

***Guidance on Surveys for Submerged Aquatic Vegetation  
Compensatory Mitigation Projects***

**Office of Resilience and Coastal Protection  
Florida Department of Environmental Protection**

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## **1.0 Introduction**

### **1.1 Purpose of Monitoring Guidance**

The purpose of this document is to provide guidance on Florida Department of Environmental Protection-approved monitoring protocols for compensatory mitigation projects to offset unavoidable impacts to submerged aquatic vegetation (SAV) that can be used to make the permitting process more efficient, predictable and consistent. Aspects of this document are intended to be scalable and adaptable to work for a wide range of projects state-wide. This document is intended to assist those applying for permits issued by the Beaches Inlets and Ports Program (BIPP) in Tallahassee, including Joint Coastal Permits (JCP) and Environmental Resource Permits (ERP). The Submerged Lands and Environmental Resource Coordination program has reviewed this guidance and determined that it is generally applicable to ERPs issued by district offices, water management districts and other delegated local governments. However, each project is unique and coordination with the department (including BIPP staff, district office staff and aquatic preserve staff, depending upon the project location) is strongly encouraged during the planning phase before an applicant's decision to use this guidance document.

This document is not currently adopted by rule or statute. Requirements (e.g., protocols, timelines and deliverables) described herein will only become binding on applicants/permittees who choose to accept them as a means of fulfilling regulatory requirements, as monitoring requirements that will be included as specific conditions of permits. Means and methods other than those described herein may be proposed by the applicant and will be subject to review and acceptance by the department under applicable rules and statutes.

### **1.2 Regulatory Basis for Monitoring**

Submerged aquatic vegetation is an economically and ecologically valuable natural resource. In fact, seagrasses are deemed essential to Florida's oceans, gulfs, estuaries and shorelines, according to Section 253.04(3)(a), Florida Statutes (F.S.). Therefore, these resources are managed and regulated by the state, including DEP (FWC 2003). The department requires reasonable assurance that permitted activities will not adversely affect the habitat of fish, wildlife and listed species, including SAV habitats, pursuant to Section 373.414(1)(a)2, F.S., Section 62-330.301(1)(d) and subparagraph 62-330.302(1)(a)2, *Florida Administrative Code* (F.A.C.), and Section 10.2.2(a) of the ERP Applicant's Handbook Volume 1.

If impacts to SAV are unavoidable, then mitigation shall be required to ensure no net loss of functions, pursuant to Section 373.414(1)(b), F.S., paragraph 18-21(2)(i), F.A.C., and Section 10.3.1 of the ERP Applicant's Handbook Volume 1.

If compensatory mitigation is required to offset impacts to SAV, then surveys are required to provide information necessary to implement the Uniform Mitigation Assessment Method (UMAM), Rule 62-345 F.A.C., which describes how the department calculates the amount of compensatory mitigation needed to offset impacts to surface waters, including SAV habitats (pursuant to Section 373.414(18), F.S.). Note: information on the current condition of SAV resources that will be impacted by the proposed project is also required for UMAM and a separate guidance document has been developed to assist applicants with such surveys (DEP 2020). Monitoring is also required to document the success of mitigation activities (pursuant to Section 10.3.4 of the ERP Applicant's Handbook Volume 1). Mitigation monitoring parameters, methods, schedule and reporting requirements, such as those described herein, will be included as specific conditions of permits in accordance with Section 10.3.4 of the ERP Applicant's Handbook Volume 1, subsection 62-4.070(3), F.A.C., and Section 373.413(1), F.S. The department has the authority to issue any permit with specific conditions necessary to provide reasonable assurance department rules can be met, pursuant to subsection 62-4.070(3) F.A.C.

### **1.3 Submerged Aquatic Vegetation**

For the purpose of this document, "submerged aquatic vegetation" is defined as a benthic community comprised of any species of seagrass and/or rhizophytic macroalgae, including both calcareous and non-calcareous taxa. An analogous definition is used by the National Marine Fisheries Service to describe SAV, which is designated as an essential fish habitat (NMFS 1998). Drifting macroalgal mats (drift algae) comprised of filamentous taxa that are ephemeral depositions on the benthos provide ecological functions (Arroyo and Bonsdorff 2016); however, areas without any seagrass or rhizophytic macroalgae that contain only drift algae are not considered SAV for the purpose of this document.

The distribution of SAV is not static. Seagrass patches migrate and unvegetated areas between patches are important to the management and conservation of these resources (Fonseca et al. 1998).

Accordingly, this document defines "SAV habitat" as areas currently vegetated by SAV as well as currently unvegetated areas adjacent to SAV that have historically supported SAV and are capable of

supporting SAV based on current conditions such as the water environment, sediment characteristics and light availability.

Please be advised, while this document is primarily intended to provide guidance for projects with marine and estuarine SAV, at the department's discretion, this guidance may also be applied to/adapted for use on projects with freshwater SAV resources (e.g., *Vallisneria american*).

## **2.0 Survey Protocols**

### **2.1 Timing of Surveys**

Surveys should be completed during the peak growing season to capture the maximum spatial extent and cover of SAV. This is particularly important in portions of the state where seagrasses senesce over the winter. To be consistent with federal requirements, the department recommends surveys be completed between June 1 and Sept. 30. However, in some circumstances the department may allow surveys to be completed at other times during the growing season. For example, under some circumstances, the department may accept SAV surveys from April to October in most of the state and year-round surveys may be acceptable in Monroe County and southern Dade County.

### **2.2 Surveys for Planning and Permitting**

The purpose of this section is to describe the types of surveys that are needed to provide the information necessary to develop a mitigation plan. Every project is unique; therefore, applicants are strongly encouraged to coordinate with the department before initiating field work to identify appropriate methods and to schedule joint site inspections. Early coordination is especially important if an application will be submitted outside of the growing season; it is imperative department staff have an opportunity to verify site conditions during the growing season.

Generally, the department will request a desktop assessment of available information and a mapping and characterization survey (MC), which includes the delineation of site boundaries and existing resources as well as an *in-situ* visual assessment of site conditions. For larger sites, a reconnaissance survey (RECON) will typically be needed to identify resources. Proposed mitigation site(s) should be surveyed during the growing season before the development of a project-specific mitigation plan. At this time, reference site(s) and donor sites for transplantation activities (if necessary) should also be identified and surveyed.

Once these tasks have been completed, applicants should provide a detailed description of the methods used to evaluate potential sites and the results of all desktop and *in-situ* survey efforts with the mitigation plan. Generally, mitigation plans are drafted during the planning/pre-application phase of project development and completed in consultation with the department during the permitting process. Mitigation plans shall be detailed and shall contain all information required pursuant to Section 10.3.3 of the ERP Applicant's Handbook Volume 1.

