

Town of Philipstown Natural Resources Inventory

December 2020

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- NYSDEC Hudson River Estuary Program
- Hudson Highlands Land Trust, Inc.
- Ecological Citizens Project, Inc.
- Scenic Hudson, Inc.
- The Chazen Companies
- 2007 Town of Philipstown Natural Resource and Open Space Protection Plan
- 2016 Town of Philipstown Open Space Index
- 2018 Town of Putnam Valley Natural Resources Inventory
- 2019 Town of Coeymans Natural Resources Inventory
- 2010 Town of Rosendale Natural Resource Inventory
- New York Natural Heritage Program
- New York Rural Water Association
- New York State Department of Environmental Conservation
- New York State GIS Clearinghouse
- New York State Office of Parks, Recreation, and Historic Preservation
- ESRI USA
- Putnam County GIS Department
- Putnam County Soil and Water Conservation District

Introduction

Dear neighbors,

As you likely know, what we now consider the Town of Philipstown has a long history of environmental conservation. This started first with the Mohican people who called the Hudson River “Mahicannituck” (waters that are never still) and the Lenape people who called this land Lenapehoking, both of whom maintained a sustainable and respectful relationship with the land until they were driven from it by European settlers during the 17th and 18th centuries.¹ Following the construction of the West Point Foundry in the Village of Cold Spring in the early 19th century, there was a period of rampant deforestation in order to fuel the fires of the foundry; however, starting in the 1870’s, and thanks to inspiration from the Hudson River School of painters, Philipstown community members began a sustained effort to reforest the hillsides of the Hudson Highlands in order to improve air and water quality in addition to protecting recreational resources. These efforts culminated over half a century later during the New Deal, when our Town was heavily reforested thanks to the volunteer efforts of the Civilian Conservation Corps.² And to this day, this tradition of conservation continues through the efforts of municipal, non-profit and citizen groups that strive to protect our natural resources. Notable contributions have come from groups such as Scenic Hudson, the Hudson Highlands Land Trust, the Open Space Institute, the Town of Philipstown’s Town Council and Conservation Board, New York State Parks, the Philipstown Garden Club and many, many more.

In 2007, in this spirit of conservation and as a part of its first Comprehensive Plan, the Town of Philipstown’s Conservation Board created both a Natural Resources and Open Space Protection Plan as well as an Open Space Index in order to both map and list priority natural resources and land areas within Philipstown, as well as to suggest future steps the Town could take to better protect its abundant natural resources for generations to come.

Then in 2017, in an effort to take its conservation values even further, the Town of Philipstown decided to pursue certification as a “Climate Smart Community” as part of the New York State Department of Environmental Conservation’s (NYSDEC) “Climate Smart Communities Program.” In reward for a municipality taking actions to reduce greenhouse gas emissions and adapt to the inevitable effects of climate change, this program offers technical support, grant opportunities for numerous sustainability projects, and bragging rights for achieving various tiers of certification (Bronze, Silver, etc.). As outlined by this program, one of the fundamental steps in both reducing greenhouse gas emissions and adapting to climate change is to complete an up-to-date Natural Resources Inventory in order to document existing resources and highlight

¹ Levine, David, Discover the Hudson Valley’s Native American History, Hudson Valley Magazine: <https://hvmag.com/life-style/history/hudson-valley-tribes/>

² Dunwell, Frances F., The Hudson River Highlands, New York, Columbia University Press, 1991

current and potential threats. Such an inventory offers many benefits, but most of all it forms the basis on which myriad additional sustainability actions may be taken, especially those that focus on conservation, development and changes in land use.

So, with this in mind, the Town of Philipstown applied for and was awarded a Climate Smart Communities grant in 2019 to pay for 50% of the costs to update and expand upon its 2007 Natural Resources and Open Space Protection Plan. This 2020 Philipstown Natural Resources Inventory is the result of that effort and we hope that it serves our community well over the next decade, until it is time for another full update in 2030. That said, this report may also be considered “a living document” and will be periodically added to over the next decade. It is also important to note that, in order to make this project as affordable as possible for the Town, in the narrative sections of this report we have often used large sections of text from resources such as the Hudson River Estuary Program’s “Creating a Natural Resources Inventory” guidebook, among others, in order to save time and costs. When used, these sections of borrowed text deal with general descriptions of natural resources and are accompanied by text that we have written specific to Philipstown.

Lastly - and this is also noted below in the “How to Use this Inventory” section but is worth mentioning here - the Town of Philipstown is developing a public online map tool of all of the maps in this report via a platform called ArcGIS Online. By the beginning of 2021, this tool will be accessible via the Town’s website - Philipstown.com - and will allow all community members, organizations and municipal committees to view the numerous map layers in this report in a more interactive format. Visitors to the online map tool will be able to select from various basemaps (which we’ll explain later in this report), as well as any map layer and combine it with another layer in order to compare the countless resources that are found in Philipstown. Furthermore, visitors will be able to select a parcel of land and select from the numerous map layers to determine which natural resources are on and around a certain property and what the potential impacts of development, conservation and land changes might be. We hope, for example, that this tool will be especially useful to the Town’s Conservation Board as it reviews the potential environmental impacts of proposed development projects. And most of all, we hope that this report and the accompanying online tool will inspire new ideas and efforts to continue and expand upon Philipstown’s long tradition of conservation.

We hope you enjoy reading and learn much from this report!

Sincerely,

Max Garfinkle
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A. Historic Setting

According to the 2018 Putnam Valley Natural Resource Inventory, around Philipstown and Putnam Valley “the earliest known people were of the Canopus group of the Wappinger Confederacy, part of the Algonquin-speaking Mohican Nation.”³ As noted above, the Lenape people (the local groups of which were called Munsee) also lived in the lower Hudson Valley and cohabitated the region with the Wappingers in a mostly peaceful relationship. Their languages were both part of the larger Algonquin language group, which allowed them to communicate and occasionally unite to protect each other from attacks by the Mohawk / Iroquois Nations to the west and the Mohegan Nation to the east.⁴

Both the Wappingers and Munsee started out as migratory hunter-gatherers that lived in small clans of 10 - 100 people. They hunted “bear, elk, white-tailed deer, rabbits, squirrels, turkey, river otter, raccoons, and woodchucks, as well as various waterfowl. Archaeological sites in the Hudson Valley have also produced evidence of fishing for most freshwater species, and, during the spring, they caught sturgeon, striped bass, shad, and herring, and probably dried, smoked, or roasted them. [They also] gathered plant foods such as hickory, nuts, butternuts, walnuts, acorns, and chestnuts, and various berries to supplement their diet.”⁵ By the time Europeans arrived, they were also skilled agriculturalists who grew corn, beans, and various species of squash.

These communities left relics behind following their forced removal by Europeans. For example, many of the stonewalls in this region were built in part by Native Americans. The book “Sermons in Stone” by Susan Allport includes quotes from firsthand material showing that colonial settlers employed Native Americans in order to fill “debts” (often accrued by Native Americans continuing their normal practices that colonists had deemed illegal). One example described in the book is: “Some of the Indians who worked for the settlers were free men who were paid a daily wage, but others were slaves, captives from the King Philip’s Indian War of 1675 who had been subsequently awarded to colonists in compensation for their own participation in that war. Both of these groups of Indians were probably employed in building stone walls.” Allport also includes firsthand accounts demonstrating that enslaved Africans and African-Americans were also forced to build stonewalls.⁶

Unfortunately, Native American land rights were essentially disregarded from the first arrival of Europeans, and eventually Dutch and English settlers completely displaced them. As described

³ Town of Putnam Valley Committee for the Conservation of the Environment, Town of Putnam Valley Natural Resource Inventory, 2018: <https://putnamvalleyresidents.com/NRI.html>

⁴ Levine, David, Discover the Hudson Valley’s Native American History, Hudson Valley Magazine: <https://hvmag.com/life-style/history/hudson-valley-tribes/>

⁵ Ibid.

⁶ Allport, Susan, Sermons in Stone: The Stone Walls of New England and New York, Second Edition, The Countryman Press, New York, September 17th, 2012

in the Hudson Highlands Land Trust's "[Land Heist in the Highlands](#)" article, the Wappingers land, which included current-day Philipstown and the rest of what became Putnam County, was illicitly taken from them by means of one questionable deed and one completely false deed which both involved one of the Town's European founders, Adolph Philipse. Despite pleading their case - the efforts of which were led by their Chief Daniel Ninham, the Wappinger were forcibly removed from their lands, as well as multiple times from the lands they then moved to. Despite their forced removal by Europeans to Wisconsin, Oklahoma, Stockbridge, and areas in Canada, the Wappinger culture is still active in these regions and deserves recognition as the culture whose ancestral lands include Philipstown.⁷

Also, it is ethically essential while studying and preserving Philipstown's history to learn the stories of people who were enslaved by landowners in or near Philipstown. Their stories are often overlooked and undertold and deserve further attention. Stories like that of Caesar, an African American miller enslaved by Adolph Philipse, the wealthy landowner who was involved in creating the false deed that stole most of what is now Putnam County from the Wappinger people. Or of families that were forcibly separated by their enslavers, such as Jack and Parthenia, who were married but held captive by different enslavers who cruelly prevented them from being together by sending Parthenia to Barbados without Jack. Stories like these are documented by Historic Hudson Valley's interactive virtual museum, "People Not Property."⁸ The resource can be found here: <https://peoplenotproperty.hudsonvalley.org/>. Also, the Hudson Highlands Land Trust has a webpage dedicated to the "People Not Property" virtual museum, which can be found here: <https://www.hhlt.org/people-not-property/>.

During the time of early European settlement, in 1669, the provincial government of New York designated a postal route between New York City and Albany, which were the two most important European population centers at the time. Before 1669, the route that the postal road followed was originally established by the Wiccoppee and Wappinger. Then in 1703, the provincial government mandated that the postal road become a "public and common general highway" to facilitate travel between the two cities.⁹ An original unpaved section of this route still exists today and is known as the "Old Albany Post Road Historic District," which is found along the eastern border of Philipstown.

Philipstown officially became a township of Dutchess County on March 7, 1788, and later became a township of Putnam County when Putnam County broke off from Dutchess County in

⁷ Cutul, Peter, Land Heist in the Highlands: Chief Daniel Ninham and the Wappinger Fight for Homeland, NYS Office of Parks, Recreation and Historic Preservation, Hudson Highlands Land Trust, <https://www.hhlt.org/land-heist-in-the-highlands/>

⁸ Historic Hudson Valley, People Not Property: Stories of Slavery in the Colonial North, 2019, <https://peoplenotproperty.hudsonvalley.org/>

⁹ Hine, C.G., The New York and Albany Post Road, 1905, Project Gutenberg EBook, Released December 14th, 2007, <http://www.gutenberg.org/files/23857/23857-h/23857-h.htm>

1812.¹⁰ In terms of living conditions, the mostly steep slopes and rocky soils of Philipstown made farming difficult and limited the area's population prior to the construction of the West Point Foundry in the Village of Cold Spring in 1818. Even now the Town remains less developed than many nearby areas. As noted above, "the Town is latticed with historic stonewalls - some constructed up to 300 years ago - which contained livestock and served as repositories for the seemingly endless rocks removed from fields to improve farming."¹¹

Prior to the construction of the West Point Foundry, "farmers eked out a subsistence living cultivating berries and fruits, nuts, maple trees for syrup, bees for honey, flax for textiles, and the crops that could be successfully grown. Grazing animals provided meat, dairy products, and wool; trees were logged for railroad ties, ship timber, barrel hoops, and construction materials for the burgeoning cities. Ice harvesting from local lakes provided a winter income; cut ice was packed in straw, driven by wagon to the Hudson, ferried to New York City and then shipped around the globe."¹²

Following the construction of the West Point Foundry, the Village of Cold Spring and surrounding Philipstown began to boom, attracting newcomers who either worked the foundry or formed a new middle class of doctors, lawyers, pastors, shop-owners, teachers and so forth. Furthermore, thanks to the influence of Gouverneur Kemble, who helped create the Foundry, Cold Spring and Philipstown became popular as fresh-air retreats for wealthy and famous New Yorkers, many of whom eventually purchased large estates as second or additional homes throughout the Town, and most prominently in the hamlet of Garrison, evidenced by the existence of such historic buildings as Castle Rock, the (Frederick) Osborne House, Eagle's Rest, and so forth.

Furthermore, the Hudson Highlands of Philipstown attracted painters from the Hudson River School, such as Thomas Cole, which further led to the fame of the region; however, the ever-hungry fires of the foundry eventually led to widespread deforestation throughout Philipstown, which took decades to replace, even after the West Point Foundry closed in 1911. The reforestation efforts, as mentioned above in the introduction letter to this NRI, were carried out in greatest number by the Civilian Conservation Corps during the years of the Great Depression, and are now largely protected in the form of public lands, private fee-owned properties and conservation easements.¹³

¹⁰ McDonald, Don, A Brief History of Philipstown, 2004, <https://philipstown.com/history-of-philipstown>

¹¹ Town of Putnam Valley Committee for the Conservation of the Environment, Town of Putnam Valley Natural Resource Inventory, 2018: <https://putnamvalleyresidents.com/NRI.html>

¹² Life on a Rocky Farm: Rural Life Near New York City in the Late Nineteenth Century. Excelsior Editions/State University of New York, 2013.

¹³ Dunwell, Frances F., The Hudson River Highlands, New York, Columbia University Press, 1991

B. Community Setting

Today, the Town of Philipstown consists of the villages of Cold Spring and Nelsonville as well as the hamlets of Garrison and Continental Village, and has an area of 51.5 square miles, of which 48.8 square miles is land and 2.7 square miles, or 5.22%, is water¹⁴. The western border of Philipstown is the Hudson River, with the Orange County towns of Highlands and Cornwall, as well as a small sliver of Stony Point in Rockland County, on the opposite shore. The north Town line borders the Dutchess County towns of Fishkill and East Fishkill, with the south Town line bordering the Westchester County town of Cortlandt. Kent and Putnam Valley border the Town on its east side.

According to the 2018 American Community Survey,¹⁵ Philipstown has a population size of 9,724, a median household income is \$110,205 and a poverty rate is 5.2%. Approximately 53.9% of the adult population has a bachelor's degree or higher. Philipstown is a comparatively older community with a median age of 47.1 years compared to the national average of 37.9 years. In terms of race and language, the Town is predominantly white (91.0%) and has a small percentage of families that speak a language other than English at home (10.5%) compared to the national average of 21.5%. The Town also has a lower military participation rate of 6.7 % compared to the national average of 7.5 %.

Interestingly, Philipstown households tend to have a much longer commute to work (46.1 minutes) compared to the national average (26.6 minutes), and 59.8% of our working adults drive a single-occupancy vehicle to work, compared to carpooling (5.7%), public transportation (19.8% - mostly by Metro North Railroad), walking (1.2%), other means - most likely bicycling (1.0%) or working from home (12.4%), although the latter has almost certainly increased since the onset of the COVID-19 pandemic.

In terms of community character, Philipstown is a relatively tight-knit town that offers numerous community-oriented spaces and activities, such as those offered by the Philipstown Recreation Department, the Depot Theatre, Hudson Valley Shakespeare Festival, the Cold Spring Farmers Market, the Cold Spring Chamber of Commerce, our local governments, our local schools of Haldane, Garrison, St. Basil Academy and Manitou, community groups such as the Philipstown Garden Club and Lions Club, our local churches, youth sports organizations and many more. Philipstown is also home to several Community-Supported Agriculture farms, such as Glynwood and Long Haul Farm, and also hosts community art exhibits organized by Collaborative Concepts at Saunders Farm. Furthermore, numerous non-profit and spiritual organizations can be

¹⁴ United States Census Bureau, 2010 United States Census:
<https://www.census.gov/quickfacts/philipstowntownputnamcountynewyork>

¹⁵ United States Census Bureau, 2018 American Community Survey:
<https://data.census.gov/cedsci/profile?g=0600000US3607957584>

found in Philipstown, including the Garrison Institute, Greymoor, the Hudson Highlands Land Trust, the Ecological Citizens Project, and the Hastings Center.

Philipstown has two weekly newspapers: The *Highlands Current*, founded in 2010 and published on Fridays, and the *Putnam County News & Recorder*, founded in 1868 and published on Wednesdays. The Town is also blessed with many small businesses, many of which can be found in the villages of Cold Spring and Nelsonville and also along the Route 9 corridor. Many Philipstown businesses depend to a large degree on tourism revenue, which has dramatically increased over the past few decades due to the increased fame of the Town's hiking trails as well as the many shops and restaurants that can be found on Main Street in Cold Spring. In a sense, tourists also make up a part of Philipstown's community due to their essential support of local businesses and their use of local state parks and other public resources located within the Town's borders.

