PUBLIC NOTICE

US Army Corps
of Engineers ®
New England District

696 Virginia Road
Concord, MA 01742-2751

Date: May 28, 2019
Comment Period Ends: June 27, 2019
File Number: NAE-2019-00007
In Reply Refer To: Ruth Ladd or Taylor Bell
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PROPOSED REVISION OF NEW ENGLAND DISTRICT COMPENSATORY MITIGATION GUIDANCE

This notice concerns guidance for compensatory mitigation for impacts to aquatic resources associated with Department of the Army permits in New England. The terms "mitigation" and "compensation" are used here interchangeably to refer to compensatory mitigation.

The Corps New England District (District) has periodically revised and updated its compensatory mitigation guidance, most recently in 2016. These revisions are generally for a variety of reasons, including incorporating new national guidance and directives, improved methodologies, and updated technical information. A combination of these has prompted this current revision.

There are several notable changes in the proposed guidance. It has been restructured so the overall compensatory mitigation guidance is the main body of the document with appendices for a variety of specific topics. All matrices have been grouped in one appendix (Appendix C) for ease of use. Based on lessons learned during the use of the 2016 guidance, major changes have been made in the matrices and calculations for vernal pools and streams. The Vernal Pool Assessment and Vernal Pool Characterization Form have been moved into the Vernal Pool module in Appendix H. Some guidance for rockweed has been added in Appendix J. Additional appendices have been added: Appendix B - Site Selection Checklist", Appendix M - Long Term Management Plan Template, and Appendix N - In Lieu Fee Programs. In addition, a number of smaller, mostly editorial changes have been made.

Preliminary review of the proposed 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.

Public comments on the proposed revisions post-marked by **June 27, 2019**, will be considered. Anyone wishing to comment is encouraged to do so. Any questions or comments regarding the District compensatory mitigation guidance revisions should be directed to Ruth Ladd at ruth.m.ladd@usace.army.mil, Taylor Bell at taylor.bell@usace.army.mil, and CENAE-R@usace.army.mil.

Any person may request, in writing, within the comment period specified in this notice, that a public hearing be held to consider this guidance. Requests for a public hearing shall specifically state the reasons for holding a public hearing. The Corps holds public hearings for the purpose of obtaining public comments when that is the best means for understanding a wide variety of concerns from a diverse segment of the public.

The preliminary determinations made herein will be reviewed in light of facts submitted in response to this notice. All comments will be considered a matter of public record.

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ROBERT J. DESISTA
Acting Chief, Regulatory Division

If you would prefer not to continue receiving Public Notices, please contact Ms. Tina Chaisson at (978) 318-8058 or e-mail her at bettina.m.chaisson@usace.army.mil. You may also check here ( ) and return this portion of the Public Notice to: Bettina Chaisson, Regulatory Division, U.S. Army Corps of Engineers, 696 Virginia Road, Concord, MA 01742-2751.

NAME: _____

ADDRESS: _____

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US Army Corps
of Engineers ®
New England District

NEW ENGLAND DISTRICT COMPENSATORY MITIGATION GUIDANCE

DRAFT 5/28/2019

This document represents New England District guidance and incorporates the requirements of the following documents. NOTE: An internet search provides a quick access to these documents:

1. Compensatory Mitigation for Losses of Aquatic Resources; Final Rule 4/10/08; 33 CFR Parts 325 and 332 ("Mitigation Rule")
2. Regulatory Guidance Letter 08-03: Minimum Monitoring Requirements for Compensatory Mitigation Projects Involving the Restoration, Establishment, and/or Enhancement of Aquatic Resources

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[1] Clark Island restoration (Maine)
[2] Belknap preservation (Connecticut)
[3] 3 Mile Bridge Rd restoration and rehabilitation (Vermont)
[4] Fogg Hill Bog preservation and rehabilitation (New Hampshire)
[5] Outlet Stream Masse Dam removal stream restoration (Maine)
[6] Lake Shore Drive stream and wetland restoration and rehabilitation (Rhode Island)

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GENERAL GUIDANCE

1. Purpose and General Considerations

Permit applicants should contact the Corps prior to developing a mitigation strategy, especially before initiation of compensatory mitigation plan development and mitigation site selection. Permittee-responsible mitigation (PRM) and In-Lieu Fee (ILF) project requirements are project-specific, and appropriate site selection is critical to mitigation meeting performance standards. By regulation, there is a preference for third party mitigation (e.g., ILF programs which are available in all New England states except Rhode Island).

This New England District Guidance is for use when the Corps determines PRM is appropriate for a particular project and for third party mitigation projects (mitigation banks and ILF programs). *When a mitigation bank or an ILF program is available, compensatory mitigation conducted using these options is considered preferable to PRM alternatives according to the federal Mitigation Rule unless the permittee can make the case that a PRM project, alone or in concert with purchase of bank or ILF credits, is more ecologically appropriate based on the needs of the watershed, sustainability, and/or has a higher likelihood of replacing lost aquatic resource functions.*

The Council on Environmental Quality (CEQ), overseeing the National Environmental Policy Act (with which the Corps must comply) 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. Department of the Army permits under the Clean Water Act Section 404 must comply with the 404(b)(1) Guidelines (40 CFR 230), which establish the environmental criteria by which activities are 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 unavoidable impacts to aquatic resources. *Note that the Mitigation Rule references the need for mitigation of impacts to all aquatic resources, not just wetlands.* Conforming to popular usage, these guidelines use the terms “mitigation” and “compensation” interchangeably to refer to compensatory mitigation, not minimization.

The purpose of this document is twofold:

1. To provide guidance to the regulated community on the requirements for compensatory 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 aquatic resource functions.

It is important to note that there is flexibility in this guidance. When variances are necessary, such as a lower carbon content of soil or use of a non-native annual grass to stabilize a site, the proposed mitigation plan should provide a simple explanation of the rationale for the variance(s). However, some items are required by regulation or policy and are indicated by use of the term "must." We acknowledge that there is no "one size fits all" approach when planning compensatory mitigation. Mitigation approaches must be adapted to the site-specific conditions. A mitigation project that will meet performance standards 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 adaptive management (e.g., invasive species control).

The checklists and checklist directions in the appendices 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 proposed mitigation projects, while the specific aquatic resource checklists are designed to note the required information unique to each resource.

Appendix A is a glossary of terms used in this document.**2. General Compensatory Mitigation Requirements**

2.a. 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 based on watershed scale considerations. 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 fits best in the landscape and provides the desired aquatic resource functions, taking into account aquatic habitat diversity, connectivity, and, for wetlands and streams, a natural balance of aquatic resources and non-wetlands. Compensation should not be situated in locations that are not conducive to successful establishment of aquatic functions (e.g., on-site compensatory mitigation functions may be degraded by proximity to the project). Larger sites are often preferable when compared to smaller sites which are often fragmented from other ecosystems which can limit establishment and/or improvement of aquatic functions. 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 but each should be sustainable long term.

The Mitigation Rule emphasizes the use of a watershed approach to siting mitigation projects. It defines watershed approach as "an analytical process for making compensatory mitigation decisions that support the sustainability or improvement of aquatic resources in a watershed. It involves consideration of watershed needs, and how locations and types of compensatory mitigation projects address those needs. A landscape perspective is used to identify the types and locations of compensatory mitigation projects that will benefit the watershed and offset losses of aquatic resource functions and services caused by activities authorized by Department of Army (DA) permits. The watershed approach may involve consideration of landscape scale, historic and potential aquatic resource conditions, past and projected aquatic resource impacts in the watershed, and terrestrial connections between aquatic resources when determining compensatory mitigation requirements for DA permits." See Appendix B "Site Selection Checklist" for specific suggestions.

If the Corps makes the determination that PRM is more ecologically appropriate than ILF or mitigation banking, then restoration in association with preservation of the work area and meaningful buffer is often preferred. However, 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), has a higher likelihood of meeting performance standards than the other compensatory mitigation methods, provides greater gains in aquatic resource functions compared to preservation, and provides greater gains in resource areas/linear feet than rehabilitation. Restoration is also less likely than creation to impact potentially ecologically important non-wetlands. In addition, restoration sites are usually appropriately situated within the landscape. As such, higher ratios are typically required for creation, rehabilitation, and preservation than those required for restoration, and different performance standards may apply. <u>Note that typically invasive species control is not suitable as compensatory mitigation, rather, it is part of the site stewardship.</u>

For additional information on planning and implementing effective 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."

2.b. <u>Effective Replacement of Functions</u>

Applicants should expect that an acreage replacement of greater than 1:1 will be deemed appropriate for permanent losses of aquatic resources. The replacement ratio or multiplier determined by the Corps will be based on several factors, including: the aquatic resource functions that are impacted, the difficulty of restoring or establishing the desired aquatic resource type and functions, the temporal loss of functions, the likelihood of meeting performance standards, and a

"safety factor." The baseline included in the New England District multipliers (see Appendix C) 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 limit risk in the case of partial project failure. Our experience shows that some portions of most mitigation sites fail to establish the required aquatic resource area and/or functions. In the case of wetlands, sites may fail to develop the appropriate hydrology, which diminishes these sites' contribution to the no net loss goal. In the case of streams, constructed in-stream structures or channel and bank grading may fail or not perform as expected. Remediation may resolve the problem(s) but there would be a temporal loss.

2.c. Temporal Losses

All projects that have not provided mitigation in advance of impacts will result in temporal losses of function that occur between the time aquatic resource functions are lost due to the project impacts and the time they are generated to a similar degree in compensatory mitigation. For example, the wildlife and ecosystem support functions of forested wetlands may take 30-50 years or more to develop and eelgrass habitat functions may take 5 years or more to develop (Evans and Short 2005). These temporal losses are generally taken into consideration in development of the mitigation multipliers (formerly "ratios").

Wetland functions vary in the amount of time it typically takes to restore them, due to a variety of factors, including the degree of degradation, wetland type, climate, surrounding land cover/land use, and the specific function under consideration (physical vs. biological). Examples of wetland functions that may recover quickly are flood storage and groundwater discharge and/or recharge. While sediment trapping functions may develop relatively quickly, water quality functions involving biogeochemical transformations can take many years to develop because they depend upon the chemical and biological characteristics of the wetland soils, mainly the relative availability of organic matter. The amount and type of additional compensation will depend upon the type of functions impacted, the type of aquatic resource proposed, the functions intended, and any pre-existing conditions that may influence the development of the desired aquatic resource(s).

As is the case for wetland functions, some stream functions also vary in the amount of time it typically takes to restore them. Restoration of functions related to physical conditions, such as expanding fish access to upstream habitat and restoration of natural streamflow can be achieved relatively quickly, whereas functions related to the development of detrital biomass may take longer. Likewise, compensation for temporal losses of function will likely be incorporated into mitigation requirements.

In cases where mitigation fails to meet performance standards, additional temporal impacts occur and may require additional mitigation. See 2.h. below.

2.d. Difficult to Replace Aquatic Resources

Some types of aquatic resources are "difficult-to-replace." These include, but are not limited to: bogs, fens, springs, vernal pools, and Atlantic white cedar swamps. Mitigating impacts to such resources require very careful analysis and study to determine if in-kind creation is likely to succeed or if out-of-kind compensation or preservation may be more appropriate for that project. We do have a module for vernal pools but replacement is difficult.

2.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 [Corps] 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** [emphasis added];
   (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.

See Appendix B for a Site Selection Checklist, the section for restoration, creation, or rehabilitation projects.

Reference sites - Compensatory restoration, rehabilitation, and creation mitigation projects should seek to duplicate the features of reference aquatic resources or

enhance connectivity with adjacent natural upland and aquatic resource landscape elements. Performance standards related to reference sites are encouraged. Mitigation project sites should be selected based on their ability to be, and continue to be, resistant to disturbance from the surrounding landscape, by locating them adjacent to refuges, buffers, green spaces, and other preserved natural elements of the landscape. *In general, aquatic resource mitigation projects should be designed to be self-sustaining, natural systems within the landscape and climate in which they are located, with little or no ongoing maintenance and/or hydrologic manipulation.*

Sustainability - Long-term sustainability is a key feature of effective mitigation. Wherever possible, sites should be selected in areas where aquatic resources previously existed and/or where nearby aquatic resources currently exist. Restoration is generally more feasible and sustainable than creation of aquatic resources. However, in some cases, long-term sustainability of restored functions is not feasible due to degradation of the overall landscape. In such cases, use of third-party and/or out-of-kind mitigation is probably appropriate to achieve long-term sustainability and, in such cases, should be based on consideration of watershed needs.

Degraded habitats are favored construction-type compensation locations; however, the potential for invasive species establishment should be taken into consideration when evaluating the appropriateness of these sites for mitigation. Habitat degradation varies across a continuum and so must flexibility in designing mitigation projects at such sites.

Conversion of non-wetland habitat - Creation and restoration sites should not result in the degradation or destruction of valuable non-wetlands. For example, mature forested uplands and other non-degraded non-wetlands are generally inappropriate for use as wetland creation sites. Likewise, projects proposing creation and restoration of eelgrass habitats and living shorelines should take into consideration bottom habitats that already have valuable aquatic functions.

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 that can be self-sustaining in the long term. 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.

A recent Maine Department of Environmental Protection study of compensatory mitigation[7] in that state made the following findings and recommendations which the Corps' endorses:

> Landscape setting and land use in the surrounding watershed have a major influence on water quality and attainment of aquatic life criteria in mitigation wetlands. Other factors include habitat complexity, the presence of adequate buffers, and the quality of aquatic and riparian habitat. Where ecological connectivity to other wetlands and water bodies is lacking or inadequate, opportunities for colonization and reproductive success of macroinvertebrates and other aquatic life are limited.
>
> Some sampled mitigation wetlands have substantial amounts of residential development, commercial development, and/or agricultural activities in close proximity that contribute high concentrations of nutrients and other toxic contaminants through surface runoff or groundwater influx. Adverse effects on wetland health from these stressors can be lessened to some degree through the use of vegetated buffers and stormwater best management practices. Careful siting of mitigation projects to avoid densely urbanized areas and other known contaminant sources is of primary importance if the desired goal is to compensate for permitted wetland losses by restoring, enhancing, or creating sustainable wetlands having physical habitat, water quality, and biological integrity comparable to naturally occurring systems.

2.f. Preservation as Mitigation

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 some, but not all circumstances. While preservation does not replace aquatic resource acres/linear feet or functions, it does reduce the threat of future impacts and may stem future aquatic resource degradation. For this reason, appropriate preservation-only projects can be a suitable means of compensatory mitigation in situations where meaningful aquatic resource restoration, creation, and/or rehabilitation 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.

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

[7] DiFranco, J.L et. al. 2013. *Evaluating Alternative Wetland Compensatory Mitigation Assessment Techniques*. 104b3 Wetland Program Development Grant Final Report DEPLW-1258. p. 34.

(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[8]; 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.

See Appendix B for a Site Selection Checklist, the section for preservation projects.

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). All of the New England states have laws protecting aquatic resources that result in reduced development pressure on aquatic resources. However, the surrounding non-wetland may not be protected, allowing degradation to the aquatic resources. Therefore, New England District supports a combination of upland and aquatic resource preservation rather than aquatic resources-only preservation.

Preservation may also be used for other elements of mitigation than compensation (avoidance and minimization). Wetlands within subdivisions, golf courses, etc. should generally be protected along with adequate buffers. This should not be part of compensation.

[8] According to Regulatory Guidance Letter 02-02: "The existence of a demonstrable threat will be based on clear evidence of destructive land use changes that are consistent with local and regional (i.e., watershed) land use trends, and that are not the consequence of actions under the permit applicant's control."

Permit applicants or mitigation bank/ILF programs with proposed preservation parcels for compensatory mitigation should provide evidence that the title is clear and does not have encumbrances that could reduce the value of the parcel for compensatory mitigation, such as timber or mineral rights. Easements and rights-of-way should be disclosed and considered in relation to their impact. In addition, all preservation projects should include in their mitigation plans a long-term management plan, to be approved by the Corps, with adequate funding to ensure appropriate stewardship in perpetuity.

2.g. Documentation of Long-Term Protection

Long-term protection is an important element of every compensatory mitigation project. The created, restored, and rehabilitated sites should be preserved in perpetuity, along with an ecologically appropriate buffer, to ensure the long term viability of these compensatory mitigation sites. There are numerous mechanisms that are deemed appropriate for providing long-term protection for mitigation sites. These include fee transfer to another entity such as a non-profit conservation organization or public agency with a conservation mandate, an easement held by 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[9].

2.h. Amount of Compensatory Mitigation

Like many Corps districts around the country, New England District has developed standard compensatory mitigation ratios, here expressed as multipliers, to serve as a starting point for developing adequate compensatory mitigation (Appendix C). These multipliers provide guidance for most compensatory aquatic resource mitigation required by New England District. There are different multipliers designed to address direct permanent impacts, as well as 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 multipliers are based on:

- Complexity of system impacted,
- Likelihood of mitigation meeting performance standards,
- Degree to which acres/linear feet and functions are replaced, and

[9] Conservation restrictions in Massachusetts that require legislative action to change are different than deed restrictions where the owner is the only responsible party.

- Temporal losses for certain functions (e.g., water quality renovation, aquatic wildlife habitat).

These guidelines represent 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 multipliers are the starting point for developing appropriate compensatory mitigation and are widely used, there continues to be flexibility on a project-by-project basis in order to achieve the most appropriate mitigation for a specific project. This flexibility may lead to a determination by the Corps of an amount and type of compensatory mitigation that differs from that included here. Project-specific multipliers may be lower than depicted here, or they may be higher so that unavoidable impacts to high quality aquatic resources may be adequately mitigated and/or secondary impacts may be addressed. The functions and levels of functions impacted are important in determining adequate and appropriate compensation. **Some of the factors to be considered in developing 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.
- The needs of the watershed and identified restoration and protection priorities identified in other appropriate watershed plans.

Proven mitigation methods and confidence that the proposed plan substantially reduces the risks inherent in aquatic resource construction may also be considered in determining the appropriate multipliers 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.

When a mitigation site fails to meet performance standards by the end of the monitoring period, temporal losses need to be addressed as well as the gap in meeting performance standards. If there is complete failure of some or all of the site, the same acreage and wetland type would need to be provided plus a temporal add-on. If there is partial failure (e.g., inappropriate soils, inappropriate hydrology for target wetland type), the Corps will determine equivalent credit needed plus a temporal add-on. An alternative to having the permittee correct the problem is to use an in-lieu fee payment that appropriately addresses the failure (hydrology, soils, vegetation, encroachments, etc.).

Recommended Mitigation for Direct Permanent Aquatic Resource Impacts (see Appendix C for resource-specific mitigation recommendations)

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 multipliers are based on the type of aquatic resource impacted, not the type of aquatic resource proposed for compensation. The multipliers were developed with the presumption of in-kind compensation (which will not always be appropriate) and any ranges are meant to reflect the quality of aquatic resource at the impact site and the level of functions impacted. If an appropriate watershed plan is available and that plan identifies a specific type or types of aquatic resources that are priorities for restoration or protection, such plans can provide a rationale for out-of–kind compensation. The ILF programs include a Compensation Planning Framework which addresses watershed needs and can be used as a watershed plan if no other exists. In cases where out-of-kind compensation is performed, project-specific multipliers may be applied.

In many cases, degraded water quality will be a major determining factor in whether a mitigation project achieves performance objectives. When an applicant proposes a mitigation project in designated impaired waters, the expected lower likelihood of meeting performance standards will be considered. Hence, locating something such as eelgrass mitigation in impaired waters would typically not be approved due to the high likelihood that the project would never attain performance standards.

Recommended Mitigation for Temporary and/or Secondary Impacts to Aquatic Resources (see Appendix C for resource-specific mitigation recommendations)

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 many cases, it will be necessary to compensate for such temporary and secondary impacts to prevent a net loss in aquatic resource functions.

Temporary Impacts

In temporary fill situations, although the fill is not permanent, impacts may 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 due to upheaval or incomplete reestablishment of grade. In addition, temporary impacts may lead to a temporal loss of aquatic resource acres/linear feet and/or functions that should be addressed through compensatory mitigation. Site conditions should be evaluated to determine if any of these long-term effects are likely to occur.

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)). **Secondary impacts are ONLY considered when there is an associated direct fill (permanent or temporary) of a jurisdictional aquatic resource (including wetlands) requiring a section 404 permit.**

Corps regulations published in the March 19, 2012, Federal Register state in C.23.(h):

> "Where certain functions and services of waters of the United States are permanently adversely 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 to the minimal level."

Suggestions for compensatory mitigation for temporary (in addition to restoration in place which is minimization) and secondary impacts are expressed as percentages or ranges of percentages of the mitigation recommended for direct, permanent impacts. There are several factors to consider in determining whether compensatory mitigation is needed for temporary and secondary impacts and in applying the ranges to determine the appropriate level of mitigation for a specific project and type of system, as described below.

- Removal of forested wetland vegetation: density and diversity of original woody vegetation, soil type (organic or mineral), effects of substrate compression, whether work is performed during dry or 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, creation of 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 and functional loss impacts during the time temporary fill is in place and during forest re-establishment and for permanent conversion to other aquatic resource types.
- Temporary and secondary impacts to scrub-shrub and emergent wetlands: soil type, effects of substrate compression, whether work is performed during dry or 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 envelope and critical terrestrial habitat (CTH) impacts: original aerial cover, relationship to other vernal pools, etc. Note that impacts to the portions of the envelope and CTH that are not aquatic resources would not be considered secondary impacts but loss of these upland resources can adversely impact the vernal pool.
- Stream riparian cover impacts: 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. Note that impacts to the portions of the riparian area that are not aquatic resources would not be considered secondary impacts but loss of these upland resources can adversely impact the stream.

2.i. Buffers

In most cases, a protected (preserved) buffer will be required around creation, restoration, and rehabilitation sites, including stream mitigation in some situations, to ensure the success and sustainability of the compensatory mitigation project (33 CFR 332.3(i)). 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 would be greater than 100 feet in width and vary spatially relative to the proximity to critical adult habitat.

Compensatory mitigation that involves restoration, creation, and rehabilitation 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.

2.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, due to the differing regulations that each operate under. 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. In some cases the state requirements result in projects that do not meet the Mitigation Rule requirements. Also note that, when mitigation banks and/or ILF programs are available, Corps regulations state a general preference for their use for mitigation unless permittee-responsible mitigation is determined to be more appropriate based on a landscape analysis and likely longterm sustainability.

2.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 identified.

2.l. Timing

Whenever feasible, mitigation construction should be in advance of or concurrent with the authorized impacts. The timing of the proposed compensatory mitigation may affect the amount of mitigation required. In cases where mitigation fails to develop as proposed, additional temporal impacts occur and may require additional mitigation. See 2.h. above.

2.m. Financial Assurances

As noted in the Preamble to the Mitigation Rule (p.19648-9 in the 4/10/08 Federal Register):

> "In this rule, financial assurances are used to provide a high level of confidence that compensatory mitigation projects will be completed, whereas long-term management measures are used to help ensure the long-term sustainability of compensatory mitigation projects. Funding for financial assurances is handled differently than funding for long-term management. The final rule clearly differentiates between financial assurances for construction and establishment

of compensatory mitigation projects and funding mechanisms for long-term management of those projects."