### *2.2.1 Desktop Assessment of Available Information*

Prior to the initiation of field work, a desktop assessment (DA) should be completed. All available information on resources in the proposed mitigation area shall be compiled and reviewed. For example, information on SAV in the project area may include historical aerial photography, imagery from unmanned aerial vehicles, side-scan survey data and data from previous field surveys. This information should be used to guide site selection and narrow down the number of potential sites that will be surveyed. A summary of the information used in the site selection process should be included as an appendix to the mitigation plan.

Any relevant information that is available on physical attributes of the proposed sites should also be compiled and reviewed. Understanding environmental conditions – such as water depth, tidal height, current speed, wave exposure and fetch and flushing – can be useful for evaluating the current and with-project conditions at the mitigation site. Therefore, information on these parameters should be evaluated if available. Existing sources of data such as bathymetric surveys, geotechnical investigations and water quality monitoring stations should also be reviewed as part of the desktop assessment.

### *2.2.2 Mapping and Characterization Survey*

This section describes the methods that should be used to investigate potential sites to inform the planning and permitting process. Mapping and characterization of site conditions are essential tasks. The manner in which these methods are employed at the mitigation, reference and donor sites is described below in section 2.2.3.

### 2.2.2.1 Mapping

Once potential mitigation site(s), reference site(s) and/or donor site(s) have been identified, the boundaries of each of these sites should be field recorded as accurately as possible. An *in-situ* survey should also be completed to identify the locations of any naturally occurring SAV within and/or adjacent to each of these sites, as described below in sections 2.2.3.1, 2.2.3.2 and 2.2.3.3. The position of SAV resources shall be recorded as accurately as possible. For sites less than 0.25 acres, the distance between survey track lines shall be no greater than the visibility at the site at the time of the survey, such that the entire benthos is visually assessed for the presence of SAV and a map of SAV with a 1-meter resolution shall be produced. During this survey, the spatial distribution of SAV within the survey area(s) shall be mapped. The edge of each SAV patch shall be visually assessed by divers *in-situ* and divers shall record the position of the edge as accurately as possible. The total acreage of SAV within each patch/bed shall be reported. For projects where SAV is extensive and continuous, it may be sufficient to delineate only the SAV edge that is proximate to the proposed activity (e.g., adjacent to a relict dredged hole to be restored).

For sites greater than 0.25 acres, a RECON shall be conducted to identify currently vegetated areas. The RECON may be completed using towed video, only if video is watched in real-time by observers on the vessel to ensure the camera is positioned at the appropriate angle and video is of sufficient quality to identify resources. Alternatively, towed diver surveys may be completed by biologists using self-contained underwater breathing apparatus (SCUBA). In-water surveys are preferred to video surveys in areas where water clarity is low or where resources are sparse or small in stature (and therefore unlikely to be detected on video); in these cases, biologists should traverse the area and visually assess resource boundaries. Spacing between survey tracks should be minimized to the maximum extent practicable to thoroughly survey the benthos (e.g., transects spaced at 10-meter intervals). The coordinates of the survey track lines shall be reported along with the in-water visibility (width of each visually censused area) on the date(s) of the survey.

The information obtained from this mapping effort shall be used to produce a georeferenced map showing the distribution of SAV taxa in the project area, which should be included in the permit application. To ensure map products will be useful for planning and permitting, it is recommended the following mapping criteria be used for creating and submitting SAV map-related deliverables:



- All spatial information should be collected using a sub-meter accurate Differential Global Positioning System (DGPS) unit.
- Geographical information should be provided in the State Plane Coordinate System (SPCS) for Florida (NAD83) and coordinates (latitude and longitude) should be provided in decimal degrees to the fifth decimal place (hundred-thousandths).
- An ArcGIS map package (“.mpk” file format) or similarly detailed and complete data package (e.g., CAD “.dwg” file format) should be provided with spatial data and metadata.
- SAV areas with different species compositions and/or densities should be distinguished via symbology (e.g., coloration and fill patterns).
- Map figures should include a legend, metric scale bar and north arrow for reference.
- Map figures should be shown at an appropriate scale that allow features to be readily discerned on a standard-size printed page.
- Map figures should be overlaid on recent aerial imagery and should include polygons or lines depicting project boundaries and significant features.

#### 2.2.2.2 Characterization of Site Conditions

For planning and permitting purposes, an *in-situ* visual assessment of site conditions shall be completed concurrent with the mapping efforts (Section 2.2.2.1) to characterize the current condition of the mitigation site, the reference site and the donor site (if such as a site is necessary). This characterization of site conditions should document the following indicators of function: location and landscape support, water environment and community structure (as defined in 62-345.500, F.A.C.). Site conditions such as sediment type, sediment depth, salinity, water temperature, current speed and flushing should be noted. For all projects, water depth shall be measured, corrected for tidal height and reported in metric units. For some projects (e.g., restoration of a relict dredged hole), a detailed bathymetric survey of the site may be required. Apparent water quality issues such as harmful algal blooms and signs of eutrophic conditions, such as mats of cyanobacteria, should also be reported. Landscape features, such as other natural communities, shoals and man-made structures, within and adjacent to sites should be described. The proximity of the site to any channels should be noted as well as boat traffic and recreational use in and around the site. Anthropogenic impacts such as the presence of debris, propeller scars or vessel blowouts within and adjacent to sites should be described. Wildlife observed at the site and signs of wildlife, including evidence of bioturbation, should also be reported. A map of all surveyed sites and a

description of conditions at each site should be provided in the permit application and in the mitigation plan.

Community structure should be qualitatively assessed; the general condition of vegetation such as canopy height, flowering, epiphyte coverage and disease shall be described. SAV communities shall also be quantitatively evaluated within quadrats placed within SAV patches. Randomized placement of quadrats is preferred, but quadrats can be placed haphazardly, if randomization is not practicable. Quadrat placement shall not be biased. However, only vegetated areas shall be surveyed. Quadrats placed within bare areas within the SAV habitat should be noted and repositioned into areas containing SAV. Within each quadrat the cover-abundance (CA) of SAV shall be assessed as prescribed in Section 2.3.4. Replicate quadrat samples are necessary to adequately characterize the SAV community. It is recommended that a 1 m<sup>2</sup> (1 m x 1 m) quadrat be used for this survey; if a smaller quadrat is used, then additional quadrats should be sampled. At least 5 m<sup>2</sup> should be sampled in small areas (those less than 0.1 acres). For larger sites, it is generally recommended that at least 1 m<sup>2</sup> be sampled per 80 m<sup>2</sup> of the area to be surveyed, which is a density of approximately 50 (1 m x 1 m) quadrats per acre. A description of the community structure, including the species composition and percent cover of SAV based on quadrat data, shall be provided with the application and in the mitigation plan. Note: the purpose of this characterization survey is to provide information on site conditions for planning and permitting, more thorough sampling will typically be required by specific conditions of the permit to document the success of mitigation activities (Section 2.3); data collected during the mapping and characterization survey will not be used to evaluate changes in the condition of sites over time.

### *2.2.3 Mapping and Characterization Survey by Site*

This section describes how the methods for mapping and characterization surveys described above (Sections 2.2.2.1 and 2.2.2.2, respectively) should be employed at the mitigation (2.2.3.1), reference (2.2.3.2) and donor sites (2.2.3.3).