Overall Philipstown residents and business owners enjoy a relatively affluent and comfortable way of life that offers numerous community connections and opportunities to give back and to support those in need. This is exemplified by the countless volunteer groups and committees that are addressing various development and community issues. That said, Philipstown has become a progressively expensive place to live and housing costs have increased dramatically over the past several decades. With this has come an increased cost of living, making it difficult for many Philipstown families to remain in the community for more than one or two generations. Also despite the numerous benefits that increased tourism has brought to the Town, there have also been challenges, especially on fair-weather weekends, such as the lack of public parking, crowded streets, heavily-used hiking trails, trash collection, and a shortage of public restrooms that have made it more difficult for local residents to enjoy what the Town has to offer, especially on weekends.

Like any town, Philipstown is constantly engaged in the balancing act of ensuring economic prosperity for its community members while also preserving and protecting its resources and their access. We hope that this Natural Resources Inventory can further support the Town of Philipstown's efforts to find the right balance in the decades ahead.

C. Why Inventory Natural Resources?

“[Philipstown’s] shorelines, wetlands, forests, streams, grasslands, and shrublands are not only habitat for abundant fish and wildlife, 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 [Philipstown].

“Land-use planning is instrumental to balancing future growth and development with the protection of natural resources. Although municipalities frequently need to make decisions affecting these resources, they often don’t have adequate data available to inform those decisions. Often they find themselves reacting to proposed development rather than planning for future growth, or making decisions on development projects without considering the larger context. This narrow approach to decision-making loses sight of broader-scale issues and goals, such as climate resilience, walkable communities, connected habitats, or watershed management.

“By identifying and describing natural resources at the local scale, a natural resources inventory (NRI) provides communities with a strong foundation for proactive planning and informed decision-making. The process encourages participation in identifying and prioritizing natural resources important to the community, and provides information that will support careful land-use planning and improved resource protection measures. And by incorporating natural resources into every level of decision -making and planning, municipalities can make a meaningful contribution toward preserving the natural heritage of the region, and can ensure that healthy, resilient ecosystems—and the benefits they provide—are available to their communities for future generations.”¹⁶

D. What is a Natural Resources Inventory (NRI)?

“A natural resources inventory (NRI) compiles and describes important, naturally occurring resources within a given locality (e.g., municipality, watershed, or region). Cultural resources, such as historic, scenic, and recreational resources, are often included in an NRI, as well. The inventory has two basic purposes: 1) to provide the building blocks for comprehensive land-use and conservation planning, and 2) to allow natural resource information to be included in local planning and zoning. The scope of the NRI is determined by the community. At its simplest, an NRI is the compilation and description of existing natural resources data. At its most complex, it

¹⁶ Haeckel, Ingrid, and Laura Heady. *Creating a Natural Resources Inventory: A Guide for Communities in the Hudson River Estuary Watershed*. (Ithaca, NY: Department of Natural Resources, Cornell University, and New York State Department of Environmental Conservation, 2014): <https://www.dec.ny.gov/lands/100925.html>.

includes detailed analysis of resources or new data collected specifically for the inventory. An NRI is not a static document. As new and revised data become available, the inventory should be updated to insure its completeness and accuracy.

“Until an inventory has been conducted, many communities don’t have a clear picture of where their natural (and cultural) resources are located, which resources are significant to the community, and why. The compilation of map data tables and descriptions in an NRI contribute to a better understanding and appreciation of the community’s natural resources and provide the foundation for a wide range of planning and conservation applications.”¹⁷

E. How to Use This Inventory

This Natural Resources Inventory should be a valuable reference for Town officials, interested community and watershed groups, industry, developers, business owners and residents. The maps in this inventory provide a general representation of the Town’s natural and cultural resources, the connections between them, and how they relate to patterns of land use and development in the community. They clearly illustrate how nature transcends political and private boundaries. By depicting resources at the townwide scale and beyond, these maps help us understand the larger context of our Town’s resources, and can be used to help evaluate the potential impacts of our land-use decisions not only on our own community but also on neighboring municipalities and ecosystems.

According to the NYS DEC’s Hudson River Estuary Program, this NRI can be used to:

- “Educate residents and developers about important resources occurring in the Town,
- “Understand the resources occurring on or near a property to inform stewardship,
- “Evaluate potential impacts of proposed actions during routine environmental reviews,
- “Update the natural resources section of the Town comprehensive plan,
- “Inform municipal open space planning,
- “Review and update existing zoning and subdivision regulations,
- “Designate Critical Environmental Areas, and
- “Inform development of new local policies and environmental review procedures.”¹⁸

¹⁷ *Ibid.*

¹⁸ Haeckel, Ingrid, and Laura Heady. *Creating a Natural Resources Inventory: A Guide for Communities in the Hudson River Estuary Watershed*. (Ithaca, NY: Department of Natural Resources, Cornell University, and New York State Department of Environmental Conservation, 2014): <https://www.dec.ny.gov/lands/100925.html>.

In addition to this NRI, the NYS DEC's "Hudson Valley Natural Resource Mapper"¹⁹ illustrates many of the resources shown on maps in this document and is a valuable companion tool. Information is organized thematically under estuary habitats, streams and watersheds, wetlands, forests, biodiversity, and scenic and recreation features. Tax parcel boundaries are available for viewing under reference layers.

It is important to keep in mind that the NRI is best suited for municipal-scale planning. The maps are not intended to provide site-specific accuracy and should not be used as a primary source for land use decisions. Any resource shown on a map should be verified in the context of environmental review. Nevertheless, the NRI can be used as a screening tool at the site-scale to raise questions or identify the need for additional site assessment.

This NRI report, including maps, is available as a PDF on the Town website at philipstown.com and physical copies are available at the Philipstown Town Hall. Within the report, the PDF maps allow for ease of navigation with the ability to zoom in to an area of interest. In addition, the NRI maps will be available for more interactive and easily accessible public viewing via the Town's ESRI ArcGIS Online Mapper tool, the link for which will also be accessible via the above-mentioned Town web address.

Methodology

As noted above, this Natural Resources Inventory was primarily compiled by the Town's Climate Smart Communities Coordinator and the Town's Natural Resources Officer, with guidance and editing assistance from the Town Conservation Board as well as essential support from the NYS DEC Hudson River Estuary Program, Hudson Highlands Land Trust, Inc. and Ecological Citizens Project, Inc.. Composed of a primary mapping component accompanied by supporting text, this inventory catalogues a broad variety of existing scientific data.

In order to produce a useful document for municipal decision-makers and community residents in a timely and affordable manner, the authors and the Philipstown Conservation Board, which together constituted the NRI working group, agreed during their initial public project kick-off meeting in October of 2019 to set the project area as the Town of Philipstown, including the Villages of Cold Spring and Nelsonville as well as a one-mile buffer around the Town borders. The working group also decided to restrict data gathering to the natural resources listed in the Hudson River Estuary Program's NRI Guidebook, previously mentioned above. The working group determined that the wealth of natural resource data already available online from numerous government agencies and non-profit organizations would provide a sufficient and

¹⁹ New York State Department of Environmental Conservation, Hudson Valley Natural Resource Mapper, A Tool for Communities in the Hudson River Estuary Watershed: <https://giservices.dec.ny.gov/gis/hvnrm/>

cost-effective foundation for this NRI, which could be complemented by and lead to future and more-detailed local studies.

Mapping for this NRI was completed in between October 2019 and September 2020 thanks to partial funding from a NYSDEC Climate Smart Communities grant. The maps were created by the Town's Natural Resources Officer, Max Garfinkle, in cooperation with the Town's Climate Smart Communities Coordinator, Roberto Muller, with guidance and feedback from the Town's Conservation Board. The maps display GIS data from federal, state, and county agencies and non-profit organizations including the Hudson Highlands Land Trust, Scenic Hudson and the Ecological Citizens Project. The original source of data sets are included and described in detail in the narrative for each map, which consists of a general description of the data layers depicted in the map, key findings, and, when appropriate, recommendations for further study.

All maps were produced using Environmental Systems Research Institute (ESRI) ArcGIS Desktop Geographic Information Systems (GIS) software. 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 may 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 in the field for legal purposes, including environmental review. Information provided by the maps can be enhanced by local knowledge, and the NRI should be updated at least every 10 years as new data becomes available.

This NRI report incorporates relevant descriptions of resources depicted in each map as well as prior text from the Town's original Natural Resources and Open Space Protection Plan²⁰, which was written in 2007 by the former Comprehensive Plan Implementation Subcommittee on Natural Resources. Additional text and background information was drawn from the Hudson River Estuary Programs' "Creating a Natural Resources Inventory: A Guide for Communities in the Hudson River Estuary Watershed."²¹ The authors also followed and used text from the Town of Coeymans Natural Resources Inventory,²² the Town of Putnam Valley's Natural Resource

²⁰ Town of Philipstown Conservation Advisory Council, Town of Philipstown Natural Resources and Open Space Protection Plan, 2007: <https://philipstown.com/Final%20Draft%20Open%20Space%20Plan%20Oct%2007.pdf>

²¹ Haeckel, Ingrid, and Laura Heady. Creating a Natural Resources Inventory: A Guide for Communities in the Hudson River Estuary Watershed. (Ithaca, NY: Department of Natural Resources, Cornell University, and New York State Department of Environmental Conservation, 2014): <https://www.dec.ny.gov/lands/100925.html>.

²² Town of Coeymans Conservation Advisory Council, Town of Coeymans Natural Resources Inventory, 2019: <https://coeymans.org/documents/natural-resource-inventory/>

Inventory²³ and the Town of Rosendale's Natural Resource Inventory²⁴ as general guides for map layers, narratives, and report format.

This text of this report was largely written by the Town's Climate Smart Communities Coordinator (Project Coordinator / Editor) and the Town's Natural Resource Officer (Principal Mapper / Editor) between April 2020 and October 2020. During this time the Principal Mapper and Project Manager received much assistance in gathering information from the Hudson River Estuary Program and the Hudson Highlands Land Trust, thanks to already existing guidance documents, as well as supportive communication via email and telephone. Upon completion of the first draft of this report at the end of September 2020, the authors requested comments and suggested edits from the Town's Conservation Board, as well as numerous other entities listed below during the project's official public comment period, which was held between October 2020 and November 2020. This period was initiated and concluded by the second and third public project meetings held in October and November 2020, which each took place as a segment of those monthly Conservation Board meetings.

The following is the schedule of public meetings, information gathering and community engagement that took place in developing and finalizing this inventory:

1. *Public Project Kick-Off Meeting*: Philipstown Conservation Board Monthly Meeting- October 8th, 2019 from 7:30 - 9pm. Attendees: Philipstown Conservation Board, Philipstown Natural Resources Officer, Philipstown Climate Smart Communities Coordinator, and members of the public.
2. *Map Data Gathering*: October 2019 - September 2020; completed by the Philipstown Natural Resources Officer and Philipstown Climate Smart Communities Coordinator.
3. *Report Narrative Writing*: April 2020 - December 2020; completed by the Philipstown Natural Resources Officer and Philipstown Climate Smart Communities Coordinator.
4. *Opening of Public Comments Period*: Initiated on October 13th, 2020 at the monthly Philipstown Conservation Board Monthly Meeting from 7:30 - 9pm. Attendees: Philipstown Conservation Board, Philipstown Natural Resources Officer, Philipstown Climate Smart Communities Coordinator, and members of the public. This was complemented by emailed and telephone requests for comments from the following additional entities (each of whom received a copy of the report's first draft): Philipstown Town Council, Philipstown Climate Smart Task Force, Philipstown Comprehensive Plan Update Committee, NYSDEC Hudson River Estuary Program, Hudson Highlands Land Trust, Ecological Citizens Project, Scenic Hudson, Open Space Institute and the Philipstown Community Congress Trails Committee. Request for General Public

²³ Town of Putnam Valley Committee for the Conservation of the Environment, Town of Putnam Valley Natural Resource Inventory, 2018: <https://putnamvalleyresidents.com/NRI.html>

²⁴ Town of Rosendale Environmental Commission, Town of Rosendale Natural Resource Inventory, 2010: <http://www.townofrosendale.com/NRI.pdf>

comments was made at the Conservation Board meeting and via the Town's Climate Smart program website: ClimateSmartPhilipstown.org/nri.

5. *Closing of Public Comments Period:* Closed on December 22nd at 5pm. Comments incorporated into the final report after review by Natural Resources Officer and Climate Smart Coordinator.
6. *Submission of Final Report:* After integrating the suggested edits from the above-mentioned community committees, organizations and members of the public, the Philipstown Natural Resources Officer and the Philipstown Climate Smart Communities Coordinator officially presented the completed report to the Philipstown Town Council at the Town's monthly Board meeting on January 7th, 2021 from 7:30 - 9pm and to the Philipstown Conservation Board at their monthly meeting on January 12th from 7:30 - 9pm. The final version of the report was posted on the Town website and the Town's Climate Smart website, and was shared with all of the above-mentioned entities. An official press release was sent to local papers to announce the official release of this NRI.
7. Finally, at the end of January 2021, the Town's ArcGIS Online interactive version of the maps in this report were made available to the public via a link on the Town's website.

Lastly, it is important to note that the completion of this NRI is only one step. Following the initial period of data gathering, it became clear that while much of the material is plentiful and current, there are certainly areas where data needs updating, and / or requires additional local studies. Suggestions for further study are included in each section of this report, and will ideally be added to this report as appendices over the next decade. In the end, by using and updating this NRI at least every ten years, the Town of Philipstown will continue to ensure that land-use decisions in the Town have the benefit of up-to-date and scientifically-sound information.

Chapter 1: Basemaps

1. Basemap - Aerial

Description:

The Town of Philipstown “Basemap - Aerial” is the foundation for the full natural resources inventory (NRI) map series. It presents general geographic context, upon which additional map information is layered in subsequent maps. It is composed of two “basemap” layers: Aerial Orthoimagery taken in March of 2016, as well as a mostly transparent Terrain map that better highlights changes in elevation via shading. Each component of this basemap is individually available as a basemap option on the town’s previously-mentioned ArcGIS Online map. The Basemap includes municipal boundaries, state roads, county roads, local roads and streets, and faint outlines of tax parcels, which approximate property boundaries and were provided by the Putnam County Information Technology/GIS Department. The map is oriented to true north and has a scale of 1: 63,360 (1 inch = 1 mile in its 8-½” x 11” printed report form). This scale is a ratio that refers to the relationship of distance on the map to distance on the ground. Furthermore, the Basemap, as well as all of the subsequent maps in the inventory, contains a one-mile buffer area surrounding the town in order to show the natural resource context along in addition to within the Town’s borders.

Data Sources:

- Aerial Orthoimagery:
 - NYS GIS Clearinghouse 2016 Orthoimagery Inventory:
<http://gis.ny.gov/gateway/mg/2016/putnam/>
- Terrain Map:
 - Offered as a “Terrain with Labels” basemap option in the ESRI ArcGIS Desktop software used for this NRI. Subdata used for this ESRI basemap are “World Terrain Reference,” “World Terrain Base,” and “World Hillshade.” Copyright: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community.
- Tax Parcels:
 - Putnam County Tax Parcels 2020:
<https://pcny.maps.arcgis.com/home/item.html?id=0961966ebbd148ec839dc3f12edae50b>

2. Terrain

Description:

This Terrain map shows the underlying hill-shading component of the above Aerial Base Map, and includes state, county and local roads. We have included it here to show what the shading looks like without the aerial imagery superimposed upon it. This is also available as a base map option in the Town's ArcGIS Online map.

Data Sources:

- Terrain Map:
 - Offered as a "Terrain with Labels" basemap option in the ESRI ArcGIS Desktop software used for this NRI. Subdata used for this ESRI basemap are "World Terrain Reference," "World Terrain Base," and "World Hillshade." Copyright: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community.

