Mississippi Canyon 252/Deepwater Horizon
Scope of Work for Emergency Restoration Project:
Response Impacts to Seagrasses within
Alabama, Florida, Louisiana, and Mississippi Coastal Waters

April 11, 2011

Prepared by:

National Oceanic and Atmospheric Administration
Office of Habitat Conservation Restoration Center

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1. GIS TABLE-TOP EXERCISE AND IMAGERY

1.1 GIS Analysis

A GIS desk-top exercise to document and map potential impacts to seagrass beds from response vessels related to booming activities has been conducted by the Submerged Aquatic Vegetation Technical Working Group (SAV TWG). The GIS data were provided by many sources and in cooperation with the Responsible Party (Table 1).

Table 1. Data layers used in the table-top GIS exercise.

Data layer	Description	Ownership
Boom_Unified	A compilation of all known boom location and respective attributes prior to its recovery. This polyline shape file captures its location and attributes. The data is available through BP's Houston database server, and is assumed to be updated on a daily basis, or when additional information is available.	BP
Boom_Removed_Grid_V3	A grid system developed by The Response Group (TRG) for the US Coast Guard to improve the boom removal process. This allows Planning and Operations in Houma. New Orleans to remove all boom and its accessories, coordinate boom removal teams, and confirm all placed and detached booms and accessories have been properly removed. This 1 x 1 square mile grid is panned throughout Louisiana only. Thus, grid cells with an attribute of not "Null" as its Grid Status implies that there was a likelihood of booming in that area.	BP
Seagrass 1987 – 2007	This is a polygon shape file depicting seagrass beds for the state of Florida. It is a compilation of statewide seagrass data from various source agencies and scales. The data were mapped from sources ranging in date from 1987 to 2007. Not all data in this compilation are mapped from photography; some are the results of field measurements. This GIS data set was developed to represent the most recent seagrass mapping available in Florida for current statewide display and analysis. Not all areas have been mapped. This data set is not appropriate for time series comparisons.	Florida Fish and Wildlife Conservation Commission
Louisiana SAV, Mississippi SAV, Alabama SAV, Florida SAV	These four feature classes represent spatial data of submerged aquatic vegetation (SAV) coverage for LA, MI, AL, and FL. They each contain data that has been aggregated by various government agencies and research institutions. These four layers were merged with the 'Seagrass 1987 – 2007' layer to create a large overall SAV/Seagrass coverage of the Gulf for this table-top GIS exercise	National Park Service (NPS)
Bathymetry	A raster file containing the Gulf of Mexico's bathymetry, in meter increments. This file was converted into an appropriate format to be able to conduct our GIS query for booming locations in mapped SAV locations in water depths of 1 meter or less.	NOAA OCS

The GIS exercise included overlaying and then querying the data layers (shape files) described above to locate boom polyline features that were over seagrass beds at depth contours less than or equal to one meter at mean lower low water. This information was also cross-referenced with observational reports from SAV TWG members of vessel and boom impacts to seagrass beds. A total of thirteen impacted or potentially impacted bay, lagoon, and/or offshore island systems were identified from the Chandeleur Islands, LA to Apalachee Bay, FL (Table 2). Preliminary maps were presented to Trustees and the Responsible Party at the SAV TWG meeting in New Orleans, LA on October 13, 2010. The refined maps are provided in Appendix A and available on the Environmental Response Management Application (ERMA).

The focused assessment efforts will be conducted around known boom placement locations or in-water boom staging areas. It is recognized that booms were transported by vessels from staging areas to placement locations, and some response vessels with booms in tow may have navigated over shallow seagrass habitats distant from boom placement locations. In addition, there may be cases where booms that were dislodged and subsequently retrieved were also towed over shallow seagrass beds. These actions may have caused direct impact to seagrass beds in areas not necessarily adjacent to the recorded location of the boom in the GIS data provided, but within close proximity. Booms may have also caused recreational boat traffic to alter course in shallower areas around these *defacto* navigation obstructions leading to vessel groundings and propeller scarring. Skirts, floats, and anchors associated with booms also have the potential to scour seagrass beds. In a conservative methodological approach, a 50 m buffer was placed around boom polylines (Appendix A) that fit the query described above to create an area (polygon) in which boom impact reconnaissance would be conducted. A total of 3455 acres have been identified for reconnaissance (Table 2).

Table 2. Locations of identified seagrass systems and the total area (acres) considered for reconnaissance.

