understanding estuaries through the use of data

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ABSTRACT - Ocean and coastal habitats in the United States are in trouble due to stressors such as non-point source pollution and intensive land development; however, the public knows little about coastal and ocean ecology and ecosystem processes. The National Estuarine Research Reserve System (NERRS) offers K-12 students and teachers educational programs and products that use real data to increase the nation's awareness of the importance of estuarine systems.

WHO WE ARE

THE NATIONAL ESTUARINE RESEARCH RESERVE SYSTEM (NERRS) is a network of 27 protected areas established for long-term research, education and stewardship. This partnership program between NOAA and the coastal states protect more than one million acres of estuarine land and water, which provide essential habitat for wildlife; offer education opportunities for students, teachers and the public; and serve as living laboratories for scientists.

NERRs are federally designated to enhance public awareness and provide suitable opportunities for public education and interpretation.

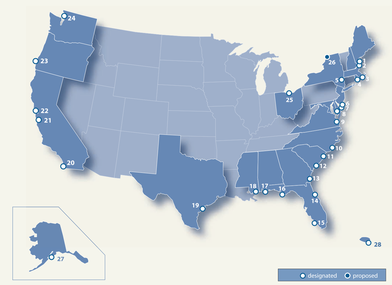
Parameters Monitored

Water parameters:	Weather parameters:
pH	Temperature
Conductivity	Wind speed and direction
Salinity	Relative humidity
Temperature	Barometric pressure
Dissolved Oxygen	Rainfall
Turbidity	Photosynthetic Active Radiation
Nitrate	
Ammonia	
Ortho-Phosphate	
Chlorophyll a	

System-Wide Monitoring Program (SWMP)

SWMP data has been collected since 1995. This continuing 10 year data set provides important information for tracking short-term variability and long term changes in estuarine conditions. SWMP is unique in that it monitors a suite of environmental parameters at all 26 NERRS in more than 125 estuarine and coastal sites. This data provides a baseline for measuring the health of the nation's estuaries.

SWMP employs Yellow Springs Instrument Co. (YSI) datasondes to collect water quality data at four stations in each of the 27 reserves at 30-minute intervals. In addition, every reserve has a Campbell CR10X weather station that collects data every 15 minutes.



1. Wells, Maine
2. Great Bay, New Hampshire
3. Waquoit Bay, Massachusetts
4. Narragansett Bay, Rhode Island
5. Hudson River, New York
6. Jacques Cousteau, New Jersey
7. Delaware
8. Chesapeake Bay, Maryland
9. Chesapeake Bay, Virginia
10. North Carolina
11. North Inlet-Winyah Bay, South Carolina
12. ACE Basin, South Carolina
13. Sapelo Island, Georgia
14. Guana Tolomato Matanzas, Florida
15. Rookery Bay, Florida
16. Apalachicola, Florida
17. Weeks Bay, Alabama
18. Grand Bay, Mississippi
19. Mission-Aransas, Texas
20. Tijuana River, California
21. Elkhorn Slough, California
22. San Francisco Bay, California
23. South Slough, Oregon
24. Padilla Bay, Washington
25. Old Woman Creek, Ohio
26. Proposed—St. Lawrence River, New York
27. Kachemak Bay, Alaska
28. Jobos Bay, Puerto Rico

NERRS Real-Time Data Capabilities

State-of-the-art automatic samplers take water quality and weather measurements every 15 minutes, and they transmit these data hourly through the Geostationary Orbiting Environmental Satellite (GOES). Within minutes the data are available on-line!

1. NERRS Weather & Water Quality Data Collection Platforms **2.** GOES Satellite **3.** Wallops Island Command and Data Aquisition Facility **4.** Hydrometeorological Automated Data System / NOAA's National Weather Service **5.** FTP server at the University of South Carolina, Columbia / NERRS Centralized Data Management Office (CDMO) **6.** www.nerrs.noaa.gov/monitoring/data.html

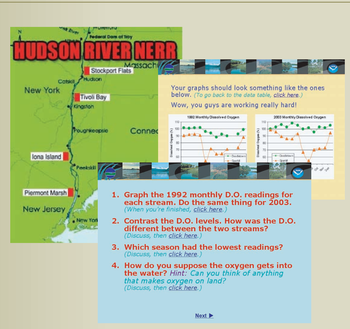
USING DATA IN EDUCATION

Applications of SWMP Data for Science Education:

- Build understanding of the health of the nation's estuaries
- Compare and contrast estuaries
- Analyze pre- and post-storm data
- Explain how land use affects water quality
- Compare with student collected water quality monitoring data

Submerged Aquatic Vegetation (SAV) Restoration Project

In Weeks Bay, Alabama a local high school is restoring SAV through a collaborative education and stewardship program. Through data analysis and hands-on activities, students learned of species' differing niches and habitat needs, and they learned about the complexity and fragility of estuarine trophic structures.



Get Ready to SWaMP Your Classroom!

SWaMPing the Classroom–created by the Hudson River NERR in New York–is a web-based education program designed to link students with local scientific data in the Hudson Valley of New York State. The program focuses on the Hudson River Estuary within its watershed using 12 years of SWMP data.

Teach Water Quality Using a Standards-Based Curriculum

The activities in the York River Water Curriculum, developed by the Chesapeake Bay NERR in Virginia, enable educators to teach concepts associated with water quality and to use SWMP data in teaching biology, earth science, computer mathematics, chemistry and statistics.

Explain the Effects of Hurricanes –

When Hurricane Ivan hit Weeks Bay NERR in Alabama on September 16, 2004, staff used SWMP data to teach students about the coastal impacts of tropical storms via an online field trip called EstuaryLive (www.estuaries.gov).

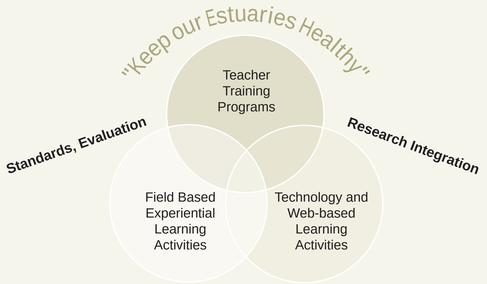
A Satellite view of Hurricane Ivan (left). Before (middle), and after (right) photographs of erosion caused by Hurricane Ivan

THE FUTURE

The Future – New K-12 Estuarine Education Program!!

GOALS in using SWMP data

- Increase teachers' and students' understanding of estuarine and coastal systems and processes
- Enable students to use data in their own investigations of coastal and ocean conditions
- Expand teachers' abilities to infuse SWMP data in their classrooms and incorporate estuarine science into a broad array of subjects areas
- Foster a sense of stewardship



New Website – Facilitates access to data & educational products

The NERRS CDMO interactive web-site lets students graph real-time data instantly. Web graphs use real-time SWMP data to illustrate science concepts such as the inverse relationship between dissolved oxygen and water temperature shown here.