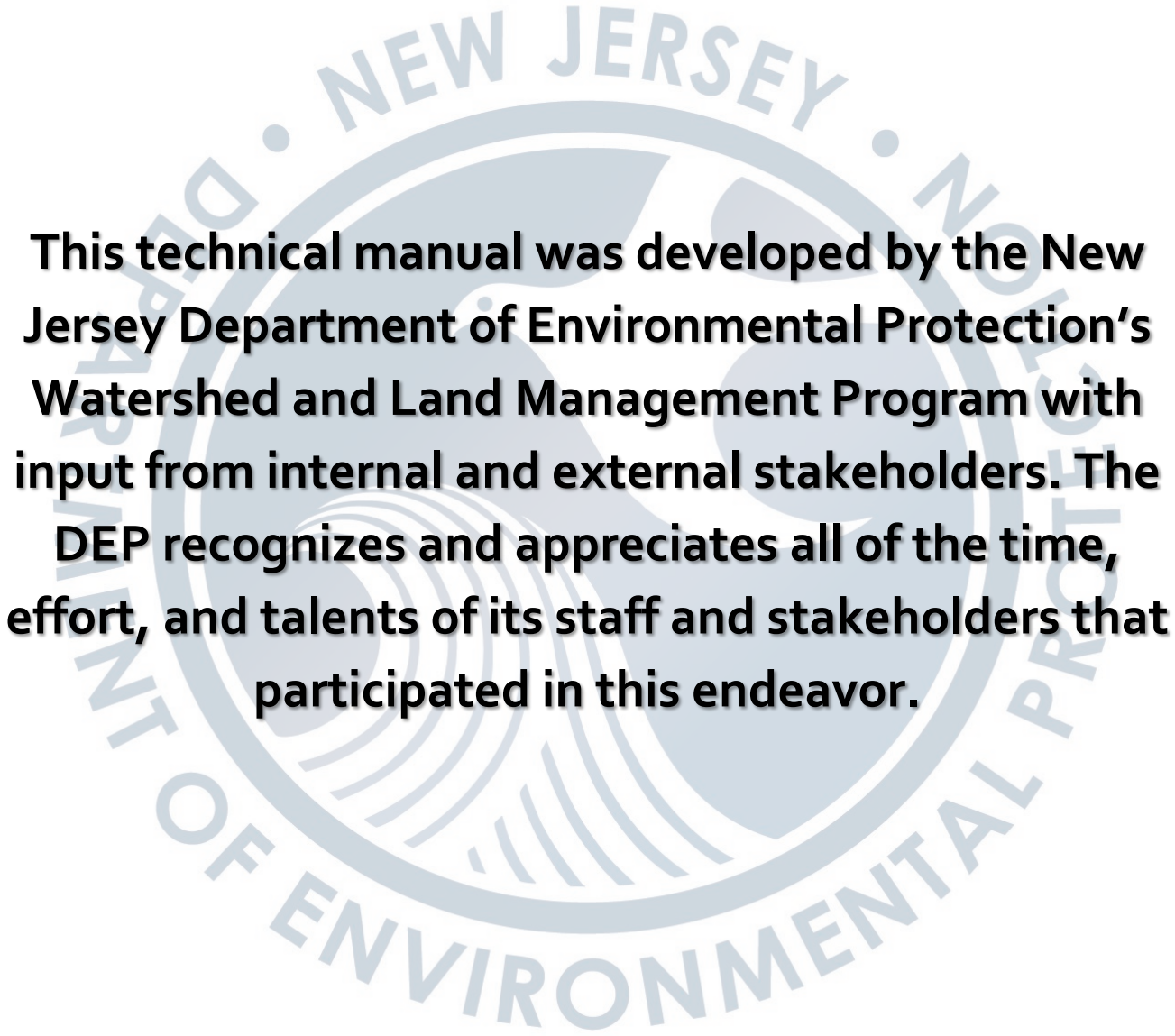
MITIGATION TECHNICAL MANUAL

New Jersey Department of Environmental Protection
Watershed and Land Management

2022



This technical manual was developed by the New Jersey Department of Environmental Protection's Watershed and Land Management Program with input from internal and external stakeholders. The DEP recognizes and appreciates all of the time, effort, and talents of its staff and stakeholders that participated in this endeavor.

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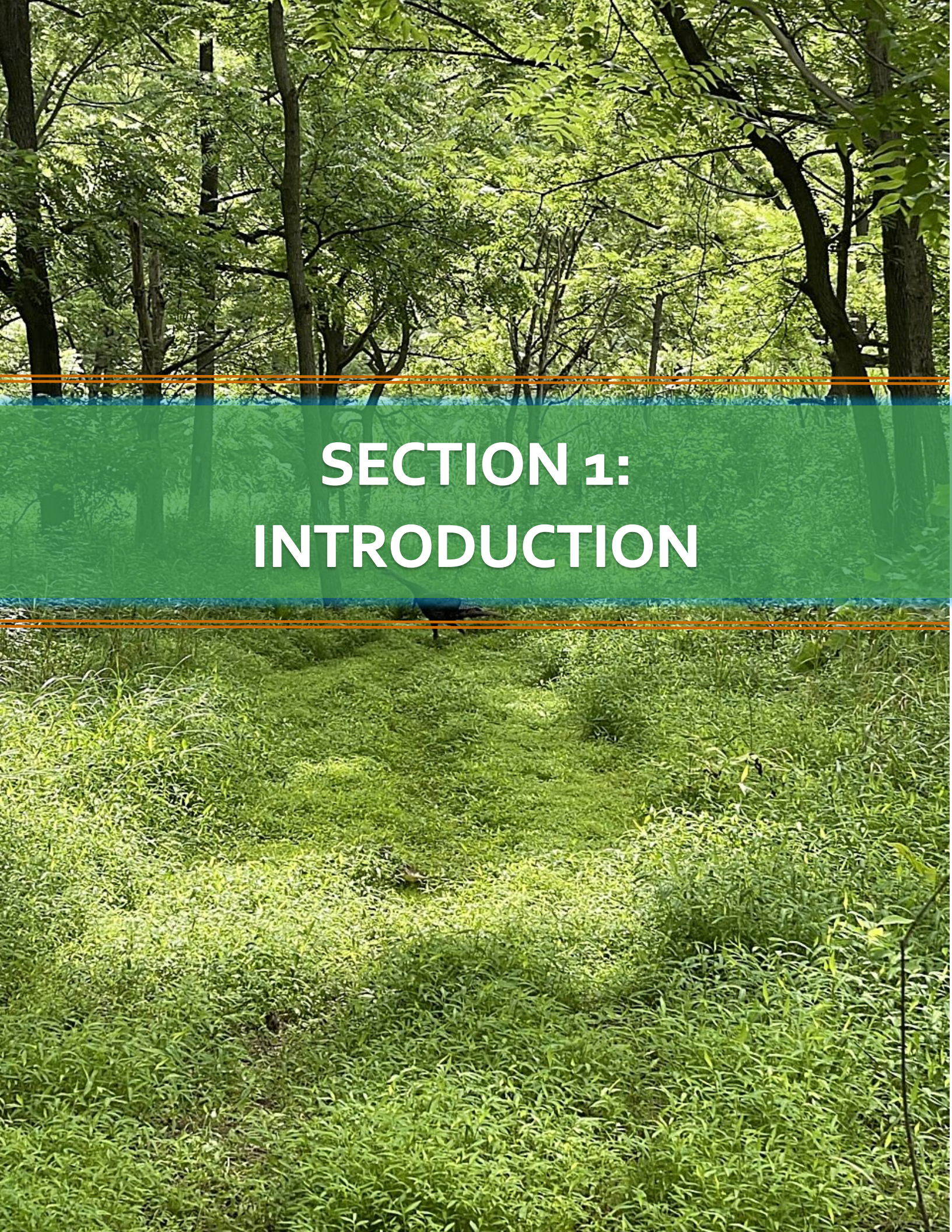


SECTION 1: INTRODUCTION

The New Jersey Department of Environmental Protection (DEP) is responsible for protecting the state's diverse ecological resources, which includes wetlands and their transition areas, riparian zones, intertidal and subtidal shallows/tidal waters, submerged aquatic vegetation, and shellfish habitats. The DEP's authority to regulate these specific resources is provided by:

- The Waterfront Development Act (N.J.S.A. 12:5-3 et seq)
- The Coastal Area Facilities Review Act (N.J.S.A. 13:19)
- The Wetlands Act of 1970 (N.J.S.A. 13:9A et seq)
- The Freshwater Wetlands Protection Act (N.J.S.A. 13:9B et seq)
- The Flood Hazard Area Control Act (N.J.S.A. 58:16A-50 et seq).

The DEP implements the protections afforded by these statutes through regulations, which are provided under three rules:

1. **The Freshwater Wetlands Protection Act (FWPA) Rules at N.J.A.C. 7:7A** – The purpose of this rule is to protect the purity and integrity of the state's inland waterways and freshwater wetlands from random, unnecessary, or undesirable alteration or disturbance.
2. **The Coastal Zone Management (CZM) Rules at N.J.A.C. 7:7** – The purpose of the CZM Rules is to establish the appropriate uses and development in New Jersey's coastal areas.
3. **The Flood Hazard Area Control Act (FHACA) Rules at N.J.A.C. 7:13** – This rule regulates flood hazard areas and riparian zones in order to minimize damage to life and property from flooding caused by development, to preserve the quality of surface waters, and to protect wildlife and vegetation.

These rules are available on the DEP's Rules and Regulations webpage. Each rule contains standards for providing compensatory mitigation, which may be required when development activities result in a disturbance to these critical environmental resources.

1.1 Purpose of this Manual

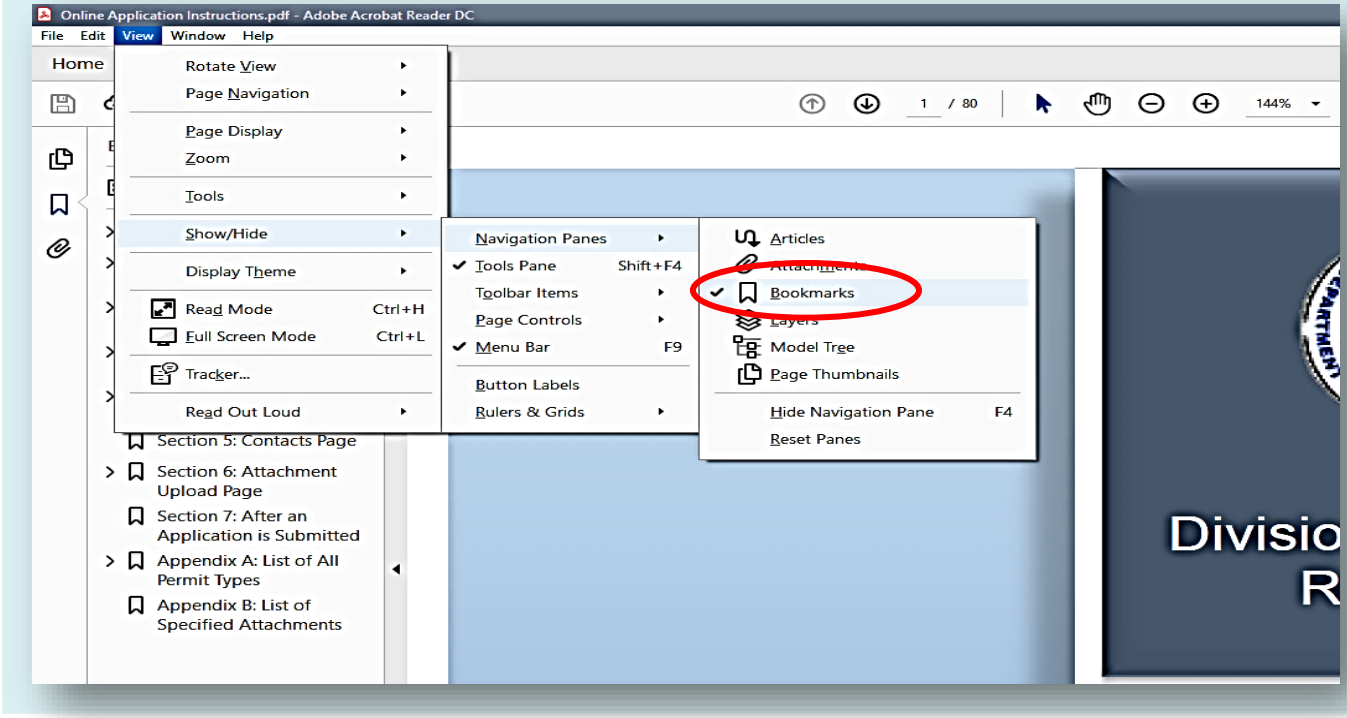
The purpose of this manual is to provide New Jersey residents and consultants with comprehensive guidance on standards and procedures for providing mitigation for disturbances to wetlands and their transition areas, riparian zones, intertidal and subtidal shallows/tidal waters, submerged aquatic

vegetation, and shellfish habitats. The manual will help the reader identify when mitigation is necessary, choose the most appropriate form of mitigation, and complete mitigation projects successfully. While the manual integrates requirements from the FWPA, CZM, and FHACA Rules, along with information from other resources that provide successful and acceptable mitigation techniques, it is intended only as a helpful resource and is in no way intended to replace or supersede the rules. Should material in this manual conflict with a requirement of the FWPA, CZM, or FHACA Rules, the rules will govern.

1.2 How to Use this Manual

The manual has been designed so that necessary information can be accessed quickly and efficiently, allowing the reader to bypass any material that may not apply to an activity or situation. For those reading this manual on a computer, internal and external links are provided to help navigate effectively through the content. Any section or subsection of this manual can also be accessed directly by clicking on the section or subsection title in the Table of Contents, which can be reached from any place in the manual by clicking the link found at the bottom of each page. You can also access the complete table of contents from an interactive sidebar available from the "View" menu. Select, *Show/Hide*, then *Navigation Pane*, and then *Bookmarks*, as shown in Figure 1.1 below.

Figure 1.1: How to View the Table of Contents



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1.3 Contact Information

Postal address:

State of New Jersey Department of Environmental Protection
Division of Watershed Protection and Restoration
Attention: Mitigation Unit
Mail Code 501-02A
P.O. Box 420
Trenton, New Jersey 08625-0420

Street address (for meetings and hand delivery of material):

State of New Jersey Department of Environmental Protection
Division of Watershed Protection
and Restoration
Attention: Mitigation Unit
501 East State Street
Second Floor
Trenton, New Jersey 08609

Telephone: (609) 777-0454

Website: www.nj.gov/dep/wlm

Email: mitigationunit@dep.nj.gov

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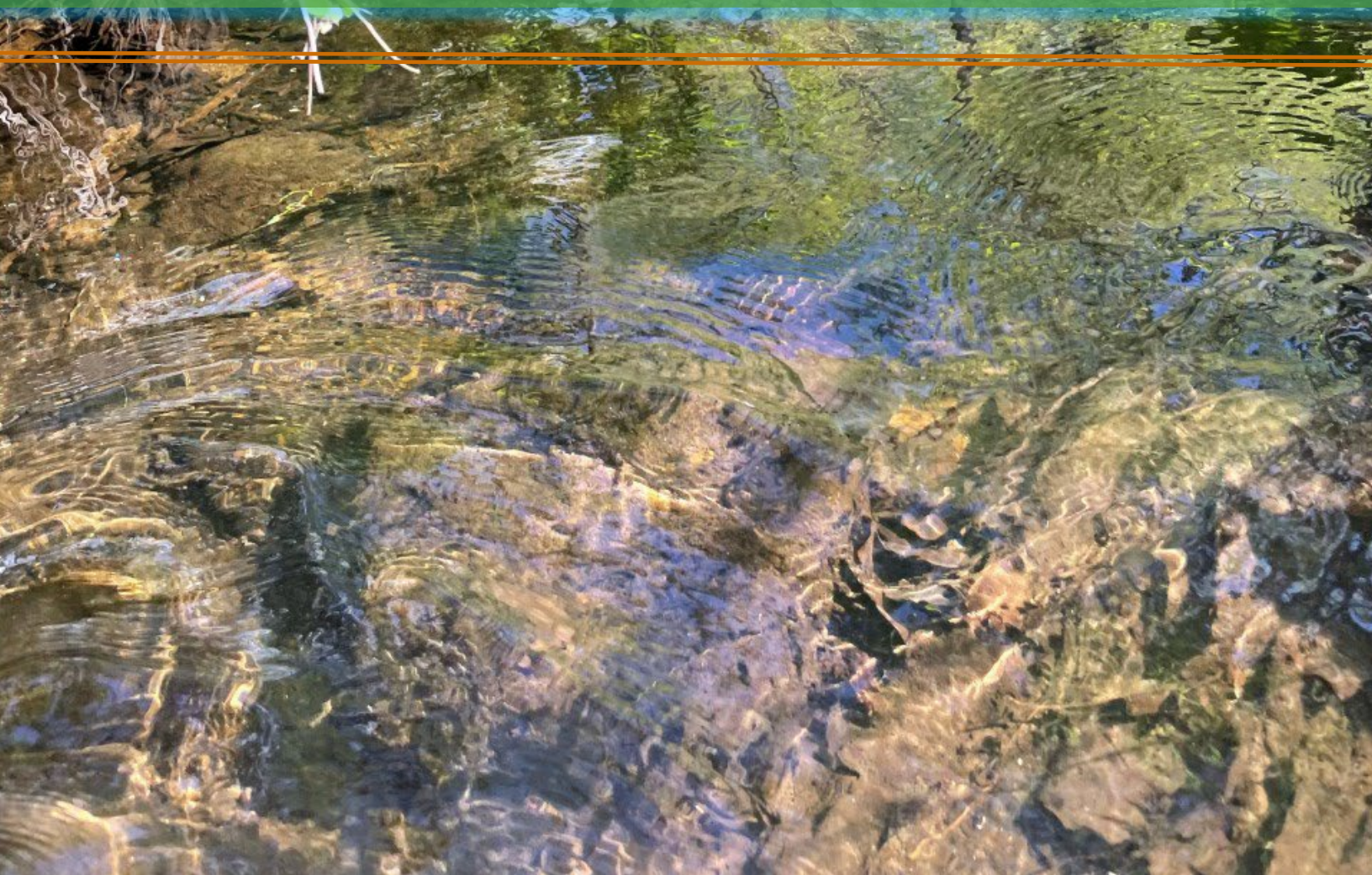
SECTION 2:
MITIGATION BASICS



The DEP utilizes a variety of methods to protect New Jersey's critical environmental resources, and mitigation is one of those methods. This section of the manual will explain the necessary basics of mitigation, including an introduction to the environmental resources for which mitigation may be required in New Jersey (see Section 2.1) and the different types of mitigation that can be provided (see Section 2.3). The information contained in this section will apply to all mitigation projects, except where otherwise noted.

The topics that will be broadly covered in this section include:

- What is Mitigation? – Section 2.1
- When is Mitigation Required? – Section 2.2
- How to Provide Mitigation – Section 2.3
- Where to Provide Mitigation – Section 2.4
- How Much Mitigation is Required? – Section 2.5
- How to Begin the Mitigation Process – Section 2.6

The main purpose of this section of the manual is to provide the necessary background information for those who may be unfamiliar with mitigation, but it may also be useful as reference material for more experienced mitigators. Sections 3 and 4 provide much greater detail on these topics for each specific type of mitigation.

2.1 What is Mitigation?

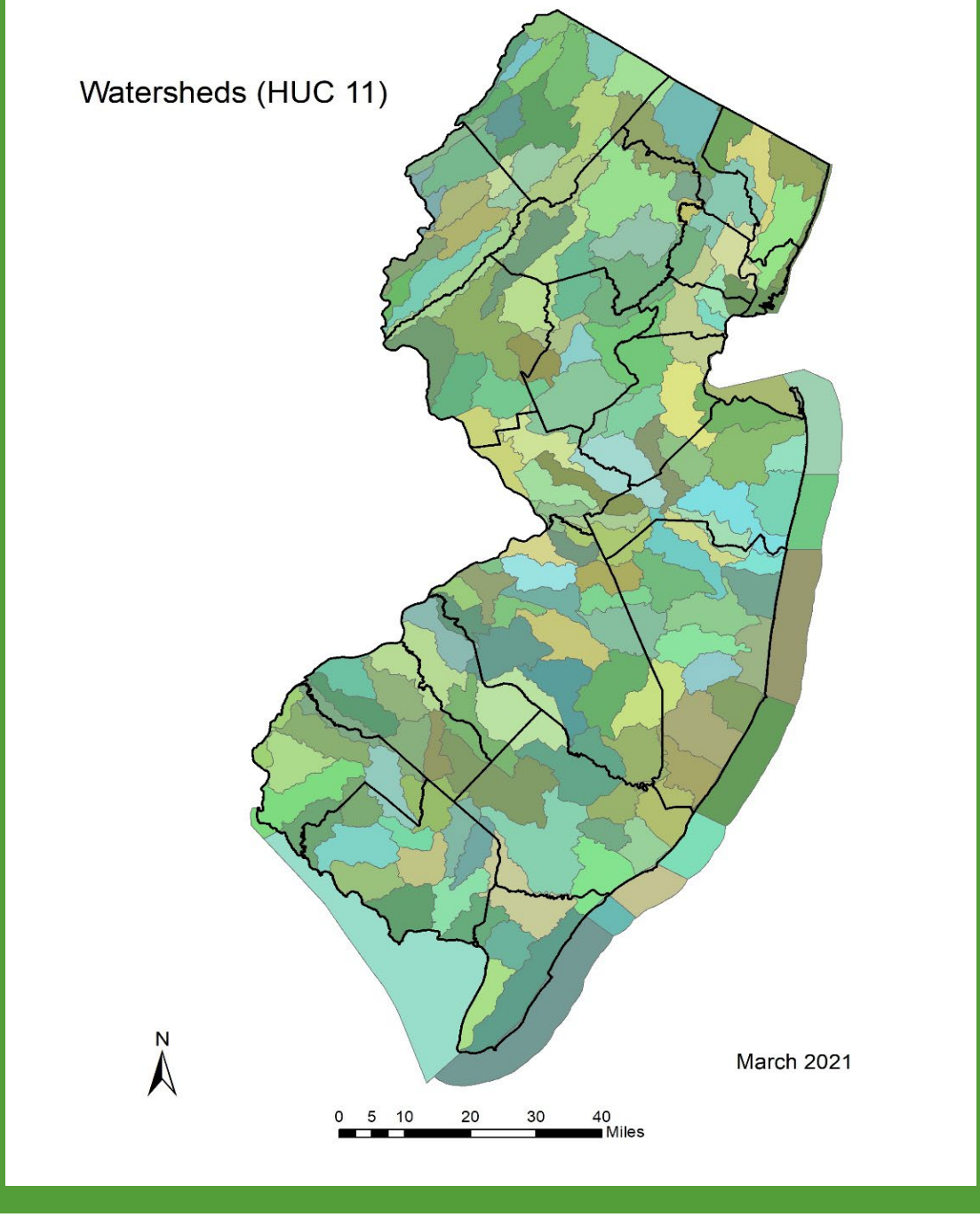
Mitigation is ecological compensation for a disturbance to an environmental resource that is protected under the FWPA, CZM, or FHACA Rules. The types of environmental resources for which mitigation may be required are described in further detail in Sections 2.1.1 through 2.1.6 below, including wetlands (Section 2.1.1), wetland transition areas (Section 2.1.2), riparian zones (Section 2.1.3), intertidal and subtidal shallows (Section 2.1.4), shellfish habitat (Section 2.1.5), and submerged aquatic vegetation (Section 2.1.6).

A disturbance to a protected resource is any activity (such as building a house, installing a swimming pool, or constructing a dock) that will impact the ecological functions and values of that resource. An *ecological function* is a resource's potential to provide a service to the surrounding environment. Examples of ecological functions are flood reduction, nutrient cycling, providing habitat, and supporting aquatic life. The *ecological value* is the level of benefits provided by the resource.

A resource's ecological functions and values are based on the services that it provides to the entire watershed. A *watershed* is the complete area of land that drains into a common body of water, such

as a river, lake, stream, or bay. For example, the watershed of a lake includes the land that drains directly into the lake, all of the streams entering the lake, and the land areas that drain into each of those streams. Watersheds are separated from one another by areas of higher elevation, such as hills or slopes. New Jersey has 151 watersheds, which are shown on the map in Figure 2.1 below.

Figure 2.1: New Jersey's Watersheds



The purpose of all mitigation projects is to replace the ecological functions and values that are lost in the watershed because of a disturbance to a protected resource. A disturbance can be either permanent or temporary. A *permanent disturbance* is a disturbance that will not be restored after the activity is completed. For example, clearing an area of trees to build a house is a permanent disturbance. A *temporary disturbance* generally refers to an activity that occupies, persists, and/or occurs on a site for no more than six months. Most of the information provided in this manual applies to mitigation for permanent disturbances. For more information on temporary disturbances, see Section 2.3.1. Both temporary and permanent disturbances may require mitigation. Section 2.2 below explains when mitigation is required.

2.1.1 Wetlands

A wetland is a unique ecosystem where the land is flooded with water at a frequency and duration that is sufficient to support plant species that have adapted for life in saturated soil conditions, commonly known as hydrophytic vegetation. The DEP uses three parameters to determine if an area is a wetland – hydrology (water), hydric soils (saturated soils), and hydrophytic vegetation, all of which are explained in greater detail in Section 3.3 of this manual.

Wetlands are an extremely valuable natural resource that provide numerous benefits, including:

- Purifying waterways by filtering out harmful pollutants
- Protecting against flooding by soaking up water during storms
- Preventing erosion
- Absorbing excess carbon dioxide from the air to help prevent climate change
- Providing habitat for numerous animal species

For these reasons, wetlands are protected under the FWPA and CZM Rules, both of which include extensive mitigation requirements for wetland disturbances that will be explained throughout this manual.

Wetlands are found throughout New Jersey and can be either tidal or non-tidal. *Tidal wetlands* are areas that are routinely flooded by the tides of the ocean, rivers, streams, and bays along the coast. Salt marshes and mudflats are common categories of tidal wetlands. *Non-tidal wetlands* can be areas that are routinely inundated by water from streams, rivers, and creeks that do not have any tidal

influence, but non-tidal wetlands can also be found in low-lying areas far from any waterway. The water in these wetlands typically comes from precipitation or groundwater.

Tidal wetlands are often called coastal wetlands while non-tidal wetlands are referred to as freshwater wetlands. In general, coastal wetlands are protected under the CZM Rules, and freshwater wetlands are protected under the FWPA Rules. However, it is important to note that the Wetlands Act of 1970 required the creation of maps showing the boundaries of all coastal wetlands within New Jersey from the Raritan Bay south, which were completed in the early 1970s. Wetlands are a dynamic ecosystem, and both coastal and freshwater wetlands in New Jersey have undergone changes since the maps were produced. Yet, for regulatory purposes, all mapped wetlands are considered coastal wetlands, even if the wetland is not tidal today. Development in mapped wetlands is regulated under the CZM Rules while development in unmapped wetlands, even if they are tidal, is regulated under the FWPA Rules. For the purposes of this manual, the term *coastal wetlands* will apply to those wetlands that are under the jurisdiction of the CZM Rules, and the term *freshwater wetlands* will apply to those wetlands under the jurisdiction of the FWPA Rules.

Wetlands are also categorized by the dominate type of vegetation found within them. *Forested wetlands* are dominated by trees and shrubs. A tree is defined as a tall, woody plant with stiff stems and bark. A forested wetland will have both an overstory and an understory. *Emergent wetlands* are characterized by herbaceous plants, which are plants that do not have woody stems, such as grasses, sedges, rushes, ferns, and broad-leaf plants like wildflowers (Cowardin et al., 1995, 35). *Scrub/shrub wetlands* are predominately comprised of woody plants that are not trees. Scrub/shrub wetlands also include an understory of herbaceous plants. Figure 2.2 on the next page shows examples of forested, emergent, and scrub/shrub wetlands.

Figure 2.2: Types of Wetlands

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2.1.2 Wetland Transition Areas

To ensure the health and safety of certain wetlands, New Jersey also protects the upland areas adjacent to these wetlands, which are called *transition areas*. A transition area has a higher elevation than the adjacent wetland and functions as a buffer between the wetland and the surrounding ecosystems, minimizing negative impacts to the wetland.
Coastal wetlands have a buffer, but not all freshwater wetlands do. In New Jersey, freshwater wetlands are classified according to their resource value. There are three resource value classifications – exceptional, intermediate, and ordinary. Only exceptional and intermediate resource value wetlands have a transition area. For more information on how to determine the resource value classification of a freshwater wetland, see N.J.A.C. 7:7A-3.2.

2.1.3 Riparian Zones

Research has shown that vegetated areas adjacent to a watercourse help maintain water quality and temperature, stabilize banks, provide protection from flooding, and serve as wildlife habitat. These vegetated areas are called *riparian zones*, and they are protected under the FHACA Rules, including robust requirements for riparian zone mitigation, which will be discussed throughout this manual. Most waters regulated under the FHACA Rules have a riparian zone. The riparian zone includes the land and vegetation within and adjacent to the water. It extends 50, 150, or 300 feet from the top of bank along both sides of the water and includes the regulated water itself. For more information on determining a riparian zone, see N.J.A.C. 7:13-4 and The Technical Manual for the Flood Hazard Area Control Act Rules.

2.1.4 Intertidal and Subtidal Shallows

Intertidal and subtidal shallows are areas that are permanently or temporarily submerged from the spring high water line to a depth of four feet below mean low water. The spring high water line is the

average height of the high waters of the spring tides, and mean low water is a tidal datum representing the average of the lower low water height of each tidal day. For more information on these terms, visit the National Oceanic and Atmospheric Administration's (NOAA) webpage on tides and water levels.

Intertidal and subtidal shallows (ISS) play a critical role in New Jersey's estuarine ecosystems. An estuary is a body of water that is located at the junction between rivers and the ocean. Notable examples of estuaries in New Jersey are the Barnegat Bay Estuary, the Delaware Bay Estuary, and the New York–New Jersey Harbor Estuary. Many material and energy exchanges between the land and the water take place within intertidal and subtidal shallows, and they are also important habitat for many benthic organisms (also known as bottom dwellers) and essential forage areas for fish and many migrant waterfowl.

Intertidal and subtidal shallow are protected under the CZM Rules at N.J.A.C. 7:7-9.15. Because of the importance of ISS to New Jersey's estuaries, mitigation may be required if ISS is disturbed.

2.1.5 Shellfish Habitat

Shellfish habitat is any area that currently or historically supported a shellfish population. Common shellfish in New Jersey include different species of oysters, scallops, mussels, and clams.

Shellfish are harvested by both commercial and leisure shellfishermen in New Jersey and are therefore important for both economic and recreational reasons. However, shellfish also play a crucial ecological role. They are a vital food source for a variety of finfish species, crabs, and migratory waterfowl, and because shellfish are filter feeders, they help maintain and improve water quality. For all of these reasons, shellfish habitat is a protected resource under the CZM Rules at N.J.A.C. 7:7-9.2 and may be subject to mitigation requirements. Section 4.2.3 of this manual contains information on shellfish habitat mitigation.

2.1.6 Submerged Aquatic Vegetation

Submerged aquatic vegetation means vascular plants that grow in patches rooted underwater. Vascular plants are those that use specialized tubes to transport water, minerals, and air through the plant to support the plant's growth. Submerged aquatic vegetation (SAV) usually refers to seagrasses in estuarine or marine environments but can include some freshwater plants and their habitats. However, in New Jersey, SAV is most prevalent in the shallow portions of the Navesink, Shrewsbury, Manasquan, and Metedeconk Rivers as well as in Barnegat, Manahawkin, and Little Egg Harbor Bays and some areas of the Delaware River.

Submerged aquatic vegetation serves many important ecological functions, including:

1. Trapping sediment suspended in the water
2. Providing important winter forage areas for migratory waterfowl
3. Providing nursery areas for juvenile fin fish, bay scallops, and blue crabs
4. Absorbing wave energy
5. Stabilizing silty bay bottoms

For these reasons, SAV is protected under the CZM Rules at N.J.A.C. 7:7-9.6 and may require mitigation if disturbed. For more information about SAV mitigation, see Section 3.7.

2.2 When is Mitigation Required?

Activities that will disturb wetlands, transition areas, riparian zones, intertidal and subtidal shallows, shellfish habitat, and/or submerged aquatic vegetation may require a permit or authorization from the DEP's Division of Land Resource Protection. Certain permits and authorizations include a mitigation requirement, meaning that mitigation must be performed in order to obtain that permit or authorization. The types of permits and authorizations that require mitigation include certain general permits, individual permits, and transition area waivers.

> Applying for a permit or authorization is a separate process from obtaining approval for a proposed mitigation project.
>
> For more information, see Section 2.6 below or visit the Watershed and Land Management website.

General Permits

- General permits are issued for specific activities under each rule. For example, the FWPA Rules include a general permit for minor road crossings. Each general permit establishes explicit criteria for the activity, including any mitigation requirements that may apply. DEP staff must review the proposed activity to ensure that the activity meets the requirements of that general permit, and the DEP then issues a written authorization under that permit for the activity to be conducted.

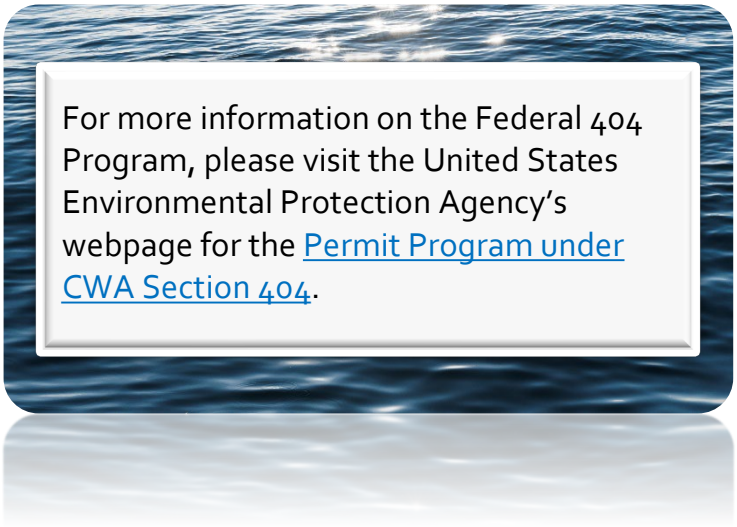
Individual Permits

- Individual permits are required for those activities with the greatest potential to impact the environment, and they require a more intensive, case-by-case review. Any activity that does not meet the specific criteria provided in the applicable rules for an authorization, such as a general permit, will need an individual permit. The mitigation requirements for an individual permit will depend upon the impacted resource, the location, and the activity.

Transition Area Waivers

- A transition area waiver is an approval issued by the DEP under the FWPA Rules to conduct certain activities in a transition area. Some transition area waivers require mitigation.

In addition to any mitigation required by the DEP under a permit or authorization, mitigation may also be required by the United States Army Corps of Engineers (USACE) if the disturbance takes place in non-delegable waters. *Non-delegable waters* refer to waters where New Jersey has not assumed responsibility for administering Section 404 of the Federal Clean Water Act (also known as the Federal 404 Program). Under Section 404, the federal government regulates the discharge of dredged or fill material into all waters of the United States, including wetlands. However, New Jersey is one of only three states (along with Michigan and Florida) that have been delegated the responsibility for administering this federal program in most freshwater wetlands and state open waters within the state's boundaries because the state's regulatory program is at least as stringent as the federal program.



For more information on the Federal 404 Program, please visit the United States Environmental Protection Agency's webpage for the Permit Program under CWA Section 404.

In New Jersey, *delegable waters* (or those waters where New Jersey has assumed sole responsibility for administering the requirements of Section 404) include all waters of the United States shoreward to their ordinary high water mark – except those waters that are currently used to transport interstate or foreign commerce (or are susceptible to this use in their natural condition or by reasonable improvement).

Non-delegable waters include all waters that are subject to the ebb and flow of the tide, shoreward to their mean high water mark, including wetlands that are partially or entirely located within 1,000 feet of their ordinary high water mark or mean high tide line. Non-delegable waters in New Jersey (where the DEP and USACE have joint jurisdiction) include, but are not limited to:

- The entire length of the Delaware River
- Waters of the United States under the jurisdiction of the New Jersey Sports and Exposition Authority (formerly the New Jersey Meadowlands Commission)
- Greenwood Lake

In non-delegable waters, both federal and state requirements apply, including mitigation requirements. Therefore, activities in non-delegable waters require a permit from the DEP under the applicable rules and a separate permit from the USACE under the Federal 404 Program. The DEP recommends that the permit applications be submitted concurrently or that the DEP application be submitted prior to submission of the USACE permit application. The USACE requires the New Jersey permit to be issued before it will issue the federal permit.

Usually, if a project is subject to mitigation requirements under both USACE and DEP permits, a single mitigation project will be accepted by both agencies. However, mitigation provided through the in-lieu fee method (also known as a monetary contribution) to New Jersey's Wetland Mitigation Council will not be accepted by the USACE. The different types of mitigation, including in-lieu fee, are described in Section 2.3 below, which includes general information on how to provide mitigation when it is required under a DEP permit or authorization.

The USACE has two regulatory districts that cover New Jersey – Philadelphia and New York.

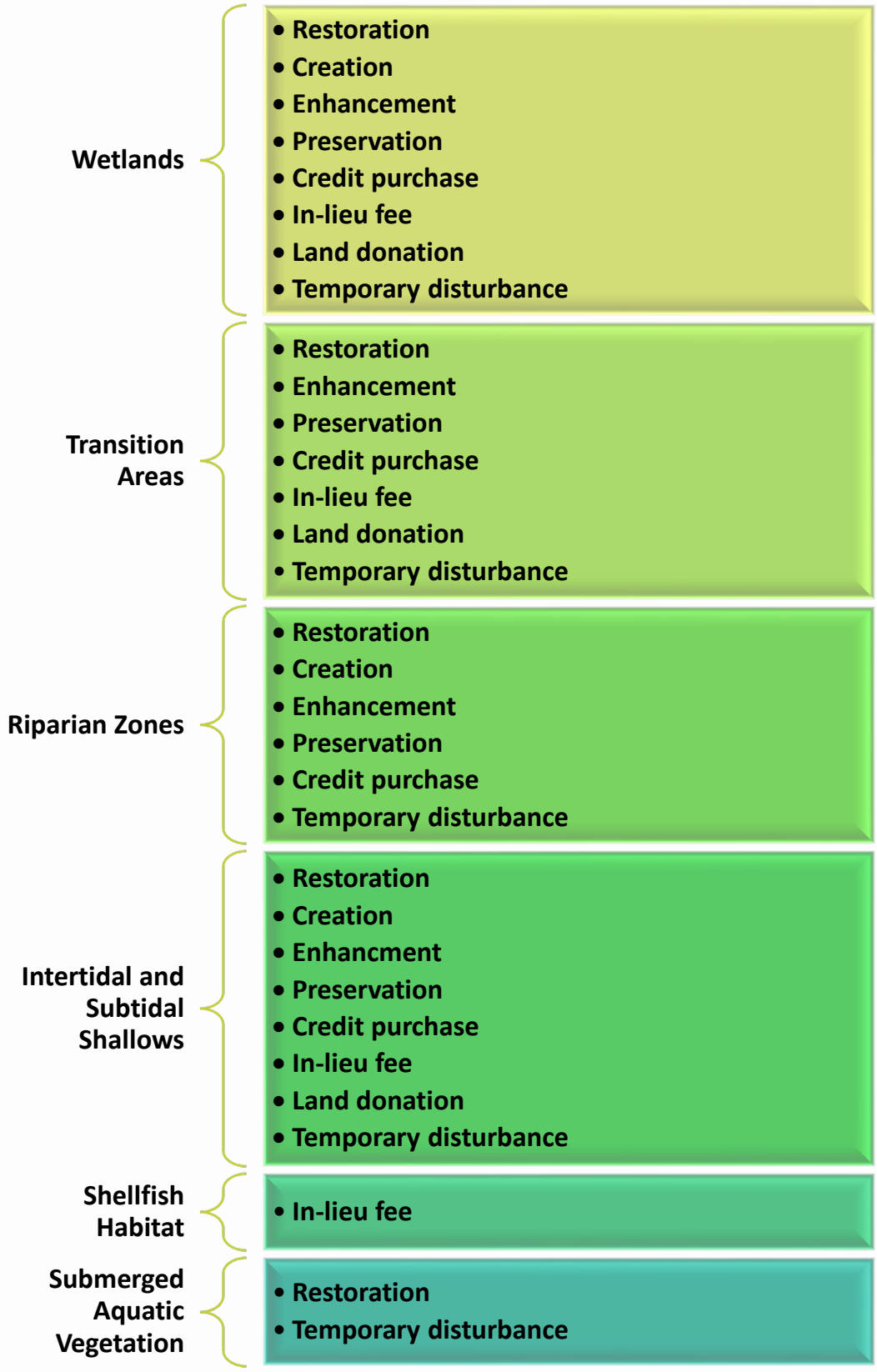
2.3 How to Provide Mitigation

There are seven methods for providing mitigation for permanent disturbances (as defined in Section 2.1 above) – restoration, creation, enhancement, preservation, credit purchase, in-lieu fee, and land donation. The DEP also provides a method for mitigating for temporary disturbances to certain resources. General descriptions for all eight types of mitigation are provided in Section 2.3.1 below, but Sections 3 and 4 of this manual will explain how to perform these types of mitigation in much greater detail.

It is crucial to note that not all of these options will be available for every mitigation project. The mitigation options that can be considered for a given project will first depend on the type of resource that is being disturbed. Figure 2.3 on the following page shows each of the protected resources that may require mitigation along with the types of mitigation that may be permissible options to compensate for a disturbance to that resource.

Even though more than one type of mitigation is listed as potentially permissible for many of these resources, the DEP has established a mitigation hierarchy for each resource. A resource's mitigation hierarchy lays out the mitigation priorities for that resource. These mitigation hierarchies are described in detail in Section 2.3.2 below.

Figure 2.3: Mitigation Options for Each Resource



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2.3.1 Types of Mitigation

As mentioned above, there are eight types of mitigation. However, some of these mitigation types have more than one definition and/or application that depends on the resource that is being disturbed. A general description for each type of mitigation is provided below for each resource to which it may apply.

- Restoration
- Creation
- Enhancement
- Preservation
- Credit purchase
- In-lieu fee
- Land donation
- Temporary disturbance

For more in-depth information on how to perform restoration, creation, enhancement, and temporary disturbance mitigation, see Section 3 of this manual, and for details about preservation, credit purchase, in-lieu fee, and land donation, see Section 4.

Restoration

Wetlands, Transition Areas, ISS, and SAV:

For these resources, restoration is the reestablishment of the resource in a location where that resource once existed. For example, if an area that is currently uplands due to historic fill was formerly a tidal wetland, removing the fill and reestablishing the historic tidal marsh would be considered a restoration mitigation project. All restoration projects must be designed and implemented so that their ecological functions and values will be greater than or equal to the ecological functions and values of the resource that was disturbed. It should be noted that intertidal and subtidal shallows cannot be restored. However, in certain cases, restoration of a tidal wetland located in the same estuary as the disturbance may be performed to mitigate for impacts to ISS.

Riparian Zones:

For riparian zone mitigation, restoration involves reestablishing functions and values to a currently non-functional riparian zone. For example, a riparian zone that has been paved or a stream that has been channelized, straightened, lined, or armored does not provide the functions and values associated with a natural, vegetation-lined stream system. Removing impervious surfaces from the

riparian zone, restoring natural curves to the waterway, or removing hard armoring, followed by planting the stream banks and riparian zone with native, non-invasive vegetation species, can restore the waterway and riparian zone to a more natural condition, reestablishing the functions and values of that riparian zone.

Creation

Wetlands and ISS:

For these resources, creation is the establishment of the resource in uplands where there is no evidence or documentation that the resource previously existed. For example, establishing a wetland in an upland area where prolonged inundation has never occurred would constitute creation mitigation.

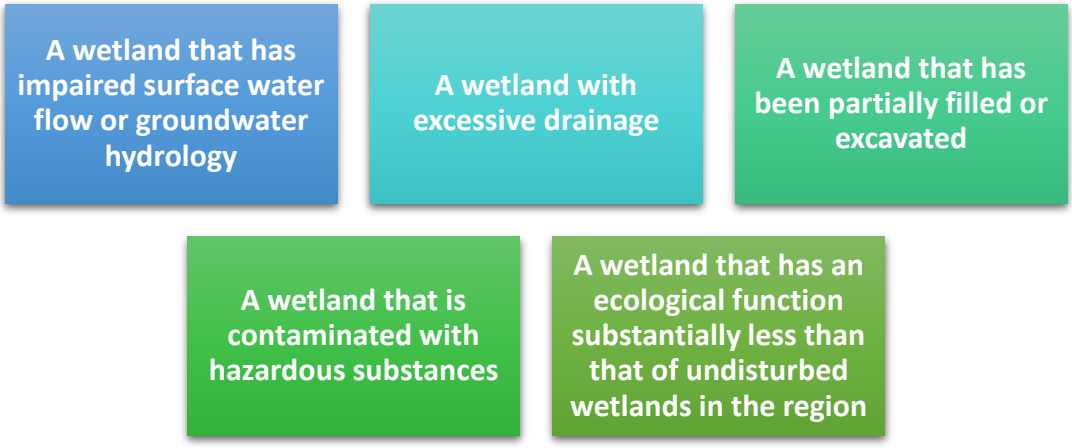
Riparian Zones:

For riparian zone mitigation, creation means establishing a riparian zone where one does not currently exist by restoring a natural waterway enclosed by a structure, such as a pipe or culvert. When a stream that was once natural is enclosed within a structure, it no longer possesses a riparian zone. If the structure is removed and the stream restored to its historically natural state, a new riparian zone is created.

Enhancement

Wetlands and ISS:

For wetlands and ISS, enhancement is the improvement of a degraded wetland. A degraded wetland is any of the following:



Improvements to a degraded wetland are made through substantial alterations to the soil, vegetation, and hydrology. For example, a degraded tidal wetland that is characterized by impaired

hydrology and invasive species could be enhanced by regrading the site to allow for proper tidal flow and by replacing invasive common reed *Phragmites* species with native *Spartina* vegetation.

For disturbances to ISS, the degraded tidal wetland that is to be enhanced must be located in the same estuary as the disturbance. Existing areas of intertidal and subtidal shallows cannot be enhanced.

Transition Areas:

In transition areas, enhancement usually includes improvements to the type of vegetation present on the site. For example, planting trees in a transition area where the existing vegetation is primarily grass would constitute a transition area enhancement.

Riparian Zones:

For riparian zones, enhancement involves making improvements to a riparian zone that is not fully functional. The riparian zone can be enhanced by removing invasive plant species and/or planting native, noninvasive vegetation of higher ecological value than the existing vegetation. Existing riparian plants may also be supplemented with additional native, noninvasive species.

