

ERMA

DeepWater Response

A CASE STUDY IN OPEN SOURCE
TOOLS IN DISASTER RESPONSE

OFFICE OF RESPONSE AND RESTORATION • NOAA's NATIONAL OCEAN SERVICE



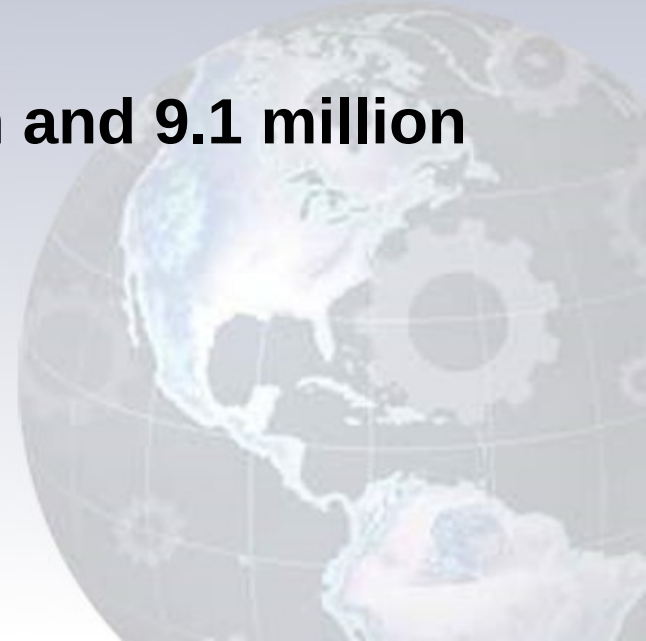
Aaron Racicot - Z-Pulley Inc.
aaronr@z-pulley.com

One Year Ago



Facts

- **11 men perished**
- **220 million gallons spilled (4.9 million barrels)**
- **587 miles of shoreline oiled**
- **1.74 million gallons of dispersant applied**
 - 669,000 subsurface
 - 1.05 million surface
- **400 controlled burns**
- **4.2 million feet of containment boom and 9.1 million feet of sorbent boom**



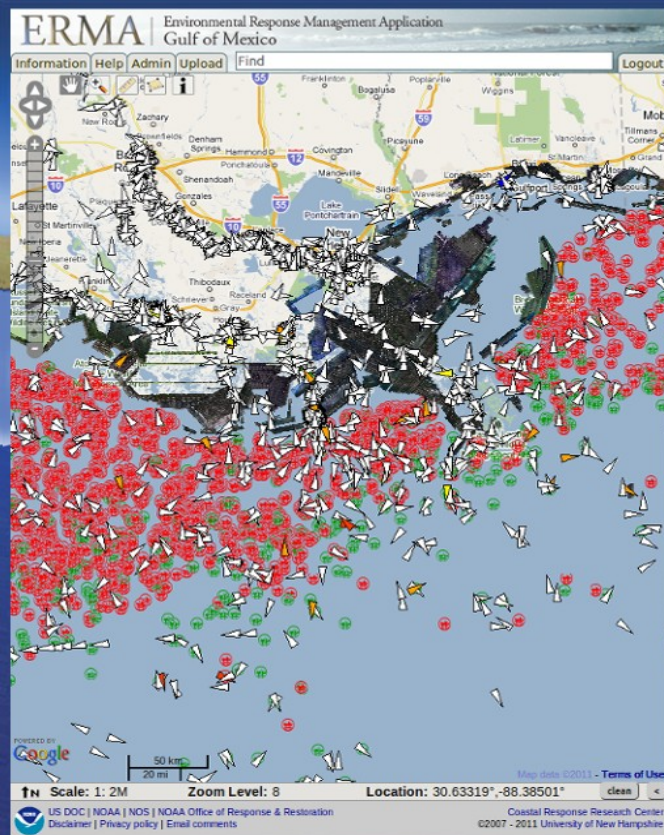
05/27/2010 - 09:17am CDT
Copyright 2010 Ocean Imaging Corp.

West

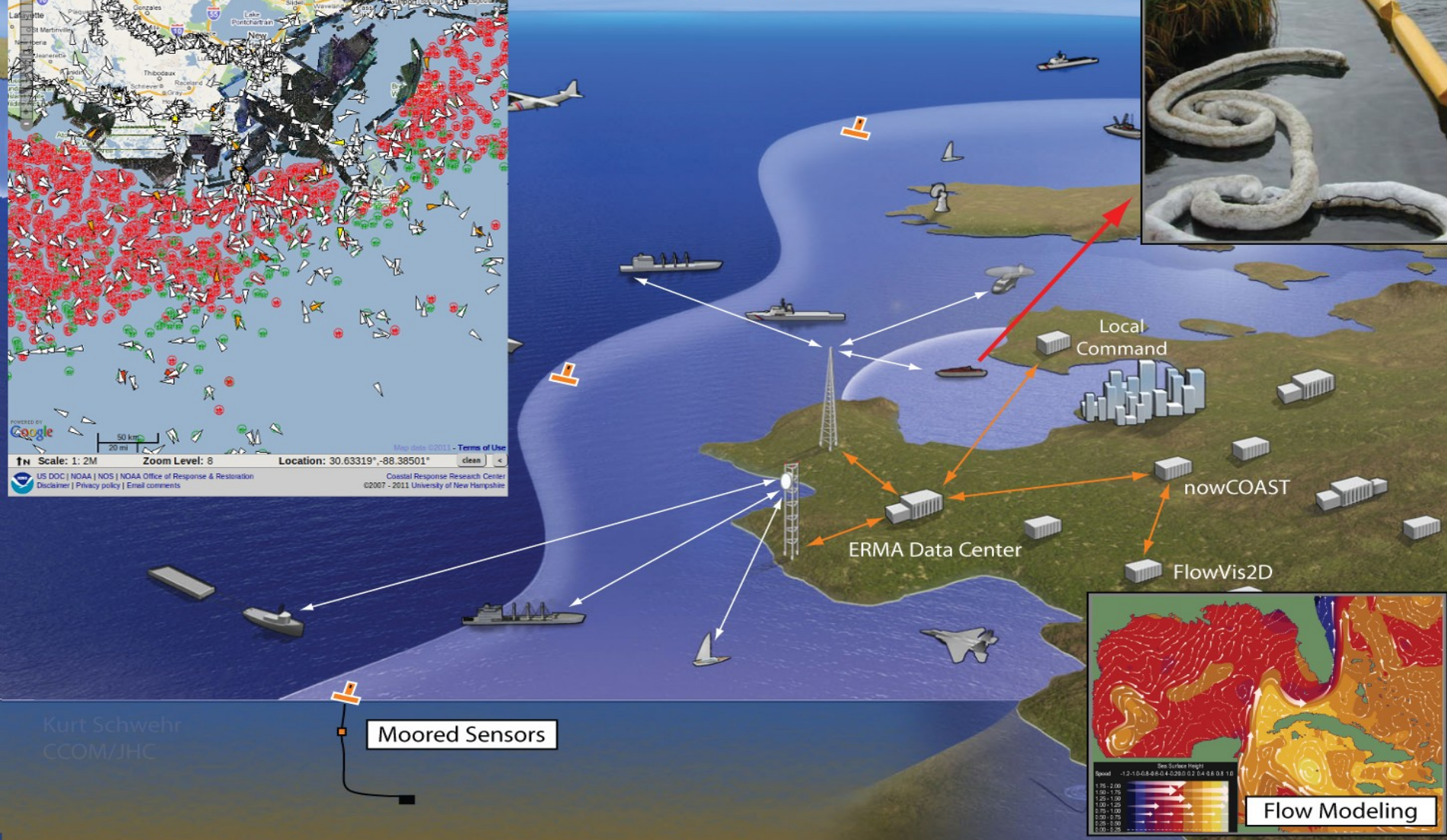
South

East





Environmental Response Management Application (ERMA)



History

2007:

- **Developed concept. Pilot site: Portsmouth Harbor, NH**

2008:

- **Tested in Industry-led PREP Drill**
- **National Responses Team □ EPA Region 2 funding for U.S. Caribbean ERMA**
- **Started discussions on Arctic ERMA**

