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REVISION OF
NEW ENGLAND DISTRICT COMPENSATORY MITIGATION GUIDANCE

The New England District (District), U.S. Army Corps of Engineers (Corps), Regulatory Division revised our compensatory mitigation guidance, for use in reviewing all mitigation for unavoidable impacts to aquatic resources required by Corps permits issued under Section 404 of the Clean Water Act. The District has periodically revised and updated its compensatory mitigation guidance, most recently January 12, 2007 and December 10, 2007, generally in response to new national guidance and directives. In April 2008, the Corps and U.S. Environmental Protection Agency issued joint regulations on compensatory mitigation for losses of aquatic resources (Mitigation Rule; http://www.usace.army.mil/CECW/Pages/final_cmr.aspx). This current revision effort brings New England District guidance into compliance with the Mitigation Rule and provides an overall update based on the state of mitigation science.

The draft revision was placed on public notice on December 15, 2009. Comments received during the public notice period have been reviewed and, where appropriate, incorporated into the final guidance which can be found at http://www.nae.usace.army.mil/reg/index.htm and then under "Mitigation." No major revisions were made based on the submitted comments. There were some wording changes to improve clarity and inclusion of more detailed guidance on vernal pool mitigation.

There are several notable changes in the new guidance. It is now structured as overall compensatory mitigation guidance and the mitigation plan checklist and checklist directions are only a portion of that guidance. Although the majority of compensatory mitigation we see in New England is for impacts to non-tidal wetlands, there is recognition that other aquatic resources are frequently impacted and have specific mitigation needs. There are now specific sections of the guidance that relate to mitigating impacts to tidal wetlands, vernal pools, stream systems, and areas of submerged aquatic vegetation. In addition, there are compensation ratios for different types of secondary and temporary impacts.

Preliminary review of the compensatory mitigation guidance revisions 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.

Any questions regarding the District checklist and guidance should be directed to Ruth Ladd at ruth.m.ladd@usace.army.mil, (978) 318-8818, (800) 343-4789, or, if calling from within Massachusetts, (800) 362-4367.

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US Army Corps of Engineers®
New England District

NEW ENGLAND DISTRICT COMPENSATORY MITIGATION GUIDANCE

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I. GENERAL GUIDANCE

1. Purpose and General Considerations

Applicants should contact the Corps prior to initiation of mitigation site selection and mitigation plan development because mitigation requirements are project-specific and appropriate site selection is critical to mitigation success. This New England District Guidance is for use when the Corps determines compensatory mitigation is appropriate for a particular project. This represents New England District policy and incorporates the requirements of the following documents:

1. Compensatory Mitigation for Losses of Aquatic Resources; Final Rule 4/10/08; 33 CFR Parts 325 and 332 ("Mitigation Rule") (**http://www.usace.army.mil/CECW/Pages/final_cmr.aspx**)
2. Regulatory Guidance Letter 08-03: Minimum Monitoring Requirements for Compensatory Mitigation Projects Involving the Restoration, Establishment, and/or Enhancement of Aquatic Resources (**http://www.usace.army.mil/CECW/Documents/cecwo/reg/rgls/rgl08_03.pdf**)

The Council on Environmental Quality (CEQ) has defined mitigation in its regulations at 40 CFR 1508.20 to include: avoiding impacts, minimizing impacts, rectifying impacts, reducing impacts over time, and compensating for impacts. The Clean Water Act Section 404(b)(1) Guidelines establish environmental criteria which must be met for activities to be permitted under Section 404, including sequencing to reduce project impacts on the aquatic environment. This sequencing hierarchy starts with avoiding impacts to aquatic resources to the extent practicable, minimizing unavoidable impacts, and finally, compensating for any remaining impacts to aquatic resources. Both the U.S. Army Corps of Engineers and the U.S. Environmental Protection Agency have a national goal of no overall net loss of wetland functions, as explained in the agencies' 1990 Memorandum of Understanding (http://www.usace.army.mil/cw/cecwo/reg/mou/mitigate.htm) and the Mitigation Rule. This goal is achieved through compensatory mitigation of aquatic resource impacts. Compensatory mitigation may be accomplished via mitigation banks or in-lieu fee programs where they exist, or through permittee-responsible mitigation. These guidelines use the terms "mitigation" and "compensation" interchangeably to refer to compensatory mitigation.

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 and ability to replace impacted functions.

It is important to note that there is flexibility in this guidance. When variances are necessary, the proposed mitigation plan should provide a simple explanation of the rationale. However, some items are required by regulation 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, commonsense oversight during construction by a person well versed in wetland or other applicable science (e.g., stream morphology, submerged aquatic vegetation ecology, vernal pool ecology), and effective and comprehensive problem resolution (e.g., invasive species removal).

The checklists and checklist directions are intended to help focus mitigation plans on the topics, items, and specific information needed for the Corps to perform a thorough review of proposed mitigation. The general checklist is intended for use with all projects, while the specific aquatic resource checklists are designed to note the required information unique to each resource.

2. Definitions

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

Coastal ecologist: A biologist that studies the interaction of biological organisms with the coastal environment. The applicant should work with the Corps Project Manager to determine the appropriate expertise for the "coastal ecologist" needed to oversee a particular project. For example, they should have expertise and practical experience in subtidal habitats for projects involving subtidal habitats.

Compensatory mitigation: 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 provided by the permittee or a third party through a mitigation bank or in-lieu fee program.

Cultivars: Non-native species or varieties which are developed for cultivation (e.g., agriculture, landscaping).

Exotic species: Used in this context the same as non-native species - species not native to New England, and usually not native to North America.

Herbivore: Any animal that primarily feeds on living plants.

Hydrogeomorphic (HGM) Classification: The Hydrogeomorphic wetland classification system is based on geomorphic position and hydrologic characteristics to group wetlands into seven different wetland classes as defined by Brinson (1993).

Invasive species: Native and non-native species which aggressively move into areas, especially sites that are disturbed, and crowd out less aggressive native species. This often results in a monoculture of the invasive species.

Mitigation in relation to S.404: While federal mitigation includes sequencing from avoidance to minimization to, finally, compensation, the term is frequently used instead of "compensation," including in this document.

Secondary impacts: Secondary impacts are effects on an aquatic ecosystem that are associated with a discharge of dredged or fill materials, but do not result from the actual placement of the dredged or fill material (40 CFR 230.11(h)).

Temporal loss: The time lag between the loss of aquatic resource FUNCTIONS caused by the permitted impacts and the replacement of aquatic resource functions at the compensatory mitigation site(s) (33 CFR 332.2).

Wetlands creation: The transformation of upland or deepwater habitat to wetland at a site where there is no evidence that it was previously wetlands. It is sometimes referred to as "establishment." Wetlands creation results in a gain in wetland acreage, however, in the case of use of deepwater habitat, it is not a gain in waters of the U.S.

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. Restoration of an existing wetland's natural functions is sometimes called "rehabilitation." Wetlands enhancement does not result 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. It is sometimes referred to as "re-establishment." Wetlands restoration results in a gain in wetland acreage.

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.

3. General Compensatory Mitigation Requirements

3.a. Temporal Losses

All projects which do not have mitigation in advance of impacts will result in temporal losses which occur as a result of the passage of time between the time when aquatic resource functions are lost to the project impact and when they exist to a similar degree in a compensatory aquatic resource. For example, the wildlife and ecosystem support functions of forested wetlands may take 30-50 years or more to develop and eelgrass habitats are variable by nature and their habitat functions may take 5 years or more to develop (Evans and Short, 2005). Applicants should be aware that additional compensation is likely to be required to offset temporal losses. Wetland 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 involving chemical transformation 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 functions impacted, the type of aquatic resource proposed, the functions intended, and pre-existing conditions that may influence the development of the desired aquatic resource(s). Such compensation may include increased area for aquatic resource creation, restoration, or enhancement or it may be solely additional preservation.

Aquatic resource mitigation is not an exact science; an adaptive management approach is a necessity. If appropriate, trial plots might compare different controls and treatments to help determine the most favorable mitigation strategy. 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.

3.b. General Compensatory Mitigation Concepts

In order to more closely replace impacted functions, in-kind mitigation is generally preferred to out-of-kind mitigation for impacted resources that are not heavily degraded, provided this is appropriate in the landscape. It is important that mitigation be functionally and geographically appropriate in the overall service area - watershed or embayment context, so in-kind mitigation may not be preferred in some situations. Out-of-kind mitigation may be preferred for heavily degraded systems or where it would be more beneficial to the overall watershed (at the U.S.G.S. Hydrologic Unit Code Level 8 or 10) or other appropriate project-specific boundary. Compensation should generally be located where it is most likely to be successful in providing the desired aquatic resource functions, taking into account aquatic habitat diversity, connectivity, and, for wetlands and streams, a natural balance of wetlands and uplands. Compensation should not be located in positions that will be detrimental to the compensation site (e.g., some on-site compensatory mitigation functions may be degraded by proximity to the project). Some functions (e.g.,

floodflow alteration) may need to be mitigated on-site, while others (e.g., wildlife and/or fisheries habitat) should be mitigated off-site in most cases. If more than one compensation site is to be used, they do not need to be contiguous with each other. Again, overall watershed or embayment concerns may affect location of compensatory mitigation projects.

Restoration is the preferred form of compensatory mitigation, but good restoration sites can be hard to find in New England. Restoration, provided there have been no irreversible changes to the hydrology (for wetlands and streams) or water quality (eelgrass), generally has the greatest likelihood of success. It is usually appropriately situated within the landscape. Successful aquatic resource restoration and creation efforts replace impacted aquatic resource acreage/linear feet and function. Enhancement yields some replacement of function based on types of functions enhanced and/or degree of functional enhancement, but it does not result in the replacement of aquatic resource amount (acreage or linear feet). Since this form of mitigation increases levels of functions in existing aquatic systems, a higher ratio is typically required than is required for mitigation involving restoration or creation.

For additional information on planning and implementing successful compensatory mitigation projects, see the National Research Council's "Operational Guidelines for Creating or Restoring Wetlands that are Ecologically Self-Sustaining" (2001). They may be found as Appendix B in the Corps' Regulatory Guidance Letter 02-02 "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" at http://www.usace.army.mil/CECW/Documents/cecwo/reg/rgls/RGL2-02.pdf

3.c. Preservation as Mitigation

Preservation is an important element of every compensatory mitigation project (please see Section I.3.h. on preservation documentation). The created, restored, and enhanced sites should be preserved in perpetuity, along with an appropriate buffer, to ensure the long term viability of these compensatory mitigation sites. In order to meet the goal of no net loss of wetland functions, the Corps expects mitigation comprised solely of preservation to be acceptable in rare circumstances. While preservation does not replace wetland functions, it does reduce future impacts and degradation to existing wetland functions. For this reason, appropriate preservation-only may be a suitable means of compensatory mitigation in situations where meaningful wetland restoration, creation, and/or enhancement opportunities have been exhaustively explored and do not exist, or are not practicable or ecologically desirable. When looking for mitigation opportunities, the geographic area of consideration is expected to be broad. If an exhaustive search of other conventional mitigation options yields a lack of additional mitigation opportunities, an applicant should work with the Corps and other agencies to develop a suitable preservation package.

In its discussion of preservation, the Mitigation Rule states (at 33 CFR 332.3(h)) that:

> (1) Preservation may be used to provide compensatory mitigation for activities authorized by DA [Department of Army] permits when all the following criteria are met:
>
> (i) The resources to be preserved provide important physical, chemical, or biological functions for the watershed;
>
> (ii) The resources to be preserved contribute significantly to the ecological sustainability of the watershed. In determining the contribution of those resources to the ecological sustainability of the watershed, the district engineer must use appropriate quantitative assessment tools, where available;
>
> (iii) Preservation is determined by the district engineer to be appropriate and practicable;
>
> (iv) The resources are under threat of destruction or adverse modifications; and
>
> (v) The preserved site will be permanently protected through an appropriate real estate or other legal instrument (e.g., easement, title transfer to state resource agency or land trust).
>
> (2) Where preservation is used to provide compensatory mitigation, to the extent appropriate and practicable the preservation shall be done in conjunction with aquatic resource restoration, establishment, and/or enhancement activities. This requirement may be waived by the district engineer where preservation has been identified as a high priority using a watershed approach described in paragraph (c) of this section, but compensation ratios shall be higher.

Following this guidance, suitable preservation as compensatory mitigation should make sense in the watershed context, provide protection of important aquatic resources, and be sustainable in the long-term (e.g., be near other protected resources to provide appropriate ecological continuities). Due to wetlands laws in all of the New England states that reduce development pressure on wetlands, New England District encourages upland preservation that protects aquatic functions over wetlands-only preservation.

3.d. <u>Effective Replacement of Functions</u>

Applicants should expect that more than 1:1 acreage replacement will usually be deemed appropriate. The replacement ratio is based on several factors, including: the aquatic resource functions that are impacted, the reasonably likely functions to be established, the temporal loss of functions, and a "safety factor." The baseline included in the New England District ratios (see I.3.g. below) addresses the expected reduction in specific functions (fish and/or wildlife habitat, water quality functions performed by soils, etc.) of created or restored aquatic resources in comparison with naturally occurring aquatic resources. It also includes a safety factor to allow for

some degree of failure. Our experience shows that some portions of most mitigation sites fail to establish the required aquatic resource features or, in the case of wetlands, fail to develop the appropriate hydrology which diminishes many resulting wetland functions.

3.e. Mitigation Site Selection

The Mitigation Rule includes the following requirements for site selection (33 CFR 332.3(d)):

> (1) The compensatory mitigation project site must be ecologically suitable for providing the desired aquatic resource functions. In determining the ecological suitability of the compensatory mitigation project site, the district engineer must consider, to the extent practicable, the following factors:
>
> (i) Hydrological conditions, soil characteristics, and other physical and chemical characteristics;
>
> (ii) Watershed-scale features, such as aquatic habitat diversity, habitat connectivity, and other landscape scale functions;
>
> (iii) The size and location of the compensatory mitigation site relative to hydrologic sources (including the availability of water rights) and other ecological features;
>
> (iv) Compatibility with adjacent land uses and watershed management plans;
>
> (v) Reasonably foreseeable effects the compensatory mitigation project will have on ecologically important aquatic or terrestrial resources (e.g., shallow sub-tidal habitat, mature forests), cultural sites, or habitat for federally- or state-listed threatened and endangered species; and
>
> (vi) Other relevant factors including, but not limited to, development trends, anticipated land use changes, habitat status and trends, the relative locations of the impact and mitigation sites in the stream network, local or regional goals for the restoration or protection of particular habitat types or functions (e.g., re-establishment of habitat corridors or habitat for species of concern), water quality goals, floodplain management goals, and the relative potential for chemical contamination of the aquatic resources.

Whenever possible, locate the mitigation site in a setting of comparable landscape position and hydrogeomorphic (HGM) class (riverine, depressional, lacustrine fringe, tidal fringe, mineral flats, organic flats, and slopes) and subclass as the impacted aquatic resource. The HGM classification relates to the landscape position and water source of the aquatic resource. These features affect the functions that the aquatic resource performs and should therefore be used as a guide for developing compensatory aquatic resources intended to duplicate the impacted functions. Slope

discharge wetlands will function very differently than precipitation-driven depressional wetlands. Functions relating to groundwater recharge/discharge, water quantity attenuation, nutrient/sediment/ toxicant retention, and even fish and wildlife habitat are affected by the location in the landscape of the aquatic resource and the way the water moves into and out of the site.

Seek to duplicate the features of reference wetlands or enhance connectivity with adjacent natural upland and wetland landscape elements. Select sites that are, and will continue to be, resistant to disturbance from the surrounding landscape, by locating the mitigation site to take advantage of refuges, buffers, green spaces, and other preserved elements of the landscape.

Long-term sustainability is a key feature of successful wetland mitigation and thus, protecting the site from degradation. Wherever possible, select sites where wetlands previously existed and/or where nearby wetlands currently exist. Restoration is frequently more feasible and sustainable than creation of wetlands. However, in some cases, long-term sustainability of restored functions is not feasible due to degradation of the overall landscape. In such cases, out of kind mitigation may be appropriate to achieve long-term sustainability. Applicants should consider both current and expected future hydrology (including effects of any proposed manipulations and sea level rise), 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, applicants must 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.