	System Location	State	Acres
1	Chandeleur Islands	Louisiana	222.3
2	Horn Island	Mississippi	252.6
3	Petit Bois Island	Mississippi	36.8
4	Point Aux Chenes Bay, MS/ Grand Bay, AL	Mississippi/ Alabama	199.2
5	Coffee Island	Alabama	122.2
6	Perdido	Alabama	22.5
7	Big Lagoon	Florida	110
8	Pensacola Bay	Florida	406
9	Choctawhatchee Bay	Florida	75.7
10	St. Andrews Bay	Florida	235.1
11	St. Joseph Bay	Florida	279.2
12	St. George Sound	Florida	342.3
13	Apalachee	Florida	1151.3
		TOTAL 3455.2 Acres	

Other potential response impacts to seagrass

Response efforts other than those associated with direct boom deployment and retrieval (e.g. vessel or barge staging areas supporting response operations) may have also occurred over shallow seagrass areas throughout the region. Through various sources (e.g. aerial photographs of response activities, local record taking or other methods) information may exist that precisely documents the locations of these staging areas. While there is no known specific dataset for these activity locations as there exists for deployed boom, the same protocols to document possible seagrass impacts as for delineated boom locations will be used should the requisite information become available. These areas of past in-water activity will first be identified through verified georeferenced aerial imagery or through other means that can provide confirmed exact locations. Standard protocols described in this document will be applied and areas will be assessed for injury along predicted track lines for vessel access to the temporary support facilities. This includes establishing a shortest route across known seagrass meadows to deep water from the facilities in a straight line, using GIS to establish a 100-meter wide polygon centered on the resulting line. The window of opportunity for identifying these sites will close with the cessation of the main pre-assessment mapping activities associated with assessment of response impact to seagrass so that emergency restoration can proceed in a timely manner.

1.2 Aerial Imagery - UPDATED

The draft Scope of Work (SOW) for the Emergency Restoration Project for SAV was provided to the RP the week of January 17, 2011. We had proposed to do on-ground field reconnaissance for all 3500 acres, which is a significant undertaking. Information became available that there is adequate pre- and post-oiling imagery for most seagrass areas of interest which would allow for a desktop GIS exercise to better help inform and focus field reconnaissance efforts regarding specific polygons and may reduce that effort as appropriate.

Also note, because of the quality of the Aerometrics imagery from October 2010, no further low-altitude imagery is required. Either the Aerial Imagery TWG or NOAA GIS support team will be required to analyze collected aerial imagery, digitize identified scars, and develop related maps and these efforts will be reflected in the budget.

Desktop Exercise

Pre-oil spill aerial imagery available for all seagrass locations have been identified and can be used to compare to October 2010 Aerometrics imagery (Table) depending on quality. If other imagery is available or not included in Table, it will be investigated and utilized as appropriate.

Table. Available pre- and post- imagery for change analysis.

Imagery data layer	Description	Ownership	Date acquired
Imagery Pre-oiling			
http://ca.dep.state.fl.us/arcgis/services	Pre oiling imagery for northern gulf coast of Florida. (8-bit)	FL DEP	2010
ERMA> Imagery and Remote Sensing> Gulf Coast Imagery 2010 (Not downloadable yet, only viewable in ERMA if you have trustee access)	Chandeleur pre oiling imagery	(LOSCO-should not be publicized trustee only on ERMA-)	Feb. 2010
USACE for 201004_Oilspill_GulfOfMexico and NOAA _MOSAIC for 201 004_Oilspill_GulfOfMexico	Individual frames of Pre-Oiling imagery Alabama and Mississippi-	USGS-USACE and NOAA	April 2010
Imagery Post-oiling			
HDDS and BP	12-bit ortho geo-rectified, 1 ft. resolution imagery.	BP-Aerometrics	October 2010

GIS will be used to attempt to identify possible impacts to seagrass from vessels occurring between the dates of pre-oil spill imagery and October 2010. Those scars identified as present after oil spill response activities, but not present in baseline aerial imagery, will be digitized and quantified within the established polygons. Areas with no visible injury may be removed from the on-ground reconnaissance efforts. In those areas where imagery is not of high enough quality to establish or rule out evidence of post- spill injury to seagrass beds, reconnaissance will be performed as described previously. This exercise will provide the trustees and the RP with quantification of total estimated injured area found in polygons where response activities occurred. The Aerial Imagery TWG has been engaged to provide support in imagery analysis. Field surveys will still occur to document and collect data such as scar depth, scar width, species composition and other crucial data, including data that may be needed for emergency restoration implementation.

