

Current Approaches to Improving Marine Geophysical Data Discovery and Access

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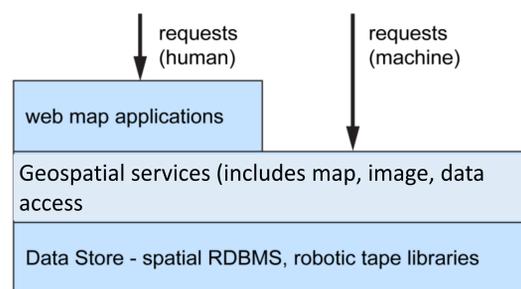


To maximize the return on investment on ocean mapping, legacy and newly acquired data must be easily discoverable and readily accessible.

Introduction

Exploring, understanding, and managing the global oceans is a challenge when hydrographic maps are available for only **5% of the world's oceans**, even less of which have been mapped geologically or to identify benthic habitats. In order to maximize effectiveness in ocean and coastal mapping, we must be sure that limited funding is not being used to collect data in areas where data already exist. Therefore, the first step for any mapping program should be to identify if data currently exist in the area of interest. There are many reasons why this seemingly simple suggestion is not commonplace. While certain datasets are accessible online (e.g., NOAA's NCEI, EMODnet, IHO-DCDB), many are not. In some cases, **data that are publicly available are difficult to discover and access.**

At NOAA's National Centers for Environmental Information (NCEI), **resources are focused on ensuring the security and widespread availability of the Nation's scientific marine geophysical data** through long-term stewardship. The public value of these data and products is maximized by streamlining data acquisition and processing operations, minimizing redundancies, facilitating discovery, and developing common standards to promote re-use. NCEI draws on a variety of software technologies and adheres to international standards to meet this challenge. The result is a geospatial framework built on spatially-enabled databases, standards-based web services, and International Standards Organization (ISO) metadata.



Framework

NCEI has built a framework of **Geospatial Services** and **Web Map Applications** to provide state-of-the-art discovery and access to one of the largest archives of marine data in the world. The framework is designed to meet the needs of a diverse set of customers and their applications. It is based on a common technology stack organized as a series of layers each of which depends on the one below allowing customers to interact directly with the **Geospatial Services** or indirectly via the **Web Map Applications**.

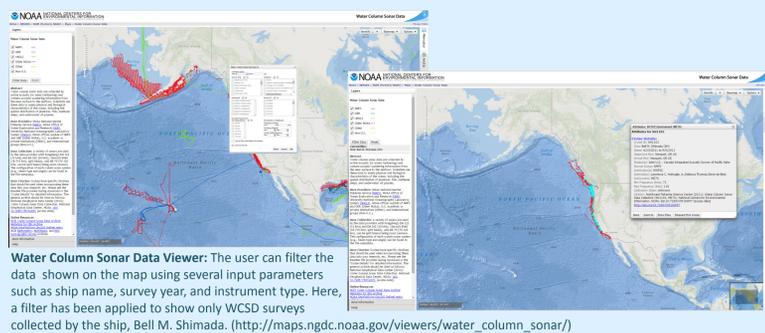
The underlying layer to everything is a spatially-enabled database that includes geometry as a native data type. Because a spatial database can support geometry and provide a set of operators for geometry data, the database can now do operations traditionally found in a geographic information system (GIS).

Data Discovery

Geospatial Services are designed primarily for machine-to-machine communication and provide a geographic representation of where the data were collected along with descriptive information about the underlying scientific data.

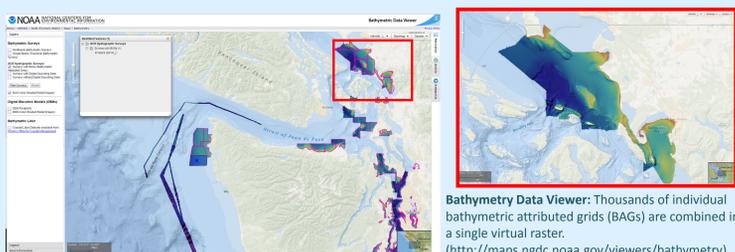
A **Map Service** is a specific type of Geospatial Service designed to handle spatial data.

It may handle requests to display data, returning a georeferenced map image. It may also handle a query, returning the data or information themselves.



Water Column Sonar Data Viewer: The user can filter the data shown on the map using several input parameters such as ship name, survey year, and instrument type. Here, a filter has been applied to show only WCSO surveys collected by the ship, Bell M. Shimada. (http://maps.ngdc.noaa.gov/viewers/water_column_sonar/)

An **Image Service** is a type of Geospatial Service that provides access to raster data and are used to host "mosaic datasets" - many rasters combined into a single virtual seamless raster.



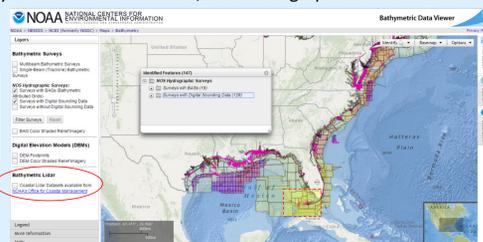
Bathymetry Data Viewer: Thousands of individual bathymetric attributed grids (BAGs) are combined into a single virtual raster. (<http://maps.ngdc.noaa.gov/viewers/bathymetry/>)

Geospatial Services are organized in a "fine-grained" manner often representing a single data type. By employing industry standards (Open Geospatial Consortium (OGC) & Esri), our services are accessible by both desktop analysis tools and web-based applications.

