

Ocean Ecological Health: New Tools and Applications

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Water Monitoring and Standards



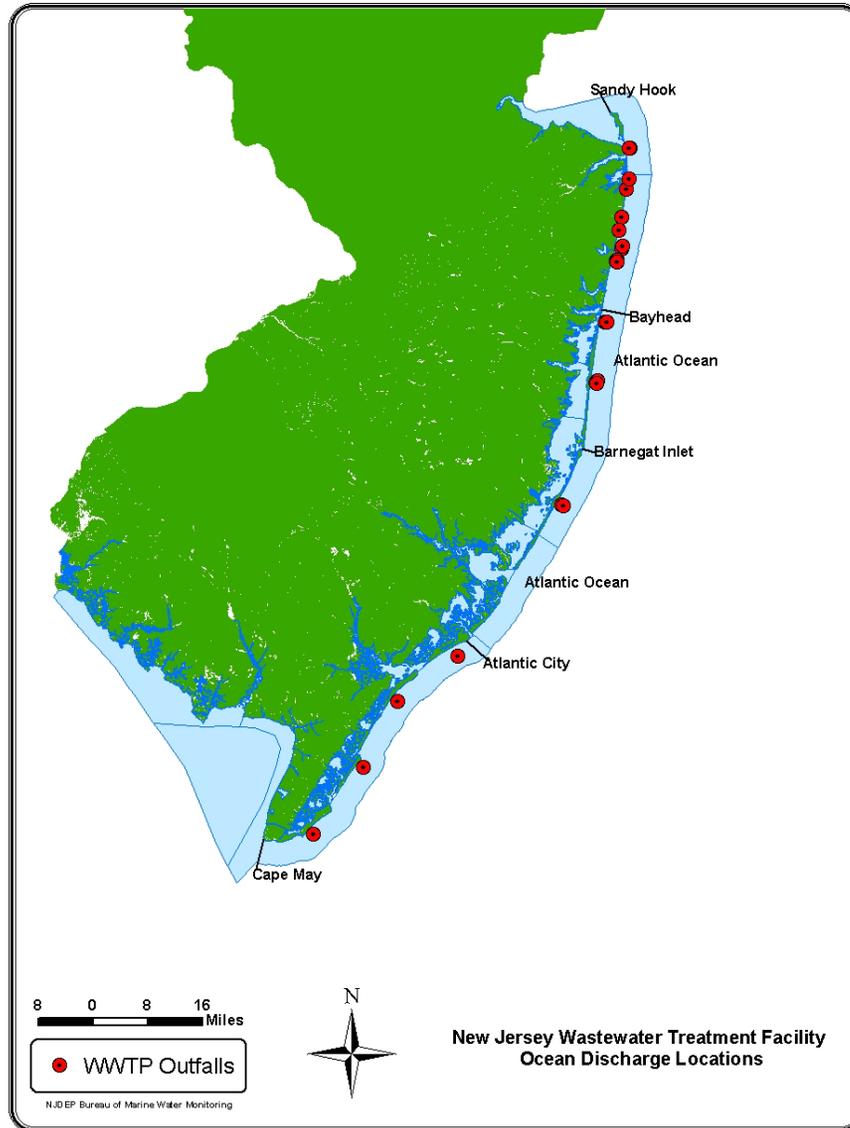
Why We Need a Nearshore Ocean Benthic Indicator



Regulatory Requirements

- ✧ CWA Section 305 (b)
Statewide Water Quality Assessment
- ✧ CWA Section 303(d)
ID waters which are impaired
- ✧ CWA Section 403(c)
Determine whether a discharge may cause unreasonable degradation of the marine environment



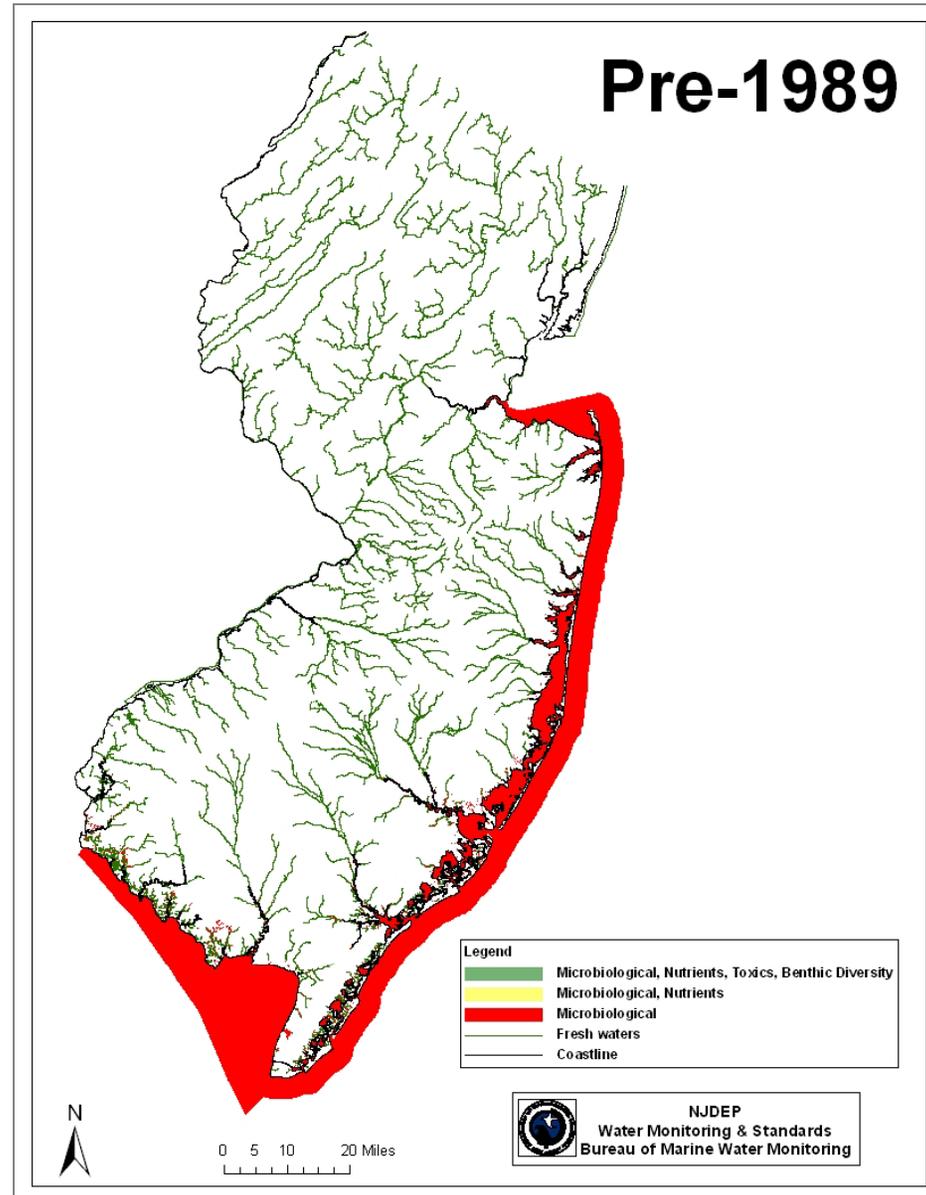


Availability of Water Quality Information

Microbiological monitoring
For public health reasons
Only information in coastal waters.

