State-Federal Research Collaboration through the National Estuary Program

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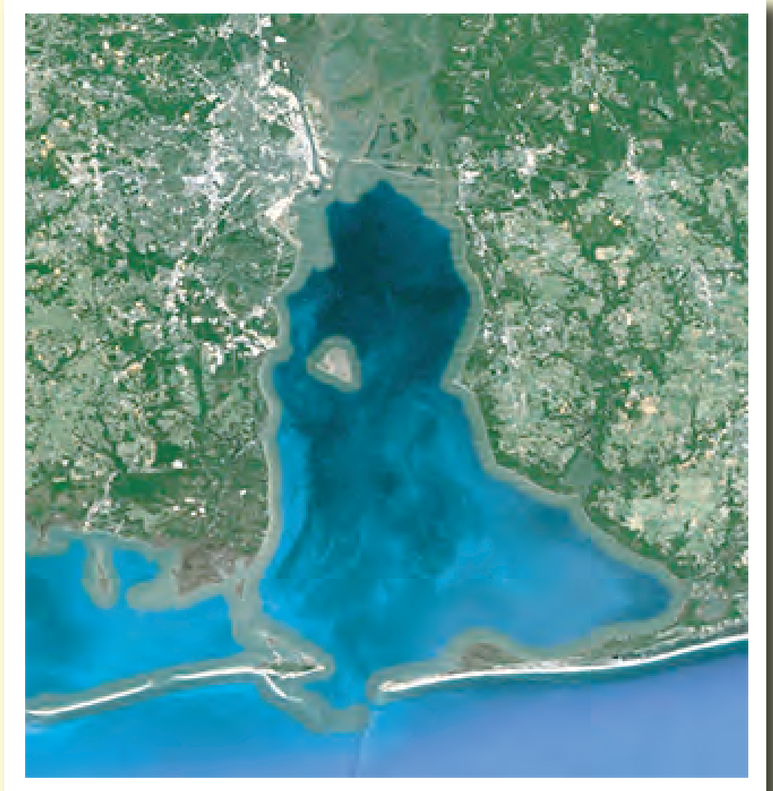
EPA United States Environmental Protection Agency

NATIONAL ESTUARY PROGRAM

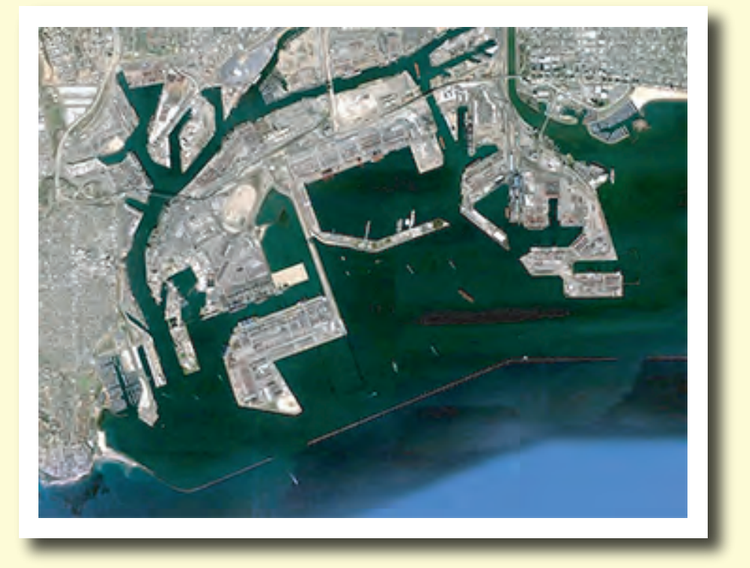
Ninigret Pond, RI



Mobile Bay, AL

Black Rock Harbor, CT

PROBLEM: Estuaries are among the most productive ecosystems in the world and provide unique habitats for freshwater and marine species as well as valuable social and economic benefits. They are also among the most degraded ecosystems in the world.

