PUBLIC NOTICE

US Army Corps
of Engineers ®
New England District

Date: December 15, 2003
Comment Period Ends: January 15, 2004
File Number: 200302555
In Reply Refer To: Ruth Ladd
Or by e-mail: ruth.m.ladd@usace.army.mil

MITIGATION CHECKLIST AND GUIDANCE

The New England District (District), U.S. Army Corps of Engineers, Regulatory Division has developed a draft mitigation checklist with associated guidance for use in reviewing all mitigation for unavoidable impacts to wetlands and waters required by Corps permits issued under Section 404 of the Clean Water Act. Both documents are included below.

On December 24, 2002, a National Wetlands Mitigation Action Plan (MAP) was signed by the Department of the Army (Civil Works), Environmental Protection Agency, Department of Commerce, Department of the Interior, Department of Agriculture, and Department of Transportation. The MAP included a category of "Clarifying Performance Standards." Two items were required to be addressed in 2003:

1. Guidance adapting the guidelines recommended by the National Research Council of the National Academy of Sciences to the Section 404 program for creating or restoring self-sustaining wetlands, and
2. A sample mitigation plan checklist.

Both items have been incorporated into this Notice.

A series of mitigation checklists have been used informally in the District for many years. They have been for internal use by Corps staff evaluating permit applications and for the public to use as a reference in preparing mitigation plans for Corps review. The checklist and guidance currently in use can be found at http://www.nae.usace.army.mil under Regulatory/Permitting. This Notice includes two related documents: 1) an update to the District's checklist which has been shortened by moving explanatory text to the associated guidance document and 2) guidance which incorporates the national guidance described above. The national checklist and supplement include broad categories which are incorporated in more detail in the District's checklist and guidance.

Preliminary review of the proposed checklist and guidance indicates that: 1) no environmental impact statement will be required; 2) implementation will not affect any species listed as threatened or endangered under the Endangered Species Act of 1973 (PL 93-205); and 3) no cultural or historic resources considered eligible or potentially eligible for listing on the National Register of Historic Places will be affected.

We are seeking public comment on the District checklist and guidance. The comments will be addressed prior to final issuance. Anyone wishing to comment is encouraged to do so. Comments

should be submitted in writing by the above date. If you have any questions, please contact Ruth Ladd at ruth.m.ladd@usace.army.mil, (978) 318-8818, (800) 343-4789 or, if calling from within Massachusetts, (800) 362-4367.

FOR THE DISTRICT ENGINEER:

Christine Godfrey
Chief, Regulatory Division

NEW ENGLAND DISTRICT
MITIGATION PLAN CHECKLIST
(see New England District Mitigation Guidance document for information on these items)

Project: _____
File No: _____
Corps Project Manager: _____
City: _____
State: _____
Plan Title, Preparer, Date: _____

TABLE OF CONTENTS

A. General Information

1. [ ] Mitigation plan and documentation submitted as one complete package.
2. Site location:
   a. [ ] Locus map(s)
   b. [ ] Aerial photo(s)
   c. [ ] Latitude/Longitude of mitigation site(s) in decimal format.
   d. [ ] 8-digit Hydrologic Unit Code(s) for impact area(s) and mitigation area(s).

B. Impact area(s)

1. [ ] Wetland acreage at each impact site.
2. [ ] Wetland classes (e.g., Cowardin, et. al.[1] and hydrogeomorphic classification[2]) at each impact site.

[1] Cowardin, et. al. (1979) "Classification of wetlands and deepwater habitats of the United States," Office of Biological Services, FWS/OBS-79/31, December 1979.

3. [ ] Stream(s) at each impact site.
4. [ ] Describe both site specific and landscape level wetland and stream functions and values at each impact site.
5. [ ] Describe type and purpose of work at each impact site.
6. [ ] Watershed or regional plans for the area.

C. Mitigation area(s)

1. Background information
   a. [ ] Mitigation alternatives.
   b. [ ] Existing wildlife use.
   c. [ ] Existing soil.
   d. [ ] Existing vegetation.
   e. [ ] Surrounding land use.
   f. [ ] USFWS and/or NOAA Clearance Letter or Biological Opinion
   g. [ ] SHPO Cultural Resource Clearance Letter
2. Mitigation proposed
   a. [ ] Wetland acreage proposed at each site.
   b. [ ] Wetland classes (e.g., Cowardin, et. al. and hydrogeomorphic classification) proposed at each site.
   c. [ ] Site specific and landscape level functions and values proposed at each site.
   d. [ ] Describe nature of any stream mitigation.
   e. [ ] Reference site(s).
   f. [ ] Design Constraints
   g. [ ] Construction oversight.
   h. [ ] Project construction timing.
   i. [ ] Responsible parties.
   j. [ ] Appropriate financial assurances.
   k. [ ] Potential to attract waterfowl and other bird species that might pose a threat to aircraft?

D. Hydrology

1. [ ] Evidence of adequate hydrology to support the desired wetland or stream.
   a. [ ] "Typical" year water budget
   b. [ ] "Wet" year water budget
   c. [ ] "Dry" year water budget
2. [ ] Water source(s)
3. [ ] Vernal pool (if any) hydrology is appropriate.

E. Grading Plan

1. Plan View
   a. [ ] Existing and proposed grading plans.
   b. [ ] Microtopography

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[2] Brinson, M. M. (1993). "A hydrogeomorphic classification for wetlands," Technical Report WRP-DE-4 <http://www.wes.army.mil/el/wetlands/pdfs/wrpde4.pdf>, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS. NTIS No. AD A270 053.

c. [ ] The scale should be in the range of 1"=20' to 1"=100'.
d. [ ] All items on the plan must be legible on 8 ½ x 11" sheets.

2. [ ] Representative cross-sections
3. [ ] Other - Specific staff recommendations related to grading.

F. Topsoil

1. [ ] Proposed source of topsoil.
2. [ ] Twelve or more inches of natural or manmade topsoil in all wetland mitigation areas.
3. [ ] Appropriate organic content of topsoil.

G. Planting Plan

1. [ ] Plans use scientific names.
2. [ ] Plant materials are native and indigenous to the area of the site(s).
3. [ ] Vegetation community types or zones are classified in accordance with Cowardin, et al. (1979) or other similar classification system.
4. [ ] Plan view drawings show proposed locations of planted stock.
5. [ ] More than 50% of the plantings in each zone are structural determinants for the community type designated for that zone.
6. [ ] Woody stock density is appropriate.
7. [ ] Herbaceous stock density is appropriate.
8. [ ] Seed mix composition is provided.
9. [ ] Representative cross section plans showing vegetative community zones.
10. [ ] Invasive species not proposed for planting or seeding.
11. [ ] Relocation of plantings allowed when appropriate.
12. [ ] Other - Specific staff recommendations related to planting.

H. Coarse Woody Debris and Other Features

[ ] Appropriate amounts and range of decomposition of coarse woody debris are proposed.

I. Erosion Controls

[ ] Erosion control removal deadline is included.

J. Invasive and Noxious Species

1. [ ] Risk
2. [ ] Constraints
3. [ ] Control Plan

K. Off-Road Vehicle Use

1. [ ] No off-road vehicle use in immediate vicinity, or if so, control measures addressed.
2. [ ] Control plan, if appropriate.

L. Preservation

1. [ ] Adequate buffers
2. [ ] Wetlands within subdivisions are protected along with appropriate buffers.

3. [ ] Required preservation language is included.
4. [ ] Plans of preservation area(s).
5. [ ] Form of legal means of preservation

M. Monitoring Plan

[ ] Appropriate monitoring is proposed.

N. Assessment Plan

[ ] An appropriate assessment plan is included.

O. Contingency

[ ] Plan for dealing with unanticipated site conditions or changes.

P. Other Comments

DRAFT

NEW ENGLAND DISTRICT MITIGATION GUIDANCE

for NEW ENGLAND DISTRICT MITIGATION PLAN CHECKLIST

TABLE OF CONTENTS

INTRODUCTION

Applicants should contact the Corps prior to initiation of site selection and mitigation plan development because mitigation requirements are project-specific. This New England District document and the associated New England District Mitigation Plan Checklist ("Checklist") are for use when the Corps determines mitigation is appropriate for a particular project. They represent New England District policy and have already incorporated the requirements of the attached two documents:

1. Model Compensatory Mitigation Plan Checklist and supporting supplement (Attachment 1), and
2. Incorporating the National Research Council's Mitigation Guidelines into the Clean Water Act Section 404 Program. (Attachment 2)

The purpose of this document is twofold:

1. To provide guidance to the regulated community on the requirements for mitigation required by the Corps of Engineers, New England District, and
2. To provide a standardized format for the Corps to use in reviewing mitigation plans for their technical merit.

It is important to note that there is some flexibility in the document. For example, it is not designed to be specific to tidal wetland creations and would therefore need to be modified for such situations. When variances are necessary, the proposed mitigation plan should provide a simple explanation of the rationale. However, some items are required by law or policy and are indicated by use of the term "must." We acknowledge that absolutes are rare in mitigation design and that a successful site requires careful design, detailed review, and common sense oversight during construction by a person well versed in wetland science.

All checklist items should be included in the mitigation plan or there should be an explanation as to why it is not appropriate.

After Corps review, items <u>not</u> marked with OK, N/A (Not Applicable), or NONE should be addressed by the applicant. A sample table to cross-reference the checklist and a mitigation plan is included as Table 1.

Occasionally there are conflicts between requirements of the Corps and those of state and/or local agencies. Notify the Corps when this situation arises and the Corps will work with the applicant and state or local agencies to avoid duplication of effort and meet agency requirements. Normally, use of the most rigorous standard will be acceptable to all agencies. The Corps prefers to receive only one monitoring report per project per year.

The ➡ used throughout this document indicates text which should typically be included in the mitigation plan.

<u>Definitions</u>

These definitions are for use with this document. Somewhat different definitions may exist in other documents.

> <u>Mitigation in relation to S.404</u>: While mitigation includes sequencing from avoidance to minimization to, finally, compensation, it is frequently used instead of "compensation," including in this document.
>
> <u>Compensatory mitigation</u>: Action taken which provides some form of substitute aquatic resource for the impacted aquatic resource. It may include created, restored, enhanced wetlands, streams, mudflats, etc. and preserved wetlands, streams, and/or uplands.
>
> <u>Wetlands creation</u>: The transformation of upland or deepwater habitat to wetland at a site where the upland or deepwater habitat was not created by human activity. Wetlands creation results in a gain in wetland acreage.

Wetlands restoration: returning a former wetland area, which had been filled, drained, or excavated so that it no longer qualifies as a wetland, to wetland conditions. Wetlands restoration results in a gain in wetland acreage.

Wetlands enhancement: restoring degraded FUNCTIONS of an existing wetland. Degradation may result from infestation by invasive species, partial filling that does not create upland, deliberate removal of woody species (natural changes such as flooding and subsequent demise of trees as a result of beaver activity is not degradation), partial draining, etc. Wetlands enhancement does not result in a gain in wetland acreage.

Invasive species: native and non-native species which aggressively move into areas, especially those that are disturbed, and crowd out less aggressive native species.

Exotic species: Species not native to New England, and usually not native to North America.

Wetland scientist: The applicant should work with the Corps Project Manager to determine the appropriate expertise for the "wetland scientist" needed to oversee a particular project.

Data Presentation

The use of charts, tables, and plan overlays to present data for impact and mitigation areas is encouraged. They are often the most concise method of conveying information and make comparison easier. Tables 2 and 3 at the end of this Introduction are examples of useful presentations of data.

Temporal Losses

All projects which do not have advance mitigation will result in temporal losses which occur as a result of the passage of time between the time when wetland functions are lost to the project impact and when they exist to a similar degree in a compensatory wetland. Applicants should be aware that additional compensation may be required to offset temporal losses. Functions which *may* not lag behind mitigation construction are flood storage and groundwater discharge and/or recharge. While sediment trapping may develop relatively quickly, water quality functions can take many years to develop as they depend upon the chemical and biological characteristics of the wetland soils. The amount of additional compensation will depend upon the nature of the wetland proposed and the functions intended. Such compensation may be increased area for wetland creation, restoration, or enhancement or it may be solely additional preservation.

In addition, applicants may expect that more than 1:1 acreage replacement may be deemed appropriate BASED ON WETLAND FUNCTIONS and a "safety factor". The baseline addresses the expected reduction in function (wildlife habitat, water quality functions performed by soils, etc.) of created or restored wetlands in comparison with wetlands formed in place. It also includes a safety factor to allow for some degree of failure. It has been our experience that some portion of most mitigation sites fail to establish wetland conditions.

Wetland mitigation is not an exact science; an adaptive management attitude is a necessity. Consider incorporating experimentation such as including experimental plots with different controls and treatments. This approach requires detailed planning, effective implementation of the plan, close monitoring, adjusting to intermediate results, and making additional modifications when needed to reach the long-term goals.

A. GENERAL INFORMATION

1. To avoid confusion, all mitigation proposal materials should be submitted as a single package without extraneous information that is needed for the permit evaluation but is not pertinent to the mitigation itself.

2. Locus maps that show the location of the impact area and the location of mitigation sites – including preservation areas – are critical components of the plan. They should depict the geographic relationship between the impacted site(s) and the proposed mitigation site(s) and include a vicinity map of approximately 1 inch equals 2,000 feet. For sites where the relationship between the impacted site(s) and proposed mitigation site(s) is not clear at USGS quadrangle scale, an additional plan should be provided at an appropriate scale.

Aerial photographs, if available, should be included. There are several on-line sources available. Recent photographs are preferred.

Watershed(s) must be identified using the USGS 8-digit Hydrologic Unit Code(s) for each mitigation site (See Item A.2 on the Checklist). One source of these codes is an EPA website at: http://cfpub.epa.gov/surf/locate/index.cfm.

B. IMPACT AREA(S)

Impact areas include both wetlands and waters. Most of the checklist items are self-explanatory but clarification is provided for stream information, functions and values assessment, and watershed plans.

If streams will be impacted, information needed includes length of banks to be impacted, nature of banks, normal seasonal flows, gradient, sinuosity, bed load, lengths of riffles and pools, and adjacent landscape.

When performing functions and values assessments, simply stating "wildlife habitat" is inadequate. Additional information needs to be provided. Provide indicator species for the habitat type such as forest-dwelling migratory birds or mole salamanders and/or woodfrogs for a vernal pool. The more specific the information, the more confidence the Corps will have in the evaluation.

Watershed and/or regional plans that describe aquatic resource objectives should be discussed if such plans are available for the impact area(s). If no such plans exist, so state.

C. MITIGATION AREA(S)

1. Background Information

Provide an explanation of sites considered for mitigation sites and the rationale for selection or rejection. Attachments 1 and 2 discuss when use of a potential mitigation site is practicable, whether on-site or off-site mitigation is appropriate, and whether out-of-kind mitigation is appropriate instead of in-kind. In order to replace the impacted functions, in-kind mitigation is generally preferred.

Wherever possible, select sites where wetlands previously existed and/or where nearby wetlands currently exist. Restoration is more feasible and sustainable that creation of wetlands.

Also, whenever possible, locate the mitigation site in a setting of comparable landscape position and hydrogeomorphic class as the impact wetland.

Information on the selected site(s)'s existing wildlife usage, soils, vegetation, and surrounding land use are required. **Wildlife usage** must include information on any possible state and federal threatened and endangered species habitat. Subsurface **soil conditions** have a critical role in mitigation design, whether the substrate be sand, loam, silt, clay, and/or bedrock. Therefore, soil profiles should be provided that extend down to two feet below the proposed new soil surface. Describe the existing **vegetation** on the site including a list of species, dominant species, density, community types, and community structure. **Surrounding land use** should be described within at least 500 feet of the site(s) and include a discussion of likely future land uses. Include a discussion of how the site(s) plans fit into the watershed context and the proximity of the site to public and private protected lands.

2. Mitigation Proposed

Similar information is required for the mitigation area(s) as for the impacted area(s).

A mitigation site may not be able to provide the full range of functions desired because some functions are incompatible. For example, some wildlife habitat may not be compatible with flood storage.

Note that Regulatory Guidance Letter 02-02 states that stream functions lost must also be mitigated. In general this should be on 1:1 linear foot of bank basis unless a functional assessment methodology is available for more detailed analysis.

Frequently mitigation designs are constrained by the project itself, landscape features, or public issues that control or otherwise influence the design and/or monitoring and remediation of the mitigation area. Such constraints need to be explained in detail. If there are no constraints (rare), the plan should so state.

To ensure that someone with expertise in wetland science provides construction oversight for the mitigation project, the following language should be included in the narrative portion of the mitigation plan:

→ A wetland scientist shall be on-site to monitor construction of the wetland mitigation area(s) to ensure compliance with the mitigation plan.

Construction timing of the mitigation and the proposed wetland impacts affects temporal impacts. Therefore, the following language should be included in the narrative portion of the mitigation plan:

→ Compensatory mitigation shall be initiated not later than 90 days after project initiation and completed not later than the completion of the permitted project.

If the impact will occur before the mitigation is constructed, the mitigation plan will address temporal losses and the permittee will work with the Corps to develop financial assurances for the mitigation completion and monitoring, including remedial actions.

All parties responsible for planning, accomplishing, and maintaining the mitigation project are identified.

In accordance with national guidance, financial assurances will be required when the Corps determined it is appropriate to ensure successful

implementation of the mitigation. The text to use when such assurances are required is:

The permittee shall post a bond for $_____ for construction of the wetland mitigation, monitoring, and potential remedial action as determined by the Corps of Engineers. The bond shall be in the form of firm commitment, supported by corporate sureties whose names appear on the list contained in Treasury Department Circular 570, individual sureties, or by other acceptable security such as postal money order, certified check, cashier's check, irrevocable letter of credit, or, in accordance with Treasury Department regulations, certain bonds or notes of the United States. The bond must be in place at all times the construction is underway and during the entire monitoring period, including any extensions required by the Corps of Engineers to ensure permit compliance.

Upon completion of construction, the bond shall be reduced to an amount that will cover the costs of monitoring and possible remedial actions.

Treasury Department Circular 570 is published in the Federal Register, or may be obtained from the U.S. Department of Treasury, Financial Management Service, Surety Bond Branch, 401 14th Street, NW, 2nd Floor, West Wing, Washington, DC 20227.

Wildlife can pose serious threats to aircraft and therefore mitigation sites near airports are of concern to the Federal Aviation Administration. See Federal Aviation Administration Advisory Circular AC No: 150/5200-33, 5/1/97, http://www1.faa.gov/arp/pdf/5200-33.pdf.

D. HYDROLOGY

Avoid use of water-control structures which must be maintained in perpetuity.

1. The expected seasonal depth, duration, and timing of both inundation and saturation should be described for each of the proposed habitat zones in the mitigation area (particularly related to root zone of the proposed plantings). If shallow monitoring wells are used to develop this rationale, the observations should be correlated to local soil morphologies, rooting depths, water marks or other local evidence of flooding, ponding or saturation, and reflect rainfall conditions during monitoring.

Monitoring Wells

Note that monitoring wells may not be necessary if other data are adequate. Please discuss this issue with Corps staff prior to installation.

Many mitigation plans include monitoring well data. Note that there is an important difference between monitoring wells and piezometers, both of which provide useful information. Details on the uses for and installation of both of these types of wells are available in a document prepared by the Engineers Research and Development Center's Environmental Lab, previously known as the Waterways Experiment Station, entitled, "Installing Monitoring Wells/Piezometers in Wetlands", ERDC TN-WRAP-00-02. It can be found at: http://www.wes.army.mil/el/wrap/pdf/tnwrap00-2.pdf.

2. Plan indicates if the water source is groundwater, surface runoff, precipitation, lake overflow, and/or stream overflow. Provide substantiation (e.g., well data, adjacent wetland conditions, stream gauge data, precipitation data). Precipitation data is available on the Internet. One site is http://www.erh.noaa.gov under the appropriate Eastern Region Weather Forecast Office.

3. If vernal pool creation is included as part of the mitigation plan, provide evidence that adequate hydrology will be provided to support the target obligate vernal pool species (mole salamanders, woodfrogs, and/or fairy shrimp).

E. GRADING PLANS

1. Plan provides existing and proposed grading plans for mitigation area. Existing contours should be to at least 2' intervals. Proposed contours should be to 1' intervals in the wetlands portion of the mitigation with spot elevations for intermediate elevations. All other areas should be shown at 2' contour intervals.

Where microtopographic variation is planned, the proposed maximum differences in elevation should be specified. The plan does not need to show the locations of each pit and mound as long as a typical cross-section and approximate number of pits and mounds is given for each zone.

Plans should be on 8 ½ x 11" sheets. Large size sheets are encouraged for clarity, but only as a supplement to the letter-sized sheets.

2. Plan provides representative cross sections showing the existing and proposed grading plan, expected range of shallow groundwater table elevations or surface water level consistently expected. Cross-sections should include key features such as upland islands and pools. They should extend beyond the mitigation site into adjacent wetlands and uplands.

F. TOPSOIL

Manmade topsoil shall consist of a mixture of equal volumes of organic and mineral materials. Clean leaf compost is the preferred soil amendment to achieve these standards. If other soil amendments are more readily available than clean leaf compost they can be used to meet the requirement for the appropriate percent organic carbon content (see Item F.3). Note, however, that compost or other organic matter should be clean and free of weed seeds, specifically the seeds of the species listed below under "Vegetation".

It is important to keep in mind the difference between organic *matter* and organic *carbon* both for meeting regulatory guidelines and when classifying the surface horizons in soils as histic (organic soils), mucky modified or mineral. The organic *carbon* content of most upland topsoil is between 1 and 6 percent of dry weight. Soils with more than 20 to 30 percent organic *matter* (12 to 17 percent organic *carbon* content)are known as organic soils or Histosols. The Field Indicators for Identifying Hydric Soils in New England (New England Hydric Soils Technical Committee, 1998, 2nd ed.) glossary defines the criteria for these classifications based on their organic *carbon* contents. 4-12% minimum organic *carbon* content (9 to 21 percent organic *matter*) on a dry weight basis for soils should be used in wetland replication areas. The rule of thumb for conversion is to divide organic *matte*r by 1.72 to get organic *carbon* content and multiply organic *carbon* by 1.72 to get organic *matter* content[1]:

$$O_m / 1.72 = O_c \quad \text{and} \quad O_c \times 1.72 = O_m$$

Scrub-shrub and forested wetlands should have about 12% organic carbon; emergent wetlands in permanently or semipermanently inundated areas may only need 4-6%.

Note that the term "loam" that is frequently used for the material spread on a mitigation site after subsoil grading is a landscaping term. In soil science, the term refers to a specific texture of soil comprised of specific amounts of soil, silt, and clay particles. The landscaping term is not a scientific term and should be avoided.

1. Topsoil for mitigation sites can be a source of invasive species seeds. Provide information on the source and the likelihood that such seeds are in it.
2. Twelve or more inches of natural or manmade topsoil should be used in most wetland mitigation areas. Exceptions might be permanently or semi-permanently inundated or saturated areas and turtle nesting areas. Rationale for less than 12 inches should be provided.

[1] Excerpted from Allen, Art, "Organic Matters", *AMWS Newsletter*, December 2001.

3. Natural topsoil proposed to be used for the creation/restoration/ enhancement of wetlands consists of at least 4-12% **with the percentage specified**, organic carbon content (by weight) (or 9-20% organic matter content). Manmade topsoil used for the creation/restoration/ enhancement of wetlands consists of a mixture of equal volumes of organic and mineral materials. This may be accomplished by adding a specific depth of organic material and disking it in to twice that depth.

G. PLANTING PLAN

Planting and/or seeding are generally appropriate for a mitigation site, as determined through consultation with the Corps. When planting is proposed as part of the plan, the guidelines noted below should be followed.

Irrigation

Note that irrigation is solely to enhance the success of vegetation establishment, not to provide hydrology. The use of irrigation for woody plantings should be considered for the first one to two growing seasons after planting due to the unpredictability of short-term local hydrologic conditions and the need for additional care to establish new plantings. Equipment (e.g., pipes, pumps, sprinklers) must be removed and irrigation discontinued no later than the end of the second growing season unless the Corps concurs with extended irrigation. In this situation, the monitoring period shall be extended an equivalent time period.

Two methodologies have been used successfully: water trucks and installation of irrigation systems. The former is limited by accessibility for the truck(s), a likely problem on large sites. The latter tends to be less expensive and may be more effective for large projects.

Use of Mulch

The use of mulch around woody plantings is strongly encouraged, and may be required, to reduce the need for irrigation and to keep down herbaceous vegetation in the immediate vicinity of each plant for a couple of years. Note that the mulch should not be considered part of the organic content of the topsoil. Suggested specifications for mulching are as follows:

Mulch balled and burlap or container-grown trees and shrubs in a 3' diameter circle approximately 2" deep.

Mulch bare-root woody planting in an 18" diameter circle approximately 2" deep.

1. The use of scientific names ensures that all involved have the correct understanding of the species of plants proposed to be planted or seeded.

2. Native planting stock from the immediate vicinity of the project is ideal. Whenever possible, plants should be salvaged from wetlands and uplands cleared by the project. In some circumstances, local "scavenging" of wetlands may be acceptable, but care is necessary to avoid jeopardizing established natural habitats or to unintentionally transplant invasive species. Be aware that state or local permits may be required to “scavenge” natural wetlands for planting stock.

No cultivars shall be used.

3. The Cowardin classification system is typically used to identify the plant communities proposed. If another system is used, an explanation of terms may be needed.

4. A plan view drawing should show where the various species are proposed to be planted. Since showing each individual plant is neither practical nor realistic, this may be illustrated with areas of uniform species composition and the number of plants or rate of seeding within the polygon. The scale should be in the range of 1”=20’ to 1”=100’, depending on the size of the site.

5. Although the prevailing hydrology will ultimately influence the type of wetland that will develop, plantings “jump start” the project. Some species tend to volunteer promptly whereas others may take years to move into a site; consideration should be given to emphasize planting species unlikely to “volunteer”.

6. Woody stock should be proposed to be planted in densities not less than 600 trees and shrubs per acre, including at least 400 trees per acre in forested cover types.

Woody planting densities may require adjustment depending upon the goals of the mitigation plan and the ‘reference wetland’ used to develop the habitat goals. For example, if the primary goal for a particular creation site is flood storage and there is minimal need for wildlife habitat but there is interest in developing a woody component in the flood storage area, the density may be reduced. Also, if the wetland type desired is a dense thicket, the density may need to be increased.

7. Where uniform coverage is anticipated, herbaceous stock is proposed to be planted in densities not less than the equivalent of 3 feet on center for species which spread with underground roots; 2 feet on center for species which form clumps.

8. The list of species proposed in seed mixes should not include any species in the list of invasives in Table 1.

Although the use of non-native species is typically discouraged, there are situations where such use may be appropriate such as using *Secale cereale* (Annual Rye) to quickly stabilize a site. The species should be noted and the reason for their use explained.

Similarly, non-native genotypes and cultivars should not be used.

Species listed in Table 4 are not to be included as seed or planting stock in the overall project.[2] Most of these species do not need to be actively removed from the site. Exceptions are included in the Monitoring section (Section M). More may be added by the Corps on a case-by-case basis.

9. Cross-sectional drawings should include identification of vegetative community (e.g., forested, shrub swamp, etc.) zones. This can be combined with the plans required for grading if they are not too complex.

10. During the first few years, while the designed wetland vegetative zones become established, they are susceptible to colonization and subsequent domination by invasive species. A number of plants are known to be especially troublesome in this regard. The following stipulationshall be included in the mitigation plan, either in the plan view or in the narrative portion of the plan:

➔ To reduce the immediate threat and minimize the long-term potential of degradation, the species included on the invasive plant species list in Table 4 of the New England District Mitigation Plan Guidance are not included as planting stock in the overall project. Only plant materials native and indigenous to the region shall be used (with the exception of **[specify]**). Species not specified in the mitigation plan shall not be used without written approval from the Corps.

11. The following stipulation shall be included in the mitigation plan, either in the drawings or in the narrative portion of the plan:

➔ During planting, a qualified wetland professional may relocate up to 50 percent of the plants in each community type if as-built site conditions would pose an unreasonable threat to the survival of plantings installed according to the mitigation plan. The plantings shall be relocated to locations with suitable hydrology and soils and where appropriate structural context with other plantings can be maintained.

[2] This list is a compilation of state lists from New England and additional species recommended by regional botanical experts.

H. COARSE WOODY DEBRIS AND OTHER FEATURES

Coarse woody debris includes such materials as logs, stumps, smaller branches, and standing snags. Placement of this material is generally inappropriate in tidal or frequently flooded environments. As much as possible, these materials will be in various stages of decomposition and salvaged from natural areas cleared for the other elements of the project. The following language is included in the mitigation plan, either in the drawings or in the narrative portion of the plan:

- A supply of dead and dying woody debris shall cover at least 2% of the ground throughout the mitigation sites after the completion of construction of the mitigation sites. These materials should not include species shown on the list of invasive species in the New England District Mitigation Plan Guidance.

When mitigation requires a component of forest or scrub-shrub habitat, the design should include plans for a continuum of coarse woody debris.

When a tree dies, it may continue to provide habitat for another century or longer. The speed of the recycling processes depends on many factors, but the main point is that coarse woody materials are relatively durable and remain as important ecological features both below- and aboveground for a long time. Long after the last needles or leaves fall to the forest floor, a tree persists, parceling itself out in bits and pieces.

In the first years, if a tree remains upright, the greatest volume of its litter may consist of bark, twigs, and small branches. Later, as insects and fungus weaken the aerial framework, larger limbs and sections of the trunk tumble to the ground where decay occurs under quite different conditions. On the forest floor, well-decomposed logs may sustain greater faunal richness. In an ideal situation, there is an uninterrupted supply of woody litter in various sizes and stages of decay providing a diverse range of habitats. Decomposition is one of the natural successions in a forest. If one link of the chain is lacking, the process falters. Wetland builders should factor coarse woody debris into most habitat mitigation strategies.

Frequently the inclusion of scattered various sized boulders, as well as woody debris is an appropriate method of increasing structure and habitat in a site. Note of caution: if not properly screened by a wetland scientist, such debris can be a source of invasive species.

I. EROSION CONTROLS

The following language is included in the mitigation plan, either in the drawings or in the narrative portion of the plan:

- Temporary devices and structures to control erosion and sedimentation in and around mitigation sites shall be properly maintained at all times. The devices and structures shall be disassembled and properly disposed of no later than November 1 three full growing seasons after planting. Sediment collected by these devices will be removed and placed upland in a manner that prevents its erosion and transport to a waterway or wetland.

Cordoning off of an entire site with erosion controls is discouraged as it impedes animal movement. If circling of an entire site is needed, either gaps or overlaps with intervening space should be provided.

J. INVASIVE AND NOXIOUS SPECIES

Projects should avoid introducing or increasing the risk of invasion by unwanted plants (such as those listed in J.3. below) or animals (such as zebra mussels). Soils disturbed by projects are very susceptible to invasion by undesirable species. Be particularly alert to the risk of invasion on exposed mineral soils. Exposed mineral soils may result from excavation or filling. Noxious species often get a foothold along project drainage features where the dynamics of erosion and accretion prevail. Along saltmarshes, be especially alert to the project's influence on freshwater runoff. Frequently, *Phragmites australis* invasion is an unanticipated consequence of freshwater intrusion into the saltmarsh.

1. The discussion of risk includes an assessment of the potential for invasion of the wetland by the species listed in J.3 or other problematic species.

2. The plan should identify regulatory and ecological constraints that influence the design of any plan to control invasive plants and animals by biological, mechanical, or chemical measures. For example, if a state requires a permit for use of herbicide, this may constrain attempts to control an invasive plant species. If there are no constraints, so state.

3. The plan should describe the strategy to control, or recognize and respond to, the invasion of the mitigation site by Common Reed (*Phragmites australis*) and Purple Loosestrife (*Lythrum salicaria*). Any other species (*Rhamnus* spp., *Elaeagnus* spp., *Rosa multiflora*, etc.) identified as a problem at the site should also have a control plan. Controls include mechanical (pulling, mowing, or excavating on-site), chemical (herbiciding), and biological (planting fast-growing trees and shrubs for shading or releasing herbivorous insects).

K. OFF-ROAD VEHICLE USE

If there is a potential for off-road vehicle access at the site, the mitigation plan shows the locations of barriers placed at access points to the mitigation sites to prevent vehicles from damaging the sites.

L. PRESERVATION

1. Adequate buffers are proposed to protect the ecological integrity of creation, restoration, and/or enhancement areas.

In most cases, a protected (preserved) buffer will be required around creation, restoration, and enhancement sites, including stream mitigation as this is of benefit on a local and watershed scale throughout New England. The extent of the buffer will depend upon the landscape position of the site(s) and current and potential surrounding land uses. Usually buffers will consist of uplands but wetlands also may serve that function.

2. Wetlands within subdivisions, golf courses, etc. should generally be protected along with appropriate buffers. This is part of the avoidance and minimization steps of mitigation.

3. Preservation should be part of every mitigation package as preservation of a creation, restoration, or enhancement area, and buffer; the remaining unimpacted wetlands on-site as part of avoidance and minimization; or as a stand-alone form of mitigation. Ideally the preservation document would be prepared, reviewed, and approved by the Corps prior to submission of the final mitigation plan and permit issuance. If this is not possible, the following language should be included in the plan:

➔ Compensatory mitigation sites and on-site unimpacted wetlands (and buffers) to be set aside for conservation shall be protected in perpetuity from future development. Within 90 days of the date this permit is issued, the permittee shall submit to the Corps of Engineers a draft of the conservation easement or deed restriction. Within 30 days of the date the Corps approves this draft document in writing, the permittee shall execute and record it with the Registry of Deeds for the Town of - _____ and the State of _____. A copy of the executed and recorded document must then be sent to the Corps of Engineers within 90 days of the date it was recorded. The conservation easement or deed restriction shall enable the site or sites to be protected in perpetuity from any future development. For preservation as part of compensation, the conservation easement or deed restriction shall expressly allow for the creation, restoration, remediation and monitoring activities required by this permit on the site or sites. It shall prohibit all other filling, clearing and other disturbances (including vehicle access) on these sites except

for activities explicitly authorized by the Corps of Engineers in these approved documents.

If it is possible to have the document prepared and approved prior to final mitigation plan submission and permit issuance, only the following needs to be included:

→ Within 30 days of the date of permit issuance, the permittee shall execute and record the preservation document with the Registry of Deeds for the Town of _____ and the State of _____. A copy of the executed and recorded document must then be sent to the Corps of Engineers within 90 days of the date it was recorded.

4. Plans showing the location of all sites to be preserved are required. In addition to a locus, they must be sufficiently detailed to determine relationships to adjacent development and/or properties.

5. There are numerous forms of preservation documents. They include fee transfer to another entity such as a non-profit organization or public agency, easement given to a non-profit organization or public agency, deed restriction, or restrictive covenant. The form should be specified or a copy of the document(s) included.

M. MONITORING PLAN

Once the final mitigation plan is incorporated into the permit, the permit will require full implementation of the mitigation plan, including remedial measures during the first five or more growing seasons to ensure success. Typically, sites proposed to be emergent-only wetlands will be monitored for five years and sites proposed to be scrub-shrub and/or forested wetlands will be monitored for five to ten years, as extended periods for monitoring may be appropriate in some cases. Unsuccessful mitigation does not, in and of itself, constitute permit non-compliance; however, failure to implement the plan and remedial measures does.

The following language should be included in the narrative portion of the mitigation plan:

→ **MONITORING**

If mitigation construction is initiated in, or continues throughout the year, but is not completed by December 31 of any given year, the permittee will provide the Corps, Policy Analysis and Technical Support Branch, a letter providing the date mitigation work began and the work completed as of December 31. The letter should be sent no later than January 31 of the following year. The letter must include the Corps permit number.

For each of the first **[specify]** full growing seasons following construction of the mitigation site(s), the site(s) shall be monitored and monitoring reports shall be submitted to the Corps, Regulatory Division, Policy Analysis and Technical Support Branch, no later than December 15 of the year being monitored. Failure to submit monitoring reports constitutes permit non-compliance. Each report coversheet shall indicate the permit number and the report number (Monitoring Report 1 of 5, for example). The reports shall answer the following success-standard questions and shall address in narrative format the items listed after the questions. The reports shall also include the monitoring-report appendices listed below. The first year of monitoring shall be the first year that the site has been through a full growing season after completion of construction and planting. For these special conditions, a growing season starts no later than May 31. However, if there are problems that need to be addressed and if the measures to correct them require prior approval from the Corps, the permittee shall contact the Corps by phone (1-800-362-4367 in MA or 1-800-343-4789 in ME, VT, NH, CT, RI) or letter as soon as the need for corrective action is discovered.

Remedial measures shall be implemented - at least two years prior to the completion of the monitoring period - to attain the success standards described below within **[specify]** growing seasons after completion of construction of the mitigation site(s). Should measures be required within two years of the end of the monitoring period, the monitoring period will be extended to ensure two years of monitoring after the remedial work is completed. Measures requiring earth movement or changes in hydrology shall not be implemented without written approval from the Corps.

At least one reference site adjacent to or near each mitigation site is described and shown on a locus map.

1) Does the site have at least 500 trees and shrubs per acre, of which at least 350 per acre are trees for proposed forested cover types, that are healthy and vigorous and are at least 18" tall in 75% of each planned woody zone AND at least the following number of non-exotic species including planted and volunteer species? Volunteer species should support functions consistent with the design goals. To count a species, it should be well represented on the site (e.g., at least 50 individuals of that species per acre).

# species planted	minimum # species required (volunteer and planted)
2	2
3	3
4	3

5	4
6	4
7	5
8	5
9 or more	6

Vegetative zones consist of areas proposed for various types of wetlands (shrub swamp, forested swamp, etc.). The performance standards for density can be assessed using either total inventory or quadrat sampling methods, depending upon the size and complexity of the site.

2) Does each mitigation site have at least 80% areal cover, excluding planned open water areas or planned bare soil areas (such as for turtle nesting), by noninvasive species? Do planned emergent areas on each mitigation site have at least 80% cover by noninvasive hydrophytes? Do planned scrub-shrub and forested cover types have at least 60% cover by noninvasive hydrophytes, of which at least 15% are woody species? For the purpose of this success standard, invasive species of hydrophytes are:

Cattails -- *Typha latifolia, Typha angustifolia, Typha glauca*;
Common Reed -- *Phragmites australis*;
Purple Loosestrife -- *Lythrum salicaria*;
Reed Canary Grass -- *Phalaris arundinacea*; and
Buckthorn – *Rhamnus frangula.*

3) Are Common Reed (*Phragmites australis*), Purple Loosestrife *(Lythrum salicaria*), Russian and Autumn Olive (*Eleagnus* spp.), Buckthorn (*Rhamnus frangula*), and/or Multiflora Rose (*Rosa multiflora*) plants at the mitigation site(s) being controlled?

4) Are all slopes, soils, substrates, and constructed features within and adjacent to the mitigation site(s) stabilized?

Items for narrative discussion:

- Dates work on each mitigation site began and ended.

- Describe the monitoring inspections that occurred since the last report.

- Soils data, commensurate with the requirements of the soils portion of the 1987 Corps Delineation Manual (Technical Report Y-87-1) New England District data form, should be collected after construction and every alternate year throughout the monitoring period. If monitoring

wells or gauges were installed as part of the project, this hydrology data should be submitted annually.

- Concisely describe remedial actions done during the monitoring year to meet the four success standards – actions such as removing debris, replanting, controlling invasive plant species (with biological, herbicidal, or mechanical methods), regrading the site, applying additional topsoil or soil amendments, adjusting site hydrology, etc. Also describe any other remedial actions done at each site.

- Report the status of all erosion control measures on the compensation site(s). Are they in place and functioning? If temporary measures are no longer needed, have they been removed?

- Give visual estimates of (1) percent vegetative cover for each mitigation site and (2) percent cover of the invasive species listed under Success Standard No. 2, above, in each mitigation site.

- What fish and wildlife use the site(s) and what do they use it for (nesting, feeding, shelter, etc.)?

- By species planted, describe the general health and vigor of the surviving plants, the prognosis for their future survival and a diagnosis of the cause(s) of morbidity or mortality.

- What remedial measures are recommended to achieve or maintain achievement of the four success standards and otherwise improve the extent to which the mitigation site(s) replace the functions and values lost because of project impacts?

IF MITIGATION INCLUDES VERNAL POOL CREATION):

Does the vernal pool creation take into account the critical need for unobstructed access to and from the pool, as well as an adequate extent of upland habitat to ensure success?

Pool(s) are monitored for obligate and facultative vernal pool species weekly for four weeks from the beginning of the vernal pool activity in the spring (will vary throughout New England) and then biweekly until the end of July for the entire monitoring period. The period of monitoring is specified. Data identify frog species, salamander genera, and the presence/absence of fairy shrimp. Macroinvertebrates can be to the order.

In addition, photographs of the pool(s) taken monthly during the pool monitoring period (March/April-July) from a set location(s) will be included. Photographs will include panoramas of surrounding habitat.

Other data required: pH and temperature of water at beginning and end of each monitoring cycle; pool depth at deepest point(s) (or state if >3') to nearest inch or centimeter; substrate of pool(s) (dead leaves, herbaceous vegetation, bare soil—organic or mineral, etc.); plant species noted in and around the perimeter of the pool(s).

If the state has a vernal pool register, the pool(s) is registered prior to the final monitoring report submission.

MONITORING-REPORT APPENDICES:

Appendix A -- A copy of this permit's mitigation special conditions and summary of the mitigation goals.

Appendix B -- An as-built planting plan showing the location and extent of the designed plant community types (e.g., shrub swamp). Within each community type the plan shall show the species planted. This is only needed in the first monitoring report unless there are additional plantings of different species in subsequent years.

Appendix C – A vegetative species list of volunteer species in each plant community type. The volunteer species list should, at a minimum, include those that cover at least 5% of their vegetative layer.

Appendix D -- Representative photos of each mitigation site taken from the same locations for each monitoring event.

N. ASSESSMENT PLAN

The following language should be included in the narrative portion of the mitigation plan:

ASSESSMENT

Following completion of the construction of the mitigation site(s), a post-construction assessment of the condition of the mitigation site(s) shall be performed after the first five growing seasons or by the end of the monitoring period, whichever is later. "Growing season" in this context begins no later than May 31st. To ensure objectivity, the person(s) who prepared the annual monitoring reports shall not perform this assessment without written approval from the Corps. The assessment report shall be

submitted to the Corps by December 15 of the year the assessment is conducted.

The post-construction assessment shall include the four assessment appendices listed below and shall:

- Summarize the original or modified mitigation goals and discuss the level of attainment of these goals at each mitigation site (include vernal pool creation if that is a component of the mitigation).

- Describe significant problems and solutions during construction and maintenance (monitoring) of the mitigation site(s).

- Identify agency procedures or policies that encumbered implementation of the mitigation plan. Specifically note procedures or policies that contributed to less success or less effectiveness than anticipated in the mitigation plan.

- Recommend measures to improve the efficiency, reduce the cost, or improve the effectiveness of similar projects in the future.

ASSESSMENT APPENDICES:

Appendix A -- Summary of the results of a functions and values assessment of the mitigation site(s), using the same methodology used to determine the functions and values of the impacted wetlands.

Appendix B -- Calculation of the area of wetlands in each mitigation site using the 1987 Corps Wetlands Delineation Manual. Supporting documents shall include (1) a scaled drawing showing the wetland boundaries and representative transects and (2) datasheets for corresponding data points along each transect.

Appendix C -- Comparison of the area and extent of delineated constructed wetlands (from Appendix B) with the area and extent of created wetlands proposed in the mitigation plan. This comparison shall be made on a scaled drawing or as an overlay on the as-built plan. This plan shall also show the major vegetation community types.

Appendix D -- Photos of each mitigation site taken from the same locations as the monitoring photos, including photos of vernal pools, if applicable.

O. CONTINGENCY

Describe the procedures to be followed should unforeseen site conditions or circumstances prevent the site from developing as intended. Examples of such situations include unanticipated beaver activity, disruption of the groundwater by blasting or other construction in the vicinity, unearthing an unexpected archaeological site, and encountering hazardous waste.

P. OTHER COMMENTS

REFERENCES

Ashby, Steven. "Approaches for the Mitigation of Water Quality Functions of Impacted Wetlands – A Review," ERDC TN-WRAP-02-03 http://www.wes.army.mil/el/wrap/pdf/tnwrap02-3.pdf, U.S. Army Research and Development Center, Vicksburg, MS.

Brinson, M. M. (1993). "A hydrogeomorphic classification for wetlands," Technical Report WRP-DE-4. http://www.wes.army.mil/el/wetlands/pdfs/wrpde4.pdf, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS. NTIS No. AD A270 053.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T LaRoe. (1979) "Classification of wetlands and deepwater habitats of the United States," Office of Biological Services, FWS/OBS-79/31, December 1979.

Environmental Laboratory. (1987). "Corps of Engineers Wetlands Delineation Manual," Technical Report Y-87-1, <http://www.wes.army.mil/el/wetlands/pdfs/wlman87.pdf>, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

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Minkin, P. and R. Ladd. 2003. Success of Corps-Required Wetland Mitigation in New England. New England District Corps of Engineers, Concord, MA.

National Research Council. 2001. Compensating for Wetland Losses Under the Clean Water Act. National Academy Press. Washington, DC. 322 pp.

Sprecher, S. W. (2000). "Installing Monitoring Wells/Piezometers in Wetlands," ERDC TN-WRAP-00-02 <http://www.wes.army.mil/el/wrap/pdf/tnwrap00-2.pdf>, U.S. Army Research and Development Center, Vicksburg, MS.

Treasury Department Circular 570.

U.S. Army Corps of Engineers. 2002. 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. Regulatory Guidance Letter No. 02-2.

Table 1
Cross-reference Between Mitigation Plan and
New England District, U. S. Army Corps of Engineers
Mitigation Plan Checklist (2003).

Check-list Item	Description	Relevant Section	Page Number
A. General Information			
1.	One complete package		
2.a	Locus map	Figure 1	
2.b	Aerial photo	Figure 2	
2.c	Lat/Long	Figure 1	
2.d	HUC	Section A	p.1
B. Impact Area(s)			
1.	Wetland acreage	Section A	p.2, Table 1
2.	Wetland classes	Section A	p.3, Table 1
3.	Streams	Section A	p. 3, Table 1
4.	Wetland and stream functions and values	Section A	p.3, Table 1
5.	Type and purpose of work	Section A	p. 3
6.	Watershed plans	Section A	p. 4
C. Mitigation Area(s)			
1.a	Mitigation alternatives	Section B	
1.b	Existing wildlife use	Section C	p.2
1.c	Existing soil	Section C	p.3
1.d	Existing vegetation	Section C	p. 7
1.e	Surrounding land use	Section C	p.9
1.f	USFWS Clearance Letter	Section C	p.12
1.g	SHPO Clearance Letter	Section C	p. 13
2.a	Wetland acreages at each site	Section D	p. 1, Table 2
2.b	Wetland classes at each site	Section D	p. 2, Table 2
2.c	Functions and values proposed at each site	Section D	p. 2, Table 2
2.d	Stream mitigation	Section D	p.3
2.e	Reference site(s)	Section D	p. 4
2.f	Design Constraints	Section E	p.1
2.g	Construction oversight	Section E	p. 2
2.h	Project construction timing	Section E	p. 3
2.i	Responsible parties	Section E	p. 5
2.j	Financial assurances	Section F	
2.k	FAA Issues	Section E	p.6
D. Hydrology			
1.	Adequate hydrology	Section G	p. 8, Tables 3, 4
1.a	Typical year water budget	Section G	Figure 1

1.b	Wet year water budget	Section G	Figure 2
1.c	Dry year water budget	Section G	Figure 3
2.	Water source(s)	Section G	p. 8
3.	If vernal pool, adequate hydrology	Section G	p. 9, 23
E. Grading Plan			
1.a	Plan View - existing and proposed contours	Appendix A	Figures 2-5
1.b	Plan View - microtopography	Appendix A	Figures 2-5
1.c	Plan View - scale	Appendix A	
1.d	Plan View - legible	Appendix A	
2.	Representative cross-sections	Appendix A	Figures 7-9
3.	Other grading comments (if any)	N/A	
F. Topsoil			
1.	Proposed source	Section H	p. 1
2.	Depth	Section H	p. 5, Figures 7-9
3.	Organic content	Section H	p. 6
G. Planting Plan			
1.	Scientific names	Appendix A	Figures 2-5
2.	Native materials	Section H	p. 8
3.	Community types	Section H	p. 8
4.	Location on plans	Appendix A	Figures 2-5
5.	Plantings for community type	Section H	p. 8
6.	Woody stock density	Appendix A	Figures 2-5
7.	Herbaceous stock density	N/A	
8.	Seed mix composition	Section H	p. 10
9.	Cross-sections	Appendix A	Figures 7-9
10.	No invasive species plantings	Section H	p. 11
11.	Relocation text	Section H	p. 12
12.	Other	N/A	
H. Coarse Woody Debris			
	Is proposed	Appendix A	Figure 2-5
I. Erosion Controls			
	Deadline for removal	Section H	p. 7
J. Invasive and Noxious Species			
1.	Risk	Section I	p.1
2.	Constraints	Section I	p. 1
3.	Control plan	Section I	p. 2
K. Off-Road Vehicle Use			
1.	Usage in vicinity	Section I	p. 4
2.	Control plan	N/A	
L. Preservation			
1.	Adequate buffers	Section J	p. 1
2.	Internal wetlands protected	Section J	Figure 10

3.	Preservation language	Section J	p. 2
4.	Preservation site plans	Section J	Figure 11
5.	Legal instrument(s)	Section J	p. 5
M. Monitoring Plan			
	Appropriate language	Section K	
N. Assessment Plan			
	Appropriate language	Section L	
O. Contingency			
	Plan in place	Section M	
P. Other			

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Table 2
Summary of Proposed Wetland Mitigation

MITIGATION SITE	TYPE OF MITIGATION	SIZE
1	Wetland Enhancement (E), Restoration (R), and Creation (C)	E = 15,600 s.f. R = 49,560 s.f. C = 15,900 s.f.
2	Wetland Creation	42,100 s.f.
3	Wetland Preservation (note: sites 1 and 2 to be preserved as well)	13.5 acres
3	Upland Preservation	6.3 acres

Table 3
Wetland Impact Area Function-Value Summary

Wetland Impact Area #	Area (s.f.)	Wetland Type (Cowardin)	WETLAND FUNCTIONS AND VALUES												
			GWR/D	FFA	S&TR	NR&T	PE	S&S	F&SH	WLH	T&E	REC	ED/S	U/H	VQ/A
1	31,350	PFO1/ PSS1B	X	X						P					X
2	14,190	PEM1/ PSS1B	X	P		X			X	X					
3	23,600	PFO1	X							P		X			
4	49,010	PSS1B	X	X		X				P					X
5	2,350	PEM1		X	X	X		P		X					

Table 4
Invasive and other Unacceptable Plant Species[1]

a. Herbs:

Aegopodium podagraria	Goutweed or Bishop's weed
Aira caryophylla	Silver hairgrass
Alliaria petiolata	Garlic mustard
Allium vineale	Field garlic
Ampelopsis brevipedunculata	Porcelain berry
Anthoxanthum odoratum	Sweet vernal grass
Anthriscus sylvestris	Chervil
Arctium minus	Common burdock
Asparagus officinalis	Asparagus
Barbarea vulgaris	Yellow rocket
Butomus umbellatus	Flowering rush
Cabomba caroliniana	Fanwort
Callitriche stagnalis	Water-starwort
Calystegia sepium	Japanese bindweed
Cardamine impatiens	Bushy rock-cress
Cardamine pratensis	Cuckoo-flower
Centaurea biebersteinii	Spotted knapweed
Cirsium arvense	Canada-thistle
Commelina communis	Asiatic day-flower
Coronilla varia	Crown vetch
Cyperus esculentus	Yellow nutsedge
Dactylis glomerata	Orchard-grass
Echinochloa crusgalli	Barnyard grass
Egeria densa	Giant waterweed
Eleusine indica	Goosegrass
Elsholtzia ciliata	Elsholtzia
Elytrigia repens	Quack-grass
Epilobium hirsutum	Hairy willow-herb
Euphorbia cyparissias	Cypress spurge
Euphorbia esula	Leafy spurge
Festuca filiformia	Hair fescue
Festuca ovina	Sheep fescue
Geranium nepalense (G. sibericum)	Nepalese crane's-bill
Glaucium flavum	Sea- or horned poppy
Glechoma hederacea	Gill-over-the-ground
Glyceria maxima	Sweet reedgrass
Hemerocallis fulva	Tiger-lily
Heracleum mantegazzianum	Giant hogweed

[1] Scientific names are those used in Gleason, Henry and A. Cronquist, 1991, *Manual of Vascular Plants of Northeastern United States and Adjacent Canada*: Second Edition, The New York Botanical Garden: New York.

