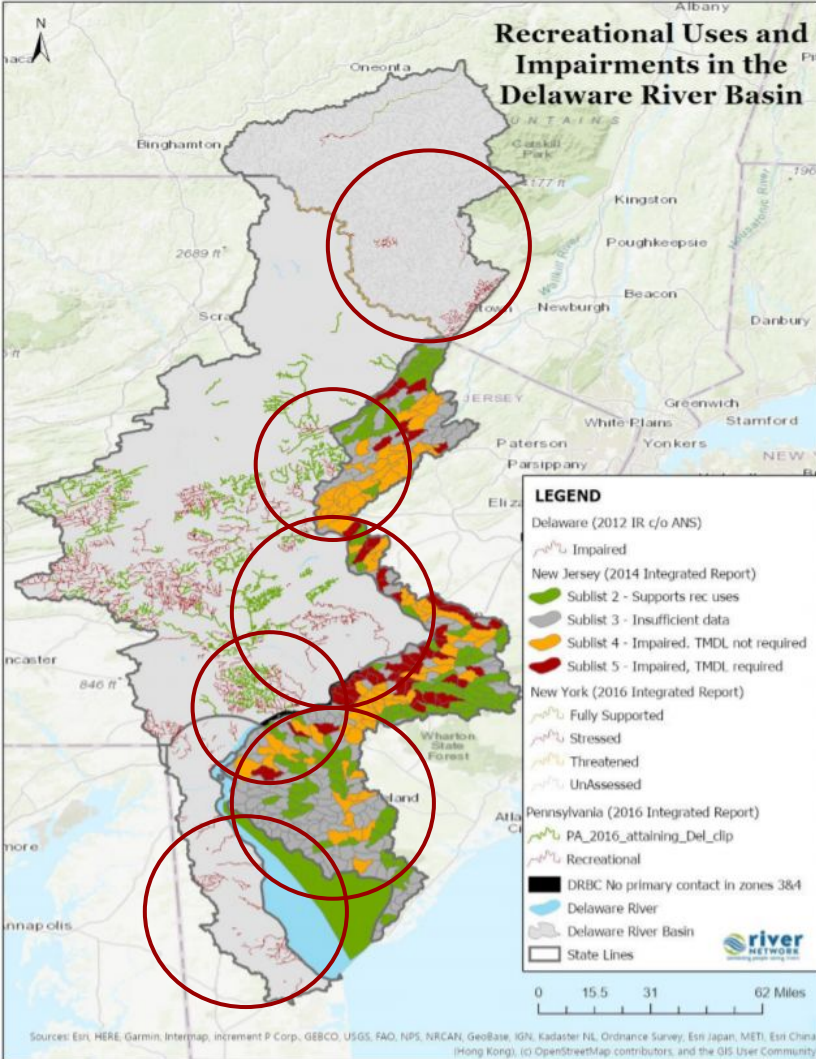
TOTAL COLIFORM

CRITERIA ELEMENTS	Recommendation 1 Estimated Illness Rate 36/1,000		Recommendation 2 Estimated Illness Rate 32/1,000	
	GM (cfu/100 mL)	STV (cfu/100 mL)	GM (cfu/100 mL)	STV (cfu/100 mL)
Enterococci (marine & fresh)	35	130	30	110
<i>E. coli</i> (fresh)	126	410	100	320

PATHOGENIC
E.COLI

	Freshwater Bacteria Water Quality Standards	Meets EPA Recommendation	Bathing Beach Criteria
NY	Fecal coliform: Geo. mean of 200 cfu	X	E. coli: Single max of 235 cfu
PA	Fecal coliform: Geo. mean of 200 cfu, then up to 2,000 cfu from Oct-April	X	E. coli: Geo. mean of 126 cfu, Single max of 235 cfu
NJ	<i>E. coli</i> : Geo. mean of 126 cfu, Single max of 235 cfu		Same as water quality standard
DE	Enterococcus: Geo. mean of 100 cfu, Single max of 235 cfu	X	Same as water quality standard
DRBC	Fecal coliform: Geo. mean of 200 cfu	X	N/A

	Brackish Bacteria Water Quality Standards	Meets EPA Recommendation
NY	N/A to Delaware River Basin	N/A
PA	Fecal coliform: Geo. mean of 200 cfu, then up to 2,000 cfu from Oct-April	X
NJ	Enterococcus: Geo. mean of 35 cfu, Single max of 104 cfu	
DE	Enterococcus: Geo. mean of 35 cfu, Single max of 104 cfu	
DRBC	Enterococcus: Geo. mean of 33-35 cfu	



Implications of Different Standards

Difficult to say due to lack of information!

Are there fewer impairments in areas with less stringent water quality standards?

Erin Stretz

estretz@thewatershed.org



THANK YOU!

Resources:

Fishable, Swimmable Waters Storymap (Resource Media)

<https://storymaps.arcgis.com/stories/0717e9a67c754a0a816264fb8814c549>

Recreational Uses in the Delaware Basin (River Network)

<https://www.rivernetwork.org/resource/recreational-uses-in-the-delaware-river-laying-the-foundation/>

Clean Water Act Resources Page (River Network)

<https://www.rivernetwork.org/our-work/clean-water/how-we-help/catalyzing-policy-change/clean-water-act/>