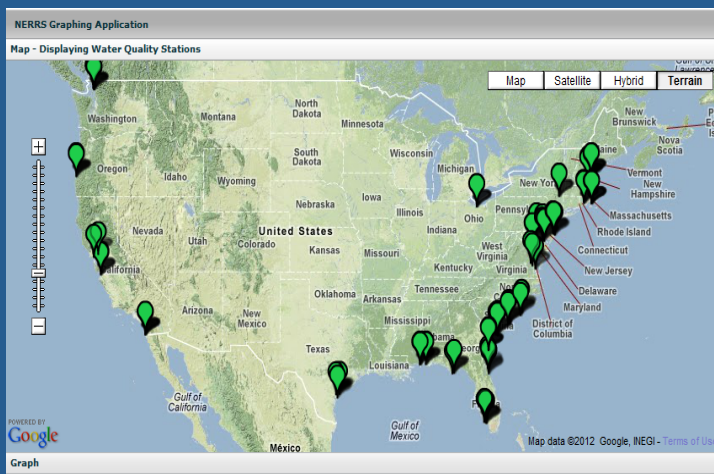


The Role of Environmental Monitoring and Data Management in Supporting Science to Inform Decision Making: A Case Study



ADVISORY INFORMATION

SC DHEC routinely collects water samples at over 100 locations on South Carolina's beaches. If high numbers of bacteria are found, an advisory is issued for that portion of the beach. An advisory means that DHEC advises you to NOT swim in certain areas. This is especially true for young children and those with compromised immune systems. Advisories do not mean that the beach is closed. Wading, fishing, and shell collecting do not pose a risk. Advisories may be issued due to high bacteria counts or rainfall. Advisories are lifted when sample results fall below the limit of 104/100mL. Check the local newspaper and television news stations. Look for advisory signs when you go to the beach.

SC DHEC - Beach Monitoring System

Map Legend

- Green pin: Advisory Issued
- Red pin: Advisory Lifted
- Yellow pin: Advisory Issued

Know before you go!

Presented by:

Dwayne E. Porter

**Arnold School of Public Health and Baruch Institute at the University of South Carolina
and the NOAA NERRS Centralized Data Management Office**



OBFS/NAML Joint Meeting 2014
22 September 2014

Outline

- An overview of the NERRS System-wide Monitoring Program
- Science-informed management applications/
potential users of the information
- Your thoughts on an expanded version of the SWMP to address...

Estuaries: Where rivers meet the sea...



