




Marine Spatial Data Infrastructure

-- *An Overview* --

Presentation of behalf of Maureen Kenny
Chair, IHO Marine Spatial Data Infrastructure Working Group
Gerd Glang, Captain, NOAA
NOAA National Ocean Service
Office of Coast Survey

Definition

Spatial Data Infrastructure

- Used to summarize
 - *activities*
 - *processes*
 - *relationships*
 - *physical entities*
 - that provide for integrated management of
 - *spatial data*
 - *information, and*
 - *services*
 - Promotes geospatial data sharing and facilitates data use
- 

Definition

Spatial Data Infrastructure

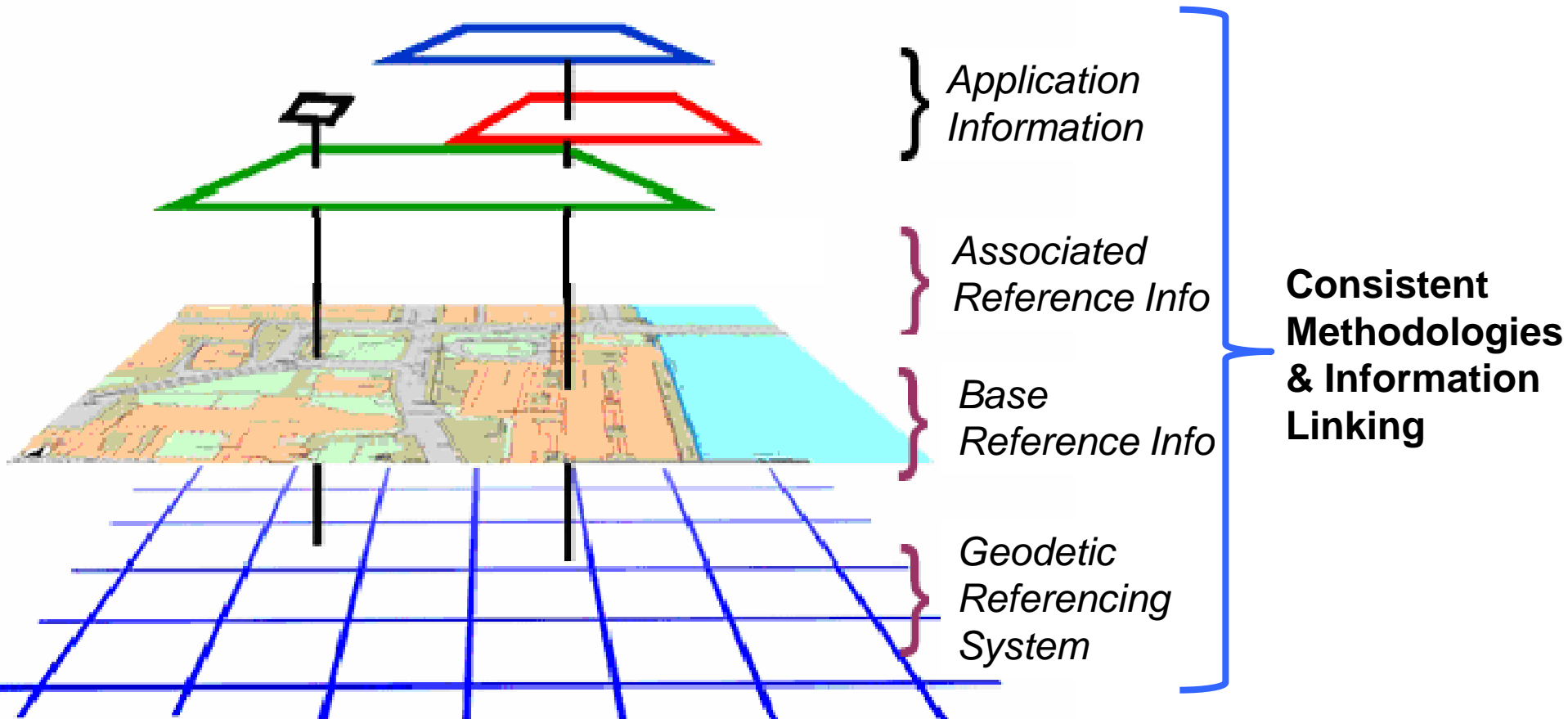
- SDI provides infrastructure for digital data
 - *Distributed across many repositories*
 - *Managed by different organizations*
 - Common set of standards and policies for
 - *Data*
 - *Metadata*
 - *Data quality*
 - Provides for
 - *Distribution*
 - *Coordinate transformation*
- 

What Constitutes an SDI

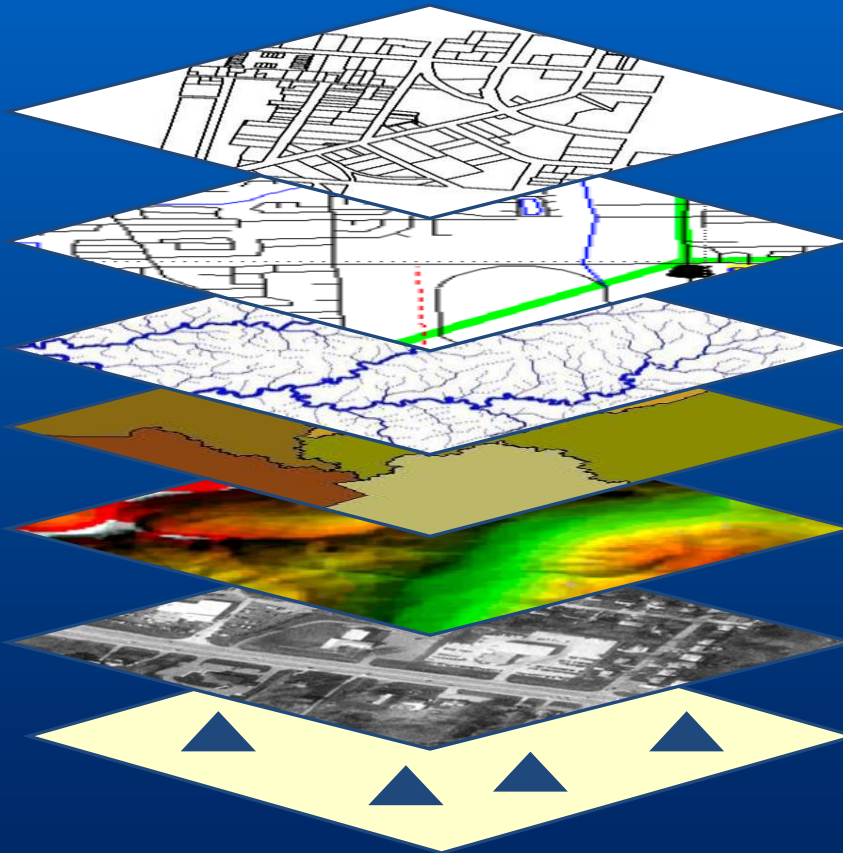


- Policy
 - Defines need to create information that is interoperable
- People and Organizations
 - Willingness
 - Cooperation
- Essential building blocks
 - Standards
 - Technology
 - Metadata
- Information/Data

Information in an SDI



Examples of Base Information



Land Ownership

Transportation

Surface Waters

Boundaries

Elevation/**Bathymetry**

Aerial Imagery

Geodetic Control



Benefits of supporting a MSDI to Hydrographic Organizations

- Wider use of hydrographic data
- Reduce data acquisition duplication

SURVEY ONCE, USE MANY TIMES

- Cost savings, effective use of funds
- Common reference data
- Facilitates cooperation with other information providers
- Improved decision making, such as...

Coastal Management

Watersheds

NOAA Portland Harbor Watershed Database & Mapping Project IMS Site - Microsoft Internet Explorer

Address: <http://mapping.orr.noaa.gov/website/portland/viewer.htm>

NOAA Coastal Protection & Restoration Division
Portland Harbor Watershed Database & Mapping Project

Pick A Location To Zoom To: Zoom to...

