

Division of Science, Research & Environmental Health

Update on Current and Recently Completed Research Projects

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Director

NJDEP

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NJDEP Vision Statement

- ✧ Regulations that are balanced, incorporate **science**, provide flexibility and accurately evaluate potential impacts including cost-benefit analyses.
- ✧ We must make permitting and inspection of individuals, businesses, governmental bodies and other organization both timely and predictable, basing our decisions on **science**, data, facts and cost-benefit analyses.
- ✧ **Science**-based decisions based on input from our Science Advisory Board and the State's colleges and universities.

DSREH Goals:

- ✖ Provide the department with, and access to, expertise and information that supports its technical, program and policy needs.
- ✖ Act as liaisons to the Science Advisory Board and Standing Committees that will help provide the Department with outside expertise on scientific issues.
- ✖ Perform **research** to meet the information and problem-solving needs of the department, and to identify and understand emerging issues that require the department's attention and response.
- ✖ Advocate and integrate the multi-disciplinary perspective into the department's identification, analysis and resolution of environmental issues.

Staff Expertise

- Toxicologists/Risk Assessment
- Biologists/Ecologists
- Air Quality/Modeling Specialists
- Water Quality Specialists
- GIS
- Chemist
- Statistician
- Microbiologist
- Environmental Scientists

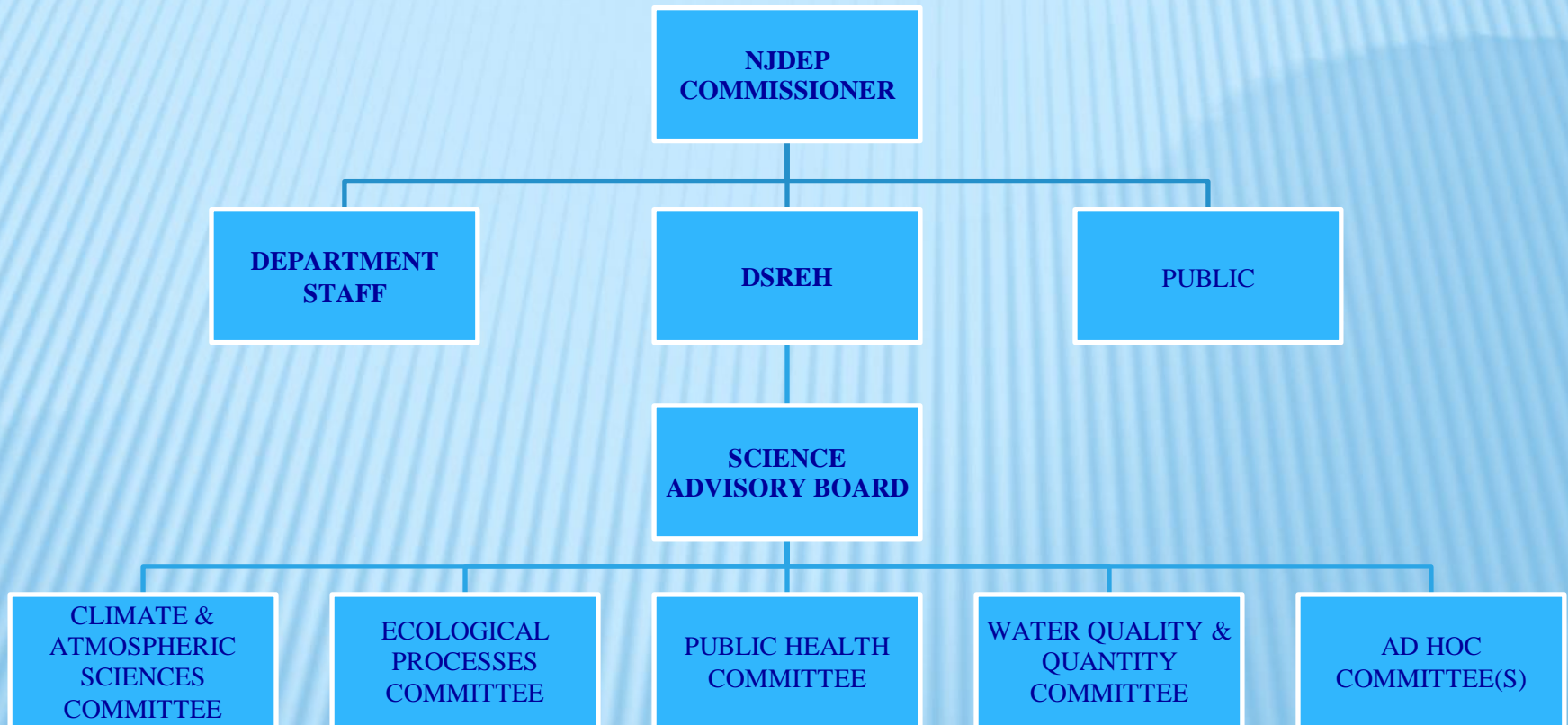
Science Based Support

- Air Monitoring/Modeling
- Fish Monitoring & Consumption Advisories
- Human Health Risk Assessment
- Standards Development
- Data Analysis & Interpretation
- Analytical Chemistry
- Literature Reviews

Science Based Support

- Spatio-temporal Modeling/GIS Mapping
- Environmental Trends Analysis
- Water Quality Indicators
- Method Development (e.g., analytical)
- Microbiological – water quality

Science Advisory Board



SCIENCE ADVISORY BOARD

- × Ocean Acidification
- × Human Biomonitoring
- × New Statistical Analysis Methods
- × Microplastics
- × Long Term Effects of Eutrophication
- × <http://www.state.nj.us/dep/sab/>

Research

- × Variety reflects scope of NJDEP programs
- × Drinking Water
- × CECs/Unregulated Contaminants
- × Ecological
- × Toxicological
- × Coastal Issues
- × Environmental Health
- × Wetlands

Active Research

Barnegat Bay



Governor's Comprehensive Plan of Action

- ✖ 10 point plan <http://www.nj.gov/dep/barnegatbay/>
- ✖ Plan 9: Producing more Comprehensive Research
 - + Support water quality improvement (nutrient criteria)
 - + Establish the baseline conditions of the bay
 - + Fill in critical data gaps
 - + Advance habitat restoration on the Bay