#### *2.2.3.1 Mitigation Site Mapping and Characterization Survey*

Once the potential mitigation site(s) has/have been selected, a mapping and characterization survey should be conducted. Site boundaries should be field recorded as accurately as possible. For creation projects, the property or project boundaries that will be converted into SAV habitat shall be delineated. For SAV restoration and enhancement projects, the entire area to be restored or enhanced (i.e., site

boundaries) shall be delineated. The boundary of each feature that will be remediated/restored, such as vessel groundings and blow-outs, shall also be delineated. Propeller scars and other linear features can generally be defined by measuring the width and reporting the end points; additional points should also be recorded along linear features, if necessary, to accurately document dimensions (i.e., inflection points). The depth of propeller scars, grounding sites and blowouts excavated by vessels, shall also be measured relative to the surrounding undisturbed seafloor.

For any other type of restoration and enhancement projects, the delineation methods should be coordinated with department staff. Additionally, an *in-situ* survey should be completed to identify the locations of any naturally occurring SAV within and/or adjacent to the mitigation site(s) (Section 2.2.2.1). A continuous track-line along the SAV edge is preferred, but if this is not possible, then individual data points (waypoints/coordinates) may be collected (e.g., at 5-meter intervals or major inflection points) to document the position of the edge.

Concurrent with the mapping effort (above), a visual assessment of SAV within and adjacent to the mitigation site shall be completed to characterize current conditions (Section 2.2.2.2). The information from this survey will be used by the department to determine if the proposed mitigation is appropriate for offsetting project-related impacts to SAV. If the proposed mitigation is determined to be appropriate, the results of this survey will also be used by the department (in addition to other available information, including observations by department staff during on-site inspections) to evaluate the amount (acreage) of compensatory mitigation required to offset impacts to SAV via UMAM.

#### *2.2.3.2 Reference Site Mapping and Characterization Survey*

A mapping and characterization survey of SAV resources near the proposed mitigation sites shall be conducted to locate and designate specific site(s) that shall serve as a reference for comparison to the mitigation site. Reference site(s) should be located as close as possible to the mitigation site. Reference site(s) should be outside of the influence of any mitigation-related construction activities (secondary impact areas: mixing zones, staging and anchoring areas). An *in-situ* visual assessment (Section 2.2.2) of the potential reference site(s) shall be completed to demonstrate that site conditions (e.g., water depth, sediment type, wave energy) and the SAV community (e.g., species composition and density) are similar to those that the mitigation site is expected to have at the time of success determination (as described in the mitigation plan). The reference site boundaries shall be recorded as accurately as possible. The

purpose of this survey is to provide a qualitative description of the site(s) and justification for selection of the site(s) as a reference for assessing the mitigation site(s).

#### 2.2.3.3 Donor Site Mapping and Characterization Survey

Not all mitigation projects will include the use of a donor site for harvesting of seagrass for transplantation to the mitigation site. For example, a donor site is not necessary if materials are harvested from direct impact areas that would otherwise be lost, if nursery-grown seagrasses are available or if natural recruitment is expected to occur relatively rapidly. If harvesting of seagrasses from a donor site is needed to obtain materials for planting at the mitigation site, then potential donor sites will need to be identified during the planning and permitting process in coordination with the department (permitting staff as well as aquatic preserve managers, if applicable). Donor sites should be as close as possible to the proposed mitigation site to reduce stress during transport. Donor sites should appear healthy and capable of rebounding from disturbance and should be densely covered by pioneer seagrass species, such as *Halodule wrightii* and *Syringodium filiforme*.

Once potentially suitable sites have been identified, a mapping and characterization survey shall be completed. Specifically, an *in-situ* visual assessment shall be completed to characterize the current condition of SAV resources at the site and to provide reasonable assurance that harvesting of materials will not adversely affect these areas. These observations shall be used to select suitable area(s) from which to harvest seagrass. The boundaries of all donor sites should be recorded as accurately as possible. The size of the donor site will be determined based on the amount of seagrass materials needed to vegetate the mitigation site. The results of this survey shall be used to develop a plan for harvesting material, which should be detailed in the mitigation plan. A georeferenced map of the donor site(s) boundaries and the starting and ending positions (GPS coordinates) of all proposed transects along which materials will be harvested should be included in the mitigation plan.

### 2.3 Permit-Required Mitigation Monitoring Protocols

This portion of the document (Sections 2.3, 3, 4 and 5) is intended to provide guidance and to serve as a template for monitoring of permitted SAV mitigation projects. The department recommends the methods described herein be used to document the status of mitigation sites and to determine whether they have achieved permit-required success criteria (Section 4.0). As previously stated (Section 1.1), the requirements (e.g., protocols, timelines, deliverables) described herein are only binding on permittees

that accept them as a means of fulfilling regulatory requirements.

Permits requiring compensatory mitigation to offset unavoidable impacts to SAV will include specific conditions prescribing the monitoring methods to be used to document the success of mitigation activities. Generally, a specific condition is used to incorporate a final department-approved mitigation plan as an enforceable component of the permit. Mitigation monitoring parameters, methods, schedule and reporting requirements (such as those described herein) will be included in this plan, pursuant to Section 10.3.4 of the ERP Applicant's Handbook Volume 1. For some projects, bathymetric surveys may also be required to document site conditions before and after mitigation. The need for such surveys should be coordinated with the department during the planning and permitting process, as the mitigation project is being developed, before finalizing the mitigation monitoring plan.

Multiple monitoring events are needed to document the status and success of permitted mitigation activities, beginning with baseline surveys of the reference site(s) and donor site(s) during the same growing season that mitigation activities (e.g., filling, harvesting and planting) are completed. An as-built survey should be conducted at the mitigation site immediately following the completion of mitigation activities (e.g., construction and/or planting). Additionally, if the mitigation site is planted, a survey will typically be completed 1-month after planting is completed to assess the condition of planting units (PUs). Annual surveys will be completed at the mitigation, reference and donor sites until permit-required success criteria have been achieved (Section 4). All surveys should be conducted during the growing season (Section 2.1), with an effort made to complete each survey in the same month each year for comparability of results. Monitoring of the mitigation site and corresponding reference site is typically conducted annually for at least five years. Donor site(s) are typically monitored annually for three years or until recovery of the sites is achieved. The number and timing of monitoring events for mitigation projects should be determined in coordination with the department during the planning/permitting process.

### *2.3.1 Assessment of Planting Units*

If the mitigation site is planted, then an assessment of planting units (APU) should be conducted approximately one month (but no later than 45 days) after the completion of planting to document the survival and expansion of planting units (PUs). The purpose of this survey will be to inform adaptive management and to identify whether additional planting is necessary. If additional PUs are transplanted

in the mitigation site because of low PU survival following the initial planting event, then another APU should be completed 1-month after the completion of the second planting event. If additional planting is necessary, the permittee should coordinate with department staff regarding appropriate adaptive management measures to improve planting success (e.g., species and/or spacing of PUs) and to reduce potential impacts from repeatedly harvesting at donor sites (e.g., use of nursery-grown PUs). If PUs have not yet coalesced (are still able to be distinguished from one another) during the year 1 annual survey, then another APU should also be completed during this survey.