Navigation: Zoom In, Zoom Out, Zoom Full Extent, Zoom Active Layer, Zoom Last Extent, Pan, Analyze, Identify, Query, Find, Measure, Set Units, Buffer, Select Items, Select By Rectangle, Select By Line/Polygon, Clear Selection, Misc., Print, Hotlink, Additional Site Help

GIS Layers:

- Planned Round 2 Sediment and Benthic Data
 - LWG FSP Sediment Locations 20040603
- Query Manager Surface Sediment and Tissue
 - Surface Sediment - Logistic Regression Model
- Query Manager Surface Sediment: Metals
 - SOG Pair Arsenic PPM TEC-PEC
 - SOG Pair Cadmium PPM TEC-PEC
 - SOG Pair Chromium - total PPM TEC-PEC
 - SOG Pair Copper PPM TEC-PEC
 - SOG Pair Lead PPM TEC-PEC
 - SOG Pair Mercury PPM TEC-PEC
 - SOG Pair Nickel PPM TEC-PEC
 - SOG Pair Zinc PPM TEC-PEC
- Query Manager Surface Sediment: PAH
- Query Manager Surface Sediment: PCB and
- Property
 - Dock Structures
 - Source Taxlots
 - Waterfront Taxlots
- Outfalls
 - Creek Outfalls
 - City-outfalls
- Transportation
- Hydrology
- Early Action Sites
 - T-4 Early Action Site Boundary
 - McCormick and Baxter Cap Footprint

Map: 7626776.1, 698706.2 -- Image: 245, 400 -- ScaleFactor: 27.984252142418967

NOAA Restoration Center - Microsoft Internet Explorer

Address: http://sharpfind.nmfs.noaa.gov/website/RC_Mapper/map.aspx?cmd=1&state_abr=FL&project_id=3&official_project_name=someproject

NOAA Restoration Center Project Mapper

Zoom to State: ----- Zoom to Region or Estuary of Interest: ----- 1: 17990

LayerList Legend

- All Layers
 - Habitat Conservation
 - RC Restoration Projects
 - Administrative
 - Transportation
 - Management Areas
 - Hydrography
 - Background Imagery
 - USGS Landsat (30m)
 - B/W Imagery DOQQ (1m)(Ter
 - USGS Topo Quad (TerraServe
 - Urban Areas Imagery (0.3m)(
 - Index and Coverage ST

Refresh Map
 Auto Refresh

Help:
A closed group, click to open.
An open group, click to close.
A hidden group/layer, click to make visible.
A visible group/layer, click to hide.
A visible layer, but not at this scale.
A partially visible group, click to make visible.
An inactive layer, click to make active.

Latitude: DD Longitude: DD

View Location Submit Cancel

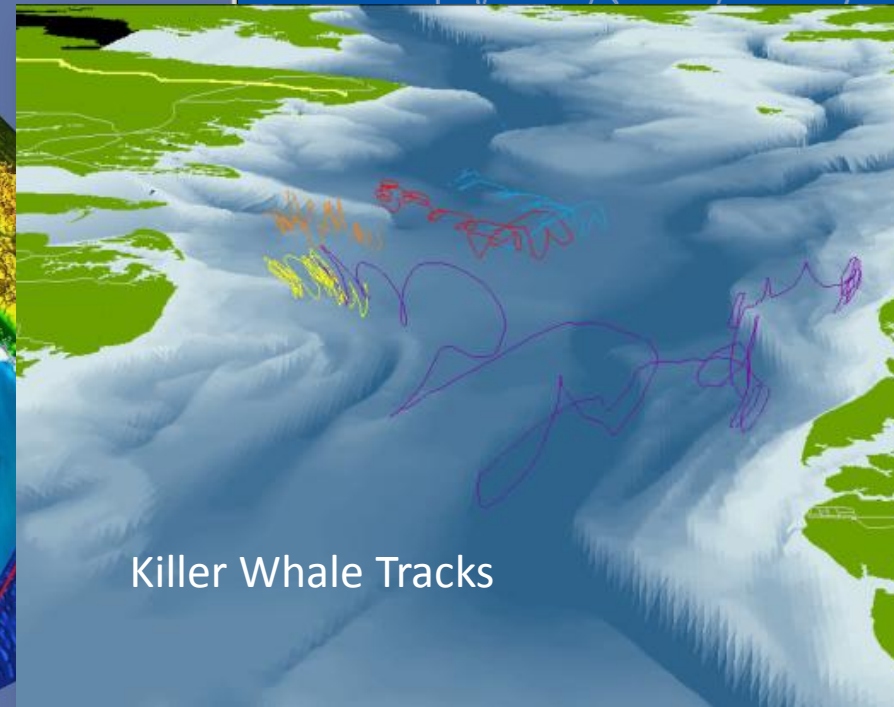
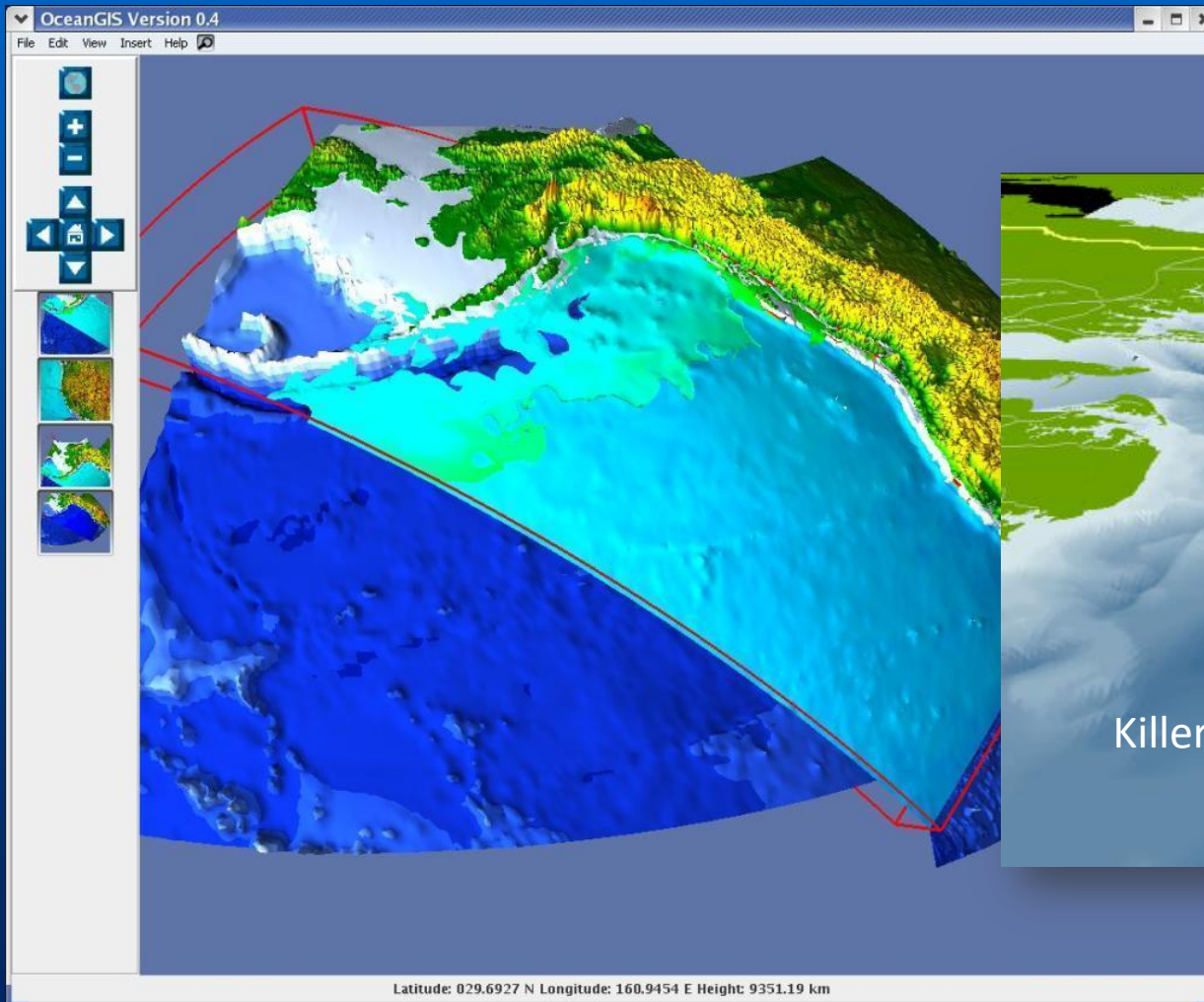
Home | Help | Contact Us
Privacy Statement | Disclaimer

