APPENDIX J: MITIGATION PLANTING, MONITORING & RELATED GUIDELINES

MITIGATION PLANTING GUIDELINES, OTHER GENERAL MITIGATION GUIDELINES, MITIGATION SUCCESS CRITERIA, MITIGATION MONITORING GUIDELINES, AND MITIGATION MONITORING SCHEDULES AND RESPONSIBILITIES

MITIGATION PLANTING GUIDELINES

PLANTING GUIDELINES FOR BOTTOMLAND HARDWOOD (BLH) HABITATS

Canopy species will be planted on 9-foot centers (average) to achieve a minimum initial stand density of 538 seedlings (trees) per acre. Midstory species will be planted on 20-foot centers (average) to achieve a minimum initial stand density of 109 seedlings per acre. Stock will be at least 1 year old, at least 2 feet in height, have a minimum root collar diameter of 0.5 inch, and must be obtained from a registered licensed regional nursery/grower and of a regional eco-type species properly stored and handled to ensure viability. The plants will typically be installed during the period from December through March 15 (planting season/dormant season); however, unanticipated events such as spring flooding may delay plantings until late spring or early summer. The seedlings will be installed in a manner that avoids monotypic rows of canopy and midstory species (i.e. goal is to have spatial diversity and mixture of planted species). If herbivory may threaten seedling survival, then seedling protection devices such as wire-mesh fencing or plastic seedling protectors will be installed around each planted seedling.

Species for Wet Bottomland Hardwood Habitats (BLH-Wet Habitats)

The canopy species installed will be in general accordance with the species lists provided in Tables 1A and 1B. Plantings will be conducted such that the total number of plants installed in a given area consists of approximately 60% hard mast-producing species (Table 1A) and approximately 40% soft mast-producing species (Table 1B). The species composition of the plantings for each of the two groups of canopy species (e.g. hard mast species and soft mast species) should mimic the percent composition guidelines indicated in Tables 1A and 1B. However, site conditions (factors such as hydrologic regime, soils, composition of existing native canopy species, etc.) and planting stock availability may necessitate deviations from the species lists and/or the percent composition guidelines indicated in these tables. In general, a minimum of 3 hard mast species and a minimum of 3 soft mast species should be utilized.

The midstory species installed will be selected from the species list provided in Table 1C. Plantings will consist of at least 3 different species. The species used and the proportion of the total midstory plantings represented by each species (percent composition) will be dependent on various factors including site conditions (composition and frequency of existing native midstory species, hydrologic regime, soils, etc.) and planting stock availability.

Table 1A: Preliminary Planting List for Wet Bottomland Hardwood Habitat, Hard Mast-Producing Canopy Species (60% of Total Canopy Species)

Common Name	Scientific name	Percent Composition
Nuttall oak	*Quercus nuttalli*	30% - 40%
Willow oak	*Quercus phellos*	30% - 40%
Water oak	*Quercus nigra*	5%
Overcup oak	*Quercus lyrata*	10% - 20%
Swamp chestnut oak	*Quercus michauxii*	10% - 20%
Bitter pecan	*Carya x lecontei*	10% - 20%
Water hickory	*Carya aquatica*	10% - 20%

Table 1B: Preliminary Planting List for Wet Bottomland Hardwood Habitat, Soft Mast-Producing Canopy Species (40% of Total Canopy Species)

Common Name	Scientific name	Percent Composition
Drummond red maple	*Acer rubrum* var. *drummondii*	15% - 25%
Sugarberry	*Celtis laevigata*	15% - 25%
Green ash	*Fraxinus pennsylvanica*	15% - 25%
Sweetgum	*Liquidambar styraciflua*	10% - 20%
American elm	*Ulmus americana*	10% - 20%
Slippery elm	*Ulmus rubra*	10% - 20%
Pumpkin ash	*Fraxinus profunda*	5% - 15%
Bald cypress	*Taxodium distichum*	5% - 15%

Table 1C: Preliminary Planting List for Wet Bottomland Hardwood Habitat, Midstory Species

Common Name	Scientific name	Percent Composition
Saltbush	*Baccharis halimifolia*	TBD
Buttonbush	*Cephalanthus occidentalis*	TBD
Roughleaf dogwood	*Cornus drummondii*	TBD
Mayhaw	*Crataegus opaca*	TBD
Green hawthorn	*Crataegus viridis*	TBD
Common persimmon	*Diospyros virginiana*	TBD
Honey locust	*Gleditsia triacanthos*	TBD
Possumhaw	*Ilex decidua*	TBD
Yaupon	*Ilex vomitoria*	TBD
Red mulberry	*Morus rubra*	TBD
Wax myrtle	*Myrica cerifera*	TBD

TBD = To Be Determined

Species for Dry Bottomland Hardwood Habitats (BLH-Dry Habitats)

The canopy species installed will be in general accordance with the species lists provided in Tables 2A and 2B. Plantings will be conducted such that the total number of plants installed in a given area consists of approximately 50% hard mast-producing species (Table 2A) and approximately 50% soft mast-producing species (Table 2B). The species composition of the plantings for each of the two groups of canopy species (e.g. hard mast species and soft mast species) should mimic the percent composition guidelines indicated in Tables 2A and 2B. However, site conditions (factors such as hydrologic regime, soils, composition of existing native canopy species, etc.) and planting stock availability may necessitate deviations from the species lists and/or the percent composition guidelines indicated in these tables. In general, a minimum of 3 hard mast species and a minimum of 3 soft mast species should be utilized.

The midstory species installed will be selected from the species list provided in Table 2C. Plantings will consist of at least 3 different species. The species used and the proportion of the total midstory plantings represented by each species (percent composition) will be dependent on various factors including site conditions (composition and frequency of existing native midstory species, hydrologic regime, soils, etc.) and planting stock availability.

Table 2A: Preliminary Planting List for Dry Bottomland Hardwood Habitat, Hard Mast-Producing Canopy Species (50% of Total Canopy Species)

Common Name	Scientific name	Percent Composition
Nuttall oak	*Quercus nuttalli* or *Q. texana*	10%
Willow oak	*Quercus phellos*	10%
Water oak	*Quercus nigra*	20%
Live oak	*Quercus virginiana*	20%
Cherrybark oak	*Quercus pagoda*	5%
Sweet Pecan	*Carya illinoensis*	20%
Southern red oak	*Quercus falcata*	5%
Cow oak	*Quercus michauxii*	10%

Table 2B: Preliminary Planting List for Dry Bottomland Hardwood Habitat, Soft Mast-Producing Canopy Species (50% of Total Canopy Species)

Common Name	Scientific name	Percent Composition
Drummond red maple	*Acer rubrum* var. *drummondii*	10%
Sugarberry	*Celtis laevigata*	15%
Green ash	*Fraxinus pennsylvanica*	15%
Sweetgum	*Liquidambar styraciflua*	20%
American elm	*Ulmus americana*	10% - 20%
Common persimmon	*Diospyros virginiana*	15%
Red mulberry	*Morus rubra*	5 - 10%
American sycamore	*Platanus occidentalis*	0 - 5%
River birch	*Salix nigra*	0 - 5%
Honey locust	*Gleditsia triacanthos*	0 – 5%

Table 2C: Preliminary Planting List for Dry Bottomland Hardwood Habitat, Midstory Species

Common Name	Scientific name	Percent Composition
Roughleaf dogwood	*Cornus drummondii*	TBD
Mayhaw	*Crataegus opaca*	TBD
Green hawthorn	*Crataegus viridis*	TBD
Deciduous holly	*Ilex decidua*	TBD
Yaupon	*Ilex vomitoria*	TBD
Palmetto	*Sabal minor*	TBD
Southern wax myrtle	*Morella cerifera*	TBD
Southern magnolia	*Magnolia grandiflora*	TBD
Southern crabapple	*Malus angustifolia*	TBD
Eastern red cedar	*Juniperus virginiana* var. *virginiana*	TBD
Elderberry	*Sambucus canadensis*	TBD

TBD = To Be Determined

Deviations from Typical Planting Guidelines

Proposed mitigation features that involve restoration will commonly require planting the entire feature using the prescribed planting guidance addressed in the preceding sections. In contrast, mitigation features that

involve enhancement will often require adjustments to the typical plant spacing/density guidelines and may further require adjustments to the guidelines pertaining to species composition.

Where initial enhancement activities include the eradication of invasive and nuisance plant species, significant numbers of native canopy and/or midstory species may remain, but in a spatial distribution that leaves relatively large "gaps" in the canopy stratum and/or the midstory stratum. In such cases, areas measuring approximately 25 feet by 25 feet that are devoid of native canopy species should be planted and areas measuring approximately 45 feet by 45 feet that are devoid of native midstory species should be planted.

The initial enhancement actions involved within a particular mitigation site could include a variety measures such as the eradication of invasive and nuisance plant species, topographic alterations (excavation, filling, grading, etc.), and hydrologic enhancement actions (alterations to drainage patterns/features, installation of water control structures, etc.). These actions may result in areas of variable size that require planting of both canopy and midstory species using the typical densities/spacing described previously. There may also be areas where several native canopy and/or midstory species remain, thus potentially altering the general guidelines described as regards the spacing of plantings, and/or the species to be planted, and/or the percent composition of planted species. Similarly, areas that must be re-planted due to failure in achieving applicable mitigation success criteria may involve cases where the general guidelines discussed above will not necessarily be applicable.

Given these uncertainties, initial planting plans specific to enhancement features will be required and must be specified in the Mitigation Work Plan for the mitigation site. The initial planting plans will be developed by the USACE in cooperation with the Interagency Team. Initial plantings will be the responsibility of the USACE. If re-planting of an area is necessary following initial plantings, a specific re-planting plan must also be prepared and must be approved by the USACE in cooperation with the Interagency Team prior to re-planting. With the exception of any re-planting actions necessary to attain the initial survivorship success criteria (i.e. survival required 1 year following completion of initial plantings), the Sponsor will be responsible for preparing re-planting plans and conducting re-planting activities. Re-planting necessary to achieve the initial survivorship criteria will be the responsibility of the USACE.

PLANTING GUIDELINES FOR SWAMP HABITATS

Canopy species will be planted on 9-foot centers (average) to achieve a minimum initial stand density of 538 seedlings (trees) per acre. Midstory species will be planted on 20-foot centers (average) to achieve a minimum initial stand density of 109 seedlings per acre. Stock used for canopy species will be at least 1 year old, at least 3 feet tall, and have a root collar diameter that exceeds 0.5 inch. Stock used for midstory species will be at least 1 year old and will be at least 3 feet tall. All stock must be obtained from a registered licensed regional nursery/grower and of a regional eco-type species properly stored and handled to ensure viability. The plants will typically be installed during the period from December through March 15 (planting season/dormant season); however, unanticipated events may delay plantings until late spring or early summer. The seedlings will be installed in a manner that that avoids monotypic rows of canopy and midstory species (i.e. goal is to have spatial diversity and mixture of planted species). If herbivory may threaten seedling survival, then seedling protection devices such as wire-mesh fencing or plastic seedling protectors will be installed around each planted seedling.

The canopy species installed will be in general accordance with the species lists provided in Table 3A. The species composition of the plantings should mimic the percent composition guidelines indicated in this table. However, site conditions (factors such as hydrologic regime, soils, composition of existing native canopy species, etc.) and planting stock availability may necessitate deviations from the species lists and/or the percent composition guidelines indicated. In general, a minimum of 3 canopy species should be utilized, the plantings must include baldcypress and tupelogum (water tupelo), and baldcypress should typically comprise at least 50% of the total number of seedlings installed.

The midstory species installed will be selected from the species list provided in Table 3B. Plantings will consist of at least 2 different species. The species used and the proportion of the total midstory plantings

represented by each species (percent composition) will be dependent on various factors including site conditions (composition and frequency of existing native midstory species, hydrologic regime, soils, etc.) and planting stock availability.

Table 3A: Preliminary Planting List for Swamp Habitat, Canopy Species

Common Name	Scientific name	Percent Composition
Bald cypress	*Taxodium distichum*	60% - 75%
Tupelogum	*Nyssa aquatic*	20% - 25%
Green ash	*Fraxinus pennsylvanica*	10% - 15%
Drummond red maple	*Acer rubrum* var. *drummondii*	5%
Bitter pecan	*Carya x lecontei*	5% - 10%

Table 3B: Preliminary Planting List for Swamp Habitat, Midstory Species

Common Name	Scientific name	Percent Composition
Buttonbush	*Cephalanthus occidentalis*	TBD
Roughleaf dogwood	*Cornus drummondii*	TBD
Swamp privet	*Forestiera acuminata*	TBD
Possumhaw	*Ilex decidua*	TBD
Virginia willow	*Itea virginica*	TBD
Wax myrtle	*Myrica cerifera*	TBD
Swamp rose	*Rosa palustris*	TBD
American snowbell	*Styrax americanus*	TBD

TBD = To Be Determined

Deviations from Typical Planting Guidelines

Proposed mitigation features that involve restoration will commonly require planting the entire feature using the prescribed planting guidance addressed in the preceding sections. In contrast, mitigation features that involve enhancement will often require adjustments to the typical plant spacing/density guidelines and may further require adjustments to the guidelines pertaining to species composition.

For swamp enhancement projects that include the eradication of invasive and nuisance plant species, significant numbers of native canopy and/or midstory species may remain, but in a spatial distribution that leaves relatively large “gaps” in the canopy stratum and/or the midstory stratum. In such cases, areas measuring approximately 25 feet by 25 feet that are devoid of native canopy species should be planted and areas measuring approximately 45 feet by 45 feet that are devoid of native midstory species should be planted.

The initial enhancement actions involved within a particular swamp enhancement mitigation site could include a variety of measures such as the eradication of invasive and nuisance plant species, topographic alterations (excavation, filling, grading, etc.), and hydrologic enhancement actions (alterations to drainage patterns/features, installation of water control structures, etc.). These actions may result in areas of variable size that require planting of both canopy and midstory species using the typical densities/spacing described above. There may also be areas where several native canopy and/or midstory species remain, thus potentially altering the general guidelines described as regards the spacing of plantings, and/or the species to be planted, and/or the percent composition of planted species. Similarly, areas that must be re-planted due to failure in achieving applicable mitigation success criteria may involve cases where the general guidelines discussed above will not necessarily be applicable.

Given these uncertainties, initial planting plans specific to a mitigation site will be required and must be specified in the Mitigation Work Plan for the site. The initial planting plans will be developed by the USACE in cooperation with the Interagency Team. Initial plantings will be the responsibility of the USACE. If re-planting

of an area is necessary following initial plantings, a specific re-planting plan must also be prepared and must be approved by the USACE in cooperation with the Interagency Team prior to re-planting. With the exception of any re-planting actions necessary to attain the initial survivorship success criteria (i.e. survival required 1 year following completion of initial plantings), the Sponsor will be responsible for preparing re-planting plans and conducting re-planting activities. Re-planting necessary to achieve the initial survivorship criteria will be the responsibility of the USACE.

PLANTING GUIDELINES FOR MARSH HABITATS

Planting Guidelines for Intermediate, Brackish, and Saline Marsh Habitats

Herbaceous species will be planted on 7-foot centers (average) to achieve a minimum density of 889 plants per acre. Stock will typically be either 4-inch container size or bare-root or liner stock, depending on the species involved. The required stock size for each plant species proposed for installation must be specified in the Mitigation Work Plan. Plants must be obtained from a registered licensed regional nursery/grower and of a regional eco-type species properly stored and handled to ensure viability. Plant installation should be conducted during the period from March 15 through June 15. Planting should not be undertaken later than approximately July 15, although planting during the early fall may be deemed acceptable on a case-by-case basis.

Species installed in proposed intermediate marsh habitats will be selected from the species list provided in Table 4. Plantings will consist of at least 2 different species. The species used and the proportion of the total plantings represented by each species will be dependent on various factors including site conditions and planting stock availability.

Table 4: Preliminary Planting List for Intermediate Marsh Habitats

Common Name	Scientific Name
California bulrush	*Schoenoplectus californicus*
Black needle rush	*Juncus roemerianus*
Giant cutgrass	*Zizaniopsis miliacea*
Marsh-hay cordgrass	*Spartina patens*
Maidencane	*Panicum hemitomon*
Common threesquare	*Shoenoplectus americanus*
Big cordgrass	*Spartina cynosuroides*
Seashore paspalum	*Paspalum vaginatum*

Species installed in proposed brackish and saline marsh habitats will be selected from the species list provided in Table 5. Plantings will consist of at least 2 different species. The species used and the proportion of the total plantings represented by each species will be dependent on various factors including site conditions and planting stock availability.

Table 5: Preliminary Planting List for Brackish and Saline Marsh Habitats

Common Name	Scientific Name
Marsh-hay cordgrass	*Spartina patens*
Black needle rush	*Juncus roemerianus*
Smooth cordgrass	*Spartina alterniflora*
Saltmarsh bulrush	*Schoenoplectus robustus*
Salt grass	*Distchilis spicata*

Planting Guidelines for Fresh Marsh Habitats

Planting of fresh marsh habitats is not proposed since it is anticipated that desirable fresh marsh vegetation would rapidly colonize such habitats through natural recruitment. Should the initial vegetation success criteria for such features not be achieved however, supplemental planting of herbaceous species would be conducted to help insure the establishment of sufficient vegetative cover. Stock will typically be either 4-inch container size or bare-root or liner stock, depending on the species involved. The required stock size for each plant species proposed for installation must be specified in the Mitigation Work Plan. Plants must be obtained from a registered licensed regional nursery/grower and of a regional eco-type species properly stored and handled to ensure viability. Plant installation should be conducted during the period from March 15 through June 15. Planting should not be undertaken later than approximately July 15, although planting during the early fall may be deemed acceptable on a case-by-case basis.

The plant species to be installed would be determined based on field inspections of the mitigation site as would the planting plan (e.g. location of supplemental plantings and density of such plantings). Potential species to be installed could include such plants as maidencane, giant cutgrass, arrowheads (*Sagittaria* spp.), pickerelweed (*Pontederia cordata*), arrow arum (*Peltandra virginica*), smartweed (*Polygonum* spp.), common rush (*Juncus effusus*), pennyworts (*Hydrocotyle* spp.), and spikerush (*Eleocharis* spp.), although other species could be utilized. Typically at least two different species would be utilized.

Deviations from Typical Planting Guidelines

Initial planting plans specific to an intermediate, brackish or saline marsh mitigation site will be required and must be specified in the Mitigation Work Plan for the site. The initial planting plans will be developed by the USACE in cooperation with the Interagency Team. Initial plantings will be the responsibility of the USACE. If re-planting of an area is necessary following initial plantings, a specific re-planting plan must also be prepared and must be approved by the USACE in cooperation with the Interagency Team prior to re-planting.

It may be determined that the initial planting of brackish or saline marsh features would best be conducted in phases. Using this approach, a certain percentage of the total number of plants required would be installed in the year that final marsh construction activities are completed while the remainder would be installed in the following year. The determination of whether to use phased planting or to install all the necessary plants upon completion of construction activities will be made during the final design phase of the mitigation project. The proposed planting scheme would be subject to review and approval by the Interagency Team.

As previously discussed, planting of fresh marsh features could be necessary if the initial vegetative cover goal is not achieved. Re-planting of intermediate marsh features and/or brackish and saline marsh features could also be required if the initial plant survivorship goal is not attained or if initial vegetative cover goals are not achieved. In such cases, re-planting or supplemental planting of such mitigation features would be the responsibility of the USACE. Once the initial success criteria are achieved, the Sponsor will be responsible for conducting any re-planting activities necessary to achieve success. All re-planting plans will be subject to review and approval by the USACE and Interagency Team prior to plant installation. These plans may deviate from the general planting guidelines as regards the density of plantings, the species utilized, or the plant stock size in an effort to rapidly establish appropriate vegetative cover.

ADDITIONAL MITIGATION GUIDELINES

GUIDELINES FOR THE ERADICATION AND CONTROL OF INVASIVE AND NUISANCE PLANT SPECIES

The eradication of invasive and nuisance plant species may incorporate a variety of eradication methods including mechanized removal (ex. hydroaxes, gyro-tracs, heavy machinery used in areas slated for topographic alterations), non-mechanized removal (use of hand implements such as chain saws and machetes, direct uprooting by hand), aerial herbicide applications (applications using aircraft), and ground herbicide applications (on-the-ground applications using backpack sprayers, wick applicators, etc.). Only

ground herbicide applications would be used in marsh habitats. Regardless of the methods involved, care will be exercised to avoid damage to desirable native species to the greatest extent practicable.

During the initial eradication process in forested habitats, larger quantities of felled materials may be removed from the mitigation site and disposed in a duly-licensed facility. Some felled woody plants may be chipped on-site with the chips spread in a layer not exceeding approximately 3 to 4 inches thick. Felled woody plants may also be gathered and stacked "teepee" style in scattered locations. In certain cases, larger invasive trees may be killed and allowed to remain standing if it is determined this would not interfere with mitigation goals. The Mitigation Work Plan must address the specific measures proposed to conduct initial eradication efforts, including handling of vegetative debris, and the recommended measures for the subsequent control of invasive and nuisance plant species.

The USACE will be responsible for the initial eradication of invasive and nuisance plants as well as for any subsequent eradication efforts until such time that the mitigation project is transferred to the Sponsor. Thereafter, the Sponsor will be responsible for the successful control and eradication of invasive and nuisance plant species. The management objectives will be to maintain the mitigation site such that it is essentially free from invasive and nuisance plant species immediately following a given maintenance event and such that the total vegetative cover accounted for by invasive and nuisance species each constitute less than 5% of the total plant cover during periods between maintenance events.

GUIDELINES FOR CLEARING, GRADING, AND OTHER EARTHWORK ACTIVITIES

Enhancement or restoration activities in certain mitigation areas where the proposed habitat is BLH or swamp may include alterations to existing topography. This includes an array of potential actions such as lowering grades over relatively large areas, breaching or removal of existing berms and spoil banks, filling of drainage canals and ditches, construction of containment berms, etc. The construction process could involve mechanized clearing and grubbing of the areas to be graded followed by the actual grading work.

Prior to the clearing, grubbing, grading, and related earthwork activities, the exact limits of zones requiring clearing and grading/earthwork will be determined in the field and will be marked with protective barriers such as flagging, ropes, stakes, silt fence, enviro-fence, or a combination of such items. These marker barriers will remain in place until grading activities are completed. Prior to initiation of the clearing and grading/earthwork activities, silt fences will also be installed at appropriate locations adjacent to existing wetlands to control erosion and sediment transport. These erosion/sediment control devices will remain in place until earthwork activities are completed and the disturbed areas are stabilized. Machinery/vehicle ingress and egress routes to the areas requiring earthwork will be restricted to avoid unnecessary damage to nearby upland and wetland areas.

Cleared vegetation will be removed from the mitigation site for disposal either within a duly licensed off-site disposal facility, or will be burned on-site if practicable. Soil removed during the grading/earthwork process will either be disposed off-site in a licensed facility or used within the mitigation site as fill if the material is suitable and fill is needed. All other debris generated during the clearing and grading process will be disposed in a duly-licensed off-site facility.

If grading or other earthwork activities are necessary, the Mitigation Work Plan must include detailed plans depicting the required activities (ex. grading contours, cross-sections, stormwater pollution prevention plans, etc.). These plans will be developed by the USACE in coordination with the Interagency Team. The USACE will be responsible for the successful completion of all initial earthwork activities. The Sponsor will be responsible for any subsequent earthwork activities necessary for the proper maintenance of the mitigation site. However if the primary purpose of the initial grading/earthwork activities is to enhance site hydrology, then the USACE will be responsible for conducting any additional grading/earthwork activities necessary to ensure the hydrologic enhancement objectives (success criteria) are achieved. Once it is demonstrated that these objectives have been satisfied, the Sponsor will then be responsible for any further earthwork activities needed to ensure proper maintenance.

The construction of all proposed marsh habitats (fresh, intermediate, brackish and saline marshes) and the construction of some BLH restoration and swamp restoration features will be achieved by adding fill to existing open water areas. The Mitigation Work Plan for such construction must include a detailed Stormwater Pollution Prevention Plan that minimizes potential impacts to adjacent natural habitats and minimizes degradation of water quality in off-site areas. The USACE will be responsible for preparation of this plan and for the successful completion of all initial construction activities. Once the applicable topographic success criteria have been achieved, the Sponsor will thereafter be responsible for any topographic alterations necessary to achieve mitigation success.

GUIDELINES FOR SURFACE WATER MANAGEMENT FEATURES AND STRUCTURES

Enhancement or restoration efforts in some mitigation areas may include construction of surface water management systems and/or installation of water conveyance or water control structures (ex. drainage culverts, flap gates, weirs). If such actions are necessary, the Mitigation Work Plan must include detailed plans for these activities as well as operational specifications if applicable. These plans and specifications will be developed by the USACE in coordination with the Interagency Team. The USACE will be responsible for the successful construction of any surface water management features, drainage structures, and water control structures. The Sponsor will be responsible for the subsequent maintenance and operation activities required.

It is noted that there is a strong preference for mitigation sites that are self-sustaining from a hydrologic perspective. While active water management might be needed in the short-term for establishment of plantings or other reasons, sites that require active hydrologic management to achieve long-term success should generally be avoided.

SWAMP HYDROLOGY GUIDELINES

The optimal hydrologic regime for baldcypress/tupelogum swamps involves both seasonal flooding and good surface water exchange between a particular swamp and adjacent systems. The typical hydroperiod should include several periods of flooding (inundation) and drawdown, or a “pulsing” hydrology. Surface water should be present for extended periods, especially during portions of the growing season, but should be absent (water table at or below the soil surface) by the end of the growing season in most years. At a minimum, standing surface water should be absent for approximately 2 months during the growing season once every 5 years. Abundant and consistent freshwater input from riverine systems is most desirable, as is relatively consistent surface water flow through the swamp during flooded periods. However, other sources of sheetflow into the swamp can be similarly beneficial. The main objective is to have sufficient surface water exchange between the swamp and adjacent habitats. Situations involving permanent flooding and/or no surface water exchange should be avoided when possible.

The following provides some general hydrologic guidelines for mitigation projects involving swamp restoration and for those mitigation projects involving swamp enhancement where enhancement of the existing hydrologic regime is a component of the mitigation work program. It is emphasized that these are merely guidelines and the attainment of one or more of these guidelines may not be possible in some situations.

- Strive for a minimum of about 200 consecutive days but no more than roughly 300 consecutive days of inundation (flooding). This period of inundation should overlap a portion of the growing season (preferably the early portion or late portion).
- Strive for a minimum of roughly 40 to 60 consecutive days during the growing season where the water table is at or below the soil surface (i.e. non-inundated period). This non-inundated period should preferably occur during the middle portion of the growing season. The non-inundated period should not exceed approximately 90 to 120 days.
- Strive to achieve an average maximum (peak) water table elevation that ranges between approximately 1.0 feet to 2.0 feet above the soil surface (i.e. depth of average peak inundation is 1.0 to 2.0 feet). Water table elevations greater than 2 feet above the soil surface may occur, however such occurrences should be of relatively short duration (i.e. brief “spikes” in the depth of inundation).

- Locate the mitigation area such that it naturally receives freshwater inputs via surface flow from adjacent lands and such that, during periods of inundation, there is good sheet flow through the mitigation area including a means for surface water discharge from the mitigation area. If the mitigation area cannot be located to attain these goals naturally, then mitigation activities should include actions to achieve these goals to the greatest degree practicable (e.g. include measures to provide for good surface water exchange between the swamp and adjacent systems), while at the same time not jeopardizing hydrology objectives pertaining to the swamp's hydroperiod.

WET BOTTOMLAND HARDWOOD HYDROLOGY GUIDELINES

The optimal hydrologic regime for wet bottomland hardwood (BLH) forests also involves both brief seasonal flooding and sufficient surface water exchange between the forest and adjacent systems. Wet BLH forests (BLH-Wet habitats) are commonly flooded for some portion of the year, although the timing, extent, depth, duration, and source of floodwaters can be highly variable. The hydroperiod commonly includes temporary flooding for brief periods during the growing season; however the water table is typically below the soil surface for the majority of the growing season. When flooding (inundation) does occur, freshwater input from riverine systems is most desirable as is relatively consistent surface water flow through the forest. Having good surface water exchange between the BLH forest and adjacent habitats is the primary objective, thus other sources of sheetflow into the forest besides riverine sources can be similarly beneficial.

The following provides some general hydrologic guidelines for mitigation projects involving BLH-Wet habitat restoration and for those mitigation projects involving BLH-Wet habitat enhancement where enhancement of the existing hydrologic regime is a component of the mitigation work program. These are simply guidelines and the attainment of one or more of these guidelines may not be possible in some situations.

- Avoid extended periods of inundation, particularly during the early portion of the growing season. Brief periods of flooding typically should occur during the winter and early spring, but the water table should be greater than 1 foot below the soil surface for an extended period during the growing season.
- The hydroperiod should be such that the forest is irregularly inundated or soils are saturated to the soil surface for a period ranging from approximately 15 to 30 days during the growing season.
- Locate the mitigation area such that it naturally receives occasional freshwater inputs via surface flow from adjacent lands and such that, during periods of inundation, there is good sheet flow through the mitigation area including a means for surface water discharge from the mitigation area. If the mitigation area cannot be located to attain these goals naturally, then mitigation activities should include actions to achieve these goals to the greatest degree practicable (e.g. include measures to provide for good surface water exchange between the BLH forest and adjacent systems), while at the same time not jeopardizing hydrology objectives pertaining to the forest's hydroperiod.

MITIGATION SUCCESS CRITERIA AND MITIGATION MONITORING: BOTTOMLAND HARDWOOD MITIGATION FEATURES (BLH-Wet and BLH-Dry)

MITIGATION SUCCESS CRITERIA

The success (performance) criteria described herein are applicable to both proposed BLH-Wet habitats and BLH-Dry habitats, unless otherwise indicated.

1. General Construction

A. As applicable, complete all necessary initial earthwork and related construction activities in Mitigation TY1 (2020). The necessary activities will vary with the mitigation site. Examples include, but are not limited to: clearing, grubbing, and grading activities; construction of new water management features (weirs, flap-gates, diversion ditches, etc.); modifications/alterations to existing water control structures and surface water management systems; construction of perimeter containment dikes and installation of fill (dredged sediments or other soil).

B. For mitigation features established in existing open water areas, complete all final construction activities in Mitigation TY2 (2021). The necessary activities will vary with the mitigation site. Examples include, but are not limited to: degrading or "gapping" of perimeter retention dikes; construction of water management structures (weirs, etc.).

2. Native Vegetation

A. Complete initial planting of canopy and midstory species.

B. 1 Year Following Completion of Initial Plantings (at end of first growing season following plantings) –
- Achieve a minimum average survival of 50% of planted canopy species (i.e. achieve a minimum average canopy species density of 269 seedlings/ac.). The surviving plants must approximate the species composition and the species percentages specified in the initial plantings component of the Mitigation Work Plan. These criteria will apply to the initial plantings as well as any subsequent replantings necessary to achieve this initial success requirement.
- Achieve a minimum average survival of 85% of planted midstory species (i.e. achieve a minimum average midstory species density of 93 seedlings/ac.). The surviving plants must approximate the species composition percentages specified in the initial plantings component of the Mitigation Work Plan. These criteria will apply to the initial plantings as well as any subsequent replantings necessary to achieve this initial success requirement.

C. 4 Years Following Completion of Initial Plantings –
- Achieve a minimum average density of 300 living native canopy species per acre (planted trees and/or naturally recruited native canopy species).
- Achieve a minimum average density of 120 living, native, hard mast-producing species in the canopy stratum but no more than approximately 150 living hard-mast producing species in the canopy stratum (planted trees and/or naturally recruited native canopy species). The remaining trees in the canopy stratum must be comprised of soft-mass producing native species. These criteria will thereafter remain in effect for the duration of the overall monitoring period. Modifications to these criteria could be necessary for reasons such as avoidance of tree thinning if thinning is not warranted and the long-term effects of sea level rise on tree survival. Proposed modifications must first be approved by the USACE in coordination with the Interagency Team.
- Achieve a minimum average density of 85 living native midstory species per acre (planted midstory and/or naturally recruited native midstory species).
- For BLH-Wet habitats only -- Demonstrate that vegetation satisfies USACE hydrophytic vegetation criteria. This criterion will thereafter remain in effect for the duration of the overall monitoring period.

D. Within 10 Years Following Completion of Initial Plantings –
- Attain a minimum average cover of 80% by planted canopy species and/or naturally recruited native canopy species. This criterion will thereafter remain in effect for the duration of the overall monitoring period.

E. 15 Years Following Completion of Initial Plantings –
- Achieve a minimum average density of 75 living native plants per acre in the midstory stratum (planted midstory and/or naturally recruited native midstory species).

F. 25 Years Following Completion of Initial Plantings –
- Average cover by native species in the midstory stratum must be greater than 20% but cannot exceed 50%. This criterion will thereafter remain in effect for the duration of the overall monitoring period.
- Average cover by native species in the understory stratum must be greater than 30% but cannot exceed 60%. This criterion will thereafter remain in effect for the duration of the overall monitoring period.

Note: The requirement that the above criteria remain in effect following attainment of initial success may need to be modified later due to factors such as the effect of sea level rise on vegetative cover. Proposed modifications must first be approved by the USACE in coordination with the Interagency Team.

3. Invasive and Nuisance Vegetation

A. Complete the initial eradication of invasive and nuisance plant species.

B. Maintain all areas such that they are essentially free from invasive and nuisance plant species immediately following a given maintenance event and such that the total vegetative cover accounted for by invasive and nuisance species each constitute less than 5% of the total plant cover during periods between maintenance events. Note -These criteria must be satisfied throughout the duration of the overall monitoring period.

4. Topography

A. For mitigation features requiring earthwork to attain desired grades (excluding areas restored from existing open water features – Following completion of initial construction activities (anticipated in TY1, 2020), demonstrate that at least 80% of the total graded area within each feature is within approximately 0.5 feet of the proposed target soil surface elevation (e.g. the desired soil surface elevation).

B. For mitigation features restored from existing open water areas – (a) In the year that final construction activities are completed (anticipated in TY2, 2021), demonstrate that at least 80% of the total graded area within each feature is within approximately 0.5 feet of the proposed target soil surface elevation (e.g. the desired soil surface elevation), and; (b) In the year after final construction activities are completed, demonstrate that at least 85% of the total graded area within each feature is within approximately 0.5 feet of the proposed target soil surface elevation

5. Thinning of Native Vegetation (Timber Management)

The USACE, in cooperation with the Interagency Team, may determine that thinning of the canopy and/or midstory strata is warranted to maintain or enhance the ecological value of the site. This determination will be made approximately 15 to 20 years following completion of initial plantings. If it is decided that timber management efforts are necessary, the Sponsor will develop a Timber Stand Improvement/Timber Management Plan in coordination with the USACE and Interagency Team. Following approval of the plan, the Sponsor will perform the necessary thinning operations and demonstrate these operations have been successfully completed. Timber management activities will only be allowed for the purposes of ecological enhancement of the mitigation site.

6. Hydrology (applicable to BLH-Wet habitats only)

A. In a year having essentially normal rainfall, demonstrate that the water table is less than or equal to 12 inches below the soil surface for a period of at least 14 consecutive days.

B. If the mitigation program includes actions intended to enhance site hydrology or hydroperiod, demonstrate that the affected site is irregularly inundated or soils are saturated to the soil surface for a period ranging from 7% to approximately 13% of the growing season during a year having essentially normal rainfall. The Mitigation Work Plan for a specific site may establish more specific hydrologic enhancement goals. If this is the case, demonstrate attainment of the specific goals identified in the plan.

MITIGATION MONITORING GUIDELINES

The following guidelines for mitigation monitoring and reporting are applicable to both BLH-Wet and BLH-Dry habitats unless otherwise indicated.

"Time Zero" Monitoring Report

Shortly after completion of all initial mitigation activities (e.g. initial eradication of invasive and nuisance plants, first/initial planting of native species, completion of initial earthwork, grading, surface water management

system alterations/construction, etc.), the mitigation site will be monitored and a “time zero” or “baseline” monitoring report prepared. Information provided will include the following items:

- A detailed discussion of all mitigation activities completed.

- A description of the various features and habitats within the mitigation site.

- A plan view drawing of the mitigation site showing the approximate boundaries of different mitigation features (ex. planted areas, areas only involving eradication of invasive and nuisance plant species; surface water management features, etc.), monitoring transect locations, sampling plot locations, photo station locations, and, if applicable, piezometer and staff gage locations.

- An as-built survey of finished grades for any relatively large areas subject to topographic alterations and an as-built survey of any surface water drainage features, drainage culverts, and/or water control structures constructed. Detailed surveys of topographic alterations simply involving the removal of existing linear features such as berms/spoil banks, or involving the filling of existing linear ditches or canals, will not be required. However, the as-built survey will include spot cross-sections of such features sufficient to represent typical conditions. The as-built survey must include a survey of areas where existing berms, spoil banks, or levees have been breached in sporadic locations. For mitigation areas involving habitat restoration in existing open water areas, the as-built survey must include a topographic survey of the entire restoration feature.

- A detailed inventory of all canopy and midstory species planted, including the number of each species planted and the stock size planted. In addition, provide a breakdown itemization indicating the number of each species planted in a particular portion of the mitigation site and correlate this itemization to the various areas depicted on the plan view drawing of the mitigation site.

Additional Monitoring Reports

All monitoring reports generated after the initial “time zero” report will provide the following information unless otherwise noted:

- A plan view drawing of the mitigation site showing the approximate boundaries of different mitigation features (ex. planted areas, areas only involving eradication of invasive and nuisance plant species; surface water management features, etc.), monitoring transect locations, sampling plot locations, photo station locations, and, if applicable, piezometer and staff gage locations.

- A brief description of maintenance and/or management and/or mitigation work performed since the previous monitoring report along with a discussion of any other significant occurrences.

- Photographs documenting conditions in the mitigation site at the time of monitoring. Photos will be taken at permanent photo stations within the mitigation site. At least two photos will be taken at each station with the view of each photo always oriented in the same general direction from one monitoring event to the next. The number of photo stations required as well as the locations of these stations will vary depending on the mitigation site. The USACE will make this determination in coordination with the Interagency Team and will specify the requirements in the Mitigation Monitoring Plan. For mitigation features involving habitat enhancement rather than restoration, the permanent photo stations will primarily be established in areas slated for planting of canopy and midstory species, but some may also be located in areas where plantings are not needed.

- Quantitative plant data collected from permanent monitoring plots measuring approximately 90 feet X 90 feet in size or from circular plots having a radius of approximately 53 feet. Data recorded in each plot will include: number of living planted canopy species present and the species composition; number of living planted midstory species present and the species composition; average density of all native species in the canopy stratum, the total number of each species present, and the wetland indicator

status of each species; average cover by native species in the canopy stratum; average density of all native species in the midstory stratum, the total number of each species present, and the wetland indicator status of each species; average cover by native species in the midstory stratum; average percent cover accounted for by invasive plant species (all vegetative strata combined); average percent cover accounted for by nuisance plant species (all vegetative strata combined). The permanent monitoring plots will be located within mitigation areas where initial planting of canopy and midstory species is necessary. The number of plots required as well as the locations of these plots will vary depending on the mitigation site. The USACE will make this determination in coordination with the Interagency Team and will specify the requirements in the Mitigation Monitoring Plan. Typically there will be at least one monitoring plot for every 20 acres planted.

- Quantitative plant data collected from either: (1) permanent transects sampled using the point-centered quarter method with a minimum of 20 sampling points established along the course of each transect, or; (2) permanent belt transects approximately 50 feet wide. The number of transects necessary as well as the location and length of each transect will vary depending on the mitigation site. The USACE will make this determination in coordination with the Interagency Team and will specify the requirements in the Mitigation Monitoring Plan. Data recorded from the sampling transects will include: average density of living planted canopy species present and the species composition; average density of living planted midstory species present and the species composition; average density of all native species in the canopy stratum along with the species composition and the wetland indicator status of each species; average percent cover by all native species in the canopy stratum; average height of native species in the canopy stratum; average density of native species in the midstory stratum, the total number of each species present, and the wetland indicator status of each species; average percent cover by native species in the midstory stratum; average height of native species in the midstory stratum; if present, average percent cover accounted for by invasive and nuisance species present in the canopy and midstory strata (combined).

- Quantitative data concerning plants in the understory (ground cover) stratum and concerning invasive and nuisance plant species will be gathered from sampling quadrats. These sampling quadrats will be established either along the axis of the belt transects discussed above, or at sampling points established along point-centered quarter transects discussed above, depending on which sampling method is used. Each sampling quadrat will be approximately 2 meters X 2 meters in size. The total number of sampling quadrats needed along each sampling transect will be determined by the USACE with the Interagency Team and will be specified in the Mitigation Monitoring Plan. Data recorded from the sampling quadrats will include: average percent cover by native subcanopy species; composition of native subcanopy species and the wetland indicator status of each species; average percent cover by invasive plant species; average percent cover by nuisance plant species.

- For BLH-Wet habitats only -- A summary of rainfall data collected during the year preceding the monitoring report based on rainfall data recorded at a station located on or in close proximity to the mitigation site. Once all hydrology success criteria have been achieved, collection and reporting of rainfall data will no longer be required.

- For BLH-Wet habitats only -- A summary of water table elevation data collected from piezometers coupled with staff gages installed within the mitigation site. Data (water table elevations) will be collected at least bi-weekly. Once the monitoring indicates the water table may be rising to an elevation that would meet hydrologic success criteria, water table elevations will be collected on a daily basis until it is evident the success criteria has been satisfied. The schedule of water table elevation readings can shift back to a bi-weekly basis for the remainder of the monitoring period. The number of piezometers and staff gages required as well as the locations of these devices will vary depending on the mitigation site. The USACE will make this determination in coordination with the Interagency Team and will specify the requirements in the Mitigation Monitoring Plan. Once hydrology success criteria have been satisfied, water table monitoring will no longer be required. However, monitoring reports generated subsequent to the attainment of success criteria will include a general discussion of water levels and hydroperiod based on qualitative observations.

- Various qualitative observations will be made in the mitigation site to help assess the status and success of mitigation and maintenance activities. These observations will include: general estimates of the average percent cover by native plant species in the canopy, midstory, and understory strata; general estimate of the average percent cover by invasive and nuisance plant species; general estimates concerning the growth of planted canopy and midstory species; general observations concerning the colonization by volunteer native plant species. General observations made during the course of monitoring will also address potential problem zones, general condition of native vegetation, trends in the composition of the plant communities, wildlife utilization as observed during monitoring, and other pertinent factors.

- For mitigation features restored from existing open water areas, provide an as-built topographic survey of all such mitigation features in the year immediately following the "time zero" monitoring event. No additional topographic surveys will typically be required following this second survey. However if the second survey indicates topographic success criteria have not been achieved and supplemental topographic alterations are necessary, then another topographic survey may be required following completion of the supplemental alterations. This determination will be made by USACE in coordination with the Interagency Team.

- Rectified aerial photographs of all mitigation features. This aerial photography will only be provided in the following monitoring reports: (a) The monitoring report prepared for monitoring conducted in the year immediately preceding the year the mitigation project is transferred to the Sponsor; (b) The monitoring report prepared for monitoring conducted approximately 15 years following completion of initial plantings.

- A summary assessment of all data and observations along with recommendations as to actions necessary to help meet mitigation and management/maintenance goals and mitigation success criteria.

- A brief description of anticipated maintenance/management work to be conducted during the period from the current monitoring report to the next monitoring report.

Monitoring Reports Involving Timber Management Activities

In cases where timber management activities (thinning of trees and/or shrubs in the canopy and/or midstory strata) have been approved by the USACE in coordination with the Interagency Team, monitoring will be required in the year immediately preceding and in the year following completion of the timber management activities (i.e. pre-timber management and post-timber management reports). These reports must include data and information that are in addition to the typical monitoring requirements. The Sponsor's proposed Timber Stand Improvement/Timber Management Plan must include the proposed monitoring data and information that will be included in the pre-timber management and post-timber management monitoring reports. The proposed monitoring plan must be approved by the USACE in coordination with the Interagency Team prior to the monitoring events and implementation of the timber management activities.

Monitoring Reports Following Re-Planting Activities

Re-planting of certain areas within the mitigation site may be necessary to ensure attainment of applicable native vegetation success criteria. Any monitoring report submitted following completion of a re-planting event must include an inventory of the number of each species planted and the stock size used. It must also include a depiction of the areas re-planted, cross-referenced to a listing of the species and number of each species planted in each area.

MITIGATION MONITORING SCHEDULE AND RESPONSIBILITIES

Monitoring will typically take place in late summer of the year of monitoring, but may be delayed until later in the growing season due to site conditions or other unforeseen circumstances. Monitoring reports will be

submitted by December 31 of each year of monitoring. Monitoring reports will be provided to the USACE, the Sponsor, and the agencies comprising the Interagency Team.

The USACE will be responsible for conducting the monitoring events and preparing the associated monitoring reports until such time that the following mitigation success criteria are achieved (criteria follow numbering system used in success criteria section):

1. General Construction – 1.A or 1.B, as applicable.
2. Native Vegetation – A and B.
3. Invasive & Nuisance Vegetation – A, plus B until such time as project is transferred to the Sponsor.
4. Topography – A, as applicable, or B, as applicable.

Monitoring events associated with the above will include the "time zero" (first or baseline) monitoring event plus annual monitoring events thereafter until the mitigation project is transferred to the Sponsor. The years applicable to these monitoring events will vary depending on the type of mitigation involved (restoration or enhancement) and site conditions present at the time mitigation activities are initiated. For example, the first monitoring event may occur in 2022 (TY2) for certain mitigation sites while this event may not occur until 2023 (TY3) for other mitigation sites.

The Sponsor will be responsible for conducting the required monitoring events and preparing the associated monitoring reports after the USACE has demonstrated the mitigation success criteria listed above have been achieved. The overall responsibility for management, maintenance, and monitoring of the mitigation will be transferred to the Sponsor during the first quarter of the year immediately following submittal of the monitoring report that demonstrates attainment of said criteria.

Once monitoring responsibilities have been transferred to the Sponsor, the next monitoring event will take place during the year that attainment of success criterion 2.C (native vegetation criterion applicable 4 years after completion of initial plantings) must be demonstrated. Thereafter, monitoring will be conducted every 5 years throughout the life or the mitigation project (based on 50-year project life beginning in 2019 (TY0) and ending in 2069 (TY50).

If the initial survival criteria for planted canopy and midstory species are not achieved (i.e. the 1-year survival criteria specified in success criteria 2.B), a monitoring report will be required for each consecutive year until two annual sequential reports indicate that all survival criteria have been satisfied (i.e. that corrective actions were successful). The USACE will be responsible for conducting this additional monitoring and preparing the monitoring reports. The USACE will also be responsible for the purchase and installation of supplemental plants needed to attain these success criteria.

If the native vegetation success criteria specified for 4 years following completion of initial plantings are not achieved (i.e. success criteria 2.C) , a monitoring report will be required for each consecutive year until two annual sequential reports indicate that these criteria have been satisfied. The Sponsor will be responsible for conducting this additional monitoring and preparing the monitoring reports. The Sponsor will also be responsible for the purchase and installation of supplemental plants needed to attain these success criteria.

If timber management activities conducted in the mitigation features by the Sponsor, the Sponsor will be responsible for conducting the additional monitoring and preparing the associated monitoring reports necessary for such activities (e.g. one monitoring event and report in the year immediately preceding timber management activities and one monitoring event and report in the year that timber management activities are completed).

The year in which mitigation features are first planted, a key milestone triggering the start of mitigation monitoring, may vary depending on the type of mitigation involved and the mitigation construction activities involved. In certain cases, it is also possible that the BLH mitigation features may be established along with other mitigation features like swamp or marsh habitats at the same mitigation site. Such factors make it necessary to develop a reasonable and efficient monitoring schedule at the time final mitigation plans are generated. This schedule must be in general accordance with the guidance provided above and will be prepared by the USACE in coordination with the Interagency Team and the Sponsor.

Once monitoring responsibilities have transferred to the Sponsor, the Sponsor will retain the ability to modify the monitoring plan and the monitoring schedule should this become necessary due to unforeseen events or to improve the information provided through monitoring. Twenty years following completion of initial plantings, the number of monitoring plots and/or monitoring transects that must be sampled during monitoring events may be reduced substantially if it is clear that mitigation success is proceeding as anticipated. Any significant modifications to the monitoring plan or the monitoring schedule must first be approved by the USACE in coordination with the Interagency Team.

MITIGATION SUCCESS CRITERIA AND MITIGATION MONITORING: SWAMP MITIGATION FEATURES

MITIGATION SUCCESS CRITERIA

The success criteria specified herein apply to both swamp restoration projects and swamp enhancement projects unless otherwise indicated.

1. General Construction

A. As applicable, complete all necessary initial earthwork and related construction activities in Mitigation TY1 (2020). The necessary activities will vary with the mitigation site. Examples include, but are not limited to: clearing, grubbing, and grading activities; construction of new water management features (weirs, flap-gates, diversion ditches, etc.); modifications/alterations to existing water control structures and surface water management systems; construction of perimeter containment dikes and installation of fill (dredged sediments or other soil).

B. For mitigation features established in existing open water areas, complete all final construction activities in Mitigation TY2 (2021). The necessary activities will vary with the mitigation site. Examples include, but are not limited to: degrading or "gapping" of perimeter retention dikes; construction of water management structures (weirs, etc.).

2. Native Vegetation

A. Complete initial planting of canopy and midstory species.

B. 1 Year Following Completion of Initial Plantings (at end of first growing season following plantings) –
- Achieve a minimum average survival of 50% of planted canopy species (i.e. achieve a minimum average canopy species density of 269 seedlings/ac.). The surviving plants must approximate the species composition and the species percentages specified in the initial plantings component of the Mitigation Work Plan. These criteria will apply to the initial plantings as well as any subsequent replantings necessary to achieve this initial success requirement.
- Achieve a minimum average survival of 85% of planted midstory species (i.e. achieve a minimum average midstory species density of 93 seedlings/ac.). The surviving plants must approximate the species composition percentages specified in the initial plantings component of the Mitigation Work Plan. These criteria will apply to the initial plantings as well as any subsequent replantings necessary to achieve this initial success requirement.

C. 4 Years Following Completion of Initial Plantings –
- Achieve a minimum average density of 250 living native canopy species per acre (planted trees and/or naturally recruited native canopy species).
- Achieve a minimum average density of 125 living baldcypress trees (planted trees and/or naturally recruited native canopy species). The species composition of the additional native canopy species present must be generally consistent with the planted ratios for such species.
- Achieve a minimum average density of 85 living native midstory species per acre (planted midstory and/or naturally recruited native midstory species).

- Demonstrate that vegetation satisfies USACE hydrophytic vegetation criteria. This criterion will thereafter remain in effect for the duration of the overall monitoring period.

D. Within 15 Years Following Completion of Initial Plantings –
- Achieve one of the two following vegetative cover requirements:
  1. The average percent cover by native species in the canopy stratum is at least 50%, and; the average percent cover by native species in the midstory stratum exceeds 33%, and; the average percent cover by native species in the ground cover stratum (herbaceous cover) exceeds 33%.
  2. The average percent cover by native species in the canopy stratum is at least 75%, and: (a) the average percent cover by native species in the midstory stratum exceeds 33%, or; (b) the average percent cover by native species in the ground cover stratum (herbaceous cover) exceeds 33%.

E. Within 45 Years Following Completion of Initial Plantings –
- Demonstrate that the average diameter at breast height (DBH) of living baldcypress trees exceeds 10 inches. This criterion will thereafter remain in effect for the duration of the overall monitoring period.
- Demonstrate that the average DBH of the other living native trees in the canopy stratum (trees other than baldcypress) exceeds 12 inches. This criterion will thereafter remain in effect for the duration of the overall monitoring period.
- Demonstrate that the average total basal area accounted for by all living native trees in the canopy stratum combined exceeds approximately 161 square feet per acre. This criterion will thereafter remain in effect for the duration of the overall monitoring period.

F. 45 Years Following Completion of Initial Plantings –
- Demonstrate that a minimum of 160 living native trees remain in the canopy stratum.
- Demonstrate that either success criteria D.1 or D.2 above have been maintained.

Note: The above requirements may need to be modified later due to factors such as the effects of sea level rise or salinity on vegetative cover. Proposed modifications must first be approved by the USACE in coordination with the Interagency Team.

3. Invasive and Nuisance Vegetation

A. Complete the initial eradication of invasive and nuisance plant species.

B. Maintain all areas such that they are essentially free from invasive and nuisance plant species immediately following a given maintenance event and such that the total vegetative cover accounted for by invasive and nuisance species each constitute less than 5% of the total plant cover during periods between maintenance events. These criteria must be satisfied throughout the duration of the overall monitoring period.

4. Topography

A. For mitigation features requiring earthwork to attain desired grades (excluding areas restored from existing open water features – Following completion of initial construction activities (anticipated in TY1, 2020), demonstrate that at least 80% of the total graded area within each feature is within approximately 0.5 feet of the proposed target soil surface elevation (e.g. the desired soil surface elevation).

B. For mitigation features restored from existing open water areas – (a) In the year that final construction activities are completed (anticipated in TY2, 2021), demonstrate that at least 80% of the total graded area within each feature is within approximately 0.5 feet of the proposed target soil surface elevation (e.g. the desired soil surface elevation), and; (b) In the year after final construction activities are completed, demonstrate that at least 85% of the total graded area within each feature is within approximately 0.5 feet of the proposed target soil surface elevation

5. Thinning of Native Vegetation (Timber Management)

The USACE, in cooperation with the Interagency Team, may determine that thinning of the canopy and/or midstory strata is warranted to maintain or enhance the ecological value of the site. This determination will likely be made after it is demonstrated that the average total basal area accounted for by living native canopy species exceeds 170 square feet per acre. If it is decided that timber management efforts are necessary, the Sponsor will develop a Timber Stand Improvement/Timber Management Plan in coordination with the USACE and Interagency Team. Following approval of the plan, the Sponsor will perform the necessary thinning operations and will demonstrate the successful completion of these operations. Timber management activities will only be allowed for the purposes of ecological enhancement of the mitigation site.

6. Hydrology

The following applies to mitigation features involving swamp restoration and to those involving swamp enhancement where hydrologic enhancement is a component of the mitigation program.

A. In a year having essentially normal rainfall, demonstrate compliance with each of the following criteria:

- Achieve inundation of the majority of the mitigation area for a minimum of 200 consecutive days but for no more than approximately 300 consecutive days, preferably with periods of inundation overlapping a portion of the growing season.
- Achieve non-inundation of the majority of the mitigation (water table at or below the soil surface) for a minimum of approximately 60 consecutive days but for no more than approximately 90 consecutive days, preferably during the period from June through August.
- The average maximum (peak) water table elevation must range between approximately 1.0 feet to 2.0 feet above the soil surface.

Note: The specific mitigation work program generated for the mitigation area may include deviations from one or more of the above criteria to better reflect the desired wetland hydroperiod. Such deviations must be approved by the USACE in coordination with the Interagency Team, and would supersede the above criteria once approved.

The following applies to swamp enhancement mitigation areas where hydrologic enhancement is not a component of the mitigation program.

B. In a year having essentially normal rainfall, demonstrate that the water table is less than or equal to 12 inches below the soil surface for a period of at least 14 consecutive days.

MITIGATION MONITORING GUIDELINES

"Time Zero" Monitoring Report

Shortly after completion of all initial mitigation activities (e.g. initial eradication of invasive and nuisance plants, first/initial planting of native species, completion of initial earthwork, grading, surface water management system alterations/construction, etc.), the mitigation site will be monitored and a "time zero" or "baseline" monitoring report prepared. Information provided will include the following items:

- A detailed discussion of all mitigation activities completed.
- A description of the various features and habitats within the mitigation site.
- A plan view drawing of the mitigation site showing the approximate boundaries of different mitigation features (ex. planted areas, areas only involving eradication of invasive and nuisance plant species; surface water management features, etc.), monitoring transect locations, sampling plot locations, photo station locations, and piezometer and staff gage locations.

- An as-built survey of finished grades for any relatively large areas subject to topographic alterations and an as-built survey of any surface water drainage features, drainage culverts, and/or water control structures constructed. Detailed surveys of topographic alterations simply involving the removal of existing linear features such as berms/spoil banks, or involving the filling of existing linear ditches or canals, will not be required. However, the as-built survey will include spot cross-sections of such features sufficient to represent typical conditions. The as-built survey must include a survey of areas where existing berms, spoil banks, or levees have been breached in sporadic locations. For mitigation features involving habitat restoration in existing open water areas, the as-built survey must include a topographic survey of the entire restoration feature.

- A detailed inventory of all canopy and midstory species planted, including the number of each species planted and the stock size planted. In addition, provide a breakdown itemization indicating the number of each species planted in a particular portion of the mitigation site and correlate this itemization to the various areas depicted on the plan view drawing of the mitigation site.

Additional Monitoring Reports

All monitoring reports generated after the initial "time zero" report will provide the following information unless otherwise noted:

- A plan view drawing of the mitigation site showing the approximate boundaries of different mitigation features (ex. planted areas, areas only involving eradication of invasive and nuisance plant species; surface water management features, etc.), monitoring transect locations, sampling plot locations, photo station locations, and piezometer and staff gage locations.

- A brief description of maintenance and/or management and/or mitigation work performed since the previous monitoring report along with a discussion of any other significant occurrences.

- Photographs documenting conditions in the mitigation site at the time of monitoring. Photos will be taken at permanent photo stations within the mitigation site. At least two photos will be taken at each station with the view of each photo always oriented in the same general direction from one monitoring event to the next. The number of photo stations required as well as the locations of these stations will vary depending on the mitigation site. The USACE will make this determination in coordination with the Interagency Team and will specify the requirements in the Mitigation Monitoring Plan. Permanent photo stations will primarily be established in areas slated for planting of canopy and midstory species. For mitigation involving swamp enhancement, some photo stations may also be located in areas where plantings are not needed.

- Quantitative plant data collected from permanent monitoring plots measuring approximately 80 feet X 80 feet in size. Data recorded in each plot will include: number of living planted canopy species present and the species composition; number of living planted midstory species present and the species composition; average density of all native species in the canopy stratum, the total number of each species present, and the wetland indicator status of each species; average percent cover by native species in the canopy stratum; average density of all native species in the midstory stratum, the total number of each species present, and the wetland indicator status of each species; average percent cover by native species in the midstory stratum; average percent cover accounted for by invasive plant species (all vegetative strata combined); average percent cover accounted for by nuisance plant species (all vegetative strata combined). In addition to these data, the following information will be recorded for native tree species in the canopy stratum: the average diameter at breast height (DBH; expressed in inches) of baldcypress trees; average DBH of all other native tree species excluding baldcypress; the average total basal area of living native trees (expressed in square feet per acre). The DBH of planted canopy species will not need to be documented until the average DBH of these trees reaches approximately 2 inches. Total basal area data will also not need to be documented until such time that the average total basal area is estimated to exceed approximately 100 square feet per acre. The permanent monitoring plots will typically be located within mitigation areas

where initial planting of canopy and midstory species is necessary. The number of plots required as well as the locations of these plots will vary depending on the mitigation site. The USACE will make this determination in coordination with the Interagency Team and will specify the requirements in the Mitigation Monitoring Plan.

- Quantitative data concerning plants in the understory (ground cover) stratum and concerning invasive and nuisance plant species will be gathered from permanent sampling quadrats nested within the permanent monitoring plots described above. There will be a total of 4 quadrats with each quadrat measuring approximately 2 meters X 2 meters in size. Data recorded from the sampling quadrats will include: average percent cover by native ground cover species; composition of native ground cover species and the wetland indicator status of each species; average percent cover by invasive plant species; average percent cover by nuisance plant species.

- Quantitative plant data collected from either: (1) permanent transects sampled using the point-centered quarter method with a minimum of 20 sampling points established along the course of each transect, or; (2) permanent belt transects approximately 50 feet wide. The number of transects necessary as well as the location and length of each transect will vary depending on the mitigation site. The USACE will make this determination in coordination with the Interagency Team and will specify the requirements in the Mitigation Monitoring Plan. Data recorded from the sampling transects will include: average density of living planted canopy species present and the species composition; average density of living planted midstory species present and the species composition; average density of all native species in the canopy stratum along with the species composition and the wetland indicator status of each species; average percent cover by all native species in the canopy stratum; average density of native species in the midstory stratum, the total number of each species present, and the wetland indicator status of each species; average percent cover by native species in the midstory stratum; if present, average percent cover accounted for by invasive and nuisance species present in the canopy and midstory strata (combined). In addition to these data, the following information will be recorded for native tree species in the canopy stratum: the average diameter at breast height (DBH; expressed in inches) of bald cypress trees; average DBH of all other native tree species excluding bald cypress; the average total basal area of living native trees (expressed in square feet per acre). The DBH of planted canopy species will not need to be documented until the average DBH of these trees reaches approximately 2 inches. Total basal area data will also not need to be documented until such time that the average total basal area is estimated to exceed approximately 100 square feet per acre.

- Quantitative data concerning plants in the understory (ground cover) stratum and concerning invasive and nuisance plant species will be gathered from sampling quadrats. These sampling quadrats will be established either along the axis of the belt transects discussed above, or at sampling points established along point-centered quarter transects discussed above, depending on which sampling method is used. Each sampling quadrat will be approximately 2 meters X 2 meters in size. The total number of sampling quadrats needed along each sampling transect will be determined by the USACE with the Interagency Team and will specify be specified in the Mitigation Monitoring Plan. Data recorded from the sampling quadrats will include: average percent cover by native ground cover species; composition of native ground cover species and the wetland indicator status of each species; average percent cover by invasive plant species; average percent cover by nuisance plant species.

- A summary of rainfall data collected during the year preceding the monitoring report based on rainfall data recorded at a station located on or in close proximity to the mitigation site. Once all hydrology success criteria have been achieved, collection and reporting of rainfall data will no longer be required.

- A summary of water table elevation data collected from piezometers coupled with staff gages installed within the mitigation site. The number of piezometers and staff gages required as well as the locations of these devices will vary depending on the mitigation site. The USACE will make this determination in coordination with the Interagency Team and will specify the requirements in the Mitigation Monitoring Plan. Data (water table elevations) will be collected at least bi-weekly throughout the year. For mitigation areas involving swamp enhancement where hydrologic enhancement is not a component of the mitigation program, it may also be necessary to collect water table elevations on a daily basis over the course of 3

to 4 weeks in order to demonstrate that the water table is less than or equal to 12 inches below the soil surface for a period of at least 14 consecutive days during the growing season. Once it is demonstrated that all applicable hydrology success criteria have been satisfied, water table monitoring will no longer be required. However, monitoring reports generated subsequent to the attainment of success criteria will include a general discussion of water levels and hydroperiod based on qualitative observations.

- Various qualitative observations will be made in the mitigation site to help assess the status and success of mitigation and maintenance activities. These observations will include: general estimates of the average percent cover by native plant species in the canopy, midstory, and ground cover strata; general estimate of the average percent cover by invasive and nuisance plant species; general estimates concerning the growth of planted canopy and midstory species; general observations concerning the colonization by volunteer native plant species; general observations regarding the growth of non-planted native species in the canopy and midstory strata. General observations made during the course of monitoring will also address potential problem zones, general condition of native vegetation, trends in the composition of the plant communities, wildlife utilization as observed during monitoring, and other pertinent factors.

- For mitigation features restored from existing open water areas, provide an as-built topographic survey of all such mitigation features in the year immediately following the "time zero" monitoring event. No additional topographic surveys will typically be required following this second survey. However if the second survey indicates topographic success criteria have not been achieved and supplemental topographic alterations are necessary, then another topographic survey may be required following completion of the supplemental alterations. This determination will be made by USACE in coordination with the Interagency Team.

- Rectified aerial photographs of all mitigation features. This aerial photography will only be provided in the following monitoring reports: (a) The monitoring report prepared for monitoring conducted in the year immediately preceding the year the mitigation project is transferred to the Sponsor; (b) The monitoring report prepared for monitoring conducted approximately 15 years following completion of initial plantings.

- A summary assessment of all data and observations along with recommendations as to actions necessary to help meet mitigation and management/maintenance goals and mitigation success criteria.

- A brief description of anticipated maintenance/management work to be conducted during the period from the current monitoring report to the next monitoring report.

Monitoring Reports Involving Timber Management Activities

In cases where timber management activities (thinning of trees and/or shrubs in the canopy and/or midstory strata) have been approved by the USACE in coordination with the Interagency Team, monitoring will be required in the year immediately preceding and in the year following completion of the timber management activities (i.e. pre-timber management and post-timber management reports). These reports must include data and information that are in addition to the typical monitoring requirements. The Sponsor's proposed Timber Stand Improvement/Timber Management Plan must include the proposed monitoring data and information that will be included in the pre-timber management and post-timber management monitoring reports. The proposed monitoring plan must be approved by the USACE in coordination with the Interagency Team prior to the monitoring events and implementation of the timber management activities.

Monitoring Reports Following Re-Planting Activities

Re-planting of certain areas within the mitigation site may be necessary to ensure attainment of applicable native vegetation success criteria. Any monitoring report submitted following completion of a re-planting event must include an inventory of the number of each species planted and the stock size used. It must also

include a depiction of the areas re-planted, cross-referenced to a listing of the species and number of each species planted in each area.

MITIGATION MONITORING SCHEDULE AND RESPONSIBILITIES

Monitoring will typically take place in late summer of the year of monitoring, but may be delayed until later in the growing season due to site conditions or other unforeseen circumstances. Monitoring reports will be submitted by December 31 of each year of monitoring. Monitoring reports will be provided to the USACE, the Sponsor, and the agencies comprising the Interagency Team.

The USACE will be responsible for conducting the monitoring events and preparing the associated monitoring reports until such time that the following mitigation success criteria are achieved (criteria follow numbering system used in success criteria section):

1. General Construction – 1.A or 1.B, as applicable.
2. Native Vegetation – A and B.
3. Invasive & Nuisance Vegetation – A, plus B until such time as project is transferred to the Sponsor.
4. Topography – A, as applicable, or B, as applicable.

Monitoring events associated with the above will include the “time zero” (first or baseline) monitoring event plus annual monitoring events thereafter until the mitigation project is transferred to the Sponsor. The years applicable to these monitoring events will vary depending on the type of mitigation involved (restoration or enhancement) and site conditions present at the time mitigation activities are initiated. For example, the first monitoring event may occur in 2021 (TY2) for certain mitigation sites while this event may not occur until 2022 (TY3) for other mitigation sites.

The Sponsor will be responsible for conducting the required monitoring events and preparing the associated monitoring reports after the USACE has demonstrated the mitigation success criteria listed above have been achieved. The overall responsibility for management, maintenance, and monitoring of the mitigation will be transferred to the Sponsor during the first quarter of the year immediately following submittal of the monitoring report that demonstrates attainment of said criteria.

Once monitoring responsibilities have been transferred to the Sponsor, the next monitoring event will take place during the year that attainment of success criterion 2.C (native vegetation criterion applicable 4 years after completion of initial plantings) must be demonstrated. Thereafter, monitoring will be conducted every 5 years throughout the life or the mitigation project (based on 50-year project life beginning in 2019 (TY0) and ending in 2069 (TY50).

If the initial survival criteria for planted canopy and midstory species are not achieved (i.e. the 1-year survival criteria specified in success criteria 2.B), a monitoring report will be required for each consecutive year until two annual sequential reports indicate that all survival criteria have been satisfied (i.e. that corrective actions were successful). The USACE will be responsible for conducting this additional monitoring and preparing the monitoring reports. The USACE will also be responsible for the purchase and installation of supplemental plants needed to attain these success criteria.

If the native vegetation success criteria specified for 4 years following completion of initial plantings are not achieved (i.e. success criteria 2.C) , a monitoring report will be required for each consecutive year until two annual sequential reports indicate that these criteria have been satisfied. The Sponsor will be responsible for conducting this additional monitoring and preparing the monitoring reports. The Sponsor will also be responsible for the purchase and installation of supplemental plants needed to attain these success criteria.

If timber management activities conducted in the mitigation features by the Sponsor, the Sponsor will be responsible for conducting the additional monitoring and preparing the associated monitoring reports necessary for such activities (e.g. one monitoring event and report in the year immediately preceding timber management activities and one monitoring event and report in the year that timber management activities are completed).

The year in which mitigation features are first planted, a key milestone triggering the start of mitigation monitoring, may vary depending on the type of mitigation involved and the mitigation construction activities involved. In certain cases, it is also possible that the BLH mitigation features may be established along with other mitigation features like swamp or marsh habitats at the same mitigation site. Such factors make it necessary to develop a reasonable and efficient monitoring schedule at the time final mitigation plans are generated. This schedule must be in general accordance with the guidance provided above and will be prepared by the USACE in coordination with the Interagency Team and the Sponsor.

Once monitoring responsibilities have transferred to the Sponsor, the Sponsor will retain the ability to modify the monitoring plan and the monitoring schedule should this become necessary due to unforeseen events or to improve the information provided through monitoring. Twenty years following completion of initial plantings, the number of monitoring plots and/or monitoring transects that must be sampled during monitoring events may be reduced substantially if it is clear that mitigation success is proceeding as anticipated. Any significant modifications to the monitoring plan or the monitoring schedule must first be approved by the USACE in coordination with the Interagency Team.

MITIGATION SUCCESS CRITERIA AND MITIGATION MONITORING:
MARSH MITIGATION FEATURES (Fresh, Intermediate, Brackish and Saline Marsh Habitats)

MITIGATION SUCCESS CRITERIA

The success (performance) criteria described herein are applicable to all proposed marsh habitats (fresh marsh, intermediate marsh, brackish and saline marsh restoration features), unless otherwise indicated.

1. General Construction

A. Within approximately 8 months following the start of mitigation construction, complete all initial mitigation construction activities (e.g. construction of temporary retention/perimeter dikes, placement of fill (borrow material/dredged material) into mitigation site, construction of permanent dikes if applicable, etc.).

B. Approximately 1 to 3 years following completion of all initial mitigation construction activities (when the restored marsh feature has attained the desired target soil surface elevation) complete all final mitigation construction activities. Such activities could include, but are not limited to: degrading temporary retention dikes such that the areas occupied by these dikes have a surface elevation equivalent to the desired target marsh elevation; completion of armoring, if required, of any permanent dikes; “gapping” or installation of “fish dips” in permanent dikes; and construction of trenasses or similar features within marsh features as a means of establishing shallow water interspersion areas within the marsh. Finishing the aforementioned construction components will be considered as the “completion of final mitigation construction activities”. As noted, this is anticipated to occur approximately 1 year after placement of fill material in the mitigation feature is completed.

2. Topography

A. Upon completion of final mitigation construction activities (approximate Target Year 2) –
- Demonstrate that at least 80% of each mitigation feature has a surface elevation that is within 0.5 feet of the desired target surface elevation.

B. 1 Year following completion of final mitigation construction activities (approximate Target Year 3) –
- Demonstrate that at least 80% of the mitigation site has a surface elevation that is within 0.5 feet of the desired target surface elevation.

C. 3 years following completion of final mitigation construction activities (approximate Target Year 5) –
- Demonstrate that at least 90% of the mitigation site has a surface elevation that is within the functional marsh elevation range.

Notes: The desired target elevation for each marsh feature will be determined during the final design phase. The "functional marsh elevation range", i.e. the range of the marsh surface elevation that is considered adequate to achieve proper marsh functions and values, will also be determined during the final design phase. The target elevation and functional marsh elevation range will be determined by the USACE in conjunction with the Interagency Team. It is currently +1.5 ft NAVD88. These determinations will apply to the topographic success criteria above and could potentially alter the marsh area percentages set forth in these criteria.

3. Native Vegetation

A. For intermediate, brackish and saline marsh restoration features only –
- Complete initial marsh planting in accordance with applicable marsh planting guidelines.

B. For fresh marsh restoration features only; 1 year following completion of final mitigation construction activities:
- Achieve a minimum average cover of 50%, comprised of native herbaceous species.
- Demonstrate that vegetation satisfies USACE hydrophytic vegetation criteria. This criterion will thereafter remain in effect for the duration of the overall monitoring period.

C. For intermediate, brackish and saline marsh restoration features only; 1 year following completion of initial plantings–
- Attain at least 80% survival of planted species, or; Achieve a minimum average cover of 25%, comprised of native herbaceous species (includes planted species and volunteer species).
- Demonstrate that vegetation satisfies USACE hydrophytic vegetation criteria. This criterion will thereafter remain in effect for the duration of the overall monitoring period.

D. For fresh marsh restoration features only; 3 years following completion of final mitigation construction activities:
- Achieve a minimum average cover of 85%, comprised of native herbaceous species.

E. For intermediate, brackish and saline marsh restoration features only; 3 years following completion of initial plantings –
- Achieve a minimum average cover of 75%, comprised of native herbaceous species (includes planted species and volunteer species).

F. For all marsh restoration features (fresh, intermediate, brackish, and saline) –
- For the period beginning 5 years following completion of final mitigation construction activities and continuing through 20 years following completion of final mitigation construction activities, maintain a minimum average cover of 80%, comprised of native herbaceous species.

4. Invasive and Nuisance Vegetation

A. Complete the initial eradication of invasive and nuisance plant species within 1 year of completion of final mitigation construction activities

B. Maintain all areas such that they are essentially free from invasive and nuisance plant species immediately following a given maintenance event and such that the total vegetative cover accounted for by invasive and nuisance species each constitute less than 5% of the total plant cover during periods between maintenance events. These criteria must be satisfied throughout the duration of the overall monitoring period.

MITIGATION MONITORING GUIDELINES

The guidelines for mitigation monitoring provided herein are applicable to all the types of marshes being restored (i.e. fresh, intermediate, brackish and saline) unless otherwise indicated.

"Time Zero" Monitoring Report

The mitigation site will be monitored and a "time zero" or "baseline" monitoring report prepared. Information provided will include the following items:

- A detailed discussion of all mitigation activities completed.

- A plan view drawing of the mitigation site showing the approximate boundaries of the restored marsh features, significant interspersion features established within the marsh features (as applicable), monitoring transect locations, sampling plot locations, photo station locations, and staff gage locations.

- An as-built survey of surface elevations (topographic survey) within each marsh feature, along with an as-built survey of any permanent dikes constructed as part of the marsh restoration features including any "gaps" or "fish dips" established in such dikes. If a particular marsh feature is immediately adjacent to existing marsh habitat, the topographic survey will include spot elevations collected within the existing marsh habitat near the restored marsh feature. In addition to the survey data, an analysis of the data will be provided addressing attainment of topographic success criteria.

- Photographs documenting conditions in each restored marsh feature at the time of monitoring. Photos will be taken at permanent photo stations within the marsh features. At least two photos will be taken at each station with the view of each photo always oriented in the same general direction from one monitoring event to the next. The number of photo stations required as well as the locations of these stations will vary depending on the mitigation site. The USACE will make this determination in coordination with the Interagency Team and will specify the requirements in the Mitigation Monitoring Plan. At a minimum, there will be at least 4 photo stations established within each marsh feature.

- For restored intermediate, brackish and saline marsh features only -- A detailed inventory of all species planted, including the number of each species planted and the stock size planted. For mitigation sites that include more than one restored marsh feature, provide a breakdown itemization indicating the number of each species planted in each marsh and correlate this itemization to the marsh features depicted on the plan view drawing of the mitigation site.

- Water level elevation readings collected at the time of monitoring from a single staff gage installed within one of the restored marsh features. The location of the staff gage will be determined by the USACE in coordination with the Interagency Team during the final design phase of the mitigation project and will be specified in the Mitigation Monitoring Plan. The monitoring report will provide the staff gage data along with mean high and mean low water elevation data as gathered from a tidal elevation recording station in the general vicinity of the mitigation site. The report will further address estimated mean high and mean low water elevations at the mitigation site based on field indicators.

- Various qualitative observations will be made in the mitigation site to help assess the status and success of mitigation and maintenance activities. These observations will include: general estimate of the average percent cover by native plant species; general estimates of the average percent cover by invasive and nuisance plant species; general observations concerning colonization of the mitigation site by volunteer native plant species; general condition of native vegetation; trends in the composition of the plant community; wildlife utilization as observed during monitoring (including fish species and other aquatic organisms); the condition of interspersion features (tidal channels, trenasses, depressions, etc.) constructed within the marsh features, noting any excessive scouring and/or siltation occurring within

such features; the natural formation of interspersion features within restored marshes; observations regarding general surface water flow characteristics within marsh interspersion features; the general condition of “gaps”, “fish dips”, or similar features constructed in permanent dikes; if present, the general condition of any armoring installed on permanent dikes. General observations made during the course of monitoring will also address potential problem zones and other factors deemed pertinent to the success of the mitigation program.

- A summary assessment of all data and observations along with recommendations as to actions necessary to help meet mitigation and management/maintenance goals and mitigation success criteria.

- A brief description of anticipated maintenance/management work to be conducted during the period from the current monitoring report to the next monitoring report.

Additional Monitoring Reports

All monitoring reports generated after the initial “time zero” report will provide the following information unless otherwise noted:

- All items listed for the “time zero” (baseline) monitoring report with the exception of: (a) the topographic/as-built survey, although additional topographic/as-built surveys are required for specific monitoring reports (see below); (b) the inventory of planted species; although such an inventory must be provided in any monitoring report generated for a year in which a restored intermediate or brackish or saline marsh feature is re-planted to meet applicable success criteria, and such an inventory must be provided in any monitoring report generated for a year in which a restored fresh marsh feature is planted to meet applicable success criteria.

- Quantitative data concerning plants in the ground cover stratum. Data will be collected from permanent sampling quadrats established at approximately equal intervals along permanent monitoring transects established within each marsh feature. Each sampling quadrat will be approximately 2 meters X 2 meters in size, although the dimensions of each quadrat may be increased if necessary to provide better data in planted marsh features. The number of monitoring transects and number of sampling quadrats per transect will vary depending on the mitigation site. This will be determined the USACE in coordination with the Interagency Team during the final design phase of the mitigation project and the resulting requirements, including quadrat dimensions, will be specified in the final Mitigation Monitoring Plan for the project. Data recorded from the sampling quadrats will include: average percent cover by native plant species; average percent cover by invasive plant species; average percent cover by nuisance plant species; composition of plant species and the wetland indicator status of each species. The average percent survival of planted species (i.e. number of living planted species as a percentage of total number of plants installed) will also be recorded in intermediate and brackish or saline marsh features. However, data for percent survival of planted species will only be recorded until such time as it is demonstrated that success criteria for plant survivorship has been achieved.

- A brief description of maintenance and/or management work performed since the previous monitoring report along with a discussion of any other significant occurrences.

- Rectified aerial photographs of all mitigation features. This aerial photography will only be provided in the monitoring report prepared for monitoring conducted 3 years following completion of mitigation construction activities (estimated TY5).

- In addition to the above items, the monitoring report prepared for 1 year following completion of mitigation construction activities (estimated TY3) and the monitoring report prepared for 3 years following completion of mitigation construction activities (estimated TY5) will include a topographic survey of each marsh restoration feature. These surveys will cover the same components as described for the topographic survey conducted for the “time zero” monitoring report. In addition to the surveys themselves, each of the two monitoring reports involving topographic surveys will include an analysis of

the data as regards attainment of applicable topographic success criteria. If the second survey indicates topographic success criteria have not been achieved and supplemental topographic alterations are necessary, then another topographic survey may be required following completion of the supplemental alterations. This determination will be made by USACE in coordination with the Interagency Team.

Monitoring Reports Following Re-Planting Activities in Intermediate, Brackish or Saline Marsh Features & Monitoring Reports Following Planting Activities in Fresh Marsh Features

Re-planting of certain areas within restored intermediate and/or brackish and saline marsh habitats may be necessary to ensure attainment of applicable native vegetation success criteria. Planting of herbaceous species within restored fresh marsh features may also be necessary to attain applicable native vegetation success criteria. Any monitoring report submitted following completion of a re-planting event (for intermediate, brackish and saline marshes) and any monitoring report submitted following completion of initial plantings (for fresh marshes) must include an inventory of the number of each species planted and the stock size used. It must also include a depiction of the areas re-planted or those planted, as applicable, cross-referenced to a listing of the species and number of each species planted in each area.

MITIGATION MONITORING SCHEDULE AND RESPONSIBILITIES

Monitoring will typically take place in mid to late summer of the year of monitoring, but may be delayed until later in the growing season due to site conditions or other unforeseen circumstances. Monitoring reports will be submitted by December 31 of each year of monitoring. Monitoring reports will be provided to the USACE, the Sponsor, and the agencies comprising the Interagency Team.

The USACE will be responsible for conducting the monitoring events and preparing the associated monitoring reports until such time that the following mitigation success criteria are achieved (criteria follow numbering system used in success criteria section):

1. General Construction – A and B.
2. Topography – A and B.
3. Native Vegetation – For intermediate, brackish and saline marsh features, criteria 3.A and 3.C; for fresh marsh features, criteria 3.B.
4. Invasive & Nuisance Vegetation – A, plus B until such time as project is transferred to the Sponsor.

Monitoring events associated with the above will include the “time zero” (first or baseline) monitoring event (estimated in TY2, 2021) and a second monitoring event 1 year after the time zero monitoring event (estimated in TY3, 2022). The USACE will be responsible for conducting these monitoring activities and preparing the associated monitoring reports.

The Sponsor will be responsible for conducting the required monitoring events and preparing the associated monitoring reports after the USACE has demonstrated the mitigation success criteria listed above have been achieved. The overall responsibility for management, maintenance, and monitoring of the mitigation will be transferred to the Sponsor during the first quarter of the year immediately following submittal of the monitoring report that demonstrates attainment of said criteria. Once monitoring responsibilities have been transferred to the Sponsor, the next monitoring event should take place in 2023 (TY5) in order to demonstrate attainment of success criteria 2.C and either 3.D (for fresh marsh) or 3.E (for intermediate, brackish and saline marsh). Thereafter, monitoring will be conducted every 5 years throughout the remaining life or the mitigation project (based on 50-year project life beginning in 2019 (TY0) and ending in 2069 (TY50).

In certain cases it is possible that the marsh mitigation features may be established along with other mitigation features, like swamp or bottomland hardwood habitats, at the same mitigation site. This scenario could require some adjustments to the typical monitoring schedule described above in order to develop a reasonable and efficient monitoring schedule that covers all the mitigation features. Such adjustments, if necessary, would be made at the time final mitigation plans are generated. This schedule must be in general accordance with the guidance provided above and will be prepared by the USACE in coordination with the Interagency Team and the Sponsor.

If certain success criteria are not achieved, failure to attain these criteria would trigger the need for additional monitoring events not addressed in the preceding paragraphs. The USACE would be responsible for conducting such additional monitoring and preparing the associated monitoring reports. The following lists instances requiring additional monitoring that would be the responsibility of the USACE:

(A) For intermediate, brackish and saline marsh features –

- If the initial survival criterion for planted species or the initial vegetative cover criterion are not achieved (i.e. the criteria specified in success criteria 3.C), a monitoring report will be required for each consecutive year until two sequential annual reports indicate that the applicable survival criterion or vegetative cover criteria have been satisfied (i.e. that corrective actions were successful). The USACE would also be responsible for the purchase and installation of supplemental plants needed to attain the success criteria.

(B) For fresh marsh features --

- If the initial vegetative cover criterion is not achieved (i.e. the requirement specified in success criteria 3.B), a monitoring report will be required for each consecutive year until two sequential annual reports indicate that the applicable vegetative cover criteria have been satisfied (i.e. that corrective actions were successful). Since failure to meet the success criterion would mandate planting the subject marsh, the USACE would also be responsible for the purchase and installation of the required plants.

(C) For all types of marsh features (fresh, intermediate, brackish, saline) –

- If topographic success criteria 2.A or 2.B are not achieved, a monitoring report will be required for each consecutive year until two sequential annual reports indicate the applicable criteria have been satisfied. Since failure to meet topographic success criteria would mandate corrective actions such as addition of fill, removal of fill, or other actions to change grades within the subject marsh feature, the USACE would also be responsible for performing the necessary corrective actions.

There could also be cases where failure to attain certain success criteria would trigger the need for additional monitoring events for which the Sponsor would be responsible:

(A) For intermediate, brackish and saline marsh features –

- If the vegetative cover criterion specified for 3 years after the initial planting of marsh features is not achieved (i.e. success criterion 3.E), a monitoring report will be required for each consecutive year until two sequential annual reports indicate that the vegetative cover criterion has been satisfied. The Sponsor would also be responsible for the purchase and installation of supplemental plants needed to attain the success criterion.

(B) For fresh marsh features --

- If the vegetative cover criterion specified for 3 years after completion of mitigation construction activities is not achieved (i.e. success criterion 3.D), a monitoring report will be required for each consecutive year until two sequential annual reports indicate that the vegetative cover criterion has been satisfied. The Sponsor would also be responsible for the purchase and installation of supplemental plants needed to attain the success criterion.

(C) For all types of marsh features (fresh, intermediate, brackish, saline) –

- If the topographic success criterion 2.C is not achieved, a monitoring report will be required for each consecutive year until two sequential annual reports indicate success criteria have been satisfied. Since failure to meet this topographic success criteria would mandate corrective actions such as addition of fill, removal of fill, or other actions to change grades within the subject marsh feature, the Sponsor would also be responsible for performing the necessary corrective actions.

- Native vegetation success criterion 3.F is applicable to the period extending from 5 years through 20 years following completion of mitigation construction activities and is applicable to all marsh features. If this criterion is not satisfied at the time of monitoring, the Sponsor would be responsible for implementing corrective actions. Such actions could include installing additional plants in the subject marsh (probable course of action), adding sediment to the subject marsh in problem zones (marsh nourishment), or a combination of these activities. Under this scenario, a monitoring report will be required for each consecutive year following completion of the corrective actions until two sequential annual reports indicate that the vegetative cover criterion has been attained. The Sponsor would be responsible for conducting these additional monitoring events and preparing the associated monitoring reports.

Once monitoring responsibilities have transferred to the Sponsor, the Sponsor will retain the ability to modify the monitoring plan and the monitoring schedule should this become necessary due to unforeseen events or to improve the information provided through monitoring. Twenty years following completion of mitigation construction activities, the number of monitoring transects and/or quadrats that must be sampled during monitoring events may be reduced substantially if it is clear that mitigation success is proceeding as anticipated. Any significant modifications to the monitoring plan or the monitoring schedule must first be approved by the USACE in coordination with the Interagency Team.

DEFINITION OF TERMS

Certain terms used herein shall have the meaning discussed in the following section.

Interagency Team
The "Interagency Team" consists of representatives from the following resource agencies; US Fish and Wildlife Service, National Marine Fisheries Service, US Environmental Protection Agency, Louisiana Department of Wildlife and Fisheries, State of Louisiana Office of Coastal Protection and Restoration, Louisiana Department of Natural Resources. In cases where proposed mitigation features will be established within Jean Lafitte National Historical Park and Preserve, representatives from the National Park Service would also comprise the Interagency Team.

Sponsor
This term refers to the Non-Federal Sponsor for the mitigation projects.

Target Year
This document often refers to mitigation "target years" or a particular mitigation "target year" (abbreviated "TY"). Target Year 0 (TY0) is the year in which mitigation construction activities are anticipated to commence, which is presently estimated to occur in calendar year 2019. Target years increase from this time forward. Hence, based on construction beginning in 2019, target year 1 (TY1) would be calendar year 2020, target year 2 (TY2) would be calendar year 2021, etc.

Invasive Plant Species
All plant species identified as invasive or as non-indigenous (exotic) in the following two sources:

> Louisiana Aquatic Invasive Species Task Force. 2005. State Management Plan for Aquatic Invasive Species in Louisiana, Appendix B. Invasive Species in Louisiana (plants). Center for Bioenvironmental Research, Tulane & Xavier Universities, New Orleans, LA.
> (Website - http://is.cbr.tulane.edu/docs_IS/LAISMP7.pdf)
>
> U.S. Geological Survey. 2011. NAS – Nonindigenous Aquatic Species, Louisiana.
> Website - http://nas.er.usgs.gov/queries/SpeciesList.aspx?group=Plants&state=LA&Sortby=2

In addition, invasive plant species include; Japanese climbing fern (*Lygodium japonicum*), tall fescue (*Festuca arundinacea*), chinaberry (*Miscanthus sinensis*), Brazil vervain (*Verbena litoralis* var. *brevibrateata*), and rescuegrass (*Bromus catharticus*).

Nuisance Plant Species
Nuisance plant species will include native species deemed detrimental due to their potential adverse competition with desirable native species. Examples of potential nuisance plant species include; dog-fennel (*Eupatorium* spp.), ragweed (*Ambrosia* spp.), cattail (*Typha* spp.), grapevine (*Vitis* spp.), wild balsam apple (*Momordica charantia*), climbing hempvine (*Mikania scandens, M. micrantha*), pepper vine (*Ampelopsis arborea*), common reed (*Phragmites australis*), catbrier (*Smilax* spp.), black willow (*Salix nigra*), and boxelder (*Acer negundo*). The determination of whether a particular plant species should be considered as a nuisance species and therefore eradicated or controlled will be determined by the USACE in coordination with the Interagency Team, based on conditions present within a particular mitigation area.

Native Plant Species
This category includes all plant species that are not classified as invasive plant species and are not considered to be nuisance plant species.

USACE Hydrophytic Vegetation Criteria
Reference to satisfaction of USACE hydrophytic vegetation criteria (i.e. plant community is dominated by hydrophytic vegetation) shall mean that sampling of the plant community demonstrates that one or more of the hydrophytic vegetation indicators set forth in the following reference is achieved:

> USACE. 2010. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region (Version 2.0); ERDC/EL TR-10-20. USACE Engineer Research and Development Center, Vicksburg, MS.

Wetland Indicator Status of Plant Species
The wetland indicator status of plants is a means of classifying the estimated probability of a species occurring in wetlands versus non-wetlands. Indicator categories include; obligate wetland (OBL), facultative wetland (FACW), facultative (FAC), facultative upland (FACU), and obligate upland (UPL). The wetland indicator status of a particular plant species shall be as it is set forth in the following reference, using the Region 2 listing contained therein. However, if the USACE approves and adopts a new list in the future, then the currently approved list will apply.

> Reed, P. B., Jr. 1988. National List of Plant Species that Occur in Wetlands: 1988 National Summary. Biological Report 88(24). Washington, DC: U.S. Fish and Wildlife Service.
> (website - http://www.usace.army.mil/CECW/Documents/cecwo/reg/plants/list88.pdf)

Growing Season
As used herein, the growing season is considered to be the period from April through October of any given year, although some deviation from this typical range is allowed.

Planting Season
This is generally considered to be the period from approximately December 15 through March 15, although some deviation from this typical range is allowed.

Point-Centered Quarter Method
A plot-less method of forest sampling. Use of this method will be in general compliance with the applicable methodology described in the following reference:

> Cottam, Grant and J. T. Curtis. 1956. The use of distance measures in phytosociological sampling. Ecology, 37(3):451-460.

Piezometer
Typically a small-diameter observation well employed as a means of measuring water elevations in the surficial aquifer (water table elevations). Piezometers used for monitoring purposes should be constructed in general accordance with the following reference, unless otherwise approved by the USACE:

U. S. Army Corps of Engineers. 2005. Technical standard for water-table monitoring of potential wetland sites. ERDC TN-WRAP-05-02. Vicksburg, MS: U.S. Army Engineer Research and Development Center. (website - http://el.erdc.usace.army.mil/wrap/pdf/tnwrap05-2.pdf)

Interspersion Features

This term refers to shallow open water features situated within marsh habitats. Examples include tidal channels, creeks, trenasses, and relatively small, isolated ponds. Emergent vegetation is typically absent in such features although they may contain submerged aquatic vegetation. They provide areas of foraging and nursery habitat for fish and shellfish along with associated predators, and provide loafing areas for waterfowl and other waterbirds. The marsh/open water interface forms an ecotone where post-larval and juvenile organisms can find cover and where prey species frequently concentrate.