NATURAL RESOURCES

CHAPTER 11

A natural resource is defined as (1) the City's biodiversity (plants, wildlife and other organisms); (2) any aquatic or terrestrial areas capable of providing suitable habitat to sustain the life processes of plants, wildlife, and other organisms; and (3) any areas capable of functioning in support of the ecological systems that maintain the City's environmental stability. Under CEQR, a natural resources assessment considers species in the context of the surrounding environment, habitat or ecosystem and examines a project's potential to impact those resources.

Resources such as ground water, soils and geologic features, numerous types of natural and human-created aquatic and terrestrial habitats (including wetlands, dunes, beaches, grasslands, woodlands, landscaped areas, gardens, parks and built structures) and any areas used by wildlife may be considered, as appropriate, in a natural resources analysis. Stormwater runoff may also be considered in a natural resources assessment and evaluated in the context of its impact on local ecosystem functions and on the quality of adjacent waterbodies. More information regarding stormwater is located in Chapter 13, "Water and Sewer Infrastructure." Although any aspect of the City's biodiversity may be considered in a CEQR evaluation, those species classified as sensitive, vulnerable, rare, special concern, threatened, endangered or otherwise worthy of protection are to be given individual consideration within the context of New York City's environment.

As mentioned throughout the Manual, it is important for an applicant to work closely with the lead agency throughout the environmental review process. The lead agency may determine it is appropriate to consult or coordinate with the New York City Department of Environmental Protection (DEP) or the New York City Department of Parks and Recreation (DPR) for the natural resources analysis. It is recommended that these expert agencies be contacted as early as possible in the environmental review process. Section 700 further outlines appropriate coordination with both DEP and other expert agencies. In addition, there are many specific federal, state, and city rules and regulations governing human interaction with natural resources. Although the permitting process is often undertaken after the CEQR process is complete, applicants requiring further permit approvals are encouraged to contact the regulatory agencies as early as possible to be certain the project is permittable and to ensure the environmental review informs the regulators' decisionmaking.

The numerous sources of information available from local, state and federal agencies that provide greater detail on the City's natural resources should be consulted for a CEQR natural resources evaluation. Table 1 provides a list of current online and print resources that offer information useful for natural resources reviews under CEQR, including species lists (including state and federally listed species), habitat communities, protective legislation and management/restoration plans targeting the City's critical habitat communities and ecosystems, interactive maps and other sources.

100. DEFINITIONS

A critical source of information on habitat communities present in New York City is the New York Natural Heritage Program's Ecological Communities of New York State. These publications provide detailed information on both the species associations and environmental conditions (*e.g.*, soils, hydrology or geology) that are characteristic of a particular habitat community. All characteristic species noted for a particular plant community, however, are not required to be present at each location to classify the presence of that community. Within the urban ecosystems of New York City, it is important to note that environmental conditions and species compositions at any location may be substantially altered from a past condition, and each location must be reviewed for evidence of recent or historic site disturbance, filling or depletion of soils and hydrologic alterations to the site and adjacent areas. Collection of field data on dominant and co-dominant vegetation, understory species composition, soils, and hydrology provides critical information when determining the appropriate ecological community classification. In addition, detailed life history information, profiles and checklists for plant, animal and other species present in New York City are offered by the New York State Department of Environmental Conservation's (NYSDEC) New York Natural Heritage Program.

110. WATER RESOURCES

New York City is situated on a large, natural, shallow-water harbor estuary complex, and has extensive open marine waters and numerous tidal marsh, freshwater wetland and stream systems. Although these systems have been significantly altered over time, these areas contain important aquatic habitats and physical features that provide food, protection and breeding habitat for aquatic organisms. Near-shore wetland habitats also provide protection from storm surges, retain stormwater, protect water quality, mitigate against urban heath island impacts, and prevent damage to existing infrastructure from the effects of a changing climate

111. Water Bodies

In the City, surface water bodies are important natural resources that serve as: (1) habitat for a wide variety of aquatic life, including finfish and bottom organisms ("benthic organisms"); (2) resources for shipping and boating; (3) recreational resources; and (4) in limited cases, water supply. Figure 1 provides a map of major estuarine resources (rivers, bays), major freshwater areas (ponds, lakes, rivers), and watersheds and drainage areas for each of the City's waterbodies.

The City contains a wide variety of water bodies. A nonexclusive list of the City's water bodies can be found here.

112. Ground Water

The water that is contained beneath the surface in various types of soils, fill, and rock is ground water; the geologic systems containing ground water are called aquifers. Ground water is usually fresh water and, in the City, is primarily recharged through rainfall that percolates into pervious areas and infiltrates through the soil. Along the coast, harbor, and river waterfronts, the tides influence ground water; in these areas ground water can be saline or partially saline (brackish). The importance of ground water as a resource is: (1) as a source of water supply for drinking water, domestic applications, business, and industry; (2) as a source of water recharge for surface water bodies and sustaining the hydrology of many wetlands; (3) to serve critical geotechnical functions related to structural load bearing capacity (lowering the water table may cause subsidence); and (4) as a barrier to salt water intrusion.

Although all five boroughs contain ground water, the major resources in the City lie beneath Brooklyn, Queens, and Staten Island. The major aquifers in the City include the Raritan formation beneath Staten Island, southeastern Brooklyn, and the eastern half of Queens; the Lloyd and Magothy aquifers beneath southern and central Brooklyn, eastern Queens, and Staten Island; and the Jameco aquifer beneath limited areas of Brooklyn and southern Queens. Ground water between these aquifers may or may not be connected. According to the Brooklyn Queens Aquifer Feasibility Study, DEP established a pilot ground water testing program at Station 6 in Jamaica, Queens and plans to develop a ground water treatment plant that would produce high quality drinking water, control ground water flooding and provide educational resources and community meeting space.

120. WETLAND RESOURCES

Wetlands are considered a subset of "waters of the United States" and are subject to Section 404 of the Clean Water Act. They are defined as "…areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances, do support a prevalence of vegetation typically adapted for life in saturated soil conditions" 40 C.F.R. §230.3(t). There are two types of wetlands:

freshwater and tidal. Freshwater wetlands are lands and submerged lands commonly called marshes, swamps, sloughs, bogs, and flats supporting aquatic or semi-aquatic vegetation. Tidal wetlands are those areas that border on or lie beneath tidal waters, such as banks, bogs, salt marsh, swamps, meadows, flats or other low lands subject to tidal action, and those areas now or formerly connected to tidal waters. Figure 2 is a representation of city-wide historical and current freshwater and tidal wetlands.

Wetlands provide myriad functions not only for wildlife habitat but also for humans. Wetlands help improve water quality and control floods by trapping pollutants, capture stormwater runoff, sequester carbon dioxide, moderate storm surges, provide habitat for local and migratory birds, fish and other wildlife, and in some areas, permit ground water or surface water recharge. Wetlands are often important to the public for recreation and open space and to commercial operations as sources of food or other materials. The City owns and manages thousands of acres of wetlands as open space and the National Park Service (NPS) controls extensive tracts of wetlands in and around Jamaica Bay and Staten Island.

Wetlands are highly sensitive resources, and as such the upland areas adjacent to them are included when assessing potential impacts on wetlands. The following definitions are grouped into two major wetland types: those containing fresh water and those influenced by tides and salt water.

122. Freshwater Wetlands

Freshwater wetlands can be found adjacent to freshwater ponds and streams (often the smaller water bodies themselves are included in the wetland definition), sometimes in low-lying areas, areas of poor soil drainage or high ground water elevation areas. In the City, freshwater wetlands can be found in the coastal zone, close by, but unconnected to, a tidal water body. Brackish wetlands occur where salinity levels are oligohaline (intermediate between fresh and marine waters), and some tidal influence may exist within these wetlands. Freshwater wetlands may also be found perched in an upland environment. Perched wetlands are those that are trapped above an impermeable layer so that the water in the wetlands does not feed the ground water system. Wetlands can either be covered with water permanently, can hold water within a few inches of the surface, and can experience times when soils are dry or when soils are inundated. In addition, they can be unvegetated, contain floating or submerged plants, herbaceous (non-woody) plants, or contain a mixture of herbaceous and woody (trees and shrubs) plants. Approximately 2,000 acres or 1% of the original 224,000 acres of freshwater wetlands remain within New York City.

The majority of the City's freshwater wetlands are located in Staten Island and Queens, but can be found citywide, including in Seton Falls, Riverdale Parks, Mariner's Marsh, Graniteville Swamp, Goethals Bridge Pond, and Alley Pond Park.

Freshwater wetlands are regulated by New York State in 6 NYCRR Parts 662-665. Under this regulation, freshwater wetlands of 12.4 acres or larger are protected, although smaller wetlands can also be protected if the NYSDEC commissioner has determined that they have unusual local importance. Wetlands smaller than 12.4 acres are often classified as "isolated wetlands" and are the most common NYSDEC regulated freshwater wetland system in the City, and have received increasing focus as contributors to local biodiversity and hydrology. In addition to the wetland itself, a buffer area of 100 feet around the freshwater wetland, called the "adjacent area," is also protected. The freshwater wetland "adjacent area" refers to the contiguous upland area that may affect conditions in the wetland. Sometimes, a larger wetland buffer is provided when critical hydrological, habitat, and other ecological functions related to the wetland are outside the 100 foot regulated adjacent area.

For further wetland information, please see the following: New York City's 2009 New York City Wetlands: Regulatory Gaps and Other Threats, Wetlands Transfer Task Force's "Recommendations for the Transfer of City-Owned Properties Containing Wetlands" report (September 2007); Local Law 31 of 2009, which creates a comprehensive wetlands protection strategy for New York City; USDA-Plants Database for further information regarding a list of characteristic plant species in the New York City area used to define the presence of wetlands; Ecological Communities of New York State, 2nd Edition (2002) "Forested Mineral Soil Wetlands"; and

USDA's Plants Database and USFWS Biological Report 88 (26.9) (1988), which help determine the wetland status of plant species.

123. Tidal Wetlands

Tidal wetlands are found along the shores of the City's tidal water bodies. The City has more than 500 miles of tidal waterfront and still contains substantial and functional tidal wetlands. Most of these are located in Jamaica Bay, northwestern Staten Island, and in the inlets and coves that line the shores of northern Queens and east and southeastern Bronx, particularly at Udall's Cove, Alley Pond Park, Pelham Park, and the mouths of the Bronx and Hutchinson Rivers.

Tidal wetlands are regulated in New York State by 6 NYCRR Parts 660-661. As with freshwater wetlands, an "adjacent area" buffer that includes the landward area within 150 feet of the wetland or elevation 10 ft above mean sea level, whichever occurs first, is also protected. A larger protective buffer is sometimes appropriate based on the relationship of the wetland and its surrounding area. State regulations group tidal wetlands according to characteristic ecological zones, as follows:

LITTORAL ZONE. The littoral zone is the tidal wetlands zone that includes all lands under tidal waters, to a depth of six feet at mean low water, that are not included in any of the other categories listed below.

COASTAL SHOALS, BARS, AND FLATS. The wetland zone that (1) at high tide is covered by water; (2) at low tide is exposed or is covered by water to a maximum depth of approximately one foot; and (3) is not vegetated by low marsh cordgrass.

INTERTIDAL MARSH. The vegetated wetland zone lying generally between average high and low tidal elevations. Thus, this area is subject to inundation by tidal flows twice daily. This and the coastal fresh marsh tidal wetlands defined below are generally considered the most biologically productive of all tidal wetlands areas. Intertidal marsh is suitable for fish spawning, and, where the area is also rocky, it supports encrusting organisms as well. Intertidal marsh is also very effective for flood and hurricane storm protection.

COASTAL FRESH MARSH. The tidal wetland zone found primarily in the upper tidal limits of riverine systems where significant fresh water inflow dominates the tidal zone. The grasses that typify the coastal fresh marsh are different from those of the intertidal marsh. Like the intertidal marsh, the coastal fresh marsh is biologically productive and effective in flood and storm protection.

HIGH MARSH OR SALT MEADOW. The uppermost tidal wetland zone that is periodically flooded by spring and storm tides and is usually dominated by salt hay and spike grasses. Also, high marshes are particularly efficient at absorbing silt and organic material, and are extremely valuable for flood and hurricane and storm control. High marshes cycle nutrients for the benefit of intertidal marshes, near which they are often located.

FORMERLY CONNECTED TIDAL WETLANDS. The tidal wetlands zone in which normal tidal flow is restricted by man-made causes. These wetlands normally occur in lowland areas, in which connections to tidal waters have generally been limited by construction of dikes, roads, and other structures. These areas, however, may still function as productive natural resources and are considered on a case-by-case basis for their value as resources.

See 6 NYCRR 661.4.

124. Surface Water Hydrology

Surface water hydrology is a field of study that addresses how precipitation runoff from impervious land surfaces contribute to wetland systems. Surface water hydrology is an important factor to consider when assessing water resources and wetlands because, depending on the land use of the source, surface water hydrology runoff can contain pollutants that could negatively affect water quality of surrounding waterbodies and wetland systems, especially if the runoff is untreated. Such polluted runoff is directed to centralized Water Pollution Control Plants (WPCPs) and waterways, short-circuiting the soils that, in the absence of the WPCPs, would used to store and filter it. To reduce the negative effects of polluted runoff on existing natural resources, a new approach is preferred that features low impact development (LID) technologies and best management practices (BMPs) to decentralize surface water hydrology runoff treatment by capturing and treating surface water hydrology runoff at the source. This method of surface water hydrology treatment provides greater benefit and treatment by handling lower volumes and overall pollutants before they can be released into adjacent waterbodies. Through many concurrent initiatives, the City is making strong progress towards treating surface water hydrology runoff--not as waste, but as a valuable resource that helps support a more sustainable city and protects the environment.

An example of LID is the development of the Bluebelt program, which preserves natural drainage corridors, including streams, ponds and other wetland areas. Preservation of these wetland systems allows them to perform their functions of conveying, storing, and filtering surface water hydrology runoff. The current Bluebelt system drains 15 watersheds clustered at the southern end of Staten Island, plus the Richmond Creek watershed. The combined area of these 16 watersheds totals approximately 10,000 acres. The system includes constructed wetlands, storm water detention ponds, and stream restoration projects, and is explained here.

Surface water hydrology runoff can be conveyed from collection points through a system of natural and built channels and pipes to a receiving waterbody or wetland ecosystem. The term "watershed drainage area" encompasses the manner in which surface water hydrology runoff is conveyed to a receiving waterbody. It refers to the physical configuration of the watershed, including those elements that determine the volume and velocity of flow for a given rainfall: its slope, soils, vegetative cover, and extent of impervious surfaces. Surface water hydrology runoff that is routed directly into a wetland may degrade water quality and habitat for the invertebrates, amphibians, and fish inhabiting the wetland. The potential impacts of increased or decreased surface water hydrology runoff inputs to small streams and wetlands should be carefully evaluated before making decisions regarding engineered solutions to surface water hydrology problems. In particular, headwater streams and isolated wetlands are extremely sensitive to changes in surface water hydrology. The quality and quantity of the surface water hydrology that flows to a water body or wetland is in large measure determined by: (1) the amount of impervious cover within a specific watershed, (2) uses and activities that take place in the watershed; (3) extent and condition of sediment and erosion control measures; (4) the type and extent of vegetation; (5) ground water elevations; (6) soils; and (7) the configuration of the drainage infrastructure (how impervious areas are drained to receiving waters and whether any detention, retention, storage, or filters are in place).

Within a watershed system, an important consideration is that portion of the watershed that is low enough to hold surface water hydrology (*e.g.*, flooding) during large storms. When the banks of rivers or streams overflow during a storm, the wide, flat floodplain allows the water to dissipate over a larger land area, thereby reducing its velocity and force so that it flows more slowly to the stream or river. The extent and condition of soils and vegetation within the watershed also contributes to removing pollutants, allowing infiltration and trapping sediments before they can be discharged to the local waterbody. Thus they are a very important element in protecting water resources and wetland systems. The floodplain has been defined by regulation (see Section 710) and includes the areas that flood during storms of a statistical frequency occurrence of once in 100 years (the 100-year storm) and once in 500 years. These are referred to as zones A and B, respectively, in federal legislation. The City's Administrative Code restricts uses in the 100-year floodplain (Zone A). NYC Admin. Code 27-316. Information and detailed data on the 100-year and 500-year floodplains within the City are available through FEMA.

130. UPLAND RESOURCES

Upland resources include all natural areas that are not water resources or wetlands. Upland habitat communities, including wildlife habitat associations, are defined in the New York Natural Heritage Program's Ecological Communities of New York State.

In New York City, upland resources are enormously diverse. Although the function, productivity, and value of specific uplands may vary considerably, these resources generally provide wildlife habitat, open space and recreational opportunities, and particular ecosystem functions such as storm and flood control or wetland protection. Upland resources are generally described by their vegetation, although soils, topography and the degree of human impact may also be important descriptors. Descriptions of the various communities highlighted below provide a broad composition of a particular plant community and as a result of local environmental conditions can vary widely with respect to the species composition from one location to another.

131. Beaches, Maritime Dunes, and Erosional Slopes/Bluffs

Sand beaches are sparsely vegetated communities that occur on unstable sandy shores of large freshwater and tidal waterbodies, where the shore is formed and continually modified by wave action and wind erosion. Sand beaches provide feeding areas for migratory birds and nesting habitat for shorebirds such as spotted sandpiper. Some examples of sand beaches in the City are located in Coney Island, Brooklyn, South Beach, Staten Island, Breezy Point, Queens, and Old Orchard Beach, Bronx.

Maritime dune is a community dominated by grasses and low shrubs. This community consists of a mosaic of vegetation patches that occurs on active and stabilized dunes along the Atlantic coast. This mosaic reflects past disturbances such as sand deposition, erosion, and dune migration. The composition and structure of the vegetation is variable depending on stability of the dunes, amounts of sand deposition and erosion, and distance from the ocean. Vegetation of active and stabilized maritime dunes often consists of beachgrass, beach pea, seaside goldenrod, beach pinweed, jointweed, sand-rose, bayberry, beach-plum, and poison ivy. Breezy Point, Queens and Conference House/Wards Point, Staten Island contain good examples of maritime dune habitat within the City.

Erosional Slopes/Bluffs are sparsely vegetated communities that occur on vertical exposures of unconsolidated material, such as small stone, gravel, sand and clay, that is exposed to erosional forces, such as water, ice, or wind. The "maritime bluff" variant is present in the City, adjacent to maritime and marine communities. Mount Loretto Unique Area in Staten Island contains maritime bluff habitat.

132. Shrublands

Shrublands generally include communities that are dominated by shrubs (more than 50% cover of shrubs). Shrublands are found most frequently on dunes, particularly where they face away from the sea, on the toe and tops of bluffs, and on the islands in Jamaica Bay. Like grasslands, the low-lying plant life supports insects, small mammals, birds, snakes and other reptiles, and provide forage for larger animals and birds. There are numerous types of shrublands in the City, including maritime shrublands, successional blueberry heath, and successional shrublands.

A maritime shrubland is a community that occurs on dry seaside bluffs and headlands that are exposed to offshore winds and salt spray. Characteristic woody species include bayberry, black cherry, and shining sumac, beach-plum, sand-rose, eastern red cedar, and sassafras. Characteristic vines include poison ivy, Virginia creeper, greenbrier, oriental bittersweet, and Japanese honeysuckle. The herb layer may include flat-topped goldenrod and little bluestem. Birds that may occur in the maritime shrubland include black-crowned night-heron, fish crow, and yellowbreasted chat and migratory songbirds. Maritime shrublands are present in the Plum Beach and Canarsie Pol areas of Brooklyn.

A successional blueberry heath is a shrubland dominated by ericaceous shrubs that occurs on sites with acidic soils that have been cleared or otherwise disturbed. Characteristic plant species include blueberries, black huckleberry, wintergreen, trailing arbutus, poverty-grass, and common hairgrass. An example of a successional blueberry heath in Staten Island is represented in Clay Pits Pond Park Preserve.

A successional shrubland is a community that occurs on sites that have been cleared or otherwise disturbed, with at least a 50% cover of shrubs. Characteristic shrubs include gray dogwood, eastern red cedar, raspberries, choke-cherry, wild plum, sumac, and multiflora rose. Birds that may occur in this community include brown thrasher, blue-winged warbler, golden-winged warbler, chestnut-sided warbler, yellow-breasted chat, eastern towhee, field sparrow, song sparrow, and indigo bunting. Successional shrubland are located at North 40 of Floyd Bennett Field in Brooklyn, Ocean Breeze in Staten Island, and Pelham Bay Park in the Bronx.

133. Grasslands

Grasslands include communities that are dominated by grasses and sedges. They may also include scattered shrubs (never more than 50% cover of shrubs) and scattered trees (usually less than one tree per acre, or 3 trees per hectare).

Grasslands are plant communities in which grasses and limited herbaceous plants are dominant and trees and shrubs are sparse or absent. In the City, maritime grasslands contain those species that can survive in the harsh environmental conditions that are created by strong winds and salt spray. This community is dominated by grasses that usually collectively have greater than 50% cover. Dominant grasses are little bluestem, common hairgrass, and poverty-grass. Other characteristic species include Pennsylvania sedge, rush, Indian grass, Atlantic golden aster, flat-top goldenrod, white-topped aster, bayberry, and shining sumac. Various wildlife species may use grassland areas (*e.g.*, some are grassland obligates, such as voles, upland sandpipers, and short-eared owls). Birds of prey and some larger species also forage in grasslands.

Native grassland habitats still exist in scattered areas, such as the Harlem Meadows in northern Manhattan, Ocean Breeze Park in Staten Island, and Vault Hill in Van Cortlandt Park in the Bronx. While fire ecology is the preferred management tool, some grasslands within the City are partially maintained through intentional management that includes mowing and land clearing. Examples include the grasslands at Floyd Bennett Field in Brooklyn and Mount Loretto on Staten Island. Grassland acreages in the City are one of the most under represented ecosystems, are relatively limited, and include maritime grasslands at Breezy Point and on the islands in Jamaica Bay; former agricultural fields (NYSDEC's Mount Loretto Unique Area, Staten Island), on serpentine soils (Latourette Park, Staten Island), on sand dredge spoils (Marine Park, Brooklyn), on restored landfills (Fresh Kills, Staten Island, Fountain Avenue Landfill, Queens, Pennsylvania Landfill, Brooklyn and Pelham Landfill, Bronx) and on thin mineral soils (Pelham Bay Park, and Van Cortlandt Park the Bronx).

134. Meadows and Old Fields

Meadows and old fields are successional communities where forbs, grasses, sedges, and shrubs are codominant--scattered trees may also be present. The dominant community of this type present in the City is the successional old field—a meadow dominated by forbs and grasses that occurs on sites that have been cleared or plowed, and then abandoned. Characteristic herbs include goldenrods, bluegrasses, timothy, quackgrass, smooth brome, sweet vernal grass, orchard grass, common chickweed, common evening primrose, oldfield cinquefoil, calico aster, New England aster, wild strawberry, Queen-Anne'slace, ragweed, hawkweeds, and dandelion. Shrubs may be present, but collectively they have less than 50% cover in the community. Shrubs may include dogwood, arrowwood, raspberries), sumac, and eastern red cedar.

Examples of this habitat in New York City are the wildflower meadows in Central Park, Vault Hill in Van Cortlandt Park, and Alley Pond Park. Examples of successional old field communities are present in the Jamaica Bay Wildlife Refuge, in Brookyn/Queens, vacant land in Charleston on Staten Island, and Flushing Meadows, in Queens.

Without maintenance, woody species eventually begin to colonize, and a natural process of foresting the land, called succession, takes over. However, while these fields still offer only low cover for wildlife, they provide habitats similar to other grasslands and grassy areas. A characteristic bird species present in successional old field habitat is the field sparrow.

135. Upland Forests, Woodlands and Barrens

There are many diverse forests within New York City, including oak forests on dry ridges and tulip tree forests on richer soils. In between are mesic oak-hickory forests containing American beech and maples.

Maritime forests, generally in immediate proximity to marine communities, are heavily influenced by coastal processes, including strong salt spray, high winds, dune shifting, and deposition and overwash processes. These forests generally contain stunted "salt pruned" trees and a dense vine layer.

Coastal forests occur within the Coastal Plain and are generally not in immediate proximity to marine communities. At most they are lightly influenced by coastal processes including minor salt spray associated with severe storms (*e.g.*, hurricanes).

Barrens and woodlands are typically upland communities that are structurally intermediate between forests and open canopy uplands. Woodlands include communities with a canopy of stunted or dwarf trees (less than 16 ft or 4.9 m tall), and wooded communities occurring on shallow soils over bedrock with numerous rock outcrops. The term "barrens" is commonly applied to certain types of woodlands (*e.g.*, pine barrens) that are rare within the City. Woodlands offer shelter and food for a broad array of wildlife, including forest interior bird species (*e.g.*, red-eyed vireo, wood thrush), mammals (*e.g.*, white-tailed deer, white footed mouse), reptiles (*e.g.*, eastern box turtle), amphibians, insects and other species.

Examples of woodlands and upland forests are present in Pelham Bay Park, Bronx Park, and Van Cortlandt Park in the Bronx, Central Park in Manhattan, Prospect Park, in Brooklyn, Staten Island Greenbelt, and Willowbrook Park in Staten Island and Alley Pond Park and Cunnigham Park in Queens. Clay Pits Pond Park Preserve in Staten Island is a good example of a reference site that contains both barrens and woodland communities within the City.

For additional information on the diverse Forested Uplands, Woodlands and Barrens that occur within New York City, please see Ecological Communities of New York State for information on specific forest types.

136. Terrestrial Cultural

Terrestrial cultural communities include those that are substantially different from the character of the substrate or resident community as it existed prior to human influence. Due to the developed and human-dominated characteristics of the City's landscapes, terrestrial cultural communities (*e.g.*, flower and herb gardens, mowed lawn with trees, paved and unpaved roads and paths, and urban vacant lot) are prevalent in all five boroughs.

A variety of gardens, landscaped areas, and small parks are found throughout the City, as well as larger, landscaped parks, such as Central Park, Prospect Park, and the many cemeteries in Queens and Brooklyn. Vegetation here is usually present as a result of landscaping activity, but these areas are nonetheless useful resources for recreation and some bird, small mammal, and insect habitat.

Caution should be exercised when applying terrestrial cultural habitat designations for natural areas present within the City. For instance, historic land use involving landfilling and other human disturbance at a site may meet the subsurface conditions of the "urban vacant lot" designation; however, the existing plant communities and existing fauna should be considered when applying a habitat community designation from Ecological Communities of New York State.

140. BUILT RESOURCES

Some native and introduced wildlife species have adapted to the City's built environment, and a number of species live not only in "natural" areas, but also use built structures such as piers, bridges, buildings, and other structures as foraging and nesting habitat and for shelter. In addition, a variety of structures have been built to replace some of the environment's natural functions for flood and erosion control. These built resources include the following:

PIERS AND OTHER WATERFRONT STRUCTURES. Most of the City's waterfront structures, whether functioning or not, provide foraging habitat and shelter for numerous marine species. These may include: plankton; encrusting organisms, such as algae, mussels, and barnacles, which live on the structures and are food sources for creatures higher on the food chain; benthic species such as clams; and fish, including striped bass, winter and summer flounder, American eel, Atlantic herring, white perch, bay anchovy, and many others, depending on the location of the habitat.

OLD PIERS, PILE FIELDS, AND OTHER RUINS. Many waterfront and other structures that have been abandoned by humans are now in active use by a range of wildlife. In addition to the species that use active waterfront structures (see above), the lack of human activity makes pile fields and old piers attractive to a number of birds, which nest and/or forage there. The pile fields and decaying piers, particularly on the Brooklyn and Staten Island waterfronts, are favorite living places for cormorants. At Shooters Island in the Kill Van Kull, hundreds of abandoned marine vessels attract many species of herons, kingfishers, cormorants, and gulls for foraging and, in some cases, nesting. On North Brother Island and Roosevelt Island, ruins of hospital and other public buildings are now the home for bats, snakes, heron colonies, and feral animals.

BEACH PROTECTION STRUCTURES. Many of the City's beaches are protected by groins, jetties, and breakwaters that break the force of ocean waves and slow the drift of sand. Groins in New York City, such as those at Coney Island and Rockaway and the abandoned groins along the south shore of Staten Island, are typically stone and timber structures perpendicular to the beach, and are erected to minimize erosion. Jetties, such as those in Rockaway Inlet, are larger rock structures used to stabilize inlets. Other protection structures used in the City include small timber wave breaks used to prevent waves and ship wakes from disturbing moored boats in marinas, and breakwaters, which are larger structures constructed of stone, timber cribs, and/or steel, that serve a similar purpose.

FLOOD PROTECTION STRUCTURES. In several low-lying areas, flood protection structures have been installed. These include tide gates (such as at the mouth of Flushing Creek), weirs (such as along Wolfe's Pond Creek in Staten Island), and pumps (such as in the College Point area along the shores of Flushing Bay).

OTHER STRUCTURES. A wide variety of structures in the City may offer habitat for some species. One example is the peregrine falcon's use of tall buildings and bridge towers. These birds prefer to nest in high places within sight of water. The number of peregrine falcons has grown steadily since 1983, when the first peregrines in decades returned to nest on bridges in the City. They can now be found once again on building ledges and other tall structures around the City, such as skyscrapers in Midtown Manhattan and the Marine Parkway Bridge in Brooklyn. For additional information on minimizing mortality to migrating birds and bats from building collisions, identifying strike hazards and "bird safe" building recommendations, please see NYC Audubon's Bird Safe Building Guidelines and in the scientific literature.

150. SIGNIFICANT, SENSITIVE, OR DESIGNATED RESOURCES

The City, state, and federal governments recognize the value, rarity, and sensitivity of many of the City's natural resources. State and federal interest is generally focused on the City's coastal areas, but the City also recognizes a number of natural habitats as having significant value. Most often, these areas combine several of the natural resources defined above. Examples of these include Significant Coastal Fish and Wildlife Habitats and Critical Environmental Areas.

The resources listed here are designated significant, sensitive, or worthy of protection within New York City. The legal protections for these natural resources are described below in Section 710. In addition to particular areas of the City that are recognized as unique, certain species and habitats are also considered important and worthy of protection, wherever they may occur.

PROTECTED SPECIES. Both the federal and state laws designate certain species of plants and animals as protected, because they are rare or in danger of extinction. Certain habitats are also designated as rare. Under federal law, plant or animal species can be considered endangered or threatened; under state law, animal species can be considered endangered, threatened, or of special concern, and plant species can be considered endangered, threatened, exploitably vulnerable, or rare. Other species that are not in these categories can also be protected. Protected species that may be found in New York City include such bird species as piping plover, least tern, common tern, northern harrier, peregrine falcon, osprey, Coopers hawk, short-eared owl, least bittern, upland sandpiper, and grasshopper sparrow; marine turtles; eastern mud turtle; amphibians such as southern leopard frogs; and such fish as shortnose sturgeon. Various designations for listed species under Federal and State jurisdiction are available from the USFWS and NYSDEC. The NYS Comprehensive Wildlife Conservation Strategy (CWCS) provides further detail on the status of fish and wildlife species in New York State.

NEW YORK STATE NATURAL HERITAGE PROGRAM. The New York Natural Heritage Program maintains a database of information on rare animals, rare plants, and significant natural communities of New York State, including a series of conservation guides. This includes an inventory of all the different ecological communities—rare and common—that occur in New York State, representing the full array of biological diversity in the State. It also includes an inventory of rare plants, fish, and wildlife in the State, including some that are not currently protected by State law. All of the habitats and species listed in the program are given a ranking indicating their rarity, both globally and in the State. Although the Natural Heritage Program rankings do not provide legal protection, they can be used for assessment of a project's impacts on rare species.

200. DETERMINING WHETHER A NATURAL RESOURCES ASSESSMENT IS APPROPRIATE

Two possibilities determine whether an adverse impact on a natural resource might occur, and therefore, whether an assessment may be appropriate: (1) the presence of a natural resource on or near the site of the project; and (2) disturbance of that resource caused by the project. The types of disturbances, both direct and indirect, are listed in Subsection 341.

If the following are all true for a given project, then no natural resources assessment is necessary:

- The site of the project and the immediate adjacent area is substantially devoid of natural resources, as defined in Section 100 above. Or, the project site either contains, or is near or contiguous to, natural resources or important subsurface conditions, but no activity associated with the project (see Subsection 341) would disturb them, either directly or indirectly.
- The project site contains no "built resource" that is known to contain or may be used as a habitat by a protected species as defined in the Federal Endangered Species Act (50 CFR 17) or the State's Environmental Conservation Law (6 NYCRR Parts 182 and 193).
- The project site contains no subsurface conditions, the disruption of which might affect the function or value of an adjacent or nearby natural resource (for more information, see Chapter 12, "Hazardous Materials").
- As determined by satisfying all of the above criteria, the proposed project involves the disturbance of a natural resource, but that disturbance has been deemed insignificant by a government agency with jurisdiction over that resource and conditions have not changed significantly since the permit was issued. An example would be the repair or replacement of piers, piles, bulkheads, and other waterfront structures. These types of projects have been classified as environmentally insignificant in the U.S. Army Corps of Engineers' (USACE) "Nationwide Permit" (see Section 710 below).

If the project does not meet all of these conditions or if it is unknown whether the project meets one or more of these conditions, some assessment of natural resources is appropriate.

300. ASSESSMENT METHODS

The assessment of potential impacts on any natural resources contains three basic elements. The level of detail may vary depending on whether the project is classified as site-specific, area-wide, or generic. The elements are as follows:

1. For existing and future No-Action conditions, at least 2 seasonal (late spring/early summer and early fall) surveys should be conducted, depending on the habitat type, as demonstrated by the uniqueness, variety, and density of its species; its use for recreation, open space, or commerce; its relationship to neighboring resources and to the overall area ecosystem; or its role in promoting ecosystem services or storm and flood management. Additional seasonal surveys may be warranted as determined by the information generated from these seasonal surveys.

2. Examine the environmental systems that support the natural resources in the study area as referenced above. As described in Subsection 143, these are most often the water resource systems that transport or retain water to maintain vegetation and provide aquatic habitat. For example, an intertidal wetland flushed twice daily by the tide becomes the source from which vegetative and organic materials are transported to adjacent waters for use in the estuarine food chain.

3. Describe in appropriate detail the construction and operational activities associated with the project and analyze their interaction with the resource itself as referenced above and the environmental systems that support it.

These three elements are interrelated, and therefore, the order in which the analyses are conducted may vary with a particular project. For example, it is often most efficient to evaluate the resource first. This helps set the level of detail required for the analysis of the project and of the underlying elements serving the resource. However, if an assessment is required because the lead agency or applicant is unsure of the extent of disturbance that a project would cause, then part of the third task (describing the project disturbance in detail) would be completed first. If completion of that task identifies the potential for an indirect effect, such as a change in drainage patterns near a running stream, then the second task might be undertaken before the first. Before determining the value of that stream, it might be most prudent to examine the drainage system serving the stream. If the project changes drainage patterns, but this change would be minimal to the surface and ground waters serving the stream, then the project's impact would not be significant and no further analysis is needed.

Regardless of which task is conducted first, a natural resources assessment always begins with selection of a study area. The following discussion addresses the study area and then describes each of the three general tasks listed above—evaluation of the resource; assessment of environmental support systems; and assessment of probable impacts of the project. These sections are followed, in Section 350, with discussions of specific issues for each resource type defined in Section 100.

310. DEFINE THE STUDY AREA

Determination of the study area for the assessment of natural resources depends on the potential effects of the project and the resource(s) in question. The study area should include the project site and resources (including surrounding adjacent areas with land use descriptions, as applicable) that may be directly or indirectly affected by activities on the project site. It may include similar, non-contiguous resources within the immediate area of a proposed project (such as undeveloped properties within one mile), or a contiguous area surrounding the proposed project (such as all natural resources within a 0.5 mile radius). Where a resource is small enough that the proposed project would affect it in its entirety, the study area may encompass the entire resource. For example, if a portion of a small pond's surface water, surrounding wetland, and adjacent area lie within the site, the proposed project may directly affect only those portions of the pond within the site; however, the overall function or value of the remainder of the pond may also be altered by the activity (for example, loss of minimum area to provide wildlife habitat). To understand impacts on this resource, it may be necessary to assess conditions in the complete aquatic, wetland, and adjacent habitat, and therefore, the study area should include the entire pond and related habitats. Similarly, where a small portion of a very large resource (such as Jamaica Bay) is located within the project site, it may not be necessary to include the whole resource; instead, it may be more appropriate to focus on the portion of the resource within and adjacent to the project site, while providing a more general discussion of the larger resource for context.

320. INFORMATION AND BACKGROUND SEARCH

Research is useful in helping to assess conditions, making an evaluation, and in supplementing the field assessment of existing conditions. The research may include locating the study area on a U.S. Geological Survey (USGS) topographic map and/or identifying and outlining potential natural resource areas. The USGS maps are most useful for the less developed areas of the City. The following describes the specific research tasks that may be conducted:

1. Submit letters to appropriate agencies, including U.S. Fish and Wildlife Service (USFWS) (New York Field Office), the New York Natural Heritage Program and the National Oceanic and Atmospheric Administration (NOAA) - National Marine Fisheries Service (Northeast Region), to request a file review on any rare, special concern, threatened, endangered or candidate species in the project area, as well as any unique associations or habitat communities in the project area (see Section 730 for contacts and addresses). In select cases, requests made to NYCDPR and the NPS may also be required. The request letter should contain a copy of the project location indicated on a USGS topographic map and a description of the project in question.
2. Review sources of information that identify natural resources of interest in the study area, including any protected species. These resources include those designated resources listed in Section 150, above, as well as any other designated or important resources. Sources of information to be reviewed would include, as appropriate: the City's Comprehensive Waterfront Plan and the Waterfront Revitalization Program, both of which identify particularly valuable habitats in coastal areas; the DEC's maps of regulated freshwater and tidal wetlands; federal flood hazard area maps; City zoning maps; NYCDPR GIS maps; New York City soil survey maps; results from DEC's Breeding Bird and Herpetological Atlases; information on any designated significant coastal fish and wildlife habitats (*e.g.*, Essential Fish Habitat, or EFH) or critical environmental areas; coastal erosion hazard area maps; National Wetland Inventory (NWI) maps (prepared by the USFWS from aerial photographs as part of the National Wetland Inventory Program), *etc.* (see Section 730). The State's list of protected fish and wildlife is located in 6 NYCRR Part 182; the list of protected plants and trees is in 6 NYCRR Part 193. In addition, local universities and organizations can be a good source of information, as these groups often sponsor or conduct ecological studies in the City and the Harbor. An expanded list of online resources and databases may be found in Table 1.
3. Review specialized maps, where available. Examples are nautical charts, drainage maps, New York City soil surveys, soil and ground coverage diagrams, and plots of slopes.
4. Review recent aerial photographs or advanced infrared and other photo imaging. These help in pinpointing the extent of vegetated and wetland areas and show disturbed areas. However, before examining photographs, evaluate local climatological data to determine whether the photo year had normal or abnormal precipitation within the year prior to the date of the photograph. If the resource is affected by tides, the stage of the tide when the image was formed needs to be determined from Tide Tables.
5. Review available site-specific information, if any. New York City has many specialized libraries that hold reports, theses and dissertations, and peer-reviewed journal articles that can contain valuable local studies. Section 730 lists several of these public and university libraries, organizations, and other borough historical societies and public libraries. Online databases, including those available through public or university libraries (Proquest, Biosis, Jstor and ISI Web of Science) and regional databases (*e.g.*, the Jamaica Bay Research and Management Information Network), may be used to retrieve reports and publications related to natural resources that may apply to the site; there are also many databases and open access journals that are published or reproduced in electronic format online, and may be located through the use of search engines.

321. Assess Existing Conditions

This task assesses a natural resource in order to understand its value for one or more functions, as determined by appropriate seasonal surveys referenced in Section 300, including but not limited to habitat for flora and fauna, ecosystem services, ground water recharge, flood and storm control, erosion control, recreation, open space, and visual quality. This includes learning what site or study area features would be present on a yearly seasonal basis in the future without the project (*e.g.*, spring, summer, fall and winter), and determining which of these are most important to maintaining natural resource functionality. As with all technical analysis areas, the level of detail required corresponds to the anticipated effect of the project. Here, however, the resource is usually presumed to be important and valuable, absent any specific information to the contrary. The evaluation of the resource should either confirm this assumption or show the extent to which the presumption of value cannot be confirmed. The tasks below outline general approaches to evaluating the City's natural resources. It is particularly important to start by setting a reasonable and ecologically responsible level of investigation effort to assess existing conditions, as warranted by a proposed project, because resources may vary in level of importance for a site or region, and from context to relative quality. For most of the work outlined below, a certified ecologist, biologist or discipline-specific specialist should be used.

322. Field Reconnaissance

Field observations are an early and critical step in determining the scope of a natural resources assessment. In limited cases, evidence gathered in initial field reconnaissance at appropriate seasonal times may support an assessment showing that a resource is of limited value and/or that a project's disturbance would not be significant. Field reconnaissance of a project site and/or study area should be designed to include the following three considerations: (1) the level of effort (number of hours, days or seasons; number and experience of observers) should be consistent with the size and complexity of the study area; (2) reconnaissance should occur at a resource's biologically relevant periods (*e.g.*, within the growing season for a particular plant, during a period of activity for a wildlife species, or during nocturnal or diurnal periods); and (3) if previous reconnaissance has been conducted for a project site, then the data should be collected in a manner consistent with the previous work to allow for comparison.

It is important to note that the appropriate level of field reconnaissance informs the assessment of impacts. The presence or absence of a resource may be assumed, based on landscaped features, without field verification; however, if the resource is sufficiently critical, such as the probable presence of a state and federally endangered species or a unique wetland habitat, then a higher level of investigation may be required. Discussion and substantive input from managing and associated agencies early in the process is required to clearly define the level of investigation expected for field reconnaissance.

These decisions allow the analyst to understand the extent of the presence of natural resources, determine the context of its surroundings, and sufficiently describe the area where the project would take place. Field reconnaissance by a certified ecologist or discipline-specific specialist can include one or more of the following tasks, as appropriate:

- Identification of major resource or habitat types during appropriate seasons for that particular resource. The reconnaissance can identify major resource types and locate these on a map (although boundary conditions would be approximate). Except under rare conditions, an initial reconnaissance is likely not sufficient to identify subtle differences within resource types and expected seasonal variations. For example, the distinction between the various types of fresh marshes often requires a number of site visits to determine the marsh's physical characteristics under varying weather conditions and a detailed listing of specific vegetative species.
- Initial characterization of resource type and condition during appropriate seasons for that particular resource. The analyst notes as much as possible in an attempt to characterize the resource(s) in the study area. Important to these observations are date and time of field visit; weather, and, if appropriate, tidal stage; general type and approximate size of each resource area; plant and animal species observed; indigenous soil types that are important for supporting diverse or unique high value vegetation; presence of wet or poorly drained areas, rock outcrops, steep slopes, and other topographic features; conditions suggesting the presence of human disturbance disturbed; and use (what types of activities the resource is subject to—such as passive or active recreation, commercial use, or unauthorized uses like dumping or off-road vehicles).
- Organization of field notes and observations. The field reconnaissance is documented with a field log including the items listed in item 2. A copy of all field notes of the site reconnaissance along with dates, name of analyst and list of equipment used should be included with the assessment to support the formal write up of the natural resources summary of the site. Photographs (color), written documenta-

tion with the date the photograph was taken, and an accompanying site diagram indicating the direction of the photograph should also be submitted to support the observations.

- Assessment and conclusions. Based on the observations from a reasonable field effort described above, the analyst assesses general conditions of natural resources in the study area. If conclusions about the value of a natural resource are clear from the reconnaissance (*e.g.*, the vegetated area is highly disturbed and unlikely to offer significant habitat, to function as a buffer for higher quality habitat, or to provide recreational opportunities—or the resource, such as a dune, is clearly present, clearly undisturbed, and hence clearly highly valuable), then this part of the analysis need go no further. More often, the conclusions of the reconnaissance would indicate a need for more detailed study. For example, reconnaissance could reveal that the site is partially forested and could potentially support valuable species that are only observable during specific conditions (*e.g.*, herbaceous plants during the growing season; nocturnal animals at night; migrating birds in the spring and fall), and therefore, further observation under the appropriate conditions is needed to determine if that species is present. There are also situations where a potentially valuable habitat is seen, but its value cannot be deduced solely on the site reconnaissance without observations of the larger surrounding area. For example, if the survey reveals that the site contains a barrens habitat, a wider area would be surveyed to determine the extent of this habitat.
- Prepare with written reconnaissance information, GIS shapefiles of project boundaries and the study area evaluated under this review.

323. Detailed Site Analysis

323.1.Characterization of Habitat

In a detailed site analysis, the habitat within, and adjacent to, the project site should be characterized first. A habitat type is defined as an area with distinct vegetative and abiotic attributes that support a specific grouping of species. Past disturbances to site elements such as soil and/or hydrology alterations must be taken into consideration when evaluating habitat composition. Habitat characterization is the procedure of identifying the dominant vegetative and physical characteristics of an area to assess its value. Habitat types are primarily described by their dominant vegetation, sources and permanence of water, and relationship to other habitat types. In addition, the site's history, geomorphology, soils or sediments, climate, past and present human disturbance, and other abiotic features are important.

Habitat characterization guides the remainder of a natural resources assessment because it provides information for regulatory approval, particularly if unique habitats, wetlands, or watercourses are involved. Consequently, when characterizing the habitat at a site, determine whether the habitat is capable of supporting aquatic and/or terrestrial biota, including special concern, threatened and endangered species.

Prior to conducting a habitat survey, the following general steps should be followed:

1. Based on the preliminary field reconnaissance, subsequent research, and a complete understanding of the location and extent of disturbance associated with the proposed project, identify the resource areas of concern on an accurate map with clearly shown off-site reference points, such as a USGS topographic map, New York City soil survey map, City map, Sanborn map, or map prepared by site engineers. GIS shapefiles of project boundaries and the study area evaluated under this review should also be included.
2. Estimate the size of the area to be studied.

3. Determine as much about the area as possible from the initial field reconnaissance and subsequent research; tentatively map using GIS the types of resources and habitats that may be present.

4. Identify using GIS mapping areas where previous disturbance has occurred.

5. When field surveys are being conducted, damage to soils and vegetation and the disturbance of wildlife, including cutting of brush, compaction from heavy equipment or other vehicles, and activities near nests of sensitive bird species during nesting seasons, should be minimized. This includes supervision of contractors and sub-contractors to ensure that they are not damaging soils or vegetation or disturbing wildlife.

Once these steps have been followed, focused field studies can be performed to characterize the habitat.

TIMING OF FIELD STUDIES

Depending on the ecosystem being evaluated, field studies for habitat assessment and vegetative communities are best conducted when growth is most evident and identifiable, typically mid-May to mid-September or during traditionally wet seasons (*e.g.*, April) if habitat types such as vernal pools may be present. Several surveys spaced over the growing season are recommended because some species are only present seasonally or are more identifiable at certain times when vegetative growth, flowers, or seeds are present. When this is not feasible, a written explanation is necessary listing the reasons why an appropriate seasonal survey could not be performed. Inferences based on the site's overall characterization should be made about the potential presence of seasonal vegetation. Surveys of nontidal watercourses should be conducted during both low-flow and high-flow periods (*e.g.*, late spring or early summer). Surveys during low-flow conditions facilitate observations of streambank conditions, channel morphology and in-stream plant growth, while surveys conducted during high-flow periods allow observations of intermittent streams and vernal pools. Surveys of intertidal wetlands should be carried out throughout the tidal regime to facilitate observations of inundation and intertidal versus high marsh vegetation. Since vegetative succession on abandoned sites in the City tends to proceed rapidly, habitat types can change in a matter of several years. Thus, depending on the length of the review process and construction schedule, habitat characterization surveys may need to be conducted over several years.

CHARACTERIZING HABITAT

A number of factors should be considered when characterizing a habitat, including size, shape, and the relationship of the habitat to adjacent areas. Rounder natural areas tend to be more valuable than oblong or linear areas of the same size (area) and vegetative composition because round habitat patches possess more interior space. For example, a two-acre round patch of shrubland may provide a better buffer with more interior space, and hence better habitat, for more yellow warblers than a five-acre narrow rectangle. Larger areas also tend to be more valuable than smaller areas of the same shape and vegetative composition. A large, blocky natural area, even one with low vegetative diversity, can be valuable. For example, large disturbed sites dominated by common reed or mugwort serve as good winter foraging habitat for raptors, can ameliorate the urban heat-island effect, and can buffer or connect to higher quality natural areas.

In addition, disparate habitat patches are more valuable if they are linked by corridors of appropriate vegetative cover. For example, Forest Park, Queens contains 413 acres of forest that is connected by a predominantly wooded parkway (the Jackie Robinson Parkway) to a golf course, several cemeteries, Highland Park, and three vegetated, inactive reservoirs. The ecological value of the 413 acre core is greatly augmented by the adjacent, contiguous habitat corridor as well as by its proximity to the Jamaica Bay Wildlife Refuge to the south and Flushing Meadow/Corona Park to the north. Because Forest Park is in the middle of a wide vegetated corridor that crosses Long Island from north to south, it is a major migratory bird stop-over. In this way, a natural area must be evaluated in the context of contributions it makes to the ecological function and biodiversity of adjacent and proximal natural areas of higher value.

Several habitat evaluation procedures, such as Habitat Evaluation Procedure (HEP) and the Wetland Evaluation Technique (WET), are available, but are generally not appropriate for CEQR evaluations because they were developed for, and validated in, non-urban environments. For CEQR habitat evaluations, input from managing and associated agencies involved with a project should be requested during the scoping process to assure that the required level of investigation is conducted. For appropriate methods to characterize habitat under CEQR, please click here.

323.2. Characterization of Aquatic and Terrestrial Biota

If the results of the habitat characterization indicate that the site contains no supporting habitat for fish, invertebrates, or wildlife, then an animal characterization survey is not necessary. If, however, it is determined that the site is valuable for fish, invertebrates, or wildlife, or if it cannot be determined whether the site would have supporting habitat value for these organisms based on vegetation or other site characteristics, a survey of aquatic and/or terrestrial biota should be conducted. It should be noted that some species live in degraded habitats.

The level of detail and types of data to be obtained must be determined before any survey of aquatic and/or terrestrial biota is conducted. Many different types of data can be collected for a variety of objectives, goals and priorities. General characterizations about animals on a site can be made from either knowledge about the site's available habitat or literature documenting animal species in an area. In the absence of animal surveys detailing the use of animal species at a site, conservative assumptions should be made about animal presence or absence based on vegetative data and the available literature. Surveys of aquatic and/or terrestrial biota should be used to confirm the potential for a significant impact if there is doubt concerning the available data or if data is conflicting.

TIMING OF SURVEY

Depending on the level of detail required, surveys may entail a single observation period (if an experienced observer notes that a particular habitat could not support a species of concern), or they may require more lengthy observation periods in one or more seasons of the year. For very small projects with little ground disturbance, a limited, appropriate seasonally based survey for the affected resources may be sufficient, even in sensitive areas. With mammals, reptiles, birds, amphibians, invertebrates, and finfish, it could be necessary to make observations during spawning/breeding seasons and times of migration if information is not available from existing sources. For example, a three-day late spring and early summer survey for birds, mammals, and invertebrates might provide sufficient information to describe the resources accurately and provide a basis for determining the potential impact the project would have on them. Different bird species are present at different times of the year so a limited survey may not account for all species using a site. For example, winter waterfowl species are found in NYC from December through February/March and shorebirds pass through before the neotropical migrants are seen in the late spring and fall. If the organism(s) being surveyed have short life cycles and/or are prevalent during known periods of time, a two-time sampling event at the appropriate time and place may be adequate. For larger projects in or near sensitive resources, as described above in Section 150, surveys in the spring, summer, and autumn might be necessary to adequately describe the animal resources. In the most complex cases, animal surveys can take place in three or four seasons of the year for up to three years. This is generally only applicable for very large, complex, City-wide or Harbor-wide projects.

METHODS FOR COLLECTING INFORMATION

In addition to the type and amount of data to be collected, the methods used to collect that data must also be determined. This includes both the sampling distribution and sampling techniques. A variety of sampling distributions are used in habitat and wildlife surveys. Some of the more common distributions suggested for CEQR evaluations are listed and described below. This is not intended to be an all-inclusive list, but rather provides guidance as to the most common sampling plans used for CEQR evaluations. Peer-reviewed ecological literature and accepted standards for sampling should be consulted for additional guidance on these and other sampling plans, as may be appropriate for the proposed project.

Habitat-specific. In these searches, selected habitats are searched because certain species and groups can only be found, or the probability of a sighting is greatly increased, in certain habitats. In addition to threatened and endangered species, these searches are useful when surveying reptiles (snakes and turtles), amphibians (frogs, toads, and salamanders), and colonially nesting birds. Examples of specific habitats include wetlands, vernal pools, and certain beach areas. The number of individuals found and the time spent in each search should be recorded. GIS maps of search areas should be developed.

Point stations. Point stations can be located evenly or randomly along a transect line or on a grid. At each point, the species observed and numbers of each are recorded. The time spent at each station as well as the distance and direction of the observation in relation to the station should also be recorded. GIS maps of point stations should be developed.

Transects. The transect method involves travel along a line or transect (usually through a large area) and recording the species wildlife observed. Transects need not be straight; they can follow paths, trails, roads, *etc.* Depending on the size of the project site or the diversity of habitats, transects can be closely spaced (*e.g.*, every fifty feet) or widely spaced (*e.g.*, every quarter mile). Transects can also be set up with perpendicular transects spaced at intervals along the baseline transect. GIS maps of transects should be developed.

Plots. Plots are generally used for sessile animals or animal sign. A plot is generally a rectangle or a square (quadrat), although circles or other shapes can sometimes be used. GIS maps of plot areas should be developed. The area within the shape is surveyed for animals or animal sign. Plots can be randomly selected within a grid-like framework that covers either the entire project site or a particular habitat type or types. Plots can be very small (*e.g.*, one square meter) to very large (*e.g.*, 0.25 acre).

In addition to the sampling distributions described above, a number of sampling techniques are available. Descriptions of some animal sampling techniques are provided here for invertebrates, fish, and wildlife (wildlife includes amphibians, reptiles, birds, and mammals). This is not intended to be an all-inclusive list, but rather it should serve to provide examples of and distinguish between some of the techniques that are more commonly used in CEQR evaluations and those that would only be used under special circumstances. The ecological literature should also be consulted for additional explanation of these and other methods.

Many animal sampling techniques require special permits, licenses, and/or authorization letters from any or all of the following resource agencies: the NYSDEC, the USFWS, the NPS, and the NMFS. Prior to conducting an animal survey, each of these agencies should be contacted for the appropriate requirements. In addition, certain site-specific permits may also be required. For example, permits should be obtained from NYCDPR if work is to be conducted in a city park. In addition, the DEP should also be contacted for any additional local requirements. All survey activities in aquatic habitats must conform to the guidelines regarding minimization of cross-contamination of habitats with pathogens and invasive aquatic species outlined by the NYSDEC Bureau of Fisheries "Sampling, Survey, Boat and Equipment Protocol" and "Biosecurity Protocol" for all aquatic surveys as well as the Declining Amphibian Populations Task Force field work standards for amphibian surveys.

Original data forms should be maintained for future reference and may be required in appendices to reports prepared for CEQR assessments.

323.3. Analysis of Data

Data collection should involve a quantitative or qualitative assessment of the value, resilience, uniqueness, and function of the resource. From the literature search and multiple appropriately-timed field surveys, the natural functions of the resource can be established. Some resources have multiple functions while others have only one. A wetland can serve as flood control, water cleansing, ground water recharge, and specialized habitat for plants and animals. Beaches can serve as erosion protection, bird breeding and foraging territory, and an area for human recreation. An open site in a densely developed area could serve as a foraging area for certain birds. Natural resources' different functions are a prime consideration later when assessing a proposed project's effect on the resource.

Some resources are known to be valuable prior to any survey effort. These are generally those designated resources listed in Section 150, above. However, the designated resources tend to focus primarily on the larger coastal and other wetland areas. There are a number of other, primarily terrestrial resources that do not have designation but are nonetheless very valuable. Some contain rare plant and animal species. In addition, there are resources and species that are valuable or sensitive because they are rare in New York City, although they may be common elsewhere (*e.g.*, northern plants at their southern range and southern plants at their northern range). Therefore, each analysis of existing conditions must consider each resource encountered on its own merits, whether or not its value has already been recognized by others.

A number of factors help determine the value or extent of the resource. The results of the literature searches and background research (see Subsections 321 and 322) can provide much information on the value of the habitat. The results of the habitat characterization, if performed, further define the ability of the habitat(s) to support invertebrates, fish, or wildlife. Factors to consider when assessing the value of a habitat are discussed in Subsection 324. Finally, if animal surveys are conducted, the value of a habitat can be further defined. This requires an analysis of the data collected from these surveys. Data from wildlife surveys can be analyzed at both the species and community levels.

Some examples of data endpoints that can be calculated and used to assess the value of a habitat for CEQR evaluations are described for species and communities below. This is not intended to be an all-inclusive list, but rather should guide the reader to those data endpoints that would be most appropriate for CEQR evaluations. The ecological literature should also be consulted for additional information on these and other data endpoints, as should texts or scientific literature on biostatistics (See Section 730).

SPECIES

PRESENCE/ABSENCE. Presence/absence is a simple type of data analysis that entails identifying whether a species is present in a particular habitat type. Here, the number of individuals is not calculated. This data type is useful in verifying whether a particular species uses a habitat or a project site. Such information can be useful by itself, or it may help focus a survey to site-specific areas, such as an area where a threatened or endangered species (TES) or species of special concern might be located. This method is useful when detailed ecological information is not necessary or when identifying the presence or absence of a TES or species of special concern. However, the results from this type of data analysis can change seasonally or from year to year. Furthermore, presence/absence data depends largely on the skill of the observers, timing, weather conditions, survey methods, and other factors. Therefore, multiple presence/absence surveys should be conducted using skilled observers and proper sampling techniques.

ABUNDANCE. Species abundance is the number of individuals in a population of a certain species. Data collection for species abundance is widely used for ecological surveys and is often expressed per unit time (time-restraint) or distance (linear transects). Absolute abundance, or the actual number of individuals in a species, is rarely measured, nor is it recommended, since it is extremely time- and labor-intensive, and methods to accurately estimate abundance are readily available. Estimates of abundance are calculated using indices that are correlated to population size. For example, a common index used with mark-recapture data is the Lincoln-Petersen index.

DENSITY. Species density is the number of individuals in a species expressed per unit area. The area can be naturally or artificially ascribed and can be project specific. Usually, density would be calculated for a project location or habitat type within a project location. Similar to abundance, estimates of density should be calculated by using indices that are correlated to population size rather than by attempting to measure absolute density. Absolute density should only be considered in rare cases, such as for TES or species of special concern.

SPATIAL ARRANGEMENT AND MOVEMENT. This type of data describes the location of individuals or species as well as their movements within a community or habitat type or from one community or habitat type to another. This type of data is rarely needed, unless very specific information is needed, usually for TES or species of special concern.

COMMUNITIES

Community measurements are data collected on groups of species. Logical groupings may include groupings by habitat use or guild, taxonomic classification, habitat type, or any other logical grouping. The following data endpoints can be calculated to describe communities:

SPECIES RICHNESS. Species richness is the total number of species in a community, habitat type, or other logical grouping. To determine species richness, all the species present in the community, habitat type, or other logical grouping should be identified. Species richness is useful in comparing the richness of different habitat types or project locations. Generally, the total number of species on a site is never known without exhaustive fieldwork. Consequently, species richness is based mostly on existing habitat valuation and size and is largely qualitative.

RELATIVE ABUNDANCE. Relative abundance is the abundance of a species relative to the total abundance (number of individuals) of all species in a community, habitat type, or other logical grouping. Relative abundance provides an indication of the degree of dominance of a species in the community, habitat type, or other logical grouping being studied.

SPECIES DIVERSITY. When it is possible to gather data on abundances of each species in a community, habitat type, or other logical grouping, a species diversity index can be calculated. The most commonly used diversity index is the Shannon-Wiener index (see Section 730). This index provides an indication of the number of species, together with their respective abundances, in a single number. Species diversity information is rarely required for a CEQR evaluation because gathering data on abundances of all species in a community is extremely time- and labor- intensive. Furthermore, diversity indices should be interpreted cautiously, as they often obscure rather than reveal patterns of conservation interest.

A site with high species richness is usually valuable because it supports many different types of organisms. A site with low richness and high abundance of one species usually indicates high disturbance and low current habitat value. These sites are often dominated by common reed and purple loosestrife in wet areas, and sumac and tree-of-heaven in upland areas. However, the potential for improved ecosystem services and diversity is possible. Areas with low diversity, however, are not always low quality, and care should be taken to interpret diversity values. For example, headwater streams have low invertebrate diversity, but are often high quality and support populations of breeding salamanders that may not survive further downstream. Marginal or harsh environments often support rare or endangered species that are excluded by competition or predation from more diverse habitats.

323.4. Assess Ecosystem Services

A natural resource does not exist alone but is part of a larger inter-connected ecosystem that includes the biotic community (living) and the surrounding abiotic environment (non-living) from which it gains and gives support. To understand fully the potential impact of a project on such resources, the biotic and abiotic systems supporting them are assessed.

An important step in the assessment is choosing the size of the system to analyze. Only the part of the system that is likely to be affected by the project is included. If too much of the system is analyzed, impacts of the project could be diluted by the larger system and appear insignificant. For a surface water hydrology analysis, for example, the only included areas would be the affected downstream and/or upstream portions of the system (stream, wetlands, and slopes) until the watercourse enters a large water body, such as New York Harbor. For wetlands, the adjoining wetland area and the immediately contiguous uplands and water body would generally be analyzed. For upland habitat, the limit of the system would usually be the area containing similar vegetation. Some examples of systems include the following:

SURFACE WATER HYDROLOGY

The potential impacts on water quality, and of changes in flow as it relates to flooding, wetlands, and water bodies, are the most commonly assessed aspects of an environmental support system. This analysis is typically performed as follows.

1. Define the whole watershed basin. For most streams, the overall watershed basin has been mapped, but the mapping tends to be generalized and does not contain sufficient detail for environmental impact analyses. Further, construction that has taken place since the mapping may have changed the contours. The USGS's topographic maps are the basis for mapping the watershed basin. The site on the topographic map is located and the direction water flows onto and off of the site is determined. Streambeds, gullies, ravines, and other watercourses can be identified on the topographic maps where contour lines appear to form a V, which points upstream. The watershed basin can be mapped by following the streams up the contours to the high points (divides), and following the contours downstream to the receiving water body.
2. Define the analysis conditions. This depends on the issues of concern. For example, for an assessment of a project's effects on flooding, the analysis would consider how the project could affect flooding during 1-, 5-, and 10-year storms (storms that have a statistical frequency of occurrence of once in 1, 5, or 10 years). It considers whether more areas would be regularly flooded during these storms if the project is implemented. The 100-year flood is also considered for a project to conform with regulations (see Section 710). The analysis should be consistent with the conditions identified in any infrastructure analysis. For instance, in assessments of erosion, a short, intense rainstorm is analyzed because it causes greater erosion than a larger storm of longer duration.
3. Determine spatial and functional relationships of the wetland system and project site. This analysis relates how the wetland system as a whole functions, and the site's role in that function. Both the location of the site in the wetland system and its size relative to the system are considered. The location of the site has an effect on its value in the functioning of the wetland system. For example, a site along a steep slope above a stream would have more effect on that stream in terms of hydrology than a flat site at a distance from the stream. The size of the site relative to the whole system is also important--a large site is normally more important to the overall system than a small site. However, small sites can sometimes be crucial and their importance can be determined only by a system-specific analysis. As an example, for stream erosion and flooding, a site's characteristics (flat, steep, with wetlands and hydric soils or rock outcrops) are considered in the context of the system's characteristics. A flat, wide site in a

steep drainage system could be a valuable flood storage area, but stormwater would pass quickly through a rocky steep site. The rocky steep site, however, could have highly erodible soils that could cause downstream siltation. The current drainage from the site is plotted, and its contribution to the system calculated using standard engineering techniques. The soil types (see New York City Soil Survey maps) and slopes are analyzed to determine erodibility and the velocity of the flows into the drainage system. Then, the downstream area is examined to determine its size. All sources and volumes of water added to the downstream area are plotted. The point at which the site's contribution becomes minimal is estimated, and at that point the system analysis is ended.

COASTAL EROSION

The analysis for coastal erosion includes an assessment of winds, waves, fetch (distance over open water), and shoreline configuration, all of which can affect erosion. Two aspects are examined in a coastal erosion analysis: 1) is the site subject to erosion to the degree that property and life could be endangered in the foreseeable future; and 2) would the project increase erosion at other locations. To answer the first question, a design storm (usually the USACE 100-year storm) is considered. Such a "design" storm would feature particular wind speeds and other meteorological characteristics. The wave heights and storm surge at the site are calculated with the waves coming from the site's most exposed direction. Based on the energy in the waves and the types of soils at the site, the amount of erosion is calculated and the danger of loss or damage to the property assessed. For potential erosion that might be caused at other locations by the project, the dominant direction of sand movement along the beach is determined. The size and location of the site affected by the project are both important in this assessment. For example, a site at the end of a coastal erosion zone would not affect sand movement at downstream sites, but a site at the beginning of the erosion zone would.

SOILS

Soils are potentially significant in determining a site's ability to support plant cover, its erosion potential, and its capacity for ground water recharge. Soils are an integral component of any habitat type, as they play a significant role in determining the type and quality of the vegetative composition, amount, and nutritive value of vegetation at a site, and they provide habitat for microbes and invertebrates that are important food sources for upper trophic level wildlife. When describing the chemical and physical properties of soil, methods outlined in the U.S. Department of Agriculture's (USDA) Soil Testing Procedures for the Northeast should be used. In New York City, the USDA's Natural Resources Conservation Service (NRCS) has undertaken a program of Reconnaissance and Intensive Surveys and has identified and characterized new soil classifications for anthropogenic and disturbed soils. For important sites in New York City, NRCS's New York City Soil Survey team may undertake a special survey on request, after a review of applications by the NYC Soil & Water conservation District and the NRCS's State Soil Scientist in Syracuse. The New York City Soil Survey map that classifies the various urban soil types should also be used.

Other examples of environmental support systems that are sometimes assessed are ground water and vegetative buffers.

330. FUTURE NO-ACTION CONDITION

The impact assessment for natural resources compares the effects of the proposed project to the future without the project. It is probable that many resources will change in the absence of the proposed project. This depends not only on future development or public works projects (without the project), but also on expected overall growth and natural ecological processes. In some cases, resources may be expected to improve over time under the future No-Action condition due to other environmentally beneficial projects that are taking place concurrently.

The future No-Action condition in the study area should be evaluated for the build year. It should be noted that anticipated changes to resources outside of the study area can affect the future No-Action condition within the study area. Therefore, it is important to consider all applicable projects and future anticipated changes both in and around the study area in order to accurately evaluate future conditions in the absence of the project. In some cases, information to support this evaluation may be available from other technical areas, particularly land use, traffic, air quality, noise, and hazardous materials. Most often, the analysis of the future No-Action condition should be qualitatively discussed. Where another environmental assessment has been completed, it may be appropriate to utilize its conclusions. However, in some instances, it may be necessary to reassess conditions quantitatively, depending on both the nature, scope, and scale of the project and the anticipated development, other projects, or expected future changes in the resource. An example of a quantitative assessment is the use of water quality modeling (see Chapter 13, "Water and Sewer Infrastructure").

340. ASSESS WITH-ACTION CONDITION (ASSESSMENT OF IMPACTS)

Assessing impacts of a project begins with understanding the extent to which the project would disturb or alter a resource in the short- and long-term. Impacts can be categorized into direct and indirect effects. Direct effects are relatively straightforward; indirect effects may require more analysis.

341. Effects of the Project

341.1.Direct Effects

Direct effects of a project include the category of activities that directly alter the condition of a resource. Direct effects include, but are not limited to:

- Removal of vegetation.
- Altering on-site hydrology or effects on hydrology to sites downstream.
- Changing one habitat type to create another.
- Filling, draining, dewatering, or dredging of a water body or wetland.
- Development of roadways, parking lots, buildings, and other paved surfaces on previously vegetated or unpaved surfaces.
- Construction of new marine structures, such as bulkheads, piers, piles, groins, jetties, *etc.*, or floating structures that disturb existing habitat, change water flow patterns, and/or change sediment transport patterns, *etc.*
- Stream channel changes, such as bank stabilization, widening, narrowing, straightening, culverts, *etc.*
- Installation of drainage systems, including sewers, culverts, retaining basins, recharge wells, *etc.*
- Introduction of buildings or structures that cast prolonged shadows on a natural resource, or otherwise alter its microclimate (see also Chapter 8, "Shadows").
- Introduction of new (particularly non-native) plant or animal species that out-compete for resources.
- Alteration of soil pH, destruction of structural properties of soil, changes to the microclimate, alteration of soil compaction, *etc.*
- Introduction of noise at the site, either temporarily during construction or permanently during operation (see also Chapter 19, "Noise").

- Landscaping with non-native vegetation.
- A change in air quality that may adversely affect native species, either temporarily or permanently (see also Chapter 17, "Air Quality").
- Increased lighting at the site, either temporarily during construction or permanent during operation.
- Alteration of physical and chemical quality of waterbodies on the site, including increased turbidity, temperature, nutrients, biological oxygen demand, pesticides, *etc.*
- Alteration in the water level or surface area of an existing water body on the site.
- Construction of a structure that may impede animal migration and movements.
- Compaction of soil and/or loss of adequate soil structure from construction vehicles and heavy equipment.
- Removal of soil during construction, either directly or due to erosion.
- Construction of storm or sewer outfalls.
- Construction or removal of bulkheads, piers, and other structures in the water.
- Introduction of contaminants or contaminated materials to a natural resource.

Usually, the description of direct effects includes a calculation of the area to be affected (in square feet or acres, for example), or volume of soils to be removed. It may also entail describing methods and types of construction at a level appropriate to understand the extent of an effect. This means that the proposed activities or assumed development scenario are defined in some detail. Where specifics are not known, a conservative but reasonable assumption is made. Furthermore, even if compensatory mitigation is planned, the calculation of affected area includes those areas required for construction activities, even if the long-term plan is to restore these areas.

341.2.Indirect Effects

Indirect effects occur when the changes on a site alter conditions to adjacent or nearby resources or on the site itself after construction has ended. Indirect effects include, but are not limited to:

- A change, such as loss and/or health of vegetation, dewatering, soil compaction, site clearance, excavation, introduction of impervious surfaces, or any other change in drainage patterns that would alter the way in which surface or ground water flows from the project site to a nearby natural resource or vice versa.
- A change that would influence the degree or period of tidal inundation of a natural resource.
- A change, such as exposure or movement of contaminated sediments or soils, that would render organisms on-site or in nearby natural resources more likely to be exposed to contaminants.
- A change that would decrease the quality of surface or ground water that currently supports a natural resource.
- A change in on-site activities that would either increase the number of people or domestic animals or increase noise, thereby increasing disturbance to on-site or nearby natural resources.
- A change in on-site conditions that would alter the amount of light that reaches natural resources on or near the site.

- An activity or a change in conditions that would introduce or facilitate colonization by new (particularly non-native) plant or animal species that could overtake existing (particularly native) species either on-site or in nearby resources.
- An activity or change in conditions that would transform stable interior vegetation into potentially unstable edge vegetation (*e.g.*, trees subject to increased wind stress, increased soil evaporation, *etc.*).
- A change that would increase scouring, erosion, or transport of soil, silt, and sediments and alters the quality of an on-site or nearby natural resource.
- A change that would increase sediment deposition on-site or in a nearby natural resource.
- A change that would impact the movements or migration of animals between or within habitats.
- A change that would encourage the spread of exotic species such as wooly adelgids and/or Asian longhorned beetles.
- A change that would increase the frequency of bird collisions with built structures due to increase in height, architectural design or lighting infrastructure.

If the project under study may potentially indirectly affect a resource, the assessment attempts to describe and measure the extent of that effect. In some cases, this amounts to nothing more than comparing the proposed landscaping to the surrounding area to determine if it would be a similar habitat. In others, it may be necessary to analyze subsurface geology in a small area to track with some accuracy the flow of ground water to a wetland and estimate the extent to which the project may alter the volume, quality, or direction of that flow.

342. Effect on the Functioning of a Natural Resource

The evaluation of the natural resources in the study area identifies the functions of a resource (under existing and No-Action conditions) and the elements that are critical to these functions. For example, ground water flow may be essential to a particular freshwater wetland; in that wetland, the soft soil and fern-lined stream banks may provide essential habitat to an important amphibian. If a project would decrease the ground water flow to the wetland or somehow compact the soil surrounding it, the water quality and habitat quality may be compromised. In another example, a stand of trees may shade an area, allowing for increased cover and a cool microclimate for small mammals, birds, plants and other organisms. The loss of the trees would remove a specific habitat. Based on this type of analysis, the assessment identifies the loss associated with the project and the importance of that loss for the critical functions of the habitat.

A critical facet of the assessment is determining the extent of habitat impairment. As described earlier, resources' resiliency, or ability to accommodate change, are key to the assessment of habitats. The project being analyzed and the resiliency of the resource are compared to determine whether the resource would retain its functions, or whether, and by how much, those functions would be impaired by the project. Impairment can range from destruction of the habitat altogether to its partial degradation to minimal impairment. Destruction includes complete elimination of a habitat or removal of a species or a condition (such as regular inundation) essential to its existence. Degradation involves the removal or alteration of a portion of a resource, where the resource may retain some ecological value, but its function would be limited. For example, if the size and shape of a woodland area is changed, interior habitat may be effectively diminished for species that require large or contiguous patches (*i.e.*, forest interior birds), while other species adapted to "edge" habitats may persist or increase. Depending on the extent, location and relative abundance or rarity of the habitat within the City, this may represent a significant adverse impact. Minimal impairment would include minor or temporary disturbances that would allow for a reasonable recovery to initial conditions over a short period of time (*i.e.*, temporary land disturbance within a successional habitat type). The parameters to be examined are physical (*e.g.*, temperature, volume of water, soil types), biological (*e.g.*, diversity, abundance, community structure), and situational (*e.g.*, size, distribution, and shape).

343. Context of the Resource Change

In addition to evaluating direct and indirect impacts as described above, the severity of the impact should also be addressed in terms of the context of the resource change. This evaluation has three components. First, if a resource would be impacted or lost due to project-related activities, these losses must be evaluated in terms of how much of that resource is left in the City. A project that would remove an acre of a habitat that is very abundant throughout the City may be less significant than a project that would remove an acre of an extremely scarce habitat. In considering the context of a resource change, it is always important to remember that many of New York City's resources may be abundant throughout the region or state, but scarce in the City's dense urban environment.

Second, each individual resource impact must be evaluated in the context of other resource impacts from the project. Impacts to each individual resource or habitat may be seemingly insignificant, but the cumulative total of the impacts may nevertheless be significant. Furthermore, the impacts to one resource could potentially affect the impacts to other resources, and the overall impacts may be synergistic. Thus, a careful evaluation of the sum of all the impacts considered together must be performed to accurately evaluate how natural resources would be affected by a project.

Finally, project-related impacts must also be evaluated in the context of both spatial and temporal changes in natural resources that will occur in the absence of the project. In other words, the anticipated changes in natural resources, both on- and off-site, that were evaluated for the future No-Action scenario must also be evaluated together with the impacts of the project in question. For example, if it is determined that a resource would be adversely impacted, not only should it be put into the context of how much of that resource is left in the study area, but also how much of that resource would be left based on what is currently known about future conditions. Again, the project-related and non-project related impacts could potentially be synergistic such that the overall impacts are greater than the sum of their parts. A careful evaluation of the sum of all the impacts, both project and non-project related, must be performed to evaluate accurately the impacts on natural resources from a project.

350. ASSESSMENT ISSUES FOR SPECIFIC NATURAL RESOURCES

351. Water Resources

351.1. Surface Water Bodies

The appropriate function and optimum condition of surface water bodies in the City are set by DEC and appear as water quality standards (see Section 710, below). NYSDEC sets these goals depending on conditions and actual function of a water body, as well as its water quality potential. Surface waters are classified as suitable for some or all of the following functions: water supply, contact recreation, fishing and boating, fish habitat, and fish passage. Each classification has a specific set of water quality standards, designed to protect the waters for the designated uses. These standards are expressed as minimum levels of dissolved oxygen that must be present, the acceptable range of pH, maximum coliform levels, and maximum amounts of toxic wastes and deleterious substances. Although these classifications do not necessarily reflect existing conditions, they express public environmental policy for the City's water bodies and, as such, serve as a basis for comparison in the analysis of impacts on surface water resources. Information on water quality standards and sampling data are provided by the NYSDEC and DEP.

Further, an order of consent between DEP and NYSDEC, published January 14, 2005, identified 18 drainage areas for which CSO facility planning studies would be utilized to develop a set of feasible alternatives to control CSO in each drainage area. These 18 Waterbody/Watershed (WB/WS) Facility

Plan Reports will become a part of the final City-wide Long Term Control Plan (LTCP) for all watersheds within the City of New York, scheduled for completion in 2017. The classification of the waters within the City can be found here.

Examples of projects that indirectly affect water bodies are listed in 351.3, below. Examples of projects that directly affect surface water bodies and issues for the assessment include:

- A project that would add to the discharges of pollutants to a surface waterbody. Generally, this activity is limited to industrial discharges, sewage treatment plants subject to the State Pollutant Discharge Elimination System (SPDES) permitting procedure (see Section 710, below) and large-area land use changes. When water quality is an issue, the analysis can include one or more of the following:
    - Collecting available data on water quality. DEP, the Interstate Environmental Commission (IEC), NPS and NYCDPR all maintain sampling programs in the City's major waterways (see above and Table 1). EPA and NYSDEC also perform more limited sampling. Parameters for which data may be available include dissolved oxygen (DO), which indicates the level at which fish life can be maintained; biochemical oxygen demand (BOD), which indicates presence of organic pollution; fecal coliform, which indicates the presence of pathogens that spread disease; heavy metals, such as iron, manganese, copper, zinc, and lead, which are indications of industrial pollution; nutrients, such as phosphorus, ammonia, nitrite, and nitrates, which are discharged from wastewater treatment plants and, in excess, allow algal growth that results in a reduction of oxygen levels; suspended solids; secchi transparency; pH; and chlorophyll 'a,' an indicator of the presence of algae.
    - Where sampling data are not available or where information for smaller areas of a larger water body is required, it may be necessary to take water quality samples. This can range from one-time sampling and testing for the parameters discussed above, to a yearlong survey with samples taken at multiple locations. Generally, runoff or drainage from a small residential development into a water body with good tidal flushing would need only one sample. If the runoff is into water with poor tidal flushing (such as Spring Creek), samples at several locations would be needed to characterize the area's water quality. A large development near a sensitive resource would require a full program. To determine the worst-case water quality conditions, sampling should be conducted during the late summer, when water quality, especially dissolved oxygen, is at its lowest. The program should not be conducted after a recent large storm, which would affect the water quality, if the project does not alter runoff or potential combined sewer overflows (CSO's) or sanitary system overflows (SSO's). Sampling after storms should be performed when stormwater discharges, CSO's, or SSO's are potentially affected by the project. Data collected in Chapter 13, "Water and Sewer Infrastructure," may be of assistance.
    - In some cases, the new pollutants could be expected to affect water quality over a wider area; for these projects, application of a computer-simulated water quality model may be appropriate to assess impacts. A report by the Water Environment Research Foundation (WERF), "Water Quality Models: A Survey and Assessment," provides descriptions of the types of models as well as modeling software, including relevant model features. This reference is useful in defining the capabilities and limitations of available water quality models and in guiding the selection of a model to meet the objectives of the environmental assessment. Data collected in Chapter 13, "Water and Sewer Infrastructure," may be of assistance.

- For water bodies that contain finfish and other aquatic or amphibian species that are considered significant, the assessment of changes in water quality parameters is also applied to the understanding of the potential for a change in habitat (see discussion in Section 310, above).

- A project, such as the introduction of a new stormwater outfall or construction of a bulkhead, pier, or other waterfront structure, may disturb a portion of the environment, particularly the benthic community. A stormwater outfall could increase the location and velocity of stormwater as it enters the water body, which could scour the bottom of sediments and consequently change the environment for the bottom (benthic) organisms that live there. Placing a new bulkhead or pier could also disturb the bottom, if only during construction, with similar, albeit short-term effects. In rare cases, it may be necessary to assess the impact on finfish and other vertebrates from the bottom sediments if they are suspended in the water. A bioassay test, which determines the potential uptake of pollutants in the sediment by animals, is performed in such cases.

- A project, such as maintenance dredging that would disturb the bottom sediments on a regular basis, altering the composition of the bottom and the volume of suspended solids in the water column. Sediment sampling and bioassay tests are appropriate so that the effects of dredging on water quality and aquatic life, including the potential release (resuspension) of contaminants into the water, can be assessed. Disposal of dredged materials is also an issue, but this activity is regulated by the USACE and EPA, who review the test data and decide where the materials can be placed without causing environmental impact or whether restrictions are needed. See USACE Dredging Operations Technical Support Program Reports. Approximately ten percent of such dredged materials require restrictions, such as capping with clean materials. Dredged materials from certain locations require special investigations and handling. These include dioxins in the sediments at the convergence of the Kill Van Kull and the Arthur Kill, and the very high pollutant levels in industrialized basins with poor or closed circulation, such as the Gowanus Canal and Newtown Creek. Such issues are disclosed in CEQR review; however, compliance with appropriate regulations would ensure appropriate disposal, based on dredge spoil quality, without creating a significant adverse impact.

- A project that would change a physical condition of the water, such as temperature, currents, flow, channel shape, *etc.* Examples include installation of piers or platforms that permanently shade portions of the water; cooling water discharges, wave curtains for marinas, culverts and channels often included in roadway design, *etc.* For certain projects, mathematical modeling may be required to determine if circulation may change, leading to an effect on water quality. Several models for the entire New York Harbor and the adjoining Long Island Sound and New York Bight are appropriate for very large projects, such as a large industrial facility, that could have Harborwide effects. For smaller projects, models are available as described in the WERF report. (See Section 730). The potential impacts from marina wave breaks and new piers can be analyzed by hydrodynamic models, several of which were evaluated in the WERF report.

- A project that would result in the draining or filling of a water body or a portion of a water body. Examples include culverts or channel modifications that direct flow away from a pond and filling to create land (such as Battery Park City) or even out a shoreline in creating a bulkhead. These projects affect water circulation and could lead to increased flooding, both off- and on-site. The potential effects on circulation can be analyzed using the models discussed above. Flooding potential can be analyzed using either hand calculations or computer models, depending on the complexity of the situation.

351.2. Ground Water

NYSDEC sets water quality standards for ground water based on its potential use. Fresh ground water is generally classified as having the potential to provide potable water supply. However, in New York City, only portions of the Lloyd, Jameco, and Magothy Aquifers are used as drinking water supply. The Jameco and Magothy Aquifers are designated as sole source aquifers in Brooklyn and Queens and are thus afforded special protection. Most projects would not have an impact on these aquifers unless wells are installed or subsurface waste disposal is part of the project. On Staten Island, the underlying aquifers are used for process water or irrigation supplies by private interests, but the aquifers are not considered to be sole source. Although some small water-bearing areas can be found beneath Manhattan and the Bronx, these are not used for drinking water supply. Throughout New York City, the Upper Pleistocene soils contain ground water, which also feeds surface water bodies. Ground water quality is of concern for natural resources where it supplies water to sensitive habitats and water bodies. Ground water quality is particularly important to maintain freshwater wetlands located in Staten Island and Queens. The analysis of ground water quality is similar to that of surface water quality. Samples are obtained, in this case by establishing a sampling well, and chemical tests are undertaken.

The quantity of ground water can also be important because it supplies water to wetlands and surface water bodies during dry periods. In a contrasting example, ground water is such a small component of the waters of the lower East River that its flow would not be a concern there. The analysis of ground water quantity and flow is geotechnical and involves establishing the characteristics of the aquifer (the material through which the ground water moves), the direction and rate of flow, and the rate of recharge. Activities that could affect ground water quality or quantity and the assessment issues associated with these activities include the following:

INSTALLATION OF INDUSTRIAL OR RESIDENTIAL WATER SUPPLY WELLS

The issue in this case is the potential that pumping would alter the flow of ground water in a specified area, possibly altering flows to another resource. If pumping takes place close enough to a source of contamination, the project could draw pollutants (such as salt) into the aquifer (See Chapter 12, "Hazardous Materials," for further information on potential contamination). To assess such potential impacts, several wells would need to be installed, and the water levels recorded. These readings are plotted and drawn as contours to create a piezometric surface, which shows the direction and strength of ground water flow. If the site is close to a tidal water body, the water levels need to be recorded for an entire tidal cycle to establish the tidal influence on the ground water flow.

DEWATERING OF A CONSTRUCTION SITE

This is similar to the installation of wells, in that the activity may alter flow of ground water in a specified area or to adjacent or nearby wetlands. However, it is a temporary condition.

PERMANENT DEWATERING

In some instances, as when all or part of a building or subway tunnel is constructed below the water table, dewatering pumps are installed to prevent flooding within the structure. This dewatering condition alters the ground water table and direction of flow on a permanent basis.

REMOVAL OF VEGETATION AND/OR PLACING AN IMPERVIOUS SURFACE ON LAND USED FOR THE RECHARGE OF GROUND WATER

This would diminish the replenishment and ultimately the total volume of ground water available. Usually as a part of site planning, current runoff and runoff with the project in place are calculated. A number of methods can be used to make this estimate, including the "rational method;" TR-20 and TR-55, computerized models developed by the USDA's Natural Resources Conservation Service; and EPA's Storm Water Management Model (SWMM). These methods calculate the volume of runoff, given the volume of rainfall and the area of impermeable surface. They typically use runoff coefficients based on types and areas of different ground surface on the project site. Using this formula and the mean annual precipitation (approximately 44 inches in New York City), the current recharge and recharge with the project can be calculated. The significance of the change caused by the project can be assessed by comparing the loss or increase in recharge volume to the volume from the recharge area.

INSTALLATION OF GROUND WATER RECHARGE WELLS OR OTHER RECHARGE FACILITIES

Where increased impervious surfaces are proposed, they are often accompanied by a plan for recharging ground water through wells. These wells return the precipitation to the ground water. Generally, the runoff is collected directly from rooftops and other impervious surfaces. Such recharge wells do not function properly unless the distance from the bottom of frozen soil (3 feet in New York City) to the top of the water table is more than 2 feet; therefore the depth to the water table is considered when assessing the wells.

CONSTRUCTION OF FOOTINGS, CAISSONS, BASEMENTS, AND OTHER SUBSURFACE IMPEDIMENTS TO GROUND WATER FLOW

Deep foundations can occasionally create wet spots and low-level flooding if they impede the flow of ground water. The impediment to flow can become noticeable near tidal water bodies with fluctuating ground water levels.

INTRODUCTION OF AN ACTIVITY ON-SITE WITH THE POTENTIAL TO CONTAMINATE GROUND WATER

Such activities include industries involved in the transport, processing, storage, or disposal of hazardous or toxic materials. In this case, the assessment first addresses the question of whether ground water on the site is important for on-site or off-site water supply or resource replenishment. If so, the assessment then considers the existing quality of the ground water, its flow direction and rate, and the pathways to contamination. The analysis undertaken for hazardous materials is described in Chapter 12, "Hazardous Materials."

351.3. Other Water Resource Systems

The quality of the surface water hydrology flow and its velocity and volume as it moves across the land affect the physical and chemical characteristics of water bodies and receiving waters. This is determined by the slope and coverage of the land, the uses on the land, the presence of built systems to convey stormwater flows, the types of storms to which the area is subject, and the ability of the low-lying floodplains to retain stormwater and diffuse the force of its flows. Other natural phenomena that strongly affect the environment include the action of tides and waves, which shape the land through erosion or accretion of sand and other materials carried in the waters. A proposed project can alter these systems or combine with them for unexpected results. Examples are as follows:

- Projects that would alter the way in which surface water hydrology flows overland or is absorbed to recharge ground water. These include activities that displace heavier vegetation (such as woodlands) with lighter vegetation (such as lawns) or add impervious surfaces to the land; alter the shape of the land (cut or fill it to build a road, for example); or introduce a built storm drainage system. Any of these activities may increase the volume of water that arrives at a water body or wetland as surface flow; increase the velocity with which it flows; create an earlier and substantially greater "peak" flow to the receiving water; or change the speed and direction of flow. The analysis of such projects includes assessing the area draining to the water body, as described in Section 330, above. Figure 3 illustrates the affects of increasing impervious surface cover on water quality.
- Changes to the floodplain, including the following: placement of structures in the floodplain that reduce its capacity for flood retention or alter stormwater flow characteristics; removal of vegetation that would otherwise reduce flow velocities and promote recharge; and removal

of stream bank vegetation, which may destabilize the stream channel or increase water temperatures. The analysis of the floodplain uses engineering techniques similar to those presented for the assessment of overland runoff. To estimate the potential for increased flooding because of a project, the volume of the floodplain occupied by any buildings facilitated by the project is compared with the total volume of the floodplain. Along small streams, such as Lemon Creek on Staten Island, a small project in the floodplain could cause flooding elsewhere. The discussion in Chapter 13, “Water and Sewer Infrastructure,” may be of assistance.

352. Wetlands

USACE has jurisdiction over virtually all freshwater and tidal wetlands. As discussed in Section 710, NYSDEC and the USACE require permits for certain projects that would take place in or affect most wetlands and the areas adjacent to them. NYSDEC also takes jurisdiction over all tidal wetlands and all freshwater wetlands greater than 12.4 acres; smaller freshwater wetlands may also fall under DEC jurisdiction if they are deemed by the Commissioner to be of unusual local importance. As discussed in Subsections 122 and 123, NYSDEC’s jurisdiction extends to buffer area known as the “adjacent area.” In New York City, the adjacent area is usually the area within 150 feet of a tidal wetland or 100 feet of a freshwater wetland. For tidal wetlands, this area can be smaller if, in general, a 10 foot rise in elevation occurs less than 150 feet from the wetland or if a functional and substantial fabricated structure of at least 100 feet in length serves to bound the wetland. In these cases, the adjacent area would be the area between the wetland boundary and the 10 foot contour or the fabricated structure. However, in many circumstances it is also appropriate to examine impacts within areas larger than 100 and 150 feet from the wetland boundary. For example, beaches, dunes, bluffs, upland nesting habitat for water birds, and other critical watershed components are often adjacent to but further than 150 or higher than 10 feet from the tidal wetland boundary. In this and many other cases, it may not be appropriate to limit the CEQR impact assessment to the adjacent area definition that constitutes NYSDEC's jurisdictional boundary. Larger areas may need to be evaluated since effects on wetland resources could be overlooked. The assessment may be based more on the ecological boundary of the impacted system.

In addition, for freshwater wetlands, it is often appropriate to consider wetlands that are smaller than the 12.4 acres. Many vernal pools, bogs, and other freshwater wetlands that are smaller than 12.4 acres are critical to regional biodiversity. Vernal pools, for example, are often smaller than 0.5 acres and are hydrologically isolated from one another, although several may be interspersed across the same local landscape. Because these systems are devoid of fish, they serve as important breeding grounds for amphibians. Amphibians migrate over land from one pool to another to breed. Although these pools are isolated and relatively small, they form an integrated wetland system at the landscape scale. In many cases, especially in fragmented urban ecosystems such as New York City, wetland value is derived from the spatial integration of small wetland units into a whole wetland system that is greater than the sum of its parts. Thus, effects on all wetland systems, regardless of size, should be considered in a CEQR evaluation. Wetland values should be rated according to function, both at the individual and the study area/ecosystem level. In all cases, it is essential for the analyst to define the area in which activities could adversely affect the resource.

NYSDEC and USACE have established technical procedures for the definition and evaluation of wetlands. Both procedures acknowledge that three elements work together to create and maintain wetlands: wetland hydrology (the movement of water to and through the wetlands that creates saturated conditions for at least one week during the growing season); hydric soils (generally dark, mucky soils with chemical and organic characteristics that reflect the lack of oxygen [anaerobic conditions] resulting from inundation); and hydrophytic vegetation (plants that can tolerate or that require periodically saturated or inundated conditions and/or anaerobic soil conditions). Tidally influenced wetlands are delineated using the vegetation and hydrologic criteria described in 6 NYCRR Part 661.2. For freshwater wetlands, the USACE technical approach emphasizes determination of soil types in delineating wetlands, while NYSDEC stresses identification of vegetation in delineating and characterizing wetlands (see 6 NYCRR Parts 660¬665 for guidance). Relying on vegetation identification to delineate wetlands is usually more expansive than relying on soils identification because wetland vegetation is often found growing in soils that are adjacent to wetlands soils but are not classified as such. Therefore, a reliance on vegetation most often results in the delineation of a larger area as wetlands.

Most of the city's remaining freshwater wetlands occur on Staten Island. Peculiar soil and hydrophytic plant factors on Staten Island, however, contribute to under-delineation of these wetlands. Standard wetland delineation protocols call for the identification of hydric soils, wetland hydrology, and hydrophytic plants. First, on Staten Island, most woody plants that are adapted to wetland conditions, including red maple, sweet gum, sycamore, tupelo, swamp white oak, pin oak, swamp azalea, high bush blueberry, and others, are equally well distributed in uplands. As a consequence, wetland delineators may underestimate the extent of forested wetlands on Staten Island. Second, a key indicator used to identify hydric soils is the presence of vertical red streaks in the soil. These are interpreted as channels of oxidation running along the roots of plants that have developed in a low-oxygen, water-logged context. Because Staten Island soils are generally derived from a red parent rock, in many areas the soils themselves tend to appear red, thereby potentially masking a key hydric soil indicator. These Elkton soils exist only on Staten Island and are not included on the state wetland soil list. Some of these reddish Staten Island soils, however, are recognized as wetland soils in other mid-Atlantic states. For example, soils in the Elkton series are identified as wetland soils on lists in New Jersey, Maryland, and Delaware. Inclusion on the lists allows wetland delineators to rely upon Elkton soils criteria when it is difficult to interpret other delineation criteria at a particular wetland site.

NYSDEC uses its March 1995 delineation manual for freshwater wetlands. The USACE and EPA have agreed to use the Corps of Engineers Wetlands Delineation Manual, 1987 (Technical Report Y-87-1) for purposes of administering the program under Section 404 of the Clean Water Act. However, in New York City, soil disturbance, past land use history, and soils on Staten Island derived from red parent rock can create ambiguity in the delineation process that often results in under-representation of wetlands when using the 1987 USACE manual. Therefore, caution should be exercised when using the 1987 USACE manual to delineate wetlands for a CEQR evaluation. In some cases, especially on Staten Island and in areas of the City in which soils are known to have been disturbed, it may be appropriate to place more emphasis on vegetation than would normally be the case for wetlands elsewhere in the state. In 2009, the USACE (in conjunction with EPA, USDA's NRCS, and the Fish and Wildlife Service) released a draft form of the Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region. Once accepted, this manual would be more appropriate for use in the City than the existing 1987 manual; a change in the standard data form would also follow. Until that time, numerous reports have been published by NRCS that provide descriptions, tests and guidance for problem soils. Currently, NYCDPR is formulating a protocol for a Wetland Rapid Assessment under EPA's WPDG grants. See the NYCDPR website for future updates on this information.

When a project requires permits from both NYSDEC and USACE, consultation with the USACE and NYSDEC is recommended prior to fieldwork when wetland delineations are necessary. If permits are required from both NYSDEC and USACE, it may be necessary to assess and identify two different wetland boundary conditions. In this case, the larger of the two areas may be identified for use in the CEQR assessment. Projects that might affect wetlands either directly or through changes to their adjacent areas are the same as those discussed above under water resources (Subsection 361) and may fall into the following general categories:

- Any form of draining, dredging, excavation, or removal of soil, mud, sand, shells, gravel, or other aggregate, either directly or indirectly.
- Any form of dumping, filling, or depositing of any soil, stones, sand, gravel, mud, rubbish, or fill of any kind, either directly or indirectly.
- Erecting any structures or roads, the driving of pilings, or the placing of any other obstructions, whether or not changing the ebb and flow of the water.
- Hydrologic alteration or introduction of chemicals or additional sediment.
- Any form of pollution.

- Any other activity that may substantially alter or impair the natural condition or function of a wetland.

In addition, the NYSDEC regulations group freshwater wetlands into four classifications based on their intrinsic value, and the tidal wetlands regulations also offer insight into the comparative value of such wetlands, as summarized below.

352.1.Freshwater Wetlands Classifications

6 NYCRR Part 664.5 denotes four wetlands classifications for New York waters as different wetlands provide different functions and benefits and in varying degrees. These classes range from Class 1, which represents the greatest benefits and is the most restrictive, to Class IV. The permit requirements are more stringent for a Class I wetland than for a Class IV wetland.

352.2. Tidal Wetlands Evaluation

6 NYCRR Part 661.2 provides a useful reference for understanding the relative value of tidal wetlands. The discussion notes that all tidal wetlands are potentially extremely valuable. Within this overall evaluation, however, intertidal wetlands and coastal fresh marsh are considered the most biologically productive and worthy of the most stringent protections.

Coastal shoals, bars, flats, and littoral zones can vary widely in their value and contribution to productivity. The discussion acknowledges that biological productivity in these wetlands may have been impaired by pollution; such areas contain few benthic organisms and show little primary productivity. However, where this has occurred, the other important functions of these wetlands (flood, hurricane, and storm control) remain intact.

High marshes or salt meadows are considered valuable, particularly for absorption of silt and organic materials and storm control. Their location near the upland makes them important for cleansing ecosystems. They also provide substantial habitat and feeding area for birds, reptiles, and insect populations.

Formerly connected tidal wetlands are variable in their contributions and functioning and are evaluated on a case-by-case basis. They are generally described by whichever of the wetlands categories (intertidal wetlands, high marsh, *etc.*) they most closely resemble.

353. Uplands

Upland habitats in the City are extremely diverse, and issues for their assessment vary widely. All provide habitat for wildlife, and most function to offer scenic, if not also recreational, opportunities for the public. Some upland habitats, including sand beach, maritime dunes, erosional bluffs, and some shrublands, are also important in controlling erosion and protecting the City's shoreline. The discussion below divides uplands into three major groups, as follows:

353.1.Sand Beach, Maritime Dunes, Erosional Bluffs, and Shrublands

These features are protected under NYSDEC's Coastal Erosion Management program (see Section 710). Few types of projects are now permitted in these areas, but they may include the following:

- Construction of walkways, pathways, boardwalks, or stairs over dunes and bluffs to the beach or along the beach.
- Construction of sheds, cabanas, and other small structures to accommodate equipment and activities at or near a beach.
- "Nonmajor" additions to existing structures.

Usually, the disruption caused by these activities is limited. However, it is appropriate to consider such possibilities as the loss of vegetation, including plant species that are endangered, threatened, exploitably vulnerable, or rare; reduction or loss of wildlife habitat; effect of increased public use; and compaction of soils or erosion from construction activities. In addition, where substantial development is proposed upland of a beach or dunes or atop a bluff, it is possible that issues of major erosion control protection may arise.

353.2. Maritime Grasslands and Sandy Oak Barrens

Except as listed in Section 150, above, these habitats are afforded no special regulatory protections. However, their fragility makes them susceptible to impact. They cannot tolerate much loss of vegetation; changes in adjacent habitats that act as buffers between these systems and more developed areas can lead to adverse impacts; and changes in drainage can be problematic.

When a project is proposed in or near one of these habitats, a detailed assessment is often appropriate. This may include identifying plant species and delineating the habitat; determining whether any species that are endangered, rare, or of special concern are present; characterizing the "buffer" habitats and their role in protecting the grasslands or barrens; and analyzing drainage patterns serving the habitat(s).

353.3. Meadows or Old Fields, Woodlands, and Gardens

These habitats are usually considered to be common and therefore are not often protected by specific regulation. For these as well as all other habitats discussed in this section, the CEQR analysis begins by assuming that they are valuable. Using the approach outlined in Sections 320 through 340, above, the resource is characterized according to its vegetation, potential for wildlife habitat, current use, and, as appropriate, the environmental systems that support it. It is then assessed giving consideration to the context of similar habitat in the area, and how the area is used by wildlife. For example, a small park with low shrubs that is located in a densely developed urban area could provide important habitat for nesting birds, but the same park located in a low-density area (such as R1 or R2 zones) would not necessarily be used for nesting.

As another example, in New York City mostly small patches of forest remain, although they are common Statewide. Only a handful of forests, mostly in parks, are large enough to support interior habitat. Thus, a relatively large wooded area, including its buffer—mowed lawn, weedy or shrubby edge, *etc.*—are important as wildlife habitat and refuge. The survival of forest communities rests on protecting large patches and their buffers, and also on protecting smaller patches that serve as wildlife corridors and seed sources.

354. Built Resources

Built resources may support species that are rare, threatened or endangered; such built resources are considered valuable, and their loss may constitute a potential significant adverse impact. Therefore, the assessment of such resources is focused on determining the extent to which such species may rely on these resources, and whether the loss of all or a part of the resource would result in a real loss of habitat, in the context of all such available habitat.

355. Significant, Sensitive, or Designated Resources

Where a project may affect one or more of the resources listed in Section 150, above, a detailed assessment is usually appropriate. This assessment can make use of information that is already available (many of these resources are the subject of ongoing study), but it may also require considerable field work. Before determining the scope of the assessment, it is recommended that the lead agency consult with either DEP or with the agency with jurisdiction over the resource.

400. DETERMINING IMPACT SIGNIFICANCE

The approach to determining impact significance takes into account that the City's natural resources are relatively scarce and precious, and any disturbance of their existing conditions may result in impacts to their ecological function.

In general, if a resource has been found to serve one or more of a number of natural or recreational functions, and a project would directly or indirectly diminish its size or its capacity to function (as determined in Section 300), the impact is considered to be significant. The following list is not all-inclusive, but serves as guidance in considering impact significance. An impact may be significant if any of the following are be true:

- A project would likely render a water resource unfit for one or more uses for which it is classified and/or cause or exacerbate a water quality violation.
- A project would, directly or indirectly, be likely to adversely affect a significant, sensitive, or designated resource as listed in Section 150, above.
- A project would likely diminish habitat for a resident or migratory endangered, threatened, or rare animal species or species of special concern.
- A project would likely result in the loss of plant species that are endangered, threatened, rare, vulnerable or rare for the City.
- A project would likely result in the loss of part or all of a resource that is important because it is large, unusual, the only one remaining in the area where the project is to take place, or occurs within a limited geographic region.
- A project would, either directly or indirectly, be likely to cause a noticeable decrease in a resource's ability to serve one or more of the following functions: wildlife habitat; food chain support; physical protection (flood protection, *e.g.*); water supply; pollution removal; recreational use; aesthetic or scenic enhancement; commercial productivity; or microclimate support.
- A project that would either directly or indirectly be likely to contribute to a cumulative loss of habitat or function which diminishes that resource's ability to perform its primary function; and that would be inconsistent with the current natural resources policies of the City.

500. DEVELOPING MITIGATION

If a significant impact on a natural resource is identified, then measures to mitigate or avoid the impact should be assessed. Mitigation measures fall under five general categories: avoidance, minimization, restoration, reduction, and compensation. The latter (compensation) should be used as a last resort to compensate for the unavoidable impacts remaining after the first four types of mitigation are investigated and implemented to the extent practicable. The five types of mitigation are discussed in more detail below:

510. AVOIDANCE

Avoidance techniques involve avoiding the impact by not taking a project or part of a project, or by simply relocating the project or part of a project. Avoidance techniques need to be identified very early in the design phase of a project when alternatives are being considered.. Adequate seasonal field assessments prior to developing site designs are critical in assessing specific information with respect to potential design alterations. Avoidance techniques are also employed during the construction phase of the project. These generally involve temporal or spatial constraints on construction. These include, but are by no means limited to, the following:

- Delaying or halting construction during ecologically sensitive time periods, such as fish spawning or wildlife breeding periods. These periods are often referred to as "environmental windows."
- Avoiding construction in ecologically important or sensitive areas by either eliminating a portion of a project or relocating it to a non-sensitive area.
- Avoiding the removal or disturbance of specific trees or plants that are known to be ecologically valuable.
- Avoiding the use of heavy equipment in areas vulnerable to the effects of compaction. For example, construction-related activities should not occur within a minimum of three times (3X) the dripline of any tree,

and heavy equipment and stored materials should not be placed or used within a minimum of three and one-half times the dripline of any tree.

- Restricting dredging to areas of low current velocity.
- Avoiding the removal, disturbance, or compaction of vegetation along stream banks and other shorelines.
- Limiting cleared areas to those required for construction and staging only; selecting the least vulnerable areas for clearing to the extent possible.

520. MINIMIZATION

Minimization involves minimizing the impact by limiting the degree or magnitude of the project and its implementation. Like avoidance techniques, minimization techniques also need to be employed very early in the design phase of a project when alternatives are being screened and eliminated. Minimization techniques can also be employed later in the process during the detailed design phase of the selected project. For example, fewer units in a development project, a building that is shorter or takes up less surface area (depending on the resource of concern), shallower dredging, or a parking lot with fewer or smaller parking spaces are all examples of limiting the degree or magnitude of a project to minimize impacts on natural resources. Often, engineering solutions can be employed to redesign a project so that the desired benefits can still be obtained from a project of smaller scale.

530. RESTORATION

Restoration involves minimizing the impact by restoring or enhancing the affected environment. This type of mitigation generally applies to reducing short-term construction related impacts, if possible. Examples of such restoration techniques include, but are not limited to: revegetation of denuded surfaces using indigenous plants; placement of appropriate soil that fully meets the requirements of the targeted restoration communities; removal of temporary structures, equipment, and other materials related to construction; and repairing accidental damage incurred during construction.

GENERAL RESTORATION GUIDELINES

The quality and appropriateness of a particular natural area landscape restoration depends on many factors. The creation and restoration of wetland (fresh and tidal) and upland ecosystems often fail because too little attention was given to some fundamental elements. To help improve the effectiveness of developing a long-term functioning target ecosystem, attention to the following is important:

1. The proposed site for a restoration project must be capable of supporting the targeted ecosystem (*e.g.*, proposed creation of freshwater wetlands should include sufficient watershed area for proper hydrological conditions).
2. Plant selection for a given restoration should be suitable and capable of thriving under proposed conditions (examples of improper plant selection include: placement of high shade requirement plants in full sun, placement of high moisture plants in dry locations, and placement of drier plants in too moist locations).
3. The soil substrate must be suitable for the targeted ecosystem. The appropriate soil depth is crucial, and a restoration site should have sufficient soil depth for type of vegetation proposed (min. 3.5’ for trees, 2’ for shrubs and 1.5’ for native grasses). In addition, the characteristics of the soil, including pH, organic matter, nutrients, salinity, *etc.*, should all be considered.
4. Implementation of and adherence to appropriate ecological landscape specifications and the use of effective erosion control measures are crucial in habitat restoration (*e.g.*, seeding or planting only within specified times, use of seed and plant material from local provenance, use of indigenous plant material, and replacement and maintenance of erosion control measures regularly).

5. Appropriate soil nutrient levels that are suitable and capable of supporting the targeted ecosystem should be established (*e.g.*, when planting a plant community with low nutrient requirements, avoid using high fertility soils and applying fertilizers or existing soils not suitable for targeted ecosystem).
6. Construction fill derived soils must not be used to construct a habitat, as these soils are limited in the plant communities that they can support (they have a high pH, often drain poorly or too much, contain high nutrients, and non-indigenous plants often colonize these soils). Frequent testing of soils is necessary to ensure appropriate growing conditions.

The following general techniques help to establish a functioning, biologically diverse wetland:

1. Establish gently rising slopes from the center of the wetland and stabilize these slopes with grasses and shrubs (this pertains only to the wetland itself; the area outside of the wetland boundary can have steeper slopes).
2. Plant trees on the wetland boundary for slight shading.
3. Maintain varying sediment depths in order to diversify plant communities.
4. Build isolated islands in the middle of the wetland.
5. Include some open water in the wetland.
6. Add boulders or logs as perching habitat for waterfowl.
7. Provide a properly maintained and functional goose exclusion fence. This is necessary to prevent geese predation until the plants have fully established themselves and have minimized exposed soil.

Monitoring and follow-up maintenance during the establishment period (3-5 years) are critical to the success of any restoration project (*e.g.*, proper watering, regular removal of invasive weeds, replacement of plant material or seeding at next available season and not at the end of the maintenance period).

540. REDUCTION

Reduction techniques involve reducing or eliminating the impact over time by preserving and maintaining the ecological integrity of the site and its surrounding areas to the extent practicable. Reduction techniques can be categorized into short-term or long-term methods. Such techniques include, but are not limited to, the following:

541. Short-term Reduction Techniques

- Use of properly installed and maintained silt fences, hay bales, mulches, temporary seeding of non-invasive grasses and other covers to limit areas of soil exposure and to stabilize slopes. Sediment and erosion control measures are often required by the City and State but are a frequently overlooked construction component. In all cases, if over one acre of upland construction disturbance is proposed, a “Stormwater Notice of Intent, Transfer, or Termination” form must be filed with the state and regional NYSDEC office citing the location of the site and compliance with any local or municipal erosion and sedimentation control techniques. Guidelines for sediment and erosion control can be found in the New York Standard and Specifications for Erosion and Sediment Controls (August 2005).
- Installing temporary drainage systems, including sediment traps, for the duration of construction.
- Limiting the use of chemicals and other potential pollutants for dust control and other construction activities.
- Strict control of the storage, handling, and transport of construction wastes.

- Limiting dewatering to the extent possible; disposing of such waters to maintain the existing drainage system and avoid surface water pollution.
- Incorporating noise or vibration controls in areas containing noise-sensitive species.
- Using environmentally friendly dredging techniques and equipment, such as silt screens, clamshell buckets or hydraulic dredging, no-barge-overflow or shunting, and split-hull barges, where appropriate.
- Frequent monitoring and observance of water quality conditions and standards.
- Employment of fish deterrent systems, if applicable.
- Employing monitoring and maintenance measures to ensure that control devices and other reduction techniques operate effectively during the period of disturbance.

542. Long-term Reduction Techniques

- Use of indigenous plant material requiring minimal use of supplemental watering, fertilizing, and herbiciding; use of pervious materials (e.g., gravel instead of blacktop) to promote infiltration of stormwater.
- Retention of stormwater on site and its slow recharge to the ground or overland to surface waters.
- Slope and surface protection, such as physical stabilization, or diversion of drainage around steeply sloped areas, grassed swales, or waterways.
- Streambank protection, such as physical stabilization.
- Water pollution controls including sediment traps or basins and drain inlet sediment filters or other stormwater best management practices.
- Use of pile foundations instead of regrading.
- Provision of tunnels under roadways for wildlife.

550. COMPENSATION

Compensation refers to replacing or substituting for the affected resource. This method of mitigation is often referred to as "compensatory mitigation" and should only be used as a last resort to mitigate for the unavoidable impacts remaining after the first four types of mitigation have been fully employed to the extent practicable. However, in all cases, sound scientific principles outlined by the Society of Ecological Restoration (SER) should direct all mitigation efforts.

There are three types of compensatory mitigation: creation, restoration, and acquisition. Creation refers to the creation of the same or similar type of habitat as that which is lost due to the project impacts. The creation of new habitats is recommended in areas of diminutive ecological value. Restoration refers to the improvement of a degraded but still partially functional habitat that is of the same or similar type as the habitat type that would be impacted. Acquisition refers to acquiring a parcel of land of the same or similar habitat type and protecting it from development in the future. Acquisition can also include a restoration component if the acquired property is degraded and can be improved to increase its habitat value. Measurements to ensure the protection of the resulting improved habitat should be undertaken.

All three types of compensatory mitigation should be accompanied by a commitment to monitor to ensure that the goals of the mitigation plan are met and the impacts from the project are fully compensated. Generally, monitoring is necessary for wetlands or forested areas to determine whether the system that is created or restored will eventually develop the full complement of intended ecological functions.

Compensatory mitigation can be either in-kind or out-of-kind. In-kind compensation refers to the creation, restoration, or acquisition of the same habitat type as the disturbed habitat type. Out-of-kind compensation refers to the creation, restoration, or acquisition of a habitat type that is different from the disturbed habitat type. In-kind compensation is preferred over out-of-kind compensation because it results in a more direct replacement of the lost resource. As a result, it is easier to determine that the value of the replaced or restored resource is equivalent to the value of the disturbed or impacted resource. Out-of-kind compensation may be selected on an individual case-by-case basis if in-kind compensation is not feasible. In addition, a combination of in-kind and out-of-kind techniques may be appropriate. In either case, the habitat value gained due to creating, restoring, or acquiring habitat should have as its objective to replace equivalent value lost due to the project impacts.

In addition to the preference for in-kind mitigation, it is also often preferred that mitigation activities take place as close as possible to the projected impacts. The possibility of mitigating for impacts on-site should first be explored. If this is not possible, then mitigation should take place as close as possible to the site. For example, if aquatic impacts are projected to occur as a result of a project, potential mitigation sites should be explored within the same waterbody. If this is not possible, mitigation sites should be selected within the same watershed.

When considering habitat creation as a compensatory mitigation technique, it is important to consider the existing habitat type from which the new habitat type would be created. Like the assessment of impacts of the project, an assessment of impacts of the compensatory mitigation activities must also be performed to ensure that the habitat to be created is not at the expense of another valuable habitat type that has its own ecological value. The objective is for the net increase in habitat value to replace the value of the impacted resource. Therefore, it is usually necessary for habitat creation to take place in existing degraded habitats that are of little to no ecological value. Similarly, when considering habitat restoration, it is important to consider the value of the existing habitat in order to determine the net increase in value that would occur from restoration and whether or not this increase would fully compensate for the project impacts.

The determination of habitat value is usually largely qualitative. One exception is the valuation of trees on land under the jurisdiction of NYCDPR, for which a quantitative calculation for replacement value of trees has been established. For these impacts, tree compensation using NYCDPR's basal area formula may be required. This entails calculating the basal areas (at breast height) of each tree that would be impacted, and replacing the total area of each species on a one-to-one ratio. For impacts to other habitats and trees on land not under NYCDPR jurisdiction, DEP, or other applicable expert agency may be consulted for guidance.

Another factor that must be considered in weighing the various compensatory mitigation techniques is the likelihood for success. Both restoration and creation can entail drastic changes in soil, hydrology, and vegetation. For example, some sites may require denuding and/or revegetating large areas or rechannelizing water courses. The proper soil conditions are essential to the success of a habitat creation or restoration project. When evaluating soils, the USDA Northeastern testing procedures, rather than the American Society for Testing and Materials (ASTM) testing procedure, should be used to determine whether existing soil conditions are appropriate for creation or restoration, or whether modified soil conditions are likely to support the intended habitat and its functions.

Although these activities may appear to be successful on a gross structural level, the system may take a long time to develop the full complement of ecological functions that a high quality natural area would have or it may never develop such functions. As mentioned previously, it is imperative that long-term monitoring (for at least five years) be an integral component of any compensatory mitigation plan to determine the success of a habitat creation or restoration effort.

Acquisition, the third type of compensatory mitigation, largely eliminates the uncertainty regarding the success of a compensatory mitigation effort, since the habitat, its necessary hydrological and soil characteristics, and its ecological functions often already exist (unless the site to be acquired is degraded, in which case restoration would also be a component of the proposed mitigation plan). However, since this technique neither increases the net acreage of the habitat in question nor does it always increase the value of the habitat (unless restoration is a component), mostly those sites that are in danger of development or degradation in the future should be considered as potential acquisition sites.

The Regional Plan Association, Trust for Public Land, HRE Comprehensive Restoration Program, Hudson River Foundation, NYC OASIS, the New York/New Jersey Harbor Estuary Program (HEP)'s Habitat Work Group (HWG) and numerous other environmental groups have identified a series of priority wetlands acquisition and restoration sites within the Harbor. Other sources that also contain lists of potential mitigation sites include the New York Open Space Plan and regional or project-specific mitigation plan reports. While these are excellent sources of potential mitigation sites that have already been identified and prioritized, they are not exhaustive lists. Furthermore, these sources may not identify sites that are of the same habitat type as, or in the vicinity of, the impacted habitat. For example, some of the HEP HWG priority list focus on wetland systems and therefore may not be applicable for compensatory mitigation for impacts on upland habitats. Therefore, it is necessary at least to attempt to identify appropriate mitigation sites that would provide in-kind mitigation in the vicinity of the impacts, if such potential sites are not already identified in other sources.

600. DEVELOPING ALTERNATIVES

Alternatives that can avoid or minimize impacts to natural resources and avoid the need for mitigation should be given first consideration. Such alternatives can include different sites as well as changes to project layout, design, and density.

700. REGULATIONS AND COORDINATION

710. REGULATIONS AND STANDARDS

There are many specific federal, state, and city rules and regulations governing natural resources. These permits are independent of CEQR, and may require their own environmental review. Typically, the permitting process is undertaken after the CEQR process is completed. However, applicants are encouraged to contact the regulatory agencies as early as possible to be certain the project is permittable and any mitigation aspects are identified. Since many projects undergoing CEQR review may be affected by permit requirements and conditions, applicants and lead agencies need to be aware of them. Those most commonly applicable for projects in New York City are described below.

711. Federal Regulations

- Section 404 of the Federal Clean Water Act: Dredge and Fill. Section 404 of the Federal Clean Water Act (33 USC 1344, jointly administered by EPA and the USACE) prohibits the discharge of dredged or fill material into the waters of the United States (including wetlands) without a permit from the USACE. These activities are regulated through Nationwide, Regional General, or Individual Permits.
- Section 10 of the Rivers and Harbors Act of 1899 (33 USC 403). Section 10 requires a permit for construction of structures on or affecting navigable waters of the United States. For the permit to be issued, the project must not obstruct or alter navigable waters, present a significant adverse effect on the aquatic environment, or result in violations of water quality criteria. As for Section 404 of the Clean Water Act, these activities can be authorized by Nationwide, Regional General, or Individual Permits, described above.
- Section 401 of the Clean Water Act (33 USC 1341). Section 401 requires a Water Quality Certificate to be issued for all discharge activities within the waters of the United States (including wetlands). In New York State, this certificate is issued by NYSDEC. This certification requires evidence that the project would not cause a violation of water quality standards. This certification is required for Individual Permits issued by the USACE (see above); it has already been issued for some of the Nationwide and Regional General Permits.
- Section 402 of the Clean Water Act: National Pollutant Discharge Elimination System (NPDES) Program (33 USC § 1342). Under the NPDES program, any point source discharge and storm-water discharges

associated with industrial activities and municipal separate storm sewer systems require a permit. The State of New York is authorized to administer the NPDES program under its own State program (see the discussion of SPDES, below).

- Flood Insurance Acts. The National Flood Insurance Act of 1968 and National Flood Insurance Reform Act of 1994 (42 USC § 4001) and the Flood Disaster Protection Act of 1973 (Public Law 93-234). These acts designate coastal high hazard areas and floodways and make federal flood insurance available to buildings and structures within those areas that are constructed so as to minimize danger to human lives, in accordance with federal guidelines.
- Essential Fish Habitat (EFH) Portions of the New York Harbor waterways are listed by the National Marine Fisheries Service (NMFS) as essential for one or more life stages of commercially and/or recreationally important fishes. This designation can limit, typically via the permitting process, the types and timing of in-water work. Early coordination with NMFS as part of the CEQR process can identify potential constraints on work schedules (environmental windows) or the need for additional habitat protection techniques, such as silt curtains or environmentally friendly dredging techniques.
- Coastal Zone Management Act of 1972 (16 USC §§ 1451 to 1465). The Coastal Zone Management Act of 1972 established a voluntary participation program to encourage coastal states to develop programs to manage development within the state's designated coastal areas to reduce conflicts between coastal development and protection of resources within the coastal area. Federal permits issued in New York State must be accompanied by a Coastal Zone Consistency Determination that evaluates consistency with New York State's federally approved coastal zone management program.
- Magnuson-Stevens Act (16 USC §§ 1801 to 1883). Section 305(b)(2)-(4) of the Magnuson-Stevens Act outlines the process for NMFS and the Regional Fishery Management Councils (in this case, the Mid-Atlantic Fishery Management Council) to comment on activities proposed by federal agencies that may adversely impact areas designated as Essential Fish Habitat (EFH). EFH is defined as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (16 USC §1802(10)). Adverse impacts, as defined in 50 CFR 600.910(A), include any impacts that reduce the quality and/or quantity of EFH. Examples include: direct impacts, such as physical disruption or the release of contaminants; indirect impacts, such as the loss of prey or reduction in the fecundity (number of offspring produced) of a managed species; and site-specific or habitat-wide impacts that may include individual, cumulative or synergistic consequences of a Federal action.
- Endangered Species Act of 1973 (16 USC §§ 1531 to 1544). The Endangered Species Act of 1973 recognizes that endangered species of wildlife and plants are of aesthetic, ecological, educational, historical, recreational, and scientific value to the nation and its people. The Act provides for the protection of these species, and the critical habitats on which they depend for survival.
- Fish and Wildlife Coordination Act (PL 85-624; 16 USC §§ 661-667d). The Fish and Wildlife Coordination Act entrusts the Secretary of the Interior with providing assistance to, and cooperating with, federal, state and public or private agencies and organizations, to ensure that wildlife conservation receives equal consideration with other water-resource development programs. These programs can include the control (such as a diversion), modification (such as channel deepening), or impoundment (through the construction of a dam) of a body of water.
- Executive Order 11988 (Flood Plain Management). Executive Order 11988 requires that agencies provide leadership and take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains.
- Executive Order 11990 (Protection of Wetlands). This Executive Order directs federal agencies to provide leadership and take action to minimize the destruction, loss or degradation of wetlands, and to

preserve and enhance wetland quality. New activities in wetlands, either undertaken or supported by a federal agency, are to be avoided unless there is no practicable alternative and all practical measures have been taken to minimize the potential impacts to the wetlands.

712. State Regulations

- Protection of Waters, Article 15, Title 5, New York State Environmental Conservation Law (ECL), Implementing Regulations 6 NYCRR Part 608. NYSDEC is responsible for administering Protection of Waters regulations to prevent undesirable activities within surface waters (rivers, streams, lakes, and ponds). The Protection of Waters permit program regulates five different categories of activities: disturbance of stream beds or banks of a protected stream or other watercourse; construction, reconstruction or repair of dams and other impoundment structures; construction, reconstruction or expansion of docking and mooring facilities; excavation or placement of fill in navigable waters and their adjacent and contiguous wetlands; and Water Quality Certification for placing fill or other activities that result in a discharge to waters of the United States in accordance with Section 401 of the CWA.

- State Pollutant Discharge Elimination System (SPDES) (N.Y. Environmental Conservation Law [ECL] Article 3, Title 3; Article 15; Article 17, Titles 3, 5, 7, and 8; Article 21; Article 70, Title 1; Article 71, Title 19; Implementing Regulations 6 NYCRR Articles 2 and 3) Title 8 of Article 17, ECL, Water Pollution Control, authorized the creation of the State Pollutant Discharge Elimination System (SPDES) to regulate discharges to the state's waters. Activities requiring a SPDES permit include: point source discharges of wastewater into surface or ground waters of the State, including the intake and discharge of water for cooling purposes; constructing or operating a disposal system (sewage treatment plant); discharge of stormwater; and construction activities that disturb one acre or more.

- Waterfront Revitalization of Coastal Areas and Inland Waterways Act (Sections 910-921, Executive Law, Implementing Regulations 6 NYCRR Part 600 *et.seq.*) Under the Waterfront Revitalization of Coastal Areas and Inland Waterways Act, NYSDOS is responsible for administering the Coastal Management Program (CMP). The Act also authorizes the State to encourage local governments to adopt Waterfront Revitalization Programs (WRP) that incorporate the state's policies. New York City has a WRP administered by the Department of City Planning.

- Tidal Wetlands Act, Article 25, ECL, Implementing Regulations 6 NYCRR Part 661. Tidal wetlands regulations apply anywhere tidal inundation occurs on a daily, monthly, or intermittent basis. In New York State, tidal wetlands occur along the salt-water shore, bays, inlets, canals, and estuaries of Long Island, New York City and Westchester County, and the tidal waters of the Hudson River up to the salt line. NYSDEC administers the tidal wetlands regulatory program and the mapping of the state's tidal wetlands. A permit is required for most activities that would alter wetlands or the adjacent areas (up to 300 feet inland from wetland boundary or up to 150 feet inland within New York City).

- Freshwater Wetlands Act, Article 24, ECL, Implementing Regulations 6 NYCRR Part 662 The Freshwater Wetlands Act requires NYSDEC to map freshwater wetlands protected by the Act (12.4 acres or greater in size containing wetland vegetation characteristic of freshwater wetlands as specified in the Act). Around each mapped wetland is a protected 100-foot buffer. In accordance with the Act, the NYSDEC ranks wetlands in one of four classes that range from Class 1, which represents the greatest benefits and is the most restrictive, to Class IV. The permit requirements are more stringent for a Class I wetland than for a Class IV wetland. Certain activities (*e.g.*, normal agricultural activities, fishing, hunting, hiking, swimming, camping or picnicking, routine maintenance of structures and lawns, and selective cutting of trees and harvesting fuel wood) are exempt from regulation. Activities that could have negative impact on wetlands are regulated and require a permit if conducted in a protected wetland or its adjacent area.

- Floodplain Management Criteria for State Projects (6 NYCRR 502). Under 6 NYCRR 502, all state agencies are required to ensure that the use of state lands, and the siting, construction, administration and disposition of state-owned and state-financed projects involving any change to improved or unimproved real estate, are conducted in ways that would minimize flood hazards and losses. Projects are required to consider alternative sites on which the project could be located outside the 100-year floodplain. Projects to be located within the floodplain are required to be designed and constructed to minimize flood damage, and to include adequate drainage to reduce exposure to flood hazards. All public utilities and facilities associated with a project are also required to be located and constructed to minimize or eliminate flood damage. The regulations specify that for nonresidential structures, the lowest floor should be elevated or flood-proofed to not less than one foot above the base flood level, so that below this elevation the structure, together with associated utility and sanitary facilities, is watertight, with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy. No project may be undertaken unless the cumulative effect of the proposed project and existing developments would not cause material flood damage to the existing developments.
- Freshwater Wetlands Protection Program—Article 24 of the New York State Environmental Conservation Law (ECL); implementing regulations 6 NYCRR, Parts 662-665. To implement the State policy to preserve, protect, and conserve freshwater wetlands, and to regulate the use and development of such wetlands, NYSDEC created the Freshwater Wetlands Protection Program, which protects freshwater wetlands of 12.4 acres or larger. Smaller wetlands can also be protected if the Commissioner of NYSDEC has determined that they have unusual local importance. All of the protected wetlands are identified on maps prepared by the NYSDEC. The Freshwater Wetlands Act provides for the regulation of activities in freshwater wetlands and adjacent areas. Adjacent areas are the areas outside the wetlands that extend 100 feet from the wetland boundary. Permits are required for most activities within the wetlands and adjacent areas.
- Tidal Wetlands Protection Program—ECL Article 25; 6 NYCRR Parts 660 and 661. To implement the State policy to preserve and protect tidal wetlands, NYSDEC created the Tidal Wetlands Protection Program, which regulates all tidal wetlands identified on maps prepared by the NYSDEC and adjacent areas. For New York City, adjacent areas generally include the area within 150 feet of the most landward boundary of the tidal wetland, with certain exceptions. Roadways (built prior to August 20, 1977), railroad lines, bulkheads, and a ten foot rise in elevation are examples of physical conditions that can limit the extent of the buffer or adjacent area (6 NYCRR Part 661.4). Permits are required for most activities within tidal wetlands and adjacent areas.
- Classification of Waters—Article 6 of the New York State Public Health Law; 6 NYCRR Part 800. Under this program, the State Water Pollution Control Board adopts and assigns classifications and standards on the basis of the existing or expected best usage of the State's waters.
- Use and Protection of Waters Program—Article 15, ECL Title 5; 6 NYCRR Part 608. The Protection of Waters Program regulates the following types of activities: disturbance of the bed or banks of a protected stream or other watercourse (those classified as AA, A, B, or C; lower classifications are not regulated under the Protection of Waters Program); construction and maintenance of dams or artificial obstructions in or across a natural stream or watercourse; excavation and/or filling in navigable waters, including adjacent marshes and wetlands. This includes conducting any activity that may result in any discharge or runoff into navigable waters. Any work in the water, even if undertaken under a Nationwide Permit (see the federal regulations, above), requires a Protection of Waters permit.

- State Pollutant Discharge Elimination System (SPDES) Program—Water Pollution Control Act (ECL Article 17); 6 NYCRR Parts 750-757. The SPDES Program is designed to regulate the discharge of pollutants into New York waters and to maintain the highest quality of water possible, consistent with public health and enjoyment of the resource, protection and propagation of fish and wildlife, and industrial development in the state. SPDES permits are required for construction or use of an outlet or discharge pipe (referred to as "point sources") of wastewater discharging into the surface waters or ground waters of the State; or construction or operation of disposal systems, such as sewage treatment plants, or subsurface systems with a usage of 1,000 gallons per day or more.
- Endangered and Threatened Species Program—ECL Articles 9 and 11; 6 NYCRR Parts 182 and 193. Similar to the federal protections, DEC maintains a list of plant and animal species that are protected. Endangered and Threatened Species of Fish and Wildlife; Species of Special Concern (ECL, Sections 11-0535[1]-[2], 11-0536[2], [4], Implementing Regulations 6 NYCRR Part 182). These regulations prohibit the taking, import, transport, possession or selling of any endangered or threatened species of fish or wildlife, or any hide, or other part of these species, as listed in 6 NYCRR §182.6. Plants listed in 6 NYCRR Part 193 and animals listed in 6 NYCRR Part 182 or 6 NYCRR Parts 182 and 193 are protected by State law: it is illegal to pick, damage, or destroy any protected plants on property not owned by the individual, to apply any defoliant or herbicide, or to carry these plants away without the owner's consent; it is also illegal to hunt, import, export, or possess protected animals.
- Coastal Management Program (CMP). The CMP established 44 policies that are applicable to development and use proposals in the state's coastal area and allowed local municipalities to enact their own local waterfront revitalization programs to implement these and other applicable policies. New York City's Waterfront Revitalization Program was established under the CMP (see discussion below).
- Coastal Erosion Hazard Areas Act—ECL Article 34; 6 NYCRR Part 505. Under this Act, NYSDEC established a Coastal Erosion Hazards Area, identified on maps. Activities in this area are regulated to minimize or prevent damage or destruction to structures, buildings, property, natural protective features, and other natural resources, and to protect human life. Permits are required for most activities in a designated Coastal Erosion Hazard Area.
- Flood Hazard Areas—ECL Article 36; 6 NYCRR Part 500. A permit is required for any development within the federally designated flood hazard areas.
- New York Natural Heritage Program. The Natural Heritage Program is administered by the NYSDEC and is intended to identify all natural and artificial ecological communities and rare species that represent the full array of ecological and biotic diversity in New York State. The program focuses on the status and distribution of rare plant and animal species and valuable natural communities because they are most at risk of elimination in the State and globally. All of the habitats and species listed in the program are given a ranking indicating their rarity both globally and in the state. Although the Natural Heritage Program rankings do not provide legal protection, they can be used for assessment of a project's impacts on rare species and recommended environmental studies for the CEQR and permitting process.
- Significant Coastal Fish and Wildlife Habitats— Waterfront Revitalization and Coastal Resources Act (Executive Law of New York, Article 42). Under this program, NYSDEC recommends for designation by the Department of State areas it considers significant coastal fish and wildlife habitats. These are habitats that are essential to the survival of a large portion of a particular fish and wildlife population; that support populations of protected species; that support fish and wildlife populations that have significant commercial, recreational, or educational value; and/or that are types not commonly found in the state or region.

- Critical Environmental Areas—6 NYCRR Part 617.14 (g). A state or local agency may designate a specific geographic area as having exceptional or unique characteristics that make the area environmentally important. The impairment of the environmental characteristics of a critical environmental area is one of the criteria for determining the significance of a project Part 617.7(c)(1)(iii).

713. New York City Regulations and Policy Documents

- Waterfront Revitalization Program (WRP). The City's WRP also established a Coastal Zone, within which all discretionary waterfront projects must be reviewed for consistency with coastal zone policies. This program is administered by the NYCDCP. This is discussed in detail in Chapter 4 of this Manual.
- Local Law 33 of 1988. This law requires that all habitable space be built at an elevation at or above the 100-year flood level.
- New York City Zoning Resolution. The Zoning Resolution includes several districts with special zoning designed to preserve unique natural features. These include the Special Natural Area Districts (Staten Island, Queens and the Bronx), the Special Hillsides Preservation District (Staten Island), and the Special South Richmond Development District (Staten Island).
- 197-a Plans and Other Planning Initiatives. Other plans and public policy can also include regulations to protect natural resources.

714. Public Policies

The City has addressed or is addressing other aspects of wetlands and natural area protection through other planning processes, reports, and policies. These include (1) The New York City Wetlands: Regulatory Gaps and Other Threats (January 2009), with suggestions for the identification and protection of urban wetland systems; (2) The Wetlands Transfer Task Force (WTTF) report issued in September 2007 pursuant to Local Law 83, recommending the transfer of city-owned properties containing wetlands to NYCDPR; (3) DEP's Jamaica Bay Watershed Protection Plan in October 2007, with an update in October 2008; (4) The City's Sustainable Stormwater Management Plan in December 2008 to help reduce sources of point and non-point stormwater pollution; and (5) the City's comprehensive planning effort to adapt wetlands and other critical infrastructure to sea level rise and other effects of climate change.

- No Net Increase in Nitrogen. New York, New Jersey, and Connecticut have agreed to keep the level of nitrogen discharged into the waters that affect Long Island Sound at or below 1990 levels, to avoid the negative effects that can result from excess nitrogen. This is important in areas of the Bronx and Queens that border the Sound or the Upper East River, which directly affects the Sound.
- *PlaNYC*. PlaNYC is a comprehensive sustainability plan for the City's future, and is discussed in Chapter 4, "Land Use, Zoning, and Public Policy."
- *2008 Sustainable Stormwater Management Plan* (2008 Sustainable Stormwater Management Plan). The Sustainable Management Plan is a key initiative of PlaNYC, the City's plan for a greener, greater New York. PlaNYC's water quality goal is to improve public access to our tributaries from 48 percent today to 90 percent by 2030. The Plan is the product of an interagency task force. It is the City's first comprehensive analysis of the costs and benefits of those alternative methods for controlling stormwater. The Plan provides a framework for testing, assessing, and implementing small installations to control stormwater at its source, which are known by various terms – source controls, green infrastructure, low impact development, best management practices, or BMPs.
- *2009 New York City Wetlands: Regulatory Gaps and Other Threats*. This report provides a summary of current federal, state and local rules and regulations regarding wetlands. The current regulatory structure does provide some protection for certain wetlands in New York City. The somewhat overlapping

Federal, State, and local regulatory regimes, however, contain gaps that may leave critical remaining wetlands vulnerable to a variety of direct and indirect pressures. This white paper identifies those gaps and suggests general approaches to adequately preserve and protect the City's wetlands.

- *Jamaica Bay Protection Plan (JBWPP).* Local Law 71 of 2005 mandates that the City asses the "technical, legal, environmental and economical feasibility" of a diverse set of protection approaches for Jamaica Bay to develop a comprehensive approach toward maintaining and restoring the ecosystems within the bay. In October 2007, NYCDEP published the JBWPP. The JBWPP is intended to provide an evaluation of the current and future threats to the bay and ensure that environmental remediation and protection efforts are coordinated in a focused and cost-effective manner. Under the JBWPP, the Mayor's Office of Environmental Coordination should ensure that actions subject to CEQR address any potential impacts to Jamaica Bay and identify stormwater management measures that could be implemented as part of an environmental assessment. Consequently, all projects within the Jamaica Bay watershed that undergo CEQR review must complete the Jamaica Bay Watershed Form.

720. APPLICABLE COORDINATION

When a project is subject to any of the regulations listed above, coordination with the appropriate regulatory agency is required.

730. KEY SOURCES OF INFORMATION

- Edinger, G.J., D.J. Evans, S. Gebauer, T.G. Howard, D.M. Hunt, and A.M. Olivero (editors). 2002. *Ecological Communities of New York State*. Second Edition. A revised and expanded edition of Carol Reschke's Ecological Communities of New York State. (Draft for review). New York Natural Heritage Program, New York State Department of Environmental Conservation, Albany, NY.
- Zar, J.H. 2009. *Biostatistical Analysis*, 5th Edition. Prentice Hall, New York, NY. 960pp.
- Shannon-Weiner Index: Weiner, N. 1948. *Cybernetics, or Control and Communication in the Animal and the Machine*. The M.I.T. Press, Cambridge, MA
- Water Environment Research Federation (WERF), *Water Quality Models: A Survey and Assessment*.

740. LOCATION OF INFORMATION

731. Regulatory Agencies

- New York City Environmental Protection

  59-17 Junction Boulevard
  Flushing, Queens, NY 11373
  Phone: 212-639-9675
  www.nyc.gov/dep

- New York City Department of Parks and Recreation

  The Arsenal, Central Park
  830 Fifth Avenue
  New York, NY 10065
  Phone: 212-360-8111
  www.nycgovparks.org

- New York State Department of Environmental Conservation (NYSDEC)

Regional Office, Region 2
Hunters Point Plaza
47-40 21st Street
Long Island City, NY 11101-5407
Phone: 718-482-4900

- NYSDEC- Division of Fish, Wildlife and Marine Resources (DFWMR)

  New York Natural Heritage Program-Information Services
  625 Broadway, 5th Floor
  Albany, NY 12233-4757

- New York State Department of State

  99 Washington Avenue, Suite 1010
  Albany, NY 12231

- U.S. Army Corps of Engineers

  Department of the Army
  ATTN: Chief, Regulatory Branch
  New York District, Corps of Engineers
  26 Federal Plaza, Suite 2109
  New York, NY 10278-0090
  Phone: 212-264-6730 or 0182
  www.usace.army.mil

- U.S. Environmental Protection Agency

  Region 2
  290 Broadway
  New York, NY 10007
  Phone: 212-637-3000
  www.epa.gov/region02

- United States Fish and Wildlife Service (NYC Projects)

  Long Island Field Office
  3 Old Barto Road
  Brookhaven, NY 11719

- U.S. Fish and Wildlife Service

  300 Westgate Center Drive
  Hadley, MA 01035-9587
  Phone: 413-253-8200
  For National Wetlands Inventory and Endangered Species Program information

- National Park Service

  Gateway National Recreation Area

Headquarters, Building 69, Floyd Bennett Field
Brooklyn, NY 11234
Phone: 718-354-4520
www.nps.gov

- National Oceanic and Atmospheric Administration (NOAA); National Marine Fisheries Service (NMFS)

  Assistant Regional Administrator for Habitat Conservation
  Habitat Conservation Division
  Attention: EFH Coordinator
  1 Blackburn Drive
  Gloucester, MA 01930

- NOAA-NMFS-Protected Resources Division

  Assistant Regional Administrator for Protected Resources
  NOAA National Marine Fisheries Service
  Protected Resources Division
  Attention: Endangered Species Coordinator
  1 Blackburn Drive
  Gloucester, MA 01930

- Federal Emergency Management Agency

  500 C Street SW
  Washington, DC 20472
  Phone: 202-646-2500
  www.fema.gov

732. Other Sources

- Agencies and Foundations

  U.S. Department of Agriculture
  Soil Conservation Service
  1400 Independence Ave, SW
  Washington, D.C. 20250
  Phone: 202-720-7327
  www.usda.gov

- United States Department of Agriculture - Natural Resources Conservation Service (NRCS)

  1400 Independence Ave, SW
  Washington, DC 20250
  Phone: 202-720-7246
  www.nrcs.usda.gov

- Hudson River Foundation for Environmental Research

  17 Battery Place

Suite 915
New York, NY 10004
Phone: 212-483-7667
www.hudsonriver.org

- Society for Ecological Restoration

  285 W. 18th Street
  Suite 1
  Tucson, Arizona 85701
  Phone: 520-622-5485
  www.ser.org

- SER Mid-Atlantic Chapter: http://www.ser.org/midatl/default.asp
- New York Public Library – Science, Industry and Business Library

  188 Madison Avenue
  New York, NY 10016
  Phone: 212-592-7000
  www.nypl.org/research/sibl

- City University of New York – Graduate School Library

  365 Fifth Avenue
  New York, NY 10016-4309
  Phone: 212-817-7000
  www.gc.cuny.edu

- Queens College Library

  65-30 Kissena Boulevard
  Flushing, NY 11367-1597
  Phone: 718-997-3700
  http://qcpages.qc.cuny.edu/Library

- Brooklyn Botanic Garden Library

  900 Washington Avenue
  Brooklyn, NY 11225
  718-623-7200
  http://www.bbg.org/research/library/

- New York Botanical Garden – Mertz Library

  Bronx River Parkway at Fordham Road
  Bronx, NY 10458
  718.817.8700
  http://library.nybg.org/

- American Museum of Natural History Research Library

  Central Park West at 79th Street
  New York, NY 10024-5192
  (212) 769-5400
  http://library.amnh.org/index.php

- Rutgers University Library of Science and Medicine

  Rutgers, The State University of New Jersey
  165 Bevier Road
  Piscataway, New Jersey 08854-8009
  (732) 445-4322
  www.rutgers.edu

- New York City Department of City Planning Bookstore

  22 Reade Street
  New York, NY 10007-1216
  Phone: 212-720-3667 or 3668
  www.nyc.gov/html/dcp/html/pub/publist.shtml