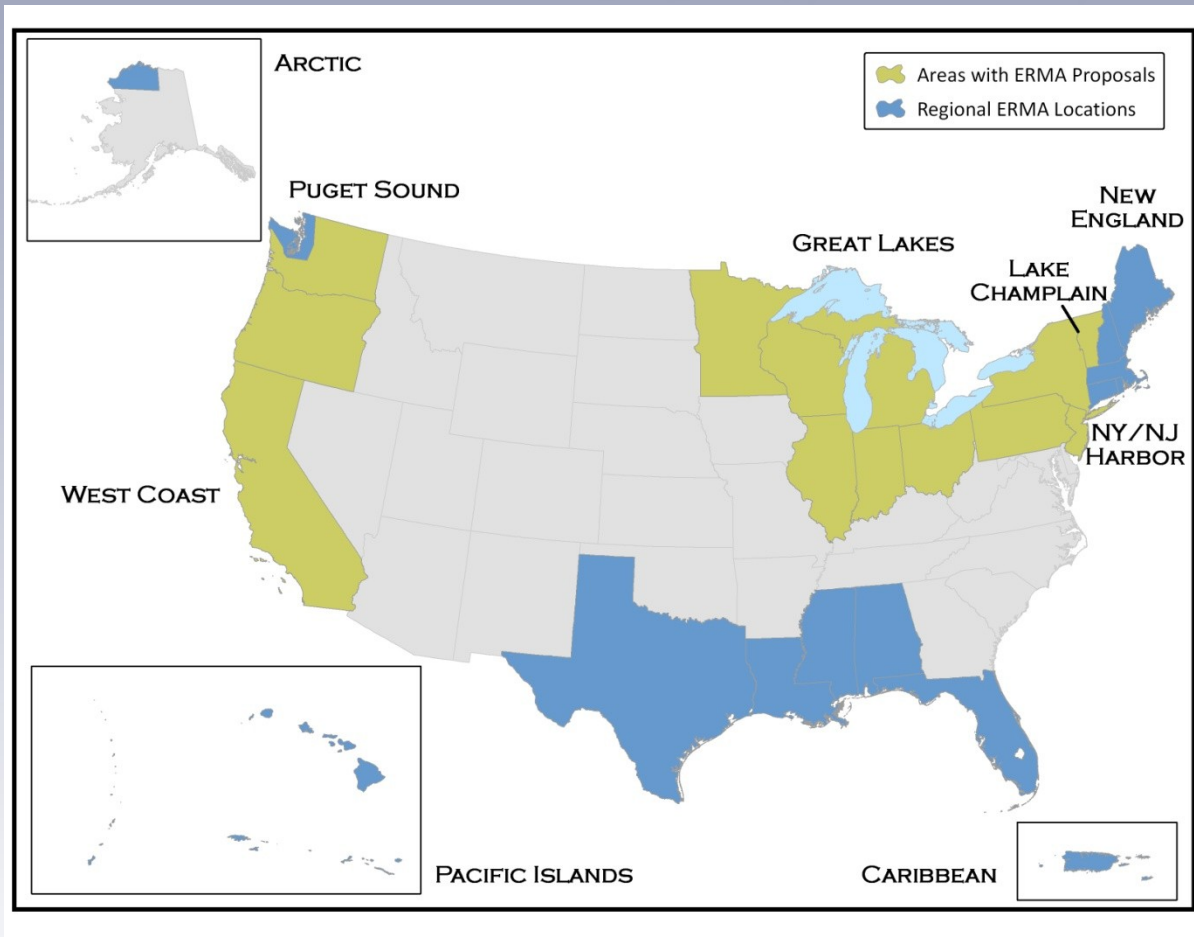
2009:

- **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 – Speed test standing-up an ERMA site**
- **April 20th, Deepwater Horizon Explosion**
- **April 22nd, NOAA Stood up the GOMEX ERMA**
- **April 24th, Demo of site in command center**
- **ADM Allen designated ERMA as the Common Operational Picture (COP) for the Deepwater Horizon Incident**

National Scope Regional Deployments



Responder ERMA


- Rapid deployment – Spill on April 20th 2010

From: Bob Ch...@unh.edu
To: Aaron Racicot <aaronr@z-pulley.com>
Subject: gomex.erma.unh.edu site
Date: Thu, 22 Apr 2010 15:57:42 -0400 (04/22/2010 12:57:42 PM)

Hi Aaron,

I just wanted to let you know that there is a new site setup on long.sr.unh.edu called gomex.erma.unh.edu. Michele said she might

- Scalable – 1400 users, 16,000 layers

 <https://gomex2.erma.unh.edu/erma.html#x=-86.36421&y=30.34918&z=11&layers=15958>

- Nimble – over 850 commits in last year

Changeset 669

Timestamp: 04/25/10 13:10:06 (12 months ago)
Author: aaron

Message: Rough notes for updating a mirror instance. Checking in so we can use it in gomex

Changeset 1531

Timestamp: 04/12/11 11:31:18 (7 days ago)
Author: rfsI

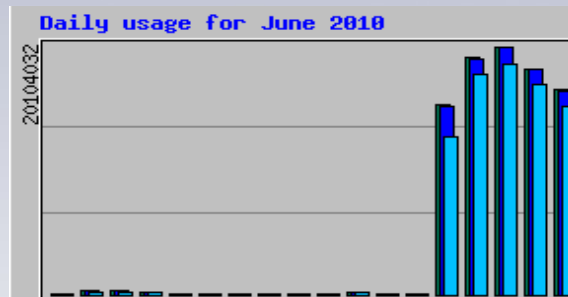
Message: Delete Layers code

Public ERMA

- First time access to information - AIS as example



- Scalable - over 20 million hits in 24 hours!



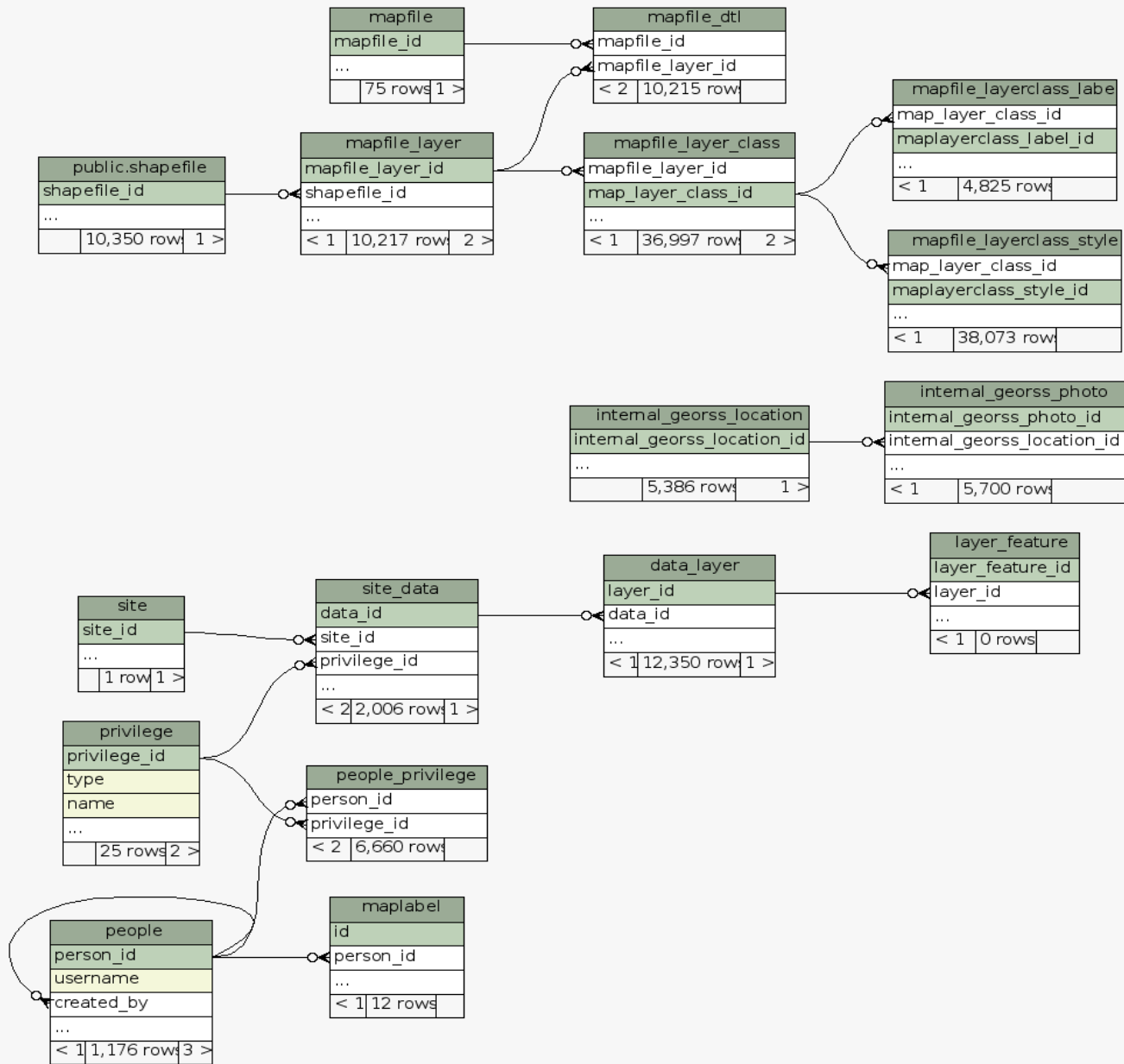
- Public!