3. Tax Parcels

Description:

This map shows the tax parcels with a stronger outline, which approximate property boundaries. It is overlaid on the basemap and is included here as a reference to refer to when studying the additional maps in this inventory. Furthermore, these tax parcels will be included as a layer on the town's ArcGIS Online map, and can be combined with any of the other layers in this report in order to see which resources occur in or around a specific tax parcel. Also, Putnam County's "eParcel" online map is a great complementary tool to use with this inventory, as the county map includes parcel numbers and property information when a parcel is selected, and is available here:

<https://pcny.maps.arcgis.com/apps/webappviewer/index.html?id=1e96617851a74cc091b081fd3b53ff20>

Data Sources (not including above-cited basemap):

- Tax Parcels:
 - Putnam County Tax Parcels 2020:
<https://pcny.maps.arcgis.com/home/item.html?id=0961966ebbd148ec839dc3f12eda50b>

4. Basemap - Color Infrared Aerial

Description:

This map displays images obtained from the NYS GIS Clearinghouse 2016 Orthoimagery Inventory - Putnam County, New York. Image pixel size is 0.5' GSD. Image type is 4-band, RGB & NIR. The image horizontal accuracy is within 4' at the 95% confidence level (NSSDA). Each aerial photo that comprises the map covers 2000 ft. by 3000 ft. on the ground, was taken in early spring before most deciduous plants leaf out and thus shows the land's features unobscured by tree canopies and can be used to identify ephemeral streams and small wetlands. The infrared orthoimagery also provides information about the vegetation in an area and can be used to define types of land cover and land use. Red areas on the map are generally coniferous trees or lawns with cool season grasses that can photosynthesize early. Vegetation does not include deciduous trees or other plants that are restricted to the later growing season. The following summary from the United States Geological Service describes the various colors found on the map as well as their significance:

- “Live vegetation is almost always associated with red tones. Very intense reds indicate dense, vigorously growing vegetation. As plant vigor decreases, the vegetation appears as lighter shades of red and pink, various shades of greens, and possibly tans.
- Bare soils appear as shades of white, blue, or green in most agricultural regions. In general, darker shades of each color indicate more moist soil.
- Man-made features appear in tones that relate to the materials with which they are made. Asphalt roads, for example, are dark blue or black; gravel or dirt roads are lighter colors depending on their composition; and clean concrete roads are light in tone. The colors of buildings are similarly dependent on the materials used to create them.
- Water appears as shades of blue, varying from nearly black (clear, clean water) to very pale blue (increasing amounts of sediment). The color of very shallow water is often determined by the material present at the bottom of the water. For example, a very shallow stream with a sandy bottom will appear white due to the high level of sand reflection.”¹

Findings:

The areas that show the darkest red and thus the most dense, vigorous growth tend to be in large coniferous forested areas, such as the areas south of Rt. 403, sections of Hudson Highlands State Park on the northeast border of the Town and sections of Fahnestock State Park along the Rt. 301

¹ United States Geological Survey, What do the different colors in a color-infrared aerial photograph represent? https://www.usgs.gov/faqs/what-do-different-colors-a-color-infrared-aerial-photograph-represent?qt-news_science_products=0#qt-news_science_products

corridor. Areas of less intense, but still significant growth then tend to occur in open grassy areas, such as on the Town's golf courses (off of Rt 9 & Travis Corners Rd as well as Rt. 9-D and Rt 403) and on athletic fields such as Philipstown Park and Mayor's Park. The numerous lighter pink areas tend to represent open meadows, pasture and other agricultural fields, as exemplified by the land on Rt 9-D south of Rt 403, as well as Saunders Farm off of Old Albany Post Rd and Glynwood farm off of Rt 301. Also of note is how dark the water bodies are Philipstown, which indicates clear, clean water, in comparison to the Hudson River, which is more of a teal color, indicating higher sedimentation, which is well-known to anyone who has spent any time on or in the Hudson River. Lastly, although they are located beyond the north border of Philipstown, the gravel yards and quarries in Fishkill along Rt 9 are evident by the bright blue color of each property. In comparison, one can see how few gravel or quarry areas there are within the town of any significant size.

Data Sources:

- Color Infrared Aerial Orthoimagery:
 - NYS GIS Clearinghouse 2016 Orthoimagery Inventory:
<http://gis.ny.gov/gateway/mg/2016/putnam/>

5. USGS Topography

This is a general-use map at medium scale in 7.5 minute quadrangle format that presents elevation (contour lines), hydrography, geographic place names, as well as a few landmarks, such as the Appalachian Trail corridor. It also represents forested areas in light green compared to developed areas in white. Current-generation topographic maps are created from digital GIS databases, and are branded "US Topo." We have included this map as a reference for elevation within Philipstown and because it is also available as a base map option in the Town's ArcGIS Online map. Also, we've been notified by the Hudson Highlands Land Trust that the trail corridor marked on this for the Appalachian Trail is not completely accurate so should be used for basic reference only.

Data Sources:

- USGS Topography:
 - USGS US Topo Map and National Elevation Dataset:
<https://viewer.nationalmap.gov/basic/?basemap=b1&category=histtopo,ustopo&tile=Map%20View>

Chapter 2: Geology and Soils

6. Bedrock Geology

Description:

According to the 2018 Putnam Valley Natural Resource Inventory, “The geology of the Hudson Valley is diverse and has helped to shape the character of its natural communities as well as its human communities; for example, cement industries line the Hudson River as a result of the area’s large supply of limestone and gypsum. Geological characteristics have an effect on many factors, such as topography, groundwater resources, migration of pollutants, and mineral resources. The properties of bedrock geology and surficial geology (loose deposits above bedrock) also strongly influence soil properties, as well as groundwater and surface water chemistry, which in turn influence the type of ecological communities that can thrive. For example, alkaline environments and the calcium rich or calcareous condition that is often associated with limestone bedrock often support more unique or rare plants and biodiversity than other areas. Significant geological features can also be important economically, by providing destinations for outdoor recreation such as hiking or scenic assets that attract tourists, or opportunity for mining operations.

“Knowledge of geological properties is important for making sound planning decisions. For example, if bedrock is close to the surface, foundation and road construction is more expensive and may cause other environmental problems such as erosion. Information about geology is also used for identifying sand and gravel aquifers and sources of sand, gravel, and crushed stone for building and road construction.”¹

This map is a digitized version of the Geologic Map of New York State, 1970. 1:250,000. Consists of five sheets: Niagara, Finger Lakes, Hudson-Mohawk, Adirondack, and Lower Hudson, the latter of which is the region where Philipstown is located. It is from the New York State Museum Map and Chart Series No. 15.


Findings:

“An examination of the Bedrock Geology map shows that the geologic units generally run from southwest to northeast. This is typical of the larger area of the Hudson Highlands and beyond, and was caused by some of the extraordinary events that have shaped the area. The nature of the bedrock plays a major role in soil formation in an area, as well as rendering the area calcareous or acidic, thus influencing the biotic community that can form. The Earth is approximately 4.6

¹ Town of Putnam Valley Committee for the Conservation of the Environment, Town of Putnam Valley Natural Resource Inventory, 2018: <https://putnamvalleyresidents.com/NRI.html>

billion years old. The geologic time scale divides the time that the planet has existed into eras and epochs in the following table:²

Table 1. Ages of Bedrock in Philipstown³

| | Era | Epoch | Years Ago |
|---|------------------------------|--------------------|------------------------|
| Oldest  Youngest | Proterozoic (Precambrian) | Middle Proterozoic | 1.6 to 1.0 billion |
| | Paleozoic | Cambrian | 542 to 488.3 million |
| | Paleozoic | Middle Ordovician | 471.8 to 460.9 million |
| | Paleozoic | Upper Ordovician | 460.9 to 443.7 million |
| | Paleozoic | Upper Devonian | 385.3 to 359.2 million |

“Over a billion years ago, ancient North America was located near the equator, and the east coast actually faced south. The warm tropical seas deposited sands, silts, muds, and limestone, and that became metamorphic rock. The plates on which the continents rest are in motion (known as plate tectonics), and ancient North America collided with another continent. That collision, known as the Grenville Orogeny, formed the Grenville Mountain range, which stretched from Canada to Mexico. The northeast-southwest trending narrow ridges and valleys evident on the Bedrock Geology maps are the result of the stresses caused by the intense compression of plates of crust. These erosion-resistant Precambrian rocks became the backbone of bedrock in Putnam Valley, and are estimated at 1.3 to 1.1 billion years old.

“In [Philipstown], bedrock is generally covered with a thin layer of recently-deposited (in geologic time) soil. The oldest layers of bedrock are under the younger layers. Some areas of the Town show exposed ancient Proterozoic or Precambrian rock. These rocks, once buried under miles of sediment, have been exposed over time through weathering and the scraping action of glaciers. Additionally, areas in the Hudson Highlands exhibit a curious phenomenon in which

² *Ibid.*

³ Geologic Time Scale, University of California Museum of Paleontology, 6 May 2011, www.ucmp.berkeley.edu/help/timeform.php.

geological events have lifted some of the older erosion-resistant Cambrian rock layers above younger Ordovician layers.

“Minerals are the building blocks of rock. Rocks can be classified according to the processes that form them. Igneous rocks cooled from molten rock. Metamorphic rocks formed through plate movements or very deep burial (pressure) or contact with molten rock (temperature). These energy sources cause preexisting rock to “metamorphose” or change. For example, granite is the parent rock that forms gneiss, a metamorphic rock. Sedimentary rocks formed by the accretion of small particles that came from the breakup of igneous, sedimentary, and metamorphic rocks. Iron ore, once a product mined locally, is found in sedimentary rocks that formed over 1.8 billion years ago. Heat and pressure associated with deep burial and tectonic deformation converted sedimentary and igneous rocks to metamorphic rocks (marble, quartzite, phyllite, schist, and gneiss).”⁴

At the end of this section, Table 2: Bedrock Geologic Units, provides additional information about the geologic units found in Philipstown and displayed on the Bedrock Geology map. It is notable that a smaller but significant portion of the Town has bedrock that is calcareous or acidic. Calcareous bedrock is that which is partly or mostly composed of calcium carbonate. The areas with calcareous bedrock (labeled OCi, OCw, Oma, bqpc, bg and mb on the map) are found mostly in the southeast corner of Town around Continental Village or over the border in Putnam Valley, but also as a central strip (bqpc) that runs from the Hudson River through the two villages through East Mountain Road into the Town of Fishkill. Plant communities that tolerate calcareous soils deriving from bedrock of this type are of biodiversity significance.⁵ The higher elevations likely include calcareous crest ledge and talus habitat. The lowland areas likely include calcareous wet meadows. All of these areas should be explored further for the presence of rare plants. Similarly, acidic bedrock (labeled Cpg, qtlg, bg, bqpc and qpg on the map) would produce soils with a pH less than 5.5, and support acid-tolerant plant communities.

Further Study:

Clearly, many areas of the Town may house plant communities that have significant biodiversity and would merit further investigation by a qualified expert with strong field identification skills. Also, potential development in these calcareous and acidic bedrock areas should be carefully considered due to the likelihood of rare species being present.

⁴ Town of Putnam Valley Committee for the Conservation of the Environment, Town of Putnam Valley Natural Resource Inventory, 2018: <https://putnamvalleyresidents.com/NRI.html>

⁵ Kiviat, Erik, and Gretchen Stevens. Biodiversity Assessment Manual for the Hudson River Estuary Corridor. NYS Department of Environmental Conservation, 2001.

Data Sources:

- Bedrock Geology
 - NYS Education Department - Natural Resources - Bedrock Geology
<http://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1327>

Table 2. Bedrock Geologic Units⁶

| Symbol | Group | Period / Era | Age Formed (million years ago) | Notes ⁷ |
|--------|--|---|-----------------------------------|---|
| Cpg | Poughquag Quartzite | Cambrian, quartzite | 542.0 to 488.3 | Quartzite forms when quartz-rich sandstone is altered by the heat, pressure, and chemical activity of metamorphism. Quartzite is one of the most physically durable and chemically-resistant rocks found at Earth's surface. Acidic. |
| OCi | Inwood Marble | Early Cambrian-Lower Ordovician, marble | 542.0 to 471.8 | Metamorphosed limestone. This is one of three primary bedrocks that underlie Manhattan island. Calcareous. |
| OCw | Wappinger Group | Cambrian, limestone and dolostone | 542.0 to 488.3 | Dolomitic Limestone, Calcitic Dolostone, Arenaceous Dolostones. Calcareous. |
| Oag | Austin Glen Formation | Cambrian, shale | 542.0 to 488.3 | Thin to thick-bedded bluish gray graywackes, gray shales |
| Od | Diorite with hornblende and/or biotite | Upper Ordovician, diorite | 460.9 to 443.7 | Alkaline but not calcareous. |
| Oma | Manhattan Formation | Middle Ordovician, schist | 471.8 to 460.9 | Schist is a metamorphic rock made up of plate-shaped mineral grains that are large enough to see with an unaided eye. To become schist, shale must be metamorphosed in steps through slate and then through phyllite. If the schist is metamorphosed further, it might become a granular rock known as gneiss. Potentially calcareous. |
| am | Amphibolite, pyroxenic amphibolite | Middle Proterozoic, amphibolite | 1600 to 1000 | Amphibolite is a coarse-grained metamorphic rock. It is harder than limestone and heavier than granite. |
| bg | Biotite granite gneiss | Middle Proterozoic, granite gneiss | 1600 to 1000 | Variable: Acidic and Calcareous |
| bqpc | Biotite-quartz-plagioclase paragneiss | Middle Proterozoic, gneiss | 1600 to 1000 | Variable: Acidic and Calcareous |

⁶ Geology, New York State Museum, www.nysm.nysed.gov/research-collections/geology/gis

⁷ Town of Putnam Valley Committee for the Conservation of the Environment, Town of Putnam Valley Natural Resource Inventory, 2018: <https://putnamvalleyresidents.com/NRI.html>

| | | | | |
|------|--|------------------------------------|--------------|---|
| h2o | Water | - | - | - |
| hg | Hornblende granite and granite gneiss | Middle Proterozoic, granite gneiss | 1600 to 1000 | Gray hornblende granite and granitic gneiss with subordinate leucogranite. |
| lg | Leucogranitic gneiss | Middle Proterozoic, granite gneiss | 1600 to 1000 | Pink or gray leucogranitic (alaskitic) gneiss and granofels; Sodic plagioclase ranges from generally subordinate to locally dominant; locally with biotite, hornblende, pyroxene, garnet, sillimanite, disseminated magnetite; commonly contains metasedimentary layers, amphibolite, migmatite; plagioclase-rich variety is host to magnetite ore bodies in eastern Adirondacks. |
| mb | Calcitic and dolomitic marble, variably siliceous | Middle Proterozoic, marble | 1600 to 1000 | Dolomitic marble, a metamorphic rock, is produced when dolostone is subjected to heat and pressure. Calcareous. |
| qpg | Pyroxene-hornblende-quartz-plagioclase gneiss | Middle Proterozoic, mafic gneiss | 1600 to 1000 | Acidic. |
| qtcs | Garnet-biotite-quartz-feldspar gneiss | Middle Proterozoic, gneiss | 1600 to 1000 | Gneiss is a metamorphic rock identified by its bands and lenses of varying composition. |
| qtlg | Garnet-bearing paragneiss and interlayered quartzite | Middle Proterozoic, gneiss | 1600 to 1000 | Acidic. |
| rg | Rusty and gray biotite-quartz-feldspar paragneisses | Middle Proterozoic, gneiss | 1600 to 1000 | Rusty facies, contains variable amounts of garnet, sillimanite, cordierite, graphite, sulphides; contains subordinate marble and calcsilicate rock. |

7. Surficial Geology

Description:

The Surficial Geology map illustrates the distribution of surface materials in Philipstown. These materials overlay the bedrock (see 6. Bedrock Geology) and contribute to the composition of the soils (see 8. Soils) in the Town. The map is a digitized version of the Surficial Geologic Map of New York and consists of 5 sheets at the scale of 1:250,000: Finger Lakes Sheet, 1986; Hudson-Mohawk Sheet, 1987; Niagara Sheet, 1988; Lower Hudson Sheet, 1989; Adirondack Sheet, 1991.

According to the Putnam Valley NRI, “the surface deposits are largely the product of the glaciers that repeatedly covered this area, most recently approximately 2.6 million years ago. This moving frozen sheet of water reached a maximum thickness of approximately 2 miles. The glacier picked up materials in its path and then, as it melted and retreated 18,000 years ago with

the changing climate, it left behind materials of varying sizes in the valleys of the Town. Large free-standing rocks that can be found all around Town are termed glacial erratics. Eroded substrate left behind by the glacier is termed till and contains a mixture of variously sized particles. Outwash is material and sediment deposited by the glacial meltwater. Some sediments were left behind in glacial ponds and lakes, others moved around by wind and local streams. The glacial till and water-sorted deposits, derived from the crystalline bedrock, are mostly stony and bouldery sands with some silt and little or no clay.”⁸

Table 3: Surficial Geologic Units, at the end of this section, explains the geological units that are displayed on the Surficial Geology map.

Findings:

The overall topography of the Town is a mixture of rugged upland, lower valleys / floodplains and lower shoreline. The majority of the Town is rocky with little or no soil covering the bedrock as seen by the large areas of bedrock and glacial till. That said, there are still significant areas within the Town that offer potential for agriculture and other uses.

