OR&R’s ERMA & Watershed Based Mapping

- **Spatial Data Team goals/purpose:**
  - Support OR&R Regional Resource Coordinators (RRC) & Scientific Support Coordinators (SSC)
  - Provide *site specific* and *watershed wide* use of data and technology to protect and restore trust resources
  - Support coordination with external partners
  - Encourage data sharing
  - Standardized GIS project
  - Scalable technology support to users
Continuum of “Response” Framework for OR&R / ERMA

Response (24 hours)

Restoration - Recovery (Years/Decades)

Emergency Response Division (ERD)

Assessment and Restoration Division (ARD)

Restoration Center (RC)
OR&R’s Watershed Based Mapping

Provide Decision Support Tools for:

- **Assessment**
  - Site discovery/ characterization

- **Remediation**
  - Source identification
  - Extent/ degree of contamination
  - Injury assessment

- **Restoration**
  - Habitat characterization
  - Site identification/ monitoring
A Picture (Map) is Worth a Thousand Words…

• Diverse datasets can be selectively overlaid on a single map to better visualize complex interactions
Concept for ERMA

Open Source, Web-based mapping tools

Planning & Analysis

Integrate & Analyze Information
On the fly

Improved Communication & Coordination
ERMA Architecture

**Web Mapping Service (Feature)**
- External GIS Data
  - ENCs/ RNCs
  - Real Time Weather Observations
  - Buoys
  - NAIS/ AFF/AMOC

**Open Layers**
- Secure Server Authentication
- Data Layer Management Access Privileges
- MapServer
- PostGres/ PostGIS Data Base (Full Backup routinely)

**Feature Server Tools**
- ESI & IPAC Query
- AIS Ship Search

**Base Public datasets**
- ESI
- Landuse
- Bathymetry
- Regional Monitoring
- Habitat Classifications
- Restoration
- Bioresource Base data

**Response datasets from sFTP**
- Trajectories
- Satellite Interpretations for oil
- SCAT Results
- Overflight Observations
- Boom plans & imagery derived
- Protected Resource Impact
- Field sampling (subsurface, analytical chemistry, photos, etc.)
- Platform observations
ERMA Background

• 2007: Developed concept. Pilot site: Portsmouth Harbor, NH
• 2008:
  • Tested in Industry-led PREP Drill
  • National Response Team/EPA Region 2 funded U.S. Caribbean ERMA
• 2009: Delivered Model ERMA: Caribbean
• 2010:
  • March 23-25th, Spill of National Significance (SONS) Drill - Expanded Pilot Project with assistance from regional stakeholders
  • May 3-8th, Planned Internal Drill – How fast could we stand-up an ERMA site?
  • April 20th, Deepwater Horizon Explosion
    NOAA SSC on-scene
  • April 22nd, NOAA Stood up the GOMEX ERMA
    Initial ERMA site for command posts deployed April 24th
    ADM Allen designated ERMA as the Common Operational Picture (COP) for the Deepwater Horizon Incident
Current ERMA Development

- New England (SONS)
- Caribbean – US territories, expanding upon need, Groundings, Haiti
- Puget Sound WA – Focus on climate change impacts
- GOM & DWH MC252
- Pacific Islands – In development, FY ‘11
- Arctic from NOAA OCRM Energy Initiative
- Lake Champlain – funded FY ‘11 (potential for NJ/ NY harbor w/EPA R2)
- Great Lakes – funded FY ‘11
ERMA Site Overview

- **Secure access**
  - Username/Password
  - Various levels of access (Public, Responder, NRDA)
- **Background Layers**
  - Google aerial, terrain, roads
  - NOAA Nautical charts
- **Incident information**
  - Trajectories
  - Field teams, aircraft, and vessel tracking
  - Shoreline Oiling
  - Geographic Response Plans Priorities
  - Analytical Chemistry Data
- **Weather & Buoys Observations**
  - Real-time feeds
  - Hurricane/Storms
  - Remote-sensing Imagery
- **Resources at Risk**
  - NOAA ESI data layers
  - Fisheries Closures
  - Local habitat and species datasets
  - Seafood Safety
  - Marine Protected Areas
- **Document & photo links**
  - ESI and GRPs PDFs
  - Field Photos
  - External links
ERMA User Tools

