

# DARRP

DAMAGE ASSESSMENT, REMEDIATION, & RESTORATION PROGRAM

## DIVER Application: Accessing Project and Environmental Data

### 2018 Gulf of Mexico Oil Spill & Ecosystem Science Conference

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IEc Inc.





# Overview

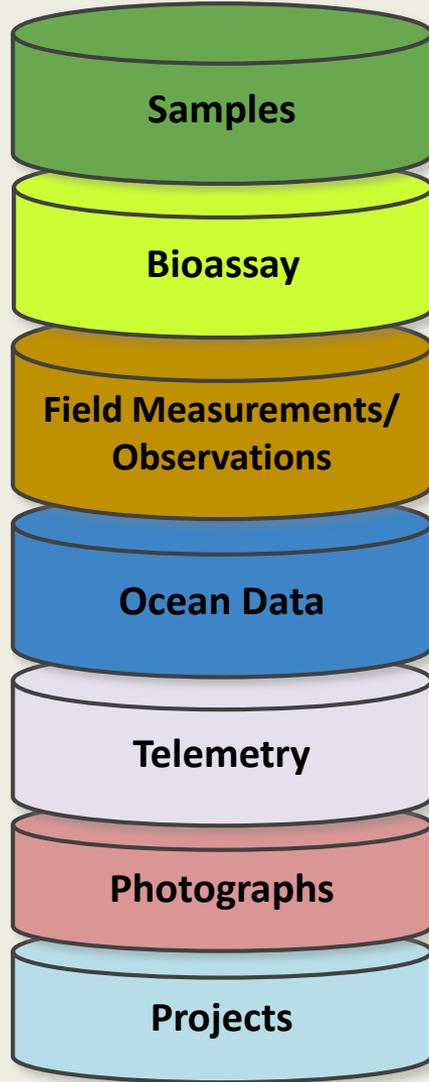
# DIVER

(Data Integration, Visualization, Exploration, and Reporting)

DIVER is a **data warehouse** and **query** application. The DIVER approach **integrates standardized** datasets so users can query across data holdings and download information and results.

# Common Data Models

## *Data type specific models*



- **Samples:** Chemistry, biological+
- **Bioassay:** Toxicity testing and results
- **Field Measurements and Observations:** shoreline, marsh, birds and mammals; biological data, oil thickness
- **Oceanographic:** Cruise-collected sensor data
- **Telemetry:** Whales, dolphins, turtles, tuna
- **Photography:** Geolocation, Keywords
- **Restoration data:** Project tracking data



# Public DIVER website

## Public facing DIVER website for case/project data

NOAA manages data associated with the evaluation and restoration of environmental injuries from hazardous waste releases, oil spills, marine debris, and vessel groundings in its role as a steward for the nation's coastal and marine resources. Use NOAA's tools to search, visualize, and download data.

Choose An Application

DIVER Explorer ERMA

Go Directly To These Popular Data

**Deepwater Horizon Restoration Projects**  
The restoration projects associated with the Deepwater Horizon oil spill are focused on restoring natural resources in the Gulf of Mexico. These data provide information on locations, project status, and monitoring data. More information...  
Search Data in DIVER

**Deepwater Horizon Natural Resource Assessment Data**  
The NOAA repository for environmental data related to the Deepwater Horizon Natural Resource Damage Assessment. More information...  
Search Data in DIVER  
View Maps in ERMA

**Hudson River Watershed**  
Explore over forty years of compiled and standardized sediment and tissue chemistry data from the Hudson River and tributaries, including long-term monitoring of PCBs in fish, birds and mammals. More information...  
Search Data in DIVER  
View Maps in ERMA

NOAA DATA & VISUALIZATION

Change Region: Select a region...

DIVER EXPLORER | DWH NATURAL RESOURCE ASSESSMENT DATA

Legend

Change Legend: Collection Matrix

Collection Matrix

- Visual Observation
- Tissue
- Soil
- Sediment

Summary Table Charts Photos Metadata Study Notes Export

Options

Data Summary for Custom Query

The following is a summary of the DIVER Explorer query results. The summary is based on the query result data and is not updated with Table or Chart filters.

Records Returned :	13,265
<small>*Number of records returned from a query is based on multiple fields and may not match result, event, or sample counts.</small>	
Non-spatial Records :	9,046
Number of Photos :	6,014

<https://www.diver.orr.noaa.gov>



# DIVER Explorer: Query Result

DIVER Explorer is a query tool. Filter, map and download. Dashboard display.

NATURAL RESOURCE DAMAGE ASSESSMENT & RESTORATION  
**DATA & VISUALIZATION**

HOME ABOUT DATA OVERVIEW HELP WHAT'S NEW

Change Region: Select a region...

**DIVER EXPLORER** | DWH NATURAL RESOURCE DAMAGE ASSESSMENT DATA

ESRI Ocean Basemap

Legend  
Change Legend: Collection Matrix  
Collection Matrix  
● Visual Observation

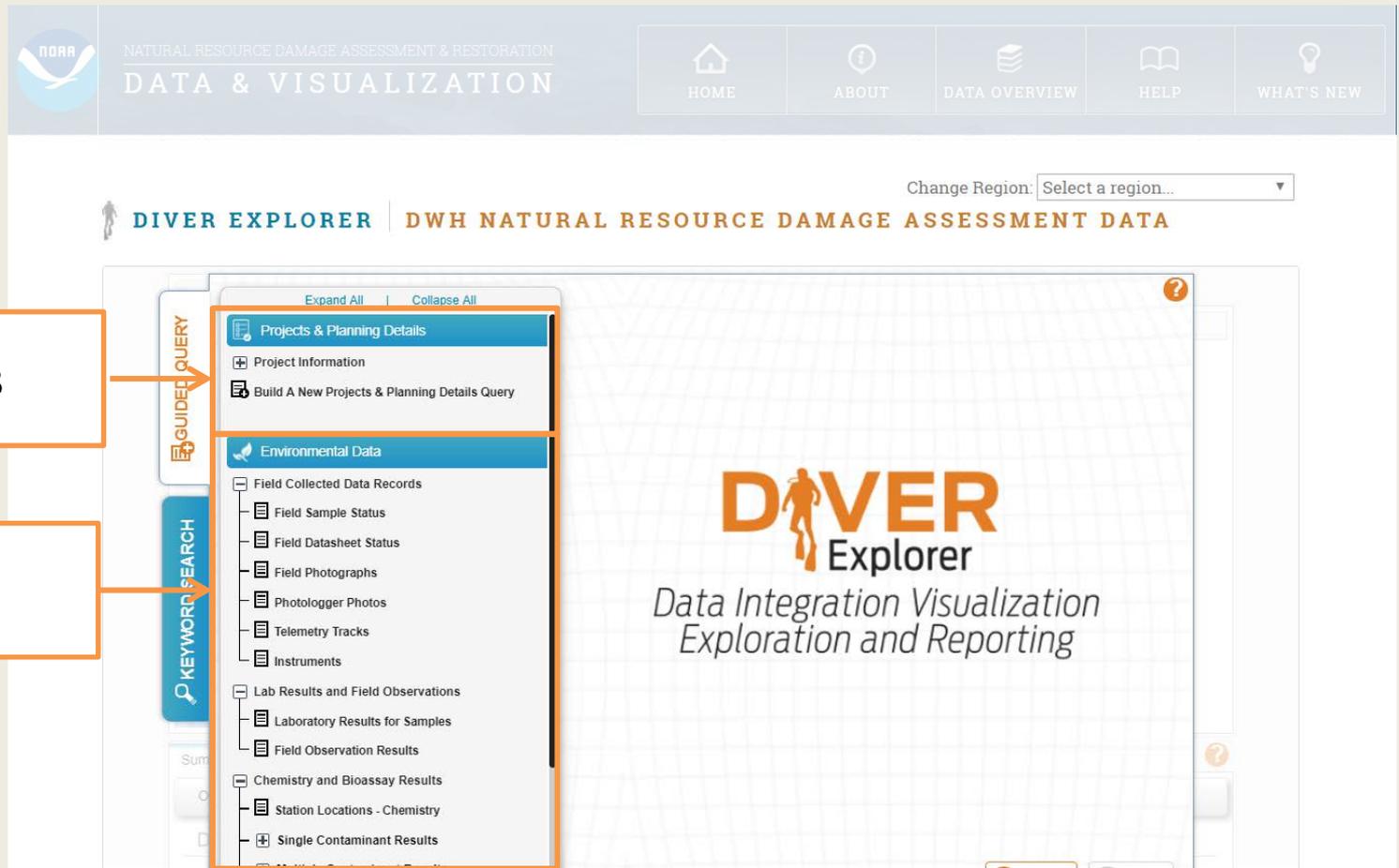
Summary Data and Export Charts Photos Study Notes Metadata

Options

Data Summary for Custom Query

# DIVER Explorer

## Guided Queries and Build New Query



NOAA NATURAL RESOURCE DAMAGE ASSESSMENT & RESTORATION DATA & VISUALIZATION

HOME ABOUT DATA OVERVIEW HELP WHAT'S NEW

Change Region: Select a region...

DIVER EXPLORER | DWH NATURAL RESOURCE DAMAGE ASSESSMENT DATA

Expand All Collapse All

**Project Queries**

**Environmental Data Queries**

**GUIDED QUERY**

- Projects & Planning Details
  - Project Information
  - Build A New Projects & Planning Details Query
- Environmental Data
  - Field Collected Data Records
    - Field Sample Status
    - Field Datasheet Status
    - Field Photographs
    - Photologger Photos
    - Telemetry Tracks
    - Instruments
  - Lab Results and Field Observations
    - Laboratory Results for Samples
    - Field Observation Results
  - Chemistry and Bioassay Results
    - Station Locations - Chemistry
    - Single Contaminant Results

**KEYWORD SEARCH**

**DIVER Explorer**  
Data Integration Visualization  
Exploration and Reporting



# DIVER Explorer

## Query Filters

**Guided Query: Field Collected Data Records » Field Datasheet Information**

Region | Case/Activity | Data Category | Workgroup | Collection Form | New Filter

Fields: Filter... | Values: Filter... | Selected Values (2):

**Fields**

- Collection Form
- Collection Study Name
- Cruise Leg
- Data Classification
- Data Source
- Source Type
- Field Data
  - Collection Matrix
  - Collection Method
  - Habitat Type
  - Occasion ID
- Location/Date/Time
  - County/Parish
  - Month

**Filter**

**Values**

- Fiddler Crab Abundance
- Fiddler Crab and Periwinkle Plot Characteristics
- Fiddler Crab
- Fiddler Crab Burrow Counts and Periwinkle Abundance
- Herbaceous Light-Adapted Fluorescence and Chlorophyll Content DataSheet 2011
- Herbaceous Light-Adapted Fluorescence and Chlorophyll Content DataSheet Fall 2011
- Herbaceous Marsh Cover Plot Datasheet
- Herbaceous Marsh Cover Plot Datasheet 2011
- Herbaceous Marsh Cover Plot Datasheet Fall 2011
- Herbaceous Marsh Cover Plot Datasheet Fall 2012
- Herbaceous Marsh Cover Plot Datasheet Fall 2013

**Selections**

- Herbaceous Marsh Cover Plot Datasheet 2011
- Shoreline/Marsh Pre-Assessment Data Sheet

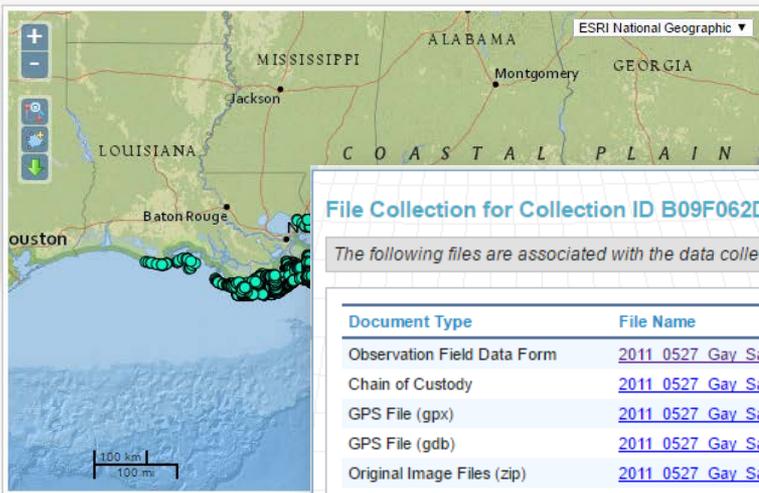
DATES | SPATIAL

CANCEL | RUN



# DIVER: Data Access

DIVER EXPLORER / DEEPWATER HORIZON



### File Collection for Collection ID B09F062D9874

The following files are associated with the data collection s...

Document Type	File Name
Observation Field Data Form	2011_0527_Gay_Sara_DM
Chain of Custody	2011_0527_Gay_Sara_DM
GPS File (gpx)	2011_0527_Gay_Sara_DM
GPS File (gdb)	2011_0527_Gay_Sara_DM
Original Image Files (zip)	2011_0527_Gay_Sara_DM
Photo Logger Document	2011_0527_Gay_Sara_DM
Other Document	2011_0527_Gay_Sara_DM
Readme Notes	2011_0527_Gay_Sara_DM

Columns	Filters	Additional
7,983 of 7,983 rows displayed:	Find forms, pl...	the selected r...
#	Collection Form	
1	Herbaceous Marsh Cover Datasheet 2011	
2	Herbaceous Marsh Cover Datasheet 2011	
3	Herbaceous Marsh Cover Datasheet 2011	
4	Herbaceous Marsh Cover Datasheet 2011	
5	Herbaceous Marsh Cover Datasheet 2011	
6	Herbaceous Marsh Cover Datasheet 2011	
7	Herbaceous Marsh Cover Datasheet 2011	

- Zoom to Center Longitude
- Find Additional Sample Data  
Display all related information based on "Sample ID"
- Find Additional Collection Data  
Display all related information based on "Trip ID"
- Display Photo  
View the image associated with this record
- Find File Collections  
Display links to all File Collections for this record

Not Defined	Not Defined
Spartina alterniflora	Spartina alterniflora (no available)
Not Defined	Not Defined
Spartina alterniflora	Spartina alterniflora (no available)
Not Defined	Not Defined

### NRDA Chain of Custody Form

#### Deepwater Horizon/MC252 Non-Analytical Sample Data

EVENT / FILE NAME: 2011.0527\_Gay\_Sara\_DM

Work Plan ID: Coastal Vegetation Assessment	Observation Team # 2	Number of Pages: 13	Type of Observation: (See key) B X SL SAV T/M F R WC
Date of Observation(s): 05/27/2011		Team # 2	

BOATS	DESCRIPTION	WayPt	Photo
Myrtle Grove Marina-Myrtle Grove, LA	1) GPS at the dock		01-02
Bayboat (unnamed)	2) SITE H-01		
- Chris	a) Arrival (R, C, L)		03, 04, 05
Airboat (LA232FR)	b) SS (C, R, L)		06, 07, 08
- Jude	c) C1	001	09, 10
	d) C4	002	11, 12
	e) C2	003	13, 14
	f) C3	004	15, 16

MEMBERS: JEB/DM 05/27/11

Spring 2011 v2 - Herbaceous Coastal Wetland Vegetation Plan - Site Set-up Verification

Date: 05/27/2011 Data Recorder/Affiliation: Sara Gay/GMI-NOAA

Other Team Members/Affiliation: Robin Paulos/GMI-NOAA, Gary Jacob/Shaw-OCPR, Lily Hassan/Shaw-OCPR, Dorcas Miller/Jentrix-PP, Leah Murphy/Jentrix-PP

Vegetation Transect Markers	Present	Absent	If absent, was it replaced?	Yes	No
Shoreline Stake	Present	Absent		Yes	No
Inland Stake	Present	Absent		Yes	No

Station Markers	Number of Stakes - Absent	Replaced	NA
C1:	4	4	NA
C2:	4	4	NA
C3:	4	4	NA
P1:	6	6	NA
P2:	6	6	NA
P3:	6	6	NA

Bearing to Inland Stake: 350° (Obtained from Site Set-up Datasheet)

Bearing Inland Stake to Shoreline Stake: 170° (Add 180° to Bearing to Inland Stake if the bearing is between 0° and 180° and subtract 180° if the bearing is between 180° and 360°)

Transect Length: 20 meters (Obtained from Site Set-up Datasheet)

Distance from Inland Stake to Marsh Edge: 19.6 meters

>10% Oil beyond 30m: Yes / No / NA

Photos

Upon arrival:

Offshore (1-2 m) looking inland (center of photo left of cover plots): 100-0005

Offshore (1-2 m) looking inland (center of photo access point between cover and productivity plots): 100-0004

Offshore (1-2 m) looking inland (center of photo right of productivity plots): 100-0003

During data collection:

At shoreline stake:

looking inland: 100-0006 looking right: 100-0007 looking left: 100-0008

At inland stake:

looking shoreward: 100-0017 looking right: 100-0018 looking left: 100-0019 looking inland: 100-0020

Upon departure:

Offshore (1-2 m) looking inland (center of photo left of cover plots): 100-0035

Offshore (1-2 m) looking inland (center of photo access point between cover and productivity plots): 100-0034

Offshore (1-2 m) looking inland (center of photo right of productivity plots): 100-0033



# Keyword Search

🌐 Search Data

periwinkle ✕

🔍 SEARCH

🔍 Filter Results

**Field:** clear

- Collection Form
- Collection Study Name
- Collection Workplan
- Common Name: Species

**Value:** clear

**Data Category:** clear

**Environmental Data**

- Photographs
- Visual Observations

## Keyword Search

Search for DIVER data using keywords! Filter and sort the search results, then choose to run or edit a data query directly from the table.

Search Table	Edit Query	returned: 6
Field		
Collection Form	<b>Field:</b> Collection Form	94 <span style="color: orange;">➔</span>
Collection Form	<b>Value:</b> Fiddler Crab and Periwinkle Site Visit/Set Up	01 <span style="color: orange;">➔</span>
Collection Form	<b>Type:</b> Environmental Data	48 <span style="color: orange;">➔</span>
Collection Study Name	<b>Data Category:</b> Visual Observations	35 <span style="color: orange;">➔</span>
Collection Workplan	<b>Detail Level:</b> Overview	

**Overview** - High level information about the available data, including activity name, data classification, stations, and types of data collected.

**Field Record** - Unique records for each piece of data collected in the field, such as individual samples, datasheets and photographs.

**Result** - Fields associated with the results of sample lab analysis or measurements taken in the field.



Change Region:

### DIVER EXPLORER | DWH NATURAL RESOURCE DAMAGE ASSESSMENT DATA

GUIDED QUERY

KEYWORD SEARCH

#### Custom Query:

Region  Case

Fields:

Expand All

#### Collection For

Collection Stud

Cruise Leg

Cruise Name

Data Category

Data Classifica

Data Source

Source Type

#### Field Data

Collection Matr

Collection Meth

Habitat Type

Observation Ty

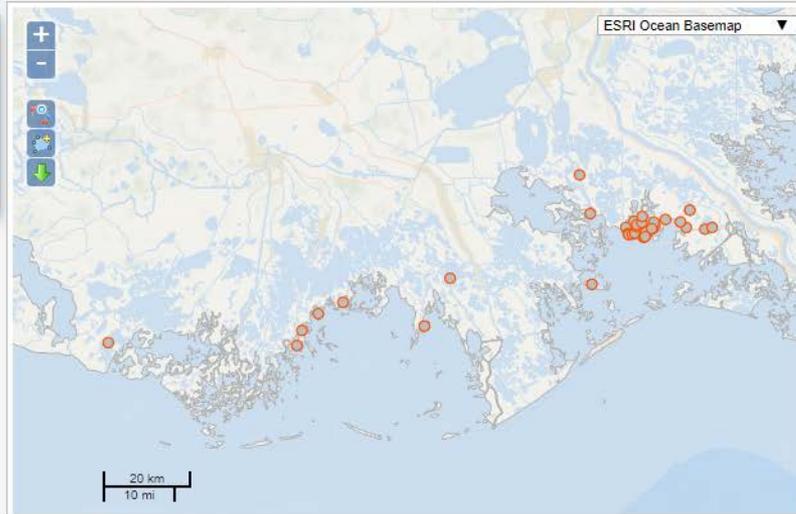
Organism ID

Primary-ESI

SCAT Segment

SCAT Survey H

Sample ID



Legend

Change Legend:

Collection Matrix

- Visual Observation

Summary Data and Export Metadata

Options

#### Data Summary for Custom Query

The following is a summary of the DIVER Explorer query results. The summary is based on the query result data and is not updated with Table or Chart filters.

Detail Level : Data are presented at the  level.  
Data Category : Visual Observations  
Data Rows : 48

Overview - High level information about the available data, including activity name, data classification, stations, and types of data collected.

Field Record - Unique records for each piece of data collected in the field, such as individual samples, datasheets and photographs.

Result - Fields associated with the results of sample lab analysis or measurements taken in the field.

DATES SPATIAL

CLEAR RUN



DIVER EXPLORER | DWH RESTORATION PROJECTS



NOAA manages data associated with hazardous waste releases, oil spill, and other threats to the nation's coastal and marine resources.



Deepwater Horizon Restoration Projects

The restoration projects associated with the Deepwater Horizon oil spill are focused on restoring natural resources in the Gulf of Mexico. These data provide information on locations, project status, and monitoring data. More information...

Search Data in DIVER

ESRI Ocean Basemap
Legend

Change Legend: Project Status

### Project Details for Louisiana Oyster Cultch Project

Overview
Components
Activities
As-Built
Monitoring
Env Compliance
Budget
Contacts
Documents

owned by the Grand Isle Port Commission and leased by LDWF. Louisiana State University plans to construct an additional building at this site prior to construction of the hatchery facility; this building is not part of this Early Restoration Project. The footprint of the hatchery building is proposed to be approximately 8400 sq ft. Parking will be available onsite. Oyster hatchery activities currently housed at the LDWF Research Lab in Grand Isle, Louisiana will all or in part be relocated to the new hatchery building once it is constructed.

**Project Modifications:**  
 The above project description was revised from the description provided in the Phase I Early Restoration Plan to reflect that the leaseholder changed from Louisiana State University to the Louisiana Department of Wildlife and Fisheries (2014 Q1).  
 The above project description was revised from the description provided in the Phase I Early Restoration Plan to reflect a change in the street name of the oyster hatchery facility from 133 Port Drive to 133 LSU Drive (2014 Q3).  
 The above project description was revised from the description provided in the Phase I Early Restoration Plan to reflect that LSU Sea Grant will provide technical direction for oyster hatchery activities and may choose not to relocate all of the oyster hatchery activities to the new facility (2014 Q3).

**Component(s):**

- [Oyster Cultch Placements](#)
- [Oyster Hatchery](#)

**Trustee Implementation Group(s):**

- Louisiana

**Implementing Trustee(s):**

- Louisiana Coastal Protection and Restoration Authority (CPRA)
- Louisiana Department of Wildlife & Fisheries (LDWF)

**Restoration Type(s):**

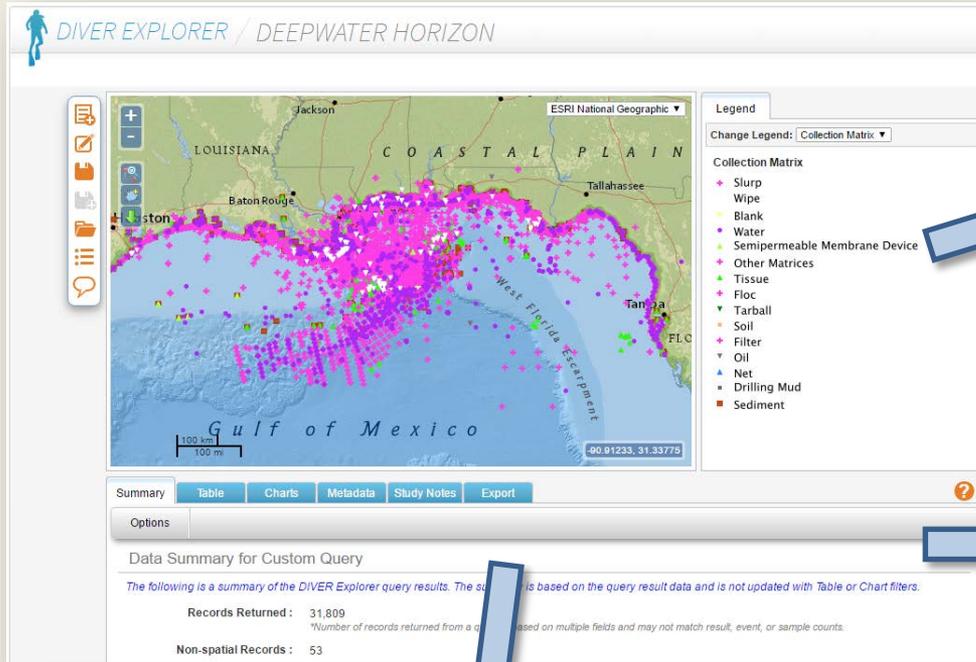
- Oysters

**Restoration Phase:**  
Early Restoration Phase 1

**Site Location(s):**

CLOSE

# DIVER Explorer: Export Packages



## Mapping/GIS

## Metadata & Study Notes

## Data Packages

## Expanded Data Services



# Additional Data Dashboards



NATURAL RESOURCE DAMAGE ASSESSMENT & RESTORATION  
**DATA & VISUALIZATION**



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WHAT'S NEW

## DEEPWATER HORIZON NRDA DATA

On April 20, 2010, an explosion on the Deepwater Horizon MC252 drilling platform killed 11 workers and caused the rig to sink and leak oil into the Gulf of Mexico. The magnitude of this spill is something our nation had not seen before, causing significant impacts to wildlife and the fishing community along the large coastal areas of Louisiana, Mississippi, Texas, Alabama, and Florida.

The Oil Pollution Act authorizes certain federal agencies, states, and Indian tribes—collectively known as natural resource trustees—to evaluate the impacts of the Deepwater Horizon (DWH) oil spill on natural resources. These trustees are responsible for studying the effects of the spill through a process known as [Natural Resource Damage Assessment \(NRDA\)](#). As part of this process, scientists work together to identify potential injuries to natural resources and lost recreational uses, such as boating and beachcombing, resulting from the spill.



## DIVER (DATA INTEGRATION VISUALIZATION EXPLORATOR)

DIVER serves as the public NOAA repository for data related to the DWH Trustees' NRDA effort. The site also includes historical (pre-2010) contaminant chemistry data for the onshore area, chemistry data collected during the [response](#) efforts and by the responsible party, British Petroleum, and are accessed through a query and mapping interface called DIVER Explorer.

Categories of Trustee NRDA data include:

- Photographs of the emergency response, the oiled animals, plants, fish, and beaches;
- Telemetry information collected from remote sensing devices such as transmitter data;
- Field observations such as notes about the condition of animals found in the spill and evidence of wildlife mortality;
- Instrument data such as water temperatures and salinity collected during the spill; and
- Sample results of laboratory analysis on tissue, sediment, oil, and water.



[Search & Query DWH Data in DIVER Explorer](#)

## ADDITIONAL DIVER DATA RESOURCES



### Work Plans

The Trustees prepared Work Plans to study potential injuries to different natural resources across the Gulf. Each plan laid out the purpose of the study and how the Trustees would achieve their assessment goals. Study designs reflected input from experienced scientists and resource managers who specialize in studying oil spills and natural resources in the Gulf. Most data collected under these Work Plans are available in DIVER and ERMA, or through the National Centers for Environmental Information archives.

[Download Work Plans](#)



### Toxicity Studies

As part of the injury assessment, the Trustees undertook a toxicity testing program covering more than 40 species of fish, aquatic invertebrates, phytoplankton, reptiles, and birds. The program tested effects on those coastal and marine creatures from dispersants and DWH oil from the well or the field, including both floating slick oil and oiled sediments collected at different times post-spill. A full review of the program is available as a technical report ([Morris et al. 2015](#)). The results of these studies are available to the public.

[Search & Export Toxicity Data](#)



### Data Packages

In addition to data available through DIVER Explorer, NOAA compiled DWH-related data packages and links to external data sources. These data packages and links cover a wide variety of topics, including raw data from recreational use surveys, links to marine mammal and sea turtle data sources, and instrument data from research cruises.

[Download Data Packages](#)

## RELATED SITES



[NOAA's Office of Response and Restoration](#) compiled links to relevant data sources and references regarding the response, assessment, and restoration phases. Data sources include records of the spill trajectories, archive locations for plankton and marine mammal tissue samples, and extensive NOAA photo collections. The site includes a compilation of literature documenting the environmental impacts of the Deepwater Horizon Spill.



[Gulf Spill Restoration](#) is a website maintained by NOAA on behalf of the Deepwater Horizon Natural Resource Damage Assessment Trustees. The site provides updates on the Trustees assessment and restoration activities. The Trustees are now in the process of implementing the programmatic restoration plan. The plan will set the course of restoration for the



# Toxicity Data Dashboard

NATURAL RESOURCE DAMAGE ASSESSMENT & RESTORATION

## DATA & VISUALIZATION

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## DEEPWATER HORIZON NRDA DATA

[Back to DWH NRDA](#) →

### NOAA'S DEEPWATER HORIZON TRUSTEE TOXICITY TESTING PROGRAM RESULTS

Build a New Toxicity Query
RESET QUERY

Filter: Species: Common ▼

Filter: Endpoint Class ▼

Filter: - Select Field - ▼

- Select Field -

To: Northern white shrimp/white shrimp ▲

Pacific Bluefin Tuna

Red drum

Red-joint fiddler/redjointed fiddler

▼

To: Cardiac ▲

Deformity

Growth

Hatching

▼

To: [Select a field to filter]

**RUN** Added Stressors

Endpoint Class

Expt #

**We** Life Stage ▼

Mixing Method

Renewal Regime

**Se** Species: Common

Species: Latin

Test Duration

**Ab** Test Substance ➔

Data Structure for Querying ➔

Click **Run Query** to view matching studies and export experimental data and related files.



# Toxicity Data Dashboard

## DEEPWATER HORIZON NRDA DATA

[Back to DWH NRDA](#) →

### NOAA'S DEEPWATER HORIZON TRUSTEE TOXICITY TESTING PROGRAM RESULTS

#### Query Results

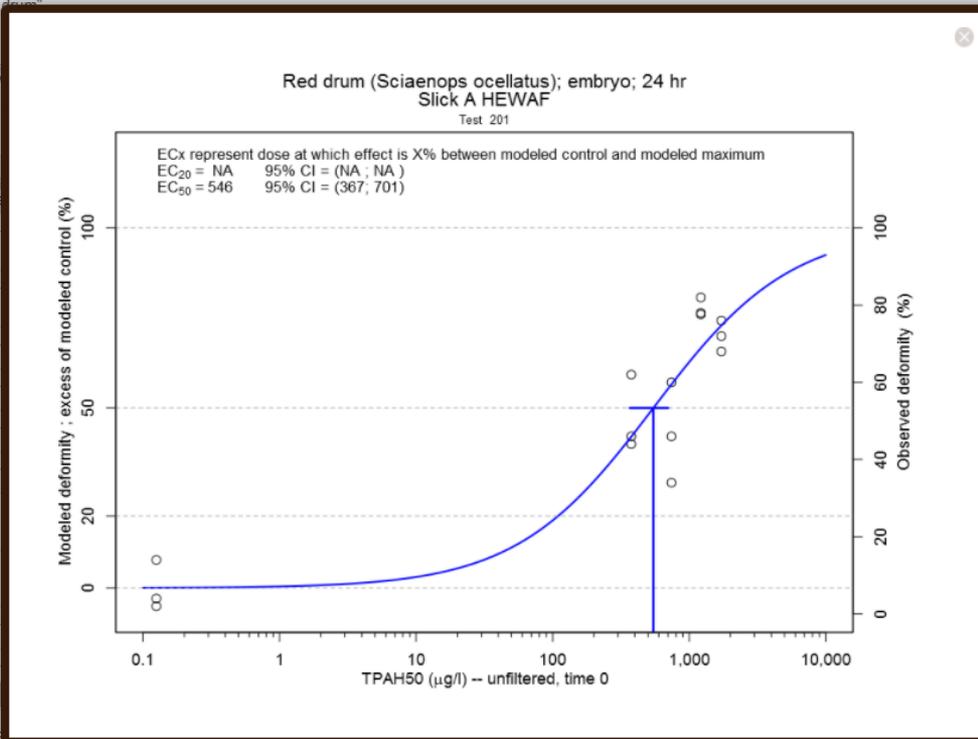
< EDIT QUERY

EXPORT DATA FOR THESE STUDIES

Species: Common = "Red drum"  
Endpoint Class = "Cardiac"

#### Study Summary

Expt #	Test Substance	Mi
200	Weathered Source (Oil)	HEWA
200	Weathered Source (Oil)	HEWA
201	Slick A (Oil)	HEWA
201	Slick A (Oil)	HEWA
202	Slick A (Oil)	CEWA
202	Slick A (Oil)	CEWA
204	Dispersant (COREXIT 9500)	DISP
204	Dispersant (COREXIT 9500)	DISP
636	Slick A (Oil)	HEWA
636	Slick A (Oil)	HEWA



Parameter Units	Parameter Analyte	Qua Coc
g/L	toxpah50	INT, MA, SU
g/L	toxpah50	INT, MA
g/L	toxpah50	Not Def
g/L	toxpah50	Not Def
g/L	toxpah50	MA
g/L	toxpah50	MA
g/L	corexit	Not Def
g/L	corexit	Not Def
g/L	toxpah50	AVC
g/L	toxpah50	AVC

Showing 1 to 53 of 53

Note: Reported statistical results are for experiments that were designed for concentration-response analysis. Some experiments produced data that were not amenable



## DEEPWATER HORIZON NRDA DATA

[Back to DWH NRDA](#) →

## NOAA'S DEEPWATER HORIZON TRUSTEE TOXICITY TESTING PROGRAM RESULTS

## Export Data

[< EDIT QUERY](#)[< BACK TO RESULTS](#)

Species: Common = "Red drum"  
Endpoint Class = "Cardiac | Deformity | Growth"

Select Download Types

**Results**

- Treatment mean results for each available time point and endpoint (bio\_mean.csv)
- Individual replicate results for each available time point and endpoint (bio\_rep.csv)
- Effect and Lethal Concentrations (EC/LCx) from modeled concentration-response curve (bio\_stat.csv)
- Details of modeled concentration-response curve (bio\_stat\_detail.csv)
- Matched bioassay and analytical chemistry results (bio\_chem.csv)
- Analytical chemistry and calculated results (full\_chem.csv)

**Supplemental Data**

- Field-collected sample information (field\_samp.csv)
- Test conditions (test\_cond.csv)
- UV exposure doses (uv\_doses.csv)
- Water quality measurements (water\_quality.csv)
- Chemistry notes (chem\_notes.csv)

**Metadata**

All exports contain the following files for selected studies: Study Notes (study\_notes.txt), Study References (study\_ref.csv), Field Definitions (field\_definitions.csv), Qualifier Definitions (qual\_definitions.csv), and Metadata (DWH\_Tox\_ISO19115.html and DWH\_Tox\_ISO19115.xml).

[EXPORT DATA](#)

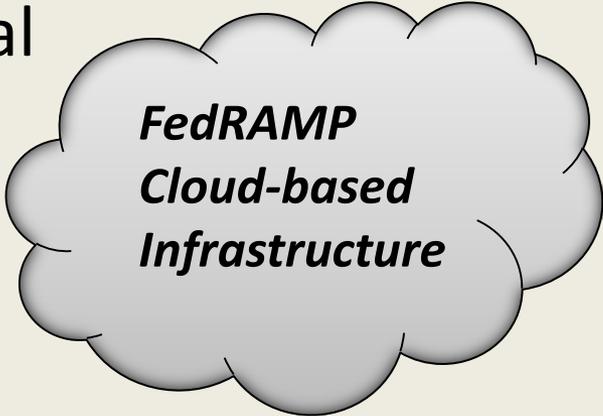
## In process and next steps

- Transitioning data holdings to NOAA NCEI Archive
  - Data Attribution (data source- data packages)
  - Digital Object Identifiers (discrete data package)
- Expanding Data Models and data exchange
  - Restoration Monitoring Data
  - Biological data model and templates
  - Linkage with other data systems (e.g. GRIIDC) and data models (e.g. IOOS; Marine Mammals; Telemetry)
- Creating Data Services – exposing millions of environmental data records directly (ERDDAP)

# DIVER Tools and Processes

## (nerd-lite slide)

- **ETL Process:** Pentaho Analytics
  - Data Integration; Schemas; PostgreSQL/PostGIS;
- **Portal:** Liferay; PostgreSQL; Drupal
- **Explorer Query Tool**
  - Custom Java API and query engine
  - MapServer/OpenLayers
  - Dojo Toolkit Javascript library
  - MDX query language – Pentaho Community Edition
  - PostgreSQL/PostGIS (AWS RDS);
  - Redshift (AWS)

A grey, stylized cloud icon with a black outline, containing text.

*FedRAMP  
Cloud-based  
Infrastructure*



# Acknowledgements (partial!)

- Amy Merten: former Spatial Data Branch Chief
- Dan Hudgens, Jim Anderton, Neal Etre, Ann Jones: IEc Inc.
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and made this possible.