A sampling scheme for the APU should be developed during permitting and included in the mitigation plan. All PUs should be surveyed if less than 500 PUs were transplanted to the mitigation site. For larger projects, at least 10 replicate transects (i.e., rows along which PUs were installed) should be surveyed (Fonseca et al. 1998). For the purpose of this survey, the presence of one or more shoot(s) indicates survival of a PU (Fonseca et al. 1998). The presence or absence of each PU will be reported and the percentage of surviving PUs will be calculated. The areal extent of each PU will be determined by measuring its dimensions (longest apparent axis and perpendicular to that axis); if PU has only a few (3 or less) shoots, then a de minimus value ( $0.0025 \text{ m}^2$ ) will be recorded. The area of PUs will be summed to calculate the acreage of seagrass at the site.

### *2.3.2 Visual Assessment of Site Conditions*

Site conditions should be visually assessed (VA) during each survey and indicators of function such as canopy height, epiphyte coverage, flowering, disease, drift algae, bioturbation, propeller scars, shoaling, water clarity and visibility shall be observed and noted. Any signs of water quality degradation or eutrophication shall be noted. Any signs or indicators of mechanical damage (anthropogenic or storm-related impacts), such as sloughing, scouring, exposed rhizomes, burial or sediment accumulation should be noted. Density of seagrasses shall be observed and reported as either sparse (<5% cover), moderate (25-50% cover) or dense (50-100% cover); if density varies within the site(s), this should be described in the reports. A detailed description of the current conditions shall be provided, including a description of any visually conspicuous changes in the condition of resources compared to previous surveys. Representative photographs of each patch (or discrete area) shall be taken to document site conditions. Additionally, water depth shall be measured, corrected for tidal height and reported in metric units.

### 2.3.3 *Line Intercept Surveys*

Line intercept (LI) surveys will typically be completed at all sites during annual surveys and at the reference and donor sites during the baseline survey (Table 2) to: 1) measure the expansion/coalescence of seagrass at the mitigation site, 2) provide an analogous dataset for the reference site(s) for comparison to the mitigation site and 3) document seagrass recovery at the donor site(s). Note: under some circumstances (e.g., if no donor site is used), a comprehensive sampling scheme using numerous randomly placed quadrats to survey SAV may be used in-lieu of line intercept surveys. If line intercept surveys are included in the monitoring plan, a series of transects shall be established at the donor, mitigation and reference sites. For the mitigation and donor sites, monitoring transects will include a representative subset of rows along which seagrass was planted and harvested, respectively.

The layout of transects (number, location, orientation and length) for each of the sites should be determined in coordination with the department during permitting and will be specified in the mitigation plan. A minimum of 10 transects at each site is typically recommended; the number of transects to be sampled at each site should be coordinated with the department during the planning and permitting process. The nature of the project should be considered when determining appropriate transect placement. For example, transects may be placed randomly or spaced regularly throughout SAV creation sites. For mitigation sites where vessel damage (e.g., propeller scars or blowouts) will be remediated by filling and/or planting, transects should be positioned within those features that were restored. To ensure consistency between monitoring events, the starting and ending positions of each transect shall be marked via the installation of PVC pipe, sub-surface buoy or other means and the starting and ending positions of each transect shall be recorded as accurately as possible. Markers used to identify transects shall be removed following the completion of the last monitoring event at each site.

All transects shall be surveyed to document the linear extent (recorded to the nearest 0.1 m) of SAV present along (directly below) each transect line. During each line intercept survey, a biologist shall swim the length of each transect and note the location and linear extent along the transect tape of bare substrate, rhizophytic macroalgae and seagrass (reported by species). During this survey, drift algae should be noted in the field observations as sparse, moderate or dense and then carefully removed to ensure no SAV is present underneath. Areas containing only drift algae shall be considered as bare substrate for the purposes of assessing net-cover/coalescence of SAV. For segments along the transect where SAV taxa overlap, each shall be reported.

The total length of each transect shall be reported along with the percentage of transect covered by each category of cover, which are defined as follows: 1) species of seagrass planted at the mitigation site, 2) seagrass species that were not planted at the mitigation site, 3) rhizophytic macroalgae and 4) bare substrate, including areas with only drift algae. The LI data shall be used to calculate the net-acreage of SAV coverage at each of the sites; net-acreage of SAV = (total acres of site) X (percentage of site covered by SAV). Reports shall include calculations for: 1) net-acreage of the seagrass species planted at the mitigation site 2) net-acreage of any seagrass taxa (including but not limited to those that were planted at the mitigation site) and 3) net-acreage of any SAV.

#### *2.3.4 Quantitative Survey of Cover-abundance*

The cover-abundance (CA) of SAV will be quantified during each Annual Survey at the mitigation and reference sites and during the Baselines Survey of the reference site(s). The cover-abundance of SAV at donor sites will not be quantified unless recovery does not occur as expected (within 3 years). The number (replication) and placement (e.g., random or uniformly distributed) of quadrats surveyed will be determined in coordination with the department during permitting and shall be specified in the mitigation plan. For small projects, it may be possible to survey the entire site using a grid of quadrats or series of belt transects. For larger projects, the applicant should use cover data collected during the mapping and characterization surveys (Section 2.2.2) to evaluate natural spatial variability in SAV cover at the site(s) and use this information to determine the minimum number of quadrats necessary to evaluate success criteria (Section 4.0): for example, conduct a power analysis to determine sample size based on the minimal detectable difference. During the initial monitoring event, quadrat placement may need to be adjusted so all quadrats are positioned in SAV. Once established, the positions of quadrats shall be consistent between monitoring events; quadrat positions will be recorded with respect to their positions along transects or will be recorded using a sub-meter DGPS.

The cover-abundance of SAV shall be visually assessed within 1 m<sup>2</sup> (1 m x 1 m) quadrats. The department shall be consulted regarding the possible use of smaller sized quadrats (0.25 m<sup>2</sup> or 0.5 m<sup>2</sup>); the use of smaller quadrats will typically require additional quadrats to be sampled. Generally, it is recommended quantitative data be collected within a quadrat that is divided into 100 sub-units or “cells”. Cover-abundance (percent cover) of SAV is determined by counting the number of cells with SAV and calculating the percentage of cells within the quadrat with SAV. This method is preferred because it is highly repeatable and interobserver error is typically low. However, the use of subdivided



quadrats (cell count method) may not be practicable at sites where long-bladed seagrass taxa are dense. Under certain circumstances, depending upon project-specific logistical constraints and site conditions, the department may accept rapid estimates of SAV cover. For example, the percent cover of SAV may be visually assessed and reported to the nearest 5% or reported using the Braun-Blanquet cover-abundance scores (Table 1). If Braun-Blanquet cover-abundance scores are recorded in the field, then data shall be converted to percent cover using a standard conversion table (Table 1) before performing data analysis. Cover-abundance methods shall be discussed during the planning and permitting process. Once cover-abundance methods have been approved by the department, these methods should remain consistent across all surveys and sites.

