AED Peer Review '07

Benthic Conditions: Developing Tools for Evaluating the Condition of Nearshore Coastal Waters of New Jersey (ECO MYP)

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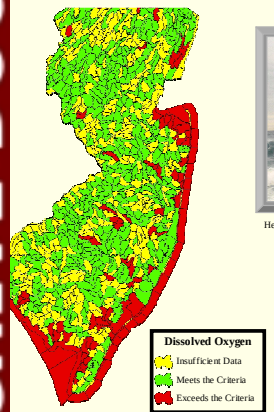
Agency Problem

Under § 305(b) of the Clean Water Act (CWA), every two years EPA must report to Congress on the condition of the Nation's surface waters. To accomplish this, EPA requires each state to provide a state-wide assessment of their waters. Unfortunately there is little uniformity in how individual states accomplish this. In addition, the indicators of condition employed do not always directly relate to the CWA goal of preserving ecological integrity. An example is the manner in which the state of New Jersey reports on the condition of their coastal waters (0-3 nautical miles). Using dissolved oxygen (DO) data collected by the State and EPA Region 2, NJ has declared 100% of their coastal waters to be impaired relative to their criterion of 5 mg/L (NJDEP, 2006). Through the REMAP program, the Region and the State have requested that we assist in determining if these waters are truly impaired, using ecological, rather than chemical, indicators, as was done by the National Coastal Assessment for the Nation's estuarine waters.

NJ 2006 Integrated Assessment Report: Dissolved Oxygen



Helicopter sampling for water quality along the Jersey shore.

Research Goals

- With NJ coastal waters being listed as impaired based on hypoxia, one could ask the question: *Are these waters biologically impaired?*

Sediment Profile Image
Healthy Community

Sediment Profile Image
Impaired Community

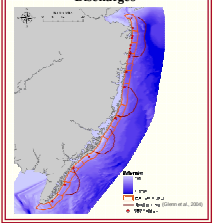
- The goal of this REMAP project is to develop methods for reporting benthic community condition for all of New Jersey's marine and estuarine waters. The specific goal is to develop one or more benthic indices which can be applied to all of these waters.
- This project will also collect necessary field data to apply these indices. EMAP/NCA collected abundant data in the estuaries. However, sufficient benthic community data for the offshore waters (0-3 nautical miles) are not currently available, and will need to be collected in this study.
- The overall goal of our research is to use biological data in assessing the condition of our coastal waters. We will work with NJ to incorporate these results into future Consolidated Assessment Reports
- Several other northeast states have expressed an interest in similar offshore studies. We intend to apply what we learn in New Jersey to the coastal waters of other coastal states.

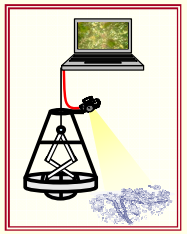
Methods/Approach

- Partners in this program are AED, EPA Region II, NJ DEP, and Rutgers University. All partners are involved in all aspects of this program
- An extensive literature search was undertaken to identify major sources of benthic community data for NJ estuarine and coastal waters and determine data gaps.
- We sponsored an expert workshop on benthic surveys and benthic index development. Benthic experts from both academia and government were invited.

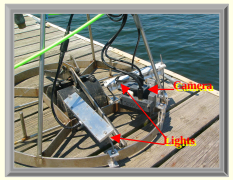
- Based on the recommendation of this panel, we designed a field effort which us currently underway. All sampling is being conducted in August-September, 2007
  - A probabilistic design is being employed to permit an assessment of 100% of the State's coastal waters out to 3 nm. In the development of this design we considered the State's management zones, wastewater outfalls, and locations of natural upwelling zones. The final design includes 100 stations spread along the entire NJ coast.
  - To allow for direct comparison to National Coastal Assessment data, and to the limited available datasets for this coastal region, grab samples are being processed through both 0.3 and 0.5 mm sieves.
  - Additional benthic information is being collected using a planar-view video camera. This collects an image of the bottom where the grab sampler is dropped. This may prove especially useful in areas where the bottom is too hard to obtain a grab sample. Basic water quality information is also being collected.
  - All sampling is being conducted from EPA Region 2's research vessel, the RV Clean Waters.
- In the Spring of 2008 we plan on reconvening the panel of benthic experts to evaluate the data and develop final benthic indices.
- Working closely with Region 2 and the NJ Department of Environmental Protection, we will develop a report on the biological (benthic community) condition of New Jersey's coastal and estuarine waters.

