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WORK PLAN FOR ESTIMATING SHOREBIRD OILING AND MORTALITY DEEPWATER HORIZON (MISSISSIPPI CANYON 252) OIL SPILL BIRD STUDY #5

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INTRODUCTION

The Deepwater Horizon (Mississippi Canyon 252) oil spill began April 22, 2010. Oil spill related injury to wildlife is of major concern to the Natural Resource Trustees and BP. Seabirds, colonial waterbirds, coastal marsh birds, and shorebirds are susceptible to impacts from the oil. Several work plans have been developed to concurrently evaluate oil spill related injuries to these different avian guilds. This plan is the fifth in a series of avian injury ephemeral data collection studies and specifically seeks to address injury to shorebirds. Those shorebirds that breed in the Gulf of Mexico during the summer are being addressed with a separate study plan. This plan will address two general categories of shorebirds: (1) species that winter in the coastal areas of the northern Gulf of Mexico (may include those individuals who are resident year-round) and (2) those species that move through the Gulf of Mexico during migration (transient shorebirds).

Evaluating spill-related mortality in both categories of shorebirds can be accomplished using carcass collection data so long as mortalities occur 'on-site' and during the time period over which carcass collection efforts are ongoing. It can also be accomplished by: (1) estimating the abundance of shorebirds in representative habitats of the affected populations, (2) estimating the proportion of live oiled and live un-oiled shorebirds in representative habitats, and (3) applying an oil-associated mortality rate to the oiled birds. This shorebird-focused effort will complement the Trustees' beached bird model estimation of total bird mortality. Since the beached bird model relies on collected carcasses, and given that dead shorebirds are rarely found during spills[1] additional data collection described in this work plan may provide data to refine the assessment of shorebird injury. However, where possible, this work will be planned in coordination with the existing Beached Bird Study (Bird Study #1).

BACKGROUND

Coastal habitats of the Gulf of Mexico host millions of shorebirds that will migrate into the spill-impacted region this fall where the birds and their prey may be susceptible to oiling in foraging sites, within the intertidal zone, and/or at roosting sites on exposed beaches or tidal flats. Exposure of birds to oil through preening or direct ingestion can have detrimental effects on survival or reproductive success. For example black oystercatchers (*Haematopus bachmani*) in Alaska suffered reductions in incidence of breeding, had smaller eggs, and had increased chick mortality in oiled areas compared to unoiled areas after the Exxon Valdez Oil Spill (Andres 1999, Andres 1997, Murphy and Mabee 2000, Petersen et al. 2003).

Areas that have been impacted or may be impacted by the Deepwater Horizon oil spill host significant numbers of shorebirds as they move through the spill zone during migration to wintering areas further south or that overwinter in the Gulf of Mexico. Migrant shorebirds use beaches, palustrine and estuarine mudflats, and marshes as resting areas and foraging areas to acquire the calories necessary to complete arduous migrations between breeding and wintering grounds. Additionally, a portion of the population of some breeding and non-breeding species overwinters along the northern Gulf of Mexico.

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[1] Low recovery rates may be partially attributable to the relatively low search efficiency associated with small carcasses (i.e. the relatively low probability that a searcher will find a small bird carcasses when a carcass is present during a search) they may also be partially attributable to the fact that carcasses of small-bodied birds may be removed (likely by predators) at a higher rate than larger birds (Ford et al. 2001).

Transient and overwintering species utilizing Gulf of Mexico beaches include piping plover (PIPL) (*Charadrius melodus*) (addressed separately in Bird Study #7), black-bellied plover (*Pluvialis squatarola)*, marbled godwit (*Limosa fedoa*), ruddy turnstone (*Arenaria interpres*), red knot (REKN) (*Calidris canutus*), sanderling (*Calidris alba*), and dunlin (*Calidris alpine*). Species common on overwash areas and mudflats include semipalmated plover (*Charadrius semipalmatus*), American avocet (*Recurvirostra americana*), greater (*Tringa melanoleuca*) and lesser yellowlegs (*Tringa flavipes*), whimbrel (*Numenius phaeopus*), long-billed curlew (*Numenius americanus*), Hudsonian godwit (*Limosa haemastica*), sandpiper (semipalmated (*Calidris pusilla*), western (*Calidris mauri*), least (*Calidris minutilla*), and stilt sandpiper (*Calidris himantopus*), willet (*Tringa semipalmata*), and both long-billed (*Limnodromus scolopaceus*) and short-billed dowitcher (*Limnodromus griseus*). In addition, several year-round residents, including the American oystercatcher (AMOY) (*Haematopus palliates*), which is the subject of proposed radio-tracking, are present along Gulf of Mexico shorelines in the fall and winter.

STUDY AREA

The study area is the United States Gulf of Mexico coast. Within this coastal area, beaches, tidal/mud flats, estuaries, overwash areas, and other such shorebird congregation areas will be surveyed.

STUDY DESIGN

There are 3 study objectives identified as follows:

Objective 1: Estimate the temporal and spatial abundance and distribution of shorebirds using the study area from inception of the study through November 2010.