WWW.GEOPLATFORM.GOV/GULFRESPONSE

Software Technology

- Open Source Top to Bottom
 - OpenLayers/jQuery
 - Mapserver/GDAL/OGR/Proj4
 - Mapnik
 - Django
 - ReportLab
 - PostgreSQL
 - PostGIS
 - Apache
 - Linux (Debian)
 - Etc. (many more)





Generated by SchemaSpy

Formats

- Open (and closed) Formats Top to Bottom
 - Ingest
 - Shapefile
 - GeoRSS
 - WMS
 - Export
 - Shapefile
 - Excel
 - CSV
 - PDF
 - KML



Styling

http://gomex-preview.sr.unh.edu/ERMA/LayerRecord?on_update=ERMA.reloadCONFIG;id=250

sys id 2509

last modified on 2010-05-31 00:00:00

description required

layer type required

parent group required

required user

display by default

metadata type: internal external if defined, metadata document opens when clicking layer name

gutter pixels

opacity % 0 - 100 or blank

single tile mode layer will be requested as a single large tile instead of many small tiles

background layer background layers will display above google map/open street map background

override legend

graphic override built in WMS legend graphic or georss marker graphic

display layer name in some legend icons already include a label

legend

map file ([edit](#)) [edit shapefile info](#)

refresh rate number of minutes for refresh, 0 or blank = no refresh

Document Upload for Layer TOC

http://gomex-preview.sr.unh.edu/ERMA/Map/MapLayer?mapfile_layer_id=1995;action=query

Layer Name

Layer Description

Use as Base Layer for Uploads

Shapefile [View Unassigned](#)

Type:

Symbol

Categorize Data By Field:

Field Information:

| Total Rows: | 1138 | | | | | | | | |
|--------------------------|---|-------|-------|-----------|-----|----------|----|-----|-----|
| Number of Unique Values: | 3 | | | | | | | | |
| Values: | <table border="1"> <thead> <tr> <th>Value</th> <th>Count</th> </tr> </thead> <tbody> <tr> <td>Displaced</td> <td>146</td> </tr> <tr> <td>On Beach</td> <td>71</td> </tr> <tr> <td>Set</td> <td>921</td> </tr> </tbody> </table> | Value | Count | Displaced | 146 | On Beach | 71 | Set | 921 |
| Value | Count | | | | | | | | |
| Displaced | 146 | | | | | | | | |
| On Beach | 71 | | | | | | | | |
| Set | 921 | | | | | | | | |

Min Scale to display layer

Max Scale to display layer

Label Items

Opacity (transparent) (opaque)

Mapfile:

Class Information ([new](#)) ([generate all classes with exact match](#))

| Name | Expression |
|-------------------|--|
| On Beach | On Beach edit /delete new style down |
| Symbol Size Color | OutlineColor #0000FF edit/delete |
| Set | Set edit /delete new style up down |
| Symbol Size Color | OutlineColor #00FF00 edit/delete |
| Displaced | Displaced edit /delete new style up |
| Symbol Size Color | OutlineColor #FF0000 edit/delete |

Languages

- Mix of the Old and New
 - Core server side lib in PERL
 - New code mostly in Python (Django)
 - Front end is all HTML with JS (jQuery)

AIS Ship Tracking Admin for GOMEX

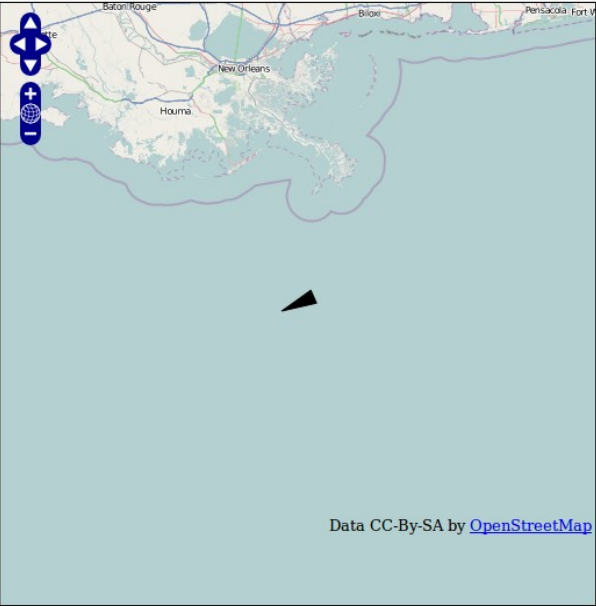
[Search](#) [New Vessel](#) [New Type](#)

DEVELOPMENT DRILLER3
[576281000](#)

- Response Class: Source Operations
- Cargo Type: 85
- [Edit this information](#) or [Delete this Ship](#)

Position

- Status: restricted maneuverability
- Speed: 0.1
- Course: 246
- Last Seen: 2011-05-09 05:48:45PM
7 minutes ago
- Location: 28.025, -89.562



Data CC-BY-SA by [OpenStreetMap](#)

AIS Admin Django App

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



Feeds

- ERMA is all about the feeds...
 - Many agencies (USGS, USCG, etc...)
 - Many hacked together on the fly during spill
 - Support box dedicated to hosting feeds
 - > 20 crons gathering data
 - All driven through PostGIS
 - AIS is special
 - Imagery partnership with Telascience
 - Helped process and host Aerial Imagery
 - Data varies from single points to layers with over 80,000 records (chemistry data etc)



The New...

- Cloud: We deployed a test instance for the Japan quake as an EC2 instance. Will continue to look at cloud deployments.
- Stand Alone ERMA: Laptop to be deployed off-site without Internet. First test will be in Caribbean next month.
- Refactor: Continued migration of code-base. This includes migrating to Git, continued leveraging of Django, and a steady move to Python.

- AWS Elastic Beanstalk
- Amazon S3
- Amazon EC2
- Amazon VPC
- Amazon CloudWatch
- Amazon Elastic MapReduce
- Amazon CloudFront
- AWS CloudFormation
- Amazon RDS
- Amazon SNS
- AWS IAM

Navigation

Region: US East (Virginia)

- EC2 Dashboard
- INSTANCES
 - Instances
 - Spot Requests
 - Reserved Instances
- IMAGES
 - AMIs
 - Bundle Tasks
- ELASTIC BLOCK STORE
 - Volumes
 - Snapshots
- NETWORKING & SECURITY
 - Security Groups
 - Elastic IPs
 - Placement Groups
 - Load Balancers
 - Key Pairs

My Instances

Launch Instance Instance Actions Show/Hide Refresh Help

Viewing: All Instances All Instance Types 1 to 1 of 1 Instances

| Name | Instance | AMI ID | Root Device | Type | Status | Security Groups | Key Pair Name | Monitoring | Virtualization | Placement Group |
|-------------------------------------|----------|--------|-------------|----------|---------|-----------------|----------------------|------------|----------------|-----------------|
| <input checked="" type="checkbox"/> | i- | ami- | ebs | m1.large | running | default | aaron-zlinux-office1 | basic | paravirtual | |

1 EC2 Instance selected

EC2 Instance: i-22f3024d

Description Monitoring Tags

Graphs are for 1 instance with basic monitoring enabled. Times are displayed in UTC. Time Range: Last Hour Refresh

Enable detailed monitoring for your Amazon EC2 instance to get these metrics at 1-minute frequency, plus additional metrics. [Learn more.](#) **Enable Detailed Monitoring**

Avg CPU Utilization (Percent)