Management Units, Upwelling Zones, & Ocean Discharges



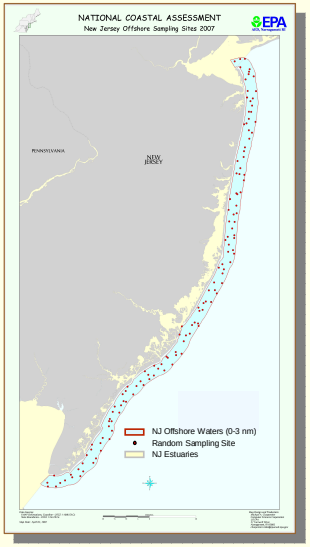


Conceptual view of the planar-view camera



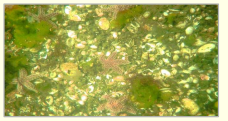
Photograph of the camera mounted on a grab sampler.

R/V Clean Waters



Expected Results

- The data collection phase of this study has just been completed. Benthic samples, water quality data, and video were collected at all 100 stations
- By Spring 2008, we expect to have benthic invertebrate community results for 100 stations off the coast of New Jersey. Results for both the 0.5 and 0.3 mm sieved fractions will be available.
- Once the data have been received and checked, a panel of experts will evaluate the results and develop an appropriate benthic index for the region.
- Using tools developed at AED, we will then produce estimates of the condition of benthic communities along the Jersey coast, and compare this to their current condition assessment, which is based solely on dissolved oxygen.

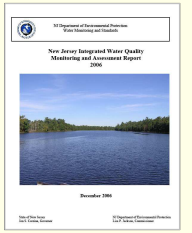


Planar-view image

Impact and Outcomes

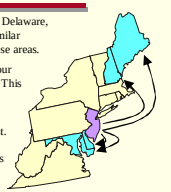
The expected outcome of this study will be a biological assessment of the condition of the waters along the New Jersey coast. Results will be compared to the extent of coastal impairment currently listed in the New Jersey Integrated Water Quality Monitoring and Assessment Report for 2006. We expect that the extent of impairment of the coastal benthic communities will be significantly less than the 100% listed as impaired relative to dissolved oxygen.

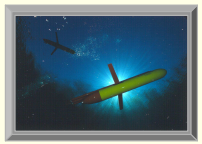
In recent years EPA, specifically the Office of Water, has recommended that states include probabilistic surveys and biological indicators in their assessment reports. This study will provide a state that currently lists its entire coast as impaired, the data and tools to evaluate whether this listing is valid. The impact of this is significant in that it will provide the State and EPA with a much better understanding of the "real" problem. We anticipate other northeast coastal states will begin using similar protocols to assess the condition of their waters.



Future Directions

- There is significant interest among other northeast coastal states in this project. Delaware, Maryland, New Hampshire, and Maine have expressed the desire to initiate a similar coastal project. Lessons learned in New Jersey will be directly applicable to those areas.
- Another related project is already being planned. EPA Region 3 has requested our assistance in developing a benthic sampling program for the Delaware Estuary. This project is expected to take place in the summer of 2008, and will be tied to the IOOS/NWQMN pilot project planned for Delaware Bay.
- The impetus for this project was evidence of hypoxia along the New Jersey coast. To a large extent, this is based on point-in-time sampling by Region 2's coastal monitoring program. We plan on working with the Region, NJDEP and Rutgers to investigate more effective ways of monitoring dissolved oxygen. The most promising is using underwater "gliders" equipped with DO sensors to routinely "fly" underwater along the coast, monitoring DO throughout the water column. These instruments can be deployed for up to a month at a time, and routinely telemeter data back to a base station.





Slocum underwater glider

References

Glenn, S., *et al.* (2004), Biogeochemical impact of summertime coastal upwelling on the New Jersey Shelf, J. Geophys. Res., 109, C12S02, doi:10.1029/2003JC002265.

NJDEP (2006). New Jersey Integrated Water Quality Monitoring and Assessment Report – 2006. New Jersey Department of Environmental Protection, December 2006, 590 pp. http://www.state.nj.us/dep/wms/bwqa/docs/2006IntegratedReport.pdf

This survey is allowing scientists to test things rarely tested and provide a base to evaluate changes. It also serves as a model for cooperation among public agencies to better gauge the health of the environment. – Asbury Park Press, 9/5/07

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