The trustees have determined that the use of a reference site is not warranted if analysis of pre and post imagery is conducted. Also note that a conservative and systematic approach was taken in choosing areas for reconnaissance. Polygons had to meet specific criteria in order to be considered. These criteria are simply: 1) documented boom deployment locations, 2) known and mapped SAV coverage and 3) less than 3 feet of depth at MLLW, as stated above. Selection of an area for reconnaissance does not constitute a determination that response-related injury has occurred in that area.

2. RECONNAISSANCE

Field personnel will ground-truth areas that were identified in the table-top GIS exercise. A pilot study to develop and test field reconnaissance methods was conducted by NOAA and SAV TWG members (FL Trustees) November 15-18th, 2010. Results from this mission and from past seagrass restoration experience were used to develop the safety protocols, mapping and Trimble protocols, and *in situ* site characterization.

2.1 Safety Protocols

1. Vessels - vessels should be sound and seaworthy and able to complete the following required tasks
    a. Safely carry all field team members and equipment
    b. Have all required safety gear in working condition according to USCG requirements
    c. Have dependable engine/engines and batteries and other gear in order to operate safely and to out-run weather and other situations that may arise in the field
    d. Be able to operate and maneuver safely in 12" to 18" of water at a slow speed to conduct seagrass injury mapping
    e. Have two means of ship-to-ship and ship-to-shore communication including a VHF radio and cell phone capabilities

2. Weather – field personnel should have appropriate personal protection equipment to handle weather conditions
    a. Water for all persons on board for an 8 hour day
    b. Sunscreen and wide brim hats
    c. Polarized sunglasses
    d. Waterproof foul weather gear and foot wear
    e. Have the appropriate waders or wetsuits for in-water work. Winter water temperatures in this region can drop to 50°F and exposure can lead to hypothermia (Figure 1).

Figure 1. An example of weather proof clothing for cold and wet conditions while on the vessel.

The Captain is responsible for standing down on-water assessment activities due to weather and any one in the group has the right to voice concerns about the weather or other safety conditions at any time. **Safety is the number one priority on these missions.**

2.2 Mapping and Identifying Potential Candidate Seagrass Emergency Restoration Locations

1. Field Teams

Field teams should prepare for full days on the water and cold temperatures. Winds will be out of the north for most of the work days but constant and vigilant attention to weather should be maintained at all times, as severe weather often results with the frequent passage of winter cold fronts in this region.

Each field team will consist of a minimum of three members, each with a required skill:

a. A Trimble GPS expert with seagrass mapping training* and/or experience.
b. An experienced vessel captain who is comfortable navigating in shallow waters with no impacts to seagrass while underway.
c. A boating-competent person who can record data and take measurements of injury width, depths and species types present in the assessed seagrass beds.

Field teams will be assigned specific bays or bodies of water and provided with pre-selected survey areas. Teams will have an appropriate numbers of days to conduct complete surveys, weather days notwithstanding. Teams will assemble at a predetermined boat launch and prepare for an eight hour day, weather and light permitting.

* Training should include Trimble GPS mapping training and Pathfinder software training. These are two of the major components to operate and record spatial data on a Trimble GPS data collection unit. The experience/background of this person should include class/computer time with the software as well as field experience using the system with an experienced Trimble operator to delineate features that have been mapped.

2. Navigation to Sites

Transect lines will be placed at 20 m intervals across the buffered polygon to create reconnaissance maps. Twenty meters was recognized as the best distance for identifying seagrass injuries from a spotter vessel during the pilot survey. GPS points for transect endpoints will be provided and will be pre- loaded in the Trimble/ Mapping GPS system as shape files. Trimble units will be used to aid in navigation along the length of each transect (Figure 2). Vessels will navigate along the predetermined transect lines within each polygon as depth and other safety concerns allow. These transects may be temporarily marked at endpoints with stakes or buoys to help with systematic coverage of the assigned polygon.

Transects may be spaced more closely (e.g. at 10 m intervals) if conditions warrant. The Trimble operator will be positioned in the bow of the vessel as the vessel operator drives the length of the transect at a slow speed. While on transect, the Trimble operator will collect a trackline for recording and filing purposes. The third person on board will stand by with a stake or buoy to mark any SAV injury considered as a potential candidate for restoration (Figure 4).