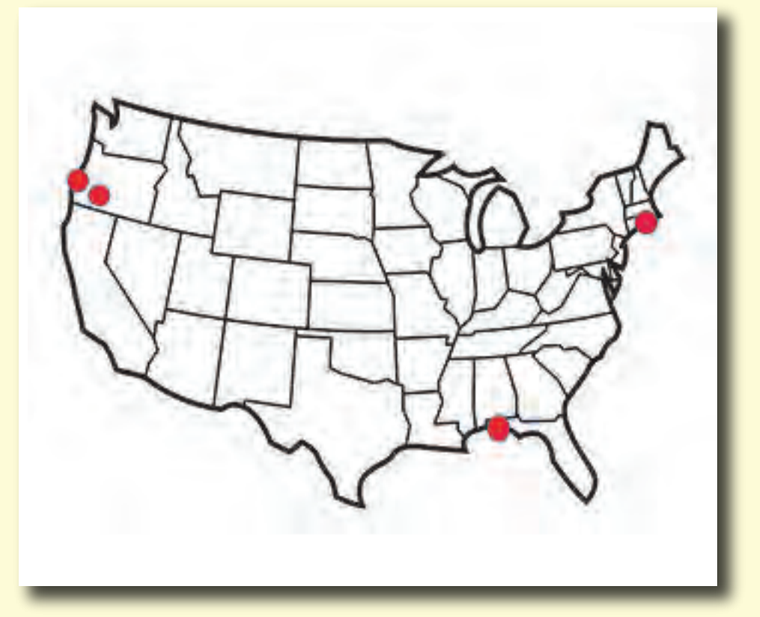


LA/Long Beach, CA

APPROACH: Collaborations between National Estuary Programs (NEPs) and the coastal Ecology Divisions of EPA's Office of Research and Development (ORD) bring science and management together to better solve the problems facing our estuaries.

- The 28 NEPs are supported by EPA's Office of Water under the Clean Water Act. Each NEP is charged with developing and implementing a management plan for their estuary.
- ORD Divisions do water quality and aquatic life research and work closely with NEP managers across the United States.

28 NEPs



ORD Coastal Ecology Divisions

Canoers enjoying estuary

RESULT: NEPs benefit from applied research directed to their high priority problems and decision-making. ORD benefits from real-world application of transferable research and management tools. People benefit from healthy and well-managed estuaries.

Fisherman enjoying estuary

IMPACT: NEP-ORD collaborations over the last years have led to -

- Better communication of science to engage members of the public and other stakeholders.
- Management frameworks to empower stakeholders and managers.
- Management decisions that are informed by science.
- More effective and efficient adaptive management.
- Protection and restoration of tens of thousands of acres of valuable habitats.
- Cleaner, safer, and more productive estuaries for people to enjoy.

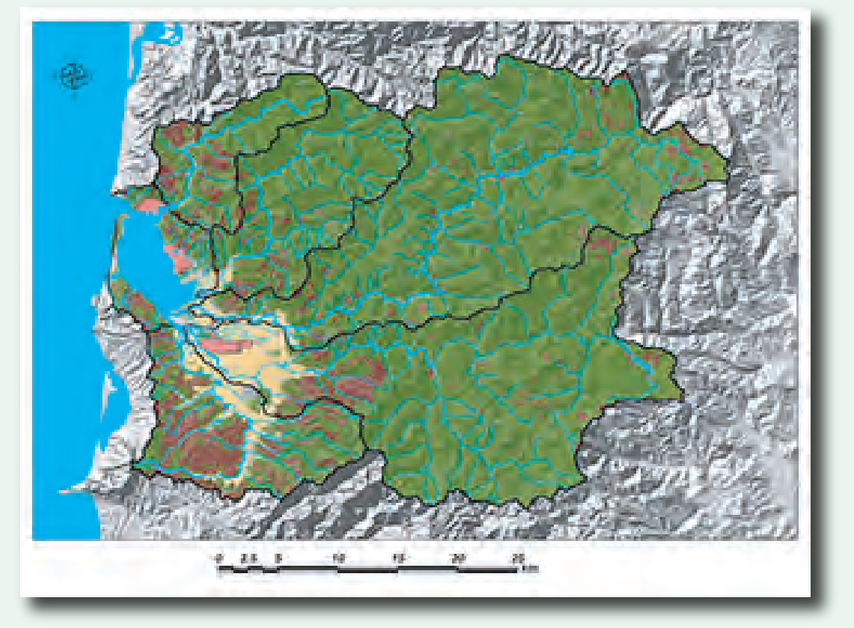
Collaboration in Oregon:

Tillamook Estuary Partnership (TEP) and ORD Western Ecology Division

PROBLEM: Changes in land use/land cover and management practices lead to losses of ecosystem services including clean safe water for swimming and drinking, fish, shellfish, and valuable nursery habitats.