Preservation

Wetlands and ISS:

The preservation of a wetland is considered a land donation under the FWPA Rules. However, when mitigation is necessary for a disturbance to wetlands or ISS, the DEP may also consider the preservation of nearby uplands, which protect the adjacent resource. *Upland preservation* is the permanent protection of the uplands from disturbance or development through transfer of the property to a charitable conservancy and the execution of legal instruments to prevent development, such as a conservation restriction.

Transition Areas and Riparian Zones:

For these resources, preservation is the permanent conservation of a transition area or riparian zone that is considered ecologically valuable. Preservation of transition areas and riparian zones is usually accomplished through the placement of a conservation restriction on the property. However, in

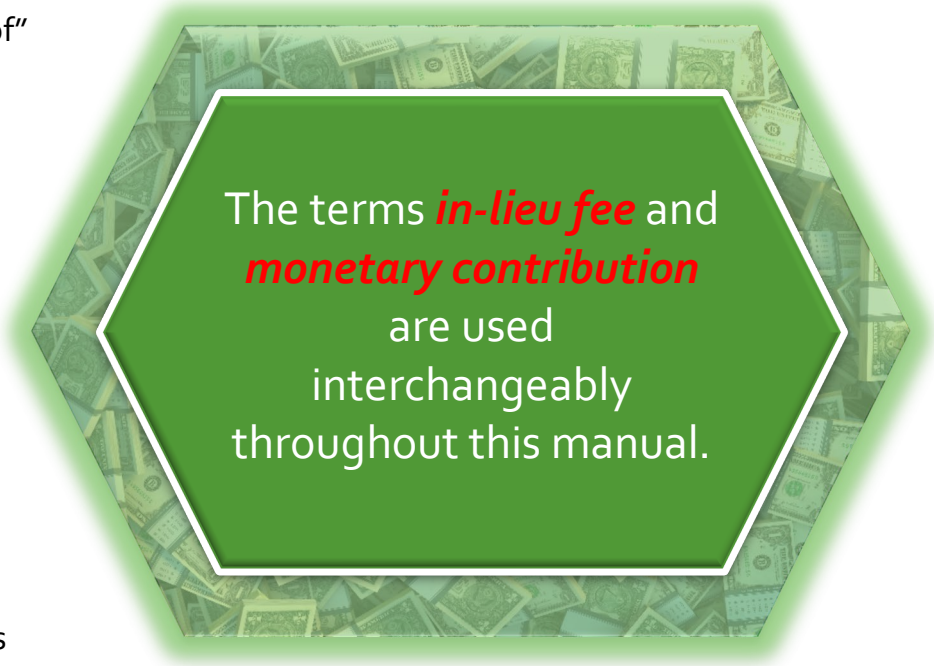
some cases, the land is transferred to a non-profit or a governmental entity for long-term conservation.

Credit Purchase

To mitigate for disturbances to wetlands, transition areas, riparian zones, and/or intertidal and subtidal shallows, credits may be purchased from a mitigation bank. A *mitigation bank* is a site that has already been restored, enhanced, created, or preserved by a mitigation bank operator for the purpose of selling credits to applicants who are required to provide mitigation in order to obtain a permit. Under this mitigation method, the mitigation occurs before the disturbance and is performed by a third party. The process for purchasing credits from an existing mitigation bank to compensate for a disturbance is explained in Section 4.5 while Section 5 describes how to establish a mitigation bank as a mitigation bank operator.

In-Lieu Fee

Under this mitigation method, the applicant makes a monetary contribution "in lieu of" conducting their own mitigation project. See Section 4.2 for more information.



Wetlands, Transition Areas, and ISS:

For wetlands, transition areas, and ISS, a monetary contribution is a payment that is made to the Wetland Mitigation Fund through the Wetland Mitigation Council. For more information about the fund and the council, see Section 4.1. As mentioned in the previous section, this form of mitigation is acceptable only to satisfy mitigation requirements for DEP permits and authorizations, not USACE permits.

Shellfish Habitat:

For disturbances to shellfish habitat, a monetary contribution must be made to the DEP's dedicated account for shellfish habitat mitigation. Section 4.2.3 contains more information about this specific type of monetary contribution.

Land Donation

A land donation is the transfer of ownership of an ecologically valuable wetland or transition area to a government or non-profit entity. For more information on land donation, see Section 4.3.

Temporary Disturbance

As mentioned in Section 2.1, a temporary disturbance is any activity that occupies, persists, and/or occurs on a site for no more than six months. However, the DEP will consider certain disturbances that exceed six months to be temporary disturbances provided they are associated with certain activities, such as hazardous substance remediation or solid waste facility closures, that are intended to be temporary but typically take longer than six months to perform.

Temporary disturbance mitigation is a form of restoration. It includes restoring the original topography as well as restoring the original vegetation to its previous condition or to an improved condition. Temporary disturbance mitigation is explained more fully in Section 3.6.

2.3.2 Mitigation Hierarchies

As mentioned above, a *mitigation hierarchy* is the DEP's order of preference for one type of mitigation over another for a specific resource. Each resource's mitigation hierarchy is based on the types of mitigation that will lead to the most ecologically valuable compensation and the greatest possibility for achieving an ecological uplift. Mitigation must be provided according to the hierarchy for that resource.

Mitigation hierarchies apply to permanent disturbances only. For information on how to mitigate for temporary disturbances, see Section 3.6.

Some resources have more than one hierarchy. The hierarchy that will apply depends on the size or location of the disturbance. For intertidal and subtidal shallows, there is one hierarchy for disturbances that occur at single-family homes or duplexes and another hierarchy for disturbances that occur at other types of properties. The mitigation hierarchy for wetlands under the FWPA Rules depends on whether the disturbance is smaller or larger. A *smaller disturbance* is any disturbance that is 1.5 acres or less in size and/or impacts only ordinary resource value wetlands. A *larger disturbance* is any disturbance that is more than 1.5 acres in size and impacts wetlands of intermediate and/or exceptional resource value. It is important to note that there is only one mitigation hierarchy for wetlands regulated under the CZM Rules that does not depend on the size of the disturbance.

A hierarchy may also distinguish between in-kind and out-of-kind mitigation. The DEP usually prefers mitigation to be provided in-kind. *In-kind mitigation* means that the ecological compensation that is provided is of the same type as the resource that was disturbed while, conversely, *out-of-kind mitigation* means that the compensation provided is different from the resource type that was disturbed. For example, if an activity disturbs a forested wetland, creating a new forested wetland would be considered in-kind mitigation while creating an herbaceous wetland would be considered out-of-kind. As another example, if an activity disturbs intertidal and subtidal shallows, buying ISS mitigation credits from a mitigation bank would be considered in-kind mitigation while enhancing a coastal wetland would be considered out-of-kind.

Although some of the hierarchies allow for out-of-kind mitigation, it is rarely approved by the DEP and will be considered on a case-by-case basis only. Out-of-kind mitigation requires a thorough assessment of all mitigation options and a demonstration that in-kind mitigation is not feasible. The proposed out-of-kind mitigation must also be of high ecological value.

A mitigation hierarchy may also provide further specificity regarding where that type of mitigation is to be provided (such as onsite, offsite, within the same service area, or within the same Watershed Management Area) and/or how much mitigation is to be provided (such as creation in a 1:1 ratio). Section 2.4 provides more information on where to provide mitigation while Section 2.5 explains how much mitigation is required.

The mitigation hierarchies are described in detail in the applicable rules and are also illustrated in the figures on the following pages:

Since only one type of mitigation is permissible for permanent disturbances to shellfish habitat and submerged aquatic vegetation (monetary contribution and restoration, respectively), these resources do not have a mitigation hierarchy.

Figure 2.4: Wetlands Mitigation Hierarchy under the FWPA Rules

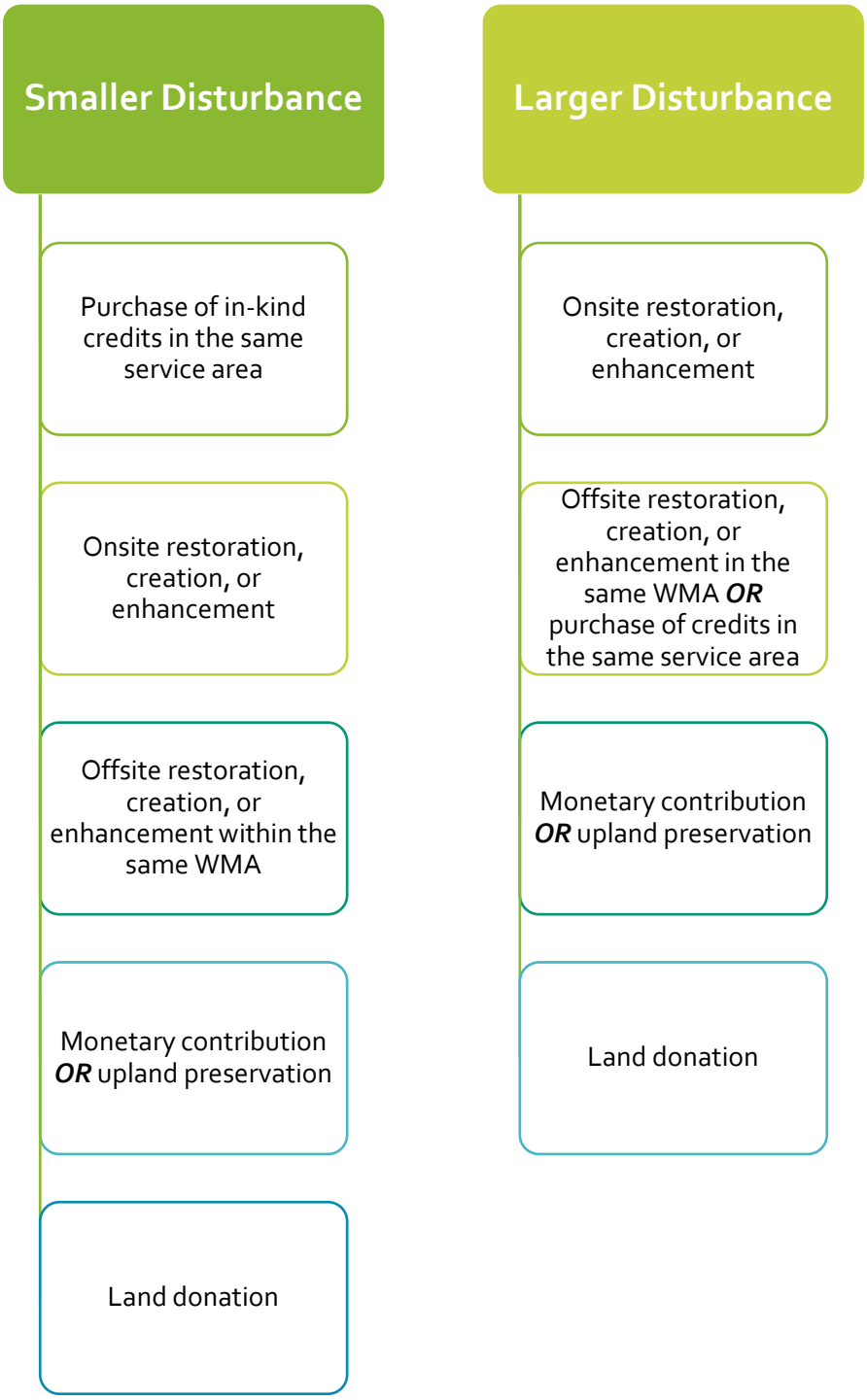


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Figure 2.5: Wetland Mitigation Hierarchy under the CZM Rules

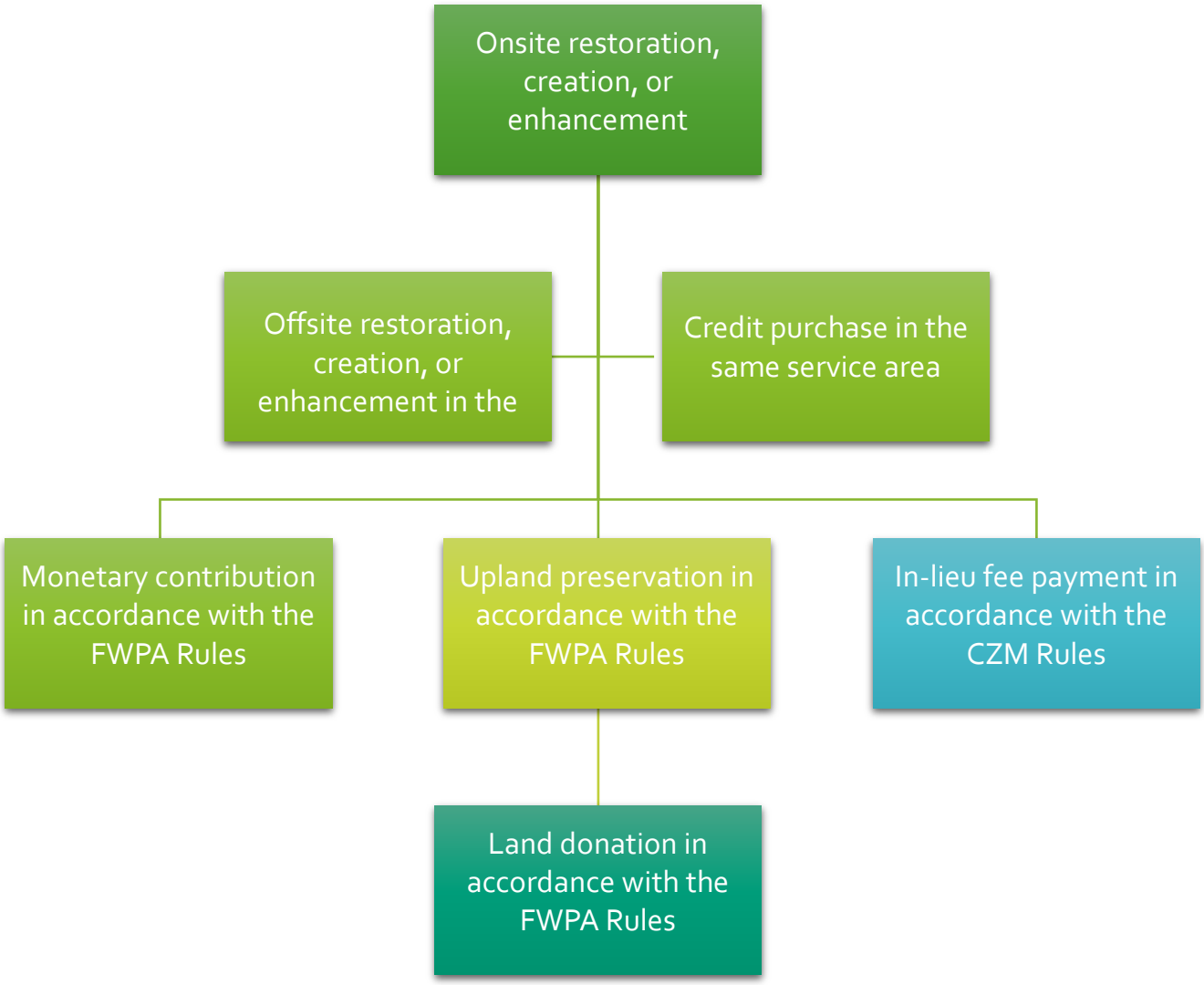

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Figure 2.6: Transition Area Mitigation Hierarchy under the FWPA Rules

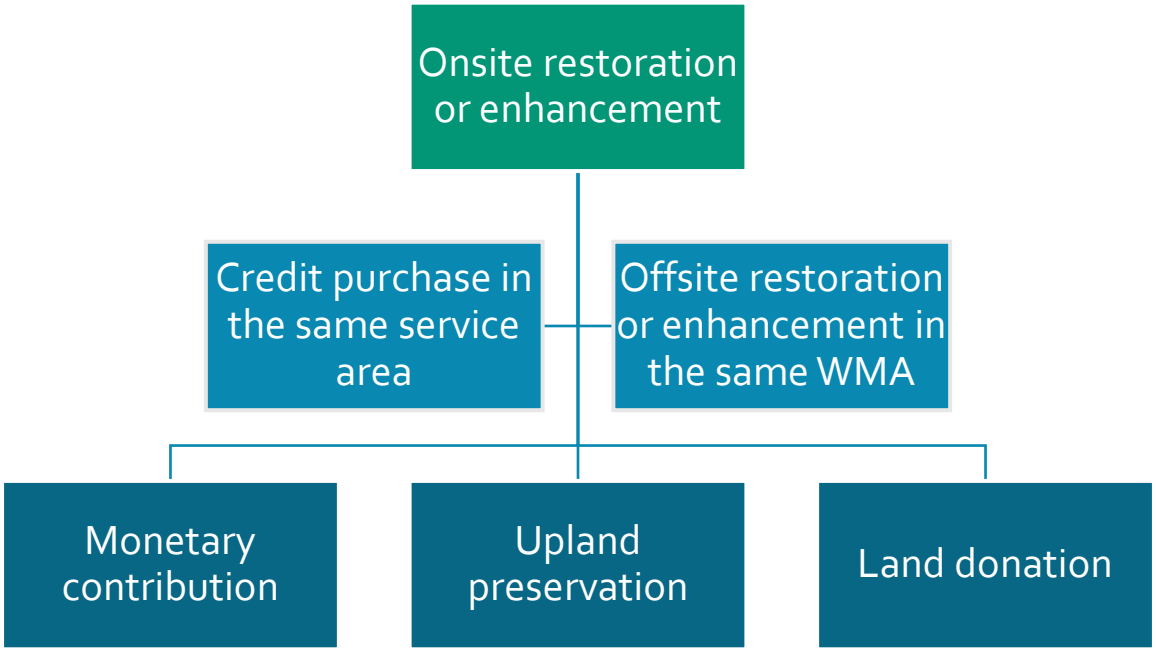

Figure 2.7: Riparian Zone Mitigation Hierarchy under the FHACA Rules

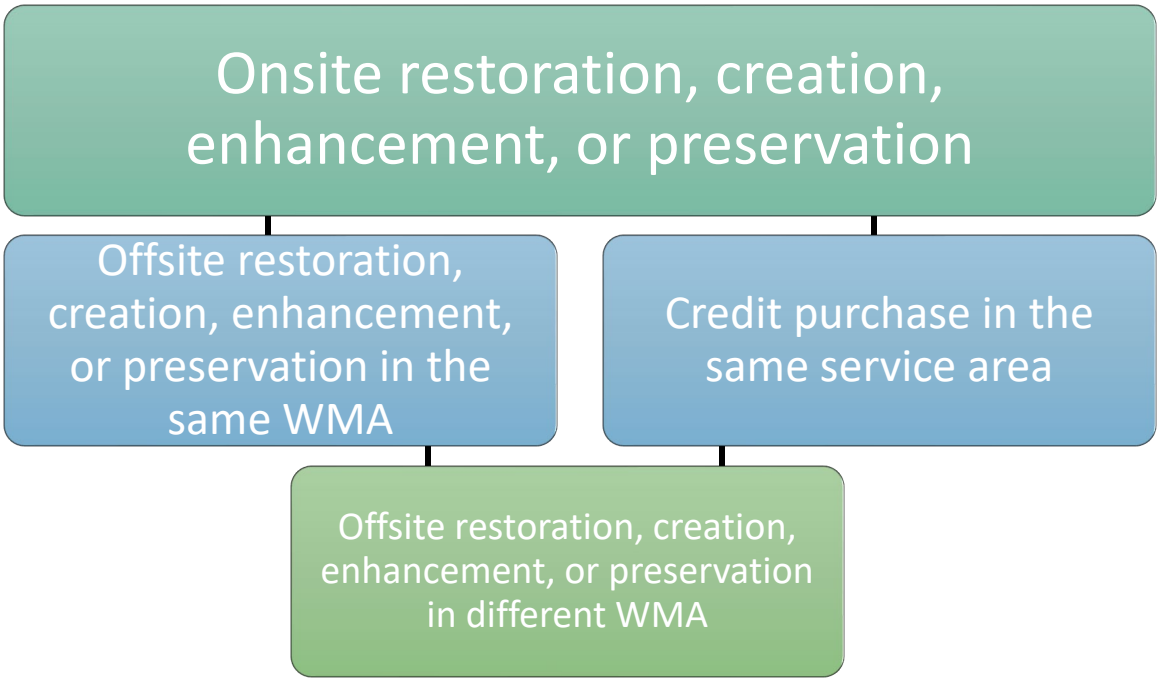

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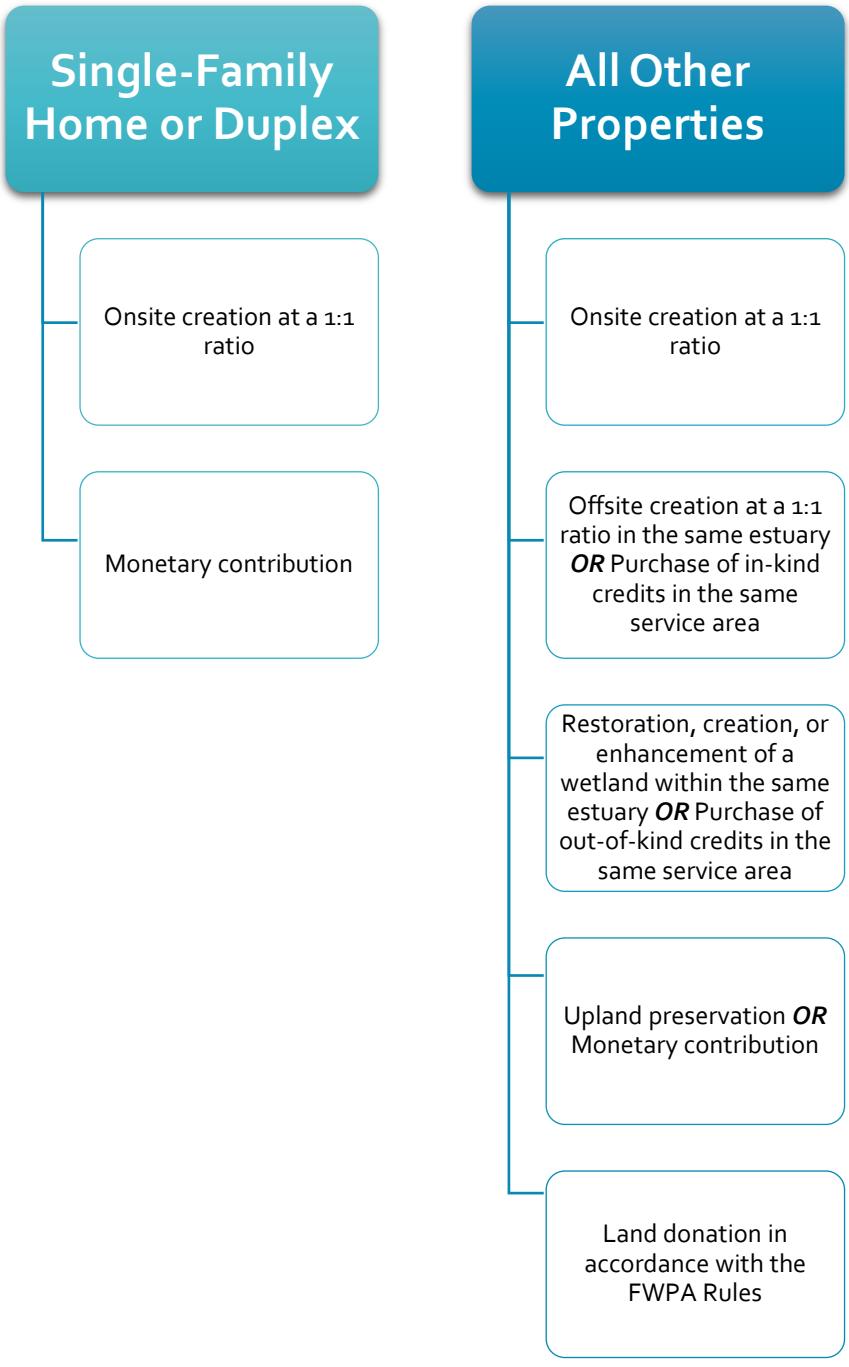
Figure 2.8: Intertidal and Subtidal Shallows Mitigation Hierarchy under the CZM Rules



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2.4 Where to Provide Mitigation

As mentioned in Section 2.1, the goal of a mitigation project is to replace any of the ecological functions and values that are lost when a protected resource is disturbed, and a resource's functions and values are based on the services that it provides to its watershed. Therefore, the location of a mitigation project is essential to ensuring that those functions and values will be effectively preserved. Location considerations depend upon the type of mitigation that will be performed – restoration, creation, enhancement, or credit purchases.

Restoration, creation, and enhancement mitigation can be performed either onsite or offsite. As shown in the mitigation hierarchies in the previous section, the DEP usually prefers *onsite mitigation*, which is mitigation that is performed on the same parcel of land as the disturbance. Conversely, mitigation performed on a different parcel of land is called *offsite mitigation*. Because onsite mitigation occurs in closer proximity to the disturbance, it is the most efficient and likely means for recovering all the local and global functions and values provided by the disturbed resource.

If restoration, creation, or enhancement mitigation must be provided offsite, the DEP usually requires it to be located within the same watershed management area (WMA) as the disturbance. *Watershed management areas* are part of the DEP's efforts to effectively manage and protect New Jersey's 151 watersheds (see Figure 2.1). The state's water resources have been organized into five water regions – the Northeast, Raritan, Northwest, Lower Delaware, and Atlantic Coastal water regions. Each region is further divided into three to five watershed management areas, and each WMA includes several watersheds. There are a total of 20 watershed management areas in New Jersey, which are shown on the map in Figure 2.9 on the next page. The table provided in Figure 2.10 lists each watershed management area by name and number and includes the water region to which it belongs.

For more information on how to select a site for restoration, creation, or enhancement mitigation, see Section 3.2.

When providing mitigation by purchasing credits from a mitigation bank, the DEP usually prefers that the bank be located in the same service area as the disturbance. The service area is typically the WMA in which the bank is located, but tidal wetland banks may include additional adjacent tidal areas. Section 4.5 explains the process for purchasing credits from an appropriate mitigation bank.

Figure 2.9: Map of New Jersey's Watershed Management Areas

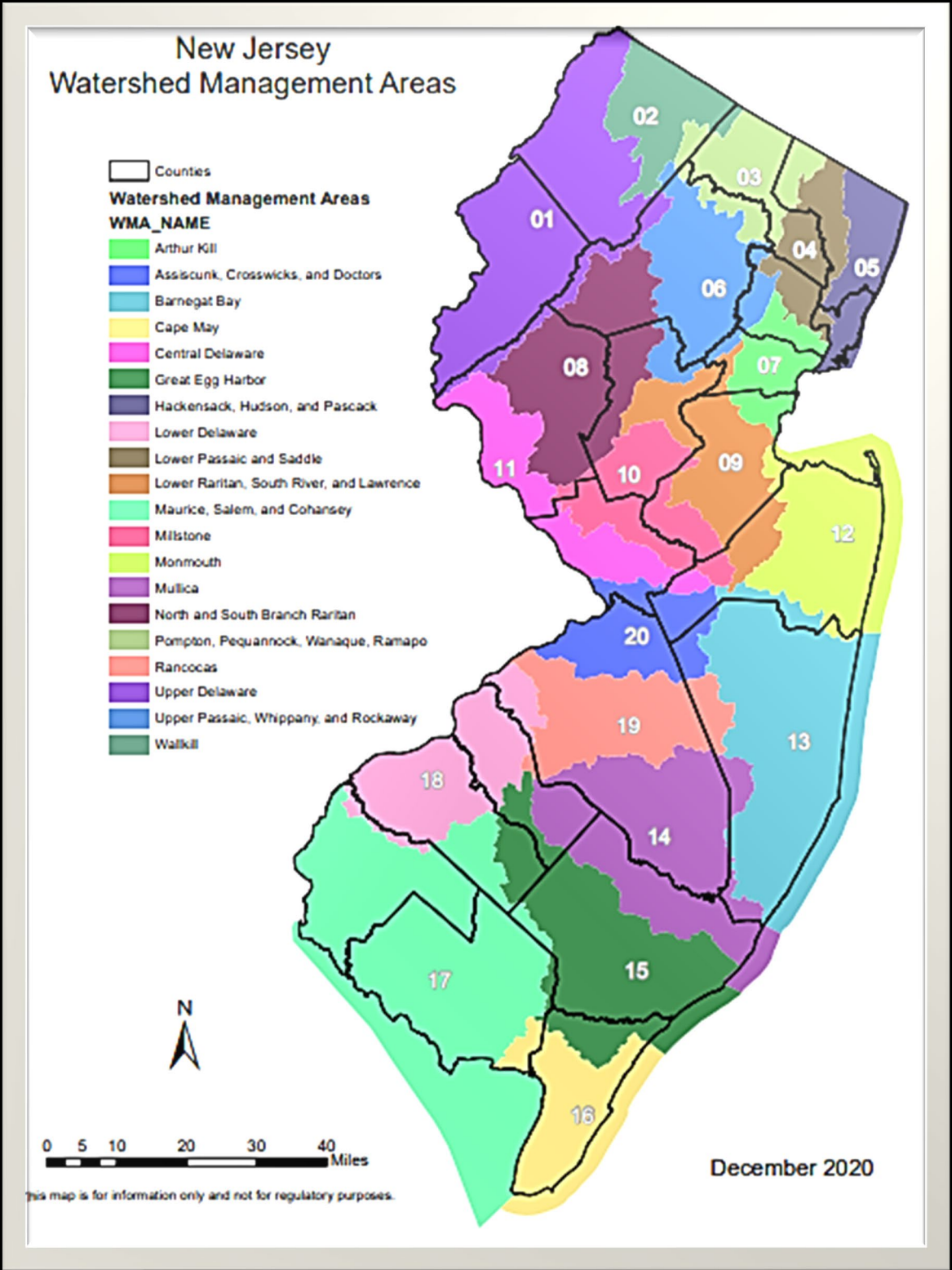

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Figure 2.10: List of New Jersey's Watershed Management Areas

WMA	WMA Name	Watershed Region
1	Upper Delaware	Northwest
2	Wallkill	Northwest
3	Pompton, Pequannock, Wanaque, Ramapo	Northeast
4	Lower Passaic and Saddle	Northeast
5	Hackensack, Hudson, and Pascack	Northeast
6	Upper Passaic, Whippany, and Rockaway	Northeast
7	Arthur Kill	Raritan
8	North and South Branch Raritan	Raritan
9	Lower Raritan, South River, and Lawrence	Raritan
10	Millstone	Raritan
11	Central Delaware	Northwest
12	Monmouth	Atlantic Coast
13	Barnegat Bay	Atlantic Coast
14	Mullica	Atlantic Coast
15	Great Egg Harbor	Atlantic Coast
16	Cape May	Atlantic Coast
17	Maurice, Salem, and Cohansey	Lower Delaware
18	Lower Delaware	Lower Delaware
19	Rancocas	Lower Delaware
20	Assiscunk, Crosswicks, and Doctors	Lower Delaware

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2.5 How Much Mitigation is Required?

To determine the amount of mitigation necessary to compensate for a disturbance, New Jersey uses a ratio system for creation, enhancement, restoration, preservation (including upland preservation), land donation, credit purchases, and temporary disturbances. Figure 2.11 below provides a list of the ratios for wetlands, riparian zones, and ISS in relation to these mitigation options.

The ratio system provides the number of acres of mitigation that are necessary to offset the number of acres of the resource that will be disturbed. For example, a 2:1 ratio means that two acres of mitigation are necessary to compensate for every acre of disturbance. The acres of mitigation required are often higher than the acres of disturbance because natural ecosystems generally provide greater ecological functions and values than mitigation project sites. A mitigation site may require a long time to achieve the same functions and values that a natural site currently provides. For example, mature trees provide greater ecological functions and values than saplings. An activity may require mature trees to be removed, but any new trees provided as mitigation are likely to be saplings.

Most of the ratios in the table are required under the applicable rules and were established to ensure that there would be no net loss of ecological functions and values. In instances where the rules do not establish a ratio, the DEP has recommended ratios, which are noted in the table and explained further below.

Figure 2.11: Standard Mitigation Ratios

Resource	Creation to Loss Ratio	Enhancement to Loss Ratio	Restoration to Loss Ratio	Preservation to Loss Ratio	Upland Preservation to Loss Ratio	Land Donation to Loss Ratio	Credit Purchase to Loss Ratio	Temporary Disturbance to Loss Ratio
Wetlands	2:1	No ratio provided: target 3:1	2:1	No ratio provided: target 27:1	No ratio provided: target 27:1	No ratio provided: target 27:1	1:1	1:1
Riparian Zones	1:1	3:1	2:1	No ratio provided: target 8:1	n/a	n/a	1:1	1:1
ISS	1:1	Follow the FWPA Rules for wetlands	Follow the FWPA Rules for wetlands	n/a	Follow the FWPA Rules for wetlands	Follow the FWPA Rules for wetlands	1:1	1:1

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As noted in the table above, neither the FWPA Rules nor the CZM Rules provide a ratio for enhancement mitigation. However, the DEP typically utilizes ratios between 3:1 and 10:1, depending on the expected uplift of the proposed enhancement activities. For example, if an applicant anticipates enhancing the hydrology, soils, and vegetation for a wetland site, mitigation will be approved at a 3:1 ratio, but if minimal enhancements are proposed, such as hand removal of invasive species, a higher ratio such as 7:1 or 10:1 may be required to mitigate for the impacts.

The FHACA Rules do not provide a ratio for riparian zone preservation in order to allow for flexibility based on the specific conditions associated with each project. For the same reason, the FWPA and CZM Rules do not provide specific ratios for upland preservation or land donation. However, for riparian zone preservation, the area to be preserved must be significantly larger than the area being disturbed, and the DEP typically recommends an 8:1 ratio. For upland preservation or land donation to mitigate for impacts to wetlands, the ratio typically accepted by the DEP is 27:1, and each proposed upland preservation area or land donation should be greater than five acres in size.

In certain situations, smaller ratios than those listed here may be permissible. The DEP will evaluate smaller ratios on a case-by-case basis, but the proposed ratio must always be at least one acre of mitigation per one acre of lost resource (1:1 ratio) to ensure there is no net loss of ecological functions and values.

The table above does not include transition areas, submerged aquatic vegetation, or shellfish habitat. For transition areas, the FWPA Rules do not include ratios because the ratio is determined on a case-by-case basis and can vary widely depending on the site and the proposed mitigation type. Likewise, the CZM Rules do not provide a ratio for the restoration of submerged aquatic vegetation because SAV mitigation practices are still evolving. How to provide mitigation for SAV is explained in Section 3.7.

As mentioned earlier in this manual, mitigation for shellfish habitat must be provided in the form of a monetary contribution. For monetary contributions, the amount of mitigation required is not based on a ratio. The specific calculation for a monetary contribution depends on the resource, and this is explained in full detail in Section 4.2.

2.6 How to Begin the Mitigation Process

The mitigation process follows these basic steps, regardless of the disturbance or the type of mitigation that is proposed:

As explained in Section 2.2 above, mitigation may be required as a condition of an approved permit or authorization for an activity that will disturb a protected resource. Both an approved permit and an approved mitigation proposal are required before the permitted activity can be performed. Once both approvals are obtained, the permitted activity and the mitigation can be conducted. The mitigation activities must be performed concurrently with the permitted activities (except for mitigation for temporary disturbances, as explained in Section 3.6).

The permit application must provide details about the disturbance, including identifying the type of resource that is being disturbed and the amount of the disturbance. For example, the permit application may indicate that the disturbance is 0.3 acres of forested freshwater wetlands or one acre of mapped coastal wetlands.

After the permit is obtained, a mitigation proposal must be submitted. The proposal must present a project that will fully compensate for the disturbance identified in the approved permit. For example, if the permit approves the filling of 0.5 acre of herbaceous wetlands, the mitigation project must be designed to mitigate for the functions and values of 0.5 acre of herbaceous wetlands.

The mitigation proposal must also explain and justify how the proposed project will fully compensate for the disturbance. At a minimum, the proposed mitigation needs to provide equal ecological functions and values to that of the disturbed resource. To design a mitigation project that will fully compensate for any lost functions and values, a detailed assessment of the impacts to the protected resource must be conducted, including an analysis of the functions and values of that resource. This assessment must be provided in the mitigation proposal.

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The applicant should begin this assessment by thoroughly evaluating the site of the disturbance. Does the site include a mapped coastal wetland, a freshwater wetland, a riparian zone? What is the density and coverage of trees, scrub/shrub, or herbaceous plants? Are there invasive species on the property, and if so, what species and coverage are present? These are just a few of the questions that can help provide information about the impact site that will help with designing and proposing the mitigation project.

> The DEP encourages all applicants to explore Watershed and Land Management's webpage at https://www.nj.gov/dep/wlm/. This page includes:
>
> - Information about protected resources
> - An interactive mapping tool to help identify the location of protected resources with respect to a specific site
> - Application forms and checklists
> - Instructions for submitting applications through the DEP's electronic submission service

Next, the applicant must analyze the functions and values of the impacted resource. One method for this analysis is to perform a functional assessment. A functional assessment is a quick, simple, process that is repeatable from project to project, and the objectives are applicable to a wide range of resources. While there are different models for performing a functional assessment, the general features include indicators, functional capacity, and thresholds for functions. An *indicator* is a condition that can be observed. *Functional capacity* is the ability of an ecosystem to perform the function that it provides to the watershed, and a *threshold* is the limit at which the resource can perform the function (National Research Council, 1995, 216-217). For example, in a coastal wetland environment that is dominated by invasive *Phragmites* species, the presence of *Phragmites* is the indicator. The functional capacity is that the wetlands system can be improved to a more native/natural environment, and the threshold is that the invasive species is limiting the wetland from functioning at its capacity.

While the DEP does not recommend one functional assessment over another, the DEP has participated in the development of the Floristic Quality Assessment (FQA) for use in New Jersey. For more information about this model, see Appendix A of this manual. In addition, some commonly used resources for performing functional assessments are WET 2 and Evaluation for Planned Wetlands (EPW).

Instead of a functional assessment, some mitigators use professional judgement and a more narrative description of the functions and values of the site, which can also be very informative. No matter what method is used for determining functions and values, the applicant must be sure that the proposal discusses the vegetation type, including identification of the eco-region and the type(s) and extent of invasive species on the proposed impacted site.

Once the functions and values of the impact site are identified, the goals and objectives for the mitigation project can be developed, the type(s) of mitigation can be determined (as discussed in

Section 2.3.1), a suitable mitigation site can be located if applicable, and the mitigation proposal can be prepared.

Selection of a mitigation site is necessary for restoration, creation, enhancement, preservation, and land donation mitigation. As mentioned earlier in this manual, the mitigation site may be located on the same parcel as the disturbance or it may be located on a different parcel, depending on the impact site and the mitigation hierarchy for the disturbed resource. The mitigation proposal for these types of mitigation must include an assessment of the selected mitigation site in addition to the assessment of the impact site described above. For preservation and land donations, a comparison between the functions and values of the proposed mitigation site and those of the impact site is necessary to ensure full compensation will be provided by the preserved or donated land. For restoration, creation, and enhancement, the mitigation proposal must show the functional uplift to the proposed mitigation site by comparing its current state with the proposed final condition. Therefore, an assessment must be provided for both the current functions and values of the mitigation site and for the future functions and values once the proposed mitigation has been completed. The mitigation proposal must also provide the assessment of the functions and values that will be lost on the impacted site to ensure that the functional uplift on the mitigation site will fully compensate for those losses.

Sections 3 and 4 of this manual will provide greater detail on how to select a site for mitigation and how to prepare a mitigation proposal for the different types of mitigation. See Section 3 for restoration, creation, enhancement, and temporary disturbances, and see Section 4 for preservation, credit purchases, monetary contributions, and land donations.

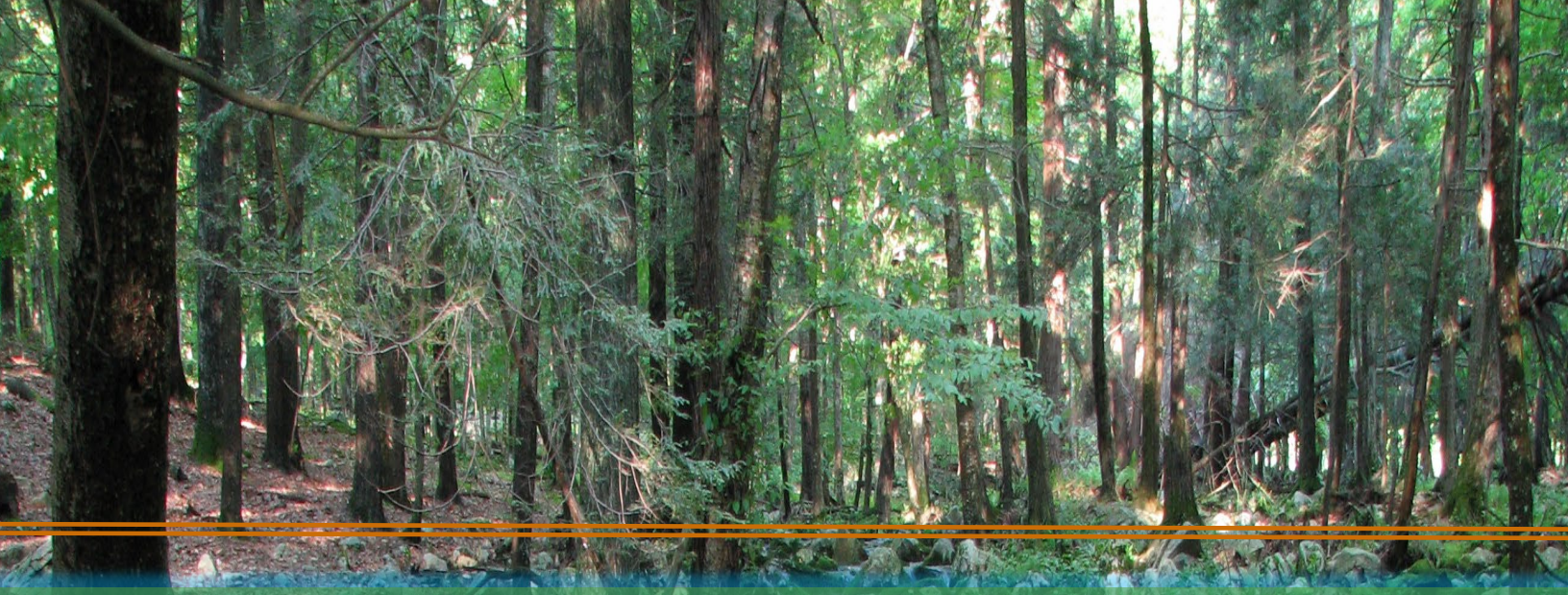
Whether the mitigation proposal is submitted with the permit application or later, the permit approval occurs independently from the approval of the mitigation proposal. The DEP cannot and does not consider the value of any proposed mitigation when evaluating the permit application for compliance with the applicable rules.

Regardless of the type of mitigation that is selected, the mitigation process will follow the general outline provided in Figure 2.12 below. This process map does not include submission of the permit application because the timing of that submission relative to the submission of the mitigation proposal can vary. For most mitigation projects, the mitigation proposal may either be submitted as part of the permit application or it may be submitted later, even after the permit is issued, provided that it is received at least 90 days prior to the start of any permitted work. However, there are two exceptions. For the general permit for hazardous site investigation and cleanup under the FWPA Rules at N.J.A.C. 7:7A-7.4 and for the general permit for the investigation, cleanup, removal, or remediation of hazardous substances under the CZM Rules at N.J.A.C. 7:7-6.11, the submission of the mitigation proposal is required before the permit may be issued. For all other applications, the DEP encourages applicants to submit the mitigation proposal as soon as it is appropriately completed,

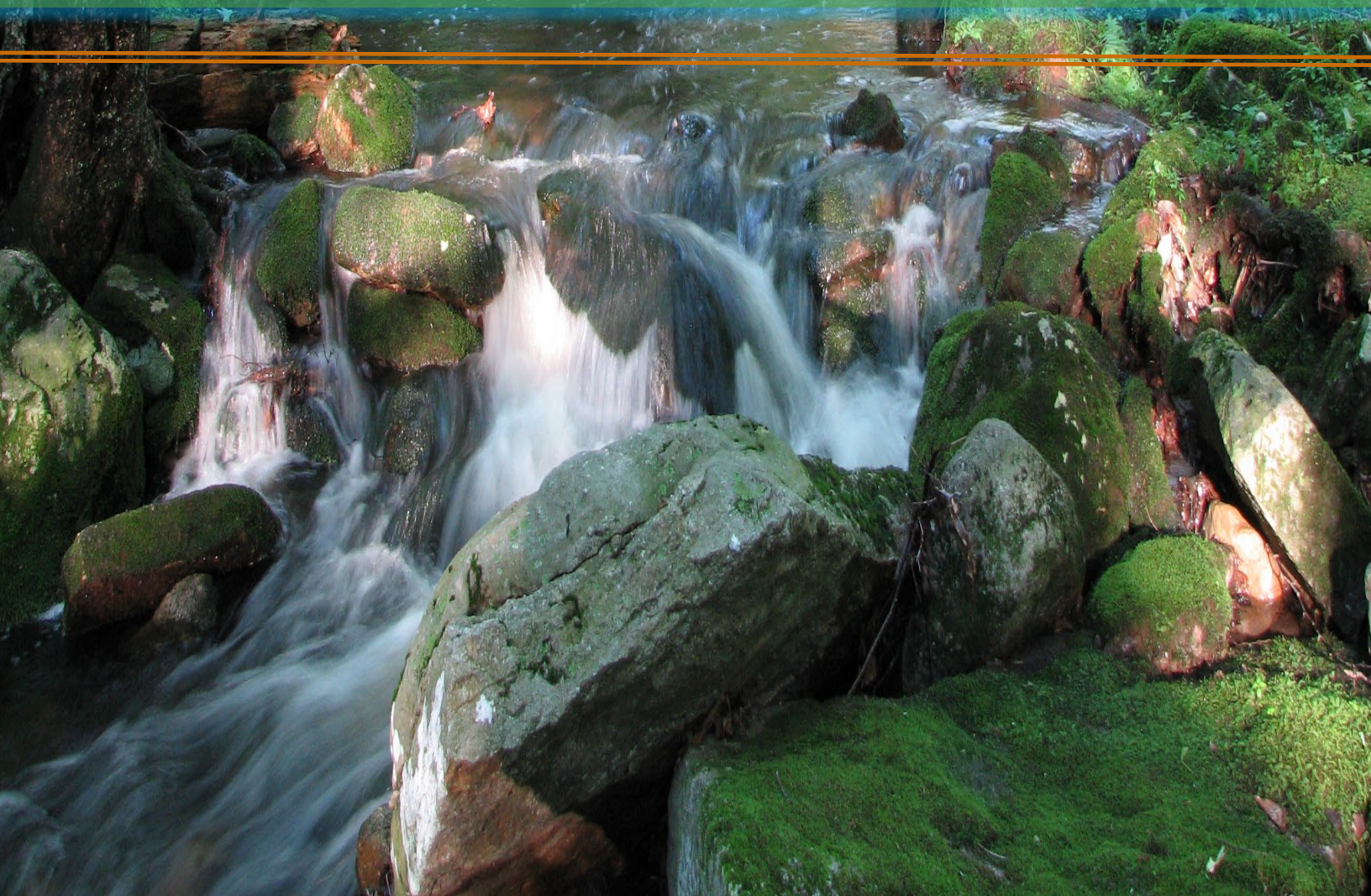
keeping in mind that the permitted activity cannot be constructed until the mitigation proposal is approved.