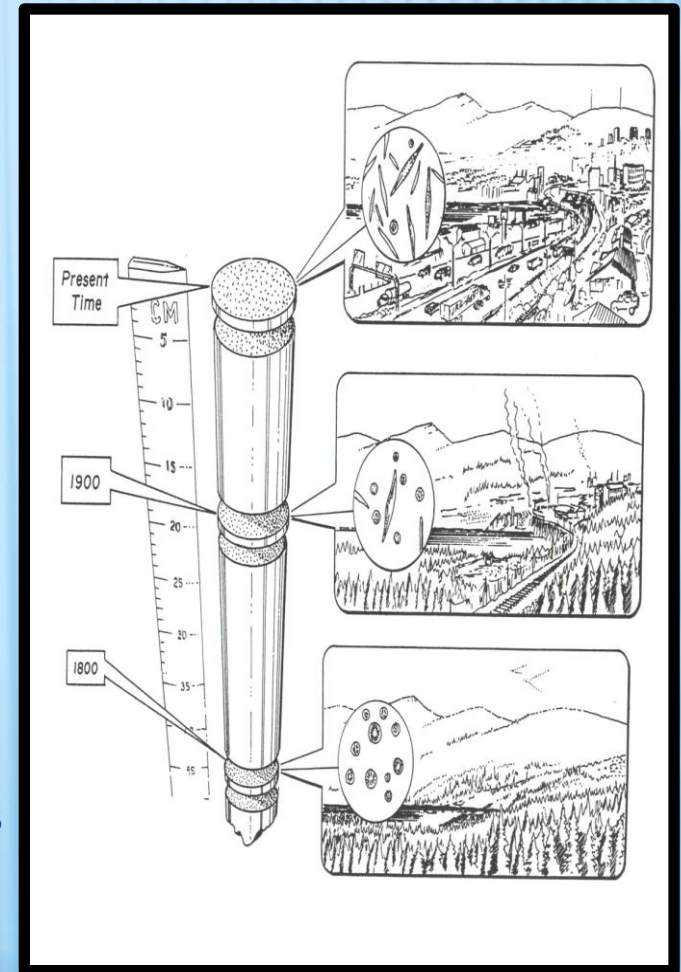
Barnegat Bay Comprehensive Research - Objectives							
	Research Project	Nutrient Bio-Criteria	TMDL	Power Plant	Tourism & Recreation	Food Safety	Comprehensive/ Baseline/Data Gaps
1	Benthic Invertebrate Community Monitoring and Indicator Development for Barnegat Bay.	X	X	X			X
2	Nutrient and Ecological Histories of Barnegat Bay	X	X				X
3	Assessment of Hard Clam Populations in Barnegat Bay			X	X		X
4	Assessment of Fishes and Crabs Responses to Human Alteration of Barnegat Bay			X	X		X
5	Assessment of the Distribution and Abundance of Stinging Sea Nettles (Jellyfishes) in Barnegat Bay			X	X		X
6	Baseline Characterization of Phytoplankton Communities and Harmful Algal Blooms (HABs)	X	X		X	X	X
7	Baseline Characterization of Zooplankton Communities	X	X	X			X
8	Multi-Trophic Level Modeling of Barnegat Bay			X	X		X
9	Tidal Freshwater and Salt Marsh Wetland Studies of Changing Ecological Function and Adaptation Strategies				X		X
10	Ecological Evaluation of Sedge Island Marine Conservation Area in Barnegat Bay				X		X

Barnegat Bay research - status

- ✕ Three years of research completed!
- ✕ Years 1 and 2 – Reports posted
- ✕ Year 3 – Reports posted soon
- ✕ Results presented at the Public Research Forum held on Nov 17 at Ocean County College
- ✕ Baseline conditions & relative health of the bay
- ✕ Science/data will be used to develop management/action plan

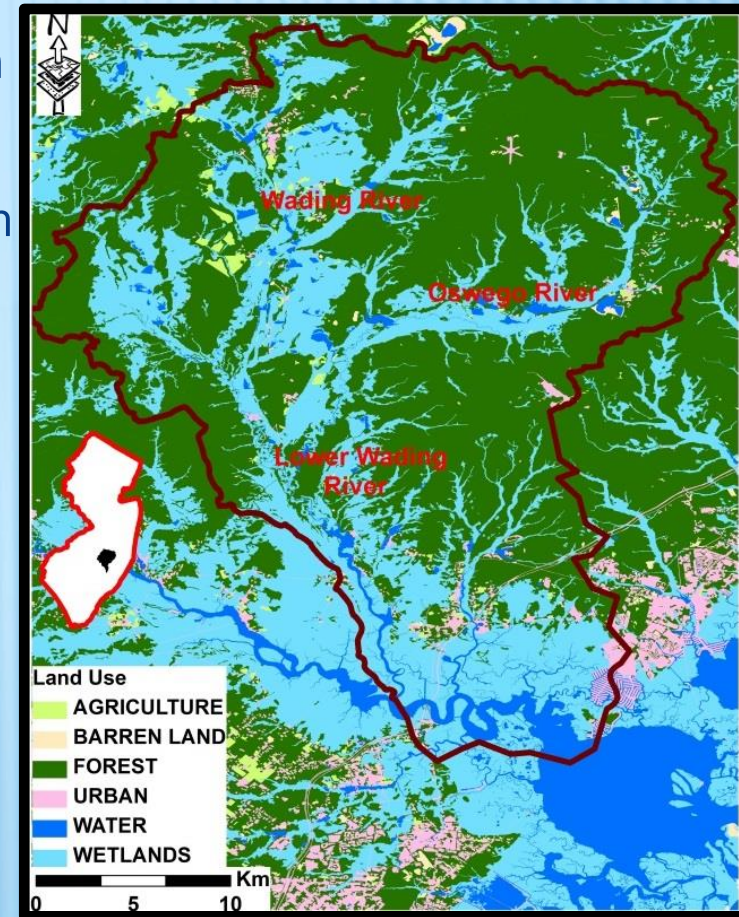
NJ Wetlands Past, Present and Future

- ✖ EPA Grant
- ✖ Lack of reference conditions is a knowledge gap.
- ✖ The reconstruction of wetland systems based on investigations of sediment cores is a valuable tool to comprehend and quantify the magnitude of anthropogenic and natural impacts and may fill the gap in the absence of historical records.
- ✖ Objectives:
 - + Assess wetland reference conditions and impact of anthropogenic activities;
 - + Assess the impact of climate and natural events on wetland characteristics;
 - + Refine the use of diatom species as indicators of wetland ecological condition



Developing a Wetland Baseline at the Watershed Scale (EPA Grant)

- ✕ Tidal wetlands support of secondary production of nekton.
- ✕ It has been estimated that up to 80% of commercial and/or recreational fishes, shellfish and their forage base in coastal regions have “estuarine dependent” early life stages.
- ✕ Objectives:
 - + conduct a meta-analysis of existing literature that relates the role of riverine fresh, tidal fresh, and tidal saline marshes as essential habitat for the secondary production of fauna that use this habitat;
 - + use aerial photo interpretation and remote sensing to develop qualitative measures of vegetation coverage, diversity, and “vigor”;
 - + establish quantitative metrics that relate marsh geo-morphology to species access to the marsh surface;
 - + describe any potential impacts of the invasive variety of *P. australis* on marsh planform and functions.