Tillamook Bay, OR

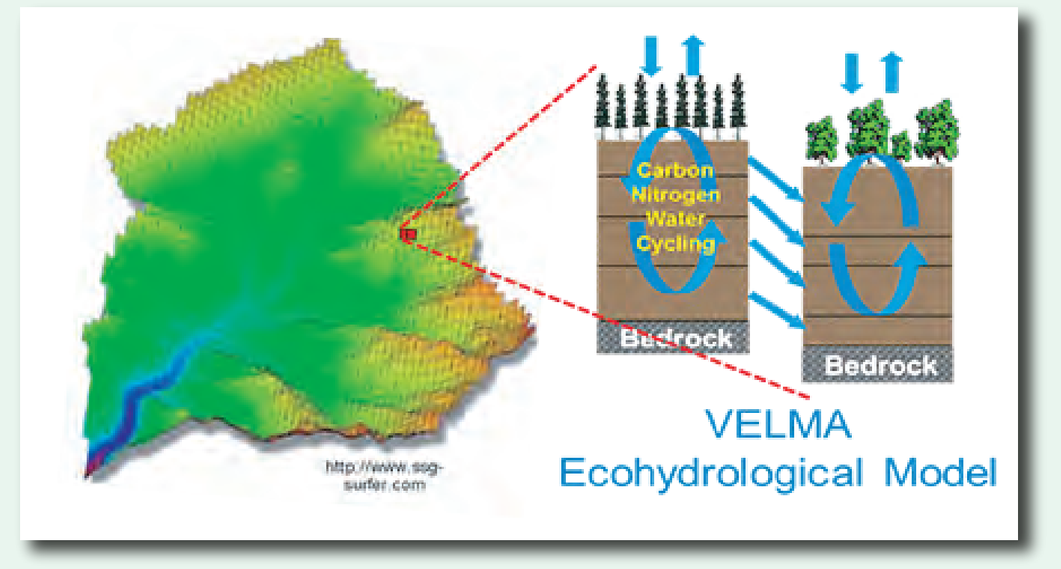
APPROACH: Develop linked watershed, estuary, and ocean models to predict water quantity and quality, nutrients, acidification, fecal contamination, and effects of habitat loss.



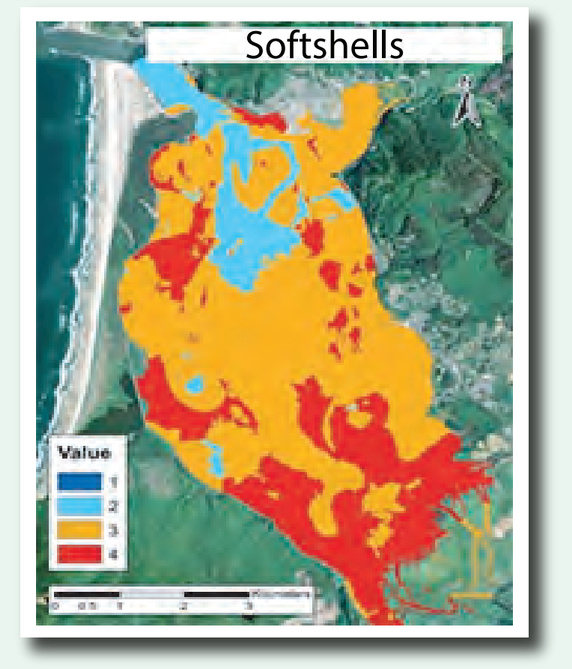
Tillamook watershed: land use/land cover

RESULT: While this effort is still underway, these models have been developed and applied:

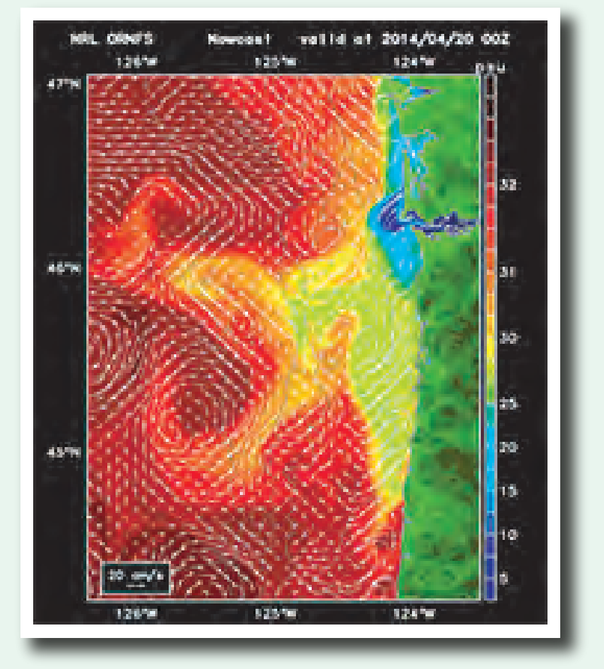
- VELMA predicts the effects of land use/cover on water quantity and water quality: https://www.epa.gov/water-research/visualizing-ecosystem-land-management-assessments-velma-model-20.
- Habitat models for bivalves.
- Ocean hydrodynamic model: https://www7320.nrlssc.navy.mil/NLIWI_WWW/ORNFS_WWW/ORNFS.html.



VELMA



Habitat model



Ocean model

IMPACT:

- Models provide TEP with preliminary spatial predictions of how land use/cover affect estuarine goods and services.
- Models promote outreach and liaison with communities, stakeholders, and agencies.
- TEP and WED co-develop decision contexts, priorities, and scenarios.

Salmon fishing

Softshell - *Mya arenaria*

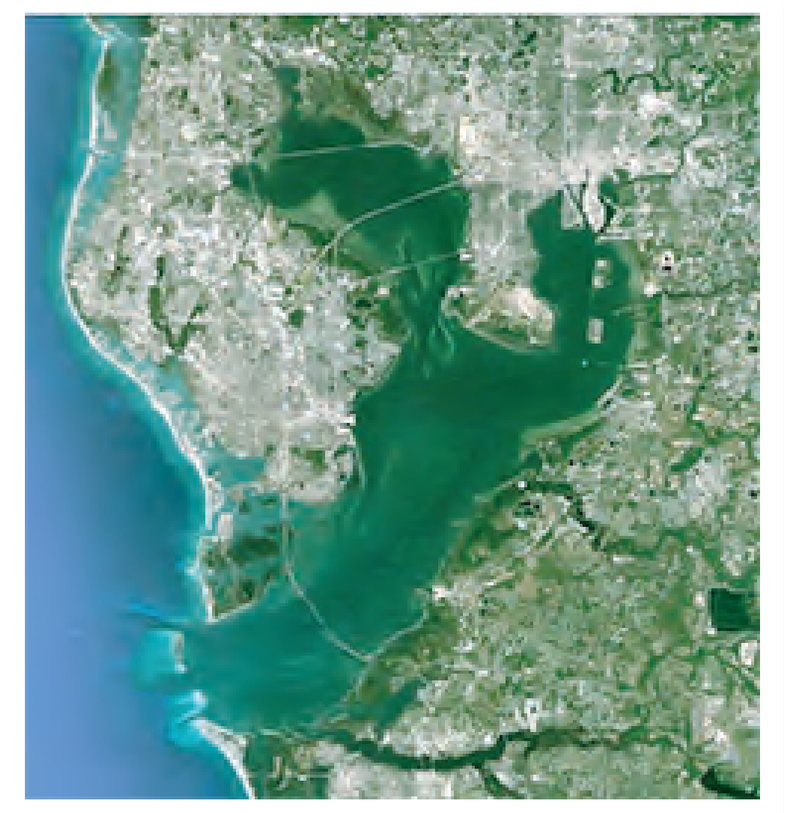
Shellfish gathering

Bird watching

Collaboration in Florida:

Tampa Bay Estuary Program (TBEP) and ORD Gulf Ecology Division

PROBLEM: NEPS need valuation approaches to engage those stakeholders who place high value on the monetary benefits of estuaries.