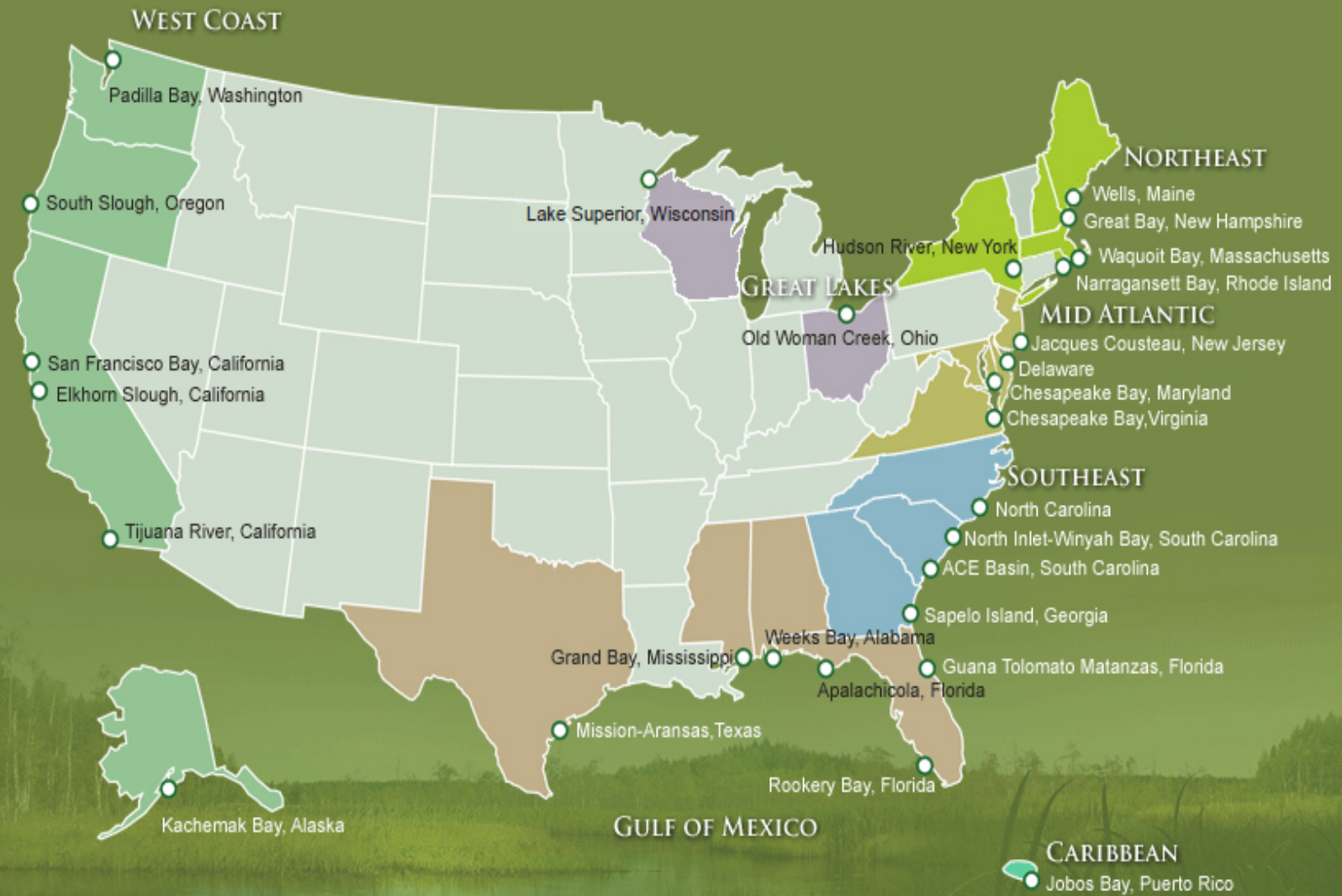
National Estuarine Research Reserves (NERRS)

“Protected areas designated for long-term research, education and stewardship. Reserves will serve to enhance public awareness and understanding of estuarine areas, and provide suitable opportunities for public education and interpretation.”

Coastal Zone Management Act (sec. 315)



NATIONAL ESTUARINE RESEARCH RESERVE SYSTEM



Our Estuarine Research Reserves

Rookery Bay NERR, FL



Our Estuarine Research Reserves



Kachemak Bay NERR, AK

Our Estuarine Research Reserves



Waquoit Bay NERR, MA

System-Wide Monitoring Program (SWMP)

Established in 1995, SWMP is a national coastal observing system...



- Designed to identify and track **short-term variability**, and **long-term changes** in representative estuarine ecosystems and coastal watersheds

- For the purpose of understanding **how human activities and natural events can impact ecosystems and mankind** and to support improved decision making



- Three major components include
 - **abiotic indicators** of water quality and weather
 - **biological monitoring** and
 - watershed, **habitat**, and land use mapping.

Monitoring Water Quality and Weather

<i>Parameters Monitored</i>	
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	



Water quality data are collected at 15 or 30 minute intervals at 4 locations within or adjacent to a research reserve.

Weather data are collected within or adjacent to a research reserve at 5 second intervals.

Monitoring Nutrients

Parameters Monitored

Nutrient parameters:

Ammonium

Nitrate

Nitrite

Ortho-phosphate

Chlorophyll a

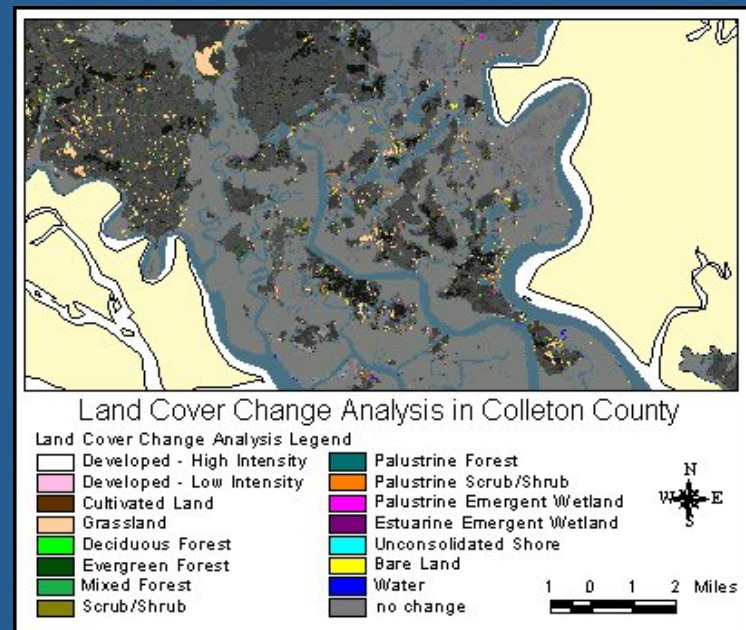
Water samples for nutrient analyses are collected monthly at each of the water quality stations. At one water quality monitoring station at each reserve, nutrient samples are collected over a 24-hour period to determine how nutrient concentrations change over a day/night cycle, and over tidal cycles.



Additional SWMP Efforts

Parameters Monitored

Habitat Mapping
Biomonitoring
Sediment Elevation



Data Management

The **Centralized Data Management Office (CDMO)** was established in 1995 in support of the NERRS System-wide Monitoring Program (SWMP) in order to:

- develop, implement and manage the basic infrastructure and data protocol of the NERRS SWMP,

- support the assimilation and exchange of data and metadata within the NERRS framework, and

- support the ingestion of high-quality data with other local to global monitoring efforts via data push and pull services.

Data Management

High-quality data require rigorous QA/QC and must involve the data provider:

Provisional data have been run through the automated QA/QC process (primary review) and data values flagged as appropriate but have not been manually reviewed or edited (secondary review). Provisional data are available via the data portal and web services.

Provisional plus data have been through primary and secondary review and are awaiting final tertiary review by the CDMO. Provisional plus data are available via the data portal and web services and replace the provisional data.

Authoritative data refer to data that have gone through final tertiary review at the CDMO. Authoritative data are available via the data portal and web services and replace provisional plus data. Authoritative data are archived with the NODC.