Short-term financial assurances to address the construction and required monitoring are generally required for permittee-responsible mitigation 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).

Government entities (federal and state agencies) are generally not required to provide performance bonds or similar assurances. However, they should provide a formal, documented commitment that covers all aspects of the mitigation, including project replacement, monitoring, remedial activities, and long-term stewardship.

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

An appropriate special condition in the permit would be:

> To ensure successful compensatory mitigation in accordance with 33 CFR 332.3(n), you shall establish a financial assurance in the form of a letter of credit, escrow account, or other appropriate instrument. The type, language, and amount of the financial assurance must be approved, in writing, by this office. You shall submit proof of the establishment of the financial assurance to this office prior to initiation of construction activities in waters of the U.S. authorized by this permit/verification. In the event it becomes necessary to draw upon the financial assurance, funds must be payable to a designee specifically approved, in writing, by this office or placed in a fund pursuant to a standby trust agreement specifically approved, in writing, by this office. You shall ensure that the financial assurance is in the form that assures that termination or revocation of the financial assurance shall not occur without prior approval by this office.

Long-term financial assurances are generally required to ensure that sites will have a source of funding for long-term management and, where appropriate, defense and management of the long-term site protection instruments. The amount of long-term funding that is set aside should reflect the management needs outlined in the long-term management plan, risks associated with the long-term site protection instrument (e.g., easement violations), and should address inflationary adjustments and other contingencies, as appropriate. Appropriate long-term financing mechanisms may include non-wasting endowments, trusts, contractual arrangements with future responsible parties, or other appropriate financial

mechanisms. A standard approach is to set up a non-wasting endowment to provide sufficient funds for annual (and annualized) expenses. For example, if $12,000 was invested to yield 7%, it would provide about $500 for expenses plus add to the principal. An appropriate special condition would require a long term management plan, approved by the Corps, which would specify the amount needed for initial expenses and for annual expenses long term and the amount of funds set aside in a non-wasting endowment [or equivalent] to cover those expenses.

3. 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. If a mitigation bank credit or an ILF is proposed, only documentation of the availability of credits is required.

The Mitigation Rule requires that individual permits requiring PRM include in the special conditions [332.3(k)(2)]:

(i) The party responsible for providing the compensatory mitigation;
(ii) Incorporate by reference the final mitigation plan approved by the Corps;
(iii) State the objectives, performance standards, and monitoring required for the projects unless they are in the mitigation plan; and
(iv) Describe all financial assurances unless they are in the mitigation plan.

For general permits with PRM, the Mitigation Rule requires that special conditions describe the proposal, which may be conceptual or detailed, and must include a special condition stating that that work in waters of the U.S. cannot begin until the Corps approved the final mitigation plan. If possible, the special conditions should also address the items required for individual permits.

The Mitigation Rule requires that the following items be incorporated into final mitigation plans [332.4(c)(2-13)]:

- 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 (See Appendix E)
- Long-term management plan

- Adaptive management plan
- Financial assurances

See Appendices B and D-I for specific mitigation plan data needs.

3.a. Submissions

Submissions in PDF and GIS polygon files (shapefile, geodatabase, or other GIS format) are strongly encouraged.

3.b. Hydrological Considerations

Hydrology is the driving force of aquatic resources, including wetlands, which are particularly sensitive to hydrologic variability. The variation in functions between wetland types is in large part due to fluctuations in water flow, depth, duration, and/or frequency. Naturally variable hydrology should be the goal; manipulation of hydrology to create static conditions should generally be discouraged. Hydrology within the mitigation site should be comparable to a reference aquatic resource within the same landscape setting (HGM type). Target hydrology should be based on this reference condition for the proposed wetland type and NOT based on a bare minimum for meeting the hydrology technical standard (US Army Corps of Engineers, 2005) as this will usually not result in functional replacement. Predictive hydrographs should be completed for all restoration, enhancement, and creation sites to help ensure that adequate hydrology is available. Reestablishment of natural hydrology is encouraged; active engineered devices are rarely approved because they must be maintained and perhaps operated in perpetuity. When natural hydrology is not feasible, consider passive structures to sustain the desired hydroperiod over the long term. 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. If this is the case, 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 three documents prepared by the Engineer 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

- "Technical Standard for Water-Table Monitoring of Potential Wetland Sites", ERDC TN-WRAP-05-02.
- "Water Table Monitoring Project Design," ERDC TN-WRAP-06-2

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 the National Weather Service under the appropriate Eastern Region Weather Forecast Office and the Northeast Regional Climate Center.

3.c. 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 vegetation establishment, not to provide hydrology. The use of irrigation for woody plantings should be considered for the first one or two growing periods 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 period 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 effectively: 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 reduce competition by herbaceous vegetation in the immediate vicinity of each plant for a couple of years. There are at least two methods available: biodegradable 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. Care should be taken to ensure that it does not contain propagules of invasive species. Suggested minimum 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 to be 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, and use of invasive species is prohibited, there are situations where use of non-natives may be appropriate such as using *Secale cereale* (Annual Rye) to quickly stabilize a site. Any such 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 were 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 (e.g., native *Typha latifolia*) are listed in Appendix I[10] and are not to be included as seed or planting stock in the overall project; however, 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.

Insects - The Emerald Ash-Borer, an insect species that is damaging to ashes, especially green ash (*Fraxinus pennsylvanicus*), is now in New England. Therefore, consideration of this should be made before incorporating ash (*Fraxinus* spp.) into planting plans. The Asian Long-horned Beetle and other invertebrate pests are 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

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

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.

3.d. Invasive Species

There is growing recognition of the negative impact that invasive species have on the environment, economy, and health of the United States[11] . 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 and Asian long-horned beetles). Soils disturbed by projects are very susceptible to invasion by undesirable plant species. Be particularly alert to the risk of invasion on exposed mineral soils resulting 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 (the US Bureau of Reclamation produced a September 2009 document on equipment inspection and cleaning). 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 unintended consequence of freshwater intrusion into the salt marsh. Useful information may be found in the Invasive Plants Atlas of New England. 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.

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

[11] U.S. Army Corps of Engineers Invasive Species Policy (2 June 2009); E.O. 13112

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 New England District's website for some links providing information on controlling these species:

    - Common reed (*Phragmites australis*)
    - Purple loosestrife (*Lythrum salicaria*)
    - Glossy 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*)
    - Black swallow-wort (*Cynanchum louiseae*)
    - Burning bush or winged euonymus (*Euonymus alatus*)
    - Japanese barberry (*Berberis thunbergii*)
    - Oriental bittersweet (*Celastrus orbiculatus*)
    - 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 L) should be planted anywhere on the project site. For more information on invasive species and ISCPs, please see additional information and guidance on New England District's Regulatory webpage

- 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 (application of herbicides), and biological (planting fast-growing trees and shrubs for shading or releasing herbivorous insects). Please review the "Guidelines for Disposal of Terrestrial Invasive Plants" published by the University of Connecticut prior to disposal of any invasive species material.

3.e. 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 must be removed when no longer needed. If straw bales are used (hay bales should be avoided as they have seeds included), they should be removed or pulled apart and spread out when no longer needed, preferably around woody vegetation to keep down herbaceous competition. Any accumulated sediments must be removed and disposed of outside of any aquatic resources, in a manner that prevents their return to any aquatic resources. Nylon netting, even those advertised as degradable, or non-biodegradable erosion control mats and/or netting must not be used in the mitigation area.

3.f. Mitigation Plan Guidance and Checklists

The majority of compensatory mitigation in New England, by acreage, 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. Some of the more common of these other aquatic resources include vernal pools, submerged aquatic vegetation (SAV), and streams. Special concerns and guidelines noted for developing compensatory mitigation for each are included as a resource module in their respective appendix. A complete mitigation plan should contain all of the pertinent information from the Overall Mitigation Plan Checklist, as well as all of the pertinent information from all of the specific resource modules that apply to the project.

Guidelines for specific resource types and directions for completing mitigation plan (using checklist) may be found in the following appendices:

Appendix D - Basic Mitigation Plan
Appendix E - Monitoring and Assessment
Appendix F - Wetlands Module
Appendix G - Stream Module
Appendix H - Vernal Pool Module (see also Appendix L)
Appendix I - Submerged Aquatic Vegetation Module
Appendix J - Other Aquatic Resources Module

4. Ecological Performance Standards

In consultation with the Corps, the applicant will develop clear, concise, and measurable 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 characteristics

(e.g., height, aerial cover, stem counts per specified area); or other aquatic resource characteristics (e.g., salinity, temperature, pH, water depth). Another option is to provide comparisons to reference aquatic resources of similar type and landscape position with specific ranges of comparability. When practicable, the performance standards should take into account the expected stages of aquatic resource development. Below are some examples of ecological performance standards. **These are ONLY EXAMPLES and specific performance standards should be individually crafted for each compensatory mitigation project.**

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 of eight weeks must be met, within two weeks at beginning and end of proposed wet season (as long as minimum hydrology technical standard is met).

   There 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 each cover type (PFO, PSS) AND at least the following number of non-invasive 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

   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.

3) 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 I).
   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* x *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]

4) 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.

5) 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.

6) 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.

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

   - Common reed (*Phragmites australis*)
   - Purple loosestrife (*Lythrum salicaria*)
   - Glossy 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*)
   - Black swallow-wort (*Cynanchum louiseae*)
   - Burning bush or winged euonymus (*Euonymus alatus*)
   - Japanese barberry (*Berberis thunbergii*)
   - Oriental bittersweet (*Celastrus orbiculatus*)

- [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.

8) Site will have documented use by breeding populations of target species: spotted salamanders and wood frogs.

9) Site will have documented use by target wildlife species: Blandings turtles.

10) Site will have documented use by target macroinvertebrates: caddis flies.

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

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

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

14) No nylon netting or non-biodegradable netting was used in the mitigation area.

15) Replace culvert which severs aquatic connectivity with one complying with the Stream Crossing Standards. New culvert complies with all applicable Stream Crossing Standards and maintains compliance through the monitoring period.

16) 25 foot wide riparian zones on both sides of Nash Stream for 1,000 linear feet will have >60% aerial coverage by native species by the end of the first growing season, >85% by the end of the second growing season, and >95% by the end of the monitoring period.

17) Following dam removal, the footprint of the former dam is stable and continues to be stable through the monitoring period.

18) Formerly inundated areas are stable and have >95% aerial coverage by native vegetation.

19) Along the newly exposed stream channel, to ensure stream shading, banks have >95% aerial coverage with native woody species which are >5' in height.

5. Monitoring

See Appendix E "Monitoring and Assessment".

6. Management

6.a. Site Protection

Appropriate real estate instruments providing long-term site protection include conservation easements (see 2.g.) should be held by third parties, government agencies with a conservation mission (e.g., state fish and game agency), or non-profit conservation organizations. If the site is on federal or state government land, long-term protection may be provided through facility management plans, integrated natural resources management plans, or other appropriate mechanisms that provide a reasonable degree of durability. The third party holder of the site protection instrument shall have the right to enforce site protections.

Another option is transfer of fee title to one of the above organizations with conservation restrictions incorporated in the transfer.

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

As required by the Mitigation Rule, 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 (see Appendix M), or other long-term protection must be approved by the Corps in advance of the authorized impacts.

6.b. Adaptive Management

Aquatic resource mitigation can be complicated and unforeseen outcomes can frequently occur. An adaptive management approach involves anticipating a variety of problems that might occur, exploring alternative ways to meet management objectives, predicting the outcomes of alternatives based on the current state of knowledge, implementing one or more of these alternatives, monitoring to learn about the impacts of management actions, and then using the results to update knowledge and adjust management actions (Williams et al., 2009). For example, pilot studies might compare various potential treatments to help determine the most effective mitigation approach. Such an 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.

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, use of a different site, or purchase of credits from a third party bank or ILF program. 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.

6.c. 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 or instrument. That entity must have the resources and expertise in the long-term management and stewardship of mitigation properties. The final mitigation plan must include a long-term management plan and should identify the party responsible for long-term management of the project. If, however, the mitigation provider is unable to designate the entity responsible for long-term management of the site at the time the mitigation plan (and its associated long-term management plan) are approved, future transfer of long-term management responsibility is acceptable after review and approval by the district engineer. In such cases, the mitigation provider is the default long-term manager until such time as the Corps approves transfer on long-term management responsibility to a third party.

The long-term management plan should include a description of possible long-term management needs (e.g., prevention of all-terrain vehicle problems, littering, encroachment, boat damage), the annual cost estimates to address them, and a funding mechanism to meet those needs. A suggested long-term management plan is in Appendix M. Long-term funding must be provided to the long-term site manager to provide the resources needed to manage the site per the terms of the long-term management plan and to enforce the site protections. The entity taking on the responsibility for the long-term management of the site may not necessarily be the same entity responsible for the real estate instrument (e.g., the easement holder).

As noted in the Preamble to the Mitigation Rule (p.19648-9 in the 4/10/08 Federal Register) in the discussion about 33 CFR 332.7(d) Long-term management:

> "Although compensatory mitigation projects should, to the extent it is practicable to do so, be self-sustaining, active long-term management and maintenance are often necessary for a compensatory mitigation project to fulfill its objectives. In such cases, provisions for long-term management need to be provided….

"For permittee responsible mitigation, § 332.7(d)(4) has been added to require approval of any required long-term financing mechanisms before the permitted impacts occur.

"…a long-term management plan should include a description of long-term management needs for the compensatory mitigation project and annual cost estimates for those needs, and identify the funding mechanism that will support the long-term management activities.…

"In this rule, financial assurances are used to provide a high level of confidence that compensatory mitigation projects will be completed, whereas long-term management measures are used to help ensure the long-term sustainability of compensatory mitigation projects. Funding for financial assurances is handled differently than funding for long-term management. The final rule clearly differentiates between financial assurances for construction and establishment of compensatory mitigation projects and funding mechanisms for long-term management of those projects. In general, funding for long-term management should not be phased out over time, since those activities usually need to be conducted for substantial periods of time."

Some examples of work that may be needed to be conducted by the long-term steward as part of long-term management include: annual walk-through or drone footage of the property to check on condition of signage, gates, and/or fences; evidence of ATV damage; presence of invasive species; unauthorized camping; evidence of dumping of trash, yard waste, etc.; and associated costs to address these (or other) issues.

To ensure the long-term management 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. 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 or requirement for credit release.

APPENDIX A – GLOSSARY

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

Active channel: The part of a non-tidal stream system within which natural processes maintain a linear depression for water flow, typically characterized by the presence of a bed and bank. The boundary of the active channel is the stream feature which most closely meets the criteria of the Ordinary High Water Mark (Mersel et al., 2014). This applies to all streams, whether or not they have been created and/or modified. For tidal streams the boundary would be the high tide line.

Belt width (or meander belt width): Width of the corridor as defined by the lateral extent of the river meanders. It is governed by valley landforms, surficial geology, and the length and slope requirements of the river channel. (VT ANR River Corridor Protection Guide).

Buffer: An area along an aquatic resource that protects that resource from adverse impacts of nearby land uses. It may intercept pollution, provide a wildlife corridor, supply shade to a waterway, stabilize sediments, reduce noise, provide habitat required by some aquatic species, etc. When located along a waterway it is termed a riparian buffer (see additional information in Appendix G - Stream Module).

Compensatory mitigation: Action taken which provides some form of substitute aquatic resource for the impacted aquatic resource after all appropriate and practicable avoidance and minimization has been achieved. It may include created, restored, and/or rehabilitated wetlands, streams, mudflats, etc. and preserved wetlands, streams, and/or uplands provided by the permittee or a third party through a mitigation bank or ILF program.

Credit: A unit of measure (e.g., a functional or areal measure or other suitable metric) representing the accrual or attainment of aquatic functions at a compensatory mitigation site. The measure of aquatic functions is based on the resources restored, established, enhanced, or preserved. [33 CFR 332.2]

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

Debit: A unit of measure (e.g., a functional or areal measure or other suitable metric) representing the loss of aquatic functions at an impact or project site. The measure of aquatic functions is based on the resources impacted by the authorized activity. [33 CFR 332.2]

Eelgrass rehabilitation: Restoring degraded functions of an existing eelgrass habitat. Degradation may result from infestation by herbivores, decreased water quality, or a change in substrate composition. Eelgrass habitat rehabilitation 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 marine/estuarine open water or marsh defined by natural topographical features such as points or islands, or by human structures such as dikes or channels. It is assumed that these semi-enclosed basins, due to their sheltered nature, provide a preferred growing environment for submerged aquatic vegetation (SAV), such as eelgrass.

Enhancement: The manipulation of the physical, chemical, or biological characteristics of an aquatic resource to heighten, intensify, or improve a specific aquatic resource function(s). Enhancement results in the gain of selected aquatic resource function(s), but may also lead to a decline in other aquatic resource function(s). Enhancement does not result in a gain in aquatic resource area. In this current sense, this is NOT the same as rehabilitation.

Epibiont (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.

Establishment (creation): The manipulation of the physical, chemical, or biological characteristics present to develop an aquatic resource that did not previously exist at an upland site. Establishment results in a gain in aquatic resource area and functions. This is equivalent to the traditional use of the term "creation."

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: A Hydrogeomorphic wetland classification system based on geomorphic position and hydrologic

characteristics used to classify wetlands into seven different wetland classes, as defined by Brinson (1993) and Smith et al. (1995).

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

In-lieu fee (ILF) program: A program involving the restoration, establishment, rehabilitation, and/or preservation of aquatic resources through funds paid to a governmental or non-profit natural resources management entity to satisfy compensatory mitigation requirements for Corps permits. Similar to a mitigation bank, an ILF program sells compensatory mitigation credits to permittees whose obligation to provide compensatory mitigation is then transferred to the ILF program sponsor. However, the rules governing the operation and use of ILF programs are somewhat different from the rules governing operation and use of mitigation banks. The operation and use of an ILF program are governed by an ILF program instrument. [33 CFR 332.2]

Intermittent stream: A stream that flows only certain times of the year, such as when it receives water from springs, ground water, or surface runoff (from Stream Visual Assessment Protocol; SVAP2).

Invasive species: Native and non-native species which aggressively invade areas, especially areas that are altered or disturbed, and displace less competitive native species. This often results in a near monoculture of the invasive species.

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

Mitigation bank: A site, or suite of sites, where aquatic resources (e.g., wetlands, streams, riparian areas) are restored, established, rehabilitated, and/or preserved for the purpose of providing compensatory mitigation for impacts authorized by Corps permits. In general, a mitigation bank sells compensatory mitigation credits to permittees whose obligation to provide compensatory mitigation is then transferred to the mitigation bank sponsor. The operation and use of a mitigation bank are governed by a mitigation banking instrument. [33 CFR 332.2]

Mitigation (in relation to S.404): While federal mitigation includes sequencing from avoidance to minimization to, finally, compensation, the term is used in this document as the equivalent of "compensation."

Ordinary High Water Mark (OHWM): "A line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear,

natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, or the presence of litter and debris." (33 CFR 328.3(e)) It is the defining element for identifying the lateral limits of non-wetland waters.

Permittee-Responsible Mitigation (PRM): Mitigation provided directly by the permittee (e.g., not credits from a mitigation bank or ILF program) and for which the permittee remains responsible in perpetuity.

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

Reach: A section of stream. When using the Stream Visual Assessment Protocol a reach is a section of stream with consistent characteristics. (See Stream Visual Assessment Protocol; SVAP2.

Re-establishment (restoration): The manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/ historic functions to a former aquatic resource. Re-establishment results in rebuilding a former aquatic resource and results in a gain in aquatic resource area and functions. This results in a restoration of area and functions. This is equivalent to the traditional use of the term "restoration."

Reference vernal pool: A minimally degraded vernal pool that is representative of expected ecological conditions. Reference pools serve as a standard for determining the health and integrity of other vernal pools in the same regional geomorphic setting. For geomorphic settings of vernal pools in the northeast, see Rheinhardt and Hollands (2008).

Rehabilitation: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of repairing natural/historic functions to a degraded aquatic resource. Rehabilitation results in a gain in aquatic resource function, but does not result in a gain in aquatic resource area. This results in a restoration of functions to a degraded aquatic resource. 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. Rehabilitation differs from enhancement in that rehabilitation is intended to result in a general improvement in the suite of the functions typically performed by an unaltered reference aquatic resource. In contrast, enhancement activities often focus on increasing one or two functions, rather than improving the suite of functions

being performed by an existing aquatic resource. Wetlands rehabilitation does not result in a gain in wetland acreage.

Restoration: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former or degraded aquatic resource. For the purpose of tracking net gains in aquatic resource area, restoration is divided into two categories: re-establishment (which results in a net gain in aquatic resource area) and rehabilitation (which does not result in a net gain in aquatic resource area). The traditional use of the term is equivalent to reestablishment.

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 (40 CFR 230.11(h)).

Stream: Unidirectionally flowing waters and their channels, which include rivers, brooks, creeks, branches, tributaries, and headwater streams. They may be periodically or seasonally non-flowing (intermittent or ephemeral) or continuously flowing (perennial).

Target species: The target species is/are the species used to help 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.

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

Vernal pool breeding season: For the purposes of this document, the breeding season 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 out, usually by early summer. It should be noted that, in areas inhabited by marbled salamander (a fall breeder), breeding season observations should also be made in the fall (September to October).

Vernal pool edge: The outer boundary of a vernal pool, determined by the maximum observed or recorded extent of inundation. The boundary may be defined by a distinct topographic break in slope or by evidence of high water marks or other appropriate physical data.

Vernal pool directional buffer: An area that links critical habitats used by pool-breeding amphibians by incorporating migration corridors between post-breeding and breeding habitat, defined by portions of the vernal pool envelope, vernal pool critical terrestrial habitat, and connections between the two.

Vernal pool facultative species: Vertebrate and invertebrate species that frequently use vernal pools for at least a portion of their life cycle, but that normally meet other life cycle requirements in other types of waters, including wetlands.

Vernal pool indicator species: Vertebrate and invertebrate species that depend upon vernal pool habitat for meeting all or a critical portion of their life cycle requirements. These species serve as direct evidence of the presence of a vernal pool. They may also be referred to as obligate or vernal pool-dependent species.

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

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

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

APPENDIX B – SITE SELECTION CHECKLIST

For restoration, creation, or rehabilitation projects

The checklist below can be used to help determine if a potential site is appropriate for compensatory mitigation. The more "yes" answers, the greater the likelihood the site is appropriate and will be sustainable over time. "No" answers, while not sufficient to remove a site from consideration, are "red flags" of potential constraints or problems which should be recognized and considered.