Degraded habitats are favored compensation locations; however, the potential for invasive species establishment should be taken into consideration when evaluating appropriateness for mitigation. Also, habitat degradation varies over a wide range, and so must flexibility in developing mitigation at such sites. Creation and restoration sites should not result in the degradation or destruction of valuable uplands. For example, mature forested uplands and other non-degraded uplands are generally inappropriate for use as wetland creation sites. Likewise, creation and restoration of eelgrass habitats should avoid bottom habitats that already have valuable aquatic functions. In addition, the presence of nearby eelgrass habitat actually argues against creating new habitat in that location as the expectation is that the eelgrass would spread to the adjacent unvegetated bottom anyway.

Surrounding land use/plans, including probable future land use - Consider current and future landscape features or public issues that may control or influence design.

Consider the effect of the mitigation site on roads, rights-of-way, site access, and utilities, as well as on drainage, including the potential for flooding both upstream and downstream of the site. Also consider the potential effect of adjoining land uses, including agriculture, residential, and industrial uses, roads, rights-of-way, utilities, and drainage easements on the mitigation site and its success and functions. Urbanization of the watershed may increase runoff and nutrient inputs from stormwater and septic systems. Both sources can degrade water clarity and quality, impacting submerged aquatic vegetation habitats. Identify the location and approximate extent of any existing, adjacent special aquatic sites. Consider whether there are riparian areas along waterways where water quality may be enhanced, or whether there are adjacent woodlands that may buffer aquatic resources from less compatible land uses.

Stormwater Basins - Typically, detention/retention basins are not appropriate for use as compensatory mitigation. Their construction results from requirements of the constructed project to mitigate stormwater concerns for the project itself, not address the lost functions of the impacted wetlands. In addition, they often require frequent maintenance to retain functionality, decreasing their ability to develop a full suite of wetland functions. However, detention/retention basins can serve to minimize the adverse effects of a project on nearby wetlands and waters, provided that the stormwater management system will be maintained for the life of the project.

Other Site Selection Considerations

There are a variety of other considerations which should be taken into account in mitigation site selection. These include watershed-scale features, size and location of sites relative to water sources, compatibility with adjacent land uses and watershed plans, foreseeable effects of mitigation on ecologically important resources, and development trends and anticipated land use changes.

3.f. Difficult to Replace Aquatic Resources

Some types of aquatic resources are “difficult-to-replace.” They include, but are not limited to: bogs, fens, springs, streams, and Atlantic white cedar swamps. Impacts to such resources should generally not be compensated for by using in-kind creation as success is too uncertain.

3.g. Amount of Compensatory Mitigation

Like many Corps districts around the country, New England District has developed standard compensatory mitigation ratios to serve as a starting point for developing adequate compensatory mitigation. These ratios provide guidance for all compensatory aquatic resource mitigation required by New England District. They are particularly designed for direct permanent impacts, with additional mitigation required to address temporary fill impacts and secondary impacts (effects on an aquatic ecosystem that are associated with a discharge of dredged or fill materials,

but do not result from the actual placement of the dredged or fill material, e.g., fragmenting wildlife habitat, alteration of hydrology, removal of vegetation, degraded water quality, increased turbidity, increased biological stressors, etc.) on another scale. The ratios are based on:

- Complexity of system impacted,
- Likelihood of mitigation success,
- Degree to which functions are replaced, and
- Temporal losses for certain functions (e.g., water quality renovation, wildlife habitat).

These guidelines represent policy guidance for the New England District. As such, they are not intended to represent a binding regulation, and are not intended to be enforceable against the Army Corps of Engineers by third parties. While these ratios are the starting point for developing appropriate compensatory mitigation, there continues to be flexibility on a project-by-project basis in order to achieve the most appropriate mitigation for a specific project and, based on the facts of a particular situation, permit decisions may result in different requirements than the ratios set forth in this document. The functions and levels of functions impacted are important in determining adequate and appropriate compensation. Some of the factors to be considered in developing the project-specific compensation include:

- The functions provided by the proposed impact site (including the level of those functions).
- The functions provided by the proposed compensatory mitigation project (including the estimated level of those functions upon completion of construction and completion of the monitoring period – as opposed to the level of functions at the site's "maturity" which may be decades in the future).
- Temporal losses of aquatic resource functions.
- The method of compensatory mitigation (e.g., restoration, creation).
- The likelihood that the compensatory mitigation project will attain the performance goals.
- Any risks and/or uncertainties associated with the proposed compensatory mitigation project.
- The distance between the impact site and the compensatory mitigation project site, particularly if they are in different HUC-8 watersheds or ecoregions.
- The relationship between the impacted watershed and the watershed served by the mitigation project.

This flexibility may lead to compensatory mitigation deemed adequate and appropriate which is at different ratios than included here. Project-specific ratios may be lower than depicted here, or they may be higher so that unavoidable impacts to high quality wetlands may be adequately mitigated and/or secondary impacts may be addressed. Proven mitigation methods and confidence that the proposed plan substantially reduces the risks inherent in wetland construction may also be

considered in determining the appropriate ratios for a specific project. The New England District will also work closely with state regulatory agencies to achieve as much consistency as possible, given differing state and federal legislative and program requirements; however, these guidelines are designed to meet the federal compensation requirements and may not meet state requirements.

Recommended Ratios for Direct Permanent Impacts (Table 1)

It is extremely important to mitigate for affected functions, generally by replacing the same type of system impacted. This will vary with watershed and landscape considerations; the mitigation should be functionally and geographically appropriate. The ratios are based on the type of aquatic resource impacted, not the type of aquatic resource proposed for compensation. They were developed with the presumption of in-kind compensation (which will not always be appropriate) and ranges are meant to reflect the quality of aquatic resource and the level of functions impacted. In cases where out-of-kind compensation is performed, project-specific ratios will be developed.

Several specific types of systems (e.g., vernal pools, riffle and pool complexes) are not specified here as they will generally require resource-specific and project-specific compensation.

The proximity of impaired waters will be considered. Greater mitigation ratios may be needed for projects near impaired waters to protect water quality. Impaired waters are those waters which do not meet state water quality standards (even after point sources of pollution have installed the minimum required levels of pollution control technology). It is the responsibility of the applicant to identify whether a project is in the vicinity of a designated impaired water by referring to a state's or tribe's Clean Water Act Section 303(d) list and/or maps of impaired waters.

In the case of eelgrass habitat, degraded water quality will be a major determining factor in whether a mitigation project achieves success. When an applicant proposes a mitigation project in designated impaired waters, the expected lower success rate will be considered. Hence, locating eelgrass mitigation in impaired waters should be contemplated only after all other alternative sites have been ruled out.

Recommended Mitigation for Temporary and/or Secondary Impacts (Table 2)

Impacts to aquatic resource functions resulting from temporary placement of fill or as a secondary impact of the permanent or temporary placement of fill can be substantial. In most cases, it will be necessary to compensate for such temporary and secondary impacts to prevent a net loss in aquatic resource functions. Corps regulations published in the March 12, 2007 Federal Register state in C.20(h): "Where certain functions and services of waters of the United States are permanently affected, such as the conversion of a forested or scrub-shrub wetland to a herbaceous wetland in a permanently maintained utility line right-of-way, mitigation

may be required to reduce the adverse effects of the project…." In temporary fill situations, although the fill remains in place only temporarily, impacts typically remain after the fill is removed. For example, there may be shearing caused by pressure on organic or fine-grained soils which presses the soil outward, causing upheaval. There may also be compaction which can result in changes to movement of subsurface and/or surface water and conversion of wetland type within and/or adjacent to the temporary fill area. There may be conversion to upland in upheaval areas. If an applicant feels they can avoid these impacts, they can elect to refute the presumption of impacts requiring compensation by performing monitoring. This would involve collecting data on pre-construction conditions (elevations to 0.5', vegetative community composition and type, hydrologic regime such as saturated to surface or inundated) within the footprint and 25' on each side and then repeating that annually during the growing season for five years after the temporary fill is removed. If, after five years (or less), the data show long-term or permanent impacts, compensation will be required. Funds should be held in escrow for this possibility. NOTE: The monitoring may only obviate the need for compensation for the impacts of the temporary fill; any temporary conversion of forest will still require compensation.

Recommendations for mitigation for temporary (in addition to restoration in place) and secondary impacts are expressed as ranges of percentages of the mitigation recommended for direct, permanent impacts. There are several factors to consider when applying the ranges to determine the appropriate level of mitigation for a specific project. Factors to consider for:

- Removal of forested wetland vegetation include density and diversity of original woody vegetation, soil type (organic or mineral), effects of substrate compression, work during frozen conditions only, original aerial cover, presence/absence of exemplary vegetative community, threatened and endangered species habitat, length of time fill will be in place, likelihood of shearing causing upheaval, etc. Habitat is presumed to be the principal function affected but there may also be changes in soil temperature, a window of opportunity for invasion by exotic species, temporary reduction in biomass and carbon sequestration, and changes to hydrology as a result of reductions in evapotranspiration. Compensatory mitigation addresses temporal impacts during the time temporary fill is in place and during forest re-establishment.
- Temporary and secondary impacts to scrub-shrub and emergent wetlands, factors to consider include soil type, effects of substrate compression, work during frozen conditions only, presence/absence of exemplary vegetative community, threatened and endangered species habitat, length of time fill will be in place, likelihood of shearing causing upheaval, etc.
- Vernal pool buffer impacts, factors to consider include original aerial cover, relationship to other vernal pools, etc.

TABLE 1 - RECOMMENDED COMPENSATORY MITIGATION RATIOS FOR DIRECT PERMANENT IMPACTS

Mitigation / Impacts	**Restoration[1] (re-establishment)**	**Creation (establishment)**	**Enhancement (rehabilitation)**	**Preservation (protection/ management)**
Emergent Wetlands (ac)	2:1	2:1 to 3:1	3:1 to 10:1[2]	15:1
Scrub-shrub Wetlands (ac)	2:1	2:1 to 3:1	3:1 to 10:1[2]	15:1
Forested Wetlands (ac)	2:1 to 3:1	3:1 to 4:1	5:1 to 10:1[2]	15:1
Open Water (ac)	1:1	1:1	project specific[3]	project specific
Submerged Aquatic Vegetation (ac)	5:1	project specific[4]	project specific[5]	N/A
Streams[6] (lf)	2:1[7]	N/A	3:1 to 5:1[8]	10:1 to 15:1[9]
Mudflat (ac)	2:1 to 3:1	2:1 to 3:1	project specific	project specific
***Upland*[10] (ac)**	≥10:1[11]	N/A	project specific	15:1[12]

[1] Assumes no irreversible change has occurred to the hydrology. If there has been such a change, then the corresponding creation ratio should be used.
[2] Based on types of functions enhanced and/or degree of functional enhancement.
[3] Might include planting submerged and/or floating aquatics and/or removal of invasive species.
[4] Rare cases, e.g., removal of uplands, old fill, etc.
[5] E.g., remove pollutant source such as an outfall, remove moorings.
[6] Note that this assumes both banks will be restored/enhanced/protected. If only one bank will be restored/ enhanced/protected, use half the linear foot credit.
[7] E.g., daylighting stream, elimination of concrete channel.
[8] Enhancement of denuded banks and channelized streams = 3:1.
Enhancement of denuded banks when there is a natural channel = 4:1.
Enhancement when there are vegetated banks but the stream has been channelized = 5:1.
[9] Preserving buffer within the 100-foot minimum from channel = 10:1.
Preserving additional buffer 100 to 250 feet from channel = 15:1.
[10] This is when upland is used for wetland mitigation, NOT mitigation for upland impacts, which are not regulated.
[11] Only applies if existing condition is pavement or structure AND should complement aquatic functions.
[12] 100' upland buffer recommended for restoration, creation, and enhancement sites would be credited here.

TABLE 2 - RECOMMENDED COMPENSATORY MITIGATION FOR TEMPORARY AND/OR SECONDARY IMPACTS

IMPACT	% OF STANDARD[13] AMOUNT[14]
Temporary fill (swamp mats, fill over membrane) in forested wetlands; area to revegetate to forest.	10-25%
Temporary fill in emergent or scrub-shrub; area to revert to previous condition.	5-20%
Temporary fill in forest and will be permanently converted to scrub-shrub or emergent	15-45%[15]
Permanent conversion of forested wetlands to other cover types	15-40%
Removal of forested wetland cover for new corridor	Project specific
Removal of forested cover of vernal pool buffer (w/in 250' of pool) when percentage of disturbance exceeds 25% of the total VP buffer area	Project specific[16]
Streams – clearing of upland forest and/or scrub-shrub vegetation within 100' of stream bank or outermost channel of braided stream	Project specific[17]
Wetlands within subdivisions	Project specific

[13] "Standard" refers to amount of compensation that would be recommended under either the Corps' mitigation ratios for permanent fill (TABLE 1) or that required in In-lieu fee payments using the standard calculation.
[14] Percentages may be reduced if appropriate project-specific BMPs are incorporated into the project.
[15] For widening existing corridors only, not new. This does not take into account fragmentation impacts.
[16] Considerations in determining appropriate mitigation for secondary impacts to vernal pools should be on overall impact to the upland vernal pool buffer and how this affects the functions of the pool.
[17] Considerations in determining appropriate mitigation for secondary impacts to streams from loss of upland buffer should be on overall impact to the upland stream buffer and how this affects the functions of the stream.

- Stream buffer impacts include distance of impact from stream, width of impact, original aerial cover, etc. Secondary impacts may include water temperature, water quality, fish and wildlife habitat (including travel corridors), production export, and streambank stabilization.

A sample hypothetical calculation of appropriate mitigation using the ratio guidance is posted on the New England District website: http://www.nae.usace.army.mil/reg/index.htm under "Mitigation."

3.h. Preservation Documentation

There are numerous forms of preservation documents. They include fee transfer to another entity such as a non-profit conservation organization or public agency with a conservation mandate, easement given to a non-profit conservation organization or public agency with a conservation mandate, deed restriction, or restrictive covenant. The form should be specified in the text and a copy of the draft document(s) included. Fee transfer with third party enforced conservation covenants or conservation easements is preferred. Deed restrictions are discouraged as they are difficult to enforce and may be easily changed.

3.i. Buffers

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 but it will be rare that a buffer less than 100 feet in width will be adequate. Buffers greater than 100 feet in width are generally encouraged. Usually buffers will consist of uplands but wetlands also may serve that function in some situations. Vernal pools require a substantial area of adjacent forested terrestrial habitat (both upland and wetland) in order to adequately support vernal pool dependent wildlife. The buffer requirements for projects involving vernal pools may be greater than 100 feet in width.

Compensatory mitigation that involves restoration, creation, and enhancement benefits greatly from the presence of upland buffer to prevent site degradation resulting from nearby activities and enhances long-term sustainability. This buffer area would count toward upland preservation mitigation credit. A preserved buffer of a minimum of 100' from each bank is recommended for stream restoration and enhancement projects, but may be smaller based on landscape features. Eelgrass also benefits from the protection of headwater streams, nearby lands, and adjacent bottom habitat but the potential for compensation credit will be dependent upon site and project-specific circumstances.

3.j. Relationship to Other Federal, Tribal, State, and Local Programs

Occasionally there are conflicts between requirements of the Corps and those of state and/or local agencies. Applicants should notify the Corps when this situation arises and the Corps will work with all parties to avoid or minimize duplication of effort and meet agency requirements. Normally, use of the most rigorous standard has been acceptable to all agencies. However, the amount, type, and location of compensatory mitigation required by the Corps can differ substantially from that required by other federal, tribal, state, and local programs.

3.k. Party(ies) Responsible for Compensatory Mitigation

The Mitigation Rule requires that the entities responsible for the implementation, performance, and long-term management of the mitigation project be listed.

3.l. Timing

Whenever feasible, mitigation construction should be in advance of or concurrent with the authorized impacts.

3.m. Financial Assurances

Financial assurances are to ensure a high level of confidence that the project will be completed and achieve the goals intended. Depending on the timing, certainty (or lack of same), difficulty of the compensation, and the track record of the applicant, financial assurances, particularly performance bonds, letters of credits, or escrow accounts, may be required for all aspects of the mitigation (acquisition, construction, and monitoring—including remediation).