-Shellfish Classification
-- Bathing Beaches

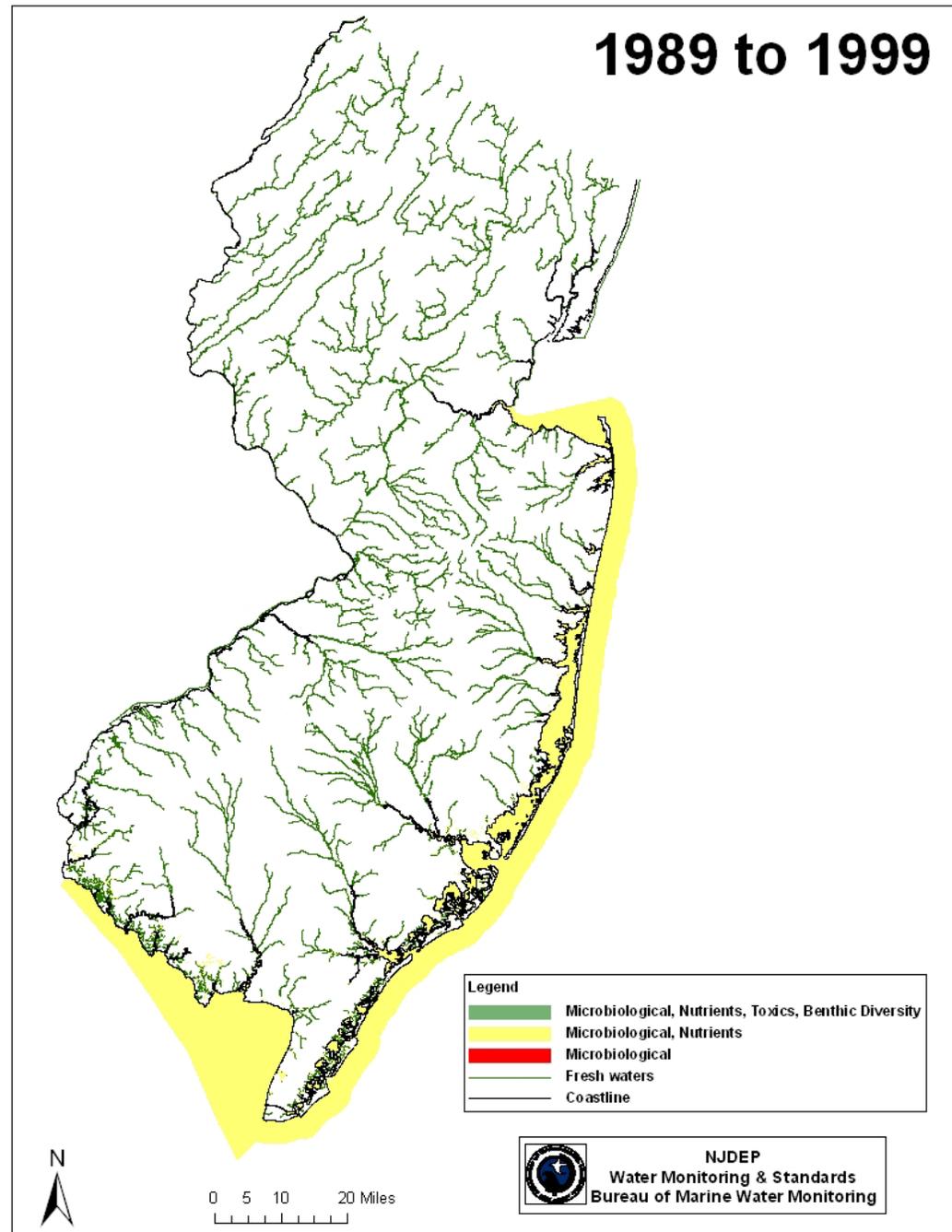
Fresh waters have
Microbiological, nutrients,
Toxics, and benthic diversity



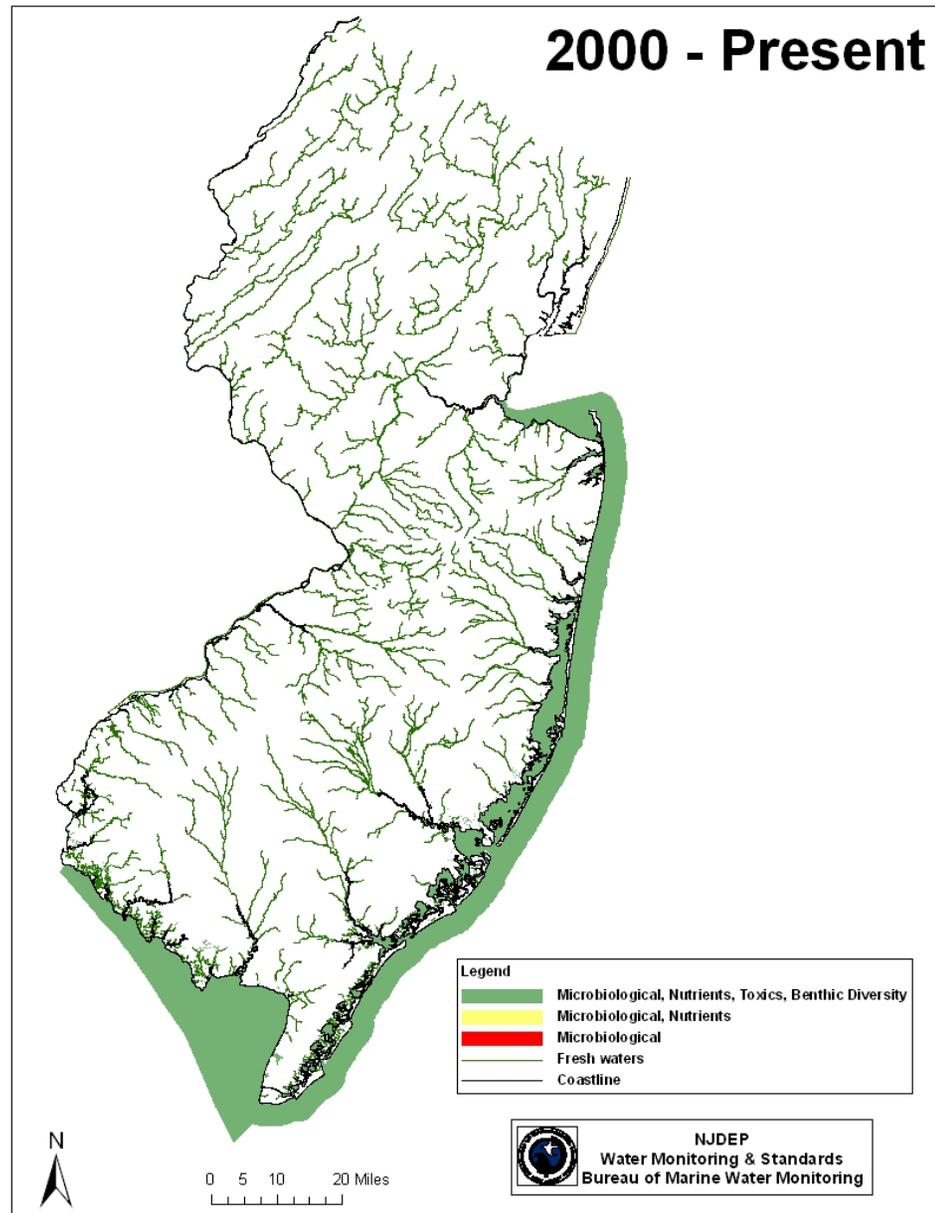
Availability of Water Quality Information

1986 Green Tide Blooms

1989 – Initiation of routine network monitoring for nutrients and DO in marine waters.



