

NJMC Wetland Program Plan

Background on New Jersey Meadowlands Commission Wetland Plans

Monitoring the state of natural areas in the Meadowlands District (District), including surveys of the biota, and restoration or enhancement of wetland areas are goals of the New Jersey Meadowlands Commission (Commission). The first of the listed founding mandates for the Commission is to “protect the delicate balance of nature”. The Commission’s 2004 NJMC Master Plan states it is essential to have an understanding of the Meadowlands District’s natural environment and properly manage it. The Commission will target and prioritize potential preservation sites for acquisition. The strategy declared in the Master Plan will safeguard the environmental resources by preserving wide expanses for open space including large tracts of wetlands. The Commission will preserve wildlife habitats through deed restriction and/or conservation easements. Wetland areas will be ecologically enhanced. There will be increased public access to natural areas and waterways in the District.

To achieve an understanding of the District’s natural resources the Commission will prepare an inventory of animal and plant species as part of its habitat management. Invasive species will be eliminated or controlled and vegetation beneficial to wildlife will be established. Targeted habitats of value to wildlife activities will be maintained and improved. Waterways and wetlands will be maintained and enhanced with reestablishment of hydrologic and ecological functions.

As part of the New Jersey Coastal Management Plan the Commission acts as the lead coastal planning and management agency for the District. The emphasis is upon the continued protection of wetlands and other environmental resources. The first of the basic coastal policies listed in the New Jersey Coastal Management Plan is to protect and enhance the coastal ecosystem.

Much has already been accomplished on a plan for ecological restoration in the District.

In 1995 a USEPA, Region II, and USACE, NY District, Draft Environmental Impact Statement on the Special Area Management Plan (SAMP) for the Hackensack Meadowlands District included an extensive description of the natural resources of the District. A functional assessment of the wetlands was carried out as part of this effort.

In 1996 the USEPA endorsed New York-New Jersey Harbor Estuary Program (HEP) issued a Final Comprehensive Conservation and Management Plan.

In 1999 USACE, NY District and the Port Authority of New York and New Jersey initiated the Hudson-Raritan Estuary (HRE) Ecosystem Restoration Feasibility Study.

In 2003 the Commission and USACE entered into a cooperative agreement to carry out a Meadowlands component of the HRE.

In 2004 the USACE and the Commission completed the Meadowlands Environmental Site Investigation Compilation (MESIC), an annotated bibliography of information on natural areas, primarily wetlands, in the District. The Commission is working to update this document.

Also in 2004 the USACE and Commission began work on a draft of the Meadowlands Comprehensive Restoration Implementation Plan (MCRIP). The all-inclusive HRE program released a draft of a Hudson-Raritan Estuary Comprehensive Restoration Plan (CRP) in 2009. The HEP adopted the HRE CRP as its plan for ecological enhancement of the NY NJ harbor area. A revision of the Meadowlands specific draft MCRIP is in progress. A draft Programmatic Environmental Impact Statement (PEIS) for the Meadowlands component of the HRE was completed by the Corps with contributions from the Commission.

The objectives in the draft MCRIP include restoration of natural hydrology; promotion of habitat diversity and habitat connectivity; removal and attenuation of contamination in aquatic habitats; and stemming the influx of contaminants including leachate from adjacent landfills. To achieve the goals and objectives, the development and implementation of the MCRIP has been conducted in several steps: identification of historical ecological functions; identification of impairments to ecological functions; identification of quantifiable restoration performance metrics; identification of conceptual restoration measures; characterization and site selection; evaluation of restoration alternatives and functions to be restored; cost-benefit assessment; selection of restoration opportunities; and determine how performance will be monitored and measured. These are addressed in the draft MCRIP but must be revised, expanded and continued. The draft MCRIP includes descriptions of existing conditions including functional value assessments of selected sites. The conditions are not static, so assessments must be undated and other sites considered.

Potential general restoration measures and how they might be implemented are explained in the draft MCRIP. Functional assessments and potential restoration activities for a selection of specific sites has been done. A variety of monitoring or performance metrics are described. It is necessary to determine which would be implemented in the future.

The 2006 draft MCRIP included much information and laid the foundation to proceed with implementing ecological enhancement at sites in the Meadowlands. Many of the steps taken in the draft MCRIP must now be updated and expanded on before applying restoration approaches to candidate restoration sites.

References

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1.0 Overall Objective

The overall objective of the NJMC's wetland program plan is to increase the quality and quantity of wetlands. This follows EPA's national goal of "No Net Loss" in wetland extent and the overall increase in wetland quality.

