Mississippi Canyon 252 Oil Spill
Submerged Aquatic Vegetation Tier 1 Pre-Assessment Plan
Pre-Impact Baseline Characterization

Natalie Cosentino-Manning (National Oceanic Atmospheric Administration)
Eva DiDonato (National Park Service)
Shahrokh Rouhani (Newfields)
Alexandra Van Geel (Industrial Economics)
Paul Carlson (Florida Fish and Wildlife Conservation Commission)
Laura Yarbro (Florida Fish and Wildlife Conservation Commission)
Jud Kenworthy (National Oceanic Atmospheric Administration)
Amy Uhrin (National Oceanic Atmospheric Administration)
Ken Heck (Dauphin Is. Sea Lab)
Sean Meehan (National Oceanic Atmospheric Administration)
Mark Fonseca (National Oceanic Atmospheric Administration)
Katherine von Stackleberg (Industrial Economics)

In coordination with

Chris Pfeifer (Entrix)
Russ Burge (Entrix)
John Dimitry (Entrix)

For the
MC 252 NRDA Submerged Aquatic Vegetation Technical Working Group

Mississippi Canyon 252 Trustees

Draft Version 7.0

Date September 28, 2010
Originally drafted May 11, 2010

Mississippi Canyon 252 Incident
Submerged Aquatic Vegetation Tier 1 Pre-Assessment Plan
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Approval of this Tier 1 Pre-Assessment plan is for the purposes 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.

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.

Unless otherwise agreed upon by the Trustees and BP, all samples will be sent to TDI Brooks Lab.

APPROVED:

BP Representative: _____ Date: 10/13/10

Department of Commerce Trustee Representative: _____ Date: 10/12/10

Louisiana Trustee Representative: _____ Date: 10/27/10

Summary

This document presents a plan to gather documentation and collect data of the pre-impact ("baseline") condition of Submerged Aquatic Vegetation (SAV) resources in the north-central Gulf of Mexico (GOM), extending from the coastal areas and island of Louisiana (LA), Mississippi (MS), Alabama (AL), through the west coast of Florida (FL) to the southeastern tip including the Keys, Tortugas and Marquesas. The plan is intended for use, to the extent feasible, both before and after oil from the Deepwater Horizon/Mississippi Canyon 252 Oil Spill (MC 252 Oil Spill) reaches SAV habitats. The activities outlined in this plan are part of the pre-assessment phase of the Natural Resource Damage Assessment (NRDA) process for the MC 252 Oil Spill. The data collection described in this plan targets ephemeral data---data that is anticipated to change or be lost within a relatively short period time (even while the spill was ongoing) (15 C.F.R. §990.43). The plan specifically addresses the following components:

1. **Introduction.** This section describes the overall purpose and objectives for an SAV assessment. It also identifies the ecosystem services and SAV metrics that will be addressed through the data collection effort.

2. **Investigative and Sampling Approach.** This section describes the specific tasks to be conducted to obtain data on the SAV metrics. It also provides information on how sampling locations will be determined, an overview of guidance for sample processing, health and safety requirements, and documentation requirements.

3. **Quality Assurance Project Plan.** This section provides an overview of the field and laboratory procedures that will be followed to maintain sample integrity.

4. **Budget.** This section provides an estimate of resources required to accomplish the objectives of this work plan.

5. **Literature Cited.** This section provides the references cited in the text.

Appendices: The appendices provide a list of SAV species, as well as detailed standard operating procedures (SOPs) for each of the tasks and SAV metrics.

1. Introduction

1.1 Purpose/Objectives

SAV are rooted vascular plants that, except for some flowering structures, live and grow below the water surface. The term "Submerged Aquatic Vegetation" includes seagrasses growing in the open Gulf of Mexico and saline estuaries as well as brackish and freshwater water plant species. There are over 26 species of SAV within the Gulf of Mexico (Appendix 1). In Florida alone, approximately 2.5 million acres of seagrass have been mapped in estuarine and nearshore waters, but, when deep water seagrass beds growing in water too deep to easily map are included, the total area of seagrasses within Florida waters and adjacent federal waters is over 3 million acres

(Handley et al. 2007). Important ecological services provided by SAV include, among others, food and habitat for many aquatic animals, maintenance and improvement of water quality, sediment stabilization and shoreline protection erosion. As a result, SAV plays an important role in the marine and estuarine ecology of the Gulf of Mexico and the Florida Keys. A separate plan will address freshwater SAV sampling.

As a result of the Deepwater Horizon/MC 252 Oil Spill, marine and estuarine ecosystems from Louisiana to Florida, and potentially beyond, are at risk of exposure to and injury from oil discharged from the wellhead as well as chemical dispersants. Potential impacts of oil and dispersants on seagrass range from complete mortality (Jackson et al. 1989; Sandulli 1998, Thorhaug and Marcus 1987; Scarlett et al. 2005, for example) to sublethal stress and chronic impairment of seagrass and SAV metabolism and function (Hatcher and Larkum 1982; Ralph and Burchett 1998; Peirano et al. 2005). Response and cleanup efforts for seagrass beds and adjacent shorelines may also cause seagrass loss and impairment (e.g., motorized vessels either engaged in booming operations or vehicles attempting to avoid boomed areas can cause damage to seagrass and SAV beds through propellers and other engine components).

A SAV Technical Working Group (TWG) of experts from government and academia, along with natural resource trustee agency representatives has been assembled to draft this work plan and to implement baseline (pre-injury) assessment of SAV beds throughout the northern Gulf of Mexico from LA to the southeastern tip of FL including the FL Keys to support the Natural Resource Damage Assessment process established by the Oil Pollution Act of 1990 (OPA). Additionally, BP has participated in a review capacity. The geographical scope of the area of concern for SAV in this event involves over 3500 linear kilometers of shoreline from LA to FL and off shore areas requiring a broad-scale baseline assessment. Because environmental conditions vary among regions and water bodies within the geographic scope of the Oil Spill, sampling methods for SAV also will necessarily vary although the goal is to maintain a consistent set of methods to facilitate subsequent analyses.

This Plan for baseline assessment has four objectives: 1) collect documentation and compile relevant data from existing SAV mapping and monitoring programs; 2) review existing information and identify spatial, temporal and/or attribute data gaps relative to the suite of SAV metrics identified herein; 3) conduct targeted sampling for baseline data to fill identified data gaps where impacts from the MC 252 Spill are likely to occur, and logistics permit mobilization of assessment teams in the field; and 4) acquire and/or develop aerial imagery in support of mapping the baseline areal extent of SAV resources at risk in the northern Gulf of Mexico. Where appropriate, these data may at some future date be compared to post-oiling data for purposes of determining impacts related to the MC 252 Spill and associated events including, but not limited to, response activities.

1.2 Geographic Scope

The geographic scope of this work plan includes the nearshore and estuarine environments containing SAV habitats along the northern Gulf of Mexico from eastern Louisiana to the Florida Panhandle to the southeastern tip of Florida, including the Florida Keys. Targeted areas include, but are not limited to, the Chandeleur Islands; Mississippi Sound including Cat, Ship, Horn, Petit

Bois and Dauphin Islands and Grand Bay; Mobile Bay; Perdido Pass and Old River; Big Lagoon, Pensacola Pass and Santa Rosa Sound, Choctawhatchee, Saint Andrew and Saint Joseph Bays in the Florida Panhandle; and Dry Tortugas, Marquesas and Lower Florida Keys, and Florida and Biscayne Bays in South Florida.

1.3 SAV Metrics

SAV provides numerous ecological services to natural resources. The SAV TWG developed a suite of metrics to characterize key SAV physical, biological and chemical attributes necessary to provide these ecological services with the specific goal of supporting the NRDA. The selection of these metrics was informed by their widespread use for characterizing the ecological condition of SAV resources in peer-reviewed studies as well as their ability to serve as useful indicators of potential exposure to MC 252 oil and dispersant and/or adverse spill-related changes that could serve as a basis for quantifying injury as shown in Table 1.

Table 1. Selected SAV Metrics

Metric	Task (Sampling Program) and SOP	Existing programs where data was collected
Extent and coverage as determined from aerial observations	Task 1; SOP 1	All locations
Coverage – visual estimates	Task 1; SOP 2	All locations
SAV biomass and shoot density	Task 2; SOP 2; SOP4; SOP 5	LA, AL, MS, FL*
SAV species composition	Task 2; SOP 2; SOP 4; SOP 5	LA, AL, MS, FL
Sediment infauna abundance and diversity	Task 4; SOP 2; SOP 4	LA, AL, MS, FL*
SAV associated fauna (fish and mobile macroinvertebrate) diversity and relative abundance	Task 5; SOP 2; SOP 5	LA, AL, MS, FL*
Exposure metrics		
Sediment chemistry	Task 3; SOP 2; SOP 3A	LA, AL, MS, FL
Water chemistry	Task 3; SOP 2; SOP 3B	LA, AL, MS, FL
Vegetation tissue chemistry	Task 3; SOP 2; SOP 3C	LA, AL, MS, FL
Invertebrate tissue chemistry	Task 3; SOP 2; SOP 3D	LA, AL, MS
Habitat characterization metrics		
Optical conditions	Task 2; SOP 2	All locations
Conductivity/salinity	Task 3; SOP 2	All locations
Depth	Task 2; SOP 2	All locations
Temperature	Task 2; SOP 2	All locations
Dissolved oxygen	Task 2; SOP 2	All locations

*at some locations in Florida, variations of the SOPs were used in order to maintain consistency with existing datasets (see Appendix 3).