Developing a Metric to Identify and Rank the Status of NJ Imperiled Wetlands

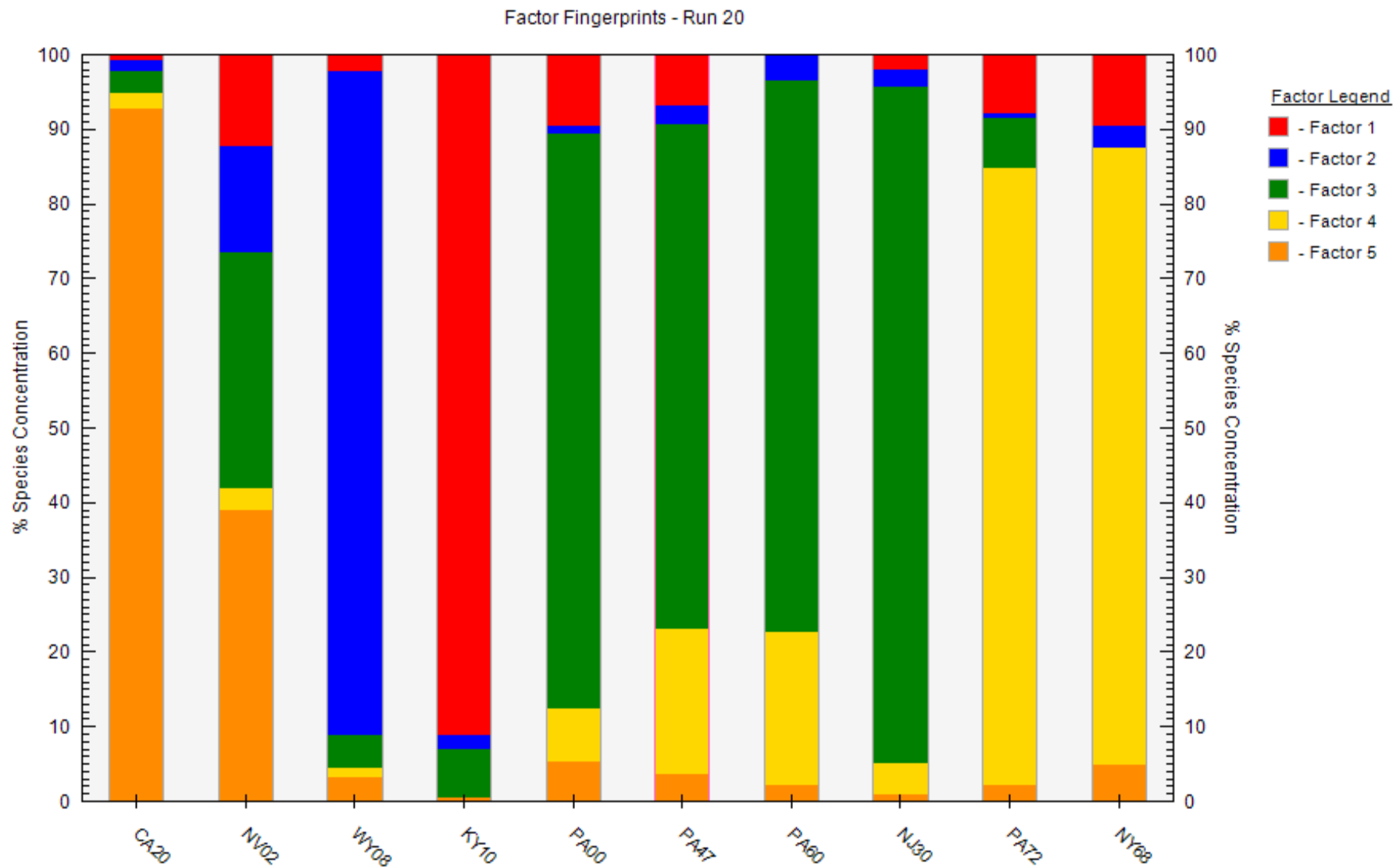
- ✖ Monitoring of the various coastal wetland systems throughout NJ would enable us to compare, contrast and make informed decisions on the status, trends, health and continued ability of wetlands to provide ecosystem services.
- ✖ Objectives are to:
 - + Develop a decision making matrix of science-based metrics to identify, quantify and rank the status of wetland degradation and link to the most appropriate restoration technique(s);
 - + Expand the long-term wetlands monitoring system to be inclusive of coastal wetland systems found in NJ.



Mercury

- × Fish tissue collection & analysis
 - + Fish Consumption Advisories
 - + Examine trends
- × Modeling sources – local, regional, global
 - + Positive Matrix Factorization

Positive Matrix Factorization results on spatial distribution of Hg sources in the US (rain data)