Latitude = -82.70259

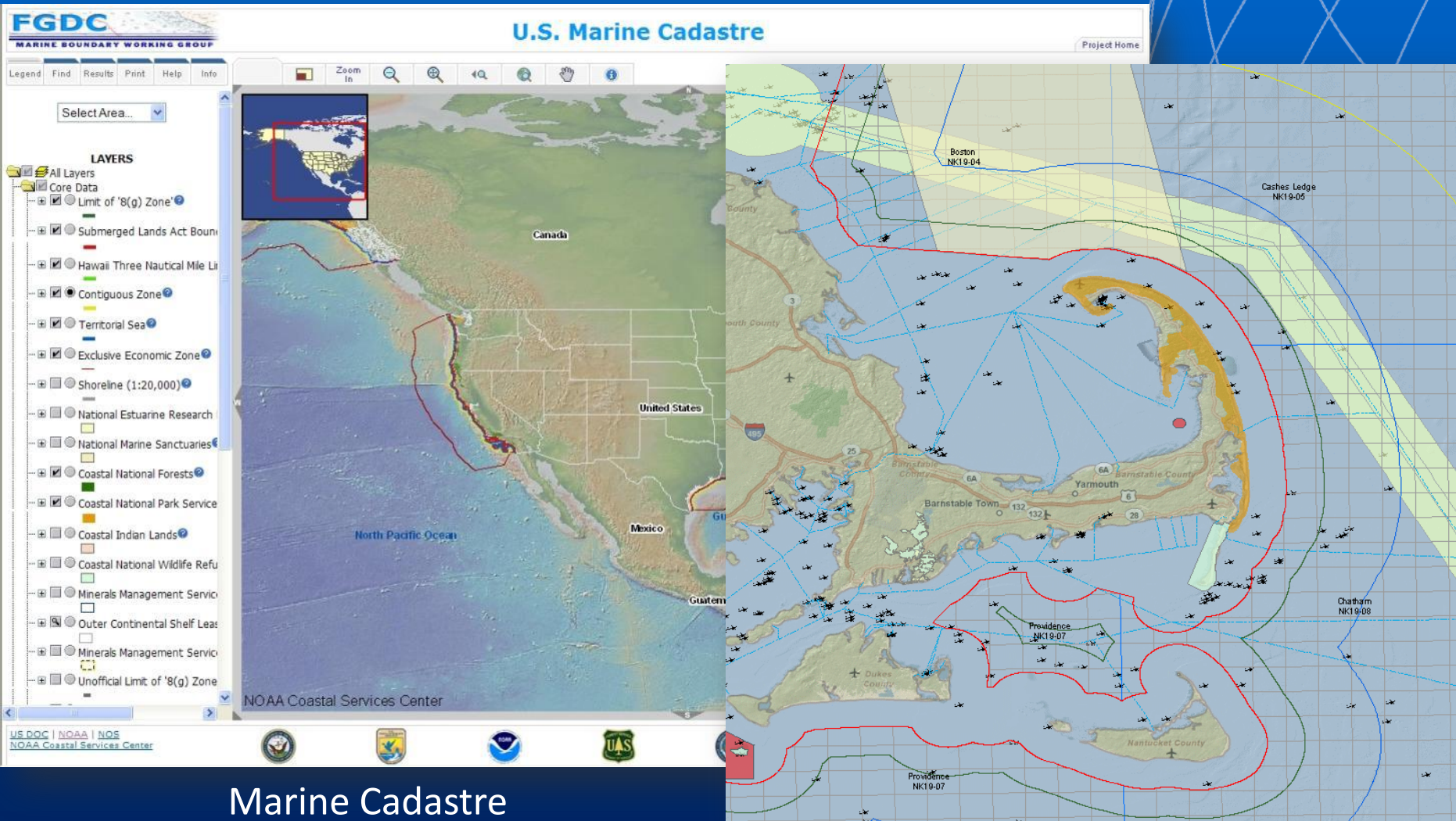
Restoration Sites

Fisheries Management

Tracking of Fish Stocks/Marine Mammals



Alternative Energy Development on the Outer Continental Shelf



Marine Cadastre

Hazards Mapping

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
MARINE DEBRIS PROGRAM

Gulf of Mexico MARINE DEBRIS PROJECT

NAVIGATION: Zoom In, Zoom Out, Previous, Full Extent, Pan

OTHER TOOLS: Identify, Map Tips

OUTPUT: Print Map, Download

DATASETS

- Debris Locations
- Estimated Clearance Depth
- Removal - Completed
- Survey - Completed
- Survey - Proposed
- Sediment Samples
- Buoys
- Lighted Buoys

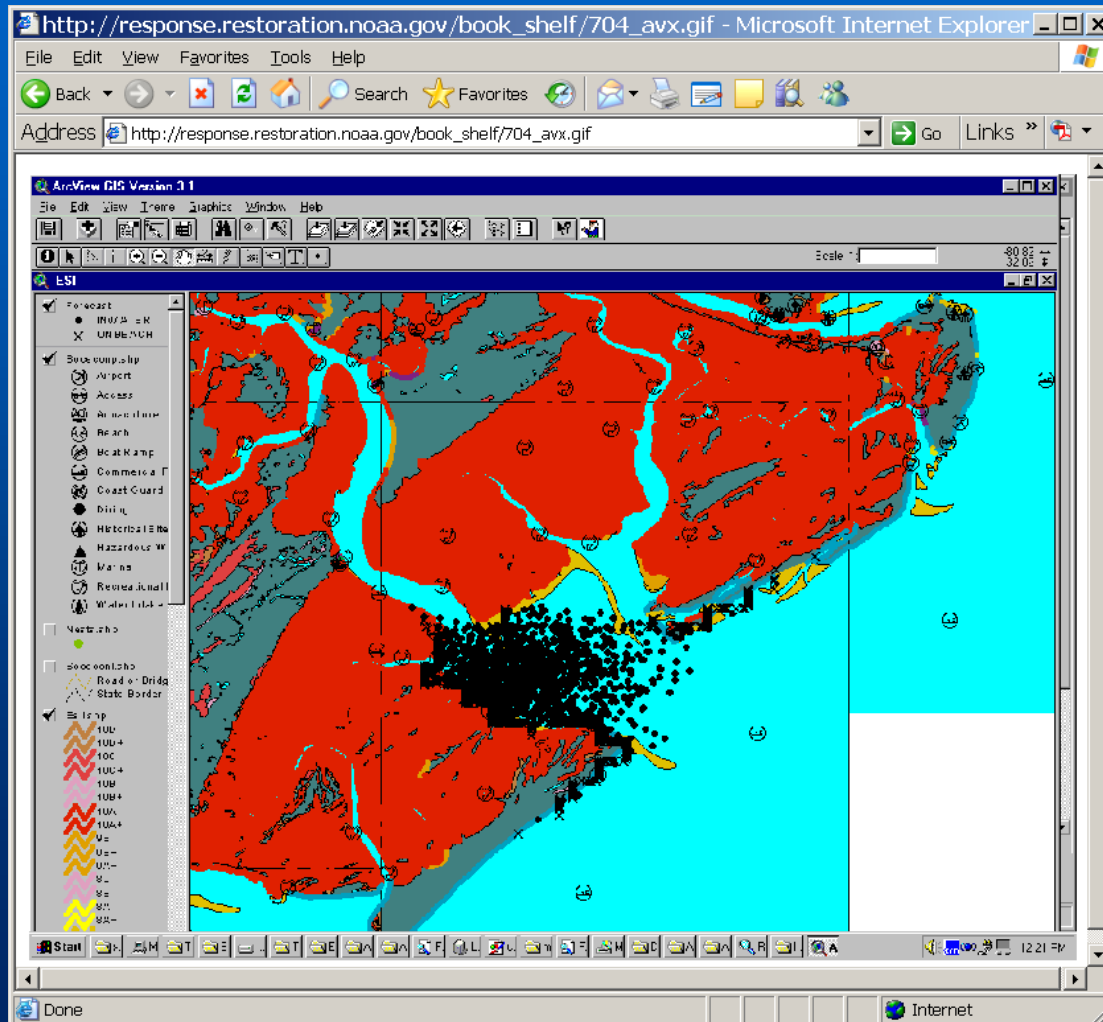
Refresh Map, Auto Refresh

Help: A visible dataset, click to hide. A visible dataset, but not at this scale. The entire dataset.

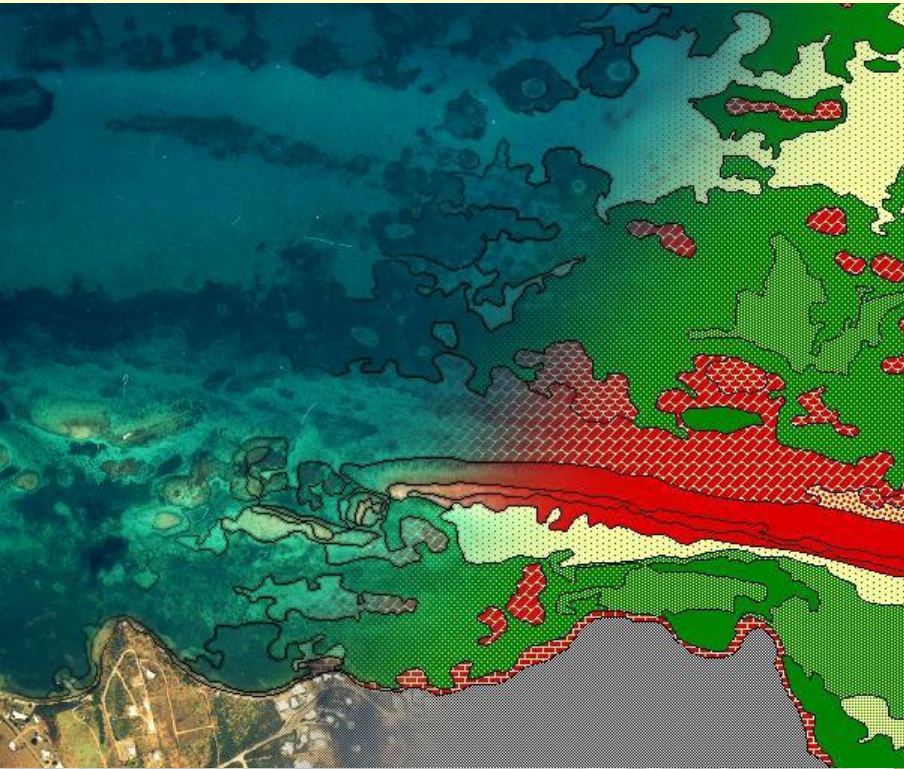
Diamondhead, Bay of St. Louis, Bay St. Louis, Biloxi, Gulfport, Long Beach, Pass Christian, Ocean Springs, Gulf Park Estates, Gulf of Mexico

