COMPENSATORY MITIGATION
LITTLE ROCK DISTRICT, REGULATORY OFFICE
U. S. ARMY CORPS OF ENGINEERS

Standard Operating Procedures

COMPENSATORY MITIGATION
LITTLE ROCK DISTRICT, REGULATORY OFFICE
U. S. ARMY CORPS OF ENGINEERS

Standard Operating Procedures

TABLE OF CONTENTS

	Page
1.0 Introduction	3
2.0 Wetland Compensatory Mitigation	4
2.1 Compensatory Mitigation for Permit Processing	4
3.0 Stream Mitigation	6
3.1 Stream Terminology	6
4.0 Upland Buffer Mitigation	9
5.0 Compensatory Mitigation Site Protection	9
6.0 Financial Assurances	10

Appendix A: Multi-Agency Compensatory Mitigation Plan Checklist and Supplement

Appendix B: National Research Council Operational Guidelines

COMPENSATORY MITIGATION
LITTLE ROCK DISTRICT, REGULATORY OFFICE
U.S. ARMY CORPS OF ENGINEERS

Standard Operating Procedure

1.0 INTRODUCTION

The purpose of this standard operating procedure (SOP) is to provide Compensatory Mitigation Guidelines for aquatic resource impacts under the Little Rock District's Regulatory program pursuant to Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act. This guidance is intended to fully support the national policy for "no overall net loss" of wetlands and other waters of the United States, consistent with the Section 404 (b)(1) Guidelines. The Section 404 (b) (1) guidelines require compensatory mitigation to offset aquatic resource losses after all appropriate and practicable steps have been taken to first avoid and then minimize aquatic resource impacts. The Little Rock District is strongly committed to the protection of the overall aquatic environment and through the Regulatory Program will ensure that authorized losses of wetlands and other waters are appropriately mitigated. These guidelines will be used in conjunction with Section 404 and Section 10 Regulations, Regulatory Guidance Letter (RGL) 02-2, Federal Guidance for the Establishment, Use and Operation of Mitigation Banks, the Federal Guidance on the Use of In-Lieu-Fee Arrangements for Compensatory Mitigation under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act, and the 1990 Corps/EPA Mitigation MOA.

The Little Rock District will use a watershed and ecosystem approach when determining compensatory mitigation requirements. The Multi-Agency Compensatory Mitigation Plan Checklist found in Appendix A and the operational guidelines developed by the National Research Council (2001) in Appendix B will be provided to the applicant and are available at http:www.swl.usace.army.mil/regulatory. The checklist and guidelines will be used to develop the applicant's compensatory mitigation plan. The Little Rock District will also coordinate proposed mitigation plans with all applicable agency representatives and tribes to ensure that the mitigation plan is consistent with watershed needs and compatible with adjacent land uses.

When evaluating Standard and applicable Letters of Permission (LOP) applications Regulatory personnel will use functional assessment methods and best professional judgment to identify wetland and stream impacts and to provide adequate compensatory mitigation. Personnel will determine functional scores for impacts and appropriate mitigation for wetlands using the Charleston Method and the Little Rock

District Stream Method for mitigation for streams. Both are found at http:www.swl.usace.army.mil/regulatory/funassessmethod.html. Copies of the Charleston Method and the Little Rock Stream Method will be made available to applicants for planning mitigation and can be obtained at the Little Rock District office. Compensatory mitigation plans are required for work in streams requiring Standard or LOP permits unless the evaluation of the permit application reveals that stream compensation measures are not practicable, constructible, or ecologically desirable. Nationwide Permit requests for stream work will be evaluated on a case-by-case basis. As successful new techniques are developed which improve functional assessments of wetlands and streams they will be included and adopted in this SOP.

2.0 **WETLAND COMPENSATORY MITIGATION**

The objective for compensating impacts to wetlands is to provide, at a minimum, one to one functional replacement. Impacts must be mitigated with an adequate margin of safety to reflect anticipated success. To achieve the no net loss policy, impacts determined by functional replacement will be more effective than acre for acre replacement. If there is no appropriate method of assessing functions such as during enforcement actions or after-the-fact permits a minimum one-to-one acreage replacement may be used as a reasonable method. The Project Manager will document the rationale for the use of acreage replacement and identify the factors considered in the decision document prepared during the evaluation of the project. As a general rule, the ratio of functional replacements will be one-to-one unless the functions associated with the area being impacted are extremely low and the proposed replacement of wetlands has a much higher function. The Charleston Method will be used to determine functional replacements on all permits in the Little Rock District with an impact greater than 0.5 acre.

2.1 **COMPENSATORY MITIGATION FOR PERMIT PROCESSING**

Regulatory Project Managers will determine or confirm the acres of wetland impact when a permit is requested. In addition, the type of wetland and waters of the United States to be impacted will be identified. The environmental setting of the project will be documented thoroughly in the decision document.