Yes	No	**Source of Water (for reestablishment, establishment, or rehabilitation projects)**
		Does the proposed mitigation site have a natural source of water (e.g., overbank flooding, precipitation, groundwater) sufficient to support a wetland and the target hydrology and functions and which does not involve maintenance over time?
		Will the source of water be sustainable and relatively predictable over the long term, taking into account climate change to the extent possible?
		Does the site include previous wetlands areas that can be restored (reestablished or rehabilitated)?
		Does the site have the necessary physical and soil features to maintain the desired hydroperiod? For example, sandy soils may not retain water long enough.
Yes	**No**	**Soils**
		Is the soil free of contamination?
		For vegetative rehabilitation without soil supplements, does the soil have levels of organic material sufficient to support the targeted vegetation and functions?
Yes	**No**	**Landscape Position**
		Will the proposed wetland have a HGM classification (riverine, depressional, lacustrine fringe, tidal fringe, mineral flats, organic flats, and slopes) appropriate for its position in the landscape, regardless of whether it is the same HGM class as the impacted wetland?
		Has the position of the site in relation to other wetlands, habitats, and processes been considered and determined to provide habitat connectivity and/or habitat linkages?
		Can the site address management problems that have been identified in watershed plans or similar (e.g., flooding, water quality, impervious surface, sedimentation)?
		If the hydroperiod of the site has been significantly altered, does the project provide measures that restore it to the proper HGM class (e.g., remove berms or other barriers)?
Yes	**No**	**Land Use**
		Is the wetland mitigation proposed for the site consistent with provisions of existing land-use plans, state wildlife action plans, zoning, etc.?
		Is the site free from past land-use practices that may affect mitigation success (e.g., is site free from filling, permanent alteration of natural water flow processes, ditching, introduction of invasive species, etc.?)?

Yes	No	Buffers
		Does the site have adjacent upland or other habitats that provide a buffer of a minimum of 100' to protect existing and/or proposed wetlands for the long term (i.e., have future land uses, as well as current land uses, been considered?)?
Yes	**No**	**Invasive Species**
		Are the site and adjacent areas relatively free of invasive species? Invasive species on adjoining properties are particularly problematic because the mitigation proponent has no control over them.
Yes	**No**	**Other Factors**
		Long term maintenance (LTM) – Are there sufficient arrangements for LTM to ensure long term sustainability of the project?
		Site ownership – Is the site free of legal constraints that would either prevent or constrain long-term protection?
		Legal mechanisms for protection – Is it possible to obtain a conservation easement from the owner or can the property be transferred to a conservation organization? Deed restrictions are highly undesirable except in limited circumstances.
		Is the site adequate distance from an airport? FAA has strict guidance on what can happen proximate to airports. The distance of concern is 2-5 miles depending on the airport.
Other Factors to Consider		
Are there any ESA-listed species present on the site? If so, the site may be a priority for protection and construction activities may be limited.		
Cultural resources – Is it likely that the site has historical or archaeological resources? If so, preservation may be a better option than construction, depending on the extent and nature of the resources.		

For preservation projects

Yes	No	Hydrology
		Are there adequate protections for maintaining water sources that originate offsite?
Yes	**No**	**Landscape Position**
		Has the position of the site, in relation to other wetlands, habitats, and processes occurring in the landscape, been considered?
		Can the site address management problems identified within the basin (e.g., flooding, sedimentation, water quality, etc.) in their long-term management plan?
		Have the protection goals for the larger watershed (if they have been developed by a town, region, and/or state) been considered in determining the location and type of mitigation?
Yes	**No**	**Land Use**
		Does existing land use at the site, surrounding areas, and the watershed support valuable ecological functions?
		Is the site free from past land-use practices that may affect long-term levels of functions and sustainability? (e.g., Is site free from filling, dumping of toxics, or permanent alteration of natural water flow processes through forest clearing, ditching, or paving activities at the site or surrounding areas?)
		Is preservation compatible with the surrounding land uses of the proposed site?
		Does the location of the site allow it to be protected from direct, indirect and, cumulative impacts from current and potential future land use? (i.e., Do existing conditions in the potential contributing basin for the site appear to support the existing wetland processes and functions for the long-term?)
Yes	**No**	**Habitat Connectivity**
		Is the site in close proximity to other aquatic sites or undisturbed upland areas under permanent protection, and/or are the connections to those habitats relatively undisturbed?
		Are there vernal pools on the site that will be protected, including their critical terrestrial habitat?
		If the answer to the above is yes, are those other sites protected in perpetuity?
Yes	**No**	**Buffers**
		Does the site have adjacent upland or other habitats that can provide, or be developed to provide, a buffer of sufficient width to protect the present aquatic resource functions for the long term (in other words, future land uses have been considered)? Generally a minimum buffer of 100' is needed with over 200' preferred, unless vernal pools are involved in which case at least 750' is needed from the vernal pool.
Yes	**No**	**Soils**
		Is the soil free of contamination (e.g., heavy metals, toxic organics, salts, acids)?
Yes	**No**	**Invasive Species**
		Are the site and adjacent areas relatively free of invasive species? Is the proponent willing to address existing and any future invasive species in a long-term management plan?
		Is the site free of a likely invasive species seed bank?

Yes	No	Endangered Species
		Are there any federal ESA-listed or state-listed species present on the site? The presence of ESA-listed or state-listed species (i.e., the answer to this question is "Yes") may make the site a priority for site protection.
Yes	**No**	**Other Factors**
		Site ownership - Is the site free of ownership or legal constraints that would prevent its long-term protection?
		Legal mechanisms for protection – Is it possible to obtain a conservation easement or fee purchase with deed restrictions by a conservation non-profit or conservation agency from the owner of the property?
		Cultural resources – Is it likely that cultural resources are present on the site? Is the site listed on the National Register of Historic Places or has the project raised concerns with the local Native American Tribes with knowledge of the area? The presence of cultural resources would not preclude preservation and could make it a higher priority for preservation.
Other Factors to Consider		
Location near an airport – Is it unlikely there is, or might there be in the future, FAA requirements that may mean forests need to be cut for aircraft safety?		

APPENDIX C – MULTIPLIER TABLES

TABLE C1 – RECOMMENDED COMPENSATORY MITIGATION MULTIPLIERS FOR DIRECT PERMANENT IMPACTS TO WETLANDS[1]

Mitigation / Impacts	Restoration[2] (re-establishment)	Creation (establishment)	Rehabilitation[3]	Preservation (protection/ management)
Emergent Wetlands	2	3	5 if hydrology 10 if vegetation	20
Scrub-shrub Wetlands	2	3	5 if hydrology 10 if vegetation	20
Forested Wetlands	3	4	5 if hydrology 10 if vegetation	20
Vernal Pools	Use the same ratios as above for the pool itself **plus**, when pool is to be eliminated: high rated VP: PRM = preservation of 5 pools and their CTH; ILF for 65,000 sf of wetland moderate rated VP: PRM = preservation of 3 pools and their CTH; ILF for 39,000 sf of wetland low rated VP: PRM = preservation of 1 pool and its CTH; ILF for 13,000 sf of wetland			
Upland[4]	≥10[5]	N/A	project specific	15[6]

[1] Includes nontidal and tidal wetlands
[2] Assumes no irreversible change has occurred to the hydrology. If there has been such a change, then the corresponding creation ratio should be used.
[3] 5 if hydrology is restored to its natural range (will generally include restoration of natural vegetation community); 10 if only the natural vegetation community is restored (hydrology is already within an acceptable range)
[4] This is when upland is used for wetland mitigation, NOT mitigation for upland impacts, which are not regulated. See the vernal pool guidance for an exception to this.
[5] Only applies if existing condition is pavement or structure AND should complement aquatic functions.
[6] 100' minimum upland buffer recommended for restoration, creation, and rehabilitation sites would be credited here as would the upland portion of preservation-only projects.

TABLE C2a – RECOMMENDED COMPENSATORY MITIGATION FOR TEMPORARY AND/OR SECONDARY IMPACTS TO NON-TIDAL WETLANDS OTHER THAN VERNAL POOLS

IMPACT	% OF STANDARD[7] AMOUNT[8]
Temporary clearing with or without temporary fill in forested wetlands; area to revegetate to forest.	15%
Temporary fill in scrub-shrub wetlands; area to revert to scrub-shrub.	10%
Temporary clearing with or without temporary fill in emergent wetlands; area to revert to emergent.	5%
Permanent conversion of forested wetlands to emergent wetlands (with or without temporary fill)	30%
Permanent conversion of forested wetlands to scrub-shrub wetlands (with or without temporary fill)	15%
Permanent conversion of scrub-shrub to emergent	15%
Removal of forested wetland cover for new corridor	Project specific[9]
Secondary impact edge effects[10]: High level impact zone Remainder of impact zone	 25% 10%

[7] "Standard" refers to amount of compensation that would be recommended under either the Corps' mitigation ratios for permanent direct fill (TABLE 1) or that required in ILF payments using the standard calculation.
[8] Percentages may be reduced if appropriate project-specific BMPs are incorporated into the project.
[9] This should also take into account fragmentation impacts as part of the secondary impacts.
[10] Total impact zone (feet): emergent – 75, scrub-shrub – 100, forested – 150
High level impact zone (feet): emergent – 25, scrub-shrub – 50, forested – 50

TABLE C2b – RECOMMENDED COMPENSATORY MITIGATION FOR TEMPORARY AND/OR SECONDARY IMPACTS TO VERNAL POOLS

The following method is the recommended way to determine compensatory mitigation for VP impacts. Different methods may be used on a case-by-case basis where specific information (e.g., VP organism migratory pathways) is adequately documented.

For direct impacts to the pool itself, compensatory mitigation amounts should be based on the recommended multipliers for the wetland type (e.g., forested, scrub-shrub) impacted (see Table C1), plus VP-specific mitigation resulting from impacts to the overall VP functions (below).

For partial filling of a VP, compensatory mitigation is based on the direct impacts plus the secondary impacts that the partial fill has on the remainder of the pool (e.g., in many cases, partial pool fill will remove all VP functions). Where a project involves partial filling of pools, more detailed information on these pools may be necessary to determine the secondary impacts.

Loss of a VP with PRM:

a. For the loss of a low value VP, as described above under "Documenting Impacted VPs", one VP and associated VP life zone should be preserved only if the protected VP is of medium or high value.

b. For the loss of a medium value pool, three VPs should be preserved only if the protected VPs are of medium or high value, along with the VP life zones. If three VPs were constructed in an area with appropriate critical terrestrial habitat, it is likely that just one would be successful .

c. For the loss of a high value pool, five VPs should be preserved only if the protected VPs are of high value, along with the VP life zones. Since these are the best pools in a high quality landscape setting and extremely difficult to replace, the high ratio is appropriate.

Loss of a VP with ILF as mitigation (the same ratio pattern of one (low): three (medium): five (high) for ILF calculations):

Factors have been developed based on the cost needed to preserve a VP and its life zone, which is then converted into a factor which is used in place of square feet of impact. **NOTE:** The factor has NO meaning in relation to area of the VP, envelope, or CTH; it is a conversion factor to ensure adequate funds are provided to protect a VP and its envelope and CTH. The applicant would therefore pay the equivalent of 13,000 square feet for a low value pool to protect one VP and life zone. Similarly, for medium VP impacts, multiply 13,000 x 3 = 39,000 square feet. For high value VP

impacts, multiply 13,000 x 5 = 65,000 square feet. This approach results in the following:

a. For the loss of a low value VP, mitigation is payment for the direct fill at the regular wetland rate. In addition, use a factor of 13,000 to determine the ILF amount.

b. For the loss of a medium value VP, mitigation is payment for the direct fill at the regular wetland rate. In addition, use a factor of 39,000 (3 x 13,000).

c. For the loss of a high value VP, mitigation is payment for the direct fill at the regular wetland rate. In addition, use a factor of 65,000 (5 x 13,000).

For secondary impacts to the VP due to loss or disturbance of the envelope and/or CTH, compensatory mitigation is based on the degradation of pool functions as determined by the Vernal Pool Characterization Form (see Appendix H "Vernal Pool Module", pg. H-17-18). When the VP will not be eliminated, the pool should be evaluated using the Vernal Pool Characterization Form and then best professional judgement should be used to evaluate it based on expected impacts to the VP envelope and CTH. The following approach should then be used:

TABLE 1

Landuse type	**Approx. % in 100' VP envelope**	**Max points available**	**Pro-rated points**
Forested *	%	15	
Shrub	%	10	
Open	%	5	
Developed	%	0	
		TOTAL:	

TABLE 2

Landuse type	**Approx. % in 100-750' VP CTH**	**Max points available**	**Pro-rated points**
Forested *	%	15	
Shrub	%	10	
Open	%	5	
Developed	%	0	
		TOTAL:	

NOTES:

* includes natural climax vegetation and natural open water

1) Total points for each resource type: 14-15 = HIGH; 7-13 = MODERATE: 0-6 = LOW

2) Documented presence of indicator species can be used to raise the category by one level; lack cannot lower it.

3) Presence of federal or state T&E species with life histories tied to VPs and observed within the VP or VP envelope should be used to raise the category by one level; lack cannot lower it.

4) In the charts below, 60% of the impact score is assigned to the VP envelope, 40% to the CTH

5) In determining area affected in Tables 3a and 4a, for % woody-dominated vegetation converted to herbaceous dominated vegetation use 66.7% of that area, for forest converted to shrub use 33.3%

6) To determine fee, take the impact score from envelope plus impact score from CTH. Use that number to determine ILF to pay for impacts.

7) Points X 1300 X $cost/sf = ILF

TABLE 3a

VP category (Condition of Envelope currently)	HIGH IMPACT (5)	MODERATE IMPACT (3)	LOW IMPACT (1)
HIGH (5)	>50% of area affected	25-50% of area affected	<25% of area affected
MODERATE (3)	>50% of area affected	25-50% of area affected	<25% of area affected
LOW (1)	>50% of area affected	25-50% of area affected	<25% of area affected

TABLE 3b

NUMBER OF POINTS (VP Category X Impact Value)	Impact score
1	0
3	3,900
5	7,800
9	15,600
15	23,400
25	39,000

TABLE 4a

VP category (Condition of CTH currently)	HIGH IMPACT (5)	MODERATE IMPACT (3)	LOW IMPACT (1)
HIGH (5)	>50% of area affected	25-50% of area affected	<25% of area affected
MODERATE (3)	>50% of area affected	25-50% of area affected	<25% of area affected
LOW (1)	>50% of area affected	25-50% of area affected	<25% of area affected

TABLE 4b

NUMBER OF POINTS (VP Category X Impact Value)	Impact score
1	0
3	2,600
5	5,200
9	10,400
15	15,600
25	26,000

The impact scores from Tables 3b and 4b are totalled and used as the factor in the determination of the ILF payment.

TABLE C2c – RECOMMENDED COMPENSATORY MITIGATION MULTIPLIERS FOR SECONDARY IMPACTS (SHADING) FROM PIERS OVER TIDAL MARSH

PIER CONDITIONS			**MITIGATION MULTIPLIER (based on 100% mitigation amount, sf, or ILF payment)**
For piers <2' above marsh			0.75
For piers 2' to 6' above marsh			
	Height:Width Ratio	**Width:Height Ratio**	
1H : 0.67W	1.5	≤0.67	none
1H : >0.67 to 1 W	<1.5 to 1.00	>0.67 to 1.00	0.25
1H : >1 to 1.2W	<1.00 to 0.83	>1.00 to 1.20	0.50
1H : >1.2 to 1.4W	<0.83 to 0.71	>1.20 to 1.4	0.75
1H : >1.4W	<0.71	>1.4	0.90
For piers >6' to 10' above marsh			
W ≤6'			none
W >6' – 10'			0.50
For piers >10' wide			0.90
Considerations:			
Alignment	If pier runs north-south, possible reduction of multiplier of up to 25%, depending on local conditions		
Grating	If pier has grating, possible reduction of multiplier of up to 25%, depending on % openings per square foot (<10% openings get no reduction)		
EXAMPLES	**AMOUNT OF MITIGATION**		
6'H x 4'W x 50'L	none		
5'H x 4'W x 50'L	ILF$/sf x 200sf x 0.25 **OR** 200 sf x 0.25 x 2 for restoration **or** x 3 for creation		
4'H x 5'W x 50'L	ILF$/sf x 250sf x 0.75 **OR** 250sf x 0.75 x 2 for restoration **or** x 3 for creation		
5'H x 7'W x 50'L	ILF$/sf x 350 sf x 0.50 **OR** 350sf x 0.5 x 2 for restoration **or** x3 for creation		
6'H x 8'W x 50'L	ILF$/sf x 400sf x 0.50 **OR** 400sf x 0.50 x 2 for restoration **or** x 3 for creation		

TABLE C3 – RECOMMENDED COMPENSATORY MITIGATION MULTIPLIERS FOR DIRECT STREAM IMPACTS TO DETERMINE CREDIT REQUIREMENTS

IMPACT ACTIVITY (linear feet)	**MULTIPLIER for PRM MITIGATION**				
	Severely Degraded	**Poor**	**Fair**	**Good**	**Excellent**
Culverting/piping/bridges not meeting the New England District Best Management Practices for Stream Crossings[11]	1	1.5	2.25	3.5	5.44
Utility crossing with disturbance of streambed. Since utility crossings are generally perpendicular to the bank, ratios are based on the length of the crossing from bank to bank (i.e., stream width). If the width of the crossing will exceed 12 LF (normal width of utility impacts), the ratio will generally need to be increased.	0.01	0.05	0.10	0.15	0.20
Fill for dam/other structure	Use wetland multipliers				
Dredging/channel excavation (within existing stream alignment), assuming there is a discharge of dredged or fill material in S.404 waters to trigger jurisdiction or the work is in S.10 waters.	0.5	1.0	1.5	2.5	3
Raising stream bed/lining stream channel (within existing stream alignment)	0.25	0.50	0.75	1.0	2
Stream Relocation (this could include secondary impacts if the fill is just for a diversion structure)[11]	1	1.5	2.25	3.5	5.44
Bank armoring/bulkhead (assumes one bank; use double for both banks) below OHWM/HTL[12]	0.1	0.2	0.4	0.8	1.6
Other miscellaneous fill in stream	Case-specific				
Other stream impacts	Case-specific				
	MULTIPLIER FOR ILF CREDIT PRICE PER LINEAR FOOT				
For impacts to both banks and the streambed (if just to one or two of these, prorate)	0.25	0.50	0.75	1.0	1.5

[11] The increase from Severely Degraded to Poor and Poor to Fair is 50%. The increase from Fair to Good and Good to Excellent is 55.56%. The higher amounts acknowledge the importance of healthy streams and the difficulty in compensating for Good and Excellent streams.

[12] The amounts double between categories to reflect the increasingly severe impacts.

TABLE C4 – RECOMMENDED COMPENSATORY MITIGATION MULTIPLIERS FOR SECONDARY STREAM IMPACTS TO DETERMINE CREDIT REQUIREMENTS

IMPACT ACTIVITY	MULTIPLIER				
	Severely Degraded	**Poor**	**Fair**	**Good**	**Excellent**
Culverting/piping/bridges – upstream and downstream impacts from flooding, degradation of channel, etc.	0.25	0.5	1	2	4
Impoundment[13]	0.5	1.0	2.0	4.0	8.0
Clearing 0-50' from bank (assumes 1 bank; double for both banks)[14, 15] assuming there is a discharge of dredged or fill material in S.404 waters to trigger jurisdiction	0.05	0.1	0.2	0.4	0.8
Clearing 50-100' from bank (assumes 1 bank; double for both banks)[16, 17] assuming there is a discharge of dredged or fill material in S.404 waters to trigger jurisdiction	0.01	0.02	0.04	0.08	0.16
Bank armouring/bulkhead above OHWM	.05	.1	.2	.4	.8
Other	Case specific				

[13] Based on length of stream impounded. Fill for dam or whatever causes a constriction is addressed under "Fill**". Note that flooded wetlands will be addressed as secondary wetland impacts in the wetlands module.** The amounts double between categories to reflect the increasingly severe impacts.
[14] This is when clearing includes removal of stumps in an upland; if is just cutting of all woody vegetation, a much smaller multiplier would be appropriate. Clearing involving removal of stumps in a wetland is a direct impact and is addressed in the Wetland Module. The amounts double between categories to reflect the increasingly severe impacts.
[15] Assumes woody vegetation in upland is removed for the entire 50'. Prorate for less than 50'.
[16] This is when clearing includes removal of stumps in an upland; if is just cutting of all woody vegetation, a much smaller multiplier would be appropriate. Clearing involving removal of stumps in a wetland is a direct impact and is addressed in the Wetland Module.
[17] Assumes woody vegetation in upland is removed for the entire 51-100'. Prorate for less.

TABLE C5 – RECOMMENDED COMPENSATORY MITIGATION MULTIPLIERS FOR STREAM CREDIT GENERATION

Starting Stream Condition / **Form of Mitigation**[18] (all shown as credits/lf)	**Severely Degraded**	**Poor**	**Fair**	**Good**	**Excellent**
Preservation - Additional credit may be granted if entire meander width, which is wider than 100' from the stream, is protected.	No credit[19]				Preservation of 100' unaltered[20]
One Side		0.025	0.05	0.1	0.2
Both Sides		0.05	0.1	0.2	0.4
Installation of fish ladder (length of stream made accessible to migratory species)					N/A
1st 3 miles			0.01		
> 3 -10 miles			0.005		
Rehabilitation of the stream, riparian area, and/or floodplain[21], resulting in improvement of channel condition (e.g., poor to good):					
1 step			0.5		
2 steps			1.0		
3 steps			2.0		

[18] Mitigation types can be additive if more than one type of mitigation is being done to a length of stream.

[19] Unless associated with enhancement to bring stream to higher functional conditions, in which case 0.25 for one side and 0.5 for both sides.

[20] No forestry, agriculture, or other modifications to the buffer.

[21] This might involve daylighting a channel, reconnecting a stream to its floodplain, reestablishment of a riparian buffer, reestablishment of a natural channel, installation of coarse woody debris, exclusion of livestock, upgrading a culvert to meet the New England District Best Management Practices for Stream Crossings, stormwater improvements, etc.

Removal of dam or other barrier a. Footprint b. Former impoundment . . . . . . c. Below dam improvement to channel condition 1 step . . . . . . 2 steps . . . . . . 3 steps[22] . . . . . . d. Up to 3 miles above former impoundment[23] . . . . . . e. >3 to 10 miles above former impoundment[5]	 2.0 (use linear feet for stream or square feet for wetland credits) . . . . . .2.0 . . . . . .0.25 . . . . . .1.0 . . . . . .2.0 . . . . . .0.02 . . . . . .0.01

[22] It is unrealistic that a stream can be changed from Severely Degraded to Excellent without major changes to the watershed.
[23] Stop at next barrier to aquatic organism passage.

TABLE C6 – RECOMMENDED COMPENSATORY MITIGATION MULTIPLIERS FOR DIRECT PERMANENT IMPACTS TO SUBMERGED AQUATIC VEGETATION

Mitigation Impacts	Restoration (re-establishment)	Creation (establishment)	Rehabilitation	Preservation (protection/ management)
Vegetation re-planting	5	project specific[24]	project specific	N/A
Conservation mooring installation	5	N/A	5	N/A
Water quality improvements to watershed	project specific	N/A	project specific[25]	project specific

TABLE C7 – RECOMMENDED COMPENSATORY MITIGATION MULTIPLIER FOR INDIRECT AND SECONDARY IMPACTS TO SUBMERGED AQUATIC VEGETATION

Mitigation / Impacts	Restoration (re-establishment)	Creation (establishment)	Rehabilitation	Preservation (protection/ management)
Shading	0.5	0.5	project specific	N/A

[24] Rare cases, e.g., removal of uplands, old fill, etc.
[25] E.g., remove pollutant source such as an outfall.

TABLE C8 – RECOMMENDED COMPENSATORY MITIGATION MULTIPLIERS FOR DIRECT PERMANENT IMPACTS TO OPEN WATER AND MUD FLATS

Mitigation / Impacts	Restoration (re-establishment)	Creation (establishment)	Rehabilitation	Preservation (protection/ management)[26]
Open Water	1	1	project specific[27]	20
Mudflat	3	3	project specific	20
Rockweed	1	1	project specific	N/A

TABLE C9 – RECOMMENDED COMPENSATORY MITIGATION MULTIPLIER FOR INDIRECT AND SECONDARY IMPACTS TO ROCKWEED

Mitigation / Impacts	Restoration (re-establishment)	Creation (establishment)	Rehabilitation	Preservation (protection/ management)
Shading	0.5	0.5	project specific	N/A

[26] This may not be an option if the area is in state ownership by law.
[27] Might include planting submerged and/or floating aquatics (would generally be a multiplier of 5) and/or removal of invasive species (would generally be a multiplier of 10 or higher) and/or installation of an artificial reef (would generally be a multiplier of 3).

APPENDIX D - BASIC MITIGATION PLAN

This is needed for PRM and ILF projects.
Preservation-only needs just A, B.4, C, D.1, D.2, G, H, J, L, and M.

BASIC MITIGATION PLAN DIRECTIONS

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All items should be included in the mitigation plan or there should be an explanation as to why they are not appropriate. The checklist at the end is to help reviewers and applicants ensure all required information is provided. While most of these items will be needed for most mitigation plans, a few items included here will need to be modified for specific resource types (see following guidance).

After Corps review, items <u>not</u> marked on the checklist 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 it have specific guidance or clarification. 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.

NOTE: If all impacts are proposed to be covered by an ILF Program and/or Mitigation Bank, a mitigation plan is not required.

A. EXECUTIVE SUMMARY

This is a short summary of key information.

B. GENERAL INFORMATION

1. The Mitigation Rule states there is a preference for use of third party mitigation. If a permittee is proposing permittee-responsible mitigation, the ecological rationale must be provided.

2. 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.

3. Fully identify, in detail, all elements of the proposed mitigation, including any purchase of credits from a Mitigation Bank or ILF program.

4.a. Locus maps that show the location of the impact area and the location of all 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.

4.b. Aerial photographs should be included.

4.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.

4.d. Watershed(s) must be identified using the USGS 8-digit Hydrologic Unit Code(s) for each proposed mitigation site, including preservation sites.

C. IMPACT AREA(S) – for PRM only

Complete items C.1 – C.6 for EACH impact site. Impact areas include both wetlands and waters.

1. Total acreage of wetlands and/or waters at each impact site should be reported. See also Item C.4 for special resource types.

2. For each site, describe the resources using Cowardin, et al.[1] 1979 and Tiner 2014[2] and tabulate total acreage for each wetland class (e.g., PFO1, PSS, PEM)

3. Wetlands at each site should also be described using the hydrogeomorphic[3] classification system and total acreage should be calculated for each HGM class.

4.a. If the impact area contains any streams, the Stream Checklist (see Appendix G – Stream Module) must be included. Descriptions of any streams that will be impacted, should include length of stream to be impacted, nature of banks, normal seasonal flows, gradient, sinuosity, bed load, lengths of riffles and pools, and adjacent landscape. The Stream Visual Assessment Protocol Worksheet should be provided for each stream being impacted.

4.b. If the impact area contains any vernal pools, the Vernal Pool Checklist (see Appendix H – Vernal Pool Module) must be included. Descriptions of any vernal

[1] Cowardin, et. al. (1979) "Classification of wetlands and deepwater habitats of the United States," Office of Biological Services, FWS/OBS-79/31, December 1979
[2] Tiner, R.W. 2014. *Dichotomous Keys and Mapping Codes for Wetland Landscape Position, Landform, Water Flow Path, and Waterbody Type Descriptors: Version 3.0*. U.S. Fish and Wildlife Service, National Wetlands Inventory Program, Northeast Region, Hadley, MA. 65 pp.
[3] Brinson, M. M. (1993). "A hydrogeomorphic classification for wetlands," Technical Report WRP-DE-4, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS. NTIS No. AD A270 053.

pool(s) on site should be documented using the Corps' Vernal Pool Characterization Form (see Appendix H) or similar approved form.

4.c. If the impact area includes any Submerged Aquatic Vegetation (SAV), the SAV Checklist (see Appendix I – SAV Module) must be included. Describe variability and extent of bed size for any SAV on-site.

4.d. Describe the extent and location of any other aquatic resources (e.g., mudflats, open water) on-site.

5. Describe both site specific and landscape level wetland and stream functions and services at each impact site. Functional assessment methods should be approved by the Corps in advance and must have adequate levels of detail (e.g., simply stating "wildlife habitat" or "fishery habitat" is inadequate. Provide indicator species for the habitat type such as forest-dwelling migratory birds or mole salamanders and/or wood frogs for a vernal pool). The more specific the information, the more confidence the Corps will have in the evaluation. The New England Wetland Functional Assessment protocol is preferred, if available.

6. Describe type and purpose of work at each impact site.

D. MITIGATION AREA(S)

1. Mitigation alternatives considered for PRM. Provide an explanation of sites and methodologies considered for mitigation activities and the rationale for selection or rejection. See Appendix B for site selection guidance.

2. Relationship of mitigation site(s) to watershed or regional plans for the area discussed. Watershed and/or regional plans that describe aquatic resource objectives should be discussed if such plans are available. If not, the Compensation Planning Framework for the state's In-lieu Fee program may be used.

3.a. Describe the site's existing wildlife usage, including information on any probable state and federal threatened and endangered species habitat.

3.b. 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.

3.c. Describe the existing vegetation on the site including a list of species, dominant species, density, community types, and community structure.

3.d. Surrounding land use should be described within at least 500 feet of the site(s) and include a discussion of likely future land uses.

3.e. **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.**

3.f. **SHPO/THPO letters on the proposed project also may not address potential concerns at the mitigation site, so evidence of coordination with these parties concerning possible effects to historic properties must be provided for the mitigation site(s).**

4.a. Describe the objectives for the project. For example:

- Restore approximately 14-acres of floodplain forest by establishing approximately 3,000 silver maples in designated areas in the property. The trees will be of a northern genotype, approximately 4-5' tall bare-root stock, and established with 5x15 foot spacing.
- Within the abandoned agricultural fields, pockets of invasive reed canary grass will be controlled prior to planting, with follow up as needed to reduce any competition with the planted trees.
- Improve stream flow and stability by removing the overburdened culvert and replacing the crossing with a structure capable of handing the maximum flows generated by the stream. Please note that the culvert replacement will be managed by NHFG staff.
- The floodplain forest restoration will result in a 100' vegetated buffer along the Connecticut River

4.b – 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, rehabilitation, 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.

4.e. Check any other aquatic resources proposed at each site.

4.f. Site-specific and landscape-level functions and values proposed at each site.

4.g. Identify fish and/or wildlife species or taxa that are planned for the site.

4.h. Identify any reference sites that are used.

4.i. Provide measurable and attainable performance standards. For example, avoid "site will be well vegetated" and replace with "site will have at least 90% coverage with native herbaceous species, at least 60% of which are hydrophytic, within three growing seasons."

4.j. 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 (e.g., prohibition on use of herbicides). Such constraints need to be explained in detail. If there are no constraints (rare), that should be stated in the plan.

4.k. 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 all stages of construction of the mitigation area(s) to ensure compliance with the mitigation plan and to make adjustments when appropriate to meet mitigation goals.

4.l. Construction timing of the mitigation and the proposed aquatic resource 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 within **[specify time period]** of commencement of mitigation construction.

4.m. All parties responsible for the implementation, performance, and long-term management of the mitigation project must be identified.

4.n. Discuss potential to attract waterfowl and other bird species that might pose a threat to aircraft. 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.

5. Identify which specific aquatic resource checklist(s) are included.

E. GRADING PLANS

1.a. Plan provides existing and proposed grading plans for mitigation area. Existing contours should be no greater than 1' intervals. Proposed contours should be to 0.5' intervals (some situations such as salt marsh restoration will require finer intervals) in the wetlands portion of the mitigation with spot elevations for intermediate elevations. All other areas should be shown at 1' 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.c. Scale is in the range of 1"=20' to 1"=100'

1.d. All items on the plan are legible. Electronic PDF documents are strongly encouraged; otherwise plans should be on 8 ½ x 11" sheets. Plans should be in black and white. Large format sheets are encouraged for clarity, but only as a supplement to the letter-sized sheets.

1.e. Plans have a bar scale.

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 non-wetland islands and pools and should extend beyond the mitigation site into adjacent wetlands and non-wetlands.

3. Specific comments related to grading.

F. EROSION CONTROLS

Erosion control removal deadline is included. 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 1st of the third full growing period 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. No plastic netting is to be used.

G. INVASIVE AND NON-NATIVE SPECIES

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

1. The discussion of risk should include evaluation of the potential for invasion of the wetland by unwanted species or varieties, such as those listed on page 23 of this document and other identified problematic species specific to the project or site.

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

3. 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 referenced in item G.1. above.

H. OFF-ROAD VEHICLE USE

1. Describe current usage including snowmobile usage and address control measures. If there is no off-road vehicle use in immediate vicinity please note this.

2. 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.

I. PERFORMANCE STANDARDS

The Executive Summary will include a summary of the standards but this section is for detailed standards that the project must meet to be compliant with the permit.

J. SITE PROTECTION – may not be needed for stream barrier removals. Consult with the Corps.

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.

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

2. Site protection should be part of every mitigation package as preservation of a creation, restoration, or rehabilitated area, **and buffer**; the remaining unimpacted aquatic resources 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[4]:

→ Compensatory mitigation sites and remaining on-site aquatic resources (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 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 and provide for access by the Corps for compliance verification. 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:

→ For compensatory mitigation, the permittee shall execute and record the enclosed conservation easement to protect the [**specify acres**] of

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

land shown on the enclosed plan titled, "**TITLE**", in perpetuity. A copy of the executed and recorded document must be sent to: "PATS Branch - Regulatory Division, Corps of Engineers, New England District, 696 Virginia Road, Concord, MA 01742-2751" within 120 days of the permit's issuance, but no later than 10 days after the date of the recording. Documents which are not addressed in this manner may not reach their intended destination and do not comply with the requirements of this permit.

3. 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. There should be signs placed at the boundaries of the preservation area(s). The sign design should be noted in the documentation.

4. Evidence of legal means of preservation. The form should be specified or a copy of the document(s) included.

5. If the site will be acquired by the permittee but transferred to another entity (e.g., land trust, government agency), a letter acknowledging this by the receiving entity must be included.

K. MONITORING AND ASSESSMENT

1. Appropriate monitoring is proposed and language included. See Appendix E for additional information on monitoring report requirements.

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 rehabilitation, the applicant will submit a signed letter to the Corps, Policy and Technical Support Branch or email to CENAE-R@usace.army.mil, 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 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 or emailed to CENAE-R@usace.army.mil 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 but no less the five]** full growing periods 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 period – in late spring/early summer and again in late summer/early fall. Each annual monitoring report, in the format provided in Regulatory Guidance Letter 08-03 (Appendix E), will be submitted to the Corps, Regulatory Division, Policy and Technical Support Branch or CENAE-R@usace.army.mil, 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[5] 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 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 period after completion of construction and planting. For these permit special conditions, a growing period 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 (800-362-4367 in MA, 800-343-4789 in NH, CT, and RI, 207-623-8367 in ME, and 802-872-2893 in VT), email to CENAE-R@usace.army.mil, 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 performance standards described below within **[specify number]** growing periods 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 as necessary to ensure two years of monitoring after the remedial work is completed. Measures requiring

[5] see Appendix D

earth movement or changes in hydrology will not be implemented without written approval from the Corps.

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.]

2. Project Overview Form is included and must be included with each Annual Monitoring Report. See Appendix E.

3. Transmittal and Self-Certification Form is included and must be included with each Annual Monitoring Report. See Appendix E.

4. Appropriate assessment is proposed and language included.

The following language 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 at the end of the monitoring period. 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.

L. CONTINGENCY

Plan for dealing with unanticipated site conditions or changes. 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/or encountering hazardous waste.

M. LONG TERM STEWARDSHIP

1. A long-term management plan must be developed and approved by the Corps. This plan may be modified periodically to address changing circumstances. A template is included in Appendix M.

2. 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.

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

N. FINANCIAL ASSURANCES

In accordance with the Mitigation Rule, financial assurances will be required when the Corps determines it is appropriate to ensure effective implementation of the mitigation[6], to include 1) mitigation construction; 2) monitoring, including remedial actions; 3) contingency procedures; and 4) a long-term stewardship endowment. Assurances for construction and monitoring will include most projects where the mitigation work is not accomplished in its entirety (construction and monitoring) prior to the permitted impacts to aquatic resources.

The text to use when a performance bond (similar language for escrow, insurance, etc.) 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 Department Circular 570[7]. 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,

[6] 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.

[7] 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 via internet search.

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.

O. OTHER COMMENTS

Case-specific.

BASIC MITIGATION PLAN CHECKLIST

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

TABLE OF CONTENTS

A. Executive Summary

1. [ ] Objective of the mitigation
2. [ ] Performance standards
3. [ ] Brief (one paragraph) description of the mitigation

B. General Information

1. [ ] For PRM, a clear and supportable case has been made as to why it is preferable to purchase of mitigation bank or in-lieu fee credits.
2. [ ] Mitigation plan and documentation submitted as one complete package.
3. [ ] Breakdown of proposed mitigation plan elements and objectives, including
   payments to ILF or Mitigation Bank
4. [ ] Mitigation site location(s)
   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 mitigation area(s)

C. Impact area(s) - for PRM only

1. [ ] Wetland acreage.
2. [ ] Cowardin classification.
3. [ ] HGM classification.
4. [ ] Other aquatic resources present.
   a. [ ] Streams
   b. [ ] Vernal Pools
   c. [ ] Submerged Aquatic Vegetation
   d. [ ] Other aquatic resources (e.g., mudflats)
5. [ ] Functional assessment.
6. [ ] Work proposed.

D. Mitigation area(s)

1. [ ] Mitigation alternatives – for PRM only
2. [ ] Watershed or regional plans (the Comprehensive Planning Framework in the state's ILF program can be used if no other plan is available).
3. Mitigation background
   a. [ ] Existing wildlife use.
   b. [ ] Existing soil.
   c. [ ] Existing vegetation.
   d. [ ] Surrounding land uses.
   e. [ ] USFWS and/or NOAA Clearance Letter or Biological Opinion.
   f. [ ] SHPO/THPO Cultural Resource Clearance Letter.

4. Mitigation proposed
   a. [ ] Objectives
   b. Wetland acreage proposed at each site.
   c. [ ] Cowardin classifications proposed at each site.
   d. [ ] HGM classifications proposed at each site.
   e. [ ] Other aquatic resources proposed at each site.
      i. [ ] Streams
      ii. [ ] Vernal Pools
      iii. [ ] Submerged Aquatic Vegetation
      iv. [ ] Other aquatic resources (e.g., rockweed, mudflats)
   f. [ ] Functions and values proposed.
   g. [ ] Target fish and/or wildlife species or categories.
   h. [ ] Reference site(s).
   i. [ ] Performance standards
   j. [ ] Design Constraints.
   k. [ ] Construction oversight.

l. [ ] Project construction timing.
m. [ ] Responsible parties for all aspects of project.
n. [ ] FAA concerns.

5. Specific Aquatic Resource Checklist Information Appended
   a. [ ] Wetlands
   b. [ ] Streams
   c. [ ] Vernal Pools
   d. [ ] Submerged aquatic vegetation
   e. [ ] Other aquatic resources (e.g., mudflats)

E. Grading Plan

1. [ ] Plan View
   a. [ ] Existing and proposed grading plans.
   b. [ ] Microtopography
   c. [ ] Appropriate scale.
   d. [ ] Appropriate size and format.
   e. [ ] Scale bar.
   f. [ ] Site access.
2. [ ] Representative cross-sections.
3. [ ] Other.

F. Erosion Controls

[ ] Removal deadline.

G. Invasive Species Control Plan

1. [ ] Risks.
2. [ ] Constraints.
3. [ ] Control strategy.

H. Off-Road Vehicle Use

1. [ ] Current usage.
2. [ ] Control plan.

I. Performance Standards

1. [ ] Clear
2. [ ] Measurable
3. [ ] Achievable/Realistic within monitoring period

J. Site Protection

1. [ ] Adequate buffers.
2. [ ] Required preservation language.
3. [ ] Plans of preservation area(s).
4. [ ] Legal documentation.

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

K. Monitoring and Assessment

1. [ ] Monitoring Plan.
2. [ ] Transmittal and Self-Certification Form.
3. [ ] Project Overview Form.
4. [ ] An appropriate final assessment is proposed and language is included.

L. Contingency

[ ] Contingency plan.

M. Long-term Stewardship

1. [ ] Long-term stewardship plan.
2. [ ] Funding for long-term stewardship
3. [ ] Legal documentation.

N. Financial Assurances for construction and monitoring

[ ] Financial assurances are included.

O. Other Comments

APPENDIX E - MONITORING AND ASSESSMENT

MONITORING

Monitoring Report Format

Monitoring reports should generally follow a 10-page maximum report format per site[1], with a self-certification form transmittal[2]. Submission of PDFs is strongly encouraged. The information required should be framed within the following format.

1) Project Overview[3] (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 (Appendix D).

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 standards, required financial assurances, required preservation, etc., and note whether required documents have been provided and evaluate whether the compensatory mitigation project site is effectively achieving the approved performance standards or trending toward meeting them.

3) Summary Data (maximum of 4 pages)

   Summary data must be provided to substantiate the progress 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.

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

[1] Based on the Corps Regulatory Guidance Letter 08-03.

[2] see form on penultimate page of this appendix

[3] See form on last page of this appendix

the Corps for subsequent site visits. Each map or diagram must include a legend, bar scale, and the location of any photos submitted for review. Plans should be at the same orientation and scale as those found in the original mitigation plan attached to the permit.

5) Conclusions (1 page)

A general statement must be included describing the conditions of the compensatory mitigation project. If performance 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. The Corps will ultimately determine if the mitigation site is successful.

6) Monitoring Report Appendices

Appendix A -- An as-built plan showing topography to 0.5-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 as-built plan should be included in the first monitoring report. If there is grading or soil modifications or additional plantings of different species in subsequent years, a modified as-built plan should be submitted with that year's monitoring report. These plant community and soils features should be documented in the final monitoring report and compared to the most recent as-built plan.

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

Appendix C -- Representative photos of each mitigation site taken from the same positions, angles, and magnification 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.

Monitoring Report Requirements

- Address achievement of performance standards 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 most recent Corps of Engineers Wetland Delineation Manual and Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast should be collected after construction and every alternate year throughout the monitoring period. If IRIS tubes (Rabenhorst 2008), 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 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 required (by performance standard) to be controlled 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.

ASSESSMENT

Assessment Format

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

- Summarize the original or modified mitigation goals (performance standards) 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 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 of aquatic resources (e.g., wetlands, vernal pools, streams, bogs, tidal, etc.) in each mitigation site. Wetlands should be identified and delineated using the Corps Wetland 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 created/restored/ rehabilitated aquatic resources (from Appendix B) with the area and extent of created/restored/rehabilitated 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 (e.g., delineate boundaries between forested, scrub-shrub, and emergent) and determine amounts of each.

Appendix D -- Photos of each mitigation site taken from the same positions, angles, and magnifications as the monitoring photos.

MITIGATION MONITORING 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

MITIGATION MONITORING 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:

APPENDIX F - WETLANDS MODULE

Table of Contents

I. OVERVIEW

The majority of impacts to aquatic resources for which we require compensatory mitigation involves wetlands; therefore, they are the most common type of compensatory mitigation.

II. DOCUMENTING IMPACTED WETLANDS

At a minimum, the areal cover of wetlands that are proposed to be impacted (primary, secondary, and temporary impacts) should be documented. The various types of wetlands (e.g., Cowardin classification, hydrogeomorphic classification) should also be documented and quantified. Where functional assessment of the wetlands is necessary to properly evaluate impacts and devise adequate mitigation, the New England Wetland Functional Assessment protocol is recommended, when available.

III. MITIGATION TYPE AND GOALS

As stated in the Mitigation Rule, in order to more closely replace impacted functions, in-kind mitigation is generally preferred to out-of-kind mitigation for impacted wetlands that are not heavily degraded, provided this is appropriate based on watershed scale considerations. Out-of-kind mitigation may be preferred for heavily degraded systems or where it would be more beneficial to the overall watershed or other appropriate project-specific boundary.

IV. MITIGATION SITE SELECTION

Mitigation site selection should follow the requirements noted in the Mitigation Rule. See Appendix B for a Site Selection Checklist.

V. SPECIAL CONSIDERATIONS

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 other suitable reference area.

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 free of weed seeds, specifically the seeds of the species listed in Appendix L. 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. This has resulted in the failure of some mitigation sites.

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, 2018 4th 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[1]:

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

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

Scrub-shrub and forested wetland soils should have about 12% organic carbon; soils in 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 therefore should be avoided. Both texturally defined loam and landscaping loam are generally not sufficiently organic to meet requirements.

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:

- 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; and
- 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 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.

Coarse Woody Material

When mitigation requires a component of forest or scrub-shrub habitat, the design should include plans for a continuum of coarse woody material (CWM), including snags (standing dead trees). This continuum should include a full range of sizes. CWM 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. NOTE: if not properly screened by a wetland scientist, coastal habitat scientist, stream scientist etc., such material can be a source of invasive species.

CWM 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, which breaks down much more quickly. Placement of CWM is generally inappropriate in tidal or frequently flooded environments unless it is appropriately anchored, and may not be appropriate for some herbaceous systems. As much as possible, these materials should 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 CWM. In fact, large CWM in stream channels performs many stream functions including retention of sediment and nutrients, creation and maintenance of pools, and complex habitats for aquatic biota.

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 most CWM is relatively durable and remains an important ecological feature both below- and above-ground for a long time. Long after the last needles or leaves fall to the forest floor, a tree decomposes slowly over time.

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 CWM into most habitat mitigation strategies.

Frequently the inclusion of scattered various sized boulders in landscapes where rocks are appropriate is an additional method of increasing structure and habitat in a site.

Tidal Wetland Establishment

The guidance in this section should be applied with the understanding that sea levels are not static and are rising in New England. The Corps civil works programs operate under the policy that "potential relative sea-level change must be considered in every USACE coastal activity as far inland as the extent of estimated tidal influence."[2] Tidal wetland establishment planning must take into account these ongoing changes. There are a variety of sources for information on current and projected sea levels. The Corps has its "USACE Sea Level Change Curve Calculator (2015.46)" which is available on-line. To the extent possible, allow for marsh migration inland.

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* and *Lepidium latifolium* (perennial pepperweed) 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* (purple loosestrife) 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 stabilize the sediments and 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.

VI. MONITORING NEEDS

[2] EC 1100-2-8162. 31 December 2013

Minimum monitoring for emergent and scrub-shrub systems will be for 5 years with monitoring events every year. Minimum monitoring for forested systems will typically be for 10 years with monitoring events on years 1, 2, 3, 5, 7, and 10 (unless the site is having problems in which case monitoring may need to be adjusted to an annual basis).

VII. WETLANDS MODULE CHECKLIST INSTRUCTIONS

I. HYDROLOGY

1. Evidence of adequate hydrology to support the desired wetland. 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 the 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). Runoff from development is NOT an appropriate water source. Reliance solely on precipitation is very risky and is discouraged.

3.a. Evidence of adequate tidal cycle to support the desired wetland. For tidal wetlands, 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 the 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.

3.b. Evidence that the site will exhibit the appropriate salinity to support the desired plant species and fauna.

II. TOPSOIL AND SUBSTRATE

1. Proposed source of topsoil or substrate supplement and the likelihood that invasive species 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. Appropriate organic content of topsoil and substrate supplements (if necessary). Natural topsoil proposed to be used for the creation/restoration/ rehabilitation 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/rehabilitation 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. NOTE: For tidal wetlands, there is no standard for substrate organic content, but it is recommended to match that of a nearby reference tidal wetland.

III. PLANTING PLAN

1. Plans must use scientific names. Since there are no standardized common names for plants, 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. 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. 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 K of the New England District Compensatory Mitigation Guidance shall not be included as planting stock in the vicinity of the mitigation. 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. All vegetation types or zones are classified in accordance with Cowardin, et al. (1979) or other similar classification system. The Cowardin classification system is typically used to identify the plant communities proposed. If another system is used, an explanation of terms may be needed.

4. A plan view drawing should show where the various species are proposed to be planted. The drawing should show the proposed locations of planted

stock and vegetative community zones in relation to expected hydrology. 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. More than 50% of the plantings in each zone are species that will become structural determinants for the community type designated for that zone. 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 and/or those that do not produce berries which attract birds that bring in invasive species seeds 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; and salt marsh cordgrass is recommended to be planted on 18-inch centers, 2 culms per hole.

8. The list of species proposed in seed mixes should not include any species in the list of invasives in Appendix K. 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, 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.

11. Specific Corps staff recommendations related to planting.

IV. COARSE WOODY MATERIAL AND OTHER FEATURES

Appropriate amounts and range of decomposition of coarse woody material are proposed. The following language shall be included in the mitigation plan, either in the drawings or in the narrative portion of the plan:

- A supply of dead and dying woody material of a wide variety of sizes 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 L) in the New England District Compensatory Mitigation Guidance.

VII. WETLANDS MODULE CHECKLIST

I. Hydrology

1. [ ] Proposed hydrology
2. [ ] Water source(s)
3. [ ] Tidal wetland hydrology
   a. Tidal cycle fluctuations
      i. [ ] Elevation of mean high water (MHW)
      ii. [ ] Elevation of mean low water (MLW)
      iii. [ ] Location of high tide line (HTL)
   b. [ ] Salinity

II. Topsoil

1. [ ] Proposed source
2. [ ] Topsoil Depth
3. [ ] Organic content

III. Planting Plan

1. [ ] Scientific names.
2. [ ] Native and indigenous plant materials.
3. [ ] Vegetation community classification.
4. [ ] Plan view drawings.
5. [ ] Early establishment species.
6. [ ] Woody stock density.
7. [ ] Herbaceous stock density.
8. [ ] Seed mix composition.
9. [ ] Cross section plans
10. [ ] Relocation stipulation.
11. [ ] Other.

IV. Coarse Woody Material and Other Features

[ ] Language included

APPENDIX G - STREAM MODULE

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I. OVERVIEW

Streams are a distinctly unique water resource within the context of the Corps' Regulatory purview. They are complex and ever evolving systems that can provide various functions and services depending on the surrounding landscape. Most importantly, due to the connected nature of stream systems, impacts to one reach in a watershed can affect other reaches within the system.

This module can be applied when determining the appropriate amount of compensatory mitigation for stream impacts. Impact "Debits" can be quantified using Tables C3 and C4 and mitigation "Credits" can be quantified using Table C5 in Appendix C. They are based on the stream condition determined using the Stream Visual Assessment Protocol Version 2 (SVAP2) developed by NRCS (National Biology Handbook, Part 614). The SVAP2 provides a basic evaluation of stream health and does not require extensive training or knowledge of aquatic biology. As with other modules, this is guidance and can be applied on a case-by-case basis using best professional judgment in response to site-specific conditions. Note that the SVAP2 is not designed for non-wadeable streams such as large rivers like most of the Connecticut and Merrimack Rivers.

II. DOCUMENTING IMPACTED STREAMS

Key Considerations:

Stream Type

All streams respond differently to disturbances—both negative and positive. Consequently, it is important to document the physical characteristics of the streams since, when mitigation is required, it will help determine the appropriate type of mitigation and if similar functions are restored or

enhanced. For example, stream reaches with steep slopes, containing bedrock or large boulders within confined channels are typically less prone to disturbance from changes in fine sediment supply and hydrology compared to reaches of flatter slope with finer textured substrates within wider channel valleys. Stream reaches that are plane-bed, riffle-pool, braided, or dune and ripple (sediment waves) are typically better at retaining nutrients and sediment. Differences in physical composition also result in differing biogeochemistry, nutrient recycling, habitat, and food web functions.

III. MITIGATION TYPE AND GOALS

Defining Goals, Objectives, and Performance Standards:

It is important for stream mitigation projects to have clearly defined goals. Specific performance standards will be integral to assessing the trajectory of the mitigation project. Goals will typically be targeted towards achieving some level of physical, chemical, and/or biological improvement within the stream system. Below is a partial list of stream mitigation projects by type and the functions they may restore or enhance.

Removal of Dams or culverts effectively functioning as dams

- Restore native ecosystem productivity and biodiversity
- Increase sediment, nutrient, and wood transport
- Restore natural hydrologic regime
- Improve water quality and thermal regime
- Improve riparian functions
- Restore migration and movement of aquatic biota (fish, invertebrates, etc.)
- Restore availability of upstream aquatic habitats

Existing culvert upgrades (to meet the New England District Best Management Practices for Stream Crossings) or removal

- Increase/restore native ecosystem productivity and biodiversity
- Increase/restore sediment, nutrient, and wood transport
- Restore natural hydrologic regime
- Improve migration and movement of aquatic biota
- Increase/restore availability of upstream aquatic habitats

Restoration of riparian and floodplain vegetation

- Increase native ecosystem productivity and biodiversity
- Increase habitat complexity of stream ecosystem
- Increase sediment and nutrient retention in riparian areas and floodplains
- Improve thermal regimes, e.g., shading by riparian vegetation
- Improve water quality

Re-establish connections to floodplains and side channels

- Increase native ecosystem productivity and biodiversity
- Increase habitat complexity of stream ecosystem
- Increase sediment and nutrient retention in riparian areas and floodplain
- Improve access to refuge and reproductive habitat for organisms
- Improve thermal regimes, e.g., shading by riparian vegetation
- Improve water quality
- Reduce flashiness
- Restore natural hydrologic regime

Remove riprap and concrete banks and channels and revegetate

- Increase native ecosystem productivity and biodiversity
- Increase availability of sediment, woody material, nutrients for aquatic habitats
- Improve hydrological regimes
- Increase habitat complexity and diversity for aquatic life
- Improve sediment and nutrient transport and retention/recycling dynamics
- Improve thermal regimes and water quality
- Potentially increase base flow
- Restore dynamic channel boundary; allow natural avulsion (migration of channel) within floodplain

Improve stormwater storage and processing

- Increase native ecosystem productivity and biodiversity
- Restore natural hydrologic regime
- Reduce flashiness
- Improve water quality and thermal regimes
- Improve habitat complexity and diversity for aquatic life
- Reduce sources of pollutants (including excess fine sediment)

Enhance or restore riparian buffer

- Increase native ecosystem productivity and biodiversity
- Improve habitat complexity and diversity for aquatic life
- Improve thermal regimes and water quality
- Increase retention of woody material, sediment and nutrients
- Improve sediment and nutrient recycling

Install coarse woody material in stream/along banks

- Increase native ecosystem productivity and biodiversity
- Improve habitat complexity and diversity for aquatic life
- Improve thermal regimes and water quality
- Increase retention of wood, sediment and nutrients
- Improve sediment and nutrient recycling

Use Low Impact Development (LID) technology (pervious surfaces, rain gardens, filter strips, etc.)

- Increase native ecosystem productivity and biodiversity
- Restore natural hydrologic regime
- Improve water quality and thermal regimes
- Improve habitat complexity and diversity for aquatic life
- Reduce flashiness

Remove pavement and other impervious surfaces

- Increase native ecosystem productivity and biodiversity
- Improve hydrologic regime
- Improve water quality and thermal regimes
- Improve habitat complexity and diversity for aquatic life

Preserve stream buffers

- Preserve native ecosystem productivity and biodiversity
- Preserve availability of sediment, wood, nutrients for aquatic habitats
- Preserve hydrological regimes
- Preserve habitat complexity and diversity for aquatic life
- Preserve sediment and nutrient transport and retention/recycling dynamics
- Preserve thermal regimes and water quality

Install fish ladders

- Restore migration and movement of salmonids and potentially eels

Determining Stream Debits/Credits

Unlike wetlands, streams require three matrices: one to calculate the credits required to compensate for various stream impacts (Table C3), one for secondary impacts (Table C4), and another to address the credits generated by various preservation, enhancement, and/or restoration projects (Table C5). Five ratio multipliers have been provided for each activity in order to compensate for varying stream conditions as determined using the SVAP2. The ratio multipliers are then multiplied by the length of stream (or stream bank) impacted by the project, to calculate the necessary credits required to compensate for the stream impacts. Best professional judgment should be used to complete the SVAP2 Worksheet and determine whether the stream in the area of the impact or mitigation project is currently Severely Degraded, Poor, Fair, Good, or Excellent. Multipliers should then be applied accordingly. For mitigation the process works in reverse with the improvement in stream condition determined and the credits determined based on that.

It should be noted that these tables assume that impacts are permanent. In general, for impacts not expected to last more than one year, mitigation is not

recommended. For impacts expected to last more than one year but no more than two years, multiply the credits needed to provide appropriate compensation by 0.25.

Calculating Mitigation Credits Needed ("Debits"):

1. Complete the Stream Visual Assessment Protocol Worksheet.
2. Determine whether the stream to be impacted is Severely Degraded, Poor, Fair, Good, or Excellent.
3. For each Impact Activity associated with the project, determine the linear feet of direct impacts to the stream.
4. Using the appropriate multiplier, calculate the mitigation credits needed to compensate for each Impact Activity.
5. Calculate the total mitigation credits needed to compensate for the project impacts by adding all of the credits calculated in Step 4.

Calculating Mitigation Credits Generated:

1. Complete the Stream Visual Assessment Protocol Worksheet.
2. Determine whether the stream to be modified is Severely Degraded, Poor, Fair, Good, or Excellent.
3. Using best professional judgement and the SVAP2, determine the likely condition of the stream after work is complete and monitoring is over (note that this item is not needed for preservation projects).
4. For each Form of Mitigation, determine the linear feet of proposed mitigation.
5. Use the appropriate multiplier to calculate the mitigation credits generated.
6. Calculate the total mitigation credits the proposed mitigation would generate by adding all of the credits calculated for preservation, stream modifications, and/or installation of a fish ladder.

IV. MITIGATION SITE SELECTION

There are many variables influencing the physical, chemical and biological composition of stream systems. All of these variables should be considered to the extent practicable when planning a mitigation project and include, but are not limited to, geography, bed material, fluvial geomorphology, and position within the surrounding landscape. For construction projects, generally removal of barriers is preferred because that basically reverses the impacts of those structures on the structure, functions, and dynamics of streams and their riparian areas and floodplains. See the Corps Regulatory Guidance Letter 18-01.

V. SPECIAL CONSIDERATIONS

Floodplains

Floodplains are important in modulating stream flow, supplying substrate for biogeochemical transformations (including denitrification), supplying and receiving coarse woody material, and providing habitat for diverse aquatic and terrestrial organisms. Overbank flow and channel migrations across the belt width create and maintain a diverse array of habitat types, including secondary channels, oxbow ponds, marshes, vernal pools, and forested wetlands. Disrupting these processes can result in impacts far beyond the project footprint. Conversely, restoring them can have far-reaching improvements to the stream and its floodplain.

Riparian Buffers

Vegetated riparian buffers are likely to help regulate water temperatures, intercept pollutants and sediment, and provide detritus which is a vital component of aquatic food webs. Buffers also provide migration corridors and can provide critical habitat for many non-aquatic species associated with stream habitat.

Changes to riparian vegetation can have long-term impacts on coarse woody material recruitment. Replacement of riparian vegetation with riprap or other hard structures along stream banks can impact water temperature, water quality, wildlife and fish habitat, stream stability and overall functionality. Such alterations can encourage recruitment of invasive species. Removal of hard structures and restoration of degraded riparian vegetation can restore these functions.

In-Stream Structures: Natural

Coarse woody material and boulders are stream features that retain materials such as sediment, organic matter, and nutrients, especially in small and moderate sized streams. As detritus decomposes, it supplies dissolved organic carbon (DOC) used in denitrification and particulate organic carbon (POC) used by shredder organisms. These natural in-stream structures create and maintain complex stream habitat features such as riffles, pools, and other resting and hiding habitat for aquatic biota. Channelization and/or removal of large, in-stream material can alter hydrologic flow characteristics as well as limit sediment and nutrient retention.

Many of the processes important in a natural high functioning system would be impaired by static structures so this should be taken into consideration in the stream mitigation design. Also, smaller diameter and length logs will be highly mobile in larger systems, and of less habitat value.

In-Stream Structures: Engineered

Vanes, J-hooks, weirs, and a variety of other structures have been installed to improve fish habitat, and direct flows away from banks and structures, etc. However, they often address problems with nearby infrastructure rather than restore the stream. They can inhibit natural processes such as stream channel movement.

Dam and other Barrier Removals

See Regulatory Guidance Letter 18-01 for a detailed discussion of the benefits of dam and other barrier removals.

VI. MONITORING NEEDS

Monitoring for stream mitigation will generally be for a minimum of 10 years, with monitoring events typically occurring in years 1, 2, 3, 5, 7, and 10.

STREAM MODULE INSTRUCTIONS

IV. HYDROLOGY

Evidence of appropriate hydrology to support the desired stream type.

1. The expected seasonal depth, duration, and timing of stream flows should be described for the mitigation area. Indicate the stream type in terms of ephemeral, intermittent, or perennial.

2. Indicate the watershed size.

3. Describe the location of the stream in the watershed.

4. The narrative for the mitigation describes water sources (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) if available.

5. Salinity information for coastal streams may be needed on a case-by-case basis.

V. SUBSTRATE

1. Describe the naturally occurring substrate in reference reaches.

2. Only clean material shall be used to construct the mitigation project. Provide information on the source and the likelihood the material contains any contaminants or invasive species seeds and/or propagules (such as *Phragmites* rhizomes). Stone to be used for the mitigation project should be washed prior to placement in waters.

3. Stone used in the mitigation project should be adequately sized to withstand high flows. Information on material size and source should be indicated on the mitigation plan.

VI. STRUCTURE AND STABILITY

1. Existing and proposed channel form shall be provided for the mitigation project. Stream profiles and cross sections must be included in the plans. Indicate active channel width based on Ordinary High Water Mark (OHWM) and length of reach. Extend the linear profile at least 25' above and below the reach on which work is proposed. OHWM must be clearly labelled on all plans.

2. Sediment Transport Models should be provided if applicable.

3. Reference reaches shall be identified and indicated on the SVAP2 worksheet and used to determine appropriate sinuosity, gradients, slopes, etc. Note that it is important to research the history of the reference reach if it is to be used as a template for construction to ensure that it is actually a natural, highly functioning system that is not in disequilibrium from human impacts.

VII. RIPARIAN BUFFER 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 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 L of the New England District Compensatory Mitigation Guidance shall not be included as planting stock if the mitigation is in proximity to 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. A plan view drawing should show where the various species are proposed to be planted. Since showing each individual plant is usually neither practical nor realistic unless the area is small such as around a bridge, this may be illustrated with areas of uniform species (may include several 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.

4. The list of species proposed in seed mixes should not include any species in the list of invasives in Appendix L. Similarly, non-native genotypes and cultivars should not be used.

5. 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 professional may relocate up to 50 percent of the plants 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 the stream can be maintained.

6. Self-explanatory.

VIII. COARSE WOODY MATERIAL AND OTHER IN-STREAM FEATURES

1. If in-stream structures (rock weirs, J-hooks, cross vanes, etc.) are proposed in the mitigation project, a statement addressing long-term maintenance shall be included on the plan. Man-made features may fail and cause unintended consequences. A remedial plan should be included in the event of failure.

2. If coarse woody material will be used, the woody material locations should be shown in the drawings and the following language must be included in the mitigation plan.

→ These materials should not include species shown on the list of invasive species (Appendix K) in the New England District Compensatory Mitigation Guidance unless they are clearly dead and include no fruits/seeds or other propagules.

3. A plan view drawing should show where the coarse woody material may be placed. Depending on the size of the mitigation area, showing each individual specimen may not be practical or realistic and may be illustrated with areas of uniform species composition and number.

IX. FLOODPLAINS

1. Describe the degree of connectivity of the stream to its floodplain. Indicate whether natural or manmade berms are present, if hard armoring has occurred along banks, and the level of development in the floodplain.

2. If a supply of dead or dying material will be included in the floodplain zone, indicate how the material will be anchored to prevent washing away during high flows.

3. Identify width of floodplain in areas of stream work.

X. MONITORING

1. Monitoring will generally take place for 10 years (years 1, 2, 3, 5, 7, and 10) unless the project is a barrier removal in which case monitoring will generally be for five years.

2. Adaptive management measures may be needed in the event of unforeseen problems/project failures, including the effects of climate change.

3. Maintenance is critical in the meeting and overall long term maintaining of mitigation performance standards.

4. Clearly defined enforceable performance standards must be established.

5. Include representative photos of the channel, banks, and side slopes.

STREAM MODULE CHECKLIST

NOTE: If the SVAP2 is used, some of these items may be addressed on that protocol's summary sheet which should be referenced in each specific item.

I. Hydrology

1. [ ] Flow regime
2. [ ] Watershed size
3. [ ] Location in watershed
4. [ ] Water source(s)
5. [ ] Salinity, if applicable

II. Substrate

1. [ ] Substrate type
2. [ ] Proposed source of material
3. [ ] Material size

III. Structure and Stability

1. [ ] Plans show existing and proposed channel form
    a. [ ] Cross section and profile
    b. [ ] Channel width
    c. [ ] Length of reach
2. [ ] Sediment Transport Model
3. [ ] Identify reference reach

IV. Riparian Buffer 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. [ ] Seed mix composition is provided
5. [ ] Relocation of plantings allowed when appropriate
6. [ ] Other - Specific staff recommendations related to planting

V. Coarse Woody Material and Other In-Stream Structures

1. [ ] Maintenance plan
2. [ ] Appropriate amounts and location of coarse woody material are proposed
3. [ ] Plan view showing approximate location of materials

VI. Floodplains

1. [ ] Level of connectivity to floodplain
2. [ ] Permanence of coarse woody material placed in floodplain
3. [ ] Floodplain width

VII. Monitoring

1. [ ] Length of time and frequency of stream monitoring
2. [ ] Adaptive management measures
3. [ ] Maintenance measures
4. [ ] Performance standards

5. [ ] Representative photos of the channel, banks, and side slopes

APPENDIX H - VERNAL POOL MODULE

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I. OVERVIEW

Vernal Pool Definition:

Vernal pools (VPs) are depressional aquatic resource basins that typically go dry in most years and may contain inlets or outlets, typically of intermittent flow. VPs range in both size and depth depending upon landscape position and parent material(s). In most years, VPs support one or more of the following obligate indicator species: wood frog, spotted salamander, blue-spotted salamander, marbled salamander, Jefferson's salamander, Jefferson's-blue spot polyploid complex, and fairy shrimp. They should preclude sustainable populations of predatory fish. VP areas are comprised of three zones:

- Depression (includes the VP depression up to the spring or fall high water mark, and includes any vegetation growing within the depression),
- Envelope (area within 100 feet of the VP depression's edge), and
- Critical terrestrial habitat (CTH) (area 100-750 feet of the VP depression's edge).

The envelope and CTH protect the water quality of the breeding site (e.g., providing shade, leaf litter, and coarse woody material) and support the non-larval life-cycle stages of amphibian species. Removing tree canopy cover can heat up the air, soil, and water, alter the period of time that water remains in the pool, and influence which species can survive there. Note: The Corps may determine that a waterbody should not be designated as a VP based on available evidence.

Determining appropriate permittee-responsible mitigation for VPs requires an understanding of the resource to be impacted and an understanding of the landscape where compensation is proposed to occur.

II. DOCUMENTING IMPACTED VERNAL POOLS

In order to determine the appropriate mitigation for VP impacts, the pools to be impacted must be evaluated using the Corps Vernal Pool Characterization Form (VPCF). This form documents both the quality of the vernal pool and its surrounding landscape to determine overall level of function of the pool.

Using the Corps VPCF, VPs may be classified as providing high, moderate, or low levels of functions. These would be determined by the following scores.

- Low rated VPs would be those with a score of 19 or less for the VP envelope and CTH combined.
- Moderate rated VPs would be those with a score of 20 to 27 for the VP envelope and CTH combined, with the VP envelope no less than 10.
- High rated VPs would be those with a score of 14 or more for both the VP envelope and CTH.

In addition, the number of egg masses or presence of specific species can be used to raise the ranking (e.g., from medium to high). The numbers of egg masses and diversity of species vary considerably between VP systems and determining the threshold to raise the ranking is determined on a project-specific basis. However, as these may be highly variable from year to year, low egg mass numbers or fewer species present in any given individual year cannot be used to lower the ranking.

It should be noted that, to reduce impacts to VPs, refer to "Best development practices: conserving pool-breeding amphibians in residential and commercial developments in the northeastern United States" by Calhoun and Klemens and consider directional corridors when that information is relevant and available.

III. MITIGATION TYPE AND GOALS

Mitigation Type: Created pools often fail to replicate VP hydrology, and may lure breeding amphibians away from more appropriate breeding sites and potentially serve as a population sink. Replacement of natural invertebrate communities is even more difficult. If loss is unavoidable, mitigation should focus on preservation of lands with existing natural VP habitat (off-site or on-site), including CTH, and restoration or rehabilitation of existing VPs and adjacent terrestrial habitat. VP creation may be an acceptable form of mitigation for rare, case-specific situations, but 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 depend on VP habitat to complete one or more of their life-cycle stages. For example, several species of amphibians are dependent on VPs to provide breeding habitat 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 VP amphibians breeding successfully in pools lacking one or more of these features, it is not possible to accurately predict the circumstances under which marginal habitat will effectively provide habitat needs. Therefore, a mitigation plan must aim towards providing VP habitat under the most pristine conditions in order to offer the best opportunity to compensate for lost wildlife habitat functionality.

Hydroperiod: The expected hydroperiod for each pool at the mitigation area must be specified. Groundwater modeling and water budget calculations should be used to demonstrate the ability of the site to provide the desired hydrology. If the mitigation plan includes VP 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 meeting performance standards. The hydroperiod should also be described for every pool for which rehabilitation or restoration is proposed. Because hydroperiod can vary annually, multiple years of data should be provided if available.

Fishless environment: VPs provide breeding habitat for amphibians whose tadpoles and larvae are especially vulnerable to fish predation. Not all VPs go dry every year, but they generally have some feature that excludes fish reproduction such as annual drying, low oxygen concentrations in the summer, or shallow conditions that permit winter freezing to the pool bottom. Seasonal 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 pools with fish may also be required.

Microtopography: Natural VP 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 hummocks, hardwood leaf litter wells, sphagnum moss, and accumulations of woody material. 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 VP bottom often consists of a thick layer of leaves and other decaying organic materials, which provides a valuable food source for VP species and invertebrates. The rare mitigation projects that involve the creation of VPs should consider the addition of such a natural substrate. Salvaging organic layers of lost pools may help inoculate 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: All pools at the mitigation site should have at least 75 percent canopy cover of trees in the VP envelope (the area immediately adjacent to the pool, up to 100

feet from the pool edge). The remaining adjacent CTH should maintain at least 50 percent canopy cover. Enhancement and restoration projects should consider reforestation of areas without intact canopy; however, it is important to realize that increases in woody vegetation immediately adjacent to the pool may alter the hydroperiod due to increased evapotranspiration.

VP life zone: Habitat for many VP species consists not only of the pool basin, but also of the adjacent terrestrial habitat. This adjacent terrestrial habitat, comprised of both the VP envelope and the CTH, we are terming the VP life zone. 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 VP habitat unless a study reveals a different configuration. In order to provide compensation for the wildlife habitat functions of an impacted VP, adequate terrestrial habitat must be included in the compensation plan. As much as possible of the adjacent terrestrial habitat should be undeveloped. BMPs should be worked into the management plan when possible.

Clusters of pools: Clusters of s that vary in size, hydroperiod, and spatial proximity, provide each resident species with a variety of potential breeding sites. This allows adults to seek out high quality habitat with low densities of predators, provides a safety net in the event that one or more pools become uninhabitable due to disease, and increases the potential for genetic diversity. Protecting existing clusters is encouraged. If creation is proposed, developing a cluster is encouraged.

Determining amount of mitigation:

To our knowledge, there are no long-term studies of VP creation in New England (egg mass counts alone do not tell you if young-of-year are surviving and producing a stable population). There have been several creation attempts over the years as part of Corps permits, usually with 3 or 5 year monitoring plans, with very mixed results. Some created pools have been too dry, and many eggs have dried up and died. Other pools have been too wet, and support green frogs and bullfrogs, predators to the VP species. Therefore, the Corps recommends the preservation of intact VPs and their VP life zones at a landscape scale as the best approach to VP mitigation. Further, when large areas with VPs are protected, it will assist in the long-term sustainability of metapopulations.

The rational for the process to determine mitigation amounts is that, based on the uncertain success of creation as observed by Corps staff over more than two decades, few VP creations are fully functionally successful, perhaps one or two out of five with the others usually too wet or too dry. Further, the VPs deemed successful were based on observing egg masses within a few years of creation. (As noted earlier, egg mass evidence alone is not an accurate indicator of long-term pool functioning and we are not aware of any long-term studies of created VPs.) Therefore, preservation of healthy VPs and their critical terrestrial habitat is preferred even though it does not

address “no net loss” of function or acreage. Compensating for pools which score poorly should not be the same as for those that are in good or excellent condition.

Based on available information, the Corps has determined that the multipliers shown in Appendix C “Multiplier Tables” are reasonable and appropriate for the project to ensure compliance with the guidelines at §230.10(d) and the Mitigation Rule for permittee-responsible-mitigation. This method yields the amount of mitigation credit necessary to compensate for VP impacts.

IV. MITIGATION SITE SELECTION

Location: Priority will be given to sites that historically supported VPs or have appropriate geology and have appropriate surrounding land use and land cover. 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 (e.g., egg mass counts) should be documented, if 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.

V. SPECIAL CONSIDERATIONS

Inoculation: This is generally not recommended due to the potential for disease transfer and introducing genes unadapted for site conditions. It may be acceptable on a case by case basis, but the inoculation plan must be well documented and monitored.

VI. MONITORING

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 VP establishment attempts have shown limited ability to replicate lost habitat functionality. Past projects have also often failed to provide the kind of long-term monitoring data necessary to advance our understanding of methodologies for VP establishment and restoration that result in meeting performance standards. All VP mitigation plans must include systematic and documented monitoring for 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 at least bi-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 VP 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. Monitors should be well-trained in recognizing different species' egg masses. Egg masses may be found anywhere in a pool and at any depth so monitor accordingly.

- Other aquatic survey techniques: It is encouraged that egg mass counts be complemented with larval sampling (such as larval dip-netting) to ensure that larvae are developing successfully and leaving the pond. This should be done close to amphibian metamorphosis as dip-netting kills young salamander larvae. 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. Use caution as green and bull frogs may call from pools, but are not necessarily breeding in them. Dip-netting and road surveys may be best to document them. Dip-netting also 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: As appropriate, monitoring plans may also include standard water quality measures (e.g., pH, conductivity, nitrogen, phosphorus, biological oxygen demand, temperature, dissolved oxygen content), 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. The species of fish is important.

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

1) Effective recruitment of VP 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 rehabilitated pools with those of reference VPs from the same immediate areas.

Indicator species found in New England: wood frog (*Lithobates sylvaticus*), spotted salamander (*Ambystoma maculatum*), marbled salamander (*A. opacum*), Jefferson salamander (*A. jeffersonianum*), blue-spotted salamander (*A. laterale*), Jefferson-blue spot polyploid complex, spade-foot toad (*Scaphiopus holbrookii*), and fairy shrimp (Order: Anostraca).

Facultative species found in New England: include fingernail clams, caddisflies, four-toed salamander, eastern newt, spring peeper, American toad, Fowler's toad, green frog, gray treefrog, spotted turtle, Blanding's turtle, wood turtle, painted turtle, snapping turtle, and the plant, American featherfoil (*Hottonia inflata*).

Additional guidance on VP 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.

VII. VERNAL POOL MODULE CHECKLIST INSTRUCTIONS

I. DOCUMENTATION OF IMPACT AREA

Complete Vernal Pool Characterization Form for each pool in the impact area following the instructions later in this appendix.

II. MITIGATION TYPE PROPOSED AND SITE SELECTION

Provide an explanation of all proposed mitigation for impacts to VPs. Explain the rational for selecting PRM rather than ILF and, if PRM, preservation vs. establishment/restoration and the site selection process. For mitigation involving site preservation, fill out section III. Note that establishment of VPs is discouraged.

III. PRESERVATION SITE EXISTING CONDITIONS

1. Complete Vernal Pool Characterization Form for each pool in the preservation area following the instructions later in this appendix. For mitigation plans that include preservation of existing VPs, wildlife observations should be documented following the same format as Section C of the Vernal Pool Characterization Form.

2. Describe the presence of other VPs (location and proximity) including information about other pools which are proposed to be established or restored, if any.

IV. ESTABLISHMENT/RESTORATION SITE EXISTING CONDITIONS

1a. Existing Wildlife Use. Mitigation plans that include establishment or restoration of pools must survey the proposed mitigation site and adjacent land for evidence that there is an existing resident population of the target species. Provide documentation of presence and estimated abundance if possible.

1b. Presence of small mammal burrows and other terrestrial refuges. Adjacent terrestrial habitat should be surveyed for the presence of small mammal burrows and other terrestrial refuges which are often used by VP 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. Existing Soil. See Appendix B - Basic Mitigation Plan Checklist C.2.b.

3. Existing Vegetation. See Appendix B - Basic Mitigation Plan Checklists C.2.c.

4. See III.2 above

V. SITE DESIGN/GOALS (ESTABLISHMENT/RESTORATION SITES).

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

1b. Mitigation projects involving the establishment or restoration of VPs should include detailed plans to create a heterogeneous pool bottom that resembles the microtopography of a reference pool. Use of a confining layer is strongly discouraged.

1c. 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 to ensure that invasives are not introduced to the site inadvertently.

1d. Egg attachment sites should consist of a combination of shrubs, persistent emergent vegetation and coarse woody material. Describe the amounts and range of decomposition of coarse woody material proposed for pool structure and egg mass attachment sites. Source and location should be specified. See Planting Plan (section VII) below.

2. Evidence of resident population(s) of target species at mitigation site. For mitigation plans that include establishment or restoration of VPs, a narrative of the target species composition (based on a reference pool) should be included.

2a. Mitigation plans should specify how the pool(s) will not support a fish population, especially in cases where preservation or restoration pools may not be completely isolated hydrologically. Signage reminding people not to stock ponds with fish may also be required.

2b. Animal transplantation plan is included, if appropriate (will only be appropriate in rare circumstances). 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 nearby 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 at the donor site. Caution should be used to prevent disease transfer.

3. Evidence that mitigation site can provide appropriate hydroperiod to support the desired VP species. If VP establishment or restoration is included as part of the mitigation plan, provide evidence that adequate hydrology (neither too little nor too much) exists or will be provided to support the hydroperiod requirements of the target species (See Section II above). In the case of VP rehabilitation, provide documentation of the hydroperiod of the existing pools proposed for mitigation use, documenting the same information as described above in Section I.2.a.

3a. For establishment or restoration, describe the subsurface geologic characteristics of the site including parent material type and water table characteristics.

3b. See Sections I.1. and I.2 in Wetlands Module (Appendix E). 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.

VI. TERRESTRIAL HABITAT AND LANDSCAPE LEVEL CONSIDERATIONS

1 – 2. An acceptable mitigation plan must include provisions for preservation (conservation easement) in perpetuity of the pool and adjacent terrestrial habitat. Most VP mitigation projects will require preservation of all undeveloped land within 750' of the pool depression edge and at least 75% of 750' radius circle.

VII. PLANTING PLAN

1 – 3. See Section III.1 – 4 in Wetlands Module (Appendix E).

4. Shade plants are an important part of VP habitat. Describe any changes to existing shade species and any proposed plantings to generate shade. In the case of enhancement, it important to realize that increases in woody vegetation immediately adjacent to the pool may alter the hydroperiod due to changes in evapotranspiration. Make sure to consider this during the development of planting plans.

5. There should be adequate places for attachment of egg masses for VP species. Typically, these are the woody stems of shrubs, persistent emergent vegetation, or woody material. Explain and describe proposed attachment provisions and specify source of material to prevent introduction of invasives.

6. See Section III.8. in Wetlands Module (Appendix E).

7. Self-explanatory.

VIII. MONITORING

1.a-e. Monitoring period and methodology should be specified and described in detail. All monitoring protocols must include hydroperiod measurements, egg mass counts, and larval sampling. Other acceptable methodologies include anuran call surveys, dip-netting, and nocturnal road surveys. Timing is extremely important (e.g., the later the larvae are still there, the greater chance of recruitment).

2 – 3. The language below is designed for spring-breeding species. If monitoring is necessary for fall-breeding species such as marbled salamanders, the wording should be modified appropriately.

➡ Pool is monitored for obligate and facultative vernal pool species at least twice during the first four weeks from the beginning of the VP activity in the

spring (the actual date will vary throughout New England), then again during the usual summer monitoring, for the entire monitoring period (minimum of 5 years). The period of monitoring is specified for each monitoring year. These data should identify frog species, salamander species, and the presence/absence of fairy shrimp. Macroinvertebrates can be identified down to the Order.

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

Other data required: conductivity, nitrogen, phosphorus, DOC, pH, and temperature of water at beginning and end of each monitoring cycle; pool depth at deepest point(s) (or state if >3 feet) 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 VP register or certification program that allows registration/certification of constructed pools, the pool(s) is registered and/or certified prior to the final monitoring report submission.

IX. CONTINGENCY

In order to ensure the greatest likelihood of success, a contingency plan should be provided. Note that financial assurances may be required because of the high level of risk in VP establishment and restoration. See p. 18 of the main document.

VIII. VERNAL POOL MODULE CHECKLIST

I. Documentation of Impact Area:
1. Vernal Pool Characterization Form

II. Mitigation Type Proposed

III. Preservation Site Existing Conditions
1. Vernal Pool Characterization Form
2. Proximity to other VPs.

IV. Establishment/Restoration Existing Conditions
1. Existing Wildlife Use
   a. Resident populations.
   b. Small mammal burrows.
2. Existing Soil.
3. Existing Vegetation
4. Proximity to other VPs.

V. Site Design/Goals (Establishment/Restoration Site)
1. [ ] Substrate and physical characteristics
   a. [ ] Description and plan drawings of basin shape, depth, area, inlets/outlets.
   b. [ ] Microtopography of pool bottom. Proposed source of material for confining layer (if needed).
   c. [ ] Leaves and other decaying organic materials for pool substrate.
   d. [ ] Egg attachment sites and woody material.
2. [ ] Target species
   a. [ ] Fish populations are unable to survive.
   b. [ ] Animal transplantation plan.
3. [ ] Target hydrology.
   a. [ ] Documentation of water table and geologic/soil characteristics.
   b. [ ] Water source(s) and water budget calculation.

VI. Terrestrial Habitat and Landscape Level Characteristics
1. [ ] Preservation of adequate adjacent terrestrial habitat.
2. [ ] Preservation Documentation

VII. 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.

VIII. 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 VP registration or certification program.

IX. [ ] **Contingency**

IX. VERNAL POOL ASSESSMENT

This VP rapid assessment method is designed to characterize VPs and to provide a valuation for features of the pool and surrounding habitat for regulatory purposes – impact and compensatory mitigation assessment. Since characteristics of VPs vary considerably and in turn can lead to varying functions and levels of functions among different pools, this methodology is designed to offer a simplified approach to assessing and comparing key features of these highly variable aquatic systems. In addition, it can provide a basis for developing appropriate compensatory mitigation for impacts to VPs. As each VP or VP complex is unique, the Corps should be consulted prior to developing any specific sampling protocol to ensure that all the necessary data are collected without an over-expenditure of time and resources. Data should be submitted on the Corps of Engineers – New England District "Vernal Pool Characterization Form."

The data collected for assessing VPs should be acquired during site visits conducted during the appropriate season(s) (e.g., early spring for egg mass counts of spring breeders, early summer for presence of metamorphs, etc.). When examining for egg masses, the entire pool should be comprehensively surveyed. A minimum of one year's data is recommended, but two to three years' data is encouraged to account for variations in reproductive effort, and hydrologic and climatologic conditions. In particular, for large projects that undergo many years of planning, it is highly recommended that VP resources be identified in the initial planning phases to allow for collection of multiple seasons' worth of site data on any VPs present. When abilities to visit and survey the pools are limited to non-optimal times of the year, documentation of the Vernal Pool Characteristics and VP Envelope and CTH Characteristics may be useful in determining the presence of VPs and their potential level of functioning.

Physical characteristics of some pools may be relatively stable, while these same characteristics (e.g., depth, vegetation, substrate, etc.) may vary in others. Such variations in pool characteristics can be accounted for through careful observations and record keeping during site visits. Timing of site visits is crucial to capture the appropriate seasons for sampling. The start of the amphibian breeding season may vary by several weeks from year to year, based on temperature, pool ice cover, and other climatic conditions. In addition to the climatic conditions, the breeding season varies geographically from southern New England to northern New England.

To appropriately document faunal usage of pools, repeated visits may be required during different seasons. For instance, some species may require more intensive sampling efforts in comparison to other species when determining presence/absence. Early spring visits are needed to conduct egg mass surveys, while later visits can identify metamorphs and determine reproductive success via the number of

metamorphs leaving prior to drying. If deemed appropriate, studies within the VP envelope and CTH areas can identify migratory pathways of the pool-breeding amphibians. This can also identify the portions of the surrounding landscape (especially in the VP envelope/CTH) that are being utilized by particular pool-breeding amphibians.

Predators such as fish and bullfrog and green frog larvae have been shown to consume the egg masses and larvae of VP-breeding amphibian species, and have the potential to lessen or cause complete reproductive failure when present in high densities. PLEASE NOTE: The specific combination of indicator and predator species present may have variable impact on the reproductive success of a given indicator species (e.g., the presence of green frog tadpoles may have little or no impact on the reproductive success of spotted salamanders). Therefore, it is important to note the presence/absence and relative abundance of predators. Enough information should be gathered to differentiate sustainable, resident predator populations from smaller, unsustainable or transient groups that will not have as great an impact on VP indicator species. In a pool with high predator densities, it is especially recommended that egg mass counts of VP indicator species be supplemented with larval dip-net sampling or amphibian trapping during the summer and fall months to document larval development and to provide insight on reproductive success.

Vernal Pool Characterization Form Instructions:

To document how a pool functions within its landscape, a Vernal Pool Characterization Form should be completed for each pool assessed. Additional notes, drawings, and photographs (of the pool and surrounding habitat) are encouraged to supplement this form. Aerial photographs of the pool and surrounding landscape should also be attached. We recommend doing a complete survey of the project area for VPs, as far in advance as possible.

The Vernal Pool Characterization Form is divided into three separate sections: VP characteristics, VP envelope and CTH characteristics, and observed species present.

The numbers to the right of the checkbox descriptions on this form are the values used to score the features of the VP being evaluated. If there is "NA" or blank space instead of a number next to the checkbox, this feature is used for overall characterization purposes; however, it is not used to value the pool and the box should only be checked if present. For each section, the numbers are totaled for all boxes checked (NA and scoreless boxes are not included) and included at the end of the envelope and CTH sections. Typically, one box per topic will be checked. Under the "Vernal Pool Envelope and Critical Habitat Area Characteristics" (items B.1 and B.2., respectively) multiple items may be checked if the surrounding land use is not homogeneous. In this case, each scored number is related to the percentage of that land use in the VP envelope. For example, if all of the land in the VP envelope is

forested, it gets a value of 15. However, if only 50% is forested, this portion gets a 7.5 (50% of 15) and the remainder gets whatever portion it encompasses (e.g., if the remaining 50% is "open," it gets a score of 2.5 and this item gets a total score of 10). It should also be noted under B.1 and B.2 if one or more barriers to migration are present within these zones. If the barrier is natural (e.g., river, lake), it should be scored as forested as the population has developed in that natural situation. If the barrier is human-made (e.g., large highway) and effectively prevents the VP fauna from crossing to utilize the habitat beyond which it likely once used, the percentage of the zone that is beyond the barrier(s) should be scored as developed and the remaining percentage of landuse types should be completed for the portion of the zone which is accessible from the pool.

Section C documents the presence/absence of species. "Few/common/many" is used for quantifying the non-indicator species present in the pool. Best professional judgment should be used in applying these terms as the actual numbers for each will vary with the type of organisms documented.

Checklist for Submissions:

_____ Vernal Pool Characterization Form
_____ Sketch of pool and surrounding habitat
_____ Pool and surrounding habitat photographs
_____ Aerial photographs
_____ Additional notes, including description of sampling methods

x. VERNAL POOL CHARACTERIZATION FORM

Project File # _____Project Name _____Pool ID _
Observer _____Phone or Email _____
Landowner/Applicant _____Phone or Email _____
Address
Location of vernal pool: _____
Survey date(s) _____
Longitude/Latitude (in decimal degrees) _____

A. VERNAL POOL CHARACTERISTICS

1. Landscape setting (check all that apply)

[ ] Upland depression
[ ] Pool part of wildlife corridor
[ ] Pool part of a pool complete (within 1000 feet of one or more other vernal pools)

2. Vernal pool condition

Describe any recent modification to the pool: _____
_____

3. Describe the aquatic resource type(s) in pool (e.g., forested, scrub-shrub, etc.) -
_____

4. Pool canopy cover (%): _____

5. Predominant substrate (e.g., mineral soil, organic matter): _____

6. Pool size

a. Approximate dimensions at maximum capacity (include units):
Length _____ Width: _____ Area: _____

b. Maximum depth at deepest point (include units): _____

7. Hydrology

a. Estimated month pool dries, or if never: _____

b. Inlet/outlet (none, temporary, permanent): _____

8. Water quality (clear, high turbidity, high algal content, tannic): _____

OTHER COMMENTS:

Append photos, sketch of pool and surrounding landscape.

B. VERNAL POOL ENVELOPE (100 ft) AND CRITICAL TERRESTRIAL HABITAT (100-750 ft)

a. Landuse type and approximate percentage within 100 ft VP envelope (total equals 100%)

[ ] Forested _____% (15 pts)

[ ] Shrub _____% (10 pts)

[ ] Open (e.g., meadow, agriculture, golf course) _____% (5 pts)

[ ] Developed (includes area beyond barriers) _____% (0 pts)

b. TOTAL for VP envelope (maximum of 15): _____

c. Landuse type and approximate percentage within 100-750 ft VP critical terrestrial habitat (total equals 100%)

[ ] Forested _____% (15 pts)

[ ] Shrub _____% (10 pts)

[ ] Open (e.g., meadow, agriculture, golf course _____% (5 pts)

[ ] Developed (includes area beyond barriers) _____% (0 pts)

d. TOTAL for VP CTH (maximum of 15): _____

e. How above determined (field estimate, GIS, air photo interpretation): _____

C. SPECIES PRESENT IN VERNAL POOL

INDICATOR SPECIES	**DATE**	**EGG MASSES (#)**	**TADPOLES/ LARVAE**
Wood Frog (*Lithobates sylvaticus*)			
Spotted Salamander (*Ambystoma maculatum*)			
Blue-spotted Salamander (*Ambystoma laterale*)			
Jefferson's Salamander (*Ambystoma jeffersonianum*)			
Marbled Salamander (*Ambystoma opacum*)			
Fairy shrimp (*Eubranchipus* spp.)		Present/ absent	Abundance:
OTHER SPECIES	**DATE**	**PRESENCE/ ABSENCE**	**FEW/ COMMON/ MANY**
Rare species (list):			
Facultative species: (e.g., Spring Peeper (*Pseudacris crucifer*), Gray Tree Frog (*Hyla versicolor*), Caddisflies (Limnephilidae, Phryganeidae), American Toad (*Anaxyrus americanusI*), Eastern Spadefoot Toad (*Scaphiopus holbrookii*), Fowler's Toad (*Anaxyrus fowleri*), Fingernail Clams (Sphaerlidae, Pisidiidae))). List:			
Predator Species (e.g., Bullfrog/Green frog tadpoles, Fish): List:			
Other species (.e.g, ducks, turtles, etc.): List:			

APPENDIX I - SUBMERGED AQUATIC VEGETATION MODULE

Table of Contents

I. OVERVIEW

Areas with Submerged Aquatic Vegetation (SAV) are aquatic systems dominated by rooted, vascular vegetation that grow completely underwater except for periods of brief exposure at low tides in marine and estuarine environments. The term SAV is generally used for marine, estuarine, and riverine flowering plants, although on occasions it can be applied to algal mats as well. SAV occurs in many freshwater, estuarine, and marine habitats. SAV has many beneficial properties which include providing refuge, nursery areas, and food sources for a number of aquatic fauna species, and the ability to stabilize these species by reducing turbidity and the remobilization of sediments.

The majority of impacts that we see to SAV in New England are in estuarine and marine systems dominated by one of several seagrass species. Typical species include eelgrass (*Zostera marina*), widgeon grass (*Ruppia maritima*), and various *Potamageton* spp. which are found in brackish, salt marsh, and coastal environments in New England. Due to their dominance in impacted SAV systems, this guidance is focused on the estuarine and marine systems, in particular those involving eelgrass. If dealing with an inland SAV system, please contact the New England District for project-specific guidance. For the purpose of this guidance we will use SAV and eelgrass interchangeably; however, other species of SAV may require a modified approach for mitigation.

II. DOCUMENTING IMPACTED SAV

The SAV area proposed to be impacted should be thoroughly documented in order to determine the appropriate type and amount of compensatory mitigation. Note that state eelgrass mapping efforts are good resources for presence/absence of SAV, but they are not designed/intended for project specific use.

III. MITIGATION TYPE AND GOALS

Zostera dominates SAV mitigation efforts in New England; however, degradation of water quality and levels of physical disturbance can greatly challenge the ability to meet performance standards for mitigation projects. Site selection is critical.

The main in-kind type of eelgrass mitigation performed in New England is eelgrass habitat restoration through planting of eelgrass propagules. To a far lesser degree, deployment of specialized (conservation) moorings in impacted eelgrass beds has been used. These are commonly considered to be a form of improvement of degraded eelgrass habit, not a creation of new eelgrass habit.

The applicant is urged to hire a qualified consultant who has a record of designing effective eelgrass mitigation projects. Several sources have promulgated comprehensive and useful SAV guidance documents, such as that issued by the Massachusetts Division of Marine Fisheries (Evans and Leschen, 2010).

IV. MITIGATION SITE SELECTION

Long-term sustainability of conditions suitable for SAV survival is key to effectively meeting performance standards for eelgrass mitigation. Meeting performance standards is largely a factor of the timing, method used, and most importantly, site selection. Low rates of SAV establishment 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 sediment bed grain size, water temperature, water quality, nutrient loading and resident nitrogen levels, especially nitrate and nitrite levels, (in fresh water phosphate levels should be measured as well), salinity, water depth, light attenuation, turbidity, exposure and wave energy, levels of human activity, historical distribution, epibiont presence, grazing pressure from herbivores, disturbance of rhizomes by foraging animals, and wasting disease. Software platforms exist that facilitate site selection for the purposes of eelgrass mitigation site selection. Applicants are encouraged to employ this software when appropriate.

Areas where recent improvements in water quality due to nitrogen reduction, improved sewage treatment or other human interventions should be given specific consideration. If why SAV was lost in a specific area is known and that stressor has been lessened or removed, the site is prime real estate for restoration.

In contrast, watershed activities and the degree of development within an embayment can set the limits for the persistence and degree of impairment for

both previously occurring and restored SAV habitat. Nutrient loading rates and turbidity levels can have significant impacts on the establishment and persistence of eelgrass stands over time. Physical disturbance from maritime activities and nitrogen loading and turbidity from contributing watersheds can contribute to SAV habitat degradation and loss (Short et al. 2012). Activities that cause physical disturbance of SAV include dredging, pier and marine facility construction, mooring placement and mooring gear type, and boat traffic.

V. SPECIAL CONSIDERATIONS

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. Of equal importance is the selection of a reference site. This site must be representative of a healthy eelgrass stand within the watershed that the project is located in. This reference site should be not so close that the project disturbance creates measurable impacts in the reference site.

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 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.

For transplanting, consider using plants from similar environmental conditions (depth, substrate) and, if possible, from multiple donor sites to enhance genetic diversity. The timing of the plantings is important: it is best to do it in the growing season, optimally in the spring with fall the second choice. Summer is the least desirable time.

Eelgrass planting methods can contribute greatly to meeting performance standards. Care should be taken to select a technique that is most likely to be effective in a particular location. A detailed discussion of planting methods

(rhizomes, seedcasting, Transplanting Eelgrass Remotely with Frame Systems (TERFS), etc.) along with proposed planting densities and grid arrays should be provided. Site bathymetry maps should also be included. The logistics of harvesting shoots or collecting seeds, then transplanting or seeding mitigation areas, must be carefully developed beforehand. Test plantings may be necessary to fully evaluate proposed site alternatives.

VI. MONITORING NEEDS

Performance Standard Examples

THESE ARE ONLY EXAMPLES. SPECIFIC PERFORMANCE STANDARDS SHOULD BE DEVELOPED FOR EACH PROJECT.

Evaluating whether performance standards are being met or not for eelgrass mitigation projects requires the evaluation of a number of habitat functions and productivity measures. These include estimates of shoot density, areal extent, epibiont density, and water quality. Performance standards are project-specific, and some EXAMPLES are included here. If performance standards are not met within the monitoring period, then extension of the monitoring period and remedial actions or alternative mitigation will be required.

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. 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 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 to have met the performance standard for that indicator.

VII. SAV MODULE DIRECTIONS

I. HYDROLOGY

1. Identify Mean Low Water (MLW) and Mean High Water (MHW) to ensure appropriate hydrology.

2. Identify substrate geometry, fetch, etc., to determine exposure and wave energy regimes.

II. OTHER ENVIRONMENTAL FACTORS

1. Identify and document these water quality factors

2. Self-explanatory

3. Self-explanatory

4. Identify risks for wasting disease.

5. Need adequate buffers to allow for eelgrass beds to expand and/or decrease in size and function and migrate within the embayment.

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.

7. Test plantings should be conducted and monitored at multiple sites based on the results of the site selection model for a minimum of one growing season.

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

1. Self-explanatory.

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 information from the National Oceanic and Atmospheric Administration, National Marine Fisheries Service). 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 ability to meet performance standards employing this method (S. Tuxbury, personal communication).

Broadcasting of eelgrass seed in Chincoteague Bay has met with some effectiveness in eelgrass establishment. 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 eelgrass establishment rates in New England were reported by Orth et al. 2009 and Orth et al. 2008. However, Leschen et al. 2009 reported good eelgrass establishment 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 the University of New Hampshire's website for further information.

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.

4. Identify proposed planting densities, grid arrays, etc.

5. Self-explanatory.

VI. MONITORING

The following language should be included in the narrative portion of the mitigation plan (this replaces the standard monitoring language in the Overall Mitigation Plan Guidance):

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 or shoots 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 m2 quadrats for each planting grid and within the reference area with a minimum of three plots, but more will likely be necessary based on size of the area.

3. Percent aerial cover based on same plots as 2. above.

4. Canopy height (80% of the average of the tallest leaves). Comparison to reference needs to be done within same depth strata.

5. Presence and number of reproductive shoots (if monitoring during June/July).

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).

7. General observations should be made on the conditions of the plants (do they look healthy? are they covered with epiphytes? do they have the wasting disease?). Observations should also be made on the presence of green crabs, waterfowl, or other wildlife that may disrupt the success of the restoration effort.

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, including performance standards.

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 epibionts (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, epibiont % cover, crabs, and light extinction levels.

VII. CONTINGENCY

A contingency plan should be in place in the event that the beds are not expanding at a desired rate, and the performance standards are not being met. 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 (e.g., drought, heat), bottom currents, etc. Alternative mitigation options, including payment into an ILF program, should be considered.

VIII. SUBMERGED AQUATIC VEGETATION MODULE CHECKLIST

I. Hydrology

1. [ ] Evidence of appropriate hydrology to support the desired SAV.
   a. [ ] Depth at MLW.
   b. [ ] Depth at MHW.
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. [ ] Epibiont presence.
3. [ ] Incidence of herbivory.
4. [ ] Likelihood of wasting disease.
5. [ ] Adequate buffers and unvegetated subtidal areas
6. [ ] Results from ESS software.
7. [ ] Test plots.

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

APPENDIX J - OTHER AQUATIC RESOURCES MODULE

Table of Contents

I. OVERVIEW

This module is intended to include other aquatic resources with less frequent impacts, such as rockweed beds, or for which we have yet to develop more detailed resource-specific guidance, such as mud flats and open water. These resources, particularly open water and mudflats, will addressed in more detail in subsequent versions of this guidance.

II. DOCUMENTING IMPACTED ROCKWEED

At a minimum, the areal cover of rockweed that is proposed to be impacted should be documented. Rockweed is lost from filling, removal of its attachment materials, and the elimination of sunlight.

III. ROCKWEED MITIGATION TYPE AND GOALS

Rockweed grows only in intertidal areas where there is abundant sunlight. Therefore it is limited in where it will establish. It needs hard substrate attachment sites (e.g., bedrock, boulders, riprap) for its holdfasts, the attachment portion of the organism.

IV. ROCKWEED MITIGATION SITE SELECTION

Compensation will generally be of habitat where rockweed can establish and which was not previously available. For example, removal of an old pier to expose riprap or bedrock, in an area otherwise suitable for rockweed, would be a reasonable approach. Placement of riprap in an otherwise healthy area with its own habitats is NOT an appropriate form of mitigation.

V. ROCKWEED SPECIAL CONSIDERATIONS

Rockweeds are brown macroalgae (*Ascophyllum* spp. and *Fucus* spp.) which are primary producers that require sunlight. They absorb required nutrients directly. They provide organic matter for other organisms and have been reported to be at least as productive as saltmarsh vegetation. They also transform inorganic nutrients and some metals which helps with water quality. Beds of rockweed are used for shelter, a food source, and attachment sites for epiphytes, and a nursery area for some crustaceans[1]. This primary producer resource is highly productive but if it is shaded out and the substrate remains, that substrate is likely to develop a community of secondary producers that can tolerate a lack of direct light.

VI. ROCKWEED MONITORING NEEDS

Monitoring rockweed will generally be for a minimum of 5 years to document the establishment of rockweed in the targeted area. The number of attachments should be compared to a nearby reference site.

VII. ROCKWEED MODULE INSTRUCTIONS

I. SUBSTRATE

1. Describe the type of material to be made available for rockweed attachment.
2. Provide the area over which rockweed is expected to establish.

II. STRUCTURE

1. Provide the tidal range at the compensation site. This is best shown on a cross-section
2. Of the tidal range, what portion is expected to colonize? This should be shown on the same cross-section as above.
3. Which direction does the proposed compensation area face?

III. MONITORING

1. Generally monitoring will occur once a year near the end of the growing season.
2. Use of a reference site is important for comparison but using attachment sites rather than volume of materials or aerial coverage because, as rockweeds age, they extend and branch and will cover more area.
3. Self explanatory.

[1] Ward, A.E. *Maine's Coastal Wetlands: I. Types, Distribution, Rankings, Functions and Values.*

VIII. ROCKWEED MODULE CHECKLIST

I. Substrate

1. [ ] Type
2. [ ] Area

II. Structure

1. [ ] Tidal range
2. [ ] Substrate depth range
3. [ ] Aspect

III. Monitoring

1. [ ] Frequency
2. [ ] Performance standards
3. [ ] Representative photos

APPENDIX K - 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. The Mitigation Rule indicates that mitigation banks and ILF programs are preferable forms of compensatory mitigation over permittee-responsible mitigation (PRM). If PRM is to be used, there must be a justification for why PRM is at least as ecologically appropriate as third party mitigation in the permit support documents (e.g., EA/SOF or MFR).

Special Conditions

Per 33 CFR 332.3(k) and district guidance, several mitigation-related items must be in the permit special conditions for any permit requiring PRM (a single condition may be used to reference ILF or bank mitigation). They may be stated as separate special conditions or combined into two or three conditions. See the All Special Conditions document at R:\RegDocs\Conditions under "d. Permittee-responsible mitigation." The items include:

- Identifying the party responsible for providing the compensatory mitigation,
- Identifying the specific mitigation proposed, including size(s) and type(s),
- Referencing the mitigation plan,
- Stating the ecologically-based performance standards, and
- Stating the implications should the proposed mitigation fail.
- Stating that compensatory mitigation requirements will not be considered fulfilled until the project has met the performance standards and received written verification from the Corps.

Example:

- Compensatory mitigation shall consist of the restoration of 1.3 acres of button-bush and alder shrub swamp and preservation of the 1.3 acres plus 15.2 acres of wetland and upland adjacent to this restoration area located off Kensington Road in accordance with the enclosed mitigation plan titled, "Reginald Day's Mitigation Site, Concord, MA" and dated 4/1/2019. Reginald Day is responsible for provide the compensatory mitigation. Mitigation work shall be completed within one year of the first impacts to regulated resources unless the Corps provides a written extension.

  The performance standards for the project are:

1) Submission of a recorded conservation easement and approved long-term management plan to the Corps prior to any work in waters of the U.S.
2) Documentation is provided to the Corps of hydrology appropriate to support a shrub swamp: inundation not exceeding 6 weeks between April 1 and October 31 in at least 4 of 5 years and saturation to the surface for at least 4 consecutive weeks during the same time period.
3) No more than 5% of the site has invasive species as listed in the Corps 2019 Mitigation Guidance.
4) Non-biodegradable erosion controls have been removed no later than three years after initiation of construction.
5) Native shrub species provide at least 50% aerial coverage with at least 10 coverage by planted or volunteer *Cephalanthus occidentalis* and/or *Alnus incana*.
6) Soils exhibit hydric characteristics.
7) Monitoring reports are submitted for five years, beginning following the first full growing season. Failure to submit reports may result in the extension of the monitoring period.

Should the 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, use of a different site, or purchase of credits from a third party bank or ILF program. 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.

The mitigation requirements will not be considered fulfilled until the project has met the performance standards and the permittee has received written verification from the Corps.

Financial Assurances

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

See the All Special Conditions document at R:\RegDocs\Conditions under Financial Assurances for more information, instructions, and special condition wording.

APPENDIX L – INVASIVE AND OTHER UNACCEPTABLE PLANT SPECIES[1]

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
Elymus repens (*Elytrigia repens*)	Quack-grass

[1] Scientific names are those used primarily in USDA PLANTS database (http://plants.usda.gov/).

Epilobium hirsutum	Hairy willow-herb
Euonymus europaeus	European Euonymus/ Common Spindle Tree
Euphorbia cyparissias	Cypress spurge
Euphorbia esula	Leafy spurge
Polygonum baldschuanicum (*P. aubertii, Fallopia baldschuanica*)	Silver lace-vine
Polygonum cuspidatum (*Fallopia japonica*)	Japanese knotweed
Polygonum sachalinense (*Fallopia sachalinensis*)	Giant knotweed
Festuca brevipila (*F. ovina, F.trachyphylla*)	Sheep fescue
Ranunculus ficaria (*Ficaria verna*)	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
Pachysandra terminalis	Japanese spurge
Pastinaca sativa	Wild parsnip
Polygonum persicaria (*Persicaria maculosa*)	Lady's thumb
Polygonum perfoliatum (*Persicaria perfoliata*)	Mile-a-minute vine
Polygonum caespitosum (*Persicaria posumbu*)	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 amphibia	Great yellow cress
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	Common or Broad-leaved cattail

Typha x *glauca*	Hybrid cattail
Valeriana officinalis	Garden heliotrope
Verbascum thapsus	Common mullein
Veronica beccabunga	European speedwell
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
Buddleja davidii	Butterfly bush
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 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	Amur corktree
Phellodendron japonicum	Japanese 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	Basket or purple-osier willow
Sorbus aucuparia	European mountain-ash
Taxus cuspidata	Japanese yew
Ulmus pumila	Siberian elm
Wisteria floribunda	Wisteria

APPENDIX M - LONG TERM MANAGEMENT PLAN TEMPLATE

MANAGEMENT PLAN

for

Fill in Project Name

Organization

Author and title

Date

The general outline that follows is designed to assist in the development of the Long-term Management Plan for Mitigation Projects. Objectives and tasks are provided for illustrative purposes only and may not represent management requirements suitable or necessary for every site. Sections in plain text represent language that should be included in a plan. Items in italics describe the type of information to be included in that section and should be deleted and replaced with the pertinent information for the project site.

Note: Maps are required. *Maps may be put into an Appendix or interspersed throughout the document. Maps showing the following are required, as outlined in the text that follows:*

- *General vicinity of the parcel showing other conservation lands;*
- *Parcel boundaries, on a topo or aerial photo;*
- *Road map showing how to get to property, with parking and trailhead information, if applicable;*
- *Man-made features on the property including structures, trails, roads, etc.;*
- *Aquatic resources including wetlands, streams and other resources related to the aquatic environment;*
- *Biological and other natural resources and communities of note;*
- *Soils and Geology;*
- *Hydrology and Topography;*
- *Threats such as locations of invasive species infestations and trash or trespass locations.*

Maps of similar content may be combined as long as the information they are to convey is clear and well-defined.

Table of Contents **Page**

I. Geographic Information

Site Name: _____
Town/County: _____
Total Site Size: _____
Type of Ownership: _*(i.e., fee or conservation easement; if easement include landowner's name*)
Date Acquired: _____

II. Introduction

A. Purpose of Management plan

The purpose of this management plan is to ensure that the property is managed and maintained in perpetuity in the Mitigation Plan referenced in Corps Permit Number [*Corps permit number*].

B. Long-Term Steward and Responsibilities

The Long-Term Steward of the site is [*steward organization*]. [*Steward organization*], and subsequent Long-Term Stewards if the property is transferred, shall implement this management plan, managing and monitoring the property in perpetuity to preserve its habitat and conservation values. Before any action is taken to void or modify the deed (or easement), management plan, or long-term protection mechanism, including transfer of title to, or establishment of any other legal claims over the site, 60-day advance notification must be given to the U.S. Army Corps of Engineers district engineer.

C. Management Plan Review

The management plan will be reviewed at a minimum once every 5 years by the Long-Term Steward. The plan may be revised or supplemented with additional information and management recommendations. Any revisions other than edits that change the management actions beyond standard maintenance activities will be reviewed with the U.S. Army Corps of Engineers.

III. Property Description

A. Setting and Location

Describe the location and general physical setting of the property: rural, urban, forest, field, upland, wetland, streams, etc. Detailed natural resource information will be described in Section V. Note if the property is adjacent to other conservation holdings. Provide maps of:
1) the general vicinity to show the parcel location in relation to municipal boundaries, major roads, lakes and streams, and other distinguishable landmarks, and
2) the project parcel which shows the property boundaries on a topographic map or aerial photo.

B. Directions and Access

Include driving directions, legal access points for the property, and information on parking and trailhead amenities (include road map with any access points, rights of way, trailhead and parking locations that are applicable).

C. History and Land Use of Property

1. Acquisition History

Describe the permittee's and/or steward's acquisition of the site, as well as historic land ownership, if known.

2. Land Use

Describe past and present land use including farming/agriculture, forest harvest history, development history, history of recreational use, etc.

3. Man-made/Cultural Features

Describe all existing man-made features including roads, trails, buildings, stone walls/fencing, water control structures, boat launches, historic areas, etc., and their intended future use on the property.

Include a map, plan, or aerial photo showing locations of all man-made/cultural features on the property including: roads, hiking and/or snowmobile/ATV trails, structures, walls, buildings, boat launches, easements, rights-of-way, leases, etc.

4. Historic or Archaeological Sites

Describe any known historic features or archaeological sites (without providing specific locations of archaeological sites), and include a summary of the results of any site surveys/inventories, including who conducted them. An assessment of the impacts of management should be given for such sites. If you are uncertain about whether there may be any Historic or Archaeological sites on your property, contact the state's Historic Preservation Office.

5. Existing Easements or Other Restrictions

Include descriptions/locations of any existing easements, rights-of-way or leases held by others, their nature (buried pipeline, overhead power, ingress/egress, snowmobile trail, mineral or timber rights or other interests), authorized users (if known), access procedures, etc.

6. Legal Documents Appendix

General note about status of legal documents with a reference to the Appendix, as applicable. The Appendix may include copies of legal documents such as deeds, legal descriptions, rights-of-way, deed restrictions, survey, mineral rights, conservation easements, conditions of transfer, etc.

D. Adjacent Land Uses

Description of adjacent uses around the property -- Detail the baseline adjacent land uses. These land uses may change over time; however, the description of the baseline conditions will

give the Long-Term Steward some idea of the conditions present when the management plan was first developed.

IV. Natural Resources

Sections below provide documentation of the current conditions on the site

A. Aquatic Resources

Describe all wetlands, streams and aquatic resources on the site with acreage/length, species and general characteristics and habitat quality.

Include maps showing all aquatic resources on the site.

B. Baseline Description of Biological Resources

1. Biological Species and Communities

Include a general description of biological and other natural resources including but not limited to: natural community structure, natural resource inventory data, wildlife use, conservation targets, natural disturbance, assessment of native vs. invasive and non-native species, an overview of native plant species present, if applicable, including their habitat and management.

Include maps of resources as appropriate.

Complete lists of species may be included in Appendices.

If invasives are present see subsection F, "Threats" below

2. Endangered, Threatened and Rare Species, and Species of Special Concern

i. *Describe all federal and state endangered and threatened species that occur or may occur on the site.*

ii. *Describe all rare species and species of special concern such as natural heritage mapped species and community occurrences that occur or may occur on the site.*

iii. *Provide a map showing locations, if appropriate.*

C. Soils & Geology

Describe soils & geology on the site. A soil scientist or other professional may also be used. Include a Soils and Geology map. This map may be combined with the Hydrology and Topography map; see section below.

NRCS has information on soils data online: http://soils.usda.gov/;

NRCS online soil survey web application: http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm

An informational brochure about the soil data can be found at: http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_050731.pdf

D. Hydrology and Topography

Describe hydrology and topography of the site. Indicate the general topography of the site and describe surface flows onto and off of the site.
USGS has online data for topographic maps, the national hydrography data set and hillshade.
http://nationalmap.gov/
Map viewer: http://viewer.nationalmap.gov/viewer/
Indicate whether wetlands are driven by surface flows (i.e., fluvial systems) or groundwater flows from offsite sources. If possible, describe the Strahler stream order of the streams onsite, (http://usgs-mrs.cr.usgs.gov/NHDHelp/WebHelp/NHD_Help/Introduction_to_the_NHD/Feature_Attribution/Stream_Order.htm) and provide a description of the channel structure.

To the extent possible, include a Hydrology and Topography map.

E. Summary of Restored or Enhanced Resources

If restoration/enhancement has taken place (or will take place) on the property, describe all restored or enhanced resources, including acreages and/or lengths. Include final, as-built plans and a map showing the locations. A brief summary is all that is needed. The Restoration/Enhancement plan should be included by reference, and may be attached as an Appendix.

F. Threats (existing or potential)

Identify areas that may be of management concern or items that may compromise biological integrity over time. Include any known or potential issues such as:

1. ***Motorized Vehicle Use***
   Including issues with ATVs or other vehicles that are causing, or may cause damage to resources on the site

2. ***Waste Disposal*** *(such as dumping of trash or debris)*

3. ***Invasive Species, Pests and Pathogens***

   Invasive species threaten the diversity or abundance of native species through competition for resources, predation, parasitism, interbreeding with native populations, transmitting diseases, or causing physical or chemical changes to the invaded habitat. Describe any current invasive species infestations on the site or in adjacent areas and include a map showing locations.

4. **Vandalism and Encroachment** *(such as destruction of signs or other property, boundary encroachments, etc)*

V. Management Vision & Goals

Describe the overall vision and goals for management of the site as a whole into the future.

The overall goal of long-term management is to foster the long term viability of the resources, and any listed species/habitat. Routine monitoring and minor maintenance tasks are intended to assure the viability of the site in perpetuity. Those who are chosen to carry out monitoring activities will have the knowledge, training, and experience to accomplish monitoring responsibilities. An objective of this long-term management plan is to conduct regular monitoring to identify any issues that arise, and use adaptive management to determine what actions might be appropriate. Adaptive management means an approach to natural resource management which incorporates changes to management practices, including corrective actions as determined to be appropriate. Adaptive management includes those activities necessary to address the effects of climate change, fire, flood, or other natural events. Before considering any adaptive management changes to the long-term management plan, the Long Term Steward will consider whether such actions will help ensure the continued viability of site's biological resources and conservation values.

Sample goals: The primary management goal is to preserve the ecological integrity of the various wetlands and other natural resources located on the property while simultaneously providing limited human access to this unique ecological area through a network of pedestrian trails.

OR The preserve shall be forever used, operated and maintained in its current undeveloped and open space condition for the long-term protection of wetlands, conservation of wildlife and other natural resources. Low-impact recreation and nature observation will be allowed.

OR The future condition of the property will be high value, forested wetlands with associated, upland buffers. Long-Term Steward will manage the property as habitat for wildlife and as a recreational/educational resource for the public. No forestry or active wildlife management is planned. The existing woods roads/trails on the property will be maintained for low impact recreation and nature observation.

A bulleted list of goals may be included.

To reach these goals, the Long-Term Steward will: *(examples)*

- *Maintain the property in its undeveloped state.*
- *Maintain the quality of the existing natural resources.*
- *Maintain and expand Best Management Practices that limit soil erosion and protect local water quality;*
- *Provide regulated, passive recreational opportunities where appropriate;*
- *Protect, maintain, and enhance existing cultural (aesthetic) resources; and*
- *Facilitate educational opportunities relating to natural resources, natural resource management, and conservation.*

A. Permitted Uses: *(examples)*

1. *Passive Recreation (hiking/walking, snowshoeing, cross-country skiing)*

2. *Hunting & fishing – may be allowed on the site but are not specifically funded or a part of this long-term management plan.*

B. Prohibited Uses: *(examples)*

1. *Off-road/motorized vehicles*
2. *Camping or overnight use*
3. *Fires*
4. *Cutting or removal of vegetation*

C. Public Use Guidelines: *(i.e., general guidelines Long-Term Steward has developed for its holdings – if desired and applicable***)**

- *Carry in, carry out*
- *Day-use only*
- *Keep dogs on leash at all times*
- *Stay on the trails*
- *Respect abutting private property*
- *Avoid disturbing plants and wildlife*

VI. Management Actions

This section includes the actions that need to be taken over time to maintain the site. Subsections may include:

A. Natural Resources

1. *Management of wetlands, streams and other natural resources*

Objectives: *Monitor, conserve and maintain the site's natural resources. Limit any impacts to resources from human use, vehicular travel, invasive species or other adverse impacts*

- *Action: At least one annual walk-through survey will be conducted to qualitatively monitor the general condition of these habitats. General topographic conditions, hydrology, general vegetation cover and composition, invasive species, erosion, will be noted, evaluated and mapped during a site examination. Notes to be made will include observations of species encountered, water quality, general extent of wetlands and streams, and any occurrences of erosion, structure failure, or invasive or non-native species establishment.*

- *Action: Establish reference sites for photographs and prepare a site map showing the reference sites for the file. Reference photographs will be taken of the overall site at least every f --- year(s) (no less than five) from the beginning of the long-term management plan, with selected reference photos taken on the ground more frequently, _____ times per year (if applicable).*

Special attention should be paid to any area adjacent to or draining into the property from off-site lands. Streams and wetlands should be observed near bank boundaries to observe if increased sediment deposition has occurred. The monitoring report should provide a discussion of any recent changes in the watershed (i.e., subdivision being developed upstream of stream bank).

2. *Ecological Monitoring for Threatened/Endangered/Rare/Special Concern Species (If applicable). The methodology used may vary for different plant and animal species as determined in consultation with the appropriate agencies.*

   ***Objectives**: Monitor population status and trends. Manage to maintain habitat for _____.*

   - *Action: Monitor status every year by conducting population assessment surveys. The annual survey dates will be selected during the appropriate period as identified by the applicable agencies and will generally occur from _____ through _____ each year. Occupied habitat will be mapped and numbered to allow repeatable data collection over subsequent survey years.*
   - *Action: Visually observe for changes to occupied habitat, such as changed hydrology or vegetation composition. Record any observed changes. Size of population (1 acre, etc).*
   - *Action: Implement other actions that enhance or monitor habitat characteristics for _____.*

3. *Invasive Species, Pests and Pathogens*

   ***Note:** Given the growing problem with invasive species, an invasive species inventory should be carried out at regular intervals on all sites.*

   ***Objectives**: Monitor and maintain control over invasive species, pests and pathogens that diminish native natural resources on the site. If invasive species are present, an Invasive Species Control Plan (ISCP) shall be developed and attached to this management plan as an Appendix (see ISCP Template in Appendix).*

   Action: Mapping of presence of invasive species, pests and pathogens presence shall occur during the first two years of site management, to establish a baseline. Mapping shall be accomplished through use of available technologies, such as GIS, GPS, and aerial photography. Note: Invasives are easier to control if they are located and a control plan is undertaken before they become established. It is recommended that all properties be evaluated for the presence of invasive species, even if none are known to occur on the site]

   - *Action: Each year's annual walk-through survey (or a supplemental survey) will include a qualitative assessment (e.g., visual estimate of cover) of invasive species and actions taken, in accordance with an Invasive Species Control Plan.*
   - *Action: Actions shall be taken to control invasive species in accordance with the Invasive Species Control Plan in Appendix A.*

4. *Forest/Vegetation Management (if approved)*

***Objectives**: Adaptively manage vegetation based on site conditions and data acquired through monitoring to maintain biological values. Analyze effects of any authorized forestry, agricultural or field maintenance activities on the wetland, streams, and buffers on the site. If determined appropriate, develop and implement specific vegetation management techniques (e.g., selective thinning) in coordination with the U.S. Army Corps of Engineers. [Site specific targets for vegetation may be specified here and actions revised or added to achieve those targets].*

- *Action: If determined appropriate, develop a forest, or other vegetation, management plan for review and approval by the Corps.*
- *Action: Implement forest/vegetation management techniques.*

B. Infrastructure and Facilities, Security and Public Access

1. *Gates, Parking, Fences, Signage, and Property Boundaries*

***Objective**: Monitor and maintain condition of gates, parking areas, fences, signage, and property boundaries to prevent casual trespass, allow necessary access, and facilitate management.*

- *Action: During each site visit, record condition of parking areas, gates, fencing, signs, crossings, and property boundaries. Record location and type of any maintenance issues, with actions to be taken for resolution, if applicable. Action: Maintain gates, fences, signs, crossings and property boundary markers as necessary. Repair or replace as necessary, and as funding allows.*

2. *Roads, Trails and Structures*

***Objectives**: Create/maintain trails to allow public access as necessary and as approved by the Corps. Any construction or maintenance of trails shall be conducted in such a manner as to avoid any disturbance to wetland habitat and buffers or habitat for sensitive species. Monitor and maintain condition of roads, trails and structures to facilitate management, public use, and prevent adverse impacts to wetlands, streams and other resources. Retire unnecessary sections of existing road.*

- *Action: During each site visit, record condition of roads, trails and structures. Record location and type of any maintenance issues, with actions to be taken for resolution.*
- *Action: Maintain roads, trails and structures as necessary. Replace as necessary, and as funding allows.*

3. *Trash and Trespass*

***Objectives**: Monitor sources of trash and trespass. Collect and remove trash, repair vandalized structures, and rectify trespass impacts. Specifically address any ATV issues, existing or potential.*

- *Action: During each site visit, record occurrences of trash and/or trespass. Record location and type of any trespass issues, with actions to be taken to avoid, minimize, or rectify trash and/or trespass impacts.*
- *Action: At least once yearly collect and remove as much trash as possible and repair and rectify vandalism and trespass impacts.*
- *Action Take appropriate action to address issues of vandalism, trespass, or ATV violations including but not limited to:*
  - *Outreach to violators*
  - *Placement of boulders, gates or other obstructions to prevent access*
  - *Contacting local law enforcement*

VII. Funding and Task Prioritization

A. Funding

Long-Term Steward will oversee implementation of the management plan, monitoring activities, and long-term stewardship of the property. With assistance from stewardship volunteers, the Long-Term Steward will maintain and monitor the property in perpetuity.

Table 1 summarizes the anticipated start-up/development costs for the site. Table 2 summarizes the anticipated annual costs for long- term management for the site After initial start-up costs, annual costs associated with the long-term maintenance of the property are estimated to be $_____ . $_____ will be/has been placed into a stewardship endowment to be maintained by _____ and distributions from the endowment will cover costs associated with stewardship of the property, if applicable. With the current annual estimated capitalization rate of ____ the total endowment amount required will be $_____.

[*The sample lists of tasks in Tables 1 and 2 are not meant to be exhaustive. Some sites may have more elements to consider and some may have fewer depending on the attributes of the site.*]

B. Task Prioritization and Cost Estimates

Table 1: Schedule of Start-up Activities *(examples)*

Goal	Action	Prior-ity	Target Date	Completed By	Cost	Other Cost	Notes
Natural Resources	*Establish baseline for monitoring*	*2*	*Summer 201x*	*Steward & volunteers*	*$200*		
Natural Resources	*Invasive species baseline*	*1*	*Summer/Fall 201x*	*Steward & volunteers*	*$200*		
Infra-structure	*Boundary Line Marking*	*1*	*Summer 201x*	*Steward*	*$200*		
Infra-structure	*Install Gates and locks*	*1*	*Summer 201x*	*Contractor*	*$1,000*		
Infra-structure	*Install Boulders/ Barricades*	*1*	*Spring 201x*	*Contractor*	*$4,000*		
Infra-structure	*Parking lot development*	*2*	*Fall 201x*	*Contractor*		*$5,000*	*Gravel and equipment costs*
Infra-structure	*Trail Planning & Developmen t*	*3*	*Spring-Fall 201y*	*Steward & volunteers*		*$1,000*	*Mileage & equipment*
Infra-structure	*Signs& Installation*	*2*	*Summer 201y*	*Steward & volunteers*	*$500*		*Mileage & equipment*
Infra-structure	*Garbage Dump Cleanup*	*2*	*Summer 201x*	*Contractor*	*$5,000*		

Total Start-up Costs: _____

Table 2 Estimated Annual Costs *(examples)*

Cost	Cost per year*	Notes
Staff Time	*$2,000*	
Trail Maintenance	*$500*	
Property Taxes	*$5.000*	
Boulder/Road Barricade Maintenance	*$400*	

Sign Maintenance/replacement	*$100*	
Trash Removal	*$500*	
Brochures, Information	*$100*	
Mileage	*$200*	
Monitoring	*$500*	
Boundary Marking (every 5 years)	*$100*	*5 year cost/5 for cost per year*
Management Plan Update (every 5 years)	*$50*	*5 year cost/5 for cost per year*

Total Annual Costs:_____

*These costs are examples only and don't necessarily represent expected costs.

Total stewardship account that will be used to fund these costs: _____

VIII. Literature Cited

IX. Appendices

May include:
Invasive Species Control Plan
Maps (if not incorporated into the main body of the plan)
Legal Documents
Species lists,
Restoration plan (if a restoration project),
Historical documents,
etc.

Appendix A

Invasive Species Control Plan (ISCP) Template

General Notes on this template: Invasive species are an ever-increasing issue all across New England. Removal of invasive species when there are very few plants is critical and should be given the highest priority. Most light infestations can be controlled by pulling or digging and this should be done when invasives are found, or immediately after. Larger infestations may require the use of a licensed herbicide applicator.

The New England District of the US Army Corps of Engineers has information on Invasive Species and control on their website. The Invasive Species Plant Atlas of New England includes descriptions, as well as links to management information on other sites. It may also be useful to consult with appropriate state or federal agencies for guidance on what species may threaten the site and or management of those species.

iMapInvasives website: http://www.imapinvasives.org/

iMapInvasives Invasive plant Management Decision Analysis tool:
http://www.imapinvasives.org/IPMDAT_v1.1_06-30-11.pdf

The template that follows is designed to help project sponsors create a plan of action when invasives are found on their property. It also includes forms that can be used to track inventory, actions taken and progress over time. Information in the template and form is based on information collected by a number of other organizations and agencies. The level of detail needed will depend on the level and type of infestation.

There are many sources of information about invasives species and their control online.

Links to Invasive Plant Information and Fact Sheets to include with your plan:

The Plant Conservation Alliance Alien Plant Working Group Fact Sheets. Includes management information. http://www.nps.gov/plants/alien/fact.htm

Invasive Plant Fact Sheets from the State of Michigan have good detailed information, particularly on control. http://www.michigan.gov/dnr/0,4570,7-153-10370_59996_61470---,00.html

Vermont Invasives "Gallery of Invaders." Includes description, control measures and videos on website, with links to fact sheets. http://www.vtinvasives.org/invaders/imagesall

Additional information:

http://www.nae.usace.army.mil/Portals/74/docs/regulatory/InvasiveSpecies/ISCPGuidance.pdf

http://www.maine.gov/dacf/mnap/features/invasive_plants/invasives.htm

http://umaine.edu/invasivespecies/

http://umaine.edu/invasivespecies/home/id_resources/

http://www.invasivespeciesinfo.gov/index.shtml

http://www.vtinvasives.org/invaders/imagesall

http://www.fws.gov/contaminants/Documents/GuidanceIPMPlan.pdf

http://www.fws.gov/invasives/staffTrainingModule/planning/plans.html

http://www.blm.gov/pgdata/etc/medialib/blm/wy/programs/invasiveplants/docs.Par.42434.File.dat/IWM handbook.pdf

http://www.invasive.org/gist/products.html

http://www.weedcenter.org/management/planning.html

http://clean-water.uwex.edu/pubs/pdf/InvasivePlants.pdf

https://extension.unh.edu/resources/files/Resource000988_Rep1135.pdf

Invasive Species Control Plan Template

For [Project name]

Organization

Author(s) and Title(s)

Date

Table of Contents Page

I. Introduction

Write a brief discussion of the context of the invasive species problem within the project, project site management objectives, and conservation targets.

II. Baseline Invasive Species Inventory

A. Survey the property and nearby areas and make a list of the invasive/nuisance species found. Attach information (such as fact sheets) for all invasive/non-native species known to be present on the site and those that might pose a danger of infestation from other locations nearby. (see links to sources of fact sheets at the beginning of the template). Specifically locate each site where invasive species are found, preferably with GPS coordinates. Label each site with a unique ID for reference and tracking purposes. See the survey form in the Appendix for an example of the kinds of data to collect.

B. Describe each area where invasives were found noting species, size of area infested and level of infestation (percent cover) for each area. Note the type of infestation, such as single plant or small patch, large patch; linear patch such as along road or stream, and whether it is increasing, decreasing or staying the same at each location, if this can be determined.

C. Identify the threats and/or issues posed by specific invasive species and how they are interfering, or could interfere in the future, with your site management objectives.

1. Within the project area
2. From adjacent properties and/or the surrounding area, watershed and/or region. (To the extent possible. Surveying the surrounding areas helps to determine potential sources of re-infestation)

D. Create baseline maps showing extent of the invasive species on and/or around the project area and identify photo reference points for use in monitoring. Show boundary of project site and, if the entire site has not been searched for invasives, indicate on the map which areas have been searched.

E. Prioritize species and/or infestation areas to be controlled. Include a rationale for the level of priority assigned. Priorities may be numbered or categorized as "High", "Medium", or "Low". In the long run, it is usually most efficient to devote resources to preventing new problems and immediately addressing recently established infestations. The following may be useful in determining which areas to focus on first:

1. current extent of the species on or near the site;
2. value of the habitats/areas that the species infests or may infest; and
3. current and potential impacts on the management goals for the project site;
4. ability to manage a particular species/difficulty of control

III. Plan Objectives/Goals

A. Goals and Anticipated Results of Control Plan. Outline the goals for management of invasive species on the site. Include measures for success, such as reduction of % cover or size of area impacted by the invasive species and the timeframe in which you hope to achieve this.

*Establish **measurable** objectives for the planned control activities. Include:*

- *the **impact** on numbers, density, cover, etc. that you want to achieve;*
- *the **size** of the area in which you hope to achieve this;*
- *the **period** in which you hope to achieve it.*

B. Summary of Actions Planned: Identify the control / management method(s) selected for each species. Different invasives may need different control methods so be sure to research each species, particularly what not to do, so you avoid spreading the problem further. Some methods of control may require permits or professional applicators. Indicate which of the available control options are preferred for this site and why, and the circumstances under which they may be used. Summarize the techniques, including disposal methods, if applicable. Escalating measures may need to be outlined in case the first measures don't work.

1. Prevention
2. Mechanical/Physical methods (such as cutting, digging, pulling, mowing, prescribed burning)
3. Chemical Methods (such as herbicides)
4. Biological Control Agents
5. Cultural control (altering the habitat to make the it less suitable to the invasive; such as maintaining a level of forest canopy closure that impedes shade intolerant species, or restoration/re-vegetation of native plants)
6. No Treatment (explain the rationale)

C. Constraints. Identify any constraints such as site conditions or regulatory issues that impact practicable solutions.

D. Required Resources

1. Personnel Qualifications and permits
2. Equipment
3. Sanitation/recontamination considerations

E. Project Partners (government agencies and/or others available for technical, administrative or practical support)

IV. Implementation

A. Implementation Schedule. A table is one way of outlining the schedule, or text format may

B. Best Management practices and record-keeping methods to be used.

C. Budget

V. Monitoring Program

A. Describe monitoring plan, frequency of monitoring and outline procedures if re-treatment or alternative methods of control are needed.

VI. Evaluation: *This section is to be filled in later, after treatment and evaluation of preliminary monitoring results. The evaluation should be used to determine whether any of the sections above should be modified.*

Invasive Species Treatment and Monitoring Form

Project Name: _____

Date: _____

Personnel Names and roles: _____

Activity Type: (circle one) initial evaluation, pre-treatment evaluation, post–treatment monitoring, other

Infestation site ID: _____ Location Lat/Long (center point)

_____

Invasive Species Scientific and Common Name:

_____

Attach photos of invasive species.

Estimated Infested Area size with unit of measure (i.e., sq. ft.): _____

An infested area is defined by drawing a line around the actual perimeter of the infestation. If multiple invasive species exist in an area, a separate form should be filled out for each one.

Estimated Gross Area size with unit of measure: _____

Like Infested Area, Gross Area is the area occupied by an invasive species. Unlike Infested Area, the area is defined by drawing a line around the general perimeter of the infestations, not the area covered by individual or groups of invasive species. Gross area may contain significant parcels of land that are not occupied by invasives. Gross area is used in describing large infestations. When a value is entered for gross area, the assumption is that the area within the perimeter of the invasive population (area perimeter) is an estimate, or the product of calculating the area within a described perimeter. It is not a measured value. If a value for Gross Area is entered, a value for Infested Area must still be entered. Infested Area is derived from estimating the actual or percentage of area occupied by invasives.

(Helpful Gross Area and Infested Area article with diagram:
http://www.se-eppc.org/wildlandweeds/pdf/Spring2009-Price-pp4-6.pdf)

Total Area Surveyed with unit of measure: _____
Total area surveyed is the entire land area surveyed for invasive species, whether invasives were found or not. This provides a general understanding of the locations that may be resistant to invasion, provides an estimation of the extent of invasions, and allows examination of areas searched so gaps in searched area and habitats can be assessed.

Abundance: ☐ Single plant or clump ☐ Scattered individuals or clumps ☐ Scattered dense patches or clumps ☐ Linear patches (e.g. along stream, trail, road) ☐ Dominant cover/Dense throughout ☐ Monoculture,
☐ Other _____

Life stage at time of observation: ☐ Seedling ☐ Vegetative ☐ Flowering ☐ Fruit ☐ Seeds ☐ Sapling ☐ Mature >4” dbh ☐ Dead

Percent of area covered by invasive plant: ☐ Trace (less than 1%) ☐ Low (1 - 5%) ☐ 5-25% ☐ 26-50% ☐ 51-75% ☐ 75-100%

Habitat in which invasive is located:

Habitat description: _____ (such as community type, wetland, lakeshore, forest edge or interior, field, disturbed ground, roadside, etc.)

Disturbance factors (*logging, grazing, mowing, erosion / sedimentation, etc*.)_____

Control method(s) used / planned (circle all that apply)

- ☐ None
- ☐ Herbicide*: Pre-emergent / Foliar / Basal bark / Cut stump
- ☐ Mechanical: Clip Pull Mow
- ☐ Fire: Controlled burn / Torch
- ☐ Soil: Bulldoze / Soil removal / Disk / Till
- ☐ Other: Flooding Plastic / Shade cloth / Biological

Herbicide Formulation(s):_____
Herbicide application method:_____
Herbicide rates used:_____

Acres treated: _____ Is this a re-treatment, if so, how many previous visits? _____

**If area to be treated is within an aquatic resource a permit is likely needed, as well as a licensed applicator to do the work.

APPENDIX N – IN-LIEU FEE PROGRAMS

NOTE: Contacts and URLs were accurate as of 5/28/2019.

STATE: Connecticut
PROGRAM NAME: Audubon Connecticut In-Lieu Fee Program
SPONSOR: National Audubon Society – Connecticut Chapter
185 East Flat Hill Road
Southbury, CT 06488
POINT(S) OF CONTACT: Leslie Kane
Managing Director, Audubon - CT
lkane@audubon.org
Anthony Zemba
ILF program manager
azemba@fhiplan.com
WEBSITE: http://ct.audubon.org/conservation/in-lieu-fee-program

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STATE: Maine
PROGRAM NAME: Maine Natural Resources Compensation Program
SPONSOR: Department of Environmental Protection
Bureau of Land and Water Quality
17 State House Station
Augusta, ME 04333
POINT(S) OF CONTACT: Dawn Hallowell
Licensing and Compliance Manager
MaineDEP
Dawn.hallowell@maine.gov
Bryan Emerson
ILF program manager
Bryan.emerson@tnc.org
WEBSITE: http://mnrcp.org/

STATE: Massachusetts
PROGRAM NAME: Massachusetts In-Lieu Fee Program
SPONSOR: Department of Fish and Game
251 Causeway Street
Boston, MA 02114
POINT OF CONTACT: Aisling O'Shea
ILF Program Administrator
Aisling.o'shea@state.ma.us
WEBSITE: https://www.mass.gov/in-lieu-fee-program

STATE: New Hampshire
PROGRAM NAME: Aquatic Resource Mitigation (ARM) Fund
SPONSOR: Department of Environmental Services
29 Hazen Drive
Concord, NH 03301
POINT OF CONTACT: Lori Sommer
Mitigation Specialist
lsommer@des.state.nh
WEBSITE:
https://www.des.nh.gov/organization/divisions/water/wetlands/wmp/index.htm

STATE: Vermont
PROGRAM NAME: Ducks Unlimited Vermont In-lieu Fee Program
SPONSOR: Ducks Unlimited
1220 Eisenhower Place
Ann Arbor, MI 48108
POINT OF CONTACT: Patrick Raney
Manager of Mitigation
praney@ducks.org
WEBSITE: http://www.ducks.org/conservation/land-protection/vermont-in-lieu-fee-program

APPENDIX O – REFERENCES

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