- **Zoom To**
  - Lat/Long
  - Place name
  - Ship – MMSI Find

- **Bookmark Map Views**
  - Saves layers and location
  - Customizable slideshow

- **Areas of Interest**
  - User-made map features

- **Measurement Tools**
  - Length/Area

- **Animations**
  - Show key layers across time

- **Find tool**
  - Automated search of all layers

- **Map Labels**
  - User-made feature labels

- **Print Tools**
  - Timestamp
  - Various page sizes

- **Query Tool (Resources at Risk)**
  - NOAA ESI (ME EVIs)
  - US Fish and Wildlife

- **Identify tool**
  - Analytical chemistry results
  - Status of ship locations
Populating ERMA & GeoPlatform.gov

Decontamination
Subsurface

NRDA
Wildlife Observations

NPS Data
Weather Data

Ship Locations

Response Data Sets

Environmental Data Sets

Data Approved for Public Release Pushed Daily by 12pm ET

WWW.GEOPLATFORM.GOV/GULFRESPONSE
ERMA Provides Data to the Public
ERMA/GeoPlatform Interface

Interactive Map
ERMA/GeoPlatform Interface
ERMA/GeoPlatform Interface

Map Tools: Pan, Zoom, Measure (line/area), Identify
ERMA/GeoPlatform Interface

TOC Tabs: Layers, Legend, Query Tool, AOI, Labels, Zoom, Download*, Print

* Limited download in GeoPlatform
ERMA/GeoPlatform Interface

Find/Search layers tool
## Field Sampling Results

### Seafood Safety Samples as of 08-25-2010

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<tr>
<th>gid</th>
<th>stationid</th>
<th>region</th>
<th>grid_zone</th>
<th>site</th>
<th>jar_label</th>
<th>sample_typ</th>
<th>collection</th>
<th>latitude</th>
<th>longitude</th>
<th>species</th>
<th>species_group</th>
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<tbody>
<tr>
<td>673</td>
<td>3516.0000000000</td>
<td>99.1002.006</td>
<td>99.1002.006.12S1</td>
<td>Tissue - Fillet</td>
<td>2010-05-06</td>
<td>30.21766667</td>
<td>-88.18033333</td>
<td>southern</td>
<td>kingfish</td>
<td>Fish</td>
<td>NC</td>
</tr>
<tr>
<td>674</td>
<td>3516.0000000000</td>
<td>99.1002.006</td>
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<td>Tissue - Fillet</td>
<td>2010-05-06</td>
<td>30.21766667</td>
<td>-88.18033333</td>
<td>southern</td>
<td>kingfish</td>
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<td>NC</td>
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<tr>
<td>675</td>
<td>3516.0000000000</td>
<td>99.1002.006</td>
<td>99.1002.006.12S1</td>
<td>Tissue - Whole Fish</td>
<td>2010-05-06</td>
<td>30.21766667</td>
<td>-88.18033333</td>
<td>atlantic</td>
<td>croaker</td>
<td>Fish</td>
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<td>atlantic</td>
<td>croaker</td>
<td>Fish</td>
<td>NC</td>
</tr>
</tbody>
</table>

**Note:** The data includes various samples from different types of seafood, collected at different locations and times, with specific geographic coordinates.
Subsurface Sampling Results

Cumulative Preliminary Subsurface DO Data (03-Aug-10 to 30-Sep-10)

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<th>station_id</th>
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<th>longitude</th>
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<th>do_depth</th>
<th>date</th>
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<td>Cape Hatteras</td>
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<td>U49-U2</td>
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<td>049-01</td>
<td>28.274333</td>
<td>-88.563333</td>
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<tr>
<td>254</td>
<td>Brooks McCall</td>
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<td>Pisces</td>
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<td>1060 + 1125</td>
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</table>
Display of Field Photos