1.4 General Approach

Federal, state and local resource management agencies and non-governmental organizations conduct SAV mapping and monitoring on a routine (regular or semi-regular) basis within areas of the Gulf of Mexico potentially impacted by the MC 252 Oil Spill. Examples of such organizations are provided in Table 2, and this Table will be augmented as additional existing relevant datasets are identified. These programs provide recent and historic data collected over varying spatial and temporal scales/frequencies that may be useful for documenting baseline conditions of at-risk and oiled SAV resources, as well as potential reference areas. Sampling designs, field methods and assessment metrics differ across programs due to varying conditions among regions and waterbodies and dissimilar organizational objectives. However, most existing monitoring programs share common elements and possess significant overlap with the NRDA metrics identified in Table 1.

Table 2: Entities Conducting SAV monitoring in the Northern GOM & South Florida

Dauphin Island Sea Lab (DISL)
Florida Fish & Wildlife Research Institute (FWRI)
Grand Bay National estuarine Research Reserve
Gulf Coast Research Laboratory
Mobile Bay National Estuary Program
U.S. Geological Survey
Florida Department of Environmental Protection
Florida International University (Florida Keys National Marine Sanctuary
Apalachicola National Estuarine Research Reserve
South Florida Water Management District
Southwest Florida Water Management District

To the maximum extent possible, data from these existing SAV monitoring programs will be utilized to characterize baseline conditions of SAV resources potentially affected by the MC 252 Oil Spill. This approach is intended to leverage existing information and focus new data collection efforts toward filling relevant data gaps.

Acquisition of new data to fill the identified data gaps constitutes the primary scope of work for NRDA-related field activities set forth in this Plan. Due to the dynamic nature of the MC 252 Spill, the exact location where oiling of SAV may occur is uncertain, thus the Trustees' determination of locations to sample to fill baseline data gaps will be informed by the trajectory of the Spill on a continual, iterative basis, using such predictive tools as the NOAA spill trajectory model results. In addition, the specific data collection efforts implemented at individual sampling stations will be a function of the extent to which existing data address the suite of NRDA parameters (SAV metrics) identified in Table 1.

As noted above, for a variety of reasons SAV sampling methods vary by program and by region. At sites where additional data collection will be performed under this Plan, site- and program-specific sampling methods consistent with previous efforts at those locations will be employed to

ensure compatibility of new and existing data. (See e.g., Appendix 3 listing available data and methods specific to the State of Florida). The SAV TWG has determined that maintaining consistent methods through time at specific sampling locations, and locations nearby, is more efficient and of more use to the NRDA than imposing a new standard data collection method across all sampling locations.

However, this Plan provides standard operating procedures (SOPs) for the collection, processing and management of additional field data needed to fulfill Tier 1 objective (See Appendix 2). The SOPs contained in Appendix 2 may be applied at Tier 1 sampling sites which are part of an existing monitoring program but which have not previously collected data for a metric identified in Table 1. Additionally, the SOPs in Appendix 2 may be applied at Tier 1 sampling sites which are not part of an existing monitoring program. The goal is to collect samples by location that are consistent and compatible with any existing data sets in order to leverage the existing data with respect to data analysis.

2. Investigative and Sampling Approach

Tier 1 sampling sites will be accessed by water using a vessel of appropriate size and configuration for the waterbody as well as anticipated weather conditions and sea state. At this time it is anticipated that the majority of in-water sampling will be performed at depths accessible by snorkeling with a number of deeper sites requiring the use of SCUBA. Collection of certain data types, such as physiochemical water quality parameters and trawl surveys, will be conducted from onboard the sampling vessel.

All sampling teams across all tasks will use GPS and digital photography to document site conditions:

- Sampling teams will use a GPS device to document geographic positions (Waypoints) of all sample locations. The datum on GPS units should be set to WGS84. Meta data will be maintained according to protocols. (See **Basic_GPS_Skills_Final_0223_2010.doc**, available on the case FTP site.)

- Digital photographs should also be taken to document pre-oiling and general site location/conditions. Photos should be linked to Lat and Lon coordinates for spatial acuity (see **NRDA Field Photography Guidance**, available on the case FTP site).

The SAV TWG identified five discrete tasks to accomplish the objectives of this Tier 1 Plan, as described below.

Task 1: SAV areal coverage (SOP 1)

- Compile presently-available areal coverage data for the GOM region from LA to the southeast tip of FL including the FL Keys in the MC 252 spill trajectory to use as potential reference and baseline for SAV that may potentially be affected by the MC 252 Oil Spill and associated events such as spill response actions.

- Identify deficiencies in existing areal coverage data and select sites that would benefit from survey data to use as potential reference and baseline for SAV that may potentially be affected by the MC 252 Oil Spill and associated events such as spill response actions.

- Acquire additional SAV coverage data through:
  - Imagery acquisition
  - Ground truthing
  - Interpretation, and
  - Post-processing of sample results.

Task 2: SAV biological characterization (SOP 2)

- Compile available SAV monitoring data on density, biomass, productivity and species composition across the GOM region in the MC 252 spill trajectory to develop an understanding of pre-assessment, baseline conditions and/or for reference, pre-oiling conditions. It is noted that monitoring methods vary by agency, scientific group and location throughout the GOM region and the goal is to maintain consistency across pre- and post-oiling datasets within a region.

- Acquire, where not available, pre-oiling data on SAV coverage, density, biomass and species composition, including composite vegetative tissue samples representing the species of SAV present across a site, the GOM region and Florida, emphasizing sites within the MC 252 spill trajectory. The techniques to be used in acquiring these data are presented in the attached SOPs (Appendices 2 and 3).

Task 3: Chemistry (SOPs 3A – 3D)

- Compile available chemical and optical data for water in the vicinity of identified SAV beds for those parts of the GOM region that may potentially be affected by the MC 252 Oil Spill and associated events. A concerted effort to collect baseline water, sediment, and biota samples prior to potential impacts by oil and/or dispersants, where possible, is being carried out or is planned by a number of agencies and entities for purposes of the MC252 NRDA. For the State of Florida, maps and data for many of these sampling efforts are shown on the Florida State Emergency Response Team website: www.nrdata.org.

- Compile available chemical data for sediments, water, SAV, and invertebrates, in the areas described in Section 1.2.

- All species collected within a sample will be recorded and photographed and relative biomass will be calculated. This will enable chemistry results to be evaluated based on species present in each sample.

- Acquire, where not available, chemical and optical water data, and chemical data for sediments, SAV and invertebrates to be used as reference and baseline in, or in the vicinity of, identified SAV beds for those parts of the GOM region that may potentially

be affected by the MC 252 Oil Spill and associated events. (For more information, See Appendix 2, SOP 2; 3A-3C.)

- Coordinate with other NRDA TWGs and state-led NRDA efforts to collect samples in all necessary locations.

- Sediment, water, SAV and invertebrate samples will include analysis of hydrocarbon contaminants through analysis of total petroleum hydrocarbons (TPH) and polycyclic aromatic hydrocarbons (PAHs) and other constituents as appropriate. (For more information, see Appendix 2, SOPs 2; 3A – 3D). Beginning in August, 2010, sediment composition will also be assessed through analysis of grain size and total organic carbon.

Task 4: Invertebrate (benthic and epibenthic) densities and species composition (SOP 2; SOP 4)

- Compile all available data on the density and species composition of SAV-associated benthic and epi-benthic invertebrates (e.g., from published literature, monitoring data, etc.) in the vicinity of identified SAV beds for those parts of the GOM region that may potentially be affected by the MC 252 Oil Spill and associated events.

- Acquire, where not available, data on the density and species composition of SAV-associated benthic and epi-benthic invertebrates (using site-appropriate methods). These data may be used as reference and baseline in areas that may potentially be affected by the MC 252 Oil Spill and associated events. Comparison is a tier 2 or 3 task. Coordinate with other NRDA TWGs and state-led NRDA efforts to collect samples in all necessary locations. (For more information, see Appendix 2, SOP Number 4).

- SAV invertebrate tissue sampling will be performed in conjunction with otter trawls conducted to sample fish and mobile invertebrates and/or hand coring to sample epi-and infaunal macroinvertebrates. (For more information, see Appendix 2, SOP Number 3D).

Task 5: SAV associated fauna (fish and mobile macroinvertebrates) (SOP 2; SOP 5)

- Compile all known available data on the density and species composition of SAV-associated fish and mobile macroinvertebrates (e.g., from the published literature, monitoring data, etc.) in the vicinity of identified SAV beds for those parts of the GOM region that may potentially be affected by the MC 252 Oil Spill and associated events.

- Acquire, where not available, data on the density and species composition of SAV-associated fish and mobile macroinvertebrates (using site-appropriate methods) to be used as potential reference and baseline in areas that may potentially be affected by the MC 252 Oil Spill and associated events. Coordinate with other NRDA TWGs and state-led NRDA efforts to collect samples in all necessary locations. (For more information, see Appendix 2, SOP Number 5).

- SAV-associated fish and mobile macroinvertebrates will also be sampled by trawling.

2.1 Sampling Locations

As noted previously, regional variation in water clarity and SAV distribution dictates the location of sampling sites and sampling plans necessarily vary somewhat among regions based on methods for historical data collection. Furthermore, many of the data to be used for baseline assessment have already been collected using differing techniques. However, in those locations where oil and/or dispersant impacts are anticipated AND time permits additional baseline sampling, the following guidance has been developed:

For purposes of characterizing the conditions of SAV prior to oiling and/or reference areas, targeted stations within areas that might be potentially oiled or reference areas should be situated no more than 400 to 500 meters apart for establishing baseline sediment, invertebrate, vegetation and water data. If necessary, additional areas and stations within areas will be added. Each station will yield: one set of sediment, invertebrate, and vegetation samples from the intertidal zone in regions where SAV occurs intertidally. This may not be applicable in all states and additional samples at a varied bathymetry will be assessed. In addition one set of sediment, invertebrate, and vegetation samples from the subtidal zone will be taken; one set of composite water samples (PAH, THC) and three grab water samples (VOA), if necessary and not already collected by other TWGs.

