Cornell University
Cooperative Extension
Dutchess County

NEW YORK STATE | Department of Environmental Conservation | Hudson River Estuary Program

Natural Resources Inventory
Union Vale, NY
Fall 2021

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Acknowledgments

Akiko Busch, Conservation Advisory Council, Union Vale, NY, August 2021

Coming into a sense of place can begin with a walk in the woods, a drive through the valley, a view to the hills. Sometimes, though, a more structured approach is required. Such was the case in the spring of 2020 when Nate Nardi-Cyrus, Conservation and Land Use Specialist at the Hudson River Estuary Program, New York State Department of Environmental Conservation (DEC)/Cornell University, reported that the program, in partnership with the Cornell Cooperative Extension Dutchess County, had offered to assist the Town of Union Vale Conservation Advisory Council with developing a Natural Resources Inventory (NRI). Funding had been allocated for technical assistance to create NRI maps and accompanying text narratives at no cost to the Town.

This was where it started, with principal mapper Sean Carroll, Cornell Cooperative Extension, Dutchess County, creating the some 20 maps of the NRI and Nate working with the CAC to create individualized narratives. The partnership with the DEC and the Cornell Cooperative Extension was a new endeavor for the CAC, itself a small and recently formed committee. Which is to say, we hardly knew what

questions to ask, much less how to find the answers to them. For their patience, humor, energy, and overall broad and creative thinking, the CAC owes a huge debt of gratitude to Nate and Sean. Along with Sean's comprehensive mapping, Nate's ability to structure, research, assist and otherwise shape the narratives provided not only indispensable editorial oversight, but a lesson in new ways to consider our local landscape and the stewardship of its resources.
The first step in moving ahead with the NRI was to secure support from the town board. Supervisor Betsy Maas was enthusiastic from the start, fully appreciating the value such a document could have in contributing to informed land use planning. Her eagerness to proceed extended to the Town Board, which affirmed its support in a March 2020 resolution authorizing the Conservation Advisory Council to work with the DEC to create this Natural Resources Inventory. The Town Board's continuing backing has been invaluable. Thanks go as well to Union Vale Town Clerk Andrea Casey for her great help in setting up a dedicated page for the CAC on the Town's website, along with a Google Drive to facilitate the exchange of information.

When the CAC began its work that spring, the Covid pandemic had put much of the country in lockdown. The Union Vale CAC had planned to work jointly with the neighboring Town of Beekman, and thus our monthly meetings with the Beekman CAC, Nate, and Sean were all held on Zoom, remote gatherings that we quickly grew accustomed to. The ongoing digital exchange of information with the Beekman CAC, particularly members Chairman Clifford Schwark, Katie Whittaker, and Shannon Fatum, proved enormously helpful.

For their review of and thoughtful commentary on the first draft of the NRI maps, we are also grateful to Erin Hoagland and Karin Roux at the Dutchess Land Conservancy; Jennifer O'Donnell, Town Planner, LaGrangeville, NY; Dylan Tuttle, Dutchess County Planning and Development; and forester Doug Ramey. Ingrid Haeckel, Conservation and Land Use Specialist at the Hudson River Estuary Program, DEC/Cornell University helped to develop the template for the text narrative used here and reviewed the entirety of the material here as it progressed, and we are indebted to her as well.

This project was carried out through a partnership with Cornell University and the New York State Department of Environmental Conservation Hudson River Estuary Program with funding from the New York State Environmental Protection Fund.

Section 1: Introduction

Union Vale is a rural town in the south-central part of Dutchess County. Comprised of 37.8 square miles, it is approximately 15 miles east of Poughkeepsie and 70 north of New York City. The 2020 census reported a population of 4,616. Its rural characteristics include vast expanses of woodlands, pastures and wetlands, along with a varying topography with a predominant north/south ridgeline. At 1,400 feet above sea level, Clove Mountain is the Town's highest point and offers panoramic views to the valleys below. Tymor Park, located at the southern edge of the Town, is nearly 500 acres and is the largest municipal park in the state of New York.

Union Vale's forests, meadows, wetlands, streams, and shorelines are not only habitat for abundant wildlife and fish, but also provide many vital benefits to people. These ecosystems help to keep drinking water and air clean, moderate temperature, filter pollutants, absorb floodwaters, and provide for pollination of agricultural crops. They also present opportunities for outdoor recreation and education, and create the scenery and sense of place that is unique to the community.

Land-use planning is instrumental to balancing future growth and development with protection of natural resources. Identifying important natural resources is the first step in proactive environmental planning and informed decision-making. This Natural Resources Inventory (NRI) identifies and describes the naturally occurring resources located in Union Vale, including topography, geology and soils, water resources, and habitat, as well as agricultural and conserved areas, land uses, and climate conditions and projections. By bringing this information together in one place, the NRI can cultivate a better understanding and appreciation of the community's natural resources and set the stage for a wide range of planning and conservation applications. The NRI provides a foundation for comprehensive and open space planning, zoning updates, identifying critical environmental areas, climate adaptation strategies, and other municipal plans and policies for Union Vale. The NRI can also inform land stewardship and conservation in the Town.

Data and Methods

Mapping for the Union Vale NRI was completed in December 2020 through technical assistance from Cornell Cooperative Extension of Dutchess County (CCE). CCE's GIS/Environmental Resource Educator, Sean Carroll, drafted 20 maps with extensive input from the Town's NRI Project volunteers and Hudson River Estuary Program staff. The maps display data from federal, state, and county agencies; and non-profit organizations including Dutchess Land Conservancy and The Nature Conservancy. The original source and publication year of data sets are included on each map and are described in the report.

All maps were produced using Geographic Information Systems (GIS) software and data in the NAD

1983 State Plane New York East FIPS 3101 Feet coordinate system. Information on the maps comes from different sources, produced at different times, at different scales, and for different purposes. Most of the GIS data were collected or developed from remote sensing data (i.e., aerial photographs, satellite imagery) or derived from paper maps. For these reasons, GIS data often contain inaccuracies from the original data, plus any errors from converting it. Therefore, maps created in GIS are approximate and best used for planning purposes. They should not be substituted for site surveys. Any resource shown on a map should be verified for legal purposes, including environmental review. Information provided by the maps can be enhanced by local knowledge, and the NRI should be updated every 10 years as new data become available.

The draft NRI maps were made available for public comment on the Town website during the fall of 2020. Due to physical-distancing guidelines established during the Covid-19 crisis, the draft maps were not available in physical locations, though the NRI project team would have preferred this. The Town Board received a virtual presentation of the draft maps from the DEC during their September 17th public meeting and the Planning Board were given a similar presentation on September 10th.

The NRI report was written during 2021 and was based on a template from the Hudson River Estuary Program, with assistance from NRI Project volunteers. It incorporates information from the Union Vale Master Plan (2001), the Dutchess County NRI (2010), and various other public information sources.

The final NRI draft was circulated to the public during August 2021 and, after addressing comments, the final NRI was published on the Town of Union Vale's website.

Bloodroot flower. *Jen Rubbo*

How to Use this Report

The NRI is a valuable land use planning tool as well as educational resource that documents aspects of Union Vale's diverse natural and cultural resources. The inventory provides an essential tool for the local Planning and Zoning, Building, and Parks and Recreation Departments by officially identifying sensitive land and water resources. It discusses development considerations for the Planning and Zoning Boards, laying a foundation for land-use planning and decision-making, zoning considerations and municipal policy guidance, as well as environmental conservation. In addition, the NRI provides property owners, developers and their consultants with information they may need in considering the impact their project may have on the Town's natural resources. It can be used to address natural resources during project planning and design and to help expedite review and approval of their endeavors. It can also be used as a general reference for landowners to understand resources that may occur on their property and to inform stewardship.

It is important to keep in mind that the NRI is best suited for municipal scale planning but may be used as a screening tool at the site-scale to raise questions or identify the need for additional site assessment. The maps are not intended to provide site-specific accuracy and should not be used as a primary source for land use decision-making but may identify where further site assessments are needed.

The NRI maps are available as PDFs on the Town website or in person at the Town Hall. The PDF maps allow for ease of navigation with the ability to zoom in to an area of interest.

Many of the data sets shown in the NRI maps are available for more detailed viewing through online interactive maps. These include:

- Dutchess County – Parcel Access
- Dutchess County – Aerial Viewer
- Hudson Valley Natural Resource Mapper
- DECinfo Locator
- Discover GIS Data NY
- National Map
- Web Soil Survey
- TNC Resilient Land Mapping Tool

Town Base Map (Map 1)

The Town Base Map is the foundation for the NRI map series. It shows municipal boundaries, municipal buildings, and transportation infrastructure including roads and railways. It shows Union Vale's municipal boundaries with adjacent towns: Washington to the north; LaGrange to the west, Dover to the east, and Beekman to the south. Verbank, Union Vale's only hamlet, is shown in the Town's northwest quadrant.

Routes 55 and 82 are the major roads in the Town, although they only traverse small portions of its southwest and southeast corners. The locations of Union Vale's two firehouses, in Verbank and Clove Valley, post office, Town Hall and Town Court are represented on this map. The boundaries of Sky Acres Airport and Tymor Park are also shown because of their large geographic areas and importance to the Town. The Base Map also illustrates general natural features such as open bodies of water, streams, and those wetlands that are regulated by the New York State Department of Environmental Conservation (DEC). Of particular note are Jackson Creek and Pray Pond at the foot of Clove Mountain, the source for the Fishkill Creek. General topographic relief, indicated by a shaded digital elevation model, shows Clove Mountain (1400 feet) and East Mountain (1280 feet). All of these features are shown in greater detail on other maps in the inventory.

Verbank Methodist Church and Cemetery. *Jen Rubbo*

Town of Union Vale

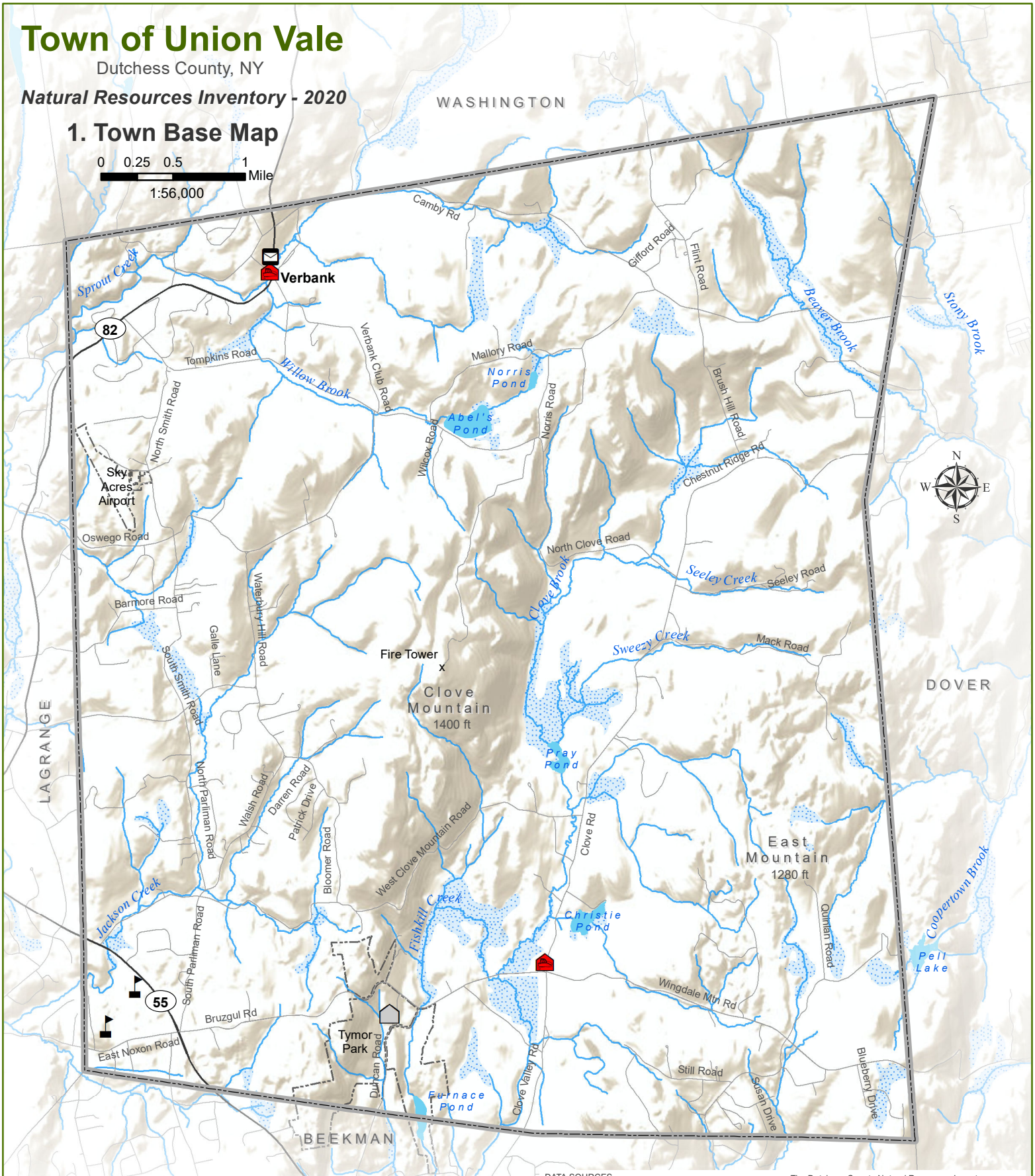
Dutchess County, NY

Natural Resources Inventory - 2020

1. Town Base Map

0 0.25 0.5 1 Mile

1:56,000



Major Road

Local Road

Waterbody

Stream

DEC Regulatory Wetland

Fire Station

Town Hall & Court

Post Office

School

DATA SOURCES

Municipal Boundary: Dutchess County Real Property, 2020
Roads: Dutchess County OCIS, 2019
Water: National Hydrography Dataset, 2012
Wetlands: NYSDEC Regulatory Freshwater Wetlands, 2002
Town Assets: Dutchess County OCIS

Prepared by: CCEDC GIS Lab, 2020

WARNING: This map is not a substitute for land surveys or legal documents. No accuracy or completeness guarantee is implied or intended.

The Dutchess County Natural Resources Inventory (NRI) Project is a partnership among the towns of Beekman and Union Vale, Cornell Cooperative Extension of Dutchess County, and Cornell University Department of Natural Resources, with funding from the Environmental Protection Fund through the New York State Department of Environmental Conservation Hudson River Estuary Program.

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Aerial Imagery (Map 2)

The Aerial Imagery Map gives a bird's-eye view of the Town, showing .5-ft resolution 4-band digital orthoimagery taken in natural color taken in 2020 by Kucera International, Inc. Orthoimagery is aerial imagery that has been georeferenced and digitally corrected to remove geometric distortion due to ground relief and camera position.[1] The resulting imagery is proportionally accurate and can be overlaid onto maps. The aerial imagery was taken in early spring prior to the leaf out of deciduous trees, resulting in a detailed view of vegetation types, land uses, and development. It can serve as a reference for comparison with features shown on other maps in the NRI.

For more detailed, interactive viewing of orthoimagery dating back to 1936, users can visit the Dutchess County Aerial Viewer at https://gis.dutchessny.gov/aerialaccess/

[1] "Frequently Asked Questions – Digital Orthoimagery Information." NYS GIS Program Office. http://gis.ny.gov/gateway/mg/faq.htm

Town of Union Vale

Dutchess County, NY

Natural Resources Inventory - 2020

2. Aerial Imagery

0 0.225 0.45 0.9 Mile

1:56,000

DATA SOURCES

Municipal Boundary: Dutchess County Real Property, 2020
Aerial Imagery: Dutchess County 2020 Aerials (via Maxar)

Prepared by: CCEDC GIS Lab, 2020

The Dutchess County Natural Resources Inventory (NRI) Project is a partnership among the towns of Beekman and Union Vale, Cornell Cooperative Extension of Dutchess County, and Cornell University Department of Natural Resources, with funding from the Environmental Protection Fund through the New York State Department of Environmental Conservation Hudson River Estuary Program.

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Section 2: Climate

As in most areas of the Northeast, Union Vale experiences cold winters with snow and warm summers. According to data collected at the closest available National Weather Service weather station in Poughkeepsie, for the period of 1981-2010 the average temperature was 49.2°F and the average precipitation received was 42.6 inches.

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

However, local data show steady and rapid changes in our climate that reflect global trends. 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 such as flooding and drought, increased overall temperature, and rapidly changing weather patterns. 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 furthermore help to sequester and store carbon, offsetting some of the impacts of local greenhouse gas emissions. This section presents general climate information prepared for Hudson Valley communities by the DEC Hudson River Estuary Program.[2]

Climate 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 New York State.[3] ClimAID translated Intergovernmental Panel on Climate Change (IPCC) scenarios into more robust regional-scale predictions incorporating local data inputs and expert knowledge. Union Vale is located within the ClimAID Climate Region 5. ***Note that models are inherently uncertain and simply present a range of possible scenarios to assist people and communities plan for the future***. Future climate changes in the Town could exceed or fall short of these projections.

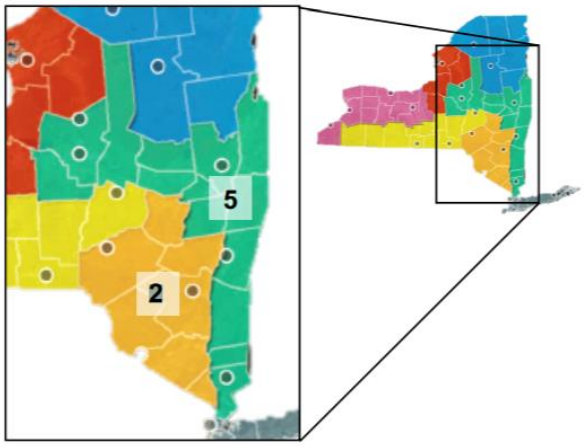

Figure 1. *Region 2 and 5 of the ClimAID report include the Hudson and Mohawk River vallevs*

Looking towards the future there are two prominent climate trends that will affect Union Vale and the region: increasing temperatures and shifting precipitation patterns.

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[2] Zemaitis, L. *Working Toward Climate Resilience: General Climate Information Prepared for Hudson Valley Communities*. NYSDEC Hudson River Estuary Program, 2018.

[3] 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, Albany, NY. www.nyserda.ny.gov/climaid

Temperature. New York has experienced particularly rapid changes to the regional climate in the last century and this trend is projected to continue through the 21st century. 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 precipitation, short-term drought and severe storms. Since 1970, Union Vale has seen a 2°F increase in average annual temperature and a 5°F winter temperature increase. These increases are above both the national and global increase in annual temperature during the same period. Current projections see an additional increase of about 4-6°F in the coming decades and up to 11°F by 2100.

AIR TEMPERATURE PROJECTIONS FOR REGION 5

	Baseline 1971-2000	2020s	2050s	2080s	2100
Annual average air temperature	50˚F	52.3 - 53.2˚F	54.5 - 56.2˚F	55.6 - 59.7˚F	56.1 - 61.4˚F
Increase in annual average	-	2.3 - 3.2˚F	4.5 - 6.2˚F	5.6 - 9.7˚F	6.1 - 11.4˚F

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 increased electricity demand from air conditioning. By mid-century, the Town could annually experience three to 10 days above 95 degrees, and five to seven heat waves that last one to two days longer than average. Increasing temperature not only affects human health and ecosystems but can impact the electrical needs of a community putting strain on both budgets and the grid while creating more challenges in agriculture and other industries.

HEAT WAVE PROJECTIONS FOR REGION 5

	Baseline 1971-2000	2020s	2050s	2080s	2100
# Days per year above 90˚F	10	26 - 31	39 - 52	44 - 76	*
# Days per year above 95˚F	1	2 - 4	3 - 10	6 - 25	*
# Heat waves per year	1	3 - 4	5 - 7	6 - 9	*
Average # days of each heat wave	4	5	5 - 6	5 - 7	*
# Days per year ≤ 32˚F	155	127 - 136	104 - 119	84 - 109	*

***Projections not available at this time**

Precipitation. Precipitation in Union Vale has become more variable and extreme, whereas total rainfall has changed only marginally. The amount of rain falling in heavy downpour events increased 71% from 1958 to 2012 in the Northeast.[4] ClimAID projections indicate total annual precipitation could increase as much as 12% by mid-century and 21% by 2100. Overall, New York State models project more dry periods intermixed with heavy rain and decreased snow cover in winter. However, precipitation is considered more uncertain since it is difficult to model.

[4] Melillo, J. M., T.C. Richmond, and G. W. Yohe. Climate Change Impacts in the United States: The Third National Climate Assessment. 841 pp. doi:10.7930/J0Z31WJ2, 2014. https://nca2014.globalchange.gov/

PRECIPITATION PROJECTIONS FOR REGION 5

	Baseline 1971-2000	2020s	2050s	2080s	2100
Total annual precipitation	51"	52" - 54.5"	53" - 57"	53.5" - 58.5"	53.5" to 61.5"
% Increase in annual precipitation	-	2 - 7%	4 - 12%	5 - 15%	5 - 21%
# Days with precipitation > 1"	10	14 - 15	14 - 16	15 - 17	*
# Days with precipitation > 2"	1	3 - 4	4	4 - 5	*

***Projections not available at this time

Union Vale can reduce potential further damage due to increased stormwater runoff by preserving natural areas, implementing green infrastructure strategies, and limiting impervious surfaces where applicable. Conservation of floodplains, stream corridors, wetlands, and forests will help reduce stormwater runoff and risk from flooding, as well as provide opportunities for plants and animals to migrate north and higher in elevation to adapt to warming conditions. Natural areas also act as carbon sinks, sequestering and storing carbon that helps offset local greenhouse gas emissions. Preservation of natural areas providing stormwater and flood control benefits is in most cases cheaper and more effective than engineered alternatives and should be prioritized wherever feasible. The DEC has published guidance for flood risk management[5] and using natural and nature-based measures to reduce flood risk.[6] In addition, the NYS Department of State has published model local laws to increase community resiliency.[7]

Special consideration should also be given to forecasts of increased temperature and heatwaves. The Town should plan for increasing temperature by increasing shaded areas in public spaces to offer relief, this can include trees and other structures. Forest areas of all sizes also contribute to moderation of local temperatures. The NYSDEC recommends developing or updating a heat emergency plan to provide a course of action during intense heat events.

Climate change is also impacting many of the region's plant and animal species. Changes in weather patterns will likely drive the migration of some species, while others might be able to persist because of favorable climate conditions. **Map 3**, **Climate Resilience Score,** shows the areas within Town that are expected to be important for the conservation of species as the climate changes.

In order to help mitigate and adapt to the effects of climate change, Union Vale's Town Board passed a resolution adopting the New York State Climate Smart Communities pledge in 2018. This pledge comprises the following ten elements:

1) Build a climate-smart community.
2) Inventory emissions, set goals, a plan for climate action.
3) Decrease energy use.

[5] New York State Flood Risk Management Guidance, NYS Department of Environmental Conservation. 2020. https://www.dec.ny.gov/docs/administration_pdf/crrafloodriskmgmtgdnc.pdf

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

[7] Model Local Laws to Increase Resilience, NYS Department of State, 2019. https://www.dos.ny.gov/opd/programs/resilience/index.html

4) Shift to clean, renewable energy.
5) Use climate-smart materials management.
6) Implement climate-smart land use.
7) Enhance community resilience to climate change.
8) Support a green innovation economy.
9) Inform and inspire the public.
10) Engage in an evolving process of climate action.

Since this pledge was made, the community has been working to achieve certification through the appointment of a Climate Smart Communities Coordinator.

Solar panels recently installed along Route 55. *Jen Rubbo*

Climate Resilience Score (Map 3)

Climate change is bringing profound changes to natural communities in Union Vale. Warming temperatures and changing precipitation patterns will make conditions less hospitable for some of 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 Union Vale 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.

Areas with:

- **diverse physical environments**
- **complex topography**
- **connected habitats**

are most likely to support a diversity of plants and animals today, and into the future.

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 Union Vale's adaptation and resilience to flooding, extreme heat, and other climate-related hazards.

The **Climate Resilience Score** map shows climate resilience values for biodiversity and natural areas from the Nature Conservancy's *Resilient Sites for Terrestrial Conservation*[8] project. 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

[8] 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.

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. In the Town of Union Vale, the most resilient sites are predicted to be along the eastern slope of Clove Mountain and in the adjacent Clove Brook Valley, from Brush Hill Road south to Tymor Park. Additional highly resilient sites include the natural areas around East Mountain, Sprout Creek, and the headwaters of Beaver Brook. The least resilient sites are generally associated with the more developed portions of the Town.

Clove Mountain, and its associated forests, are expected to be a stronghold for plants and wildlife as the climate changes. *Travellerspoint Blog*

Town of Union Vale

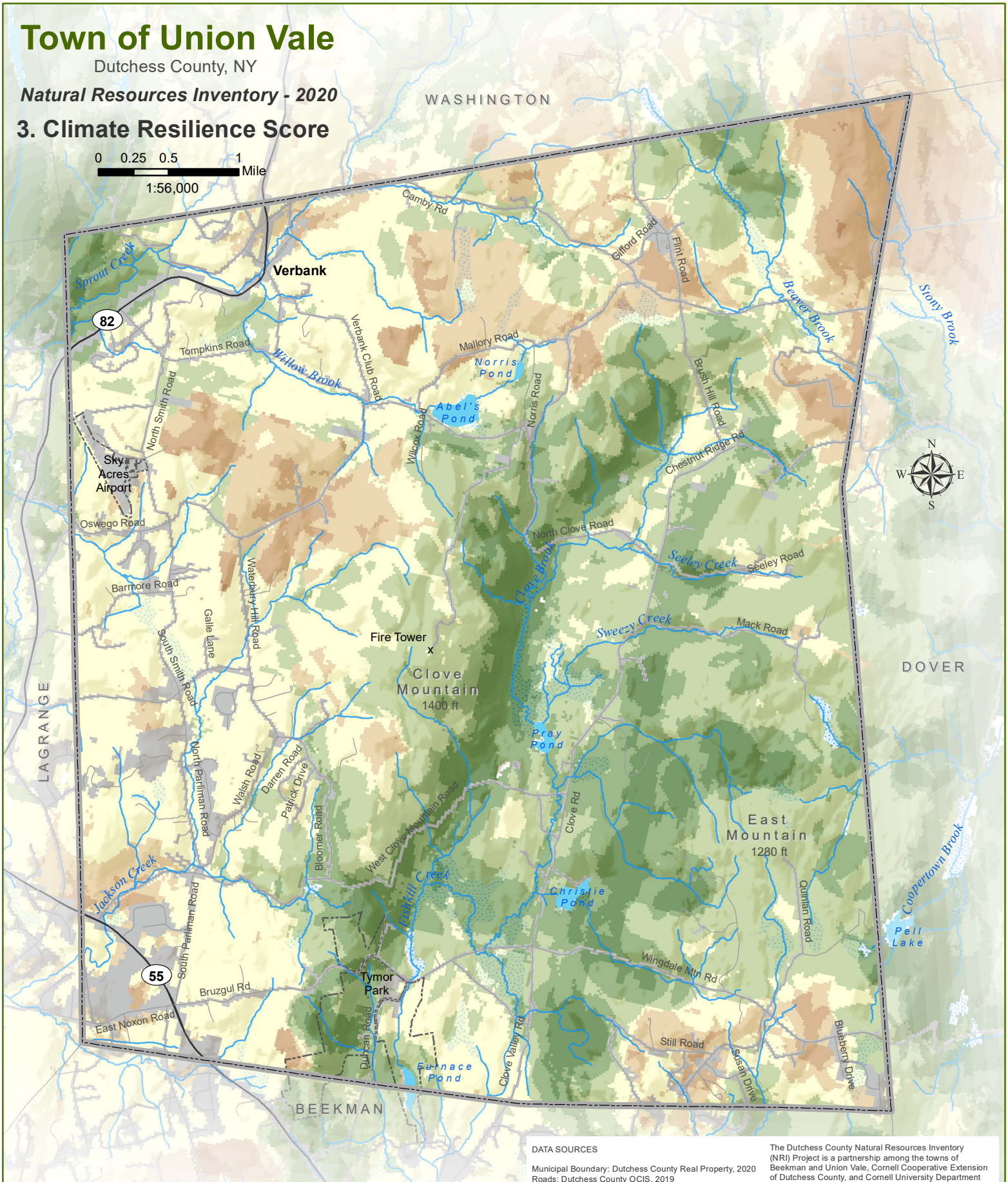
Dutchess County, NY

Natural Resources Inventory - 2020

3. Climate Resilience Score

0 0.25 0.5 1 Mile

1:56,000



Major Road

Local Road

Waterbody

Stream

DEC Regulatory Wetland

Climate Resilience Score

Far Above Average

Above Average

Slightly Above Average

Average

Slightly Below Average

Below Average

Far Below Average

Developed

DATA SOURCES

Municipal Boundary: Dutchess County Real Property, 2020
Roads: Dutchess County OCIS, 2019
Water: National Hydrography Dataset, 2012
Wetlands: NYSDEC Regulatory Freshwater Wetlands, 2002
Climate Resilience Data: The Nature Conservancy, 2016

Prepared by: CCEDC GIS Lab, 2020

WARNING: This map is not a substitute for land surveys or legal documents. No accuracy or completeness guarantee is implied or intended.

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Cornell Cooperative Extension Dutchess County

Section 3: Physical Setting

Topography and Elevation (Map 4)

Union Vale has a varied topography, including fertile floodplains, rolling hills, and high ridges. The variation in the Town's topography reflects differences in the underlying geology and has been an important factor influencing the location of development.

Union Vale's highest point is on **Clove Mountain**, which is **1,400 feet** above sea level.

Elevation is shown on the map by color, with greenish hues representing the lowest areas and dark brown representing higher locations. The highest elevations in Union Vale are on Clove Mountain (1,400'), in the central portion of Town, and East Mountain (1,280'), along the Town's eastern boundary with the Town of Dover. There are also some high hills in the northeast corner of Town, adjacent to Beaver Brook. The lowest elevations are along Union Vale's largest streams – Fishkill Creek, Clove Brook, Jackson Creek, and Sprout Creek. Headwater tributaries to these streams cut through Clove Mountain and East Mountain to form deep ravines, especially in areas adjacent to Clove Valley.

It is critical to understand the topography of a site when designing development and construction projects. Overall elevation affects the layout of stormwater drainage and the developable land on a particular site. Low-lying areas can be prone to flooding, and understanding the absolute elevation as well as elevation change across a site can provide insight into the potential for the existence of floodplains, wetlands, steep slopes and other sensitive environmental features. Development of higher elevation areas can impact surrounding lower-elevation areas unless stormwater is properly managed on site.