WWW.GeoPlatform.GOV/GULFRESPONSE

Environmental Response Management Application (ERMA)

SCAT Team 5 Mobile at 30.242900 -87.7160...
Belled oil horizon up to 5 cm thick. Located at 60 cm depth. Gulf Shores, AL.
Source: NOAA

SCAT Team 6 Mobile at 30.287270 -87.4840...
3% coverage of tar balls after mechanical clean-up. Perdido Key, FL
Source: NOAA

SCAT Team 6 Mobile at 30.208000 -88.5688...
Wind and sand degraded tarballs. 13% coverage.
Source: NOAA
Display of Field Photos

ERMA | Environmental Response Management Application
Gulf of Mexico
Online PhotoLogger

Developing online tool to provide improved access and performance

34,768 photos logged to date

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
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<tbody>
<tr>
<td>Geo-Tagging Photo Source</td>
<td>Geo-Tagging Status</td>
<td>Photo Linked</td>
<td>Photo Log</td>
<td>Left to Process</td>
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<td></td>
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<tr>
<td>NRDA TWG</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shoreline</td>
<td></td>
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<td>Marsh Vegetation Survey</td>
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<td>Into November</td>
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<td>Analytical Chemistry ***</td>
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<td>SCAT</td>
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<td>Houma</td>
<td>4,206</td>
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<td>from 6/26 on</td>
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<td>static</td>
<td>10/6/10</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Overflight******</td>
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<td>Venice</td>
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<td>static</td>
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<tr>
<td>Houma</td>
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<td></td>
<td>static</td>
</tr>
<tr>
<td>Mobile</td>
<td></td>
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<td>static</td>
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<tr>
<td>USCG Boom Overflights*****</td>
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</tr>
<tr>
<td>Mobile</td>
<td></td>
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<tr>
<td>running totals</td>
<td>GPS</td>
<td>28,892</td>
<td>PhotoLogger</td>
<td>34,768</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* GPS Failure not consistently tracked
** Human Use photo processing being performed by STRATUS and is not available to other TWGS
*** Analytical photo processing being performed by IEC and will be made available as appropriate
**** Mobile SCAT will require re-processing for TWG use, currently on hold
****** Overflight photos have not been assessed, but live on OR&R/Genwest portable hard-drives

34,768 photos logged to date
ERMA Query Tools: NOAA ESI / USFWS IPaC
ESI Query Tool – Select Area

1st
Draw Polygon

2nd
Run Query

ESI Query Tool

Create and Edit Shapes:

Create shapes by selecting the Create Polygon button. Draw it on the map by left clicking your mouse, double click or press any key to end drawing.

Query tools:

Please select at least two shapes for the query tools. Select with left mouse click, multiple selects hold down shift, reverse select hold down control.

ESI maps provide a summary of oil at spill areas and spills. This includes biological, resource, cultural, and human-use resources.

U.S. Fish and Wildlife Service IPaC Tool

IPaC provides information about U.S. Fish and Wildlife Service trust resources for your selected area, including threatened and endangered species affected by the oil spill. It also provides recommended conservation measures tailored to your project activities and trust resource species.

IPaC accepts one or more polygons. It does not currently support points or line segments. If you need to define your project location as a point or line segment, draw a small polygon around the location.
ESI Query Tool – Select Species

3rd - Select features
4th - Select timeline
5th - Run ESI Tool
Background and Instructions

Species listed in Red are either listed as Threatened (T) or Endangered (E) by the State (S) or Federal government (F).

Notes: Click on column headers to sort rows; hover or click on species link to get more information.