2.2 Sample processing and health and safety requirements

After completing all field sampling activities for a given day, the field team must take the collected samples, datasheets and electronic information (including photographs and GPS track log) to an appropriate sample processing center.

At this center, the following activities will take place:

- Samples must be appropriately packaged and prepared for shipment to the receiving laboratory(ies).
- **Chain-of-custody** forms must be completed.
- All data from all field forms should be entered into the appropriate Excel file format (Forms or Flat version) either by the field sampler or a data management team member. Once the file is completed, it should be submitted to the data management team for incorporation into the database.
- All photographs must be archived, in accordance with the instructions in the **NOAA Field Photography Guidance** (NRDA_Field_Photographpy_Guidance.doc, available on the case FTP site).
- Synchronize the photos with the GPS track in accordance with the instructions in the **NOAA ARD-FAST Using GPS-Photo Link** instructions (GPSPhotoLink.doc, available on the case FTP site).
- Import the photos into the ORR PhotoLogger database. (This will allow the photos to be uploaded to ERMA.) See the document **NOAA PhotoLogger** for more information.

- All field data sheets will be scanned and originals stored in a secure location.

2.3 Health and Safety

All personnel will participate in training modules required by Incident Command and BP Exploration and Production Inc. (BP). Float plans will be filed with the IC for each day's activities on the water. Vessel operators and passengers must be trained commensurately to DEQ PPM requirements. All necessary personal protective equipment (PPE) will be used. BP and their contractors, including ENTRIX, are prohibited from participating in surveys requiring SCUBA due to BP corporate health and safety policies. This restriction will not apply to trustee or other non-BP affiliated personnel.

- **The team leader and field crew parties should have completed all applicable health and safety training as directed by NOAA or state agency oil spill policy.**

- **All field team members must complete the NOAA safety training and documentation requirements** as set forth in "Safety Requirements for All Personnel Working on NOAA-led NRDA teams for MS Canyon 252 Incident" (NOAA Safety Documentation Requirements.doc).

- **All field team members should read all of the documents in the Safety directory on the case's ftp site** (http://www.researchplanning.com/downloads/index.php?dir=/Safety). Exception: if field activities do not include use of or helicopter, then familiarity with the safety documents for these vehicles is not required.

- **Each field team must submit a plan, not later than the night prior to going into the field.** This plan must specify:
  - The team leader;
  - Names of all team members;
  - The sampling location(s)
  - What kind of sampling they are doing;
  - Expected arrival time at sampling area (daily);
  - Expected departure from sampling area (daily);
  - Team deployment date;
  - Team return date.

  This information may be reported in one of two ways:
  1. Fill out the Excel spreadsheet "Team Member Information Form – Excel.xls"[1] and send it to dwhnrda@gmail.com. Please use one tab for each team.
  2. If you cannot submit this spreadsheet electronically, you can call in and report the information using this number: 1 (985) 746-4916.

- **Field teams must adhere to all procedures set forth in the MC252 Site Safety Plan** ("NRDA MC 252 Site Safety Plan_5.13.10.pdf"). [2]

[1] This file is available on the case's ftp site: http://www.researchplanning.com/downloads/index.php?dir=/Safety

2.4 Documentation Requirements

All team members should familiarize themselves with case-wide protocols for data collection and documentation and should adhere to these. Currently available case-wide documentation procedures include (but are not necessarily limited to):

- GPS setup, use and archiving,
- Camera setup and use,
- Electronic data downloads,
- Sample collection documentation,
- Photo documentation (including in-field photo logging, post-field photo archiving, synchronization with GPS tracks, and importing into the ORR PhogoLogger database),
- Sample packaging and shipping, and
- Chain-of-custody documentation, including for electronic records (e.g., photographs, databases, etc.).

Additional case-wide data documentation requirements are expected, including requirements for transferring hard copy field data into electronic form.

In addition, all SOP-specific documentation requirements should be reviewed and followed.

3. Quality Assurance Project Plan

Under the auspices of the TWGs, field teams are being organized to implement the plans developed by the TWGs. Field team members have partially overlapping and partially distinct areas of responsibility. All field team members are responsible for ensuring that they are adequately trained with respect to health and safety requirements, requirements relating to the implementation of study-specific data generation activities, and adherence to case-wide protocols on topics including (but not limited to) chain-of-custody documentation, sample collection documentation, use of camera and GPS equipment, sample handling, packaging, and shipping requirements.

Designated field team leaders have additional responsibilities, including overall responsibility for the activities of the field teams while they are deployed. Field team leaders have responsibility for communication with designated contacts on the status and safety of their teams. They are also responsible for ensuring the accuracy of information and the integrity of samples collected during field activities, and to make sure samples are appropriately handled and delivered, under chain-of-custody, to designated locations where they will be temporarily stored prior to shipment to an appropriate laboratory. Field team leaders are also responsible for ensuring complete collection of all information, data, and samples, specified in the SOPs, where possible. They have responsibility for ensuring that electronic data (e.g., from cameras and GPS units) are appropriately archived and uploaded into Trustee databases, and that hard copy data are

[2] This file is available on the case's ftp site: http://www.researchplanning.com/downloads/index.php?dir=/Safety

transcribed into case-wide databases. The Laboratory Project Manager is responsible for monitoring and documenting the quality of laboratory work.

3.1 Data Quality Indicators

Data developed in this study must meet acceptable standards of precision, accuracy, completeness, representativeness, comparability and sensitivity. Each of these data quality indicators, several of which have quantitative measures and several only qualitative measures, is discussed next with specific reference to the current study.

Precision is defined as the level of agreement among repeated independent measurements of the same characteristics. Precision for this study is assessed through the use of field duplicates for those data types that are amenable to duplicate measurements (e.g. field duplicates are to be taken at a 5% rate for samples collected for chemical analysis) and by taking records of multiple in-situ measurements where this is possible. Precision in the context of laboratory analysis is described in Section 5.1 of the MC 252 AQAP (July 2010).

Accuracy, or bias, is defined as the agreement of a measure with its true value. Accuracy in the context of laboratory chemical analyses is addressed in Section 5.2 of the MC 252 AQAP (July 2010) using, for example, laboratory control samples, standard reference materials, matrix spike samples, and matrix spike duplicate samples. Accuracy in species identification and in abundance measurements (e.g., in core samples) will be estimated by subjecting a proportion of samples (5%) to re-analysis by a second reviewer. Accuracy of *in-situ* field measurements may be estimated by repeated measurements (at the same time) at a proportion of stations by a second field surveyor.

Completeness is defined as the percentage of the planned samples actually collected and processed (analyzed) to provide valid results. Completeness can be evaluated for all components of this study. In particular, for all sites visited, it can be determined whether all specified measurements were recorded, and whether samples were acquired from all sites for which sampling was planned. Completeness can also be evaluated with respect to the proposed sampling strategy — e.g., establishment of selected SAV sampling sites to represent SAV habitat areas of the northern Gulf SAV beds (final number of sites to be determined). Of note, however, oil may reach some areas before it is technically or logistically possible to conduct sampling, thereby limiting the overall completeness of the pre-oiling dataset. Failure to collect as many pre-oiling samples as desired will not necessarily limit the ability to draw conclusions about the effects of oil and related activities on natural resources: after oiling has occurred, data from suitable reference areas can also be used to develop a complete picture of the overall effects of the spill and associated events. Completeness in the context of the analytical chemistry measurements is a measure of the planned data vs. the amount of valid or usable data generated, as described in Section 5.4 of the MC 252 AQAP (July 2010).

Representativeness refers to the degree to which the data accurately reflect the broader community represented by the sampling effort. The careful selection of sites for evaluation, among all possible sites, and the positioning of specific sampling locations within sites, has been designed using statistical considerations intended to allow results to be representative. Representativeness also will be ensured by proper handling and storage of samples and analysis within accepted holding times so that the material analyzed reflects the material collected as accurately as possible. Additionally, a quantitative measure of representativeness is the relative percent difference of field duplicate results.

Comparability expresses the confidence with which one data set can be compared to another. Comparability for this project will not be quantified, but will be addressed through the use of consistent field and laboratory methods, particularly with respect to geographical areas to maintain continuity and consistency with historical data sets. Additional discussion of comparability is presented in Section 5.3 of the MC 252 AQAP (July 2010).

Sensitivity, the ability of a measurement technique or instrument to operate at a level sufficient to measure the parameter of interest, is largely not applicable to the biological parameters. The detection limits for chemistry parameters are addressed in Section 6.0 of the MC 252 AQAP (July 2010). These, in conjunction with the measured biological parameters, will provide sufficient sensitivity for the purpose of providing insight into the potential for the measured contaminants to impact the sand shore community.

Table 3. Summary of Field Quality Control Samples to Support DQOs

Sample Media/Type	Field Duplicate frequency of collection	Additional Sample Collection for Matrix Spike / Matrix Spike Duplicate or Lab Matrix Duplicate
Sediment: Grain Size	1 per 20 field samples	1 Lab Matrix Duplicate per station or per 20 field samples, whichever is more frequent
Sediment: TOC	1 per 20 field samples	1 MS/MSD per station or per 20 field samples, whichever is more frequent
Sediment: Contaminants	1 per 20 field samples	1 MS/MSD per station or per 20 field samples, whichever is more frequent
Vegetation: Contaminants	1 per 20 field samples	1 MS/MSD per station or per 20 field samples, whichever is more frequent
Tissue: Contaminants	Not applicable because all samples identify individual organisms	1 MS/MSD per station or per 20 field samples, whichever is more frequent

3.2 Project Management

Project organization, roles, and responsibilities help ensure that individuals are aware of specific areas of responsibility as well as internal lines of communication and authority. Overall authority for project management will rest with the Trustee Council. Currently, Trustee representatives have divided their staff into a number of technical work groups (TWGs), which are overseeing the development of specific plans for the evaluation and generation of information of relevance for the ongoing natural resource damage assessment. The current

leaders of the SAV TWG are Natalie Manning of NOAA and Eva DiDonato of the National Park Service. Representatives from the States of Louisiana, Mississippi, Alabama, and Florida are participating in the TWG. Furthermore, the Trustees are currently engaged in a cooperative effort with BP, whose representatives are also participating in the TWG. TWG participants have contributed to the development of this report.