Union Vale is higher in elevation than many of the Dutchess County communities to the west.
Travellerspoint Blog

Town of Union Vale

Dutchess County, NY

Natural Resources Inventory - 2020

4. Topography & Elevation

Major Road
Local Road
Waterbody
Stream
DEC Regulatory Wetland

Elevation (ft)

201-400
401-600
601-800
801-1000
1001-1200
1201-1400

DATA SOURCES

Municipal Boundary: Dutchess County Real Property, 2020
Roads: Dutchess County OCIS, 2019
Water: National Hydrography Dataset, 2012
Wetlands: NYSDEC Regulatory Freshwater Wetlands, 2002
Elevation (DEM): USGS National Map 3D Elevation, April 2017

Prepared by: CCEDC GIS Lab, 2020

WARNING: This map is not a substitute for land surveys or legal documents. No accuracy or completeness guarantee is implied or intended.

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NEW YORK STATE | Department of Environmental Conservation | Hudson River Estuary Program

Cornell Cooperative Extension Dutchess County

Steep Slopes (Map 5)

Steep slopes pose significant limitations to development and are among the most sensitive environmental features in the landscape.

Although Union Vale has two high ridges and many rolling hills, the steepest slopes in the Town are generally limited to those on the east side of Clove Mountain and on a western section of East Mountain. Slope is defined as the vertical change in elevation over a given horizontal distance. For example, a 10% slope is one that rises 10 feet over a horizontal distance of 100 feet. The Steep Slope map is derived from 10-meter resolution digital elevation models from the U.S. Geological Survey and should only be considered an approximate depiction of steeply sloped areas in the Town. These slopes are shown on the map, with green indicating the shallowest slopes and dark red indicating the steepest.

The Steep Slopes Map includes the following slope classes, based on the national Soil Survey Manual:[9]

<10% (nearly level to gently sloping)
10 – 15% (strongly sloping)
15 – 25% (steep)
Over 25 % (very steep)

Sloping agricultural fields in Union Vale. *Travellerspoint Blog*

In general, slopes greater than 15% pose significant limitations to development and are among the most sensitive environmental features in the landscape. Development of steeply sloped landscapes can increase the danger of erosion, landslides, and excessive polluted runoff.[10] Steep slope disturbance can introduce sediment to streams and waterbodies, affecting downstream water quality. Grading and construction on steep slopes can also be prohibitively expensive, and such sites may not be able to support a properly functioning public or private sewer system.[11] Steep slopes may also be important scenic resources visible from surrounding areas, as in the case of the views from the summit of Clove Mountain and from Bruzgul Road traveling west down East Mountain. Development on steep slopes can also obstruct scenic views. Steep slopes are addressed in Union Vale town code, including sections 210-32

[9] Ditzler, C., K. Scheffe, and H.C. Monger (eds.). *Soil Survey Manual.* USDA Handbook 18. Government Printing Office, 2017, Washington, D.C.

[10] *Steep Slopes and Land Use Decisions*. Southern Tier Central Regional Planning and Development Board, February 2012. www.stcplanning.org/usr/Program_Areas/Flood_Mitigation/SCAP_steepslopes 2010_02_21_CR.pdf.

[11] Chemung County Environmental Management Council. *Chemung County Natural Resources Inventory.* 2008. https://www.chemungcountyny.gov/chemung_county_executive_s_advisory_commission_on_natural_energy_solutions/natural_resources_inventory.php.

(Residential cluster development) and 210-56 (Additional standards and requirements for certains special use permits).

Several significant habitats are associated with steep slopes, as well. Thinly soiled steep slopes may support rocky ledges and talus, which are used for denning, shelter, foraging, and basking by various wildlife species.[12]

[12] Kiviat, E. and G. Stevens. *Biodiversity Assessment Manual for the Hudson River Estuary Corridor.* New York State Department of Environmental Conservation, 2001.

Town of Union Vale

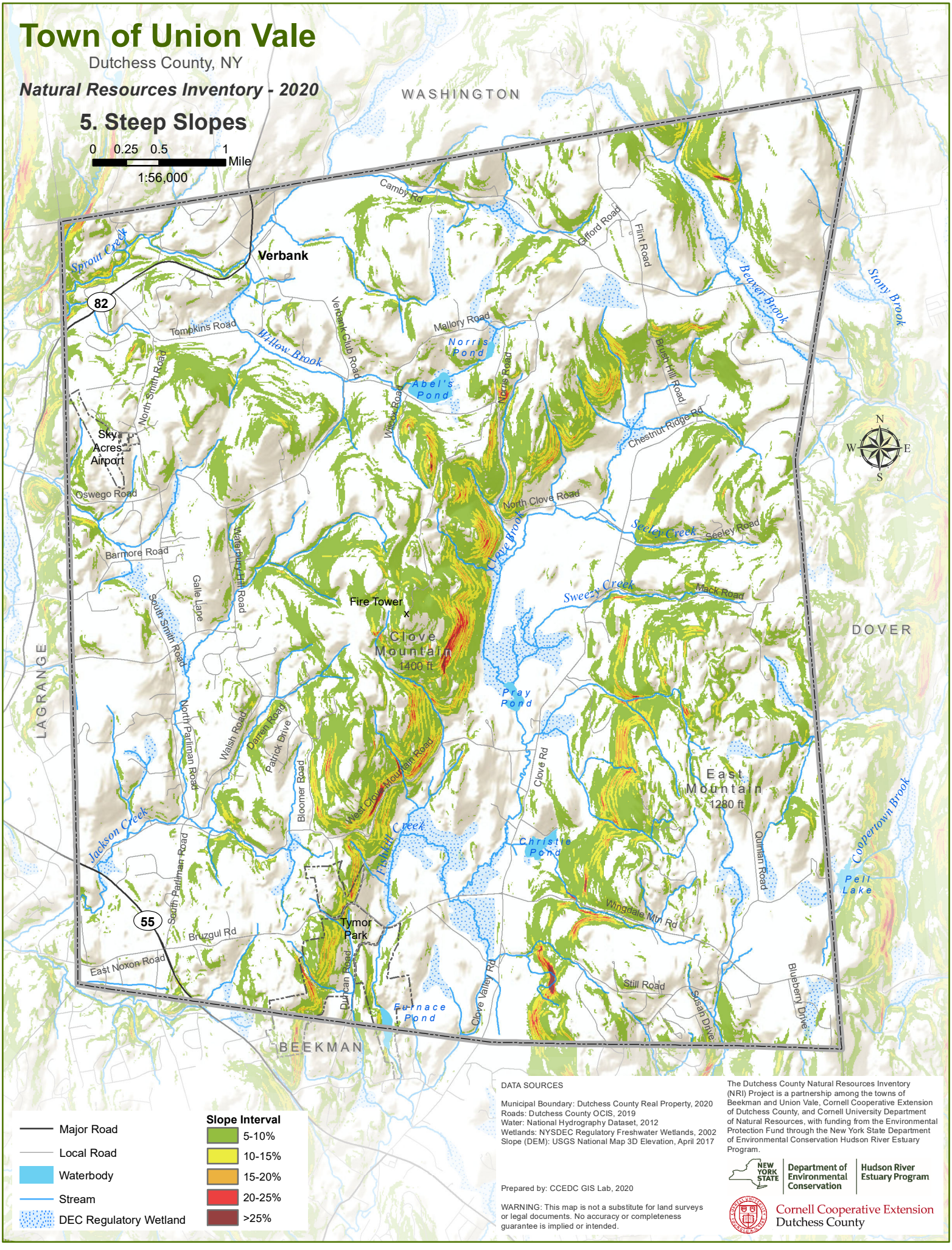
Dutchess County, NY

Natural Resources Inventory - 2020

5. Steep Slopes

0 0.25 0.5 1 Mile

1:56,000



Major Road

Local Road

Waterbody

Stream

DEC Regulatory Wetland

Slope Interval

5-10%

10-15%

15-20%

20-25%

>25%

DATA SOURCES

Municipal Boundary: Dutchess County Real Property, 2020
Roads: Dutchess County OCIS, 2019
Water: National Hydrography Dataset, 2012
Wetlands: NYSDEC Regulatory Freshwater Wetlands, 2002
Slope (DEM): USGS National Map 3D Elevation, April 2017

Prepared by: CCEDC GIS Lab, 2020

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Cornell Cooperative Extension Dutchess County

Bedrock Geology (Map 6)

Bedrock is the solid rock that lies beneath the soil and subsoil.[13] The New York State Museum has mapped general bedrock geology for New York State at a 1:250,000 scale.[14] Bedrock geologic groups are determined by looking at the processes of rock formation, types of rock in the formation, the time period of formation, and other geologically significant identifiers. **Table 1** describes the geology units shown on the **Bedrock Geology Map**.

Geology influences many environmental factors, including topography, groundwater and mineral resources, and the establishment of natural communities.

Table 1. Bedrock Geology Units in the Town of Union Vale[15]

Code	Bedrock Unit	Primary Materials	Geologic Age
Oag	Austin Glen Formation	Clastic Sedimentary: Shale and Graywacke (type of sandstone)	Middle Ordovician
Osh	Autochthonous Shale	Shale (formed in place)	Middle Ordovician, Silurian, or Early Devonian
O€w	Autochthonous Limestone	Limestone (formed in place)	Middle Ordovician, Silurian, or Early Devonian
€t	Taconic Sequence	Clastic Sedimentary: Shale and Graywacke, minor components of carbonates and orthoquartzites	Cambrian or Ordovician

Half a billion years ago, the Grenville Supercontinent formed when the Grenville Orogeny broke apart along the present Atlantic coast, forming a proto-Atlantic Ocean called the Iapetus Ocean. The edge of the North American continent was near the present location of Dutchess County, and as sea level rose and fell, different kinds of sediments were deposited depending on the depth of the water. Before the sea inundated the region, coarse sands and gravels were deposited on the land. After the area was inundated,

[13] Rafferty, J. "Bedrock." Encyclopedia Britannica, 2019.

[14] Fisher, D. W., Y. W. Isachsen, and V. L. Rickard. *Geologic Map of New York: Hudson-Mohawk Sheet*. New York State Museum and Science Service, Map and Chart Series No. 15, 1970. http://www.nysm.nysed.gov/research-collections/geology/gis.

[15] "Geology" Dutchess County Environmental Management Council. 2009. https://dutchessemc.files.wordpress.com/2009/10/c3geology.pdf

but while sea level was still relatively low, the Dutchess County area was covered by shallow waters at the edge of the sea, and limestone rich in the carbonate minerals calcite and dolomite were deposited in coral reefs and carbonate banks much like the Bahamas today. At times when sea level was high, Dutchess County was covered by deeper water, and fine-grained black shales were formed, representing deposition in deep ocean waters of the abyssal plain (the deepest and flattest part of the ocean basins). These shales underlie much of the county, but since they are relatively soft they are not often seen at the surface. Both the **limestone** and **shales** are **autochthonous**, meaning that they were formed in their present location.

Based on graptolite fossil evidence, the **Austin Glen Formation** was created around 450-465 million years ago during the Middle Ordovician. These mostly shales and graywackes (a type of sandstone) were deposited in a deep marine setting when pre-existing sedimentary rocks were broken down and carried down into the water. The shales are a mix of fine-grained materials. Over time, the mud-like sediments that formed this shale accumulated, creating low pressure, which eventually formed the rocks. Due to the low nature of this pressure, the shale breaks easily into slabs.

Younger bedrock types in Town include the Taconic Sequence and autochthonous shales and limestone. **The Taconic Sequence** is made up of metamorphosed clastic sedimentary schists that now overtop younger autochthonous shales.

In the Town of Union Vale, Clove Valley is comprised of autochthonous limestone, while a majority of the rest of the Town is autochthonous shale. Clove Mountain and locations in the western and northeastern portions of the Town are made up of bedrock from the Taconic sequence. Small inclusions of all of these formations are generally within a larger matrix of shale.

Geology influences many environmental factors, including topography, groundwater resources, migration of pollutants, and mineral resources.[16] Geologic properties also strongly influence soil properties, as well as groundwater and surface water chemistry, which in turn influence the establishment of ecological communities. Calcium-rich bedrock including limestone and certain shales often support rare plants and uncommon habitats, such as fens, calcareous wet meadows, and limestone woodland communities. The majority of Clove Valley and a small area near Verbank are underlain by limestone bedrock.

[16] Haeckel, I., and L. Heady. *Creating a Natural Resources Inventory: A Guide for Communities in the Hudson River Estuary Watershed*. New York State Department of Environmental Conservation and Cornell University, 2014.

Town of Union Vale

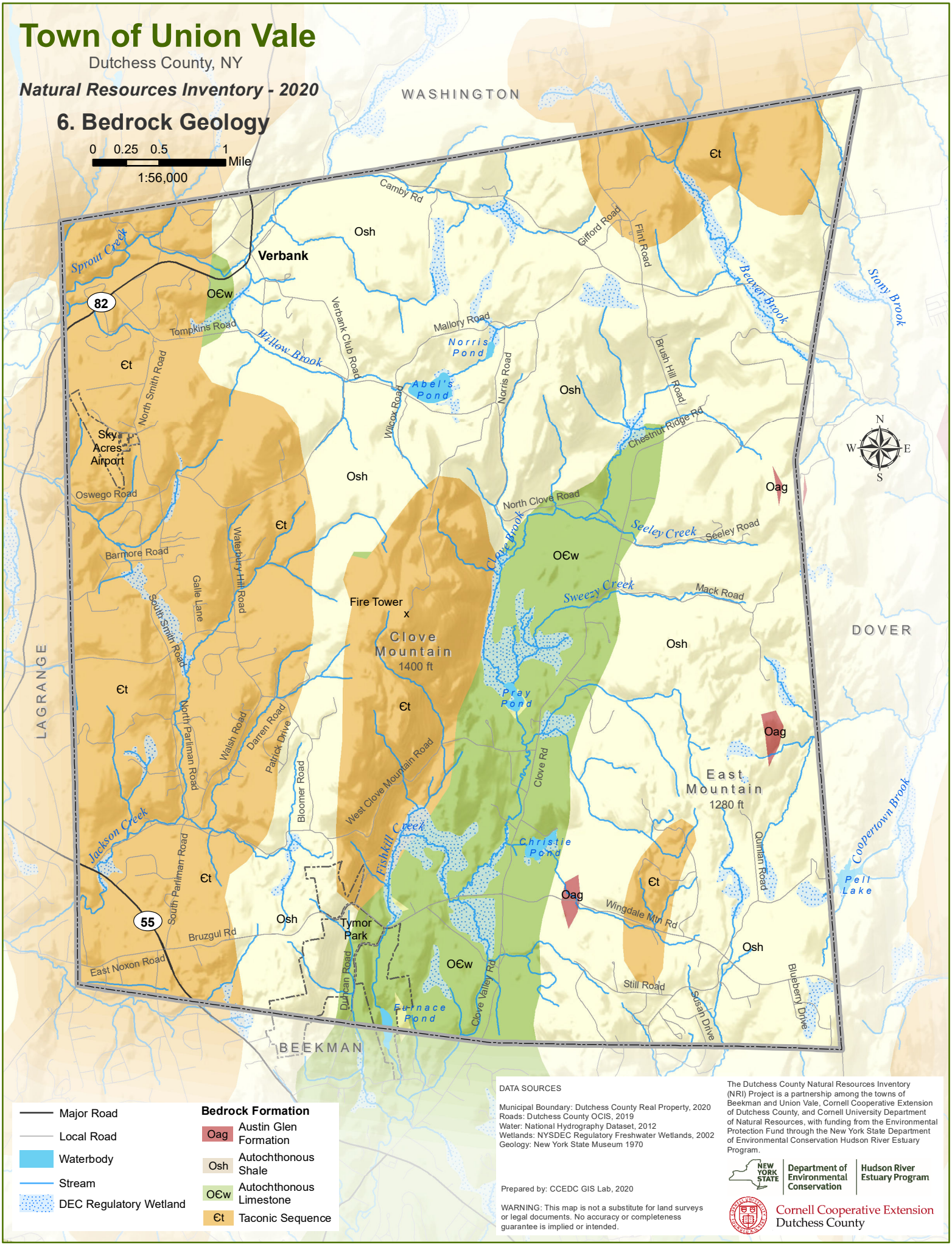
Dutchess County, NY

Natural Resources Inventory - 2020

6. Bedrock Geology

0 0.25 0.5 1 Mile

1:56,000



Major Road

Local Road

Waterbody

Stream

DEC Regulatory Wetland

Bedrock Formation

Oag Austin Glen Formation

Osh Autochthonous Shale

OEw Autochthonous Limestone

Et Taconic Sequence

DATA SOURCES

Municipal Boundary: Dutchess County Real Property, 2020
Roads: Dutchess County OCIS, 2019
Water: National Hydrography Dataset, 2012
Wetlands: NYSDEC Regulatory Freshwater Wetlands, 2002
Geology: New York State Museum 1970

Prepared by: CCEDC GIS Lab, 2020

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Cornell Cooperative Extension Dutchess County

Surficial Geology (Map 7)

Surficial geology refers to unconsolidated sediments lying above the bedrock. The weathering of both bedrock and surficial geology deposits along with organic matter, water, and air is responsible for the slow process of soil formation and the properties of these "parent materials" strongly influence resulting soil chemistry, nutrients, and texture.

The surficial geology of Union Vale largely reflects the retreat of glaciers following the last ice age. A giant ice sheet blanketed the area during the Wisconsin Stage of the Pleistocene Epoch, about 21,000 years ago. Glacial ice, as much as 5,000 feet thick, scoured the landscape and deposited boulders, sand, and gravel in its path.

Surficial deposits are unconsolidated sediments primarily resulting from deposits left behind as glaciers retreated at the end of the last ice age. They are important sources of sand, gravel, and crushed stone.

The Surficial Geology Map displays information from statewide maps produced by the New York State Geological Survey. This map, like the one for bedrock geology, was developed at a scale of 1:250,000 and is best used as a general reference. There are 4 types of surficial materials mapped in Union Vale:

- Bedrock (exposed bedrock, typically within 1 meter of the soil surface)
- Outwash Sand and Gravel (sand and gravel deposits from glacial meltwater streams)
- Till (dense, unsorted clay, silt, sand, gravel, boulders)
- Lake Sediments

Unconsolidated materials overlie the bedrock in most parts of Dutchess county. These include glacial deposits formed by the Laurentide ice sheet during the last Ice Age as well as more recent stream deposits. The sedimentary deposits produced by the advance and retreat of ice sheets vary depending on whether the deposits were formed under the ice sheet or adjacent to it as climate warmed and the ice margin retreated northward. Rocks embedded in the bottom of ice sheets were pushed over the underlying landscape, scratching bedrock surfaces and creating particles that range in size from large boulders (erratics) to fine clay.

Unsorted mixtures of fine material, sand, and larger cobble-sized rocks make up **glacial till** found throughout the county. This material blankets the hills and underlies the other glacial deposits in the valleys. It was deposited directly from the melting ice without further modification by moving water. In some areas, till was pushed up into linear ridges by the episodic re-advance of the ice sheet.

Meltwater issuing from the edge of a glacier can transport large volumes of debris, much the same as today's streams do during flooding. The coarser-grained materials are deposited where the flow velocity of the stream ebbs because it enters a lake or floodplain. In contrast, fine-grained sediments are carried far away. The resulting **glacial outwash** is relatively free of very large boulders and fine silts and clays. During the retreat of the Laurentide ice sheet, sands and gravels were deposited in deltas where

meltwater streams issuing from the front of the ice sheet entered glacial lakes and dropped their coarse-grained loads. The layers within the outwash terraces reflect changes in grain size due to changes in stream flow volume and velocity.

Finer silt- and clay-sized particles, winnowed from the sand and gravel portion of stream sediment loads, were carried farther downstream, eventually being deposited into local lakes and ponds. These deposits are very dense and uniform in grain-size, although some of the **lake deposits** are finely layered, possibly reflecting seasonal changes in flow. The lake deposits are located in the lowest parts of the glacial terrain and are commonly found above a thin layer of till and beneath glacial outwash or modern wetland soils.[17]

On Clove Mountain and portions of East Mountain, soils are shallow and bedrock is usually close to the surface or exposed in outcrops. The majority of the Town is underlain by glacial till, with the largest deposits of glacial outwash associated with the eastern slope of Clove Mountain and Jackson Creek. Lake sediments can be found adjacent to Fishkill Creek, and its associated floodplain, in the southern portion of Town.

Mapped bedrock and surficial geology can provide important information to aid land use decisions related to the of building roads and other structures; safeguarding drinking water; preparing for natural disasters; protecting wildlife and their habitats; and mitigating the effects of geologic hazards, such as landslides and land subsidence.[18]

[17] *The Natural Resource Inventory of Dutchess County, NY*. Cornell Cooperative Extension Dutchess County. 2010. https://www.dutchessny.gov/Departments/Planning/Docs/nritoc.pdf

[18] *Cornwall Natural Resources Inventory.* Town of Cornwall Conservation Advisory Council. 2019. https://cornwallny.com/Portals/1/Downloads,%20Forms%20&%20Schedules/Cornwall%20Conservation%20Advisory%20Council/CornwallNRI-TextOnly-2019.pdf

Town of Union Vale

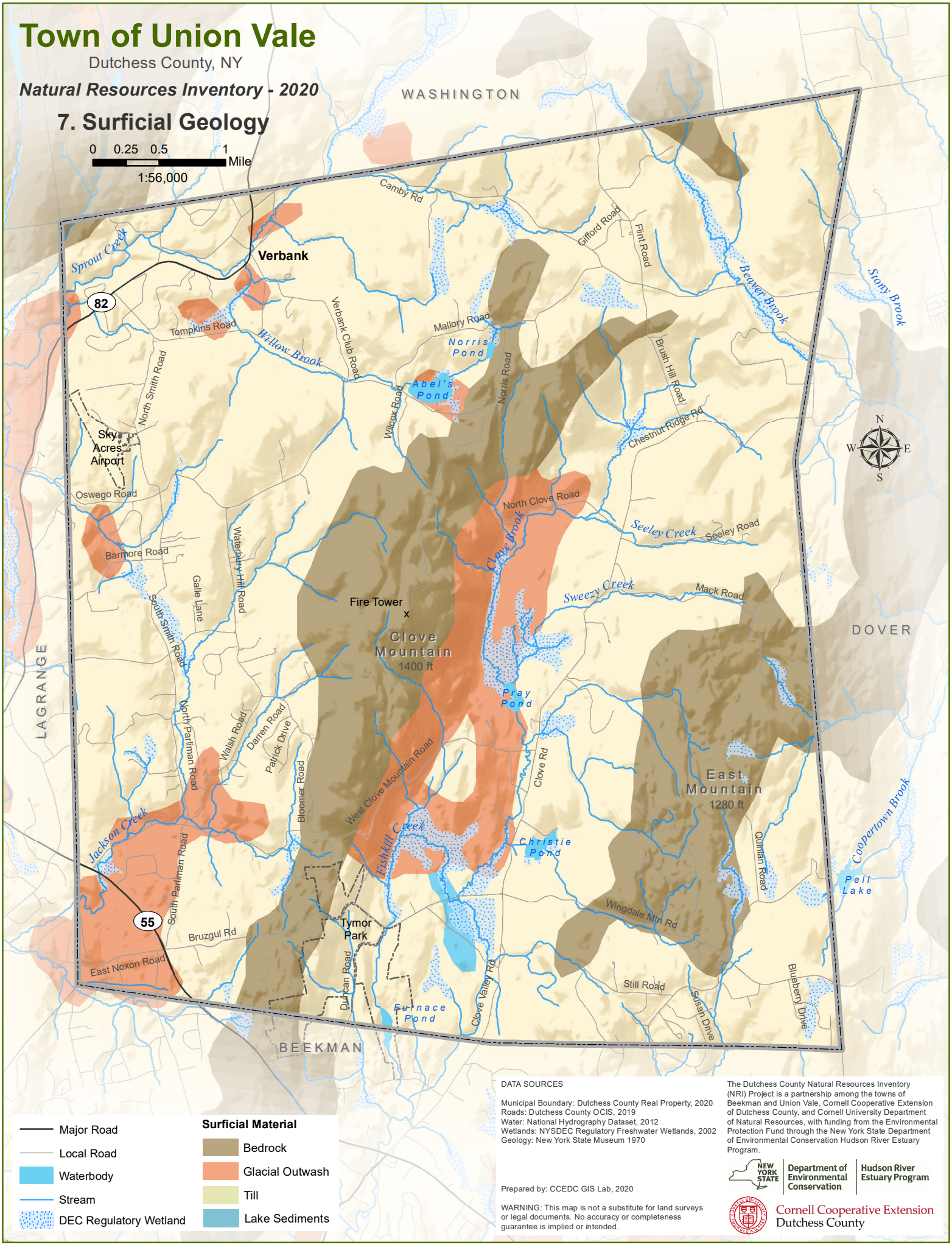
Dutchess County, NY

Natural Resources Inventory - 2020

7. Surficial Geology

0 0.25 0.5 1 Mile

1:56,000



Major Road

Local Road

Waterbody

Stream

DEC Regulatory Wetland

Surficial Material

Bedrock

Glacial Outwash

Till

Lake Sediments

DATA SOURCES

Municipal Boundary: Dutchess County Real Property, 2020
Roads: Dutchess County OCIS, 2019
Water: National Hydrography Dataset, 2012
Wetlands: NYSDEC Regulatory Freshwater Wetlands, 2002
Geology: New York State Museum 1970

Prepared by: CCEDC GIS Lab, 2020

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Soils (No Map)

> **Soils** determine the suitability of an area for particular land uses and are the foundation for the establishment of natural communities of plants and animals.

Soils are the foundation for the establishment of natural communities of plants and animals as well as for critical ecological processes from decomposition and nutrient cycling to the water cycle. Soil characteristics including reaction (acidity or alkalinity), drainage, soil texture, depth to bedrock, and slope inform the natural habitats that become established in a particular area.[19] Soils also play a fundamental role in determining suitability for land uses. Soil characteristics determine potential for agricultural production as well as vulnerability to flooding, soil erosion or instability, and efficiency at filtering pollutants and wastes. (Farmland soils are further discussed in relation to **Map 18**, **Agricultural Resources**.) Consideration of soil properties is important for planning and designing drainage systems; siting of structures; evaluating the potential for septic systems; assessing requirements for constructing foundations, basements, and roads; and determining the feasibility of excavation; among other uses.[20]

The Dutchess County Soil Survey includes detailed soil maps for the entire county along with descriptions of soil types and tables of chemical, hydrologic, and structural characteristics of the soils for various human uses. It's important to note that county soil maps are only approximate; any soil unit may contain "inclusions" of up to 2 acres of soil types different from the mapped unit. The soil data may also be viewed online using the USDA Natural Resources Conservation Service (NRCS) Web Soil Survey. The soil survey report is available for download in PDF format on the NRCS website. **Table 2** (see below) lists soil types found in Union Vale along with selected soil characteristics, such as soil code, soil unit name, percent of Town area, drainage class, depth to bedrock, agricultural suitability, and soil reaction, based on tabular information provided in the county soil survey. **Appendix A** includes soil maps that display pH, drainage class, and depth to bedrock for all soil types in the Town.

Soil drainage class indicates the possible presence of wetlands and is a particularly important factor to consider in the evaluation of proposed development. Somewhat poorly drained soils are good indicators of possible wetland areas and poorly drained and very poorly drained soils are indicators of probable wetland areas.[21] They are also shown on **Map 13** (**Wetlands**). These soils occur in several areas in the Town of Union Vale, including large portions of the northern half of the Town and Clove Valley, between Clove Mountain and East Mountain.

Depth to bedrock is another important soil characteristic to consider in land use planning. Soil depth

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[19] Heady, L., and G. Stevens. *Biodiversity Assessment Guidebook*, Hudsonia Ltd, 2018.

[20] Haeckel, I., and L. Heady. 2014. Creating a Natural Resources Inventory: A Guide for Communities in the Hudson River Estuary Watershed. *New York State Department of Environmental Conservation and Cornell University*, 2014.

[21] Kiviat, E. and G. Stevens. *Biodiversity Assessment Manual for the Hudson River Estuary Corridor.* New York State Department of Environmental Conservation, 2001.

influences suitability for septic and other wastewater treatment systems, as well as the siting of buildings and roads. Shallow soils (<20 inches to bedrock) are often associated with steep slopes, increasing susceptibility to erosion. Shallow soils are also less capable of filtering pollutants draining to surface and groundwater supplies. The shallowest soils in the Town of Union Vale are found on the slopes of Clove Mountain and East Mountain.

Soil reaction refers to the acidity or alkalinity of the soil, expressed in pH values.[22] Soil chemistry exerts a strong influence on plant and animal communities, and can be a useful predictor for certain habitats, from acidic bogs to calcareous wet meadows. Soils developing over calcium-rich bedrock such as limestone often support disproportionately high numbers of rare plants, animals, and natural communities. Soils in the Town on Union Vale tend to be strongly to very strongly acidic. The exception to this is the Clove Valley area between Clove Mountain and East Mountain where the soils are generally slightly acidic, with smaller inclusions of more alkaline soil.

Table 2. Soils in the Town of Union Vale

Map Unit Symbol	Map Unit Name	Town Area	Drainage Class	Depth to Bedrock (inches)	Farmland	Reaction Class
BeB	Bernardston silt loam	0.10%	Well drained	>60	All areas are prime farmland	Strongly Acid
BeC	Bernardston silt loam	0.80%	Well drained	>60	Farmland of statewide importance	Strongly Acid
BeD	Bernardston silt loam	0.10%	Well drained	>60	Not prime farmland	Strongly Acid
Cc	Catden muck	1.30%	Very poorly drained	>60	Not prime farmland	
ChB	Charlton fine sandy loam	0.10%	Well drained	>60	All areas are prime farmland	Strongly Acid

[22] Heady, L., and G. Stevens. *Biodiversity Assessment Guidebook*, Hudsonia Ltd, 2018.