Avg Disk Reads (Bytes)

Avg Disk Writes (Bytes)

Max Network In (Bytes)

Max Network Out (Bytes)

Instance Details

Instance Id: i-

State: **running**

i-

Monitoring: **disabled**

Reboot Terminate Console

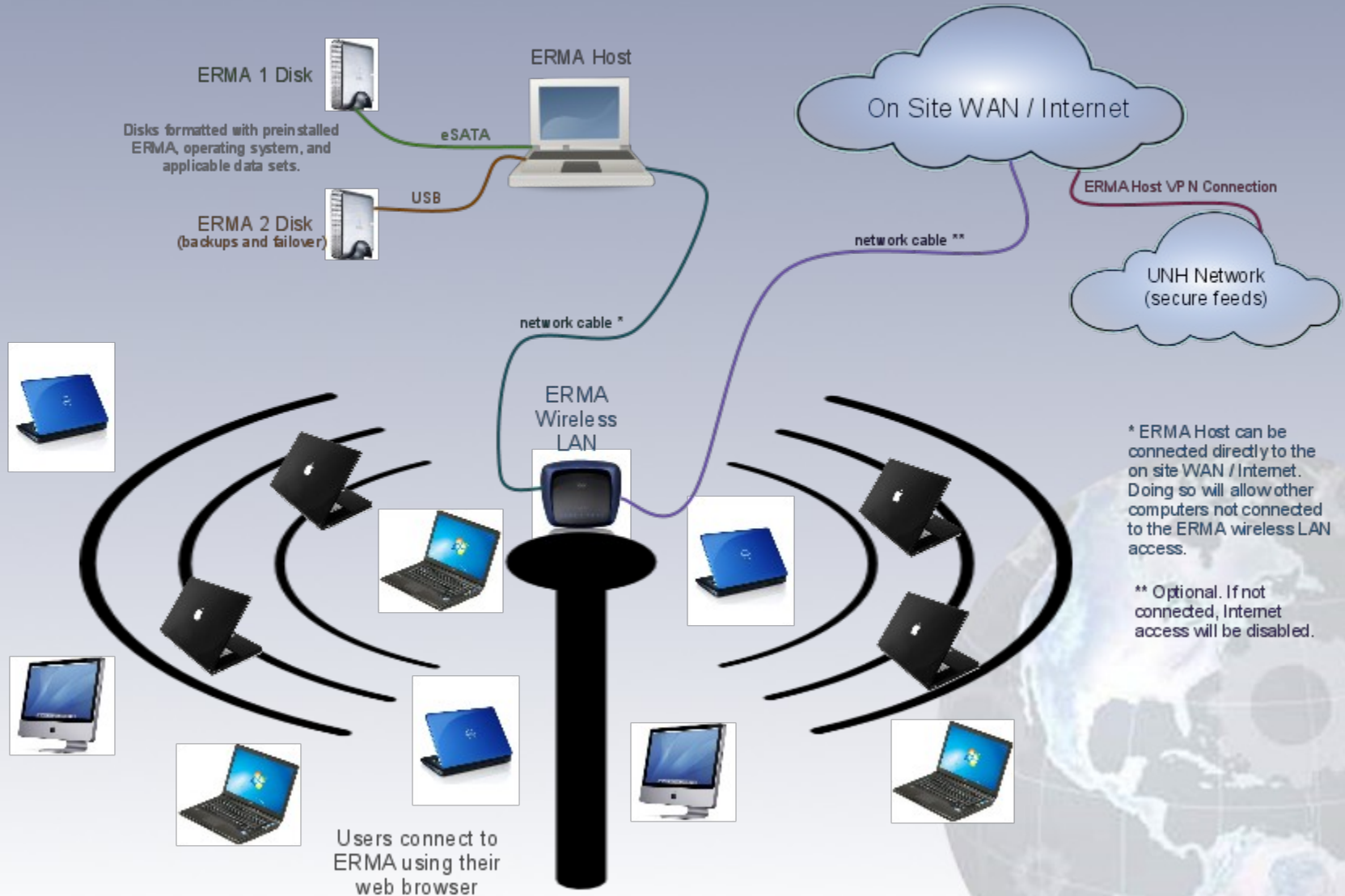
Start Stop Associate ElasticIp

Attach Volume Enable Monitoring SSH

CloudWatch Monitoring

Updated 05/09/11 03:42 PM

PORTABLE ERMA



* ERMA Host can be connected directly to the on site WAN / Internet. Doing so will allow other computers not connected to the ERMA wireless LAN access.

** Optional. If not connected, Internet access will be disabled.

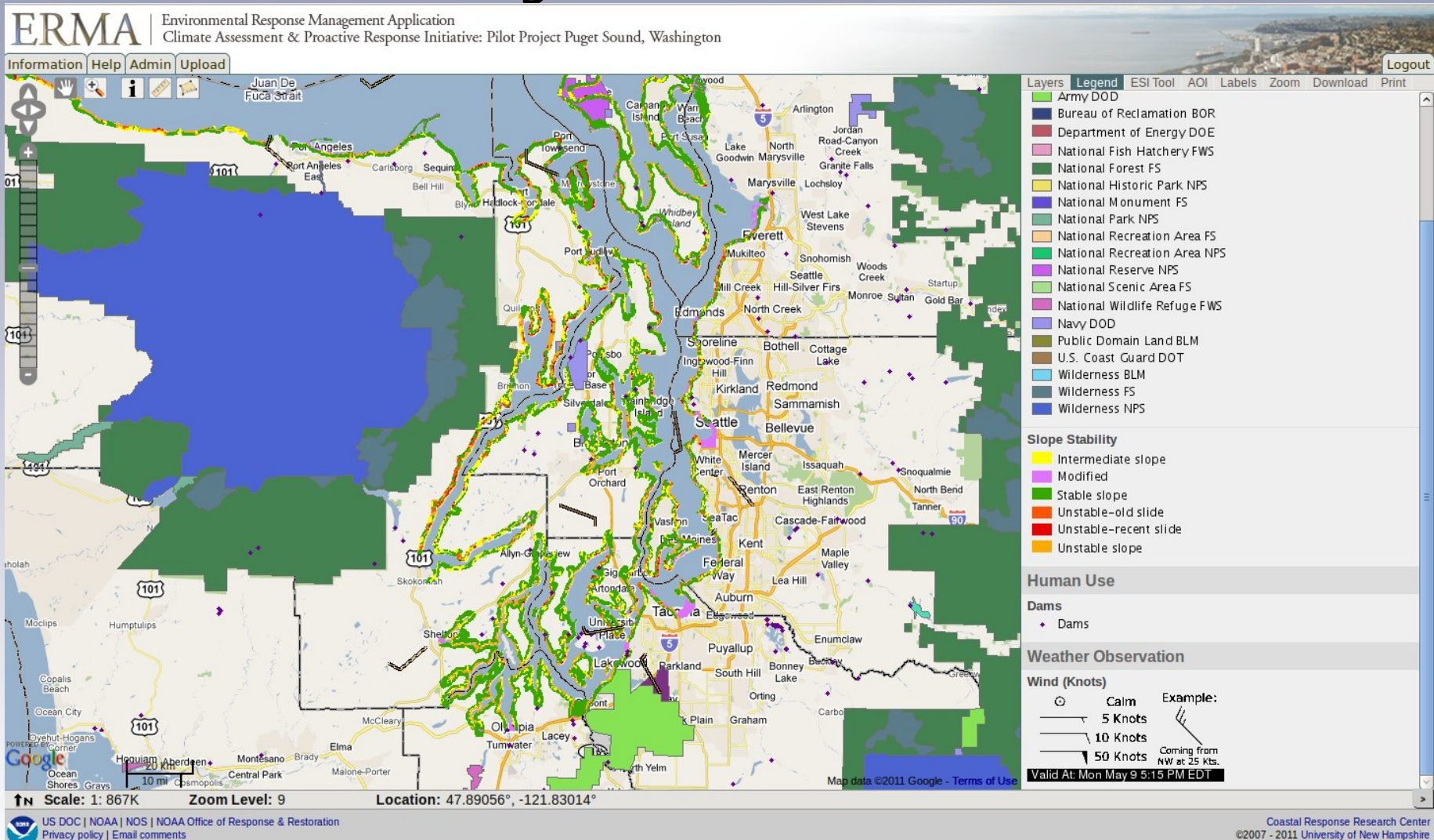
The Long Term New...

- Get ERMA to be more of a producer of data to the public... exporting feeds and not just consuming
- Creation of a true API to be able to drive ERMA from external apps (i.e. be able to push layers to ERMA from QGIS, Arc, or other authorized apps).
- Get National (and maybe even international) coverage
- Scaling... scaling... scaling.



Bringing it back home...

Puget Sound ERMA



•NOAA:

- Michele Jacobi
- George Graettinger
- Amy Merten
- Mark Miller
- Ben Shorr
- Kari Sheets

•Genwest Systems:

- Jill Bodnar
- Janet Matta
- JB Huyett
- Zach Winters-Staszak
- Hayley Pickus

•Development Team:

- Phillip Collins
- Robert St. Lawrence
- Kurt Schwehr
- Allison Bailey, SoundGIS
- Aaron Racicot, Z-Pulley
- Dane Springmeyer
- Chander Ganesan, OTG

Funding Sources: Coastal Response Research Center, US EPA Region II, U.S. Coast Guard, NOAA's Office of Response and Restoration and Coastal Storms Program

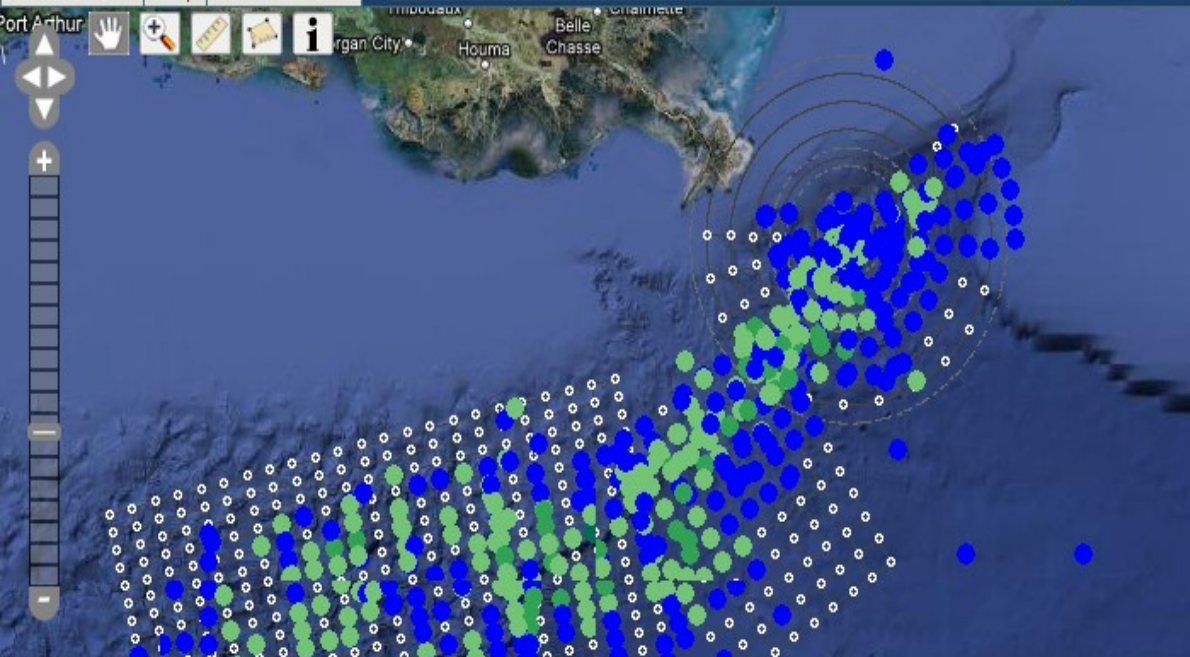


Subsurface Sampling Results

WWW.GEOPLATFORM.GOV/GULFRESPONSE

Environmental Response
Management Application (ERMA)

Information Help Recent Data Find



Layers Legend Query Tool Zoom

BP Deepwater Horizon Oil Spill

Wellhead Buffer
 Buffer distances from Wellhead

Subsurface Sampling Grid
 Subsurface Sampling Grid

Subsurface Sampling Points
 Subsurface Sampling Points

Wellhead Surface Location
 Wellhead

Cumulative Preliminary Subsurface DO Data (03-Aug-10 to 30-Sep-10)
 Background Level
 Weak, Very Weak (> 0 - 0.5 mg/l Below Background)

Identify

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

| gid | vessel | cruise_num | station_id | latitude | longitude | do_descrip | do_depth | date |
|-----|---------------|------------|------------|-----------|------------|------------|-------------|------------|
| 53 | Cape Hatteras | 2 | 049-02 | 28.275 | -88.56 | No Signal | | 2010-09-06 |
| 54 | Cape Hatteras | 2 | 049-01 | 28.274333 | -88.563333 | Moderate | | 2010-09-06 |
| 254 | Brooks McCall | 2 | BM187 | 28.221935 | -88.546965 | No Signal | | 2010-08-23 |
| 480 | Pisces | 1 | PC024 | 28.222 | -88.54667 | Moderate | 1060 + 1125 | 2010-08-09 |

POWERED BY Google
 Scale: 1: 3M
 National Oceanic and Atmospheric Administration
 U.S. Department of the Interior

Subsurface Sampling Grid

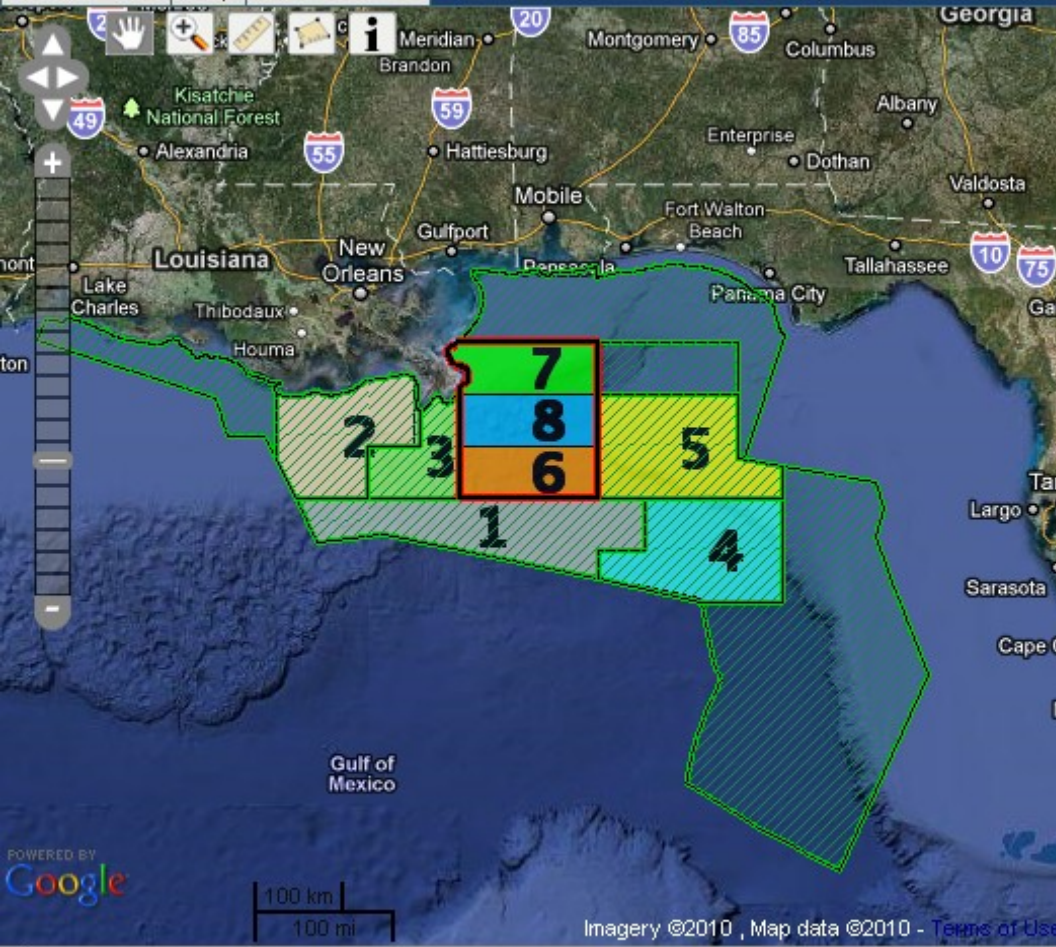
NMFS Fishery Closures & Re-Openings

WWW.GEOPLATFORM.GOV/GULFRESPONSE

Environmental Response
Management Application (ERMA)



Information Help Recent Data Find



Layers Legend Query Tool Zoom

BP Deepwater Horizon Oil Spill

Tentative Sequence of Remaining Sampling Within the Federal Closures as of 10/14/2010

- Area 2: Re-Opened as of 10/01/2010
- Area 1: Re-Opened on 09/21/2010
- Area 5: Re-Opened as of 10/22/2010
- Area 3: Re-Opened as of 10/05/2010
- Area 4: Re-Opened as of 10/15/2010
- Area 6
- Area 7:
- Area 8:

NMFS Fishery Reopened Areas - Cumulative 22 October 2010

NMFS Fishery Re-Opened Area

NMFS Fishery Reopened Area as of 6pm Eastern Time 22 October 2010

NMFS Fishery Re-Opened Area

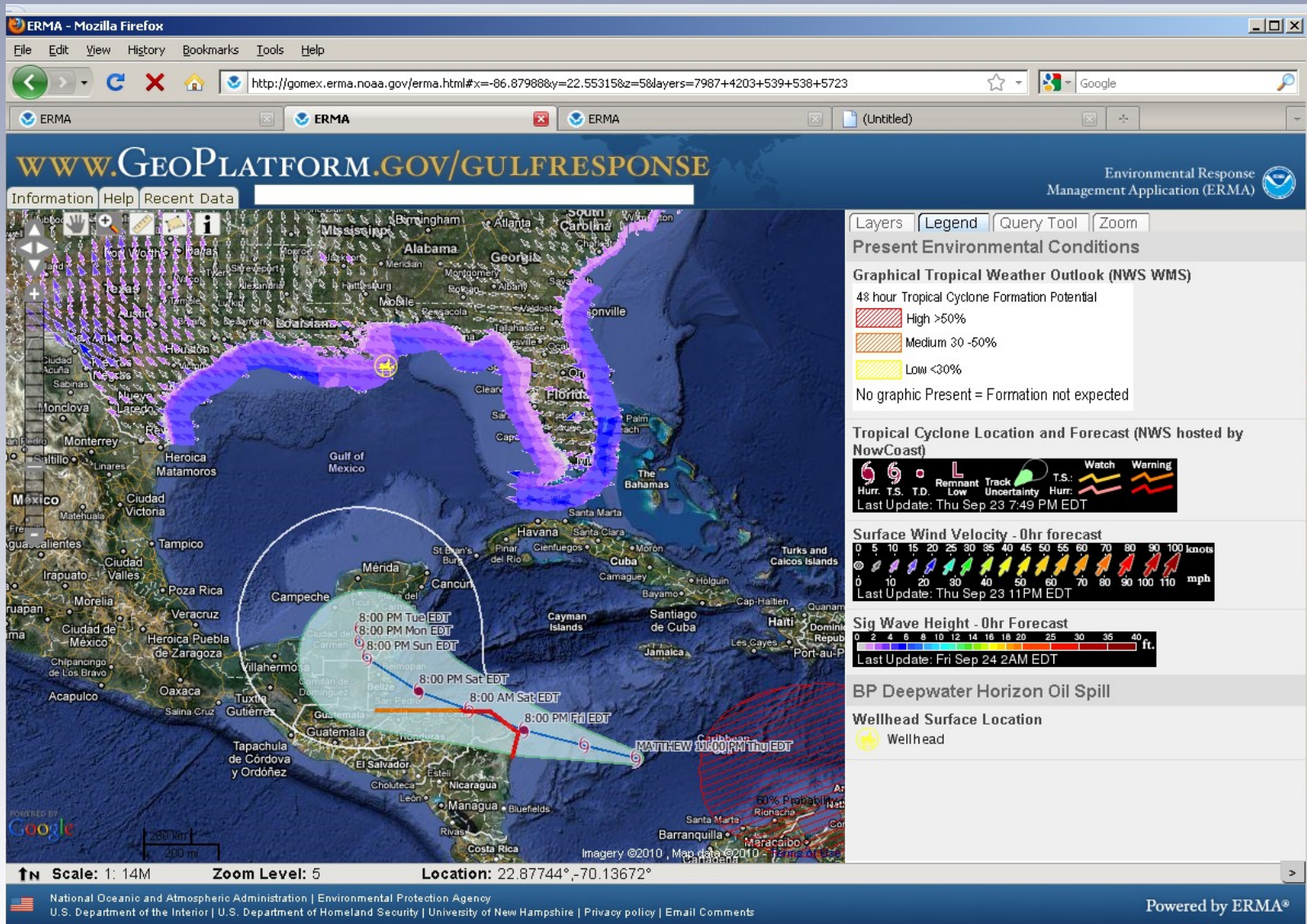
NMFS Fishery Closure Boundary as of 6pm Eastern Time 22 October 2010

NMFS Fishery Closure Boundary as of 6pm Eastern Time 1 October 2010

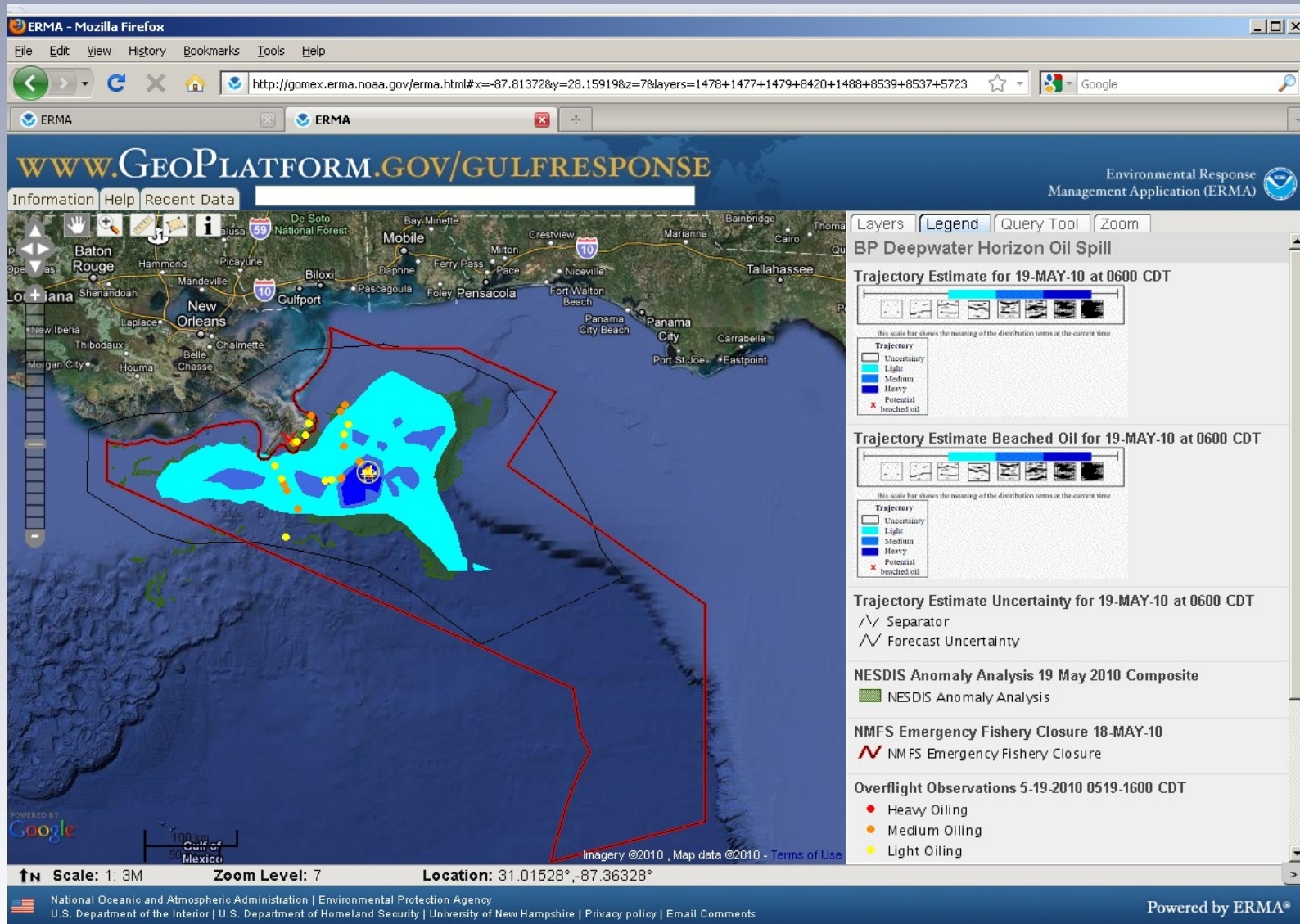
POWERED BY Google

Scale: 1: 7M Zoom Level: 6 Location: 27.11781°,-87.91260°

Current Weather Conditions



Operational Response Data



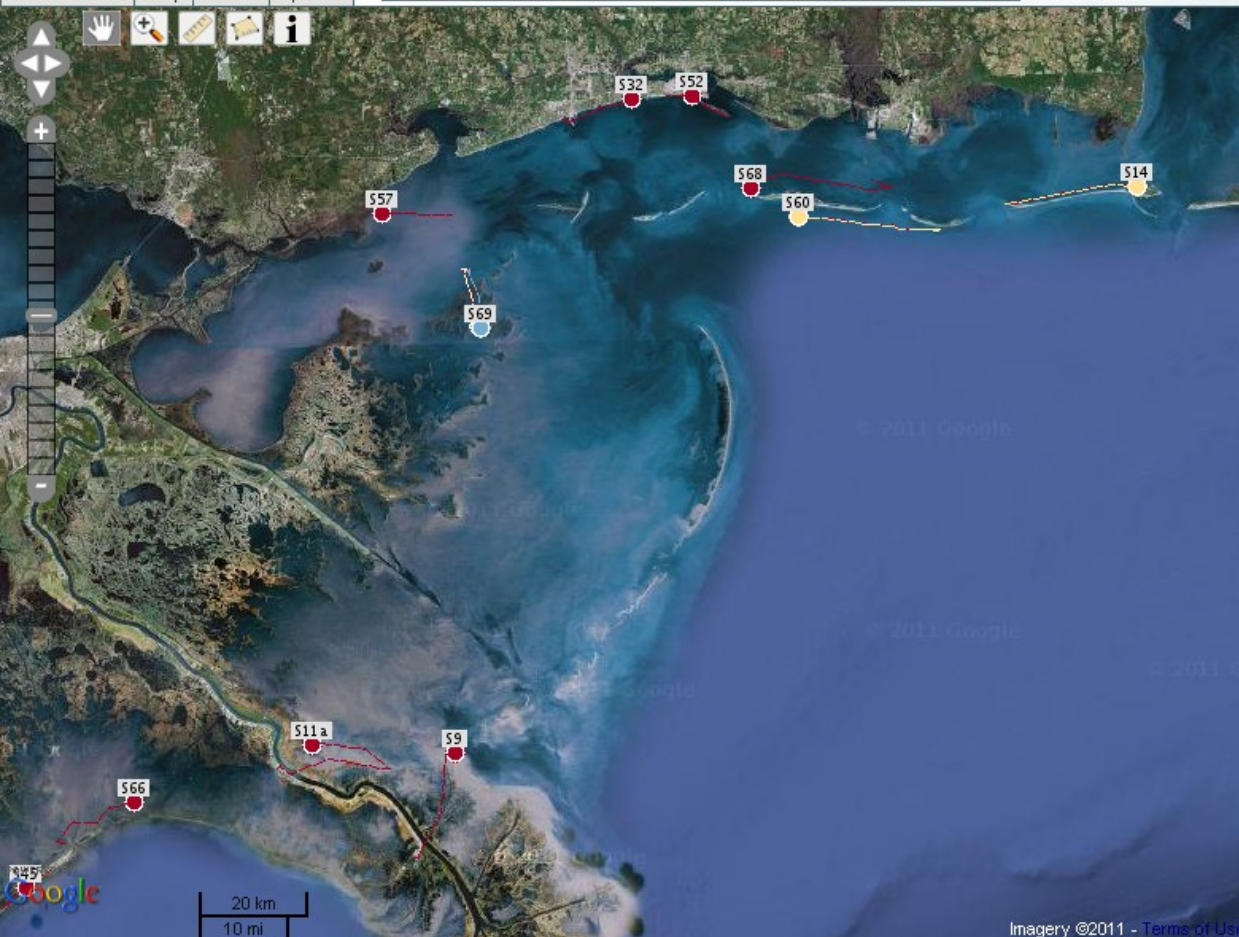
Field Personnel Tracking

ERMA

Environmental Response Management Application
Gulf of Mexico

Information Help Admin Upload Find

Logout



Layers Legend Query Tools AOI Labels Zoom Download Print

Deepwater Horizon MC 252 Incident

- Points + Labels + Tracks
● All SPOT Teams
- Points + Labels + Tracks
● Bird SPOT Teams
- Points + Labels + Tracks
● Marsh SPOT Teams
- Points + Labels + Tracks
● Rapid_Marsh SPOT Teams
- Points + Labels + Tracks
● Submerged SPOT Teams
- Points + Labels + Tracks
● Mussel Watch SPOT Teams
- Points + Labels + Tracks
● Oyster SPOT Teams
- Points + Labels + Tracks
● WQS SPOT Teams
- Points + Labels + Tracks
● Fish SPOT Teams

Scale: 1: 867K Zoom Level: 9 Location: 29.29359°,-87.71210° clean >

Single Click Full Metadata Access

ERMA Environmental Response Management Application
Gulf of Mexico

Information Help Admin Upload Find

Layers Legend Query Tools AOI Labels Zoom Download Print

Layers clear all collapse all manage reload

- Water
- Sediment
 - Location of Sediment Chemistry Reference Stations
 - Qualitative Observations
 - All Sampling (23-Apr-2010 to 25-Oct-2010)
 - PAH Aquatic Life Benchmark Analysis
 - Aquatic Life Benchmark Analysis - PAH Exceedance Not Consistent with MC-252 For All Sediment Samples
 - Aquatic Life Benchmark Analysis - PAH Exceedances For All Sediment Samples (06-Dec-2010)
 - Aquatic Life Benchmark Analysis - PAH Detects For All Sediment Samples (06-Dec-2010)
 - Aquatic Life Benchmark Analysis - Locations For All PAH

ERMA: SedPAHNC2522010_1206AllFinal - Mozilla Firefox

Parent Group: Deepwater Horizon MC 252 Incident>Subsurface Oil and Dispersant Detection (OSAT 1 - Analysis)>Sediment>All Sampling (23-Apr-2010 to 25-Oct-2010)>PAH Aquatic Life Benchmark Analysis

Layer Name: Aquatic Life Benchmark Analysis - PAH Exceedance Not Consistent with MC-252 For All Sediment Samples

Full Metadata: [AquaPAH.htm](#)

Last Modified: 03/17/2011

Last Modified By: Graettinger, George (NOAA ORR ARD)

Shapefile: SedPAHNC2522010_1206AllFinal

Date Created: 12/14/2010 2:56 pm

Created By: Dorsey, Mathew (NMFS)

Geometry: POINT

Additional Information: This layer represents samples that where fingerprinting results suggest that the exceedances are not

Done

Mozilla Firefox

unh.edu https://gomex2.erma.unh.edu/layerfiles/14298/metadata/AquaPAH.htm

Aquatic Life PAH Benchmark Analysis - Deepwater Horizon Spill Response - Gulf of Mexico - OSAT Report

Metadata:

- [Identification Information](#)
- [Data Quality Information](#)
- [Spatial Data Organization Information](#)
- [Spatial Reference Information](#)
- [Entity and Attribute Information](#)
- [Distribution Information](#)
- [Metadata Reference Information](#)

Identification Information:

Citation:

Citation Information:

Originator: BP/Environmental Standards, CTEH, NOAA, EPA, USGS, LA, MS, AL, FL, Others.

Publication Date: 2010

Title:

Aquatic Life PAH Benchmark Analysis - Deepwater Horizon Spill Response - Gulf of Mexico - OSAT Report

Geospatial Data Presentation Form: vector digital data

Publication Information:

Publication Place: New Orleans, LA

Publisher: Deepwater Horizon - Unified Area Command

Online Linkage: <http://www.geoplatform.gov>

Online Linkage: <https://gomex2.erma.unh.edu/erma>

Scale: 1: 3M Zoom Level: 7 Location: 27.36201°, -88.30811°

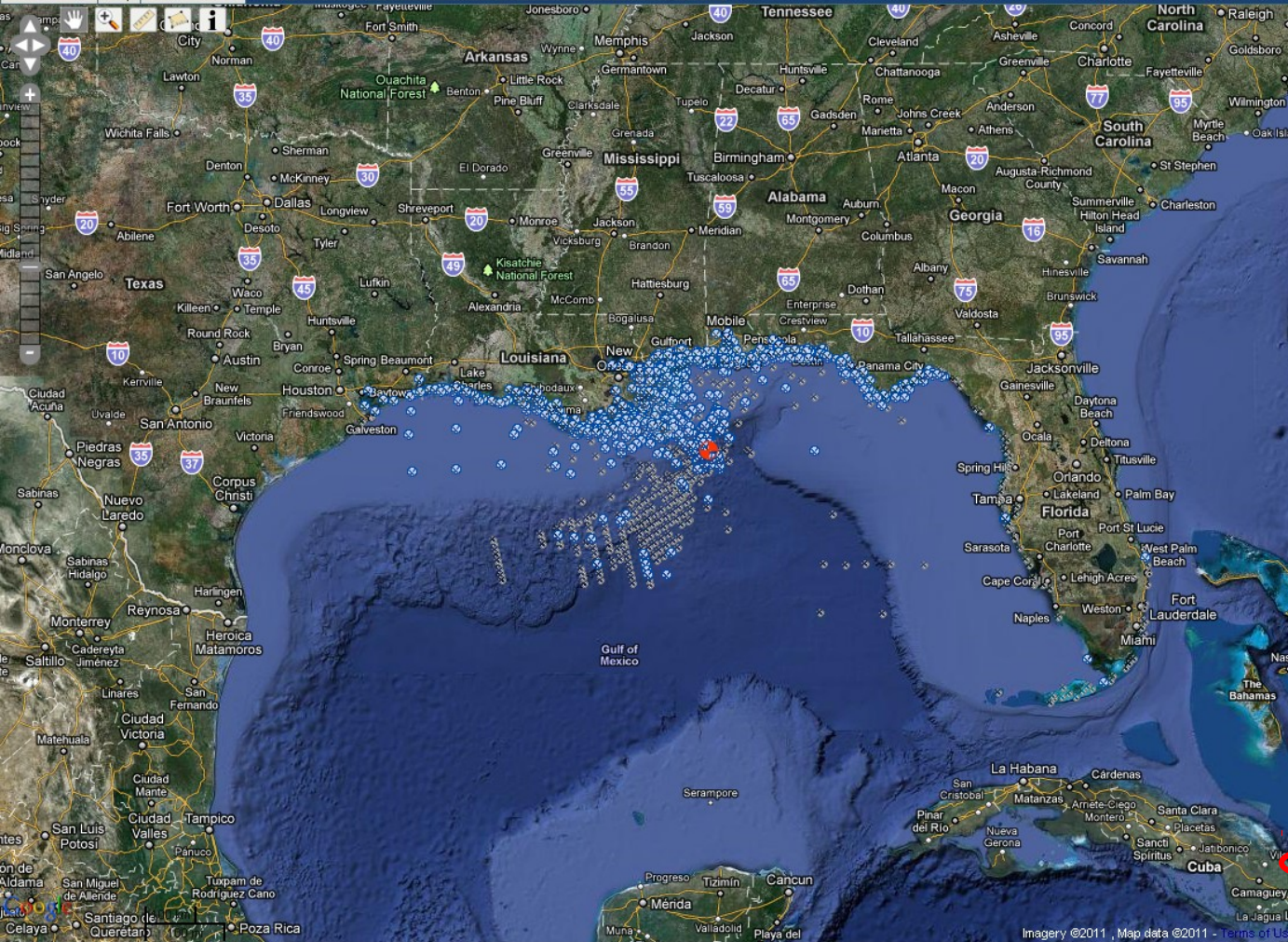
US DOC | NOAA | NOS | NOAA Office of Response & Restoration
Disclaimer | Privacy policy | Email comments

Spatial Bookmarks

WWW.GEOPATFORM.GOV/GULFRESPONSE

Information Help Recent Data Find

Environmental Response Management Application (ERMA)



Layers Legend Query Tool Zoom

Zoom Tools

Zoom to (Lat / Lon / Zoom Level):

Example: 17.989765N 66.763333W

Zoom to (Place / Zoom Level):

Sample - Robert, LA

Saved View Bookmarks

play at 30 second interval

- Area of Interest Weather
- Cumulative Snare Obs
- FEMA/Emergency Managers Hurricane Preparedness
- Gulf Coast SCAT/Gulf Coast SCAT Max Oiling
- NRDA Presentation 0 - blank bathy and wellhead
- NRDA Presentation 4 - fishery and turtles
- OSAT 2 - Aquatic Invertebrates and Fish
- OSAT 2 - Areas of Interest
- OSAT 2 - BIOMARUN Degredation Model
- OSAT 2 - Chemistry Data
- OSAT 2 - Habitat: Bon Secour
- OSAT 2 - Habitat: Fort Pickens
- OSAT 2 - Habitat: Grand Isle
- OSAT 2 - Habitat: Petit Bois
- OSAT 2 - Human Health - Exposure
- OSAT 2 - Human Health - Risk Assessment
- OSAT 2 - Human Health - Swimming
- OSAT 2 - Mammals (Beach Mouse) - Consumption
- OSAT 2 - Mammals (Beach Mouse) - Exposure
- OSAT 2 - Sea Turtles
- OSAT 2 - Water Birds
- OSAT REPORT: AOI (Final Report Attached To Layer)
- OSAT REPORT: Fig 2.1 Sediment Reference Stations
- OSAT REPORT: Fig 5.2 Qualitative Observations Oil
- OSAT REPORT: Fig 7.1 Sampling Zones
- OSAT REPORT: Fig 7.2 & 7.3 All Sample Locations
- OSAT REPORT: Fig 7.2 & 7.3 Co-Located Samples
- OSAT REPORT: Fig 7.4a Aquatic Life - All Water
- OSAT REPORT: Fig 7.4b Aquatic Life - Plan Water
- OSAT REPORT: Fig 7.5a Aquatic Life - All Sediment
- OSAT REPORT: Fig 7.5b Aquatic Life - Plan Sediment
- OSAT REPORT: Fig 7.6 Human Health - All Water
- OSAT REPORT: Fig 7.7 Dispersant Ind. - All Water
- OSAT REPORT: Fig 7.8 Dispersant Ind. - All Sediment
- OSAT REPORT: Pisces Water Column Results (Attach)
- Seafood Safety NMFS Proposed Strategy
- Seafood Safety and Reopening Samples
- Spill Imagery Animation w/Wellhead
- Subsurface Monitoring Dissolved Oxygen

Scale: 1: 7M Zoom Level: 6 Location: 30.90222°N, -82.61719°W Imagery ©2011, Map data ©2011 - Terms of Use

Query by Polygon – Select Area

ERMA | Environmental Response Management Application
Gulf of Mexico

Information Help Admin Upload Find

Layers Legend Query Tools AOI Labels Zoom Download Print

Logout

Query Tools

Step 1: 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.**

Create Polygon Delete Selected Delete All

Step 2: Select a Query Tool:

Please select at least one shape to run the query tools. Select with left mouse click, multiple selects hold down shift, remove select hold down control. (Blue polygons are selected, yellow are unselected.)

ERMA Layer Query by Polygon tool

Select all features that touch these polygons (intersect)
 Select only features COMPLETELY inside these polygons (contains)

Limit results to 2,000 records (per layer.)

Run ERMA Query By Shape

The query by shape tool allows queries against all currently enabled ERMA hosted layers (**layers externally hosted are not supported by this tool.**)

NOAA ESI Query tool

Run ESI Query

ESI maps provide a summary of coastal resources that are at risk if an oil spill occurs. This includes biological resources, sensitive shorelines, and human-use resources.

U.S. Fish and Wildlife Service IPaC Tool

Run IPaC Query

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.

Scale: 1: 3M Zoom Level: 7 Location: 32.04533°,-83.84766°

clean >

US DDC | NOAA | NOS | NOAA Office of Response & Restoration
Disclaimer | Privacy policy | Email comments

Coastal Response Research Center
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1. Draw free-form polygon
2. Select intersect or contains
3. Select optional record limit function
4. Run Query by shape tool