Summary Results

AOI total area: 645,047 acres

LA Bird Habitat

19 unique species: American coot, American wigeon, Blue-winged teal, Canvasback, Colonial waterbirds, Gadwall, Green-winged teal, Hooded merganser, Lessor scaup, Mallard, Moitlaid duck, Northern pintail, Northern shoveler, Piping plover, Rare raptor, Rare seabird, Rare shorebird, Ring-necked duck, Shorebirds

LA Fish Habitat

37 unique species: Alligator gar, Bantam sunfish, Bighead carp, Bignemouth buffalo, Black buffalo, Black crappie, Bluegill, Bowfin, Catfish, Chubsucker, Common carp, Freshwater drum, Gizzard shad, Grass carp, Gulf menhaden, Hybrid sunfish, Largemouth bass, Logperch, Longear sunfish, Minnows, Orangespotted sunfish, Paddlefish, Raerar sunfish, River carp, Suckers, Shiner, Shortnose gar, Siowalness sturgeon, Silver carp, Smallmouth buffalo, Spotted gar, Spotted sunfish, Striped bass, Striped mullet, Threadfin shad, White bass, White crappie, Yellow bass

LA Shoreline Classification (lines)

Summary Length (miles) by type:

- 1A: Salt and brackish-water marshes: 601
- 1B: Salt marsh: 196
- 3A: Fine to medium grained sand beaches: 24
- 10C: Swamps: 21
- 6B: Gravel beaches and riprap: 14
- 7: Exposed tidal flats: 10
- 9B: Vegetated low banks: 10
- 9B: Scars and steep slopes in sand: 9
- 1B: Exposed, solid man-made structures: 3
- 9B: Sheltered, solid man-made structures: 2
- 9A: Sheltered tidal flats: 0.3
- 2A: Exposed wave-cut platforms in bedrock, mud, or clay: 0.3
- 9A: Sheltered scarps in bedrock, mud, or clay: 0.2
- 9A: Gravel beaches: 0.0
- 2B: Exposed scarps and steep slopes in clay: 0.2
- 5: Mixed sand and gravel beaches: 0.0
- 3C: Sheltered riprap: 0.0

Generate PDF of entire ESI Report (All Resources)
IPAC Query Tool – Select Area

Create and Edit Shapes:
Create shapes by selecting the Create Polygon button. Draw it on the map by left clicking your mouse, double click or press any key to end drawing.

Query Tool:
Please select at least one shape to run the query tools. Select with left mouse click, multiple selects hold down shift, remove selected hold down control.

NOAA ESI Query tool
ESI maps provide a summary of coastal resources that are at risk if an oil spill occurs. This includes benthic resources, sensitive shorelines, and wetland resources.

U.S. Fish and Wildlife Service IPAC Tool
IPaC provides information about U.S. Fish and Wildlife Service trust resources for your selected area, including threatened and endangered species affected by the oil spill. It also provides recommended conservation measures tailored to your project activities and trust resource species.

IPaC accepts one or more polygons. It does not currently support points or line segments. If you need to define your project location as a point or line segment, draw a small polygon around the location.
IPAC Query Tool – Report

- Endangered Species summary
- Detailed information on species life histories
- PDF output
Trustee Support in the Delaware

ARD developed a Watershed based GIS project for the Delaware in 2006

Webguide features extensive information on Waste sites, Contaminant sources, Habitat and Species data all in a geospatial framework

Provides an easy to use interactive reference for resources and activities across the Delaware Watershed

Delaware River Habitats

Habitat Description

The Upper Delaware River Estuary is the tidally influenced area of primarily freshwater in the Delaware River, located approximately from the C & D Canal to Trenton, New Jersey. The salt line, or the transition point between salt water and freshwater (USGS definition), moves depending on rainfall. In drought conditions, backwater can move upstream. Between 1999 and 2003, the salt line ranged from below river mile 54 (near the C & D Canal) to as high as river mile 83 (near Philadelphia). River mile 0 is at the mouth of the Delaware River, where it joins the Atlantic Ocean. The transition zone generally lies between Marcus Hook, PA, and Artificial Island, NJ, and has a wide range of salinity, from 0 to 15 parts per thousand (ppt) (Gartner 2008). The map on the right shows a graphical interpretation of these salinity zones.