Map Unit Symbol	Map Unit Name	Town Area	Drainage Class	Depth to Bedrock (inches)	Farmland	Reaction Class
ChC	Charlton fine sandy loam	0.70%	Well drained	>60	Farmland of statewide importance	Strongly Acid
CrB	Charlton-Chatfield complex, undulating, rocky	0.30%	Well drained	20-40	All areas are prime farmland	Strongly Acid
CrC	Charlton-Chatfield complex, rolling, rocky	0.30%	Well drained	20-40	Farmland of statewide importance	Strongly Acid
CtB	Chatfield-Hollis complex, undulating, very rocky	0.50%	Well drained	<20	Not prime farmland	Strongly Acid
CtC	Chatfield-Hollis complex, rolling, very rocky	1.90%	Well drained	<20	Not prime farmland	Strongly Acid
DuB	Dutchess silt loam	3.80%	Well drained	>60	All areas are prime farmland	Strongly Acid
DuC	Dutchess silt loam	5.20%	Well drained	>60	Farmland of statewide importance	Strongly Acid
DuD	Dutchess silt loam	1.00%	Well drained	>60	Not prime farmland	Strongly Acid
DwB	Dutchess-Cardigan complex, undulating, rocky	5.20%	Well drained	20-40	All areas are prime farmland	Strongly Acid
DwC	Dutchess-Cardigan complex, rolling, rocky	8.60%	Well drained	20-40	Farmland of statewide importance	Strongly Acid

Map Unit Symbol	Map Unit Name	Town Area	Drainage Class	Depth to Bedrock (inches)	Farmland	Reaction Class
DwD	Dutchess-Cardigan complex, hilly, rocky	3.90%	Well drained	20-40	Not prime farmland	Strongly Acid
FeE	Farmington-Rock outcrop complex, steep	0.10%	Somewhat excessively drained	>60	Not prime farmland	Slightly Acid
Ff	Fluvaquents-Udifluvents complex, frequently flooded	1.50%	Poorly drained	>60	Not prime farmland	Moderately Acid
Fr	Fredon silt loam	0.30%	Somewhat poorly drained	>60	Prime farmland if drained	Slightly Acid
GfB	Galway-Farmington complex, undulating, rocky	0.30%	Well drained	<20	All areas are prime farmland	Slightly Acid
GfC	Galway-Farmington complex, rolling, rocky	0.40%	Well drained	<20	Farmland of statewide importance	Slightly Acid
GfD	Galway-Farmington complex, hilly	0.10%	Well drained	<20	Not prime farmland	Slightly Acid
GsA	Georgia silt loam	0.30%	Moderately well drained	>60	All areas are prime farmland	Slightly Acid
GsB	Georgia silt loam	3.30%	Moderately well drained	>60	All areas are prime farmland	Slightly Acid
GsC	Georgia silt loam	0.50%	Moderately well drained	>60	Farmland of statewide importance	Slightly Acid

Map Unit Symbol	Map Unit Name	Town Area	Drainage Class	Depth to Bedrock (inches)	Farmland	Reaction Class
Ha	Halsey mucky silt loam	0.10%	Very poorly drained	>60	Not prime farmland	Slightly Acid
HoC	Hollis-Chatfield-Rock outcrop complex, rolling	2.80%	Somewhat excessively drained	>60	Not prime farmland	Strongly Acid
HoD	Hollis-Chatfield-Rock outcrop complex, hilly	9.20%	Somewhat excessively drained	>60	Not prime farmland	Strongly Acid
HoE	Hollis-Chatfield-Rock outcrop complex, steep	0.30%	Somewhat excessively drained	>60	Not prime farmland	Strongly Acid
HoF	Hollis-Chatfield-Rock outcrop complex, very steep	3.30%	Somewhat excessively drained	>60	Not prime farmland	Strongly Acid
HsA	Hoosic gravelly loam, nearly level	0.80%	Somewhat excessively drained	>60	Farmland of statewide importance	Very Strongly Acid
HsB	Hoosic gravelly loam, undulating	1.20%	Somewhat excessively drained	>60	Farmland of statewide importance	Very Strongly Acid
HsC	Hoosic gravelly loam, rolling	0.80%	Somewhat excessively drained	>60	Farmland of statewide importance	Very Strongly Acid
HtA	Hoosic channery loam, fan	0.30%	Somewhat excessively drained	>60	Farmland of statewide importance	Very Strongly Acid
HtB	Hoosic channery loam, fan	1.10%	Somewhat excessively	>60	Farmland of statewide	Very Strongly

Map Unit Symbol	Map Unit Name	Town Area	Drainage Class	Depth to Bedrock (inches)	Farmland	Reaction Class
			drained		importance	Acid
MnA	Massena silt loam	1.00%	Somewhat poorly drained	>60	Prime farmland if drained	Slightly Acid
MnB	Massena silt loam	1.90%	Somewhat poorly drained	>60	Prime farmland if drained	Slightly Acid
NwB	Nassau-Cardigan complex, undulating, very rocky	0.70%	Somewhat excessively drained	<20	Not prime farmland	Very Strongly Acid
NwC	Nassau-Cardigan complex, rolling, very rocky	4.30%	Somewhat excessively drained	<20	Not prime farmland	Very Strongly Acid
NwD	Nassau-Cardigan complex, hilly, very rocky	7.00%	Somewhat excessively drained	<20	Not prime farmland	Very Strongly Acid
NxE	Nassau-Rock outcrop complex, steep	2.50%	Not rated	Not rated	Not prime farmland	
NxF	Nassau-Rock outcrop complex, very steep	2.00%	Somewhat excessively drained	>60	Not prime farmland	Very Strongly Acid
NyA	Natchaug muck	0.60%	Very poorly drained	>60	Not prime farmland	
Pg	Pawling silt loam	0.40%	Moderately well drained	>60	All areas are prime farmland	Moderately Acid

Map Unit Symbol	Map Unit Name	Town Area	Drainage Class	Depth to Bedrock (inches)	Farmland	Reaction Class
Ps	Pits, gravel	0.20%	Not rated	Not rated	Not prime farmland	
PwB	Pittstown silt loam	3.30%	Moderately well drained	>60	All areas are prime farmland	Strongly Acid
PwC	Pittstown silt loam	1.10%	Moderately well drained	>60	Farmland of statewide importance	Strongly Acid
PzA	Punsit silt loam	0.40%	Somewhat poorly drained	>60	Prime farmland if drained	Slightly Acid
PzB	Punsit silt loam	0.30%	Somewhat poorly drained	>60	Prime farmland if drained	Slightly Acid
SkB	Stockbridge silt loam	2.90%	Well drained	>60	All areas are prime farmland	Slightly Acid
SkC	Stockbridge silt loam	2.30%	Well drained	>60	Farmland of statewide importance	Slightly Acid
SmB	Stockbridge-Farmington complex, undulating, rocky	0.30%	Well drained	<20	All areas are prime farmland	Slightly Acid
SmC	Stockbridge-Farmington complex, rolling, rocky	0.10%	Well drained	<20	Farmland of statewide importance	Slightly Acid
Su	Sun silt loam	4.60%	Poorly drained	>60	Farmland of statewide	Moderately Acid

Map Unit Symbol	Map Unit Name	Town Area	Drainage Class	Depth to Bedrock (inches)	Farmland	Reaction Class
					importance	
Ud	Udorthents, smoothed	0.20%	Well drained	>60	Not prime farmland	Moderately Acid
Ue	Udorthents, wet substratum	0.10%	Somewhat poorly drained	>60	Not prime farmland	Moderately Acid
Wy	Wayland silt loam	2.30%	Poorly drained	>60	Not prime farmland	Slightly Acid

* The final letter in each soil unit code (i.e., the “A” in “CaA”) refers to slope. Slopes are given letter codes A-F, with “A” signifying the gentlest slopes and “F” the steepest. The absence of a final uppercase letter indicates more-or-less flat terrain.

A	0-3%	level to gently sloping
B	3-8%	gently sloping
C	3-15%	gently to strongly sloping
D	15-35%	strongly sloping to steep, or hilly
E	25-45%	moderately steep to very steep
F	>45%	extremely steep

Section 4: Water Resources

Aquifers and Water Supply (Map 8)

> **Major Aquifers** are unconsolidated deposits of sand and gravel that are capable of storing large quantities of water.

The **Aquifers and Water Supply** map shows features that are important to Union Vale's water supply. The natural areas and surface waters of Union Vale recharge the private wells supplying drinking water to the town's residents and businesses. The map shows these surface water features and groundwater aquifers that are important for supplying a sufficient quantity of water for residential and commercial use. The rural character of the community—with its many lakes, wetlands, and groundwater aquifers—helps provide natural filtration that improves water quality.

The Town's residents rely exclusively on water in private wells supplied by aquifers and other groundwater stored in the cracks and fractures of bedrock. **Major aquifers** are unconsolidated deposits of sand and gravel that can store large quantities of water. Aquifers also provide important base flow to streams during dry periods of the year. The map displays **Aquifer Protection Areas** that were mapped in 1992 by the University of New Hampshire GIS lab for Horsley, Witten and Hegemann, Inc., consultants to the Dutchess County Water and Wastewater Authority. Several communities in Dutchess County, including Beekman, NY, have used these areas as the basis for Aquifer Protection Overlay districts in their zoning code.

Hydraulic conductivity is a measure of the ability of a material to transmit water. In unconsolidated deposits, defined by loose materials such as silt, clay, sand, and gravel, permeability depends on the degree of air flow between these materials. In bedrock, permeability depends on the degree of fracturing and how well the rock fractures, crevices, and cavities interconnect. The higher the permeability of a material, the greater the potential immediate yield, again, providing there is adequate recharge to replenish the withdrawal.[23]

Public water supply catchments refer to the geographic areas that drain to a public water supply reservoir or water intake. Both surface water and groundwater in these areas contribute to the public water supply systems. It is possible that downstream communities rely on headwater streams in Union Vale to provide clean water to fill their reservoirs or supply intakes along streams. The unique land and vegetation characteristics of public water supply catchments are directly linked to the water quantity and quality of the supply system. Wetlands, streams, and lakes capture runoff and play a crucial role in providing a sufficient quantity of clean water to public drinking water systems. They are susceptible to degradation by bacteria and pollutants from sources in their drainage area. These surface water features also help recharge groundwater wells, impacting groundwater quality. Human activities and land use in

[23] *The Natural Resource Inventory of Dutchess County, NY*. Cornell Cooperative Extension Dutchess County. 2010. https://www.dutchessny.gov/Departments/Planning/Docs/nritoc.pdf

the public water supply catchments also have the potential to impact the quantity and quality of the water supply. Urban development, land clearing, agriculture, application and improper storage of chemicals, and the use of septic systems may all contribute to the condition of water. It is imperative that land use in these catchment areas is managed to ensure clean water.

Areas of Union Vale adjacent to Fishkill Creek are sensitive to groundwater contamination.
Town of Union Vale

Aquifer protection areas in Union Vale lie largely in the Clove Valley area, with permeable deposits directly overlying the aquifer along the floor of the valley and less permeable deposits located upgradient on Clove and East mountains. Aquifers and wellhead protection areas within the Environmental Resource Overlay zoning district are subject regulation by the Planning Board. See the **Zoning** section of the NRI for more information. The 2001 Union Vale Master Plan suggests assessing the current zoning to determine how it might better protect the Town's sole drinking water resource – its aquifers. The plan further suggests seeking a "sole source aquifer" designation from the US Environmental Protection Agency to provide additional protection.[24]

It is important to avoid the siting of potentially contaminating land uses near local wells. Understanding the boundaries of these drainage areas is important in order to identify potential sources of contamination and estimate pollutant travel times. Wells may be contaminated by naturally occurring sources or human activities, including residential, commercial, agricultural, or industrial sources. The US Geological Survey publication *Groundwater and the Rural Homeowner*[25] discusses common well contamination problems and some remedies.

[24] *Town of Union Vale: Master Plan*. 2001. http://nebula.wsimg.com/7ad4452f40eba6fd5da93479c4d3a79e?AccessKeyId=DE12759CD62206A763E1&disposition=0&alloworigin=1

[25] *Groundwater and the Rural Homeowner.* US Geological Survey, 1994. https://pubs.usgs.gov/gip/gw_ruralhomeowner/index.html

Town of Union Vale

Dutchess County, NY

Natural Resources Inventory - 2020

8. Aquifers

0 0.25 0.5 1 Mile

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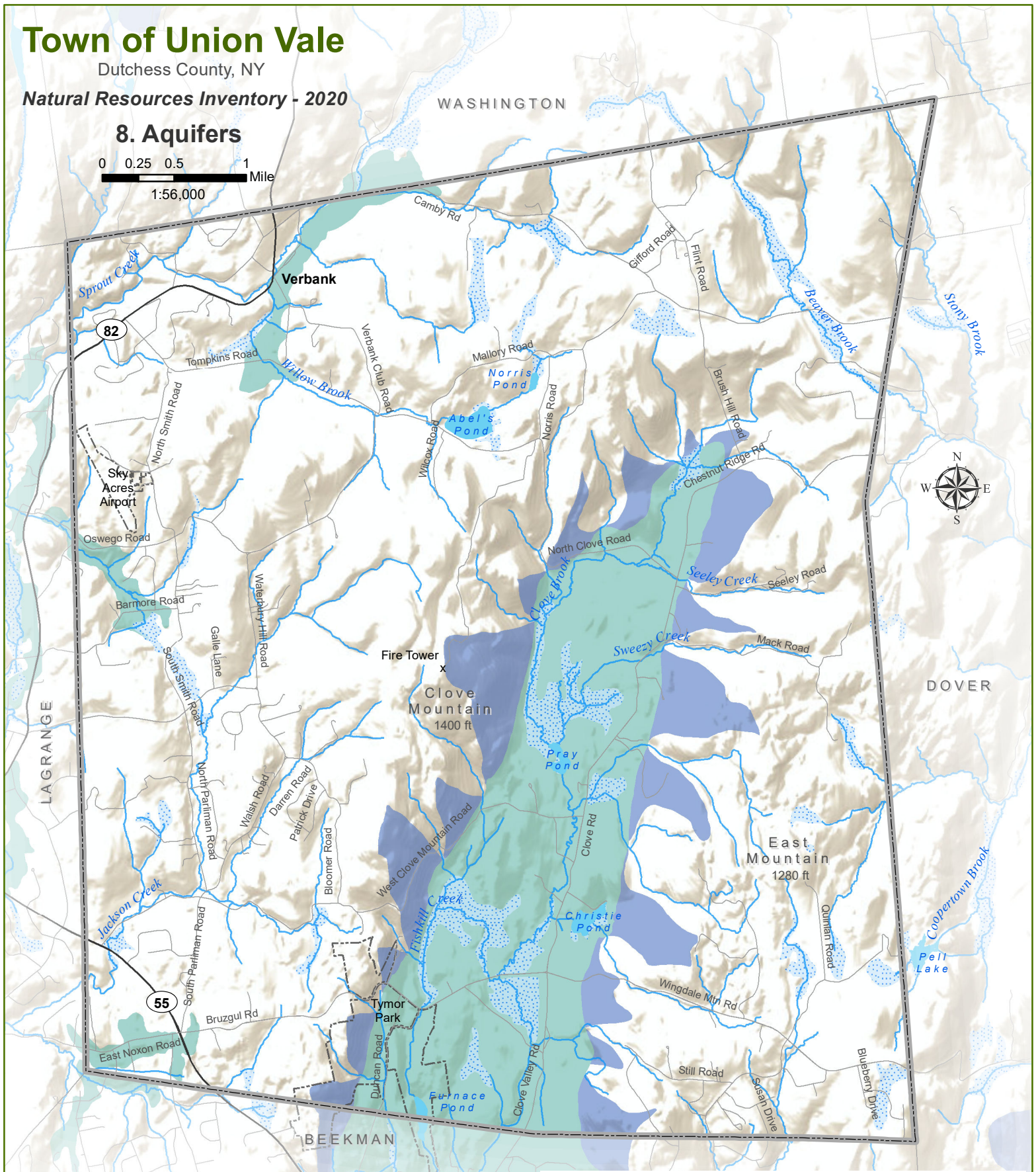

Major Road

Local Road

Waterbody

Stream

DEC Regulatory Wetland

Aquifer Protection Areas

Zone 1: Permeable deposits directly overlying the aquifer

Zone 2: Less permeable deposits located upgradient from the aquifer

DATA SOURCES

Municipal Boundary: Dutchess County Real Property, 2020
Roads: Dutchess County OCIS, 2019
Water: National Hydrography Dataset, 2012
Wetlands: NYSDEC Regulatory Freshwater Wetlands, 2002
Aquifer Protection Areas: Water Supply Protection Program for Dutchess County, 1992

Prepared by: CCEDC GIS Lab, 2020

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Streams and Watersheds (Map 9)

A **watershed** is the area of land from which water drains into a river, lake or other waterbody. Watersheds are divided by high points on the land such as ridges, mountains and hills. Watersheds are nested, with smaller catchments or subwatersheds existing within larger watersheds. There is a strong relationship between land use and water quality in streams, wetlands, and other waterbodies. Land and water are connected through the interactions of water, soil, organisms, and chemical components. Healthy watersheds can recharge groundwater, reduce erosion and flooding impacts, minimize public infrastructure, and be more resilient to climate change—all ecosystem services that directly benefit Union Vale and cost less than the alternatives.[26]

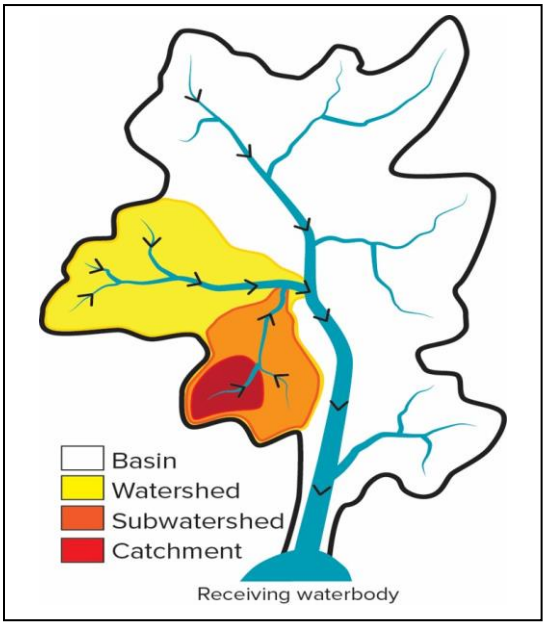

Figure 2. *Nested watersheds within a larger drainage basin. Source: DEC*

Major watersheds in the Town are shown on the **Watersheds Map**. Standard watershed boundaries for the entire U.S. have been created through the United States Geologic Survey (USGS) National Hydrography Dataset in a nested hierarchy by size and are referred to by their Hydrologic Unit Code (HUC) scale. The finest scale of standardized watershed data available for New York State are the HUC-12 watershed boundaries, delineated to encompass less than 40,000 acres or about 60 square miles each. The USGS StreamsStats tool can be used to delineate watersheds at a finer scale where desired.

Streams and waterbodies on this and other maps in the inventory are also from the USGS National Hydrography Dataset and were digitized from air photos. Perennial streams flow continuously throughout years with normal precipitation, but some may dry up during droughts. Intermittent streams only flow seasonally or after rain and are frequently unmapped. Intermittent streams are in fact widespread, accounting for an estimated 59% or more of total stream length in the United States. The US Environmental Protection Agency compiled an extensive scientific review highlighting their essential role in maintaining water quantity, quality, and overall watershed function or health.[27] Intermittent streams also play a vital role in dissipating stream energy during storms and reducing erosion and downstream flood impacts. By visiting sites and creating more accurate maps the Town can ensure that intermittent streams are identified and considered during planning and project review. See

[26] "The Economic Benefits of Protecting Healthy Watersheds." US Environmental Protection Agency, 2015. https://www.epa.gov/sites/production/files/2015-10/documents/economic_benefits_factsheet3.pdf

[27] *Connectivity of Streams and Wetlands to Downstream Waters: A Review and Synthesis of the Scientific Evidence (Final Report)*. U.S. Environmental Protection Agency, EPA/600/R-14/475F, 2015, Washington, DC. https://cfpub.epa.gov/ncea/risk/recordisplay.cfm?deid=296414

the **Stream Habitat** section for further discussion of stream values.

Healthy watersheds can:

- recharge groundwater
- reduce erosion and flooding impacts
- minimize public infrastructure
- be more resilient to climate change

The headwaters of the Fishkill Creek are at the foot of Clove Mountain where Seeley Creek, Clove Brook, and Sweezy Creek converge in Pray Pond. The creek flows southwest, entering the Hudson River at the City of Beacon. On the west side of Clove Mountain, Jackson Creek flows south where it meets with Sprout Creek which eventually drains into the Fishkill Creek. The Fishkill Creek basin covers approximately 194 square miles. It drains large parts of Union Vale, Beekman, East Fishkill, and Fishkill, and a smaller portion of Wappinger. Sprout Creek, Fishkill Creek's primary tributary, drains major sections of LaGrange and Union Vale and small portions of Wappinger and East Fishkill. The land cover and land use in the Fishkill basin grades from forest, agriculture and low-density residential in the upper basin to higher-density and urban nearer Beacon.[28]

Most of the streams in Union Vale drain into the Hudson River estuary. The Hudson River Estuary Program provides technical assistance, grants, and training to municipalities and non-profits within the **Hudson River estuary watershed**. The Fishkill Creek Watershed Association is a non-profit community group that worked with the Dutchess County Environmental Management Council to create a Natural Resources Management Plan for the watershed. This group is currently inactive.

Some streams in the eastern part of the town are in the Swamp River and Tenmile River sub-watersheds, both in the greater **Housatonic River watershed**. Tenmile River joins the Housatonic River near Kent, CT. The Housatonic Valley Association is a non-profit watershed group that "works to conserve the natural character, environmental health and the economies of the region by protecting and restoring its lands and waters."

[28] *The Natural Resource Inventory of Dutchess County, NY*. Cornell Cooperative Extension Dutchess County. 2010. https://www.dutchessny.gov/Departments/Planning/Docs/nritoc.pdf

Table 3. Watersheds in the Town of Union Vale

HUC-10 Watershed	HUC-12 Watershed	Acres	2016 Forest Cover (%)	2016 Impervious Cover (%)
Fishkill Creek (Hudson River Watershed)	Sprout Creek	35,049	54.9	3.8
	Clove Brook – Fishkill Creek	16,522	62.2	2.4
	Whaley Lake Stream	11,423	64.5	2.5
Tenmile River (Housatonic River Watershed)	Swamp River	30,563	64.2	2

Land cover is closely linked to the health of a watershed and the quality of its surface and subsurface waters. **Table 3** shows each mapped watershed, its size, and the percent impervious and forest cover within each respective watershed. Some studies strongly suggest that there are critical thresholds of impervious cover (e.g. roofs, pavement, and other development) in a landscape. Specifically, researchers have demonstrated that where watersheds exceed 10% impervious surface cover, the probability of stream degradation greatly increases.[29] [30] In research undertaken in several small Dutchess County watersheds, impacts to nutrient levels in streams have been found in watersheds with less than 5% impervious cover.[31] Conversely, other studies have shown that watersheds with a greater percentage of forest cover are generally associated with higher water quality and can produce significant savings on drinking water treatment costs[32]. Of the four watersheds that comprise most of the Town (i.e. Sprout Creek, Clove Brook – Fishkill Creek, Whaley Lake Stream, and Swamp River), Whaley Lake Stream has the highest percentage of forest cover at about 64.5% and one of the lower percentages of impervious cover (2.5%).

[29] National Research Council, Committee on Reducing Stormwater Discharge Contributions to Water Pollution. 2008. Urban Stormwater Management in the United States. Water Science and Technology Board, Division of Earth and Life Studies of the National Research Council. National Academies Press, Washington D.C., pp 529. http://www.epa.gov/npdes/pubs/nrc_stormwaterreport.pdf

[30] Walsh C.J., A.H. Roy, J.W. Feminella, P.D. Cottingham, P.M Groffman, and R.P Morgan III. 2005 The Urban Stream Syndrome: Current Knowledge and the Search For A Cure. Journal of the North American Benthological Society, 24(3):706-723 pp18

[31] Cunningham M.A., C.M. O'Reilly, K.M. Menking,, D.P. Gillikin, K.C. Smith, C.M Foley, S.L Belli, A.M. Pregnall, M.A. Schlessman, and P. Batur. 2009. The Suburban Stream Syndrome: Evaluating Land Use and Stream Impairments in the Suburbs. Physical Geography. 30, 3, pp 269-284.

[32] "The Economic Benefits of Protecting Healthy Watersheds." US Environmental Protection Agency, 2015. https://www.epa.gov/sites/production/files/2015-10/documents/economic_benefits_factsheet3.pdf

Town of Union Vale

Dutchess County, NY

Natural Resources Inventory - 2020

9. Streams & Watersheds

0 0.25 0.5 1 Mile

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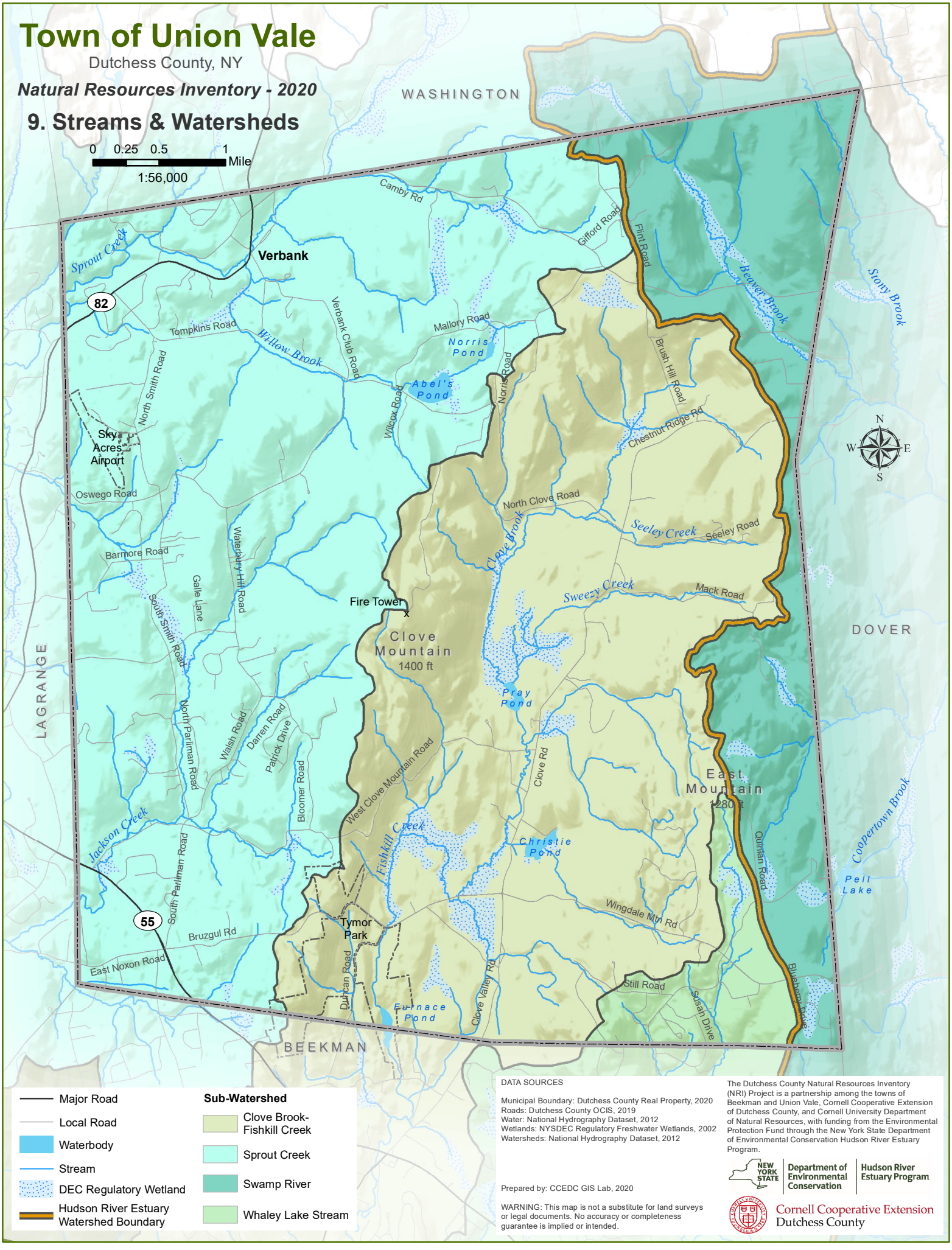

- Major Road
- Local Road
- Waterbody
- Stream
- DEC Regulatory Wetland
- Hudson River Estuary Watershed Boundary

Sub-Watershed

- Clove Brook-Fishkill Creek
- Sprout Creek
- Swamp River
- Whaley Lake Stream

DATA SOURCES

Municipal Boundary: Dutchess County Real Property, 2020
Roads: Dutchess County OCIS, 2019
Water: National Hydrography Dataset, 2012
Wetlands: NYSDEC Regulatory Freshwater Wetlands, 2002
Watersheds: National Hydrography Dataset, 2012

Prepared by: CCEDC GIS Lab, 2020

WARNING: This map is not a substitute for land surveys or legal documents. No accuracy or completeness guarantee is implied or intended.

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Water Quality Classification (Map 10)

NYSDEC designates the "best uses" that a waterbody should be supporting. Waterbodies are classified by the letters A, B, C, or D for freshwater. The letter classifications and their best uses are described in regulation NYS regulation 6 NYCRR Part 701. For more information about classifications, see the NYSDEC's webpage on Water Quality Standards and Classifications.[33] For each class, the designated best uses are defined as follows:

Activities allowed in and around waterbodies are regulated by NYSDEC based on their classification and standard.

- C**lassification AA or A** is assigned to waters used as a source of drinking water.
- **Classification B** indicates a best usage for swimming and other contact recreation, but not for drinking water.
- **Classification C** is for waters supporting fisheries and suitable for non-contact activities.
- C**lassification D** is the lowest classification and standard.

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. The **Water Quality Classifications Map** shows the water quality classifications of surface waters in the town. 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 their assigned classification and uses an anti-degradation policy to protect and maintain high-quality streams.

Note that not all waterbodies appear on classification maps. However, the missing waterbodies will always have a classification. Waterbodies that do not appear on classification maps and have flow all year (perennial flow) have the classification of the waterbody into which they flow. Waterbodies that do not appear on these maps and have seasonal or intermittent flow seasonally have a classification of "D." DEC has the final authority to determine if a waterbody has perennial or intermittent flow.

NYSDEC also establishes water quality standards, specific for particular parameters and pollutants, to protect the uses associated with these classifications. These standards are found in NYS regulation 6

[33] "Water Quality Standards and Classifications." NYS Department of Environmental Conservation. https://www.dec.ny.gov/chemical/23853.html

The DEC classifies Sprout Creek as a Class B stream trout stream.
Jen Rubbo

NYCRR Part 703. Standards can be numerical or narrative. For example, dissolved oxygen has a numerical standard of no less than 7.0 mg/l in trout spawning waters. Turbidity has a narrative water quality standard which states there should be "no increase that will cause a substantial visible contrast to natural conditions." Information on surface water and groundwater quality standards can be found at Surface Water and Groundwater Quality Standards.[34] If waterbodies are not supporting the standards for their best uses, they may be listed on the Priority Waterbody List as impaired (see the **Waterbody Impairment** section).

Activities allowed in and around waterbodies are regulated 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.[35] NYSDEC regulates the bed and banks of protected streams, defined as the areas immediately adjacent to and sloping toward the stream, extending 50 feet or more. 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.[36] In situations where streams are unmapped in DEC databases, perennial streams share the classification of the receiving stream, while intermittent streams become Class D.

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, which can include perennial streams and intermittent streams. This regulatory authority also covers estuaries, marshes, tidal marshes and other wetlands inundated at mean high water level or tide that are adjacent and contiguous at any point to any of New York State's 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.