Figure 2.12: General Mitigation Process

1	The applicant determines that a permit is necessary to perform an activity that will disturb a protected resource, either physically or functionally. If the activity exceeds the disturbance thresholds allowed under the applicable rules, the applicant must perform mitigation to compensate for the disturbance.
2	The applicant performs an assessment of the impact site, including the functions and values of the disturbed resource.
3	Based on this assessment and the mitigation hierarchy for the resource that is being disturbed, the applicant selects the type of mitigation that is to be performed. The applicant may need to identify and evaluate potential mitigation sites to determine if they are suitable for the required mitigation. • Note that the DEP recommends submitting a conceptual review of a parcel of land before the applicant purchases that land for a mitigation site and prior to the preparation of the mitigation proposal. For more information about conceptual reviews, see Section 3.1.
4	In most cases, the applicant is required to provide financial assurance to cover the cost of the mitigation in accordance with the applicable regulations. For more information on financial assurance, see Section 3.3.5.
5	The applicant prepares and submits a mitigation proposal to the DEP.
6	The DEP reviews the mitigation proposal. The proposal may be approved, denied, or additional information may be requested.
7	Once a mitigation proposal is approved, the mitigation is constructed or otherwise completed.
8	A mitigation construction completion report or other administrative documents are submitted, depending on the type of mitigation that has been approved and conducted, and are reviewed by DEP. • For restoration, creation, and enhancement mitigation, the mitigation site is monitored for five years or until performance standards are met, and annual monitoring reports are submitted each year. For information about monitoring, see Section 3.5.
9	Corrective actions are implemented, as needed.
10	The DEP signs off on the mitigation project once it is deemed to have been successfully completed.



SECTION 3: RESTORATION, CREATION, AND ENHANCEMENT



Restoration, creation, and enhancement are often referred to as "on the ground" mitigation options, which means that the physical alteration of land is necessary to improve ecological functions and values. Since these three types of mitigation include construction activities, the requirements and mitigation process for them are distinct. The purpose of this section of the manual is to help ensure successful restoration, creation, and enhancement mitigation and to provide tips for navigating through the mitigation process for these types of projects.

As restoration, creation, and enhancement require construction, it is important to note that permits may be required for the mitigation activities in addition to the permit(s) that are necessary for the activity that is disturbing the protected resource. While this manual will not go into details about permitting, it will point out key permitting requirements when they facilitate the mitigation requirements. Applicants should consult the applicable rules for permitting information and requirements.

Depending on the resource and the specific project, some of the requirements described in this section may not be applicable. Applicability is addressed to the greatest extent possible in this manual, but if there are any questions related to applicability, please contact the DEP for assistance. See Section 1.3 for contact information.

As mentioned in Section 2.3, restoration, creation, and/or enhancement mitigation may be applicable for disturbances to wetlands, transition areas, riparian zones, intertidal and subtidal shallows, and submerged aquatic vegetation. The bulk of this section (Sections 3.1 through 3.5) focuses on the mitigation requirements and process for wetlands and riparian zones, which are the most commonly impacted resources, but this information can also be applied to wetland transition areas and ISS where applicable.

Specifically, Section 3.1 explains the overall mitigation process while Sections 3.2 through 3.5 provide greater detail on the requirements for certain steps in that process:

- Site Selection – Section 3.2
- Developing the Mitigation Proposal – Section 3.3
- Site Preparation and Construction – Section 3.4
- Monitoring – Section 3.5

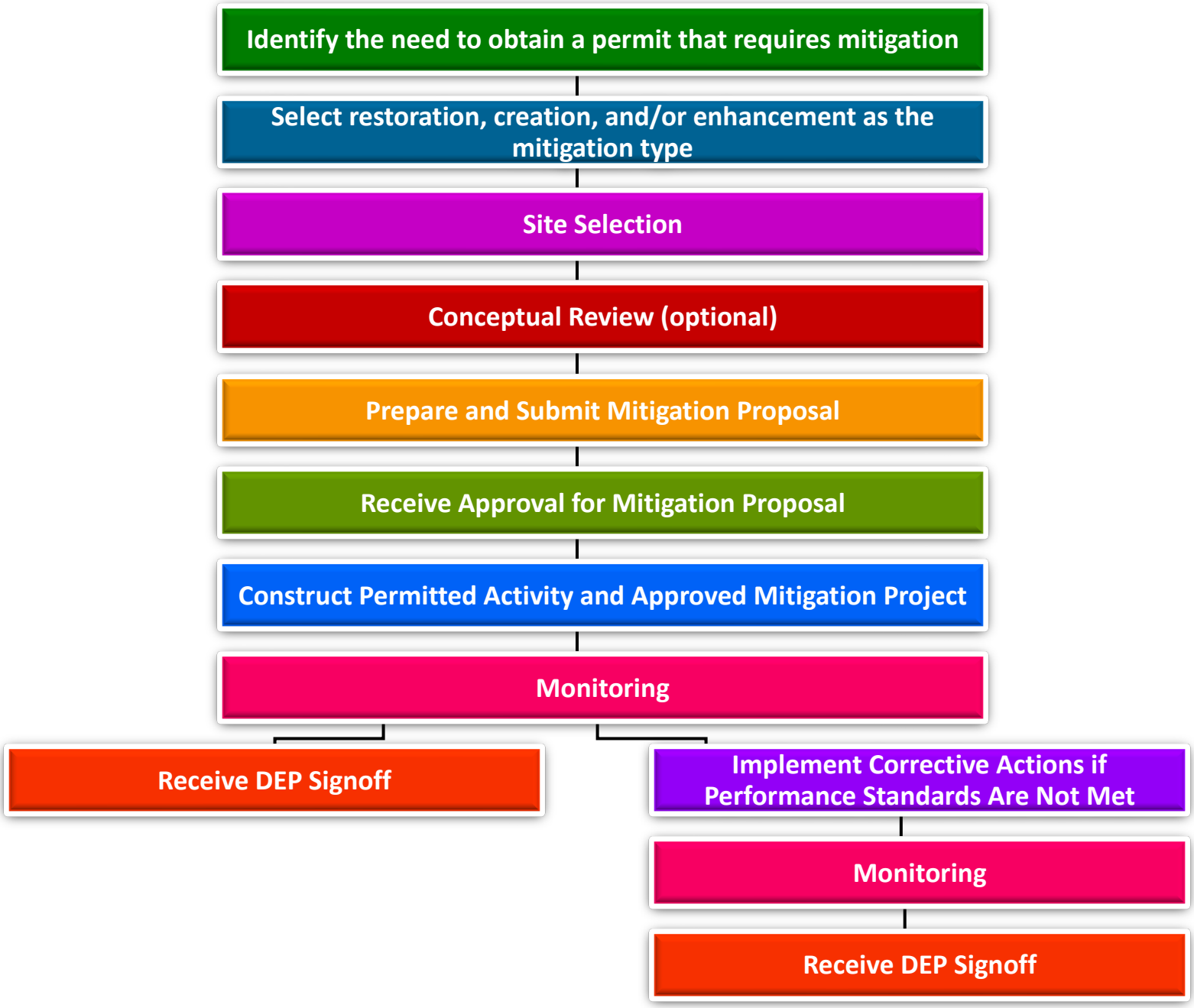
Restoration is also a mitigation option for submerged aquatic vegetation, but the requirements and process are different for SAV than for the other resources. For this reason, SAV restoration is covered separately in Section 3.7.

Also, as mentioned in Section 2.3.1, temporary disturbance mitigation is a form of restoration. Therefore, this section of the manual will also provide information on how to mitigate for temporary disturbances in Section 3.6.

3.1 The Mitigation Process

Section 2.6 of this manual provides important background information on the mitigation process that applies to all mitigation projects, and DEP recommends reading that section. This section will elaborate on that process, specifically for restoration, creation, and enhancement mitigation projects for wetlands, transition areas, and riparian zones. This process applies to both onsite and offsite restoration, creation, and enhancement activities.

Generally, the process consists of the following steps:



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There is no standard timeframe for this process. Each project will have a unique schedule that will be developed and included in the mitigation proposal. However, the timing will depend on several factors, including, but not limited to, the resource that is being impacted, any unanticipated events (such as flooding or catastrophic weather), and the applicant's ability to provide the information necessary for the mitigation proposal and the permit application for the mitigation activities (if needed).

Since mitigation is a permit condition, this process begins with identifying the necessary permit and determining that it requires mitigation (see Section 2.2 for details). After determining that mitigation is necessary, the applicant must identify the appropriate type(s) of mitigation based on the mitigation hierarchy for the specific resource being disturbed (see Section 2.3.2) and the other requirements in the applicable rules. In certain instances, multiple types of mitigation can be utilized to compensate for a single disturbance when performing a single type of mitigation will not provide adequate compensation for the lost functions and values. An applicant may propose a combination of restoration, creation, and enhancement activities or may propose using any of these types of mitigation in conjunction with any of the mitigation options that are discussed in Section 4 (preservation, credit purchase, in-lieu fee, and land donation).

When an applicant determines that either onsite or offsite restoration, creation, and/or enhancement is an appropriate type of mitigation, the next step is to identify a suitable site for the mitigation project. Many factors must be considered during site selection, so it will be discussed in detail in Section 3.2.

After selecting a proposed mitigation site, the DEP strongly recommends that the applicant request a conceptual review of that site prior to purchasing any land. A conceptual review is an optional additional step, but it allows the applicant and the DEP to discuss the land that will be proposed for mitigation and to identify any red flag issues that may prevent the mitigation from being successful on that site. The conceptual review may occur either remotely or on the site. Following the conceptual review, the DEP will inform the applicant whether the site seems appropriate for mitigation so they can determine if they wish to move forward with acquiring the land. It is crucial to note that the conceptual review is not an official approval or denial of the mitigation project, and a determination that a site is appropriate for mitigation does not guarantee that the mitigation proposal will be approved.

To obtain a conceptual review of a potential mitigation site, the applicant should submit a written request to the DEP. The request should include a description of the area and the mitigation project being considered, a map showing the location and extent of the prospective mitigation area that includes topography, a United States Geological Survey (USGS) quad map showing the mitigation area, a county soil survey, and consent from the current owners of the land to allow the DEP to inspect the site.

Following the conceptual review (or following site selection if the applicant chooses not to request a conceptual review), the applicant must prepare and submit the mitigation proposal. To ensure a more streamlined application and review process, applicants are encouraged to submit the mitigation proposal as part of the permit application whenever feasible. Most permit applications require public notice, which is also required for any mitigation project that includes restoration, creation, or enhancement activities. If the mitigation proposal is provided as part of the permit application and the mitigation is to be provided on the same site as the disturbance, separate public notice is not required for the mitigation activities, but if the mitigation proposal is submitted later, additional public notice will be necessary.
Similarly, if the mitigation proposal is not included in the permit application, an additional permit may be needed to perform the mitigation activities, but a separate permit is not required if the mitigation proposal is submitted as part of the permit application.

Early coordination between the applicant and the DEP is recommended.

Regardless of when the mitigation proposal is submitted, the DEP will review the proposal and conduct a site inspection (if necessary) within 30 calendar days of receipt. During the review process, DEP staff may provide recommendations to modify the design or the details of the mitigation proposal or request further information in order to determine if the proposed mitigation is acceptable. After any DEP comments and/or questions are addressed, the DEP will issue a letter either approving or denying the proposal. To ensure that the mitigation proposal will be successful, see Section 3.3 for information on how to develop the proposal.

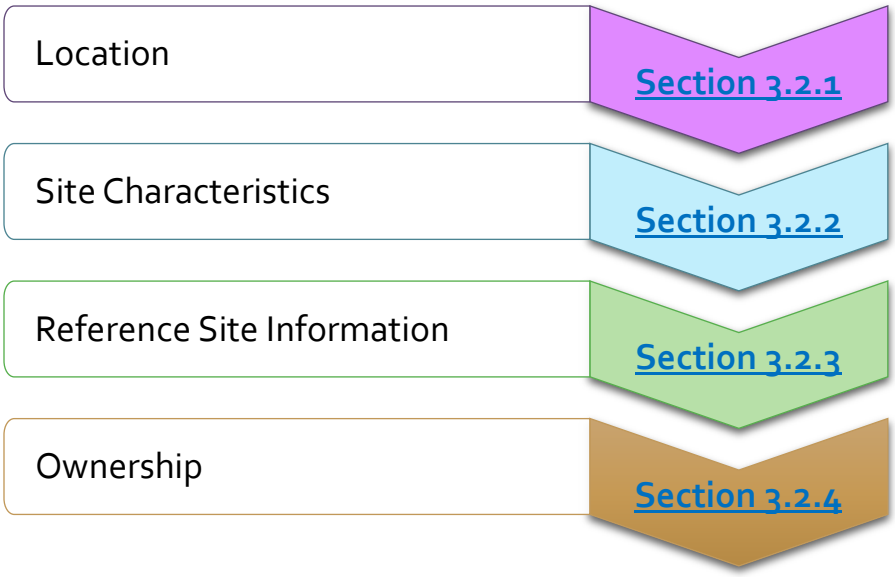
Once a mitigation proposal is approved by the DEP in writing, the construction of the mitigation site and the permitted activity can commence. It is important to reiterate that the construction of the permitted activity must be carried out concurrently with the construction of the mitigation project. To avoid delays in commencing construction of the permitted activity, the applicant should carefully consider the time necessary to select a mitigation site and prepare and submit a mitigation proposal as well as the time the DEP requires to review and approve the proposal when developing their desired schedule for the permitted activity. Construction of the mitigation site should generally follow the schedule that is required as part of the mitigation proposal. Site preparation and construction of a mitigation site are discussed in greater detail in Section 3.4.

After the mitigation project is constructed, monitoring is essential to ensure that the project has been successful. Monitoring requirements and procedures are provided in Section 3.5.

3.2 Site Selection

Selecting a site that is suitable for a restoration, creation, or enhancement project is crucial to achieving successful wetlands or riparian zone mitigation. The FWPA, CZM, and FHACA Rules each contain specific standards for these mitigation sites, and any site that is selected for mitigation must be consistent with the applicable rules. A mitigation proposal will not be approved if the applicant proposes a mitigation project on a site that is inconsistent with the rules and/or that is unlikely to result in adequate or successful mitigation.

This section of the manual provides information to help select a site that will be appropriate for a restoration, creation, or enhancement project. The essential factors that should be considered when searching for and selecting a site include the following, each of which is discussed in further detail below:



The DEP highly recommends screening a potential mitigation site to identify any issues that may render the site unsuitable for mitigation. Section 3.2.5 explains how to screen a site using a desktop analysis.

As mentioned in the previous section, the DEP also recommends applicants request a conceptual review of a potential mitigation site prior to purchasing land or preparing a mitigation proposal.

3.2.1 Location

Location is one of the most essential criteria to consider during site selection. The site must be located in an area that is appropriate for the type of resource and for the specific method of mitigation that will be proposed. For example, a potential mitigation site that is located outside of an existing riparian zone may not be appropriate for riparian zone enhancement. The site must be located directly adjacent to the riparian zone without any intervening separation, such as a road, and must be within a certain distance from the waterway. For a waterway with a 50-foot riparian zone, the mitigation site must be located within 100 feet of the waterway, and for a waterway with a 150- or 300-foot riparian zone, the mitigation site must be located within 300 feet from the waterway. For riparian zone restoration activities, the mitigation site will not be approved if separated from the waterway by a roadway, railroad, or other intervening structure.

For wetlands mitigation, the site should be in a location where the resource could be expected to exist under natural conditions. This will maximize the likelihood that the mitigation will be successful. The applicant should look for sites that were formerly wetlands as well as sites that are located adjacent to existing wetlands. If an area was previously a wetland, some of the conditions necessary for wetlands may still exist on the site. If the site is adjacent to a wetland, it may be possible to extend the wetland onto the proposed mitigation site, provided it does not harm the existing wetland. Selecting a site that is not located near existing or former wetlands increases the chances that the site's characteristics, such as its hydrology (see Section 3.2.2 below), will not be suitable for wetlands mitigation. For example, the site may require the removal of several feet of material to reach the groundwater necessary to sustain a wetland, which is unlikely to result in successful wetland mitigation.

Applicants should consider the following areas for potential mitigation sites (depending on whether the resource is wetlands or riparian zones), as these areas usually have the highest potential for mitigation success:

- Existing wetlands that are degraded
- Former wetlands that are no longer wetlands because they have been man-altered
- Areas adjacent to existing wetlands
- Disturbed riparian zones
- Areas connected to waterways or within the 100-year floodplain
- Areas adjacent to forested areas
- Disturbed areas, such as sand and gravel mines
- Areas accessible to equipment needed for construction

When considering potential locations, the applicant must also consider the rule requirements for onsite vs. offsite mitigation. As explained in Section 2.4, the DEP usually prefers restoration, creation, and enhancement activities to be conducted on the same site as the disturbance. When

offsite mitigation is allowed, the mitigation site will at least need to be in the same watershed management area as the permitted disturbance in most cases. New Jersey's watershed management areas are shown in Figure 2.9.

Figure 3.1 below provides a brief outline of the requirements for the project's location when offsite mitigation is permissible.

Figure 3.1: Where to Select a Site for Offsite Mitigation Projects

Resource	Rule	Where to Select a Site
Freshwater Wetlands and Transition Areas	FWPA Rule	Within the same WMA as the disturbance
Riparian Zones	FHA Rule	Within the same WMA as the disturbance and preferably along the same waterway
Coastal Wetlands and ISS	CZM Rule	Within the same WMA or the same estuary as the disturbance

It is important to note that the mitigation hierarchy for riparian zones (see Figure 2.7) allows applicants to perform restoration, creation, and enhancement mitigation in a different watershed management area from the disturbance if it is not feasible to perform mitigation in the same watershed management area. However, the mitigation must be provided as close as possible to the WMA where the disturbance is to occur and must fully compensate for the disturbance.

To determine that performing the mitigation in the same WMA as the disturbance is not feasible, the applicant will need to thoroughly assess at least six sites that are located within the same WMA. This assessment will need to evaluate the locations of the sites in relation to the site of the disturbance, the suitability of each site for riparian zone mitigation, and why each site is ineligible for mitigation. For example, a suitable riparian zone site may be located in the correct WMA, but the site may be subject to a conservation restriction that renders it ineligible for mitigation. The assessment will need to be included in the mitigation proposal (see Section 3.3).

3.2.2 Site Characteristics

All sites proposed for restoration, creation, or enhancement mitigation should be degraded or otherwise altered so that they will benefit ecologically from the proposed mitigation. The site will not be acceptable for mitigation if it already has high ecological functions and values. For instance, forested sites often have high functions and values, and therefore provide limited opportunities for mitigation.

Some of the specific site characteristics that the applicant should consider include the following, each of which is explained below:

- Vegetation
- Wildlife
- Threatened and endangered species
- Hydrology
- Soils, substrates, sediments, and leaf litter
- Climate change vulnerability
- Topography
- Historic and archeological resources
- Contamination and ecological risk

The following areas are often not acceptable for mitigation but may have some potential depending upon the type and nature of the mitigation project. Applicants should consider carefully before choosing a site in one of these areas:

- Upland forested areas
- Areas identified as important habitat for rare, threatened, or endangered plant and wildlife species
- Areas with historic or archeological resources
- Areas with moderate or steep slopes
- Contaminated sites
- Dredged material disposal areas
- Areas adjacent to commercial development and highways that will be a source of pollutants

Vegetation

Both the existing and proposed vegetation are crucial to a successful mitigation project. During site selection, the applicant should consider at least the following aspects of the site's vegetation:

1. What vegetation will need to be removed? For example, the DEP does not allow any forest removal for the purposes of conducting mitigation. If the site will require trees to be removed to accommodate the project, the mitigation proposal will not be approved, even if the applicant proposes to replace the trees after construction. During site selection, the applicant should identify if there are trees on the site that will need to be protected as the project is constructed.

2. How much invasive cover exists? Sites covered predominately with non-native, invasive species are much more likely to be suitable for riparian zone or wetlands mitigation than sites featuring mostly native, non-invasive vegetation.
3. Is there a nearby invasive seed source? If the potential is high for the site to be naturally repopulated by invasive species after construction of the mitigation project, the site is unlikely to be successful for mitigation.
4. What plantings and protective measures will be needed on the site for successful mitigation? See Section 3.3.3 for more information about planting and preventative maintenance requirements for mitigation.

Wildlife

Both the existing wildlife on the site and the site's potential for wildlife are important aspects to consider during site selection. If performing mitigation on a site can increase the site's suitability for wildlife, the mitigation project is more likely to be deemed ecologically successful. However, if a site has existing wildlife, the proposed plantings may need to be protected from the wildlife during and after construction of the mitigation project. See Section 3.3.3 for information on protecting vegetation from wildlife.

Threatened and Endangered Species

In addition to the vegetation and wildlife considerations described above, the presence of threatened or endangered plant and animal species must be taken into account during site selection because the mitigation project cannot adversely impact those species and/or their habitat. If a site with threatened or endangered species is selected for mitigation, the applicant will need to ensure and demonstrate that the mitigation will not negatively impact the threatened or endangered species. However, a proposed mitigation project that can provide a benefit to a threatened or endangered species has a high likelihood of success. Section 3.2.5 explains how to screen a site for the potential presence of threatened or endangered species.

Hydrology

For a wetlands mitigation site, hydrology should be considered during site selection to ensure that the site has the water, or the potential for the water, that will be necessary to support a wetland. For more information on hydrology, see Section 3.3.1.

Substrates, Sediments, and Leaf Litter

Substrates, sediments, and leaf litter all provide indicators of the factors affecting the site. For example, if sediment is present, the site may be impacted by current or future erosion, which could affect the long-term success of the mitigation project. If the substrate on the site includes hydric soils, the site likely has wetland hydrology (see Section 3.3.1 for information on hydrology and Section 3.3.2 for how to perform a soil analysis). Leaf litter can also be an indicator of the site's hydrology.

Climate Change Vulnerability

During site selection, the applicant should consider if the site is potentially vulnerable to climate change impacts. Climate change models for New Jersey indicate five feet of sea level rise above the existing mean higher high water elevation by 2100. Other predicted changes include an increase in the frequency, intensity, and amount of precipitation as well as a potential increase in summertime drought (New Jersey Department of Environmental Protection, 2020). Sea level rise and increases in precipitation lead to more intense and frequent storms and flood events, especially in coastal areas.

Wetlands are dependent upon hydrology (water), which includes groundwater and precipitation. Therefore, it is important to consider the effects of potential changes in precipitation patterns when planning a wetlands mitigation project. Forested systems can be especially sensitive, especially when newly planted. Young trees in New Jersey cannot survive with either too much or too little water. Storms and flooding can also lead to intense saturation of soils and could negatively impact future plantings on both wetland and riparian zone mitigation sites.

Topography

The elevation and slope of a site are both critical to ensuring that the mitigation site will receive adequate hydrology, which is necessary for successful wetlands mitigation. Sites located at higher elevations are unlikely to achieve the hydrology necessary to sustain wetlands. As for the site's slope, the Department recommends a 10:1 slope, which provides a gentle transition from wetland to upland. Sites that do not feature the appropriate elevation and/or slope may require grading. *Grading* refers to shaping the land or soil to achieve the elevation and slope necessary for a wetland to be established.

The applicant should also consider the site's microtopography. *Microtopography* describes soil surface variations, such as small rills, mounds, and valleys in the soil. Such surface variations increase the surface area, which helps the site to retain water.

Historic and Archeological Resources

The FWPA, CZM, and FHACA Rules do not allow for any impacts to historic, cultural, or archaeological resources. Therefore, if any earthwork activities will be necessary to prepare a potential mitigation site for mitigation, the applicant should take into consideration whether the site contains these resources and if they will be impacted by the proposed earthwork activities. *Earthwork* is any work that a mitigator will do to prepare the mitigation site for construction, including the excavation of soil, creation of microtopography, decompaction of soil, or any other activity that requires the physical alteration or movement of earth.

The National Register of Historic Places in New Jersey identifies historic resources. Section 3.2.5 also provides information to help screen a site for the potential presence of these resources using a desktop analysis.

Contamination and Ecological Risk

The FWPA, CZM, and FHACA Rules prohibit mitigation projects that pose an ecological risk. With respect to mitigation, *ecological risk* means the mitigation will result in exposure or introduction of contamination to an ecological community. Contamination is often caused by industrial and farming activities or waste disposal.

Before selecting a site for restoration, creation, or enhancement mitigation, the applicant should screen the site for contamination. It is common in New Jersey to encounter potential mitigation sites that are contaminated. Screening a potential site can help identify current contamination on the site. If the screening identifies possible contamination, the applicant should consider carefully before selecting that site for mitigation as further investigation and assessment of the ecological risk will likely be required, and remediation may be necessary to make the site suitable for mitigation. The process for screening, assessing, and remediating sites for contamination is explained in detail in Section 3.3.4.

3.2.3 Reference Site Information

Reference sites should be consulted, particularly for wetlands mitigation projects. *Reference sites* are field sites encompassing the range of variability exhibited by wetlands in the area that illustrate the local conditions that could affect the mitigation project. Researching local reference sites can provide

valuable information about the plants that grow naturally in the area, the type(s) of soils that are present, and the hydrology of the area.

An assessment of the vigor of the reference wetlands can also provide an indication as to whether the proposed mitigation project is likely to be successful. For example, if the applicant must mitigate for impacts to forested wetlands, reference sites will demonstrate whether forests in the vicinity of the proposed mitigation site are healthy or showing signs of decline. Is there greater inundation than would support a forested condition, or are neighboring sites too dry? Is that due to precipitation, subsidence, or other causes? Without such an assessment of the local conditions, the short and long-term success of the proposed mitigation project may be jeopardized.

In some cases, reference site data may assist with the design of the mitigation project. The applicant may be able to simply reproduce the conditions and standards found in the reference site(s) to achieve the same functional capacity on the mitigation site (Smith et al., 1995, 30). However, wetland ecosystems are constantly changing, so the applicant may need to adapt from the reference site.

3.2.4 Ownership

The ownership of a site may impact its suitability for restoration, creation, and enhancement mitigation projects. Freshwater wetlands mitigation projects must be constructed on private property in most cases. However, a government agency may conduct a mitigation project on public property provided that the project meets all of the following criteria:

1. The project is funded solely with public monies.
2. The land was not acquired with Green Acres funding.
3. At least one of the following three criteria is met:

The land is obtained or held by the government agency for the purposes of mitigation.

The land is obtained by the government agency by default or operation of law, through tax lien, or other similar circumstances.

The land obtained or held by the government agency is or was formerly a wetland, and the government agency is proposing to restore and/or enhance that wetland through mitigation.

Restoration, creation, and enhancement mitigation projects for coastal wetlands and riparian zones may be constructed on either public or privately owned property. However, regardless of whether the property is public or private, it must be owned in fee simple and under the legal control of the person performing the mitigation unless that person demonstrates that they have sufficient legal

rights to the property to comply with the applicable rules. If a public property was purchased with Green Acres funding or is subject to any Green Acres restrictions, the Green Acres Program must approve the use of that property for mitigation.

For all restoration, creation, and enhancement mitigation projects, regardless of the resource, the mitigator must have the legal authority to place a conservation restriction on the land when the mitigation is complete. If for some reason a conservation restriction cannot be placed on the property, the site cannot be used for mitigation.

3.2.5 Screening a Potential Mitigation Site

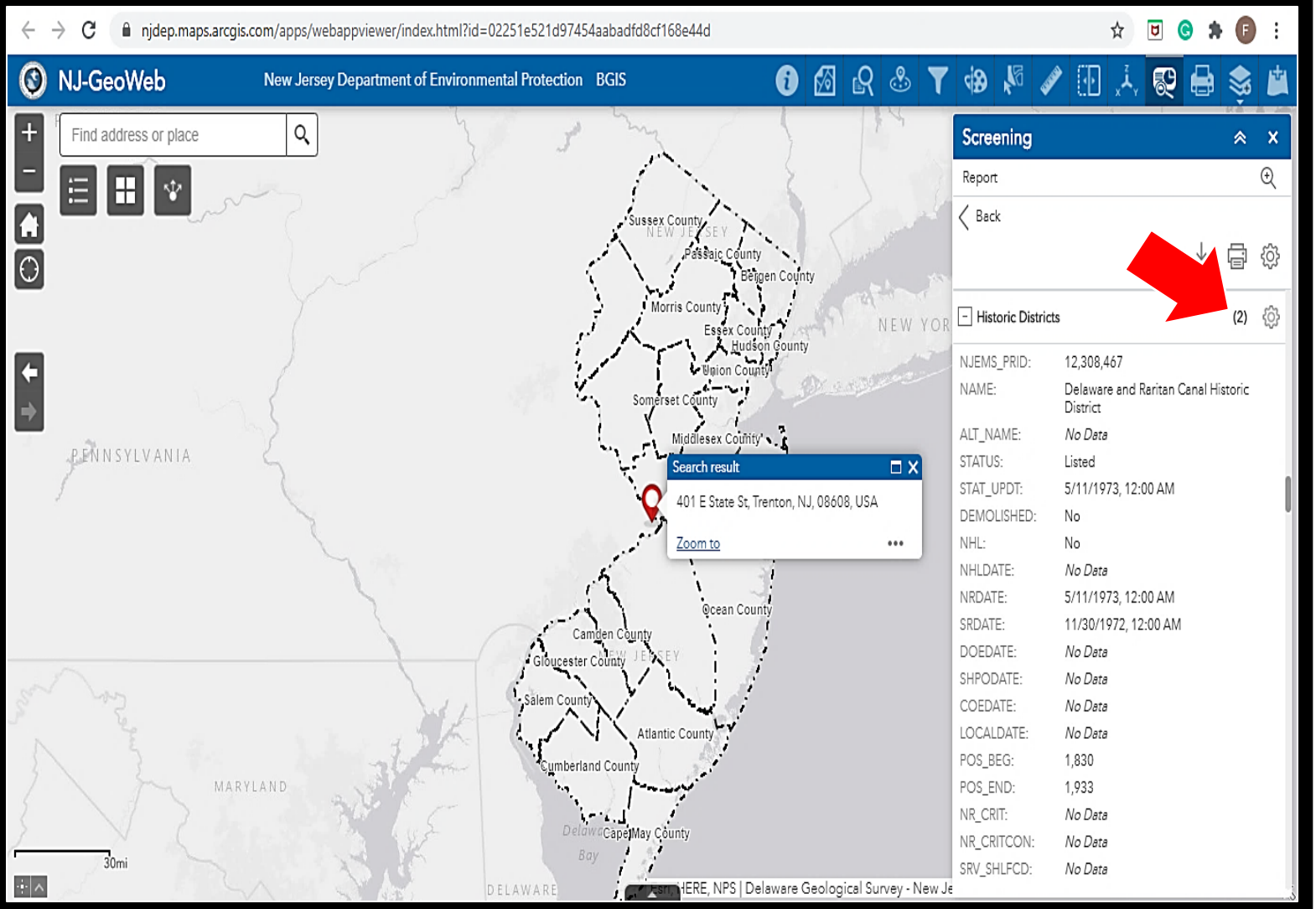
Screening a potential mitigation site through a desktop analysis can provide useful information for determining if the site is appropriate for a restoration, creation, or enhancement mitigation project. The DEP recommends using NJ-GeoWeb, which will provide information on several important factors that may impact the selected site, including watershed boundaries, possible contamination information, known state historic resources, and known threatened and endangered wildlife habitat.

To screen a potential mitigation site using NJ-GeoWeb, first click on the screening button at the top right corner of the page. 

Next, enter the site's street address or x, y coordinates, and hit *Report*. The program will now provide the list of factors for the site. Any factor that has already been identified on the site by the DEP will be flagged, and further information about that factor can be accessed by pressing the dropdown button indicated by a plus sign (+) to the left of the listed factor.

For example, Figure 3.2 on the next page shows the DEPs headquarters in NJ-GeoWeb. The screening tool indicates that the address is located within two historic districts, as indicated by the (2) located to the right of the factor title "Historic Districts." The plus sign for historic districts has been selected, so the menu at the right side of the screen is providing additional information about that factor.

Figure 3.2: Example Desktop Screening Using NJ-GeoWeb



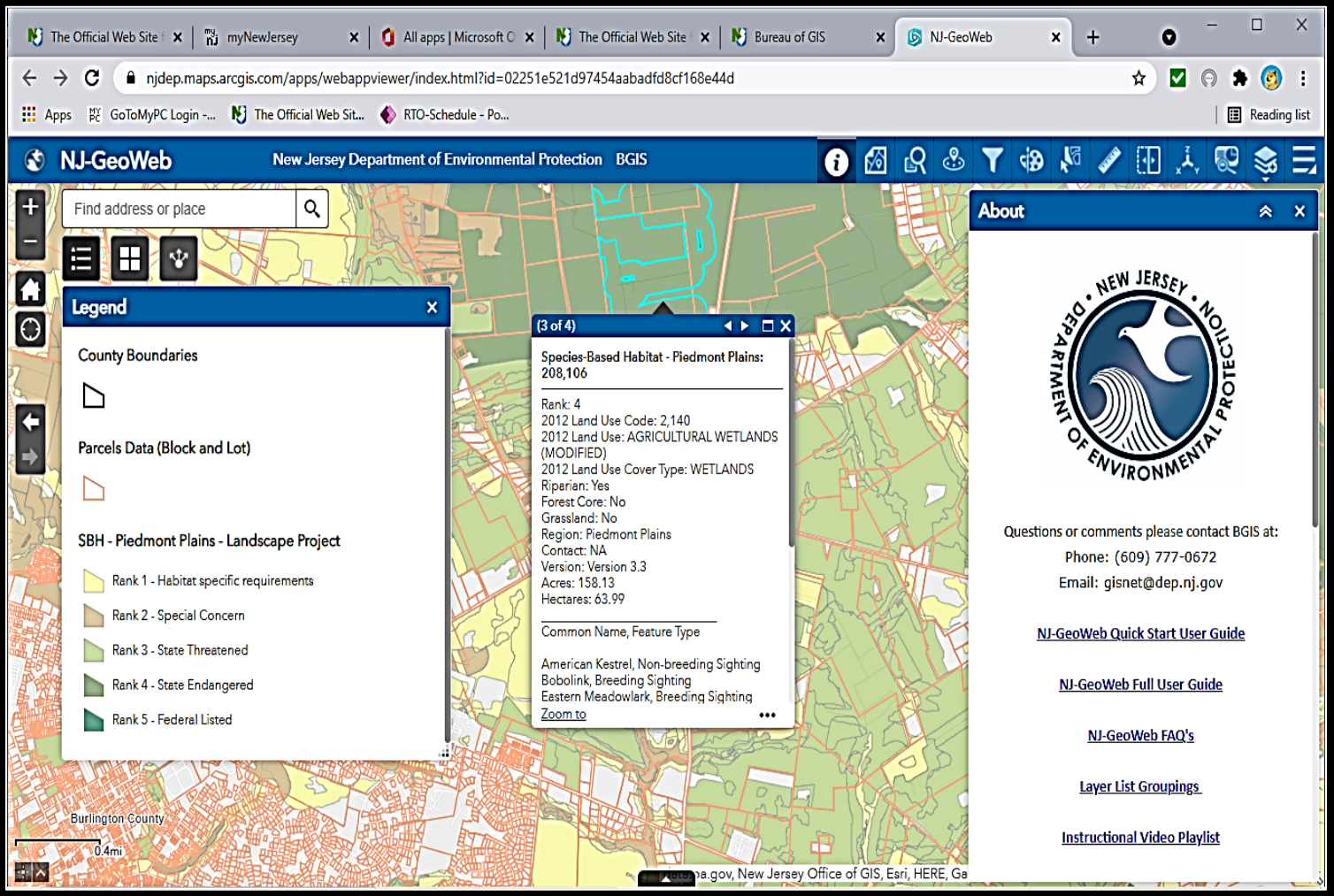
While NJ-GeoWeb provides useful information for the site selection process, the applicant may need to examine mapping and/or other more detailed sources of information for some of the listed factors in order to fully screen potential mitigation sites and prepare the mitigation proposal. See Section 3.3.4 for more detailed information on assessing possible contamination and ecological risk.

A good tool for identifying the location of threatened and endangered species habitat is the DEP's Landscape Project mapping, which is available for download at https://www.nj.gov/dep/gis/. The Landscape Project will provide a rank for the site of interest based on its potential to have threatened or endangered animal species (see Figure 3.3 on the next page). A site identified as Rank 3, 4, or 5 indicates that the site contains, has been identified as, or has the potential to be feature habitat for threatened and endangered species. For mitigation purposes, identifying a site as Rank 3, 4, or 5 does

not prevent the site from being used for mitigation, but the applicant may wish to consider carefully before selecting such a site for restoration, creation, or enhancement. A demonstration that the proposed activities will not have negative consequences for the species in question will be required as part of the mitigation proposal.

The Landscape Project mapping also provides a list of the species that value each habitat patch on the map, as shown in Figure 3.3. Click on the habitat patch of interest with the identify tool, and then page over to the landscape data.

Figure 3.3: Landcape Project Mapping



It is important to note that this mapping tool will not provide all of the information necessary to select a site or complete a mitigation proposal. A field evaluation may be necessary to determine if the habitat on the site remains suitable for the documented species.

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Other tools that might be useful for screening threatened and endangered species include:

- Section 7 ESA mapper
- The United States Fish and Wildlife Service (USFWS) website for federally listed species
- Natural Heritage Grid Maps for New Jersey (for identifying rare plants)

One additional tool that could prove useful for screening potential mitigation sites is the Water Resource Registry, produced by the United States Environmental Protection Agency (USEPA). The goal of the Water Resource Registry (WRR) is to map natural resource areas that are a priority for preservation or restoration. A major effort of the WRR project is to design a screening tool to target available sites for the protection of high-quality resources, restoration of impaired resources, and improvement of water resources. New Jersey is currently working with the USEPA to develop a Water Resource Registry specifically for New Jersey. Once this project is completed, this manual will be updated to provide further information on this resource.

3.3 Developing the Mitigation Proposal

The mitigation proposal for a restoration, creation, or enhancement project must be a detailed narrative with accompanying documentation that conclusively demonstrates that the project has a high probability of success and will adequately compensate for the disturbance to the protected resource. To do so, the mitigation proposal must provide a thorough description and analysis of:

1. The disturbed site and resource
2. The proposed mitigation site prior to construction
3. The mitigation plan
4. The intended condition of the mitigation site after construction

This section of the manual provides information to help adequately analyze and describe these required components so that the mitigation proposal will be successful. The DEP also provides checklists with the specific requirements for each type of mitigation proposal at https://www.nj.gov/dep/landuse/forms.html. This manual does not address every requirement, so the checklists should be consulted carefully along with the applicable rules. Each mitigation proposal must include all of the information listed in the applicable checklist. If any item on the checklist is missing from the mitigation proposal, the proposal will not be approved.

Each proposal should begin with an introduction, which should describe the project for which the mitigation is required, including the types of resources being impacted (e.g., forested wetlands, herbaceous wetlands, riparian zone, etc.) and the number of acres of impact for each resource. A copy of the permit should be included in the proposal if it has been issued. If the permit application is

still pending, the introduction should describe the proposed impacts. The introduction should also provide the number of acres of proposed restoration, creation, and/or enhancement required to compensate for each disturbance. A useful way to provide this introductory information is in a table, such as the one shown in Figure 3.4 below. If multiple mitigation sites are necessary to provide the necessary compensation, this table can also be used to show how the mitigation will be performed across those different sites.

Figure 3.4: Sample Table for Proposed Mitigation

Mitigation Type	Resource Type	Acres of Impact	Ratio	Acres of Mitigation	Lot, Block, Municipality, & County
Restoration	Forested Wetland	1.4	2:1	2.8	Lot X, Block X, Municipality, County
Enhancement	Herbaceous Wetland	3	3:1	9	Lot X, Block X, Municipality, County
Enhancement	Forested Riparian Zone	0.2	3:1	0.6	Lot X, Block X, Municipality, County

The introduction must also describe the goals of the mitigation project in terms of the resource type(s) and their functions and values as well as how the project will satisfy those goals.

Following the introduction, the proposal should describe the resource that is being disturbed or destroyed. Section 2.6 of this manual explains how to perform a functional assessment of the disturbed resource, which must be included in the mitigation proposal. The mitigation proposal checklists include additional information necessary for describing the disturbance and the disturbance site, such as maps and delineations. Some of the information contained later in this section may also be useful for describing the disturbance site, such as the sections on hydrology, soils, and vegetation.

The proposal should be written so that anyone reading it will have a good understanding of the disturbance site, the mitigation site, the project, and its goals and objectives, regardless of whether they have visited the sites.

Next, the mitigation proposal must adequately describe the proposed mitigation site in its pre-construction state and provide any documentation that is appropriate for each site characteristic, including, but not limited to:

Site location within the landscape	See Section 3.2.1	
Topography, including microtopography	See Section 3.2.2	
Boundaries of the mitigation site and existing resources		Necessary documentation → a wetland delineation or riparian zone verification
Functions and values of existing resources	See Section 2.6	Necessary documentation → functional assessment, such as a Floristic Quality Assessment (see Appendix A)
Reference Site Information	See Section 3.2.3	
Hydrology	See Section 3.3.1	Necessary documentation → water budget
Soils	See Section 3.3.2	Necessary documentation → soil profiles and data sheets
Vegetation	See Section 3.2.2	
Wildlife and threatened and endangered species	See Section 3.2.2	
Contamination and ecological risk	See Section 3.3.4	Necessary documentation → ecological risk assessment

The proposal must also fully describe the proposed mitigation project and the intended condition of the site post-construction, including the proposed modifications to the functions of the existing resources. Supporting documentation should include maps, photographs, surveys, topography plans, and site plans. In addition, the proposal must describe the vegetation for the proposed mitigation site, including planting plans, an invasive species plan, and proposed measures for controlling deer or other herbivores. Vegetation is discussed in depth in Section 3.3.3, including how to develop a planting plan and a preventative maintenance plan.

In addition to the introduction, narrative elements, and supporting documentation described above, every proposal should also include:

1. A table of contents
2. Site information
    - The lot, block, municipality, and county of the proposed mitigation site should be listed on the front page of the mitigation proposal.
3. Property ownership information
4. Contact information
    - Contact information should be provided for all parties involved with the mitigation site and the construction, if known, including the names and addresses of all current and proposed owner(s) of the proposed mitigation site as well as the names and addresses of all consultants, engineers, and others providing technical assistance in preparing the mitigation proposal.
5. Draft conservation restrictions
6. Financial assurance (see Section 3.3.5 below)

3.3.1 Hydrology

Hydrology refers to the regular presence of water, which causes soil to be saturated periodically, seasonally, or even permanently. The potential sources of water on a site include precipitation, overbank flooding, surface water runoff, ground water discharge, and tidal flooding. For coastal wetlands, the hydrology is the tidal range.

All wetlands restoration, creation, or enhancement mitigation proposals must include a discussion of hydrology, which is one of the three parameters used by the DEP to determine if an area is a wetland. An area has wetland hydrology when it meets the criteria contained in *The Federal Manual for Identifying and Delineating Jurisdictional Wetlands*, published in 1989 by the USEPA, USACE, USFWS, and the Soil Conservation Service, which was the precursor to the United States Department of Agriculture's Natural Resource Conservation Service (NRCS). This manual should be used as the default guide for determining wetland hydrology on a site.

For wetlands enhancement projects, the mitigation proposal should demonstrate that wetland hydrology already exists on the proposed mitigation site prior to construction. When evaluating hydrology, it is important to consider local and regional weather/climate conditions because excess precipitation can lead to a false positive for hydrologic function.

To demonstrate the presence of wetland hydrology, the applicant can utilize any of the following:

- Field indicators
- Monitoring wells
- Tidal gauges
- Piezometers
- Aerial imagery
- Other appropriate methods

However, the DEP encourages the use of monitoring wells, piezometers, and tidal gauges. On sites where groundwater (which is water that lies beneath the surface) may be a potential source of hydrology, monitoring wells provide access to that water and help determine the depth to groundwater. On tidal sites, tidal gauges measure the water level change in relation to tidal datums and should be placed where a tidal regime is unknown. Piezometers measure water pressure in pores under the ground.

Hydrologic field indicators are characteristics that can be visually observed on a mitigation site and are one of the more common methods for determining if wetland hydrology is present. The wetland hydrologic indicators are listed and explained in *The Federal Manual for Identifying and Delineating Jurisdictional Wetlands*. In general, the hydrologic indicators are as follows, organized into four categories (U.S. Army Corps of Engineers, 2012, 83-113):

Group A: Observation of surface water or saturated soils	Group B: Evidence of Recent Inundation	Group C: Evidence of Current or Recent Soil Saturation	Group D: Evidence from other Site Conditions or Data
• Surface water • High water table • Saturation	• Water marks • Sediment deposits • Drift deposits • Algal mat or crust • Iron deposits • Surface soil cracks • Inundation visible on aerial imagery • Sparsely vegetated concave surface • Water-stained leaves • Drainage patterns • Aquatic fauna • Marl deposits • Moss trim lines	• Hydrogen Sulfide odor • Dry season water table • Recent iron reduction in tilled soils • Oxidized rhizospheres along living roots • Presence of reduced iron • Thin muck surface • Crayfish burrows • Saturation visible on aerial imagery	• Stunted or stressed plants • Geomorphic position • Shallow aquitard • Microtopographic relief • FAC – neutral test

It is important to note that the lack of a hydrologic indicator on a site does not confirm the lack of wetland hydrology (U.S. Army Corps of Engineers, 2012, 114).

For wetland restoration and creation projects, wetland hydrology does not need to be present on a proposed mitigation site prior to construction of the mitigation project. However, the DEP requires the submission of a water budget, which demonstrates that the site has an adequate water supply to achieve proper wetland hydrology and provides a complete assessment of all sources of water on the site.

Identifying the sources of water on a site can be crucial as the DEP may consider a site that relies on precipitation or surface water flow as the primary source of water to be a risky site for mitigation (unless the site is located in a tidal area or floodplain that experiences extensive periods of flooding). Precipitation and surface water flow can be inconsistent and are subject to change as development and alterations to the landscape occur within the surrounding areas.

To assist applicants with assessing hydrology and preparing water budgets for potential mitigation sites, the DEP created the *Regionalized Water Budget Manual for Compensatory Wetland Mitigation Sites in New Jersey*. When submitting a water budget, the applicant should also submit all of the data that was used to prepare the water budget.

Additional resources related to hydrology that may be useful include:

- NRCS Web Soil Survey
- USGS Real-Time Water Data
- USGS Surface-Water Data for the Nation
- NOAA - National Climate Data Center

A discussion of hydrology is not required for riparian zone mitigation sites. However, the mitigation plan should include a discussion of how any proposed plantings will obtain sufficient water to sustain and support them. Also, the required description of the pre-construction mitigation site should address whether the site is in a floodplain. If flooding occurs before any proposed vegetation has established, the newly planted vegetation could be destroyed.