Another map showing the 3 zone average annual salinity geography was developed by NOAA’s Coastal Assessment Framework (CAF). Note that this dataset is a depth averaged annualized representation of salinity gradients.

Watershed Description

Most of the Estuary is residential, with physical processes mixing and remediating sediments with tides, areas of deposition and non-deposition. In the upper estuary at Philadelphia and north, the dominant substrate is sand and gravel. As you move down the river, the bottom-type transitions from coarse to finer substrates, becoming clays to silty clay at the Delaware/Pennsylvania border (Gartner 2008).

The Estuary is highly urbanized and commercialized. It has been described as hosting the largest freshwater port in the United States (PCG 2010), and the largest freshwater port complex (including docking facilities in Pennsylvania, New Jersey, and Delaware) in the world (UBEC 2008). It accommodates the third largest petrochemical port, and five of the largest east coast refineries with over 42 million gallons of crude transported on the river daily. The estuary also provides habitat to over 130 species of finfish as well as clams, oysters, and crabs. In addition, the river also provides habitat to over 38 species of marine mammals and sea turtles, including whales, dolphins, porpoises, seals, manatees, and sea turtles. The second largest concentration of migrating shorebirds in the western hemisphere is found in the Delaware Estuary, along with habitat for 15 different species of waterfowl, totaling half a million individuals who either migrate through or spend the winter here (PCG 2010).

Habitat Impacts

Significant negative habitat impacts have occurred in the urban Estuary. It has been estimated that perhaps less than 5% of the pre-settlement acreage of tidal marsh remain. In particular freshwater tidal marshes have been severely impacted by development in the area from Wilmington DE to Trenton, NJ. These wetlands help maintain water quality and serve as critical feeding, spawning, and nursery areas for finfish, shellfish, birds and mammals. Tidal wetlands have been assigned special status in the estuary and are listed in the top-tier technical needs for advancing science and management of the Delaware Estuary (Kisegar et al. 2003).

Coastal development and filling of tidal wetlands has also resulted in shoreline areas that are unstable and eroding and that do not have sufficient vegetative buffers. The eroding material usually contains contaminants due to the poor quality of the fill. Shoreline stabilization is often attempted by traditional engineering practices such as using sheet pile barriers or installation of rip rap. These measures increase the problem of shoreline erosion by deflecting wave energy to the edges or occurs at the base. Vegetative shorelines, in particular tidal wetlands, attenuate wave energy and sediments thus controlling erosion. However some tidal wetlands have become overrun with the invasive species Phragmites sp. that significantly lowers the habitat value. Vegetated uplands along the spanas corridors also provide water quality benefits, food sources, and shading.
Delaware Estuary Species

Species Life History

Alewife and Blueback Herring (River herring)

Alewife and blueback herring, commonly referred to as river herring, are migratory fish that live most of their life in the ocean and migrate into freshwater streams to spawn. Within the Delaware Estuary, blueback herring tend to be more abundant in the upper region of the estuary than do the closely related alewives. Alewife spawn in streams and rivers with sluggish to slow currents in fairly shallow areas, while blueback herring require swift and stronger currents (Fay, News, and Parpard 1983). Both species can tolerate a variety of substrates including silt, mud, sand, gravel, and boulders. Eggs and sperm are released in the water column where fertilization takes place. Eggs stay suspended in the water column until eggs hatch (Fay, News, and Parpard 1983). Spawning occurs far enough upstream for eggs to develop and hatch before reaching saltwater.

Adults spawn from spring to early summer in upstream brackish or freshwater areas of rivers and tributaries. Spawning occurs at night in fast currents over a hard substrate. After spawning, adults move downstream and return to the ocean. Eggs float near the bottom for 2 to 4 days until hatching, depending on temperature. At hatching, blueback herring larvae are 3.1 to 5.0 mm (0.12 to 0.20 in.). Larvae become juveniles at approximately 20 mm (0.79 in.) or at 25 to 15 days.

Both river herring species spend their first spring and summer in the freshwater and tidal reaches of their natal stream where they forage on aquatic insects and small crustaceans. Juveniles are distributed high in the water column and avoid bottom depth. In the early juvenile stages, fish are swept downstream by the tide. Some juveniles will move upstream until late summer before migrating downstream in late summer to early fall. Juveniles are sensitive to sudden water temperature changes and emigrate downstream in response to a decline in temperature. By late fall, most young-of-year emigrate to ocean waters to overwinter.

For more information on alewives:
- Atlantic States Marine Fisheries Commission: Shad and River Herring Fact Sheet
- Fishbase: Alewife
- Marine Biology Laboratory: Alewife
- NatureServe Explorer: Alewife
- Virginia Institute of Marine Science: Alewife
- PPSC: Alewife

For more information on blueback herring:
- Atlantic States Marine Fisheries Commission: Shad and River Herring Fact Sheet
- Fishbase: Blueback Herring
- NatureServe Explorer: Blueback Herring
- Virginia Institute of Marine Science: Blueback Herring
- PPSC: Blueback Herring

And a very good watercolor comparing the two, on the U.S. Fish and Wildlife site:
- New Jersey Field Office Partnership and Habitat Restoration

American Eel

American eel spend the majority of their lives in estuaries and freshwater streams. American eel are able to migrate upstream of many barriers including spillways, low dams, falls, and rapids that are impassable to other migratory fish (Chesapeake Bay Program 2006). In the mid-Atlantic region, American eel spend between 8 to 24 years in the estuary and freshwater streams before returning to their birthplace in the Sargasso Sea to spawn. The red eel spawn in winter and early spring (ASMFC 2005). The Delaware River has the most abundant population of eels of all streams in Pennsylvania, because there are no dam obstructions to prevent the eels upstream migration (Stoner, 2009)

American eel are able to live in a variety of habitats and have a very large geographic range. American eel migrate and spawn at night. Adult American eel forage on insects, mollusks, crustaceans, worms, and other fish (Chesapeake Bay Program 2004).

For more information on American eel:
Delaware Estuary Waste Sites

The Delaware Estuary, in the Greater Philadelphia region, was the former center of the industrial revolution and continues as a major industrial region. The area is also highly populated and developed. The legacy of these activities has resulted in contaminants being considered among the ten top management issues in the Delaware Estuary (Gagner et al. 2005).

Information on many contaminated sites and potential contaminant sources in the Delaware Estuary is presented in the following sections:

- NOAA DEPR Waste Sites
- Brownfields
- New Jersey Delaware River Initiative

Watershed-Wide Data

Information on watershed-wide as well as site-specific sources of contamination is available from a variety of data sources. Watershed-wide data are available from the Delaware River Basin Commission (DRBC), NOAA's National Status & Trends Monitoring (NSTM) program, EPA, and from state programs. The focus on this project is on toxic chemical contaminants (e.g., petroleum related compounds, pesticides, and heavy metals). Unconventional contaminants (e.g., pharmaceuticals), nutrients and biological pathogens are also contaminants in the Delaware Estuary.

To complement site-specific investigations and for restoration planning, watershed-wide data are obtained and reviewed. This information is used to coordinate site investigations at individual sites within a regional context, help facilitate the remedial decision-making process, and integrate restoration opportunities into remedial efforts. The Delaware River Toxic Reduction Program (DelTRP) is an ongoing effort, led by DRBC, that is collecting information from specific waste sites in the area.

Waste Sites

By partnering with EPA and the states and working as a Natural Resource Trustee under DEGCA, NOAA is working on many sites that have been identified as potential sources of contamination to the watershed including the National Priority Listed (NPL) sites, DuPont Newport (DE), Rogers Co. Newport Plant (DE), Army Creek Landfill (DE), Standard Oil Company (DE), Lower Darby Creek (PA), Bridgeport Portal and Oil Services (NJ), Chemical Leaman (NJ), booming shed (NJ), Route 91 Quim (NJ), Shores Williams Hillards Creek (NJ), United States Avenue Burn (NJ), and Mattis & Sons, Inc. (NJ). NOAA is also working on the DuPont Chambers Works Site (NJ) under the Resource Conservation and Recovery Act (RCRA) program.

There are numerous other sites that are state-led sites and/or are in voluntary remediation programs. Of note are nine of the 10 sites identified in the New Jersey Delaware River Initiative, including the Former Lait Property. The tenth site, Mattis & Sons, Inc. is an NPL site, as noted above.

Oil Spills

Thousands of incidents occur each year in which oil or chemicals are released into the environment as a result of accidents or natural disasters. Spills into our coastal waters, whether accidental or intentional, can harm people and the environment and cause substantial disruption of marine transportation with potential widespread economic impacts. NOAA provides scientific expertise 24 hours a day, 7 days a week, to support incident response for oil spills and helps initiate natural resource damage assessment.

NOAA is currently working with federal and state trustees agencies regarding restoration planning for the Atlantic/Oil Spill, which severely impacted Delaware River shoreline in late November, 2004, and the more recent Bermuda Islander (April 25, 2006) and International Petroleum Corp. (IPC) (July 15, 2006) Oil Spills. Restoration from the June 24, 1989 Presidente Rivera Oil Spill is ongoing. Information on many of these cases can be accessed at http://www.darp.noaa.gov/neast/index.html, with updates regarding all cases impacting the Delaware River to be available in the near future.

Point and Non-Point Source Contamination

Point sources that are permitted discharges are being evaluated by the Delaware River Basin Commission's Toxics Advisory Committee. In particular there has been an effort to establish a Total Maximum Daily Load (TMDL) for PCBs. (DEP: Toxics - PCB Data Information)

Non-point sources of contamination are a significant source of contamination to the Delaware Estuary. In general, the strength of non-point sources of contamination increases as development occurs and as the buffering capacity is lost. The buffering capacity has been severely reduced in the estuary by the loss of total wetlands and riparian buffers. Habitat restoration efforts as well as environmentally responsible development and re-development efforts are important in addressing non-point sources of contamination to the estuary.
Delaware Estuary Restoration

Restoration Projects

Restoration projects, including ecological restoration, are a critical component of revitalization efforts in the tidal Delaware River from both an economic and environmental perspective. Significant habitat impacts have occurred in the tidal Delaware River which are the focus of restoration efforts.

The [NOAA Habitat Program](#) provides information on NOAA Habitat Program activities and offices. This program works nationwide to protect and restore habitats that support NOAA trust resources that are essential to the long-term health and sustainability of coastal, marine, and Great Lakes ecosystem. Restoration activities are highlighted in the [NOAA Restoration Portal](#).

NOAA is one of the members of the interagency council implementing the Estuary Restoration Act, and is the lead agency for the restoration project database and monitoring protocol required by the ERA. The [Estuaries Research Federation](#) and [Restore Americas Estuaries](#) have developed a set of principles to guide restoration activities in coastal environments. Several of these principles are directly applicable to restoration projects in the tidal Delaware River. Of note for an urban river is the principle that ecological engineering practices should be applied in implementing restoration projects and that the best way to accomplish full restoration is to address barriers to natural functioning, such as dams, dikes, ditches, and other man-made structures (e.g., hardened shorelines) and allow natural hydrology and drainage patterns to re-establish themselves.

Information on restoration projects and techniques that benefit estuarine habitats and species in the tidal Delaware River are presented in the following sections:

- **Tidal Delaware River Restoration Opportunities**
  This section contains a summary of priority restoration types, habitats and species in the tidal Delaware River that NOAA has identified as important for restoration and revitalization efforts.

- **Existing Restoration Projects**
  This section presents a combination of restoration projects that are in the NERI (National Estuaries Restoration Inventory) and NOAA’s Restoration Center Database (RCDB). This is not intended to be a complete review of ALL restoration projects in the watershed and mainly consists of restoration efforts that are funded by federal agencies and are already being tracked in existing (separate) federal databases. The majority of the project information in NERI comes from NOAA’s existing RCDB, which tracks information for NOAA funded projects.

- **Potential Restoration Opportunities**
  This section contains a summary of potential restoration opportunities including information on project types, habitat types and potential restoration techniques. Potential restoration opportunities have been compiled by NOAA with contributions from Federal, Regional, State and local agencies but is not meant to be a comprehensive list.

- **Restoration Initiatives and Programs**
  This section contains a listing of Federal, Regional, State and local restoration initiatives and programs in the Delaware Estuary Watershed.
Next Steps with Restoration
Next Steps with Delaware Estuary

- Potential re-development of the Delaware Estuary Webguide
- Creation of a Delaware Estuary ERMA
  - EPA Region 3
  - RRT III Response
  - Delaware Estuary NRDA Trustees
- Real-time data feeds from NOAA Restoration Center database
  - Current, planned, potential restoration sites
ERMA User Benefits

• Platform that easily crosses boundaries
• Improves data sharing and communication
• Easy to use – non-GIS users
• Real-time data sets overlaid with baseline environmental and operational data
• Access from anywhere
• Planning and Preparedness tool
• Distributed upload capabilities
• Query tools
• Customizable on the fly
Practical Implementation of ERMA

• Assist with spill preparedness
  • Display jurisdictional boundaries, specially regulated areas, areas of socio-economic importance, environmentally sensitive areas
  • Access points for cleanup
  • Staging areas and command centers
  • Regional documentation, points of contact, etc.

• Assist in coordinating response efforts
  • Visualize magnitude and extent
  • Triage sites for action
  • Track progress of clean-up
  • Access real-time data
  • Upload data from the field and access forms
  • Increase communication
Practical Implementation of ERMA

• Define the extent of potential impacts
  • General habitat and land use information
  • Areas of biological significance - haul outs, rookeries, nesting grounds, essential or critical habitat
  • Species specific data - biological resources in the region - threatened or endangered?
  • Where is there current monitoring data

• Assist in Recovery and Restoration
  • Access existing environmental monitoring sites
  • Assist with sampling design
  • Inventory restoration projects
  • Locate long-term monitoring sites
  • Coordinate with regional projects
ERMA Usability

- Easily accessible via Web browser
  - Field, Command Post, External Offices
- Quick to display
- User friendly interface
- Secure, multi-tailored password protection
  - Public interface
  - Responder interface
  - NRDA interface
  - Trustee interface
ERMA DWH Lessons Learned

• **Non-technical Interface**
  - GIS background not necessary to navigate
  - “How to” sessions in command posts and WebEx to socialize ease of use

• **Scalable Access**
  - Quick to stand up foundation
  - Public Facing data needed- Geoplatform.gov/Gulfresponse
  - Varying data access levels based on account type (Public, responder, NRDA, Trustee)

• **Cost Effective Open Source Software**

• **Customizable Programming & Modular development**
  - public facing or specialized sites
  - (Climate Change, Wildfires, Marine Debris, Tsunami)
ERMA DWH Lessons Learned

• Collaboration is KEY
  • Need to leverage existing resources & data for application buy in by partners

• Government Agencies & NGO’s
  • EPA
  • USCG
  • DOI/USFWS
  • NGA
  • LA FWS & DEQ
  • MS FWS & Disaster Plan
  • FL Disaster Plan

• Private Sector
  • BP & contractors
  • Google
    • Imagery service
    • Investigating potential 3-D display
  • Telascience - faster display by tile caching of image mosaics
  • ESRI - hosted WMS for public consumption
Next Steps

• Hawaiian Islands project for FY ‘11
  • Coastal Storms Program
• CA Regional Project
• FEMA Collaboration
• Arctic ERMA
• Great Lakes
• Lake Champlain, EPA Region II / RRTII
• Delaware Estuary, EPA Region III / RRTIII
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