The Project Manager and the applicant will discuss the possible scenarios for mitigation for a project. The applicant will be given this document (Compensatory Mitigation Plan, Little Rock District, SOP). Mitigation should be required on-site or adjacent to or contiguous to the project. If on-site is not practicable, a combination of on-site and off-site may be considered. Off-site mitigation may be used if there is no opportunity for on-site mitigation or off-site mitigation provides more benefit to the over-all aquatic resources in the watershed. In-kind, out-of-kind or a combination may also be required to functionally replace lost aquatic resources. Wetland losses, which are replaced in-kind, are wetlands established, restored, enhanced, or protected of the same physical and functional type. Out-of-kind replacements replace aquatic resources of a

different physical and functional type. Out-of-kind is appropriate when it provides more environmental benefit and is more practical.

Other options for compensatory mitigation are mitigation banks, in-lieu-fee arrangements, and the inclusion of upland areas in the mitigation plan. Mitigation banks and in-lieu-fee arrangements require that the applicant use an established third party to provide for mitigation. The third party is paid by the applicant to administer the mitigation plan and develop the wetlands as required by the permitted activity. Arrangements can be made with agencies and private conservation organizations to provide mitigation for an applicant as well.

The types of compensatory mitigation projects are discussed below:

(1) **Establishment (Creation)**: The manipulation of the physical, chemical, or biological characteristics present to develop a wetland on an upland or deepwater site, where a wetland did not previously exist. Establishment results in a net gain in wetland acres.

(2) **Restoration**: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural functions to a former or degraded wetland. Restoration is divided into: a) Re-establishment, which results in a gain of wetland acres, and b)Rehabilitation, which results in a gain of wetland functions but not in a gain of wetland acres.

(3) **Enhancement**: The manipulation of the physical, chemical, or biological characteristics of a wetland (undisturbed or degraded) site to heighten, intensify, or improve specific functions or to change the growth stage or composition of the vegetation present. Enhancement is undertaken for a specified purpose. Enhancement leads to a change in wetland functions and may lead to a decline or increase in functions. Enhancement does not lead to a gain in wetland acres.

(4) **Protection/Maintenance (Preservation)**: The removal of a threat to, or preventing the decline of, wetland conditions by an action in or near a wetland. Preservation does not result in a gain in wetland acres. Preservation will be used in conjunction with establishment, restoration, and enhancement activities. Preservation used as the sole basis of mitigation will be used only in exceptional circumstances where the wetland is under a demonstrable threat of degradation by development or it is unique and performs important functions to the region where it is located.

On-Site and Off-Site Mitigation: On-site, off-site, or a combination of on-site and off-site mitigation may be required to maintain functional levels within watersheds. Mitigation should be required, when practicable, in areas adjacent or contiguous to the project site. Off-site mitigation may be used when there is no practicable opportunity for on-site mitigation. Off-site mitigation will be in the same geographic area as close as possible to the authorized impacts and, to the extent practicable, in the same watershed.

In-Kind and Out-of-Kind Mitigation: In-kind, out-of-kind, or a combination of in-kind and out-of-kind, mitigation to achieve functional replacement within surrounding watersheds may be required. In-kind mitigation requires the replacement of the wetland area by a wetland of the same physical and functional type. In-kind replacement will be required when the impacted resource is locally important. Out-of-kind involves the replacement of the wetland area by a wetland of a different physical and functional type. Out-of-kind is appropriate when it provides more ecological or watershed benefit than in-kind.

3.0 STREAM MITIGATION

Mitigation for projects in streams is required to replace functions lost by work below the ordinary high water mark (OHWM) of streams. Mitigation for streams will replace linear feet of stream on a one to one functional replacement basis or acreage of impact if more practical. Compensatory mitigation for impacts to stream resources should be in the form of restoration and/or enhancement of degraded stream channels and stream creation utilizing natural channel design and bioengineering techniques. Channel preservation of unique or otherwise ecologically important stream segments may also play an important role in mitigating stream impacts. Compensatory stream mitigation using the Little Rock Stream Method will be required for Standard Permits and LOPs. Nationwide Permit mitigation for stream impacts will be on a case-by-case basis. The requirement for stream mitigation will be determined by the Regulatory Project Manager using the Little Rock Stream Method. Linear impacts converted to acres which exceed 0.5 acres will be evaluated for mitigation using the stream functional assessment method. The functional assessment method is not required for temporary fills.

3.1 STREAM TERMINOLOGY

- **Bankfull Stage** - The point at which water begins to overflow onto its floodplain. This may or may not be at the top of the stream bank on entrenched streams. Typically, the bankfull discharge recurrence interval is between one and two years. It is this discharge that is most effective at moving sediment, forming and removing bars, shaping meanders and generally doing work that results in the morphological characteristics of channels. Bankfull stage is not considered the OHWM by the Corps.
- **Channel Dimension** - The two-dimensional, cross sectional profile of a channel taken at selected points on a reach, usually taken at riffle locations. Variables that are commonly measured include width, depth, cross-sectional area, floodprone area and entrenchment ratio. These variables are usually measured relative to the bankfull stage.
- **Channel Pattern** - The sinuosity or meander geometry of a stream. Variables commonly measured include sinuosity, meander wavelength, belt width, meander width ratio and radius of curvature.
- **Channel Profile** - The longitudinal slope of a channel. Variables commonly measured include water surface slope, pool-to-pool spacing, pool slope and riffle slope.

- **Channelized Stream** – A stream that has been degraded (straightened) by human activities. A channelized stream will generally have increased depth, increased width, and a steeper profile, be disconnected from its floodplain and have a decreased pattern or sinuosity.
- **Compensatory Stream Mitigation** - The restoration, enhancement, or, for streams of national or state significance because of the resources they support, preservation of streams and their associated floodplains for the purpose of compensating for unavoidable adverse impacts which remain after all appropriate and practicable avoidance and minimization has been achieved. Compensatory stream mitigation may be required for impacts to perennial and intermittent streams and should be designed to restore, enhance, and maintain stream uses that are adversely impacted by authorized activities.
- **Conservation Easement** - A legally binding, recorded instrument approved by the District to protect and preserve mitigation sites.
- **Deed Restriction -** A provision in a deed limiting the use of the property and prohibiting certain uses. The Little Rock District approves mitigation areas and requires deed restrictions to protect and preserve mitigation sites.
- **Ditches Acting as Streams -** Considered to be waters of the United States.
- **Ephemeral Stream** - An ephemeral stream has flowing water only during and for a short duration after precipitation events in a typical year. Ephemeral streambeds are located above the water table year-round. Groundwater is not a source of water for the stream. Runoff from precipitation is the primary source of water for stream flow. Ephemeral streams typically support few aquatic organisms. When aquatic organisms are found they typically have a very short aquatic life stage.
- **Flood-Prone Area** - Floodplain width measured at an elevation corresponding to twice the maximum bankfull depth. The area often correlates to an approximate 50-year flood or less.
- **Intermittent Stream** - An intermittent stream has flowing water during certain times of the year, when ground water provides water for stream flow. During dry periods, intermittent streams may not have flowing water. Runoff from precipitation is a supplemental source of water for stream flow. The biological community of intermittent streams is composed of species that are aquatic during a part of their life history or move to perennial water sources.
- **OHWM -** The term ordinary high water mark (OHWM) means that line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of the soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas.
- **Perennial Stream** - A perennial stream has flowing water year-round during a typical year. The water table is located above the streambed for most of the year. Groundwater is the primary source of water for stream flow. Runoff from precipitation is a supplemental source of water for stream flow. Perennial streams support a diverse aquatic community of organisms year round and are typically the streams that support major fisheries.

- **Stream Enhancement** - Stream rehabilitation activities undertaken to improve water quality or ecological function of a fluvial system. Enhancement activities generally will include some activities that would be required for restoration. These activities may include in-stream or stream-bank activities, but in total fall short of restoring one or more of the geomorphic variables: dimension, pattern and profile. Any proposed stream enhancement activity must demonstrate long-term stability.
- **Stream Preservation** - Protection of ecologically important streams, generally, in perpetuity through the implementation of appropriate legal and physical mechanisms. Preservation may include the protection of upland buffer areas adjacent to streams as necessary to ensure protection or enhancement of the overall stream. Generally, stream preservation should be in combination with restoration or enhancement activities. Under exceptional circumstances, preservation may stand-alone where high value waters will be protected or ecologically important waters may be subject to developmental pressure.
- **Stream Relocation** - Movement of a stream to a new location to allow an authorized project to be constructed in the stream's former location. In general, relocated streams must reflect the dimension, pattern and profile indicated by a natural reference reach/condition in order to be adequate compensation for the authorized stream impact. Relocated streams will generally require protected buffers of sufficient width. Relocations resulting in a reduced channel length will generally require mitigation.
- **Stream Restoration** - (As a category used for mitigation) The process of converting an unstable, altered, or degraded stream corridor, including adjacent riparian zone (buffers) and flood-prone areas, to its natural stable condition considering recent and future watershed conditions. This process should be based on a reference condition/reach for the valley type and includes restoring the appropriate geomorphic dimension (cross-section), pattern (sinuosity), and profile (channel slopes), as well as reestablishing the biological and chemical integrity, including transport of the water and sediment produced by the stream's watershed in order to achieve dynamic equilibrium.
- **Stream Riparian Zone** - A riparian zone is the area of vegetated land along each side of a stream or river that includes, but is not limited to, the floodplain. The quality of this terrestrial or wetland habitat varies depending on width and vegetation growing there. As with vegetated buffers, functions of the riparian zone include reducing floodwater velocity, filtering pollutants such as sediment, providing wildlife cover and food, and shading the stream. The ability of the riparian zones to filter pollutants that move to the stream from higher elevations results in this area being referred to as a buffer zone. The riparian zone is measured landward from the OHWM on each side of a stream or river.
- **Streambank Stabilization** - The in-place stabilization of an eroding streambank. Stabilization techniques, which include primarily natural materials, like root wads and log crib structures, as well as sloping stream banks and revegetating the riparian zone may be considered for mitigation. When streambank stabilization is proposed for mitigation the completed condition should be based on a reference condition.

- **Vegetated Buffer** - An upland or wetland area vegetated with native trees and shrubs next to rivers, streams, lakes, or other open waters that separate aquatic habitats from developed areas, including agricultural land.

4.0 **UPLAND BUFFER MITIGATION**

Buffer protection for stream protection is required to ensure that the overall mitigation project performs as expected. Buffer zones may also be required in wetlands if appropriate to protect the integrity of the mitigation site. In most cases, the establishment, maintenance, and legal protection (conservation easements, deed restrictions) of a buffer of a minimum of 25 feet wide on each side of the stream will be required. Vegetated buffers may be required to be wider to protect sensitive riparian or instream environments, threatened or endangered species, or historical or cultural resources. Consideration for reduced buffer widths will be based on issues related to construction constraints and land ownership and may result in increased mitigation ratios. All submittals of buffer zones used for mitigation will be evaluated on a case-by-case basis.

