LOUISIANA WETLAND RAPID ASSESSMENT METHOD
FOR USE WITHIN THE BOUNDARIES OF THE NEW ORLEANS DISTRICT
DRAFT VERSION 1.0

United States Army Corps of Engineers, New Orleans District

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I. Introduction

A. Purpose

The U.S. Army Corps of Engineers (USACE), New Orleans District, Regulatory Branch (CEMVN), has developed this manual to provide a rapid assessment method for evaluating the condition of wetlands. This manual describes the intended use, scope, background, procedures, and guidelines for the Louisiana Wetland Rapid Assessment Method (LRAM). The output from LRAM will be used for calculating unavoidable adverse impacts and compensatory mitigation associated with USACE authorized activities under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899. The appropriate use of LRAM will provide consistent methods for wetland assessment and will support the integrity of data collection and comparison.

B. Definitions

The following is a list of key terms defined as appropriate for use within LRAM.

Absolute cover – (used in LRAM related to vegetation sampling) the percentage of the ground surface that is covered by the aerial portions (leaves and stems) of a plant species when viewed from above. Due to overlapping plant canopies, the sum of absolute cover values for all species in a community or stratum may exceed 100 percent.

Aquatic resources – a natural resource that wholly or partially contains water including, but not limited to wetlands, rivers, streams, lakes, channelized waterbodies or estuarine waterbodies.

Buffer - an upland, wetland, and/or riparian area that protects and/or enhances aquatic resource functions associated with wetlands, rivers, streams, lakes, marine, and estuarine systems from disturbances associated with adjacent land uses.

Compensatory mitigation - the restoration (re-establishment or rehabilitation), establishment (creation), enhancement, and/or in certain circumstances preservation of aquatic resources for the purposes of offsetting unavoidable adverse impacts which remain after all appropriate and practicable avoidance and minimization has been achieved.

Condition - the relative ability of an aquatic resource to support and maintain a community of organisms having a species composition, diversity, and functional organization comparable to reference aquatic resources in the region.

Credit - a unit of measure (e.g., a functional or areal measure or other suitable metric) representing the accrual or attainment of aquatic functions at a compensatory mitigation site. The measure of aquatic functions is based on the resources restored, established, enhanced, or preserved.

Cumulative Impact - the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

DA - Department of the Army.

Debit - a unit of measure (e.g., a functional or areal measure or other suitable metric) representing the loss of aquatic functions at an impact or project site. The measure of aquatic functions is based on the resources impacted by the authorized activity.

Dominant Impact - the work responsible for degrading/improving the wetland functions.
Ecologically preferable - the replacement of impacted wetland functions of one wetland type with a different wetland type that has different morphological and biological features, but is considered to be a more valuable and/or threatened habitat type than the impacted aquatic site.

Enhancement - the manipulation of the physical, chemical, or biological characteristics of an aquatic resource to heighten, intensify, or improve a specific aquatic resource function(s). Enhancement results in the gain of selected aquatic resource function(s), but may also lead to a decline in other aquatic resource function(s). Enhancement does not result in a gain in aquatic resource area.

Establishment (creation) - the manipulation of the physical, chemical, or biological characteristics present to develop an aquatic resource that did not previously exist at an upland site. Establishment results in a gain in aquatic resource area and functions.

Florida Parishes - eight parishes (East Baton Rouge, East Feliciana, Livingston, St. Helena, St. Tammany, Tangipahoa, Washington, and West Feliciana) in the southeastern part of Louisiana on the eastern side of Mississippi River and north of Lake Pontchartrain.

Functional capacity - the degree to which an area of aquatic resource performs a specific function.

Functions - the physical, chemical, and biological processes that occur in ecosystems.

Hydrologic Unit Code (HUC) - a way of identifying all of the drainage basins in the United States in a nested arrangement developed by the United States Geological Survey (USGS). Drainage basins in the United States have been divided and subdivided at four different levels and each assigned a unique HUC consisting of eight digits based on these four levels. The four levels from largest to smallest are regions, sub-regions, accounting units, and cataloging units.

i-value – values within LRAM associated with the options for each factor related to an impact site

In-kind - a resource of a similar structural and functional type to the impacted resource.

Interagency Review Team (IRT) - an interagency group of federal, tribal, state, and/or local regulatory and resource agency representatives that reviews documentation for, and advises the district engineer on, the establishment and management of a mitigation bank or an in-lieu fee program.

m-value – values within LRAM associated with the options for each factor related to a mitigation site

Mitigation bank - a site, or suite of sites, where resources (e.g., wetlands, streams, riparian areas) are restored, established, enhanced, and/or preserved for the purpose of providing compensatory mitigation for impacts authorized by DA permits. In general, a mitigation bank sells compensatory mitigation credits to permittees whose obligation to provide compensatory mitigation is then transferred to the mitigation bank sponsor. The operation and use of a mitigation bank are governed by a mitigation banking instrument.

Mitigation Banking Instrument (MBI) - the legal document for the establishment, operation, maintenance and use of a mitigation bank.

Off-site - an area that is neither located on the same parcel of land as the impact site, nor on a parcel of land contiguous to the parcel containing the impact site.

On-site - an area located on the same parcel of land as the impact site, or on a parcel of land contiguous to the impact site.

Out-of-kind - a resource of a different structural and functional type from the impacted resource.

Performance standards - observable or measurable physical (including hydrological), chemical and/or biological attributes that are used to determine if a compensatory mitigation project meets its objectives.

Permittee-Responsible Mitigation - an aquatic resource restoration, establishment, enhancement, and/or preservation activity undertaken by the permittee (or an authorized agent or contractor) to provide compensatory mitigation for which the permittee retains full responsibility.

Pine plantation – monoculture stands of pine trees managed for silvicultural purposes. These areas are typically in rows, are burned and or mechanically maintained on a regular basis such that very little midstory or understory plant communities exist.

Preservation - the removal of a threat to, or preventing the decline of, aquatic resources by an action in or near those aquatic resources. This term includes activities commonly associated with the protection and maintenance of aquatic resources through the implementation of appropriate legal and physical mechanisms. Preservation does not result in a gain of aquatic resource area or functions.

Re-establishment - the manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former aquatic resource. Re-establishment results in rebuilding a former aquatic resource and results in a gain in aquatic resource area and functions.

Reference aquatic resources - a set of aquatic resources that represent the full range of variability exhibited by a regional class of aquatic resources as a result of natural processes and anthropogenic disturbances.

Rehabilitation - the manipulation of the physical, chemical, or biological characteristics of a site with the goal of repairing natural/historic functions to a degraded aquatic resource. Rehabilitation results in a gain in aquatic resource function, but does not result in a gain in aquatic resource area.

Release of credits - a determination by the district engineer, in consultation with the IRT, that credits associated with an approved mitigation plan are available for sale or transfer, or in the case of an in-lieu fee program, for fulfillment of advance credit sales. A proportion of projected credits for a specific mitigation bank or in-lieu fee project may be released upon approval of the mitigation plan, with additional credits released as milestones specified in the credit release schedule are achieved.

Restoration - the manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former or degraded aquatic resource. For the purpose of tracking net gains in aquatic resource area, restoration is divided into two categories: reestablishment and rehabilitation.

Riparian areas - lands adjacent to streams, rivers, lakes, and estuarine/marine shorelines. Riparian areas provide a variety of ecological functions and services and help improve or maintain local water quality.

Service area - the geographic area within which impacts can be mitigated at a specific mitigation bank or an in-lieu fee program, as designated in its MBI.

Services - the benefits that human populations receive from functions that occur in ecosystems.

Sponsor - any public or private entity responsible for establishing, and in most circumstances, operating a mitigation bank or in-lieu fee program.

Temporal loss - the time lag between the loss of aquatic resource functions caused by the permitted impacts and the replacement of aquatic resource functions at the compensatory mitigation site.

Watershed - a land area that drains to a common waterbody, such as a stream, lake, estuary, wetland, or ultimately the ocean.

Watershed approach - an analytical process for making compensatory mitigation decisions that support the sustainability or improvement of aquatic resources in a watershed. It involves consideration of watershed needs, and how locations and types of compensatory mitigation projects address those needs. A landscape perspective is used to identify the types and locations of compensatory mitigation projects that will benefit the watershed and offset losses of aquatic resource functions and services caused by activities authorized by DA permits. The watershed approach may involve consideration of landscape scale, historic and potential aquatic resource conditions, past and projected aquatic resource impacts in the watershed, and terrestrial connections between aquatic resources when determining compensatory mitigation requirements for DA permits.

Watershed basin – a division of basin subsegments developed by the Louisiana Department of Environmental Quality (LDEQ) for utilization in water quality planning, watershed assessment and management tasks.

Watershed plan - a plan developed by federal, tribal, state, and/or local government agencies or appropriate non-governmental organizations, in consultation with relevant stakeholders, for the specific goal of aquatic resource restoration, establishment, enhancement, and preservation. A watershed plan addresses aquatic resource conditions in the watershed, multiple stakeholder interests, and land uses. Watershed plans may also identify priority sites for aquatic resource restoration and protection. Examples of watershed plans include special area management plans, advance identification programs, and wetland management plans.

Waters of the United States – means:

(1) All waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;

(2) All interstate waters including interstate wetlands;

(3) All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce including any such waters:

(i) Which are or could be used by interstate or foreign travelers for recreational or other purposes; or

(ii) From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or

(iii) Which are used or could be used for industrial purpose by industries in interstate commerce;

(4) All impoundments of waters otherwise defined as waters of the United States under the definition;

(5) Tributaries of waters identified in paragraphs (a) (1) through (4) of this section;

(6) The territorial seas;

(7) Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (a) (1) through (6) of this section.

(8) Waters of the United States do not include prior converted cropland. Notwithstanding the determination of an area's status as prior converted cropland by any other Federal agency, for the purposes of the Clean Water Act, the final authority regarding Clean Water Act jurisdiction remains with EPA.

C. Intended Use

The goal of LRAM is to provide a rapid and repeatable wetland assessment method that can be completed by users with various backgrounds and limited field data. LRAM does not focus on any specific ecologic functions or societal values provided by wetlands, rather it infers functional and value output based on its ecological condition.

LRAM has several applications applicable to the USACE Regulatory Program for CEMVN project managers, permit applicants, and mitigation bank sponsors. LRAM has been developed to assist project managers in efficiently and consistently quantifying adverse impacts associated with permit applications and environmental benefits associated with compensatory mitigation projects. By determining the adverse and beneficial impacts, the project manager is assured that unavoidable impacts to wetland functions are fully compensated by the applicant’s mitigation plan. That mitigation plan may include the use of an appropriate mitigation bank, in-lieu fee program or an individual permittee-responsible mitigation project. LRAM can also assist applicants in evaluating the scale of compensatory mitigation that would be required by an impact. Sponsors can evaluate a potential mitigation bank site to predict potential mitigation credits available depending upon different restoration/enhancement techniques.