In addition, endowments to provide a funding source in perpetuity to long-term stewards are generally encouraged.

Government entities which are unable to provide performance bonds, or similar assurances, should provide a formal, documented commitment that covers all aspects of the mitigation, especially monitoring and remedial activities.

Financial assurances may be phased out, with written approval by the Corps, as various stages of the project are deemed complete and successful according to specified conditions linked to performance standards, adaptive management, or compliance with special conditions.

4. Planning and Documentation – Mitigation Plan

The Mitigation Rule requires that the public notice for an individual permit contain a statement explaining how impacts associated with the proposed activity are proposed to be avoided, minimized, and compensated for. This would include the amount,

type, and location of proposed compensatory mitigation, including if any is out-of-kind.

The Mitigation Rule requires that the following items be incorporated into final mitigation plans:

- Objectives
- Site Selection
- Site protection instrument
- Baseline information
- Determination of credits (how the project will provide the required compensation for unavoidable impacts)
- Mitigation work plan
- Maintenance plan
- Performance standards
- Monitoring requirements
- Long-term management plan
- Adaptive management plan
- Financial assurances

See Section IV for specific mitigation plan data needs.

4.a. 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. Appendices B and C are examples of useful presentations of data. Submissions in portable document format (pdf) and GIS polygon files (shapefile, geodatabase, or other GIS format) are strongly encouraged.

4.b. Hydrological Considerations

The emphasis should be on establishing naturally variable hydrology. This includes fluctuations in water flow, depth, duration, and/or frequency. Hydrology within the mitigation site should be comparable to a reference aquatic resource within the same landscape setting (HGM type). Reestablishment of natural hydrology is encouraged; active engineered devices are discouraged. When natural hydrology is not feasible, consider passive structures to sustain the desired hydroperiod over the long term. Avoid designing a system that depends on water-control structures or other infrastructure that must be maintained in perpetuity in order to provide the necessary hydrology. In situations where direct or in-kind replacement is desired, mitigation sites should have the same basic hydrological attributes as the impacted site.

Essential hydrology may not be immediately available. For example, a stream diversion portion of a project may be completed after the mitigation grading construction, thus the portion of the stream diversion intended to flow to the mitigation site will not be directed there immediately. It is appropriate to factor the availability of that water in the timing of any plantings.

Monitoring Wells - Note that monitoring wells may not be necessary if other data are adequate. If you are considering monitoring wells, you should discuss this issue with Corps staff to clarify the need and nature of the data prior to installation.

Note that there is an important difference between monitoring wells and piezometers, both of which provide useful information. Since accurate placement and installation of monitoring wells and/or piezometers affects the accuracy and usefulness of the data, details on the uses for and installation of both of these types of wells are available in two documents prepared by the Engineers Research and Development Center's (ERDC) Environmental Lab, previously known as the Waterways Experiment Station (WES):

- "Installing Monitoring Wells/Piezometers in Wetlands", ERDC TN-WRAP-00-02, can be found at: **http://el.erdc.usace.army.mil/wrap/pdf/tnwrap00-2.pdf**,

- "Technical Standard for Water-Table Monitoring of Potential Wetland Sites", ERDC TN-WRAP-05-02, can be found at: **http://el.erdc.usace.army.mil/wrap/pdf/tnwrap05-2.pdf** .

If monitoring wells are used and the site is adjacent to a wetland system, installation of at least one well in the adjacent system may provide useful information on the relationship of the water table in the wetland to the one in the proposed mitigation site.

Precipitation data is available on the Internet. Sites include **http://water.weather.gov** under the appropriate Eastern Region Weather Forecast Office and the Northeast Regional Climate Center (**http://www.nrcc.cornell.edu**).

4.c. Microtopography

Note that natural wetland systems, particularly those with trees and/or shrubs, typically have an intricate pattern of topographic relief. Created or restored areas should have variability (elevational and size) similar to the impacted resource or a suitable reference area.

4.d. Soil

Manmade topsoil shall consist of a mixture of equal volumes of organic and mineral materials. Well-decomposed clean leaf compost is the preferred soil amendment to

achieve these standards. Note that "clean" refers both to a negligible amount of physical contaminants such as plastic and to the lack of chemical contaminants that might pose a hazard to plants or animals. 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. Note, however, that compost or other organic matter should be clean and free of weed seeds, specifically the seeds of the species listed in Appendix D. Commercial peat is not recommended for soil amendments as its harvesting methods are generally destructive to wetlands. Caution should be used when using non-commercial peat salvaged from project impact sites as the chemical composition of that material may not be adequately buffered against phytotoxic levels of pH.

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 if in a layer of adequate thickness. The Field Indicators for Identifying Hydric Soils in New England (New England Hydric Soils Technical Committee, 2004, 3rd ed.) glossary defines the criteria for these classifications based on their organic *carbon* contents. A minimum organic *carbon* content of 4-12% (7 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 percent organic *matte*r by 1.72 to get percent organic *carbon* content and multiply percent organic *carbon* by 1.72 to get percent organic *matter* content[18]:

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

Scrub-shrub and forested wetlands should have about 12% organic carbon; emergent wetlands in permanently or semi-permanently inundated areas may only need 4-6%. Under certain circumstances, increased organic matter can lead to acidification of the soil, which damages the soil microbial community and the vegetation. Care should be taken to properly evaluate the soil and hydrology proposed for a site to prevent this from occurring.

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 sand, silt, and clay particles. The landscaping term is not a scientific term and should be avoided.

When topsoil must be stockpiled on site, the plan should include plans for maintaining moisture in the soil. The following measures are suggested for the contractor doing the work:

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

- Soil should not be stockpiled in wetlands or waters
- Seek approval for location of stockpiled materials (from owner/engineer);
- Avoid stockpiling compost organics in piles over 4 feet in height;
- Protect stockpiles from surface water flow and contain them with hay bales and/or silt fence;
- Cover stockpiles with a material that prevents erosion (tarps, erosion control mat, straw and temporary seed, depending on size and duration of storage)
- Inspect and repair protection measures listed above regularly (weekly), as well as prior to (to the extent possible) and after storm events.
- Maintain moisture in the soils during droughty periods.

Soil Compaction - Soil compaction by heavy machinery may adversely affect plantings and/or may result in perching of water. Therefore, efforts should be made to minimize soil compaction area during grading of the mitigation site. If use of heavy machinery cannot be avoided, compaction must be addressed by disking or some other treatment to loosen the soil surface. Finer grained soils are more susceptible to compaction than more coarsely grained soils, so clayey soils should not be worked at all except in extremely dry condition. Similar consideration should be given while spreading the topsoil.

4.e. Planting (for Wetlands, Vernal Pools, and Stream Riparian Areas)

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 a temporary measure 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 or 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 methods 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. There are at least two methods available: biodegradable plastic or fiber (which should be stapled

or staked to the ground) or organic mulch. Note that organic mulch is not considered to be part of the organic content of the topsoil and it should not be used in locations that will be inundated as it may float away. Suggested specifications for organic mulching are as follows:

- Mulch balled and burlaped 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.

Planting Density - 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.

Plant Species - Native planting stock scavenged from the immediate vicinity of the project is ideal as it minimizes the threat to native diversity. Salvaging native plants from wetlands and uplands cleared by the project is strongly encouraged. Transplanting entire blocks of vegetation with several inches of the original wetland soil substrate from the impact areas has been found effective in establishing mitigation wetlands. However, beware of the potential for transplanting invasive species.

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.

No cultivars shall be used. Beware of stock identified as a native species which is actually a cultivar or non-native species (e.g., there have been numerous instances around New England of *Alnus incana* or *Alnus rugosa* labels appearing on seedlings of non-native *Alnus glutinosa*).

Non-native or otherwise unacceptable species are listed in Appendix D[19] and are not to be included as seed or planting stock in the overall project. Many of these species may not need to be actively removed from the site. Exceptions are included below in the discussion of invasive species. More may be added by the Corps on a case-by-case basis.

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

The Emerald Ash-Borer (http://www.emeraldashborer.info/), an insect species that is damaging to ashes, especially green ash (*Fraxinus pennsylvanicus*), is moving toward New England. Therefore, consideration of this should be made before incorporating ash (*Fraxinus* spp.) into planting plans. The Asian Longhorned Beetle (http://www.ct.gov/dep/cwp/view.asp?a=2697&q=421754&depNAV_GID=1631&pp=12&n=1) and other invertebrate pests may be problems in certain areas and/or on specific species.

Herbivory - Herbivory by white tailed deer, rodents (e.g., meadow voles, beaver), and rabbits can adversely impact forest stand development. Rodents frequently girdle seedlings, increasing mortality of plantings. Herbivory by Canada geese has impaired establishment of both herbaceous and woody communities in agricultural and old field settings, as well as in salt marshes. Mute swans (*Cygnus alor*) cause significant damage to submerged aquatic beds throughout Long Island Sound. Herbivory from invasive species like the green crab (*Carcinus maenas*) has been shown to extirpate naturally occurring or created eelgrass beds (Williams 2007). Measures that have been used to address herbivory, with mixed success, include the use of tree tubes, fencing, nurse crops, trapping, hunting, chemical deterrents, attracting predators, removing cover for herbivores, planting browse-tolerant coppicing shrubs (e.g., willows and alders), etc.

4.f. Invasive Species

There is growing recognition of the negative impact that invasive species have on the environment, economy, and health of the United States[20]. Projects should avoid introducing or increasing the risk of invasion by unwanted plants (such as those species listed 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; these may result from excavation or filling. In addition, construction equipment can be a source of contamination and should be thoroughly cleaned prior to arrival on the project site (http://www.usbr.gov/pps/EquipmentInspectionandCleaningManual_Sept09.pdf). Invasive species often get a foothold along project drainage features where the dynamics of erosion and accretion prevail. Along salt marshes, be especially alert to the project's influence on freshwater runoff. Frequently, *Phragmites australis* invasion is an unanticipated consequence of freshwater intrusion into the salt marsh. Information from the Invasive Plants Atlas of New England is available at: http://nbii-nin.ciesin.columbia.edu/ipane/. It should also be noted that, although relatively rare, there are populations of native *Phragmites australis* (*P.a.* ssp. *americanus*) throughout New England and these plants should be conserved, rather than controlled (http://ian.umces.edu/pdfs/iannewsletter7.pdf, http://www.invasiveplants.net/phragmites/phrag/morph.htm).

[20] U.S. Army Corps of Engineers Invasive Species Policy (2 June 2009)

In the case of eelgrass habitat, non-native species can negatively impact the establishment and persistence of mitigation beds through herbivory, encrusting growth on shoots, physical disturbance, etc. Common invasive species in these habitats include green crabs, mute swans, colonial tunicates, and bryozoans (Williams 2007).

Because of the pervasiveness of invasive species in New England and the damage they do to aquatic resources, the Mitigation Plan must include an Invasive Species Control Plan (ISCP). The ISCP should:

- Discuss the risk of colonization by invasive species (plant and/or animal). The discussion of risk should include an assessment of the potential for invasion of the wetland by the species listed below or other identified problematic species specific to this project or site. The assessment of risk should consider the local and regional backdrop of invasive species, the potential mechanisms for the spread of invasives (e.g., contaminated equipment and machinery), the potential virulence and responsiveness to control of the species.

- 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 will be a factor in developing a plan to control an invasive plant species. If there are no constraints, this should be stated.

- Describe the strategies to prevent the introduction of invasives and to recognize and eradicate or control the degradation of the mitigation site by invasive or non-native plant species. The invasion by the following invasive species, and any other species identified as a problem at the project or mitigation sites, should be controlled. See the Corps website http://www.nae.usace.army.mil/reg under "Invasive Species" for some websites providing information on controlling these species. The ISCP should address a full range of practicable measures to minimize threats to wetlands as well as all associated buffers or other habitats that are factored in project impact mitigation. The ISCP should consider traditional control methods including: mechanical (pulling, mowing, or excavating on-site), chemical (herbiciding), and biological (planting fast-growing trees and shrubs for shading or releasing herbivorous insects).

    - Common reed (*Phragmites australis*)
    - Purple loosestrife (*Lythrum salicaria*)
    - Smooth and Common buckthorns (*Frangula alnus*, *Rhamnus cathartica*)
    - Russian and Autumn olives (*Elaeagnus angustifolia* and *E. umbellata*)
    - Multiflora rose (*Rosa multiflora*)
    - Reed canary-grass (*Phalaris arundinacea*)
    - Japanese knotweed (*Fallopia japonica*)

- other species identified as a current or likely problem at the site

In addition to these species, none of the species listed in the "Invasive and Other Unacceptable Plant Species" (Appendix D) should be planted anywhere on the project site. For more information on ISCPs, please see this item on New England District's Regulatory webpage - http://www.nae.usace.army.mil/reg/index.htm

4.g. Coarse Woody Debris

Coarse woody debris includes such materials as logs (ideally, a mix of hardwoods for longevity and softwoods), stumps, smaller branches, and standing snags but not woodchips or mulch made from wood. Placement of this material is generally inappropriate in tidal or frequently flooded environments, and may not be appropriate for some herbaceous systems. 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. Where floodwaters are a factor, it may be practical to anchor or partially bury snags and other larger components of woody debris.

When mitigation requires a component of forest or scrub-shrub habitat, the design should include plans for a continuum of coarse woody debris, including snags (standing dead trees). This continuum should include a full range of sizes, including small twigs and brush, not merely larger logs, stumps, and snags. Woody debris also plays an important role in vernal pool habitat by providing egg mass attachment sites in the pool basin and terrestrial refuges in the adjacent terrestrial habitat.

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 above-ground 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 processes in a healthy 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: if not

properly screened by a wetland scientist, such debris can be a source of invasive species.

4.h. Erosion Controls

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. Silt fences should be removed or cut to ground level when no longer needed.

5. Ecological Performance Standards

In consultation with the Corps, the applicant will develop clear and concise ecological performance standards to be used to assess whether the mitigation project is achieving its objectives. The standards must be based on attributes that are objective and verifiable.

Performance standards may be based on variables or measures of functional capacity, measurements of hydrology, vegetative diversity or physical characteristic (e.g., height, aerial cover, stem counts per specified area) or other aquatic resource characteristics. Another option is to provide comparisons to reference aquatic resources of similar type and landscape position. When practicable, they should take into account the expected stages of aquatic resource development.

6. Monitoring

A thorough monitoring plan is part of an adaptive management program that provides an early indication of potential problems and possible correction actions and is used to determine if the project is meeting its performance standards. Monitoring of aquatic resource structure, processes, and function from the onset of restoration, creation, or enhancement 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 may identify the source of a problem and remedial measures, as well as identifying functional development. Monitoring and control of non-native species should be a part of any effective adaptive management program. Assessment of aquatic resource performance must be integrated with adaptive management. Both require understanding the processes that drive the structure and characteristics of a developing the desired aquatic resource. Simply documenting the structure (i.e., vegetation, sediments, fauna, and nutrients) will not provide the knowledge and guidance required to make adaptive “corrections” when adverse conditions are discovered. Although the full maturation of a compensatory aquatic resource may take many years or even decades, process-based monitoring facilitates adaptive management to insure that the mitigation site is developing along an appropriate trajectory.

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 (monitoring period) to ensure success. Typically, sites proposed to be emergent-only wetlands or submerged aquatic vegetation 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 (years 1, 2, 3, 5, 7, and 10 for the latter), as extended periods for monitoring will be appropriate in some cases. While formal monitoring and submission of reports may not be required every year, some remediation activities (e.g., invasive species control efforts) should continue.

Permit non-compliance can include:

- failure to implement the plan and/or remedial measures;
- failure to achieve the designed aquatic resource types (HGM and/or Cowardin for wetlands);
- failure to submit copies of financial assurances and/or preservation documents;
- failure to submit required monitoring reports, transmittal, and self-certification documents; and
- failure to submit the final assessment document.

If all or part of the mitigation is still deemed unsuccessful at the end of the monitoring period, or recognized during the monitoring period as unlikely to ever succeed, alternative mitigation must be developed to fully compensate for the authorized impacts.

Electronic submission of monitoring reports is strongly encouraged. Portable Document Format is preferred (e.g., Adobe PDF). When submitted in electronic format, there is no restriction for using standard paper sizes. These monitoring reports should be concise and effectively provide the information necessary to assess the status of the compensatory mitigation project. Large, bulky reports containing general information are contrary to national mitigation policy. The concise format for monitoring reports is included in Section IV: Directions for Completing Mitigation Plans, with Checklist. Additional monitoring guidance for specific habitat types is provided in several of the specific aquatic resource type modules.

7. Management

Site Protection

Management includes real estate instruments such as conservation easements (see I.3.h.) held by third parties, generally government agencies with a conservation mission or non-profit conservation organizations. If the site is on federal government land, long-term protection may be provided through federal facility management plans or integrated natural resources management plans. The third party shall have the right to enforce site protections. An endowment shall be provided for the third

party to provide the resources needed to monitor the site and enforce the site protections.

The site protection document shall prohibit incompatible uses that would jeopardize the objectives of the mitigation project.

The document must also contain a provision requiring 60-day advance notification to the Corps before any action is taken to void or modify the instrument, including transfer of title to or establishment of other legal claims to the site(s).

Real estate instruments, management plans, or other long-term protection must be approved by the Corps in advance of, or concurrent with, the authorized impacts.

Adaptive Management

If the project cannot be constructed substantially in accordance with the approved mitigation plan, the permittee must notify the Corps and obtain written approval for changes.

Should a site not meet the ecological performance objectives of the project, the Corps will work with the permittee to determine appropriate measures to remedy the deficiencies. This may include site modifications, design changes, revisions to maintenance requirements, revised monitoring requirements, or use of a different site. Performance standards may be revised in accordance with adaptive management to account for measures taken to address deficiencies. They may also be revised to reflect changes in management strategies and objectives if the new standards provide ecological benefits that are comparable or superior to those originally approved. No other revisions to performance standards will be allowed except in the case of natural disasters.

Long-Term Management/Stewardship

Compensation sites are expected to mitigate impacts "in perpetuity." Since monitoring has a limited timeframe, a willing entity must be found to receive responsibility for the mitigation site(s) associated with a permit. That entity must have the resources and expertise in the long-term management and stewardship of mitigation properties. The final mitigation plan must identify the party responsible for long-term management of the project and should include a long-term management plan. This plan should include a description of long-term management needs (e.g., ATV problems, littering, encroachment, boat damage), the annual cost estimates to address them, and a funding mechanism to meet those needs.

To ensure the entity has adequate funding to do annual inspections, perform needed maintenance, and deal with problems, a financing mechanism (e.g., endowment, trust, or long-term financing plan for a public entity) should be provided. If an endowment is used, it should be sufficient that the needed stewardship activities can

be covered by 3 to 4.5% of the principal. This should generally allow the principal to continue to grow and cover inflation. The long-term steward/manager and the particulars of the endowment should be included in the mitigation plan and may also be included as a special permit condition.

II. GUIDELINES FOR SPECIFIC RESOURCE TYPES

The majority of compensatory mitigation in New England is for impacts to non-tidal wetlands and much of this guidance reflects that. However, there are a variety of other types of aquatic resources which are impacted and for which compensatory mitigation is required. Below are some of the more common of these other aquatic resources and special concerns noted for developing compensatory mitigation for each.

1. Tidal Wetland Establishment:

Planting zones should be based on species requirements and a tidal datum. Each species must be planted at the appropriate elevation for that species and at the proper depth. Following grading, a survey shall be conducted to determine if supplemental backfill materials need to be placed to achieve required elevations for planting. If necessary, supplemental backfill shall be applied and then allowed to settle for a minimum of six tidal cycles prior to planting.

The potential for establishment of *Phragmites australis* is an important consideration in the design of tidal wetlands. Selected backfill material should be free of seed and vegetative propagules of *Phragmites*. For freshwater tidal wetlands, *Lythrum salicaria* may also be a species of concern.

The elevation of low marsh should be identified and considered in the design and should be provided in the plan. Low marsh plants should be planted between mean tide level and mean high water. High marsh plants should be planted between mean high water and spring high water. Salt hardened plants are most likely to survive. Plant storage on site should be kept short (less than 2 weeks). Planting densely (i.e., on 12 inch centers) will encourage the site to provide habitat and some water quality functions more quickly. A nitrogen-rich slow-release fertilizer may be added to each planting hole prior to closing. Salt marsh cordgrass (*Spartina alterniflora*) is shade intolerant, so it should not be planted in shady areas or, if a mitigation plan involves planting a riparian buffer, trees should not be planted within 20 feet of a salt marsh mitigation area. Additionally, salt marsh cordgrass is recommended to be planted on 18-inch centers, 2 culms per hole. Also, in areas with geese, a goose exclusion system is very important during the plant establishment period.

2. Vernal Pool Establishment:

Definitions:

Adjacent Terrestrial Habitat: Uplands and wetlands associated with vernal pools used by pool-breeding amphibians for migration, feeding, and

hibernation. Typically, includes all land within 750 feet of the pool depression edge.

Breeding Season: The period of time during which amphibians begin migrating to pools to breed and lay eggs. For the purposes of this document, the breeding season also refers to the entire period of time necessary to complete the amphibian cycle from egg-laying through metamorphosis and emergence from the pool. The breeding season may vary regionally and annually, but generally begins between early to mid March (southern New England) and mid to late April (northern Maine). The breeding season ends when the pool dries in the summer months. It should be noted that, in areas with marbled salamander activity (a fall breeder), breeding season observations should also be made in the fall (September to October).

Facultative Species: Vertebrate and invertebrate species that frequently use vernal pools for all or a portion of their life cycle, but frequently successfully complete their life cycle in other types of wetlands and/or waters.

Hydroperiod: Timing and duration of seasonal inundation and drying in a typical year.

Indicator Species: Vertebrate and invertebrate species that depend upon vernal pool habitat for all or a portion of their life cycle. These species serve as direct indicators of the presence of a vernal pool. May also be referred to as obligate or vernal pool-dependent species.

Metamorph: Name for a young amphibian that has just completed, or is close to completing metamorphosis. Metamorphosis is the process of growth and development of an amphibian (or other animal) from an egg through larval stages to become an adult.

Pool depression edge: The maximum observed or recorded extent of inundation. May be determined by a distinct and clear topographic break at the edge of a pool or by evidence of high water marks or other physical data.

Reference pool: A minimally impaired vernal pool that is representative of the expected ecological conditions. Reference pools serve as a measuring stick to determine the health and integrity of other vernal pools.

Target Species: The target species is/are the species used to define the mitigation plan habitat goals. It may be appropriate to design different parts of the plan to address each target species' habitat requirements, for example multiple pools with different hydroperiods.

Documenting Impacted Vernal Pools: The seasonal timing and duration of inundation determines whether a pool will provide sufficient habitat for vernal pool-

dependent species. Hydroperiod also influences predator composition and abundance. In order to determine appropriate compensation, detailed documentation of the hydroperiod for every pool which may be impacted either directly or indirectly should be provided.
Although the pool depression may contain limited or no woody vegetation, a surrounding intact forested canopy cover provides shading, leaf litter for nutrients, and woody debris for protection and egg attachment sites within the pool. Removing the shade of the tree canopy can heat up the air, soil, and water in the pool, change the period of time that water remains in the pool, and influence which species can survive there. Any impacts to the canopy cover should be considered impacts to the vernal pool and documented.

Mitigation Type: Created pools often fail to replicate vernal pool hydrology, and may lure breeding amphibians away from more appropriate breeding areas. Replacement of natural invertebrate communities is even more difficult. If loss is unavoidable, mitigation should focus on preservation of lands with existing natural vernal pool habitat (off-site or on-site), and restoration or enhancement of existing vernal pools and adjacent terrestrial habitat. Any creation projects will require a detailed adaptive management and contingency plan. All creation projects will also require the preservation of appropriate adjacent undeveloped terrestrial habitat.

Wildlife Habitat Function: There are a variety of species which are dependent on or utilize vernal pools as habitat for one or more critical life-cycle needs. For example, several species of amphibians are dependent on vernal pools to provide breeding habitat in order to ensure successful reproduction. The ability of a pool to adequately provide safe and productive breeding habitat is dependent on a number of physical and biological characteristics. Although in nature we often find vernal pool amphibians breeding successfully in pools lacking one or more of these features, it is not possible to accurately predict the circumstances under which apparently marginal habitat will effectively provide habitat needs. Therefore, a mitigation plan must aim towards providing vernal pool habitat under the most pristine conditions in order to offer the best opportunity to compensate for lost wildlife habitat functionality.

- The expected hydroperiod for each pool at the mitigation area must be specified. A mitigation plan which includes vernal pool creation should attempt to replicate the hydroperiod of the impacted pool(s) as closely as possible. Groundwater modelling, water budget calculations, and detailed soil descriptions should be used to demonstrate the ability of the site to provide the desired hydrology. If the mitigation plan includes vernal pool creation as part of a larger compensation package, multiple pools with a variety of hydroperiods should be constructed in order to provide the best chance of success. The hydroperiod should also be described for all pool(s) for which enhancement or restoration is proposed. Because hydroperiod can vary annually, multiple years of data should be provided if available.

- Fishless environment: Vernal pools provide breeding habitat for amphibians whose tadpoles and larvae are especially vulnerable to fish predation. Not all vernal pools go dry every year, but they generally have some feature that excludes fish such as annual drying, low oxygen concentrations in the summer, or shallow conditions that permit winter freezing to the pool bottom. Pools which are truly isolated, having no permanent inlet or outlet, are not susceptible to the establishment of a predatory fish population during ponding. Although there are pools in nature where fish and amphibians coexist, due to the presence of microtopographical barriers, mitigation plans should specify how the pool(s) will maintain a fish-free environment. Signage reminding people not to stock ponds with fish may also be required.

- Microtopography: Natural vernal pool depressions often have varied microtopography throughout the pool basin. The basin of many pools is extremely heterogeneous, offering varied moisture and temperature conditions including the development of hummock topography, hardwood leaf litter wells, sphagnum moss, and accumulations of woody debris. Creating pool bottoms with microtopography that will enhance plant distribution and invertebrate habitat will add to the functionality of the mitigation.

- Substrate: The substrate of a natural vernal pool bottom often consists of a thick layer of leaves and other decaying organic materials, which provides a valuable food source for vernal pool species. Mitigation projects involving the creation of vernal pools should consider the addition of such a natural substrate. Salvaging organic layers of lost pools may help "seal" the bottom and colonize the new pools with an invertebrate food base and seeds from native plants. However, be alert to the potential for transplanting invasive species.

- Canopy cover – mitigation: All pools at the mitigation site should have at least 75 percent canopy cover of trees in the area immediately adjacent to the pool (up to 100 feet from the pool edge). The remaining adjacent terrestrial habitat (up to 750 feet from the pool edge, should maintain at least 50 percent canopy cover. Enhancement and restoration projects should consider reforestation of areas without intact canopy; however, it important to realize that increases in woody vegetation immediately adjacent to the pool may alter the hydroperiod due to increased evapotranspiration.

- Adjacent terrestrial habitat: Habitat for many vernal pool species consists not only of the pool basin, but also of the adjacent terrestrial habitat. Because studies have shown that pool-breeding amphibians can migrate significant distances during the non-breeding season, all land within 750 feet of the pool depression edge should be considered part of the vernal pool habitat.

- In order to provide compensation for the wildlife habitat functions of an impacted vernal pool, adequate terrestrial habitat must be included in the compensation plan. At least 75 percent of the adjacent terrestrial habitat should be undeveloped. Appropriately designed and located tunnel crossings and drift fencing should be incorporated along any existing roads within this area to minimize deaths during amphibian migration. A complete mitigation package must include preservation of as much undeveloped adjacent terrestrial habitat as possible.

- Small mammal burrows: Research has shown that amphibians are dependent on small mammal burrows and other terrestrial refuges to prevent desiccation during migration. Documentation of the existence of small mammal populations in the adjacent terrestrial habitat will add to the value of a mitigation plan.

- Clusters of pools: Clusters of vernal pools that vary in size, hydroperiod, and spatial proximity, provide each resident species with a variety of potential breeding sites and allow adults to seek out high quality habitat with low densities of predators. Protecting existing clusters is encouraged. If creation is proposed, developing a cluster is encouraged.

Location: Priority will be given to sites that historically supported vernal pools or have appropriate soil type and will be adequately buffered. Agricultural fields, clearcuts, pasture, and other lands lacking impermeable surfaces, but that have historically supported pools and can be reforested, are good options for mitigation, assuming that there is suitable adjacent habitat.

- Resident population: Existing resident population(s) of the target species may improve the likelihood that the mitigation pool(s) will be colonized. Mitigation sites should be surveyed for evidence of existing source populations and estimates of population size should be documented, if possible.

- Inoculation: Transplantation of vernal pool organisms from sites impacted by the construction project may be warranted. There is limited data on successful methodology for this process. It is important that any inoculation plan is well documented and monitored in order to further understanding on appropriate applications of this technique.

Monitoring: Investigators should be familiar with the various types of amphibian monitoring techniques that are available. Specific methods are appropriate for particular species and life stages but not for others. Previous studies of vernal pool establishment attempts have shown limited success in replication of lost habitat functionality. Past projects have also often failed to provide the kind of long-term monitoring data necessary to advance our understanding of successful methodologies for vernal pool establishment and restoration. All vernal pool mitigation plans must include systematic and documented monitoring for

hydroperiod and presence of indicator species. Additional guidance documents on some of these methods are listed in the reference section.

- Hydroperiod: Depth, area, and duration of inundation must be recorded weekly throughout the entire monitoring period. Pool depth should be monitored in all constructed and reference pools using hydrology staff gauges or some other documented method. The date on which each pool floods and dries should be recorded annually. Pool hydrology should also be documented using hydrographs and photographs.

- Egg mass counts: Egg mass counts provide an index to population size for several indicator species, including wood frogs and spotted salamanders, and are required for all vernal pool mitigation projects. Egg mass counts should be conducted during daylight hours (not within 2.5 hours of sunrise or sunset) on sunny days. Observers should wear polarized sunglasses to reduce glare.

- Other aquatic survey techniques: Egg mass counts should be combined with larval sampling (such as larval dip-netting) to ensure that eggs are developing successfully. Other methods which may be incorporated into the monitoring plan, depending on the site requirements, include anuran call surveys, road surveys, walking transects, pitfall traps, and dip-netting. For example, anuran call surveys may be used to monitor predatory green frog populations. Dip-netting may be used to document establishment of invertebrate populations. All species observed should be documented including insect taxa and estimates of population size should be included when possible.

- Other: Monitoring plans should also include standard water quality measures (e.g., pH, conductivity, nitrogen, phosphorus, BOD, temperature, DOC), contaminant levels, plant species in and around the pool perimeter, and canopy closure. Presence of fish and other predators or invasive species should be documented.

Performance Standard Examples: Measures of success could include the following criteria:

1) Use of the pools by vernal pool indicator species.
2) Maintenance of viable populations of target amphibians.
3) Maintaining a fish-free environment.
4) Maintenance or establishment of closed canopy cover.
5) Hydroperiod replication within project-specific percentage of reference pool.
6) Availability and use of egg mass attachment sites.
7) Establishment of biological viability by comparing specific parameters **[specify]** of constructed pools with those of reference vernal pools from the same immediate areas.

Indicator species found in New England: Wood Frog (*Rana sylvatica)*, Spotted Salamander *(Ambystoma maculatum)*, Marbled Salamander *(A. opacum)*, Jefferson Salamander *(A. jeffersonianum)*, Blue-Spotted Salamander *(A. laterale)*, Spade-Foot Toad (*Scaphiopus holbrookii)*, and Fairy Shrimp (Order: Anostraca).

Facultative species found in New England: include Fingernail Clams, Caddis Flies, Four-Toed Salamander, Eastern Newt, Spring Peeper, American Toad, Green Frog, Gray Treefrog, Spotted Turtle, Blanding's Turtle, Wood Turtle, Painted Turtle, Snapping Turtle, Fowler's Toad.

Additional guidance on vernal pool conservation, restoration, and creation is included in an excerpt from Science and Conservation of Vernal Pools in Northeastern North America, which is posted on our website at: http://www.nae.usace.army.mil/reg/Science%20and%20Conservation%20of%20VPs%20-%20Chapter%2012.pdf .

3. **Stream Restoration:**

Guidance on developing stream restoration projects is available on our website, including:

- a national Stream Mitigation Compendium (http://www.nae.usace.army.mil/reg/PhysicalStreamAssessment.pdf),
- two documents developed for New Hampshire, (http://www.nae.usace.army.mil/reg/River%20Restoration%20and%20Fluvial%20Geomorphology.pdf and
- http://www.nae.usace.army.mil/reg/Guidelines%20for%20Naturalized%20River%20Channel%20Design%20and.pdf), and
- Natural Resources Conservation Service's Stream Restoration Design Handbook (http://www.nae.usace.army.mil/reg/nrrbs/MAIN-MENU.pdf).

For projects involving removal of dams, ideas for project goals and monitoring may be found in this document: http://www.gulfofmaine.org/streambarrierremoval/, with additional resources:

- http://www.bae.ncsu.edu/programs/extension/wqg/srp/pdfs/tullos.pdf
- http://www.greatlakeswiki.org/index.php/Stronach_Dam_removal_provides_model_for_monitoring
- http://tbabs.org/OWEB/MONITOR/docs/SmallDams/StatementofWork_SavageRapids.pdf
- http://h2o.enr.state.nc.us/ncwetlands/documents/DamRemovalGuidanceFinal061908.doc
- http://www.pc.ctc.edu/coe/pdfs/ERC/05Woodward2008.pdf

Details of each stream restoration are project-specific and should be discussed with the Corps at the earliest opportunity. Such projects include restoration of natural streams, removal of channelization, dam removal, and other such work. When doing

stream restoration work or considering preservation of a riparian area, it is important to look at the whole stream system bandwidth, not merely the bank-to-bank area.

4. Submerged Aquatic Vegetation (SAV):

The majority of SAV projects in New England involve eelgrass (Zostera marina) and this guidance reflects that. For projects involving other species of SAV, this guidance may need to be modified.

Definitions:

Eelgrass enhancement: Restoring degraded FUNCTIONS of an existing eelgrass habitat. Degradation may result from infestation by herbivores, decreased water quality or a change in substrate composition. Restoration of previous natural functions but not acreage is sometimes called "rehabilitation." Eelgrass habitat enhancement does **not** result in a gain in vegetated aquatic resource acreage.

Eelgrass habitat creation: The transformation of subtidal habitat to eelgrass beds at a site where it did not previously exist, so far as is known. It is sometimes referred to as "establishment." Eelgrass bed creation results in a gain in vegetated aquatic resource acreage.

Eelgrass restoration: Returning a former eelgrass habitat area, which had been altered or disturbed to the extent that it was no longer functioning as eelgrass habitat, to viable eelgrass habitat. It is sometimes referred to as "re-establishment." Eelgrass restoration results in a gain in vegetated aquatic resource acreage.

Embayment: Portions of open water or marsh defined by natural topographical features such as points or islands, or by human structures such as dikes or channels. In the context of eelgrass mitigation, it is assumed that these semi-enclosed basins, due to their sheltered nature, provide a preferred growing environment for submerged aquatic vegetation (SAV).

Epiphyte (in the context of SAV): A plant or animal (e.g., macroalgae or colonial tunicates) that grows on the surface of another plant, usually for the purposes of physical support and exposure to currents that enhance nutrient exchange.

Long-term sustainability of conditions suitable for SAV is key to successful eelgrass mitigation. Success is largely a factor of the site selection, timing, and method used.

Low success rates in the past have been primarily attributed to poor site selection. Wherever possible, select sites where eelgrass previously existed and/or where

potentially optimum environmental conditions for eelgrass currently exist. The environmental factors evaluated should include light attenuation, exposure and wave energy regimes, substrate quality, historical distribution, temperature, salinity, epiphyte presence, incidence of herbivory, near shore assessment, and some discussion of the likelihood of wasting disease.

A number of research efforts have been conducted to quantify and standardize the establishment and monitoring of eelgrass mitigation projects. The applicant is urged to consult one of the guidance documents to get practical knowledge for designing successful eelgrass mitigation projects. An example of a comprehensive and useful effort can be seen in the guidance documents promulgated by the Massachusetts Division of Marine Fisheries (Evans and Leschen 2009) http://www.mass.gov/dfwele/dmf/programsandprojects/eelgrass_mitigation_guidelines.pdf.

There are a number of steps to initiating an eelgrass restoration project. These are:

- Find areas with optimum growth conditions using Eelgrass Site Selection (ESS) software and environmental criteria from previously chosen preliminary test sites
- Characterize the site using the ESS software
- Create a 100-meter buffer around existing beds to minimize impacts from mitigation work, provide the opportunity for the beds to expand naturally, and to simplify post-construction monitoring
- Choose a preferred mitigation site from among the candidate test sites
- Select a minimum of three vegetated reference sites
- Find a donor site (the preferred donor source would be shoots harvested from the impacted site)
- Harvest eelgrass shoots from donor site
- Replant shoots or, alternatively, broadcast seeds (reportedly this method has a low success rate in New England)
- Monitor establishment and success rate using appropriate indices at both the mitigation and all of the reference sites

Each of these steps is designed to maximize the probable success of the proposed area of eelgrass habitat. The logistics of harvesting shoots or collecting seeds, then transplanting or seeding mitigation areas must be carefully developed beforehand.

When planning eelgrass mitigation projects, it is vital to choose locations with optimum environmental conditions before the project is started. A number of test sites should be selected and subjected to rigorous evaluation before a final mitigation site is selected. To this end, eelgrass mitigation projects usually employ the ESS software, an example of which is described in Short, et al. (2002). This software uses long-term, tidally averaged environmental data to rate potential mitigation sites.

In order to have long-term sustainability, sites must be protected from degradation. Applicants should consider both current and expected future environmental conditions (including effects of any proposed manipulations) and evaluate long-term trends in water quality, sediment transport, maritime activities in the vicinity, locations of contributing water resources, and overall watershed functional goals before choosing a mitigation site. This is extremely critical in watersheds that are rapidly urbanizing; changing watershed development rates can modify runoff and nutrient loading profiles substantially, with associated changes in sediment transport, flooding frequency, and water quality. Water quality problems, such as increased nutrient loading and sedimentation, lead to degraded eelgrass habitat in the form of lower light attenuation, increased epiphytic growth on the eelgrass shoots and increased water column turbidity.

Water quality is critical. Every effort must be made to maintain or increase water quality long term. More importantly, applicants must plan for long-term survival by placing mitigation in areas that will not be severely impacted by clearly predictable water quality degradation factors. During the first few years while the designed eelgrass beds become established, they are susceptible to degraded water quality, herbivory, temperature extremes and physical disturbance. Buffers are particularly important to insure that changing conditions are ameliorated, especially in watersheds and embayments that have been, or are in the process of being, heavily developed. In addition, because eelgrass habitats are so dynamic, adequate buffers and unvegetated subtidal areas are vital to allowing for eelgrass beds to expand and/or decrease in size and function and migrate within the embayment, particularly in coastal areas under natural and/or man-made pressures.

Eelgrass planting methods can contribute greatly to potential success rates. Care should be taken to select a technique that is most likely to succeed in a particular location. A detailed discussion of planting methods (rhizomes, seedcasting, Transplanting Eelgrass Remotely with Frame Systems (TERFS) http://marine.unh.edu/jel/seagrass_ecology/communityeelgrassrestoration/commeelgrassrestor2002.pdf , etc.) along with proposed planting densities and grid arrays should be provided. Site bathymetry maps should also be included. Test plantings may be necessary to fully evaluate proposed site alternatives.

III. ADDITIONAL GUIDANCE FOR CORPS PROJECT MANAGERS

Information on the Mitigation Rule and New England District Guidance should be provided to applicants as early as possible.

Special Conditions

Four mitigation-related items must be in the permit special conditions for any permit requiring compensatory mitigation. They may be stated as four separate special conditions or combined into two or three conditions. The items include:

- identifying the specific mitigation proposed,
- referencing the mitigation plan,
- stating the ecologically-based performance standards, and
- stating the implications should the proposed mitigation fail.

Examples:

- Mitigation shall consist of the restoration of 3.3 acres of button-bush and alder shrub swamp and preservation of the 3.3 acres plus 5.2 acres of wetland and upland adjacent to this restoration area located off Kensington Road in Concord, Massachusetts.

- This work shall be performed in accordance with the attached mitigation plan entitled, "Lower Bonneville Road Mitigation Plan" and dated "6 May 2009."

- The performance standards for this project are: a) documented presence of wetland hydrology appropriate for forested wetlands (soil saturation to the surface a minimum of two consecutive weeks during the growing season with no extended inundation of greater than two weeks, other than by greater than 10 year storms, between 30 April and 1 November), b) 75% cover by native hydrophytes, including 50% aerial cover by native wetland tree species, including red maple, (*Acer rubrum*), green ash (*Fraxinus pennsylvanicus*), and yellow birch (*Betula alleghaniensis*), at least 75% of which are over 2 meters tall, c) documented usage of the site by forested wetland-dwelling reptiles, d) control of non-native species with less than 10% total areal coverage by the end of the monitoring period, and e) all slopes stabilized and any silt fencing removed no later than the end of the third growing season.

- Mitigation shall consist of the restoration of 0.6 acres of non-degraded eelgrass habitat in Scituate, Massachusetts. The performance standards for density can be assessed using quadrat sampling methods. Final estimates of shoot density should be at least equal to that of the original impacted eelgrass bed which is 15 stems/sq. meter.

- Your responsibility to complete the required compensatory mitigation as set forth in Special Condition X will not be considered fulfilled until you have demonstrated mitigation success and have received written verification from the U.S. Army Corps of Engineers. The term 'mitigation success' means success as defined in the mitigation plan this permit requires you to implement. Demonstration of success under this permit shall consist of meeting the performance standards listed in Special Condition X plus the required mitigation monitoring, corrective measures, submittal of mitigation monitoring reports, and a final wetland assessment. Should the mitigation not meet the performance standards in Special Condition X by the end of the

monitoring period, you will be required to provide alternative compensation for the impacts authorized with this permit.

Financial Assurances

See 33 CFR 332.3(n) for requirements on financial assurances.

Original performance bonds, letters of credit, documentation of escrow accounts, insurance policies, etc. are now kept in the Resource Management (RM) safe in an envelope marked "REGULATORY" (see the RM Chief to access them). The Policy Analysis and Technical Support (PATS) Chief will also keep a file of copies and there should be a copy in the official project file.

Procedurally, if you have a project involving a financial assurance document, please provide the original (we will only get the original if we are the 'obligee') to the Chief, PATS Branch, to add it to the envelope in the RM safe. If you need to retrieve a document because the work is complete and the Corps has verified completion or satisfaction with the appropriate stage of work, contact the PATS chief.

These documents are very important and ORIGINALS SHOULD NEVER BE KEPT IN THE PERMIT FILE since eventually the file will be scanned and the original tossed.

IV. DIRECTIONS FOR COMPLETING MITIGATION PLAN (WITH CHECKLIST)

1. **Overall Mitigation Plan**
2. **Nontidal Wetland Module**
3. **Tidal Wetland Module**
4. **Vernal Pool Module**
5. **Submerged Aquatic Vegetation Module**
6. **Stream Module**

1. OVERALL MITIGATION PLAN CHECKLIST

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

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. [ ] Cowardin classifications at each impact site.
3. [ ] HGM classifications at each impact site.
4. [ ] Other aquatic resources at each impact site.
   a. [ ] Vernal pools
   b. [ ] Streams
   c. [ ] Submerged Aquatic Vegetation

d. [ ] Mudflats

5. [ ] Describe both site specific and landscape level wetland and stream functions and values at each impact site.
6. [ ] Describe type and purpose of work at each impact site.
7. [ ] Relationship of impact area(s) to watershed or regional plans for the area discussed.

C. Mitigation area(s)

1. Background information
   a. [ ] Mitigation alternatives.
   b. [ ] Existing wildlife use.
   c. [ ] Existing soil.
   d. [ ] Existing vegetation.
   e. [ ] Surrounding land uses.
   f. [ ] USFWS and/or NOAA Clearance Letter or Biological Opinion.
   g. [ ] SHPO/THPO Cultural Resource Clearance Letter.
2. Mitigation proposed
   a. [ ] Wetland acreage proposed at each site.
   b. [ ] Cowardin classifications proposed at each site.
   c. [ ] HGM classifications proposed at each site.
   d. [ ] Other aquatic resources proposed at each site.
      i. [ ] Vernal pools
      ii. [ ] Streams
      iii. [ ] Submerged Aquatic Vegetation
      iv. [ ] Mudflats
   e. [ ] Site-specific and landscape-level functions and values proposed at each site.
   f. [ ] Target fish and/or wildlife species.
   g. [ ] Reference site(s).
   h. [ ] Design Constraints.
   i. [ ] Construction oversight.
   j. [ ] Project construction timing.
   k. [ ] Responsible parties for all aspects of project.
   l. [ ] Potential to attract waterfowl and other bird species that might pose a threat to aircraft?
3. Specific Aquatic Resource Checklist Information Appended
   a. [ ] Non-tidal wetlands
   b. [ ] Tidal wetlands
   c. [ ] Vernal pools
   d. [ ] Streams
   e. [ ] Submerged aquatic vegetation

D. Grading Plan

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

c. [ ] Scale is in the range of 1"=20' to 1"=100'.
d. [ ] All items on the plan are legible. Electronic documents are encouraged (e.g., PDF); otherwise plans should be on 8 ½ x 11" sheets.
e. [ ] Plans have a bar scale.
f. [ ] The drawings show the access for maintenance and monitoring.

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

E. Erosion Controls

[ ] Erosion control removal deadline is included.

F. Invasive Species

[ ] Invasive Species Control Plan (ISCP) is included.
a. [ ] Risks – includes evaluation of the potential for unwanted species or varieties.
b. [ ] Constraints – regulatory or environmental factors affecting control strategies.
c. [ ] Addresses a scope commensurate with risk & constraints.

G. Off-Road Vehicle Use

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

H. 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.
6. [ ] Documentation of acceptance by receiving agency (if applicable).

I. Monitoring

[ ] Appropriate monitoring is proposed and language included.
[ ] Project Overview Form will be included with each Annual Monitoring Report.
[ ] Transmittal and Self-Certification Form will be included with each Annual Monitoring Report.

J. Assessment

[ ] An appropriate final assessment is proposed and language included.

K. Contingency

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

L. Long-term Stewardship

[ ] Plan for long-term stewardship is included.

[ ] Documentation of acceptance by the receiving steward (if applicable).

M. Financial Assurances

[ ] Appropriate financial assurances in place:
- a. [ ] Construction
- b. [ ] Monitoring and remediation
- c. [ ] Contingency
- d. [ ] Long-term stewardship (endowment)

N. Other Comments

OVERALL MITIGATION PLAN CHECKLIST DIRECTIONS

A. General Information
B. Impact Area(s)
C. Mitigation Area(s)
D. Grading Plans
E. Erosion Controls
F. Invasive Species
G. Off-Road Vehicle Use
H. Preservation
I. Monitoring
J. Assessment
K. Contingency
L. Long Term Stewardship
M. Financial Assurances
N. Other Comments

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

After Corps review, items not marked with X (included), N/A (Not Applicable), or NONE should be addressed by the applicant, as well as any comments under any item.

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

Many items on the checklist are self-explanatory. Those which require specific guidance or clarification are noted below. Basic project information as noted in the main portion of the checklist should be included in every mitigation plan. Information noted in specific resource modules should be submitted for any project which includes mitigation involving the specific resource(s), e.g., nontidal wetlands, vernal pools, SAV, etc.

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. A complete mitigation plan is important so that it may be cited in the permit and be easily used for permit compliance.

2. a. 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.

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

2.c. Longitude and latitude of the mitigation site(s), including preservation areas, should be given in decimal format, rather than degrees and minutes or UTMs.

2.d. Watershed(s) must be identified using the USGS 8-digit Hydrologic Unit Code(s) for each impact and mitigation site (See Item A.2 on the Checklist), including preservation sites. 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.

2. Wetlands and/or waters at each impact site should be described using Cowardin, et al.[21]

3. Wetlands at each site should be described using the hydrogeomorphic[22] classification system.

4.a. Descriptions of the vernal pool(s) should include species use and approximate numbers of egg masses.

4.b. If any streams will be impacted, information needed includes length of stream to be impacted, nature of banks, normal seasonal flows, gradient, sinuosity, bed load, lengths of riffles and pools, and adjacent landscape. Note that the Mitigation Rule references the need for mitigation of impacts to all aquatic resources.

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[21] Cowardin, et. al. (1979) "Classification of wetlands and deepwater habitats of the United States," Office of Biological Services, FWS/OBS-79/31, December 1979. http://www.wbdg.org/ccb/ENVREG/habitat.pdf , http://www.npwrc.usgs.gov/resource/wetlands/classwet/index.htm

[22] 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.

4.c. Include information on variability and extent of bed size.

5. When performing functions and values assessments, simply stating "wildlife habitat" or "fishery 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.

7. 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, this should be stated.

C. MITIGATION AREA(S)

1.a. Provide an explanation of sites and methodologies considered for mitigation activities and the rationale for selection or rejection. The Mitigation Rule discusses 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 strongly preferred unless the impacted site is heavily degraded.

1.b. – e. Information on the selected site(s)'s existing wildlife usage, soils, vegetation, and surrounding land use are needed. **Wildlife usage** should include information on any probable state and federal threatened and endangered species habitat. Subsurface **soil conditions** have a critical role in mitigation design, whether the substrate is sand, loam, silt, clay, and/or bedrock. Therefore, soil profiles should be provided that extend down to at least two feet below the proposed new soil surface. Since much of New England has been and continues to be heavily developed, there is a potential for industrial and agricultural contaminants in the soil. Although contamination does not necessarily preclude the use of a site, testing that is commensurate with the risk may be needed. 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 <u>future</u> 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.

1.f. USFWS and/or NOAA Clearance Letter or Biological Opinion is for the mitigation site(s) and necessary to ensure that threatened or endangered species will not be impacted by the mitigation. This is not necessarily addressed in those agencies' comments on the proposed project that requires the mitigation.

1.g. SHPO/THPO letters on the proposed project also may not address potential concerns at the mitigation site, so these must be provided for the mitigation site(s).

2.a. – d. Similar information is required for the mitigation area(s) as for the impacted area(s). Along with mitigation acreage at each site, the type of mitigation (i.e., creation, restoration, enhancement, preservation) should be identified. A single 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.

2.h. 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), that should be stated in the plan.

2.i. To ensure that someone with expertise in the specific aquatic resource(s) being mitigated provides construction oversight for the mitigation project, the following language should be included in the narrative portion of the mitigation plan:

→ A wetland scientist/coastal habitat scientist/stream scientist **[choose appropriate for project]** shall be on-site to monitor construction of the wetland mitigation area(s) to ensure compliance with the mitigation plan and to make adjustments when appropriate to meet mitigation goals.

2.j. 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 initiation of project construction and completed not later than one year after the permitted wetland impacts occur.

2.k. All parties responsible for the implementation, performance, and long-term management of the mitigation project are identified.

2.l. Wildlife can pose serious threats to aircraft and therefore mitigation sites near airports are of concern to the Federal Aviation Administration. Indicate how far the nearest airport is from the site. See Federal Aviation Administration Advisory Circular AC No: 150/5200-33B Hazardous Wildlife Attractants on or Near Airports, 8/28/2007:
http://www.airweb.faa.gov/Regulatory_and_Guidance_Library/rgAdvisoryCircular.nsf/0/532dcafa8349a872862573540068c023/$FILE/150_5200_33b.pdf

For a search of nearby airports, see:

https://www.oeaaa.faa.gov/oeaaa/external/searchAction.jsp?action=showCircleSearchAirportsForm

3. Identify what specific aquatic resource checklist information is included.

D. GRADING PLANS

1. a. Plan provides existing and proposed grading plans for mitigation area. Existing contours should be no greater than 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.

1.b. 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.

1.d. Plans should be in black and white on 8 ½ x 11" sheets. Large format sheets are encouraged for clarity, but only as a supplement to the letter-sized sheets. Color reproductions of large format sheets should also be submitted in electronic form but should not be part of the formal plan as the color is lost during digitization of files.

1.f. The drawings should show the access for maintenance and monitoring.

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.

E. 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 as soon as the site is stable but 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.

F. INVASIVE AND NON-NATIVE SPECIES

The mitigation plan should include an Invasive Species Control Plan (ISCP).

a. The discussion of risk should include an assessment of the potential for invasion of the wetland by Common reed (*Phragmites australis*), Purple loosestrife

(*Lythrum salicaria*), Smooth and Common buckthorns (*Frangula alnus* and *Rhamnus cathartica*), Russian and Autumn olives (*Elaeagnus angustifolia* and *E. umbellata*), Multiflora rose (*Rosa multiflora*), Reed canary-grass (*Phalaris arundinacea*), Japanese knotweed (*Fallopia japonica*), or other identified problematic species specific to this project or site.

b. 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, this should be stated.

c. The plan should describe the strategy to control, or recognize and respond to, the degradation of the mitigation site by invasive or non-native plants, particularly those listed in F.a. above.

G. OFF-ROAD VEHICLE USE

If there is a potential for off-road vehicle access at the site, including snowmobile usage, the mitigation plan shall include a strategy to minimize impacts. Plans should illustrate locations of any necessary barriers placed at access points to the mitigation sites to prevent vehicles from damaging the sites.

H. PRESERVATION

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

2. Wetlands within subdivisions, golf courses, etc. should generally be protected along with adequate buffers. This is part of the avoidance and minimization steps of mitigation, not part of compensation.

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; as a stand-alone form of mitigation; or as any combination of these. Ideally the preservation document will be prepared, then 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[23]:

➡ 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 and prior to

[23] Departments of Transportation, in particular, may need to have the timing requirements modified. This will be addressed on a case-by-case basis.

initiation of permitted work in aquatic resources, 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 120 days of the date the Corps approves it. 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 and prior to initiation of permitted work in aquatic resources, 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 120 days of the date the Corps approves it.

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 as these adjacent areas affect the long term sustainability of the site. In some cases it may be appropriate to have signs at the boundaries of the preservation area(s). The sign design should be noted in the documentation.

5. The form should be specified or a copy of the document(s) included.

I. MONITORING

The following language, through performance standards (specific to the project), should be included in the narrative portion of the mitigation plan:

→ **MONITORING**

Notification of Construction Completion

Within 60 days of completing a mitigation project that includes restoration, creation, and/or enhancement, the applicant will submit a signed letter to the

Corps, Policy Analysis and Technical Support Branch, specifying the date of completion of the mitigation work and the Corps permit number.

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 will be sent no later than January 31 of the next year. The letter will include the Corps permit number.

Monitoring Report Guidance

For each of the first **[specify number]** full growing seasons following construction of the mitigation site(s), the site(s) will be monitored and annual monitoring reports submitted. Observations will occur at least two times during the growing season – in late spring/early summer and again in late summer/early fall. Each annual monitoring report, in the format provided in the New England District Compensatory Mitigation Guidance, will 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 perform the monitoring and submit monitoring reports constitutes permit non-compliance. A self-certification form[24] will be completed and signed as the transmittal coversheet for each annual monitoring report and will indicate the permit number and the report number (Monitoring Report 1 of 5, for example). The reports will address the following performance standards in the summary data section and will address the additional items noted in the monitoring report requirements, in the appropriate section. The reports will also include the monitoring-report appendices. The first year of monitoring will be the first year that the site has been through a full growing season after completion of construction and planting. For these permit 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 will 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 will be implemented - at least two years prior to the completion of the monitoring period - to attain the success standards described below within **[specify number]** growing seasons after completion of construction of the mitigation site(s). Should measures be required within two years of the end of the original 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 will not be implemented without written approval from the Corps.

[24] see Appendix E

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

Performance Standards

[Specific performance standards for the project should be included here. See list of examples below.]

Performance Standard Examples

1) The site has the necessary depth of hydrology, as demonstrated with well data collected at least weekly from March through June or other substantial evidence, to support the designed wetland type as compared to the reference wetland. Minimum of 90% of the site must meet desired hydrology levels. Areas that are too wet or too dry (i.e., seasonal high water tables are more than 3" above or below target levels) should be identified along with suggested corrective measures.

2) Target hydroperiod **[specify]** must be met, within two weeks at beginning and end of season (as long as minimum hydrology technical standard is met).

3) The proposed vegetation diversity and/or density goals for woody plants from the plan are met.

Unless otherwise specified in the mitigation plans, this should be 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.

4) a. Each mitigation site shall have at least 95% areal cover, excluding planned open water areas or planned bare soil areas (such as for turtle nesting), by native species (See Appendix D).

b. Planned emergent areas on each mitigation site shall have at least 80% cover by non-invasive hydrophytes.

c. Planned scrub-shrub and forested cover types shall have at least 60% cover by non-invasive hydrophytes, including at least 15% cover by woody species.

For the purpose of this performance 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
Glossy Buckthorn – *Frangula alnus* (= *Rhamnus frangula*).
[Other species determined case-by-case]

5) Until canopy coverage exceeds 30%, the average height of all woody stems of tree species including volunteers in each site, must increase by not less than an average of 10% per year by the fifth (Year 5 following construction) and tenth (Year 10 following construction) monitoring years.

6) The fifth year (Year 5) and tenth year (Year 10) monitoring reports shall contain documentation that all vegetation within the buffer areas is healthy and thriving and the average tree height of all established and surviving trees is at least 5 feet in height.

7) There is evidence of expected natural colonization as documented by the presence of at least 100 volunteer native trees and/or shrubs at least 3 feet in height per acre.

8) The following plants are being controlled at the site:

- Common reed (*Phragmites australis*)
- Purple loosestrife (*Lythrum salicaria*)
- Smooth and Common buckthorns (*Frangula alnus*, *Rhamnus cathartica*)
- Russian and Autumn olives (*Elaeagnus angustifolia* and *E. umbellata*)
- Multiflora rose (*Rosa multiflora*)
- Reed canary-grass (*Phalaris arundinacea*)
- Japanese knotweed (*Fallopia japonica*)
- [other species identified as a problem at the site]

For this standard, small patches must be eliminated during the entire monitoring period. Large patches must be aggressively treated and the treatment documented.

9) Site will have documented use by breeding populations of target species: **[insert species]**

10) Site will have documented use by target wildlife species: **[insert species]**

11) Site will have documented use by target macroinvertebrate species: **[insert species]**

12) Soil pH will be within target range of 6.2 – 6.8 for the site.

13) Soil has documented evidence of redoxymorphic features developing by the third year (Year 3) after construction.

14) All slopes, soils, substrates, and constructed features within and adjacent to the mitigation site(s) are stable.

Monitoring Report Requirements

Monitoring reports should generally follow a 10-page maximum report format per site, with a self-certification form transmittal[25]. Submission of electronic formats (e.g., pdf) is strongly encouraged. The information required should be framed within the following format.

1) Project Overview[26] (1 page)

   Highlighted summary of problems which need immediate attention (e.g., problem with hydrology, severe invasive species problem, serious erosion, major losses from herbivory, etc.). This should be at the beginning of the report and highlighted in the self-certification form and the project overview (Appendices E and F).

2) Requirements (1 page)

   List all mitigation-related requirements as specified in the approved mitigation plan and special conditions of the permit including: the monitoring and performance and/or success standards, required financial assurances, required preservation, etc., and note whether required documents have been provided and evaluate whether the compensatory

[25] see Appendix E
[26] see Appendix F

mitigation project site is successfully achieving the approved performance and/or success standards or trending toward success.

3) Summary Data (maximum of 4 pages)

Summary data must be provided to substantiate the success and/or potential challenges associated with the compensatory mitigation project. Photo documentation should be provided to support the findings and recommendations, and placed in the Appendix.

- Address performance standards achievement and/or measures to attain the standards.

- Describe the monitoring inspections, and provide their dates, that occurred since the last report.

- Soils data, commensurate with the requirements of the soils portion of the Corps Wetlands Delineation Manual (Technical Report Y-87-1 and approved regional supplements) 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 performance or 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. 3, 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.

4) Maps/Plans (maximum of 3 pages)

Maps must be provided to show the location of the compensatory mitigation site relative to other landscape features, habitat types, locations of photographic reference points, transects, sampling data points, and/or other features pertinent to the mitigation plan. In addition, the submitted maps/plans must clearly delineate the mitigation site boundaries to assist in proper locations for subsequent site visits. Each map or diagram must fit on a standard 8 ½ x 11" piece of paper and include a legend, bar scale, and the location of any photos submitted for review.

5) Conclusions (1 page)

A general statement must be included describing the conditions of the compensatory mitigation project. If performance or success standards are not being met, a brief discussion of the difficulties and potential remedial actions proposed by the permittee, including a timetable, must be provided.

6) Monitoring Report Appendices

Appendix A -- An as-built plan showing topography to 1-foot contours, any inlet/outlet structures and 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—but it is not necessary to illustrate the precise location of each individual plant. There should also be a soil profile description and the actual measured organic content of the topsoil. This should be included in the first monitoring report unless there is grading or soil modifications or additional plantings of different species in subsequent years.

Appendix B – A vegetative species list of volunteers 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 C -- Representative photos of each mitigation site taken from the same locations for each monitoring event. Photos should be dated and clearly labelled with the direction from which the photo was taken. The photo sites must also be identified on the appropriate maps.

J. ASSESSMENT

The following language (the remainder of item J.) should be included in the narrative portion of the mitigation plan:

ASSESSMENT

A post-construction assessment of the condition of the mitigation site(s) shall be performed following the fifth growing season (Year 5) after completion of the mitigation site(s) construction, 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; this will coincide with the year of the final monitoring report, so it is acceptable to include both the final monitoring report and assessment in the same document.

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.

- 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 by type (e.g., wetlands, vernal pools) of aquatic resources in each mitigation site. Wetlands should be identified and delineated using the Corps Wetlands Delineation Manual and approved regional supplements. Supporting documents shall include (1) a scaled drawing showing the aquatic resource boundaries and representative data plots and (2) datasheets for the corresponding data plots.

Appendix C -- Comparison of the area and extent of delineated constructed aquatic resources (from Appendix B) with the area and extent of created aquatic resources 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 any major vegetation community types.

Appendix D -- Photos of each mitigation site taken from the same locations as the monitoring photos.

K. 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 but are not limited to, unanticipated beaver activity, disruption of the groundwater by blasting or other construction in the vicinity, unexpected subgrade texture, unearthing an unexpected archaeological site, and encountering hazardous waste.

L. LONG TERM STEWARDSHIP

Appropriate provisions must be made to support the mitigation site in perpetuity. The owner of the site or the holder of a conservation easement will be responsible for ensuring the mitigation site(s) is in compliance with the permit in perpetuity.

M. FINANCIAL ASSURANCES

In accordance with national guidance, financial assurances will be required when the Corps determines it is appropriate to ensure successful implementation of the mitigation[27], to include mitigation construction and monitoring, including remedial actions, and a long-term stewardship endowment. Assurances for construction and monitoring will include most projects where the mitigation work is not accomplished in its entirety prior to the permitted impacts to aquatic resources.

The text to use when such assurances are required is:

→ The permittee will post a performance bond for $_____ for construction of the wetland mitigation, monitoring, and potential remedial action as determined by the Corps of Engineers. This figure was based on the attached worksheet of construction and monitoring costs, plus a specified inflation factor, plus a 10% contingency. The bond shall be in the form of a firm commitment, supported by corporate sureties whose names appear on the list contained in Treasury

[27] In the case of state agencies and other federal agencies which cannot provide bonds, letters of credit, or the like, this issue may be addressed by providing a copy of obligation language which includes funding for the mitigation construction, required number of years of monitoring (including providing reports to the Corps), and appropriate remedial actions..

Department Circular 570. 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. Permitted impacts to aquatic resources will not occur until the Corps has approved the bond format, the bond has been executed, and the original **[assumes the Corps is the obligee]** has been provided to the Corps.

Upon completion of construction and written concurrence from the Corps, the bond may be reduced to an amount that will cover the costs of monitoring and possible remedial actions.

Note that other forms of acceptable security may be possible such as an escrow account, 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. However, please discuss alternatives to performance bonds with the Corps prior to their use.

Treasury Department Circular 570 is published in the Federal Register, and 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, or found at **http://www.fms.treas.gov/c570/index.html** .

N. OTHER COMMENTS

These will be provided by the Corps case-by-case.

2. NONTIDAL WETLAND MODULE CHECKLIST

I. Hydrology

1. [ ] Evidence of adequate hydrology to support the desired wetland.
2. [ ] Water source(s)

II. 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.

III. Planting Plan

1. [ ] Plans use scientific names.
2. [ ] Plant materials are native and indigenous to the area of the site(s); invasive species, nonnative species, and/or cultivars are not proposed for planting or seeding.
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 species that will become 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. [ ] Relocation of plantings allowed when appropriate.
11. [ ] Other - Specific staff recommendations related to planting.

IV. Coarse Woody Debris and Other Features

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

NONTIDAL WETLANDS MODULE DIRECTIONS

I. HYDROLOGY

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.

2. Plan indicates if the water source is groundwater, surface runoff, precipitation, lake and/or stream overflow, tidal, and/or springs and seeps. Provide substantiation (e.g., well data, adjacent wetland conditions, stream gauge data, precipitation data).

II. TOPSOIL

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.

3. Natural topsoil proposed to be used for the creation/restoration/ enhancement of wetlands consists of at least 4-12% organic carbon content (by weight) (or 9-21% organic matter content), **with the percentage specified**. 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. The actual measured organic content of the topsoil used should be provided in the as-built plan submitted with the first monitoring report. Manufactured soil may also have to be tested for contaminants.

III. PLANTING PLAN

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. 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 stipulation shall 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 and Other Unacceptable Plant Species" list in Appendix D of the New England District Mitigation Plan Guidance shall not be 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 prior written approval from the Corps.

3. The Cowardin (1979) 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. When determining species to plant, considerations should include the tendency of some species to volunteer promptly whereas others may take years to move into a site. Determine whether it is preferable to include rapidly establishing species to help prevent invasive species problems or to emphasize planting species unlikely to "volunteer" during the monitoring period.

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.

7. Where uniform coverage is anticipated, herbaceous stock should be proposed to be planted in densities not less than the equivalent of 3 feet on center for species which spread with underground rhizomes; 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 Appendix D. Similarly, non-native genotypes and cultivars should not be used.

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

10. 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.

IV. COARSE WOODY DEBRIS AND OTHER FEATURES

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 4% 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 (Appendix D) in the New England District Mitigation Plan Guidance.

3. TIDAL WETLAND MODULE CHECKLIST

I. Hydrology

1. [ ] Evidence of adequate hydrology to support the desired wetland.
   a. [ ] elevation of mean high water (MHW).
   b. [ ] elevation of mean low water (MLW).
2. [ ] Salinity

II. Substrate

1. [ ] Proposed source of substrate supplements.
2. [ ] Organic content of substrate supplements (if necessary).

III. Planting Plan

1. [ ] Plans use scientific names.
2. [ ] Plant materials are native and indigenous to the area of the site(s); invasive species, nonnative species, and/or cultivars are not proposed for planting or seeding.
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 appropriate 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 in relation to MLW and MHW.
10. [ ] Relocation of plantings allowed when appropriate.
11. [ ] Other - Specific staff recommendations related to planting.

TIDAL WETLAND MODULE DIRECTIONS

I. Hydrology

1. The expected tidal cycle fluctuations in 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). Note elevations of mean high water (MHW), mean low water (MLW), and the high tide line, as well as expected storm tide.

2. Salinity range is important for plant and animal species usage and survival.

II. Substrate

2. There is no recommended standard for substrate organic content, but it is recommended to match that of a nearby reference tidal wetland.

III. Planting plan

1. – 5. See III. 1. – 5. in Nontidal Wetlands Module.

6. This would only likely be for freshwater tidal systems unless the planting of a riparian zone is included in the tidal mitigation plan.

7. – 8. See III.7. – 8. in Nontidal Wetlands Module. Additionally, salt marsh cordgrass is recommended to be planted on 18-inch centers, 2 culms per hole.

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

10. 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.

4. VERNAL POOL MODULE CHECKLIST

I. Hydrology

1. [ ] Documentation of hydroperiod of pools which will be impacted.
    a. [ ] Timing of seasonal cycle of inundation and drying.
    b. [ ] Duration of inundation and saturation.
2. [ ] Evidence that mitigation site can provide appropriate hydroperiod to support the desired vernal pool species.
    a. [ ] Documentation of water table and soils characteristics.
    b. [ ] Water source(s) and water budget calculation.

II. Target Species Considerations

1. [ ] Description of vernal pool species populations at impact site.
2. [ ] Evidence of resident population(s) of target species at mitigation site.
3. [ ] Animal transplantation plan is included (if appropriate).

III. Substrate and Physical Characteristics of the Basin

1. [ ] Description and plan drawings of basin shape, slope, depth, area.
2. [ ] Microtopography of pool bottom.
    a. [ ] Proposed source of material for confining layer (if needed).
    b. [ ] Leaves and other decaying organic materials for pool substrate.
3. [ ] Egg attachment sites and woody debris.

IV. Terrestrial Habitat and Landscape Level Characteristics

1. [ ] Description of landscape surrounding vernal pool.
    a. [ ] Percent developed and other barriers.
    b. [ ] Percent forested.
    c. [ ] Location(s) of and proximity to other vernal pools.
    d. [ ] Presence of small mammal burrows and other terrestrial refuges.
2. [ ] Preservation of adjacent terrestrial habitat.

V. Planting Plan

1. [ ] Plans use scientific names.
2. [ ] Plant materials are native and indigenous to the area of the site(s); invasive species, nonnative species, and/or cultivars are not proposed for planting or seeding.
3. [ ] Plan view drawings show proposed locations of planted stock.
4. [ ] Plantings for shading.
5. [ ] Plantings for egg mass attachment.
6. [ ] Seed mix composition is provided.
7. [ ] Other - Specific staff recommendations related to planting.

VI. Monitoring

1. [ ] The monitoring methodology is specified.
    a. [ ] Monitoring period.
    b. [ ] Timing of monitoring visits.
    c. [ ] Egg mass counts.
    d. [ ] Larval sampling (such as larval dip-netting).
    e. [ ] Hydroperiod
2. [ ] Appropriate language included.
3. [ ] Information on state/local vernal pool registration or certification program.

VII. Contingency

VERNAL POOL MODULE DIRECTIONS

I. HYDROLOGY

1. Provide documentation of the hydroperiod of all vernal pools which may be impacted, either directly or indirectly. Hydroperiod documentation must include both the temporal pattern of the inundation/drying cycle and the duration of inundation. Observations should be made and documented during at least one entire breeding season in advance of any construction activity. See definitions.

2. If vernal pool creation or restoration is included as part of the mitigation plan, provide evidence that adequate hydrology exists or will be provided to support the hydroperiod requirements of the target species. In the case of vernal pool enhancement or preservation, provide documentation of the hydroperiod of the existing pools.

2b. See I. 2 in Nontidal Wetlands Module. Water budget calculations (showing all sources of hydrologic inputs to and outputs from the system) should be provided to ensure that desired degree of seasonal drying will occur.

II. TARGET SPECIES CONSIDERATIONS

1. All wildlife observations (including, but not limited to, all vernal pool species) at the impact site(s) must be documented. This documentation should include, but not be limited to all observations of indicator species and facultative species, including those species for which only a single individual has been sighted. Estimates of population size for all observed species should be included when available.

2. The proposed mitigation site and adjacent land should be surveyed for evidence that there is an existing resident population of the target species.

3. Under certain circumstances, such as the absence of an existing resident population of target species, it may be appropriate to inoculate mitigation pools with egg masses from existing pools. A detailed plan must include the source and location of the inoculum, storage and transportation, timing of activity, and provisions to minimize disturbance to the remaining egg mass population.

III. SUBSTRATE AND PHYSICAL CHARACTERISTICS

1. Where vernal pools are to be created or restored, include detailed descriptions and plan drawings of the parameters: basin shape, slope, depth, and area.

2. Mitigation projects involving the creation or restoration of vernal pools should include detailed plans to create a heterogeneous pool bottom that resembles the microtopography of a reference pool.

2b. Appropriate amounts of leaf litter and other decaying organic materials are needed to provide adequate habitat in the pool(s). Source and location should be specified.

3. Appropriate amounts and range of decomposition of coarse woody debris are proposed for pool structure and egg mass attachment sites. Source and location should be specified.

IV. TERRESTRIAL HABITAT AND LANDSCAPE LEVEL CHARACTERISTICS

1. A detailed description of the adjacent terrestrial habitat must be included in the mitigation plan. When feasible, this description should encompass all land within 750 feet of the pool depression edge. A detailed description should include: the percentage of surrounding landscape which is already developed and the types of development; the percentage of the surrounding landscape which consists of intact forest canopy (both wetland and upland); location and proximity to other vernal pools; presence of existing physical barriers to movement.

1d. Adjacent terrestrial habitat should be surveyed for the presence of small mammal burrows and other terrestrial refuges which are often used by vernal pool amphibians to prevent desiccation during migration. Documented evidence that multiple such features exist in the surrounding landscape will enhance the value of the mitigation project.

2. An acceptable mitigation plan must include provisions for preservation (conservation easement) in perpetuity of adjacent terrestrial habitat. Most vernal pool mitigation projects will require preservation of all undeveloped land within 750' of the pool depression edge.

V. PLANTING PLAN

1. – 3. See III. 1. – 3. in Nontidal Wetlands Module.

4. Adequate shade is an important part of vernal pool habitat. Are there existing shade species that will remain? Are there proposed plantings to generate shade? Explain and describe.

5. There should be adequate places for attachment of egg masses from vernal pool species. Typically, these are the woody stems of shrubs or woody debris. Explain and describe proposed attachment provisions.

6. See III. 8. in Nontidal Wetlands Module.

VI. Monitoring

1. Monitoring methodology should be specified and described in detail. All monitoring protocols must include egg mass counts and larval sampling. Other acceptable methodologies include anuran call surveys, dip-netting, and nocturnal road surveys.

MONITORING

Pool(s) is monitored for obligate and facultative vernal pool species weekly for four weeks from the beginning of the vernal pool activity in the spring (the actual date will vary throughout New England), then biweekly until the end of July or until the pool is dry, whichever comes first, for the entire monitoring period (minimum of 5 years). The period of monitoring is specified for each monitoring year. Data identify frog species, salamander genera, and the presence/absence of fairy shrimp. Macroinvertebrates can be identified to 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 or certification program, the pool(s) is registered and/or certified prior to the final monitoring report submission.

5. SUBMERGED AQUATIC VEGETATION MODULE CHECKLIST

I. Hydrology

1. [ ] Evidence of appropriate hydrology to support the desired SAV.
   a. [ ] Depth at mean low water.
   b. [ ] Depth at mean high water.
2. [ ] Exposure and wave energy regimes.

II. Other Environmental Factors

1. [ ] Appropriate water quality.
   a. [ ] Light attenuation.
   b. [ ] Quantitative evaluation of nitrogen-loading regimes.
   c. [ ] Temperature.
   d. [ ] Salinity.
2. [ ] Epiphyte presence.
3. [ ] Incidence of herbivory.
4. [ ] Likelihood of wasting disease.
5. [ ] Adequate buffers and unvegetated subtidal areas (to allow for eelgrass beds to expand and/or decrease in size and function and migrate within the embayment).
6. [ ] Results from ESS software.

III. Plans

1. [ ] Planting.
2. [ ] Location of boat access.

IV. Environmental Conditions

1. [ ] Substrate material and quality.
2. [ ] Historical distribution of SAV.

V. Planting Plan

1. [ ] Plans use scientific names.
2. [ ] Planting methods.
3. [ ] Location of donor beds.
4. [ ] Planting densities and grid arrays.
5. [ ] Other - Specific staff recommendations related to planting.

VI. Monitoring

[ ] Appropriate monitoring language is included.

VII. Contingency

SUBMERGED AQUATIC VEGETATION MODULE DIRECTIONS

I. Hydrology

II. Other Environmental Factors

6. Use of Eelgrass Site Selection software is strongly recommended for all eelgrass mitigation and is required for mitigation projects over 0.25 acre in size. Results from the software, along with other environmental data should be submitted to the Corps for review and approval before the preliminary test sites are chosen.

III. Plans

1. A plan view drawing clearly delineating where the eelgrass is proposed to be planted. Since showing each individual plant is neither practical nor realistic, this may be illustrated with 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.

2. The drawings should show the boat access for maintenance and monitoring.

IV. Environmental Conditions

1. Substrate must be suitable for development and maintenance of SAV. The site has the environmental conditions, as demonstrated with data gleaned from archival sources or collected on site, to support the designed subtidal habitat.

2. Identify historical distribution of SAV in the project area.

V. Planting Plan

2. Whole-plant planting and/or seeding are generally appropriate for a mitigation site, as determined through consultation with the Corps. Several eelgrass planting methods have been developed over time (for more information, see http://www.csc.noaa.gov/coastal/expert/natreview/natreview06.htm). When any of the planting methods are used, planting techniques should employ a checkerboard pattern with the shoot density in each quadrat to be 50 per quarter-acre. Among those most commonly used are:

The **horizontal rhizome** technique is commonly employed to restore eelgrass habitat (Davis and Short, 1997). In this approach, rhizomes are harvested from a donor site. After harvesting the shoots, they are gathered into bundles of 50 and transported by cooler to the transplant site. Eelgrass shoots should be installed at a minimum of the initial density of the impacted bed. Two rhizomes are tied together so that their shoots are on opposite ends of the bundle. Then, the whole bundle is manually planted in the substrate by divers. The horizontal rhizome method is labor-intensive

and works best when no more than four shoots are bundled together. A variety of this technique involves tying large bundles of shoots together and planting them all at once. Anecdotal evidence indicates favourable success rates employing this method (S. Tuxbury, personal communication).

Broadcasting of eelgrass seed in Chincoteague Bay has met with some success. Although the technique is much less labor-intensive, the sprouting seedlings are very sensitive to environmental conditions at the bottom as well as herbivory and bioturbation. Low overall success rates in New England were reported by Orth, et al., 2009 and Orth, et al., 2008. However, Leschen, et al., 2009 reported good success rates in Boston Harbor.

TERFS (or Transplanting Eelgrass Remotely with Frame Systems) is a rigid frame grid made of wire and bricks (Burdick and Short 2002). Two rhizomes are tied to each of the intersections of the grid with biodegradable material, and then the entire frame is deployed on the bottom. Frames should be planted 2-3 meters apart. The frame is then removed after approximately a month when the rhizomes have established themselves in the substrate. See this link for further information (http://marine.unh.edu/jel/seagrass_ecology/communityeelgrassrestoration/commeelgrassrestor2002.pdf).

3. Native planting stock from the immediate vicinity of the project is ideal. Whenever possible, plants should be salvaged from eelgrass beds destined for removal or impact from the original project. Other donor beds should be carefully chosen. Care must be taken not to cause negative impacts to the donor bed by harvesting. Overharvesting of donor beds can damage physical structure and encourage the invasion of green crabs into the mitigation site. For this reason donor beds not located in the impact area must be specified in the mitigation plan.

VI. Monitoring

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

MONITORING

Monitoring should begin one month after transplanting or seeding and again at semi-annual intervals and include:

1. Calculation of the percentage of planting units (clumps or horizontal rhizomes) that survived vs. the total planted.

2. Shoot density (# of shoots vs. baseline shoot density). Shoot density should be measured *in situ* within the 0.0625 m^2 quadrats for each planting grid and within the reference area.

3. Percent cover.

4. Canopy height (80% of the average of the tallest leaves).

5. Presence and number of reproductive shoots.

6. Areal extent of the bed (determined as the total area of continuous eelgrass and patches at the project site, excluding grass that is 100m away (Short, et al., 2006, Lockwood, et al., 1991). The extent of the bed can be mapped using a drop camera or divers recording GPS readings at several points along the edges of the continuous bed and at the last shoot (Short, et al., 2006 and Short, et al., 2001).

