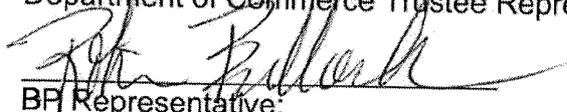
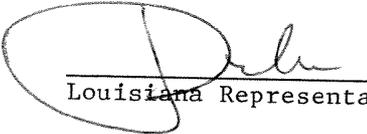


06-07-2011

**Deepwater Horizon/Mississippi Canyon 252
Pre-Assessment and Data Collection Plan – Marine Mammal and Turtle Workgroup**

APPROVED:

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

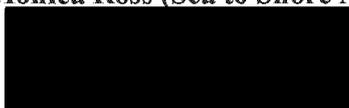
	<u>6/8/10</u>
Department of Commerce Trustee Representative:	Date
	<u>June 7, 2010</u>
BP Representative:	Date
	<u>8/30/10</u>
Louisiana Representative	Date

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

Proposed data collection plan to assess injury to West Indian manatees from the Deepwater Horizon Oil Spill outside of Florida

Point of Contact AL, MS, LA: Monica Ross (Sea to Shore Alliance)



Ruth Carmichael (Dauphin Island Sea Lab)



I. Natural Resources Being Addressed

The West Indian manatee (*Trichechus manatus*) is listed as endangered under the federal Endangered Species Act and the state Imperiled Species List; it is also listed as depleted under the federal Marine Mammal Protection Act.

This proposal is in response for cooperative efforts needed to address impacts from the Deepwater Horizon oil spill to manatees outside of Florida. The assessment and response efforts follow all protocols and methodologies outlined by the Florida Fish and Wildlife Conservation Commission's (FWC) proposal to assess injury to manatees from the Deepwater Horizon Oil Spill in Florida. All efforts in this proposal are explicitly linked to the parallel proposal for Florida to provide a species cooperative approach with FWC and the U.S. Fish and Wildlife Service.

Distribution and Habitat: The West Indian manatee primarily inhabits the coastal waters, estuaries, and freshwater river systems of peninsular Florida, with migrations as far north as Massachusetts and west into Texas during summer months. In recent years, manatee sightings have increased in coastal northern Gulf of Mexico (nGOM), particularly in Alabama (Fig. 1, Pabody et al. 2009).

Manatees could be most susceptible to contaminant exposure if oil and oil spill related contaminants enter estuaries, river mouths, and intracoastal waters inshore of barrier islands, particularly where there are seagrass beds and other submerged aquatic vegetation upon which manatee forage. Manatees could potentially be most susceptible to contamination in these areas, during their regular seasonal migration when water temperatures exceed 20°C (March/April through October/November) (Lefebvre et al. 2001). On the nGOM coast outside of Florida, these areas include Alabama, Mississippi, and Louisiana with some individuals traveling as far west as Texas (Powell and Rathbun 1984; Rathbun et al. 1990; Fertl et al. 2005).

Diving and Surfacing Behavior: Manatees are generally found in very shallow waters, in depths 3m or less usually close to shore. These important manatee areas are in most need of protection. Manatees must surface to breathe every few minutes (rate depending on activity). This behavior places their nostrils just at the surface, making them potentially vulnerable to inhalation of volatile hydrocarbons and potentially could also expose the animals' skin, eyes, nares and oral cavity to oil compounds and dispersants in and on the water surface. Because manatees often rest or forage on the bottom, their skin could also be exposed to tar balls and other forms of oil that settled to the bottom. Oil and spill-related contaminants may also be shared among manatees during social interactions that often involve tactile oral contact (Hartman 1979).

