Slopes

Background
Steep topographical features can bring special character to a community, often providing scenic vistas, hiking opportunities, and natural beauty. Steep slopes are environmentally sensitive, however, and require special attention during land-use planning because they are vulnerable to soil erosion, excessive stormwater runoff, and slope instability. Disturbance of steep slopes can introduce sediment and impact the quality of adjacent water resources.

What to include
A slopes map can display steepness in the study area by percent slope class, based on a digital elevation model (DEM). DEMs with 10-meter spacing are available for most of New York through a partnership between USGS and DEC. These DEMs were produced using contour lines compiled for USGS 7.5-minute quadrangle maps, and are hosted by Cornell University Geospatial Information Repository (CUGIR). More recently, higher-resolution DEMs have been created using LIDAR (light detection and ranging) data in some parts of New York State. Check the NYS GIS Clearinghouse to find the finest-scale data available for the study area. Note that creating a map of slopes using a DEM entails an analysis that may require the assistance of a consultant or GIS professional. General data and narrative about slope can also be obtained from county soil surveys. To help with interpretation of the slopes map in the NRI, describe the significant topographical features and steepness characteristics of the study area in the report.

Where to find help
See Appendix A for organization contact information and Appendix C for sources of GIS data.

Cornell University Geographic Information Repository
Digital elevation models for New York State

New York State Orthos Online interactive mapping tool
High-resolution digital elevation models for selected areas of New York State

WATER RESOURCES

Groundwater and Aquifers

Background
At least one-quarter of New Yorkers depend on groundwater supplies for drinking water, and many Hudson Valley communities depend entirely on groundwater. Groundwater also supports habitats and species, and is particularly important during dry periods when it is often the dominant source of water flowing in streams and rivers. Groundwater is found between grains of sand, gravel, silt, or clay (unconsolidated sediments) or in the cracks and fractures of bedrock (consolidated sediments). The saturated geologic zones in sediments and bedrock that receive, store, and transmit significant amounts of water to wells and springs are called aquifers. The upper surface of the saturated zone is called the water table. Groundwater is recharged when rain and melting snow slowly infiltrate through the soil. The land surface principally contributing to aquifer recharge is called the aquifer recharge area. This is generally all watershed land areas aside from streams and their riparian margins, which are aquifer discharge areas.

An assumption is often made that groundwater is less vulnerable to spills and pathogens than surface water and less likely to be contaminated. In reality, aquifers can become polluted by a variety of mechanisms, including chemical spills, leaking buried sources such as landfills or underground storage tanks, road salt, common household use of herbicides and other chemicals, and improperly spaced or poorly installed septic systems. A wellhead protection area, usually a subset of the larger aquifer recharge area, is the area surrounding and upgradient of a public water supply well or well field of interest. Wellhead protection programs seek to limit contaminants in such areas to limit water quality risks to well water.

Regional aquifer depletion is rare in New York, but local groundwater overuse occurs when water withdrawal exceeds local recharge and can result in nearby wells running...
What to include

The location and extent of aquifers should be mapped, as well as a visual representation of areas covered through local aquifer protection ordinances, if any. Unconsolidated aquifers in New York State, consisting typically of valley-fill glacial outwash deposits, were coarsely mapped at a scale of 1:250,000 by USGS in partnership with DEC and are available on the NYS GIS Clearinghouse. Most other lands overlie bedrock formations sufficiently fractured to support modest water uses (domestic wells and occasional high-capacity wells) and should be recognized in NRI assessments as bedrock aquifers. Detailed maps of specific wellhead protection areas may be available from county agencies or from a municipal or private water supplier.

Detailed inventory studies

Additional groundwater information may be obtained from well reports, published groundwater studies, unpublished consultant reports, well constructors, source water assessment reports, county soil surveys, and county health departments. Examples of information that can be gleaned from these existing sources include:

- consolidated (bedrock) and unconsolidated (sand and gravel) aquifer locations and yield
- aquifer discharge areas, typically consisting of all perennial streams and non-isolated ponds/lakes and their associated riparian wetlands, as well as all other non-isolated wetlands; all other areas should be considered as recharge areas
- any wellhead protection areas of interest

A comprehensive groundwater resources study can help communities to interpret and understand their groundwater resources. By analyzing the existing groundwater information and providing any additional necessary documentation, the comprehensive study can identify areas where groundwater protection is appropriate, look for potential conflicts between land use and groundwater resources, address wellhead or groundwater protection plans, and assess wastewater treatment systems. Comprehensive groundwater studies require professional expertise and are typically prepared by consultants. The New York Rural Water Association is a nonprofit organization that has experience preparing wellhead protection plans and has completed groundwater assessments as well.

Groundwater assessments and reports may be available from the DEC’s Ambient Groundwater Monitoring Program, which seeks to document the quality of New York State’s groundwater, identify long-term groundwater quality trends, characterize naturally occurring conditions, and establish an initial statewide comprehensive groundwater quality baseline.

Where to find help

See Appendix A for organization contact information, Appendix B for publications and web resources, and Appendix C for sources of GIS data.

Dec Division of Water
- Unconsolidated aquifers, Ambient Groundwater Monitoring Program reports and data

NYS Department of Health Source Water Assessment Program
- Source water assessments, maps

County health department
- Water assessments

County planning department or regional planning commission
- Well locations and yields, maps

Local water supplier
- Well locations and yields

New York Rural Water Association
- Local source water assessments, aquifer locations, groundwater quality, maps

Dry along with impacts to waterbodies and habitats that depend on groundwater for base flow. Excessive extraction can harm fish and other aquatic organisms by changing the stream flows and water temperatures they rely on for survival and successful reproduction. Buildings, parking lots, and roads can interfere with groundwater recharge if adjacent areas do not allow compensatory recharge and may reduce recharge volumes considerably, exacerbating the effects of overconsumption.
Watersheds

Background
A watershed is the area of land from which water drains into a stream, river, lake, or other waterbody. Watersheds are divided by high points on the land, such as ridges, mountains, and hills and may be made up of many smaller drainage areas, or subwatersheds. A subwatershed that drains a small creek can be encompassed by a single parcel. At the regional scale, watersheds are more complex. For example, the Wappinger Creek watershed in Dutchess County spans thirteen towns and includes a number of tributaries, each with its own subwatershed. Similarly, the Wappinger Creek watershed itself is a subwatershed of the larger Hudson River watershed, which drains about 13,500 square miles of land into the Atlantic Ocean at New York Harbor. Healthy watersheds, including both land and water resources, can recharge groundwater, reduce erosion and flooding impacts, minimize public infrastructure and water treatment costs, and be more resilient to climate change. All of these benefits contribute to the health and safety of human communities.

A watershed is the area of land that drains into a stream, river, lake, or other waterbody.

Watersheds provide logical units to study and manage water resources because issues such as water quality and water quantity commonly extend beyond both property and political boundaries. Mapped watershed boundaries also provide a quick visual reference of how surface waters relate to each other and other features, such as adjacent steep slopes or floodplains. The particular land-use questions under consideration will determine the appropriate watershed scale to evaluate. An NRI can be conducted on a watershed scale involving several towns within a single watershed, or a municipality can choose to focus inventory efforts on local subwatersheds occurring within and adjacent to its borders. This approach may help focus an inventory on a priority area and be more easily accomplished.

What to include
Regional watersheds and subwatersheds should be mapped at a regional scale showing the study area’s context, and the narrative can make reference to any ongoing watershed management efforts or groups, such as local watershed associations or intermunicipal agreements. A regional map can include other major features such as significant biodiversity areas and major forest blocks and linkage zones, described later in this guide. Standard watershed boundaries for the entire US have been created through the USGS National Hydrography Dataset in a nested hierarchy by size. Each watershed is assigned a Hydrologic Unit Code (HUC). Size 10-digit HUC watershed boundaries correspond approximately to the regional-scale tributary watershed boundaries of the Hudson River. Size 12-digit HUC subwatershed boundaries encompass about 60 square miles each and are the finest-scale USGS data available for New York State. 12-digit HUC data can be the most useful watershed units for municipalities because they often fall within jurisdictional boundaries and match the scale of potential local impacts, thus making it easier for towns to address issues. The National Hydrography Dataset can be viewed online using the USGS Hydrography Viewer and GIS data can be obtained from the USGS website. In the Hudson Valley, the Hudson River Watershed Alliance’s Watershed Atlas provides online maps of major and subwatershed boundaries and surface water resources.

Finer-scale subwatershed boundaries can be mapped with the USGS StreamStats Program or GIS. Note that some local watersheds may have already been delineated and digitized by watershed associations or county agencies.
Where to find help
See Appendix A for organization contact information, Appendix B for publications and web resources, and Appendix C for sources of GIS data.

United States Geological Survey
HUC watershed delineations, StreamStats tool for local watershed delineation

DEC Hudson River Estuary Program
Technical and mapping assistance

Hudson River Watershed Alliance
Watershed Atlas maps, information on local watershed groups, watershed plans, and intermunicipal agreements

Local watershed association
Maps, watershed assessments and plans

County agencies (such as planning department, soil & water conservation district, or Cornell Cooperative Extension)
Maps, watershed plans

Streams and Waterbodies

Background
Streams, reservoirs, lakes, and ponds and their adjacent riparian (streamside) habitats provide critical benefits to communities, including clean water, flood management, and recreational opportunities like fishing and kayaking. The health of the Hudson River estuary is closely linked to the health of its tributaries and their watersheds.

There are various classification systems for surface water systems based on a range of physical conditions, habitat values, and human uses, including hydrology, flow, average depth, surface area, temperature, habitat structure, water quality, sensitivity to pollutants, and recreational uses, among other attributes. A basic NRI may simply document known streams and waterbodies, while detailed inventory studies can research characteristics relevant to local water resource concerns and interest.

Perennial streams flow continuously throughout years with normal precipitation, but some may dry up during droughts. Intermittent streams only flow seasonally or after rain. They can easily be overlooked when dry, but have great impact on the water quality and quantity of larger downstream waters and warrant attention. Stream barriers, such as dams and poorly designed and installed culverts, can have serious effects on stream habitat, local flooding, and water quality. Bridges, open-bottom culverts and similar structures that completely span a waterway and associated riparian area and floodplain usually have the least impact on streams. Stream habitat values are discussed further in the Stream and Riparian Habitat section.

Poorly planned development in a watershed can dramatically increase the amount of stormwater runoff, chemicals, sediment, and other contaminants entering streams and waterbodies, threatening water quality, degrading habitat value, and increasing flood risk. Precipitation has become more variable and extreme with climate change in the Northeast, exacerbating these threats. Annual rainfall occurring in heavy downpour events increased 74% between the periods of 1950-1979 and 1980-2009, and most areas of the Hudson Valley have been impacted by serious flooding in recent years (Rosenzweig et al. 2011). Thorough documentation of streams and waterbodies in an NRI can help communities to plan for and mitigate future flood risk as precipitation trends continue. See the Floodplains section for more information on flooding considerations and Appendix F for information on precipitation projections in the Hudson Valley. See the Water Quality and Land Use sections for further discussion of watershed connections to surface water pollution, water quality assessment, and monitoring studies.

What to include
Streams and waterbodies can be mapped and described using the USGS National Hydrography Dataset or more detailed local data sources, where available. (Some municipal and county agencies have developed finer-scale stream maps, for example.) This information may be displayed together with watershed boundaries, which provide logical units for evaluating surface water resources (see Watersheds section). The National Hydrography Dataset can be viewed online using the USGS Hydrography Viewer and GIS data can be obtained from the USGS website. It may be helpful to combine features such as floodplains, riparian wetlands and forests, waterbodies, and subwatersheds in a single map in the NRI.
Detailed inventory studies

*Intermittent streams and small waterbodies* are not captured on USGS and statewide stream maps. These important resources can be identified and delineated through airphoto interpretation, map analysis, local knowledge, and site visits to create more accurate maps. See Appendix E, Biodiversity Assessment, for details.

*The New York State Inventory of Dams* and the USGS National Hydrography Dataset document a small fraction of dam locations. Many dams, especially small ones, are missing from these data sets. Culvert data sets do not exist on any standard, county, or statewide scale in New York. The DEC Hudson River Estuary Program is collecting information on dams and culverts in the Hudson Valley. Field surveys can fill in missing dam and culvert information.

Where to find help

See Appendix A for organization contact information, Appendix B for publications and web resources, and Appendix C for sources of GIS data.

United States Geological Survey
National Hydrography Dataset, Hydrography Viewer

DEC Hudson River Estuary Program
Technical and mapping assistance, aquatic barrier information

Hudson River Watershed Alliance
Watershed Atlas maps

Local watershed association
Maps, watershed plans

County agencies (such as planning department or soil & water conservation district)
Maps

Floodplains

Background

Floodplains are low-lying areas adjacent to streams and other waterbodies that become inundated during heavy precipitation or snowmelt. By slowing and storing floodwaters, floodplains reduce downstream flood damage and serve as a safety zone between human settlement and the damaging impacts of floods. Naturally vegetated floodplains help prevent erosion, recharge groundwater, and can serve as travel corridors for wildlife. These highly productive ecosystems are home to a unique suite of plants and animals that tolerate occasional flooding and support the in-stream food web. When left in their natural state, they provide space for the fluctuations in flow that cause streams to expand, contract, and sometimes change course. Floodplains and other streamside areas are also where land-use change will most easily influence stream quality.

Floodplains have traditionally been delineated by the Federal Emergency Management Agency (FEMA) and the US Department of Housing and Urban Development based on flood frequency according to the extent of land expected to have a 1% or greater chance of being inundated in any given year (often referred to as the “100-year flood”). It is important to note that floodplains and their statistical flooding intervals are estimations based on the best data and technology available at the time of mapping. Due to many variables, such as the often unpredictable nature of floods, local drainage problems, and the variable intensity of land development in watersheds, some flood-prone areas may not appear on designated floodplain maps, and floodplain designations may change over time as more information becomes available.
Creating a Natural Resources Inventory

As development occurs in a watershed, pavement and other impervious surfaces (e.g., roofs of buildings) increase runoff volume and velocity, leading to more frequent and damaging floods. Preserving floodplains and minimizing the extent of impervious surfaces are ever more important as uplands are developed and as the frequency and magnitude of flood events increases with climate change (see Climate section). Floodplain maps provide a starting point for proactive conservation planning.

What to include
The 100-year floodway and 100-year and 500-year floodplains mapped by FEMA should be mapped together with streams and waterbodies. The floodway is defined as the stream channel and adjoining floodplain areas that are reasonably required to carry the 100-year flood without increasing the flood surface elevation by more than a foot. It is the area where flood hazard is generally highest in the floodplain, i.e., where water depths and velocities are the greatest. The 500-year floodplain refers to the area that has a 0.2% chance of being inundated in any given year.

Future projected floodplains accounting for sea level rise have been calculated for communities along the Hudson and can be accessed using the online Scenic Hudson Sea Level Rise Mapper tool.

Preserving floodplains and minimizing the extent of impervious surfaces are ever more important as uplands are developed and as the frequency and magnitude of flood events increases with climate change.

Where to find help
See Appendix A for organization contact information and Appendix C for sources of GIS data.

Federal Emergency Management Agency
Flood hazard maps

DEC Hudson River Estuary Program
Technical and mapping assistance

County agencies (such as planning department, soil and water conservation district, emergency management office)
Flood hazard maps, technical assistance

Scenic Hudson
Sea Level Rise Mapper

Wetlands

Background
Wetlands are areas saturated by surface water or groundwater sufficient to support distinctive vegetation adapted for life in saturated soil conditions. In addition to providing critical habitat for many plants and animals, wetlands provide important benefits to human communities. They help to control flooding and reduce damage from storm surge, act as filters to cleanse water of impurities, and provide recreation opportunities for many people.

Knowing about local wetlands enables municipalities to proactively plan to conserve this critical resource. Although several existing maps provide approximate locations and extent of wetlands, they are inherently inaccurate and not a substitute for site visits and on-the-ground delineation. Small wetlands in particular are often missed. Nonetheless, towns can use wetland maps as a starting point for inventorying local wetlands and supplement with more refined data as they become available. To understand how land-use decisions can impact wetlands, it’s important to also consider adjacent upland areas and connected hydrologic features such as streams; the NRI maps will help illustrate the relationships between these different resources.

For discussion of wetland habitats such as vernal pools, see the Habitats and Wildlife section. For discussion of tidal wetlands, see the Hudson River Coastal and Shoreline Habitat section.

Wetlands help to control flooding and reduce damage from storm surge, act as filters to cleanse water of impurities, and provide recreation opportunities for many people.
Chapter 4: What to Include in the NRI

What to include
There are several GIS data sets that can be assembled to create a composite wetland map for the study area:

**National Wetland Inventory (NWI)** maps from the US Fish and Wildlife Service (USFWS) have been completed for most of the Hudson Valley region, or are available in draft form. NWI maps are created using aerial photo interpretation and some field checking, and include wetlands of all sizes with some information on habitat. They are not intended for regulatory purposes. NWI maps often underestimate wetland area and omit smaller and drier wetlands. In particular, vernal pools, wet meadows, and swamps are often under-represented on maps. NWI data are available from the USFWS website. See Appendix D for more information about NWI maps.

**NYS Freshwater Wetland Maps** depict mainly large wetlands (12.4 acres or larger) and a few smaller ones with special attributes. The maps were created by aerial photo interpretation and minimal field checking, and are not intended to be accurate depictions of the limits of state wetland jurisdiction on any site. Many of DEC's regulatory maps are outdated and have similar inaccuracies to the NWI maps (Huffman and Associates 2000). Digital data are available from CUGIR.

**County soil survey** data provide information about poorly drained and very poorly drained soils, which are commonly used indicators of probable wetlands. Somewhat poorly drained soils can be used to predict locations of possible wetlands. In general, the soils maps tend to somewhat overestimate the acreage of wetland soils, due in part to the scale of the soils mapping (the smallest mapping unit is two acres). The Soil Survey Geographic Database (SSURGO) contains digital soil data from NRCS and is available on the NRCS Geospatial Data Gateway and the NYS GIS Clearinghouse. See Soils section and Appendix D for more information on soils.

In addition, there may be county data, local studies or wetland mapping efforts, or wetland delineations from development reviews that can be added to the wetland map and narrative text. Communities may also want to include wetlands that are created, such as mitigation wetlands for road projects or large developments. County planning departments, New York State Department of Transportation, and departments of public works may have this information.

**Detailed inventory studies**

**Wetland evaluation** is the process of determining the values of a wetland based on an assessment of the functions that it performs, such as scenic quality, erosion control and sediment trapping, floodwater storage, or groundwater discharge or recharge. Evaluation of wetlands for different functions allows a municipality to tailor wetland protection for those values it views as most
important. For example, a community may wish to protect wetlands with high value for flood storage, or large wetland complexes that provide important wildlife habitat. While the help of a consultant may be necessary, there are numerous approaches to “rapid assessment” of wetland values that may be used by municipal officials and volunteers; e.g., *Method for Inventorying and Evaluating Freshwater Wetlands in New Hampshire*. Note that methods developed for other states or regions may need some adjustment to ensure relevance in New York.

**Wetland Buffers.** The topography, land uses, and natural areas surrounding a wetland, along with the habitat needs of resident and migrating wildlife, warrant consideration when developing a wetland conservation strategy. By showing wetland buffers (adjacent areas) on the NRI map, these features can be considered along with the functional value of each wetland, if available, and appropriate conservation buffers can be recommended for protection through a wetland law or other formal or voluntary land conservation efforts. The Environmental Law Institute’s *Planner’s Guide to Wetland Buffers for Local Governments* discusses a range of practices for conserving wetland buffers.

**Where to find help**
*See Appendix A for organization contact information, Appendix B for publications and web resources, and Appendix C for sources of GIS data. See Appendix D for more information on soil and wetland maps.*

**DEC Division of Fish, Wildlife, and Marine Resources**
New York State freshwater wetlands information, Environmental Resource Mapper

**US Fish and Wildlife Service**
National Wetlands Inventory, Wetlands Mapper

**Natural Resources Conservation Service**
Soil Survey Geographic Database (SSURGO), Web Soil Survey tool, digital soil survey reports

**DEC Hudson River Estuary Program**
Technical and mapping assistance

**County soil and water conservation district**
County soil survey maps

**Water Quality: Standards and Assessments**

**Background**
In addition to documenting the location of water resources, an NRI should address water quality in the community. The federal government and New York State have developed water quality standards to monitor and protect waterbodies. The Clean Water Act imposes strict standards on water quality and pollutant levels and New York State’s Environmental Conservation Law outlines water quality and priority classifications and standards for waterbodies. DEC Water Quality Standards and Classifications designate the “best uses” that waterbodies should support and are the basis for programs to protect New York State waters. Freshwater stream segments and open waterbodies are classified by the letters AA, A, B, C, or D, which is the lowest classification. Additional designations of “T” or “TS” can be added to Class A, B, or C streams if a waterbody has sufficient amounts of dissolved oxygen to support trout (T) and/or trout spawning (TS). Waterbodies that are designated as “C (T)” or higher (e.g., “C (TS),” “B,” “A,” or “AA”) are collectively referred to as protected streams, and are subject to additional regulations and require a State permit for disturbance of the bed or banks. Waterbodies can receive more comprehensive protection at the municipal level. It is important to note that the DEC waterbody classification does not relate directly to water quality; rather, it reflects the quality expected of a waterbody. The DEC Waterbody Inventory/Priority Waterbodies List tracks the degree to which waterbodies are meeting their “best uses” based on their DEC classification, provides a summary of general water quality conditions, and monitors progress toward the identification and resolution of water quality problems, pollutants, and sources.
To assess actual water quality and track human-induced impacts, many parameters are measured and monitored. Monitoring programs sample the chemical condition of water, sediments, and fish tissue to determine levels of constituents such as dissolved oxygen, nutrients, metals, oils, and pesticides. They also monitor physical conditions such as temperature, flow, sediments, and the erosion potential of stream banks and lakeshores. Biological monitoring or biomonitoring uses the abundance and variety of aquatic plant and animal life to provide information on the quality of streams and waterbodies. The results of these programs can be used to describe water quality in the study area, identify potential threats, and develop recommendations in the NRI. Careful quality monitoring can help specify targeted mitigation, for example, where nutrient management is needed, where shading and stormwater controls are needed for thermal management, or where streambed/bank restoration is needed to stabilize sources of sediment.

**What to include**

*DEC Water Quality Standards and Classifications* and their status from the Waterbody Inventory/Priority Waterbody List should be mapped to indicate state-protected waters and identify waterbodies that are not meeting their “best uses.” The former data set is available for viewing on DEC’s online Environmental Resource Mapper and both data sets may be obtained on the NYS GIS Clearinghouse.

*Biomonitoring data* for streams and waterbodies are available through the DEC Rotating Integrated Basin Studies (RIBS) program and the Lake Classification and Inventory Program. The *30 Year Trends in Water Quality of Rivers and Streams in New York State* report summarizes the findings of DEC’s biomonitoring from 1972-2002 by watershed. See the DEC website to learn about these programs and find information regarding local water resources.

**Detailed inventory studies**

*Citizen-based water quality assessment data* for streams and waterbodies are available through the DEC Citizens Statewide Lake Assessment Program (CSLAP) and Water Assessment by Volunteer Evaluators (WAVE) program. Consider participating in these programs to augment the existing record, raise awareness among residents, and track changes in water quality over time. Citizen monitors can also help identify specific water quality threats, such as observed illicit outfalls or evidence of failing septic systems resulting in overland wastewater flows into streams.

*Local watershed groups or county agencies* (soil and water conservation districts) may also have information on water quality, including biological, physical, or chemical data. If local data are limited or unavailable, water quality assessment studies can be undertaken to document baseline conditions.

**Where to find help**

See Appendix A for organization contact information, Appendix B for publications and web resources, and Appendix C for sources of GIS data.

**DEC Division of Water**

- Water Quality Standards and Classifications
- Waterbody Inventory/Priority Waterbodies List
- DEC Lake Classification and Inventory Program
- DEC water quality monitoring data and reports
- Citizen science monitoring programs (CSLAP and WAVE)

**DEC Hudson River Estuary Program**

Technical assistance

**Local watershed association/watershed management plan**

**County agencies** (such as planning department, soil & water conservation district, or county water quality committee)

Water quality information

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Backswimmer. © P. Kernan
Water Quality: Potential and Known Sources of Contamination

Background
Stormwater and wastewater problems can impact a community’s water resources. By including the locations of stormwater and wastewater infrastructure in the NRI, planners have access to additional information on potential threats to water quality. New York State uses the State Pollutant Discharge Elimination System (SPDES) to control wastewater and stormwater discharges to groundwater and surface water in accordance with the Clean Water Act. The SPDES program requires that a permit be obtained prior to initiation of construction or discharge of wastewater to surface or ground waters. The program also regulates construction or operation of sewage treatment plants and other disposal systems. A Municipal Separated Storm Sewer System (MS4) is a stormwater collection and conveyance system owned by a state, city, town, village, or other public entity that is not part of a sewage treatment plant or combined sewer system. As a permit condition, designated MS4 municipalities are required to map their stormwater outfalls where polluted runoff can enter waterbodies. An inventory of SPDES permit locations for both wastewater and stormwater infrastructure is useful for analyzing cumulative effects of discharges on water resources.

Hazardous waste sites, landfills, junkyards, and salt storage facilities may also pose threats to water resources. In the past, many waste disposal sites were located without regard to human health or environmental impacts. Similarly, the use of uncovered salt storage piles resulted in many cases of groundwater contamination and high concentrations of salt in runoff and surface waters in the past and many contaminated areas remain. It is important to locate and assess the impact of these sites to direct future land uses and protect human health.

What to include
SPDES permit sites and known wastewater infrastructure can be mapped to identify potential point-source pollution locations. Wastewater monitoring data from permit sites can be requested from DEC or the treatment facility and evaluated to identify areas that are stressed or threatened due to increased effluent levels or cumulative land-use impacts.

Stormwater outfalls can be obtained from the municipality’s MS4 coordinator.

Hazardous waste sites, landfills, junkyards, and salt storage facilities can be mapped to provide information on potential threats to water quality. DEC maintains an inventory of known hazardous waste sites in New York State that are under remediation or review.

Detailed inventory studies
An outfall inventory is also useful for non-MS4 communities to undertake, if they have not yet mapped stormwater infrastructure.

Where to find help
See Appendix A for organization contact information and Appendix B for publications and web resources.

DEC Division of Environmental Remediation
Hazardous Waste Management Program, hazardous waste sites

DEC Hudson River Estuary Program
Technical assistance

County agencies (such as Planning Department, Soil & Water Conservation District, and County Water Quality Committee)
Water quality information, stormwater outfall locations

Municipal MS4 coordinator
SPDES permit sites

HABITATS AND WILDLIFE

Significant Biodiversity Areas of the Hudson River Estuary Corridor

Background
Biodiversity encompasses the variety of life in all its forms, from genes to species, and communities to ecosystems, and the interactions between living organisms and their environment. Significant Biodiversity Areas (SBAs) are landscape areas in the Hudson River estuary watershed that contain high concentrations of biological diversity or unusual ecological features that contribute to and serve as a framework for conservation partnerships and voluntary protection efforts. Altogether, 22 SBAs have been identified in the watershed, accounting for much of the range in regional biodiversity (Penhollow et al. 2006). SBAs should not be interpreted as the only important areas for biodiversity.

What to include
The DEC Hudson River Estuary Program worked with the New York Cooperative Fish and Wildlife Research Unit at Cornell University and the New York Natural Heritage Program to identify SBAs in the estuary corridor. SBAs are available on the NYS GIS Clearinghouse.