Hesperis matronalis	Dame's rocket
Hydrilla verticillata	Hydrilla
Hydrocharis morsus-ranae	European frog-bit
Hylotelephium telephium (*Sedum telephium*)	Live-forever or Orpine
Hypericum perforatum	St. John's wort
Iris pseudacorus	Yellow iris
Kochia scoparia	Summer cypress
Lamium spp. (all)	Dead nettle
Lepidium latifolium	Tall pepperwort
Lotus corniculatus	Birdsfoot trefoil
Lysimachia nummularia	Moneywort
Lysimachia vulgaris	Garden loosestrife
Lythrum salicaria	Purple loosestrife
Malva neglecta	Cheeses or common malva
Marsilea quadrifolia	Water shamrock or Eu. water clover
Mentha arvensis	Field-mint
Microstegium vimineum	Japanese stilt-grass
Miscanthus sinensis	Eulalia
Myosotis scorpioides	True forget-me-not
Myosoton aquaticum	Giant chickweed
Myriophyllum aquaticum	Parrot feather
Myriophyllum heterophyllum	Variable water-milfoil
Myriophyllum spicatum	Eurasian water-milfoil
Najas minor	Lesser naiad
Nymphoides peltata	Yellow floating heart
Ornithogalum umbellatum	Star of Bethlehem
Pastinaca sativa	Wild parsnip
Phalaris arundinacea	Reed canary-grass
Phragmites australis	Reed grass, Phragmites
Poa compressa	Canada bluegrass
Poa pratensis	Kentucky bluegrass
Poa trivialis	Rough bluegrass
Polygonum aubertii	Silver lace-vine
Polygonum cespitosum	Cespitose knotweed
Polygonum cuspidatum	Japanese knotweed
Polygonum perfoliatum	Mile-a-minute vine
Polygonum persicaria	Lady's thumb
Polygonum sachalinense	Giant knotweed
Potamogeton crispus	Curly pondweed
Puccinellia maritima	Seaside alkali-grass
Pueraria montana	Kudzu
Ranunculus ficaria	Lesser celandine
Ranunculus repens	Creeping buttercup
Rorippa nasturtium-aquaticum	Watercress
Rorippa sylvestris	Creeping yellow cress

Rumex acetosella	Sheep-sorrel
Rumex obtusifolius	Bitter dock
Setaria pumila (S.lutescens, S. glauca)	Yellow foxtail or y. bristlegrass
Solanum dulcamara	Bittersweet nightshade
Stellaria graminea	Common stitchwort
Tanacetum vulgare	Tansy
Thymus pulegioides	Wild thyme
Trapa natans	Water-chestnut
Tussilago farfara	Coltsfoot
Typha latifolia[2]	Common or Broad-leaved cattail
Typha angustifolia[4]	Narrow-leaved cattail
Verbascum thapsus	Common mullein
Vincetoxicum rossicum (V. nigrum)	Black swallow-wort
Xanthium strumarium	Common cocklebur

b. Woody Plants:

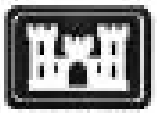
Acer ginnala	Amur maple
Acer platanoides	Norway maple
Acer pseudoplatanus	Sycamore maple
Actinidia arguta	Kiwi vine
Ailanthus altissima	Tree-of-heaven
Berberis thunbergii	Japanese barberry
Berberis vulgaris	Common barberry
Catalpa speciosa	Western catalpa
Celastrus orbiculatus	Oriental bittersweet
Cynanchum louiseae	Black swallow-wort
Cytisis scoparius	Scotch broom
Elaeagnus angustifolia	Russian olive
Elaeagnus umbellata	Autumn olive
Euonymus alata	Winged euonymus
Euonymus fortunei	Climbing euonymus
Humulus japonicus	Japanese hops
Ligustrum obtusifolium	Japanese privet
Ligustrum vulgare	Common/hedge privet
Lonicera japonica	Japanese honeysuckle
Lonicera maackii	Amur honeysuckle
Lonicera morrowii	Morrow's honeysuckle
Lonicera tartarica	Tatarian honeysuckle
Lonicera x bella	Morrow's X Tatarian honeysuckle
Lonicera xylosteum	European fly-honeysuckle

[2] *Typha* spp. are native species which provide good water quality renovation and other functions/values. However, they are aggressive colonizers which, given the opportunity, will preclude establishment of other native species. They are included in this list as species not to be planted, not because they are undesirable in an established wetland, but to provide opportunities for other species to become established. It is likely they will eventually move in without human assistance.

Morus alba	White mulberry
Paulownia tomentosa	Princess tree or empress tree
Phellodendron japonicum	Corktree
Populus alba	Silver poplar
Rhamnus cathartica	Common buckthorn
Rhamnus frangula	European buckthorn
Ribes sativum	Garden red currant
Robinia pseudoacacia	Black locust
Rosa multiflora	Multiflora rose
Rosa rugosa	Rugosa rose
Rubus phoenicolasius	Wineberry
Salix purpurea[3]	Basket or purple-osier willow
Sorbus aucuparia	European mountain-ash
Taxus cuspidata	Japanese yew
Ulmus pumila	Siberian elm
Wisteria floribunda	Wisteria

[3] This is not appropriate for use in wetland mitigation. In some circumstances it may be appropriate in stream bank stabilization.

ATTACHMENT 1



US Army Corps
of Engineers

United States Army Corps of Engineers
Regulatory Branch
Washington, D.C. 20314

United States Environmental Protection Agency
Wetlands and Aquatic Resources Regulatory Branch
Washington, D.C. 20460

MEMORANDUM TO THE FIELD

SUBJECT: Model Compensatory Mitigation Plan Checklist 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.

We are pleased, as part of the implementation of the National Wetlands Mitigation Action Plan, to enclose a model compensatory mitigation plan checklist with a supporting supplement. The checklist and supplement should serve as a technical guide for permit applicants preparing compensatory mitigation plans to offset impacts to aquatic resources authorized under the Clean Water Act Section 404 and the Rivers and Harbors Act Section 10 programs.

The purpose of the checklist is to identify the types and extent of information that agency personnel need to assess the likelihood of success of a mitigation proposal. The checklist provides a basic framework that will improve predictability and consistency in the development of mitigation plans for permit applicants. This checklist should be included, along with the National Research Council's Guidelines for Self-Sustaining Mitigation sent under separate cover, in each Corps Districts' Mitigation and Monitoring Guidelines currently under development or revision. This checklist can be adapted to account for specific environmental conditions in different regions of the U.S.

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John W. Meagher
Director, Wetlands Division
U.S. Environmental Protection Agency

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.)

- ☐ 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[1] 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.

[1] 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.

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.

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)[2] , 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 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[3] 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.

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

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

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., 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[1]

- ☐ NRCS conservation practice standards and specifications
- ☐ NRCS Environmental Evaluation
- ☐ Mitigation agreement
- ☐ Federal/State/Local required permits
- ☐ Compatible use statement:
  - o Allowable uses (e.g. hunting, fishing)
  - o Prohibited uses (e.g. grazing, silviculture)
  - o 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:
  - o NRCS-CPA-026 Highly Erodible Land and Wetland Conservation Certification
  - o 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

[1] 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.

ATTACHMENT 2
Incorporating the National Research Council's Mitigation Guidelines
Into the Clean Water Act Section 404 Program

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 chooses 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 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. An agricultural watershed where nitrates, herbicides, pesticides, etc., have the potential to reach surface and/or subsurface water sources, may severely limit the success of a mitigation project 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 depths of \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/waters 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 again that wetland restoration rather than creation is much more likely to achieve desired results than wetland creation, as evidence of a previously existing wetland or other historic data of a previously functioning aquatic resources is are a strong indicator of what will return, given the proper circumstances if the opportunity for restoration occurs. 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 helps insure 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.