Developing Water Monitoring Consortium to Support NJ’s Barnegat Bay Action Plan

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National Water Monitoring Conference
Session O1 – Strengthening Monitoring Programs Through Non-Profit/Government Collaboration

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Overview

- Barnegat Bay Ecological Concerns
- Governor’s Action Plan
- Monitoring Objectives & Design
- Partnership Development
- Preliminary Results
Barnegat Bay Stressors and Ecological Concerns

Stressors include:
- Rapid population increase, LU/LC Changes, intensive boating uses, nuclear facility cooling water discharge, nutrient & other pollutant loadings

Ecological concerns include:
- Loss of SAV
- Occurrences of macroalgae & brown tide
- Declining hard clams
- Increasing stinging nettle populations
- Water quality concerns, including DO
Submerged Aquatic Vegetation (SAV) Decline

**BIOMASS DECLINED WITHIN AND ACROSS YEARS**

Lowest recorded SAV biomass in Barnegat Bay...

...until 2010.

Institute of Marine & Coastal Sciences

Kennish, Fertig & Sakowicz, 2011
Governor’s Action Plan
for Barnegat Bay - December 9, 2010
(to address ecological health of bay)

1. Close Oyster Creek Nuclear Facility Early
2. Fund Stormwater Mitigation Projects
3. Reduce Nutrient Pollution from Fertilizers
4. Require Post-Construction Soil Restoration
5. Acquire Land in the Watershed
6. Est. Special Area Management Plan
7. Adopt More Rigorous Water Quality Standards

**Monitoring Consortium & Model Development**

8. Educate the Public
9. Fill Research Gaps – 10 projects developed
e.g. benthic macroinvertebrates, hard clam pops
10. Reduce Water Craft Impacts
Barnegat Bay Water Quality Monitoring Program: Objectives

- Determine type and extent of water quality impairments
- Develop models for use in directing water quality restoration or TMDL development
- Based on pollutant load responses, identify water quality or loading targets for nutrients or other pollutants
## Monitoring Design

### Phase 1 (6/11-3/12)
- 13 Trib stations & 14 Bay stations
- Grab water quality sampling (~ biweekly)
- Flow monitoring – tribs (manual & gages) & bay
- Trib benthic macroinvert. monitoring

### Phase 2 Changes (3/12-2013)
- Increased sampling frequency (weekly)
- 2 intensive (4 day) sampling events
- Continuous monitoring - 1 trib & 7 bay stations
- Sediment quality
- Bathymetric bay survey
WE NEED HELP!

- Monitoring & sample prep exceeds DEP capacity
- Simultaneous sampling - trib & bay sites
- First 6 months:
  - ~7500 field measurements
  - ~10,000 Bottles for 4 labs
  - > 100 Flow measurements

Field & Laboratory Parameters include:

Temp, DO, DO Sat, pH, Specific Conductance, Turbidity, Transmissionmetry, Salinity, Secchi Depth, TSS, Chlorophyll a, BOD5, CBOD5, CBOD20, Dissolved and Total Nutrients, Alkalinity, Silica, TOC, DOC
Partnership Development

• How find interested & willing partners?

• Start w/ **NJ Water Monitoring Council**
  • USGS, EPA, Water Utility, Planning Commission, University, Estuary Program

• Meet w/ entities - ask what they can do?

• Add monitoring & lab partners
  • County Health Dept, Local Technical High School & Sewage Utility, University, & Health Dept

• Find partners in our own agency
  QA Office, Forestry Center facility, AmeriCorps

• Retask existing partner work - e.g. USGS flow work

• **Now have 13 partners!**
7 Tributary and 3 Bay Monitoring Partners

Barnegat Bay Watershed Tributary Water Quality Partners

- Brick Township Municipal Utilities Authority
- NJDEP (Freshwater & Biological Monitoring)
- Barnegat Bay Partnership (Estuary Program)
- Ocean County Health Department
- MATES (Technical High School)
- NJ Pinelands Commission
- NJDEP (Marine Water Monitoring)

Bay Water Quality Partners

- Monmouth University
- USEPA Region 2
- NJDEP (Marine Water Monitoring)

SITE | NAME
--- | ---
BB01 | at Mantoloking
BB02 | between Silver Bay and Goose Creek
BB03 | by Route 37 bridge
BB04 | near the mouth of the Toms River
BB05 | above Cedar Creek
BB06 | below Cedar Creek and above Forked River
BB07 | below Oyster Creek and above Barnegat Bay
BB08 | by Barnegat Inlet
BB09 | below Barnegat Inlet and close to Long Beach
BB10 | by Route 72 bridge
BB11 | above Westcunk Creek
BB12 | in Little Egg Harbor
BB13 | near Tuckerton Creek
BB14 | Little Egg Harbor Inlet near Beach Haven Heights

Map: Bureau of Freshwater & Biological Monitoring 6/16/13

NJDEP Water Monitoring and Standards
Our Dedicated Partners !!!
Partnership Development

• **Monitoring Agreements** – written agreements with each entity specifying project commitments

• **Comprehensive Quality Assurance Plan**
  - Referred to in all Partner Agreements
  - Assure data of known quality & comparability of results
  - Includes:
    - Station locations/dates/ times
    - Sample preparation – preservation & filtering in 2 labs
    - Parameters, analytical & field methods
    - Data quality requirements/ review
    - Sample routing
    - Chain of custody forms
Complex Sample Collection & Transport Logistics

Partners:
- NJDEP Bureau of Marine Water Monitoring
- USEPA Region 2
- Monmouth University

Bay Monitoring

Partners:
- NJDEP Bureau of Freshwater & Biological Monitoring
- NJ Pinelands Commission
- OCVTS MATES
- Ocean County Health Department
- Brick Twp MUA
- Barnegat Bay Partnership

Tributary Monitoring

Partners:
- US EPA Edison Staff
- NJDEP-BFBM Staff

NJ Forest Research & Education Center

Partners:
- NJDEP Trenton
- Overnight Express
- University of Maryland Center for Environmental Studies Lab
- Ocean County Utilities Authority Lab

US EPA Lab

NJDEP Bureau of Marine Water Monitoring Lab

NJDEP Bureau of Freshwater Monitoring & Standards Lab

Logistics:
- Saltwater Carbon
- Freshwater Carbon, Silica, Alkalinity
- BOD, CBOD
- Nutrients, TSS, Chlorophyll a
- Turbidity

NJDEP Water Monitoring and Standards
Partnership Development

• **Training & QA Approval** - Partner meetings on project design, sample collection, equipment calibration, and QA Office approval for field measurements (DO, SC, T)

• **Partner Communication** – 1 point agency contact overall project, 1 field contact for tribs and 1 for bay, frequent emails

• **Data access** – Website w/ Interactive map
Lessons Learned So Far

- Don’t be afraid to ask for participation
- Importance of QAPP and QA approval for field measurements
- Communicate, communicate, communicate
- Anticipate data gaps
- Accommodate partners scheduling needs & have backup staff to fill in
- Recognize partner resource limitations, be flexible & have backup plans
- Expect the unexpected!
Example Phase 1 Results:
June – December 2011

Tributaries
- Ecological Health
- Flow
- Concentrations
- Loadings

Bay
- Concentrations
- Ecological Responses
**Barnegat Bay Watershed Tributary Macroinvertebrate Index Results**

<table>
<thead>
<tr>
<th>Trib Site</th>
<th>Stream Name</th>
<th>Impairment Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>BT01</td>
<td>NB Metedeconk River</td>
<td>Good</td>
</tr>
<tr>
<td>BT02</td>
<td>SB Metedeconk River</td>
<td>Fair</td>
</tr>
<tr>
<td>BT03</td>
<td>Toms River</td>
<td>Not sampled, nonwadeable. Will try to re-sample.</td>
</tr>
<tr>
<td>BT04</td>
<td>Wrangle Brook</td>
<td>Fair</td>
</tr>
<tr>
<td>BT05</td>
<td>Jakes Branch</td>
<td>Fair</td>
</tr>
<tr>
<td>BT06</td>
<td>Cedar Creek</td>
<td>Good</td>
</tr>
<tr>
<td>BT07</td>
<td>NB Forked River</td>
<td>Will not sample. Site does not meet protocol.</td>
</tr>
<tr>
<td>BT08</td>
<td>Middle Br.</td>
<td>Fair</td>
</tr>
<tr>
<td>BT09</td>
<td>South Br.</td>
<td>Excellent</td>
</tr>
<tr>
<td>BT10</td>
<td>Oyster Creek</td>
<td>Good</td>
</tr>
<tr>
<td>BT11</td>
<td>Mill Creek</td>
<td>Poor</td>
</tr>
<tr>
<td>BT12</td>
<td>Westecunk Ck.</td>
<td>Good</td>
</tr>
<tr>
<td>BT13</td>
<td>Tuckerton Ck.</td>
<td>Will not sample. Site does not meet protocol.</td>
</tr>
</tbody>
</table>

**Index Impairment**

- ★★ No data
- ★★★ Excellent
- ★★★ Good
- ★★ Fair
- ★ Poor

Map: Bureau of Freshwater & Biological Monitoring 4/16/10
Nitrate - Nitrite Concentrations (mg/L) at Barnegat Bay Tributary Stations (June - December, 2011)

Surface Water Quality Criterion (Human Health) = 10 mg/L

Reporting Limit = 0.025 mg/L

*number of samples = 12 except BT04 (11), BT04a (1) and BT13 (6)
Discharge (flow) (cubic feet per second) at Barnegat Bay Tributary Stations (June - December, 2011)

Station

Discharge (Cfs)

0 100 200 300 400 500
Mean Nitrite-Nitrate Loadings & Concentrations (12 Sampling Events)

Barnegat Bay Tributary
Mean Total NO2+No3 Loading Levels
June - Dec 2011

Total NO2+NO3 Loadings (lbs/day)
- 0 - 5
- 5.1 - 10
- 10.1 - 35
- 35.1 - 210
- > 210

*BKage Load = sum of all individual load events/number of events
Loads = lbs/day

Barnegat Bay
Mean NO2+NO3 Concentrations (mg/l)
June - Dec 2011

Mean NO2+NO3 Concentrations (mg/l)
- 0.025 - 0.027
- 0.028 - 0.032
- 0.033 - 0.038
- 0.039 - 0.046
- > 0.046

Map: Bureau of Freshwater & Biological Monitoring 4/12/12

NJDEP Water Monitoring and Standards
Mean Nitrite-Nitrate Loadings & Chlorophyll Concentrations (12 Sampling Events)

Barnegat Bay
Mean NO₂+NO₃ Concentrations (mg/l)
June - Dec 2011

Mean NO₂+NO₃ Concentrations (mg/l)
- 0.025 - 0.027
- 0.028 - 0.032
- 0.033 - 0.038
- 0.039 - 0.046
- > 0.046

Barnegat Bay
Mean Chlorophyll a Concentrations (ug/L)
June-Dec 2011

Mean Chlorophyll a Concentrations (ug/L)
- 3.5 - 3.9
- 3.9 - 4.5
- 4.5 - 5.3
- 5.3 - 5.9
- 5.9 - 6.5

Map: Bureau of Freshwater & Biological Monitoring 4/18/12

NJDEP Water Monitoring and Standards
Barnegat Bay Website: www.state.nj.us/dep/barnegatbay/
(including Interactive Map for monitoring data)

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