D. Model Development / Justification

LRAM has been established based on ratios for various mitigation types. The factors within LRAM modify the final ratios based on two outputs: (1) the perceived functions and values of an impact site based on its ecological condition with the perceived level of impact to those functions and values and (2) the perceived increase in functions and values of an aquatic resource at a compensatory mitigation project site based on the mitigation type and the inherent value of the mitigation project within its watershed landscape. The following is a table of ratios that have been utilized as a base to develop factor values within LRAM:

Site Quality	Mitigation Type			
	Re-Establishment	Rehabilitation	Enhancement	Preservation
High	2	2.5	4	30
Med	1.5	2	3	20
Low	1	1.5	2	15

As documented in several journals referenced herein, there are both ecological and regulatory justifications for compensatory mitigation requirements above a one to one areal extent (one acre of mitigation for one acre of impact). Studies have shown that successful wetland restoration sites only provide 74% of the biological structure and biogeochemical functions that natural wetland systems provide (Moreno-Mateos et al., 2012). Not included in this 26% loss of functions are additional temporal losses to functional outputs due to time lag in structural restoration versus impact occurrences. The degree of functional loss due to time lag has largely gone unmeasured through scientific study (Robb, 2002). The mitigation type involved also provides justification for ratios above one to one. Although likely not at optimal levels, wetland functions already exist on rehabilitation and enhancement sites. Therefore, more acreage may be required to account for losses at another site based on the level of functional output.

E. Geographic Scope

LRAM was developed for utilization across all wetland habitat types within the geographic boundaries of the New Orleans District. Specific wetland habitat types that will be included are baldcypress/tupelo swamp, bayhead swamp, bottomland hardwoods, brackish marsh, coastal prairie, flatwood ponds, forested batture, fresh marsh, hardwoods flats, intermediate marsh, pine flatwoods, pine-hardwood flatwoods, pine savannah and saline marsh, all of which are further discussed in Section I.F below.

F. Habitat Descriptions

1. *Specific Habitat Classifications within the Geographic Scope*

The following paragraphs define each specific wetland habitat type, identified from Louisiana Natural Heritage Program's (LNHP) *The Natural Communities of Louisiana*, 2009, that LRAM can be utilized to assess:

Baldcypress/tupelo swamp - forested, alluvial swamps growing on intermittently exposed soils. The soils are inundated or saturated by surface water or ground water on a nearly permanent basis throughout the growing season except during periods of extreme drought.

Bayhead swamp - extremely variable community ranging from a shrub dominated swamp to a mature swamp forest with evergreen shrubs forming the primary understory and midstory. Although very similar to wooded seeps, the community is well-developed and swamp-like, and occurrences are relatively sizable (typically at least a few acres). Bayhead Swamps occur in the heads of creeks or branches, at the base of slopes, in acid depressions in pine flatwoods, and borders of swamps in north, central, western, and southeastern Louisiana. Soils are usually very acid, sandy in texture, primarily colluvial in origin, and are saturated, inundated, or at least moist throughout the growing season. They are often deep and "mucky".

Bottomland Hardwood forest - a forested, alluvial wetland occupying broad floodplain areas that flank large river systems.

Brackish Marsh – a marsh habitat that is typically located between salt marsh and intermediate marsh with an average salinity of 8 parts per thousand (ppt), although it may occasionally lie adjacent to the Gulf of Mexico. Brackish marsh experiences irregular tidal flooding and is dominated by salt-tolerant grasses. Small pools or ponds may be scattered throughout. Plant diversity and soil organic matter content are higher in brackish marsh than in salt marsh and are typically dominated by *Spartina patens* (wire grass).

Coastal Prairie - This is the prairie region of southwestern Louisiana which may occur on "islands" or "ridges" surrounded by marsh. The region is underlain by an impervious clay pan 6 to 18 inches below the surface that prevents downward percolation of water and inhibits upward movement of capillary water. Soils are typically circum-neutral to alkaline, saturated in winter, and often very dry in late spring and fall. The vegetation is quite diverse and dominated by grasses.

Flatwood Ponds – small, linear or circular depressional emergent wetlands nestled within pine savannah habitat in Western Louisiana. Flatwoods ponds can vary in size from 0.5 acre to 40 acres. The vegetation is dominated by fire dependant facultative wet and obligate grass and sedge species.

Forested batture – a community developed on the slope between the natural levee crest and major streams/rivers. It is a pioneer community which is first to appear on newly formed sand bars and river margins. The area receives sands and silts with each flood. The soils are semi-permanently inundated or saturated. Soil inundation or saturation by surface water or groundwater occurs periodically for a major portion of the growing season.

Fresh Marsh – a marsh habitat that is generally located adjacent to intermediate marsh along the northern most extent of the coastal marshes as well as adjacent to coastal bays where freshwater input is entering the bay. Fresh marsh habitat may contain small, scattered pools or ponds and salinities less than 2 ppt with a typical average around 0.5 – 1.0 ppt. Fresh marsh has the most diverse pant communities, highest wildlife populations and the highest soil organic matter content of any of the marsh types.

Hardwood Flats – a forested wetland that occurs on hydric soils on poorly drained flats and depressions typically not affected by overbank flooding. The topography is flat to gently undulating. Several inches of water may occur on the surface during the winter months with soil saturation continuing into the spring.

Intermediate Marsh – a marsh habitat that typically occurs between brackish marsh and freshwater marsh and rarely can be found adjacent to the Gulf of Mexico. Intermediate marsh has an irregular tidal regime, is oligohaline (salinity of 3 to 10 ppt), and is dominated by narrow-leaved, persistent emergent plant species. Small pools or ponds may be scattered. Plant diversity and soil organic matter content is higher than in brackish marsh. This marsh is characterized by a diversity of species, many of which are found in freshwater marsh and some of which are found in brackish marsh.

Pine flatwoods - habitat occurs primarily in the southern Florida Parishes and southwest Louisiana on essentially flat, low-relief areas with a high water table. They may infrequently occur in central Louisiana. Soils are normally mesic but may be saturated in winter and may become dry in summer. Soils are generally strongly acidic and fine sandy or silty.

Pine-Hardwood Flatwoods - a natural mixed forest community indigenous to the western Florida Parishes in southeast Louisiana. This community occupies poorly drained flats, depressional areas and small drainages that lie in a mosaic with higher, non-wetland areas. Hardwoods usually dominate the forest composition, but spruce pine can dominate areas within the stand.

Pine savannah - floristically rich, herb-dominated wetlands, that are naturally sparsely stocked with Pinus palustris (longleaf pine). They historically dominated the Gulf Coastal Plain flatwood regions of southeast and southwest Louisiana. The term “savannah” is classically used to describe expansive herb-dominated areas with scattered trees. Wet savannas occupy the poorly drained and seasonally saturated/flooded depressional areas and low flats, while the non-wetland flatwoods occupy the better drained slight rises, low ridges and “pimple mounds” (only southwest LA). Pine savannahs are subject to a highly fluctuating water table, from surface saturation/shallow flooding in late fall/winter/early spring to growing-season drought. Soils are hydric, very strongly acidic, nutrient poor, fine sandy loams and silt loams, low in organic matter.

Saline Marsh – a marsh habitat that is typically found adjacent to or at the interface of coastal lands with the open waters of the Gulf of Mexico. Salt marshes are regularly tidally flooded, flat, polyhaline (18 – 30 parts per thousand) areas dominated by salt-tolerant grasses with small pools or ponds scattered throughout. Salt marshes have the lowest plant species diversity (often totally dominated by *Spartina alterniflora*) as well as the lowest soil organic matter content of any of the marsh types. Salt marsh functions as a nitrogen and phosphorus sink, thereby improving the quality of water that passes through it. Salt marsh provides nursery areas for myriads of larval forms of shrimp, crabs, redfish, seatrout, menhadden, etc., and also as important waterfowl habitat.

Small Stream Forest - riparian forests that are relatively narrow occurring along small rivers and large creeks. They are seasonally flooded for brief periods. The percentage of sand, silt, calcareous clay, acidic clay, and organic material in the soil is highly variable (depending on local geology) and has a significant effect on plant species composition. Soils are typically classified as silt-loams.

2. *Mitigation Kind / Habitat Communities*

Following the requirements of 33 CFR Part 332.3(e) and 40 CFR Part 230.93(e), CEMVN compensatory mitigation requirements include in-kind habitat replacement. The focus of in-kind habitat replacement is to assure similar functions and services that are lost at an impact site are gained at a mitigation site. Several of the habitats described in Section I.F.1 above either provide similar wetland functions or naturally exist together as a community (i.e., pine flatwoods, bayhead swamps, pine savanna exist together as a pine/flatwoods savanna community). CEMVN will consider the following as a list of habitats that will be grouped together as in-kind:

- **Bottomland hardwoods** (bottomland hardwoods, hardwood flats, pine-hardwood flatwoods, forested batture, small stream forest)
- **Baldcypress/tupelo swamp**
- **Pine flatwoods/savanna** (bayhead swamp, flatwood ponds, pine flatwoods, pine savanna)
- **Coastal prairie**
- **Fresh/Intermediate marsh** (fresh marsh, intermediate marsh)
- **Brackish/saline marsh** (brackish marsh, saline marsh)

In certain circumstances, impacts will occur to low-quality wetland habitats such as farmed wetlands or wet emergent pastures which may not fit the definition of habitats listed above. These low-quality habitats at impact sites will be considered in-kind with compensatory mitigation sites with habitat types that are typical of what existed in the region prior to that habitat becoming low quality. Additional detailed descriptions of these situations are found in Section II.B as the ‘Low Quality’ selection for each habitat type.

G. Watershed Approach

As required in 33 CFR Part 332.3(c) and 40 CFR Part 230.93(c), CEMVN utilizes a watershed approach to compensatory mitigation. Using the watershed approach, CEMVN analyzes the spatial relationship of an impact and/or mitigation site to other directly abutting or regionally situated aquatic resources. Wetlands that are interconnected by the flow of water and/or the movements of wildlife generally have higher function of ecosystem processes (Collins et al. 2008). In addition, a wetland’s proximity to other wetlands and the wetland density (number) in the surrounding area are positively correlated with wetland condition (Fennessy et al. 1998).

For bottomland hardwoods, baldcypress/tupelo swamp, pine/flatwoods savannah, and coastal prairie habitats, CEMVN utilizes the Louisiana watershed basins, as defined by Louisiana Department of Environmental Quality (LDEQ) source data, LOSCO (2004), to define the limits of its watersheds. There are eight watershed basins within CEMVN as recognized by the LDEQ. As such, compensatory mitigation projects should be selected within the same watershed basin of the impact it is intended to mitigate. The major watershed basins and their corresponding 8-digit HUC's are as follows:

Lake Pontchartrain Basin	08070202: Amite River
	08070203: Tickfaw River
	08070204: Lake Maurepas
	08070205: Tangipahoa River
	08090201: Liberty Bayou - Tchefuncta River
	08090202: Lake Pontchartrain
	08090203: Eastern Louisiana Coastal
Mississippi River Basin	08070100: Lower Mississippi River - Baton Rouge
	08070201: Bayou Sara - Thompson Creek
	08090100: Lower Mississippi River - New Orleans
Terrebonne Basin	08070300: Lower Grand River
	08090302: West - Central Louisiana Coastal
Atchafalaya Basin	08080101: Atchafalaya River
Vermilion-Teche Basin	08080102: Bayou Teche
	08080103: Vermilion River
Barataria Basin	08090301: East - Central Louisiana Coastal
Mermentau Basin	08080201: Mermentau Headwaters
	08080202: Mermentau
Calcasieu Basin	08080203: Upper Calcasieu River
	08080204: Whiskey Chitto River
	08080205: West Fork Calcasieu
	08080206: Lower Calcasieu

For fresh/intermediate and brackish/saline marsh impacts, CEMVN utilizes only two service areas, the deltaic and chenier plains. For viewing purposes within LRAM, those service areas are identified without HUC listings. For marsh impacts, the deltaic plain service area includes HUCs 08070204, 08070205, 08090201, 08090203, 08090100, 08090302, 08090301, 08080101, 08080102, and those portions of 08080103 within Iberia Parish while the chenier plain service area includes HUCs 08080202, 08080206, and those portions of 08080103 within Vermilion Parish.

II. Impact Factors

There are four factors which are utilized in LRAM to assess the "Impact Site(s):" Wetland Status, Habitat Condition, Hydrologic Condition, and Impact Type. The below table is a list of each "Impact Site" factor, the options for each factor, and the associated i-values assigned to each option:

Factor	Option	i value
Wetland Status	Rare, Imperiled, Difficult to Replace (RID)	3
	Secure	2
	Degraded	1
Habitat Condition	High	3
	Medium	2
	Low	1
Hydrologic Condition	High	3
	Medium	2
	Low	1
Impact Type	Full/Permanent Loss	3
	Partial/Temporary Loss	0.5

The impact value (I) per acre is calculated by summing all of the i factors listed above ($\sum i = I$). The I is then multiplied by the acreage of an impact project to determine the total number of LRAM debits generated. Detailed discussion of each "Impact Site" factor and their options are discussed below in Sections II.A through II.D.

A. Wetland Status

The wetland status factor considers several conditions of the impacted wetland site and its overall contributions within its watershed. When considering the wetland status factor, the user should consider the rarity of the habitat type within the CEMVN boundary, the difficulty involved in replacement of that habitat and its ecological (habitat and hydrology) connectivity within its watershed. Habitat classification and rarity information were obtained from the *The Natural Communities of Louisiana, (LNHP, 2009)*.

1. <u>Rare, Imperiled or Difficult to Replace</u>

Rare, imperiled or difficult to replace (RID) wetland areas are those habitats that are classified by LNHP as rare or imperiled and/or exhibit extreme difficulty in restoration. Imperiled habitats are defined by LNHP (2009) as those which have approximately 20 or less known occurrences and are extremely vulnerable to extirpation. Rare habitats are defined by LNHP (2009) as those which may only be found in a single region within Louisiana or have only up to 100 known occurrences.

Robb (2002) described a conceptual requirement of higher mitigation ratios based on the risk of failure of certain types of restoration projects. These types of projects represent restoration activities which can either be characterized by construction specifications that have a narrow margin of error or those which have inherent difficulty in establishment. Examples of these would include meeting target construction marsh elevations or establishing an emergent coastal prairie ecosystem without an existing seed source.

In addition to those habitats with difficult construction and establishment parameters, habitats defined by LNHP (2009) as Secure and are physically connected to greater than 500 acres of similar wetland habitat are also considered difficult to replace. These wetland areas are given higher values based on landscape principles discussed in Schaffer *et al.* (1992) such as increased species richness within larger blocks of habitat and increased habitat for interior species in one larger block rather than in two disjointed blocks of habitat.

Below is a specific list of habitats that will be considered RID:

- Baldcypress / tupelo Swamp
- Bayhead swamp
- Brackish marsh
- Coastal Prairie
- Flatwood Ponds
- Fresh marsh
- Hardwood flatwoods
- Intermediate marsh
- Pine flatwoods
- Pine – hardwood flatwoods
- Pine savannah
- Saline marsh
- Small stream forest
- Bottomland hardwoods connected to greater than 500 acres
- Forested batture connected to greater than 500 acres

2. Secure

Secure wetland areas are those habitats which are defined by the NHP as having over 100 known occurrences across the state of Louisiana and are generally secure in their existence. Below is a specific list of habitats that are considered Secure:

- Bottomland hardwoods
- Forested batture

3. <u>Degraded</u>

Degraded wetland areas are those sites which lack the physical structure of the wetland habitats defined in Section I.F.1 but still meet the criteria of jurisdictional wetlands. These degraded wetland areas provide minor habitat value for most wildlife and fisheries species throughout most of the year.

- Wet pastures
- Farmed wetlands
- Pine plantations
- Scrub-shrub or forested system with average absolute cover of greater than 50% exotic species

B. Habitat Condition

The habitat condition factor assesses the physical structure of the impacted wetland area. The number of plant strata present influences the richness of the plant community and the diversity of the biotic structure. A more complex biotic structure gives rise to a higher wetland condition (Collins et al. 2008). In addition, the presence of a rich assemblage of native plants generally indicates a healthy condition and optimal functions in a wetland. A rich plant community will generally exhibit a seed bank that can maintain vegetative productivity when environmental conditions fluctuate.

The habitat condition factor requires field data on the plant species that exist on the impacted wetland area. The field data collected during a wetland delineation conducted in accordance with the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region (ERDC, 2010), is typically sufficient to make a selection for the habitat condition factor. To assess habitat condition, the user should acquire a list of species present and the stratum in which those species exist. From this data, habitat condition measurements such as species richness, stratum richness, exotic species presence, and overall structure of the habitat (e.g., emergent, scrub-shrub, forested) can be determined.

The habitat condition factor contains three options of high, medium and low. Specific community parameters for wetland areas of each habitat type are described below. These parameters were developed utilizing literature reviewed as well as field data gathered during model development and testing. The field data collected is further discussed in Section V.

Baldcypress/tupelo swamp

High Condition:

Tree stratum contains more than 50% absolute cover of one or a mixture of both tree stratum species for baldcypress tupelo swamp listed below;
AND,

Shrub stratum does not exceed 50% absolute cover of one or a mixture of the shrub stratum species for baldcypress tupelo swamp listed below.
AND,
Tree and shrub stratum cumulatively contain less than 15% absolute cover exotic plant species.

Medium Condition:

Tree stratum contains 50% or less absolute cover of one or a mixture of both tree stratum species for baldcypress tupelo swamp listed below:
OR:
Shrub stratum exceeds 50% absolute cover of one or a mixture of the shrub stratum species for baldcypress tupelo swamp listed below.
OR:
Tree and shrub stratum cumulatively contain between 15% and 50% absolute cover exotic plant species.

Low Condition:

Tree and shrub stratum cumulatively contain more than 50% absolute cover exotic plant species.
OR:
Site exists as a palustrine, emergent wetland utilized as a wet pasture or farmed wetland.

Tree Stratum Species:

Taxodium distichum (baldcypress)
Nyssa aquatica (tupelo gum)

Shrub Stratum Species:

Nyssa biflora (swamp blackgum)
Fraxinus profunda (pumpkin ash)
Fraxinus pennsylvanica (green ash)
Salix nigra (black willow)
Acer rubrum var. *drummondii* (swamp red maple)
Planera aquatica (water elm)
Gleditsia aquatica (water locust)
Itea virginica (Virginia willow)
Cephalanthus occidentalis (buttonbush)

Bayhead swamp

High Condition:
Tree stratum contains more than 50% absolute cover of three or more of the following tree stratum species for bayhead swamps listed below.
AND,
Shrub stratum contains between 20% and 80% absolute cover of one or a mixture of the following shrub stratum species for bayhead swamps listed below.
AND,
Tree and shrub stratum cumulatively contain 15% or less absolute cover exotic plant species.

Medium Condition:
Tree stratum contains more than 50% absolute cover of less than three of the following tree stratum species for bayhead swamps listed below.
OR,
Tree stratum contains 50% or less absolute cover of one or more of the following tree stratum species for bayhead swamps listed below:
OR,
Shrub stratum does not fall within 20% and 80% absolute cover of one or a mixture of the following shrub stratum species for bayhead swamps listed below:
OR:
Tree and shrub stratum cumulatively contain between 15% and 50% absolute cover exotic plant species.

Low Condition:
Tree and shrub stratum cumulatively contain more than 50% absolute cover of exotic plant species.
OR:
Site exists as a palustrine, emergent wetland utilized as a wet pasture or farmed wetland.

Tree Stratum Species:

Magnolia virginiana (sweet bay magnolia)
Nyssa biflora (swamp blackgum)
Quercus laurifolia (laurel oak)
Q. nigra (water oak)
Acer rubrum (red maple)
Liquidambar styraciflua. (sweetgum)
Taxodium distichum (baldcypress)
T. ascendens (pondcypress)
Pinus elliottii (slash pine)
P. palustris (longleaf pine),

Shrub Stratum Species:

Persea borbonia (red bay)
Cyrilla racemiflora (swamp titi)
Morella heterophylla (bigleaf wax myrtle)
M. cerifera (wax myrtle)
Ilex glabra (little-leaf gallberry)
I. coriacea (sweet gallberry)
I. opaca (American holly)
Lyonia lucida (fetterbush)
L. ligustrina (fetterbush)
L. racemosa (leucothoe)
Lindera subcoriacea (bog spicebush)
Itea virginica (Virginia willow)
Leucothoe axillaris (leucothoe)
Aronia arbutifolia (red chokeberry)
Viburnum nudum (possum-haw)
Toxicodendron vernix (poison sumac),
Clethra alnifolia (summer sweet)
Alnus serrulata (hazel alder)
Styrax americana (American snowbell)
Rhododendron spp. (wild azalea)
Smilax laurifolia (laurel-leaf greenbrier)
Decumaria barbara (climbing hydrangea)

Bottomland hardwoods

High Condition:
Tree stratum contains more than 50% absolute cover of at least three or more of the following tree stratum species for bottomland hardwoods listed below.
AND,
Shrub stratum does not exceed 50% absolute cover of one or a mixture of the following shrub species for bottomland hardwoods listed below.
AND,
Tree and shrub stratum cumulatively contain 15% or less absolute cover exotic plant species.

Medium Condition:
Tree stratum contains more than 50% absolute cover of less than three of the following tree stratum species for bottomland hardwoods listed below.
OR,
Tree stratum contains 50% or less absolute cover of a mixture of the following tree stratum species for bottomland hardwoods listed below.
OR,
Shrub stratum does exceed 50% absolute cover of one or a mixture of the following shrub species for bottomland hardwoods listed below.

OR,
Tree and shrub stratum cumulatively contain between 15% and 50% absolute cover of exotic plant species.

Low Condition:
Tree and shrub stratum cumulatively contain more than 50% absolute cover exotic plant species.
OR:
Site exists as a palustrine, emergent wetland utilized as a wet pasture or farmed wetland.

Tree Stratum Species:

Quercus lyrata (overcup oak)
Q. texana (nuttall oak)
Q. phellos (willow oak)
Q. nigra (water oak)
Q. pagoda (cherrybark oak)
Q. laurifolia (laurel oak)
Q. michauxii (swamp chestnut oak)
Q. virginiana (live oak)
Liquidambar styraciflua (sweetgum)
Gleditsia aquatica (water locust)
Ulmus americana (American elm)
Fraxinus pennsylvanica (green ash)
Acer rubrum (red maple)
A. negundo (box elder)
Cornus foemina (**swamp** dogwood)
C. drummondii (roughleaf dogwood)
Celtis laevigata (hackberry)
Planera aquatica (planertree)
Plantanus occidentalis (American sycamore)
Carya aquatica (water hickory)
C. illinoinensis (sweet pecan)
Diospyros virginiana (persimmon)
Populus deltoides (cottonwood)

Shrub Stratum Species:

Ilex decidua (deciduous holly)
Crataegus sp. (hawthorn)
Arundinaria gigantea (switchcane)
Cephalanthus occidentalis (buttonbush)
Forestiera acuminata (swamp privet)
Morus rubra (red mulberry)

Brackish marsh

The user should note that brackish marsh conditions are described with the terms emergent vegetative cover and do not refer to absolute cover. When measuring emergent vegetative cover in brackish marsh, the user should consider the entire project area when determining emergent vegetative cover, which will typically include a percent of open water and a percent of emergent marsh. While the entire project area should be used to determine emergent vegetative cover, the acreage of open water should not be included in the final acreage of impact to brackish marsh. Detailed examples of these calculations can be found in Section IV.D.

High Condition:
Emergent vegetative cover is greater than 50% and is comprised of the typical common native species found in healthy brackish marshes including any of the plant species below.
AND,
Vegetative cover contains less than 15% absolute cover of exotic plant species.

Medium Condition:
Emergent vegetative cover is between 25% and 50% and is comprised of the typical common native species found in healthy brackish marshes including any of the plant species below:
OR:
Vegetative cover contains between 15% and 50% absolute cover of exotic plant species.

Low Condition:
Emergent vegetative cover is less than 25% and is comprised of the typical common native species found in healthy brackish marshes including any of the plant species below:
OR:
Vegetative cover contains more than 50% absolute cover of exotic plant species.

Plant Species for brackish marsh:

Spartina patens (wire grass)
S. alterniflora (smooth cordgrass)
S. cynosuroides (big cordgrass)
Distichlis spicata (salt grass)
Bacopa monnieri (coastal water hyssop)
Juncus roemerianus (black rush)
Schoenoplectus olneyi (three-cornered grass)
S. robustus (salt marsh bulrush)
Ruppia maritima (widgeon grass)
Eleocharis parvula (dwarf spikesedge)
Paspalum vaginatum (seashore paspalum)

Coastal Prairie

High Condition:
Emergent vegetation cover is greater than 50% absolute cover comprised of any mixture of the plant species for coastal prairie listed below.
AND,
Tree and shrub stratum vegetative cover is less than 25% absolute cover.
AND,
Emergent vegetative cover contains less than 15% absolute cover of exotic plant species.

Medium Condition:
Emergent vegetative cover is 50% or less absolute cover comprised of any mixture of the plant species for coastal prairie listed below.
OR:
Tree and shrub stratum vegetative cover is 25% or more absolute cover.
OR:
Emergent vegetative cover contains between 15% and 50% exotic plant species.

Low Condition:
Emergent vegetative cover contains more than 50% exotic plant species.
OR:
Site exists as a palustrine, emergent wetland utilized as a wet pasture or farmed wetland.

Common herbaceous species include:
Aristida spp. (three-awn grasses)
Paspalum plicatulum (brownseed paspalum)
Paspalum spp. (paspy grasses)
Schizachyrium scoparium (little bluestem)
S. tenerum (slender bluestem)
Andropogon spp. (broomsedges)
Andropogon gerardii (big bluestem)
Eragrostis spp. (love grasses)
Spartina patens (wire grass, near marshes)
Panicum virgatum (switch grass)
Panicum spp. (panic grasses)
Sorghastrum nutans (Indian grass)
Sporobolus spp. (dropseeds)
Tridens spp. (purple-top)
Carex spp. (caric sedges)
Cyperus spp. (umbrella sedges)
Rhynchospora spp. (beaked sedges)
Scleria spp. (nut-rushes)

Common forb (wildflower) species include:
Cacalia ovata (Indian platain)
Helianthus mollis (sunflower)
Liatris spp. (blazing-stars)
Asclepias spp. (milkweeds)
Silphium spp. (rosin-weeds)
Petalostemum spp. (prairie clovers)
Baptisia spp. (indigos)
Amsonia tabernaemontana (blue star)
Rudbeckia spp. (brown-eyed susans)
Euphorbia spp. (spurges)
Euthamia spp. (flat-topped goldenrods)
Hedyotis nigricans (bluets)
Ruellia humilis (wild petunia)
Ludwigia spp. (water primroses)
Coreopsis spp. (tickseeds)
Solidago spp. (goldenrods)
Agalinis spp. (false foxgloves)
Eupatorium spp. (thoroughworts)
Sabatia spp. (rose-gentians)
Polygala spp. (milkworts)
Aletris spp. (colic-roots)
Rhexia spp. (meadow beauties)

Flatwood Ponds

High Condition:
Emergent vegetative cover is at least 85% including any mixture of the plant species for flatwood ponds listed below.
AND,
Vegetative cover contains less than 15% exotic plant species.

Medium Condition:
Emergent vegetative cover is at least 85% and is comprised of less than 42.5% any mixture of the plant species below:
OR,
Vegetative cover contains between 15% and 50% exotic plant species.

Low Condition:
Emergent vegetative cover contains more than 50% exotic plant species.
OR:
Site exists as a palustrine, emergent wetland utilized as a wet pasture or farmed wetland.

Plant Species for flatwood ponds:
Andropogon glomeratus var. *glaucopsis* (bushy beardgrass)

Aristida palustris (longleaf three-awn grass)
Coreopsis linifolia (tickseed)
Eleocharis tuberculosa (spikerush)
Eriocaulon decangulare (pipewort)
Rhynchospora spp. (beakrushes)
Oxypolis filiformis (hog-fennel)
Gratiola brevifolia (hyssop)
Hypericum galioides (St. John's wort)
Hyptis alata (bitter mint)
Panicum virgatum (switchgrass)
Pluchea rosea (stinkweed)
Polygala ramosa (candyroot)
Proserpinaca pectinata (mermaid-weed)
Hibiscus aculeatus (comfort-root)
Rhexia lutea (meadow beauty)
Amsonia glaberrima (bluestar)
Bacopa caroliniana (blue-hyssop)
Panicum hemitomon (maidencane)
Carex verrucosa
Dichanthelium spp
Hibiscus moscheutos ssp. *Lasiocarpus*
Juncus effuses (soft rush)
Ludwigia pilosa (evening primrose)
Lycopus rubellus (bugleweed)
Sagittaria graminea (arrowhead)

Forested batture

High Condition:
Tree stratum contains more than 50% absolute cover and includes one or any mixture of the tree stratum species for forested batture listed below.
AND,
Vegetative cover contains less than 15% exotic plant species.

Medium Condition:
Tree stratum contains 50% or less absolute cover and includes one or any mixture of the tree stratum species for forested batture listed below.
OR:
Vegetative cover contains between 15% and 50% exotic plant species.

Low Condition:
Vegetative cover contains more than 50% exotic plant species.

Tree Stratum Species:
Salix nigra (black willow)
S. exigua (sandbar willow)

Populus deltoides (cottonwood)
Betula nigra (riverbirch)

Fresh marsh

The user should note that fresh marsh conditions are described with the terms emergent vegetative cover and do not refer to absolute cover. When measuring emergent vegetative cover in fresh marsh, the user should consider the entire project area when determining emergent vegetative cover, which will typically include a percent of open water and a percent of emergent marsh. While the entire project area should be used to determine emergent vegetative cover, the acreage of open water should not be included in the final acreage of impact to fresh marsh. Detailed examples of these calculations can be found in Section IV.D.

High Condition:
Emergent vegetative cover is greater than 50% and is comprised of the typical common native species found in healthy fresh marshes including any of the plant species below.
AND,
Vegetative cover contains less than 15% absolute cover of exotic plant species.

Medium Condition:
Emergent vegetative cover is between 25% and 50% and is comprised of the typical common native species found in healthy fresh marshes including any of the plant species below:
OR:
Vegetative cover contains between 15% and 50% absolute cover of exotic plant species.

Low Condition:
Emergent vegetative cover is less than 25% and is comprised of the typical common native species found in healthy fresh marshes including any of the plant species below:
OR:
Vegetative cover contains more than 50% absolute cover of exotic plant species.

Plant species for fresh marsh:
Panicum hemitomon (maidencane)
Eleocharis spp. (spikesedge)
Sagittaria lancifolia (= *S. falcata*)
Lemna minor (common duckweed)
Alternanthera philoxeroides (alligator weed)
Phragmites communis (roseau cane)
Bacopa monnieri (coastal water hyssop)
Ceratophyllum demursum (coontail)
Cyperus odoratus (fragrant flatsedge)
Eichhornia crassipes (water hyacinth)
Pontederia cordata (pickerelweed)

Peltandra virginica (arrow arum)
Hydrocotyle spp. (pennyworts)
Zizaniopsis miliacea (southern wildrice)
Myriophyllum spp. (water milfoils)
Nymphaea odorata (white waterlilly)
Typha spp. (cattail)
Utricularia spp. (bladderworts)
Vigna luteola (deer pea)

Hardwood flatwoods

High Condition:
Tree stratum contains more than 50% absolute cover of at least three or more of the following tree stratum species for hardwood flatwoods listed below.
AND,
Shrub stratum does not exceed 50% absolute cover of one or a mixture of the following shrub species for hardwood flatwoods listed below.
AND,
Tree and shrub stratum cumulatively contain 15% or less absolute cover exotic plant species.

Medium Condition:
Tree stratum contains more than 50% absolute cover of less than three of the following tree stratum species for hardwood flatwoods listed below.
OR,
Tree stratum contains 50% or less absolute cover of a mixture of the following tree stratum species for hardwood flatwoods listed below.
OR,
Shrub stratum does exceed 50% absolute cover of one or a mixture of the following shrub species for hardwood flatwoods listed below.
OR,
Tree and shrub stratum cumulatively contain between 15% and 50% absolute cover of exotic plant species.

Low Condition:
Vegetative cover contains more than 50% exotic plant species.
OR:
Site exists as a palustrine, emergent wetland utilized as a wet pasture or farmed wetland.

Tree Stratum Species:
Quercus phellos (willow oak)
Q. lyrata (overcup oak)
Q. texana (Nuttall oak)
Fraxinus pennsylvanica (green ash)
Carya ovata (shagbark hickory)

Ulmus americana (American elm)
Ulmus crassifolia (cedar elm)
Celtis laevigata (hackberry)

Shrub Stratum Species:
Ulmus alata (winged elm)
U. crassifolia (cedar elm)
Sabal minor (palmetto)
Ilex decidua (deciduous holly)
Styrax americana (snowbell)
Forestiera acuminata (swamp privet)
Planera aquatica (planertree)

Intermediate marsh

The user should note that intermediate marsh conditions are described with the terms emergent vegetative cover and do not refer to absolute cover. When measuring emergent vegetative cover in intermediate marsh, the user should consider the entire project area when determining emergent vegetative cover, which will typically include a percent of open water and a percent of emergent marsh. While the entire project area should be used to determine emergent vegetative cover, the acreage of open water should not be included in the final acreage of impact to intermediate marsh. Detailed examples of these calculations can be found in Section IV.D.

High Condition:
Emergent vegetative cover is greater than 50% and is comprised of the typical common native species found in healthy intermediate marshes including any of the plant species below.
AND,
Vegetative cover contains less than 15% absolute cover of exotic plant species.

Medium Condition:
Emergent vegetative cover is between 25% and 50% and is comprised of the typical common native species found in healthy intermediate marshes including any of the plant species below:
OR:
Vegetative cover contains between 15% and 50% exotic plant species.

Low Condition:
Emergent vegetative cover is less than 25% and is comprised of the typical common native species found in healthy intermediate marshes including any of the plant species below:
OR:
Vegetative cover contains more than 50% exotic plant species.

Plant species for intermediate marsh:
Spartina patens (wire grass)
Phragmites communis (roseau cane)
Sagittaria lancifolia (= *S. falcata*; bulltongue)
Bacopa monnieri (coastal water hyssop)
Eleocharis spp. (spikesedge)
Scirpus olneyi (three-cornered grass)
Scirpus californicus (giant bulrush)
Vigna luteola (deer pea)
Scirpus americanus (common threesquare)
Panicum virgatum (switch grass)
Paspalum vaginatum (seashore paspalum)
Pluchea camphorata (camphor-weed)
Leptochloa fascicularis (bearded sprangletop)
Echinonchloa walteri (walter millet)
Cyperus odoratus (fragrant flatsedge)
Najas guadalupensis (southern naiad)
Alternanthora philoxeroides (alligator weed)
Spartina cynosuroides (big cordgrass)
Spartina spartineae (gulf cordgrass)

Pine flatwoods

High Condition:
Tree stratum contains more than 75% absolute cover of one or a mixture of the Pinus spp. listed below.
AND,
Tree stratum contains no more than 15% absolute cover of one or a mixture of the tree stratum species listed below.
AND,
Vegetative cover contains less than 15% absolute cover of exotic plant species.

Medium Condition:
Tree stratum contains 75% or less absolute cover of one or a mixture of the Pinus spp. listed below:
OR,
Tree stratum contains more than 15% absolute cover of one or a mixture of the tree stratum species listed below:
OR,
Vegetative cover contains between 15% and 50% absolute cover of exotic plant species.

Low Condition:
Tree stratum contains more than 95% absolute cover of one or a mixture of the Pinus spp. listed below (site is managed as a pine plantation):
OR,

Vegetative cover contains more than 50% absolute cover of exotic plant species.

***Pinus* species:**
Pinus palustris (longleaf pine)
P.elliottii (slash pine)
P. taeda (loblolly pine)
P. glabra (spruce pine)

Tree stratum species in pine flatwoods:
Quercus nigra (water oak)
Q. laurifolia (laurel oak)
Magnolia virginiana (sweetbay magnolia)
Acer rubrum (red maple)
Liquidambar styraciflua (sweetgum)
Nyssa sylvatica (blackgum)

Pine–hardwood flatwoods

High Condition:
Tree stratum contains a minimum 90% absolute cover comprised of less than 50% of the Pinus species listed below and no more than 80% of the native hardwoods listed below.
AND,
Shrub stratum does not exceed 50% absolute cover of one or a mixture of the following plant species:
AND,
Vegetative cover contains 15% or less exotic plant species.

Medium Condition:
Tree stratum contains less than 90% absolute cover comprised of more than 45% of the Pinus species listed below and less than 45% of the native hardwoods listed below:
OR,
Shrub stratum does exceed 50% absolute cover of one or a mixture of the following plant species:
OR,
Vegetative cover contains between 15% and 50% exotic plant species.

Low Condition:
Tree stratum contains 95% absolute cover of one or a mixture of the Pinus spp. listed below (site is managed as a pine plantation).
OR:
Vegetative cover contains more than 50% absolute cover of exotic plant species.

Tree stratum species in pine-hardwood flatwoods:
Pinus glabra (spruce pine)
P. taeda (loblolly pine)

Acer rubrum (red maple)
Carya glabra (pignut hickory)
Quercus laurifolia (laurel oak)
Q. michauxii (swamp chestnut oak)
Q. nigra (water oak)
Q. pagoda (cherrybark oak)
Q. phellos (willow oak)
Nyssa biflora (swamp blackgum)
N. sylvatica (blackgum)
Liquidambar styraciflua (sweetgum)
Fraxinus caroliniana (Carolina ash)
F. pennsylvanica (green ash)
Fagus grandifolia (American beech)
Magnolia grandiflora (Southern magnolia)

Shrub stratum species in pine-hardwood flatwoods:
Cephalanthus occidentalis (buttonbush)
Cornus foemina (swamp dogwood)
Crataegus opaca (mayhaw)
Arundinaria gigantea (switchcane)
Diospyros virginiana (persimmon)
Ilex decidua (deciduous holly)
I. opaca (American holly)
Itea virginica (Virginia willow)
Morella cerifera (wax myrtle)
Toxicodendron radicans (poison ivy)
Sambucus canadensis (elderberry)
Smilax spp. (greenbriars)
Styrax americanus (snowbell)
Viburnum dentatum (arrowwood)
Vitis rotundifolia (muscadine)
Ampelopsis arborea (peppervine)
Berchemia scandens (rattan vine)
Brunnichia cirrhosa (ladies' eardrops)
Campsis radicans (trumpet creeper)
Sabal minor (dwarf palmetto)

Pine savannah

High Condition:
Tree stratum does not exceed 80% absolute cover of the *Pinus* species listed below.
AND,
Tree and shrub stratum cumulatively contain 15% or less absolute cover of the native hardwoods listed below:
AND,

Herbaceous stratum contains 80% - 100% absolute cover comprised of a mixture of the emergent plant species listed below:
AND,
Vegetative cover contains 15% or less exotic plant species.

Medium Condition:
Tree stratum exceeds 80% absolute cover of the Pinus species listed below.
OR,
Tree and shrub stratum cumulatively contains more than 15% absolute cover of the native hardwoods listed below:
OR,
Herbaceous stratum contains less than 80% absolute cover comprised of a mixture of the plant species listed below.
OR,
Vegetative cover contains between 15% and 50% exotic plant species.

Low Condition:
Tree stratum contains 95% absolute cover of one or a mixture of the Pinus spp. listed below (site is managed as a pine plantation):
OR:
Vegetative cover contains more than 50% exotic plant species.

Pinus species:
Pinus palustris (longleaf pine)
P. elliottii (slash pine)

Hardwood species:
Magnolia virginiana (sweet bay)
Nyssa biflora (swamp black gum)
Quercus virginiana (live oak)
Q. marilandica (blackjack oak)
Q. laurifolia (laurel oak)
Cyrilla racemiflora (swamp cyrilla)
Morella spp. (wax myrtles)
Hypericum spp. (St. John's worts)
Styrax americana (littleleaf snowbell)
Taxodium ascendens (pondcypress)

Emergent species in pine savannah:
Andropogon spp. (broomsedges)
Schizachyrium scoparium (little bluestem)
S. tenerum (slender bluestem)
Panicum spp. (panic grasses)
Aristida spp. (three-awn grasses)
Ctenium aromaticum (toothache grass)
Muhlenbergia capillaris (hairawn muhly)
Erianthus spp. (plume-grasses)

Coelorachis spp. (jointgrasses)
Rhynchospora spp. (beak-rushes)
Xyris spp. (yellow-eyed grasses)
Fuirena spp. (umbrella grasses)
Scleria spp. (nut-rushes)
Dichromena latifolia (white top sedge)
Eriocaulon spp. (pipeworts)
Lachnocaulon spp. (bog buttons)
Fimbristylis spp. (fimbry-sedge)
Sarracenia spp. (pitcherplants)
S. psittacina (parrot pitcherplant)
Agalinis spp. (gerardias)
Lobelia spp. (lobelias)
Rhexia spp. (meadow beauties)
Eryngium integrifolium (bog thistle)
Oxypolis filiformis (hog-fennel)
Polygala spp. (milkworts)
Liatris spp. (blazing-stars)
Sabatia spp. (rose-gentians)
Drosera spp. (sundews)
Pinguicula spp. (butterworts)
Utricularia spp. (bladderworts)
Platanthera spp. (fringed-orchids)
lily family (Liliaceae)
Aletris lutea (yellow colic-root)
Tofieldia racemosa (coastal false-asphodel)
sunflower family (Asteraceae)
orchid family (Orchidaceae)
Cleistes bifaria (spreading pogonia)
Lycopodium spp. (club-mosses)

Saline marsh

The user should note that saline marsh conditions are described with the terms emergent vegetative cover and do not refer to absolute cover. When measuring emergent vegetative cover in saline marsh, the user should consider the entire project area when determining emergent vegetative cover, which will typically include a percent of open water and a percent of emergent marsh. While the entire project area should be used to determine emergent vegetative cover, the acreage of open water should not be included in the final acreage of impact to saline marsh. Detailed examples of these calculations can be found in Section IV.D.

High Condition:
Emergent vegetative cover is greater than 50% and is comprised of the typical common native species found in healthy saline marshes including any of the plant species below. AND,

Vegetative cover contains less than 15% absolute cover of exotic plant species.

Medium Condition:
Emergent vegetative cover is between 25% and 50% and is comprised of the typical common native species found in healthy saline marshes including any of the plant species below:
OR:
Vegetative cover contains between 15% and 50% exotic plant species.

Low Condition:
Emergent vegetative cover is less than 25% and is comprised of the typical common native species found in healthy saline marshes including any of the plant species below:
OR:
Vegetative cover contains more than 50% exotic plant species.

Emergent species in saline marsh:
Spartina alterniflora (smooth cordgrass)
Spartina patens (wire grass)
Distichlis spicata (salt grass)
Juncus roemarianus (black rush)
Batis maritima (salt wort)

Small Stream Forests

High Condition:
Tree stratum contains more than 50% absolute cover of at least three or more of the following tree stratum species for small stream forests listed below.
AND,
Shrub stratum does not exceed 50% absolute cover of one or a mixture of the following shrub species for small stream forests listed below.
AND,
Tree and shrub stratum cumulatively contain 15% or less absolute cover exotic plant species.

Medium Condition:
Tree stratum contains more than 50% absolute cover of less than three of the following tree stratum species for small stream forests listed below.
OR,
Tree stratum contains 50% or less absolute cover of a mixture of the following tree stratum species for small stream forests listed below.
OR,
Shrub stratum does exceed 50% absolute cover of one or a mixture of the following shrub species for small stream forests listed below.
OR,
Tree and shrub stratum cumulatively contain between 15% and 50% absolute cover of exotic plant species.

Low Condition:
Tree and shrub stratum cumulatively contain more than 50% absolute cover exotic plant species.

Tree stratum species:
Magnolia grandiflora (southern magnolia)
Fagus grandifolia (beech)
Nyssa sylvatica (black gum)
Quercus michauxii (swamp white oak)
Q. alba (white oak)
Q. nigra (water oak)
Q. laurifolia (laurel oak)
Q. falcata var. pagodaefolia (cherrybark oak)
Liquidambar styraciflua (sweetgum)
Platanus occidentalis (sycamore)
Acer rubrum (red maple)
Betula nigra (river birch)
Carya ovata (shagbark hickory)
C. cordiformis (bitternut hickory)
Fraxinus americana (white ash)
F. caroliniana (water ash)
Prunus caroliniana (cherry laurel)
Ulmus alata (winged elm)
Liriodendron tulipifera (yellow poplar)
Pinus glabra (spruce pine)
P. taeda (loblolly pine)
Taxodium distichum (bald cypress)

Shrub stratum species:
Halesia diptera (silverbell)
Carpinus caroliniana (ironwood)
Viburnum dentatum (arrow-wood)
Itea virginica (Virginia willow)
Symplocos tinctoria (sweetleaf)
Alnus serrulata (hazel alder)
Rhododendron canescens (wild azalea)
Styrax grandifolia (bigleaf snowbell)
Illicium floridanum (starbush)
Sebastiana fruticosa (sebastian bush)
Cyrilla racemiflora (swamp cyrilla)
Lyonia lucida (fetterbush)
Leucothoe axillaris (leucothoe)
L. racemosa (leucothoe)
Ilex verticillata (winterberry)

C. Hydrologic Condition

The hydrologic condition is a measure of the degree to which an impact site's hydrology is controlled by anthropogenic forces or natural processes. Hydrology is the most important factor in the maintenance of wetland processes (Mitsch and Gosselink 2000) and natural inflows of water to a wetland affect the wetland's ability to perform and maintain its typical functions (Collins et al. 2008). Therefore, anthropogenic alterations to natural hydrology will reduce wetland condition. Natural sources of hydrology include surface water inflow (flooding or runoff), groundwater discharge, and precipitation. Anthropogenic alterations to hydrology include levees, canals/ditches and drainage pumps.

Any anthropogenic alterations to regional hydrology may also have an effect on a wetland systems' hydroperiod. The hydroperiod is the duration, frequency, and magnitude of inundation and/or saturation in a wetland. In general, wetlands with greater variation, fluctuation, or pulsing in their hydroperiod also have higher function (Mitsch and Gosselink 2000). In addition, wetlands with seasonal hydroperiods (e.g., more than four weeks in spring and fall) typically have higher plant species diversity than wetlands with temporary hydroperiods (e.g., two to four weeks) which are dominated by facultative species and wetlands with nearly permanent hydroperiods which are dominated by a few obligate species.

1. *High*

Regional and local hydrology are generally unaffected by anthropogenic disturbances or have minor disturbances that could self-restore through natural processes. Such minor disturbances may include logging ruts, shallow bedding activities associated with forestry practices, shallow abandoned ditches, old road beds with shallow ditches or minor earthen dikes that impair flow causing minor ponding or have a minor shadow effect or redirect flow but do not affect water quality or surface water retention time.

2. *Medium*

Regional and local hydrology has been impaired by anthropogenic disturbances such that full functional recovery would not occur through natural processes. Hydrologic restoration would require implementation of a restoration plan. Such disturbances include multiple canals with spoil banks higher than tidal reach, areas encompassed by levees with fisheries access through weirs with boat bays, regularly maintained ditches that effectively reduce surface water retention time, is downstream from developed areas where excessive water or water containing high levels of sediments, nutrients, hydrocarbons or other pollutants are directed onto the site affecting surface water quality, or water is directed away from the site by roadway or other earthen embankments reducing the duration that surface water remains on the site.

3. *Low*

Regional and local hydrology has been permanently impaired by site or off-site disturbances such that the site no longer performs many of those functions. Functions cannot be restored through on or off site restoration. Such disturbances include areas near major drainage canals or within forced drainage systems that have subsided to such an extent that restoring hydrologic connections to outside wetlands would permanently flood the area or areas encompassed by levees with minimal to no fisheries access due to fixed, slotted or variable crest weir without boat bay, rock weir or flap gated culvert.

D. Impact Type

The impact type factor is a measure of the permanent, partial or temporary loss of wetland functions and values at the impact site. Permanent impact projects involve those where all wetland functions values are removed completely from the site. Partial impact projects are those that result in the permanent loss of only certain aquatic functions. These projects typically involve the clearing or grading of a forested habitat which result in the conversion to an emergent habitat. Temporary impact projects involve only a temporal loss of aquatic functions. Temporary work areas associated with larger projects (i.e., highway, pipelines, levees, etc.) that will be restored to pre-project elevations following completion of work are examples of temporal losses.

1. *Full/Permanent Loss*

Impact projects which involve the permanent loss of all wetland functions are considered full/permanent loss projects in LRAM. These projects represent the highest impacts types and are given the highest i-value.

2. *Partial/Temporary Loss*

Impact projects which involve the permanent partial loss or the temporary loss of some wetland functions are considered partial/temporary loss projects in LRAM.

III. Mitigation Factors

There are nine factors which are utilized in LRAM to assess the “Mitigation Site(s):” Mitigation Type, Management, Kind, Project Implementation, Development Impacts, O&G Impacts, Size, Corridor, Buffer and Upland Inclusions. The below table is a list of each “Mitigation Site” factor, the options for each factor, and the associated m-values assigned to each option:

Factor	Option	m value
Mitigation Type	Re-Establishment	6
	Rehabilitation	5
	Enhancement	3
	Preservation	0.4
Management	None	0
	Passive	-0.5
	Active	-2
Kind	In-Kind	0
	Out-of-Kind	-0.5
Project Implementation	Before	0
	After	-1.0
Development Impacts	None	0
	Exists, but Low Impact (EBLI)	-0.2
	Impacts	-0.5
O&G Impact	None	0
	Exists, but Low Impact (EBLI)	-0.2
	Impacts	-0.5
Size	> 500 acres	0.5
	500 : 100 acres	0
	< 100 acres	-0.5
Corridor	No Impacts	0
	Site Divided	-0.2
	Site Severely Divided	-0.5
Buffer/Upland	None	0
	Minimum Required	0.1
	Maximum or above	0.2

The mitigation potential (M) per acre is calculated by summing all of the m factors listed above ($\sum m = M$). The M is then multiplied by the acreage of a compensatory mitigation project to determine the total number of LRAM credits generated. Detailed discussion of each "Mitigation Site" factor and their options are discussed below in Sections III.A through III.J.

A. Mitigation Type

The mitigation type factor is identified based on the wetland project type definitions found in 33 CFR 332.2 and 40 CFR Part 230.92. The mitigation type evaluates the net level of functional change to a site associated with the ecological lift provided by the mitigation work plan. The user should note that the amount of work required in a mitigation work plan may not correspond to the amount of credit generated.

Re-establishment (Re-Est). The proposed site is a former wetland having lost the necessary hydrologic component to support hydrophytic vegetation. Potential sites include agricultural areas or maintained pasture areas. The mitigation plan includes the manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural or historic functions to a former wetland.

OR: Site is predominantly open water. Sponsor to deposit dredged material to an elevation conducive to tidal marsh re-establishment, plant dredged material and restore/create small tidal channels for fisheries access.

Rehabilitation (Rehab). The proposed site is a degraded wetland on which most aquatic resource functions have been severely impacted by prior land use such that it does not exhibit the general characteristics of the target-type ecosystem. Site is farmed wetlands, wet pasture, crawfish pond constructed in former wet areas that have been out of agricultural production for less than five years, and areas with greater than 50% absolute cover of Chinese tallow tree.

Enhancement (Enhance). Proposed site is a wetland that requires modification to heighten, intensify, or improve specific function(s) or to change the growth stage or composition of the vegetation present (i.e., pine plantation conversion back to mixed pine/hardwood system).

Preservation (Preser). Site is a functioning wetland and integral to the functionality of adjacent wetlands or aquatic resources. The project site must be encumbered by a site protection instrument as defined in 33 CFR Part 332. Credit granted should accompany credit generated by re-establishment, rehabilitation or enhancement.

B. Project Site Management

The project site management factor refers to the level of maintenance or management that is required to maintain wetland hydrology on the project site.

None: Project site functions in a self sustaining manner without dependence on structural management. Example: internal and external ditches rendered ineffective at onset of project; culverts exist on-site only to improve sheetflow within the project site.

Passive Management: Open culverts, breaches or other passive management structures that are required for habitat restoration and require monitoring and irregular repair or replacement to maintain hydrology from off-site.

Active Management: Tidal exchange or overflow from adjacent waterbody under active management. Gated structures or variable crest weirs that function to regulate water levels and/or salinities working in conjunction with dikes or natural landscape features to effectively manage surface hydrology, i.e., greentree reservoirs, marsh management projects, areas within existing leveed areas.

C. Habitat Kind

CEMVN follows the requirements of 33 CFR Part 332.3(e) and 40 CFR 230.93(e), which include in-kind habitat replacement. In-kind mitigation is preferable to out-of-kind in order to assure similar functions and services that are lost at an impact site are gained at a mitigation site. Several of the habitats described in Section I.F.1 provide similar wetland functions or naturally exist together as a community (i.e., pine flatwoods, bayhead swamps, pine savanna exist together as a pine/flatwoods savanna community). CEMVN will consider the following as a list of habitats that will be grouped together as in-kind:

- **Bottomland hardwoods** (bottomland hardwoods, hardwood flats, pine-hardwood flatwoods, forested batture)
- **Baldcypress/tupelo swamp**
- **Pine flatwoods/savanna** (bayhead swamp, flatwood ponds, pine flatwoods, pine savanna)
- **Coastal prairie**
- **Fresh/Intermediate marsh** (fresh marsh, intermediate marsh)
- **Brackish/saline marsh** (brackish marsh, saline marsh)

If in-kind mitigation is not available within a specific watershed, it may be preferable to utilize out-of-kind mitigation. This may be necessary to serve the aquatic resource needs of that specific watershed. The use of out-of-kind compensatory mitigation within the concept of the watershed approach will be considered on a case-by-case basis.

D. Project Implementation

The project implementation factor refers to the time when the mitigation will be performed relative to the impact for which it compensates (i.e. timing of mitigation).

Before - Mitigation completed prior to project impacts occurring.

After - Mitigation completed after project impacts occurring.

E. Development Impacts

The development impact factor refers to residential and commercial development near or adjacent to the mitigation project site that negatively impact wetland functions of that site. Commercial and residential developments may affect the ability of a wetland to provide high quality wildlife/fisheries habitat. The degree of the impact is dependent upon the size of the mitigation projects.

This user should review the surrounding landscape and determine if the development found within one mile of the mitigation site boundary causes negative impacts. If development borders one side of the mitigation project, then assume at minimum an impact.

None: Commercial and/or residential development does not exist within one mile radius of the mitigation site boundary or, commercial and/or residential development may exist within one mile radius of the mitigation site boundary, but does not impact the mitigations site's ability to provide wetland functions and values.

Exists, but Low Impacts (EBLI): Commercial and/or residential development exists adjacent to no more than one side of the mitigation site boundary, but does not severely impact the mitigations site's ability to provide wetland functions and values.

Impacts: Commercial and/or residential development exists adjacent to one or more sides of the mitigation site boundary, and severely impacts the mitigations site's ability to provide wetland functions and values.

F. Oil & Gas Impacts

The oil & gas impacts factor captures the negative impacts from oil and gas development.

None: There are no active or abandoned oil and gas wells on the site.

Exists, but Low Impacts (EBLI): No active oil and gas wells on the site and no more than one abandoned well closed in accordance with applicable regulations per 100 acres of the site.

Impacts: Existing active oil and gas wells on the site or greater than one abandoned well per 100 acres of the site closed under applicable regulations.

G. Size

The size factor is measure of the total size of the mitigation project or the cumulative size of the mitigation project and the adjacent property of similar habitat that has low risk of development. The assumption of this factor is that larger tracts are less common, have a greater potential for habitat diversity, provide a greater degree of isolation and thereby offer higher quality habitat than smaller tracts. As stated in Roy et al (2010), although edge habitat produces habitat diversity and are used by many wildlife species, it is important to understand four concepts: 1) wildlife species which thrive in edge habitat are highly mobile and presently occur in substantial numbers, 2) edge habitat is quite available due to continual forest fragmentation from residential and/or commercial development and ongoing timber harvesting, 3) most wildlife species found in "edge" habitat are "generalists" in habitat use and are quite capable of existing in larger tracts, and 4) those species in greatest need of conservation are "specialists" in habitat use and require large forested tracts for maintaining populations.

> 500 – Greater than 500 acres or adjacent to greater than 500 acres of wetlands either protected by legal instrument or due to its location within the landscape has a low probability of development.

500 : 100 – Between 500 and 100 acres or adjacent to between 500 and 100 acres of wetlands either protected by a legal instrument or due to its location within the landscape has a low probability of development.

Less than 100 - Less than 100 acres cumulative from proposed site and adjacent wetlands protected by a legal instrument or due to its location within the landscape has a low probability of development.

H. Corridor

The corridor factor captures the negative impacts imposed upon a mitigation project site due to the existence of road, transmission, pipeline or other rights-of-way that fragment on-site habitat or create fragments from adjacent habitats (rights-of-way that exist along boundaries). Besides habitat fragmentation, local hydrology can be seriously impacted by high road beds, minimal surface connectivity due to low presence of culverts or poor structural maintenance of existing culverts.

No Impacts (NI) : No highways bisect the site or are directly adjacent to the site. Lightly traveled two lane public road directly adjacent to no more than one side of the site. No roadway, pipeline or utility corridors that fragment the habitat type or hinder mitigation site management are present on the site. If a transmission right-of-way traverses the project site, the habitat must be emergent such that the right-of-way does not fragment habitat or forested habitat may only be fragmented into two smaller blocks no less than 100 acres in size.

Site Divided or Bordered (SiteDevBor): A highway directly adjacent to only one side of the site, and does not bisect the site, or; A single lightly traveled public road or right-of-way bisects the site into more than 2 fragments not less than 100 acres in size each.

Site Severely Divided: A highway bisects the site, or; A single lightly traveled public road, pipeline, or utility corridor bisects the site into more than 2 fragments less than

100 acres in size each, or; More than one lightly traveled public road, pipeline, or utility corridor bisects the site.

I. Buffer and Upland Inclusions

The buffer and upland inclusion factor captures the extent of buffers and upland inclusions provided by the mitigation plan. Buffers provide a reduction on the negative effects of stressors and disturbance on the mitigation project site. Anthropogenic disturbances that occur in uplands adjacent to wetland areas can impact the biological, chemical, and physical processes in a wetland (Castelle et al. 1994). Plant species richness and sedimentation have been shown to be influenced by buffers surrounding wetlands (Houlahan et al. 2006 and Skagen et al. 2008, respectively). Wetland buffers reduce adverse impacts to wetland functions from adjacent development by moderating stormwater runoff, stabilizing soil to prevent erosion, providing habitat for wetland-associated species, reducing direct human impact/access to a wetland, and by filtering suspended solids, nutrients, and toxic substances (Castelle et al. 1992). The buffer width necessary for the protection of wetland condition varies widely depending on the wetland processes requiring protection, intensity of adjacent land use, buffer characteristics, and specific buffer functions required (Castelle et al. 1994). Castelle et al. (1994) and Houlahan et al. (2006) stated that buffer width requirements vary from 100 to 820 feet to provide maximum effectiveness.

The presence of uplands provides an increase in habitat diversity, creates wetland/nonwetland interface and can also buffer effects from external stressors.

Minimum (Min): A minimum buffer of 100 foot corridor along all or the portion of the perimeter of the site which is integral to functionality of adjacent wetlands or aquatic resources and provides a barrier between the site and adjacent properties. OR:

A minimum of 10% of the total project area under a site protection instrument contains upland inclusions.

Maximum (Max): A maximum of 500 foot corridor along all or a portion of the perimeter of the site which is integral to functionality of adjacent wetlands or aquatic resources and provides a barrier between the site and adjacent properties. OR:

A minimum of 20% of the total project area under a site protection instrument contains upland inclusions. OR:

A minimum buffer of 100 foot corridor along all or the portion of the perimeter of the site which is integral to functionality of adjacent wetlands or aquatic resources and provides a barrier between the site and adjacent properties. AND;
A minimum of 10% of the total project area under a site protection instrument contains upland inclusions.

Individual credit acres will not be gained from buffers and upland inclusions. Credits obtained from buffers and upland inclusion will add value to other re-establishment, rehabilitation, enhancement or preservation acres.

IV. Workbook Structure

The user should note that additional functionality of the LRAM workbook is anticipated to be completed following public reviews. Any updates will be added to the written sections below.

A. Impact – Mitigation Bank

The first three cells located at the top of the impact worksheet include the CEMVN Account Number, total acres of wetlands impacted, and the watershed basin of the impact. The account number and acres of impact must be typed in by the user. The watershed basin will be selected from list generated within the LRAM.

There are four impact factors which must be selected to determine the final impact value per acre (I). A selection can be made from a drop down list in the cell for that factor, which subsequently will generate the i-value for that factor in the cell below the drop down list. There are eight columns across the impact worksheet to allow the user to enter several different field conditions. When the user has selected an option for all four impact factors, the acreage of impact must be entered below the I-value for each column. The sum of acreages entered in each column should equal the acreage entered in the single cell at the top of the page. The total I-value is summed in a cell at the bottom, right hand side of the impact worksheet.

Once the user has completed entering the impact factors, mitigation bank options may be selected in the cells below the Impact Factors. Eight columns are provided to allow the user to select several mitigation bank options. There are only two factors which must be selected to determine the acres required from a bank. The user should first select the bank name followed by the in-kind/out-of-kind determination. The total acres required will populate at the bottom of each column.

*Values for specific banks are not provided in this draft LRAM, rather examples of typical projects are provided. A full list of banks will be provided after any modifications of this first draft of LRAM are completed and consultation with each Bank Sponsor and the IRT is completed.

B. Mitigation Bank

The first three cells located at the top of the mitigation bank worksheet include the CEMVN Account Number, total acres of wetlands generating credit in the mitigation project, and the watershed basin of the impact. The account number and acres of wetlands must be typed in by the user. The total acres of wetlands generating credit should include all acres that will be included under a separate mitigation type, which may include re-establishment, rehabilitation, enhancement or preservation acres. The buffers and upland inclusions should not be included in the total acreage. The watershed basin will be selected from list generated within the LRAM.

There are nine mitigation factors which must be selected to determine the final mitigation value per acre (M). A selection can be made from a drop down list in the cell for that factor, which subsequently will generate the m-value for that factor in the cell below the drop down list. There are eight columns across the mitigation worksheet to allow the user to enter several different field conditions. When the user has selected an option for all nine impact factors, the acreage of mitigation must be entered below the M-value for each column. The sum of acreages entered in each column should equal the acreage entered in the single cell at the top of the page. The total M-value is summed in a cell at the bottom, right hand side of the mitigation worksheet.

