Town of Rosendale
Natural Resource Inventory

Prepared by
The Town of Rosendale Environmental Commission

September 2010

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Acknowledgements

This Natural Resource Inventory is the fruit of two years of mostly volunteer labor by members of the Town of Rosendale Environmental Commission. We want to acknowledge, in particular, Nava Tabak, whose mapping skills and commitment to this project made its completion possible. Neil Curri, Amanda LaValle, and John Mickelson provided technical mapping assistance, and Hudsonia Ltd. provided access to computer equipment and mapping software. We also want to acknowledge and thank former Commission members who contributed to this project, including Joan Maylie, who gathered the data for the historic sites map, and Naja Kraus, who worked with Joan in obtaining the GPS coordinates for the historic sites. Many individuals and organizations outside of the Environmental Commission made important contributions to this project. We would like to thank Town Historian Ann LeFevre Gilchrist for her assistance in reviewing the Historic Sites Map for accuracy as well as for writing the accompanying text. We would also like to thank Rosendale Town Assessor Dan Baker for his assistance in researching conservation easements for the Protected Lands Map.

Many individuals, some representing the following agencies, organizations, and businesses, have shared their map data and knowledge with us in order to make this project possible. We wish to sincerely thank all of the contributors for their time and participation.

Behan Planning and Design
Cornell University Geospatial Information Repository
D&H Canal Museum
Mohonk Preserve
New York Natural Heritage Program
New York Rural Water Association
New York State Department of Environmental Conservation
New York State GIS Clearinghouse
New York State Office of Parks, Recreation, and Historic Preservation
Rondout Creek Watershed Council
The Nature Conservancy
The Shawangunk Ridge Biodiversity Partnership
Ulster County Information Services
Ulster County Soil and Water Conservation District
Wallkill Valley Land Trust

SECTION I. Introduction

The Town of Rosendale Environmental Commission has prepared this Natural Resource Inventory (NRI) to provide a baseline of information for helping town officials, developers, and residents make informed and environmentally sound land use decisions. The Environmental Commission is responsible for developing and maintaining an NRI under Rosendale Town Code and N.Y. State General Municipal Law.[1] Without such data it is difficult to fully assess the likely impacts of development on the health and quality of water resources, soils, and biological communities, as well as on the welfare of residents and the safety of their homes. Many kinds of decisions can benefit from consulting these maps—where to place a septic system, what land to farm, how to lay out a development, and what lands to protect and preserve.

In addition to serving as a valuable land use planning tool, the NRI can be used as a public education resource and as a classroom resource for teaching environmental studies, geography, biology, and geology, among other subjects. Collectively, the 21 maps in this Inventory provide a sense of the natural richness of Rosendale and the ways in which its resources and topography have shaped the town's history and development. The maps illustrate Rosendale's geology, soils, surface and ground water, habitats, historical sites, cultural and recreational sites, agricultural lands, and other resources and land uses, both natural and human-made.

The NRI is an evolving document that will be updated periodically by the Rosendale Environmental Commission to reflect both the availability of more accurate data and the natural and human changes to the landscape over time. This revision process is essential to ensuring that land use decision-makers, whether they are residents, developers, or town officials, have the best and most up-to-date information available.

Data and Methods

The data sources for these maps are numerous, and include federal, state, and county agencies, the Rosendale Environmental Commission, non-profit organizations, and knowledgeable individuals. Some of the maps included in this Inventory are representations of existing maps that were either previously created and adopted by the town (the groundwater and geology maps of Rosendale's 2007 *Groundwater Protection Plan* as well as the Binnewater Lakes Region habitat map), or larger maps that included at least a portion of the town (the Shawangunks vegetation and land cover map). All maps were compiled into this set of NRI maps using Geographic Information System (GIS) data and software. This software is designed for visualizing, manipulating, analyzing, and displaying geographic (spatial) data. All maps were compiled in NAD 1983 UTM zone 18N coordinate system, with exception of the 2009 Aerial View Map, which is in NAD 1983 New York State Plane. The spatial accuracy of features on these maps is dependent on the original data sets used to make the maps. Some agencies, including Ulster County Information Services and the New York State GIS Clearinghouse, provided us with multiple data sets originating from other entities. We have documented the original sources of data on each map to the best of our knowledge.

The Rosendale Environmental Commission collected original data for the Agricultural Lands Map, the Historical Sites Map, the Protected Open Space Map, and the Cultural and Recreational Sites Map. The data used to create the other maps in this Inventory originated with other sources. Data sources and additional mapping method details specific to individual maps is found in Section II of this report.

[1] Section 7-5(C) and (D) of the Town Code requires the Environmental Commission to "conduct studies, surveys and inventories of the natural and man-made features within the Town of Rosendale" and to maintain an up-to-date inventory of all open spaces within the town's boundaries. New York State enabling legislation for municipal Conservation Advisory Councils (of which the Rosendale Environmental Commission is one) also specifies in section 239-x of the General Municipal Law that an NRI be developed and maintained by these municipal bodies.

How to Use this Report

The town-wide scope of the NRI maps makes them suitable for general planning (for instance, comprehensive plan and open space plan) and education purposes. On a site-specific scale, these maps should be consulted by residents, developers, and town planning officials and consultants as a preliminary step in identifying site features and constraints. These maps should not be used as the basis for land use decision-making at the site-specific scale or for jurisdictional determinations, as they are not uniformly ground-truthed, and do not reflect survey accuracy. Rather, they are intended to serve as a basis for gathering additional, more precise data of the site through field investigation and professional surveys.

The natural resources displayed in the Inventory maps are interrelated—for instance, the susceptibility of groundwater to contamination can be affected by bedrock type, soil type, and the slope of the land—so it is important to view the maps together when making land use decisions. The digital version of the NRI maps, which will be available on the Town website (www.townofrosendale.com), is best suited for viewing these interrelationships since it allows the viewer to overlay the maps as well as to zoom in for a close-range view and zoom out for a wider view. The digital version of the maps will also have a map layer identifying tax parcels, which will allow easy navigation for viewers interested in finding a particular site.

For viewers using a paper copy of the NRI, it may be helpful to refer to the Base Map (below), which serves as a geographic reference for other maps in the Natural Resources Inventory. The Base Map displays useful information regarding the lay of the land, showing town, county, and state roads; tax parcel boundaries (which approximate property boundaries); and such topographic features as surface waters, land elevation, and contour lines. This map was created using the U.S. Geological Survey's topographic map, data on roads and 2010 tax parcels from the Ulster County Information Services, and data on surface waters from the NYS Department of Environmental Conservation's Division of Water.[2] The three Aerial View Maps of the town (below) will also be helpful for general orientation. They display three distinct sets of orthophotos obtained from the New York State GIS Clearinghouse (one foot color infrared in 2001, two foot panchromatic in 2004, and one foot 4 band in 2009). The orthophotos were taken in early spring, before most deciduous plants leaf out, and can be used to interpret the land cover in the town.

For easy reference, the maps are grouped in this Inventory by topic, where possible. All maps list the sources of data and provide a legend explaining the features that are mapped. The accompanying text provides additional context and explanation for each of the maps as well as additional information on sources and methods.

[2] It should be noted that the Binnewater Lake names used in the Base Map and all other maps in this Inventory are consistent with the U.S. Geological Survey; however, local residents are known to refer to them by different names.

Town of Rosendale
Natural Resources Inventory

Base Map

Miles
0 0.5 1 1.5

Kilometers
0 0.5 1 1.5

1:35,000

N
W E
S

Local Roads
County Roads
State Roads
New York State Thruway
Town Boundary
Tax Parcels
Surface Waters

Map produced for the Town of Rosendale
Environmental Commission, June 2010.

Data Sources:
Topographic map: U.S. Geologic Survey, obtained from Cornell University Geospatial Information Repository.
Roads: Ulster County Information Services (2008).
Town boundary: Ulster County Information Services (1999).
Tax parcels: Ulster County Information Services (2010).
Surface waters: NYS DEC Division of Water (2005).

This map is intended for general planning and education purposes. Corrections or updates may be submitted to the Town of Rosendale Environmental Commission.

Town of Rosendale
Natural Resources Inventory

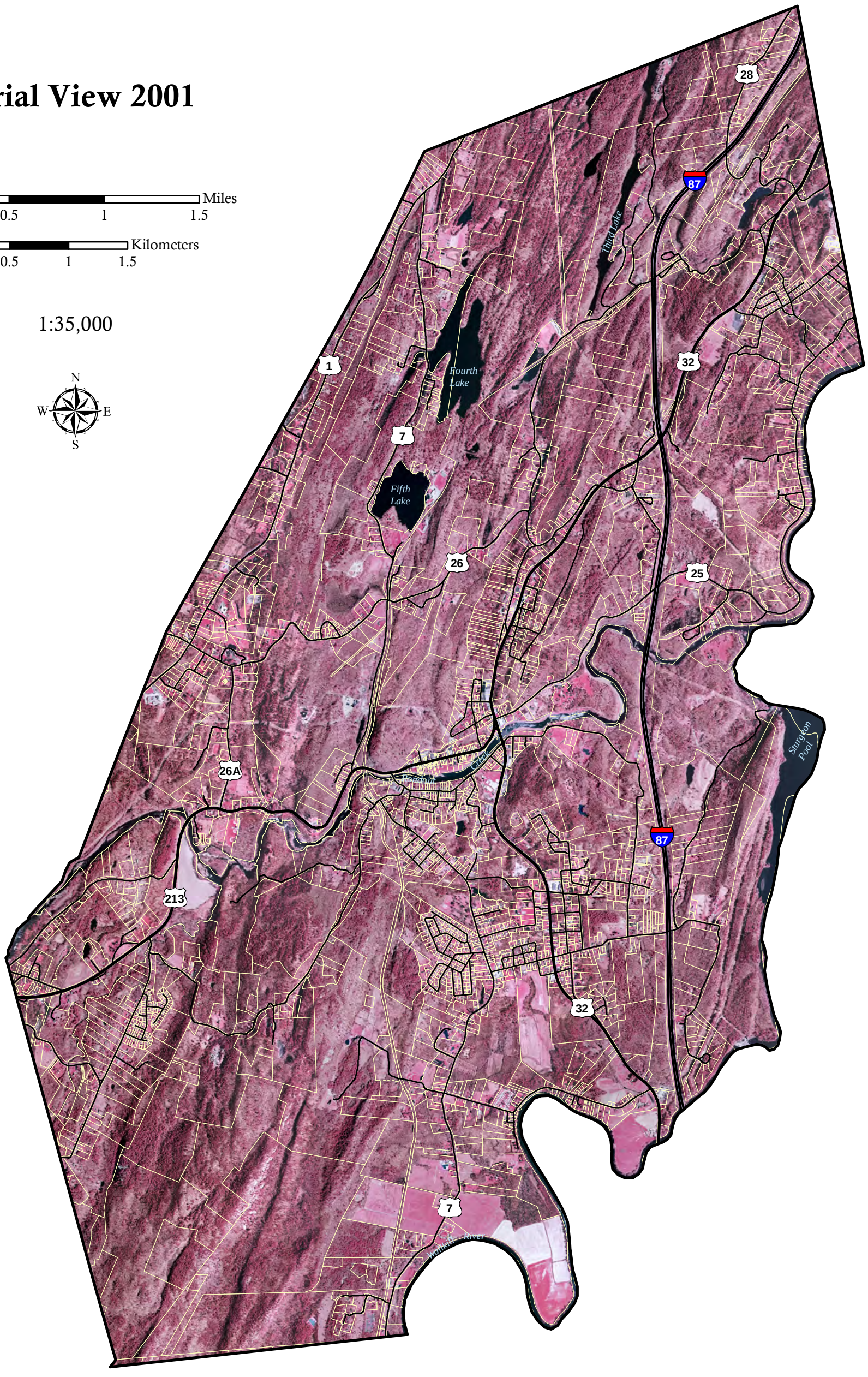
Aerial View 2001

Miles
0 0.5 1 1.5

Kilometers
0 0.5 1 1.5

1:35,000

N
W E
S



Map produced for the Town of Rosendale
Environmental Commission, June 2010.

Data Sources:
Roads, town boundary, tax parcels: Ulster County Information Services.
Color infrared orthophotos: NYS GIS Clearinghouse (2001).

This map is intended for general planning and education purposes. Corrections or updates may be submitted to the Town of Rosendale Environmental Commission.

Roads
Town Boundary
Tax Parcels

Town of Rosendale
Natural Resources Inventory

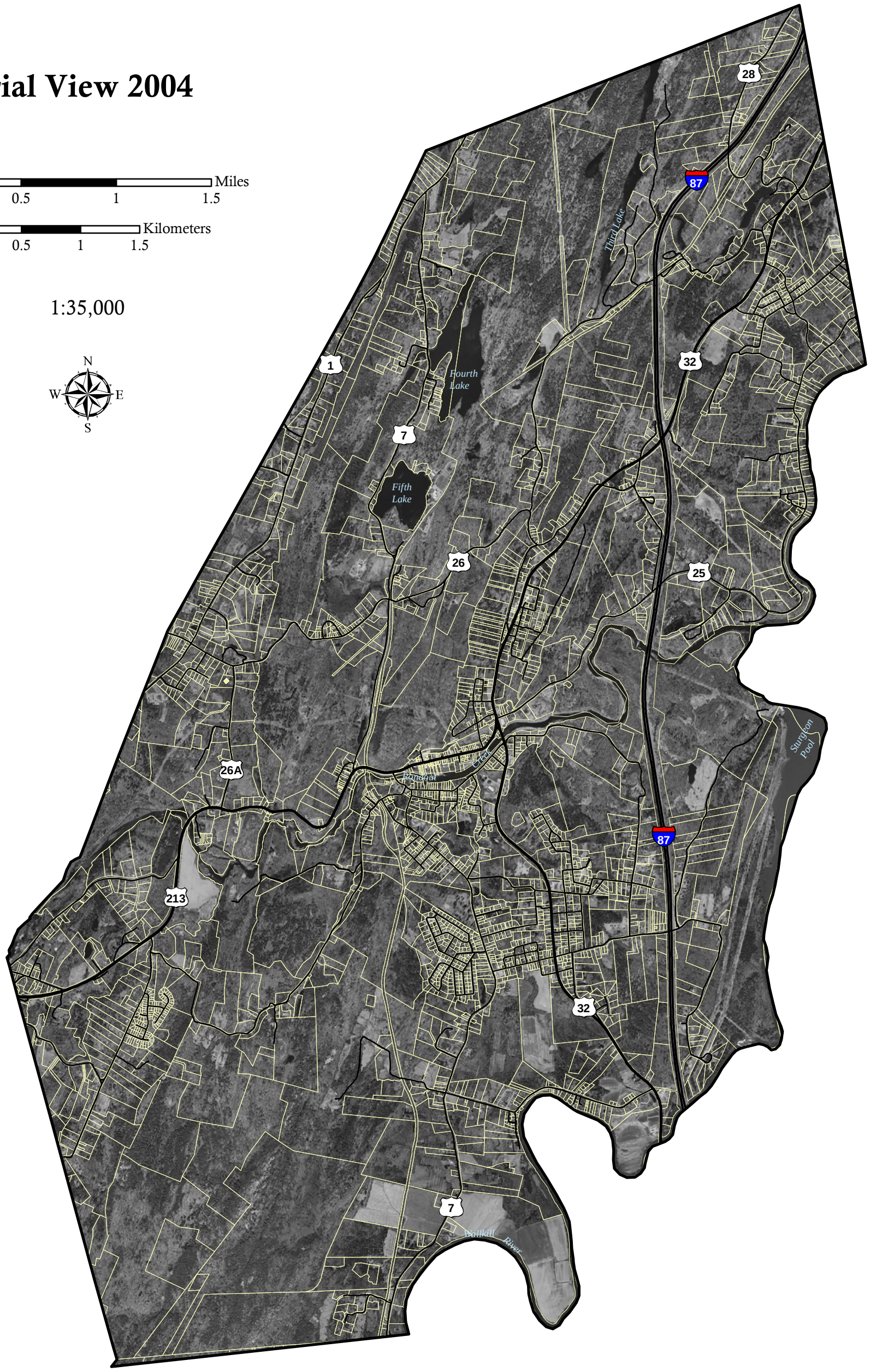
Aerial View 2004

0 0.5 1 1.5 Miles

0 0.5 1 1.5 Kilometers

1:35,000

N
W E
S



Map produced for the Town of Rosendale Environmental Commission, June 2010.

Data Sources:
Roads, town boundary, tax parcels: Ulster County Information Services.
Panchromatic orthophotos: NYS GIS Clearinghouse (2004).

This map is intended for general planning and education purposes. Corrections or updates may be submitted to the Town of Rosendale Environmental Commission.

Roads
Town Boundary
Tax Parcels

Town of Rosendale
Natural Resources Inventory

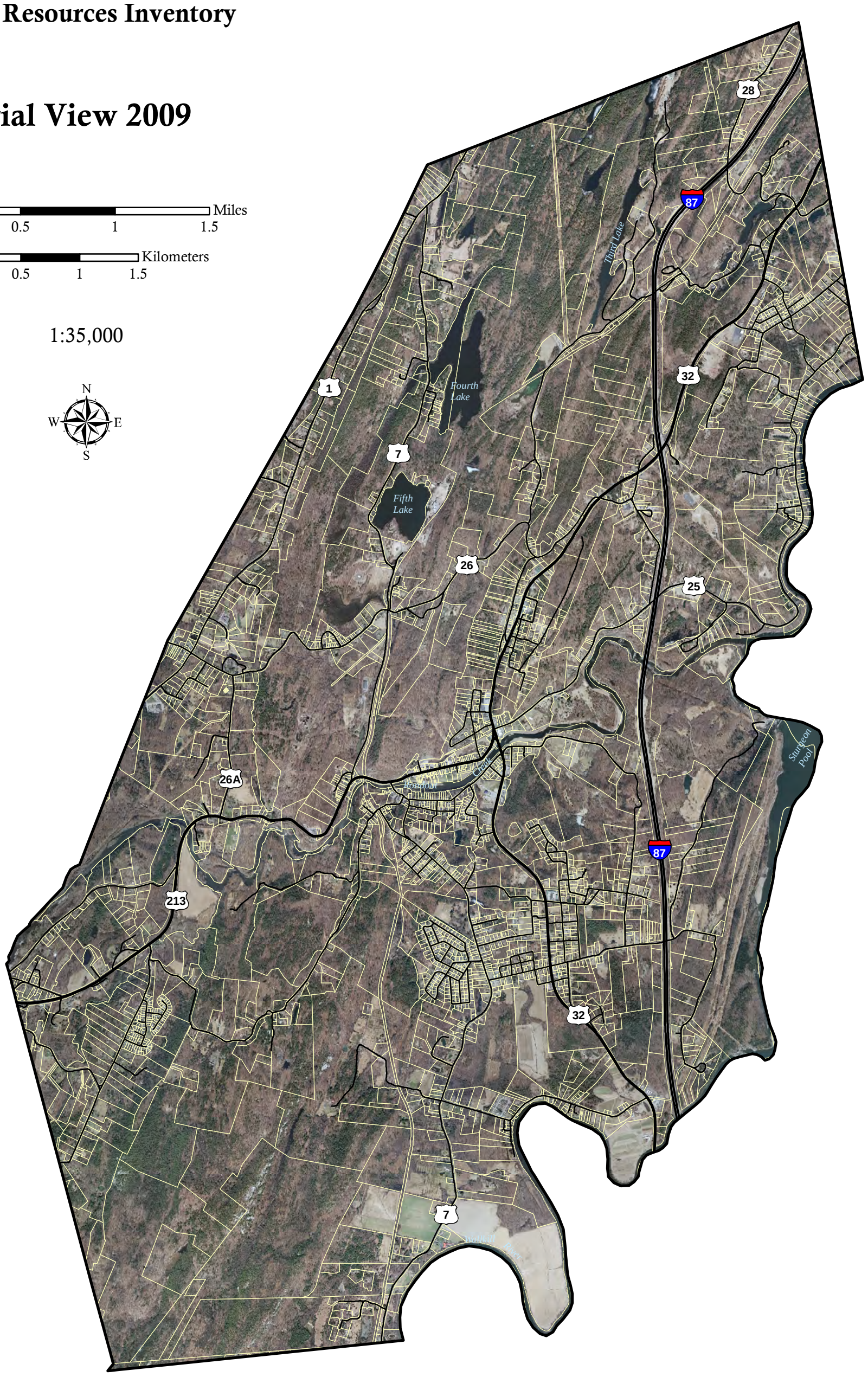
Aerial View 2009

0 0.5 1 1.5 Miles

0 0.5 1 1.5 Kilometers

1:35,000

N
W E
S



Map produced for the Town of Rosendale Environmental Commission, June 2010.

Data Sources:
Roads, town boundary, tax parcels: Ulster County Information Services.
4 Band Orthophotos: NYS GIS Clearinghouse (2009).

This map is intended for general planning and education purposes. Corrections or updates may be submitted to the Town of Rosendale Environmental Commission.

Roads
Town Boundary
Tax Parcels

SECTION II: Natural Resources

Geology

Rosendale's history and character have been strongly shaped by its geology. With the discovery of limestone suitable for making hydraulic cement, the town's abundant stores of this rock became the single most important resource to its economy and development from the late 1820s through the early 1900s. Indeed, the town was literally created on the basis of this industry, incorporated in 1844 by the county in order to consolidate the cement district.[3] Although the town's natural cement industry is long gone, the many abandoned mines and kilns from this era are a notable feature of the landscape in the former cement district and a visible reminder of the town's past.

Today, geological features of the town are increasingly important to recreation and tourism, with numerous scenic ridges and rock outcroppings enticing hikers, rock-climbers, cross-country skiers, cyclists, and other outdoor enthusiasts, as well as students and professionals in the geological and ecological fields. Among the most significant of these geological attractions is the Shawangunk Ridge, which extends northeast from New Jersey to the upper Rondout Creek in Rosendale (see Bedrock Geology Map). Where exposed, the hard and weather-resistant Shawangunk Conglomerate bedrock formation forms ledges that are well suited to rock-climbing. This makes "the Gunks," as the ridge is known to climbers, a world-renowned climbing destination. In Rosendale, more than 600 acres of land on the Shawangunk Ridge, including Table Rock, a well-known crag offering breath-taking views, is protected open space owned by the Mohonk Preserve (see Protected Lands Map).

The town's geology is not only important to its history, character, and economy but also to its ecology: Geological characteristics influence soil development and hydrology, which in turn influence plant growth and the variety of plant and animal habitats likely to be found in a given location. Rosendale is home to several significant habitats that are associated with its particular geology, including "calcareous crest, ledge, and talus," a habitat type associated with limestone bedrock that supports many rare plants.[4] The complex geology of the Shawangunk Ridge is also noted for its rich diversity of habitats, some of which support rare plant and animal species.[5]

From a land-use planning perspective, understanding geology is essential for making development decisions. For example, geological information is necessary for assessing the yield and depth of groundwater supplies for wells (see "Groundwater Resources" section), the placement of septic systems, and the siting of buildings, pipeline, and roads. If bedrock is too close to the surface, construction will not only be more expensive but may also cause soil erosion, groundwater contamination, and other environmental problems—in either the short term or long term. Some of the town's carbonate bedrock formations have, in some places, formed such Karst features as sinking streams, which have great potential to impact groundwater resources (see Karst Aquifer Region section in this report).

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[3] "The Binnewater Lakes Region: An Ecological Assessment of Habitats and Species," *Rosendale Biodiversity Assessment,* December 2006.

[4] For habitat information for Rosendale, see "The Binnewater Lakes Region: An Ecological Assessment of Habitats and Species," and "Shawangunk Region: An Ecological Assessment of Habitats and Species," *Rosendale Biodiversity Assessment,* December 2006.

[5] Ibid.

Bedrock Geology

The bedrock formations underlying Rosendale date back to the Paleozoic Age and are of three rock types: **limestones/dolostones**--water-soluble sedimentary rock composed primarily of calcium carbonate; **shales**--fine-grained, clastic sedimentary rock composed of mud that is a mix of flakes of clay minerals and tiny fragments of other minerals; and **conglomerates**--sedimentary rock consisting of individual clasts within a finer-grained matrix that have become cemented together. The formations on the Bedrock Geology Map are classified as follows:

Limestone/Dolostone (as primary or secondary rock type)
Binnewater Sandstone and Rondout Formation
Manlius and Coeymans Formations
Becraft Limestone
Alsen, Port Ewen, Connelly, and Glenerie Formations,
Kalkberg and New Scotland Formations
Schoharie Formation

With the exception of the Schoharie Formation, these bedrock formations are members of the Helderberg Group of carbonate rocks. Most, though not all, of the carbonate bedrock formations in Rosendale are north of the Rondout Creek. Several of these formations are particularly prone to the development of karst features at the land surface, such as sink holes, disappearing streams, caves, and springs (see Groundwater Resources section and the Karst Aquifer Region Map).

Shale:
High Falls Shale
Esopus Shale
Martinsburg Shale
Austin Glen

Conglomerate:
The Shawangunk Formation, which is interbedded conglomerate and sandstone, underlies areas of Rosendale south of the Rondout Creek in the eastern and central portions of the town. Conglomerate is a type of rock made up of "clasts," or fragments of pre-existing rock, that have become cemented together within a fine-grained mass of material, making it exceptionally hard. The clasts in Shawangunk Conglomerate are a nearly pure milky quartz, and appear almost white in color.[6] The formation itself ranges in color from light- to dark-gray, containing thin shale interbeds.[7]

The Quassaic Group, found just to the west of Sturgeon Pool, consists of quartzite, sandstone, and conglomerate, and is another more resistant type of bedrock.

In many areas of Rosendale, the bedrock is often at or near the surface—particularly in the Binnewater Lakes region and on the Shawangunk Ridge (see Soils Map).

The Bedrock Geology Map was prepared by Steven Winkley of the New York Rural Water Association by digitizing maps completed by Burmeister (2005) and Marshak (1990). The map is part of Rosendale's *2007 Groundwater Protection Plan* (see Groundwater Resources section in this report).

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[6] United States Geological Survey, "The Shawangunks," *NYS Regional Geology* http://3dparks.wr.usgs.gov/nyc/valleyandridge/shawangunks.htm (July 2003).
[7] United States Geological Survey, "Shawangunk Formation," http://3dparks.wr.usgs.gov/nyc/valleyandridge/greenpond.htm (May 2010).

Town of Rosendale
Natural Resources Inventory

Bedrock Geology

Miles
0 0.5 1 1.5

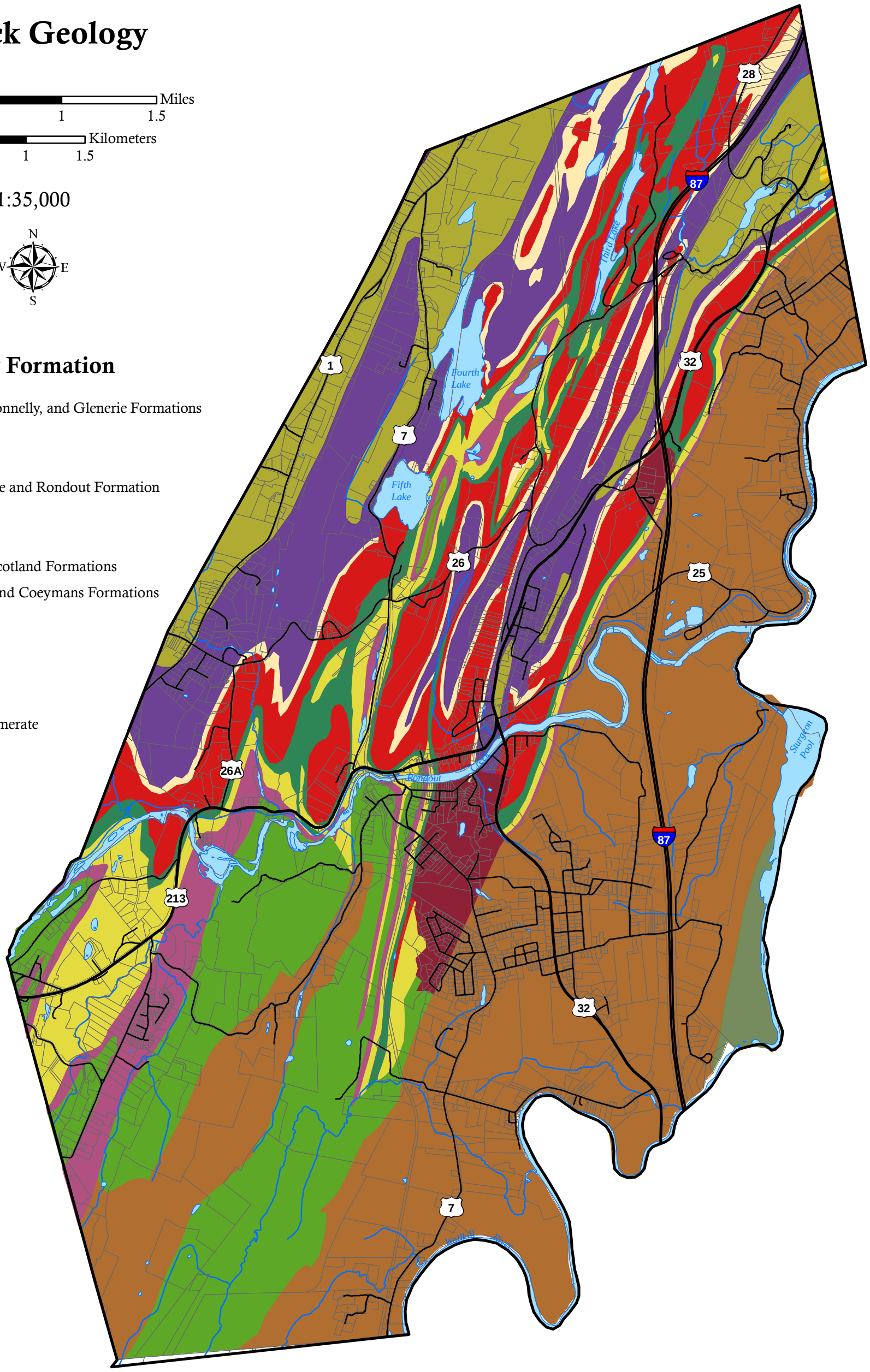
Kilometers
0 0.5 1 1.5

1:35,000

N
W E
S

Bedrock Geology Formation

- Alsen, Port Ewen, Connelly, and Glenerie Formations
- Austin Glen
- Becraft Limestone
- Binnewater Sandstone and Rondout Formation
- Esopus Shale
- High Falls Shale
- Kalkberg and New Scotland Formations
- Manlius Limestone and Coeymans Formations
- Martinsburg Shale
- Obscured
- Quassaic Group
- Schoharie Formation
- Shawangunk Conglomerate



Roads
Streams
Town Boundary
Tax Parcels
Surface Waters

Map produced for the Town of Rosendale
Environmental Commission, June 2010.

Data Sources:
Roads, town boundary, tax parcels: Ulster County Information Services.
Bedrock geology: New York Rural Water Association (2007).
Surface waters, streams: NYS DEC Division of Water (2005).

This map is a representation of a larger map created by the New York Rural Water Association for the Town of Rosendale's Groundwater Plan. It is intended for general planning and education purposes.

Surficial Geology

Surficial geology refers to the unconsolidated geologic materials lying on top of the bedrock, and includes sand and gravel, clay and silts, and glacial tills. Mapping the surficial materials of the town is important for land-use planning and development decisions because the nature of these materials affects the suitability of areas for septic systems, the productivity of agriculture, the flow and quality of surface and groundwater, and appropriate locations for roads and buildings.

The Surficial Geology Map shows nine types of surficial material in Rosendale, which are Recent Alluvium and other Pleistocene deposits associated with deglaciation:

- Alluvium (modern stream deposits)
- Swamp deposits (largely organic deposits)
- Lacustrine clay and silt (fine-grained deposits deposited in glacial lakes)
- Glaciolacustrine delta (sand and gravel deposits often underlain by finer-grained sand and silt/clay
- Glaciolacustrine sand (fine to medium sand often underlain by silt or clay deposits)
- Ice-contact deposits (sand and gravel deposits with highly variable texture)
- Outwash sand and gravel (sand and gravel deposits from glacial meltwater streams)
- Bedrock outcrops with thin (0-3 feet thick), discontinous glacial till
- Till (dense, unsorted clay, silt, sand, gravel, boulders)

The Surficial Geology Map was created by Steven Winkley of the New York Rural Water Association, based on reconnaissance, Duskin (1985), water well data, and soils mapping data from Ulster County Soil Survey. The map is part of Rosendale's *2007 Groundwater Protection Plan* (see Groundwater Resources section in this report).

ADDITIONAL REFERENCES:

Duskin, Priscilla, 1985. *The Glacial Geology of the Rosendale, New York Quadrangle,* Masters Thesis, Rensselaer Polytechnic Institute: New York.

Winkley, Steven, 2007. *Groundwater Protection Plan for the Town of Rosendale*, New York Rural Water Association.

Town of Rosendale
Natural Resources Inventory

Surficial Geology

0 0.5 1 1.5 Miles

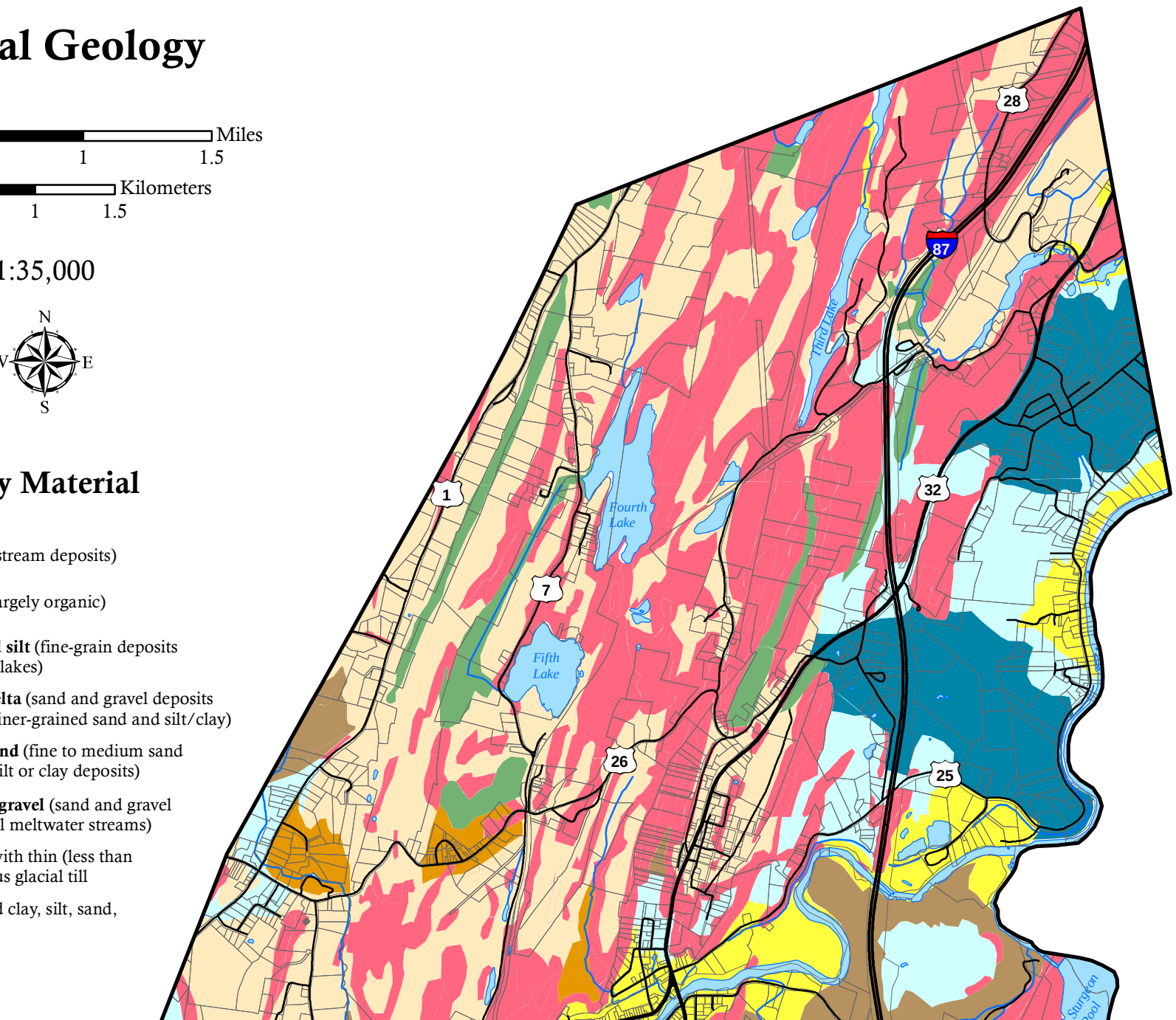
0 0.5 1 1.5 Kilometers

1:35,000

N W E S

Surficial Geology Material

- **Alluvium** (modern stream deposits)
- **Swamp Deposits** (largely organic)
- **Lacustrine clay and silt** (fine-grain deposits deposited in glacial lakes)
- **Glaciolacustrine delta** (sand and gravel deposits often underlain by finer-grained sand and silt/clay)
- **Glaciolacustrine sand** (fine to medium sand often underlain by silt or clay deposits)
- **Outwash sand and gravel** (sand and gravel deposits from glacial meltwater streams)
- **Bedrock outcrops** with thin (less than 3 feet), discontinuous glacial till
- **Till** (dense, unsorted clay, silt, sand, gravel, boulders)



New York Rural Water Association • Founded 1979 •

Map produced for the Town of Rosendale Environmental Commission, June 2010.

Data Sources:
Roads, town boundary, tax parcels: Ulster County Information Services.
Surficial geology: New York Rural Water Association (2007).
Surface waters, streams: NYS DEC Division of Water (2005).

This map is a representation of a larger map created by the New York Rural Water Association for the Town of Rosendale's Groundwater Plan. It is intended for general planning and education purposes.

- Roads
- Streams
- Town Boundary
- Tax Parcels
- Surface Waters

Soils and Topography

Soils

Soil underlies and shapes the biodiversity of a region. Such soil characteristics as pH (acidity and alkalinity), drainage, soil texture, depth to bedrock, and slope inform the types of habitat likely to occur in a particular area, with distinctive natural communities becoming established on calcareous (alkaline) soils, acidic soils, clayey soils, sandy soils, and shallow soils, among other soil types.

Soil characteristics also influence human uses of the land: soils range in suitability for food production, their proneness to flooding and inundation, vulnerability to soil erosion and soil instability, and efficiency at filtering pollutants and wastes. What we grow, where we build, and how we maintain the quality of our environment depend directly on the nature of our soils.

Rosendale has an unusually high number of soil types in a relatively small area, with 74 soil types affecting the site conditions of individual parcels within the town. While there are many different soils, three main types predominate, according to the United States Department of Agriculture *Soil Survey of Ulster County, New York.*: **Stockbridge-Farmington-Bath** soils occupy the western and northern portions of the town; **Lordstown-Arnot-Mardin** soils occupy the southern section of the town (the northern end of the Shawangunk Ridge); and **Hoosic-Schoharie-Chenango** soils occupy the Rondout Valley and eastern portion of the town.

Stockbridge-Farmington-Bath:
These soils occupy the northwestern portion of the town. This region is noteworthy because of its unique topography. A pattern of ridges extends in a northeast/southwesterly direction. The Stockbridge-Farmington Bath complex is comprised of well-drained, medium textured soils that are underlain dominantly with limestone. The limestone creates calcareous soils, which can be home to uncommon plant species. Interspersed with the ridges are several lakes. This area has well-drained soils that occur on moderate to steep slopes. The rocky terrain, steep slopes and shallow soils create concerns for development.

Lordstown-Arnot-Mardin:
This category of soils typifies the Shawangunk Ridge, an offshoot of the Appalachian Mountains that lies between the Catskills and the Hudson River. The soils are very shallow in places and are very well drained. The landscape is rocky, with bedrock outcroppings and surface boulders. This area has limited development potential due to dry and shallow soils and to steep slopes.

Hoosic-Schoharie-Chenango:
Occupying the most fertile regions of the Town, the Hoosic-Schoharie-Chenango soils are found in the Rondout Valley and the eastern part of the town. They are deep soils, somewhat excessively to moderately well-drained and predominantly gently sloping. These soils are the remnants of glacial outwash and tend to be finely textured. They tend to be good pastureland and are generally suited to development.

It is advised that any major development include a thorough exploration of local soil conditions. Two soil types that are particularly important to consider are **hydric soils**, which indicate the possible presence of wetlands, and **prime farmland soils**, which are soils considered optimal for agricultural production. These soil types are shown on the Wetlands Map and Agricultural Map, respectively, and are discussed in greater detail in the companion text to these maps.

Another important soil characteristic to consider in land-use and development planning is the soil's **depth to bedrock**. The depth of the soils can affect the placement of septic and other wastewater treatment systems, buildings, and roads. Very shallow soils (10 inches or less to bedrock) and shallow soils (between 10 inches and 20 inches to bedrock) are often found on steep slopes, making them extremely vulnerable to soil erosion. The filtering capacity of shallow soils is also generally less than that of deeper soils, leading to a reduced capacity for filtering pollutants before they reach groundwater and surface waters. The Soils Map shows soil types with depths of 20 inches or less (very shallow to shallow); between 20 and 40 inches (moderately deep); greater than 40 inches (deep); and greater than 60 inches (very deep). It is important to note that, while these depth classes represent the typical range for the soil types associated with them, all depth classes may include areas with shallow soils (less than 20 inches to bedrock).

The Soils Map displays data from the Natural Resources Conservation Service (2005). The Soils Chart below describes the soil types displayed on the map as well as some of their characteristics.

Soils Descriptions[8]:

Label on Map	Name	Reaction*	Depth (inches)	Drainage**
CnB	Chenango gravelly silt loam	sc, nc	>60	sx-w
HgB	Hoosic gravelly loam	nc	>60	x-w
HgC	Hoosic gravelly loam	nc	>60	x-w
HgD	Hoosic gravelly loam	nc	>60	x-w
HSF	Hoosic soils	nc	>60	x-w
HXE	Hudson and Schoharie soils	c	>60	mw
SaB	Schoharie silt loam	c	>60	mw-w
SaC	Schoharie silt loam	c	>60	mw-w
ARD	Arnot-Lordstown-Rock outcrop complex	nc	<=20/20-40	mw-sx/w
ARF	Arnot-Oquaga-Rock outcrop complex	nc	<=20/20-40	mw-sx/w-x
CvA	Churchville silt loam	c	>60	sp
LOC	Lordstown-Arnot-Rock outcrop complex	nc	20-40/<=20	w/mw-sx

[8] The source for these descriptions is the *Soil Survey Manual*, U.S. Department of Agriculture, Natural Resources Conservation Service (updated 1993), at http://soils.usda.gov/technical/manual.

MdB	Mardin gravelly silt loam	sc	>40	mw
MgB	Mardin-Nassau complex	sc	>40	mw
RXE	Rock outcrop-Arnot complex	nc	<=20	mw-sx
RXF	Rock outcrop-Arnot complex	nc	<=20	mw-sx
BgC	Bath gravelly silt loam	sc, nc	>40	w
BHE	Bath very stony soils	sc, nc	>40	w
BnC	Bath-Nassau complex	sc, nc	>40	w
BOD	Bath-Nassau-Rock outcrop complex	sc, nc	>40/<=20	w/sx
FAE	Farmington-Rock outcrop complex	c	<=20	sx-w
NBF	Nassau-Bath-Rock outcrop complex	sc, nc	<=20	sx
SmB	Stockbridge-Farmington gravelly sitl loams	c	>40/<-20	w/sx-w
SmC	Stockbridge-Farmington gravelly silt loams	c	>40/<-20	w/sx-w
STD	Stockbridge-Farmington-Rock outcrop complex	c	>40	w
AA	Alluvial land			(h)
AcB	Arnot channery silt loam	nc	<=20	mw-sx
At	Atherton silt loam	c	>60	p-vp (h)
BP	Burrow Pit			
Cc	Canandaigua silt loam	c	>60	p-vp (h)
Cd	Canandaigua silt loam, till substratum	c	>60	p-vp (h)
Ce	Carlisle muck	c	>60	vp (h)

CF	Cut and fill land			
CvB	Churchville silt loam	c	>60	sp
GP	Gravel pit			
Ha	Hamlin silt loam	c	>60	w
He	Haven loam	nc	>60	w
HuB	Hudson silt loam	c	>60	mw
HuC	Hudson silt loam	c	>60	mw
HvC3	Hudson and Schoharie silty clay loams, severely eroded	c	>60	mw, mw-w
HwD	Hudson and Schoharie soils	c	>60	mw
Lm	Lamstone fine sandy loam	c	>60	p-vp (h)
LY	Lyons-Atherton complex, very stony	c	>60	p-vp (h)
Ma	Madalin silty clay loam	c	>60	p-vp (h)
ML	Made-land			
MO	Menlo very bouldery soils	nc	>60	vp (h)
Mr	Middlebury silt loam	c	>60	mw-sp
MTB	Morris-Tuller complex, very bouldery	nc	>60,<=20	sp/sp-p (h)
NMC	Nassau-Manlius shaly silt loams	nc	<=20/20-40	sx. x-w
NNF	Nassau-Manlius complex	nc	<=20/20-40	sx. x-w
OdA	Odessa silt loam	c	>60	sp
OdB	Odessa silt loam	c	>60	sp
Pa	Palms muck	c	>60	vp (h)
PlB	Plainfield loamy sand	sc	>60	x

PlC	Plainfield loamy sand	sc	>60	x
PmD	Plainfield-Riverhead complex	sc	>60	x
PmF	Plainfield-Riverhead complex	sc	>60	x
PrC	Plainfield-Rock outcrop complex	sc	>60	x
Pt	Pompton fine sandy loam	nc	>60	mw-sp
QU	Mine or quarry			
Ra	Raynham silt loam	c	>60	sp-p
Re	Red Hook gravelly silt loam	c	>60	sp
RhA	Rhinebeck silt loam	c	>60	sp
RhB	Rhinebeck silt loam	c	>60	sp
RvA	Riverhead fine sandy loam	sc, nc	>60	w
RvB	Riverhead fine sandy loam	sc, nc	>60	w
RvC	Riverhead fine sandy loam	sc, nc	>60	w
Sc	Scio silt loam	sc, nc	>60	mw
SdB	Scriba and Morris soils	c, nc	>60	sp
Su	Suncook loamy fine sand	nc	>60	x
SwB	Swartswood stony fine sandy loam	nc	>60	mw-w
SwC	Swartswood stony fine sandy loam	nc	>60	mw-w
Te	Teel silt loam	c	>60	mw-sp
Tg	Tioga fine sandy loam	c	>60	w
Un	Unadilla silt loam	variable	>60	w
VoA	Volusia gravelly silt loam	sc	>60	sp

VoB	Volusia gravelly silt loam	sc	>60	sp
VSB	Volusia very stony soils	sc	>60	sp
W	Water			
Wa	Walpole fine sandy loam	c, nc	>60	sp
Wb	Wayland silt loam	c	>60	p-vp (h)
WLB	Wellsboro and Wurtsboro very bouldery soils	nc	>60	mw-sp
WsB	Williamson silt loam	sc	>60	mw
WuB	Wurtsboro stony loam	nc	>60	mw-sp

***Reaction: c = calcareous, sc = somewhat calcareous, nc = non-calcareous.**
****Drainage: x = excessively drained, sx = somewhat excessively drained, w = well drained, mw = moderately well drained, p = poorly drained, sp = somewhat poorly drained, vp = very poorly drained, (h) + hydric.**

Town of Rosendale
Natural Resources Inventory

Soils

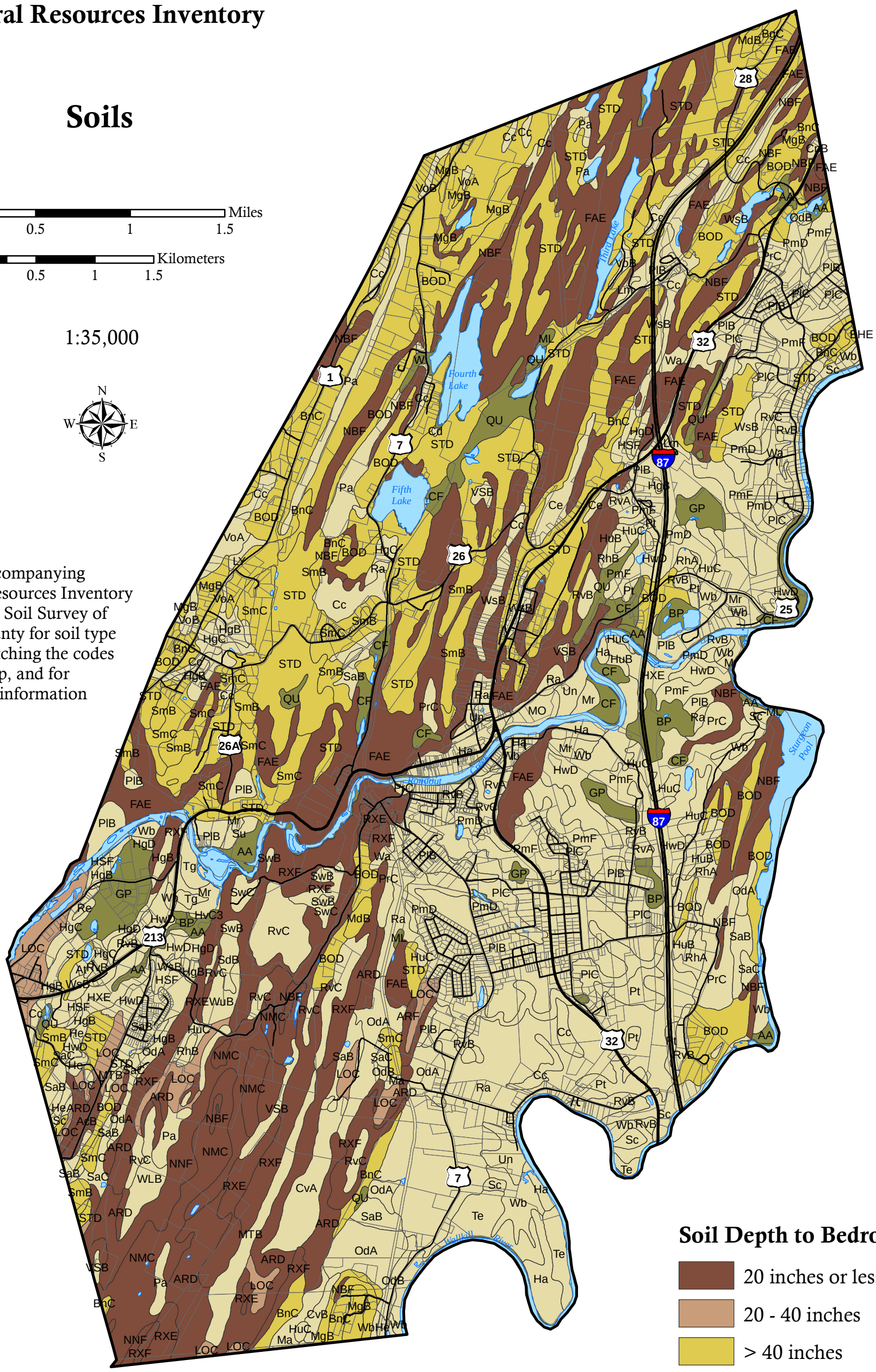
Miles
0 0.5 1 1.5

Kilometers
0 0.5 1 1.5

1:35,000

N
W E
S

See the accompanying Natural Resources Inventory text or the Soil Survey of Ulster County for soil type names matching the codes on this map, and for additional information on soils.



Soil Depth to Bedrock*

- 20 inches or less
- 20 - 40 inches
- > 40 inches
- > 60 inches
- Unclassified

* All depth classes may include areas with shallow soil (< 20 in to bedrock).

- Roads
- Town Boundary
- Tax Parcels
- Surface Waters

Map produced for the Town of Rosendale Environmental Commission, June 2010.

Data Sources:
Soils: Natural Resources Conservation Service (2005) classified by Rosendale Environmental Commission.
Roads, town boundary: Ulster County Information Services.
Surface waters: NYS DEC Division of Water (2005).

This map is intended for general planning and education purposes. Corrections or updates may be submitted to the Town of Rosendale Environmental Commission.

Slopes

Rosendale is distinctive for its numerous ridges, formed in response to ancient plate tectonic forces combined with variable erosion of alternating resistant and weaker bedrock formations.. With the notable exception of the Tillson area--including the Tillson Plains, a significant expanse of flat-lying floodplain in the Wallkill River watershed--much of Rosendale is on sloping terrain. The three main ridge-lined areas, together comprising much of town, are the Binnewater Lakes Fold-Thrust Belt (north of the Rondout Creek), the Shawangunk Mountains (south of the Rondout Creek), and the High Falls-Cottekill Fold-Thrust Belt, which are characterized by a series of northeast-trending thrust faults and folds in the bedrock.[9] The unique topography of Rosendale contributes greatly to the town's natural beauty, but it also necessitates careful land-use planning because of the environmental sensitivity of steep slopes. Soil erosion, excessive storm-water flows and flooding, pollution of surface waters from sedimentation, and slope instability and land slides can result from improper site disturbance on steep slopes.

The Slopes Map measures the degree of steepness of the land in a given area of town, and includes the following slope classes:[10]

Less than 5% (nearly level to gently sloping)
5 – 10% (gently sloping to strongly sloping)
10 – 15% (strongly sloping)
15 – 20% (strongly sloping to steep)
20 – 30% (steep)
over 30% (very steep)

The steepness of the slope affects the proneness of a land area to the environmental problems discussed above when clearing, grading, and construction activities are undertaken on slopes. Slopes of 15% and above are generally considered to be more vulnerable to soil erosion, sedimentation, and other problems than more gently sloping areas, with vulnerability increasing with steepness. Approximately 16% of the land area in Rosendale has slopes within the range of 15% to 25%, and 18% of the land area has slopes greater than 25%.[11] Other factors that can influence the environmental sensitivity of slopes are depth to bedrock, the erosion potential of soils, subsurface hydrology, drainage patterns, and proximity to surface water bodies.

Slopes data was created by Behan Planning Associates, LLC (modeled from New York State's digital elevation model).

[9] Steven Winkley, *Groundwater Protection Plan for the Town of Rosendale,* New York Rural Water Association, 2007.
[10] The source for the descriptions of each of these classes is the *Soil Survey Manual,* U.S. Department of Agriculture, Natural Resources Conservation Service (updated 1993), at http://soils.usda.gov/technical/manual.
[11] Calculated by Nava Tabak of the Town of Rosendale Environmental Commission using ArcView GIS software.

Town of Rosendale
Natural Resources Inventory

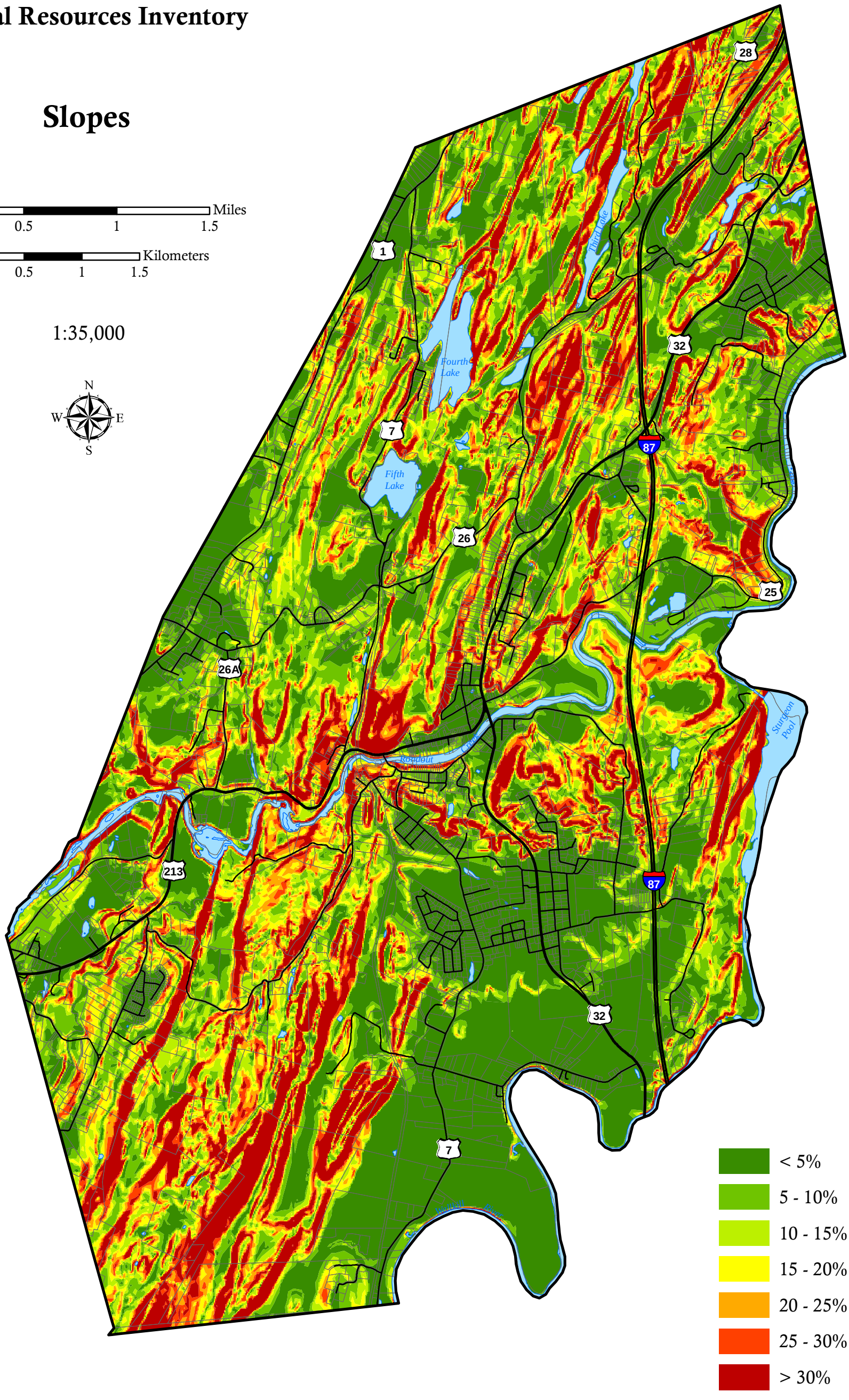
Slopes

0 0.5 1 1.5 Miles

0 0.5 1 1.5 Kilometers

1:35,000

N W E S



Map produced for the Town of Rosendale
Environmental Commission, June 2010.

Data Sources:
Slopes: Behan Planning Associates, LLC (2008).
Roads, town boundary, tax parcels: Ulster County Information Services.
Surface waters: NYS DEC Division of Water (2005).

This map is intended for general planning and education purposes. Corrections or updates may be submitted to the Town of Rosendale Environmental Commission.

Groundwater Resources

In 2007, Steven Winkley of the New York Rural Water Association (NYRWA) completed a Groundwater Protection Plan for the Town of Rosendale*, which maps the groundwater resources and aquifers of Rosendale, identifies potential sources of contamination, evaluates the susceptibility to contamination and possible impacts from future growth, and outlines potential protection strategies.*[12] *A number of maps from this plan are adapted and included in this Natural Resource Inventory, and much of the text for this section is drawn primarily from the plan's written report. For a more comprehensive assessment of the Town's groundwater resources, see the full* 2007 Groundwater Protection Plan and the original maps.

Groundwater, or subsurface water, is an invaluable resource for the Town of Rosendale. Approximately one-half of all town residents receive their drinking water from individual groundwater wells; close to a thousand additional residents are served by community water systems that rely on groundwater wells; and the elementary school and numerous businesses also rely upon well water. The Town of Rosendale Water District relies upon groundwater as a supplementary water source for its two surface resevoirs (the primary water sources). Beyond a water supply for homes, schools, and businesses, groundwater is also critical to the Town's surface water supplies, contributing a significant portion of surface water discharge to local streams, wetlands, and ponds.

Where can groundwater be found?
Groundwater can be found in the cracks and fractures of bedrock (consolidated deposits) or in the pore spaces between individual grains of clay, sand, soil, and gravel above the bedrock (unconsolidated deposits). In the Town of Rosendale, bedrock is the major source of groundwater for most residents and businesses. The quantity of groundwater available at a particular location depends upon topographical, geological, climactic, and other factors as well as on withdrawal rate. A body of rock or sediment that yields *significant* quantities of water (sufficient for use as a municipal water supply source) is known as an "aquifer".[13]

Most of the groundwater in Rosendale is ultimately recharged, or replenished, through infiltration of rainfall or snow melt, although rates of groundwater recharge vary widely. Groundwater can become depleted over time if withdrawal rates exceed natural replenishment rates.

Well Water Data

The Well Water Data Map provides information on the location of homeowner wells in Rosendale (where data was available), their depth, and their yield. Each well on the map is labeled with three numbers separated by forward slashes, with the first number representing well depth (in feet), the second number measuring casing depth (in feet), and the third number representing well yield (gallons per minute). Since 2000, well-drilling has been particularly intensive in the unconsolidated aquifers of Tillson (see Unconsolidated Aquifers Map), and to a lesser extent, in Cottekill.[14]

Over 95 percent of the wells in Rosendale have been completed in the bedrock. Not all types of bedrock are equal in terms of well yields. Typically, the Helderberg Group Carbonates and the High Falls Shale/Shawangunk Conglomerate produce higher yields, and Esopus Shale and Martinsburg Shale are the least productive bedrock units.[15] (Refer to the Bedrock Geology Map to see where these bedrock formations are

[12] Winkley, 2007, p.1.
[13] While "aquifer" can be variously defined, this is the definition used in the *2007 Rosendale Groundwater Protection Plan.*
[14] Winkley, 2007.
[15] See the Bedrock Hydrostratigraphic Units and Well Yields Map in Winkley, 2007.

located.)

The well water data was mapped by Steven Winkley of the New York Rural Water Association, based on data collected from the United States Geological Survey (Frimper, 1972), the New York State Department of Environmental Conservation, and Ulster County Information Services. In all, 229 homeowner wells were mapped.

Town of Rosendale
Natural Resources Inventory

Water Well Data

Miles
0 0.5 1 1.5

Kilometers
0 0.5 1 1.5

1:35,000

N
W E
S

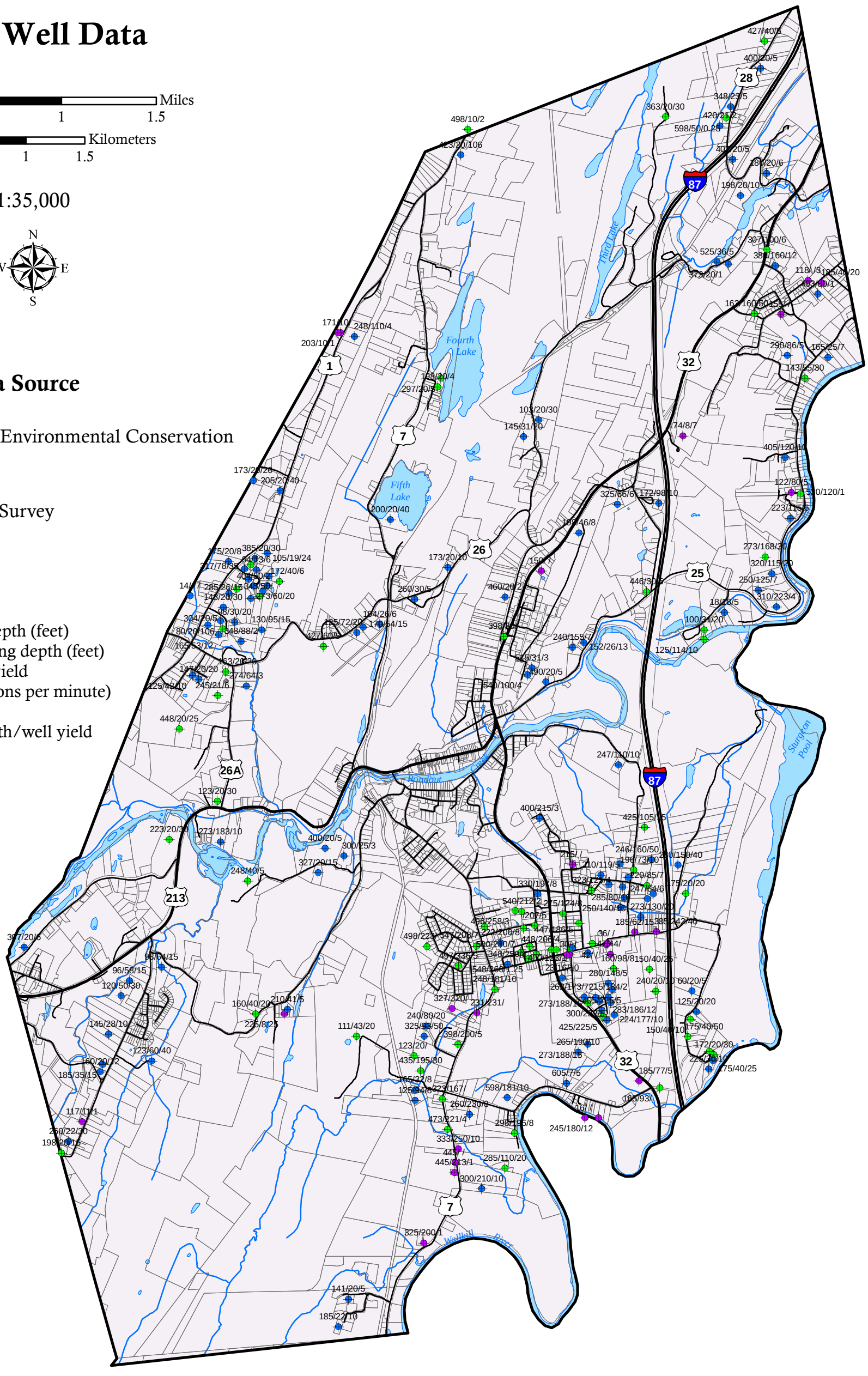
Water Well Data Source

- NYS Dept. of Environmental Conservation
- Ulster County
- U.S. Geologic Survey

Label notation:

First number = well depth (feet)
Second number = casing depth (feet)
Third number = well yield
(gallons per minute)

Example:
well depth/casing depth/well yield



Map produced for the Town of Rosendale
Environmental Commission, June 2010.

Data Sources:
Roads, town boundary, tax parcels: Ulster County Information Services.
Water well data: New York Rural Water Association (2007).
Surface waters, streams: NYS DEC Division of Water (2005).

This map is a representation of a larger map created by the New York Rural Water Association for the Town of Rosendale's Groundwater Plan. It is intended for general planning and education purposes.

Roads
Streams
Town Boundary
Tax Parcels
Surface Waters

Unconsolidated Aquifers

The Unconsolidated Aquifers Map shows the location of aquifers occurring in the overburden above the bedrock. Although less than 5 percent of all wells drilled in the Town of Rosendale rely on these deposits for their water, unconsolidated aquifers can produce very high yields if wells are finished with a properly sized and developed screen.[16] Two types of unconsolidated aquifer appear on the map—unconfined sand aquifer and alluvial aquifer. Rosendale has one unconfined sand aquifer--the Tillson Delta, which underlies a substantial portion of the hamlet of Tillson. Alluvial aquifers are modern stream deposits up to 40 feet deep, and can be found in several different areas within the Rondout Creek and Wallkill River watersheds.

Unconsolidated aquifers were mapped by Steven Winkley of the New York Rural Water Association, based on 1:24000 scale surficial geologic mapping and water well data from the New York State Department of Environmental Conservation, Ulster County, and the United States Geological Survey.[17]

[16] Winkley, 2007.
[17] Winkley, 2000.

Town of Rosendale
Natural Resources Inventory

Unconsolidated Aquifers

Miles
0 0.5 1 1.5

Kilometers
0 0.5 1 1.5

1:35,000

N W E S

Unconsolidated Aquifer

Alluvial aquifer (up to 40 ft. thick with possible confined sand and gravel at deeper depth).

Unconfined sand aquifer (5 to 100 ft. thick) underlain by clay; possible confined sand and gravel at depths of 100 to 300 feet.

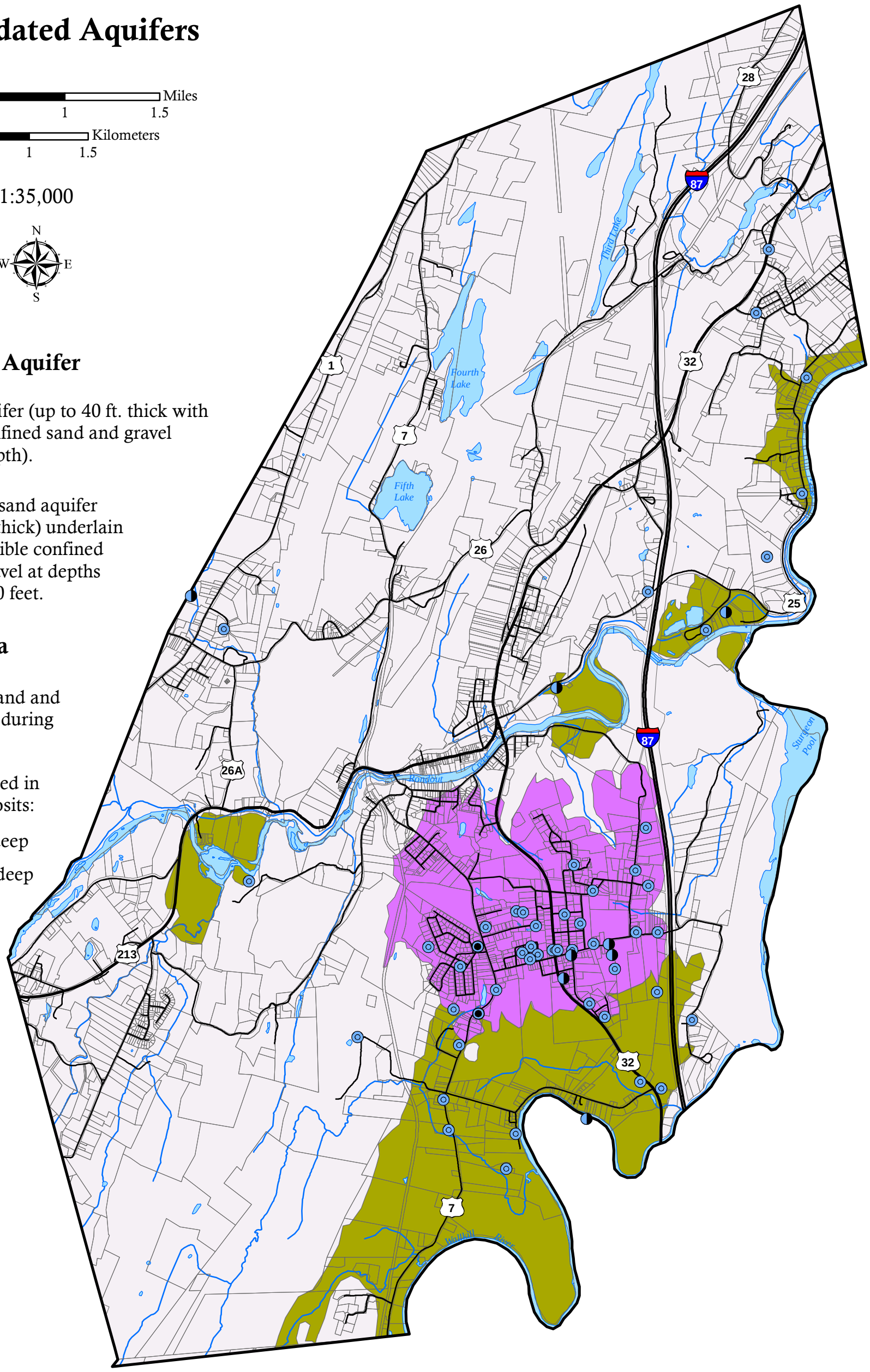
Water Well Data

Wells with sand and gravel noted during drilling

Water wells completed in unconsolidated deposits:

16 - 47 feet deep

48- 284 feet deep



Roads
Streams
Town Boundary
Tax Parcels
Surface Waters

Map produced for the Town of Rosendale Environmental Commission, June 2010.

Data Sources:
Roads, town boundary, tax parcels: Ulster County Information Services.
Unconsolidated aquifers, water well data: New York Rural Water Association (2007).
Surface waters, streams: NYS DEC Division of Water (2005).

This map is a representation of a larger map created by the New York Rural Water Association for the Town of Rosendale's Groundwater Plan. It is intended for general planning and education purposes.

Karst Aquifer Region

The Karst Aquifer Region is defined by a band of carbonate rocks (primarily limestone and dolostone) that extends south-southwest through Ulster County, including a large area of Rosendale north of the Rondout Creek. The New York State Department of Environmental Conservation (NYS DEC) has designated the Karst Aquifer Region a Priority Conservation Area because "the area is rich in biological, geological and historical resources, and provides diverse outdoor recreational opportunities and critical water reserves."[18] For Rosendale, the Karst Aquifer Region has particular historical significance as former home to the town's famed natural cement industry. As the *Rosendale Biodiversity Assessment* points out, the Karst Aquifer Region is also home to rare and significant habitats associated with limestone bedrock.[19]

"Karst" is a descriptive term for landforms produced primarily through the dissolving of water-soluble rock, such as limestone and dolostone. Karst features include sink holes, caves, springs, and sinking streams, which provide a direct channel between the land surface and the groundwater system. In addition to these features, the Rosendale Karst Aquifer Region contains many old cement industry mines which can also be a direct conduit between the land surface and groundwater system in the same way that karst features are.

The Karst Aquifer Region Map does not map karst features. Rather, it identifies those areas that are more or less susceptible to karst development based on the type of bedrock and depth of the soils. Areas underlain by Rondout, Manlius, Coeymans, and Onondaga Formations have a very high potential for karst development, while other bedrock types (for instance, the Kalkberg and New Scotland formations and Becraft limestone) have a moderate potential for karst development, and still others (for instance, Esopus Shale) have a low potential for karst development. (See the Bedrock Geology Map for the location of these formations.) In areas of moderate potential for karst formation, shallow soil depth to bedrock increases the potential for localized karst development.

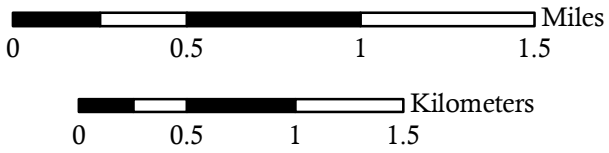
Groundwater flow in karst aquifers is very different from that of other aquifers because of enlarged solution conduits (underground streams) caused by dissolving bedrock, which permits rapid groundwater flow. Because karst features like sinkholes and sinking streams allow pollutants to directly enter these conduits without first being filtered by the soil, karst aquifers are particularly vulnerable to groundwater contamination. It is therefore especially important to minimize the potential for groundwater pollution in this region.

The Karst Aquifer Region Map was prepared by Steven Winkley of the New York Rural Water Association principally through digitizing of mapping completed by Burmeister (2005) and Marshak (1990).

[18] NYS Department of Environmental Conservation, New York Open Space Plan, 2006.
[19] "The Binnewater Lakes Region: An Ecological Assessment of Habitats and Species," *Rosendale Biodiversity Assessment,* December 2006.

Town of Rosendale
Natural Resources Inventory

Karst Aquifer Region



1:35,000

Karst Aquifer Region

Shallow bedrock (<10 feet)

Bedrock with very high potential for karst development

Bedrock with moderate potential for karst development

Bedrock with very low potential for karst development

Roads

Streams

Town Boundary

Tax Parcels

Surface Waters

New York Rural Water Association • Founded 1979 •

Map produced for the Town of Rosendale
Environmental Commission, June 2010.

Data Sources:
Roads, town boundary, tax parcels: Ulster County Information Services.
Karst Aquifer Region, shallow bedrock, bedrock potential for karst development: New York Rural Water Association (2007).
Surface waters, streams: NYS DEC Division of Water (2005).

This map is a representation of a larger map created by the New York Rural Water Association for the Town of Rosendale's Groundwater Plan. It is intended for general planning and education purposes. The original map and the Natural Resources Inventory text provide details regarding the karst aquifer region and bedrock potential for karst development.

Hydrogeologic Sensitivity

The Hydrogeologic Sensitivity Map provides information on the vulnerability of groundwater resources to contamination in a particular area. Groundwater resources are susceptible to contamination from a variety of industrial, commercial, residential, and agricultural uses and activities. Once contaminated, groundwater is very difficult and costly to cleanup.

The Rosendale Groundwater Protection Plan (2007) defines hydrogeologic sensitivity as a relative measure of the ease and speed with which a contaminant could migrate into and within the upper-most water-bearing unit.[20] The two factors controlling hydrogeologic sensitivity are the site's geologic materials (the hydraulic characteristics of the uppermost water-bearing unit and the overlying soils) and the site's topographic position (the topographic factors influencing the vertical migration of groundwater). Data used by New York Rural Water Association to map hydrogeologic sensitivity include surficial geology and soils; the thickness of the overburden; the subsurface stratigraphy, including the type and nature of bedrock, the slope of the land surface (from digital elevation models), and the inferred location within the groundwater flow system based upon the compound topographic index or the "wetness index."[21]

On the Hydrogeologic Sensitivity Map, a rating of "low" hydrogeologic sensitivity indicates that local groundwater is naturally well-protected from contaminants at or near the land surface. "High" to "very high" hydrogeologic sensitivity ratings indicate that, in general, groundwater could be easily and quickly impacted by surface activities. Relatively high hydrogeologic sensitivity in Rosendale is found across topographic highs where the soil is either thin or is coarse-grained. Values are especially high where the underlying aquifer has relatively high groundwater flow rates. This includes sand and gravel, limestone, and conglomerate.

Ways to minimize contamination of groundwater:

- Ensure proper operation and maintenance of wells and wastewater treatment systems (septic systems that are not working properly are the biggest source of groundwater contamination);
- Choose environmentally-friendly household cleaning products;
- Employ natural landscaping and other lower-demand vegetation;
- Avoid chemical fertilizer and herbicide applications for lawn and garden;
- Use water-saving devices within the home and consider a rain barrel to collect water for gardens;
- Do not dispose of harsh household chemicals, such as paint thinner, down the drain;
- Recycle products that can be recycled, such as motor oil and some paints;
- Store chemicals in sealed containers in a secure location;
- Use proper waste disposal;
- Take advantage of hazardous waste collection opportunities (see resources below);
- When planning development or redevelopment, employ Better Site Design practices to ensure effective on-site filtration of stormwater run-off (see resources below);
- When undertaking clearing, grading, or construction activities, employ Best Management Practices (BMPs) for stormwater management and soil erosion and sedimentation prevention (see resources below).

RESOURCES:

NYS Department of Environmental Conservation, Division of Water, *Better Site Design*, (2008).

[20] Winkley, 2007.
[21] Winkley, 2007.

NYS Department of Environmental Conservation, *New York State Standards and Specifications for Sediment and Erosion Control*, (2005).

NYS Department of Environmental Conservation, *New York State Stormwater Management Design Manual*, (August, 2010).

Ulster County Resource Recovery Agency, (845) 336-0600.

REFERENCES:

Marshak, Stephen. 1990. Structural geology of Silurian and Devonian strata in the mid-Hudson Valley, New York: fold-thrust belt tectonics in miniature. New York State Museum Map and Chart Series Number 41. Albany, New York. 66 pp.

Burmeister, Kurtis C. 2005. Aspects of Deformation and Strain in the Appalachian Foldthrust Belt (New York) and the Shear Zones of the Sveconorwegian Orogen (Norway). Ph.D. Dissertation. University of Illinois at Urbana-Champaign.

Burmeister, Kurtis C., 2003. Geologic Map of the Rosendale Natural Cement Region, Central Hudson Valley, Ulster County, New York. Geology by Kurtis Burmeister, Todd Leeds, and Stephen Marshak. Manuscript funded by USGS National Cooperative Geologic Mapping Program.

Winkley, Steven, 2007. *Groundwater Protection Plan for the Town of Rosendale*, New York Rural Water Association.

Town of Rosendale
Natural Resources Inventory

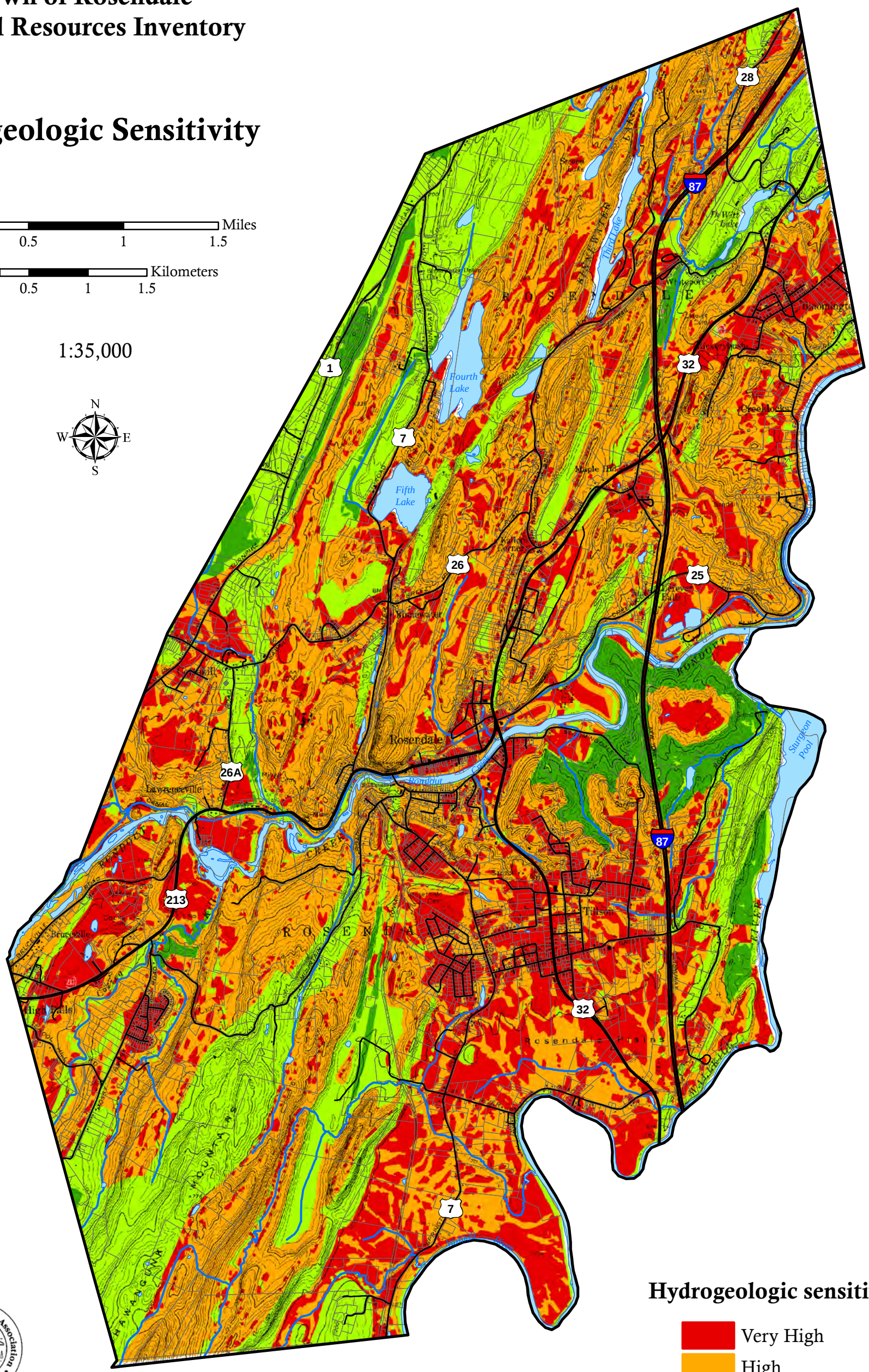
Hydrogeologic Sensitivity

Miles
0 0.5 1 1.5

Kilometers
0 0.5 1 1.5

1:35,000

N
W E
S



Hydrogeologic sensitivity

- Very High
- High
- Medium
- Low

- Roads
- Streams
- Town Boundary
- Tax Parcels
- Surface Waters

Map produced for the Town of Rosendale
Environmental Commission, June 2010.

Data Sources:
Roads, town boundary, tax parcels: Ulster County Information Services.
Hydrogeologic sensitivity: New York Rural Water Association (2007).
Surface waters, streams: NYS DEC Division of Water (2005).

This map is a representation of a larger map created by the New York Rural Water Association for the Town of Rosendale's Groundwater Plan. It is intended for general planning and education purposes. The original map and the Natural Resources Inventory text provide explanations of hydrogeologic sensitivity.

Surface Waters

Surface waters encompass wetlands, water bodies, and streams, and are vital to the community for water supply, recreational enjoyment, and for numerous ecological services. In addition to providing critical habitat for insects, fish, birds, amphibians, and some mammal species, surface waters play an important role in recharging our groundwater supplies.

The quality and quantity of the town's surface waters are affected by human activities and development on the surrounding lands--on floodplains and areas immediately adjacent to the water's edge as well as in the larger watershed. The maps in this section provide information on the location of Rosendale's surface waters and associated floodplains, and describe the watersheds of which they are a part. To understand how land use decisions could potentially affect surface water resources, it is important to consult other natural resource maps in this Inventory in conjunction with these maps because characteristics of the surrounding land (including topography, soil characteristics, and vegetation) control how water flows into wetlands, streams, and water bodies.

Wetlands, Streams and Hydric Soils

Wetlands and Hydric Soils

The wetlands displayed on this map include wetlands shown on the National Wetlands Inventory (NWI) map and the NYS Department of Environmental Conservation's (DEC) Freshwater Wetlands map. As defined by the Code of Federal Regulations governing wetlands, wetlands are "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions."[22] While there are many types of wetlands, including those commonly known as marshes, swamps and bogs, all wetlands generally have three characteristics in common: (1) saturation or flooding for some duration in the growing season, (2) hydric soils, and (3) a predominance of hydrophytic (water-loving) vegetation. Prolonged saturation during the growing season leads to low oxygen conditions that result in the formation of hydric soils and favor the growth of specially adapted plant species. When wetlands delineators document the presence and extent of a wetland, they typically look for these three characteristics.

Wetlands occur throughout the landscape. They are often found adjacent to streams and rivers or fringing lakes and ponds. They also occur outside of the riparian zone, in meadows and in forested areas where groundwater is intercepted or in depressions fed by groundwater, overland flow, and precipitation. Because of the wide variety of landscape settings in which they occur as well as their unique hydrologic, biologic, and chemical conditions, wetlands provide a number of ecological, economic, and social benefits:

- Wetlands provide cost-effective stormwater management by detaining vast quantities of flood waters and overland flow, thereby minimizing property damage and reducing erosion.

- Wetlands improve water quality by trapping sediment, and retaining and transforming nutrients and pollutants though vegetation uptake and chemical reactions unique to the low oxygen conditions in wetland substrates.

- Wetlands hold and slowly release water, whether from flooding, snow melt, rainfall, or runoff, thus maintaining base stream flow and recharging the groundwater supply that many residents in Rosendale rely upon for their drinking water.

[22] Code of Federal Regulations, Title 33 (Navigation and Navigable Waters), Section 328.3(b), 1986.

- ❖ Wetlands are important sites of biodiversity, sustaining native animal and plant species that rely on this specific habitat for their survival.

On a worldwide scale, wetlands provide habitat for nearly half of all endangered species. Eighty percent of breeding birds and 50% of migratory birds depend on wetlands, and nearly all significant sport fish species spawn in wetlands.[23] **Intermittent woodland pools** (a variety of vernal pools), a wetland type formed in small depressions in upland forests, are critical breeding and nursery grounds for many amphibians of conservation concern. Because of the seasonal drawdown and the absence of surface water connection to other water bodies, fish are unable to survive in these pools, making them essential habitat for amphibians that do not reproduce successfully in the presence of fish.[24]

Because of the essential role of wetlands in the capture and purification of drinking water supplies, storm and flood water absorption, surface water protection, and habitat provision for both plant and animal species, their protection is necessary for the common good. The Freshwater Wetlands Act requires the NYS Department on Environmental Conservation (DEC) to regulate wetlands measuring 12.4 acres or larger. (In some cases, DEC jurisdiction has been extended to smaller wetlands determined to have unusual importance.) DEC-regulated wetlands, including a "buffer" area extending 100 feet from the boundary of the actual wetland, are protected: Certain activities, including filling, draining, and clearing, may be prohibited or require a permit. Activities that require a permit but are conducted without one may result in penalties such as fines, and may require remediation. Many additional uses are considered exempt from permitting, including most recreational uses and the selective harvesting (not clear-cutting) of trees.[25]

Wetlands under 12.4 acres that are not "isolated" are regulated by the U.S. Army Corps of Engineers (ACE) under Section 404 of the Clean Water Act of 1977.[26] A process known as a jurisdictional determination (JD) may be necessary to determine whether a particular activity requires permitting. The New York District Office can be reached at: 917-790-8411 (Western Permit Section).

The sources of wetland data displayed on the Wetlands, Streams, and Hydric Soils Map use different criteria for mapping wetlands. The National Wetland Inventory (NWI) wetlands that appear on this map are non-regulatory: The U.S. Fish and Wildlife Service compiles and digitizes this data to show the extent, distribution, and characteristics of the nation's wetlands.[27] The DEC wetlands that appear on this map, by contrast, show the location and approximate extent of wetlands subject to State regulation under the Freshwater Wetlands Act. While the NWI includes wetlands smaller than one acre, the DEC wetlands maps generally only include wetlands 12.4 acres and larger. Both maps are produced through aerial photograph interpretation and may omit wetlands difficult to detect through remote sensing, such as seasonally flooded wetlands, forested, and small isolated wetlands like vernal pools. Thus, additional wetlands may be found in Rosendale that do not appear on this map. The **habitat maps** in this Inventory are an important supplementary source of information on the town's wetlands: they contain more detailed information on wetlands by type as well as additional wetlands not mapped on the NWI and DEC maps. As a rule, all wetlands data in this Inventory should be considered preliminary, providing an estimate of the boundaries and extent of wetlands. Some wetlands shown on these

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[23] N.Y. Department of Environmental Conservation, "Wetlands in the Watersheds of the New York City Water Supply System, 2009: p. 9.

[24] "The Binnewater Lakes Region: An Ecological Assessment of Habitats and Species," *Rosendale Biodiversity Assessment,* December 2006: p. 28.

[25] For more detailed information, go to http://www.dec.ny.gov/permits/6058.html, or contact the NYS DEC Region 3 District Office at (845) 256-3000.

[26] Isolated wetlands are those whose disturbance or degradation does not affect "interstate or foreign commerce." Isolated wetlands are those not connected to a tributary (or, in some cases, a drainage ditch). For more information, see the National Archives and Records Administration, Code of Federal Regulations, 40 CFR 230.3.

[27] A "non-regulatory" map is a map that was created to display all wetlands as opposed to only those wetlands that are regulated.

maps have not been field verified, and may not meet wetland criteria upon field verification by professional wetlands delineators.

Areas with **hydric soils** have been mapped in this Inventory because they are areas where there is a particularly high potential for additional wetlands that may have been overlooked or omitted in the NWI and DEC maps, or may identify previously drained areas with wetland restoration or creation potential. Hydric soils have a higher than average potential for containing additional wetlands than do non-hydric soils. However, not all areas mapped as having hydric soils support wetlands.

The wetlands and hydric soils mapped in this Inventory can be used in the land-use planning process as an indicator of the overall extent and distribution of wetlands in Rosendale. It is important to view this data in conjunction with other maps in the Natural Resource Inventory, including maps of flood zones, aquifers, and habitats, to assess the importance of particular wetlands within the Town and to help protect their associated functions and values from direct and indirect impacts.

Streams

Healthy streams and rivers are important to the community's water supply, to recreational enjoyment, and to the health and proper functioning of ecosystems and the habitats they support. Rosendale has two major streams, the Rondout Creek—a tributary of the Hudson River, running through the center of the village behind Main Street--and the Wallkill River, which merges with the Rondout Creek north of Sturgeon Pool. Both are fed by numerous smaller streams or tributaries. **Perennial streams**, which flow year-round, and **intermittent streams** can be found throughout the town. Unlike perennial streams, intermittent streams have flowing water during certain times of the year and are dry at other times. The primary source of water for both types of streams is groundwater, with runoff from rainfall providing a supplementary source.[28] Though flowing only part of the year, intermittent streams play an important role in water quality and supply, transporting water from spring snow melt and heavy rains, together with nutrients, to the lower stream reaches. Intermittent streams also have important habitat value, supporting natural communities that are specially adapted to a wide range of hydrologic conditions.[29]

To protect and maintain the quality of Rosendale's streams, development needs to be carefully planned so that it minimizes biological stresses on streams and stream ecology. The streams depicted on the Wetlands, Hydric Soils and Streams Map are limited to those classified by the NYS Department of Environmental Conservation, and do not include all streams in the town—particularly the many intermittent streams. The habitat map of the Binnewater Lakes Region in this Inventory provides more comprehensive data on streams and should be used as a supplementary source of information for land-use and development planning in this region.

The data in this map are from various sources. Ulster County Information Services provided the DEC wetlands data (obtained from Cornell University Geospatial Information Repository), the NWI wetlands data (obtained from U.S. Fish and Wildlife Service in 2008), and soils data from the Natural Resources Conservation Service (2005). Streams are from the state's DEC Division of Water. The Town of Rosendale Environmental Commission created a layer to show the overlap of DEC and NWI wetlands, and classified the soils data to show hydric soils based on the U.S. Department of Agriculture's list of hydric soils (accessed in 2010).

[28] The source used to define perennial and intermittent streams is the U.S. Army Corps of Engineers. See Code of Federal Regulations, Title 33, Part 330, Nationwide Permit Program (electronic version, current as of Jan. 2011).
[29] N.Y. Natural Heritage Program, N.Y. Department of Environmental Conservation, "Intermittent Stream Guide," http://www.acris.nynhp.org/guide.php?id=9944 2004-2005.

Town of Rosendale
Natural Resources Inventory

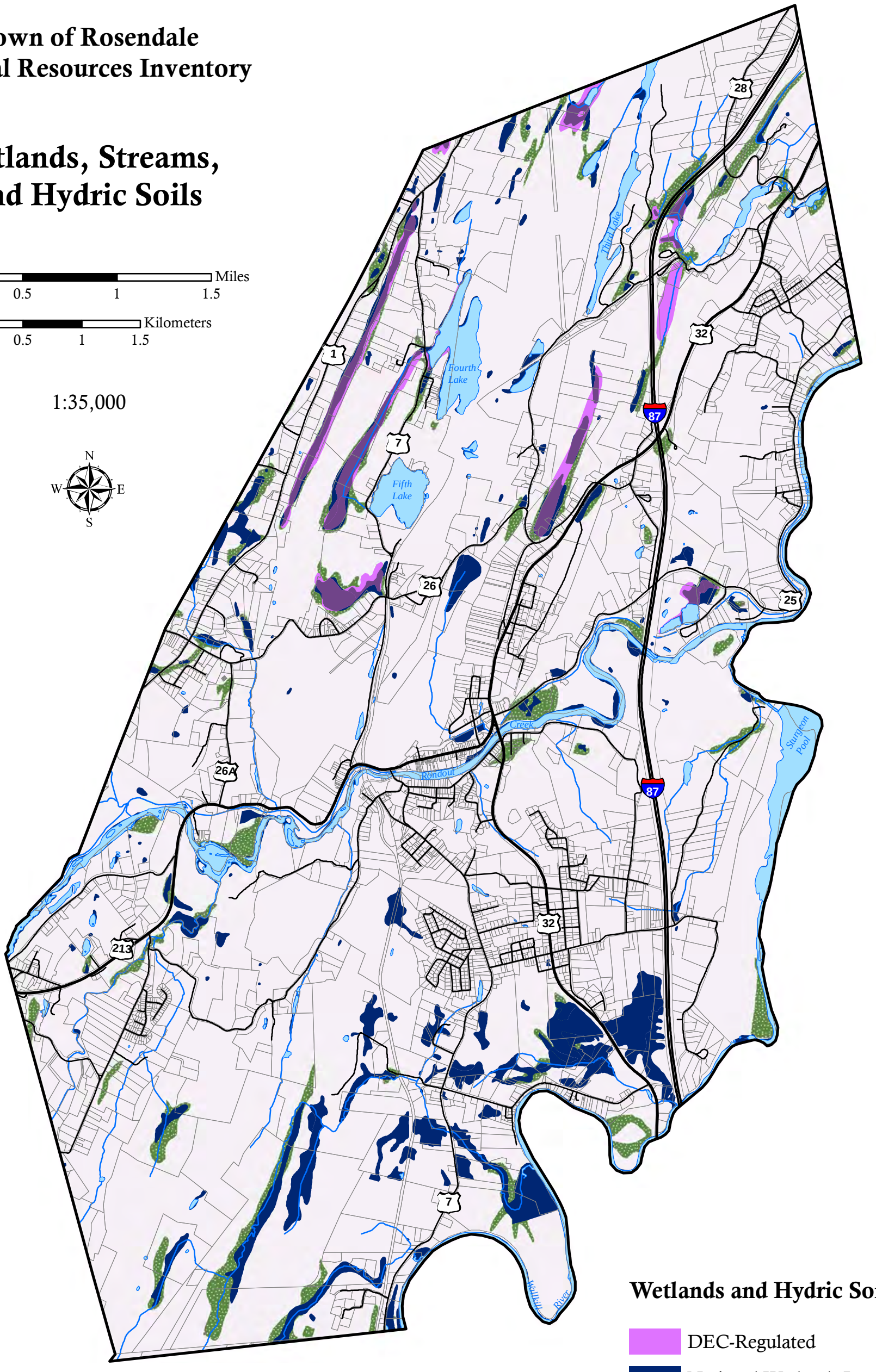
Wetlands, Streams, and Hydric Soils

Miles
0 0.5 1 1.5

Kilometers
0 0.5 1 1.5

1:35,000

N
W E
S



Wetlands and Hydric Soils

- DEC-Regulated
- National Wetlands Inventory
- DEC and NWI
- Hydric Soils

- Roads
- Streams
- Town Boundary
- Tax Parcels
- Surface Waters

Map produced for the Town of Rosendale
Environmental Commission, June 2010.

Data Sources:
DEC-regulated wetlands: NYS Department of Environmental Conservation, obtained from Cornell University Geospatial Information Repository.
National Wetlands Inventory: U.S. Fish and Wildlife Service, obtained by Ulster County Information Services (2008).
Hydric soils: Soils from Natural Resources Conservation Service (2005), classified by Rosendale Environmental Commission.
Roads, town boundary, tax parcels: Ulster County Information Services.
Surface waters, streams: NYS DEC Division of Water (2005).

This map is intended for general planning and education purposes. Corrections or updates may be submitted to the Town of Rosendale Environmental Commission.

Flood Zones

Floodplains are low-lying areas of land that are occasionally inundated with flood waters during or after high precipitation events or from snow melt in the spring. They can be wet or dry most of the year, depending on the soil type. As the Flood Zones Map shows, the most significant floodplain areas in Rosendale are found along the Rondout Creek and Wallkill River--both of which have historically seen major flood events. Indeed, severe flooding in the village of Rosendale prompted the U.S. Army Corps of Engineers to undertake a flood control project through the center of town, widening the channel and lining the banks with riprap to help move water quickly through the village and prevent destructively high water levels. Even with the flood control project, several historic houses in the village have been inundated by flood waters in recent years.

The largest floodplain in Rosendale is located in the hamlet of Tillson, in the Wallkill River watershed, and contains sizeable wetland areas that are bisected by Route 32. The Route 32 bridge in Tillson has periodically been closed as a result of high water events.

The Flood Zones Map shows data from the Federal Emergency Management Agency (FEMA), obtained from Ulster County Information Services, and it distinguishes two categories of floodplain: floodplains that have a one percent annual chance of being completely inundated (100-year floodplains) and floodplains that have a 0.2 percent annual chance of being completely inundated (500-year floodplains) or a one percent change under specific conditions. FEMA uses this data to administer the National Flood Insurance Program (NFIP), which makes federally-backed flood insurance available to residents and business owners in towns that adopt and enforce floodplain management ordinances. The Town of Rosendale participates in the NFIP and in 2009 adopted new flood damage prevention regulations to comply with changes to federal and state floodplain management programs. The local law requires that a floodplain development permit be obtained for any construction and development within a 100-year floodplain (zones A and AE on the Flood Zones Map) in order to ensure that new development is constructed in a manner that minimizes exposure to flooding and reduces flood hazards. These regulations, which include construction standards to limit the impact of the development on flood-water levels, are aimed primarily at protecting property and the safety of residents from flood hazards. It is important to note that floodplains be may be present along other streams in Rosendale that are not mapped by FEMA.

If left in their natural state, floodplains are often the first and most economical line of defense against flood hazards because they temporarily store water and decrease floodwater velocity, facilitating infiltration of water into the groundwater and preventing more severe flooding downstream. Floodplain areas also play an important role in maintaining water quality by capturing and sequestering sediment and nutrients from storm-water run-off. The trees and plants in floodplain areas slow flood waters, stabilize riverbanks, and protect against erosion. Finally, floodplains have significant habitat value, providing important wildlife corridors (particularly along the Rondout Creek and Wallkill River) as well as breeding, nesting, and feeding habitat for numerous species.

The best way to ensure that floodplains continue to perform these valuable functions is to prevent the proliferation of impervious surfaces in these areas--the spread of roads, driveways, and buildings, which prevent absorption of floodwaters, direct stormwater run-off into waterways, and degrade habitat. With the increase in severe weather events and associated flooding that is predicted for the region as a consequence of global climate change, the natural defenses against severe flooding and water quality problems that natural floodplains provide will only become more important in the future.[30]

[30] For additional information on this topic, see Union of Concerned Scientists, *Climate Choices*, at http://www.climatechoices.org/index.html.

Town of Rosendale
Natural Resources Inventory

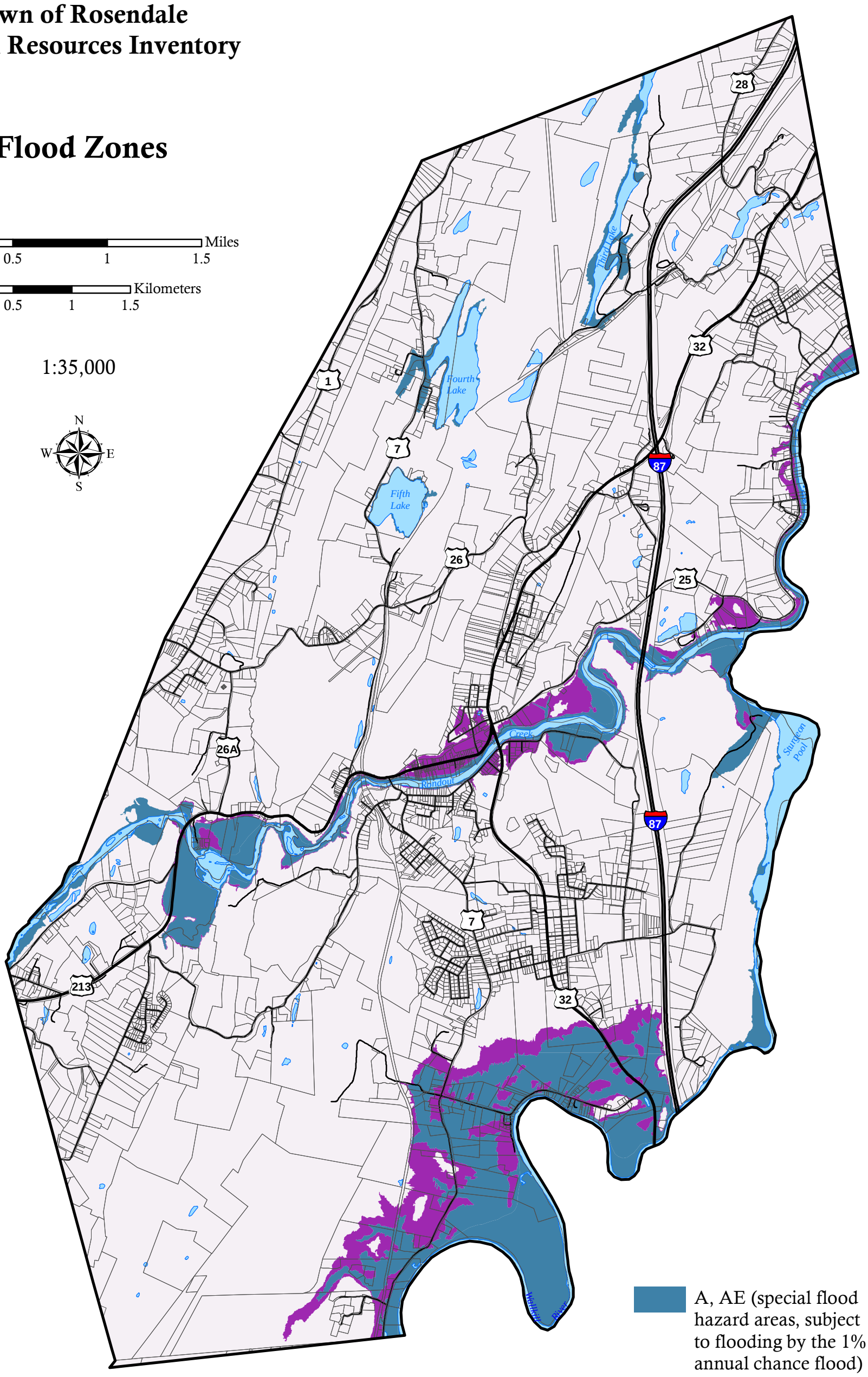
Flood Zones

0 0.5 1 1.5 Miles

0 0.5 1 1.5 Kilometers

1:35,000

N W E S



A, AE (special flood hazard areas, subject to flooding by the 1% annual chance flood)

X (areas of 0.2% annual chance flood, or areas of 1% annual chance flood with specific conditions)

Roads

Town Boundary

Tax Parcels

Surface Waters

Map produced for the Town of Rosendale Environmental Commission, June 2010.

Data Sources:
Flood zones: Federal Emergency Management Agency (2008), obtained by Ulster County Information Services.
Roads, town boundary, tax parcels: Ulster County Information Services.
Surface waters: NYS DEC Division of Water (2005).

This map is intended for general planning and education purposes. Corrections or updates may be submitted to the Town of Rosendale Environmental Commission.

Watersheds

A watershed is an area of land in which all drainage flows to a common outlet. Every water body and watercourse has its own watershed, with smaller watersheds comprising the sub-basins of larger watersheds. On this map, the three largest stream watersheds in the town are identified--the Rondout Creek basin, Wallkill River basin, and the Esopus Creek basin—along with five of the larger sub-basins of the Rondout Creek watershed within Rosendale. In reality, however, watersheds know no town boundaries: The entire Rondout Creek watershed spans 14 towns and villages and comprises 383 square miles of land (and is itself a sub-basin of the Hudson River).[31] The quality of water flowing through Rosendale depends in part on the land-use choices of upstream communities, making cooperation among towns vital to watershed management and maintaining water quality over the long run.

The Watersheds Map displays data compiled by the Ulster County Soil and Water Conservation District from various data sources, primarily HUC 11 digit watershed shape files.

[31] Hudson Basin River Watch, "2007 Watershed Report Card for the Rondout Creek," 2007.

Town of Rosendale
Natural Resources Inventory

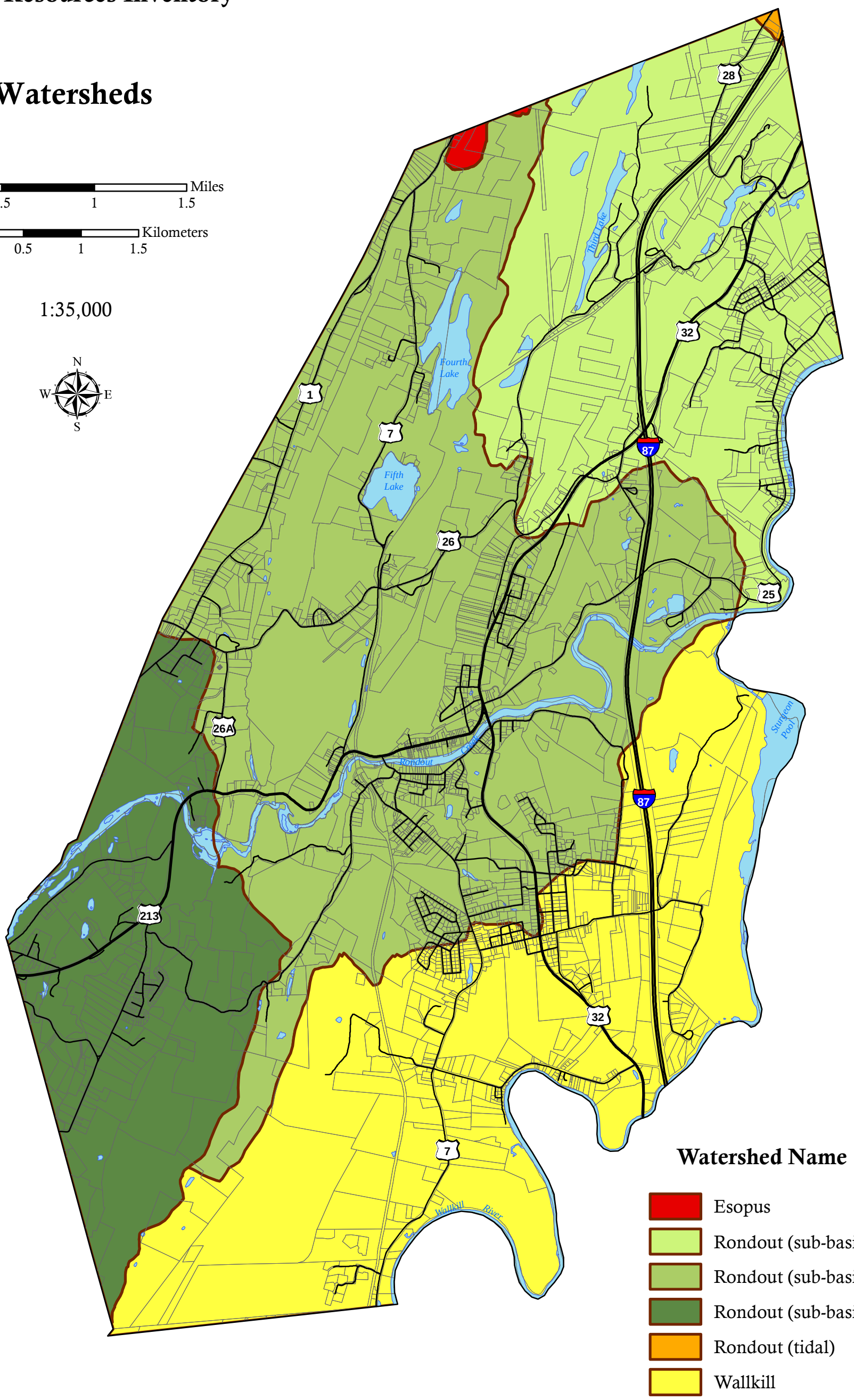
Watersheds

0 0.5 1 1.5 Miles

0 0.5 1 1.5 Kilometers

1:35,000

N W E S



Watershed Name

- Esopus
- Rondout (sub-basin)
- Rondout (sub-basin)
- Rondout (sub-basin)
- Rondout (tidal)
- Wallkill

- Roads
- Town Boundary
- Tax Parcels
- Surface Waters

Map produced for the Town of Rosendale
Environmental Commission, June 2010.

Data Sources:
Watersheds: Ulster County Soil and Water Conservation District.
Roads, town boundary, tax parcels: Ulster County Information Services.
Surface waters: NYS DEC Division of Water (2005).

This map is intended for general planning and education purposes. Corrections or updates may be submitted to the Town of Rosendale Environmental Commission.

Biological Communities

Rosendale is home to a rich and diverse array of biological communities that reflect its unique and varied geology, soils, topography, and hydrology. The biological diversity (or biodiversity) that exists here—the variety of life and its processes--comprises much of the town's natural wealth. Biological communities provide some of the ecological services we depend upon, like filtering our water, ensuring our water supply, buffering and reducing storm damage, creating and enriching our soils, pollinating our crops, producing oxygen, and moderating climate. Ensuring the integrity of our diverse biological communities is therefore directly connected to our own welfare and that of future generations.

A prerequisite for making ecologically-informed decisions about land use is knowing the types and location of ecologically significant habitats within the town. A "habitat" is a place where a particular species or group of species is likely to occur. This Inventory includes several habitat maps, which differ in the geographical area of Rosendale they cover as well as in the habitat classifications they use. The New York Natural Heritage Program's Significant Ecological Communities Map shows only those ecological communities that are considered to be of state-wide significance in the town, and are not based on a systematic town-wide survey. The two other maps comprehensively cover the habitats of particular areas—the Binnewater Lakes region and the Shawangunk Ridge lands—and are part of a larger town-wide biodiversity assessment, "The Natural Wealth of Rosendale." At the time of writing, the third and final biodiversity study to be included in this volume, covering the habitats of Eastern Rosendale, is still underway. Once completed, the habitat map of Eastern Rosendale will be added to this Inventory.

The habitat maps, described below, should be consulted in land-use and development planning as a first step in identifying potentially significant habitats and planning development in ways that minimize habitat degradation or loss. Use of these maps should be considered part of a preliminary assessment and not as conclusive evidence of the presence of these habitats at a particular location. Field verification of habitats and their boundaries should also be conducted prior to decision-making.

Significant Ecological Communities (N.Y. Natural Heritage Program)

The Significant Ecological Communities Map, based on data from the NYS Department of Conservation's New York Natural Heritage Program (NYNHP), shows the habitats in Rosendale that are considered either to be rare ecological communities in the State of New York or the best examples of common communities within the state.

As the map indicates, Rosendale is home to a number of ecological communities of state-wide significance, including significant tracts of **hemlock-northern hardwood forest** in the Binnewater Lakes and Shawangunk regions, and large areas of **chestnut oak forest** in the Shawangunk region. Three ecologically significant habitats reflect Rosendale's geology--**calcareous talus slope woodland** and **limestone woodland**—which prefer the alkaline soils associated with limestone bedrock and often support many rare plants, and **cliff community**, which is typical of the Shawangunk Ridge rock outcrops. The town also has several wetland habitats of state-wide significance, including **floodplain forest** along the Wallkill River at the south end of the town and **hemlock hardwood swamp** and **red-maple hardwood swamp** in the Binnewater Lakes region. **Vernal pools**, which provide critical breeding habitat for many amphibians--some rare and endangered--also appear on the map. It is important to note, however, that the small size of vernal pools poses challenges to mapping them; thus it is likely that other vernal pools with significant habitat value exist in the town but have not been mapped.

Town of Rosendale
Natural Resources Inventory

Significant Ecological Communities

Miles
0 0.5 1 1.5

Kilometers
0 0.5 1 1.5

1:35,000

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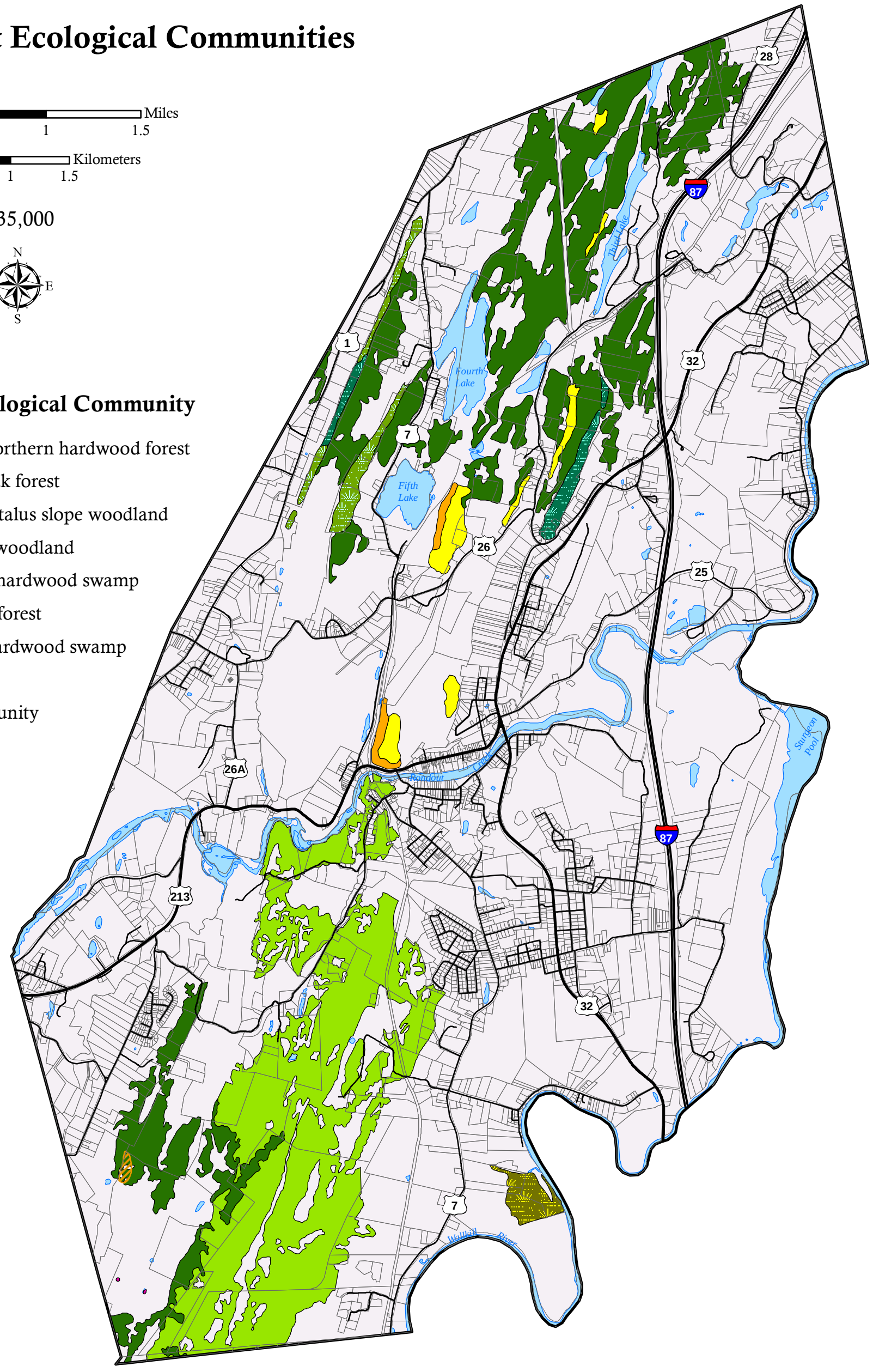


Significant Ecological Community

- Hemlock-northern hardwood forest
- Chestnut oak forest
- Calcareous talus slope woodland
- Limestone woodland
- Red maple-hardwood swamp
- Floodplain forest
- Hemlock-hardwood swamp
- Vernal pool
- Cliff community

Map produced for the Town of Rosendale
Environmental Commission, June 2010.

Data Sources:
Significant ecological communities: NY Natural Heritage Program (March 2010).
Roads, town boundary, tax parcels: Ulster County Information Services.
Surface waters: NYS DEC Division of Water (2005).

This map is intended for general planning and education purposes. Corrections or updates may be submitted to the Town of Rosendale Environmental Commission.

- Roads
- Town Boundary
- Tax Parcels
- Surface Waters

The Binnewater Lakes Region

"Ecologically Significant Habitats in the Binnewater Lakes Region" covers a 4,300-acre area of Rosendale that is particularly rich in biological, geological, and historical resources. Beginning at the Rondout Creek and the historic Delaware and Hudson canal, the study area includes Joppenbergh Mountain and the limestone ridge that extends northward, the Century House Snyder Estate, and the five Binnewater Lakes.

The map is the product of a 10-month study by a nine-member team from Rosendale who, with leadership and training from Hudsonia Ltd., identified and documented habitats of ecological significance in this area in 2004. The team predicted habitat occurrences based on analysis of topographic maps, soil and geology maps, stereoscopic aerial photographs, and other data, and then used field assessments to refine predictions.

"Ecological significance" is defined by Hudsonia as encompassing a broad range of attributes related to the habitats' role in the larger ecosystem. These include:

- **rarity** (a habitat that is itself rare or supports rare native species);
- **extent** (certain animal species require large, contiguous areas with a complex of habitats, while others require small size or isolation from other habitats);
- **juxtaposition with other habitats** (proximity between different but related habitats can be important to sustaining particular species);
- **vulnerability** (some habitats are particularly vulnerable to disease, invasive species, or human disturbance, and are in danger of becoming rare, increasing the significance of undisturbed examples of these habitats);
- **exemplary nature** (the best examples of certain types of habitat can have ecological significance).[32]

The assessment found that this region contains many special habitats--including extensive forests, abandoned caves and mineshafts, calcareous ridges, intermittent woodland pools, and large hardwood swamps—that are important to a diversity of species of conservation concern. Several New York State (NYS) Species of Special Concern were identified in the study area, including marbled salamander, Jefferson salamander, and red-shouldered hawk. The project team also found cricket frog, which is on the Federal and NYS Endangered Species Lists; and noted records documenting the presence of Indiana bat, which is on both the Federal and NYS Endangered Species Lists. The assessment's final report, which was adopted as an addendum to the town's 2007 Comprehensive Plan, recommends that the location and specific habitat needs of these species should be taken into in land-use planning to avoid or minimize any harmful impacts to local biodiversity. The report, "The Binnewater Lakes Region: An Ecological Assessment of Habitats and Species" (December 2006), also recommends that land-use planning seek to maintain the large contiguous habitat areas to the extent possible to avoid fragmentation of habitats, which negatively impacts biodiversity (for example, by degrading habitat quality for species that require larger habitat areas, or creating introduction pathways for invasive species).

[32] Erik Kiviat and Gretchen Stevens, *Biodiversity Assessment Manual for the Hudson River Estuary Corridor*, New York: Hudsonia Ltd., 2001.

Town of Rosendale
Natural Resources Inventory

Ecologically Significant Habitats in the Binnewater Lakes Region

Miles
0 0.5 1

Kilometers
0 0.5 1

1:21,000

N
W E
S

Legend

- Binnewater Lakes Study Area
- Tax parcels
- Developed
- Paved road
- Dirt road
- Railbed
- D & H canal

Upland Habitats

- Upland conifer forest (ucf)
- Upland mixed forest (umf)
- Upland deciduous forest (udf)
- Young woods (yw)
- Shrubby oldfield (sof)
- Upland meadow (um)

Wetland Habitats

- Hemlock-hardwood swamp (hhs)
- Hardwood swamp (hs)
- Wet meadow (wm)
- Emergent marsh (em)
- Intermittent woodland pool (iwp)
- Open water (ow) & Rondout Creek
- Floodplain forest
- Perennial stream
- Intermittent stream
- Springs & seeps

Map produced for the Town of Rosendale
Environmental Commission, June 2010.

Data Sources:
Ecologically significant habitats, roads, railbed, and canal:
Rosendale Biodiversity Assessment Training group (2005).
Tax parcels: Ulster County Information Services (2010).

This is a reduction of a large-format map of ecologically significant habitats created at a scale of 1:8,000. Habitats were identified and mapped by the Rosendale Biodiversity Assessment Training group in 2004-2005, with assistance from Hudsonia Ltd.

The Shawangunks Vegetation and Land Cover

The habitats of Shawangunks were mapped by the Shawangunk Ridge Biodiversity Partnership—a group of non-profit and public organizations that have been studying the northern Shawangunks (an area encompassing 94,000 acres in seven townships) since 1994. The Rosendale portion of the Partnership's study area covers 5,036 acres. The map was compiled from aerial photographs, field studies, and existing information about Shawangunk Ridge vegetation. Mapped habitats were ground-truthed by field surveys and by using existing information available from NYNHP.

The habitat categories used in this map are generally more detailed than those used in the Binnewater Lakes Region Map. For example, "beech-maple mesic forest," "Appalacian oak-hickory forest," "northern hardwood forest," and "successional forest" are all examples of Upland Deciduous Forest—a habitat category used in the biodiversity assessment of the Binnewater Lakes region discussed above. The Binnewater Lakes region and Shawangunk region also have some habitats that are distinctive to each area. For more information about these habitats, see the Rosendale Environmental Commission's biodiversity assessment reports for these regions.

Town of Rosendale
Natural Resources Inventory

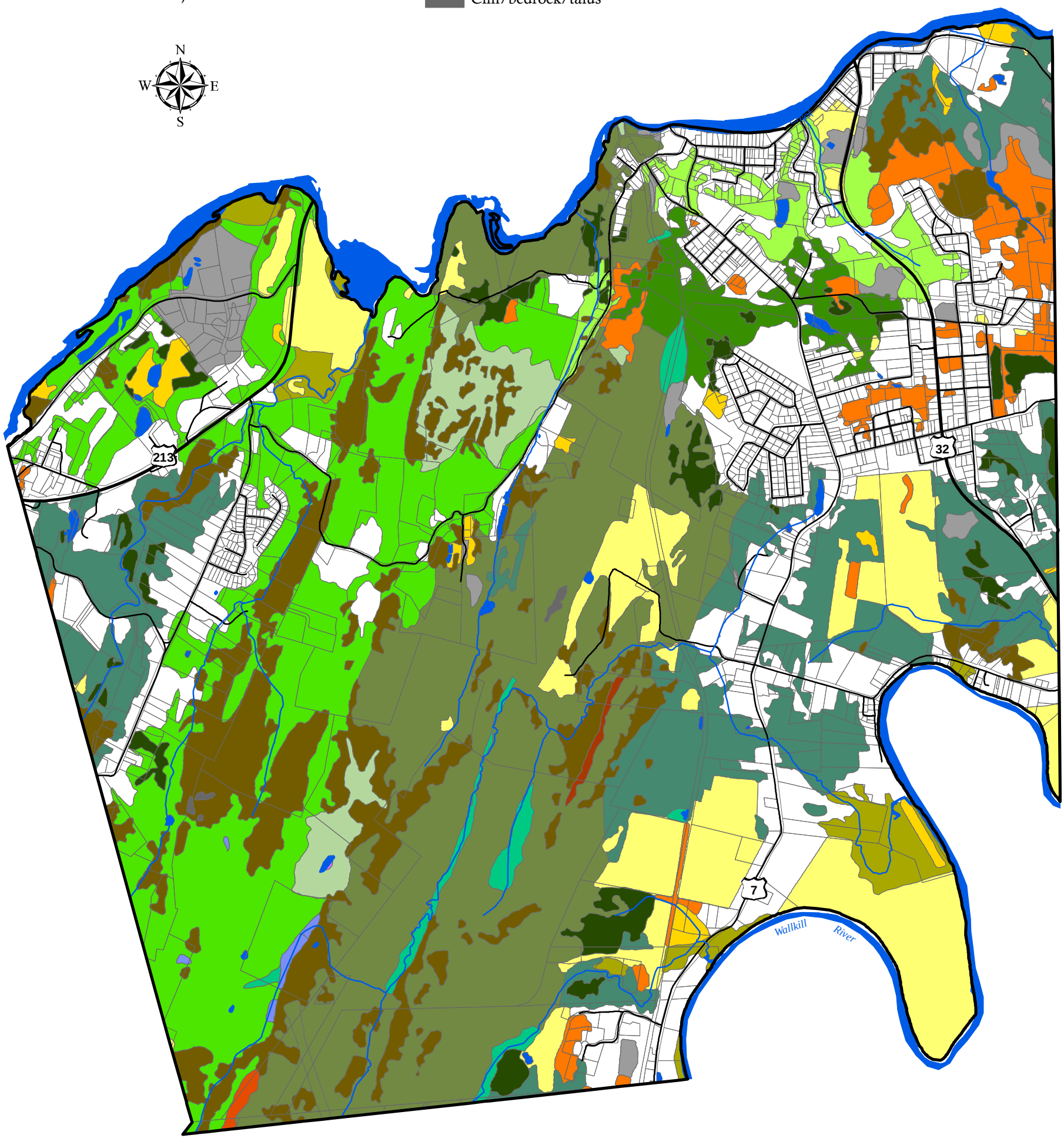
Shawangunks Vegetation and Other Land Cover Types

Miles
0 0.5 1

Kilometers
0 0.5 1

1:22,000

- White pine forest
- Hemlock-northern hardwood forest
- Chestnut oak forest
- Appalachian oak-hickory forest
- Appalachian oak-pine forest
- Beech-maple mesic forest
- Northern hardwood forest
- Floodplain forest
- Acidic talus slope woodland
- Pitch pine-oak-heath rocky summit
- Cliff/bedrock/talus
- Successional forest
- Successional old field
- Agricultural/golf course/lawn
- Cleared/logged land
- Hemlock Swamp/Highbush blueberry bog thicket
- Sedge meadow/shallow emergent marsh
- Red maple-hardwood swamp
- Lake/pond/river
- Graded land/construction/mine
- Low density residential



- Roads
- Streams
- Tax Parcels
- Map Area Boundary (in the Town of Rosendale)

Map produced for the Town of Rosendale
Environmental Commission, June 2010.

Data Sources:
Vegetation and land cover types: The Nature Conservancy (1996).
Roads, tax parcels: Ulster County Information Services.
Streams: NYS DEC Division of Water (2005).

This map is a representation of a portion of a map created by Green Assets for the Shawangunk Ridge. It is intended for general planning and education purposes.

SECTION III: Land Uses

Zoning

Zoning is a land-use planning tool available to municipal governments to protect the health, safety, and general welfare of their municipality.[33] Typically, zoning laws divide the community into land use districts and establish building restrictions regarding building height, lot area coverage, the dimension of structures, and other aspects of building and land use. The Town of Rosendale's Zoning Code, found in Chapter 75 of the Town Code, designates permitted uses of land based on the mapped zones shown on the Zoning Map.[34] A detailed schedule of permitted uses for each zone can be found in Chapter 75, Attachment 1 of the Town Code.[35] Broadly speaking, industrial uses are permitted in the I zone, commercial uses are permitted in the B zones, and residential uses are permitted in the A, R, and B-1 zones. Each zone also has minimum lot size requirements. Most of the land in Rosendale is in an A zone, with a minimum lot size of 1.5 acres, or an R zone, with a minimum lot size ranging from .5 acre to 1 acre depending upon the availability of community sewer and/or water.

Examining the zoning map in relation to other maps of the Natural Resource Inventory can provide insight into how potential development could affect the existing natural resource base, and is a valuable tool for developing and evaluating subdivision plans, for Open Space planning, and for updating the Comprehensive Plan and Zoning Code.

[33] Kory Salamone (editor), *Gaining Ground: Training Book for Land Use Leaders*, Land Use Law Center, Pace University School of Law, New York (2004): p. 19.

[34] Please note that the I-zone within the large parcel with frontage on Binnewater Road (Route 7) was sketched based on the existing hard copy zoning map and not based on GIS coordinates, which were not available.

[35] The Town of Rosendale Town Code is available on the town website, www.townofrosendale.com).

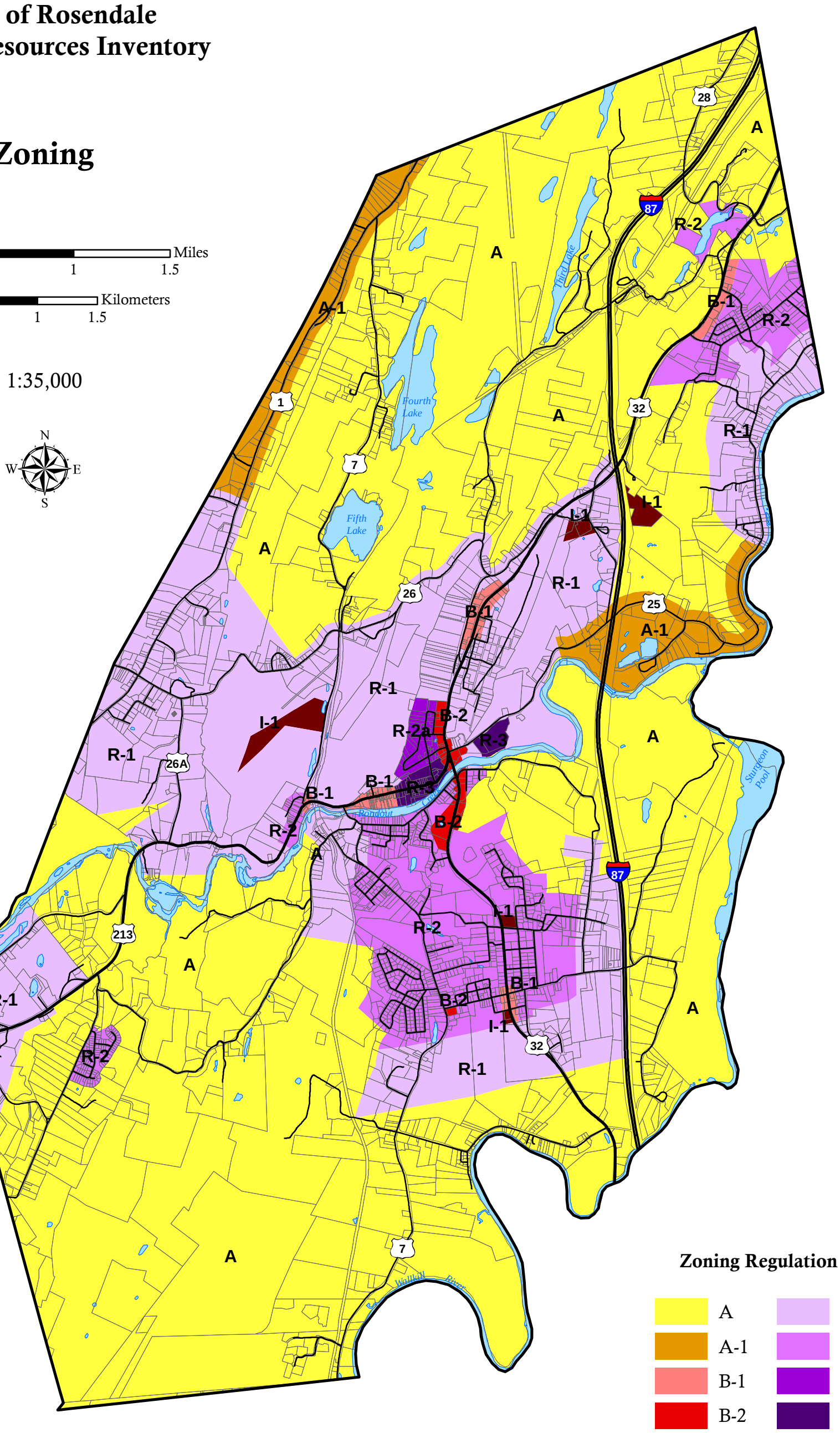
Town of Rosendale
Natural Resources Inventory

Zoning

Miles
0 0.5 1 1.5

Kilometers
0 0.5 1 1.5

1:35,000



Zoning Regulation

- A
- A-1
- B-1
- B-2
- I-1
- R-1
- R-2
- R-2a
- R-3

- Roads
- Town Boundary
- Tax Parcels
- Surface Waters

Map produced for the Town of Rosendale
Environmental Commission, June 2010.

Data Sources:
Zoning: Ulster County Planning Department (2005).
Roads, town boundary, tax parcels: Ulster County Information Services.
Surface waters: NYS DEC Division of Water (2005).

This map is intended for general planning and education purposes. Corrections or updates may be submitted to the Town of Rosendale Environmental Commission.

Protected Lands

Protecting open space has become increasingly important to rural communities as development encroaches on areas of ecological, scenic, agricultural, and recreational value. There are a variety of non-regulatory tools that can be used to protect open space, including voluntary conservation easements and direct acquisition of land by conservancies or by government. In Rosendale, some of the most ecologically valuable and environmentally sensitive areas, including 782 acres of the Shawangunk Ridge and 426 acres in the Binnewater Lakes region, have been protected in perpetuity, thanks to conservation-minded landowners and organizations.

Most of the protected lands in Rosendale are privately owned and protected through conservation easements held by local land trusts. An exception is the Shawangunk Ridge land owned by the Mohonk Preserve, which is a private preserve. There is very little publicly-owned, forever-wild open space in Rosendale, and only the Mohonk Preserve is publicly accessible (through purchase of a membership or day pass).

Town of Rosendale
Natural Resources Inventory

Protected Lands

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Kilometers
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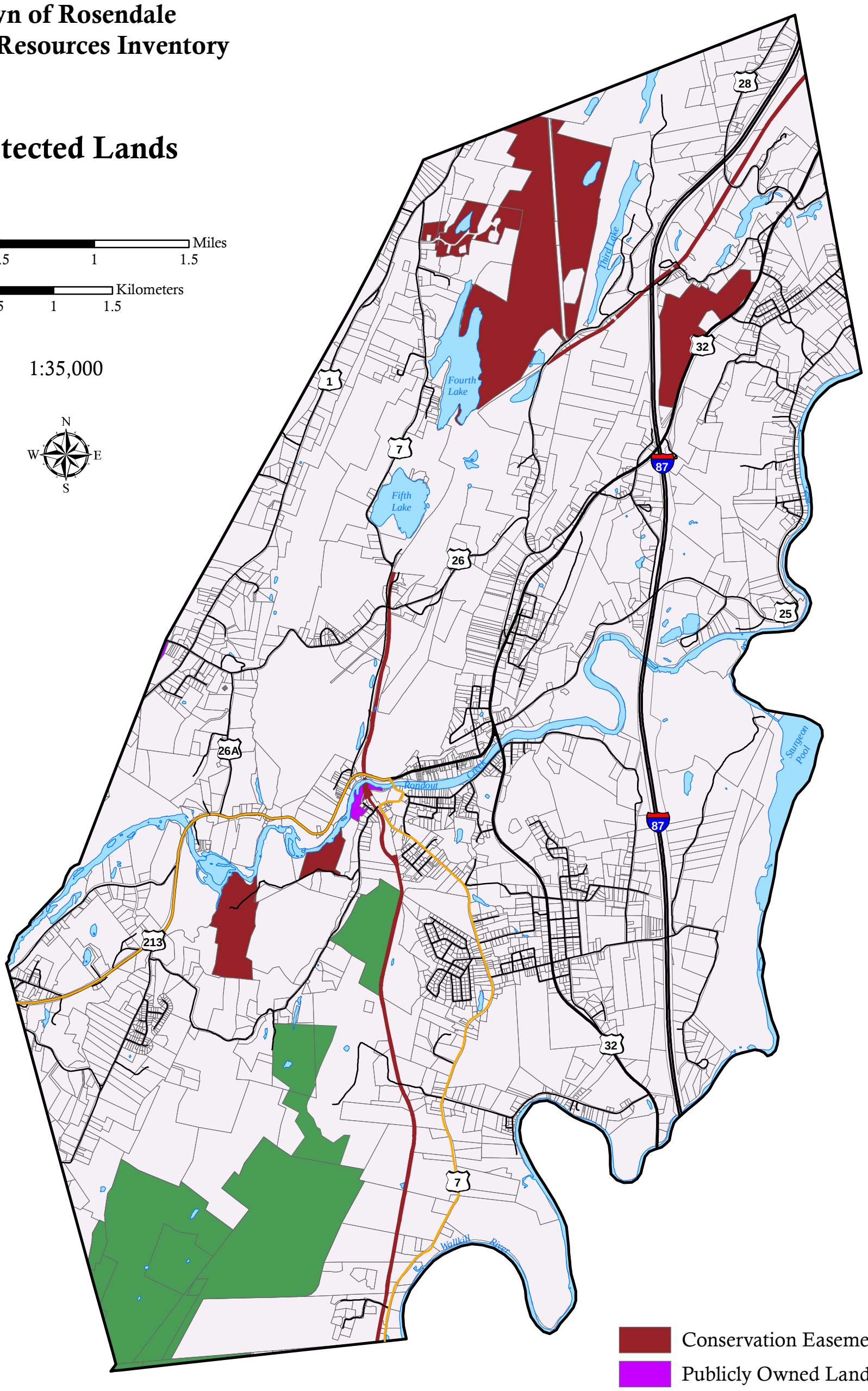

Conservation Easement
Publicly Owned Land
Private Preserve
Shawangunk Mountains Scenic Byway

Roads
Town Boundary
Tax Parcels
Surface Waters

Map produced for the Town of Rosendale Environmental Commission, June 2010.

Data Sources:
Protected lands: Rosendale Environmental Commission (2010), informed by county, town, land trust, and private sources.
Roads, town boundary, tax parcels: Ulster County Information Services.
Surface waters: NYS DEC Division of Water (2005).

This map is intended for general planning and education purposes. Corrections or updates may be submitted to the Town of Rosendale Environmental Commission.

Agricultural Lands

The Agricultural Lands Map identifies both actual and potential farmland in Rosendale. As the map indicates, lands currently used for agriculture in Rosendale account for a small fraction of the town's total land area. Of these agricultural lands, approximately 70% have a county agricultural district designation, which entitles landowners to a mix of incentives aimed at preventing the conversion of farmland to non-agricultural uses. The map also identifies lands that are not within a county agricultural district but are currently being used for agricultural purposes. The Town of Rosendale Environmental Commission identified these lands through analysis of aerial photographs and subsequent field investigation.

While Rosendale's numerous ridges and sloping terrain have historically limited the role of agriculture in the town's economy, there is nonetheless some potential for growth in local food production, as indicated by the numerous areas of **prime farmland soils** on the map. Prime farmland soils are a U.S. Department of Agriculture designation, based upon favorable attributes of the soil for producing food, feed, forage, fiber, and oilseed crops. The soils on this map were classified by the Ulster County Planning Department.

Growing food locally can benefit the local economy, the environment, and the health and welfare of the community if sustainable agricultural practices are used. In addition to providing the community with a local source of crops and livestock, farmlands can also serve as an important source of food and cover for wildlife, and is better than development in controlling flooding and protecting wetlands and watersheds (again, if sustainable agricultural practices are used).

The Rosendale Farmers' Market, founded in 2006, plays a key role in supporting local food production and the preservation of farmland by providing a venue for local farmers to sell their produce directly to the community. (The location of the Farmers' Market is shown on the Cultural and Recreational Sites Map in this Inventory.)

REFERENCES:

American Farmland Trust. http://www.farmland.org
Ulster County Information Services. http://www.co.ulster.ny.us/ucis/
Natural Resources Conservation Service. http://www.nrcs.usda.gov
New York State Department of Agriculture and Markets.
http://www.agmkt.state.ny.us/AP/agservices/agdistricts.html
U.S. Department of Agriculture. Soil Survey Staff (1993). "Soil Survey Manual". Soil Conservation Service. U.S. Department of Agriculture Handbook 18.
http://soils.usda.gov/technical/manual/print_version/complete.html. Retrieved 2006-08-30.

Town of Rosendale
Natural Resources Inventory

Agricultural Lands

Miles
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Kilometers
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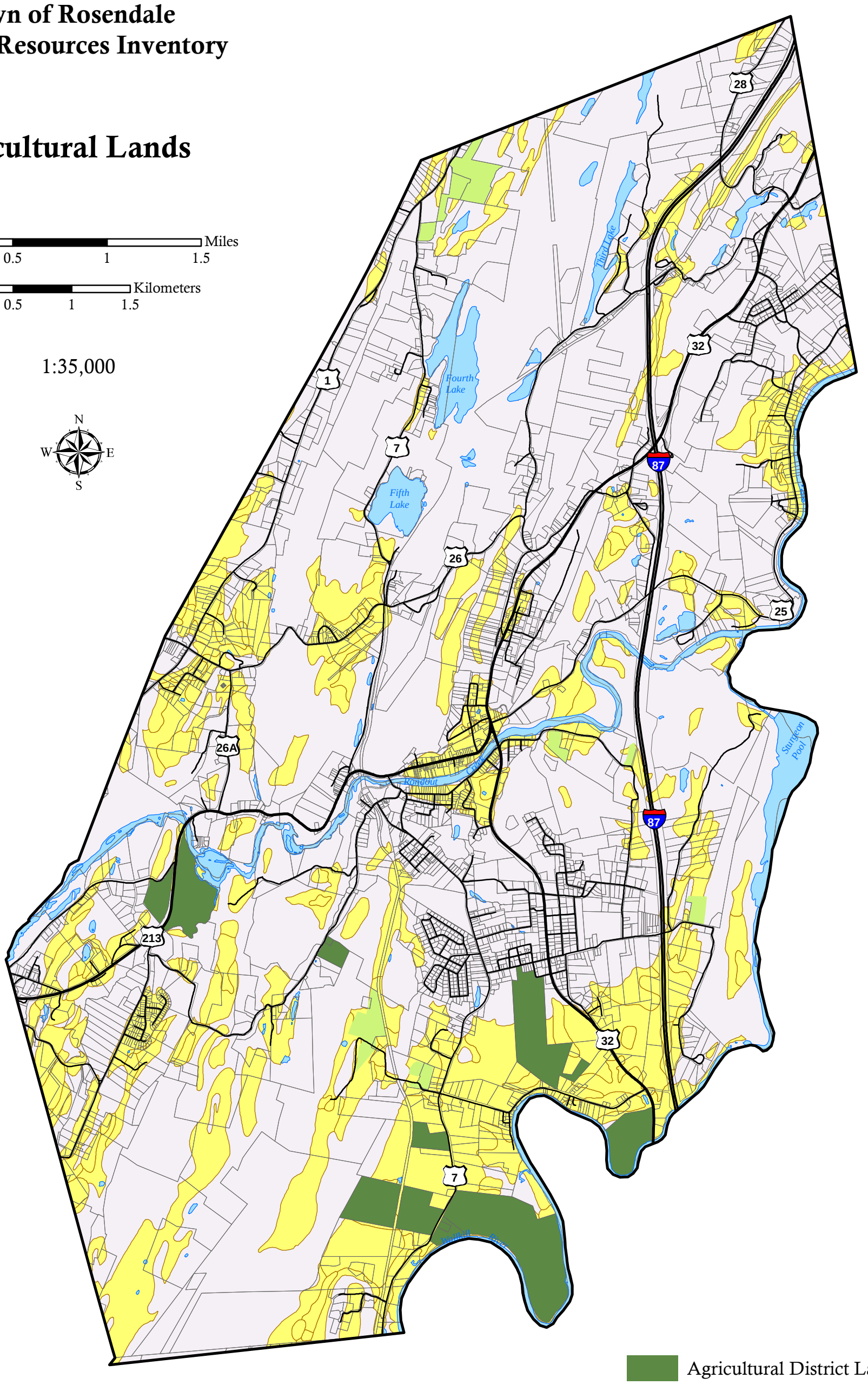

Agricultural District Lands
Lands in Agricultural Use
Prime Farmland Soils

Map produced for the Town of Rosendale
Environmental Commission, June 2010.

Data Sources:
Agricultural district lands: Ulster County Planning (2007) and Rosendale Environmental Commission (2009).
Lands in agricultural use: Rosendale Environmental Commission (2009).
Prime farmland soils: Soils from Natural Resources Conservation Service (2005), classified by Ulster County Planning.
Roads, town boundary, tax parcels: Ulster County Information Services.
Surface waters: NYS DEC Division of Water (2005).

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Roads
Town Boundary
Tax Parcels
Surface Waters

Historic, Cultural & Recreational Resources

Historic, cultural, and recreational resources, like natural resources, are vital to the town's community and identity, and are important to consider in land-use and development decision-making. Data for the Historic Sites Map was collected by the Rosendale Environmental Commission through research, field reconnaissance, and consultation with Ann LeFevre Gilchrist, Rosendale Town Historian and Professor Emerita, Ulster County Community College. The Cultural and Recreational Sites Map is based on data gathered by the Town of Rosendale Environmental Commission, and includes both publicly-owned and privately-owned lands and facilities.

Historic Sites

(Editor's note: At the author's request, the text below has been reproduced exactly as it was submitted.)

Text Explaining the Sites Included on the Historic Map of Rosendale
by
Ann LeFevre Gilchrist
Rosendale Town Historian and Professor Emerita. Ulster County Community College

Responding to the request to explain how the historic sites were selected, I concurred with the locations already delineated on the map given to me, and added corrections that were based on my knowledge of local history. I acquired this expertise from being Rosendale Town Historian for 30 years and from doing local history research in order to write a number of books and articles about Rosendale's past.

Natural Cement

Natural cement was discovered in the summer of 1825, during the building of the locks for the Delaware & Hudson Canal in Lawrenceville, located in the present Town of Rosendale. This discovery led to a booming cement industry that included its use in such structures as the Brooklyn Bridge and the bottom lift of the pedestal of the Statue of Liberty.

During the late 1880s, Rosendale's cement reached its height of usage after which portland cement that is fast setting became increasingly more widely used. Eventually, almost all the cement operations in Rosendale were forced to close.

However, Andrew J. Snyder never lost faith in the durability of Rosendale cement, and he reopened his operation in 1920. This venture was timely since it was beginning to be noticed that portions of portland cement were disintegrating and needed to be replaced.

Chemists and engineers arrived at a quick setting concrete that had durability by mixing 16 to 25 percent Rosendale cement with portland cement, the resulting product was called masonry cement. This mixture was used in numerous construction projects such as in miles of the New York State Thruway and in six runways at Kennedy Airport. However, about 1970, Snyder closed his operation down for reasons that are not entirely known.

Because of its cement history, sites such as Hugh White's Mill, the Whiteport kilns, and the Snyder Estate Natural Cement Historic District are very much part of Rosendale's past. Furthermore, in 2005, the Town of Rosendale cleaned out the area around the kilns still standing behind Main Street in the Village of Rosendale

and created Willow Kiln Park.

Early Settlers

The homes of Petrus Van Wagenen, Abraham Van Wagenen, Cornelius LeFevre on Route 32, Christopher Snyder, Captain Frederick Schoonmaker and the Keators are all evidence of the early settlement of the area. Furthermore, the houses of Benjamin DuBois and Jacob Freer, both grandsons of the original New Paltz Patentees, are located in the northwest corner of the township. In fact, Tawarataque, spelled a variety of ways, is a rock that marked the northwest corner of the New Paltz Patent.

The Churches

The United Reformed of Rosendale, located in Bloomington, was the first church established in what became the Town of Rosendale. Organized on May 14, 1796 in Maple Hill, this religious institution was known as the Reformed Dutch Church of Bloomendol. However, on December 28, 1846, a fire destroyed the church, and in 1848, it was rebuilt on its current site in Bloomington.

Located on Main Street in the Village of Rosendale, the Historic Site of All Saints Church, a former Episcopal Church, built in 1877, became the Rosendale Library after it was donated to the Rosendale Women's Club by Andrew J Snyder for this purpose. Also located just above Main Street at the western end of the village, is St. Peter's Catholic Church that was built in 1850 and formally incorporated in 1865.

The Friend's Meeting House, a Quaker church, is situated on Grist Mill Road in Tillson. Established in 1800, Phebe Tillson became the first minister, and the first building was probably constructed a few years after its date of origin. Although there have been occasional interruptions in its operation, it is currently a functioning congregation.

Newkirk Tavern

The field stone structure that housed Newkirk's Tavern is still standing in Maple Hill. Built in 1781, it was operated by Gerrit Newkirk.

Site of the Dewitt Grist Mill

During the Revolution, Charles DeWitt operated his grist mill on the Greenkill. Since this mill was located on a fast running stream, it could grind gain during the winter. For this reason, DeWitt was able to supply grain to Washington's numerous encampments, including that at Valley Forge.

Delaware & Hudson Canal Locks 2, 3 and 4

The Delaware and Hudson Canal was constructed from Honesdale, Pennsylvania to Kingston, New York for the purpose of transporting coal to New York City. On this waterway, Locks 2, 3 and 4 are still standing along side of Creek Locks Road.

Bridges

Nine hundred feet long, 160 high and just outside the Village of Rosendale, the Wallkill Valley Railroad Trestle crosses the Rondout Creek and Route 213. This structure, originally completed in November of 1872, was made sturdier sometime before 1907.

In Tillson, Perrine's Bridge, constructed in 1850, is one of only a few covered bridges that still stand in New York State. Crossing the Wallkill River, this bridge has been restored several times.

Fording Place

Probably crossing the Rondout Creek at the fording place in Rosendale, an advanced unit of Governor George Clinton's Army proceeded to Kingston, New York where on October 16, 1777, they witnessed from what is now called Golden Hill the burning of the city by the British.

Binnewater Historic District

The site of the former Rosendale Cement Company is now the Women's Studio Workshop. As a visual arts center, this site contains artists' studios and has professional staff in residence. The center also conducts classes on such topics as photography, ceramics and printmaking.

Historic Map Notes

First Church: This site is the First Site of the Bloomingdale Reformed Church, now located in Bloomington and renamed the United Reformed Church of Rosendale after this church merged with the Rosendale and Tillson Reformed Churches.

Taueratake: This site is the northwest marker of the New Paltz Patent.

All Saints Church (Rosendale Library), Binnewater Historic District, D&H Canal, Dubois House, Perrine's Bridge, and the Snyder Estate Natural Cement Historic District: These sites are listed on the State and National Register of Historic Places, which list buildings, structures, districts, objects, and sites significant in the history, architecture, archeology, engineering, and culture of New York and the nation. Other sites in Rosendale (including sites on this map), though not listed, may be National Register and State Register Eligible for listing and receive a measure of protection due to this eligibility.

Additional resources used for the Historical Map include:

National Register of Historic Places, National Park Service, U.S. Department of the Interior, www.nps.gov/nr.

Barber, D. G. 2003. A guide to the Delaware and Hudson Canal. Canal History and Technology Press, National Canal Museum, Easton, PA. (Reference used to estimate location of two of the canal locks shown on the Historical Sites Map.)

Gilchrist, Ann LeFevre, Rosendale Town Historian (communications with the Environmental Commission).

Questions about the historic map should be directed to the Town Historian. Contact Town Hall at (845) 658-3159, ext. 2.

Town of Rosendale
Natural Resources Inventory

Historic Sites

Miles
0 0.5 1 1.5

Kilometers
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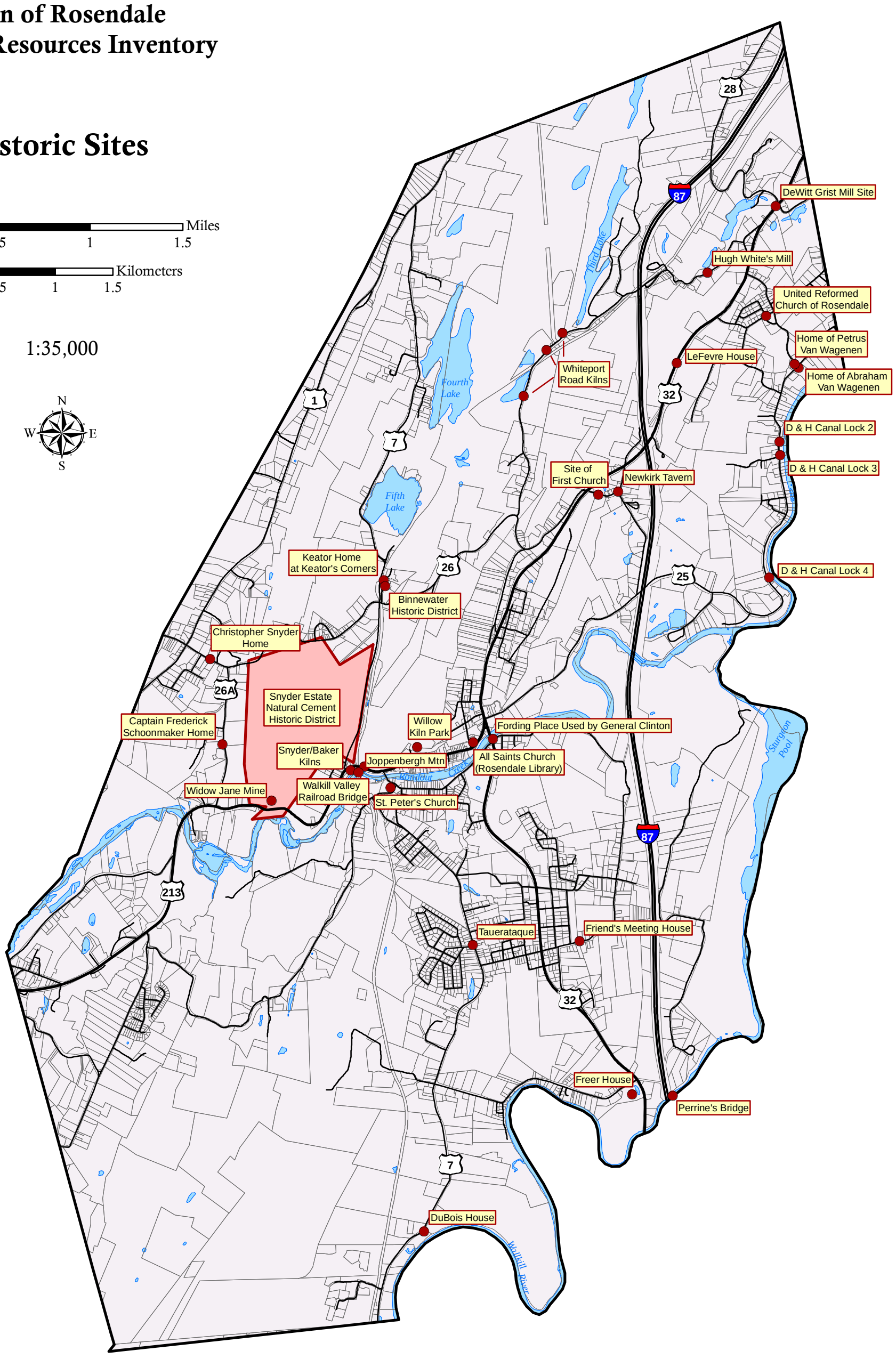

Historic Sites/Districts
Historic District
Roads
Town Boundary
Tax Parcels
Surface Waters

Map produced for the Town of Rosendale Environmental Commission, June 2010.

Data Sources:
Historic sites: Rosendale Environmental Commission (2009).
Historic district: NYS Office of Parks, Recreation, and Historic Preservation, Historic Preservation Office (2009).
Roads, town boundary, tax parcels: Ulster County Information Services.
Surface waters: NYS DEC Division of Water (2005).

This map is intended for general planning and education purposes. Corrections or updates may be submitted to the Town of Rosendale Environmental Commission.

Cultural and Recreational Sites

For a small town, Rosendale has quite a number of cultural and recreational resources--over 20 cultural sites and a variety of recreational areas, trails, and facilities.

The Wallkill Valley Rail Trail, enjoyed for walking, jogging, biking, and cross-country skiing, is a publicly accessible trail that traverses the town, continuing north through Kingston and south through New Paltz and Gardiner for a total of over 23 miles. This scenic trail passes through woodlands, wetlands, farms, and meadows and crosses the Rondout Creek on the iconic 940-foot long Rosendale Railroad Trestle. At the time of writing, the trestle, originally constructed in 1895, has been closed for repair and renovation.[36] Not far from the Rail Trail at the south end of Rosendale, the Mohonk Preserve occupies 782 acres of land on the Shawangunk Ridge that includes an extensive trail network and bouldering areas. The closest public entrances to the Preserve are in High Falls and New Paltz.

Rosendale's roads are widely used for cycling, and one of the more popular routes includes the **Shawangunk Mountains Scenic Byway**, which extends along Route 213 from High Falls to Route 7, where it continues south to New Paltz. The entire 88-mile route, designated by the state legislature and the governor in 2006 as a New York State Scenic Byway because of its scenic, natural, historic, and recreational value, circles the northern Shawangunk Mountains and traverses the Rondout and Wallkill valleys.[37]

The town's water bodies--most notably the Binnewater Lakes, the Rondout Creek, the Wallkill River and Sturgeon Pool--have long been used for fishing, boating, swimming, and ice-skating. Public access to waterways is, however, limited to particular areas, and the land surrounding most of the lakes in town is privately owned.

Sports facilities in town include the Little League Fields on Route 213 and the Rosendale Recreation Center on Route 32, which has softball and soccer fields, an outdoor swimming pool, basketball courts, and tennis courts. As a multi-use facility, the Recreation Center is both a recreational and cultural resource, with a playground and picnic area, and a Community Center that is widely used throughout the year for town meetings and events. The annual Rosendale International Pickle Festival and the Rosendale Earthfest and Expo are among the town festivals held on the Recreation Center grounds. The facility is also home to the Rosendale Farmer's Market, which is held in the parking lot on Sundays from June to November.

Another, smaller park in Rosendale is Willow Kiln Park, which is located between Main Street and Joppenbergh Mountain and is used for recreation, picnicking, and performances.

Cultural resources are defined in this Inventory as including **cemeteries** (Coxing Cemetery, Rosendale Cemetery, St. Peter's Church Cemetery) **memorials** (Veterans Memorial Park by the Route 32 Bridge), **religious centers** (Binnewater Union Chapel, St. Peters Church, Tillson Community Church, the United Reform Church in Bloomington), **educational institutions** (Rosendale Elementary School and Brookside School), **community centers and foundations** (Rosendale Community Center, American Legion Post 1219 Rosendale-Tillson), **museums** Snyder Estate Century House and Widow Jane Mine), **libraries** (Rosendale Library), and **artistic, spiritual, and cultural centers** (Center for Symbolic Studies, Center for Sustainable Living, Lifebridge Sanctuary, Rosendale Farmers' Market, Rosendale Theatre, Sky Lake Lodge, Women's Studio Workshop).

[36] Wallkill Valley Land Trust, "Preserving Open Space in Southern Ulster County to Benefit Present and Future Generations," Wallkill Valley Land Trust website, www.wallkillvalleylt.org.
[37] Shawangunk Mountains Scenic Byway website, www.mtnscenicbyway.org.

Town of Rosendale
Natural Resources Inventory

Cultural & Recreational Sites

Miles
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Kilometers
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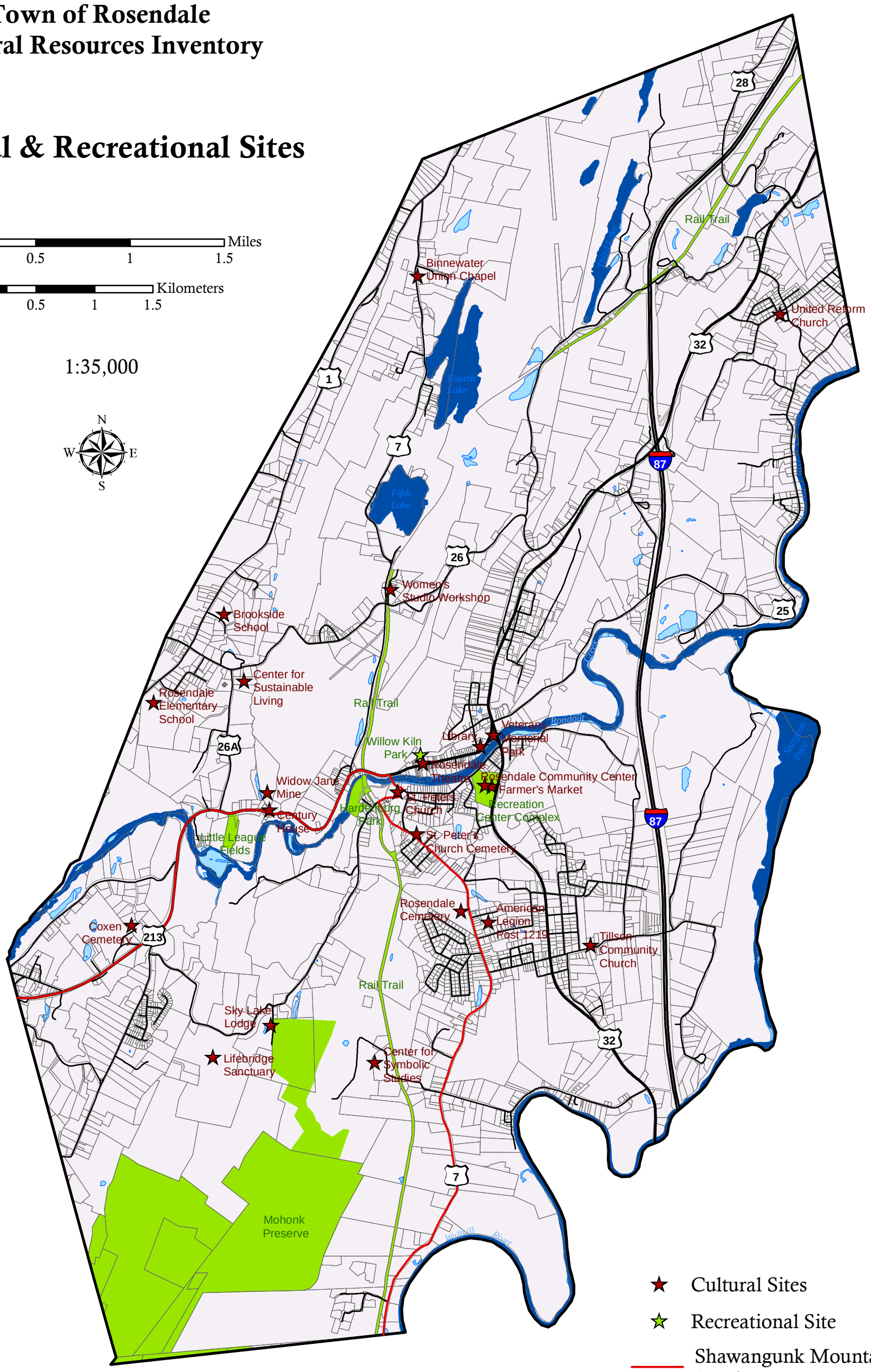

Map produced for the Town of Rosendale
Environmental Commission, June 2010.

Data Sources:
Cultural and recreational places: Rosendale Environmental Commission (2009).
Roads, town boundary, tax parcels: Ulster County Information Services.
Surface waters: NYS DEC Division of Water (2005).

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