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[34] "Surface Water and Groundwater Quality Standards." NYS Department of Environmental Conservation. http://www.dec.ny.gov/regs/4590.html

[35] "Protection of Waters Program." NYS Department of Environmental Conservation. https://www.dec.ny.gov/permits/6042.html

[36] "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

While the regulations stemming from stream classifications provide a level of protection from damage to the bed and banks of protected streams, lack of jurisdiction on "non-protected streams" and on stream buffers more broadly may be an opportunity for local-level protection efforts. Local level stream protection efforts can play an important role in comprehensive watershed protection.

The Town of Union Vale does not currently have any municipal law that directly protects "non-protected streams" or their adjacent areas but Section 210-29 of the town code requires a special permit for some actions within a 100-foot adjacent area of DEC-classified streams, water bodies greater than ¼-acre, and DEC-regulated wetlands within the Town.[37]

[37] Town of Union Vale Zoning Code. Section 210-29 Development near streams, wetlands and waterbodies. https://ecode360.com/7977416

Town of Union Vale

Dutchess County, NY

Natural Resources Inventory - 2020

10. Water Quality Classification

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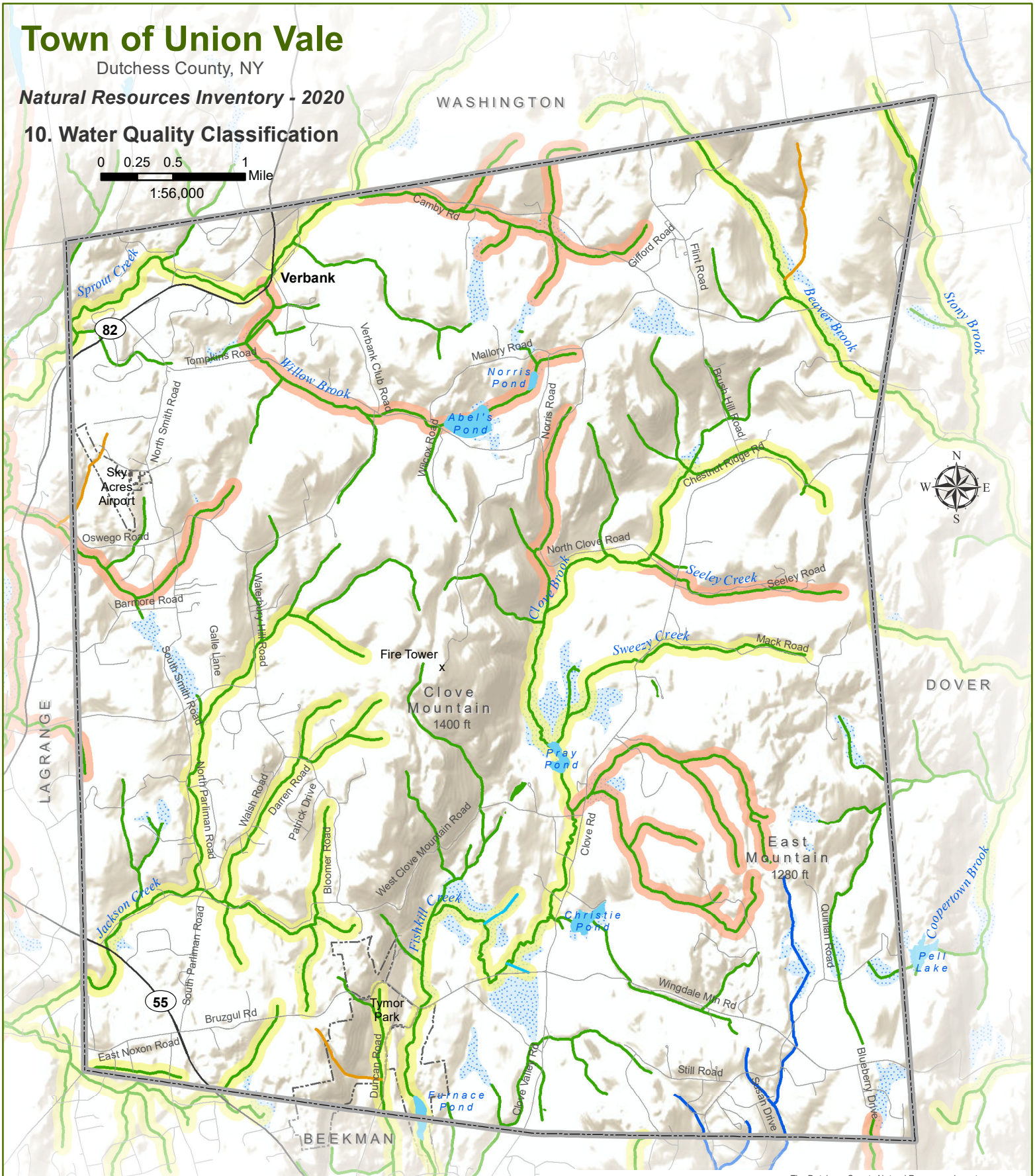

Major Road

Local Road

Waterbody

Stream

DEC Regulatory Wetland

Stream Classification

A

B

C

D

Trout Habitat

Trout Spawning

DATA SOURCES

Municipal Boundary: Dutchess County Real Property, 2020
Roads: Dutchess County OCIS, 2019
Water: National Hydrography Dataset, 2012
Wetlands: NYSDEC Regulatory Freshwater Wetlands, 2002
Water Quality Classification: NYSDEC 2010

Prepared by: CCEDC GIS Lab, 2020

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Waterbody Monitoring and Assessment (No Map)

The New York Department of Environmental Conservation (DEC) monitors water quality through several routine statewide monitoring programs and publishes assessments that describe the quality of water resources. A waterbody's assessment results, compared with its classification, provides an understanding of its health and can lead to the designation of a stream or waterbody as impaired. A waterbody's level of impairment influences which programs, opportunities, and responsibilities the community has for addressing problems.

The NYS **Waterbody Inventory/ Priority Waterbodies List (WI/PWL)** is a document that lists New York State waterbodies and information about water quality in relation to the state's waterbody classifications

Lake Assessments

Lakes, ponds, and reservoirs are monitored through the Lake Classification and Inventory Program (LCI) and through the Citizens Statewide Lake Assessment Program (CSLAP). The first program is conducted by DEC staff, and the second is directed by DEC but run by volunteers from lake associations. *Diet for a Small Lake: The Expanded Guide to New York State Lake and Watershed Management* is a compendium of information about the ecology, monitoring, and management of lakes and watersheds in New York State. The guide is written for both lake residents and professionals.

Stream Assessments

The DEC's Stream Biomonitoring Unit conducts biomonitoring sampling throughout New York State. Based on the number and kinds of macroinvertebrates, each sample receives a Biotic Assessment Profile (BAP) score. A BAP score integrates several community characteristics to calculate a single water quality score. BAPs range from 0 to 10, with 10 being the healthiest.

In addition, DEC Division of Water runs a citizen monitoring program for biomonitoring called Water Assessments by Volunteer Evaluators (WAVE). Citizen monitors visit a stream and collect and identify stream organisms. WAVE data is included in federal and state water quality reports and will be used to focus DEC assessments and local restoration efforts to where they are most needed. WAVE is particularly useful for *Unassessed* waterbodies.

Impairment

The Waterbody Inventory/Priority Waterbodies List (WI/PWL) is a document that lists New York State waterbodies and information about their water quality. The WI/PWL documents support (or impairment) of water uses, overall assessment of water quality, causes and sources of water quality impact/impairment, and the status of restoration, protection and other water quality activities and efforts. WI/PWL information is used to identify those water quality issues and specific waterbodies where efforts will have the greatest impact and benefit, objectively evaluate needs for project funding, monitor water quality improvement, and record and report changes over time. The WI/PWL includes waterbody fact sheets outlining the most recent assessment of support for best uses, identification of water quality

problems and sources, and a summary of activities to restore and protect each individual waterbody.

The WI/PWL records for the Town of Union Vale can be found in the table below. The majority of the Town's waterbodies are unassessed, however, Jackson Creek and Upper Sprout Creek and their tributaries rated as having 'no known impact,' the highest quality rating available. Only a small portion of the Swamp River headwaters was rated as having 'minor impacts,' likely due to excess nutrients from agricultural practices far downstream at the sampling site in Dover Plains. Based on other datasets in the NRI, it is highly likely that the small portion of the stream in Union Vale has exceptional water quality.

Table 4. Waterbody Inventory/Priority Waterbodies List for the Town of Union Vale

Waterbody		Assessment	Likely Pollution Sources
Lake	Furnace Pond	Unassessed	Unassessed
	Christie Pond	Unassessed	Unassessed
	Pray Pond	Unassessed	Unassessed
Stream	Jackson Creek and tributaries	No Known Impact	N/A
	Upper Sprout Creek and tributaries	No Known Impact	N/A
	Lower Swamp River and minor tributaries	Minor Impacts	Agriculture
	Upper Fishkill Creek and minor tributaries	Unassessed	Unassessed
	Mill River and tributaries	Unassessed	Unassessed
	Upper Gardner Hollow Brook and tributaries	Unassessed	Unassessed

Floodplains and Riparian Areas (Map 11)

Floodplains and riparian buffers provide many critical functions for a healthy stream and its watershed. Successful stream management done on a watershed scale must include the condition and connection of a stream to its floodplain and adjacent riparian areas.

Floodplains are low-lying areas, often next to streams and rivers, which are inundated during heavy precipitation or snowmelt events. They are naturally connected to streams but can extend far from a stream or river and aren't necessarily found alongside of them. Flooding is a natural process and is one way a stream reacts to an increase in water coming into it. Streams of all sizes can have floodplains at various locations along their length. The total size of a floodplain and its distance from and connection to a stream can vary greatly with topography and other local conditions.

When left in a natural state, floodplains act as a natural infrastructure, providing a safety zone between people and the damaging waters of a flood. They provide the space streams need to expand, contract, and sometimes change course. Building in floodplains increases the risk of property damage and loss of life. The location of floodplain boundaries can change over time and in response to climate change, changes in land use in and around the floodplain and in the surrounding watershed, obstructions in the floodway, stream projects (including dams and levees), and natural stream processes.

Sections 135 (Flood Damage Prevention), 192 (Subdivision of Land), and 210 (Zoning) in Union Vale's town code describe local floodplain protections and regulations. See the **Zoning** section for a more detailed explanation of section 210.

The Floodplains and Riparian Areas Map shows flood hazard areas mapped by the Federal Emergency Management Agency (FEMA) for the National Flood Insurance Program (NFIP).[38] Flood insurance rate maps (FIRM) show areas estimated to have a 1% chance (1 in 100) or greater probability of being inundated in any given year, areas commonly referred to as the 100-year floodplain. Some narrow additional flood hazard areas are mapped by FEMA with a 0.2% chance (1 in 500) or greater probability of flooding in any given year (referred to as the "500-year flood"). Map 11 shows data from FEMA Digital FIRM, including the floodway, 1% annual chance (with and without 1-3 foot average depths) and .2% annual chance floods. FEMA has recently updated many flood hazard maps across the country to reflect physical changes in floodplains, new data, and improved modeling capabilities. The data used in this map was effective as of May 2012. The largest floodplains mapped by FEMA include those associated with Clove Brook and Fishkill Creek. Other mapped floodplains include those adjacent to Sprout Creek, Jackson Creek, Willow Brook and their tributaries.

[38] "National Flood Insurance Program." Federal Emergency Management Agency. https://www.fema.gov/national-flood-insurance-program

The floodplain map is a valuable tool, but it is important to note that FIRMs are only estimates based on the data and modeling technology available at the time of mapping. Due to the unpredictable nature of some kinds of floods, they often omit many areas subject to flooding from localized drainage problems, including undersized culverts, ice jams or sheet flooding down a slope. Climate change is furthermore changing precipitation patterns and increasing flood frequency in the Hudson Valley – annual rainfall occurring in heavy downpour events across the Northeast increased 74% between the periods of 1950-1979 and 1980-2009.[39] See the **Climate** section for more information.

Floodplains and riparian areas perform many functions:

- prevent erosion
- habitat for plants and wildlife
- temporary storage of flood waters
- moderate peak flows
- maintain water quality
- recharge groundwater
- recreational opportunities
- aesthetic benefits

Riparian areas including the floodplain as well as buffers adjacent to streams, ponds, wetlands, and other waterbodies 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. Riparian areas help clean water by intercepting runoff and filtering sediment and nutrients. They can attenuate flooding by slowing down and absorbing floodwaters. Forested 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.

From the standpoint of stream protection, naturally vegetated riparian buffers provide different functions depending on width.[40] In general, wider buffers provide better habitat connectivity and more protection to the water quality of streams and other waterbodies. Recent studies recommend 100 feet as the minimum buffer width to improve wildlife habitat, water quality and storm resiliency. Riparian buffers of 300 feet or more provide the greatest opportunity for natural functions to benefit ecological and human communities. While narrower buffers could still provide viable functions and critical protections, protecting existing buffers and restoring degraded ones can help protect streams.

The riparian areas shown were mapped by the New York Natural Heritage Program for the Statewide Riparian Opportunity Assessment.[41] They are delineated around streams based on digital elevation data,

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[39] 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, Albany, NY. www.nyserda.ny.gov/climaid

[40] Sweeney, B.W. and Newbold, J.D. Streamside forest buffer width needed to protect stream water quality, habitat, and organisms: a literature review. JAWRA Journal of the American Water Resources Association, 50(3), pp.560-584, 2014.

[41] 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

known wetlands, and modeling for the 50-year flood zone. The riparian areas overlap with FEMA floodplain data in the map. 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 and stream protection efforts. The Hudson River Estuary Program's "Trees for Tribs" initiative offers free consultation and native trees and shrubs for qualifying streamside buffer planting projects in the estuary watershed.[42]

Floodplain Forests are a subset of floodplain habitats that host a unique assemblage of plants and animals adapted to regular disturbance. The Hawthorne Valley Farmscape Ecology Program describes these locally-rare habitats in their 2010 report titled, *Floodplain Forests of Columbia and Dutchess Counties, NY: Distribution, Biodiversity, Classification, and Conservation*. The authors identify the areas immediately north of Pray Pond, along Clove Brook and its tributaries, as the largest concentration of both 'ancient' forest' (greater than 70 years old) and recently reforested floodplains.

[42] "Hudson River Estuary Trees for Tribs Program." NYS DEC Hudson River Estuary Program. http://www.dec.ny.gov/lands/43668.html

Town of Union Vale

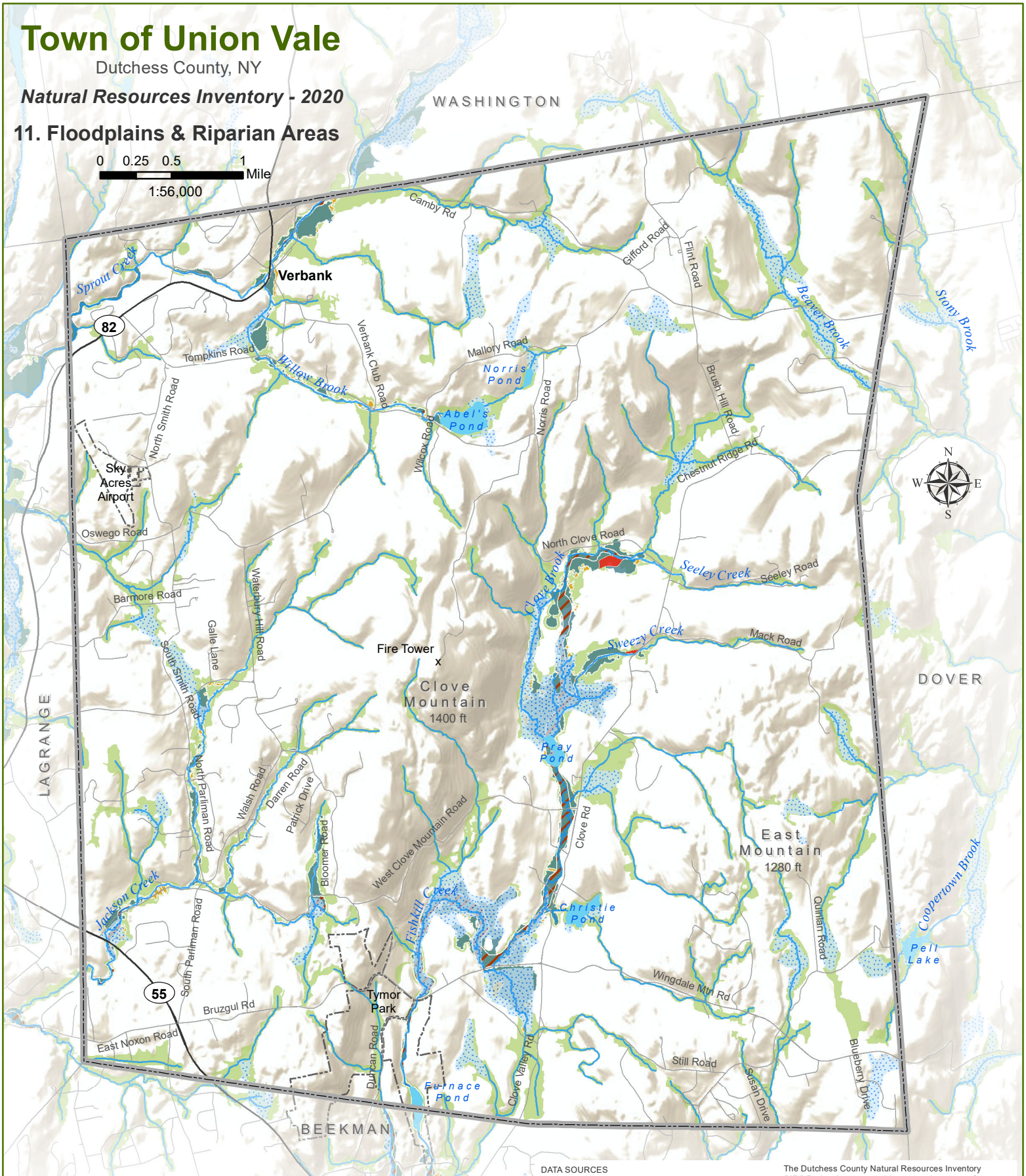
Dutchess County, NY

Natural Resources Inventory - 2020

11. Floodplains & Riparian Areas

0 0.25 0.5 1 Mile

1:56,000



Major Road

Local Road

Waterbody

Stream

DEC Regulatory Wetland

Riparian Area (NYNHP)

FEMA Flood Hazard Zones

Floodway

1% annual chance (100-year flood)

1% annual chance (100-year flood) with 1-3 ft average depths

.2% annual chance (500-year flood)

DATA SOURCES

Municipal Boundary: Dutchess County Real Property, 2020
Roads: Dutchess County OCIS, 2019
Water: National Hydrography Dataset, 2012
Wetlands: NYSDEC Regulatory Freshwater Wetlands, 2002
Flood Areas: FEMA DFIRM (Effective May 2012)
Riparian Areas: New York Natural Heritage Program, 2018

Prepared by: CCEDC GIS Lab, 2020

WARNING: This map is not a substitute for land surveys or legal documents. No accuracy or completeness guarantee is implied or intended.

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NEW YORK STATE | Department of Environmental Conservation | Hudson River Estuary Program

Cornell Cooperative Extension Dutchess County

Stream Habitats (Map 12)

From headwater creeks to meandering lowland rivers, Union Vale supports a variety of streams and rivers illustrated in the Stream Habitats map. The Town's streams are an important water resource and support diverse aquatic life, as well as recreational activities like fishing and boating. Stream infrastructure, such as dams and culverts, plays an important role in determining connectivity and access to stream habitat for fish and other aquatic species.

> *"In-stream and river environments provide critical biological resources including fish, eels, invertebrates, and plants that contribute to on-shore ecosystems and even to human food supplies."*
>
> - ***Dutchess County Natural Resources Inventory (2010)***

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. Intermittent and epehmeral streams make up 50-80% of stream miles in a river system.[43]

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.

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 material, and nutrients that benefit fish and other aquatic life. When inundated, floodplains also provide important fish breeding and

[43] https://www.americanrivers.org/conservation-resource/small-streams-wetlands/

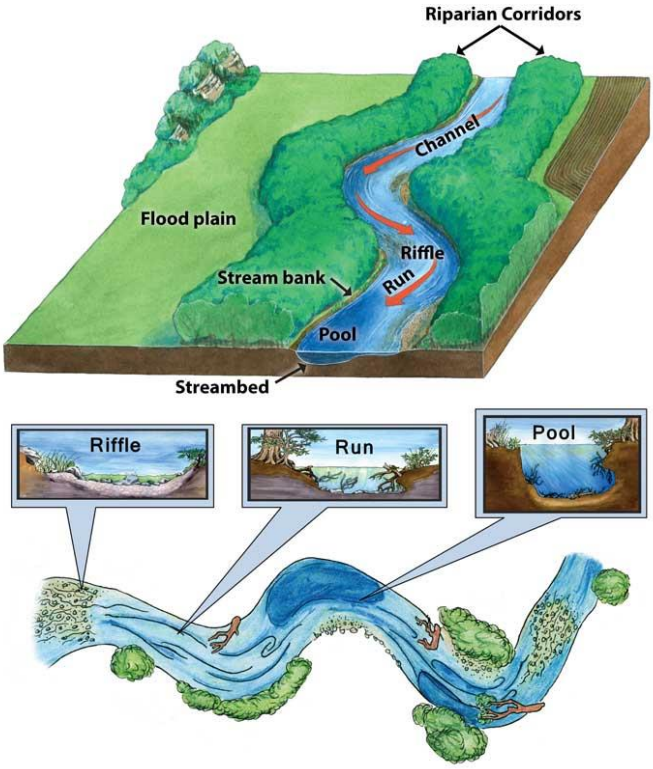

Figure 3. Stream Features
https://texasaquaticscience.org/streams-and-rivers-aquatic-science-texas/

nursery habitat areas. Many other wildlife species also depend on riparian and floodplain habitats and use them as travel corridors. See the Floodplains and Riparian Areas map for more information.

Trout Habitat 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. The New York State Department of Environmental Conservation's (DEC) Water Quality Standards provide a starting point for identifying trout or trout-spawning stream habitat and suggest there is cold-water habitat suitable for trout in Jackson Creek, Fishkill Creek, Clove Brook, Sprout Creek, Beaver Brook, Stony Brook and some of their tributaries. Trout-spawning habitat was identified in tributaries to Fishkill Creek and Clove Brook, including Seely Creek. The headwaters of Sprout Creek, including Willow Brook, are also designated as trout-spawning waters. The widespread nature of Union Vale's trout habitat indicates exceptional stream habitat throughout the Town.

Important Coldwater Stream Habitat
The map identifies important areas for sustaining coldwater stream habitat based on DEC fish survey records and habitat modeling from the New York Natural Heritage Program. Coldwater streams are important to maintaining native wild brook trout and other coldwater fishes in region-wide decline due to habitat loss, fragmentation, and degradation. Mapped areas include wild brook trout locations identified in DEC fish surveys since 1980, as well as buffers along associated stream and waterbody segments to account for lands most likely to contribute to the continued presence and quality of the stream habitat. The headwaters of Jackson Creek and Sprout Creek and its tributaries contain important coldwater stream habitat.

Dams and Culverts
Infrastructure in streams, such as dams and culverts, serve important functions, protecting roadways, generating energy, storing drinking water, and providing recreation opportunities. However, they can also create barriers that disconnect and decrease available habitat to fish and other aquatic organisms

Furnace Pond Dam, in Tymor Park, limits the movement of trout and other fish species.
Aki Busch

that use stream corridors. Dams and culverts can present physical barriers to passage, and these structures can also become impassable by changing water temperature or velocity. Dams can also cut off streamflow to downstream reaches during dry periods, especially common when the water behind the dam is consumed or diverted for other purposes. Streams flowing into undersized culverts can flood upstream and, in some cases, overtake and wash out a road during heavy precipitation or snowmelt. Although lakes and wetlands that form behind a dam can create beneficial wetland and open water habitat for a variety of species, protecting and restoring free-flowing streams should be evaluated where possible to restore stream habitat for species of greatest conservation need such as brook trout and American eel. These benefits should be considered together with other factors such as public safety, cost of infrastructure maintenance, recreation value, and existing habitat that would be altered.

Dam locations are provided from the New York State Inventory of Dams. While the DEC tries to maintain an accurate inventory, this data should not be relied upon for emergency response decision-making. Note that assessments by the DEC Hudson River Estuary Program in trial watersheds indicate that perhaps two to three times as many barriers exist than are recorded in the NYS Inventory of Dams. Although it is shown on the map, the McKinney Pond Dam, north of Bruzgul Road, was recently breached. The newly exposed floodplain is now the target of reforestation efforts by the Town, Riverkeeper, and the DEC Hudson River Estuary Program.

Culvert data was not available during the writing of this report, however, future assessments can be accessed using the North Atlantic Aquatic Connectivity Collaborative (NAACC), a network focused on improving aquatic habitat connectivity across the Northeast region. Culverts classified as barriers to aquatic organism passage (because they are elevated above the stream bed, for example) may be eligible for mitigation or replacement through a variety of grant funding programs. A comprehensive assessment has yet to be completed for Union Vale. The Hudson River Estuary Program is leading efforts in the Hudson Valley to assess road-stream crossings for aquatic habitat passage and to mitigate significant barriers.

Protecting and restoring vegetated stream buffers and restoring free-flowing streams where possible are effective actions to conserve and restore stream habitat. Bridges, open-bottom culverts and similar structures that completely span the waterway and associated floodplain/ riparian area generally have the least potential impacts on stream hydrology, floodplains, and habitat. The Town should explore technical assistance and grants available from the DEC Hudson River Estuary Program to assess and prioritize

known aquatic barriers for removal or mitigation.

Town of Union Vale

Dutchess County, NY

Natural Resources Inventory - 2020

12. Stream Habitats

0 0.25 0.5 1 Mile

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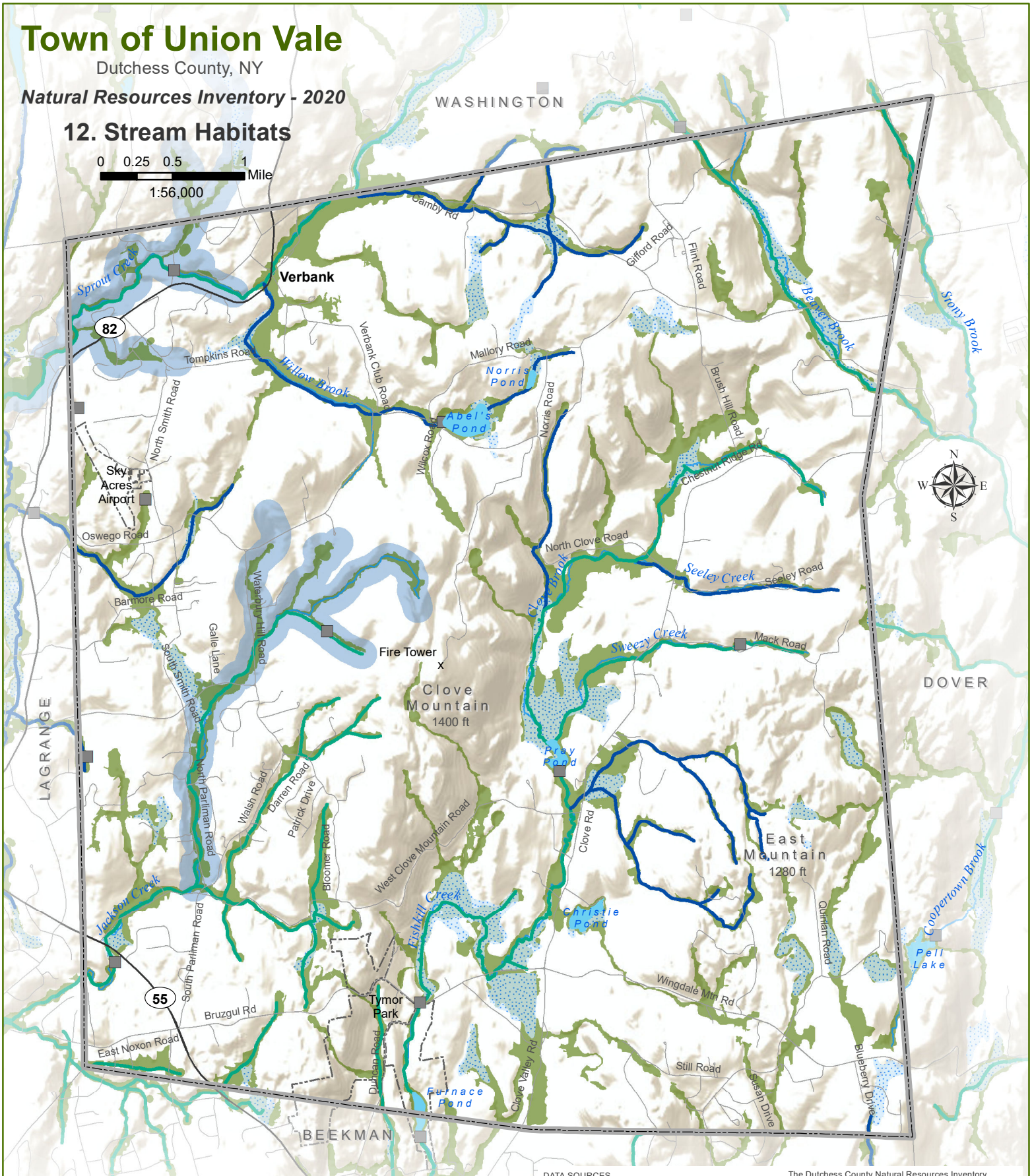

Major Road

Local Road

Waterbody

Stream

DEC Regulatory Wetland

Dam

Riparian Area

Important Coldwater Stream Habitat

NYSDEC Stream Class Standard

Trout Habitat

Trout Spawning

DATA SOURCES

Municipal Boundary: Dutchess County Real Property, 2020
Roads: Dutchess County OCIS, 2019
Dams: NYSDEC, 2015
Trout Streams: NYSDEC, 2010
Water: National Hydrography Dataset, 2012
Wetlands: NYSDEC Regulatory Freshwater Wetlands, 2002
Riparian Areas & Important Areas: NY Natural Heritage Program, 2018

Prepared by: CCEDC GIS Lab, 2020

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NEW YORK STATE | Department of Environmental Conservation | Hudson River Estuary Program

Cornell Cooperative Extension Dutchess County

Wetlands (Map 13)

Wetlands are areas saturated by surface or groundwater sufficient to support distinctive vegetation adapted for life in saturated soil conditions.[44] There are many types of freshwater wetlands in Union Vale, including wet meadows, emergent marsh, forested and shrub swamps, vernal pools, floating and submerged vegetation, and open water. In addition to providing critical habitat for many plants and animals, wetlands help to control flooding, recharge groundwater, filter and purify surface water, and provide recreation opportunities. The upland area surrounding a wetland is essential to its survival and function; both may diminish when a wetland is surrounded by pavement, buildings, and pollution-generating or other incompatible land uses.[45]

Wetlands:

- provide critical habitat
- control flooding
- recharge ground water
- filter and purify surface water
- store carbon
- provide recreational opportunities

Wetland Data

The **Wetlands Map** shows information from several existing sources that provide approximate locations and extent of wetlands. Open water habitats are symbolized in blue as "waterbodies." **New York State Freshwater Wetlands** only include wetlands larger than 12.4 acres, unless designated "of unusual local importance." The U.S. Fish and Wildlife Service's **National Wetlands Inventory** (NWI) includes wetlands of all sizes. NWI maps offer general information on wetland habitat, distinguishing forested wetlands (e.g., shrub or forest swamp) from emergent wetlands (e.g. marsh or wet meadow). Note that NWI maps often underestimate wetland area and omit smaller and drier wetlands. In particular, vernal pools, wet meadows, and swamps are often under-represented on maps. Many of the New York State Department of Environmental Conservation's (DEC) wetland maps are outdated and have similar inaccuracies.[46]

County soil maps are also a good source for predicting the location of potential wetlands. Soils classified in the county soil survey as very poorly drained or poorly drained are good indicators of **probable wetland areas**, and soils classified as somewhat poorly drained may indicate **possible wetland areas** (see Soils section for further discussion of soil properties).[47] Note that the probable and possible wetland areas cover a greater area than Hudsonia and DEC wetland layers. Likewise, note that soil units are only mapped to an approximate area of about two acres, and that soils within the unit may not be

[44] "Wetlands." NYS Department of Environmental Conservation. https://www.dec.ny.gov/lands/305.html
[45] *Planner's Guide to Wetland Buffers for Local Governments*. Environmental Law Institute, 2008, Washington, DC. www.eli.org/sites/default/files/eli-pubs/d18_01.pdf
[46] *Wetlands Status and Trend Analysis of New York State - Mid-1980's to Mid-1990's*. Huffman & Associates, Inc. Prepared for New York State Department of Environmental Conservation, 2000. http://www.dec.ny.gov/docs/wildlife_pdf/wetstattrend2.pdf
[47] Kiviat and Stevens, 2001.

homogeneous. Areas shown as supporting probable or possible wetlands should always be verified in the field for the purposes of environmental review.