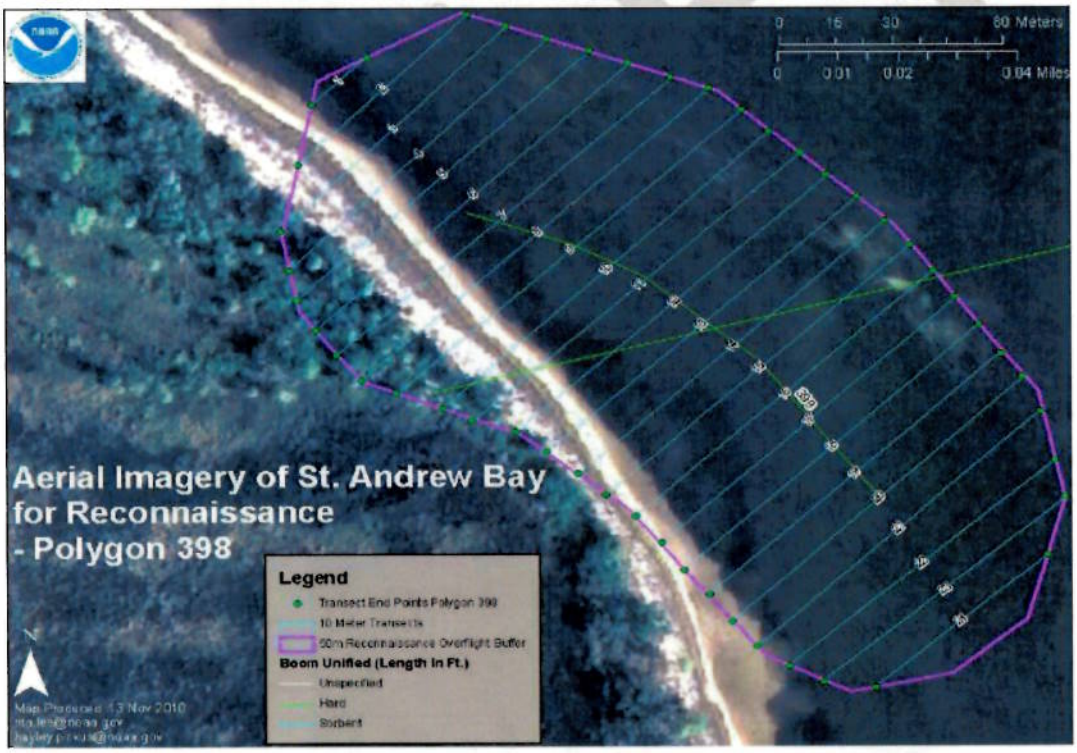

Figure 2. One of the pilot maps used as a guide for reconnaissance. These maps were produced through data provided by Aerial Imagery and SAV TWGs, and the responsible party. Note the aerial imagery (BP aerometric imagery) shows seagrass scaring in the area.

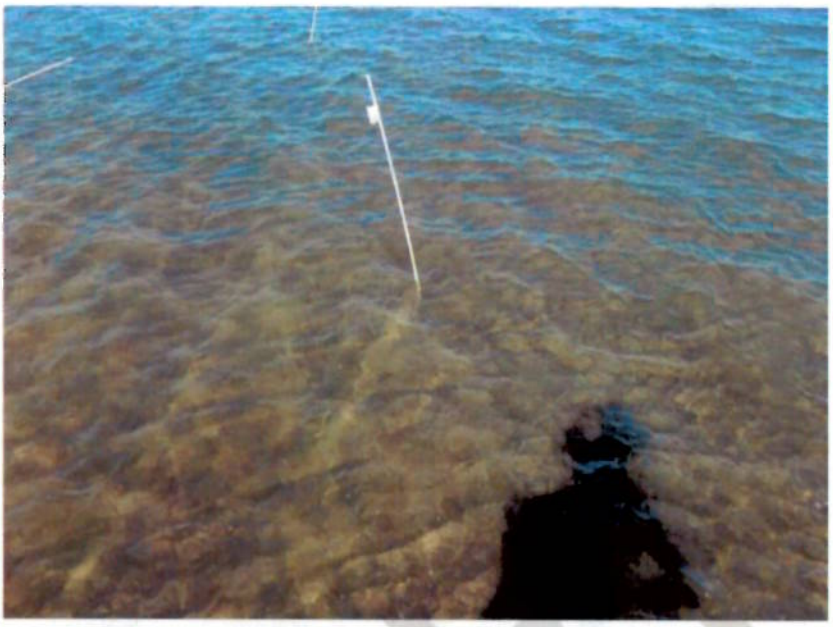

Figure 3. Potential candidate scars marked by field team in pilot study in St. Andrews Bay, FL

Figure 4. A Trimble operator traces an injury to seagrass from the bow of the boat.

2.3 Trimble Protocols

1. Trimble and ArcGIS Protocol for Seagrass Injury Mapping

Utilizing a survey–grade, differential global positioning system (DGPS; Trimble ® Geo XT handheld or similar equipment), each seagrass injury considered a candidate for emergency restoration will be mapped by physically tracing the foot print of the injury and recording its total length (m). The physical features obtained from mapping will be downloaded to ArcGIS 9.3 (ESRI). Using XTools Pro®, (projection: GCSNorth America_1 993; Datum: D_North America_1983). The injury IDs will be assigned by computing the following procedure in ArcGIS within the Injury Layers Attribute Table: Select the "Line _ID" field; Right click on "Field Calculator" in the drop- down menu; Double click on FID within Fields; Compute field calculator operation as Line _ID=FID+1.

File naming protocols – To ensure consistency with mapping and data collection, we suggest the following file naming standards for Trimble files:

1. For end points of transect through a polygon to be surveyed:
   Site_polyID_transectpoints
   Ex: standrews_poly868_transectspoints

2. For transect lines:
   Site_polyID_Transectlines
   Ex: standrews_poly868_transectlines

In addition to recording information on hard-copy field data sheets, a Trimble Data Dictionary may be created that incorporates all of the fields contained in the datasheets with predetermined values (ranges) and descriptive fields (drop-down list) to provide a consistent basis for measurement and assessment. This will facilitate a consistent set of criteria to evaluate and quantify restoration options for the assessed areas. The following file naming convention should be used:

3. Site_polyID_feature_date
   Ex: standrews_poly868_scars_112310

Once all transects are complete and the polygon area has been surveyed, the field team should prepare to examine each eligible* seagrass injury characteristic to determine whether it is a candidate for restoration.

*Eligible seagrass injuries will be those that are determined to have been created after the initial oil release. Determinations will be based on GIS exercise and Aerial imagery dates as well as field team observations.

2.4 *In Situ* Seagrass Injury Assessment Characterization

Candidate seagrass injuries should meet the following criteria in order to be evaluated for restoration:

1. Injury occurs within the predetermined area around the oil boom location (GIS polygon)
2. Injury is devoid of any seagrass re-growth suggesting it is less than 6 months in age

The following characteristics for the candidate seagrass injuries should be noted:

1. Injury depth:
    a. If injury is deeper than 15 cm, candidate for sediment fill
    b. If injury is less than 15 cm in depth, potential candidate for nutrient addition or seagrass transplanting but not automatically fill.
2. Seagrass Species: Injuries mapped in *Thalassia testudinum* dominated seagrass beds are of highest priority followed in descending order by *Syringodium filiforme* dominated beds and finally *Halodule wrightii* / *Ruppia maritima* dominated beds.
3. Injury length: from Trimble data (described above)

Seagrass injury widths should be obtained every 5 m along the length of the injury for a total of at least three measurements (> 15 m) to determine average width. If an injury is greater than 50 m in length, divide the length of the injury by 10, and measure widths at the resulting product interval to provide a total of at least 10 measurements. The field party can opt to take additional width measurements if these 10 do not accurately represent the average width of the injury.

If the injury is less than 15 m in total length, the field team should take a minimum of three width measurements – one at each endpoint and one in the middle. Measurements at the endpoints should be taken one meter from the visible edge of the injury. The field team will use a PVC L-shaped device marked in 10 cm increments along both the vertical and horizontal axes (Figure 5). These measuring devices should be constructed of at least one-inch diameter schedule 40 PVC and should be at least 2 m along the vertical axis and 0.5 m along the horizontal axis. This allows for measurement from both the vessel and *in situ*. Widths are easily measured by direct placement of the horizontal end of the "L" across the injury.

Depth measurements may be taken by recording depth in the center of the injury and subtracting from the depth measured in the undisturbed seagrass immediately adjacent to the injury at the same measurement location. Teams may also use measuring tapes or other devices that accurately measure these injury parameters (Figure 6). Depth and habitat data for each injury as well as other notable features should be recorded within the Comments section in the Trimble file. In addition, hard copy data sheets will be filled out to record the data. Standard data sheets will be made available to field teams.

Table 3 provides additional criteria to consider for evaluating and prioritizing restoration of injured sites. These criteria satisfy the restoration objectives while taking into account technical, environmental, economic, and social factors. The order in which these criteria are listed in Table 3 does not reflect any measure of their relative importance.

Table 3. Criteria for evaluating candidate seagrass injury locations.

Criteria	Definition
Technical Feasibility	Likelihood that a given restoration action will work at the site and that the technology and management skills exist to implement the restoration action. Factors include depth, current regimes, ability for restoration teams to work in area and travel distance.
Reduce Recovery Time	Measures that accelerate or sustain the long-term natural processes important to recovery of the affected resources and/or services injured or lost in the incident. Species composition will be a factor here with *Thalassia testudinum* dominated habitats requiring more intensive restoration than *Halodule wrightii,* as a general rule. Of course there are exceptions.
Reduce Potential for Additional Injury	Likelihood that the requirements, materials, or implementation of a restoration action minimizes the potential for additional injury. Factors may include fetch/exposure to wind and wave energy, proximity to highly traveled navigation channels and current regime
Aesthetic Acceptability	Restoration alternatives that create substrates and topography that most closely resemble the surrounding habitat and minimize visual degradation.
Site Specific Context	Restoration alternatives are selected depending on the site specific context of environmental conditions at the site including but not limited to location, extent, and severity of the injury, hydrological characteristics of the site, seagrass species composition, and other social and resource management concerns.

Table from Florida Keys National Marine Sanctuary's Programmatic Environmental Impact Statement for seagrass restoration for NRDA conducted under the National Marine Sanctuaries Act Sect. 312. FPEIS Chapter 2.1.

This plan will be implemented consistent with existing trustee regulations and policies. All applicable state and federal permits must be obtained prior to conducting work.

3. PROJECT MANAGEMENT TEAM

NOAA is proposing to be the Project Lead on all reconnaissance activities in collaboration with State trustees and the Responsible Party (RP; Figure 7). This on-site oversight will ensure that proper safety practices are followed, no impacts to the marine habitat occur, effective cross-party coordination occurs, and close adherence to the scope of work and methods are followed.

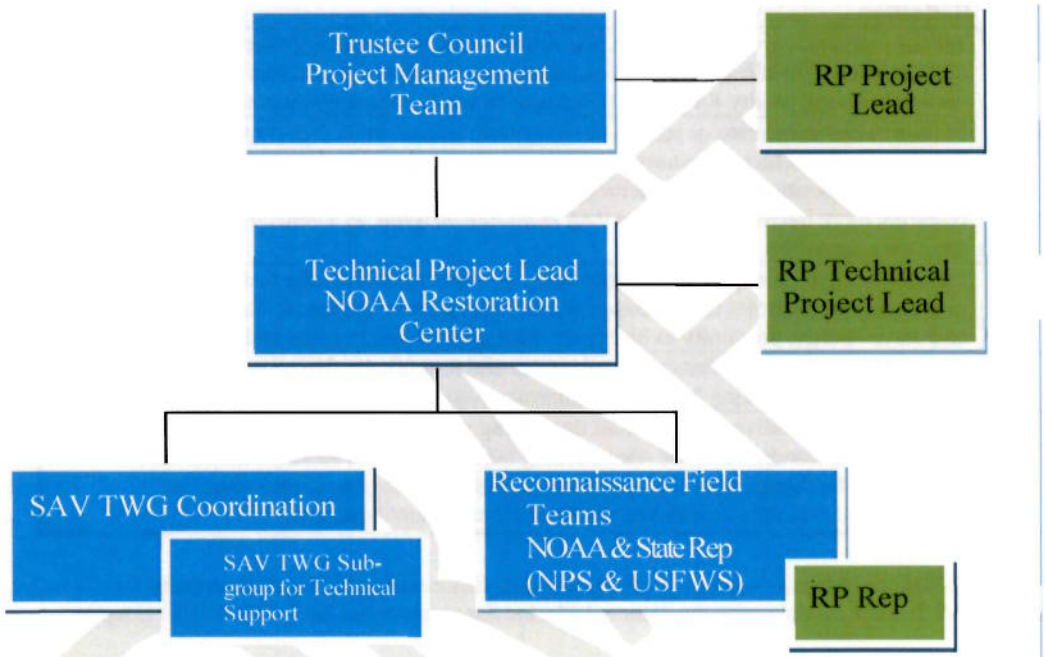

Figure 7. A graphic of the suggested organizational hierarchy for the reconnaissance activities for the emergency restoration project.

The SAV TWG will serve in a coordination role with the sub-group, providing technical support to the NOAA Technical Project Lead. The reconnaissance field teams will be led by NOAA and State Representatives with experience in these reconnaissance methods (*e.g.* NOAA Center for Coastal Fisheries and Habitat Research in Beaufort, NC, Florida Fish and Wildlife Conservation Commission, the Seagrass Damage Assessment team from the Florida Keys National Marine Sanctuary, and local academia). It is strongly encouraged to have State trustee representation on trips in state waters. National Park Service (NPS) staff must be present when surveying NPS waters (Gulf Island National Sea Shore) and the US Fish and Wildlife Service (USFWS) should be informed of Chandeleur Island's activities. In addition, RP Representatives shall have the opportunity to assist and observe all field surveys. All field operations will be in coordination with State, Federal, and Responsible Party representatives.

4. TIMELINE

The following is an updated timeline that also includes Restoration plan development, potential trustee and RP sign-off processes, and implementation (Table 4.). Aerial imagery desktop analysis should begin immediately upon Scope of Work approval and will be assisted by the Aerial Imagery TWG. Based on this analysis, site reconnaissance will occur in the spring months, when seagrass is actively growing. Once reconnaissance is complete, the amount and location of injured areas will be presented within the full restoration plan along with restoration alternatives (see discussion on Next Steps). By the end of May 2011, we would like to see this plan agreed upon to expedite implementation of the actual restoration activities during the summer months and before the potential for physical disruption during the hurricane season.

Table 4. UPDATED timeline

Activity	Feb	March	April	May	June/July/Aug
Imagery analysis, digitizing, and mapping	Desk-top analysis of pre- and post-oil spill potential response-related impact imagery, digitizing and				
Reconnaissance FL		Team 1: Apalachee Bay, St. George Sound, St. Joe Bay	Team 1: Choctawhatchee Bay, St. Andrews Bays Team 2: Big Lagoon, Pensacola Bay		
AL			Team 2:Perdido Bay, Coffee Island, Grand Bay		
MS		Team 2: Petit Bois and Horn Islands			
LA		Team 2: Chandeleurs			
Restoration Plan		Begin development of full restoration Plan. Provide toTrustee Council		Beginning of May: finish full restoration plan. Provide to RP.	
Sign-off				End of May: Sign-off for restoration of agreed locations	
Implementation					Implement restoration at appropriate sites

Estimates of the amount of field days for reconnaissance will vary based on results of desktop exercise. At a maximum, all 3500 acres (plus any opportunistic site reports) will be visited. However, we believe that aerial imagery analysis will reduce the need for complete field assessment and help to focus reconnaissance efforts to those sites with identified oil spill response injury and eliminate those areas unimpacted during this response effort (Table 5).

Table 5. System locations, total area to be surveyed, and estimated number of field days.

	System Location	Area in m^2 to be surveyed	Field Days	State	Acres
1	Chandeleur Islands	899,456	3	LA	222.3
2	Horn Island	1,022,373	3.5	MS	252.6
3	Petit Bois Island	148,760	1	MS	36.8
4	Point Aux Chenes, MS/ Grand Bay, AL	806,017	3	MS/AL	199.2
5	Coffee Island	494,400	2	AL	122.2
6	Perdido	90,906	0.5	AL	22.5
7	Big Lagoon	445,352	1.5	FL	110
8	Pensacola Bay	1,642,937	5.5	FL	406
9	Choctawhatchee Bay	306,230	1	FL	75.7
10	St. Andrews Bay	951,334	3	FL	235.1
11	St. Joseph Bay	1,129,792	4	FL	279.2
12	St. George Sound	1,385,211	5	FL	342.3
13	Apalachee	4,658,104	15	FL	1151.3
	TOTAL	AL/MS/LA- 3,461,912 FL- 10,518,960	AL/MS/LA - 13 FL - 35		3455.2

5. BUDGET

The imagery budget is based on the cost for pre- and post- oiling spill imagery analysis, digitizing, and mapping. We estimate one-month of work will require assistance by the Aerial Imagery TWG to complete these specific tasks.