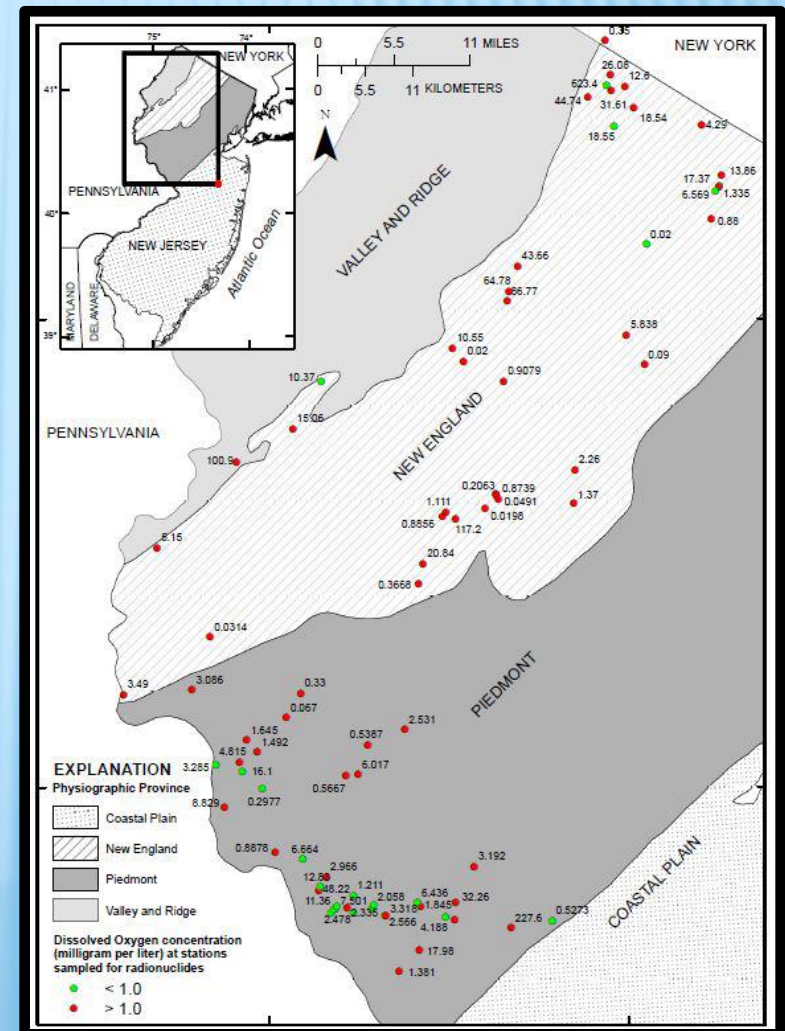


Detection of Unregulated Contaminants in Waste-Water Treatment Plants

- ✦ Study investigated the occurrence of (CECs) in untreated wastewater, fully treated wastewater and sewage sludge produced at 3 POTWs.
- ✦ Study focused on detection of:
 - Pharmaceuticals and Personal Care Products
 - Steroids and Hormones (S/H)
 - Alkylphenols and Phosphates
 - Pesticides and Insecticides
 - Perfluorinated Acids, Sulfonates, and Sulfonamides

CONTRIBUTION OF NATURALLY OCCURRING RADIOISOTOPES TO GROSS ALPHA-PARTICLE ACTIVITY IN GROUND WATER IN BEDROCK AQUIFERS OF NORTHERN NEW JERSEY

- ✖ The purpose was to analyze ground water samples in the Highlands and Piedmont Provinces of NJ for gross alpha-particle activity, isotopes of uranium and radium, and other water-quality parameters to ascertain the relative contribution of isotopes to the overall alpha particle activity.
- ✖ The general relationship between these two radionuclides and concomitant water chemistry in aquifers of the Highlands Province and the sedimentary rocks of the Piedmont Province of New Jersey was also evaluated.



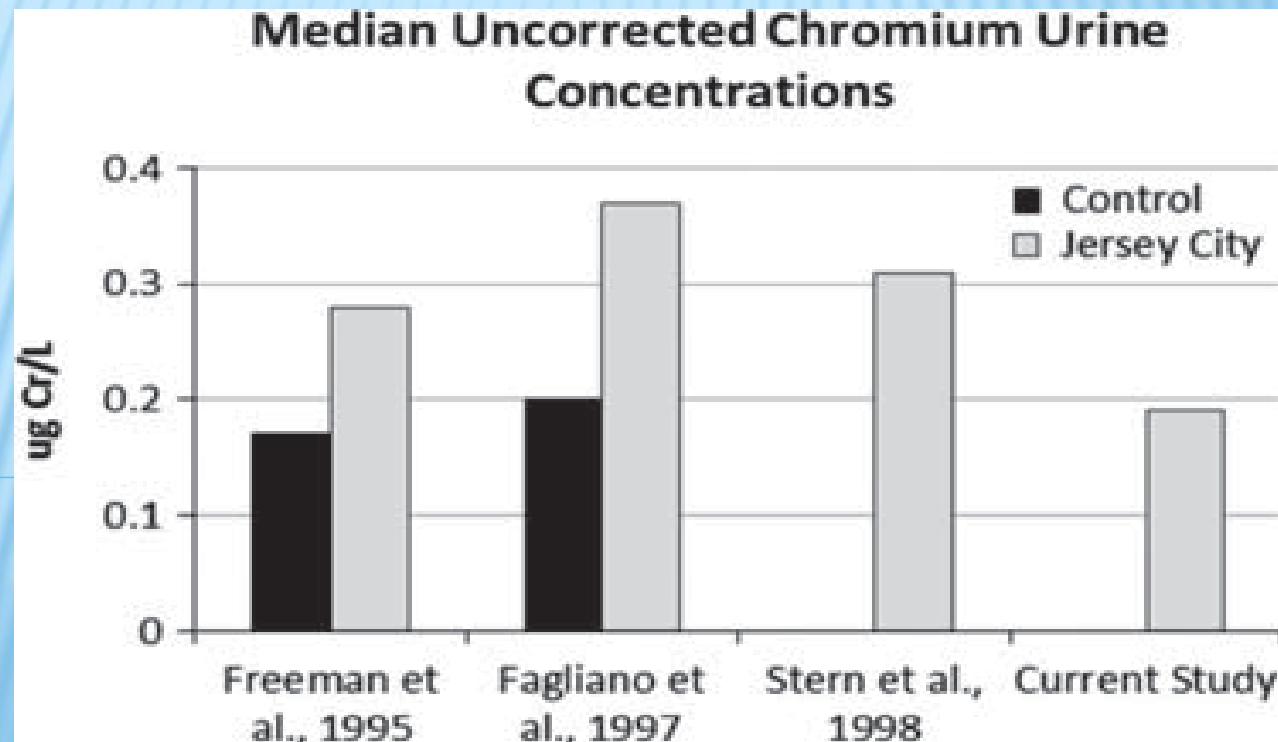
Completed Research

A post-remediation assessment in Jersey City of the association of hexavalent chromium in house dust and urinary chromium in children

