Town of Rosendale
Natural Resource Inventory

Amberly Jane Campbell / Shawangunk Journal

Prepared by
The Town of Rosendale Environmental Commission

Update – January 2023

Original - September 2010

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Acknowledgements

The Natural Resource Inventory update was initiated by Town of Rosendale Environmental Commission member Nate Nardi-Cyrus, who updated the series of NRI maps in 2021. Late that year, Nate presented the revised NRI maps to both the Planning Board and Town Board and solicited their feedback. In 2022, Ingrid Haeckel from the Hudson River Estuary Program assisted with updating the report text to reflect changes to the maps and to incorporate other new information, in particular a new section on climate. Penny Coleman, a Commission member and the Town's Climate Smart Coordinator, made important contributions to the new climate section and assisted with other updates. We would like to thank other members of the Commission and Nate Nardi-Cyrus for reviewing the revised report and maps, as well.

The original 2010 Natural Resource Inventory was 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

Amberly Jane Campbell/Shawangunk Journal

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 31 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. 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.

[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.

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 III of this report.

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.

Since completion of the original NRI in 2010, it has regularly been used for many of these purposes. The Environmental Commission has regularly used the NRI to inform reviews of proposed development and comments to the Planning Board. When the Pilgrim Pipeline route was proposed to cross the Town, the Commission used the NRI for a detailed assessment of potential environmental impacts. The NRI has also been used an educational resource and the maps have been displayed in local venues and most recently in the public meeting room at the town hall.

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. PDFs of the NRI maps, which will be available on the Town website (www.townofrosendale.com), are best suited for viewing these interrelationships since they allow the viewer to zoom in for a close-range view and zoom out for a wider view. A complete set of the maps with tax parcel boundaries will also be available on the Town website and 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 a topographic relief hillshade from the New York State GIS Program Office and data on surface waters, roads and 2022 tax parcels from the Ulster County Information Services, and local stream mapping carried out by Hudsonia Biologist Kristen Bell Travis.[2] The Aerial View Map of the town (below) will also be helpful for general orientation. It displays orthoimagery obtained from the New York State GIS Clearinghouse (0.5 foot 4 band, taken in 2016). 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

0 0.5 1 1.5 Miles

1:35,000

N W E S

HURLEY
ULSTER
MARBLETOWN
ESOPUS
NEW PALTZ
Third Lake
Fourth Lake
Fifth Lake
Rondout Creek
Wallkill River
Sturgeon Pool
1
7
26
26A
28
32
87
213
25

Map produced for the Town of Rosendale Environmental Commission, June 2010. Revised, 2022

Data Sources:
Roads, town boundary, tax parcels (2022), surface waters: Ulster County Information Services (2015, 2022).
Rosendale streams: Kristen Bell Travis (2011).
Protected lands: : New York Protected Areas Database, Mohonk Preserve, Wallkill Valley Land Trust, Rondout Valley Land Conservancy, municipal tax parcels (2021).
Wallkill Valley Rail Trail: Wallkill Valley Land Trust (2020).
Hillshade: New York State GIS Program Office (2020).

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

New York State Thruway
State Roads
County and Local Roads
Wallkill Valley Rail Trail
Waterbodies
Streams
Protected Lands

NYS GIS Program Office

Town of Rosendale
Natural Resources Inventory

Aerial View 2016

0 0.5 1 1.5 Miles

1:35,000

N W E S

HURLEY

ULSTER

ESOPUS

MARBLETOWN

NEW PALTZ

Third Lake

Fourth Lake

Fifth Lake

Rondout Creek

Sturgeon Pool

Wallkill River

28 87 32 1 7 26 25 26A 213 7 87 32

Map produced for the Town of Rosendale Environmental Commission, June 2010. Revised, 2022

Data Sources:
Roads, town boundary, tax parcels (2022):
Ulster County Information Services (2015, 2022).
Orthoimagry: New York State GIS Program Office (2016).

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

NYS ITS GIS Program Office

SECTION II: CLIMATE

Global average temperature has been rising in unison with increasing input of insulating greenhouse gases, driving changes to regional and local climate. Warming atmospheric temperature alters the water cycle, leading to more extreme storms and precipitation and short-term drought. New York State has experienced particularly rapid changes to the regional climate in the last century and this trend is projected to continue through the 21st century.

Climate is the long-term average of weather, typically averaged over a period of 30 years. The Town of Rosendale is already experiencing the effects of rapid climate change.

Communities, governments, and businesses are working to reduce risks and costs associated with climate change by taking action to lower greenhouse gas emissions and implement adaptation strategies. Mitigation and adaptation efforts have expanded substantially in recent years. Many of the natural resources described throughout this inventory contribute to the community's safety and ability to adapt to the impacts of climate change. Natural areas like forests and wetlands help to sequester and store carbon, offsetting some of the impacts of local greenhouse gas emissions. Still, these efforts do not yet approach the scale considered necessary to avoid substantial damages to human health, ecosystems, the environment, and the economy over the coming decades.[3]

It is vital for local decision-makers to understand these trends and the related climate hazards facing the region and to plan for future conditions. We need to do more; we need to do it quickly; and we need to do it fairly. Climate change is very likely to accentuate the disparities already evident in American society. Many of the expected health effects of climate change are likely to fall disproportionately on communities of color, low-income communities, the elderly, the disabled and the uninsured. The same factors that contribute to health inequities influence climate vulnerability.

Climate Observations and Projections

Responding to Climate Change in New York State (the ClimAID Report), written in 2011 and updated in 2014, is the current authoritative source for climate projections for the state.[4] ClimAID translates the Intergovernmental Panel on Climate Change (IPCC) scenarios into more robust regional-scale predictions incorporating local data inputs and expert knowledge. A report with updated climate projections for New York State is anticipated to be published in 2023.

ClimAID divides New York State into geographic regions grouped together based on a variety of factors, including type of climate and ecosystems, watersheds, and dominant types of agricultural and economic activities. The Town of Rosendale is included in Region 2, along with the Catskill Mountains and the West Hudson River Valley.

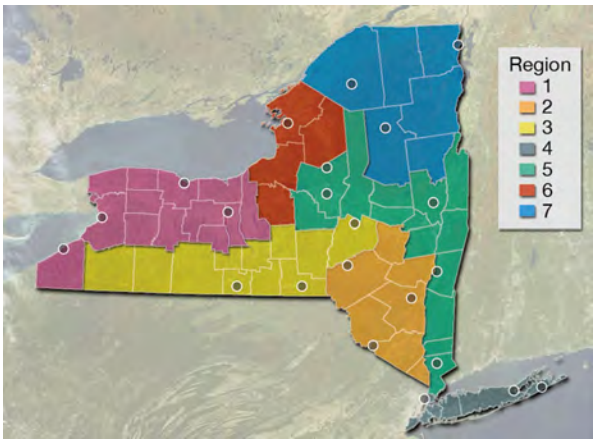

Figure 3. ClimAID Report regions. *Region 2 includes the Town of Rosendale along with the Catskill Mountains and the West Hudson River Valley.*

[3] *Fourth National Climate Assessment. Chapter 1: Overview.* U.S. Government Publishing Office, 2018, https://nca2018.globalchange.gov/chapter/1/.

[4] Horton, R., D. Bader, C. Rosenzweig, A. DeGaetano, and W.Solecki. *Climate Change in New York State: Updating the 2011 ClimAID Climate Risk Information*. New York State Energy Research and Development Authority (NYSERDA), 2014, www.nyserda.ny.gov/climaid.

Section II of the NRI presents general climate information based on a summary of the ClimAID Report produced by the New York State Department of Environmental Conservation (DEC) Hudson River Estuary Program.[5] The summary breaks down three prominent climate trends directly affecting the Town of Rosendale:

- increasing temperatures,
- shifting precipitation patterns,
- extreme events.

In addition, the nearby tidal Hudson River and Rondout Creek are affected by sea level rise (SLR), which will have indirect effects on the Town of Rosendale.

Note that models are inherently uncertain and simply present a range of possible scenarios to assist people and communities in planning for the future. Future climate changes in The Town of Rosendale could exceed or fall short of these projections.

Temperature

Observed Changes

Annual average temperatures have been steadily increasing in New York State, posing new challenges to human and ecosystem health, and the infrastructure and industries we depend on. The most recent decade was the nation's warmest on record. Because human-induced warming is superimposed on a naturally varying climate, the temperature rise has not been, and will not be, uniform or smooth across the country or over time. Annual average temperatures in New York State have risen about 0.6°F per decade, with winter warming exceeding 1.1°F per decade.[6]

Since 1970, temperature increases in New York have surpassed national and global averages with winter temperatures rising faster than summer[7]:

- Global annual average temperature up **1.4°F**
- U.S. annual average temperature up **1.8°F**
- N.Y. annual average temperature up **2°F**
- N.Y. winter temperatures up **5°F**

Projections

Future human-induced warming depends on both past and future emissions of heat-trapping gases and changes in the amount of particle pollution. The amount of climate change (aside from natural variability) expected for the next two to three decades is a combination of the warming already built into the climate system by the history of human emissions of heat-trapping gases, and the expected ongoing increases in emissions of those gases. However, the magnitude of temperature increases over the second half of this century, both in the U.S. and globally, will be primarily determined by the emissions produced now and over the next few decades, and there are substantial differences between higher, fossil-fuel intensive scenarios compared to scenarios in which emissions are reduced.

The average annual temperature in the Hudson Valley, including the Town of Rosendale, is projected to increase approximately four to six degrees by mid-century and as much as 11 degrees by the end of the century.

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[5] Zemaitis, L. *Working Toward Climate Resilience: General Climate Information Prepared for Hudson Valley Communities*. DEC Hudson River Estuary Program, 2018, https://wri.cals.cornell.edu/sites/wri.cals.cornell.edu/files/shared/documents/HV%20Climate%20Summary%20General%20MAR2018.pdf.

[6] Zemaitis, 2018, p. 6.

[7] Ibid.

Summers will become warmer and winters milder. *This projected increase is higher than both the national and global projected increase in average annual temperature for the same period.*

AIR TEMPERATURE PROJECTIONS FOR REGION 2

	Baseline 1971-2000	2020s	2050s	2080s	2100
Annual average air temperature	48°F	52.2 - 53.1°F	54.2 - 56.1°F	55.4 - 59.6°F	56.2 - 61.2°F
Increase in annual average	-	2.2 - 3.1°F	4.2 - 6.1°F	5.4 - 9.6°F	6.2 - 11.2°F

Extreme Temperature Events

Increasing annual temperatures will lead to more frequent, intense, and long-lasting heat waves during the summer, posing a serious threat to human health and ecosystems. Extreme heat days are defined as those with maximum temperatures at or above 90°F. Heat waves are defined as periods of three or more consecutive days with maximum temperatures at or above 90°F. Extreme cold days are defined as those with maximum temperatures at or below 32°F.

By mid-century, the Town of Rosendale could annually experience three to 12 days above 95 degrees, and four to six heat waves that last one to two days longer or longer.

Heat Waves

By mid-century, the Town of Rosendale could annually experience between 31 and 47 days with temperatures over 90 degrees, and 4-6 heat waves lasting 3 days or longer – conditions similar to those in South Carolina today. [8]

HEAT WAVE PROJECTIONS FOR REGION 2

	Baseline 1971-2000	2020s	2050s	2080s	2100
# Days per year above 90°F	12	19 - 25	31 - 47	38 - 77	*
# Days per year above 95°F	2	2 - 5	5 - 12	7 - 28	*
# Heat waves per year	2	3	4 - 6	5 - 9	*
Average # days of each heat wave	4	5	5 - 6	5 - 7	*
# Days per year ≤ 32°F	138	108 - 116	86 - 100	65 - 89	*

Warming Winters

The frequency of heat waves has increased across the contiguous U.S since the early 1900s, while the frequency of cold waves has decreased since the mid-1960s, but at a significantly faster rate. Winters in the northeastern U.S. have warmed three times faster than have summers, resulting in an increase in the proportion of winter precipitation falling as rain[9].

From 1971-2000 the annual average number of days in which the temperature dropped below freezing was 133. By midcentury the number of days when the temperature drops below freezing could be as few as 106 and by 2100, we could see only 59 days out of the year with a maximum temperature at or below 32°F.

[8] Zemaitis 2018, pg. 9

[9] *Observed and Projected Climate Change in New York*. New York State Department of Environmental Conservation, 2021, https://www.dec.ny.gov/docs/administration_pdf/ccnys2021.pdf

Precipitation

Observed Changes
Most regions of New York State have experienced a slight increase in average annual precipitation over the past century. In addition to increased mean annual precipitation, both year-to-year variability and multiyear variability of precipitation have become more pronounced.[10]

Projections
Projections indicate total annual precipitation could increase as much as 11% by mid-century and as much as 18% by 2100. Most of the increase in total precipitation is expected in winter and spring, with little change expected in the summer.[11] The Fourth National Climate Assessment projects that monthly precipitation in the Northeast will be about 1 inch greater for December through April by the end of the century.[12]

PRECIPITATION PROJECTIONS FOR REGION 2

	Baseline 1971-2000	2020s	2050s	2080s	2100
Total annual precipitation	48"	48.5" - 52"	49.5" - 53.5"	51" - 54.5"	48.5" - 56.5"
% Increase in annual precipitation	-	1 - 8%	3 - 11%	6 - 14%	1 - 18%
# Days with precipitation > 1"	12	12 - 13	13 - 14	13 - 15	*
# Days with precipitation > 2"	2	2	2 - 3	2 - 3	*

Extreme Precipitation Events
In addition to observed increases in total annual precipitation in New York State, precipitation has become more variable and extreme. Warmer air can hold more water vapor. For each degree of warming, the air's capacity for water vapor retention goes up by about 7 percent. An atmosphere with more moisture can produce more intense precipitation events, which is what has been observed.[13]

The ClimAID Report defines "extreme precipitation" events as the heaviest 1% of daily values for rain or snowfall. In other words, an event in the 99th percentile for daily rain or snowfall totals in a given year. The nationwide trend of increasingly frequent extreme precipitation events has been particularly pronounced in the Northeast, including in New York. From 1958 to 2016, the proportion of total annual precipitation falling in the heaviest 1% of events increased by 55% in the Northeast.[14] Scientists expect these trends to continue as the planet continues to warm. The Northeast may see additional increases in extreme precipitation events of 40% or more by the end of the century, relative to the period of 1986-2015 (Figure 1).[15]

ClimAID projects increases in the frequency and duration of precipitation events with more than one, two, and four inches of precipitation at daily timescales, and that the frequency and severity of downpours at sub-daily or even sub-hourly timescales are also very likely to increase.[16]

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[10] Horton et al., 2014.
[11] *Observed and Projected Climate Change in New York*, 2021, p. 5
[12] *Fourth National Climate Assessment. Chapter 18: Northeast Region*. U.S. Government Publishing Office, 2018, https://nca2018.globalchange.gov/chapter/18/.
[13] Extreme Precipitation and Climate Change. Center for Climate and Energy Solutions, accessed October 2022, https://www.c2es.org/content/extreme-precipitation-and-climate-change/.
[14] *Fourth National Climate Assessment. Chapter 2: Our Changing Climate*. U.S. Government Publishing Office, 2018, https://nca2018.globalchange.gov/chapter/2/.
[15] Ibid.
[16] *Observed and Projected Climate Change in New York*, 2021, p. 6

PRECIPITATION PROJECTIONS FOR REGION 2

	Baseline 1971-2000	2020s	2050s	2080s	2100
Total annual precipitation	48"	48.5" - 52"	49.5" - 53.5"	51" - 54.5"	48.5" - 56.5"
% Increase in annual precipitation	-	1 - 8%	3 - 11%	6 - 14%	1 - 18%
# Days with precipitation > 1"	12	12 - 13	13 - 14	13 - 15	*
# Days with precipitation > 2"	2	2	2 - 3	2 - 3	*