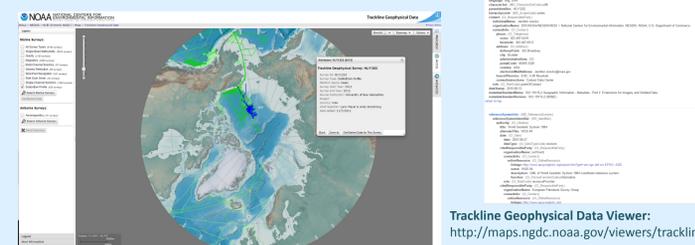
The Index to Marine and Lacustrine Geological Samples, shown in an Arctic map projection. (http://maps.ngdc.noaa.gov/viewers/sample_index)

Web Map Applications are designed primarily for human interaction, include a graphical user interface and are built upon **Geospatial Services**.

Most incorporate a number of **Geospatial Services**, or "building blocks", some of which are hosted at NCEI and some from other organizations (eg: NOAA's Office for Coastal Management Bathymetric Lidar map service).



For **Web Map Applications** to be effective, they must show not only where data exist, but also what data. **Standard metadata** describes the who, what, when, where, how, and sometimes why of the archived data in well-defined fields that are easily machine-readable. Web Map Applications can then handle queries, returning the attribute data themselves - populated by metadata.



Trackline Geophysical Data Viewer: <http://maps.ngdc.noaa.gov/viewers/trackline>
 Attribute information populated by an ISO-compliant metadata record for subbottom profiler data collected in the Arctic.



NCEI employs several tools and strategies to facilitate the discovery and maximize reuse of data based on the ISO metadata standard. Our metadata is maintained in web-accessible folders, allowing us to work with other web portals and data catalogs to ensure the metadata (and associated data & Geospatial Services) are discoverable through a variety of methods.

NCEI's ESRI Geoportals, NOAA's Data Catalog, U.S. Data.gov Ocean Community, Esri's ArcGIS Online, NOAA GeoPlatform (prototype)

North Atlantic Data Portal

In Dec. 2014, the Atlantic Seabed Mapping International Working Group (ASMIWG) was established by the Tri-Partite Galway Statement Implementation Committee to identify the steps required to implement a seabed mapping strategy to underpin the objectives of the Galway Statement. **Improved data sharing, discovery, and access** will allow potential mapping targets to be designated. The ASMIWG recommends that all bathymetric data that currently exists (and newly collected data) be identified and made accessible to the public through the establishment of a North Atlantic Data Portal.

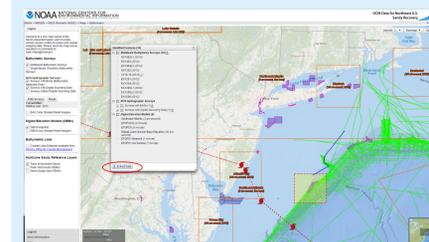
Current Efforts include working with participating institutes and agencies:

- To integrate their existing **Geospatial Services** into the North Atlantic Data Portal (**Web Map Application**) that allows the public to locate and access **publicly available data** in the North Atlantic using a single web portal.
- To acquire polygons of **proprietary data** locations in the North Atlantic to display bathymetric coverage and provide contact information, allowing further inquiry about potential data access using the same single portal.

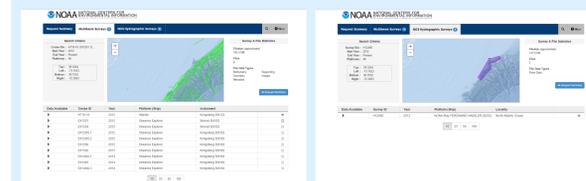
The prototype viewer (**Web Map Application**) displays numerous **Map Services** (NOAA's NCEI, the European Marine Observation and Data Network (EMODnet), Natural Resources Canada, Norway Hydrographic Office) and **Image Services** (LDEO's Global Multi-Resolution Topography). The viewer also displays a **Map Service** generated with information provided by Portugal.

Data Access

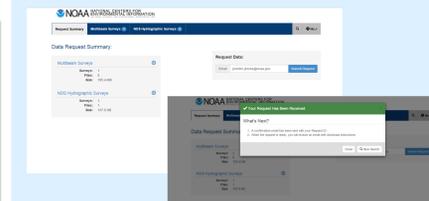
NCEI Extract System (NEXT): NCEI stewards far more data than can be kept on disk, so we must provide access to data from our robotic tape archive for delivery to users. Retrieving data from tape is not instantaneous, so NCEI developed a data extract and processing system called NEXT.



STEP 1: Select data of interest from Web Map Application and create a data request.



STEP 2: Refine and finalize order.



STEP 3: The map application sends this data request, along with the requestor's email, to the NEXT system, which verifies the request is well-formed and queues the work in the processing system.



STEP 4: NEXT then returns the user a link to monitor the status of the request. Behind the scenes, the NEXT system queries a catalog to locate the data matching the request; retrieves the data from the robotic tape library, file system, or database; retrieves associated metadata; and potentially reformats data to meet the user's requirements.



STEP 5: When the retrieval and preparation are complete, NEXT notifies the user via email and includes a URL for pickup of the data package.

By making data more accessible, NCEI extends the use of, and therefore the value of, marine geophysical data.

Working together, we can ensure that valuable data are made available to the broadest community.

For access to map services and viewers at NCEI, visit <http://maps.ngdc.noaa.gov/viewers>