**Table 1. Braun-Blanquet cover-abundance scores and conversions to percent cover.**

Score	Description of Cover	Approximation of Percent Cover
0	Absent from quadrat	0
0.1	A solitary shoot, <5% cover	0.02
0.5	Few (<5) shoots, <5% cover	0.1
1	Many (>5) shoots, <5% cover	2.5
2	5 - 25% cover	15
3	25 - 50% cover	37.5
4	50 - 75% cover	62.5
5	75 - 100% cover	87.5

Drift algae can obscure SAV and dense accumulations of drift algae may smother SAV; therefore, reporting dense accumulations of drift algae is necessary to understand potential factors that could limit mitigation success. Drift algae within the quadrat shall be recorded in the field notes as sparse, moderate or abundant and then carefully removed before visually assessing rooted or anchored SAV taxa (seagrass and rhizophytic macroalgae, respectively). Once drift algae have been removed from the quadrat, the biologist shall assess the total cover-abundance of SAV, which is the total cover of all seagrass and rhizophytic macroalgae taxa. The total cover-abundance of all seagrass species and the total cover-abundance of all rhizophytic macroalgae genera shall also be reported. The biologist shall

also report the cover-abundance of each seagrass species and each rhizophytic macroalgae genera present within the quadrat.

The results of this assessment should be used to calculate the frequency of occurrence (percentage of all quadrats that contained SAV), the density (average cover-abundance for all quadrats sampled) and the abundance (average cover-abundance for only those quadrats containing SAV). These metrics shall be calculated for 1) all SAV, 2) all seagrass, 3) all rhizophytic macroalgae, 4) each seagrass species and 5) each rhizophytic macroalgae genera.

For some projects, the density of seagrass shoots shall also be recorded and reported as another metric of abundance. Seagrass shoots shall be counted within multiple 0.01 m<sup>2</sup> (10 cm x 10 cm) quadrats and the density of seagrass shoots shall be reported separately for all species present within quadrats. The collection of seagrass shoot density data is consistent with recommendations from the Deepwater Horizon Natural Resource Damage Assessment Trustees (2016) and the Gulf of Mexico Habitat Resources Team (Handley et al. 2018).

### 2.3.5 *Other Survey Types*

#### 2.3.5.1 *Assessment of Structures*

Structures, such as signs, buoys and bird stakes, are sometimes emplaced at SAV mitigation sites. For example, at mitigation sites where damage caused by vessels is restored by filling and/or planting, the permittee may be required to install informational signage to notify vessel operators of the presence of shallow SAV at the mitigation site. In some phosphorous-limited sites with *H. wrightii*, bird stakes may be temporarily installed to facilitate the growth of SAV. If structures are not properly maintained, then SAV resources may be adversely affected; derelict structures may smother SAV and will not serve their intended purpose of protecting SAV from vessel damage. Therefore, Assessments of Structures (AS) shall be completed to document the status (presence/absence) and structural integrity of any signage, buoys, stakes and any other structures that are emplaced at the mitigation site. All structures emplaced at mitigation sites shall be visually assessed during each Annual Survey; an additional assessment shall be completed following any major storm event that may have damaged or dislodged structures.

Representative photographs should be taken to document the condition of structures and any visually conspicuous signs of damage due to derelict or dislodged structures should be documented. Note: permits will typically include specific conditions describing the installation, maintenance and removal of

such structures; these conditions should be coordinated with the department during the planning and permitting process.

#### *2.3.5.2 Vessel Damage Assessment*

Some mitigation projects include the installation of informational signs at/around a mitigation site to notify boaters of SAV resources to protect these resources from vessel damage. If such signage is emplaced as part of a mitigation project, then vessel damage assessments (VDA) may also be completed to document recovery of the area encompassed by the signage. During the growing season before the installation of in-water signs, the number, area (acreage) and severity (depth: 0 – 10 cm, 11 – 20 cm, > 20 cm) of damaged areas (e.g., propeller scars or blowouts) shall be visually assessed and documented to establish the pre-project baseline condition. The pre-project baseline condition will also be evaluated by assessing available aerial imagery over a period of at least five years before the installation of the signage. During the first five years after sign installation, the number, area and severity of damaged areas shall also be visually assessed in the field annually and aerial images of the mitigation site shall be analyzed on an annual basis to evaluate changes in the number and area of vessel-damaged areas at the site over time. If the aerial images are available before the field effort, then these images shall be used to guide the field survey; all vessel-damaged areas visible on the aerials shall be inspected in the field. During each field survey, the boundaries of all vessel-damaged areas shall be delineated as accurately as possible; these data will be used to calculate the acreage of damaged areas. The acreage of propeller scars and other linear features will be measured by recording the width and end points; additional points should also be recorded, if necessary, to accurately document dimensions. The results of these surveys should be used to create a geo-referenced map that illustrates changes in vessel damage over time (e.g., features color-coded by year); mapping criteria described in (Section 2.2.2.1) should be used for this purpose.

#### *2.3.5.3 Surveys to document potential unauthorized impacts*

Depending upon the nature of the project and site conditions, the department may require surveys to be conducted before and after construction at the mitigation site(s) to document potential impacts to adjacent SAV resources in order to ensure compliance with Section 373.414(1)(a)2, F.S. (DEP 2020). For example, filling a relict dredged hole may temporarily elevate turbidity, which can cause sedimentation on SAV beds around the perimeter of the hole. Impacts may also occur due to accidents during construction of the mitigation project, e.g., spillage of materials or dragging of anchors. A

separate guidance document has been developed to assist applicants in developing monitoring protocols to document potential unauthorized impacts to SAV resources (DEP 2020). The applicant should coordinate with department staff during the planning/permitting process to determine which monitoring methods are appropriate for their project.

## **2.4 Specifications for Mitigation Monitoring by Site**

This section describes how the survey methods described above (Section 2.3) should be employed at the mitigation (2.4.1), reference (2.4.2) and donor sites (2.4.3).

### *2.4.1 Mitigation Site Monitoring Methodology*

If the mitigation site will be planted, then immediately following planting, the number and spacing of PUs transplanted to the mitigation site shall be reported to document planting was completed in compliance with the mitigation plan (as-built report). One month after each planting event (and again during the year 1 annual survey if PUs have not yet coalesced), the survival and acreage of PUs shall be documented (APU) and reported (Planting Report; Section 2.3.1). Annual Surveys shall be conducted following the completion of construction and planting activities at the mitigation site; these surveys shall include a visual assessment of site conditions (Section 2.3.2), line intercept surveys along transects (Section 2.3.3) and the collection of quantitative data on the cover-abundance of SAV in quadrats (Section 2.3.4). Annual surveys shall be conducted at the same time the reference and donor sites are surveyed. The mitigation site will be surveyed annually for at least five years. If success has not been achieved by year 5, but success appears imminent, then annual monitoring shall continue until the mitigation site achieves success criteria (Section 4.0).

