SECTION 3.3 BIODIVERSITY

Significance of Biodiversity to Watershed Planning

Watershed planning provides an ideal opportunity to consider conservation of biological resources. The plants, animals, and habitats—or *biodiversity*—of the Rondout watershed are a significant part of the region's character, natural infrastructure, and economy, and contribute directly to the quality and quantity of drinking water available to residents living in the region.

The term "biodiversity" is used to describe all the components of nature that are needed to sustain life. While people often associate the term biodiversity with threatened and endangered species, it actually encompasses much more. Biodiversity refers to all living things, both rare *and* common, the complex relationships between them, as well as their relationship to the environment. Biodiversity includes genetic variety, species diversity, and variability in natural communities, ecosystems, and landscapes. All of these parts and processes comprise the web of life that contributes to healthy ecosystems. For example, soil organisms convert leaves, twigs, and other organic litter into humus, and affect the infiltration and distribution of water in the soil.

Why is biodiversity important to the people living in the Lower non-tidal Rondout Creek watershed? For starters, the watershed has a diverse and rich natural heritage, with species and ecological communities of regional, statewide, and global significance. These natural systems are the scenery and living fabric that provides the Rondout Creek watershed with a regional identity, and creates a sense of place for its residents. And healthy, natural systems are in essence a "green infrastructure," supplying services that support life as we know it, through purification of drinking water, control of floodwaters, replenishment of aquifers, pollination of crops, creation of fertile soil, control of insect pests, and adaptation to a changing climate. They also provide opportunities for hunting and fishing, outdoor recreation, and environmental education and research. All of these services and benefits to the community cost less than the artificial or built alternatives, contribute to local economies, and are widely recognized as important assets by a variety of stakeholders.

Threats to Biodiversity and Associated Impacts to Watershed Health

Two of the greatest threats to biodiversity are habitat loss and invasion of non-native species (Wilcove et al. 1998). In particular, land use changes that degrade and destroy natural habitats pose the most significant threats to native biodiversity. Suburban sprawl, for instance, fragments the landscape into smaller and smaller patches of habitat, and surrounds these fragments with development, often having lethal effects on wildlife species that require large, connected natural areas. Furthermore, the resulting patchwork of land uses and human activity creates ideal conditions for invasive species to take hold. For example, the recent discovery of the invasive emerald ash borer in the Catskill Forest Preserve may have serious impacts on North American ash tree species, which comprise nearly 7% of all trees in the state. (NYSDEC 2010) Increasingly, global climate change presents a new array of conservation challenges and variables, such as shifts in habitat availability and timing of natural events.

Land-use decisions made at the municipal and regional level will have lasting impacts on the function of natural systems in the Lower non-tidal Rondout Creek watershed, and their ability to support its human communities. For example, loss of habitat can lead to a corresponding loss in basic watershed functions, such as water infiltration and purification by forests and grasslands, erosion control along stream banks, and flood attenuation in wetlands. Habitat loss and fragmentation also creates unsuitable conditions for many native plants and animals, and leads to increased populations of more common, nuisance species such as white-tailed deer, Canada geese, mosquitoes, and black-legged tick, which carries Lyme disease. The effects of widespread deer browse, for instance, are a major cause of regeneration failure and change in forest composition in the region.

Additional threats to biodiversity include impacts associated with human development, many of which can be reduced or prevented altogether, such as light pollution, failing septic systems, and household pets; and pollution of natural areas from contaminants such as road salt, pesticides, fertilizers, and household chemicals and pharmaceuticals.

Biodiversity of the Lower Non-Tidal Rondout Creek Watershed

The rich biodiversity of the Lower non-tidal Rondout Creek watershed is a result of the variable landscape included within its boundaries.

To the north are the forested Catskill Mountain foothills, where several headwater streams, like Sapbush Creek in Rochester, originate in the Catskill Forest Preserve. To the south are the steep rocky slopes of the Shawangunk Ridge, supporting another large forested area that is the source of several headwater streams like the Stony Kill in Wawarsing. The higher-elevation tributaries flow to the more level terrain of the Upper Rondout and Rondout Creek valley, where farmland and fields are more common, such as where Kripplebush Creek meets the Rondout in southern Marbletown. To the east, before the non-tidal Upper Rondout becomes tidal, the watershed holds the limestone caves and Binnewater Lakes of Rosendale.

The biological resources of the Lower non-tidal Rondout Creek watershed have been recognized on many levels as having high conservation value:

- The Nature Conservancy's report, *Identifying Conservation Priorities in the Hudson River Estuary Watershed* (Shirer and Tear 2005), identifies ecoregional aquatic conservation targets (priority watersheds) within the Hudson River Estuary watershed, and the Rondout Creek Watershed is listed as one of these priorities.

- The *New York State Open Space Conservation Plan* (2009) recognizes the Lower Hudson Valley for its extremely diverse natural landscape, and identifies several "Regional Priority Conservation Areas" in the Rondout watershed. These conservation priorities include the "Great Rondout Wetlands," of which the Great Pacama Vly and Cedar Swamp occur in the watershed; the "Karst Aquifer Region" which is characterized by caves, sinkholes, mines, springs, lakes, and sinking streams; the "Catskills Unfragmented Forest;" and the "Shawangunk Mountain Region." The Plan also prioritizes the protection of natural linkages between the Shawangunk Ridge and other significant

biodiversity areas in close proximity. In the Rondout watershed, such linkages include a Catskills/Shawangunk connection in Wawarsing (NYS Department of Correctional Services – Wawarsing farmlands) and a Shawangunk/Karst Aquifer connection surrounding the Wallkill Valley Rail Trail in Rosendale.

- The Rondout watershed includes portions of three Significant Biodiversity Areas (SBA) described in the NYSDEC's *Hudson River Estuary Wildlife and Habitat Conservation Framework* (Penhollow et al. 2006). Much of the Shawangunk Ridge SBA is within the watershed, and all of the Rosendale Cave Complex SBA falls within its boundaries. The southern end of the Catskill Mountain SBA is within the northern limits of the watershed.

- The Shawangunk Mountains Scenic Byway region is a 134,000 acre area that is largely defined by the 88-mile state scenic byway that encircles the northern Shawangunks and lands in the Rondout and Wallkill Valleys. The northern half of the Byway region lies within the Rondout watershed. The *Shawangunk Mountains Regional Open Space Plan* (December 2008) outlines strategies to preserve valuable resources, including the waterways, wetlands, forests, grasslands, and landscape connections that support the region's rich biodiversity and maintain clean air and water.

- [The Nature Conservancy has designated both mountain features of the watershed, the Shawangunk Ridge and Catskill Mountains, as "Last Great Places on Earth."] The Ridge is home to 35 natural communities; including one of only two ridgetop dwarf pine barrens in the world, chestnut oak forests, hemlock forests, pitch pine forests, lakes, rivers and wetlands. Twenty-seven rare plant and animal species have been documented there. The Catskills are part of a vast unfragmented forest that provides important habitat to many species, including timber rattlesnake, a threatened species in New York.

Priority Habitats of the Watershed

The underlying geology, soils, topography, surface and groundwater, and land use history of the Rondout Creek watershed all weave together to shape a diversity of habitats that support an equally diverse array of plant and animal communities. The biodiversity of the **creek mouth and lower, tidal portion of the Rondout** will be described in [the tidal Rondout Creek watershed plan underway by the City of Kingston – working title?] and the *Upper Rondout Creek Stream Management Plan* (2010) describes the biodiversity of the **upper Rondout Creek watershed** from the Peekamoose Gorge to the Rondout Reservoir.

The priority habitats of the **lower non-tidal Rondout watershed**, discussed in this plan, include streams and riparian corridors; forests; a variety of wetlands; grasslands, shrublands, and farms; and cliffs and caves. Tables [ ] contain lists of breeding birds, amphibians, reptiles, rare species, and ecological communities that have been documented in the Towns of Marbletown, Rochester, Rosendale, and Warwarsing.

While the entire watershed has not been studied to locate and map all biological resources, there is a growing body of information on where important habitats are, and what plants and animals they support, as a result of local and regional initiatives:

- The Shawangunk Ridge Biodiversity Partnership's *Green Assets* project developed a series of maps that show important ecological community types or "conservation targets" on the Ridge, along with elevation/slope, protected areas, and tax parcels. The maps were designed to help land use decision-makers identify and protect ecologically important habitat, unfragmented forest, and connections between natural areas. Parts of the four municipalities in the Lower non-tidal Rondout watershed are included on these maps. (2006)

- The Town of Marbletown has detailed habitat maps for approximately 6,000 acres in the Catskill foothills and along the Rondout Creek (Hudsonia 2007), and an additional 7,500 acres of habitat mapped in an adjacent area by a volunteer community group in 2006. Both maps are described in companion reports, which also include habitat profiles and specific conservation recommendations. Further discussion of the Town's forests, streams, and wildlife habitats are contained in the Marbletown Natural Heritage Plan. (2008)

- The Town of Rochester completed a Draft Natural Resource Inventory in 2006 that has maps and information on resources and features such as geology, wetlands and streams, and slope. Biological data are largely limited to information from the Green Assets program and New York Natural Heritage Program for the portion of the town south of the Rondout Creek.

- The Town of Rosendale completed a Natural Resource Inventory in 2010 that incorporates maps and information about the town's geology, groundwater, surface water, and biological communities, including a detailed habitat map of 4,300 acres in the Binnewater Lakes region completed by a volunteer training group in 2004. Maps of ecological communities are included for other parts of the town. Habitat mapping for the remaining one-third of the town is underway and will complete a larger town-wide biodiversity assessment, "The Natural Wealth of Rosendale."

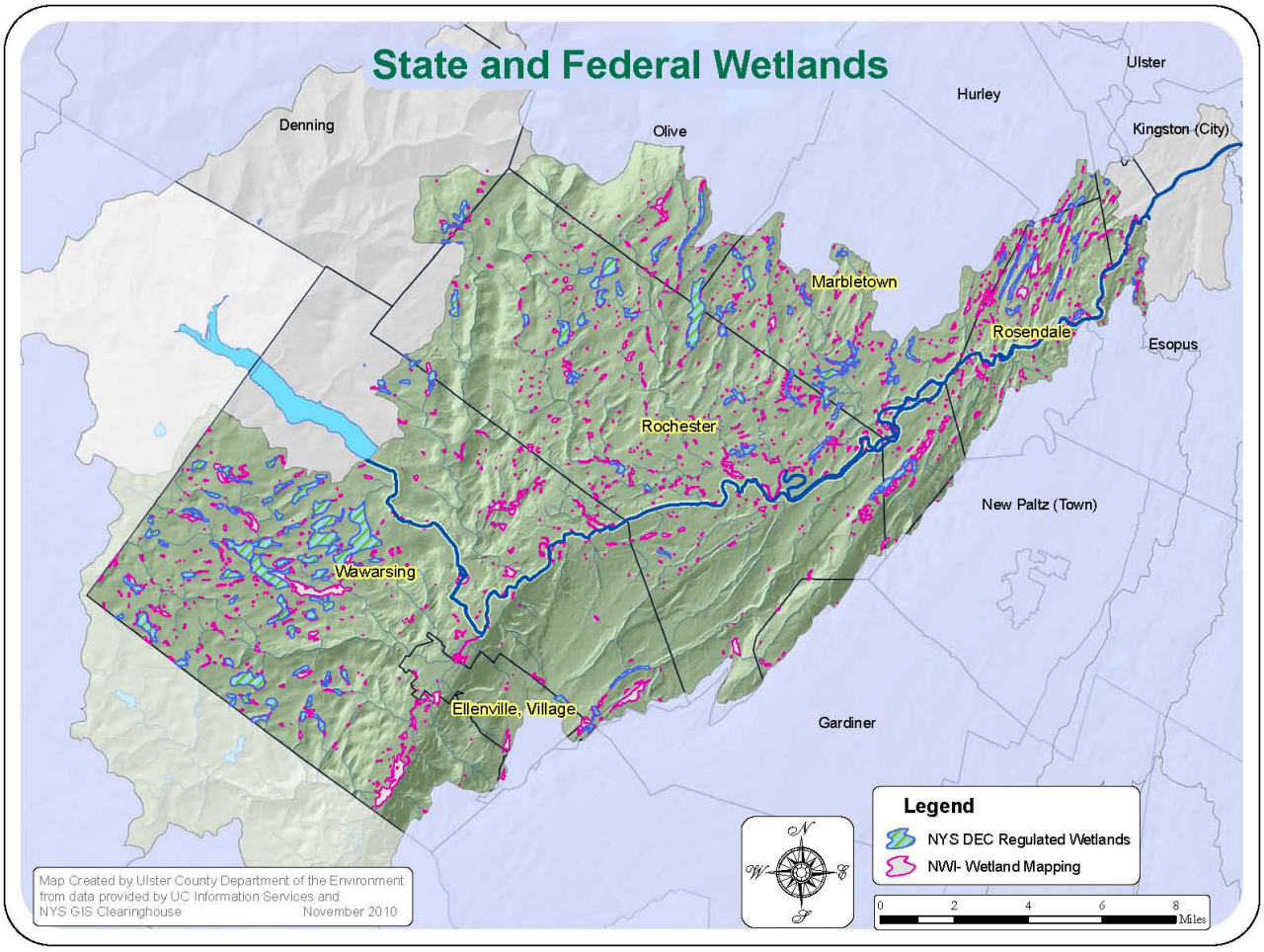
How to Use This Information

Knowing what habitats and species occur in the Rondout watershed can be useful not only for watershed planning, but for taking conservation action at the municipal level, as well. It is likely that many of the habitats that have been identified and mapped in the watershed occur elsewhere where underlying conditions are similar. Future assessments can take into consideration what is known about important habitat occurrences in the watershed, to predict and assess their distribution in other unstudied areas, and to proactively plan for the associated rare species. Such information can provide a starting place for habitat maps, natural resource inventories, open space plans, and other conservation and smart growth plans. This approach will also contribute to

keeping common species in the watershed common, and maintaining overall ecosystem function. Finally, many of the planning and conservation recommendations discussed in this plan for the watershed also apply to land-use decision making at the local level.

Stream Corridors and Wetlands

INSERT HERE: Brief discussion of biodiversity of headwater wetlands, riparian wetland complexes, streams, wildlife connections. [Streams, riparian corridors already covered in Grieser section? Keep this section complimentary and not redundant. Refer to Grieser section accordingly.]



Lakes, Ponds, and Pools

INSERT HERE: Brief discussion of biodiversity of Sky Lakes, Binnewater Lakes, intermittent woodland pools.

Forests

INSERT HERE: Brief discussion of biodiversity of Catskill Mountain and Shawangunk Ridge forests, stepping stone forests, young forests, and habitats that occur within forest matrix.

Grasslands, Shrublands, and Farms

INSERT HERE: Brief discussion of biodiversity of old fields, meadows, successional habitats.

Cliffs and Caves

INSERT HERE: Brief discussion of biodiversity of limestone cave complex, Shawangunk cliffs.

Cores, Connections, and Landscape Perspective

INSERT HERE: Brief discussion of landscape connections and the "big picture" of biodiversity in the Lower non-tidal Rondout watershed.

Threats and Conservation Recommendations

INSERT HERE: Habitat-specific discussion of threats and opportunities for conservation-oriented planning in the watershed.

Conclusions

INSERT HERE: Brief discussion of economic benefits of conservation-oriented planning.

Whatever the scale, from making decisions at a site-plan review, to developing a town open space plan, or setting watershed protection goals, the key steps to conserving biodiversity resources are as follows:

1) identify resources
2) prioritize resources
3) plan, protect, and manage resources.

The Lower Non-Tidal Rondout Creek Watershed Plan is a tool that residents, municipalities, conservation groups, county agencies, and other stakeholders can use to learn about the rich diversity of plants, animals, and habitats in the watershed, and set priorities so that implementation efforts are effective and efficient, and reflect community values. It also can be used to identify gaps in information and set goals for future study and research. Finally, it can provide a planning framework to protect the biodiversity of the Rondout watershed, so that future generations will be able to live in healthy, quality communities and enjoy their natural heritage for a long time to come.

Many of the recommendations outlined here reflect general conservation principles for protecting biodiversity. They include (adapted from Kiviat and Stevens 2001):

- Consider habitat and biodiversity concerns early in the planning process.
- Direct human uses toward the least sensitive areas, and minimize alteration of natural features, including vegetation, soils, bedrock, and waterways.
- Protect large, contiguous, and unaltered tracts of habitats wherever possible.
- Protect contiguous habitat areas in large, circular or broadly-shaped configurations within the larger landscape.
- Preserve links between habitats on adjacent properties via broad connections, not narrow corridors.
- Create, restore, and maintain broad buffer zones of natural vegetation along streams, along shores of other water bodies and wetlands, and at the perimeter of other sensitive habitats.
- Maintain buffer zones between development and land intended for habitat.
- Prioritize higher-quality habitats for protection, as degraded habitats decrease the biological value of the larger ecological landscape.
- Preserve natural processes such as forest fires, floodplain flooding, and beaver flooding to maintain the diversity of habitats and species dependent on such processes.
- Preserve farmland potential.
- Protect habitats associated with resources of special economic, public health, or aesthetic importance to the community. These include aquifers or other sources of drinking water, active farms, and scenic views.
- In general, encourage development of altered land instead of unaltered land.
- Concentrate development along existing roads; discourage construction of new roads in undeveloped areas.
- Promote clustered and pedestrian-centered development wherever possible, to maximize extent of unaltered land and minimize expanded vehicle use.
- Minimize extent of impervious surfaces (roofs, roads, parking lots, etc.), and maximize onsite groundwater infiltration. Minimize areas of disturbance.

Municipalities in the watershed might consider including similar principles in their comprehensive plans or in future intermunicipal agreements. If followed by communities in the Rondout watershed, these general guiding principles may contribute to the realization of the watershed plan's goals for smart growth, water resource protection, and biodiversity conservation.

Literature Cited ***[INCOMPLETE]***

INSERT HERE: complete list of citations

Penhollow, M. E., P. G. Jensen, and L.A. Zucker. 2006. *Wildlife and Habitat Conservation Framework: An Approach for Conserving Biodiversity in the Hudson River Estuary Corridor.* New York Cooperative Fish and Wildlife Research Unit, Cornell University and New York State Department of Environmental Conservation, Hudson River Estuary Program, Ithaca, NY.

Upper Rondout Creek Stream Management Plan. February 2010, Catskill Streams website. Last updated, August 2010. ‹http://catskillstreams.org/Rondout_stream_management_plan.html›.

Wilcove, D.S., D. Rothstein, J. Dubow, A. Phillips, and E. Losos. 1998. *Quantifying threats to imperiled species in the United States.* Bioscience 48(8):607-615.