2. Strategy and framework

2.1 The NJMC's strategy for reaching this overall objective rests on three main initiatives: 1. wetland acquisition, 2. wetland enhancement, and 3. sustainable wetland preservation with management.

2.2 The NJMC's framework for implementing this strategy draws upon:

- a.** Landscape level assessment using Geographic Information System (GIS) and landscape metrics,
- b.** Area level assessments based on plant and animal community associations and sediment contaminant burdens, and,
- c.** Intensive site assessments through monitoring plant and animal community structure, soil biogeochemical processes, contaminant loads and gas flux measurements.

(Note: This framework is consistent with the three-tier framework for wetlands monitoring and assessment as stated in the EPA Core Element Framework (CEF).

3. Core Element

3.1 Monitoring and Assessment

The NJMC Master Plan states we will prepare inventories of species to be considered in habitat management and used in species protection. The Plan says we will promote research related to flora and fauna to facilitate protection of sites and their biota. This will help in management of invasive species and sensitive species, reestablish hydrologic functions, and restore the ecology of waterways or wetlands.

3.1.1 Objectives

The objectives are to conduct the sampling and analysis of the air quality, water quality, sediment quality, flora and fauna of the Meadowlands. These will also serve as a baseline for the existing conditions when future changes and progress are made.

3.1.2 Rationale

The Meadowlands Environmental Research Institute's (MERI) landscape assessment, as in USEPA CEF Level 1 landscape assessments, has created an exceptional GIS database on physical conditions and landuse in the Meadowlands. MERI has extensive mapping showing the location of greenspace and wetlands in the District. Related to Level 2 rapid assessments, the NJMC in cooperation with other agencies has performed Hydrogeomorphic (HGM) assessment and

Indicator Value Assessment (IVA) of many sites. Level 3 intensive sites assessments have been catalogued in the Meadowlands Environmental Site Investigation Compilations (MESIC) as part of the cooperative effort between the NJMC and the USACE in the Hackensack Meadowlands Ecosystem Restoration Study, which is a component of the greater Hudson Raritan Estuary (HRE) project. NJMC has carried out detailed studies of biota- plants, macroinvertebrates, fish and birds in particular-with the understanding that there is a relationship between diversity and ecological function. MERI has a long- standing program for monitoring of physical and chemical parameters at sites in the District. The NJMC is cooperating with various academic institutions on studies of carbon and nitrogen cycling.

The NJMC has implemented a monitoring program. The geographic location within the District as well as the state of a site as determined by this data gathering on hydrology, levels of contamination, and biota, especially vegetation, have a bearing on which sites are acquired, preserved, and restored. Monitoring guides management. Preservation, restoration, and management are rationalized as being ecologically beneficial. Monitoring and studies allow us to test this premise by evaluating change over time.

Under USEPA CEF Objective 1, developing a monitoring and assessment strategy, our Master Plan declares our goal is to preserve, enhance and manage. The HRE related efforts added more specific detail to this. Data gathering associated with permit applications and then monitoring as post construction permit requirements has provided much information on sites in the District. The NJMC has continued monitoring of restored sites much longer than permit requirements. This has enabled us to track trends. Monitoring water quality in particular is done in collaboration with other agencies and academic institutions. Monitoring data is considered for planning, including acquisition, preservation, restoration, and management. This is consistent with the activities described in the Actions a in the Objective 1.

NJMC has been active in numerous cooperative projects related to data gathering and planning. This is consistent with the 1st activity as in the Actions b. Agencies we have worked with include USACE, USEPA, NOAA, USFWS, USDA, PANYNJ, NJDEP, and the Meadowlands Conservation Trust. We have regular interaction with academic institutions including Rutgers University, NJ Institute of Technology, Ramapo College of NJ, Fairleigh Dickenson University, Montclair State University, Cornell University and Princeton University. NJMC has funded research and planning conducted by NJ Audubon Society and Ducks Unlimited. In addition to obtaining information from the above sources there are also documents submitted by applicants to the Meadowlands Interagency Review Team and reports associated with the Berry's Creek Superfund Study Area.

Considerations for which sites are studied or monitored include whether the site is largely wetland or upland and currently unenhanced, previously enhanced, or viewed as having potential for enhancement. Though all sites in the Meadowlands District potentially could be studied, NJMC ownership or potential ownership dictates whether we have enhanced the site or are likely to in the future. NJMC is one of the larger landholders in the Meadowlands. This matches the activities described in the Actions c in the Objective 1.