Outwash sand and gravel deposits (og) can be an important economic resource for construction and road maintenance, for example. These deposits in Philipstown are located along Rt 9 north of Rt 301, and in a small section along the southeast border with Putnam Valley. They also are host to numerous prime farmland areas, which will be shown in more detail in Section 8. Soils and also in Section 40. Farmland.

Recent Alluvium (al), Kame deposits (k) and Lacustrine delta (ld) surficial geology areas are found mostly along the Hudson River and overlap with some prime farmland soils. The Kame and Lacustrine areas also suggest the presence of aquifers and groundwater, which will be explored in more detail in Section 14. Groundwater and Drinking Water Resources.

Lastly, the Swamp deposits (pm) suggest the presence of peat-muck wetlands, which is confirmed just by glancing at the map since the Swamp deposits area overlaps with Constitution Marsh. This will be covered in further detail in Section 13. Wetlands and Section 27. Significant Coastal Habitat.

⁸ Town of Putnam Valley Committee for the Conservation of the Environment, Town of Putnam Valley Natural Resource Inventory, 2018: <https://putnamvalleyresidents.com/NRI.html>

Further Study:

One suggestion is to hire a geologist to confirm the presence of these surficial areas and to make more in-depth recommendations and analysis on the potential ecological benefits and natural resource uses of these areas.

Data Sources:

- Surficial Geology:
 - NYS Education Department - Natural Resources - Surficial Geology
<http://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1327>

Table 3: Surficial Geologic Units

| Map Key | Name | Description ⁹ |
|---------|--------------------------|--|
| al | Recent alluvium | Oxidized fine sand to gravel, permeable, generally confined to flood plains within a valley, in larger valleys may be overlain by silt, subject to flooding, thickness 1-10 meters. |
| h2o | Water | - |
| k | Kame deposits | Coarse to fine gravel and/or sand, includes kames, eskers, kame terraces, kame deltas, ice contact, or ice cored deposition, lateral variability in sorting, texture and permeability, may be firmly cemented with calcareous cement, thickness variable (10-30 meters). |
| ld | Lacustrine delta | Coarse to fine gravel and sand, stratified, generally well sorted, deposited at a lake shoreline, thickness variable (3-15 meters). |
| lsc | Lacustrine silt and clay | Generally laminated silt and clay, deposited in proglacial lakes, generally calcareous, low permeability, potential land instability, thickness variable (up to 50 meters). |
| og | Outwash sand and gravel | Coarse to fine gravel with sand, proglacial fluvial deposition, well rounded and stratified, generally finer texture away from ice border, permeable, |

⁹ Geology, New York State Museum, nysm.nysed.gov/research-collections/geology/gis

| | | |
|----|----------------|--|
| | | thickness variable (2-20 meters). |
| pm | Swamp deposits | Peat-muck, organic silt and sand in poorly drained areas, unoxidized, commonly overlies marl and lake silt, potential land instability, thickness 2-20 meters. |
| r | Bedrock | Exposed or generally within 1 meter of surface, in some areas saprolite is preserved |
| t | Glacial Till | Variable texture (boulders to silt), usually poorly sorted sand-rich diamict, deposition beneath glacier ice, permeability varies with compaction, thickness variable (1-50 meters). |

8. Soils

Description:

According to the Hudson River Estuary Program, “soil is a natural body comprised of solids (minerals and organic matter), liquid, and gases, and it is the product of physical and biotic factors that degrade bedrock, surficial geological materials, and organic matter (waste products and dead organisms) in various stages of decomposition. To understand the natural processes of the land, and to plan land use accordingly, there is no more fundamental place to start than soil. Soil controls decomposition of organic matter and biogeochemical cycles; regulates water flow; influences the vegetation, habitat type, and agricultural potential of particular locations; and supports human habitation and structures. Soil acts as a natural filter to help protect the quality of water and air, regulates rates of aquifer recharge versus runoff, supports food production, growth of forests, and biological communities that society depends on.

“Soil information is critical for land-use planning as it helps to determine where it is appropriate or feasible to build. Each soil type has a certain set of characteristics defined by (but not limited to) properties such as permeability, drainage, available water capacity, pH, depth to bedrock, and risk of corrosion. Consideration of soil properties is important for planning and designing drainage systems; siting of structures; evaluating the potential for septic systems; assessing the need for specially-designed foundations, basements, and roads; determining the feasibility of excavation; and more.

“Soil properties are important for identifying ecological resources as well. Drainage classes can help predict the occurrence of wetlands. Poorly and very poorly drained soils are typically hydric soils and indicate wetland areas and somewhat poorly drained soils are indicators of possible

wetland locations. Similarly, muck or peat soils indicate probable wetland presence. Soil chemistry is often influenced by underlying bedrock geology, and similarly influences the kinds of ecological communities that occur in a given place. Calcareous soils are often associated with uncommon habitats and biota. Agriculture and forestry practices are also informed by soil data. Soils influence which crops are best to grow, whether irrigation or drainage is needed and how to design irrigation systems, and whether soil amendments are necessary. Soil properties can inform which farms are most valuable for preservation.”¹⁰

The Putnam and Westchester County Soil Survey,¹¹ which maps and describes the soils of Philipstown, was completed by soil scientists based on a combination of field surveys and remote analyses. The surveys categorize soil data into series, types, and phases. Soil series delineate soils originating from the same parent materials and having relatively uniform structural engineering properties, except for texture. Soil series are the main unit of a county’s detailed soil survey. Within a series, differing soils are broken down into soil phase categories according to slope and other properties. The USDA Natural Resources Conservation Service (NRCS) Web Soil Survey compiles nationwide soil data and information produced by the National Cooperative Soil Survey.¹² Users can use the Web Soil Survey for easy, interactive access to information from the Putnam County Soil Survey. It is possible to zoom in to an area of interest and print a map of soil units or to classify the soils, as well.

Findings:

The soils mapped within Philipstown are classified according to natural drainage patterns in Table 4: Soils in Philipstown below. It is important to note that the smallest mapping unit is 2 acres in size so there are likely smaller inclusions of different soil types within mapped units. Notably, the Web Soil Survey indicates areas where the loamy soil is fertile and thus “prime farmland” (2,775.7 acres, 8.3%), and also how much land (1,941.2 acres, 5.7%) is flagged as “of state-wide importance.” This will be discussed further in Section 40. Farmland of this report. In addition, certain soils types indicate the likelihood of wetlands due to their poor drainage and are classified as “Hydric Soils.” These are indicated in Table 4 as poorly drained or very poorly drained soils (2,584.9 acres, 7.8%). These Hydric Soils are also collectively shown in Section 13. Wetlands and are discussed in more detail. Also, a much smaller area of somewhat poorly drained soils are considered probable wetlands (48.3 acres, 0.10%). Lastly, included in Table 4 are Septic Tank Field Ratings, which we will cover further in the next section.

¹⁰ Haeckel, Ingrid, and Laura Heady. Creating a Natural Resources Inventory: A Guide for Communities in the Hudson River Estuary Watershed. (Ithaca, NY: Department of Natural Resources, Cornell University, and New York State Department of Environmental Conservation, 2014): <https://www.dec.ny.gov/lands/100925.html>.

¹¹ Soil Survey of Putnam and Westchester Counties, New York. United State Department of Agriculture, Soil Conservation Service, 1994, pp. 1–205, Soil Survey of Putnam and Westchester Counties, New York: nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/new_york/putnam_westchesterNY1994/putnam_westch_ester.pdf

¹² Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey: websoilsurvey.sc.egov.usda.gov/

Further Study:

This could include local soil studies to confirm the approximated soil types shown in the map. Special focus could be placed on confirming prime farmland soils as well as hydric soils suggesting the presence of wetlands.

Data Sources:

- Soils:
 - NRCS SSURGO Database:
<https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm>

Table 4: Soils in Philipstown¹³

| Soil Symbol | Description | Acreage | Percentage of Total Soils | Farmland Class | Parent Material ¹⁴ | Drainage Class | Septic Tank Absorption Fields Rating ¹⁵ |
|-------------|---|----------|---------------------------|-------------------------|-------------------------------|---------------------|--|
| Ce | Catden muck, 0 to 2 percent slopes | 222.9 | 0.70% | Prime | Organic | Very Poorly Drained | Very Limited |
| ChB | Charlton fine sandy loam, 3 to 8 percent slopes | 1,157.90 | 3.50% | Prime | Till | Well Drained | Somewhat limited |
| ChC | Charlton fine sandy loam, 8 to 15 percent slopes | 779.8 | 2.30% | Of Statewide Importance | Till | Well Drained | Very limited |
| ChD | Charlton fine sandy loam, 15 to 25 percent slopes | 449.5 | 1.40% | | Till | Well Drained | Very Limited |
| ChE | Charlton loam, 25 to 35 percent slopes | 249.9 | 0.80% | | Till | Well Drained | Very Limited |
| CIB | Charlton fine sandy loam, 3 to 8 percent slopes, very stony | 404.3 | 1.20% | | Till | Well Drained | Somewhat limited |

¹³ Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey: websoilsurvey.sc.egov.usda.gov/

¹⁴ Heady, Laura, and Gretchen Stevens. Guidebook for Biodiversity Assessment. Hudsonia, 2017

¹⁵ Web Soil Survey, United States Department of Agriculture Natural Resources Conservation Service: websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx

| | | | | | | | |
|-----|--|----------|--------|-------------------------|----------|---------------------------|--------------|
| CIC | Charlton fine sandy loam, 8 to 15 percent slopes, very stony | 857.9 | 2.60% | | Till | Well Drained | Very Limited |
| CID | Charlton loam, 15 to 25 percent slopes, very stony | 758.9 | 2.30% | | Till | Well Drained | Very Limited |
| CIE | Charlton loam, 25 to 35 percent slopes, very stony | 310 | 0.90% | | Till | Well Drained | Very Limited |
| CIF | Charlton loam, 35 to 45 percent slopes, very stony | 333.6 | 1.00% | | Till | Well Drained | Very Limited |
| CrC | Charlton - Chatfield complex, 0 to 15 percent slopes, very rocky | 5,508.30 | 16.60% | | Till | Well Drained | Very Limited |
| CsD | Chatfield - Charlton complex, 15 to 35 percent slopes, very rocky | 3,202.30 | 9.60% | | Till | Well Drained | Very Limited |
| CtC | Chatfield - Hollis - Rock outcrop complex, 0 to 15 percent slopes | 3,266.80 | 9.80% | | Till | Well Drained | Very Limited |
| CuD | Chatfield - Hollis - Rock outcrop complex, 15 to 35 percent slopes | 4,474.70 | 13.50% | | Till | Well drained | Very Limited |
| Ff | Fluvaquents - Udifluvents complex, frequently flooded | 337.4 | 1.00% | | Alluvium | Poorly Drained | Very Limited |
| Fr | Fredon silt loam | 36.7 | 0.10% | Prime | Outwash | Poorly Drained | Very Limited |
| HnB | Hinckley loamy sand, 3 to 8 percent slopes | 38.6 | 0.10% | Of Statewide Importance | Outwash | Excessively drained (dry) | Very limited |
| HnC | Hinckley loamy sand, 8 to 15 percent slopes | 52.8 | 0.20% | | Outwash | Excessively drained (dry) | Very limited |

| | | | | | | | |
|-----|--|----------|-------|-------------------------|---------|------------------------------|------------------|
| HnD | Hinckley loamy sand, 15 to 25 percent slopes | 28.7 | 0.10% | | Outwash | Excessively drained (dry) | Very limited |
| HrF | Hollis-Rock outcrop complex, 35 to 60 percent slopes | 3,216.10 | 9.70% | | Till | Somewhat Excessively Drained | Very limited |
| Ip | Ipswich mucky peat, 0 to 2 percent slopes, very frequently flooded | 293.5 | 0.90% | - | Organic | Very Poorly Drained | Very Limited |
| KnB | Knickerbocker fine sandy loam, 2 to 8 percent slopes | 8.2 | 0.00% | Prime | Outwash | Somewhat Excessively Drained | Very limited |
| LcA | Leicester loam, 0 to 3 percent slopes, stony | 93 | 0.30% | | Till | Poorly Drained | Very Limited |
| LcB | Leicester loam, 3 to 8 percent slopes, stony | 270.9 | 0.80% | | Till | Poorly Drained | Very Limited |
| LeB | Leicester loam, 2 to 8 percent slopes, very stony | 604.3 | 1.80% | | Till | Poorly Drained | Very Limited |
| NcA | Natchaug muck, 0 to 2 percent slopes | 171.4 | 0.50% | | Organic | Very Poorly Drained | Very Limited |
| NdA | Natchaug and Catden mucks, ponded, 0 to 2 percent slopes | 46.3 | 0.10% | | Organic | Very Poorly Drained | Very Limited |
| PnB | Paxton fine sandy loam, 3 to 8 percent slopes | 364.9 | 1.10% | Prime | Till | Well drained | Somewhat Limited |
| PnC | Paxton fine sandy loam, 8 to 15 percent slopes | 595.40 | 1.80% | Of Statewide Importance | Till | Well drained | Very Limited |
| PnD | Paxton fine sandy loam, 15 to 25 percent slopes | 289.2 | 0.90% | | Till | Well drained | Very Limited |
| PoB | Paxton fine sandy loam, 0 to 8 | 52.4 | 0.20% | | Till | Well drained | Somewhat Limited |

| | | | | | | | |
|-----|--|-------|-------|-------------------------------|------------------------|-------------------------------|---------------------|
| | percent slopes, very stony | | | | | | |
| PoC | Paxton fine sandy loam, 8 to 15 percent slopes, very stony | 145.9 | 0.40% | | Till | Well drained | Very Limited |
| PoD | Paxton fine sandy loam, 15 to 25 percent slopes, very stony | 79.5 | 0.20% | | Till | Well drained | Very Limited |
| Pt | Pits, gravel | 84.5 | 0.30% | | Gravel | Not Rated | Not Rated |
| Pv | Pits, quarry | 20.2 | 0.10% | | Unweathered Bedrock | Not Rated | Not Rated |
| Pw | Pompton silt loam, loamy substratum | 48.3 | 0.10% | Prime | Outwash | Somewhat Poorly Drained | Very Limited |
| Ra | Raynham silt loam | 29.2 | 0.10% | Prime | Lacustrine | Poorly Drained | Somewhat Limited |
| RdA | Ridgebury complex, 0 to 3 percent slopes | 6.10 | 0.00% | Of Statewide Importance | Till | Poorly Drained | Very Limited |
| RdB | Ridgebury complex, 3 to 8 percent slopes | 61.80 | 0.20% | Of Statewide Importance | Till | Poorly Drained | Very Limited |
| RgB | Ridgebury complex, 0 to 8 percent slopes, very stony | 88.70 | 0.30% | | Till | Poorly Drained | Very Limited |
| RhA | Riverhead loam, 0 to 3 percent slopes | 77.30 | 0.20% | Prime | Outwash | Well Drained | Very Limited |
| RhB | Riverhead loam, 3 to 8 percent slopes | 427.5 | 1.30% | Prime | Outwash | Well Drained | Very Limited |
| RhC | Riverhead loam, 8 to 15 percent slopes | 114.9 | 0.30% | Of Statewide Importance | Outwash | Well Drained | Very Limited |
| RhD | Riverhead loam, 15 to 25 percent slopes | 42.9 | 0.10% | | Outwash | Well Drained | Very Limited |
| RhE | Riverhead loam, 25 to 50 percent | 162.9 | 0.50% | | Outwash | Well Drained | Very Limited |

| | | | | | | | |
|-----|--|----------|-------|-------------------------------|------------------------|-------------------------------|--------------|
| | slopes | | | | | | |
| Sh | Sun loam | 201.3 | 0.60% | Of Statewide Importance | Till | Very Poorly Drained | Very Limited |
| Sm | Sun loam, extremely stony | 121.40 | 0.40% | | Till | Very Poorly Drained | Very Limited |
| SuA | Sutton loam, 0 to 3 percent slopes | 44.6 | 0.10% | Prime | Till | Moderately Well Drained | Very Limited |
| SuB | Sutton loam, 3 to 8 percent slopes | 182.2 | 0.50% | Prime | Till | Moderately Well Drained | Very Limited |
| Ub | Udorthents, smoothed | 235.3 | 0.70% | | Disturbanc e (Fill) | Moderately Well Drained | Very Limited |
| Uc | Udorthents, wet substratum | 162.4 | 0.50% | | Disturbanc e (Fill) | Moderately Well Drained | Very Limited |
| UdB | Unadilla silt loam, 2 to 6 percent slopes | 17 | 0.10% | Prime Farmland | Lacustrine | Well Drained | Not Rated |
| Uf | Urban land | 26 | 0.10% | | Urban (built) | Not Rated | Not Rated |
| UhB | Urban land - Charlton complex, 3 to 8 percent slopes | 146.4 | 0.40% | | Urban (built) | Well Drained | Not Rated |
| UhC | Urban land - Charlton complex, 8 to 15 percent slopes | 38.2 | 0.10% | | Urban (built) | Well Drained | Not Rated |
| UIC | Urban land - Charlton - Chatfield complex, rolling, very rocky | 17.9 | 0.10% | | Urban (built) | Well Drained | Not Rated |
| UvB | Urban land - Riverhead complex, 2 to 8 percent slopes | 5.4 | 0.00% | | Urban (built) | Well Drained | Not Rated |
| W | Water | 1,828.90 | 5.50% | - | - | - | - |
| WdB | Woodbridge loam, 3 to 8 | 159 | 0.50% | Prime | Till | Moderately Well | Very Limited |

| | | | | | | | |
|-----|---|------------------|----------------|-------------------------|------|-------------------------|--------------|
| | percent slopes | | | | | Drained | |
| WdC | Woodbridge loam, 8 to 15 percent slopes | 143.3 | 0.40% | Of Statewide Importance | Till | Moderately Well Drained | Very Limited |
| | Totals: | 33,195.80 | 100.00% | | | | |

9. Third Party Map: Septic Tank Absorption Fields

Description and Findings:

Interestingly, based on Section 8. Soils, most of the Town (27,780.7 acres, 83.7%) is classified as well drained, somewhat excessively drained or excessively drained; however, when the Town soil drainage is classified according to USDA criteria for septic tank absorption fields, the results are very different. The soils in Philipstown are rated as either *somewhat limited* or *very limited* in terms of septic tank absorption (with a small percentage of unrated areas). These septic tank absorption fields rely on the soil features between depths of 24 and 72 inches that affect the absorption of the effluent: permeability, depth to saturated zone, depth to dense material, and depth to bedrock. (Some areas of Town have a very shallow depth to bedrock - see Section 6. Bedrock Geology and Section 7. Surficial Geology). These features were used to assign the ratings for each soil type in Philipstown.