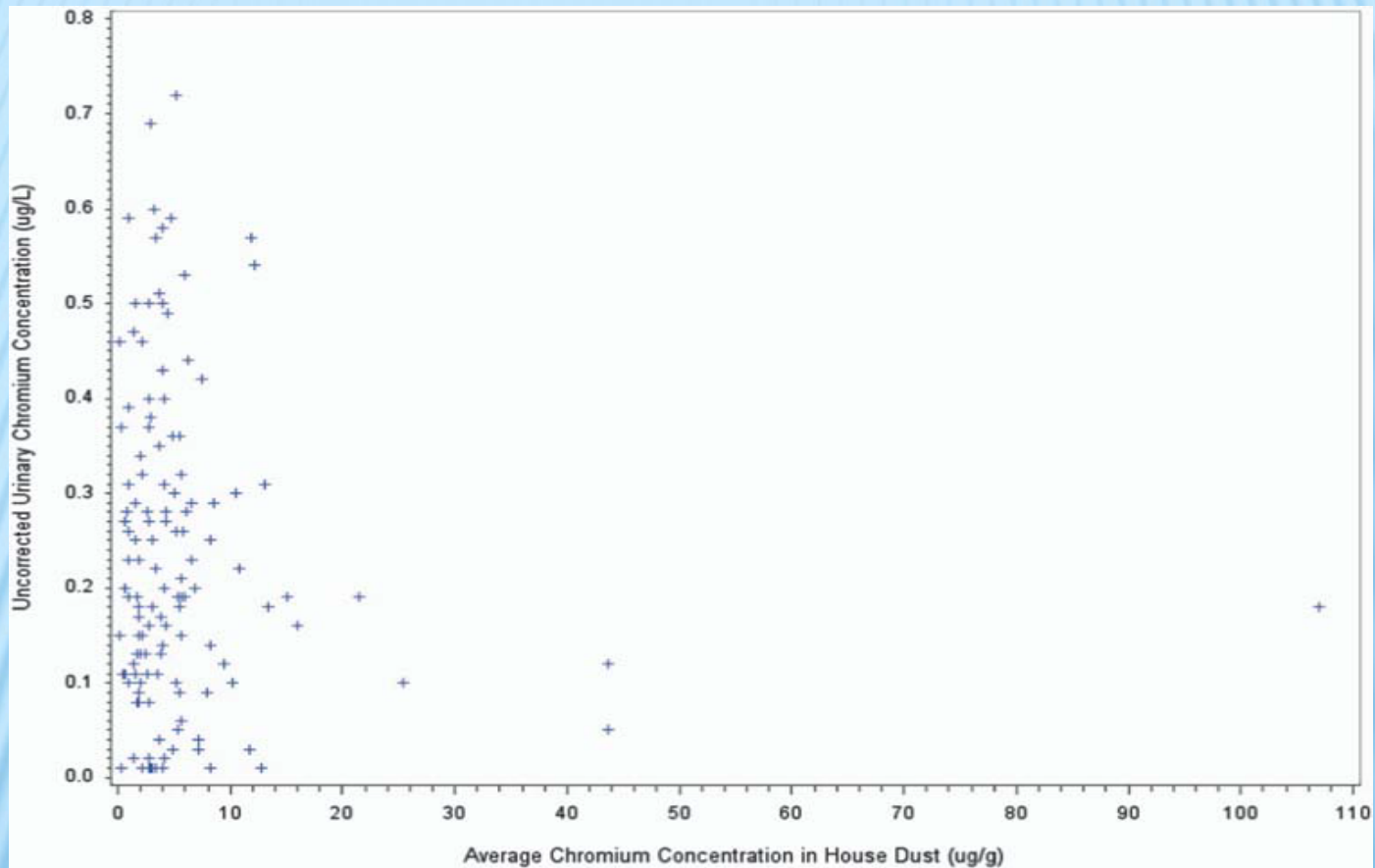
Kathleen Black¹, Michael Gochfeld, Paul J. Liroy¹, Zhi-Hua (Tina) Fan, Chang Ho Yu, Chris Jeitner, Marta Hernandez, Stephanie A. Einstein¹ and Alan H. Stern

Journal of Exposure Science and Environmental Epidemiology (2015), 1–7

Comparison of current urinary chromium concentration in children (0–6 years) with pre-remediation levels.

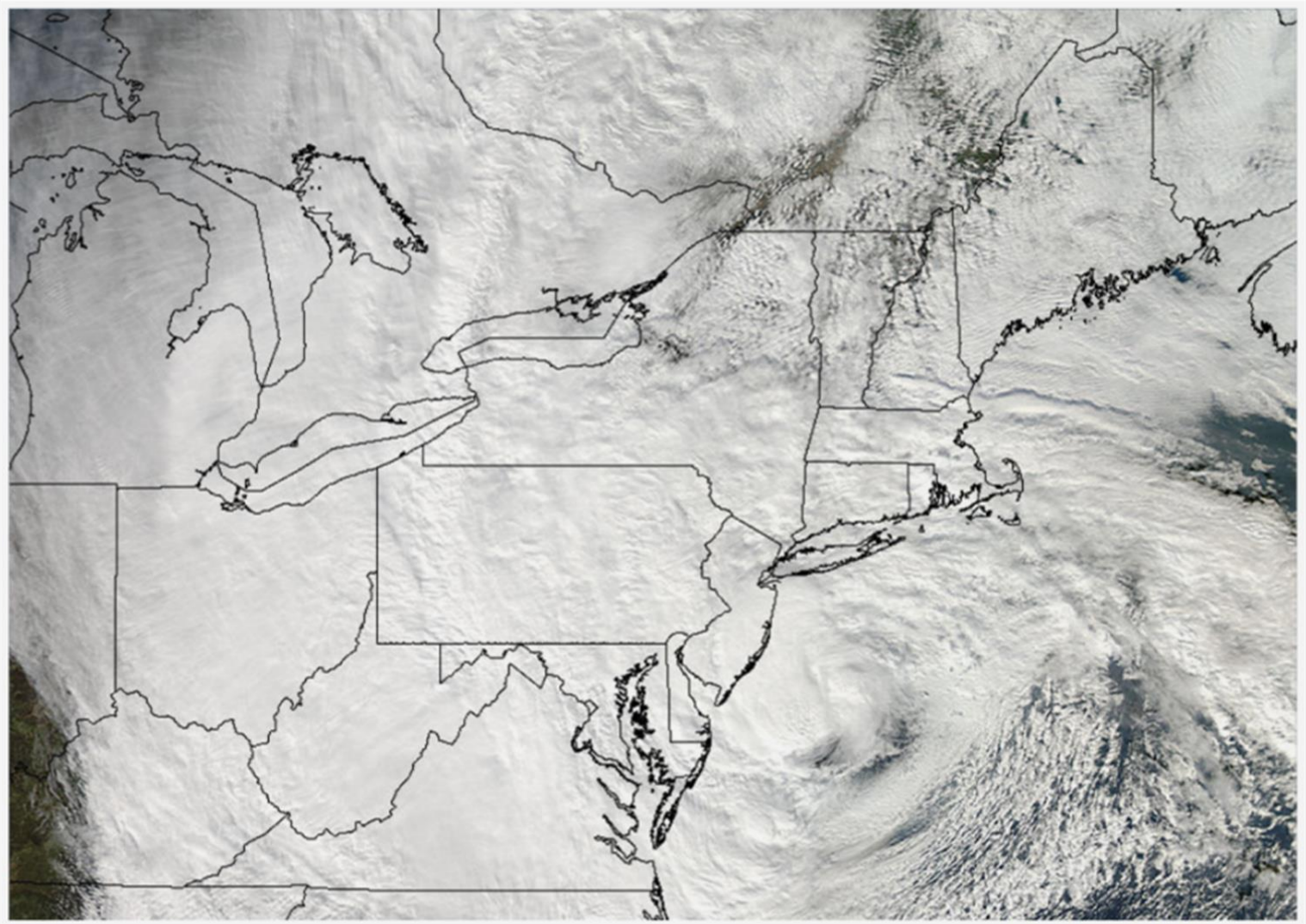


A post-remediation assessment in Jersey City (CONT.)