Tampa Bay, FL

APPROACH: Habitat valuation and monetization: calculate Nitrogen removal value per acre of habitat.

- ORD develops H20: A simple mapping website and interactive tool for decision-making and public outreach: https://archive.epa.gov/ged/tbes/web/html/index.html.

H_2O tool

H_2O tool Screenshot

RESULT: Several habitats were monetized and incorporated into H2O.

- In one example, the value of 40,295 acres of seagrass restored by TBEP between 1980 and 2016 was calculated as:
- 9 g N/m2/year Nitrogen removal of seagrass (Welsh et al. 2001) at $18 per kg N (Birch et al 2011) x 40,295 acres of seagrass = **$26.4 M per year** in replacement value (based on wastewater treatment costs).

Tampa Bay Seagrass

IMPACT:

- Model showed that seagrass restoration precluded the need to build a new medium-sized wastewater treatment plant.
- TBEP then incorporated valuation metrics in their long-term goals and targets for managing Tampa Bay, with H2O as a scenario-testing tool for decision-making.

Everyone benefits from a clean bay

Collaboration in Delaware:

Partnership for the Delaware Estuary (PDE) and ORD Atlantic Ecology Division

PROBLEM: Saltmarsh loss, excess Nitrogen (eutrophication), and excess suspended sediment (turbidity) affect many estuaries, leading to loss of shoreline protection, seagrass nursery habitat, clear water for swimming and fishing, and contributing to fish kills.

- The Delaware Estuary loses saltmarsh at ~ 1 acre per day.

Delaware Bay, DE

Martha's Vineyard, MA

APPROACH: Test saltmarsh restoration with coir logs and ribbed mussels in DE and MA.

- Logs protect marshes and trap sediment, mussels remove Nitrogen.

Delaware restoration

RESULT:

- Very successful in DE: 5.6 mm per yr greater marsh accretion, 476 kg N and 92.6 tons suspended sediment removed per ha per yr.
- Only slight improvements in MA - a lack of suspended sediment in this oceanic setting prevented marsh build-up, and mussel spat did not settle on logs.

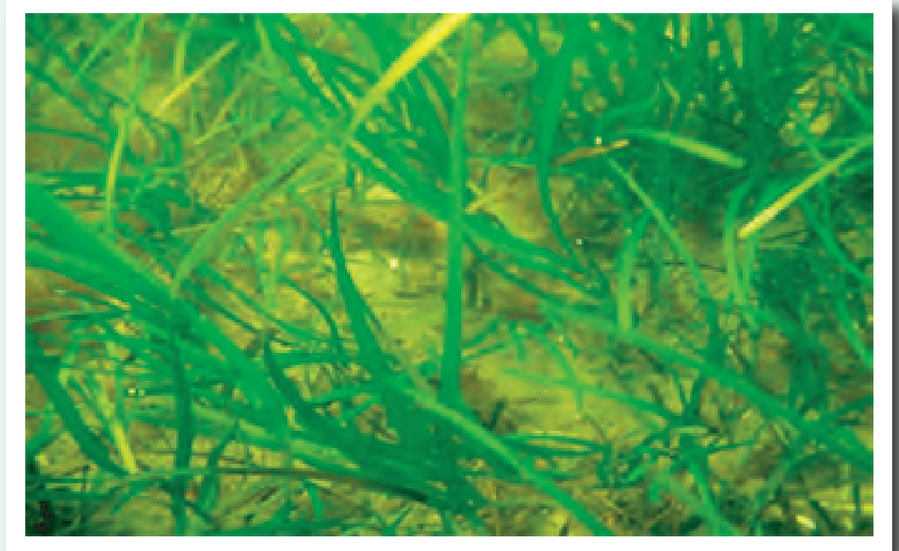
Massachusetts restoration

Ribbed mussels on coir log

IMPACT:

- Provided a transferable approach to restore valued marsh habitat while cleaning estuarine water and reducing N loads that lead to losses of productive seagrass, benthic habitat, fish and shellfish.
- Provided guidance on where and where not to apply this approach for marsh restoration.

More marsh



More seagrass