

US EPA ARCHIVE DOCUMENT



Assessing the Condition of Estuaries, Streams, and Lakes: Technology Transfer, Planning and Analysis Tools, and Electronic Reporting (ECO MYP)

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Agency Problem

The National Coastal Assessment (NCA) is a mature monitoring program. Working since 2000, the NCA has successfully accomplished several of its intended goals, such as developing improved methods of conducting assessments in estuaries, reporting on the condition of estuaries at the national and regional scales, and helping States build capacity to conduct their own assessments.

Our current challenges deal with how to assure that the lessons learned in the program continue to be applied and improved, not only for future assessments of estuaries, but also for lakes, streams, and wetlands. We continue to develop online tools that make data more accessible and easier to interpret. And we are exploring the potential of using electronic reporting and the concepts of Reproducible Research to better distribute information and present assessment results.



Research Goals

Successfully completed NCA goals include:

- Developed and refined aquatic monitoring methods, e.g., probabilistic and hybrid sampling designs and standardized assessment indicators.
- Introduced States to the NCA assessment methods, provided QA manuals and training regarding the collection and review of assessment data, helped the States collect data annually from 2000-2006, and provided advice regarding interpretation and reporting of the results.
- Reported on the condition of estuaries at the national and regional scales, for instance, in the National Coastal Condition Reports I, II, and III, and National Estuary Program Condition Report.

The Narragansett AED Assessment Team is working closely with Northeast States (Maine through Virginia) and other Agencies to achieve our current goals:

- Encourage the States and other Agencies to continue NCA-type monitoring of aquatic resources in the future, and help them report on conditions at the State and local scales.
- Provide advice and support for partners applying probabilistic survey designs in aquatic assessments. A website maintained by EPA's Western Ecology Division (Corvallis) provides online design service at http://www.epa.gov/nheerl/arm/designing/design_est.htm
- Continue developing online assessment and statistical tools to aid in the visualization and analysis of environmental monitoring data.
- Make the tools, techniques, data, and results of our monitoring and assessment transparent and available to the public through the use of Reproducible Research concepts.

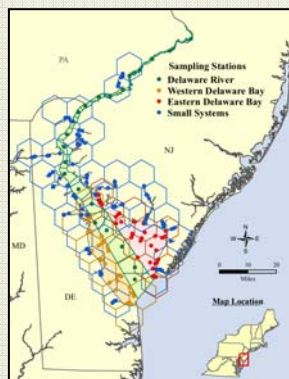
Extensive Support is Provided to NCA Partners



Extensive contacts. Members of the NCA Team at the Atlantic Ecology Division cultivated close working relationships with dozens of partners in the Northeast.



Frequent interaction with partners. NCA personnel visit State partners 2-3 times each year to review designs, train field crews, and discuss results.



Help with designs. Example of probabilistic design created at AED for a State partners and online at: http://www.epa.gov/nheerl/arm/designing/design_est.htm



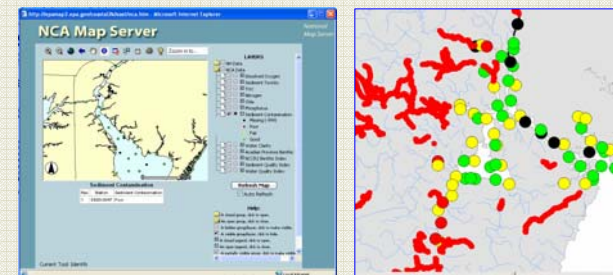
Reference manuals document field operations, quality assurance, information management, and fish pathology

Databases are maintained in several formats, providing quick access to fully QA reviewed data; available online at <http://www.epa.gov/emap/nca/html/regions/>

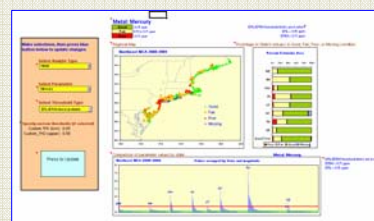
Analysis Tools Available Online (<http://www.epa.gov/emap/nca/html/regions/er>)



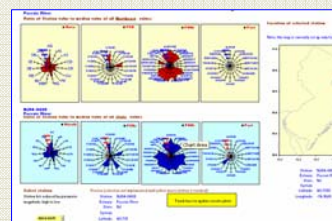
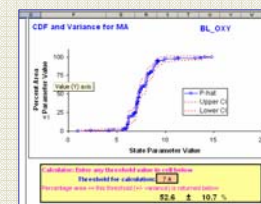
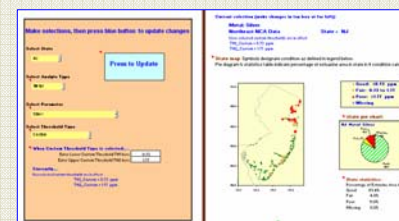
An Electronic Reporting website was designed to facilitate collaboration, data sharing, and transfer of computational technology to our partners.



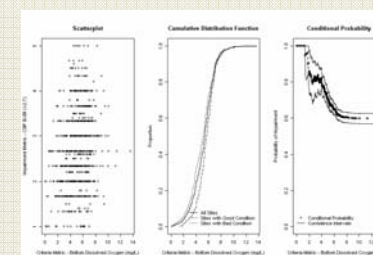
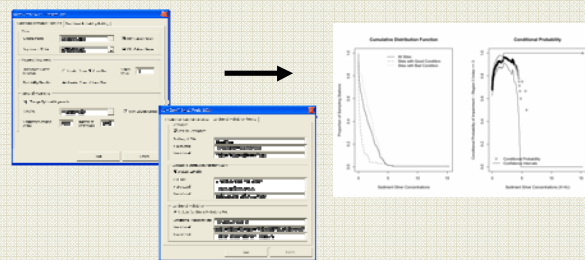
Geospatial analytical tools were developed to facilitate spatial data summaries of NCA data. An Internet Map Server was designed for use over the internet and it requires little experience with GIS and does not need specialized software other than a web browser. Also, an ArcMap project was developed for experienced GIS users so that they may easily add other coverages (i.e. state impaired waters) to compare and contrast with NCA data.



Simple Excel tools were developed to help visualize and analyze NCA data. The upper three panels show applications that focus on the regional, state, and station level, respectively. Thresholds defining good, fair, and poor conditions are set by the user. Panels to the right perform specific analytical calculations: calculating the area impaired and light extinction coefficients, respectively.



CProb is a conditional probability analysis (CPA) tool that uses R and Excel together to provide a user friendly interface to calculate and plot conditional probabilities (Hollister et al., 2007).



The State of Virginia CPA, has utilized the CProb tool to compare dissolved oxygen concentration to Chesapeake Bay Program Index of Biotic Integrity. Graphs are default output from CProb. (Courtesy of: Don Smith, Virginia Department of Environmental Quality)

Impacts and Outcomes

- Regional assessments for the Northeast have been prepared using NCA data in several national reports, including the National Coastal Condition Reports I, II, and III, and National Estuary Program Condition Report. NCA data have also been used in the Heinz Report and in an National Geographic article about coastal conditions.
- NH, RI, CT, NJ, and VA have adopted probabilistic survey designs and recommended analysis methods for future assessments of estuaries. NCA techniques are also being adopted by Northeast States for future lake and stream surveys.
- ME, NH, CT, NJ, VA, and MD have incorporated NCA data into 305(b) Reports. In several cases, online tools were used for analysis and to prepare graphics.
- Several Agencies have embraced aspects of NCA methods for estuarine assessments in the Northeast. For example, Long Island Sound, Casco Bay, and Maryland Coastal Bays have adopted NCA indices for water quality and benthic integrity in their reporting. The National Park Service will analyze water quality in coastal parks using probabilistic surveys and NCA indicators.

➤ Use of NCA data and analysis tools will improve the quality and timeliness of state CWA reporting, and will provide the knowledge needed for effective management to protect the quality of aquatic resources.

Future Directions

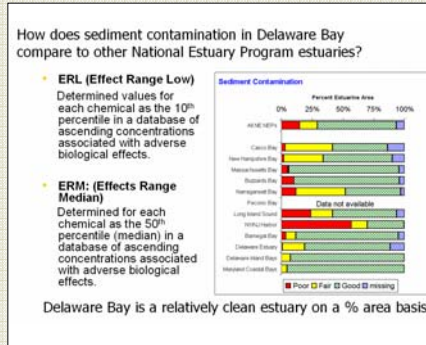
Our efforts in the future will include:

- Continuation of probabilistic survey design development.
- Modification and improvement of tools in collaboration with partners. For instance, including change point analysis into CProb is a requested modification.
- Include Lakes in surveys and assessments. Efforts underway with UNH.
- Re-work website to include reports, data, scripts etc. Following a Reproducible Research Framework.
- Utilize newer GIS technologies, such as ArcGIS Server to increase the functionality and accessibility of our online mapping applications.
- Strengthen existing collaborations and forge new ones via the EPA's Environmental Science Connector. An "NCA Northeast Electronic Reporting" project on the Environmental Science Connector already exists with 40+ members.

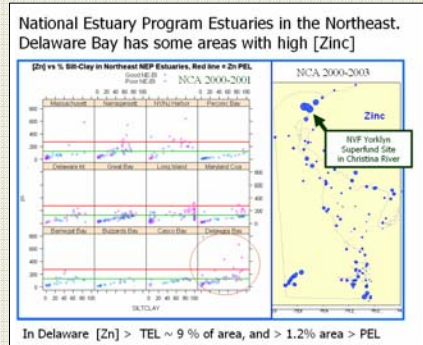


Example of Using Tools to Analyze and Interpret Data

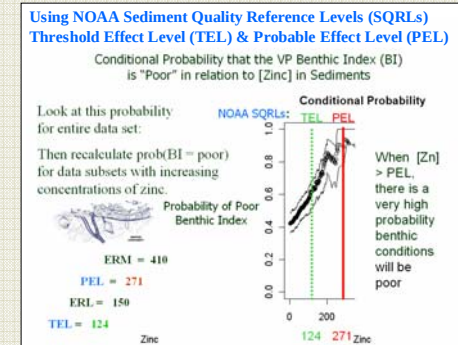
Sediment Contamination in the Delaware Estuary



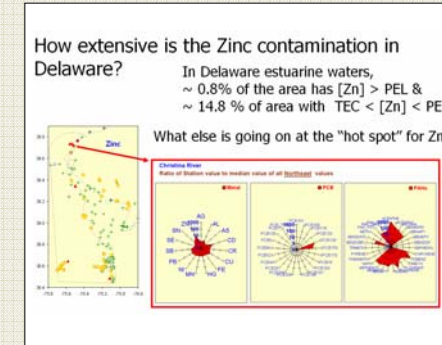
Zinc: NCA hit a "hot spot" in the Delaware Bay



High probability of poor biotic condition when [Zn] is high



Other sediment contaminants at the Zinc "hot spot"



References

- Hollister JW, Paul JP, Walker HA (2007). CProb: A Tool for Conditional Probability Analysis. <http://epa.gov/emap/nca/html/regions/cprob/index.html>
- National Coastal Condition Report (2001). USEPA EPA-620/R-01/005
- National Coastal Condition Report II (2005). USEPA EPA-620/R-03/002
- National Estuary Program Coastal Condition Report (2007). USEPA EPA-842/B-06/001