Foraging Behavior and Ecology: Manatees may be most vulnerable to the effects of oil during foraging. Manatees are generalist herbivores that feed on a large variety of marine and freshwater vegetation (Smith 1993), including benthic floating, emergent, and bank vegetation. Therefore, manatees in oil-contaminated areas could ingest toxic or oil compounds while foraging at the surface, along banks or on the bottom where they may encounter and eat tar balls and other forms of the oil that have settled to the bottom or among grasses and other vegetation. In addition, manatees in estuarine or marine environments regularly seek freshwater sources to drink, such as creeks or industrial outfalls (Lefebvre et al. 2001), which may also become contaminated as the spill-impacts expands into these sensitive areas. Indirect adverse effects of oil on manatee populations could occur through reduced quantity and quality of these forage resources (FDEP et al. 1997) and potential impacts on vital rates such as reproduction and survival (Preen and Marsh 1995).

Life History Considerations: Spring and summer are peak periods for manatee migration, calving and mating (O'Shea and Hartley 1995, Rathbun et al. 1995, Reid et al. 1995), which puts these activities temporally and spatially coincidental with oil spill effects (Fig. 1). Manatees have a slow reproductive rate with a calving interval of 2-5 years and 1-2 years of maternal dependence (Reynolds and Powell, 2002). Knowledge of the effects of oil on manatees is nonexistent, and effects of oil exposure on manatee reproduction and development can only be hypothesized. Spring and summer are periods when manatees extensively forage to store fat reserves in preparation for winter energetic demands and seasonal reduction of food resources. The extensive coastal estuaries of the northern nGOM from Alabama through Louisiana are summer foraging area for manatees that overwinter in Florida (Pabody et al. 2009, MMSN 2010).

II. Purpose/Objectives

- 1. To estimate abundance and distribution of manatees in areas adjacent to and affected by the Deepwater Horizon oil spill (before, during and after impact) in summer habitats of Alabama, Mississippi and Louisiana.**
- 2. To conduct an aerial assessment of impacted areas to document locations of marine mammals in fouled areas; locate fouled, distressed or dead animals; and inform manatee rescue efforts.**

Two types of aerial surveys (stratified random sampling surveys [Williams et al. 2002] and response surveys) will be conducted in manatee habitats affected by the oil spill and in manatee habitats adjacent to the affected areas. Information collected during the surveys will determine the number and distribution of manatees that are in and around exposed areas or have been directly exposed to oil (document exposure). In addition, the surveys will aim to determine if

manatees avoid or enter oiled areas. A second survey type, (response survey) with a separate mission, will be conducted to help inform rescue efforts. Both surveys are part of an overall injury assessment (FWC is participating as rescue and necropsy leaders) to document the portion of the local population that is impacted and exposed to the product.

III. Methods

All methods are consistent and complementary with those of FWC response.

Equipment and Protocols: Surveys will be flown in a fashion similar to historical manatee surveys in the area of operation.. One experienced manatee observer will be present, and seated on the right side of the aircraft with the window open (if possible). Ideally, we would have two observers per plane in order to be able to evaluate the observer effect on detectability; but because of logistical constraints we may not be able to include two observers in each survey. Fortunately, it is still possible to estimate abundance of manatees with just one observer. By adding an additional observer in each plane we may be able to increase the accuracy of the estimates; therefore, we plan on including an additional observer whenever possible. No surveys (in which the mission is to count manatees) will be flown in winds greater than 15 kts with gusts no greater than 25 kts or in rainy or foggy conditions. Observers will record the start and end times of the survey, aircraft track line (with GPS), wind speed and direction, sea state (beaufort scale), turbidity and any sightings of manatees (and other marine wildlife such as dolphins and sea turtles) including the number of calves and adults.

Survey Type 1--Stratified Random Sampling Survey to Estimate Abundance and Distribution:

There are some obstacles to obtaining reliable inference from manatee survey data. Unlike marine mammals that inhabit large, open-water areas, manatees often reside in narrow, irregularly shaped bodies of water (e.g., man-made canals, rivers, creeks) that are difficult or impossible to survey using standard methods like distance sampling (Barlow, 1995; Calambokidas and Barlow, 2004). In addition, the difficulty of detecting manatees (heterogeneous detection) during a survey can lead to biased results. Because of the limitations inherent in surveying manatees, a stratified random sample survey has been developed to estimate abundance and distribution of this species, and will be implemented here as part of the Deepwater Horizon oil spill response.

Pre-Impact (<72 hrs before oil impact) and Post-Impact Phases

We will conduct one reconnaissance survey (during each phase) of the region which may become impacted by oil (i.e., within the boundaries of uncertainty projected by NOAA, http://response.restoration.noaa.gov/book_shelf/2098_TMF24-2010-05-30-2100.pdf) to determine if manatees are present. This survey will entail following a predefined flight line that will include plots that are randomly selected according to the design outlined below. Each selected plot will be circled three times. If no manatees are present we will continue to monitor the situation by conducting reconnaissance surveys every week for a maximum of four weeks for implementation of this work plan (per budget). If potential of oil exposure beyond one month in a region is anticipated, this work plan can be extended. If more than one manatee is present in the region, we will implement one stratified random sampling survey that incorporates stratified random sampling and occupancy estimation to determine abundance and distribution in that region.

The stratified random sampling survey will entail: 1.) Stratifying the survey region into two strata (stratum 1 will consist of known manatee habitat [known manatee habitat are areas where manatees have been reported by aerial or other observers, tracked through radio or satellite telemetry, or where carcasses have been recovered], and stratum 2 will consist of habitat less likely to have manatees but may be utilized occasionally (Fig. 2). Habitat deemed unlikely (unlikely habitats are areas that are too deep or too shallow) to be occupied by manatees will be excluded from the survey); 2.) Dividing the area into plots 1.0 mi x 0.5 mi in area; 3.) Randomly selecting plots to be sampled using a random number generator; and 4.) Surveying selected plots during a single sampling event using repeated counts (Royle and Dorazio 2008). Three consecutive repeated counts (each count will take approximately 2 to 3 minutes) will be obtained at each plot by a single plane and will be used to estimate the total abundance of each stratum. Occupancy estimation techniques, for example by Royle and Dorazio (2008) will be used to estimate the probability that at least one manatee was present given that no manatee were observed during the three consecutive passes. Environmental information including sea state, water turbidity, glare, and air temperature will be recorded at each plot at the end of the three consecutive passes and used as covariates in the model. This is part of an overall injury assessment and contributes through documentation of the portion of the regional population that is impacted.

Impact Phase (Oil in or very near region of concern)

Once oil is in the region of concern we will implement one stratified random sampling survey to determine abundance and distribution in the region (per protocols listed above in pre-impact phase).

Survey Type 2--Response Surveys to Assist Rescue Operations:

Impact Phase (Oil in or very near region of concern)

In addition to the stratified random sampling surveys, we will also conduct another type of aerial survey (as stated in the purpose/objectives) to document and map manatees (and other wildlife species such as sea turtles and dolphins) in the impacted areas; locate fouled, distressed or dead marine animals; assist rescue/stranding responses; photograph fouled, distressed or dead marine animals and impacted areas; and collect relevant environmental information (e.g., presence and type of oil) along flight track and at sightings ; and disseminate information (e.g., data, photos) to the appropriate parties regarding distribution and counts of manatees and other wildlife species, oil extent within survey areas, and potential impacts.. Most importantly, these surveys will be flown to assist and inform manatee rescue efforts. These surveys will be ad hoc and will focus solely on the impacted areas and areas surrounding the impacted waters. The aircraft will circle areas where sightings of marine wildlife may occur to help direct rescuers to distressed animals, and to photograph marine mammals (near shore and in estuaries) and other points of interest, and collect environmental information (sea state, water turbidity, glare, air temperature, oil presence and type). Observers will report all relevant information to appropriate parties.

IV. Expected Budget and Requested Resources (TWO BUDGETS proposed)

Estimated cost of a survey for Alabama, Mississippi OR Louisiana, using the FWC-approve method:

Below budget based on using helicopter or twin engine plane per BP protocols:

	# of Aircraft*	# of hrs/survey	Cost/hour	# of Surveys*	Cost
Survey Type					
Reconnaissance	1	8	\$700	4	\$22,400
Plot Sampling	1	8	\$700	2	\$11,200
Response (impact phase)	1	8	\$700	30	\$168,000
Sub-total					\$201,600
	# of staff hrs	Cost/hr			Cost
Salary (GIS staff)	80	\$25			\$2,000
Salary (aerial observers)	288	\$35			\$10,080
	# of days	Cost/day			
Lodging	35 (approx. month)	\$160			\$5,600
Fuel and Car Rental**					\$3,500
Data Analyses & Coord.	50	\$100			\$5,000
Administrative					\$16,813
Sub-total					\$43,713
TOTAL					\$245,313

* Budget is based on potential impacts per state for a one month response to include one of the following: Alabama, Mississippi, Louisiana. Number of aircraft and surveys is subject to change based on the extent and duration of the impact. Number of reconnaissance surveys is based on an estimate of up to 4 surveys.

**Travel estimates account for travel of trained staff from Florida to outside locations averaged among destinations.

Below budget based on using a single engine plane per approved standard manatee aerial survey protocols:

Survey Type	# of Aircraft*	# of hrs/survey	Cost/hour	# of Surveys*	Cost
Reconnaissance	1	8	\$250	4	\$8,000
Plot Sampling	1	8	\$250	2	\$4,000
Response (impact phase)	1	8	\$250	30	\$60,000
Sub-total					\$72,000
	# of staff hrs	Cost/hr			Cost
Salary (GIS staff)	80	\$25			\$2,000
Salary (aerial observers)	288	\$35			\$10,080
	# of days	Cost/day			
Lodging	35 (approx. month)	\$160			\$5,600
Fuel and Car Rental**					\$3,500
Data Analyses & Coord.	50	\$100			\$5,000
Administrative					\$16,813
Sub-total					\$42,993
TOTAL					\$114,993

* Budget is based on potential impacts per state for a one month response to include one of the following: Alabama, Mississippi, Louisiana. Number of aircraft and surveys is subject to change based on the extent and duration of the impact. Number of reconnaissance surveys is based on an estimate of up to 4 surveys.

**Travel estimates account for travel of trained staff from Florida to outside locations averaged among destinations.

V. Data Management:

Aerial survey data will be provided in electronic form (excel spreadsheets; GIS shapefiles; and electronic maps with locations of manatee sightings). We also will provide estimates of local abundance for each stratified random sample survey.

VI. Schedule:

Manatees and other wildlife species that are found fouled, distressed or dead will be reported immediately to appropriate parties. A written summary of the survey and/or a map of manatee sightings and other wildlife sightings will be provided to appropriate parties with 24 hours. A report will be submitted within 90 days of the completion of data collection to appropriate parties.

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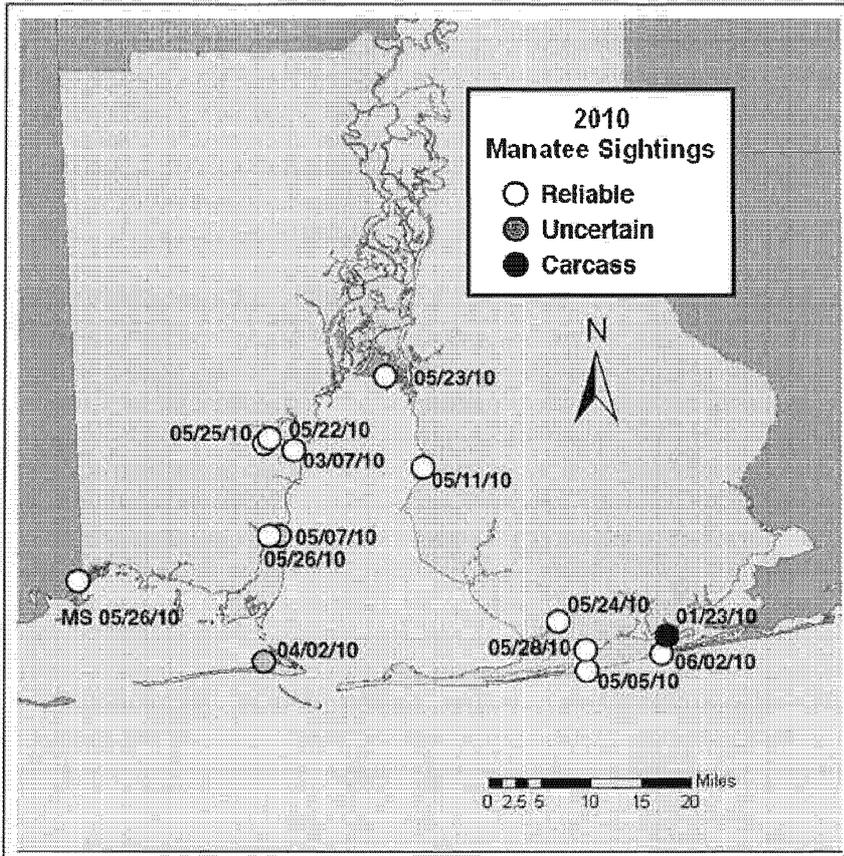


Fig 1 Manatee sightings in 2010 along the Mississippi River delta. The map shows a concentration of sightings in the area around the Curlew Bay, which is a known manatee habitat. The sightings are marked with circles, and the legend indicates that open circles represent reliable sightings, circles with a dot represent uncertain sightings, and solid black circles represent carcass sightings.

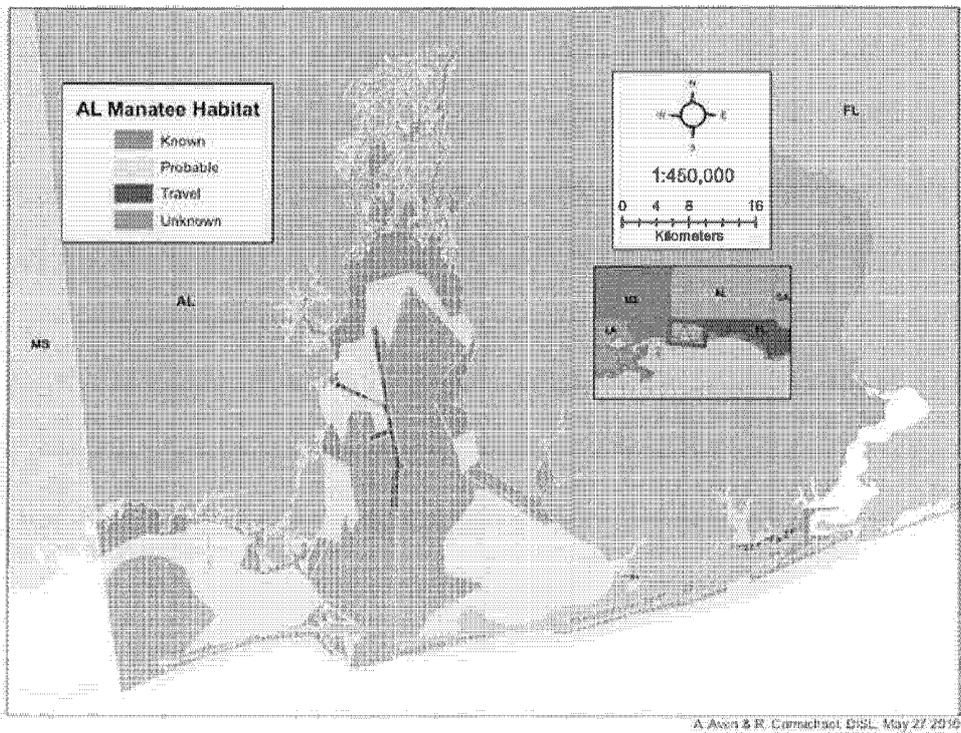


Fig. 2. Example stratified habitat sampling map to be used for aerial surveys.

ERRATA SHEET
for

Proposed Data Collection Plan to Assess Injury to West Indian Manatees from the Deepwater
Horizon Oil Spill Outside of Florida,
June 9, 2010

- ❖ The cover to this plan bears the date of 06-07-2011; the correct date is 06-07-2010.