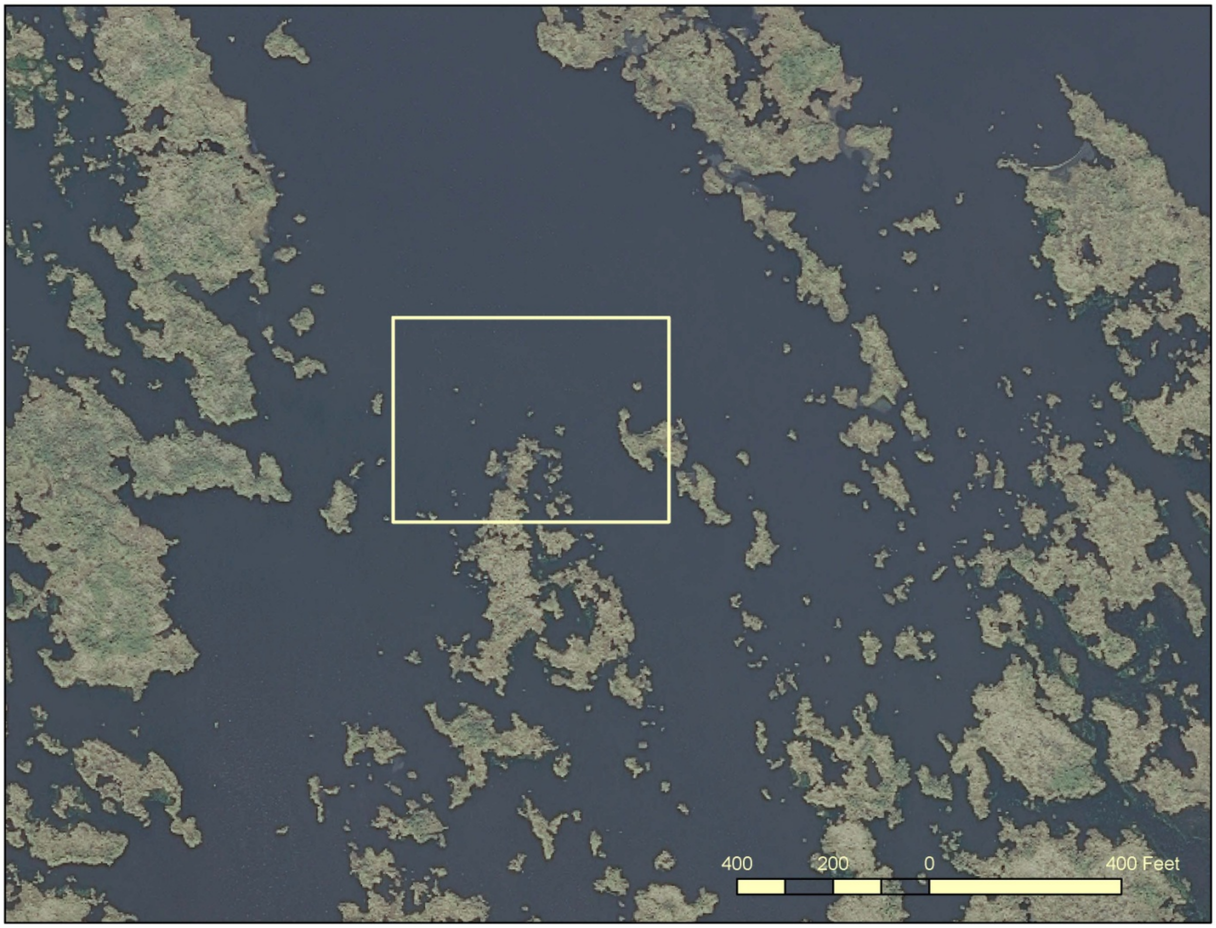
C. Impact – Permittee Responsible Mitigation Plan

The Impact – Permittee Responsible Mitigation (PRM) Plan worksheet contains both the impact worksheet and mitigation worksheet on one page to allow the user to determine potential PRM requirements. Both worksheets are completed in the same manner as described in Sections IV.A and IV.B above.

D. Sample Projects

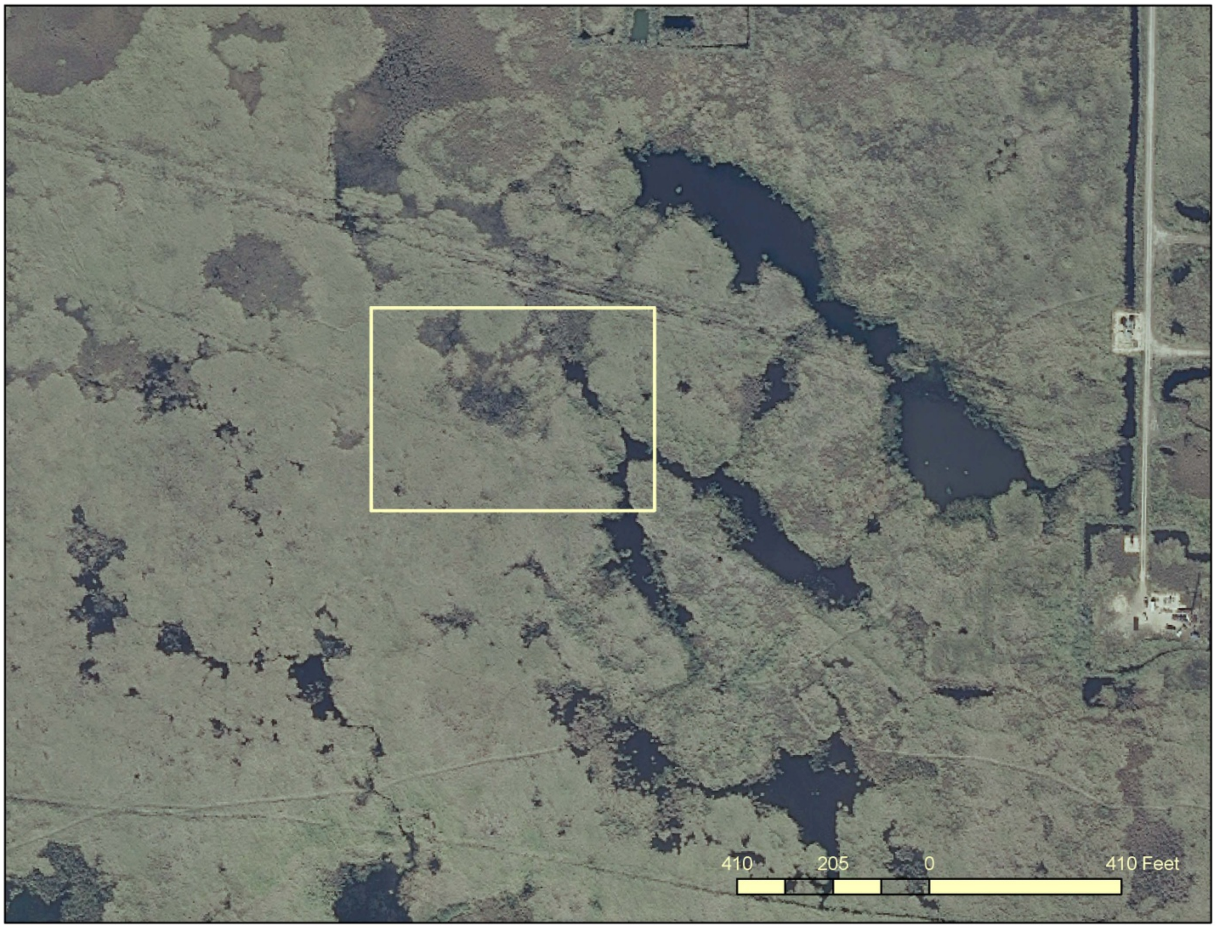
The following aerial photographs are provided as sample project examples to assist the user in understanding selections that would be made for habitat condition in the impact factors. It is assumed in each example that the project area within the box has been determined to be a least damaging alternative that could be authorized with sufficient compensatory mitigation.

Sample 1:



The above photograph represents a brackish marsh scenario. The entire project area encompasses approximately 5.5 acres, with approximately 0.4 acre of brackish marsh. In this scenario, the habitat condition for the project area would be selected as Low, based on the project area containing approximately 7% aerial coverage of emergent vegetation. The acreage of impact that would be assessed as brackish marsh would be 0.4 acre.

Sample 2:



The above photograph represents an intermediate marsh scenario. The entire project area encompasses approximately 5.9 acres, which includes approximately 0.3 acre of open water ponds. In this scenario, the habitat condition for the project area would be selected as High, based on the project area containing approximately 95% aerial coverage of emergent vegetation. The acreage of impact that would be assessed as intermediate marsh would be 5.6 acres.

Sample 3:

The above photograph represents a scenario with two different habitat conditions. The entire project area encompasses approximately 10 acres, which includes approximately 5 acres of pine savannah habitat and 5 acres of pine plantation. For the pine savannah, the habitat condition meets the criteria for High as shown in the wetland determination data form below:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: PFS A

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Pinus palustris*	10	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	10	=Total Cover	
50% of total cover: 5		20% of total cover:	2

Sapling/Shrub Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus nigra*	5	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	5	=Total Cover	
50% of total cover: 3		20% of total cover:	1

Herb Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Andropogon glomeratus*	30	Yes	FACW
2. *Aristida stricta*	30	Yes	FAC
3. *Muhlenbergia capillaris*	10	No	FAC
4. *Rhynchospora baldwinii*	10	No	FACW
5. *Aletris lutea*	5	No	FACW
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	85	=Total Cover	
50% of total cover: 43		20% of total cover:	17

Woody Vine Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
		=Total Cover	
50% of total cover:		20% of total cover:	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	45	x 2 =	90
FAC species	55	x 3 =	165
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	100	(A)	255 (E
Prevalence Index = B/A =			2.55

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
_X_ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must b present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) o more in diameter at breast height (DBH), regardless o height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 r tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes _X_ No ___

Remarks: (If observed, list morphological adaptations below.)

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The tree stratum contains 10% absolute cover of longleaf pine, the shrub stratum contains less than 15% of native hardwoods, and the absolute cover of emergent vegetation is 85%.

For the pine plantation area, the habitat condition meets the criteria for low as shown in the wetland determination data form below:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: PFS B

Tree Stratum (Plot size: ______)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Pinus taeda*	100	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	100	=Total Cover	
50% of total cover:	50	20% of total cover:	20

Sapling/Shrub Stratum (Plot size: ______)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Magnolia virginiana*	10	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	10	=Total Cover	
50% of total cover:	5	20% of total cover:	2

Herb Stratum (Plot size: ______)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
		=Total Cover	
50% of total cover:		20% of total cover:	

Woody Vine Stratum (Plot size: ______)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
		=Total Cover	
50% of total cover:		20% of total cover:	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	10	x 2 =	20
FAC species	100	x 3 =	300
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	110	(A)	320 (E

Prevalence Index = B/A = 2.91

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
_X_ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must b present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) o more in diameter at breast height (DBH), regardless o height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 r tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes _X_ No ___

Remarks: (If observed, list morphological adaptations below.)

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The pine plantation area contains 100% absolute cover of loblolly pine in the tree stratum.

V. Methodology Review

TO BE COMPLETED FOLLOWING ALL INTERNAL AND EXTERNAL REVIEW PROCESSES INCLUDING PUBLIC NOTICE, PUBLIC WORKSHOPS

VI. References

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