Performance Standards

[Specific performance standards for the project should be included here. See list of examples below.]

Performance Standard Examples

Estimating the success (or degradation) of eelgrass mitigation projects requires the evaluation of a number of habitat functions and productivity measures. These include estimates of shoot density, areal extent, epiphyte density, and water quality. Performance standards are project-specific, but some examples are included here, each of the criteria to be met within a minimum of five years for the project to be determined successful.

1) The mitigation site had at least 75% survival of shoots after one year.

2) Shoot densities are no less than 50% of the target densities in the first two growing seasons, followed by no less than 75% in the third, fourth, and fifth years of monitoring.

3) Unless otherwise specified in the mitigation plans, the plant/shoot density is no less than that observed at the impacted site. The density measurement is the greater of the impacted site and the reference site. This can be assessed using either total inventory or quadrat sampling methods, depending upon the size and complexity of the site.

4) Transplants demonstrate at least 25% expansion of areal coverage within 1 year of transplanting. After the first 3 years the parameters are on a trajectory approaching reference levels.

5) Chosen indicators of function (e.g., eelgrass biomass, density) in the transplanted and reference eelgrass beds are compared and a bench mark of success calculated from the reference site data as follows:

- Success Criteria (SC) =100*(mean of all reference sites – 1 standard deviation/mean of all reference sites).
- Measured indicators at the restoration and reference sites are then compared in the following equation:
- Success Ratio (SR) = 100*(mean of one restoration site/ mean of selected reference sites).

When the SR for a given indicator equals or exceeds the SC, the restoration is considered successful for that indicator.

Monitoring Report Requirements

Additional items for inclusion:

Project Overview

- Highlighted summary of problems which need immediate attention (e.g., problems with substrate characteristics, severe invasive species intrusion, serious erosion, major losses from herbivory, disease, etc.). This should be at the beginning of the report and highlighted in the project overview and in the self-certification form.

Requirements

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

Summary Data

- Address performance standards achievement and/or measures to attain the standards.

- Describe the monitoring inspections, and provide their dates, that occurred since the last report.

- Quantify tidal ranges, measured seasonally, in physical parameters of substrates.

- Quantify water clarity, nitrogen loading, and salinity.

- Presence of crab populations as well as the presence and density of epiphytes (quantified by percent leaf shoot cover) must be estimated.

- Concisely describe remedial actions done during the monitoring year to meet the performance standards – actions such as removing debris, replanting, controlling herbivores (with biological, herbicidal, or mechanical methods), deploying exclosures, adjusting site bathymetry, etc.

- Report the status of all disturbance barriers or other techniques for minimizing effects of bottom disturbance 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 percent vegetative cover for each mitigation site using shoot densities collected in a quadrat sampling plan.

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

- 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.

Conclusions

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

Monitoring Report Appendices

Appendix A – An as-built/as-planted plan showing bathymetry to 1-foot contours and the location and extent of the designed eelgrass beds. Within each community type, the plan shall show the species planted—but it is not necessary to illustrate the precise location of each individual plant. This document should be included in the first monitoring report and updated if there is grading or additional plantings required in subsequent years.

Appendix B – A percent cover of SAV by species. The volunteer species list should, at a minimum, include those that cover at least 5% of the cover.

Appendix C – Video documentation of each mitigation site and representative photos of transects from each mitigation site taken from the same locations for each monitoring event. This documentation will consist of video transect monitoring along

fixed lines to be done during the peak growing season at a time to be the same each year. Photos should be dated and clearly labelled with the direction from which the photo was taken. The photo sites must also be identified on the appropriate maps. In addition, in-water surveys will be conducted that include shoot density, % cover, epiphyte % cover, crabs, and light extinction levels.

VII. Contingency

If the beds are not expanding at a desired rate, and success as measured by the performance standards is not met, then a contingency plan should be considered. Describe the procedures to be followed should unforeseen site conditions or circumstances prevent the site from developing as intended. Examples of such situations include ship wrecks, oil spills, weather conditions (drought, heat, etc.), bottom currents, etc.

Alternatives to creation of eelgrass habitat may only be considered as a last resort if the constructed beds fail and/or if no alternate appropriate site can be found (determined after consultation with the Corps). The Corps will have the final say as to whether an alternative shall be used by a permittee in part or in full to meet mitigation requirements. This will be evaluated each year after reviewing results of the monitoring report

There are a number of alternative compensatory mitigation types. These may include:

- Improvements in watershed development activities, such as establishing sediment input management plans.
- Improvement in marine-related technologies, such as alternative techniques to minimize bottom scouring in eelgrass beds.
- Improvement of sewage technologies, such as increasing efficiency of nutrient removal technologies in a sewage system or installing sewer lines to a non-sewered development adjacent to eelgrass habitat.
- Where state policies allow, contribution to an in lieu fee program, provided program funds of at least the amount of the payment are used for eelgrass mitigation.

In all cases except the fourth, these options are not preferred alternatives because of the inability to quantify their potential to enhance or create eelgrass habitat. For this reason, the Corps will require a larger mitigation ratio in these cases.

6. STREAM MODULE CHECKLIST

I. Hydrology

1. [ ] Evidence of appropriate hydrology to support the desired stream type.
   a. [ ] Watershed size.
   b. [ ] Design discharge.
2. [ ] Water source(s).

II. Structure

1. [ ] Planform geometry.
2. [ ] Channel form.
3. [ ] Sinuosity and length.
4. [ ] Floodplain.
5. [ ] Riffles and pools.

III. Riparian Planting Plan

1. [ ] Plans use scientific names.
2. [ ] Plant materials are native and indigenous to the area of the site(s); invasive species, nonnative species, and/or cultivars are not proposed for planting or seeding.
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. [ ] Seed mix composition is provided.
6. [ ] Representative cross section plans showing vegetative community zones.
7. [ ] Relocation of plantings allowed when appropriate.
8. [ ] Other - Specific staff recommendations related to planting.

STREAM MODULE DIRECTIONS

For projects involving removal of dams, ideas for project goals and monitoring may be found in this document: http://www.gulfofmaine.org/streambarrierremoval/.

I. Hydrology

Sources of water and documentation of availability should be provided.

II. Structure

Some of the relevant information includes planform geometry, channel form (e.g., typical channel cross sections), watershed size, design discharge, length, sinuosity, riffles/pools, and floodplain.

III. Riparian Planting Plan

1. – 4. See III. 1. – 4. in Nontidal Wetlands Module.

5. See III. 8. in Nontidal Wetlands Module.

6. See III. 9. in Nontidal Wetlands Module.

7. See III. 10. in Nontidal Wetlands Module.

APPENDIX A

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APPENDIX B

MITIGATION REPORT
SAMPLE SUMMARY OF PROPOSED 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

APPENDIX C

MITIGATION REPORT
SAMPLE WETLAND IMPACT AREA FUNCTIONS-SERVICES SUMMARY

(Using the New England District's Highway Methodology Workbook Supplement, Wetland Functions and Values: a Descriptive Approach)
http://www.nae.usace.army.mil/reg/hwsplmnt.pdf

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					

APPENDIX D

INVASIVE AND OTHER UNACCEPTABLE PLANT SPECIES[28]

a. Herbs:

Aegopodium podagraria	Goutweed or Bishop's weed
Aira caryophyllea	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
Arthraxon hispidus	Hairy joint grass
Asparagus officinalis	Asparagus
Barbarea vulgaris	Yellow rocket
Bassia scoparia (*Kochia scoparia*)	Summer cypress
Bromus tectorum	Drooping brome-grass
Butomus umbellatus	Flowering rush
Cabomba caroliniana	Fanwort
Callitriche stagnalis	Water-starwort
Calystegia sepium	Japanese bindweed
Cardamine impatiens	Bushy rock-cress
Cardamine pratensis	Cuckoo-flower
Carex kobomugi	Japanese sedge
Centaurea stoebe ssp. *micranthos* (*C. biebersteinii*)	Spotted knapweed
Chelidonium majus	Celandine
Cirsium arvense	Canada-thistle
Cirsium palustre	Marsh thistle
Commelina communis	Asiatic day-flower
Cynanchum louiseae (*Vincetoxicum nigrum*)	Black swallow-wort
Cynanchum rossicum (*Vincetoxicum rossicum*)	Black swallow-wort
Cyperus esculentus	Yellow nutsedge
Dactylis glomerata	Orchard-grass
Datura stramonium	Jimsonweed
Echinochloa crus-galli	Barnyard grass
Egeria densa	Giant waterweed
Eichhornia crassipes	Water hyacinth
Eleusine indica	Goosegrass
Elsholtzia ciliata	Elsholtzia

[28] Scientific names are those used primarily in National Wetland Plant List (http://wetland_plants.usace.army.mil/) and secondarily in USDA PLANTS database (http://plants.usda.gov/).

Elymus repens (*Elytrigia repens*)	Quack-grass
Epilobium hirsutum	Hairy willow-herb
Euphorbia cyparissias	Cypress spurge
Euphorbia esula	Leafy spurge
Fallopia baldschuanica (*Polygonum baldschuanicum*, *P. aubertii*)	Silver lace-vine
Fallopia japonica (*Polygonum cuspidatum*)	Japanese knotweed
Fallopia sachalinensis (*Polygonum sachalinense*)	Giant knotweed
Festuca trachyphylla (*F. ovina*, *F. brevipila*)	Sheep fescue
Ficaria verna (*Ranunculus ficaria*)	Lesser celandine
Froelichia gracilis	Slender snake cotton
Geranium ibericum	Nepalese crane's-bill
Geranium sibiricum	Siberian crane's-bill
Geranium thunbergii	Thunberg's geranium
Glaucium flavum	Sea- or horned poppy
Glechoma hederacea	Gill-over-the-ground
Glyceria maxima	Sweet reedgrass
Hemerocallis fulva	Tiger-lily
Heracleum mantegazzianum	Giant hogweed
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
Impatiens glandulifera	Ornamental jewelweed
Iris pseudacorus	Yellow iris
Lamium spp. (all)	Dead nettle
Lepidium latifolium	Tall pepperwort
Leptochloa panicea	Hair fescue
Lotus corniculatus	Birdsfoot trefoil
Luzula luzuloides	Oakforest woodrush
Lychnis flos-cuculi	Ragged robin
Lysimachia nummularia	Moneywort
Lysimachia vulgaris	Garden loosestrife
Lythrum salicaria	Purple loosestrife
Malva neglecta	Cheeses or common malva
Marsilea quadrifolia	Water shamrock or Eurasian 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
Nasturtium microphyllum (*Rorippa microphylla*)	One-row yellow cress
Nasturtium officionale (*Rorippa nasturtium-aquaticum*)	Watercress
Nymphoides peltata	Yellow floating heart
Onopordum acanthium	Scotch thistle
Ornithogalum umbellatum	Star of Bethlehem
Pastinaca sativa	Wild parsnip
Persicaria maculosa (*Polygonum persicaria*)	Lady's thumb
Persicaria perfoliata (*Polygonum perfoliatum*)	Mile-a-minute vine
Persicaria posumbu (*Polygonum caespitosum*)	Cespitose knotweed
Phalaris arundinacea	Reed canary-grass
Phragmites australis	Reed grass, Phragmites
Pistia stratiotes	Water lettuce
Poa compressa	Canada bluegrass
Poa pratensis	Kentucky bluegrass
Poa trivialis	Rough bluegrass
Potamogeton crispus	Curly pondweed
Puccinellia maritima (*P. americana*)	Seaside alkali-grass
Pueraria montana	Kudzu
Ranunculus repens	Creeping buttercup
Rorippa sylvestris	Creeping yellow cress
Rumex acetosella	Sheep-sorrel
Rumex obtusifolius	Bitter dock
Salvinia molesta	Salvinia
Securigera varia (*Coronilla varia*)	Crown vetch
Senecio jacobaea	Tansy ragwort
Setaria pumila (*S. lutescens, S. glauca*)	Yellow foxtail or yellow bristlegrass
Silphium perfoliatum	Cup plant
Solanum dulcamara	Bittersweet nightshade
Stellaria graminea	Common stitchwort
Tanacetum vulgare	Tansy
Thymus pulegioides	Wild thyme
Trapa natans	Water-chestnut
Tussilago farfara	Coltsfoot
Typha angustifolia	Narrow-leaved cattail
Typha latifolia[29]	Common or Broad-leaved cattail
Typha X glauca	Hybrid cattail
Valeriana officinalis	Garden heliotrope
Verbascum thapsus	Common mullein
Veronica beccabunga	European speedwell

[29] *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.

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
Alnus glutinosa	European alder
Amorpha fruticosa	False indigo
Berberis thunbergii	Japanese barberry
Berberis vulgaris	Common barberry
Catalpa speciosa	Western catalpa
Celastrus orbiculatus	Oriental bittersweet
Cytisus scoparius	Scotch broom
Elaeagnus angustifolia	Russian olive
Elaeagnus umbellata	Autumn olive
Euonymus alatus	Winged euonymus
Euonymus hederaceus (*E. fortunei*)	Climbing euonymus
Frangula alnus (*Rhamnus frangula*)	European buckthorn
Humulus japonicus	Japanese hops
Hypericum prolificum	Shrubby St. John's wort
Ligustrum obtusifolium	Japanese privet
Ligustrum ovalifolium	California privet
Ligustrum sinense	Chinese privet
Ligustrum vulgare	Common/hedge privet
Lonicera japonica	Japanese honeysuckle
Lonicera maackii	Amur honeysuckle
Lonicera morrowii	Morrow's honeysuckle
Lonicera tatarica	Tatarian honeysuckle
Lonicera X bella	Morrow's X Tatarian honeysuckle
Lonicera xylosteum	European fly-honeysuckle
Morus alba	White mulberry
Paulownia tomentosa	Princess tree or empress tree
Phellodendron amurense (*P. japonicum*)	Corktree
Populus alba	Silver poplar
Rhamnus cathartica	Common buckthorn
Ribes rubrum (*R. sativum*)	Garden red currant
Robinia pseudoacacia	Black locust
Rosa multiflora	Multiflora rose
Rosa rugosa	Rugosa rose
Rubus phoenicolasius	Wineberry

Salix purpurea[30]	Basket or purple-osier willow
Sorbus aucuparia	European mountain-ash
Taxus cuspidata	Japanese yew
Ulmus pumila	Siberian elm
Wisteria floribunda	Wisteria

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

APPENDIX E

MITIGATION REPORT
TRANSMITTAL AND SELF-CERTIFICATION

DEPARTMENT OF THE ARMY PERMIT NUMBER:
PROJECT TITLE:

PERMITTEE:
MAILING ADDRESS:

TELEPHONE:

AUTHORIZED AGENT:
MAILING ADDRESS:

TELEPHONE:

ATTACHED MITIGATION REPORT
TITLE:

PREPARERS:

DATE:

CERTIFICATION OF COMPLIANCE: I certify that the attached report is accurate and discloses that the mitigation required by the Department of the Army Permit **[is] [is not]** in full compliance with the terms and conditions of that permit.

CORRECTIVE ACTION: A need for corrective action **[is] [is not]** identified in the attached report.

CONSULTATION: I **[do] [do not]** request consultation with the Corps of Engineers to discuss a corrective strategy or permit modification.

CERTIFIED:_____
(Signature of permittee) Date

APPENDIX F

MITIGATION REPORT
PROJECT OVERVIEW FORM

Corps Permit No.:
Mitigation Site Name(s):
Monitoring Report: _____ of _____
Name and Contact Information for Permittee and Agent:

Name of Party Responsible for Conducting the Monitoring:

Date(s) of Inspection(s):

Project Summary:

[include purpose of approved project, acreage and type of aquatic resources impacted, and mitigation acreage and type of aquatic resources authorized to compensate for the aquatic impacts]

Location of and Directions to Mitigation Site(s):

Start and Completion Dates for Mitigation:

Performance Standards **are**/**are not** being met:

[describe how]

Dates of Corrective or Maintenance Activities Conducted Since Last Report:

Recommendations for Additional Remedial Actions: