NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Second Interim, Partial Claim for Assessment and Restoration Planning Costs

20 April 2010 Deepwater Horizon (MC252) Incident

Time Period: January-December 2013

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TABLE OF CONTENTS

LIST OF TABLES

EXECUTIVE SUMMARY

On April 20, 2010, an explosion and fire on the *Deepwater Horizon* mobile offshore drilling unit resulted in 11 worker fatalities and discharges of oil and other substances from the rig and seabed wellhead into the Gulf of Mexico. Pursuant to section 1006 of the Oil Pollution Act ("OPA"), 33 U.S.C. §§ 2701, *et seq.,* federal, state, and federally recognized tribes are Trustees for natural resources and are authorized to act on behalf of the public to: (1) assess natural resource injuries resulting from a discharge of oil or the substantial threat of a discharge and response activities and; (2) develop and implement a plan for restoration of such injured resources.

Immediately following the *Deepwater Horizon/*Mississippi Canyon 252 ("MC252") Oil Spill, the affected Trustees initiated joint efforts to begin the collection and analysis of: (1) data reasonably expected to be necessary to make a determination of jurisdiction or a determination to conduct restoration planning; (2) ephemeral data; and (3) information needed to design or implement anticipated emergency restoration and assessment activities as part of the Restoration Planning Phase. In addition, pursuant to Natural Resource Damage Assessment (NRDA) regulations (15 CFR § 990.14), one of the identified Responsible Parties, BP Exploration and Production, Inc. "BP", informed the Trustees of its intent to participate in the NRDA. As a result, the Trustees provided opportunities for BP to comment on Trustee-developed assessment plans and to participate in field work when the Trustees and BP reached a mutual agreement. As a condition of participation, BP is required to fund the joint plans. In this Claim, the *Deepwater Horizon*/MC252 Oil Spill is referred to as "Oil Spill" or "Incident" which may include, as applicable, all Incident(s) related to the events of the explosion, fire and subsequent discharges of oil and other substances from the rig and wellhead on the seabed into the Gulf of Mexico.

Pursuant to the NRDA regulations applicable to OPA, 15 C.F.R. Part 990 ("NRDA regulations"), the Trustees issued a Notice of Intent to Conduct Restoration Planning ("Notice"). That Notice confirmed the Trustees were ready to proceed with restoration planning to fully evaluate, assess, and quantify and develop plans for restoring, replacing or acquiring the equivalent of natural resources and their services injured by and losses resulting from the Incident. The restoration planning process will include collection of information that the Trustees determine is appropriate for identifying and quantifying natural resource injuries and associated losses of resources and their services, and determination of the need for, and type and scale of restoration actions.

This Claim document identifies assessment and restoration planning activities, including studies, that the U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA) plans to implement in 2013 to inform injury determination, injury quantification, and restoration selection activities associated with the Incident. The collection of activities identified in this Claim reflect consideration of the factors identified in 15 C.F.R. §990.27 (use of assessment procedures), §990.51 (injury determination) and §990.52 (injury quantification). The assessment activities also reflect consideration of data and analyses conducted during the pre-assessment phase of the NRDA. Restoration planning activities identified reflect consideration of the factors identified in 15 C.F.R. §990.53 (developing restoration alternatives), §990.54 (evaluation of alternatives), and §990.55 (developing

restoration plans). NOAA also will be evaluating injury assessment and restoration planning and implementation records for inclusion into Administrative Record(s) (§990.61). Scientific information to support injury determination and quantification, although incomplete, is sufficient for the Trustees to proceed with restoration planning. NOAA assessment and restoration planning activities in this Claim are a subset of the NRDA activities conducted by all Trustees. NOAA activities in this Claim focus on affected natural resources that NOAA directly manages – including coastal habitats, fisheries, marine mammals and sea turtles, endangered and threatened marine species, and resources associated with National Estuarine Research Reserves and National Marine Sanctuaries. NOAA reserves its ability to supplement the assessment and restoration planning procedures identified herein.

This Claim covers NOAA's assessment and restoration planning activities and estimated costs for 2013 that are unique from activities already paid for by BP or the U.S. Coast Guard. The document is organized to provide a description of NOAA's proposed activities and associated expenditures by resource category or major topic area. NOAA combined labor costs of all scientists and attorneys required to prepare a comprehensive injury assessment and continue region-wide restoration planning. NOAA requests a total of $115,526,088 to complete NRDA activities during the budgeted period. Although different labor rates and total hours were estimated for a variety of NOAA personnel, the total cost is used to cover expenses for 94 administrative support specialists, scientists, restoration specialists, attorneys, and program managers working on the NRDA. A contract and agency sub-total is provided in each section of the Claim to clearly indicate the amount money needed for a particular study or activity. In total, NOAA requests $24,364,516 for agency support and $91,161,572 for contract support to complete NRDA procedures outlined in this Claim (Table 1). NOAA is not requesting contingency funding for any of the activities.

NOAA and co-Trustees also are examining human use patterns in the region affected by the Incident, and how the oil is affecting recreational activities or use of the Gulf of Mexico. The Trustees are surveying for potential direct, lost human-uses related to this oil spill, including effects to outdoor recreation. NOAA submitted separate claims for assessment costs on November 9, 2011, May 4, 2012, and July 27, 2012 to the RPs to address these activities. The requested funds for procedures in this Claim are additional to monies provided by the NPFC in Summer 2012 for Claim #N10036-OC08. On July 5, 2012, The NPFC provided $19.4M in a partial adjudication of NOAA's Interim Claim submitted on March 23, 2012. About three weeks later on July 27, 2012, the NPFC adjudicated the remaining portion of NOAA's first Interim Claim for assessment and restoration planning. The NPFC provided $103.1M to NOAA in 2012 for all procedures that were originally scheduled for April-December 2012.

In total, NOAA requests a sum certain of $115,526,088 for injury assessment and restoration planning activities specified in this second Interim Claim for Assessment and Restoration Planning.

Table 1. Summary of contract costs and labor effort by injury and restoration procedure.

ACTIVITY/PROCEDURE	TOTAL CONTRACT COSTS	CONTRACT EQUIVALENTS
Soft Bottom Sediment	$2,274,466	11.2
Hard Ground Corals	$562,466	1.8
Mesophotic Reefs	$557,466	2.1
Benthic Megafauna	$460,266	1.7
Bluefin Tuna Telemetry Studies	$1,288,124	5.2
Oil Fate Modeling and Comparisons with Observational Data	$1,443,600	3.4
Hydrodynamic Modeling	$324,000	0.8
Physical-Chemical Observational Data Analysis	$589,000	1.3
Remote Sensing Products Supporting Modeling	$706,000	1.6
Exposure and Injury Modeling and Data Inputs	$983,000	2.2
Data Management for Transport, Fates and Effects Modeling Activities	$2,074,820	7.4
Evaluation of Historical Biological Data and Analysis of Field Data from 2010-2011	$16,526,400	7.2
Documentation of Oil Pathway, Water Column Organisms Exposed and Injured	$1,592,250	5.2
Data Management for Fish and Plankton Activities	$2,094,820	7.4
Sargassum Communities	$1,893,405	7.5
Sea Turtle Exposure and Injury Assessment Report	$445,500	1.4
Sea Turtle Surrogate Study	$29,000	0.1
Transport and Storage of Stranded Sea Turtles and Marine Mammals	$193,000	1.0
Estuarine Dolphins	$4,125,201	12.9
Coastal/Shelf Dolphins	$305,000	0.9
Coastal and Estuarine Cetacean Strandings	$1,379,816	5.5

ACTIVITY/PROCEDURE	TOTAL CONTRACT COSTS	CONTRACT EQUIVALENTS
Oceanic Marine Mammals	$915,203	3.0
Inhalation Risk Assessment	$289,000	0.7
Completing Analysis of Coastal Wetland Vegetation Injury	$8,290,321	24.1
Completing Analysis of Coastal Wetland Faunal Injury	$920,876	2.6
Completing Analysis of Coastal Wetland Erosion	$311,124	1.0
Characterizing Nearshore Sediment Contamination	$743,186	2.6
Characterizing Nearshore Biota Contamination	$69,600	0.2
Completing Analysis of Nearshore Benthic Injury	$924,555	3.2
Completing Analysis of Subtidal Oyster Injury (Abundance and Biomass)	$6,557,645	21.6
Completing Analysis of Subtidal Oyster Injury (Recruitment)	$4,325,428	16.9
Completing Analysis of Intertidal Oyster Injury	$4,217,939	15.2
Comprehensive Integration of Oyster Injury Assessment Elements	$986,970	3.6
Completing Analysis of Injury to Submerged Aquatic Vegetation	$635,360	2.4
Integrate and Interpret Findings Regarding Nearshore Exposure and Injury and Prepare Reports	$467,400	1.1
Restoration Planning Activities	$3,843,536	21.0
Toxicity to Aquatic Organisms	$7,408,402	19.2
Data Infrastructure and Systems Architecture	$5,736,428	20.3
Injury Assessment and Legal Case Management	$1,131,000	3.4
Field Operations Support	$0	0.0
Comprehensive Document Management System for Assessment & Restoration Planning Records	$552,000	1.6
Legal Review of Assessment & Records Produced by NOAA	$2,988,000	9.6
TOTAL	**91,161,572**	**261**

Table 2. Summary of agency labor effort by injury and restoration procedure

ACTIVITY/PROCEDURE	AGENCY LABOR EQUIVALENTS
Soft Bottom Sediment	0.5
Hard Ground Corals	0.1
Mesophotic Reefs	0.6
Benthic Megafauna	0.1
Bluefin Tuna Telemetry Studies	1.6
Oil Fate Modeling and Comparisons with Observational Data	0.7
Hydrodynamic Modeling	0.0
Physical-Chemical Observational Data Analysis	0.0
Remote Sensing Products Supporting Modeling	0.4
Exposure and Injury Modeling and Data Inputs	0.0
Data Management for Transport, Fates and Effects Modeling Activities	0.2
Evaluation of Historical Biological Data and Analysis of Field Data from 2010-2011	0.6
Documentation of Oil Pathway, Water Column Organisms Exposed and Injured	0.0
Data Management for Fish and Plankton Activities	0.6
Sargassum Communities	0.5
Sea Turtle Exposure and Injury Assessment Report	1.1
Sea Turtle Surrogate Study	0.2
Transport and Storage of Stranded Sea Turtles and Marine Mammals	0.6
Estuarine Dolphins	4.7
Coastal/Shelf Dolphins	0.9
Coastal and Estuarine Cetacean Strandings	0.9

ACTIVITY/PROCEDURE	AGENCY LABOR EQUIVALENTS
Oceanic Marine Mammals	0.9
Inhalation Risk Assessment	0.3
Completing Analysis of Coastal Wetland Vegetation Injury	0.9
Completing Analysis of Coastal Wetland Faunal Injury	0.2
Completing Analysis of Coastal Wetland Erosion	0.2
Characterizing Nearshore Sediment Contamination	0.6
Characterizing Nearshore Biota Contamination	0.0
Completing Analysis of Nearshore Benthic Injury	0.6
Completing Analysis of Subtidal Oyster Injury (Abundance and Biomass)	0.3
Completing Analysis of Subtidal Oyster Injury (Recruitment)	0.3
Completing Analysis of Intertidal Oyster Injury	0.3
Comprehensive Integration of Oyster Injury Assessment Elements	0.2
Completing Analysis of Injury to Submerged Aquatic Vegetation	0.4
Integrate and Interpret Findings Regarding Nearshore Exposure and Injury and Prepare Reports	1.3
Restoration Planning Activities	50.0
Toxicity to Aquatic Organisms	1.9
Data Infrastructure and Systems Architecture	2.5
Injury Assessment and Legal Case Management	17.5
Field Operations Support	0.6
Comprehensive Document Management System for Assessment & Restoration Planning Records	0.9
Legal Review of Assessment & Records Produced by NOAA	0.0
TOTAL	**94.4**

Claimant eligibility and coordination with co-Trustees

The following entities are designated natural resource Trustees under OPA and are acting as Trustees for this Incident:

- the National Oceanic and Atmospheric Administration ("NOAA"), on behalf of the U.S. Department of Commerce;
- the U.S. DOI, as represented by the National Park Service ("NPS"), United States Fish and Wildlife Service ("USFWS"), Bureau of Indian Affairs ("BIA"), and Bureau of Land Management ("BLM");
- the Environmental Protection Agency (EPA);
- the U.S. Department of Agriculture (USDA);
- the U.S. Department of Defense ("DOD");
- the State of Louisiana's Coastal Protection and Restoration Authority, Oil Spill Coordinator's Office, Department of Environmental Quality, Department of Wildlife and Fisheries and Department of Natural Resources;
- the State of Mississippi's Department of Environmental Quality;
- the State of Alabama's Department of Conservation and Natural Resources and Geological Survey of Alabama;
- the State of Florida's Department of Environmental Protection; and Florida Fish and Wildlife Conservation Commission;
- the State of Texas' Parks and Wildlife Department, General Land Office, and Commission on Environmental Quality.

In addition to acting as Trustees for this Incident under OPA, the States of Louisiana, Mississippi, Alabama, Florida and Texas are also acting pursuant to their applicable state laws and authorities, including the Louisiana Oil Spill Prevention and Response Act of 1991, La. R.S. 30:2451 *et seq.,* and accompanying regulations, La. Admin. Code 43: 10 1 *et seq.;* the Texas Oil Spill Prevention and Response Act, Tex. Nat. Res. Code, Chapter 40, Section 376.011 *et seq.,* Fla. Statutes, and Section 403.161, Fla. Statutes; the Mississippi Air and Water Pollution Control Law, Miss. Code Ann. § § 49-17-1 through 49-17-43; and Alabama Code § § 9-2-1 *et seq.* and 9-4-1 *et seq.*

Several technical working groups (TWGs) are led by the Trustees to guide and coordinate data collection and analysis for the NRDA. As appropriate, these TWGs coordinate with and consider input from BP on joint plans. All of the procedures identified in this document are planned to be implemented by NOAA personnel, and were developed in coordination with co-Trustees, including extensive review in the appropriate TWGs. Proposed assessment work in deepwater communities are planned to be implemented by NOAA and DOI scientists. Expenses incurred in the following Claim categories may occur from NOAA or DOI personnel:

- Deep sea soft bottom sediments
- Deep sea hard ground corals
- Mesophotic reefs
- Benthic megafauna

Funds received by NOAA previously from BP have not been applied to any of the proposed activities in this Claim.

Responsible Party information

The Responsible Parties ("RPs") identified for this Incident thus far are BP Exploration and Production, Inc. ("BP"); Transocean Holdings Inc. ("Transocean"); Triton Asset Leasing GmbH ("Triton"); Transocean Offshore Deepwater Drilling Inc. ("Transocean Offshore"); Transocean Deepwater Inc. ("Transocean Deepwater"); Anadarko Petroleum ("Anadarko"); Anadarko E&P Company LP ("Anadarko E&P"); and MOEX Offshore 2007 LLC ("MOEX"). Pursuant to 15 CFR § 990.14(c), concurrent with the publication of the Notice to Conduct Restoration Planning, the Trustees invited the RPs identified above to participate in an NRDA. The Trustees have coordinated with BP, the only RP who accepted this invitation to actively participate in the NRDA process.

Determination of jurisdiction

For reasons identified in the Notice of Intent to Conduct Restoration Planning for this Incident, the Trustees determined they have jurisdiction to pursue restoration under OPA. 75 Fed. Reg. 60800 (Oct. 1, 2010).

Time limitations on claims

This Claim for funding of reasonably necessary assessment and restoration planning procedures to inform Incident- specific injury determination and quantification analyses is presented in writing to the Director, National Pollution Funds Center (NPFC) within time limits specified in 33 C.F.R. §136. 101. The NRDA for this Incident is not complete.

Legal action

On December 15, 2010, the United States filed its complaint against the RPs in the Eastern District of Louisiana (Civil Case no.2:10-cv-04536). At this time, the trial schedule does not include natural resource damages quantification in the first two phases of litigation.

Claim presentation

This Interim, Partial Claim for Assessment and Restoration Planning Costs has been presented for a sum certain, in accordance with OPA to all of the identified RPs by letters dated September 19, 2012.

ASSESSMENT: OVERVIEW OF APPROACH

OPA regulations provide that NRDA procedures be tailored to the circumstances of the Incident and the information needed to determine appropriate restoration. With respect to standards for assessment procedures, the regulations provide that (15 CFR § 990.27(a)):

> (1) The procedure(s) must be capable of providing assessment information of use in determining the type and scale of restoration appropriate for a particular injury;
>
> (2) The additional cost of a more complex procedure must be reasonably related to the expected increase in the quantity and/or quality of relevant information provided by the more complex procedure; and
>
> (3) The procedure must be reliable and valid for the particular Incident**.**

OPA regulations identify several categories of assessment procedures available to Trustees, including but not limited to: procedures conducted in the field or laboratory; model-based procedures; and/or literature-based procedures (15 CFR § 990.27(b)). If a range of assessment procedures providing the same type and quality of information is available, the most cost- effective procedure must be used (15 CFR § 990.27(c)). Finally, assessment procedures must contribute to injury determination (i.e., by establishing the spatial and temporal magnitude of exposure to oil, the pathway(s) of exposure, and/or the presence of injury, as described in 15 CFR § 990.51) and/or injury quantification (i.e., quantifying the degree, spatial and temporal extent of injury to natural resources and the associated reduction in services caused by the injury, as described in 15 CFR § 990.52).

The goal of NOAA's assessment is to create a holistic view of the effects to the Gulf of Mexico ecosystem from the discharged oil. Immediately following the Incident, NOAA evaluated the resources at risk in the affected area and developed injury assessment hypotheses and conceptual models to guide field investigations. NOAA then developed work plans to document the pathway and exposure of discharged oil to resources and services that may have been affected by the Incident. Finally, NOAA and co-Trustees designed and implemented studies to evaluate the severity and extent of injuries to resources and services from discharged oil and to evaluate alternative hypotheses for potential injuries. As of September 14, 2012, NOAA completed or is participating in more than 125 NRDA investigations in all resource categories except birds and terrestrial mammals.

Many ongoing and proposed activities in 2013 involve the collection and analysis of field data needed to inform estimates of the magnitude of injury and associated reductions in services. Models and literature-based methods also are used in selected investigations. The scale and cost of each proposed activity was carefully considered with co-Trustees, and represents a balance between the need for cost-effective assessment efforts and the unprecedented geographic scale and complexity of this oil spill.

NOAA determined that the assessment procedures identified in this document meet the requirements set forth in the OPA regulations, and are integrated with and not duplicative of co-Trustee NRDA data collection and analysis activities. Modifications to the identified assessment procedures may be made because of the participation of BP in the NRDA pursuant to 15 CFR § 990.14. A description of each

assessment activity's purpose and related implementation information is provided in subsequent sections of this document, and in some cases, in the related work plans. Additional budget detail or information about the proposed activities can be provided upon request.

NOAA regularly posts final NRDA work plans and study-related data on the Internet. For the official record of Trustee NRDA investigations, visit the Deepwater Horizon Oil Spill NRDA Administrative Record. As of September 14, 2012, the site contains links to more than 125 NRDA work plans. Many of these work plans provide detailed technical methods and implementation information, and are incorporated by reference into this Claim.

NRDA work plans and study-related data
http://www.gulfspillrestoration.noaa.gov/oil-spill/gulf-spill-data/

NRDA Administrative Record
http://www.doi.gov/deepwaterhorizon/adminrecord/index.cfm

In Table A-1, the title and date each workplan was signed is provided, and the general objectives of the plans are described. Almost all of these assessment workplans were focused intentionally on the data collection phase after the Incident. Therefore, the assessment plans do not address Trustee activities focused on data compilation, synthesis, analysis, interpretation, reporting, and restoration planning. Many of our activities in this Claim are focused on the analysis and interpretation of scientific data necessary to quantify injuries from the Incident, complete NRDA analyses, and plan for restoration.

Overview of How NOAA Estimated Assessment Costs for Each Activity

NOAA is planning to complete many NRDA assessment analyses by the end of 2013 (including injury quantification and draft technical and interpretive reporting). Therefore, our Claim is largely based on the amount of technical effort required to develop our interpretation of injuries to natural resources and services from the Incident and conduct region-wide restoration planning with the co-Trustees. For each activity, we first estimated the number of agency staff and contractor labor hours and any direct contract or agency costs that were necessary to complete all appropriate NRDA tasks. Data management, scientific documentation, and legal review of analyses and technical deliverables are included as part of each activity's cost. We used agency and contract equivalents to simply portray the extent of our labor effort in each category. Since the Responsible Parties have not paid our NRDA costs since late-2011, we did not assume in our estimates that they would offset any technical assessment, data management, field operations, laboratory analysis, or restoration planning costs.

We then compared each activity's projected level of effort and cost against the expected amount of co-Trustee and RP coordination, laboratory and other data analysis schedules, and the number of anticipated deliverables, including finalization of large environmental and chemical datasets. The types of deliverables and laboratory/sample analyses are described in more detail below. Our internal analysis of cost projections was extensive and involved agency technical experts and managers in each resource area to ensure double-counting was avoided and to ensure we could complete the activities with co-Trustees

according to the schedules provided in this Claim. Where appropriate in this Claim, we noted that some of the assessment subtasks, injury quantification activities, and Trustee review of data and interpretive reports may extend into 2014.

The types of deliverables described in this Claim are diverse:

- Datasets/databases – Datasets/databases include laboratory-based chemistry analyses, other biological laboratory analyses, field observation and measurement data, models and model outputs, and maps of observations in two and three dimensions. They include electronic data deliverables (EDDs) from laboratories, third-party validated or TWG-validated data, and final spatial data layers housed on Trustee data management systems.
- Work plans – Work plans have been developed for each major sampling effort. Final, signed work plans are redacted as appropriate and posted to NOAA's Gulf Spill Restoration web site (http://www.gulfspillrestoration.noaa.gov/) and other relevant locations.
- Data reports – Data reports and data summaries present relevant data and sometimes include descriptive statistics, basic analyses, or study methods. They typically present data in tabular format and may also include figures and maps.
- Interpretive reports – Interpretive reports are authored by senior technical experts and provide extensive interpretation of study results across studies and even across Technical Working Groups (TWGs). Quantification of injured resources and services is included and the technical basis for our interpretation is described using all relevant data about the release scenario, pathway of oil, exposure of resources to oil, and measureable injuries documented from discharged oil.

The third and final step in our process involved checking to make sure that 2013 costs were not duplicative of previous funding received in 2011 from BP and 2012 by the NPFC. All of NOAA's costs in this Claim are for assessment analyses, restoration planning, and interpretive activities that are not accounted for in previous funding requests to BP and the NPFC.

We structured this Claim to present to the National Pollution Funds Center after 90 days if the Responsible Party(s) declines to pay NOAA's assessment and restoration planning costs. The repetitive style of the document helps ensure that critical information for each activity is considered.

Table 3. 2013 analysis costs for analytical and non-analytical samples or analyses

2013 Claim Activity	2013 Sample or Analysis Type	2013 Number of Samples or Amount of Analysis	2013 Principal Investigators and Laboratories	Portion of 2013 Total Activity Cost Related to Sample Analyses	Number of Samples or Analyses Estimated Completed with 2012 NPFC Funds by December 31, 2012
Activity A: Soft bottom sediment	Macrofauna	1000 samples from SB9	TAMU/Montagna	5.8 Contract Equiv. ($1.1M)	390 Response samples done for macrofauna; approximately 168 NRDA samples from SB9 and 120 samples from HC3
Activity A: Soft bottom sediment	Meiofauna	300 NRDA samples from SB9	Nevada Reno/Baguley	2.4 Contract Equiv. ($250K)	130 Response samples done for meiofauna; 152 NRDA samples from SB9 and 120 samples from HC3
Activity A: Hard bottom corals	Histological and genetic analyses	2013 Costs include additional genetic sequencing on a subset of samples already analyzed to refine speciation, labor time to read histology slides, and reporting costs	Ester Peters/Eric Cordes	0.2 Contract Equiv. ($74K)	132 coral samples analyzed for genetics, 30 samples analyzed for histology, several thousand photos assessed
Activity A: Mesophotic Reefs	Analysis of video transects	Analysis of newly identified baseline video from 16 ROV dives for fish abundance and coral health, as well as continued analysis of baseline video; as well as reporting	Sulak (USGS) / Etnoyer (NOAA)	2.1 Contract Equiv. ($557K)	Enumeration of fish and assessment of coral health from 182 video transects taken on the 55 ROV dives on the HC2, enumeration of fish from half of baseline video
Activity A: Benthic Megafauna (Red Crab)	Reporting only	2013 Costs include data management and reporting costs only	IEc	1.7 Contract Equiv. ($460K)	Analysis of tissues from approximately 400 Red Crabs, including histological analysis and reproductive health assessment

2013 Claim Activity	2013 Sample or Analysis Type	2013 Number of Samples or Amount of Analysis	2013 Principal Investigators and Laboratories	Portion of 2013 Total Activity Cost Related to Sample Analyses	Number of Samples or Analyses Estimated Completed with 2012 NPFC Funds by December 31, 2012
Activity B: Bluefin Tuna Telemetry	Data analysis and injury quantification only	2013 costs include analyses, interpretation, and reporting	Stanford / Block	3.6 Contract Equiv. ; including 262K for GulfTOPP ($897K)	Final tracks for 25 of 33 tagged fish that entered the Gulf of Mexico from 2010 to 2012
Activity C: Exposure and Injury Modeling and Data Inputs	Updating biological datasets	Analysis and interpretation of 1200 historical plankton samples	ASA/ various	2.2 Contract Equiv. ($694K)	Data from 1200 historical plankton samples (collected 1999-2009) compiled
Activity C: Hydrodynamic Modeling	CTD Casts	QA/QC of 3500 casts + analysis and interpretation	ASA/ Yong Kim	0.1 Contract Equiv. ($45K)	3500 casts processed
Activity C: Remote Sensing to Support Modeling	Interpretation: Oil thickness and volume calculations	82 Image Days	ASA / Stratus	1.7 Contract Equiv. ($418K)	Imagery from 82 image days processed
Activity D: Documentation of Oil Pathway, Water Column Organisms Exposed and Injured	Acoustics data from cruises; observations of dead animals from cruises	40,000 hours of acoustic data collected from 4 cruises	FIU/ Boswell	3.8 Contract Equiv. ($919K)	N/A; New Request

2013 Claim Activity	2013 Sample or Analysis Type	2013 Number of Samples or Amount of Analysis	2013 Principal Investigators and Laboratories	Portion of 2013 Total Activity Cost Related to Sample Analyses	Number of Samples or Analyses Estimated Completed with 2012 NPFC Funds by December 31, 2012
Activity D: Evaluation of Historical Biological Data and Analysis of Field Data from 2010 and 2011	Isotope analyses	1500 collected, 700 proposed for analysis	TAMU/Wells	0.3 Contract Equiv. ($100K)	N/A; New Request
Activity D: Evaluation of Historical Biological Data and Analysis of Field Data from 2010 and 2011	FlowCAM imaging microscope, Chlorophyll, and Nutrients	1300 microzooplankton for FlowCAM, 3400 chlorophyll, 6500 nutrient	LSU/ Sutor	1.3 Contract Equiv. ($370K)	N/A; New Request
Activity D: Evaluation of Historical Biological Data and Analysis of Field Data from 2010 and 2011	Plankton sample	6000	LSU /Sutor and others	Contract Cost Only ($13.8M)	1500 done

2013 Claim Activity	2013 Sample or Analysis Type	2013 Number of Samples or Amount of Analysis	2013 Principal Investigators and Laboratories	Portion of 2013 Total Activity Cost Related to Sample Analyses	Number of Samples or Analyses Estimated Completed with 2012 NPFC Funds by December 31, 2012
Activity D: Evaluation of Historical Biological Data and Analysis of Field Data from 2010 and 2011	Nekton sample	8 cruises; 1206 samples	VIMS/ Sutton and others	0.1 Contract Equiv. ($40K)	450 done (one cruise)
Activity D: Evaluation of Historical Biological Data and Analysis of Field Data from 2010 and 2011	Holocam, DAVPR, VPRII, SIPPER, and ISIIS	36 ISIIS deployments	Davis/WHOI; Remsen/USF; Cowen/U. Miami;	2.7 Contract Equiv. ($933K)	195 Holocam/DAVPR/VPRII, SIPPER deployments
Activity D: Evaluation of Historical Biological Data and Analysis of Field Data from 2010 and 2011	Fish and Invertebrate Trawl and Net Sample Processing (Midwater, MOCNESS, and epipelagic trawls)	900	VIMS /Sutton; NSU/ Frank; TAMU/Wells	2.0 Contract Equiv. ($633K)	450

2013 Claim Activity	2013 Sample or Analysis Type	2013 Number of Samples or Amount of Analysis	2013 Principal Investigators and Laboratories	Portion of 2013 Total Activity Cost Related to Sample Analyses	Number of Samples or Analyses Estimated Completed with 2012 NPFC Funds by December 31, 2012
Activity D: Evaluation of Historical Biological Data and Analysis of Field Data from 2010 and 2011	Small Pelagics and gelatinous zooplankton	50	TAMU / Wells	0.4 Contract Equiv. ($141K)	0
Activity E: Sargassum Communities	Biological samples and ROV video (bongo and neuston net)	Video from 7 cruises; 140 biological samples	DISL/Powers; GCRL/Hernandez and Franks	4.8 Contract Eqiuv. ($642K)	0
Activity F: Transport and Storage of Stranded Turtles and Marine Mammals	Samples from dead, live captured, stranded turtles	Estimate approximately 300 animals stranded in 2013, 30 samples per carcass.	Stacy / U. Florida	1.0 Contract Equiv. ($102K)	>1000 animals from 2010-2011, resulting in over 10,000 samples. Samples analyzed for PAH from bile, liver and other tissue.

2013 Claim Activity	2013 Sample or Analysis Type	2013 Number of Samples or Amount of Analysis	2013 Principal Investigators and Laboratories	Portion of 2013 Total Activity Cost Related to Sample Analyses	Number of Samples or Analyses Estimated Completed with 2012 NPFC Funds by December 31, 2012
Activity G: Estuarine Dolphins	Blood, urine, feces, blowhole and blubber/POPs/ PAH, age determination (tooth extraction), ultrasound, CYPIA, genomics mRNA, hormones, stable isotope analysis, health parameters	80 animals	Schwacke/Rowles and UCAR/Collier	NOAA Labs: $120K for blubber POP; $195K for blubber hormone; $20K for microarray; $80K for toxicogenomics @ 500/sample by NCCOS Agency Labor: 0.6 Agency Equiv. SE Fisheries Science Center Contract Labs: Stable isotope ($16K); Hematology ($28K); CYP1A ($21K); Immunochemistry ($90K); Dental Assessment ($50K); Contract Labor: 0.9 Contract Equiv. ($165K)	No new data collected 2012. The remaining 2011 health assessment samples completed with 2012 NPFC funds. Most analyses were already done cooperatively or before NPFC money was received. Cyp 1a, stable isotope, microarray; Approx. n= 50 of each
Activity G: Estuarine Dolphins	Human adrenal gene expression changes and hormone production	100 PAH, adrenal function measures	Schwacke/Rowles and UCAR/Collier	0.5 Contract Equiv. ($98K)	N/A; New Activity

2013 Claim Activity	2013 Sample or Analysis Type	2013 Number of Samples or Amount of Analysis	2013 Principal Investigators and Laboratories	Portion of 2013 Total Activity Cost Related to Sample Analyses	Number of Samples or Analyses Estimated Completed with 2012 NPFC Funds by December 31, 2012
Activity G: Estuarine Dolphins	Remote biopsies (genetic microarray, stable isotope hormones, CYP1A, POPs)	30-40	Mullin, Schwacke, Rosel, and Garrison	0.2 Agency Equiv. for Interpretation ($29K) NOAA Labs: $40K for blubber POP; $30K for blubber hormone; $20K for microarray Contract Labs: $12K for Cyp1A; $8K for stable isotopes	Approx. 200 completed through 2011, 200 remain from early 2012 to complete Cyp, microarray,hormones, stable isotope. Analysis underway or complete with 2012 NPFC Funding.
Activity G: Estuarine Dolphins	Blubber/skin samples collected during 2013 health assessment and remote biopsies and from strandings	150	Rosel (NOAA SEFSC)	0.8 Agency Equiv. ($87K)	N/A; Samples from 2011 health assessment already analyzed
Activity F: Transport and Storage of Stranded Turtles and Marine Mammals	Samples from marine mammals	NOAA is planning conservatively to handle up to 200 marine mammals. We expect an average of at least 50 samples from each animal, depending on carcass condition.	Rowles; U. Illinois/histiopath;	Contract Labs: Histiopath ($85K); Stable Isotope ($60K)	Approximately 626 animals from 2010-2011, resulting in over 15,000 samples analyzed already

2013 Claim Activity	2013 Sample or Analysis Type	2013 Number of Samples or Amount of Analysis	2013 Principal Investigators and Laboratories	Portion of 2013 Total Activity Cost Related to Sample Analyses	Number of Samples or Analyses Estimated Completed with 2012 NPFC Funds by December 31, 2012
Activity H: Completing analysis of coastal wetland vegetation injury	belowground biomass cores	256	ULL/Hester and Willis	Contract Labs: $400K CAS/Alpha grain size; $526K CAS/Alpha PAH; $2.0M Ecoanalysts	N/A
Activity H: Completing analysis of coastal wetland vegetation injury	aboveground vegetative clips	206	ULL/Hester and Willis	(same as belowground biomass cores)	N/A
Activity H: Completing analysis of coastal wetland vegetation injury	nutrient analyses cores	580	ULL/Hester and Willis	(same as belowground biomass cores)	N/A
Activity H: Completing analysis of coastal wetland vegetation injury	physical analyses cores	580	ULL/Hester and Willis	(same as belowground biomass cores)	N/A

2013 Claim Activity	2013 Sample or Analysis Type	2013 Number of Samples or Amount of Analysis	2013 Principal Investigators and Laboratories	Portion of 2013 Total Activity Cost Related to Sample Analyses	Number of Samples or Analyses Estimated Completed with 2012 NPFC Funds by December 31, 2012
Activity J: Completing analysis of subtidal oyster injury [abundance & biomass]	Oyster abundance/bio mass	149 stations	DISL/Powers	0.4 Contract Equiv. ($49K)	149 stations
Activity J: Completing analysis of subtidal oyster injury [recruitment]	Settlement plates (live/dead spat)	400	DISL/Powers	0.2 Contract Equiv. ($37K)	1385
Activity J: Completing analysis of subtidal oyster injury [recruitment]	Gonadal index	400	UNO/Soniat	0.3 Contract Equiv. ($54K)	460
Activity J: Completing analysis of intertidal oyster injury	Transect mapping and abundance/bio mass	Less than 150 sites - TBD	DISL/Powers	0.2 Contract Equiv. ($42K) Contract Labs: $210K for quadrat chemistry	53 sites

Offshore Aquatic Habitat and Resource Investigations

A. Offshore Benthic Habitat and Communities

NOAA is assessing injuries soft bottom sediments, hard ground corals, mesophotic reefs, and benthic megafauna injured by discharged oil. After the spill, oil was transported through the water column, exposing resources along the sea floor, and then settled out onto the benthic environment. Soft bottom sediments, and the infauna and epifauna (including benthic megafauna, such as red crabs) that inhabit these sediments, as well as hard ground corals were injured as a result. In addition, the surface oil slick resulting from the oil spill, and associated airborne dispersant applications, extended over areas along the continental shelf edge, where mesophotic reef habitats were injured.

Soft bottom sediments and the biota that inhabit them, including the infauna as well as benthic megafauna, play an important role in the turnover and cycling of nutrients in the deep sea, as well as provide a ready prey source to higher tropic level organisms that feed in the deep ocean. Mesophotic reefs and the deeper hard ground coral habitats support unique and long-lived coral assemblages and provide protective structure for a variety of resident and migrating water column and benthic species.

For each of these four resource groups, below we provide (1) background information about the projects and work expected to be completed by the end of 2012; (2) details about specific activities for which we are seeking funding in 2013; (3) names of individuals responsible for conducting the particular activities; and (4) budgets for completing the outlined work.

Soft Bottom Sediment

Soft bottom sediment assessment activities are focused on the identification, enumeration, and analysis of sediment infauna collected as part of Response on the *Gyre* and *Ocean Veritas* cruises and NRDA sample collection efforts on the *Sarah Bordelon* and *Holiday Chouest* cruises. Data collected will be used to assess the geographic extent and magnitude of changes in infauna community health. As has been done to date, infauna will be identified to the lowest practical taxonomic level. Biological response variables being evaluated include common benthic attributes such as numbers of taxa, diversity, total density, species abundances, community structure, Swartz's Dominance Index (SDI), and percentages of sensitive vs. tolerant species. Data will be evaluated in the context of known responses that have been shown in previous studies to serve as sensitive indicators of pollution-induced disturbances. For example, bioindicators of contaminant exposure previously used around platforms in the Gulf of Mexico include the relative percentages of sensitive species such as echinoderms and crustaceans (especially amphipods and harpacticoids) versus other more tolerant species such as polychaetes, oligochaetes, and nematodes (especially non-selective deposit feeders) that are often enhanced by the presence of contaminants. In addition, the biota are being examined for evidence of visible abnormalities, such as oil-coated appendages, empty shells or other animal parts, lesions, parasites, and any other abnormal appearances that may be apparent.

Data analyses during 2013 will allow for among-station spatial comparisons through application of appropriate multivariate data-analysis methods (e.g., combinations of numerical classification (cluster

analysis), multidimensional scaling, principal components analysis, and discriminant analysis to define groups of stations with similar faunal composition). Data will then be used to identify which of the measured abiotic environmental variables (including oil concentrations) are the most correlated with any observed among-group differences.

By the end of 2012, it is anticipated that all 65 cores collected as part of the Response, one third of the 870 cores collected during the *Sarah Bordeon* cruise, and all of the samples collected on the *Holiday Chouest* will have been analyzed. Further, hydrocarbon analysis will have been completed for all samples. As such, funds being requested for the 2013 calendar year are primarily for completion of the infauna statistical analysis, associated data evaluation and reporting, and coordination of activities and findings with the co-Trustees and BP. Specifically, anticipated activities include the following:

- Infauna analysis (identification and enumeration) at the Texas A&M and University of Nevada-Reno laboratories. It is anticipated that approximately 1,000 samples for macrofauna analysis and 300 samples for meiofauna analysis will remain in the queue for analysis the end of 2012. Completion of the sample analysis will allow for a complete understanding of the temporal change in infauna community health from 2010 to 2011 and will provide for better spatial resolution of infauna injuries. New funds are not requested for the analysis of infauna samples already in the queue at contract laboratories.
- Participation of technical contractors in ongoing technical consultations with BP. Soft bottom sediment infauna analysis is being conducted under a cooperative work plan with BP. As such, ongoing interaction with BP and its consultants, including the provision of interim results and verbal updates, is required.
- Statistical evaluation and reporting of results in data reports, as well as in Trustee-internal interpretive reports.
- Oversight and consulting support provided by the contract TWG lead, and legal and technical support provided by NOAA experts. Data management support related to soft bottom sediment investigation will include support systems for housing resultant data and sharing those data with other Trustees and BP and its contractors (i.e., through NOAANRDA.org), as well as mapping support.
- Refinement of data and interpretive reports in response to comments and other NRDA data made available during 2013.

Connection of Activities to NRDA Process

Reductions in infauna community health (particularly, reductions in the density of animals) will be evaluated in the context of sediment concentrations of contaminants including the toxic components of petroleum hydrocarbons (e.g., PAHs). Injury will be quantified in terms of the magnitude of reduction of infauna community health and the spatial and temporal extent of reduction.

Sample/Data Handling

No new field samples will be collected as part of activities anticipated during 2013. Sediment cores to be evaluated during 2013 will be those cores that remain unanalyzed at the end of 2012. Sample processing

will be conducted at Texas A&M University (under the direction of Dr. Paul Montagna) and the University of Nevada, Reno (under the direction of Dr. Jeff Baguley). Data will be analyzed by scientists at these locations, as well as by Dr. Demopoulos at USGS, Gainesville. Data and metadata for sample analysis will be managed at these locations and by IEc in Cambridge, MA. Data management activities required to manage, statistically analyze, and map these data are described below

Samples and associated data acquired through cooperative work plans were collected through methods defined in jointly signed protocols. These samples are being analyzed and data organized and QA/QC administered by NOAA under strictly defined joint protocols. These data are maintained by NOAA and will be distributed to Trustee representatives through NRDA and cooperative databases. Associated activities to manage the data include:

- Maintenance of the original field data as well as associated analytical results in secure data repositories (e.g., NOAANRDA.ORG, ERMA), including associated server, data transfer and storage space costs
- Maintenance of and training in data retrieval/sharing websites to ensure Trustee-wide access to data while maintaining associated metadata (e.g., data history / change logs)
- Storage of physical data
- Training for sample confirmation and results delivery to obtain all necessary documentation (e.g., lab/analytical standard operating procedures)
- Physical delivery of lab data to Trustee and RP representatives per data sharing agreement
- Storage and tracking of external hard drives collected during field sampling to manage large files
- Regular participation in TWG calls to provide consultation on the above matters.

In addition to the effort associated with physically analyzing samples collected previously, associated management of the process includes coordinating analytical activities; data tracking activities to provide status reports on analytical progress and data availability; third-party validation of lab results to ensure data is in proper format and meets quality standards; secondary QA/QC of field data prior to merging with lab results; incorporation into repositories as final, validated products; forensic chemistry to identify source of contamination; and, spatial processing and loading into ERMA.

As raw field data are finalized, data support activities will also extend to the sharing of these results with the public. Data support activities will include the packaging, organization, and release of each data product along with associated metadata. Associated data storage and transfer costs as well as response to public inquiries are incorporated. Furthermore, the files associated with interim and final products generated through the processing and analysis of field and other collected data will be managed and shared in the NOAA data repositories to promote Trustee-wide data access.

Data/Deliverables Produced

The final dataset that will be produced will be a single database of infauna data (both macro- and meiofauna) counts by taxon by sampling station; including all relevant metadata and paired sediment parameter data (e.g., sediment grain size, sediment contaminant concentrations, etc.). Further, two reports

are anticipated to be produced as a result of this effort: one data report and one interpretive Trustee-internal report that addresses the extent and magnitude of injury to the sediment infauna community resulting from the oil spill, based on data from samples collected in 2010 and 2011.

Level of Effort

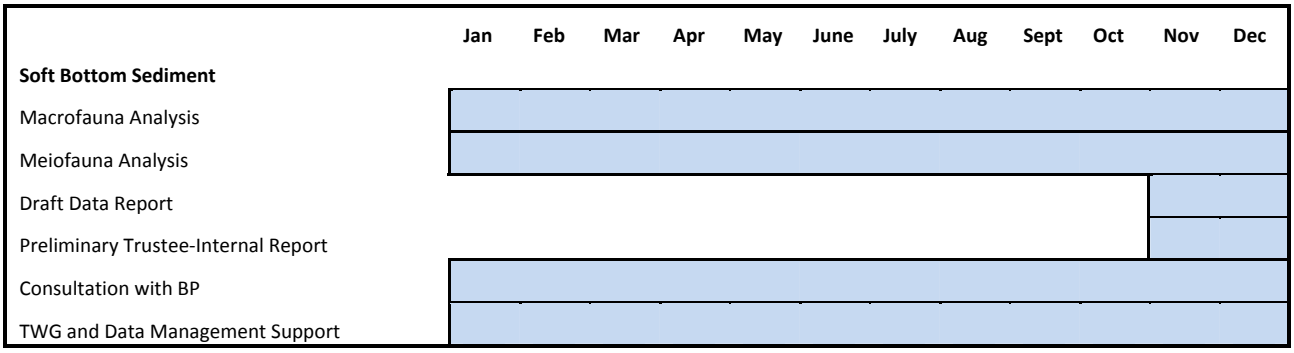
Our request for the soft bottom sediment activity is $2,274,466 in contract funds. These costs include 0.5 agency FTEs and 11.2 contract equivalents. Key personnel include the PIs and their staff, agency scientists, and agency and IEc data management teams.

PIs (NOAA and other)

Macrofauna are being evaluated by Dr. Paul Montagna and his team at Texas A&M University, and meiofauna are being evaluated by Dr. Jeff Baguley and his team at the University of Nevada, Reno. In addition, Dr. Amanda Demopoulos of USGS and her team are evaluating both macro- and meiofauna in sediment cores collected in close proximity to deep sea hardground locations. Drs. Jeff Hyland and Cynthia Cooksey of NOAA, are providing technical support.

Timetable

Timetable for Soft Bottom Sediment Tasks in 2013



The focus of this activity in the first quarter of 2013 will be completing the infauna (macrofauna and meiofauna) analyses. These analyses are expected to be ongoing and to continue through the end of the year. Also continuing throughout the entire year will be support activities by NOAA and contract staff as well as data management activities. In the fourth quarter of 2013, the database, draft data report, and preliminary Trustee-internal interpretive report will be prepared as the infauna analyses near completion. It is expected that data analyses and statistical evaluations will be conducted on an ongoing basis as provisional lab data become validated.

RP Involvement

The Deepwater Benthic Communities TWG Trustees and their representatives have worked cooperatively with BP throughout the exposure and injury assessment phases. Trustees and BP have weekly coordination conference calls and additional calls, as necessary. Some of the work related to the soft bottom sediment assessment is being conducted pursuant to a cooperative work plan: *Deepwater*

Sediment Sampling to Assess Post-Spill Benthic Impacts from the Deepwater Horizon Oil Spill. The Trustees are developing the interpretive report independently of BP.

Hard Ground Corals

Hard substrate is uncommon relative to soft substrate in the northern Gulf of Mexico, but can have distinct associated communities. Megafaunal communities associated with hard-bottom include chemosynthetic seep communities (including foundation species such as tube worms with life spans that can exceed 250 years and deepwater mussels), as well as deep-sea coral communities (e.g., framework-forming scleractinian coral species such as *Lophelia pertusa* or *Madrepora oculata*, and/or antipatharian and gorgonian corals, sponges, and other associated taxa). These habitats are diverse in and of themselves, but also provide structure and protection to a host of other transient species.

Hard ground coral assessment activities to date have focused on identifying hard ground coral sites within the vicinity of the wellhead or the likely path of water column oil movement, close-up evaluation of the health of the corals at these sites, and quantitative evaluation of coral health. Most recently, in October 2011, coral colonies at numerous sites in the vicinity of the wellhead were photographed and samples taken for species identification, exposure assessment, and histological analysis. Two hard ground coral sites have been confirmed to have been injured, and quantitative and statistical analysis of additional sites where injury may have occurred is ongoing, but anticipated to conclude by the end of 2012.

Although it was previously anticipated that all assessment activities related to hard ground coral habitats would be completed by the end of 2012, it is now anticipated that efforts related to reporting of results, and limited laboratory analysis, will continue into the first quarter of 2013 (but using 2012 NPFC funds). This delay is the result of the inclusion of additional data collected outside of the NRDA process that will be used to support injury quantification (i.e., additional photographs of corals taken on the NOAA Ocean Explorer cruise conducted in March 2012) as well as delays associated with the drafting and finalization of cooperative work plans with BP.

Although costs are not claimed for the activities below because 2012 NPFC funds will be used, assessment activities extending into the 2013 calendar year include the following:

- Final drafting of a technical data report for BP and the Trustees summarizing the results of cooperative assessment efforts, as well as a Trustee interpretive report related to the footprint, magnitude, and temporal progression of injury to corals resulting from the oil spill.
- A small amount of histological analysis will carry over into the beginning of 2013. The results from this analysis will inform injury determination and quantification efforts.
- Limited genetic analysis of coral genome sequences from colonies collected at a variety of nearfield and farfield sites to aid understanding of colony uniqueness and potential recruitment rates to hard bottom sites (an important factor in coral community recovery).
- Participation of laboratory leaders in ongoing technical consultations with BP. Hard ground coral data collection efforts were conducted under a cooperative work plan with BP: *Deepwater ROV Sampling to Assess Potential Impacts to Hard Bottom Coral Communities and Associates from*

the Deepwater Horizon Oil Spill. As such, ongoing interaction with BP and its consultants, including the provision of interim results and verbal updates, is required.

- Oversight and consulting support provided by the contract TWG lead, and legal and technical support provided by NOAA. The TWG lead and subcontractors, as well as legal staff from NOAA's General Counsel will provide scientists involved with the hard ground coral analysis the technical and legal support specific to conducting NRDA.
- Data management support related to hard ground coral investigation will include support systems for ultimately housing resultant data and sharing those data with other Trustees and/or BP and its contractors (i.e., through NOAANRDA.org). In addition, data management costs cover mapping and data coordination efforts.
- Refinement of data and interpretive reports in response to comments and other NRDA data made available during 2013.

Connection of Activities to NRDA Process

Assessment activities expected to continue through the end of 2012 include injury quantification through the digitization of injury patterns in photographs of corals (i.e., presence/absence of necrotic tissue and/or opportunistic parasites). For 2013, funds are being requested for final statistical analyses of data generated in 2012, as well as the preparation of data and interpretive reports.

Sample/Data Handling

No new field collection of samples is anticipated during 2013 as part of NRDA-funded activities. Further, it is anticipated that laboratory analysis of all samples, with the exception of some coral samples for histological analysis and limited genetics analysis, will be completed by the end of 2012. Finally, digitization of all collected photographs of corals should be complete by the end of 2012. Resultant data currently housed at Pennsylvania State University, Woods Hole Oceanographic Institute, and Temple University will be the subject of statistical analysis and interpretation in 2013. Data management activities required to manage, statistically analyze, and map these data are described below.

Samples and associated data acquired through cooperative work plans were collected through methods defined in jointly signed protocols. These samples are being analyzed and data organized and QA/QC administered by NOAA under strictly defined joint protocols. These data are maintained by NOAA and will be distributed to Trustee representatives through NRDA and cooperative databases. Associated activities to manage the data include:

- Maintenance of the original field data as well as associated analytical results in secure data repositories (e.g., NOAANRDA.ORG, ERMA), including associated server, data transfer and storage space costs
- Maintenance of and training in data retrieval/sharing websites to ensure Trustee-wide access to data while maintaining associated metadata (e.g., data history / change logs)
- Storage of physical data

- Training for sample confirmation and results delivery to obtain all necessary documentation (e.g., lab/analytical standard operating procedures)
- Physical delivery of lab data to Trustee and RP representatives per data sharing agreement
- Storage and tracking of external hard drives collected during field sampling to manage large files
- Regular participation in TWG calls to provide consultation on the above matters.

In addition to the effort associated with physically analyzing samples collected previously, associated management of the process includes coordinating analytical activities; data tracking activities to provide status reports on analytical progress and data availability; third-party validation of lab results to ensure data is in proper format and meets quality standards; secondary QA/QC of field data prior to merging with lab results; incorporation into repositories as final, validated products; forensic chemistry to identify source of contamination; and, spatial processing and loading into ERMA.

As raw field data are finalized, data support activities will also extend to the sharing of these results with the public. Data support activities will include the packaging, organization, and release of each data product along with associated metadata. Associated data storage and transfer costs as well as response to public inquiries are incorporated. Furthermore, the files associated with interim and final products generated through the processing and analysis of field and other collected data will be managed and shared in the NOAA data repositories to promote Trustee-wide data access.

Data/Deliverables Produced

By the end of 2012, data in the form of hundreds of individually digitized coral colonies, affirmative genetic species identification, coral ageing, and some coral histology will have been produced. Deliverables anticipated in 2013 include (1) a draft data report; and (2) a preliminary Trustee interpretive report related to the footprint and magnitude of injuries to hard ground coral communities.

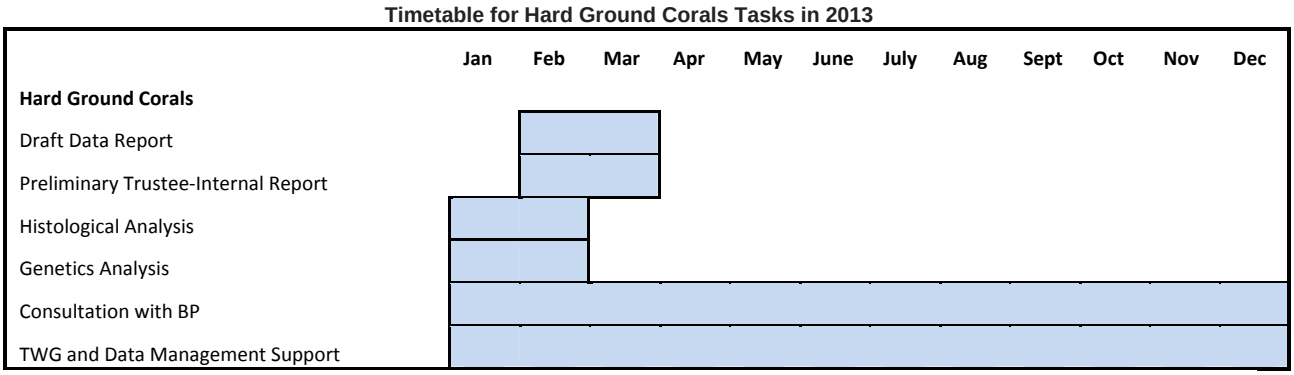
Level of Effort

Our request for the hard ground corals activity is $562,466 in contract funds. These costs include 0.1 agency FTEs and 1.8 contract equivalents. Key personnel include the PIs and their staff, agency scientists, and agency and IEc data management teams.

PIs (NOAA and other)

Hard ground coral assessment activities have been undertaken, and will continue to be undertaken, by Drs. Chuck Fisher (Pennsylvania State University), Tim Shank (Woods Hole Oceanographic Institute), Erik Cordes (Temple University), and Esther Peters (George Mason University).

Timetable



The primary focus during the first quarter of 2013 will be on the completion of the histological and genetics analyses. As these analyses near completion, the development of the draft data report and preliminary Trustee report will commence. These reports are expected to reach completion by the end of March 2013. Support activities by NOAA and contract staff, as well as data management activities, are budgeted based on the expectation that they will be ongoing throughout 2013.

RP Involvement

The Deepwater Benthic Communities TWG Trustees and their representatives have worked cooperatively with BP throughout the exposure and injury assessment phases. Trustees and BP have weekly coordination conference calls and additional calls, as necessary. Some of the work described herein related to hard ground coral assessment is being conducted pursuant to a cooperative work plan: *Deepwater ROV Sampling to Assess Potential Impacts to Hard Bottom Coral Communities and Associates from the Deepwater Horizon Oil Spill*. The result of the cooperative efforts will be the data report, which will be generated for the Trustees and BP. However the interpretation of photographs being conducted in 2012 and the production of the Trustee interpretive report will be conducted independently of BP.

Mesophotic Reefs

The Deepwater Benthic Community TWG is evaluating injuries to mesophotic reefs, which reside along the length of the continental shelf at depths ranging from 60 to 90 m. Two well-studied mesophotic reefs, in particular, referred to as Alabama Alps and Roughtongue Reef, were overlain by the surface oil slick (and associated areal dispersant applications) for a period of months during 2010. Mesophotic reef assessment activities to date have focused on photographic and video documentation of reef health, and enumeration of resident planktivorous fish abundance. Analysis of video collected at the mesophotic reefs during 2010 and 2011 indicates persistently low abundances of resident planktivorous fish. Further,

although video collected in 2010 indicated that the resident corals were relatively healthy, video collected in 2011 indicated the prevalence of coral injury. It is anticipated that evaluation of coral health and enumeration of fish from videos taken post-spill will have been analyzed by the end of 2012.

For 2013, we are requesting to funds to enumerate fish in baseline imagery collected prior to the oil spill. Over the period from 1997-2003, USGS undertook a series of multi-purpose northern Gulf of Mexico oceanographic sampling cruises on behalf of the then-named Minerals Management Service. ROV operations were central to most of these cruises. Video transecting was accomplished on most cruises. USGS missions studied a large number of shelf-edge reef features, with priority on the same NRDA priority reef sites studied in 2010-2011. One objective of the historical cruises was to identify and quantify the fish fauna associated with northern Gulf of Mexico mesophotic reefs along the Louisiana to Florida tract of shelf-edge features. This objective was addressed using Phantom® ROVs deployed by coastal class scientific research vessels. The archive of USGS mission videotapes is maintained at USGS-SESC by the CEC research group. Additionally, historical pre-Deepwater Horizon (DWH) incident ROV videotapes are available for 12 stations from the NOAA NMFS 2008 northern Gulf of Mexico reef-fish survey conducted in the vicinity of the CTR and MSSR reference reef sites. The analyses of these data are critical for our injury assessment so that post-spill data are reliably compared to baseline conditions at the reefs.

Nominal transect times from historical ROV videos vary depending on the objectives of the cruises. Thus, transects will be vetted for comparability (i.e., in terms of length of time of transect) to NRDA data obtained in 2010 and 2011. Video imagery during these historical USGS ROV cruises was obtained with earlier generations of underwater video cameras, underwater lighting, and video media (VHS, S-VHS, High-8, and mini-DV tapes). Thus, image quality for historical missions is lower than for the HDTV video imagery obtained in 2010 and 2011. Nevertheless, video transects from the 1997-2003 dives will provide comparable quantitative data on reef-fish species identities and numbers, as well as the assessment of coral health.

There are several anticipated activities associated with baseline imagery analysis and quantification of injury in 2013:

- Review of historical imagery. Quantification of fish abundance and diversity, as well as assessment of coral health in historical, pre-release video will allow for documentation of baseline conditions at reefs targeted for assessment. A complete understanding of baseline will allow for the accurate quantification of injury to these reefs.
- Participation of Drs. Sulak and Etnoyer in ongoing technical consultations with BP. Mesophotic reef data collection efforts were conducted under a cooperative work plan with BP. As such, ongoing interaction with BP and its consultants, including the provision of interim results and verbal updates, is required.
- Oversight and consulting support provided by the TWG lead, and legal and technical support provided by NOAA. The TWG lead, as well as legal staff from NOAA's General Council, will provide the PIs involved with the mesophotic reef assessment the technical and legal support specific to conducting NRDA. In addition, these individuals will assist in supporting PIs in ongoing interactions with BP and its contractors.

- Data management. Data management support related to mesophotic reef investigation will include support systems for ultimately housing resultant data and sharing those data with other Trustees and/or BP and its contractors (i.e., through NOAANRDA.org).
- Costs to revise the assessment, including refining the reports in response to comments. These activities will include clarification of results and opinions expressed by the PIs conducting the analysis related to the natural resource injuries upon which they are reporting.

Connection of Activities to NRDA Process

Quantification of fish abundance and diversity, as well as assessment of coral health in historical, pre-release video will allow for documentation of baseline conditions at reefs targeted for assessment, and therefore aid in the accurate quantification of injury to these reefs.

Sample/Data Handling

No new field collection of samples is anticipated during 2013. Further, it is anticipated that laboratory analysis of all samples will be completed by the end of 2012. Analysis of all post-spill video transects for the assessment of coral health and the enumeration of fish should be complete by the end of 2012. The majority of videos to be used in baseline analysis to be completed in 2013 reside at USGS in Gainesville, with the exception of video from approximately 16 dives at reference reef locations and data from drop-cameras, which are in the process of being requested from NOAA SEFSC. All interpretation of video transects will be conducted either at USGS Gainesville, or at NOAA NCCOS in South Carolina.

Data management activities required to manage, statistically analyze, and map the data generated from the baseline analysis are described here. Data acquired through cooperative work plans were or will be collected through methods defined in jointly signed protocols; data acquired through non-cooperative work plans were or will be collected through methods defined in the Trustee-approved protocols. These data will be organized and QA/QC administered by NOAA under strictly defined joint protocols. These data will be maintained by NOAA and will be distributed to Trustee representatives through NRDA and cooperative databases. Associated activities to manage the data include:

- Maintenance of the original field data as well as associated analytical results in secure data repositories (e.g., NOAANRDA.ORG, ERMA), including associated server, data transfer and storage space costs
- Maintenance of and training in data retrieval/sharing websites to ensure Trustee-wide access to data while maintaining associated metadata (e.g., data history / change logs)
- Storage of physical data
- Physical delivery of lab data to Trustee and RP representatives per data sharing agreement
- Regular participation in TWG calls to provide consultation on the above matters.

As raw data are finalized, data support activities will also extend to the sharing of these results with the public. Data support activities will include the packaging, organization, and release of each data product along with associated metadata. Associated data storage and transfer costs as well as response to public inquiries are incorporated. Furthermore, the files associated with interim and final products generated

through the processing and analysis of field and other collected data will be managed and shared in the NOAA data repositories to promote Trustee-wide data access.

Data/Deliverables Produced

Deliverables anticipated in 2013 include a data report and a preliminary Trustee interpretive report. The data report will outline the results of evaluation of video collected during the 2010 and 2011 assessment cruises as well as the results of analyses of baseline videos. The Trustee interpretive report will address the magnitude of injury to mesophotic reefs as determined by comparison of fish count and coral health data between test and reference reefs, as well as baseline data from test reefs.

Level of Effort

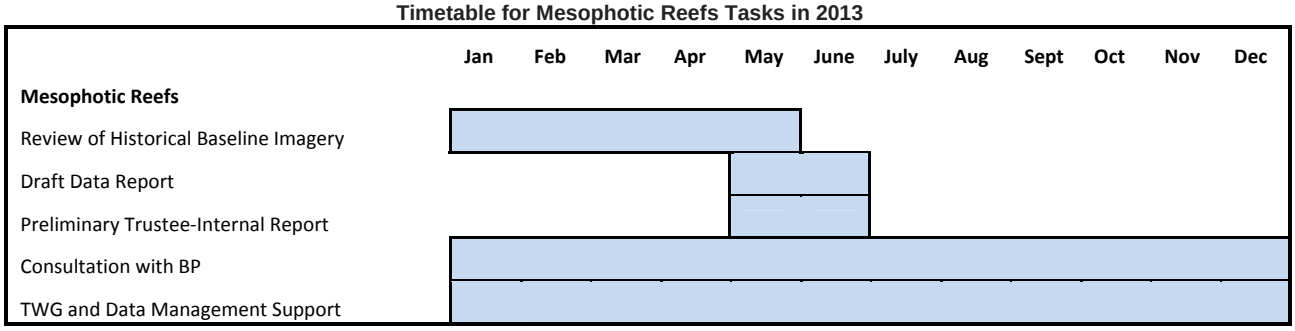
Our request for the mesophotic reef activity is $557,466 in contract funds. These costs include 0.6 agency FTEs and 2.1 contract equivalents. Key personnel include the PIs and their staff, agency scientists, and agency and IEc data management teams.

PIs (NOAA and other)

Dr. Ken Sulak and his team at USGS have been responsible for fish assessment to date, and will be responsible for assessing this historical imagery for identification and enumeration of resident planktivorous fish. Similarly, Dr. Peter Etnoyer and his team at NOAA will be responsible for assessing coral health in these historical images.

Timetable

Timetable for Mesophotic Reefs Tasks in 2013



The greatest level of effort for this activity during the first quarter of 2013 will be focused on the baseline video analysis of historical imagery. This task is expected to continue through the first half of the year. The data report and preliminary Trustee interpretive report will be completed after the completion of the baseline imagery analysis. Analyses and statistical evaluation will likely be conducted on an ongoing basis, using provisional data as necessary. It is anticipated that both reports will be completed by mid-2013. Support activities by NOAA and contract staff, as well as data management activities are budgeted based on the assumptions that they will be ongoing throughout 2013.

RP Involvement

The Deepwater Benthic Communities TWG Trustees and their representatives have worked cooperatively with BP throughout the exposure and injury assessment phases. Trustees and BP have weekly coordination conference calls and additional calls, as necessary. The assessment of video collected during 2010 and 2011 (expected to be completed by the end of 2012) is being conducted pursuant to a cooperative work plan: *Mesophotic Reef Follow-up Cruise Plan*. Baseline video assessment may be conducted cooperatively or may be conducted independently of BP. It is currently anticipated that the interpretation of data and the production of both the data report and the Trustee interpretive report to be produced by mid-2013 will be conducted independently of BP.

Benthic Megafauna

The term "benthic megafauna" refers to those larger biological organisms that reside on the ocean floor, which may be stationary or mobile. In order to assess potential injuries to benthic megafauna, the assessment has focused on red crabs as a susceptible representative organism. More specifically, assessment activities have focused on evaluating red crab health. After the oil spill, researchers studying red crabs reported decreased catches and apparently unhealthy crabs. NRDA activities in 2011 included the collection of red crabs at various locations throughout the Gulf of Mexico, the evaluation of their potential exposure to oil, and assessment of reproductive health and a full histological evaluation of several tissue types. It is anticipated that all laboratory analyses and initial data syntheses focused on red crabs will be completed by the end of 2012. In 2013, a variety of assessment activities are slated to occur:

- Drafting a data report and a preliminary interpretive report. Once all of the analyses of crab tissue are completed (expected by the end of 2012), scientists will draft a data report to compile the results of red crab assessment efforts. In addition, it is anticipated that a draft injury determination report based on interpretation of the red crab data will be prepared.
- Oversight and consulting support provided by the contract TWG lead, and legal and technical support provided by NOAA. The TWG lead, as well as legal staff from NOAA's General Counsel office will provide the IEc staff involved with the red crab assessment the technical and legal support specific to conducting NRDA.
- Data management. Data management support related to red crab assessment will include support systems for ultimately housing resultant data and sharing those data with other Trustees and/or BP and its contractors (i.e., through NOAANRDA.org); as well as mapping and sample coordination support.
- Refinement of data and interpretive reports in response to comments and other NRDA data made available during 2013.

Connection of Activities to NRDA Process

Reporting activities will synthesize data with the objective of understanding the magnitude of potential injury to red crabs.

Sample/Data Handling

No additional field sample collection related to benthic megafauna is anticipated for 2013. Data management activities required to manage, statistically analyze, and map the data generated from a number of laboratories, including NOAA AKFSC, NOAA NWFSC, and Alpha Labs, are described here. Data acquired through cooperative work plans were collected through methods defined in jointly signed protocols. These data are organized and QA/QC administered by NOAA under strictly defined joint protocols. These data will be maintained by NOAA and will be distributed to Trustee representatives through NRDA and cooperative databases. Associated activities to manage the data include:

- Maintenance of the original field data as well as associated analytical results in secure data repositories (e.g., NOAANRDA.ORG, ERMA), including associated server, data transfer and storage space costs
- Maintenance of and training in data retrieval/sharing websites to ensure Trustee-wide access to data while maintaining associated metadata (e.g., data history / change logs)
- Storage of physical data
- Physical delivery of lab data to Trustee and RP representatives per data sharing agreement
- Regular participation in TWG calls to provide consultation on the above matters.

Data support activities in 2013 will also extend to the sharing of the results with the public. Data support activities will include the packaging, organization, and release of each data product along with associated metadata. Associated data storage and transfer costs as well as response to public inquiries are incorporated. Furthermore, the files associated with interim and final products generated through the processing and analysis of field and other collected data will be managed and shared in the NOAA data repositories to promote Trustee-wide data access.

Data/Deliverables Produced

The two deliverables in 2013 include a Trustee data report as well as a preliminary Trustee interpretive report.

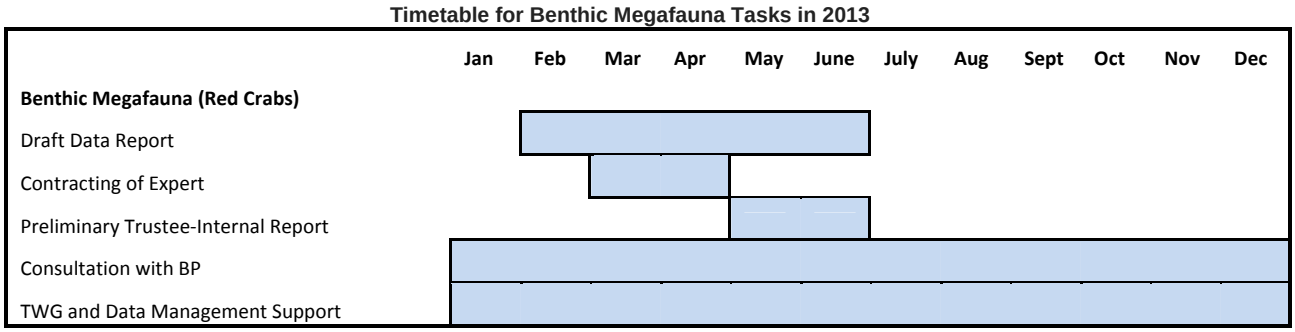
Level of Effort

Our request for the benthic megafauna activity is $460,266 in contract funds. These costs include 0.1 agency FTEs and 1.7 contract equivalents. Key personnel include IEc scientists and data management team, as well as a red crab specialist.

PIs (NOAA and other)

Staff from IEc will draft the data report and a contract red crab specialist (to be determined) will draft the interpretive report.

Timetable



Developing the draft data report and the contracting of a red crab expert will begin in the first quarter of 2013. Once the expert has been brought under contract and the data report is well underway, the drafting of the preliminary interpretive report will begin. Both the draft data report and preliminary interpretive report are anticipated to be completed by mid-2013. Additionally, support activities by NOAA and contract staff, as well as data management activities, are budgeted based on the expectation that they will be ongoing throughout 2013.

RP Involvement

Red crab data collection efforts have been performed cooperatively, and BP funded the red crab collection efforts. The cooperative work plan (*Assessment of Impacts from the Deepwater Horizon Oil Spill on Red Crabs*) for this effort is under development. Data and interpretative reporting are anticipated to be conducted independently of BP.

B. Bluefin Tuna Telemetry

Bluefin Tuna Telemetry Studies

NRDA field investigations with Atlantic bluefin tuna started in 2010 and continued through 2012. As part of each year's study, Atlantic bluefin tuna were tagged with satellite transmitters, and data was transmitted or retrieved from tags. Funds are requested in 2013 to complete the analysis of the telemetry data and quantify injures to pelagic tunas.

Atlantic Bluefin tuna (*Thunnus thynnus)* are a large, long-lived highly migratory tuna. The shelf waters of the Gulf of Mexico are the known North American spawning ground for a portion of the western Atlantic stock. This region was designated a Habitat Area of Particular Concern by NOAA in 2009 (NFMS, 2009) The Deepwater Horizon Oil Spill occurred during the peak of the known spawning time, thereby exposing fish at all life stages from egg to adult. Atlantic bluefin tuna move from spring spawning grounds (April to June) to northern foraging grounds off of the northeast U.S. and Canadian coastlines where intensive commercial fisheries exist (Mather et al., 1995; Block et al., 2005).

Spawning areas for bluefin tuna in the Gulf of Mexico are important to consider during offshore restoration planning and for the broader management of the species. Atlantic bluefin tuna are among the world's more imperiled commercial pelagic fish. The western population that spawns in the Gulf of Mexico has been depleted by over 70% since 1970, and that adult biomass is estimated to be as low at 15% of the target sustainable population level (ICCAT, 2010). Site- specific knowledge of behavioral injuries and habitat injuries to tuna spawning areas is important for targeting potential species-specific or habitat-based restoration for the maximum benefit of the Gulf of Mexico spawning population.

A total of 63 satellite tags were deployed on adult bluefin tuna in 2010 (n=32) and 2011 (n=31), with a tag life of about one year. The tags transmit information about location via satellites. The number of tagged Atlantic bluefin tuna that used the Gulf of Mexico was 33. Additionally, tags that were recovered by vessels in 2011 (n=3) and 2012 (n=7) contain full records of location, light, and depth.

Agency scientists and specialists under contract to NOAA from Stanford University will collect raw and interpolated point data on animal movements from satellites and display raw observations on maps to assess animal movement patterns and spawning behavior. For each animal, NOAA will then use algorithms from the peer-reviewed literature to create linear animal tracks over the tagging period. Creating these tracks is important because the time spent in certain sections of the Gulf of Mexico with oiling and/or dispersants from the Deepwater Horizon Oil Spill can be computed. Factors such as the animal's size, spawning dates, and entry/exit into the Gulf of Mexico will be evaluated during the analysis. Contract staff then will use statistical methods to evaluate whether tagged animals spawned earlier or later after the spill compared to an extensive pre-spill dataset maintained by Stanford University (Dr. Barbara Block).

Leveraging science capabilities from NOAA's ocean laboratories, contract staff also will evaluate ambient environmental conditions in the vicinity of the animals in the Gulf of Mexico using ocean datasets, such as sea surface anomalies, sea surface temperature, and ocean currents. The ocean datasets are large (terabyte size) and require special computing equipment to handle and display the volume of data over the size of the impact area and in Gulf of Mexico habitats used by bluefin tuna. Other injury endpoints, such as altered site fidelity in regions of the Gulf of Mexico and altered movement patterns, will be evaluated with statistical methods and compared with results from pre-spill datasets (e.g., Block et al., 2005; hundreds of thousands of observations).

As stated in the NPFC Phase 1 claim, the Trustees have evidence from Stanford University telemetry records in 2010 that at least one Atlantic bluefin tuna spawned in oiled waters of the Gulf of Mexico. A second tagged Atlantic bluefin tuna was in the oiled area and exhibited directed movements away from the oiled region to spawn nearby off Tampa, Florida. The Trustees also have preliminary SIMAP model runs that show surface and sub-surface oil in previously-observed Atlantic bluefin tuna spawning locations determined from catch and telemetry datasets. The SIMAP model, in concert with toxicity tests on bluefin tuna, indicates that bluefin tuna eggs and larvae were killed based on oil dose calculations in ppb-hours. The Trustees also have evidence from ichthyoplankton collections that tuna eggs and larvae are found in waters that were oiled in 2010 during the spill. These facts, combined with the concerns about the potential long-term spill effects to this imperiled species, provide the rationale for why NOAA is undertaking these analyses and requesting the assessment funds to finalize injury quantification.

In general, we will be using the tagging data and models to document contaminant pathway and exposure, and to help assess injury. The injury will be determined by SIMAP direct loss and production foregone based on literature-based toxicity thresholds and incident specific data. Evaluations of spawning or ranging areas (i.e., movement corridors) that were oiled will be considered habitat injury, and dose-response relationships from tuna toxicity testing will be used to inform final model-based calculations of resource injuries. That means there are three potential kinds of injuries: behavioral, spawning or ranging habitat, and direct loss.

The analysis funds requested in 2013 will be used to complete seven tasks necessary for complete injury quantification:

Task 1: *Convert uncorrected location observations to final animal tracks*

In Fall 2012 with NPFC funds already received, our scientific team will use telemetry data from the tags and apply state-space algorithms to generate final animal tracks with statistical confidence for all Atlantic bluefin tuna that entered the Gulf of Mexico during and after the spill. The use of state-space models for bluefin tunas and for other species (e.g., sperm whales) tagged with satellite transmitters is peer-reviewed and published in the literature (Block et al., 2011). We will interpret tens of thousands of observations from the tagged animals that are partially explicit in three dimensions. Bluefin carrying the tags dive to depths up to 1,800 meters in the Gulf of Mexico, recording explicit oceanographic profiles. A peer-reviewed state-space model (Jonsen et al., 2005, 2007) that incorporates behavioral changes, called the "SSM Switching Model," will permit examining horizontal movement track behavior in relationship to environmental features at the surface. Factors such as the animal's size, behavior classification (e.g., spawning or transit), ambient ocean conditions, spawning dates, and entry/exit into the Gulf of Mexico also will be associated with each animal's final track.

The work product associated with this task will result in the final animal tracks for all tagged fish that used the Gulf of Mexico in 2010, 2011, and 2012. With 2012 funds, we expect to be 75% complete with converting raw tracks to final state-space tracks and ingested in the data management system by the end of 2012 (n=25).

In 2013, we are requesting funds to complete the last 25% of the tracks in Q1 of 2013 (n=8). All tracks and metadata from tuna tagged through 2011will then be summarized by Q2 2013 and be used during the preparation of a bluefin tuna data report.

Task 2: *Delineate spawning and habitat use areas from final animal tracks*

In 2013, our team will overlay all tracks from 2010 to 2012 (n=33) in a spatial database system. Spawning behavior and transit behavior can be defined from the behavioral record on the tag (Teo et al., 2005). Geographical areas of spawning in the Gulf of Mexico can then be delineated (Teo et al., 2007).

Once spawning locations have been identified with the final animal tracks, by year, ambient ocean condition data will be overlaid with the tracks to help define a set of ocean conditions that are conducive to spawning. General additive models (Block et al., 2011) will be used to examine presence or absence of a spawning track in the context of the oceanographic environment (SST, SSH, chlorophyll, geostrophic flow). The envelope of ocean conditions for habitat and behaviors defined as spawning will be used to designate areas for spawning bluefin tuna in the Gulf of Mexico for 2010 through 2012. The spawning

site habitat selection models then will be applied to ocean condition datasets obtained in 2010 immediately after the spill to create a statistical assessment of the habitats where bluefin tuna spawned.

To complete the analyses, telemetry data will be reviewed from bluefin tagged in prior years (2000-2008, n=25). The pre-spill dataset contains information from the same species and with similar tags. There will be no cost for the creation of final pre-spill tracks, as the tracks have already been analyzed by state-space. The result of these analyses will be the number of acres or water volume of oiled spawning habitat for bluefin tuna. The final analysis outcomes will be presented in an interpretive report.

The bluefin analyses in tasks 1 & 2 will enable us to define the environmental and geographic preferences of bluefin tuna in the Gulf of Mexico. The result of this analysis will be spatially-explicit tables of animal presence/absence and associated strength of statistical comparisons between years.

Task 3: *Pairing injured habitat with aquatic fate, transport, and effects models*

In 2013, particularly in Q2 and Q3, our team anticipates being able to mesh our bluefin telemetry results with biological effects outputs from the SIMAP model. The SIMAP model will calculate direct kill and lost production foregone for bluefin tuna and other aquatic species. The model also will be able to generate model-derived evidence of oil presence in spawning areas, and many of these observations will be able to be validated with field-collected data such as aerial imagery or observations of surface oiling from vessels. Our team expects to evaluate the spatially-explicit direct kill and production forgone results of several SIMAP model runs in 2013. The final SIMAP model outcomes will be presented in a separate report described elsewhere in this Claim that is supported with data, charts and maps.

Our team also will work with experts at Stanford University and NOAA NMFS on bluefin tuna population modeling, specifically the effects of spill-related injuries to eggs and larvae on the age-class structure of the bluefin tuna population after 2010. The work product for this task is a preliminary evaluation from agency scientists and contract SIMAP specialists on the likely impact to the species' age-class structure and population size caused by the spill. NOAA NMFS, ASA, and Stanford University scientists will identify and apply one or more peer-reviewed models to fully evaluate the range of oiling effects to bluefin tuna populations in the Gulf.

Task 4: *Validating SIMAP and bluefin tuna telemetry results with field-collected ichthyoplankton standardized sampling*

NOAA and Gulf states collect ichthyoplankton annually at stations throughout the Gulf of Mexico. Data from these collections are used to better manage fisheries in the region. Our team will work with specialists from NOAA National Marine Fisheries Service (NMFS) to confirm that bluefin tuna eggs and larvae are present and collected in areas categorized as spawning areas during the injury assessment. The magnitude of eggs and larvae observed during sampling will be compared against model-predicted injuries. Ichthyoplankton information from more than 50 standardized sampling stations will be reviewed for the years since the spill. The work product for this task is summarized ichthyoplankton data at sites throughout the Gulf of Mexico that document bluefin tuna egg and larvae presence in oiled areas used by bluefin for spawning. This will also use data already summarized for the water column effort. Expected products are maps portraying ichthyoplankton over the study period, as well as historical ichthyoplankton locations. These maps will be used to support the presence of bluefin tuna eggs and larvae in the

spawning areas. All ichthyoplankton data relevant to this analysis will be summarized in the bluefin tuna data report in Q3 and Q4 2013.

Task 5: *Comparison of behavioral metrics of bluefin tuna pre, during, and post-spill.*

Stanford University and NOAA staff will use habitat use models to evaluate whether electronic tagged animals spawned in the same types of oceanographic habitat available in the Gulf during the post-oil spill years. This will include evaluations with general additive models of the environmental envelope used and spatial regions (eastern versus western Gulf of Mexico).

Other injury endpoints like altered site fidelity in regions of the Gulf of Mexico and altered movement patterns will be evaluated by examining habitat selected in 2011 and 2012 and compared with results from pre-spill datasets (e.g. Teo et al., 2007a, 2007b, 2010). Products produced will be a series of maps that highlight spawning areas through time. Other maps will be produced highlighting changes or consistency in bluefin tuna behavior. All of these maps will be based on the tracks from the bluefin tuna tags, combined with different behavioral aspects. In task 2, those behavioral areas are identified, and this task then interprets those behaviors over time. This component of the analysis will include historical data.

A second component of this task is utilizing surface oiling observations, shoreline oiling observations, and nearshore sediment oiling. These observations will be used like the habitat models in assessing if the tuna moved through oiled areas. Products produced will be maps that highlight bluefin tuna patterns and habitat use in oiled areas.

Task 6: *Integrating ocean conditions data and statistics to evaluate robustness of conclusions and overall results*

Ambient environmental conditions are important to consider during any animal behavioral study. Terabytes of ocean conditions data including sea surface temperature (SST), sea surface height (SSH), Chlorophyll *a (* Chl-A), dissolved organic material, dissolved oxygen, wind stress, and geostrophic flow will be compiled and interpolated from the study area (see also Teo et al., 2007, 2010). Statistics will be performed on the clusters of observations in a geographic area and on comparisons of clusters across time. The statistical evaluation is critically important to ensure we express statically meaningful ocean condition data, in particular when making judgments on injury.

Task 7: *Document and communicate results with Trustees and within relevant portions of NOAA that are responsible for high migratory species.*

Data and results will be regularly communicated with the Trustees. There will be three primary forms of communication that underpin our funding request:

GulfTOPP- a password protected, web-based product will display tracks of bluefin tuna and final oceanographic parameters using Google Maps and Google Earth displays.

Report(s): Status reports (as needed), and a data and interpretive report will be produced. The data and interpretive report will include information from the six tasks mentioned above.

Two technical meetings: NOAA and contract staff will meet to review results, draft reports, and discuss analysis timetables.

A secondary component of communication will be intra-agency communication within NOAA. As bluefin tuna are a special listed species, coordination needs to occur with the Highly Migratory Species Branch of NOAA. This will occur at low levels in 2013 as results are compiled and analyses are finalized.

Team locations:

Tuna Research and Conservation Center at Hopkins Marine Center, Stanford University

NOAA scientists in Pacific Grove, CA

NOAA Southeast Fisheries Science Center, Highly Migratory Branch

Sample/Data Handling

Telemetery data will be available in GulfTOPP, and the raw data can be accessed by the RP and Trustees. The GulfTOPP data management system is comprised of a postgres database, geospatially enabled, with an automated tag data acquisition and processing front end, using a combination of in-house produced data processing tools and vendor provided tag decoding routines.

Data flow starts with tag data input, automatic for satellite tag data and semi-automatic for archival tag data, where the tags must be manually downloaded. Once tag data are input to the system, they are passed through a QC processing system, geolocated where appropriate, and loaded into the database. Once the tag information is in the database, track and profile data can be provided in combination with oceanographic parameters, such as SST, Chl-A, and sea surface height. Additionally, the terabytes of data will be managed and applied to ocean data for analyses of ambient conditions on behavior. The data access portals consist of password-protected c web pages with Google Maps and Google Earth-enabled graphical user interfaces via the LAS, as well as password protected direct file downloads available from our servers. Nightly data backups occur, which are archived both locally and at offsite systems.

Due to the complex nature of the many data sets, statisticians, spatial analysts, oceanographers, NRDA specialists, and Subject Matter Experts (SMEs) are all needed. This team will coordinate to achieve all the analysis tasks described above.

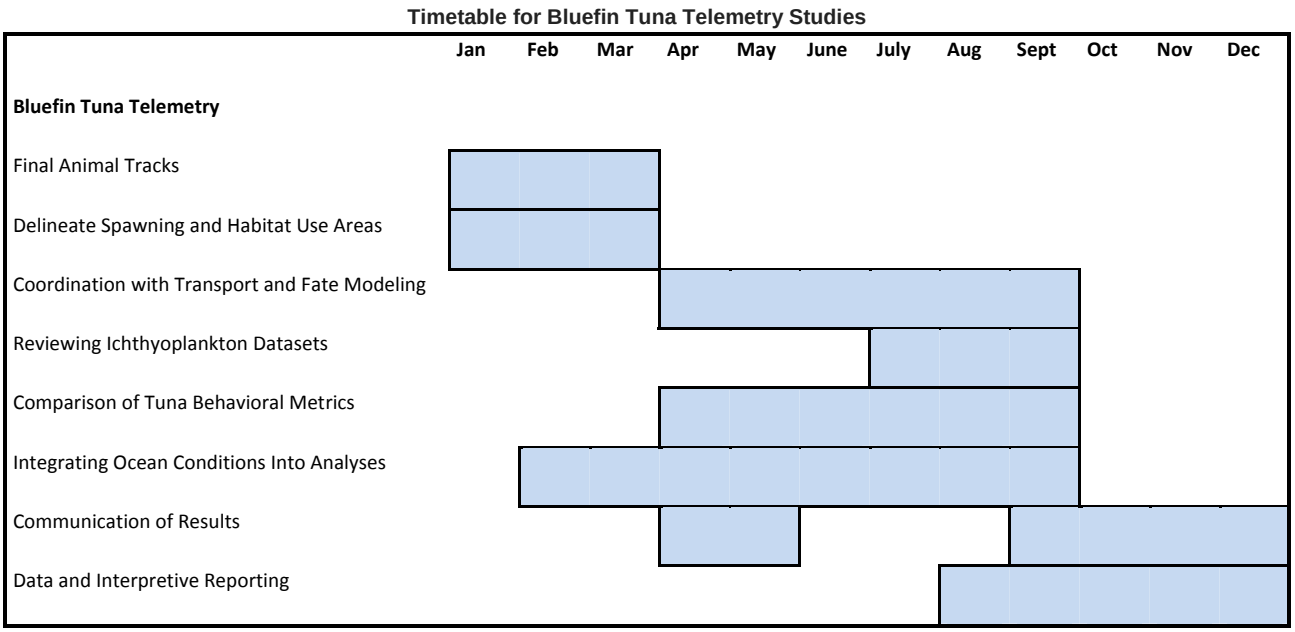
Level of Effort

Our request for the bluefin tuna telemetry studies is $1,288,124 in contract funds. These costs include 1.6 agency FTEs and 5.2 contract equivalents. Key personnel include PIs and their staff, agency scientists, and the Genwest data management team.

PIs (NOAA and other)

The PI for this study is Dr. Barbara Block of Stanford University. Other investigators include Dr. Steven J. Bograd of the NOAA Southwest Fisheries Center, Dr. Randy Kochevar of Stanford University, and Dr. Wilson of Stanford University.

TimetableData analyses in 2013 will occur during Q1-Q3 and reporting will be focused in Q3 and Q4.



C. Transport, Fate, and Effects Modeling

Introduction and Background

The massive release of MC252 oil and application of chemicals during the Response had a high probability of causing substantial harm to life throughout the Gulf. Under emergency conditions, the Water Column Technical Working Group (TWG) undertook a large, sustained, and multifaceted oceanographic field program involving 42 cooperative work plans with BP that required multiple oceanographic research vessels, remotely operated underwater vehicles, aircraft, satellite resources, and much specialized equipment. The study area for TWG was enormous and diverse, covering the full range environments from 1,500 meters below the ocean surface to the shoreline and across nearly 700 kilometers of the northern Gulf of Mexico. Technical considerations ranged broadly from survey design to oceanography, engineering, image processing, database design, and computer science. This effort produced a large inventory of biological and chemical samples and voluminous electronic data, all of which requires extensive processing.

Oil released from the broken wellhead both dispersed at depth and rose through nearly a mile of water column. The composition of the released gas-liquid mixture changed over time and space as the result of dilution, changes in pressure, dissolution, and addition of other constituents such as dispersants, methanol, and anti-foaming additives. Of oil that made it to the water surface, some volatilized in the air, entrained water forming mousse, was dispersed into the water column naturally and by application of dispersants, and was removed mechanically or by in situ burning. Floating oil, oil droplets and dissolved

components were transported large distances at various levels of the water column. Oil also picked up sediments and other particulate material, some of which became neutrally or negative buoyant, sinking to various depths. The oil dispersed at the wellhead (both via turbulence and by injection of dispersants) and was transported by currents that varied in time and space, yielding a complex pathway of subsurface oil contamination that affected abyssal, bathypelagic, and meso-pelagic waters of the Gulf of Mexico.

Fish and invertebrates throughout the water column, from ocean depths to surface, are exposed to both dissolved and droplet forms of contaminants by swimming through the water column, passing water over respiratory structures, and ingesting water and particulates contaminated with oil as part of feeding. Sensitive life stages of pelagic fish and invertebrates come in direct contact with floating oil that covered and mixed into the neuston layer where embryos and larvae develop. Developing embryos, when exposed to oil, are shown to have genetic, physiological, metabolic, and developmental problems that lead to reduced fitness and higher mortality. Cardiac edema, reduced heart rate and blood flow, and spinal deformations are likely effects, contributing to an overall increase in mortality. Effects to the eggs, developing embryos, juveniles, and adults are a function of both physical fouling with oil and the toxicity of oil constituents. Dispersants and other chemicals introduced into the water column during the Incident Response may have increased toxicity of or vulnerability to oil hydrocarbon effects. Other neustonic organisms exposed to surface oil include many small invertebrates important to the food web. Offshore water column organisms also were exposed to dissolved and water-borne chemical additives such as methanol and anti-foaming agents in addition to dispersants.

Because of the scope of the problem, the extensive area of the Northeastern Gulf of Mexico potentially affected, and the logistical constraints of obtaining sufficient field sample data to completely characterize the contamination in space and time over and after the 84 days of oil and gas release, the trustees are engaging in a modeling analysis of the transport, fate and effects of the spill. Figure C-1 is a flow diagram of the modeling approach, and models and input data sets being developed, for quantification of the injuries to water column biota caused by the spill. The modeling will also provide data sets and products for other TWGs for their analyses of injuries.

The modeling approach encompasses several separate model codes and analyses, each providing information that is input to the next model in the chain. The core model is based on Spill Impact Model Application Package (SIMAP, French McCay, 2004), with other models providing needed inputs to the SIMAP calculations.

The blowout model evaluates the oil-gas release near to the wellhead and broken riser. This model follows the movements of the oil and gas as it comes out of the pipe holes The blowout model outputs the locations, volumes, and droplet sizes of the released oil droplets, which then becomes input to the oil fate modeling.

The oil fate model (part of SIMAP) used by NOAA and co-Trustees estimates the distribution and mass of oil in the water column, on the water surface, on shorelines, and in the sediments through time. Processes simulated in the physical fates model include oil droplet and surface oil transport and dispersion, oil surfacing, surface oil spreading, evaporation of volatiles from surface oil to the atmosphere, stranding of oil on shorelines, emulsification of oil, entrainment of oil as droplets into the water column, re-surfacing of oil, dissolution of soluble components into the water column, volatilization from the water column to the atmosphere, partitioning of oil between water and sediment, sedimentation

of oil droplets, and degradation. The model results provide estimates of water volumes and their associated chemical concentrations. The output of the fate model includes the location and dimensions of floating oil, concentrations of hydrocarbon constituents in water, and fluxes of hydrocarbons to air and sediment over time. Concentrations of particulate (oil droplet) and dissolved aromatic concentrations are used by the exposure, toxicity, and biological effects models.

In addition to the initial conditions provided by the blowout model, the oil fate model requires winds, waves and currents as inputs. NOAA and BP have cooperatively agreed to use the Ocean Weather wind and wave models, and BP has provided a licensed copy of the Ocean Weather wind and wave model output for the Gulf of Mexico in 2010 to the trustees for their use in the DWH modeling analysis. In addition, NOAA is evaluating and utilizing other wind products and measurement data.

Current data are available for the offshore continental slope area of the northern Gulf of Mexico from Acoustic Doppler Current Profilers (ADCPs) that are moored or attached to offshore platforms and are included in NOAA's online data sets. Other field data designed to measure currents are also available for 2010. However, these data sets do not characterize shelf or nearshore waters, or the deeper parts of the Gulf of Mexico adequately to be used on their own for input to the SIMAP models. Thus, existing and tested hydrodynamic models are being further developed by the trustees to develop appropriate data sets for the modeling of transport, i.e., for modeling oil trajectory, fate, and effects.

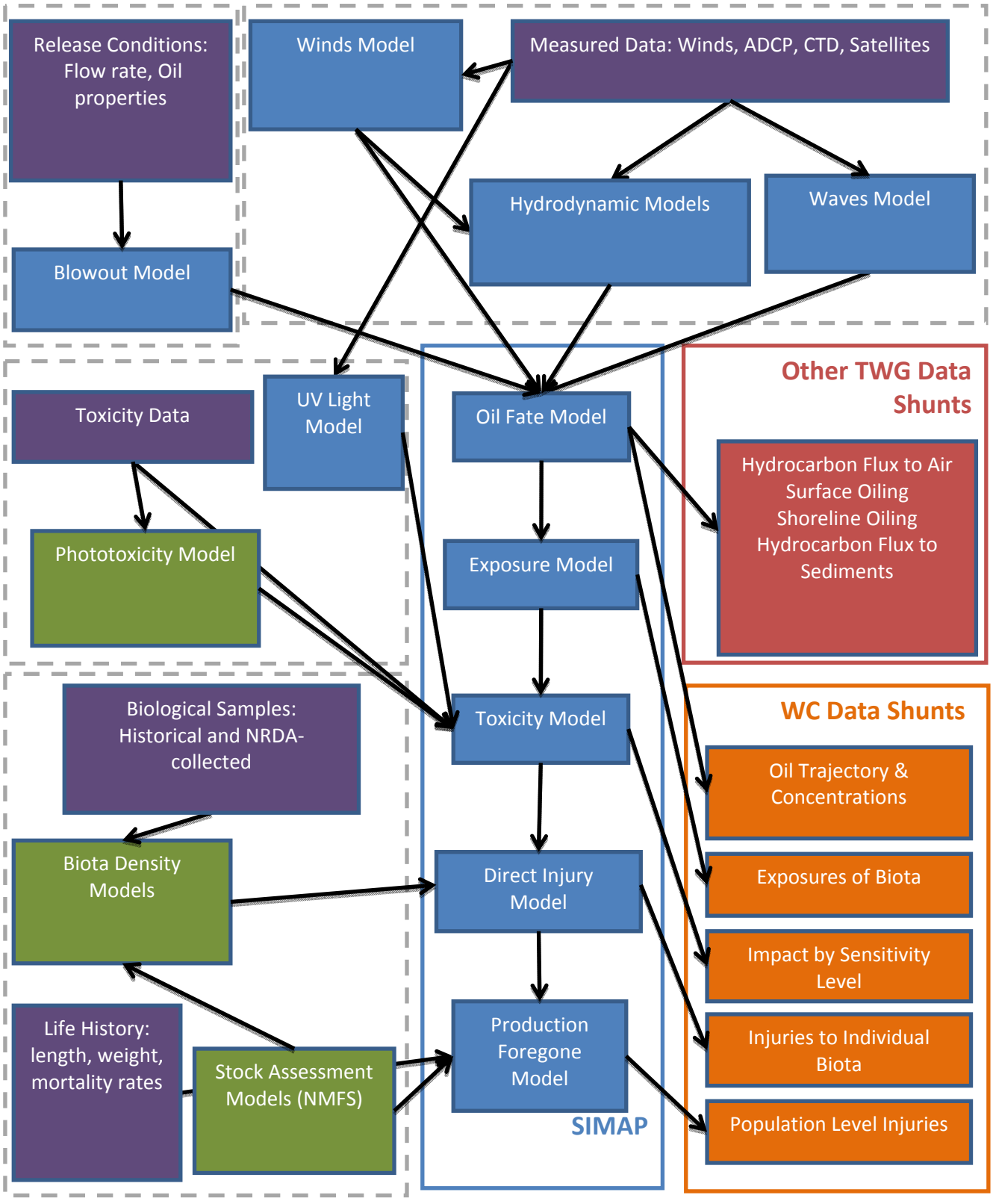
The trustees will use the exposure model in SIMAP to evaluate the time history of oil component concentrations experienced by various types of water column biota, representing biota with Lagrangian Elements to track their movements in the environment. Biota may be simulated as stationary, planktonic, or swimming under their volition with a variety of behavior patterns and habitats used. By combining model estimates of water volumes exposed above various thresholds indicating injury (based on the Lagrangian Elements' time histories and the volume sampled by each Lagrangian Element) with spatially- and time-varying density estimates for water column biota, direct exposure to biota can be estimated. Toxicity modeling is being used to evaluate the effects of these exposures to dissolved and whole oil constituents. The SIMAP toxicity model described in French McCay (2002) provides a basis for the acute toxicity modeling being employed. The toxicity model is being updated with information being developed by the trustees.

Modeling activities include incorporation of data from plankton samples, net tows, trawls, and related information from the Fish and Plankton Activity to develop baseline density estimates for assessing injuries. A variety of statistical techniques are being examined to develop densities for model input. The trustees are also reviewing and including information gleaned from stock assessments by the National Marine Fisheries Service (NMFS). In addition, the injury analyses include consideration of the growth and (natural plus fishing) mortality the affected organisms would have undergone if there had not been a spill in projecting future losses.

The effort under these modeling activities will support analyses by other TWGs. For instance, water column biota are the prey base for marine mammals, sea turtles and birds, and so the activities outlined here and described below support the assessment of injuries via the prey base for these high trophic-level vertebrates. Modeling will provide quantification of exposures to floating oil and subsurface hydrocarbons for fish, invertebrates, aquatic plants (including *Sargassum* communities) and higher trophic level vertebrates. Injury quantification of fish, invertebrates, and aquatic plants exposed may be

used by other TWGs in their evaluations of injuries via the food web or other ecosystem-level effects. The modeling will also provide estimates of hydrocarbon fluxes to the atmosphere at the sea surface and to the sediments. Other TWGs, such as those concerned with marine mammals, sea turtles, birds and benthos, may use this information as input to their analyses.

NOAA performed many assessment tasks in 2012 related to oil transport, fate, and effects modeling; several of these activities will continue into 2013. By the end of 2012, initial draft model simulations of the spilled oil fate and resulting concentrations will be completed using NPFC Phase 1 funds, but input and verification data are still being developed and will be incorporated into refined fate and transport models in 2013. For example, hydrodynamics modeling is being refined after some contracting delays; digital sensor and particulate imaging information is still being analyzed following extensive protocol development and negotiations with BP; and many needed biological samples remain to be worked up and quantified. Biological effects modeling will be performed in late 2012 with available data inputs using NPFC Phase 1 funds and refined in 2013 as more information becomes available. Activities related to Transport, Fate, and Effects Modeling to be performed in 2013 are described below. Several of these tasks are directly related to the Fish and Plankton activities described in this claim. In general, the modeling activities will use the data produced from Fish and Plankton activities as inputs or for calibration of the model and are not duplicative of any effort detailed in that portion of the claim.



Flow diagram of the oil transport, fate and effects modeling approach.
Legend: Purple – direct data sources; Blue – SIMAP and SIMAP-input models; Green – indirect input models; Orange – output data for WC; Red – output data for other TWGs

Oil Fate Modeling and Comparisons with Observational Data

The NRDA oil transport and fate modeling framework employs demonstrable laws of physics and chemistry to calculate the time-dependent distribution of oil and surfactants in the study area. The water column, ocean surface, and sediments are all explicitly considered. This framework addresses such processes as the release specifications, rising, dispersion, surfacing, and advection of subsurface oil, the spreading, entrainment, emulsification and evaporation of surface oil, the effects of dispersants, the dissolution of soluble components, the partitioning onto suspended particulate matter, sedimentation to the sea floor, impingement on the shoreline, stranding on shoreline, and weathering and degradation.

NOAA undertook a number of studies and data compilation activities to define the release and provide inputs for the oil transport and fate modeling, including: winds and waves at the water surface and over time; currents in 3-dimensional space and over time; oil characterization and amount released in space and time; spatially- and time-varying environmental conditions (e.g., temperature, salinity, suspended particulates); bathymetry and habitat mapping; Response activities; and oil and component hydrocarbon properties. Twelve work plans were developed cooperatively for the collection of physical and chemical data from the water column which are being used for modeling the discharge, transport, and fate of oil from the wellhead.

It is important to evaluate the oil and gas release conditions in order to initialize the oil fate modeling with appropriate distributions of oil volume in space (horizontally and vertically) and over time. NOAA is examining the ROV videos that recorded events at the oil and gas release points to evaluate the specific conditions determining release rates and droplet sizes. The extent of the ROV video already obtained from BP amounts to 10 terabytes of data. Additional information is still being sought or gleaned from the estimated 20,160 hours of underwater video recorded by BP contractors. This work will continue into fall of 2012, as some requested video is still expected to be delivered to the trustees.

As may be seen in hundreds of CTD/fluorometers/dissolved oxygen profiles taken by vertical casts and transects, hydrocarbons from the spill were trapped and transported several hundred kilometers in deep waters between approximately 1000 and 1300m (~3300-4300 feet) below the sea surface. Using blowout modeling, NOAA and the trustees will develop outputs of locations, volumes, and droplet sizes of the released oil droplets, which then become input to the oil fate modeling.

In addition to the initial conditions provided by the blowout model, the oil fate model requires winds, waves and currents as inputs. NOAA has evaluated and utilized various wind products and measurement data for model inputs. While BP has provided a licensed copy of the Ocean Weather wind and wave model output for the Gulf of Mexico in 2010 to the trustees for their use in the DWH modeling analysis, the trustees have requested from BP, but not yet received, Ocean Weather wind and wave hindcasts for a larger domain to cover areas being hydrodynamically modeled. The Ocean Weather wind and waves models utilize measured winds to hindcast the 2010 time period of interest. This approach interpolates available measurement data, accounting for fetch to land and land effects on the winds. The wave model used is a government accepted "community" model named Simulating WAves Nearshore (SWAN) that was developed by Delft University of Technology. SWAN is supported by Office of Naval Research (USA) and Rijkswaterstaat (as part of the Ministry of Transport, Public Works and Water Management,

The Netherlands). NOAA is evaluating the performance of the Ocean Weather winds and waves, as well as NOAA products and measurement data.

Hydrodynamics modeling is being used to develop current data sets for input to the oil transport and fate modeling. Activities related to hydrodynamics modeling are described in the next task.

Physical measurements and samples were collected cooperatively during and after the oil spill (in 2010 and 2011) to document oil pathway and calibrate/verify the oil transport and fate modeling. These datasets include conductivity/temperature/depth (CTD) data; fluorometry results that indicate oil and organic material presence; dissolved oxygen measurements indicating microbial degradation of oil; transmissometers that sense particulates in the water; acoustics that reflect from oil, gas, and particulates; video and photography; water chemistry measurements of hydrocarbons, dispersants, and isotopes; chlorophyll measurements of plant life; and plant/microbial nutrient analyses. Thousands of water chemistry samples were analyzed under the management of the Chemistry TWG, and the resulting data are continuing to be validated. Other physical chemical data continue to be analyzed according to carefully and cooperatively developed protocols and quality assurance/quality control procedures. Analyses of these data sets are described in a later task.

In 2012 NOAA used NPFC Phase 1 funds to perform several assessment tasks related to oil transport and fate modeling and these activities will continue into 2013. Draft model simulations of the spilled oil fate and resulting concentrations will be largely completed by December 2012, but refinements utilizing input and verification data (such as those described above and under the hydrodynamics task) still being developed are expected in 2013. Tasks performed in 2012 included:

- Use information from the Response phase and ROV video to characterize oil discharge scenarios for blowout modeling;
- Review and update of SIMAP oil fate model codes;
- Update oil transport and fate modeling with relevant ocean data, including calibration of model output to appropriate field observations of oiling, such as floating oil and shoreline oiling distributions;

In 2013, tasks under this activity will continue work on-going in 2012 and will focus on:

- Model refinements incorporating new information and data (e.g., CTD and sensor measurements, hydrodynamics results, analyses of floating oil distributions) as they become available;
- Documentation and reporting; and
- Coordination of co-Trustee data review and interpretation.

Connection of Activities to NRDA Process

The oil and chemical transport and fate modeling quantifies pathway and exposure concentrations for water column biota. Physical and chemical data evaluations are being compared to model results to document the pathway and exposures, and verify the transport and fate modeling.

The effort under these modeling activities will support analyses by other TWGs such as the areas exposed to floating oil, timing of shoreline oiling and the overlap between tagged animals and oil. Oil transport and fates modeling will provide quantification of exposures for fish, invertebrates (water column and benthos exposed to water concentrations), aquatic plants (phytoplankton and *Sargassum*) and higher trophic level vertebrates (marine mammals, sea turtles and birds).

Sample/Data Handling

Environmental and chemistry data collected under cooperative work plans were collected using the methods specified in joint signed protocols. These samples are being analyzed and data organized with QA/QC administered by NOAA under strictly defined joint protocols. These data are maintained by NOAA and will be distributed through NRDA and cooperative databases. Data and information retrieved from published literature are recorded in a database which undergoes NOAA QA/QC protocols.

Data/Deliverables Produced

Output of transport and fate modeling includes estimates of the water volume and surface water contaminated and the degree of contamination. These results will be in geographic information system format, as well as tabular summaries. Information on the degree of contamination is then related back to established thresholds for assessing injury, such as water quality criteria and other standards.

A technical data report will be generated from the oil and chemical transport and fate modeling, and the report will contain graphics and summaries of mass distribution and concentrations of oil components floating and in the water column in space and time; mass loading to sediments and shorelines over time; and mass loss to degradation and volatilization. An additional product will be videos that track transport and fate through time so that mass distributions can more easily be visualized.

Level of Effort

Our request for the oil fate modeling and comparisons with observational data activity is $1,443,600 in contract funds. These costs include 0.7 agency FTEs and 3.4 contract equivalents. Key personnel include ASA staff and agency scientists.

One agency scientist will oversee all of the contractors working on the various aspects of the SIMAP model. Since NOAA is leading the offshore portion of the assessment, additional agency scientists will be focusing on co-Trustee coordination throughout 2013 and creating and reviewing the deliverables described above, which will be generated by the end of 2013.The contractors assisting NOAA are all experienced with NRDA and are senior engineers, modelers, and physical oceanographers.

The budget for this activity includes evaluation and preparation of needed input datasets, as well as modeling of oil transport and fate. Multiple model runs will be conducted for sensitivity analysis and calibration to observational data and to refine the modeling to best characterize the transport and oil fate. This activity will require considerable effort for documenting model inputs and algorithms, evaluation and comparison to extensive observational datasets and sample results, description of the outputs, and dissemination of results to other TWGs.

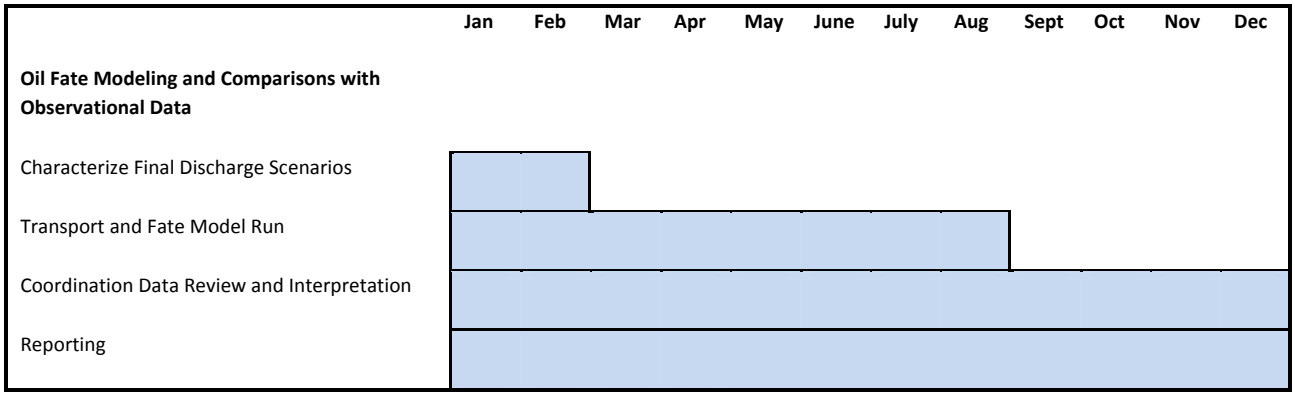
The activity in 2013 will continue and follow-up on work underway in 2012. Input data continue to be developed and will become available late in 2012 and throughout 2013. For example, chemical analyses are on-going, CTD and sensor data are being evaluated for quality control, hydrodynamics modeling for currents inputs is still in development, and analysis of floating oil distributions from remote sensing data are on-going. The activity will involve model updates as these data are analyzed, as well as documentation and reporting.

PIs (including NOAA)

The Principal Investigator for this activity is Deborah French McCay (RPS-ASA). Other investigators include Malcolm Spaulding, Yong Kim, and Matthew Horn, all of RPS-ASA.

Timetable

Timetable for Oil Fate Modeling and Comparisons with Observational Data Tasks in 2013



Some of the modeling efforts that were projected to be completed in 2012 will be performed in 2013 owing to longer-than-expected time required to negotiate protocols (for example, for the CTD data processing) and develop necessary input datasets for oil transport and fates modeling (such as the hydrodynamics modeling needed). Several datasets will not be ready until October of 2012, and additional information will continue to become available in 2013. Thus the timelines provided in the NPFC Phase 1 claim have been updated here, and projected through 2013. Much of the effort is expected to be completed by the end of 2013, but reviews and updates will continue after December of 2013. Due to the complex nature of ongoing cooperative assessment activities, formal and informal reporting will occur throughout 2013.

Task	Approximate Percentage of Total Contract Cost	% Complete (start of Claim period)	% Complete (end of Claim period)	Approximate Timing of Task (2013)
Use information from the Response phase to characterize final oil discharge scenarios for SIMAP model runs.	10	90	100	Jan-Feb
Run model for transport and fate quantification	30	80	95	Jan-Aug
Coordination co-Trustee data review and interpretation	10	40	90	Jan – Dec
Reporting	50	80	95	Jan – Dec

RP Involvement

This is not a cooperative study with BP.

Hydrodynamic Modeling

NOAA is using hydrodynamic modeling to evaluate currents in three-dimensional space and over time. Hydrodynamic models use winds and other environmental data as inputs, and established methods and equations based on physical laws to compute the currents and related information. Specifically, the model inputs include: wind stress and direction at water surface and over time; radiation (heat); river inflows over time; model boundary conditions such as tides; calibration data, such as Acoustic Doppler Current Profilers (ADCPs), sea surface height, and sea surface temperature; and verification data such as additional ADCPs, drifters, and documentation of transport of materials.

NOAA has employed the ROMS models SABGOM and IASROMS to provide hindcasts of the currents in the Gulf of Mexico in 2010. These models are well-established and supported by both government agencies and industry for application to the Gulf of Mexico. In Phase 1 of the hydrodynamic modeling effort in 2011, the SABGOM hindcast was run without adding calibration to ADCP measurement data of currents and other so-called assimilated data. In Phase 2, performed in 2012, the expanded ROMS grid of IASROMS was used to hindcast 2010 and include data assimilation (i.e., calibration) to ADCPs, temperature and salinity data sets, and estimates of sea surface height based on satellite imagery that is supplied by an international consortium of governments (i.e., the 1/4 degree global product produced by AVISO (http://www.aviso.oceanobs.com/en/data/products/sea-surface-height-products/global/index.html), a public source). Also in 2012, NOAA NOS prepared and provided an updated hindcast for 2010 using its NGOM and NGOFS models, which assimilate temperature and salinity data sets, and estimates of sea surface height in order to calibrate the model results. NOAA will continue to evaluate the results of these hindcasts against measurement data into 2013.

In addition, NOAA is evaluating the ADCIRC model that has been successfully applied to the Gulf of Mexico previously to evaluate the currents and storm surges related to Hurricanes Katrina and Rita. The ADCIRC grid and model inputs were updated in 2010 under National Science Foundation funding for application to the Deepwater Horizon spill.

In 2012 NOAA used NPFC Phase 1 funds to perform several assessment tasks related to hydrodynamic modeling and these activities will continue into 2013. Draft hydrodynamic model simulations will be largely completed by December 2012. Evaluation and refinement of hydrodynamic models will be completed in 2013, along with documentation of the work. Additionally, determinations will be made on how to best integrate offshore and shelf hydrodynamics. Tasks performed in 2012 and to be continued into 2013 include:

- Compiling and interpreting in-situ and remotely sensed oceanographic data; and
- Developing hydrodynamic models including model comparisons with in-situ data.

Connection of Activities to NRDA Process

Hindcasting of the circulation patterns present in the northern Gulf of Mexico throughout the study period will enhance NOAA's ability to establish, document, quantify, understand, and communicate the pathway for contaminants and the resulting exposure to natural resources in the region. These hydrodynamic results will provide insights into the physical state of the environment during the study period and the major processes involved in contaminant transport and fate, as well as for interpreting the results of field operations. These results will also have direct linkages to other Technical Working Groups such as Marine Mammals, Turtles, Shoreline, and Deepwater Communities.

Sample/Data Handling

Environmental and current data originally maintained and distributed by NOAA and data retrieved from published literature and ongoing federally-funded studies are being maintained under strict QA/QC management plans. Outside sources of data have been used with author's permission. All original data have been pre-processed and QC administered by NOAA in coordination with the originating entity.

Data used as model inputs of for comparisons to the hydrodynamic model results obtained through cooperative work plans were collected through methods defined in joint signed protocols. These data are being analyzed and organized and QA/QC administered by NOAA under strictly defined joint protocols. This data is maintained by NOAA and will be distributed through NRDA and cooperative databases. Data and information retrieved from published literature are recorded in a database which undergoes NOAA QA/QC protocols.

Data/Deliverables Produced

The hydrodynamic modeling efforts produce current data (u,v,w components of current vectors) spatially- and time- varying for entire oil model domain and from April to September of 2010 (or potentially longer and into 2011). Data will be provided as a circulation model hindcast in NetCDF (Network Common Data Form). Technical data reports documenting methodology and hydrodynamic model comparisons with in-situ data will be developed in 2013 when a final hydrodynamic model, or suite of models, is developed.

Level of Effort

Our request for the hydrodynamic modeling activity is $324,000 in contract funds. These costs include 0.8 contract equivalents. Key personnel include the PIs and their staff.

One agency scientist will oversee all of the contractors working on the various aspects of the hydrodynamic modeling. Since NOAA is leading the offshore portion of the assessment, additional agency scientists will be focusing on co-Trustee coordination throughout 2013 and creating and reviewing the deliverables described above, which will be generated by the end of 2013.

The types of contractors assisting NOAA are all experienced with NRDA and are senior engineers, modelers, and physical oceanographers.

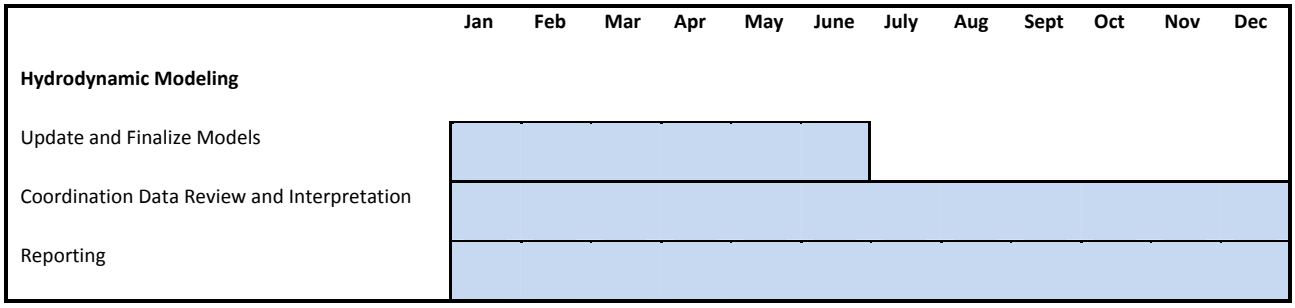
This activity includes refinement of hydrodynamic modeling of currents, utilizing observational data for calibration. The activity in 2013 will continue and follow-up on work underway in 2012. The activity will involve model updates, as well as documentation of methodology and results.

PIs (including NOAA)

The Principal Investigators for this activity include John Quinlan (NOAA), Deborah French McCay, Malcolm Spaulding, and Yong Kim, all of RPS-ASA, who are coordinating with hydrodynamic modelers and evaluating the results as compared with observational datasets.

Timetable

Timetable for Hydrodynamic Modeling Tasks in 2013



The hydrodynamic modeling work in 2013 will continue and follow-up on work underway in 2012. NOAA is expecting to have updated hydrodynamic results in 2012, but refinements will continue into 2013. Due to the complex nature of ongoing cooperative assessment activities, formal and informal reporting will occur throughout 2013.

Task	Approximate Percentage of Total Contract Cost	% Complete (start of Claim period)	% Complete (end of Claim period)	Approximate Timing of Task (2013)
Update and finalize hydrodynamic models with all relevant ocean data, including calibration of model to field observations.	40	80	95	Jan - Jun
Coordination co-Trustee data review and interpretation	10	40	90	Jan – Dec
Reporting	50	80	95	Jan – Dec

RP Involvement

NOAA has met with the RP several times to discuss hydrodynamic modeling. However, different timeframes for delivery of hydrodynamic models have necessitated less interaction with the RP on hydrodynamics than previously anticipated, and the overall effort is not a cooperative study with the RP.

Physical-Chemical Observational Data Analysis

Water column chemistry and physics were monitored during the cooperative field program. These observations included: conductivity/temperature/depth (CTD) data; fluorometry results that indicate oil and organic material presence; dissolved oxygen measurements indicating microbial degradation of oil; transmissometers that sense particulates in the water; and water chemistry measurements of hydrocarbons, dispersants, and isotopes. This activity covers the continued processing of these samples and data, and the analysis of the results.

The CTD processing plan and its amendment account for the processing and validation of conductivity, temperature, and depth (CTD) data, and associated sensor (e.g., fluorescence, dissolved oxygen, turbidity) data, collected as part of the Deepwater Horizon NRDA and other Deepwater sampling efforts in 2010-2011. The data to be compiled, processed, verified, and validated under this plan include those data collected during cruises conducted pursuant to various NRDA work plans developed by the NOAA NRDA Water Column TWG as well as during other cruises where NRDA participation was requested by other members of the Trustees (e.g., cruises led by other NOAA NRDA TWGs, NOAA Response, BP or its contractors, and by third party investigators). The data products resulting from this processing plan will be a compiled dataset of vertical CTD profiles (both downcast and upcast), including data from all auxiliary sensors and metadata, in electronic format (e.g., NetCDF).

In addition to the above types of data and samples, during the December 2010 Cooperative Deep Tow Cruise, water samples were collected at locations and depths where sensors indicated potential presence of hydrocarbons. These water samples were taken for shore-based analyses of dissolved inorganic carbon (DIC) and dissolved organic carbon (DOC) concentration and natural isotopes. Measurements may be made to determine if these bulk carbon properties have changed due to the presence or respiration of oil

by evaluating samples taken near and at a distance from the DWHOS release location. A work plan for DIC-DOC analyses would be developed.

As validated data sets of chemistry sample results, CTDs and sensors, and the DIC-DOC sample results become available, the Water Column TWG is evaluating and interpreting these data. Given the extensive data sets, the complexity of the sampling plans and the scope of the problem, the analyses involve considerable effort to appropriately interpret and document the findings. Much of this effort will be complete by the end of 2012, but more data is expected to become available in 2013, and the interpretations will be updated accordingly. Some of the information is being used as model inputs, and other information is being used for model comparison and verification. All of the information contributes to the evaluation of pathway and exposure for fish and plankton (discussed further under the Fish and Plankton activities).

Connection of Activities to NRDA Process

Hydrocarbon data, water chemistry data, and water column parameter data are all used in a variety of other NRDA investigation efforts. These data are used to characterize environmental conditions present in the northern Gulf of Mexico during the time of the Incident and how these conditions compare to historical conditions. These data are also used to establish the time-dependent distribution of contaminants during and after the Incident. These data will be used in establishing initial conditions in modeling exercises and for validating model results. Results from this activity will be used in a variety of ways by other Technical Working Groups either directly or in the form of secondary products arising from various modeling and analytical efforts.

Sample/Data Handling

Data will be stored by NOAA for access by both the Trustees and BP. Extra storage space was allocated for this effort in 2012.

Various data sources are being analyzed for this activity, including environmental and chemistry data. Some of these data are originally maintained and distributed by NOAA. Data have also been retrieved from published literature and have been used with author's permission. All original data have been pre-processed and QC administered by NOAA in coordination with the originating entity.

Data obtained through cooperative work plans were collected through methods defined in joint signed protocols. These data are being analyzed and organized and QA/QC administered by NOAA under strictly defined joint protocols. This data is maintained by NOAA and will be distributed through NRDA and cooperative databases. Data and information retrieved from published literature are recorded in a database which undergoes NOAA QA/QC protocols.

Data/Deliverables Produced

Data produced by this effort include:

1) Processed CTD and associated sensors' cast data,
2) Processed towed vehicle data,

3) Processed historical data,

4) Analysis of the above and data provided by the efforts of other TWGs (such as the Chemistry TWG),

5) Processing and analysis of deep tow samples,

6) Appropriate synthesis and reporting, and

7) Transition of hydrographic information to the circulation and oil fates modeling teams.

Level of Effort

Our request for the physical-chemical observational data analysis activity is $589,000 in contract funds. These costs include 1.3 contract equivalents. Key personnel include the PIs and their staff.

The data from approximately 3500 CTD casts from 91 cruises during 2010 and 2011 were compiled for processing under the CTD processing plan. NOAA is processing these data, and NOAA NRDA contractors are conducting the quality assurance procedures. The projected timeframe for this work is six months to complete the processing and four months for quality assurance of these data.

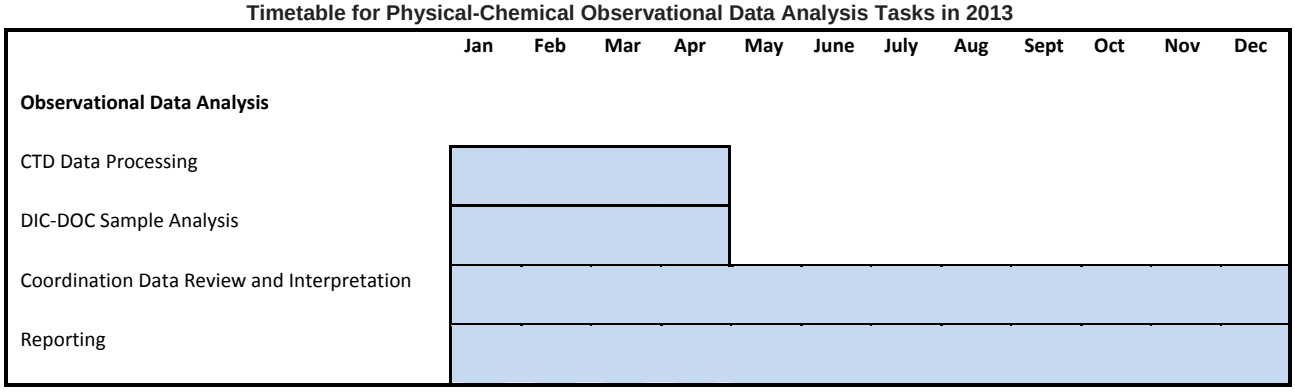
Approximately 435 discrete samples were collected for the DIC-DOC-isotope analyses. This number includes samples collected in the depth zone where fluorescence and dissolved oxygen sensors indicated potential presence of oil, as well as samples above and below those depths at every station, the occasional full water column profile, and replicates. The projected timeframe for this work is three months to analyze the samples, utilizing different labs for the different analysis procedures.

PIs (including NOAA)

The Principal Investigator for the interpretation of chemical data includes Greg Baker (NOAA),. The PI for the CTD processing plan is Yong Kim (RPS-ASA). The PI for the DIC-DOC study is John Kessler (U Rochester).

Timetable

Timetable for Physical-Chemical Observational Data Analysis Tasks in 2013



The work in 2013 will continue and follow-up on work on-going during 2012. Some of the analysis efforts that were projected to be largely completed in 2012 will be performed in 2013 owing to longer-than-expected time required to negotiate protocols and perform laboratory analyses. As a result some information will become available in 2013. Thus the timelines provided in the NPFC Phase 1 claim have been updated here, and projected through 2013.Formal and informal reporting will occur throughout 2013. Most of the effort is expected to be completed by the end of 2013, but reviews and updates may continue after December of 2013.

Task	Approximate Percentage of Total Contract Cost	% Complete (start of Claim period)	% Complete (end of Claim period)	Approximate Timing of Task (2013)
CTD Data Processing	40	80	100	Jan – Apr
DIC-DOC Sample Analysis	45	0	100	Jan – Apr
Coordination co-Trustee Data review and interpretation	15	40	90	Jan – Dec
Reporting	50	80	95	Jan – Dec

RP Involvement

The CTD processing plan and its amendment are cooperative plans with BP. The data review and interpretation is a Trustee-only task.

Remote Sensing Products Supporting Modeling

The Remote Sensing Products Supporting Modeling activity is a continuation of remote sensing activities from 2012. These activities include the compilation, evaluation, and interpretation of remote sensing data from NOAA, NASA, and other government sources to provide a time series of the distribution and thickness of surface oil in the Gulf of Mexico between April and August of 2010. This data will be used as input into hydrodynamic modeling, and for use in the analysis of Plankton and Fish sample data. Additional remote sensing products being evaluated include sea surface temperature, sea surface height, ocean color, and surface reflectance. The estimates of both the thickness and volume of surface oil will enhance quantification of the pathway and exposure to ocean and shoreline habitats. Resulting oiling maps will also provide input and calibration opportunities for the modeling efforts described elsewhere in this document. Completion of the remote sensing product development is extremely high priority as it will be a fundamental component in several TWG's assessment activities

Specific tasks in the activity include:

- Imagery acquisition, processing, and analysis of Moderate Resolution Imaging Spectrometer (MODIS)/ Medium Resolution Imaging Spectrometer (MERIS), MODIS Thermal, Synthetic Aperture Radar (SAR) data;
- Acquisition and processing of Airborne Visible/Infrared Imaging Spectrometer (AVIRIS) imagery is not included in this effort (DOI-lead), though the AVIRIS data will eventually be incorporated into the analysis with other imagery;
- Coordination of image experts, data, and analysis from multiple remote sensing platforms;
- Coordination of federal Trustee agencies and experts, NRDA TWGs, and expert panel quarterly meetings;
- Requesting access to data from the RP;
- Coordinated postings of data for panel and TWG use;
- Development of interim interpretive products based on analysis;
- Final imagery based thickness and volume estimates for available image days; and
- Report preparation.

Connection of Activities to NRDA Process

The specific remote sensing products described above are for the environmental data used to support the Oil Transport, Fate, and Effects modeling work. The development of these products is not duplicative of the other remote sensing activities included in this claim (i.e. Shoreline Mapping, Sargassum mapping) or in the DOI claim. Though several of the datasets used are similar, the specific images processed for each activity are different, and when select imagery may be used in more than one analysis, those costs are only included in one portion of the claim. The surface oil analysis integrates pathway and exposure information across open water, nearshore, and shoreline resources and habitats. This information will be used to quantify snapshots of observed floating oil and can be compared to model-based fate and

transport. And because these products cover both the offshore and nearshore environment they may provide important data for use in several other TWG's assessment activities.

Sample/Data Handling

Various data sources are being analyzed for this activity, including direct observations and remotely sensed data. Some of these data are originally maintained and distributed by NOAA. All original data have been pre-processed and QC administered by NOAA in coordination with the originating entity. Data and information retrieved from published literature are recorded in a database which undergoes NOAA QA/QC protocols.

Remote sensing products for environmental data are downloaded and documented with the data source and other metadata. QA/QC protocols used in developing the remote sensing products will be fully documented.

The effort related to the oil on water analysis will rely exclusively on data collected from a variety of remote sensing platforms engaged in the Deepwater Horizon Response and NRDA activities. These data will be re-processed and re-analyzed to support pathway and exposure assessment.

Data/Deliverables Produced

The environmental data products will be those downloaded from government servers and compiled for easy access and use within noaanrda.org/ERMA.

The surface-oil related products include:

- Re-processed and re-analyzed SAR data for 82 image days,
- Thickness and volume estimates for 82 image days,
- Cumulative oiling extent from all SAR data footprints (maximum, total coverage area),
- Cumulative oiling index

In addition, a technical data report will be developed that summarizes the results of the remote sensing analyses.

Level of Effort

Our request for the remote sensing products supporting modeling activity is $706,000 in contract funds. These costs include 0.4 agency FTEs and 1.6 contract equivalents. Key personnel include the PIs and their staff.

One agency scientist will oversee all of the contractors working on the various aspects of the modeling. Since NOAA is leading the offshore portion of the assessment, additional agency scientists will be focusing on co-Trustee coordination throughout 2013 and creating and reviewing relevant deliverables. A technical data report summarizing the results of the remote sensing analyses obtained from NRDA investigations will be generated by the end of 2013.

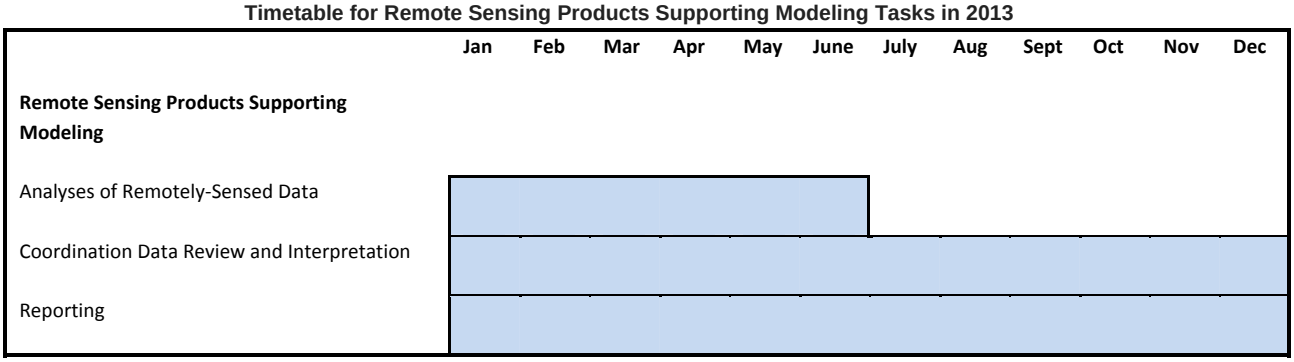
The types of contractors assisting NOAA are all experienced with NRDA and are remote sensing experts, senior engineers, modelers, and physical oceanographers.

PIs (including NOAA)

The Principal Investigators for this activity is Jamie Holmes (Stratus), George Graettinger (NOAA), Dr. Oscar Garcia-Pineda (FSU), Dr. Chuanmin Hu (USF), Dr. Ira Leifer (UCSB).

Timetable

Timetable for Remote Sensing Products Supporting Modeling Tasks in 2013



The work in 2013 will continue and follow-up on work begun in 2011 and underway in 2012. Most of the effort is expected to be completed by the end of 2013, but reviews and updates may continue after December of 2013. Due to the complex nature of ongoing cooperative assessment activities, potential for settlement, and need to prepare for litigation, formal and informal reporting will occur throughout 2013.

Task	Approximate Percentage of Total Contract Cost	% Complete (start of Claim period)	% Complete (end of Claim period)	Approximate Timing of Task (2013)
Analyses of remotely-sensed data	40	50	95	Jan - Jun
Coordination co-Trustee data review and interpretation	10	10	90	Jan – Dec
Reporting	50	10	95	Jan – Dec

RP Involvement

This is not a cooperative study with BP. No involvement of the responsible party is envisioned in this activity.

Exposure and Injury Modeling and Data Inputs

NOAA will use oil exposure and biological effects modeling (an updated set of models based on SIMAP, described in French McCay, 2002, 2009) to evaluate and quantify water column injuries resulting from oil hydrocarbons and chemicals introduced into the water column during the Deepwater Horizon Oil Spill. Modeling includes several components related to water column biota. First, the oil distributions, degree of weathering and concentrations produced by the oil fate modeling described above is evaluated to determine the exposure history of various types of water column biota. This involves consideration of the distributions and behavior of the organisms. In the exposure model, Lagrangian Elements are used to track the movements and exposure history (time history of oil component concentrations experienced) of each organism behavior type defined in the inputs to the model. Biota are simulated as stationary, planktonic, or swimming under their volition with a variety of behavior patterns and habitats used. The results are summarized as water volumes exposed to varying degrees to each of the hydrocarbon components by each of the behavior categories.

Toxicity modeling is being used to evaluate the effects of these exposures to dissolved and whole oil constituents. The SIMAP toxicity model described in French McCay (2002) provides a basis for the acute toxicity modeling being employed. The toxicity model is being updated with information being developed by the trustees.

To support these models, NOAA and the trustees are performing extensive literature and data reviews involving evaluation of horizontal and vertical distributions, behavior and movements, densities, life histories, growth rates and natural and fishing mortalities. The organisms considered include plankton, early life history stages (eggs and larvae) of fish and invertebrates (e.g., decapods), and juvenile and adult fish and invertebrates in deep offshore, surface offshore, and continental shelf waters. As the life stages and size classes of fish and invertebrates within a species occupy different habitats and parts of the water column as well as show various behavior patterns, there are numerous species to be considered, and the literature and available databases are diverse and disparate in approaches and analyses; compiling, quantifying and formatting these datasets for use in the modeling is a resource intensive task. A variety of statistical techniques are being examined to develop densities for model input. The trustees are also reviewing and including information gleaned from stock assessments by the National Marine Fisheries Service (NMFS) and new information as it becomes available from field studies and the analyses being performed by trustee experts.NOAA undertook a number of studies and data compilation activities to define an extensive set of the organisms present to the biological abundances in the affected region. Numerous updates to existing biological databases were necessary and included the assimilation of biological information collected on cruises. The sample processing effort for this activity is included in the Fish and Plankton activity and those data products will be incorporated into the modeling activities described here.

Approximately thirty cooperative work plans were primarily designed to collect biological abundance and distribution data for plankton and/or small pelagic fish and invertebrates. These samples require sorting and identification, and a network of labs are currently working up the samples. Data is being compiled, evaluated for quality assurance and quality control, statistically analyzed, and integrated into the biological distribution and abundance maps for use in injury modeling and direct comparison with

historical datasets. The sample processing effort for this activity is included in the Fish and Plankton activity and those data products will be incorporated into the modeling activities described here.

In late 2012, NOAA will address several major injury assessment tasks related to offshore fish and water column biota using NPFC Phase 1 funds, including:

- Continuation of literature reviews and analysis of historically-collected data;
- Updating biological databases with evidence that will be processed in labs through fall 2012;
- Defining the spatial and temporal trends in distribution and abundance of biological resources in deepwater and surface waters;
- Updating exposure algorithms, effects thresholds, and toxicity models in the biological effects model in SIMAP;
- Integrating NRDA toxicity studies as they become available throughout 2012;
- Compiling baseline life history information for Gulf of Mexico species; and
- Refining exposure and injury modeling using the most complete physical, chemical, biological and toxicological information available.

Biological databases from the Southeast Area Monitoring and Assessment Program (SEAMAP; a state/federal/university program for collection, management and dissemination of fishery-independent data and information in the southeastern United States) and published literature are being reviewed and extensively analyzed to develop inputs for the biological effects modeling. As described in the Fish and Plankton activity, the SEAMAP data sets include bongo (0-200m) and neuston (surface ~0.5meter) samples of ichthyoplankton and other plankton, fish trawls, and longline catch statistics, as well as associated size and weight information and analyses in published reports. The stock assessments for fisheries and other species contain considerable information, but involve complex quantitative analyses, modeling, and interpretations, that the trustees will review. The effort to analyze and utilize this information is on-going and will continue into 2013.

The analysis of these databases will be used to develop baseline densities of fish (adult, juvenile, and ichthyoplankton), invertebrates, and other to be spatiotemporally resolved resulting in baseline density maps used to inform injury modeling. Additional analysis of SEAMAP databases, published literature, and data from cooperative studies will allow integration of horizontal and vertical distributions of water column biota into the injury modeling effort.

Published literature documentation, results of towed image analysis systems that are used to identify and count plankton, analyses of biota filmed in video taken on ROVs deployed deep in offshore waters, data from multiple opening and closing net samples that sample individual depth strata, counts and identifications of fish and invertebrates taken in mid-water trawls, analysis of acoustics identifying aggregations of fish and invertebrates at specific depths, and technical expertise will be used to determine depth distributions, behavior and movements of water column biota. The data sets and on-going analyses are described in the Fish and Plankton activity. These collected data, as well as biota density models and general biological information regarding water column biota, will be incorporated into various components of the injury modeling effort to quantify exposure of biota to floating and water column oil and hydrocarbons. This will subsequently allow for injury quantification modeling and estimation of direct losses from hydrocarbon exposures.

To more accurately quantify injury to water column biota, oil toxicity modeling will continue to be refined as more data become available. The Trustees are performing extensive toxicity testing and results are still being developed. The toxicity model will be updated in 2012 with previously-available information, and revised in 2013 to reflect the findings of the toxicity testing.

The potential phototoxic effects of exposure to UV light following aromatics exposure will also be considered in the modeling effort. Specifically, suspended particle and UV light exposure data will be mapped and analyzed. These analyses will be incorporated into the model in order to more accurately describe injury.

Life histories, growth rates, and mortality rates of water column biota are being developed from published literature, stock assessment analyses, technical reports, and newly-collected NRDA data sets for model input. These model inputs are import for analyzing how long the biota directly injured would have otherwise lived, and what production (growth) they would have undergone, had there not been a spill.

Connection of Activities to NRDA Process

The objective of this activity is to quantify injuries to water column biota resulting from the Incident. NOAA is developing baseline density estimates both to evaluate organisms exposed and as inputs to the modeling used for quantification of injuries from direct exposures. The injury modeling will also utilize information developed from toxicity studies as part of the NRDA and gleaned from the literature.

The effort under these modeling activities will support analyses by other TWGs. Water column biota are the prey base for marine mammals, sea turtles and birds, and so the activities described support the assessment of injuries via the prey base for high trophic-level vertebrates. Modeling will provide quantification of exposures for fish, invertebrates, aquatic plants and higher trophic level vertebrates. Injury quantification of fish, invertebrates, and aquatic plants exposed may be used by other TWGs in their evaluations of injuries via the food web or other ecosystem-level effects.

Sample/Data Handling

Biological data include information on species location and catch numbers from various gear type collections. These data are originally maintained and distributed by NOAA, the Gulf States Marine Fisheries Commission, state agencies, and academic institutions. Data have also been retrieved from published literature to inform biota densities and have been used with author's permission. All original data have been pre-processed and QC administered by NOAA in coordination with the originating entity.

Data obtained through cooperative work plans were collected through methods defined in joint signed protocols. These data are being analyzed and organized and QA/QC administered by NOAA under strictly defined joint protocols. These data are maintained by NOAA and will be distributed through NRDA and cooperative databases. Biological information regarding behavior and movements and life history of water column biota are retrieved from published literature and recorded in a database which undergoes NOAA QA/QC protocols.

Data/Deliverable Produced

The biological exposure and effects modeling will estimate for water column biota:

- Exposures (e.g., concentrations experienced over time) to dissolved and whole-oil hydrocarbons for each behavior group modeled (e.g., deepwater mesopelagic, pelagic, demersal, and planktonic);
- Exposures for each of the species/life stage groups modeled (e.g., the various species and life stages considered are assigned a behavior to evaluate their exposure);
- Toxic effects in exposed water volumes for each species/life stage group modeled;
- Numbers and biomass of organisms directly injured (by species and life stage); and
- Future lost production.

A technical data report summarizing injury modeling results will also be produced.

Level of Effort

Our request for the exposure and injury modeling and data inputs activity is $983,000 in contract funds. These costs include 2.2 contract equivalents. Key personnel include ASA staff.

One agency scientist will oversee all of the contractors working on the various aspects of the SIMAP model, including quantifying injuries using information from the toxicity investigations. Another scientist is focused on the statistical analysis of biological information obtained from all of the offshore sampling cruises conducted in 2010 and 2011, and in particular the trends of field-collected information compared to baseline. Since NOAA is leading the offshore portion of the assessment, additional agency scientists will be focusing on co-Trustee coordination throughout 2013 and creating and reviewing relevant deliverables.

By the end of 2012, a draft technical data report summarizing injury modeling results, using the best available inputs at the time, will be generated. These results and the draft technical data report will be updated in 2013 as additional data become available.

The majority of effort in this activity is being undertaken by contractors, including:

- Updating biological datasets (ichthyoplankton, other plankton, and mesopelagic, deepwater demersal, offshore pelagic, shelf and shelf demersal fish and invertebrates) for model inputs with results that will be processed in labs through fall 2013;
- Defining the spatial and temporal trends in distribution and abundance of biological resources with statistical and other approaches;
- Integrating NRDA toxicity studies as they become available in 2013;
- Refining injury model runs using the most complete physical, chemical, biological, and toxicological information available;
- Technical reviews and refinements of the input data and modeling; and
- Documentation and reporting.

The contractors assisting NOAA are all experienced with NRDA and are senior engineers, ecological modelers, statisticians, oceanographers, biologists, fisheries scientists and toxicologists.

The budget for this activity includes evaluation and preparation of needed biological datasets for plankton, fish and invertebrates offshore (deep and surface waters), on the shelf and nearshore, as well as modeling of exposure, toxicity, and injuries. The work 2013 will continue and follow-up on work

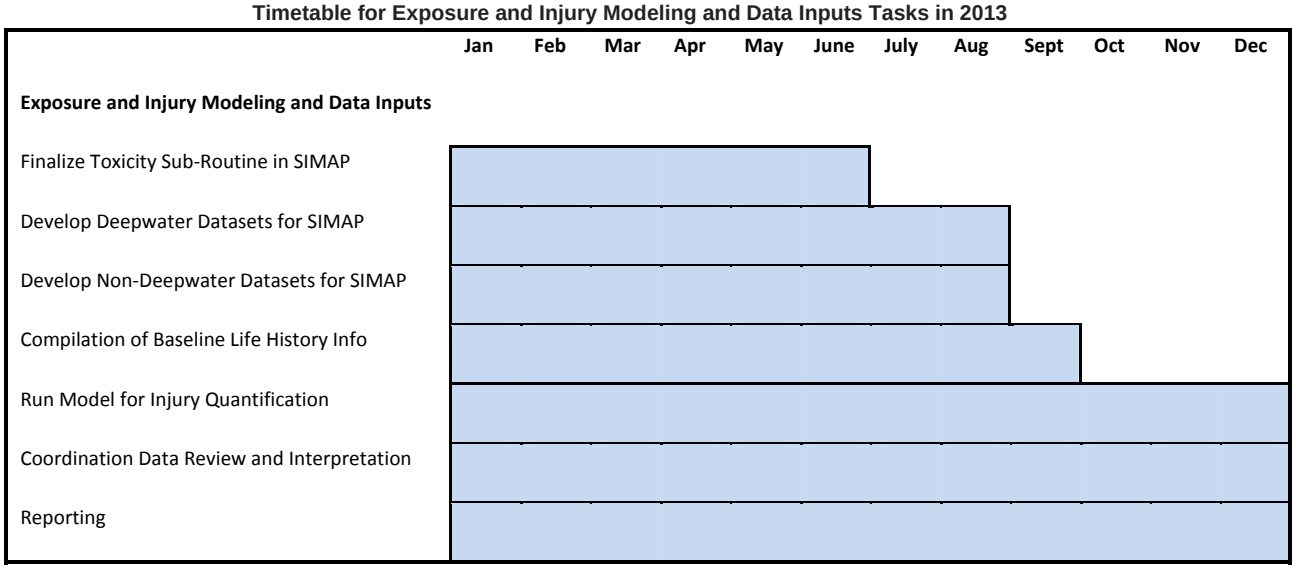
underway in 2012. Biological and toxicological data continue to be developed and will become available late in 2012 and throughout 2013. The activity will involve analysis of the data to prepare needed model inputs, model updates as these data are analyzed, evaluation of the results, comparison to observations and evidence of injuries, and technical reviews, as well as documentation, reporting, and coordination with other Trustees. We are expecting multiple detailed technical reviews and updates of these analyses and reports.

PIs (including NOAA)

The Principal Investigator for this activity is Deborah French McCay of RPS-ASA. Marine biologists at RPS-ASA who are leading tasks for this effort are Jill Rowe, Melanie Schroeder, Eileen Graham, Erin Bohaboy, Richard Balouskus, and Danielle Reich.

Timetable

Timetable for Exposure and Injury Modeling and Data Inputs Tasks in 2013



Some of the modeling efforts that were projected to be largely completed in 2012 will be performed in 2013 owing to longer-than-expected time required to develop necessary input datasets for biological effects modeling (such as biological density data from samples, trawls and image-processing) and the oil fate modeling (such as the hydrodynamics modeling) that is used for the biological effects calculations. Some datasets will not be ready until November of 2012, and additional information will continue to become available in 2013. Toxicity studies are expected to continue through 2013, and results will be incorporated into the modeling as these become available. Thus the timelines provided in the NPFC Phase 1 claim have been updated here, and projected through 2013. Due to the complex nature of ongoing cooperative assessment activities formal and informal reporting will occur throughout 2013. Most of the effort is expected to be completed by the end of 2013.

Task	Approximate Percentage of Total 2013 Contract Cost	% Complete (start of Claim period)	% Complete (end of Claim period)	Approximate Timing of Task (2013)
Update exposure scenarios, effects thresholds, and toxicity models to finalize the toxicity sub-routine in SIMAP	10	70	95	Jan - Jun
Compilation, statistical evaluation, and integration of deepwater (>200m) trawl datasets to develop the deepwater biological datasets for input to SIMAP	10	60	90	Jan - Aug
Compilation, statistical evaluation, and integration of ichthyoplankton, stock assessment, shrimp trawls, and invertebrate sampling datasets to develop the non-deepwater biological data inputs for input to SIMAP	10	70	90	Jan - Aug
Compilation of baseline life history information for species known to be injured after the Incident	5	80	95	Jan – Sep
Run model for injury quantification	20	70	95	Jan - Dec
Coordination co-Trustee data review and interpretation	5	40	90	Jan – Dec
Reporting	40	70	95	Jan – Dec

RP Involvement

The RP has been involved in the development of numerous work plans including biological sampling cruises and work-up of samples. The RP had representatives in the field for most data collection efforts, and the RP's representatives participate in several of the biological processing plans by either providing experts for identification of animals or by providing input on QA/QC among NOAA contracted labs. NOAA holds weekly calls with the RP to discuss water column work plans.

Analysis and interpretation of the data, as well as biological effects modeling, are not being conducted cooperatively with the RP.

Data Management for Transport, Fates and Effects Modeling Activities

This effort integrates oil, water, and sediment chemistry and other lab sample data collected by Response, NRDA, and other activities. In addition, visual observation, instrumentation, photographs, and video were collected to further support the assessment. Data management activities required to manage, statistically analyze, and map these data are described here. IEc's Data Management Team and associated

subcontractors, as well as agency data management staff, are primarily responsible for the activities described here.

Samples and associated data acquired through cooperative work plans were collected through methods defined in joint signed protocols. Samples and associated data acquired through non-cooperative work plans were collected through methods defined in the Trustee-approved protocols. These samples are being analyzed and data organized and QA/QC administered by NOAA under strictly defined joint protocols. These data are maintained by NOAA and will be distributed to Trustee representatives through NRDA and cooperative databases. Associated activities to manage the data include:

- Maintenance of the original field data as well as associated analytical results in secure data repositories (e.g., noaanrda.org, ERMA), including associated server, data transfer and storage space costs.
- Maintenance of and training in data retrieval/sharing websites to ensure Trustee-wide access to data while maintaining associated metadata (e.g., data history / change logs).
- Storage, tracking and distribution of physical samples.
- Training for sample confirmation and results delivery to obtain all necessary documentation (e.g., lab/analytical standard operating procedures)
- Physical delivery of lab data to Trustee and RP representatives per data sharing agreement
- Storage and tracking of external hard drives collected during field sampling to manage large files
- Regular participation in TWG calls to provide consultation on all above matters.

To facilitate the validation of visual observation data, data management activities include participating in 1) TWG-wide coordination activities (e.g., promote standard validation approaches) as well as 2) the incorporation of changes (e.g., transcription verification and data validation changes) into the NOAA data repositories to promote Trustee-wide analysis of a consistent data product.

In addition to the effort associated with physically analyzing samples collected previously, associated management of the process includes coordinating analytical activities; data tracking activities to provide status reports on analytical progress and data availability; third-party validation of lab results to ensure data is in proper format and meets quality standards; secondary QA/QC of field data prior to merging with lab results; incorporation into repositories as final, validated products; forensic chemistry to identify source of contamination; and spatial processing and loading into ERMA.

As raw field data are validated and finalized, data support activities will also extend to the sharing of these results with the public. Data support activities will include the packaging, organization, and release of each data product along with associated metadata. Associated data storage and transfer costs as well as response to public inquiries are incorporated. Furthermore, the files associated with interim and final products generated through the processing and analysis of field and other collected data will be managed and shared in the NOAA data repositories to promote Trustee-wide data access.

Level of Effort

Our request for the data management for transport, fates, and effects modeling activities is $2,074,820 in contract funds. These costs include 0.2 agency FTEs and 7.4 contract equivalents. Key personnel include IEc and agency data management teams.

D. Fish and Plankton

Introduction and Background

The 2010 Deepwater Horizon Incident resulted in an unprecedented release of contaminants into US waters with respect to both duration and spatial scope. The Natural Resource Damage Assessment (NRDA) has been investigating the full range of environments from 1,500 meters below the ocean surface to the shoreline and across nearly 700 kilometers of the northern Gulf of Mexico. Direct mortality has been observed across a number of trophic levels and shifts in ecological community structure and function have occurred. It is clear that the Deepwater Horizon Incident resulted in substantial impacts and the NRDA continues to evaluate the extent and severity of this injury.

The NRDA Water Column Technical Working Group's (TWG) has been focused on assessing injury associated with the Deepwater Horizon Incident to the natural resources present in the water column. The approach taken by the Water Column TWG was to examine potential injury across a number of trophic levels ranging from primary producers to top-level predators. Based on the expected sensitivity of the early life stages of fishes and invertebrates to hydrocarbons, significant effort was placed on collecting data regarding the distribution and abundance of these life stages. Additionally, extant sampling programs (SEAMAP) largely fielded in support of fisheries management, were reviewed and found to be useful, however needing augmentation to supply adequate information for assessing injury to mesopelagic and epipelagic organisms. The extensive field program developed by the TWG collected ephemeral data for a significant component of the northern Gulf of Mexico ecosystem, helping to address gaps in available data and provide high-resolution information across seasons. In combination with the historical data sets, this information was collected in order to meet a set of specific objectives as described below.

An extensive compilation of pre-spill 'historical' data characterizing the physics, chemistry, biota, and ecology of the northern Gulf of Mexico is under development by the TWG. These data drew from a variety of information sources including previous Minerals Management Service field programs, National Marine Fisheries Service living marine resource surveys, laboratory studies, stock assessments, data collections by state agencies and academics, NOAA/NASA remote sensing, and the scientific literature. Some of these data collections extend back decades. These data are used to characterize baseline conditions, systematic changes, and the magnitude of variability of biological, physical, and chemical conditions in the northern Gulf of Mexico.

The 2010 – 2011 water column biological field program was comprised of over 42 oceanographic cruises and supported by an array of scientific expertise (biology, ecology, toxicology, physics, engineering, computer science, remote sensing, oceanography, numerical modeling, etc.) using a variety of sampling platforms (ships, towed instruments packages, profiling instruments, remotely operated underwater vehicles (ROVs), aircraft, and satellites). This field program specifically targeted the collection of phytoplankton, microzooplankton, zooplankton, ichthyoplankton, juvenile fishes and invertebrates, adult fishes and invertebrates, mesopelagic organisms, and epipelagic organisms (i.e., collections across multiple trophic levels and biomes). In addition to net-based biological samples, the field program collected an enormous amount of electronic data using holographic cameras, video cameras, line scan cameras, LIDAR, and acoustic-based sensors. The sheer size of the electronic data collection program is exemplified by the fact that collections for one of the line scan cameras produced about 80 terabytes of

raw data during three fourteen day cruises. These data are used to define both immediate impacts and for providing information on components of the ecosystem which have not been adequately examined in previous work.

The TWG's physical/chemical oceanographic program (described in detail in the Transport, Fate and Effects section of the claim) was largely conducted concurrently with the biological program and collected physical and chemical information such as temperature, salinity, fluorescence, dissolved oxygen, methane concentration, PAH concentration, etc. This program also deployed ROVs and ADCPS as well as drifters or drogues to provide additional information on oceanographic circulation patterns in the study area. These data are critical for defining the physical and environmental conditions present in the northern Gulf during and subsequent to the Incident and for analyzing the spatial and temporal distribution of the associated biological community.

The information sources described above were collected and compiled to support four fundamental objectives for the NRDA:

- First, historical data is being used to characterize the baseline conditions and variability of the ecosystem of the northern Gulf of Mexico. This objective will help the TWG gauge whether or not 2010 and 2011 were anomalous given observations from previous years. It will also help the TWG to better understand the distribution, dynamics and properties of water masses, river discharge, species-habitat associations, and ecological community structure.
- Second, these data will provide valuable evidence on the pathway of DWH contaminants from release to injury. This objective will help the TWG to provide empirical evidence in support of the NRDA. Field observations collected during and after the Incident will be used to provide as complete a description as possible of the temporal and spatial dynamics of discharged oil as the event unfolded.
- Third, these data sources will allow NRDA to assess the impact of the spill on the biota and chemistry of the northern Gulf of Mexico. DWH event-related data will be directly contrasted with data collected from other periods of time to provide a statistically rigorous evaluation of the DWH Incident's impacts on the ecosystem and its natural resources.
- Fourth, all of this information will be used to support numerical modeling studies which will help the TWG better describe and infer the magnitude of the injury resulting from the DWH Incident. These modeling studies, described elsewhere, help synthesize, or pull together, this vast collection of data and will allow scientists, the legal teams, and the general public to better understand and gauge the damage caused by the release of discharged oil into the Gulf of Mexico in 2010.

The work associated with collecting, processing and analyzing the data necessary to evaluate the scope and scale of injury to natural resources in the water column has consumed the scientific capacity of the region with regard to skilled personnel and laboratory facilities. For instance, processing biological samples (more than 7000 individual plankton samples were collected) involve approximately ten different sorting and identification laboratories and approximately 70 agency and contract staff. Additional capacity is required to speed completion of the sorting and identification of all samples; three to five times the current level of effort may be required. The physical oceanographic samples (CTD casts, remote sensing, etc.) involve at least four different laboratories and numerous dedicated scientists and

technicians. Processing components of the other electronic data for biology requires several technicians. Information gleaned from the literature, preliminary results of the Trustees' toxicity testing program, and other direct evidence clearly suggested substantial impacts to water column organisms are more likely than not.

Evaluation of Historical Biological Data and Analysis of Field Data from 2010-2011

Historical Biological Data – During the past 30 years, the National Marine Fisheries Service and state partners working in the northern Gulf of Mexico have developed a variety of specialized, multispecies, fishery-independent living marine resource surveys using either a stratified random or fixed grid systematic survey designs. Sampling gear employed (ranging from bongo nets to longlines) depends on the target species and the habitat expected. Additionally, because each survey was initiated at a different time and is conducted at fixed times of the year, the spatial and temporal coverage is survey-specific. These surveys are now organized under the Southeast Area Monitoring and Assessment Program (SEAMAP) and are conducted to supply data to support fisheries stock assessments, however, SEAMAP is also a primary source of baseline information for the NRDA investigation.

Data collected under the auspices of SEAMAP include information from extensive plankton, shrimp/groundfish, mesopelagic (high opening bottom trawl), and longline surveys. These surveys also collect information on environmental parameters such as temperature and salinity. Because this information was collected for supporting fisheries stock assessments, it was generally not prepared in a manner intended to address NRDA needs. The NRDA evaluates injuries to all components of the ecosystem which includes organisms that were collected by SEAMAP but not evaluated in detail (for example, the plankton database alone consisted of several gigabytes of data on hundreds of different taxa collected from thousands of individual samples, over the course of eleven years). While significant progress has been made by the NRDA in examining some of the plankton data, much additional work continuing into 2013 is required.

Analyses of these data fall into the general framework of statistical analyses/modeling and the applications fall into direct assessment of injury and oil transport and fate modeling. The SIMAP model deployed to infer the magnitude of damage requires detailed information on the spatial and temporal abundance of organisms in the impacted area. These supporting data will be largely derived from SEAMAP data with augmentation from Incident-related data. Direct evaluation of the injury will be derived from both the historical data described here and from the Incident-related data to be described below. Both of these applications will rest on sophisticated and rigorously reviewed statistical modeling currently under development by the Trustees. This work will be described in the Analysis section below.

Overview of data availability for various 'ecosystem components' from historical standard sampling (SEAMAP) and sampling conducted as part of the NRDA investigation into the Deepwater Horizon Incident.

Ecosystem Component	***SEAMAP***	***Incident-Related***
Biovolume	X	X
Phytoplankton		X
Microzooplankton		X
Zooplankton		X
Ichthyoplankton	X	X
Juvenile Fishes and Invertebrates	X	X
Adult Fishes and Invertebrates	X	X
Epipelagic Community		X
Mesopelagic Community		X

Overview of SEAMAP historical sampling programs for the northern Gulf of Mexico. Approximate years of operation, seasons of operations, and number of stations per year. Sampling at a single station can result in one to several samples each containing from zero to many thousands of organisms which must be classified.

Survey Program	***Years of Operation***	***Seasons***	***Number of Stations***
Plankton Sampling	1977-present	Win,Spr, Fall	300
Shrimp/Juvenile Groundfish	1982-present	Sum,Fall	45
Reef Fish	1996-present		
Bottom Longline	1995-present		
Shark Longline	1995-present		
Small Pelagics Deepwater	2002-present		

Analysis of Field Data from 2010-2011 - This activity encompasses the completion of the processing of field data collected during the 2010-2011 field programs. Completion of the sample processing described in the section below is critical for the assessment of exposure and injury of the water column biota as a result of the spill. The data produced will be compared with historical information described above, analyzed spatially and temporally, and used as input for the Transport, Fate, and Effects Modeling activity.

Plankton Sample Processing
The purpose of the plankton sample processing plan is to establish a protocol for the analysis of plankton samples collected during the Deepwater Horizon NRDA. Over 7000 plankton samples were collected during the 2010-2011 field activities. Data products from sample processing include taxonomic identifications, biomass measurements, counts, and length/width measurements of each component of the plankton samples. The purpose of the first amendment to the plankton sample processing plan is to bring on additional laboratory capacity compared to that outlined in the original plan.

Fish and Invertebrate Trawl and Net Sample Processing
This activity encompasses the continuation of the processing of fish and nekton samples collected during the 2010-2011 field programs. This is a continuation of a processing plan that was signed by BP, the nekton sample processing plan, and its forthcoming amendment which will increase the sample processing capacity by adding an additional laboratory.

The fish and nekton sample processing plan establishes a protocol for the analysis of fish and large invertebrate samples collected during the Deepwater Horizon NRDA. Due to the large number of fish and nekton samples, the priority is to (i) compile counts for midwater trawl samples sorted to the family level onboard the ship, (ii) sort the 10 m^2 MOCNESS samples to the family level and conduct counts, and (iii) sort and conduct family-level counts for the epipelagic trawl samples and coordinate these counts with LIDAR interpretation. After family-level counts have been completed, all specimens will be identified to the lowest possible taxonomic level.

Image Analysis Processing
This activity encompasses the continued effort to analyze the imaging data collected in situ on a series of cruises during 2010-2011. This activity will allow each of the PIs to complete the data processing, documentation, and technical data reports. Data collection plans were all cooperative with BP, as well as the first of the three data processing plans.

As part of the Water Column TWG sampling effort, digital images for the identification and quantification of plankton, marine snow (suspended particulate material, SPM), and oil droplets were collected using a Holocam, DAVPR, VPRII, SIPPER, and/or ISIIS. The data collected require post-processing to extract sub-images, classify and measure the objects imaged, compute abundance and size distributions, and identify location (latitude, longitude, depth) of the imaged objects. The end data products will include the extracted sub-images (in a common digital photo format), spreadsheets of image information (classifications, measurements, locations, etc.), summary tables and figures, and narrative descriptions of the data.

Production and Energy Flow Analyses
During a number of cruises (e.g., *American Diver* 1 and 3, *Walton Smith* 1, 3, 4 and *Nick Skansi* 8) conducted to investigate the biological communities of the Gulf of Mexico, chlorophyll and

phytoplankton/microzooplankton samples were collected alongside other plankton samples. These samples represent the lower trophic levels of the ecosystem and, when processed, will allow for analysis of the planktonic ecosystem of the regions sampled. Chlorophyll analysis follows published documents from the EPA and other sources and is tailored specifically to equipment available in the Louisiana State University (LSU) laboratory. The analysis of the phytoplankton/microzooplankton samples is conducted using an imaging microscope system, the FlowCAM, and associated software (Visual Spreadsheet) to analyze the digital images. The resulting data will provide the amount of chlorophyll in each of the different size classes (chlorophyll analysis) and the abundance, biomass, and taxonomic composition of the phytoplankton and microzooplankton communities (FlowCAM analysis). These data will allow determination of important ecosystem productivity measures, such as grazing and production rates and the dominant taxa and size classes responsible for primary production and respiration. In addition to analyses of these data, nutrient, isotope, and other available data will be analyzed to evaluate the potential for changes in the Gulf of Mexico ecosystem structure and processes.

Mesopelagic Megafauna Sample Processing
The Mesopelagic Megafauna plan is a BP-led plan for analysis of video and still image data collected during two cooperative cruises for data that could be used to estimate the abundances of: (1) macroplanktonic, megaplanktonic, and micronektonic organisms in the water column between 150 m and the seafloor; and (2) benthic/demersal megafauna at the sea floor. NOAA will provide the expertise of four PIs to provide review and quality assurance of the data produced from this work.

Connection of Activities to NRDA Process

The plankton and the fish and invertebrate sample processing activities cover the continued processing of samples and data collected under cooperative field programs. Due to the volume of samples and data collected during 2010-2011, not everything has been processed. As such, this activity accounts for the samples and data that will not have been processed by the end of 2012. The data produced from this activity will expand the NRDA-collected dataset and allow for further injury quantification-related analyses as discussed in the Transport, Fate, and Effects Modeling activity above.

The image analysis activity covers the continuation and completion of the processing of digital data collected under cooperative field programs. Due to the volume of data collected during 2010-2011, not everything has been processed. As such, this activity accounts for additional time needed to complete the processing, document the work, and compile a final technical data report.

This information will expand the dataset of NRDA-collected data and allow for further injury quantification-related analyses. Oil droplet and suspended particulate information will inform oil fate modeling, and the plankton data will contribute to the analysis of plankton distributions.

The objective of the chlorophyll and phytoplankton/microzooplankton sample processing activity is to evaluate evidence of changes in the Gulf of Mexico ecosystem as a result of the spill. These analyses will also evaluate the lower trophic levels and food web and help determine a potential oil pathway via the microbial web.

The objective of the Mesopelagic Megafauna processing is to provide minimum densities for megafauna to be used in analyses.

The complete processing of field data collected 2010-2011 will support analyses in progress by the Water Column and several other TWGs. Water column biota are the prey base for marine mammals, sea turtles, and birds, and so these analyses support the assessment of injuries via the prey base for high trophic-level vertebrates.

Sample/Data Handling

Sample and data handling for the plankton and the fish and invertebrate sample processing activity will continue to utilize the existing protocols currently in place. The plankton and nekton plans will require continued logistical support as samples are processed in labs around the country. Samples and data collected through cooperative work plans were collected through methods defined in joint signed protocols. These data are being analyzed and organized and QA/QC administered by NOAA under strictly defined joint protocols. Imaging data is being processed by the individual PIs. These data are being analyzed and organized and QA/QC administered by NOAA under strictly defined joint protocols. Upon completion of tasks listed in the work plans, the PIs pass on the processed datasets to NOAA. These data are maintained by NOAA and will be distributed through NRDA and cooperative databases.

All samples will be handled according to standard NRDA procedures and protocol, including strict adherence to chain of custody. Data handling will also require the previously developed NRDA systems. It is not envisioned that additional protocols will need to be developed for these activities. All data handling systems developed in 2010-2011 should be able to incorporate this additional information.

Data/Deliverables Produced

Data produced by the plankton processing activity include taxonomic identifications, biomass measurements, counts, and length/width measurements of each component of the samples.

Data produced from the fish and invertebrate sample processing activity include specimens identified to family- and species-level. For both the plankton and the fish and invertebrate sample processing the following data reports will be provided: (i) quarterly progress reports, (ii) electronic data reports (prepared upon completion of family-level identification for all samples from a cruise and upon completion of full taxonomic identifications for all samples from a cruise), and (iii) a final, comprehensive data report with summaries of data generated as part of this plan. At the species level, data products include taxonomic identifications, biomass measurements, counts, and length/width measurements of the nekton samples. At the family level, data products include taxonomic identifications and counts of the nekton samples. The purpose of the first amendment to the nekton sample processing plan is to bring on additional laboratory capacity compared to that outlined in the original plan. This information is delivered to all parties with the field sample information (see descriptions above and the full work plans for further detail on the data that will be produced).

Data produced from the image analysis activity include the extracted sub-images, classification, and measurements of the objects imaged, computed abundance and size distributions, and locational information (latitude, longitude, depth) of the imaged objects. See descriptions above and the full work plans for further detail on the data that will be produced. Summary reports and interpretation of distribution patterns related to geographic area, depth, and proximity to the oil impact areas will also be generated in 2013.

Data proposed by the chlorophyll and phytoplankton/microzooplankton sample processing activity include digitized images of phytoplankton/microzooplankton samples, results of chlorophyll analyses, and quantification from FlowCAM analysis. The datasets provide the amount of chlorophyll in different size classes and the abundance, biomass and taxonomic composition of the phytoplankton and microzooplankton communities. Methodology, data, and analyses will be documented.

The BP-led Mesopelagic Megafauna plan will include identification, counts, and sizes (where possible) of organisms observed during ROV surveys. The Trustees are providing expert review and quality assurance of the BP-led work.

Level of Effort

Our request for the evaluation of historical biological data and analysis of field data from 2010-2011 activity is $16,526,000 in contract funds. These costs include 0.6 agency FTEs and 7.2 contract equivalents. Key personnel include PIs and their staff, as well as agency scientists. The study also requires $46,000 in direct costs associated with laboratory analyses and shipping of samples.

For the plankton processing activity, there are over 7,000 samples that are slated for processing under the plankton processing plan. By the end of 2012, roughly 1,500 samples will have been processed leaving 6,000 samples to be processed in 2013. Each sample requires analysis at three taxonomic levels before it is completed processed; the taxonomic analysis for each sample is completed for zooplankton, ichthyoplankton, and decapods. To ensure quality across all participants, five percent of samples are completely reprocessed and resulting information compared. It is estimated that 2,000 samples per year can be processed with the current level of effort working on the project. The current level of effort includes three lab cohorts which employ personnel to cover the three taxonomic analysis groups (zooplankton, ichthyoplankton, and decapods). In order to complete the plankton processing plan, an effort three times the current capacity is needed to fully process the samples during the 2013 claim period.

For the fish and invertebrate sample processing activity, three agency scientists will oversee all of the contractors working on the various aspects of this activity. Since NOAA is leading the offshore portion of the assessment, additional agency scientists will be focusing on co-Trustee coordination throughout 2013 and creating and reviewing relevant deliverables. The types of contractors assisting NOAA are all experienced with NRDA and are ecological modelers, statisticians, oceanographers, biologists, and toxicologists.

The samples under the nekton processing plan were collected on eight cruises: four cruises for deepwater fish and nekton (average number of samples: 64), three cruises for micronekton throughout the water column (average number of sample (450), and one cruise for small pelagic species at the surface (sample estimate: 50). It takes roughly four months for the lab to process all the samples from one of the micronekton cruises and one of the three will be completed in 2012. The other two micronekton cruise, and more refined taxonomic identifications for the deepwater fish and nekton will be completed in 2013 by the same lab. An additional lab will be brought on to process the small pelagic samples, beginning in 2012 and continuing through the first half of 2013. At the end of 2013 all the samples will be processed.

For the image analysis activity, the level of effort needed to complete this activity will require the first quarter of 2013 for the Holocam/DAVPR/VPRII analyses and the SIPPER analyses. The ISIIS study will

require the effort of a single laboratory described in the plan for the entire 2013 period to complete the processing. This effort includes image analysis, taxonomic identifications, data management, and computer systems development due to the large volume of images collected.

One agency scientist will oversee all of the contractors working on the various aspects of this activity. Another scientist is focused on the statistical analysis of biological information obtained from all of the offshore sampling cruises conducted in 2010 and 2011, and in particular the trends of field-collected information compared to baseline. Since NOAA is leading the offshore portion of the assessment, additional agency scientists will be focusing on co-Trustee coordination throughout 2013 and creating and reviewing relevant deliverables. The types of contractors assisting NOAA are all experienced with NRDA and are ecological modelers, statisticians, oceanographers, biologists, and toxicologists.

For the chlorophyll and phytoplankton/microzooplankton sample processing activity, one agency scientist will oversee all of the contractors working on the various aspects of this activity. Another scientist is focused on the statistical analysis of biological information obtained from all of the offshore sampling cruises conducted in 2010 and 2011, and in particular the trends of field-collected information compared to baseline. Since NOAA is leading the offshore portion of the assessment, additional agency scientists will be focusing on co-Trustee coordination throughout 2013 and creating and reviewing relevant deliverables. The types of contractors assisting NOAA are all experienced with NRDA and are biological oceanographers and support staff.

For the mesopelagic megafauna activity, one agency scientist will oversee all of the contractors working on the various aspects of this activity. Four academic PIs under contract will provide approximately 40 hours each to QA samples processed by BP's contractor.

An additional cost of $300,000 is included in the budget for completing the processing of samples collected 2010-2011 for shipment of samples between labs during the 2013 claim period. Certain samples undergo different stages of processing at multiple labs requiring that an individual sample be shipped multiple times. Due to the number of samples collected and remaining to be analyzed, the shipping costs are large.

PIs, Other Investigators and NOAA Investigators

The Principal Investigators for the plankton processing plan include Malinda Sutor (LSU), Joanne Lyczkowski-Shultz (NOAA), Trika Girard (NOAA), James Ditty (NOAA), Richard Heard (University of Southern Mississippi, USM), Sara LaCroy (USM), Robert Cowen (University of Miami), Maria Criales (University of Miami), and Carly Knight (NOAA). The PIs for the nekton processing plan include Tracey Sutton (Virginia Institute of Marine Science, VIMS), Jon Moore (Florida Atlantic University, FAU), Tamara Frank (Nova Southeastern University, NSU), Martha Nizinski (NOAA), Michael Vecchione (NOAA), Heather Judkins (USF), Bruce Collette (NOAA), David Wells (TAMU), and Marsh Youngbluth (HBOI).

The PIs for the fish and invertebrate sample processing activity are Tracey Sutton (VIMS), Tamara Frank (NSU), and David Wells (TAMU). The PIs for the image analysis activity are Cabell Davis (Woods Hole Oceanographic Institute, WHOI) who is responsible for the Holocam, DAVPR, and VPRII data; Andrew

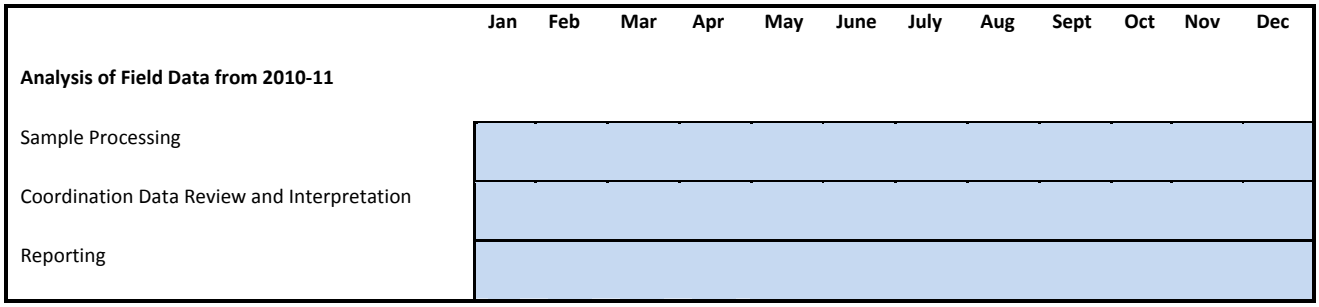
Remsen (contractor), who is responsible for the SIPPER data; and Robert Cowen (University of Miami) who is responsible for the ISIIS data.

The Principal Investigator for the chlorophyll and phytoplankton/microzooplankton sample processing activity is Malinda Sutor (LSU).

The PIs for the Mesopelagic Megafauna QA/QC activity include Marsh Youngbluth (HBOI), Michael Vecchione (NOAA), Jon Moore (Florida Atlantic University, FAU), Tamara Frank (Nova Southeastern University, NSU), Martha Nizinski (NOAA).

Timetable

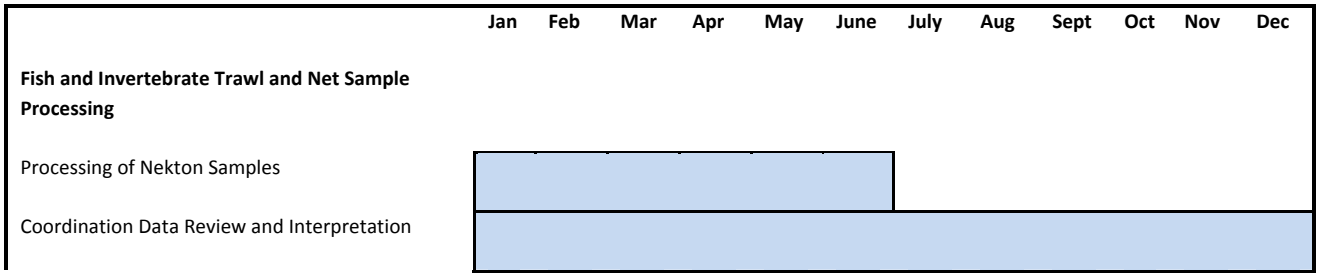
Timetable for Analysis of Plankton Samples Collected 2010-11 Subtasks in 2013



The work in 2013 will continue and follow-up on work underway in 2012. The plankton processing plan will continue for the entirety of 2013.

Task	Approximate Percentage of Total Contract Cost	% Complete (start of Claim period)	% Complete (end of Claim period)	Approximate Timing of Task (2013)
Sample processing of 2010-2011 field data	40	20	95	Jan-Dec
Coordination co-Trustee data review and interpretation	10	20	90	Jan – Dec
Reporting	50	20	95	Jan – Dec

Timetable for Fish and Invertebrate Trawl and Net Sample Processing Subtasks in 2013



Reporting	

The work in 2013 will be a continuation of work underway in 2012. The nekton processing plan will also continue throughout 2013. The small pelagic sample processing, under the nekton processing plan, will continue through the first half of 2013. By the end of 2013 some additional data review, interpretation, and reporting may still be required.

Task	Approximate Percentage of Total Contract Cost	% Complete (start of Claim period)	% Complete (end of Claim period)	Approximate Timing of Task (2013)
Processing of nekton samples	40	50	100	Jan-Dec
Coordination co-Trustee data review and interpretation	10	10	90	Jan – Dec
Reporting	50	10	95	Jan – Dec

Timetable for Image Analysis Processing Subtasks in 2013

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Image Analysis Processing												
Analysis of Imagery Data												
Coordination Data Review and Interpretation												
Reporting												

Processing and analysis of the imagery has been delayed by contracting issues. The ISIIS study will continue throughout 2013. It is expected that most of the sample and image processing can be completed by the end of 2013. The work on SIPPER and DAVPR/VPRII image analysis will follow-up on work underway in 2012 and continue into the first quarter of 2013.

Task	Approximate Percentage of Total Contract Cost	% Complete (start of Claim period)	% Complete (end of Claim period)	Approximate Timing of Task (2013)
Analysis of imagery data	40	40	100	Jan-Jun

Coordination co-Trustee data review and interpretation	10	10	90	Jan – Dec
Reporting	50	20	95	Jan – Dec

Timetable for Production and Energy Flow Analyses Subtasks in 2013

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Evaluation of Ecosystem Effects												
Analysis of Ecosystem Effects												
Coordination Data Review and Interpretation												
Reporting												

The work in 2013 will continue and follow-up on work begun in 2012. The majority of this effort will occur in 2013.

Task	Approximate Percentage of Total Contract Cost	% Complete (start of Claim period)	% Complete (end of Claim period)	Approximate Timing of Task (2013)
Analysis of ecosystem effects	0.1	5	95	Jan – Dec
Coordination co-Trustee data review and interpretation	10	5	90	Jan – Dec
Reporting	50	5	95	Jan – Dec

Due to the complex nature of ongoing cooperative assessment activities, potential for settlement, and need to prepare for litigation, formal and informal reporting will occur throughout 2013.

RP Involvement

The plankton processing plan and the nekton processing plan are cooperative work plans with the RP. The field data collections and the processing of the imaging data are cooperative studies with BP. BP signed all the cruise plans involved and has signed the first of the three data processing plans.

The field data collections and the processing of the samples and data are cooperative studies with BP. BP signed all the cruise plans involved. The small pelagic cruise plan also included the processing of the LIDAR data collected as part of the cooperative study. BP has also signed the nekton sample processing plan. The addendum to the nekton plan has been developed but is currently in Trustee review before being submitted to BP.

The chlorophyll and phytoplankton/microzooplankton samples were collected cooperatively with the RP and the processing plans are in development cooperatively with the RP.

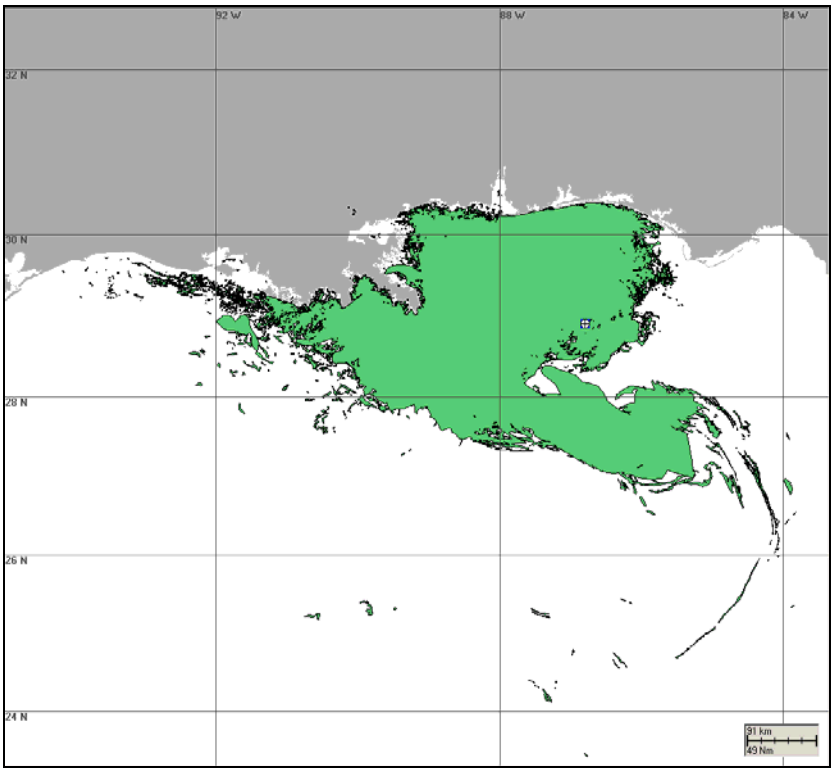
The mesopelagic megafauna activity is a BP-led activity.

Documentation of Oil Pathway, Water Column Organisms Exposed and Injured

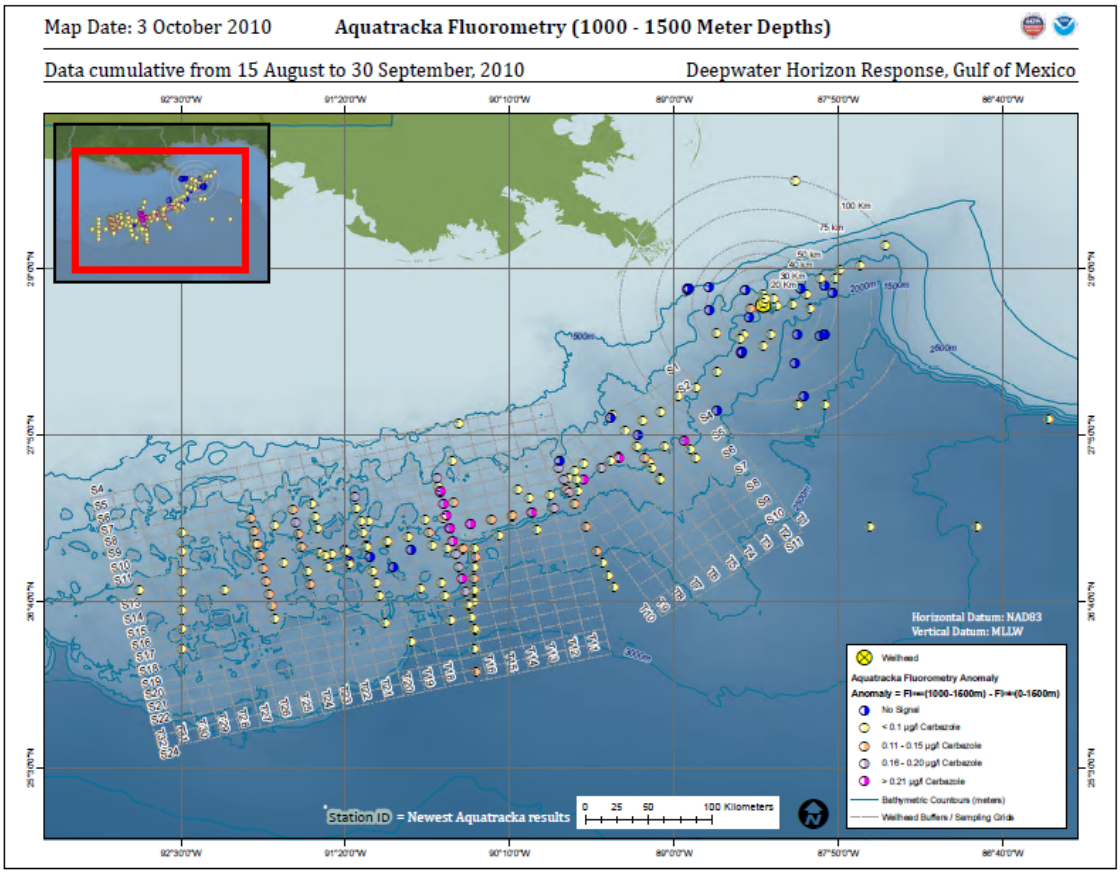
Oil pathway and water column organisms exposed and injured will be documented using empirical observations, spatio-temporal distributions, abundances, trends, and any changes in the living marine resources of the water column. Pathway and exposure will be assessed by evaluating water chemistry observations, instrument records (e.g., fluorometry, dissolved oxygen, transmissometer, and acoustics), and imaging data (e.g., from SIPPER, Holocam, and video data analysis). Pathway and exposure will also be assessed based on the observations of oil at the surface, which include visual observations from overflights and related documentation, observations from photography (as documented in ERMA from Response activities and monitoring) and remote sensing observations. Additional sources of information for this evaluation arise in observations of oil at the shoreline analyzed by the Shoreline Technical Working Group, and sediment samples and chemistry taken during the spill analyzed by the Deepwater Communities and Chemistry Technical Working Groups.

Fish and invertebrates in the water column are exposed to contaminants by swimming through contaminated water, spending time on/in contaminated sediments, taking up contaminants through body surfaces, passing contaminated water over respiratory structures, and ingesting water, oil droplets, contaminated biota, and particulates contaminated with oil as part of feeding. Additionally, sensitive life stages of pelagic fish and invertebrates come in direct contact with floating oil that covers and is mixed into the neuston layer where many embryos and larvae develop. Other neustonic organisms exposed to surface oil include many small invertebrates important to the food web. In the water column, organisms are also exposed to suspended oil droplets, which can foul appendages or other body surfaces. Water column organisms have also been exposed to dispersants dissolved in water, on oil droplets and adsorbed to suspended particulate matter. Water column organisms were also exposed to dissolved and water-borne chemical additives, such as methanol and anti-foaming agents.

Invertebrates and fish in the north-eastern Gulf of Mexico, which include early life history stages of fish and invertebrates, as well as smaller invertebrate holoplankton, gelatinous zooplankton and fish of various size classes, are among those biota exposed to the released oil and spill-related chemicals. Organisms throughout the water column of deep offshore slope areas were potentially exposed, including the deeper depth strata where sub-surface oil has been observed (i.e. 1000-1300m). The figure below shows the approximate extent of oil observed on the water surface, which indicates areas of surface waters potentially affected. A second figure shows a cumulative summary of fluorescence measurements between 1000 and 1500m, indicating a possible southwestward transport of the oil and some locations where plankton may have been exposed in deepwater (laboratory analyses to establish whether or not these measurements are linked to MC252 oil have not yet been analyzed).



Cumulative potential surface floating oil extent of the Deepwater Horizon oil spill. (Figure derived from compositing April, May, June, and July 2010 radar shape files available on the NOAA ERMA website. Note that radar images with noted anomalies were not included in composite.)



Cumulative summary of Aquatracka fluorescence measurements between 1000 and 1500m, 15 August to 30 September 2010.

Exposure to oil is being evaluated from an inventory of observations, photos, and videos of animals in surface oil (e.g., Portuguese man-of-war and flying fish swimming or "flying" though oil), as well as through an assessment of the co-occurrence of biota in the oil pathway. Exposures were further documented during cooperative cruises and subsequent sample processing (i.e., plankton, image processing, fish and invertebrate samples). These data will be described with appropriate statistical and mathematical techniques to establish exposure.

Active acoustics were deployed on many cruises during both Response and NRDA activities. These data contain valuable insight into the distribution, abundance, and size distribution of marine organisms that can backscatter sound. These data may also be used to evaluate the vertical distribution of backscatters (organisms), and how these distributions change in time and space. Often, these acoustic data were collected concomitantly with net samples and/or aerial observations in an effort to identify the organisms contributing to the backscatter. These data will be processed using standard hydroacoustic techniques (i.e., Echoview and MATLAB software), and interpreted to yield information on the distribution of biomass in the northern Gulf of Mexico region through time. Comparisons between historical, Incident, and post-spill conditions will be made.

During NRDA sampling cruises, as well as cruises by other scientists, researchers observed potential instances of water column injury, including oiled jellyfish, dead fish, and dead pyrosomes at the water

surface. In addition, some cruises observed excessive mucus production in the ocean (e.g., the NRDA Jack Fritz 1,2 &3 sampling cruises and Weatherbird cruises employing the towed imaging system SIPPER), which may be related to water column injury. To further document injury from the spill, observations of dead animals floating on the surface during the spill are being compiled and evaluated. This activity is being conducted as a follow-on to the Fish Kill Technical Report compiled by the Nearshore Fish Technical Working Group in December 2010 as partial fulfillment of the NRDA Fish Kill work plan (Powers and Blanchet, 2010). The objectives of this plan were to (1) acquire, compile, and organize fish kill data from Louisiana, Mississippi, Alabama and Florida (the northern Gulf of Mexico (NGOM)) from April 2000 to present, and (2) be prepared to conduct NRDA-coordinated field investigations of fish kill events in coastal waters. In general, there was an increase in total number of fish kill events in Louisiana waters during the summer months of 2010 as compared to previous years. While a number of factors could be responsible for this, such as increased public reporting, flow regulation in rivers, high summer water temperatures, and poor circulation of coastal salt marsh areas, this is being investigated further. In addition to the information summarized in this Fish Kill Technical Report, the reports of other dead animals floating during the spill will be compared to baseline observations of such events.

Connection of Activities to NRDA Process

The objective of this activity is to synthesize and thoroughly evaluate empirical evidence to establish the pathway, exposure and injury resulting from the Deepwater Horizon Incident, as well as to support and validate the oil transport, fate and effects modeling results. This work will have linkages to other Technical Working Groups including those focused on marine mammals, turtles, and fish.

Sample/Data Handling

Various data sources are being analyzed for this activity, including direct observations, field measurements, and remotely sensed data. Some of these data, specifically the remotely sensed data, are originally maintained and distributed by NOAA. All original data have been pre-processed and QC administered by NOAA in coordination with the originating entity. Data and information retrieved from published literature are recorded in a database which undergoes NOAA QA/QC protocols. Samples and data collected through cooperative work plans as part of the NRDA were collected through methods defined in joint signed protocols. These data are being analyzed and organized and QA/QC administered by NOAA under strictly defined joint protocols. These data are maintained by NOAA and will be distributed through NRDA and cooperative databases.

Data/Deliverables Produced

This activity will produce an interpretive report documenting and synthesizing empirical evidence to establish the pathway, exposure, and injury resulting from the Incident for resources under the Water Column Technical Working Group area of responsibility.

Level of Effort

Our request for the documentation of oil pathway, water column organisms exposed and injured activity is $1,592,250 in contract funds. These costs include 5.2 contract equivalents. Key personnel include the PIs and their staff.

One agency scientist will oversee all of the contractors working on the various aspects of this activity. Another scientist is focused on the statistical analysis of biological information obtained from all of the offshore sampling cruises conducted in 2010 and 2011, and in particular the trends of field-collected information compared to baseline. Since NOAA is leading the offshore portion of the assessment, additional agency scientists will be focusing on co-Trustee coordination throughout 2013 and creating and reviewing draft and final data and interpretive reports. One agency scientist will oversee all of the contractors working on the various aspects of this activity. The types of contractors assisting NOAA are all experienced with NRDA and are ecological modelers, statisticians, oceanographers, biologists, and toxicologists.

About 50% of the cost of this activity is for processing and evaluation of acoustics data collected in 2010 and 2011. Costs for processing acoustic data are relatively high owing largely to 1) the volume of data collected (40,000 hours of acoustic data was collected during 4 cruises), 2) the need for specialized software (i.e., Echoview), and 3) the computational infrastructure needed for processing. The remaining budget is for additional processing, statistical analysis, and synthesis of pre-spill and post-spill data. This effort will likely require coordination between investigators and occasional meetings of small working groups.

PIs (including NOAA)

The Principal Investigators for this activity are Kevin Boswell (Florida International University, FIU) and John Quinlan (NOAA). Additional key personnel include Daniel Hahn (NOAA), Jennifer Kunzelman (NOAA), Deborah French McCay (RPS-ASA), Yong Kim (RPS-ASA), and lead PI's from other activities.

Timetable

Timetable for Documentation of Oil Pathway, Water Column Organisms Exposed and Injured Tasks in 2013

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Documentation of Oil Pathway, Water Column Organisms Exposed and Injured												
Analysis of Oil Pathway, Water Column Organisms												
Coordination Data Review and Interpretation												
Reporting												

The 2013 work will continue and follow-up on work begun in 2012. The majority of this effort will occur in 2013. Due to the complex nature of ongoing cooperative assessment activities, formal and informal reporting will occur throughout 2013.

Task	Approximate Percentage of Total Contract Cost	% Complete (start of Claim period)	% Complete (end of Claim period)	Approximate Timing of Task (2013)
Analysis of oil pathway, water column organisms exposed and injury	40	20	95	Jan-Dec
Coordination co-Trustee data review and interpretation	10	20	90	Jan – Dec
Reporting	50	20	95	Jan – Dec

RP Involvement

BP was engaged in the collection of acoustic data in cooperatively signed work plans. NOAA contractors will take the lead on processing the data and BP may be involved. Other components of this activity are not cooperative.

Data Management for Fish and Plankton Activities

This effort integrates oil, water, and tissue chemistry and other lab sample data collected by prior Response, NRDA, and other activities. In addition, visual observation, instrumentation, and photographs were collected to further support the assessment. Data management activities required to manage, analyze, and map these data are described here. IEc's Data Management Team and associated subcontractors, as well as agency data management staff, are primarily responsible for the activities described here.

Samples and associated data acquired through cooperative work plans were collected through methods defined in joint signed protocols. Samples and associated data acquired through non-cooperative work plans were collected through methods defined in the Trustee-approved protocols. These samples are being analyzed and data organized and QA/QC administered by NOAA under strictly defined joint protocols. These data are maintained by NOAA and will be distributed to Trustee representatives through NRDA and cooperative databases. Associated activities to manage the data include:

- Maintenance of the original field data as well as associated analytical results in secure data repositories (e.g., noaanrda.og, ERMA), including associated server, data transfer and storage space costs.

- Maintenance of and training in data retrieval/sharing websites to ensure Trustee-wide access to data while maintaining associated metadata (e.g., data history / change logs)
- Storage, tracking and distribution of physical samples
- Training for sample confirmation and results delivery to obtain all necessary documentation (e.g., lab/analytical standard operating procedures)
- Physical Delivery of lab data to Trustee and RP representatives per data sharing agreement
- Storage and tracking of external hard drives collected during field sampling to manage large files
- Regular participation in TWG calls to provide consultation on all above matters

To facilitate the validation of visual observation data, data management activities include participating in 1) TWG-wide coordination activities (e.g., promote standard validation approaches) as well as 2) the incorporation of changes (e.g., transcription verification and data validation changes) into the NOAA data repositories to promote Trustee-wide analysis of a consistent data product.

In addition to the effort associated with physically analyzing samples collected previously, associated management of the process includes coordinating analytical activities; data tracking activities to provide status reports on analytical progress and data availability; third-party validation of lab results to ensure data is in proper format and meets quality standards; secondary QA/QC of field data prior to merging with lab results; incorporation into repositories as final, validated products; forensic chemistry to identify source of contamination; and, spatial processing and loading into ERMA.

As raw field data are validated and finalized, data support activities will also extend to the sharing of these results with the public. Data support activities will include the packaging, organization, and release of each data product along with associated metadata. Associated data storage and transfer costs as well as response to public inquiries are incorporated. Furthermore, the files associated with interim and final products generated through the processing and analysis of field and other collected data will be managed and shared in the NOAA data repositories to promote Trustee-wide data access.

Level of Effort

Our request for the data management for fish and plankton activities work is $2,094,820 in contract funds. These costs include 0.6 agency FTEs and 7.4 contract equivalents. Key personnel include IEc and agency data management teams.

E. Sargassum Communities

Sargassum Communities

The sargassum community assessment investigation is focused on the scientific process of mapping sargassum communities and characterizing the organisms associated with sargassum in order to quantify injuries to this resource. Trustees will analyze field data collected in 2011 and remote sensing data from 2000-2011 to characterize sargassum communities, determine the spatial and temporal extent of

sargassum, and quantify injury from exposure to MC252 oil. This work is needed because thousands of acres of sargassum were more than likely oiled based on all available surface oiling observations, field observations from various NRDA investigations, and baseline maps of sargassum distribution.

Field observations from 15 total flights in 2011 can be used to create more accurate maps of sargassum distribution in the Gulf of Mexico. Nine were conducted solely for mapping with academic contractors and six were associated with oceanic sea turtle investigations (field costs for the 15 flights are not included in this claim). Trustees will evaluate the MC252 surface oil slick with respect to sargassum, generating an exposure and injury zone for this important open ocean habitat.

The Trustees collected about 140 samples of fish, postlarval/juvenile decapods, ichthyoplankton, and encrusting communities from seven sargassum cruises. Twenty-five locations were sampled with neuston and bongo nets. Neuston net samples will be analyzed for type, abundance and size frequency of fishes and postlarval/juvenile decapods. Bongo net samples will be analyzed for type, abundance and size frequency of ichthyoplankton. In addition, sargassum collected in neuston nets will be analyzed for encrusting invertebrates (e.g., hydroids, bryozoans, tunicates). ROV video surveys will be analyzed to characterize fish communities, including species composition, abundance, and length frequency of fish associated with sargassum.

Several tasks described in NOAA's 2012 NPFC Phase 1 funding request will continue into 2013. This primarily includes lab analyses and mapping activities. New work proposed for 2013 includes data validation, synthesis, and interpretation. Funding for 2013 also includes TWG coordination and data management.

Specific tasks under this activity include:

- Completion of 2011 cruise samples analysis
- Summarization of lab results
- Mapping of sargassum distribution
- Validation of data
- Injury assessment development
- Data management
- TWG coordination

Connection to NRDA Process

This activity is an injury quantification task and integrates information on pathway, exposure, and effects across nearshore and shoreline resources.

Sample/Data Handling

This effort integrates chemistry data, lab sample data, and field data collected by prior NRDA activities. Data management activities required to manage, statistically analyze, and map these data are described here.

Samples and associated data acquired through cooperative work plans were collected through methods defined in joint signed protocols; samples and associated data acquired through non-cooperative work plans were collected through methods defined in the Trustee-approved protocols. These samples are analyzed and data organized and QA/QC administered by NOAA under strictly defined joint protocols. These data are maintained by NOAA and are distributed to Trustee representatives through NRDA and cooperative databases. Associated activities to manage the data include:

- Maintenance of the original field data as well as associated analytical results in secure data repositories (e.g., NOAANRDA.ORG, ERMA), including associated server, data transfer and storage space costs
- Maintenance of and training in data retrieval/sharing websites to ensure Trustee-wide access to data while maintaining associated metadata (e.g., data history / change logs)
- Storage of physical data
- Training for sample confirmation and results delivery to obtain all necessary documentation (e.g., lab/analytical standard operating procedures)
- Physical delivery of lab data to Trustee and RP representatives per data sharing agreement
- Storage and tracking of external hard drives collected during field sampling to manage large files
- Regular participation in TWG calls to provide consultation on the above matters

Once raw field data are validated and finalized, data support activities extend to the sharing of these results with the public. Data support activities will include the packaging, organization, and release of each data product along with associated metadata. Associated data storage and transfer costs as well as response to public inquiries are incorporated. Furthermore, the files associated with interim and final products generated through the processing and analysis of field and other collected data will be managed and shared in the NOAA data repositories to promote Trustee-wide data access.

Data/Deliverables Produced

Sargassum Community Data:

- Data report summarizing ROV video, bongo net, and neuston net data from the 2011 sargassum cruises. The report will be updated as needed in 2013.
- Data report summarizing overflight data associated with the 2011 sargassum cruises. A draft report should be complete by February 2013.

Sargassum Mapping:

- Sargassum maps in the areas affected by the spill, starting with 2010 and expanding over time. Maps will be made available throughout 2013 as they are developed.

Interpretation and Synthesis:

- Preliminary sargassum injury assessment incorporating data from sargassum studies, literature, and toxicity studies.

Level of Effort

Our request for the sargassum communities' activity is $1,893,405 in contract funds. These costs include 0.5 agency FTEs and 7.5 contract equivalents. Key personnel include PIs and their staff, agency scientists, and IEc data management team. The study also requires $476,000 in direct costs associated with laboratory analysis and data analysis and interpretation at USF and DISL/GCRL.

PIs (NOAA and other)

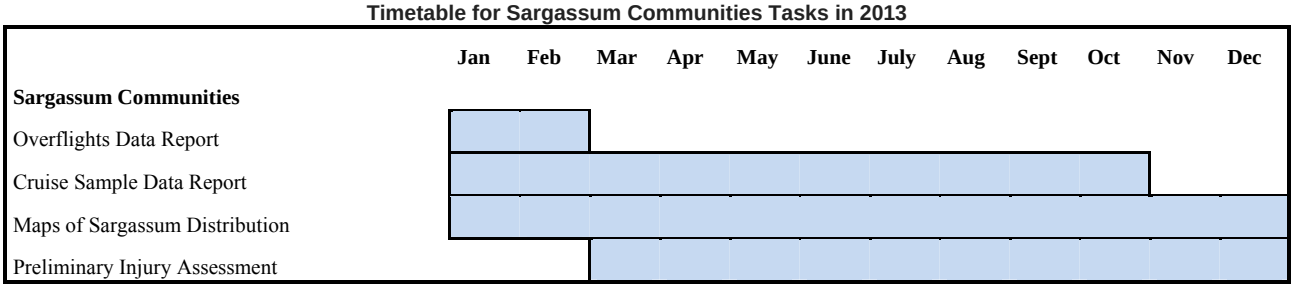
Sean Powers, DISL

Frank Hernandez, GCRL

Jim Franks, GCRL

Timetable

Timetable for Sargassum Communities Tasks in 2013



The greatest level of effort under this activity during the first quarter of 2013 will be focused on the development of the overflights data report and the cruise sample data report. The former task is expected to be finished by February 2013 and the latter by October of 2013. The production of maps and the analysis of remote sensing data will progress through 2013 and into 2014 (not shown on timetable above). Finally, preliminary interpretation and injury quantification will begin toward the end of the first quarter of 2013 and is expected to continue through the end of the year.

RP Involvement

The RP was involved in the sargassum field efforts and collection of most of the underlying data. The Trustees continue to engage the RP as analyses are completed and the data are validated. Interpretation will be conducted independent of BP.

F. Sea Turtles

Sea Turtle Exposure and Injury Assessment Report

This activity will integrate and summarize data and findings from ongoing efforts to document exposure and injury to oceanic, neritic, and nesting sea turtles from the Deepwater Horizon Oil Spill. Funding was previously requested from NOAA in 2012 under NPFC Phase 1 for the following sea turtle related

activities: (1) oceanic sea turtle investigations associated with Sargassum, (2) analysis of dead, live captured, and stranded sea turtles, (3) abundance and distribution of neritic sea turtles, and (4) sea turtle prey availability. The analysis of the data from these activities is underway, and data reports are expected by the end of 2012. No further funding is being requested for the efforts funded in 2012. Data and analyses generated as part of these efforts as well as other ongoing activities to document exposure and injury to oceanic, neritic, and nesting turtles, including DOI's efforts on nesting turtles and the turtle surrogate toxicity study , will need to be synthesized into an overall sea turtle exposure and injury assessment report. This interpretive report will represent the culmination of the injury determination and will discuss exposure and subsequent quantification of injuries to sea turtles resulting from the Deepwater Horizon Incident. This activity will include involvement of sea turtle experts and peer review to help interpret findings and develop conclusions. The tasks included under this activity, including the development of an overall injury assessment report, are described below:

Oceanic Sea Turtle Exposure and Injury Assessment
Ongoing efforts in 2012 to document exposure and injury to oceanic sea turtles are focused on the following activities: estimates of oceanic turtle abundance, estimates of oceanic turtle habitat (Sargassum), oil ingestion exposure, estimates of biological impacts for oceanic turtles from veterinary and toxicological expert panels, and postmortem turtle sample analysis. Information from these activities, as well as necropsy findings, inhalation exposure estimates being characterized for marine mammals, surface oil mapping products, and mapping products on impacts from response actions on water, will also be incorporated into this effort. These efforts will be completed in 2012 (in part using NPFC Phase 1 funds); hence, no further funding is being requested for these activities. For 2013, NOAA requests funds to integrate data and analyses generated by the efforts completed in 2012 and develop an interpretive report describing exposure and injury to oceanic sea turtles. Activities to be completed include review of available literature on oceanic sea turtle exposure and injury, as well as preparation of an interpretative report based on information available in the literature and data collected as part of the efforts noted, including estimates of oceanic turtle abundance and habitat oiled, oil ingestion, dietary information, biological impacts and postmortem turtle sample analyses combined with conclusions from necropsies.

Exposure assessment efforts will include estimates of oceanic sea turtle abundance based on directed capture data. Estimates of oceanic turtle habitat (Sargassum) may be used in conjunction with the estimates of oceanic turtle abundance in the determination of the number of oceanic turtles that were exposed to oil. The oil ingestion exposure will be estimated and may be combined with an estimate of inhalation exposure base on an evaluation of the applicability of marine mammal inhalation exposure work to sea turtles. Necropsy findings will include summaries of the extent of oiling. Surface oil and response actions maps will display where the surface oil was and where response activities took place.

Injury assessment efforts will summarize work completed by expert veterinary and toxicology panels to estimate biological impact by degree of oiling. Postmortem sea turtle data, including PAH and DOSS concentrations detected in samples of various tissues (liver, enteric contents, bile, esophagus and muscle) will be incorporated, as well as an assessment of impacts from response actions on water. The injury assessment will also consider the results of the proposed sea turtle surrogate study. Injury assessment efforts will also consider data generated on oceanic sea turtles recovered through the sea turtle stranding response network and findings from necropsies completed or that may be completed in 2013 as part of Activity: Turtles – Sample Storage.

Neritic Sea Turtle Exposure and Injury Assessment
Ongoing efforts in 2012 to document exposure and injury to neritic sea turtles are focused on the following activities: estimates of neritic turtle abundance, turtle tag dive analysis, and prey collection and analysis (joint effort with the Marine Mammal TWG). Necropsy findings and surface oil mapping products will also be incorporated into this effort. These efforts will be completed in 2012; hence no further funding is being requested for these activities (with the exception of additional funds requested in the marine mammal aerial survey activity to estimate neritic turtle abundance in 2013). For 2013, NOAA requests funds to integrate data and analyses generated by the efforts completed in 2012 and develop an interpretive report describing exposure and injury to neritic sea turtles. Activities to be completed include review of available literature on neritic sea turtle exposure and injury, preparation of an interpretative report based on information available in the literature and data collected as part of the efforts noted above, including estimates of neritic turtle abundance and oiling, turtle tag dive data, and prey collection analysis, combined with conclusions from necropsies completed.

Exposure assessment efforts will include estimates abundance for neritic turtles gathered during synoptic aerial surveys and adjustment of the abundance estimate with dive data from turtle satellite tags to account for turtles that may have been diving when observations were made. Data on PAH levels in common turtle prey items collected in 2011 and 2012 will be evaluated and surface oil maps incorporated. Necropsy findings will include summaries of the extent of oiling.

Injury assessment efforts will consider data generated on neritic sea turtles recovered through the sea turtle stranding response network and findings from necropsies completed or that may be completed in 2013 as part of Activity: Turtles – Sample Storage.

Integration of Oceanic and Neritic Sea Turtle Exposure and Injury Assessment with Nesting Sea Turtle Exposure and Injury Assessment
For 2013, NOAA requests funds to integrate our findings of the oceanic and neritic sea turtle exposure and injury assessment reports to be completed as parts a. and b. of this activity with the ongoing efforts by DOI to document exposure and injury to nesting sea turtles (being conducted by the USFWS). The end product of this effort will be the production of a Trustee sea turtle interpretive report which will integrate and summarize data and findings for all life stages of turtles impacted by the Deepwater Horizon Oil Spill.

Connection to the NRDA Process

This task documents and describes exposures and quantifies injuries to oceanic, neritic and nesting turtles. Determining the spatial extent of exposure and injury will enable the determination of appropriate restoration projects to compensate for injury.

Sample/Data Handling

This effort integrates a variety of oil and tissue chemistry and other lab sample data collected by prior response, NRDA and other activities. In addition, visual observation and photographs were collected to further support the assessment. Data management activities required to manage, statistically analyze and map these data are described here.

Samples and associated data acquired through cooperative work plans were collected through methods defined in joint signed protocols. Samples and associated data acquired through non-cooperative work plans were collected through methods defined in the Trustee-approved protocols. These samples are being analyzed and data organized and QA/QC administered by NOAA under strictly defined joint protocols. These data are maintained by NOAA and will be distributed to Trustee representatives through NRDA and cooperative databases. Associated activities to manage the data include:

- Maintenance of the original field data as well as associated analytical results in secure data repositories (e.g., NOAANRDA.ORG, ERMA), including associated server, data transfer and storage space costs
- Maintenance of and training in data retrieval/sharing websites to ensure Trustee-wide access to data while maintaining associated metadata (e.g., data history / change logs)
- Storage of physical data
- Training for sample confirmation and results delivery to obtain all necessary documentation (e.g., lab/analytical standard operating procedures)
- Physical delivery of lab data to Trustee and RP representatives per data sharing agreement
- Storage and tracking of external hard drives collected during field sampling to manage large files
- Regular participation in TWG calls to provide consultation on all above matters.

As raw field data are validated and finalized, data support activities will also extend to the sharing of these results with the public. Data support activities will include the packaging, organization, and release of each data product along with associated metadata. Associated data storage and transfer costs as well as response to public inquiries are incorporated. Furthermore, the files associated with interim and final products generated through the processing and analysis of field and other collected data will be managed and shared in the NOAA data repositories to promote Trustee-wide data access.

Data/Deliverables Produced

Deliverables for this activity will include draft and final interpretive reports summarizing exposure and injury to sea turtles. The reports will include documentation of purpose and methods, as well as data tables, maps, and figures illustrating and summarizing results, conclusions, and interpretations.

Level of Effort

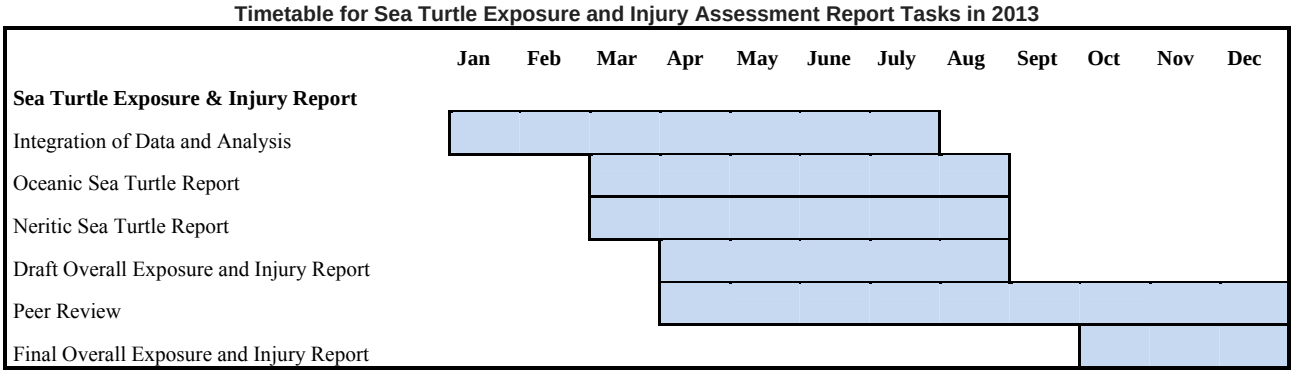
Our request for the sea turtle exposure and injury assessment report activity is $445,500 in contract funds. These costs include 1.1 agency FTEs and 1.4 contract equivalents. Key personnel include study PIs and agency scientists.

Funding is requested to support the PIs in data analysis, interpretation, synthesis, and report writing. Other costs include NOAA staff and contract support to assist in the completion of the oceanic and neritic exposure and injury assessment reports, as well as synthesis with nesting turtle reports being generated by DOI into an overall sea turtle injury and assessment report.

PIs (NOAA and other)

The work described in this activity will be led by Barbara Schroeder of NOAA NMFS, Brian Stacy of NOAA), turtle expert contractors, and peer reviewers (individuals to be determined).

Timetable



The overall timetable for this activity is from January to December 2013. During the first quarter of 2013, the focus of efforts will be the integration of data and analyses, a task scheduled to be completed by the end of July. The effort to quantify injury will be conducted from March through August. This effort will result in the production of an interpretive report that describes exposure and injury to oceanic sea turtles and an interpretive report that describes exposure and injury to neritic sea turtles. The draft Trustee exposure and injury report will be developed from April through the end of August 2013. Peer review of integration, quantification of injury, and the exposure and injury report will occur from April through December 2013. The final draft exposure and injury report will be drafted during the fourth quarter of 2013 and completed before the end of the year.

RP Involvement

No direct involvement of the Responsible Party (RP) is envisioned for this activity. Only two of the studies being relied on for developing the sea turtle exposure and injury assessment report are being conducted cooperatively with the RP – the aerial surveys to quantify neritic turtles and the collection and analysis of prey species for oil contamination.

Sea Turtle Surrogate Study

For 2013, NOAA requests funds to conduct a study to examine the toxicity of ingested oil on juvenile sea turtles. Given the protected nature of sea turtles, two surrogate turtle species are being used in this study: the red-eared slider and the snapping turtle. Turtle hatchlings have been obtained, and will be housed, and reared by the Toxicity TWG in 2012 so that the resulting juveniles in the spring/summer 2013 are of appropriate age and size to mimic juvenile sea turtles. 200 red-eared sliders and 85 snapping turtles will be studied. Funding for the actual completion of the study is submitted as part of Activity: Toxicity to Aquatic Organisms. 2013 Funds requested in this section of the Claim are for NOAA staff and technical

contractors to assist in the planning and development of the study, data management, and review of study results in draft and final data and interpretive reports.

The objective of this study is to examine the potential lethal and sub-lethal effects on multiple biological and ecological traits of turtles that result from exposure to MC252 oil. This project will be initiated (Tier 1) with controlled dose oil gavage exposures so that clear dose-response relationships with the biological endpoints under study can be established. An array of biological effects endpoints, including molecular, cellular, physiological, and behavioral will be assessed following exposure: cytochrome P450 (CYP) induction, genotoxicity (DNA damage) assessment, general clinical blood chemistry parameters, immune response, adrenal dysfunction assays, behavioral/performance test assays (e.g., foraging success and righting response), and bioenergetic/metabolic function assessments, coupled with overall visual, gross, and individual endpoints (i.e., growth and somatic indices). Furthermore, tissues (blood and/or intestinal material) will be analyzed for PAHs. The results of this study may lead to Tier 2 studies that would investigate different routes of exposure (i.e., water-borne) and potentially the additional effect of chemical oil spill dispersant application that may reflect a more realistic field-exposure scenario; however, such Tier 2 activities are not included in the scope of this request. The goal of this work is to determine the effects of oil on juvenile sea turtles that were exposed during the Deepwater Horizon Oil Spill. To date there is very little laboratory-based information regarding the levels of exposure to oil and associated effects of oil in turtles, making it challenging to estimate injury following oil spill events. Furthermore, compared with other species, very few sub-lethal endpoints have been developed in the scientific literature to follow the impacts and/or recovery of turtles following oil exposure.

Connection to the NRDA Process

This activity evaluates and quantifies injuries to juvenile sea turtles from ingestion of oil. The results of the study will be used to interpret the significance of oil exposure estimates based sea turtle oil ingestion.

Sample/Data Handling

This effort is focused on the analysis of sea turtle toxicity data, but the data management activities required to manage these data are described below.

Samples and associated data will be collected through methods defined in protocols (through either cooperative work plans or through Trustee-approved protocols should this study proceed on a non-cooperative basis). These samples will be analyzed and data organized and QA/QC administered by NOAA under strictly defined joint protocols. These data are maintained by NOAA and will be distributed to Trustee representatives through NRDA and cooperative databases. Associated activities to manage the data include:

- Maintenance of and training in data retrieval/sharing websites to ensure Trustee-wide access to data while maintaining associated metadata (e.g., data history / change logs)
- Storage of physical data
- Training for sample confirmation and results delivery to obtain all necessary documentation (e.g., lab/analytical standard operating procedures)

- Physical delivery of lab data to Trustee and RP representatives per data sharing agreement
- Storage and tracking of external hard drives collected during field sampling to manage large files
- Regular participation in TWG calls to provide consultation on the above matters.

As raw data are validated and finalized, data support activities will also extend to the sharing of these results with the public. Data support activities will include the packaging, organization and release of each data product along with associated metadata. Associated data storage and transfer costs as well as response to public inquiries are incorporated. Furthermore, the files associated with interim and final products generated through the processing and analysis of field and other collected data will be managed and shared in the NOAA data repositories to promote Trustee-wide data access.

Data/Deliverables Produced

NOAA and contractors will provide input on any study results documented for the turtle surrogate study under Activity: Toxicity to Aquatic Organisms. NOAA staff and contractors will help prepare and review data and interpretive sea turtle toxicity reports.

Level of Effort

Our request for the sea turtle surrogate study is $29,000 in contract funds. These costs include 0.2 agency FTEs and 0.1 contract equivalents. Key personnel include agency and IEc scientists and the agency data management team.

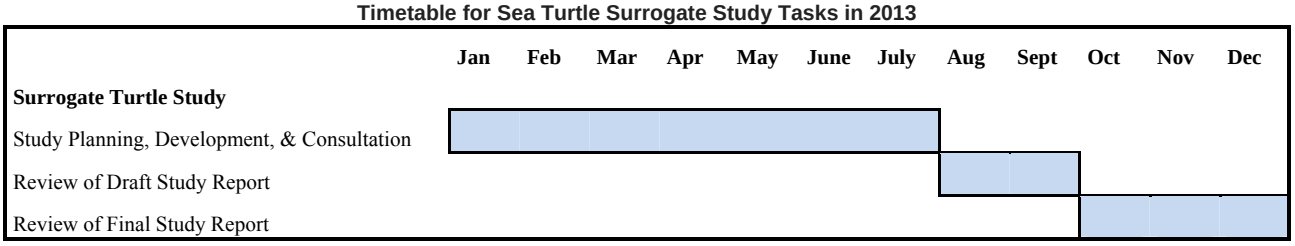
Funding related to this study under this activity is requested for NOAA staff and contract support for study planning and development, data management, and review of any draft and final study results.

PIs (NOAA and other)

The study leads will be Drs. Mitchelmore and Rowe at the Chesapeake Biological Laboratory, University of Maryland. NOAA staff and contractors will provide oversight for the investigation.

Timetable

Timetable for Sea Turtle Surrogate Study Tasks in 2013



The overall timetable for this activity is from January to December 2013. The focus of the first quarter of 2013 will be on study planning and development, a task that is slated to last through July. The review of draft and final study results is anticipated to take place from August through December 2013.

RP Involvement

No involvement of the Responsible Parties is envisioned in this task.

Transport and Storage of Stranded Sea Turtles and Marine Mammals

This activity will allow for the collection, necropsy, and storage of dead, stranded sea turtles collected to date through 2013. This work will further NOAA's effort to continue to investigate the nature and extent of sea turtles that wash ashore or "strand" on shorelines of the northern Gulf of Mexico. Approximately 400 sea turtle carcasses are currently in storage at NRDA supported facilities at present. It is estimated that approximately 300-400 additional sea turtle carcasses will be collected in 2013. This request also includes resources for collection and storage of marine mammal carcasses, which is described more fully under the marine mammal activities.

Marine mammal and sea turtle strandings continue to occur, with some stranded animals showing external evidence of oil. It is of critical importance for NOAA to have the capability to continue to quickly respond to stranded animals, conduct field necropsies using enhanced protocols and NRDA chain of custody procedures, transport carcasses to laboratory necropsy facilities and storage, properly preserve samples and carcasses for additional examination, and provide data/evidence handling and support. These data will be used to assess the need for further assessment of potential injuries to marine mammals and sea turtles resulting from the Deepwater Horizon Oil Spill. Funds to support the existing marine mammal and sea turtle stranding network are being requested under the marine mammal activities. Under this activity, funds are being requested for the transport and storage of marine mammal and sea turtle carcasses once they have been collected by the stranding network. This activity also involves the conduct of necropsies on the collected sea turtle carcasses obtained during and after the oil spill.

Connection to the NRDA Process

This task documents and describes exposure of stranded marine mammals and sea turtles to MC252 oil.

Sample/Data Handling

The specific sample and data handling activities include transport of sea turtle carcasses from stranding network facilities to the University of Florida (UF) where necropsies will be performed and carcasses will be retained. Marine mammal carcasses will be stored in field freezers located in several locations in the Northern Gulf during the stranding season. After they are necropsied by stranding personnel, the carcasses will be transported to the long-term storage facility located in Louisiana.

Data/Deliverables Produced

Deliverables for this effort include data summaries on numbers and location of stranded marine mammals and sea turtles, description of condition, and results of necropsies (for sea turtles).

Level of Effort

Our request for the transport and storage of stranded sea turtles and marine mammals activity is $193,000 in contract funds. These costs include 0.6 agency FTEs and 1.0 contract equivalents. The study also requires $135,000 in direct costs associated with transport and storage.

The majority of funding requested here is for Brian Stacy (veterinarian) and a laboratory technician for the handling and storage of sea turtle carcasses and subsequent necropsy work at UF. Funding is also being requested for 2013 for NOAA staff and contract support to assist with handling and storage of carcasses from sea turtle and marine mammal strandings. Other costs include NOAA staff and contract support to assist and coordinate these activities.

PIs (NOAA and other)

Brian Stacy, a veterinarian at UF, is the PI for this activity. Sara McNulty is the freezer/transport coordinator.

Timetable

Timetable for Transport and Storage of Stranded Sea Turtles and Marine Mammals Tasks in 2013

Transport & Storage of Stranded Turtles and Marine Mammals	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**
Carcass Transport and Records Intake												
Necropsies (Turtles Only)												
Carcass Storage												

All tasks described under this activity may occur throughout the entire year: January to December 2013.

RP Involvement

No direct involvement of the Responsible Party (RP) is envisioned for this task. However, the RP provides direct payment for the long-term holding of marine mammal and sea turtle carcasses at the facility in Louisiana, which currently holds all marine mammals and sea turtle carcasses collected in 2010 and 2011 and the majority of carcasses collected in 2012. This task involves periodically transporting 2013 stranded carcasses to the Louisiana facility for long-term storage when the field freezers meet their capacity.

G. Marine Mammals

The Marine Mammal Technical Work Group (TWG) is assessing injury from the Deepwater Horizon Oil Spill to Gulf of Mexico marine mammals by habitat and stock as follows:

Habitat	**Stock**
Bays, sounds, and estuaries (BSE) of the northern Gulf of Mexico	Multiple bottlenose dolphin stocks
Coastal areas outside the bays, sounds and estuaries to the 200 m isobath	Delphinids with a focus on coastal and shelf stocks of bottlenose dolphin
Oceanic areas from 200 m depth to the US EEZ	Approximately 20 species of delphinids, Brydes whale and the endangered sperm whale

This request is organized by resource category as follows:

Estuarine dolphins (BSE stocks)—NRDA studies and overall injury assessment for estuarine dolphins

Coastal/shelf dolphins—NRDA studies and overall injury assessment for coastal/shelf dolphins,

Coastal and estuarine strandings—relevant data and samples from strandings will be used to support injury assessment for estuarine and coastal/shelf dolphins.

Oceanic marine mammals—NRDA studies and overall injury assessment for oceanic marine mammals

Inhalation risk—a separate assessment that may be used to support injury assessment for estuarine, coastal/shelf and oceanic marine mammals

Estuarine Dolphins

In contrast to other species such as sea otters, dolphins may be less vulnerable to immediate physical effects of external oiling but are susceptible to sublethal toxic effects, which may result in increased mortality and/or reproductive failure over subsequent months and even years. However, assessment of mortality, illness, and reproductive outcome for dolphins, or cetaceans in general, is particularly difficult. While recovery of stranded animals including carcasses and investigation of cause-of-death or illness is essential, mortality or illness cannot be solely determined by direct observation because only a very small fraction of carcasses or strandings are ever reported or recovered. In addition, ethical and legal issues preclude experimental toxicity studies for these protected species. These limitations prompt the need for additional observational studies such as longitudinal photographic surveys to document and follow

individuals over time, non-lethal remote sampling, and capture release health assessments. The longitudinal studies allow for the estimation of population losses (presumed mortality), documentation of reproductive outcomes, and detection of declines in overall abundance over time. In addition to photographic surveys, non-lethal sampling of tissues via remote biopsy can provide biomarker measures to assess exposure, measures of hormone values (which can indicate pregnancy), and genetic analyses to determine sex and elucidate stock structure. Capture-release health assessments allow for the evaluation of overall health and diagnoses of disease conditions potentially indicative of oil-related toxic effects. The combined information from stranding response, photographic monitoring surveys, tissue analysis, and health evaluations provides an integrated picture of the health of estuarine dolphin populations, allowing for assessment of impacts from the DWH oil spill and covers the full spectrum of health to death conditions. As with other difficult investigations of the impacts of a stressor on mammals in which direct toxicity studies are not possible (such the harmful effects of tobacco on people), broad integrated studies evaluating health metrics in living animals, studies of the dead or dying, and targeted surrogate studies or literature evidence are critical to determining the acute and long term impacts of chemicals on any animal or population.

For many species, such as estuarine bottlenose dolphin populations and humans, such studies must be carried out over multiple years. Cetaceans represent an extreme for k-selected species, having life spans of 50+ years, gestation periods generally of at least one year, and calving intervals of 3-5 years. Therefore, for dolphins and cetaceans in general, impacts on survival and/or reproduction cannot be immediately quantified but must be evaluated over a longer period of time. As an example, direct mortality of killer whales following the Exxon Valdez oil spill could not be documented, but through photographic monitoring it was concluded that one resident pod and one transient pod had suffered losses of 33 and 41%, respectively in the year following the Exxon Valdez spill. Continued population assessments a decade after the spill have suggested that the loss of members, which included reproductive females, has hindered the pods' recovery and that one of the pods continues to decline towards extinction. In addition, studies in mink have shown first and second generation reproductive effects which would indicate additional need for longer term reproductive studies.

Eleven stocks of bottlenose dolphins (*Tusiops truncatus*) in bays, sounds, and estuaries were likely exposed to oil and response activities from the Deepwater Horizon (DWH) Oil Spill. The Natural Resource Damage Assessment (NRDA) initiated a combination of cooperative preassessment and assessment field work in the summer of 2010, with the last of the current cooperative field work ending in summer 2012. In addition, 2010 was the first of several years of unusually high marine mammal strandings in the northern Gulf of Mexico, precipitating the declaration of an Unusual Mortality Event (UME) under the Marine Mammal Protection Act (NOAA, 2012a). Relevant data and analyses from marine mammal strandings are being incorporated into the injury assessment for estuarine dolphins and for coastal/shelf dolphins.

The NRDA targeted studies and stranding response for the Gulf of Mexico dolphin UME have documented heightened mortality, a high incidence of reproductive failure, and a number of health issues consistent with known toxic effects from oil exposure (more details provided in subsequent sections). Therefore, the Trustees are proposing additional analysis and review of findings, laboratory analyses, stranding response support, and additional fieldwork in 2013 to continue to document population effects, and to examine potential recovery.

Specific endpoints of interest for the NRDA are: 1) sublethal effects, 2) mortality, and 3) reproductive failure. Sublethal effects will be addressed with additional capture-release health assessments, laboratory analyses of samples, and a cell line study to better understand underlying toxic mechanisms. Mortality (direct observation and indirect assessment of population losses) will be addressed using information from longitudinal photographic surveys, genetic analyses, and continued stranding response and analysis of tissues. Reproductive failure will be assessed with combined information from hormone analyses of tissues samples (from both remote biopsy and capture-release studies), direct observations of live or dead fetuses in ultrasound examinations in capture-release studies, direct observations of fetal, perinatal and calf mortalities through photo-identification and strandings, and longitudinal follow-up of individual dolphins to assess success/failure of documented pregnancies. Activities included in this funding request for estuarine dolphins build on data collected by NRDA cooperative plans as well as efforts and analyses performed independently by the Trustees.

a. Dolphin capture-release health assessment

In 2011, bottlenose dolphin (*Tursiops truncatus*) capture-release health assessments were conducted in Barataria Bay, LA and in Sarasota Bay, FL to address potential sublethal and/or chronic health impacts of the DWH Oil Spill. Barataria Bay was selected as an assessment site due to the prolonged oiling that occurred within the area. Sarasota Bay was selected as a comparison site because it did not receive significant DWH oil. To date, the dolphin health assessment studies have found endocrine, respiratory, and hepatic disease in Barataria Bay dolphins consistent with adverse health effects reported from experimental oil exposure studies. Specifically, severe lung damage, evidence of poor adrenal stress response, and abnormal liver enzymes were observed. These health conditions were not observed in dolphins from Sarasota Bay. The 2011 health assessment/sample collection and a subset of sample analyses were conducted cooperatively with the Responsible Party under the work plan *Assessing potential sublethal and chronic health impacts from the Mississippi Canyon 252 Oil Spill on coastal and estuarine bottlenose dolphins, April 2011* with follow up for tag assessment and to document outcome of pregnancies in summer of 2012 under the work plan *Assessing potential sublethal and chronic health impacts from the Mississippi Canyon 252 Oil Spill on coastal and estuarine bottlenose dolphins: addendum, February 2012*. Sample analysis for cytochrome P4501A (CYP1A) and genomics (microarray), and other analyses, as well as data interpretation, are being conducted under NOAA's 2012 NPFC Phase 1 request ('Estuarine dolphin population distribution and health assessment' and 'Analysis of dead, remote biopsied, and stranded animals').

In 2013, the Trustees will conduct follow-up health assessments in the same two sites (Barataria Bay and Sarasota Bay), as well as in one additional site (Mississippi Sound) that received oiling from the DWH Oil Spill. Similar to the dolphin health assessments conducted in 2011, a team of veterinarians, biologists, toxicologists, and epidemiologists will conduct comprehensive health evaluations including a physical examination, diagnostic ultrasound, and blood and tissue sampling for a suite of diagnostic assessments. Dolphins will be captured using established methods and temporarily (usually < 1 hour) restrained for the examination and tissue sampling. Satellite-linked tags will be attached to the dorsal fin of dolphins in Mississippi Sound to obtain location information for up to 6 months to help elucidate movements of dolphins.

The objectives of the follow-up health assessment in Barataria Bay are: 1) to determine if health conditions of dolphins have persisted or improved two years past the initial health assessment study, and

2) to measure additional parameters that may help to identify more specific diagnoses or a better understanding for the previously observed disease conditions and to identify potential new sequelae as a consequence of previously observed conditions. The objective of the health assessment in Mississippi Sound is to determine if similar or different disease conditions are occurring in dolphins outside of Barataria Bay but within the range of DWH oiling.

Laboratory analyses, data analysis, and initial injury quantification are expected to be completed by the end of 2013. Another level of interpretive review will be conducted in late 2013 once all data from other TWGs have been received and interpreted by the investigative team.

Connection to NRDA Process

The proposed health assessment and associated analyses in 2013 is important for NOAA to fully quantify the duration of marine mammal injuries and/or the timing and duration of recovery as a result of the DWH Oil Spill.

Sample/Data Handling

This effort involves sample and observation data that will be collected to support the assessment. Data management activities required to manage, statistically analyze, and map these data are described here.

Samples and associated data acquired through cooperative work plans were collected through methods defined in joint signed protocols; samples and associated data acquired through non-cooperative work plans were collected through methods defined in Trustee-approved protocols. These samples are being and will be analyzed and data organized and QA/QC administered by NOAA under strictly defined joint protocols. These data are maintained by NOAA and will be distributed to Trustee representatives through NRDA and cooperative databases. Associated activities to manage the data include:

- Maintenance of the original field data as well as associated analytical results in secure data repositories (e.g., NOAANRDA.ORG, ERMA), including associated server, data transfer and storage space costs
- Maintenance of and training in data retrieval/sharing websites to ensure Trustee-wide access to data while maintaining associated metadata (e.g., data history / change logs)
- Storage of physical data
- Training for sample confirmation and results delivery to obtain all necessary documentation (e.g., lab/analytical standard operating procedures)
- Physical delivery of lab data to Trustee and RP representatives per data sharing agreement
- Storage and tracking of external hard drives collected during field sampling to manage large files
- Regular participation in TWG calls to provide consultation on all above matters.

To facilitate the validation of visual observation data, data management activities include participating in 1) TWG-wide coordination activities (e.g., promote standard validation approaches) as well as 2) the

incorporation of changes (e.g., transcription verification and data validation changes) into the NOAA data repositories to promote Trustee-wide analysis of a consistent data product.

To facilitate the collection of additional field data, the support activities include:

- Developing data documentation protocols (e.g., sample ID naming convention, file naming convention, photo documentation)
- Training data managers and other cruise staff on use of various field collection forms and documents
- Facilitating uploading of field data and associated files (e.g., chains of custody) to noaanrda.org data repository
- Data entry and transcription of field forms
- Conducting initial QC of field sampling data
- Processing of field sampling and/or observation data into NOAA data systems
- Managing lab analysis priorities through regular coordination with analytical laboratories
- Responding to various data management questions during field sampling, data upload, and data sharing activities

As raw field data are validated and finalized, data support activities will also extend to the sharing of these results with the public. Data support activities will include the packaging, organization, and release of each data product along with associated metadata. Associated data storage and transfer costs as well as response to public inquiries are incorporated. Furthermore, the files associated with interim and final products generated through the processing and analysis of field and other collected data will be managed and shared in the NOAA data repositories to promote Trustee-wide data access.

Data/Deliverables Produced

The routine dolphin health examinations will provide data on morphometric measurements, sampling of blood, urine, feces, blowhole and blubber as well as a tooth extraction to determine age (as necessary, most dolphins in Sarasota Bay are of known-age because they have been followed since birth). Diagnostic ultrasound may also be conducted. Specific routine health parameters to be measured are provided in the table below. In addition, CYP1A will be assessed in skin samples and genomic analysis will be conducted using mRNA extracted from skin and blood. Persistent organochlorine pollutants (POPs) will be measured in blubber as they can be considered a potential confounding factor for CYP1A measures. Health data for individual dolphins will be synthesized and the prevalence of specific disease categories will be determined for each study site.

Health parameters to be measured from dolphin blood & urine samples

Hematology (Cornell)	Electrophoresis (Cornell)	Serum chemistry (Cornell)	Endocrinology (Blood –Cornell; Blubber - NOAA)	Functional Immunology (UConn)	Urinalysis (on vessel)
Hematocrit	total protein	electrolytes: sodium, potassium, chloride	total thyroxine	T-lymphocyte proliferation	color
packed cell volume	albumin	bicarbonate	free thyroxine	B-lymphocyte proliferation	turbidity
Hemoglobin	alpha 1, alpha 2 & total alpha globulin	anion gap	total triidothyronine	neutrophil phagocytosis	pH
red blood cell count	beta 1, beta 2 & total beta globulin	urea nitrogen	progesterone (blood & blubber)	monocyte phagocytosis	specific gravity
MCV, MCH, MCHC	gamma globulin	creatinine	estradiol	cytokines	glucose
red cell distribution width		uric acid	aldosterone	respiratory burst	bilirubin
reticulocyte count		calcium, phosphate, magnesium	testosterone (blood & blubber)		ketone
white blood cell (WBC) count & differential: segmented neutrophils, band neutrophils, lymphocytes, monocytes, eosinophils		total protein, albumin, globulin	cortisol (blood & blubber)		blood
platelet count		glucose			protein
plasma appearance		enzymes: ALT, AST, SDH, LDH, AP, GGT			urobilinogen
RBC morphology, WBC exam, parasites		total, direct, & indirect bilirubin			nitrite
		amylase			leukocytes
		cholesterol, triglycerides			
		creatine kinase			
		iron, total iron binding capacity, saturation			
		lipemia, hemolysis, icterus			

The health assessment studies will be conducted over a one-week period in May 2013 in Sarasota Bay, Florida and over two two-week periods in June 2013 and July 2013 in Barataria Bay and Mississippi Sound, respectively. Dolphins will be captured using established method, estimating 30 dolphins apiece for Barataria Bay and Mississippi Sound and 20 dolphins for Sarasota. The capture fleet will consist of 6-

7 boats: a net boat, up to five chase boats, and a veterinary processing boat. The field team will consist of approximately 50 experienced personnel including at least three experienced veterinarians and all field work will be done under a MMPA research permit and Animal Care and Use Committee review issued to Dr. Teri Rowles. Permit reports will be provided as needed to fulfill permit requirements.

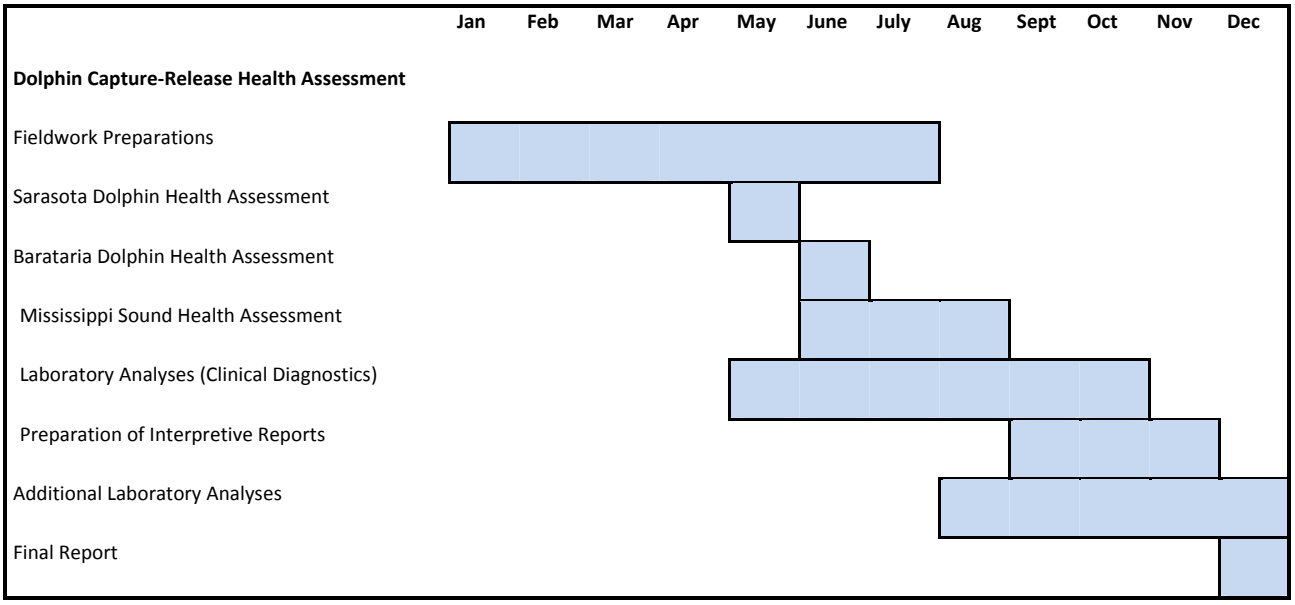
PIs

Dr. Lori Schwacke, NOAA NCCOS

Dr. Teri Rowles, NOAA OPR

Timetable

Timetable for Estuarine Dolphins: Dolphin Capture-Release Health Assessment Subtasks in 2013



The primary focus of the first quarter of CY 2013 will be preparations for fieldwork. The dolphin health assessments will take place in the second and third quarters of the calendar year; the Sarasota effort will be followed by the Barataria effort, followed by the Mississippi Sound assessment. Some clinical diagnostics are ephemeral and will be done as the samples are collected and shipped to diagnostic laboratories. The rest of the clinical diagnostics will be submitted for laboratory analyses in batches after the completion of the health assessments and therefore will likely begin in the third quarter. Completion of this subtask is expected by the end of August 2013, with additional laboratory analyses lasting through December 2013. Work on the interpretive reports will begin in September 2013. Development of the final report will commence in the fourth quarter of 2013.

RP Involvement

The 2011 health assessment/sample collection and a subset of sample analysis were conducted cooperatively with the Responsible Party (RP) under the work plan *Assessing potential sublethal and chronic health impacts from the Mississippi Canyon 252 Oil Spill on coastal and estuarine bottlenose dolphins, April 2011* with follow-up for tag monitoring and calving success in summer of 2012 under the work plan *Assessing potential sublethal and chronic health impacts from the Mississippi Canyon 252 Oil Spill on coastal and estuarine bottlenose dolphins: addendum, February 2012*. The RP, declined to cooperate on analyses, such as CYP1A induction and microarray. NOAA continues to discuss potential studies with the RP; however, the RP has not committed to participation in work planned for 2013.

b. Cell line study

Previous studies have shown that *in vivo* exposures to bunker fuel and Alaskan North Slope crude oil (ANSCO) can result in adverse effects on adrenal organ function and structure in mink. This suggests that exposure to other petroleum products, such as Louisiana crude oil (MC252) could have similar effects on marine mammals. Dolphins from the 2011 DWH NRDA health assessment showed signs of adverse adrenal function. The Trustees propose to conduct cell line studies similar to the published literature that compare impacts to adrenal function from exposure to several petroleum products, including MC252 oil, to assess the relationship between oil exposure and direct adrenal organ function in mammals.

The basic method uses human adrenal cell culture introduced onto a medium mixed with different exposure levels of DWH oil. This study will provide a comparison of direct adrenal toxicity from exposure to the bunker fuel and ANSCO used in the mink studies to MC252 oil products that are hypothesized to be causing adrenal impairment in Gulf of Mexico dolphins through direct mechanisms. We propose to use an adrenal cell line derived from human adenocarcinoma cells that has been shown to be responsive to PAH in previous studies. We will conduct these *in vitro* studies to evaluate and measure the relative adrenal toxicities of bunker fuel, ANSCO, and MC252 oil.

The Trustees plan to assess changes in gene expression in 10 genes associated with steroidogenesis (along with a housekeeping gene and an unexposed control), and previously found to be the target of toxicity of xenobiotics. The Trustees also plan to assess changes in the production of steroid hormones upon exposure of the human adrenal cortex cell line H295R (available from ATCC) to different types of oil (MC252, ANSCO, and bunker fuel compared to vehicle control). The use of three different concentrations compared to unexposed vehicle control will allow the generation of dose-response curves to compare of the relative potency of the different oils with greater sensitivity. The study investigates the effects of oil exposure to human adrenal cell lines H295R. Endpoints measured in response to select doses of bunker fuel, ANSCO, and MC252 oil include: (1) cell viability; (2) steroid production; (3) gene expression, and (4) morphology. In addition, this study will evaluate the actual PAH measures in the media of exposure.

Connection to NRDA Process

This activity is being undertaken to evaluate findings from the dolphin health assessments through an initial study of the effects of various levels of oil exposure in mammalian cell lines. By evaluating the

potential mechanism of action, the Trustees may be able to focus the dolphin health assessment on key endpoints and better assess potential toxicity associated with MC252 oil.

Sample/Data Handling

Samples will be managed under chain of custody. Analytical chemistry data will be managed according to the NRDA QAPP and data management plan. Standard operating procedures and quality assurance standards for the laboratory will be evaluated prior to the commencement of the work. Validated non-chemistry laboratory data will be uploaded to the NRDA data warehouse when complete.

Data/Deliverables Produced

Deliverables include study results from the investigations. The Trustees will use the results to enhance field health assessments, refine mortality interpretations, and interpret additional sample analyses from stranded or live captured animals.

PIs (NOAA and other)

Stratus Consulting

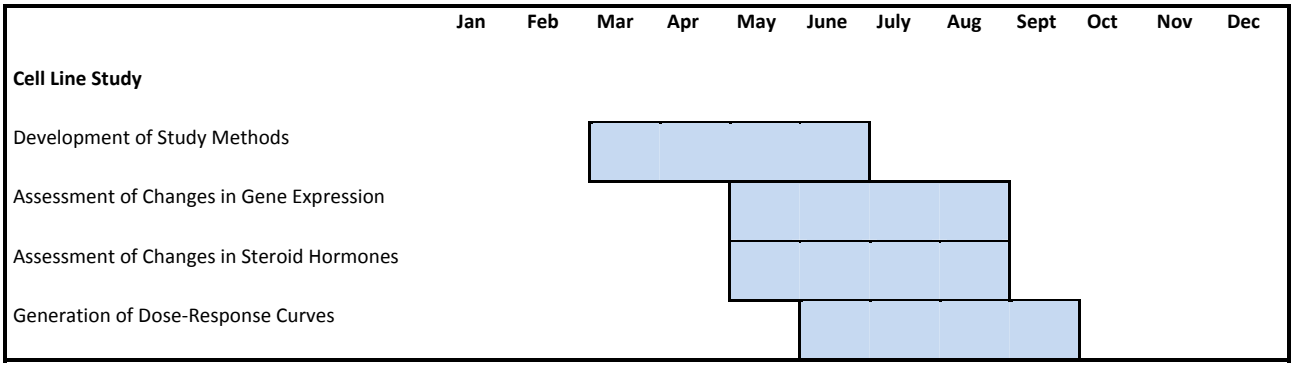
Dr. Lori Schwacke, NOAA NCCOS

Dr. Teri Rowles, NOAA OPR

Dr. Tracy Collier, UCAR

Timetable

Timetable for Estuarine Dolphins: Cell Line Study Subtasks in 2013



The development of study methods for this task will begin in the first quarter of 2013 and extend through the second quarter. The assessment of changes in gene expression and in the production of steroid hormones will begin in the second quarter. Concurrent with these assessments will be the generation of dose-response curves. All subtasks are expected to be complete by September 2013.

RP Involvement

The RP has not participated in planning this work proposed for 2013.

c. Longitudinal Surveys

MC252 oil has been documented in Barataria Bay, Chandeleur Sound, and Mississippi Sound in the north central Gulf of Mexico. Each of these areas is inhabited by a large number of bottlenose dolphins, and seasonal dolphin surveys of each area (photo-identification (photo-ID) and biopsy sampling) were conducted from May 2010 through May 2012 under cooperative NRDA work plans: *Proposed Data Collection Plan for LA and MS Estuarine Dolphin Stocks (including Addendum), May-June 2010*; *Second Addendum to Data Collection Plan to Assess Injury to Estuarine Dolphin Stocks, November 2010*;and *Proposed Data Collection Plan to Assess Injury to MS & LA Estuarine Dolphin Stock - 3rd Addendum, July 2011*. The remote biopsy surveys were conducted to collect longitudinal tissue samples for genetic stock assessments, hormone analyses, and analyses for measures of exposure. The photo-ID surveys were conducted to estimate losses to the population, to provide documentation of reproductive outcome for dolphins determined to be pregnant via analysis of remote biopsy tissue samples and/or evaluation during health assessment, and to provide estimates of seasonal population abundance using mark-recapture analysis methods. Photo-ID surveys during 2012 documented a high reproductive failure rate. Additional analyses to examine population losses, population abundance and potential changes in population abundance are ongoing.

Given the extended oiling in Barataria Bay and the observed disease conditions from the 2011 health assessment, continued population-level assessment of Barataria Bay dolphins is warranted in 2013. A photo-identification (photo-ID) survey that replicates the mark-recapture surveys conducted previously will be conducted in the summer of 2013 following the Barataria Bay health assessment. This survey will provide additional data to assess abundance and survival rates and will also provide opportunity for essential follow-up of dolphins sampled during the health assessment. In addition, biopsy sampling of bottlenose dolphins in coastal waters adjacent to Barataria Bay are proposed for summer 2013 to help determine potential genetic overlap of the Barataria Bay and coastal stocks.

Field surveys will be conducted using standard photo-ID techniques to collect data for mark-recapture analysis to estimate abundance and survival. The photo-ID survey that replicates the previous surveys will be conducted over a 14-day window during July 2013 in Barataria Bay. To account for poor weather, survey windows include roughly two days for each full survey day required (i.e., 7-8 survey days are required to complete a full survey). The survey will be conducted by two boats, each staffed with three scientists.

Remote biopsy surveys will collect samples for genetic analysis, stable isotope hormone analysis (i.e. to determine pregnancy). Subsamples from the biopsies will also be taken for analysis of PAH exposure markers. Specifically, skin/blubber will be preserved for immunohistochemistry and qPCR to assess CYP1A, genomic analyses, stable isotope, and quantification of persistent organochlorine pollutants (POPs) which may also influence CYP1A measures. The biopsy sampling survey of bottlenose dolphins in coastal waters more than 2 km from shore adjacent to Barataria Bay will be conducted during June 2013 to obtain an adequate sample size for genetic stock structure analysis. The data from these samples will be compared with data from samples to be collected from dolphins inside Barataria Bay as part of the 2013 health assessment. Analysis of photos from the photo-ID surveys (photo analysis) will be performed

using the Finbase database and photos will be incorporated into the Barataria Bay Finbase catalog. Data interpretation and report incorporating 2010-2011 results are expected to be complete by the end of 2013.

NOAA is also proposing to conduct additional analysis of abundance trends for Mississippi Sound/Chandeleur Sound dolphins using aerial survey data from 2010-2012. Results from aerial surveys and photo-ID surveys will be integrated into existing data and analyses.

Connection to NRDA Process

The longitudinal surveys will support the assessment of injury associated with exposure to MC252 oil for the Barataria Bay dolphin stock as well as provide information for establishing a weight of evidence for injury. The information gained from the studies, integrated with information from the capture-release health assessment and findings from stranding investigation, will allow for the estimation of overall population losses likely associated with MC252 oil exposure.

Abundance estimates will provide a basis for estimating the total number of dolphins from the population likely to have been affected by the oil exposure. Because abundance in some estuarine populations may fluctuate due to seasonal emigration/immigration, it is important to estimate seasonal abundance over a multi-year period. The combined seasonal abundance estimates, genetic/isotope analysis, and movement information from satellite-tagged dolphins from the capture-release study will help to define the overlap of the Barataria Bay stock with other dolphin stocks, which is necessary for estimating the number of dolphins injured overall for Bay, Sound and Estuary (BSE) and coastal stocks. The additional survey session will also provide for more robust estimates of sighting probabilities, improving the confidence in estimated survival rates and calculation of probability of individual losses from the population.

Sample/Data Handling

Samples will be collected and managed under chain of custody. Field sample sheets will be uploaded to the NRDA data warehouse daily. Analytical chemistry data will be managed according to the NRDA QAPP and data management plan. Validated Non-chemistry laboratory data will be uploaded to the NRDA data warehouse when complete.

Data/Deliverables Produced

Analysis of photos from the photo-ID surveys (photo analysis) will be performed using the Finbase database and photos will be incorporated into the Barataria Bay Finbase catalog. Data interpretation incorporating 2010-2012 results will be completed in 2013.

NOAA is also proposing to conduct additional work on the 2010-2012 data reports. A draft summary is anticipated by the end of 2012 and was funded as part of NOAA's 2012 NPFC Phase 1 request. Additional work in 2013 includes conducting a peer review of the findings and revising the summary based on comments.

Biopsy sampling will be conducted during a 30-day window using one boat staffed with four scientists. The goal is to obtain 30-40 biopsy samples. The survey window includes roughly two days for each full

survey day required (i.e., assumes an average of 2-3 samples/day during 15 survey days). Estimated effort includes two contract staff for two months to complete the photo analysis from the summer 2013 survey.

This task includes managing the project, processing data (e.g., photos), analysis of photo-ID data (e.g., managing and matching), laboratory analyses for blubber hormones, CYP1A immunohistochemistry & qPCR, genomic (microarray) analysis of skin, stable isotopes, and analysis of blubber for persistent organochlorine pollutants. Supply and reagent costs for genetic analyses of sex and stock structure are in section d, Genetic Stock Structure.

PIs (NOAA and other)

Dr. Keith Mullin, NOAA SEFSC

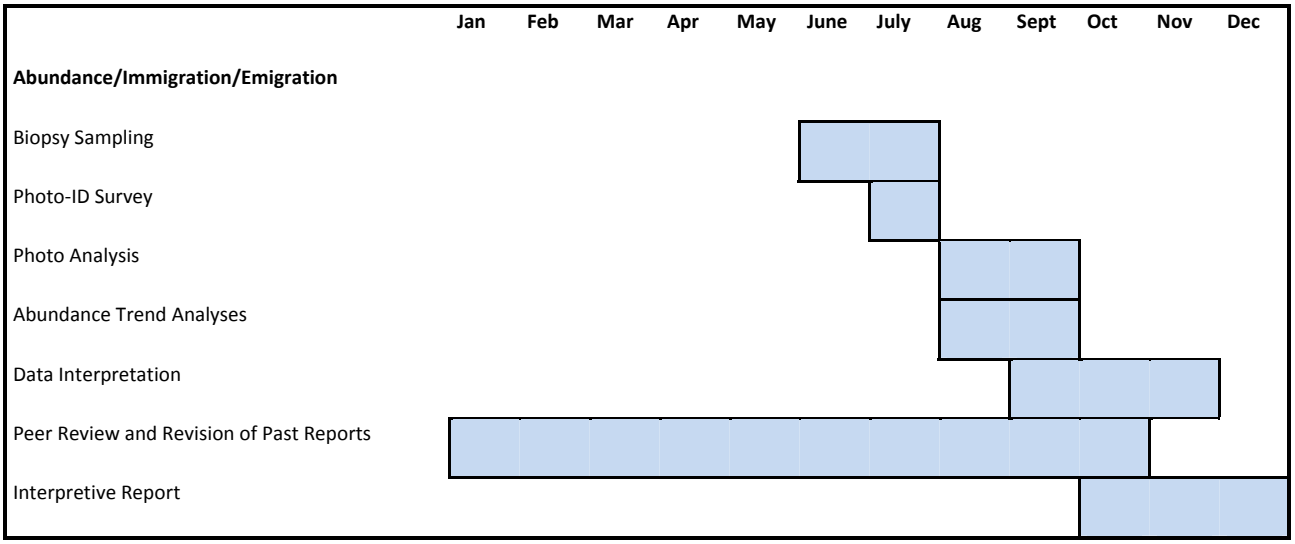
Dr. Lori Schwacke, NOAA NCCOS

Dr. Patricia Rosel, NOAA SEFSC

Dr. Lance Garrison, NOAA SEFSC

Timetable

Timetable for Estuarine Dolphins: Abundance/Immigration/Emigration Subtasks in 2013



The biopsy sampling will begin in June 2013 and last approximately 40 days (five days of prep time and travel, 30 field days, and five post-survey days). The photo-ID survey will begin soon after in July 2013 and is estimated to last approximately 25 days (six days of prep time and travel, 14 field days, and five post-survey days). Photo analysis and abundance trend analyses will follow these surveys and will last through the end of the third quarter of 2013. Reviewing findings from 2010 and 2011 and revising the data reports for these years based on comments will be a subtask extending into the beginning of the fourth quarter of 2013. The interpretive report, combining data from 2010 and 2011, will be produced in the fourth quarter and completed by the end of the year.

RP Involvement

Photo-ID and biopsy data collection was done cooperatively under the plans listed below. In addition to the data collection, NOAA performed the photo-ID analyses and provided the FinBase database to the RP.

1. *Proposed Data Collection Plan for LA and MS Estuarine Dolphin Stocks (including Addendum), May-June 2010.*

2. *Second Addendum to Data Collection Plan to Assess Injury to Estuarine Dolphin Stocks, November 2010*.

3. *Proposed Data Collection Plan to Assess Injury to MS & LA Estuarine Dolphin Stock - 3rd Addendum, July 2011*.

NOAA is conducting independent data analysis and interpretation as outlined in NOAA's 2012 NPFC Phase 1 claim. The RP has not participated in planning work proposed for 2013.

d. Genetic stock structure

For dolphins observed remotely, species verification and stock genetics must be conducted through analysis of skin collected from remote dart biopsies using genetic sexing techniques. Genetic analysis of NRDA-collected marine mammal samples was completed for samples collected from 2010 to August 2011. These analyses include, sex determination, species/ecotype identification, and/or mtDNA and microsatellite analysis for stock structure. Most of the genetics was completed under a cooperative assessment plan *Genetic analysis of stock structure, species identification, and sex determination for marine mammal biopsies and strandings*. Analysis of the remaining biopsy samples collected through spring 2012 is underway. This analysis supports both the health assessment and biopsy samples by completing genetic analysis for samples collected under the proposed field work (Activity: Estuarine Dolphins, Tasks: Dolphin Capture-Release Health Assessment and Abundance/Immigration/Emigration) as well as relevant samples from strandings to be determined (Activity: Coastal and Estuarine Strandings, Task: Stranding Network Support).

The proposed work will analyze up to 150 skin/blubber samples from the 2013 health assessment (Activity: Estuarine Dolphins, Task: Dolphin Capture-Release Health Assessment), remote biopsy work (Activity: Estuarine Dolphins, Task: Abundance/Immigration/Emigration), and animals stranded in 2013. Animals will be assessed for sex determination and species/ecotype definition through genetic analysis and/or stock structure through mtDNA analysis and microsatellite analysis. These latter techniques determine the degree of genetic exchange between animals from different geographic areas. This information will help identify genetic isolation amongst estuarine stocks and between Barataria Bay and the adjacent coastal waters.

Connection to NRDA Process

These analyses are necessary to complete the health assessment and photo-ID work, as well as to evaluate stranding patterns. This is important for understanding how health and distribution relate to temporal and spatial patterns of exposure to oil.

Sample/Data Handling

Samples will be managed under chain of custody. Validated non-chemistry laboratory data will be uploaded to the NRDA data warehouse when complete.

Data/Deliverables Produced

Analyses will be complete by the end of 2013 and associated data delivered to the data warehouse.

Laboratory analysis will begin in summer 2013 as samples are received. The genetic analysis and reporting will be performed by the Principal Investigator and staff.

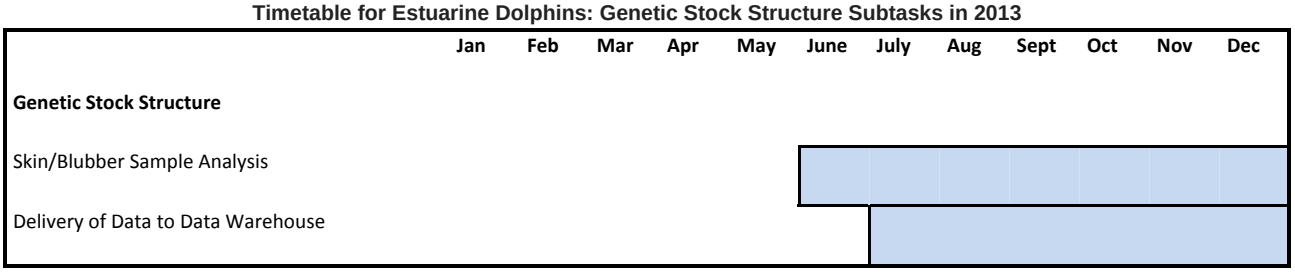
The number of samples is an estimate, since the actual number of captured animals, remote biopsies, and strandings is unknown. However, 40 biopsy samples and 60 health assessment samples are expected. In addition, approximately 50 stranding samples could be collected in 2013.

PIs (NOAA and other)

Dr. Patricia Rosel, NOAA SEFSC

Timetable

Timetable for Estuarine Dolphins: Genetic Stock Structure Subtasks in 2013



The primary activity of this task is the analysis of skin and blubber samples collected under 2013 health assessment tasks. Samples will be received from June through August 2013 and analyses will be completed by the end of the fourth quarter. As analyses are completed, the data will be made available in the data warehouse.

RP Involvement

Genetic analysis of health assessment, biopsy and stranded samples collected up to August 2011was completed under a cooperative assessment plan *Genetic analysis of stock structure, species identification, and sex determination for marine mammal biopsies and strandings*. (Note that though this plan has been signed by all parties, it is currently in the process of being made publicly available.) Data, including stock structure analyses, were provided to the RP as per the signed work plan.

The RP declined to sign an addendum to finish samples through early 2012, and so these are currently being analyzed non-cooperatively. The Trustees and the RP are still working to determine if cooperative analysis of these samples will proceed.

The RP has not participated in planning work proposed for 2013.

e. Exposure
Oil exposure information aids in the interpretation of dolphin health effects and helps isolate potential spill effects. The Trustees are evaluating oil exposure to marine mammals on an on-going basis as data and oil exposure products become available. Data collected specifically for BSE dolphin exposure include: 1) concentrations of oil-related chemicals and CYP1A induction in samples from marine mammal remote biopsies and strandings over time (pre and post spill), and 2) concentrations of oil-related compounds in prey samples for oiled areas in Louisiana collected in 2011. These samples are being analyzed under the 2012 NPFC request, but the data will not be available and validated until 2013. This current request is to perform statistical and geospatial analyses on these results. Where possible, we will use these exposure metrics in conjunction with relevant exposure products developed by other workgroups for a comprehensive exposure analysis, including exposure routes and duration.

Connection to NRDA Process

Dolphins of the bays, sounds, and estuaries were observed swimming in MC252 oil during 2010. This activity will improve injury assessment efforts through an assessment of exposure indices such as CYP1A expression in conjunction with other metrics.

Sample/Data Handling

This effort relies on existing data and information or results currently being processed. The specifics of data handling for the data employed in this task are described in detail in the sections for the relevant activities or tasks under which the work is performed.

Data/Deliverables Produced

The effort will formalize the estuarine dolphin exposure evaluation.

PIs (NOAA and other)

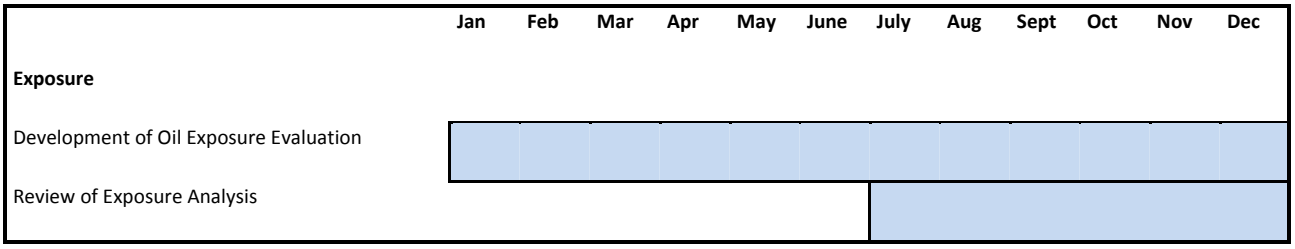
Dr. Lance Garrison, NOAA SEFSC

Dr. Lori Schwacke, NOAA NCCOS

Shahrokh Rouhani, NewFields

Timetable

Timetable for Estuarine Dolphins: Exposure Subtasks in 2013



An interim exposure evaluation was funded as part of NOAA's 2012 NPFC Phase 1 request. This effort will update the exposure evaluation using additional information and data developed in 2013. The evaluation of oil exposure occurs on an on-going basis as data and oil exposure products become available. The subtasks are expected to be complete by the end of 2013.

RP Involvement

The RP has not participated in planning work proposed for 2013.

F. Injury assessment integration

The injury to estuarine dolphins will need to take into account multiple lines of evidence from multiple studies, using data from live capture, aerial and boat surveys, and analysis of stranded animal samples from 2010-2013. This would include working with the UME to incorporate any information regarding cause of death for stranded dead animals. This effort is directed at planning and implementing an integrated assessment that includes data and conclusions relevant to the impacts of MC252 oil on BSE dolphins. It will be necessary to collaborate across all studies and incorporate peer review of findings to bring the different studies together.

The Trustees anticipate producing an interpretive analysis that summarizes multiple lines of evidence gathered through the BSE dolphin assessment. The summary will be developed throughout 2013 as assessment activities are completed and data are available and analyzed. This activity includes all the necessary coordination, planning, and reviews of the overall estuarine dolphin assessment with legal, with co-trustees, and with the responsible party.

Connection to NRDA Process

This effort integrates data and findings into an injury assessment and final injury quantification.

Sample/Data Handling

This effort integrates tissue and other lab sample data collected by prior NRDA and other activities. In addition, visual observations were collected to further support the assessment. Data management activities required to manage, statistically analyze, and map these data are described here.

Samples and associated data acquired through cooperative work plans were collected through methods defined in joint signed protocols; samples and associated data acquired through non-cooperative work plans were collected through methods defined in the Trustee-approved protocols. These samples are being analyzed and data organized and QA/QC administered by NOAA under strictly defined joint protocols. These data are maintained by NOAA and will be distributed to Trustee representatives through NRDA and cooperative databases. Associated activities to manage the data include:

- Maintenance of the original field data as well as associated analytical results in secure data repositories (e.g., NOAANRDA.ORG, ERMA), including associated server, data transfer and storage space costs
- Maintenance of and training in data retrieval/sharing websites to ensure Trustee-wide access to data while maintaining associated metadata (e.g., data history / change logs)
- Storage of physical data
- Training for sample confirmation and results delivery to obtain all necessary documentation (e.g., lab/analytical standard operating procedures)
- Physical delivery of lab data to Trustee and RP representatives per data sharing agreement
- Storage and tracking of external hard drives collected during field sampling to manage large files
- Regular participation in TWG calls to provide consultation on all above matters.

As raw field data are validated and finalized, data support activities will also extend to the sharing of these results with the public. Data support activities will include the packaging, organization, and release of each data product along with associated metadata. Associated data storage and transfer costs as well as response to public inquiries are incorporated. Furthermore, the files associated with interim and final products generated through the processing and analysis of field and other collected data will be managed and shared in the NOAA data repositories to promote Trustee-wide data access.

Data/Deliverables Produced

This activity will culminate with an injury assessment and final injury quantification.

PIs (NOAA and other)

Dr. Lori Schwacke, NOAA NCCOS

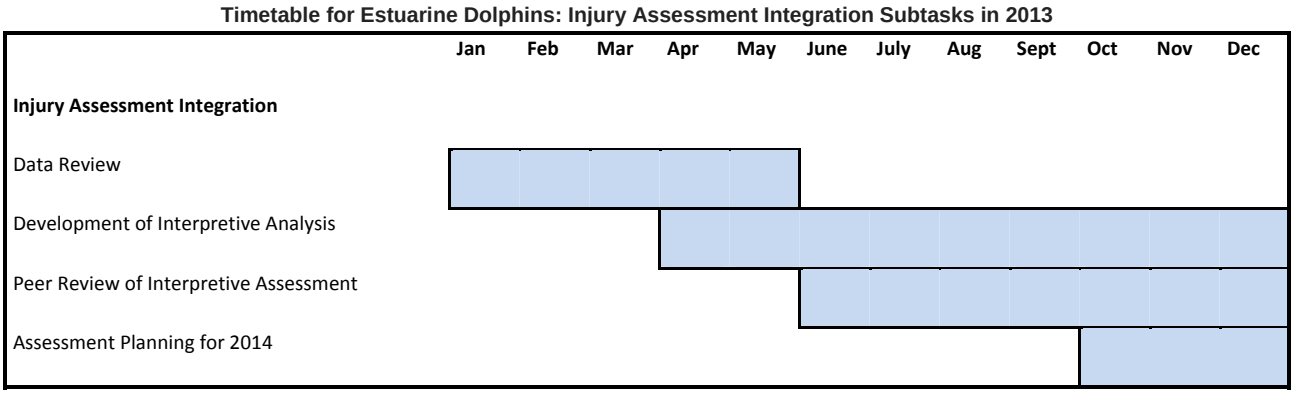
Dr. Teri Rowles, NOAA OPR

Dr. Keith Mullin, NOAA SEFSC

Dr. Lance Garrison, NOAA SEFSC

Dr. Patricia Rosel, NOAA SEFSC

Timetable



Work on the integration of assessment results will begin in early 2013 and continue throughout 2013. The primary focus in the first quarter of the year will be a comprehensive review of the data. Development of the interpretive analysis that summarizes multiple lines of evidence gathered through the dolphin assessment will begin in the second quarter. Soon after, peer review of this assessment will take place. Both activities will continue through the end of the year; complete integration of all information cannot begin until field work is complete in August 2013 and initial data analyses are complete.

RP Involvement

The RP has not participated in planning work proposed for 2013.

Level of Effort – Estuarine Dolphins Activity

Our request for the estuarine dolphin activity is $4,125,201 in contract funds. These costs include 4.7 agency FTEs and 12.9 contract equivalents. Key personnel include study PIs, field staff, agency scientists, and IEc and agency data management teams. The study also requires $451,240 in direct costs for field work.

Coastal/Shelf Dolphins

There are four stocks of bottlenose dolphins (*Tursiops truncatus*) occupying the coastal and continental shelf waters of the northern Gulf of Mexico. These include the Eastern, Northern, and Western Coastal stocks that occupy waters from the shoreline to the 20m isobath, and the continental shelf stock, which occupies waters from the 20m isobath to the continental shelf break at the 200m isobath. The Northern Coastal, Western Coastal, and Continental Shelf stocks occur within the primary area of the northern Gulf

of Mexico impacted by DWH oil. At this point in time, coastal/shelf bottlenose dolphins cannot be genetically distinguished from estuarine stocks.

In addition to bottlenose dolphins, Atlantic spotted dolphins (*Stenella frontalis*) and rough-toothed dolphins (*Steno bredanensis*) are known to occur in continental shelf waters. This assessment relies on information from health assessment studies for estuarine dolphins, survival rates from photo ID studies from estuarine dolphins, inhalation risk evaluations, and abundance estimates from aerial surveys done in 2010-2012. These evaluations are based on the behavioral characteristics, study methods, and potential exposure scenarios specifically related to coastal and continental shelf stocks.

a. Refining Exposure
The Trustees are using marine mammal aerial survey data in combination with surface oil maps developed in other parts of the case to document oil exposure to coastal and shelf marine mammals. The determination of exposure metrics is an ongoing process that is expected to occur into 2013, dependent partially on products from other parts of the NRDA.

There are no NRDA biological (remote biopsy) or live capture studies that were directed for coastal shelf dolphins, although it is likely that some bottlenose dolphins captured or sampled are from coastal and estuarine stocks. However, coastal and shelf marine mammals would have encountered substantial surface oil during the spill. Aerial surveys conducted during the spill and through 2012 will document abundance and number of animals exposed.

Connection to NRDA Process

Coastal and shelf marine mammals were exposed to MC252 oil. Fully analyzing aerial survey data and other observations of marine mammals during the spill will improve injury assessment efforts.

Sample/Data Handling

This effort relies on existing data and information. Specifics regarding data handling measures for these data are described in this section under the relevant activity or task under which the work is performed.

Data/Deliverables Produced

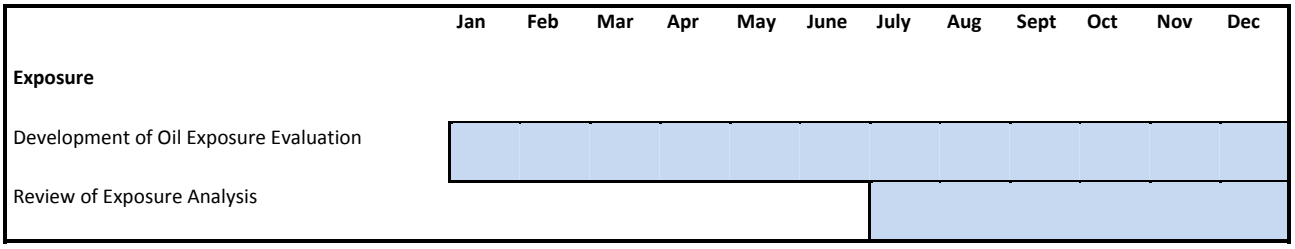
The effort will formalize the coastal and shelf exposure evaluation for marine mammals.

PIs (NOAA and other)

Dr. Lance Garrison, NOAA SEFSC

Timetable

Timetable for Coastal/Shelf Dolphins: Exposure Subtasks in 2013



An interim exposure evaluation was funded as part of NOAA's 2012 NPFC request, and the initial analysis of aerial survey information is largely complete. We are requesting funds to update the exposure evaluation using additional information and data reviewed within the TWG in 2013.

RP Involvement

The RP has not participated in planning work proposed for 2013.

b. Injury assessment integration

The injury to coastal and shelf dolphins will build on information developed for BSE dolphins and other information. However, the different species, habitats and exposure regimes for coastal/shelf stocks need to be taken into account for developing an integrated injury assessment. The trustees will use multiple lines of evidence from multiple studies, using data from live captures for estuarine animals (2011 and 2013) aerial surveys (2010-2012), and analysis of stranded animal samples from 2010-2013. This would include working with the UME to incorporate any information regarding cause of death for stranded dead animals. This effort is directed at planning and implementing an integrated assessment that includes data and conclusions relevant to the impacts of MC252 oil on coastal/shelf dolphins. It will be necessary to collaborate across all studies and incorporate peer review of findings to bring the different studies together.

The Trustees anticipate producing an interpretive analysis that summarizes multiple lines of evidence. The summary will be developed throughout 2013 as assessment activities are completed and data are available and analyzed. The Trustees will utilize peer review to assess the interim summary. Funding for 2013 will cover development of the interim analysis, TWG coordination, and data management.

This activity includes all the necessary coordination, planning, and reviews of the overall coastal/shelf dolphin assessment with legal, with co-trustees, and with the responsible party.

Connection to NRDA Process

This effort integrates data and findings into an injury assessment.

Sample/Data Handling

This effort relies on existing data and information. Data handling measures for these data are described in this section under the relevant activity or task under which the work is performed.

Data/Deliverables Produced

This activity will culminate with an injury assessment.

PIs (NOAA and other)

Dr. Lance Garrison, NOAA SEFSC

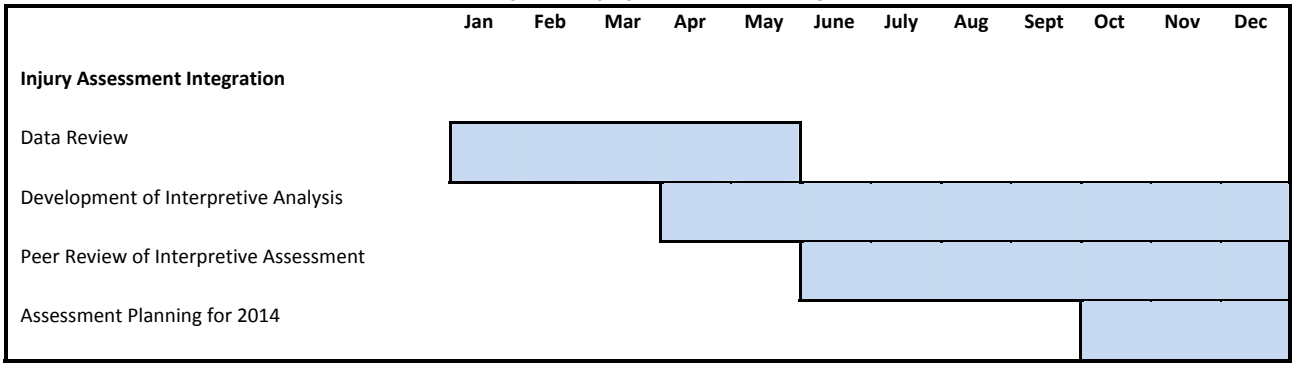
Dr. Keith Mullin, NOAA SEFSC

Dr. Patricia Rosel, NOAA SEFSC

Dr. Trent MacDonald, West, Inc.

Timetable

Timetable for Coastal/Shelf Dolphins: Injury Assessment Integration Subtasks in 2013



Work on the integration of assessment results will begin in early 2013 and continue throughout 2013. The primary focus in the first quarter of the year will be a comprehensive review of the data. Development of the interpretive analysis that summarizes multiple lines of evidence gathered through the coastal and shelf dolphin assessment will begin in the second quarter. Soon after, peer review of this assessment will take place. Both activities will continue through the end of the year; complete integration of all information cannot begin until field work is complete in August 2013 and initial data analyses are complete.

RP Involvement

The RP has not participated in planning work proposed for 2013.

Level of Effort – Coastal/Shelf Dolphins Activity

Our request for the coastal/shelf dolphins activity is $305,000 in contract funds. These costs include 0.9 agency FTEs and 0.9 contract equivalents. Key personnel include the study PIs, and agency, IEc, and WEST scientists.

The funding will support data evaluations and integrated assessment development, statistical analysis and data interpretation, review of findings (including peer review), and preparing an injury assessment. In addition, the level of effort includes TWG coordination, legal review and planning for future assessment activities.

Coastal and Estuarine Cetacean Strandings

The Marine Mammal Stranding Network (MMSN) was formalized as part of the Marine Mammal Health and Stranding Response Act in the 1992 amendments to the Marine Mammal Protection Act (MMPA), and NOAA NMFS was designated as the lead agency to establish the program and coordinate responses in US waters for all cetaceans and pinnipeds (except walrus). Volunteer participation in the National Marine Mammal Stranding Program exist in all coastal states and territories to respond to marine mammal strandings and are authorized under Section 112c Stranding Agreements from one of the 6 NOAA NMFS regional offices or under Section 109h (for federal, state, or local government officials who are operating in their official duties) of the MMPA. These MMSN organizations/participants receive no consistent financial support from the federal government for their activities, thus the ability of the MMSN to respond to and investigate strandings can vary by organization, by level of training, by level of other funding, and by year. Participants in the MMSN may apply for Prescott grants (NOAA, 2012b) in annual competitions or through emergency funds, which do provide limited support for stranding response activities to some MMSN organizations. In the northern Gulf, for the FY2012 awards, only Louisiana Department of Wildlife and Fisheries has some limited Prescott funding to conduct stranding response activities.

In accordance with the Marine Mammal Health and Stranding Response Act, an Unusual Mortality Event (UME) has been declared for cetaceans in the northern Gulf of Mexico from February 2010 through the present. As per the requirements under the National Contingency Plan, an independent investigation of causes of strandings/deaths is underway using samples from cetaceans which stranded in the northern Gulf of Mexico from February 2010 to the present.

Preliminary analysis suggests that oil cannot be ruled out as a causal effect in cetacean mortalities that have occurred since the DWH spill. As described in the approach above in the section on estuarine dolphin injuries, as shown in previous studies on oil impacts from spills, and from laboratory investigations, the impacts of oil exposure can have profound changes in reproduction, health, and mortality. Using a robust system of evaluation utilizing both live (from health assessments, live strandings, remote sensing) and dead animals allows us to evaluate the continuum from exposure to poor health (disease) to reproductive failure or death and to identify the processes by which those occur over time. As a result of this integrated approach to evaluating the impacts of oil exposure and response activities, the NRDA is evaluating results from the UME investigations related to mortality and oil-related connections to these mortalities. The NRDA activities to coordinate with UME investigations regarding

study timing, documentation, sample retention requirements, and data management as well as targeted interpretations and data evaluation are included in this request.

This activity for 2013 includes continued enhanced support for stranding networks to collect NRDA targeted samples, perform the NRDA-required sample handling and retention, database management, completing pathologies that may be consistent with oil exposure, spatial/temporal and historical trends in strandings, evaluation and interpretation of data, and the evaluation of multipliers. Freezer and transport costs for carcasses are shared with other assessment activities and are included in the turtle request.

a. Data and sample analysis and enhanced stranding database management to support NRDA
Some samples and data from strandings are of interest to the NRDA and require additional analysis beyond what is needed for the stranding program or UME. Within this activity are included some additional analyses of strandings data or samples from strandings (i.e., histopathology) to assist in the assessment, including evaluating potential stressors such as disease or other environmental stressors. This request includes the analysis of remaining samples that were not covered for the 2012 NPFC request.

The remaining work includes stranding database management and sample handling for strandings. Basic information regarding strandings (location, date, time) is collected by the stranding network on national forms completed by the individual stranding agencies (Level A data). These data are entered into a national database (MMHSRP database) and only include the basic stranding information. Given the large temporal and spatial scale of this event, there continues to be a need to add additional fields not typically collected (degree of visible oiling, etc.) and combine these stranding data with tissue tracking and chain of custody information in a single database that was developed over the last year. The needs in 2013 are to continue data entry, data validation, sample tracking, and integrate this data with the UME analytical results data for easier searching and access. In addition, for the interpretation portion, there continues to be a need to update historic records and query them as additional questions or needs are raised from the NRDA assessment team. Over 15,000 samples have been entered into the sample tracking database to date. The data entries for tracking these samples is only halfway complete and samples are still being shipped for analyses. This activity requires funding in 2013 to complete entry of the available data. This activity requires funding in 2013 to continue data entry, data validation, data integration, data and sample tracking, and data assessment and comparisons to historic data.

This activity funds agency employees and contractors to manage the data and samples from stranded animals including data entry, QA/QC, database management, and data integration. Funding also covers sample tracking, documentation, and shipping.

Connection to NRDA Process

Presently, exposure to MC252 oil cannot be ruled out as a contributor to mortality under the UME. Stranding data are one of the lines of evidence that may be used to develop the injury assessment for coastal and estuarine dolphins.

Sample/Data Handling

This effort relies on data previously collected under NRDA and other activities. Data management activities required to manage, statistically analyze, and map these data are described here.

Samples and associated data acquired through cooperative work plans were collected through methods defined in joint signed protocols; samples and associated data acquired through non-cooperative work plans were collected through methods defined in the Trustee-approved protocols. These data are organized and QA/QC administered by NOAA under strictly defined joint protocols. These data are maintained by NOAA and will be distributed to Trustee representatives through NRDA and cooperative databases. Associated activities to manage the data include:

- Maintenance of the original field data as well as associated analytical results in secure data repositories (e.g., NOAANRDA.ORG, ERMA), including associated server, data transfer and storage space costs
- Maintenance of and training in data retrieval/sharing websites to ensure Trustee-wide access to data while maintaining associated metadata (e.g., data history / change logs)
- Storage of physical data
- Training for sample confirmation and results delivery to obtain all necessary documentation (e.g., lab/analytical standard operating procedures)
- Physical delivery of lab data to Trustee and RP representatives per data sharing agreement
- Storage and tracking of external hard drives collected during field sampling to manage large files
- Regular participation in TWG calls to provide consultation on the above matters.

As raw field data are reviewed for accuracy and finalized, data support activities will also extend to the sharing of these results with the public. Data support activities will include the packaging, organization, and release of each data product along with associated metadata. Associated data storage and transfer costs as well as response to public inquiries are incorporated. Furthermore, the files associated with interim and final products generated through the processing and analysis of field and other collected data will be managed and shared in the NOAA data repositories to promote Trustee-wide data access.

Data/Deliverables Produced

This activity will provide a database that contains UME-related data.

PIs (NOAA and other)

Dr. Lance Garrison, NOAA SEFSC

Dr. Jenny Litz, NOAA SEFSC

Timetable

Timetable for Coastal and Estuarine Strandings: Database Management Subtasks in 2013

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Data and sample analysis and database Management												
Development of UME-Related Database												

The development of a database containing UME-related data will continue throughout the duration of the UME, which may endure through the end of 2013.

RP Involvement

The RP has not participated in planning work proposed for 2013.

b. Stranding network support

As explained above, NOAA NMFS is designated as the lead agency to coordinate Marine Mammal Stranding Networks (MMSNs) in the United States for cetaceans and pinnipeds (except walrus). In the Gulf of Mexico, the NMFS Southeast Region staff coordinate cetacean stranding response. As a result of the NRDA for the DWH Oil Spill, the MMSNs in the northern Gulf of Mexico have been directed by NOAA to follow strict sampling, necropsy, handling, and documentation protocols for all stranded marine mammals. These protocols require the network to collect and handle carcasses and samples differently than their normal operating procedures. These requirements result in additional NRDA-specific costs.

This 2013 activity provides funds to continue support (NPFC in funded 2011-12) for the MMSNs in LA and MS, both areas with sustained higher stranding rates and that had oil exposure, to continue enhanced NRDA data and sample collection. These data include information that is necessary to determine cause of death, types of lesions or diseases, and assess potential impacts of the DWH Oil Spill on coastal/estuarine bottlenose dolphins. In addition, providing rapid response and investigations of neonatal, calf or pregnant female morbidity and mortality, especially during the peak stranding season from January through April 2013, is critical to ongoing monitoring and assessment of this population for reproductive impacts, and the effects on this population from the DWH Oil Spill.

Connection to NRDA Process

Presently, exposure to MC252 oil cannot be ruled out as a contributor to mortality for stranded marine mammals. As noted previously and as funded in previous years, actual mortality data is a critical component in understanding the continuum from oil exposure through various disease processes as outlined above in estuarine dolphins to death. Stranding data continue to be one of the critical lines of evidence that may be used to develop the injury assessment for coastal and estuarine dolphins as the longer term consequences of oil exposure are recognized.

Sample/Data Handling

Samples will continue to be collected and managed under chain of custody and coordinated by the data management team as outlined above. Field sample data sheets will be maintained by the NOAA NMFS SEFSC under chain of custody and entered into the stranding database. Analytical chemistry data will be managed according to the NRDA QAPP and data management plan. Validated non-chemistry laboratory data collected for the NRDA will be uploaded to the NRDA data warehouse when complete. Sample tracking data will be entered into the sample tracking database as described above and pathology data and data from analyses will be entered into the NOAA database. After data is validated, the NRDA data management team will work with the NOAA stranding program to provide access to the data.

Data/Deliverables Produced

This activity will provide a database that contains stranding data.

PIs (NOAA and other)

Dr. Teri Rowles, NOAA OPR

Dr. Erin Fougeres, NOAA SE OPR

Timetable

Timetable for Coastal and Estuarine Strandings: Stranding Network Support Subtasks in 2013

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Stranding Network Support												
Stranding response, necropsy, and sample collection												
Stranding Data Database Entry,												

This activity will continue throughout 2013 as dictated by strandings. Though the work is slated to occur during all quarters of 2013, we anticipate the majority of work will be conducted throughout the first half of 2013 with the peak of strandings expected January to June. Of particular concern is the critical need to maintain significant capability and sampling for the peak calving and late term abortion time periods.

RP Involvement

The RP has not participated in planning work proposed for 2013 but has supported stranding response during the response phase of this oil spill.

c. Multipliers

Marine mammal carcasses recovered from beaches (i.e., strandings) provide a minimum count of the mortalities that have occurred within bottlenose dolphin stocks occupying a region and time period. Spatial and temporal patterns in the recovery of stranded carcasses reflect variability in both the rate of mortalities and the probability that animals dying in nearshore coastal waters will be transported to beaches where they can be recovered by responders. Wind or currents may transport carcasses away from the initial location of the mortality and affect the likelihood that carcasses will reach the beach.

Between April 2010 and April 2012, the number of observed marine mammal carcasses on the beaches of Alabama, Mississippi, and Louisiana was significantly higher that historical numbers. The underlying cause of this elevated number of strandings is currently under investigation to determine if it is related to the DWH Oil Spill. To determine the actual number of mortalities, it is necessary to estimate the probability that a given marine mammal carcass will be transported to the beach where it could be observed and recovered. Further, it is necessary to understand the underlying variability in that probability given possible changes in weather and current patterns. Estimating this probability will result in a multiplier that expands the number of observed stranded carcasses to the predicted mortality for affected marine mammal stocks.

To develop this multiplier, the Marine Mammal TWG will leverage a planned project to use the Advanced Circulation (ADCIRC) coastal inundation model which is being requested through the Water Column TWG. The ADCIRC model is a state-of-the-art hydrodynamic model that is explicitly designed to predict the tracks of Lagrangian particles within nearshore and estuarine environments of the northern Gulf of Mexico. ADCIRC is used to derive flood predictions associated with hurricane driven storm surges and has been used to develop predictions of nearshore transport of MC252 oil. It assimilates data from tidal gauges, wind stations, and stream flows to validate predicted flows and transport patterns. The model is particularly relevant to estimating stranding rates of marine mammal carcasses since it deals explicitly with the physical transport processes in waters close to shore. The Marine Mammal TWG will work with the ADCIRC modelers to conduct a study of particle drift to simulate the movements of marine mammal carcasses and estimate both the likely sources of carcasses and the probability that a floating carcass would be transported to the shoreline at different places and times within the period of the DWH Oil Spill and the northern Gulf UME.

Funds for the ADCIRC modeling effort will be provided through the Water Column TWG. Funds to support the Marine Mammal TWG will support staff time to define the model runs for dolphin carcass tracking and evaluation of results. After developing appropriate multipliers from the ADCIRC runs, the Marine Mammal TWG will use these data to develop estimates of the total mortality of marine mammals within coastal and estuarine waters of the northern Gulf of Mexico during the period from April 2010 to April 2012.

Connection to NRDA Process

Presently, exposure to MC252 oil cannot be ruled out as a contributor to mortality for stranded marine mammals. Stranding data continue to be one of the critical lines of evidence that may be used to develop the injury assessment for coastal and estuarine dolphins. This activity will improve the estimate of

number of cetaceans that actually died during the UME post oil spill based on observed carcasses and additional data.

Sample/Data Handling

This activity does not contemplate additional data collection. The activity requires use of existing data.

Data/Deliverables Produced

Draft multipliers are planned to be available in October 2013.

PIs (NOAA and other)

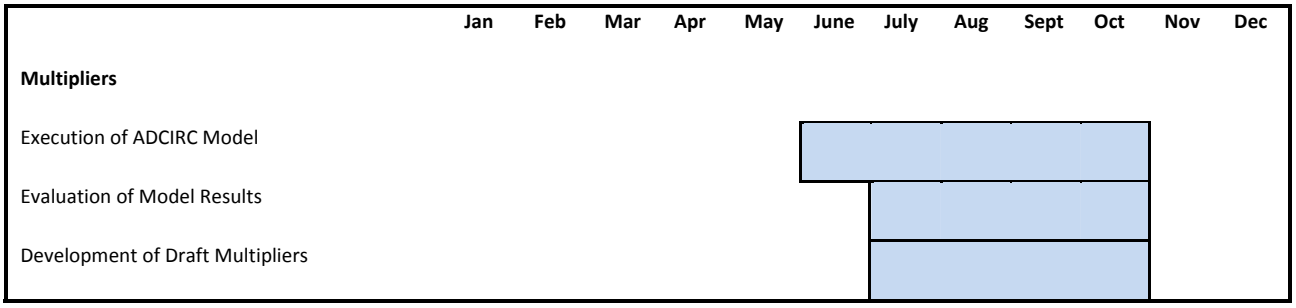
Dr. Lance Garrison, NOAA SEFSC

Dr. Jenny Litz, NOAA SEFSC

Dr. John Quinlan, NOAA SEFSC

Timetable

Timetable for Coastal and Estuarine Strandings: Multipliers Subtasks in 2013



This activity is dependent on strandings and the development of the ADCIRC model. We anticipate work will commence in the second quarter of 2013. Following executions of the model and evaluations of the results, we anticipate that draft multipliers will be available in October 2013.

RP Involvement

The RP has not participated in planning work proposed for 2013.

Level of Effort – Coastal and Estuarine Cetacean Strandings Activity

Our request for the coastal and estuarine cetacean strandings activity is $1,379,816 in contract funds. These costs include 0.9 agency FTEs and 5.5 contract equivalents. Key personnel include study PIs, agency and IEc scientists, and agency and contractor data management teams.

Oceanic Marine Mammals

A diverse community of tropical and sub-tropical cetaceans occupies the waters of the north-central Gulf of Mexico. Twenty defined stocks of marine mammals in the oceanic waters of the northern Gulf of Mexico include the endangered sperm whale (*Physeter macrocephalus*), a small resident population of Bryde's whales (*Balenoptera edeni*), and a suite of medium and small-bodied delphinids and small whales. The region affected by the DWH Oil Spill includes a high diversity and abundance of many of these species, particularly in the area along the shelf-break between Mississippi Canyon and DeSoto Canyon.

a. Injury assessment integration
Visual observations for marine mammals were made near the DWH site by helicopter from 28 April through 31 July 2010. Observations included characterization of oil within the area and photo-documentation of marine mammals. In addition, skin biopsies for CYP1A induction were collected in a limited number of sperm whales in 2010 to assess exposure. Additional measures of exposure are being developed in other work groups and include the development of surface and subsurface oiling products and water contamination observations and modeling. Exposure

Several cooperative studies were undertaken to better understand the abundance of sperm whales and other marine mammals in the Gulf of Mexico through passive acoustic arrays and shipboard surveys. Sperm whales were satellite tagged in 2010, 2011 and 2012 to assess behavioral changes and home range patterns.

The Trustees anticipate producing an interpretive analysis that incorporates multiple lines of evidence for multiple species of oceanic mammals. The injury assessment will integrate information on surface oil, inhalation risk, effects to prey, shipboard surveys, passive acoustics, and telemetry .The report will be developed throughout 2013 as assessment activities are completed and data analyses become available. Because of the complexity of the data and analyses for this activity and the involvement of multiple species and multiple studies, we will incorporate peer review as part of the review process.

This activity includes all the necessary coordination, planning, and reviews of the overall coastal/shelf dolphin assessment with legal, with co-trustees, and with the responsible party.

Connection to NRDA Process

This effort integrates data and findings into an injury assessment.

Sample/Data Handling

This effort integrates tissue and other lab sample data collected by prior NRDA activities. Data management activities required to manage, statistically analyze, and map these data are described here.

Samples and associated data acquired through cooperative work plans were collected through methods defined in joint signed protocols; samples and associated data acquired through non-cooperative work plans were collected through methods defined in the Trustee-approved protocols. These samples are analyzed and data organized and QA/QC administered by NOAA under strictly defined joint protocols.

These data are maintained by NOAA and will be distributed to Trustee representatives through NRDA and cooperative databases. Associated activities to manage the data include:

- Maintenance of the original field data as well as associated analytical results in secure data repositories (e.g., NOAANRDA.ORG, ERMA), including associated server, data transfer and storage space costs
- Maintenance of and training in data retrieval/sharing websites to ensure Trustee-wide access to data while maintaining associated metadata (e.g., data history / change logs)
- Storage of physical data
- Training for sample confirmation and results delivery to obtain all necessary documentation (e.g., lab/analytical standard operating procedures)
- Physical delivery of lab data to Trustee and RP representatives per data sharing agreement
- Storage and tracking of external hard drives collected during field sampling to manage large files
- Regular participation in TWG calls to provide consultation on the above matters.

As raw field data are validated and finalized, data support activities will also extend to the sharing of these results with the public. Data support activities will include the packaging, organization, and release of each data product along with associated metadata. Associated data storage and transfer costs as well as response to public inquiries are incorporated. Furthermore, the files associated with interim and final products generated through the processing and analysis of field and other collected data will be managed and shared in the NOAA data repositories to promote Trustee-wide data access.

Data/Deliverables Produced

This activity will culminate with an injury assessment.

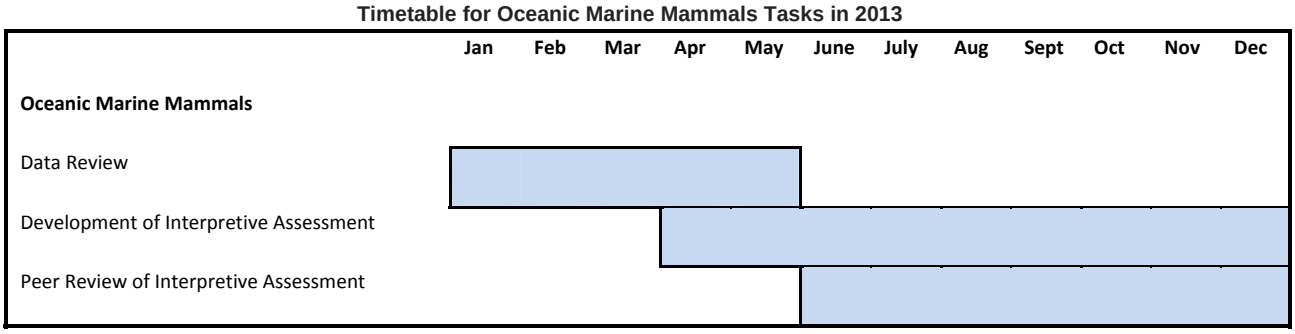
Level of Effort

Our request for the oceanic marine mammals activity is $915,203 in contract funds. These costs include 0.9 agency FTEs and 3.0 contract equivalents. Key personnel include agency and IEc scientists and data management teams.

PIs (NOAA and other)

Agency and contract staff

Timetable



The primary focus of this effort during the first quarter of 2013 will be data review to investigate the process of summarizing multiple lines of evidence gathered through the assessment of oceanic marine mammals. The development of the interpretive assessment will begin in the second quarter and will continue through the end of the year as assessment activities are completed and data become available. Concurrent to the development of the assessment will be the peer review of this assessment, a task anticipated to begin in June 2013 and continue to the end of the year. The draft injury assessment will be available by the end of 2013.

RP Involvement

The RP has been very active in the data collection for this part of the case. The reports produced for passive acoustics and satellite tagging are submitted jointly to the RP and the Trustees. The injury interpretive injury assessment and quantification will be prepared by the Trustees.

Inhalation Risk Assessment

The Trustees hypothesize that marine mammals may have been exposed to MC252 oil and related response activities through inhalation. Airborne contaminants from discharged oil result from both volatilization of oil and entrainment of droplets from the ocean surface, as well as the generation of particulate matter and products of incomplete combustion during controlled burns conducted during the response effort. The Trustees have identified multiple marine mammal species that may have been exposed during the oil spill via inhalation, based on known populations in the Gulf and on sightings during the spill, for an assessment of risks to marine mammals from inhalation exposure.

To support this risk assessment, estimated contaminant exposure levels have been compiled from measured and modeled air concentrations (both oceanic and near-shore). In addition, a comprehensive toxicology literature review, encompassing both marine mammals and laboratory mammals, has been conducted to evaluate the inhalation toxicity of oil and its individual constituents. For approximately 15 individual compounds, and potentially mixtures, exposure concentrations and toxicity assessments will be combined to predict the potential for short-term (acute) and long-term (chronic) marine mammal health effects due to inhalation exposures during and following the Deepwater Horizon oil spill. The unique physiology and behaviors of the marine mammals will be quantitatively taken into account when estimating potential health risks for these animals. Finally, the predicted health impacts will be correlated

with observations of marine mammal health from the dolphin capture-release health assessments conducted over the past two years in the Gulf, as well as results from the ongoing investigation of the Unusual Mortality Event in the Gulf.

NOAA's NPFC Phase 1 claim for 2012 contained funding to perform a literature review and to collect air monitoring data. Based on our review of the information, and particularly the modeled magnitude of harmful oil compounds near the ocean surface for multiple months after the spill, we determined that injuries to marine mammals from inhalation of oil compounds was more likely than not. We are requesting funds to prepare the inhalation injury quantification based on model results and peer-reviewed, mammalian injury thresholds for inhalation of oil compounds. The results of this injury assessment will be incorporated into injury assessments for estuarine, coastal/shelf and oceanic marine mammals described in previous sections.

This activity includes all the necessary coordination, planning, and reviews of the overall coastal/shelf dolphin assessment with legal, with co-trustees, and with the responsible party.

Connection to NRDA Process

Inhalation of contaminants is a potential exposure pathway for marine mammals that may result in potential health impacts. This activity will evaluate exposure and potential toxicity to marine mammals.

Sample/Data Handling

This activity does not involve additional data collection. The specifics governing the data handling of data reviewed in this activity are outlined in the text for the activity or task under which the data were collected.

Data/Deliverables Produced

This activity will provide a draft risk assessment. The risk assessment will be revised pending the results of the peer review.

Level of Effort

Our request for the inhalation risk assessment activity is $289,000 in contract funds. These costs include 0.3 agency FTEs and 0.7 contract equivalents. Key personnel include study PIs and agency and IEc scientists.

PIs (NOAA and other)

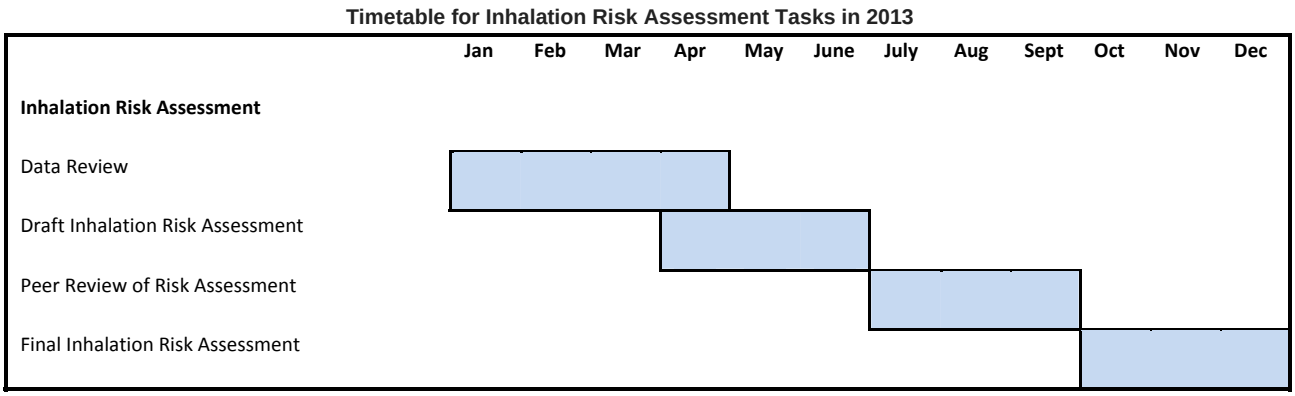
Amy Rosenstein, MPH, Industrial Economics, Inc.

Dr. Tracy Collier, UCAR

Dr. Lance Garrison, NOAA SEFSC

Dr. Teri Rowles, NOAAOPR

Timetable



The primary focus during the first quarter of 2013 for this activity will be data review. In the second quarter of the year, the preparation of the draft inhalation risk assessment will begin. This draft is anticipated to be complete by the end of June 2013 at which point it will be available for peer review. A revised risk assessment will be prepared subject to the results of the peer review. This revised assessment is scheduled to be complete by the end of 2013.

RP Involvement

The RP has not participated in planning work proposed for 2013.

NEARSHORE HABITAT AND RESOURCE INVESTIGATIONS

H. Shoreline

Completing Analysis of Coastal Wetland Vegetation Injury

The Trustees are using the coastal wetland vegetation study to assess injury to coastal marshes and mangroves resulting from exposure to MC252 oil. The work plan for this effort, *Sampling and Monitoring Plan for the Assessment of MC252 Oil Impacts to Coastal Wetland Vegetation in the Gulf of Mexico* (coastal wetland vegetation plan), describes the study methodology in detail. The coastal wetland investigations are designed to detect changes in primary production, reproduction, and soil function. Data have been collected across three sampling seasons (fall 2010, spring 2011, and fall 2011) in Louisiana and across two sampling seasons (spring 2011 and fall 2011) in Mississippi and Alabama. Sampling sites represent a spectrum of oiling conditions (including sites where no oil was observed) and a variety of coastal wetland vegetation habitat types (including herbaceous salt marsh, coastal mangroves, and Phragmites). A total of 200 sites have been sampled. At many of these sites, multiple "zones" have been sampled at various distances from the marsh edge (e.g., edge, middle, and furthest inland, with the furthest inland zone located at the inland boundary of observed oiling), resulting in the study of more than 500 zones. At each zone, field observation and measurement data have been collected. Key metrics include: visual measures of oiling, vegetative condition (based on degree of chlorosis), percent live and

dead vegetative cover, canopy height, chlorophyll content, light adapted fluorescence, and elevation, among others. Soil and vegetative biomass samples have also been collected from each zone for a variety of metrics, including PAHs and chemical fingerprinting, sediment grain size, soil bulk density, soil organic matter, nutrients, and extractable elements. Field collection methods are based on standard methods published in peer-reviewed journals and standard NRDA methods. Laboratory methods are standard methods used by academic or commercial laboratories. These field and lab measurements allow for an evaluation of a range of ecological services, including primary production, provision of marsh habitat, marsh sustainability (i.e., resilience to land loss), and soil function.

Initial data analyses have indicated adverse impacts (for metrics such as vegetative health, biomass, and percent vegetative cover) to coastal wetland vegetation in oiled areas compared to unoiled areas, particularly in heavily oiled areas and when the oiling was persistent in nature. Greater adverse impacts to the vegetation have also been observed along the marsh edge, compared to the marsh interior.

Funding was previously requested under the NPFC Phase 1 claim to conduct sampling in fall 2012 across the 200 sites. This funding was to cover collection of field observation and measurement data, as well as samples for PAH analysis, but not samples for non-PAH analyses. (The previous budget request did include costs to complete non-contaminant chemistry analyses of soil samples collected under the fall 2011 effort, but not the fall 2012 effort.) The fall 2012 sampling has now been expanded to include collection of soil and vegetative biomass samples for laboratory analysis of the analytes described above, with the exception of chemical fingerprinting and extractable elements, which are not planned for fall 2012 samples. Specifically, we anticipate collection and analysis of approximately 465 belowground biomass cores, 375 aboveground vegetative clips, 1052 cores for nutrient analyses, and 1052 cores for physical analysis. Justifications for this and other tasks under this activity are provided in the "Connection to NRDA Process" section below.

This activity also includes a full fall 2013 sampling event, including field observation and measurement data, sample collection, and laboratory analyses. The final scope of the fall 2013 sampling event (sites and metrics sampled) will be determined based on a careful review of the data from the fall 2012 survey. However, for this budget request, we are assuming sampling at all mainland herbaceous and mangrove sites in Louisiana (111 sites total) for all metrics sampled in fall 2012. We assume no sampling at Louisiana back barrier herbaceous or Phragmites sites, as well as no sampling at Mississippi or Alabama sites. Costs include field planning and training, field work oversight, field sampling (two NOAA representatives per team, in addition to one "quality assurance floater" and one field chief), equipment and vessels, sample and data intake, laboratory analyses, data management, and validation of both observational and laboratory data. Field costs assume that the RP will provide one field sampler per team, as in previous field seasons.

Analysis and integration of data from all field sampling events are also included in this activity. Analysis of data from the first three sampling events (fall 2010, spring 2011, and fall 2011) is underway using funds from the NPFC Phase 1 claim. Under the current claim, data from the fall 2012 and fall 2013 sampling events will be integrated into the analyses. We expect that more than 178,000 data elements from fall 2012 and fall 2013 sampling will be added to the existing 384,000 data elements from the first three field seasons, which include nearly 300 data fields (metrics for injury assessment and supporting information) per site. NOAA will produce a data report that will present and summarize all data (likely

largely electronically). A draft data report will be produced by the end of 2012 (using NPFC Phase 1 funds) for data from the first three field seasons, as well as possibly preliminary data from fall 2012.

This activity also includes completion of hydrologic calculations for the coastal wetland vegetation sites. Accurate information regarding the depth and degree of flooding at the coastal wetland vegetation sites is an important factor in analysis. Information regarding the depth and degree of flooding can inform the understanding of the fate and transport of oiling in the marsh. NOAA tide gages and Louisiana Coastwise Reference Monitoring System (CRMS) sites will be paired with our 200 coastal wetland vegetation sites. These tide gages will be used to calculate a series of hydrologic calculations such as average flooding depth, average and maximum duration of a flooding event, and percent time flooded on an annual basis. NOAA's Center for Operational Products and Services (CO-OPs) will perform these water level time series covering the DWH impact period and carry out an inundation analysis, including frequency and duration. This is a new activity for which funds were not requested in the NPFC Phase 1 claim. Thus, under this Phase 2 claim we request funds to begin this task in 2012.

We will also produce an interpretive report that summarizes objectives and methods, presents results of data analyses, and interprets results in the context of injury to vegetation. The interpretive report will synthesize statistical analyses of the coastal wetland vegetation data and geospatial analyses (i.e., the shoreline oiling database and mapping). Examples of specific types of statistical analyses are summarized in the "Connection to NRDA Process" section below. The interpretive report will also consider the findings of non-NRDA and non-DWH studies, if relevant, and describe the findings of our study in the context of other relevant studies, including literature from other spills. For this task, a careful review of relevant literature is required.

NOAA will also create maps derived from imagery mosaics and compare them to existing habitat classification maps. NOAA will update the existing habitat classification maps with new information, as appropriate, since accurately classifying shoreline habitat is an important component of injury quantification. Other tasks include using aerial imagery to identify vegetated areas reduced to stubble and quantifying the acreage of these areas. Aerial images collected by NRDA personnel during fall 2010 will be used to update habitat classifications and identify areas of marsh stubble. USGS hyperspectral remote sensing data will be used to evaluate depth of oil penetration and vegetative health. NOAA data management personnel will provide support for this task.

Connection to NRDA Process

Under this activity, we will document and describe injury to coastal wetland vegetation habitats. The importance to the NRDA process of each task within this activity is described below.

Laboratory analysis of Fall 2012 samples will allow for a comparison with the previous three sampling seasons for a number of metrics that indicate injury due to oiling. Laboratory analysis of fall 2012 samples will enable us to continue to track changes in key measures of primary production, health of marsh habitat, marsh sustainability (i.e., resilience to land loss), and soil function. Results related to marsh sustainability may be used to support analyses and interpretation under Activity H: Completing Analysis of Coastal Wetland Erosion.

Fall 2013 field collection and laboratory analyses will enable us to continue to track changes in key measures of primary production, provision of marsh habitat, marsh sustainability (i.e., resilience to land loss), and soil function. Preliminary data analyses and literature from other spills indicate that continued sampling is warranted to track the recovery trajectory of this habitat.

Aerial imagery has applications to exposure and injury assessment. The imagery allows for improved characterization of exposed habitats by improving delineation of habitat types and oiled areas. The imagery also is useful in identifying vegetated areas that are no longer vegetated and may experience long term effects.

Hydrologic calculations are required to determine the depth and degree of flooding at the coastal wetland vegetation sites, which can inform the understanding of the fate and transport of oiling in the marsh. This information can also be used to evaluate the comparability of reference sites to oiled sites.

Data analysis and interpretation entails integrating the fall 2012 and fall 2013 data into existing analyses. Analysis of coastal wetland vegetation data collected over the first three field seasons is well underway (using funds from the NPFC Phase 1 claim). Injuries will be assessed through comparison of key metrics between oiled and unoiled sites, as well as over time. Statistical analyses will be grouped by habitat type, as well as by marsh zone (edge, middle, furthest inland). Injuries and recovery, if applicable, will then be synoptically extended using the shoreline oiling database and mapping effort that determines shoreline lengths and/or areas in several oiling categories. Temporal data will be used to assess recovery and will be used to assess the need for future monitoring.

The degree and spatial extent of habitat injuries over time will be used to inform the extent of restoration needed to compensate for injuries.

Sample/Data Handling

This effort will entail the collection of new data and the integration of these data with oil and sediment chemistry and observation data collected by prior NRDA activities. Data management activities required to manage, statistically analyze, and map these data are described here.

NOAA's shoreline statistical team, comprised primarily of NewFields staff, has taken the lead on all data manipulation and statistical analyses to date and will continue to do so under this activity. Their analyses are directed by the study's Principal Investigators and are regularly shared with Trustees. Industrial Economics, Incorporated's (IEc's) Data Management Team (DMT) will provide support for data entry, transcription verification, sharing of laboratory results, data access support, processing and analysis file sharing, and public data sharing as described below.

Previous samples and associated data acquired through cooperative work plans were collected through methods defined in joint signed protocols. These samples are being analyzed and data organized and QA/QC administered by NOAA under strictly defined joint protocols. These data are maintained by NOAA and will be distributed to Trustee representatives through NRDA and cooperative databases. Associated activities to manage the data include:

- Maintenance of the original field data as well as associated analytical results in secure data repositories (e.g., NOAANRDA.ORG, ERMA), including associated server, data transfer, and storage space costs
- Maintenance of and training in data retrieval/sharing websites to ensure Trustee-wide access to data while maintaining associated metadata (e.g., data history / change logs)
- Training for sample confirmation and results delivery to obtain all necessary documentation (e.g., lab/analytical standard operating procedures)
- Physical delivery of lab data to Trustee and RP representatives per data sharing agreement
- Storage and tracking of external hard drives collected during field sampling to manage large files
- Regular participation in TWG calls to provide consultation on all above matters.

To facilitate the validation of visual observation data, data management activities include participating in 1) TWG-wide coordination activities (e.g., promote standard validation approaches) as well as 2) the incorporation of changes (e.g., transcription verification and data validation changes) into the NOAA data repositories to promote Trustee-wide analysis of a consistent data product.

In addition to the effort associated with physically analyzing samples collected previously, associated management of the process includes coordinating analytical activities; data tracking activities to provide status reports on analytical progress and data availability; third-party validation of lab results to ensure data is in proper format and meets quality standards; secondary QA/QC of field data prior to merging with lab results; incorporation into repositories as final, validated products; forensic chemistry to identify source of contamination; and, spatial processing and loading into ERMA.

Under this activity, new sample collection is proposed. To facilitate the collection of additional field data, the support activities include:

- Developing data documentation protocols (e.g., sample ID naming convention, file naming convention, photo documentation)
- Training data managers and other cruise staff on use of various field collection forms and documents
- Facilitating uploading of field data and associated files (e.g., chains of custody) to noaanrda.org data repository
- Data entry and transcription of field forms
- Conducting Initial QC of field sampling data
- Processing of field sampling and/or observation data into NOAA data systems
- Managing lab analysis priorities through regular coordination with analytical laboratories
- Responding to various DMT questions during field sampling, data upload, and data sharing activities

As raw field data are validated and finalized, data support activities will also extend to the sharing of these results with the public. Data support activities will include the packaging, organization, and release

of each data product along with associated metadata. Associated data storage and transfer costs as well as response to public inquiries are incorporated. Furthermore, the files associated with interim and final products generated through the processing and analysis of field and other collected data will be managed and shared in the NOAA data repositories to promote Trustee-wide data access.

Data/Deliverables Produced

The fall 2013 field effort will generate field observation and measurement data collected at 111 locations, which will result in an anticipated 72,000 or more individual data elements. In addition, the field work will result in lab data for approximately 256 belowground biomass cores, 206 aboveground vegetative clips, 580 cores for nutrient analyses, 580 cores for physical analysis, and 290 samples for PAH analysis. Lab analyses of the 2012 samples will result in data for an additional approximately 465 belowground biomass cores, 375 aboveground vegetative clips, 1052 cores for nutrient analyses, and 1052 cores for physical analysis.

Deliverables for this effort include draft and final interpretive reports summarizing pathway, exposure, and injury for shoreline habitats. The reports will include documentation of purpose and methods, as well as data tables, maps, and figures illustrating and summarizing results, conclusions, and interpretations. The reports will also include (physically or by reference) the final validated coastal wetland vegetation dataset. The final dataset will also be posted on public websites.

Level of Effort

Our request for the coastal wetland vegetation activity is $8,290,321 in contract funds. These costs include 0.9 agency FTEs and 24.1 contract equivalents. Key personnel include the study PIs, statisticians and data analysts, field crews, laboratory staff, IEc and agency data management teams, and data intake/equipment resupply teams.

The majority of the coastal wetland vegetation data manipulation and statistical analysis will be conducted by high-level statisticians and data analysts at NewFields, with agency scientists providing guidance and oversight and managing communication with Trustees and the RP. Dr. Shahrokh Rouhani of NewFields is providing expert statistical support. Marla Steinhoff of NOAA is overseeing the effort. Contractors, including academic research biologists (PIs), expert statisticians, and data analysts, will collaborate on statistical analyses, interpreting the results of coastal wetland vegetation studies, and production of the interpretive report. The interpretive report will largely be written by Drs. Mark Hester and Jonathan Willis, both of the University of Louisiana at Lafayette. IEc will assist in report development. The statisticians and PIs will regularly communicate with the Trustees and attend and present at analysis-focused meetings.

Costs for this activity are driven by field staff and field operations labor hours, vessels, data management support /sample intake (assuming other field activities are also funded, which will provide economies of scale), and laboratory analysis costs. The field effort is expected to extend over one and a half months and utilize five teams (each with two NOAA contractors – one team leader and one staff), one "quality assurance floater", and one field chief. Two vessels are required per team for safety reasons. Costs assume purchase of a full set of field equipment, including all "non-consumable" equipment previously purchased by and currently held by the RP. Trustees will request the use of the non-consumable

equipment for the fall 2013 field season and will only purchase this equipment if the RP declines to provide it.

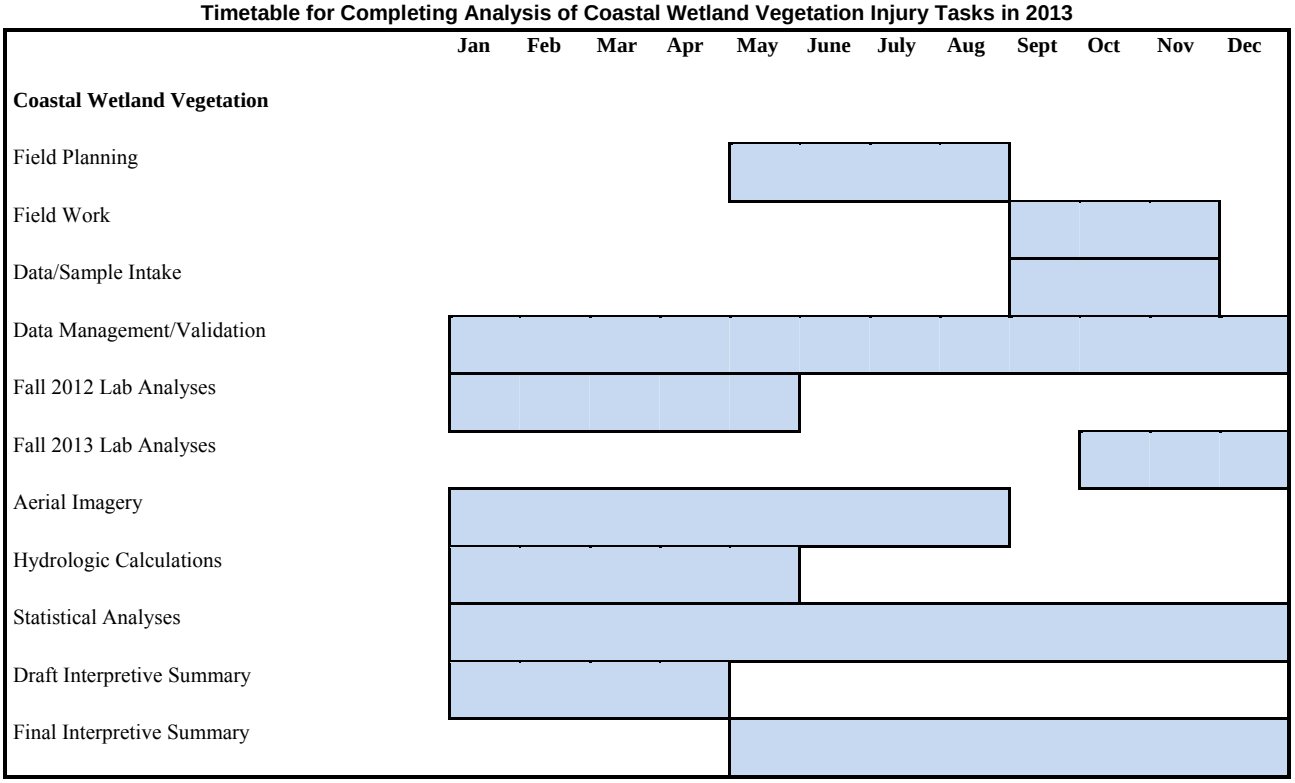
The total for this task also includes supplemental funds to begin hydrologic calculations of the coastal wetland vegetation sites in 2012. Funds will be used to acquire, validate, and process data and complete analysis products for up to 2 years of water level data at up to 24 locations within Louisiana's CRMS. NOAA CO-OPS will construct specialized tidal zoning based on existing CO-OPS data holdings and CRMS datasets, produce synthesized water level time series covering the DWH impact period, and analyze frequency and duration of inundation. The funding will support 1 contract equivalent and 0.4 FTE for this analysis.

PIs (NOAA and other)

The PIs for the coastal wetland vegetation study are Drs. Mark Hester and Jonathan Willis, both of the University of Louisiana at Lafayette.

Timetable

Timetable for Completing Analysis of Coastal Wetland Vegetation Injury Tasks in 2013



The first quarter of 2013 will be primarily focused on data analyses, including lab analyses of fall 2012 data, hydrologic calculations, and statistical analyses, and data validation efforts. In addition to these data tasks, an initial version of an interpretive summary will be drafted. All of these tasks will extend into the second quarter with data management and statistical analyses lasting the entire year. Also in the second quarter, field planning will begin and the preparation of a final interpretive summary will commence. In the third quarter of 2013, field work and data/sample intake for the fall 2013 sampling season will take place. The fourth quarter of the year will see lab analyses of fall 2013 samples as the expected completion of the final interpretive summary.

RP Involvement

The RP participated in the development of and is a signatory to the coastal wetland vegetation plan and its associated addenda (for Mississippi/Alabama and response cleanup site sampling). (Note that though the Mississippi/Alabama addendum has been signed by all parties, it is currently in the process of being made publicly available.) They also provided field staff for these sampling efforts. The addendum for the fall 2012 field effort has not been signed by the RP. The RP actively participates in the monthly Shoreline TWG RP-Trustee calls to discuss the status of data collection and laboratory analysis activities, as well as future assessment activities.

The Shoreline TWG has shared data generated from the coastal wetland vegetation study with the RP. Observational data has been entered in a shared web-based database within weeks of data collection. (RP field representatives have access to copies of the completed datasheets on the day of data collection.) NOAA expects to work cooperatively with the RP on the process to validate observational data. Laboratory data are shared upon receipt following third-party data validation.

The RP participated in the development of the aerial imagery work plan and has participated in the development and is a signatory to the *Technical Specifications and Scope of Work for Aerial Imagery Acquisition and the Low Altitude Aerial Photography of the Seagrass Beds of Southeastern Louisiana and Coastal Mississippi* (undertaken as part of the Mississippi Canyon 252 Incident Submerged Aquatic Vegetation Tier 2 Pre-Assessment). The RP and Trustees participated in nightly calls during imagery acquisition and in the review of the initial data for quality and correspondence with the imagery and flight specifications. The RP actively participates in the monthly Aerial Imagery TWG RP-Trustee calls and periodic meetings to discuss the status of data collection activities and data distribution.

Responsible party involvement is not envisioned for data analysis/interpretation or report development.

Completing Analysis of Coastal Wetland Faunal Injury

The potential effects of oiling on fiddler crabs and marsh periwinkles will be used to represent effects on secondary production more broadly in salt marsh communities and will complement the assessment of effects on vegetation. The fiddler crab and marsh periwinkle are good indicator species because of their abundance, importance to the marsh community and food web, and sensitivity to oil.

Under the work plan *Work Plan for MC252 Oil Impacts to Fiddler Crabs and Periwinkles along the Gulf of Mexico*, faunal data were collected in fall 2011 at 41 herbaceous salt marsh sites along the Louisiana coast. Sites included unoiled and heavily oiled locations adjacent to established coastal wetland vegetation sites. In addition to these two oiling categories, a third category included sites that were previously heavily oiled but were cleaned up under the DWH response. At each of these sites, three zones were sampled at various distances from the marsh edge (edge, middle, and furthest inland, with the further inland zone located just outside the region of observed oiling). At each zone, field observations and measurement data were collected. More than 100 types of data were collected for each zone, resulting in more than 60,000 individual data elements. Field collection methods were based on standard methods published in peer-reviewed journals. Planned field sampling in fall 2012 (for which NPFC Phase 1 funds were received) will not be conducted. Data from the fall 2011 sampling will be interpreted in combination with the results of laboratory toxicity testing and several non-NRDA studies.

Analysis of coastal wetland faunal data collected in fall 2011 is underway, and a data report will be produced by the end of 2012 (using funds from the NPFC Phase 1 claim). Fiddler crabs and marsh periwinkles are typically considered good indicators of coastal wetland faunal health, and injury to these two taxa (as indicated by a comparison to unoiled areas) will be used to represent injury to the broader coastal wetland faunal community, particularly invertebrates. Results from the clean-up areas require further data interpretation, but a full evaluation of these results may provide insight into the faunal effects of the clean-up actions.

Additional funds are required to develop an interpretive report, which will build off the data report, incorporate the results of other studies, and provide conclusions about injury to coastal wetland fauna. Fiddler crab toxicity testing is being conducted in 2012 using NPFC Phase 1 funds provided as part of the NRDA toxicity testing activity. The focus of these tests is to investigate the lethal and sublethal effects of oil on fiddler crabs, both from the chemical toxicity of the oil as well as from physical smothering of the oil. Treatments will be related to field exposure conditions, and injury will be spatially quantified using the shoreline oil exposure map. In addition to the toxicity studies, several non-NRDA studies have identified injury from DWH oil to coastal wetland fauna, including fiddler crabs and marsh periwinkles. These studies fill important gaps in our understanding of effects to coastal wetland fauna in the months following the spill (a time for which we do not have NRDA data for this resource) or for locations or oiling conditions not studied under the NRDA. Funds will be used to integrate and interpret the results of these non-NRDA studies to develop a more comprehensive assessment.

Statistical analyses to date, which have been limited to the fall 2011 NRDA data, have focused on assessing adverse impacts to fiddler crabs and marsh periwinkles in oiled areas and clean-up sites compared to unoiled areas. Metrics evaluated have included measures of size, abundance, sex ratios, and species composition, and statistical evaluations have been descriptive and univariate in nature. Going forward, results of non-NRDA studies may be analyzed using similar statistical methods, as appropriate to each individual study. Injury will generally be determined based on a comparison to unoiled locations; however, for some non-NRDA studies, a comparison to pre-spill conditions may be appropriate. Findings from non-NRDA and non-DWH spills will be considered when making assumptions about recovery trajectories. Toxicity test results will be applied to the injury quantification as described above.

The degree and spatial extent of injuries to coastal wetland fauna over time will be used in conjunction with the coastal wetland vegetation injury assessment to determine restoration projects of sufficient magnitude to compensate for lost ecological services.

Connection to NRDA Process

Under this activity, we will document and describe injury to coastal wetland biota using the methods described above. Funds are needed to finalize ongoing data analyses and to develop an interpretive report that incorporates non-NRDA and toxicity results and presents conclusions on the degree and spatial extent of injury to coastal wetland fauna over time as a result of the MC252 oil. The report will be used to determine injury in herbaceous salt marshes, which will inform the determination of restoration needed to compensate for this loss.

Sample/Data Handling

This effort integrates injury data collected during prior NRDA and non-NRDA activities. Data management activities required to manage, statistically analyze, and map data are described here.

Observation data acquired through the cooperative fiddler crab / periwinkle work plan were collected through methods defined in jointly signed protocols. These data are being organized and QA/QC administered by NOAA under strictly defined joint protocols. These data are maintained by NOAA and will be distributed to Trustee representatives through NRDA and cooperative databases. Activities to

manage the data are undertaken by Industrial Economics, Incorporated's (IEc's) data management team and include:

- Maintenance of the original field data in secure data repositories (e.g., NOAANRDA.ORG, ERMA), including associated server, data transfer, and storage space costs
- Maintenance of and training in data retrieval/sharing websites to ensure Trustee-wide access to data while maintaining associated metadata (e.g., data history/change logs)
- Regular participation in TWG calls to provide consultation on the above matters

To facilitate the validation of visual observation data, data management activities include participating in 1) TWG-wide coordination activities (e.g., promote standard validation approaches) as well as 2) the incorporation of changes (e.g., transcription verification and data validation changes) into the NOAA data repositories to promote Trustee-wide analysis of a consistent data product.

As raw field data are validated and finalized, IEc's data management team's data support activities will also extend to the sharing of these results with the public. Data support activities will include the packaging, organization, and release of each data product along with associated metadata. Associated data storage and transfer costs as well as response to public inquiries are incorporated. Furthermore, the files associated with interim and final products generated through the processing and analysis of field and other collected data will be managed and shared in the NOAA data repositories to promote Trustee-wide data access.

Data from relevant non-NRDA studies will be obtained from the study PIs and imported into a database. Appropriate data manipulation and statistical analyses will be specific to each study but are described in general terms above. Data manipulation and statistics will be performed by data analysts and statisticians at NewFields, in consultation with the coastal wetland fauna PIs. Injury will be spatially quantified based on oiling conditions and using the shoreline oiling geodatabase. Spatial quantification will be performed by or in consultation with Zach Nixon of RPI, the chief PI for the shoreline oiling geodatabase.

Data/Deliverables Produced

Deliverables for this effort include draft and final interpretive reports summarizing injury to shoreline resources. The interpretive report will document methods, summarize observational data from the fall 2011 survey for all key metrics, contain plots and figures showing data distributions, present statistical analyses comparing oiled and clean-up sites to unoiled sites, and provide interpretations and conclusions about injury. It will also interpret the fall 2011 coastal wetland faunal study results in the context of the laboratory toxicity results and relevant non-NRDA studies.

Level of Effort

Our request for the coastal wetland faunal activity is $920,876 in contract funds. These costs include 0.2 agency FTEs and 2.6 contract equivalents. Key personnel include study PIs, statisticians and data analysts, agency and contract scientists, and agency and IEc data management teams.

The majority of the data manipulation and statistical analysis will be conducted by high-level statisticians and data analysts at NewFields, with agency scientists providing guidance and oversight and managing

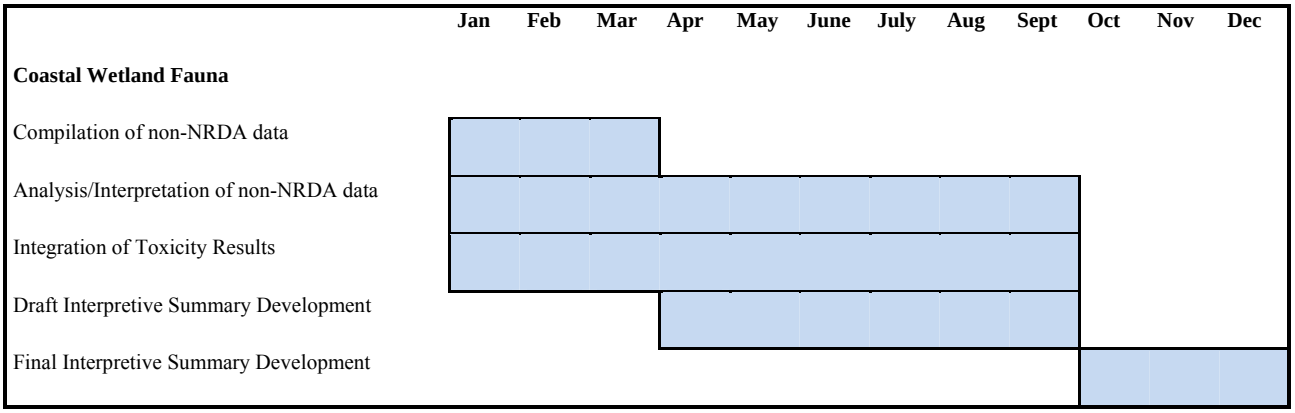
communication with Trustees and the RP. Dr. Shahrokh Rouhani of NewFields is providing expert statistical support for the study. Marla Steinhoff of NOAA will provide oversight of the activity and coordination with other NRDA and non-NRDA entities who will supply data and analyses in support of the evaluation. Contractors, including the study's PIs, expert statisticians, and data analysts will collaborate on statistical analyses, interpretation of the results of the coastal wetland faunal studies, and production of an interpretive report. The interpretive report will largely be written by Dr. Scott Zengel of Atkins North America and Dr. Clay Montague, Professor Emeritus of the University of Florida, Gainesville. IEc will assist in literature reviews and report development. Contractors and agency staff will also work closely with the toxicity testing PIs and non-NRDA PIs to understand their results in order to integrate them into the coastal wetland faunal injury assessment. The statisticians and PIs will regularly communicate with the Trustees and attend and present at analysis-focused meetings.

PIs (NOAA and other)

The PIs for the coastal wetland faunal study are Dr. Scott Zengel of Atkins North America and Dr. Clay Montague, Professor Emeritus of the University of Florida, Gainesville.

Timetable

Timetable for Completing Analysis of Coastal Wetland Fauna Injury Tasks in 2013



In the first quarter of 2013, a significant level of effort will focus on collecting relevant non-NRDA data, conducting analyses of the data, and interpreting results in the context of the injury assessment. In the first quarter, we will also interpret the toxicity results in the context of the fall 2011 data and the shoreline oiling geodatabase. An outline for the report text will be developed based on the initial data interpretation and analysis. In the second quarter, data interpretation will continue, and report writing will commence. In the third quarter, data interpretation/analysis will be completed along with a draft interpretive report, and internal review of the draft report will begin. In the fourth quarter, the report text will be finalized.

RP Involvement

The RP participated in the development of the coastal wetland faunal plan and is a signatory to the plan. They also provided field staff for the fall 2011 sampling effort. The RP actively participates in the monthly Shoreline TWG RP-Trustee calls to discuss the status of data collection and laboratory analysis

activities, as well as future assessment activities. The focus of the more recent meeting was on the status of field studies and associated work plans, plans for additional field efforts, and the status of data, including QA/QC of the data.

The Shoreline TWG has shared data generated from the coastal wetland faunal study with the RP. Observational data were entered in a shared web-based database within weeks of data collection (and the RP field representatives had access to copies of the completed datasheets on the day of data collection). The Shoreline Trustees and the RP plan to cooperatively validate the fall 2011 data in the second half of fall 2012, using NPFC Phase 1 funds.

Responsible party involvement is not envisioned for data analysis/interpretation or report development.

Completing Analysis of Coastal Wetland Erosion

Loss of substrate and structure of wetland habitat is an important component of the injury assessment for coastal wetlands. Vegetation stabilizes soil and helps minimize loss due to waves and wind. Loss of vegetation along the marsh edge due to oiling may render areas vulnerable to erosion. Accelerated erosion due to oiling is of significant concern in light of current loss of wetlands in Louisiana. The Shoreline TWG has coastal wetland vegetation sites across Louisiana, Mississippi, and Alabama. In Louisiana, sites were established in fall 2010. In subsequent resampling in 2011, site erosion was documented. Therefore, Trustees are interested in determining erosion as another component of shoreline injury.

A variety of data has been collected to evaluate potential erosion. These various datasets provide complementary information that could be used to determine whether coastal wetlands are experiencing land loss due to oiling. Additional historical erosion data will need to be collected, synthesized, interpreted and analyzed. Potential erosion due to oiling will be evaluated relative to historical erosion rates and unoiled areas. A conceptual model will be developed to explain shoreline change rates. This activity will culminate in a data assessment and analysis product detailing findings. This product will incorporate information from the draft data report developed by the end of 2012 (using NPFC Phase 1 funds).

A large portion of the data compilation and analysis will be conducted by contract staff, with input from Trustees. NOAA, USGS, and contract experts in coastal geology, coastal wetland systems, and NRDA will participate in the marsh erosion investigation. The contract technical lead will regularly communicate with the Trustees and lead shoreline change assessment calls and in-person meetings. The funding will support the contract technical lead for the analysis, including travel for participation in technical meetings. It will also fund technical assistance from USGS and contract statistical support from NewFields.

The following tasks will be completed in 2012 with NPFC Phase 1 and addition Phase 2 funding:

- Assess any previous and ongoing studies or data addressing shoreline change. These studies will inform the range of background rate of shoreline change and indicate quality of datasets. An assessment is needed of previous and ongoing studies regarding deterioration of marshes that may cause enhanced shoreline retreat. Non-NRDA studies involving soil strength changes will also be

assessed. This information will aid in the development of a conceptual model explaining how shoreline oiling may be expected to cause enhanced shoreline retreat.

- Compile and evaluate existing datasets and determine method for shoreline change analysis. Remote sensing and ground survey datasets will be evaluated, and the most appropriate approach for measuring shoreline change and attributing causes will be selected. The best methods for preparing datasets and extracting shoreline positions from pre and post-oil impact periods will also be determined.
- Extract shoreline positions and measure change for three select areas using remote sensing datasets. Initially, rate of shoreline change will be calculated from time series of shoreline positions for three areas that represent a range of oiling, exposure, and background rates of change. A comparison of change from ground surveys and remote sensing datasets will be made. Depending on suitability of historical aerial photography or the availability of previous scientific studies, a comparison of change rates from pre-impact periods will be made. This comparison is needed to better understand the causes and patterns of shoreline change. Results from these pilot areas will inform the approach for determining rates of change and attributing causes in other areas.
- Draft a data report outlining the methodology and evaluation of the three pilot areas for Trustee review.
- Additional funding is required in the Phase 2 request for the evaluation of historical datasets, drafting the data report, technical support from USGS, and statistical support for the evaluation of the three pilot areas.

In 2013, we will build upon work completed in 2012. A conceptual model explaining shoreline change rates will be developed based on the pilot area work. Prior scientific studies and data from NRDA and non-NRDA studies, such as the Shoreline TWG's coastal wetland vegetation study, will be used to explain the pattern of shoreline change. Using the conceptual model, other areas will be analyzed for shoreline change. A data assessment and analysis product will be developed that outlines the approach, data utilized, and conclusions.

Connection of Activities to NRDA Process

This assessment is a component of the injury assessment for coastal wetland vegetation and associated fauna. The degree and spatial extent of coastal erosion over time will be used to inform the extent of restoration needed to compensate for injuries.

Sample/Data Handling

This effort integrates several key datasets previously collected by NRDA activities. No new data will be collected under this activity. The following describes several key datasets previously collected under the NRDA and funded by the RP to evaluate potential erosion due to oiling. Real Time Kinematic (RTK) elevation surveys were conducted in association with 150 Louisiana coastal wetland vegetation sites. The RTK surveys provide horizontal and vertical coordinate data along a specified transect. These data characterize geomorphology and the elevation of substrate and coastal wetland vegetation at specific sites. Repeated surveys provide data on topographic changes at the coastal wetland vegetation edge. The first

survey was conducted November 2010 through June 2011. These sites were resurveyed in April through May 2012. LiDAR data were acquired in spring of 2011 in oiled and reference areas in Louisiana. The LiDAR data allow for the mapping of elevation and shoreline position continuously along impacted and reference shorelines. In addition, the RP funded acquisition of aerial imagery, which is suitable for shoreline mapping and change analysis, during the fall of 2010, fall of 2011, and spring of 2012. This imagery is available via the Aerial Imagery TWG. The USGS holds historical aerial photography datasets, which after digital scanning and georeferencing, could provide shoreline positions for determining background rates of shoreline change. These datasets and others will be considered in the analysis.

Data management activities required to manage these data are described here. Data acquired through the cooperative work plans outlined above were collected through methods defined in the plans' protocols. These data are being organized and QA/QC administered by NOAA under strictly defined joint protocols. Additionally, these data are maintained by NOAA and will be distributed to Trustee representatives through NRDA and cooperative databases. Associated activities to manage the data include:

- Maintenance of the original field data as well as associated analytical results in secure data repositories (e.g., NOAANRDA.ORG, ERMA), including associated server, data transfer and storage space costs.
- Maintenance of and training in data retrieval/sharing websites to ensure Trustee-wide access to data while maintaining associated metadata (e.g., data history / change logs).
- Storage and tracking of external hard drives to manage large files
- Regular participation in TWG calls to provide consultation on the above matters.

As raw field data are finalized, data support activities will also extend to the sharing of these results with the public. Data support activities will include the packaging, organization, and release of each data product along with associated metadata. Associated data storage and transfer costs as well as response to public inquiries are incorporated. Furthermore, the files associated with interim and final products generated through the processing and analysis of field and other collected data will be managed and shared in the NOAA data repositories to promote Trustee-wide data access.

Data/Deliverables Produced

NOAA is requesting funding to analyze the datasets described above and to characterize historical erosion rates through the analysis of earlier aerial photography and studies in the scientific literature. The product is a data assessment and analysis that will include shoreline positions as a derived product from existing datasets. No new data acquisition is included.

Level of Effort

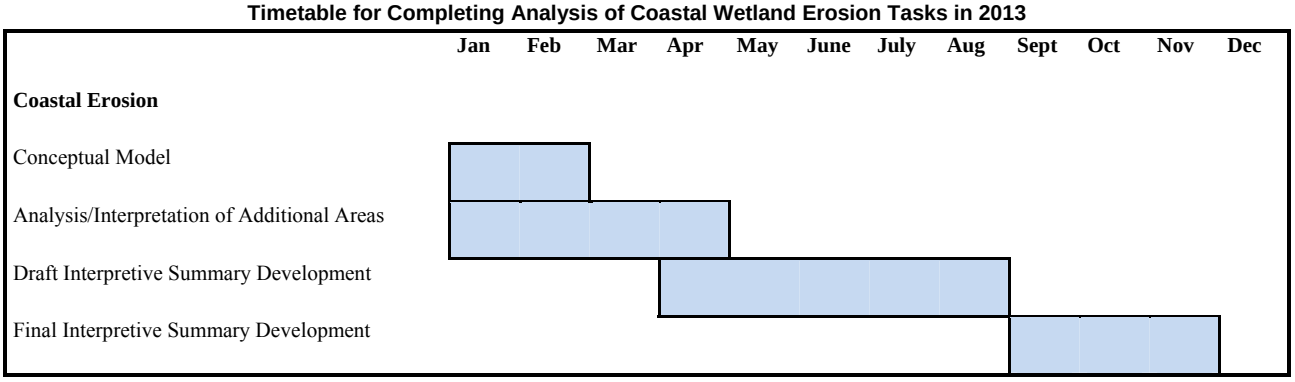
Our request for the coastal wetland erosion activity is $311,124 in contract funds. These costs include 0.2 agency FTEs and 1.0 contract equivalent. Key personnel include the study PI and his staff, agency scientists, and IEc and agency data management teams.

PIs (including NOAA)

Dr. James Gibeaut, a coastal geologist and shoreline change expert from Texas A&M University - Corpus Christi, is the PI for this activity.

Timetable

Timetable for Completing Analysis of Coastal Wetland Erosion Tasks in 2013



The primary focus of the first quarter of 2013 will be the development of the conceptual model and the analysis and interpretation of additional areas employing the conceptual model. These activities are predicted to end in the first and second quarters, respectively. The development of a draft interpretive summary will commence in the second quarter of 2013 with the final interpretive summary beginning in the third quarter and reaching completion in the fourth quarter of the year.

RP Involvement

The RP participated in the development of the LiDAR acquisition plan and both RTK acquisitions. The first RTK survey (fall 2010 – spring 2011) was a component of the coastal wetland vegetation study. The second RTK survey in 2012 was an addendum to the coastal wetland vegetation study.

The RP participated in the development of the aerial imagery work plan and has participated in the development and is a signatory to the *Technical Specifications and Scope of Work for Aerial Imagery Acquisition, and the Low Altitude Aerial Photography of the Seagrass Beds of Southeastern Louisiana and Coastal Mississippi* (undertaken as part of the Mississippi Canyon 252 Incident Submerged Aquatic Vegetation Tier 2 Pre-Assessment). The RP and Trustees have participated in nightly calls during imagery acquisition and in the review of the initial data for quality and correspondence with the imagery and flight specifications. The RP actively participates in the monthly Aerial Imagery TWG RP-Trustee calls and periodic meetings to discuss the status of data collection activities and data distribution. The Aerial Imagery TWG has shared data generated from the aerial imagery flights, the Quick Look for 2010, and the low altitude flights oblique imagery with the RP in a timely manner. Trustees have not yet collaborated on assessment of coastal erosion with the RP.

I. Nearshore Sediment and Biota

Characterizing Nearshore Sediment Contamination

To determine the potential for injury to organisms in the nearshore zone, nearshore sediment contamination will be evaluated for 2010 and 2011. This activity documents and evaluates exposure and pathways for PAHs attributable to the incident and will be used as input for Activity I: Completing Analysis of Nearshore Benthic Injury and Activity L: Integration of Nearshore Exposure and Injury. Activities between April and December 2012 (funded under the NPFC Phase 1 claim) included developing initial maps of PAH concentrations in sediment across the entire affected area for 2010 and 2011. Maps for 2010 incorporate the analytical results of geographically relevant NRDA and Response sample collections. Maps for 2011 use data collected specifically for determining nearshore sediment concentrations based on geomorphological/observed oiling strata (see work plans for more details on strata). The maps and related analyses are also incorporating the shoreline oiling database and maps that are currently under development as well as forensic chemistry analyses.

Additional effort is required beyond that described in our NPFC Phase 1 request. The process we are using to generate the sediment contamination products is iterative. At the end of 2012, activities proposed in the NPFC Phase 1 request for 2012 are projected to be approximately 50% complete due to delays in chemical analysis and data validation. In addition (beyond the scope of tasks covered in the NPFC Phase 1 request), we will integrate additional datasets collected by other TWGs and non-NRDA studies. Additional funds are required for 2012 to begin these additional tasks. We will continue to refine our products through 2012 and finalize the products in 2013. The final products are integrative and will rely on finalized input from the shoreline oiling database and forensics efforts. Additionally, the final analysis will also require fully validated datasets. Validation, posting, and analysis of these additional datasets are ongoing and will continue into 2013 (and were not accounted for in the NPFC Phase 1 request).

Specific activities include:

- coordinating across technical working groups to gather relevant data
- validating data
- coordinating data reporting and posting
- integrating exposure information across resource categories for the nearshore zone
- summarizing interpretive results, including synthesis of statistical and geospatial analyses
- producing maps and tables describing nearshore sediment contamination concentrations in 2010 and 2011(including near SAV beds and oyster reefs)
- interpreting prior data to determine exposure concentrations for intertidal oysters, nearshore fish, and invertebrates
- determining areal extent of concentrations that exceed injury thresholds
- conducting peer review on approaches for characterizing and describing exposure

Connection to NRDA Process

This activity documents and describes pathways and exposure to nearshore habitats and biota by characterizing the nature and extent of sediment contamination. The nearshore sediment contaminant characterization is a critical product for the nearshore exposure assessment. The data will be used to relate injury to benthic fauna to oiled areas in the Gulf. Determining the spatial extent of exposure and injury will enable the determination of appropriate restoration projects to compensate for injury.

Sample/Data Handling

This effort integrates sediment chemistry data collected by prior Response, multiple NRDA work plans (particularly the 2010 and 2011 submerged oil characterization plans), and other activities. Results from approximately 1,200 sediment samples are available for 2010; the Trustees collected 5,443 sediment samples in 2011, and analysis of these samples is ongoing. Data management tasks required to compile, prepare, statistically analyze, map, and post data are included here. Data management activities will be undertaken primarily by Industrial Economics, Incorporated (IEc). WEST will be providing validation and QA/QC evaluations of the data.

Samples and associated data acquired through cooperative work plans were collected through methods defined in jointly signed protocols; samples and associated data acquired through non-cooperative work plans were collected through methods defined in the Trustee-approved protocols. These data are maintained by NOAA and will be distributed to Trustee representatives through NRDA and cooperative databases. Associated activities to manage the data include:

- Maintenance of the original field data as well as associated analytical results in secure data repositories (e.g., NOAANRDA.ORG, ERMA), including associated server, data transfer and storage space costs.
- Maintenance of and training in data retrieval/sharing websites to ensure Trustee-wide access to data while maintaining associated metadata (e.g., data history / change logs).
- Training for sample confirmation and results delivery to obtain all necessary documentation (e.g., lab/analytical standard operating procedures)
- Physical delivery of lab data to Trustee and RP representatives per data sharing agreement
- Regular participation in TWG calls to provide consultation on the above matters.

To facilitate the validation of visual observation data, data management activities include participating in 1) TWG-wide coordination activities (e.g., promote standard validation approaches) as well as 2) the incorporation of changes (e.g., transcription verification and data validation changes) into the NOAA data repositories to promote Trustee-wide analysis of a consistent data product.

In addition to the effort associated with physically analyzing samples collected previously, associated management of the process includes coordinating analytical activities; data tracking activities to provide status reports on analytical progress and data availability; third-party validation of lab results to ensure data is in proper format and meets quality standards; secondary QA/QC of field data prior to merging

with lab results; incorporation into repositories as final, validated products; forensic chemistry to identify source of contamination; and, spatial processing and loading into ERMA.

As raw field data are validated and finalized, data support activities will also extend to the sharing of these results with the public. Data support activities will include the packaging, organization, and release of each data product along with associated metadata. Associated data storage and transfer costs as well as response to public inquiries are incorporated. Furthermore, the files associated with interim and final products generated through the processing and analysis of field and other collected data will be managed and shared in the NOAA data repositories to promote Trustee-wide data access.

Data/Deliverables Produced

Deliverables for this effort include data summaries and syntheses, including relevant maps, tables, and figures. New data will not be collected; instead, existing datasets will be analyzed and integrated. Additional deliverables include final tables of validated data posted on public websites.

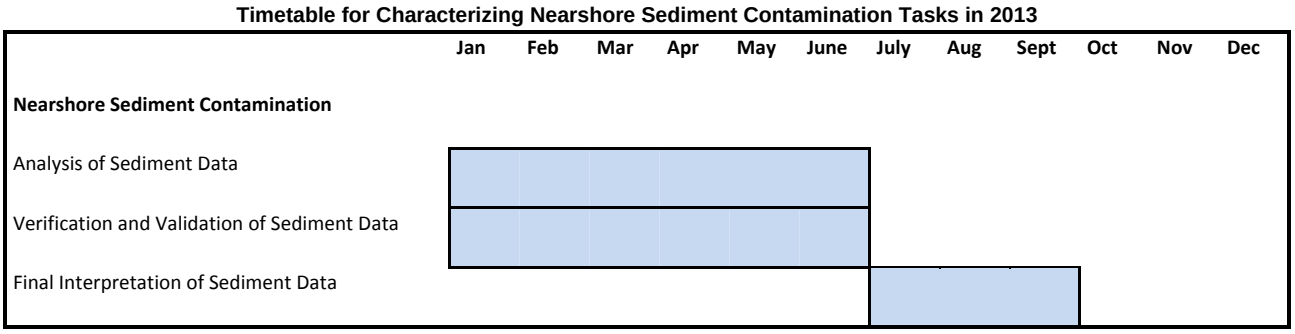
Level of Effort

Our request for the activity to characterize nearshore sediment contamination is $743,186 in contract funds. These costs include 0.6 agency FTEs and 2.6 contract equivalents. Key personnel include the study PIs and their staff, agency and contractor scientists, and agency and contractor data management teams. The majority of funds are for data management contractors to process and post final datasets. Additional major tasks are overseeing and coordinating the activity and analyses, coordination, producing a data summary/synthesis (to be completed by NOAA staff and IEc), and completing statistical analyses (to be performed by NewFields).

PIs (NOAA and other)

Ian Zelo of NOAA will provide oversight of the activity and coordination with other NRDA entities who will supply data and analyses in support of the evaluation. Shahrokh Rouhani of NewFields will conduct spatial and statistical analyses and contribute technical findings (data tables, maps, figures) and interpretations to the technical report.

Timetable



The first two quarters of 2013 will focus on the remaining analyses of sediment data and the verification and validation processes for these data. These tasks are expected to be complete by the end of the second quarter. The final interpretation of the sediment data is scheduled to commence and be completed within the third quarter of the year. All activities are anticipated to be finalized by the fourth quarter of 2013.

RP Involvement

Most of the sediment data to be used for this activity was collected cooperatively with the RP (as part of the 2010 and 2011 Submerged Oil Characterization Plans). We continue to engage the RP routinely as we complete analyses and work through the data validation process. We are actively engaged in jointly validating our sediment data from both 2010 and 2011.

Characterizing Nearshore Biota Contamination

Interpretation of nearshore biota chemistry will assist with interpreting the implications of nearshore biota contamination and will document exposure pathways to higher trophic level biota. This activity documents and evaluates biological exposure and pathways for PAHs attributable to the incident and will be used as input for Activity I: Completing Analysis of Nearshore Benthic Injury and Activity L: Integration of Nearshore Exposure and Injury. This is a new 2012 activity that will continue into 2013. Funds were not requested for this effort as part of the NPFC Phase 1 claim; thus, under the NPFC Phase 2 claim, funds are requested for both 2012 and 2013.

The activity includes summarizing and interpreting concentrations of contaminants in nearshore biota (to include oyster tissues, SAV-associated biota, marine mammal and turtle prey, marsh edge sandy shore samples, and non-NRDA samples). Results will be used to document the pathway connections between sediment and water PAH concentrations, and between prey and upper trophic level biota. Tissue concentrations will be collated and compared to sediment concentrations at co-located and synoptic stations through correlation and other statistical techniques. The sediment concentrations used for this activity are described in Activity I: Characterizing Nearshore Sediment Contamination. Field sampling activities to support this activity were completed previously or are described in other NPFC Phase 2

activities. The effort will use standardized methods to summarize and statistically compare results, including correlation analysis between sediment and biota PAH concentrations.

Specific activities include:

- Gathering and collating relevant tissue and sediment concentration data from other NRDA efforts (marsh edge sandy shore, marine mammal/turtle prey plan, SAV, and oyster plans)
- Gathering and collating relevant tissue and sediment concentration data from non-NRDA efforts
- Summarizing results in tables and maps
- Interpreting results for use in exposure and injury analyses (completing a draft and final report)

Connection to NRDA Process

This activity documents and describes exposure to nearshore biota and pathways to higher trophic levels. The data and analyses will be used as part of the benthic injury assessment to evaluate whether there are indications of biological uptake in addition to effects from sediment exposures. It will also be used to evaluate exposure pathways to turtles and marine mammals. Determining the spatial extent of exposure and injury will enable the determination of appropriate restoration projects to compensate for injury.

Sample/Data Handling

This effort integrates tissue chemistry data collected by prior response, NRDA, and other activities, particularly those collected as part of the marsh edge sandy shore sampling plan, submerged aquatic vegetation oil exposure plan, marine mammal and turtle prey plan, the 2012 oyster intertidal plan, the oyster sampling plan, the oyster transition plan, the spring 2011 oyster recruitment plan, and the 2012 oyster recruitment monitoring plan. Results from several hundred samples are or will be available for this analysis. Data management activities required to compile, prepare, statistically analyze, map, and post data will be led by Industrial Economics, Incorporated's (IEc's) data management team.

Data/Deliverables Produced

Deliverables for this effort include validated datasets and a draft and final interpretive report summarizing pathways and exposure to nearshore and shoreline resources. New data will not be collected; instead, existing datasets will be analyzed and integrated. The report will include documentation of purpose and methods, as well as data tables, maps, and figures illustrating and summarizing results, conclusions, and interpretations. Additional deliverables include final tables of validated data posted on public websites.

Level of Effort

Our request for the activity to characterize nearshore biota contamination is $69,600 in contract funds. These costs include 0.2 contract equivalents. Key personnel include IEc scientists and NewFields statisticians and data analysts, who will complete statistical analyses and produce interpretive reports

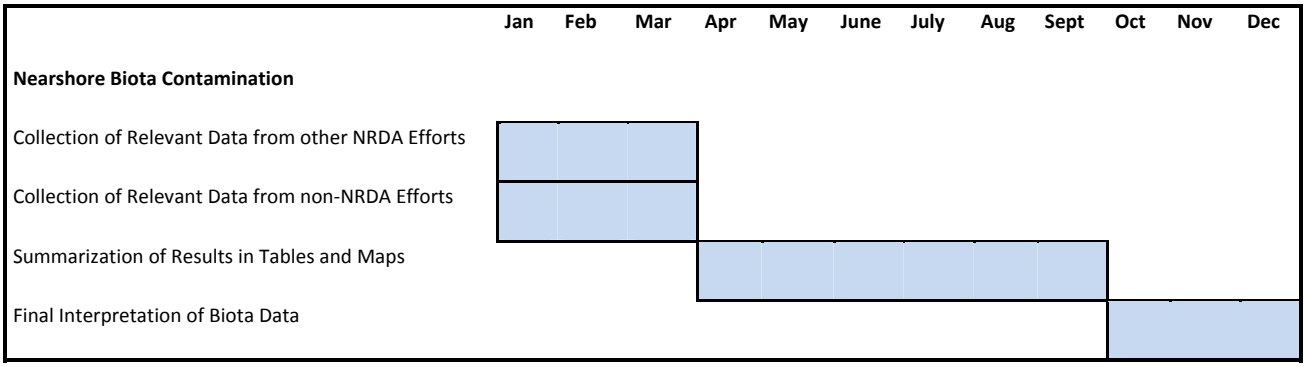
PIs (NOAA and other)

Ian Zelo of NOAA will provide oversight of the activity and coordination with other NRDA entities who will supply data and analyses in support of the evaluation.

Shahrokh Rouhani of NewFields will conduct spatial and statistical analyses and contribute technical findings (data tables, maps, figures) and interpretations to the interpretive reports.

Timetable

Timetable for Characterizing Nearshore Biota Tasks in 2013



The greatest level of effort during the first quarter of 2013 will be focused on the gathering and collecting of relevant tissue and sediment concentration from other NRDA efforts as well as from non-NRDA activities. The continuation of these tasks in 2013 follows their commencement in late 2012 (not shown on the timetable above). This data collection is expected to be complete by the beginning of the second quarter. The second and third quarters of 2013 will see a shift to focusing on summarizing results and producing relevant tables and maps. Final interpretation of the biota data will take place in the fourth quarter of the year.

RP Involvement

The RP was intensely involved in the collection of most of the underlying data, including the marsh edge sandy shore sampling plan, submerged aquatic vegetation oil exposure plan, the oyster sampling plan, and the oyster transition plan. We continue to engage the RP routinely as we complete analyses and work through the data validation process.

Completing Analysis of Nearshore Benthic Injury

This activity documents and evaluates injury from PAHs attributable to the Deepwater Horizon incident and will be used as input for Activity L: Integration of Nearshore Exposure and Injury. Activities between April and December 2012 (funded under the NPFC Phase 1 claim) include evaluating benthic injury associated with sediment PAH concentrations using a tiered approach. The first tier involves gathering and evaluating literature on toxicity of PAHs to key nearshore Gulf organisms to determine injury thresholds. Later tiers include applying results of laboratory toxicity testing of sediment to key organisms (see Activity N: Toxicity to Aquatic Organisms) to validate injury thresholds. Maps of sediment

concentrations which document exposure to PAHs (produced in Activity I: Characterizing Nearshore Sediment Contamination) will be interpreted to indicate spatial extent and magnitude of injury to benthic organisms in nearshore areas. Literature and previous studies of populations and communities of benthic organisms will be used as input for the assessment of injuries to benthic populations and communities. Relationships between sediment and biota PAH concentrations (documented in Activity I: Characterizing Nearshore Biota Contamination) will also be used as supplemental evidence of exposure of benthic organisms to incident-related contaminants. Additionally, interpretation of injury will also require fully validated datasets. Validation of these datasets is ongoing and will continue into 2013.

The tiered approach described above will expand and extend work proposed as part of our NPFC Phase 1 request into 2013. Activities proposed in the NPFC Phase 1 request for 2012 will be approximately 30% complete by December due to delays in toxicity testing and data validation and delivery. In 2012 we will complete the first tier literature reviews and begin on all the other work. A data report, which will form the basis of the interpretive report developed in 2013, will be completed in the latter half of 2012 and will continue to be refined as relevant toxicity work is completed and improved sediment contamination analyses become available. The assessment will also expand geographically as our methods become more refined. A new task for 2013 will be to conduct a peer review of the approaches and methods used to evaluate injury to nearshore benthic organisms.

Additional 2013 tasks for this activity include coordinating across technical working groups and integrating exposure and injury information across resource categories for the nearshore zone. Specific activities include coordination of data reporting and summarizing interpretive results, including synthesis of statistical and geospatial analyses. The outcome of this effort is quantification of injury across the entire affected area in the nearshore while addressing key variability factors including region, habitat, species, and level of contamination.

Connection to NRDA Process

This activity documents and connects exposure, pathway and injury to nearshore benthic species. The injury evaluation will apply the exposure documentation from Activity I: Characterizing Nearshore Sediment Contamination to relate injury to benthic fauna to oiled areas in the Gulf. The data and analyses from Activity I: Characterizing Nearshore Biota Contamination will also be used as part of the benthic injury assessment to evaluate whether there are indications of biological uptake in addition to effects from sediment exposures. Information developed under this activity will be used as input for Activity L: Integration of Nearshore Exposure and Injury, which will integrate nearshore benthic injury with other nearshore injury categories. Injury determination and quantification is a critical step in the NRDA process. Determining the spatial extent of injury will enable the determination of appropriate restoration projects to compensate for lost services.

Sample/Data Handling

This effort integrates sediment chemistry data and laboratory toxicity data collected by prior Response, NRDA, and other activities. More than 6,600 samples were analyzed for sediment chemistry and toxicity tests were performed on more than five species. This activity does not collect additional data. We will use field-collected sediment data, literature-based sediment concentration benchmarks for injury, and incident-specific toxicity thresholds to quantify injury to nearshore organisms from contaminated

sediments considering multiple scenarios to address factors influencing natural variability in benthic populations. Data management tasks required to compile, prepare, statistically analyze, map, and post data and results are described here. Industrial Economic, Incorporated (IEc) will be primarily responsible for data management activities. WEST will conduct QA/QC evaluations of the data from non-chemical analyses.

Samples and associated data acquired through cooperative work plans were collected through methods defined in jointly signed protocols; samples and associated data acquired through non-cooperative work plans were collected through methods defined in the Trustee-approved protocols. These data are maintained by NOAA and will be distributed to Trustee representatives through NRDA and cooperative databases. Associated activities to manage the data include:

- Maintenance of the original field data as well as associated analytical results in secure data repositories (e.g., NOAANRDA.ORG, ERMA), including associated server, data transfer and storage space costs.
- Maintenance of and training in data retrieval/sharing websites to ensure Trustee-wide access to data while maintaining associated metadata (e.g., data history / change logs).
- Physical delivery of lab data to Trustee and RP representatives per data sharing agreement
- Regular participation in TWG calls to provide consultation on the above matters.

To facilitate the validation of visual observation data, particularly that collected as part of the marsh edge sandy shore sampling plan, data management activities include participating in 1) TWG-wide coordination activities (e.g., promote standard validation approaches) as well as 2) the incorporation of changes (e.g., transcription verification and data validation changes) into the NOAA data repositories to promote Trustee-wide analysis of a consistent data product.

In addition to the effort associated with physically analyzing samples collected previously, associated management of the process includes coordinating analytical activities; data tracking activities to provide status reports on analytical progress and data availability; third-party validation of lab results to ensure data is in proper format and meets quality standards; secondary QA/QC of field data prior to merging with lab results; incorporation into repositories as final, validated products; forensic chemistry to identify source of contamination; and, spatial processing and loading into ERMA.

As raw field data are validated and finalized, data support activities will also extend to the sharing of these results with the public. Data support activities will include the packaging, organization, and release of each data product along with associated metadata. Associated data storage and transfer costs as well as response to public inquiries are incorporated. Furthermore, the files associated with interim and final products generated through the processing and analysis of field and other collected data will be managed and shared in the NOAA data repositories to promote Trustee-wide data access.

Data/Deliverables Produced

Deliverables for this effort include a draft and final interpretive report summarizing pathway, exposure, and injury to nearshore benthic species. New data will not be collected; instead, existing datasets will be analyzed and integrated. The report will include documentation of purpose and methods, as well as data

tables, maps, and figures illustrating and summarizing results, conclusions, and interpretations. Additional deliverables include final tables of validated data posted on public websites.

Level of Effort

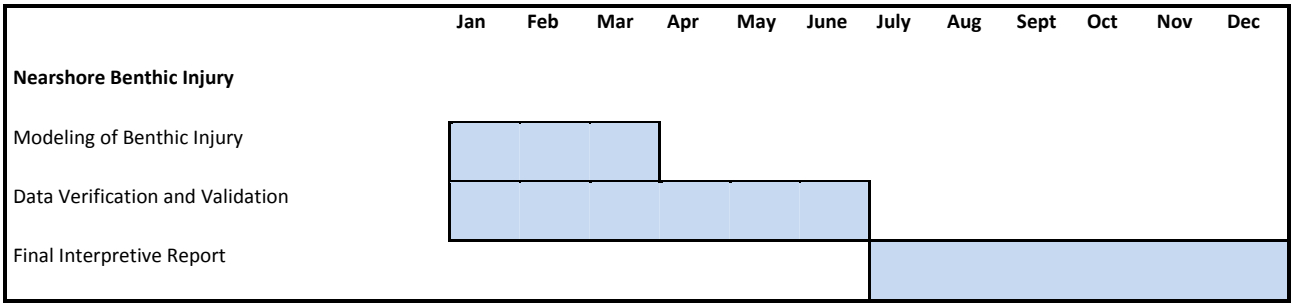
Our request for the activity to complete analysis of nearshore benthic injury is $924,555 in contract funds. These costs include 0.6 agency FTEs and 3.2 contract equivalents. Key personnel include the study PI and his staff, agency and contractor scientists, and IEc and agency data management teams. The majority of funds is for data management contractors to process and post final datasets. An additional major task is to conduct interpretive technical analyses, a task that will be completed by DISL. Additional funds are for overseeing and coordinating the activity and analyses, coordination, producing an interpretive report (to be completed by NOAA staff and IEc), statistical exploration and analysis (to be completed by NewFields), and validation of non-chemical analyses (to be completed by WEST).

PIs (NOAA and other)

Sean Powers of DISL will complete technical analyses and complete draft and final reports. Ian Zelo of NOAA will provide oversight of the activity and coordination with other NRDA entities who will supply data and analyses in support of the evaluation. Shahrokh Rouhani of NewFields will conduct spatial and statistical analyses and contribute technical findings (data tables, maps, figures) and interpretations to the interpretive reports.

Timetable

Timetable for Completing Analysis of Nearshore Benthic Injury Tasks in 2013



Following the completion of chemical analysis of marsh edge sandy shore biota samples in 2012 (funded under the NPFC Phase 1 request and not shown in timetable above), the primary focus of the first quarter of 2013 will be on modeling benthic injury. This task is expected to reach completion by the end of the first quarter. Also commencing in the first quarter of 2013 will be the verification and validation processes of marsh edge sandy shore biota data, a task that will reach completion by the end of the second quarter. The development of the final interpretive report will take place during the third and fourth quarters of the year.

RP Involvement

The Responsible Party participated in the collection of underlying data (for example, the 2010 and 2011 submerged oil characterization plans, marsh edge sandy shore sampling plan, submerged aquatic

vegetation oil exposure plan, oyster sampling plan, and the oyster transition plan). We expect to continue to collaborate with RP representatives in the determination of final datasets to consider and apply as part of this activity.

J. Oysters

Completing Analysis of Subtidal Oyster Injury (Abundance and Biomass)

At field sites across the Gulf Coast, NOAA is participating in injury assessment activities centered on measuring oyster abundance and biomass, assessing the reproductive condition of oysters, and estimating the recruitment of oyster larvae to oyster reefs throughout the portion of the coast affected by oil from the Deepwater Horizon Incident and in unoiled areas to determine reference conditions. Oyster sampling occurs in areas with varying levels of oiling, including areas that were also affected by low salinities because of the openings of the freshwater diversion structures in 2010 and the Bonnet Carré and Morganza spillways in 2011. Sampling conducted by NOAA and its contractors throughout 2011 reinforced NOAA's concern that both spat settlement and abundance of live seed and market oysters in subtidal oyster reefs remain low in areas throughout much of the Gulf 18 months or more following the Incident. NOAA and co-Trustees are beginning NPFC Phase 1-funded monitoring efforts in 2012 to assess potential recovery of the oyster resource, through the use of quadrat sampling and settlement plates. Because NOAA continues to observe both low abundances of juvenile and adult oysters in Gulf areas affected by the Incident and impairment to oyster reproduction as evidenced by low to zero recruitment of oyster larvae over a wide portion of the Gulf, we expect that recovery of the oyster resource may take several years. As a result, NOAA believes further monitoring of subtidal oysters in 2013 will be necessary to allow Trustees to quantify the degree of injury and the temporal and spatial extent of diminished oyster resources. Evidence obtained from these studies is needed to refine the Trustees' understanding of the recovery trajectory for oyster resources injured as a result of the Incident, which is a critical component in the quantification of the oyster injury. The tasks that will be undertaken to complete the field work and analysis of subtidal oyster abundance and biomass are described in this section. Descriptions of subtidal oyster recruitment assessment work, intertidal oyster assessment work, and work necessary to integrate the results of the separate oyster assessment studies into a conceptual model that can be used to quantify the overall injury to oyster resources and the loss of ecological services that resulted from that injury, are discussed in Activities: Completing Analysis of Subtidal Oyster Injury - Recruitment, Completing Analysis of Intertidal Oyster Injury, and Comprehensive Integration of Oyster Injury Assessment Elements.

Under this activity, we will continue to monitor abundance, biomass, and oyster mortality levels in 2013 for spat, seed, and market-sized oysters in sub-tidal nearshore habitats in Louisiana, Mississippi, Alabama, and Florida. We will also continue efforts to validate and analyze abundance, biomass, and mortality data from past field efforts. Past data, newly collected data, and 2013 monitoring results will be integrated into models of exposure and injury to subtidal oyster resources. All efforts described below represent work supplemental to the efforts included in NOAA's NPFC Phase 1 claim.

In 2010, a large number of stations (roughly half) indicated low to very low abundance of market-size, spat-size, and seed-size oysters, particularly at the stations in upper Barataria Bay, Breton Sound, Mississippi Sound, and Mobile Bay. These areas had recently dead oysters present. In 2011, a greater number of stations indicated low to very low abundance in Louisiana, Mississippi, and Alabama, and recently dead oysters were only observed in a limited number of stations. Initial analysis of larval settlement patterns (see Activity: Completing Analysis of Subtidal Oyster Injury - Recruitment) shows widespread recruitment failure in 2010 and 2011.

Recent analysis of preliminary quadrat-based abundance results from 2010 and 2011 shows a decrease in oyster abundances between late summer/early fall 2010 and fall 2011. Decreased preliminary dredge abundances from spring 2011 also appear to support a decline from low 2010 levels. The almost total lack of new recruitment in most of the areas potentially affected by the Incident signals the possibility of continued decreases in oyster abundance that could be seen for many years. Continued monitoring of oyster abundance and biomass provides critical information on whether oyster populations are facing longer term injury and a potential failure to fully recover to baseline levels.

Thus, although we have yet to collect the abundance monitoring samples for 2012, the NOAA team believes strongly that continued monitoring of abundance and biomass is also warranted in 2013. Continued monitoring of adult, spat, and seed oysters will bolster the Trustees' ability to assess and understand the temporal extent of injury and the recovery trajectory of the adult and juvenile oyster resources injured by the Incident. This understanding is a critical component in the quantification of the oyster injury and is absolutely necessary to inform a determination of restoration needed to compensate for injuries.

Furthermore, the counts in 2011 were lower than NOAA had anticipated when planning for the 2012 abundance monitoring effort in the 2012 NPFC budget, which proposed sampling half of the subtidal sites previously sampled for abundance and biomass. Analysis of these lower abundance values suggests that monitoring abundance at all 2011 sites is needed to supply sufficient statistical power to detect significant differences in abundance from these low starting values. Thus, we are proposing in 2013 to increase our monitoring to all sites sampled in 2011 for abundance and biomass; doing so will greatly increase the sensitivity of monitoring effort to detect signs of potential recovery of oyster resources.

Additional field work will be focused on developing a percent cover estimate of oyster abundance to support subtidal oyster injury determination. The NOAA team is proposing to conduct additional reconnaissance of oyster resource in a subsample of sites in two sample strata: targeting areas of higher likelihood of the presence of oyster resource (based on consultation with state Trustee experts); and targeting sites where physical and water quality conditions (e.g., depth, salinity) are suitable to support subtidal oyster resource, and which may have been affected by the Incident, but which have not been previously studied to assess percent cover of oyster reef. Determining the amount of oyster reef within a representative random sample of potential oyster resource areas is a very important component of injury quantification, as it is used to estimate a percent cover of oysters for specific sample strata that can then be used to synoptically extend abundance and biomass injury measurements over all similar potentially affected oyster habitats for quantifying injury. Key areas to be targeted by the reconnaissance effort are areas in Louisiana which are expected to have higher oyster coverage than other locations (many private oyster leases and public oyster seed grounds are located within this zone) and unstudied potential resource

areas, for which little is known about percent cover. It should be noted that while damage to private oyster leases might be recoverable, in part, as a third-party claim, the loss of ecological services from oysters on private leases is a public loss recoverable under OPA.

Proposed non-field activities include in-depth analysis of the freshwater exposures, water quality modeling in the 2010 freshwater diversion areas and 2011 spillway areas, and extensive modeling of subtidal oyster survival based on historic annual Louisiana data from Nestier Tray data in the freshwater diversion areas. The many years of Nestier tray data will allow us to model oyster mortality as a function of salinity, temperature and other important factors, which will be important to be able to identify impacts associated with MC252 oil apart from other factors that could influence mortality. The NOAA team has begun preliminary work on water quality modeling in 2012; however the scope of the data required to generate predictive models of all these areas and the complexity of NOAA's planned refinements to the modeling require that work on these models continues well into the first half of 2013. The Louisiana Nestier Tray data was provided to NOAA after its submission of the NPFC Phase 1 claim, and that claim did not reflect plans for such an analysis. Therefore, the survival analysis, which is also expected to continue through the first half of 2013, represents new work. Documentation of the new field work and these additional analyses will also require additional effort to validate new data, integrate it into existing analyses, and document analytical approaches and results.

Specific activities include:

- Oyster abundance and biomass, by size class, will be sampled using quadrats at all 149 previously sampled sites and enumerated at a contract lab (Dauphin Island Sea Lab) using the same protocols as previous oyster abundance and biomass sampling efforts. Analysis of abundance and biomass, including both absolute changes and changes in the relative abundance in different size classes, is crucial to understanding the extent of injuries and the trajectory of recovery for adult and juvenile oysters. Sampling will begin with a two-day in-person training for field samplers covering monitoring plan standard operating practices and NRDA sample collection guidelines. This task also requires funds for field sampling support, technical support from Dauphin Island Sea Lab, contractor-provided project management support, oyster specialists, statisticians, data management support, sample preparations and shipping support, and vessels.
- Subtidal oyster reef reconnaissance for estimating percent cover of oyster resource will be completed using side-scan sonar. Side-scan sonar records reflectance on the ocean floor, which can be interpreted to determine the presence of oyster reef. The reflectance data will then be analyzed to estimate percent cover of oyster reef for each site visited. Results will be truth-checked using poles, dredges, or tongs to assess the accuracy of the side-scan sonar results. Subtidal sites will be selected for mapping from two distinct areas. The first is known oyster habitat, or Stratum A, in which the public oyster seed grounds and many private oyster leases are located. The Trustees will map approximately 150 sites in this stratum. This is the stratum in which all sampling and previous mapping has occurred. Stratum B covers areas that are environmentally suitable for oyster habitat, but where the Trustees have no information on the presence of oyster reef. The Trustees will map approximately 300 sites in Stratum B. The Trustees do not intend to sample oysters in Stratum B, but information about the extent of the resource in these areas is necessary for estimating injury. This task requires funds for field sampling support, technical support from Dauphin Island Sea Lab for interpreting the sonar

results, contractor-provided project management support, oyster specialists, statisticians, data management support, and vessels.

- Refinement of preliminary models for the prediction of water quality parameters in areas critical to the injury claim; specifically, the areas of influence of the Davis Pond and Caenarvon freshwater diversion areas in Louisiana (which were fully opened as a response action to the Incident in 2010) where lowered salinities could increase the susceptibility of oysters to other stressors, such as MC252 oil, as well as in the estimated areas of influence of the Morganza and Bonnet Carre spillways, which were opened to relieve high Mississippi River water levels in spring 2011. The latter are important to address any subsequent oyster mortality or sub-lethal impacts that may have occurred in areas impacted by the Incident in 2011, which could limit the temporal extent of injury in those zones due to the incident. Refinement to the models includes adjustment of the preliminary models to better account for land influences, influences of continuous data monitoring versus monthly monitoring at some locations, influences of wind, water depth, and fetch, smaller diversions or freshwater seeps, and incorporation of variables for precipitation, water temperature, and other relevant factors. These refinements will be followed by additional statistical model testing of refined products and development of draft and final interpretive reports. This task requires funds for contractor-provided project management, analysis, and documentation drafting support, and support from oyster specialists and statisticians.
- Refinement of survival models based on Louisiana historical Nestier tray data in the Davis Pond and Caernarvon areas of influence. Refinements are expected to include incorporation of additional years of Nestier tray data, development of relevant data on key covariates such as hurricane activity, river discharge, lagged temperature, and data on rapid temperature and/or salinity changes. These refinements will be followed by additional statistical model testing of refined products and development of draft and final interpretive reports. This task requires funds for contractor-provided project management, analysis, and documentation drafting support, and support from oyster specialists and statisticians.
- Percent cover will be calculated from subtidal oyster reconnaissance efforts and used to synoptically extend the injury assessment to other affected areas of subtidal oyster habitat. The data collected under the NRDA will be compared to historical data to quantify the temporal and geographic extent of injury and determine changes in abundance and biomass. This task requires funds for contractor-provided project management, analysis, and documentation drafting support, and support from oyster specialists and statisticians.

Connection to NRDA Process

This activity will enable the Trustees to quantify injury and integrate exposure, pathway, and injury information for subtidal oysters by producing estimates of changes in abundance and biomass following the Incident. The monitoring component continues the work of previous NRDA oyster abundance and biomass sampling plans and is critical to assessing the injury and recovery trajectory of oyster resources following the Incident. The percent cover task will provide key information needed to synoptically extend injury to relevant habitats that may have been affected by the Incident but for which little is currently

known about the extent of oyster habitat. Results will be used to inform a determination of restoration needed to compensate for lost ecological services.

Sample/Data Handling

This effort integrates and analyzes data collected under both previous and proposed new oyster work plans. This effort will collect and analyze abundance and biomass of subtidal oysters in previously sampled locations and will produce new data on percent cover of oysters in subtidal areas. Data from previous oyster work plans as well as historical data will be combined to characterized temporal and geographic changes and assess impacts related to the Incident.

This effort integrates abundance and biomass of oyster tissue samples collected by prior response, NRDA, and other activities. In addition, visual observation, instrumentation, and photographs were collected to further support the assessment. Approximately 600 oyster quadrats will be collected under the 2013 oyster subtidal work to ascertain abundance and biomass metrics in addition to approximately 960 quadrats collected under previous plans. Data management activities required to manage, statistically analyze, and map these data are described here.

Samples and associated data acquired through cooperative work plans were collected through methods defined in joint signed protocols and samples and associated data acquired through non-cooperative work plans were collected through methods defined in the Trustee-approved protocols. These samples are being analyzed and data organized and QA/QC administered by NOAA under strictly defined joint protocols. These data are maintained by NOAA and will be distributed to Trustee representatives through NRDA and cooperative databases. Associated activities to manage the data include:

- Maintenance of the original field data as well as associated analytical results in secure data repositories (e.g., NOAANRDA.ORG, ERMA), including associated server, data transfer and storage space costs
- Maintenance of and training in data retrieval/sharing websites to ensure Trustee-wide access to data while maintaining associated metadata (e.g., data history / change logs)
- Training for sample confirmation and results delivery to obtain all necessary documentation (e.g., lab/analytical standard operating procedures)
- Physical delivery of lab data to Trustee and RP representatives per data sharing agreement
- Storage and tracking of external hard drives collected during field sampling to manage large files
- Regular participation in TWG calls to provide consultation on all above matters

To facilitate the validation of visual observation data, data management activities include participating in 1) TWG-wide coordination activities (e.g., promote standard validation approaches) as well as 2) the incorporation of changes (e.g., transcription verification and data validation changes) into the NOAA data repositories to promote Trustee-wide analysis of a consistent data product.

In addition to the effort associated with physically analyzing samples collected previously, associated management of the process includes coordinating analytical activities; data tracking activities to provide status reports on analytical progress and data availability; third-party validation of lab results to ensure

data is in proper format and meets quality standards; secondary QA/QC of field data prior to merging with lab results; incorporation into repositories as final, validated products; forensic chemistry to identify source of contamination; and, spatial processing and loading into ERMA.

To facilitate the collection of additional field data, the support activities include:

- Developing data documentation protocols (e.g., Sample ID naming convention, file naming convention, photo documentation)
- Training data managers and other cruise staff on use of various field collection forms and documents
- Facilitating uploading of field data and associated files (e.g., chains of custody) to noaanrda.org data repository
- Entering and transcribing data from field forms
- Conducting initial QC of field sampling data
- Processing of field sampling and/or observation data into NOAA data systems
- Managing lab analysis priorities through regular coordination with analytical laboratories
- Responding to various DMT questions during field sampling, data upload, and data sharing activities

As raw field data are validated and finalized, data support activities will also extend to the sharing of these results with the public. Data support activities will include the packaging, organization, and release of each data product along with associated metadata. Associated data storage and transfer costs as well as response to public inquiries are incorporated. Furthermore, the files associated with interim and final products generated through the processing and analysis of field and other collected data will be managed and shared in the NOAA data repositories to promote Trustee-wide data access.

Data/Deliverables Produced

- Validated dataset of abundance and biomass measurements (at the Dauphin Island Sea Lab).
- Validated percent cover estimates of oyster habitats affected by the DWH Oil Spill.
- Statistical and geographic analysis of abundance and biomass and percent cover from previous years (2010, 2011, and 2012) to 2013 for sites with quadrat samples in all years. Analysis of data collected by the states at historically sampled sites and comparisons of these data with the NRDA collected data.
- Documentation of modeling to predict freshwater exposures and effects in 2010 in Davis Pond and Caernarvon and in spillway affected areas in 2011.
- Draft and final interpretive reports of potential exposure and injury to subtidal oysters. The abundance and biomass data collected under NRDA plans will be assessed in models to estimate the link between exposure and injury and compared with historical data to determine the extent of injury to oyster populations following the Incident.

Level of Effort

Our request for the subtidal oyster injury (abundance and biomass) activity is $6,557,645 in contract funds. These costs include 0.3 agency FTEs and 21.6 contract equivalents. Key personnel include the study PI, agency and IEc scientists, WEST statisticians, field and lab staff, and IEc and agency data management teams. Costs are driven by the field work and associated data management efforts.

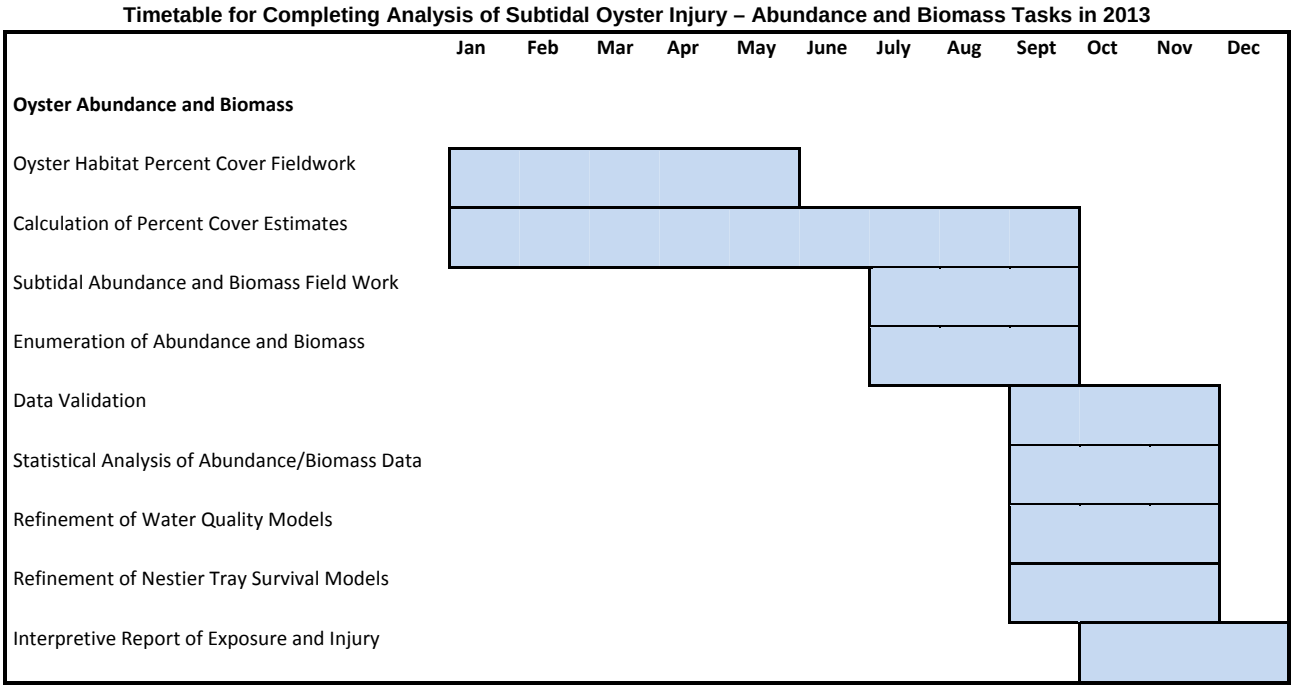
PIs (NOAA and other)

Dr. Sean Powers is a senior marine scientist at the Dauphin Island Sea Lab (DISL) and an associate professor at the University of South Alabama. He has been the lead oyster biologist advising and overseeing the Oyster TWG sampling activities since the start of the DWH NRDA injury assessment. He directs the fisheries ecology lab at DISL, which is responsible for analyzing oyster quadrats for abundance and biomass of oysters and related fauna. In addition, Dr. Powers will play a key role in advising the design of mapping and sampling activities as well as in writing and editing the interpretive report of exposure and injury.

Other key personnel include:

- John Kern, NOAA
- Henry Roman, Industrial Economics, Inc.
- Michelle Bourassa Stahl, WEST, Inc.
- Lyman McDonald, WEST, Inc.

Timetable



Efforts in the first quarter of 2013 will be primarily focused on oyster habitat percent cover fieldwork (anticipated to begin in late winter 2012) as well as on the processing and visualization of percent cover data to generate estimates of percent cover in subtidal area. Both of these tasks will extend into the second quarter with the latter task extending through the end of the third quarter. During the third quarter of 2013, the field work for subtidal abundance and biomass work will be completed. Also during this quarter, the enumeration of abundance and biomass data will occur such that preliminary results will be finished within several days of the completion of field activities. Toward the end of the third quarter, statistical analysis of abundance and biomass data, water quality exposure modeling, and Nestier tray mortality modeling (including comparisons to previous NRDA sampling efforts and historical data) are expected to begin. These three tasks are expected to be complete before the end of the fourth quarter. Completion of the interpretive report of exposure and injury to subtidal oysters will take place by the end of 2013.

RP Involvement

No RP involvement is expected for this activity. The RP funded previous oyster work plans and has access to the data. The Oyster TWG was informed by the RP in the fall of 2011 that they were not interested in participating in any further cooperative fieldwork until analysis of previous studies had been completed and been reviewed by them. The RP participates on Oyster TWG calls periodically to discuss the status of data collection and laboratory analysis activities on cooperative plans.

Completing Analysis of Subtidal Oyster Injury (Recruitment)

As mentioned above, recruitment of oyster larvae to reefs has shown very little recovery up through the fall of 2011, and although sampling for 2012 has not yet begun, it is clear that additional work in 2013 will be needed to complete the analysis of subtidal oyster recruitment injury. Under this activity, we will continue to monitor oyster larval recruitment rates (spat settlement) and adult oyster reproductive condition in sub-tidal near-shore habitats in Louisiana, Mississippi, Alabama, and Florida, and integrate the 2013 monitoring results into models of injury to subtidal oyster resources. All effort described below represents work supplemental to the efforts included in NOAA's NPFC Phase 1 claim.

Recruitment (the successful attachment of live oyster larvae to hard substrate) is a key event in the oyster life cycle. The Trustees collected recruitment and reproductive data in the late summer through fall of 2010 and through most of 2011. Preliminary analysis of recruitment data shows widespread recruitment failure in areas affected by the Deepwater Horizon Incident and a continued lack of recovery in 2011. Reproductive condition data also suggests impaired reproduction in many locations, including the possibility that many subtidal oysters may not have spawned in 2011. The Trustees expect this persistent oyster recruitment failure and poor reproductive condition to result in diminished oyster populations for several years following the Incident. NOAA is thus proposing continued monitoring of recruitment and reproductive health during the spring 2013 spawning season to assess whether recovery is occurring. NOAA is currently planning to perform recruitment sampling during the fall spawning season of 2012. This study will provide information about the trajectory of oyster recruitment recovery. After sampling is complete, NOAA and co-Trustees will synthesize and interpret all the results of the analyses and develop interpretive reports.

NOAA's NPFC Phase 1 claim proposed monitoring at half of the sites sampled in 2011. However, at the time NOAA developed that claim, the full extent of the low recruitment values in 2011 was not known, and the counts throughout 2011 were lower than anticipated when planning for the 2012 monitoring effort. Analysis of these lower recruitment values suggests that monitoring recruitment at all 2011 sites is needed to supply sufficient power to detect statistically significant differences in recruitment from these low starting values. Thus, we are proposing in 2013 to increase our monitoring to all sites sampled in 2011 for recruitment and reproductive condition; doing so will greatly increase the sensitivity of monitoring effort to detect signs of potential recovery of oyster reproduction.

Specific activities include:

- Recruitment monitoring will include collection of settlement plates deployed for three-week intervals and collection of adult oysters for gonadal index measurement via dredges. In the spring of 2013, field teams will deploy settlement plates at all sampling stations of the 2011 spring recruitment sampling. About 400 settlement plates will be deployed for three weeks, and Trustees will enumerate live and dead spat that settle at these stations following retrieval of the plates. Gonadal index will be measured from about 400 samples of adult oysters to help understand the reproductive status of oysters and to identify when spawning is approaching, when it has occurred, or if it does not appear to occur within the sampling period. The project PI, Dr. Sean Powers (from the University of South Alabama and the Dauphin Island Sea Lab) will oversee the measurement of recruitment rates using the settlement plate samples. Settled live and dead oyster

larvae (spat) will be enumerated for the three plates in each sample. Data will be converted into a measure of settlement per meter squared per day, using the enumeration data and the length of deployment. Dr. Thomas Soniat, from the University of New Orleans, will oversee the evaluation of the reproductive condition of the adult oysters collected using the gonadal index measurement. The gonadal index is measured as the width of the gonad divided by adductor muscle length. A condition index can also be measured for each oyster and is calculated as the weight of the oyster meat divided by shell weight. The field work will be preceded by a two-day in-person training for field samplers detailing monitoring plan standard operating procedures and NRDA sample collection guidelines. This task requires funds for field sampling support, technical support from Dauphin Island Sea Lab and the University of New Orleans, contractor-provided project management support, oyster specialists, statisticians, data management support, sample preparations and shipping support, and vessels.

- Statistical analysis of all recruitment metrics collected under the oyster sampling plan, the oyster transition plan, the spring 2011 recruitment plan, the 2012 recruitment monitoring plan, and the 2013 recruitment monitoring efforts will be performed. Additional exposure metrics, including water and sediment data from other NRDA sampling efforts, will be integrated into this analysis to better characterize injury to oysters. The data collected under the NRDA will be compared to historical data to quantify the temporal and geographic extent of injury and determine changes in recruitment patterns. This activity will require additional effort to refine analyses and reports conducted or developed under the NPFC Phase 1 claim to incorporate new data collected in 2013. This task requires funds for contractor-provided project management, analysis, and report drafting support, and support from oyster specialists and statisticians.

Connection to NRDA Process

This activity will quantify injury and integrate exposure pathway and injury information for subtidal oysters to produce estimates of changes in recruitment following the Deepwater Horizon spill. The monitoring component continues the work of previous NRDA oyster recruitment and reproductive condition sampling efforts and will improve the Trustees' ability to understand and characterize the temporal extent of injury and the recovery trajectory expected for oyster reproductive injury. The degree and spatial extent of diminished oyster larvae settlement over time, including recovery trajectories, has implications for recovery of spat, seed, and adult oyster populations and may be used in combination with data from other oyster NRDA studies to inform a determination of restoration needed to compensate for injuries.

Sample/Data Handling

This effort will collect and analyze larval recruitment and reproductive condition in previously sampled locations. Data generated from this plan will be combined with data from previous work plans as well as historical data to characterize potential temporal and geographical components of injury.

This effort integrates tissue samples analyzed for oyster larval recruitment, gonadal index, and condition index metrics collected by prior response, NRDA, and other activities. In addition, visual observation, instrumentation, and photographs were collected to further support the assessment. Approximately 400 oyster settlement plates will be collected under the 2,013 oyster recruitment work to ascertain larval

recruitment rates in addition to approximately 1,385 settlement plates and 460 gonad and condition samples collected under previous plans. Data management activities required to manage, statistically analyze, and map these data are described here.

Samples and associated data acquired through cooperative work plans were collected through methods defined in joint signed protocols and samples and associated data acquired through non-cooperative work plans were collected through methods defined in the Trustee-approved protocols. These samples are being analyzed and data organized and QA/QC administered by NOAA under strictly defined joint protocols. These data are maintained by NOAA and will be distributed to Trustee representatives through NRDA and cooperative databases. Associated activities to manage the data include:

- Maintenance of the original field data as well as associated analytical results in secure data repositories (e.g., NOAANRDA.ORG, ERMA), including associated server, data transfer and storage space costs
- Maintenance of and training in data retrieval/sharing websites to ensure Trustee-wide access to data while maintaining associated metadata (e.g., data history / change logs)
- Training for sample confirmation and results delivery to obtain all necessary documentation (e.g., lab/analytical standard operating procedures)
- Physical delivery of lab data to Trustee and RP representatives per data sharing agreement
- Storage and tracking of external hard drives collected during field sampling to manage large files
- Regular participation in TWG calls to provide consultation on all above matters.

To facilitate the validation of visual observation data, data management activities include participating in 1) TWG-wide coordination activities (e.g., promote standard validation approaches) as well as 2) the incorporation of changes (e.g., transcription verification and data validation changes) into the NOAA data repositories to promote Trustee-wide analysis of a consistent data product.

In addition to the effort associated with physically analyzing samples collected previously, associated management of the process includes coordinating analytical activities; data tracking activities to provide status reports on analytical progress and data availability; third-party validation of lab results to ensure data is in proper format and meets quality standards; secondary QA/QC of field data prior to merging with lab results; incorporation into repositories as final, validated products; forensic chemistry to identify source of contamination; and, spatial processing and loading into ERMA.

To facilitate the collection of additional field data, the support activities include:

- Developing data documentation protocols (e.g., sample ID naming convention, file naming convention, photo documentation)
- Training data managers and other cruise staff on use of various field collection forms and documents
- Facilitating uploading of field data and associated files (e.g., chains of custody) to noaanrda.org data repository

- Entering and transcribing data from field forms
- Conducting initial QC of field sampling data
- Processing of field sampling and/or observation data into NOAA data systems
- Managing lab analysis priorities through regular coordination with analytical laboratories
- Responding to various data management questions during field sampling, data upload, and data sharing activities

As raw field data are validated and finalized, data support activities will also extend to the sharing of these results with the public. Data support activities will include the packaging, organization, and release of each data product along with associated metadata. Associated data storage and transfer costs as well as response to public inquiries are incorporated. Furthermore, the files associated with interim and final products generated through the processing and analysis of field and other collected data will be managed and shared in the NOAA data repositories to promote Trustee-wide data access.

Data/Deliverables Produced

- Verified dataset of recruitment and gonadal index metrics. Lab enumeration and measurement of field collected samples will be completed at the University of New Orleans and Dauphin Island Sea Lab.
- Statistical and geographic analysis of collected data, including comparisons to previously collected data and assessment of recovery or lingering sub-lethal injury.
- Draft and final interpretive reports which will detail potential exposure and injury to larval recruitment of subtidal oysters. The larval recruitment data collected under NRDA plans will be compared with historical data to determine the extent of injury to oyster recruitment. This analysis will be used to quantify the impact of the Incident on oyster resources in terms of forgone productivity and biomass.

Level of Effort

Our request for the subtidal oyster injury (recruitment) activity is $4,325,428 in contract funds. These costs include 0.3 agency FTEs and 16.9 contract equivalents. Key personnel include the study PI, agency and IEc scientists, WEST statisticians, field and lab staff, and IEc and agency data management teams.

PIs (NOAA and other)

Dr. Sean Powers is a senior marine scientist at the Dauphin Island Sea Lab (DISL) and an associate professor at the University of South Alabama. He has been the lead oyster biologist advising and overseeing the Oyster TWG sampling activities since the start of the DWH NRDA injury assessment. He directs the fisheries ecology lab at DISL, which is responsible for analyzing oyster settlement plates to measure recruitment of oysters and related fauna. In addition, Dr. Powers will play a key role in advising the design of sampling activities as well as writing and editing the draft and final interpretive reports. Furthermore, his lab will prepare samples to be sent to Dr. Thomas Soniat for analysis of disease and gonadal index of adult oysters.

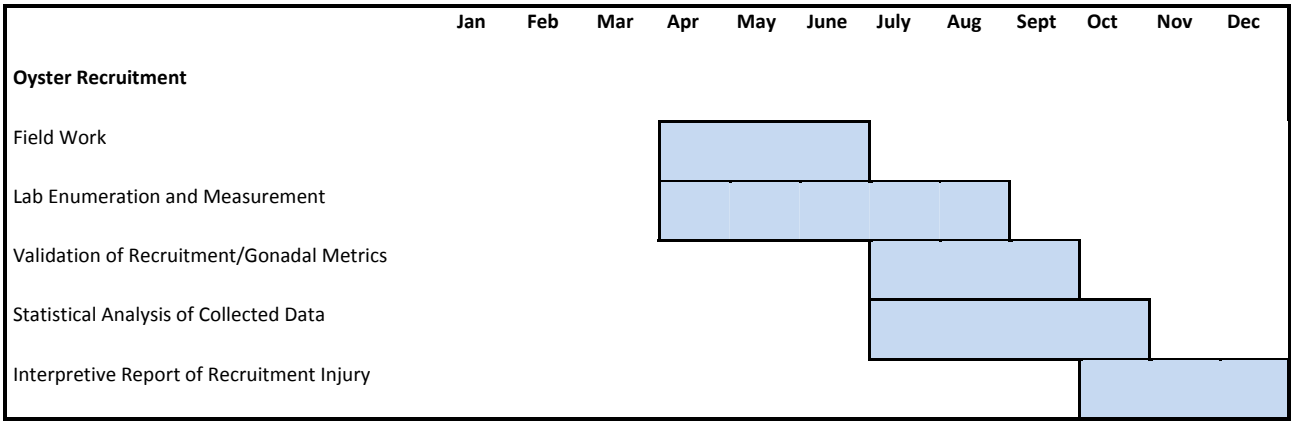
Dr. Thomas Soniat, professor of biological sciences at the University of New Orleans, has evaluated adult oysters collected under previous Deepwater Horizons NRDA fieldwork for reproductive condition. He will continue to oversee laboratory assessment of reproductive condition of adult oysters collected under the 2013 oyster recruitment assessment activities. Analysis of the reproductive condition includes assessing the gonadal index and condition index of adult oysters.

Other key personnel for this effort include:

- John Kern, NOAA
- Henry Roman, Industrial Economics, Inc.
- Michelle Bourassa Stahl, WEST, Inc.

Timetable

Timetable for Completing Analysis of Subtidal Oyster Injury - Recruitment Tasks in 2013



The primary focus of the second quarter of 2013 will be the field collection of all samples. Also during this time, lab enumeration and measurement of field collected samples will commence at the University of New Orleans and the Dauphin Island Sea Lab. This task is expected to be complete by the middle of the third quarter. The third quarter of 2013 will mark the beginning of the validation of recruitment and gonadal index metrics as well as the start of the statistical and geographic analyses of collected data. This latter task includes comparisons to previously collected data and the assessment of recovery or lingering effect and is estimated to be complete by early in the fourth quarter. Finally, the completion of an interpretive report related to the extent of injury to larval oysters and oyster reproduction will be drafted in the fourth quarter of 2013 and completed by the end of the year.

RP Involvement

No RP involvement is expected for this activity. The RP funded previous oyster work plans and has access to the data. The Oyster TWG was informed by the RP in the fall of 2011 that they were not interested in participating in any further cooperative fieldwork until analysis of previous studies had been completed and been reviewed by them. The RP participates on Oyster TWG calls periodically to discuss the status of data collection and laboratory analysis activities on cooperative plans.

Completing Analysis of Intertidal Oyster Injury

NOAA is concerned about potential injury to oyster resources in the intertidal zone, based on preliminary results from a BP-funded NOAA study of exposure and abundance of oysters at marsh and beach sites along the Gulf of Mexico coastline in early 2012. Initial results from this limited study at over 50 sites with a varying range of oiling in sediments strongly suggest the presence of MC252 oil in oyster tissues collected by NOAA at some stations, as well as low oyster abundances in locations with petroleum. The study also found that oyster habitat was present at more sites than previously anticipated based on observations of NOAA teams conducting submerged oil investigations. These preliminary findings of potential continued exposure of oysters to MC252-related contaminants, low abundance in areas with submerged oil, and the greater than expected extent of potential oyster habitat, coupled with the substantial extent of potentially affected shoreline, indicates the need for NOAA to expand its investigations of oyster injury in the intertidal zone. Additionally, intertidal oysters have been suggested to be a very important source of larvae that recruit to subtidal reefs (Dr. Earl Melancon, pers. comm. to Dr. Sean Powers). Our preliminary findings of potential injury to intertidal oysters, together with the dramatic and widespread recruitment failure observed in the subtidal reefs, further indicate the importance of additional intertidal oyster injury assessment study. A better understanding of the degree and extent of the intertidal oyster injury may therefore be critical in understanding when oyster recruitment may return to pre-Incident levels in subtidal oyster reefs and thus may be used to quantify injury to subtidal oyster resources, as well to intertidal oyster resources themselves.

Under this activity NOAA will assess, evaluate, and quantitatively characterize Incident-related exposure and injuries to oysters in the intertidal zone along the shoreline of the Gulf. NOAA first studied these oysters in early 2012, following receipt of information from the marsh edge sandy shore submerged oil sampling teams that oysters were present at more than thirty of their sites. NOAA believes that the presence of oysters in shallow water (0.5 meters or less) in areas affected by wave tidal action, combined with the presence of submerged oil, could create the potential for further exposure and injury. Furthermore, as noted above, intertidal oysters are thought to contribute substantially to the overall larval pool of oysters in the Gulf, and thus injury to these resources may have ripple effects on the rest of the oyster population. Preliminary data from NOAA's 2012 oyster intertidal plan supports the conceptual injury model above; however, it was conducted on a convenience sample of 53 sites. To strengthen the basis for estimating oyster injury across the entire shoreline of our study area and to develop a valid and defensible estimate of percent cover of this resource in the intertidal zone, NOAA is proposing an expanded 2013 oyster intertidal effort on a larger, random sample of sites (detailed below), as well as exposure assessment activities using data and modeling results from other TWGs to develop models that would allow us to quantify injury to intertidal oysters. Under this activity, the 2012 and 2013 intertidal study results and related analysis and modeling efforts will be integrated and documented into interpretive reports that will describe and quantify injury to intertidal oysters and describe the implications of these findings.

Field work for this activity includes additional reconnaissance activities to locate and estimate percent cover of resource at each site, assessment of oyster abundance and biomass, and characterization of contaminant levels in oyster tissues in intertidal areas. In 2012 the NOAA team developed a new transect-based reconnaissance method for finding intertidal oyster reefs that can be conducted from the shoreline. This method is efficient in finding potential oyster resource, is cost-effective, and allows the team to map

percent cover and identify quadrat sampling locations all within the same site visit, minimizing the need for multiple trips and for additional labor to pre-identify sample sites. The resulting detailed data on the percent cover of oyster resources in intertidal habitats are critical for the Trustees to estimate more broadly the percent cover of oyster resources in areas with suitable environmental conditions, information which we need to conduct injury quantification and restoration planning. Mapping is typically not conducted in this zone, and NOAA's team has not been able to identify any pre-existing intertidal oyster habitat maps or estimates of intertidal oyster densities on relevant geographical scales.

Specific activities include:

- The 2013 intertidal field effort will consist of sampling a random selection of 150 sites along the shoreline of our study area. Sites will be chosen from sites for which exposure has been characterized either through previous sediment sampling or via modeling efforts by other TWGs. No additional sediment sampling is proposed. By using randomly chosen intertidal sites, the results of this mapping exercise can be used to synoptically extend injury estimates to intertidal oysters across the Gulf coast. As noted above, the plan will involve transect mapping of oyster resources at each site coupled with sampling of oysters. As in the 2012 study, abundance and biomass by size class will be assessed using quadrat samples, which will be subsampled for contaminant tissue samples. The field component of intertidal oyster work is expected to begin in January 2013 and be finished in late-spring 2013. The result of this investigation will be detailed data on percent cover of oyster habitat and abundance estimates that can be compared across site exposure characteristics and data on tissue contaminant levels. Field work will begin with a two day in-person training for field samplers detailing monitoring plan standard operating procedures and NRDA sample collection guidelines, as well as safety procedures.
- All non-chemistry data collected in 2012 and 2013 will be verified by a team of NOAA contractors to ensure validity for use in injury analysis. This effort is separate from data validation efforts for chemistry lab data. Statistical analysis of the data from the 2012 oyster intertidal plan and the 2013 oyster intertidal plan will be performed, including generating a percent cover estimate from intertidal field efforts, as well as analyzing the abundance and biomass data collected under this plan and developing statistical models linking exposure estimates to injury. Additional exposure metrics, including water and sediment data from other NRDA TWG sampling efforts will be integrated into this analysis to better characterize injury to intertidal oysters. Finally, we will develop a quantitative injury assessment model for injuries to oyster abundance and biomass in the intertidal zone and will prepare interpretive reports describing data collection and analysis, results, and implications of injuries to intertidal oysters. None of this work was submitted as part of the NPFC Phase 1 claim. The data validation and analysis work will begin in the second quarter of 2012, continuing through the third quarter, with report writing beginning in the third quarter and continuing to the end of 2013.

Connection to NRDA Process

This activity continues work performed under the 2012 oyster intertidal plan and provides additional data on oyster habitat and abundance in intertidal areas. This activity will enable NOAA to quantify injury and integrate exposure pathway and injury information for intertidal oysters and will also enable NOAA to estimate a percent cover estimate for intertidal oysters critical to the final injury assessment and

quantification of the intertidal area impacted as a result of the Incident. The results of the intertidal effort will help inform injury assessment in the subtidal zone related to the suspected link to the diminished larval supply in the Gulf, under the activity of developing the integrated oyster injury quantification discussed below (Activity J: Comprehensive Integration of Oyster Injury Assessment Elements). Results will inform determination of restoration needed to compensate for injury.

Sample/Data Handling

The field work aspect of this activity will produce new data on percent cover of oysters in intertidal areas as well as abundance and biomass counts of intertidal oysters. This effort integrates data collected under previous NRDA activities, including the 2012 and 2013 oyster intertidal plans.

This effort integrates abundance and biomass of oyster tissue samples collected by the 2012 and 2013 oyster intertidal sampling activities. In addition, visual observation, instrumentation, and photographs were collected to further support the assessment. Up to 900 oyster quadrats will be collected under the 2013 oyster subtidal work to ascertain abundance and biomass metrics in addition to approximately 265 quadrats collected under the previous oyster intertidal plan. Data management activities required to manage, statistically analyze, and map these data are described here.

Samples and associated data acquired through cooperative work plans were collected through methods defined in joint signed protocols and samples and associated data acquired through non-cooperative work plans were collected through methods defined in the Trustee-approved protocols. These samples are being analyzed and data organized and QA/QC administered by NOAA under strictly defined joint protocols. These data are maintained by NOAA and will be distributed to Trustee representatives through NRDA and cooperative databases. Associated activities to manage the data include:

- Maintenance of the original field data as well as associated analytical results in secure data repositories (e.g., NOAANRDA.ORG, ERMA), including associated server, data transfer and storage space costs
- Maintenance of and training in data retrieval/sharing websites to ensure Trustee-wide access to data while maintaining associated metadata (e.g., data history / change logs)
- Training for sample confirmation and results delivery to obtain all necessary documentation (e.g., lab/analytical standard operating procedures)
- Physical delivery of lab data to Trustee and RP representatives per data sharing agreement
- Storage and tracking of external hard drives collected during field sampling to manage large files
- Regular participation in TWG calls to provide consultation on all above matters.

To facilitate the validation of visual observation data, data management activities include participating in 1) TWG-wide coordination activities (e.g., promote standard validation approaches) as well as 2) the incorporation of changes (e.g., transcription verification and data validation changes) into the NOAA data repositories to promote Trustee-wide analysis of a consistent data product.

In addition to the effort associated with physically analyzing samples collected previously, associated management of the process includes coordinating analytical activities; data tracking activities to provide

status reports on analytical progress and data availability; third-party validation of lab results to ensure data is in proper format and meets quality standards; secondary QA/QC of field data prior to merging with lab results; incorporation into repositories as final, validated products; forensic chemistry to identify source of contamination; and, spatial processing and loading into ERMA.

To facilitate the collection of additional field data, the support activities include:

- Developing data documentation protocols (e.g., sample ID naming convention, file naming convention, photo documentation)
- Training data managers and other cruise staff on use of various field collection forms and documents
- Facilitating uploading of field data and associated files (e.g., chains of custody) to noaanrda.org data repository
- Entering and transcribing data from field forms
- Conducting initial QC of field sampling data
- Processing of field sampling and/or observation data into NOAA data systems
- Managing lab analysis priorities through regular coordination with analytical laboratories
- Responding to various data management questions during field sampling, data upload, and data sharing activities

As raw field data are validated and finalized, data support activities will also extend to the sharing of these results with the public. Data support activities will include the packaging, organization, and release of each data product along with associated metadata. Associated data storage and transfer costs as well as response to public inquiries are incorporated. Furthermore, the files associated with interim and final products generated through the processing and analysis of field and other collected data will be managed and shared in the NOAA data repositories to promote Trustee-wide data access.

Data/Deliverables Produced

- Verified percent cover estimates of intertidal oyster habitat.
- Verified 2012 and 2013 datasets of abundance and biomass measurements (at Dauphin Island Sea Lab).
- Draft and final interpretive reports which will detail potential exposure and injury to intertidal oysters. These reports will integrate data gathered under the 2012 and 2013 oyster intertidal plans and provide the percent cover of intertidal oysters as well as analyses of abundance and biomass of intertidal oysters.

Level of Effort

Our request for the intertidal oyster injury activity is $4,217,939 in contract funds. These costs include 0.3 agency FTEs and 15.2 contract equivalents. Key personnel include the study PI, agency and IEc scientists, WEST statisticians, field and lab staff, and IEc and agency data management teams.

PIs (NOAA and other)

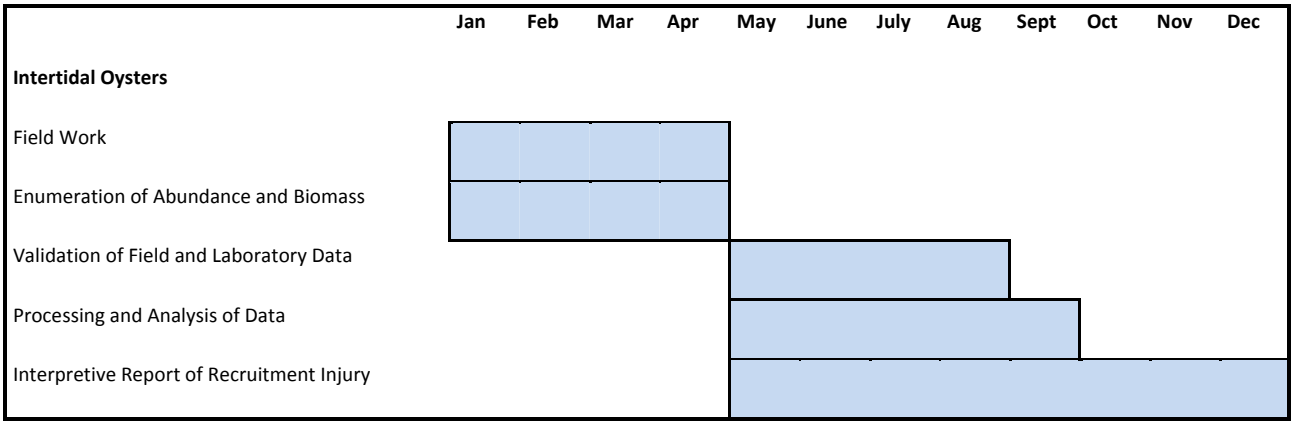
Dr. Sean Powers is a senior marine scientist at the Dauphin Island Sea Lab (DISL) and an associate professor at the University of South Alabama. He has been the lead oyster biologist advising and overseeing the Oyster TWG sampling activities since the start of the Deepwater Horizon NRDA injury assessment. He directs the fisheries ecology lab at DISL, which is responsible for analyzing oyster quadrats for abundance and biomass of oysters and related fauna. In addition, Dr. Powers will play a key role in advising intertidal study design and statistical analysis as well as writing and editing the draft and final interpretive reports.

Other key personnel include:

- John Kern, NOAA
- Henry Roman, Industrial Economics, Inc.
- Michelle Bourassa Stahl, WEST, Inc.

Timetable

Timetable for Completing Analysis of Intertidal Oyster Injury Tasks in 2013



The primary focus during the first quarter of 2013 will be the field component of the intertidal oyster work which is expected to finish by late spring 2013. The enumeration of abundance and biomass will occur concurrently with fieldwork and preliminary results will be finished within several days of the completion of field activities. Validation of field and laboratory data will begin in the second quarter and is expected to be complete by the end of summer 2013. Also beginning in the second quarter is the processing and analysis of field collected data, which is estimated to be complete by the end of the third quarter of 2013. The interpretive report on the injury assessment of intertidal oysters is estimated to be complete by the end of 2013.

RP Involvement

No RP involvement is expected for this activity. The RP funded previous oyster work plans and has access to the data. The Oyster TWG was informed by the RP in the fall of 2011 that they were not interested in participating in any further cooperative fieldwork until analysis of previous studies had been

completed and been reviewed by them. The RP participates on Oyster TWG calls periodically to discuss the status of data collection and laboratory analysis activities on cooperative plans.

Comprehensive Integration of Oyster Injury Assessment Elements

After the work described in Activities J: Completing Analysis of Subtidal Oyster Injury – Abundance and Biomass, Completing Analysis of Subtidal Oyster Injury – Recruitment, and Completing Analysis of Intertidal Oyster Injury above is completed, NOAA and co-Trustees will synthesize and interpret results of the analyses and develop injury quantification reports. Completion of this activity will involve piecing together the separate lines of evidence for oyster injury from the different metrics measured in the various oyster Deepwater Horizon (DWH) NRDA studies that have been conducted to develop an overall quantification of injury to oysters resulting from the Incident. For example, the reduction in larval supply from both subtidal and intertidal oysters has resulted in oyster production foregone, as well as a reduction in the amount of ecological services that would have been provided by these "missing" oysters. The injury quantification reports will use relevant scientific literature and reports (both DWH and non-DWH related) to support our conclusions. Therefore, even prior to the completion of the work related to analysis of all the oyster DWH NRDA studies, NOAA personnel and contractors will be reviewing literature and other data reports.

Under this task, the NOAA team will conduct additional analysis and will coordinate with other Trustees to review injury assessment results for the oysters by zone (subtidal and intertidal) and metric (abundance and reproduction) to develop a unified summary report of the impacts of the Incident on oysters in the Gulf. Completion of this task will involve both in-person meetings as well as continued validation and analysis of data from past plans to ensure consistency across datasets and to address the remaining data validation needs related to the substantial volume of data generated during past oyster plans.

This effort will develop a comprehensive interpretive report on oyster injury assessment, explaining the conceptual model for the impacts of the Incident on oyster resources in the Gulf and linking the results of individual injury assessments according to that model. This task will first involve completion of data validation for all plans – a task that requires greater effort than originally anticipated, due to the large volume of data involved, the need to effectively link and harmonize data across multiple plans, and the need to coordinate with the RP to agree on changes leading to the ultimate development of a consensus dataset on which both sides can conduct analyses. Completion of this validation is a critical step in moving from preliminary analytical results to final results. We fully expect data validation to continue through the third quarter of 2013, as we correct data and update preliminary analyses of oyster metrics to address data changes.

Additionally, this task involves coordinating several in-person meetings. Two meetings will bring the Trustees on the Oyster TWG together to discuss the results of sampling and data analysis tasks and to discuss the development of a cohesive model of injury across multiple oyster life-stages. These meetings will likely take place in New Orleans, LA – one in the second quarter of 2013, and one in the third. Additionally, four smaller meetings with NOAA personnel and contractors will focus on determining the most appropriate analytical approaches and discussing the refinement of the comprehensive interpretive report. These meetings are expected to take place in Cambridge, MA; Laramie, WY; and Seattle WA (2 meetings).

Connection to NRDA Process

This work will use data collected under previous NRDA oyster sampling plans and refine preliminary analyses on oyster recruitment, adult and juvenile abundance and biomass, and oyster resource percent cover estimation efforts. The product will be the TWG's final injury determination of injury to oysters due to the Incident.

Sample/Data Handling

This effort integrates and analyzes data collected under previous NRDA oyster work plans, response, other NRDA TWGs, and other activities. No new samples will be taken under this activity. Data management activities required to manage, statistically analyze, and map the previously collected data are described here.

Samples and associated data acquired through cooperative work plans were collected through methods defined in joint signed protocols and samples and associated data acquired through non-cooperative work plans were collected through methods defined in the Trustee-approved protocols. These samples are being analyzed and data organized and QA/QC administered by NOAA under strictly defined joint protocols. These data are maintained by NOAA and will be distributed to Trustee representatives through NRDA and cooperative databases. Industrial Economics, Incorporated (IEc) and WEST will be responsible for the data management tasks under this activity, including supplemental data tabulation and manipulation and the QA/QC of non-analytical pre-2013 data

To facilitate the validation of visual observation data, data management activities include participating in 1) TWG-wide coordination activities (e.g., promote standard validation approaches) as well as 2) the incorporation of changes (e.g., transcription verification and data validation changes) into the NOAA data repositories to promote Trustee-wide analysis of a consistent data product.

As raw field data are validated and finalized, data support activities will also extend to the sharing of these results with the public. Data support activities will include the packaging, organization, and release of each data product along with associated metadata. Associated data storage and transfer costs as well as response to public inquiries are incorporated. Furthermore, the files associated with interim and final products generated through the processing and analysis of field and other collected data will be managed and shared in the NOAA data repositories to promote Trustee-wide data access.

Data/Deliverables Produced

The deliverables from this task include:

- Comprehensive interpretive report on the extent of injury to both intertidal and subtidal oysters across multiple life-stages.
- Validated data sets from all earlier (pre-2013) work plans.
- Collection and organization of all field-collected and non-analytical lab data into a usable electronic form or databases that can be used in analysis.

- Statistical and geographic analysis of abundance, biomass, recruitment, reproductive, and oyster resource coverage data, to inform the development of statistical modeling.
- Continued univariate and multivariate statistical modeling to assess the impacts of oil and freshwater exposure on the response metrics.
- Collection and statistical analysis of historical data, response data, and relevant data from other NRDA TWG sampling efforts, including oyster population measurements as well as water and sediment quality metrics.
- Two Oyster TWG Trustee in-person meetings and four meetings with NOAA personnel and contractors, which will focus on refining analytical approaches and quantifying the extent of injury to oysters.

Level of Effort

Our request for the comprehensive oyster integration activity is $986,970 in contract funds. These costs include 0.2 agency FTEs and 3.6 contract equivalents. Key personnel include the study PI, agency and IEc scientists, and WEST statisticians.

PIs (NOAA and other)

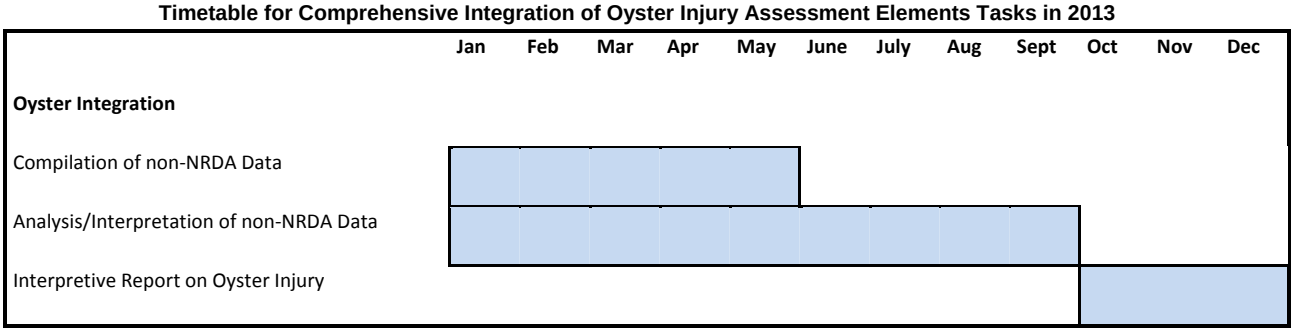
Dr. Sean Powers is a senior marine scientist at the Dauphin Island Sea Lab (DISL) and an associate professor at the University of South Alabama. He has been the lead oyster biologist advising and overseeing the Oyster TWG sampling activities since the start of the DWH NRDA injury assessment. Dr. Powers will use his expertise gained from his many years of experience studying oysters in the Gulf of Mexico to direct the analysis of data related to the oyster injury assessment. His tasks will include continuing to oversee the laboratory analysis of oyster quadrats and settlement plates, performing literature reviews, and coordinating with other key personnel to finalize the statistical analysis of data relating to oyster injury assessment. He will play a key role in writing and editing the draft and final interpretive reports.

Other key personnel include:

- John Kern, NOAA
- Henry Roman, Industrial Economics, Inc.
- Michelle Bourassa Stahl, WEST, Inc.

Timetable

Timetable for Comprehensive Integration of Oyster Injury Assessment Elements Tasks in 2013



Under this activity, the primary focus of the first quarter of 2013 will be the compilation of non-NRDA data, a task slated to be complete by June 2013. A task subsequent to the compilation of the data is the analysis and interpretation of this non-NRDA data. This component of the activity will start concurrent with the compilation of the data but will continue through the end of the third quarter of 2013. The interpretive report on extent of injury to both intertidal and subtidal oysters across multiple life-stages will begin in the fourth quarter of 2013 and will be complete by the end of the year.

RP Involvement

No RP involvement is expected for this activity. This activity will synthesize and interpret oyster data, some of which were collected under cooperative studies.

K. SAV

Completing Analysis of Injury to Submerged Aquatic Vegetation

This activity will integrate and describe pathways, exposure, and injuries to submerged aquatic vegetation (SAV) and associated biota. It will integrate and summarize data and findings from previous activities (some of which were funded by NPFC Phase 1) and is necessary to describe and quantify injury. It also includes the analysis of aerial imagery taken during and after the spill. The imagery was captured under the Aerial Imagery TWG with consultation from the SAV TWG (and was funded by the RP). The tasks under this activity are distinct from the scope of the SAV activities funded under NPFC Phase 1 but constitute a follow-up to that work. This activity does not include any field assessments. All tasks will

commence in 2012; coordination (with other Trustees, the US Department of Justice, and the RP), data analysis, and data management activities will continue into 2013.

Specific tasks include:

- Evaluation of injury to fish: This task will take all analyzed trawl data collected during fall 2010, spring 2011, and fall 2011 and compare with five years of historical trawl data to determine if injury to fish from MC252 has occurred. A data summary will be produced under this task. Metrics to be analyzed and reported on include catch per unit effort by species over a span of five years.
- Evaluation of injury to benthos: Several hundred benthic invertebrate samples were collected in 2011 from the Chandeleur Islands by NOAA and co-Trustees. All remaining benthic invertebrate samples will be sorted and analyzed in 2012 to quantify injuries to benthic invertebrates. NOAA requests funds to complete laboratory analyses, interpret benthic community data, and develop a data summary, which will be completed in 2013 with the requested funding.
- Evaluation of injury to SAV: This task will review all the analyzed core data collected during fall 2010, spring 2011, and fall 2011 and compare with historical data to determine if injury from MC252 has occurred. A data summary will be produced under this task. Metrics to be analyzed and reported on include shoot numbers and percent cover.
- Evaluation of changes to SAV extent: High-altitude, high-resolution aerial images are available for SAV areas potentially affected by the Incident. Imagery data collected during four aerial missions will be analyzed by NOAA using object-based habitat classification techniques in spatial software. The analysis will allow the Trustees to quantify the extent of structural and functional injuries in the Chandeleur Islands, Petit Bois Island, and Horn Island SAV from oil exposure and from propeller and boom scars attributable to response activities. In addition, impacts from the creation of a five mile sand berm at the north end of the Chandeleur Island chain will be analyzed. Funds are requested to complete the analysis of aerial imagery and the interpretation of the imagery by using the object-based habitat classification technique. Various datasets will be compared and degree of injury (as determined by change in percent cover) will be determined in areas where MC252 oil has been confirmed.

Connection to NRDA Process

These tasks document, connect, and describe exposure, pathways, and injuries to SAV and associated faunal species. The degree and spatial extent of injuries over time will be used to inform the determination of restoration needed to compensate for injuries.

Sample/Data Handling

This effort integrates core, trawl, and aerial imagery data. Samples and associated data acquired through cooperative work plans were collected through methods defined in joint signed protocols. These include the Tier 1, Tier 2, and Tier 3 work plans associated with the SAV TWG. These samples are being analyzed and data organized and QA/QC administered by NOAA under strictly defined joint protocols.

These data are maintained by NOAA and will be distributed to Trustee representatives through NRDA and cooperative databases. Associated activities to manage the data include:

- Maintenance of the original field data as well as associated analytical results in secure data repositories (e.g., NOAANRDA.ORG, ERMA), including associated server, data transfer and storage space costs
- Maintenance of and training in data retrieval/sharing websites to ensure Trustee-wide access to data while maintaining associated metadata (e.g., data history / change logs)
- Storage of physical data
- Training for sample confirmation and results delivery to obtain all necessary documentation (e.g., lab/analytical standard operating procedures)
- Physical delivery of lab data to Trustee and RP representatives per data sharing agreement
- Storage and tracking of external hard drives collected during field sampling to manage large files
- Regular participation in TWG calls to provide consultation on all above matters

To facilitate the validation of visual observation data, data management activities include participating in 1) TWG-wide coordination activities (e.g., promote standard validation approaches) as well as 2) the incorporation of changes (e.g., transcription verification and data validation changes) into the NOAA data repositories to promote Trustee-wide analysis of a consistent data product.

Data/Deliverables Produced

Deliverables for this effort include the data summaries described above, as well as a draft and final interpretive report summarizing injury to SAV and associated fauna. The report will include documentation of purpose and methods, as well as data tables, maps, and figures illustrating and summarizing results, conclusions, and interpretations. Validated data will be posted to publicly accessible websites.

Level of Effort

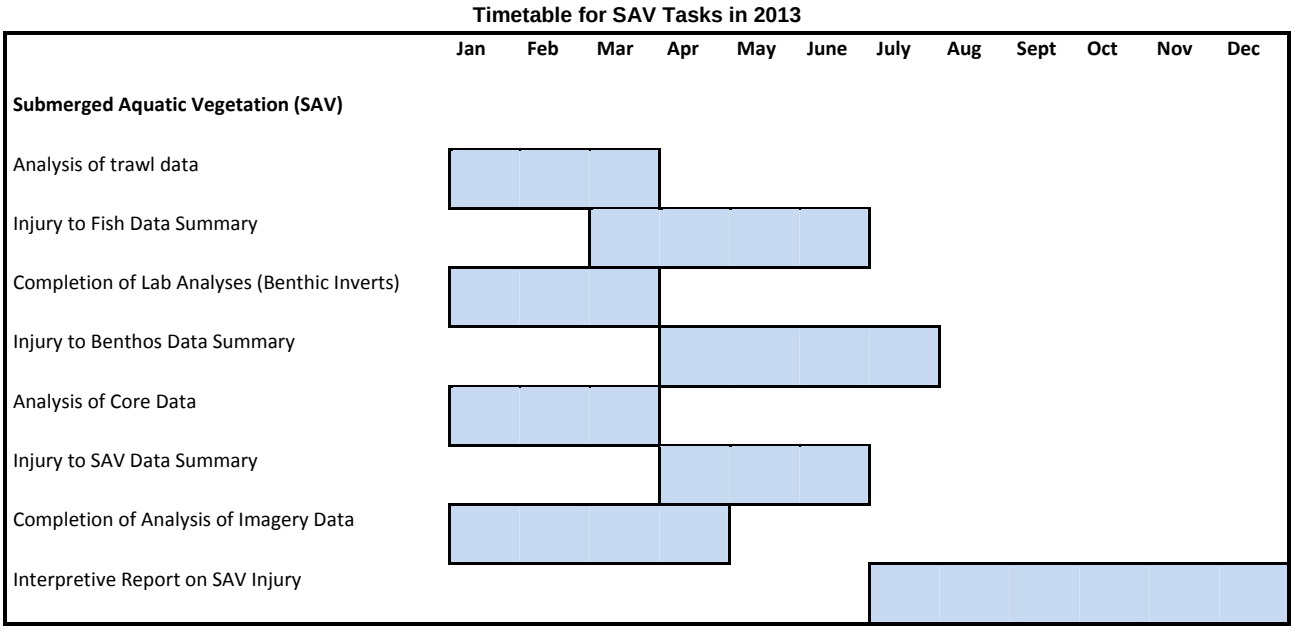
Our request for the submerged aquatic vegetation injury assessment activity is $635,360 in contract funds. These costs include 0.4 agency FTEs and 2.4 contract equivalents. Key personnel include study PIs and their staff. Tasks under this activity include completion of the aerial imagery work and the object based classification analysis, data management efforts, and development of an interpretive report.

PIs (NOAA and other)

Natalie Cosentino-Manning of NOAA is the TWG lead and is responsible for all aspects of the SAV TWG. These include communication with the Trustees, consultants, NOAA and DOI management, the RP, and attorneys as well as management of all data collection activities, data interpretation and final products. Jud Kenworthy, a NOAA contractor, is the scientific lead for SAV and will be responsible for the reports. Ken Heck of the Dauphin Island Sea Lab (DISL) is the scientific lead for fish-related sampling and analysis. Ken will also be secondary author on the reports. Dane Williams of NewFields is

responsible for analyzing aerial imagery data and object based habitat classification. Shahrokh Rouhani of NewFields is the SAV TWG statistician. Mike Wild of NewFields is responsible for mapping chemistry data for the SAV TWG.

Timetable



All tasks excluding the data summaries and the final interpretive report on SAV injury will commence in 2012 (not shown in timetable above). The first quarter of 2013 will be primarily focused on completing the data and lab analyses begun in 2012. Trawl data, benthic invertebrate samples, core data, and imagery data will all be analyzed during this period. The greatest level of effort during the second quarter of 2013 will be directed toward producing data summaries based on the completed analyses. Data summaries will be produced for the following tasks: evaluation of injury to fish, evaluation of injury to benthos, and evaluation of injury to SAV. The final interpretative report addressing SAV injury will be prepared in the third and fourth quarters of 2013, reaching completion prior to the end of the year.

RP Involvement

The RP has been involved in all field collections and has duplicate documentation of all samples and physical observations taken. The RP has worked cooperatively on all work plans. Responsible party involvement is not envisioned for data analysis/interpretation or report development.

L. Integration of Nearshore Exposure and Injury

Integrate and Interpret Findings Regarding Nearshore Exposure and Injury and Prepare Reports

The shoreline and nearshore environment is a complex ecosystem that processes and transfers nutrients, productivity, and energy to other zones of the Gulf of Mexico. Oiling of vegetated and beach shorelines creates a pathway for exposure and injury to nearshore biota. The importance of marsh edge as nursery habitat for fish species is of particular interest. This task will integrate analysis of final data and describe pathways, exposure and injuries to nearshore and shoreline habitats and biota, including coastal wetland vegetation and fauna, beaches, nearshore fish and benthos, oysters, gulf sturgeon, nesting turtles, and submerged aquatic vegetation. It will integrate and summarize data and findings from other activities and is necessary to describe and quantify injury and its implications. This task includes two face-to-face meetings to review and interpret results and preparation of an interpretive report required to support presentation of the Trustees' claim for damages/compensatory restoration for injury to shoreline and nearshore ecological resources. This is a new task that will begin in 2012 and continue through 2013. Funds are requested for the 2013 work.

Specific activities include:

- Coordinating within and across technical working groups
- Compiling and analyzing exposure data
- Compiling and analyzing injury findings
- Analyzing and interpreting baseline conditions
- Synthesizing statistical and geospatial analyses
- Preparing reports
- Completing a peer review

Connection to NRDA Process

This activity is an injury quantification task and integrates pathway, exposure, and injury information across nearshore and shoreline resources and habitats. Determining the degree and spatial extent of injury will enable the determination of appropriate restoration projects to compensate for injury.

Sample/Data Handling

This effort will summarize and integrate data collected in specific exposure and injury assessment tasks. NewFields data analysts will compile final, validated databases for each of the studies of interest into a relational database or databases and will perform any manipulations necessary to facilitate the necessary statistics. GIS software will also be used. NewFields will direct these efforts, including activities required to integrate, summarize, and statistically analyze the data.

Data/Deliverables Produced

Deliverables for this effort include a draft and final interpretive report summarizing pathway, exposure, and injury to nearshore and shoreline resources and habitats. The report will include documentation of purpose and methods, as well as data tables, maps, and figures illustrating and summarizing results, conclusions, and interpretations.

Level of Effort

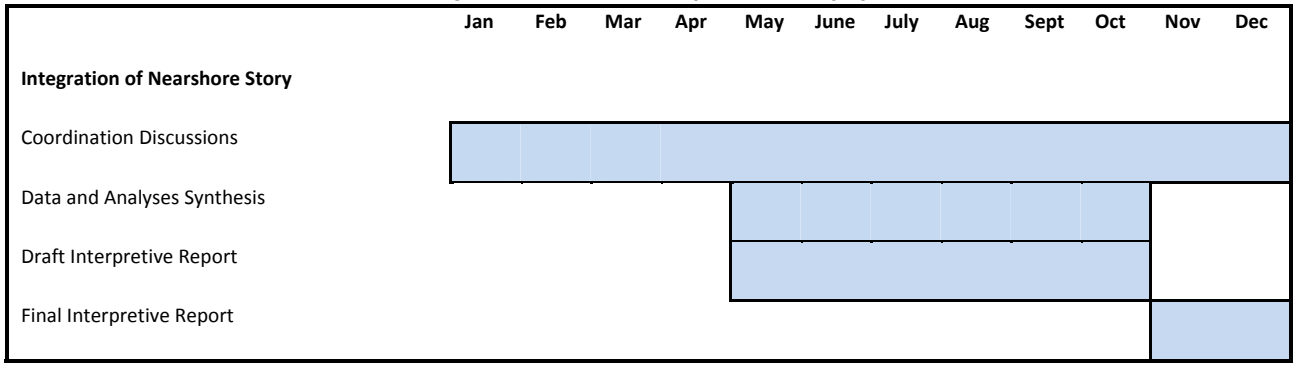
Our request for the activity to integrate nearshore exposure and injury is $467,400 in contract funds. These costs include 1.3 agency FTEs and 1.1 contract equivalents. Key personnel include agency scientists, statisticians and data analysts from NewFields, and scientists and support staff from IEc. Tasks include coordination support from the PIs, data analysis support from NewFields, input from PIs of key studies of nearshore and shoreline habitats and biota, and document and coordination support from IEc.

PIs (NOAA and other)

Mary Baker of NOAA will lead this activity. The activity will be a collaborative effort of the NOAA TWG leads for each of the relevant habitats and biota. These TWG leads include Marla Steinhoff, Ian Zelo, Natalie Cosentino-Manning, John Kern, Laurie Sullivan, and Diane Wehner. Representatives from DOI will also collaborate on nesting sea turtles. Shahrokh Rouhani of NewFields will provide expert statistical support.

Timetable

Timetable for Integration of Nearshore Exposure and Injury Tasks in 2013



Coordination discussions between the nearshore TWGs will commence in January 2013 and will continue regularly throughout the year. Beginning in May 2013, data and analyses from each of the relevant studies will be synthesized, and a draft interpretive report will be developed by the end of October 2013. This report will be finalized by the end of 2013.

RP Involvement

Responsible party representatives have been involved in designing and implementing data collection activities to support these tasks. Additional time for collaborating and coordinating with responsible

parties regarding designing future studies and processing and sharing data has been included in the level of effort estimates. Data interpretation and analysis is envisioned as an independent task for Trustees without responsible party involvement.

OTHER

M. Restoration Planning Activities

Restoration Planning Activities

Restoration planning activities are presented in eight categories. These categories do not differ greatly from the first assessment claim, but they are more expansive with respect to descriptions of activities now underway. The table below shows the differences between the categories of the first and second claim.

First Assessment Claim Restoration Planning Categories	Second Assessment Claim Restoration Planning Categories
Case Management	Leadership, Management and Oversight
Finance	Finance
Early Restoration Project Development and Compliance	Early Restoration and Offset Development
Long-term Restoration Planning	Project Management
Programmatic Environmental Impact Statement (PEIS) and Environmental Planning	Regulatory and Environmental Compliance
Data Management	Programmatic Environmental Impact Statement and Programmatic Restoration Plan
Communications	Data Management
	Communications

Leadership, Management and Oversight

Every facet of restoration planning and implementation under OPA, from Emergency Restoration, to concept development to post implementation data management, is underway for this case. Managers, supervisors and senior staff, including attorneys with NOAA General Council for Natural Resources, are both actively engaging with and prioritizing and coordinating the day to day work of teams made up of both FTE and contract personnel. Coordinating and communicating relevant information on the progress and status of ongoing efforts with the Department of Commerce, other line offices within NOAA, DOI and other federal cooperating agencies (including the Council on Environmental Quality, Army Corps of Engineers, Forest Service and Environmental Protection Agency), state co-trustees, the Trustee Council and Executive Council, members of Congress and a variety of interested NGOs, local governments, and members of the public also falls upon senior managers, supervisors and senior staff. Finally, senior managers are responsible for the broad financial oversight and fiscal management of restoration planning and implementation funds. For the purposes of this claim presentment, managers, supervisors and certain

senior staff labor is being budgeted under the single category of Leadership, Management and Oversight despite their active participation in multiple categories.

Level of effort: A total of 7 agency FTEs and contractor equivalents and $2.0M are projected for this requirement

Other requirements for this effort: There is no contract or other support requirements required under Leadership, Management and Oversight.

Finance

Finance team activities include budget planning, tracking and execution as well as documenting expenditures for cost recovery. The finance team supports major restoration planning expenditures requiring contracts or other procurement vehicles. Finance staffs apply knowledge of both agency policies and Federal Acquisition Regulations in order to execute day to day budget execution requirements. Cost recovery Teams compile restoration planning documentation for all NMFS program offices, as well as non-NMFS program offices, engaged in NRDA restoration. Contract and FTE personnel track, review and compile all supporting cost documentation needed to satisfy both program requirements as well as responsible party and NPFC requirements.

Level of effort: A total of 4 agency FTEs and contractor equivalents and $488K are projected for this requirement

Other requirements for this effort: There is no additional contract or other support requirements under Finance.

Early Restoration and Offsets Development

Activities under this category relate to Early Restoration Project development for both non-NOAA led and NOAA led projects and activities supporting development of restoration scaling and injury offset. Because NOAA staffs are working across this and other restoration planning categories, the number of staff working under any one category is dynamic and depends upon agreement of Early Restoration projects between BP and the co-trustees. Consequently, actual labor effort within any category may shift considerably from projections.

Multiple projects are in various stages of development for inclusion under the Early Restoration Framework Agreement for which NOAA is an affected trustee. In one form or another, as an affected trustee, NOAA anticipates participating in all phases of most non-NOAA led project development as it has done during the development of Tranche 1 projects. Among the many responsibilities of being an affected trustee for most of the injured resources arising from the spill, NOAA staff evaluate co-trustee project designs and engineering specifications (specifically NOAA coastal engineers), review cost estimation packages, coordinate the development of consistent monitoring and evaluation approaches across similar projects but different states, lead the technical development of restoration scaling for many projects, and participate in most of the offset and stipulation negotiations. Like the Tranche I projects, we anticipate being involved with our co-trustees after negotiations with BP with activities such as Statement of Work development, project and financial management oversight, project monitoring and evaluation, and incorporating project data into a DWH project database.

As the sole Deepwater Horizon trustee for offshore and blue water resources, as well as sharing trust responsibility for all (except terrestrial and bird) resources, NOAA is leading the development of several Early Restoration Projects. NOAA-led projects require involvement of a variety of program offices for successful restoration planning. For instance, protected resources staff and fisheries management staff both have unique skill sets required for developing different resource-based projects. Identifying and coordinating the needed expertise for restoration project development, within the legal confines of OPA, ensures legally defensible and effective projects. Specific activities include evaluating restoration project or restoration program concepts for scientific merit and efficacy, developing procedures and protocols for program-based restoration approaches, determining restoration benefits in order to scale projects, developing restoration costs and implementation budgets, developing monitoring and evaluation approaches, and developing the technical positions for offset and stipulation negotiations.

NOAA staff and contractors will be developing adaptive management concepts, processes and structure for the evaluation of restoration projects. While much is known about restoration projects, there is still incomplete knowledge about the efficacy of all restoration projects and the synergistic effect of multiple restoration projects. Therefore, restoration science and project evaluation is needed to adapt, alter and, perhaps, abandon restoration projects or programs. Such science-based checks and balances ensure desirable restoration outcomes and wise use of restoration funds.

OPA requires that restoration projects be scaled to natural resource injuries and lost resource services. Similarly, the Early Restoration Framework Agreement also specifies that offsets, i.e., restoration credits, be negotiated for every Early Restoration Project proposed by and agreed to by BP. Further, the injury offsets must be incorporated into a draft restoration plan available for Public review before both BP and the Trustee can stipulate to the offsets and proceed with project implementation. Therefore, restoration scaling and offset development is a time intensive effort.

Level of effort: A total of 12 agency FTEs and contractor equivalents and $2.2M are projected for this requirement.

Other requirements for this effort: ($60K FY13Q4). NOAA will conduct a workshop to bring together agency, academic, and private sector scientists who are experts in their fields to discuss restoration science needs for restoration plan development and projects selection. The 1 day meeting will be held at a government facility and involve 30 scientists. The budget allows for $2000 travel and per diem expenses, assuming air travel and 1 night hotel accommodations for each participant. The anticipated time for this workshop is the fall of 2013.

A database and web-based solution for managing, tracking, and reporting Early Restoration projects through project planning, implementation, and long-term monitoring is required. Contracted services are needed to fully scope the requirements and design, implement, and maintain the data system. (FY13Q2, $850,000)

Project Management

This category includes activities involving Early Restoration projects already negotiated with BP but for which no funds are available to provide oversight. Emergency restoration implementation and activities

supporting the development of overall operational procedures and oversight of the Trustee Council are also included in this category.

Eight (8) early restoration projects were negotiated under the early restoration framework agreement. While NOAA did not put forth one of these projects, we do have a vested interest in the outcome of the projects as an affected trustee with shared responsibility for the resources being restored. Accordingly, NOAA FTE and contract labor costs have been estimated and incorporated for those Early Restoration projects agreed to by BP under the Early Restoration Framework Agreement for activities such as participating in the Statement of Work development, overseeing project and financial management of projects, monitoring and evaluating project performance, and identifying Early Restoration project data reporting requirements necessary to populate a publicly accessible restoration project database.

NOAA continues to proceed with implementation of a Submerged Aquatic Vegetation Emergency Restoration Plan project. A draft plan was finalized after being presented to, reviewed and commented upon and finally agreed upon by BP. Funding for the project was requested but never provided by BP. NOAA is incurring the contract costs of this project and will present the contract costs to BP outside of this assessment claim. FTE and contract labor, however, are included in this assessment claim for activities including, but not limited to, contract oversight and close-out, project monitoring and evaluation, and incorporating project data into a DWH project database.

NOAA staffs are participating in developing the overall Trustee Council support structure and governance requirements for both Early and long term restoration implementation. Like the Exxon Valdez Trustee Council, procedures, protocols, common terms of reference, internal controls and periodic audits will be necessary to govern what will be decade's worth of restoration implementation. Because there is no precedence for multi-state and federal trustee governance agreements, crafting procedures agreeable to all parties will take time and a sustained effort.

In particular, financial oversight of restoration funds, whether Early or post-settlement funds, is of paramount importance. Never before have multiple states and federal trustees been accountable for the financial oversight of such considerable restoration funds. Accordingly, it is important to ensure that proper internal controls, independent validation of costs, and transparency of expenditure reporting is put into place early to ensure the proper use and administration of restoration funds the public. Towards this end, a contract for an accounting firm to provide NOAA independent reviews of cost documentation and other audit services is a specific part of this request.

Level of effort: A total of 6 agency FTEs and contractor equivalents and $2.4M are projected for Project Management.

Other requirements for this effort: NOAA is requesting funds to support a contract for independent financial review services of restoration expenditures. Specifically, the contractor will be an independent third party accounting firm that will perform the following activities at NOAA's request, 1) compile and summarize the certified cost packages of co-trustees' projects, 2) validate that those certified packages are accurate, complete, and have appropriate supporting documentation, 3) provide NOAA the option to perform audits, at the request of any Trustee, for projects undertaken by contractors or 3rd parties other than co-trustees, and 4) provide summary level (i.e., clearinghouse) accounting services to the Trustee Council. NOAA sees this contract as a necessary element of its fiduciary responsibility and to enhance

transparency of their restoration expenditures to the public. At the time of this request, the co-trustees are evaluating whether they also desire these services. Accordingly, NOAA's estimate of this contract is based on the assumption that the contract will be made available for and will serve all co-trustees. Funds are requested to cover the first 24 months of this contract (FY13Q1, $1M)

Regulatory and Environmental Compliance

NOAA must meet numerous environmental compliance responsibilities for both programmatic level restoration planning actions and project specific restoration actions. The broadest environmental compliance statute is the National Environmental Policy Act (NEPA) which, simply put, requires federal agencies to evaluate and document the environmental effects of proposed federal actions. NOAA is leading the development of the DWH Programmatic Environmental Impact Statement for restoration to meet this responsibility. The scope of the draft PEIS is comprehensive which is requiring a massive effort that can neither be assumed by the responsible party nor delegated to the state co-trustees. Non-trustee federal agencies and state-co-trustees have an integral role as cooperating agencies in NEPA which NOAA is coordinating. Likewise the public (including BP) also has a role during the next phase which will be reviewing and commenting upon the public draft documents. Thus, the effort to comply with just NEPA is considerable. This endeavor is into its second year of effort and will require, as it already has, considerable FTE labor, contract labor, and contract-based effort (See discussion below).

Like the Deepwater Horizon Oil Spill Final Phase I Early Restoration Plan and Environmental Assessment, additional NEPA documents will continue to be prepared for subsequent rounds of Early restoration projects. NOAA staff will participate in the development, drafting, review, and public engagement of these future documents as the need arises (i.e., following agreement between the Trustees and BP on Early Restoration projects).

The other regulatory compliance regulations that NOAA must either comply with or provide consultations to achieve compliance, include:

- Section 7 of the Endangered Species Act;
- Section 404 of the Clean Water Act (e.g., dredge and fill permits);
- Essential Fish Habitat consultations under the *Magnuson-Stevens* Fishery Conservation and Management Act (MSA);
- the Marine Mammal Protection Act (MMPA); and ,

Section 106 of the National Historic Preservation Act of 1966 (NHPA).

Programmatic and project specific compliance with the above regulations and statutes will expand NOAA's FTE and contract labor effort. NOAA staff who were not previously part of the DWH effort, now must be engaged in order to fulfill regulatory compliance requirements.

Level of effort: A total of 10 agency FTEs and contractor equivalents and $2.7M are projected for Regulatory and Environmental Compliance.

Other requirements for this effort: Additional contract support required for consultations under ESA and MSA will be coordinated through the Final PEIS contract and are included under that cost.

Programmatic Environmental Impact Statement and Programmatic Restoration Plan

Work continues on the draft Programmatic Environmental Impact Statement (PEIS) for comprehensive restoration planning for the oil spill. Labor estimates for this activity are not included with the Regulatory and Environmental Compliance category. The PEIS is focused on the broad analysis of environmental impacts for programmatic restoration which will result in more focused analysis of site-specific impacts from future long-term restoration. The PEIS will be used as a general reference for these site-specific efforts and thus concentrate the future analysis on issues specific to the statement subsequently prepared.

Drafting of the PEIS has been a combination of contract supported efforts and internal FTE and contractor staff, cooperating agencies, and co-trustees. The Draft PEIS will undergo simultaneous internal NOAA, Trustee and Cooperating Agency review and subsequent adjudication of Trustee and agency comment in preparation for public review of the document. Public review will consist of meetings, distribution of the PEIS to repositories and identified members of the public and availability on a NOAA website. Resulting public review comment will be captured and synthesized in a Comment Response document and all input considered in the development of the Final PEIS.

Considerable effort from other NOAA line offices including FTE and contract labor is being utilized for review of the Draft to ensure the document is technically sufficient and accurately captures the impacts of potential future restoration efforts. The Programmatic Restoration Plan PRP, currently under development and described below, will be a companion document to the PEIS. Integration of regulatory and environmental compliance and coordination efforts will be critical to completing the Final PEIS. Preparation of the Final PEIS will occur through a negotiated contract and supported by NOAA contract labor and FTE technical oversight. Incorporation of public comment, and subsequent Trustee, Cooperating Agency and internal review and approval of the Final PEIS will be required to complete the Final PEIS.

A draft Programmatic Restoration Plan, the foundation of an OPA restoration-based claim to compensate the public for injured resources and lost services, is underway and will continue until the draft plan is ready for public review and input. The plan will contain restoration categories, described in the draft programmatic EIS, deemed necessary to restore and compensate for resource injuries and lost services and will serve as a companion document to the PEIS. Drafting this document will be the primary responsibility of NOAA. It will be done in-house with FTE and contract staff. It will not be contracted to an outside entity.

Level of effort: A total of 5 agency FTEs and contractor equivalents and $2.1M are projected for the programmatic PEIS effort.

Other requirements for this effort: A Final Programmatic PEIS ($1M FY13Q1) will be developed through Contract. As a logical follow-on to the existing Draft PEIS, EA Engineering, Science and Technology will be utilized for development of the FPEIS. Preparation of the FPEIS Statement of Work includes 6 main Tasks: (1) Meetings, Calls and Project Management; (2) Printing and Distribution; (3) Public Review Meetings; (4) Response to Comment Report; (5) Preparation of Clearance Ready FPEIS; and (6) EFH and ESA consultation requirements. The current estimate of $1M for this Contract is based on the DPEIS contract and projected requirements. Anticipated award for this contract is mid-October

2012. The FPEIS will receive internal NOAA, Trustee, Cooperating Agency and public review (including BP). The projected timeframe for public review is February 2013.

Data Management

The Data Management Team supports the document management and information needs of the DWH Restoration Planning case teams. The team coordinates discovery requests, provides guidance on records management, and ensures appropriate documentation is included in the Administrative Record per NOAA's responsibilities. The team continues to manage a DWH SharePoint site and provides guidance, technical expertise, and problem solving skills to all case team members (federal and state). The team also provides technical support to the public to assist with submitting project ideas through the online database or with viewing the information on the website. The Data Management Team continues to maintain and manage a database to collect and analyze restoration project suggestions. The team coordinates with other federal and state trustees to provide periodic data exports of all suggested projects as well as a web-based interactive project atlas that allows for viewing the project information. The Data Management team is also developing solutions for managing and tracking Early Restoration projects through project planning, implementation, and long-term monitoring. The team is coordinating with other federal and state trustees to determine tracking and reporting needs for Early Restoration as well as future projects. This effort requires dedicated time to coordinate with a number of trustees as well as IT staff to fully scope the requirements and manage the development of the project tracking system. Finally, the Data Management team supports the spatial analysis and mapping needs of the case team and is actively working to integrate restoration project information into existing mapping tools.

Level of effort: A total of 3 agency FTEs and contractor equivalents and $1.5M are required for this requirement.

Other requirements for this effort: Document management and information needs of the DWH Restoration Planning case teams are supported through the use of a MS SharePoint site. Contracted services are needed to provide enhancements and maintenance as well as cover software license cost. (FY13Q1 $10,000).

Contracted services are needed to provide enhancements and maintenance of the DWH Restoration Project Suggestion database, which is a system use to collect ideas on restoration projects from the public through an online data entry form. Project ideas are compiled and displayed in an online interactive atlas. (FY13Q3, $50K)

The database can be found at the following URL:
http://www.gulfspillrestoration.noaa.gov/restoration/give-us-your-ideas/suggest-a-restoration-project/

Development and hosting costs for the Socrata software and services used for the collection and management of public comments is required. (FY13Q3, $5K):

The Trustees' use of the Socrata software application can be found at the following URL:

http://www.gulfspillrestoration.noaa.gov/restoration/give-us-your-ideas/see-what-others-are-saying/

Funding is requested to cover software maintenance cost for the Cognos reporting software used for the DWH Restoration Project Suggestion database. (FY13Q4, $4K)

Communications

The NOAA communications team will provide support integral to the overall restoration planning effort. Working to ensure that the American public is well-informed about and fully engaged in the NRDA process will continue to be central to its responsibilities. Managing media requests for information and visits to restoration project sites are critical to this effort, as are the NOAA Gulf Spill Restoration website, social media channels and list-serves the communications team manages. The website (www.gulfspillrestoration.noaa.gov) is the centerpiece of this effort, as it provides the avenues for the public to submit restoration project ideas, review the PEIS and Early Restoration planning documents, and explore the natural resource injuries that drive restoration planning decisions. This platform has been embraced by the trustees as the central repository for materials, an invaluable function, and will house a restoration project tracking database critical to providing public transparency during project implementation.

Communications staff also will spearhead the production of a range of print publications, including a suite of quarterly-updated fact sheets on NRDA, as well as materials related to the specific milestones in the PEIS and Early Restoration processes. Throughout these same processes, communications staff will aid the planning, promotion and execution of numerous public meetings throughout the Gulf Coast and in Washington, DC that afford the trustees an invaluable opportunity to educate the public and gather input on proposed restoration approaches. Similar opportunities for exchange also come in the form of regular correspondence and in-person meetings with non-governmental organizations (NGO), on many of which the communications team will provide logistical and tactical support.

Level of effort: A total of 3 agency FTEs and contractor equivalents and $772K are projected for Communication requirements.

Other requirements for this effort: Starting very early in the Deepwater Horizon damage assessment process, NOAA has taken great care to afford the public the opportunity to see and learn more about our field and laboratory operations through three-to-five-minute videos. Showcased through our Gulf Spill Restoration website (www.gulfspillrestoration.noaa.gov), social media channels, at public meetings and in presentations to a variety of community groups, these widely viewed video productions have allowed viewers the rare chance to witness firsthand how resources like dolphins, oysters and marshes are being evaluated by Trustee researchers. NOAA proposes to continue the production of similar NRDA-focused "webisodes" through the period currently under consideration of this claim. As the NRDA process advances, the subject matter covered in these productions will evolve to focus greater attention on presenting damage assessment findings and documenting our progress in restoration project implementation. In this vein, extended treatments of Phase II early restoration projects are contemplated. The expenses forecast cover costs associated with on-site video shoots, editing and post-production, as well as closed captioning. ($20K, FY13Q2, $10K FY14Q1).

Throughout the NRDA process, NOAA has used custom illustrations produced under contract as a key part of our public education and outreach efforts. For example, we have commissioned illustrations to convey a conceptual model of natural resource exposure to oil in the Gulf, along with three-dimensional

breakdowns of the NRDA Technical Working Groups and the resources they are studying. Pictures being worth thousands of words, the images have aided our efforts to promote public appreciation for the efforts of the trustees. The illustrations have been integrated into fact sheets, comprehensive reports and numerous public presentations. NOAA proposes the continued use of custom illustrations in this claim. A growing proportion of these illustrations is likely to be focused on restoration project proposals, specifically Phase II Early Restoration projects. ($8K, FY13Q2, $4K FY14Q1)

N. Toxicity to Aquatic Organisms

Toxicity to Aquatic Organisms

Comparison of CY 2012 and 2013 Requests:

The funding NOAA received from the NPFC obtained in CY 2012, requested in part because BP discontinued advance funding of our work, was recently received and has not been spent. These monies are being obligated now in contracts to continue toxicity work through the end of CY 2012. None of this funding was requested to carry the toxicity testing into FY2013.

The FY 2013 toxicity funding request to the NPFC is in addition to the FY 2012 funding and is roughly $7.4 million of contract costs. We projected the FY 2013 costs with the understanding that there will be a similar amount of testing as occurring now, a similar or greater frequency of meetings with BP, and additional time needed by the trustees to distill and summarize test findings. Although we have undertaken many tests already, some have required repetition, some need to be replaced with other test species, and some new types of tests are needed in CY 2013 to help interpret field data obtained for specific groups of animals not included in the initials rounds of toxicity testing. We have also identified additional species to test based on their ecological importance in specific habitat types affected by the spill.

In summary, the toxicity work is a central and critical piece of the DWH damage assessment and will be used by all technical working groups (TWGs) to aid interpretation of their data and frame documented or modeled exposure concentrations in terms of likely resulting injuries. The following text provides detail on the toxicity work for the case and specific funding needs.

Toxicity to aquatic organisms

The primary goal of the toxicity investigations is to evaluate toxicological responses of representative Gulf of Mexico aquatic organisms, or appropriate surrogate species, to petroleum constituents and dispersants comparable to what was discharged by the Deepwater Horizon oil spill. The laboratory toxicity data, as represented through dose responses, will be used to help interpret empirical and modeled data representing field conditions, observations, and samples. As such, the toxicity studies serve a broad role in the overall case to explain or predict levels of injury to natural resources associated with a range of exposure conditions.

Assessment activities in the toxicity group are focused on understanding the exposure, pathway, and effects of oil and dispersant from the incident on a variety of test animals. NOAA requests funds to continue toxicity tests as part of a program that was started in 2010 and is ongoing in 2012. The

additional work that we propose for 2013 will complement existing studies and strengthen our current toxicity testing plan.

The toxicity budget for 2013 is based on maintaining a comparable level of effort to that of activities in 2012. We will continue additional phases of toxicity tests that are currently underway as well as design and implement new toxicity tests for selected species. We will also continue analytical chemistry testing of oil and dispersant formulations. We identified some data gaps within our nearshore and offshore species for addressing potential spill impacts to specific communities. Additionally, through the course of testing some species that are prevalent in the Gulf but are not standardized test species (e.g., pelagic fish species), we identified better methods to handle and test organisms that improved survivorship in controls and yielded more robust data. Consequently, we plan to repeat some tests with the new methods. We also plan to include some new species in our toxicity tests. For example, we need to conduct tests that will help us evaluate the toxicity of oil to sea turtles.

Toxicity studies for protected species like sea turtles are constrained by their special status as threatened or endangered animals. Consequently, we propose using surrogate species, the red-eared slider and the snapping turtle, that our experts feel will provide valuable information about toxicological implications from oil exposures. As turtles, these surrogate species are expected to provide more relevant comparisons than could be obtained using results from existing literature for mammals fed with oil contaminated food. Our initial studies will focus on the toxicological consequences of oil ingestion because sea turtles collected during the spill were observed with substantial amounts of oil in their oral cavities. These studies will allow us to put the field collected observations and turtle physiology data in a toxicological context.

Contract expenditures are included to cover all laboratory-based toxicity testing, sample analysis, and work by Principal Investigators and their teams to oversee the assessment studies. The Trustees, through NOAA, are working with roughly 15 Principal Investigators and implementing tests in more than ten research laboratories to complete toxicity investigations for the NRDA. Toxicity testing investigations are not collaborative with the Responsible Party, thus signed study plans are not available.

Total contract cost for toxicity studies projected for 2013: **$7,408,402**

To assess the effects of oil discharged by the Incident, a variety of tests are conducted using representative Gulf of Mexico fish and invertebrate species. The lethal and sub-lethal toxicity of field-collected MC252 oil, artificially weathered MC252 oil, COREXIT 9500, and oiled sediments is evaluated using several exposure pathways and endpoints. Pathways investigated include water accommodated fractions (WAFs) of oil, exposure to oil droplets, exposure to oil slicks, exposure to oiled sediment, and ingestion of contaminated prey. The type(s) of oil used for test exposures depend on what oil(s) species were likely exposed to over the duration of the Oil Spill. Endpoints evaluated during these tests include survival, growth, reproductive metrics, development, tissue damage (histology), gene expression, immunological effects, other physiological injuries, and behavior. The majority of tests are focused on the effects to early life stages (e.g., embryo and larvae) or on adults during their reproductive cycles. The Trustee schedule of toxicity testing coincides with the reproductive season(s) for each test species when appropriate.

Institutions under contract to NOAA for conducting laboratory-based toxicity work:

- Auburn University
- Florida Gulf Coast University
- Miami University of Ohio
- Monterey Bay Aquarium
- Mote Marine Laboratory
- Queen's University
- Stanford University
- University of Manchester
- University of Maryland
- University of Miami, Rosenstiel School of Marine and Atmospheric Science
- University of North Texas
- University of Southern Mississippi, Gulf Coast Research Laboratory

Species used in toxicity tests:

- Amberjack (*Seriola lalandi lalandi*)
- Amphipod (*Ampelisca abdita*)
- Amphipod (*Leptocheirus plumulosus*)
- Blackfin Tuna (*Thunnus atlanticus*)
- Blue crab (*Callinectes sapidus*)
- Bluefin tuna (*Thunnus thynnus* and *T. maccoyii*)
- Cobia (*Rachycentron canadum*)
- Comb jelly (*Mnemiopsis leidyi, a.k.a. sea walnut*)
- Eastern oyster (*Crassostrea virginica*)
- Fiddler crab (*Uca spp.*)
- Goggle eye (*Selar crumenophthalmus*)
- Grass shrimp (*Palaemonetes pugio*)
- Inland silverside (*Menidia beryllina*)
- Killifish (*Fundulus grandis*)
- Mahi-mahi (*Coryphaena hippurus*)
- Moon jelly (*Aurelia aurita*)
- Pacific mackerel (*Scomber japonicus*)
- Polychaete worm (*Neanthes arenacoedentata*)
- Red drum (*Scianenops ocellatus*)
- Red-eared slider (*Trachemys scripta elegans)*
- Sea urchin (*Strongylocentrotus purpuratus*) or Sand dollar (*Dendraster excentricus*)
- Sheepshead minnow (*Cyprinodon variegates*)
- Southern flounder (*Paralichthys lethostigmata*)
- Snapping turtle (*Chelydra serpentina*)
- Speckled sea trout (*Cynoscion nebulosus*)
- Yellowfin Tuna (*Thunnus albacares*)

Toxicity investigations scheduled between January and December 2013 will use animals from a variety of ecological habitats that are addressed in our injury assessment. Further testing will be conducted on pelagic fish (e.g., tuna, goggle eye, cobia, and mahi-mahi), invertebrates (e.g., shrimp), predatory fish (e.g., red drum), and prey fish (e.g., inland silverside and sheepshead minnow). To address potential injuries in benthic habitats, testing is planned for invertebrates (e. g., amphipods, blue crab, flounder, gulf killifish). NOAA is completing tests, with all appropriate oil and dispersant formulations, on the

organisms and life stages that were started in 2012. In 2013, tests will be conducted on appropriate life stages that were not started in 2012. Results from 2011 and 2012 testing will be used to inform future testing. The results produced to date will undergo rigorous statistical evaluation starting in fall 2012.

NOAA's estimated costs for 2013 include funds to support planned toxicity testing using various life stages, endpoints, exposure scenarios and test species. NOAA requests funds for laboratory analysis of samples collected during the tests. Water and sediment samples are analyzed during the course of each toxicity test to characterize the actual exposure conditions and consequently the dose. Also included in the budget are funds for analysis and interpretation of the resulting data. Water samples analyzed for PAHs and dispersant markers cost approximately $400 per sample. The unit cost for analysis of sediments is higher. Each test that Trustees conduct results in approximately 5-15 water samples sent to the lab, and depending on the testing scenario, there may be both sediment and water samples for analysis.

Data produced by assessment activities: The sum total of the individual toxicity tests that NOAA expects to conduct will be around 300, with roughly 50% of these tests being conducted in 2013. The actual number of data points produced depends on the type of test. However, the endpoints evaluated during these tests include survival, growth, reproductive metrics, development, tissue damage (histology), gene expression, immunological effects, and behavior. An individual test can produce hundreds to thousands of individual data points, and certain tests monitoring behavioral changes utilize video documentation that has not yet been quantified in terms of individual data points. The data from all of these 300 tests will require robust statistical analysis and interpretation. NOAA has selected a team of statisticians for this purpose, and they will begin their analysis in mid-2012 and continue into 2013. Based on recommendations of the statisticians, data will be analyzed and reported through summaries to account for statistical power and appropriate presentation of the results. Data will be examined to look for trends within a species, among species, and within ecozones (nearshore, offshore, deep water). The anticipated deliverables will be data summary reports and internal reports including data interpretation. Individual technical work groups (TWGs) will also be using the toxicity data in their assessments, models, and data interpretations. The proposed budget accounts for a limited amount of vetting drafts and revisions through multiple steps of review by the case teams.

Timeframe for assessment activities: NOAA plans to conduct additional tests from January to December 2013. Data from individual tests will be compiled and undergo QA/QC as the results become available. Data from individual tests will be statistically analyzed during the summer and fall of 2013. Data from individual tests will be integrated with previously conducted tests during the summer and fall of 2013.

Level of effort needed to complete activities: Our request for the toxicity to aquatic organisms activity is $7,408,402 in contract funds. These costs include 1.9 agency FTEs and 19.2 contract equivalents.

All of the testing will be led by Principal Investigators from laboratories specified in the Claim. For the period of January – December 2013, NOAA requested funds for the PIs and their lab staff to work nearly full-time for the duration of their portion of the testing. About two FTE personnel will handle all technical, legal, and coordination tasks related to this large testing program. NOAA is using two contract equivalents at the Office Support, Contract Support, Support Associate, Research Associate, Associate, Senior Associate, Manger, and Officer levels to help oversee the subcontracts with the individual

laboratories, assist coordinating with the Trustees and RP, and assist with inter-lab coordination and data sharing.

Toxicity data application for determining injury and planning for restoration: The toxicity testing results will be used to produce dose - response curves and determine the water and sediment concentrations that are toxic to organisms. The Trustees' toxicity testing program considers field evidence of oil impacts to resources observed in large areas of the Gulf of Mexico and at different trophic levels and utilizes the laboratory results and dose - response curves to put the field observations in a toxicological perspective. The selection of species in the Trustees' testing regime is representative of many ecological niches or guilds that were affected by MC252 oil (using models or direct observations from field sampling). Incident-specific toxicity data is important because existing literature cannot address toxicity of the sweet crude oil spilled as altered by the unique scenario of deep sea release, associated biological and physical weathering, and mixing with a large volume of applied dispersants. Literature values do not exist for many of the representative Gulf of Mexico species that NOAA is and will be testing. The DWH oils that NOAA is utilizing for toxicity tests represent a variety of weathering states and a unique combination of oil constituents. For Gulf of Mexico species that have literature values for a similar type of sweet crude oil, the testing was typically done using unweathered oil, which is not representative of many exposure conditions during the DWH oil spill. Additionally, the toxicity testing that NOAA will conduct is using current scientific testing and analytical methods with sensitive endpoints such as early life stage development, cardiac function, immune function, and gene alterations – a combination that represents a more comprehensive and improved approach than found in most previously published studies.

Water and sediment concentrations that are toxic to the aquatic organism may be paired with laboratory results of field-collected environmental samples that have been displayed on maps. Exactly how the information is used will depend on the animal's spatial distribution in the Gulf habitats and related exposure characterization. For example, aquatic toxicity information for pelagic species will be utilized in the SIMAP modeling efforts to predict toxicity and losses in many blue water habitats affected by the spill incident. MC252-specific LC50 values for species will be incorporated in the SIMAP model and used to quantify lost biomass and production forgone.

Results from the toxicity tests may be used to calculate direct loss of animals in areas affected by oil or contribute to service loss estimates in various habitats. Restoration specialists will consider the spatial scale and magnitude of resource or habitat injuries supported by the toxicity test results and target restoration projects or types that have a close geographic or resource nexus to the injuries.

Responsible Party involvement: NOAA has had discussions with BP and their contractors regarding the general scope of the toxicity testing program. NOAA had two meetings (April 29, 2011 and November 15, 2011) and numerous phone conferences. NOAA has coordinated with BP but jointly agreed to conduct tests separately and share data when tests are fully completed and data have undergone full QA/QC. This constitutes the basic level of our cooperative arrangement between the trustees and BP on the toxicity portion of the assessment. The expressed intent of both sides is to share toxicity data at a future date comes with the understanding that BP will reimburse the Trustees for all relevant and associated costs deemed reasonable and appropriate under the law.

NOAA does not jointly sign toxicity work plans with BP. Beyond the two in-person meetings, NOAA provides a calendar every month to BP that includes the tests completed to date and the tests that NOAA expects to conduct in the upcoming month. The schedule conveys the following information about the tests: date, laboratory, test substance, test substance mixing method, species, life stage, endpoints, test conditions, and test duration.

In summary, the full complement of toxicity tests on a cross-section of species and life stages, as they are designed, are necessary for Trustees to complete their injury assessment. The unique release and response scenario associated with the Incident and paucity of toxicity testing literature on Gulf of Mexico species influence the complex toxicity testing design. Further, toxicity testing is a proven, reasonable, and cost-effective assessment method to address potential injuries to a wide variety of resources and habitats potentially exposed in a large marine ecosystem. The Trustees will use the toxicity results to aid interpretation of field exposures and support injury quantification activities.

O. Data Management and Visualization

Data Infrastructure and Systems Architecture

An unprecedented quantity of samples, instrument files, photographs, video recordings, and visual observations were acquired to assess the impact of the MC252 oil spill. The Data Management TWG has led and continues to lead the effort to ensure the preservation of all such files and data. This effort has entailed tracking, storage, maintenance, and sharing of these data with the NOAA TWG PIs and support staff as well as the wider Trustee community. For example, data from over 20,000 field event collections, comprising nearly 1 million individual field data forms and associated files, have been generated and uploaded to the file collection repository. Similarly, 2 million contaminant chemistry sample analytical result records have already been generated and are maintained in the database repositories.

Many of the resource-based analysis activities presented in this NPFC Phase 2 claim incorporate the direct data management support of acquiring, storing, and sharing data collected in direct support of each of the activities. In addition to these efforts, NOAA directs the architecture, development, management, and oversight of the data repositories. These repositories include ERMA; noaanrda.org; Data Integration, Visualization, Exploration, and Reporting (DIVER); Photologger; and, Query Manager. Such tasks include:

- Maintenance of the information management servers, including server patching and rebooting of separate production, testing, and development environments
- System backups
- Infrastructure monitoring, such as data drive space, memory allocation, and server error logs
- Resolution of server connection and user administration issues
- Oversight and implementation of functionality to ensure litigation-sensitive control of files and metadata
- Design, development, and maintenance of overarching data retrieval and information sharing tools
- Configuration of new data storage arrays and databases
- Forensically sound transfer of data, as required

Connection of Activities to NRDA Process

These overarching activities, while not specific to a particular activity or TWG, are necessary to comprehensively maintain and ensure proper document and data preservation necessary for litigation. Furthermore, system development and maintenance is necessary to continue fostering access to assessment files and data.

Data/Deliverables Produced

The information management systems are actively managed on a daily basis to ensure continued access to NRDA and related data by the Trustees. Systems functionality changes (e.g., data retrieval for analysis products posted to data repositories) are released on a bi-weekly basis, as necessary.

Level of Effort

Our request for the data infrastructure and systems architecture activity is $5,736,428 in contract funds. These costs include 2.5 agency FTEs and 20.3 contract equivalents. Key personnel include agency and IEc/contractor data management teams.

PIs (NOAA and other)

The PIs for this effort include Amy Merten, Kevin Kirsch, Michele Jacobi, Jay Field, Ben Shorr, George Graettinger (NOAA); Daniel Hudgens (IEc); and Mike Jackson and Jim Anderton (Solea).

Timetable

Ongoing infrastructure management will occur in concert with timing of other Phase 2 activities.

RP Involvement

The RP does not have direct involvement in these infrastructure activities with the exception of the TWG-specific activities under which the RP is allowed access to the corresponding file and data records.

P. Injury Assessment Management and Administration

Injury Assessment and Legal Case Management

NOAA included agency costs in this activity to cover incident-wide case management and administration. These FTEs are program or regional managers that are dedicated for a significant period of time on the Oil Spill, or are staff assigned full-time to lead large areas of NOAA's assessment activities at the technical level. Attorneys that are supporting assessment activities full-time also are included in the estimate. The types of management-oriented roles associated with the Oil Spill are summarized below:

- Program leads for the Assessment & Restoration Division, and General Counsel for Natural Resources, and their key managers. The program lead and several key management positions for restoration are additional needs and accounted for in the restoration scaling and planning activity;

- Assigned Trustee Council representatives that cover all assessment activities coordinated with co-Trustees, and the legal considerations associated with them;
- Technical leaders that are managing or coordinating large agency teams in broad issue areas, such as deepwater communities, water column, nearshore/shoreline, and technical documentation; and
- Field operations lead and safety officer.

Our request for the injury assessment and legal case management activity is $1,131,000 in contract funds (primarily vessel costs) and 3.4 contract equivalents and 17.5 agency equivalents. Key personnel include ARD program managers and regional managers, agency attorneys, and IEc scientists.

Documentation of information provided to the Responsible Party: The Responsible Party has worked with all of the agency management staff on activities identified in this section of the Claim since the Oil Spill, and worked with the Trustees to optimize the activities of the New Orleans field command post.

Field Operations Support

Data Produced for assessment activity: The NRDA activities related to this procedure are management- and administration-oriented and thus technical deliverables will not be produced.

Timeframe for assessment activity: The NRDA activities will occur continuously during the period of the Claim.

Level of Effort needed to complete the activity and cost justification: Our request is 0.6 agency equivalents to complete shoreline, marine mammal, and oyster field studies. Key personnel include agency field operations and safety staff. The vessel costs were included within the individual activity estimates.

A) Vessels

The table below summarizes the numbers of vessels needed to complete the field activities described in the Claim. The costs for vessels are not included in this section of the Claim, but are instead within the contract costs for the shoreline and oyster resource activities.

Table 4. Breakdown of boat days and vessel costs for 2013 field investigations

TWG	Activity	Estimated required boat days in 2013	2013 Average daily boat rate*	2013 Estimated cost
Shoreline	Coastal Wetland Vegetation-Bay Boat	218	$ 1,200	$ 261,600
Shoreline	Coastal Wetland Vegetation- Air Boat	65	$ 1,000	$ 65,000
Shoreline	Coastal Wetland Vegetation - Bay Boat Twin Vee	26	$ 1,500	$ 39,000

TWG	Activity	Estimated required boat days in 2013	2013 Average daily boat rate*	2013 Estimated cost
Shoreline	Coastal Wetland Vegetation - Mud Boat	1	$ 750	$ 750
Shoreline	Coastal Wetland Vegetation - Skiff	38	$ 950	$ 36,100
Shoreline	Coastal Wetland Vegetation - Overnight Vessel	5	$ 3,700	$ 18,500
Shoreline	Coastal Wetland Vegetation - Cabin Boat	2	$ 1,700	$ 3,400
Oyster	Oyster Abundance Monitoring - Skiff	55	$ 1,521	$ 83,679
Oyster	Oyster Abundance Monitoring - Bay Boat	46	$ 1,265	$ 58,190
Oyster	Oyster Abundance Monitoring - Bay Boat Twin Vee	33	$ 1,505	$ 49,665
Oyster	Recruitment Monitoring - Skiff	66	$ 1,530	$ 100,980
Oyster	Recruitment Monitoring - Bay Boat	101	$ 1,269	$ 128,151
Oyster	Recruitment Monitoring - Bay Boat Twin Vee	22	$ 1,175	$ 25,850
Oyster	Intertidal Sampling - Airboat	1	$ 850	$ 850
Oyster	Intertidal Sampling – Skiff	61	$ 1,148	$ 70,000
Oyster	Intertidal Sampling - Bay Boat	77	$ 1,182	$ 91,000
Oyster	Intertidal Sampling - Cabin Boat	3	$ 1,400	$ 4,200
TOTAL				**$710,315**

* Daily rates represent a blended rate for the each boat type used historically by a given plan. This varies by plan due to the specific mix of boats used within each boat type because prices vary by boat size, features, and location.

Comprehensive Document Management System for Assessment & Restoration Planning Records

The purpose of this activity is to provide a Deepwater Horizon (DWH) Document Management System that improves NOAA staff efficiency and productivity by opening access to DWH-related information, while protecting the integrity and availability of mission critical information. This system is distinct from the Data Management System that NOAA is using for DWH assessment samples, analytical databases and results. It has a separate architecture and serves separate needs.

Valuable information related to NOAA's continuing study of the DWH oil spill's effects on natural resources, including habitats and species in and using the Gulf of Mexico, has accumulated and is stored in locations across NOAA line and staff offices and behind multiple fire walls; that is, in individual email accounts, local area network shares, and on the hard drives of devices. This information has critical operational and strategic value. Access to this information is essential to enable NOAA to utilize existing research and studies collected and produced by researchers and scientists for decision making related to the natural resource damage assessment and restoration planning and implementation. Many NOAA employees require real time access to DWH-related information in a system where it is organized and can be located, searched, retrieved and read. Currently, however, this information is neither organized nor accessible in this manner.

The goal of this activity is to establish a pragmatic and defensible architecture to support a user-friendly, centralized, Federal Information Security Management Act (FISMA) compliant, web-accessible and archived Document Management System, hosted within NOAA or with a NOAA contractor, that will initially access approximately 10 terabytes of documents in a repository from which authorized NOAA users can efficiently retrieve and productively use, but not make changes to the stored information. The NOAA records team already is addressing 10-15 million documents.

The Document Management System will allow NOAA staff and contractors to organize, index and share the collected information within NOAA using an internal-facing, permission-based web link. The Document Management System will preserve and provide for long term maintenance of information. The system will also include a rights management module which allows an administrator to give access to documents, based on type, to appropriate people or groups of people within NOAA. This document management request is additive to the activity below (Legal Review of Assessment & Restoration Planning Records Produced by NOAA) because we are not requesting funds in this activity for any records review.

NOAA will coordinate with Technical Working Groups, Chemistry and Toxicology Groups, National Marine Fisheries Service scientists at Centers and Labs, the National Marine Fisheries Service Habitat and Restoration Division, the National Marine Fisheries Service Protected Resources Section, the National Ocean Service Office of Response and Restoration, the NOAA Office of the Chief Information Officer, line and staff office information technology personnel and others in the NOAA science community to populate and update this repository.

Timeframe for assessment activity: The NRDA activities will occur continuously during the period of the Claim.

Level of Effort: We are budgeting for a total contract cost for this activity of $552,000. This includes 1.6 contract equivalents and a small amount of agency time for oversight.

Documentation of information provided to the Responsible Party: NOAA is not planning to coordinate with the RP on this activity.

Legal Review of Assessment & Restoration Planning Records Produced by NOAA

The Trustees announced the establishment and opening of the Administrative Record for this NRDA (AR) on October 1, 2010, with DOI having lead for the AR. (See Notice of Intent to Proceed with Restoration Planning, 75 Fed. Reg. 60800, at 60802). The establishment of the AR is in accordance with 15 CFR 990.44 and .45. The AR is publicly accessible and is intended to include documents considered by the Trustees during the preassessment, assessment, and restoration planning phases of the NRDA performed in connection with the DWH Incident. Although DOI has lead responsibility for the AR, the underlying effort to identify, collect, organize, review and approve materials for inclusion in the AR necessarily involves all Trustees and the costs to provide for and maintain a sufficient AR have been increasing rapidly and exponentially, particularly as attention in the AR effort has turned in 2012 to fully addressing both TWG and Trustee Council level records.

NOAA costs for the Administrative Record in this regard reflect four major components: (1) identification, routing, and management of legal records from the assessment; (2) identification, routing, and management of legal records of restoration planning processes; (3) contributions to co-Trustee, joint records management and coordination, including for Trustee Council level legal records management, legal reviews, and public accessibility; and (4) hardware and data architecture for legal document management.

(1) Identification/management of legal assessment records for the AR from NOAA-led or managed activities – Includes searches, collection, organization, routing, and management of AR records from NOAA-led TWGs, NRDA operational support groups, etc., that are candidate for inclusion in the NRDA AR;
(2) Identification and management of legal records for the AR from restoration planning processes - Includes searches, collection, organization, routing, and management of AR records for restoration planning processes for which NOAA is lead (e.g., PEIS and related restoration plan(s)) or is participating (e.g, Early Restoration plans) that are candidate for inclusion in the NRDA AR;
(3) Contributions to joint legal management of records with co-Trustees – Includes helping DOI to provide legal guidance for AR record searches, to define protocols and platforms for joint legal reviews, and to participate and provide services appropriate to support AR decision-making processes at the Trustee Council level, including records management, joint legal reviews, redaction reviews for NOAA records, and public accessibility;
(4) Hardware and data architecture – Candidate NOAA records for the AR extracted from NOAA's document management system (described above) will be voluminous. Existing data and records management systems will not be sufficient alone to support NOAA's legal record review tasks for the AR and this NRDA. We intend to create a companion system or module for the AR that is linked to our larger, more comprehensive document management system (described in activity above). An AR-focused document repository for NOAA will require software and hardware specially designed for this task, as well as information management architecture for tagging, cataloging, and creating document workflows for processing and review of documents. Staff and contractor time will be required to design the architecture and process the documents in

workflows that have been agreed-to by all of the Trustees. These activities will occur continuously over the entire span of CY 2013.

Level of Effort: Our request for the legal review and routing of assessment & restoration records for the AR is $2,988,000 in contract support. A total of 9.6 contract equivalents is required for this activity in 2013. The level of effort, by sub-task, is provided below:

1. Assessment - $0.8M, or 2.6 contract equivalents
2. Restoration - $0.7M, or 2.2 contract equivalents
3. EC/public AR - $0.3M, or 1.0 contract equivalents
4. Hardware and data architecture - $1.2M, or 3.8 contract equivalents, including hardware costs

These estimates were based on the potential scope of this effort (and costs) across all of NOAA's NRDA activities, and the volumes of candidate AR records that may require review. The contractors undertaking this task will be in communication with hundreds of Trustees or Trustee representatives across the region on a monthly basis. We expect our AR workflows and review needs for this incident to be unique because of the volume of records and national scope of the effort. Off-the-shelf file sharing and document review systems cannot be used for this activity without extensive modification to the software or data management architecture.

Timeframe for assessment activity: The NRDA-related AR activities will occur continuously during the period of the Claim.

Documentation of information provided to the Responsible Party: NOAA is not planning to coordinate with the RP on this activity.

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Table A-1. List of final, signed work plans posted on the Internet as of September 14, 2012

Claim Category	Habitat / Resource / Claim Activity	Workplan #	Name of Workplan	Date Signed	Objective
Shoreline	Shoreline	1	Deepwater Horizon/MC252/BP Shoreline/Vegetation NRDA Pre-assessment Data Collection Plan	7/30/2010	To determine the shoreline areas that were exposed to potentially harmful levels of oil and to characterize the habitat, vegetation, and fauna on those shoreline resources that were exposed to DWH oil. The purpose of this pre-assessment study is to collect the information necessary to map the extent of shoreline exposure to oil and select locations so that further potential injury assessment studies can be identified
Shoreline	Shoreline	2	Shoreline/Vegetation Rapid Shoreline Oiling Survey NRDA Pre-Assessment Data Collection Plan	3/3/2011	To provide additional information to be used in conjunction with information obtained in the Tier 2 data collection efforts under the Deepwater Horizon/MC252/BP Shoreline/Vegetation NRDA Pre-Assessment Data Collection Plan to determine the spatial extent and degree of oiling on intertidal shoreline resources.
Shoreline	Shoreline	3	Sampling and Monitoring Plan for the Assessment of MC252 Oil Impacts to Coastal Wetland Vegetation in the Gulf of Mexico	8/23/2011	Assessing impacts of DWH Oil Spill on coastal wetlands, especially in LA
Shoreline	Shoreline	4	Light Detection and Ranging (LIDAR) Data Acquisition	11/3/2011	to acquire Light Detection and Ranging (LIDAR) data along the affected and unaffected areas of the Louisiana coast. This data will provide information for deriving and mapping elevation and shoreline position along the shorelines.
Shoreline	Shoreline	6	Work Plans for MC252 Oil Impacts to Fiddler Crabs and Periwinkle along the Gulf of Mexico; <not currently available on gulfspillrestoration website	3/29/2012	This document presents a work plan for use in assessing the impacts of MC252 oil on the density, size distribution, and sex ratios of fiddler crabs and the density and size of periwinkles in coastal marshes along the Gulf of Mexico, particularly in Louisiana.

Claim Category	Habitat / Resource / Claim Activity	Workplan #	Name of Workplan	Date Signed	Objective
Shoreline	Shoreline	7	Addendum to the Sampling and Monitoring Plan for the Assessment of MC252 Oil Impacts to Coastal Wetland Vegetation in the Gulf of Mexico - 2012 Data Collection - Coastal Wetland Vegetation Elevation Survey; <not currently available on gulfspillrestoration website, on CD: "2012_03_19_SHORELINE_Coastal_Wetland_Vegetation_Elevation_Survey (LA signature).pdf>	4/10/2012	This addendum will allow the 2012 surveys to begin in February with an anticipated 45 day fieldcollection effort. The methodology for data collection and processing will remain as conducted in 2010-11 to ensure the comparability between the data sets to calculate changes that may have occurred
Data Management and Visualization	Aerial Imagery	8	Technical Specification and Scope of Work/Services for Aerial Image Acquisition and Image Processing in Support of the MC252 NRDA Process	10/11/2010	This document is a scope of work that has been developed to support the needs of the submerged aquatic vegetation (SAV) and shoreline technical working groups. Aerial imagery will be acquired in predefined priority areas on a six-month basis.

Claim Category	Habitat / Resource / Claim Activity	Workplan #	Name of Workplan	Date Signed	Objective
Nearshore	Oysters	9	Mississippi Canyon 252 Spill Oyster Sampling Plan Phase 1 - High Priority Sites	2/22/2011	This plan provides for the collection of ephemeral data on the condition of oysters in the Gulf of Mexico - both baseline (pre-oiling) and post-oiling. These data will be collected for use in evaluating whether oysters may be or are being injured by oil or response actions associated with the Deepwater Horizon/Mississippi Canyon 252 incident (MC 252 Spill) and to assist in implementing future procedures that may be chosen to assess any such injuries to oysters, as appropriate.
Nearshore	Oysters	10	Mississippi Canyon 252 Spill Oyster Sampling Plan Phase 1 - High Priority Sites - Amendment 1	2/22/2011	This first amendment makes modifications to the previous Oyster Sampling Plan Phase I, adding 18 additional alternative sampling locations for the heavily oiled sites
Nearshore	Oysters	11	Mississippi Canyon 252 Spill Oyster Sampling Plan Phase 1 - High Priority Sites - Amendment 2	2/22/2011	This second amendment makes modifications to the previous Oyster Sampling Plan Phase I.
Nearshore	Oysters	12	Mississippi Canyon 252 Spill Oyster Sampling Transition Plan Summary October 2010 - April 2011	2/22/2011	To collect further data to document the potential exposure of oysters to oil and dispersants released into the environment as a result of the Deepwater Horizon Oil Spill, as well as documenting potential injury to oyster resources as a result of such exposure. Specifically, this transition plan will allow for continued progress on identifying future sample locations within the area of known oyster habitat, including both mapped oyster reef and unmapped areas. Quantitative contaminant samples of oysters and sediments, larval densities, and recruitment of spat as well as qualitative abundance estimates of adult oysters (catch per unit effort (CPUE) data from oyster dredges).

Claim Category	Habitat / Resource / Claim Activity	Workplan #	Name of Workplan	Date Signed	Objective
Nearshore	Oysters	13	Mississippi Canyon 252 Spill Oyster Sampling Transition Plan - Amendment 1	7/29/2011	This document amends the initial Oyster Sampling Transition Plan covering sampling efforts from October 2010 to April 2011. It updates three sections of the Transition Plan including the Estimated Samples from This Activity section, the Site Selection section, and the Cost Estimate section. These are updated to reflect the addition of 20 supplemental sites based on a review of available exposure data.
Nearshore	Oysters	14	Mississippi Canyon 252 Spill Spring 2011 Oyster Recruitment Sampling Plan	7/29/2011	This plan is intended to resample sites from both Phase I Pre-assessment work plan and its amendments and the Oyster Sampling Transition Plan, during the spring oyster reproductive season to further characterize the temporal and geographic extent of any potential injury.
Nearshore	Oysters	15	Mississippi Canyon 252 Spill Spring 2011 Oyster Recruitment Sampling Plan - Amendment 1	9/6/2011	This plan amends the initial Spring 2011 Oyster Recruitment Sampling Plan (Spring Plan). The original Spring Plan included three rounds of recruitment sampling starting in April 2011. This amendment updates the plan to include additional rounds of recruitment sampling across all sites to gather additional data through the summer months.
Nearshore	Oysters	16	Mississippi Canyon 252 Spill Spring 2011 Oyster Recruitment Sampling Plan - Amendment 2	9/23/2011	This plan further amends the Spring 2011 Oyster Recruitment Sampling Plan (Spring Plan). This plan expands the Spring Plan to include continued recruitment sampling into the fall of 2011.

Claim Category	Habitat / Resource / Claim Activity	Workplan #	Name of Workplan	Date Signed	Objective
Nearshore	Oysters	17	2011 Oyster Quadrat and Sediment Sampling Plan	10/6/2011	This plan involves resampling of the Phase I sites (from summer 2010) for oysters by quadrat and expands the sampling plan to collect quadrat samples from the Transition Plan sites in Louisiana and Mississippi as well. The plan also includes collecting sediment samples for contaminant analysis at all sites. Quadrat sampling at the Transition Plan sites would provide abundance and biomass per square meter values for these locations. This additional sampling will contribute to understanding of the geographical and temporal extent of injuries to the adult and juvenile oyster populations, and counts of spat-sized oysters from the quadrat samples will complement data on oyster settlement monitoring that the oyster working group has been collecting under the Phase I, Transition, and Spring 2011 plans
Offshore	Telemetry	18	Satellite Tracking of Sperm Whales in the Gulf of Mexico in 2011, a Follow-up to the Deepwater Horizon Oil Spill	10/6/2011	Objectives: (1) obtain a better understanding of 2011 sperm whale movements, including home range, core areas, and habitat utilization; diurnal behavior, and foraging behavior, and abundance and distribution, through collection of satellite tag and dive tag data; (2) determine any differences between such movements in comparison with previous datasets; (3) if practicable, obtain a better understanding of the movement of Brydes whales, by tagging up to 5 of them opportunistically; (4) collect echosounder data using the Simrad EK60 to assess biomass in an effort to understand squid abundance and distribution, and obtain a better understanding of squid species in the vicinity of sperm whales through opportunistic sampling; (5) obtain visual information on the health condition of tagged whales; and (6) determine sex and genetics of biopsied, tagged sperm whales.

Claim Category	Habitat / Resource / Claim Activity	Workplan #	Name of Workplan	Date Signed	Objective
Offshore	Telemetry	19	Addendum to the Satellite Tracking of Sperm Whales in the Gulf of Mexico in 2011, a Follow-up to the Deepwater Horizon Oil Spill: Analysis Plan for Years 2010/201	3/29/2012	Details the analysis to be done in association with the tagging and sample collection detailed in Workplan #19
Nearshore	Injury Quantification to Organisms from Contaminated Sediments	20	Submerged Oil Reconnaissance Plan	6/6/2010	To conduct an initial reconnaissance of very shallow (<3m) subtidal habitats in the very nearshore water column (within 100m from the shoreline). The sampling would target areas where submerged oil is observed or is expected to be found based on shoreline assessment observations, to characterize the extent of oiling and document exposure of the water column and benthos to hydrocarbons. The method used to detect the submerged oil is through the use of chain-weighted snare drags using devices know as V-SORS along designated transects identified from incident response or NRDA shoreline assessment observations. Additionally, as able, survey teams will conduct opportunistic biological sampling using small seine or trawl nets, and/or ponar grab samples to characterize the biological communities at the snare deployments.
Nearshore	Injury Quantification to Organisms from Contaminated Sediments	21	Submerged Oil Characterization Plan 2010	8/4/2010	The purpose of the plan is to direct the collection of samples of weathered, submerged oil from the nearshore environment (from the shoreline to the 20m isobath). The sampling locations are to be determined in the field, and the total volume to be collected is approximately 250gallons. The samples will be collected using trawl nets towed by typical shrimp trawlers or other appropriate vessels. To the extent possible, the samples of submerged oil will be collected from discrete geographic areas over a limited period of time (any single sample will be collected during a period of no more than one day).

Claim Category	Habitat / Resource / Claim Activity	Workplan #	Name of Workplan	Date Signed	Objective
Nearshore	Injury Quantification to Organisms from Contaminated Sediments	22	Submerged Oil Characterization Plan 2011	6/7/2011	To document and quantify MC 252-related hydrocarbon and other contaminant levels in benthic sediments of shallow subtidal nearshore environments known or suspected to have been impacted by the MC 252 oil spill.
Nearshore	Injury Quantification to Organisms from Contaminated Sediments	23	Marsh Edge and Sandy Shoreline Biota Sampling Plan	8/17/2011	Determine contaminant levels in benthic infauna and small, epibenthic crustaceans along a continuum of exposure levels to MC252 oil
Offshore	Sargassum / Sea Turtles	24	Assessment Plan for Juvenile Sea Turtles in Sargassum Communities Potentially Exposed to MC252 Discharge	1/5/2011	Objectives:(1) Determine the areal extent and distribution of Sargassum in the north-central and eastern Gulf of Mexico, and its spatial relationship to previously observed surface oil and dispersants associated with the MC 252 discharge via aerial surveys; and(2) Document the density, condition, diet, and potential MC 252 oil exposure of pelagic neonate sea turtles associated with floating Sargassum in the north-central and eastern Gulf of Mexico, and along the southeast coast of Florida.
Offshore	Sargassum	25	Sargassum Communities and Associated Fauna	5/8/2011	Objectives: (1) Determine the 2011 areal extent and distribution of Sargassum in the north-central Gulf of Mexico via aerial surveys, and its spatial relationship to previously observed surface oil and dispersants in 2010 associated with the MC 252 discharge; and (2) Document the density, abundance and diversity of invertebrate and fishes associated with pelagic Sargassum, including assessment of any remaining degrees of MC252 oil

Claim Category	Habitat / Resource / Claim Activity	Workplan #	Name of Workplan	Date Signed	Objective
Offshore	Sargassum / Sea Turtles	26	2011 Addendum to the Assessment Plan for Juvenile Sea Turtles in Sargassum Communities	5/13/2011	The main objectives of this addendum are to: (1) Determine the 2011 areal extent and distribution of Sargassum the north-central and eastern Gulf of Mexico; and (2) document the density, condition diet, and MC252 oil exposure of pelagic neonate sea turtles associated with floating Sargassum in the north-central and eastern Gulf of Mexico
Offshore	Sargassum	27	Addendum to Assessment Plan for Sargassum Communities and Associated Fauna in the Northern Gulf to Support Sargassum Mapping	11/3/2011	Objective: the determination of 2011 areal extent and distribution of Sargassum in the north-central Gulf of Mexico via aerial surveys, and its spatial relationship to previously observed surface oil and dispersants in 2010 associated with the MC 252 discharge. The purpose of this addendum is to obtain field data to facilitate the interpretation of satellite imagery of Sargassum before and during the MC 252 oil spill, and since the plume has dissipated.
Offshore	Sargassum	28	Sargassum Injury Assessment Plan: Mapping Using Remote Sensing	2/28/2012	Objectives: (1) using existing remote sensing datasets, develop a validated method that can differentiate among oil, oiled Sargassum, and un-oiled Sargassum; (2) map Sargassum abundance and distribution in 2010; (3) depending on results of Phases 1 -3, map Sargassum abundance and distribution from 2000-2009 and 2011; and (4) depending on method development, attempt to determine what percent of Sargassum was contaminated by oil during the spill.

Claim Category	Habitat / Resource / Claim Activity	Workplan #	Name of Workplan	Date Signed	Objective
Nearshore	SAV	29	Submerged Aquatic Vegetation Tier 1 Pre-Assessment Plan Pre-Impact Baseline Characterization	10/27/2010	Objectives: (1) to document and compile relevant data from existing Submerged Aquatic Vegetation (SAV) mapping and monitoring programs; (2) to review existing information and identify spatial, temporal and/or attribute data gaps relative to the suite of SAV metrics identified; (3) to conduct targeted sampling for baseline data to fill identified data gaps; and (4) to acquire and/or develop aerial imagery in support of mapping the baseline areal extent of SAV resources at risk in the northern Gulf of Mexico. To achieve these objectives, the following tasks will be conducted: compile SAV areal coverage; compile SAV biological characteristics, including SAV coverage, density, biomass and species composition; and compile chemistry data, including available chemical data for sediments, water, SAV, and invertebrates, in the areas; obtain invertebrate densities and species composition; and obtain SAV associated fauna data. The geographic scope of this work plan includes the nearshore and estuarine environments containing SAV habitats along the northern Gulf of Mexico from eastern Louisiana to the Florida Panhandle to the southeastern tip of Florida, including the Florida Keys.
Nearshore	SAV	30	Workplan for Assessing Potential Impacts of Fresh and Brackish Water Submerged Aquatic Vegetation Communities	2/11/2011	To determine if fresh and brackish water SAV and associated faunal communities that are likely to support wintering waterfowl and fisheries have been exposed to MC252 related products and or agents by identifying whether PAH residues and PAH sources, or dispersants and other agents, related to the MC252 release are present in sediment, plant, detrital material, and invertebrate tissues collected from oiled and unoiled areas.

Claim Category	Habitat / Resource / Claim Activity	Workplan #	Name of Workplan	Date Signed	Objective
Nearshore	SAV	31	Sampling and Analysis Plan for the Jean Lafitte National Historic Park and Preserve Submerged Aquatic Vegetation	9/5/2011	The purpose of the study is to assess the potential impacts of the increased freshwater inputs into JELA due to the diversion of Mississippi River freshwater into JELA following the MC 252 Oil Spill.
Nearshore	SAV	32	Submerged Aquatic Vegetation Tier 2 Pre-Assessment Post-Spill Exposure Characterization Plan	11/8/2011	This document presents a plan to collect data concerning the post-spill condition of Submerged Aquatic Vegetation (SAV) resources in the north-central Gulf of Mexico, extending from the coastal areas and islands of Louisiana, Mississippi, and Alabama, through the panhandle of Florida to evaluate whether SAV habitats and communities were exposed to MC252 oil or related products. This plan builds on the ―Mississippi Canyon 252 Oil Spill Submerged Aquatic Vegetation Tier 1 Pre-Assessment Plan Pre-Impact Baseline Characterization with some additional parameters added to evaluate potential exposure.
Offshore	Deepwater communities	33	NRDA Tier 1 for Deepwater Communities	7/2/2010	Objectives: Systematic photosurvey of previously surveyed mesophotic reef, deep water corals, and chemosyntheic community sites to a) increase baseline, b) document ephemeral data for initial injury; increase pre-exposure baseline data; obtain tissue samples; document and measure other initial injuries to deep water biota potentially caused by the MC252; deploy sediment trap moorings; retrieve passive oil samplers (SPMDs)
Offshore	Deepwater communities	34	NRDA Tier 1 for Deepwater Communities - Addendum	7/2/2010	Modifications to Tier 1 plan due to weather impacts on cruise progress

Claim Category	Habitat / Resource / Claim Activity	Workplan #	Name of Workplan	Date Signed	Objective
Offshore	Deepwater communities	35	NRDA Tier 1 Proposal: SPMD Detection of DWHOS Hydrocarbons in the Water Column Immediately Over the NEGOM Shelf-Edge Pinnacle Reefs	7/9/2010	To deploy 2 moored arrays of 4 SPMD canisters immediately above the reef top of Alabama Alps reef to document the presence of oil (PAHs) if any in the near bottom habitat of the deep reef community during the early potential impacts stage of the DWH oil spill event
Offshore	Deepwater communities	36	NRDA Tier 1 Sampling Plan - Reconnaissance Survey of Hard Ground Megafauna Communities in the Vicinity of the Deepwater Horizon Spill Site	10/19/2010	Utilizing a drift camera to survey predicted hard-ground areas and obtain visual determination of the presence of megafauna communities; Identify these areas in relation to potential exposure to oil, dispersants, or other chemicals associated with the Deepwater Horizon Incident
Offshore	Deepwater communities	37	NRDA Sampling Plan: Time Lapse Camera and Sediment Trap Retrieval and Redeployment Plan	3/8/2011	Collection of time-lapse camera used to collect imagery from MC338 site of deep water coral community covered with flocculent-like material; retrieve sediment traps from site VK826 in order to examine the chemical composition and temporal delivery of particulate matter, and the identification of larval composition (e.g., larvae of coral, tube worms, crustaceans, etc.) and flux; visit site MC118 to collect high resolution imagery and examine corals in this area for visual signs of impact, collect a limited number of soft sediment cores and faunal samples for analysis for the presence of hydrocarbons from the MC252 incident and the assessment of macro- and meiofauna, including identification to the lowest possible taxonomic level and enumeration

Claim Category	Habitat / Resource / Claim Activity	Workplan #	Name of Workplan	Date Signed	Objective
Offshore	Deepwater communities	38	NRDA Sampling Plan: Offshore and Deepwater Softbottom Sediment and Benthic Community Structure Survey; not currently available on gulfspillrestoration website; in signature process	NOAA signed 4/6/11, BP signature pending	This SPI survey will complement the proposed Deepwater Sediment Sampling Study and any other planned benthic studies by: (1) obtaining much greater sample density than is feasible with sediment coring techniques; (2) providing additional information on bottom habitat conditions that may aid in the interpretation of benthic data collected during sediment coring efforts; and (3) helping to inform future sediment sampling designs by identifying areas or strata that show potential impact.

Claim Category	Habitat / Resource / Claim Activity	Workplan #	Name of Workplan	Date Signed	Objective
Offshore	Deepwater communities	39	NRDA Tier 1 Sampling Plan - AUV Reconnaissance Survey II of Potential Hard-Ground Megafaunal Communities in the Vicinity of the Deepwater Horizon Spill Site	4/26/2011	The overall objectives of this cruise are to identify biological communities associated with hard ground in the deep waters of the Gulf of Mexico that may have been adversely affected by the release of oil, dispersants, and/or other adverse secondary effects associated with the oil spill. Because the extent of such communities is not fully understood, and due to the difficulty of conducting natural resource damage assessment activities in the deep ocean, this plan proposes a targeted assessment of potential sites within the study area (described below). The work to be executed under this plan represents preliminary potential exposure assessment. Exposure and injury assessment of any biological communities discovered through the course of execution ofthis plan may be pursued in subsequent cooperative work plans.This plan describes the use of two underwater reconnaissance systems that will be used in parallel. The primary objective for the cruise will be the use of the Sentry AUV at prioritized sites to confirm the presence of hard ground and associated biological communities. The use of the TowCam is an additional tool to be used in a complementary manner to the AUV to meet and support this objective. Using these two systems together will allow for more efficient identification of potential hard ground biological communities. For example, the use of the TowCam will allow the survey team to preview some larger sites before deciding where to deploy the Sentry over larger features. Similarly, while the Sentry is in the water, the TowCam may also be used to examine close-by features that may be near to the prioritized sites. Finally, if longer, linear features are found, use of TowCam may be warranted for a rapid assessment so that the Sentry can focus on the areas more appropriate for survey by AUV. Below, we describe the objectives for the work proposed in this plan. The Methodologies section below describes in greater detail the use of the proposed survey systems.

Claim Category	Habitat / Resource / Claim Activity	Workplan #	Name of Workplan	Date Signed	Objective
Offshore	Deepwater communities	40	Deepwater Sediment Sampling to Assess Post-Spill Benthic Impacts from the Deepwater Horizon Oil Spill		The overall goal of this study is to help identify any potential impacts of the DWH oil spill on deep water sediments and resident benthic fauna in support of the NRDA injury-assessment process. There are two fundamental questions to be answered in addressing this goal. First, are sediments in areas with a greater likelihood of exposure, such as near the well-head, under the former surface sea slick, or under the dispersed sub-surface hydrocarbons, impacted by hydrocarbons traceable to the oil spill? If the answer is yes, the second question is, do living benthic resources show evidence of a difference in community indices or other injuries that can be related to exposure to the hydrocarbons?
Offshore	Deepwater communities	41	NRDA Tier 1 for Deepwater Communities - Addendum Plan for Coral Aging; <not currently available on gulfspillrestoration website		This work plan outlines the ageing of corals collected as part of these NRDA efforts

Claim Category	Habitat / Resource / Claim Activity	Workplan #	Name of Workplan	Date Signed	Objective
Offshore	Deepwater communities	42	Distribution, Abundance, and Biodiversity of Benthic Megafauna and Mesopelagic Bathypelagic Megaplankton	6/8/2011	This document describes a plan to conduct surveys ofmegafauna that include revisits to sites sampled in August 2010, which may help quantify how the biological conditions (in terms of megafauna) have changed around the spill site following capping of the well. This program will provide data with the potential to quantify the biodiversity, distribution, and abundance of benthic and demersal megafauna that are observable and identifiable from video and still photography on the seafloor at selected locations around MC252. In this plan it is understood that estimates of biodiversity, distribution, and abundance are all restricted to organisms that are observable with the cameras. As a secondary objective, the data necessary to estimate biodiversity and relative abundance of megaplanktonic organisms larger than 2.5 centimeters in diameter will also be collected. This program will conduct a single examination of selected sites in close proximity to, and further away from the Macondo BOP.
Offshore	Deepwater communities	43	Distribution, Abundance, and Biodiversity of Benthic Megafauna and Mesopelagic Bathypelagic Megaplankton - Addendum	8/15/2011	Perform water column and seafloor and surveys in selected locations both near and distant from the Macondo Blowout Preventer. Sites are primarily those not visited in the first phase of the plan.

Claim Category	Habitat / Resource / Claim Activity	Workplan #	Name of Workplan	Date Signed	Objective
Offshore	Deepwater communities / Transport, Fate and Effects Modeling	44	Offshore and Deepwater Softbottom Sediment and Benthic Community Structure Survey	4/6/2011	Sediment Profiling Objectives: to complement the proposed Deepwater Sediment Sampling Study and any other planned benthic studies by: 1) obtaining much greater sample density than is feasible with sediment coring techniques; 2) providing additional information on bottom habitat conditions that may aid in the interpretation of benthic data collected during sediment coring efforts; and 3) helping to inform future sediment sampling designs by identifying areas or strata that show potential impact. B. Water Sampling Objectives: 1) to provide measurements of the general water column structure at the time of SPI survey, and 2) if features suggestive of the presence of hydrocarbons in the water column are detected, then to characterize water chemistry near those features and the sediment bed.
Offshore	Transport, Fate and Effects Modeling	45	Field Plan for Cooperative Research Cruise (RV Weatherbird II)	5/4/2010	Objectives: establish pre-impact baseline for organism abundance in Gulf of Mexico continental shelf waters near spill; characterize zooplankton distribution, abundance, and species composition at a minimum of 6 stations in the area to the southeast of the oil plume, and use SIPPER (Shadowed Image Particle Profiling Image Evaluation Recorder) technology to detect and document mortality of zooplankton and fish larvae in spill area; and characterize the distribution of crude oil droplets (number and size) in the vicinity of the oil plume, to 300 m depths. Sample collection includes invertebrate zooplankton, fish eggs, fish larvae and postlarval, shrimp and groundfish, benthic (bottom-dwelling) invertebrates, tissue samples for toxicology and stable-isotope analysis, water and sediment samples.

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Offshore	Transport, Fate and Effects Modeling	46	Field Plan for Water Column Profiling Measurements (M/V Jack Fitz)	5/8/2010	Objectives: a. measure discrete, free-oil droplet concentrations at multiple depths and b. measure dissolved phase (BTEX (benzene, toluene, ethylbenzene, and xylenes) and water-soluble lower-molecular-weight PAH (naphthalenes and phenanthrenes/anthracenes) at the same stations. Data to be used to calibrate 3-dimensional modeling of subsurface oil plume structure, fate (dissolution behavior), and transport.
Offshore	Transport, Fate and Effects Modeling	47	Proposal to Extend Water Column Profiling Cruise (M/V Jack Fitz)	5/11/2010	An extension of the original cruise of May 9-10 to include May 10-15. The extension was needed to maximize the sampling window referenced in the original cruise plan, for the purpose of collecting samples at additional locations.
Offshore	Transport, Fate and Effects Modeling	48	Sampling Plan for R/V TDI Brooks McCall Cruise	5/13/2012	Objective: to obtain splits of whole water samples for NRDA from a response cruise on the RV TDI Brooks McCall. Samples will be analyzed for Trustee list of PAHs and VOAs.
Offshore	Transport, Fate and Effects Modeling	49	Water Column Injury Ephemeral Data Collection: ADCP Monitoring Plan (M/V Bunny Bordelon)	5/21/2010	Objective: to monitor currents throughout the water column in the vicinity of the Wellhead via ADCP (Acoustic Doppler Current Profiler) to a. improve NRDA water sampling location selections and, b. refine data inputs into the SIMAP and CSIM models.
Offshore	Transport, Fate and Effects Modeling	50	Water Column Injury Ephemeral Data Collections, Cruise 2: Surface Water Sampling Plan (M/V Jack Fitz)	5/31/2010	A cruise originally planned for May 21 - 28, aboard the Jack Fitz, was extended to June 1 due to a vessel mechanical problem.

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Offshore	Transport, Fate and Effects Modeling	51	Data Collection Plan for Gordon Gunter Cruise	6/5/2010	Objective: to collect data and analytical samples to better quantify and model the distribution and weathering of oil (including dispersed and burned oil) released from the Deepwater Horizon platform. Water samples in the surface mixed layer will be collected to test for the presence of dispersed oil and droplet size. Sample locations are in areas of where oil dispersant was applied or suspected, and the area of a controlled burn. SIPPER (Shadowed Image Particle Profiling and Evaluation Recorder) will be used to measure plankton presence and distribution.
Offshore	Transport, Fate and Effects Modeling	52	NRDA Plans for Samples of Opportunity in Support of a Water Column Baseline	6/5/2010	Objective: to obtain samples of whole water from the Coral Reef Monitoring Project in the Florida Keys. Chemical analysis of whole water, sub-surface discrete samples will augment or complement other baseline samples collected under other work plans.
Offshore	Transport, Fate and Effects Modeling	53	Water Column Injury Ephemeral Data Collections, Cruise 3: Surface Water Sampling Plan for Dispersant Treated Oil (M/V) Bunny Bordelon)	6/5/2010	Objective: to obtain surface and sub-surface samples of water impacted by oil. Water samples were collected for an analysis of physical and chemical conditions of surface waters. Conductivity, Temperature and Depth (CTD) was utilized for characterizing the surface mixed layer and pycnoclines; CDOM fluorescence for indicating the vertical distribution of hydrocarbons; whole water samples for measurement of PAH, BTEX, TPH, dispersant concentrations, and oil droplet size and distribution using FLOWCAM. Surface oil photography and samplings of water for oil weathering analysis were also collected. FLOWCAM and ZOOSCAN were used for plankton analysis, identification and density counts.
Offshore	Transport, Fate and Effects Modeling	54	Water Column Injury Ephemeral Data Collections, Cruise 4 Jack Fitz 3 Water Sampling Plan	6/11/2010	Objective: to document physical and chemical conditions of deep waters and to characterize the deep water oil plumes. In addition, to sample conditions in surface waters near the spill source.

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Offshore	Transport, Fate and Effects Modeling	55	DWHOS Plan for Adaptive Water Column NOAA-NRDA Sampling Cruise Plan - American Diver 1 and Ocean Veritas 9	7/29/2010	Two cruises in July were proposed to conduct an adaptive focused sampling strategy that was to target portions of the water column and areas where oil was detected within 20 km of the wellhead. Many categories of data were collected, including, but not limited to: salinity, temperature, dissolved oxygen, along with concentrations of hydrocarbon, suspended sediments, plankton, and pyrosomes. Analysis of data during and between cruise deployments will aid in determining the need for additional sampling efforts or any modifications for additional sampling efforts.
Offshore	Transport, Fate and Effects Modeling	56	Amendment to DWHOS Plan for Adaptive Water Column NOAA-NRDA Sampling Cruise Plan - American Diver 1 and Ocean Veritas 9	7/31/2010	The cruises in July were delayed due to logistics, storms, and staff scheduling and rescheduled from July to late July-early August.
Offshore	Transport, Fate and Effects Modeling	57	Plan for Adaptive Water Column NOAA-NRDA Sampling Cruise Plan - HOS1	8/25/2010	This plan is another in a series of cruises conducted with adaptive sampling strategy. The objective is to apply in-situ methods to characterize subsurface oil at and beyond the area of the MC252 wellhead. The goals of this cruise include the following: (1) develop and employ sampling protocols for various continuous sampling instruments in characterizing and measuring oil droplet sizes and numerical densities of particulates; (2) characterize signals identified by acoustics and fluorescence measurements; and (3) obtain data on oil droplet size, water chemistry, and other particulate densities.
Offshore	Transport, Fate and Effects Modeling	58	Plan for Adaptive Water Column NOAA-NRDA Sampling Cruise Plan - HOS Davis 2	9/7/2010	This plan is another in a series of cruises conducted with an adaptive sampling strategy. It is a continuation of the HOS Davis 1 plan with the same goals.

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Offshore	Transport, Fate and Effects Modeling	59	Plan for Adaptive Water Column NOAA-NRDA Sampling Cruise Plan - American Diver2	9/22/2010	Objective: to determine the plankton distributions and community composition in the upper water column in a region to the southwest of the wellhead where oil exposure may have occurred. The plan will utilize acoustic, bio-optics, and direct collection methods to assess the horizontal and vertical distribution patterns, along with the abundance and community composition of the plankton. The data collected for this plan can be compared with concurrent sampling on the HOS Davis 2 in the deeper water.
Offshore	Transport, Fate and Effects Modeling	60	Plan for Adaptive Water Column NOAA-NRDA Sampling (PAWNNS) Cruise Plan for HOS Davis 3 (September 8 to September 20)	11/15/2010	This plan is another in a series of cruises conducted with adaptive sampling strategy. It is a continuation of the HOS Davis 1 and 2 plan (excluding attachments 7 and 8 from HOS Davis 1) with the same goals.
Offshore	Transport, Fate and Effects Modeling	61	NRDA Plankton Sampling Plan & Fall 2010 Cruise Plan (Specialty Diver 1), September 2010 SIPPER Cruise	11/15/2010	This plan is part of a series of cruises to be conducted to evaluate the distribution and densities of ichthyoplankton and other zooplankton in Gulf of Mexico waters potentially affected by the Deepwater Horizon Oil Spill and in surrounding areas. Herein, the fall 2010 Specialty Diver 1 upper-water column (200m) plankton sampling plan is described. Sampling and analysis protocols have been developed for offshore stations for the upper 200m of the water column. The primary objective of the cruise is to collect plankton image data using the Shadowed Image Particle Profiling and Evaluation Recorder (SIPPER). The occurrence, abundance, biomass, vertical distribution, and daily vertical migration of zooplankton species of theGulfof Mexico will be assessed.

Claim Category	Habitat / Resource / Claim Activity	Workplan #	Name of Workplan	Date Signed	Objective
Offshore	Transport, Fate and Effects Modeling	62	NRDA Plankton Sampling Plan & Fall 2010 Cruise Plan: Walton Smith 1	11/15/2010	This plan is part of a series of cruises to be conducted to evaluate the distribution and densities of ichthyoplankton and other zooplankton in Gulf of Mexico waters potentially affected by the Deepwater Horizon Oil Spill and in surrounding areas. The primary objective is to collect depth discrete plankton samples at various intervals throughout the entire water column using a Multiple Opening/Closing Net and Environmental Sensing System (MOCNESS). Stations correspond to locations sampled during the 2010 SEAMAP Fall Plankton survey cruise on the R/V Gordon Gunter. The occurrence, abundance, biomass, vertical distribution, and daily vertical migration of the early life stages of fall spawning and deep water ichthyo- and zooplankton species of the Gulf of Mexico will be assessed.
Offshore	Transport, Fate and Effects Modeling	63	NRDA Plankton Sampling Plan & Fall 2010 Cruise Plan: Walton Smith 2	11/15/2010	This plan is part of a series of cruises to be conducted to evaluate the distribution and densities of ichthyoplankton and other zooplankton in Gulf of Mexico waters potentially affected by the Deepwater Horizon Oil Spill and in surrounding areas. Herein, the fall 2010 Walton Smith 2 deep water plankton sampling plan is described. Sampling and analysis protocols have been developed for offshore stations for the entire water column. The primary objective of the cruise is to collect plankton image data using the digital-automatic Video Plankton Recorder (DAVPR) and the Holocam. The occurrence, abundance, biomass, vertical distribution, of plankton and marine snow in the Gulf of Mexico will be assessed. In addition, high resolution imagery of the seabed will be collected using the Woods Hole Seasled.

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Offshore	Transport, Fate and Effects Modeling	64	NRDA Plankton Sampling Plan & Fall 2010 Cruise Plan: Walton Smith 3	11/15/2010	This plan is part of a series of cruises to be conducted to evaluate the distribution and densities of ichthyoplankton and other zooplankton in Gulf of Mexico waters potentially affected by the Deepwater Horizon Oil Spill and in surrounding areas. Herein, the fall 2010 Walton Smith3 deep water plankton sampling plan is described. The same overall sampling approach will be followed in subsequent seasons. Sampling and analysis protocols have been developed for offshore stations for the entire water column. The primary objective is to collect depth discrete plankton samples at various intervals throughout the entire water column using a Multiple Opening/Closing Net and Environmental Sensing System (MOCNESS). Stations correspond to locations sampled during the 2010 SEAMAP Fall Plankton survey cruise on the R/V Gordon Gunter. The occurrence, abundance, biomass, vertical distribution, and daily vertical migration of the early life stages of fall spawning and deep water ichthyo- and zooplankton species of the Gulf of Mexico will be assessed.
Offshore	Transport, Fate and Effects Modeling	65	NRDA SEAMAP Plankton Sampling Plan and Fall Cruise Plan (Gordon Gunter: 8/24-9/30)	11/15/2010	This plan is the first of a series of cruises to be conducted to evaluate the distribution and densities of ichthyoplankton and other zooplankton in Gulf of Mexico waters potentially affected by the Deepwater Horizon oil spill and in surrounding areas. This plan describes a program of expanded fall SEAMAP plankton sampling to be conducted in August and September, 2010. The same sampling design will be followed in subsequent seasons as needed to capture data relevant to the injury assessment. The sampling and analysis protocols in the upper 200m of the water column are those used in the SEAMAP program. lchthyo- and zooplankton will be sampled using paired bongo nets and at the water surface with a neuston net. Depth-discrete plankton samples taken at various intervals will be carried out using a Multiple Opening/Closing Net and Environmental Sensing System (MOCNESS).

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Offshore	Transport, Fate and Effects Modeling	66	Deepwater Horizon Oil Spill (DWHOS) NRDA Offshore Deep Meso- and Bathypealic Fish Sampling Plan	11/30/2010	Objective: to collect fish and invertebrate samples using a High Speed Midwater Rope Trawl (HSMRT). In addition to trawling, the shipboard acoustics system will be running and collecting water column data for the entire cruise track. In this way, the occurrence, abundance biomass and daily vertical migration of juvenile and adult deep water meso and bathypelagic species within the study area can be assessed.
Offshore	Transport, Fate and Effects Modeling	67	NRDA Winter 2011 Plankton Imaging Sampling Cruise Plan (Arctic)	1/12/2011	This plan is part of a series of cruises scheduled for the winter of 2011 intended to evaluate the distribution and densities of ichthyoplankton, other zooplankton, and some phytoplankton in Gulf of Mexico waters potentially affected by the Deepwater Horizon Oil Spill and in surrounding areas. This plan describes the sampling effort for winter 2011. The primary objective of the cruise is to collect plankton image data using the digital autonomous Video Plankton Recorder (DAVPR) and the Holocaum. The occurrence, abundance, biomass, and vertical distribution, of plankton and marine snow in the Gulf of Mexico will be assessed.
Offshore	Transport, Fate and Effects Modeling	68	NRDA 10-meter MOCNESS Winter 2011 Plankton Sampling Cruise Plan: Meg Skansi	1/24/2011	This plan is a series of cruises scheduled for the winter of 2011 to evaluate the distribution and densities of invertebrates (i.e., larger plankton and small nekton) and small fish (also considered small nekton) in Gulf of Mexico waters potentially affected by the Deepwater Horizon Oil Spill and in surrounding areas.

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Offshore	Transport, Fate and Effects Modeling	69	ADCP-Measured Currents Monitoring Plan: February 2011 ADCP Maintenance Mission HARP Recovery and Maintenance Plan - Amended	2/26/2011	The initial ADCP single mooring study plan was approved and implemented in June 2010. Following the initial array installation, two amended work plans were developed and approved authorizing the installation of the real-time buoy and the conduction of quarterly maintenance missions. These amended tasks were successfully conducted in September and December of 2010. The following mission is required to repair components of the array and conduct regularly scheduled maintenance and extend data collection and management for the period of March 2011 through June 2011.
Offshore	Transport, Fate and Effects Modeling	70	Spring 2011 Plankton Imaging Sampling Cruise Plan (RV Oceanus)	3/8/2011	This plan describes the sampling effort for March 8-April 9, 2011. The cruise plan covers March 1-April 18, 2011 to account for the eight day transit to/from the Woods Hole Oceanographic Institute, Massachusetts. The primary objective of the proposed Spring 2011 R/V Oceanus plankton imaging sampling cruise is to collect high-resolution data on plankton and marine snow together with environmental variables using the VPRII.
Offshore	Transport, Fate and Effects Modeling	71	Deepwater Horizon Oil Spill (DWHOS) NRDA Offshore Deep Meso- and Bathypealic Fish Sampling Plan - RV Pisces, Spring 2011	3/19/2011	This plan is being conducted along with other surveys to evaluate the composition, distribution, and densities of juvenile and adult fish and larger invertebrates in the offshore Gulf of Mexico waters potentially affected by the Deepwater Horizon Oil Spill (DWHOS) and in surrounding areas. The primary objective is to collect fish and invertebrate samples using a midwater trawl net.

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Offshore	Transport, Fate and Effects Modeling	72	Plankton Sampling Plan & Winter 2011 Cruise Plan (Oregon II)	3/29/2011	This plan is part of a series of cruises intended to evaluate the distribution and densities of ichthyoplankton, other zooplankton and phytoplankton in Gulf of Mexico waters potentially affected by the Deepwater Horizon Oil Spill (DWHOS) and in surrounding areas. This plan describes a NRDA survey for winter 2011 plankton sampling where a subset of the standard SEAMAP stations have been selected for sampling, as well as additional offshore stations.
Offshore	Transport, Fate and Effects Modeling	73	Addendum - Plankton Imaging Sampling	4/7/2011	The NRDA Spring 2011 Plankton Imaging Sampling Cruise Plan, utilizing the R/V Oceanus, is presently underway as a signed cooperative cruise (date of the signed plan: 2011 March 8, signed March 9). This addendum documents the use of an instrument package being utilized on the cruise, which was inadvertently left out of the cruise plan.
Offshore	Transport, Fate and Effects Modeling	74	Addendum to Offshore Deep Meso- and Bathypelagic Fish Sampling Plan, Spring 2011 - R/V Pisces	4/16/2011	The NRDA Spring 2011 Offshore Deep Meso- and Bathypelagic Fish Sampling Plan, utilizing the R/V Pisces, is presently underway as a signed cooperative cruise (date of the signed plan: March 19, 2011). The plan is being conducted along with other surveys to evaluate the composition, distribution, and densities of juvenile and adult fish and larger invertebrates in the offshore Gulf of Mexico waters potentially affected by the Deepwater Horizon Oil Spill (DWHOS) and in surrounding areas. This addendum documents a change in the cruise plan necessitated by the failure of the portside trawl block on the Pisces, which is jammed irreparably. With the jammed block, conducting deep trawls is no longer an option, even with a back-up net. Thus, expanding the acoustic and DIDSON work already being conducted as part of the approved plan is a viable way to acquire information on vertical distributions of biota in the Deep Scattering Layer and at other depths.

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Offshore	Transport, Fate and Effects Modeling	75	NRDA 1-meter MOCNESS Spring 2011 Sampling Cruise Plan (M/V Nick Skansi)	4/16/2011	This plan is a series of cruises scheduled for the spring of 2011 to evaluate the distribution and densities of ichthyoplankton and other zooplankton in Gulf of Mexico waters potentially affected by the Deepwater Horizon Oil Spill (DWHOS) and in surrounding areas. Plankton in the upper 200 m of the water column of the Gulf of Mexico off of Texas to Florida have been sampled by the NMFS/NOAA SEAMAP program over the past ~25 years (attachment 9). The overall NRDA plankton sampling plan takes advantage of this historical data set and plans for continuation and extension of the NMFS Southeast Fisheries Science Center (SEFSC) SEAMAP program into deep water areas where the spill took place
Offshore	Transport, Fate and Effects Modeling	76	NRDA 10-meter MOCNESS Spring 2011 Plankton Sampling Cruise Plan: Meg Skansi	4/16/2011	This plan is a series of cruises scheduled for the spring of 2011 to evaluate the distribution and densities of invertebrates (i.e., larger plankton and small nekton) and small fish (also considered small nekton) in Gulf of Mexico waters potentially affected by the Deepwater Horizon Oil Spill (DWHOS) and in surrounding areas. The primary objective is to collect depth discrete samples at various intervals throughout the entire water column using a 10-m2 MOCNESS. The occurrence, abundance, biomass, vertical distribution, and daily vertical migration of large plankton and small nekton of both surface and deep water species/life stages of the Gulf of Mexico will be assessed.
Offshore	Transport, Fate and Effects Modeling	77	Addendum - Epipelagic Plankton Bongo & Neuston Sampling	5/23/2011	Assess the occurrence, abundance, and distribution of the early life stages of fishes in the north central Gulf of Mexico, commercially important invertebrates (lobsters, decapods) and other zooplankton potentially affected by the DWH Oil Spill.
Offshore	Transport, Fate and Effects Modeling	78	Addendum to 10-meter MOCNESS Spring 2011 Plankton Sampling Cruise Plan (Meg Skanski)	6/16/2011	This addendum incorporates into the plan the archiving of tissue samples at the discretion of the Chief Scientist.

Claim Category	Habitat / Resource / Claim Activity	Workplan #	Name of Workplan	Date Signed	Objective
Offshore	Transport, Fate and Effects Modeling	79	Addendum to the 1-meter MOCNESS Spring 2011 Plankton Sampling Cruise Plan (Nick Skanski)	6/16/2011	This workplan is an addendum to NRDA Summer 2011 Plankton Imaging Sampling Cruise Plan Sampling Vessel: R/V McArthur II and incorporates additional sampling effort and vessel coordination.
Offshore	Transport, Fate and Effects Modeling	80	NRDA Summer 2011 Plankton Imaging Sampling Cruise Plan (R/V McArthur JJ)	6/16/2011	This plan is part of a series of cruises scheduled for the summer of 2011 intended to evaluate the distribution and densities of ichthyoplankton, other zooplankton, and some phytoplankton in Gulf of Mexico waters potentially affected by the Deepwater Horizon Oil Spill and in surrounding areas. This plan describes the sampling effort for summer 2011. The primary activity of these cruises is to collect plankton image data using the In Situ Ichthyoplankton Imaging System (ISIIS). The objective of these ISIIS surveys is to assess the degree of patchiness are scales not resolved by sampling on the 30 nautical mile SEAMAP grid. The occurrence, abundance, biomass, and vertical distribution of plankton and marine snow in the GOM will be assessed.
Offshore	Transport, Fate and Effects Modeling	81	Offshore Deep Meso- and Bathypelagic Fish Sampling Plan, Summer 2011 (R/V Pisces)	6/21/2011	This plan is being conducted along with other surveys to evaluate the composition, distribution, and densities of juvenile and adult fish and larger invertebrates in the offshore Gulf of Mexico wasters potentially affected by the DWHOS. In this plan, deep water communities (deep mesopelagic and bathypelagic) are targeted. This plan is not intended to investigate deep water benthic communities.
Offshore	Transport, Fate and Effects Modeling	82	Epipelagic Plankton Bongo & Neuston Sampling Cruise Plan - McArthur II	7/1/2011	Evaluate the distribution and densities of ichthyoplankton and other zooplankton in the Gulf of Mexico waters potentially affected by the DWH Oil Spill.

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Offshore	Transport, Fate and Effects Modeling	83	Deepwater Benthic Communities and Water Column Data Collection/ Sediment and Bottom-Water Sampling Cruise Plan, July - September 2011 (HOS Sweetwater ROV)	7/15/2011	Objectives: (1) Examine potential locations where hydrocarbons and dispersants related to the MC252 oil spill and particulate matter may have settled on the sea floor by sampling surface sediments and flocculent material; (2) evaluate potential concentrations of MC252-related hydrocarbons and dispersants in bottom waters that may be related to any sediment contamination by sampling water overlying locations of sediment samples; (3) opportunistically collect red crabs and other megafauna found along transects for exposure assessment; and (4) document occurrence and location of hardgrounds and/or sessile megafauna potentially exposed.
Offshore	Transport, Fate and Effects Modeling	84	NRDA 1-meter MOCNESS Summer 2011 Plankton Sampling Cruise Plan (M/V Nick Skanski)	7/15/2011	This plan is part of a series of cruises scheduled for the summer of 2011 intended to evaluate the distribution and densities of ichthyoplankton and other zooplankton in Gulf of Mexico waters potentially affected by the Deepwater Horizon Oil Spill and in surrounding areas. This plan describes the sampling effort for summer 2011. The primary objective is to collect depth discrete samples at various intervals to a maximum depth of 1500 meters. The occurrence, abundance, biomass, vertical distribution and daily vertical migration of mero- and holoplankton of both surface and deepwater species/life stages of the GOM will be assessed.

Claim Category	Habitat / Resource / Claim Activity	Workplan #	Name of Workplan	Date Signed	Objective
Offshore	Transport, Fate and Effects Modeling	85	NRDA Summer 2011 Epipelagic Plankton Bongo & Neuston Sampling Cruise Plan (M/V Bunny Bordelon)	7/19/2011	This plan is part of a series of cruises scheduled for the summer of 2011 intended to evaluate the distribution and densities of ichthyoplankton and other zooplankton in Gulf of Mexico waters potentially affected by the Deepwater Horizon Oil Spill and in surrounding areas. This plan describes the NRDA survey for summer 2011 where a subset of the SEAMAP stations have been selected for sampling ichthyo-and other plankton in the upper water column. The primary objective is to assess the occurrence, abundance, and distribution of the early life stages of fishes in the northern GOM, commercially important invertebrates (lobsters, decapods), and other zooplankton found in the surface waters less than 200 meters.
Offshore	Transport, Fate and Effects Modeling	86	Plankton Sampling Cruise, August 11	8/8/2011	Evaluate the distribution and densities of invertebrates and small fish in Gulf of Mexico waters potentially affected by the Deepwater Horizon Oil Spill (DWHOS)
Offshore	Transport, Fate and Effects Modeling	87	NRDA Offshore Deep Meso- and Bathypelagic Fish Sampling Plan, September 2011 (NOAA Ship Pisces)	9/2/2011	Objective: to collect fish and invertebrate samples using a midwater trawl net. The primary intended use of the resulting data is to fill existing data gaps on community characteristics to better inform biological inputs to models and other potential injury assessments.
Offshore	Transport, Fate and Effects Modeling	88	Addendum - Epipelagic Plankton Bongo & Neuston Sampling	9/6/2011	Assess the occurrence, abundance, and distribution of the early life stages of fishes in the north central Gulf of Mexico, commercially important invertebrates (lobsters, decapods) and other zooplankton potentially affected by the DWH Oil Spill.

Claim Category	Habitat / Resource / Claim Activity	Workplan #	Name of Workplan	Date Signed	Objective
Offshore	Transport, Fate and Effects Modeling	89	ADCP-Measured Currents Monitoring Plan: September 2011 ADCP Maintenance Plan	9/9/2011	The initial ADCP single mooring study plan was approved and implemented in June 2010. This plan is required to conduct regularly scheduled maintenance (scheduled for September 2011) and extend data collection and management for the period of September 2011 thru December 2011.
Offshore	Transport, Fate and Effects Modeling	90	Plankton Processing Plan	6/7/2012	This plan describes processing of imaging data collected as part of the NRDA cooperative sampling efforts in 2010-2011. Imaging and particle size data were collected by a variety of instruments on various cruises. This plan covers the data collected by Holographic Camera, Digital Autonomous Video Planton Recorder (DAVPR) and Video Plankton Recorder II (VPRII).
Offshore	Transport, Fate and Effects Modeling	91	NRDA Offshore Fish and Nekton Sample Processing Plan	6/1/2012	The purpose is to establish a protocol for the analysis of fish and large invertebrate samples collected during the NRDA associated with the DWH Oil Spill. The samples to be analyzed under this plan include the following cruises: Pisces Summer 2011, Meg Skansi Spring 2011, McArthur II Fall 2011, Pisces Spring 2011, Meg Skansi Summer 2011, Meg Skansi Summer 2011, Pisces Fall 2011, Pisces Winter 2010, and Meg Skansi Winter 2011. The first sample processing priority will be completion of family-level identification and associated counts followed by full taxonomic identification.
Nearshore	Transport, Fate and Effects Modeling	92	NRDA Late Summer 2011 Small Pelagics Sampling Plan: NOAA Ship McArthur II	10/8/2011	Objectives: (1) Document the large scale distribution of epipelagic fish and plankton in the study area; (2) document day/night differences in the distribution of fish and plankton; (3) investigate spatial scales not available to the ship survey; (4) use aerial imagery/Light Detection And Ranging (LIDAR) to direct ship sampling to regions of high biological concentrations; and (5) collect biological, physical, and acoustic data to help support and interpret the LIDAR observations.

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Nearshore	Marine Mammals	93	Assess Injury to MS & LA Estuarine Dolphin Stock - 3rd Addendum	8/1/2011	Assess potential changes in seasonal abundance, to estimate dolphin survival rates, to increase sample sizes for genetic stock assessment, and to collect longitudinal tissue samples for two years post spill.
Nearshore	Marine Mammals	94	Northern Gulf of Mexico MARU Recovery Mission Plan	11/3/2011	Objective: to recover the Marine Autonomous Recording Units (MARU), retrieve the data, and redeploy the instrument in a new location for the passive acoustic monitoring of marine mammals in the Northern Gulf. The specific scope of this plan covers the recovery, servicing (data download and sensor refurbishment), and redeployment of the 18 northern Gulf of Mexico MARU units, and the final recovery of the four MARU units located in the vicinity of the Dry Tortugas.
Nearshore	Marine Mammals	95	Proposed Data Collection Plan for LA and MS Estuarine Dolphin Stocks (including Addendum	6/9/2010	Objective: to assess polycyclic aromatic hydrocarbon (PAH) and other contaminant exposure to dolphins associated with the DWH incident and to determine potential effects on fecundity and survival and document changes in abundance. This plan identifies the required sampling of dolphin tissues to assess contaminant exposure and hormone levels, and photo-identification mark-recapture surveys to establish baseline abundance, prevalence of calves and to identify individual animals to support longitudinal study for survival analysis. An addendum also states that biopsy samples will be analyzed for sex and stock identification. For this plan, there are 4 areas that are targeted for sampling and include: Chandeleur Sound, LA; Mississippi Sound, MS; Barataria Bay, LA; and St. Joseph Bay, FL. Sampling was planned to begin in May and continue through December.

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Nearshore	Marine Mammals	96	Workplan for the Collection of Data to Determine Impacts on Endangered and Protected Marine Mammals in the Northern Gulf	6/14/2010	This plan proposes a study of sperm whales and other protected marine mammals in four areas of the deep-water habitats of the north-central Gulf of Mexico impacted by the oil spill. The study will provide information on the acute effects of the spill, monitor spatial distribution in the near-term, and develop information with which to evaluate longer-term chronic effects. Specifically, the objectives of the study include the collection of data to (1) identify the incidence of exposure to oil through photo documentation, visual and passive acoustic monitoring, and satellite tags; (2) cetacean distribution related to oil exposure or other factors through passive acoustic, satellite tags, and visual and passive acoustic monitoring; (3) information on population demographics of Sperm and Brydes whales through tissue biopsy; (4) habitat information to characterize water column productivity and prey resources; and (5) necropsy analysis and/or sampling of discovered carcasses.
Nearshore	Marine Mammals	97	Post-release monitoring/ tracking of injured, stranded, or entrapped and released cetaceans in the oil spill impact area	9/10/2010	Objective: to tag, track, and monitor rehabilitated and released cetaceans. Post-release monitoring could provide information on ranging patterns for these animals, potential exposure of these populations to MC252 oil and dispersants, and effectiveness of rehabilitation (received as part of the spill response). This proposal provides the capability to track and monitor up to eight cetaceans that become stranded in the area likely impacted by MC252 oil after rehabilitated and released

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Nearshore	Marine Mammals	98	Second Addendum to Data Collection Plan to Assess Injury to Estuarine Dolphin Stocks	11/1/2010	The original dolphin assessment plan proposed to conduct three sessions of biopsy sampling and photo-identification (photo-id) session surveys in Barataria Bay, Chandeleur Sound, and Mississippi Sound. However, logistical and safety concerns have prevented crews from completing photo-id surveys within Chandeleur Sound and therefore this addendum addresses survey plan revision. The revision includes omitting photo-identification surveys in Chandeleur Sound and extending photo-identification in Baratara Bay and Mississippi Sound to include a Spring 2011 session.
Nearshore	Marine Mammals	99	Addendum to Collection of Data to Determine the Impacts on Endangered and Protected Marine Mammals in the Northern Gulf	1/4/2011	Objectives: (1) collect field data on the abundance, spatial distribution and habitat of Bryde's whales in the northeastern Gulf; (2) obtain samples from Bryde's whales for future analysis to be conducted under a separate Plan; and (3) evaluate potential impacts of the MC252 events on the prey of sperm whales and other oceanic marine mammals.
Nearshore	Marine Mammals	100	Assessing Potential Sublethal and Chronic Health Impacts on Coastal and Estuarine Bottlenose Dolphins	4/1/2011	Objectives: 1) to provide information on potential health impacts of DWH oil and dispersants in bottlenose dolphins; and 2) gain a better understanding of movements and ranges of dolphins in Barataria Bay, an area which has been impacted by the oil from MC 252 oil spill
Nearshore	Marine Mammals	101	Northern Gulf of Mexico HARP Servicing Cruise, September and December 2011 Mission Plan	8/25/2011	This plan describes the proposed field operations to support a bioacoustics monitoring program. The purpose of the September effort will be the recovery, refurbishment and redeployment of a recording package used for passive acoustic monitoring of marine mammals at the site north of the Dry Tortugas.

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Nearshore	Marine Mammals	102	Assessing Potential Sublethal and Chronic Health Impacts from the Mississippi Canyon 252 Oil Spill on Coastal and Estuarine Bottlenose Dolphins	3/21/2012	Objectives: 1) to continue tracking satellite-linked tags and photographic monitoring of Barataria Bay Dolphins; and 2) Conduct focused boat-based surveys to monitor reproductive outcomes of pregnant dolphins identified during the August 2011 capture and release in Bartaria Bay as well as dolphins that have been sampled via remote biopsy in Barataria Bay and Mississippi Sound during 2011.
Nearshore	Marine Mammals and Sea Turtles	104	Aerial Surveys for Marine Mammals and Turtles	5/5/2010	Objective: to conduct aerial surveys using helicopters and Twin Otter aircraft to document the exposure of the diverse marine mammal community of the Mississippi canyon area to impacts from the oil spill. In addition, the flights will allow documentation of acute adverse effects, if any, through behavioral changes or distribution shifts. Data collected from the Twin Otter flights will allow quantitative estimation of the abundance and spatial distribution of marine mammals and sea turtles within the surveyed area.
Nearshore	Marine Mammals and Sea Turtles	105	Addendum-Aerial Surveys for Marine Mammals and Sea Turtles	8/27/2010	This addendum serves to continue survey efforts to monitor marine mammal and sea turtle exposure to oil and dispersants and their spatial distribution and abundance.
Nearshore	Marine Mammals and Sea Turtles	106	Assessing Population Size and Spatial Distribution of Marine Mammals and Sea Turtles in the Northern Gulf of Mexico	1/23/2012	The objective of this study is to collect data that will help assess potential injury from MC 252 oil on continental shelf and inner continental slope populations of marine mammals and sea turtles in the northern Gulf of Mexico. Specific objectives to be accomplished by conducting aerial visual line-transect surveys include: (1) collect data on the seasonal abundance and spatial distribution of marine mammals and turtles over the continental shelf in the Northern Gulf of Mexico; and (2) collect data on the seasonal abundance and spatial distribution of marine mammals near the shelf-break in the north-central Gulf of Mexico.

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Nearshore	Marine Mammals and Sea Turtles	107	Assessing Population Size and Spatial Distribution of Marine Mammals and Sea Turtles in the Northern Gulf of Mexico - Addendum	8/16/2011	This addendum reflects budget changes to the original plan due to flight schedule changes
Nearshore	Sea Turtles	108	Pre-assessment Plan to Determine Potential Exposure and Injuries of Nesting and Hatchling Loggerhead Sea Turtles	8/2/2010	The purpose of this Plan is to determine potential exposure to DWH oil and dispersants and associated injuries of the nesting adult loggerhead turtles that reside in and nest along the U.S. shores of the Gulf of Mexico as a result of the DWH spill. Objectives: 1. assessing nesting female physical condition, inter-nesting movements and blood chemistry, egg and hatchling toxicity; and hatching and emergence success as a function of concentrations of DWH oil; and 2. measuring chemical, toxicological and physiological levels for DWH oil and constituents in sand samples, nesting females, eggs and hatchlings along beaches in the Gulf of Mexico to evaluate potential exposure to oil and determine if there is a concentration gradient of oil across the study area.

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Nearshore	Sea Turtles	109	Preassessment Plan to Determine Potential Exposure and Injuries of Nesting and Hatchling Kemp's Ridley Turtles	9/7/2010	The purpose of this Plan is to determine potential exposure to DWH and dispersants and associated injuries of the nesting adult Kemp's Ridley sea turtles that reside in the Gulf of Mexico and nest along the Texas shoreline. The objectives include: 1. Assessing nesting female physical condition, inter-nesting movements, and blood chemistry as part of the normal annual assessment. In addition, the Plan calls for assessment of potential egg and hatchling toxicity impacts and hatching and emergence success to determine the potential relationship between MC252 oil exposure and injury; and 2. assessing possible toxicological and physiological effects and impairments in nesting females, eggs, and hatchlings along beaches in the Gulf of Mexico within Texas.
Nearshore	Sea Turtles	110	Plan to Determine Potential Exposure and Injury of Sea Turtles West of the Mississippi Delta Utilizing Entanglement Netting Surveys	10/26/2010	Objectives: (1) to characterize sea turtle species composition spatial distribution, catch-per-unit effort, size/age structure, site fidelity and habitat preferences at beachfront and estuarine nearshore habitats at selected oiled and non-oiled areas along Louisiana coast; (2) to use satellite telemetry to assess post –capture/release movements and habitat use patterns; (3) to assess potential exposure of sea turtles to MC 252 oil and possibility of associated injury; and (4) to provide blood and other tissue samples for chemical, toxicological and sex ratio analyses. To collect these data, large mesh entanglement nets will be set in MC252 oil impacted areas, along with areas of the Louisiana, and possibly the Texas coast.

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Nearshore	Marine Mammals	111	Unscheduled HARP Recovery February Mission Plan	2/14/2011	This document describes the recovery, refurbishment, and re-deployment of the HARP unit which was deployed for passive acoustic monitoring of marine mammals but was prematurely released on 6 February 2011.
Nearshore	Marine Mammals	112	MC252 Deepwater Horizon Oil Spill Dry Tortugas MARU and HARP Recovery February Mission Plan	2/24/2011	The following describes the proposed field operations to support two bioacoustics monitoring programs. These programs are being conducted by the Whale Acoustics Laboratory, Scripps Institution of Oceanography and the Cornell Bioacoustics research program, Cornell University.
Nearshore	Sea Turtles	113	Nearshore Cetacean & Sea Turtle Prey Item Sampling Plan	7/6/2011	Collect samples of prey species potentially consumed by nearshore cetaceans and sea turtles that are known to inhabit the geographic area of the Deep Water Horizon Gulf of Mexico oil spill
Nearshore	Sea Turtles	114	Addendum to Plan to Determine Potential Exposure and Injury of Sea Turtles West of the Mississippi Delta Utilizing Entanglement Netting Surveys	8/1/2011	Objectives: (1) to characterize sea turtle species composition, spatial distribution, catch-per-unit effort, size/age structure, site fidelity and habitat preferences at high energy and low energy nearshore habitats, as well as in selected oiled and lesser or non-oiled areas along the Louisiana coast, and west of the Mississippi River Delta; (2) to utilize satellite telemetry to assess post-capture/release movements and habitat use patterns; (3) to assess potential exposure of sea turtles to MC252 oil and the possibility of associated injury via visual inspection of captured turtles for external evidence of MC 252 oil as well as the observation of potential oil-related adverse effects on their overall external body condition and behavior at study areas along the Louisiana coast; and (4) to provide blood and other tissue samples for chemical, toxicological, and sex ratio analyses which may provide evidence related to the potential exposure of nearshore sea turtle populations along the Louisiana coast, and west of the Mississippi River Delta to MC 252 oil.

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Nearshore	Sea Turtles	115	Addendum to Preassessment Plan to Determine Potential Exposure and Injuries of Nesting and Hatchling Loggerhead Sea Turtles Nests	9/7/2011	Objectives: (1) assess nesting female physical condition, inter-nesting and post-nesting movements, and blood chemistry; (2) collect samples to assess possible toxicological and physiological effects and impairments in nesting females, eggs, and hatchlings along the Florida and Alabama beaches in the Gulf of Mexico.
Nearshore	Sea Turtles	116	Addendum to Preassessment Plan to Determine Potential Exposure and Injuries of Nesting and Hatchling Loggerhead Sea Turtles Nests	10/12/2011	Objectives: (1) Assess nesting female physical condition, conduct satellite tracking inter-nesting and post-nesting movement, and collect blood samples as part of the annual Kemp's ridley management program; and (2) collect samples to assess possible toxicological and physiology effects and impairments in nesting females, eggs, and hatchlings at Padre Island National Seashore and Upper Texas coastal beaches in the GOM.
Offshore	Telemetry	117	Investigative Plan to Monitor and Assess Potential Impacts of the Deepwater Horizon on Whale Sharks in the Northern Gulf of Mexico	8/14/2010	Objectives: (1) to document movements of whale sharks in the northern Gulf of Mexico including the time of occurrence in the spill area to evaluate the potential for exposure to oil or dispersants; and (2) to document the disappearance or continued presence of whale sharks. The plan is to deploy 60 satellite tags to whale sharks as a reliable method to assess the behavioral aspects within an area of the Gulf of Mexico that is identified as essential feeding habitat.
Offshore	Telemetry	118	Whale Shark Tagging Plan Addendum	9/24/2010	This Plan is an addendum to the Whale Shark Tagging Plan. In this addendum, the plan is to include a second spotter aircraft in the field work plan in order to cover more area and increase the chances of finding and successfully tagging whale sharks.

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Offshore	Telemetry	119	Preassessment Plan for the Collection of Data to Determine Potential Exposure and Injuries of Threatened Gulf Sturgeon	9/7/2010	Objective: to collect information that will facilitate the evaluation of potential injury of the Deepwater Horizon oil spill to adult sturgeon. The specific objectives of this plan are to document the condition of Gulf sturgeon during fall and spring migrations, collect blood samples from up to 180 adult Gulf sturgeon from nine major river systems, and document offshore movement and habitat use of up to 180 adult Gulf sturgeon during the overwintering period.
Nearshore	Injury Quantification to Organisms from Contaminated Sediments	120	Investigative Plan for Fish and Invertebrate Kills in the Northern Gulf of Mexico	12/14/2010	Objectives: (1) to gather information on location and causes (if known) and counts by species of fish kills in the last ten years to help establish a baseline for variability of fish kills between years; and (2) documentation and investigation of reported fish kills from April 20, 2010 until the presence of MC 252 oil is no longer detected in concentration that could likely cause fish kills.
Chemistry	Chemistry	121	Procedure for Obtaining Source Oil Samples from Drillship	8/16/2010	Objective: to initiate the protocols and sampling sites that would be used for the collection of baseline water and sediment samples to represent conditions prior to any oil from the Deepwater Horizon spill affecting the Keys.
Chemistry	Chemistry	122	Work Plan for Obtaining Nearshore Spatial Extent of On-Water Samples	8/16/2010	Objective: to obtain initial samples of on-water oil believed to be from the MC 252 event for polycyclic aromatic hydrocarbons characterization and fingerprinting. Samples will be collected opportunistically from areas where teams or other information sources have identified where oil accumulations are on water in near shore areas (less than half a mile from shore). Samples will also be collected from locations where sensitive resources or shorelines exist and appreciable quantities of oil pose a significant threat to natural resources and services.

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Chemistry	Chemistry	123	Work Plan for Obtaining Nearshore Spatial Extent of On-Water Samples - Addendum 1	8/16/2010	Addendum 1 - Work Plan for Obtaining Near Shore Spatial Extent of On-Water Samples, August 16, 2010: The plan is being expanded to include collection of stranded oil and oil in vegetation or on other environmental media for the purpose of documenting the presence and current condition of oil believed to be from the MS Canyon 252 event on shorelines in different habitats in Mississippi River delta region.
Chemistry	Chemistry	124	NRDA UV Radiation Sampling Plan - October 2010 Cruise Plan (CSA-P1_25 ft Parker)	10/23/2010	This plan is designed to collect scoping data aimed at evaluating the potential magnitudes of UV light extinction coefficients in nearshore waters. Data collected will help elucidate the amount of data collection needed in the future to quantify extinction coefficients of radiation as a function of sun angle, wavelength and organic and inorganic content in the water.
Chemistry	Chemistry	125	Holding Time Study for Environmental Samples in Frozen Archives: Laboratory Analysis Plan	8/18/2011	The purpose of this analytical effort is to begin an assessment of the stability of hydrocarbons in fresh-frozen tissue samples stored for long periods of time at -20 degrees Celsius.
[1] There is no workplan number 5 or 103 in this list. **Both of these plans are signed by all parties but undergoing attorney review prior to posting on the Internet.**					
· Addendum to the Sampling and Monitoring Plan for the Assessment of MC252 Oil Impacts to Coastal Wetland Vegetation in the Gulf of Mexico - Addendum to the states of Mississippi and Alabama					
· Genetic analysis of stock structure, species identification, and sex determination for marine mammal biopsies and strandings					