3.3.2 Soils

An analysis of the soils on a mitigation site is essential for any wetland restoration, creation, or enhancement mitigation proposal. The proposal must provide soil profiles taken from the mitigation site prior to any construction. Photographs of the soil profiles should be included along with a description of the types of soils present and the location of each soil boring, which is a shallow core

extracted from the ground that is used to survey the soil. In addition, the proposal should include data sheets that confirm the soil texture, chemistry, depth, and any other features that may affect the proposed mitigation project.

For wetlands enhancement projects, the pre-construction site should be a functioning wetland, so the soil profiles should show evidence of hydric soils, which are one of the three parameters the DEP uses to identify a wetland. *Hydric soil* is soil that is saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions, meaning there is no oxygen present in the soil. The microbes that live in soil break down the soil's organic carbon compounds for energy but do so at a much lower rate in saturated, anaerobic environments. This leads to an accumulation of partially decomposed organic material that often takes the form of "thick organic surface horizons, such as peat or muck, or dark organic-rich mineral surface layers" (United States Department of Agriculture, 2018, 3). As a result, hydric soil generally appears darker in color than regular soil and sometimes has red, green, or purple tones, which indicate the presence of certain minerals. Figure 3.5 below shows a visual comparison of upland (non-hydric) soil and wetland (hydric) soil.

Figure 3.5: Upland vs. Wetland Soil

Upland (Non-Hydric) Soil

Wetland (Hydric) Soil

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For information on how to identify hydric soils, applicants should consult *The Federal Manual for Identifying and Delineating Jurisdictional Wetlands*. The following resources may also be helpful:

- *Field Indicators of Hydric Soils in the United States*, published by the NRCS
- New Jersey's Official List of Hydric Soils, developed by the NRCS
- The National Wetlands Inventory, entitled "The Wetlands of New Jersey," published in 1985 by the USFWS

It is important to note that in New Jersey, the following may also be considered hydric soils for the purposes of identifying wetlands:

1. Alluvial land (which is a type of soil deposited by running water) that is mapped on soil surveys
2. Other soils that are identified as having hydric characteristics through field investigations conducted in accordance with Part III of the 1989 Federal manual
3. Wet phases of somewhat poorly drained soils that are not on New Jersey's Official List of Hydric Soils but are associated with a wetland

In contrast to sites for wetlands enhancement, mitigation sites that are proposed for wetland creation or restoration projects should not be functioning wetlands prior to construction since the purpose of creation and restoration mitigation is to establish or re-establish wetland functions where such functions do not currently exist. Therefore, soil from the pre-construction mitigation site should show upland characteristics, similar to the image on the left in Figure 3.5. If the soil profiles show evidence of hydric soils, the applicant should evaluate the plants inhabiting the site to determine if they are predominantly wetland plants (see Section 3.3.3 below). If so, then creation or restoration may not be the appropriate form of mitigation.

In addition to providing an analysis of the existing soil conditions on the mitigation site, a wetlands mitigation proposal must also include a detailed narrative of the proposed soil/substrate. This narrative should address all of the following:

1. How will the substrate be prepared?
2. How much topsoil will be removed and/or added?
3. What is the chemical condition of the proposed soil?

Finally, the proposal should explain the types of fertilization, excavation, and soil amendments anticipated for the site. A *soil amendment* is any material that is added to the soil to create the soil conditions needed on a site.

Soil analysis is not as critical for riparian zone mitigation since hydric soils are not an indicator for riparian zones. However, for mitigation to be successful, every mitigation project should include the proper grading and substrate/fill type.

3.3.3 Vegetation

Both wetlands and riparian zone mitigation proposals for restoration, creation, or enhancement projects must contain a thorough description of the existing vegetation on the site of the disturbance and the pre-construction mitigation site. They must also include a plan that depicts the vegetative community that is proposed for the mitigation site. This plan can be part of a site plan or a landscape plan, or it can be a separate plan specifically identified as a riparian zone or wetland mitigation planting plan. Any of these will be accepted by the DEP, provided the proposed mitigation vegetation is clearly identified, but for the sake of brevity, the term "planting plan" will be used throughout the remainder of this manual.

The mitigation proposal must also include a discussion about preventative maintenance that details how invasive plants and herbivory will be controlled. The preventative maintenance plan should explain the measures that will be taken if a problem arises with invasive or noxious plants or predation during the construction or monitoring phases of the project.

This section of the manual provides helpful information for developing a planting plan and developing a preventative maintenance plan.

Developing a Planting Plan

All planting plans must include specific details of the plant materials that will be utilized for the mitigation project, including the plant material types, the diversity of plant material, the specific

species that will be planted, the quantity of each species, and the source of the plant materials. In addition, the plan must specify the plant material size, the proposed spacing for the plants, and whether there is a need for irrigation.

To help the applicant develop a successful planting plan for a mitigation project, this section provides detailed information on:

Selecting Plant Material

Plant Material Sizing

Plant Material Spacing

Irrigation

This section also describes the required components of a planting plan to ensure that the plan submitted to the DEP provides all of the information necessary to determine if the proposed restoration, creation, or enhancement project meets all of the applicable rules and is likely to result in successful mitigation.

Selecting Plant Material

When selecting plant material for a mitigation site, the key factors to consider are:

Native species

All species selected for mitigation must be native to New Jersey. Non-native species will not be accepted. The DEP will also not accept cultivar material of native woody and herbaceous species. *Cultivars* are a divergence of the native gene type that usually possess a colorful, common name such as 'red rocket' or 'purple star' and are indicated by "*Genus species x species*." Cultivars have been found to be ineffective in providing ecological functions compared to the natural, native genotype.

Species appropriate to the region

Certain species have adapted to the unique conditions found in specific regions of the state. For example, a plant species may be prevalent throughout the coastal plain but will be uncommon in the eastern mountain piedmont. Plant material that is suitable to the region of the mitigation site will be more likely to survive, so a mitigation project that utilizes regional plants is more likely to be successful. Appendix B provides access to a list of regional plant species for New Jersey.

Species appropriate for the protected resource

The plant materials selected for a wetlands mitigation project must include hydrophytes (also called hydrophytic vegetation). A *hydrophyte* is a plant species that has adapted to grow and reproduce

under periodically saturated root zone conditions during at least a portion of the growing season. Hydrophytic vegetation is one of the three parameters the DEP uses to determine a wetland (along with hydrology and hydric soils). When selecting plant material for wetlands mitigation projects, it is important for the applicant to know the wetland indicator status, which is the probability that the plant will occur in wetlands. The wetland indicator status can be obtained from the USACE on their National Wetland Plant List website. More information is also provided in this manual in the discussion of the monitoring requirements in Section 3.5.

It is also important to note that species that are appropriate for wetlands may not establish in transition areas or upland riparian zones.

Reference site information

When selecting plant materials for a planting plan, the DEP recommends using reference sites, which were discussed earlier in this manual. Reference sites will illustrate the local conditions, including the types of plant materials that are likely to survive in the immediate vicinity of the mitigation site. However, when using a reference site, the applicant should only reference the native vegetation. If a reference site is dominated by an invasive species, such as common reed (*Phragmites australis)*, the applicant should not select that species for the planting plan but should instead conduct a historical assessment by reviewing historical aerial photography to determine the original flora of the area.

Wildlife

The planting plan should include plants that provide value to the wildlife found on the mitigation site and in the watershed, such as appropriate pollinator species or fruit and seed production species.

Diversity

Selecting a diverse mix of plants increases the likelihood that a mitigation project will be successful.

Planting Types

The types of plantings include the following, each of which is explained below:

- Herbaceous vegetation
- Woody vegetation

Herbaceous Vegetation

As explained earlier in this manual, herbaceous vegetation includes plants that do not have woody stems, such as grasses, ferns, and wildflowers. Herbaceous vegetation is typically planted on a

mitigation site in the form of seeds. However, in some situations, such as coastal wetlands, individual herbaceous plants or plugs can be used to populate a mitigation site. All herbaceous plants and seeds should be obtained from a local source.

When a seed mix will be utilized on a mitigation site, the mix must be approved for the protected resource (wetlands or upland riparian zones and transition areas) to ensure that native vegetation will establish successfully and will be able to compete with invasive, early successional species, helping to prevent the establishment of less desired, non-native flora. Using an approved seed mix also helps prevent erosion.

The planting plan must include the composition of every seed mix that will be used for the mitigation project. The seed mix should not include fescue (*Festuca spp*.), reed canary grass (*Phalaris arundinacea*), or deer tongue (*Dichanthelium clandestinum*). While deer tongue is a native species, it tends to be aggressive, keeping out other native species. Rye grasses may also be aggressive; however, the DEP will allow the use of an annual rye grass if needed to stabilize a site as it should die out after a year, allowing more desirable species to dominate.

While the DEP cannot recommend any one commercial seed provider, a simple internet search will provide multiple providers within New Jersey. Most commercial seed providers offer several different seed mixes specific to each eco-type.

When planting seed mixes, mulch should not be used on the site. Mulch can attract voles and fungal growth, both of which decrease the chances the seeds will be successful.

Woody Vegetation

If a mitigation project is required to address impacts to scrub/shrub or forested areas, the planting plan must include woody vegetation. The amount of woody vegetation required depends on the acreage needed to satisfy the mitigation requirements.

Some species of woody plants cannot withstand prolonged flooding, so the hydrology of the site must be taken into consideration when selecting woody plants.

All woody plants should be obtained from a local source. Similar to commercial seed mix providers, several companies and nurseries specialize in providing tree and shrub material for mitigation sites and other development or landscape projects. For larger mitigation projects, the applicant should ensure that the plant provider can provide all the necessary stock necessary to complete the project before finalizing any purchase contracts.

Plant Material Sizing

The planting plan must include information about the size and stock type of the selected plant materials. The *stock type* is the type/size of the plant material. For example, trees come in a variety of stock types, such as whip, containerized, and ball and burlap. Figure 3.6 below explains the different stock types.

Figure 3.6: Plant Material Size

Size	Description	Size of planting
Whip	Plants produced from seed or cuttings that have little to no branching	3.25 feet – 4 feet
Feathered whip	Slightly older and bigger whips that have some branching	4.9 feet – 5.75 feet
Plugs	Seedlings that have been grown in a tray of small cells and have sufficient roots to be pushed out of the tray and transplanted	Forb and grasses with deep fibrous roots: 2 inches wide by 5 inches deep
		Plants with lateral root systems: 2.2 inches wide by 4 inches deep
Container	Gallon sized containers for larger plantings	Varying sizes: 1, 2, 3, 5, and 7 gallons ranging in height from 7 inches – 11.5 inches
Balled and Burlapped	A field grown tree that has been dug up and placed in a wire basket lined with burlap	4-10 feet

The DEP recommends utilizing a variety of sizes of plant material for a mitigation project. Very large material, such as ball and burlap sized trees, will meet the height criteria quickly (see the vegetation monitoring requirements in Section 3.5) but ultimately may not survive because substantial quantities of nutrients and water are necessary to sustain healthy growth. In contrast, smaller whip-sized material or containerized material with small gallon number sizes may take longer to establish canopy and height criteria, but the younger growth does not require such a significant quantity of nutrients and may adapt to conditions more readily over time without additional maintenance.

Size variation example:

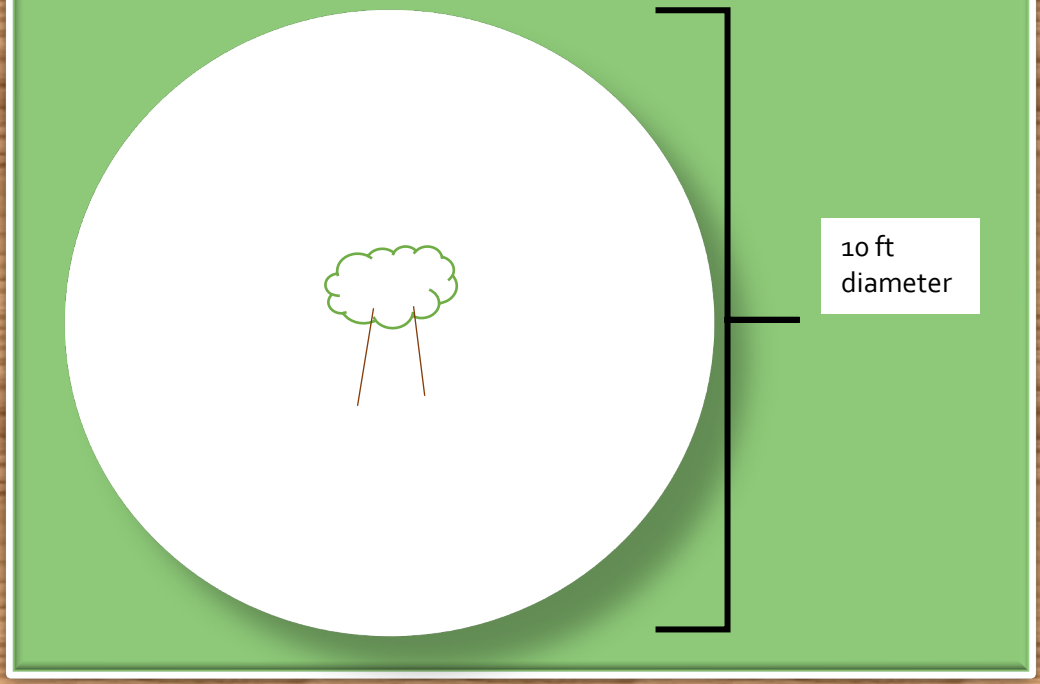
If 400 trees are to be planted on the mitigation site, a potential combination of sizes would be:

- 100 whips
- 100 #2 gallon containers
- 100 #3 gallon containers
- 100 balled & burlapped

Plant Spacing for Mitigation Sites

The planting plan must also describe how the proposed plants will be spaced apart. For trees, the DEP recommends spacing 10 feet on center, meaning a tree is planted at the center of a theoretical circle of space with a 10-foot diameter, as shown in Figure 3.7 below. For shrubs, 8 feet on center is recommended. These spacing recommendations help ensure that each individual plant has sufficient growing space and aim to achieve appropriate canopy cover for establishing future, forested growth. The spacing recommendations will result in 436 plants per acre.

Figure 3.7: Spacing for Trees – 10 Feet on Center



The DEP always recommends planting the amount of material necessary to satisfy 10 feet or 8 feet on center spacing, depending on the type of vegetation (see How to Calculate the Number of Plants Needed for a Mitigation Project on page 67). However, certain mitigation projects may require the plants to be placed closer together in enclave planting units. An *enclave* is a small, tightly bundled planting area that has been separated out from the larger mitigation area with fencing. Enclaves may be necessary to facilitate herbivory protection or when fencing cannot be used to protect the entire mitigation area, such as when a riparian zone mitigation site is located within the floodway. The enclaves create small, compact planting areas that are too small for deer to enter and exit.

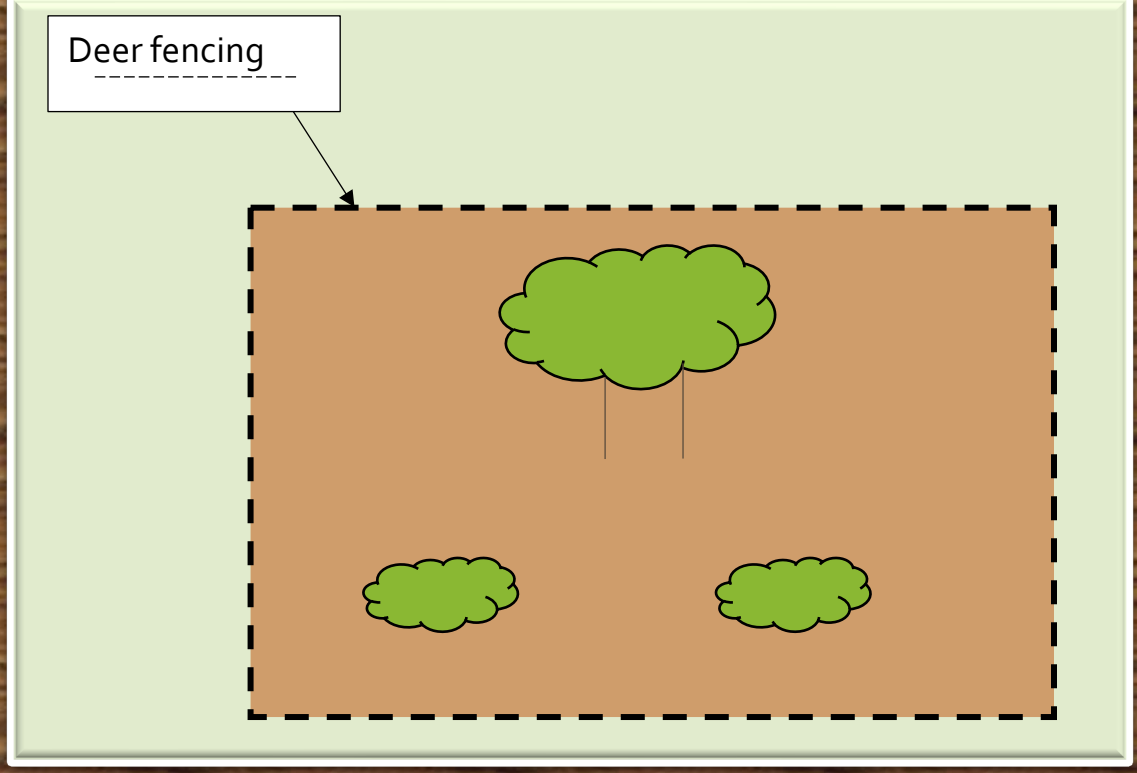
Enclaves are typically 64 to 100 square feet (or about 8′ x 8′) in size and should be planted appropriately with trees, shrubs, and herbaceous material to ensure survivorship. Each enclave will

usually contain 2 to 5 trees or 3 to 6 shrubs. However, an enclave can be any size and can contain any number of plants. The size and number of plants will be a function of the total density required for the overall site. Enclaves should be spaced approximately 10 feet on center from one another.

Enclave fencing typically consists of small-gauge wire with wooden, PVC, or metal fence posts. Fencing should be at least 8 feet tall to prevent deer herbivory.

Enclaves can be built in any shape or configuration. Figure 3.8 below shows an example enclave design where a tree and two shrubs are fenced in a square to protect them from herbivory.

Figure 3.8: Example of a Potential Enclave Design



Please note that when using enclaves, any native, woody, or herbaceous recruit material growing outside of the enclaves is also part of the mitigation site. As such, proactive actions should be undertaken to prevent mowing. The DEP suggests constructing a temporary perimeter fence, such as split rail, around the mitigation area to better identify the area.

How to Calculate the Number of Plants Needed for a Mitigation Project

1. Determine the size of the mitigation area in square feet (one acre = 43,560 square feet).
2. Calculate how much space is necessary for each tree or shrub:

   Trees: With trees spaced on 10-foot centers plotted on a grid system, there would be one tree in each 10' X 10' grid space.

   10 feet X 10 feet = 100 square feet for each tree

   Shrubs: With shrubs spaced on 8-foot centers plotted on a grid system, there would be one shrub in each 8' X 8' foot grid space.

   8 feet X 8 feet = 64 square feet for each shrub

3. Calculate how many plants are necessary to cover the mitigation area.

Examples:

1. A proposed mitigation area is 0.2 acres. How many trees are necessary?
   - Convert the acres to square feet: 0.2 acres X 43,560 square feet/acre = 8,712 square feet
   - Determine how many trees (spaced at 10 feet on center) are needed:

     Size of mitigation site in square feet/100 square feet for each tree = number of trees necessary

     8,712 square feet/100 square feet = 87.12 trees
2. The proposed mitigation area is 0.2 acres, but the applicant is proposing to plant only 40 trees instead of the recommended 87.12 trees. How far apart would the trees be?
   - Calculate the spacing between trees:

     Number of trees required at 10-foot center spacing/number of trees proposed x 10 feet = feet of spacing between trees

     87.12 trees required/40 trees proposed = 2.178 trees

     2.178 trees x 10 feet = 21.78 feet between trees
3. A proposed mitigation area is 0.2 acres. How many shrubs are necessary?
   - Convert the acres to square feet: 0.2 acres X 43,560 square feet/acre = 8,712 square feet
   - Determine how many shrubs (spaced at 8 feet on center) are needed:

     Size of mitigation site in square feet/64 square feet for each shrub = number of shrubs necessary

     8,712 square feet/64 square feet = 137 shrubs (rounded up)
4. The proposed mitigation area is 0.2 acres, but the applicant is proposing to plant only 100 shrubs instead of the recommended 137 shrubs. How far apart would the shrubs be?
   - Calculate the spacing between shrubs:

     Number of shrubs required at 8-foot center spacing/number of shrubs proposed x 8 feet = feet of spacing between shrubs

     137 shrubs required/100 shrubs proposed = 1.37 shrubs

     1.37 shrubs x 8 feet = 10.96 feet between shrubs

Irrigation

The planting plan will also need to address whether irrigation is necessary to help planting materials establish. Typically, irrigation is needed only for transition area and riparian zone mitigation projects since a natural source of hydrology should already be present on most wetland mitigation sites. However, irrigation may also be necessary in those rare cases when planting occurs during a drought year.

When irrigation is necessary, temporary irrigation measures are recommended to help plants establish a root system when first planted, but these temporary measures should not be relied on long-term. A successful mitigation project must be able to survive naturally on its own by the end of its required monitoring period (see Section 3.5 below).

Temporary irrigation measures include tree gators and temporary irrigation systems. Tree gators are durable, pouch-like bags that hang from the planted material and collect rainwater that will be slowly released into the soils. Figure 3.9 below shows an image of a tree gator. They are designed to provide irrigation over a period of time when constant maintenance of the planted material is impractical. Tree gators can help to ensure that the planted material obtains the proper hydrology and the nutrients necessary to establish.

Figure 3.9: Tree Gator

Temporary irrigation systems that use aboveground hosing and fixtures can also be used to promote healthy establishment. The system should use watering fixtures that slowly release water to the bases of the plants, either from porous hosing or nozzles, rather than standard sprinkler nozzles that emit water over the entire plant. If only a sprinkler system is possible, the system should be programmed to provide water in the early morning or evening hours – not during the day. Water magnifies light; thus, watering should occur in the absence of sunlight so that plants do not burn.

Components of a Planting Plan

Every planting plan should include all of the following:

- The project's location, including the block, lot, municipality, and county as well as an inset location map, north arrow, and scale
- The existing and proposed elevations and grades of the site
- A pre- and post-construction plan view with cross- sectional views of the mitigation site and location of any monitoring wells and/or stream gauges used for hydrologic monitoring
- A metes and bounds description of the mitigation site, including any required transition area. Metes and bounds are a legal description of the boundaries of the site.

In addition, the proposed planting plan should contain at least the following two sheets:

1. Planting Plan Sheet
   This sheet must show the proposed conditions and contours of the site as well as the proposed location for each planting. The DEP also prefers the planting plan sheet to include all of the proposed planting material in table form. Each planting list table (also called a planting schedule) must provide the species name (both Latin and common), sizing of material, plant spacing, and quantity of each individual species that will be planted. This sheet may also provide the seed mixes, which must be clearly described, including each constituent of the mix and the composition percentage.

   For large-scale projects, identifying the location of the proposed plantings can be accomplished through planting zones, which are areas on the plan marked out in a certain hatching pattern or color that is then associated with a particular planting list table. For

instance, a planting list containing trees relative to forested mitigation areas may be linked to areas of cross-hatching on the plan while another list for emergent wetland plantings may be associated with an area on the plan that is marked with honeycomb hatching.

2. Details and Notes Sheet

   This sheet must contain all notes relative to the planting procedures, contractor notes, details regarding maintenance or monitoring, irrigation details (if applicable), fencing details, and any other notes relative to the mitigation project.

   This sheet may also contain the seed mixes and the list of proposed plantings, although the DEP prefers these to be on the planting plan sheet, as mentioned above. If the applicant chooses to include the planting lists on the details and notes sheet, a clear distinction must be made as to where the plants are being planted using planting zones. Both sheets must contain appropriate details regarding the mitigation planting plan.

Developing a Preventative Maintenance Plan

The preventative maintenance plan should include herbivory control measures and a plan for any invasive species that may be on the site. Invasive species will need to be removed prior to planting and should be controlled after the mitigation site is planted through methods described later in this section.

Herbivory Control Measures

Since herbivores eat plants, herbivory control is an essential part of protecting the vegetation on a mitigation site. New Jersey herbivores include deer, beavers, voles, geese, and other rodents and waterfowl. Fencing is recommended for herbivory control for most mitigation projects. However, for mitigation sites with trees where fencing is not possible, tree guards or tree tubes may be necessary. Other herbivory control measures may also be recommended specifically for voles, beavers, and geese/waterfowl , all of which are described below.

Fencing

Fencing is recommended for most projects because the DEP has found it to be an important contributing factor on successful mitigation sites. Fencing the mitigation site prevents deer from browsing on planted material, which also promotes native vegetative growth. As a result, invasive species cover tends to be less problematic on a site that has been fenced appropriately. Fencing can also protect a site from beavers and geese/waterfowl, as described below.

In most cases, fences should be constructed with wooden fence posts and larger gauge wire mesh and should be at least eight feet high to keep out deer (see below for the fencing requirements for

beavers and geese and waterfowl). Figure 3.10 shows several examples of fencing for herbivory control. Fence maintenance will be required to ensure that no breaches occur due to fallen trees.

Figure 3.10: Herbivory Control Fences

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Tree Guards and Tree Tubes

If a mitigation site contains trees but fencing the site is not possible, the DEP recommends the use of tree guards or tree tubes to protect the trees from deer rub. Deer rub occurs when bucks rub their heads and antlers against the base of the tree, resulting in scrapes and cuts on the plant. Tree guards or tree tubes may also be useful protection against beavers. In most cases, tree guards and tree tubes are applicable only for plant material exceeding six feet in height.

Tree guards are a plastic, cage-like material that surrounds the tree but allows for full sunlight penetration (see Figure 3.11 below).

Figure 3.11: Tree Guard for Herbivory Control

Tree tubes are similar to tree guards, except the tube is simply impervious plastic wrapping that encases the plant (as shown in Figure 3.12). Tree guards are preferrable to tree tubes in most cases because the tubes do not allow the access to sunlight that tree guards provide. In order for the plant within a tree tube to reach the light, it usually grows in an unhealthy irregular pattern (often referred to as leggy growth), resulting in a weakened stem. Further, tree tubes create an ideal habitat for vole populations. Tubes should not be used with smaller planting material, such as tree whips or small gallon sized materials. Smaller material typically gets choked out by other herbaceous growth within the tube.

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Figure 3.12: Tree Tubes for Herbivory Control

Vole Herbivory Control Measures

Voles are rodents that live mainly underground, have boom and bust population cycles, and feed on root and lower stem material. Protecting the lower portions of plants will curtail aggressive feeding. Therefore, trunk wraps are recommended for sites that are experiencing vole herbivory. *Trunk wraps* are protective strips of material that are wrapped around the lower portion of the plant.

On wetlands mitigation sites, mulch will provide ideal habitat for voles. Therefore, as an herbivory protection measure, mulch should not be used on these sites.

Beaver Herbivory Control Measures

Beavers are the largest rodent found in North America and are famous for their construction of dams and lodges (see Figure 3.13). Because of their dam-building activities, beavers may impact both the plantings and the hydrology on a mitigation site.

Figure 3.13: Evidence of Beavers

For protection from beavers, the DEP recommends fencing, tree guards or tubes, or enclaves. Other beaver control options include exclusion fencing at culverts, water level control devices, trunk wraps, and trapping.

Fencing should be installed either around the site or around the trees themselves. Fencing around trees should be at least four feet high and should be no more than six inches away from the plants on all sides.

If beavers impact the hydrology or plantings on a mitigation site after construction, the DEP will not hold the applicant responsible for addressing the beaver-related issues provided the applicant has made a good faith effort to control the beavers.

For more information on beavers in New Jersey, see https://nj.gov/dep/fgw//ensp/pdf/chanj_beaver_profile.pdf.

Goose/Waterfowl Herbivory Control Measures

At mitigation sites planted with herbaceous vegetation where geese or other waterfowl may be expected, a four-foot-high plastic or wire mesh fence affixed with wooden posts can be constructed for herbivory control. To deter flying geese and waterfowl from landing within the mitigation area, cords affixed with bird scare ribbon may be strung between the fence posts in a zig-zag pattern. Fence maintenance is required to ensure continued functionality.

Invasive Species Removal and Control

For a mitigation site to be deemed successful by the DEP, the site must contain less than 10 percent invasive species at the end of the required monitoring period (see Section 3.5.2). To help achieve these goals, the DEP recommends including invasive species removal and control actions in the preventative maintenance plan. The preventative maintenance plan should contain details regarding the existing invasive species on the site, how those species will be removed, and how invasive species will be controlled after construction of the mitigation project. For information about common invasive species that may be encountered on a mitigation site in New Jersey, see Appendix C and the United States Department of Agriculture (USDA) Plants Database.

The Department recommends the following methods for removal and control of invasive species:

1. Mechanical Control
2. Biological Control
3. Chemical Control

Using a combination of these methods will often be useful to control an invasive plant species. Each of these methods is explained below, utilizing information derived from The Nature Conservancy's publication, *Weed Control Methods Handbook: Tools & Techniques for Use in Natural Areas* (Tu, Hurd, and Randall, 2001).

Another option for invasive species control is to provide a dense planting plan so the native species outcompete any invasive species that might arise. The applicant may also choose to clear the target invasive species beyond the mitigation site to allow for a buffer that will help prevent the invasive species from returning.

Mechanical Control

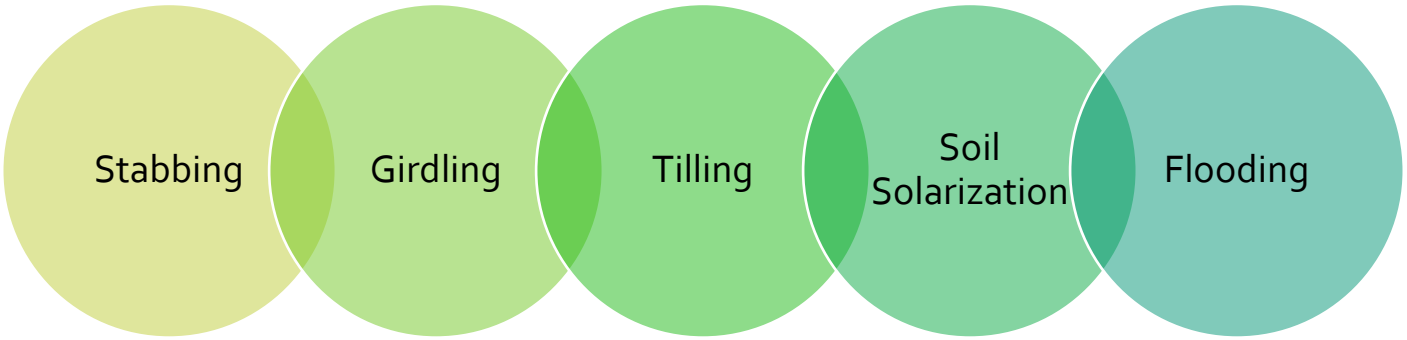
Mechanical control means physically removing an invasive species. When performing mechanical control, soil disturbance should be minimized by removing the invasive species slowly and carefully, avoiding trampling, and replacing the disturbed soils where possible. Trampling and soil disturbance increase the risk that invasive species will intrude on the site. Any instruments used when implementing mechanical control should be carefully inspected for seeds to avoid the spread of invasive species.

The time of year that mechanical control of invasive species will need to be performed will depend on the specific method of mechanical control, the invasive plant species, and the growth stage of the plant.

Common methods of mechanical control include hand-pulling, mowing, cutting, and prescribed burns. Hand-pulling involves removing individual plants. This method is best performed on annual and tap-rooted plants, which are plants with a primary root and smaller lateral roots diverging from that primary root. Hand-pulling is most useful in smaller populations where individual removal is feasible.

Mowing and cutting are most useful in small to medium-sized populations. They can be beneficial when performed on annual plants before they flower and set seeds. However, some species will quickly resprout, creating more viable flowers and seeds. Prescribed burns are heavily regulated and require a permit from the New Jersey Forest Fire Service.

Less common mechanical control options include:



When the invasive is *Phragmites australis*, the root mass should also be removed. In tidal areas, the elevation may also be lowered to control the *Phragmites*. *Phragmites* does not thrive when frequently inundated. However, sea level rise should be considered at the specific site before any elevation changes are proposed.

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Biological Control

Biological control means introducing a natural enemy to an invasive plant species, usually an insect species that preys on the invasive plant or otherwise limits its occurrence. Biological control is most useful for widespread, persistent invasives as biological control organisms are not easily removed from an environment once they have established. The biology and life habits of both the invasive plant and the organism used for control must be considered carefully when implementing a biological control measure.

The introduction of species that have been brought to the United States for the biological control of plants is heavily regulated by the USDA's Animal and Plant Health Inspection Service (APHIS). Petitions for release of plant biological control agents are handled by a Technical Advisory Committee (TAG). New Jersey also has a state-level program for federally approved biological control through the Phillip Alampi Beneficial Insect Lab. For more information or to purchase available biological control agents, please contact:

Bureau of Biological Control – Division of Plant Industry
PO Box 330
Trenton, NJ 08625-0330
www.nj.gov/agriculture/divisions/pi/prog/beneficialinsect.html

Figure 3.14 on the next page provides a list of invasive species in New Jersey that are or may be subject to biological control along with the organisms that have been approved or are under consideration as a means for controlling each species.

Chemical Control

Chemical control refers to applying herbicides to invasive plant species. Herbicide should not be selected as a method for controlling invasive species if indigenous and other desirable plant species will be impacted.

A permit from the DEP's Division of Land Resource Protection may be required to apply herbicide on a mitigation site. Additional state or local permits may also be necessary. In addition, a license is required for anyone who performs the application of herbicide as it involves developing and using safety protocols for storing, mixing, and transporting chemicals as well as handling spills and disposing of unused herbicides and containers. Therefore, selecting herbicide as a means to control invasive species may require obtaining the appropriate license or sub-contracting with licensed professionals.

Before undertaking any systematic management process using herbicides, the DEP encourages applicants to consult with its Bureau of Pesticide Compliance and Enforcement. All chemicals must be evaluated for legal use in New Jersey. Appendix D provides a list of herbicide varieties and the particular species they can be used to control.

Figure 3.14: Biological Control of Invasive Species in New Jersey

Alliaria petiolata (Bieb.) Cavara & Grande (garlic mustard)	• No biological control methods are currently in widespread use, but several insects are proposed and being studied. Use of the weevil *Ceutorhynchus scrobicollis* is currently pending a final decision by the federal government (Forest Health Technology Enterprise Team, "Garlic Mustard Biological Control).
Centaurea biebersteinii DC. [Centaurea maculosa auct. non-Lam.] (spotted knapweed)	• Several agents have established in the eastern United States. The fly species *Urophora quadrifasciata* is established in New Jersey (Lang, n.d.).
Cirsium arvense (L.) Scop. (Canada thistle)	• No species is specifically established in New Jersey but several are established in the eastern United States. These include the beetles *Altica carduorum* and *Cassida rubiginosa;* the weeviles *Ceutorhynchus litura*, *Cleonis pigra* (Scopoli), and *Larinus planus*; the flies *Terellia ruficauda* and *Urophora cardui*; and the fungus *Puccinia punctiformis* (U.S. Department of Agriculture, 2014).
Cynanchum louiseae and C. rossicum (pale and black swallow-worts)	• The moth *Hypena opulenta*, whose larvae feed on the leaves of swallow-worts, has been released for study but is not yet commercially approved or available (Foster and Szucs, 2020).
Lythrum salicaria L. (Purple loosestrife)	• Three insect species have been approved by the USDA: the weevil *Hylobius transversovittatus* and the beetles *Galerucella calmariensis* and *Galerucella pusilla*. *Galerucella* species are currently being reared in New Jersey's Phillip Alampi Beneficial Insect Lab (Mayer et al., 2017).
Myriophyllum spicatum L. (Eurasian watermilfoil)	• *Euhrychiopsis lecontei* is a weevil species that has been made commercially available for control in some locations (Alwin and Cheruvelil, 2009).
Polygonum cuspidatum Sieb. & Zucc. / *Fallopia japonica* (Japanese knotweed)	• The plant louse *Aphalara itadori* is used for control in the United Kingdom and is currently awaiting approval in the United States. It is recommended for use by the USDA (Forest Health Technology Enterprise Team,"Japanese Knotweed Biological Control").
Polygonum perfoliatum L. (Mile-a-minute)	• The weevil *Rhinoncomimus latipes* is currently established and preys on mile-a-minute. It is currently being reared in New Jersey's Phillip Alampi Beneficial Insect Lab (Hudson et al., 2017).
Pueraria montana var. lobata (Kudzu or Japanese arrowroot)	• The fungus *Myrothecium verrucaria* has been studied but is not yet available as a biological control (Weaver, Boyette, and Hoagland, 2016).

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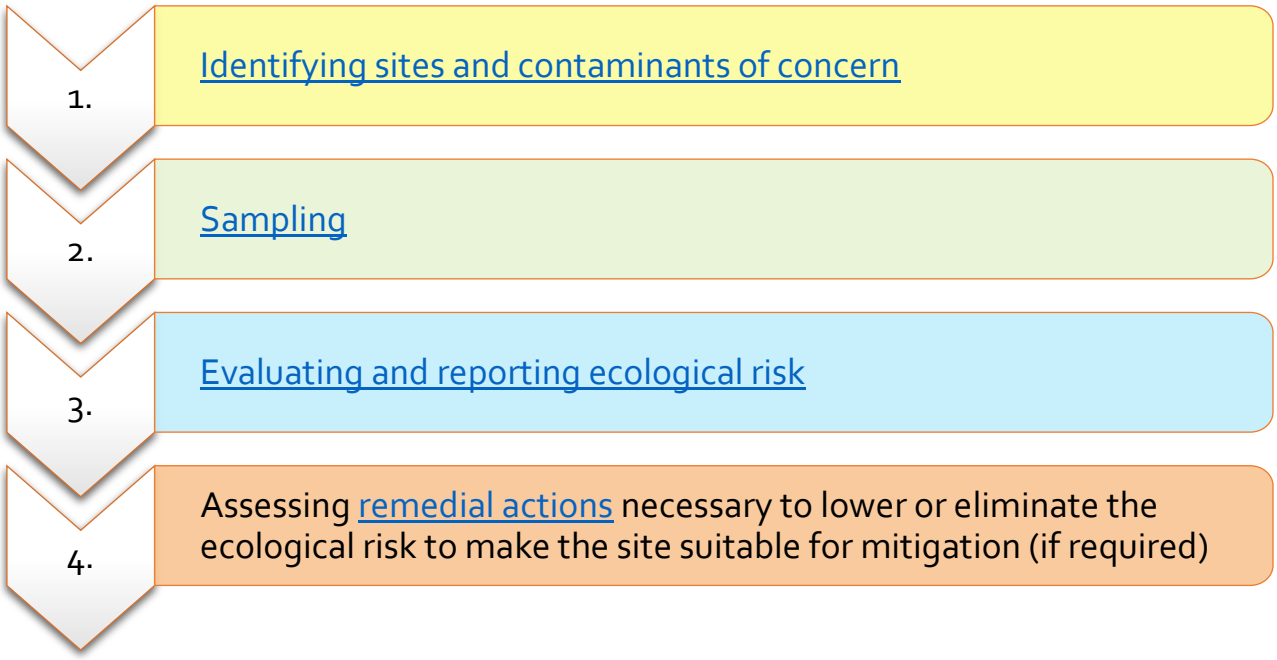
3.3.4 Contamination and Ecological Risk

Soil, sediment, groundwater, and surface water are all critical to the health of an ecosystem and can become contaminated from a myriad of sources, including industrial discharges, agricultural practices, and various other human activities. As mentioned earlier in this manual, the FWPA, CZM, and FHACA Rules prohibit mitigation projects that pose an ecological risk, which means that the mitigation will result in exposure or introduction of contamination to an ecological community, such as during earthmoving. For this reason, the mitigation proposal must identify the existing contamination levels on a proposed mitigation site and determine if there are any potential ecological risks associated with the proposed mitigation activities.

This section provides a broad overview of the process for investigating, assessing, and remediating ecological risk on a mitigation site. However, this process, which is governed by the Technical Requirements for Site Remediation at N.J.A.C. 7:26E, is highly technical. Therefore, the DEP recommends that applicants consult the extensive guidance developed by the DEP's Site Remediation and Waste Management Program, including the Ecological Evaluation Technical Guidance, which will help with determining whether a mitigation project presents an ecological risk.

While each site is unique, the general process for investigating, assessing, and remediating a site includes the following steps, each of which is discussed further below:



Applicants should contact the DEP in advance to ensure that each step will be completed correctly to avoid having to repeat steps or perform additional costly sampling or analysis.

Initial Contaminant Assessment

The first step is to assess the potential for contamination at the proposed mitigation site and on adjacent contaminated sites as well as assessing other offsite contaminant sources with the potential to migrate onto the proposed site. To do so, the DEP recommends the following:

NJ-GeoWeb

Section 3.2.5 explains how to use NJ-GeoWeb to screen a potential mitigation site. When screening a potential mitigation site in NJ-GeoWeb to check for possible contamination, the DEP recommends utilizing the following layers:

1. Chromate Waste Site Boundaries
2. Groundwater contamination Areas (CEA)
3. Groundwater contamination Areas (CKA)
4. Historic Fill
5. Immediate Environmental Concern Sites
6. Known Contaminated Sites List

DataMiner

DataMiner is the DEP's online reports portal, which can provide information about any contamination that has already been identified by the DEP. DataMiner provides three ways to search, but the DEP suggests selecting *Search by Category* and then choosing *Site Remediation* from the dropdown menu. The DEP does not recommend selecting *Search by Site* because data may be missed if the block and lot number has changed at any point in time. After selecting the *Site Remediation* category, the applicant can select from multiple report options. If nothing is known about the site, one option that may be helpful is *The Known and Suspected Sites by County*.

OPRA

Requests may be made through the Open Public Records Act (OPRA requests) to obtain copies of DEP records for a particular site.

Photographic history and review

A photographic history and review of a site may also be useful. To conduct such a review, applicants can utilize the commercial website https://historicaerials.com/ or review Sanborn maps, which is a series of large-scale maps covering the United States, Canada, and Mexico from 1867 to the present.

For additional information on assessing a site for potential contamination, see the Site Remediation and Waste Management Program's Preliminary Assessment Technical Guidance.

After this initial assessment is completed, the project can proceed if both of the following conditions are met:

1. Neither the applicant nor the DEP has identified the site as having the potential to increase contaminant exposure to ecological receptors
2. The project does not involve any excavation or change in the surface of a wetland beyond the enhancement of vegetation

However, if the site is expected to contain contamination or there is any uncertainty regarding possible contaminants and levels, the site should be characterized for the presence of contamination. Existing data may be available, such as for listed contaminated sites under the DEP's Site Remediation and Waste Management Program. However, field data collection and evaluation may be necessary.

Field Sampling and Analyses

This second step is for sites that are expected to contain contamination or for which the initial assessment was inconclusive. If existing data is not available for the contamination on the proposed mitigation site, an initial site characterization should be conducted via sample collection and laboratory analyses. This process is analogous to the Site Remediation and Waste Management Program's ecological evaluation process, so the applicant may use the Ecological Evaluation Technical Guidance and Field Sampling Procedures Manual for guidance.

Before undertaking sampling on mitigation sites, the DEP requires applicants to prepare a proposed sampling plan that reflects the onsite contamination concerns, which must be submitted to the Mitigation Unit. Once the sampling plan is approved, the applicant must obtain the samples and procure analyses by a New Jersey-certified laboratory. In general, samples for all environmental media must be analyzed for the contaminants that may be present as determined during the initial assessment and/or from any other information sources. Applicants should refer to N.J.A.C. 7:26E-2 for guidance on laboratory methods and analyte selection. The DEP recommends the analysis of Target Analyte List (TAL) metals, Target Compound List (TCL) compounds, and polycyclic aromatic hydrocarbons (PAHs) at a minimum. All soil and sediment must be collected as discrete samples rather than composite samples to obtain a more representative contaminant profile.

See Section 1.3 for the Mitigation Unit's contact information, including mailing address.

For mitigation projects, the DEP recommends that soil and sediment samples be collected at the current site surface and at the proposed final elevation of the mitigation project. For example, if a potential mitigation site is currently at elevation 10 but the mitigation proposal will include lowering the elevation to elevation 8, the sampling must be conducted at elevation 8 since this will be the final elevation on the site.

In expanses of wetlands soil (non-channelized areas), the DEP recommends a minimum of three sample locations and at least two sample locations per acre for larger sites. However, sites may require more samples based upon the size and nature of the site. Samples should be taken from areas that accurately represent each portion of the site. For example, if a site contains a stream discharging to a wetland, it may be appropriate to sample in the wetlands, at the point where the stream discharges to the wetland, and in various stream locations.

The sample depth will vary depending upon the types of potential contaminants on the site and the depth where those contaminants are likely to exist.

The applicant should also refer to the Ecological Evaluation Technical Guidance regarding recommendations for sediment and surface water sampling. Depositional areas and other "worst case" locations should be targeted for sampling, and sampling at background locations should also be considered (see Section 5.3.4 of the Ecological Evaluation Technical Guidance).

Data Evaluation and Reporting

After samples have been collected and analyzed, all of the sample data and the site mean-contaminant concentrations should be compared to the ecological screening criteria in the DEP's Table of Ecological Screening Criteria. The sample locations, depths, and results should be plotted on a figure using chemical data boxes. Then, a final report must be prepared in the format recommended in Section 5.5 of the Ecological Evaluation Technical Guidance and submitted to the Mitigation Unit.

If the samples exceed the ecological screening criteria, the contamination on the mitigation site has the potential for adverse ecological effects. The DEP recommends consulting with the Mitigation Unit as it may be appropriate to conduct an ecological risk assessment in such cases. An *ecological risk assessment* is a quantitative assessment of the potential or actual impacts of contaminants of potential ecological concern on ecological receptors (soil and sediment invertebrates, fish, avian and mammalian wildlife, and plants) in environmentally sensitive natural resources, such as wetlands and waterways. An ecological risk assessment helps to determine the ecological risk-based remediation goals for the specific site. For guidance on conducting an ecological risk assessment, see Section 6 of the Ecological Evaluation Technical Guidance.

Remediation of a Mitigation Site

The remediation of a proposed mitigation site may be warranted if levels of any contaminant exceed the ecological screening criteria for protection of the soil/sediment invertebrate community or when indicated by the results of an ecological risk assessment. The goal for the remediation of the site can be either the highest of regional background levels, the ecological screening criteria, or a site-specific risk-based remediation goal. However, it is important to note that the Mitigation Unit requires mitigation sites to be remediated to levels at or below ecologically protective levels and does not accept cleanups that are targeted to residential or non-residential soil remediation standards.

Prior to remediation, the applicant must prepare a restoration plan describing how the remediation level target will be achieved. The restoration plan should include a thorough assessment of the existing vegetation on the mitigation site, including both the more general vegetative type and the specific vegetative species. For example, the site should be mapped to show areas of herbaceous, scrub shrub, and forested wetlands or riparian zones, and then the specific species associated with those areas should also be provided. If the site is dominated by an invasive species, it should still be characterized as herbaceous, scrub shrub, or forested, and the restoration plan should include the amount or extent of the invasive species.

If the remediation of the site includes work that could affect the soil and/or hydrology of the site, the restoration plan should address how they will be restored. For the restoration of vegetation upon completion of the remediation activities, native plant species must be included in the plan. The applicant will not be permitted to allow the site to naturally revegetate or to replant invasive plant species.

Example 1:

- A tidal wetlands site that is dominated by *Phragmites australis* contains underlying contamination. The approved remedial action is to remove the contaminated soil, replace it with clean soil, and restore the vegetation on the site. Therefore, the pre-remediation site should be classified as herbaceous dominated by *Phragmites australis*. The restoration plan should include replanting native, herbaceous vegetation, such as *Spartina alterniflora*, *Spartina patens*, or whatever comprises the dominant, native plant species in the uncontaminated wetlands in the surrounding area.

Example 2:

- A riparian zone is dominated by a mixed hardwood forest, including pin oaks and red maples. The site contains soil contamination. The approved remedial action is to remove all of the trees, excavate to remove the contaminated soil, replace it with clean soil, and replant the site. Therefore, the pre-remediation site should be classified as forested, dominated by pin oak and red maple. The restoration plan should provide the number, size, location, and species of trees that will be replanted (pin oaks, red maples, and/or other native tree species).

3.3.5 Financial Assurance

Financial assurance means that the applicant has the appropriate financial resources to complete the mitigation project. Most mitigation proposals for restoration, creation, or enhancement projects will need to include financial assurance. The only exceptions are:

1. Riparian zone enhancement projects
2. Government agencies
3. Entities that are exempt from the requirement to provide financial assurance by federal law. For example, a portion of a mitigation area might be the subject of a cleanup under the Comprehensive Environmental Response, Compensation and Liability Act of 1980, which requires its own financial assurance. While there may not be separate financial assurance required for the mitigation, mitigation should be included as a line item in the financial assurance established for the cleanup project.

Generally, financial assurance needs to be provided from a legitimate, insured entity, such as a bank. Financial assurance should not be a personal loan from an individual. Both the type and the amount of the financial assurance must be reviewed and approved by the DEP before the financial assurance is secured. The DEP accepts a few different types of financial assurance for a mitigation project, which are explained later in this section.

To calculate the necessary amount of the financial assurance, the applicant must perform a cost estimate for the mitigation project, which must be included in the mitigation proposal. The cost estimate should include, but is not limited to, the following:

- $ The value of the land
- $ Engineering costs
- $ Environmental consultant fees
- $ Attorney fees
- $ Site preparation costs
- $ Construction costs
- $ Planting costs
- $ Supervising construction fees
- $ Monitoring costs (including the cost to replant the entire site)

Most applicants establish two forms of financial assurance – one for the construction of the mitigation project and another for the monitoring and maintenance. This allows the DEP to release the financial assurance for construction as soon as it verifies that the mitigation project has been constructed as approved. The construction financial assurance must be an amount equal to 115 percent of the estimated cost of completing the mitigation project.

The maintenance and monitoring financial assurance must be an amount equal to 115 percent of the estimated cost of monitoring and maintaining the site for the entire monitoring period (see Section 3.5 for information about monitoring). This estimated cost must also include the cost to replant the

entire mitigation site should that be necessary. The monitoring and maintenance financial assurance will remain in place until the DEP determines that the mitigation project has satisfied the applicable performance standards, permit conditions, enforcement document, or settlement agreement, as applicable. The DEP may allow for incremental reductions in the total amount of maintenance and monitoring financial assurance each monitoring year, provided the mitigation site is achieving the performance standards.

Once the DEP has approved the type and amount of the financial assurance, the applicant must post the financial assurance at least 30 calendar days prior to undertaking the mitigation activities. The DEP will then review the financial assurance on an annual basis and adjust the assurance to reflect current economic factors. Additional financial assurance may be required where additional construction and/or monitoring are necessary to ensure success of the mitigation project.

If the DEP determines that the person responsible for establishing the financial assurance has failed to perform the mitigation project as required, the DEP will notify that person in writing that the mitigation project must be brought into conformance within 30 calendar days (unless the time frame for compliance is extended by the DEP). The DEP may, at its discretion, undertake the mitigation project by drawing on the funds available in the financial assurance if the responsible party fails to perform successful mitigation. This ensures that the mitigation project will be completed.

Types of Financial Assurance

The DEP accepts the following types of financial assurance for a mitigation project:

1. A fully funded trust fund
2. A line of credit
3. A letter of credit
4. A surety bond
5. Other forms of financial assurance (other than self-insurance or self-guarantee), such as an escrow account. Self-insurance and self-guarantee are not acceptable forms of financial assurance because these options require a third party to guarantee the financial support for the project should the applicant file for bankruptcy or otherwise fail to complete the mitigation.

Fully Funded Trust Funds

A fully funded trust fund requires a grantor who provides the funds, a beneficiary who will ultimately receive the funds, and a trustee who receives the funds from the grantor and holds them on behalf of the beneficiary. For mitigation projects, the DEP is the beneficiary.

The trustee must be an entity that has the authority to act as such and whose trust operations are regulated and examined by a New Jersey or federal agency. That is, the trust fund must be executed by an entity that is a true and legitimate business, which is registered to conduct business in New Jersey.

The fully funded trust fund should also meet all of the following requirements:

1. Include any applicable DEP file number and information concerning the location of the mitigation site
2. Specify that the fully funded trust fund cannot be revoked or terminated without the prior written approval of the DEP
3. Specify that the trustee may only disburse funds with the DEP's written approval
4. Specify that funds shall be utilized solely for the purposes of conducting the mitigation project as approved by the DEP
5. Specify that the DEP may access the fully funded trust fund to pay for the cost of the mitigation project
6. Identify the DEP as the sole beneficiary of the fully funded trust fund

The applicant must also provide a written statement from the trustee of the trust fund confirming the value of the trust in the amount that the DEP has approved and that the trust will continue for the next consecutive 12-month period. This statement must be submitted to the DEP on an annual basis, at least 30 calendar days prior to the anniversary of the date the applicant was obligated to establish a financial assurance.

Line of Credit

A line of credit is money that is borrowed from a lender and is subject to interest charges. For mitigation projects, the line of credit must be issued by an entity that is licensed by the New Jersey Department of Banking and Insurance to transact business in New Jersey or by a federally regulated bank. The applicant must submit the original line of credit to the DEP.

The line of credit should include or specify all of the following:

1. Any applicable DEP file number and information concerning the location of the mitigation site
2. That the line of credit shall be issued for a period of one year and will be automatically extended for a period of at least one year

3. That if the issuer of the line of credit decides not to extend the line of credit after its expiration, the issuer will notify both the DEP and applicant by certified mail of such decision within 120 calendar days before the current expiration
4. That the lender shall disburse only those funds that the DEP approves in writing
5. That the funds in the line of credit will be utilized solely for the purposes of conducting the mitigation project
6. That the DEP may access the line of credit to pay for the cost of the mitigation project

Lines of credit do not typically include restrictions on the use of the funds. However, for mitigation projects, the line of credit must specify that disbursement requires the DEP's written approval and that the funds will be used solely for the purpose of conducting the mitigation project in order to ensure that the funds will be used only for the approved mitigation project.

The applicant must also provide an annual statement concerning the value of the line of credit, which must state that the financial assurance will be in place for the next consecutive 12-month period.

Letter of Credit

A letter of credit is a letter issued by a bank on behalf of a buyer that guarantees to the seller that the buyer's payment will be received on time and for the correct amount. For mitigation projects, the DEP is "the seller," and the applicant must submit the original letter of credit to the DEP. The letter of credit must be issued by an entity that is licensed by the New Jersey Department of Banking and Insurance to transact business in New Jersey or by a federally regulated bank.

The letter of credit should include and specify all of the following:

1. Any applicable DEP file number and information concerning the location of the mitigation site
2. That the letter of credit shall be issued for a period of one year and will be automatically extended for a period of at least one year
3. That if the issuer of the letter of credit decides not to extend the letter of credit after its expiration, the issuer will notify both the DEP and applicant by certified mail of such decision within 120 calendar days before the current expiration
4. Indicate that the DEP may access the letter of credit to pay for the cost of the mitigation project

Surety Bond

A surety bond is a three-way agreement that involves an obligee who requires the bond, a customer who purchases the bond, and a surety who issues the bond. For mitigation projects, the DEP is the obligee. The person who is responsible for posting the financial assurance is the customer and must complete and submit the surety bond. The surety must be an entity that is licensed by the New

Jersey Department of Banking and Insurance to transact business in New Jersey or is listed as acceptable surety on federal bonds in Circular 570 of the United States Department of the Treasury.

The surety bond must include or specify all of the following:

1. Any applicable DEP file number and information concerning the location of the mitigation site
2. That if the issuer of the surety bond decides not to extend the surety bond after its expiration, the issuer will notify both the DEP and applicant by certified mail of such decision within 120 calendar days before the current expiration, beginning from the date of receipt by the DEP as shown on the signed return receipt
3. Specify that the DEP may access the surety bond to pay for the cost of the mitigation project

3.4 Site Preparation and Construction

Once a mitigation proposal is approved by the DEP, the site preparation and construction phases of the mitigation project can begin. The DEP requires the mitigation designer to be present on the site during all critical stages of mitigation construction to ensure that the intent of the mitigation design is realized in the landscape. Critical stages of construction include, but are not limited to:

- Herbicide applications (see Section 3.3.3)
- Earthwork, such as grading and creation of microtopography (see Section 3.2.2)
- Planting (see Section 3.3.3)
- Inspections

The mitigation designer must also ensure that best management practices are used throughout construction to control the spread and colonization of highly invasive plants. Specifically, all equipment, especially tracks and tires, should be thoroughly cleaned every time equipment or vehicles arrive from offsite or from another area onsite that contains invasive plant species. In addition, soil containing root fragments and aboveground vegetative material from invasive plants must be carefully managed during earthwork and disposed of at a suitable offsite location rather than mulched and reused or stockpiled elsewhere on the site.

The mitigation designer must also evaluate the site conditions as construction progresses. For certain projects, site conditions may necessitate changes to the design. If the designer determines

that changes to the mitigation design are necessary to ensure success of the project, the designer must immediately notify the DEP in writing and submit an alternative plan that achieves the proposed site conditions.

Upon completion of construction, the DEP requires submittal of a construction completion report that will be used as the baseline upon which future monitoring reports will be evaluated (see Section 3.5.4 for information on monitoring reports).

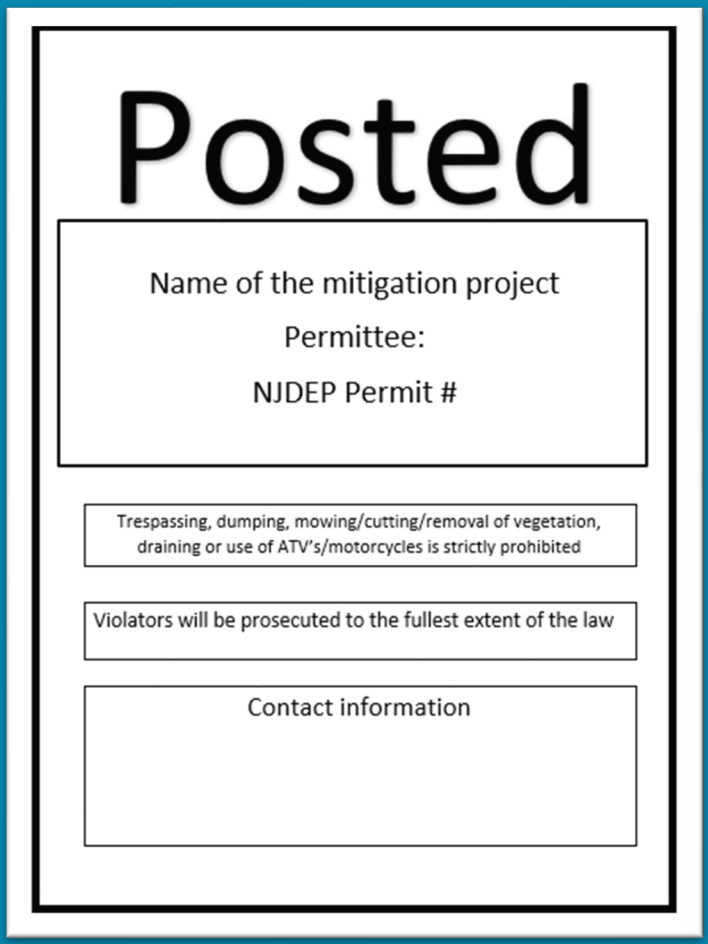
A construction completion report should include the following:

1. A mitigation project completion of construction form, which must clearly indicate the date when the mitigation project was completed
2. Signed and sealed as-built plans that depict:
   - Final grade elevations at one-foot contours
   - Plantings (species, size, and densities). The plan should include a table listing all vegetative species along with the quantities of each that were planted, including any grasses that may have been used for soil stabilization purposes.
   - Any structures included in the approved mitigation proposal
   - Any deviations from the approved mitigation plans, which must be highlighted and explained for review and approval
   - The boundaries of the mitigation area. The plan must indicate that the boundaries have been visibly marked onsite with three-inch diameter white PVC pipe extending four feet above the ground surface. The stakes must remain on the site for the entire monitoring period.

   If the project was modified during construction due to site conditions as described above, the revised plan that was submitted as part of the construction modification process may serve as the as-built plan if necessary due to time constraints, provided the DEP approves this in writing.
3. Photographs of the constructed wetland mitigation project with a photo location map as well as the GPS waypoints in New Jersey State Plane coordinates NAD 1983.
4. Photographs of the sign(s) that have been posted to identify the site as a mitigation project and to prohibit mowing, cutting, dumping, and draining of the property. The signs must also include the permittee's contact information and permit number. See Figure 3.15 for an example sign.

To help ensure that the construction completion report meets all criteria, the DEP provides a construction completion report checklist.

Figure 3.15: Example Sign for Constructed Mitigation Site



3.5 Monitoring

Once construction of the mitigation site is complete, the mitigation project moves into the monitoring and maintenance phase, which is required to ensure that the project can achieve long term success. The DEP requires all restoration, creation, and enhancement mitigation sites to be monitored for five years or until the performance standards for the site are met. *Performance standards* are requirements that are specific to the goals and objectives of the mitigation site that were provided in the approved mitigation proposal. Annual monitoring reports must be submitted to the DEP.

When monitoring a mitigation site, the applicant must consider the goals and objectives for the project, the performance standards, and the resource. For example, monitoring a wetlands mitigation site requires the evaluation of all three wetland parameters (vegetation, hydrology, and soils) while monitoring a riparian zone mitigation site will focus on the vegetation.

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To help ensure successful mitigation, this section provides information on:

- Monitoring methods – Section 3.5.1
- Monitoring requirements for vegetation, hydrology, and hydric soils – Section 3.5.2
- Performance standards – Section 3.5.3
- Monitoring reports – Section 3.5.4

3.5.1 Monitoring Methods

Applicants may select from a variety of monitoring methods. However, this manual provides more detailed information on the more commonly utilized monitoring protocols – plot-based monitoring, transect monitoring, and visual monitoring.

While the DEP does not require any specific monitoring protocol, the use of the plot-based monitoring method is recommended.

Plot-Based Monitoring

Plot-based monitoring methods are standard for evaluating wetland sites over time. A plot is a two-dimensional area of any size or shape. Data is collected from the selected plots, and that data is considered representative of the entire mitigation site (DeBerry, 2018, 3). When conducting plot-based monitoring, data should be presented for each plot and then averaged across plots over the entire site to obtain a single figure for plant density in order to meet performance standards.

For plot-based monitoring, the Department recommends a vegetation sampling strategy that is based on the findings in *Vegetation Sampling on Compensatory Mitigation Sites: Literature Review*, published in 2018 by Douglas A. DeBerry for the College of William and Mary. Specifically, the sampling strategy should include the following characteristics:

- A stratified-random sampling design coupled with sample adequacy determination using the species-area relationship
- Plot sizes of 100 square meters for woody species sampling and one square meter for herbaceous species sampling
- Initial woody species plot density based on sample size covering approximately 2 percent of the sample area for woody sampling with a minimum of four woody sampling plots (for sites one to five acres in size)
- Initial herbaceous species plot density of five plots per acre

This review includes several standardized plot sampling methods, all of which utilize the 100-square-meter plot. One of these methods, the Carolina Vegetation Survey, was developed by Robert K. Peet and other notable ecologists in 1998. In this method, monitoring plots for vegetation sampling are randomly selected on the mitigation site for each of the target plant communities. The plots should represent all of the types of vegetation on the site (Peet, Wentworth, and White, 1998). Within each plot, the applicant must monitor the vegetation and soils as well as hydrology when applicable. If the site contains monitoring wells or piezometers, these wells may or may not be included within the plots.

A minimum of four monitoring plots are necessary for each site under this method. Plots are usually square-shaped and should be at least 100 square meters in size, or 10 meters by 10 meters (Peet, Wentworth, and White, 1998). The plot corners should be identified in the field with visible flagging or markers and georeferenced for subsequent monitoring events. The monitoring plots should comprise at least 2 percent of the planted portion of the site. Exceptions to this requirement may be permitted on a case-by-case basis for very small sites or for large, uniform sites and must be noted on the mitigation plan.

Each plot should be divided into a grid pattern, and every planting should be identified according to its grid location within the plot. The monitoring data collected for each planting should include the grid location as well as the species, height, and date of planting. The total number of volunteer woody plants should also be noted.

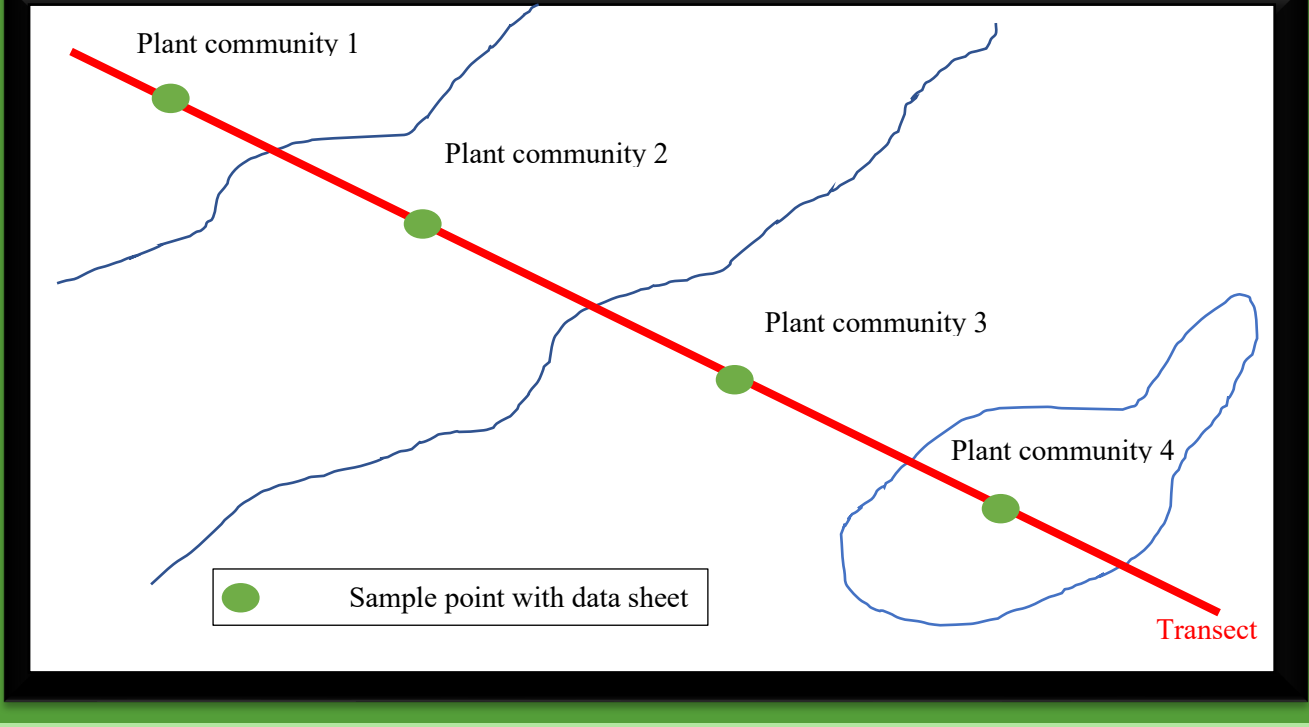
Transect Monitoring

In the transect monitoring method, the applicant establishes one or more lines (transects) across the site and samples vegetation from various points along the entire line, as illustrated in Figure 3.16 on the next page. Each transect is considered a sample unit and is summarized for monitoring. The length and number of sampling points along each transect can be adjusted to cover a wide variety of habitats and vegetation but should not be adjusted to bias the sample purposely or incidentally.

Transect monitoring is generally easy to follow and replicate from transect to transect but can be slower than other methods. If the applicant is utilizing transect monitoring, the USEPA's three-tiered protocol for monitoring is recommended. More information is available on the USEPA's Wetlands Monitoring and Assessment webpage.

Transect monitoring is used to review and analyze ground cover, canopy cover, and species composition as well as invasive species coverage and the height and viability of tree species. Ground cover includes the plants, litter, biotic soil crust (e.g., mosses and lichens), rocks, water, and/or gravel covering the surface of the soil while canopy cover is the layer of branches, stems, and leaves above the ground. For any area, the total canopy cover can exceed 100 percent because plants can overlap.

Figure 3.16: Transect Monitoring



Species composition (also called botanical composition) refers to the contribution of each plant species to the vegetation. Species composition is generally expressed as a percentage so that all species components add up to 100 percent. Species composition can be expressed on an individual species basis or by species groups, which are defined according to the objectives of the inventory or monitoring program. For example, all *Aristida* species or all perennial forage grasses could be considered species groups (Coulloudon et al., 1996, 81).

USEPA's *National Wetland Condition Assessment 2021 Field Operations Manual* provides visual guides for estimating vegetation cover. Another method that can be used to assess species composition is the Floristic Quality Assessment (FQA), which is used to track changes in vegetation quality over time. Appendix A provides more information on the FQA.

Visual Monitoring

The goal of visual monitoring is to identify any concerns on a mitigation site that may not be detected by other routine monitoring activities, such as encroachments, areas with poor vegetation growth, herbivory, excessively or inadequately drained areas, and stream bank instability. Visual monitoring is conducted by traversing the entire mitigation site to identify and document these areas of concern.

The DEP recommends conducting visual monitoring of all areas of the mitigation project twice per monitoring year throughout the required monitoring period to identify areas of concern. To obtain the best results, one of the two annual visual monitoring events should be conducted in conjunction with vegetation plot-based monitoring activities. Visual monitoring events should be held at least five months apart.

Once a feature of concern has been identified during a visual assessment, that feature must be reassessed during all subsequent visual assessments. A brief narrative of the results of the visual assessments and photographs must be included in the annual monitoring report.

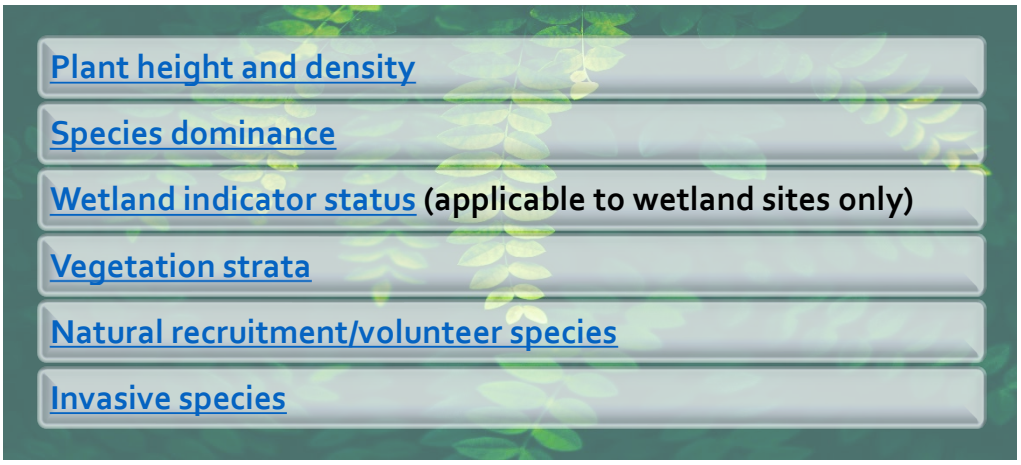
3.5.2 Monitoring Requirements for Vegetation, Hydrology, and Hydric Soils

Regardless of the monitoring method(s) that are utilized, the DEP has certain monitoring requirements that must be met for all restoration, creation, and enhancement mitigation sites. This section explains the requirements for:

- Vegetation monitoring
- Hydrologic monitoring
- Hydric soil monitoring

Vegetation Monitoring Requirements

When monitoring vegetation on a restoration, creation, or enhancement mitigation site, the applicant will need to consider each of the following, as explained further below:



Plant Height and Density

Plant height and density must be measured within each plot or transect. Height data should be categorized as follows:

- Up to 1.5 feet
- 1.5 feet up to and including 3 feet
- Greater than 3 feet up to and including 4 feet
- Greater than 4 feet up to and including 5 feet
- Greater than 5 feet

The DEP recommends recording and reporting the density of planted species as the number of living plants per acre. Plants with multiple shoots are treated as a single plant.

Figure 3.17 shows two examples of vegetation monitoring sheets for plant height and density.

Species Dominance

Within each plot or transect, the applicant must assess plant species dominance. To determine which species are dominant, the applicant must determine the percent cover and stem density for each species.

To estimate percent cover, the applicant should use areal coverage, looking from the top down, without moving the plants. *Areal coverage* is the proportion of ground surface covered by the vertical projection of a plant (i.e., how much shadow would be cast by the plant if the sun was directly overhead?).

The *stem density* is the number of plants per area.

Figure 3.18 provides an example vegetative monitoring sheet for species dominance data.

Figure 3.17: Example Vegetative Monitoring Sheets for Height and Density Data

Species	Below 1.5 ft	1.5-3 ft	3-4 ft	4-5 ft	5 ft and above	Total Feet	Species Average Height
Species A							
Species B							
Total Trees and Shrubs							
Total Trees							

Average height only tree species
Total trees in 100 square meter plot
Total woody species in 100 square meter plot
Woody species density/acres

Plot	Average Tree Height	Density	Density	Density	Density	Density	Density Total
	All Trees	# of Trees Below 1.5 ft/Acre	# of Trees 1.5-3 ft/Acre	# of Trees 3-4 ft/Acre	# of Trees 4-5 ft/Acre	# of Trees 5+ ft/Acre	Trees/Acre
Plot 1							
Plot 2							
Plot 3							
Average							

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Figure 3.18: Example Vegetative Monitoring Sheet for Species Dominance Data

			Plot 1				Plot 2			
Genus	Species	Common Name	1a	1b	1c	1d	2a	2b	2c	2d
	…									
	…									
	…									
Total Vegetation Percent Cover										
Invasive Species Percent Cover										
			Plot 1				Plot 2			
Genus	Species	Common Name	1a	1b	1c	1d	2a	2b	2c	2d
	…									
	…									
Total Species Percent Cover										

Wetland Indicator Status

When monitoring wetlands sites, the applicant must record the wetland indicator status of each species that is present within the plot or transect in order to ensure the site has sufficient hydrophytic vegetation to be considered a wetland.

The National Wetland Plant List, which is hosted by the USACE, is the approved list for classifying wetland plants in New Jersey. Each plant is assigned an indicator status, which are listed in Figure 3.19. When monitoring hydrophytic vegetation, more than 50 percent of the dominant species should be classified as obligate wetland plants, facultative wetland plants, or facultative plants.

Figure 3.19: Plant Indicator Status

Indicator Category	Symbol	Occurrence in Wetlands
Obligate Wetland Plants	OBL	>99%
Facultative Wetland Plants	FACW	67-99%
Facultative Plants	FAC	34-66%
Facultative Upland Plants	FACU	1-33%
Obligate Upland Plants	UPL	<1%

(Lichvar et al., 2012, 1)

The regional lists provided by the USACE may also be used to determine wetlands indicator status for plant species. However, New Jersey is split between three of the ten regions, so applicants must be sure to use the correct regional list for their site.

Appendix A of this manual also provides a link to a report containing a list of New Jersey species by ecoregion with USACE wetland indicator status.

Vegetation Strata

When monitoring vegetation, the applicant will often need to review multiple levels of vegetation individually to determine the overall success of the mitigation site. The vegetation strata that will need to be reviewed on a particular mitigation site will depend on the resource (tidal wetland, emergent wetland, forested wetland, etc.). For example, on a forested wetland site, the applicant may have to monitor some or all of the following vegetation layers:

- Ground layer – contains decaying leaves, duff, and other vegetation (e.g. mosses, lichens), bare soil, and water
- Herbaceous layer – contains a variety of soft stemmed plants, such as grasses, ferns, wildflowers, rushes, and sedges. The herbaceous layer may also be referred to as emergent vegetation.
- Shrub layer – contains smaller woody vegetation, such as shrubs, bushes, and saplings
- Tree layer – formed by the crowns of growing trees and other large woody vegetation (Klappenbach, 2018)

For a tidal wetland site, the potential layers to be monitored are:

- Submerged aquatic vegetation layer – contains vegetation completely inundated with water, such as eelgrass (*Zostera marina*) and wild celery (*Vallisneria americana*) (see Section 2.1.6)
- Mudflats – exposed muck or sand. Mudflats typically contain little to no vegetation.
- Low marsh layer – contains hydrophytic emergent vegetation that will be partially inundated with water at high tide, such as saltmarsh cordgrass *(spartina alterniflora)*
- High marsh layer – contains hydrophytic emergent vegetation that may be inundated during spring high tides (high tides on the full moon) and neap high tides (high tides on the new moon), such as saltmeadow hay (*Spartina patens*), and may contain some scrub-shrub, such as groundsel bush (*Baccharis halimifolia*), along with other tidal herbaceous plants and shrubs

Natural Recruitment/Volunteer Species

Natural recruitment, also known as *volunteer species*, are those plants that enter the mitigation site through natural means (e.g., transported by the wind, water, or animals) rather than being planted as part of the mitigation plan. Volunteer species growing within plots or transects may be considered when determining whether a project has met the overall goal of the target vegetation community on a case-by-case basis. However, to accurately assess whether the overall mitigation plan as designed is successful, volunteer species should be monitored separately from planted species, and volunteer plant data should be presented separately from planted vegetation data in the monitoring reports.

Invasive Species

Monitoring invasive species is a crucial component of mitigation monitoring. A successful mitigation site must have no more than 10 percent invasive species cover. When evaluating invasive species cover, the monitoring data must be sitewide. For example, a mitigation site will not be deemed successful because it has only 5 percent invasive species coverage in its northwest quadrant if it has 25 percent invasive species coverage in the other three quadrants.

To determine the invasive species coverage for the entire site, all areas of invasive species should be identified and mapped. The size of each area should be calculated, and then the sizes of these individual areas must be totaled. The total size of the area of invasive species cover on the site must then be expressed as a percentage of the area of the entire site.

Figure 3.20 below provides an example vegetative monitoring sheet for invasive species data. Section 3.5.4 provides additional information on how to provide the necessary monitoring information for invasive species in the annual monitoring report.

Appendix C contains information about common invasive species that may be encountered on a mitigation site in New Jersey. The United States Department of Agriculture (USDA) Plants Database is another useful source for determining which species are considered invasive.

Any occurrences of invasive species should be addressed immediately, especially within the first one to three years of monitoring to prevent the invasive species from spreading and occupying more than 10 percent of the site by the end of the monitoring period. See Section 3.3.3 for information on how to control invasive species.

Figure 3.20: Example Vegetative Monitoring Sheet for Invasive Species Data

Polygon Area	Sq Ft	Species A	Species B	Species C	…	Total % Invasive	Sq Ft Invasive
A							
B							
C							
…							
Site Total							

Hydrologic Monitoring Requirements

As explained earlier in this manual, hydrology is one of the three parameters the DEP uses to identify a wetland. For a wetland mitigation site to be deemed successful, it must be inundated or saturated for a sufficient time during the growing season in most years to result in the development of hydric soils and support the growth of hydrophytic vegetation, which are the other two parameters necessary for every wetland.

At the beginning of the required monitoring period, the applicant must monitor the site's hydrology to ensure that the wetland is meeting the hydrologic requirements for a wetland. Methods for determining wetlands hydrology are explained in Section 3.3.1. Upon determining that the expected hydrology is present on the mitigation site, conducting hydrologic monitoring each year is not necessary unless there is a failure of the hydrophytic vegetation later in the monitoring period that suggests the hydrology has changed.

When performing hydrologic monitoring, the following must be observed during scheduled field visits and documented for inclusion in the monitoring reports:

- Surface flow
- Inundation
- Saturation
- Other indicators of hydrology, including stream thread formation, wrack lines, water stains on tree trunks, and water-stained leaves

The hydrology documentation submitted in the monitoring reports must also include photographs. See Section 3.5.4 for more information on monitoring report requirements.

Hydric Soil Monitoring

As noted above, hydric soils, which are explained in Section 3.3.2, are one of the three parameters the DEP uses to determine if a site is a wetland. Therefore, it is important to evaluate soil conditions on a wetland mitigation site during the monitoring period to determine whether hydric soils are present. However, sources vary regarding how quickly hydric soil conditions and indicators develop and whether they will develop within the five years of monitoring. Consequently, the DEP does not require specific hydric soil indicators to demonstrate the success of a wetland site, provided that hydrophytic vegetation is successfully surviving and thriving on the site.

3.5.3 Performance Standards

As explained above, performance standards are requirements that are specific to the goals and objectives of each site and will therefore differ from mitigation site to mitigation site. For example, a tidal wetland will not have the same performance standards as a forested freshwater wetland. Trees will need to be monitored on the forested freshwater wetland site but not on the tidal wetland site, and there may be more concern about maintaining hydrology on the forested freshwater wetlands site since the hydrology on a tidal wetland site is provided by the tides.

However, for all mitigation sites, the final goal at the end of the five-year monitoring period is 85 percent coverage by desirable species with no more than 10 percent coverage by invasive species. For a forested site, all trees must be five feet high and thriving.

Performance standards should be established for each year of monitoring to demonstrate that the site is improving each year and will achieve the final goals by the end of year five. Any plants that have been in the ground for less than two growing seasons should not be counted towards meeting performance standards for years three and up. Appendix E of this manual provides suggested annual performance standards, including specific percentages for mitigation plant survival and coverage for each monitoring year. The Department also recommends including a Floristic Quality Assessment (FQA), which tracks changes in vegetation quality over time. More information about the FQA can be found in Appendix A.

In some years, the annual performance standards may be more narrative but must still ensure that the site is making steady progress toward meeting the final goal. The first year of monitoring should demonstrate that the site has the potential for success as designed, and the performance standards should focus on whether most of the mitigation plantings have survived through the year (all four seasons). High survival rate is a positive indication that the hydrology and plant selection were appropriate for the site. If survival rates are low, the site must be assessed to try to determine the cause. For example, was the site too wet, too dry, or too windy? Were the plants eaten by herbivores or overrun by invasive species? Was there a catastrophic event that is not likely to recur?

After the first year, the performance standards should continue to evaluate the success of the mitigation plantings but can also begin to evaluate the coverage and report on volunteer species colonizing the site, as explained above. Each monitoring report should demonstrate that survival is stable and vegetative coverage is increasing so that the final goals will be met.

3.5.4 Monitoring Reports

Monitoring reports must be submitted to the DEP by December 31 of each monitoring year. As mentioned above, monitoring is required for a minimum of five years or until all performance standards have been met and the DEP deems the mitigation successful.

The DEP provides two checklists that provide all of the requirements for the monitoring reports – a checklist for coastal wetlands monitoring reports and a checklist for monitoring reports for all other resources.

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Photographs are an essential requirement for every monitoring report. Photographs provide a visual documentation of the status of the mitigation site, the changes on the site from construction to completion, and any potential problems with the site. Permanent photo locations must be established when the monitoring plots or transects are selected. The photographs for each monitoring report should then build on the photographs from the previous report(s). For example, the DEP recommends the following photographs be taken from several locations within the mitigation site:

- Year 1 – Pre-construction and post-construction photographs
- Year 2 – Year 1 post-construction photograph and a current photograph for year 2
- Year 3 – Photographs from year 1 and year 2 and a current photograph for year 3
- Year 4 – Photographs from years 1-3 and a current photograph for year 4
- Year 5 – Photographs from years 1-4 and a current photograph for year 5

In recent years, several environmental agencies have been utilizing new technology to capture images and perform other functions. Drone equipment and software have been developed to take pictures and videos, measure grading/elevation, and record many other observations without a site inspection. The DEP encourages the use of technology if advantageous or useful for the success of the mitigation project.

An analysis of the vegetation on the project site is another crucial component for every monitoring report. This analysis must include an assessment of the success of the planted vegetation, a separate assessment of any volunteer species, and an overall assessment of plant coverage, including documentation concerning invasive or noxious plant species and the percent coverage of these species on the site. Section 3.5.2 above describes some of the requirements for monitoring vegetation, including the requirements for evaluating invasive species cover.

Each monitoring report must include an invasive species section regardless of whether any invasive species are present on the site. Photographs of the site must identify the location of any areas of invasive species. A plan or drawing must also be provided to identify the locations of these areas as well as to provide the acreage of each area. The applicant may opt to submit the GPS boundary of an invasive species stand in the location drawing or percent cover assessment to understand the extent of the invasive species coverage.

Other vegetation data that should be provided in the monitoring reports includes:

- Visual estimates of the percentage of overall cover and the percent cover by each vegetation layer

- Species diversity and percent of non-native/invasive vegetation in each vegetation layer
- Total percent facultative and total percent upland species in each vegetation layer (wetland indicator status)
- Survival rate of planted vegetation
- An estimate of volunteer species
- Average height of woody species in each sample and the percent change in height since the previous monitoring event

For riparian zone restoration, creation, or enhancement, the vegetation section of the monitoring report should also include a qualitative estimate of plant vigor.

The monitoring report must also include a description of any features or issues of concern on the mitigation site. All areas of concern should be annotated on a plan view of the site with GPS coordinates and photographs. Photographs should be taken from the same location each year to document the current condition of the area of concern. The monitoring report should also identify all recommended courses of action, which may include continued monitoring, repair, or other remedial action to alleviate the concerns.

In addition to photographs, vegetative data, and an analysis of any concerning issues on the site, post-construction monitoring reports should also include the items listed below:

1. An executive summary
2. The requirements and goals of the approved mitigation proposal
3. A detailed explanation of the ways in which the mitigation project has or has not progressed toward the goals established in the approved mitigation proposal. If mitigation has not achieved anticipated progress, the report must also include a list of corrective actions to be implemented and a timeframe for completion.
4. Information required by the mitigation monitoring project checklist, including:
    - A USGS quad map and an aerial photograph on which the limits of the mitigation site and all proposed access points are clearly indicated
    - A location map indicating the location and direction of each photograph
    - When appropriate, an assessment of the hydrology of the mitigation site, including, any monitoring well data, stream gauge data, relevant tidal data, photographs, and field observation notes collected throughout the monitoring period. For freshwater wetlands, hydrology measurements including soil saturation, depth of standing water, and daily precipitation data for the growing season with a comparison to historical average precipitation
    - Soil data

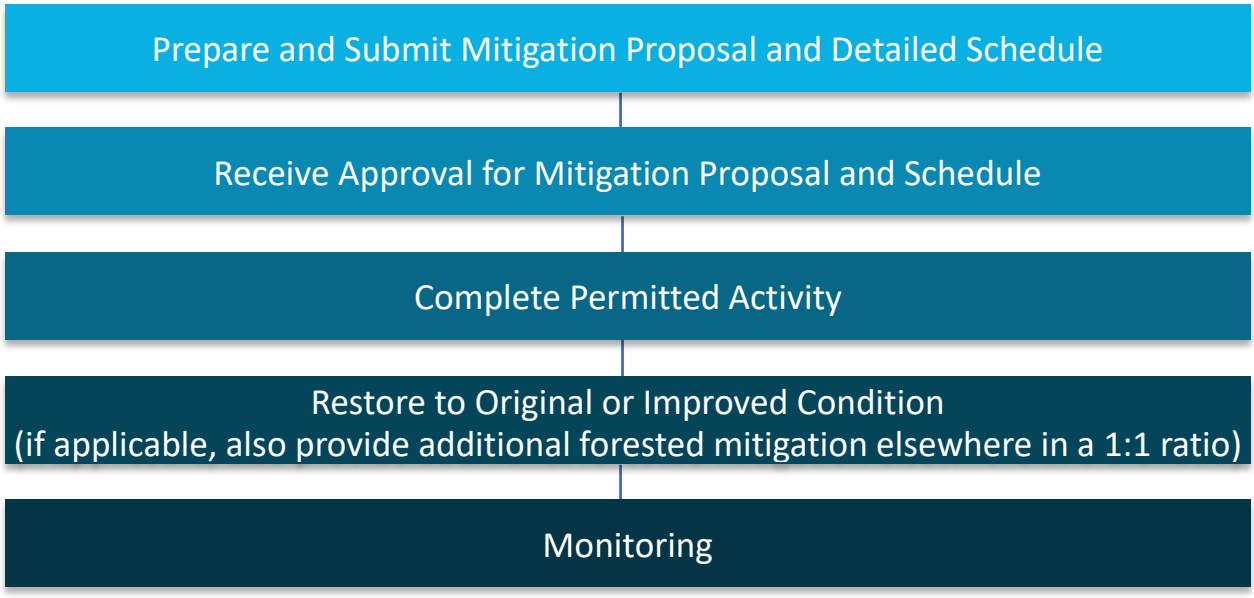
- When appropriate, a field delineation of the wetlands at the wetlands mitigation project site based on techniques specified in *The Federal Manual for Identifying and Delineating Jurisdictional Wetlands*, published in 1989 by the USEPA, USACE, USFWS, and NRCS
- A plan showing the flagged wetlands delineation or riparian zone verification and global positioning system (GPS) data points
- Vegetative cover maps

3.6 Mitigating for Temporary Disturbances

Mitigation for a temporary disturbance, which is fully defined in Section 2.3.1, is a form of restoration mitigation that includes restoring the original topography as well as restoring the original vegetation to its previous condition or to an improved condition. Therefore, temporary disturbance mitigation is commonly referred to as temporary restoration.

It is important to note that temporary restoration mitigation is not an acceptable mitigation alternative if the affected resource will be permanently altered or eliminated by the permitted activity. For example, temporary restoration mitigation is commonly performed after the remediation of contaminated sites. While the DEP recognizes the benefits of environmental cleanup activities, any project that involves capping of a freshwater wetland or riparian zone is not considered a temporary disturbance as there is a permanent loss of all functions provided by the wetland or riparian zone. Therefore, any project that involves capping is not eligible for temporary restoration mitigation.

For projects that meet the definition of a temporary disturbance, the mitigation process includes the following steps:



To ensure the success of temporary restoration, the mitigation proposal must include a description and documentation of the pre-disturbance vegetation, hydrology (where appropriate), and soil conditions. Samples, data sheets, and photographs of the pre-disturbance site can be used to document the pre-disturbed conditions. The mitigation proposal must also include the intended results and conditions after the mitigation is complete and a restoration plan that identifies any proposed grading necessary to return the disturbed area to its pre-disturbed elevation as well as all proposed plantings, including type, species, size, number of plants, and location. The DEP also requires a detailed schedule that provides the sequence of mitigation activities with their estimated dates for completion. Section 3.3 provides helpful information on developing the mitigation proposal, including information regarding vegetation, hydrology, and hydric soils.

Once the DEP has approved the mitigation proposal and schedule, the applicant may complete the permitted activity. In the case of temporary impacts, the restoration of the site to its pre-disturbance conditions must commence immediately upon completion of the permitted activity.

Generally, restoring the original vegetation to its previous condition includes restoring the appropriate vegetative component. For example, if a forested riparian zone or wetland is temporarily disturbed, the area should be replanted with trees once the disturbance is removed. However, if it is not possible to restore the area to a forested wetland or riparian system, the applicant must replace the lost forested component of the wetland or riparian zone elsewhere in a 1:1 ratio to compensate for the loss of the ecological functions and values. For example, if a 0.25-acre forested wetland area is temporarily disturbed to install an underground utility line and upon completion, the site will remain a wetland but no trees will be permitted to grow on the line, the applicant will be required to restore the impacted area with herbaceous wetland vegetation and to plant 0.25 acres of trees in another wetland area that is devoid of trees.

Once the mitigation is complete, monitoring will be required. See Section 3.5 for monitoring information and requirements.

3.7 Submerged Aquatic Vegetation Restoration

Submerged aquatic vegetation habitat, which is fully defined in Section 2.1.6 of this manual, are areas that currently or historically support aquatic vascular plants, whether marine, estuarine, or freshwater species. As mentioned in the discussion of the types of mitigation in Section 2.3.1, only restoration mitigation may be conducted for impacts to SAV. The mitigation must be performed at a 3:1 ratio or higher depending on the size, persistence, and density of the impacted SAV.

Restoring impacted SAV resources is more difficult and expensive than restoring other resources, such as wetlands or riparian zones, as it typically involves harvesting existing SAV material and transplanting it to a selected mitigation site. Because of the challenges associated with SAV mitigation, the DEP routinely works with applicants to avoid any disturbances to submerged aquatic vegetation, alleviating the need for mitigation. As a result, SAV impacts are infrequent and SAV mitigation is not commonly practiced in New Jersey for freshwater, estuarine, or marine species.

> If impacts to SAV are anticipated, applicants are strongly encouraged to request a pre-application conference early in the permitting process to avoid delays in construction. Applicants may need to conduct up to a year-long study and perform surveys of the proposed impact areas as well as locate suitable mitigation sites for SAV transplants. Information regarding pre-application conferences can be found in the CZM Rules at N.J.A.C. 7:7-22.

Nevertheless, there have been some instances where disturbance to SAV was unavoidable, and mitigation was necessary. As such, the CZM Rules provide certain standards for SAV mitigation at N.J.A.C. 7:7-17.10. Notably, permanent impacts to SAV habitat require mitigation in accordance with scientifically documented transplanting methods, mitigation should be performed in-kind, and biannual monitoring must be conducted.

A mitigation proposal must be approved by the DEP before the permitted activity may take place.

This section of the manual provides guidance for mitigating for permanent impacts to SAV, including:

- Selecting a mitigation site – Section 3.7.1
- Choosing a transplanting method – Section 3.7.2
- Designing other aspects of the mitigation project – Section 3.7.3
- Monitoring – Section 3.7.4

The CZM Rules also provide standards for mitigating for temporary impacts to SAV, which are discussed in Section 3.7.5.

It is important to note that the information contained in this section is based on the DEP's experiences with previous SAV mitigation projects and is intended as a guide for choosing the best possible means of mitigating and utilizing the most up-to-date mitigation practices. However, there is a significant variety of regulated SAV species that can differ greatly in their life histories, and the science surrounding SAV restoration is constantly evolving. As such, the DEP acknowledges that there are other alternatives for conducting SAV restoration mitigation.

3.7.1 Selecting a Mitigation Site

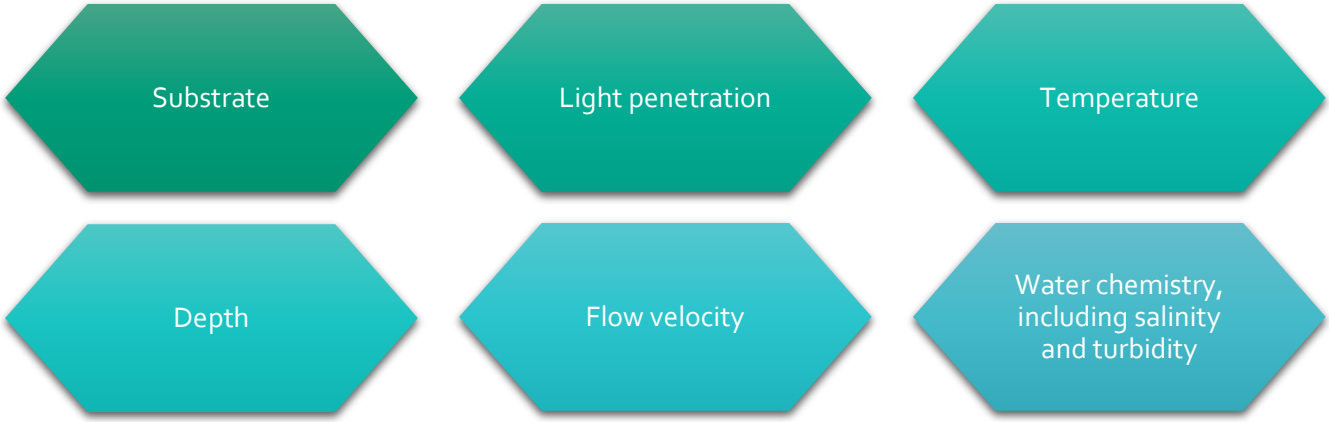
Site location is the most crucial aspect of SAV mitigation. The mitigation site must be located as close to the disturbance site as possible. At the very least, it should be within the same waterway and watershed management area.

However, the CZM Rules prohibit SAV mitigation in areas that already contain SAV. SAV often occurs in patches, meaning there are areas that are unvegetated within an SAV vegetation bed. The rules define a *vegetation bed* as "an area where submerged vegetation rhizomes overlap, or where submerged vegetation shoots intermingle within less than one square meter." SAV mitigation is not permitted within these unvegetated patches of an existing SAV vegetation bed.

To help applicants avoid areas that already contain submerged aquatic vegetation, the DEP provides SAV maps. While the maps are useful resources, it must be noted that SAV is often dynamic in its growth patterns and can move from year to year, so in the absence of regular mapping, potential mitigation sites will need to be analyzed to ensure they do not already contain SAV.

While mitigation cannot take place within an area that already contains SAV, the DEP recommends searching for a potential mitigation site near an existing SAV community. For mitigation to be successful, the mitigation area must be comparable to the site of the impacted SAV and have the appropriate conditions to support SAV growth. Proximity to existing SAV increases the likelihood that the site will meet those requirements.

To begin the site selection process, surveys should be conducted at the proposed impact site as they will provide the applicant with a better understanding of the parameters for that habitat at the appropriate time of year, which will provide direction for choosing a comparable mitigation site. Data related to the following should be collected from the site:



Field surveys of a potential mitigation site will help determine if the site is comparable to the impact site. In addition to field surveys, several tools, such as GIS, can be used to locate areas for mitigation that meet water quality, hydrodynamics, and other environmental parameters that are critical factors in the establishment, growth, and survival of SAV.

To further ensure that the potential mitigation site can support SAV growth:

1. Sediment grain size at the potential mitigation site should ideally be free of cobble and characterized as muddy sand.
2. The tidal range at the mitigation site must be taken into account as SAV will not be able to establish if any substrate in the area is exposed to the air. Not all tides are consistent throughout the course of the year, and the maximum extent of any low tides must be identified so plantings are effectively submerged all year round.
3. The depth of the water at the mitigation site must be shallow enough to allow sunlight to penetrate to the SAV.
4. The mitigation site should have flow but not fast-moving waters.
5. Areas with clamming activities, dredge disposal sites, and waters used for recreational purposes should be avoided.

3.7.2 Transplanting Methods

As mentioned above, permanent impacts to SAV habitat require mitigation in accordance with scientifically documented transplanting methods. The following methods are potential options for

planting the mitigation site, and each is described further below. They are listed in order of the DEP's recommendation.

1. Transplanting from the impact site
2. Seed collection and dispersal
3. Transplanting from donor beds

Transplanting from the Impact Site

For the greatest likelihood of achieving successful SAV mitigation, the DEP recommends transplanting vegetation directly from the impact site. Under this method, the applicant will remove as many individual plants as possible from the impact site before the permitted activity is conducted and will then replant them at the mitigation site.

The entire plant must be removed from the substrate, including rhizomes, turions (winter/overwintering buds), and blades. Small, hand-held garden tools work well for removing the plants as well as for re-planting them in the mitigation area.

After individual plants have been removed from the impact site, they must be kept in local water or within cloth or paper material that has been soaked in local water until they are ready for replanting. Transplant material should not be stored for longer than 24 hours after harvesting.

At the mitigation site, plants should be placed within planting grids for ease of monitoring. When replanting, the roots/rhizomes/tubers of each plant must be planted no more than four inches below the substrate surface. Studies have shown that deeper planting limits healthy growth and re-establishment and that maximum establishment occurs when the material is planted from 0.75 inches to 2 inches below the substrate surface. Landscape staples or bamboo stakes should be used to keep the plants in place.

Seed Collection and Dispersal

Collecting seeds from a local SAV community for planting at the mitigation site, rather than harvesting mature plants, has proven successful for SAV mitigation. However, in certain circumstances, species such as water celery (*Vallisneria americana)* may not produce fertilized seed pods in persistent currents of tidal or riverine systems.

To determine if seed collection is a viable method for mitigation, the applicant should assess local SAV populations to determine if seeds are being produced. This assessment must be conducted at the appropriate time of the year. If seeds are being produced, the applicant must then determine if the seeds are mature. Only mature seeds are viable for planting. When mature, seeds are generally darker in color, although that may not be true for some species.

If mature seeds are present at the local source and are adequate in number for transplanting to the mitigation site, they must be collected by hand and stored for no more than 24 hours in local water.

If seeds cannot be sourced from a local population, commercial seed sources are available.

Seed dispersal at the mitigation site can be performed by hand or by using the tea bag method. The term *tea bag* refers to a small, degradable pouch or cloth that contains several seeds. Utilizing the tea bag method in a planting area is most successful when used in conjunction with another form of mitigation, such as transplanting mature plants from either the impact site or a donor bed, because the plants act as a breakwater, preventing too many seeds from washing out of the mitigation area.

Transplanting from Donor Beds

Transplanting from a donor bed involves harvesting mature plant material from existing populations other than the impact site. Donor beds should be located within the same waterbody or near to the mitigation site to provide the greatest chance for successful growth and survival of the transplanted materials.

A permit from the Division of Land Resource Protection is necessary for transplanting from a donor bed. The applicant should consult with the Mitigation Unit if they are unsure if their permit covers this activity.

This method of SAV mitigation is not as highly recommended by the DEP as the other methods described above because it must be conducted with extreme care in order to minimize impacts to the donor bed. Depleting the vegetative coverage in the donor bed to obtain the necessary plant material for the mitigation site is not acceptable.

To ensure the donor bed is not depleted, the individual plants should be removed individually by-hand over a large area. Removing too many plants from one group at the same time can result in large holes in coverage, subjecting the surrounding bed to erosion and habitat loss. Collection of the

plant material should proceed along a transect tape or within a designated area marked with GPS coordinates, buoys, and/or stakes to prevent repeated harvesting from the same location. The donor bed must be monitored after collection.

As with transplanting from the impact site, the entire plant must be removed from the substrate, including rhizomes, turions (winter/overwintering buds), and blades. Small, hand-held garden tools work well for removing the plants as well as for re-planting them in the mitigation area.

After individual plants have been removed from the impact site, they must be kept in local water or within cloth or paper material that has been soaked in local water until they are ready for replanting. Transplant material should not be stored for longer than 24 hours after harvesting.

When replanting at the mitigation site, the roots/rhizomes/tubers of each plant must be planted no more than four inches below the substrate surface. Studies have shown that deeper planting limits healthy growth and re-establishment and that maximum establishment occurs when the material is planted from 0.75 inches to 2 inches below the substrate surface. Landscape staples or bamboo stakes should be used to keep the plants in place.

3.7.3 Designing the Mitigation Project

In addition to selecting the mitigation site and determining the method for transplanting, the applicant must keep the following in mind when designing the mitigation project:

- Marking the mitigation site
- Herbivory control

Marking the Mitigation Site

As SAV mitigation sites are located in water, each site must be clearly marked. The applicant must record GPS points for the mitigation site's boundaries, which should be demarcated using either buoys or PVC poles or other saline water-resistant markers that are one to two inches in diameter. All poles or markers should be long enough that at least five feet of the marker is exposed at mean high water after they are installed securely in the sediment.

If practical, planting grids can be laid out within the larger mitigation site. Each grid is typically one square meter and is split into quadrants. A planting grid might contain anywhere from two to five individual plants (or other suitable propagation materials) per quadrant, clumped together. The planting grids should be depicted on a planting plan or drawing and provided with the SAV mitigation proposal. Numbering the specific planting grids allows for easy data collection.

Bio-degradable flagging or other visible markers should be used to indicate planting grids, monitoring plots, or other site information. For example, flags of one color may be placed on PVC poles at the corners of the mitigation site while flags of a different color are placed on poles within the site to indicate the locations of the monitoring plots. See Section 3.7.4 for more information on monitoring.

Herbivory Control

In some cases, herbivory from waterfowl or other organisms may negatively impact the mitigation site. As such, the applicant must understand the specific SAV species that are being transplanted in order to anticipate and protect against potential herbivory.

To deter waterfowl, goose fencing with reflective ribbon may be used where feasible. Goose fencing is described in the discussion of herbivory control measures in Section 3.3.3.

Another method of herbivory control for SAV is utilizing growing enclosures that prevent organisms from feeding on the SAV plant material. With this method, one to two-inch PVC poles are driven into the substrate and fastened with polyethylene aquaculture mesh or other poultry fencing. Any mesh caging must not only encase the planting beds above the water but must also be fixed along the substrate to ensure potential herbivores are not able to gain access to the growing enclosure below the water's surface.

Enclosures should be large enough or situated in a manner that allows for surveys to be conducted. Providing an accessway along the enclosure may be necessary to allow for underwater monitoring.

Frequent maintenance of growing enclosures is necessary to ensure the enclosures are functioning and do not contain floating debris that could damage the cage or plant material.

3.7.4 Monitoring

The general procedures and requirements for monitoring restoration projects are discussed in Section 3.5, but this section provides information and requirements that are specific to SAV restoration. Submerged aquatic vegetation mitigation areas must be monitored twice per year during the growing season for a minimum of three years or until the DEP has deemed the mitigation a success. If the mitigation method involved transplanting from a donor bed, the donor beds must also be monitored. Some SAV mitigation projects require permits from the USACE in addition to the DEP permit. Monitoring may be required for five years as a condition of the USACE permit, depending on the growth rates and habits of the planted SAV.

Some SAV mitigation sites will require additional maintenance throughout the year if enclosures are required to prevent herbivory, and the barriers need to be cleaned of any flotsam or debris.

The monitoring methods that are currently accepted by the scientific community for SAV are plot-based methods in which fixed plots (or grids) are randomly selected and assessed for individual plants and percent vegetative coverage. Reference areas of existing SAV should be identified and utilized for SAV monitoring to ensure the mitigation is successful. Metrics to be monitored include but are not limited to:

- Initial calculation of the percentage of planting units (clumps or horizontal rhizomes) that survived. This may be assessed one to four months after planting.
- Percent cover
- Blade height (80 percent of the average of the tallest leaves)
- Presence and number of reproductive shoots
- Areal extent of the bed
- Shoot density, which is the number of shoots versus the baseline shoot density. Shoot density should be measured *in situ* within the quadrats for each planting grid and within the reference area.

Monitoring reports are to be provided to the DEP by December 31st of each year.

The success criteria for SAV mitigation should be designed to meet site-specific parameters, using the reference area as well as data taken from the impact site. As such, specific success criteria will likely be different from one project to another. As a general threshold, successful transplants should demonstrate at least 25 percent expansion of areal coverage within one year of transplanting. The

final goal of 85 percent vegetative coverage that is utilized for other restoration projects may not be an appropriate goal for submerged aquatic vegetation since SAV is known to be dynamic in its growth patterns. Instead, a final goal may be that the planting area must support SAV for a minimum of three years. Regardless of the specific success criteria that are established for the project, all success criteria must be agreed upon by all parties and clearly defined in the approved mitigation proposal before the project commences.

3.7.5 Temporary SAV Disturbances

Mitigation for temporary disturbances is described in Section 3.6. This section provides some additional information that is specific to mitigating for temporary disturbances to submerged aquatic vegetation. Temporary disturbances to SAV require restoration to pre-construction vegetation and benthic conditions. Specifically, benthic topography must be restored to pre-existing grade and contour.

The mitigation proposal for a temporary disturbance to SAV must be submitted to the DEP 30 days before the applicant begins construction of the permitted activity that will cause the disturbance. At a minimum, the proposal must include:

1. A schedule describing the sequence of proposed mitigation
2. Estimated dates for completion of proposed restoration
3. A detailed restoration plan report that includes pre-construction surveys, proposed compensatory activities with success criteria, an adaptive management protocol, and site aerials and plans. The restoration plan should include any proposed grading needed to return the disturbed area to its pre-disturbed grades and contours and should identify all proposed plantings, including type, size, and number of plants.

Three years of monitoring of the disturbed area is required after restoration. If natural re-colonization of vegetation does not return to the spatial coverage and densities of the pre-impact SAV habitat after three years, further maintenance and corrective action is required through replanting of the disturbed area.

The DEP also recommends monitoring at one or more nearby sites that were unaffected by the project to ensure that widespread change did not occur as a result of the project.

SECTION 4: ADDITIONAL MITIGATION ALTERNATIVES

Some applicants prefer not to undertake the construction activities that are necessary to complete a restoration, creation, or enhancement mitigation project, as explained in Section 3. Therefore, the DEP also offers four mitigation alternatives that do not require the applicant to perform their own construction – in-lieu fee, preservation, land donation, and credit purchase. These alternatives may be used to mitigate for permanent disturbances only. Temporary disturbances require restoration, as explained in Section 2.3.1.

These mitigation alternatives may each be performed on their own where appropriate. However, they may also be performed in combination with one another and/or in combination with restoration, creation, and enhancement mitigation projects. When an applicant is utilizing more than one mitigation alternative, all requirements for each mitigation alternative must be met.

Sections 4.2 through 4.5 below provide detailed explanations for each of the four non-construction types of mitigation, including the resources to which the method applies, the process for conducting the mitigation, the mitigation requirements, and how to prepare the mitigation proposal. In-lieu fee and land donation mitigation must be conducted through the Wetland Mitigation Council, which is described in Section 4.1.

- In-lieu fee – Section 4.2
- Land donation – Section 4.3
- Preservation – Section 4.4
- Credit purchase from a mitigation bank – Section 4.5

4.1 The Wetland Mitigation Council

The Wetland Mitigation Council was established under the Freshwater Wetlands Protection Act (N.J.S.A. 13:9B-14) to serve as an oversight committee for monetary contributions (see Section 4.2) and land donations (see Section 4.3) to satisfy mitigation requirements. No monetary contribution or land donation can be accepted to satisfy a mitigation requirement unless it is first approved by the council.

The council serves as Program Administrator for the state's only approved In-Lieu Fee (ILF) Program. In-lieu fee programs must be approved by the USEPA under an ILF instrument, which sets forth the guidelines and responsibilities necessary to ensure the program produces the necessary compensatory mitigation for unavoidable impacts to all waters of the United States, including wetlands. The council upholds this objective by ensuring every monetary contribution represents adequate recompense for the related disturbance. Also under the ILF program, the council ensures that monetary contributions are utilized for the creation, restoration, enhancement, and preservation in perpetuity of both freshwater and coastal wetland habitats throughout New Jersey.

It is important to note that the ILF program has not been approved by the USACE and therefore cannot be used to satisfy any mitigation requirements associated with a USACE permit.

In addition to receiving and allocating funds, the council is also responsible for reviewing and dispensing lands donated for the purposes of mitigation. Specifically, the council may transfer any funds or any donated lands to a state or federal conservation agency or charitable conservancy that consents to the transfer in order to expand or provide for freshwater wetlands preserves, transition areas around existing freshwater wetlands, and future mitigation sites for freshwater wetlands enhancement, restoration, or other mitigation efforts.

A ***charitable conservancy***, as defined by N.J.S.A. 13:8B-2, is a corporation or trust whose purposes include the acquisition and preservation of land or water areas or of a particular land or water area, or either thereof, in a natural, scenic, or open condition, no part of the net earnings of which benefits any private shareholder or individual, and which has received tax exemption under section 501(c) of the 1954 Internal Revenue Code.

The council is comprised of seven members, including the Commissioner of the Department of Environmental Protection, who serves ex officio. The remaining six members are appointed to three-year terms by the governor with the advice and consent of the senate. Two of these members must be persons recommended by recognized building and development organizations, two must be recommended by recognized environmental and conservation organizations, and two must represent institutions of higher learning in the state.

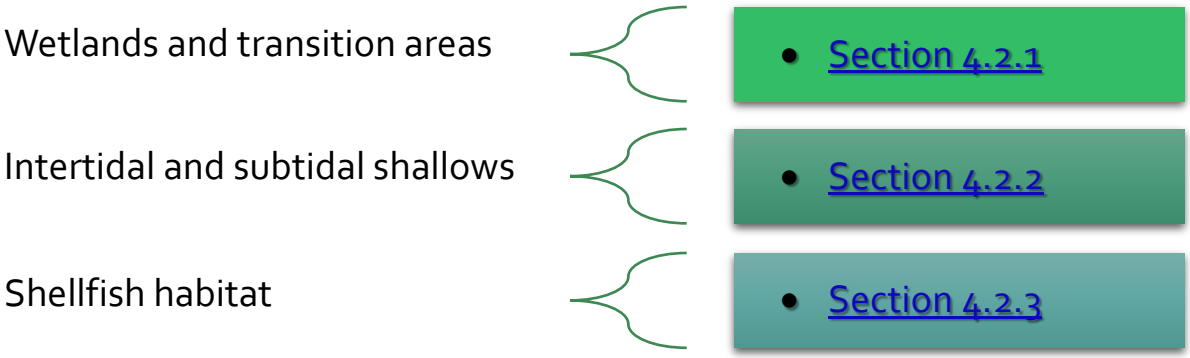
The Wetland Mitigation Council meetings are generally held six times per year. Council meetings are conducted as "public meetings," including public notice, a published agenda, and opportunity for applicants and the public to comment during the meeting. The council will vote on the applications that are presented at each meeting after all of the comments on that application have been heard. Applications must receive a majority vote for approval. However, a majority is not the majority of the council members present at a specific meeting but rather a majority of the full membership of the council. Therefore, an application must receive four affirmative votes for approval.

4.2 In-Lieu Fee Mitigation

As mentioned in Section 2.3.1, the in-lieu fee method of mitigation is also called a monetary contribution. Under this method, the applicant makes a monetary contribution "in lieu of" conducting their own mitigation project. Monetary contributions may be made to mitigate for disturbances to wetlands, wetland transition areas, intertidal and subtidal shallows, or shellfish habitat. Monetary contributions are not currently an acceptable form of mitigation for riparian zones or submerged aquatic vegetation.

For wetlands, transition areas, and ISS, all monetary contributions go to a common fund called the Wetland Mitigation Fund, which is overseen by the Wetland Mitigation Council under New Jersey's approved ILF program (see Section 4.1). Monetary contributions for disturbances to shellfish habitat go to a designated shellfish habitat mitigation fund, which is administered by the DEP.

This section of the manual elaborates on the general mitigation process that is described in Section 2.6, providing information that is specific to the process for making a monetary contribution for each of the following:



4.2.1 Wetlands and Transition Areas

The process for making a monetary contribution to mitigate for disturbances to wetlands or transition areas depends on which rule the permitted project is conducted under. This section explains in detail the mitigation process for monetary contributions under the FWPA Rules and the mitigation process for monetary contributions under the CZM Rules.

The Mitigation Process for Monetary Contributions Under the FWPA Rules

When an applicant wishes to provide a monetary contribution to compensate for a disturbance to wetlands or transition areas under the FWPA Rules, the first step is for the applicant to request and receive approval from the DEP to use this type of mitigation.

As shown in the mitigation hierarchies for both wetlands (Figure 2.4) and transition areas (Figure 2.6), the DEP prefers onsite mitigation, offsite mitigation, and the purchase of credits from a mitigation bank over a monetary contribution. Therefore, the applicant must explain why each of those preferred options is not feasible in order to receive approval to proceed with a monetary contribution.

If the DEP approves the use of a monetary contribution for mitigation, the approval will be one of the following:

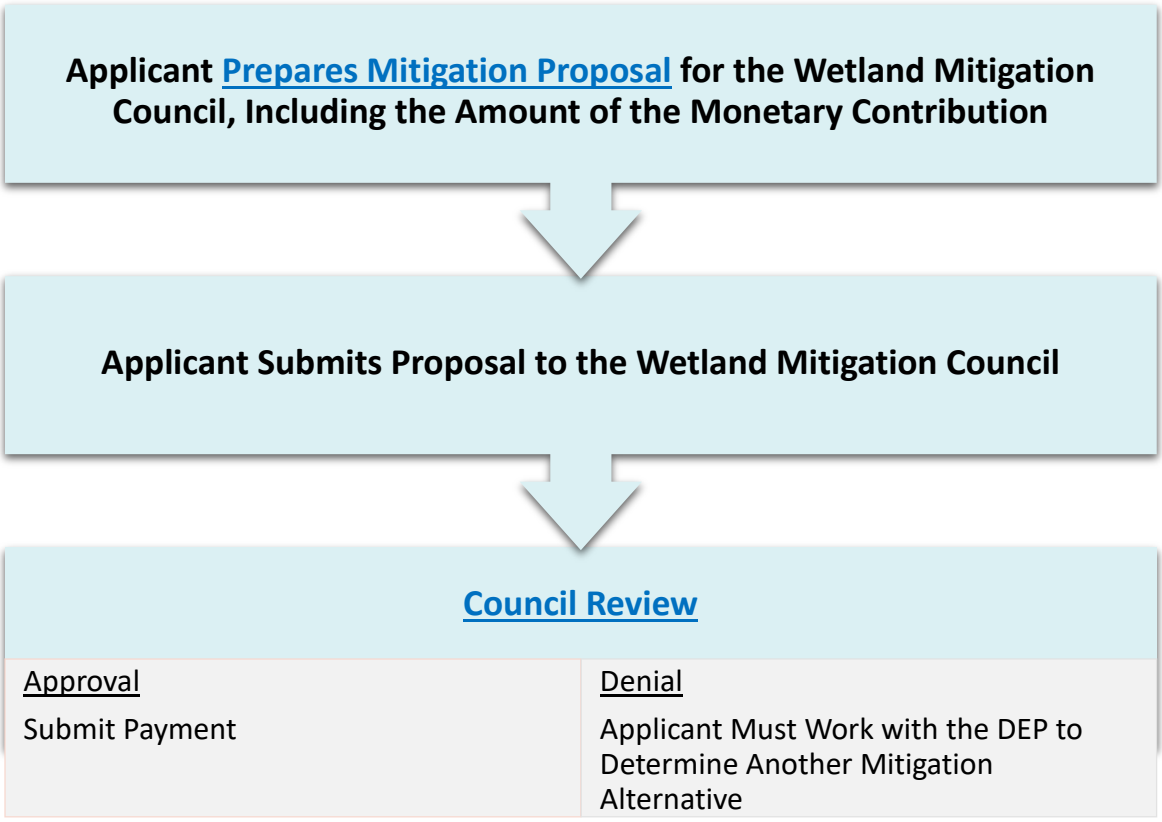
If submitted and approved prior to the issuance of the permit:	• Approval = a permit condition
If not approved prior to the issuance of a permit:	• Approval = a letter or email from the DEP

Once the DEP deems a monetary contribution to be an acceptable form of mitigation, the remainder of the process, including how to determine the amount of the monetary contribution, depends on whether the permitted project is authorized under a general permit or an individual permit. Both processes are explained below.

- Mitigation process for an individual permit
- Mitigation process for a general permit

Mitigation Process for an Individual Permit

After the DEP approves the use of a monetary contribution for mitigation for an activity under an individual permit, the process for completing the mitigation includes the following steps:

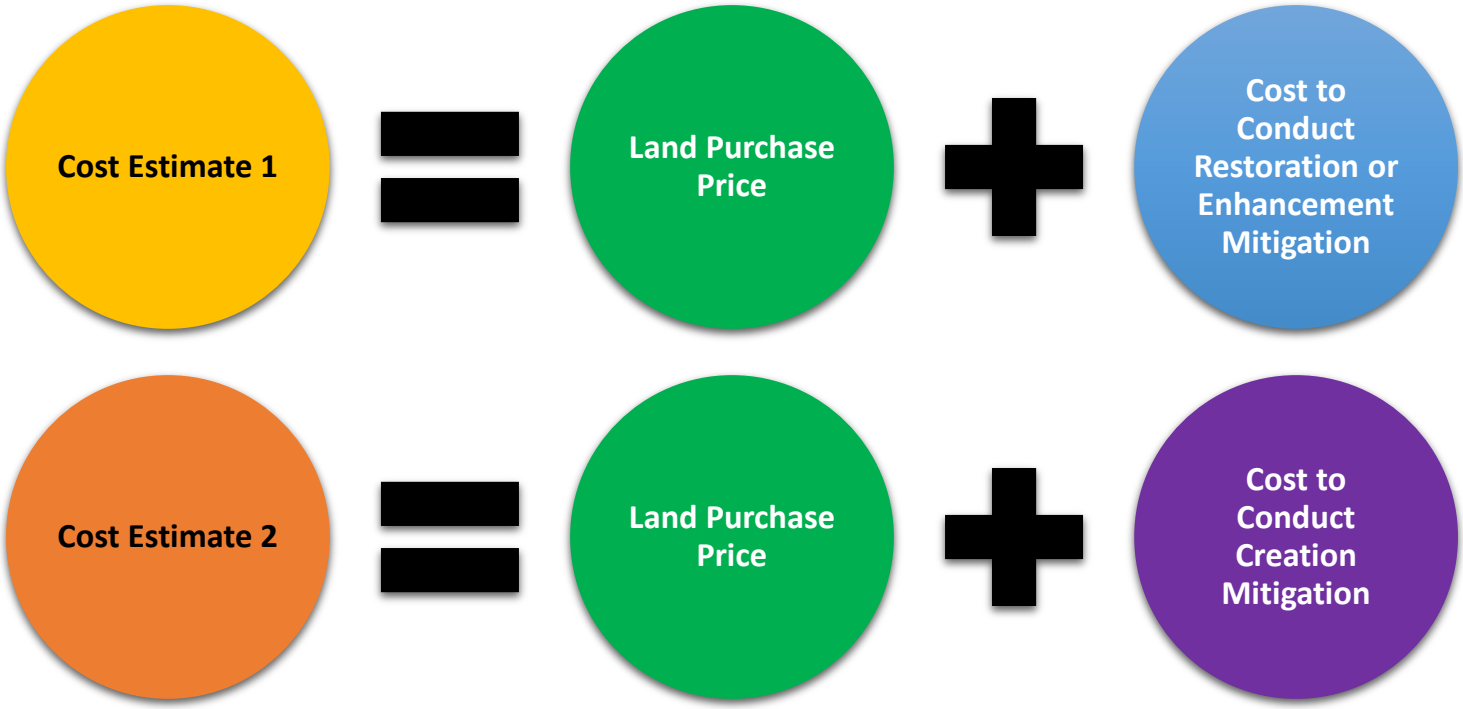


Preparing the Mitigation Proposal and Determining the Amount of the Monetary Contribution

Despite having secured an approval from the DEP to make a monetary contribution, the applicant must also submit a mitigation proposal in the form of an application to the Wetland Mitigation Council. The DEP provides a checklist for this application, which must include:

1. A copy of the permit, letter, or other correspondence from the DEP approving a monetary contribution
2. A description of all options for conducting mitigation onsite and offsite, including the option for credit purchase, and a justification explaining why those options are not feasible
3. A determination of the amount of the monetary contribution

To determine the amount of the monetary contribution, the applicant must prepare two cost estimates, as described and illustrated below. If approved by the council, the amount of the monetary contribution will be the lower of these two cost estimates.



The first cost estimate should represent the sum of the price to purchase land on which mitigation could be conducted and the cost to actually perform restoration or enhancement mitigation on that land. The cost estimate for the restoration or enhancement mitigation should be based on a 3:1 ratio, meaning it should assume that three acres will be restored or enhanced for each acre of disturbance.

The cost estimate should be based on restoration or enhancement mitigation activities that would provide ecological functions and values that are equal to those that will be lost as a result of the disturbance. Restoration and enhancement require a site to be planted with trees, herbaceous plants, and/or grasses, so the mitigation cost estimate must reflect the appropriate vegetation. For example, if forested freshwater wetlands are being disturbed, the cost estimate should reflect enhancement or restoration of a forested freshwater wetland.

The second cost estimate should represent the sum of the price to purchase land and the cost to create a wetland on that land that is the same type and ecological value as the wetland or transition area that is being disturbed. For example, if forested freshwater wetlands are being disturbed under the permit, this second cost estimate should reflect the cost to establish a forested freshwater wetland. This cost estimate should provide the same estimation for the land acquisition as the first cost estimate plus the estimated cost for the creation mitigation at a 2:1 ratio, meaning it should assume that two acres shall be created for each acre disturbed.

Both mitigation cost estimates (restoration/enhancement and creation) must include all costs that would be necessary to complete the proposed mitigation and monitoring, including at least all of the following:

1. Engineering costs, which may include surveying of land, a soil erosion and sediment control plan, a grading plan, a soil removal plan, a wetland planting plan, calculation of a water budget, etc.
2. Environmental consultant fees, such as preparation of a seeding/planting and restoration plan, interface with engineering plans and personnel, permit processing costs, etc.
3. Attorney fees, including preparation of a conservation restriction
4. Cost of financial assurance that complies with the appropriate rule, where applicable
5. Site preparation and construction costs
6. Vegetation planting costs, which should include an estimate from a local nursery reflecting the size and quantity of the planting material that would be used
7. Cost of supervising construction
8. Cost of monitoring the project and the preparation of monitoring reports for five years

Both cost estimates should be prepared in accordance with the real estate appraisal requirements, which are attached to the DEP's checklist for monetary contributions for individual permits. They should be included in either a self-contained appraisal report or a summary appraisal report prepared by a real estate appraiser who is licensed by the New Jersey State Board of Real Estate Appraisers.

The appraisal report must use the entire site within the record title, the appropriate unit of value for the subject property (e.g., per building lot, per buildable unit, per acre, or per square foot), and the current market value of the entire estate (land only) when put to its highest and best use. The report must contain current photographs of the subject property and comparable sales, meaning the price of similar properties in the area. It must also contain copies of the tax map of the subject property and the comparable sales, a sales location map, and a flood map. For more information regarding appraisal reports and licensed appraisers, see the New Jersey Division of Consumer Affairs website for the State Real Estate Appraiser Board.

Wetland Mitigation Council Review Process

Once the application for a monetary contribution is received, it must be placed on the Wetland Mitigation Council's meeting agenda. The application should be delivered to the Mitigation Unit 60 days prior to the intended council meeting to allow time for review. As mentioned above, the council generally meets every two months.

Once the Mitigation Unit deems the application to be complete, they will prepare comments and recommendations for the council. In addition to the application and staff comments, the council will also receive a draft resolution prepared by DEP staff prior to the meeting. The applicant will receive a copy of the council agenda for the meeting, the staff comments, and the draft resolution approximately two weeks before the meeting date.

During the council meeting, the applicant will have the opportunity to present their application to the council and to address any questions or comments that the council may have. There will also be time for council discussion as well as public comment on the application. After the discussion and comment period, the council will vote to approve or deny the application.

At the time of the council decision, a resolution reflecting the approval or denial of the application will be prepared. If the monetary contribution proposal is approved, the applicant will receive a letter from the DEP instructing them how and where to submit payment. Once the monetary contribution is received by the DEP, the applicant will receive a letter indicating that the mitigation is complete. If the council denies the application for a monetary contribution, the applicant will need to work with the DEP to determine another mitigation alternative.

Mitigation Process for a General Permit

For a general permit, after the DEP approves a monetary contribution as an acceptable form of mitigation for the project, the applicant must submit a mitigation proposal in the form of an application that includes the following:

1. A copy of the permit authorizing the impact
2. A letter agreeing to make a monetary contribution to satisfy the mitigation obligation based on the rate per acre of disturbance currently in effect for single-family homeowners and all other property owners in accordance with N.J.A.C. 7:7A-11.16(e)

The DEP provides a checklist for this application.

As of November 7, 2022, the monetary contribution for single-family homeowners is the number of acres disturbed multiplied by $47,600. For example, a general permit for a minor road crossing is issued to a single-family homeowner for impacts to 0.15 acres of wetlands. The applicant is approved for a monetary contribution because there is no mitigation bank located within the same service area as the home and there are no feasible onsite or offsite options for mitigation. Based on the current rate, the monetary contribution would be 0.15 acres disturbed X $47,600= $7,140.

If the applicant is not a single-family homeowner, the monetary contribution is the number of acres disturbed multiplied by $377,000. For example, a general permit for a minor road crossing and an outfall structure is issued to a business park owner for impacts to 0.2 acres of wetlands. The applicant is approved for a monetary contribution because there is no mitigation bank located within the same service area as the home and there are no feasible onsite or offsite options for mitigation. Based on the current rate, the monetary contribution would be 0.20 acres disturbed X $377,000= $75,400.

The current rates mentioned in this manual for both single-family homeowners and all other applicants are based on the Consumer Price Index (CPI). The *CPI* is a measure of the average change in prices paid by consumers for goods and services, and it is adjusted every February by the United States Bureau of Labor Statistics.

If the annual adjustment to the CPI results in an increase of $500 or more above the current rate for a monetary contribution, the DEP must adjust the rate so that it is consistent with the CPI. To do so, the DEP must publish a notice of administrative change to the applicable rule in the New Jersey Register announcing the new rate. The New Jersey Register is published bimonthly by the New Jersey Office of Administrative Law, and it includes rule proposals and adoptions for all state agencies. The existing rate for a monetary contribution will remain in effect until the notice is published.

A monetary contribution for a general permit that has been approved by the DEP and is specifically identified in the permit conditions does not require any formal approval by the Wetland Mitigation Council. Provided the application for a monetary contribution is prepared in accordance with the rules and approved by the DEP, the application is also deemed approved by the council. The applicant will either receive a letter from the DEP instructing them how and where to submit the monetary contribution or that information will be included in the permit condition. Once the monetary contribution is received by the DEP, the applicant will receive a letter indicating that the mitigation is complete.

The Mitigation Process for Monetary Contributions Under the CZM Rules

Similar to the process for monetary contributions for wetlands under the FWPA Rules, when an applicant wishes to provide a monetary contribution to compensate for a disturbance to wetlands or

transition areas under the CZM Rules, the applicant must request and receive approval from the DEP to use this type of mitigation.

As shown in the mitigation hierarchy for wetlands under the CZM Rules (Figure 2.5), the DEP prefers onsite mitigation, offsite mitigation, and the purchase of credits from a mitigation bank over a monetary contribution. Therefore, the applicant must explain why those preferred options are not feasible in order to receive approval to make a monetary contribution.

For projects within delegable waters, the DEP will have the final authority to determine the acceptability of a monetary contribution. However, for projects within non-delegable waters, if the USACE requires a permit, the applicant will not be permitted to make a monetary contribution.

When monetary contributions are deemed acceptable, the monetary contribution must be in the form of a check or money order made payable to the New Jersey Natural Lands Trust, accompanied by a letter explaining that it is a monetary contribution to the Wetland Mitigation Fund. The letter must specify the DEP file number for the permitted project and the name of the person or entity to whom the permit was issued.

The payment and letter should be sent to:

NJ Natural Lands Trust
Attn: Mr. Bob Cartica
Mail Code 501-04
501 E. State Street
PO Box 42004
Trenton, NJ 08625

A copy of the payment and letter must also be sent to the Mitigation Unit at the address provided in Section 1.3 of this manual.

4.2.2 Intertidal and Subtidal Shallows

The mitigation hierarchy for ISS depends on whether the project is associated with a single-family home or duplex, as shown in Figure 2.8. Likewise, the process for making a monetary contribution for a disturbance to ISS depends on the project. This section explains both of the following:

- ISS monetary contributions for single-family homes and duplexes
- ISS monetary contributions for all other projects

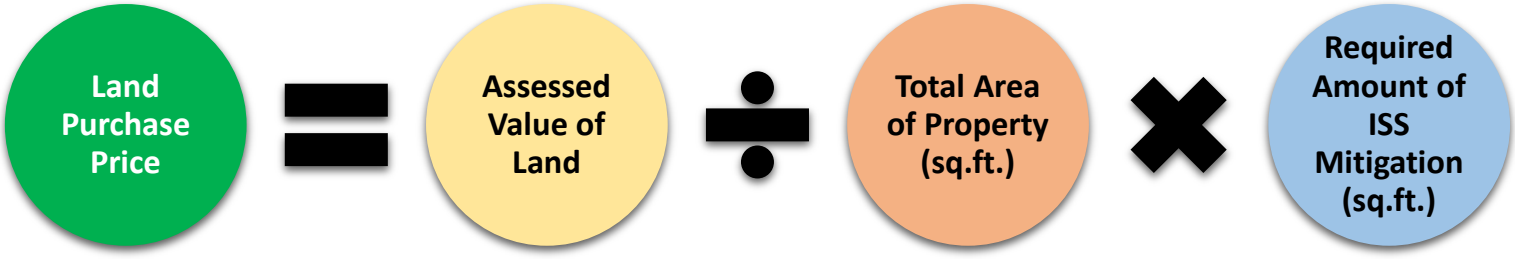
ISS Monetary Contributions for Single-Family Homes and Duplexes

When a single-family homeowner wishes to provide a monetary contribution to compensate for a disturbance to ISS, the first step is for the applicant to request and receive approval from the DEP to use this type of mitigation.

For projects associated with single-family homes and duplexes, the only options for mitigation are onsite creation of ISS and a monetary contribution. However, the DEP prefers onsite creation. Therefore, the applicant will need to explain why onsite creation is not feasible. For example, onsite creation may not be possible due to the small size of the property and/or the presence of a shore stabilization structure, such as a bulkhead.

Once the DEP has approved the use of a monetary contribution for ISS mitigation for a single-family home or duplex, the applicant must determine the amount of the monetary contribution, as illustrated below. The monetary contribution should represent the sum of the estimated price to purchase land upon which mitigation could potentially be conducted and the estimated cost to actually perform mitigation on that land.

To determine the land purchase price, the applicant may use the tax assessed value of their own property as the basis for the value of the land. The formula for the land purchase price should be:



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For example, a permit is issued to a single-family homeowner for a project that will impact 85.5 square feet (0.0019 acres) of intertidal and subtidal shallows. The property is 5,500 square feet, and it has been assessed at $750,000. The land purchase price would be calculated by first determining the value of the land per square foot: 750,000/5,500 square feet = $136.36 per square foot. This value must then be multiplied by the required amount of mitigation in order to obtain the land purchase price: $136.36 per square foot x 85.5 square feet = $11,658.78.

Next, the cost of conducting the ISS mitigation must be determined. Since intertidal and subtidal shallows are tidal areas, they do not always contain vegetation. Therefore, the applicant's cost estimate for the mitigation should be based on the cost of excavating an area to bring it to the appropriate tidal elevation necessary to create ISS. This cost estimate should be obtained from an excavation company. Continuing with the above example, a contractor prepares a proposal to excavate 85.5 square feet, which the contractor equates to 25 cubic yards, to be excavated at a cost of $30 per cubic yard for a total cost of $750 for the mitigation.

Finally, the amount of the monetary contribution can be determined by adding the land purchase price to the cost of the mitigation. In the example provided, the monetary contribution would be $11,658.78 (land purchase price) + $750 (mitigation cost) = $12,408.78.

Provided the amount of the monetary contribution is determined in accordance with the rules and is approved by the DEP, it is also deemed approved by the Wetland Mitigation Council. The applicant will either receive a letter from the DEP instructing them how and where to submit the monetary contribution or that information will be included in a permit condition. Once the monetary contribution is received by the DEP, the applicant will receive a letter indicating that the mitigation is complete.

ISS Monetary Contributions for All Other Projects

For projects disturbing ISS that are not associated with single-family homes or duplexes, any mitigation type may be considered, including restoration, creation, enhancement, credit purchase, preservation, land donation, and monetary contribution. However, the DEP prefers onsite or offsite creation of ISS; offsite creation, restoration, or enhancement of a wetland; and the purchase of credits from a mitigation bank (both in-kind and out-of-kind) over a monetary contribution. Therefore, the applicant must request and receive approval from the DEP to use this type of mitigation. The request should include a justification explaining why each of these preferred options is not feasible.

If the DEP approves a monetary contribution as an acceptable form of mitigation for impacts to ISS, the remainder of the process is identical to the process for making a monetary contribution for a disturbance to wetlands under an individual permit in accordance with the FWPA Rules, which is explained in detail in Section 4.2.1 above.

4.2.3 Shellfish Habitat

When mitigation is required for disturbances to shellfish habitat, the mitigation must be in the form of a monetary contribution to the DEP's dedicated account for shellfish habitat mitigation. Unlike other forms of mitigation, shellfish habitat mitigation does not require a separate mitigation proposal or application for mitigation. The monetary contribution will be calculated and approved as part of the review of the permit application. The amount of the contribution will be based on the area of shellfish habitat covered by structures and moorings, the documented shellfish density on the property, and the commercial value of the resource. When issued, the permit will specify the amount of the monetary contribution as well as how and where the applicant must submit payment.

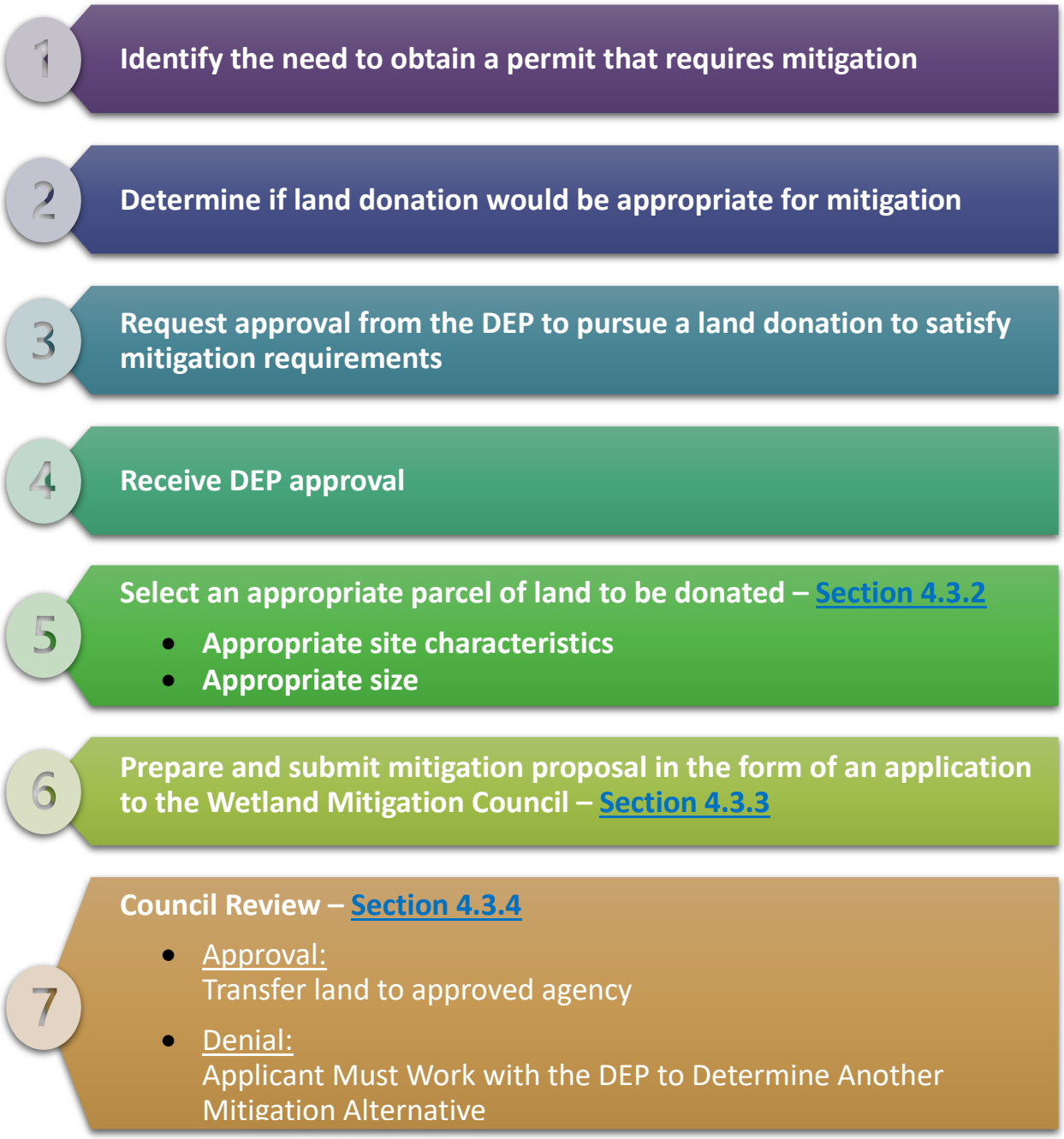
4.3 Land Donation

As mentioned in Section 2.3.1, a land donation is the transfer of ownership of an ecologically valuable wetland or transition area to a government or non-profit entity to compensate for a disturbance to a protected environmental resource. Land donations may be made to mitigate for disturbances to wetlands, wetland transition areas, or intertidal and subtidal shallows. Land donations are not currently an acceptable form of mitigation for riparian zones, submerged aquatic vegetation, or shellfish habitat. Land donations require approval from the Wetland Mitigation Council (see Section 4.1).

Section 2.6 of this manual provides important background information on the mitigation process that applies to all mitigation projects, and the DEP recommends reading that section. This section will elaborate on that process for land donations in Section 4.3.1. Section 4.3.2 provides the essential criteria that a parcel of land must meet in order to be acceptable for a land donation while Section 4.3.3 describes the necessary requirements for the mitigation proposal. Section 4.3.4 explains the Wetland Mitigation Council's review process for land donations.

4.3.1 The Mitigation Process

The mitigation process for land donations consists of the following steps:



After identifying the need for mitigation, the applicant must determine if a land donation is appropriate based on the mitigation hierarchy for the specific resource being disturbed (see Section 2.3.2) and the other requirements in the applicable rules. Land donation is one of the last options in

the mitigation hierarchies for wetlands, transition areas, and ISS and is usually only acceptable when all other types of mitigation are not feasible.

Next, the applicant must request and receive approval from the DEP to use a land donation to satisfy the mitigation requirement. The applicant will need to provide a justification for why the preferred types of mitigation in the applicable mitigation hierarchy cannot be performed.

Once the applicant receives the DEP's approval to pursue a land donation, they must select a parcel of land that is appropriate for donation, meaning it possesses the necessary site characteristics and meets the size requirements. The essential criteria for a land donation are explained in Section 4.3.2.

After selecting a suitable parcel of land for donation, the next step is to prepare and submit a mitigation proposal in the form of an application to the Wetland Mitigation Council. The requirements for the mitigation proposal are discussed in Section 4.3.3. Once this application is deemed complete by DEP staff, the council will review the application and determine whether to approve or deny the land donation. See Section 4.3.4 for an explanation of the council review process.

If the land donation is denied, the applicant will need to work with the DEP to determine another mitigation alternative. If the land donation proposal is approved, the applicant will receive a letter from the DEP providing the next steps for completing the land donation.

Upon council approval, the land must be transferred in fee simple to the approved government or non-profit entity. The applicant must also provide an adequate maintenance fund for the parcel, which will be determined via an agreement between the applicant and the recipient of the land. A conservation restriction must be recorded to ensure the donated parcel is preserved in perpetuity. Once the DEP receives the required documents, the applicant will receive a letter indicating that the mitigation is complete.

4.3.2 Essential Criteria for a Land Donation

For a parcel of land to be accepted by the Wetland Mitigation Council for a land donation, it must meet certain essential criteria. These criteria include specific site characteristics as well as size requirements, as described below.

It is also important to note that the council will not accept land for donation that already contains a conservation restriction or that has been previously required to be protected by another agency. If the property is already protected, the DEP may consider allowing the use of the land for creation, restoration, or enhancement activities, but it will not be accepted as a land donation.

Required Site Characteristics

The parcel must be predominately wetlands and/or transition areas. If the parcel is mostly comprised of uplands, it may not be acceptable for a land donation (see instead preservation, which is described in Section 4.4).

The land to be donated must also be free of contamination and should be ecologically valuable, providing functions and values to the entire watershed management area.

Finally, the property must contain at least one of the following features:

1. Exceptional resource value wetlands
2. Critical habitat for flora or fauna

> **Critical habitat for fauna** is an area that serves an essential role in maintaining wildlife, particularly for wintering, breeding, spawning, and migrating activities.
>
> **Critical habitat for flora** is an area supporting rare or unique plant species or uncommon vegetational communities in New Jersey.

3. Wetlands or waters draining to FW1 or Category one (C1) waters (as defined and listed in the DEP's Surface Water Quality Standards at N.J.A.C. 7:9B)

> **FW1 and C1 are stream classifications.**
>
> FW1 is applied to fresh waters that are set aside for posterity because of their clarity, color, scenic setting, other characteristic of aesthetic value, unique ecological significance, exceptional recreational significance, exceptional water supply significance, or exceptional fisheries resource(s).
>
> C1 is applied to waters with exceptional ecological significance, recreational significance, water supply significance, or fisheries resources that are therefore protected from any measurable change in water quality.

4. Wetlands or waters draining into public drinking water sources
5. Adjacency to public land containing wetland preserves
6. Unique aspects or characteristics that contribute to ecological value, such as, but not limited to, the following:

- Providing habitat to critically endangered or threatened species
- Draining into trout production waters
- Buffering protected wetlands or other habitats
- Providing a special habitat (e.g., a vernal pool)

Size Requirements

The land donation must be at least five acres in size unless it is immediately adjacent to a protected natural area, such as a state wildlife management area.

The size of the donated parcel must also be sufficient to compensate for the functions and values of the resource that is being disturbed. Generally, the ratio of acres of land donated to the acres of disturbance should be 27:1 to adequately compensate for the ecological value of the disturbed resource. However, the DEP may require a different ratio based on the actual ecological functions and values of the disturbed resource and those of the land to be donated. Land donation requires a much higher mitigation to loss ratio than other forms of mitigation because the ecological functions and values of the donated land are not increasing.

4.3.3 Preparing the Mitigation Proposal

The mitigation proposal for a land donation must be submitted no later than 90 days prior to beginning construction of the permitted activity.

The DEP provides a checklist to help applicants ensure their application for a land donation proposal is complete. This section highlights some of the requirements, but applicants should consult the checklist for the complete list.

The proposal should begin with an introduction providing the following information:

1. A USGS quad map showing the location of the permitted activity and the location of the proposed land donation
2. A tax map and county map showing the location of the land donation, including lot and block
3. A description of the site, including acreage, existing or proposed structures, and any easements, rights-of-way, or deed restrictions (other than the DEP required conservation restriction that will be imposed as part of the mitigation) on the parcel
4. The names and addresses of all current and proposed owner(s) of the proposed land donation parcel as well as all consultants or any other persons providing assistance on the land donation proposal

5. At least six photographs of both the property where the permitted activity will occur and the land proposed for donation with a location map showing where the photographs were taken
6. Written consent from the owner of the proposed land donation (if different from the applicant) allowing DEP representatives to enter and inspect the property at reasonable times

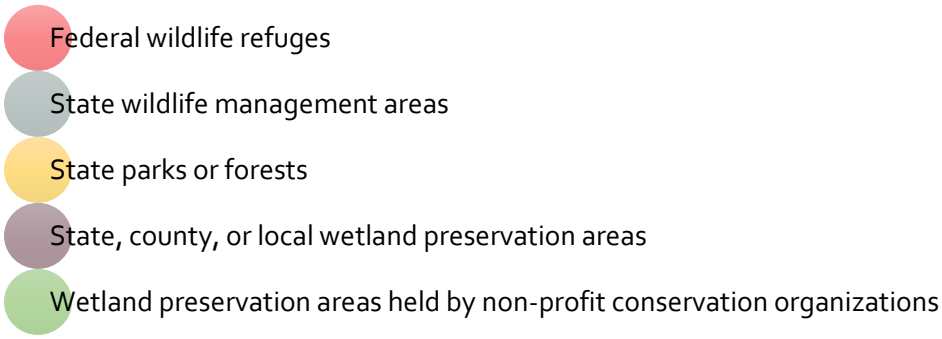
The proposal must include a copy of the permit, letter, or other correspondence from the DEP authorizing mitigation through land donation as well as the justification for why the types of mitigation preferred in the applicable mitigation hierarchy are not feasible (see Section 4.3.1 above).

The proposal must describe which of the following required criteria, as described in Section 4.3.2, are met by the parcel that is proposed for donation:

- Contains exceptional resource value wetlands
- Contains critical habitat for flora and fauna
- Contains wetlands or waters draining to FW1 or C1 waters or into public drinking water sources
- Is adjacent to public land containing wetland preserves
- Contains unique aspects or characteristics that contribute to ecological value

In addition, the proposal should provide relevant information regarding the value of the land that is proposed for donation, including:

1. A description of any current or potential public access or recreational use of the donation site as well as the proximity to any public land containing wetland preserves, such as the following:



2. A demonstration that the land has unique aspects or characteristics that contribute to its ecological value, such as the presence of an unusual or rare type of wetland within the state or region (e.g. bog, fen, etc.)
3. Inventories of the flora and fauna on the site and identification of any endangered and/or threatened species (if applicable)
4. Documentation that the proposed land donation site is not affected by hazardous or solid waste disposal sites or air, water, or soil pollution

To demonstrate that the donated parcel meets the size requirements necessary to provide the ecological functions and values of the disturbed land, the applicant should provide a comparison between the size and function of the wetlands disturbed and the land to be donated.

The proposal must also include a site plan and a draft conservation restriction. The site plan must show the topography and all features on the property, such as wetlands, streams, open water areas, structures, easements, rights-of-way, etc. The draft conservation restriction must conform to the format and content of the wetlands mitigation area model conservation restriction, including a metes and bounds description and visual representation of the proposed land donation site.

Finally, the applicant should include a copy of a letter or agreement from the charitable conservancy or governmental agency that is willing to accept the land donation. The letter or agreement should contain the amount of the maintenance fund that has been agreed to by the applicant and the agency or conservancy.

4.3.4 Wetland Mitigation Council Review Process

Once the application for a land donation is received, it must be placed on the Wetland Mitigation Council's meeting agenda. The application should be delivered to the Mitigation Unit 60 days prior to the intended council meeting to allow time for review. As mentioned in Section 4.1, the council generally meets every two months.

Once the Mitigation Unit deems the application to be complete, they will prepare comments and recommendations for the council. In addition to the application and staff comments, the council will also receive a draft resolution prepared by DEP staff prior to the meeting. The applicant will receive a copy of the council agenda for the meeting, the staff comments, and the draft resolution approximately two weeks before the meeting date.

During the council meeting, the applicant will have the opportunity to present their application to the council and to address any questions or comments that the council may have. There will also be time for council discussion as well as public comment on the application. After the discussion and comment period, the council will vote to approve or deny the application. At the time of the council decision, a resolution reflecting the approval or denial of the application will be prepared.

4.4 Preservation

Preservation means the permanent protection of land from disturbance or development through the transfer of the property to a charitable conservancy or governmental agency and/or the execution of

a conservation restriction, as mentioned in Section 2.3.1. Preservation may be an option to compensate for a disturbance to wetlands, transition areas, intertidal and subtidal shallows, or riparian zones. Preservation is not currently an acceptable form of mitigation for submerged aquatic vegetation or shellfish habitat.

Preservation is one of the last options in the mitigation hierarchies described in Section 2.3.2 and is usually only acceptable when other types of mitigation are not feasible because with preservation, the functions and values of the land are not increasing. For this same reason, preservation requires a higher mitigation to loss ratio than most other forms of mitigation (see Section 2.5). For these reasons, the DEP recommends combining preservation with other mitigation options, such as restoration, creation, or enhancement, to fulfill mitigation requirements.

There are two types of preservation – upland preservation and riparian zone preservation, which will each be discussed separately in this section. The type of preservation depends upon the resource. Upland preservation applies to wetlands, transition areas, and ISS and is discussed in Section 4.4.1. Riparian zone preservation applies only to riparian zones and is discussed in Section 4.4.2.

4.4.1 Upland Preservation

Upland preservation is the permanent protection of uplands that are adjacent to wetlands or intertidal and subtidal shallows and help protect the resource.

The mitigation process for upland preservation consists of the following steps:

1. **Identify the need to obtain a permit that requires mitigation**
2. **Determine if upland preservation would be appropriate for mitigation**
3. **Select an appropriate parcel of land to be preserved**
   - **Appropriate site characteristics**
   - **Appropriate size**
4. **Prepare and submit mitigation proposal**
5. **Receive DEP approval**
6. **Record a conservation restriction and transfer the land to the approved agency**

After identifying the need for mitigation, the applicant must determine if upland preservation is appropriate based on the mitigation hierarchy for the specific resource being disturbed and the other requirements in the applicable rules. As mentioned, upland preservation is not the preferred type of mitigation and should only be used if the preferred types of mitigation in the mitigation hierarchy are not feasible.

If the applicant decides to pursue upland preservation, they must select a parcel of land that is appropriate, meaning it possesses the necessary site characteristics and meets the size requirements. The essential criteria for land proposed for upland preservation are explained below.

After selecting a suitable parcel of land for preservation, the next step is to prepare and submit a mitigation proposal to the DEP. Unlike land donations, upland preservation does not require review and approval from the Wetland Mitigation Council, but the DEP must approve the use of upland preservation for mitigation and the specific parcel of land proposed to be preserved. See below for information on preparing the mitigation proposal for upland preservation.

Following DEP approval, the last step in the process for the preservation of uplands is to transfer the land in fee simple to a charitable conservancy or governmental agency and to record a conservation restriction to ensure the land will be preserved in perpetuity. The applicant will also need to establish a maintenance fund for the land, with the agreement of the recipient of the land, within 60 days following the DEP's approval of the upland preservation.

Essential Criteria for Upland Preservation

For a parcel of land to be accepted for upland preservation, it must meet certain essential criteria. These criteria include specific site characteristics as well as size requirements, as described below.

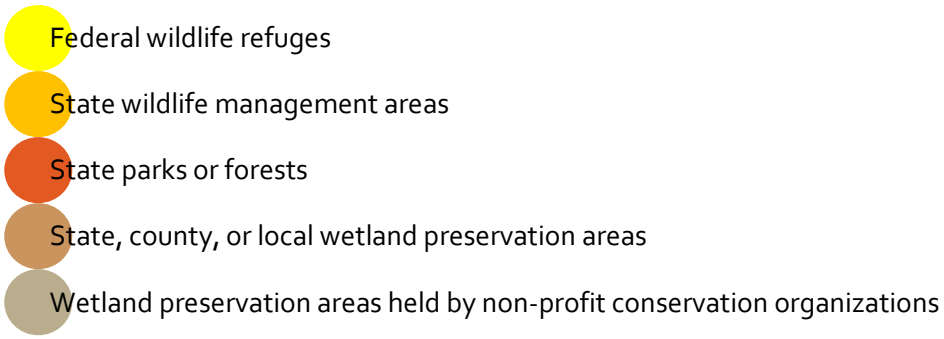
Required Site Characteristics

The parcel must be predominately uplands. If the parcel is mostly comprised of wetlands or ISS, it may not be acceptable for upland preservation (see instead land donation, which is described in Section 4.3).

The land to be preserved should be located within the same watershed management area as the disturbance. It should also be ecologically valuable and free of contamination.

Finally, the property should meet at least one of the following criteria:

- Adjacent to a freshwater wetland with exceptional resource value
- Adjacent to wetlands or waters draining to FW1 or Category one (C1) waters (as defined and listed in the DEP's Surface Water Quality Standards at N.J.A.C. 7:9B)
- Adjacent to wetlands or waters draining into public drinking water sources
- Adjacent to public land containing wetland preserves, such as the following:



- Serves as critical habitat for flora or fauna
- Provides unique aspects or characteristics that contribute to ecological value, such as an unusual or regionally rare type of wetland
- Provides diverse ecological communities
- Designated for preservation in a watershed management area plan approved by the Department under the Water Quality Management Planning Act, N.J.S.A. 58:11A-1 et seq., and implementing rules at N.J.A.C. 7:15

Size Requirements

Since upland preservation does not directly replace the functions and values lost because of the disturbance, all parcels proposed for preservation must be at least five acres in size and significantly larger than the area that would be required for any other mitigation alternative. Generally, the ratio of acres of uplands preserved to the acres of disturbance should be 27:1 to adequately compensate for the ecological value of the disturbed resource. However, the DEP may require a different ratio based on the actual ecological functions and values of the disturbed resource and those of the land to be preserved.

Preparing the Mitigation Proposal

The mitigation proposal for upland preservation must be submitted no later than 90 days prior to beginning construction of the permitted activity.

The DEP provides a helpful checklist to help applicants ensure their mitigation proposal for upland preservation is complete. This section highlights some of the requirements, but applicants should consult the checklist for the complete list.

The proposal should begin with an introduction providing the following information:

- A USGS quad map showing the location of the permitted activity and the location of the proposed upland preservation area
- A tax map and county road map showing the location of the upland preservation area, including lot and block
- A description of the site, including acreage, existing or proposed structures, and any easements, rights-of-way, or deed restrictions (other than the DEP required conservation restriction that will be imposed as part of the mitigation) on the parcel
- The names and addresses of all current and proposed owner(s) of the proposed upland preservation parcel as well as all consultants or any other persons providing assistance on the upland preservation proposal
- At least six photographs of both the site of the permitted disturbance and the site proposed for preservation with a location map showing where the photographs were taken
- Information demonstrating that the upland preservation complies with N.J.A.C. 7:7A-11.9 or 11.10 as applicable, including information on the feasibility or practicability of other mitigation alternatives

Following the introduction, the proposal should contain a detailed section about the site of the disturbance. This section should provide the scientific information necessary for the DEP to determine the functions and values that will be lost as a result of the disturbance, such as the following:

- Scientific literature, models, or other studies concerning wetlands and their ecological functions and values
- Previous DEP approvals or correspondence regarding the disturbance
- Maps
- Photographs
- Soil or vegetation samples
- Delineations and/or other visual materials relating to the site of the disturbance

Next, the proposal must provide information regarding the resource value of the parcel that is proposed for upland preservation, including the following:

1. Flora and fauna inventories of the site noting the presence of threatened and endangered species
2. Documentation that the proposed upland preservation site is not affected by hazardous or solid waste disposal sites or air, water, or soil pollution
3. Information on whether the potential preservation area is located within the same watershed management area as the disturbance
4. Information on whether the land has been designated for preservation in a watershed management plan approved by the DEP under N.J.A.C. 7:15
5. A site plan with topography showing all features on the property, such as wetlands, transition areas, streams, open water areas, structures, easements, rights-of-way, etc.
6. A description of the upland site's relationship to existing and proposed development

The proposal must also describe which of the following required criteria, as described in Section 4.4.1, are met by the parcel that is proposed for upland preservation:

- Contains exceptional resource value wetlands
- Contains critical habitat for flora and fauna
- Contains wetlands or waters draining to FW1 or C1 waters or into public drinking water sources
- Is adjacent to public land containing wetland preserves
- Contains unique aspects or characteristics that contribute to ecological value

Next, the proposal must demonstrate that the donated parcel meets the size requirements necessary to provide the ecological functions and values of the disturbed land and should include a comparison between the size and function of the wetlands disturbed and the land to be preserved.

The proposal must also include a draft conservation restriction that conforms to the format and content of the wetlands mitigation area model conservation restriction, including a metes and bounds description and visual representation of the proposed upland preservation site.

Finally, the applicant should include a copy of a letter or agreement from the charitable conservancy or governmental agency that is willing to accept the land. The letter or agreement should contain the amount of the maintenance fund that has been agreed to by the applicant and the agency or conservancy.

4.4.2 Riparian Zone Preservation

Riparian zone preservation refers to the permanent conservation of an ecologically valuable vegetated area that is adjacent to or within a watercourse. The general process for riparian zone preservation includes the following steps:

1. Identify the need to obtain a permit that requires riparian zone mitigation
2. Determine if preservation would be appropriate for mitigation
3. Select an appropriate parcel of land to be preserved
4. Prepare and submit mitigation proposal
5. Receive DEP approval
6. Record a conservation restriction

After identifying the need to provide mitigation for a disturbance to a riparian zone, the applicant must determine if preservation is appropriate based on the mitigation hierarchy for riparian zones and the other requirements in the applicable rules. As shown in Figure 2.7, the hierarchy for riparian

zones is primarily based on the location of the proposed mitigation (see Section 2.4) rather than on the type of mitigation. For example, onsite preservation is preferred over offsite restoration.

If the applicant decides to pursue riparian zone preservation, they must ensure the parcel of land they wish to preserve is appropriate. The functions and values of the preserved area must fully compensate for the functions and values that will be lost as a result of the disturbance. Since preservation does not replace the functions and values that will be lost, a preservation area must be significantly larger than the area that would be required for any other mitigation alternative. Generally, the ratio of acres of preserved land to the acres of disturbance should be 8:1. However, the DEP may require a different ratio based on the actual ecological functions and values of the disturbed riparian zone and those of the riparian zone to be preserved.

The land proposed for preservation should also be free of solid or hazardous waste as well as water and soil pollution, and it must be valuable for the protection of a riparian zone ecosystem. To assess the value of the land, the applicant should consider the land's relationship to a riverine system and the diversity of its ecological communities. Riparian lands that are valuable for preservation include headwater areas, lands adjacent to preserved public lands, and lands with unique aspects or characteristics that raise their ecological value. For example, is the proposed land adjacent to a C1 waterway? Does it feature threatened or endangered species? Will it provide a forested buffer between the waterway and development that has the potential to degrade the waterway, like a parking lot on a commercial site?

After selecting a suitable parcel of land for preservation, the next step is to prepare and submit a mitigation proposal to the DEP. A riparian zone preservation proposal must describe in detail why the proposed preservation parcel should be accepted. It should include all of the following:

1. A map showing the location of the permitted impact site
2. The mapped location of the preservation site in relation to the impact site
3. The respective acreages of the properties (that is, the impact acreage and the preservation site acreage)
4. The riparian zone width at both the impact and preservation sites
5. A discussion of the attributes of the preservation site property

If the applicant is proposing a preservation site that is not located within the same watershed management area as the disturbance, the proposal must include a demonstration that performing mitigation in the same watershed management area is not feasible. This demonstration should consist of a thorough assessment and documentation of at least six sites that are located within the same WMA as the disturbance. The assessment will need to include the locations of the sites in relation to the site of the disturbance, the suitability of each site for riparian zone mitigation, and an explanation describing why each site was determined to be ineligible for mitigation. For example, a

site may contain a riparian zone, but if the riparian zone is subject to a right-of-way easement, the property is not suitable for mitigation.

After the DEP approves the mitigation proposal, the last step in the process is to record a conservation restriction, including a site plan containing a metes and bounds description of the property, to ensure the land will be preserved in perpetuity.

4.5 Purchasing Credits from a Mitigation Bank

As explained in Section 2.3.1, a mitigation bank is a site on which a protected environmental resource has already been restored, enhanced, created, or preserved by a mitigation bank operator. The mitigation banker receives credits for the mitigation project that can then be sold to applicants who are required to provide mitigation in order to obtain a permit. Under this mitigation method, the mitigation occurs before the disturbance and is performed by a third party.

Purchasing credits from a mitigation bank may satisfy mitigation requirements for impacts to wetlands, transition areas, riparian zones, and intertidal and subtidal shallows. Credits cannot currently be purchased to mitigate for impacts to shellfish habitat or submerged aquatic vegetation.

The process for purchasing credits consists of the following steps:

1. Identify the need to obtain a permit that requires mitigation
2. Determine if credit purchase would be appropriate for mitigation
3. Identify a potentially suitable mitigation bank
4. Contact the mitigation bank operator
5. Submit the mitigation proposal to the DEP
6. Receive approval from the DEP
7. Purchase credits from the banker and submit necessary documentation to the DEP

After identifying the need for mitigation, the applicant must determine if credit purchase is appropriate based on the mitigation hierarchy for the specific resource being disturbed (see Section 2.3.2) and the other requirements in the applicable rules. The applicant will also need to identify a potentially suitable mitigation bank. In most cases, the applicant will need to locate a bank within the same service area as the disturbance site that sells the applicable type of credits. For example, if

mitigation is required to compensate for a riparian zone disturbance, the applicant will not be able to purchase credits from a mitigation bank that sells only wetland credits.

If there is a bank in the service area that sells the appropriate credits, the applicant should contact the bank owner to determine if credits are available for sale as well as the cost of those credits. Each mitigation bank is allotted a certain number of credits to sell by the DEP based on the applicable rules and the ecological uplift that the mitigation bank project provides to the site and surrounding ecosystems. Once a credit is sold to satisfy a mitigation obligation, that credit is exhausted and may not be sold or used again.

The DEP provides lists of approved mitigation banks that provide helpful information, including the service area, types of credits, and contact information for the mitigation bank operator.

Credit prices are established by the mitigation banker and are based on the costs incurred to construct the mitigation bank site. The DEP is not involved in establishing or controlling mitigation credit prices. However, the DEP will determine how many credits must be purchased to satisfy an applicant's mitigation requirement. Bank credits are usually purchased at a 1:1 ratio. That is, for each acre of disturbance, one credit must be purchased.

Once the applicant has determined that their preferred method of mitigation includes purchasing credits from a specific mitigation bank, they must prepare and submit a mitigation proposal to the DEP. The proposal must include the types of impacts that require mitigation and the service area in which the impacts will occur as well as a statement indicating that the bank of choice has appropriate credits available for sale.

Credits should not be purchased until the DEP approves the mitigation proposal, including the bank from which the credits will be purchased and the number of credits to be purchased. Following DEP approval, the applicant must work with the operator of the approved mitigation bank to complete the purchase and must then send the DEP documentation of the purchase, including a written certification from the mitigation bank operator indicating the number of credits purchased and the DEP permit number. The banker will also submit a current credit ledger to the DEP to confirm the correct number of credits were purchased.

Section 5 of this manual explains the process for establishing and operating a mitigation bank.

SECTION 5: ESTABLISHING A MITIGATION BANK

A mitigation bank is a site on which a protected resource is created, restored, enhanced, and/or preserved, and the site is then set aside to compensate for future permitted impacts. Under this mitigation method, the mitigation occurs before the disturbance and is performed by a third party, the mitigation bank operator, for the purpose of selling credits to applicants who are required to provide mitigation as a condition of a permit. While Section 4.5 of this manual outlines the process for how applicants may purchase credits from a mitigation bank, this section discusses how a mitigation bank operator establishes a mitigation bank in order to sell credits.

A mitigation bank operator (or mitigation banker) may be either a non-profit or a for-profit organization. The banker is responsible for all aspects of creating, operating, and maintaining the bank, including site selection, obtaining all necessary permits, preparing the mitigation bank proposal (also known as a mitigation banking instrument), construction, and monitoring.

Certain banks will be solely under the jurisdiction of the state of New Jersey while others will be subject to both state and federal regulations.

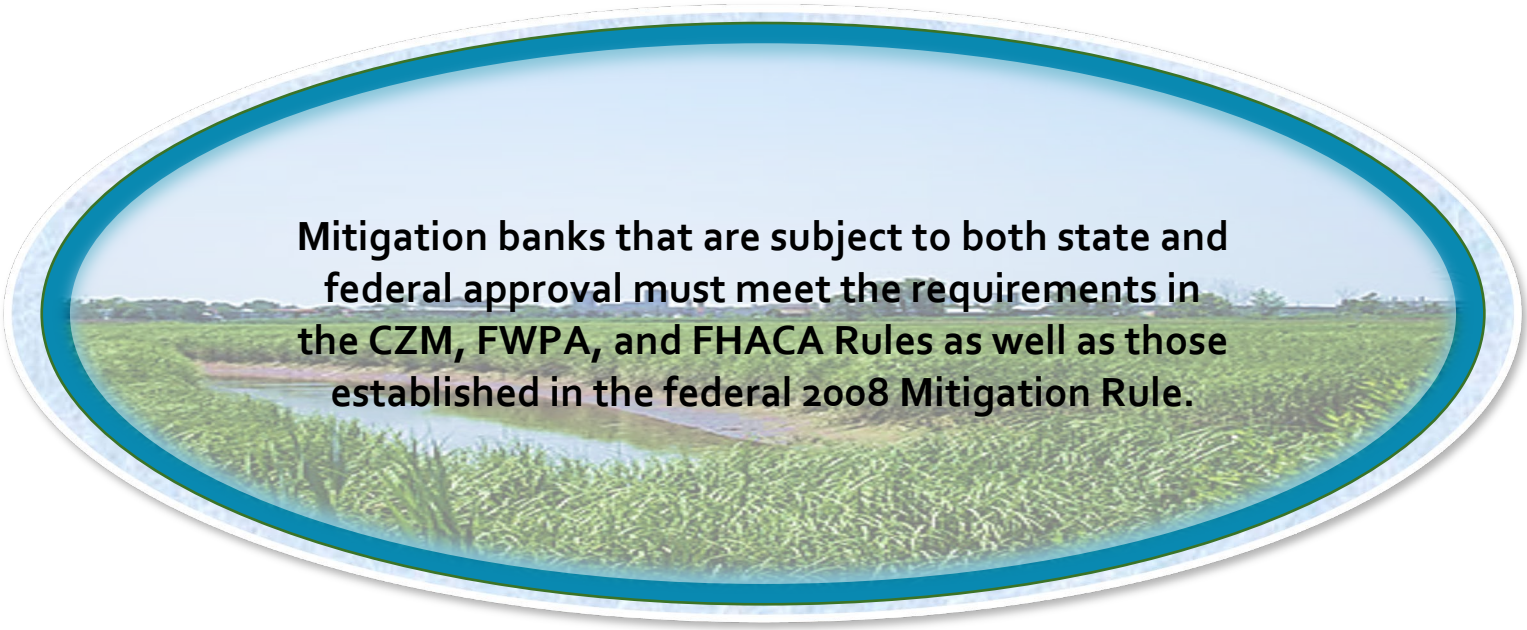
- Section 5.1 of this manual explains the regulatory authority for mitigation banks.
- Section 5.2 describes the process for establishing a mitigation bank, including how to prepare the mitigation banking instrument.
- Section 5.3 explains how credits are released so that the banker may sell them.
- Section 5.4 provides information on closing a mitigation bank once all credits have been released and sold.

5.1 Regulatory Authority

All mitigation banks in New Jersey are regulated by the DEP. A bank site may be subject to the FWPA, CZM, and/or FHACA Rules. If a site is under the jurisdiction of more than one rule chapter, the proposed bank and the mitigation banking instrument must meet the specific requirements for each chapter that applies.

New Jersey has sole regulatory authority over all riparian zone mitigation banks and over all wetland banks in delegable waters regulated under the FWPA Rules. However, in areas that are regulated under the CZM Rules, the USACE usually has joint authority with New Jersey to regulate wetland mitigation banks. In these cases, both federal and state approvals are required.

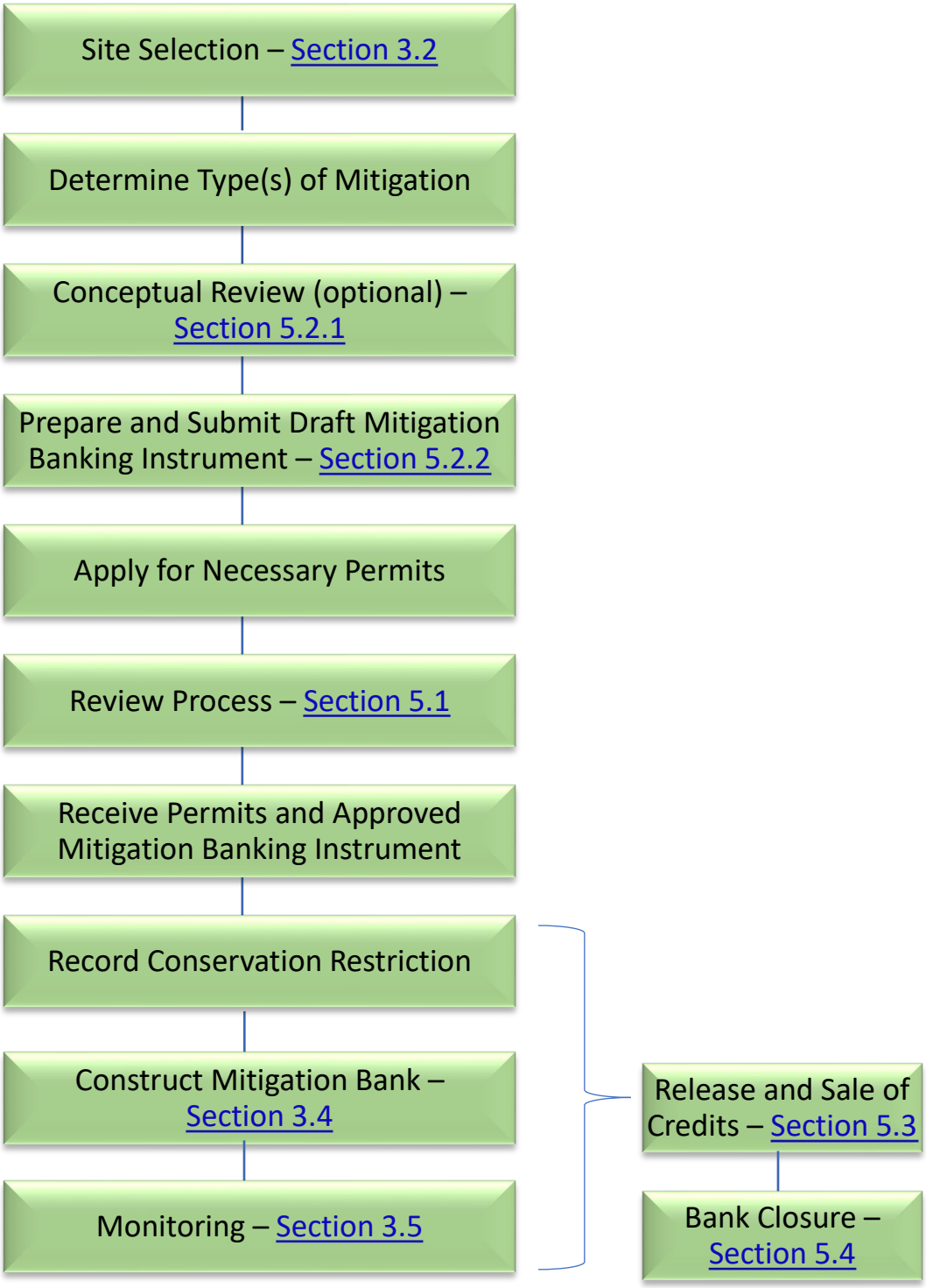
Mitigation banks that are subject to both state and federal approval must meet the requirements in the CZM, FWPA, and FHACA Rules as well as those established in the federal 2008 Mitigation Rule (United States Department of Defense, Department of the Army Corps of Engineers 33 CFR Parts 325 and 332 and United States Environmental Protection Agency 40 CFR Part 230, "Compensatory Mitigation for Losses of Aquatic Resources"). This rule provides the minimum requirements for mitigation banks, including definitions, type and location of mitigation, hierarchy for compensation, amount of mitigation, watershed approach, preservation criteria, planning and documentation, ecological performance standards, monitoring, and management and complete applications.



Most of the requirements that apply to banks that require DEP approval only are the same as those that apply to banks that are under joint state and federal jurisdiction. The key difference is the review process. If a prospective bank is located solely within the DEP's jurisdiction, the DEP is the primary reviewer. If a prospective bank is subject to federal approval, an Interagency Review Team (IRT) will be convened. The IRT is generally made up of representatives from the DEP, USACE, USEPA, National Marine Fisheries Service (NMFS), and USFWS. If the bank is located within the New Jersey Meadowlands District, a representative from the New Jersey Sports and Exposition Authority (NJSEA) will also be included as a member of the IRT. The IRT participates in the negotiations of terms and conditions for the mitigation banking instrument and any other legal documents that may apply.

5.2 The Process for Establishing a Mitigation Bank

Generally, the process for establishing a mitigation bank consists of the following steps:



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The first step for any potential mitigation bank is to identify a suitable site for a project. Many factors need to be considered when selecting a site for a mitigation bank, including but not limited to location, vegetation, hydrology, topography, wildlife, threatened and endangered species, contamination, and climate change vulnerability. Site selection is discussed in detail in Section 3.2.

The mitigation banker will also need to determine which type(s) of mitigation to perform on the selected site. Most mitigation banks involve the restoration, creation, and/or enhancement of wetlands, riparian zones, or both. Section 3 covers these three types of mitigation in detail. Preservation is also an acceptable form of mitigation for a small percentage of the mitigation bank site, but the majority of the bank must be a restoration, creation, or enhancement project. See Section 4.4 for more information on preservation.

After identifying a suitable site and method(s) of mitigation, the DEP strongly recommends that the mitigation bank operator request a conceptual review of the site prior to purchasing any land. A conceptual review is an optional additional step, but it allows the banker and the DEP to discuss the land that will be proposed for the mitigation bank and to identify any red flag issues that may prevent the proposed mitigation bank from being successful on that site. For more information on conceptual reviews, including the information that must be submitted to the DEP, see Section 5.2.1 below.

Next, the banker must prepare and submit the draft mitigation banking instrument (MBI). All mitigation banks require an approved mitigation banking instrument. Mitigation banks also require permits from the DEP. The permits authorize the construction of the proposed bank while the MBI provides the criteria for establishing, operating, and monitoring the bank site, authorizing the proposed bank to establish and sell credits. The draft MBI and the permit applications may be submitted at the same time, or the banker may choose to submit the draft MBI before seeking construction permits. For more information on how to prepare a draft MBI, see Section 5.2.2.

Once the draft MBI and permit applications have been received, the applications will be reviewed by DEP staff. Certain draft MBI's will require review by an Interagency Review Team (see Section 5.1).

After a draft MBI is approved, the mitigation bank operator must record a conservation restriction to ensure the land is preserved in perpetuity. Credits cannot be released until the conservation restriction is enacted.

Construction of the mitigation bank can begin after the MBI is approved and all necessary permits have been obtained. When developing their desired construction schedule, the mitigation banker should carefully consider the time necessary to prepare and submit both the draft MBI and the permit application(s) as well as the time the DEP requires to review and approve these applications to avoid delays in commencing construction. Site preparation and construction of a mitigation site are discussed in Section 3.4.

After the mitigation bank is constructed, monitoring is essential to ensure that the project has been successful. Monitoring is required for at least five years with annual monitoring reports to be provided to the DEP. After five years, assuming all success criteria have been met, the mitigation bank will be subject to long-term monitoring until all credits are sold. Monitoring requirements and procedures are provided in Section 3.5.

The DEP will begin to release credits following the completion of all administrative tasks, including the filing of the conservation restriction. Once credits have been released, the mitigation banker may sell them. Credits will continue to be released through construction and monitoring. Section 5.3 below explains the credit release process in detail. After all credits have been released and sold, the mitigation bank can be closed. The process for bank closure is discussed in Section 5.4.

5.2.1 Conceptual Review

As mentioned above, the DEP strongly recommends a mitigation bank operator submit a conceptual review application, also called a conceptual mitigation bank proposal, prior to purchasing land for a mitigation bank site or submitting a formal draft MBI so that the banker does not invest significant time or money on a project that will not be approved by the DEP.

A conceptual review provides the mitigation banker the opportunity to discuss the strengths and weaknesses of the proposed mitigation bank with the DEP, allowing the banker to make more informed decisions with respect to proceeding with the project. However, a conceptual review is not binding on the DEP, meaning it does not guarantee approval for the mitigation banking project or for any necessary permits, and it does not grant any property or other rights.

To obtain a conceptual review of a potential mitigation bank site, the mitigation banker should submit a written request to the DEP. The information that must be provided as part of the request for a conceptual review includes:

1. Information on the location, size, and environmental characteristics of the proposed mitigation bank site
2. Information on previous uses of the site, including any potential for contamination and ecological risk. See Section 3.3.4 for information on how to screen and assess a site for contamination and ecological risk. For potential mitigation banks that are under the jurisdiction of the FWPA Rules, the request must also address any potential for the presence of historic or archaeological resources (see Section 3.2.2 and N.J.A.C. 7:7A-19.5).
3. The proposed types of mitigation that will be performed on the site, such as creation, restoration, and/ or enhancement
4. A determination as to whether the credits generated by the bank will be made available to others. Mitigation bankers may develop a bank that is solely for their own use. For example, a

county may act as a mitigation bank operator and establish a bank that is only to be used to compensate for future disturbances associated with county projects.

5. Maps, photographs, diagrams, delineations, and/or other visual materials necessary for the DEP to generally evaluate the proposed mitigation bank
6. The names and addresses of all current owners of the mitigation bank site and any prospective owners as of the date the request for the conceptual review is submitted
7. Consent from the owner of the proposed mitigation bank site allowing DEP representatives to enter the property in a reasonable manner and at reasonable times in order to inspect the site

5.2.2 Developing the Mitigation Banking Instrument

A mitigation banking instrument is similar to a mitigation proposal for a restoration, creation, or enhancement project, as described in Section 3.3, but has specific additional requirements, such as information regarding proposed credits. Unlike a restoration, creation, or enhancement mitigation proposal, an MBI does not require an analysis of the disturbed site and resource since a mitigation bank is established prior to the disturbances for which it will compensate.

The DEP provides a checklist for wetland mitigation bank proposals to ensure the mitigation banking instrument includes all necessary information. While this section of the manual explains many of the requirements for an MBI, mitigation bank operators should consult the checklist for the complete list. The wetland mitigation bank proposal checklist may also be used for riparian zone MBIs as there is no separate checklist for riparian zone banks at this time.

Each MBI should begin with an introduction, which should provide site location information for the proposed bank site, including the block, lot, municipality, and county. The MBI should also note the proposed service area for the bank. For mitigation banks regulated under the FWPA or FHACA Rules, the service area is the watershed management area in which the bank will be located. For mitigation banks under the CZM Rules, the service area is either the drainage area or the estuary.

The introduction should also include names and addresses for all current and proposed owners of the bank site. Other detailed information relevant to the ownership of the site is also required, such as leases, easements, rights-of-way, and any other encumbrances.

An MBI must be a detailed narrative with accompanying documentation that conclusively demonstrates that the proposed bank has a high probability of success. To do so, the MBI must provide a thorough description and analysis of:

1. The baseline conditions of the proposed mitigation bank site prior to construction
2. The mitigation plan

3. The intended condition of the mitigation bank site after construction

Following the introduction, every mitigation banking instrument must include a thorough description of the bank site's baseline conditions. *Baseline conditions* are the conditions of the site prior to construction of the mitigation bank, which will be used to assess the success of the completed bank project. A baseline condition report should include an explanation and any necessary documentation for all relevant natural features and parameters as well as other factors that could affect the success of the bank, including, but not limited to:

The size of the site		
Boundaries of the site and the existing resources		Necessary documentation → either a letter of interpretation or a riparian zone verification that covers the entire site
Functions and values of existing resources	See Section 2.6	Necessary documentation → functional assessment, such as a Floristic Quality Assessment (see Appendix A)
Existing topography, including microtopography	See Section 3.2.2	
Hydrology	See Section 3.3.1	Necessary documentation → water budget (for wetland sites only)
Soils	See Section 3.3.2	Necessary documentation → soil profiles and data sheets
Vegetation	See Section 3.2.2	
Wildlife and threatened and endangered species	See Section 3.2.2	
Contamination and ecological risk	See Section 3.3.4	Necessary documentation → ecological risk assessment
Historic and archaeological resources	See Section 3.2.2	

Next, the MBI must fully describe the proposed mitigation plan, including the applicable resources and types of mitigation that will be performed (e.g., wetland restoration, riparian zone enhancement, etc.). A thorough explanation of the vegetation that will be planted on the site is also required. Section 3.3.3 discusses vegetation and provides information on how to develop a planting plan. For a wetland bank, the MBI must also provide a detailed explanation of how the necessary hydrology will be achieved as well as how the appropriate microtopography will be created, whether through discing, rototilling, or ripping. A disc is a commercial gardening tool that turns soil.

Other required items include:

1. A detailed construction schedule with specific dates for excavation, planting, fertilizing, and other important phases of the mitigation bank project
2. Cost estimates for construction of the mitigation bank. The cost estimates must be prepared by a third party, not by the mitigation bank operator.

The MBI must also describe the intended post-construction conditions of the completed mitigation bank. This includes a description of the goals and objectives of the bank as well as a functional assessment for the proposed bank conditions (see Section 2.6 for information on how to perform functional assessments). A highly detailed site plan is also required, which must include both the existing and proposed conditions of the site. It should describe the project's location as well as the existing and proposed elevations and grades of the site. If the banker is proposing wetland creation, the site plan must demonstrate that there is adequate space onsite for the transition area that will apply to the new wetland. The site plan should include both a pre- and post-construction plan view with cross sectional views of the mitigation site. The location of any monitoring wells and/or stream gauges used for hydrologic monitoring should be noted on the plan.

Every MBI must also provide monitoring protocols, which are discussed in Section 3.5, including performance standards that are specific to the goals and objectives of the mitigation bank project. Performance standards are explained in Section 3.5.3. The performance standards should be measurable, specific, and time based to enable the DEP to determine bank success and credit release. Appendix E provides some suggested performance standards.

As previously mentioned, mitigation banks require two monitoring plans – one for the first five years of monitoring and another for long-term monitoring, which will be in effect after the performance standards are met until all credits are sold.

The MBI should also provide details regarding contingency and corrective actions that will be enacted by the banker during monitoring if the bank fails, including a preventative maintenance plan with an invasive species plan and proposed measures for controlling deer or other herbivores. Preventative maintenance plans are discussed in depth in Section 3.3.3.

All MBI's must include a draft of the conservation restriction that will protect the bank site in perpetuity. The DEP provides a template that may be used for the draft conservation restriction.

Finally, the MBI must provide credit information. Along with the narrative description of the types of mitigation that will be performed, the mitigation bank operator must provide the corresponding number of acres and the proposed number of credits for each type of mitigation. This information should be presented in a table, as shown in Figure 5.1 below. The proposed credits should be based on the mitigation ratios described in Section 2.5. If the mitigation banker is proposing alternative ratios, the MBI must include a justification for the proposed credit ratios. The DEP also requires a draft mitigation banking ledger to be included in the MBI, which will be used to track the release and sale of credits. An example banking ledger is provided in Figure 5.2. For more information on credit release, see Section 5.3.

Figure 5.1: Example Table for Credit Proposal

Mitigation Category	Ratio	Acres	Credits
Freshwater Wetlands Restoration			
Freshwater Wetlands Creation			
Freshwater Wetlands Enhancement			
Tidal Wetlands Restoration			
Tidal Wetlands Creation			
Tidal Wetlands Enhancement			
Riparian Zone Restoration			
Riparian Zone Creation			
Riparian Zone Enhancement			
Other (please specify)			
Mitigation Bank Total			

Figure 5.2: Example Mitigation Banking Ledger

Credit Ledger: Bank Title					
General Date:			Type of Mitigation Credits		
Service Areas:			Site Acreage:		
Total Credits in Bank:					
Unreleased Credits:					
	Type of Mitigation Credits		Balance		
Date	Credit (+)	Debit (-)	Credits	NJDEP File/Permit #	Purchaser/Transactor

5.3 Credit Release

During the review of the mitigation banking instrument, the DEP will determine the number of credits that a bank will receive for sale based on the applicable regulations and the ecological uplift that the mitigation provides to the site and surrounding ecosystems. The DEP will work with the mitigation bank operator to determine the final performance standards (see Section 3.5.3) and credit release schedule. The mitigation banker must follow the schedule and meet the performance standards to obtain the credits.

If the required monitoring reports, as explained in Section 3.5.4, indicate that the mitigation bank is failing to meet the established performance standards, credits will not be released until the standards are met. The DEP may reduce the number of credits that can be sold if it becomes evident that the performance standards established in the MBI will never be achieved.

The general process for credit release depends on whether the resource is wetlands or riparian zones.

Credit Release for Wetlands Mitigation

In general, credits for wetlands mitigation will be released as follows:

Milestone	Credits to be Released Upon Milestone Completion
Compliance with all pre-release conditions as outlined in the final MBI. Includes: • Securing all construction permits • Posting adequate and effective financial assurance (see Section 3.3.5) • Filing a conservation restriction DEP signs the approved MBI	10 percent
Successful establishment of the approved hydrologic regime, such that this regime will persist over time under normal hydrologic conditions	Up to 10 percent
Completion of planting as required in the approved MBI	Up to 10 percent
Performance standards have been met for an entire one-year period	Up to 10 percent
Performance standards have been met for two consecutive years	Up to 10 percent
Performance standards have been met for three consecutive years	Up to 15 percent
Performance standards have been met for four consecutive years	Up to 15 percent
Performance standards have been met for five consecutive years	Remaining credits

Credit Release for Riparian Zone Mitigation

In general, credits for riparian zone mitigation will be released as follows:

Milestone	Credits to be Released Upon Milestone Completion
Compliance with all pre-release conditions as outlined in the final MBI. Includes: • Securing all construction permits • Posting adequate and effective financial assurance (see Section 3.3.5) • Filing a conservation restriction DEP signs the approved MBI	10 percent

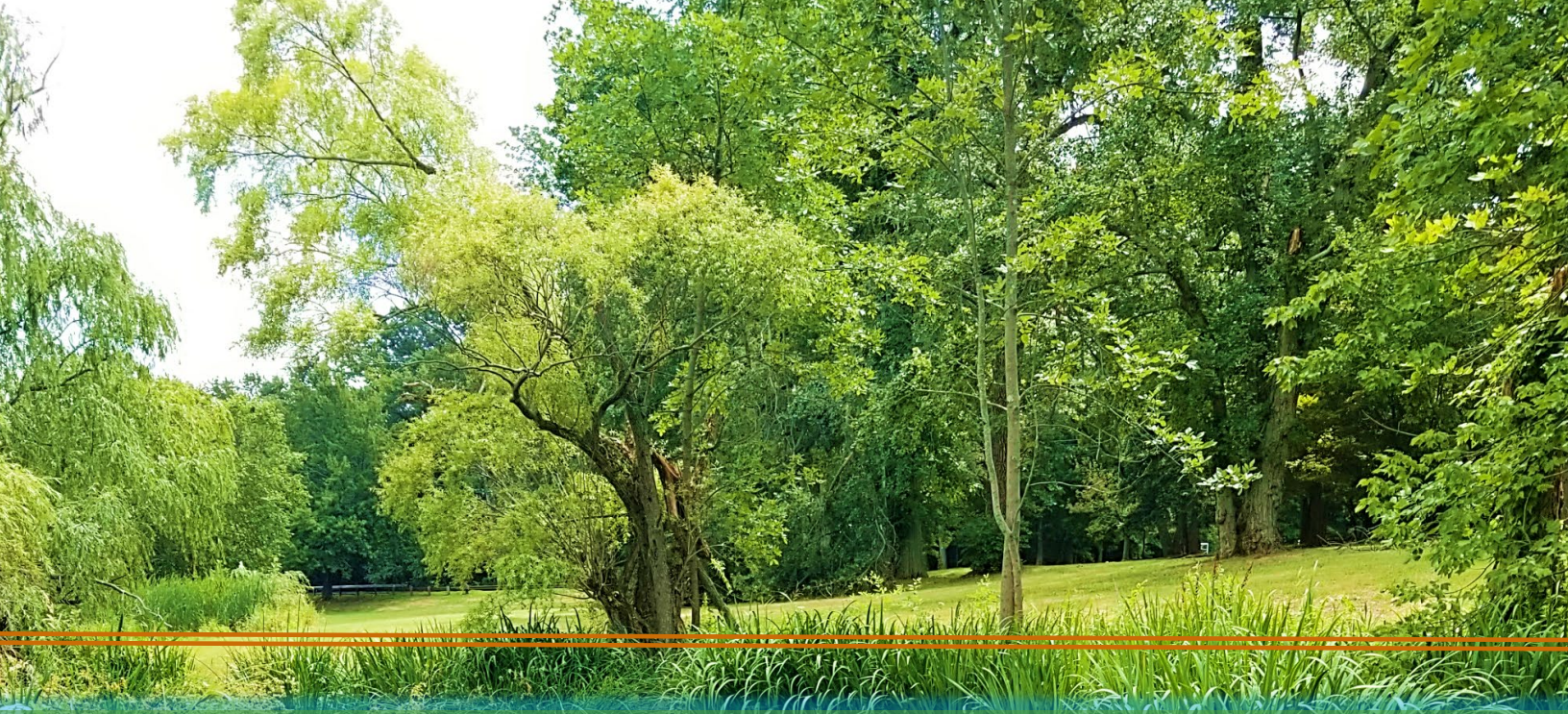
Completion of planting as required in the approved MBI	Up to 15 percent
Performance standards have been met for an entire one-year period	Up to 10 percent
Performance standards have been met for two consecutive years	Up to 15 percent
Performance standards have been met for three consecutive years	Up to 15 percent
Performance standards have been met for four consecutive years	Up to 15 percent
Performance standards have been met for five consecutive years	Remaining credits

5.4 Bank Closures

After all credits have been released and sold, the mitigation bank operator must request the DEP's approval to close the bank. Closing a bank involves the transfer of the bank site to the long-term steward. The long-term steward is the person or entity who will be responsible for the continuing maintenance of the property to ensure that it continues to provide the required ecological functions and values. The mitigation bank operator may either assume this role or convey responsibility for the property to a willing person or entity, such as a charitable conservancy or government agency. The long-term steward should be identified in the approved mitigation banking instrument.

To receive DEP approval to close a bank, the mitigation bank operator must prepare and submit an appropriate GIS shape file or similar exhibit depicting the location and extent of the bank.

The DEP will then work with the mitigation bank operator to ensure that any financial assurance (see Section 3.3.5) is authorized for release. However, a fund for the long-term management of the property may be necessary and must be provided before the DEP will authorize the closure of the bank. The approved MBI will stipulate if a long-term management fund is required.



APPENDIX A: FLORISTIC QUALITY ASSESSMENT AND WETLAND FACT SHEETS

The New Jersey Department of Environmental Protection has developed A Guide to Wetland Types in New Jersey with Ecoregional Floristic Quality Assessment Metrics, which is available from the New Jersey State Library. This document is a report on the wetland types in New Jersey that focuses on four of the state's major wetland ecosystems:

- Floodplain and Swamp Forest
- Bog and Fen
- Freshwater Marsh, Wet Meadow, and Shrub Swamp
- Salt Marsh

Within these major ecosystems, wetland types are based on the U.S. National Vegetation Classification (USNVC) hierarchy ecological group, which is a mid-scale regional wetland type with distinct hydrologic and floristic composition that is important for identification and mapping as well as for mitigation and restoration efforts. References to finer detailed floristic alliances and associations are included within each group description. Ecoregional Floristic Quality Assessment (eFQA) metrics and condition thresholds (Excellent-Good-Fair-Poor) are presented by group for use in monitoring and assessment of wetland sites.

The report includes an introduction to the USNVC classification system as well as FQA and eFQA concepts, a key to USNVC Wetland Groups in New Jersey, and fact sheets for 30 wetland groups. These fact sheets provide the following information:

- Wetland classification (group, alliance, association)
- Type description (vegetation, soils, hydrology)
- Plant species list by strata with Coefficient of Conservatism (CoC) values
- eFQA metric rating thresholds (Excellent-Good-Fair-Poor)
- Ecoregion distribution map
- References

APPENDIX B: REGIONAL PLANT LIST

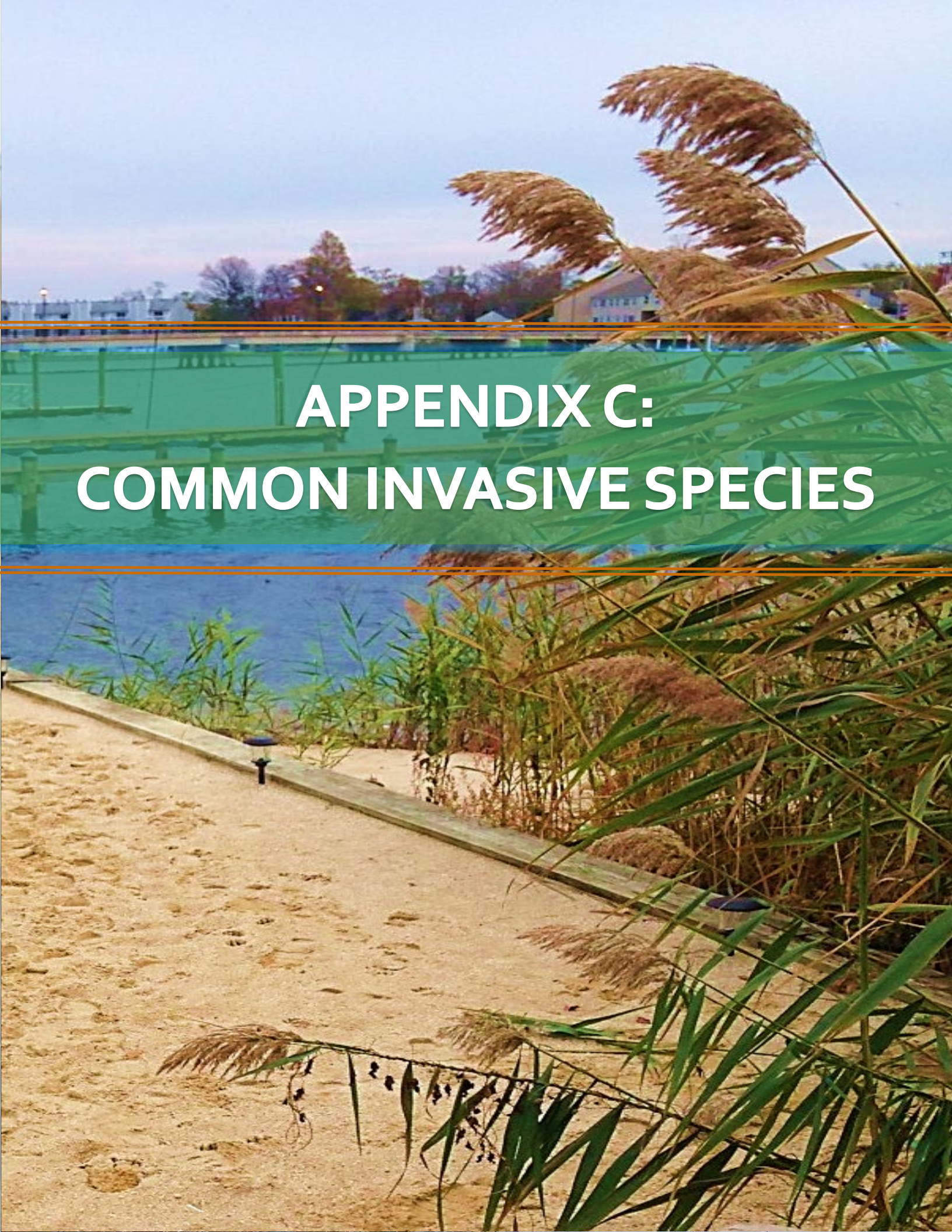
The New Jersey Native Regional Plant List 2022 is a list of 1,519 plants native to New Jersey. These plants may be used in planning and monitoring wetland mitigation and restoration projects.

The list provides the following information for each plant:

- Scientific Name
- Rare Species Status
- USACE National Wetland Plant List (NWPL) Wetland Indicator Status by Wetland Delineation Region (see Section 3.5)
- Distribution by EPA Ecoregion
- Floristic Quality Assessment Coefficient of Conservatism (see Appendix A)
- Growth Form (e.g., tree, shrub, etc.)

Scientific Name	Rare Species - DO NOT PLANT	NWPL National Wetland Indicator Status			Distribution by Ecoregion					FQA Coefficient of Conservatism (CoC)	Growth Form
		AGCP	EMP	NCNE	Northern Highlands (58)	Mid-Atlantic Coastal Plain (63)	Northern Piedmont (64)	Ridge and Valley (67)	Atlantic Coastal Pine Barrens (84)	NJ CoC Statewide (2022)	
Abies balsamea	Rare Species - DO NOT PLANT		FAC	FAC	x		x	x		9	Tree
Acalypha gracilens		FAC	FAC	FACU	x	x	x		x	2	Forb/herb
Acalypha rhomboidea		FAC	FACU	FACU	x	x	x	x	x	1	Forb/herb
Acalypha virginica		FACU	FACU	FACU	x	x	x	x	x	3	Forb/herb
Acer negundo		FAC	FAC	FAC	x	x	x	x	x	2	Tree
Acer nigrum	Rare Species - DO NOT PLANT	UPL	FACU	FACU	x		x	x	x	6	Tree
Acer pensylvanicum		FACU	FACU	FACU	x		x	x		7	Tree
Acer rubrum		FAC	FAC	FAC	x	x	x	x	x	3	Tree

The New Jersey Native Regional Plant List 2022 is available for download from the New Jersey State Library in three file formats – excel, csv, and pdf. The excel file format can be filtered by any of the header data fields and includes worksheets with ecoregion maps referenced in the plant list as well as references for those resources. This list is also provided in a comma separated value (csv) file in plain text format without the ecoregion maps and references. The list and associated maps and references are formatted to be printed as pdf files.



APPENDIX C: COMMON INVASIVE SPECIES

In New Jersey, certain invasive species are more prevalent than others on mitigation sites. This appendix lists common invasive species, categorized as follows:

- Most common invasive species
- Common invasive species
- Less common invasive species

While robust, these lists are not comprehensive. Please contact the Mitigation Unit with any questions regarding whether a species is considered invasive in New Jersey.

The complete citations for the photographs utilized in this appendix are listed at the end of the appendix. Any uncited photographs are the property of the DEP.

The most common and problematic invasive plant species on mitigation sites in New Jersey include:

1. *Ailanthus altissima* (P. Mill.) Swingle (Tree-of-Heaven)

   Tree-of-Heaven, shown in Figure C.1 below, is tolerant of poor soils and will grow through cracks in pavement but is not shade tolerant. The species grows rapidly and can reach up to 80 feet high with a six-foot trunk diameter. It flowers in early summer with yellowish flower clusters. Its leaves are divided into 10 to 41 leaflets (see Figure C.2).

Figure C.1: *Ailanthus altissima* (P. Mill.) Swingle (Tree-of-Heaven)

Famartin, n.d.

Figure C.2: *Ailanthus altissima* (P. Mill.) Swingle (Tree-of-Heaven) – Leaf Detail

Hexafluoride, n.d.

2. *Artemisia vulgaris* (Mugwort or Common wormwood)

   Mugwort (or common wormwood), which is pictured in Figure C.3, grows best in poor to moderately fertile, dry to medium moisture soils with good drainage. In poorly drained soils, its roots will rot. This species grows in varying levels of sun from two to four feet tall and is often 6 feet wide. It spreads aggressively due to rhizomes (stems that grow underground). *Arthraxon hispidus* (Small carpetgrass)

Figure C.3: Artemisia vulgaris (Mugwort or Common wormwood)

3. *Arthraxon hispidus* (Small carpetgrass)

Small carpetgrass (shown in Figure C.4) grows in wet areas, such as wetlands. This species prefers sunshine and moisture. It grows up to 1.5 feet high and is characterized by lance-shaped leaves that are one to three inches long (see Figure C.5 for detail).

Figure C.4: *Arthraxon hispidus* (Small carpetgrass)

Dalgial, n.d. https://commons.wikimedia.org/wiki/File:Arthraxon_hispidus_04.JPG

Figure C.5: *Arthraxon hispidus* (Small carpetgrass) – Leaf Detail

Dalgial, n.d. https://commons.wikimedia.org/wiki/File:Arthraxon_hispidus_01.JPG

4. *Elaeagnus angustifolia* (Russian olive) and *Elaeagnus umbellata* Thun. var. *parvifolia* (Royle) Schneid. (Autumn olive)

   Russian olive (shown in Figure C.6) and Autumn olive are both successful in open and sparse areas, particularly disturbed sites and sandy floodplains. These species can reach 20 feet in height. Young plants are notably covered in silvery scales. The flowers become edible fruit in late summer. The fruit of Russian olives are orange while the fruit of Autumn olives are red.

Figure C.6: *Elaeagnus angustifolia* (Russian olive)

Dinnye, n.d.

5. *Lonicera japonica* (Japanese honeysuckle)

   Japanese honeysuckle is an evergreen to semi-evergreen wooded vine that grows in nearly any habitat, especially disturbed habitats. It has opposite leaves that are oval or lobed in shape. This species has fragrant, white-to-yellow flowers, as shown in Figure C.7.

Figure C.7: *Lonicera japonica* (Japanese honeysuckle)

6. *Microstegium vimineum* (Trin.) A. Camus (Japanese stiltgrass)

   Japanese stiltgrass (see Figure C.8 below) is a mat-like grass that grows in many habitats, but it prefers moist environments with acidic to neutral soils and high levels of nitrogen. This species grows easily and quickly in areas of disturbance and is typically one to three feet high. Its leaves are narrow and lance-shaped with a silvery stripe of reflective hairs.

Figure C.8: *Microstegium vimineum* (Trin.) A. Camus (Japanese stiltgrass)

7. *Phalaris arundinacea* (Reed canary grass)

   Reed canary grass grows in various types of wetlands and is particularly partial to organic soil and full sun although it will occasionally grow in dry, shaded upland areas. This species can grow up to nine feet tall. It is characterized by flat, blue-green leaves and large, green and slightly purple flower plumes that eventually turn tan in color, as shown in Figure C.9.

Figure C.9: *Phalaris arundinacea* (Reed canary grass)

Rasbak, n.d.

8. *Phragmites australis* (Common reed grass)

   This perennial grass is tolerant of many wetland conditions, including saline and alkaline environments. Common reed grass is often found in marshes, areas of disturbance, and along shores, river edges, and roadsides. The species can grow to 15 feet in height with its stems extending up to three feet underground. It has long leaves with rough margins and purple or golden colored, feathery flower plumes in late summer (see Figure C.10). Stands of phragmites usually include both living and dead plants.

Figure C.10: *Phragmites australis* (Common reed grass)

9. Polygonum cuspidatum Sieb. & Zucc./ Fallopia japonica (Japanese knotweed)

   Japanese knotweed can grow in many environments with different combinations of sun, moisture, and disturbance. This species grows very quickly (three to four inches per day in early season) and can reach 3 to 12 feet in height. It has erect, hollow, light-green stems with leaves that are round-to-heart shaped but squared-off at the base. It also has four-inch, greenish-white flowers, as visible in Figure C.11 below.

Figure C.11: Polygonum cuspidatum Sieb. & Zucc./ Fallopia japonica (Japanese knotweed)

Superior National Forest, n.d.

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10. Polygonum perfoliatum L. (Mile-a-minute)

Mile-a-minute (see Figure C.12) grows up to six inches a day and has highly spreadable seeds. This species colonizes area of disturbance but requires regular sunlight and prefers high soil moisture. Its leaves are triangular, barbed on the underside, and one to three inches wide. The plant features metallic blue fruits that appear starting in mid-July.

Figure C.12: Polygonum perfoliatum L. (Mile-a-minute)

Melissa McMasters, n.d.

11. *Rosa multiflora* Thunberg (Multiflora rose)

Multiflora rose can grow in most moisture, light, and soil conditions. The plant is a dense and thorny shrub that grows up to 15 inches high. Its leaves are divided into seven to nine leaflets, and it has fragrant, white-to-pink flowers that appear in May or June, as shown in Figure C.13.

Figure C.13: Rosa multiflora Thunberg (Multiflora rose)

Sesamehoneytart, n.d.

Other common invasive plant species in New Jersey:

- Alliaria petiolata (Bieb.) Cavara & Grande (Garlic mustard)
- Ampelopsis brevipedunculata (Maxim.) Trautv. (Porcelain berry)
- Berberis thunbergii BC. (Japanese barberry)
- *Cirsium arvense* (L.) *Scop.* (Canada thistle)
- *Humulus japonica* (Japanese hops)
- *Lespedeza cuneata* (Chinese bush clover)
- *Lythrum salicaria L.* (Purple loosestrife)*

*As of 2021, purple loosestrife remains an invasive species. However, it is now being controlled biologically in New Jersey by *Calmariensis* (both leaf-feeding beetles), and *Hylobius transversovittatus* (a root-mining weevil). Therefore, chemical control is not recommended for this species.

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Less common invasive/aggressive plant species to avoid in New Jersey:

- *Acer ginnala* (Amur Maple)
- *Acer platanoides L.* (Norway maple)
- *Acer pseudoplatanus L.* (Sycamore maple)
- *Akebia quinata* (chocolate vine)
- *Alnus glutinosa* (European Black Alder)
- Albizia julibrissin (Mimosa)
- *Aralia elata* (Japanese Angelica tree)
- *Artemisia biennis* (Biennial wormwood)
- *Berberis vulgaris* (Common barberry)
- Broussonetia papyrifera (paper mulberry)
- *Bromus tectorum* and *Bromus sterilis* (cheatgrass and poverty brome)
- Buddleja davidii Franch. (butterfly bush)
- Carex kobomugi Ohwi (Japanese sedge)
- Celastrus orbiculatus Thunb. (Asian bittersweet)
- Centaurea biebersteinii DC. [Centaurea maculosa auct. non-Lam.] (spotted knapweed)
- *Cynanchum louiseae* and *C. rossicum* (pale and black swallow-worts)
- Dipsacus fullonum L. ssp. sylvestris (Huds.) Clapham (wild teasel) Dipsacus laciniatus L. (cut-leaf teasel)
- *Euonymus alata* (Thunb.) *Sieb.* (winged spindletree)
- Euonymus fortunei (Wintercreeper)
- *Hedera helix* (English ivy)
- *Holcus lanatus* (common velvet grass)
- Ligustrum obtusifolium (Japanese privet)
- Ligustrum vulgare (Common privet)
- *Melilotus officinalis* (L.) *Pallas* (yellow sweetclover)
- Miscanthus sinensis Anderss. (chinese silvergrass)
- *Morus alba* (white mulberry)
- *Myriophyllum spicatum L.* (Eurasian watermilfoil)
- Oplismenus undulatifolius (wavyleaf basketgrass)

- *Paulownia tomentosa* (Thunb.) *Sieb.* & *Zucc ex Steud.* (Empress or Princess tree)
- Phellodendron japonicum Maxim., P. amurense Rupr. and P. lavallei Dode. (Cork-trees)
- Phyllostachys aurea (golden bamboo)
- Potamogeton crispus L. (curly leaf pondweed)
- *Poa trivialis* (rough bluegrass)
- *Pueraria montana var. lobata* (Kudzu or Japanese arrowroot)
- *Pyrus calleryana* (Callery or Bradford pear)
- Ranunculus ficaria L. (lesser celandine)
- Rhamnus cathartica L. (common buckthorn)
- Rhodotypos scandens (jetbead)
- Robinia pseudoacacia L. (black locust)
- Rubus phoenicolasius Maxim (wineberry)
- Schedonorus phoenix (Scop.) Holub (tall fescue)
- Sorghum bicolor ssp. X. drummondii and S. halapense (shattercane and Johnsongrass)
- *Spiraea japonica* (Japanese spiraea)
- *Typha latifolia* (Broad-leaved cattail)
- *Typha angustifolia* (Narrowed leaved cattail)
- Viburnum opulus var. Opulus (guelder rose)
- Viburnum plicatum Thunb. (doublefile viburnum)
- Viburnum sieboldii (Siebold viburnum)
- *Vinca minor L.* and *Vinca major L.* (common and bigleaf periwinkle)
- *Wisteria sinensis* and *Wisteria floribunda* (Chinese and Japanese Wisteria)

The following species are native to New Jersey but are aggressive, forming monocultures and excluding other species, and should not be included on planting lists for mitigation projects:

1. T*ypha latifolia* (broad leaved cattail)
2. *Typha angustifolia* (narrow leaved cattail)
3. *Dichanthelium clandestinum* (deer tongue grass)

Photographs:

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Hexafluoride, CC BY-SA 4.0 <https://creativecommons.org/licenses/by-sa/4.0>, via Wikimedia Commons, https://commons.wikimedia.org/wiki/File:Tree_of_Heaven_(Ailanthus_altissima)_-_Resprout_from_a_stump.jpg

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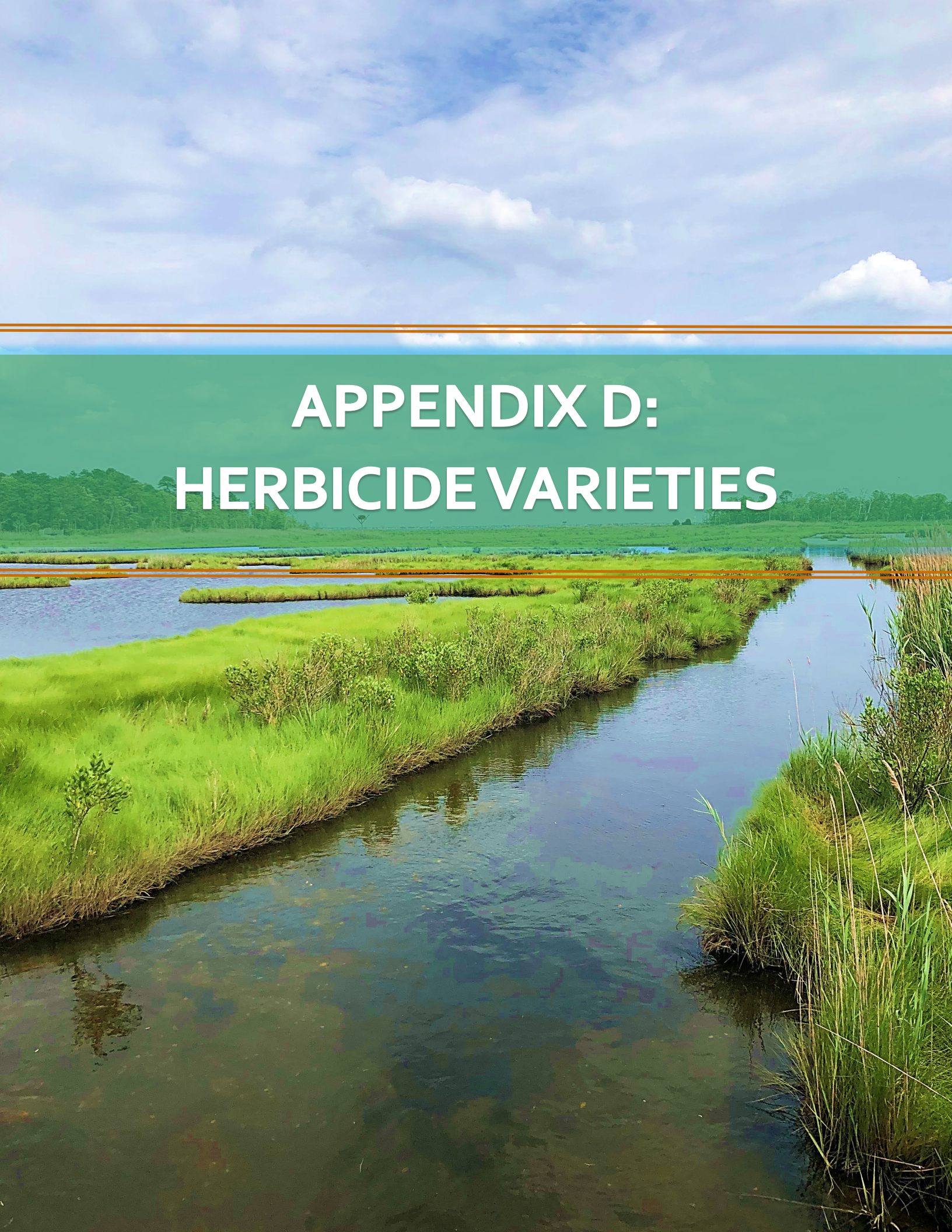

APPENDIX D: HERBICIDE VARIETIES

The information contained in this Appendix was obtained from the *Weed Control Methods Handbook: Tools & Techniques for Use in Natural Areas* by Mandy Tu, Callie Hurd, and John M. Randall, prepared for The Nature Conservancy, 2001. Please see the References section for the complete citation.

2,4-D (Navigate, Weed-Pro, Justice)

- Targets general broadleaf weeds. Useful for controlling Garlic Mustard, Canada Thistle, and Teasel (common or cut leaf), among others.

Altrazine (Aatrex, Atrazine)

- Applied to crops. Generally useful against broadleaf weeds.

Ammonium salt of Imazamox (Clearcast)

- Useful in wetlands and slow-moving water channels. Useful in some cases against SAV and against some emergent vegetation, including Eurasian water milfoil, cattails, and common reed.

Aminopyralid (Milestone)

- Useful in grass pastures, roadsides, seasonally dry wetlands, natural areas, and transition areas. Useful to control Canada thistle and Spotted Knapweed, among others.

Clopyralid (Reclaim, Curtail, Stinger)

- Targets selected annual and perennial broadleaf weeds in wildlife openings and rights-of-way. Useful to control Canada thistle, sweet clovers, and teasels, among others.

Cyanazine (Bladex/DuPont)

- Applied to crops. Generally useful against broadleaf weeds.

Dicamba (Banval, Clarity, Vanquish, Veteran)

- Applied to weeds in small grain crops. Used on pastures, lawns, and grassy rights-of-way. Generally useful against broadleaf weeds and conifer species.

Fosamaine (Krenite)

- Useful on tree and bush species in the fall with effects seen the following spring. Useful in rights-of-way, parklands, conifer plantations, and reforested areas. Generally useful in brush control, specifically against leafy spurge.

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Glyphosate (Roundup, Ultra, Rodeo, TouchDown Pro, Accord)

- Useful on Garlic Mustard, Japanese Barberry, Canada Thistle, Teasel (common or cut-leaf), Autumn Olive, Japanese Hops, Japanese Honeysuckle, Bush Honeysuckle, Purple Loosestrife, Japanese stiltgrass, Black Locust and Multiflora Rose, among others.

Imazethapyr (Pursuit)

- Controls weeds in alfalfa, barley, soybeans, and wheat. Used to control grasses and broadleaved weeds, including garlic mustard and Johnsongrass.

Metolachlor (Dual, Dual Magnum, Pennant Magnum)

- Applied pre-planting to control annual grasses and broadleaf species in crops.

Pendimethalin (Prowl, Pentagon, Pendulum, Stomp)

- Applied to control grasses and broadleaf weeds in bean, peanut, cotton, and tobacco crops. Generally useful against annual grasses and certain broadleaf weeds.

Sethoxydim (Poast, Ultima, Vantage, Rezult)

- Treats grasses without affecting broadleaf or sedges. Works best on annuals and not recommended for perennials.

Thifensulfuron (Beacon, Pinnacle, Harmony)

- Applied to control weeds in small grains, conifer, and hardwood plantations.

Triclopyr (Garlon, Remedy, Access)

- Target's woody and broadleaf weeds in rights-of-way and wildlife openings. Little impact on grasses. Highly toxic to aquatic organisms. Useful against Tree-of-heaven, Norway maple, and Buckthorns, among others.

Trifluralin (Treflan)

- Applied to control grasses and broadleaf weeds in bean, peanut, cotton, and tobacco crops.

APPENDIX E: SUGGESTED PERFORMANCE STANDARDS FOR MONITORING

The following lists provide suggested performance standards for:

1. Establishing a Hydrologic Regime
2. Planting the Vegetative Community
3. Yearly recommended monitoring standards for:
    - Tidal wetland vegetation
    - Tidal wetland hydrology
    - Freshwater wetland vegetation
    - Freshwater wetland hydrology
    - Soils
    - Riparian zone vegetation
4. Open water areas
5. Mudflat areas

Applicants can modify or adapt these recommendations for their project as some standards may not be applicable.

Establishing a Hydrologic Regime

1. A construction completion report including as-built plans documenting that the target elevations have been achieved across the site
2. For a tidal wetland: Installation of the approved number of tidal gauges shown on monitoring plans, demonstrating that the target tidal regime has been achieved
3. For a freshwater wetland: Submittal of an as-built plan showing the site was designed as per approved plans, documentation that the proposed elevations (using drone or traditional methods for elevation) were achieved, and that monitoring wells as shown in approved monitoring plan are in place

Planting the Vegetative Community

1. Submittal of as-built report that includes the construction completion report
2. Before and after photographs of the site showing planting (drone footage may be acceptable)
3. Map showing the locations of the monitoring plots
4. Established fixed photo location points so that photos can be taken from the same point and in the same direction each subsequent year

Yearly Recommended Monitoring Standards

Tidal Wetland Vegetation

Year 1

- Demonstration of at least 70 percent cover of the mitigation plantings or target hydrophytes, which are species native to the area and similar to ones identified on the mitigation planting plan
- Demonstration that less than 10 percent of the restoration, creation, and/or enhancement area is occupied by invasive or noxious species
- Aerial photograph, taken during the growing season of the site, showing monitoring locations and the percentages of vegetative and non-vegetative cover of the site as well as identification of any areas that may need corrective action (NOTE: Aerial photograph can be taken using drone or fixed wing airline flight. The aerial photograph should not include a Google or Bing image.)
- Evidence of minimal erosion

Year 2

- Demonstration of at least 75 percent cover of the target hydrophytes. Documentation can include aerial coverage and/or photographs of herbaceous plantings shooting from the roots. Recruits should also be included in the coverage.
- Demonstration that plant species in the mitigation area are healthy and thriving.
- Demonstration that less than 10 percent of the restoration, creation, and/or enhancement area is occupied by invasive or noxious species and that the amount of invasive species from year one has not increased.
- Aerial photograph of the site showing monitoring locations and percentages of vegetative and non-vegetative cover of the site as well as identification of any areas that may need corrective action. (NOTE: Aerial photograph can be taken using drone or fixed wing airline flight. The aerial photograph should not include a Google or Bing image.)
- Evidence of minimal erosion

Year 3

- Demonstration of at least 80 percent cover of the target hydrophytes. Documentation can include aerial coverage and/or photographs of herbaceous plantings shooting from the roots. Recruits should also be included in the coverage.
- Documentation, such as photographs, showing rhizome reproduction of colonizing species, such as *S. alterniflora* and *D. spicata*
- Demonstration that plant species in the mitigation area are healthy and thriving.
- Demonstration that less than 10 percent of the restoration, creation, and/or enhancement area is occupied by invasive or noxious species and that the amount of invasive species from year one has not increased.
- Aerial photograph of the site showing monitoring locations and percentages of vegetative and non-vegetative cover of the site as well as identification of any areas that may need corrective action. (NOTE: Aerial photograph can be taken using drone or fixed wing airline flight. The aerial photograph should not include a Google or Bing image.)
- Evidence of minimal erosion
- A field delineation of the wetlands onsite, as per N.J.A.C. 7:7-17.13(f)4(v)

Year 4

- Demonstration of at least 85 percent cover of the target hydrophytes. Documentation can include aerial coverage and/or photographs of herbaceous plantings shooting from the roots. Recruits should also be included in the coverage.
- Demonstration that plant species in the mitigation area are healthy and thriving.
- Demonstration that less than 10 percent of the restoration, creation, and/or enhancement area is occupied by invasive or noxious species and that the amount of invasive species from year one has not increased.
- Aerial photograph of the site showing monitoring locations and percentages of vegetative and non-vegetative cover of the site as well as identification of any areas that may need corrective action. (NOTE: Aerial photograph can be taken using drone or fixed wing airline flight. The aerial photograph should not include a Google or Bing image.)
- Evidence of minimal erosion

Year 5

- Demonstration of at least 85 percent cover of the target hydrophytes. Documentation can include aerial coverage and/or photographs of herbaceous plantings shooting from the roots. Recruits should also be included in the coverage.
- Demonstration that plant species in the mitigation area are healthy and thriving.
- Demonstration that less than 10 percent of the restoration, creation, and/or enhancement area is occupied by invasive or noxious species and that the amount of invasive species from year one has not increased.
- Aerial photograph of the site showing monitoring locations and percentages of vegetative and non-vegetative cover of the site as well as identification of any areas that may need corrective action. (NOTE: Aerial photograph can be taken using drone or fixed wing airline flight. The aerial photograph should not include a Google or Bing image.)
- Evidence of minimal erosion
- A field delineation of the wetlands onsite, as per N.J.A.C. 7:7-17.13(f)4(v)

Tidal Wetland Hydrology

Year 1

- Documentation that the hydroperiod approved in the mitigation plan has been met (e.g., the marsh plain surface is inundated and drained as designed) by providing continuous marsh plain tidal data collected at a minimum of 15-minute intervals over a minimum of three lunar cycles from several locations across the site

Year 2
Year 3
Year 4
Year 5

- Documentation that the hydroperiod approved in the mitigation plan has been met (e.g., the marsh plain surface is inundated and drained as designed) by providing continuous marsh plain tidal data collected at a minimum of 15-minute intervals over a minimum of three lunar cycles from several locations across the site
- Documentation of any areas where drainage is not occurring properly, any pools that have established, and any areas of undercutting or severe erosion

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Freshwater Wetland Vegetation

Year 1

- Demonstration of at least 70 percent cover of the mitigation plantings or target hydrophytes, which are species native to the area and similar to ones identified on the mitigation planting plan
- Demonstration that a specific planting density has been achieved based on the goals of the mitigation site and the size and type of plantings to be utilized. For example, a performance standard could be to develop healthy trees above the herbaceous layer. Alternative performance standards may be proposed to meet this goal and will be considered on a case-by-case basis.
- Demonstration that less than 10 percent of the restoration, creation, and/or enhancement area is occupied by invasive or noxious species
- Aerial photograph, taken during the growing season of the site, showing monitoring locations and the percentages of vegetative and non-vegetative cover of the site as well as identification of any areas that may need corrective action (NOTE: Aerial photograph can be taken using drone or fixed wing airline flight. The aerial photograph should not include a Google or Bing image.)
- Evidence of minimal erosion
- For all planted woody vegetation, documentation of a 10 percent increase in height from the previous year

Year 2

- Demonstration of at least 75 percent cover of the target hydrophytes
- Demonstration that a specific planting density has been achieved based on the goals of the mitigation site and the size and type of plantings to be utilized. For example, a performance standard could be to develop healthy trees above the herbaceous layer. Alternative performance standards may be proposed to meet this goal and will be considered on a case-by-case basis.
- Demonstration that all plant species in the mitigation area are healthy and thriving
- Demonstration that the percent of canopy coverage is increasing every year
- Demonstration that less than 10 percent of the restoration, creation, and/or enhancement area is occupied by invasive or noxious species and that the amount of invasive species from year one has not increased.
- Aerial photograph of the site showing monitoring locations and percentages of vegetative and non-vegetative cover of the site as well as identification of any areas that may need corrective action. (NOTE: Aerial photograph can be taken using drone or fixed wing airline flight. The aerial photograph should not include a Google or Bing image.)
- Evidence of minimal erosion
- For all planted woody vegetation, documentation of a 10 percent increase in height from the previous year

Year 3

- Demonstration of at least 80 percent cover of the target hydrophytes
- Demonstration that a specific planting density has been achieved based on the goals of the mitigation site and the size and type of plantings to be utilized. For example, a performance standard could be to develop healthy trees above the herbaceous layer. Alternative performance standards may be proposed to meet this goal and will be considered on a case-by-case basis.
- Demonstration that all plant species in the mitigation area are healthy and thriving
- Demonstration that the percent of canopy coverage is increasing every year
- Demonstration that less than 10 percent of the restoration, creation, and/or enhancement area is occupied by invasive or noxious species and that the amount of invasive species from year one has not increased.
- Aerial photograph of the site showing monitoring locations and percentages of vegetative and non-vegetative cover of the site as well as identification of any areas that may need corrective action. (NOTE: Aerial photograph can be taken using drone or fixed wing airline flight. The aerial photograph should not include a Google or Bing image.)
- Evidence of minimal erosion
- For all planted woody vegetation, documentation of a 10 percent increase in height from previous years
- A field delineation of the wetlands onsite as per N.J.A.C. 7:7A-11.12(g)

Year 4

- Demonstration of at least 85 percent cover of the target hydrophytes
- Demonstration that a specific planting density has been achieved based on the goals of the mitigation site and the size and type of plantings to be utilized. For example, a performance standard could be to develop healthy trees above the herbaceous layer. Alternative performance standards may be proposed to meet this goal and will be considered on a case-by-case basis.
- Demonstration that all plant species in the mitigation area are healthy and thriving
- Demonstration that the percent of canopy coverage is increasing every year
- Demonstration that less than 10 percent of the restoration, creation, and/or enhancement area is occupied by invasive or noxious species and that the amount of invasive species from year one has not increased.
- Aerial photograph of the site showing monitoring locations and percentages of vegetative and non-vegetative cover of the site as well as identification of any areas that may need corrective action. (NOTE: Aerial photograph can be taken using drone or fixed wing airline flight. The aerial photograph should not include a Google or Bing image.)
- Evidence of minimal erosion
- For all planted woody vegetation, documentation of a 10 percent increase in height from previous year

Year 5

- Demonstration of at least 85 percent cover of the target hydrophytes
- Demonstration that a specific planting density has been achieved based on the goals of the mitigation site and the size and type of plantings to be utilized. For example, a performance standard could be to develop healthy trees above the herbaceous layer. Alternative performance standards may be proposed to meet this goal and will be considered on a case-by-case basis.
- Demonstration that all plant species in the mitigation area are healthy and thriving
- Demonstration that the percent of canopy coverage is increasing every year
- Demonstration that less than 10 percent of the restoration, creation, and/or enhancement area is occupied by invasive or noxious species and that the amount of invasive species from year one has not increased.
- Aerial photograph of the site showing monitoring locations and percentages of vegetative and non-vegetative cover of the site as well as identification of any areas that may need corrective action. (NOTE: Aerial photograph can be taken using drone or fixed wing airline flight. The aerial photograph should not include a Google or Bing image.)
- Evidence of minimal erosion
- For all planted woody vegetation, documentation of a 10 percent increase in height from previous years
- A field delineation of the wetlands onsite as per N.J.A.C. 7:7A-11.12(g)

Freshwater Wetland Hydrology

Year 1
Year 2
Year 3
Year 4
Year 5

Documentation that the appropriate hydrology has been established for the project (see above performance standards for establishment of hydrologic regime)

Soils

Year 1, Year 2, Year 3, Year 4

- Documentation that the site contains hydric soils or evidence of reduction occurring in the soil

Year 5

- Documentation that the site contains hydric soils or evidence of reduction occurring in the soil
- Demonstration that the goals of the wetland mitigation project stated in the approved mitigation plan and the permit, including acreage, have been satisfied
- Demonstration that the site is a wetland based on the water budget in the approved mitigation plan, as documented through, when appropriate, relevant tidal data, photographs, and field observation notes collected throughout the monitoring period. At the end of the fifth growing season, submission of a final wetland delineation of the wetland mitigation project that shows the exact acreage of wetlands in the mitigation area

Riparian Zone Vegetation

Year 1

- Demonstration of at least 70 percent cover of the target riparian zone species, which are species native to the area and similar to ones identified on the mitigation planting plan
- Demonstration that a specific planting density has been achieved based on the goals of the mitigation site and the size and type of plantings to be utilized. For example, a performance standard could be to develop healthy trees above the herbaceous layer. Alternative performance standards may be proposed to meet this goal and will be considered on a case-by-case basis.
- Demonstration that less than 10 percent of the restoration, creation, and/or enhancement area is occupied by invasive or noxious species
- Aerial photograph, taken during the growing season of the site, showing monitoring locations and the percentages of vegetative and non-vegetative cover of the site as well as identification of any areas that may need corrective action (NOTE: Aerial photograph can be taken using drone or fixed wing airline flight. The aerial photograph should not include a Google or Bing image.)
- Evidence of minimal erosion
- For all planted woody vegetation, documentation of a 10 percent increase in height from the previous year

Year 2

- Demonstration of at least 75 percent cover of the target riparian zone species
- Demonstration that a specific planting density has been achieved based on the goals of the mitigation site and the size and type of plantings to be utilized. For example, a performance standard could be to develop healthy trees above the herbaceous layer. Alternative performance standards may be proposed to meet this goal and will be considered on a case-by-case basis.
- Demonstration that the percent of canopy coverage is increasing every year
- Demonstration that less than 10 percent of the restoration, creation, and/or enhancement area is occupied by invasive or noxious species
- Aerial photograph, taken during the growing season of the site, showing monitoring locations and the percentages of vegetative and non-vegetative cover of the site as well as identification of any areas that may need corrective action (NOTE: Aerial photograph can be taken using drone or fixed wing airline flight. The aerial photograph should not include a Google or Bing image.)
- Evidence of minimal erosion
- For all planted woody vegetation, documentation of a 10 percent increase in height from the previous year

Year 3

- Demonstration of at least 80 percent cover of the target riparian zone species
- Demonstration that a specific planting density has been achieved based on the goals of the mitigation site and the size and type of plantings to be utilized. For example, a performance standard could be to develop healthy trees above the herbaceous layer. Alternative performance standards may be proposed to meet this goal and will be considered on a case-by-case basis.
- Demonstration that the percent of canopy coverage is increasing every year
- Demonstration that less than 10 percent of the restoration, creation, and/or enhancement area is occupied by invasive or noxious species
- Aerial photograph, taken during the growing season of the site, showing monitoring locations and the percentages of vegetative and non-vegetative cover of the site as well as identification of any areas that may need corrective action (NOTE: Aerial photograph can be taken using drone or fixed wing airline flight. The aerial photograph should not include a Google or Bing image.)
- Evidence of minimal erosion
- For all planted woody vegetation, documentation of a 10 percent increase in height from the previous year

Year 4
Year 5

- Demonstration of at least 85 percent cover of the target riparian zone species
- Demonstration that a specific planting density has been achieved based on the goals of the mitigation site and the size and type of plantings to be utilized. For example, a performance standard could be to develop healthy trees above the herbaceous layer. Alternative performance standards may be proposed to meet this goal and will be considered on a case-by-case basis.
- Demonstration that the percent of canopy coverage is increasing every year
- Demonstration that less than 10 percent of the restoration, creation, and/or enhancement area is occupied by invasive or noxious species
- Aerial photograph, taken during the growing season of the site, showing monitoring locations and the percentages of vegetative and non-vegetative cover of the site as well as identification of any areas that may need corrective action (NOTE: Aerial photograph can be taken using drone or fixed wing airline flight. The aerial photograph should not include a Google or Bing image.)
- Evidence of minimal erosion
- For all planted woody vegetation, documentation of a 10 percent increase in height from the previous year

Open Water Areas

1. Demonstration that the proposed hydrologic regime as specified in the mitigation design plan, which proves the mitigation site is a wetland, has been satisfied
2. Demonstration that the goals of the wetland mitigation project as stated in the approved wetland mitigation plan and the permit, including acreage of open water area, have been satisfied
3. At the end of the fifth growing season, submission of a final wetland delineation of the wetland mitigation project that shows the exact acreage of open water areas in the mitigation area

Mudflat Areas

1. Demonstration that the proposed hydrologic regime as specified in the mitigation design plan, which proves the mitigation site is a wetland, has been satisfied
2. Evidence that the area is being used by wildlife

3. Demonstration that the goals of the wetland mitigation project as stated in the approved wetland mitigation plan and the permit, including acreage of open water area, have been satisfied
4. At the end of the fifth growing season, submission of a final wetland delineation of the wetland mitigation project that shows the exact acreage of open water areas in the mitigation area
5. Documentation that the site is stable and that no undercutting is occurring

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