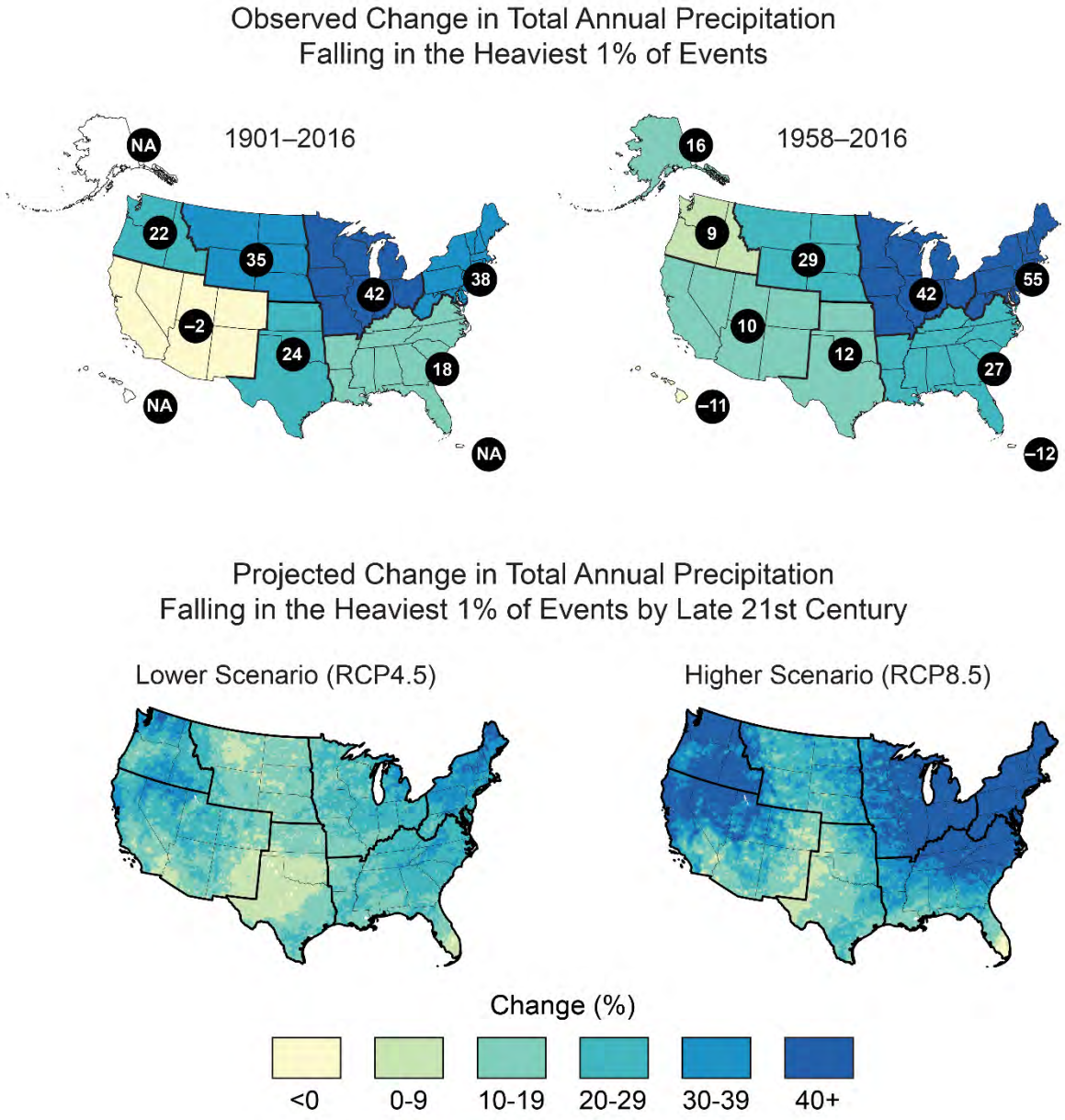

Figure 1. Observed Change in Extreme Precipitation Events.
Source: *Fourth National Climate Assessment. Chapter 2: Our Changing Climate*. U.S. Government Publishing Office, 2018, https://nca2018.globalchange.gov/chapter/2/.

Flood Risk

Flooding has emerged as perhaps the most pressing climate risk faced by Hudson Valley communities. Downpours, with intense precipitation occurring over a period of minutes or hours, are likely to increase in frequency and intensity as the climate warms. These events elevate the risk for flooding due to stormwater runoff and/or tributary flooding. Flooding threatens many important assets, like transportation infrastructure, sewage treatment infrastructure, roads, businesses, recreational facilities, and more.[17]

Little League Field off Rt 213 underwater
Drone photo/ Dave Hargrove

The Wallkill River joins Rondout Creek at the eastern edge of Rosendale, just downstream from Sturgeon Pool. Together they flow approximately 6 miles further downstream before entering the Hudson. The Rondout and Wallkill form the Hudson River estuary's largest tributary system. Rosendale is entirely within the Rondout Creek watershed area and includes a portion of the Wallkill River watershed (see Figure 2), and is vulnerable to inland flooding along these rivers and their tributaries.

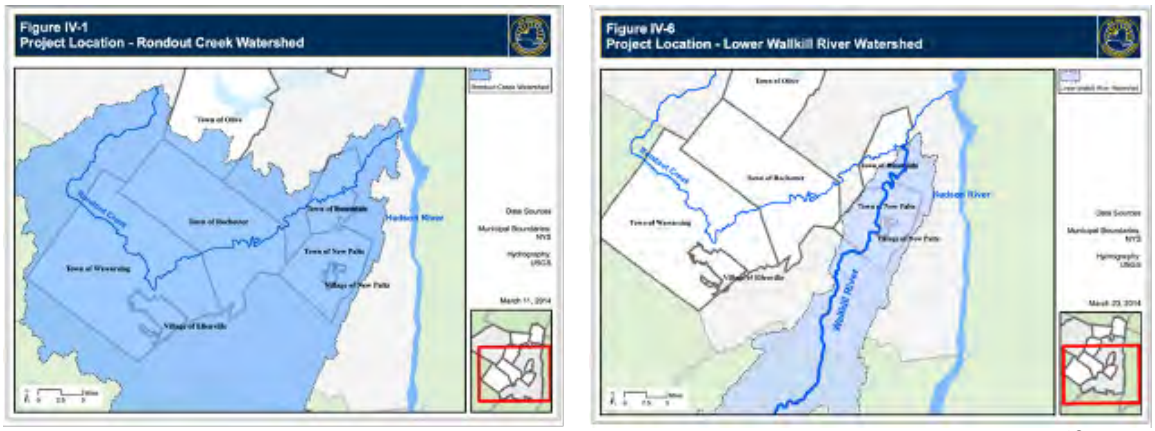

Figure 2: The Rondout Creek watershed (left) and lower Wallkill River Watershed[18] (right)

Rosendale experienced significant flooding from Hurricane Irene and Tropical Storm Lee in 2011. Several key road intersections were flooded, including Route 32 at Rifton Bridge (the flooding closed Route 32 cut off access and egress to/from the south side of Town); 4th Binnewater Lane & Binnewater Road (road closures isolated residents from emergency services); and Hickory Bush Road (road closures isolated residents from emergency services).[19] James Street remained closed for a year to complete repairs due to the heavy erosion caused by flooding from these events. Flood risk will increase as extreme precipitation events become more frequent. NOAA forecasts for flooding along the Rondout are posted on their website routinely year-round.

Drought

Scientists project droughts to become more frequent toward the end of the century due to increased evaporation of surface moisture caused by higher temperatures. Short term drought may affect water quantity and quality both for drinking water and for aquatic life in the Rondout, Wallkill, and other streams and waterbodies. Warmer air and water temperatures will affect recreational fish species of the region and may lead to an

[17] Zemaitis, 2018, p.10.
[18] *NY Rising Community Reconstruction Plan: Ulster County Communities*. Governor's Office of Storm Recovery, 2014, https://stormrecovery.ny.gov/sites/default/files/crp/community/documents/ulstercounty_nyrcr_plan.pdf, pp. 126 and 143.
[19] Ibid, Section IV, p. 28.

increase in pests and insect epidemics.[20] Drought may further exacerbate the risk and potential impacts of flooding. Dry, parched, ground compacts and hardens and doesn't absorb water as effectively as already moist ground.

Wildfire

Historically, wildfires were a common occurrence on the Shawangunk Ridge.[21] Pitch pine barrens and oak forests of the Shawangunks depend on periodic fire to maintain their health and ecology, and are adapted to survive and/or recover quickly following fires. Fire suppression efforts beginning in the 19th century have prevented burning in most areas of the ridge for over 100 years and led to the expansion of tall shrub fuels (primarily mountain laurel) that are highly flammable and support aggressive fire behavior under dry conditions. Drought conditions exacerbate the risk of wildfires. In the dry summer of 2022, at least three wildfires spread on the Shawangunk Ridge in Minnewaska State Park Preserve, and climate change was identified as a significant contributing factor.[22]

Napanoch Point Fire 8/30/22
N.Y.S. Park Supervisor Zach Wesley-Krueger

Sea Level Rise

Observed Changes

Global sea level is rising due to various factors, including thermal expansion from warmer water temperatures and melting of land-based ice. The Hudson River is connected to and influenced by daily tides from the Atlantic Ocean and its water levels are rising with global sea level. Sea level along New York's ocean coast and in the Hudson River has risen by more than 1 foot since 1900, or about 1.2 inches (30.48 mm) per decade.[23] In addition, the rate of sea level rise is increasing. From 2000 to 2014 the average rate was 0.26 inches (6.8 mm) per year compared to 0.18 inches (4.6 mm) per year from 1990 to 2014.[24] The lower reaches of Rondout Creek are also tidal and influenced by sea level rise.

Projections

New York's Community Risk and Resiliency Act (CRRA) was signed into law in 2014 to advance planning for climate resilience and requires the state to adopt SLR projections and update them every five years. New York's first official SLR projections were adopted in 2017 and are shown in Table 1.[25] The regulation includes five projections of varying sea-level rise scenarios and across four different time intervals: 2020s, 2050s, 2080s, and 2100. The projections are based on the 2014 ClimAID report. "Low" signifies the lower end of model forecasts (the 10th percentile of ClimAID model outputs), while "high" signifies the upper end over the range of different model formulations and initialization scenarios (90th percentile of ClimAID model outputs).

[20] *Draft Rondout Creek Interim Watershed Management Plan, Section 3.2: Climate and Precipitation*, 2009, https://www.clearwater.org/wp-content/uploads/2009/09/Section-3.2-Climate-Change-and-Precip-12.30.pdf

[21] *Northern Shawangunk Ridge Fire Management Plan*. Shawangunk Ridge Biodiversity Partnership, 2011, https://parks.ny.gov/documents/inside-our-agency/ShawangunkRidgeFireManagementPlan.pdf.

[22] "Climate Change blamed for fires burning across Hudson Valley," Hudson Valley Post, 2 September 2022, https://hudsonvalleypost.com/climate-change-blamed-for-fires-burning-across-hudson-valley/.

[23] *Observed and Projected Climate Change in New York*, 2021, p. 8.

[24] Zemaitis, 2018, pg. 7.

[25] 6 NYCRR Part 490, Projected Sea-Level Rise – Express Terms, accessed November 2022, https://www.dec.ny.gov/regulations/103877.html.

Table 1: New York State Sea Level Rise Projections for the Mid-Hudson region (Kingston to Troy).

Time Interval	Low Projection	Low-Medium Projection	Medium Projection	High-Medium Projection	High Projection
2020s	1 inch	3 inches	5 inches	7 inches	9 inches
2050s	5 inches	9 inches	14 inches	19 inches	27 inches
2080s	10 inches	14 inches	25 inches	36 inches	54 inches
2100	11 inches	18 inches	32 inches	46 inches	71 inches

Projections for sea level rise along the mid-Hudson River range from 5 to 27 inches by mid-century. The nearby City of Kingston could experience as much as 71 inches of sea-level rise by the end of the 21st century if rapid ice melt from the Greenland ice sheet continues.[26] Even if that SLR does not occur by 2100, there is near certainty that this degree of SLR will be achieved in the following century due to warming that is already locked into the atmosphere.

The impacts of SLR on coastal urban centers like nearby Kingston will likely include more frequent flooding and impacts from storm surges. Though Rosendale is not directly threatened by SLR, SLR may drive more residents of coastal areas to relocate to inland communities such as Rosendale and the threats to the regional infrastructure and the economy will directly impact Rosendale. New York's SLR projections illustrate the vital need to plan for SLR and its regional (and global) ramifications.

New York State Policy and Action

In addition to requiring the adoption of state SLR projections, CRRA requires state agencies to assess potential future climate risks related to sea level rise, storm surge, and flooding when making certain permitting, funding, and regulatory decisions. The 2019 Climate Leadership and Community Protection Act (Climate Act) amended CRRA to expand the list of climate hazards to be considered and the permit programs covered by the law. In fulfillment of CRRA, DEC and the NYS Department of State published model local laws to enhance community resiliency in 2019.[27] This voluntary guidance for municipalities includes a broad array of strategies to increase climate resilience through local land use regulations. In 2020, DEC published guidance on Using Natural Measures to Reduce the Risk of Flooding and Erosion[28] and New York State Flood Risk Management Guidance for implementation of CRRA.[29]

New York State's 2019 Climate Act is among the most ambitious climate laws in the world and requires New York to reduce economy-wide greenhouse gas emissions 40 percent by 2030 and no less than 85 percent by 2050 from 1990 levels.[30] The law creates a Climate Action Council charged with developing a scoping plan of recommendations to meet these targets and place New York on a path toward carbon neutrality. A draft scoping plan was released in late 2021 and the final scoping plan is due by January 1, 2023.

Climate Smart Community Certification

The Climate Smart Communities program is a New York State program that helps local governments take

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[26] Ibid.

[27] *Model Local Laws to Increase Resilience*, New York State Department of State and New York State Department of Environmental Conservation, 2019, https://www.dos.ny.gov/opd/programs/resilience/index.html

[28] *Using Natural Measures to Reduce Risk of Flooding and Erosion*, New York State Department of State and New York State Department of Environmental Conservation, 2020, https://www.dec.ny.gov/docs/administration_pdf/crranaturalmeasuresgndc.pdf

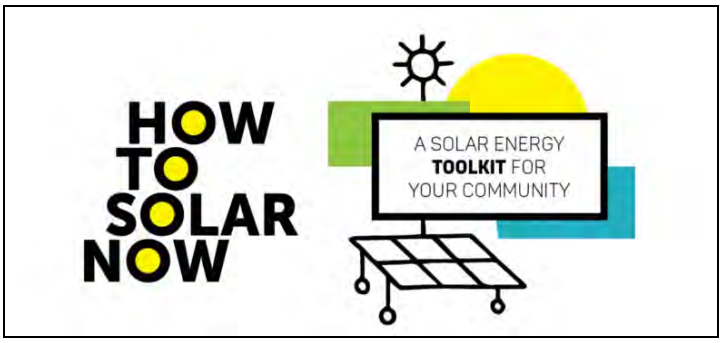
[29] *New York State Flood Risk Management Guidance for Implementation of the Community Risk and Resiliency Act*, New York State Department of Environmental Conservation, 2020, https://www.dec.ny.gov/docs/administration_pdf/crrafloodriskmgmtgdnc.pdf.

[30] *The Climate Act*, accessed November 2022, https://climate.ny.gov/

action to reduce greenhouse gas emissions and adapt to a changing climate. The Rosendale Climate Smart Task Force is leading local efforts to engage and educate residents and to reduce carbon emissions and be more prepared for climate change. The Town is currently working toward Climate Smart Bronze certification. Some of the actions completed to date include:

- Government operations greenhouse gas inventory
- Comprehensive Plan update with sustainability elements
- LED streetlight replacement
- Shift to clean, renewable energy at town buildings
- Geothermal installation at the highway garage and town hall
- PV solar array installation at the highway garage and town hall
- EV charging station installation
- Electrification of town fleet initiated
- Municipal building heat pump retrofits
- Heat and cold emergency plan creation and heat and cold emergency site establishment
- Water and sewer system updates

In addition, the Town is working with Marbletown to explore the possibility of community geothermal and has been running regular solar mapping workshops for Hudson Valley communities.



SECTION III: 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.[31] 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.[32] 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.[33]

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).

[31] "The Binnewater Lakes Region: An Ecological Assessment of Habitats and Species," *Rosendale Biodiversity Assessment*, December 2006.
[32] 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.
[33] 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.[34] The formation itself ranges in color from light- to dark-gray, containing thin shale interbeds.

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).

[34] New York State Museum, "Shawangunk Ridge," accessed October 2022, *http://www.nysm.nysed.gov/research-collections/geology/resources/shawangunk-ridge.*

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

Bedrock Geology

0 0.5 1 1.5 Miles

N W E S

1:35,000

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

HURLEY
ULSTER
MARBLETOWN
ESOPUS
NEW PALTZ
Third Lake
Fourth Lake
Fifth Lake
Rondout Creek
Sturgeon Pool
Wallkill River
28
87
1
7
26
25
32
26A
213

Map produced for the Town of Rosendale Environmental Commission, June 2010. Revised, 2022

Data Sources:
Roads, town boundary, tax parcels (2022), surface waters: Ulster County Information Services (2015, 2022).
Wallkill Valley Rail Trail: Wallkill Valley Land Trust (2020).
Rosendale streams: Kristen Bell Travis (2011).
Bedrock Geology: New York Rural Water Association(2010).
Hillshade: New York State GIS Program Office (2020).

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

- New York State Thruway
- State Roads
- County and Local Roads
- Wallkill Valley Rail Trail
- Waterbodies
- Streams

NYS GIS Program Office

Town of Rosendale
Natural Resources Inventory

Surficial Geology

Miles
0 0.5 1 1.5

N W E S

1:35,000

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, and boulders)

HURLEY
ULSTER
MARBLETOWN
ESOPUS
NEW PALTZ
Third Lake
Fourth Lake
Fifth Lake
Rondout Creek
Sturgeon Pool
Wallkill River

28 87 1 32 7 26 25 26A 213

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- Wallkill Valley Rail Trail
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- Streams

Map produced for the Town of Rosendale Environmental Commission, June 2010. Revised, 2022

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NYS GIS Program Office

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.

Table 2: Soils Descriptions[35]:

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	nc	20-40/<=20	w/mw-sx

[35] 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.

	complex			
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.**

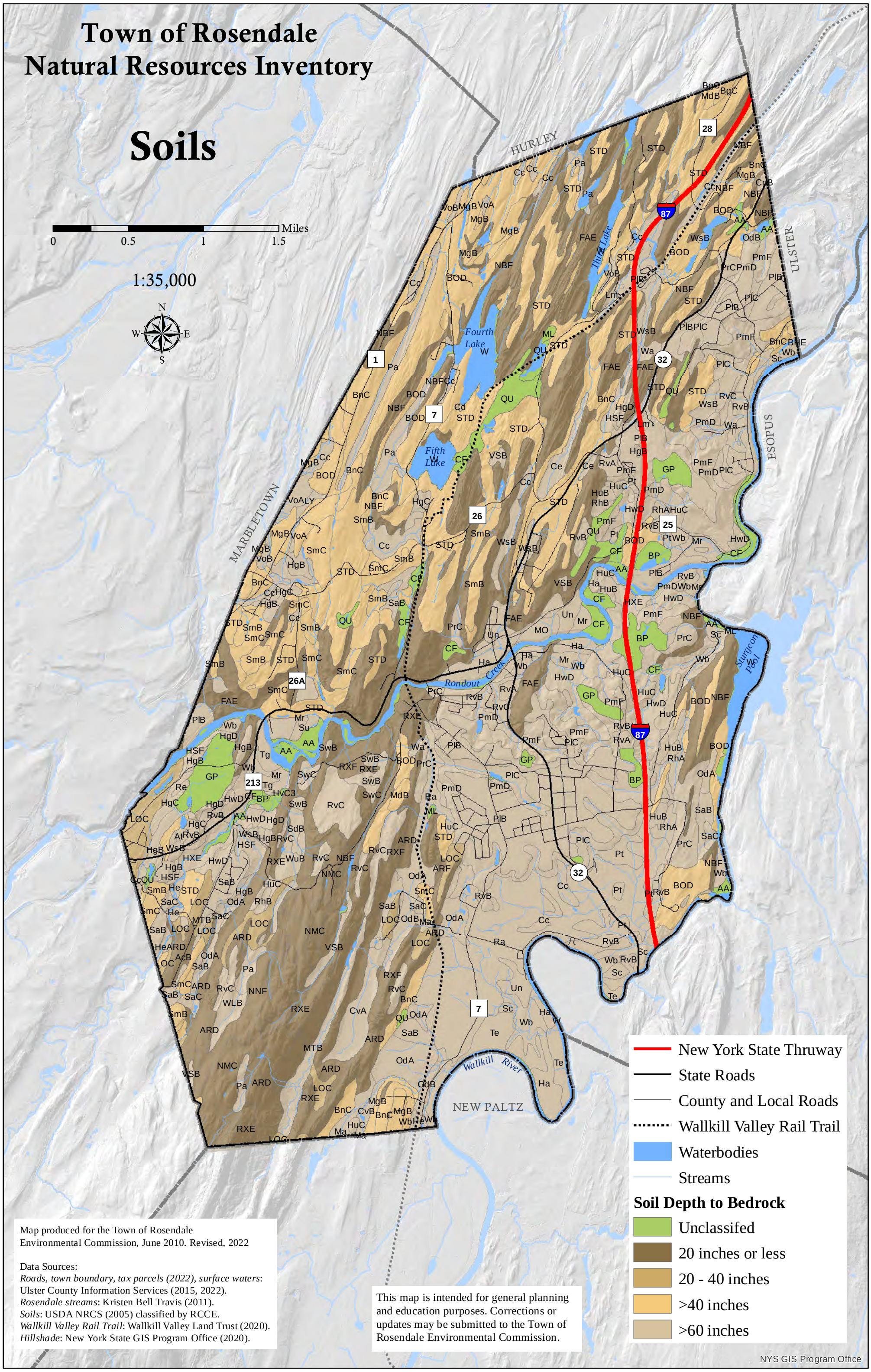
Town of Rosendale
Natural Resources Inventory

Soils

0 0.5 1 1.5 Miles

1:35,000

N W E S



New York State Thruway
State Roads
County and Local Roads
Wallkill Valley Rail Trail
Waterbodies
Streams

Soil Depth to Bedrock

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

Map produced for the Town of Rosendale Environmental Commission, June 2010. Revised, 2022

Data Sources:
Roads, town boundary, tax parcels (2022), surface waters: Ulster County Information Services (2015, 2022).
Rosendale streams: Kristen Bell Travis (2011).
Soils: USDA NRCS (2005) classified by RCCE.
Wallkill Valley Rail Trail: Wallkill Valley Land Trust (2020).
Hillshade: New York State GIS Program Office (2020).

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NYS GIS Program Office

Topography and Slopes


Amberly Jane Campbell/Shawangunk Journal

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.[36] 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 Topography Map displays 20-ft and 100-ft contours from the U.S. Geological Survey, derived from topographic quadrangle maps. Elevations in Rosendale range from 8 feet above sea level along lower Rondout Creek in Bloomington to approximately 900 ft on the Shawangunk Ridge.

The Slopes Map measures the degree of steepness of the land in a given area of town, and includes the following slope classes:[37]

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%.[38] 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).

[36] Steven Winkley, *Groundwater Protection Plan for the Town of Rosendale*, New York Rural Water Association, 2007.
[37] 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.
[38] Calculated by Nava Tabak of the Town of Rosendale Environmental Commission using ArcView GIS software.

Town of Rosendale
Natural Resources Inventory

Topography

0 0.5 1 1.5 Miles

1:35,000

N W E S

HURLEY

MARBLETOWN

NEW PALTZ

ULSTER

ESOPUS

Third Lake

Fourth Lake

Fifth Lake

Rondout Creek

Wallkill River

Sturgeon Pool

1 7 26 26A 213 28 87 32 25

Map produced for the Town of Rosendale Environmental Commission, June 2010. Revised, 2022

Data Sources:
Roads, town boundary, tax parcels (2022), surface waters: Ulster County Information Services (2015, 2022).
Rosendale streams: Kristen Bell Travis (2011).
Wallkill Valley Rail Trail: Wallkill Valley Land Trust (2020).
Contours: US Geological Survey (1995).
Hillshade: New York State GIS Program Office (2020).

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

- New York State Thruway
- State Roads
- County and Local Roads
- Wallkill Valley Rail Trail
- Waterbodies
- Streams
- 100 ft Contour
- 20 ft Contour
- Higher Elevation
- Lower Elevation

NYS GIS Program Office

Town of Rosendale
Natural Resources Inventory

Slopes

0 0.5 1 1.5 Miles

1:35,000

N W E S

HURLEY
ULSTER
MARBLETOWN
ESOPUS
NEW PALTZ

Third Lake
Fourth Lake
Fifth Lake
Rondout Creek
Sturgeon Pool
Wallkill River

28 87 1 7 26 25 32 26A 213

New York State Thruway
State Roads
County and Local Roads
Wallkill Valley Rail Trail
Waterbodies
Streams

Slope Grade

- < 5%
- 5 to 10%
- 10 to 15%
- 15 to 20%
- 20 to 25%
- 25 to 30%
- > 30%

Map produced for the Town of Rosendale Environmental Commission, June 2010. Revised, 2022

Data Sources:
Roads, town boundary, tax parcels (2022), surface waters: Ulster County Information Services (2015, 2022).
Rosendale streams: Kristen Bell Travis (2011).
Slopes: Behan Planning Associates, LLC (2008).
Hillshade: New York State GIS Program Office (2020).
Wallkill Valley Rail Trail: Wallkill Valley Land Trust (2020).

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

NYS GIS Program Office

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.*[39] *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".[40]

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.

Drinking Water Sources

The Drinking Water Sources Map provides information on the location of unconsolidated aquifers as well as homeowner wells in Rosendale (where data was available), their depth, and their yield. Unconsolidated aquifers occur 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.[41] 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.[42]

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[39] Winkley, 2007, p.1.
[40] While "aquifer" can be variously defined, this is the definition used in the *2007 Rosendale Groundwater Protection Plan.*
[41] Winkley, 2007.
[42] Winkley, 2000.

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.[43] (Refer to the Bedrock Geology Map to see where these bedrock formations are 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.

The following is an excerpt from the Town's 2020 annual drinking water report. Public supply watersheds and well fields are shown on the Drinking Water Resources Map.

"Our water system serves 2,200 residents through 26 service connections. Our water source is a surface water supply known as The Still Pond Reservoir with an auxiliary ground water source referred to as Well #1, (formerly the Renda Well). Water from the Still Pond Reservoir is filtered and disinfected. The Well supply is treated with an ion exchange unit and then disinfected. Well Number I is put into service whenever the Still Pond Reservoir cannot meet the system demand for water. The Water District has a five hundred thousand gallon water storage tank, which provides fire protection to sixty percent of the District's residents, and it also provides a 3 to 4 day reserve in case of a supply failure. The other 40% of the town receives fire protection from a 50,000 gallons water tank that is located on Mountain Road. Both the Still Pond Filter Plant and the Well treatment Facility have emergency power supplies to enable the systems to operate in the event of a prolonged power failure."

[43] See the Bedrock Hydrostratigraphic Units and Well Yields Map in Winkley, 2007.

Town of Rosendale
Natural Resources Inventory

Drinking Water Resources

Miles
0 0.5 1 1.5

1:35,000

N W E S

Unconsolidated Aquifers

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.

HURLEY
MARBLETOWN
ULSTER
ESOPUS
NEW PALTZ
Third Lake
Fourth Lake
Fifth Lake
Rondout Creek
Wallkill River
Sturgeon Pool
1
7
26
26A
213
28
87
32
25

New York State Thruway
State Roads
County and Local Roads
Wallkill Valley Rail Trail
Waterbodies
Streams
Municipal Reservoir Watershed
Municipal Well Field

Known Private Well Locations

NYSDEC
Ulster County
USGS

Map produced for the Town of Rosendale Environmental Commission, June 2010. Revised, 2022

Data Sources:
Roads, town boundary, tax parcels (2022), surface waters: Ulster County Information Services (2015, 2022).
Rosendale streams: Kristen Bell Travis (2011).
Private Well Data and Aquifers:NYRWA (2010).
Municipal Reservoir Watersheds:USGS (2021).
Municipal Well Field:Rosendale Enironmental Commission (2010).
Wallkill Valley Rail Trail: Wallkill Valley Land Trust (2020).
Hillshade: New York State GIS Program Office (2020).

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

NYS GIS Program Office

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."[44] 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.[45]

"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).

[44] NYS Department of Environmental Conservation, New York Open Space Plan, 2006.
[45] "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

0 0.5 1 1.5 Miles

1:35,000

N W E S

HURLEY

ULSTER

ESOPUS

MARBLETOWN

NEW PALTZ

Third Lake

Fourth Lake

Fifth Lake

Rondout Creek

Sturgeon Pool

Wallkill River

28 87 1 7 26 26A 213 32 25

New York State Thruway
State Roads
County and Local Roads
Wallkill Valley Rail Trail
Waterbodies
Streams
Karst Aquifer Region
Shallow Bedrock (< 10 feet)
Bedrock with very high potential for karst development
Bedrock with moderate potential for karst development

Map produced for the Town of Rosendale Environmental Commission, June 2010. Revised, 2022

Data Sources:
Roads, town boundary, tax parcels (2022), surface waters: Ulster County Information Services (2015, 2022).
Rosendale streams: Kristen Bell Travis (2011).
Karst Aquifer Region, shallow bedrock, bedrock potential for karst development:: New York Rural Water Association (2007).
Wallkill Valley Rail Trail: Wallkill Valley Land Trust (2020).
Hillshade: New York State GIS Program Office (2020).

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

NYS GIS Program Office

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.[46] 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."[47]

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).

NYS Department of Environmental Conservation, *New York State Standards and Specifications for Sediment*

[46] Winkley, 2007.
[47] Winkley, 2007.

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

0 0.5 1 1.5 Miles

1:35,000

N W E S

HURLEY
ULSTER
MARBLETOWN
NEW PALTZ
ESOPUS
Third Lake
Fourth Lake
Fifth Lake
Rondout Creek
Sturgeon Pool
Wallkill River
1
7
26
26A
213
28
87
32
25

Map produced for the Town of Rosendale
Environmental Commission, June 2010. Revised, 2022

Data Sources:
Roads, town boundary, tax parcels (2022), surface waters:
Ulster County Information Services (2015, 2022).
Rosendale streams: Kristen Bell Travis (2011).
Hydrogeologic Sensitivity: New York Rural Water Association (2007).
Hillshade: New York State GIS Program Office (2020).
Wallkill Valley Rail Trail: Wallkill Valley Land Trust (2020).

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

New York State Thruway
State Roads
County and Local Roads
Wallkill Valley Rail Trail
Waterbodies
Streams

RATING

Very High
High
Medium
Low

NYS GIS Program Office

Surface Waters

Rondout Creek
|Nate Nardi-Cyrus

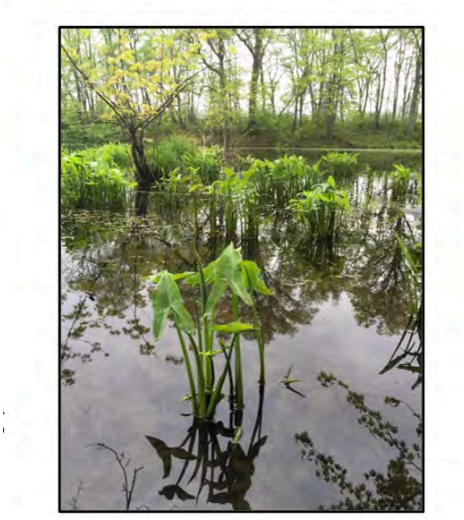
Surface waters encompass wetlands, water bodies, and streams, and are vital to the community for water supply, recreational enjoyment, and for numerous ecological services. In addition to providing critical habitat for insects, fish, birds, amphibians, and some mammal species, surface waters play an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

Wetlands and Hydric Soils

The wetlands displayed on this map include wetlands from the Rosendale Habitat map by Angela Sisson 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."[48] 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.



Oxbow Marsh
Nate Nardi-Cyrus

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

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

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.

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


Amberly Jane Campbell / Shawangunk Journal

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.[49] **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.[50]

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.[51]

DEC's freshwater wetlands jurisdiction has historically been limited to wetlands meeting the aforementioned criteria *and* appearing on the state's Freshwater Wetland Map. However, 2022 an amendment to the Freshwater Wetlands Act that goes into effect in 2025 will remove the jurisdictional mapping requirement and impose new criteria for wetlands of unusual importance. Additionally, beginning in 2028, the size threshold for regulated wetlands will drop from 12.4 acres to 7.4 acres.

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

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

[51] 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.

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. [52] 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 and Hydric Soils Map use different criteria for mapping wetlands. The wetland habitats that appear on this map are non-regulatory and were mapped by Angela Sisson for the Wallkill Valley Land Trust using remote sensing and aerial photo interpretation techniques (see Habitat Map description). 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 wetland habitat layer 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. 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 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 Sisson 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.

The data in this map are from various sources. Wetland habitats were mapped by Angela Sisson for the Wallkill Valley Land Trust (2018). Ulster County Information Services provided the DEC wetlands data (obtained from Cornell University Geospatial Information Repository) and soils data from the Natural Resources Conservation Service (2005). Streams were mapped by Kristen Bell Travis (2011).

[52] 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.

Town of Rosendale
Natural Resources Inventory

Wetlands and Hydric Soils

Miles
0 0.5 1 1.5

1:35,000

N W E S

HURLEY
MARBLETOWN
NEW PALTZ
ULSTER
ESOPUS
Third Lake
Fourth Lake
Fifth Lake
Rondout Creek
Wallkill River
Sturgeon Pool
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26A
213
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Map produced for the Town of Rosendale Environmental Commission, June 2010. Revised, 2022

Data Sources:
Roads, town boundary, tax parcels (2022), surface waters: Ulster County Information Services (2015, 2022).
Rosendale streams: Kristen Bell Travis (2011).
DEC-Regulated Wetlands: NYS Department of Environmental Conservation (2019).
Wetland Habitats: Angela Sisson (2018).
Hydric Soils: US Natural Resource Conservation Service (2019).
Hillshade: New York State GIS Program Office (2020).
Wallkill Valley Rail Trail: Wallkill Valley Land Trust (2020).

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

New York State Thruway
State Roads
County and Local Roads
Wallkill Valley Rail Trail
Waterbodies
Streams
DEC-Regulated Wetlands
Wetland Habitats
Hydric Soils

NYS GIS Program Office

Flood Zones and Riparian Areas

Streams

Wallkill Forested Floodplain
Nate Nardi-Cyrus

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.[53] 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.[54]

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 throughout the NRI were mapped by Kristen Bell Travis, a Biologist with Hudsonia Ltd. using aerial imagery interpretation and remote sensing techniques, and likely do not include all streams in the town—particularly some 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.

Flood Zones

A.J. Snyder Little League Field Submerged Aug. 8, 2022
Drone photo/ Dave Hargrave

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

[53] 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).
[54] 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.

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.

Amberly Jane Campbell / Shawangunk Journal

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 and Riparian Areas Map shows flood hazard area data from the Federal Emergency Management Agency (FEMA), with an effective date of September 2009, obtained from Ulster County Information Services. The map 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) 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 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.[55]

Riparian Areas

Riparian areas are areas adjacent to streams, ponds, wetlands, and other waterbodies and generally include the floodplain. Riparian areas are sensitive transition zones between land and water and are vital to stream physical processes, habitat, and water quality. They support unique soil and vegetation characteristics that are strongly influenced by proximity to water. Healthy riparian areas help clean water by intercepting runoff and filtering sediment and nutrients. They can attenuate flooding by slowing down and absorbing floodwaters. Forested

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

riparian buffers provide organic matter that supports the in-stream food web and shade that keeps water cool. They also support unique, diverse habitats and serve as wildlife corridors.

The Flood Zones and Riparian Areas map shows riparian areas mapped by the New York Natural Heritage Program for the Statewide Riparian Opportunity Assessment.[56] They are delineated around streams based on digital elevation data, known wetlands, and modeling for the 50-year flood zone. The riparian areas overlap with FEMA flood zones in parts of the map but also include mapping along smaller streams omitted from the FEMA flood zone mapping. They thus help identify additional flood-prone areas, though they are not a substitute for official FEMA data. Note that the riparian areas were developed through modeling and have not been field verified. Nevertheless, they can provide a starting point to inform land use planning and stream protection efforts.

[56] Conley, A., T. Howard, and E. White. *New York State Riparian Opportunity Assessment*. New York Natural Heritage Program, State University of New York College of Environmental Science and Forestry, 2018, Albany, NY. http://nynhp.org/files/TreesForTribs2017/Statewide_riparian_assessment_final_jan2018.pdf

Town of Rosendale
Natural Resources Inventory

Flood Zones

0 0.5 1 1.5 Miles

1:35,000

N W E S

HURLEY
MARBLETOWN
ULSTER
ESOPUS
NEW PALTZ
Third Lake
Fourth Lake
Fifth Lake
Rondout Creek
Sturgeon Pool
Wallkill River

1 7 26 26A 213 25 28 32 87

Map produced for the Town of Rosendale Environmental Commission, June 2010. Revised, 2022

Data Sources:
Roads, town boundary, tax parcels (2022), surface waters: Ulster County Information Services (2015, 2022).
Rosendale streams: Kristen Bell Travis (2011).
Wallkill Valley Rail Trail: Wallkill Valley Land Trust (2020).
Flood Hazard Zones: Federal Emergency Management Agency (2008).
Hillshade: New York State GIS Program Office (2020).

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

New York State Thruway
State Roads
County and Local Roads
Wallkill Valley Rail Trail
Waterbodies
Streams

FEMA Flood Hazard Zone

1% (100-year) annual chance
.2% (500-year) annual chance

NYS GIS Program Office

Watersheds and DEC-Regulated Streams

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).[57] 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.

There are a number of initiatives directed at watershed protection in Rosendale's watersheds. The Rondout Creek Watershed Council published *An Interim Watershed Management Plan for the Lower, Non-Tidal Portion of the Rondout Creek, Ulster County, New York* (2010),[58] which address watershed protection upstream from Eddyville Dam. Since 2015, the Wallkill River Watershed Alliance has been actively working to restore the Wallkill River and improve opportunities for recreation. Their actions are guided by a *Science-Based Action Plan* (2018),[59] which prioritizes projects to improve water quality, public access and engagement, and capacity building. This work also builds off of previous planning efforts, including the *Wallkill River Watershed Conservation and Management Plan* (2007),[60] which continues to serve as a valuable reference.

DEC-Regulated Streams

DEC designates the "best uses" that a waterbody should support, which forms the basis for New York State Protection of Waters regulations. Freshwater waterbodies are classified by the letters A, B, C, or D. The letter classifications and their best uses are described in regulation NYS regulation 6 NYCRR Part 701. For more information about classifications, see the DEC's webpage on Water Quality Standards and Classifications.[61] For each class, the designated best uses are defined as follows[62]:

- Class A, AA-water supply, primary and secondary contact recreation and fishing
- Class B-primary and secondary contact recreation and fishing
- Class C-fishing, suitable for fish propagation and survival
- Class D-fishing

Waterbodies classified as A, B, or C may also have a standard of (T), indicating they are trout waters, or (TS), indicating they are trout spawning waters. Certain activities allowed in and around waterbodies are regulated

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

[58] *An Interim Watershed Management Plan for the Lower, Non-Tidal Portion of the Rondout Creek, Ulster County, New York*, Rondout Creek Watershed Alliance, 2010, http://www.clearwater.org/wp-content/uploads/2009/09/Table-of-Content-Exec-Summary2.pdf.

[59] *Science-Based Action Plan*, Wallkill River Watershed Alliance, 2018, https://hudsonwatershed.org/wp-content/uploads/Wallkill-River-Watershed-Alliance-Action-Plan-2017-2019.pdf.

[60] *Wallkill River Watershed Conservation and Management Plan*, Orange County Soil and Water Conservation District, 2007, https://www.orangecountygov.com/DocumentCenter/View/4134/Wallkill-River-Watershed-Conservation-and-Management-Plan-2010-PDF.

[61] Water Quality Standards and Classifications, NYS Department of Environmental Conservation, accessed November 2022, https://www.dec.ny.gov/chemical/23853.html.

[62] Note that the waterbody classification does not necessarily indicate good or bad water quality – it relates simply to the designated "best uses" that should be supported. DEC recognizes that some waterbodies have an existing quality that is better than the assigned classification and uses an anti-degradation policy to protect and maintain high-quality streams.

based on their classification and standard. C(T), C(TS) and all types of B and A streams (as well as waterbodies under 10 acres located in the course of these streams) are collectively referred to as "protected streams". They are subject to the stream protective provisions of the Protection of Waters regulations in Article 15 of the Environmental Conservation Law.[63] DEC regulates the bed and banks of protected streams, defined as the areas immediately adjacent to and sloping toward the stream. Activities that excavate, fill or disturb these beds or banks require a DEC permit. See Protection of Waters: Disturbance of the Bed or Banks of a Protected Stream or Other Watercourse for more information.[64]

Article 15 also offers protection to navigable waters of the state. DEC permits are required for direct or indirect excavating or filling of navigable waters (Protection of Waters: Excavation and placement of fill in navigable waters). DEC water quality certification permits and U.S. Army Corps of Engineers (ACOE) permits may also be required for work involving streams; contact the DEC biologist responsible for applying state regulations in the protection of surface water resources for information regarding specific projects.

In Rosendale, the Rondout Creek and Wallkill River are class B streams, and the Coxing Kill is class C(T), examples of protected streams. In addition, Fifth Lake is class AA, and Third Lake and tributaries thereof are class A. Note that legislation that would expand the Protection of Waters Program to all Class C streams passed the State Legislature in 2022 and is awaiting the Governor's signature at the time of writing this update.

The Watersheds and DEC-Regulated Streams Map displays watershed data compiled by the Ulster County Soil and Water Conservation District from various data sources, primarily HUC 11-digit watershed shape files. DEC's water quality classification data for streams were obtained from the GIS Clearinghouse.

[63] "Protection of Waters Program." NYS Department of Environmental Conservation. https://www.dec.ny.gov/permits/6042.html
[64] "Protection of Waters: Disturbance of The Bed or Banks of a Protected Stream or Other Watercourse." NYS Department of Environmental Conservation. https://www.dec.ny.gov/permits/6554.html

Town of Rosendale
Natural Resources Inventory
Watersheds and DEC-Regulated Streams

0 0.5 1 1.5 Miles

1:35,000

N W E S

Esopus Creek

Rondout Creek

Coxing Kill
Rondout Creek

Wallkill River

HURLEY
MARBLETOWN
ULSTER
ESOPUS
NEW PALTZ

Third Lake
Fourth Lake
Fifth Lake
Rondout Creek
Sturgeon Pool
Wallkill River

1 7 26 26A 28 32 87 213 25

New York State Thruway
State Roads
County and Local Roads
Wallkill Valley Rail Trail
Waterbodies
Streams
Trout Water
Trout Spawning Water

DEC Stream Classification

A/AA
B
C
D

Map produced for the Town of Rosendale Environmental Commission, June 2010. Revised, 2022

Data Sources:
Roads, town boundary, tax parcels (2022), surface waters: Ulster County Information Services (2015, 2022).
Rosendale streams: Kristen Bell Travis (2011).
Wallkill Valley Rail Trail: Wallkill Valley Land Trust (2020).
Water Quality Classifications: NYS DEC (2019).
Watersheds: NYS DEC and USGS (2009).
Hillshade: New York State GIS Program Office (2020).

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

NYS GIS Program Office

Stream Habitats

Types of Streams and Stream Habitats

The beginnings of streams, referred to as headwaters, are often intermittent or ephemeral. **Intermittent streams** only flow during certain times of the year, fed by groundwater and runoff from rainfall and snowmelt. Some headwaters are **ephemeral**, only flowing after rainfall. **Perennial streams** and rivers flow year-round, with most water fed by smaller upstream intermittent and ephemeral streams or groundwater. Despite their seasonal nature, the vast network of intermittent streams in the landscape provide many of the same functions and values as larger perennial streams. Intermittent streams provide seasonal refuge and spawning habitat for small fish, habitat for macroinvertebrates that drift downstream to feed larger fish and organisms, and support nutrient cycling and flood control processes, among other benefits. However, they are often unmapped, underappreciated, and overlooked.

Wood Turtle
Megan Johnson

Box Turtle
Megan Johnson

Streams share some common habitat features. Many streams have alternating deep and shallow areas called **pools** and **riffles**. The deep, slow water in pools provides shelter and resting areas for fish. Shallow, swift water in the riffles adds oxygen to the water and provides fish with spawning and feeding areas. The fast moving water between riffle areas and pools is called a **run**. Some streams also form natural **meanders** or curves that slow down the water and absorb energy. These curves produce erosion such as **cut banks** and depositional areas like **gravel bars** where sediments are deposited. Large woody material such as logs, trees, and branches is an important component of in-stream habitat that supports the capture of sediment, gravel, and organic matter, prevents streambank erosion, and decreases water temperature – all factors that enhance habitat for fish and other organisms.

Beyond the stream channel and banks, **riparian areas** and **floodplains** support unique soil and vegetation that are strongly influenced by proximity to water and frequent flooding. Riparian trees are especially important for providing shade, bank stabilization, woody debris, and nutrients that benefit fish and other aquatic life. When inundated, floodplains also provide important fish breeding and nursery habitat areas. Many other wildlife species also depend on riparian and floodplain habitats and use them as travel corridors. See the Flood Zones and Riparian Areas map for more information.

Trout and Trout Spawning Waters

Trout are valuable indicators of healthy aquatic ecosystems because of their high water quality and habitat requirements. They typically inhabit clear, cool, well-oxygenated streams and lakes and depend on clean gravel areas for spawning. DEC's Water Quality Standards suggest there is coldwater habitat suitable for trout in the Coxing Kill and for trout-spawning in a nearby tributary on the Marbletown border.

Important Areas for American Eel

The map shows important areas along the Wallkill River, Rondout Creek, Coxing Kill, and adjacent lands for sustaining known populations of this declining species, mapped by the New York Natural Heritage Program and based on DEC Bureau of Fisheries surveys and other studies completed in New York since 1980. The important

areas highlight stream reaches providing important passage for eel traveling between ocean and freshwater habitats. Routes were modeled from tributary stream reaches with documented eel presence to the Atlantic Ocean, where this species spawns. The important areas include upstream habitat and stream adjacent areas that support the health and integrity of stream habitats used by migratory fish.

Riparian Areas

Riparian areas are areas adjacent to streams, ponds, wetlands, and other waterbodies, and are further described under the Flood Zones and Riparian Areas map.

Dams and Culverts

Infrastructure in streams, such as dams and culverts, can isolate and severely limit the range of fish and other aquatic organisms that use stream corridors. Dams and culverts can present physical barriers to passage, and these structures can also become impassable by changing water quality (e.g. temperature) and quantity (e.g. high velocity). Dams can also impact stream flow, when the water in the impoundment behind the dam is used, consumed, or diverted for other purposes (e.g., drinking water supply), leading to lack of water downstream. In some cases, pollution and channel modifications can create similar issues. Stream barriers disconnect streams and decrease available habitat for organisms like trout and American eel. In addition to impacts on fish and other aquatic life, stream barriers can also have serious effects on local flooding and water quality. Streams flowing into undersized culverts can flood upstream and, in some cases, overtake and wash out a road during heavy precipitation or snowmelt.

The DEC Hudson River Estuary Program is leading efforts in the Hudson Valley to assess road-stream crossings for aquatic passability and to mitigate significant barriers to increase aquatic habitat available for Species of Greatest Conservation Need such as Brook Trout and American Eel. Rosendale's culverts have not yet been comprehensively mapped or assessed, but data are available for 89 road-stream crossings in the town, including culverts and bridges. Of those, 56 were assessed for aquatic organism passability. Thirty-one culverts were assessed as either no barrier, or minor or insignificant barrier, while 10 were considered moderate barriers and 15 were assessed as significant (10) or severe (5) barriers.

The data in this map are from various sources. Trout waters are from DEC's Water Quality Standards. Riparian Areas are from the New York Natural Heritage Program. Dam locations are provided from the New York State Inventory of Dams. Culvert data are provided from the North Atlantic Aquatic Connectivity Collaborative (NAACC).

Town of Rosendale
Natural Resources Inventory

Stream Habitats

0 0.5 1 1.5 Miles

1:35,000

N W E S

HURLEY
MARBLETOWN
ULSTER
ESOPUS
NEW PALTZ
Third Lake
Fourth Lake
Fifth Lake
Rondout Creek
Sturgeon Pool
Wallkill River

1 7 26 26A 213 25 28 32 87

Map produced for the Town of Rosendale Environmental Commission, June 2010. Revised, 2022

Data Sources:
Roads, town boundary, tax parcels (2022), surface waters: Ulster County Information Services (2015, 2022).
Rosendale streams: Kristen Bell Travis (2011).
Dams, trout water, trout-spawning water: DEC (2020).
Riparian areas and important area: NYNHP (2018).
Wallkill Valley Rail Trail: Wallkill Valley Land Trust (2020).
Hillshade: New York State GIS Program Office (2020).

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

New York State Thruway
State Roads
County and Local Roads
Wallkill Valley Rail Trail
Waterbodies
Streams
Trout Water
Trout-Spawning Water
Important Area for American Eel
Riparian Areas
Dams

Culvert Status

No Data
Barrier
No Barrier

NYS GIS Program Office

Biological Communities

Red-Spotted Eft
Penny Coleman

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. Two other maps comprehensively cover the habitats of particular areas—the Binnewater Lakes region and the Shawangunk Ridge lands. Subsequently, a town-wide habitat map was developed incorporating the prior maps. However, the additional areas mapped in the third study have not been field verified.

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.

Landscape Context

The first step to understanding habitats the Town of Rosendale to consider the broader landscape context. The Landscape Context map helps illustrate the major ecological features in Rosendale extending beyond the Town's borders, including habitat areas that have been identified as significant at inter-municipal, regional, and statewide level.

Eastern Small-Footed Bat
Michael Durham

Significant Biodiversity Areas

Rosendale includes portions of the **Shawangunk Ridge** and **Rosendale Limestone Cave Complex Significant Biodiversity Areas** (SBAs), regionally significant landscapes recognized by DEC's Hudson River Estuary Program. The *Wildlife and Habitat Conservation Framework* for the Hudson River Estuary Corridor states "The Shawangunk Ridge contains an unusual diversity of plant communities and a high diversity of associated plant and animal species. The high diversity in the area is due in part to the wide range of topography and substrate. The area contains communities that range from wetland to ridgetop, slope, and cliff. The forest habitats are important as a migration corridor for raptors, other migratory birds, and wide-ranging mammals."[65]

The Rosendale Limestone Cave Complex "encompasses a series of extensive abandoned limestone mines that serve as critical habitat for several native bat species… The [Complex] is most noted for providing critical winter hibernacula for several bat species including the federally listed endangered Indiana bat and a state species of special concern, the eastern small-footed bat. The caves in this area are among the top 15 sites in the world for hibernating populations of both Indiana bat and small-footed bat… All species combined, this area has the second largest total number of hibernating bats of any site in New York State. The wetland communities in this area are also notable for supporting regionally significant animal species. Principle among them is the state listed endangered northern cricket frog… Another rare animal reported from the area is pied-billed grebe."[66]

Matrix Forest Blocks and Regional Forest Linkage Zones

The Nature Conservancy has identified globally-significant matrix forests across the northeastern United States -- forests large enough to withstand major natural disturbances, maintain important ecological processes, and support populations of forest-interior wildlife and plants.[67] In partnership with the New York Natural Heritage Program, they mapped forest linkage zones representing intact natural corridors that connect matrix forests at a regional scale across New York State. Rosendale lies within a major forest linkage zone connecting forests of the Shawangunk Ridge with the Shaupeneak forest block east of the NYS Thruway. From a regional perspective this forest linkage helps to connect forests of the Catskills and Shawangunks to large forests east of the Hudson River and beyond.

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[65] Penhollow, M., P. Jensen, and L. Zucker. *Wildlife and Habitat Conservation Framework: An Approach for Conserving Biodiversity in the Hudson River Estuary Corridor*, New York Cooperative Fish and Wildlife Research Unit, Cornell University and New York State Department of Environmental Conservation, Hudson River Estuary Program, 2006, pg. 98, https://www.dec.ny.gov/docs/remediation_hudson_pdf/hrebcf.pdf

[66] Ibid., pg. 94-95.

[67] Anderson, M. and S. Bernstein (editors). *Planning methods for ecoregional targets: Matrix forming ecosystems.* The Nature Conservancy, Conservation Science Support, Northeast & Caribbean Division, 2003, Boston, MA

Town of Rosendale
Natural Resources Inventory

Landscape Context

0 2 4 Miles

1:100,000

N W E S

Hurley

Ulster

Marbletown

Esopus

New Paltz

Rondout Creek

Wallkill River

Hudson River

Map produced for the Town of Rosendale Environmental Commission, June 2010. Revised, 2022

Data Sources:
Town boundaries and waterbodies:
Ulster County Information Services (2015).
Significant Biodiversity Areas: NYSDEC (2006).
Hudson River Estuary: Scenic Hudson (2012).
Matrix Forest Blocks and Linkage Zones : TNC and NYNHP (2006).
Hillshade: New York State GIS Program Office (2020).

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

Waterbodies
Matrix Forest Blocks
Forest Linkage Zones

Significant Biodiversity Area

Catskill Mountains
Esopus/Lloyd Wetlands and Ridges
Rosendale Limestone Cave Complex
Shawangunk Ridge

Habitats

Ghost Pipe (Monotropa)
Penny Coleman

In 2018, Angela Sisson created habitat maps for six towns in southeastern Ulster County comprising the service areas of the Wallkill Valley Land Trust (WVLT), including the Town of Rosendale.[68] The project was funded by a grant from the New York State Environmental Protection Fund through the Land Trust Alliance. The resulting habitat map for Rosendale drew from earlier habitat maps of portions of the town including "Ecologically Significant Habitats in the Binnewater Lakes Region" (and subsequent mapping of the Binnewater region by Hudsonia in 2013) and the Shawangunks Vegetation and Land Cover map, described separately in the NRI. The habitat map was created through remote sensing using a Geographic Information System (GIS) to overlay data to inform the identification of habitats. Data layers included topography, 2016 aerial photography, the Ulster County soil survey, mapped wetlands from the National Wetlands Inventory, and FEMA floodplains. It has not been field verified – therefore, it should be used as a general guide for land use planning, and field verification of habitats should be included in any formal environmental review process.

The Habitat Map shows the great diversity of habitat types throughout the Town of Rosendale. A total of 12,700 acres of 10,433 acres of the Town are mapped as natural habitats while 2,310 acres are developed. Wetlands make up about 1,622 acres of the Town with about 56 miles of perennial and intermittent streams.
A total of 8,288 acres of forest (upland and wetland) were mapped in the town, along with 1,064 acres of upland meadow or shrubland. The wetlands mapped in the Habitat Map are used throughout the NRI as they are considered to be the most accurate rendering of these resources currently available. Table 3 lists the significant habitats mapped in the Town of Rosendale with brief descriptions and total acreage.

Table 3: Significant Habitats in the Town of Rosendale

Upland Habitats		
Name	**Description**	**Acres**
upland hardwood forest	non-wetland forest dominated by hardwood trees (conifers make up < 25% of canopy).	3,630 acres
upland conifer forest	non-wetland forest dominated by conifer trees (>75% of canopy).	403 acres
upland mixed forest	non-wetland forest with a mix of hardwoods and conifers (conifers make up 25-75% of canopy).	3296 acres
floodplain forest	hardwood forest in floodplains adjacent to Rondout Creek	88 acres
crest/ledge/talus	partially or fully-exposed bedrock on a summit or knoll (crest) or slope (ledge). Talus occurs where rock fragments accumulate at the base of ledges and cliffs.	25 acres
bare ledge/ boulders		10 acres
rocky barren	open woodland with a sparse and often stunted canopy of pitch pine, oaks, and scrub oak, occuring on mountain summits or slopes with exposed bedrock and thin soils.	120 acres
gravel bar		15 acres

[68] Sisson, Angela. Habitat Map Report for the Towns of Esopus, Lloyd, Marlborough, New Paltz, Plattekill, and Rosendale, Ulster County, New York State. Report to the Wallkill Valley Land Trust and the Land Trust Alliance, 2018, https://wallkillvalleylt.org/wp-content/uploads/2021/06/habitat-map-report-for-six-towns.pdf.

orchard/plantation	actively maintained or recently abandoned fruit orchards, tree farms, or plant nurseries.	49 acres
upland shrubland	open (nonforested) area with shrubs making up > 20% of ground cover.	410 acres
upland meadow	open area dominated by herbaceous vegetation (shrubs and saplings < 20% ground cover; may have scattered trees) and either unmowed or mowed infrequently (up to a few times a year, such as a hayfield); includes pasture, cropland, abandoned fields.	654 acres
cultural	open area (may have scattered trees) mowed frequently or otherwise managed in an intensive way (lawn, playing field, golf course, garden, park, cemetery).	72 acres
waste ground	land that has been severely altered by human activity but lacks pavement or structures. Gravel mines, quarries, dumps, wetland fill, abandoned lots, or construction sites. Places where soil has been removed, and sometimes replaced with fill.	32 acres
development (non-habitat)	buildings, roads, pavement, and adjacent lawn areas.	2,310 acres
Total upland		**11,121 acres**
Wetland Habitats		
hardwood & shrub swamp	wetland (identified by predominance of hydrophytic vegetation) dominated by trees and/or shrubs. (conifers make up < 25% of canopy).	620 acres
mixed forest swamp	wetland with a mix of hardwood and conifers trees and/or shrubs (conifers make up 25-75% of canopy).	251 acres
conifer swamp	wetland dominated by conifer trees or shrubs (>75% of canopy).	1
intermittent woodland pool	small, isolated, seasonally flooded pool, generally with an open basin, surrounded by forest.	17 acres
buttonbush pool		3 acres
marsh	wetland dominated by hydrophytic herbaceous vegetation that stays saturated/flooded most of the time.	53 acres
wet meadow	area of seasonally saturated or flooded soils dominated by hydrophytic herbaceous vegetation.	110 acres
circumneutral bog lake	spring-fed, calcareous waterbody with floating peat mats supporting vegetation of acidic bogs and surrounding vegetation typical of calcareous marshes.	15
constructed pond	manmade body of water with a mostly managed shoreline (bordered by developed or cultural areas).	163 acres (107 ponds)
open water	body of water (natural or manmade) with a mostly undeveloped shoreline.	172 acres
stream	stream channel	220 acres
Total wetland		**1,622 acres**

HABITAT MAP
Town of Rosendale, New York

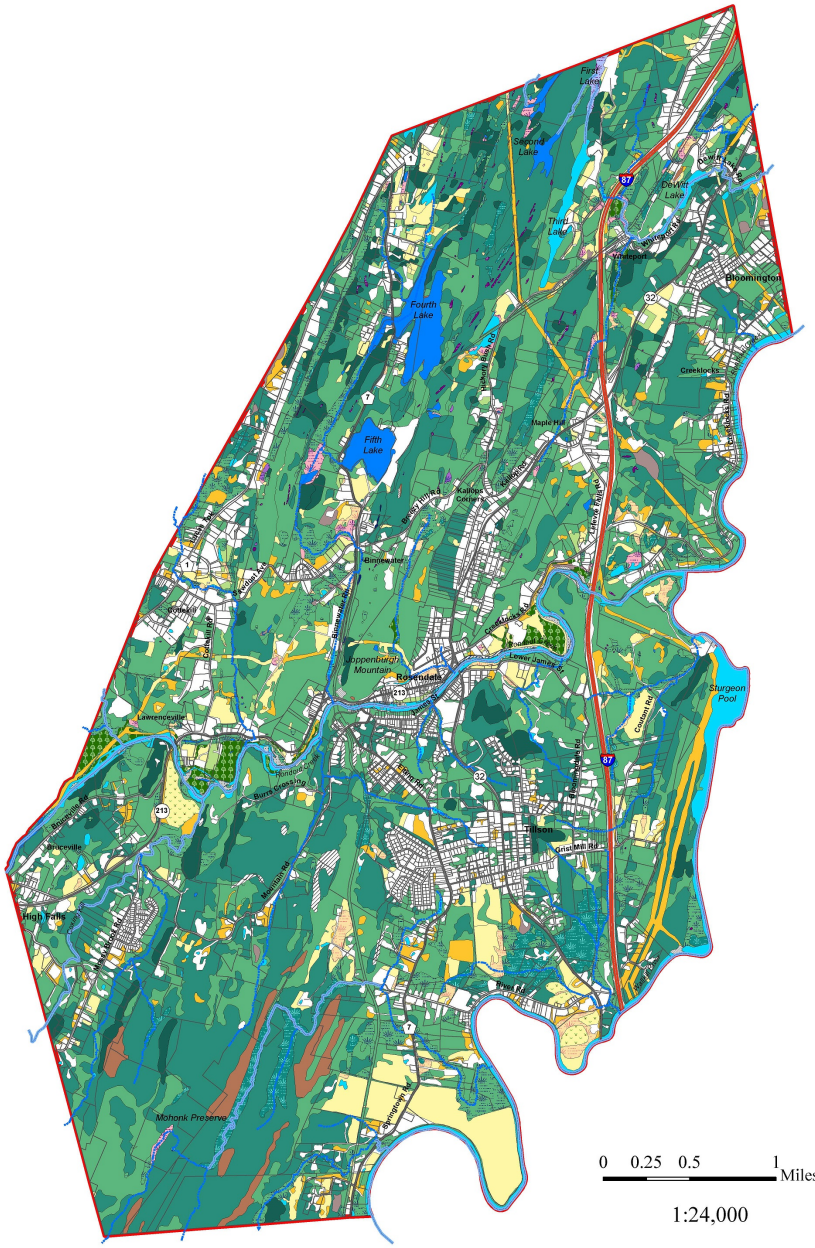
prepared March, 2018
By Angela Sisson
For The Wallkill Valley Land Trust.

This project has been funded by a grant from
The New York State Environmental Protection Fund
Through the Land Trust Alliance.

Legend

Habitat

- Bare Ledge/Boulders
- Buttonbush Pool
- Circumneutral Bog Lake
- Conifer Swamp
- Constructed Pond
- Crest, Ledge, and Talus
- Cultural
- Developed
- Floodplain Hardwood Forest
- Gravel Bar
- Hardwood & Shrub Swamp
- Intermittent Woodland Pool
- Marsh
- Mine Pool
- Mixed Forest Swamp
- Open Water
- Orchard/Plantation
- Rip-rap
- Rocky Barren
- Stream
- Upland Conifer Forest
- Upland Hardwood Forest
- Upland Meadow
- Upland Mixed Forest
- Upland Shrubland
- Waste Ground
- Wet Meadow
- Intermittent Stream
- Perennial Stream



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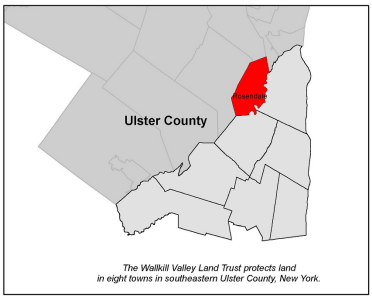

The Wallkill Valley Land Trust protects land in eight towns in southeastern Ulster County, New York.

This map is suitable for general land use planning, but is unsuitable for detailed planning and site design or for jurisdictional determinations. Boundaries of wetlands and other habitats depicted here are approximate.

Habitats were identified through map analysis and aerial photograph interpretation. Habitats were digitized onscreen, using ArcGIS software, over orthophoto images taken in spring 2013 obtained from the New York State GIS Clearinghouse. The report prepared in conjunction with these maps explains the habitat identification and mapping methods, describes the ecological significance of each habitat type, and offers conservation recommendations.

Wallkill Valley LAND TRUST
64 Huguenot Street, PO Box 208, New Paltz, NY 12561
845-255-2761, www.WallkillValleyLT.org

Important Areas for Rare Species and Significant Natural Communities


Pink Lady Slipper Orchid
Penny Coleman

The Important Areas for Rare Species and Significant Natural Communities map is based on data from the New York Natural Heritage Program (NYNHP) and 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 well as important areas for documented occurrences of rare plant and animal species. Table 4 provides a complete list of species of conservation concern documented in New York State's biodiversity databases from Rosendale. Links are provided to NYNHP online guides with more information on rare animals, plants, and natural communities, along with conservation and management guidance.[69]

Significant Natural Communities

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. Additional vernal pools are identified in the Habitat Map.

Important Areas for Rare Animals and Rare Plants

NYNHP has also identified important areas for sustaining populations of rare plants, rare animals, and significant natural communities based on documented occurrences.[70] These areas include the specific locations where a species has been observed, the adjacent habitat, as well as areas critical to maintaining the quality or integrity of the habitat or natural community. The following species or taxonomic groups have mapped important areas in the Town of Rosendale. Proactive planning that considers how species move across the landscape, with careful attention to maintaining connected habitat complexes, will contribute to the long-term survival and persistence of rare species and significant natural communities. To request more detailed rare species or habitat data, visit http://www.dec.ny.gov/animals/31181.html or contact NaturalHeritage@dec.ny.gov

Important Areas for Rare Animals

- Indiana bat
- Northern long-eared bat
- Eastern small-footed bat
- Bald eagle
- Timber rattlesnake
- Wood turtle
- Eastern box turtle
- Northern cricket frog
- Tawny emperor
- Arrowhead spiketail
- Rapids clubtail

[69] New York Natural Heritage Program Conservation Guides, https://guides.nynhp.org/
[70] New York Natural Heritage Program and New York State Department of Environmental Conservation, Biodiversity Databases. Important Areas Digital Data Set, 2018.

Important Areas for Rare Plants

- False hop sedge
- Goldenseal
- Violet wood sorrel
- Riverweed

Important Areas for Diadromous Fishes

- American eel

Table 4: Species of Conservation Concern in the Town of Rosendale

The following table lists species of conservation concern that have been recorded in Rosendale, NY. The information comes from the New York Natural Heritage Program (NYNHP) biodiversity databases, the 1990-1999 New York Amphibian and Reptile Atlas (NYARA), and the 2000-2005 New York State Breeding Bird Atlas (NYBBA, blocks 5763A and 5763B). The table only includes species listed in New York as endangered (at the state (NY) and/or federal (US) level), threatened, special concern, rare, Species of Greatest Conservation Need (SGCN), or a Hudson River Valley Priority Bird species recognized by Audubon New York. Generalized primary habitat types are provided for each species, but for conservation and planning purposes, it's important to recognize that many species utilize more than one kind of habitat. **Note:** Additional rare species and habitats may occur in Rosendale. The DEC Region 3 Office should be contacted at 845-256-3098 with any concerns or questions about the presence of protected species in Rosendale.

			NYS Conservation Status					
Common Name	**Scientific Name**	**General Habitat**	Hudson River Valley Priority Bird	Species of Greatest Conservation Need xx = high priority	Special Concern	Threatened	Endangered	**Data Source**
Mammals								
Eastern small-footed bat	*Myotis leibii*	cave, forest		x	x			NYNHP
Indiana Bat	*Myotis sodalis*	cave, forest		xx			US NY	NYNHP
Northern Long-eared Bat	*Myotis septentrionalis*	cave, forest		xx		US NY		NYNHP
Tri-colored Bat	*Perimyotis subflavus*	cave, forest, stream		xx				NYNHP
Birds								
American Black Duck	*Anas rubripes*	wetland	x	xx				NYBBA
American Goldfinch	*Spinus tristis*	young forest, shrubland	x					NYBBA
American Redstart	*Setophaga ruticilla*	forest	x					NYBBA
American Woodcock	*Scolopax minor*	young forest, shrubland	x	x				NYBBA
Bald Eagle	*Haliaeetus leucocephalus*	lake, stream, forest	x	x		NY		NYNHP
Baltimore Oriole	*Icterus galbula*	forest	x					NYBBA
Barn Owl	*Tyto alba*	grassland	x	xx				NYBBA
Belted Kingfisher	*Megaceryle alcyon*	lake, stream	x					NYBBA

Common Name	Scientific Name	General Habitat	NYS Conservation Status					Data Source
			Hudson River Valley Priority Bird	Species of Greatest Conservation Need xx = high priority	Special Concern	Threatened	Endangered	
Black-and-white Warbler	*Mniotilta varia*	forest	x					NYBBA
Brown Thrasher	*Toxostoma rufum*	young forest, shrubland	x	xx				NYBBA
Chimney Swift	*Chaetura pelagica*	urban	x					NYBBA
Cooper's Hawk	*Accipiter cooperii*	forest	x		x			NYBBA
Downy Woodpecker	*Picoides pubescens*	forest	x					NYBBA
Eastern Kingbird	*Tyrannus tyrannus*	young forest, shrubland	x					NYBBA
Eastern Wood-Pewee	*Contopus virens*	forest	x					NYBBA
Field Sparrow	*Spizella pusilla*	young forest, shrubland	x					NYBBA
Northern Flicker	*Colaptes auratus*	forest	x					NYBBA
Osprey	*Pandion haliaetus*	open water, wetland	x		x			NYBBA
Pied-billed Grebe	*Podilymbus podiceps*	wetland	x	x		NY		NYNHP
Purple Finch	*Carpodacus purpureus*	forest	x					NYBBA
Purple Martin	*Progne subis*	wetland	x					NYBBA
Red-shouldered Hawk	*Buteo lineatus*	forest	x	x	x			NYBBA
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	forest	x					NYBBA
Scarlet Tanager	*Piranga olivacea*	forest	x	x				NYBBA
Wood Thrush	*Hylocichla mustelina*	forest	x	x				NYBBA
Worm-eating Warbler	*Helmitheros vermivorum*	forest	x	x				NYBBA
Yellow-throated Vireo	*Vireo flavifrons*	forest	x					NYBBA
Reptiles								
Eastern Box Turtle	*Terrapene c. carolina*	forest, young forest		xx	x			NYARA
Eastern Musk Turtle/ Stinkpot	*Sternotherus odoratus*	wetland, stream		xx				NYARA
Eastern Rat Snake	*Pantherophis alleghaniensis*	forest		x				NYARA
Northern Black Racer	*Coluber c. constrictor*	forest, shrubland, meadow		x				NYARA
Snapping Turtle	*Chelydra serpentina*	wetland, stream, forest, lake		x				NYARA
Timber Rattlesnake	*Crotalus horridus*	forest, rocky summit		xx		NY		NYNHP
Wood Turtle	*Clemmys insculpta*	stream		xx	x			NYARA
Amphibians								
Fowler's Toad	*Bufo fowleri*	forest, meadow		x				NYARA
Jefferson Salamander	*Ambystoma jeffersonianum*	vernal pool, forest			x			NYARA

Common Name	Scientific Name	General Habitat	NYS Conservation Status					Data Source
			Hudson River Valley Priority Bird	Species of Greatest Conservation Need xx = high priority	Special Concern	Threatened	Endangered	
Northern Cricket Frog	*Acris crepitans*	wetland		xx			NY	NYNHP
Fish								
American Eel	*Anguilla rostrata*	stream		xx				NYSDEC
Plants								
Cream-colored Avens	*Geum virginianum*	stream, floodplain				NY		NYNHP
False Hop Sedge	*Carex lupuliformis*	wetland				NY		NYNHP
Golden-seal	*Hydrastis canadensis*	stream, forest				NY		NYNHP
Prickly Pear	*Opuntia cespitosa*	rock outcrops					NY	NYNHP
Riverweed	*Podostemum ceratophyllum*	stream				NY		NYNHP
Two-ranked Moss	*Pseudotaxiphyllum distichaceum*	forest						NYNHP
Violet Wood-sorrel	*Oxalis violacea*	forest, rocky summit				NY		NYNHP

Town of Rosendale
Natural Resources Inventory
Important Areas for Rare Species and Significant Natural Communities

0 0.5 1 1.5 Miles

1:35,000

N W E S

Community Type

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

HURLEY
MARBLETOWN
ULSTER
ESOPUS
NEW PALTZ
Third Lake
Fourth Lake
Fifth Lake
Rondout Creek
Sturgeon Pool
Wallkill River
28
87
1
32
7
26
25
26A
213

- New York State Thruway
- State Roads
- County and Local Roads
- Wallkill Valley Rail Trail
- Waterbodies
- Streams

Important Areas for:

- American eel
- Wetland Animals
- Plants
- Terrestrial Animals
- Aquatic Animals

Map produced for the Town of Rosendale Environmental Commission, June 2010. Revised, 2022

Data Sources:
Roads, town boundary, tax parcels (2022), surface waters: Ulster County Information Services (2015, 2022).
Wallkill Valley Rail Trail: Wallkill Valley Land Trust (2020).
Rosendale streams: Kristen Bell Travis (2011).
NY Natural Heritage Program : Important Areas and Significant Habitats (2019).
Hillshade: New York State GIS Program Office (2020).

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

NYS GIS Program Office

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).[71]

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).

[71] 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
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Kilometers
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W E
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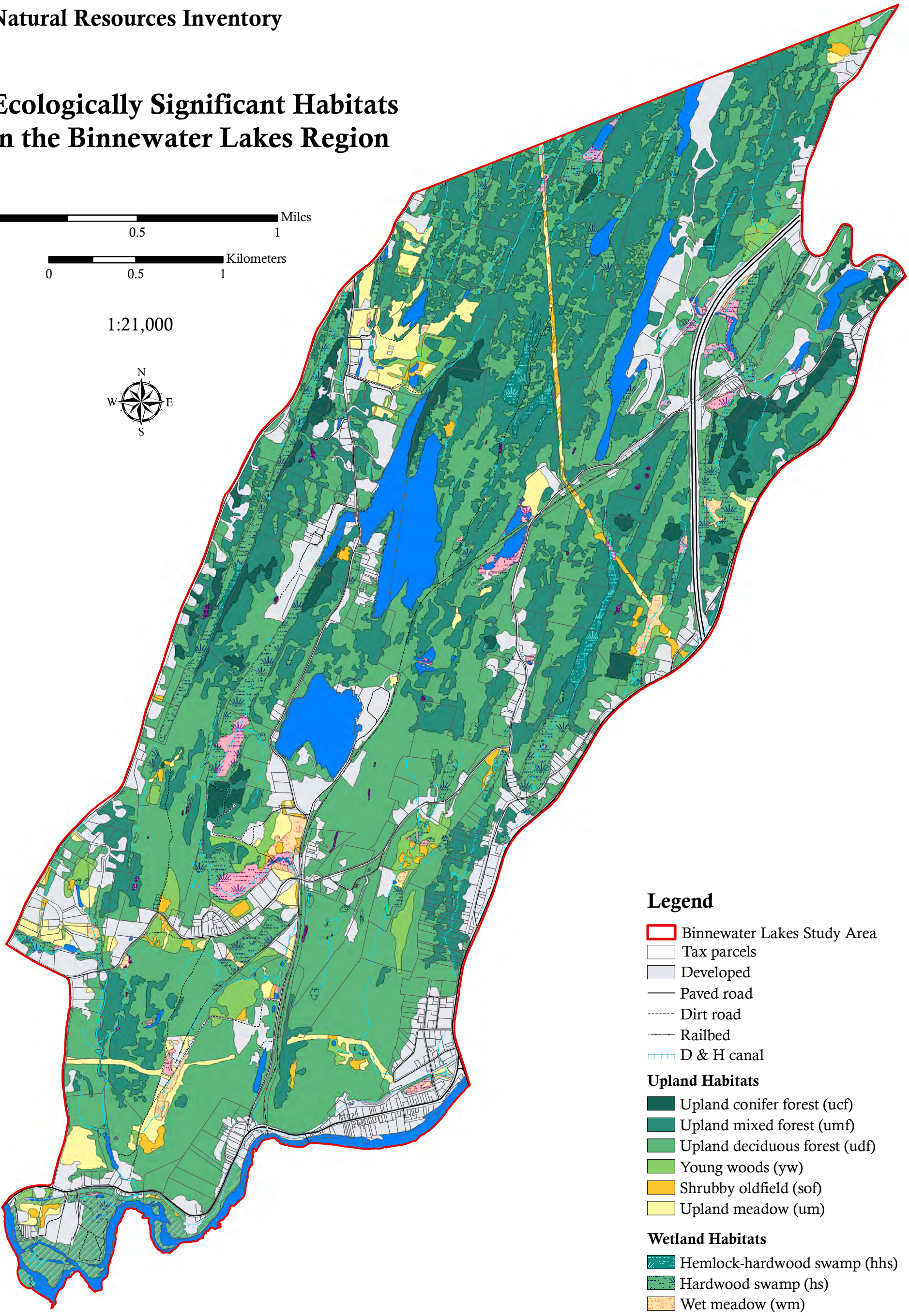

Legend

- 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

Ghost Pipe (Monotropa)
Penny Coleman

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
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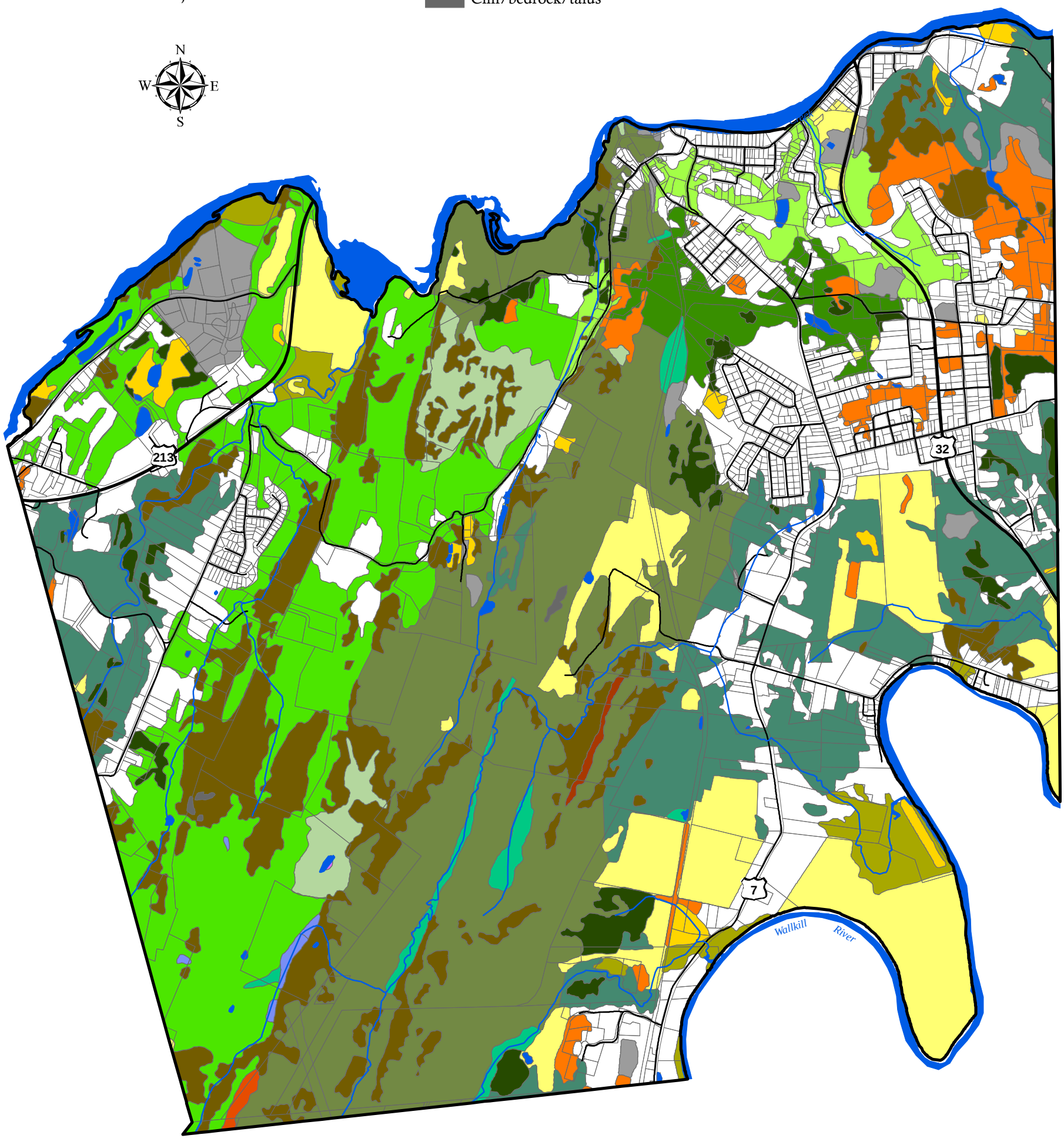
Kilometers
0 0.5 1

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.

Large Forests

White Pine
Penny Coleman

Forests provide numerous benefits including wildlife habitat, clean water, climate moderation, and forest products. Though each forest's value is relative to the surrounding landscape, in general, larger forests provide higher quality habitat and greater benefits than smaller ones. Over time, many large forests in Rosendale have been divided into smaller forest patches through the process of fragmentation. Forest fragmentation often occurs through clearing for new roads or development and is linked to decreased habitat quality and health, disruptions in wildlife movement, and the spread of invasive species. These impacts are greatest at forest edges but can extend for hundreds of feet into forest patches, often displacing sensitive species that depend on interior forest. After fragmentation occurs, interior habitat, or forest cores, are unable to support the same diversity of species because of the loss of core habitat.

Forest Condition Index

Forests vary in their ability to support native species and withstand or recover from external stressors such as fragmentation, severe storms, and invasive species. The Hudson Valley Forest Condition Index maps and prioritizes forest patches based on a variety of metrics relating to ecosystem health or integrity. Large forest patches in the estuary watershed were first identified through a landscape fragmentation analysis using forested and other woody land cover classes from the 2016 National Land Cover Database. The resulting areas represent continuous patches of forest unfragmented by major roads, railroads, and non-forest habitat, with a minimum patch size of 100 acres. The forest patches were then scored for 22 metrics related to forest condition, connectivity, stress, habitat, and other ecosystem values. These component metrics were summed to create the index and ranked according to percentile of all forest patches in the estuary watershed.[72]

Rosendale's largest intact forest spans the northern Shawangunk Ridge and extends nearly 5,000 acres including areas within the towns of New Paltz and Marbletown. This forest scores in the 98th percentile of Hudson Valley forests and is the top 1% for habitat diversity, and in the top 5% for landform diversity, patch size, and local habitat connectedness. The continuation of this forest from Mountain Rd to the Rondout Creek also scores in the 91st percentile and provides important connectivity between the Shawangunk Ridge and forests of the Binnewater Lakes Region. The latter forest patches are smaller but still score highly on a regional scale, ranking between 70-80th percentile including top 1% for landform diversity and top 5% for habitat diversity. High landform diversity reflects the town's complex topography, which creates a diversity of physical conditions associated with high biodiversity. Forests east of State Route 32 and the New York State Thruway are generally smaller and more fragmented, but nevertheless provide significant habitat and ecological values.

Core Forests

Core forests are interior forest areas surrounded by at least a 100-meter wide buffer of edge forest habitat. These interior forest areas support a unique array of plants and animals that are easily disturbed by human activity generally associated with more open habitats (e.g. agricultural fields, meadow, roads and developed areas). Core forest is especially important for sensitive wildlife including many forest songbirds, which avoid nesting near areas with human disturbance. Although the value of individual forest patches for wildlife depends on landscape context and other factors, core forests that are at least 500 acres in size are more likely to provide enough suitable habitat to support a diversity of interior forest species. Core forests were mapped using the large forest patches identified for the Forest Condition Index, described above. Avoiding further fragmentation

[72] Conley, A. K., E. Cheadle, and T. G. Howard. *Updating Forest Patches and a Patch Assessment for the Hudson Valley.* New York Natural Heritage Program, State University of New York College of Environmental Science and Forestry, 2019, Albany, NY. www.nynhp.org/forest-patches

of core forests will help conserve the integrity and habitat value of ecologically significant forest patches. By guiding development toward the edges of forest patches, fragmentation of these resources can be limited, and vital benefits can be maintained. The highest quality forests are good candidates for protection or other municipal conservation efforts. The northern Shawangunk Ridge forest in Rosendale includes nearly 3,600 acres of core forest (spanning Rosendale, New Paltz, and Marbletown). The largest forest of the Binnewater Lakes region between Hickory Bush Rd and Binnewater Rd includes over 1,000 acres of core forest, which extends into the Town of Hurley. Other core forests in Rosendale are less than 500 acres in size.

Forest Health

Beyond fragmentation, the greatest threats to forests in Rosendale today are from overabundant deer and the introduction of tree diseases, forest pests, and other invasive species. The Lower Hudson Partnership for Regional Invasive Species Management (PRISM) works to promote education, prevention, early detection and control of invasive species. works to promote education, prevention, early detection and control of invasive species in and is helping communities to prepare for and respond to these threats. Guiding future development to minimize forest fragmentation will help avoid the spread of invasive species into interior forests and conserve important habitats in the town.

Town of Rosendale
Natural Resources Inventory

Large Forests

0 0.5 1 1.5 Miles

1:35,000

N W E S

HURLEY

MARBLETOWN

ULSTER

ESOPUS

NEW PALTZ

Fourth Lake

Fifth Lake

Third Lake

Rondout Creek

Sturgeon Pool

Wallkill River

1 7 26 26A 213 28 87 32 25

New York State Thruway
State Roads
County and Local Roads
Wallkill Valley Rail Trail
Waterbodies
Streams
Core Forest

Forest Condition Index (Percentile)

0-15
15-30
30-45
45-60
60-75
75-90 - Top 25%
90-100 - Top 10%

Map produced for the Town of Rosendale Environmental Commission, June 2010. Revised, 2022

Data Sources:
Roads, town boundary, tax parcels (2022), surface waters: Ulster County Information Services (2015, 2022).
Rosendale streams: Kristen Bell Travis (2011).
Wallkill Valley Rail Trail: Wallkill Valley Land Trust (2020).
Forest Condition Index: New York Natural Heritage Program (2019).
Hillshade: New York State GIS Program Office (2020).

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

NYS GIS Program Office

Intact Habitat Cores

In 2013, Ulster County was selected as a case study for a collaboration with the Green Infrastructure Center (GIC) and NYS DEC to develop a methodology for mapping natural green infrastructure and create a model for replication by other counties in New York State. [73] The project was developed around a vision to "draw more focused attention to critical resource protection areas … in a meaningful, visual and accessible manner. Borne of this focused attention are initial steps to address pressing concerns and potential threats to Ulster County's critical resources as well as new recognition of great opportunities inherent in better protecting and understanding our natural assets."[74]

The GIC formed a mapping team with county staff coordinated by the Ulster County Department of the Environment and determined the key focal areas to overlay on the base map. The county staff reviewed and consulted key documents, such as the Open Space Plan; technical reports, such as those covering the Catskills and Shawangunk Ridges; and current on-going efforts such as the Greenways Plan. The GIC also consulted with key stakeholder groups, such as the Nature Conservancy, Hudsonia and the Federated Sportsmen's Club of Ulster County; local towns within Ulster County's borders; other county departments and agencies, such as Economic Development and Tourism; state and regional offices of the DEC; and the U.S. Environmental Protection Agency.

To create a map of intact habitats, a digital data layer consisting of large areas of intact habitat was created using natural land cover. Next, a layer consisting of developed lands and transportation features was overlaid to determine which areas were fragmented. Edge areas were removed to determine the amount of land that makes up the interior habitat. Following that step, the habitat cores were analyzed for additional attributes relating to size, biological and habitat diversity and water quality. Finally, based on these attributes, the cores were ranked to aid in prioritization for protection or conservation actions. Cores are ranked as Outstanding, High, Medium, or General. These categories are based on each core's size and shape, species diversity, and water quality and quantity values. Individual cores were ranked relative to other habitat cores at the county level.

The Habitat Cores map shows intact habitat cores in the Town of Rosendale. The habitat core associated with the northern Shawangunk Ridge are rated as "outstanding." Several cores in the Binnewater Lakes Region are rated as "high." Other lower rated cores are still important for the reasons described above, considering the value they provide to the adjacent natural and human communities.

[73] Firehock, K. *Evaluating and Conserving Green Infrastructure Across the Landscape: A Practitioner's Guide for New York*. Green Infrastructure Center, 2013, Ulster County case study available at http://www.gicinc.org/PDFs/GIC%20NY-Practitioners%20Guide-Chapter%205-reduced.pdf

[74] Ibid., pg. 87

Town of Rosendale
Natural Resources Inventory

Habitat Cores

0 0.5 1 1.5 Miles

1:35,000

N W E S

HURLEY
MARBLETOWN
NEW PALTZ
ULSTER
ESOPUS

Third Lake
Fourth Lake
Fifth Lake
Rondout Creek
Wallkill River
Sturgeon Pool

1 7 26 26A 213 28 87 32 25

New York State Thruway
State Roads
County and Local Roads
Wallkill Valley Rail Trail
Waterbodies
Streams

Core Ranking

Outstanding
Very High
High
Medium
General

Map produced for the Town of Rosendale
Environmental Commission, June 2010. Revised, 2022

Data Sources:
Roads, town boundary, tax parcels (2022), surface waters:
Ulster County Information Services (2015, 2022).
Rosendale streams: Kristen Bell Travis (2011).
Wallkill Valley Rail Trail: Wallkill Valley Land Trust (2020).
Hillshade: New York State GIS Program Office (2020).
Habitat Cores: Ulster County Department of the Environment (2014).

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

NYS GIS Program Office

Climate Resiliency for Biodiversity

Areas with diverse physical environments, complex topography, and connected habitats are most likely to support a diversity of plants and animals *today*, and into the future.

Climate change is slowly bringing profound changes to natural communities in Rosendale. Warming temperatures and changing precipitation patterns will make conditions less hospitable for some of the local flora and fauna – and more hospitable to other species, including newcomers. This process is shifting species ranges and rearranging habitats in ways that are difficult to predict. The locations of rare species or important natural communities may change. Common habitats providing important ecosystem benefits to the Town will also be affected. These include large intact forests, wetlands, and stream corridors that support stormwater management, flood control, aquifer recharge, climate moderation, and carbon sequestration.

In a dynamic, changing environment, it is important to identify natural areas most likely to support biodiversity and ecosystem benefits into the future. Conserving these "strongholds" for nature will ensure that plants and animals have places to move and adapt as local climate conditions change. Conserving resilient sites for nature will also contribute to Gardiner's adaptation and resilience to flooding, extreme heat, and other climate-related hazards.

The Climate Resiliency for Biodiversity Map shows climate resilience values from the Nature Conservancy's *Resilient Sites for Terrestrial Conservation*[75] and *Resilient and Connected Landscapes*[76] projects. Modeling for climate resilience was based on three primary attributes: geodiversity (diversity of physical environments), topographic complexity, and landscape connectedness. Sites that have diverse physical environments, complex topography, and connected habitats are places most likely to support a diversity of plants, animals, and habitats today and in the future.

- **Geodiversity** reflects unique combinations of geology, elevation, and landforms. Ecosystem and species diversity relate strongly to their associated geophysical settings. Conserving a range of physical environments will in turn protect a diversity of plants and animals under both current and future climates.
- **Complex topography** is important because it creates a range of temperature and moisture options for the species, providing a variety of local microclimates. Factors that create microclimates include slope, aspect (i.e. north vs. south-facing), shade, and proximity to waterbodies.
- **Connected landscapes** are places that allow species to move and disperse, and processes like water movement can occur unimpeded. Maintaining a connected area in which species can move ensures that the area can adapt to climate change.

On the map, dark green indicates high estimated resilience. Brown indicates areas vulnerable to climate change. The areas in Rosendale that have the highest Climate Resilience Score are generally associated with the Shawangunk Ridge and connected forests along the Rondout Creek and Binnewater Lakes region.

[75] Anderson, M.G., M. Clark, and A. Olivero Sheldon. 2012. Resilient Sites for Terrestrial Conservation in the Northeast and Mid-Atlantic Region. The Nature Conservancy, Eastern Conservation Science.
[76] Anderson, M.G., Barnett, A., Clark, M., Prince, J., Olivero Sheldon, A. and Vickery B. 2016. Resilient and Connected Landscapes for Terrestrial Conservation. The Nature Conservancy, Eastern Conservation Science, Eastern Regional Office. Boston, MA.

Town of Rosendale
Natural Resources Inventory

Climate Resiliency for Biodiversity

0 0.5 1 1.5 Miles

1:35,000

N W E S

HURLEY
MARBLETOWN
ULSTER
ESOPUS
NEW PALTZ

Third Lake
Fourth Lake
Fifth Lake
Rondout Creek
Wallkill River
Sturgeon Pool

28
87
1
7
26
25
32
26A
213

New York State Thruway
State Roads
County and Local Roads
Wallkill Valley Rail Trail
Waterbodies
Streams

Climate Resilient Score

Most resilient
More resilient
Slightly more resilient
Average/median resilient
Slightly less resilient
Less resilient
Least resilient
Developed

Map produced for the Town of Rosendale
Environmental Commission, June 2010. Revised, 2022

Data Sources:
Roads, town boundary, tax parcels (2022), surface waters: Ulster County Information Services (2015, 2022).
Rosendale streams: Kristen Bell Travis (2011).
Wallkill Valley Rail Trail: Wallkill Valley Land Trust (2020).
Climate Resilient Score: The Nature Conservancy (2016).
Hillshade: New York State GIS Program Office (2020).

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

NYS GIS Program Office

SECTION IV: 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.[77] 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.[78] A detailed schedule of permitted uses for each zone can be found in Chapter 75, Attachment 1 of the Town Code.[79] 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.

[77] 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.

[78] 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.

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

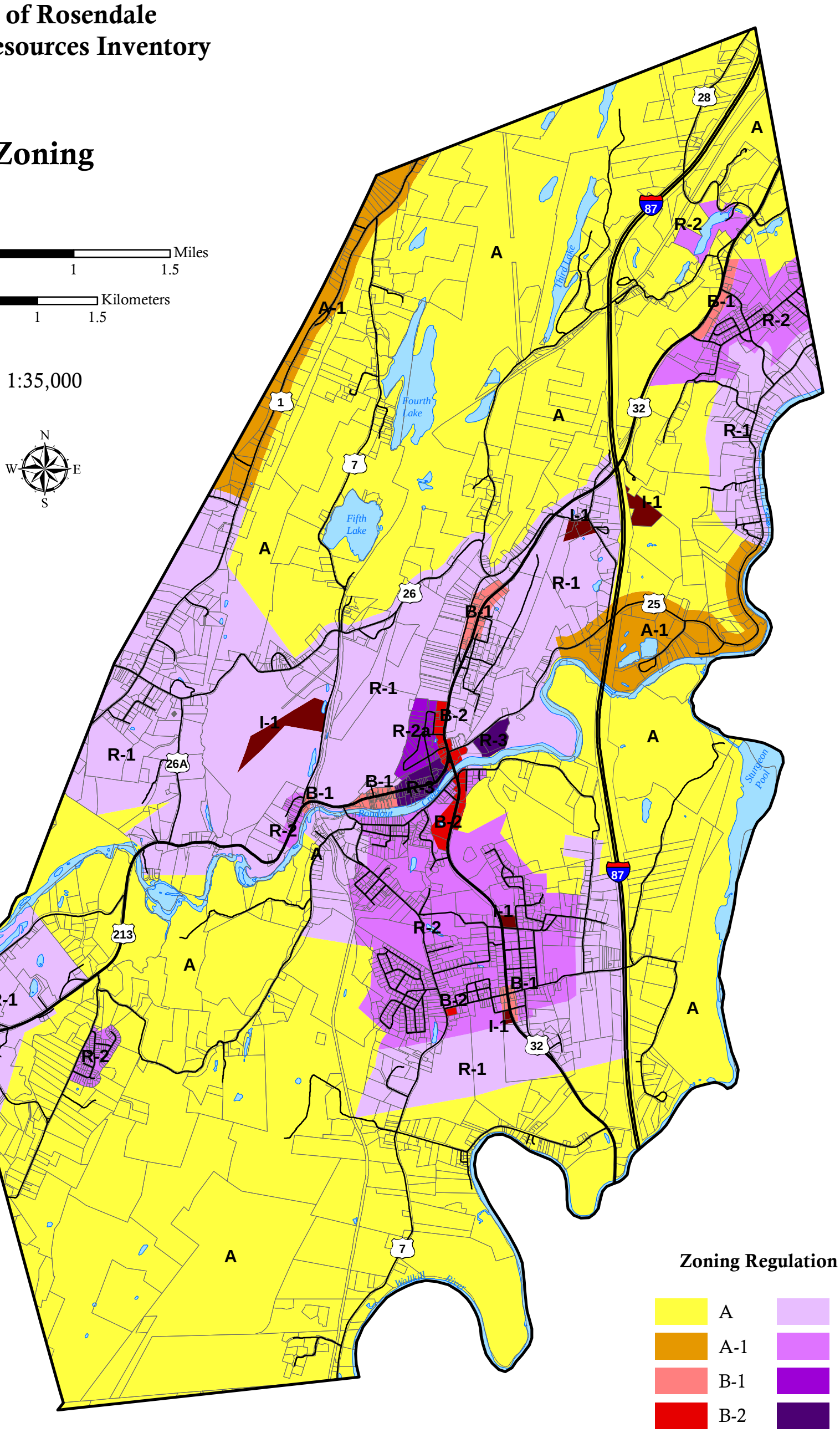
Town of Rosendale
Natural Resources Inventory

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 790 acres of the Shawangunk Ridge and 438 acres in the Binnewater Lakes region, have been protected in perpetuity, thanks to conservation-minded landowners and organizations. In total, 1,774 acres of land are owned or protected by conservation organizations or are publicly owned by the Town or New York State.

Protected lands include fee-owned lands and properties with conservation easements. Fee-owned lands are lands directly owned by a government or private organization. Conservation easement properties have both a landowner and an easement holder. The conservation easement is a legally enforceable land protection agreement between the landowner and the easement holder wherein the landowner gives up the right to develop the land and the easement holder is responsible for ensuring that the provisions of the easement are followed by the owner. Many 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).

Table 5: Protected and Public Land by category in the Town of Rosendale

Protected and Public Land Category	Acres
Mohonk Preserve (Fee)	790.2
Wallkill Valley Land Trust (Fee)	218.8
Wallkill Valley Land Trust (Easement)	507
Rondout-Esopus Land Conservancy (Easement)	85.2
New York State (Fee)	23.4
Town of Rosendale (Fee)	150.1
Total	1774.7

Town of Rosendale
Natural Resources Inventory

Protected and Public Lands

Miles
0 0.5 1 1.5

1:35,000

N W E S

HURLEY
ULSTER
MARBLETOWN
NEW PALTZ
ESOPUS
Third Lake
Fourth Lake
Fifth Lake
Rondout Creek
Wallkill River
Sturgeon Pool
1
7
26
26A
28
32
87
213
25

New York State Thruway
State Roads
Local Roads
Wallkill Valley Rail Trail
Waterbodies
Streams

Protected Lands

RELC - Conservation Easement
WVLT - Conservation Easement
WVLT
Mohonk Preserve
New York State
Town of Rosendale

Map produced for the Town of Rosendale
Environmental Commission, June 2010. Revised, 2022

Data Sources:
Roads, town boundary, tax parcels (2022), surface waters: Ulster County Information Services (2015, 2022).
Rosendale streams: Kristen Bell Travis (2011).
Protected lands: Rosendale Environmental Commission (2020).
Hillshade: New York State GIS Program Office (2020).
Wallkill Valley Rail Trail: Wallkill Valley Land Trust (2020).

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

NYS GIS Program Office

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.

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

0 0.5 1 1.5 Miles

1:35,000

N W E S

HURLEY
ULSTER
MARBLETOWN
NEW PALTZ
ESOPUS
Third Lake
Fourth Lake
Fifth Lake
Rondout Creek
Sturgeon Pool
Wallkill River
28
87
1
7
26
25
32
26A
213

Map produced for the Town of Rosendale
Environmental Commission, June 2010. Revised, 2022

Data Sources:
Roads, town boundary, tax parcels (2022), surface waters:
Ulster County Information Services (2015, 2022).
Wallkill Valley Rail Trail: Wallkill Valley Land Trust (2020)
Ulster County Information Services (2015).
Rosendale streams: Kristen Bell Travis (2011).
Hillshade: New York State GIS Program Office (2020).
Agricultural Districts: New York State GIS Program Office (2018).
Farmland Soils: USDA NRCS (1979).

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

- New York State Thruway
- State Roads
- County and Local Roads
- Wallkill Valley Rail Trail
- Waterbodies
- Streams
- State Agricultural District
- Prime Farmland Soils
- Prime Farmland Soils if Drained
- Farmland Soils of Statewide Importance

NYS GIS Program Office

Solar panels on the Rosendale Rec Center
Penny Coleman

Solar Development Suitability

Efforts at combating climate change include a rapid transition from fossil fuels to clean and renewable energy sources. Solar energy, in particular, is expected to become more widespread in the Hudson Valley in the coming years. Solar panels can provide energy for on or off-site use and can be integrated into building materials, installed on roofs, or mounted on the ground. Scenic Hudson projects that over 6,000 acres of land in the Hudson Valley alone will need to be converted to solar energy production to meet New York State's ambitious climate change mitigation goals.[80] While this type of land use change might be more reversible than more traditional development (e.g. residential and commercial construction), large-scale ground mounted solar arrays should be carefully sited to avoid impacts to natural resources.

The Large Scale Ground Mounted Solar Feasibility map focuses on the presence of power lines that are enabled to accept power onto the grid and where on the landscape solar panels are expected to have the least negative impact and produce the most energy. Solar Feasibility Landforms uses an assessment of surface topography and aspect to identify sites that are ideal for solar development. These include landscapes where the slope is less than 30 degrees and the aspect (direction of slope exposure) is to the east, west or south. Utility-scale solar projects are those that produce at least one mega-watt of power and generally require a direct connection to transmission lines, through a substation, as opposed to local distribution lines.

This map displays data developed and shared through the Scenic Hudson's Solar Mapping Tool. This four-part resource introduces users to the basics of solar development and provides a process for planning for solar at municipal and county scales. Data throughout this NRI can be used to identify priority sites for solar development including areas outside of large contiguous habitats, known important areas for rare species, and important water resources. For more information on the siting renewable energy projects, Clean Energy, Green Communities: A Guide to Siting Renewable Energy in the Hudson Valley provides a good overview of the factors land-use decision-makers must consider.

[80] Friedrichsen, A. *Clean Energy, Green Communities: A Guide to Siting Renewable Energy in the Hudson Valley*. Scenic Hudson, Inc., 2018, https://scenichudson.org/wp-content/uploads/legacy/renewables-siting-guide_web.pdf

Town of Rosendale
Natural Resources Inventory

Large Scale Ground Mounted Solar Feasibility

Miles
0 0.5 1 1.5

1:35,000

N W E S

HURLEY
MARBLETOWN
ULSTER
ESOPUS
NEW PALTZ
Third Lake
Fourth Lake
Fifth Lake
Rondout Creek
Sturgeon Pool
Wallkill River

1 7 26 26A 213 28 87 32 25

New York State Thruway
State Roads
County and Local Roads
Wallkill Valley Rail Trail
Transmission Lines
Waterbodies
Streams

Solar Landform Feasibility

Most Feasible (Slope <= 5 deg)
Somewhat Feasible (South Slope >5 and <=15 deg)
Least Feasible (South Slope >15 and <=30 deg)
Infeasible (Slope >30 deg)

Map produced for the Town of Rosendale Environmental Commission, June 2010. Revised, 2022

Data Sources:
Roads, town boundary, tax parcels (2022), surface waters: Ulster County Information Services (2015, 2022).
Rosendale streams: Kristen Bell Travis (2011).
Solar Landform Feasibility: Scenic Hudson (2020).
Transmission Lines: Homeland Infrastructure Foundation Level Database (2021)
Wallkill Valley Rail Trail: Wallkill Valley Land Trust (2020).
Hillshade: New York State GIS Program Office (2020).

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

Scenic Hudson, Inc. , NYS GIS Program Office

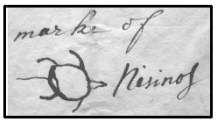
Historic, Cultural & Recreational Resources

The Town of Rosendale was founded in 1844 and includes the hamlets of Binnewater, Bloomington, Bruceville, Cottekill, Creeklocks, Hickory Bush, parts of High Falls, Lawrenceville, Lefevre Falls, Maple Hill, Rosendale, Tillson and Whiteport. Originally incorporated around new and booming cement industry, Rosendale grew into a quiet and quirky town where creative people have gathered, opening small niche shops, farm-to-table restaurants and its own small independent theatre. Rosendale offers has a wide variety of cultural and historic resources, including access to the 22-miles of Wallkill Valley rail trail for biking, hiking or walking; a weekly farmer's market from June to October; multiple annual family-focused festivals and many national and locally significant historic sites. While many of these community assets might not be considered "natural resources," they are fundamental to the character of our town.

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.

Early Inhabitants

For 12,000 years, the Lenape people and their ancestors lived on the land we now call Rosendale. They spoke a dialect of Algonquin called Munsee, in which language they referred to themselves as Leni Lenape, "original souls."



The Lenape lived in small nomadic groups, moving seasonally to take advantage of the fertile bottomlands of our river valleys and the abundance of game and fish to be found in our forests and streams. The Lenape believed that all things had souls, including the land, and that the proper relationship between humans and the land was one of kinship and reciprocity. Land, like air and water, could not be owned. When in 1652, Thomas Chambers "bought" 72 acres in what is now the City of Kingston, the Lenapi never imagined they had sold the land itself, but only the grasses that grew on it. The deed for this land is still preserved in the Senate House State Historical Site in Kingston.

In the centuries that followed, the arrival of Europeans brought disease and warfare. The Lenape lost all claims to the lands they had inhabited for untold generations, culminating in the mid-19th century with the forcible removal of most who still remained in the eastern United States to present-day Oklahoma under the Indian Removal Policy.

Weènchipahkihëlèxkwe, "Leaves-that-touch-each-other-from-time-to-time woman" (a.k.a. Nora Thompson Dean) was the last full-blooded Lenape and one of the last fluent speakers of the language. She died in 1984 in Oklahoma, where she was born.

Many of the descendants of the Lenape and other indigenous people of the Hudson Valley region are now members of the federally-recognized Delaware Tribe of Indians[81] or the Stockbridge-Munsee Community, part of the federally recognized Mohican nation

[81] Delaware Tribe of Indians, https://delawaretribe.org/

whose government is based in Wisconsin.[82,83] The Stockbridge-Munsee Community operates an Historic Preservation Office in Williamstown, Ma., and conducts outreach in the Hudson Valley.[84] The culture and society of these indigenous groups is and was based on reciprocity with the natural world, recognizing humans as being part of a community that includes the environment, rather than humans being separate from and above nature.

Historic Sites

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.

Iron Mountain Cement Silos
Penny Coleman

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 European 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.

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[82] Stockbridge-Munsee Band of Mohican Indidans, https://www.mohican.com/

[83] Native Land Mapper. Native Land Digital, Canada, accessed November 2022, https://native-land.ca/

[84] Stockbridge-Munsee Community. Williams College Office of Institutional Diversity, Equity and Inclusion, accessed November 2022, https://diversity.williams.edu/the-stockbridge-munsee-community/

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.


Amberly Jane Campbell / Shawangunk Journal

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

1:35,000

N W E S

HURLEY
MARBLETOWN
NEW PALTZ
ULSTER
ESOPUS

Fourth Lake
Third Lake
Fifth Lake
Rondout Creek
Wallkill River
Sturgeon Pool

1 7 26 28 87 32 25 213 26A

DeWitt Grist Mill Site
Hugh White's Mill
Reformed Church of Rosendale
Home of Petrus Van Wagenen
LeFevre House
Home of Abraham Van Wagenen
Whiteport Rd. Kilns
D & H Canal Lock 2
D & H Canal Lock 3
Site of First Church
Newkirk Tavern
D & H Canal Lock 4
Keator Home at Keator's Corners
Binnewater Historic District
Home of Christopher Snyder
Snyder Estate Natural Cement Historic District & Widow Jane Mine
All Saints Church (Rosendale Library)
Willow Kiln Park
Joppenbergh Mtn.
Fording Place used by General Clinton
Captain Frederick Schoonmaker Home
Snyder/Baker Kilns
Wallkill Valley Railroad Bridge
St. Peter's Church
Taueretaque
Friend's Meeting House
Freer House
Perrine's Bridge
DuBois House

New York State Thruway
State Roads
County and Local Roads
Wallkill Valley Rail Trail
Waterbodies
Streams
Historic District
Historic Sites/Districts

Map produced for the Town of Rosendale Environmental Commission, June 2010. Revised, 2022

Data Sources:
Roads, town boundary, tax parcels (2022), surface waters: Ulster County Information Services (2015, 2022).
Rosendale streams: Kristen Bell Travis (2011).
Historic Sites: Rosendale Environmental Commission (2009).
Wallkill Valley Rail Trail: Wallkill Valley Land Trust (2020).
Hillshade: New York State GIS Program Office (2020).

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NYS GIS Program Office

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. 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. In 2011, the Preserve acquired a 142.5-acre parcel in the northernmost section of the Shawangunks adjacent to the Wallkill Valley Rail Trail. The 0.75-mile Lime Kiln Trail off the rail trail includes impressive boulders, talus fields, and a scenic lookout from Giant's Ledges. The trail offers connections to other trails further south in the Mohonk Preserve. Other nearby 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.[85]

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.

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).

[85] Shawangunk Mountains Scenic Byway website, www.mtnscenicbyway.org.

Town of Rosendale
Natural Resources Inventory

Cultural and Recreational Sites

Miles
0 0.5 1 1.5

1:35,000

N W E S

HURLEY
ULSTER
MARBLETOWN
NEW PALTZ
ESOPUS

28
87
1
7
26
25
32
213
26A

Binnewater
Union Chapel
Third Lake
United Reform
Church
Fourth
Lake
Fifth
Lake
Women's Studio
Workshop
Brookside
School
Center for
Sustainable Living
Joppenbergh
Mountain
Willow
Kiln Park
Farmer's
Market
Library
Veterans
Memorial Park
Rosendale
Theatre
Rondout Creek
Recreation
Center Complex
Rosendale
Community Center
Widow Jane
Mine
Century House
Hardenburg
Park
St. Peters
Church
St. Peter's
Church Cemetery
Sturgeon
Pool
Little Leauge
Fields
Rosendale
Cemetery
Coxen Cemetery
Mohonk
Preserve
Tillson
Community Church
American Legion Post 1219
Rosendale-Tillson
Sky Lake
Lodge
Center for Symbolic Studies
Lifebridge
Sanctuary
Mohonk
Preserve
Wallkill River
DEC Boat
Launch

New York State Thruway
State Roads
County and Local Roads
Wallkill Valley Rail Trail
Shawangunk Mountains Scenic Byway
Trail Parking
Cultural Sites
Recreational Sites
Recreational Waterbodies
Waterbodies
Streams

Map produced for the Town of Rosendale
Environmental Commission, June 2010. Revised, 2022

Data Sources:
Roads, byway, town boundary, tax parcels (2022), surface waters: Ulster County Information Services (2015, 2022).
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Cultural and recreational sites and waterbodies: Rosendale Environmental Commission (2021).
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NYS GIS Program Office