SWMP Datasets

32 Meteorological Datasets (13,014,425 records)

29 active and 3 inactive

29 are reporting data via telemetry and 3 being repaired

5 additional non-SWMP stations reporting via telemetry

150 Water Quality Datasets (42,855,637 records)

114 are active 36 inactive

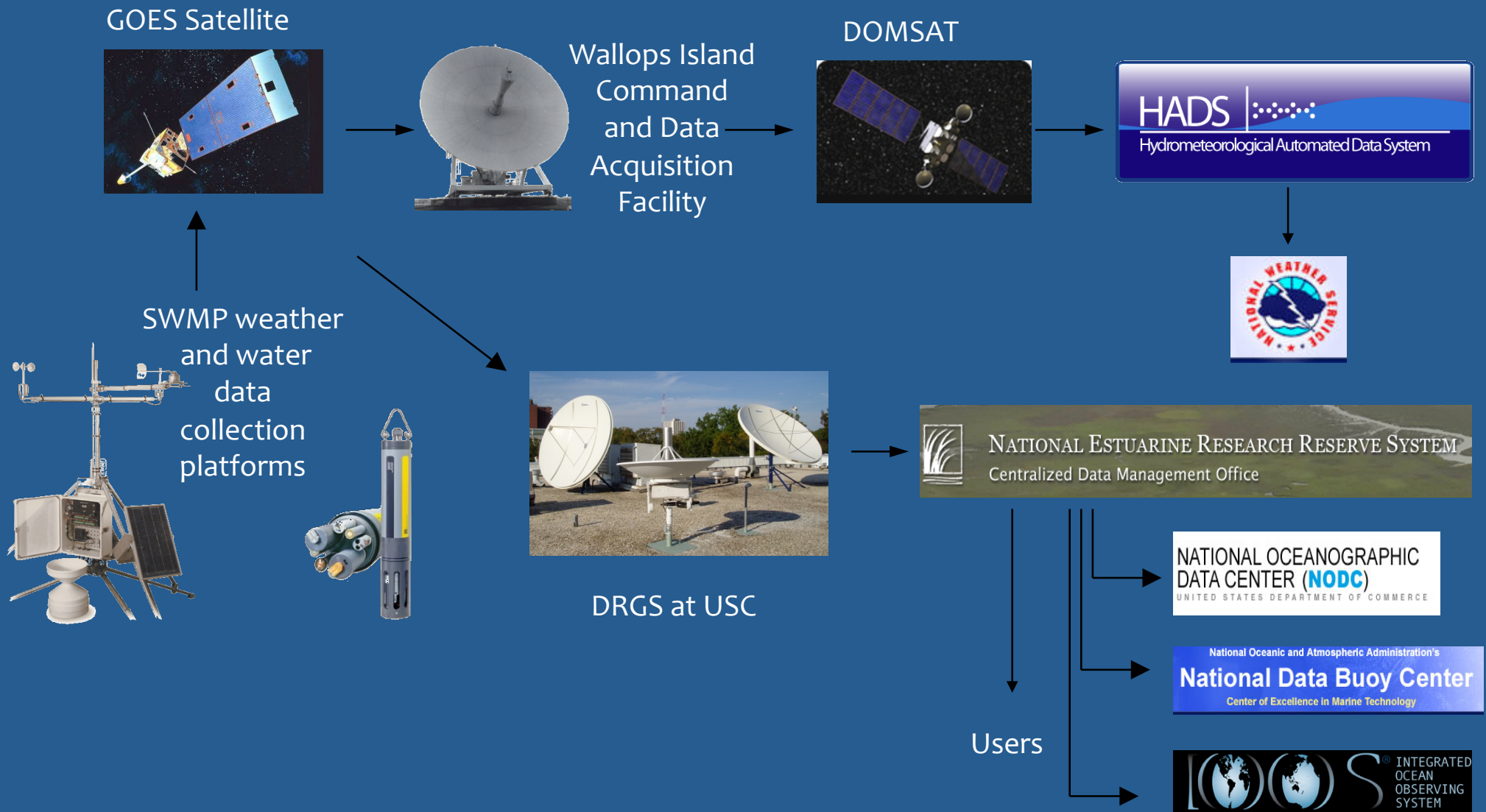
56 are capable of reporting data via telemetry

3 additional non-SWMP stations reporting via telemetry

144 Nutrient Datasets (93,465 records)

130 active and 14 inactive

SWMP Near-real-time Data Flow



Users of SWMP Data Include...

NOAA related: Oceans and Human Health Initiative, National Data Buoy Center, Data in the Classroom (www.dataintheclassroom.org), Chesapeake Bay Interpretive Buoy System (www.buoybay.org), National Coastal Data Development Center, National Ocean Service, National Weather Service Hydrometeorological Automated Data System, NWS Regional Forecast Offices

IOOS related: NANOOS, NERACOOS, SECOORA, AOOS, MARACOOS, GCOOS

Others: Estuaries.Gov, Pacific Shellfish Growers Association, San Diego State University Field Stations Program, Stockton College, Maryland DNR, Chesapeake Bay Eyes on the Bay, Georgia Forestry Commission, Georgia Coastal Ecosystems LTER, Center for Integrative Coastal Observation, Research and Education, Environmental Monitoring Sensor Intelligence Corp, SC Department of Health and Environmental Control, Smithsonian Institute, Insurance companies, Attorneys, MBARI EARTH, South Brunswick High School

The Real Value is in Integrating Observing Systems!