Septic Tank Absorption Field Ratings are shown in Table 4 above and in the accompanying map for each of the soil types found in Town:

- Somewhat limited (yellow on the map) indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected.
- Very limited (red on the map) indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.
- Not Rated or Not Available (grey on the map) indicated water bodies or areas excluded from the study.

Data Sources:

- Septic Field Absorption Ratings:

- NRCS SSURGO Database:
<https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm>

10. Slopes

Description:

According to the Putnam Valley NRI, “Many of the scenic vistas in [Philipstown] are associated with its varied topography and the ridgelines running predominantly NE-SW. As discussed in the reports accompanying the Bedrock Geology and Surficial Geology maps, these ridgelines are a product of the movement of the bedrock throughout geological history and the retreat of the glaciers that covered this area several times in geological history.

“The Steep Slopes maps categorize the slope of the areas throughout the Town. 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. Because an on-site survey is necessary to determine the exact topographic conditions of a particular parcel, this map should only be considered an approximate depiction of steeply sloped areas in the Town.

“Steep slopes are among the most sensitive environmental features in our landscapes. Steep slopes are highly susceptible to disturbance due to erosion, land slippage, and subsidence and thus pose significant constraints to land development and resource extraction. Such disturbance can harm water quality, damage built structures, and present public safety risks. Steep slopes are vulnerable to soil erosion, excessive stormwater runoff, and slope instability. Disturbance of steep slopes can introduce sediment into water bodies and thus affect the quality of water resources in a watershed. In many settings, steep slopes provide scenic views for neighboring areas, and extensive removal of vegetation along with extensive earthwork can transform these intrinsic resources into visible eyesores. In consideration of these factors, Philipstown should pay close attention to steep slopes in its planning, conservation, and development permitting processes.”¹⁶

For this map, percent slope was calculated from a Digital Elevation Model (DEM). Each DEM raster has a pixel resolution of approximately 10 meters. Elevation values were derived from USGS contour lines mapped at a scale of 1:24,000. DEMs can be used as source data for digital orthophotos and as layers in geographic information systems for earth science analysis. DEMs can also serve as tools for volumetric analysis, for site location of towers, or for drainage basin delineation. These data are collected as part of the USGS National Mapping Program.

¹⁶ Town of Putnam Valley Committee for the Conservation of the Environment, Town of Putnam Valley Natural Resource Inventory, 2018: <https://putnamvalleyresidents.com/NRI.html>

Findings:

Philipstown's varied topography results in moderate-to-steep slopes over a sizable portion of the Town. The Town currently has a steep slope ordinance which restricts development on lands with a 20% or greater slope (dark orange and red on the map).¹⁷ The criterion for a steep slope varies with local municipality. While nearby Putnam Valley also uses a steep slope threshold of 20%, Fishkill uses 33% and Cortlandt Manor 15%. Much of Philipstown's acreage is, by definition, protected by the steep slopes ordinance. On the map we have also highlighted areas of 15 - 20% slope as a light orange color since they may have sections greater than 20% slope. While interpreting the map, all areas that are light orange, dark orange or red should be considered as steep slopes and be confirmed in the field. These steeply-sloped areas can be found throughout the Town but are predominant along the major ridgelines. These ridgelines are presented later in this inventory in Section 35. Scenic Resources.

While development is not prohibited on slopes greater than 20%, the Town's Planning Board is charged with reviewing proposals with the goal of "identifying, protecting, and providing for the proper management of steep terrain, ridgelines, and hillsides."¹⁸ If a proposed development of a parcel on a steep slope is approved, developers are required to minimize and mitigate the effects of disturbance in these ecologically sensitive steep slope and ridgeline areas.

The hillsides and ridgelines of Philipstown feature prominently in the Scenic Resources of the Town. Steep slopes with shallow soils (see Section 7. Surficial Geology) are also potential crest ledge and talus habitats, some of which promise to be calcareous based on Section 6. Bedrock Geology and may contain unique biotic communities, worthy of careful conservation practices.

Further Study:

A follow up study could analyze the current amount of development and corresponding ecological impacts on steep slopes within Philipstown and prepare suggestions for improved practices and regulations, if necessary.

Data Sources:

- Slopes
 - U.S. Geological Survey: Index of Digital Elevation Models (DEM), New York
<https://cugir.library.cornell.edu/catalog/cugir-008186>

¹⁷ Code of the Town of Philipstown. § 175-36. Steep terrain and ridgelines protection regulations.
<https://www.ecode360.com/6319342#6319342>

¹⁸ Ibid.

Chapter 3: Water Resources

11. Watersheds

Description:

This U.S. Geological Survey (USGS) map layer displays the National Watershed Boundary Dataset (WBD), focusing on Hydrologic Unit Class 12 (HUC 12) Watersheds. The watershed hydrologic unit boundaries provide a uniquely identified and uniform method of subdividing large drainage areas. A watershed is an area of land draining to a stream, river, lake, or other waterbody. Watersheds are divided by high points on the land, such as ridges, mountains, and hills, and may be made up of many smaller drainage areas, or further watersheds. Each of the watersheds included in this map provide drinking water, either via a well or public water supply, to residents and businesses. Septic systems and wastewater treatment facilities, in addition to numerous other potentially polluting activities, directly impact the quality of water that flows through these watersheds. This data set is intended to be used as a tool for water-resource management and planning activities, particularly for site-specific and localized studies requiring a level of detail provided by large-scale map information.

Findings:

The Town of Philipstown drains into 8 watersheds, which are as follows:

Annsville Creek:

A large portion of the Annsville Creek Watershed's headwaters is just over the border in Putnam Valley, but a significant portion passes through the southeast corner of Philipstown. The Annsville Creek Watershed originates at Canopus Lake in Fahnestock State Park in Kent and from there Canopus Creek flows south into the Town of Philipstown, Annsville Creek, and ultimately into the Hudson River. Significant water bodies include Canopus Lake, Indian Lake, Lake Celeste and Cortlandt Lake. Significant streams are the Canopus Creek, West Branch Canopus Creek and the Annsville Creek. Also, the Catskill Aqueduct, which transports water to New York City passes through this watershed. These water bodies and streams will be covered in more detail in the next Section 12. Streams and Waterbodies. Notable human development is centered around the hamlet of Continental Village in Philipstown.

Breakneck Brook - Hudson River:

This watershed is located on the northwest border of Philipstown and includes part of the Town of Fishkill. Water flows from the heights of the Hudson Highlands State Park into the significant water bodies of the Meltingah Reservoir and Lake Surprise before continuing down into the Hudson River via Gordons Brook and Breakneck Brook. Other notable streams include Squirrel Hollow Brook and Wades Brook. This watershed includes significant human development in the Village of Cold Spring, including the Cold Spring Wastewater Treatment Plant, which will be covered in more detail in 21. Threats to Water Quality. The Catskill Aqueduct also passes through this watershed.

Clove Creek:

This covers the north-central portion of Philipstown and drains primarily through Clove Creek, which originates in Clarence Fahnestock State Park, eventually joins the Fishkill Creek in the Town of Fishkill and thereafter flows into the Hudson River. This watershed drains significant portions of Fahnestock State park, the northeastern edge of Hudson Highlands State Park and all the land in the valley in between, which is bisected by State Rt. 9. Notable water bodies include Jordan Pond, Glynwood's reservoir (through which Clove Creek flows), Barrett Pond, Lake Valhalla and the Beacon Reservoir. Notable streams include Clove Creek, Sand Spring Brook, and Bull Creek. The Clove Creek watershed is also home to significant human development, especially along Rt. 9, East Mountain Road South and North, and around Lake Valhalla. The Rt. 9 corridor not only contains many residential properties with septic systems, but also numerous commercial properties as well as a small area designated for industrial / manufacturing and Soil Mining (shown in Section 37. Zoning). Just over the northern border in Fishkill, there are several open sand and gravel mines that border Clove Creek. All of these combined activities pose numerous potential threats to the health of Clove Creek and the Fishkill Creek into which it flows. This will be covered in more detail in several remaining maps in this chapter.

Foundry Brook - Hudson River:

This watershed covers the largest area within Philipstown, consists of many water bodies and streams that flow down to the Hudson River, and also includes several population centers, such as the Village of Nelsonville, part of the Village of Cold Spring and the hamlet of Garrison. In addition to providing drinking water for residents and businesses, this watershed supplies water to several water districts, including the Villages of Nelsonville and Cold Spring and Garrison's Landing. Notable water bodies include the Cold Spring Reservoir, Jaycox Pond, Laths Pond, Dales Pond, Loch Lyall, Catfish Pond and Duck Pond. Notable streams include Foundry Brook, Indian Brook, Philipse Brook, Arden Brook and Copper Mine Brook. The Catskill Aqueduct also

passes through this watershed. This watershed will be covered in much depth in the next few sections.

Furnace Brook - Hudson River:

This watershed just barely touches the southern border of Philipstown, but is very large and part of an important watershed for the communities of northern Westchester, including the nearby City of Peekskill. Streams and waterbodies that drain the small area within Philipstown's border include Broccy Creek and Dickiebusch Lake, among others, both of which flow down into the Hudson River.

Peekskill Hollow Creek:

This is another major watershed that only drains a small area of Philipstown, in the southeast corner of the Town in Continental Village, but is very important to neighboring communities. According to the Putnam Valley NRI, "the watershed drains a total of 47.4 square miles and flows to the Hudson River via Annsville Creek near the Town's border with the Town of Cortlandt Manor. Peekskill Hollow Creek originates at the outflow of Lake Tibet in the Town of Kent and flows southwest for approximately 17 miles before joining Sprout Creek and then Annsville Creek. Approximately 20 tributaries including Roaring Brook, Wiccopee Brook, Shrub Oak Creek and Oscawana Brook feed it. Lake Peekskill drains to Peekskill Hollow Creek via an unnamed stream below its confluence with Oscawana Brook. The neighboring Town of Putnam Valley's three major lake communities - Roaring Brook Lake, Oscawana Lake and Lake Peekskill - as well as Stillwater Pond and Wiccopee Reservoir are located in the Peekskill Hollow Creek watershed. These lakes were created as impoundments with water levels controlled by their dams. The Peekskill Hollow Creek Watershed is an important secondary source of drinking water for communities in Westchester County and feeds groundwater wells for hundreds of Putnam Valley residents and businesses. The City of Peekskill owns the Wiccopee Reservoir, which supplies drinking water to about 21,000 residents in Peekskill, the Village of Buchanan, and the Town of Cortlandt. The Peekskill Hollow system supplies an additional 23,000 residents in Cortlandt and Yorktown via Northern Westchester Joint Water Works to supplement water from the New York City water supply, which also passes through this watershed via the Catskill Aqueduct."¹

West Branch Croton River:

Although none of the Town of Philipstown lies within this watershed, it is important to note its importance due to its proximity to the Town. According to the Putnam Valley NRI, "this

¹ Town of Putnam Valley Committee for the Conservation of the Environment, Town of Putnam Valley Natural Resource Inventory, 2018: <https://putnamvalleyresidents.com/NRI.html>

watershed serves the New York City Water Supply. As seen on the map, part of neighboring Putnam Valley is in the watershed of the West Branch of the Croton River, which feeds the Boyd Corners Reservoir in Kent. Boyd Corners is part of the New York City Water Supply's Delaware System, which supplies up to half of the City's water. Most of the water in this Watershed goes to the City through Kensico Reservoir in Valhalla, New York but some is released into the West Branch Croton River where it eventually either goes to the City through New Croton Reservoir or to the Hudson River via the Croton River."²

Wiccopee Creek - Fishkill Creek:

This watershed drains the northeast corner of Philipstown, including part of Clarence Fahnestock State Park and sections of the East Mountain Road South and East Mountain Road North residential areas. In addition, it drains a small section of the Hudson Highlands State Park found on the north west border of the Town. This watershed is an important source of water for the downhill communities within the Town of Fishkill, the City of Beacon and a small area of the Town of East Fishkill. Notable streams within Philipstown are Trout Creek and Wiccopee Creek, which eventually converge as a further section of Wiccopee Creek before it joins the Fishkill Creek on its way to the Hudson River. The small western section of the watershed found within Philipstown and the Hudson Highlands State Park drains into the western Beacon Reservoir, which provides potable water to the City of Beacon.

Lastly, Table 5. Tree Canopy Cover and Impervious Cover of Watersheds shows the percentages of tree canopy and impervious areas (buildings, asphalt / concrete / stone pavement, and gravel) within each watershed. This can be a proxy for watershed health (the more canopy area and the less impervious area, the better for the watershed). It is important to note that most of these watersheds cross municipal boundaries and thus the percentages of cover may include areas of conservation or development outside of Philipstown. This highlights the importance of inter-municipal watershed planning, since decisions made in one municipality can have significant consequences for a nearby municipality. The information for this table comes from the Hudson Valley Natural Resource Mapper, and can be accessed by clicking on the polygons for HUC-12 watersheds within Philipstown.³

Data Sources:

- Watersheds
 - NHD: Watershed Boundary Dataset
<https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/water/watersheds/dataset/>

² Ibid.

³ NYS DEC, Hudson Valley Natural Resource Mapper, <https://gisservices.dec.ny.gov/gis/hvnrnm/>

Table 5: Tree Canopy Cover and Impervious Cover of Watersheds⁴

| Watershed | Tree Canopy Cover (%) | Impervious Cover (%) |
|---------------------------------|------------------------------|-----------------------------|
| Annsville Creek | 66.6 | 1.7 |
| Breakneck Brook - Hudson River | 38.1 | 8.9 |
| Clove Creek | 71.8 | 2.6 |
| Foundry Brook - Hudson River | 59.7 | 3.6 |
| Furnace Brook - Hudson River | 36.6 | 9.2 |
| Peekskill Hollow Creek | 63.2 | 6.5 |
| West Branch Croton River | 64.4 | 2.4 |
| Wiccopee Creek - Fishkill Creek | 58.8 | 12.9 |

12. Streams and Waterbodies

Description:

This map depicts the streams, lakes, ponds and reservoirs located within Philipstown, all of which offer countless resource functions, such as drinking water resources and wildlife habitat, with benefits to the Town as well as recreational opportunities and scenic beauty. Primary water bodies and streams are labeled, but there are numerous smaller or seasonal streams that are found on the map that are not labeled or have not been named. Data for these layers from the National Hydrography Dataset (NHD), which is used to portray surface water on The National Map. The NHD represents the drainage network with features such as rivers, streams, canals, lakes, ponds, coastline, dams, and streamgages. These data are designed to be used in general mapping and in the analysis of surface water systems.

