APPENDIX H

Planting and Monitoring Guidelines and Adaptive Management Plan

Appendix H: Planting Guidelines

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 18-foot centers (average) to achieve a minimum initial stand density of 134 seedlings per acre. Stock will be at least 1 year old, at least 2 feet in height, have a minimum root collar diameter of 3/8 inch, have a root length of at least 8 to 10 inches with at least 4 to 8 lateral roots, 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, Q. texana*	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%
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%
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
Dahoon holly	*Ilex cassine*	TBD
Red mulberry	*Morus rubra*	TBD
Wax myrtle	*Myrica cerifera*	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 NFS will be responsible for preparing re-planting plans and conducting re-planting activities, subject to the provisions mentioned in the Introduction section. Re-planting necessary to achieve the initial survivorship criteria will be the responsibility of the USACE. subject to the provisions mentioned in the Introduction section.

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 18-foot centers (average) to achieve a minimum initial stand density of 134 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

Appendix H: 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 NFS will be responsible for preparing re-planting plans and conducting re-planting activities, subject to the provisions contained in the Introduction section. Re-planting necessary to achieve the initial survivorship criteria will be the responsibility of the USACE, subject to the aforementioned provisions.

APPENDIX H

DRAFT ENVIRONMENTAL ASSESSMENT

MONITORING PLAN AND SUCCESS CRITERIA

BOTTOM LAND HARDWOOD WET and SWAMP

Contents

INTRODUCTION

This document follows the monitoring and success criteria guidelines developed for the Hurricane Storm Damage and Risk Reduction System (HSDRRS) Mitigation Program. The guidelines were developed by the U.S. Army Corps of Engineers (USACE) in coordination with an Interagency Team and the non-Federal project sponsor (NFS). The original general guidelines for plantings, success criteria, and monitoring were included as Appendix L in PIER 37 and are included here by reference. Those general guidelines are being revised by the USACE, the Interagency Team and the NFS. This appendix outlines the refined project specific monitoring, reporting and success criteria for the mitigation alternative included in EA #576. The specific mitigation projects are fully described in EA #576 and include the following:

Table 1: Tentatively Selected Alternative

	Projects	Habitat	AAHUs	Acres
BLH-Wet in basin in CZ	Mitigation Bank	BLH-wet		TBD
	Ascension	BLH-wet	30.7	55.8
	Saint John	BLH-wet	47.4	94.7
	Gravity	BLH-wet	45.1	75.2
Swamp in CZ	Mitigation Bank	Swamp		TBD
	Pine Island	Swamp	884.3	1,965.0
	Joyce	Swamp	337.8	1,126.1
	Albania South	Swamp	32.4	81.1
	Albania North	Swamp	284.9	633.0
	Bayou Vista	Swamp	18.8	41.7
	Cote Blanche	Swamp	121.5	270.0
BLH-Wet in basin out of CZ	Mitigation Bank	BLH-wet		TBD
	Feliciana	BLH-wet	160.2	267.0
	GBRPC	BLH-wet	68.2	134.9
	Amite	BLH-wet	221.2	368.6
	St James	BLH-wet	685.3	1246.0

It should be noted that even though the proposed mitigation actions under EA #576 include the potential purchase of credits from a mitigation bank this appendix only details the project specific information for the Corps constructed projects. In the event that mitigation bank credits are purchased the mitigation success criteria, mitigation monitoring and reporting requirements, and mitigation management and maintenance activities will be set forth in the Mitigation Banking Instrument (MBI) for each particular bank. The bank sponsor (bank permittee) will be responsible for these activities rather than the USACE and/or the local Sponsor. USACE Regulatory staff will review the mitigation bank monitoring reports and conduct periodic inspections of mitigation banks to ensure compliance with mitigation success criteria stated in the MBI.

The proposed mitigation actions under EA #576 include construction of Swamp and BLH habitat with the NFS responsible for operation and maintenance of functional portions of work as they are completed. On a cost shared basis, the USACE will monitor completed the mitigation to determine whether additional construction, invasive species control and/or plantings are necessary to achieve mitigation success. The USACE will undertake additional actions necessary to achieve mitigation success in accordance with cost sharing applicable to the project and subject to the availability of funds. Once the USACE determines that the mitigation has achieved initial success criteria, monitoring will be performed by the NFS as part of its OMRR&R obligations. If, after meeting initial success criteria, the mitigation fails to meet its intermediate and/or long-term ecological success criteria, USACE will consult with other agencies and the NFS to determine whether operational changes would be sufficient to achieve ecological success criteria. If, instead, structural changes are deemed necessary to achieve ecological success, USACE will implement appropriate adaptive management measures in accordance with the contingency plan and subject to cost sharing requirements, availability of funding, and current budgetary and other guidance.

The respective responsibilities for the construction, monitoring and maintenance of the mitigation projects within the TSA are as follows:

1. Construction and planting (the "construction phase") - performed by the USACE per applicable cost-sharing;

2. After construction and planting, the USACE issues Notice of Construction Complete (NCC) and provides the Operation, Maintenance, Repair, Replacement, and Rehabilitation manual to the NFS (the "O&M phase");

3. Notwithstanding NCC, the USACE will monitor the project on a cost-shared basis until it reaches its Initial Success Criteria;

4. If, after NCC but before Initial Success Criteria are achieved, the project needs additional construction, invasive species control or planting, the USACE will perform these items subject to applicable cost-sharing and availability of funds;

5. After Initial Success Criteria are achieved, the NFS will monitor project;

6. If, after Initial Success Criteria are achieved, there is a problem that can be corrected through a change in operation, the NFS will be responsible to change its operation of the project; and

7. If, after Initial Success Criteria are achieved, there is a problem that requires structural changes, USACE will implement adaptive management according to applicable cost-sharing and subject to availability of funds.

MITIGATION SUCCESS CRITERIA

The success criteria for the BLH and Swamp project features were initially included in the PIER Appendix L and are presented below and summarized in Table 2. Again, these criteria are currently under revision and will be incorporated when completed.

Success Criteria-Bottomland Hardwood Forest

The success (performance) criteria for BLH-Wet are included.

1. General Construction

A. Complete all necessary initial earthwork and related construction activities in accordance with the mitigation work plan as well as the final project plans and specifications. These requirements classify as initial success criteria.

2. Native Vegetation

A. Complete initial planting of canopy and midstory species in accordance with the authorized initial planting plan described in EA #576 Appendix H. This requirement classifies as an initial success criterion.

B. 1 Year Following Completion of Initial Plantings (at end of first growing season following the year plants are first installed) –

- Achieve a minimum average survival of 50 percent 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 would apply to the initial plantings as well as any subsequent replantings necessary to achieve this initial success requirement.
- Achieve a minimum average survival of 80% of planted midstory species (i.e. achieve a minimum average midstory species density of 108 seedlings/ac.). The surviving plants must approximate the species composition percentages specified in the initial plantings component of the Planting 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 269 living native canopy species per acre (planted trees and/or naturally recruited native canopy species).
- Achieve an average cover of 60% living, native, hard mast-producing species and 40% living soft-mast producing species in the canopy stratum (planted trees and/or naturally recruited native canopy 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 75 living native midstory species per acre (planted midstory and/or naturally recruited native midstory species).

- For BLH-Wet habitats -- Demonstrate that vegetation satisfies the USACE hydrophytic vegetation criteria. This criterion (requirement) will thereafter remain in effect for the duration of the overall monitoring period.
- The requirements above classify as intermediate success criteria; with the exception that the requirement to demonstrate vegetation satisfies the USACE hydrophytic vegetation criteria throughout the duration of the overall monitoring period classifies as a long-term success criterion.

D. Within 10 Years Following Completion of Initial Plantings –

- Attain a minimum average canopy 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. This requirement to meet the specified minimum average cover within 10 years following completion of initial plantings classifies as an intermediate success criterion. The requirement to meet the specified minimum average cover for the duration of the overall monitoring period classifies as a long-term success criterion.

E. 15 Years Following Completion of Initial Plantings –

- Average cover by native species in the midstory stratum must be greater than 20%. This criterion will thereafter remain in effect for the duration of the overall monitoring period. This requirement classifies as intermediate and long term success criteria.

  Note: The requirement that the above criteria remain in effect for the duration of the overall monitoring period 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. This requirement classifies as an initial success criterion.

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 average vegetative cover accounted for by invasive and nuisance species each constitute less than 5 percent of the total average plant cover during periods between maintenance events. Note -These criteria must be satisfied throughout the duration of the overall monitoring period. Until such time that monitoring responsibilities are transferred from the USACE to the NFS, this requirement classifies as an initial success criterion. Following the transfer of monitoring responsibilities, this requirement classifies as a long-term success criterion.

4. Topography

A. Following completion of initial construction activities, demonstrate that at least 80% of the total area within each feature is within approximately 0.5 feet of the proposed target soil

surface elevation (e.g. the desired soil surface elevation). This requirement classifies as an initial success criterion.

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 ensure the achievement of success criteria within the plan. This determination would be made approximately 15 to 20 years following completion of initial plantings. If, under normal climatic conditions, two or more successive monitoring reports do not indicate average growth rates for the species installed and site conditions are being achieved then remedial actions will be discussed with the resource agencies. If it is decided that timber management efforts are necessary, the NFS would develop a Timber Stand Improvement/Timber Management Plan, and associated long-term success criteria, in coordination with the USACE and Interagency Team. Following approval of the plan, the NFS would perform the necessary thinning operations and demonstrate that these operations have been successfully completed. Timber management activities would only be allowed for the operations that have been successfully completed.

Reference Table 2. Desired stand conditions for bottomland hardwood forests within the MS Alluvial Valley. (Page 23) in the following Handbook:

LMVJV Forest Resource Conservation Working Group. 2007. Restoration. Mangement, and Monitoring of Forest Resources in the Mississippi Alluvial Valley: Recommendations for Enhancing Wildlife Habitat. Edited by R. Wilson, K. Ribbeck, S. King, and D. Twedt.

6. Hydrology

The optimal hydrologic regime for BLH-Wet forests also involves both brief seasonal flooding and sufficient surface water exchange between the forest and adjacent systems. Wet BLH forests 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.

Success Criteria

A. Ground surface elevations must be conducive to establishment and support of hydrophytic vegetation, and re-establishment and maintenance of hydric soil characteristics.

B. Two years following attainment of the one-year survivorship criteria, site hydrology will be restored such that the Property meets the wetland criterion as described in the 1987 Manual as well as the November 2010 Regional Supplement to the Corps of Engineers wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region Version 2.0 (USACE 1987, 2010). Data

demonstrating that wetland hydrology is being or has been re-established is to be presented in the monitoring report.

Success Criteria-Swamp Habitat Restoration

1. General Construction

A. As applicable, complete all necessary initial earthwork and related construction activities in accordance with the mitigation work plan as well as the final project plans and specifications. Examples include, but are not limited to: grading and clearing activities; modifications/alterations to existing perimeter dikes. These requirements classify as initial success criteria.

2. Native Vegetation

A. Complete initial planting of canopy and midstory species in accordance with the authorized initial planting plan. This requirement classifies as an initial success criterion.

B. 1 Year Following Completion of Initial Plantings (at end of first growing season following the year plants are first installed) –

- 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 planting 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 80% of planted midstory species (i.e. achieve a minimum average midstory species density of 108 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.
- The requirements above classify as initial success criteria.

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.
- The requirements above classify as intermediate success criteria; with the exception that the requirement to demonstrate vegetation satisfies USACE hydrophytic vegetation criteria

throughout the duration of the overall monitoring period classifies as a long-term success criterion.

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%.
- The requirements above classify as intermediate success criteria.

E. Within 45 Years Following Completion of Initial Plantings –

- Demonstrate that the average diameter at breast height (DBH) of living trees exceeds 10 inches. This criterion will thereafter remain in effect for the duration of the overall monitoring period.

3. Invasive and Nuisance Vegetation

A. Complete the initial eradication of invasive and nuisance plant species. This requirement classifies as an initial success criterion.

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 average vegetative cover accounted for by invasive and nuisance species each constitute less than 5% of the total average plant cover during periods between maintenance events. These criteria must be satisfied throughout the duration of the overall monitoring period. Until such time that monitoring responsibilities are transferred from the USACE to the NFS, this requirement classifies as an initial success criterion. Following the transfer of monitoring responsibilities, this requirement classifies as a long-term success criterion.

4. Topography

A. Following completion of initial construction activities, demonstrate that at least 80% of the total area within each feature is within approximately 0.5 feet of the proposed target soil surface elevation (e.g. the desired soil surface elevation). This requirement classifies as an initial success criterion.

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 ensure the achievement of success criteria within the

plan. This determination would be made approximately 15 to 20 years following completion of initial plantings. If, under normal climatic conditions, two or more successive monitoring reports do not indicate average growth rates for the species installed and site conditions are being achieved then remedial actions will be discussed with the resource agencies. If it is decided that timber management efforts are necessary, the NFS would develop a Timber Stand Improvement/Timber Management Plan, and associated long-term success criteria, in coordination with the USACE and Interagency Team. Following approval of the plan, the NFS would perform the necessary thinning operations and demonstrate that these operations have been successfully completed. Timber management activities would only be allowed for the operations that have been successfully completed.

6. Hydrology

The optimal hydrologic regime for baldcypress/tupelogum swamp 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.

General Hydrologic Guidelines -The following provides some general hydrologic guidelines for the mitigation project since altering the existing hydrologic regime by modifying the perimeter dikes is a component of the mitigation work plan. It is emphasized that 1-4 below are not the required success criteria they are merely guidelines and the attainment of one or more of these guidelines may not be possible in some situations. The required success criteria are outlined below these guidelines.

1. 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).
2. 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.
3. 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).

4. 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.

Hydrologic Success Criteria- The following criteria will be used to determine hydrologic success of the mitigation feature.

A. Ground surface elevations must be conducive to establishment and support of hydrophytic vegetation, and re-establishment and maintenance of hydric soil characteristics.

B. Two years following attainment of the one-year survivorship criteria, site hydrology will be restored such that the Property meets the wetland criterion as described in the 1987 Manual as well as the November 2010 Regional Supplement to the Corps of Engineers wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region Version 2.0 (USACE 1987, 2010). Data demonstrating that wetland hydrology is being or has been re-established is to be presented in the monitoring report.

Table 2. Summary of Standard BLH and Swamp Success Criteria

Performance Categories	**Mitigation Success Criteria by Habitat Type**	
	BLH Wet	**Swamp**
Mitigation Construction	Criteria 1A: Complete necessary initial earthwork and construction activities.	Criteria 1A: Complete necessary initial earthwork and construction activities.
Native Vegetation	Criteria 2A: Complete initial plantings. Criteria 2B: 1 year after initial plantings achieve: • Survival of ≥50% canopy species. • Survival of ≥80% midstory species. Criteria 2C: 4 years after initial plantings achieve: • ≥269 living native canopy species per acre.	Criteria 2A: Complete initial plantings. Criteria 2B: 1 year after initial plantings achieve: • Survival of ≥50% canopy species. • Survival of ≥80% midstory species. Criteria 2C: 4 years after initial plantings achieve: • ≥250 native canopy species per acre.

	• 60% living, native hard mast trees per acre in the canopy stratum. • 40% living soft mast species in the canopy stratum. • 75 living native midstory species per acre • If applicable in final design BLH-wet must meet hydrophytic vegetation criteria. Criteria 2D: Within 10 years after initial plantings, achieve: ≥80% coverage by native canopy species. Criteria 2E: 15 years after initial plantings, achieve: • >20% cover by native midstory species.	• ≥125 living bald cypress trees per acre. • ≥ 85 native midstory species per acre. • Vegetation meets hydrophytic vegetation criteria. Criteria 2D. Within 15 years after initial plantings, achieve: • (1) ≥50% native canopy cover & >33% native midstory cover & >33% ground cover. OR (2): ≥75% native canopy cover AND: >33% native midstory cover; OR >33% native ground cover Criteria 2E: Within 45 years after initial plantings, achieve: • DBH of living trees >10 inches.
Invasive and Nuisance Vegetation (INV)	Criteria 3A. Complete initial Eradication of INV. Criteria 3B. Maintain <5% cover by INV.	Criteria 3A. Complete initial Eradication of INV. Criteria 3B. Maintain <5% cover by INV.
Topography	Criteria 4A: After completion of construction, ≥ 80% of total area must be within 0.5 ft of target elevation.	Criteria 4A: After completion of construction, ≥ 80% of total graded area must be within 0.5 ft of target elevation (for mitigation other than in open water areas).
Thinning of Native Vegetation	Criteria 5: TBD; at 15 to 20 years following initial plantings PDT will determine if thinning of canopy and midstory strata is warranted.	Criteria 5: TBD; at 15 to 20 years following initial plantings PDT will determine if thinning of canopy and midstory strata is warranted.

Hydrology	Criteria 6A: Ground surface elevations must be conducive to establishment and support of hydrophytic vegetation, and re-establishment and maintenance of hydric soil characteristics. Criteria 6B: 2 years following attainment of survivorship criteria, demonstrate wetland hydrology has been reestablished.	Criteria 6A: Ground surface elevations must be conducive to establishment and support of hydrophytic vegetation, and re-establishment and maintenance of hydric soil characteristics. Criteria 6B: 2 years following attainment of survivorship criteria, demonstrate wetland hydrology has been reestablished.

MITIGATION MONITORING GUIDELINES

Reference Document for Monitoring

All project monitoring would follow the procedures detailed within the revised monitoring plan (to be incorporated once completed) in concert with the procedures outlined in the following document: A Standard Operating Procedures Manual for the Coast-wide Reference Monitoring System (CRMS)– Wetlands: Methods for Site Establishment, Data Collection, and Quality Assurance/Quality Control, prepared by the Louisiana Coastal Protection and Restoration Authority, January 27, 2012. The referenced document is specific to coastal Louisiana wetlands and provides very detailed methodology for conducting field. The detailed methods provided in the CRMS Standard Operating Procedures Manual are incorporated by reference and are intended to supplement the procedures documented within this monitoring plan.

Bottomland Hardwood Forest

Baseline Monitoring Report

The mitigation site would be monitored and a baseline monitoring report prepared after final construction is complete. See Table 3. Monitoring and reporting requirements for the baseline report include the following items:

A. A detailed discussion of all mitigation activities completed.

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

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

station locations, and piezometer and staff gage locations will be identified once the final designs for the mitigation site are completed. The final locations will be determined and documented during the initial site visit and baseline monitoring report. Once finalized the final monitoring design will need to be coordinate with the USACE. If available aerial imagery of the mitigation site will also be included.

D. 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.

E. 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.

F. Photographs documenting conditions in the mitigation feature at the time of monitoring would be included. Photos would be taken at permanent photo stations within the mitigation feature. The number of photo stations required as well as the locations of these stations will vary depending on the mitigation site and will be determined once the specific mitigation features have been identified. The USACE will make this determination in coordination with the Interagency Team and will specify the requirements in an updated monitoring plan. At least two photos would 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.

G. Various qualitative observations would be made in the mitigation site to help assess the status and success of mitigation and maintenance activities. These observations would 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; observations regarding general surface inundation indicators. General observations made during the course of monitoring would also address potential problem zones and other factors deemed pertinent to the success of the mitigation program.

H. 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.

I. For BLH-Wet habitats only -- Water level elevation readings would be collected at the time of monitoring from staff gauges. The monitoring report would provide the staff gauge data along with mean high and mean low water elevation data. The report would further address estimated mean high and mean low water elevations at the mitigation site based on field indicators. The exact location of the proposed staff gauges would be determined during the initial site visit and the baseline monitoring event.

J. 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.

K. 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 baseline report as indicated in Table 3 would provide the following information unless otherwise noted:

L. All items listed for the baseline monitoring report with the exception of: (a) the topographic/as-built survey, unless additional topographic/as-built surveys are available; (b) the inventory of planted species; although such an inventory must be provided in any monitoring report generated for a year in which a feature is re-planted to meet applicable success criteria.

M. Quantitative plant data collection and results. Methodology includes a combination of various sized plots for measuring the canopy, midstory, and understory/groundcover.

- Permanent Plots: 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. The permanent monitoring plots will be located within mitigation areas where initial planting of canopy and midstory species is necessary. Whichever method is chosen for the initial monitoring report must be followed for all subsequent reports. The number of plots necessary as well as the location and length of each transect will vary depending on the mitigation site will be determined once the specific mitigation features have been identified.

- Data recorded in each permanent 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 the canopy stratum,
  - the wetland indicator status of each species the canopy stratum;
  - 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 midstory stratum,
  - and the wetland indicator status of each species midstory stratum;
  - 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).

- Transects: 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 methodology chosen for the initial monitoring report must be followed for all subsequent reports. The number of transects necessary as well as the location and length of each transect will vary depending on the mitigation site and will be determined once the specific mitigation features have been identified.

  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 species present in the canopy and midstory strata (combined).

- Quadrats: 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 methodology chosen for the initial monitoring report must be followed for all subsequent reports. The number of quadrats necessary as well as the location and length of each quadrat will vary depending on the mitigation site and will be determined once the specific mitigation features for BLH have been identified.

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.

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

O. A summary of water elevation data (NAVD88 or current) collected from a water level recorder in the same immediate hydrologic area of the mitigation site. As determined by the USACE and the IET, if a nearby Coastwide Reference Monitoring System [CRMS] station is available, its data may be used. If no CRMS station is available, a data logger must be installed immediately adjacent to the project. Water level data will be collected to provide average annual mean, high and low water levels as determined by the USACE and the IET. Once hydrology success criteria have been satisfied, water level 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 (e.g., wrack lines, water marks, etc.) and CRMS or other publicly available water level data in the same immediate hydrologic area.

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

Q. In addition to the above items, the monitoring report prepared upon completion of the final mitigation construction activities and the monitoring report prepared for 3 years following completion of final mitigation construction activities would include a topographic survey of each restoration feature. These surveys would cover the same components as described for the topographic survey conducted for the baseline monitoring report. In addition to the surveys themselves, each of the two monitoring reports involving topographic surveys would 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 would be made by the USACE in coordination with the Interagency Team and NFS.

R. 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.

Swamp Restoration

Baseline 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 baseline or monitoring report will be prepared. See Table 3. Monitoring and reporting requirements for the baseline report include the following items:

A. A detailed discussion of all mitigation activities completed.

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

C. 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. The proposed locations for the permanent monitoring transect locations, sampling plot locations, quadrats, photo station locations, and piezometer and staff gage locations will be identified once the final designs for the mitigation site are completed. The final locations will be determined and documented during the initial site visit and baseline monitoring report.

D. If applicable, 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.

E. 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.

F. 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.

G. 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 final mitigation site design. The USACE will make this determination in coordination with the Interagency Team and will specify the requirements in an updated monitoring plan. Permanent photo stations will primarily be established in areas slated for planting of canopy and midstory species.

H. 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.

I. A summary of water table elevation data collected from staff gages installed within the mitigation site. The number of gages required as well as the locations of these devices will vary depending on the final design of the mitigation site. The USACE will make this determination in coordination with the Interagency Team and will specify the requirements in an updated 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.

J. 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.

K. 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

In addition to the items required in the baseline monitoring report all monitoring reports generated after the initial baseline report will typically provide the following information unless otherwise noted:

L. Quantitative plant data collected from permanent monitoring plots measuring approximately 80 feet X 80 feet in size. 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 final design of the mitigation site. The USACE will make this determination in coordination with the Interagency Team and will specify the requirements in an updated monitoring plan.

   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.

M. 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.

N. 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 final design of mitigation site. The USACE will make this determination in coordination with the Interagency Team and will specify the requirements in an updated monitoring plan. The methodology chosen for the initial monitoring report must be followed for all subsequent reports.

   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 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.

O. 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 an updated monitoring plan. The methodology chosen for the initial monitoring report must be followed for all subsequent reports.

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.

P. In addition to the above items, the monitoring report prepared upon completion of the final mitigation construction activities and the monitoring report prepared for 3 years following completion of final mitigation construction activities would include a topographic survey of each restoration feature. These surveys would cover the same components as described for the topographic survey conducted for the baseline monitoring report. In addition to the surveys themselves, each of the two monitoring reports involving topographic surveys would 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 would be made by the USACE in coordination with the Interagency Team and NFS.

Q. 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.

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 would 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 NFS's proposed Timber Stand Improvement/Timber Management Plan must include the proposed monitoring data and information that would 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.

MONITORING SCHEDULE, RESPONSIBILITIES AND COSTS

Bottomland Hardwood Wet

Monitoring for BLH Wet 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 NFS, and the agencies comprising the Interagency Team. See Table 3 and 4 for a schedule of the currently proposed monitoring events. The timing of these events may be modified or shifted once the final project design and construction schedule have been identified.

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
2. Native Vegetation – 2.A and 2.B.
3. Invasive & Nuisance Vegetation – 3A, plus 3B until such time as monitoring responsibilities are transferred to the NFS.
4. Topography – 4A

Monitoring events associated with the above will include the first or baseline monitoring event plus annual monitoring events thereafter until the monitoring responsibilities are transferred to the NFS. The NFS 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 typically 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, subject to the provisions identified in the Introduction section.

Once monitoring responsibilities have been transferred to the NFS, the next monitoring event will typically 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 typically be conducted every 5 years throughout the 50-year period of analysis. See Table 3 and 4 for the currently proposed monitoring events. The timing of these events may be shifted once the final project design and construction schedule have been identified.

If the initial survival criteria for planted canopy and midstory species are not achieved (i.e. the 1-year survival criteria specified in native vegetation 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 this success criterion, subject to the provisions mentioned in the Introduction section.

If the native vegetation success criteria specified for 4 years following completion of initial plantings are not achieved (i.e. native vegetation 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 NFS will be responsible for conducting this additional monitoring and preparing the monitoring reports. The NFS will also be responsible for the purchase and installation of supplemental plants needed to attain these success criteria.

Once monitoring responsibilities have transferred to the NFS, the NFS 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.

Table 3 and 4 provides a cost estimate based on the currently available information and may need to be revised in the future as additional information regarding the mitigation feature designs and construction schedule become available.

Table 3. Mitigation Monitoring Report Schedule and NFS Costs for BLH Wet

Target Year	Work Item	Work Item Description	Estimated Cost
0	Begin Construction	Start of mitigation construction activities	
1	Complete Construction	Finish clearing, grubbing, grading (excavation; ditch & berm removal), drainage alterations, etc.	
	Topographic/As-Built Survey	Perform as-built topographic survey of areas in enhancement features requiring significant grading. Includes survey of any structures installed plus cross-sections of significant ditches or berms removed, and for any new drainage features. Results documented in mitigation monitoring report.	
	Invasive/Nuisance Plant Eradication	Initial eradication of invasive and nuisance plant species in enhancement features. Ground application.	
	Invasive/Nuisance Plant Eradication	Follow-up eradication of invasive and nuisance plant species in enhancement features. Ground application.	
2	Initial Plantings*	Install canopy and midstory species	
	Nutria Guards	Install nutria guards for all initial plantings.	
	Invasive/Nuisance Plant Eradication	Follow-up eradication of invasive and nuisance plant species in enhancement features. Ground application.	
	Invasive/Nuisance Plant Eradication	Follow-up eradication of invasive and nuisance plant species in enhancement features. Ground application.	
	Monitoring & Report	Perform field mitigation monitoring. Submit report by Dec. 31.	
3	Invasive/Nuisance Plant Eradication	Follow-up eradication of invasive and nuisance plant species in enhancement features. Ground application.	
	Analysis for Notice of Construction Complete	Review As-Builts and O&M manual. Review monitoring report from prior year and other data as compared to success criteria. Coordination with Interagency Team as needed.	
	NCC	Transfer (turn-over) project to the Non-Federal Sponsor. The USACE will continue to monitor and conduct activities necessary to ensure initial success criteria are met	
	Monitoring & Report	Perform field mitigation monitoring. Submit report by Dec. 31.	
4	Additional Plantings*	Re-plant restoration features where plant survival success criteria not achieved	
	Invasive/Nuisance Plant Eradication	Follow-up eradication of invasive and nuisance plant species in enhancement features. Ground application.	
	Monitoring & Report*	Perform field mitigation monitoring. Submit report by Dec. 31. This monitoring required only if area had to be replanted in TY4 per success criteria requirements.	

	Review and Coordination	Review monitoring report from prior year and other data as compared to success criteria. Coordination with Interagency Team as needed.	
5	Invasive/Nuisance Plant Eradication	Follow-up eradication of invasive and nuisance plant species in enhancement features. Ground application.	
	Monitoring & Report	Perform field mitigation monitoring. Submit report by Dec. 31. Report also accomplished added monitoring needed due to re-planting.	
	Review and Coordination	Review monitoring report from prior year and other data as compared to success criteria. Coordination with Interagency Team as needed.	
6	Analysis for Success Criteria	Review monitoring report from prior year and other data to make initial success criteria determination and to turn over monitoring to Non-Federal Sponsor.	
		Transfer (turn-over) project monitoring to Non-Federal Sponsor. Note: transfer occurs this year unless additional plantings needed in TY5 or canopy/midstory densities not achieved in TY5 per success criteria.	
	Invasive/Nuisance Plant Eradication	Follow-up eradication of invasive and nuisance plant species in enhancement features. Ground application.	
7	Invasive/Nuisance Plant Eradication	Follow-up eradication of invasive and nuisance plant species in enhancement features. Ground application.	
	Monitoring & Report	Perform field mitigation monitoring. Submit report by Dec. 31.	
	Analysis for satisfaction of initial success criteria	Review monitoring report from TY7 and other data as compared to success criteria. Make determination to completely turn over project to Non-Federal Sponsor.	
10	Invasive/Nuisance Plant Eradication	Follow-up eradication of invasive and nuisance plant species in enhancement features. Ground application.	
	Transfer to NFS	Transfer (turn-over) project to Non-Federal Sponsor (Feb. thru April?) for all OMRR&R. Note: transfer occurs early this year unless topographic corrections and/or marsh planting required.	
12	Invasive/Nuisance Plant Eradication	Follow-up eradication of invasive and nuisance plant species in enhancement features. Ground application.	$ 25,933
	Monitoring & Report	Perform field mitigation monitoring. Submit report by Dec. 31.	$ 30,000
	Review and Coordination	Review monitoring report from TY12 and other data as compared to success criteria. Coordination with Interagency Team as needed.	$ 5,000
17	Aerial Photography	Obtain rectified aerial photo of restoration features. Provide as part of mitigation monitoring report.	
	Invasive/Nuisance Plant Eradication	Follow-up eradication of invasive and nuisance plant species in enhancement features. Ground application.	$ 25,933
	Monitoring & Report	Perform field mitigation monitoring. Submit report by Dec. 31.	$ 30,000
	Review and Coordination	Review monitoring report and other data as compared to success criteria. Coordination with Interagency Team as needed.	$ 5,000
22	Invasive/Nuisance Plant Eradication	Follow-up eradication of invasive and nuisance plant species in enhancement features. Ground application.	$ 25,933
	Monitoring & Report	Perform field mitigation monitoring. Submit report by Dec. 31.	$ 30,000
	Review and Coordination	Review monitoring report and other data as compared to success criteria. Coordination with Interagency Team as needed.	$ 5,000

27	Invasive/Nuisance Plant Eradication	Follow-up eradication of invasive and nuisance plant species in enhancement features. Ground application.	$ 25,933
	Monitoring & Report	Perform field mitigation monitoring. Submit report by Dec. 31.	$ 30,000
	Review and Coordination	Review monitoring report and other data as compared to success criteria. Coordination with Interagency Team as needed.	$ 5,000
32	Invasive/Nuisance Plant Eradication	Follow-up eradication of invasive and nuisance plant species in enhancement features. Ground application.	$ 25,933
	Monitoring & Report	Perform field mitigation monitoring. Submit report by Dec. 31.	$ 30,000
	Review and Coordination	Review monitoring report and other data as compared to success criteria. Coordination with Interagency Team as needed.	$ 5,000
37	Invasive/Nuisance Plant Eradication	Follow-up eradication of invasive and nuisance plant species in enhancement features. Ground application.	$ 25,933
	Monitoring & Report	Perform field mitigation monitoring. Submit report by Dec. 31.	$ 30,000
	Review and Coordination	Review monitoring report and other data as compared to success criteria. Coordination with Interagency Team as needed.	$ 5,000
42	Invasive/Nuisance Plant Eradication	Follow-up eradication of invasive and nuisance plant species in enhancement features. Ground application.	$ 25,933
	Monitoring & Report	Perform field mitigation monitoring. Submit report by Dec. 31.	$ 30,000
	Review and Coordination	Review monitoring report and other data as compared to success criteria. Coordination with Interagency Team as needed.	$ 5,000
47	Invasive/Nuisance Plant Eradication	Follow-up eradication of invasive and nuisance plant species in enhancement features. Ground application.	$ 25,933
	Monitoring & Report	Perform field mitigation monitoring. Submit report by Dec. 31.	$ 30,000
	Review and Coordination	Review monitoring report and other data as compared to success criteria. Coordination with Interagency Team as needed.	$ 5,000
52	Invasive/Nuisance Plant Eradication	Follow-up eradication of invasive and nuisance plant species in enhancement features. Ground application.	$ 25,933
	Monitoring & Report	Perform field mitigation monitoring. Submit report by Dec. 31.	$ 30,000
	Review and Coordination	Review monitoring report and other data as compared to success criteria. Coordination with Interagency Team as needed.	$ 5,000
		TOTAL	$548,397
		TOTAL + 15% Contingency	$630,657
NOTES:			

*The costs for topographic/as-built surveys needed for monitoring are NOT included in the cost for the "monitoring and report" events.
*Cost for initial plantings should already be in Engineering's cost estimate; thus not repeated herein.
*Assume mitigation features will require 1 re-planting event to meet vegetation success criteria. For cost, assume that 20% of the total quantity of plants used in the initial planting will be the quantity needed for re-planting.
*The contract to obtain plants for initial planting will need to be issued at least 13 to 14 months prior to the date that plants will be installed since the plants must be 1 year old at the time of installation (must start growing the plants at the nursery).
*Assume approximately 1,167 acres of BLH would need to be monitored and maintained

Swamp

Monitoring for swamp 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 NFS, and the agencies comprising the Interagency Team. The various monitoring and reporting responsibilities addressed in this section are all subject to the provisions set forth in the Introduction section. See Table 4 for a schedule of the currently proposed monitoring events. The timing of these events may be modified or shifted once the final project design and construction schedule have been identified.

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
2. Native Vegetation – A and B.
3. Invasive & Nuisance Vegetation – A, plus B until such time as monitoring responsibilities are transferred to the NFS.
4. Topography – 4.A.

Monitoring events associated with the above will include the "time zero" (first or baseline) monitoring event plus annual monitoring events thereafter until the mitigation monitoring responsibility is transferred to the NFS. The NFS 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 typically be transferred to the NFS 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 NFS, 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 typically be conducted every 5 years throughout the 50-year period of analysis. See Table 4 for a schedule of the currently proposed monitoring events. The timing of these events may be modified or shifted once the final project design and construction schedule have been identified.

If the initial survival criteria for planted canopy and midstory species are not achieved (i.e. the 1-year survival criteria specified in native vegetation success criterion 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 this success criterion.

If the native vegetation success criteria specified for 4 years following completion of initial plantings are not achieved (i.e. native vegetation success criterion 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 NFS will be responsible for conducting this additional monitoring and preparing the monitoring reports. The NFS will also be responsible for the purchase and installation of supplemental plants needed to attain this success criterion.

If timber management activities conducted in the mitigation features by the NFS, the NFS 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).

Once monitoring responsibilities have transferred to the NFS, the NFS 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.

Table 4 also provides a cost estimate based on the currently available information and may need to be revised in the future as additional information regarding mitigation feature designs and the construction schedule becomes available.

Table 4. - Mitigation Monitoring Report Schedule and NFS Costs for Swamp

Target Year	Work Item	Work Item Description	Estimated Cost
0	Begin Construction	Start of mitigation construction activities.	
1	Complete Construction	Finish clearing, grubbing, grading (excavation; ditch & berm removal), drainage alterations, etc.	
	Topographic/As-Built Survey	Perform as-built topographic survey of areas in enhancement. Includes survey of any structures installed plus cross-sections of significant ditches or berms removed, and for any new drainage features. Results documented in mitigation monitoring report.	
	Invasive/Nuisance Plant Eradication	Initial eradication of invasive and nuisance plant species in enhancement features. Ground application.	
	Invasive/Nuisance Plant Eradication	Follow-up eradication of invasive and nuisance plant species in enhancement features. Ground application.	
	Review and Coordination	Review ongoing activities, coordination with Interagency Team as needed.	
2	Initial Plantings*	Install canopy and midstory species	
	Nutria Guards	Install nutria guards for all initial plantings.	

	Invasive/Nuisance Plant Eradication	Follow-up eradication of invasive and nuisance plant species in enhancement features. Ground application.	
	Invasive/Nuisance Plant Eradication	Follow-up eradication of invasive and nuisance plant species in enhancement features. Ground application.	
	Monitoring & Report	Perform field mitigation monitoring. Submit report by Dec. 31.	
	Review and Coordination	Review ongoing activities, coordination with Interagency Team as needed.	
3	Topographic/As-Built Survey	Perform topographic survey. Includes survey of any structures installed plus cross-sections of significant ditches or berms removed, and for any new drainage features. Results documented in mitigation monitoring report.	
	Invasive/Nuisance Plant Eradication	Follow-up eradication of invasive and nuisance plant species in enhancement features. Ground application.	
	Invasive/Nuisance Plant Eradication	Follow-up eradication of invasive and nuisance plant species in enhancement features. Ground application.	
	Monitoring & Report	Perform field mitigation monitoring. Submit report by Dec. 31.	
	Analysis for Notice of Construction Complete	Review As-Builts and O&M manual. Review ongoing activities, review monitoring report from prior year and other data as compared to success criteria. Coordination with Interagency Team as needed.	
	NCC	Transfer (turn-over) project to the Non-Federal Sponsor. The USACE will continue to monitor and conduct activities necessary to ensure initial success criteria are met.	
4	Additional Plantings*	Re-plant restoration features where plant survival success criteria not achieved (Feb. thru mid-March).	
	Invasive/Nuisance Plant Eradication	Follow-up eradication of invasive and nuisance plant species in enhancement features. Ground application.	
	Invasive/Nuisance Plant Eradication	Follow-up eradication of invasive and nuisance plant species in enhancement features. Ground application.	
	Monitoring & Report*	Perform field mitigation monitoring. Submit report by Dec. 31. This monitoring required only if area had to be replanted in TY4 per success criteria requirements.	
	Review and Coordination	Review ongoing activities, review monitoring report from prior year and other data as compared to success criteria. Coordination with Interagency Team as needed.	
5	Invasive/Nuisance Plant Eradication	Follow-up eradication of invasive and nuisance plant species in enhancement features. Ground application.	
	Invasive/Nuisance Plant Eradication	Follow-up eradication of invasive and nuisance plant species in enhancement features. Ground application.	
	Monitoring & Report	Perform field mitigation monitoring. Submit report by Dec. 31. Report also accomplished added monitoring needed due to re-planting.	

	Review and Coordination	Review ongoing activities, review monitoring report from prior year and other data as compared to success criteria. Coordination with Interagency Team as needed.	
6	Analysis for Success Criteria	Review monitoring report from prior year and other data to make initial success criteria determination and to turn over monitoring to Non-Federal Sponsor.	
		Transfer (turn-over) project to Non-Federal Sponsor. Note: transfer occurs this year unless additional plantings needed in TY5 or canopy/midstory densities not achieved in TY5 per success criteria.	
	Invasive/Nuisance Plant Eradication	Follow-up eradication of invasive and nuisance plant species in enhancement features. Ground application.	
7	Aerial Photography	Obtain rectified aerial photo of restoration features if available. Provide as part of mitigation monitoring report.	
	Invasive/Nuisance Plant Eradication	Follow-up eradication of invasive and nuisance plant species in enhancement features. Ground application.	
	Monitoring & Report	Perform field mitigation monitoring. Submit report by Dec. 31.	
	Analysis for satisfaction of initial success criteria.	Review monitoring report from prior year and other data to make determination to completely turn over project to Non-Federal Sponsor. Review ongoing activities, review monitoring report and other data as compared to success criteria. Coordination with Interagency Team as needed.	
	Transfer to NFS	Transfer (turn-over) project to Non-Federal Sponsor for all OMRR&R. Note: transfer occurs early this year unless topographic corrections and/or plantings required.	
10	Invasive/Nuisance Plant Eradication	Follow-up eradication of invasive and nuisance plant species in enhancement features. Ground application.	$ 76,100
12	Invasive/Nuisance Plant Eradication	Follow-up eradication of invasive and nuisance plant species in enhancement features. Ground application.	$ 76,100
	Monitoring & Report	Perform field mitigation monitoring. Submit report by Dec. 31.	$ 56,000
	Review and Coordination	Review ongoing activities, review monitoring report and other data as compared to success criteria. Coordination with Interagency Team as needed.	$ 5,000
17	Invasive/Nuisance Plant Eradication	Follow-up eradication of invasive and nuisance plant species in enhancement features. Ground application.	$ 76,100
	Monitoring & Report	Perform field mitigation monitoring. Submit report by Dec. 31.	$ 56,000
	Review and Coordination	Review ongoing activities, review monitoring report and other data as compared to success criteria. Coordination with Interagency Team as needed.	$ 5,000
22	Invasive/Nuisance Plant Eradication	Follow-up eradication of invasive and nuisance plant species in enhancement features. Ground application.	$ 76,100
	Monitoring & Report	Perform field mitigation monitoring. Submit report by Dec. 31.	$ 56,000

	Review and Coordination	Review ongoing activities, review monitoring report and other data as compared to success criteria. Coordination with Interagency Team as needed.	$ 5,000
27	Invasive/Nuisance Plant Eradication	Follow-up eradication of invasive and nuisance plant species in enhancement features. Ground application.	$ 76,100
	Monitoring & Report	Perform field mitigation monitoring. Submit report by Dec. 31.	$ 56,000
	Review and Coordination	Review ongoing activities, review monitoring report and other data as compared to success criteria. Coordination with Interagency Team as needed.	$ 5,000
32	Invasive/Nuisance Plant Eradication	Follow-up eradication of invasive and nuisance plant species in enhancement features. Ground application.	$ 76,100
	Monitoring & Report	Perform field mitigation monitoring. Submit report by Dec. 31.	$ 56,000
	Review and Coordination	Review ongoing activities, review monitoring report and other data as compared to success criteria. Coordination with Interagency Team as needed.	$ 5,000
37	Invasive/Nuisance Plant Eradication	Follow-up eradication of invasive and nuisance plant species in enhancement features. Ground application.	$ 76,100
	Monitoring & Report	Perform field mitigation monitoring. Submit report by Dec. 31.	$ 56,000
	Review and Coordination	Review ongoing activities, review monitoring report and other data as compared to success criteria. Coordination with Interagency Team as needed.	$ 5,000
42	Invasive/Nuisance Plant Eradication	Follow-up eradication of invasive and nuisance plant species in enhancement features. Ground application.	$ 76,100
	Monitoring & Report	Perform field mitigation monitoring. Submit report by Dec. 31.	$ 56,000
	Review and Coordination	Review ongoing activities, review monitoring report and other data as compared to success criteria. Coordination with Interagency Team as needed.	$ 5,000
47	Invasive/Nuisance Plant Eradication	Follow-up eradication of invasive and nuisance plant species in enhancement features. Ground application.	$ 76,100
	Monitoring & Report	Perform field mitigation monitoring. Submit report by Dec. 31.	$ 56,000
	Review and Coordination	Review ongoing activities, review monitoring report from prior year and other data as compared to success criteria. Coordination with Interagency Team as needed.	$ 5,000
52	Invasive/Nuisance Plant Eradication	Follow-up eradication of invasive and nuisance plant species in enhancement features. Ground application.	$ 76,100
	Monitoring & Report	Perform field mitigation monitoring. Submit report by Dec. 31.	$ 56,000
	Review and Coordination	Review ongoing activities, review monitoring report and other data as compared to success criteria. Coordination with Interagency Team as needed.	$ 5,000
		TOTAL	$ 1,310,000
		TOTAL + 15%	$ 1,506,500
NOTES			

*The costs for topographic/as-built surveys needed for monitoring may not all be included in the cost for the "monitoring and report" events and may be covered by some engineering costs.
*Cost for initial plantings should already be in Engineering's cost estimate; thus not repeated herein.
*Assume mitigation features will require 1 re-planting event to meet vegetation success criteria. For cost, assume that 20% of the total quantity of plants used in the initial planting will be the quantity needed for re-planting.
*Assume 3,805 acres would need to be maintained and monitored

DRAFT ENVIRONMENTAL ASSESSMENT (EA #576)

ADAPTIVE MANAGEMENT

BOTTOM LAND HARDWOOD WET AND SWAMP

1.0. Introduction

This Adaptive Management (AM) Plan is for BBA mitigation sites included in EA #576 which are designed to mitigate for bottomland hardwood wet and swamp impacts. The mitigation features are fully described in EA ##576. The Water Resources Development Act (WRDA) of 2007, Section 2036(a) and U.S Army Corps of Engineers (USACE) implementation guidance for Section 2036(a) (CECW-PC Memorandum dated August 31, 2009: "Implementation Guidance for Section *2036 (a) of the Water Resources Development* Act of 2007 (WRDA 2007) – Mitigation for Fish and Wildlife and Wetland Losses") require adaptive management be included in all mitigation plans for fish and wildlife habitat and wetland losses.

It should be noted that even though the proposed mitigation actions under EA #576 include the potential purchase of credits from a mitigation bank this appendix only details the Adaptive Management planning for the Corps constructed projects. In the event that mitigation bank credits are purchased the mitigation management and maintenance activities for the mitigation bank credits will be set forth in the Mitigation Banking Instrument (MBI) for each particular bank. The bank sponsor (bank permittee) will be responsible for these activities rather than the USACE and/or the local Sponsor. USACE Regulatory staff reviews mitigation bank monitoring reports and conducts periodic inspections of mitigation banks to ensure compliance with mitigation success criteria stated in the MBI.

2.0. Adaptive Management Planning

Adaptive management planning elements included: 1) development of a Conceptual Ecological Model (CEM), 2) identification of key project uncertainties and associated risks, 3) evaluation of the mitigation projects as a candidate for adaptive management and 4) the identification of potential adaptive management actions (contingency plan) to better ensure the mitigation project meets identified success criteria. The adaptive management plan is a living document and will be refined as necessary as new mitigation project information becomes available.

2.1. Conceptual Ecological Model

A CEM was developed to identify the major stressors and drivers affecting the proposed mitigation projects under SEA #576 (see Table 1). The CEM does not attempt to explain all possible relationships of potential factors influencing the mitigation sites; rather, the CEM presents only those relationships and factors deemed most relevant to obtaining the required acres/average annual habitat units (AAHUs). Furthermore this CEM represents the current understanding of these factors and will be updated and modified, as necessary, as new information becomes available.

Table 1. Conceptual Ecological Model

Alternatives/Issues/Drivers	BLH Wet	Swamp	Mitigation Banks
Freshwater Input	+/-	+/-	*
Salinity Impacts	-	-	*
Subsidence	-	-	*
Sea Level Rise	-	-	*
Runoff	-	-	*
Vegetative Invasive Species	-	-	*
Herbivory	-	-	*
Hydrology	+/-	+/-	*
Topography (elevation)	+/-	+/-	*

Key to Cell Codes:
- = Negative Impact/Decrease
+ = Positive Impact/Increase
+/- = Duration Dependent
*Issues and drivers assumed to be addressed by Mitigation Bank sponsors

2.2. Sources of Uncertainty and Associated Risks

A fundamental tenet underlying adaptive management is decision making and achieving desired project outcomes in the face of uncertainties. There are many uncertainties associated with restoration of the coastal systems. The project delivery team identified the following uncertainties during the planning process.

A. Climate change, such as relative sea level rise, drought conditions, and variability of tropical storm frequency, intensity, and timing
B. Subsidence and water level trends at the mitigation sites
C. Uncertainty Relative to Achieving Ecological Success:
    i. Water, sediment, and nutrient requirements for BLH and Swamp
    ii. Magnitude and duration of wet/dry cycles for BLH and Swamp
    iii. Nutrients required for desired productivity for BLH and Swamp
    iv. Growth curves based on hydroperiod and nutrient application for BLH and Swamp
    v. Tree litter production based on nutrient and water levels for BLH and Swamp

vi. Tree propagation in relation to management/regulation of hydroperiod for BLH and Swamp

D. Loss rate of vegetative plantings due to herbivory
E. Long-Term Sustainability of Project Benefits

2.3. Adaptive Management Evaluation

The project sites were evaluated and planned to develop a project with minimal risk and uncertainty. The items listed below were incorporated into the mitigation project implementation plan and Operation, Maintenance, Repair, Replacement and Rehabilitation (OMRR&R) plans to minimize project risks.

- Specified success criteria (i.e., mitigation targets)
- Detailed planting guidelines for BLH and Swamp
- Invasive species control
- Supplementary plantings as necessary (contingency)
- Corrective actions to meet topographic and hydrologic success as required (contingency)

Subsequently, as part of the adaptive management planning effort the mitigation project features were re-evaluated against the CEM and sources of uncertainty and risk were identified to determine if there was any need for additional actions and costs under the adaptive management plan to ensure that the project meets the required success criteria. Based on the uncertainties and risks associated with the project implementation the following contingency actions have been identified to be implemented if needed to ensure the required AAHUs are met.

Potential Action #1. Additional vegetative plantings as needed to meet identified success criteria.

Uncertainties addressed: A,B,C,D, E

Potential Action #2. Additional earthwork at mitigation sites (by adding sediment or degrading) to obtain elevations necessary for BLH and Swamp vegetative establishment and maintenance.

Uncertainties addressed: A,B,C,E

Potential Action #3. Invasive species control to ensure survival of native species and meet required success criteria.

Uncertainties addressed: E

Actions 1 & 3 are not recommended as separate adaptive management actions since they are already built into the mitigation plan and success criteria identified. In the event that monitoring reveals the project does not meet the identified vegetation, or hydrologic success criteria, additional plantings or construction activities are already accounted for and would be conducted under the mitigation project. Specific measures to implement Action 2, if determined necessary

to achieve project benefits, would be coordinated with the NFS and other agencies to determine the appropriate course of action. If it is determined that the project benefits are significantly compromised because of improper elevation, additional fill material may need to be pumped into or removed from the project area. Due to the impact the addition of fill to the mitigation projects once they have been planted would incur, lifts to the projects are not currently considered as a viable remedial action. Instead, increasing the size of the existing mitigation project or mitigating the outstanding balance of the mitigation requirement elsewhere or through the purchase of mitigation bank credits would be options that could be considered through additional coordination with the NFS and the IET. However, such options would have to undergo further analysis in a supplemental NEPA document.

Action 2 is potentially very costly actions. Before implementing such an action, the Corps would coordinate with the NFS and other agencies to determine if other actions, such as purchasing of credits in a mitigation bank or building additional mitigation elsewhere, would be more cost-effective options to fulfill any shortfalls in the overall project success. The USACE would be responsible for performing any necessary corrective actions, but the overall cost would be shared with the NFS according to the project cost-share agreement.

The USACE would be responsible for the proposed mitigation construction and monitoring until the initial success criteria are met. Initial construction and monitoring would be funded in accordance with all applicable cost-share agreements with the NFS. The USACE would monitor (on a cost-shared basis) the completed mitigation to determine whether additional construction, invasive/nuisance plant species control, and/or plantings are necessary to achieve initial mitigation success criteria. Once the USACE determines that the mitigation has met the initial success criteria, monitoring would be performed by the NFS as part of its OMRR&R obligations. If after meeting initial success criteria, the mitigation fails to meet its intermediate and/or long-term ecological success criteria, the USACE would consult with other agencies and the NFS to determine the appropriate management or remedial actions required to achieve ecological success. The USACE would retain the final decision on whether or not the project's required mitigation benefits are being achieved and whether or not remedial actions are required. If structural changes are deemed necessary to achieve ecological success, the USACE would implement appropriate adaptive management measures in accordance with the contingency plan and subject to cost-sharing requirements, availability of funding, and current budgetary and other guidance.