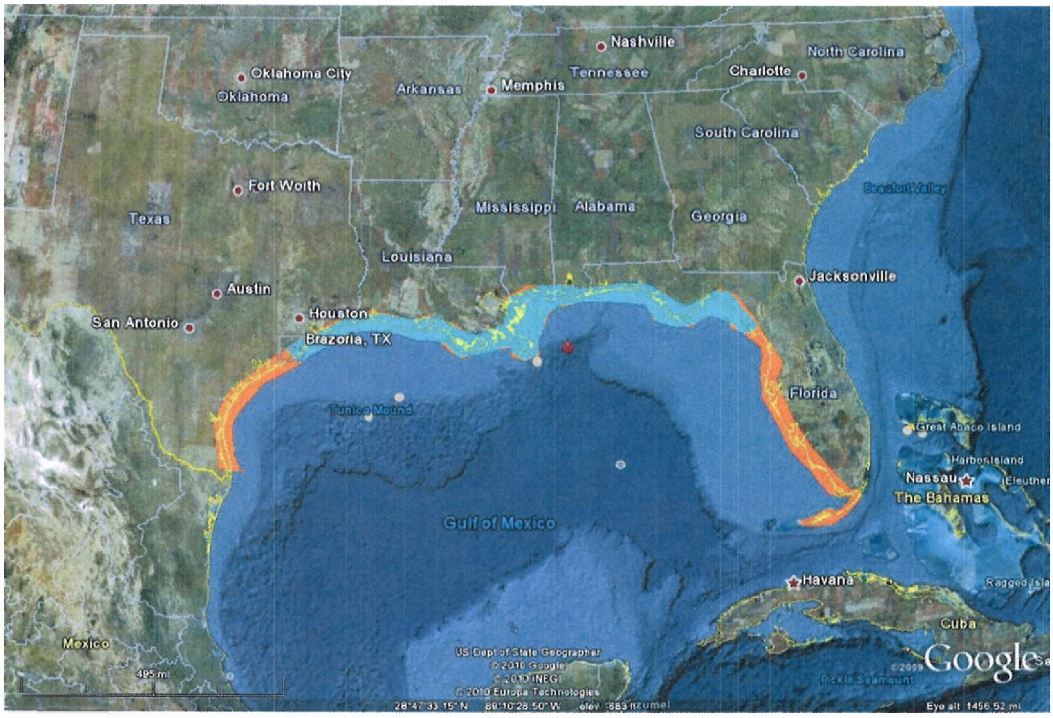
Objective 2: Estimate the percentage of shorebirds that are visibly-oiled at representative sites throughout the study area.

Objective 3: Estimate survival rates for AMOY and other shorebirds.

Objectives 1 and 2 will be adaptively managed in two phases. As currently budgeted, Phase 1 sampling will begin immediately and will continue for approximately 18 days (two 9-day ground survey cycles and one aerial survey) at shorebird concentration areas throughout the entire study area (see figure 1). Phase 2 is expected to continue through late November and 1) reduces the geographic scope for both the aerial survey and ground surveys from the United States Gulf Coast (southern Texas to the Florida Keys) to a "central" study area (Brazoria, TX to Apalachee Bay, FL see figure 1) and 2) includes four "sentinel" sites at high concentration shorebird sites outside of the "central" study area (in south Texas and south Florida, see orange shaded area in figure 1). "Sentinel" sites will be surveyed by ground crews on an 18-day cycle.

The duration and/or geographic extent of both phases may be modified as conditions warrant upon mutual agreement of the Trustees and BP. For example, if shoreline oiling or appreciable numbers of oiled birds occur outside of the "central" study area, the central area may be expanded. If no visibly oiled shorebirds are observed along the eastern or western edge of the central area for several weeks in a row, the central area may be reduced in size. Additional detail on each of the study objectives is described below.

Figure 1. The "central" study area is shown in light blue shading. The full geographic scope of the study is shown in both light blue and orange shading. "Sentinel" sites will be located in the orange shaded area (all areas are approximate locations).



Objective 1: Estimate the temporal and spatial abundance and distribution of shorebirds using the study area from inception of the study through November 2010.

The focus of this portion of this study will be to conduct overflights to provide photo-documentation and direct counts of shorebird abundance throughout shorebird habitat in the area of potential impact. Surveys will be conducted approximately every 18 days during the study period; however, the frequency may be increased as needed. Objective 1 will be accomplished independently by the Trustees.

Objective 2: Estimate the percentage of shorebirds that are visibly-oiled at representative sites throughout the study area.

The focus of this portion of the study will be on evaluating the proportion of live-oiled shorebirds in the population, including both wintering birds and transient shorebirds in the survey areas. While other natural resource damage assessment studies will obtain some data on observations of live-oiled shorebirds (Deepwater Horizon (MC 252) Oil Spill Beach Bird Protocol – Beach Study #1 Field Procedures, the Colonial Waterbird Protocol—Bird Study #4, and the Marsh Bird Protocol—Bird Study #3), this study will direct surveys to areas not well covered by the other surveys, such as interior beach dunes (i.e., inland of the area being surveyed by beached-bird searchers), tidal flats, exposed bay bottoms and estuarine ponds within salt marshes, as well as any known congregational areas. The survey locations may shift or expand as migrant shorebirds move through the Gulf of Mexico.

A secondary objective of this portion of the study is to supplement data collected from aerial surveys of shorebird concentration areas with ground based species determinations.

Sample Units — The sample unit is a site- and day-specific observation effort. The primary spatial sampling units consist of a combination of already established beached bird survey segments, pre-determined routes through Tier 1 and Tier 2 concentration areas (see Objective 1), and randomly selected segments designed to capture specific species including piping plover, red knot, and sanderling that may not occur in large concentrations. Within each selected polygon, a ground survey route will be established through a subset of the habitat where shorebirds are likely to be encountered; routes should focus on beachfront, tidal/storm overwash areas, exposed bay bottoms, and tidal flats. Where possible, existing carcass survey segments will be used for ground survey routes if they comprehensively cover known shorebird concentration locations. The shorebird teams will not conduct formal beached bird searches as are being done for the Beached Bird Study (Study #1), since it is not possible for an observer to dedicate the appropriate attention to both live shorebird searches and carcass searches at the same time. Nevertheless, if carcasses are encountered, they will be collected according to the Carcass Collection Protocol detailed in the implementing guidance provided to the beached carcass survey teams. Designated routes should be accessible throughout the temporal scope of the project, although some important aggregation sites may not always be accessible during every sampling event due to travel time, weather, or tides.

In some cases, known shifts in shorebird distribution within a polygon occur due to tide, weather, or season. In these cases, multiple routes in the polygon will be predetermined and surveys will be shifted as appropriate to capture the maximum number of shorebird observations. For example, in the Colorado River delta of Texas, birds shift to inland wetlands and agricultural fields during periods of high water and to exposed mudflats when they are available; usually late fall and winter (Brent Ortego, personal communication). Routes should only be substituted under the circumstances described above and not because no shorebirds were present. Routes selected for determining oiling rates will also be used to ground truth aerial surveys outlined in Objective 1. Additional concentration sites for beach-nesting shorebirds may be added as needed.

Sample Size — During each sampling event, the searchers will classify the oiling status of all individuals within 50 m of the transect that can be confidently placed into one of five predetermined oiling categories. Those within 50 m that cannot be confidently identified as oiled or not visibly oiled will not be documented. Typically, no more than 3 hours would be spent at a shorebird concentration area. Once oiling rates have been recorded, the observer will then count and identify all birds. These counts will provide data to inform species composition from aerial surveys.

Data Collection — Data on oiling incidence of live shorebirds will be collected according to the procedures in the Deepwater Horizon (MC 252) Oil Spill Beach Bird Protocol – Field Procedures (Bird Study #1), as amended. Observations of birds at sampling sites will be made with binoculars and/or a spotting scope and recorded on the data form in Appendix I. Only birds observed within 50 m of the observer and well enough to be confidently classified as being visibly oiled or not visibly oiled will be included in the sample (i.e., do not just count all birds, record the number of visibly oiled birds, and assume all the others are un-oiled). Standard equipment will include at minimum 10 x 42 mm binoculars and a 60 x spotting scope with tripod. Sample methods will include traveling along a pre-determined route through a shorebird concentration polygon, recording waypoints when individuals or flocks of birds are encountered. Prior to counting birds in a flock, a digital photograph of the flock will be taken for later species identification and enumeration.

Survey Procedures — Routes will be surveyed by two observers. It will likely be most efficient for one observer to make the assessment, and one observer to record data. Birds will be placed into one of the

following five oiling categories: no visible oiling (0%), trace (1-5%), light (6-20%), moderate (21-40%), or heavy (>40%) using the visual aid in Appendix I. Because many factors influence the ability of an observer to clearly assess the extent of oiling (glare, distance, species plumage color, body size, molt cycle, observer experience, and flock density), it is critically important that the observer have a clear view of each shorebird he/she assigns to an oiling category, including un-oiled individuals. Use of a high-quality spotting scope and rangefinder is recommended and will increase the number of sampled individuals. Novel observers should be trained by experienced field workers and should practice assessing oiling extent before collecting data.

At sites with relatively few shorebirds, observers will walk or boat along linear transects. Under these low shorebird density scenarios, observers should assess as many individuals as possible by spending 2-3 hours at each segment. At some of the very large sites in Texas, Louisiana, and the Florida Panhandle more time will be needed.

At ground segments with large aggregations of shorebirds, observers might not be able to assess all the individuals present. For roosting flocks, only a small proportion of the flock may be visible; observers should not be concerned about randomizing count initiation direction. For large, concentrated flocks, observers should use the appended random table to determine which part of the flock will be assessed (Appendix II). This procedure is important to minimize bias associated with observers' unconscious attraction to oiled individuals, particularly if a flock flushes after the assessment begins. To also minimize bias in selecting shorebirds to assess, observers should try to make counts in groups of 100 individuals. If several discrete flocks are present along a route, observers should attempt to distribute their assessment across all flocks, which may require assessing $\leq$200 individuals in each flock. After the oiling assessment, observers should count the flock, by species, to provide an idea of flock size and composition along assessment routes.

Precision and Bias — Training observers is important to minimize error in assessing oiling extent. By collecting oiling extent data by individual observer, we can assess deviations from average proportions reported by all observers within a region and time period and adjust estimates accordingly. Because individual observers will be sampling across a range of conditions and species, effects of these factors will be included in a general observer effect. Estimates of precision of overall oiling abundance will contain components of observer variability in assessing oil extent and spatial variability in abundance from aerial surveys.

Although distance estimation was considered, several issues precluded its adoption: the assumption of complete detection (within categories) near the observer (an observer can misclassify a near individual and flock density inhibits assessment of close birds); not all units will consist of a linear route; stationary points could be highly inefficient for assessing an adequate number of birds; and uncertainty about how detection curves would be used to adjust proportions within oiling extent categories.

Survey Frequency and Duration — Will be adaptively managed to ensure an acceptable level of variation in the estimate of the proportion of shorebirds that are visibly oiled as discussed previously. For purposes of adaptively managing the shorebird effort, Trustee and BP representatives will meet during the first or second week following completion of Phase I to review the data collected to date and develop a schedule for future data review meetings.

Taxa and Inferential Populations — A measure of oiling extent may be determined for all shorebird species present during each nine-day period. Because shoreline oiling, will not be uniform across the entire geographic scope of this project, post-stratification of oiling rate, by shoreline oiling amounts (e.g., light, heavy) may be investigated as a way to increase precision of oiling abundance estimates.

Primary Response Variable — The primary response variable is the extent of oiling on an individual shorebird, which will be used to produce an unbiased estimate of the proportion of oiled individuals (by accepted NRDA categories) within a species. Important explanatory variables may include time period, shoreline oiling amount, and habitat location (e.g., tidal flats, beachfronts).

Data Analysis — Estimates of the percentage of visibly-oiled birds in each area may be combined into comparable geographic units (e.g., areas with relatively high and low oiling rates) and temporal units (e.g., monthly periods) based on clearly defined strata.

Stratification — Because of the likelihood of variation in the proportion of oiled birds at different parts of the study area, it may become appropriate to stratify the study units post-sampling according to oiling rate.

Data Management — Field forms are to be filled out as observations are being made. Both observers will sign each field form indicating that the recorded data reflects consensus observations. If discrepancies arise in the field, they will be noted on field forms and both observers will sign the annotated field form. After completing the survey, field data forms will be reviewed by observers. Chain-of- custody protocols will be maintained at all times.

Scheduling Cooperative Data Collection – A good faith effort will be made to conduct Objective 2 with cooperative, integrated teams of observers. A weekly schedule describing the number of teams and their general area of operation will be prepared by the Trustees' project coordinator and provided to BP or its designated representative two weeks in advance of the scheduled field operations. BP or its designated representative will provide the Trustees' project coordinator a list of the teams on which it will participate at least 10 days prior to the beginning of the designated week. If these agreed-upon notification and communication procedures are followed, yet circumstances prevent BP or its designated representative from participating in a survey, the survey will be carried out without BP's or its designated representative's participation. If BP or its designated representative is available and on site for the survey, then the field work will be carried out as an integrated team.

Prior to concluding each field day, integrated teams will share (1) all data sheets (2) all official photographs, and (3) the official GPS tracklog using methods developed as part of the beached bird survey (Study #1) effort. In the event that the survey must be conducted without a BP representative present, the data (data sheets, track logs, photos) will be e-mailed to a designated BP representative within 18 hours of its being collected. The original data forms will be transmitted to the Trustee project coordinator within 24 hours or according to a procedure agreed upon by the Trustee and Manomet.

Objective 3: Estimate the mortality rate of adult shorebirds using color marking and/or radio telemetry.

This objective will assess the mortality rate of un-oiled and oiled adult shorebirds using two techniques: (1) un-oiled AMOY and oiled AMOY captured in suitable reference location(s) and various near shore habitats in the northern Gulf of Mexico region, respectively, will be fitted with radio transmitters and monitored for mortality, and (2) color-banded shorebirds will be monitored to evaluate survival rates among birds with various degrees of oiling.

All banding will be done in accordance with appropriate federal and state permits and coordinated through the U.S. bird banding lab.

Objective 3a: AMOY radio telemetry

The purpose of this data collection effort is to estimate survival rates among American Oystercatchers to determine if exposure to oil has an effect on survival rates.

Sample Unit — Single adult resident AMOY.

Sample Selection — Individual AMOY will be captured at targeted areas/sites. The number of breeding pairs in each state is relatively very small (e.g., there are at most 40 AMOY breeding pairs along the Florida panhandle in 2010). Therefore, the sampling sites will be sufficiently distant from each other so as to avoid excessive disturbance of any one State's AMOY population.

Sample Size — At least 60 individual adult AMOY (including up to 30 oiled individuals and 30 un-oiled)) will be selected for color marking and radiotelemetric monitoring. Attempts will be made to radio-tag birds with varying degrees of oiling.

Data Collection — Trapped AMOY will be outfitted with radio transmitters equipped with mortality switches and color bands with individual field-readable codes. Each bird will receive two identical coded bands to facilitate re-sighting and minimize the effects of band loss in accordance with the banding protocol developed by the AMOY Working Group. The transmitter will be attached to one of the coded bands using marine epoxy. The mass of the device will not exceed 3% of the individual's body mass. The transmitters will allow the birds to be more easily located in a broad landscape so that oiling status can be determined repeatedly for individual known birds. In addition, bird mortality will be indicated by a "mortality switch" that detects the cessation of movement of the transmitter.

Territorial AMOY adults will be captured with decoys and whoosh net or noose carpet, while local non-breeding flocks of mostly subadult birds on roosts will be captured using whoosh, canon, or rocket nets.

Radiotagged AMOY will be remotely located (via radio transmitter) daily for the first 14 days after transmitter attachment to monitor for post-handling mortality. Thereafter, each tagged AMOY will be remotely located at least once a week until approximately November[2] or transmitter failure, whichever is earlier. Relocation surveys will be conducted from the ground, boat or plane as needed. Study birds may be regularly checked for signs of oiling throughout the study period. If a mortality signal is received, every effort will be made to recover the individual within 24 hours. When possible, radiotagged carcasses will be retrieved, documented, and turned over to the appropriate authority. Prior to turning over each carcass, the radio transmitter will be removed. Radio tags will then be returned to BP or their designated contractor.

The results of daily location efforts will be added to a telemetry summary sheet and e-mailed to the Trustee project coordinator and BP or their designated representatives within 24 hours. BP or its designated representative will be notified of all mortality signals and provided at least two hours advance notice, if possible, to participate in any carcass recovery effort.

Blood samples will be collected from all captured individuals. Blood samples will be collected and prepared for archiving in the following manner. Hematocrit will be read using microcapillary tube, and a blood smear will be stained, fixed, and archived. Whole blood will be centrifuged to separate plasma and red blood cells,

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[2] Radio transmitter may still be functional past November. In November, the Trustees will coordinate with the Responsible Party to evaluate the need to extend the radio transmitter tracking into the future.

transferred to separate cryovials, and stored at -80 degrees Celsius. While not used to categorize a bird as being visibly oiled, internal oiling will also be assessed by taking a small blood sample that will be analyzed for hydrocarbons within 24 hours after sampling. Two oiled feathers will be collected from each oiled bird that is handled. Two feathers will also be removed from non-oiled birds that are handled for sake of consistency of handling.

Prior to the initiation of any bird capture, detailed field protocols will be cooperatively developed. Consensus protocols will be distributed to all field team members prior to their deployment and at least one copy will accompany all teams in the field should it need to be referenced.

Sample and Data Handling – Chain-of-custody procedures will be observed at all times for all samples. All samples will be transferred with appropriate chain of custody forms.

All field and laboratory data will be collected, managed and stored in accordance with US EPA Good Laboratory Practice regulations (GLPs) to the extent practicable. In accordance with GLPs, all field and laboratory work, and the calibration and use of field and laboratory equipment (e.g. scales, hand held GPS devices, etc.) shall be conducted using written Standard Operating Procedures (SOPs). Manomet shall complete the applicable SOPs prior to the implementation of the field study. The appropriate training on particular equipment or in the conduct of specific field studies for all personnel involved with the project shall be documented and those records kept on file at Manomet for the duration of this project. All data (including electronically archived data), and original data sheets or electronic files, must be promptly transferred to USFWS, BP or their representative and other Trustees.