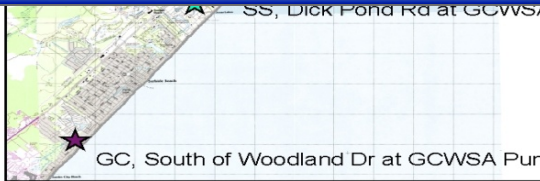
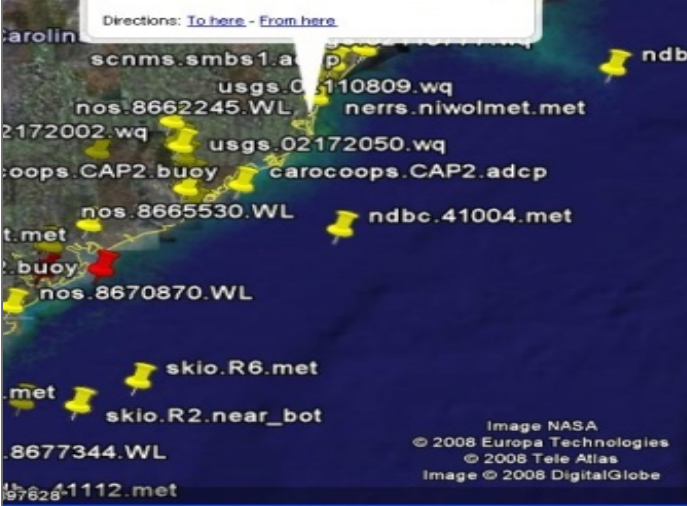
nerrs.niwolmet.met

Last update: 2008-10-09 12:45:00Z
 Description: North Inlet Winyah Bay, SC
 Operator URL
 Platform URL
 Related links: CbskML, Xenia <http://secoora.org>

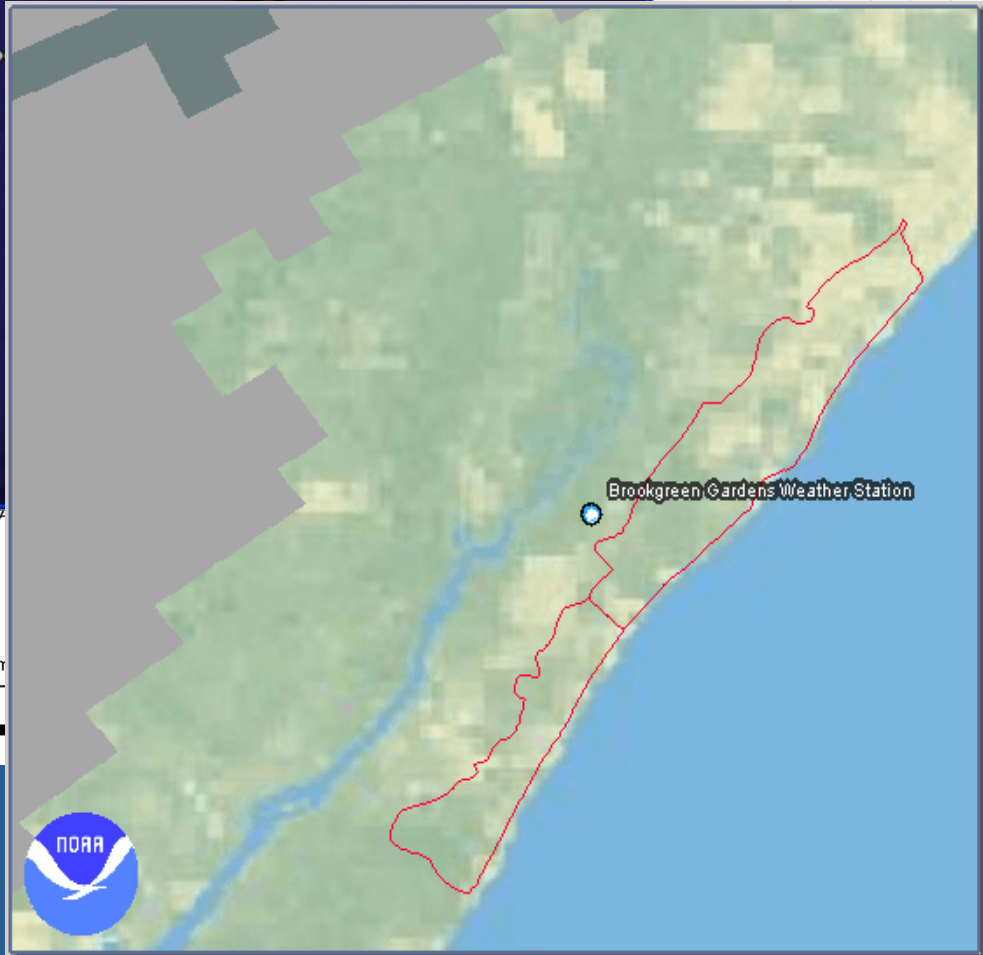
Click on the latest observation reading to view graphs of previous observations.

air_pressure.mbar	1015.00
air_temperature.celsius	21.40
precipitation.millimeter	0.00
relative_humidity.percent	87.00
solar_radiation.millimoles_per_m^2	74.00
wind_from_direction.degrees_true	313.00
wind_speed.m_s-1	0.90

Directions: [To here](#) - [From here](#)



Erica A. Johnson
01/23/2007



NEXRAD LEVEL-III
 ONE HOUR PRECIP
 KLTX - WILMINGTON, NC
 11/11/2002 21:47:14 GMT
 LAT: 33/59/20 N
 LON: 78/25/44 W
 ELEV: 145 FT
 MODE/VCP: A / 11

MAX: 2.10 IN
 END: 11/11/2002 21:48

Legend: IN (Category)

8.00	(15)
6.00	(14)
4.00	(13)
3.00	(12)
2.50	(11)
2.00	(10)
1.75	(9)
1.50	(8)
1.25	(7)
1.00	(6)
0.75	(5)
0.50	(4)
0.25	(3)
0.10	(2)
0.00	(1)

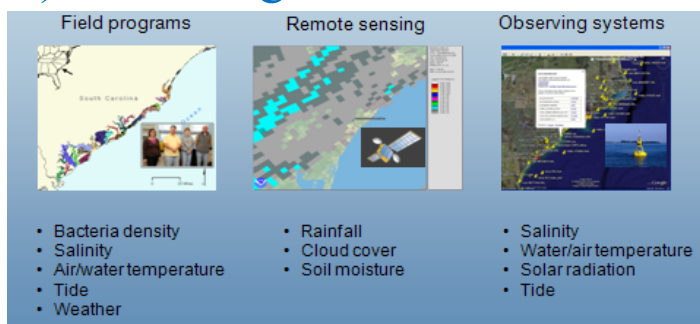
Examples of Integrating
Monitoring Programs and Sound Science
to
Inform Decision Making

Beach Water Quality Assessment and Modeling Activities

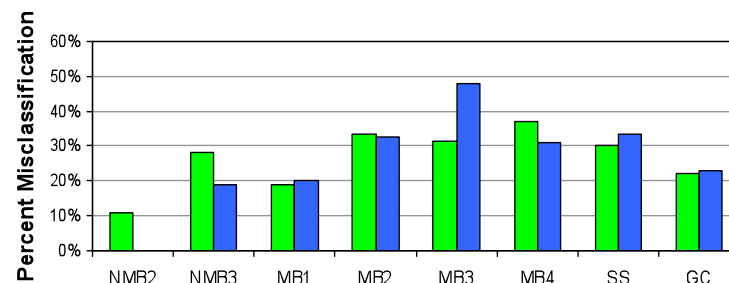
Issue: Exposure to beach swimming waters with elevated bacterial levels is a public health concern and one of economic vitality.

Goal: Develop and implement scientifically-justified, decision-support tools for accurate and defensible preemptive advisory issuance decisions.

