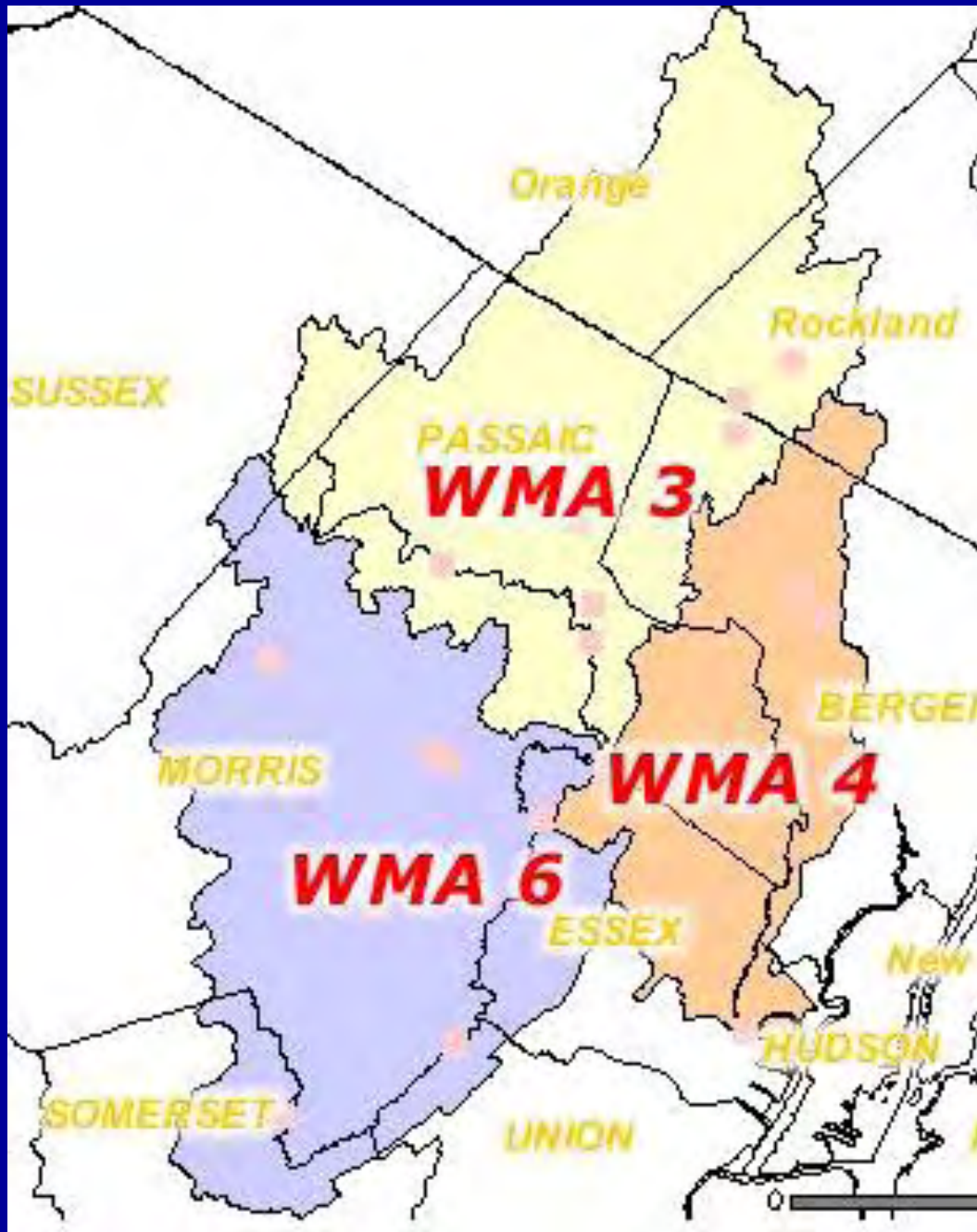


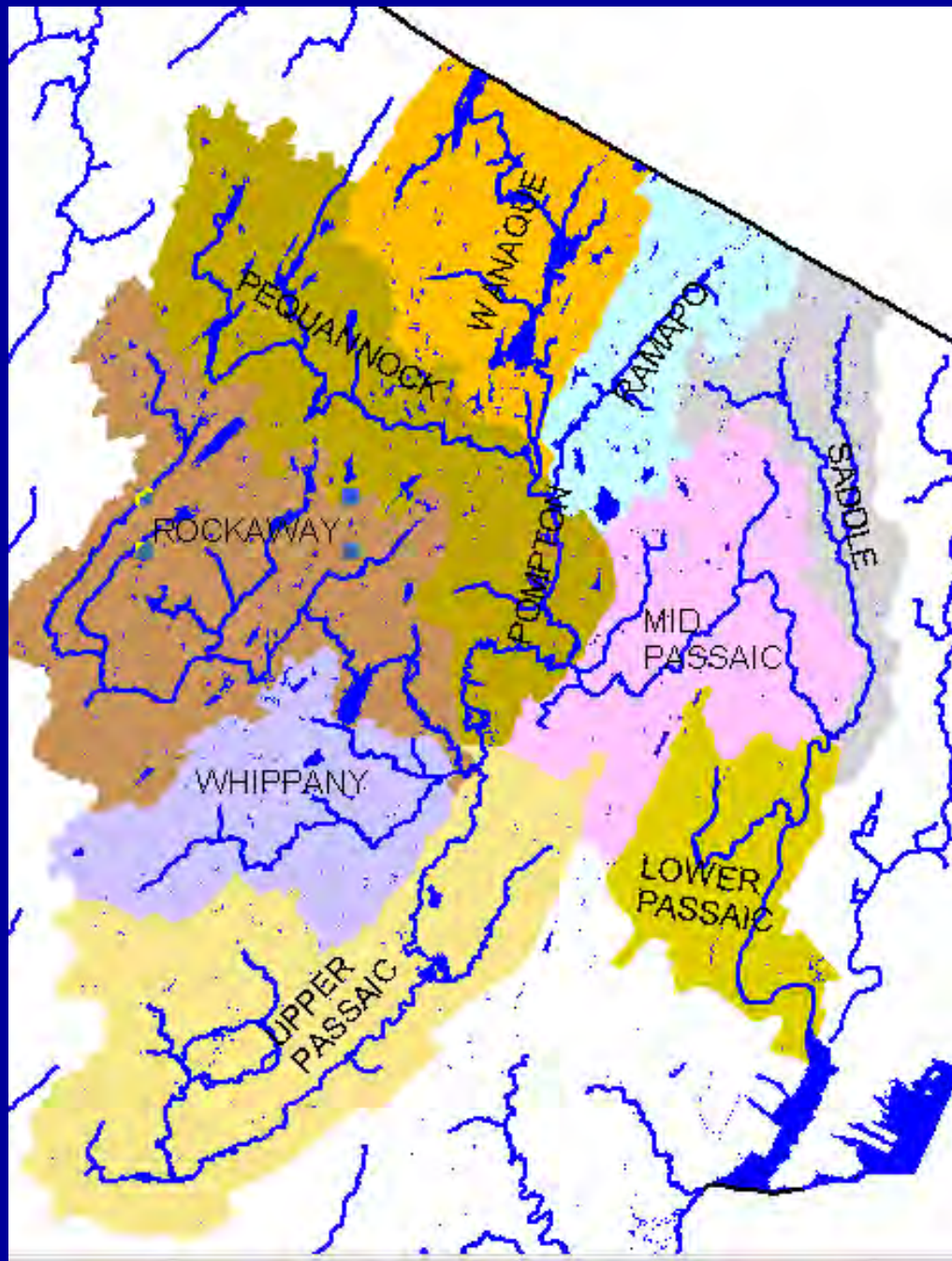
An Academic's Perspective on the Headline Environmental Issues in the Passaic River Basin

**Dr. Kirk Barrett, Director
Passaic River Institute
Montclair State University
email: pri@montclair.edu
web: www.primsu.org**

[relying heavily on the work of others](#)