Graph of Cr VI concentration in house dust in children's play areas in Jersey City homes post-remediation versus children's urine Cr concentration showing a lack of correlation. Indicates lack of ongoing exposure to Cr VI and benefits of remediation.

Hurricane Sandy



DAMAGE ASSESSMENT REPORT ON THE EFFECTS OF HURRICANE SANDY ON THE STATE OF NEW JERSEY'S NATURAL RESOURCES

FINAL REPORT

PREPARED BY: OFFICE OF SCIENCE
NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

FOR:
HURRICANE SANDY
NATURAL & CULTURAL RESOURCE WORKGROUP

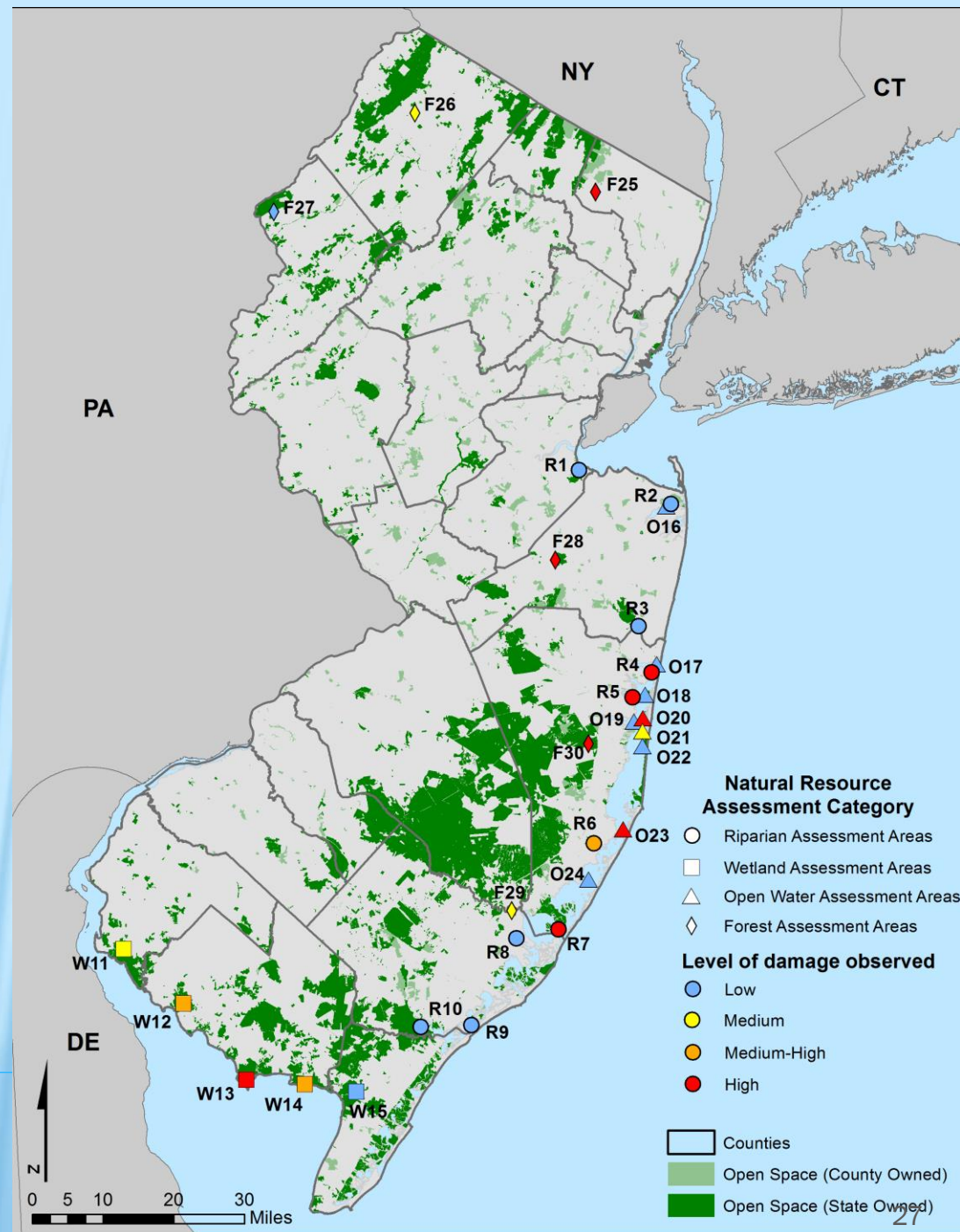
May 2015



FIELD ASSESSMENTS:

Site Locations and Levels of Observed Damage

- Wetlands
- Riparian Habitats & Floodplains
- Forests
- Open Water
- Cumulatively, highest impacts were observed along Central NJ coast
- Moderate Damage observed in Delaware Bay and Highlands



RIPARIAN HABITAT/FLOODPLAINS:

Assessment Criteria & General Impacts:

- **Compromised Shoreline Stability & Erosion**
- **Compromised Buffer Vegetation (loss, canopy disturbance, blow-down, etc.)**
- **Vegetation Stress/Dieback due to Salinity Effects**
- **Wrack/Debris Accumulation**
- **Sediment/Sand Deposition**



FORESTS



Stokes State Forest

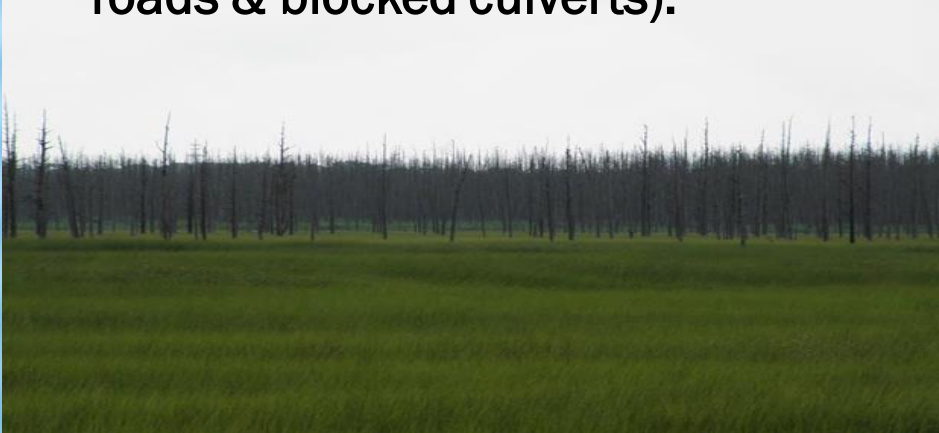
OBSERVATIONS

- ❖ **Two Primary Impacts from Sandy:**
 - **Downed trees due to wind**
 - **Inundation & salt water toxicity to coastal conifers.**
- ❖ **Overall extent of downed trees on natural lands was not significant (Less than 1% of total).**
- ❖ **Atlantic White Cedar (AWC) most affected in storm surge areas.**



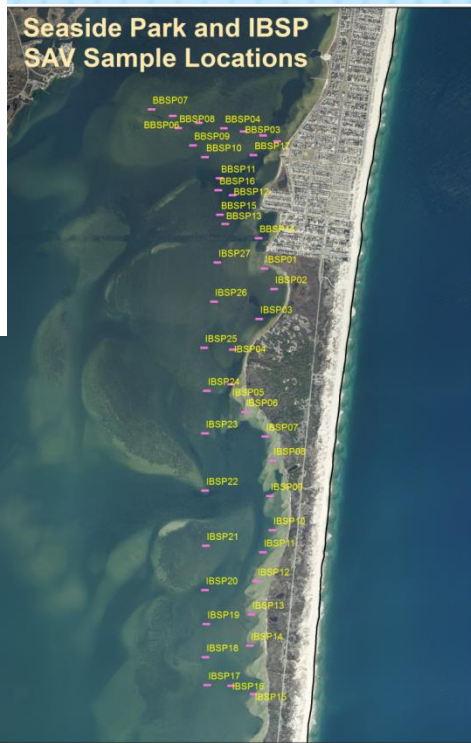
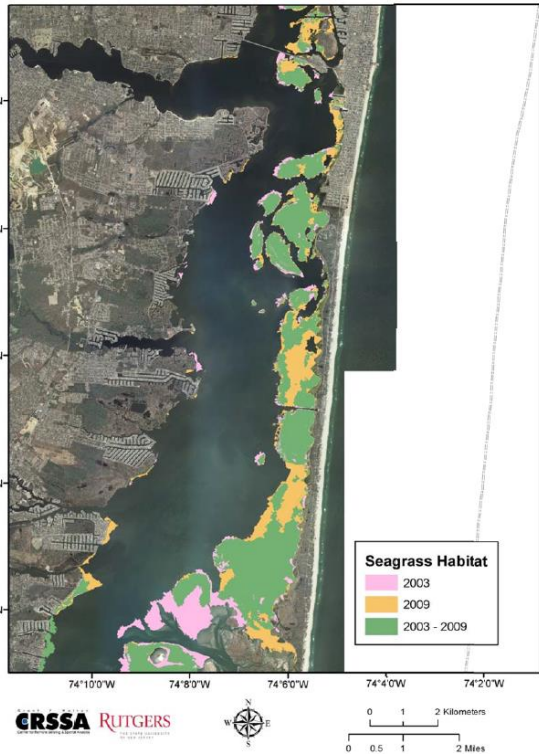
Atlantic White Cedar (AWC)

- ✖ Spring 2013 DPF Surveys: Significant areas of AWC dieback along BBay and south coast tributaries.
- ✖ AWC has been in steady decline prior to Sandy.
- ✖ Mid- & Upper-BBay, Mullica R. most heavily impacted.
- ✖ Most severe impacts where water retained by physical barriers (e.g. roads & blocked culverts).



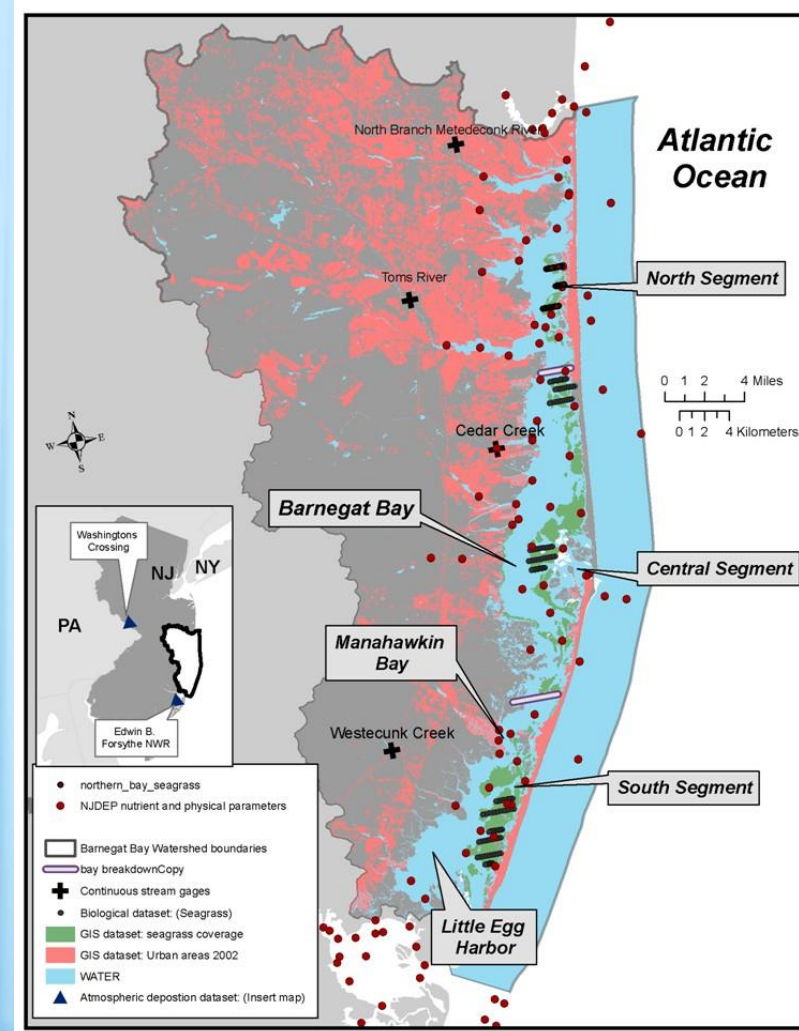
SAV Assessment & Sampling Methodology

- ✗ Review baseline information from previous surveys.
- ✗ Establish survey course and sampling locations.
- ✗ Collect GPS, Sediment Sample, Water Analysis and Underwater Video data at each location.