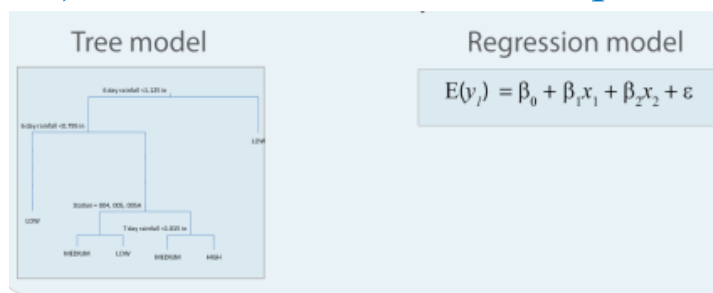
Process 1.) Data integration and fusion



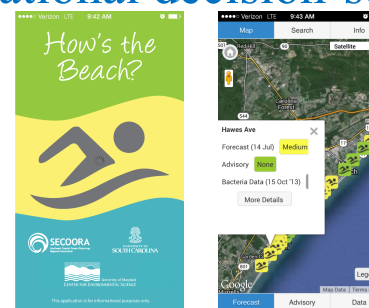
3.) Model validation



2.) Ensemble model development



4.) Operational decision-support tool



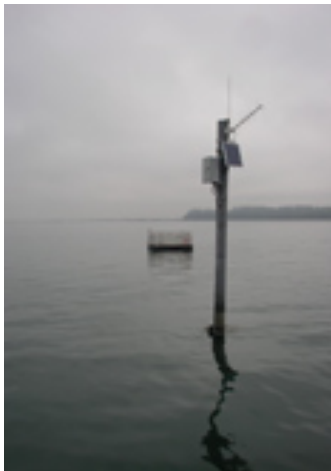
Who is doing it: A partnership among beach managers, tourism interests, public health officials and the general public including...

Monitoring Water Conditions in Shellfish Harvesting Waters

Issue: Commercial shellfish growers in the Pacific Northwest depend on good water quality data in order to make informed decisions that have economic implications.

Goal: To provide critical information about water temperature, chlorophyll levels, salinity, turbidity, and dissolved oxygen so that better decisions can be made about managing mariculture operations.

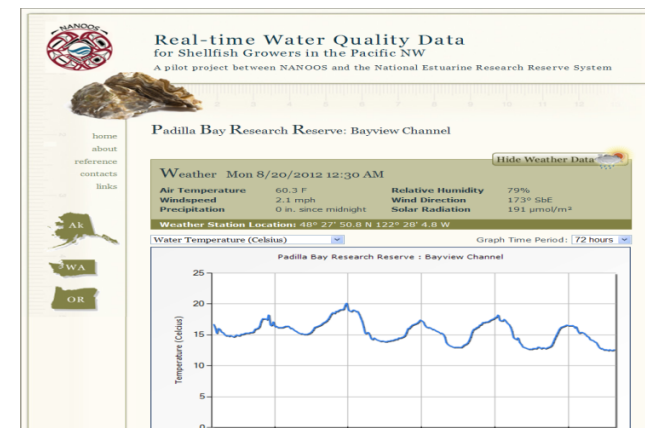
Process: 1.) Data collection



2.) Data integration and fusion



3.) Decision support



Who is doing it: A partnership between NANOOS, the KAT, PAD and SOS NERRS, Pacific Coast Shellfish Growers Association, Pacific Shellfish Institute, University of Washington and the CDMO (support from CSC and NERRA)



Supporting Safe Marine Activities

Issue: Mariners need dependable access to current and forecasted information on winds, waves and weather.

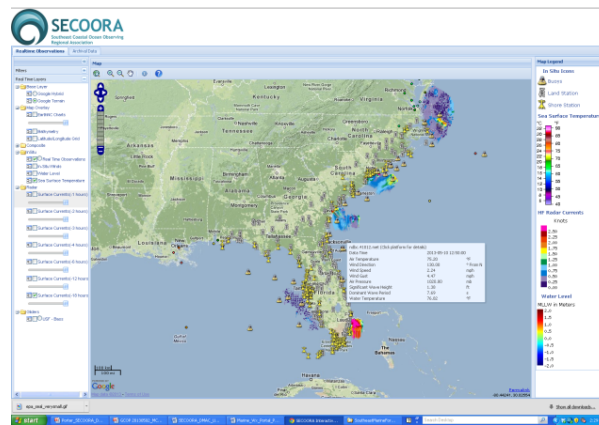
Goal: To provide 24/7 access to critical marine information for the commercial and recreational marine communities within the SECOORA region.