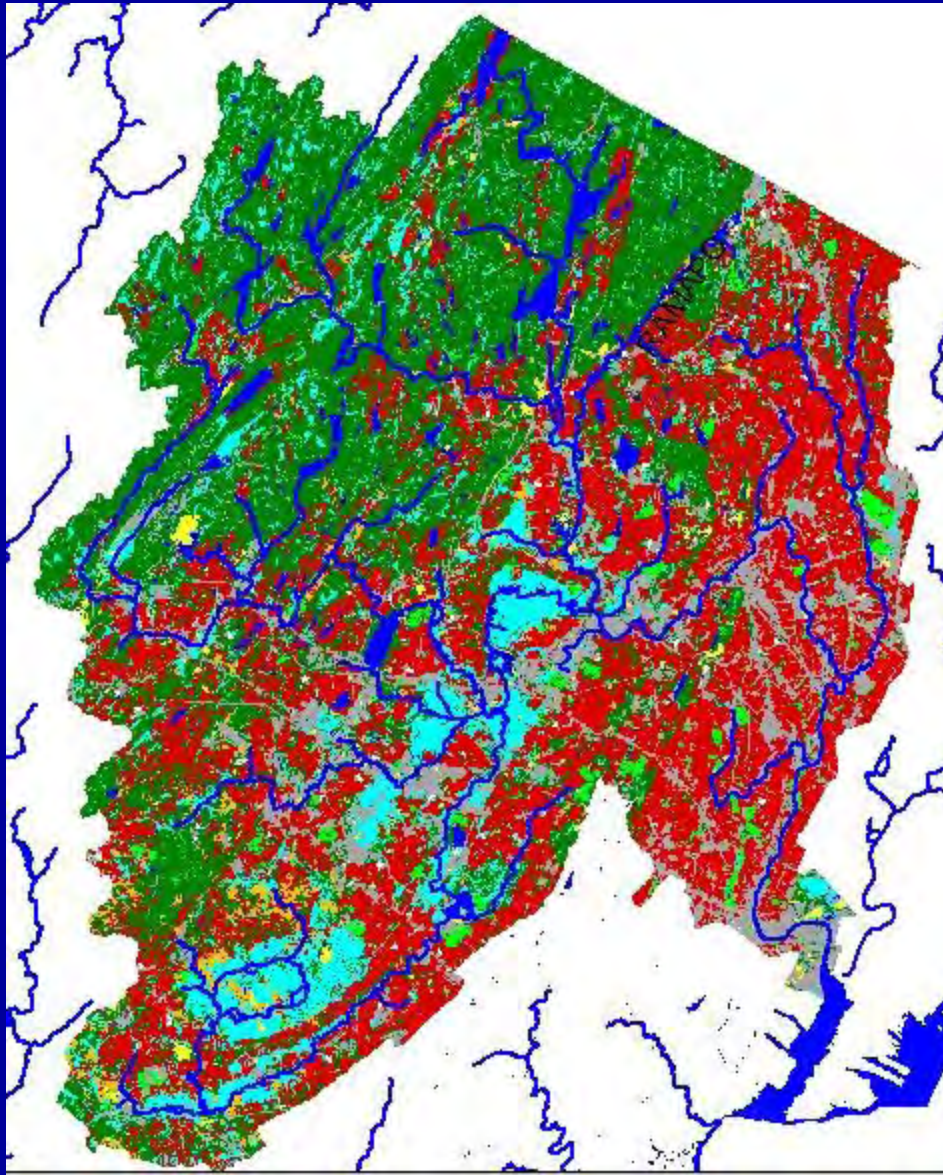


**Passaic River
basin
comprises ~935
mi² (2400 km²),
780 mi² in NJ
(10% of state)**

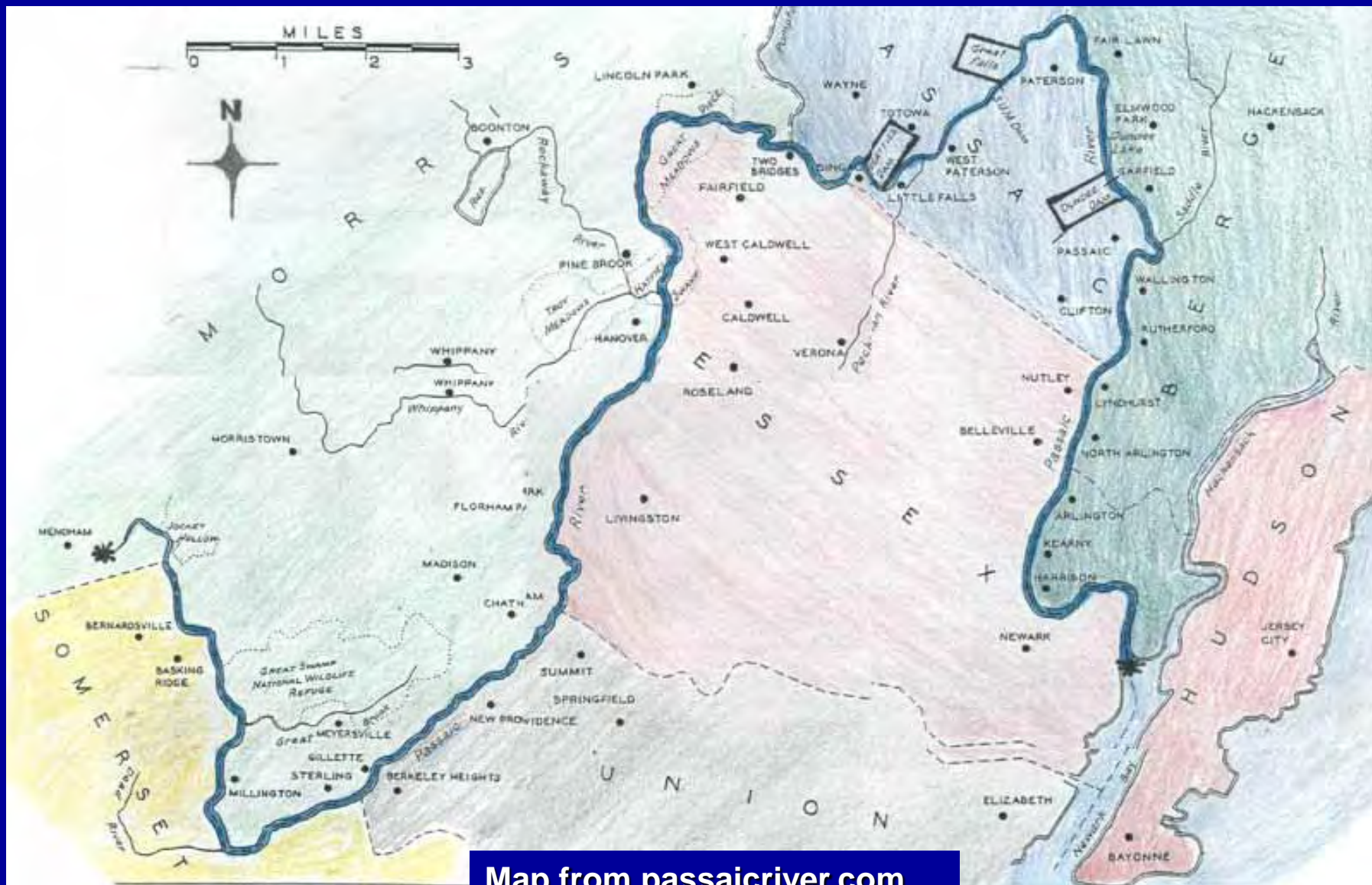


Major NJ waterways and sub-watersheds

NJ Land Use



Main stem of the Passaic River flows about 80 miles



Headline environmental issues in the Basin

- How should we deal with contaminated sediment in lower Passaic river?
- How can we protect water quality (including drinking water supplies) from effects of excess nutrients?
- How can flooding be controlled and/or flood damage reduced?
- How can we ensure adequate water supply during drought?

Headline Problem: Contaminated sediment in the lower Passaic River



The Problems

Sediment & Water Contamination

- Dioxin
- PCBs
- Mercury
- Pesticides
- PAHs
- And others...

Degraded Habitat

- Lost wetlands
- Injured bird & fish habitats

Continuing Sources

- Combined Sewers
- Upland Sites



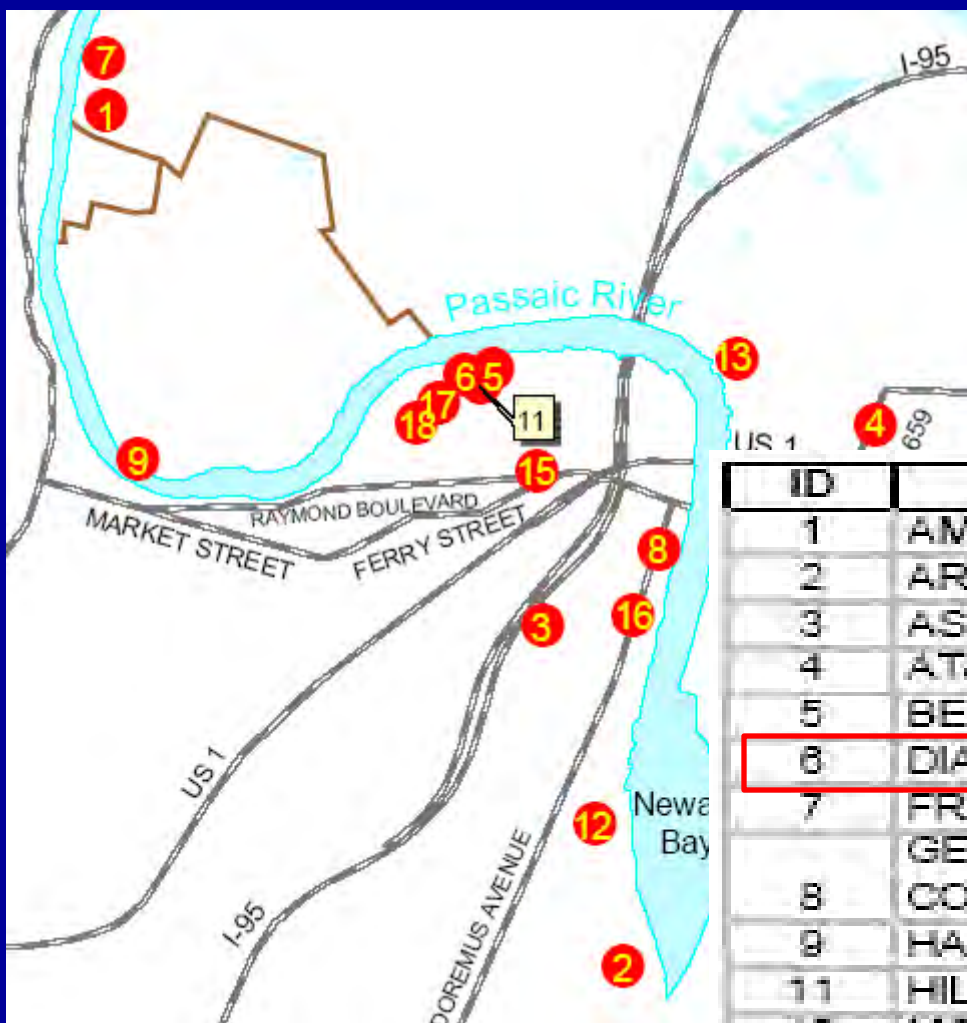
Slide from presentation by Alice Yeh, USEPA, et al. Overview of Partner Agency Efforts to Clean Up the Lower Passaic River. Fourth Passaic River Symposium. June 2010.