### *2.4.2 Reference Site Monitoring Methodology*

A Baseline Survey shall be conducted and transects shall be established at the reference site during the same growing season that construction and/or planting of the mitigation site is completed. All transects shall be marked via the installation of PVC pipe, sub-surface buoy or other means and the starting and ending positions of each transect shall be recorded as accurately as possible. The Baseline Survey and subsequent Annual Surveys of the reference site shall consist of a visual assessment of site conditions (Section 2.3.2), line intercept surveys along transects (Section 2.3.3) and the collection of quantitative data on the cover-abundance of SAV in quadrats (Section 2.3.4). Annual monitoring shall be conducted at the same time the mitigation site and donor sites are surveyed. Monitoring of the reference site will be

conducted annually for at least five years.

#### 2.4.3 Donor Site Monitoring Methodology

A Baseline Survey shall be conducted and transects shall be established at the donor site during the same growing season that planting of the mitigation site is completed, immediately before the harvesting of seagrass. The coordinates for the starting and ending positions of each transect along which donor materials are harvested shall be marked via the installation of PVC pipe, sub-surface buoy or other means and the starting and ending positions of each transect shall be recorded as accurately as possible. Following harvesting, Annual Surveys shall be conducted to document the recovery of seagrasses at the donor site. The Baseline Survey and each subsequent Annual Survey of the donor site(s) shall consist of a visual assessment of site conditions (Section 2.3.2), line intercept surveys along transects (Section 2.3.3). Quantitative data on the cover-abundance of SAV (Section 2.3.4) will only be collected if following the year 3 survey line intercept results indicate bare areas are not recovering as expected (e.g., the average linear extent of seagrass declines over time relative to the Baseline Survey). Annual monitoring shall be conducted at the same time the reference and mitigation sites are surveyed. Donor sites shall be monitored annually for three years or until recovery of the sites is achieved.

### 3.0 Quality Control/Quality Assurance

Measures shall be taken to ensure the production of high-quality data, which are accurate, complete and consistent. Data should only be collected by qualified biologists, who have cross-trained and completed *in-situ* calibration exercises to reduce interobserver error. The data management process should be well documented and transparent. Consistent methods should be used for all monitoring events to allow temporal comparisons to be made between datasets.

#### 3.1 Qualifications for Biologists

To provide reasonable assurance surveys will accurately document the condition of SAV resources, all surveys should be conducted by qualified biologists with experience performing *in-situ* SAV surveys. The department recommends biologists have at least a Bachelor of Science (a graduate degree is preferable, but not required) from an accredited institution in either marine biology, biology with a concentration in marine sciences, environmental science with a minor in biology or a similar degree. Biologists should also have professional experience and expertise in surveying SAV (preferably for similar construction projects) and a scientific knowledge of SAV. Biologists should have experience

collecting data while snorkeling and certification for self-contained underwater breathing apparatus (SCUBA) may be required if site conditions necessitate such equipment. The resumes for all biologists shall be submitted to the department at least 15 days before the initiation of surveys. The department will review this information, verify whether biologists meet the minimum qualifications and will provide written comments regarding any perceived deficits in qualifications or experience.

### **3.2 *In-situ* Calibration**

If more than one biologist is responsible for *in-situ* data collection, then all biologists shall participate in cross training and calibration activities to verify correct species identification and survey practices. These Quality Assurance/Quality Control (QA/QC) activities should be completed at the beginning of each monitoring event. The results of these QA/QC activities shall reflect consistency of at least 90% for each SAV cover metric that will be used for the project (e.g., cell-counts, Braun-Blanquet scores and shoot counts); biologists should be able to positively identify all SAV taxa (i.e., 100% agreement on seagrass species and macroalgae genera). Copies of the field sheets used for these QA/QC activities should be submitted with data deliverables (Section 5.2). If only one biologist will be collecting data for a project, then regular cross-training and calibration with other biologists is recommended but is not required.

### **3.3 Data Management**

During data collection, biologists shall check their field datasheets to ensure completeness, legibility and accuracy. Biologists should initial each sheet after it has been checked in this manner. Once field datasheets are cleaned and dried at the office, data shall be entered into a project-specific Excel spreadsheet. The spreadsheet data shall be checked against the original datasheet (or a photocopy) to ensure data were transferred correctly. Any changes to datasheets shall be made in coordination with the biologist who collected the data; any changes to field sheets shall be done using a colored marker. Datasheets shall be electronically scanned, saved as pdf files and submitted to the department with data deliverables (Section 5.2).

### **3.4 Amendment of Survey Protocols**

Consistent data collection methods are necessary to evaluate changes in the condition of SAV resources over time. If any amendments to the sampling design or methods are necessary due to field conditions or any other reason, then the permittee and the monitoring firm shall contact resource staff in the

permitting office that issued their permit (BIPP, District Office or other delegated permitting authority). Any changes to permitted monitoring protocols shall be coordinated with department staff and the permittee or their monitoring firm must receive written approval from the department before the implementation of revised protocols. Such coordination is necessary to ensure revised protocols fulfill the monitoring objectives and provide reasonable assurance to the department. Note: a permit modification may be required to authorize changes to survey protocols.

### **3.5 Addressing Potential Conflicts of Interest**

Permittees who want to remain eligible for potential cost-sharing of monitoring costs for JCP projects must demonstrate there are no potential conflicts of interest or perceptions of such conflicting interests. Therefore, monitoring data and statistical analysis must be provided directly and concurrently from the monitoring firm to the department, permittee, consultant(s) and local sponsor(s) in order to comply with the Florida Auditor General report 2014-064 and to be consistent with Section 287.057(17)(a)(1), F.S.

### **4.0 Success Criteria**

This section describes how success criteria will be developed for mitigation sites and donor sites and how these criteria will be evaluated using the monitoring data.

#### **4.1 Success Criteria for Mitigation Site**

Mitigation success shall be measured in terms of whether the objectives of mitigation activities are realized pursuant to Section 10.3.6 of the ERP Applicant's Handbook Volume 1. An overarching objective of mitigation is to achieve viable and sustainable ecological and hydrological functions like those that were provided by the impacted SAV community, pursuant to Section 10.3 of the ERP Applicant's Handbook Volume 1. Success criteria generally reflect the site has achieved (or is trending toward) the acreage and level of ecological function scored by the department using UMAM, considering the monitoring duration and the time-lag applied to the project. The success criteria for the mitigation site will typically be based on comparisons with the reference site(s), which the department has determined 1) will provide functions similar to the impacted community and 2) the mitigation site is likely to resemble over time.

Success criteria are typically based on the net-acreage and percent cover by all seagrass species, unless otherwise specified in the Permit. Under some circumstances, the department may set success criteria for

a particular species of seagrass, may allow cover by rhizophytic macroalgae to be considered toward success criteria, or may use shoot count data as another metric of success. The permit-required acreage of SAV or seagrass (as determined by the department using UMAM) must be achieved at the mitigation site. For this purpose, the net-acreage of SAV or seagrass should be calculated using the line intercept results (Section 2.3.3). The cover-abundance data (Section 2.3.4) shall be used to evaluate whether the average percent cover of SAV and/or seagrass at the mitigation site is similar to (e.g., within 20% of) the average percent cover of SAV and/or seagrass at the reference site(s). Sustainable function must be demonstrated; for example, success criteria should be maintained for two consecutive years or should be achieved during at least three Annual Surveys. Additionally, in some cases, the Baseline Survey data for the reference site(s) may be used as a backstop to evaluate success (e.g., if the reference site experiences a catastrophic event during the monitoring period).

#### **4.2 Success Criteria for Donor Site Recovery**

An objective of the mitigation plan is to ensure the donor site recovers following the harvesting of seagrass. The department will determine the donor site(s) to have successfully recovered when the bare areas from which seagrass was harvested are no longer discernable. Specifically, the linear coverage (as determined by line intercept surveys) of seagrass along transects at the donor site should be similar to (e.g., within ~20% of) the values documented during the baseline survey. However, the department may choose to consider natural variation in seagrass coverage at the reference site when assessing recovery of the donor site(s). Additionally, the department acknowledges some seagrasses (*S. filiforme*) respond to disturbance by overcompensating; therefore, an increase in shoot density at the donor site will not be considered as compensatory mitigation for any impacts that may occur due to harvesting.

#### **4.3 Success Criteria for Reducing Vessel Damage**

If informational signs are emplaced in and/or around the mitigation site to notifying boaters of SAV resources in order to protect these resources from vessel damage, then five years from the date signs were installed at the mitigation site, the following criteria must be achieved for the site to be determined successful: a) field survey results show a reduction in the number, area (acreage) and severity of scars relative to the pre-project baseline survey and b) the analysis of aerial imagery demonstrates the number and area of vessel damage features have been reduced relative to the pre-project baseline period.



## **5.0 Notification and Reporting**

All correspondence related to the submittal of information, data deliverables or reports for the project should be provided to the department's point-of-contact (POC) specified by the permit. For projects permitted by BIPP, the POC for such correspondence is the JCP Compliance Officer ([JCPCompliance@floridadep.gov](mailto:JCPCompliance@floridadep.gov)). All correspondence shall reference the permit number and project name. Additionally, correspondence should reference the number of the specific condition(s) in the permit and/or section(s) of the monitoring plan that requires the submittal of the information provided in each deliverable. Email correspondence is preferable when possible, but some deliverables may need to be submitted using other electronic delivery methods such as a file transfer protocol (FTP) website or delivery of an external hard drive. Regardless of the delivery mechanism, the permittee is responsible for ensuring the department receives all deliverables before permit-required deadlines.

### **5.1 Notification of Initiation/Completion of Work**

The department's POC shall be notified before the initiation of mitigation activities (e.g., filling, harvesting and planting) with the approximate date that work will begin; the department's POC shall also be notified (via email within 48 hours) when work has been initiated and when it has been completed. For some projects, the department may request weekly status updates while activities are ongoing. The department's POC shall be notified before the initiation of each monitoring event and provided with an approximate date that survey work will begin; the department's POC shall also be notified (via email within 48 hours) when survey work has been initiated and when each survey has been completed.

### **5.2 Submittal of Data**

Data (scanned field datasheets and Excel spreadsheets), ArcView GIS files (including SAV delineations) and representative photographs shall be submitted no later than 45 days after the completion of each monitoring event. All data shall be carefully checked (as described in Section 3.0) before submittal (Table 2). Digital photographs submitted to the department shall be organized (sorted within file folders) by location (e.g., mitigation, reference or donor site; transect and/or quadrat position). Monitoring data and statistical analyses must be provided directly and concurrently from the monitoring firm to the department, permittee, consultant(s) and local sponsor(s) (Section 3.4).

### **5.3 As-built Report**

As soon as possible, but no later than 15 days following the completion of mitigation activities (e.g., filling, harvesting and planting), an as-built report (summary of executed work) shall be submitted to demonstrate work was done in compliance with the mitigation plan (Table 2). If filling is required to restore the mitigation site, then the volume of fill materials placed should be reported along with any post-construction bathymetric surveys that were completed by the contractor to document work was compliant with the permit and mitigation plan (e.g., target elevation/water depth was achieved). If seagrass was transplanted to the mitigation site, then the number, spatial arrangement and size (average number of shoots and approximate dimensions) of PUs by species should be provided with representative photographs of the site.

### **5.4 Planting Unit Assessment Report**

If an APU is conducted one month after planting (Section 2.3.1), then a report shall be submitted within 90 days of completing that APU survey (Table 2). This report shall include the percentage of PUs surviving and the total area occupied by seagrass. Representative photographs of PUs shall be provided. If another APUs is done during the 1 Year Annual Survey, then the results of this assessment should be submitted with the Annual Report (Section 5.5).

### **5.5 Annual Reports**

A single comprehensive report (annual report) summarizing the results of surveys at all sites shall be submitted no later than 90 days after the completion of Annual Surveys each year (Table 2). Annual Reports shall document the extent to which permit success criteria (Section 4) have been satisfied. A trend analysis shall be conducted each year to document success and data from all years shall be included in this trend analysis. Annual reports shall include the information outlined below in Sections 5.5.1, 5.5.2 and 5.5.3 and 5.5.4.

#### *5.5.1 Results of the Visual Assessment of Site Conditions (Section 2.3.2)*

- a) Detailed description of site conditions, including any conspicuous changes.
- b) Representative photographs.

### 5.5.2 *Results for Line Intercept Survey (Section 2.3.3)*

- a) Total length of each transect shall be reported along with the percentage of that transect covered by each of the following cover categories: species of seagrass planted, seagrass species that were not planted, rhizophytic macroalgae and bare substrate. Summary statistics, including the average and standard deviation, should be provided for the linear coverage of each category along transects at each site.
- b) Site-level calculations for: 1) net-acreage of the seagrass species planted at the mitigation site, 2) net-acreage of any seagrass taxa, including but not limited to those that were planted at the mitigation site and 3) net-acreage of any SAV shall also be provided.

### 5.5.3 *Results for Cover-abundance Survey (Section 2.3.4)*

- a) Cover-abundance shall be reported for 1) all SAV, 2) all seagrass, 3) all rhizophytic macroalgae, 4) each seagrass species and 5) each rhizophytic macroalgae genera.
- b) Summary statistics shall include but are not limited to the average and standard deviation for the following metrics: frequency of occurrence (proportion of all quadrats that contained SAV), density (average percent cover for all quadrats sampled) and abundance (average percent cover for quadrats containing SAV) at each site.
- c) If seagrass shoots are counted, then the average density of shoots (number per m<sup>2</sup>) shall be reported separately for all species present within quadrats for each site.