In addition, we have highlighted streams that are home to trout or trout spawning, which are labeled as Trout Streams. These streams tend to provide cold water temperature, limited sediment loads, diverse macroinvertebrate communities, and low pollution, and thus have the potential to support a trout population or to support trout spawning. This layer was derived from

⁴ Ibid.

the NYS DEC Water Quality Classifications dataset, which is also included and will be covered in more detail in Section 19. NYS DEC Stream Classifications.

This map serves mainly as a reference map for the sections that follow, which dive deeper into issues of water quality, water classifications and potential hazards to our streams and water bodies. We included this map separately to avoid making the subsequent maps in this chapter of the report too busy, but the layers from this map can be combined with any of the preceding or subsequent maps and their layers on the Town's ArcGIS Online map.

Findings:

As is evident on the map, Philipstown is home to numerous streams and waterbodies, which, as described in Section 11. Watersheds above, all eventually flow into the Hudson River. Many of these water bodies and streams drain into drinking water resources, whether accessed by wells or public water supply systems. And as shown on the map, many of the Town's streams are considered Trout Streams and / or Trout Spawning Streams, which suggest great potential for supporting not only trout, but countless other forms of life, which will be covered later in this report in Chapter 4. Habitats and Wildlife. Lastly, many of the Town's water bodies also offer scenic and recreational opportunities, which will be explored in further detail in Chapter 6. Historic, Scenic and Recreational Resources.

Data Sources:

- Streams, Lakes and Ponds
 - National Hydrography Dataset
<http://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1337>
- Trout Streams
 - NYS DEC Water Quality Classifications
<http://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1118>

16. Wetlands

Description:

According to the Hudson River Estuary Program, “wetlands are areas saturated by surface water or groundwater sufficient to support distinctive vegetation adapted for life in saturated soil conditions. In addition to providing critical habitat for many plants and animals, wetlands provide important benefits to human communities. They help to control flooding and reduce

damage from storm surge, act as filters to cleanse water of impurities, and provide recreation opportunities for many people.

“Knowing about local wetlands enables municipalities to proactively plan to conserve this critical resource. Although this map provides approximate locations and extent of wetlands, it is inherently inaccurate and not a substitute for site visits and on-the-ground delineation. Small wetlands in particular are often missed. Nonetheless, the Town can use its updated wetland map as a starting point for further inventorying local wetlands and supplement with more refined data as they become available. To understand how land use decisions can impact wetlands, it’s important to also consider adjacent upland areas and connected hydrologic features such as streams, as already described and also described in later sections of this chapter; the combined NRI maps of this chapter will help illustrate the relationships between these different resources.”⁵

The data for this map came from several sources:

Hydric Soils:

Soils considered as “Hydric Soils” from the above Section 8. Soils have been included here since they suggest the presence of wetlands. This “Putnam County soil survey data provides information about poorly drained and very poorly drained soils, which are commonly used indicators of probable wetlands. Somewhat poorly drained soils can be used to predict locations of possible wetlands. In general, the soils maps tend to somewhat overestimate the acreage of wetland soils, due in part to the scale of the soils mapping (the smallest mapping unit is two acres). The Soil Survey Geographic Database (SSURGO) contains digital soil data from the Putnam County Soil Survey.”⁶ The specific soils are listed below in Table 6: Hydric Soils.

Tidal, Freshwater Emergent, and Freshwater Forested/Shrub Wetlands:

All of these wetland layers come from the National Wetland Inventory (NWI), created by the US Fish and Wildlife Service (USFWS). “These NWI layers are created using aerial photo interpretation and some field checking, and include wetlands of all sizes with some information on habitat. They are not intended for regulatory purposes. 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 and merit further local study.”⁷ The following are short descriptions of the layers from the NWI dataset:

⁵ Haeckel, Ingrid, and Laura Heady. Creating a Natural Resources Inventory: A Guide for Communities in the Hudson River Estuary Watershed. (Ithaca, NY: Department of Natural Resources, Cornell University, and New York State Department of Environmental Conservation, 2014): <https://www.dec.ny.gov/lands/100925.html>.

⁶ Ibid.

⁷ Ibid.

1. *“Tidal Wetland* - Consists of deepwater tidal habitats and adjacent tidal wetlands that are usually semi-enclosed by land but have open, partly obstructed, or sporadic access to the open ocean / an estuary, and in which salt water is at least occasionally diluted by freshwater runoff from the land. The salinity may be periodically increased above that of the open ocean by evaporation. Along some low-energy coastlines, there is appreciable dilution of seawater. Offshore areas with typical estuarine plants and animals, such as red mangroves (*Rhizophora mangle*) and eastern oysters (*Crassostrea virginica*), are also included in the Estuarine System
2. *Freshwater Emergent Wetland* - Characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens. This vegetation is present for most of the growing season in most years. These wetlands are usually dominated by perennial plants.
3. *Freshwater Forested/ Shrub Wetland* - A Forested wetland is characterized by woody vegetation that is 6 m tall or taller; a Shrub wetland includes areas dominated by woody vegetation less than 6 m (20 feet) tall. The species include true shrubs, young trees (saplings), and trees or shrubs that are small or stunted because of environmental conditions.”⁸

It is important to note that the National Wetlands Inventory offers an online mapper that is incredibly rich with information, including detailed classification descriptions for every single wetland included in this dataset and on our map. This fantastic additional resource can serve as a supplemental source of information to the Town's wetland conservation efforts and can be accessed here: <https://www.fws.gov/wetlands/data/Mapper.html>.

NYS DEC Regulated Wetland Check Zones:

The data for this layer comes from the “NYS DEC Regulatory Freshwater Wetland dataset, which depicts mainly large wetlands (12.4 acres or larger) and a few smaller ones with special attributes. The maps were created by aerial photo interpretation and minimal field checking, and are not intended to be accurate depictions of the limits of state wetland jurisdiction on any site. Many of DEC’s regulatory maps are outdated and have similar inaccuracies to the NWI maps. New York's freshwater wetlands maps only show the approximate location of the actual wetland boundary. They are not precise, regardless of how closely you zoom in on the map.”⁹

⁸ Surface Waters and Wetlands, National Wetlands Inventory, U.S. Fish and Wildlife Service, <https://www.fws.gov/wetlands/data/Mapper.html>

⁹ Haeckel, Ingrid, and Laura Heady. Creating a Natural Resources Inventory: A Guide for Communities in the Hudson River Estuary Watershed. (Ithaca, NY: Department of Natural Resources, Cornell University, and New York State Department of Environmental Conservation, 2014): <https://www.dec.ny.gov/lands/100925.html>.

Since these wetlands mostly duplicate the NWI wetlands already shown on the map, we only included from this dataset the DEC "Check Zones," which are the areas surrounding the NYS DEC Regulated Wetlands that may also include wetland habitat. They are named "Check Zones" because they require in-the-field checking to confirm the actual limits of each regulated wetland. Also, this approach to designing the map allows the NWI wetlands to be clearly seen without being covered by the DEC Regulated Wetlands layer, which on our map are simply those areas within each Check Zone. As noted above, however, these Check Zones are approximate, and must be confirmed in the field.

Conveniently, each DEC Regulated Wetland has already been classified from Class I (which provides the most benefits) to Class IV (which provides fewer benefits). The classification is based on the work that each wetland performs, such as storing flood water and providing wildlife habitat. Information about how any individual wetland was classified is contained in program files at the regional DEC office closest to where the wetland is located. Since it is too cumbersome to include all of the wetland classifications in this report, we instead refer readers to the Hudson Valley Natural Resources Mapper, where, under the "Wetland Layers" category, you may select "State Regulated Freshwater Wetlands," zoom in on the map and then click on any shown wetland to pull up a small window that shows the Wetland ID, Wetland Class, and Wetland Size (Acres). This resource can serve as a valuable complement to the map included in this report, and can be found here: <https://gisservices.dec.ny.gov/gis/hvnrm/>.

Also, for reference, the Wetland Class criteria are described in the Code of New York State here: <https://govt.westlaw.com/nycrr/Document/I4ece2eaecd1711dda432a117e6e0f345?viewType=FullText&originationContext=documenttoc&transitionType=CategoryPageItem&contextData=%28sc.Default%29>

Findings:

Philipstown is home to numerous high quality and ecologically essential wetlands, including both inland freshwater wetlands, such as those concentrated in the Clove Creek watershed, in the center of Town along Rt. 9 and along the eastern border of the Town, as well as tidal wetlands, sections of which can fluctuate from brackish to freshwater depending on the time of the year, such as Constitution Marsh adjacent to Cold Spring and the marsh around Manitou in the south west corner of the Town. In addition to those wetlands portrayed by the National Wetlands Inventory, the NYS DEC Check Zones suggest an even greater extent of land that may be protected as wetlands. Furthermore, state law requires that all wetlands have an additional 100-foot buffer area surrounding them for added regulation of potential development. Locally these regulations are overseen by the Town's Natural Resources Review Officer / Wetland Inspector and the Conservation Board.

Using the [Hudson Valley Natural Resource Mapper](#) as a complementary source of information, you can see that the Town has a large number of Class I wetlands, including:

- Constitution Marsh (*Wetland ID: WP-7*, Wetland Class: 1, Wetland Size (Acres): 279.20),
- The wetlands located in the Hubbard Estate section of Clarence Fahnestock State Park to the north east of the intersection of Rt. 9 and Rt 301 (*Wetland ID: WP-6*, Wetland Class: 1, Wetland Size (Acres): 145.50), and
- The long stretch of wetlands that runs along Canopus Creek from Putnam Valley into Continental Village in the southeast corner of Town (*Wetland ID: PK-3*, Wetland Class: 1, Wetland Size (Acres): 180.20).

In addition, many smaller wetlands are considered Class I and very few wetlands within the Town are below a Class II rating, further indicating that essentially all of Philipstown's wetlands are worthy of strict protection due to their significant habitat contributions, often for rare species, and also their hydrological and pollution controls features, such as reducing the negative impacts of flooding and filtering harmful pollutants before they travel further downstream through *riparian* (which means "stream-side" or "river-side") habitats.

In addition to the regulated wetlands depicted on the map using data from the National Wetlands Inventory and the NYS DEC Wetlands, the presence of hydric soils outside of the regulated areas suggest the additional presence of wetlands, as described above and presented in Table 6 below. Several large clusters of hydric soils include the area just north of the Town border along Clove Creek (adjacent to the two gravel and sand quarries on Rt 9), the area near the Beacon Reservoir along East Mountain Road North, sections of Fahnestock State Park to the north and northwest of Rt 301 (near and even on Glynwood Farm), the area in the center of Town between Rt 9, Old Albany Post Road, Indian Brook and Philipse Brook, and the area in the hamlet of Garrison between Upper Station Road and Snake Hill Road. These hydric soil areas do not receive the same state regulatory protections as the regulated wetlands, and could benefit from further study to establish their existence, extent and quality to improve their protection.

As noted above, the Town of Philipstown takes our wetlands very seriously and has taken several major steps to protect them. In addition to employing a Natural Resources Review Office and Wetlands Inspector, who is responsible for inspecting any potential development project and its impacts on nearby wetlands in addition to ensuring ongoing compliance with Town regulations, the Town also converted its former Conservation Advisory Committee into the current Conservation Board, which has more regulatory authority when it comes to protecting Natural Resources, such as wetlands.

Going further, the Town adopted a “Freshwater Wetlands and Watercourse Law,”¹⁰ which “[regulates] the dredging, filling, deposition or removal of materials, diversion or obstruction of water flow, placement of structures and other uses in wetlands and watercourses and in certain associated lands and waters located in the Town of Philipstown. It further sets forth permit requirements governing such actions... It is the intent of the Town of Philipstown to control and regulate the use of wetlands and watercourses... within the Town to ensure that the benefits found to be provided by them will not be lost and to protect the important physical, ecological, social, educational, aesthetic, recreational and economic assets of the present and future residents of the Town so as to protect the public interest.” The Law goes into much more detail about the benefits of wetlands, potential threats, regulated activities, exempted activities and so forth and can be found here: <https://www.ecode360.com/6317427>

Lastly, there are numerous potential threats to wetland health, including run-off of silt and salt from gravel roads, salt from paved roads, fertilizers and pesticides used on private residential and commercial properties and farms, leaked or improperly disposed off hazardous waste, leaking septic systems, improper stormwater management, deforestation, dredging, and so forth. These hazards will be covered in more detail in Section 21. Threats to Water Quality.

Further Study:

As mentioned above, vernal pools, wet meadows, and swamps are often under-represented on maps and merit further local study. Vernal pools are small, isolated wetlands that are often dry in summer. They provide habitat for many animals, including many forest amphibians that use the pools for breeding. Vernal pools often go undetected in the forest due to their small size and seasonal drawdown, and are not protected to the same extent as regulated wetlands.

In neighboring Putnam Valley, a study carried out by the Teatown Lake Reservation mapped potential vernal pools in the Town and other neighboring towns, some of which have been confirmed through actual field visits. Such a study could serve as an additional resource for the Town of Philipstown and as a model for the Town to replicate.¹¹ Specific management recommendations can be found in Best Development Practices: Conserving Pool-Breeding Amphibians in Residential and Commercial Development in the Northeastern United States¹², and the Maine Municipal Guide to Mapping and Conserving Vernal Pool Resources.¹³ In

¹⁰ Town of Philipstown, § 93-1 - § 93-19: Freshwater Wetlands and Watercourse Law of the Town of Philipstown, Zoning Code, <https://www.ecode360.com/6317427>

¹¹ Rubbo, M. 2013. Mapping Woodland Pools in the Hudson Hills and Highlands: Report to the Hudson River Estuary Program. Ossining, NY. 6 pp.

¹² Calhoun, A. and M. Klemens. 2002. 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, Bronx, New York. maineaudubon.org/wp-content/uploads/2012/08/Best-Development-Practices-ConservingPool-breeding-Amph.pdf

¹³ Morgan, D. and A. Calhoun. 2012. The Maine Municipal Guide to Mapping and Conserving Vernal Pools. University of Maine, Sustainability Solutions Initiative, Orono, ME.

addition, an updated local study of the Town's wetlands, especially focusing on hydric soils outside of regulated wetlands can add more information to and confirm that which is depicted in this section's map in order to help the Town's Natural Resources Officer and Conservation Board better protect wetlands areas that are more likely to be overlooked.

Data Sources:

- Hydric Soils:
 - NRCS SSURGO Database:
<https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm>
- Tidal, Freshwater Emergent, and Freshwater Forested/Shrub Wetlands:
 - National Wetlands Inventory - NYS
<https://www.fws.gov/wetlands/data/Mapper.html>
- NYS DEC Wetland Checkzones
 - NYS DEC Regulatory Freshwater Wetlands
<https://cugir.library.cornell.edu/catalog/cugir-008187?id=111>

Table 6: Hydric Soils¹⁴

| Soil Symbol | Description | Acreage | Percentage of Total Soils | Farmland Class | Parent Material ¹⁵ | Drainage Class | Septic Tank Absorption Fields Rating ¹⁶ |
|-------------|---|---------|---------------------------|----------------|-------------------------------|---------------------|--|
| Ce | Catden muck, 0 to 2 percent slopes | 222.9 | 0.70% | Prime | Organic | Very Poorly Drained | Very Limited |
| Ff | Fluvaquents - Udifluvents complex, frequently flooded | 337.4 | 1.00% | | Alluvium | Poorly Drained | Very Limited |
| Fr | Fredon silt loam | 36.7 | 0.10% | Prime | Outwash | Poorly Drained | Very Limited |

maineaudubon.org/wpcontent/uploads/2012/08/MeAud-ME-Municipal-Guide-to-Mapping-and-Conserving-Vernal-Pool.pdf

¹⁴ Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey: websoilsurvey.sc.egov.usda.gov/

¹⁵ Heady, Laura, and Gretchen Stevens. Guidebook for Biodiversity Assessment. Hudsonia, 2017

¹⁶ Web Soil Survey, United States Department of Agriculture Natural Resources Conservation Service: websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx

| | | | | | | | |
|-----|--|--------|-------|-------------------------|------------|-------------------------|------------------|
| Ip | Ipswich mucky peat, 0 to 2 percent slopes, very frequently flooded | 293.5 | 0.90% | - | Organic | Very Poorly Drained | Very Limited |
| LcA | Leicester loam, 0 to 3 percent slopes, stony | 93 | 0.30% | | Till | Poorly Drained | Very Limited |
| LcB | Leicester loam, 3 to 8 percent slopes, stony | 270.9 | 0.80% | | Till | Poorly Drained | Very Limited |
| LeB | Leicester loam, 2 to 8 percent slopes, very stony | 604.3 | 1.80% | | Till | Poorly Drained | Very Limited |
| NcA | Natchaug muck, 0 to 2 percent slopes | 171.4 | 0.50% | | Organic | Very Poorly Drained | Very Limited |
| NdA | Natchaug and Catden mucks, ponded, 0 to 2 percent slopes | 46.3 | 0.10% | | Organic | Very Poorly Drained | Very Limited |
| Pw | Pompton silt loam, loamy substratum | 48.3 | 0.10% | Prime | Outwash | Somewhat Poorly Drained | Very Limited |
| Ra | Raynham silt loam | 29.2 | 0.10% | Prime | Lacustrine | Poorly Drained | Somewhat Limited |
| RdA | Ridgebury complex, 0 to 3 percent slopes | 6.10 | 0.00% | Of Statewide Importance | Till | Poorly Drained | Very Limited |
| RdB | Ridgebury complex, 3 to 8 percent slopes | 61.80 | 0.20% | Of Statewide Importance | Till | Poorly Drained | Very Limited |
| RgB | Ridgebury complex, 0 to 8 percent slopes, very stony | 88.70 | 0.30% | | Till | Poorly Drained | Very Limited |
| Sh | Sun loam | 201.3 | 0.60% | Of Statewide Importance | Till | Very Poorly Drained | Very Limited |
| Sm | Sun loam, extremely stony | 121.40 | 0.40% | | Till | Very Poorly Drained | Very Limited |

14. Groundwater and Drinking Water Resources

Description:

According to the Hudson River Estuary Program, “at least one-quarter of New Yorkers depend on groundwater supplies for drinking water, and many Hudson Valley communities depend entirely on groundwater. Groundwater also supports habitats and species, and is particularly important during dry periods when it is often the dominant source of water flowing in streams and rivers. Groundwater is found between grains of sand, gravel, silt, or clay (unconsolidated sediments) or in the cracks and fractures of bedrock (consolidated sediments). The saturated geologic zones in sediments and bedrock that receive, store, and transmit significant amounts of water to wells and springs are called aquifers. The upper surface of the saturated zone is called the water table. Groundwater is recharged when rain and melting snow slowly infiltrate through the soil. The land surface principally contributing to aquifer recharge is called the aquifer recharge area. This is generally all watershed land areas aside from streams and their riparian margins, which are aquifer discharge areas.

An assumption is often made that groundwater is less vulnerable to spills and pathogens than surface water and less likely to be contaminated. In reality, aquifers can become polluted by a variety of mechanisms, including chemical spills, leaking buried sources such as landfills or underground storage tanks, road salt, common household use of herbicides and other chemicals, and improperly spaced or poorly installed septic systems. A wellhead protection area, usually a subset of the larger aquifer recharge area, is the area surrounding and upgradient of a public water supply well or well field of interest. Wellhead protection programs seek to limit contaminants in such areas to limit water quality risks to well water.

Regional aquifer depletion is rare in New York, but local groundwater overuse occurs when water withdrawal exceeds local recharge and can result in nearby wells running dry along with impacts to water bodies and habitats that depend on groundwater for base flow. Excessive extraction can harm fish and other aquatic organisms by changing the stream flows and water temperatures they rely on for survival and successful reproduction. Buildings, parking lots, and roads can interfere with groundwater recharge if adjacent areas do not allow compensatory recharge and may reduce recharge volumes considerably, exacerbating the effects of overconsumption.”¹⁷

¹⁷ Haeckel, Ingrid, and Laura Heady. Creating a Natural Resources Inventory: A Guide for Communities in the Hudson River Estuary Watershed. (Ithaca, NY: Department of Natural Resources, Cornell University, and New York State Department of Environmental Conservation, 2014): <https://www.dec.ny.gov/lands/100925.html>.

The layers on this map come from several sources. First, those listed under “Aquifer Type” come from the New York State Department of Environmental Conservation, Division of Water, Bureau of Water Resources Management. They are “those aquifers in upstate NY that consist of sand and gravel and yield large supplies of water to wells. Bedrock aquifers, although significant in some areas, are not addressed here. Source data is 1:250,000, same scale as the NYS Geological Survey surficial and bedrock geology maps on which they were based. Together these maps form a consistent set of geologic and groundwater maps for use in regional management of the groundwater resources of the State. These maps indicate only the general location of the unconsolidated aquifers; they are not intended for detailed site evaluations. Determination of the precise location of aquifer boundaries or of well yields may require additional data, according to the authors of the source maps.”¹⁸

The following four types of aquifers were mapped from this data source.

- “1. Kame, Kame Terrace, Kame Moraine, Outwash, Alluvium (collectively described as Unknown Aquifers). These include areas of sand, or sand and gravel for which little to no well data are on file to determine yield potential. These areas require further local study to determine flow rates.
- 2. Lacustrine or Eolian (also described as Unconfined, Low-Yield Aquifers): These include areas of fine sand and gravel as well as silt and clay that have either been deposited from lakes by streams or eroded by wind and deposited by streams. Due to their relative impermeability and thickness, they have flow rates of less than 10 gallons per minute.
- 3. Primary Aquifer Region: these regions include aquifers that are highly productive and are being used as sources of drinking water by major public supply systems. The aquifers in these areas were mapped at the 1:24,000 scale by the USGS and included in separate map reports. Further, these fine scale studies were represented as citation blocks on the 1:250,000 scale unconsolidated aquifer maps. These blocks are a part of this digitized layer. These regions replace the previous "Primary Aquifers" layer, as this digitization is of higher quality. The individual 1:24,000 report layers are in the process of being published as digital files by USGS.
- 4. Unconfined, Mid-Yield Aquifers: These have flow rates of 10 to 100 gallons per minute and consist of sand and gravel with saturated zones generally less than 10 ft thick. Thicker deposits with less permeable silty sand and gravel may also be included. Yields in areas adjacent to streams may exceed 100 gal/min through pumping-induced infiltration, but these areas are too small to show at 1:250,000 scale.”¹⁹

¹⁸ New York State Department of Environmental Conservation, Division of Water, Bureau of Water Resources Management, Unconsolidated Aquifers of Upstate New York at 1:250,000, Metadata: http://gis.ny.gov/gisdata/metadata/nysdec.uncon_aqui.html#6

¹⁹ Ibid.

Although not portrayed on this map, it is important to note that all other areas of the Town not highlighted on the map should be considered to be “Confined Aquifers,” which consist essentially of bedrock without an overlying surficial aquifer. These areas tend to have impermeable material above and below the aquifer and are under pressure so water will rise when punctured by a well, and may produce from 5 to more than 500 gallons per minute.²⁰ Many Philipstown residences and businesses depend on well water from these confined aquifers, due to their larger area and often higher flow rates. It is *crucial* to note that each of the above listed aquifers, which are collectively described as unconfined aquifers, are more sensitive to pollution since they don’t have an impermeable layer above them as a buffer (only sand, gravel, silt or clay). Confined aquifers, on the other hand, do have such a buffer in the form of bedrock.

The second data source for this map comes from several maps produced by The Chazen Companies for the Town of Philipstown as part of the Town’s Groundwater Resource Management Program. These maps are also shown in Sections 16 and 17 of this report, but we have included a simplified version of them here to highlight the (Clove Creek) Aquifer Protection Priority Parcels and the (Cold Spring) Reservoir Priority Parcels. Both of these sets of parcels are shown in order to portray the importance of conservation efforts in the areas surrounding the aquifers and public drinking water resources already described above and in previous sections. Each of these sets of priority parcels will be described in further detail in subsequent maps.

As a note, in the next section, we have included a copy of the Town’s map that portrays its Watershed Overlay District, Aquifer Overlay District and Regional Aquifer to clearly show the areas that have particular zoning requirements with regard to development that could impact the Town’s water resources. This will be described in more detail in the next section. Also, we will describe the numerous potential threats to the Town’s aquifers and drinking water sources later in this chapter.

Findings:

Unconfined Mid-Yield Aquifers, Surface Water Resources and Primary Aquifer Regions:

As the map clearly shows, the majority of the Town’s aquifers and drinking water resources are located in the northern half of the Town, and include the priority areas of the Clove Creek Aquifer (Unconfined, Mid-Yield) and the Cold Spring Reservoir (surface water). As shown in subsequent maps, both of these priority areas drain large portions of the Town and are vulnerable to numerous impacts from human development.

²⁰ United States Geological Survey. 2018. [usgs.gov/faqs/what-difference-between-a-confined-and-unconfined-water-table-aquifer?qt-news_science_products=0-qt-news_science_products](https://www.usgs.gov/faqs/what-difference-between-a-confined-and-unconfined-water-table-aquifer?qt-news_science_products=0-qt-news_science_products).

The Clove Creek Aquifer provides water to the numerous residences and businesses located along the northern Rt 9 corridor and is also an important part of the Clove Creek - Fishkill Creek watershed and the Fishkill and Sprout Creek Primary Aquifer Region, which is highlighted in pink, and, as noted above, provides drinking water to major public water supply systems to the north of Philipstown, including the Towns of Fishkill and Wappinger, the Village of Fishkill and the City of Beacon.

The Cold Spring Reservoir and Foundry Brook supply water for the Villages of Nelsonville and Cold Spring and thus are considered priority surface water resources. They also include parcels around Barrett Pond, Jaycox Pond and Lake Valhalla, although the latter is not a high priority parcel, which will be explained in the next few sections.

In addition to these priority areas, there are numerous additional aquifers. The Unconfined, Mid-Yield aquifer in the northeast of Philipstown primarily drains into Trout Creek, which flows into Wiccopee Creek and eventually the Fishkill Creek and Hudson River. As noted above in Section 11. Watersheds and like the Clove Creek Aquifer, this area drains into watersheds that are used for public water supply by the Town of Fishkill, and thus, activities upstream in Philipstown can impact water users downstream in more populated areas.

Another important Unconfined, Mid-Yield aquifer runs along Foundry Brook on the eastern edge of the Villages of Nelsonville and Cold Spring and extends into Garrison around Constitution Marsh. This aquifer, although not primarily used for drinking water, has essential ecosystem impacts due to its flow into Constitution Marsh, which is a sensitive and important habitat for countless forms of life, in addition to being a breeding ground for birds and fish as well as a stopover for migratory birds. Pollution that enters this aquifer upstream can have serious consequences for the health of the treasured resource and ecological community that is Constitution Marsh.

In the southeast corner of Town, several Unconfined, Mid-Yield aquifers supply water to nearby communities both in Philipstown and in neighboring Putnam Valley, Cortlandt and Peekskill. The smallest of these is located near Graymoor, just east of the intersection of Rt. 9 and Rt. 403. This aquifer then flows downhill into the Canopus Creek aquifer, which covers a large portion of Canopus Creek as it flows downstream to eventually merge with Annsville Creek and the Hudson River. Both of these aquifers supply water to the community of Continental Village, which has a public water supply system via the Town's Aqueduct Road, Arden Drive and Howland Drive Pump Houses. This aquifer also feeds Cortlandt Lake, which is used for recreational purposes. This will be discussed in greater detail in subsequent sections, but a major concern for this watershed is the concentrated presence of septic systems that unfortunately are overloading the aquifer and surface water resources around Continental Village with nutrients and are leading to impaired ecosystems and water quality.

Also, although it is beyond the border of Philipstown, it is important to note the presence of the Unconfined Mid-Yield aquifer along the Peekskill Hollow Creek in the most southeast section of the map. As noted above in the Subwatersheds section, this Creek provides water to the communities of Cortlandt and Peekskill and serves thousands of residents and business owners to the south of Philipstown. The southeast corner of Philipstown, east of the Canopus Creek Aquifer, drains into the Peekskill Hollow Aquifer, and thus any detrimental activities that occur in this small section of Philipstown impact our neighbors that depend on this aquifer.

Kame, Kame Terrace, Kame Moraine, Outwash, Alluvium (Unknown Yield Aquifers)

There are also a scattering of aquifers of unknown flow rates around Town, including the area around Trout Creek Pond (in the northeast part of Town), along Rt 9 in the center of Town, and in two smaller areas in Garrison along Snake Hill Road and Rt 9. Since these aquifers are relatively unknown, it would merit their further study to test their flow rates to better understand their contributions to local ecosystems and as water resources for human use.

Lacustrine & Eolian Aquifers

Although this aquifer is located outside of Philipstown on the northwest border of the Town, it is worth noting its presence. It is a slower flowing aquifer of silt, clay, sand and gravel composition, and, located on the western edge of the Hudson Highlands State Park, it likely serves as a source of groundwater for local habitat and for the relatively small number of rural residences scattered along the edge of the park.

Further Study:

Although most of its information could not be included in this report, the Town's 2007 Groundwater Report completed by The Chazen Companies offers much more in-depth information about the groundwater resources located within Philipstown. This document rich with information and additional maps can be found at: <https://www.philipstown.com/topgroundwater.pdf>. In addition, a future study that aims to determine the flow rates of the Unknown Yield Aquifers (Kame, Kame Terrace, etc.) within Philipstown would also be worthwhile to understand their contributions to the Town's groundwater resources. Also, since the Chazen study was completed 13 years ago, a follow-up study might be helpful to determine what impacts subsequent development and also climate change have had and might continue to have on the Town's groundwater.

Data Sources:

- Aquifer Types
 - Unconsolidated Aquifers at 1:250,000
<http://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1141>
- Aquifer Protection Priority Parcels and Reservoir Protection Priority Parcels
 - Parcel Prioritization - Clove Creek Aquifer Accumulation Area, The Chazen Companies, 2018 (see Section 19)
 - Parcel Prioritization - Reservoir Watersheds, The Chazen Companies, 2018 (see Section 20)

15. Cold Spring Watershed and Aquifer Overlay Districts

Description:

As a reference, we have included the Town's 2011 Resource Protection Overlay District Zoning Map that highlights the Cold Spring Reservoir Watershed Overlay District and the Aquifer Overlay District. We did not add these layers to the previous map to avoid cluttering the map with too many layers. Each of these overlay districts receive additional protection from potentially harmful activities, the details and penalties for which are described in the Town's Zoning Code sections § 175-14 Cold Spring Reservoir Watershed Overlay District (WSO) and § 175-16 Aquifer Overlay District (AQO). These sections of the Town's Zoning Code can be found at: <https://www.ecode360.com/6319088>.

Findings:

Regarding the WSO, "The Town of Philipstown finds that the drinking water quality of the Cold Spring Reservoirs represents an essential economic and environmental resource. The Comprehensive Plan establishes a sound justification and framework for protecting the quality of the reservoirs' water. It is the purpose of this section to establish regulations on land uses within the Cold Spring Reservoir Watershed to assure the protection of the quality of the water resource. The Town desires to achieve such protection by cooperating with the Villages of Cold Spring and Nelsonville."²¹

Regarding the AQO, "The purpose of the Aquifer Overlay (AQO) District is to protect the health and welfare of residents of the Town of Philipstown by minimizing the potential for contamination and depletion of the Town's aquifer system. The Town of Philipstown contains an

²¹ Town of Philipstown, § 175-14 Cold Spring Reservoir Watershed Overlay District (WSO), Article IV Overlay District Regulations, Zoning Code, <https://www.ecode360.com/6319088>

aquifer system that covers the entire Town and, for purposes of this section, has been divided into two areas: A) The Clove Creek Aquifer (CCA) Subdistrict, which is extensively developed and fully dependent on groundwater as a source of water supply; and B) The Regional Aquifer (RA) Subdistrict, which covers the remainder of the Town. Within the RA Subdistrict, most areas depend upon groundwater as the primary source of potable water supply. The combined aquifer system provides drinking water to private wells as well as groundwater and surface water that is essential to the maintenance of healthy aquatic and terrestrial ecosystems. The Town has determined that a limiting factor on the carrying capacity of the land is its capability to provide water in sufficient quality and quantity so that water use by some users does not adversely affect other users. Another limiting factor on the carrying capacity of the land is its ability to absorb wastewater without adversely affecting the quality or quantity of groundwater and surface water necessary for water supplies and other needs of the natural and human environment. The purposes of this § 175-16 are to protect public health and safety by safeguarding the Town's groundwater aquifer system, to provide the most protective standards to those areas of the aquifer at greatest risk of contamination, and to manage development so that groundwater supplies are not depleted or degraded.”²²

Data Sources:

- Cold Spring Reservoir Watershed Overlay District and Aquifer Overlay District
 - Putnam IT Department and The Chazen Companies (2011)
 - <https://philipstown.com/zmwsoapril.pdf>

16. Parcel Prioritization - Clove Creek Aquifer Accumulation Area & 17. Parcel Prioritization - Reservoir Watersheds

Description:

We have combined the narratives for these two maps into one section since they are from the same third-party source - The Chazen Companies - and were produced for the Hudson Highlands Land Trust and the Town of Philipstown. Created in 2018, these maps rank both undeveloped and relatively unoccupied parcels located around both the Clove Creek Aquifer and the Cold Spring Reservoir in order to guide the Town and private landowners in prioritizing land conservation of these parcels for water resource protection. The following is the description provided by The Chazen Companies that explains what is presented on their maps as well as how the parcel priority rankings were created:

²² Town of Philipstown, § 175-16 Aquifer Overlay District (AQO), Article IV Overlay District Regulations, Zoning Code, <https://www.ecode360.com/6319096>

“The Chazen Companies (Chazen) has completed hydrogeologic analyses to identify properties with potential source water conservation value associated with the reservoir and watershed system supporting the Cold Spring and Nelsonville Water Supply (Reservoir Source) and the Clove Creek Aquifer (CCA).

