

# DARRP

DAMAGE ASSESSMENT, REMEDIATION, & RESTORATION PROGRAM

## DIVER Application: Common Data Models for Data Integration

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

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IEc Inc.



# DWH Damage Assessment Data



Shoreline Data



Marsh Assessment



Oyster Collections



Telemetry Data

- **20,000+** trips for field data collection
- **1 million+** field data forms and related electronic files
- **100,000+** water, tissue, oil and sediment samples
- **15 million+** database records
- **30 terabytes** of data
- Data Referenced in many Publications/Journals



Toxicity Data



Water Column



Seafood Safety



Marine Mammal & Turtle Assessment



# 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.



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

# Injury Assessment

Deepwater Horizon Administrative Record

## Marine Mammals Injury Data

Data related to the Deepwater Horizon incident is available in a variety of size and format. DWH data may be available through tools such as DIVER direct downloads. Also, in some cases, data may be available by request. Descriptions in this box below are general and may not be applicable to data available for this specific resource as described later in this document.

### DIVER

NOAA created a [public website](#) as the primary public access for data related to the Deepwater Horizon (DWH) incident and the associated National Response and Disaster Act (NRDA) efforts. To provide additional context to the NRDA data, the site also includes 2010 contaminant chemistry data for the onshore area of the Gulf of Mexico. These data are available through the mapping interface called DIVER (Data Integration Visualization Explorer). Please visit the [help](#) materials to learn more.

### ERMA Deepwater Gulf Response

[ERMA@ Deepwater Gulf Response](#) (Environmental Response Management Application) is an online mapping tool used to integrate environmental response information. ERMA was used as the Common Operational Picture during the DWH incident. A variety of spatial layers related to the DWH Response and damage assessment operations, oiling observations, sampling results and analysis products provide public access to data from the response through the NRDA.

### Direct Downloads

Data files may be available as direct downloads from DIVER or other repositories. Use the links provided to access these files.

### By Request

Some datasets are in the process of being integrated into public access. These datasets are large to transmit on-line. Please contact [dwh.data@noaa.gov](mailto:dwh.data@noaa.gov) for access to these data.

### Data Links

Datasets	Links
DIVER: Contaminant Chemistry Sample Data	<a href="https://www.diver.orr.noaa.gov/web/que">https://www.diver.orr.noaa.gov/web/que</a>
DIVER: Other Lab Results Data	<a href="https://www.diver.orr.noaa.gov/web/que">https://www.diver.orr.noaa.gov/web/que</a>
DIVER: Photographs	2010: <a href="https://www.diver.orr.noaa.gov/web/que">https://www.diver.orr.noaa.gov/web/que</a>

Questions? Email [dwh.data@noaa.gov](mailto:dwh.data@noaa.gov).

The screenshot shows the DIVER web application interface. At the top, there is a map of the Gulf of Mexico with green and yellow data points. Below the map is a legend with 'Collection Matrix' and 'Collection Matrix' options. A data table is displayed below the map, showing columns for 'Sharing Status', 'Workgroup', 'Collection Study Name', 'QM Station ID', 'QM Matrix', 'Station/Site', 'Date', and 'Coll'. The table contains 6 rows of data.

#	Sharing Status	Workgroup	Collection Study Name	QM Station ID	QM Matrix	Station/Site	Date	Coll
1	Publicly Available	Marine Mammals and Turtles	Gordon Gunter Cruise 02 JUN 17-21 2010	Not Defined	Not Applicable	Not Defined	06/17/2010	Tiss
2	Publicly Available	Marine Mammals and Turtles	Gordon Gunter Cruise 02 JUN 17-21 2010	Not Defined	Not Applicable	Not Defined	06/17/2010	Tiss
3	Publicly Available	Marine Mammals and Turtles	Gordon Gunter Cruise 02 JUN 17-21 2010	Not Defined	Not Applicable	Not Defined	06/17/2010	Tiss
4	Publicly Available	Marine Mammals and Turtles	Gordon Gunter Cruise 02 JUN 17-21 2010	Not Defined	Not Applicable	Not Defined	06/19/2010	Tiss
5	Publicly Available	Marine Mammals and Turtles	Gordon Gunter Cruise 02 JUN 17-21 2010	Not Defined	Not Applicable	Not Defined	06/18/2010	Tiss
6	Publicly Available	Marine Mammals and Turtles	Gordon Gunter Cruise 02 JUN 17-21 2010	Not Defined	Not Applicable	Not Defined	06/18/2010	Tiss

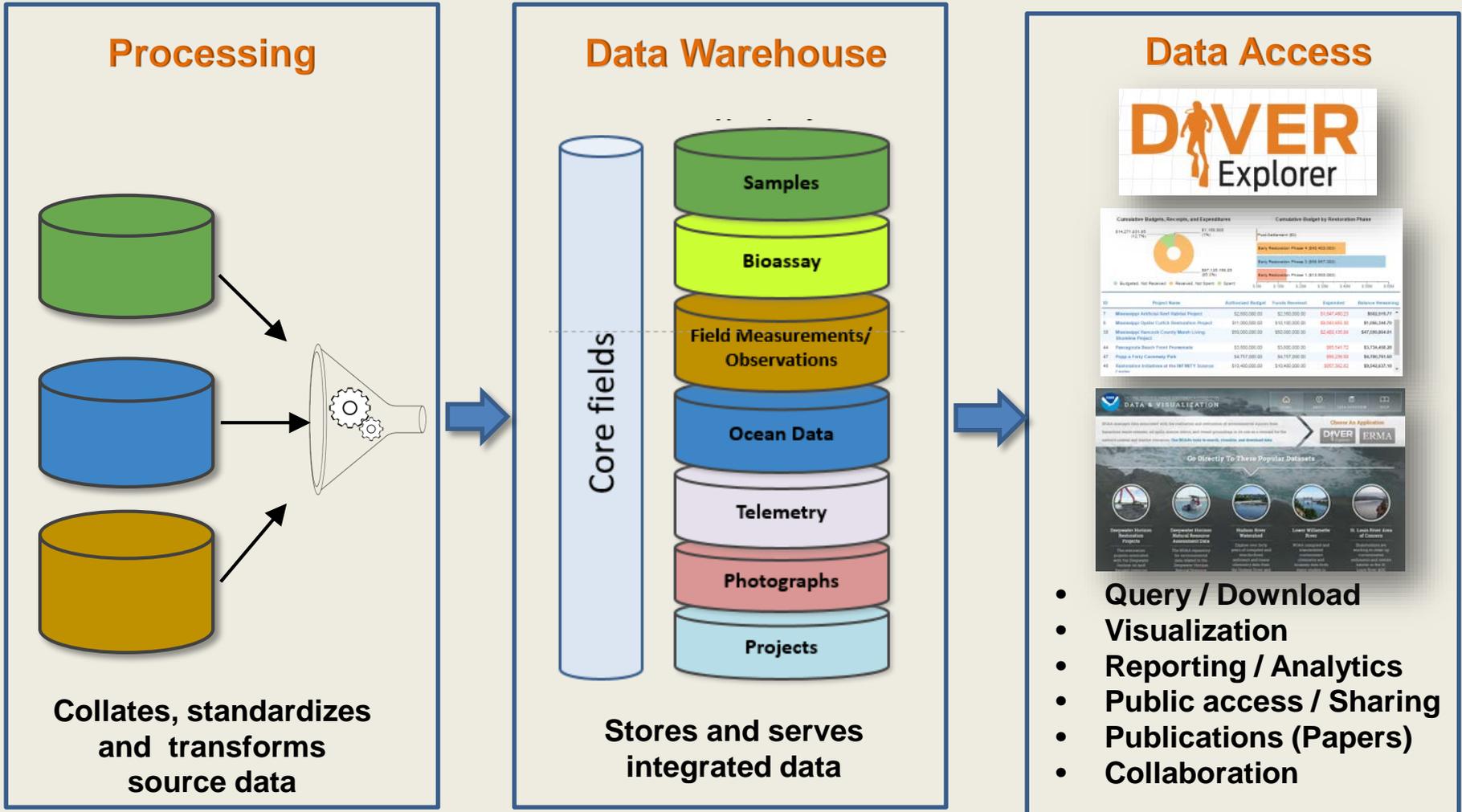
The screenshot shows the ERMA website navigation menu. It includes a search bar and a list of categories with sub-items:

- 1 Case File Index
- 2 Applicable Laws, Regulations,
- 3 Legal Documents
- 4 Trustee Coordination and Man
- 5 Preassessment/Assessment (5)
  - 5.1 Preassessment Related M
  - 5.2 Bird Injury
  - 5.3 Deep Benthic Injury
  - 5.4 Fish Injury
  - 5.5 Oyster Injury
  - 5.6 Marine Mammal Injury
  - 5.7 Sea Turtle Injury
  - 5.8 Shoreline Habitat Injury
  - 5.9 Water Column Injury
  - 5.10 Lost Human Use
  - 5.11 General Chemistry Activi
  - 5.12 General Toxicity Asses
  - 5.13 General Data Managem
  - 5.14 Aerial Imagery/Remote Sensing Activities

The screenshot shows the ERMA web application interface for the Deepwater Horizon Gulf of Mexico Response, Damage Assessment & Restoration. It features a map of the Gulf of Mexico with various data layers overlaid. The map shows the coastline of the Gulf of Mexico, including Louisiana, Mississippi, Alabama, Georgia, and Florida. The map is titled 'ERMA Deepwater Horizon Gulf of Mexico Response, Damage Assessment & Restoration'. The interface includes a search bar, a legend, and a list of data layers. The legend includes 'BP Deepwater Horizon Oil Spill', 'Wellhead Surface Location', 'Dolphin Population & Abundance', 'Schematic Representation of Estuarine Dolphin Stock Boundaries (NOAA) (PDARP)', '20-Meter Bathymetric Line (NOAA) (PDARP)', '20-Meter Bathy Line', 'Turtle & Marine Mammal Observations (NMFS)', 'Northern Gulf of Mexico Cetacean Unusual Mortality Event 2010-2015 (NOAA) (PDARP)', and 'Telemetry'. The map shows various data points and lines, including a purple line representing the 20-meter bathymetric line and orange circles representing dolphin observations.

<http://>

# What is DIVER?

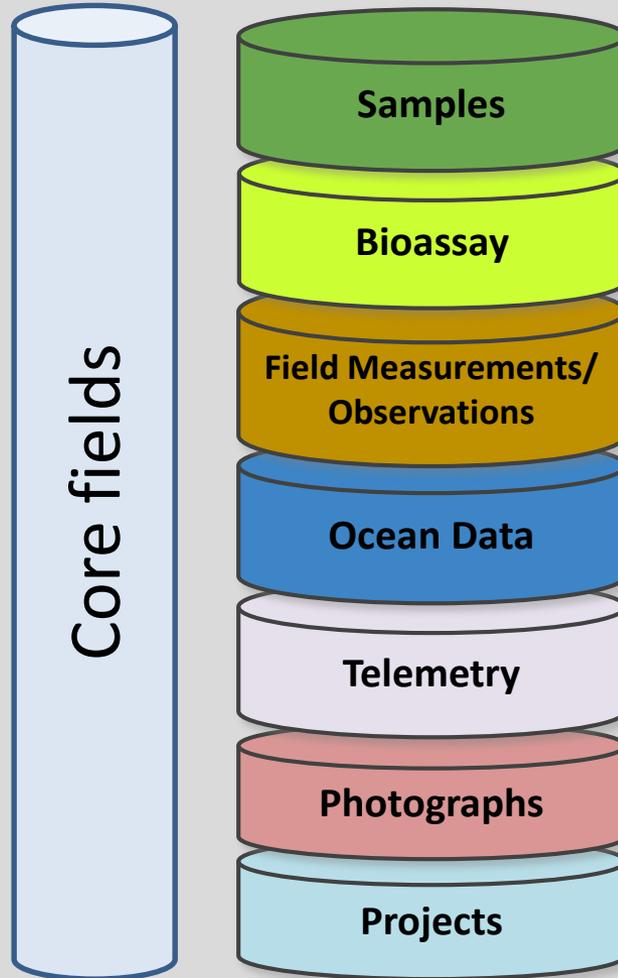
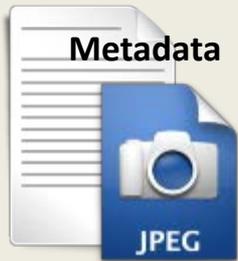






# File Collections

## Unstructured Data



## Structured Data

**Digital Data Form**

Start form

Presenter's name: \_\_\_\_\_ Presenter's topic: \_\_\_\_\_

Evaluate category: \_\_\_\_\_ Yes/No Rating

Begin with an explanation of audience, assist on topic (before starting the actual presentation)?

Begin the actual presentation with an introduction? Introduction indicated purpose?

Introduction gave overview? Introduction attempted to motivate interest?

Used one or more visuals? Visuals were effective?

Did presenter explain visuals? Used verbal headings?

Presentation was organized? Explained technical information clearly?

Spelling/typos/delays were effective? Held my attention?

Ended with a real conclusion? Presentation was the expected length?

Presentation was adequate (overall rating)?

Comments: \_\_\_\_\_

Metadata

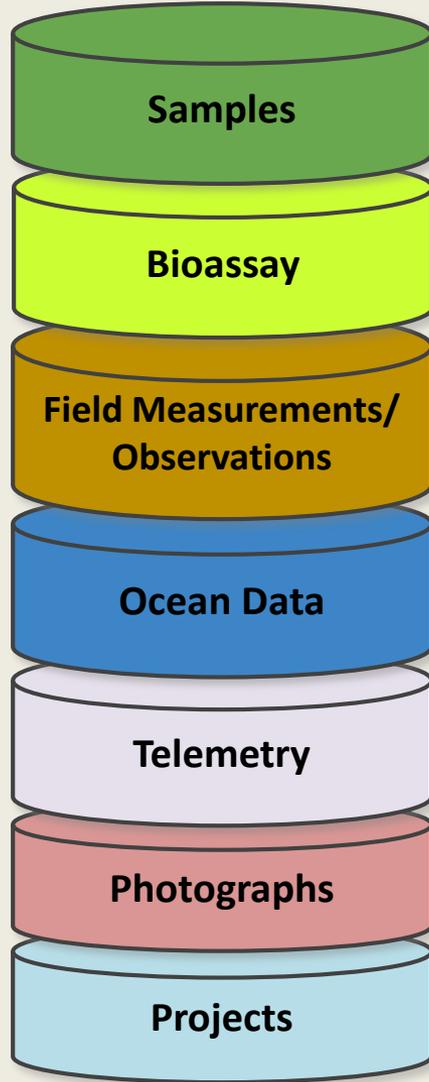


Category	Resolution	Date	Time	Latitude	Longitude	Depth	Temperature	Salinity	Chlorophyll	Transmittance	Beam Attenuation	Backscatter	Water Temperature	Water Salinity	Water Chlorophyll	Water Transmittance	Water Beam Attenuation	Water Backscatter
NOAA-DU	NOAA-DU	2010-01-01	12:00:00	40.000000	-100.000000	1000	15.000000	35.000000	0.000000	0.000000	0.000000	0.000000	15.000000	35.000000	0.000000	0.000000	0.000000	0.000000
NOAA-DU	NOAA-DU	2010-01-01	12:00:00	40.000000	-100.000000	1000	15.000000	35.000000	0.000000	0.000000	0.000000	0.000000	15.000000	35.000000	0.000000	0.000000	0.000000	0.000000

Metadata

# Common Data Models

## *Data type specific models (Data Categories)*



- **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

# Common Data Model (example)

**Core Fields**

Workgroup | Workplan | Data Source |  
Matrix | Location | Date | Form | Station |  
Sample ID...

**Data Category**

Samples

Bioassay

**Detail Fields**

Analysis

Units

Depth

Species

Endpoint

Duration

# Environmental Data Specification



NATURAL RESOURCE DAMAGE ASSESSMENT & RESTORATION  
DATA & VISUALIZATION



HOME



ABOUT



DATA OVERVIEW



HELP



WHAT'S NEW

## DATA OVERVIEW

DIVER (Data Integration, Visualization, Exploration, and Reporting) is a NOAA application for the integration and distribution of primarily NRDA-related response, assessment, and restoration data, as well as historical data collected from hazardous sites around the country. Both environmental data and project planning data are available in DIVER. Below, we provide a general description of the data structures used in DIVER, and access to detailed data specifications.

Check out the forms and guidance NOAA uses to collect field data

## ENVIRONMENTAL DATA STRUCTURE

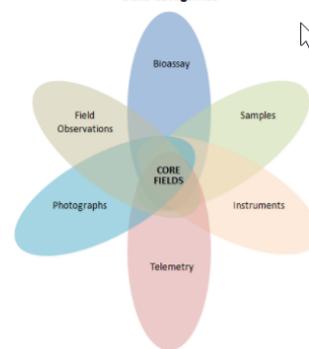
Environmental data are organized by data category:

- **Samples:** Collection data and analysis results for discrete samples;
- **Bioassay:** Results from field and laboratory-based bioassay studies;
- **Instruments:** Packages of data from CTDs or other oceanographic instruments;
- **Field Observations:** Observations and measurements from field studies;
- **Telemetry:** Position tracks and related data for tagged animals; and
- **Photographs:** Field photos keyword tagged using NOAA's Photologger.

Each data category contains a set of fields necessary to describe that data. Some common fields, like date and coordinates, appear in multiple categories (see diagram). Fields that appear in every environmental data category are known as **core fields** and form the fundamental relationships among data categories.

In DIVER, queries which are run across multiple data categories return and map information at the core fields level (also called "Overview"). In these cross-category queries, data category-specific fields are available as related downloads. For queries within a single data category (e.g. Samples or Field Observations), the data table and maps will present a wider set of fields specific to that data category.

Relationships Between Environmental Data Categories




The **DIVER Environmental Data Specification** describes the underlying data structures and data exchange methods, including detailed field information and valid values, and is intended as a resource for both data providers and data users. The data specification includes a discussion of the core fields required to organize and categorize data brought into DIVER, as well as general requirements regarding submission of structured and unstructured data and metadata. Tabular versions are available for **Appendix 1B**, defining available DIVER fields across different data categories, and **Appendix 2**, valid values and chemical dictionary.

Data Categories

Core Fields

Detail Fields

Valid Values

Data Submission

Data Access

References/Appendices

Public DIVER website: <https://www.diver.orr.noaa.gov>



# Field Forms, Data Templates and Guidelines

NATURAL RESOURCE DAMAGE ASSESSMENT & RESTORATION

DATA & VISUALIZATION

HOME

ABOUT

DATA OVERVIEW

HELP

WHAT'S NEW

## FIELD FORMS, DATA TEMPLATES, AND GUIDELINES

Through the Field Assessment and Science Techniques (FAST) program, NOAA's Assessment and Restoration Division (ARD) creates tools to improve preparation for and implementation of Natural Resource Damage Assessment (NRDA) field efforts. Field and laboratory protocols, data templates, chain of custody, and field data collection forms to standardize data collection and intake are a key component of FAST. Many of these materials, such as the [Sampling Guidelines for Arctic Oil Spill Damage Assessments](#), are the genesis of field practices and lessons learned from the Deepwater Horizon oil spill. While many of these documents were developed for use in the Arctic, they are generally applicable to other regions.

NOAA provides these materials to partners and the public as part of ensuring consistency and best practices across different environmental assessments in all regions of the United States. NOAA's FAST team is actively reviewing, revising and developing forms and guidelines with partners, and will post updated materials as they become available. For more information please contact the [FAST team](#). Current documents can be downloaded by document type, or environmental resource through the dashboard below.

### FIELD FORMS AND GUIDANCE DOCUMENTS

Document Type: Document Type(s) ▾

Resource: Resource(s) ▾

Search:

RESET FILTERS

DOWNLOAD

SELECT ALL <input type="checkbox"/>	DOCUMENT TYPE	RESOURCE	DESCRIPTION	FILENAME
<input type="checkbox"/>	Form	Plankton, Fish, Water	Sample collection form for plankton, including tow, flow meter, and other instrument data. Also includes a short Chain of Custody (COC).	<a href="#">Plankton_Form_2014.pdf</a>
<input type="checkbox"/>	Form	Beach, Tidal Flat, Marsh, Vegetation	Preassessment data sheet to collect shoreline oiling exposure information at a point location.	<a href="#">Preassessment datasheet_2016_08.xlsx</a>
<input type="checkbox"/>	Form	Beach, Tidal Flat, Marsh, Vegetation	NRDA rapid shoreline assessment datasheet to document exposure to marsh habitat by collecting linear data.	<a href="#">Rapid Pre-Assessment Datasheet_2016_0816.pdf</a>
<input type="checkbox"/>	Form	Soil, Sediment	Sample collection form for soil and sediment, including the sampling method and depth. Also includes a short Chain of Custody (COC).	<a href="#">Soil_Sediment_Form_2014.pdf</a>
<input type="checkbox"/>	Form	Tissue, Vegetation, Wrack	Sample collection form for tissue and wrack, including the species, tissue type, and number of organisms. Also includes a short Chain of Custody (COC).	<a href="#">Tissue_Wrack_Form_2014.pdf</a>
<input type="checkbox"/>	Form	Vegetation	Field data sheet for vegetative habitat, including physical and chemical parameters, transect characterization, exposure to oiling, quadrat characterization, and sample collection.	<a href="#">VegetationForm_2014.pdf</a>

Showing 1 to 37 of 37 entries

# DIVER Data Templates

## Electronic Data Deliverables

### Labs: Electronic Data Deliverables (EDDs)

- Chemistry and Bioassay (Toxicity)

### Data Providers: Electronic Data Deliverables (EDDs)

- Chemistry
- Bioassay (Toxicity)
- Biological Data
- Field Measurements and Observations

### Guidance, Study Notes and Template “Tester”

### Additional Templates

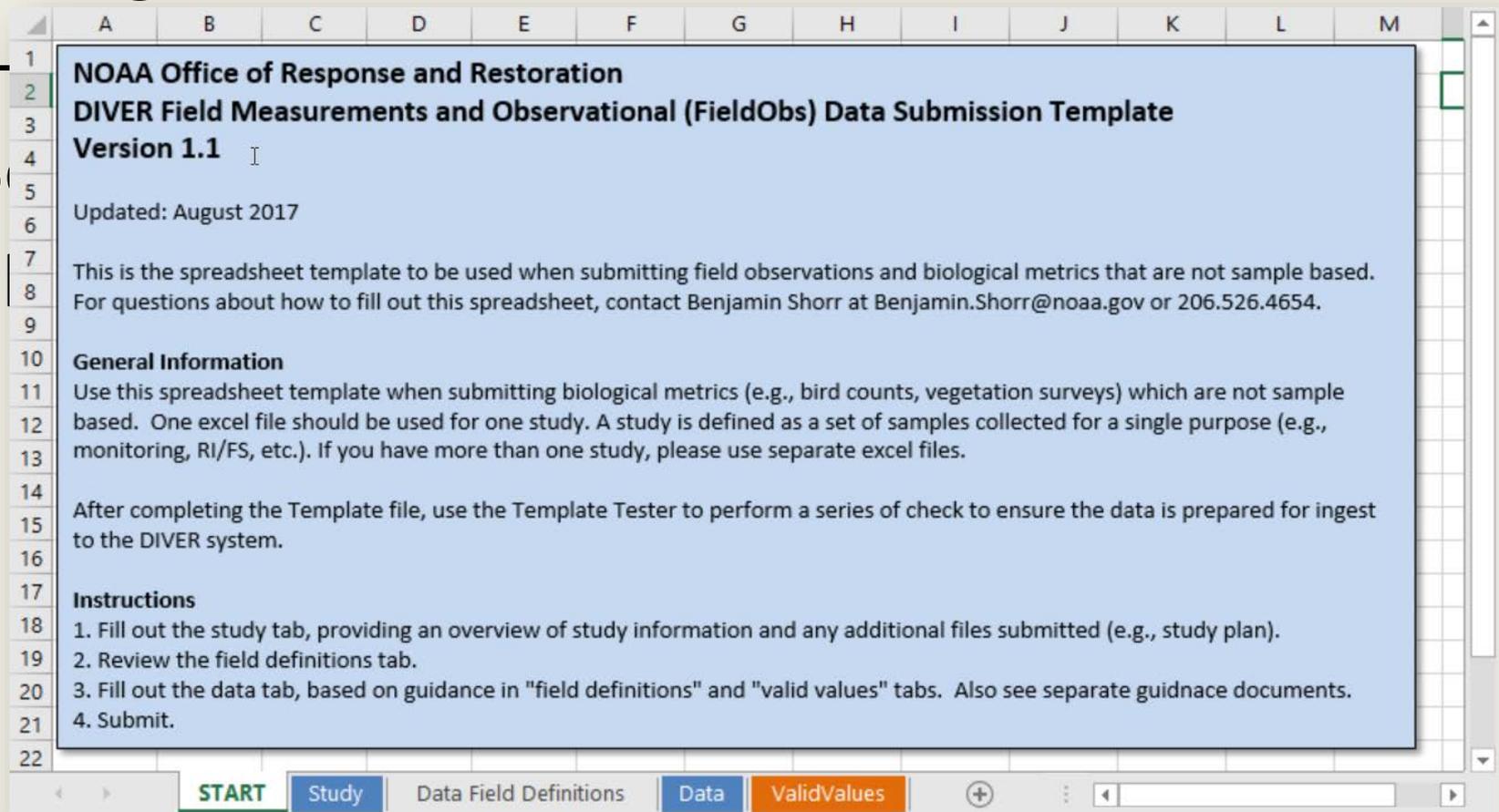
- Photos Database (NOAA Photologger)
- Shoreline Cleanup Assessment Techniques (SCAT)

# Field Measurements and Observations

- Biological

- B

- P



The screenshot shows an Excel spreadsheet with the following content:

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	<b>NOAA Office of Response and Restoration</b>												
2	<b>DIVER Field Measurements and Observational (FieldObs) Data Submission Template</b>												
3	<b>Version 1.1</b>												
4	Updated: August 2017												
5	This is the spreadsheet template to be used when submitting field observations and biological metrics that are not sample based.												
6	For questions about how to fill out this spreadsheet, contact Benjamin Shorr at Benjamin.Shorr@noaa.gov or 206.526.4654.												
7	<b>General Information</b>												
8	Use this spreadsheet template when submitting biological metrics (e.g., bird counts, vegetation surveys) which are not sample based. One excel file should be used for one study. A study is defined as a set of samples collected for a single purpose (e.g., monitoring, RI/FS, etc.). If you have more than one study, please use separate excel files.												
9	After completing the Template file, use the Template Tester to perform a series of check to ensure the data is prepared for ingest to the DIVER system.												
10	<b>Instructions</b>												
11	1. Fill out the study tab, providing an overview of study information and any additional files submitted (e.g., study plan).												
12	2. Review the field definitions tab.												
13	3. Fill out the data tab, based on guidance in "field definitions" and "valid values" tabs. Also see separate guidnace documents.												
14	4. Submit.												

The spreadsheet has tabs at the bottom: START (green), Study (blue), Data Field Definitions (grey), Data (blue), ValidValues (orange), and a plus sign for additional tabs.





# Monitoring and Adaptive Management Standards

**GULF SPILL RESTORATION**

Website maintained by NOAA on behalf of the Deepwater Horizon Natural Resource Damage Assessment Trustees

Home About Us How We Restore Restoration Areas Data Media & News

## Monitoring and Adaptive Management

Adaptive restoration monitoring creates restoration approaches setting

The Trust framework Horizon and AD guidance benefit scientific improve to procu question

More In

- M
- M

**DIVER Portal**

SELECT A WORKSPACE

Favorites Only Filter...

- Great Lakes
- Northeast
- Northwest & Arctic
- Southeast
- Barge B No. 255 Fire
- Bay Long Incident LA
- Citgo Refinery/Calcasieu River
- Deepwater Horizon
  - Alabama TIG
  - DWH File Collections
  - DWH Harddrive Manifests
  - Equipment and Sample Forms
  - Florida TIG
  - Louisiana TIG
  - Mississippi TIG
    - File Collection
    - Open Ocean TIG
    - Regionwide TIG
    - Reports
    - Restoration Plan Tracking
    - Texas TIG
  - Toxicity Data
  - Trustee Council
- Demonstration
- Florida and Caribbean Marine Debris
- Green Canyon 248
- Gulf of Mexico Marine Debris
- Hurricane Harvey
- Hurricane Irma
- Keathley Canyon 919 (MEXUS)
- South Alabama Mercury NRDAR
- Southeast Marine Debris

Benjamin Shorr Sign Out

### Project Details

Overview Activities As-Built Monitoring Env Compliance Budget Contacts Documents

Last Data Refresh: 02/05/2018 [Expand All](#) | [Collapse All](#)

#### Documents

Monitoring Documents (12)

Document Title	Document Type	Modified Date	File Size	File Type
<a href="#">Artificial Reef Data Spring 2014 - Tray</a>	Monitoring Data	12/22/2017	88 kB	xlsx
<a href="#">Artificial Reef 2014 Baskets Summary</a>	Monitoring Data	12/22/2017	74 kB	xlsx
<a href="#">Artificial Reef Data Spring 2015 - Tray</a>	Monitoring Data	12/22/2017	41 kB	xlsx
<a href="#">Monitoring Progress Report Year 2 (2015) Mississippi Artificial Reef Habitat Early Restoration Project</a>	DWH NRDA Monitoring Progress Report	12/22/2017	360 kB	pdf
<a href="#">Artificial Reef Spring 2015 Results - Baskets</a>	Monitoring Data	12/22/2017	39 kB	xlsx
<a href="#">Artificial Reef 2015 Baskets Summary</a>	Monitoring Data	12/22/2017	67 kB	xlsx
<a href="#">Artificial Reef Spring 2014 Results - Baskets</a>	Monitoring Data	12/22/2017	41 kB	xlsx
<a href="#">Artificial Reef Monitoring Final Report Form GCRL 2017</a>	DWH NRDA Final Monitoring Report	12/22/2017	803 kB	pdf
<a href="#">Monitoring Progress Report Mississippi Artificial Reef Habitat Project</a>	DWH NRDA Monitoring Progress Report	12/22/2017	866 kB	pdf
<a href="#">MS DEQ Artificial Reefs Monitoring Plan May 2015 Final.pdf</a>	Monitoring Plan	10/18/2017	635 kB	pdf
<a href="#">Monitoring Progress Report Year 3 (2016) Mississippi Artificial Reef Habitat Early Restoration Project</a>	DWH NRDA Monitoring Progress Report	12/22/2017	347 kB	pdf
<a href="#">MS ER Artificial Reef Deployment and Monitoring Sites Final.pdf</a>	DWH NRDA Monitoring Progress Report	10/18/2017	1583 kB	pdf



# Restoration Monitoring Data

Oyster Reef Data Spring 2015 - Tray.xlsx - Excel

File Home Insert Page Layout Formulas Data Review View Developer ACROBAT Power Pivot Tell me what you want to do... Share

	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	Central 1	Central 6	Central 7	Central Control		Spring 2015	North 4	North 8	North 11	North Control		Spring 2015	South 13A	South 13B	South 13C
2	Taxa Count	Taxa Count	Taxa Count	Taxa Count		Identified Taxa List	Taxa Count	Taxa Count	Taxa Count	Taxa Count		Identified Taxa List	Taxa Count	Taxa Count	Taxa Count
3	-	6	-	-		Alpheus sp.	-	-	-	-		Alpheus sp.	-	-	-
4	2	-	-	1		Callinectes sapidus	1	-	-	4		Callinectes sapidus	-	-	-
5	-	-	-	1		Caranx hippos	-	-	-	-		Caranx hippos	-	-	-
6	-	5	-	1		Chloroscombrus chrysurus	-	-	-	-		Chloroscombrus chrysurus	-	-	-
7	-	3	1	2		Clibanarius vittatus	-	-	-	-		Clibanarius vittatus	2	-	-
8	2	-	-	2		Erotelis smaragdus	-	-	-	-		Erotelis smaragdus	-	-	-
9	2	-	-	2		Farfantepenaeus aztecus	-	-	-	9		Farfantepenaeus aztecus	-	-	-
10	-	1	-	-		Gobiesox strumosus	-	-	-	-		Gobiesox strumosus	3	-	1
11	2	4	-	1		Gobiosoma bosc	-	-	-	-		Gobiosoma bosc	3	-	1
12	-	-	-	3		Hypsoblennius invemar	-	-	-	-		Hypsoblennius invemar	-	-	-
13	1	-	-	2		Hypsoblennius ionthas	-	-	-	-		Hypsoblennius ionthas	-	-	1
14	-	-	-	-		Lagodon rhomboides	-	-	-	1		Lagodon rhomboides	-	-	-
15	2	3	11	4		Menippe adina	-	-	-	-		Menippe adina	-	-	-
16	1	-	-	-		Myrophis punctatus	-	-	-	-		Myrophis punctatus	-	-	-
17	3	-	-	1		Opsanus beta	-	-	-	-		Opsanus beta	1	-	1
18	1	-	-	-		Palaemonetes sp	-	-	-	-		Palaemonetes sp	6	-	-
19	10	6	12	16		Panopeidae	-	-	4	1		Panopeidae	20	8	11
20	1	-	3	-		Stramonita haemastoma	4	1	-	-		Stramonita haemastoma	-	-	-
21															
22	27	28	27	36		<b>Total</b>	5	1	4	15		<b>Total</b>	35	8	15
23	11	7	4	12		<b># of Species</b>	2	1	1	4		<b># of Species</b>	5	1	5
24	4	3	3	4		<b># of Trays</b>	4	4	4	4		<b># of Trays</b>	3	1	2
25	27 per m2	28 per 0.75m2	27 per 0.75m2	36 per m2		<b>Taxa Density (#/m2)</b>	5 per m2	1 per m2	4 per m2	15 per m2		<b>Taxa Density (#/m2)</b>	35 per 0.75m2	8 per 0.25m2	15 per 0.5m2
26	11 per m2	7 per 0.75m2	4 per 0.75m2	12 per m2		<b>Taxa Diversity (#taxa/m2)</b>	2 per m2	1 per m2	1 per m2	4 per m2		<b>Taxa Diversity (#taxa/m2)</b>	5 per 0.75m2	1 per 0.25m2	5 per 0.5m2

Ready South Summary Biomass-Productivity Summary **Density-Diversity Summary** 85%



**Because, Data.**