Natural Areas and Wildlife in Your Community

A Habitat Summary Prepared for the City of Kingston
May 2014

This summary was completed to provide information for land-use planning and decision-making as requested by the City of Kingston. It identifies significant ecosystems in the city, including streams, forests, wetlands, shoreline habitats, and other natural areas with important biological values. This summary is based only on existing information available to the New York State Department of Environmental Conservation (DEC) and its partners, and, therefore should not be considered a complete inventory. Additional information about habitats in our region can be found in the *Wildlife and Habitat Conservation Framework* developed by the Hudson River Estuary Program (Penhollow et al. 2006) and in the *Biodiversity Assessment Manual for the Hudson River Estuary Corridor* developed by Hudsonia and published by NYSDEC (Kiviat and Stevens 2001).

Ecosystems of the estuary watershed—wetlands, forests, stream corridors, grasslands, and shrublands—are not only habitat for abundant fish and wildlife, but also support the estuary and provide many vital benefits to human communities. These ecosystems help to keep drinking water and air clean, moderate temperature, filter pollutants, and absorb floodwaters. They also provide opportunity for outdoor recreation and education, and create the scenery and sense of place that is unique to the Hudson Valley. Local land-use planning efforts are instrumental in balancing future development with protection of these resources. By conserving sufficient habitat to support the region's astonishing diversity of plants and animals, communities can ensure that healthy, resilient ecosystems—and the benefits they provide—are available to future generations. For more information on local conservation approaches, see *Conserving Natural Areas and Wildlife in Your Community: Smart Growth Strategies for Protecting the Biological Diversity of New York's Hudson River Valley* (Strong 2008).

To further support land-use and conservation planning efforts in the City of Kingston, this Natural Areas and Habitat Summary can be supplemented by complementary Water Resource and Climate Resilience Summaries, also available from the Hudson River Estuary Program by request.

Hudson River Estuary

Cornell University

This document was created by the New York State Department of Environmental Conservation's Hudson River Estuary Program and Cornell University's Department of Natural Resources. The Estuary Program (http://www.dec.ny.gov/lands/4920.html) protects and improves the natural and scenic Hudson River watershed for all its residents. The program was created in 1987 and extends from the Troy dam to upper New York Harbor.

The Estuary Program is funded by the NYS Environmental Protection Fund. The Biodiversity Outreach Program was created in partnership with Cornell University to help Hudson Valley communities learn what plants, animals, and habitats are found locally; understand the value of these resources; and increase their capacity to identify, prioritize, and conserve important natural areas through informed decision-making.

Additional information about habitats and the state of habitats in the Hudson Valley can be found on DEC's webpages, starting with http://www.dec.ny.gov/lands/5094.html.

The core mission of the Hudson River Estuary Program is to:

- *Ensure clean water*
- *Protect and restore fish, wildlife and their habitats*
- *Provide water recreation and river access*
- *Adapt to climate change*
- *Conserve world-famous scenery*

For more information about this summary or the Estuary Program, please contact:

Laura Heady, Biodiversity Outreach Coordinator

ltheady@gw.dec.state.ny.us

New York State Department of Environmental Conservation

Hudson River Estuary Program

21 South Putts Corners Road

New Paltz, NY 12561

Phone: 845-256-3016 • Fax: 845-255-3649

Website: http://www.dec.ny.gov/lands/4920.html

Introduction

The Hudson River estuary and its watershed is a region of remarkable beauty, historical and economic significance, and high biological diversity. The region, comprising only 13.5% of the land area in New York, contains nearly 85% of the bird, mammal, reptile, and amphibian species found in the state (Penhollow et al. 2006). Local municipalities can play a key role in conserving this natural heritage and the ecological processes that sustain it. By identifying important areas for habitat and wildlife, municipalities are better equipped to pursue conservation opportunities and make informed land-use decisions. This proactive approach to planning can help municipalities avoid the costs of urban and suburban sprawl, maintain community character and quality of life, and importantly, preserve the many benefits, or *ecosystem services*, that healthy, natural systems provide to present and future generations.

> *An **ecosystem** is a community of animals and plants interacting with one another and with their physical environment. **Ecosystem services** are life-sustaining benefits we receive from nature, such as food, medicine, water purification, flood control, and pollination. Many of these services are provided for "free," yet are worth many trillions of dollars.*
>
> *- Ecological Society of America*

Summary Content

This summary includes complementary text, maps, and tables. The Habitat Summary text describes what is known about the city's important natural areas and habitats and has the same headings as the maps. It details the information in the maps, including the ecological importance of the data and its sources. There are eight habitat maps for the City of Kingston, which follow the text:

Figure 1: **Regional Context** of Kingston, NY
Figure 2: **Major Ecological Features** in Kingston, NY
Figure 3: **Streams and Watersheds** in Kingston, NY
Figure 4: **Wetlands** in Kingston, NY
Figure 5: **Large Forests (≥ 200 acres)** in Kingston, NY
Figure 6: **Hudson River Shorelne Habitat** in Kingston, NY
Figure 7: **Hudson River Shoreline Type** in Kingston, NY
Figure 8: **Shoreline Habitat at Mouth of Rondout Creek** in Kingston, NY

Descriptions of grassland, shrubland, and young forest habitats are included in the text but not mapped.

Following the maps, Tables 1 and 2 list known species and habitats of conservation concern that have been recorded for Kingston.

Table 1: **State Rare Plants, Animals, and Ecosystems** in Kingston, NY
Table 2: **Significant Birds** in Kingston, NY

At the end of the summary, the References section lists the sources of information used to develop this document and places to find more information. General conservation measures for protecting natural areas and wildlife are also provided.

When read electronically, links in the summary will direct you to websites, publications, and fact sheets for supplemental information. Adobe Reader will enable you to zoom in and turn off data layers to customize your view of the maps.

Please note that some habitats and species identified in this document may be protected by state or federal programs. The Environmental Resource Mapper on DEC's website can help identify those resources. Please work with the DEC's Region 3 Office in New Paltz and other appropriate agencies as necessary.

Limitations of Maps in this Summary

Maps included here were created in a geographic information system, or GIS. Information on the maps comes from different sources, produced at different times and scales, and for different purposes. It is often collected or developed from remote sensing data (i.e., aerial photographs, satellite imagery) or derived from paper maps. For these reasons, GIS data often contain all the inaccuracies of the original data, in addition to any errors from converting it. Therefore, maps created in GIS are approximate and best used for planning purposes. They should not be substituted for site surveys. Any resource shown on a map should be ground-truthed for legal purposes, including environmental review.

How to Use this Summary

This summary provides a starting point for recognizing important natural areas in the city and surrounding areas, but is limited to existing information and is not a substitute for on-the-ground survey and assessment. Effective conservation occurs across property and political boundaries and therefore necessitates a broader view of natural landscapes. By identifying areas with high-quality resources, this summary will be especially useful for setting priorities to inform city planning. Habitat summaries like this one have been used by communities for open space plans, comprehensive plans, natural resource inventories, and other conservation and planning actions. One Hudson Valley town used the species lists in its comprehensive plan's generic environmental impact statement, another to designate critical environmental areas. Some communities have incorporated their summaries directly into plans, while others refer to the information when writing their own documents.

Though this summary does not contain adequate detail for site planning purposes, it can be useful for environmental review. First, by identifying high quality habitats on a city-wide scale, it helps land-use decision-makers and applicants understand how a proposed site plan might relate to important natural areas on and off site. Second, the summary highlights areas that may require more detailed assessment in order to evaluate potential impacts. Third, the tables identify species of conservation concern that may warrant special attention during reviews. If it's not already a routine step, the planning board should consider requiring applicants to produce a current letter from the New York Natural Heritage Program that identifies rare plants, rare animals, and significant ecosystems that are known to be on or near a proposed development site. The planning board and applicants should also work closely with DEC Region 3 permits staff to ensure regulatory requirements are met.

How to Find More Information

Information in this summary can be enhanced by local knowledge. Local studies, maps, plans, and knowledgeable residents can provide details and may reveal previously unknown, high-quality ecosystems. Biological information in environmental impact statements may also be useful, especially when a municipality has habitat standards for environmental review. In Kingston, additional information is available from Hudsonia Ltd. biologists, who worked with the city's Conservation Advisory Council (CAC) to complete a habitat mapping project in the undeveloped portions of Kingston, through support from the Hudson River Estuary Program (Appendix 1). In addition, a group of community volunteers completed a training program in biodiversity assessment offered by Hudsonia and the Hudson River Estuary Program in 2009, in which they completed a study of 3,200 acres that straddle the Esopus Creek in northwestern Kingston and the Town of Ulster. Their observations are documented in the *Esopus Valley Biodiversity Assessment Report* (Budziak 2009). The Ulster County Planning Department and Department for the Environment can also provide county-based information and technical assistance on conservation and planning projects. For help with incorporating additional information into the Habitat Summary, please contact Laura Heady, Hudson River Estuary Biodiversity Outreach Coordinator.

Conservation

Once their important habitats and natural areas are identified, municipalities have numerous options to strengthen their protection, such as incorporating maps and data into comprehensive plans and zoning, developing critical environmental areas or conservation overlay districts, adopting resource protection regulations, and acquiring conservation easements for sensitive habitats, such as floodplains or wetlands and their buffers.

Included with this summary are General Conservation Measures for Protecting Natural Areas and Wildlife that can help guide Kingston's planning and land-use decisions. More detailed information on the how and why of local habitat conservation is available in *Conserving Natural Areas in Your Community: Smart Growth Strategies for Protecting the Biological Diversity of New York's Hudson River Valley* (Strong 2008). This handbook was published by DEC and details why municipalities should conserve their biological resources, as well as the tools and techniques local governments can use to conserve natural areas and wildlife. Chapter 5 covers habitat conservation. The document is available in CD or hard copy upon request.

Technical assistance is available through the Estuary Program and its partners, including help with incorporating natural resource conservation principles and information into municipal land-use planning procedures, plans, and policies. The Estuary Program and its partners also provide training to local leaders to recognize and map ecologically significant habitats and communicate their importance to the community. The Hudson River Estuary Grants program supports projects that continue to raise the capacity of municipalities, land trusts, and non-profits to identify and assess watershed biodiversity, promote stewardship and conservation of vital habitats, and create local conservation programs. For more information on technical assistance opportunities, please contact Laura Heady, Hudson River Estuary Biodiversity Outreach Coordinator.

Important Habitats in the City of Kingston

Regional Context (Figure 1)

> *A **watershed** is the area of land where all of the water that is under it, or drains off of it, goes into the same stream, river, lake, or other waterbody.*
> *– U.S. Environmental Protection Agency*

The first step to understanding the natural areas and habitats of Kingston is to consider how the city relates to the ecological features that extend beyond its borders. Most of the southern half of Kingston is in the Rondout-Wallkill watershed, which drains approximately 1,190 square miles and is the largest tributary basin entering the Hudson River estuary (Rondout Creek Watershed Council 2010). Rondout Creek creates the southern border of the city and is tidal for a four-mile stretch before emptying into the Hudson in Kingston's historic waterfront district. The northwest portion of Kingston drains into Esopus Creek, which follows the city's border before flowing north to the Hudson in Saugerties, and the rest of the city drains directly to the Hudson River. These watersheds, as well as other significant natural features in Kingston, are further discussed in the following sections.

> ***Significant Biodiversity Areas (SBAs)** are locations of high concentration of biological diversity or value for regional biodiversity, described in The Hudson River Estuary Wildlife and Habitat Conservation Framework (Penhollow et al. 2006).*

Most of Kingston is underlain by a band of limestone bedrock that extends far to the north and to the southwest of the city. The ridges and forests that are associated with this significant geologic feature may function as an important connection between two significant biodiversity areas (SBAs): the Hudson Valley Limestone and Shale Ridges to the north, and the Rosendale Limestone Cave Complex to the south (Meyer et al. 2010, Penhollow et al. 2006). The limestone bedrock in these SBAs supports diverse ecological communities, and the associated cave formations—many from historic mining activity—provide important winter hibernacula for bat species of conservation concern. See Major Ecological Features, below, for more information on limestone features and bat habitat in Kingston.

Major Ecological Features (Figure 2)

Figure 2 shows the major ecological and natural features that are known to occur in Kingston, including Significant Coastal Fish and Wildlife Habitat; stream habitat for migratory fish; an important habitat area for bats; calcium-rich crest and ledge habitat; and contiguous natural areas. Rondout and Esopus Creeks are major Hudson River tributaries that flow along the city's boundaries; their habitat values are described below and more details about both streams are in the Regional Context and Streams and Watersheds sections. The CAC's plan to develop a Natural Resource Inventory (NRI) will contribute to what is known about ecological features in the city and can incorporate information from this summary and the detailed habitat mapping projects that have been completed for Kingston.

Significant Coastal Fish and Wildlife Habitat. Kingston's shorelines are some of the most biologically rich areas of the city. The NYS Department of State has designated three areas of Significant Coastal Fish and

Wildlife Habitat in Kingston: Kingston-Poughkeepsie Deepwater, Rondout Creek, and The Flats. These areas are noted for their aquatic habitats that support a diversity of fish and birds. Note there are many coastal habitat features that do not appear on Figure 2. See the Hudson River Coastal Habitat section, below, and Figures 6, 7, and 8 for greater detail on the Significant Coastal Fish and Wildlife Habitat designations and more information on Kingston's shoreline.

Stream Habitat for Migratory Fish. DEC Bureau of Fisheries data and an aquatic habitat connectivity study by NYNHP indicate that the reaches of the Rondout and Esopus in Kingston are migratory routes for American eel, and the stretch of the Rondout below the Eddyville dam is migratory habitat for alewife and blueback herring (White, et al., 2011). See the Streams and Watersheds section, below, for greater detail on stream habitat in Kingston.

Area of Known Importance for Bats. NYNHP identified an important area for winter bat habitat in the southeastern part of Kingston. Eastern small-footed myotis (NYS Special Concern) and northern long-eared bat (candidate for Federally-endangered listing) have both been documented in winter hibernacula in Kingston, and the NYS-endangered and Federally-endangered Indiana bat could also be utilizing suitable habitat in the city. White-Nose Syndrome has caused catastrophic declines in hibernating bats in the United States and Canada; since first discovered in 2007, this previously unknown disease has spread quickly and poses a considerable threat to millions of bats and entire ecosystems. Where caves and abandoned mines are known or suspected to provide habitat for bats, human disturbance should be prevented, and forests above and around hibernacula should not be dramatically altered as deforestation can alter temperature, humidity, and air and water flow inside caves (NatureServe 2014). **Note:** Rare species may occur in more locations than are currently known by NYNHP or DEC. The DEC Region 3 Office in New Paltz should be contacted at 845-256-3098 with general wildlife inquires or at 845-256-3054 with questions related to environmental permitting requirements.

Calcium-Rich Crest and Ledge Habitat. In their map of "Significant Habitats in Selected Areas of the City of Kingston," Hudsonia identified several areas of calcareous crest and ledge habitat. In Kingston, this habitat type includes rocky barrens, outcrops, and ridges that most frequently occur in forested areas of the city. The *calcareous* condition is derived from the underlying limestone bedrock, which is composed of calcium carbonate and occurs in a band throughout most of the city and extends long distances to the north and southwest (Figure 1). Calcium-rich bedrock is somewhat unusual in the Hudson Valley and often supports more unique or rare plants and ecological communities than other areas (Anderson and Ferree 2010, Kiviat and Stevens 2001). Walking fern and purple cliffbrake, regionally-scarce plants of calcium-rich, rocky habitat, and eastern prickly-pear, also a regionally-scarce plant of rocky habitats, have both been observed in Kingston (I. Haeckel, pers. comm., Kiviat and Stevens 2001). Further investigation may find additional rare occurrences in these undeveloped, calcareous areas.

> ***Geology** strongly influences features like soil and groundwater chemistry, and thereby helps to shape where different kinds of habitats can occur.*

Contiguous Natural Areas. Figure 2 also highlights the remaining large, natural areas in Kingston. The green areas shown on the map are an aggregate of the approximately 20 terrestrial habitat types mapped by Hudsonia (Appendix 1) and the biodiversity training team (Budziak et al. 2009), and include both ecologically-significant habitats as well as connected undeveloped areas such as parkland, surface mines, and cemeteries, which could have greater habitat value in the future. In general, larger patches of undisturbed natural areas have higher habitat quality than smaller ones and benefit from measures that maintain connectivity of habitats. However, in largely urbanized areas, even smaller undeveloped areas may provide "stepping stone" habitats that enable wildlife to migrate between larger patches. Small habitat areas may also provide community benefits such as stormwater management or recreational opportunities, or present opportunities to enhance or restore habitat. The *Biodiversity Assessment Manual for the Hudson River Valley* (Kiviat and Stevens 2001) describes many of the specific habitat types shown on the map in Appendix 1.

Streams and Watersheds (Figure 3)

Streams, their floodplains, adjacent wetlands, and other "riparian" or streamside habitats that occur along their channel provide important ecosystem services to communities, including clean water, flood management, and recreational opportunities like fishing and kayaking. In addition, Hudson River tributary streams and their associated shoreline and floodplain areas provide some of the most productive wildlife habitat in the region. The health of the Hudson River estuary is closely linked to the health of its tributaries and their watersheds (Penhollow et al. 2006).

> ***Riparian zones** are transitional areas along waterbodies that link land and water. They include streambanks, lakeshores, wetlands, and floodplains and are closely tied to stream health. They often have very high biological diversity.*

All of the land in Kingston drains to the Hudson River estuary (Figures 1 and 3). About half of the city is contained in the Rondout-Wallkill watershed, where smaller tributaries like the Twaalfskill Brook flow south to Rondout Creek. The northwestern portion of Kingston is in the Esopus Creek watershed and the eastern side of the city flows directly to the Hudson River. (Note that Kingston's infrastructure has altered its hydrology and stormwater may not flow according to topographic watershed boundaries in some parts of the city.) There are a number of initiatives directed at watershed protection for the Rondout Creek, including the Rondout Creek Watershed Council and *An Interim Watershed Management Plan for the Lower, Non-Tidal Portion of the Rondout Creek, Ulster County, New York* (2010), which address watershed protection upstream from Kingston; and the *Tidal Rondout Creek Watershed Management Plan*, which is underway and will address the 11.25 square mile watershed of the tidal portion of the Rondout that flows along Kingston's southern border. The Lower Esopus Watershed Partnership works to foster appreciation and stewardship of the Lower Esopus Watershed and has developed many resources, including a draft watershed management plan; Kingston is one of many watershed municipalities involved in the partnership.

In addition to watershed boundaries, Figure 3 shows streams, floodplains, waterbodies, and general stream habitat information. Much like stormwater flow in Kingston, many of the city's stream channels have been altered and in some cases are buried, ditched, or otherwise changed. In the three areas of

the city where Hudsonia and the training team mapped habitats, the stream locations are likely to be more accurate and more complete than those shown in the interior areas of the city, which are based on existing data developed at coarser scales. Site visits and field verifications can ensure that all of Kingston's streams, including intermittent streams, are identified and considered during planning processes.

***Intermittent streams** only flow seasonally or after rain. They can easily be overlooked when dry, but have great impact on larger downstream waters and warrant attention. Many flow directly into the Hudson and its tributaries, wetlands, and other water bodies, influencing water quantity and quality.*

DEC's water quality classifications indicate the only coldwater stream habitat in Kingston is in Esopus Creek. Streams deemed to have conditions suitable for trout (T) or trout spawning (TS) are considered coldwater habitat; streams without that designation are considered warmwater habitat. These are generalized stream habitat types based on limited information, and do not reflect site-specific habitat quality. Trout require well-shaded, cool to cold, flowing water and are sensitive to warmer temperatures. While all streams benefit from adequate streamside vegetation, it is especially important for maintaining clean, coldwater habitats that support native species like brook trout.

DEC fisheries data and a NYNHP aquatic connectivity study indicate that Esopus Creek and Rondout Creek comprise a migratory route for American eel, and Rondout Creek also provides habitat for migrating alewife and blueback herring (White et al. 2011). American eel is a fish species that begins life in the Atlantic Ocean and migrates to the headwaters of North American tributary streams as tiny "glass eels." American eel is in decline throughout much of its range, and though adult eels are able to bypass certain dams, culverts, and other aquatic barriers, they rely on aquatic connectivity along streams to complete their life cycle and return to the sea to spawn. Unlike American eel, alewife and blueback herring are anadromous fish, spending most of their lives in the ocean and only returning to freshwater to spawn. Also unlike the eel, river herring are more limited by in-stream barriers. In the Rondout, the first barrier to fish migration is a dam at Eddyville, about 4 miles from the Hudson near where Route 213 crosses over the stream between the Towns of Esopus and Ulster. Spawning habitat above the Eddyville dam is not accessible to alewife or blueback herring (Schmidt and Cooper 1996).

Floodplain information included in Figure 3 comes from the Federal Emergency Management Agency (FEMA) Digital Flood Insurance Rate Map (DFIRM) Database. This information was included in the Habitat Summary to highlight the riparian corridors where stream and floodplain habitats occur, and where land-use change can directly influence stream quality. In addition to their high ecological value, floodplains provide many important functions including preventing erosion and recharging groundwater. They also act as a safety zone between human settlement and the damaging impacts of flood events. When left in their natural state, they provide space for the fluctuations in flow that cause streams to expand, contract, and sometimes change course. Figure 3 shows the areas

***Floodplains** are low-lying areas adjacent to streams and rivers that can become inundated during heavy precipitation or snow melt events. The **floodway** is the channel of a stream or river that carries the deepest, fastest water downstream.*

estimated by FEMA to have a 1% chance or greater probability of being inundated in any given year (often referred to as the "100-year flood"). Areas with 0.2% chance of flooding in a given year ("500-year flood") are also included on the map. It is important to note that these floodplains, and their statistical flooding intervals, are estimations based on the data and technology available at the time of mapping. Due to many variables, such as the unpredictable nature of some kinds of floods, localized drainage problems, and the variable intensity of land development in watersheds, there may be flood-prone areas that do not appear on the maps. Nonetheless, the mapped floodplains provide a starting point for proactive conservation planning and may contain a variety of habitats, including but not limited to upland meadows, wet meadows, swamps, marshes, and forests (Kiviat and Stevens 2001).

For more information on streams, water quality, and watershed issues in Kingston, a complementary Water Resources Summary is available from the Estuary Program by request.

Wetlands (Figure 4)

In addition to providing critical habitat for many plants and animals, wetlands provide important services for human communities. They help to control flooding and reduce damage from storm surge, recharge groundwater, act as filters to cleanse water of impurities, and provide recreation opportunities for many people. The upland area surrounding a wetland is essential to its survival and function; both may diminish when a wetland is surrounded by pavement, buildings, and pollution-generating or other incompatible land uses (Environmental Law Institute 2008).

> ***Wetlands** are areas saturated by surface or ground water sufficient to support distinctive vegetation adapted for life in saturated soil conditions.*

Knowing about local wetlands enables municipalities to proactively plan to conserve this critical part of our life support system. Although several existing maps provide approximate locations and extent of wetlands, they are inherently inaccurate. Kingston has the advantage of its Hudsonia habitat map (Appendix 1), which offers a more comprehensive account of wetland occurrence and habitat type, although it is not a substitute for site visits and on-the-ground delineation.

Figure 4 shows "known wetlands" from the U.S. Fish and Wildlife Service's (USFWS) National Wetlands Inventory (NWI) and the DEC's Freshwater Wetlands Program maps (which only include wetlands larger than 12.4 acres, unless they are designated "of unusual local importance"). NWI data are available for viewing on the NWI Wetlands Mapper or as a download for use in Geographic Information Systems (GIS). NYS freshwater wetland maps are available to view using the Environmental Resource Mapper or to download as GIS files at the NYS GIS Clearinghouse. Figure 4 also includes information from county soil maps, which are a good source for predicting the location of potential wetlands. "Probable wetlands" are those areas classified in the soil survey as very poorly drained or poorly drained soils, and "possible wetlands" are those classified as somewhat poorly drained (after Kiviat and Stevens 2001). Note that in Figure 4, the probable and possible wetlands cover a greater area than the NWI and DEC wetland layers. NWI maps often underestimate wetland area and omit smaller and drier wetlands (Zucker and Lau, unpublished report). In particular, vernal pools, wet meadows, and swamps are often

under-represented on maps. Many of DEC's regulatory maps are outdated and have similar inaccuracies (Huffman and Associates 2000).

While NWI maps offer some limited, generalized information on wetland type (e.g., forested, emergent), most existing map resources are focused on wetland locations and do not yield information about habitat or importance for biodiversity. Kingston can learn more about its wetland resources from the Hudsonia habitat map (Appendix 1) and by conducting additional local surveys and studies. In Kingston, the largest non-tidal wetland areas mapped by Hudsonia and Budziak et al. (2009) included floodplain forest and hardwood swamp along the Esopus Creek. In addition to providing habitat to riparian wildlife and supporting the in-stream food web, these streamside forests and wetlands help to reduce pollution and sediment entering the Esopus and can help to mitigate flooding along the creek. The Hudson River Estuary Program's "Trees for Tribs" initiative offers free consultation and native trees and shrubs for qualifying streamside buffer planting projects in the estuary watershed.

Hudsonia also documented vernal pools ("intermittent woodland pools") during their mapping project and the NY Amphibian and Reptile Atlas had a Kingston record for wood frog, a good indicator species of vernal pools. Vernal pools are small, isolated wetlands that are often dry in summer. They provide habitat to many animals, including forest amphibians like wood frog and spotted salamander, which use the pools for breeding. Vernal pools often go undetected in the forest due to their small size and seasonal drawdown, and are vulnerable due to reduced regulatory protection of isolated wetlands (see Conserving Small Wetlands in the Hudson Valley for more information.) Because most of the amphibians that breed in vernal pools require large, connected areas of healthy forest for the non-breeding season, the forested landscape in the eastern portion of Kingston may increase the habitat value of the pools that occur there (Appendix 1). Although more fragmented, the forest and vernal pools in the southwest corner of the city may also support amphibian populations. Outreach to landowners and planners may help promote stewardship and land-use decisions that protect vernal pools, surrounding forest habitat, and associated wildlife in Kingston. Specific management recommendations can be found in *Best Development Practices: Conserving Pool-Breeding Amphibians in Residential and Commercial Development in the Northeastern United States* (Calhoun and Klemens 2002) and *Maine Municipal Guide to Mapping and Conserving Vernal Pool Resources* (Morgan and Calhoun 2012). The Hudsonia habitat map also shows small areas of wet meadow, wet clay meadow, marsh, and shrub swamp in the city; descriptions of these wetland habitat types can be found in the *Biodiversity Assessment Manual for the Hudson River Valley* (Kiviat and Stevens 2001).

The large complex of tidal wetlands at the Rondout Creek mouth are described in the Hudson River Coastal Habitat section, below.

Forests (Figure 5)

The ability of Hudson Valley forests to provide wildlife habitat, clean water, climate moderation, and economically viable forest products depends in part on our ability to maintain sizeable tracts of forest. In general, larger forests will provide more ecosystem services and higher quality forest habitat than smaller ones. However, the value of each forest is relative to the values of other forests in your

community, watershed, or natural landscape. Even small patches of forest can be extremely valuable depending on different factors, such as their relationship to the surrounding landscape. For example, a network of forest patches along a stream can create a riparian corridor that helps maintain water quality and wildlife habitat, and serves as a travel route for terrestrial species.

Figure 5 shows forest patches in Kingston. The map was created from land cover data developed for the Coastal Change Analysis Program (National Oceanic and Atmospheric Administration 2006). Land cover categories considered 'forest' for this analysis included deciduous forest, evergreen forest, mixed forest, and palustrine forested wetland. Roads were buffered and removed from forest patches to show results of development-related fragmentation. Interstate roads were buffered by a total of 300 feet and state and county roads by 66 feet. Forest patch size classifications follow the Orange County Open Space Plan (Orange County Planning Department 2004) as cited in Strong (2008).

> ***Forest fragmentation*** *is the process of breaking up large patches of forest into smaller pieces, often by clearing for new roads or development. Fragmentation decreases forest habitat quality and health, disrupts wildlife movement, and facilitates the spread of invasive species. These impacts are greatest at forest edges, but can extend for hundreds of feet into forest patches, often displacing sensitive species that depend on interior forest.*

As is typical of most urban areas, Kingston's forests are small compared to more rural parts of the Hudson Valley; however, there remain sizeable patches of forest habitat in the more undeveloped parts of the city, as well as small patches and street trees that contribute to a better quality of life in more residential areas. Kingston's most notable forested area is the fairly contiguous patch in the eastern part of the city, between Route 9W and the Hudson River. This band of upland hardwood forest extends along the steep ridges from Hasbrouck Park to the area of former cement mines and limestone quarries at the city's northern border (Figure 5, Appendix 1). Although the forest is "perforated" with disturbed areas (such as the quarry, residential and industrial development, and utility right-of-way), it likely has important ecological value as it is situated along the limestone bedrock corridor between the Hudson Valley Limestone and Shale SBA and the Rosendale Limestone Cave Complex SBA, where it may serve as a stepping stone for some terrestrial wildlife moving between forest patches to the north and southwest in the Town of Ulster (Figure 1). It also provides terrestrial habitat for vernal pool breeding amphibians (see Wetlands section, above.) There are also patches of predominantly upland hardwood and upland mixed forests in the southwest portion of Kingston. While some are more fragmented by roads, development, and cultural features such as cemeteries and a golf course, there are more contiguous forests west of Twaalfskill Brook that continue southwest into the Binnewater Lakes area of Rosendale. Minimizing further fragmentation of these forests will contribute to their habitat value and may require intermunicipal cooperation to ensure forest connectivity across municipal boundaries.

The NYS Breeding Bird Atlas has several records of birds that indicate the availability of high-quality forest habitat (scarlet tanager, wood thrush) and high-quality riparian forest habitat (Louisiana waterthrush, yellow-throated vireo) in Kingston (see Table 2). Conserving adequate forest in the city to sustain populations of these species will help other wildlife and contribute to preserving the ecosystem

services that the city's forests are providing to its residents. Audubon New York's website has specific information on managing habitat for forest birds.

Hudson River Coastal Habitat (Figures 6, 7, and 8)

Kingston is bordered to the east by the tidal Hudson River Estuary and to the south by the tidal Rondout Creek. Although affected by tides, the water is completely fresh at this distance from New York City (91 miles). The connection to the Atlantic Ocean, upper watershed, and the changing tides make the shore zone a dynamic area. The following description of Hudson River coastal habitat in Kingston relies on reports and existing data from several sources; some of the information is publicly available. Figures 6 and 7 show Kingston's coastal and shoreline habitats along the tidal Rondout and Hudson; Figure 8 provides a detailed look at habitat at the mouth of the Rondout Creek.

This regional landscape is identified as the "Upper Hudson River Estuary" significant biodiversity area by the Hudson River Estuary Program because it's a globally rare ecosystem that supports many rare species as well as regionally important fisheries (Penhollow et al. 2006):

> "The Hudson River Estuary contains significant freshwater and brackish tidal wetlands, as well as other riverine and estuarine habitats, islands, riparian zones, and important tributaries. These habitats support a high diversity of fish, birds, and mammals….The open water, tidal wetlands, and tributaries in the upper reach of the Hudson are regionally important fish spawning habitats for anadromous fish, especially American shad, striped bass, Atlantic sturgeon and shortnose sturgeon, and provide habitat for all life stages of resident freshwater species. The numerous creeks and tidal freshwater marshes in this stretch serve as breeding, nursery, and migration corridors supporting waterfowl, shorebirds, herons, raptors, and passerine birds. Regionally and globally rare tidal communities include freshwater tidal swamp, freshwater tidal marsh, freshwater intertidal mudflats, and freshwater intertidal shore."

Kingston's Hudson River coastal area encompasses some of the most biologically rich habitats in the city. Significant plants, animals, and habitats on the Hudson shoreline and at the mouth of the tidal Rondout in Kingston include several species of rare plants that are associated with tidal habitats; globally rare freshwater tidal marshes and freshwater intertidal shore; and important concentration areas for migratory fish and waterfowl. Shortnose sturgeon (NYS Endangered) and bald eagle (NYS Threatened) both use the river and tributary mouth habitats near Kingston. See Table 1 for more information on the rare plants, rare animals, and significant ecosystems associated with Kingston's coastal habitats.

Significant Coastal Fish and Wildlife Habitats

There are many different kinds of coastal habitats in New York, including marshes, wetlands, mud and sandflats, beaches, rocky shores, riverine wetlands and riparian corridors, stream, bay and harbor bottoms, submerged aquatic vegetation beds, dunes, old fields, grasslands and woodlands, and forests that provide habitat and feeding areas for animals and are also economically important. The DEC has identified and evaluated coastal habitats throughout the state's coastal regions, providing recommendations to the NYS Department of State so that the most important or "significant" habitats

may be designated for protection in accordance with the Waterfront Revitalization and Coastal Resources Act. The Significant Coastal Fish and Wildlife Habitats are useful for planning at the local level because they describe the highest quality habitats on the Hudson, outlining fish and wildlife values and activities that may have large impacts on the habitats.

There are three designated Significant Coastal Fish and Wildlife Habitat areas in Kingston (Figure 2). Figure 8 shows the Kingston-Poughkeepsie Deepwater and Rondout Creek significant areas and Figure 6 includes the southern end of the third area, The Flats, along the middle of the Hudson and centered under the Kingston Rhinecliff Bridge. The NYS Department of State webpage has detailed descriptions of each of these sites, including discussions of their value to fish and wildlife, and information on potential impacts to their habitat values. The Kingston-Poughkeepsie Deepwater area supports a diversity of freshwater and migratory species, including shortnose and Altantic sturgeon (NYS Endangered). The Flats area also provides habitat for Hudson fish and is especially important for American shad spawning. Both areas are used extensively by waterfowl. NYNHP considers The Flats an anadromous fish concentration area and waterfowl winter concentration area.

The Rondout Creek area encompasses a four-mile tidal segment of the tributary from the Hudson River to the Eddyville dam. It includes Sleightsburg Marsh at the mouth of the creek in the Town of Esopus and habitats such as flats, tidal wetlands, and shallows, especially behind Gumaer Island. The warmwater stream has experienced considerable human disturbance but remains important for migratory and resident freshwater fish. NYNHP recognizes the tidal creek as a waterfowl winter concentration area, important for species like mallard, black duck, and wood duck, and an anadromous fish concentration area, important for species like American shad, alewife, blueback herring, and striped bass. State and federal law requires that some projects may be reviewed for consistency with coastal policies on significant fish and wildlife habitat. Contact the NYS Department of State Office of Planning & Development for more information on the protection and regulation of these habitats. Kingston has a Local Waterfront Revitalization Program, adopted in 1992 with federal concurrence in 1993; an implementation plan for the LWRP was completed in 2002.

Underwater (subtidal) Habitats

Beds of submerged aquatic vegetation (SAV), primarily water celery, occur along most of Kingston's Hudson River shoreline and in the Rondout Creek mouth (Figure 6 and 8). SAV improves the water quality in the Hudson and provides essential habitat for invertebrate animals, which feed fish and waterfowl that use the estuary. The areas mapped indicate locations where SAV growth has been documented and needs protection, even though in any given year the SAV may not be present. Figures 6 and 8 show linear areas that have fragmented SAV patches; these are most likely caused by propellers and other boat traffic. The city can obtain SAV data for free from the NYS GIS Clearinghouse.

Tidal Hudson River Estuary Wetlands

The wetlands at the mouth of the Rondout Creek are both freshwater and tidal, a globally rare ecosystem type. Tidal wetlands serve a very important purpose in the river, not only providing habitat for rare plants and young fish, but other benefits for people like flood attenuation and wastewater

dilution/purification. There are two sources of information on tidal wetlands in the Hudson River: DEC and NYNHP. Each are discussed separately below but are combined on Figure 8 to facilitate viewing of the complex shoreline habitats.

A 2007 inventory by the DEC identified about 75 acres of tidal wetlands at and near the mouth of the Rondout. Almost half is lower intertidal mix (33 acres) but there are also unvegetated flats (17 acres), invasive water chestnut (14.5 acres) and common reed (9 acres), cattail marsh (9 acres), and smaller interspersed areas of other tidal wetland types. The green areas on Figure 6 and 8 are an aggregate of these different tidal wetland habitat types, combined in order to facilitate viewing of the complex shoreline features. The city can obtain the finer-scale tidal wetlands data for free from the NYS GIS Clearinghouse.

NYNHP has mapped areas of freshwater tidal marsh between Kingston Point Park and the Kingston lighthouse breakwater, and in Sleightsburg marsh on the Town of Esopus shoreline. There is manmade freshwater intertidal shore mapped along the peninsula and breakwaters at the mouth of the Rondout. (These ecological communities are displayed in purple and orange over the DEC tidal wetlands data shown in green in Figure 8.) Despite moderate to extreme human disturbance in the Rondout Creek system, the wetlands provide feeding areas for waterfowl during spring and fall migrations and support shorebirds, wading birds, and songbirds. The habitats in the mouth of the Rondout and Sleightsburg marsh were identified by NYNHP as an area of importance for wetland birds, such as least bittern (Figure 6). NYNHP has mapped rare plants including smooth-bur marigold and Davis' sedge in the tidal wetlands, and has historical records for rare species like riverbank quillwort. See Table 1 for more information on the rare species and significant ecosystems associated with Kingston's coastal habitats.

Tidal Shoreline Status

Natural shorelines provide a vital transition zone between water and land and important habitat for diverse plants, fish, and wildlife. Knowing the status of tidal shoreline habitat can help the city guide restoration and management of a more natural shoreline and identify natural shorelines that might be priorities for conservation. Furthermore, global sea level rise will fundamentally affect the shoreline of the Hudson River Estuary in the coming decades. Natural shorelines will potentially allow for the migration of tidal and shoreline habitats as sea level rises. For more information on sea level rise and climate resiliency in the city, see the Kingston Tidal Waterfront Flooding Task Force web page.

Tidal shoreline comprises lands directly on the Hudson River and the shorelines of tidal wetlands, tidal tributaries, and coves, including both naturally vegetated and engineered shoreline. Kingston has approximately 2.4 miles of shoreline directly along the Hudson River, most of which was documented as natural vegetation in a 2005 inventory (Figure 7). In addition, small areas of engineered bulkhead, unconsolidated rock revetment, and unvegetated shoreline were observed. Tidal portions of the Rondout are also considered shoreline habitat; however, shoreline types in the Rondout were not mapped by the 2005 inventory.

Opportunities for managing coastal habitats and restoring coastal habitat value exist in virtually the entire waterfont area. Understanding the resource is the first step. Some areas are already protected, such as parks and wetlands; it is important in these areas that shorelines remain natural to maintain connectivity between the water and land and to allow for inundation by sea level rise. The Hudson River Sustainable Shorelines Project provides information and tools on how to enhance the ecology of engineered shoreline protection, including bulkheads and rip-rap revetments, as well as how to conserve natural shorelines.

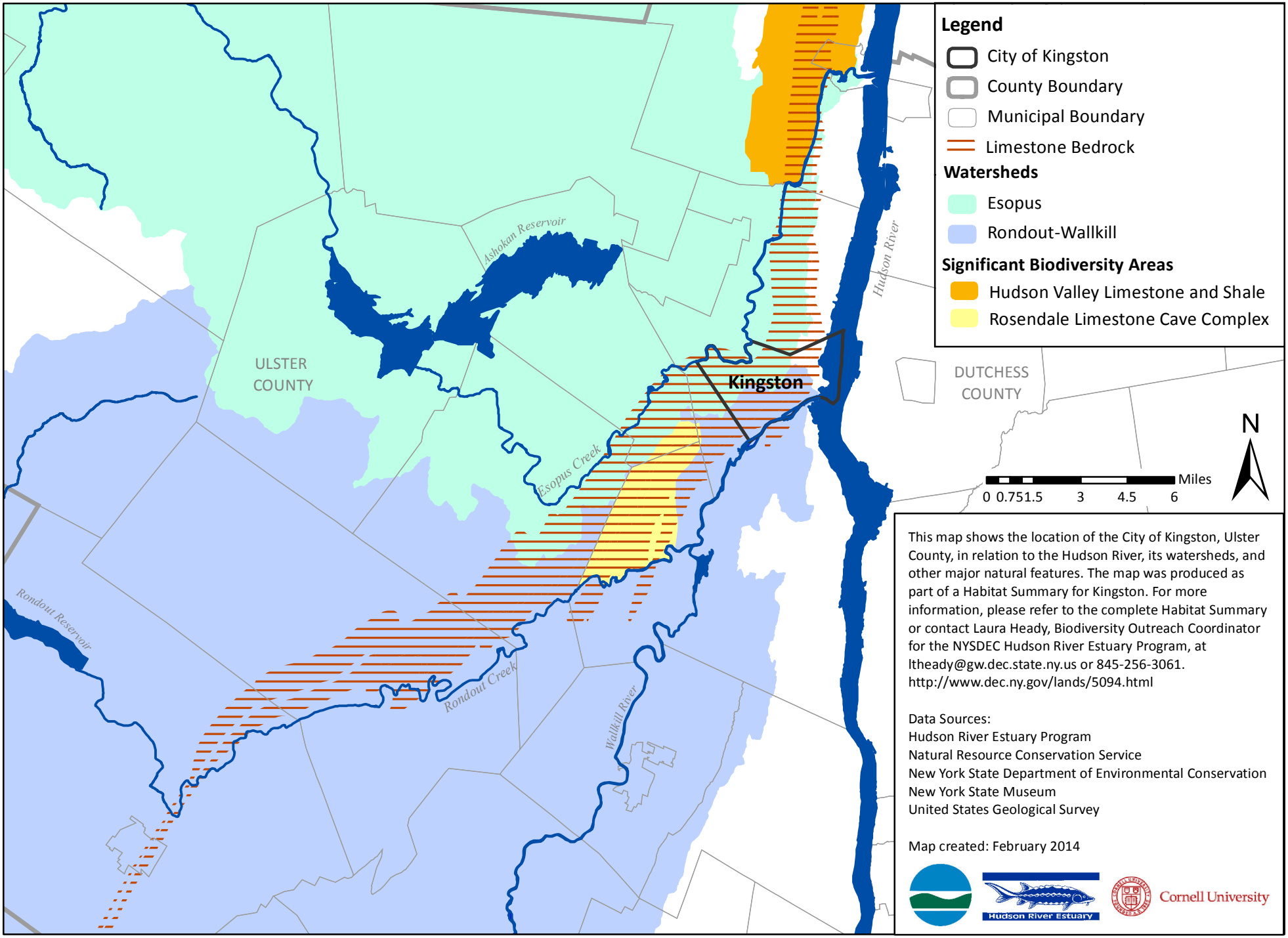
Grasslands, Shrublands and Young Forests (not mapped)

Recently disturbed sites such as abandoned farm fields or forest clearings can provide important habitat for species that require grassland, shrubland, and young forest. These successional habitat types are transitional and relatively short-lived, and typically require periodic management to maintain or they will become more densely vegetated and eventually develop a canopy and become forest.

Upland grassland or meadow habitat can support a variety of life, including rare plants, butterflies, reptiles, and birds, in addition to providing agricultural uses and scenic values. The quantity and quality of grasslands for wildlife have rapidly decreased in the Northeast over the last century due to an increase in human population, changes in agricultural technology, and the abandonment of family farms. This continuing trend threatens populations of grassland birds that have adapted to the agricultural landscape. Although there are no records of grassland-dependent species in Kingston in the NYS Breeding Bird Atlas and NY Amphibian and Reptile Atlas, Hudsonia identified some large upland meadows of 18-26 acres in size along the Esopus. These meadows could potentially be used by species like bobolink, eastern meadowlark, and northern harrier. Audubon New York offers guidance on managing habitat for grassland birds.

Young forests and shrublands are transitional habitats characterized by few or no mature trees, with a diverse mix of shrubs and/or tree saplings, along with openings where grasses and wildflowers grow. They can occur in recently cleared areas and abandoned farmland and are sometimes maintained along utility corridors by cutting or herbicides. These habitats are important for many wildlife species that are declining throughout the region as former agricultural areas have grown into forests and natural forest disturbances that trigger young forest growth, such as fires, have been suppressed. The Hudsonia habitat map shows small areas of upland shrubland in the city, as well as a long, linear patch in the utility right of way (Appendix 1). The NYS Breeding Bird Atlas documented nine species of conservation concern in Kinston that prefer young forest and shrubland habitat, including blue-winged warbler, brown thrasher, prairie warbler, and willow flycatcher. Extensive young forests and those that form large complexes with meadow habitats may be particularly important for nesting by these species, as well as for grassland nesting birds; for more information, see Audubon's guidance on managing habitat for shrubland birds.

Figure 1: Regional Context of Kingston, NY



This map shows the location of the City of Kingston, Ulster County, in relation to the Hudson River, its watersheds, and other major natural features. The map was produced as part of a Habitat Summary for Kingston. For more information, please refer to the complete Habitat Summary or contact Laura Heady, Biodiversity Outreach Coordinator for the NYSDEC Hudson River Estuary Program, at ltheady@gw.dec.state.ny.us or 845-256-3061. http://www.dec.ny.gov/lands/5094.html

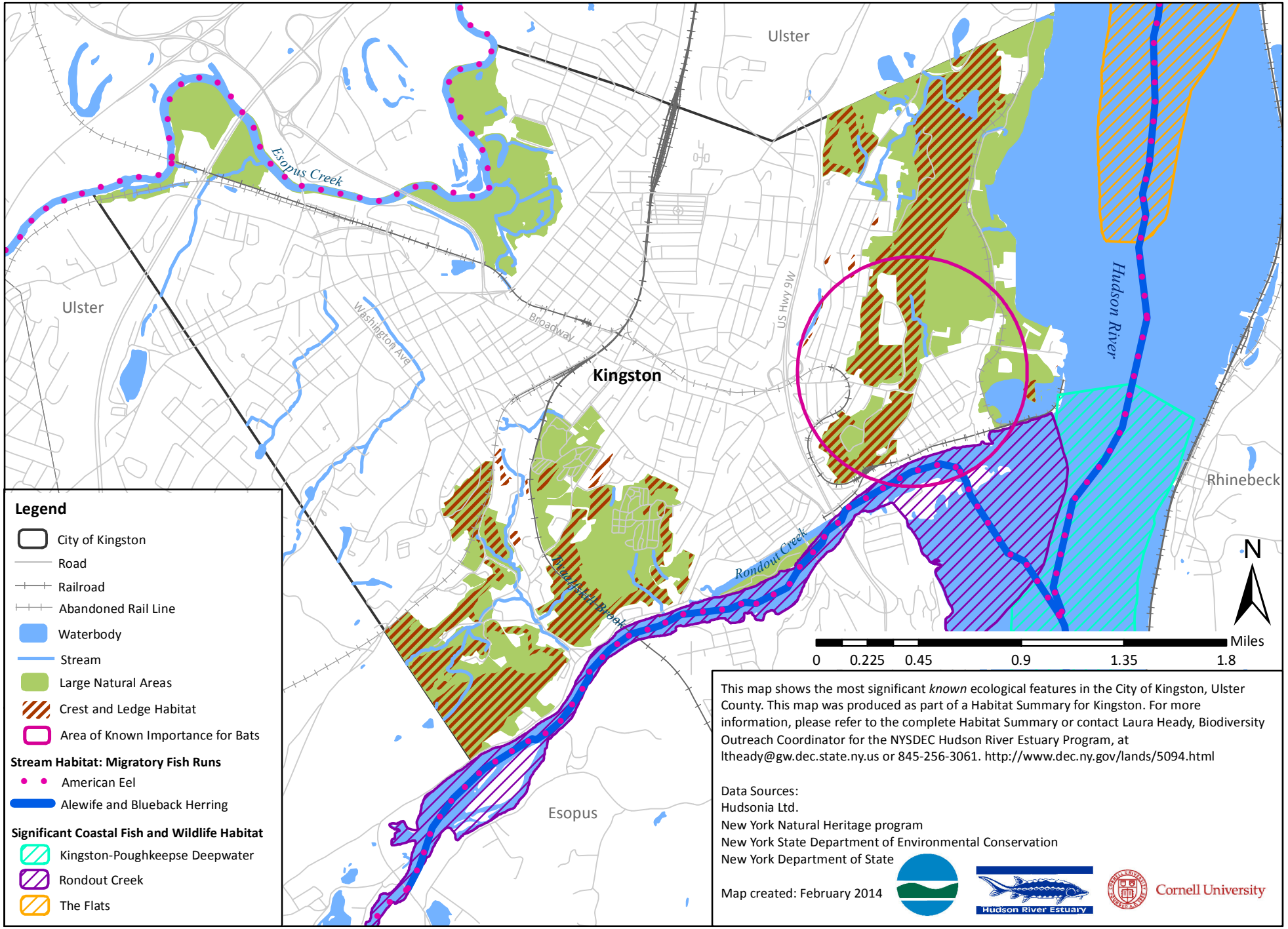
Data Sources:
Hudson River Estuary Program
Natural Resource Conservation Service
New York State Department of Environmental Conservation
New York State Museum
United States Geological Survey

Map created: February 2014

Hudson River Estuary

Cornell University

Figure 2: Major Ecological Features in Kingston, NY



This map shows the most significant *known* ecological features in the City of Kingston, Ulster County. This map was produced as part of a Habitat Summary for Kingston. For more information, please refer to the complete Habitat Summary or contact Laura Heady, Biodiversity Outreach Coordinator for the NYSDEC Hudson River Estuary Program, at ltheady@gw.dec.state.ny.us or 845-256-3061. http://www.dec.ny.gov/lands/5094.html

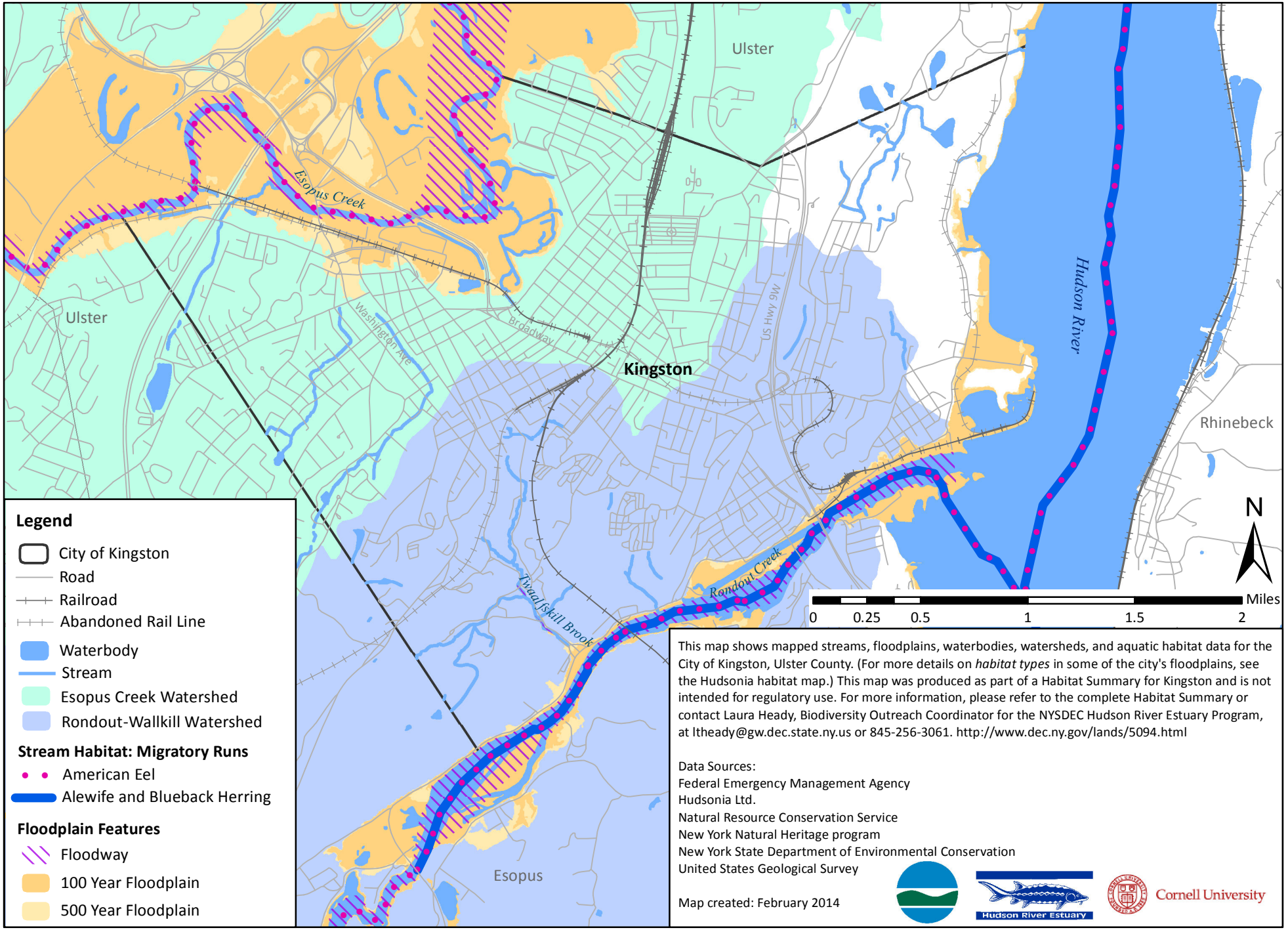
Data Sources:
Hudsonia Ltd.
New York Natural Heritage program
New York State Department of Environmental Conservation
New York Department of State

Map created: February 2014

Hudson River Estuary

Cornell University

Figure 3: Streams and Watersheds in Kingston, NY



This map shows mapped streams, floodplains, waterbodies, watersheds, and aquatic habitat data for the City of Kingston, Ulster County. (For more details on *habitat types* in some of the city's floodplains, see the Hudsonia habitat map.) This map was produced as part of a Habitat Summary for Kingston and is not intended for regulatory use. For more information, please refer to the complete Habitat Summary or contact Laura Heady, Biodiversity Outreach Coordinator for the NYSDEC Hudson River Estuary Program, at lheady@gw.dec.state.ny.us or 845-256-3061. http://www.dec.ny.gov/lands/5094.html

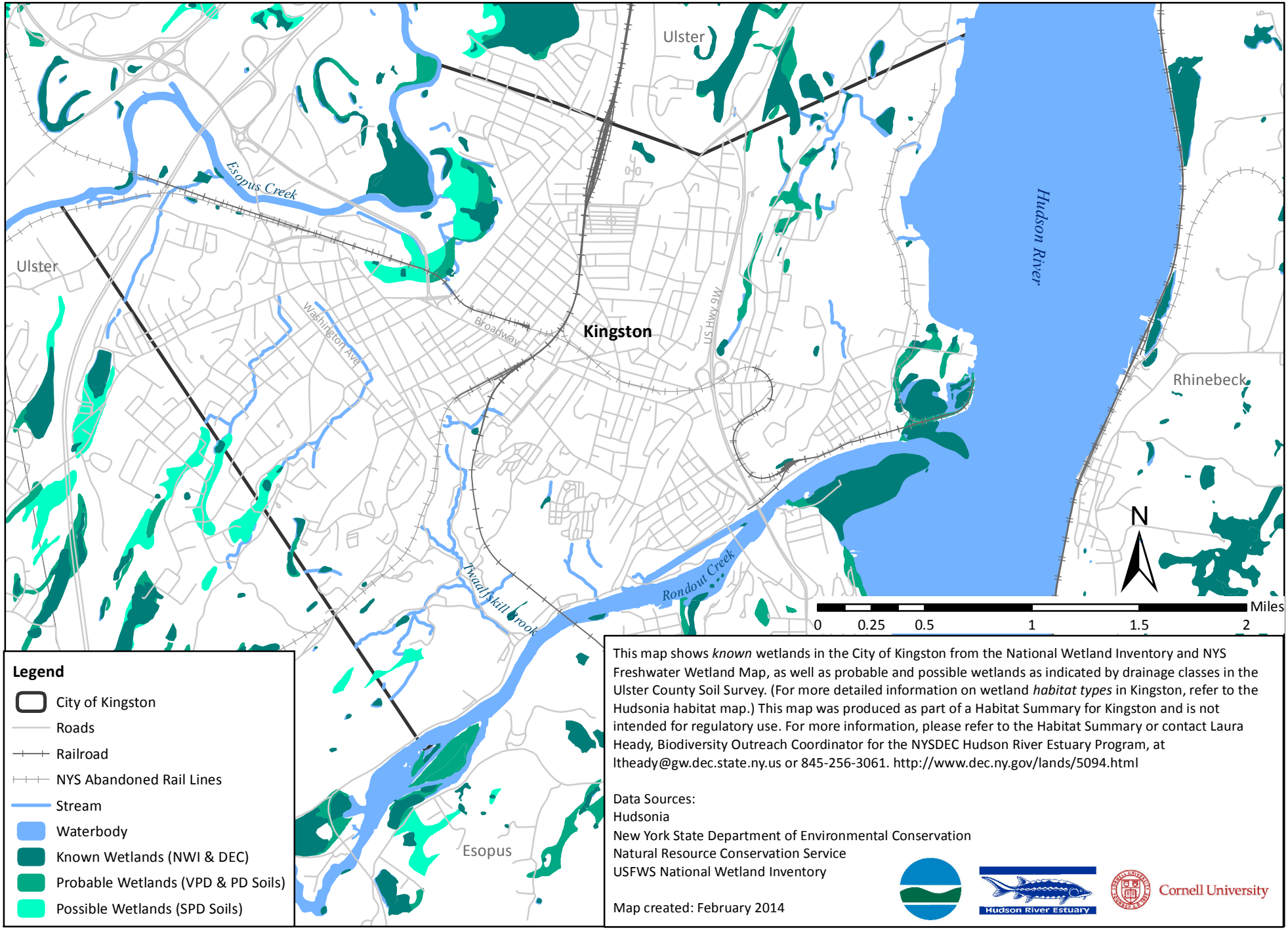
Data Sources:
Federal Emergency Management Agency
Hudsonia Ltd.
Natural Resource Conservation Service
New York Natural Heritage program
New York State Department of Environmental Conservation
United States Geological Survey

Map created: February 2014

Hudson River Estuary

Cornell University

Figure 4: Wetlands in Kingston, NY



Legend

- City of Kingston
- Roads
- Railroad
- NYS Abandoned Rail Lines
- Stream
- Waterbody
- Known Wetlands (NWI & DEC)
- Probable Wetlands (VPD & PD Soils)
- Possible Wetlands (SPD Soils)

This map shows *known* wetlands in the City of Kingston from the National Wetland Inventory and NYS Freshwater Wetland Map, as well as probable and possible wetlands as indicated by drainage classes in the Ulster County Soil Survey. (For more detailed information on wetland *habitat types* in Kingston, refer to the Hudsonia habitat map.) This map was produced as part of a Habitat Summary for Kingston and is not intended for regulatory use. For more information, please refer to the Habitat Summary or contact Laura Heady, Biodiversity Outreach Coordinator for the NYSDEC Hudson River Estuary Program, at lheady@gw.dec.state.ny.us or 845-256-3061. http://www.dec.ny.gov/lands/5094.html

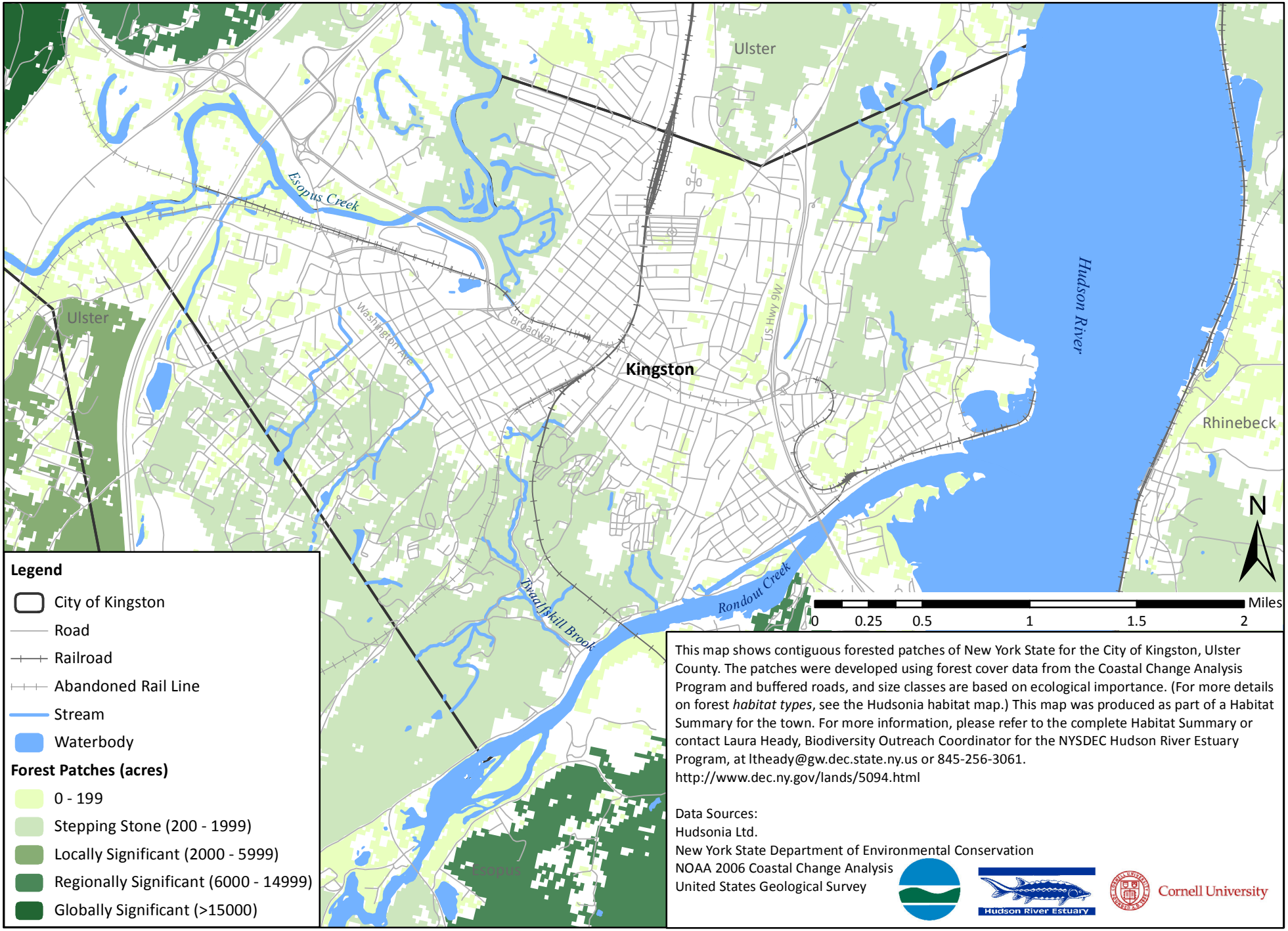
Data Sources:
Hudsonia
New York State Department of Environmental Conservation
Natural Resource Conservation Service
USFWS National Wetland Inventory

Map created: February 2014

Hudson River Estuary

Cornell University

Figure 5: Forests in Kingston, NY



This map shows contiguous forested patches of New York State for the City of Kingston, Ulster County. The patches were developed using forest cover data from the Coastal Change Analysis Program and buffered roads, and size classes are based on ecological importance. (For more details on forest *habitat types*, see the Hudsonia habitat map.) This map was produced as part of a Habitat Summary for the town. For more information, please refer to the complete Habitat Summary or contact Laura Heady, Biodiversity Outreach Coordinator for the NYSDEC Hudson River Estuary Program, at ltheady@gw.dec.state.ny.us or 845-256-3061.
http://www.dec.ny.gov/lands/5094.html

Data Sources:
Hudsonia Ltd.
New York State Department of Environmental Conservation
NOAA 2006 Coastal Change Analysis
United States Geological Survey

Hudson River Estuary

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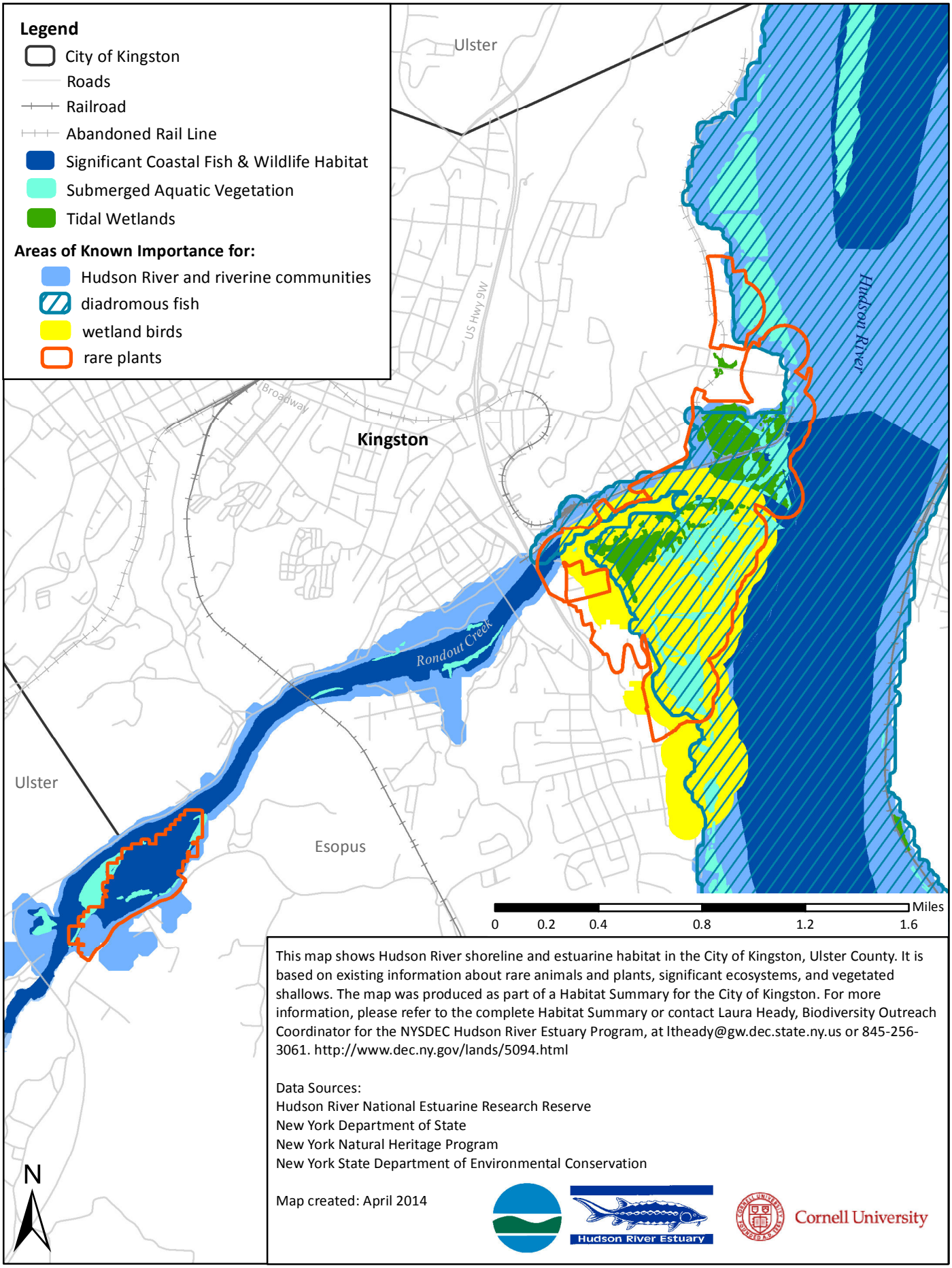
Figure 6: Hudson River Shoreline Habitat in Kingston, NY



This map shows Hudson River shoreline and estuarine habitat in the City of Kingston, Ulster County. It is based on existing information about rare animals and plants, significant ecosystems, and vegetated shallows. The map was produced as part of a Habitat Summary for the City of Kingston. For more information, please refer to the complete Habitat Summary or contact Laura Heady, Biodiversity Outreach Coordinator for the NYSDEC Hudson River Estuary Program, at lheady@gw.dec.state.ny.us or 845-256-3061. http://www.dec.ny.gov/lands/5094.html

Data Sources:
Hudson River National Estuarine Research Reserve
New York Department of State
New York Natural Heritage Program
New York State Department of Environmental Conservation

Map created: April 2014

Hudson River Estuary

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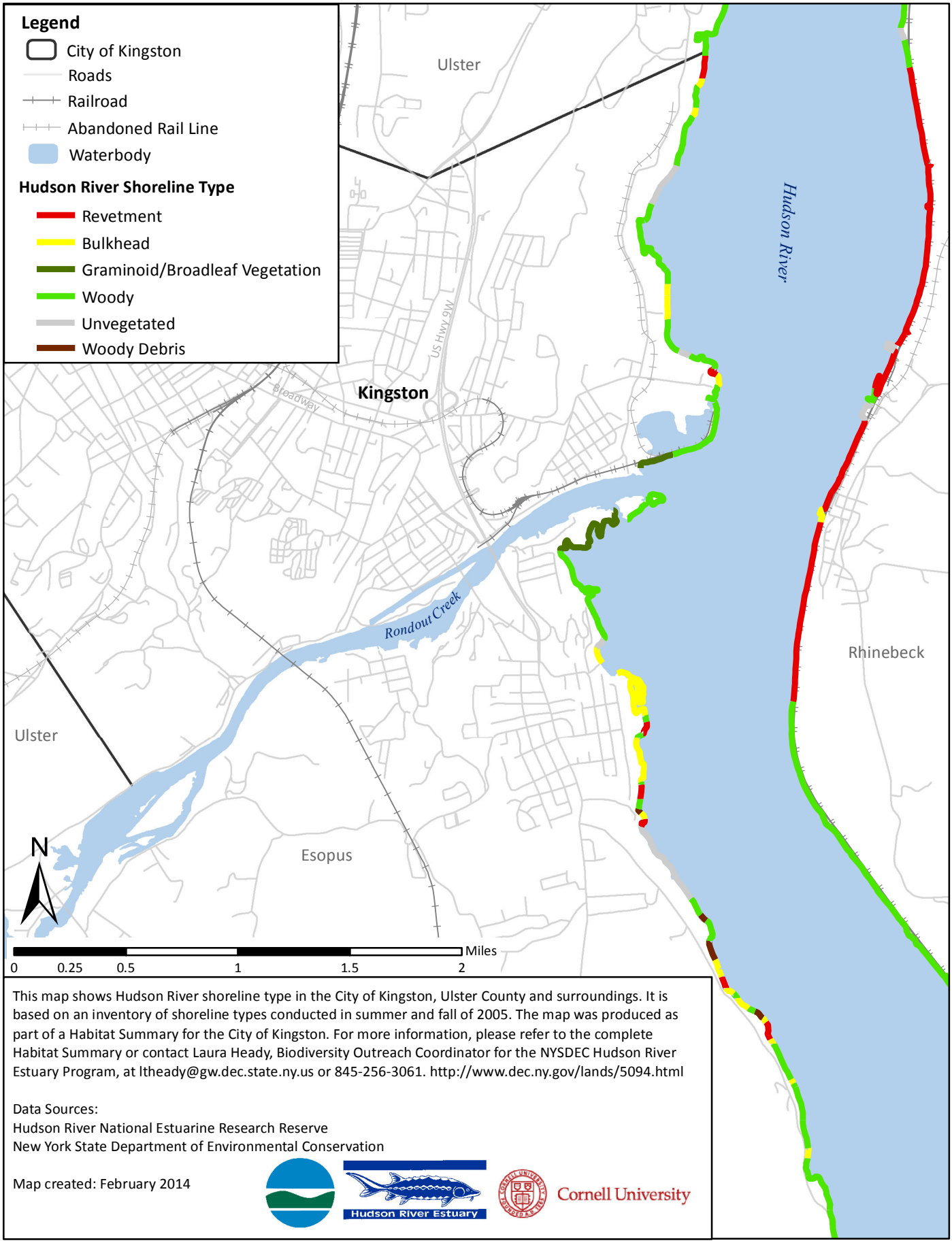
Figure 7: Hudson River Shoreline Type in Kingston, NY



This map shows Hudson River shoreline type in the City of Kingston, Ulster County and surroundings. It is based on an inventory of shoreline types conducted in summer and fall of 2005. The map was produced as part of a Habitat Summary for the City of Kingston. For more information, please refer to the complete Habitat Summary or contact Laura Heady, Biodiversity Outreach Coordinator for the NYSDEC Hudson River Estuary Program, at ltheady@gw.dec.state.ny.us or 845-256-3061. http://www.dec.ny.gov/lands/5094.html

Data Sources:
Hudson River National Estuarine Research Reserve
New York State Department of Environmental Conservation

Map created: February 2014

Hudson River Estuary

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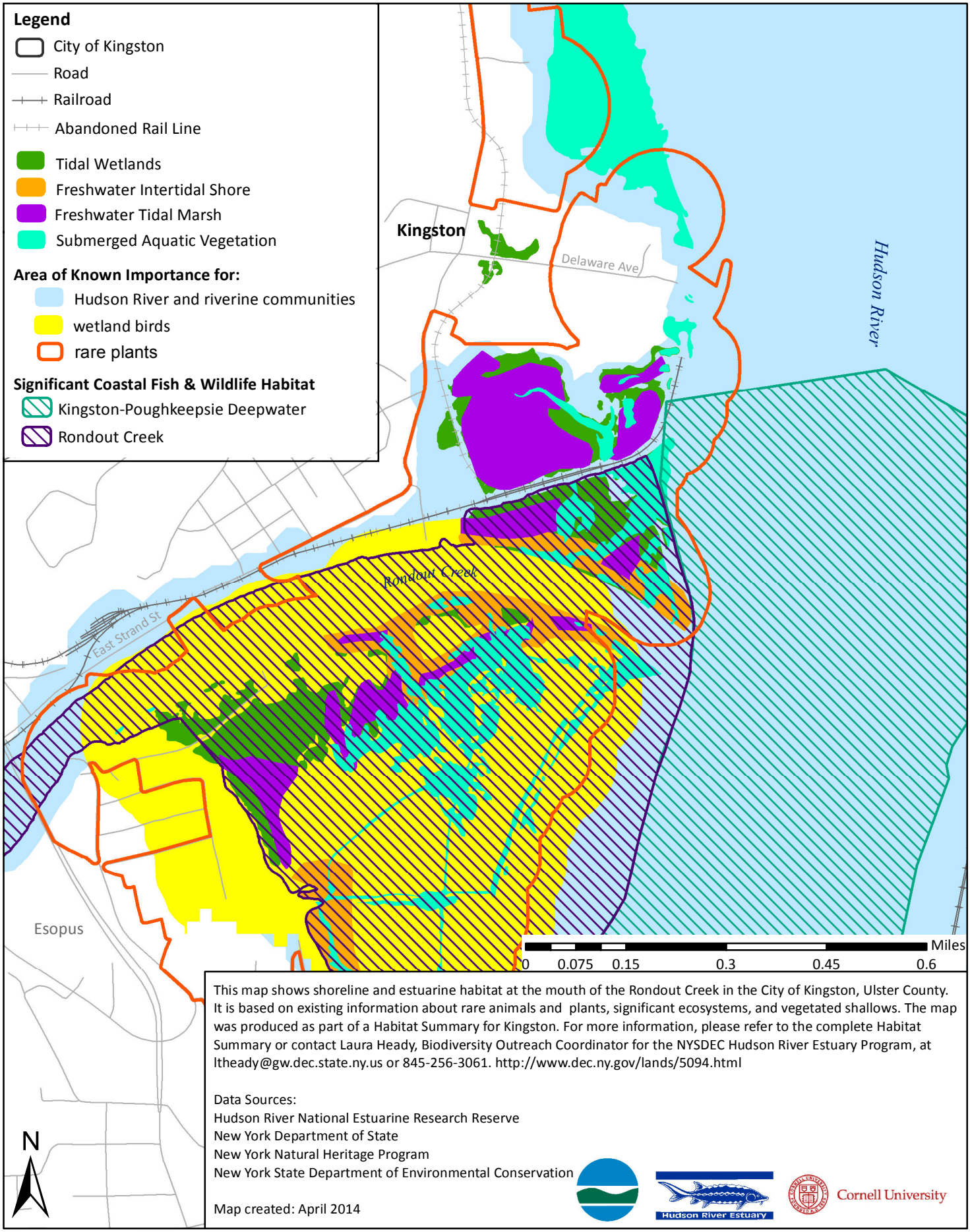
Figure 8: Shoreline Habitat at Mouth of Rondout Creek, Kingston, NY



This map shows shoreline and estuarine habitat at the mouth of the Rondout Creek in the City of Kingston, Ulster County. It is based on existing information about rare animals and plants, significant ecosystems, and vegetated shallows. The map was produced as part of a Habitat Summary for Kingston. For more information, please refer to the complete Habitat Summary or contact Laura Heady, Biodiversity Outreach Coordinator for the NYSDEC Hudson River Estuary Program, at ltheady@gw.dec.state.ny.us or 845-256-3061. http://www.dec.ny.gov/lands/5094.html

Data Sources:
Hudson River National Estuarine Research Reserve
New York Department of State
New York Natural Heritage Program
New York State Department of Environmental Conservation

Map created: April 2014

Hudson River Estuary

Cornell University

Species and Ecosystems of Conservation Concern in Kingston

The species and ecosystems of conservation concern that have been recorded in Kingston are listed in Tables 1 and 2. Table 1 lists state rare species and ecosystems and Table 2 lists bird species of conservation concern; both are referenced throughout the Habitat Summary text. In Tables 1 and 2, species are included if they are on the State or Federal Endangered and Threatened Species list, listed as a Species of Greatest Conservation Need in New York's Comprehensive Wildlife Conservation Strategy Plan, recognized as a Hudson River Valley Priority Bird by Audubon New York, or are other indicators of high quality habitat. All species and ecosystems in the lists are linked to a habitat described in the summary.

Note: There may be additional rare species and habitats in Kingston not yet documented.

Table 1. State Rare Animals and Ecosystems in Kingston

The following information comes from the New York Natural Heritage Program (NYNHP) biodiversity databases and the NY Amphibian and Reptile Atlas (NYARA). Data from NYNHP is available on-line from the New York Nature Explorer and information on rare animals, plants, and ecological communities can be found at http://guides.nynhp.org. The NYARA documented more reptile and amphibian species in Kingston than listed below; the table only includes those that are of conservation concern or are indicators of high quality habitat. For wildlife species, the "Description" column is largely based on the species groups in the NYS Comprehensive Wildlife Conservation Strategy (2005).

Common Name	Description	Scientific Name	Source
tidal river	Hudson River estuary	n/a	NYNHP
freshwater intertidal shore	Hudson River coastal habitat	n/a	NYNHP
freshwater tidal marsh	Hudson River coastal habitat	n/a	NYNHP
waterfowl winter concentration area	Hudson River coastal habitat	n/a	NYNHP
anadromous fish concentration area	Hudson River coastal habitat	n/a	NYNHP
shortnose sturgeon[4]	Hudson River fish	*Acipenser brevirostrum*	NYNHP
bald eagle[3]	open water/forest bird	*Haliaeetus leucocephalus*	NYNHP
Indiana bat[4]	forest mammal	*Myotis sodalis*	NYNHP
eastern small-footed myotis[2]	forest mammal	*Myotis leibii*	NYNHP
northern long-eared bat	forest mammal	*Myotis septentrionalis*	NYNHP
wood frog	vernal pool/forest amphibian	*Rana sylvatica*	NYARA
heartleaf plantain*	vascular plant of Hudson River coastal habitat	*Plantago cordata*	NYNHP
delmarva beggar-ticks*	vascular plant of Hudson River coastal habitat	*Bidens bidentoides*	NYNHP
Davis' sedge[3]	vascular plant of Hudson River coastal habitat	*Carex davisii*	NYNHP
smooth bur-marigold[3]	vascular plant of Hudson River coastal habitat	*Bidens laevis*	NYNHP

American waterwort[4]**	vascular plant of Hudson River coastal habitat	*Elatine americana*	NYNHP
riverbank quillwort[4]**	vascular plant of Hudson River coastal habitat	*Isoetes riparia*	NYNHP
Hudson River water-nymph[4]**	vascular plant of Hudson River coastal habitat	*Najas guadalupensis ssp. muenscheri*	NYNHP
estuary hatpins***	vascular plant of Hudson River coastal habitat	*Eriocaulon parkeri*	NYNHP

[1]NYS Species of Greatest Conservation Need (SGCN)
[2]NYS Special Concern
[3]NYS Threatened Species
[4]NYS Endangered Species
*State rare
**historical record
***historical record, extirpated from NY

Table 2. Significant Birds in Kingston

The following table lists bird species of conservation concern that were observed in Kingston during the 2000-2005 New York State Breeding Bird Atlas (BBA). Species are included in the table if 1) they were documented in Atlas blocks that are more than 50% in Kingston and 2) they have been identified as Hudson River Valley Priority Birds by Audubon NY (2009). Associated habitat information and links to species profiles, when available, are also from Audubon NY (2009); young forest and shrubland habitat designations are from DEC Biologist Paul Novak.

		NYS Conservation Status			
Common Name	**Scientific Name**	Species of Greatest Conservation Need	Special Concern	Threatened	Endangered
Forest Birds					
American Redstart	*Setophaga ruticilla*				
Baltimore Oriole	*Icterus galbula*				
Black-and-white Warbler	*Mniotilta varia*				
Black-throated Green Warbler	*Dendroica virens*				
Broad-winged Hawk	*Buteo platypterus*				
Downy Woodpecker	*Picoides pubescens*				
Eastern Wood-Pewee	*Contopus virens*				
Louisiana Waterthrush	*Seiurus motacilla*	x			
Northern Flicker	*Colaptes auratus*				
Purple Finch	*Carpodacus purpureus*				
Rose-breasted Grosbeak	*Pheucticus ludovicianus*				
Scarlet Tanager	*Piranga olivacea*	x			
Veery	*Catharus fuscescens*				
Wood Thrush	*Hylocichla mustelina*	x			
Yellow-throated Vireo	*Vireo flavifrons*				
Young Forest and Shrubland Birds					
American Woodcock	*Scolopax minor*	x			
Black-billed Cuckoo	*Coccyzus erythropthalmus*	x			
Blue-Winged Warbler	*Vermivora pinus*	x			
Brown Thrasher	*Toxostoma rufum*	x			
Eastern Kingbird	*Tyrannus tyrannus*				
Eastern Towhee	*Pipilo erythrophthalmus*				
Indigo Bunting	*Passerina cyanea*				
Prairie Warbler	*Dendroica discolor*	x			
Willow Flycatcher	*Empidonax trailli*	x			

		NYS Conservation Status			
Common Name	**Scientific Name**	Species of Greatest Conservation Need	Special Concern	Threatened	Endangered
Wetland Birds					
Least Bittern	*Ixobrychus exilis*	**x**		**x**	
Marsh Wren	*Cistothorus palustris*				
Birds of Other Habitats					
Chimney Swift (urban)	*Chaetura pelagica*				

General Conservation Measures for Protecting Natural Areas and Wildlife

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- **Protect large, contiguous, unaltered tracts of land** wherever possible. Avoid fragmentation of such areas by roads, driveways, and other developed uses.
- **Preserve broad links** between natural habitats on adjacent properties.
- **Preserve natural disturbance processes**, such as fires, floods, tidal flushing, seasonal drawdowns, landslides, and wind exposures wherever possible. Discourage development that would interfere with these processes.
- **Restore and maintain broad buffer zones** of natural vegetation along streams, along shores of other water bodies and wetlands, and at the perimeters of other sensitive habitats.
- **Encourage development of altered land** instead of unaltered land wherever possible.
- **Promote redevelopment of brownfields** and other previously-altered sites, "infill" development, and "adaptive re-use" of existing structures wherever possible, instead of breaking new ground in unaltered areas.
- **Direct human uses toward the least sensitive areas**, and minimize alteration of natural features, including vegetation, soils, bedrock, and waterways.
- **Concentrate development along existing roads**; discourage construction of new roads in undeveloped areas.
- **Encourage pedestrian-centered developments** that enhance existing neighborhoods, instead of isolated developments requiring new roads or expanded vehicle use.
- **Preserve farmland potential** wherever possible.
- **Minimize areas of impervious surfaces** (roof surfaces, roads, parking lots, driveways, etc.), and maximize onsite retention and infiltration of stormwater runoff, to help protect the quality and quantity of groundwater and surface water resources. Design new development such that surface runoff from the site during and after construction does not exceed pre-construction runoff volumes.
- **Restore degraded habitats** wherever possible, but do not use restoration projects as a "license" to destroy existing high-quality habitats.
- **Consider environmental concerns early in the planning process** for new developments. Incorporate biodiversity conservation principles into the choice of development sites, the site design, and the construction practices.

Adapted from: Kiviat, E. and G. Stevens. 2001. Biodiversity assessment manual for the Hudson River estuary corridor. New York State Department of Environmental Conservation, Albany, NY. 508 p.

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Appendix 1

SIGNIFICANT HABITATS IN SELECTED AREAS OF THE CITY OF KINGSTON, ULSTER COUNTY, NY