Unless otherwise agreed upon by the Trustees party to this study plan and BP or their designated representative, all samples intended for petroleum hydrocarbon quantification will be sent to TDI Brooks Lab.

In the event that samples are sent to TDI Brooks Lab or another agreed-upon laboratory for analysis, each laboratory shall simultaneously deliver raw data, including all necessary metadata, generated as part of this work plan as a Laboratory Analytical Data Package (LADP) to the Trustee Data Management Team (DMT), the Louisiana Oil Spill Coordinator's Office (LOSCO) on behalf of the State of Louisiana (for data regarding the natural resources managed by the state of Louisiana) and to ENTRIX (on behalf of BP). The electronic data deliverable (EDD) spreadsheet with pre-validated analytical results, which is a component of the complete LADP, will also be delivered to the secure FTP drop box maintained by the DMT. Any preliminary data distributed to the DMT shall also be distributed to LOSCO and to ENTRIX. Thereafter, the DMT will validate and perform quality assurance/quality control (QA/QC) procedures on the LADP consistent with the authorized Quality Assurance Project Plan, after which time the validated/QA/QC'd data shall be made available to all Trustees and ENTRIX. Any questions raised on the validated/QA/QC results shall be handled per the procedures in the Quality Assurance Project Plan and the issue and results shall be distributed to all parties. In the interest of maintaining one consistent data set for use by all parties, only the validated/QA/QC'd data set released by the DMT shall be considered the consensus data set. The LADP shall not be released by the DMT, LOSCO, BP or ENTRIX prior to validation/QA/QC absent a showing of critical operational need. Should any party show a critical operational need for data prior to validation/QA/QC, any released data will be clearly marked "preliminary/unvalidated" and will be made available equally to all Trustees and ENTRIX.

Scheduling Capture and Tagging Efforts - A good faith effort will be made to conduct Objective 3 with cooperative, integrated teams of observers. A weekly schedule describing the number of teams and their general area of operation will be prepared by the Trustees' project coordinator and provided to BP or its designated

representative two weeks in advance of the scheduled field operations. BP or its designated representative will provide the Trustees' project coordinator a list of the teams on which it will participate at least 10 days prior to the beginning of the designated week. If these agreed-upon notification and communication procedures are followed, yet circumstances prevent BP or its designated representative from participating in a survey, the survey will be carried out without BP's or its designated representative's participation. If BP or its designated representative is available and on site for the survey, then the field work will be carried out as an integrated team.

Prior to concluding each field day, integrated teams will share (1) all data sheets (2) all official photographs, and (3) the official GPS tracklog using methods developed as part of the beached bird survey (Study #1) effort. In the event that the survey must be conducted without a BP representative present, the data (data sheets, track logs, photos) will be e-mailed to a designated BP representative within 18 hours of its being collected. The original data forms will be transmitted to the Trustee project coordinator within 24 hours or according to a procedure agreed upon by the Trustee and Manomet.

Disposition of radio tags not deployed within 9 weeks of project initiation- Any radio tags not successfully attached to AMOY within 9 weeks of project initiation will be returned to BP or their designated contractor. At that time, all interested parties will meet to evaluate capture and tagging efforts and to determine if and how additional capture and tagging of AMOY will be conducted.

Objective 3b: Monitoring return rates of color-marked SNPL, REKN, AMOY, and PIPL.

While carrying out the surveys described in Objective 2, ground teams will record band sequence of SNPL, REKN, AMOY, and PIPL when banded birds are encountered. Approximately 50% of the SNPL population in Florida has been previously banded (Pruner 2010). In addition, PIPL have been previously banded on their breeding and wintering grounds (and additional banding work is proposed in Bird Study #7).

Sample unit — Single adult SNPL, REKN, AMOY, and PIPL.
Sample selection — Color banded individual birds (SNPL, REKN, AMOY, and PIPL)

Sample size — Re-sighting data will be collected opportunistically on previously color-banded SNPL, REKN, AMOY and PIPL individuals.

Data collection — The PIPL re-sighting method is discussed in greater detail in Bird Study #7. Any resighting data collected through this effort will be coordinated with the PIPL team. During ground surveys conducted for Objective 2 of this study, observers will collect re-sighting data on color-banded birds. Photo-documentation of all banded birds will be conducted. Data (e.g., date, time, habitat, condition [oiled or un-oiled], and geo-referenced location) on band recoveries and other dead birds will be collected.

Survey Frequency and Duration — This plan assumes that each site will be surveyed approximately once every nine days through November 2010. However, for purposes of adaptively managing the shorebird effort, Trustee and BP representatives will meet during the first or second week following completion of Phase I to review the data collected to date and develop a schedule for future data review meetings.

Data Analysis — We may use appropriate mark resight models to estimate survival, while controlling for other variables known from past studies to affect survival.

PROJECT ADMINISTRATION

The Trustees propose Shiloh Schulte, Manomet Center for Conservation Sciences, as the Principle Investigator for this project. Manomet will work with state natural resource agencies and local bird conservation groups to implement the project.

Study Budget

	Rate ($)	Units	Total Cost ($)
Objective #1 (anticipates 6 surveys: 1 for the entire Gulf of Mexico study area and 5 within the central area)			
R.G. Ford Consulting Co.			
Professional Services			
Survey Director	[redacted]		
Data Manager	[redacted]		
Subcontracted Personnel:			
Coordination/Oversight	[redacted]		
Lead Observer/Trainer	[redacted]		
Sr Observer/Photographer	[redacted]		
Observers (various)	[redacted]		
Sr Navigator/Recorder	[redacted]		
Navigator/Recorder	[redacted]		
Data Transcription/Checking	[redacted]		
Photo and Data Analysts	[redacted]		
Other Direct Costs:			
Travel			65,400.00
Equipment and Supplies			3,000.00
Subtotal			420,000
Overhead @ % of Subs, Travel, etc.			50,400
Aircraft and Pilot (estimate- would be a separate contract through AMD).			[redacted]
Objective #1 Cost			[redacted]
Objective #2 and #3			
Objective 2 anticipates first 2 9-day cycles covering sites throughout the Gulf of Mexico with remaining surveys focused on central area and 4 additional sentinel sites surveyed on an 18-day cycle			
Manomet Inc.			
Professional Services			
Shorebird Director	[redacted]		
Oystercatcher Coordinator/NRDA Liaison	[redacted]		
Shorebird Conservation Specialist	[redacted]		
Database and Mapping Specialist	[redacted]		
Contract and Safety Manager	[redacted]		
Telemetry Project Supervisor	[redacted]		
Data Technician (2)	[redacted]		
Subtotal - Professional Services			[redacted]

	Rate ($)	Units	Total Cost ($)
Travel			32,700.00
Equipment and Supplies			65,400.00
Field kits (supplied by USFWS) - 6			11,520.00
Shipping for all field kits (USFWS)			5,000.00
Fed-ex shipping costs for data sheets			5,250.00
Subtotal – Manomet Professionall/Administrative			*643,870.00*
AMOY radio telemetry[3]			
Field Technicians (7)	[redacted]		
Travel/housing			390,500.00
Aerial Surveys (hours)			310,000.00
Subtotal – AMOY			*1,057,500.00*
Shorebird Surveys			
Florida			
Shorebird Surveys			216,600.00
Equipment and travel			52,186.00
Field kits (supplied by USFWS) - 12			23,040.00
Subtotal – Florida			*291,826.00*
Alabama/Mississippi			
Shorebird Surveys			102,000.00
Travel			31,700.00
Housing			42,000.00
Field kits (supplied by USFWS) - 1			1,920.00
Subtotal - Alabama/Mississippi			*177,620.00*
Louisiana			
Shorebird Surveys			612,000.00
Travel			107,000.00
Housing			84,000.00
Field kits (supplied by USFWS) - 8			15,360.00
Subtotal – Louisiana			*818,360.00*
North/Central Texas (GCBO)			
Shorebird Surveys, coordination, and training			181,831.00

[3] Radio transmitters for AMOY purchased by BP through a separate process. Costs not reflected in this budget.

	Rate ($)	Units	17,017.00 Total Cost ($)
Field kits (supplied by USFWS) - 10			19,200.00
Subtotal - North Texas			*218,048.00*
South Texas			
Shorebird surveys and coordination			66,000.00
Equipment/Travel/Housing			15,100.00
Field kits (supplied by USFWS) - 2			1,920.00
Subtotal - South Texas			*83,020.00*
Objectives #2 and #3 costs			***3,290,244.00***
Total Study Cost			**3,980,644.00**

Literature Cited

Alonso-Alvarez, C., C. Perez, and A. Velando. 2007. Effects of acute exposure to heavy fuel oil from the Prestige spill on a seabird. Aquatic Toxicology 84:103-110.

Andres, B.A. 1999. Effects of persistent shoreline oil on breeding success and chick growth in black oystercatchers. Auk 116: 640–650.

Andres, B.A. 1997. The Exxon Valdez Oil Spill disrupted the breeding of black oystercatchers. Journal of Wildlife Management 61: 1322–1328.

Andres, B.A. 1994. The effects of the Exxon Valdez oil spill on black oystercatchers breeding in Prince William Sound, Alaska. Exxon Valdez Oil Spill State/Federal Natural Resource Damage Assessment Final Report (Bird Study 12/Restoration Study Number 17), U.S. Fish and Wildlife Service, Anchorage, AK.

Burger, J. 1997. Effects of oiling on feeding behavior of sanderling and semipalmated sandpipers in New Jersey. Condor 99: 290–298.

Burger, J., and N. Tsipoura. 1998. Experimental oiling of Sanderlings (*Calidris alba*): Behavior and weight changes. Environmental Toxicology and Chemistry 17: 1154–1158.

Chapman, B.R. 1981. Effects of the Ixtoc I oil spill on Texas shorebird populations. Pages 461–465 *in* Proceedings of the 1981 Oil Spill Conference, American Petroleum Institute, Washington, D.C.

Chapman, B.R. 1984. Seasonal abundance and habitat use patterns of coastal bird populations on Padre and Mustang Island barrier beaches following the Ixtoc I oil spill. U.S. Fish and Wildlife Service report FWS/OBS-83/31, Washington, D.C.

Corbat, Carol A. and Peter W. Bergstrom. 2000. Wilson's Plover (*Charadrius wilsonia*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/516.

Evans, M.I., and G.O. Keijl. 1993. Impact of Gulf War oil spills on wader populations of the Saudia Arabian Gulf coast. Sandgrouse 15: 85–105.

Ford, R.G., G.K.H. Boor, and J.C. Ward. 2001. Seabird mortality resulting from the M/V New Carissa oil spill incident February and March 1999. Final report, R.G. Ford Consulting Company, Portland, OR.

Howell, S. N. G. and S. Webb. 1995. A guide to the birds of Mexico and northern Central America. Oxford Univ. Press, New York.

Larsen, E.M., and S.A. Richardson. 1990. Some effects of major oil spill on wintering shorebirds at Grays Harbor, Washington. Northwest Naturalist 71: 88–92.

Lowery, G. H. Jr. Louisiana Birds. 1974. Louisiana Wild Life and Fisheries Commission. Louisiana State University Press. Baton Rouge, LA.

Murphy, S.M., and T.J. Mabee. 2000. Status of Black Oystercatchers in Prince William Sound, Alaska, Nine Years After the Exxon Valdez Oil Spill. Waterbirds 23: 204-213.

Nol, Erica and Robert C. Humphrey. 1994. American Oystercatcher (*Haematopus palliatus*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/082

Page, Gary W., Lynne E. Stenzel, G. W. Page, J. S. Warriner, J. C. Warriner and P. W. Paton. 2009. Snowy Plover (*Charadrius alexandrinus*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/154

Peterson, C. H., S. D. Rice, J. W. Short, D. Esler, J. L. Bodkin, B. E. Ballachey, and D. B. Irons. 2003. Long-Term Ecosystem Response to the Exxon Valdez Oil Spill. Science 302:2082-2086.

Smith, P.C., and J.S. Bleakney. 1969. Observations on oil pollution and wintering purple sandpipers, *Erolia maritima* (Brunnich), in Nova Scotia. Canadian Field-Naturalist 83: 19–22.

Turcotte, W. H., and D. L. Watts. 1999. Birds of Mississippi. Univ. Press of Mississippi, Jackson.

Zdravkovic M. and R. DeMay 2006. Status of select beach-nesting birds in coastal Louisiana 2005: breeding abundance, habitat use, and distribution. Barataria-Terrebonne National Estuary Program, Thibodaux, LA, report number thirty-three.

Zdravkovic, M. 2006. The 2005 Beach-nesting Bird Census and Report for Coastal Mississippi, Louisiana, and Texas, Coastal Bird Conservation Program, National Audubon Society, Science Dept. New York, NY.

Zdravkovic, M. 2007. 2007 Beach-nesting bird census and report for coastal Mississippi. National Audubon Society, Coastal Bird Conservation Program. Unpublished report.

Zdravkovic, M. 2008. Beach-nesting bird breeding census and report for coastal Alabama – 2007 report. Audubon Coastal Bird Conservation Program, Science Department, National Audubon Society, New York, NY. Unpublished report.

Zdravkovic, M. and S. Hecker. 2006. 2005 beach-nesting bird census and report for coastal Mississippi, Louisiana, and Texas. National Audubon Society, Coastal Bird Conservation Program,. Unpublished report.

APPENDIX I – Data Forms

Live Animal Assessment Form – Non-Breeding Shorebird Oiling Observations[1]

Incident Name: Deepwater Horizon MC-252 **Crew (Print and Sign Names):** _____

Date: _____ **Start time:** _____ **End time:** _____ **Photographer** _____ **Camera** _____

ACP/Segment: _____ **Survey Tools (circle one):** Binoculars Scope Both **Survey Type (circle one):** Point Count Transect

Start Lat-Decimal Degree: _____ **Long-Decimal Degree:** _____

GPS Waypoint No: _____

End Lat-Decimal Degree: _____ **Long-Decimal Degree:** _____

GPS Equipment: _____

Oil Presence (circle all that apply):
Oil Smell **Oil in water** **Oil on vegetation** **Oil on birds** **Oil on exposed land** **None**

Tide Stage and Direction: _____

Weather: _____ (describe briefly) **Wind Direction:** _____ (Blowing toward or away from shore) **Visibility:** <0.1 mi 0.5 mi 1.0 mi >1.0 mi

		Degree of Oiling (record number of birds in category)						
Species/Class	No Visible Oil	Trace (≤5%)	Light (6 -20%)	Moderate (21-40%)	Heavy (>40%)	Debilitated	Photo ID	Notes

[1] Observations within 50m of the transect

Live Animal Assessment Form – Non-Breeding Shorebird Total Numbers/Species Composition

Incident Name: Deepwater Horizon MC-252 Crew (Print and Sign Names): _____

Date: _____ Start time: _____ End time: _____ Photographer _____ Camera _____

ACP/Segment: _____ Survey Tools (circle one): Binoculars Scope Both Survey Type (circle one): Point Count Transect

Start Lat-Decimal Degree: _____ Long-Decimal Degree: _____ GPS Waypoint No: _____

End Lat-Decimal Degree: _____ Long-Decimal Degree: _____ GPS Equipment: _____

Oil Smell Oil in water Oil on vegetation Oil on birds Oil on exposed land None Tide Stage and Direction: _____

Weather: _____ Wind Direction: _____ Visibility: <0.1 mi 0.5 mi 1.0 mi >1.0 mi

Species	Number	Species	Number

Survey Protocol:

1. Identify and record all birds possible in a single flock.
2. Use a new data sheet for each flock.
3. If the flock flushes before it can be completely counted, move on to the next flock.

Live Animal Assessment Form – Non-Breeding Shorebird Re-sighting

Incident Name: Deepwater Horizon MC-252 Crew (Print and Sign Names): _____

Date: _____ Start time: _____ End time: _____ Photographer _____ Camera _____

ACP/Segment: _____ Survey Tools (circle one): Binoculars Scope Both Survey Type (circle one): Point Count Transect

Start Lat-Decimal Degree: _____ Long-Decimal Degree: _____ GPS Waypoint No: _____

End Lat-Decimal Degree: _____ Long-Decimal Degree: _____ GPS Equipment: _____

Oil Smell Oil in water Oil on vegetation Oil on birds Oil on exposed land None Tide Stage and Direction: _____

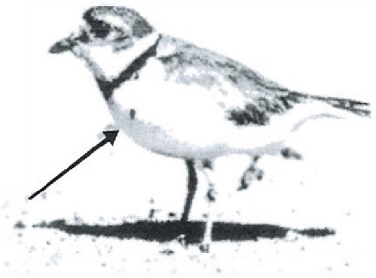
Record Band Nos/Color Band Combinations for each banded bird:

SNPL	REKN	AMOY	PIPL

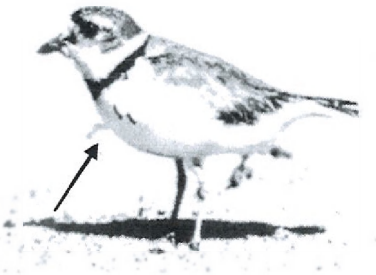
Deepwater Horizon / Mississippi Canyon 252

NRDA Bird Oiling Levels

TRACE
(≤5%)

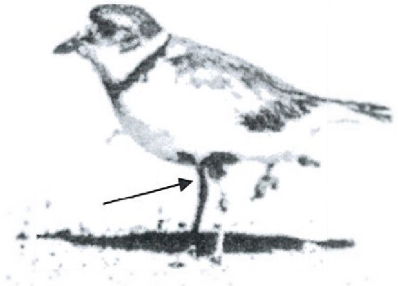


Note single tiny spot or fine streak on breast, face, or side.



Typically a single to several tiny spots or hairline streaks.

LIGHT
(6-20%)



Note light soiling around the top of leg(s).

Other example of light oiling may also appear as light colored spots on the face or breast or belly, or parts of the body. Oiling on 2 or more body parts is recorded as Moderate.

MODERATE
(21-40%)

Note that the whole belly is covered with moderately darker oil

Another example of moderate oiling showing most of the breast, belly and vent covered with oil.

HEAVY
(>40%)

Note that the breast and belly are covered with a very dark layer of oil.

Here, a heavy dark layer of oil is seen on the face, breast, and belly.

APPENDIX II – Random Number Table

Random starting points to assess extent of oiling on live shorebirds. Mark off values after using.

middle	left	right	Left	right	left	middle
middle	left	middle	middle	middle	middle	left
middle	middle	right	middle	middle	left	right
right	middle	middle	right	left	middle	left
middle	middle	right	right	right	middle	middle
left	middle	left	right	right	middle	left
middle	right	left	Left	right	right	right
middle	left	middle	right	left	left	right
right	left	middle	right	middle	middle	middle
right	left	right	right	left	middle	left
left	middle	right	left	middle	left	left
middle	right	left	left	left	middle	left
middle	right	right	right	right	left	middle
right	right	left	left	left	left	left

WORK PLAN FOR ESTIMATING SHOREBIRD

OILING AND MORTALITY

DEEPWATER HORIZON (MISSISSIPPI CANYON 252) OIL SPILL

BIRD STUDY #5

****Approval of this work plan is for the purpose of obtaining data for the Natural Resources Damage Assessment. Each Party signing below reserves its right to produce its own independent interpretation and analysis of any data collected pursuant to this work plan****

APPROVAL

Veronica W. Varela — 8/13/2010

Trustee NRDA Bird Group Lead — Date

Veronica W. Varela

FOR ROLAND GUIDRY — 9/11/10

State of Louisiana Trustee Representative — Date

8/17/2010

BP Representative — Date

Robin J. Bullock

Objective 1: Estimate the temporal and spatial abundance and distribution of shorebirds using the study area from inception of the study through November 2010.

Numbers of transient shorebirds along beaches, overwash sites, tidal flats, exposed bay bottoms, estuaries, marsh edges, and mudflats in marshes will be quantified using surveys from fixed-wing aircraft at an altitude of 200' (following protocols outlined in Bird Study #2). Aerial surveys will include a combination of complete counts in those polygons containing primarily beach or bay shoreline habitat and strip transects through those that are primarily marsh. Polygons consist of identified concentration areas for non-breeding transient shorebirds based on previous monitoring efforts (Figure 2). Two observers, one seated on the starboard side of the aircraft, and one on the port side of the aircraft, will count all shorebirds observed along a fixed-width transect and group them into small, medium, and large shorebird classes. Surveys will be conducted approximately every 18 days during the study period; however, the frequency may be increased as needed.

To attempt to quantify observer efficiency for finding flocks, a number of calibration flights will be completed where the habitat is photographed so that flocks may be identified later and compared to observer counts of the same area. To accomplish this, shorebird habitat will be photographed in multiple frames using high resolution digital cameras equipped with telephoto lenses. The aircraft will remain at an altitude sufficient to avoid any disturbance of roosting or foraging birds. The aircraft will then fly over the same area at survey height and a complete count will be made by the observer to compare with the photographs. A second type of calibration will occur to address observer detectability. In this effort, a photographer will be seated directly behind one of the observers and attempt to photograph as many flocks as possible. The photographs can then be compared to the observer counts.

Dedicated shorebird ground surveys will also be completed in priority shorebird concentration areas (described in Objective 2) to provide data describing the species composition of flocks in congregation areas and degree of oiling.

Sample Universe — Shorebird habitat in the U.S. portion of the Gulf of Mexico may be sampled.

Sample Units — Spatially and temporally explicit count data.

Sample Selection — Overflights will provide photo-documentation and direct counts of shorebird abundance throughout shorebird habitat in the area of potential impact.

Shorebird concentration areas which typically contain more than 10,000 shorebirds or those identified by shorebird experts as critical areas, are classified as Tier 1 concentration areas. Those areas supporting between 2,500 and 10,000 shorebirds are classified as Tier 2 concentration areas. Tier 1 and Tier 2 concentration in the area of potential impact will be surveyed with either a systematic area search or randomized transect approach depending on the habitat type. It is likely that a subset of existing beached bird survey segments (as well as some estuarine, palustrine, and mangrove segments will be included in the Tier 1 and 2 survey areas). Additional concentration sites for transient or nonbreeding shorebirds may be added as needed, as birds make normal large scale seasonal shifts, or move in response to weather events. Statistical criteria will be developed to determine if additional counts are necessary based on the variability observed in overflight data and the spatial coverage of those efforts.

Data Collection —All data will be recorded on appropriate data forms or, in the case of voice recordings, GPS data, and photography, in easily accessible electronic format. Chain of custody protocols will be maintained at all times.

Survey Frequency and Duration — Aerial surveys will be conducted approximately every 18 days during the study period. Unless expressly agreed to by the Trustees party to this study plan and BP or their representative, the raw data associated with each flight cycle (overflight date, general description of overflight, data sheets or recordings linked to a track log, photographs) will be provided to the Trustees and BP prior to the initiation of the next set of overflights.

For purposes of adaptively managing the frequency and spatial extent of overflights, Trustee and BP representatives will meet during the first or second week following completion of Phase I to review the data collected to date and develop a schedule for future data review meetings.

Figure 2. Aerial survey polygons for nonbreeding and transient shorebird study.