SUBMERGED AQUATIC VEGETATION (SAV)

- 2013 SAV surveys in Barnegat Bay show variable amounts of loss/change as compared to Lathrop (2011).
- Significant loss of SAV in Central (Conklin Is.) & Lower BBLEH (Loveladies to Beach Haven) locations.
- Causes of SAV loss can be due to multiple factors (e.g. disease, water quality, disturbance, etc.)
- Losses observed may not be due solely to Hurricane Sandy/other storm events.
- Sand/sediment deposition can negatively impact SAV survival (Kennish 2012).



From Lathrop 2011 (DEP sites not included)

WETLANDS



WETLANDS - Assessment Criteria and Observed Impacts

- **Matting**
- **Marsh scour**
- **Sediment /sand deposition**
- **General marsh appearance**
- **Condition of high marsh/upland edge**
- **Extent of debris/wrack line & ponding**
- **Evidence of salinity effects on vegetation** (e.g. stress/dieback)
- **Development adjacent to marsh** – condition of bulkheads, docks, piers & condition of adjacent marsh
- **Observed damage to residential and commercial development upland of marsh**
- **Stream Channel modifications**

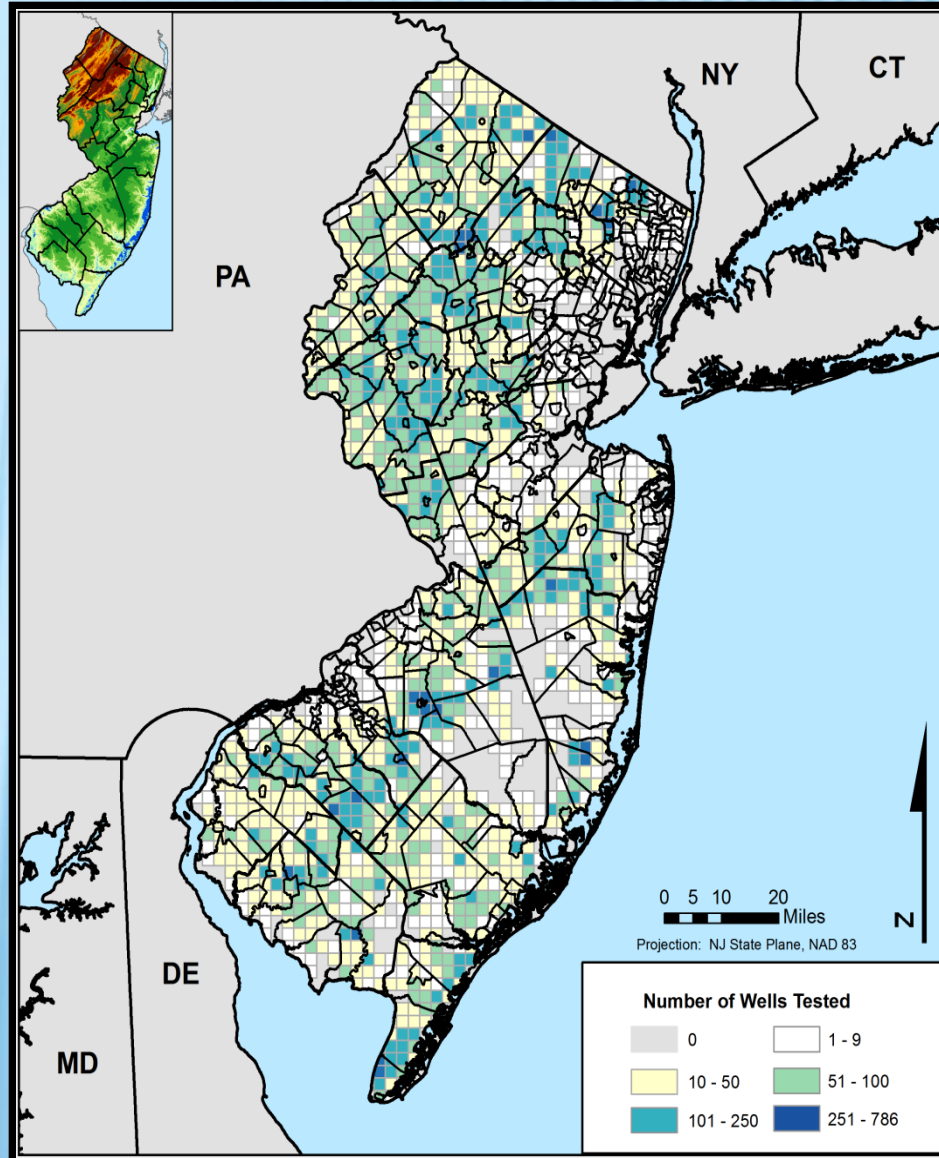


NFWF FUNDED RESTORATION PROJECTS

	Awarded To	Funding Level
Enhancing Liberty State Park's Marshes and Upland Habitats	NJDEP	\$396,968
Reusing Dredged Material to Restore Salt Marshes and Protect Communities	NJDEP	\$8,202,320
Building Ecological Solutions to Coastal Community Hazards (NJ)	NJDEP	\$4,334,888
Replenishing Little Egg Harbor's Marshes and Wetlands	Little Egg Harbor Township	\$2,221,500
Restoring Wetland in Great Egg Harbor Bay	City of Ocean City	\$3,906,775
Strengthening Monmouth Beach's Marshes and Dunes	Monmouth Beach	\$3,530,000

New Jersey Private Well Testing Act results

- ✖ Approximately 400,000 private wells (13 % of residents) in NJ.
- ✖ Statewide, wells are required to be tested for bacteria, nitrates, 26 volatile organic compounds, and lead, along with three secondary parameters; pH, iron, and manganese. Mercury, arsenic, and radium (gross alpha) are only required in certain counties.
- ✖ Analysis of data show the variability in the concentration for each parameter in relation to State standards.
- ✖ Data can be used to identify vulnerable communities and direct outreach efforts.
- ✖ Data used by SDW, SRP, and NJGS.
- ✖ www.nj.gov/dep/dsr/pwta/index.htm



IDENTIFICATION OF (PFCs) IN THE METEDECONK RIVER WATERSHED

- ✖ Brick Twp. initiated a PFC source track down study in collaboration with the DSREH.
- ✖ The data collected from sampling events show that low levels of various PFCs are present in the study area and likely originate from a number of sources.
- ✖ BTMUA documented a localized area of high-level PFC contamination along the River.
- ✖ A groundwater contamination plume emanating from an industrial park is suspected to be the principle source of PFCs.



Future research

- × Marine Fisheries
- × Emerging Contaminants, e.g., PFCs
- × Priority Issues

Division of Science, Research & Environmental Health

- × Acknowledgements: DSREH Scientists, DEP Programs, PIs and their Universities
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www.state.nj.us/dep/dsr/
- × Check for new reports