Under the auspices of the SAV TWG, field teams will be organized to implement this plan. Field team members have partially overlapping and partially distinct areas of responsibility. All field team members are responsible for ensuring that they are adequately trained with respect to health and safety requirements, requirements relating to the implementation of study-specific data generation activities, and adherence to case-wide protocols on topics including (but not necessarily limited to) chain-of-custody documentation, sample collection documentation, use of camera and GPS equipment, sample handling, packaging, and shipping requirements.

Designated field team leaders have additional responsibilities, including overall responsibility for the activities of the field teams while they are deployed. Field team leaders have responsibility for communication with designated contacts on the status and safety of their teams. They are also responsible for ensuring the accuracy of information and the integrity of samples collected during field activities, and to make sure samples are appropriately handled and delivered, under chain-of-custody, to designated locations where they will be temporarily stored prior to shipment to an appropriate laboratory. Field team leaders also responsible for ensuring complete collection of all information, data, and samples, as specified in the SOPs. They have responsibility for ensuring that electronic data (e.g., from cameras and GPS units) are appropriately archived and uploaded into Trustee databases, and that hard copy data are transcribed into case-wide databases. The Laboratory Project Manager is responsible for monitoring and documenting the quality of laboratory work.

The Trustees have also been assembling a quality assurance team, comprised of individuals who will have responsibility for various aspects of quality assurance for this NRDA including the effort described in this plan. Individuals from the QA team have been and will continue to serve in roles including but not necessarily limited to: development of the Analytical Quality Assurance Plan; reviewing/assisting TWGs with the development of project-specific QA plans; conducting audits and ensuring implementation of QA plans; archiving samples, data, and all documentation supporting the data in a secure and accessible form; and reporting to the Trustee Council.

3.3 Data Generation and Acquisition

The SOPs included in this document, and included by reference, as well as Sections 3.0 and 7.0 of the MC 252 AQAP (July 2010), provide full details about how data will be generated, including sampling methods, sample handling, and chain-of-custody requirements, and data reporting. All data generated will be compiled in a GIS-compatible electronic database such as the Environmental Response Management Application (ERMA) which will be accessible to all parties.

3.4 Assessment and Oversight

All field-collected information is recorded in forms kept in loose leaf notebooks and will be signed and dated. The Field Team Leader supervises day-to-day field investigations, including sample collection, field observations, and field measurements and generally is responsible for all field quality assurance procedures. The Field Team Leader shall review all forms for accuracy prior to their submittal at the end of the field day. The field forms will be scanned and archived, and data from the forms will be entered into the case-wide database (in development).

If technically and logistically feasible, during the course of the field work, an external audit will be conducted by a Trustee-designated member of the QA team to evaluate adherence to relevant protocols and ensure that procedures are in place for proper sample handling, processing, and documentation of results. Laboratory audits are also anticipated.

If, during the course of any field or laboratory audits, the QA auditor identifies deficiencies and other non-conforming conditions, the QA auditor or designee shall document these issues and shall formulate recommendations for corrective actions, which shall be communicated to the responsible team members (including the analytical laboratory and field personnel, as applicable), designated TWG representatives, and/or Trustee Council representatives. Follow-up of corrective actions will be the responsibility of the NOAA QA Manager.

3.5 Data Validation, Usability, and Sharing

All of the chemistry data will be subjected to formal data validation prior to use, in accordance with the requirements in Section 7.0 of the MC 252 AQAP (July 2010). The other data will also be evaluated to determine if they meet the performance criteria for measurement data that are described in this document. Any data that do not meet the performance criteria for measurement data will be flagged appropriately to indicate potential uncertainty in the data. Descriptions of potential bias and reason for the uncertainty will be documented.

The data generated in this study will be compiled in a GIS-compatible electronic database. The accuracy of data transcriptions will be evaluated by conducting spot-checks (at a minimum of 10%) checks of the data. This evaluation level will be increased if any errors are encountered during the initial evaluation of the data.

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 and to BP (or ENTRIX 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 trustees' Data Management Team (DMT). Any preliminary data distributed to the DMT shall also be distributed to LOSCO and to BP (or ENTRIX on behalf of BP). 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 simultaneously to all trustees and BP (or

ENTRIX on behalf of BP). 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. In order to assure reliability of the consensus data and full review by the parties, no party shall publish consensus data until 7 days after such data has been made available to the parties. Also, 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 to BP (or ENTRIX on behalf of BP)."

4. Budget

COST ELEMENTS SAV Tier 1				
Labor: All labor under NOAA contract, NOAA, NPS, USFWS staff or State Reps – all recoverable under NRDA but not calculated here.				
Laboratory Analysis (Chemistry cost not included)				
Item	**Unit**	**Rate**	**Number of samples***	**Total**
Sediment forensic chemistry	per sample		250	
Water forensic chemistry	per sample		250	
Vegetation forensic chemistry	per sample		250	
Invertebrate forensic chemistry	per sample		250	
Sediment epifauna/infaunal taxonomic ID	per sample	$300	250	75,000
Laboratory Analysis Total				**$75,000**
Other Direct Costs				
Item	**Unit**	**Rate**	**Number of days**	**Total**
Boat rental, including gas	per team-day	$2,000	30	60,000
Keys Live aboard (per Entrix)	per team-day	$1,800	12	21,600
Other transport	per team-day	$200	10	2,000
Scuba gear rental **	per team-day	$100	10	0.00
Other equipment rental	per team-day	$100	10	1,000
SUBTOTAL				**$84,600**
Additional Costs				
Item		Rate		
Project management		0%		
Contingency		0%		
TOTAL				**$159,600**
Cost Not Explicitly Included:				
Costs for sampling plan development				
Reanalysis costs if QA/QC goals are not met.				
Costs for audits or other QA/QC measures.				
Report development/data analysis.				
Travel costs, including per diem, from outside of the immediate area				
Costs for sample management team and data management team support				

*Not all samples may be processed. The number of sample reflects the high end of samples that could be process and analyzed.

** SCUBA not supported by BP

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 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.

5. Literature Cited

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Thorhaug, A. and J. Marcus. 1987. Oil spill cleanup: the effect of three dispersants on three subtropical/tropical seagrasses. Marine Pollution Bulletin 18:124-126.

Appendix 1.
SAV list

Table 1. List of Species found in Alabama, Louisiana, Mississippi and Florida

Seagrass:
Halodule wrightii Asch. shoal grass
Halophila decipiens Paddle Grass
Halophila engelmannii Star grass
Halophila johnsonii – Johnson's Seagrass, if oil is found between south Miami and Sebastian FL
Thalassia testudinum Banks & Sol. ex J. König turtle grass
Syringodium filiforme Manatee grass
Ruppiaceae
Ruppia maritima L. widgeon grass

Other:
Cabombaceae
Cabomba caroliniana A. Gray Carolina fanwort
Ceratophyllaceae
Ceratophyllum demersum L. coon's tail
Cymodoceaceae
Cyperaceae
Eleocharis elongata Chapm slim spikerush
Haloragaceae
Myriophyllum heterophyllum Michx. twoleaf watermilfoil
Myriophyllum spicatum L. Eurasian watermilfoil †
Hydrocharitaceae
Hydrilla verticillata (L.f.) Royle hydrilla †
Najas guadelupensis (Spreng.) Magnus southern naiad
Najas minor All. brittle waternymph †
Vallisneria neotropicalis Marie-Victorin. wild celery
Lentibulariaceae
Utricularia foliosa L. leafy bladderwort
Utricularia gibba L. humped bladderwort
Poaceae
Luziola fluitans (Michx.) Terrell & H. Rob southern watergrass
Pontederiaceae
Heteranthera dubia (Jacq.) MacMill. water stargrass
Potamogetonaceae
Potamogeton crispus L. curly pondweed †
Potamogeton illinoensis Morong Illinois pondweed
Potamogeton pusillus L. small pondweed
Stuckenia pectinata (L.) Böerner sago pondweed
Zannichellia palustris L. horned pondweed

Appendix 2.
SOPS

1. SOP for SAV Areal Coverage

A. Intertidal and Shallow Subtidal Aerial SAV Surveys

Available and acquired aerial imagery will first be evaluated in the following manner: 1) determination of baseline year for imagery; 2) determination that the spatial coverage and quality of the imagery are adequate for baseline SAV cover assessment. This will be accomplished by georectification and overlays with existing map products, and visual inspection for glare, water column turbidity and other visual impairments; 3) determine whether the resolution of the imagery will support finer-scale damage assessment than was planned for its original mapping use. If imagery does not meet at least the first two criteria, then the SAV TWG will request additional imagery acquisition. For areas likely to be oiled imagery should meet criteria #3 as well.

Methods for aerial surveys, photo interpretation, and creation of mapping data will follow the U.S. NOAA Coastal Services Center (2001) Guidance for Benthic Habitat Mapping: An Aerial Photographic Approach by Mark Finkbeiner, Bill Stevenson and Renee Seaman, Technology Planning and Management Corporation, Charleston, SC. (NOAA/CSC/20117-PUB). Available on: U.S. National Oceanic and Atmospheric Administration. Coastal Services Center. Submerged Aquatic Vegetation: Data Development and Applied Uses. (CD-ROM). (NOAA/CSC/20116-CD). Charleston, SC. 2001.

Locations for imagery to be acquired:

Initially, the SAV TWG has identified the following locations that are a priority for imagery acquisition:

1. Chandeleurs to Pensacola
2. Tortugas, Marquesas, and Lower Keys;
3. Upper Keys and Florida Bay;
4. Big Bend ; and
5. Ten Thousand Islands.

The most recent imagery for these areas was acquired in 2006. At this time, a formal proposal for imagery acquisition for the above-listed priority regions using either traditional aerial photography or by tasking satellites is under review by the Aerial Imagery TWG.

Additional mapping locations for SAV will be identified by the SAV TWG as the assessment continues. Additional, high-resolution imagery collection and sampling will be performed in those areas that are found to be impacted by oil and/or dispersants.

Baseline assessment using on site assessment techniques (quadrats):

Sampling methods vary by agency, scientific group and location throughout the GOM region, but all groups determine percent bottom cover by species. Some sampling programs use a variant of the Braun/Blanquet quadrat assessment method. This method produces a quantitative assessment of species composition, shoot density, and overall bed density and is often used along a transect running through a seagrass bed from closest shore limit to the deep edge, where evaluation is done at specific intervals (5, 10 meters, for example). Spatially-distributed random sampling designs determine percent bottom cover by evaluating several quadrats (3-8) at randomly chosen, spatially distributed sampling points within an estuary or coastal waters. Within a specific estuary or subregion, before and after event data sets can be statistically analysed if the same quadrat method is used throughout the study. Where data has not been collected that can serve as baseline assessment, the SAV TWG will select appropriate methods for those particular estuaries or regions that provide consistent data going forward (See the Site Characterization Form in Appendix 4 and the SOP 2 in Appendix 2). Use of the same sampling methodology is recommended, however, there may be minor variations in these methods from one area to another within the GOM.

Coarse scale deepwater seagrass surveys[3]

Extensive areas of deepwater seagrass habitats can be visualized and recorded for analysis using a towed camera and GPS. A large (2 x 3m) benthic sled would be deployed from a suitable vessel (must have towing frame capable of swinging on-and over-board a 200lb object of these dimensions) equipped with a video camera. Cameras will be mounted obliquely on the sled creating a visual track of the seafloor 1m wide with ~0.5cm resolution. Differential GPS (DGPS) information will be collected in tandem with video, allowing for geo-rectification of all collected video. Calculations may be necessary to determine the precise location of the sled from the DGPS unit, all information needed to make these calculations, including water depth, the angle and amount of tow cable deployed, will be recorded.

The dominant habitat within the frame of view will be recorded using a present or absent score. Adjacent but non-overlapping frames will be analyzed, ensuring each area is classified only once. Dominant coverage will be determined following Fonseca et al. (2008) and previously developed visual assessment techniques[4]. These habitats are:

1. hard coral,
2. macroalgae (non-drift – typically calcareous green),
3. mixed reef (hard and soft corals),
4. sand,
5. seagrass (*Halophila decipiens* or other deep water seagrasses as a vector of 0's and 1's indicates absence of *H. decipiens*)
6. soft coral and
7. bioturbation (mounded sand or excavation pit).

[4] Adapted by M. Fonseca, May 21, 2010from: Fonseca, M.S. Kenworthy, W.J., Griffith, E., Hall, M.O., Finkbeiner, M., Bell, S.S. 2008. Factors influencing landscape pattern of the seagrass Halophila decipiens in an oceanic setting. Est. Coastal Shelf Sci. 76:163-174

2. SOP for Site Characterization (Appendix 4; required for all sites)

Equipment

- Sampling Points (if pre-determined)
- GPS with extra batteries
- Digital camera with extra batteries
- Secchi disk
- PAR sensor with datalogger (LICOR spherical sensors, one for air one for water, and LICOR 1400 datalogger, or equivalent setup)
- Refractometer
- Thermometer
- Dissolved oxygen meter
- Meter stick or weighted transect tape (or boat equipped with depth sounder)
- 0.25 m^2 quadrat - Quadrat can be constructed from 4 pieces of regular plastic plumbing pipe (not too flexible) with right-angle elbow joints. Ensure that internal dimension of each side is 50 centimeters.
- Waterproof pens
- Waterproof forms (SAV Site Characterization Form, Chain-of-Custody, NRDA Sample Collection Forms for both tissues and sediments, PhotoLogger Form)
- *For equipment specific to collecting samples, see the relevant SOPs.*

Set up and use the GPS unit in accordance with case-wide protocols (see Basic_GPS_Skills_Final_0223_2010.doc, available on the case FTP site).

Samplers should complete all portions of the **SAV Site Characterization Form** (Appendix 4). The following descriptions correspond to the sections of the SAV Site Characterization Form:

1. *Site Description*

The site name (general geographic location or established sampling area) along with the latitude and longitude coordinates obtained via a GPS should be noted. Coordinates should be recorded in decimal degrees with WGS84 as the datum. The time of day and date should be noted next.

Next, the habitat setting of the SAV bed should be indicated. The habitat setting is a reference to the tidal regime the bed normally experiences (intertidal or subtidal). If the bed is located subtidally, indicate the depth at the time of sampling, in meters. The overall visual condition of the bed should also be described--for example, whether the bed appears to be impacted by oiling, disease, or scarring and to what extent.

2. *Physical/Chemical Parameters*

Because SAV distribution and abundance are influenced by a range of physical and chemical parameters, several variables should be measured, as indicated in the **SAV Site Characterization Form # 1 (Appendix 4)**, including salinity and water temperature. If beds are subtidal, bottom water samples are the most appropriate to measure. If the beds are intertidal, the nearest source of tidal water should be used if the beds are not flooded at the time sampling is performed.

The standard protocol for rapidly assessing optical conditions in the water column that affect SAV is the Secchi disk and measurements of light attenuation using quantum sensors. These measures are of paramount importance and should be taken as described below.

Secchi depth: Secchi depth is measured using a Secchi disk, a round black and white weighted disc (20 cm) that is lowered through the water until the distinction between white and black quadrants is no longer visible to the human eye. The disk is attached to a non-stretching rope, marked at appropriate intervals (5 and/or 10 cm apart). The observer lowers the disk over the side of the boat facing the sun and not in the shadow of the vessel, until the disk disappears, then raises it until it reappears and records this depth. At the time of the measurement record the time of day, cloud cover, and wave height. Do not wear sunglasses when taking the measurement.

Light Attenuation (irradiance): For teams possessing the appropriate equipment, light attenuation in the water will be calculated using either a 2pi or 4 pi quantum sensors attached to a data recorder. The sensor is lowered in the water column to obtain a profile of light readings. A sub-surface reading denoted I_o is taken just below the water surface and then at least three additional readings with depth down to the bottom. Readings are taken closer together near the surface, as this is where light attenuates the fastest. For each depth, record the irradiance value displayed on the data logger. At the time of the measurement record the time of day, cloud cover, and wave height. Perform three profiles per station. For calculating light attenuation (k_d) in each profile take the natural log of the irradiance values and regress light on depth. The attenuation coefficient is the absolute value of the lope of the line. Note: Under oiled conditions the sensor should be wrapped in plastic wrap.

Oiling (if applicable). Several descriptors are given for the sampler to denote the relative amount of oil present within the area sampled. The list should be thought of as a range of oiled conditions from none to the most saturated.

3. *Seagrass percent cover*

If water clarity allows for a visual survey of SAV abundance to occur, haphazardly toss the $0.25m^2$ quadrat within the SAV habitat a minimum of three times but preferably ten times. Estimate seagrass vegetative cover visually (first total cover, and then, if multiple species are present, estimate seagrass cover for each species; the cover estimates for the individual species must equal the total cover) on a percent cover scale (0-100%).

Look for the presence of any flowering shoots and record their presence/absence.

4. *Sample Collection and Disposition*

For detailed sample collection protocols, see the relevant SOP included in this work plan.

If samples are collected for a site, the individual who collected the sample should be specified on the field data form. If more than one person, list the field party leader and the person who entered the data (if different).

Sample IDs should be clearly listed under each category. If no samples of a given type are taken, write "none". Sample IDs should be assigned in accordance with the instructions in the **NOAA Field Sampling Workbooks** (available on the case's FTP site[5]).

Samples must also be recorded in the appropriate case-wide NRDA Sample Collection Form (also available on the case's FTP site).

Field duplicates should be clearly marked and Field duplicates are separate samples, so should be assigned a new sample number distinct from the original duplicated sample. On the sample form, use the Sample QA/QC Type column to indicate that the sample is a duplicate. The associated parent sample number can be identified in the Sample Notes column (the entire Sample ID should not be required in most situations since the location ID, matrix, and data should be the same). If a particular type of sample is not collected at a site, enter "none" for that sample type.

5. Trawl Data

For detailed trawl data collection protocol, see the relevant SOP indicated in this work plan. See instructions about Sample IDs in (4) above. If no trawl is conducted, enter "none" in this area.

6. Photographs

Set up the camera in accordance with NRDA Field Photography Guidance (NRDA_Field_Photographpy_Guidance.doc, available on the case FTP site). **Always begin by taking a photo of the operating GPS screen showing the date and time to synchronize the photos with the GPS track.**

Take photographs of the site and sample collection itself if possible; make sure each photograph or series can be later associated with the corresponding sampling locations (e.g. through use of GPS Photolink software or by keeping a detailed photo log). Do not delete or alter any photographs, the numbering sequence of photos uploaded from your camera must not have any gaps (see separate NRDA Field Photography Guidance).

Enter all photographs into the **NOAA NRDA Trustees Sampler Photo Logger Form**. Follow all required Chain of Custody procedures, as indicated in the data management Chain of Custody training session. Original photo files must either be left on flash cards and placed in locked storage or uploaded to a hard drive and not opened. A copy can be made of the original, and that file may then be opened.

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3. SOPs for Sediment, Water, Vegetation and Invertebrate Chemistry

Scope of Sediment, Water, Vegetation and Invertebrate Chemistry Sampling within SAV beds

The following protocols will be followed to ensure sediment, water, vegetation, and invertebrate data collection is done consistently with other media sampling efforts as well as other sediment and water data collections that may occur opportunistically with other NRDA TWG activities. At this time, locations include inshore and offshore SAV coastal areas across the northern Gulf of Mexico from Louisiana to Florida, including the Florida Keys.

Equipment

- (2) 20' boats
- (6) trained personnel (staff recommended)
- (8) 12 hr days for sampling per boat
- (8) 8 hr days for sample prep, handling, and shipping
- (4) 150qt ice chests
- (8) 80 qt ice chests
- (6) boxes Nitrile gloves, Nomex coveralls
- (2) Eckman dredges mounted on poles
- Sample containers as described in the protocols below, i.e.:
    - 500 mL (16 oz) or 250 ml (8 oz) glass jars certified-clean to be organic-free (solvent rinsed), with Teflon-lined lids(for sediment chemistry samples)
    - 4 oz glass jars or sealable plastic bags (for grain size analysis samples)
    - 1-liter amber glass containers, certified-clean organic-free (solvent rinsed), with Teflon- or aluminum foil-lined lids (for water chemistry samples)
    - 10-mL glass vials with Teflon septa (for water VOC samples)
    - Pre-cleaned aluminum foils (to make packets for various biota samples) and plastic bags
    - Sample bags (Ziploc quart or gallon size depending on coring device size)
- Laboratory grade detergent, nylon brushes, paper towel
- Sorbent pads
- Plastic sheeting
- Pre-cleaned metal spoons or spatulas
- Food/water for remote deployment of personnel
- 3 GPS units with extra batteries
- 3 digital cameras with extra batteries
- Sampling device (dredge, grab, or core)
- Disposable aluminum pan, on aluminum foil, or on other disposable, non-contaminating material (for mixing samples prior to distribution into jars, if necessary)
- Clear tape
- Chain-of-custody forms
- Sample collection forms

- Waterproof forms: Chain-of-Custody, NRDA Sample Collection Forms, PhotoLogger Forms
- Waterproof pens
- Waterproof labels

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3 A. SOP for SAV Sediment Chemistry

Purpose/Objectives

- To determine the concentration and source of oil compounds in the sediments collected.
- To measure sediment characteristics for interpreting chemical and biological results.
- To maintain the integrity the sample(s) during sampling, transport, and storage.

Methods

Target sample volume for TPH/THC and PAH analysis: two 250 ml (8 oz) glass jars filled ¾ full or one 500 ml (16 oz) jar filled ¾ full.

Target sample volume for grain size analysis: 100 g in sealed plastic bag or 4 oz jar

Samplers should use disposable surgical gloves and pre-cleaned metal spoons or spatulas.

- Sediment samples \ should be placed in glass containers, certified-clean to be organic-free (solvent rinsed), with Teflon- or aluminum foil-lined lids.
- Decontaminate all sampling gear before using and between sampling stations by washing with laboratory-grade detergent and clean water.
- For subtidal samples when SCUBA is not feasible, lower and retrieve the sampling device at a controlled speed of ~1 foot per second. Sampling devices may include dredges, grabs and cores.
- The device should contact the bottom gently; only its weight or piston mechanism should be used to penetrate the sediment. It is important to minimize disturbance to the surface floc which may contain oil contaminants.
- Inspect the sample to make sure that it meets the following criteria:
    - The sampler is not overfilled; the sediment surface is not pressed against the sampler top.
    - Overlying water is present, indicating minimal leakage.
    - Sediment surface is undisturbed, indicating lack of channeling or sample washout.
    - The desired penetration depth is achieved (e.g., 4-5 cm for a 2 cm sample).
- Siphon off the overlying water near one side of the sampler.
- Using a pre-cleaned flat spoon or spatula, accurately collect the top 2 cm, avoiding sediments in contact with the sides of the sampler. Use a new spoon or spatula for each station. Collect other intervals, per the sampling plan.
- If placing sediment in more than one jar, or if compositing samples from more than one location, the sample must be mixed before placing in the jar(s). This should be performed in a disposable aluminum pan, on aluminum foil, or on other disposable, non-contaminating material.

Labeling / Documentation / Other Considerations

- Prepare sample labels following sample ID protocol provided in the instructions from the trustee data management team.
- Affix sample ID labels to each container and cover with clear tape wrapped around the entire container circumference.
- Apply tape around lid to secure.
- Note collection of sample both in the **SAV Site Characterization Form (Appendix 4)** and in the **NRDA Sample Collection Form for Soils and Sediments**.
- Field duplicates should be clearly marked and Field duplicates are separate samples, so should be assigned a new sample number distinct from the original duplicated sample. On the sample form, use the Sample QA/QC Type column to indicate that the sample is a duplicate. The associated parent sample number can be identified in the Sample Notes column (the entire Sample ID should not be required in most situations since the location ID, matrix, and data should be the same).
- Preserve all original field notebooks, forms, and notes, which should be signed and dated. If crossing out or correcting any entries, date and initial when making the changes. Documentation is critical; original records will be gathered and kept on file by the trustees.
- Ship known oil-contaminated samples separate from non-contaminated or low contaminated samples to reduce risk of cross-contamination.
- See related NRDA protocol documents for specific sample shipping and notification/ sampling documentation instructions.

Preservation/Holding Times

- Immediately place all samples in cooler and keep at 4°C. Freeze as soon as possible.

- Please see the Analytical Quality Assurance Plan for the MS Canyon 252 (Deepwater Horizon) Natural Resource Damage Assessment (QAP) for further details on storage and holding times.

3 B. SOP for SAV Water Chemistry

Purpose/Sampling Objectives

- To determine the concentration and source of oil compounds in the inshore water samples collected.
- To document the presence or absence of oil.
- To maintain the integrity the sample(s) during sampling, transport, and storage.

Sample Volume and Container by Analytical Method

Parameter	Sample Volume	Container
THC by GC/FID	1-liter Amber glass jar	Glass containers, certified-clean organic-free (solvent rinsed), with Teflon- or aluminum foil-lined lids
PAH by GC/MS-SIM	1-liter Amber glass jar	Glass containers, certified-clean organic-free (solvent rinsed), with Teflon- or aluminum foil-lined lids
VOC analysis	3- 40ml vials with Teflon septa	Glass vials with Teflon septa

Sampling Equipment

- Surface waters are collected by hand, or using stainless steel or Teflon-lined sampling equipment. If equipment is used, cleaning protocols must be followed between stations as described in sediment collection sections.
- For volatile organic analyses, equipment suitable for dissolved gas analyses is required, e.g., DEQ waste water samplers with flow-through filling.

Sample Collection Methods

- Collect samples (wearing clean nitrile or other non-contaminating gloves) directly into the sample container from the water, to minimize risks of cross-contamination.
- Collect 1 liter water samples in glass containers with Teflon lined lids, certified clean for semi-volatile analysis. Amber glass is preferred to reduce light exposure, but not required. Leave headspace of about 1 inch; do not leave for prolonged periods in the light.
- To collect VOA samples, prior coordination with the receiving lab is recommended. Typically, 40-ml VOA vials preserved with 0.2 ml HCl should be obtained in advance from the lab; if not possible, obtain from a supplier that certifies them clean and pre-preserved for volatile analysis. When collecting VOA sample, fill vials so that they have no headspace or air bubbles remaining after lid is replaced.
- If oil or sheen is present, decontaminate everything that contacts the oil or sheen after each collection. Wash with laboratory-grade detergent and clean water, with a triple clean water rinse (distilled water from a local store is OK).
- Collect subsurface samples to characterize constituents present in particulate and/or dissolved state in the top 15 cm of the water column. Do not take samples from water surface to characterize water column concentrations.

- Containers for subsurface samples must be deployed and retrieved with the lid sealed so that the sample does not inadvertently include water surface constituents. Remove and replace the lid only at the sampling depth.
- If present, clear surface slicks prior to immersing sample container, but carefully so that the surface oil is not dispersed into the water column. Sweeping the area with sorbents is effective.
- On each trip, try to sample least oiled areas first, then more contaminated areas subsequently.
- Immediately place all water samples into coolers and keep on ice (but do not freeze).

Preservation/Holding Times

- Follow NRDA case-wide protocols

Analytical Methods

- Follow NRDA case-wide protocols

Other Considerations

- Prepare sample labels following sample ID protocol provided in the instructions from the trustee data management team.
- Field duplicates should be clearly marked and Field duplicates are separate samples, so should be assigned a new sample number distinct from the original duplicated sample. On the sample form, use the Sample QA/QC Type column to indicate that the sample is a duplicate. The associated parent sample number can be identified in the Sample Notes column (the entire Sample ID should not be required in most situations since the location ID, matrix, and data should be the same).
- If collecting a replicate water sample at each location as recommended above (i.e. as a backup in case of breakage or loss of containers during shipment and handling), both containers should receive the same sample ID (label the first container, "XYZ...1 of 2" and the 2nd container, "XYZ...2 of 2") and both should be entered on the same line on the CoC form.
- Affix sample ID labels to each container and cover with clear tape wrapped around the entire container circumference.
- Note collection of sample both in the **SAV Site Characterization Form** and in the **NRDA Sample Collection Form for Soils and Sediments**.
- Preserve all original field notebooks and data sheets, which should be signed and dated. If crossing out or correcting any entries, date and initial when making the changes. Documentation is critical; original records will be gathered and kept on file by the trustees.
- If collecting samples from a vessel, be aware of potential sources of contamination on the vessel (e.g. exhaust fumes, oily surfaces). Work up-wind of any exhausts. Segregate dirty/clean areas. Lay out clean substrates to work on and replace frequently.
- Ship known oil-contaminated samples separate from non-contaminated or low contaminated samples to reduce risk of cross-contamination.
- See related NRDA protocol documents for specific sample shipping and notification/ sampling documentation instructions.

3 C. SOP for SAV Vegetation Chemistry

Purpose/Sampling Objectives

- To determine the concentration and source of oil compounds (fingerprinting) in/on SAV samples collected.
- To document the presence or absence of oil.
- To maintain the integrity the sample(s) during sampling, transport, and storage.

Treatment of samples will be given the same consideration as those collected for sediment. Vegetation will be collected from multiple sampling stations (numbers to be determined). Vegetation samples for hydrocarbon analysis should be collected in 8-ounce (250 mL) wide-mouth glass jars (certified clean to be organic free). The minimum target sample volumes for vegetation is 30 grams (wet weight) although 50 grams is desirable. If the jars are filled approximately 3/4 full the minimum volumes are assuredly achieved. Composite a sufficient number of plants to fill the sample jars approximately 3/4 full. Visibly oiled vegetation requires less volume than unoiled (background) vegetation. Excess sediment adhered to vegetation should be physically removed or avoided to the degree practical. Immediately place all samples in a cooler and keep at between 2-6 degrees C.

Sampling using glass jars is preferred, however, if necessary, pre-cleaned aluminum foil and plastic Ziploc bags can be used instead of glass jars. Solvent-rinsed aluminum foil is available from dwhsampleintake@gmail.com. (Use of aluminum foil that has not been solvent [Dichloromethane. PR (pesticide research) or HPLC grade] rinsed is undesirable as it contains contaminants that interfere with low level hydrocarbon analysis.)

Each vegetation sample should be photographed and the genus and species should be recorded.

3 D. SOP for SAV Invertebrate Chemistry

Purpose/Sampling Objectives

- To determine the concentration and source of oil compounds (fingerprinting) in/on biota collected off and within SAV beds.
- To document the presence or absence of oil.
- To maintain the integrity the sample(s) during sampling, transport, and storage.

Treatment of samples will be given the same consideration as those collected for sediment. Invertebrates will be collected from the blades of SAV or within the beds and will be collected of the same sampling stations for the collection of SAV (numbers to be determined). Invertebrate samples for hydrocarbon analysis should be collected in 8-ounce (250 mL) wide-mouth glass jars (certified clean to be organic free). The minimum target sample volume for invertebrates is 30 grams (wet weight) although 50 grams is desirable. If the jars are filled approximately 3/4 full the minimum volumes will be achieved. Composite a sufficient number of individuals to fill the sample jars approximately 3/4 full. Excess sediment adhered to invertebrates should be physically removed or avoided to the degree practical. Immediately place all samples in a cooler and keep at between 2-6 degrees C.

Sampling using glass jars is preferred, however, if necessary, pre-cleaned aluminum foil and plastic Ziploc bags can be used instead of glass jars. Solvent-rinsed aluminum foil will be available from dwhsampleintake@gmail.com. (Use of aluminum foil that has not been solvent [Dichloromethane. PR (pesticide research) or HPLC grade] rinsed is undesirable as it contains contaminants that interfere with low level hydrocarbon analysis.)

Each invertebrate sample should be photographed and the genus and species should be recorded.

Please note: If collecting small invertebrates, you will need a significant amount of bodies (especially amphipods (e.g. caprellids) and isopods to obtain the number of grams needed).

4. SOP for Submerged Aquatic Vegetation and Associated Epifauna and Infauna

Note: The following protocol can be used for both epi- and infaunal macroinvertebrates sampling events (i.e. one sample will yield data for both objectives).

Purpose/Objective

- To document the presence/absence and species composition of SAV and associated epi- and infaunal macroinvertebrates for baseline and post-oiling comparison
- To provide qualitative and quantitative estimates of SAV abundance
- To provide quantitative estimates of SAV- associated epi- and infaunal macroinvertebrates
- To provide preliminary information that is easily compared with data gathered by prior studies, and to help evaluate the need for more comprehensive studies

Sampling parameters

- SAV presence/absence & species composition
- SAV biomass and shoot density
- SAV-associated epi- and infaunal macroinvertebrate presence/absence & species composition
- SAV-associated epi- and infaunal macroinvertebrate relative abundance distributions and densities

Equipment

- Hand coring device (cylindrical, 7.6cm (3") or 15.2cm (6") inner diameter) with hole near the top for attaching a rubber stopper
- Sieve with 0.5mm mesh
- Large tub or bucket (optional)
- 10% formalin solution

Sample labeling and chain of custody forms

Follow NRDA case-wide protocols

Methods (assuming sites are accessed by vessel)

- After arriving at site, look for
    - Presence/absence of SAV bed. If no SAV patch occurs at pre-determined location but can be found within the near vicinity, move to the new patch.
- If SAV is patchy and not present as a continuous bed, take sample in the center of the patch; avoid taking samples on patch edges.

- To take a core, place cylindrical coring device on the sediment surface, making sure to the best of your ability that the leaves of the shoots within the coring area are inside the coring device and those shoots outside the coring area are outside the coring device.
- Push the coring device into the sediment to a depth of approximately 15cm. It is helpful to pre-mark or etch the outside of the corer to the appropriate depth to ensure that core does not exceed 15 cm in depth.
- Put the rubber stopper into the hole and gently rock the corer back and forth to break it loose. Pull the core up and make sure that you place your hand underneath the opening once the corer is above the sediment surface.
- Samples are preferably sieved in the field, using a 0.5 mm mesh sieve. A large bucket / tub of water may be useful, particularly in rough seas. Take care to avoid techniques that might force soft bodied animals through the sieve or splash them out of sieve.
- With the core opening over the sieve, remove the rubber stopper and allow the cored sediment to fall into the sieve. When sieving, it is best to force water up through the bottom of the sieve, by bobbing the sieve up and down in a large bucket or tub of water, thus preventing forcing animals through the sieve.
- After sieving, place remaining sediment, seagrass and animals in a sample bag or jar, using a minimum amount of water.
- Place a waterproof label with the station location, sample number, and date inside the sample bag or jar.
- Place sample bag or jar in cooler with ice.

5. SOP for Submerged Aquatic Vegetation Associated Fauna (fish and mobile macroinvertebrates)

Purpose/Objective

- To document the presence/absence and species composition of SAV-associated faunal community for baseline and post-oiling comparison
- To provide quantitative estimates of SAV- associated fauna.
- To provide preliminary information that is easily compared with prior studies, and to help evaluate the need for more comprehensive studies

Sampling parameters

- SAV-associated fauna presence/absence & composition
- SAV-associated fauna abundance or density

Equipment

- Watch
- 16' Otter Trawl (3/4" mesh wings, and ¼" liner)
- Work gloves
- Sieve with 1 mm mesh (optional)
- Large tub or bucket (2-3 are sufficient)
- Sample bags (gallon size)

Sample labeling and chain of custody forms

Follow NRDA case-wide protocols

Methods (assuming sites are accessed by vessel)

- After arriving at site, look for presence/absence of SAV bed. If no SAV patch occurs at pre-determined location but can be found within the near vicinity, move to the new patch.
- Collect physical data (water depth (cm or m), salinity (ppt), temperature (^{o}C), and time).
- With the vessel moving in a tight circle around the starting seagrass patch or bed, toss out the net portion of the otter trawl. Once the net is fully deployed, straighten out the boat and place the doors of the trawl in the water. Be sure that the doors and the lines attaching the trawl to the boat do not cross.
- Once the doors are deployed, record starting coordinates (lat/long in decimal degrees, WGS84), for the sampling site. Ensure that GPS is giving accuracy < 5meters. Record the start time for the trawl.
- Begin trawling. Trawl times are 2 minutes and if the SAV is not a continuous bed, but instead patchy, steer the vessel so that you cover as many patches as possible within the 2 minutes. Vessel speed should be relatively slow (approximately 2-3 knots) and

consistent. Record RPM of vessel. **Note: our trawling speed is usually around 1600 RPM to 2500 RPM.

- Once 2 minutes has passed, stop the vessel and begin pulling in the trawl. Once the trawl doors are at the boat, record the ending coordinates (lat/long in decimal degrees, WGS84), for the sampling site. Ensure that GPS is giving accuracy < 5meters.
- With the trawl doors and lead and float lines of the trawl in the vessel, begin to "shake" down any animals in the trawl net as you pull it into the boat. Release the trawl over a large tub or bucket.
- Sort the "catch", identify and enumerate to species level (common name).
- Place any fauna to be retained (e.g. commercially important fish and invertebrates) into foil and label.
- Place a waterproof label with the station location, sample number, and date inside the sample bag or jar.
- Place sample bag or jar in cooler with ice.

Appendix 3.