The pilot study helped to shape the budget for reconnaissance. This budget is based upon the maximum amount of area identified for reconnaissance in each bay, lagoon, or island system and the identified effort that it would take to cover those areas. The pilot study also provided cost estimates for potential participants in the reconnaissance effort (Table 6).

Table 6. Current Budget estimate as of 02/16/2011.

	Cost per day	Days	ITEM
Imagery			
Imagery analysis, digitizing, and mapping ($53.34/hour – FTE	427	60	$25603
Software licenses			$3000
Total Costs for Imagery			**$28603**
Reconnaissance			
FL –10,518,960 m^2, 320,000m^2/day		35	
Boats	140.00	35	$4900
Lodging/Meals	(77/51)3 staff	37	$14208
Personnel	1900.00	37	$70300
Equipment (Trimble)	50.00	35	$1750
Vehicle	255.00	37	$9435
Fuel	100.00	37	$3700

Field Supplies	20.00	35	$700
Weather days*	2284.00	10	22840
Total Costs for FL	**Shore**		**$127833**
MS, LA – 2,070,589 m^2 , 320,000 m^2 /day		9	
Live aboard vessel	$3,143/day	7	$22000
Travel	1000	1	$1000
Meals	$286/day	7	$2000
Personnel	2500.00	9	$22500
Equipment (Trimble)	50.00	7	$350
Field Supplies	20.00	7	$140
Weather Days**	3500.00	3	$10500
Lodging/Meals (day before and after)	(77/51)3 staff	2	$256
Total Cost for LA&MS	**(Live aboard)**		**$58746**
Point Aux Chenes Bay, MS and AL – 1,391,323 m^2, 320,000 m^2 /day		8	
Travel	1000	1	$1000
Boats	140.00	6	$840
Lodging/Meals	(77/51)3 staff	8	$3072
Personnel	1900.00	8	$15200
Equipment (Trimble)	50.00	6	$300
Vehicle	255.00	8	$1800
Fuel	100.00	8	$800
Field Supplies	20.00	6	$200
Travel	1000.00	1	$1000
Weather Days*	2284.00	2	$4568
Total Costs for AL,MS	(shore based)		**$28780**
TOTAL for Recon			**$ 243,962**
10% contingency			**$24,396**
Grand Total: (2010 dollars)			**$ 268,358**

*Weather days are for days where weather is too severe to allow for safe and accurate mapping. These days are charged for per diem and personnel only. No other costs are charged on these days therefore per diem of 128 x 3 ($384) and personnel salary of $ 1900.00= $2284.00 per weather day. ** Weather day for the mother ship includes staff time and $1000.00 each day for the ship.

The Parties acknowledge that this budget is an estimate, and that actual costs may prove to be higher. BP's commitment to fund the costs of this work includes any additional reasonable costs within the approved scope of this work plan that may arise. The trustees will make a good faith effort to notify BP in advance of any such increased costs.

6. DELIVERABLES

The primary deliverables of this effort will be 1) a detailed record of all data collected; and 2) a full emergency restoration plan that includes site-specific, proposed restoration actions with a schedule and cost estimate. Included in the restoration plan will be a proposed monitoring protocol for measuring the outcome of the restoration actions.

Prior to concluding each field day, integrated teams will share (1) all hard copy data sheets; (2) all Trimble files, and (3) any photographs or other official records of the data collection effort. In the event that the data is collected without an RP representative present, those data (data sheets, track logs, photos, any and all data collected as part of the field effort) will be e-mailed to a designated RP representative within 3 days of its being collected. In the event that transfer of such data is delayed due to equipment malfunction or other reasons beyond the reasonable control of the Trustees, it will be emailed to an RP representative as soon as practicable.

7. RESERVATIONS

BP reserves the rights 1) to challenge the Trustees' determination that SAV injury is a result of response activity in relation to the Deepwater Horizon spill; and 2) to seek credit for compensatory restoration in connection with emergency restoration of SAV.

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**** Each party reserves its right to produce its own independent interpretation and analysis of any data collected pursuant to this scope of work. Agreement to this scope of work does not constitute agreement to conduct any specific emergency SAV restoration activities. ****

APPROVAL

Trustee Representative

4-7-11
Date

RP Representative

April 12, 2011
Date