Process:

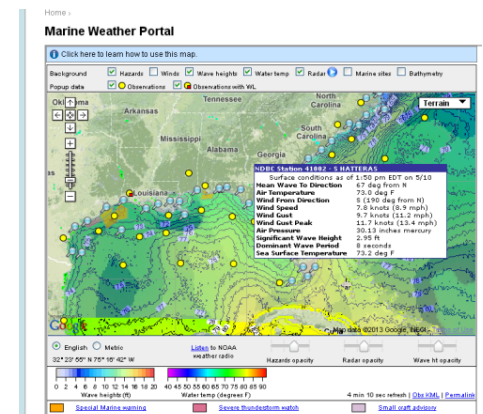
1.) Determine user needs



2.) Data integration and fusion



3.) Decision support



Who is doing it: A partnership between SECOORA, UNC-W, USC, USF and the NWS Office of the CIO, NWS Eastern and Southern Region Headquarters and WFOs, NERRS and Second Creek Consulting



Supporting Marine Spatial Planning

Issue: Local to regional resource managers and planners needs access to spatially and temporally relevant data and to planning tools in support of healthy ecosystems, clean coastal and ocean waters, disaster planning and recovery, and working waterfronts.

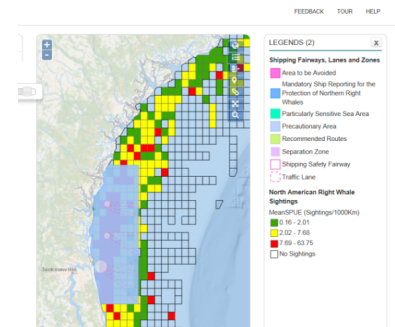
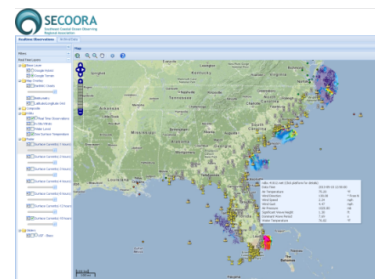
Goal: To provide access to regional coastal and ocean data and planning tools in support of the Governors' South Atlantic Alliance (GSAA).

Process:

1.) Determine user needs

2.) Data development and fusion

3.) Decision support



Who is doing it: A partnership involving NC, SC, GA, FL agencies and academic institutions, SECOORA, TNC, EcoTrust and NOAA.



Supporting Improved Decision Making Globally

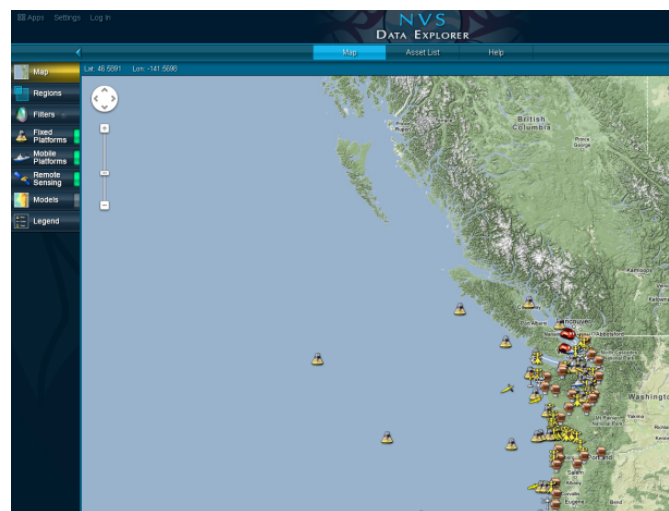
Issue: In support of addressing global issues such as ocean acidification, there is a need for a public information network for creating and sharing environmentally relevant data and information online.

Goal: To improve the global environment by sharing information and knowledge.

Process: 1.) Data assimilation



2.) Decision support



Who is doing it: IOOS Program Office, NERRS, NANOOS, SECOORA, European Environment Agency and ESRI.



Wrap up (Criteria to consider)

Do the data have:

- relevance to regional information needs?
 - Yes!
- a well designed and adhered to data management program?
 - Yes.
- demonstrated use in management decisions?
 - Examples provided, and user base is growing.
- existing funding for data collection?
 - Yes ... but never enough.
- the ability for additional leveraging to assist with scale-up?
 - Absolutely!
- the backing of an operational (24/7) backbone?
 - Oh cr...!

For more information

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NATIONAL ESTUARINE RESEARCH RESERVE SYSTEM