Planting buffers and riparian zones should be done as the work proceeds or at the latest, immediately upon completion of the stream activities. Stream banks should be planted with native vegetation and should be an appropriate vegetative community for the site. Detailed monitoring reports of mitigation results should be submitted to the Corps of Engineers on a periodic basis as outlined in the Special Conditions of the permit..

5.0 **COMPENSATORY MITIGATION SITE PROTECTION**

(1) Compensatory mitigation sites will generally be held and protected in perpetuity. Each mitigation plan should include a written description of the legal means for protecting the site and the permit should contain conditions to ensure protection of the site. Conservation easements, deed restrictions or other appropriate means must be recorded with the appropriate county official where the mitigation site is located. In no case will the Corps or Federal government hold title or interest in the mitigation site. The applicant may transfer the responsibility to perform mitigation to a third party, a Federal or state resource agency or a non-profit organization. The Corps must approve any organization other than the applicant that requests to do the mitigation work. Except for very small sites, a registered land surveyor must survey all mitigation sites and a plat or survey be provided to the Corps.

(2) Contingency plans should be included in the mitigation plan. Depending on the extent and complexity of the impacts being mitigated, the plan should identify the remedial or financial assurance mechanisms required to protect the development of the mitigation. Contingency plans will also allow for modifications to performance standards if mitigation is developing and meeting compensatory mitigation goals in unanticipated ways. Additionally, contingency plans should address circumstances beyond the control of the responsible parties that might result in no enforcement or other remedial actions.

In every case Little Rock District Regulatory personnel will determine the course of action to be taken in the event of unexpected conditions requiring implementation of the contingency plan.

(3) Long term monitoring will also be used to protect sites. The mitigation plan will identify the party(s) responsible for long term monitoring. Monitoring reports will be on a case-by-case basis depending on the circumstances of the impacts and mitigation ratios. Monitoring reports will generally be submitted for 1, 3, and 5 years to determine compliance with permit conditions and the need for any remedial action to ensure the success of the mitigation within the 5-year monitoring period. Monitoring reports can extend beyond 5 years if the mitigation site is not successful. The responsible party will submit monitoring reports by 31 December of each year as stipulated in the permit conditions. The Little Rock District may take enforcement actions even after the monitoring period for a violation of permit conditions.

6.0 **FINANCIAL ASSURANCES**

Compensatory mitigation plans will identify the party(s) responsible for mitigation success. This includes identifying any party that will be responsible for the long-term management and success of the site. Financial assurances should be commensurate with the size and complexity of the impacts and the mitigation requirements including any contingency plans. Permit conditions are generally sufficient for enforcing the mitigation plan in minimal and low impact projects without additional financial assurances. In actions where the mitigation will be such that financial assurances are required, it may be requested in the form of performance bonds, irrevocable trusts, escrow accounts, or any other acceptable means. The Project Manager will be responsible for consultation with the Regulatory Office Chief and Team Leader for the development of adequate financial assurances.

Appendix A

MULTI-AGENCY COMPENSATORY MITIGATION PLAN CHECKLIST[1]

- ☐ Mitigation Goals and Objectives
  - Describe functions lost at impact site
  - Describe functions to be gained at mitigation site
  - Describe overall watershed improvements to be gained

- ☐ Baseline Information for Impact and Proposed Mitigation Sites
  - Provide data on physical attributes of sites (soils, vegetation, hydrology)
  - Describe historic and existing land uses and resources impacted
  - Describe reference site attributes if available

- ☐ Mitigation Site Selection and Justification
  - Describe process of selecting proposed site
  - Likelihood of success, future land use compatibility, etc.

- ☐ Mitigation Work Plan
  - Location
  - Construction Plan
  - Describe planned hydrology, vegetation, soils, buffers, etc.

- ☐ Performance Standards
  - Identify success criteria
  - Compare functions lost and gained at impact and mitigation sites
  - Describe soils, vegetation and hydrology parameter changes

- ☐ Site Protection and Maintenance
  - List parties and responsibilities
  - Provide evidence of legal protective measures
  - Maintenance plan and schedule

- ☐ Monitoring Plan
  - Provide monitoring schedule, identify party (ies) and responsibilities
  - Specify data to be collected, including assessment tools and methodologies

- ☐ Adaptive Management Plan
  - Identify party (ies) and responsibilities
  - Remedial measures (financial assurances, management plan, etc.)

- ☐ Financial Assurances
  - Identify party (ies) responsible for assurances
  - Specify type of assurance, contents and schedule

[1] Refer to "Supplement: Compensatory Mitigation Plan Checklist" for further explanation of specific checklist items.

SUPPLEMENT: COMPENSATORY MITIGATION PLAN CHECKLIST

This document is intended as a technical guide for Clean Water Act (CWA) Section 404 permit applicants[2] preparing compensatory mitigation plans. Compensatory mitigation is required to offset impacts that cannot be avoided and minimized to the extent practicable. The purpose of this document is to identify the types and extent of information that agency personnel need to assess the likelihood of success of a mitigation proposal. Success is generally defined as: a healthy sustainable wetland/water that – to the extent practicable – compensates for the lost functions of the impacted water in an appropriate landscape/watershed position. This checklist provides a basic framework that will improve predictability and consistency in the development of mitigation plans for permit applicants. Although every mitigation plan may not need to include each specific item, applicants should address as many as possible and indicate, when appropriate, why a particular item was not included (For example, permit applicants who will be using a mitigation bank would not be expected to include detailed information regarding the proposed mitigation bank site since that information is included in the bank's enabling instrument). This checklist can be adapted to account for specific environmental conditions in different regions of the U.S.

1. Mitigation Goals and Objectives

Impact Site

a. Describe and quantify the aquatic resource type and functions that will be impacted at the proposed impact site. Include temporary and permanent impacts to the aquatic environment.

b. Describe aquatic resource concerns in the watershed (e.g. flooding, water quality, habitat) and how the impact site contributes to overall watershed/regional functions. Identify watershed or other regional plans that describe aquatic resource objectives.

Mitigation Site

c. Describe and quantify the aquatic resource type and functions for which the mitigation project is intended to compensate.

d. Describe the contribution to overall watershed/regional functions that the mitigation site(s) is intended to provide.

2. Baseline Information - for proposed impact site, proposed mitigation site & if applicable, proposed reference site(s).

a. Location

1. Coordinates (preferably using DGPS) & written location description (including block, lot, township, county, Hydrologic Unit Code (HUC) number, as appropriate and pertinent.
2. Maps (e.g., site map with delineation (verified by the Corps), map of vicinity, map identifying location within the watershed, NWI map, NRCS soils map, zoning or planning maps; indicate area of proposed fill on site map).
3. Aerial/Satellite photos.

b. Classification – Hydrogeomorphic as well as Cowardin classification, Rosgen stream type, NRCS classification, as appropriate.

[2] The checklist may be used in other federal or state programs as well; however, additional information may be needed to satisfy specific program requirements. For example, Attachment A indicates additional information needed by the Natural Resources Conservation Service (NRCS) to satisfy the Swampbuster provisions of the Food Security Act.

c. Quantify wetland resources (acreage) or stream resources (linear feet) by type(s).
d. Assessment method(s) used to quantify impacts to aquatic resource functions (e.g., HGM, IBI, WRAP, etc.); explain findings. The same method should be used at both impact and mitigation sites.
e. Existing hydrology
    1. Water budget. Include water source(s) (precipitation, surface runoff, groundwater, stream) and losses(s). Provide budgets for both wet and dry years.
    2. Hydroperiod (seasonal depth, duration, and timing of inundation and/or saturation), percent open water.
    3. Historical hydrology of mitigation site if different than present conditions
    4. Contributing drainage area (acres).
    5. Results of water quality analyses (e.g., data on surface water, groundwater, and tides for such attributes as pH, redox, nutrients, organic content, suspended matter, DO, heavy metals).
f. Existing vegetation
    1. List of species on site, indicating dominants.
    2. Species characteristics such as densities, general age and health, and native/non-native/invasive status.
    3. Percent vegetative cover; community structure (canopy stratification).
    4. Map showing location of plant communities.
g. Existing soils
    1. Soil profile description (e.g., soil survey classification and series) and/or stream substrate (locate soil samples on site map).
    2. Results of standard soils analyses, including percent organic matter, structure, texture, permeability.
h. Existing wildlife usage (indicate possible threatened and endangered species habitat).
i. Historic and current land use; note prior converted cropland.
j. Current owner(s)
k. Watershed context/surrounding land use.
    1. Impairment status and impairment type (e.g., 303(d) list) of aquatic resources.
    2. Description of watershed land uses (percent ag, forested, wetland, developed).
    3. Size/Width of natural buffers (describe, show on map).
    4. Description of landscape connectivity: proximity and connectivity of existing aquatic resources and natural upland areas (show on map).
    5. Relative amount of aquatic resource area that the impact site represents for the watershed and/or region (i.e., by individual type and overall resources).

3. Mitigation Site Selection & Justification

a. Site-specific objectives: Description of mitigation type(s)[3], acreage(s) and proposed compensation ratios.
b. Watershed/regional objectives: Description of how the mitigation project will compensate for the functions identified in the Mitigation Goals section 1(c).
c. Description of how the mitigation project will contribute to aquatic resource functions within the watershed or region (or sustain/protect existing watershed functions) identified in the Mitigation

[3] That is, restoration, enhancement, creation or preservation: see Regulatory Guidance Letter (RGL) 02-2, Mitigation RGL, for definitions for these terms.

Goals section 1(d). How will the planned mitigation project contribute to landscape connectivity?

d. Likely future adjacent land uses and compatibility (show on map or aerial photo).

e. Description of site selection practicability in terms of cost, existing technology, and logistics.

f. If the proposed mitigation is off-site and/or out-of-kind, explain why on-site or in-kind options[4] are not practicable or environmentally preferable.

g. Existing and proposed mitigation site deed restrictions, easements and rights-of-way. Demonstrate how the existence of any such restriction will be addressed, particularly in the context of incompatible uses.

h. Explanation of how the design is sustainable and self-maintaining. Show by means of a water budget that there is sufficient water available to sustain long-term wetland or stream hydrology. Provide evidence that a legally defensible, adequate and reliable source of water exists.

i. USFWS and/or NOAA Fisheries Listed Species Clearance Letter or Biological Opinion.

j. SHPO Cultural Resource Clearance Letter.

4. Mitigation Work Plan

a. Maps marking boundaries of proposed mitigation types; include DGPS coordinates.

b. Timing of mitigation: before, concurrent or after authorized impacts; if mitigation is not in advance or concurrent with impacts, explain why it is not practicable and describe other measures to compensate for the consequences of temporal losses.

c. Grading plan

1. Indicate existing and proposed elevations and slopes.
2. Describe plans for establishing appropriate microtopography. Reference wetland(s) can provide design templates.

d. Description of construction methods (e.g., equipment to be used)

e. Construction schedule (expected start and end dates of each construction phase, expected date for as-built plan).

f. Planned hydrology

1. Source of water.
2. Connection(s) to existing waters.
3. Hydroperiod (seasonal depth, duration, and timing of inundation and saturation), percent open water, water velocity.
4. Potential interaction with groundwater.
5. Existing monitoring data, if applicable; indicate location of monitoring wells and stream gauges on site map.
6. Stream or other open water geomorphic features (e.g., riffles, pools, bends, deflectors).
7. Structures requiring maintenance (show on map) Explain structure maintenance in section 6(c).

g. Planned vegetation

1. Native plant species composition (e.g., list of acceptable native hydrophytic vegetation).
2. Source of native plant species (e.g. salvaged from impact site, local source, seed bank) stock type (bare root, potted, seed) and plant age(s)/size(s).
3. Plant zonation/location map (refer to grading plan to ensure plants will have an acceptable hydrological environment).

[4] See Federal Guidance on the Use of Off-Site and Out-of-Kind Compensatory Mitigation under Section 404 of the CWA.

4. Plant spatial structure – quantities/densities, % cover, community structure (e.g., canopy stratification).
5. Expected natural regeneration from existing seed bank, plantings, and natural recruitment.

h. Planned soils
1. Soil profile
2. Source of soils (e.g., existing soil, imported impact site hydric soil), target soil characteristics (organic content, structure, texture, permeability), soil amendments (e.g., organic material or topsoil).
3. Erosion and soil compaction control measures.

i. Planned habitat features (identify large woody debris, rock mounds, etc. on map).

j. Planned buffer (identify on map).
1. Evaluation of the buffer's expected contribution to aquatic resource functions.
2. Physical characteristics (location, dimensions, native plant composition, spatial and vertical structure.

k. Other planned features, such as interpretive signs, trails, fence(s), etc.

5. Performance Standards

a. Identify clear, precise, quantifiable parameters that can be used to evaluate the status of desired functions. These may include hydrological, vegetative, faunal and soil measures. (e.g., plant richness, percent exotic/invasive species, water inundation/saturation levels). Describe how performance standards will be used to verify that objectives identified in 3(b) and 3(c) have been attained.

b. Set target values or ranges for the parameters identified. Ideally, these targets should be set to mimic the trends and eventually approximate the values of a reference wetland(s).

6. Site Protection and Maintenance

a. Long-term legal protection instrument (e.g. conservation easement, deed restriction, transfer of title).

b. Party(ies) responsible and their role (e.g. site owner, easement owner, maintenance implementation). If more than one party, identify primary party.

c. Maintenance plan and schedule (e.g. measures to control predation/grazing of mitigation plantings, temporary irrigation for plant establishment, replacement planting, structure maintenance/repair, etc.).

d. Invasive species control plan (plant and animal).

7. Monitoring Plan

a. Party(ies) responsible for monitoring. If more than one, identify primary party.

b. Data to be collected and reported, how often and for what duration (identify proposed monitoring stations, including transect locations on map).

c. Assessment tools and/or methods to be used for data collection monitoring the progress towards attainment of performance standard targets.

d. Format for reporting monitoring data and assessing mitigation status.

e. Monitoring schedule

8. Adaptive Management Plan

a. Party(ies) responsible for adaptive management.

b. Identification of potential challenges (e.g., flooding, drought, invasive species, seriously degraded site, extensively developed landscape) that pose a risk to project success. Discuss how the design accommodates these challenges.

c. Discussion of potential remedial measures in the event mitigation does not meet performance standards in a timely manner.

d. Description of procedures to allow for modifications of performance standards if mitigation projects are meeting mitigation goals, but in unanticipated ways.

9. Financial Assurances

a. For each of the following, identify party(ies) responsible to establish and manage the financial assurance, the specific type of financial instrument, the method used to estimate assurance amount, the date of establishment, and the release and forfeiture conditions:

1. Construction phase
2. Maintenance
3. Monitoring
4. Remedial measures
5. Project success

b. Types of assurances (e.g., performance bonds, irrevocable trusts, escrow accounts, casualty insurance, letters of credit, etc.).

c. Schedule by which financial assurance will be reviewed and adjusted to reflect current economic factors.

Appendix B

Taken from ***Operational Guidelines for Creating or Restoring Self-Sustaining Wetlands*, National Research Council 'Compensating for Wetland Losses Under The Clean Water Act,' June 2001** (Chapter 7, pp. 123-128).

1. Consider the hydrogeomorphic and ecological landscape and climate. Whenever possible locate the mitigation site in a setting of comparable landscape position and hydrogeomorphic class. Do not generate atypical "hydrogeomorphic hybrids"; instead, duplicate the features of reference wetlands or enhance connectivity with natural upland landscape elements (Gwin et al. 1999).

Regulatory agency personnel should provide a landscape setting characterization of both the wetland to be developed and, using comparable descriptors, the proposed mitigation site. Consider conducting a cumulative impact analysis at the landscape level based on templates for wetland development (Bedford 1999). Landscapes have natural patterns that maximize the value and function of individual habitats. For example, isolated wetlands function in ways that are quite different from wetlands adjacent to rivers. A forested wetland island, created in an otherwise grassy or agricultural landscape, will support species that are different from those in a forested wetland in a large forest tract. For wildlife and fisheries enhancement, determine if the wetland site is along ecological corridors such as migratory flyways or spawning runs. Constraints also include landscape factors. Shoreline and coastal wetlands adjacent to heavy wave action have historically high erosion rates or highly erodible soils, and often heavy boat wakes. Placement of wetlands in these locations may require shoreline armoring and other protective engineered structures that are contrary to the mitigation goals and at cross-purposes to the desired functions

Even though catastrophic events cannot be prevented, a fundamental factor in mitigation plan design should be how well the site will respond to natural disturbances that are likely to occur. Floods, droughts, muskrats, geese, and storms are expected natural disturbances and should be accommodated in mitigation designs rather than feared. Natural ecosystems generally recover rapidly from natural disturbances to which they are adapted. The design should aim to restore a series of natural processes at the mitigation sites to ensure that resilience will have been achieved.

2. Adopt a dynamic landscape perspective. Consider both current and future watershed hydrology and wetland location. Take into account surrounding land use and future plans for the land. Select sites that are, and will continue to be, resistant to disturbance from the surrounding landscape, such as preserving large buffers and connectivity to other wetlands. Build on existing wetland and upland systems. If possible, locate the mitigation site to take advantage of refuges, buffers, green spaces, and other preserved elements of the landscape. Design a system that utilizes natural processes and energies, such as the potential energy of streams as natural subsidies to the system. Flooding rivers and tides transport great quantities of water, nutrients, and organic matter in relatively short time periods, subsidizing the wetlands open to these flows as well as the adjacent rivers, lakes, and estuaries.

3. *Restore or develop naturally variable hydrological conditions.* Promote naturally variable hydrology, with emphasis on enabling fluctuations in water flow and level, and duration and frequency of change, representative of other comparable wetlands in the same landscape setting. Preferably, natural hydrology should be allowed to become reestablished rather than finessed through active engineering devices to mimic a natural hydroperiod. When restoration is not an option, favor the use of passive devices that have a higher likelihood to sustain the desired hydroperiod over long term. Try to avoid designing a system dependent on water-control structures or other artificial infrastructure that must be maintained in perpetuity in order for wetland hydrology to meet the specified design. In situations where direct (in-kind) replacement is desired, candidate mitigation sites should have the same basic hydrological attributes as the impacted site.

Hydrology should be inspected during flood seasons and heavy rains, and the annual and extreme-event flooding histories of the site should be reviewed as closely as possible. A detailed hydrological study of the site should be undertaken, including a determination of the potential interaction of groundwater with the proposed wetland. Without flooding or saturated soils, for at least part of the growing season, a wetland will not develop. Similarly, a site that is too wet will not support the desired biodiversity. The tidal cycle and stages are important to the hydrology of coastal wetlands.

4. *Whenever possible, choose wetland restoration over creation.* Select sites where wetlands previously existed or where nearby wetlands still exist. Restoration of wetlands has been observed to be more feasible and sustainable than creation of wetlands. In restored sites the proper substrate may be present, seed sources may be on-site or nearby, and the appropriate hydrological conditions may exist or may be more easily restored.

The U.S. Army Corps of Engineers (Corps) and Environmental Protection Agency (EPA) Mitigation Memorandum of Agreement states that, "because the likelihood of success is greater and the impacts to potentially valuable uplands are reduced, restoration should be the first option considered" (Fed. Regist. 60(Nov. 28):58605). The Florida Department of Environmental Regulation (FDER 1991a) recommends an emphasis on restoration first, then enhancement, and, finally, creation as a last resort. Morgan and Roberts (1999) recommend encouraging the use of more restoration and less creation.

5. *Avoid over-engineered structures in the wetland's design.* Design the system for minimal maintenance. Set initial conditions and let the system develop. Natural systems should be planned to accommodate biological systems. The system of plants, animals, microbes, substrate, and water flows should be developed for self-maintenance and self-design. Whenever possible, avoid manipulating wetland processes using approaches that require continual maintenance. Avoid hydraulic control structures and other engineered structures that are vulnerable to chronic failure and require maintenance and replacement. If necessary to design in structures, such as to prevent erosion until the wetland has developed soil stability, do so using natural features, such as large woody debris. Be aware that more specific habitat designs and planting will be required where rare and endangered species are among the specific restoration targets.

Whenever feasible, use natural recruitment sources for more resilient vegetation establishment. Some systems, especially estuarine wetlands, are rapidly colonized, and natural recruitment is often equivalent or superior to plantings (Dawe et al. 2000). Try to take advantage of native seed banks, and use soil and plant material salvage whenever possible. Consider planting mature plants as supplemental rather than required, with the decision depending on early results from natural recruitment and invasive species occurrence. Evaluate on-site and nearby seed banks to ascertain their viability and response to hydrological conditions. When plant introduction is necessary to promote soil stability and prevent invasive species, the vegetation selected must be appropriate to the site rather than forced to fit external pressures for an ancillary purpose (e.g., preferred wildlife food source or habitat).

6. *Pay particular attention to appropriate planting elevation, depth, soil type, and seasonal timing.* When the introduction of species is necessary, select appropriate genotypes. Genetic differences within species can affect wetland restoration outcomes, as found by Seliskar (1995), who planted cordgrass (*Spartina alterniflora*) from Georgia, Delaware, and Massachusetts into a tidal wetland restoration site in Delaware. Different genotypes displayed differences in stem density, stem height, below-ground biomass, rooting depth, decomposition rate, and carbohydrate allocation. Beneath the plantings, there were differences in edaphic chlorophyll and invertebrates.

Many sites are deemed compliant once the vegetation community becomes established. If a site is still being irrigated or recently stopped being irrigated, the vegetation might not survive. In other cases, plants that are dependent on surface-water input might not have developed deep root systems. When the surface-water input is stopped, the plants decline and eventually die, leaving the mitigation site in poor condition after the Corps has certified the project as compliant.

7. *Provide appropriately heterogeneous topography.* The need to promote specific hydroperiods to support specific wetland plants and animals means that appropriate elevations and topographic variations must be present in restoration and creation sites. Slight differences in topography (e.g., micro- and meso-scale variations and presence and absence of drainage connections) can alter the timing, frequency, amplitude, and duration of inundation. In the case of some less-studied, restored wetland types, there is little scientific or technical information on natural microtopography (e.g., what causes strings and flarks in patterned fens or how hummocks in fens control local nutrient dynamics and species assemblages and subsurface hydrology are poorly known). In all cases, but especially those with minimal scientific and technical background, the proposed development wetland or appropriate example(s) of the target wetland type should provide a model template for incorporating microtopography.

Plan for elevations that are appropriate to plant and animal communities that are reflected in adjacent or close-by natural systems. In tidal systems, be aware of local variations in tidal flooding regime (e.g., due to freshwater flow and local controls on circulation) that might affect flooding duration and frequency.

8. *Pay attention to subsurface conditions, including soil and sediment geochemistry and physics, groundwater quantity and quality, and infaunal communities.* Inspect and characterize the

soils in some detail to determine their permeability, texture, and stratigraphy. Highly permeable soils are not likely to support a wetland unless water inflow rates or water tables are high. Characterize the general chemical structure and variability of soils, surface water, groundwater, and tides. Even if the wetland is being created or restored primarily for wildlife enhancement, chemicals in the soil and water may be significant, either for wetland productivity or bioaccumulation of toxic materials. At a minimum, these should included chemical attributes that control critical geochemical or biological processes, such as pH, redox, nutrients (nitrogen and phosphorus species), organic content and suspended matter.

9. Consider complications associated with creation or restoration in seriously degraded or disturbed sites. A seriously degraded wetland, surrounded by an extensively developed landscape, may achieve its maximal function only as an impaired system that requires active management to support natural processes and native species (NRC 1992). It should be recognized, however, that the functional performance of some degraded sites may be optimized by mitigation, and these considerations should be included if the goal of the mitigation is water- or sediment-quality improvement, promotion of rare or endangered species, or other objectives best served by locating a wetland in a disturbed landscape position. Disturbance that is intense, unnatural, or rare can promote extensive invasion by exotic species or at least delay the natural rates of redevelopment. Reintroducing natural hydrology with minimal excavation of soils often promotes alternative pathways of wetland development. It is often advantageous to preserve the integrity of native soils and to avoid deep grading of substrates that may destroy natural below-ground processes and facilitate exotic species colonization (Zedler 1996).

10. Conduct early monitoring as part of adaptive management. Develop a thorough monitoring plan as part of an adaptive management program that provides early indication of potential problems and direction for correction actions. The monitoring of wetland structure, processes, and function from the onset of wetland restoration or creation can indicate potential problems. Process monitoring (e.g., water-level fluctuations, sediment accretion and erosion, plant flowering, and bird nesting) is particularly important because it will likely identify the source of a problem and how it can be remedied. Monitoring and control of nonindigenous species should be a part of any effective adaptive management program. Assessment of wetland performance must be integrated with adaptive management. Both require understanding the processes that drive the structure and characteristics of a developing wetland. Simply documenting the structure (vegetation, sediments, fauna, and nutrients) will not provide the knowledge and guidance required to make adaptive "corrections" when adverse conditions are discovered. Although wetland development may take years to decades, process-based monitoring might provide more sensitive early indicators of whether a mitigation site is proceeding along an appropriate trajectory.