Existing wetland maps are inherently inaccurate and omit many smaller, drier wetlands. When it comes to identifying wetlands, there is no substitute for site visits and on-the-ground delineation. The Wetlands Map is a starting point for inventorying local wetlands and more refined data should be added as they become available. It is also important to recognize that upland buffer areas around wetlands play an essential role in protecting wetland habitat and water quality, although in many cases they have no formal protection.

Wetlands in Union Vale

The major wetland complexes in Union Vale can be found in the Town's broad valleys, especially those adjacent to the Fishkill Creek and Clove Brook. Other notable concentrations include the headwaters associated with East Mountain, and areas adjacent to Beaver Brook and the tributaries to Sprout Creek and Jackson Creek.

Wildlife records from the DEC indicate that the state-endangered bog turtle might inhabit certain wetlands in Union Vale, especially calcareous fens that are underlain by limestone bedrock, and numerous species of rare bats depend on the Town's wetlands to hunt their insect prey. In addition, the New York State Breeding Bird Atlas has identified many rare or vulnerable wetland birds either in or in close proximity to the Town including red-shouldered hawk and purple martin.

Vernal pools are likely to occur in Union Vale, although none have been confirmed in the field. Vernal pools are small, isolated wetlands that are often dry in summer. They provide habitat for many animals, including a group of forest amphibians which use the pools for breeding. These unique wetlands often go undetected in the forest due to their small size and seasonal drawdown. Specific development and management recommendations are available to minimize impacts to vernal pools and associated wildlife.[48] [49] Additional local studies or surveys could improve understanding of wetland habitat values in the Town and help to identify vernal pools and other currently unmapped wetlands.

State and federal laws protect some but not all wetlands. The New York State Freshwater Wetlands Act generally regulates activities in and around large wetlands, including a 100-foot adjacent area.[50] To be protected, a wetland must be at least 12.4 acres or considered of unusual local importance, and appear on

[48] Morgan, D. and A. Calhoun. *The Maine Municipal Guide to Mapping and Conserving Vernal Pools*. University of Maine, Sustainability Solutions Initiative, 2012, Orono, ME. http://www.vernalpools.me/wp-content/uploads/2015/06/Maine-Municipal-Guide-to-Mapping-and-Conserving-Vernal-Pool.pdf

[49] Calhoun, A. and M. Klemens. *Best development practices: Conserving pool-breeding amphibians in residential and commercial developments in the northeastern United States*. MCA Technical Paper No. 5, Metropolitan Conservation Alliance, Wildlife Conservation Society, 2002, Bronx, New York. https://www.nae.usace.army.mil/Portals/74/docs/regulatory/VernalPools/BestDevelopmentPractices20Oct2014.pdf.

[50] " Freshwater Wetlands Program." NYS Department of Environmental Conservation. http://www.dec.ny.gov/lands/4937.html

the NYS Freshwater Wetlands Map. The U.S. Army Corps of Engineers regulates wetlands of all sizes in New York under section 404 of the Clean Water Act.[51] However, to be protected, wetlands must be connected to a navigable waterway. Vernal pools and other isolated wetlands less than 12.4 acres are generally unprotected by state or federal wetland regulations.[52]

The Town of Union Vale does not currently have any municipal law that directly protects "non-protected wetlands" or their adjacent areas but Section 210-29 of the town code requires a special permit for some actions within a 100-foot adjacent area of DEC-classified streams, water bodies greater than ¼-acre, and DEC-regulated wetlands within the Town.[53]

[51] "Section 404 of the Clean Water Act." United States Environmental Protection Agency. https://www.epa.gov/cwa-404
[52] "Conserving Small Wetlands in the Hudson Valley." NYS Department of Environmental Conservation. http://www.dec.ny.gov/lands/47486.html
[53] Town of Union Vale Zoning Code. Section 210-29 Development near streams, wetlands and waterbodies. https://ecode360.com/7977416

Town of Union Vale

Dutchess County, NY

Natural Resources Inventory - 2020

13. Wetlands

0 0.25 0.5 1 Mile

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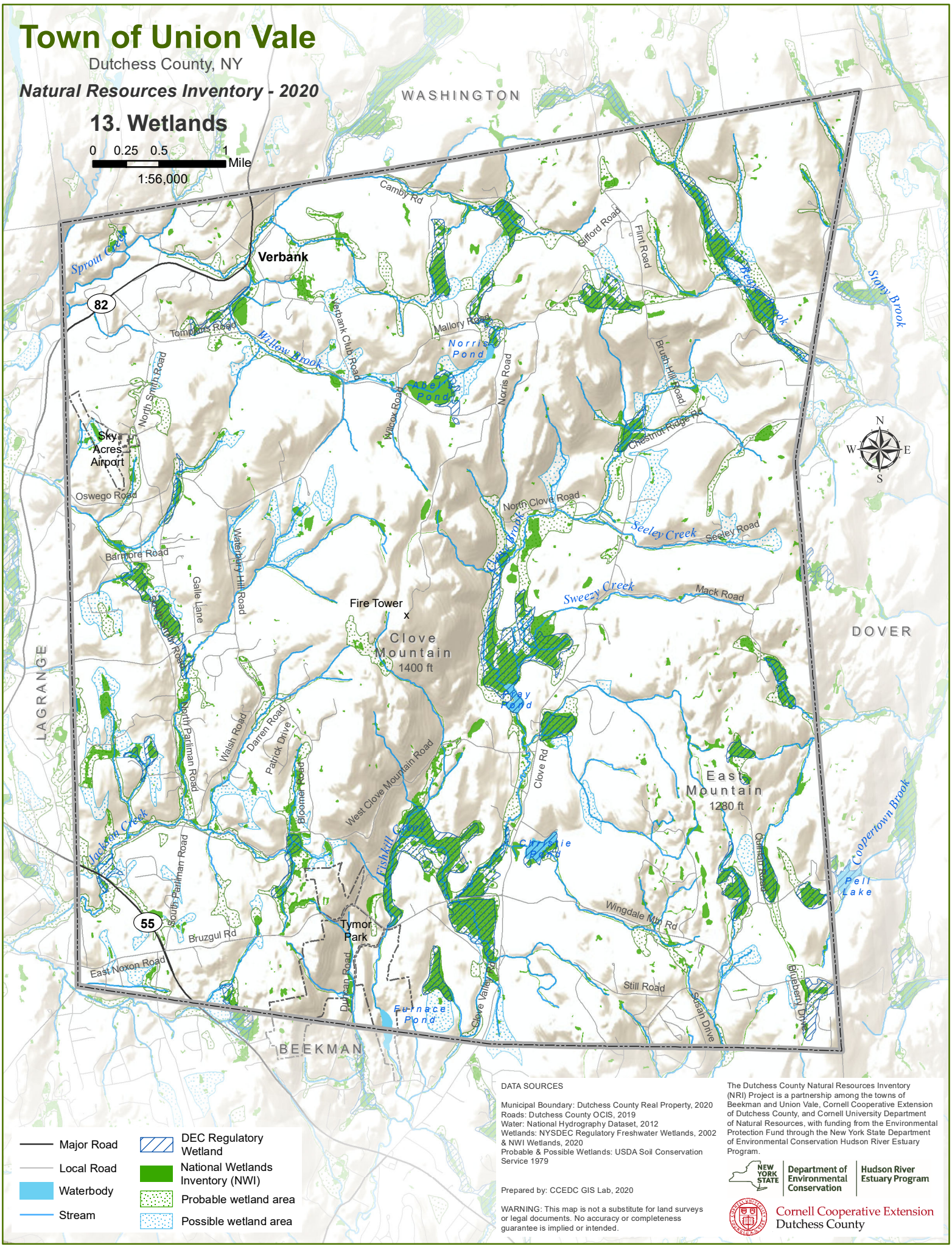

Major Road

Local Road

Waterbody

Stream

DEC Regulatory Wetland

National Wetlands Inventory (NWI)

Probable wetland area

Possible wetland area

DATA SOURCES

Municipal Boundary: Dutchess County Real Property, 2020
Roads: Dutchess County OCIS, 2019
Water: National Hydrography Dataset, 2012
Wetlands: NYSDEC Regulatory Freshwater Wetlands, 2002 & NWI Wetlands, 2020
Probable & Possible Wetlands: USDA Soil Conservation Service 1979

Prepared by: CCEDC GIS Lab, 2020

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Section 5: Habitats and Wildlife

Landscape Context (Map 14)

The first step to understanding habitats in Union Vale is to consider the Town's larger ecological context. The Ecological Context map helps illustrate the major ecological features in Union Vale extending beyond the Town's borders, including habitat areas that have been identified as significant at inter-municipal, regional, and statewide level. The Town of Beekman is also highlighted in this map because this NRI was completed through an intermunicipal partnership with their Town Conservation Advisory Council.

Significant Biodiversity Areas
Significant Biodiversity Areas (SBAs) are regionally significant landscapes recognized by the NYSDEC's Hudson River Estuary Program. These areas are recognized as unique to the Hudson River Estuary corridor due to their topography, geology, hydrology and plant and animal communities and contribute to regional biodiversity. More information about SBAs can be found at the *Hudson River Estuary Wildlife and Habitat Conservation Framework*.[54]

East Mountain is within the **Mid-Dutchess Matrix Forest Block**, which is part of a critical pathway for forest-dependent species, as they migrate northward in response to climate change.

While there are no SBAs in the Town of Union Vale the surrounding Towns of Beekman, East Fishkill and La Grange are within the Dutchess County Wetlands SBA, and the Towns of Dover and Pawling are within the Harlem Valley Calcareous Wetland SBA. The **Dutchess County Wetlands SBA** is a network of four wetland complexes comprising a total of 66,000 acres. This area supports habitat for important wildlife species such as the state endangered bog turtle and state threatened Blanding's turtles, in addition to other rare amphibians and reptiles. **The Harlem Valley Calcareous Wetlands SBA** include a diversity of wetland types that provide important habitat for bog turtles and upland areas that support northern copperhead, timber rattlesnake and five lined skink.

Matrix Forest Blocks and Regional Forest Linkage Zones
The Nature Conservancy has identified globally-rare matrix forests at the statewide level -- forests large enough to withstand major natural disturbances, maintain important ecological processes, and support populations of forest-interior wildlife and plants.[55] In partnership with the New York Natural Heritage Program, forest linkage zones representing intact natural corridors that connect matrix forests at a

[54] 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, Ithaca, NY. https://www.dec.ny.gov/lands/5096.html

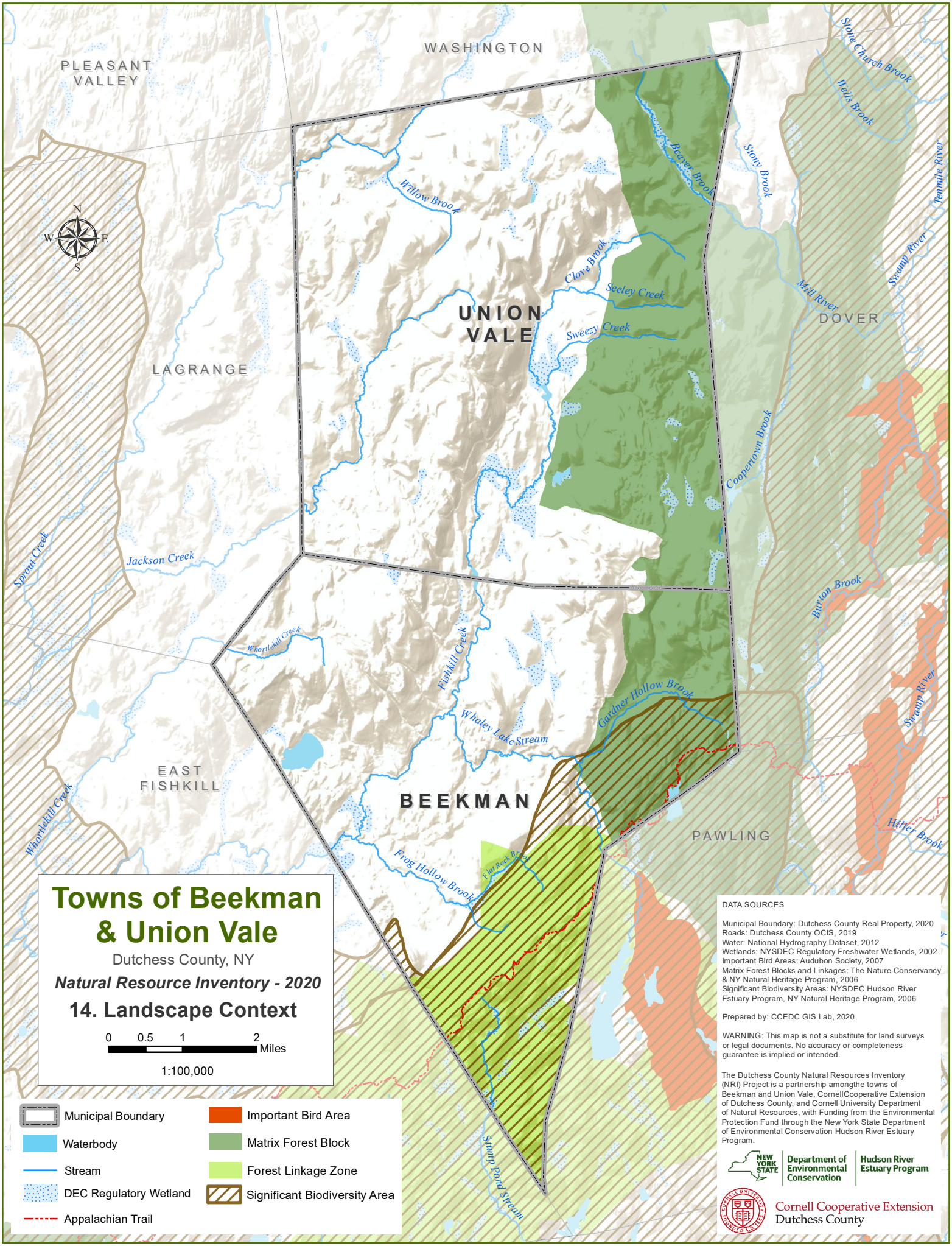
[55] Anderson, M. and S. Bernstein (editors). *Planning methods for ecoregional targets: Matrix forming ecosystems.* The Nature Conservancy, Conservation Science Support, Northeast & Caribbean Division, 2003, Boston, MA

regional scale across New York State.

The Mid-Dutchess matrix forest block, indicated in dark green, is an important area because of its large size and high-quality habitats. More importantly perhaps, it is also part of a corridor that connects the forests of the Hudson Highlands to the south with those of the Berkshires to the north. This is of critical importance for forest-dependent species, as they migrate north in response to climate change. For more information on forest resources in Union Vale, see the **Forests** section of this report.

By visualizing how natural resources extend beyond political boundaries, municipalities can better understand the context of their decisions at a landscape scale. Furthermore, climate change, habitat fragmentation and other human disturbance will continue to cause plants and animals to move across the landscape and municipal governments might be able to facilitate this movement through land use planning and decision-making. Whether planning or making decisions at the site scale or town wide level, stepping back to understand a site's ecological context can help guide new development to avoid cumulative impacts or death by a thousand cuts to major natural features.

East Mountain is a part of the Mid-Dutchess matrix forest block.
BHHS Hudson Valley Properties LG



Towns of Beekman & Union Vale

Dutchess County, NY

Natural Resource Inventory - 2020

14. Landscape Context

0 0.5 1 2 Miles

1:100,000

- Municipal Boundary
- Waterbody
- Stream
- DEC Regulatory Wetland
- Appalachian Trail
- Important Bird Area
- Matrix Forest Block
- Forest Linkage Zone
- Significant Biodiversity Area

DATA SOURCES

Municipal Boundary: Dutchess County Real Property, 2020
Roads: Dutchess County OCIS, 2019
Water: National Hydrography Dataset, 2012
Wetlands: NYSDEC Regulatory Freshwater Wetlands, 2002
Important Bird Areas: Audubon Society, 2007
Matrix Forest Blocks and Linkages: The Nature Conservancy & NY Natural Heritage Program, 2006
Significant Biodiversity Areas: NYSDEC Hudson River Estuary Program, NY Natural Heritage Program, 2006

Prepared by: CCEDC GIS Lab, 2020

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NEW YORK STATE | Department of Environmental Conservation | Hudson River Estuary Program

Cornell Cooperative Extension
Dutchess County

Land Cover (Map 15)

The Land Use and Land Cover Map provides a bird's-eye view of general habitat types, development, and land use patterns in Union Vale based on remote sensing analysis of Landsat satellite imagery. It displays information at a 30-meter spatial resolution from the 2016 National Land Cover Dataset. Each 30x30m square displays a land cover or land use class.[56] An accuracy assessment found overall accuracy for the 2016 data was 86%, with variations by geography and by identified class.[57] **Note that NLCD data are most reliable at regional scales and have important limitations at the municipal scale. The data are not necessarily accurate for all locations and do not distinguish many important habitat types.** Read more about the applications and limitations on the NLCD factsheet.[58] Used in an appropriate manner, the land cover/land use data can be a helpful tool to understand general patterns of land cover and land use, to identify large connected habitat areas, and to identify potential areas of concern where land uses may impact habitats or water resources. **Table 5** provides a summary of the acreage and percentage of land in Union Vale for each land cover or land use class. Definitions for land cover and land use classes shown on the map are as follows[59]:

Developed, Open Space - areas with a mixture of some constructed materials, but mostly vegetation in the form of lawn grasses. Impervious surfaces account for less than 20% of total cover. These areas most commonly include large-lot single-family housing units, parks, golf courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes.

Developed, Low Intensity - areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 20% to 49% percent of total cover. These areas most commonly include single-family housing units.

Developed, Medium Intensity - areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 50% to 79% of the total cover. These areas most commonly include single-family housing units.

Barren Land (Rock/Sand/Clay) - areas of bedrock, desert pavement, scarps, talus, slides, volcanic material, glacial debris, sand dunes, strip mines, gravel pits and other accumulations of earthen material. Generally, vegetation accounts for less than 15% of total cover.

Developed High Intensity - highly developed areas where people reside or work in high numbers. Examples include apartment complexes, row houses and commercial/industrial. Impervious surfaces account for 80% to 100% of the total cover.

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[56] Wickham, J., S. Stehman, L. Gass, J. Dewitz, D. Sorenson, B. Granneman, R. Poss, L. Baer, "Thematic accuracy assessment of the 2011 National Land Cover Database," Remote Sensing of Environment, 191. 328-341. 10.1016/j.rse.2016.12.026. 2017.

[57] Wickham, J., S. Stehman, L. Gass, D. Sorenson, L. Gass, and J. Dewitz. 2021. Thematic accuracy assessment of the NLCD 2016 land cover for the conterminous United States. Remote Sensing of Environment, Vol. 257, 2021, 112357, ISSN 0034-4257, https://doi.org/10.1016/j.rse.2021.112357.

[58] "National Land Cover Database Fact Sheet." U.S. Geological Survey, 2012. https://pubs.usgs.gov/fs/2012/3020/

[59] "National Land Cover Database 2011 (NLCD)." U.S. Geological Survey, https://www.mrlc.gov/data/legends/national-land-cover-database-2011-nlcd2011-legend

Deciduous Forest - areas dominated by trees generally greater than five meters tall, and greater than 20% of total vegetation cover. More than 75% of the tree species shed foliage simultaneously in response to seasonal change.

Evergreen Forest - areas dominated by trees generally greater than five meters tall, and greater than 20% of total vegetation cover. More than 75% of the tree species maintain their leaves all year. Canopy is never without green foliage.

Mixed Forest - areas dominated by trees generally greater than five meters tall, and greater than 20% of total vegetation cover. Neither deciduous nor evergreen species are greater than 75% of total tree cover.

Shrub/Scrub - areas dominated by shrubs; less than five meters tall with shrub canopy typically greater than 20% of total vegetation. This class includes true shrubs, young trees in an early successional stage or trees stunted from environmental conditions.

Grassland/Herbaceous - areas dominated by gramanoid or herbaceous vegetation, generally greater than 80% of total vegetation. These areas are not subject to intensive management such as tilling, but can be utilized for grazing.

Pasture/Hay - areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle. Pasture/hay vegetation accounts for greater than 20% of total vegetation.

Woody Wetlands - areas where forest or shrubland vegetation accounts for greater than 20% of vegetative cover and the soil or substrate is periodically saturated with or covered with water.

Emergent Herbaceous Wetlands - Areas where perennial herbaceous vegetation accounts for greater than 80% of vegetative cover and the soil or substrate is periodically saturated with or covered with water.

Table 5. Land cover and use in the Town of Union Vale

Land Cover/Use Type	Acres	Percent Cover
Deciduous Forest	14,629	61.2%
Pasture/Hay	4,712	19.7%
Woody Wetlands	1,405	5.9%
Developed, Open Space	1,188	5.0%
Developed, Low Intensity	458	1.9%
Mixed Forest	433	1.8%
Evergreen Forest	284	1.2%
Grassland/Herbaceous	194	0.8%
Open Water	147	0.6%
Cultivated Crops	144	0.6%
Developed, Medium Intensity	121	0.5%
Shrub/Scrub	63	0.3%
Emergent Herbaceous Wetlands	49	0.2%
Barren Land (Rock/Sand/Clay)	36	0.2%
Developed, High Intensity	26	0.1%

Union Vale spans approximately 37 square miles. Approximately 2.5% of the Town is classified as developed, with an additional 5% of land in developed "open space" such as lawns and golf courses. Union Vale is predominately forested (about 70%), which is an important resource to the local forest products industry. Agricultural land cover is also a significant portion of the Town (about 21%), which includes pasture, hay, grasslands, and cultivated crops. Other land uses have economic value in the form of scenery, drinking water, recreation, and ecosystem services (e.g. purifying water, lessening flood impacts, moderating temperature, and pollinating crops). The land cover data also provide a generalized view of vegetation in the Town. Specific habitats and wildlife of conservation concern are discussed in greater detail throughout the **Habitats and Wildlife** section of the NRI.

Town of Union Vale

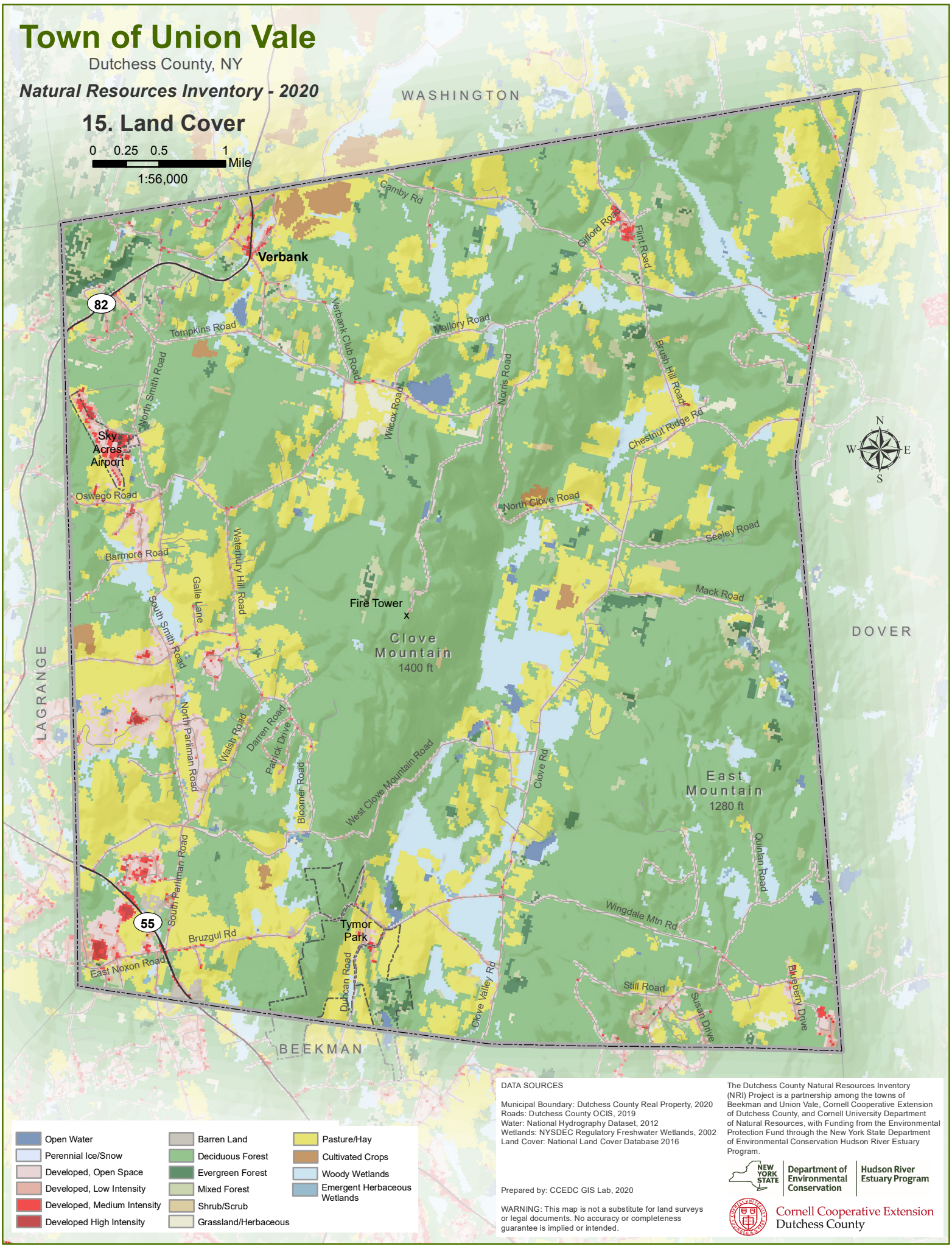
Dutchess County, NY

Natural Resources Inventory - 2020

15. Land Cover

0 0.25 0.5 1 Mile

1:56,000



Open Water
Perennial Ice/Snow
Developed, Open Space
Developed, Low Intensity
Developed, Medium Intensity
Developed High Intensity
Barren Land
Deciduous Forest
Evergreen Forest
Mixed Forest
Shrub/Scrub
Grassland/Herbaceous
Pasture/Hay
Cultivated Crops
Woody Wetlands
Emergent Herbaceous Wetlands

DATA SOURCES

Municipal Boundary: Dutchess County Real Property, 2020
Roads: Dutchess County OCIS, 2019
Water: National Hydrography Dataset, 2012
Wetlands: NYSDEC Regulatory Freshwater Wetlands, 2002
Land Cover: National Land Cover Database 2016

Prepared by: CCEDC GIS Lab, 2020

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The Dutchess County Natural Resources Inventory (NRI) Project is a partnership among the towns of Beekman and Union Vale, Cornell Cooperative Extension of Dutchess County, and Cornell University Department of Natural Resources, with Funding from the Environmental Protection Fund through the New York State Department of Environmental Conservation Hudson River Estuary Program.

NEW YORK STATE | Department of Environmental Conservation | Hudson River Estuary Program

Cornell Cooperative Extension Dutchess County

Important Biodiversity Areas (Map 16)

The Important Biodiversity Areas Map highlights the most significant known ecological features in Union Vale based on state and regional assessments. The map and descriptions are based on limited existing information; more study is needed to better document the Town's natural features.

> The **New York Natural Heritage Program** is a partnership between DEC and SUNY ESF, with a mission to monitor and conserve New York State's rare plants, animals and habitats.
>
> To request more detailed rare species or habitat data, visit their website at http://www.dec.ny.gov/animals/31181.html or e-mail them directly at NaturalHeritage@dec.ny.gov

Known Important Areas for rare plants, rare animals, and significant natural communities

The New York Natural Heritage Program (NYNHP) has also identified important areas for sustaining populations of rare plants, rare animals, and significant natural communities based on documented occurrences.[60] 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. 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.

NYNHP identified important areas in Union Vale for Blanding's turtle, timber rattlesnake, rare bats, and wild brook trout. Important areas for individual species are not shown explicitly on the map, however, species have been combined into thematic groups including **Important Areas for:**

- **Rare Terrestrial Animals**
- **Rare Wetland Animals**
- **Rare Bat Foraging**
- **Coldwater Stream Habitat**

A complete list of species of conservation concern known from Union Vale is shown in **Table 6**.

> **Blanding's turtle** (NY-Threatened, High Priority SGCN) is a mobile species that requires a variety of wetland and upland habitats. Their core habitats are kettle shrub pools, but they also use buttonbush pools, swamps, marshes, ponds, vernal pools, and upland areas for nesting. They move over land within their large habitat complex, at times traveling distances exceeding one mile; these movements increase their vulnerability to road mortality, collection, and injury or

[60] New York Natural Heritage Program and New York State Department of Environmental Conservation, Biodiversity Database, accessed 2021, Important Areas Digital Data Set, 2018, Albany, NY.

mortality from agricultural or mowing equipment. Habitat loss and degradation further threaten Blanding's turtle populations in Dutchess County.

Timber rattlesnake (NY-Threatened, High Priority SGCN) inhabits mountainous or hilly forests, often with rock outcroppings, steep ledges, and rock slides. They migrate widely from their dens in summer to forage in the forest surrounding den sites. The numerous forested and open rocky habitats of the Hudson Highlands provide important habitat for timber rattlesnakes in the Town. Timber rattlesnakes are threatened due to habitat loss and fragmentation, illegal collecting, and malicious killing.

Bat hibernacula are sites where bats hibernate over the winter, most often caves. The Town of Union Vale is surrounded by and encompasses many caves used by a diverse group of cave-hibernating bats. The federally-endangered Indiana bat has been found in hibernacula in and around the Town, while NYS high-priority species of greatest conservation need: the little brown bat and hoary bat are also found in Beekman. Bats will return year after year to the same hibernation site and are susceptible to human disturbance and disease. The recent spread of the fungal disease white-nose syndrome has devastated bat colonies throughout the northeast, resulting in large die-offs of bats across the region. Research is ongoing by a number of agencies to determine if there are measures to protect these populations.

Bat Foraging Areas

At-risk bats may travel long distances from their winter hibernacula during the summer months, using forested areas and stream corridors for shelter and foraging for insect prey. Female bats roost in trees and snags in maternity colonies to raise their young. Existing restrictions on tree cutting aim to protect threatened bat species, especially during the period when mothers are birthing and raising pups. Bat conservation areas depict bat summer habitat areas in Union Vale. The New York State Department of Environmental Conservation (DEC) recommends restricting any tree-cutting activities to the winter months (November 1-March 31) in areas occupied by protected bats to avoid direct impacts to the species.

Important Coldwater Stream Habitat

Trout are valuable indicators of healthy aquatic ecosystems because of their habitat requirements of cold and high-quality water. Trout become thermally stressed when the water temperature rises above 70°F. They typically inhabit clear, cool, well-oxygenated streams and lakes and depend on clean gravel areas for spawning. Among trout species, native brook trout are the most highly sensitive to increases in water temperature and sedimentation of stream habitats. The Important Biodiversity Areas Map identifies important areas for coldwater stream habitat mapped by the New York Natural Heritage Program based on known populations of wild brook trout. For more information on Union Vale's stream habitats, refer to the Riparian Habitats map. Note that these maps do NOT indicate areas with public fishing rights, and many areas are unsuitable for recreational trout fishing due to small fish populations and small fish size.

Blanding's Turtle Conservation Zone

Blanding's turtle is a charismatic rare turtle species that utilizes a variety of habitats during its life cycle. In New York State, it is designated as a threatened species, largely due to habitat loss associated with the rapid suburbanization of the region.

Blanding's turtle.
Lisa Masi

In 2009, Hudsonia assessed potential Blanding's turtle habitat in southern Dutchess County, including portions of Union Vale. These habitats include "core wetlands," "associated wetlands," upland nesting areas, and other upland areas used for basking or refuge from unfavorable water temperatures (Hudsonia 2009)[61].

The following excerpt describes the conservation zone in the Town:

> *"Union Vale contains two potential core wetlands in the southwest section of town, both in the headwaters of a tributary to Jackson Creek. In addition, several Blanding's turtle Conservation Zones and Areas of Concern in LaGrange extend beyond its eastern border into Union Vale. There are extensive wetlands associated with the Clove Valley in the central part of town, but none were deemed potential Blanding's turtle habitat. We also found no core wetlands in the northern and eastern parts of town, which are quite rugged…NYS 55, a heavy-duty road, passes through two Conservation Zones. Several medium-duty roads pass through Conservation Zones, including Clapp Hill Rd and Noxon Rd. Noxon Rd is within 25 m (82 ft) of a core wetland."*

NOTE: The DEC Region 3 Office should be contacted at 845-256-3098 with any concerns or questions about the presence of protected species in Union Vale.

Table 6. Species and Ecosystems of Conservation Concern in Union Vale, NY.

Species of Conservation Concern in the Town of Union Vale, NY The following table lists species of conservation concern that have been observed in the Town of Union Vale and some adjacent areas. The information comes from the New York Natural Heritage Program (NYNHP) biodiversity databases, New York State Department of Environmental Conservation (DEC) wildlife biologists, the 2000-2005 New York State Breeding Bird Atlas (NYBBA), and the 1990-1999 New York Amphibian and Reptile Atlas

[61]"Blanding's Turtle Habitats in Southern Dutchess County." Hudsonia, 2009. https://hudsonia.org/wp-content/uploads/2019/05/Blandings-turtle-Habitats_optimized.pdf

(NYARA). Species from the NYBBA are included in the table if they were documented in Atlas blocks occupying more than 50% of the municipalities land area or other notable habitat features (e.g. large contiguous forest areas, grasslands or coastal areas). Note that NYBBA blocks include records from areas outside of the Town. The table only includes species listed in New York as endangered, threatened, special concern, or 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. More information on rare animals, plants, and ecological communities can be found at http:// guides.nynhp.org. This table was provided for the Town of Union Vale Natural Resources Inventory project in May 2021 by the DEC Hudson River Estuary Program to inform land-use planning and decision-making.

			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 red bat	*Lasiurus borealis*	forest		x				DEC
hoary bat	*Lasiurus cinereus*	forest		x				DEC
Indiana bat	*Myotis sodalis*	cave, forest		xx			US NY	DEC
little brown bat	*Myotis lucifugus*	cave, forest, wetland		xx				DEC
Birds								
American goldfinch	*Spinus tristis*	young forest, shrubland	x					NYBBA
American kestrel	*Falco sparverius*	meadow	x	x				NYBBA
American redstart	*Setophaga ruticilla*	forest	x					NYBBA
American woodcock	*Scolopax minor*	young forest, shrubland	x	x				NYBBA
Baltimore oriole	*Icterus galbula*	forest	x					NYBBA
belted kingfisher	*Megaceryle alcyon*	lake, stream	x					NYBBA
black-and-white warbler	*Mniotilta varia*	forest	x					NYBBA
black-billed cuckoo	*Coccyzus erythropthalmus*	young forest, shrubland	x	x				NYBBA
blackburnian warbler	*Dendroica fusca*	forest	x					NYBBA
black-throated blue warbler	*Dendroica caerulescens*	forest	x	x				NYBBA

			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**
blue-winged warbler	*Vermivora pinus*	young forest, shrubland	x	x				NYBBA
bobolink	*Dolichonyx oryzivorus*	grassland	x	xx				NYBBA
broad-winged hawk	*Buteo platypterus*	forest	x					NYBBA
brown thrasher	*Toxostoma rufum*	young forest, shrubland	x	xx				NYBBA
Canada warbler	*Wilsonia canadensis*	young forest, shrubland	x	xx				NYBBA
cerulean warbler	*Dendroica cerulea*	forest	x	x	x			NYBBA
chestnut-sided warbler	*Setophaga pensylvanica*	young forest, shrubland	x					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 meadowlark	*Sturnella magna*	grassland	x	xx				NYBBA
eastern towhee	*Pipilo erythrophthalmus*	young forest, shrubland	x					NYBBA
eastern wood-pewee	*Contopus virens*	forest	x					NYBBA
field sparrow	*Spizella pusilla*	young forest, shrubland	x					NYBBA
hooded warbler	*Wilsonia citrina*	forest	x					NYBBA
least flycatcher	*Empidonax minimus*	forest	x					NYBBA
Louisiana waterthrush	*Seiurus motacilla*	forest	x	x				NYBBA
northern flicker	*Colaptes auratus*	forest	x					NYBBA
prairie warbler	*Dendroica discolor*	young forest, shrubland	x	x				NYBBA
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

			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**
savannah sparrow	*Passerculus sandwichensis*	grassland	x					NYBBA
scarlet tanager	*Piranga olivacea*	forest	x	x				NYBBA
veery	*Catharus fuscescens*	forest	x					NYBBA
wood thrush	*Hylocichla mustelina*	forest	x	x				NYBBA
worm-eating warbler	*Helmitheros vermivorum*	forest	x	x				NYBBA
yellow-billed cuckoo	*Coccyzus americanus*	young forest, shrubland	x					NYBBA
yellow-throated vireo	*Vireo flavifrons*	forest	x					NYBBA
Reptiles								
bog turtle	*Glyptemys muhlenbergii*	wetland		xx		US	NY	NYNHP
snapping turtle	*Chelydra serpentina*	wetland, stream, forest, lake		x				DEC
Fish								
brook trout	*Salvelinus fontinalis*	stream		x				DEC

Town of Union Vale

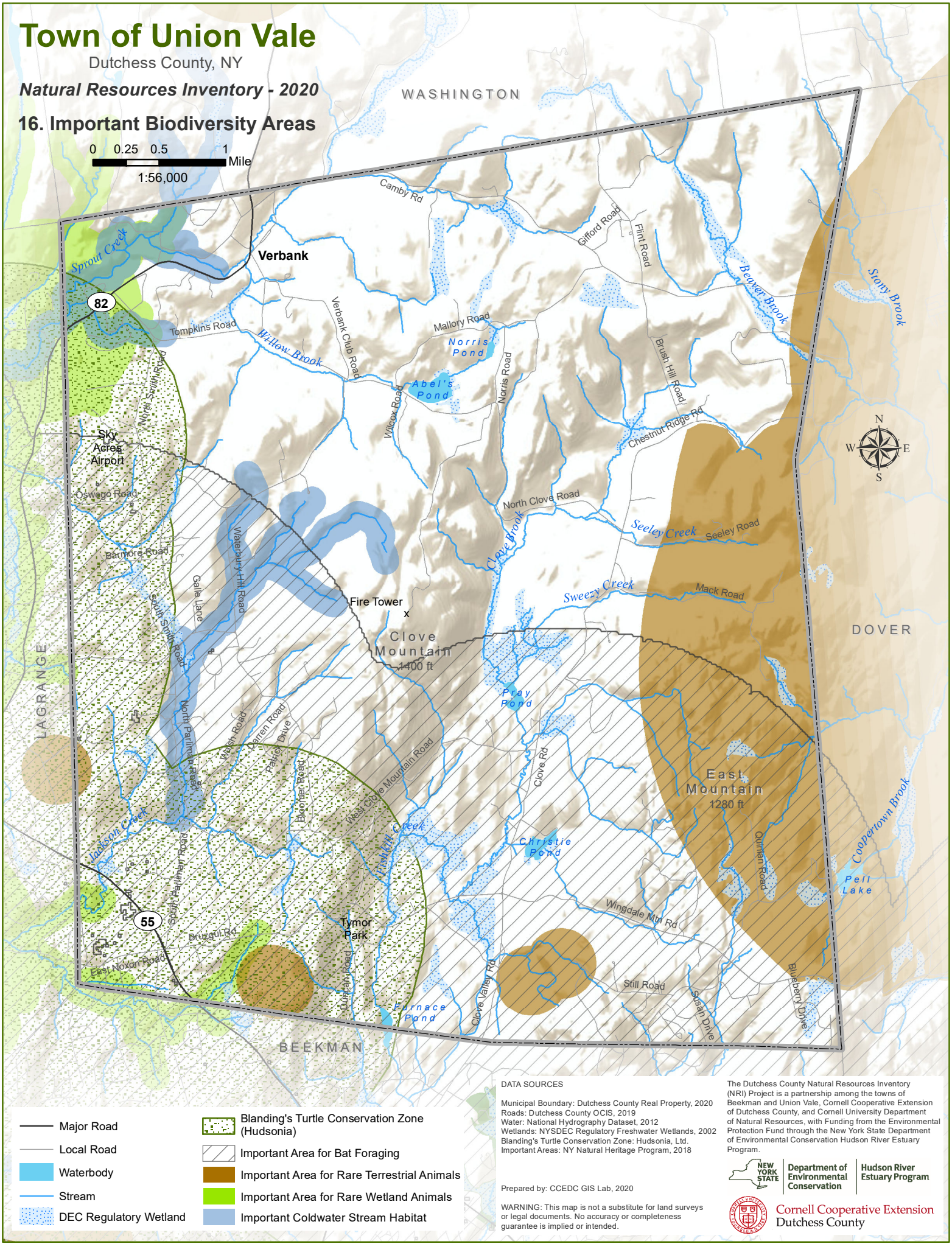
Dutchess County, NY

Natural Resources Inventory - 2020

16. Important Biodiversity Areas

0 0.25 0.5 1 Mile

1:56,000



- Major Road
- Local Road
- Waterbody
- Stream
- DEC Regulatory Wetland
- Blanding's Turtle Conservation Zone (Hudsonia)
- Important Area for Bat Foraging
- Important Area for Rare Terrestrial Animals
- Important Area for Rare Wetland Animals
- Important Coldwater Stream Habitat

DATA SOURCES

Municipal Boundary: Dutchess County Real Property, 2020
Roads: Dutchess County OCIS, 2019
Water: National Hydrography Dataset, 2012
Wetlands: NYSDEC Regulatory Freshwater Wetlands, 2002
Blanding's Turtle Conservation Zone: Hudsonia, Ltd.
Important Areas: NY Natural Heritage Program, 2018

Prepared by: CCEDC GIS Lab, 2020

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Large Forests (Map 17)

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 Union Vale have been divided into smaller forest patches, resulting in forest fragmentation. Forest fragmentation often occurs from 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. Figure 4 illustrates what happens when a forest is fragmented. After fragmentation occurs, interior core forest habitat is reduced or eliminated, impacting suitability for wildlife that depend on those conditions.

> **Forest fragmentation** is the process of breaking large patches of forest into smaller areas, often by clearing for new roads or development.
>
> Fragmentation decreases forest habitat quality and health, disrupts wildlife movement, and facilitates the spread of invasive species.

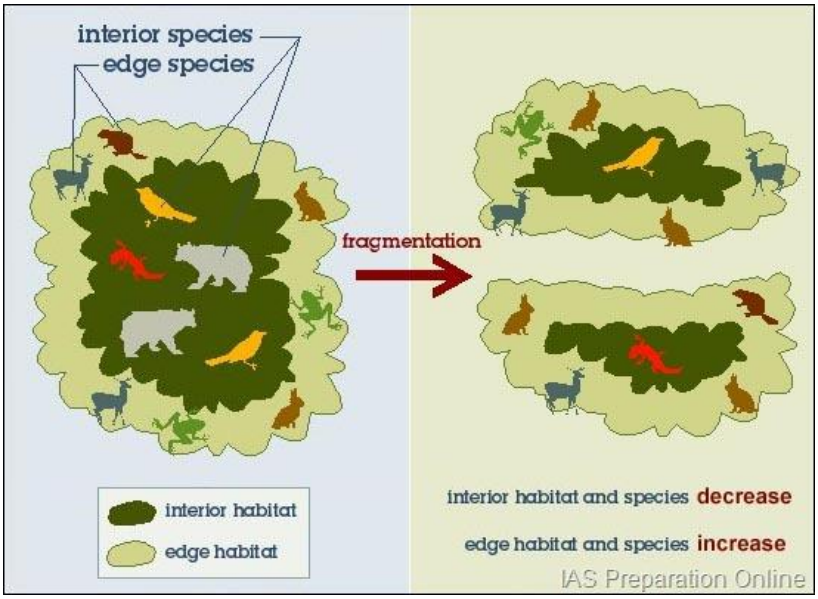

Figure 4. *The effect of forest fragmentation on species diversity*

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 Hudson River 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, stressors, 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.[62]

Core Forest

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[63]. Core forests were mapped based on the large forest patches identified for the Forest Condition Index, described above. Avoiding further fragmentation of core forests will help conserve the integrity and habitat value of ecologically significant forest patches. By guiding development away from core forest habitat, fragmentation of these resources can be limited, and vital benefits can be maintained. The highest quality forests may be good candidates for protection or other municipal conservation efforts.

Important Forests in Union Vale

The highest ranked forest patches in Union Vale are those associated with Clove Mountain, East Mountain, and Sprout Creek. These forests also have the largest areas of core forest. The forest patch on the north side of Wingdale Road is especially important because it is one of the largest forests in the Hudson Valley and is a critical wildlife corridor between the Hudson Highlands and the Berkshires. See the **Landscape Context** section for a more detailed discussion of the regional importance of Union Vale's forests. Other important forest patches include those adjacent to Beaver Brook, Clove Mountain, and East Mountain.

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[62] 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

[63] Environment Canada. How Much Habitat is Enough? 2013, Toronto, Ontario, CA. https://www.documentcloud.org/documents/2999368-THUNDER-BAY-How-Much-Habitat-Is-Enough-3rd-Ed-2013.html

Tree tube protecting seedling oak from deer browse. *Nate Nardi-Cyrus*

Forest Health

Beyond fragmentation, the greatest threats to forests in Union Vale come from overabundant deer, climate change, and the introduction of tree diseases, forest pests, and other invasive species. The Lower Hudson PRISM works to promote education, prevention, early detection, and control of invasive species and is helping communities 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. The newly released New York State Forest Action Plan provides more information on the state of New York's forests and their management.

Town of Union Vale

Dutchess County, NY

Natural Resources Inventory - 2020

17. Large Forests

0 0.25 0.5 1 Mile

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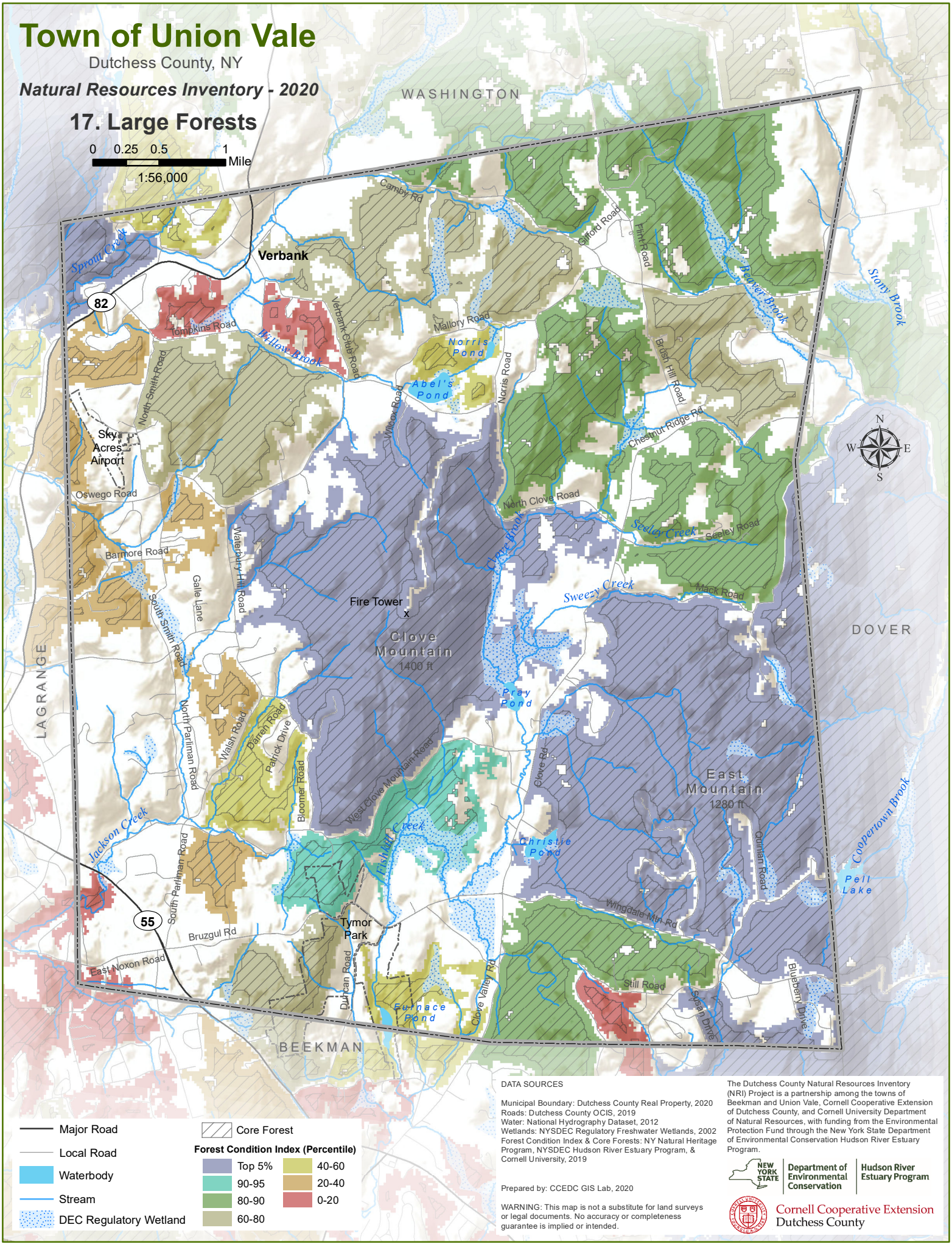

Major Road

Local Road

Waterbody

Stream

DEC Regulatory Wetland

Core Forest

Forest Condition Index (Percentile)

Top 5%

90-95

80-90

60-80

40-60

20-40

0-20

DATA SOURCES

Municipal Boundary: Dutchess County Real Property, 2020
Roads: Dutchess County OCIS, 2019
Water: National Hydrography Dataset, 2012
Wetlands: NYSDEC Regulatory Freshwater Wetlands, 2002
Forest Condition Index & Core Forests: NY Natural Heritage Program, NYSDEC Hudson River Estuary Program, & Cornell University, 2019

Prepared by: CCEDC GIS Lab, 2020

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Section 6: Land Use

Zoning (No Map)

The Union Vale Zoning Map illustrates land use regulations which apply to real property in the Town.

Zoning

Cities, towns and villages in New York State are authorized by state statutes (called "zoning enabling laws") to regulate the use of land by enacting what is commonly referred to as "zoning." Zoning governs the way land in a municipality is used and developed. Its goal is to carry out the municipality's long-range land use objectives. Zoning regulates the uses to which property may be devoted, the siting of development on land, and the density of development on property. 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. New York is a "home rule" state and municipalities have the choice of whether to implement zoning.

> *"The power to enact local laws [including zoning] is granted by the State Constitution. The scope of this power and the procedures for implementing it are set out in the* ***Municipal Home Rule Law****. A local law has the same status as an act of the State Legislature."*
>
> - NYS Department of State

Districts

The intent of the aforementioned nine zoning districts is to guide both the development and conservation of the Town's land resources in harmony with the Town of Union Vale and Dutchess County comprehensive plans and land use policies.

- The Rural Development 10 (RD10) District is intended to provide for the continuing natural resource, conservation, open space, agricultural and farm, recreational, larger-scale institutional and low-density rural residential use consistent with the existing development pattern.

- The Residential Agricultural 5 (RA5) District is intended to provide for similar continuing natural resource, conservation, open space, agricultural and farm, and recreational use, as well as low-to-moderate density rural residential use and limited institutional uses and guest accommodations consistent with the Town's rural setting.

- The Residential Agricultural 3 (RA3) District is intended to recognize the Town's predominant rural moderate-density single-family residential development pattern with individual on-site water supply and sanitary sewage arrangements and to accommodate similar density residential development where appropriately planned.

- The Residential 1.5 (R1.5) District is intended to recognize areas within the Town with a substantially established moderate-to-low density suburban development pattern likewise served by individual on-site water supply and sanitary sewage arrangements where either a conventional or cluster subdivision technique might be applied to any remaining vacant land proposed for continuing residential development and limited smaller-scale institutional uses are permitted.

- The Residential 1 (R1) District is intended to similarly recognize areas within the Town with a substantially established moderate density suburban development pattern, likewise without central water supply and/or common sanitary sewage facilities.

- The Hamlet (H) District is intended to recognize an established settlement pattern typical of a small rural village and to foster opportunity for a mix of continuing residential use, including two-family dwellings, and limited, small-scale institutional, office, retail and personal service uses contributing through diversity and investment to the vitality of the H District but being regulated in terms of design, scale and other factors so as to not detract from the quality of residential environment.

- The Neighborhood Commercial (NC) District is intended to accommodate within a limited portion of the Town in the NYS Route 82 corridor a continuing mix of single-family residential use and small-to-moderate scale institutional, community service, retail, office, service and other establishments primarily to serve the neighboring residents.

- The Town Center (TC) District is intended to encourage mixed-use development of lands within the NYS Route 55 corridor and adjacent to County Road 21. This is to occur through the siting of larger-scale institutional and community service, commercial, or office uses and facilities to serve the residents of the Town of Union Vale.

- The Airport (A) District is intended to recognize Sky Acres Airport as both a unique land use and an important transportation amenity within the Town.

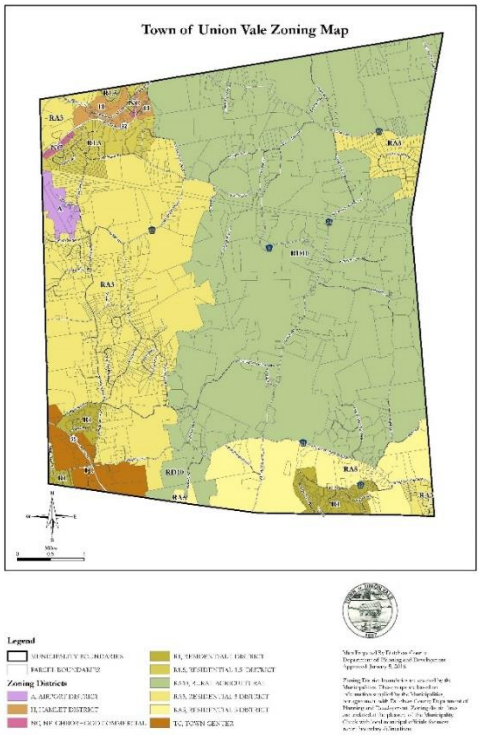
Overlay Districts
Union Vale has three districts that provide additional natural resources protections to the zoning map shown in Figure 4: The Flood-Fringe, Environmental Resource, and Scenic Corridor Overlay Districts. The locations of these districts are described in the code but are not shown on the map.

- The **Flood Fringe Overlay District (FF-O)** requires all development within mapped FEMA floodplains to receive a special permit in advance of all activities.
- The **Environmental Resource Overlay District (ER-O)** includes, DEC-regulated freshwater wetlands, federally-regulated wetlands, DEC-regulated streams, Town-designated streams and their adjacent areas. Specified activities within 100 feet of these features are subject to a special

permit and most activities within 50 feet are prohibited. Activities within specially-designed aquifer, wellhead, scenic, agricultural, and historic or cultural sites are also regulated.

- The **Scenic Corridor Overlay District (SC-O)** imposes additional scenic protections to specially-designated scenic roads. These include doubling setbacks from the road, management guidelines for roadside vegetation, and preference for conservation subdivision in these areas.

Figure 5. *Zoning Map and Abbreviations*



Zoning District	Abbreviation
Rural Development 10 District	RD10
Rural Agricultural 5 District	RA5
Rural Agricultural 3 District	RA3
Residential 1.5 District	R1.5
Residential 1 District	R1
Hamlet District	H
Neighborhood Commercial District	NC
Town Center District	TC
Airport District	A
Overlay Districts and Floating Zones	
Flood-Fringe Overlay District	FF-O
Environmental Resource Overlay District	ER-O
Scenic Corridor Overlay District	SC-O
Airport Overlay District	A-O

Tax Parcels

The zoning map also includes property boundaries as reflected by tax parcel lines, which are used for tax collection purposes. State law requires local governments to prepare and maintain tax maps in accordance with standards established by New York State. Union Vale's tax map reflects the size, shape and geographical characteristics of each parcel of land in the assessing unit. The tax map is a graphic display of the Town's land inventory, and as such is the major source to the real property assessment roll. The working copy of the tax map is used by the Town Assessor to record and analyze property transfers and record other features pertinent to the valuation of land.[64] Tax parcel data shown in the Natural Resources Inventory map series were published in 2021 by the Dutchess County Tax Services

[64] "Tax Mapping in New York State." New York State Department of Taxation and Finance. www.tax.ny.gov/research/property/assess/gis/taxmap/.

Department.

Examining the zoning map and tax parcels in relation to other maps of the Natural Resources Inventory can provide insight into potential development scenarios which could affect the existing natural resource base, ecology, and other significant features. Future zoning updates should consider the Dutchess County Centers and Greenspaces Plan, which has mapped the potential priority growth areas and conservation targets in the Town. This map is also useful when placed in relation to the other NRI maps when making decisions about how to update the comprehensive plan and zoning districts.

Regulated Facilities (No Map)

State and federal agencies regulate many types of facilities to maintain environmental quality and public health. The New York State Department of Environmental Conservation (DEC) has created an online web map, the DECinfo Locator, which provides digital access to regularly updated DEC documents and public data about the environmental quality of specific sites. Please refer to the DECinfo Locator to view locations of these regulated facilities in Union Vale.

SPDES Permit Sites
New York's State Pollutant Discharge Elimination System (SPDES) program is intended to control of surface wastewater and stormwater discharges in accordance with the Clean Water Act. Permits are required for constructing or using an outlet or discharge pipe (i.e. a "point source") discharging wastewater to surface waters or ground waters of the state and disposal systems such as a sewage treatment plant.[65] Sky Acres Airport in Union Vale has a SPDES permit.

The New York State Department of Environmental Conservation (DEC) has created an online web map that provides digital access to regularly updated DEC documents and public data about the environmental quality of specific sites.

The **DECinfo Locator** is a free resource that can be found at the following web address: https://www.dec.ny.gov/pubs/109457.html.

Petroleum Bulk Storage Facility
These locations are regulated under the NYS Petroleum Bulk Storage (PBS) program, which applies to facilities that store more than 1,100 gallons of petroleum in aboveground and underground storage tanks.[66] Union Vale has nine such sites, with three in Verbank and the rest scattered across the Town.

Chemical Bulk Storage Facility
These locations are regulated under the NYS Chemical Bulk Storage (CBS) program which applies to facilities that store a "hazardous substance" listed in 6 NYCRR Part 597 in an aboveground storage tank larger than 185 gallons, any size underground storage tank, with some exceptions, or in a non-stationary tank used to store 1,000 kg or more for a period of 90 consecutive days or more.[66] There is one such site on Waterbury Hill Road.

Salt Bulk Storage Facility
These facilities are locations where road salt and other materials used for snow and ice operations by public works and roadway agencies are stockpiled. All road salt used by Union Vale's Highway

[65] "State Pollutant Discharge Elimination System (SPDES) Permit Program." NYS Department of Environmental Conservation. https://www.dec.ny.gov/permits/6054.html.
[66] "Bulk Storage of Chemicals, Petroleum, and Liquefied Natural Gas." NYS Department of Environmental Conservation. https://www.dec.ny.gov/chemical/287.html.

Union Vale Transfer Station.
Jen Rubbo

Department is stored in a salt barn on the Town of Union Vale Highway Department facility at 844 North Clove Road, Verbank, NY, 12585. The salt barn which comfortably holds 750 tons of salt, was constructed in October of 1992. The roof was replaced in 2020 and currently the facility is deemed to be in good shape.

Active or Reclaimed Mine

These are regulated sites in the mining and oil and gas industries.[67] There are thirteen of such sites in Union Vale, along with several small gravel mining operations on privately-owned property.

State Superfund Site

The NYS Superfund Program is an enforcement program whose goal to identify and characterize suspected inactive hazardous waste disposal sites and to ensure that those sites which pose a significant threat to public health or the environment are properly addressed. These are locations where presence of a consequential amount of hazardous waste has been confirmed and to which various tracking, remediation, environmental management and reporting requirements apply.[68] Union Vale has one Superfund site on Route 55.

Transfer Station and Former Landfill

Union Vale's Municipal Landfill stopped accepting waste in August of 1989 and was officially closed in 1995. In 2007, Union Vale put a landfill cap extension very near the Town line between Beekman and Union Vale, near the landfill where solid waste was discovered after the closing of the original landfill site. The Town's transfer/recycling handling center on the western edge of Rt. 55 between Noxon Road and DeForrest Road in the southwestern corner of the Town was constructed on the same site and is used to handle solid waste that was formerly dumped in the landfill.

Understanding the sites of potential contamination, in relation to other maps in the Natural Resource Inventory, can provide insight into threats (i.e. pollution) to natural resources and other significant features in the Town.

[67] "Mining and Reclamation." NYS Department of Environmental Conservation. https://www.dec.ny.gov/lands/5020.html.
[68] "State Superfund Sites." NYS Department of Environmental Conservation. https://www.dec.ny.gov/chemical/8439.html.

Agricultural Resources (Map 18)

The Agricultural Resources Map shows the distribution of high-quality farmland soils and designated agricultural districts in the Town of Union Vale.

Soils

Successful agriculture is supported by quality soils. High quality soils require small fertilizer and nutrient inputs, leading to lower costs and higher production rates. Prime Farmland Soils are defined by the USDA and New York State and considered the most productive soils for farming.[1] Farmland Soils of Statewide Importance are soils that do not meet all criteria for Prime Farmland. Though not as productive as Prime Farmland, if managed properly, these soils can produce fair to good yields. There are soils conducive to agriculture found across the Town. The majority of Union Vale is comprised of important agricultural soils, except for areas on East Mountain, Clove Mountain and a few other excessively dry or wet sites.

Tax Exemptions and Agricultural Districts

County agricultural district designation entitles landowners to a mix of incentives aimed at preventing the conversion of farmland to non-agricultural uses. Agricultural tax exemptions limit local property tax liability to a prescribed agricultural assessment value. As of 2020, 47% of the land in Union Vale supported some type of agricultural use, although often the entire property is not farmed (e.g. areas with ponds, wetlands, or steep slopes). The Town has a total of 23,891 acres, with 11,120 of those in farms. Union Vale has 185 farm parcels, with the average size of parcels 61 acres. Hay, corn, and field crops represent by far the largest category of agricultural enterprise in Union Vale. Many smaller farms produce specialty crops, including dairy, beef and livestock; horse boarding and private farms.[69]

The **NYS Agricultural Districts Law** allows for state review of local laws affecting farms located within an agricultural district.

In cases where a local law is determined to be unreasonable, the NYS Department of Agriculture and Markets will work with the local government to develop mutually acceptable alternatives.

Agricultural Habitats

In additional to providing food crops, agricultural lands also host a variety of unique plants and wildlife that depend on the disturbance and subsequent regrowth related to farm operations (i.e. haying, grazing, and recolonization of abandoned farmland by woody plants). For this reason, grassland, meadow,

[69] *Community Profile: Agriculture and Farms, Union Vale, NY.* Cornell Cooperative Extension Dutchess County, 2020. https://s3.amazonaws.com/assets.cce.cornell.edu/attachments/48459/2020_Community_Ag_Profile_-_Union_Vale.pdf?1607536794

Small meadow, with native wildflowers, in Union Vale.
Jen Rubbo

shrubland, and young forest habitat require periodic maintenance or they will eventually revert to mature forest habitat. According to the **Aerial Imagery** and **Land Cover** maps, a majority of these resources are likely to be found in Clove Valley and along the LaGrange Town line, with smaller fragments of habitat in the northern portion of Town.

Grassland and meadow habitat can support a variety of life, including rare plants, butterflies, reptiles, and birds, in addition to providing agricultural uses and scenic values. The quantity and quality of grasslands for wildlife have rapidly decreased in the Northeast during the last century due to increased human population, changes in agricultural technology, and abandonment of family farms. This continuing trend threatens populations of grassland birds that have adapted to the agricultural landscape.

The 2000-2005 NYS Breeding Bird Atlas (NYS BBA) documented many priority grassland birds, including Species of Greatest Conservation Need (SGCN) – High Priority bobolink and SGCN – High Priority eastern meadowlark breeding in these open habitats.

Grassland breeding birds respond to habitat structure rather than species composition, so even hayfields dominated by non-native grasses can provide suitable habitat for species of conservation concern if they are managed appropriately. It is likely that the numerous hunting clubs in the Town actively manage their grasslands and meadows for game species, which benefits non-game species who use the same habitat. See Audubon's guidance on managing habitat for grassland birds.

Shrublands and young forests are transitional habitats characterized by few or no mature trees, with a diverse mix of shrubs and/or tree saplings, along with openings where grasses and wildflowers grow. They can occur in recently cleared areas and abandoned farmland and are sometimes maintained along utility corridors by cutting or herbicides. These habitats are important for many wildlife species declining throughout the region because former agricultural areas have grown into forests, and natural forest disturbances that trigger young forest growth, such as fires, have been suppressed.

Records from the NYS BBA support the presence of shrubland and young forest specialists; SGCN High-Priority brown thrasher and Canada warbler along with four other SGCN bird species. It is likely that the numerous hunting clubs in the Town actively manage some of their shrublands and young forest for game species, which benefits non-game species who use the same habitat. For more information, see Audubon's guidance on managing habitat for shrubland birds.

Large areas of farmland can promote a critical mass of farming, which is important to the long-term viability of agriculture in Union Vale and in Dutchess County. Understanding the distribution of these agricultural resources should be an important consideration in municipal planning and development management processes. The Dutchess County Agricultural and Farmland Protection Plan (2015) is the best local resource for understanding priority agricultural resources in the region.

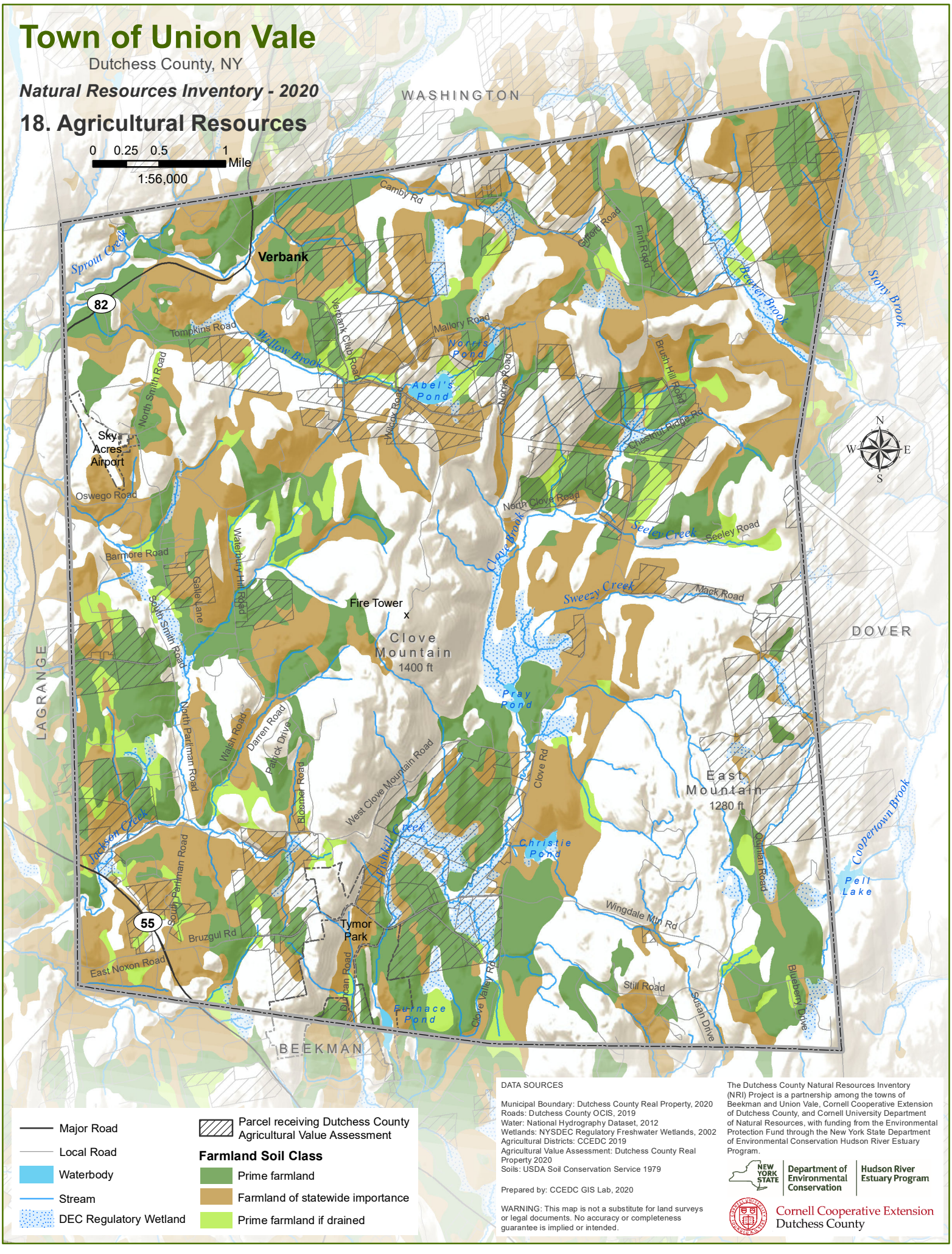
Growing food locally can benefit the local economy, the environment, and the health and welfare of the community if sustainable agricultural practices are used. In addition to providing the community with a local source of crops, livestock, and economic benefits, farmlands can also serve as an important source of food and cover for wildlife, and provided certain practices are used, can help control flooding and protect wetlands and watersheds. Farmland also contributes to scenic beauty and open space.

Town of Union Vale

Dutchess County, NY

Natural Resources Inventory - 2020

18. Agricultural Resources



Major Road
Local Road
Waterbody
Stream
DEC Regulatory Wetland

Parcel receiving Dutchess County Agricultural Value Assessment

Farmland Soil Class

Prime farmland
Farmland of statewide importance
Prime farmland if drained

DATA SOURCES

Municipal Boundary: Dutchess County Real Property, 2020
Roads: Dutchess County OCIS, 2019
Water: National Hydrography Dataset, 2012
Wetlands: NYSDEC Regulatory Freshwater Wetlands, 2002
Agricultural Districts: CCEDC 2019
Agricultural Value Assessment: Dutchess County Real Property 2020
Soils: USDA Soil Conservation Service 1979

Prepared by: CCEDC GIS Lab, 2020

WARNING: This map is not a substitute for land surveys or legal documents. No accuracy or completeness guarantee is implied or intended.

The Dutchess County Natural Resources Inventory (NRI) Project is a partnership among the towns of Beekman and Union Vale, Cornell Cooperative Extension of Dutchess County, and Cornell University Department of Natural Resources, with funding from the Environmental Protection Fund through the New York State Department of Environmental Conservation Hudson River Estuary Program.

NEW YORK STATE | Department of Environmental Conservation | Hudson River Estuary Program

Cornell Cooperative Extension Dutchess County

Conservation Lands (Map 19)

Access to parks and open space within a community brings substantial social, environmental, economic, and health benefits.[70] These places help define Union Vale by giving residents opportunities to enjoy the natural beauty of the region and provide areas to promote relaxation and exercise.

Protected Lands in Union Vale

405 acres of parks, preserves, and other public and protected lands in the Union Vale were identified from the NY Protected Areas Database (NYPAD), a spatial database of lands protected, designated, or functioning as open space, natural areas, conservation lands, or recreational areas. NYPAD uses the term "protected" broadly, including lands that may be public or private, open or closed to public use, permanently protected from development or subject to future changes in management. NYPAD was created by the NY Natural Heritage Program, and can be accessed through NYPAD.org, or though the Hudson River Valley Natural Resource Mapper.[71]

Tymor Park, 500 acres of mostly fields and forest, is the largest municipal park in New York State.

At approximately 500 acres, Union Vale's Tymor Park (boundary indicated on all NRI maps) is the largest municipal park in New York State (A portion of the property is within Beekman but is still owned by the Town of Union Vale). The park was deeded to the Town between 1971 and 1978 when Ralph and Jean Connor donated 500 acres of their former dairy farm. The land includes hardwood and softwood forests, open fields, wetlands, over a mile of the length of Fishkill Creek, and Furnace Pond. Recreational facilities offer both passive and active opportunities to Town residents—six miles of main trails and many smaller trails through meadows and forests; picnicking areas and three pavilions; a swimming pool; an equestrian center; soccer fields; a baseball diamond, tennis courts and playground. An area at the south end of the park includes vestiges of an old iron ore mill that is of historic interest. The park also accommodates the Town's community center and Town Hall. The park's master plan, produced in 2004, is an effort to reaffirm the park's natural resources and honor the donors' commitment to the conservation of resources while continuing to offer such a wide array of community services to residents. In more recent years, the management of non-native species has become of concern as well.

A **conservation easement** is a voluntary legal agreement between a landowner and a land trust or government agency that permanently limits development and other uses of the land in order to protect its conservation values. Landowners retain many of their rights, including the right to own and use the land, sell it and pass it on to their heirs and in some cases subdivide it.[72] Local lands trusts, such as the Dutchess Land Conservancy (DLC), offer conservation easement programs and may purchase conservation easements or land directly to help residents preserve their land for future generations.

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[70] Sherer, P. M. *The Benefits of Parks: Why America Needs More City Parks and Open Space*. 2006

[71] "Hudson Valley Natural Resource Mapper." http://www.dec.ny.gov/lands/112137.html

[72] "What can you do?" Land Trust Alliance. https://www.landtrustalliance.org/what-you-can-do/conserve-your-land/questions

There are about 901 acres of privately-held land under conservation easement in Union Vale. The 191-acre Abel Tree Farm on North Clove Road is protected by a conservation easement granted in 2007, the result of a funding partnership between the county, the Town of Union Vale, and the DLC. Likewise in 2007, the New York State Department of Agriculture and Markets announced an award to Dutchess County to secure the development rights on 177 acres of the 207-acre Bos Haven farm on Camby Road (occupying land in both Union Vale and Washington).[73] In addition, several smaller privately owned parcels in the north and east of Union Vale have been protected by DLC conservation easements in an effort to help preserve the Town's rural character.

Table.7 Protected Lands in Union Vale

Landowner	Acres
Town of Union Vale (Municipal Park)	405
Private (Dutchess Land Conservancy Conservation Easements)	901
Total Protected Land	**1,306**

Scenic Views

The visual character of the Hudson Valley is defined by its beautiful and abundant natural scenery. Whether it's a dramatic vista or a quiet place in nature, the river and its valley are known for inspiring those who have lived here. In addition to creating a community's sense of place, views of nature can have direct economic and health impacts, benefiting tourists and residents alike. Natural scenery is the backdrop for New York State's nearly 115-billion-dollar tourism industry; the state's third largest employer[74]. Residents also enjoy viewing nature, either through active recreation or by admiring it as they go about their daily business. Numerous studies document the health benefits of simply looking at trees, which include reduced stress, improved mental health, increased academic performance, and enhanced social cohesion[75]

Scenic view from Clove Road. *Jen Rubbo.*

[73] *Community Profile: Agriculture and Farms, Union Vale, NY.* Cornell Cooperative Extension Dutchess County, 2020. https://s3.amazonaws.com/assets.cce.cornell.edu/attachments/48459/2020_Community_Ag_Profile_-_Union_Vale.pdf?1607536794

[74] "Tourism." Empire State Development. https://esd.ny.gov/industries/tourism.

[75] Bowyer, J., S. Bratkovich, K. Fernholz, J. Howe, H. Groot, E. Pepke. *The Human Health and Social Benefits of Urban Forests.* Dovetail Partners Inc. 2016. https://www.dec.ny.gov/docs/lands_forests_pdf/ucfdovetail2016rpt.pdf].

Union Vale has protected its scenic vistas through land conservation and through its zoning code. See the **Zoning** section of this report for a description of the protections offered by the Environmental Protection and Scenic Corridor overlay districts. The code helps to protect the views from these scenic and historic locations and many more[76]:

Scenic

- Waterbury Hill and Rickes Road
- Sky Acres Airport
- Brush Hill Road
- Union Vale Town Hall on Duncan Road
- Blueberry Hill
- Rt 82 at the Washington town line

Historic

- The 18th-century Verbank village and green
- The Verbank Methodist Church and Cemetery
- the Oswego Meeting House and Cemetery
- Abel Tree Farm
- Union Vale Grange, active since 1900; town garage (WPA project)
- Clove Valley School House
- Emigh Stone House, ca 1740
- The Clove Cemetery, ca 1858
- Valley Bible Fellowship Church, ca 1871
- Skidmore house, ca 1790
- Tymor Park.

The Conservation Lands map can help the Town consider how projects adjacent to parks, open space, and trails may impact the value residents gain from these areas, as well as ways to maintain habitat connectivity with preserves and other protected lands. This map can also help identify opportunities to grow and connect parks, preserves, paths, and trails as new projects arise. During site plan and subdivision review, the Town should consider creating and maintaining habitat connections for the movement of plants and animals. It should also consider creating new connections among parks and trails, and the potential to create connections among future trails, for pedestrian mobility and accessibility. (Creating connections for pedestrians can also advance habitat connectivity objectives.) In order to accomplish these objectives, land can be set aside and deed restricted, put under a conservation easement, or conveyed to the Town on site and subdivision plans for these purposes.

[76] *Town of Union Vale: Master Plan*. 2001. http://nebula.wsimg.com/7ad4452f40eba6fd5da93479c4d3a79e?AccessKeyId=DE12759CD62206A763E1&disposition=0&alloworigin=1

Town of Union Vale

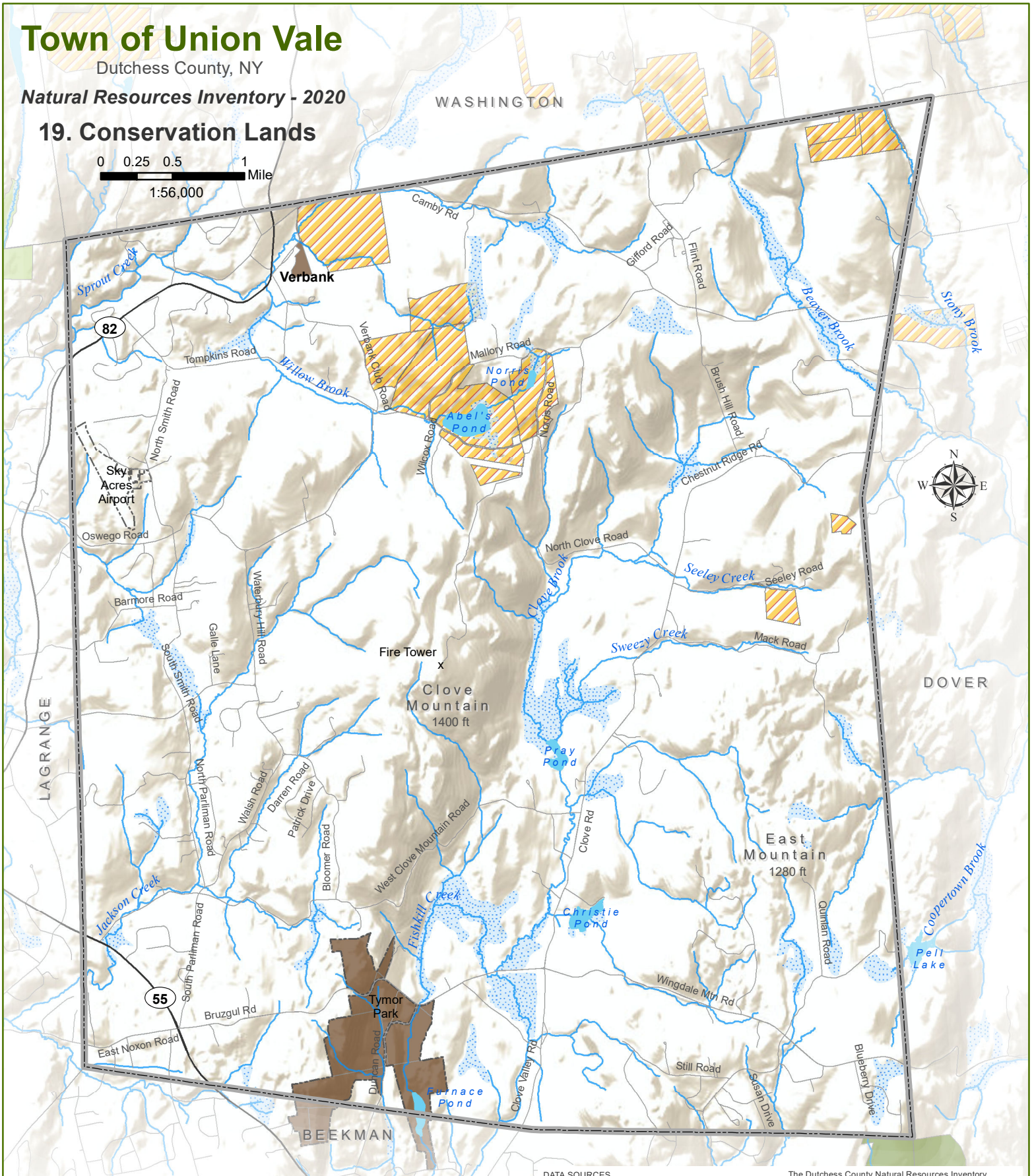
Dutchess County, NY

Natural Resources Inventory - 2020

19. Conservation Lands

0 0.25 0.5 1 Mile

1:56,000



Major Road

Local Road

Waterbody

Stream

DEC Regulatory Wetland

Dutchess Land Conservancy Easements (NO PUBLIC ACCESS)

Protected Areas (NYPAD)

Local Park

State Forest

DATA SOURCES

Municipal Boundary: Dutchess County Real Property, 2020
Roads: Dutchess County OCIS, 2019
Water: National Hydrography Dataset, 2012
Wetlands: NYSDEC Regulatory Freshwater Wetlands, 2002
Conservation Lands: NYPAD, 2019 & Dutchess Land Conservancy, 2020

Prepared by: CCEDC GIS Lab, 2020

The Dutchess County Natural Resources Inventory (NRI) Project is a partnership among the towns of Beekman and Union Vale, Cornell Cooperative Extension of Dutchess County, and Cornell University Department of Natural Resources, with funding from the Environmental Protection Fund through the New York State Department of Environmental Conservation Hudson River Estuary Program.

NEW YORK STATE | Department of Environmental Conservation | Hudson River Estuary Program

Cornell Cooperative Extension Dutchess County

Hunt Clubs (Map 20)

Three local Rod and Gun clubs own a comparatively large portion of Union Vale's lands, approximately 4,936 acres: Verbank Hunting and Fishing Club, Mid-County Rod and Gun Club, and Clove Valley Rod and Gun Club. These private hunting lands host a mostly contiguous block of natural lands that connect regionally important habitats on Clove Mountain and East Mountain. While these organizations and their expansive land holdings are partly responsible for maintaining the rural, undeveloped character of much of the Town, their ownership of the land does present a unique situation. Land that is owned by the clubs is private and not open to the public.

The nature of the use on these lands, hunting and fishing, is prohibitive to the establishment of an interconnecting public trail system. Another issue concerning the future use of these lands is that the parcels could be sold for development. Their central location near the bucolic Clove Valley makes these parcels prime locations for new home sites. Union Vale might consider exploring the different options available for preserving the areas as open space including zoning updates and partnerships with local land trusts to purchase parkland or conservation easements on privately held land.

Town of Union Vale

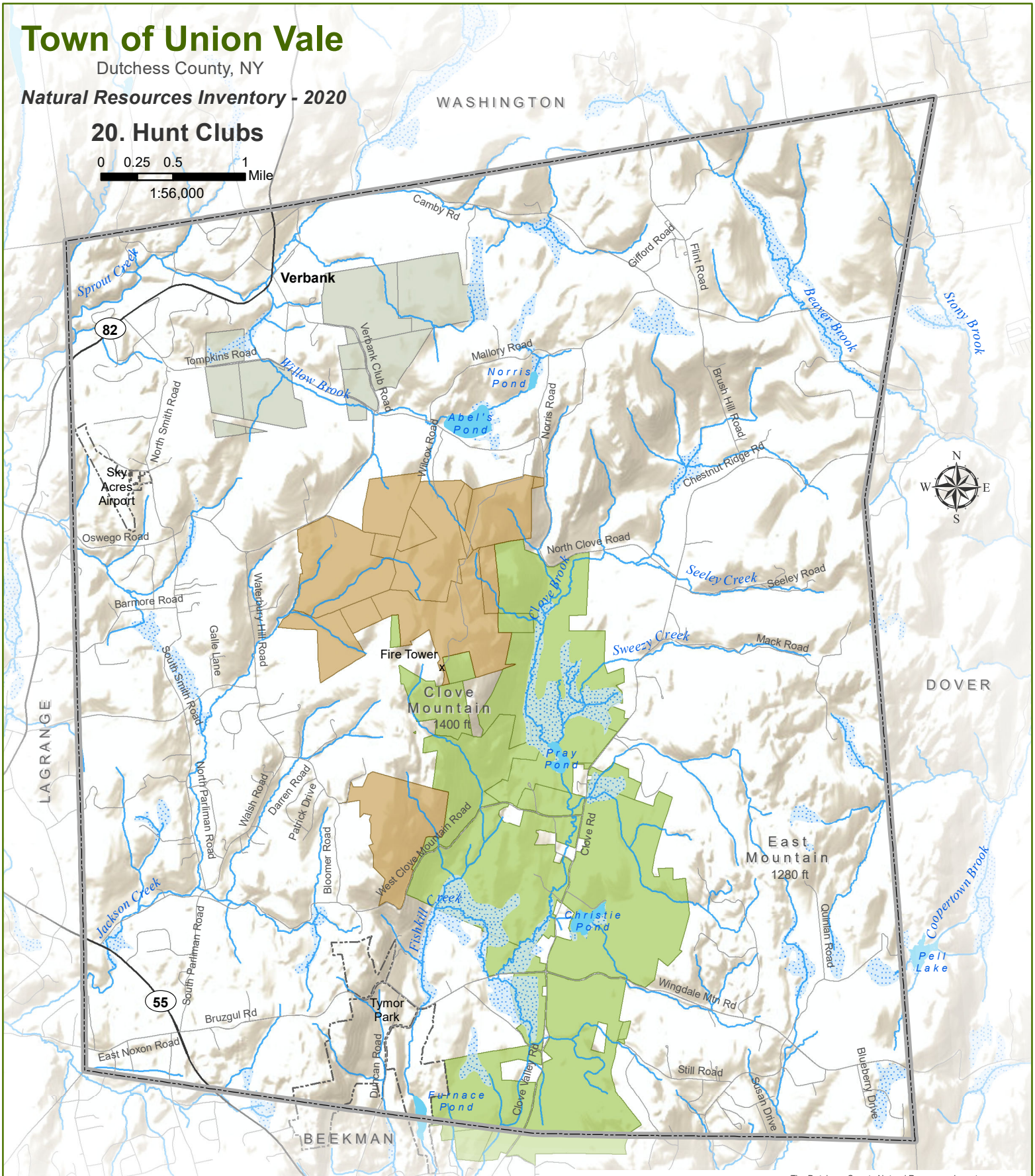
Dutchess County, NY

Natural Resources Inventory - 2020

20. Hunt Clubs

0 0.25 0.5 1 Mile

1:56,000



Major Road

Local Road

Waterbody

Stream

DEC Regulatory Wetland

Hunt Clubs

Verbank Hunting & Fishing Club

Mid-County Rod & Gun Club

Clove Valley Rod & Gun Club

DATA SOURCES

Municipal Boundary: Dutchess County Real Property, 2020
Roads: Dutchess County OCIS, 2019
Water: National Hydrography Dataset, 2012
Wetlands: NYSDEC Regulatory Freshwater Wetlands, 2002
Hunt Club Properties: Dutchess County Real Property, 2020

Prepared by: CCEDC GIS Lab, 2020

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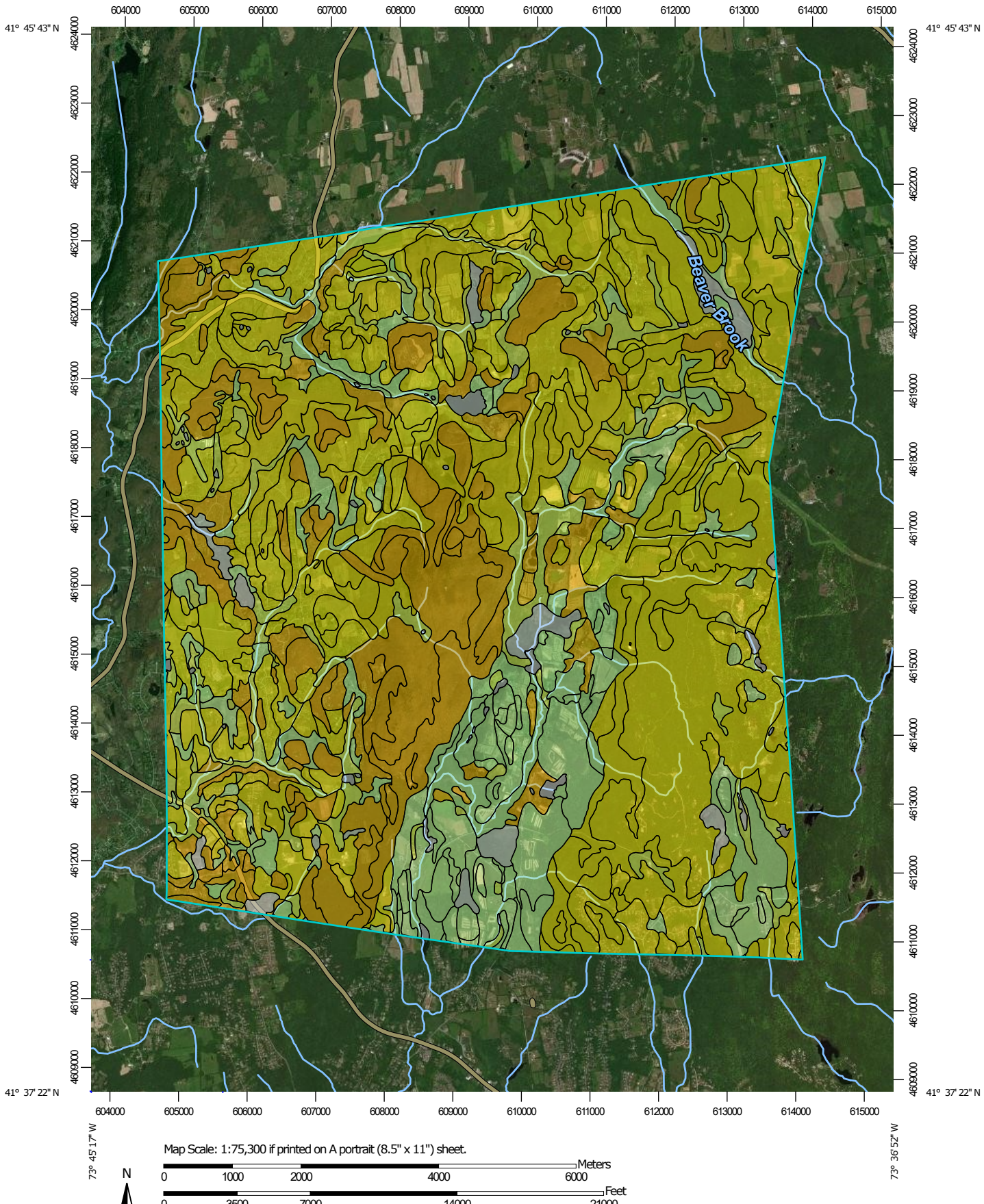
Appendix A
Soil Maps and Attributes

pH (1 to 1 Water)—Dutchess County, New York
(_pH)



Map Scale: 1:75,300 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 1000 2000 4000 6000

Feet
0 3500 7000 14000 21000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- Ultra acid (ph < 3.5)
- Extremely acid (pH 3.5 - 4.4)
- Very strongly acid (pH 4.5 - 5.0)
- Strongly acid (pH 5.1 - 5.5)
- Moderately acid (pH 5.6 - 6.0)
- Slightly acid (pH 6.1 - 6.5)
- Neutral (pH 6.6 - 7.3)
- Slightly alkaline (pH 7.4 - 7.8)
- Moderately alkaline (pH 7.9 - 8.4)
- Strongly alkaline (pH 8.5 - 9.0)
- Very strongly alkaline (pH > 9.0)
- Not rated or not available

Soil Rating Lines

- Ultra acid (ph < 3.5)
- Extremely acid (pH 3.5 - 4.4)
- Very strongly acid (pH 4.5 - 5.0)
- Strongly acid (pH 5.1 - 5.5)
- Moderately acid (pH 5.6 - 6.0)
- Slightly acid (pH 6.1 - 6.5)
- Neutral (pH 6.6 - 7.3)
- Slightly alkaline (pH 7.4 - 7.8)
- Moderately alkaline (pH 7.9 - 8.4)
- Strongly alkaline (pH 8.5 - 9.0)
- Very strongly alkaline (pH > 9.0)
- Not rated or not available

Soil Rating Points

- Ultra acid (ph < 3.5)
- Extremely acid (pH 3.5 - 4.4)
- Very strongly acid (pH 4.5 - 5.0)
- Strongly acid (pH 5.1 - 5.5)
- Moderately acid (pH 5.6 - 6.0)
- Slightly acid (pH 6.1 - 6.5)
- Neutral (pH 6.6 - 7.3)
- Slightly alkaline (pH 7.4 - 7.8)
- Moderately alkaline (pH 7.9 - 8.4)
- Strongly alkaline (pH 8.5 - 9.0)
- Very strongly alkaline (pH > 9.0)
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Dutchess County, New York
Survey Area Data: Version 17, Jun 11, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 2, 2015—Oct 5, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

pH (1 to 1 Water)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
BeB	Bernardston silt loam, 3 to 8 percent slopes	5.3	29.7	0.1%
BeC	Bernardston silt loam, 8 to 15 percent slopes	5.3	200.1	0.8%
BeD	Bernardston silt loam, 15 to 25 percent slopes	5.3	31.4	0.1%
Cc	Catden muck, 0 to 2 percent slopes		308.5	1.3%
ChB	Charlton fine sandy loam, 3 to 8 percent slopes	5.1	30.8	0.1%
ChC	Charlton fine sandy loam, 8 to 15 percent slopes	5.1	174.2	0.7%
CrB	Charlton-Chatfield complex, undulating, rocky	5.3	65.5	0.3%
CrC	Charlton-Chatfield complex, rolling, rocky	5.3	79.3	0.3%
CtB	Chatfield-Hollis complex, undulating, very rocky	5.3	107.8	0.5%
CtC	Chatfield-Hollis complex, rolling, very rocky	5.3	464.1	1.9%
CuA	Copake gravelly silt loam, nearly level	5.9	0.4	0.0%
DuB	Dutchess silt loam, 3 to 8 percent slopes	5.3	910.1	3.8%
DuC	Dutchess silt loam, 8 to 15 percent slopes	5.3	1,249.4	5.2%
DuD	Dutchess silt loam, 15 to 25 percent slopes	5.3	238.4	1.0%
DwB	Dutchess-Cardigan complex, undulating, rocky	5.3	1,244.2	5.2%
DwC	Dutchess-Cardigan complex, rolling, rocky	5.3	2,066.2	8.6%
DwD	Dutchess-Cardigan complex, hilly, rocky	5.3	930.5	3.9%
FcD	Farmington-Galway complex, hilly, very rocky	6.2	3.2	0.0%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
FeE	Farmington-Rock outcrop complex, steep	6.2	19.7	0.1%
Ff	Fluvaquents-Udifluvents complex, frequently flooded	5.9	370.1	1.5%
Fr	Fredon silt loam	6.5	82.0	0.3%
GfB	Galway-Farmington complex, undulating, rocky	6.5	69.2	0.3%
GfC	Galway-Farmington complex, rolling, rocky	6.5	103.3	0.4%
GfD	Galway-Farmington complex, hilly	6.5	13.5	0.1%
GsA	Georgia silt loam, 0 to 3 percent slopes	6.2	77.4	0.3%
GsB	Georgia silt loam, 3 to 8 percent slopes	6.2	780.5	3.3%
GsC	Georgia silt loam, 8 to 15 percent slopes	6.2	108.8	0.5%
Ha	Halsey mucky silt loam	6.5	17.2	0.1%
HoC	Hollis-Chatfield-Rock outcrop complex, rolling	5.3	658.2	2.8%
HoD	Hollis-Chatfield-Rock outcrop complex, hilly	5.3	2,189.2	9.2%
HoE	Hollis-Chatfield-Rock outcrop complex, steep	5.3	77.2	0.3%
HoF	Hollis-Chatfield-Rock outcrop complex, very steep	5.3	791.7	3.3%
HsA	Hoosic gravelly loam, nearly level	5.0	192.4	0.8%
HsB	Hoosic gravelly loam, undulating	5.0	297.5	1.2%
HsC	Hoosic gravelly loam, rolling	5.0	190.5	0.8%
HsD	Hoosic gravelly loam, hilly	5.0	5.6	0.0%
HtA	Hoosic channery loam, fan, 0 to 3 percent slopes	5.0	68.3	0.3%
HtB	Hoosic channery loam, fan, 3 to 8 percent slopes	5.0	264.5	1.1%
MnA	Massena silt loam, 0 to 3 percent slopes	6.5	243.5	1.0%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
MnB	Massena silt loam, 3 to 8 percent slopes	6.5	457.3	1.9%
NwB	Nassau-Cardigan complex, undulating, very rocky	5.0	164.2	0.7%
NwC	Nassau-Cardigan complex, rolling, very rocky	5.0	1,030.5	4.3%
NwD	Nassau-Cardigan complex, hilly, very rocky	5.0	1,674.3	7.0%
NxE	Nassau-Rock outcrop complex, steep	5.0	595.0	2.5%
NxF	Nassau-Rock outcrop complex, very steep	5.0	475.7	2.0%
NyA	Natchaug muck, 0 to 2 percent slopes		134.8	0.6%
Pg	Pawling silt loam	5.6	91.7	0.4%
Ps	Pits, gravel		52.5	0.2%
PwB	Pittstown silt loam, 3 to 8 percent slopes	5.3	798.6	3.3%
PwC	Pittstown silt loam, 8 to 15 percent slopes	5.3	258.1	1.1%
PzA	Punsit silt loam, 0 to 3 percent slopes	6.1	94.9	0.4%
PzB	Punsit silt loam, 3 to 8 percent slopes	6.1	66.0	0.3%
SkB	Stockbridge silt loam, 3 to 8 percent slopes	6.2	702.1	2.9%
SkC	Stockbridge silt loam, 8 to 15 percent slopes	6.2	556.4	2.3%
SmB	Stockbridge-Farmington complex, undulating, rocky	6.2	72.5	0.3%
SmC	Stockbridge-Farmington complex, rolling, rocky	6.2	19.8	0.1%
SmD	Stockbridge-Farmington complex, hilly, rocky	6.2	5.4	0.0%
Su	Sun silt loam	5.8	1,100.1	4.6%
Ud	Udorthents, smoothed	5.9	47.6	0.2%
Ue	Udorthents, wet substratum	5.9	16.2	0.1%
W	Water		164.5	0.7%
We	Wappinger loam	5.6	3.6	0.0%
Wy	Wayland silt loam	6.5	557.1	2.3%
Totals for Area of Interest			**23,893.2**	**100.0%**

Description

Soil reaction is a measure of acidity or alkalinity. It is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion. In general, soils that are either highly alkaline or highly acid are likely to be very corrosive to steel. The most common soil laboratory measurement of pH is the 1:1 water method. A crushed soil sample is mixed with an equal amount of water, and a measurement is made of the suspension.

For each soil layer, this attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

Rating Options

Aggregation Method: Dominant Component

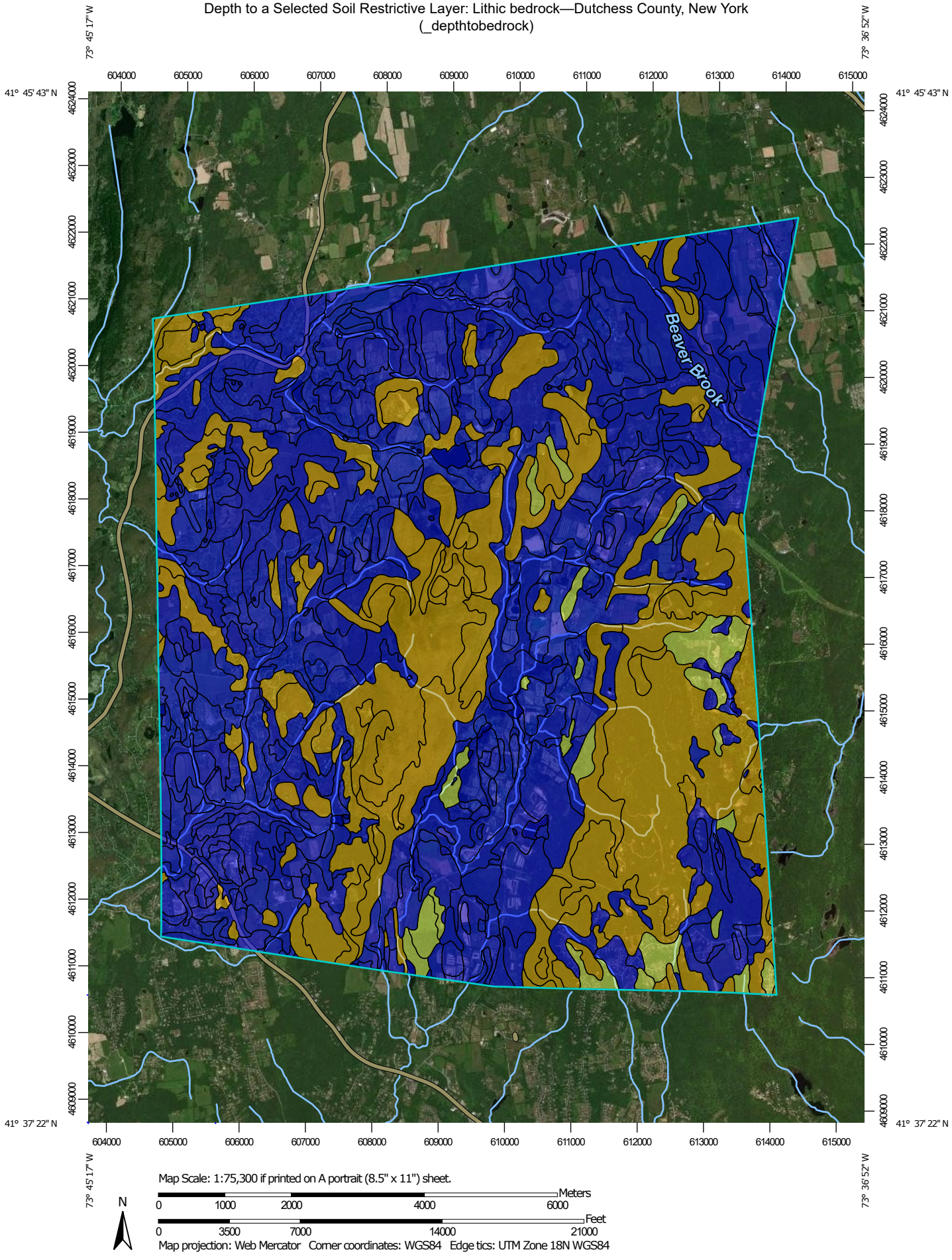
Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Interpret Nulls as Zero: No

Layer Options (Horizon Aggregation Method): Surface Layer (Not applicable)

Depth to a Selected Soil Restrictive Layer: Lithic bedrock—Dutchess County, New York
(_depthtobedrock)



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Soil Rating Lines

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Soil Rating Points

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Dutchess County, New York
Survey Area Data: Version 17, Jun 11, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 2, 2015—Oct 5, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Depth to a Selected Soil Restrictive Layer: Lithic bedrock

Map unit symbol	Map unit name	Rating (centimeters)	Acres in AOI	Percent of AOI
BeB	Bernardston silt loam, 3 to 8 percent slopes	>200	29.7	0.1%
BeC	Bernardston silt loam, 8 to 15 percent slopes	>200	200.1	0.8%
BeD	Bernardston silt loam, 15 to 25 percent slopes	>200	31.4	0.1%
Cc	Catden muck, 0 to 2 percent slopes	>200	308.5	1.3%
ChB	Charlton fine sandy loam, 3 to 8 percent slopes	>200	30.8	0.1%
ChC	Charlton fine sandy loam, 8 to 15 percent slopes	>200	174.2	0.7%
CrB	Charlton-Chatfield complex, undulating, rocky	>200	65.5	0.3%
CrC	Charlton-Chatfield complex, rolling, rocky	>200	79.3	0.3%
CtB	Chatfield-Hollis complex, undulating, very rocky	76	107.8	0.5%
CtC	Chatfield-Hollis complex, rolling, very rocky	76	464.1	1.9%
CuA	Copake gravelly silt loam, nearly level	>200	0.4	0.0%
DuB	Dutchess silt loam, 3 to 8 percent slopes	>200	910.1	3.8%
DuC	Dutchess silt loam, 8 to 15 percent slopes	>200	1,249.4	5.2%
DuD	Dutchess silt loam, 15 to 25 percent slopes	>200	238.4	1.0%
DwB	Dutchess-Cardigan complex, undulating, rocky	>200	1,244.2	5.2%
DwC	Dutchess-Cardigan complex, rolling, rocky	>200	2,066.2	8.6%
DwD	Dutchess-Cardigan complex, hilly, rocky	>200	930.5	3.9%
FcD	Farmington-Galway complex, hilly, very rocky	38	3.2	0.0%

Map unit symbol	Map unit name	Rating (centimeters)	Acres in AOI	Percent of AOI
FeE	Farmington-Rock outcrop complex, steep	38	19.7	0.1%
Ff	Fluvaquents-Udifluvents complex, frequently flooded	>200	370.1	1.5%
Fr	Fredon silt loam	>200	82.0	0.3%
GfB	Galway-Farmington complex, undulating, rocky	79	69.2	0.3%
GfC	Galway-Farmington complex, rolling, rocky	79	103.3	0.4%
GfD	Galway-Farmington complex, hilly	79	13.5	0.1%
GsA	Georgia silt loam, 0 to 3 percent slopes	>200	77.4	0.3%
GsB	Georgia silt loam, 3 to 8 percent slopes	>200	780.5	3.3%
GsC	Georgia silt loam, 8 to 15 percent slopes	>200	108.8	0.5%
Ha	Halsey mucky silt loam	>200	17.2	0.1%
HoC	Hollis-Chatfield-Rock outcrop complex, rolling	38	658.2	2.8%
HoD	Hollis-Chatfield-Rock outcrop complex, hilly	38	2,189.2	9.2%
HoE	Hollis-Chatfield-Rock outcrop complex, steep	38	77.2	0.3%
HoF	Hollis-Chatfield-Rock outcrop complex, very steep	38	791.7	3.3%
HsA	Hoosic gravelly loam, nearly level	>200	192.4	0.8%
HsB	Hoosic gravelly loam, undulating	>200	297.5	1.2%
HsC	Hoosic gravelly loam, rolling	>200	190.5	0.8%
HsD	Hoosic gravelly loam, hilly	>200	5.6	0.0%
HtA	Hoosic channery loam, fan, 0 to 3 percent slopes	>200	68.3	0.3%
HtB	Hoosic channery loam, fan, 3 to 8 percent slopes	>200	264.5	1.1%
MnA	Massena silt loam, 0 to 3 percent slopes	>200	243.5	1.0%

Map unit symbol	Map unit name	Rating (centimeters)	Acres in AOI	Percent of AOI
MnB	Massena silt loam, 3 to 8 percent slopes	>200	457.3	1.9%
NwB	Nassau-Cardigan complex, undulating, very rocky	41	164.2	0.7%
NwC	Nassau-Cardigan complex, rolling, very rocky	41	1,030.5	4.3%
NwD	Nassau-Cardigan complex, hilly, very rocky	41	1,674.3	7.0%
NxE	Nassau-Rock outcrop complex, steep	41	595.0	2.5%
NxF	Nassau-Rock outcrop complex, very steep	41	475.7	2.0%
NyA	Natchaug muck, 0 to 2 percent slopes	>200	134.8	0.6%
Pg	Pawling silt loam	>200	91.7	0.4%
Ps	Pits, gravel	>200	52.5	0.2%
PwB	Pittstown silt loam, 3 to 8 percent slopes	>200	798.6	3.3%
PwC	Pittstown silt loam, 8 to 15 percent slopes	>200	258.1	1.1%
PzA	Punsit silt loam, 0 to 3 percent slopes	>200	94.9	0.4%
PzB	Punsit silt loam, 3 to 8 percent slopes	>200	66.0	0.3%
SkB	Stockbridge silt loam, 3 to 8 percent slopes	>200	702.1	2.9%
SkC	Stockbridge silt loam, 8 to 15 percent slopes	>200	556.4	2.3%
SmB	Stockbridge-Farmington complex, undulating, rocky	>200	72.5	0.3%
SmC	Stockbridge-Farmington complex, rolling, rocky	>200	19.8	0.1%
SmD	Stockbridge-Farmington complex, hilly, rocky	>200	5.4	0.0%
Su	Sun silt loam	>200	1,100.1	4.6%
Ud	Udorthents, smoothed	>200	47.6	0.2%
Ue	Udorthents, wet substratum	>200	16.2	0.1%
W	Water	>200	164.5	0.7%
We	Wappinger loam	>200	3.6	0.0%
Wy	Wayland silt loam	>200	557.1	2.3%
Totals for Area of Interest			**23,893.2**	**100.0%**

Description

A "restrictive layer" is a nearly continuous layer that has one or more physical, chemical, or thermal properties that significantly impede the movement of water and air through the soil or that restrict roots or otherwise provide an unfavorable root environment. Examples are bedrock, cemented layers, dense layers, and frozen layers.

This theme presents the depth to the user selected type of restrictive layer as described in for each map unit. If no restrictive layer is described in a map unit, it is represented by the "greater than 200" depth class.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

Rating Options

Units of Measure: centimeters

Restriction Kind: Lithic bedrock

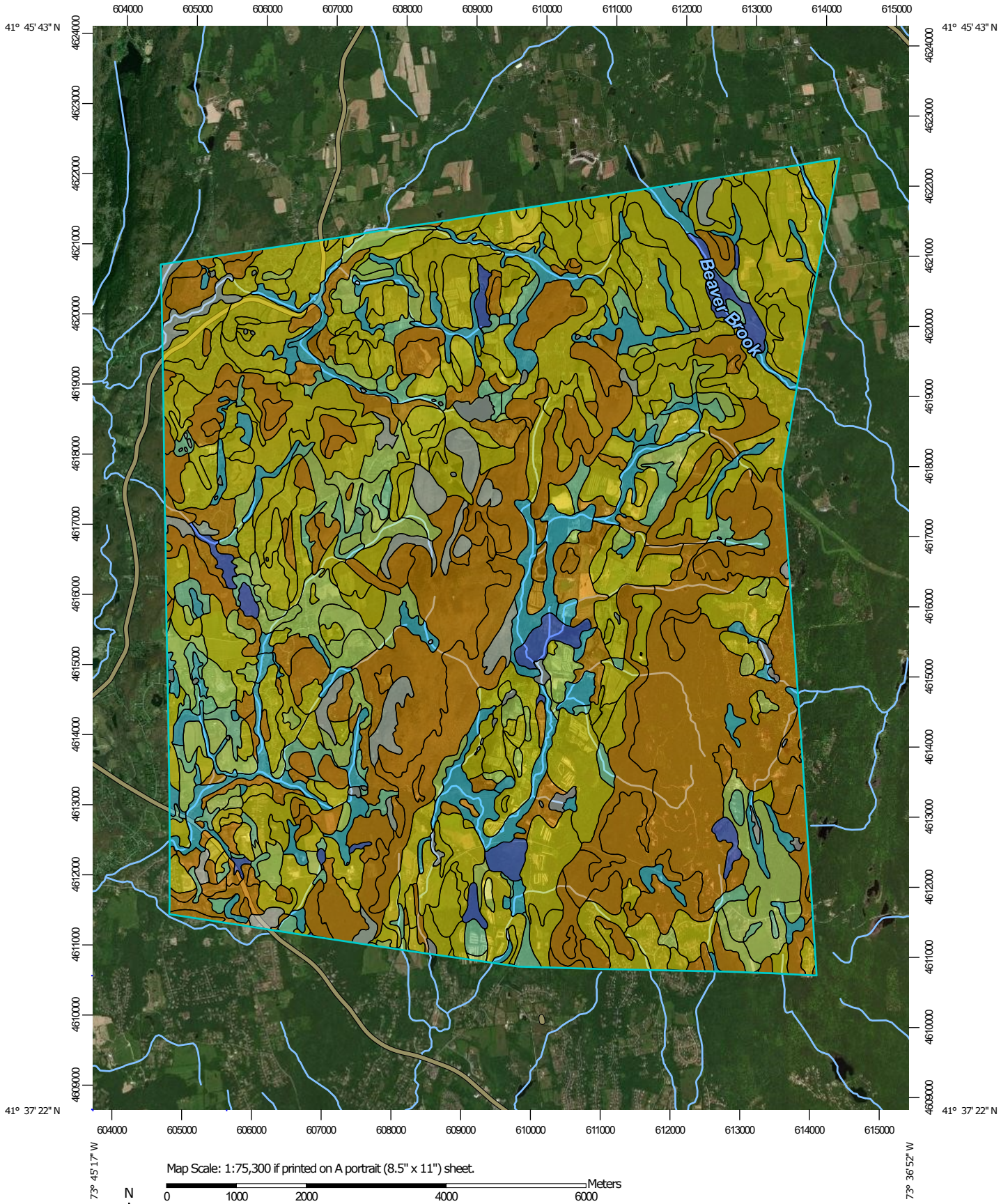
Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Interpret Nulls as Zero: No

Drainage Class—Dutchess County, New York
(UnionValeBoundary_20200222)



Map Scale: 1:75,300 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 1000 2000 4000 6000

Feet
0 3500 7000 14000 21000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- Excessively drained
- Somewhat excessively drained
- Well drained
- Moderately well drained
- Somewhat poorly drained
- Poorly drained
- Very poorly drained
- Subaqueous
- Not rated or not available

Soil Rating Lines

- Excessively drained
- Somewhat excessively drained
- Well drained
- Moderately well drained
- Somewhat poorly drained
- Poorly drained
- Very poorly drained
- Subaqueous
- Not rated or not available

Soil Rating Points

- Excessively drained
- Somewhat excessively drained
- Well drained
- Moderately well drained
- Somewhat poorly drained
- Poorly drained
- Very poorly drained
- Subaqueous
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Dutchess County, New York
Survey Area Data: Version 17, Jun 11, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 2, 2015—Oct 5, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Drainage Class

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
BeB	Bernardston silt loam, 3 to 8 percent slopes	Well drained	29.7	0.1%
BeC	Bernardston silt loam, 8 to 15 percent slopes	Well drained	200.1	0.8%
BeD	Bernardston silt loam, 15 to 25 percent slopes	Well drained	31.4	0.1%
Cc	Catden muck, 0 to 2 percent slopes	Very poorly drained	308.5	1.3%
ChB	Charlton fine sandy loam, 3 to 8 percent slopes	Well drained	30.8	0.1%
ChC	Charlton fine sandy loam, 8 to 15 percent slopes	Well drained	174.2	0.7%
CrB	Charlton-Chatfield complex, undulating, rocky	Well drained	65.5	0.3%
CrC	Charlton-Chatfield complex, rolling, rocky	Well drained	79.3	0.3%
CtB	Chatfield-Hollis complex, undulating, very rocky	Well drained	107.8	0.5%
CtC	Chatfield-Hollis complex, rolling, very rocky	Well drained	464.1	1.9%
CuA	Copake gravelly silt loam, nearly level	Well drained	0.4	0.0%
DuB	Dutchess silt loam, 3 to 8 percent slopes	Well drained	910.1	3.8%
DuC	Dutchess silt loam, 8 to 15 percent slopes	Well drained	1,249.4	5.2%
DuD	Dutchess silt loam, 15 to 25 percent slopes	Well drained	238.4	1.0%
DwB	Dutchess-Cardigan complex, undulating, rocky	Well drained	1,244.2	5.2%
DwC	Dutchess-Cardigan complex, rolling, rocky	Well drained	2,066.2	8.6%
DwD	Dutchess-Cardigan complex, hilly, rocky	Well drained	930.5	3.9%
FcD	Farmington-Galway complex, hilly, very rocky	Somewhat excessively drained	3.2	0.0%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
FeE	Farmington-Rock outcrop complex, steep	Somewhat excessively drained	19.7	0.1%
Ff	Fluvaquents-Udifluvents complex, frequently flooded	Poorly drained	370.1	1.5%
Fr	Fredon silt loam	Somewhat poorly drained	82.0	0.3%
GfB	Galway-Farmington complex, undulating, rocky	Well drained	69.2	0.3%
GfC	Galway-Farmington complex, rolling, rocky	Well drained	103.3	0.4%
GfD	Galway-Farmington complex, hilly	Well drained	13.5	0.1%
GsA	Georgia silt loam, 0 to 3 percent slopes	Moderately well drained	77.4	0.3%
GsB	Georgia silt loam, 3 to 8 percent slopes	Moderately well drained	780.5	3.3%
GsC	Georgia silt loam, 8 to 15 percent slopes	Moderately well drained	108.8	0.5%
Ha	Halsey mucky silt loam	Very poorly drained	17.2	0.1%
HoC	Hollis-Chatfield-Rock outcrop complex, rolling	Somewhat excessively drained	658.2	2.8%
HoD	Hollis-Chatfield-Rock outcrop complex, hilly	Somewhat excessively drained	2,189.2	9.2%
HoE	Hollis-Chatfield-Rock outcrop complex, steep	Somewhat excessively drained	77.2	0.3%
HoF	Hollis-Chatfield-Rock outcrop complex, very steep	Somewhat excessively drained	791.7	3.3%
HsA	Hoosic gravelly loam, nearly level	Somewhat excessively drained	192.4	0.8%
HsB	Hoosic gravelly loam, undulating	Somewhat excessively drained	297.5	1.2%
HsC	Hoosic gravelly loam, rolling	Somewhat excessively drained	190.5	0.8%
HsD	Hoosic gravelly loam, hilly	Somewhat excessively drained	5.6	0.0%
HtA	Hoosic channery loam, fan, 0 to 3 percent slopes	Somewhat excessively drained	68.3	0.3%
HtB	Hoosic channery loam, fan, 3 to 8 percent slopes	Somewhat excessively drained	264.5	1.1%
MnA	Massena silt loam, 0 to 3 percent slopes	Somewhat poorly drained	243.5	1.0%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
MnB	Massena silt loam, 3 to 8 percent slopes	Somewhat poorly drained	457.3	1.9%
NwB	Nassau-Cardigan complex, undulating, very rocky	Somewhat excessively drained	164.2	0.7%
NwC	Nassau-Cardigan complex, rolling, very rocky	Somewhat excessively drained	1,030.5	4.3%
NwD	Nassau-Cardigan complex, hilly, very rocky	Somewhat excessively drained	1,674.3	7.0%
NxE	Nassau-Rock outcrop complex, steep		595.0	2.5%
NxF	Nassau-Rock outcrop complex, very steep	Somewhat excessively drained	475.7	2.0%
NyA	Natchaug muck, 0 to 2 percent slopes	Very poorly drained	134.8	0.6%
Pg	Pawling silt loam	Moderately well drained	91.7	0.4%
Ps	Pits, gravel		52.5	0.2%
PwB	Pittstown silt loam, 3 to 8 percent slopes	Moderately well drained	798.6	3.3%
PwC	Pittstown silt loam, 8 to 15 percent slopes	Moderately well drained	258.1	1.1%
PzA	Punsit silt loam, 0 to 3 percent slopes	Somewhat poorly drained	94.9	0.4%
PzB	Punsit silt loam, 3 to 8 percent slopes	Somewhat poorly drained	66.0	0.3%
SkB	Stockbridge silt loam, 3 to 8 percent slopes	Well drained	702.1	2.9%
SkC	Stockbridge silt loam, 8 to 15 percent slopes	Well drained	556.4	2.3%
SmB	Stockbridge-Farmington complex, undulating, rocky	Well drained	72.5	0.3%
SmC	Stockbridge-Farmington complex, rolling, rocky	Well drained	19.8	0.1%
SmD	Stockbridge-Farmington complex, hilly, rocky	Well drained	5.4	0.0%
Su	Sun silt loam	Poorly drained	1,100.1	4.6%
Ud	Udorthents, smoothed	Well drained	47.6	0.2%
Ue	Udorthents, wet substratum	Somewhat poorly drained	16.2	0.1%
W	Water		164.5	0.7%
We	Wappinger loam	Well drained	3.6	0.0%
Wy	Wayland silt loam	Poorly drained	557.1	2.3%
Totals for Area of Interest			**23,893.2**	**100.0%**

Description

"Drainage class (natural)" refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized-excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained, and very poorly drained. These classes are defined in the "Soil Survey Manual."

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher