

# The Ocean Data Partnership Exchange Network (ODPX):

***Building a consensus-based system for  
discovery, accessibility, and interoperability  
of diverse water data in the Northeast US  
and Atlantic Canada***

Paul Carrier<sup>1</sup>, Deb Soule<sup>1</sup>, Riley Young-Morse<sup>2</sup>, Tom Shyka<sup>2</sup>

<sup>1</sup>New Hampshire Department of Environmental Services, Concord, NH

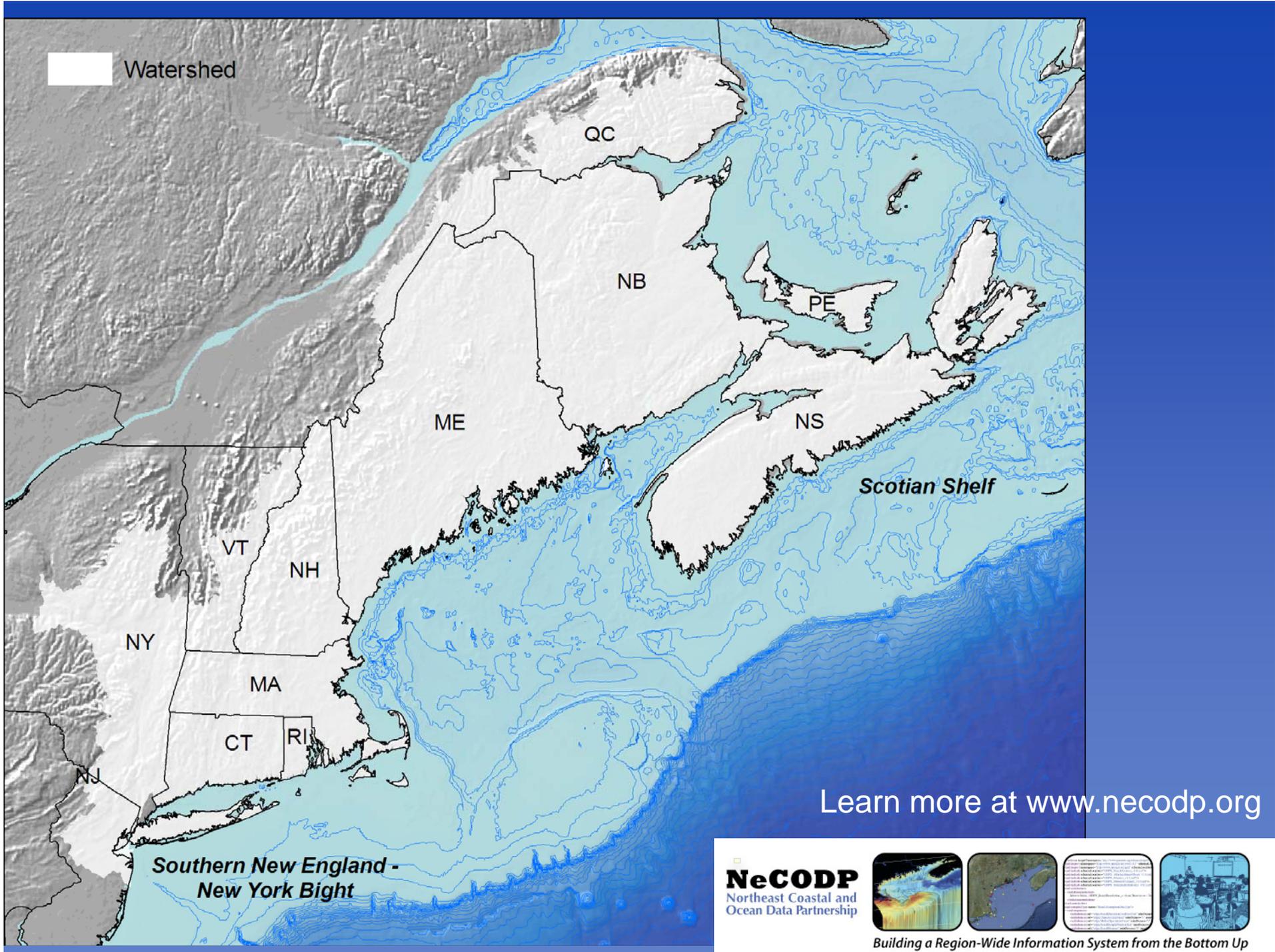
<sup>2</sup>Gulf of Maine Research Institute, Portland, ME

2010 National Water Quality Monitoring Conference, Denver, CO

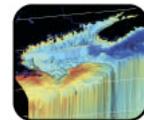
# The Northeast Coastal and Ocean Data Partnership (NeCODP)

- Formed in 2004 (Census of Marine Life origin)
- Expanded in 2009 to include NERACOOS region + Atlantic Canada + tributary watershed
- Voluntary
- Collaborative
- Diverse

**“The goal of the Northeast Coastal and Ocean Data Partnership is to make each partner's long term datasets discoverable, accessible, and eventually interoperable through tools available on the internet .”**



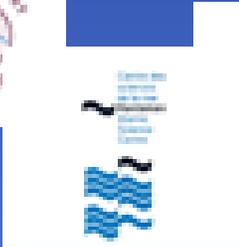
**NeCODP**  
Northeast Coastal and  
Ocean Data Partnership



Building a Region-Wide Information System from the Bottom Up



# NERACOOS



# CURRENT PARTNERS



- **Discovery**

- Data existence can be found by web search
- Good, registered metadata (NASA's Global Change Master Directory, GCMD)

- **Accessibility**

- The actual data can be obtained from a website

- **Interoperability**

- automated machine-to-machine data exchange using consensus-based standards (Web Services)

# Enter the Exchange Network (EN)

**“a secure Internet- and standards-based approach for exchanging environmental data”**

- SOAP web services
  - data is returned in a standardized machine-parseable format
  - it can then be integrated directly into a third-party web site or application
- XML, more XML, and then still more XML
- Schema, schema, schema

**AND THEY WANT ORGANIZATIONS  
TO BUILD DATA EXCHANGES!**

**AND THEY HAVE  
GRANT MONEY!**

# 2007 EN Project

## Share ocean/coastal data via EN protocols

- 
- Used WQX as starting point for schema and added data elements from:
    - NJ Water Quality Data Elements (similar project)
    - Global Change Master Directory (to use partners' registered metadata)
    - Geography Markup Language (GML) and GeoRSS (to include lines and polygons for trawls etc.)
    - Sensor Web Enablement (SWE) (for buoys)
    - Sensor Observation Service (SOS) (for buoys)
    - National data standards (for anything else not in the above)
  - Developed a new schema called Ocean Data Partnership Exchange (ODPX)
    - 281 data elements

# Project Partners

## Funded partners:

- New Hampshire Dept of Environmental Services (NHDES) – **Grant/Project Lead**
- Gulf of Maine Research Institute (GMRI) – **Technical Lead**
- Tufts University – Seabird Ecological Assessment Network (SEANET)
- Coastal Ocean Observing Center, University of New Hampshire
- University of South Carolina Research Foundation (NOAA, NERRS and Southeast Atlantic Coastal Ocean Observing System (SEACOOS))
- Gulf of Maine Council on the Marine Environment (GOMC)

## Unfunded partners:

- USGS
- USEPA Atlantic Ecology Division (AED)
- Woods Hole Oceanographic Institution (WHOI)
- Division of Fisheries and Ocean/Bedford Institute of Oceanography (DFO/BIO - Canadian)
- Northeast Fisheries Science Center (NFSC- NOAA)
- Maine Dept of Marine Resources (MEDMR)



# Diverse data types



Type of Data	Contributing Partners
Dead sea bird survey	Tufts SEANET
Buoy (real time sensors)	GMRI and UNH
Watershed (lakes, streams, wells, etc.)	NHDES and USGS
Estuarine reserves – Meteorological	University of South Carolina (NERRS)
Gulfwatch (mussel tissue)	Gulf of Maine Council
Ocean trawl (biological)	DFO/Bedford Institute of Oceanography (Canada)
Ocean observations by lobstermen	NOAA Northeast Fisheries Science Ctr.
Continuous track meteorology and sea surface	Woods Hole Oceanographic Institute
Shellfish harvest areas	MEDMR and NHDES

# OpenNode2 Success!

- Created java plug-in for our ODPX flow
  - Windsor Solutions provided tools to allow us to customize, not reinvent
- Embedded domain lists/business rules into schema to validate XML as partner submits
- Parse XML, insert into database
- Developed crosswalk to NOAA IOOS Data Integration Framework (DIF) Nat'l Data Buoy Center Sensor Observation Service (SOS)
- Our technology stack:
  - Red Hat Linux web server and database server
  - Web server running Tomcat
  - Database server running PostGres

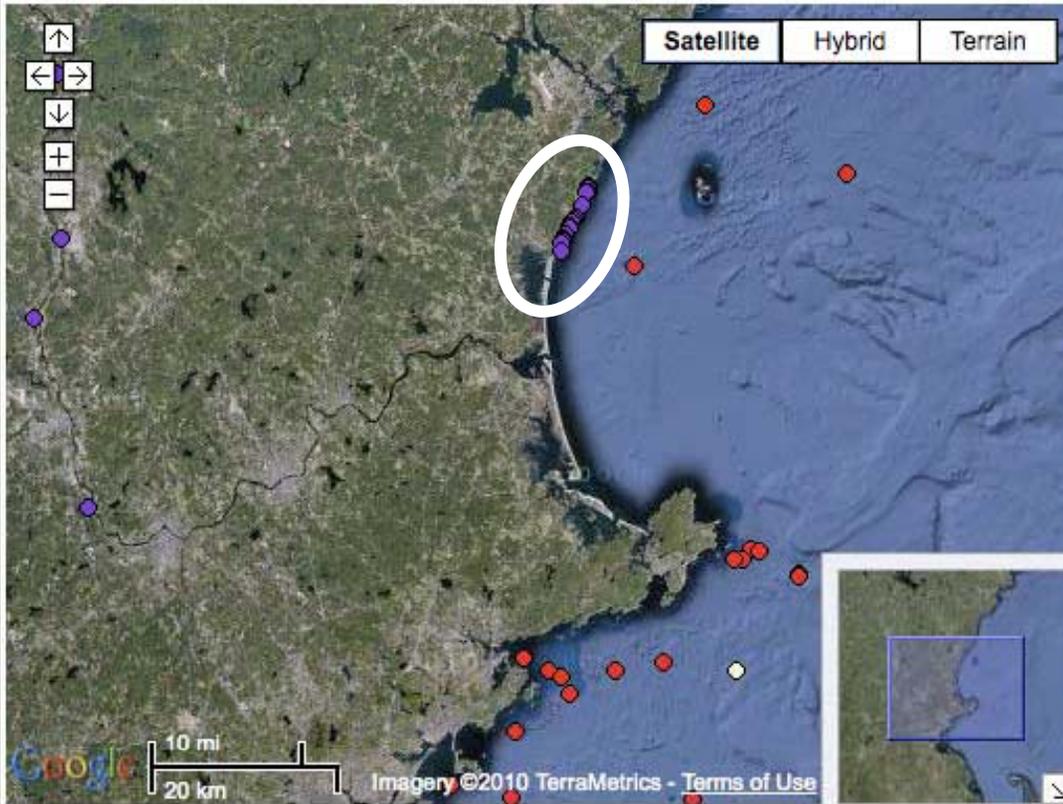
***Its all  
open source!***

# DATA DISCOVERY ACCESS PORTAL (under construction)

Public access to query, retrieve and display data

- Prototyped harvesting GMCD metadata records and displaying on map
- Prototyped harvesting USGS WQX feed for monitoring locations
- Accesses partner data via node and displays monitoring locations
- Working on actual data retrieval and presentation





**Organization:** 11113300  
**Name:** NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL SERVICES  
**Monitoring Location:** BCHSYRRYERT  
**Name:** SAWYER BEACH-RIGHT  
**Location:** 42.979557,-70.76459

- Legend  Deselect all
- NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL SERVICES
  - Fisheries and Oceans Canada
  - Northeast Fisheries Science Center
  - Gulfwatch Program
  - Northeastern Regional Association of Coastal Ocean Observing System (NERACOOS) moored buoy program
  - Seanet Ecological Assessment Network



# THE POTENTIAL !

- **REGIONAL, CONSENSUS-BASED DATA PUBLISHING**
  - Any NeCODP partner can publish their data via web services
- **MAKES THE WQX CONCEPTUAL MODEL A REGIONAL STANDARD**
  - Organization, Project, Activity, Results
- **THREE LEVELS OF PARTNER PARTICIPATION**
  - Catalog level (harvest GCMD metadata record)
  - Catalog + monitoring locations Submitting monitoring locations (partner submits XML of monitoring loOrgacations via node client)
  - Full data exchange (full ODPX - includes all of the above plus results)

# MORE POTENTIAL !

- **ACCOMODATES ALL DATA TYPES**
  - Full ODPX may not be best for all types
  - Can use catalog + locations and then interface with other data publishing formats
- **INTEGRATES DIVERSE COMMUNITIES OF PRACTICE**
  - Watershed / Coastal / Ocean
  - Federal / State / Academic / Volunteer
  - IOOS / USGS / EPA
- **OPEN SOURCE, STANDARDS-BASED**
  - Can change and grow with technology



# NEW WORK - 2009 EN Project

## **THE CHALLENGE: FIND A USE CASE!**

Title: Enabling Geospatial Data Exchange to Support Environmental Decision Making

Goals:

- 1) Develop product or service that supports regional environmental decision makers
- 2) Enable exchange of geospatial data between multi-jurisdictional agencies
- 3) Develop best practices, lessons learned documentation and other transferable capabilities



# Partners

- 
- ME Dept. of Marine Resources (Grant lead)
  - Gulf of Maine Research Institute (Technical lead)
  - Friends of Casco Bay
  - ME Dept. of Environmental Protection
  - NH Dept. of Environmental Services
  - University of New Hampshire - GRANIT
  - Federal Partners – USGS, EPA and NOAA
  - New partners since project start
    - Casco Bay Estuary Partnership (NEP)
    - Maine Healthy Beaches
    - NERACOOS (IOOS Region)
    - Wells Reserve (NERRS)

# Develop a product or service (Use Case) that supports regional environmental decision makers

- Define specific marine resource management use
- Define data & metadata needed for product
- Develop application
  - Utilize open source visualization and mapping tools for representing point and geospatial data (Google Earth, OpenLayers)





- **Potential Projects:**
  - **Partners' Water Quality data one stop shop**
    - Use framework from EN 07 project with additional data and capabilities (state agencies, volunteer monitoring programs)
  - **Sea grass status and trends**
    - Sea grass (eelgrass and salt marsh) coverage data coupled with **water quality point data**
  - **Embayment and eutrophication predictor**
    - Coupling model output and observation data (SPARROW, nitrogen box models)
  - **Integrate rainfall/flow/discharge data**
    - Beach/shellfish bed closure predictive tool
    - Compare to historical WQ data for trends based on weather

# Enable exchange of geospatial data between multi-jurisdictional agencies

- Evaluate data elements for geospatial data-exchange requirements
- Modify ODPX schema to accommodate geospatial data
  - May include: time series, points, line, polygons, shape files, model output
- Get partner data into the node
- Install OGC web services on node to make EN data accessible via feed
  - Web Feature Service (WFS), Mapping Service (WMS) or Sensor Observation Service (SOS)



## Develop best practices and other transferable capabilities

- Publish final schema/flows to Exchange Network XML Registry
- Publish data exchange to Exchange Network Discovery Service (ENDS)
- Document what we've learned about using Exchange Network protocols to serve geospatial data
- Develop cookbooks and reference implementations (for web services, node modifications, scripts, etc) that Exchange Network community can implement



# Project Contacts

2007 EN Grant:

Deb Soule - NH Dept of Environmental Services

Email: [Deb.Soule@des.nh.gov](mailto:Deb.Soule@des.nh.gov)

2009 EN Grant:

Seth Barker - ME Dept of Marine Resources

Email: [Seth.Barker@maine.gov](mailto:Seth.Barker@maine.gov)

Technical Info on Both Grants (Both at GMRI):

Riley Young Morse – [rmorse@gmri.org](mailto:rmorse@gmri.org)

Ian Ogilvie – [iogilvie@gmri.org](mailto:iogilvie@gmri.org)