NJDEP Fish Consumption Advisories, based primarily on PCBs and Dioxins

Estuarine & Marine Sites		GENERAL POPULATION		HI
		LIFETIME CANCER RISK		
Tidal Passaic River & Newark Bay Complex		1 in 10,000	1 in 100,000	L
		DO NOT EAT MORE THAN:	DO NOT EAT MORE THAN:	
Newark Bay Complex (including Newark Bay, tidal Hackensack River, Arthur Kill, Kill Van Kull and tidal tributaries)	Blue Crab *	Do not eat or harvest ⁴		
	Striped Bass *	Do not eat		
	American Eel*	One meal per year	Do not eat	
	White Perch			
	White Catfish			
Tidal Passaic River (Dundee Dam to Newark Bay and Tributaries)	All Finfish & Shellfish*	Do not eat		
	Blue Crab *	Do not eat or harvest ⁴		

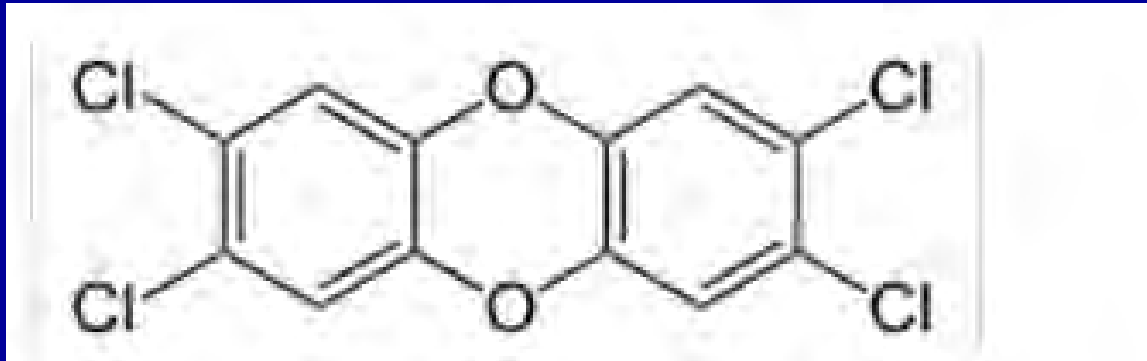
Lower Passaic

Map of Some “Responsible Parties”

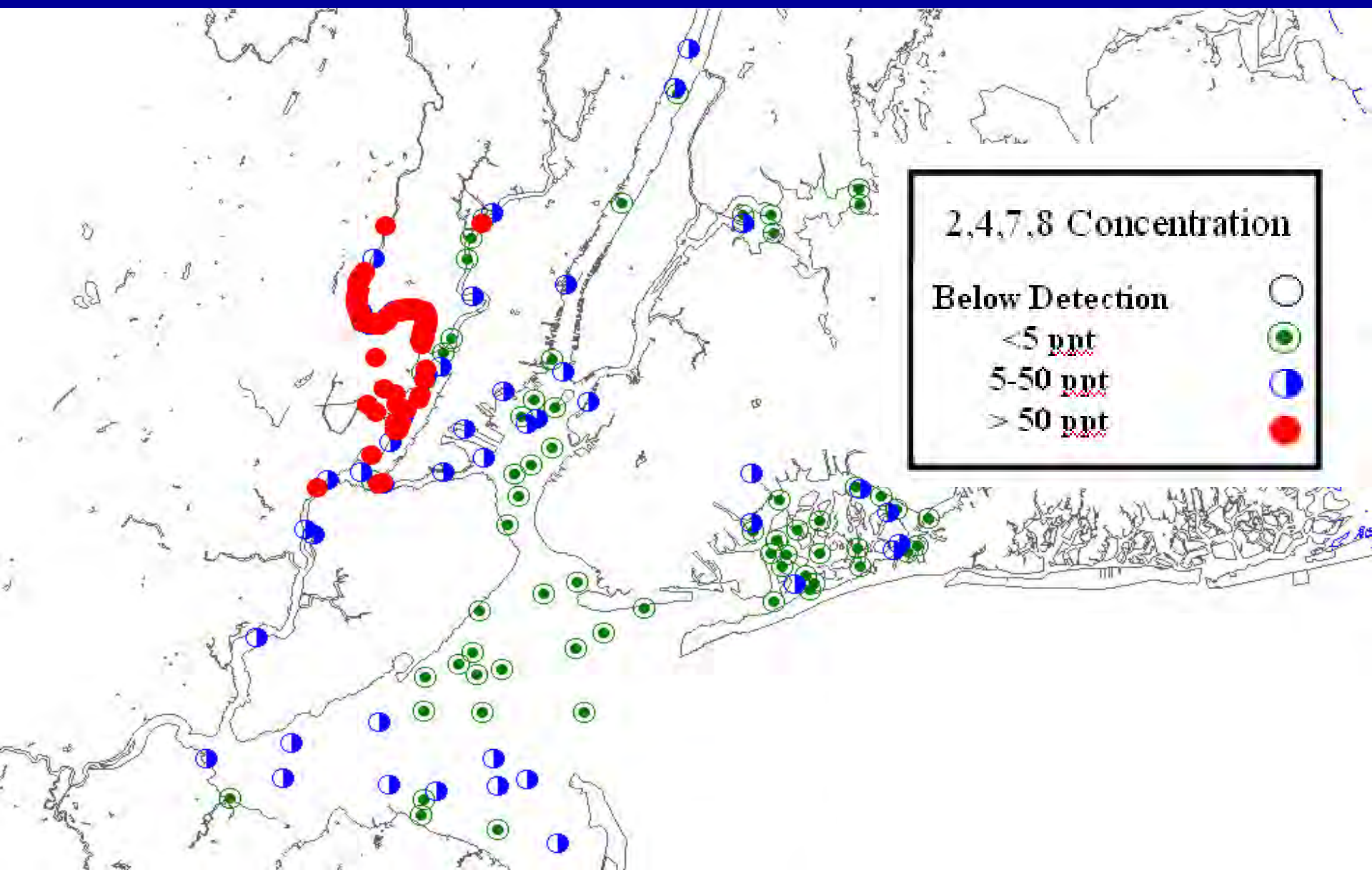


ID	NAME
1	AMERICAN MODERN METALS
2	ARCO PETROLEUM PRODUCTS COMPANY
3	ASHLAND CHEMICAL COMPANY
4	AT&T TECHNOLOGIES INCORPORATED
5	BENJAMIN MOORE
6	DIAMOND ALKALI COMPANY
7	FRANKLIN PLASTICS CORPORATION
8	GETTY REFINING & MARKETING CORPORATION
9	HARRISON COAL GAS (PSE&G)
11	HILTON DAVIS CHEMICAL COMPANY
12	MCKESSON ENVIRO SYSTEMS COMPANY
13	MONSANTO COMPANY
15	NEWARK COAL GAS (PSE&G)
16	PITT CONSOL CHEMICAL COMPANY
17	SHERWIN WILLIAMS COMPANY
18	STANLEY TOOLS

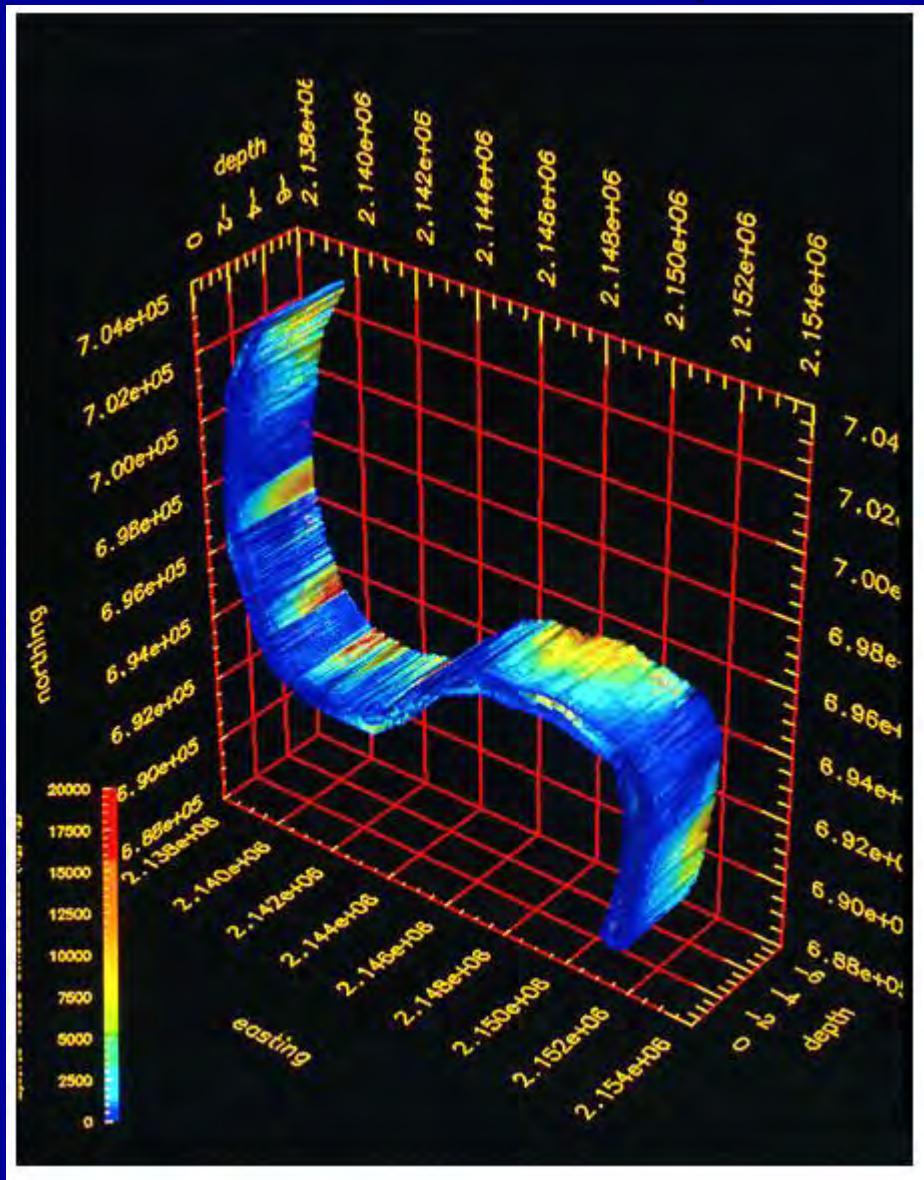
**“Marquee” Pollutant
2,3,7,8 TCDD or simply “Dioxin”**



Dioxin in Surface Sediments



Dioxin in sediment showing variation with depth below sediment surface, Lower River



Graphic by
Brookhaven
National Lab

“Lower Passaic Restoration Project”

- **Led by USEPA and USACE with NJDEP, NOAA, USFWS playing secondary roles**
- **Web site: www.ourpassaic.org**
- **>>20M\$ spent on studies since 2004, most from the “Lower Passaic Cooperating Parties”**