Post-Katrina Marine Debris Interactive Map

Oil Spill Tracking



Mapping Benthic Habitats



Habitat Maps



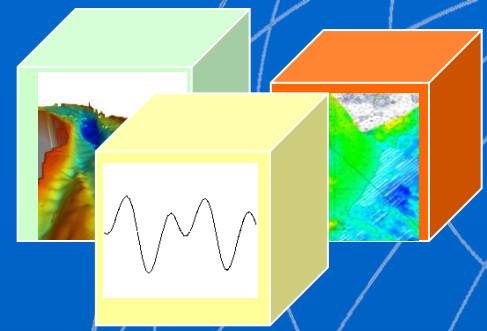
Ecosystem Monitoring

Challenges

- Developing joint policy approaches with other organizations
- Investing in improved business processes/ information management
- Difficulty by non-marine community to understand marine SDI components
- Resources
- Gathering support for SDI activities from decision makers and budget managers
- Ensuring correct knowledge, skills, and training

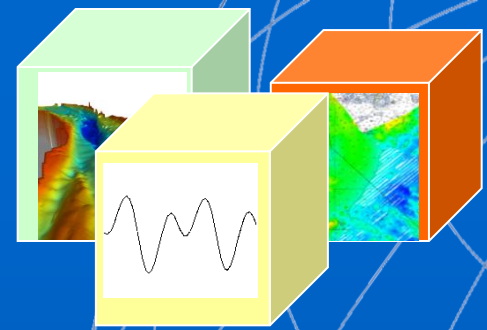


Working Toward a MSDI



- Identify data holders/service providers
- Determine user requirements
 - Used to determine formats for distribution, metadata required, data needs, areas for focus*
- Develop road map for SDI implementation
- Develop policies
- Establish support and engagement

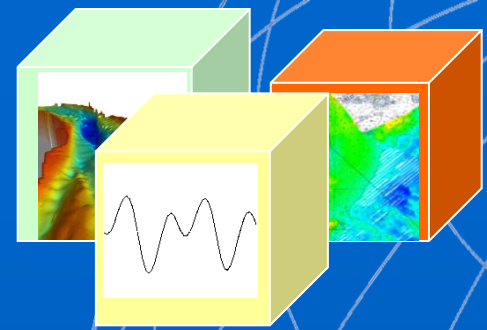
Working Toward a MSDI



Ensure necessary skills and knowledge available

- Identify existing data that you are authorized to distribute (focus on base data and digital data first)
- Capture non-digital data of interest by scanning or vectorizing at original scale
- Establish data access levels
 - *Internal vs. external, Government vs. public*
 - *Cost vs. free of charge*
 - *Full data set vs. data thinning or gridding*

Working Toward a MSDI



- Create metadata if doesn't exist, ensure appropriate information included
 - Characterize data, facilitate discovery, use standards to ensure interoperability*
- Enable search of metadata on Website or through portal for spatial data
- Make data available
 - Initially could be by ftp, or mail on media*
 - Preferably, via automated search and download*
 - Later move to Web mapping/features services*

Examples of MSDI at Work

ENC Direct to GIS

NOAA ENC Direct to GIS Select a Port or Marine Sanctuary to Zoom to: Map Services More Info @ Send Email

ENC GIS DATA

- Approach/Harbor ENC GIS Data
- Coastal ENC GIS Data
- General ENC GIS Data
- Overview ENC GIS Data
- Base Map

Initial View (Default Layers)

Auto Refresh

Layer List Help:
Click on layer names for definition and metadata.

- A closed group, click to open.
- An open group, click to close.
- A map layer.
- A hidden group/layer, click to make visible.
- A visible group/layer, click to hide.
- A visible layer, but not at this scale.
- A partially visible group, click to make visible.
- An inactive layer, click to make active.
- The active layer.

THIS PRODUCT IS NOT FOR NAVIGATIONAL USE.

<http://nauticalcharts.noaa.gov/Staff/gisintro.htm>

ENC Direct to GIS

NOAA **ENC Direct to GIS** Select a Port or Marine Sanctuary to Zoom to: Map Services More Info @ Send Email

ENC GIS DATA

- Approach/Harbor ENC GIS Data
- Aids to Navigation
- Caution
- Cultural Features
- Depth
- Harbor Installations
- Infrastructure
- Metadata
- Natural Features
- Regulated Area
- Time Varying Objects
- Coastal ENC GIS Data
- General ENC GIS Data
- Overview ENC GIS Data
- Base Map

Auto Refresh

Layer List Help:

Download all or specified layers in .shp files and other user selectable formats

Overview Map On
Zoom In
Zoom Out
Full Extent
Zoom Last
Pan
Identify
Find
Query
Select By Rectangle
Clear
Extract

Punta Guayanes
Playa de Guayanes
Area foul with rocks and coral
Punta Yaguajay
Virgin Passage and Sound
Mar Caribe
Puerto Rico and Virgin Islands
Puerto Maunabo
Punta Yaguajay

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755.2

CMSP Data Registry



Coastal and Marine Spatial Planning Data Registry

National Oceanic and Atmospheric Administration

Data Registry Help

NOAA's Coastal and Marine Spatial Planning (CMSP) Data Registry is a collection of Web-accessible NOAA geospatial data deemed essential for local, regional, or national-level CMSP processes. Registry data sets are provided in a variety of formats accessible for download, and many can be easily previewed using ESRI's new ArcGIS.com map viewer.

Mashup Check off the box below for data mash-up

▼ Elevation, Bathymetry, and Shoreline

▼ Jurisdictional Boundaries and Limits

▼ Marine Transportation, Infrastructure, and Obstructions

▼ Living Marine Resources

▼ Human Uses (Commercial, Recreational, and Industrial)

▼ Coastal Population and Socioeconomic Data

▼ Ocean Observations Data

Data Registry Help

What does Mashup mean?

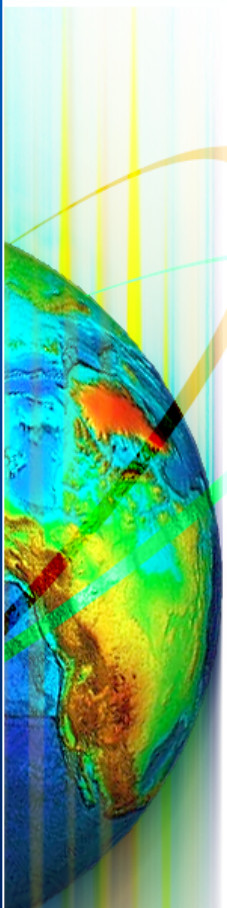
This button allows the user to view multiple registry datasets simultaneously in the ArcGIS.com viewer. Simply, check the checkboxes for the desired datasets, and click the "Mashup" button.

What does mean?

This button takes the user to the Web mapping application for the dataset, if such an application exists.

What does mean?

This button allows the user to view the dataset in the ArcGIS.com viewer. The ArcGIS.com Web site provides a gateway to your online GIS experience, and is intended to be a useful destination for anyone - GIS professionals, Web developers, and those that want to view maps, or create



CMSP Data Registry

Selection from Map (multiple layers)
ESRI's ArcGIS.com Map Viewer
REST Servers
Web Mapping Services
KML
Download Data
View Metadata

Coastal Planning Data Registry
Administration

Coastal Planning (CMSP) Data Registry is a collection of Web-accessible NOAA geospatial data deemed coastal-level CMSP processes. Registry data sets are provided in a variety of formats accessible for viewing using ESRI's new ArcGIS.com map viewer.