### 5.5.4 *Evaluation of Success Criteria (Section 4)*

- a) The results of linear regression analyses (figures and statistical results) for each measured metric over time shall be reported for each site.
- b) Reference site data shall be presented in a manner that facilitates comparisons to the mitigation site; comparisons with the reference site shall also be made to the donor site, if one is used.

## 5.6 **Other Survey Reports**

### 5.6.1 *Reporting for Assessments of Structures*

If Assessments of Structures (AS) are required (Section 2.3.5.1), then the status (presence/ absence) and structural integrity of structures shall be described in the Annual Report (Section 5.5; Table 2). If any additional assessments are conducted (e.g., following a storm event), a Status of Structures Report shall

be submitted within 30 days of completing the assessment. Reports shall describe whether structures required repair, reinstallation or relocation and when these activities were/will be completed. Any impacts to SAV due to derelict or dislodged structures should also be reported.

#### *5.6.2 Reporting for Vessel Damage Assessments*

If Vessel Damage Assessments (VDA) are required (Section 2.3.5.2), then the permittee shall provide a description of the pre-project conditions at the mitigation site in the first Annual Report. Subsequent Annual Reports shall document the results of annual field-surveys and aerial imagery analyses. The number, size and severity of damaged areas during each annual VDA shall be compared to the pre-project baseline. Annual Reports shall also describe whether the mitigation site has achieved the success criteria for the recovery of vessel damage (Section 4.3). A geo-referenced map should be provided that illustrates changes in vessel damage over time (e.g., features color-coded by year); mapping criteria described in (Section 2.2.2.1) should be used for this purpose.

#### *5.6.3 Notification and Reporting for Potential Unauthorized Impacts*

If any unpermitted impacts to SAV resources occur or are suspected to have occurred as a result of construction activities associated with the mitigation project, the department's POC shall be notified as soon as practicable (but no later than 24 hours after the time of discovery) via email. This correspondence should include all available information on impacts and/or incident(s) that (may) have caused impacts, such as the accidental spillage of materials into surrounding SAV areas during filling of a dredge hole or blowout.

Depending upon the nature of the project and site conditions, the department may require surveys to be conducted before and after construction at the mitigation site(s) to document potential impacts to adjacent SAV resources in order to ensure compliance with Section 373.414(1)(a)2, F.S. (DEP 2020). If such surveys are required, then the results of these surveys shall be submitted with the As-built Report, unless an extension is granted in writing by the department.

### **5.7 Contingency Mitigation Plan**

A contingency mitigation plan (CMP) will be submitted if the mitigation site a) has less than 50% survival of PUs during the year 1 annual survey or b) is not within 50% of reference site percent cover or not within 50% of acreage requirement following the year 3 annual survey. The contingency

mitigation plan shall be submitted with the annual report (year 1 if triggered by condition “a” or year 3 if triggered by condition “b,” above). Additionally, if the donor site has not recovered by year 3, then the Permittees shall coordinate with the department to determine if remediation or other actions, including additional monitoring are warranted.

**Table 2. Summary of monitoring events, survey tasks (DA: desktop assessment, RECON: reconnaissance, MC: mapping and characterization, VA: visual assessment of site conditions; LI: line intercept and CA: cover-abundance; APU: assessment of planting units) and deliverables that may be required for the mitigation, reference and donor sites.**

	<b>Monitoring Event</b>	<b>Survey Tasks</b>	<b>Deliverable(s)</b>	<b>Timeline</b>
<b>Mitigation</b>	Planning and Permitting	DA, RECON, and MC	Permit Application / Mitigation Plan	Prior to completion of the application
	Upon Completion	As-built Survey	As-built Report	15 days after completion
	1-Month Post-planting <sup>1</sup>	APU <sup>1</sup>	Planting Unit Assessment Report	30 days after planting
	Annual Survey (Year 1)	VA, LI, and CA, APU <sup>2,3,4</sup>	Annual Report (Year 1) / Data	1 year after completion
	Annual Survey (Year 2)	VA, LI, and CA <sup>3</sup>	Annual Report (Year 2) / Data	2 years after completion
	Annual Survey (Year 3)	VA, LI, and CA <sup>3,4</sup>	Annual Report (Year 3) / Data	3 years after completion
	Annual Survey (Year 4)	VA, LI, and CA <sup>3</sup>	Annual Report (Year 4) / Data	4 years after completion
	Annual Survey (Year 5) <sup>5</sup>	VA, LI, and CA <sup>3</sup>	Annual Report (Year 5) / Data	5 years after completion
<b>Reference</b>	Planning and Permitting	MC	Permit Application / Mitigation Plan	Prior to completion of the application
	Baseline	VA, LI, and CA	Data	Prior to (or concurrent with) mitigation

	Annual Survey (Year 1)	VA, LI, and CA	Annual Report (Year 1) / Data	1 year after completion
	Annual Survey (Year 2)	VA, LI, and CA	Annual Report (Year 2) / Data	2 years after completion
	Annual Survey (Year 3)	VA, LI, and CA	Annual Report (Year 3) / Data	3 years after completion
	Annual Survey (Year 4)	VA, LI, and CA	Annual Report (Year 4) / Data	4 years after completion
	Annual Survey (Year 5) <sup>5</sup>	VA, LI, and CA	Annual Report (Year 5) / Data	5 years after completion
<b>Donor<sup>6</sup></b>	Planning and Permitting	MC	Permit Application / Mitigation Plan	Prior to completion of the application
	Baseline	VA and LI	Data	Prior to harvesting
	Annual Survey (Year 1)	VA and LI	Annual Report (Year 1) / Data	1 year after harvesting
	Annual Survey (Year 2) <sup>7</sup>	VA and LI	Annual Report (Year 2) / Data	2 years after harvesting
	Annual Survey (Year 3) <sup>7</sup>	VA and LI	Annual Report (Year 3) / Data	3 years after harvesting

1. An APU is not required if mitigation site is not planted/rapid natural recruitment expected. The APU shall be repeated if additional planting is done because of low PU survival.
2. An APU shall be completed during the Year 1 survey if PUs have not coalesced.
3. Assessments of Structures (AS; Section 2.3.5.1), Vessel Damage Assessments (VDA; Section 2.3.5.2), and surveys to document potential unauthorized impacts (Section 2.3.5.3) may also be required.
4. A Contingency Mitigation Plan (CMP) may also be required to be submitted (Section 5.7)
5. Additional surveys may be required if the mitigation site is trending toward success but has not yet achieved success criteria at Year 5.
6. A donor site may not be needed, if nursery-grown plants and/or natural recruitment are used instead.
7. Monitoring shall only be required until success/recovery has been documented. If the donor site has not recovered by Year 3 than additional monitoring and/or remediation may be required; quantitative data on the cover-abundance of SAV shall be collected if donor site has not recovered by Year 3.

## 6.0 LITERATURE CITED

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