The Goals

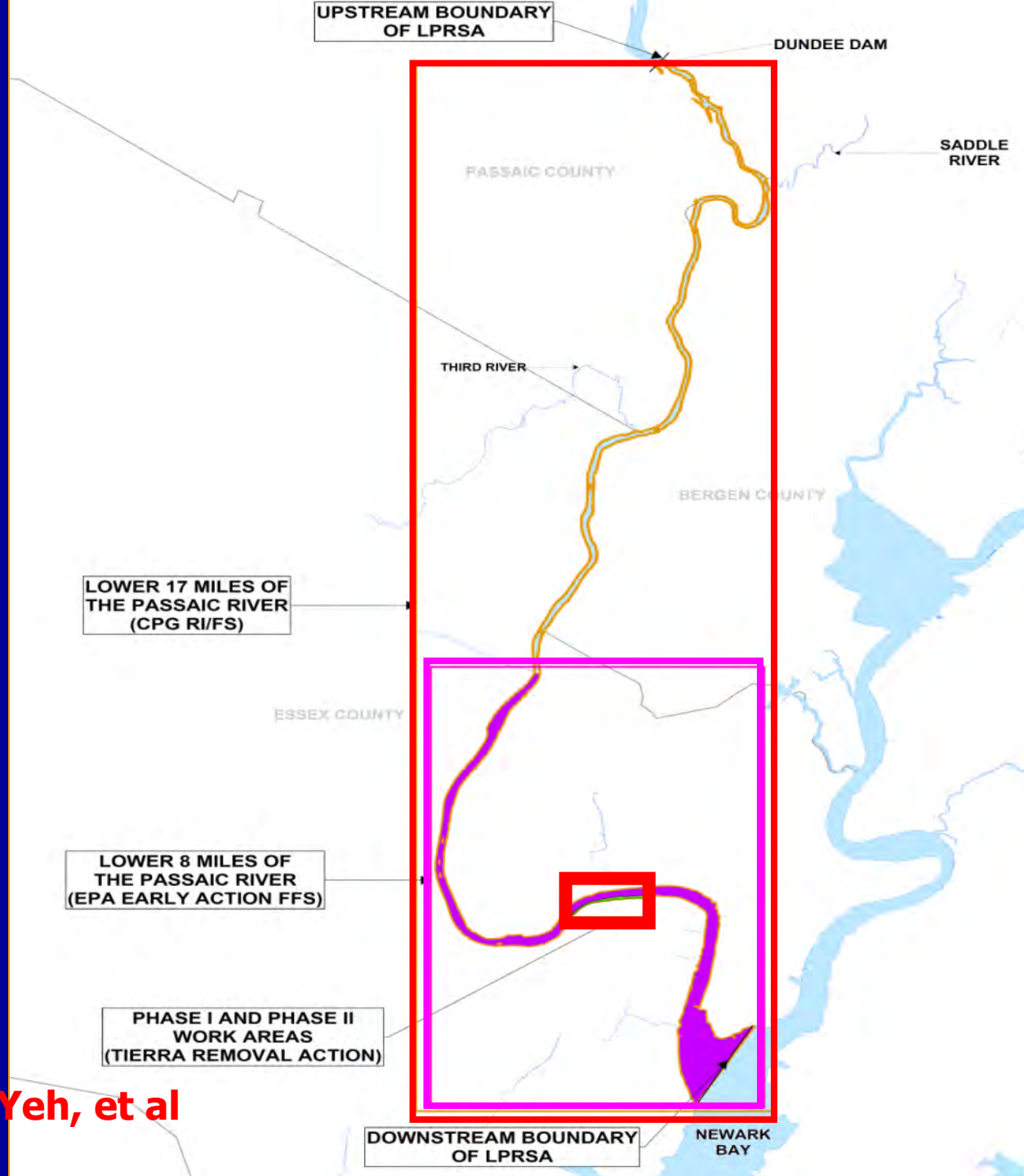
- Clean up contaminated sediments
- Improve water quality
- Restore degraded shorelines
- Restore and create new habitats
- Revitalize communities
- Compensate the public for lost use of natural resources



Overriding Policy Question: Where, when, and how to remediate contaminated sediments?

Possible Solutions

- **Dredging**
- **Capping**
- **Insitu Stabilization**
- **Monitored Natural Recovery**
- **Mix of Above**



Slide from Yeh, et al

Removal Project



LOWER 17 MILES OF
THE PASSAIC RIVER
(CPG RI/FS)

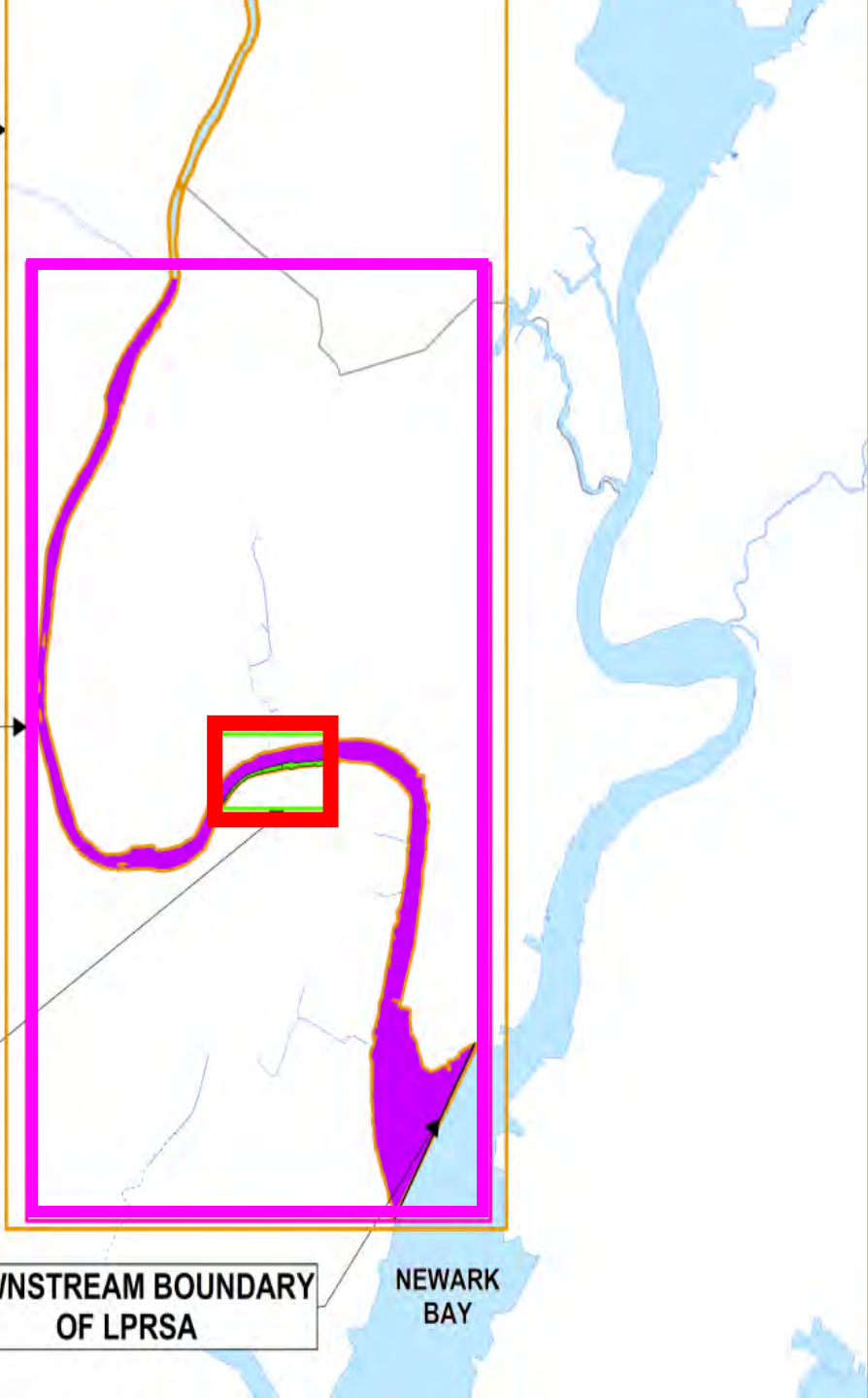
ESSEX COUNTY

LOWER 8 MILES OF
THE PASSAIC RIVER
(EPA EARLY ACTION FFS)

PHASE I AND PHASE II
WORK AREAS
(TIERRA REMOVAL ACTION)

DOWNSTREAM BOUNDARY
OF LPRSA

NEWARK
BAY



Lower 8 Mile Early Action

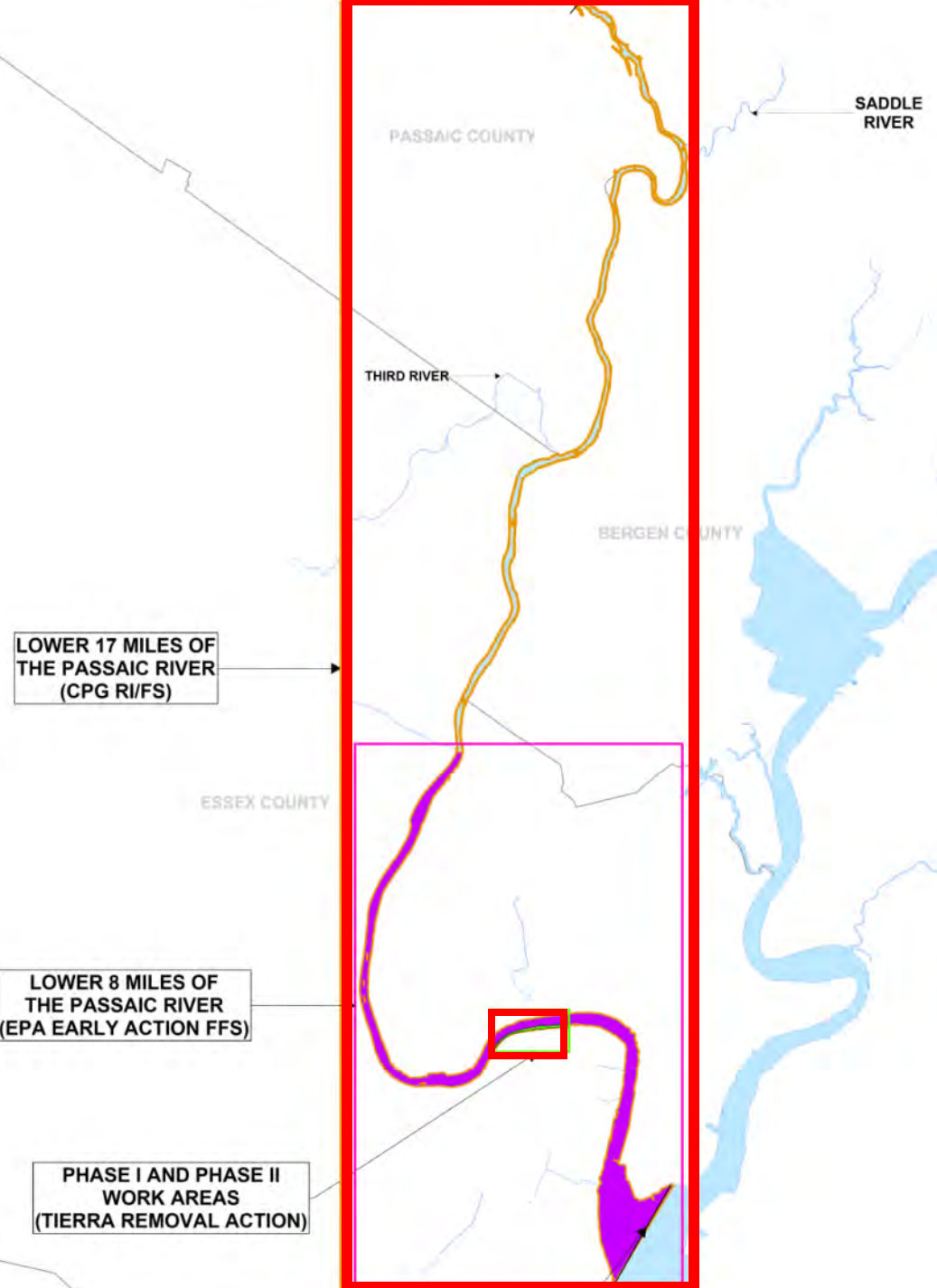
- Lower 8-mile sediments are major source of contamination to tidal River and Newark Bay.
- Focused Feasibility Study (FFS) evaluates alternatives.
- Proposed Plan in 2011: EPA's preferred alternative for public comment

Current Alternatives for Lower 8 Miles

#	Alternative	DMM Scenario	Dredged Sediment Volume (MCY)	Cost in Billion \$
1	No Action	N/A	0	Minimal
2	Deep Dredging with Backfill	CAD/CDF Disposal	11	1.3 – 3.7
		Off-site Treatmt & Disposal		
		Decontam & Beneficial Use		
3	Capping with Dredging for Flooding & Navigation	CAD/CDF Disposal	3.7	0.9 – 2.1
		Off-site Treatmt & Disposal		
		Decontam & Beneficial Use		

Other Considerations:

- Dredging: resuspension impacts
- CAD/CDF: habitat impacts, long-term maintenance
- Off-site treatment and Decontamination: large on-land footprint, emissions



Slide from Yeh, et al

Lower 17 Mile Study

- Joint Superfund/WRDA study to clean up and restore the lower 17 miles of the Passaic
- Cooperating Parties Group (~70 parties) implementing study of contamination under EPA & NJDEP oversight
- USACE conducting restoration study with State of NJ as local sponsor

Lower 17 Miles: Work

- Bathymetry (3x)
- Sediment Cores
- Fish and Benthic (on-going)
- Physical Water Quality (on-going)
- Future:
 - Chemical Water Quality
 - Pore Water
 - Habitat & Bird Surveys

Natural Resource Damage Assessment

- Preassessment
- Injury Assessment
- Restoration Planning
- Damage Claim
- Settlement or Litigation
- Restoration Implementation

Restoration Opportunities



- **Habitat improvement**
(river bottom, aquatic vegetation, wetlands, shorelines, tributaries, adjacent uplands)
- **Species enhancements**
(reintroduction, habitat protection, habitat enhancement.)
- **Human use enhancements**
(fishing, boating, birding, access improvements)



Another Headline Problem: Reducing Phosphorus Loading to Protect Water Quality



Wanaque Reservoir, Ringwood, NJ

Photo from the NJWDSC website

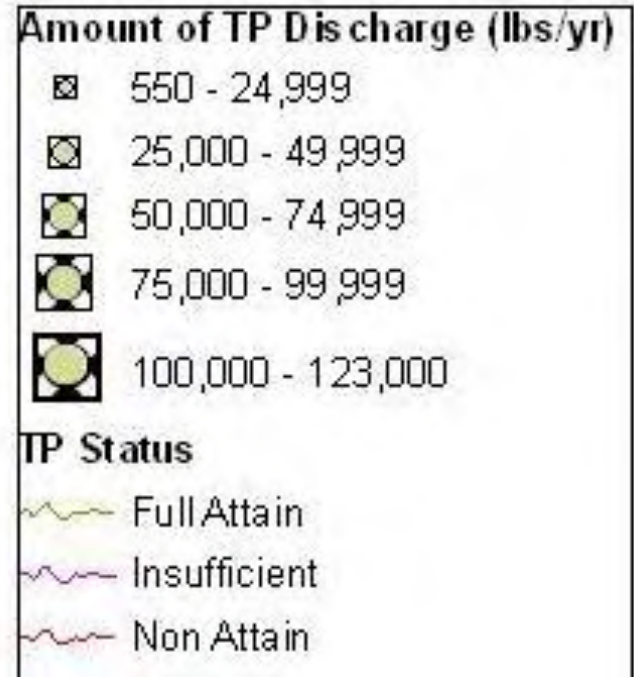
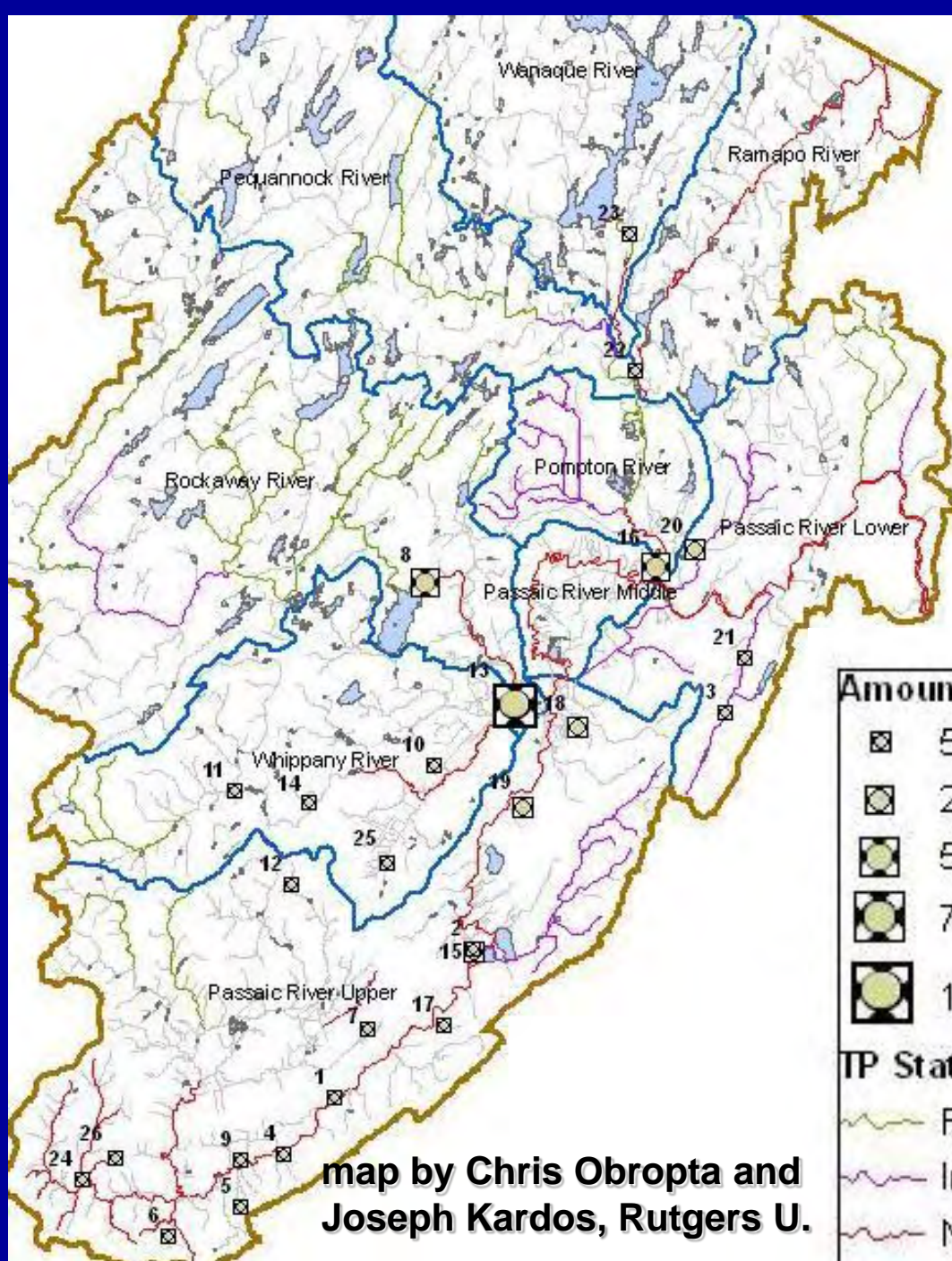
Key Policy Issue:

excessive phosphorus concentration and possible eutrophication in streams and Wanaque Reservoir

Too much P can lead to eutrophication” -- excessive plant/algae growth

- ugly, green water**
- low dissolved oxygen, stressing or killing fish**
- alter ecological community**
- bad taste and odor in drinking water**
- higher treatment costs for drinking water**

Wastewater Treatment Plant Discharge Points and P impaired streams



map by Chris Obropta and Joseph Kardos, Rutgers U.

NJ has a strict numeric P standard

STREAMS

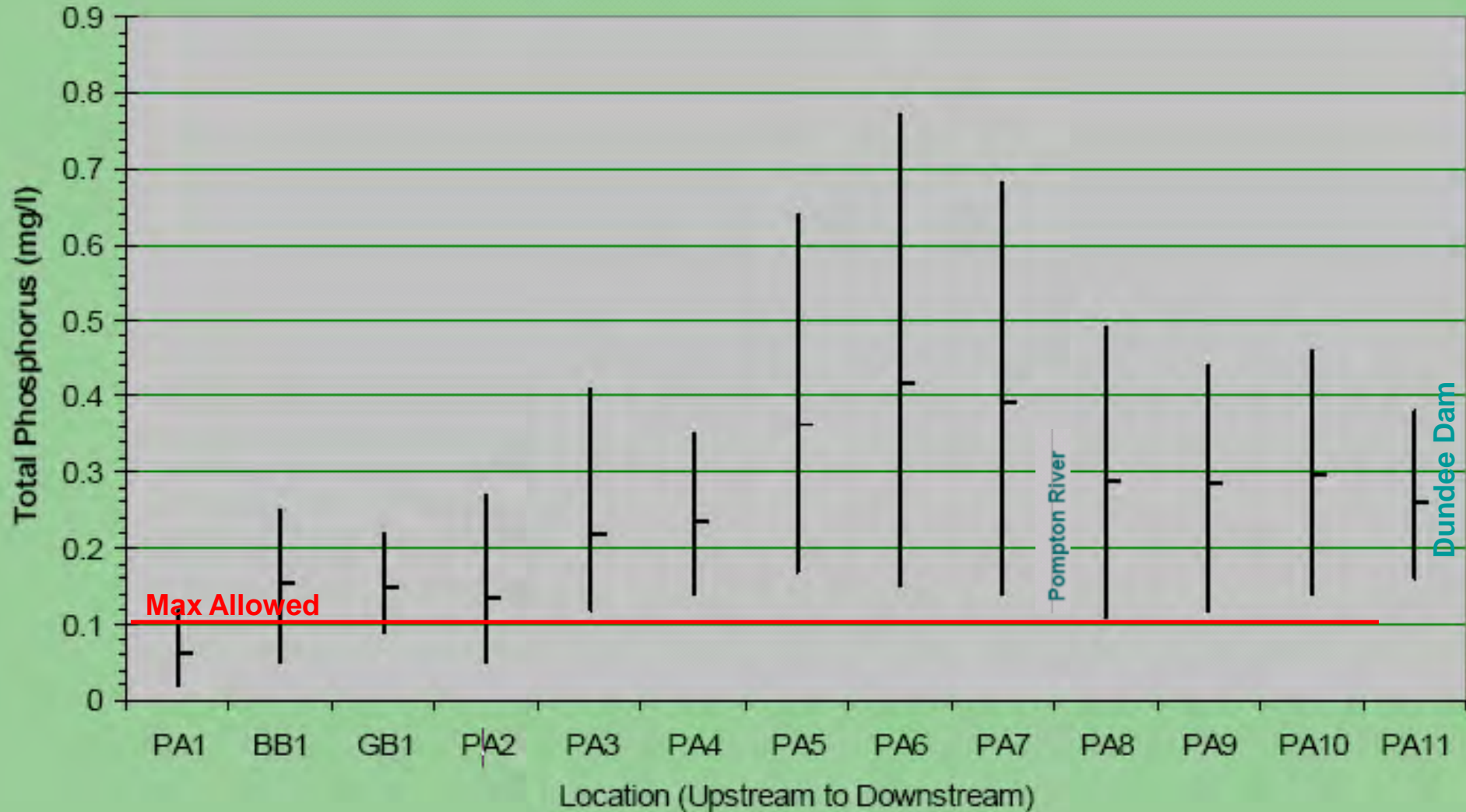
TP \leq 0.1 mg/l, unless TP is not the limiting nutrient and TP will not render water unsuitable for designated uses.

LAKES, PONDS, RESERVOIRS

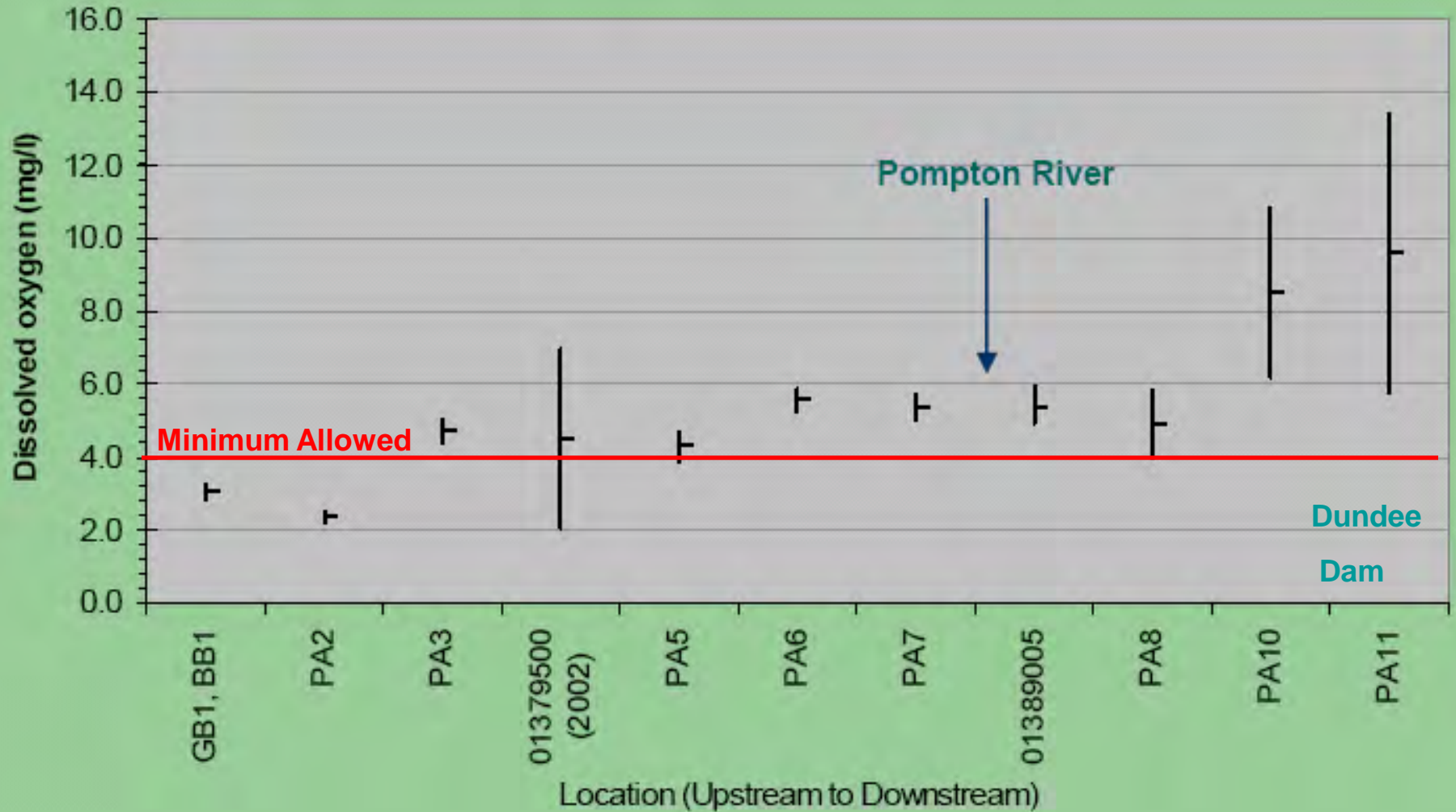
TP \leq 0.05 mg/l

...except where watershed or site-specific criteria are developed

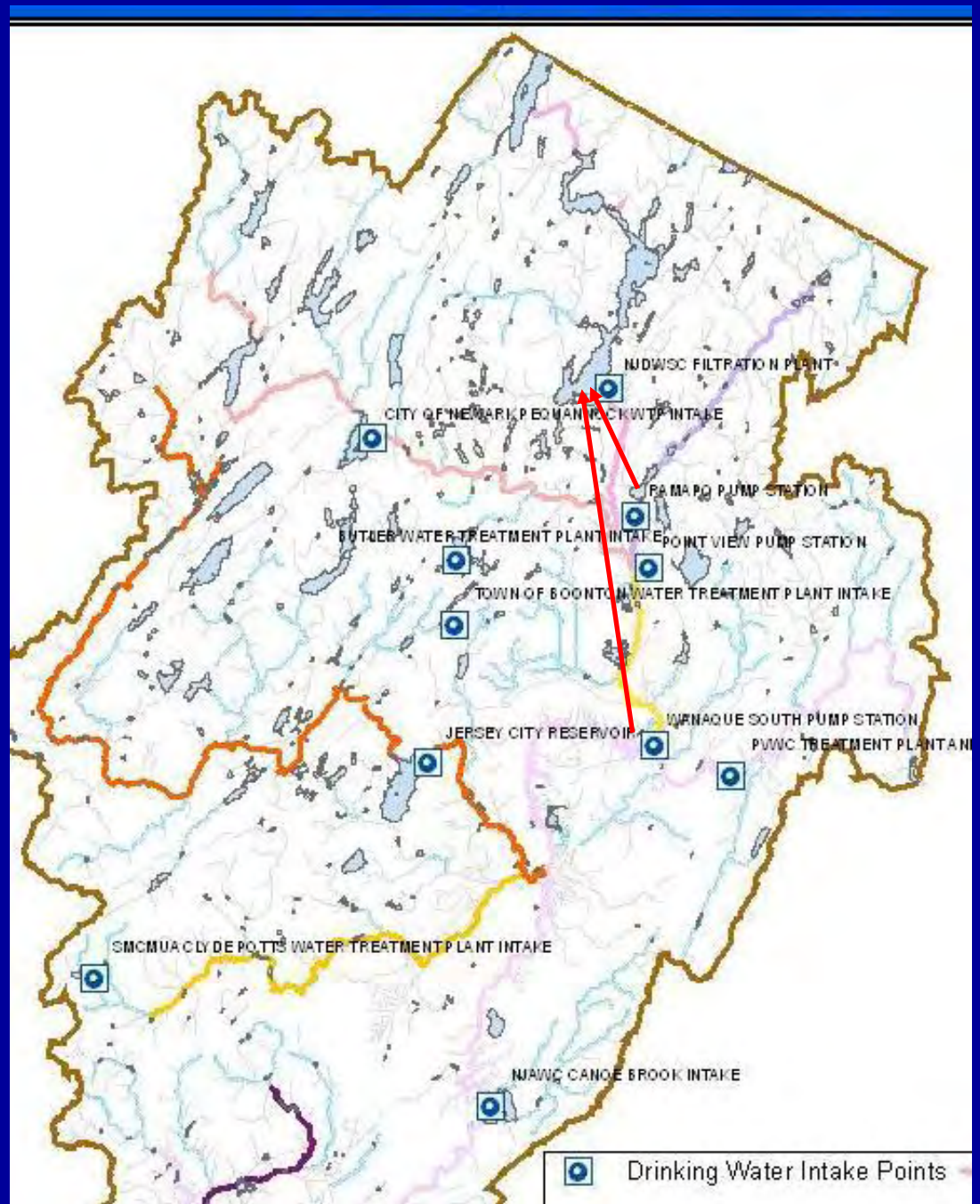
Passaic River Total Phosphorus 2003 data collected under high and low flows



Passaic River Summer Diurnal Dissolved Oxygen Variation Approximated from 2003 data collected below 70th percentile flow



Surface water intakes in the Passaic River Basin



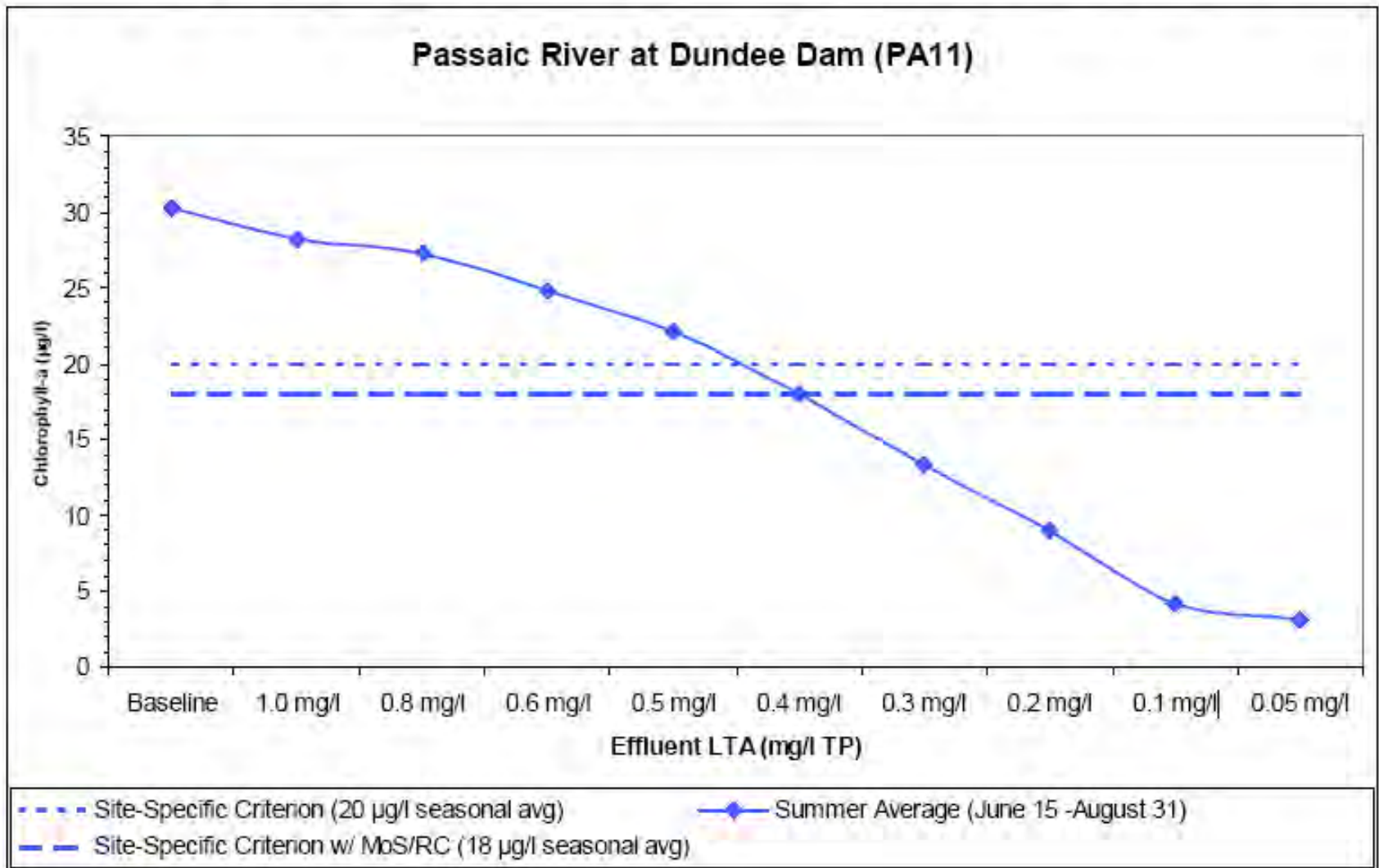
Map by Chris Obropta and Joseph Kardos, Rutgers U



Passaic River TMDL Approach

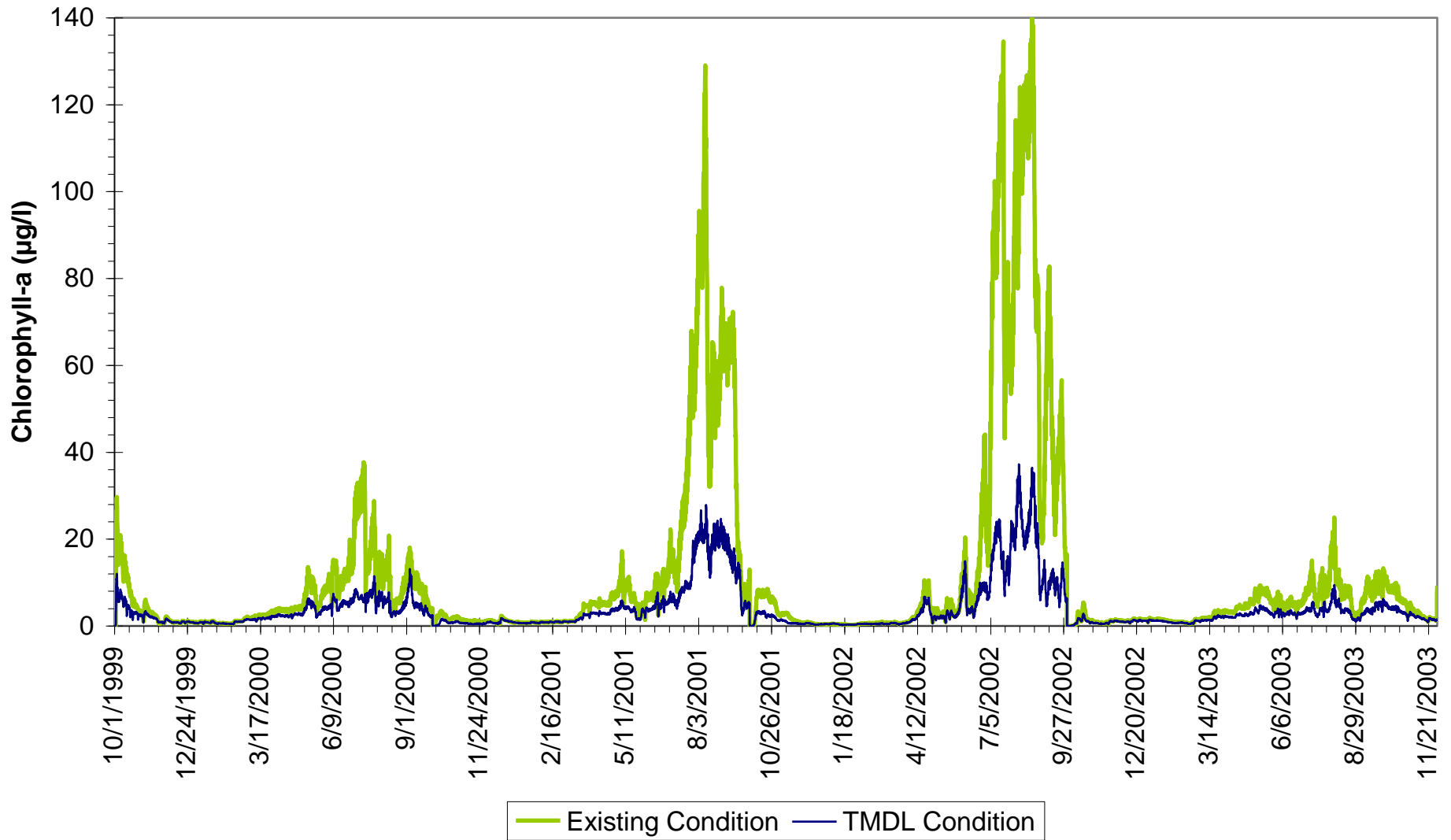
- What is a TMDL?
 - Total Maximum Daily Load
 - Required under the Clean Water Act for impaired waterbodies
 - Represents the assimilative capacity of the receiving water
- Developed comprehensive watershed model to relate nutrient sources to productivity impacts
 - Diurnal Dissolved Oxygen Swings
 - Phytoplankton Blooms
 - Instream Phosphorus Loads
- Calculated load and wasteload allocations to achieve water quality targets

Impact of Effluent TP Concentration on Phytoplankton



Benefits of TMDL

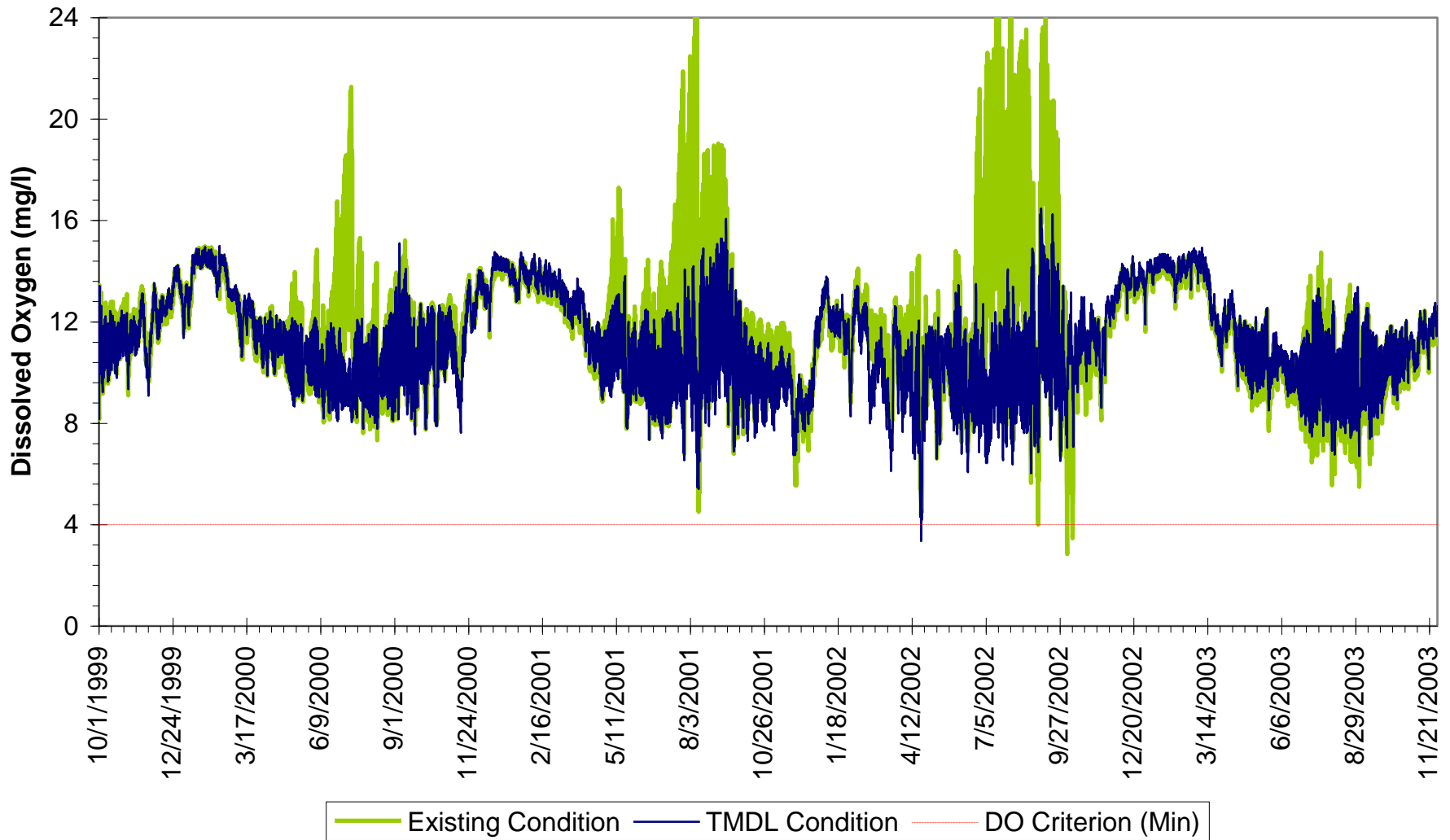
Passaic River above Dundee Dam



Slide from presentation by Thomas Amidon, Omni Environmental, 2008

Benefits of TMDL

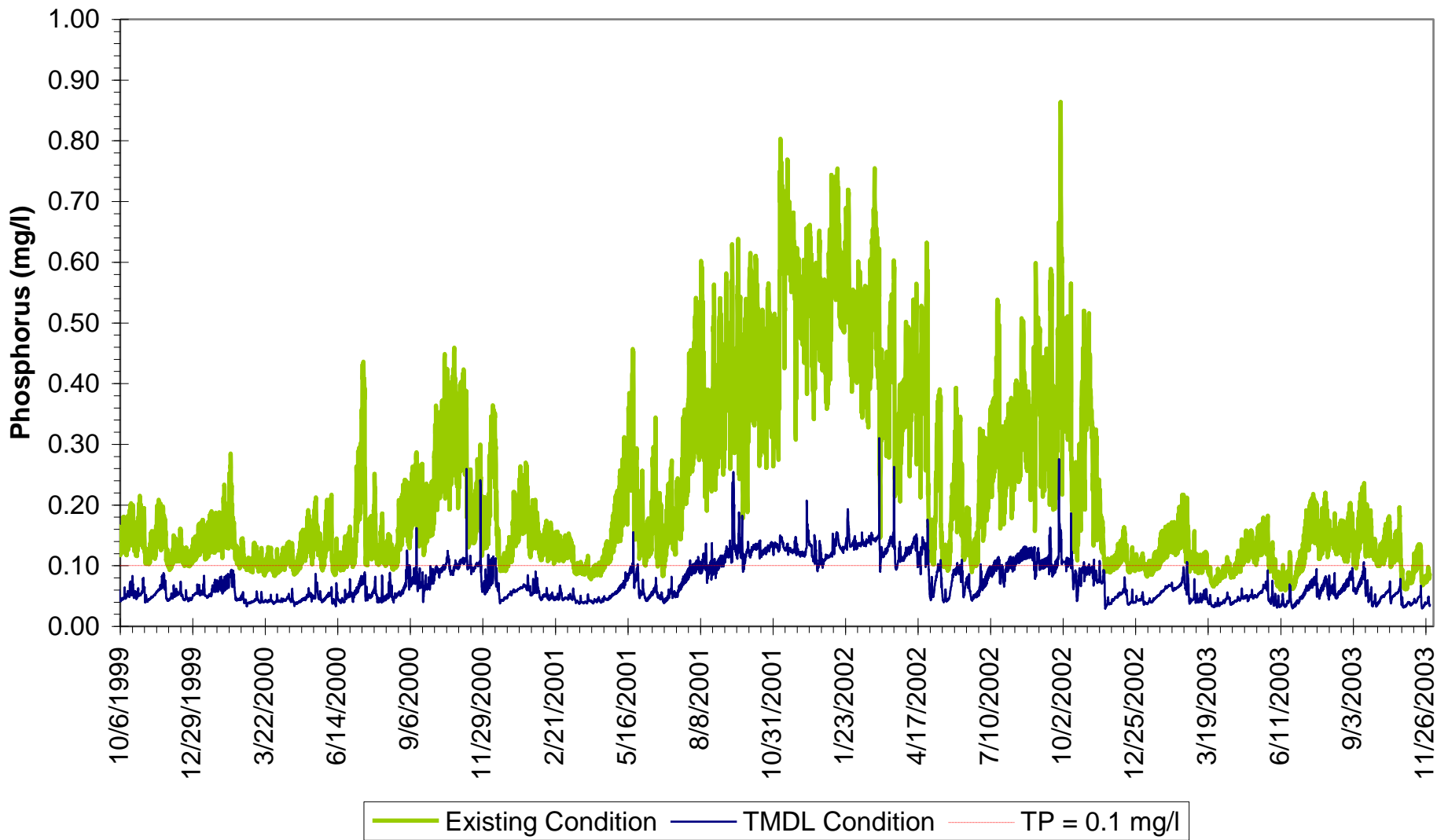
Passaic River above Dundee Dam



Slide from presentation by Thomas Amidon, Omni Environmental, 2008

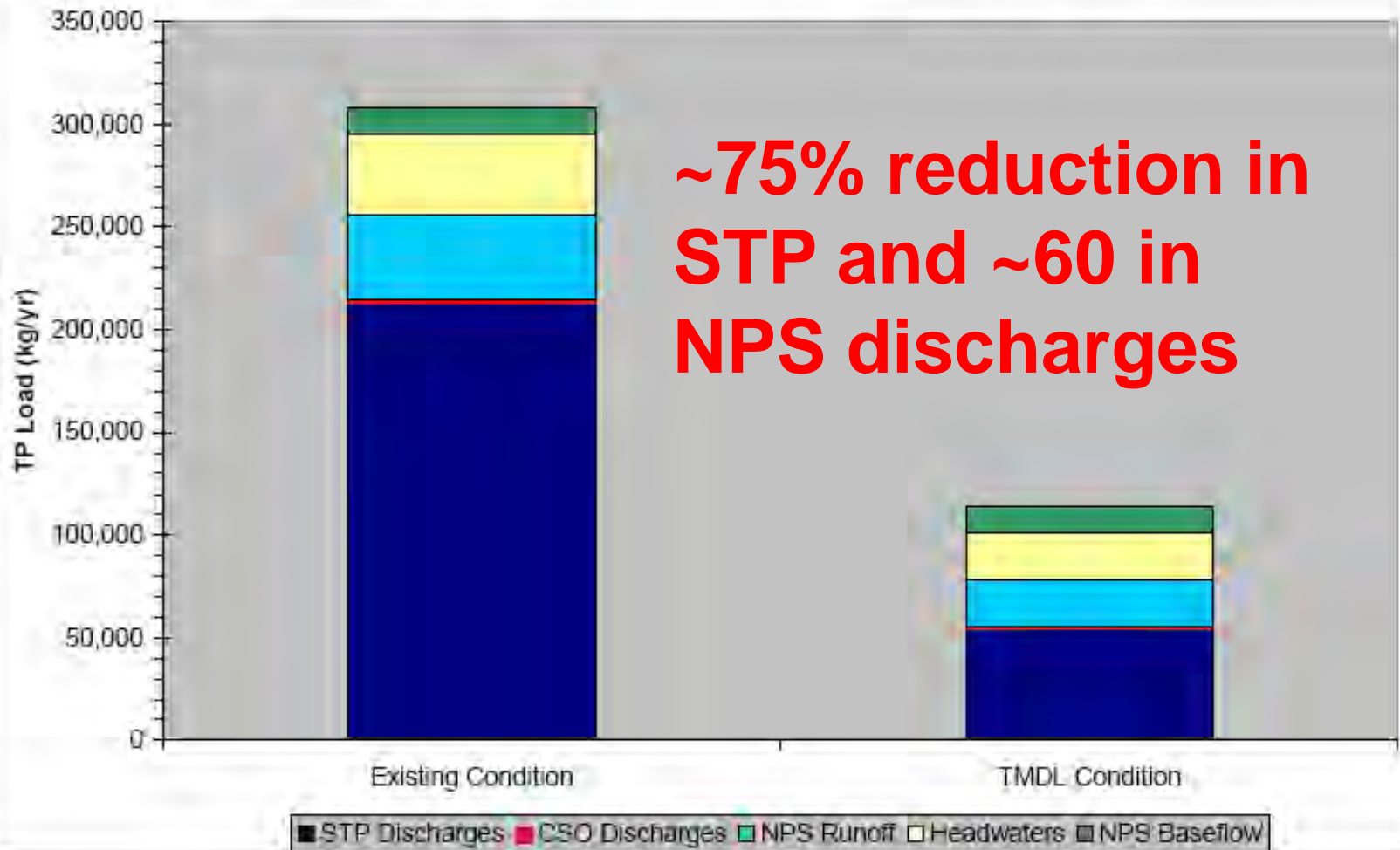
Benefits of TMDL

Pompton River at Wanaque South Intake



Slide from presentation by Thomas Amidon, Omni Environmental, 2008

Annual Average Phosphorus Loads: Existing vs. TMDL



Are the benefits worth the cost?

That is not a question that science can answer.

Decisions always come down to value judgments.

Science is not a method for making value judgments