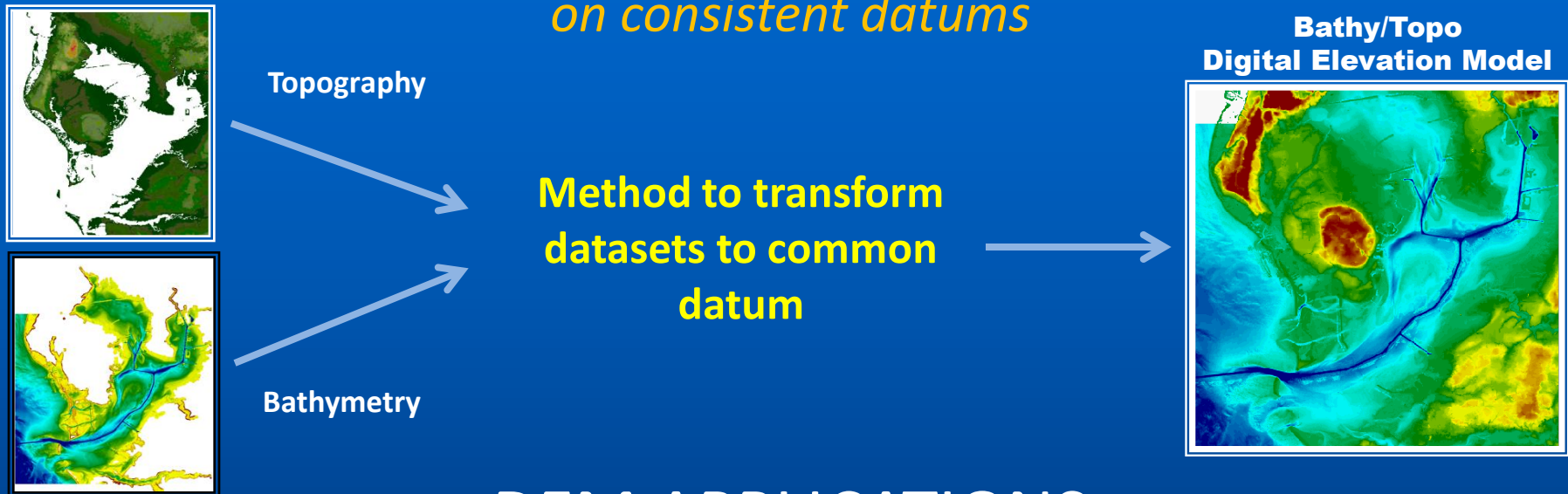
data mash-up

- ▶ Elevation, Bathymetry, and Shoreline
- ▼ Jurisdictional Boundaries and Limits
- ▲ Marine Transportation, Infrastructure, and Obstructions
 - map app .com REST WMS KML data metadata
 - map app .com REST WMS KML data metadata
 - map app .com REST WMS KML data metadata
 - map app .com REST WMS KML data metadata
 - map app .com REST WMS KML data metadata
 - map app .com REST WMS KML data metadata
 - map app .com REST WMS KML data metadata
- ▼ Living Marine Resources
- ▼ Human Uses (Commercial, Recreational, and Industrial)
- ▼ Coastal Population and Socioeconomic Data
- ▼ Ocean Observations Data

Raster Nautical Charts
Anchorage Areas
Marine Collision Regulation Lines
Precautionary Areas for Navigation
Restricted Areas
Dredge Disposal Areas Affecting Navigation
Shipping Lanes

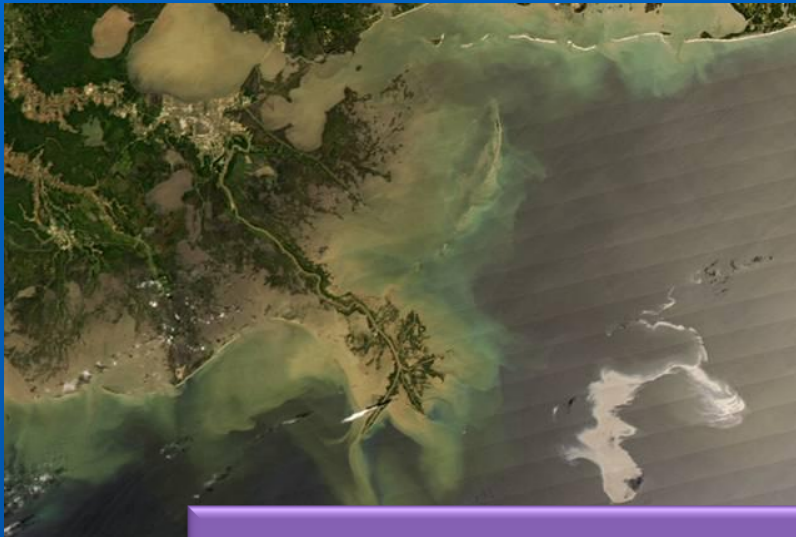
Digital Elevation Models

*Possible because of bathymetric/topographic datasets
on consistent datums*



DEM APPLICATIONS

- Inundation modeling for storm surge, tsunamis, and sea level rise
- Erosion, accretion, re-nourishment
- Analyzing storm impacts
- Determining setback lines
- Determining local, state, and national boundaries
- Navigation products and services
- Habitat restoration
- Shoreline change analysis
- Analyzing environmental and natural resources
- Permitting



Environmental Response Management Application (ERMA)

*Web-based GIS system supporting environmental
response efforts and operations*

- developed by NOAA as pilot project in 2008
- expanded for use in Haiti after earthquake
- full operations for Gulf Oil Spill



Site Basics

Readily accessible via web browsers

Initially secure access, then expanded to public

Data from multiple federal agencies & academia

Incident Information

- Trajectories
- Asset tracking
- Field team locations
- Shoreline cleanup and assessment data
- Sample collection & results

Real-Time Feed

- Weather, buoys, ship tracking, etc.

Background Layers

- Nautical charts
- Aerial, terrain, roads

Resources at Risk

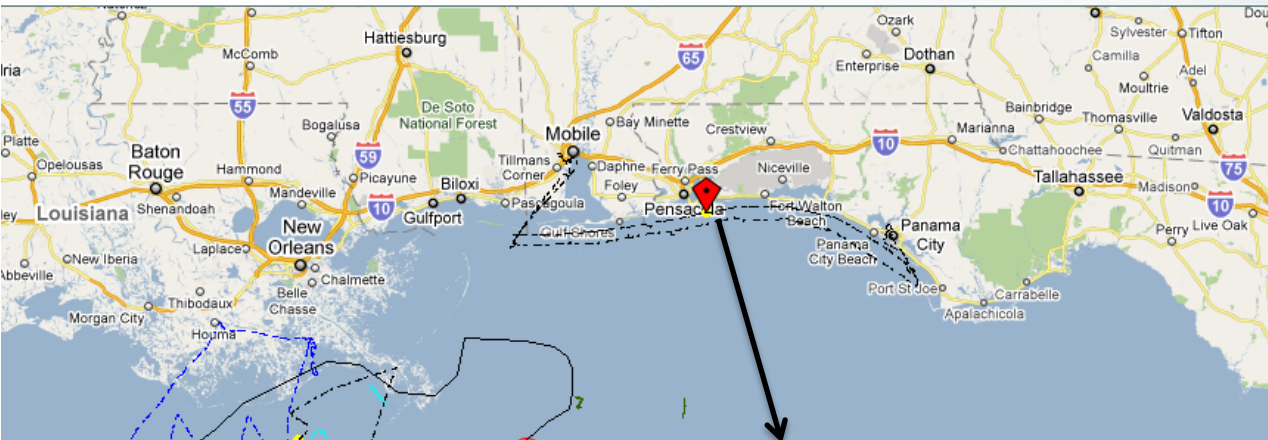
- Shoreline information
- Local habitat and species datasets
- Fisheries Closures

Document & Photo Links

- Field Photos
- External links

Overflight oil observations and photos uploaded

ERMA | Environmental Response Management Application
Gulf of Mexico



Houma overflight symbology test for 8-1-2010
 No oil observed during overflight

Oil Observations 08-01-2010 1155-1300hrs CDT

- Heavy Oiling
- Medium Oiling
- Light Oiling
- No Oil Observed

Observer Comments Mobile 08-01-2010 0905-1430 hrs CDT

- Heavy Oiling
- Medium Oiling
- Light Oiling
- No Oil Observed

Mobile Overflight Photos 8-01-2010

Deepwater Horizon MC 252 Incident Gulf o...