NRDA Baseline Assessment for Submerged Aquatic Vegetation (SAV): Florida

Appendix 3: Status of MC252 Baseline Mapping and Monitoring Activity in Florida

Table 1: Seagrass Imagery and Mapping Status for Florida

Bay System	Most Recent Imagery	Agency	Most Recent Maps
Perdido Bay	2010	NASA, NOAA	2003
Big Lagoon	2010	NASA, NOAA	2003
Pensacola Bay System	2010	FWC FWRI SIMM	2003
Santa Rosa Sound	2010	FWC FWRI SIMM	2003
Choctawhatchee Bay	2010	FWC FWRI SIMM	2007
St. Andrews Bay	2010	GCCC	2003
St. Joseph Bay	2010	FDEP CAMA	2006
Franklin County	2010	FWC FWRI SIMM	1992
Big Bend Region	2006	FWC FWRI SIMM	2006
Cedar Keys and Waccasassa	2001	SRWMD	2001
Springs Coast	2007	SWFWMD	2007
Tampa Bay	2010	SWFWMD	2008
Sarasota Bay	2010	SWFWMD	2008
Lemon Bay	2010	SWFWMD	2008
Charlotte Harbor North	2010	SWFWMD	2006
Pine Island Sound	2008	SFWMD	2006
Matlacha Pass	2008	SFWMD	2006
Caloosahatchee Estuary	2008	SFWMD	2006
Estero Bay	2008	SFWMD	2006
Rookery Bay	2009	FDEP CAMA	Unknown
Ten Thousand Islands	2009	None	Unknown
Florida Bay	2004	FWC FWRI SIMM	2004
Gulf Upper Keys	2006	NOAA NCCOS	1992
Gulf Lower Keys, Marquesas	2006	NOAA NCCOS	1992
Tortugas	2006	NOAA NCCOS	1992
Atlantic Lower Keys	2006	NOAA NCCOS	1992
Atlantic Upper Keys	2006	NOAA NCCOS	1992
Biscayne Bay	2005	FWC FWRI SIMM	1992
Palm Beach County	2009	Palm Beach Co	2007
Southern Indian River Lagoon	2009	SFWMD	1999
Northern Indian River Lagoon	2009	SJRWMD	2007

Table 2: Seagrass Monitoring Programs in Florida

Estuary	Lead Agency	Most Recent Sampling	Sampling Frequency
Perdido Bay	DISL	May 2010	Event driven
Big Lagoon	DISL	May 2010	Event driven
Pensacola Bay	DISL	May 2010	Event driven
Santa Rosa Sound	DISL?	May 2010?	Event driven
Choctawhatchee Bay	FWRI	August 2009	Annual
St. Joe Bay	FWRI	August 2009	Annual
St. Joe Bay	DEP/CAMA	June 2009	Annual
St. Andrew Bay	FWRI	August 2009	Annual
St. Andrew Bay	GCCC	June 2009	Annual
Apalachicola Bay	ANERR	Unknown	Uncertain
St. Georges Sound	FWRI	June 2009	Annual
Franklin County	FWRI	June 2009	Annual
Ochlockonee Bay	None	None	None
St Marks	FWRI	June 2009	Annual
St Marks	DEP/CAMA	Summer 2009	Annual
Big Bend	FWRI	June 2009	Annual
Steinhatchee	DEP/CAMA	Summer 2009	Annual
Cedar Key	DEP/CAMA	Summer 2009	Annual
Waccasassa Bay	None	None	none
St. Martins Marsh	DEP/CAMA	Summer 2009	Annual
Homosassa	FWRI	August 2008	Sporadic
Springs Coast	DEP/CAMA	Summer 2009	Annual
Western Pinellas	Pinellas County	Fall 2009	Annual
Tampa Bay	City of Tampa	Fall 2009	Annual
Sarasota Bay	Sarasota County	February 2010	2X a year
Sarasota Bay	DEP/CAMA	Fall 2009	Annual
Lemon Bay	Sarasota County	February 2010	
Charlotte Harbor	DEP/CAMA	Fall 2009	Annual
Estero Bay	DEP/CAMA	February 2010	Twice yearly
Ten Thousand Islands	USGS/NOAA	May 2010	none
Florida Bay	FWRI	May 2010	Twice yearly
FKNMS	FIU	March 2010	quarterly
Biscayne Bay	FWRI	May 2010	Twice yearly
Biscayne Bay	Miami-Dade DERM	June 2009	Annual
Palm Beach	Palm Beach County	Summer 2009	Annual
South Indian River	SFWMD	February 2010	Bimonthly
North Indian River	SJRWMD	February 2010	Twice yearly

Table 3: Seagrass Metrics Used by Monitoring Programs in Florida

Estuary	Lead Agency	Visual Density	Spp Comp	Shoot Counts	Biomass	Sediment Contam	Benthic Inverts
Perdido Bay	DISL	No	Yes	Yes	Yes	??	Yes
Big Lagoon	DISL	No	Yes	Yes	Yes	??	Yes
Pensacola Bay	DISL	No	Yes	Yes	Yes	??	Yes
Santa Rosa Sound	DISL?	No	Yes	Yes	Yes	??	Yes
Choctowhatchee Bay	FWRI	No	Yes	No	No	No	No
St. Joe Bay	FWRI	No	Yes	Yes	No	No	No
St. Joe Bay	DEP/CAMA	Yes	Yes	Yes	Yes	No	No
St. Andrew Bay	FWRI	No	Yes	No	No	No	No
St. Andrew Bay	GCCC	No	Yes	Yes	No	No	No
Apalachicola Bay	ANERR						
St. Georges Sound	FWRI	No	Yes	No	No	No	No
Franklin County	FWRI	No	Yes	No	No	No	No
Ochlockonee Bay	None						
St Marks	FWRI	No	Yes	No	No	No	No
St Marks	DEP/CAMA	Yes	Yes	??	Yes	No	No
Big Bend	FWRI	No	Yes	No	No	No	No
Steinhatchee	DEP/CAMA	Yes	Yes	??	Yes	No	No
Cedar Key	DEP/CAMA	Yes	Yes	??	Yes	No	No
Waccasassa Bay	None						
St. Martins Marsh	DEP/CAMA	Yes	Yes	??	Yes	No	No
Homosassa	FWRI	Yes	Yes	No	No	No	No
Springs Coast	DEP/CAMA	Yes	Yes	??	Yes	No	No
Western Pinellas	Pinellas County	No	Yes	Yes	No	No	No
Tampa Bay	City of Tampa	Yes	Yes	??	No	No	No
Sarasota Bay	Sarasota County	No	Yes	Yes	No	No	No
Sarasota Bay	DEP/CAMA	No	Yes	No	No	No	No
Lemon Bay	Sarasota County	No	Yes	Yes	No	No	No
Charlotte Harbor	DEP/CAMA	Yes	Yes	Yes	No	No	No
Estero Bay	DEP/CAMA	Yes	Yes	Yes	No	No	No
Ten Thousand Islands	USGS/NOAA	Yes	Yes	??	??	No	??
Florida Bay	FWRI	Yes	Yes	Yes	Yes	No	No
FKNMS	FIU	Yes	Yes	No	Some	No	No
Biscayne Bay	FWRI	Yes	Yes	Yes	Yes	No	No
Biscayne Bay	Miami-Dade	Yes	Yes	Yes	Yes	No	No
Palm Beach	Palm Beach Co	Yes	Yes	Yes	No	No	No
South Indian River	SFWMD	Yes	Yes	Yes	No	No	No
North Indian River	SJRWMD	No	Yes	Yes	No	No	No

Appendix 4.

SAV Site Characterization Form

SAV Site Characterization Form #1 [*Page 1 of 3*]

Survey Team ID: _____

Field Crew Leader: _____ _____

Data Entry: _____ _____
(Name) (Agency)

1. Site Descriptors

Site Name/ID:_____ **Lat:**_____ **Lon:**_____
Time:_____ **Date:**_____
Habitat Setting (check one) ____ **Intertidal** _____ **Subtidal (Depth (m)** _____)
Bed size: _____ **Width (m)** _____ **Length (m)**
Location of samples with respect to bed:_____
Overall bed condition:_____
_____

2. Physical/Chemical Parameters

Bottom Salinity (ppt): _____ **Air Temperature (C):** _____
Bottom Temperature (C)_____ **Bottom Dissolved Oxygen (mg/L):**_____
Weather/Cloud Cover: _____ **Wave height (m):** _____
PAR (uEm^{-2}s^{-1}) :_____ **Secchi depth (cm):**_____
Irradiance: _____ **(value 1)** _____ **(value 2)** _____ **(value 3)**
Depth: _____ **(value 1)** _____ **(value 2)** _____ **(value 3)**

Oiled Condition (check one): _____ **None** _____ **Sheen** _____ **Light**
_____ **Moderate** _____ **Heavy**

3. Seagrass percent cover: ***Fill in table below, or check if visibility is too poor to estimate:*** _____

Species	Quadrat 1	Quadrat 2	Quadrat 3
Overall			

Flowering shoots: _____**yes** _____**no**

SAV Site Characterization Form #2 [*Page 2 of 3]*

Site Name/ID:_____ **Lat:**_____ **Lon:**_____

Date:_____ **Survey Team ID:** _____

4. Point Sample Collection and Disposition

The following subsamples were collected [list all sample IDs for each, indicating any that are field duplicates, as well as geographic coordinates in decimal degrees]

Sediment samples for contaminant analysis:

Sample ID	Latitude	Longitude

Sediment samples for grain size analysis:

Water samples for contaminant analysis:

Vegetation samples for contaminant analysis:

Invertebrate samples for contaminant analysis:

Vegetation/faunal core samples for species and abundance metrics: **Core Diameter (cm):** _____

Other (Please Describe):_____

SAV Site Characterization Form # 3 *[Page 3 of 3]*

Site Name:_____ **Lat:**_____ **Lon:**_____

Date:_____ **Survey Team ID:** _____

5. Trawl Sample Collection and Disposition ***[Enter "none" if no trawl conducted]***

Collected by: _____ _____

Field Crew Leader: _____ _____

Data Entry:_ _____ _____

(Name) (Agency)

Trawl Details

Trawl No.	Starting Lat	Starting Lon	Ending Lat	Ending Lon	RPM	Sample ID
1						
2						

Trawl 1 Sample Data and Disposition			Trawl 2 Sample Data and Disposition		
Species	Number	Sample Retained? (y/n)	Species	Number	Sample Retained? (y/n)

Other Site Notes: _____

_____