Public Notice

U.S. Army Corps of Engineers

Baltimore District

In Reply Refer To CENAB-OP-R **Date** December 29, 2003

Proposed Baltimore District Mitigation and Monitoring Guidelines

Special Public Notice # 03-21R

Please note that this is a revision to Special Public Notice #03-21 that was issued on December 19, 2003.

The Baltimore District has developed new draft Mitigation and Monitoring Guidelines ("Guidelines") as a result of the recommendations of the National Academy of Science (NAS), "Compensating For Wetland Losses Under the Clean Water Act, " report on wetland mitigation and the consequential National Mitigation Action Plan. These Guidelines are intended to facilitate the understanding of policies and requirements associated with compensatory mitigation for aquatic resource impacts authorized by the Baltimore District's Regulatory Branch; to ensure predictability and consistency for the development, review, and approval of compensatory mitigation plans and; to improve the overall success of compensatory mitigation proposals. These Guidelines also are intended to improve upon and supplement existing interagency mitigation guidance papers, such as the "Maryland Compensatory Mitigation Guidance" dated August 1994, for consistency with the mitigation implementation clarification provided in Regulatory Guidance Letter #02-2 and the National Academy of Science Recommendations.

These Mitigation and Monitoring Guidelines will be periodically reviewed and modified as the National Mitigation Action Plan is implemented over the next 3-5 years and our knowledge base on mitigation increases. In addition to the requirements set forth herein, there may be other individual guidance provided by Federal or State agencies. These Guidelines do not supercede existing Federal or State laws or regulations.

The purpose of this 30 day Public Notice is to request comments on these draft proposed Mitigation and Monitoring Guidelines. Comments are requested by close of business on January 30, 2003. A copy of the Mitigation and Monitoring Guidelines can be reviewed on the Baltimore District's web site: http://www.nab.usace.army.mil/Regulatory/PublicNotice/spnotices.htm. Interested persons who do not have access to the Internet, but who would like to review the Mitigation and Monitoring Guidelines, may request a copy of this document by calling Ms. Beth Bachur at (410) 962-4336.

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Acting Chief, Regulatory Branch

DRAFT
PROPOSED MITIGATION AND MONITORING GUIDELINES
BALTIMORE DISTRICT
REGULATORY PROGRAM
U.S. ARMY CORPS OF ENGINEERS
December 2003

1. Applicability: These Mitigation and Monitoring Guidelines ("Guidelines") apply to all permit actions requiring compensatory mitigation for aquatic resource impacts under the Baltimore District Regulatory Program pursuant to Section 404 of the Clean Water Act (CWA) and Section 10 of the Rivers and Harbors Act of 1899. These Guidelines do not address mitigation for categories of effects other than ecological (e.g., historic, cultural, aesthetic).

Please note that this document is subject to periodic review and modification, and consultation with the local U.S. Army Corps of Engineers Regulatory office is necessary during permit application processing to ensure compliance with the latest operating procedures.

2. Purpose: These Guidelines are intended to facilitate understanding of the policies and requirements associated with compensatory mitigation for aquatic resource impacts authorized by the Baltimore District's Regulatory Branch, to ensure predictability and consistency for the development, review, and approval of compensatory mitigation plans, and to improve the overall success of compensatory mitigation proposals. Furthermore, these Guidelines are intended to improve upon and supplement existing interagency mitigation guidance papers, such as the "Maryland Compensatory Mitigation Guidance" dated August 1994, for consistency with the mitigation implementation clarification provided in Regulatory Guidance Letter (RGL) 02-2 and the National Academy of Science (NAS) Recommendations.

Mitigation proposals are evaluated on a case-by-case basis during review of permit applications in accordance with relevant laws, regulations, and guidance. In addition to the requirements set forth herein, there may be other individual guidance provided by Federal or State agencies. These Guidelines do not supercede existing Federal or State laws or regulations.

3. Mitigation Policy and Guidance:

a) Department of the Army, Section 404 Permit Regulations, Corps 1986 Consolidated Rule (33 CFR 320.4(r)).
b) Council on Environmental Quality (CEQ) Mitigation Policy (40 CFR 1508.20 of CEQ's Implementing Regulations for National Environmental Policy Act (NEPA) and 40 Questions.
c) 1990 Memorandum of Agreement (MOA) between the Environmental Protection Agency (EPA) and the Department of the Army (DA) concerning the Determination of Mitigation under the Clean Water Act Section 404(b)(1) Guidelines.
d) Federal Guidance on the Appropriate Level of Analysis for Compliance with the Section 404(b)(1) Guidelines (RGL 93-2, dated August 23, 1993).
e) 1995 Federal Guidance on Establishment, Use, and Operation of Mitigation Banks (Banking Guidance, published in the Federal Register on November 28, 1995).

f) 2000 Federal Guidance on the Use of In-Lieu Fee Arrangements for Compensatory Mitigation under Section 404 of the CWA and Section 10 of the Rivers and Harbors Act (In-Lieu Fee Guidance).
g) Nationwide Permit Regulation (Issuance of Nationwide Permits Notice, published in Federal Register on January 15, 2002).
h) Guidance on Compensatory Mitigation Projects for Aquatic Resource Impacts Under the Corps Regulatory Program Pursuant to Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899 (RGL 02-2, dated December 24, 2002).
i) Federal Guidance on the Use of the TEA-21 Preference for Mitigation Banking to fulfill Mitigation Requirements Under Section 404 of the Clean Water Act (July 11, 2003): This document identifies the preference for wetland mitigation banking mandated in the Transportation Equity Act for the 21st Century to compensatory mitigation requirements under Section 404 of the Clean Water Act.
j) Maryland State Programmatic General Permit (MDSPGP-2).
k) Pennsylvania State Programmatic General Permit (PASPGP-2).

4. Processing Procedures:

a) **Pre-application meetings:** The permit applicant should contact the Corps as early in the project development process as possible to schedule a pre-application meeting. Pre-application meetings are encouraged to facilitate the evaluation of potentially complex or controversial projects and to discuss mitigation requirements and opportunities. Pre-application meetings are not recommended for projects resulting in only minor adverse impacts to the aquatic environment. The Corps is responsible for determining if a pre-application meeting is necessary and who will facilitate the meeting. The applicant shall request a pre-application meeting through the appropriate permit section chief/evaluator. Prior to the meeting date, the applicant shall provide to this office additional information such as project location, a conceptual project plan showing proposed activities and preliminary delineation of waters of the U.S., and any compensatory mitigation proposals. This information will help to ensure a successful pre-application meeting in which the Corps can be prepared to discuss ways to avoid/minimize project impacts and possible time-consuming concerns like historic properties, endangered species, etc.

b) **Individual Permits:** Compensatory mitigation will generally be required for most unavoidable impacts to wetlands and streams requiring an Individual Permit (IP). Although, compensatory mitigation plans are not required by regulation before a Public Notice can be issued, we strongly encourage that a preliminary mitigation plan be submitted with the formal application materials to facilitate timely and effective review. A preliminary mitigation plan shall include a discussion of how on-site impacts to aquatic
resources were avoided and minimized and how the proposed compensatory mitigation will appropriately compensate for the remaining unavoidable impacts. When mitigation plans are available, the Public Notice will indicate the form of the proposed compensatory mitigation and include information on the compensatory mitigation plan components. Large-scale mitigation plans will be made available for inspection at the District offices. If mitigation plans are available and reproducible, copies will be forwarded to Federal, tribal, and state resource agencies.

c) **Nationwide Permits (NWP)**: Generally, compensatory mitigation at a minimum 1:1 replacement ratio will be required for most unavoidable permanent wetland and stream impacts requiring a preconstruction notification (PCN) under the NWP program, unless the Corps evaluator determines that some other form of mitigation would be more environmentally appropriate and provides a project-specific waiver of this requirement. A preliminary compensatory mitigation and monitoring plan should be submitted with the request for verification of a project's authorization under an existing Nationwide Permit.

d) **State Programmatic General Permits (MDSPGP-2/PASPGP-2):** Generally, compensatory mitigation will be required for most unavoidable permanent wetland and stream impacts either through the State's tidal or nontidal compensation/replacement fund or by the permittee as required by special condition of the General Permit or the State authorization, unless the Corps evaluator determines that some other form of mitigation would be more environmentally appropriate and provides a project-specific waiver of this requirement. A preliminary compensatory mitigation and monitoring plan should be submitted with the request for verification of a project's authorization under the appropriate State Programmatic General Permit to facilitate a timely and effective review.

e) **Special Conditions:** Special conditions will be included in individual permits and general permit verifications that contain a wetland compensatory mitigation requirement. These special conditions will identify: 1) the party(s) responsible for meeting any or all components of compensatory mitigation requirements; 2) performance standards for determining compliance; and, 3) other requirements such as financial assurances, real estate assurances, monitoring programs, and the provisions for the short- and long-term maintenance of the mitigation site. Furthermore, special conditions may reference the compensatory mitigation plan, monitoring requirements, and a contingency mitigation plan. In general, the special conditions will identify the who, what, where, when, and why behind the compensatory mitigation plan.

f) **Success Criteria/Performance Standards:** Performance standards shall refer to practicably measurable or observable attributes that reflect the compensatory mitigation objectives. Compensatory mitigation plans will contain written performance standards. In addition, the performance standards will become part of the special conditions of individual permits and general permit verifications and will be used for assessing whether mitigation is achieving the project goals. Performance standards will vary by geographic region and aquatic habitat type. For wetlands, the criteria in the 1987 Corps of Engineers Wetlands Delineation Manual, such as duration of soil saturation required to meet the wetland hydrology criterion; the variables and associated functional capacity indices in the hydrogeomorphic assessment method regional guidebooks; or the conditions based on nearby natural reference wetlands may be used to develop performance standards. The performance standards will be monitored for an adequate period of time, normally 5 or more years.

g) **Final Mitigation and Monitoring Plans:** A final mitigation and monitoring plan will not be prepared until the Corps has accepted a final jurisdictional map for the impact area and the mitigation site, and has agreed that the conceptual mitigation plan would likely compensate for the remaining unavoidable impacts. The final mitigation plan, as well as the management and monitoring plan, will be completed following the public review period and District review of the preliminary plan. If conceptual mitigation and monitoring plans are approved under the verification/authorization, then the verification/authorization will be conditioned to require the final mitigation and monitoring plan to be submitted and approved by the Baltimore District prior to construction of the authorized activity in waters of the U.S. Final mitigation and monitoring plans will be submitted in a single document. It should contain up-to-date versions of all materials even if other version were submitted earlier in the application process. The plans will include the date of the final submittal. Corps approval of a mitigation plan means that the proposed mitigation is found to adequately offset the authorized impact. The Corps does not bear any responsibility for failure to achieve the desired mitigation objectives. If the mitigation is not successful, the permittee will be required to provide other agreed-upon mitigation.

h) **Timing of Mitigation Construction:** Construction of the compensatory mitigation project shall be concurrent with the authorized impacts to the extent practicable. When compensation will occur after project construction, additional compensation will generally be required to reduce temporal losses of aquatic functions. Consideration to allow impacts to aquatic resources to occur before accomplishing compensatory mitigation may be given to cases where construction of the authorized activity would disturb or harm on-site mitigation work or when simple restoration is required. In addition, some Federal-aid highway projects have legal and contractual requirements regarding the timing of mitigation that may conflict with the policy for advance or concurrent mitigation. In-lieu fee arrangements and mitigation banks will follow the guidance consistent with the Banking and In-Lieu-Fee provisions with regard to timing of mitigation construction.

i) **Compensatory Mitigation Accomplished After the Overall Project Construction:** When authorization of aquatic resource impacts occurs prior to the initiation of mitigation, we will require: 1) a Corps-approved mitigation plan; 2) a secured mitigation project site; 3) appropriate financial assurances in place; and, 4) legally protected, adequate water rights, where necessary. All initial physical and biological improvements at the mitigation site will be completed no later than the first full growing season following the impacts from authorized activities. If beginning these initial improvements is not practicable within this time frame, then other measures to mitigate for these temporal losses need to be included in the mitigation plan.

j) **As-Built Plans:** As-built plans will be certified by a professional engineer and submitted within 60 days of implementing the compensatory mitigation plan. Benchmarks depicting elevations in mitigation areas, water level elevations, and acreage of open water will be specified. An explanation for any deviations from the approved mitigation plan,

including indications of any changes in red ink on legible copies of the plans, shall be provided. In addition, the as-built plan shall indicate the actual plantings (i.e., list of actual species planted by community zone, densities, sizes, the source of stock, the planting method, and time of planting).

k) **Mitigation Banks and In-Lieu Fee Arrangements:** Consolidated compensatory mitigation projects such as mitigation banks and in-lieu-fee programs should be considered when available to facilitate a watershed approach to mitigating impacts to waters of the U.S. Public review and comment will be provided for proposed mitigation banks and in-lieu-fee arrangements consistent with the Banking Guidance and In-lieu-fee Guidance provisions.

l) **Special Area Management Plans (SAMP) and Other Watershed Plans:** Mitigation shall be proposed consistent with the recommendations of the specific SAMP or other watershed plan.

m) **Enforcement and Non-Compliance Actions:** Mitigation for enforcement and non-compliance cases may not follow these procedures. Mitigation in these cases should be discussed with the enforcement project manager.

5. <u>General Mitigation Considerations:</u>

a) **Avoidance and Minimization:** The project must be designed and constructed to avoid and minimize adverse impacts to waters of the U.S. to the maximum extent practicable (an offsite alternatives analysis does not apply to any NWP/MDSPGP-2/PASPGP-2). Compensation is the last step in the sequencing requirements of the Section 404(b)(1) Guidelines.

b) **Watershed Approach:** In the past, the Corps has traditionally recommended the preferred sequence of on-site, in-kind compensation rather than off-site, out-of-kind approaches. However, on-site and in-kind compensatory mitigation is not always practicable or beneficial for the watershed's ecological needs. Off-site and/or out-of-kind mitigation may be acceptable when on-site is not practicable or would provide more environmental benefits to the watershed than on-site and/or in-kind compensation. Compensatory mitigation plans will describe how the mitigation proposal will contribute to the specific aquatic resource needs of the impacted watershed. Consideration will be given to the likelihood for success, ecological sustainability, practicability for long-term monitoring and maintenance, and mitigation costs when choosing between on-site or off-site mitigation. To the extent practicable, a compensatory mitigation project will be in the same watershed as the impact site. Watersheds will be identified using the U.S. Geological Survey Hydrologic Unit Codes.

c) **Consistency and Compatibility:** Compensatory mitigation proposals submitted to the District will be coordinated with tribes, local governments, and other Federal agencies consistent with existing laws, regulation, and policy guidance to ensure that applicants'

mitigation plans are consistent with watershed needs and compatible with adjacent land uses. Full consideration shall be given to comments and recommendations from tribes, states, local governments, and other Federal agencies. Coordination may occur on a case-by-case basis during the application evaluation process, or on a programmatic basis to promote consistent and timely decision making. The Baltimore District will work closely with their Maryland and Pennsylvania State counterpart agencies to fully consider State
requirements in the District's determination of compensatory mitigation requirements.

d) **Impacts and Compensation:** These guidelines do not supercede existing Federal or State laws or regulations. In coordination with Maryland and Pennsylvania, the Baltimore District generally requires compensatory mitigation at a minimum of 1:1 replacement ratio (i.e., establishment/creation or restoration). This replacement ratio is often increased to compensate for the scarcity and quality of the habitat to be impacted in consideration of the region or watershed, any temporal loss of aquatic habitat functions and values caused by delay in the construction of the compensatory mitigation site, the cumulative effects of that portion of the project in the Corps' scope of analysis in the context of past and reasonably foreseeable projects in the region or watershed, and the inclusion of an adequate margin of safety to reflect the expected degree of success associated with the compensatory mitigation plan. For example, the Baltimore District commonly applies a 2:1 replacement ratio for impacts to Palustrine Forested and Scrub/Shrub wetlands. For more specific established acreage replacement ratios in Maryland, see the "Maryland Compensatory Mitigation Guidance" dated August 1994.

At this time, the Baltimore District will determine, on a case-by-case basis, whether to use a functional assessment or acreage surrogates for determining mitigation and for describing authorized impacts. When using a functional assessment technique, the goal is
to provide a minimum of 1:1 functional replacement (i.e. no net loss of functions), with an adequate margin of safety to reflect anticipated success. The same functional assessment method will be used to determine losses and gains in terms of amounts, types, and locations for describing both impacts and compensatory mitigation. The functional assessment technique (e.g., a Hydrogeomorphic Assessment or Wetland Rapid Assessment Procedure) used should generally be accepted by experts in the field or the best professional judgement of Federal, tribal, and state agency representatives.

e) **Streams:** At this time, we generally are applying a minimum 1:1 linear foot replacement ratio surrogate, but for many intermittent and perennial stream systems, this ratio will often be higher (e.g., 2:1 up to 4:1). The District will determine, on a case-by-case basis, the exact replacement ratio to apply for impacts to intermittent and perennial streams. A few examples of potential stream compensatory mitigation projects may include restoration of a degraded stream system, establishment of vegetated buffers, and removal/retrofit of fish passage barriers. The Baltimore District Regulatory Stream Team is currently working on developing a stream mitigation assessment technique that will provide a predictable and fair approach to determining compensatory stream mitigation requirements.

f) Mitigation Options:

1. **Establishment (Creation):** Establishment is the manipulation of the physical, chemical, or biological characteristics of a site to convert a persistent non-wetland habitat into a wetland (or other aquatic) habitat resulting in a gain in wetland acres.

2. **Restoration:** Restoration is the manipulation of the physical, chemical, or biological characteristics of a site to re-establish natural or historic functions to a former wetland
site. Restoration projects generally have the greatest potential for success in terms of functional compensation. Restoration may or may not result in a gain in wetland acres.

3. **Enhancement:** Enhancement is the manipulation of the physical, chemical, or biological characteristics of an existing wetland site to increase or improve one or more specific function(s). Enhancement results in a change in wetland function(s) and may cause a decline in other wetland functions. Enhancement does not result in a gain in wetland acres.

4. **Preservation:** Preservation is the protection of lands for the purpose of increasing the functional value of nearby or adjacent wetlands. Some examples of preservation include the purchase of land, conservation easements, or other legal mechanism that provides for perpetual protection. Compensatory mitigation credit for preservation of existing wetlands or other aquatic resources will only be considered when preservation is a part of a mitigation project that achieves at least a 1:1 replacement ratio through establishment or restoration activities; when preservation is used to protect particularly rare, valuable, or difficult to replicate wetland types; or preservation that would augment the functions of other mitigation measures. Generally, preservation does not result in a gain in wetland acres and will be used as the sole basis for mitigation only in exceptional circumstances.

5. **On-Site and Off-Site Mitigation:** Generally, mitigation will be performed, when practicable, in areas adjacent or contiguous to the discharge site (on-site compensatory mitigation). However, off-site mitigation will be considered when on-site compensation is not practicable or when off-site mitigation would provide more environmental benefits to the watershed. Off-site mitigation will be in close proximity to the authorized impacts and generally in the same watershed. When deciding between on-site or off-site mitigation, consideration will be given to the likelihood for success, ecological sustainability, practicability of long-term monitoring and maintenance, and relative costs of mitigation alternatives. In most cases, distant or out-of-watershed compensatory mitigation will result in a lower credit calculation.

6. **In-Kind and Out-of-Kind Mitigation:** In-kind mitigation involves the replacement of the impacted aquatic site with the same physical and functional aquatic resource type. Out-of-kind mitigation means the replacement of an impacted aquatic site with

one of a different physical and functional aquatic resource type. In-kind mitigation is generally preferred when the impacted resource is locally important. However, out-of-kind may be considered when in-kind is not practicable or out-of-kind would provide more environmental benefits to the watershed than in-kind compensation.

7. **Upland Buffers:** Generally, buffers will be used as part of the overall mitigation strategy. The compensatory mitigation plan will incorporate upland and/or riparian buffers that are protected by a conservation easement or a restrictive covenant and that separate wetlands or other aquatic resources from development and agricultural areas. Buffers generally are vegetated by native plant communities. Wetlands and other aquatic areas cannot be used as buffers. To be credited for mitigation, buffers must have a minimum width of 25 feet for single family residential land uses, increasing to 40-50 feet for multi-family and commercial land uses, and up to 75-100 feet for industrial and landfill land uses. Other categories will be determined on a case-by-case basis. Credit will be given for inclusion of buffers within a compensatory mitigation project only when the District determines that these buffers enhance the overall aquatic functions of the adjacent aquatic resources and that this is best for the aquatic environment on a watershed basis. In limited circumstances, buffers may be used as sole basis for mitigation.

8. **Other:** Mitigation banking and in-lieu-fee arrangements are also options. Project managers will work with applicants to determine suitable options.

g) **Pre-Construction Meetings:** Pre-construction meetings between contractors, environmental consultants, and the project manager are encouraged for larger, more complex, and/or higher risk mitigation projects to prevent permit compliance violations. At the pre-construction meeting, the project manager can review the mitigation plans with the environmental consultant and, most importantly, with the contractor.

h) **Stormwater Management Facilities:** The use of stormwater management facilities for compensatory mitigation is generally not acceptable because these wetlands may not replace functions of any wetland other than a severely degraded one. Stormwater runoff contains sediment, petroleum products, salt, pesticides, etc., all of which degrade water quality. In addition, invasive weedy species gain a competitive edge in such situations.

i) **Double-dipping:** Wetlands or other aquatic areas used to generate wetland mitigation credit cannot be used to generate riparian buffer credits (i.e., multiple mitigation cannot be generated from one area).

6. <u>Compensatory Mitigation Plan Checklist and Supplement (see Enclosure A):</u> The enclosed compensatory mitigation plan checklist with the supporting supplement will be used by permit applicants when preparing and submitting compensatory mitigation plans. Mitigation proposals will be reviewed against this checklist to determine completeness of the submittal.

7. **Compensatory Mitigation Site Design Considerations – NAS Recommendations (see Enclosure B):** The NAS recommendations should be viewed as general suggestions to guide the planning and implementing of compensatory mitigation projects so as to increase the likelihood of mitigation success. Mitigation proposals submitted to the District will include a discussion on how each of these ten guidelines has been considered and incorporated into the development of the compensatory mitigation project.

(ENCLOSURE A)

MULTI-AGENCY COMPENSATORY MITIGATION PLAN CHECKLIST[1]

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

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

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

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

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

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

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

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

[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.

3. Aerial/Satellite photos.

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

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

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

Mitigation 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. Plant spatial structure – quantities/densities, % cover, community structure (e.g.,

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

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.

ATTACHMENT A
NATURAL RESOURCES CONSERVATION SERVICE (NRCS) PROGRAM REQUIREMENTS[5]

- ☐ NRCS conservation practice standards and specifications
- ☐ NRCS Environmental Evaluation
- ☐ Mitigation agreement
- ☐ Federal/State/Local required permits
- ☐ Compatible use statement:
  - Allowable uses (e.g. hunting, fishing)
  - Prohibited uses (e.g. grazing, silviculture)
  - Uses approved by compatible use permit
- ☐ Copy of recorded easement
- ☐ Subordination waiver on any existing liens on mitigation site
- ☐ Statement of landowner's tax liability
- ☐ Copy of Warrantee Deed from landowner's attorney (no encumbrances, if so list)
- ☐ Copy of certified wetland determination:
  - NRCS-CPA-026 Highly Erodible Land and Wetland Conservation Certification
  - Wetland label map
- ☐ Copy of FSA Good Faith Waiver
- ☐ Copy of easement(s) ingress/egress granted to USDA employees for gaining legal access to mitigation site
- ☐ Copy of NRCS-CPA-38 Request for Certified Wetland Determination/Delineation

ENCLOSURE B

[5] For a complete list of the program requirements needed by NRCS to satisfy the Swampbuster provisions of the Food Security Act see the National Food Security Act Manual.

Incorporating the National Research Council's Mitigation Guidelines
Into the Clean Water Act Section 404 Program

BACKGROUND

In its comprehensive report entitled *"Compensating for Wetland Losses Under the Clean Water Act,"* the National Research Council (NRC) provided ten guidelines to aid in planning and implementing successful mitigation projects ("Operational Guidelines for Creating or Restoring Wetlands that are Ecologically Self-Sustaining"; NRC, 2001). Please note that these guidelines also pertain to restoration and enhancement of other aquatic resource systems, such as streams. Each of the ten guidelines can generally be described as A) basic requirement for mitigation success, or B) guide for mitigation site selection. The following sections include both the original text of the NRC guidelines, in italics, as well as a discussion of how applicants and field staff can incorporate these guidelines into the development and review of mitigation projects.

A. **Basic Requirements for Success**

When considering mitigation sites it is important to note that wetland mitigation is not a precise, exact science and predictable results are not always obtainable. Having an adaptive management attitude is a necessity. One should incorporate experimentation into the mitigation plan when possible. This may mean using experimental plots within a mitigation site with different controls, replication, different treatments, inputs, etc., to determine if specific mitigation efforts are effectively meeting the desired goals. This requires detailed planning, effective implementation of the mitigation project, close monitoring (both short and long term) of the implemented plans and finally adjusting to intermediate results with an adaptive attitude and additional modifications to obtain long range wetland and watershed goals. In addition, researchers have found that restoration is the most likely type of mitigation to result in successful and sustainable aquatic resource replacement. Moreover, numerous studies in a variety of landscapes and watershed types have shown that of all factors contributing to mitigation success, attaining and maintaining appropriate hydrological conditions is the most important. The following NRC guidelines should be considered basic requirements for mitigation success.

A.1. **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.

The applicant proposes the type of mitigation. However, the Corps and other agencies will evaluate proposals based on the ease of completion and the likelihood of success. Therefore, pure wetland creation will be evaluated using very stringent criteria before being approved for use as compensatory mitigation for project impacts. Some projects may include creation as part of an overall mitigation effort that involves restoration, enhancement, and/or preservation (e.g., as in a proposed mitigation bank). In these cases, evaluation will be based on the entire proposal and its location in the watershed.

A.2. **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).

The use of over-engineered structures and maintenance intensive plans for mitigation is not recommended and will be evaluated using very stringent criteria. If these types of plans are ultimately approved, they must include a comprehensive remedial plan and financial assurances [note that all mitigation projects should have remedial plans and financial assurances], along with a non-wasting endowment to insure that proper maintenance occurs.

It should also be noted that aggressive soil and planting plans using introduced plants and soil from outside sources must be closely monitored to prevent invasive plant takeovers and monotypic plant communities. Such failures can be minimized by undertaking both short-term and long-term monitoring, and having contingency plans in place.

A. 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. For larger mitigation projects, 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.

Natural hydrology is the most important factor in the development of successful mitigation. Wetlands and other waters are very dynamic, and dependent on natural seasonal and yearly variations that are unlikely to be sustainable in a controlled hydrologic environment. Artificial structures and mechanisms should be used only temporarily. Complex engineering and solely artificial mechanisms to maintain water flow normally will not be acceptable in a mitigation proposal. In those sites where an artificial water source (irrigation) has been used to attempt to simulate natural hydrology there are several problems that lead to reduced likelihood of success. First, artificial irrigation does not provide the dynamic and variable nature of water flow normally found in wetlands or riparian systems. Second, the lack of seasonal flows limits the transport of organic matter into and out of the wetland or riparian system. Without any inflow, the net result of artificial irrigation is transport of organic material out of the system. Third, depending on the timing, the use of flood or sprinkler systems on newly created or restoration sites often promotes the germination and growth of exotic plant species.

Note that this changes the Corps' past policy of accepting artificial irrigation as the sole source of hydrology for mitigation projects. If permitted at all, these projects will require substantial financial assurances and a higher mitigation ratio to offset their risk of failure. Applicants must weigh the potential investment costs of acquiring land suitable for restoration versus creation projects in upland environments that will likely involve higher long-term costs and greater risks of mitigation site failure.

The Corps may approve exceptions dealing with hydrologic manipulations, on a case-by-case basis in highly unusual circumstances. It should be noted, however, that even minor engineering or hydraulic manipulation requiring long-term maintenance will only be approved after the applicant posts a non-wasting endowment, performance bond, or other financial assurance.

A.4. **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 belowground processes and facilitate exotic species colonization (Zedler 1996).*

When considering restoration options it is necessary to determine the spatial and temporal scale of the damage: is the damage limited to the water body itself, or is it a predominant characteristic of the watershed or the surrounding landscape? On-site damage may be restorable, whereas regional-scale damage may be more difficult, or impossible, to reverse or obtain historic conditions. Alternate goals may be necessary in order to determine specific goals of the restoration project. Those desired wetland mitigation goals will depend on the resources needed, the level of degradation and realistic mitigation targets as reflected by the watershed and surrounding landscape. This issue points to the importance of evaluating mitigation plans from a broader watershed perspective.

A.5. **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.*

There are many factors that may positively or negatively influence aquatic resources and the functions they provide, such as urbanization, farming or grazing. Wetlands and other aquatic resources are often subject to a wide range and frequency of events such as floods, fires and ice storms. As with all natural systems, some things are beyond control. Well-crafted mitigation plans,

however, recognize the likelihood of these events and attempt to plan for them, primarily through monitoring and adaptive management. In addition, it is important to realize the mobile nature of wetlands and streams. They change over time and over the landscape in response to internal and external forces.

Monitoring and adaptive management should be used to evaluate and adjust maintenance (e.g., predator control, irrigation), and design remedial actions. Adaptive management should consider changes in ecological patterns and processes, including biodiversity of the mitigation project as it evolves or goes through successional stages. Trends in the surrounding area must also be taken into account (i.e., landscape/watershed context). Being proactive helps ensure the ultimate success of the mitigation, and improvement of the greater landscape. One proactive methodology is incorporation of experimentation into the mitigation plan when possible, such as using experimental plots within a mitigation site with different controls, replication, different treatments, inputs, etc., to determine if specific mitigation efforts are meeting the desired goals.

B. **Mitigation Site Selection**

The selection of an appropriate site to construct a mitigation project is one of the most important, yet often under-evaluated, aspects of mitigation planning. In many instances, the choice of the mitigation site has been completed by the applicant based solely on economic considerations with minimal concern for the underlying physical and ecological characteristics of the site. While economic factors are important in determining the practicability of site selection, current technology and the following NRC guidelines should also factor into the selection of a mitigation site.

B.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.

Watershed management requires thinking in terms of multiple spatial scales: the specific wetland or stream itself, the watershed that influences the wetland/stream, and the greater landscape. The landscape in which a wetland or water exists, defines its hydrogeologic setting. The hydrogeologic setting in turn controls surface and sub-surface flows of water, while a variety of hydrogeologic settings results in biological and functional diversity of aquatic resources.

There are three aspects of watershed management that the applicant must address in a mitigation plan: hydrogeomorphic considerations, the ecological landscape, and climate. It should be noted that the overall goal of compensatory mitigation is to replace the functions being lost (functional equivalency) due to a permitted Section 404 activity. By evaluating the hydrogeomorphic setting, ecological landscape and climate, one can determine which attributes can be manipulated (i.e. hydrology, topography, soil, vegetation or fauna) to restore, create or enhance viable aquatic functions.

Hydrogeomorphic considerations refers to the source of water and the geomorphic setting of the area. For example, a riverine wetland receives water from upstream sources in a linear manner, whereas vernal pools exist as relatively closed depressions underlain by an impermeable layer that allows rainfall runoff from a small watershed to fill the pool during specific times of year. Applicants should strive to replicate the hydrogeomorphic regime of the impacted water to increase the potential that the mitigation site mimics the functions lost. Only as a last resort, should applicants prepare plans for constructing wetlands using artificial water sources or placing wetlands into non-appropriate areas of the landscape. In such cases, there should be a contingency plan to prepare for unanticipated events or failures.

Ecological landscape describes the location and setting of the wetland/water in the surrounding landscape. For example, attempting to place mitigation in a dissimilar ecological complex than that of the impacted water is expected to result in a wetland/water unlikely to replicate the functions of the wetland/water that was lost. In all cases, the applicant should evaluate the historical ecological landscape of the mitigation site; for example, if there had been large areas of forested wetland in an agricultural area, then replacement of a forested wetland may be appropriate given other factors that should be considered. In most cases, applicants should plan for a mitigation area that fits best within the ecological landscape of the watershed or region of the mitigation site. Applicants should also consider constructing mitigation sites with more than one type of wetland/water regime, if appropriate, to provide for landscape diversity.

Climate also affects mitigation and is clearly beyond the control of the applicant. Therefore, the mitigation site should be sited in an area supported by the normal rainfall, subsurface and/or groundwater in the region. Climate considerations also can impact other hydrologic issues, sediment transport factors and other factors affecting attainment of desired functions. While climate cannot be manipulated, applicants need to account for it in mitigation plans, including local and regional variability and extremes.

B. 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.

Applicants should consider both current and expected future hydrology (including effects of any proposed manipulations), sediment transport, locations of water resources, and overall watershed functional goals before choosing a mitigation site. This is extremely critical in watersheds that are rapidly urbanizing; changing infiltration rates can modify runoff profiles substantially, with associated changes in sediment transport, flooding frequency, and water quality. More importantly, this factor encourages applicants to plan for long-term survival by placing mitigation in areas that will remain as open space and not be severely impacted by clearly predictable development. Consideration of the landscape perspective requires evaluation of buffers and connectivity (both hydrologic- and habitat-related). Buffers are particularly important to insure that changing conditions are ameliorated, especially in watersheds that have been, or are in the process of being, heavily developed. In addition, because wetlands are so dynamic, adequate buffers and open space upland areas are vital to allowing for wetlands to "breath" (expand and/or decrease in size and function) and migrate within the landscape, particularly in watersheds under natural and/or man-made pressures.

B.3. **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 include chemical attributes that control critical geochemical or biological processes, such as pH, redox, nutrients (nitrogen and phosphorus species), organic content and suspended matter.

Knowledge of the physical and chemical properties of the soil and water at the mitigation site is also critical to choice of location. For example, to mitigate for a saline wetland, without knowing the properties of the soil and water sources at the mitigation site, it is unlikely that such a wetland is restorable or creatable. Certain plants are capable of tolerating some chemicals and actually thrive in those environments, while others plants have low tolerances and quickly diminish when subjected to water containing certain chemicals, promoting monotypic plant communities. Planning for outside influences that may negatively affect the mitigation project can make a big difference as to the success of the mitigation efforts and meeting watershed objectives.

B.4 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, belowground 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.*

A successful mitigation plan needs to consider soil type and source, base elevation and water depth, plant adaptability and tolerances, and the timing of water input. When possible: a) use local plant stock already genetically adapted to the local environment; b) use stock known to be generally free from invasive or non-native species; c) use soil banks predetermined to have desirable seed sources; d) choose soil with desirable characteristics (e.g., high clay composition and low silt and sand

composition for compaction purposes); e) determine \final bottom elevations to insure that targeted water regimes are met and the planned plant community can tolerate the water depth, frequency of inundation and quality of water sources.

It is particularly helpful to examine reference wetlands and/or waters near the mitigation area, in order to identify typical characteristics of sustainable waters in a particular watershed or region. This allows one to determine the likelihood of certain attributes developing in a proposed mitigation site. It should be emphasized that wetland restoration is much more likely to achieve desired results than wetland creation, as evidence of a previously existing wetland or other aquatic resource is a strong indicator of what will return, given the proper circumstances Historical data for a particular site, if available, can also help establish management goals and monitoring objectives. Creating wetlands from uplands has proven to be difficult and often requires extensive maintenance.

B.5. **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.

While manipulations of natural water supply may not be possible or desirable, changes in topography are possible and should be incorporated in the design of a restored or created wetland/water when needed. Varying the depths of the substrate of the mitigation area ensures a heterogeneous topography, decreasing the likelihood of homogenous plant communities. Rather than plan on one water level or one elevation of the substrate, in hopes of establishing a specific plant community, it is best to vary the depth of the bottom stratum. This will increase the likelihood of success for a more diverse targeted plant community and desired functions.