Scientific literature provides rationales for multi-taxa monitoring. Plants, benthic invertebrates, fish, and birds are frequently used elsewhere and the NJMC has used these taxa in monitoring here. The methodology is largely standard and consistent with academic and other professional input. The NJMC staff have experience with conducting monitoring and studies. Academics and consultants have also participated in our activities. Additional indicators could be added as needed or knowledge dictates and resources allow. This follows the activities described in the Actions d in the Objective 1. The frequency of monitoring or studies is significantly influenced by funding.

In reference to USEPA CEF Objective 2, the NJMC has implemented monitoring for several years. Some of the statistical analysis of the summary datasets has been conducted at NJIT.

Selection of a reference site within the Meadowlands has been challenging because the entire District is so disturbed. Sometimes sites far from the Meadowlands, such as marshes at Tuckerton in Little Egg Harbor, have been used. The restoration goal is usually the best attainable condition. The most recent NJMC restoration project, the Secaucus High School Wetland Enhancement Site, shows much improvement over its previous state in coverage by desirable emergent vegetation as well as much increase in diversity of flora and fauna. That site appears to be a good model for success. This is consistent with the actions and activities as described in the Objective 2.

3.1.3 Monitor and Assess Air Quality

The objective is to monitor nitrogen transfers from the atmosphere to aquatic and terrestrial ecosystems and assess how these inputs (NO₃- and HNO₃) may influence wetland function by promoting unsustainable emission of powerful greenhouse gases (i.e. N₂O). (See 2.2.c -Intensive site assessments through monitoring plant and animal community structure, soil biogeochemical processes, contaminant loads and gas flux measurements).

Monitor and Assess Air Quality						
Activity	2013	2014	2015	2016	2017	2018
Conduct continuous air quality monitoring: O ₃ , NO _x , SO ₂ , CO ₂ and CO	X	X	X	X	X	X
Summarize measurements on a biennial basis using descriptive statistics	X	X	X	X	X	X
Detect seasonal trends and patterns using analysis of variance, regressions, and comparisons of means			X			X
Publish biennial analysis and compare to established criteria levels		X		X		X
Develop policies and strategies to meet the established criteria levels					X	X

3.1.4 Monitor and Assess Water Quality

The objective is to monitor water quality over time to assess the amount of pollutants reaching wetland surfaces through tidal inundation and by good planning and decision making minimize the flow of contaminants so that preserved wetlands under tidal influence maintain their enhanced status over time. (See 2.2.b -Area level assessments based on plant and animal community associations and sediment contaminant burdens).

Monitor and Assess Water Quality						
Activity	2013	2014	2015	2016	2017	2018
Conduct seasonal water quality monitoring at 14 locations: DO, conductivity, pH, salinity, temperature, BOD, COD, sulfate fecal coliform, TSS, TDS, turbidity, chloride, phosphate, nitrate NH ₄ , iron, lead, cadmium, chromium, copper, maganese, nickel and zinc.	X	X	X	X	X	X
Summarize measurements on a biennial basis using descriptive statistics		X		X		X
Detect seasonal trends and patterns using analysis of variance, regressions, and comparisons of means			X			X
Publish biennial analysis and compare to established criteria levels		X		X		X
Develop policies and strategies to meet the established criteria levels					X	
Sample and analyze landfill leachate monthly at 3 locations: BOD, TSS, pH, , cadmium, copper, lead, mercury, nickel, zinc, cyanide and non-polar material	X	X	X	X	X	X

3.1.5 Monitor and Assess Sediment Quality

Objective:

Biogeochemical process in sediments such as oxidation–reduction potential greatly influences how readily pollutants such as heavy metals may enter food webs, our objective is to promote wetland functions that may help immobilize legacy contaminants and increase wetland quality. (See 2.2.c -Intensive site assessments through monitoring plant and animal community structure, soil biogeochemical processes, contaminant loads and gas flux measurements).

Monitor and Assess Sediment Quality						
Activity	2013	2014	2015	2016	2017	2018
Monitor and assess sediment quality at specific wetland sites as they are identified and funding becomes available. The current site is Secaucus High School Wetland Site: Cd, Cr, Cu, Fe, Hg, Mn, Ni, Pb, Zn, PCBs, OCPs, pH, % moist, % OM, % fines	X	X	X	X	X	X
Summarize results using descriptive and predictive statistics and publish it on line		X		X		X
Extract the data and populate on the MERI sediment chemistry web portal	X		X		X	

3.1.6 Monitor and Assess Flora

The objective is to document the ecological function of the wetland sites by monitoring the plant diversity and vegetation cover through the traditional monitoring methods, balloon imagery and geo-referenced true color image mosaics at these sites. The information gathered will guide in the management of invasive and sensitive species on site as well as in the determination of site acquisition, preservation and restoration. (See 2.2.c -Intensive site assessments through monitoring plant and animal community structure, soil biogeochemical processes, contaminant loads and gas flux measurements).