Location



Deepwater Horizon MC252 Incident Gulf of Mexico at 30.299317 -87.05048955
 Photo taken at 8/1/2010 1:19:48 PM by NOAA
 Patch of silver sheen (5m x 50m)

st 2010 1201 CDT
 st 2010 0615 CDT

Coastal Response Research Center
 ©2007 - 2010 University of New Hampshire

POWERED BY Google
 Scale: 1: 3M
 US DOC | NOAA | NDS | NOAA Office of Respons
 Disclaimer | Privacy policy | Email comments

Subsurface monitoring data displayed

ERMA | Environmental Response Management Application Gulf of Mexico

Deepwater Horizon MC 252 Incident

Snare Monitoring Sites

- Snare Base Sites

Sentinel Snare Oiling - Top as of 08-10-10

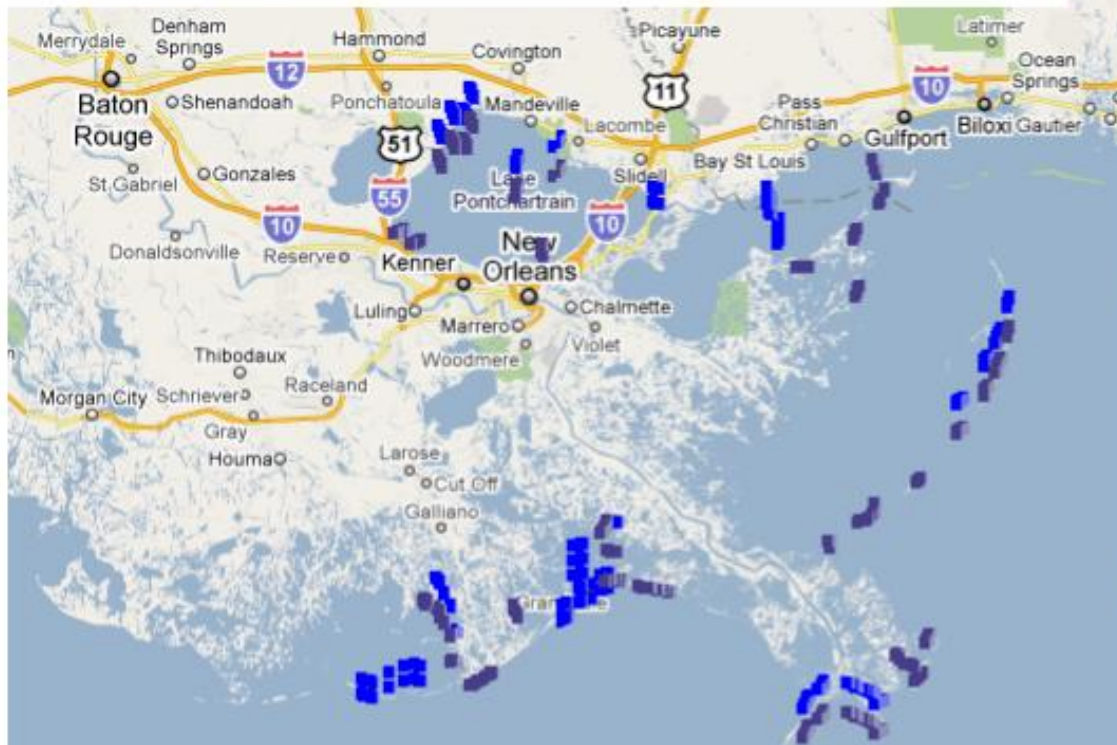
- Heavy Oiling
- Medium Oiling
- Light Oiling
- No Oil Observed
- Not Checked

Sentinel Snare Oiling - Middle as of 08-10-10

- Heavy Oiling
- Medium Oiling
- Light Oiling
- No Oil Observed
- Not Checked

Sentinel Snare Oiling - Bottom as of 08-10-10

- Heavy Oiling
- Medium Oiling
- Light Oiling
- No Oil Observed
- Not Checked



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Date: Sunday, August 15, 2010 2:44:16 PM



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Newly acquired imagery printed with shoreline impacts

ERMA | Environmental Response Management Application
Gulf of Mexico

Deepwater Horizon MC 252 Incident

2010-06-02 (Telascience)

8-11-10 Shoreline SCAT Oiling Ground Observations

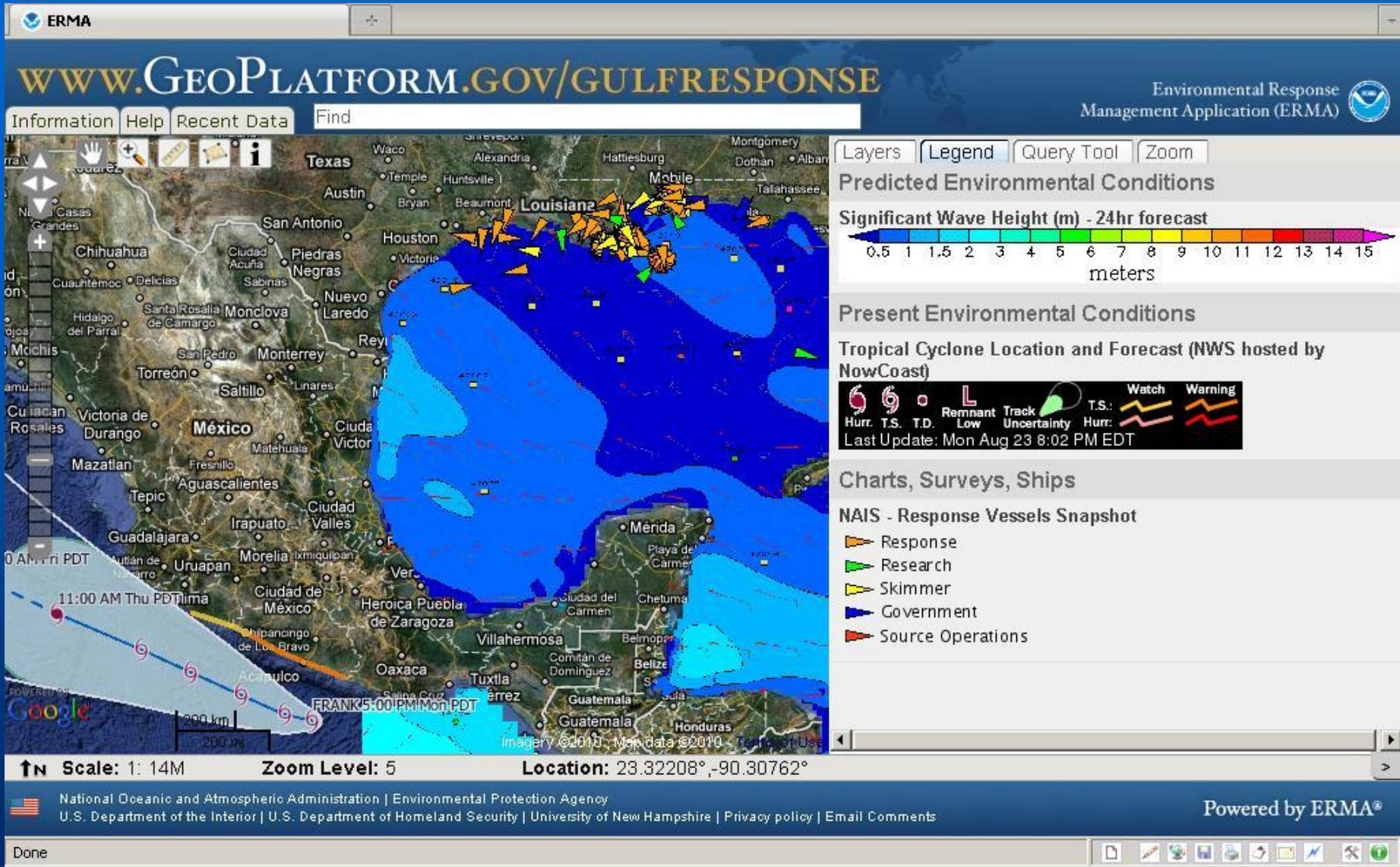
-  Heavy Oiling
-  Moderate Oiling
-  Light Oiling
-  Very Light Oiling
-  Heavy Tarballs
-  Moderate Tarballs
-  Light Tarballs
-  Negligible Tarballs
-  No Oil Observed