- We have been performing the USEPA National Coastal Assessment (NCA) since 2000 for ecosystem assessment of estuarine waters.
- Sediment toxicity, toxics, benthic diversity were added.
- Standard methods nationwide.



National Aquatic Resource Surveys (USEPA)

Figure 1: Schedule for Surveys of the Nation's Waters

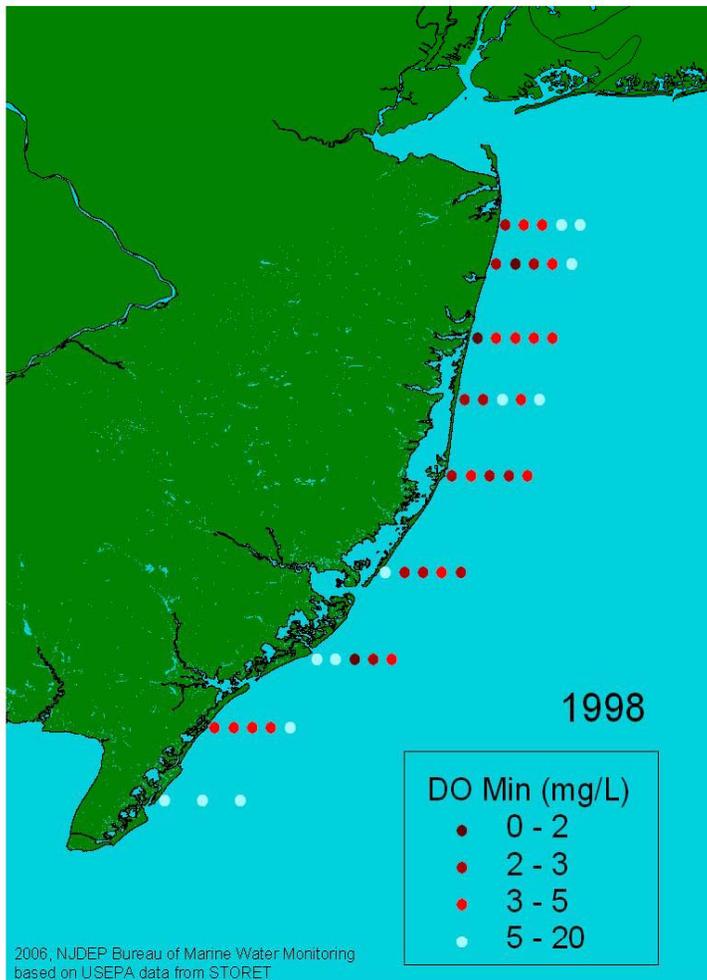
General schedule of activities by water resource type:

	FY06	FY07	FY08	FY09	FY10	FY11
Coastal(Estuarine)	Lab,data	Report	Research	Design	Field	Lab,data
Streams	Report	Research	Design	Field	Lab,data	Report*
Lakes, reservoirs	Design	Field	Lab,data	Report	Research	Design
Rivers	Research	Design	Field	Lab,data	Report*	Research
Wetlands	Research	Research	Research	Research	Design	Field

The USEPA coastal survey (National Coastal Assessment) has only involved the nation's estuarine (bay) waters, not the ocean waters.



NJ Ocean Assessments to Date



- ✳ Based solely on dissolved oxygen (DO) measurements due to a lack of biological data and/or accepted indices for these waters.
- ✳ NJ currently lists the majority of its ocean waters as being impaired, based on DO criteria of 5 mg/L.
- ✳ Does seasonal hypoxia result in impairment of the benthic communities?



Ocean Ecosystem Assessment Project



Goals

Enable the Department:

- ✧ To assess the Aquatic Life Designated Use in coastal waters as required under Sections 305(b) and 303(d) of the CWA

- ✧ Assess whether or not there are impacts from discharges to the ocean under Section 403(c) of the CWA



The Ocean Ecosystem Assessment Project is a collaborative initiative of state and federal government agencies

- ✧ NJDEP Water Monitoring & Standards
- ✧ USEPA Region 2 Monitoring & Assessment
- ✧ USEPA ORD – Atlantic Ecology Division
- ✧ Rutgers University – Institute of Marine and Coastal Sciences

Funding: USEPA Regional Environmental Monitoring & Assessment Program (REMAP)



1st Experts Workshop (Nov 2006)

Recommendations

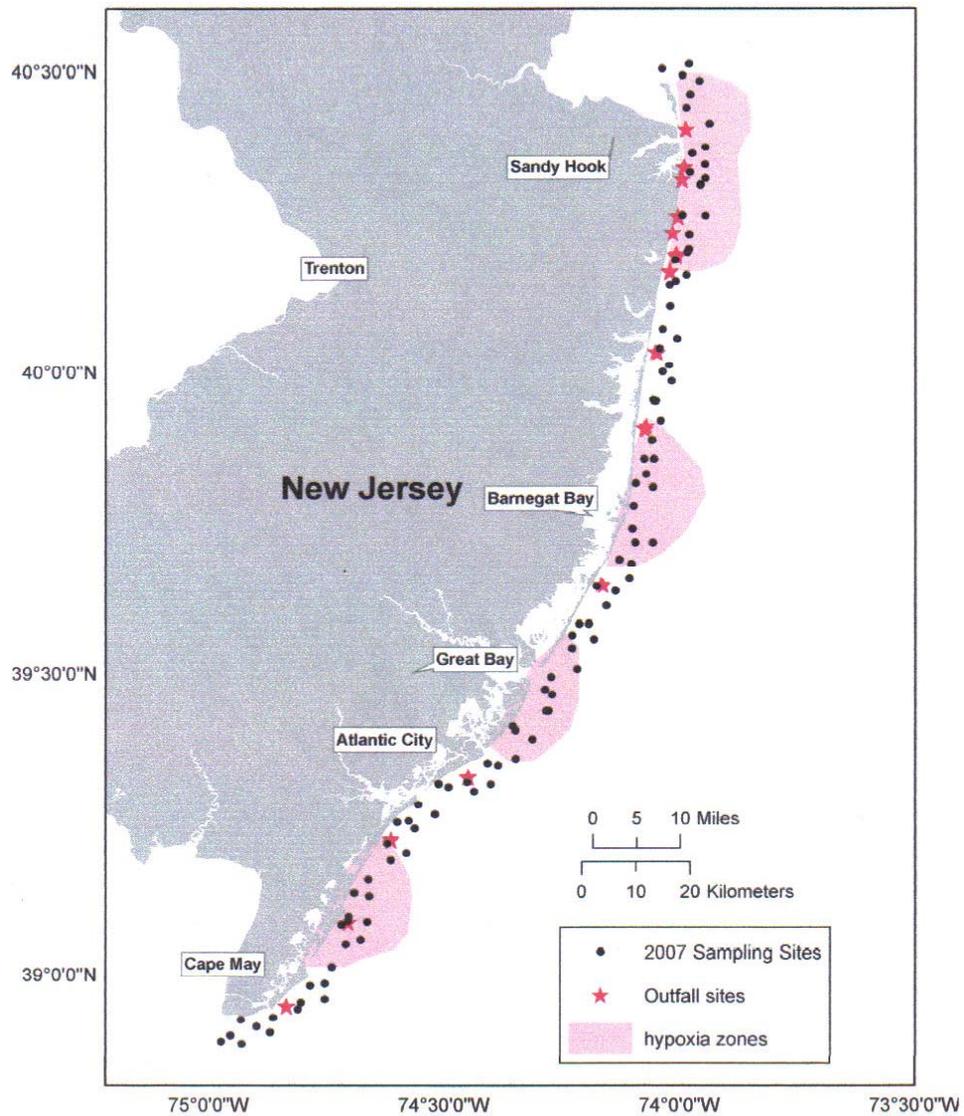
- ✱ The process for calibration and validation must be clearly established for the project.
- ✱ The sampling design, number of replicates, type of grab, sieve size, level of taxonomic analysis, and strata must also be established as early as possible for summer 2007 sampling.
- ✱ The investigators must consider the level of taxonomic identification of the samples (e.g. oligochaetes).



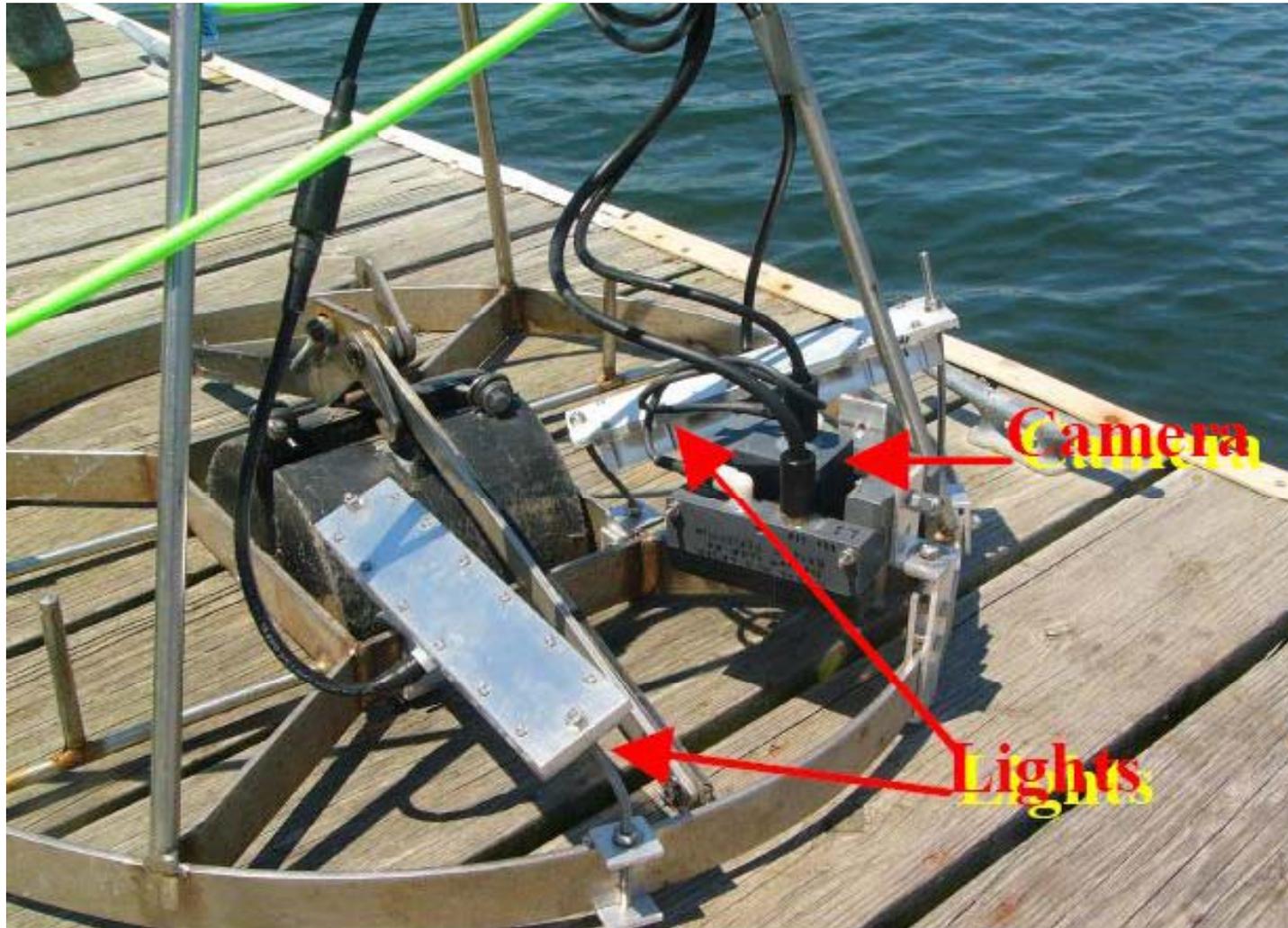
2007 Summer Sampling

- 100 stations were sampled in New Jersey Ocean Waters from Sandy Hook to Cape May.
- Sediment samples were collected using a 0.04m² Young Modified Van Veen, fitted with a camera to capture images to help characterize the bottom.
- Sediments were sieved through both .5mm and .3mm sieves.
- Water Quality profiles were taken from the surface to the bottom at ~ 1 meter intervals using a YSI Inc. 6600 Multi-parameter probe to assess the conditions at the time of benthic sampling.

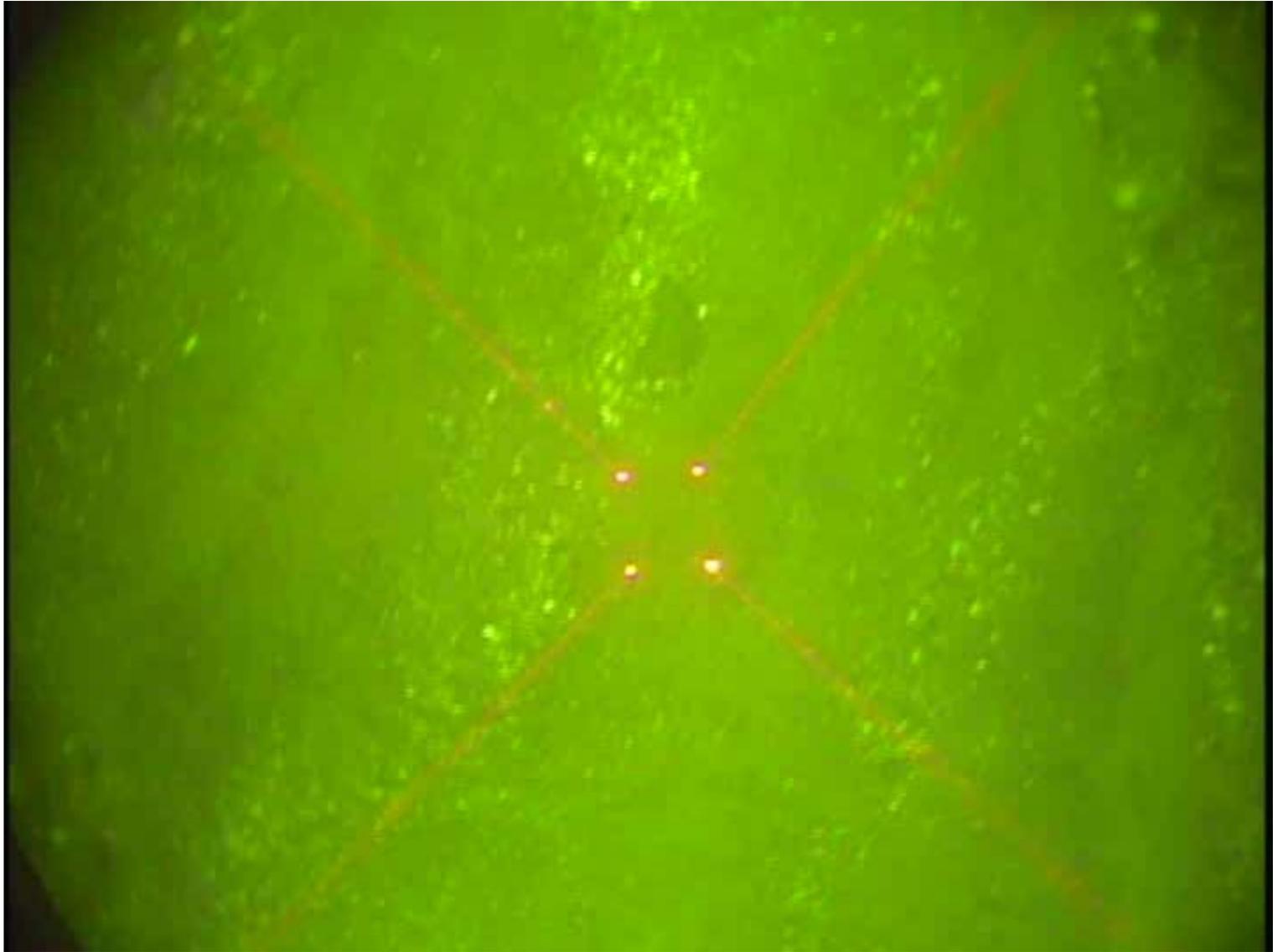


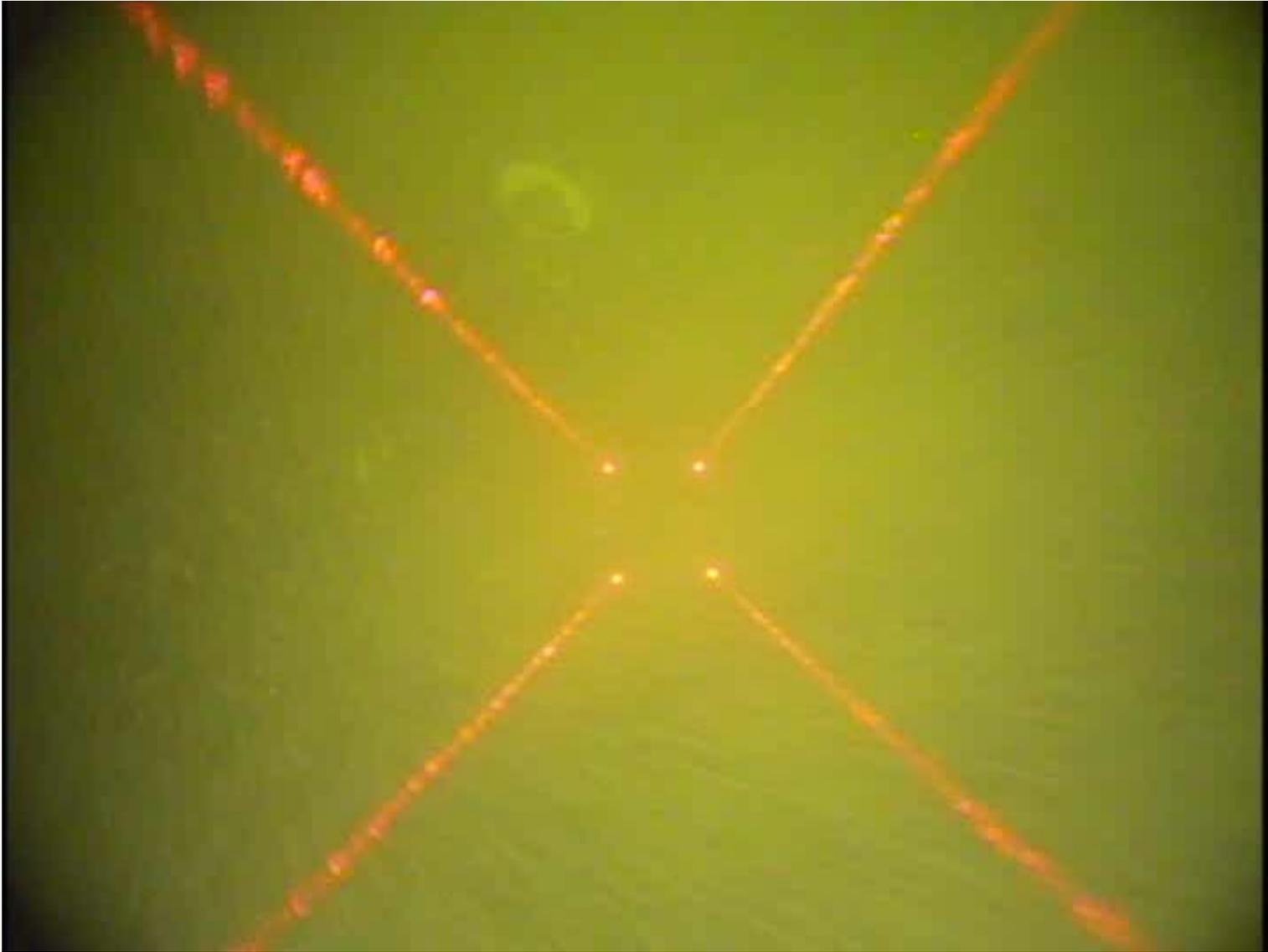


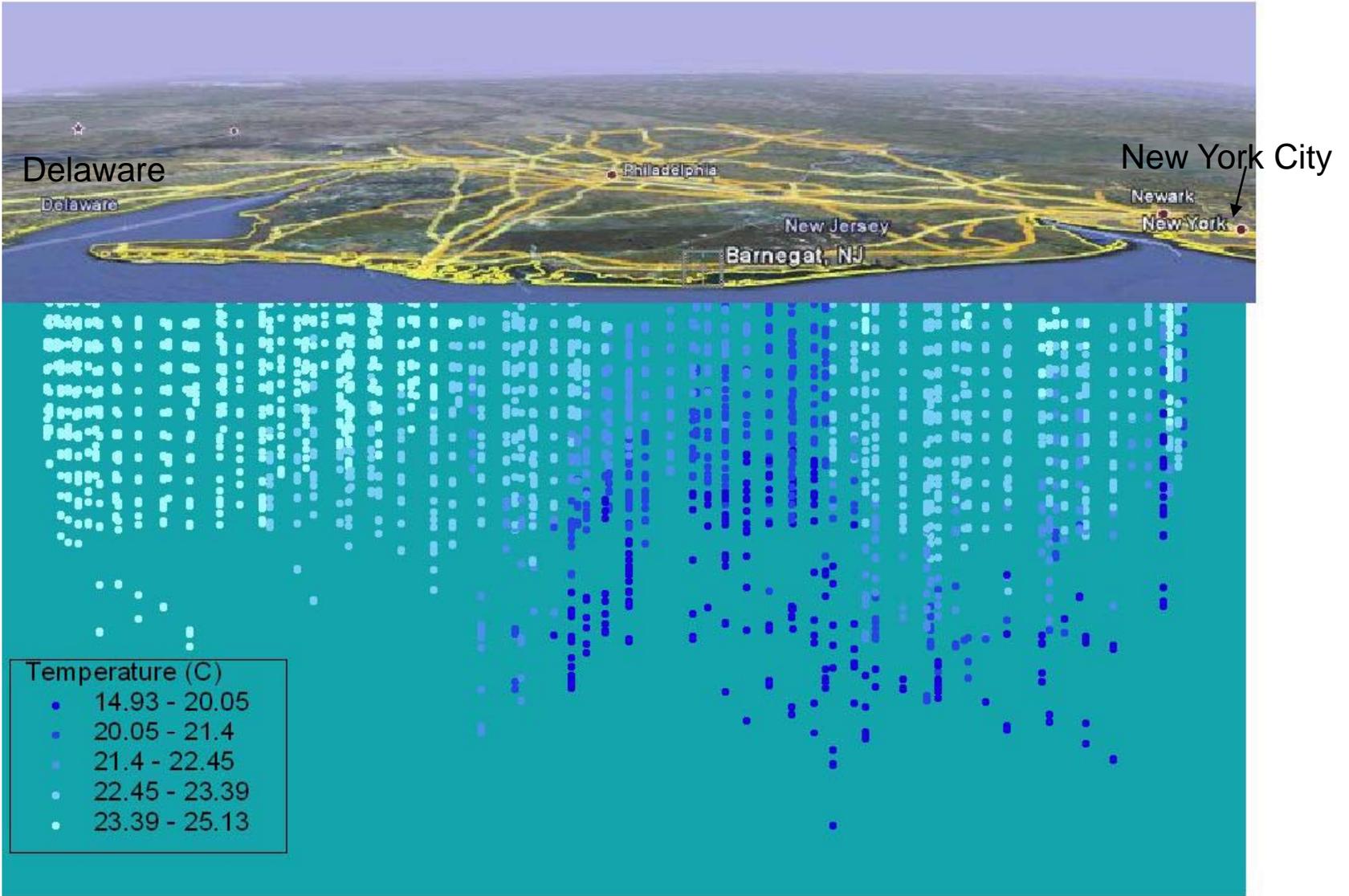
Modified Van Veen Dredge with Plan View Camera

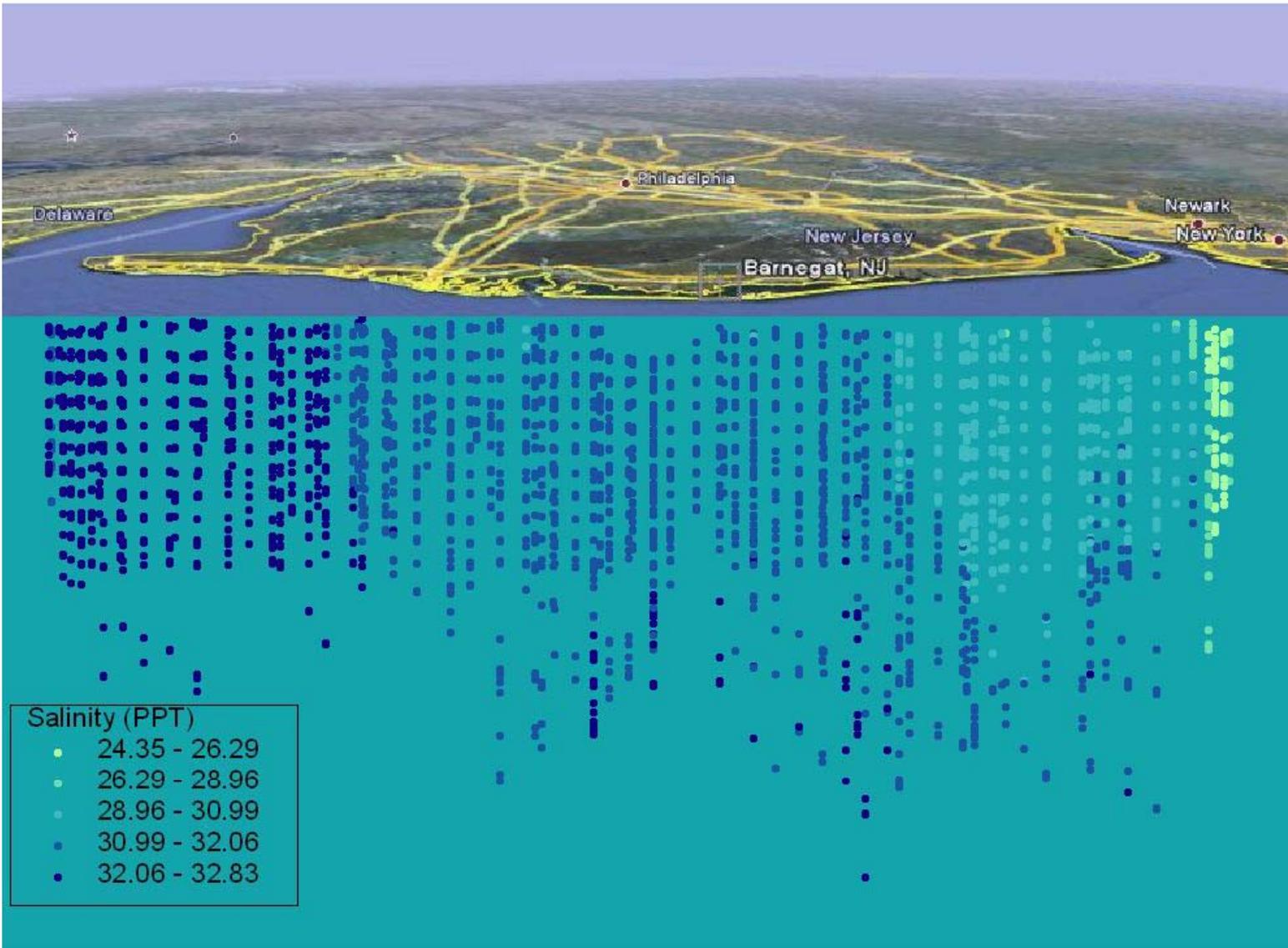


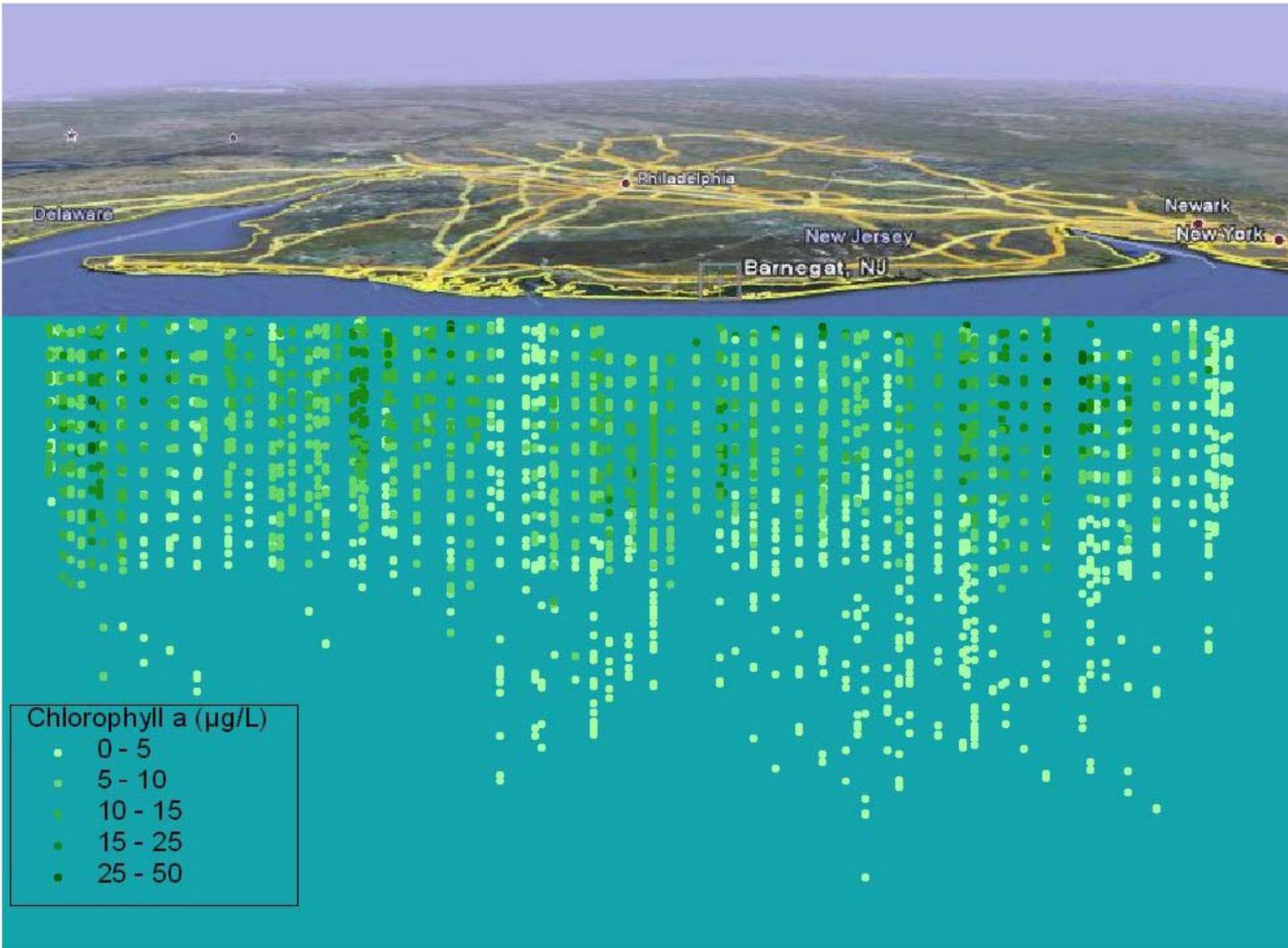


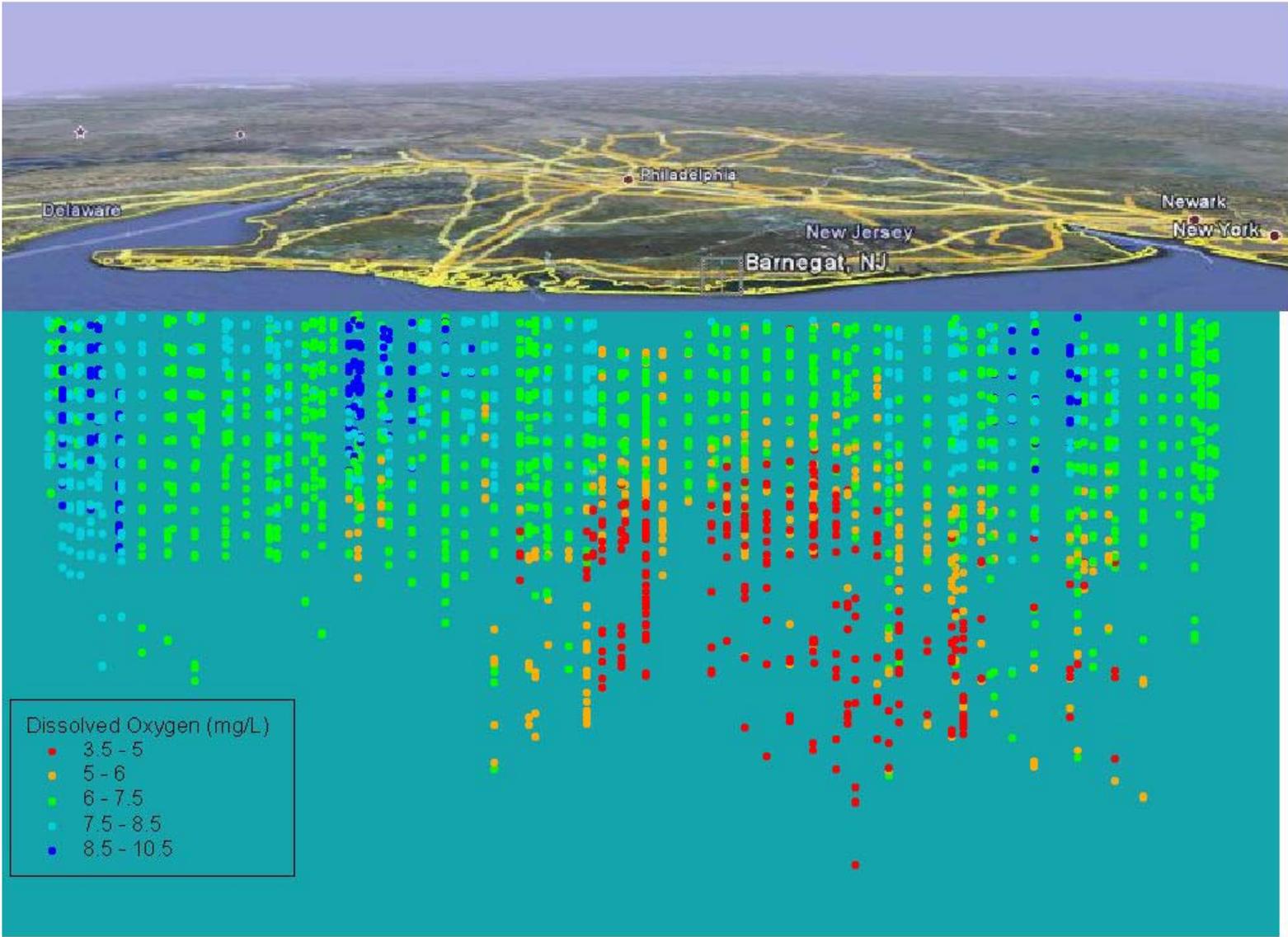


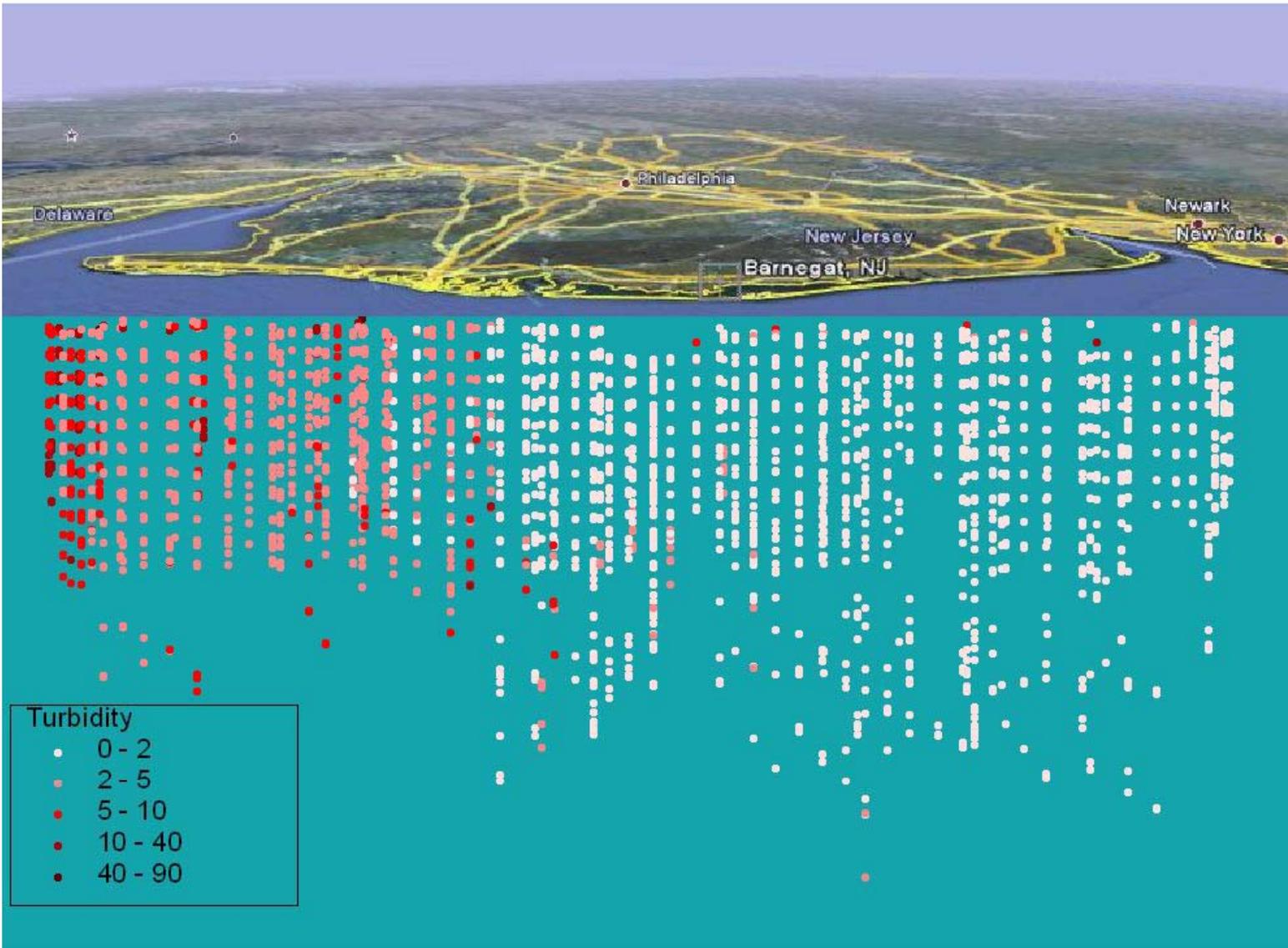












CANDIDATE METRICS FOR BENTHIC INDEX

Taxonomic Composition

Diversity Measures (Shannon Weiner Index)

**Faunal Abundance (e.g. Bivalves, Gastropods,
Polychaetes)**

Biomass and Species Dominance

Percent Abundance of Pollution Tolerant Taxa

Percent Abundance of Pollution Sensitive Taxa



2nd Experts Workshop – Recommendations 2009

- Species tolerance index best meets NJ's needs for ocean assessment
 - It is habitat independent.
 - The presence/absence of species is a sensitive metric.
 - Easy to calculate and to explain to the public
- Multivariate approach should be used if Species tolerance index does not work.
- Must identify and sample “impaired” sites to provide sufficient range in the data for calibration of the metric.



Additional Data Collection 2009

- 53 Stations
 - 9 discharge area - 3 locations per outfall randomly selected from an area beginning at the boundary of the 100 meter mixing zone and extending out 200 meters.
 - 30 new, randomly selected sites for background conditions.
 - 10 original sites from 2007 re-sampled to assess interannual variation.
 - 4 “impaired” sites – 6 mile dredge spoils site and the 12 mile sludge dump site. Two sites were sampled at each of these locations.



Preliminary Report of 2007 Data

- Completed by Rutgers in March 2010
- Poor agreement on species tolerance by a group of experts.
- Need to look at multivariate approach.
- An absence of impaired sites, all of the waters sampled were not considered impaired.
- Need to assess the 2009 data when available.



Next Steps

- ✧ Development of a Nearshore Ocean Benthic Index to be completed by Dec. 31, 2010
- ✧ Summer 2010 Sampling
 - ✧ 3 samples at each of NJ's 14 ocean discharges
 - ✧ Additional background and revisit sites to assess interannual variability
- ✧ Assessment of ocean discharges – Spring 2011



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