Monitor and Assess Flora						
Activity	2013	2014	2015	2016	2017	2018
Assess floral diversity and vegetative cover at selected wetland The current sites include Secaucus High School Wetland, Anderson Creek Marsh, Riverbend Marsh, Oritani Marsh, Hawk Site and Little Snake Hill.	X	X	X	X	X	X
Use balloon imagery to produce vegetation maps incorporating ground-level field data. Current sites include Secaucus High School Wetland, Anderson Creek Marsh and Riverbend Marsh.	X	X	X	X	X	X
Create geo-referenced true color image mosaics showing vegetation cover		X		X		X

3.1.7 Survey of Avian Fauna

Objective:

The wetlands in the meadowlands region have long been recognized as a critical habitat for the wildlife, especially birds. The objective is to determine the abundance and distribution of the bird species at the wetlands sites, so that the function of these wetlands can be assessed and the policy decisions can be made on preserving and enhancing these wetland sites. (See 2.2.c -Intensive site assessments through monitoring plant and animal community structure, soil biogeochemical processes, contaminant loads and gas flux measurements).

Survey of Avian Fauna						
Activity	2013	2014	2015	2016	2017	2018
Assess the bird diversity Current sites include Harrier Meadow, Mill Creek Marsh, Secaucus High School Wetland, and Erie Landfill.	X	X	X	X	X	X
Provide summary report	X	X	X	X	X	X

3.1.8. Survey of Fish and Benthic Invertebrates Fauna

Objective:

The objective is to continue monitoring the fish and benthic invertebrate fauna in the estuary and document any changes that the improvement of the water and habitat quality may have on fauna. (See 2.2.b -Area level assessments based on plant and animal community associations and sediment contaminant burdens).

Survey of Fish and Benthic Invertebrates Fauna						
Activity	2013	2014	2015	2016	2017	2018
Assess fish and benthic invertebrate diversity	X	X				
Compare with past studies		X	X			
Provide summary report				X		

3.1.9 Survey Diamondback Terrapin population

Objective:

The Diamondback Terrapin is an important part of the aquatic biota in the lower Hackensack River. The objective is to assess its population size and distribution in the River as a baseline for future studies. (See 2.2.b -Area level assessments based on plant and animal community associations and sediment contaminant burdens). This information will help in the restoration of the waterways.

Survey Diamondback Terrapin population						
Activity	2013	2014	2015	2016	2017	2018
Assess the Diamondback Terrapin population numbers	X					
Provide summary report		X				

3.2 Voluntary Restoration and Protection

The NJMC Master Plan states we will not only acquire and preserve wetland sites for water quality, wildlife, and flood storage, but also reestablish hydrologic functions and restore the ecology of open spaces. The multiyear cooperative effort between the NJMC and the USACE, as well as other agencies, on the Hackensack Meadowlands Ecosystem Restoration Study, which is a component of the greater HRE project, recognizes the intended objectives, actions, and associated activities of the NJMC relative to restoration. Some of the declared activities have already been accomplished as part of the Study.

3.2.1 Objectives

The objectives include restoration of natural hydrology, promotion of habitat diversity and habitat connectivity, removal and attenuation of contamination within aquatic habitats, and stemming the influx of contaminants which include leachate from adjacent landfills.

3.2.2 Rationale

These objectives are consistent with actions under USEPA CEF Objective 1 to define restoration and protection goals. NJMC and USACE have worked for several years on establishing restoration goals with a watershed approach consistent with the NJMC Master Plan and the means to achieve them. As part of that effort, we have documented what data exists on wetlands in the MESIC. NJMC has cooperated with and funded other interagency, academic, and NGO efforts to perform studies and produce natural resources and restoration plans. NJMC is active in the Meadowlands Interagency Review Team's consideration of wetland impacts and the associated mitigation. NJMC has an active program to gather more data and update the MESIC. This data and frequent site monitoring is being used to evaluate the success of restoration and natural resources management. NJMC has sophisticated GIS capabilities that are applied to these objectives. The list of potential or candidate sites for restoration as originally appeared in MESIC and considered during the ongoing HRE program is updated as sites on that list are restored, other sites are acquired, and conditions at potential sites change.

The NJMC and USEPA share the intention to protect wetlands, as in USEPA CEF Objective 2. To achieve this we have acquired and preserved approximately 2,500 acres of wetlands and facilitated protection of about 1,400 more acres. Our Master Plan calls for acquisition of wetlands and our agency continues to do so when they are available. We established partnerships with Federal and State agencies as well as NGOs and colleagues at academic institutions to protect and study our resources. Over the years there have been several Meadowlands stakeholder meetings. NJMC carries out management of the physical and hydrologic state of sites, invasive plants, and goose or swan herbivory.

A lengthy and detailed assessment of the potential for restoration in the Meadowlands, the rationale for doing this, and how this can be accomplished has been the cooperative effort of the NJMC and the USACE in the Hackensack Meadowlands Ecosystem Restoration Study. The actions of this program match USEPA CEF Objective 3 to restore wetlands.

USEPA CEF Objective 4 calls for monitoring and tracking progress and success of restoration projects and natural resources in general. NJMC collects its own data and gathers publications or studies done by other entities about the Meadowlands. These are catalogued as updates to the MESIC and, when possible, made available to others. NJMC monitors restoration sites long past permit requirements. As part of the Meadowlands Interagency Review Team, the NJMC comments on proposals and reports regarding restoration for mitigation and advises the permitting agencies accordingly. The NJMC conducts monitoring and studies from specific habitats and sites to District-wide multiyear studies. These are done with varying frequencies from monthly to multiyear, often with the goal of assessing change over time.

Monitoring of sites enhanced by NJMC in the past has documented long-term success in achieving stated goals of improving hydrology and increasing ecological function, as demonstrated by the significant reduction of invasive plants species and an impressive increase in biotic diversity. Sites where the NJMC has accomplished significant enhancement include Harrier Meadow, Mill Creek Marsh, and the Secaucus High School Wetland Enhancement Site.

3.2.3 Identify Impairments to Ecological Functions of Wetlands

Identify Impairments to Ecological Functions of Wetlands						
Activity	2013	2014	2015	2016	2017	2018
Identify extent of invasive species	X	X				
Detect areas of low habitat diversity	X	X				
Identify habitat fragmentation	X	X				
Evaluate anaerobic tidal exchange	X	X				

3.2.4 Identify Physical Impairments to Wetlands

Identify Physical Impairments to Wetlands						
Activity	2013	2014	2015	2016	2017	2018
Identify the wetland fill	X	X				
Evaluate the hydrological restrictions	X	X				
Assess the contamination levels	X	X				

3.2.5 Identify Quantifiable Restoration Performance Metrics

Identify Quantifiable Restoration Performance Metrics						
Activity	2013	2014	2015	2016	2017	2018
Monitor water quality: DO and contaminants	X	X				
Measure the wetland extent	X	X				
Sample and analyze sediment quality	X	X				
Monitor wildlife species abundance and diversity	X	X				
Monitor plant diversity	X	X	X	X	X	X

3.2.6 Characterize, Prioritize and Select Sites

Characterize, Prioritize and Select Sites						
Activity	2013	2014	2015	2016	2017	2018
Assess the site based on specific characteristics	X	X	X			
Assess the sites based on regional characteristics	X	X				
Catalogue critical sites based on site selection criteria	X	X				

3.2.7 Evaluate Restoration Alternatives and Functions to be Restored

Evaluate Restoration Alternatives and Functions to be Restored						
Activity	2013	2014	2015	2016	2017	2018
Evaluate alternative schemes at each potential action and assess against performance metrics	X	X				
Determine which HRE CRP TECs can be incorporated as restoration goals	X	X				

3.2.8. Submit plans for regulatory review and permitting

Submit plans for regulatory review and permitting						
Activity	2013	2014	2015	2016	2017	2018
Design plan for selected sites			X	X		
Complete baseline reports			X	X		
Submit for regulatory review				X		

3.2.9 Perform restoration

Perform restoration						
Activity	2013	2014	2015	2016	2017	2018
Remove invasive plants; remove tidal restriction; remove fill; restore hydrology; remove contaminated sediment; plant native species;				X	X	
Improve public access						X

3.2.10 Monitor, Manage, and Measure Performance

Monitor, Manage, and Measure Performance						
Activity	2013	2014	2015	2016	2017	2018
Monitor the established matrix in Action 3.2.5						X
Determine if restoration has met the objectives						X
Assess need for adaptive management						X
Review lessons learned before proceeding to next restoration project						X

* Many of the actions and activities are taken from the draft MCRIP and are dependent on funding for implementation.