Something was needed for the general public

 Printed by: Michele Jacobi
Date: Sunday, August 15, 2010 3:35:00 PM

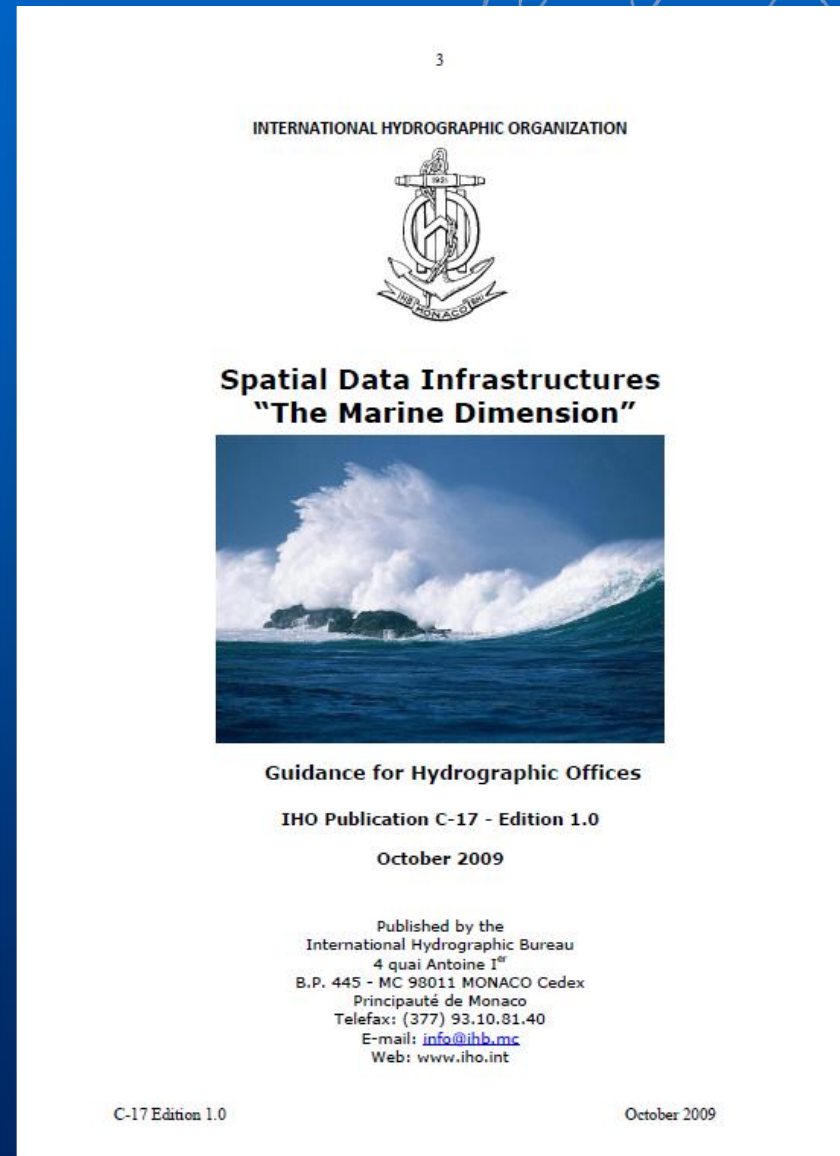
Public display of response asset locations and weather feeds



3.4 million hits first day of release

Resources

- *IHO SDI Guide for Hydrographic Offices*
 - Benefits
 - Definition
 - Getting ready for SDI
 - Making it happen
 - SDIs in perspective
- *Also Provides*
 - Frequently Asked Questions
 - Stakeholders List
 - Hydro Data Policy Best Practice Guidelines for HOs
 - SDI Awareness Training Course Template



Resources

- GSDI (Global SDI Association)
 - *The SDI Cookbook*
- INSPIRE (Infrastructure for Spatial Information in the European Community)
- FGDC (U.S. Federal Geographic Data Committee)
- IHO Baltic Sea Hydrographic Commission
(Established Baltic Sea MSDI Working Group)



IHO Marine Spatial Data Infrastructure Working Group

Updated Terms of Reference

- Monitor national and international SDI activities (focus marine)
- Liaise with appropriate groups to discuss efforts
- Identify and recommend possible solutions to significant technical issues related to interoperability looking at:
 - Datum issues
 - S-100 interoperability
- Identify IHO capacity building requirements



Correspondence Group

IHO Web Site: www.iho.int

Standards and Publications C-17

Spatial Data Infrastructures

“The Marine Dimension”

Guidance for Hydrographic Offices



SDI Needs to Address Datum Transformations

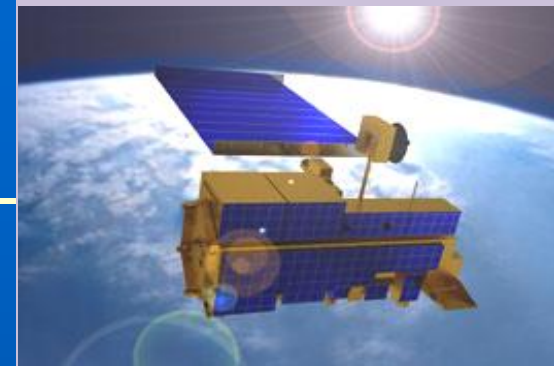
There are a many different vertical datums in use

Relationship of vertical datums for Tampa Bay:

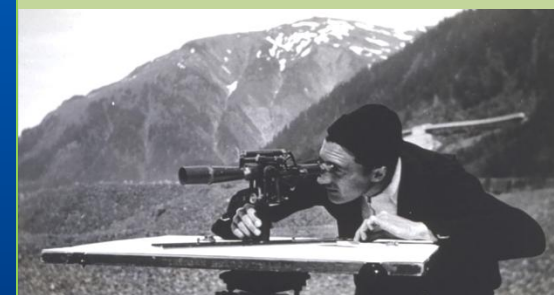
86.39 ft	WGS 84 (G873)	26.33 m
81.33 ft	NAD 83 (NSRS)	24.79 m
0.792 ft	MHHW	0.241 m
0.409 ft	MHW	0.125 m
0.0 ft	NAVD 88	0.0 m
-0.535 ft	LMSL	-0.163 m
-0.850 ft	NGVD 29	-0.259 m
-1.495 ft	MLW	-0.456 m
-1.919 ft	MLLW	-0.585 m

For elevation data sets to be blended together they must be referenced to same vertical datum.

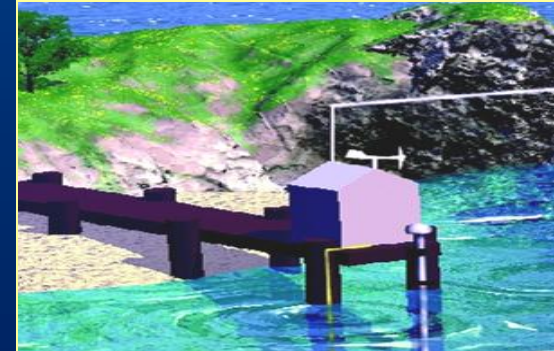
Ellipsoid Datums



Orthometric Datums



Tidal Datums



NOAA Map-Based Web Portal to Real-Time Coastal Observations & NOAA Forecasts

noaa's **nowCOAST**
Web Mapping Portal to Real-Time Coastal Observations and NOAA Forecasts

More Information ? Show Instructions @ Send Email

1) LOCATION → 2) INFORMATION → 3) VARIABLE → 4) TIME → 5) **GO**

-Select Location- -Select Map Layer- -Select Variable- -Real Time-

Map Layers Display Active
Active Layer: Meteorological

Observations:

- Meteorological
- Oceanographic
- River
- Water Quality
- Weather Radars
- Boundary Layer Profiles
- Upper Air Soundings
- HF Radar Surface Currents
- Web Cameras

Predictions:

- Astronomical Tidal

Forecast Model Guidance:

- Meteorological
- Oceanographic
- River

Refresh Map Automatically

refresh map

Map Tools tool help Use the Map Tools below to navigate the map manually or retrieve information about feature in the nowCOAST database.

Active Tool: Zoom In

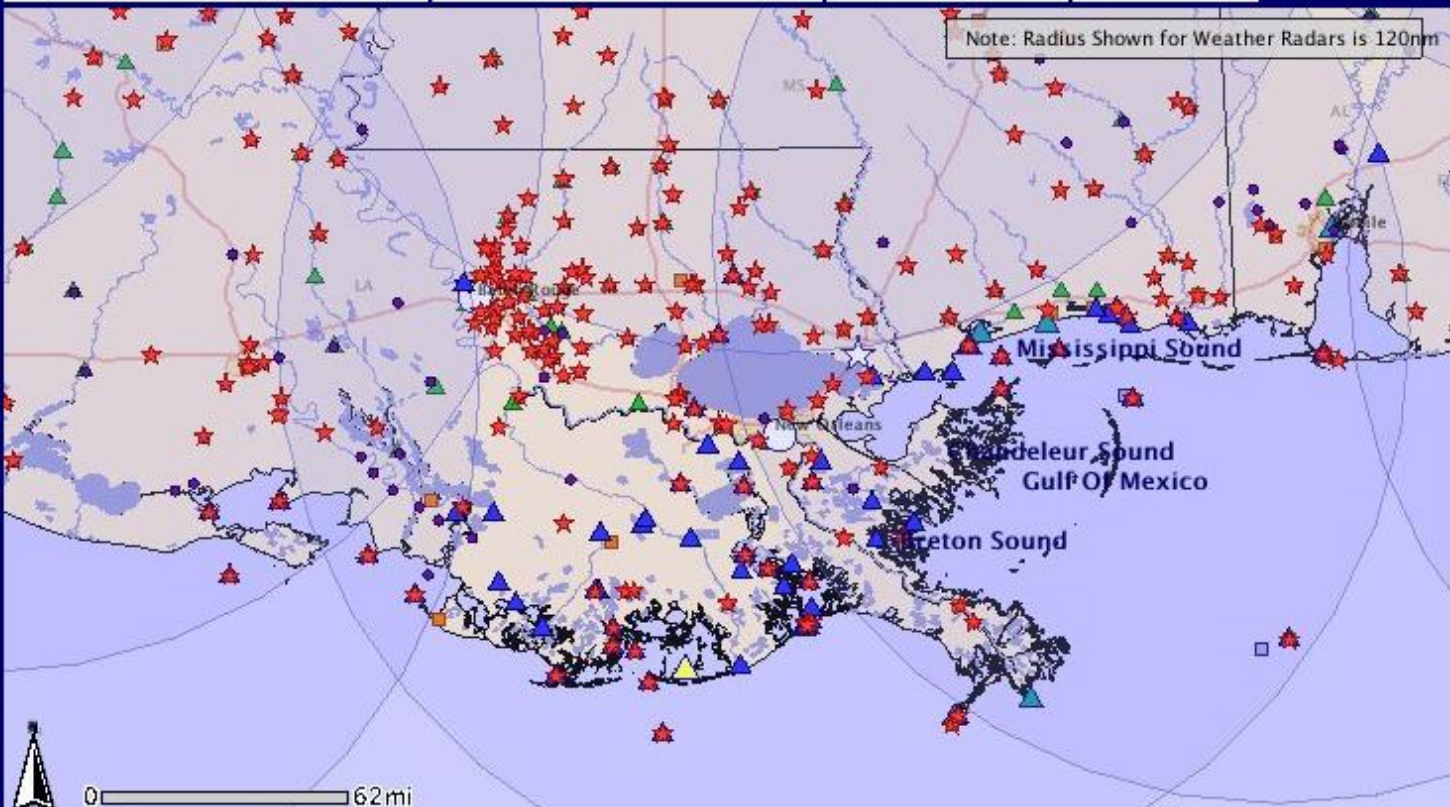
Zoom In Zoom Out Pan Select by Rectangle Identify Print Link to Data
Full Extent Zoom Last Zoom to Lat/Lon Clear Selected Open Databrowser Query

DOC > NOAA > NOS > Privacy Policy

meteorological, oceanographic, & river observations
from national and regionally operated networks as well as NOAA
(NOS & NWS) forecasts for U.S. coastal areas.

1) LOCATION → 2) INFORMATION → 3) VARIABLE → 4) TIME → 5)

Current Extent | -River | -Select Variable- | -Real Time-



Map Layers Display

Active Layer: River

Observations:

- Meteorological
- Oceanographic
- River
- Water Quality
- Weather Radars
- Boundary Layer Profiles
- Upper Air Soundings
- HF Radar Surface Currents
- Web Cameras

Predictions:

- Astronomical Tidal

Forecast Model Guidance:

- Meteorological
- Oceanographic
- River

Refresh Map Automatically

Map Tools [tool](#) [help](#)

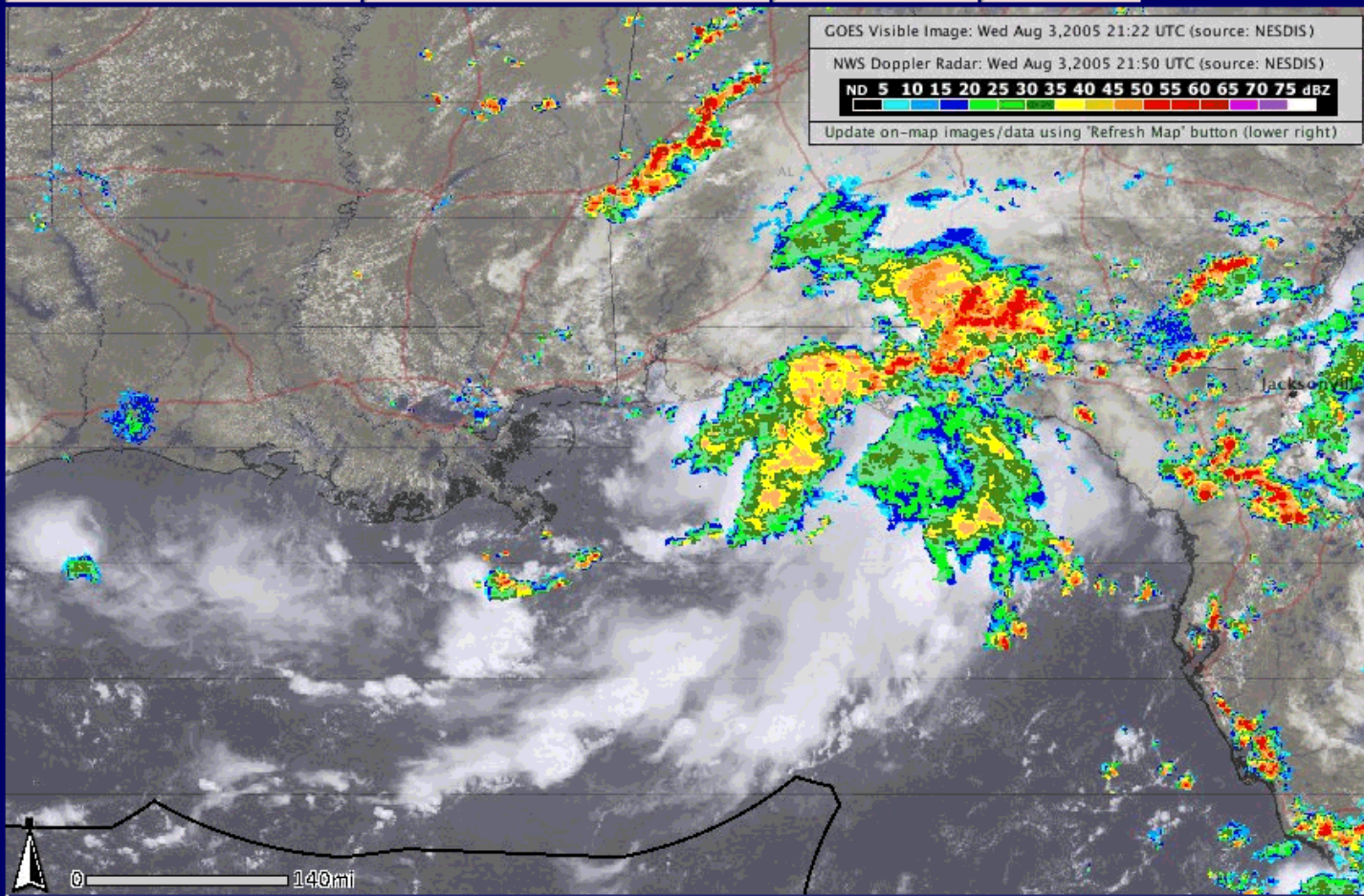
The Zoom In/Out and Pan tools are used to navigate the map to a particular scale and location. After selecting location, use the Map Layers list to toggle on and off individual layers, then use the Link to Data tool to click on a station or forecast point to display data.

-
-
-
-
-



1) LOCATION → 2) INFORMATION → 3) VARIABLE → 4) TIME → 5) **GO**

-Select Location- | - Meteorological | -Select Variable- | -Real Time- |



Map Layers Controls: Display Active

Active Layer: Air Temp
(Click on individual layer names below for more info on each)

On-Map Data, Imagery, Forecasts:

- Observations - In-Situ Stations:**
- Meteorological Obs Composite
 - 76** Air Temp
 - Wind
 - 10** Barometric Pressure
- Observations - Remote Sensors:**
- Doppler Radar Composite
 - GOES Visible Satellite

Geo-Referenced Links:

- Observations - In-Situ Stations:**
- Meteorological
 - Oceanographic
 - River
 - Water Quality
- Observations - Remote Sensors:**
- Weather Radars
 - Boundary Layer Profiles
 - Upper Air Soundings
 - HF Radar Surface Currents
 - Web Cameras

Predictions:

- Astronomical Tidal

refresh map

Refresh Map Automatically
[DOC](#) > [NOAA](#) > [NOS](#) > [OCS](#)
[Privacy Policy](#)

Map Tools [tool ? help](#)

The Zoom In/Out and Pan tools are used to navigate the map to a particular scale and location. After selecting location, use the Map Layers list to toggle on and off individual layers, then use the Link to Data tool to click on a station or forecast point to display data.

Active Tool: Pan