“The two evaluations were completed using similar methodologies, described as follows:

- “Watershed delineations were completed for the CCA and the Reservoir Source utilizing ArcGIS Spatial Analyst software and USGS 10-meter resolution digital elevation models (DEMs).
 - “Clove Creek Aquifer watershed map. This map shows: 1) the aerial extent of the CCA from the existing Philipstown zoning maps (yellow crosshatch), 2) areas where precipitation and groundwater recharge flow into or directly onto the CCA (dark blue hatch), and 3) upland streams and their watersheds which flow onto the CCA (light blue outline). These three zones, respectively, represent the direct aquifer footprint, areas where aquifer recharge directly enters or migrates directly into the CCA, and areas where streamflow passes over and may be drawn into the CCA. The upland watershed (light blue hatch) extends marginally beyond the sheet boundaries north into Dutchess County and south into the Town of Putnam Valley.
 - Reservoir Source map. This map shows: 1) the joint Cold Spring reservoirs on Foundry Pond Road and the Foundry Brook Reservoir with adjoining water plant 2) areas where precipitation and groundwater recharge flow into these reservoirs (dark blue hatch), and 3) streams and their watersheds which flow into the reservoirs (light blue hatch). Respectively, these identify the active municipal reservoirs, areas where groundwater and stormwater flow directly into reservoirs, and areas where streams and their watersheds deliver water to the reservoirs. For planning purposes, the figure also shows Jaycox Pond and related watershed collection areas as far downstream as its outlet confluence with Foundry Brook, in case this reservoir is ever incorporated into the municipal source water system.”
- “For parcels within or partially within these delineation areas, Chazen completed a source water analysis to rank the water conservation value for all vacant or nominally-developed parcels. The scoring was developed as follows:
 - **“Hydrologic Soil Groups:** The Natural Resource Conservation Service assigned all soils into four Hydrologic Soil Groups (**HSG**) based on the soil's runoff potential. HSG A soils are very granular and allow most rain

to recharge into the subsurface, while most HSG D soils include clay that prevents most recharge. For purposes of CCA recharge and sustained flows into Reservoirs, HSG A soils were assigned three points and HSG B soils were assigned two points. Areas with C or D soils provide nominal aquifer recharge and peak runoff to reservoirs which frequently overtop the dams so are considered of lower source water conservation value.

- **Slopes:** Steep slopes promote rapid runoff while lower slopes promote water retention in soils and vegetation allowing time for groundwater infiltration or for delayed arrival at reservoirs. Slopes under 10% were assigned three points. Slopes between 10 and 15 % received two points, and slopes between 15 and 20 percent received one point.
- **Land Cover:** Using 2011 National Land Cover Data (NLCD), non-developed land including forests, scrub/shrub, pasture/hay, and wetlands received three points. Developed open space, typically assigned for low-density rural development and cultivated crops were assigned two points, and low intensity development and barren land were assigned one point.
- **Land within the Clover Creek Aquifer:** for the CCA figure, land directly over the CCA was assigned three bonus points.”

“These scores were assigned on a pixel land area basis and then summed to create a total score per pixel of land area. The sum of the scored pixels values within individual parcels was calculated to determine a parcel’s total conservation score. The score was also divided by the acres within the respective analysis area (CCA or Reservoir Source), yielding the score-per-acre values. Only vacant parcels of two acres or greater, or developed parcels greater than 10 acres, were included in the analyses. Attached spreadsheets provide the scoring record for all parcels evaluated in the CCA and Reservoir Source analyses.

“We hope this analysis provides Hudson Highlands Land Trust and the Town of Philipstown a useful basis for considering source water conservation initiatives. Parcels scoring highly on either a ‘per acre’ or ‘total score’ basis can be interpreted to be of relatively higher conservation importance to the protection of water resources, whether for the current municipal reservoirs or the Clove Creek Aquifer.

“We would welcome the opportunity to continue working together on water supply, water resource, or related natural resource conservation and planning initiatives. In general, the most important measures streamside protection approaches may include risk management along Fishkill Road and broadly-applied stream and floodplain setback and disturbance avoidance programs. And for the source water parcels identified by this

evaluation, source water protection options range from full no-build acquisition/agreements, through less restrictive conservation agreements, to simple due-diligence reviews of site, wastewater, and stormwater designs.”²³

Findings:

Clove Creek Aquifer:

One can see the sheer size of the Clove Creek watershed, depicted on this map as “Stream Input” by the light blue borders and crosshatch areas on the map. Luckily a large portion of this land is already protected as part of the Clarence Fahnestock State Park, although there are also numerous privately-owner parcels that are not currently protected from development, many of which are considered “high priority” or “moderate priority.” On the other hand, the “Direct Flow” area depicted on the map by the dark blue borders and crosshatches is almost entirely covered by privately owned land, and contains all of the “highest priority” parcels, in addition to numerous “high priority” and “moderate priority” parcels. Furthermore, all of the “highest priority” parcels are located on top of the aquifer itself, showing how activities that take place on the land directly above an aquifer are of the utmost importance to the health of that aquifer.

Although too large to include in this report, the above-referenced “attached spreadsheets providing the score record for all parcels” from The Chazen Companies summary can be requested from the Hudson Highlands Land Trust or from The Chazen Companies directly and can be used to understand on a parcel-by-parcel basis what factors are contributing to their prioritization or lack thereof.

Also, although not the highest priority area, it is encouraging to note that since this map was created, the parcels of land uphill from Rt 9 around Lake Valhalla have been converted into protected land, preventing potential development upstream from this sensitive water supply. This is depicted in Section 39. Conservation Open Areas and Open Space Overlay.

Cold Spring Reservoir Watershed:

Although it covers a smaller area than the Clove Creek watershed, the Cold Spring Reservoir Watershed serves the public water supply districts of the Villages of Cold Spring and Nelsonville and thus is an essential resource for several of the Town’s population centers. As described above, the light blue areas signify water that enters the reservoir system via stream flow and the dark blue areas show where groundwater flows directly into the reservoir system. Interestingly, there are two direct flow areas that impact the reservoir system - the first around the higher

²³ Urban Mead, Russell, Professional Services Proposal - Groundwater Resource Management - Chazen Project Number 41824.00 Task 001, The Chazen Companies, October 1, 2018.

elevation Cold Spring Reservoir, and second around the lower-elevation Foundry Brook Reservoir, the latter of which being where the Municipal water districts treat and pipe the potable water to the villages below. Although it is currently not part of the reservoir system, Jaycox Pond and its surrounding area has been included in case some day the villages decide to incorporate it into their water districts.

Similar to above, although not the highest priority area, it is encouraging to note that since this map was created, the parcels of land uphill from the Cold Spring Reservoir that stretch over to Lake Valhalla have been converted into protected land, preventing potential development upstream from this sensitive water supply. This is depicted in Section 39. Conservation Open Areas and Open Space Overlay. As for priority parcels, the majority are located along the Foundry Brook as it flows from the Cold Spring Reservoir down to the Foundry Brook Reservoir, with particular emphasis on the parcels located along Lake Surprise Road, including several large parcels of “high priority” and a scattering of smaller “highest priority” parcels. It is also worth noting that although Jaycox Pond and its watershed are not currently used as reservoirs for the public water supply, they contain several “highest priority” parcels that should be protected in case this area needs to eventually be added as a reservoir.

Data Sources:

- Aquifer Protection Priority Parcels and Reservoir Protection Priority Parcels
 - Parcel Prioritization - Clove Creek Aquifer Accumulation Area, The Chazen Companies, 2018
 - Parcel Prioritization - Reservoir Watersheds, The Chazen Companies, 2018

18. Flood Zones

Description:

According to the Hudson River Estuary Program, “floodplains are low-lying areas adjacent to streams and other waterbodies that become inundated during heavy precipitation or snowmelt. By slowing and storing floodwaters, floodplains reduce downstream flood damage and serve as a safety zone between human settlement and the damaging impacts of floods. Naturally vegetated floodplains help prevent erosion, recharge groundwater, and can serve as travel corridors for wildlife. These highly productive ecosystems are home to a unique suite of plants and animals that tolerate occasional flooding and support the in-stream food web. When left in their natural state, they provide space for the fluctuations in flow that cause streams to expand, contract, and sometimes change course. Floodplains and other streamside areas are also where land-use change will most easily influence stream quality.

“Floodplains have traditionally been delineated by the Federal Emergency Management Agency (FEMA) and the US Department of Housing and Urban Development based on flood frequency according to the extent of land expected to have a 1% or greater chance of being inundated in any given year (often referred to as the ‘100-year flood’). It is important to note that floodplains and their statistical flooding intervals are estimations based on the best data and technology available at the time of mapping. Due to many variables, such as the often unpredictable nature of floods, local drainage problems, and the variable intensity of land development in watersheds, some flood-prone areas may not appear on designated floodplain maps, and floodplain designations may change over time as more information becomes available.

“As development occurs in a watershed, pavement and other impervious surfaces (e.g., roofs of buildings) increase runoff volume and velocity, leading to more frequent and damaging floods. Preserving floodplains and minimizing the extent of impervious surfaces are ever more important as uplands are developed and as the frequency and magnitude of flood events increases with climate change [see Chapter 5: Climate Change]. Floodplain maps provide a starting point for proactive conservation planning.”²⁴

Included on this map are the following layers:

- 100-year Floodplains (A - 1% Annual Chance of Flooding)
- 100-year Floodways (AE - 1% Annual Chance of Flooding)
- 500-Year Floodplains (X - 0.2% Annual Chance of Flooding)

Each of these layers are mapped by FEMA as part of their FEMA National Flood Hazard Layer - County Maps. As noted above, the 100-year floodplain is the extent of land expected to have a 1% or greater chance of being inundated in any given year. The 100-year floodway is defined as the stream channel and adjoining floodplain areas that are reasonably required to carry the 100-year flood without increasing the flood surface elevation by more than a foot. It is the area where flood hazard is generally highest in the floodplain, i.e., where water depths and velocities are the greatest. The 500-year floodplain refers to the area that has a 0.2% chance of being inundated in any given year.²⁵ Descriptions of these and other floodplain types can be found here: https://efotg.sc.egov.usda.gov/references/public/NM/FEMA_FLD_HAZ_guide.pdf.

²⁴ Haeckel, Ingrid, and Laura Heady. Creating a Natural Resources Inventory: A Guide for Communities in the Hudson River Estuary Watershed. (Ithaca, NY: Department of Natural Resources, Cornell University, and New York State Department of Environmental Conservation, 2014): <https://www.dec.ny.gov/lands/100925.html>.

²⁵ FEMA Map Center Service, FEMA Flood Zone Designations (100-year/500-year floodplain) https://efotg.sc.egov.usda.gov/references/public/NM/FEMA_FLD_HAZ_guide.pdf.

Findings:

Not surprisingly, the Town's Hudson River shoreline falls entirely within the 100-Year Floodway. We have seen this exhibited in recent years due to flooding caused by major storms such as Hurricanes Irene and Sandy. Similarly, essentially the entire lengths of Clove Creek and Canopus Creek fall within the 100-Year Floodways, as well as the majority of Foundry Brook. Each of these streams at one point or another pass through fairly concentrated developed areas, whether along Rt 9, in Nelsonville or in Continental Village. Buildings located in these floodways have the highest flood insurance rates through the National Flood Insurance Program.²⁶

The Town also has a handful of designated 100-Year Floodplains, which are distinguished from the 100-Year Floodways because detailed analyses have not been performed for such areas and no depths or base flood elevations are shown within these zones. These zones include:

- The section of Foundry Brook between the Cold Spring Reservoir and Fishkill Road,
- The small stream and wetland areas along Rt 301 as water flows west towards Foundry Brook,
- A significant portion of Clove Creek as it flows from the reservoir on Glynwood Farm down to and along Rt 301 until it reaches the 100-Year Floodway,
- Indian Brook as it flows from Loch Lyall down to the Hudson River, passing under Rt 9 and Rt 9-D on its way, and
- Philipse Brook as it flows from the area north of the Garrison Fish and Game Club, around Earl's Chimney, all the way to the Hudson River, similarly passing under Rt 9 and Rt 9-D on its way.

Both the Philipse Brook and Indian Brook floodplains experienced tremendous flooding and infrastructure damage during Hurricane Irene in August of 2011, including damage to bridges along Snake Hill Road and Avery Road, respectively. It is important to note that the health of riparian areas (stream- / river-side habitats) along streams within Philipstown can have an impact on mitigating or exacerbating flooding. Well-vegetated riparian areas will resist erosion from flooding events and can potentially slow some of the flow of water during such events. On the other hand, streams that have riparian areas with reduced natural vegetation can suffer from increased erosion, which can exacerbate flooding issues, such as the rate of water flow, sedimentation downstream and damage to streamside communities and infrastructure.

And the 500-Year Floodplain covers the rest of the Town and is considered as a minimal risk flood zone, due to the chance of a flood only happening once every 500 years. Unfortunately,

²⁶ Ibid.

however, all of the various flood zones will be exacerbated and expanded by climate change in the form of severe flooding events both in-land and also along the Hudson River shoreline. This will further jeopardize natural resources, homes, businesses and infrastructure located in or near these flood-prone areas and has already been exemplified by damage from the Hurricanes mentioned above. This will be explored in more detail in Chapter 5: Climate Change.

Further Study:

There are certainly additional streams and waterbodies through Philipstown that, although not considered as 100-year floodplains, carry the potential for flooding. Such may include Trout Creek, Bull Creek, Arden Brook, Annsville Creek and Copper Mine Brook. Currently, these streams fall within the 500-year flood zone areas of the Town, most likely because they pose less risk for flooding than the more flood-prone streams, but have not been confirmed as such and thus should be studied further, especially in light of the increased risk of flooding resulting from climate change.

As noted above, the health of riparian areas can have significant impacts on damages from flooding. As the Town looks at its various flood-prone areas and develops plans to mitigate damage from future floods, it will be essential to include a study on the health of riparian areas, especially focusing on the presence or absence of riparian vegetation and its ability to resist erosion from future flooding events. We recommend that the Town include such a study as part of its Vulnerability Assessment and Climate Adaptation Plan, which are discussed in more detail in Chapter 5. Climate Change.

Data Sources:

- Flood Zones
 - FEMA National Flood Hazard Layer
<https://msc.fema.gov/portal/availabilitySearch?addcommunity=361026&communityName=PHILIPSTOWN,TOWN%20OF#searchresultsanchor>

19. NYS DEC Stream Classifications & 20. Impaired Waterbody Ratings

Description:

According to the Hudson River Estuary Program, “in addition to documenting the location of water resources, an NRI should address water quality in the community. The federal government and New York State have developed water quality standards to monitor and protect waterbodies. The Clean Water Act imposes strict standards on water quality and pollutant levels and New

York State's Environmental Conservation Law outlines water quality and priority classifications and standards for waterbodies. DEC Water Quality Standards and Classifications designate the 'best uses' that waterbodies should support and are the basis for programs to protect New York State waters. Freshwater stream segments and open waterbodies are classified by the letters AA, A, B, C, or D, which is the lowest classification."²⁷ The best uses for each Class are as follows:

- Classifications AA and A are 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;
- Classification D is the lowest classification and reflects a best use for fishing."

According to the Putnam Valley NRI, "additional designations of 'T' or 'TS' can be added to Class A, B, or C streams if they have sufficient amounts of dissolved oxygen, cold water temperatures, high macroinvertebrate populations, low sedimentation and low pollution levels in order to support trout (T) and/or trout spawning (TS). Waterbodies that are designated as 'C (T)' or higher (e.g., 'C (TS),' 'B,' 'A,' or 'AA') are collectively referred to as protected streams, and are subject to additional regulations and require a State permit for disturbance of the bed or banks. Disturbance may be temporary or permanent in nature. Examples of activities requiring this permit include placement of structures in or across a stream, fill placement for bank stabilization or to isolate a work area, excavations for gravel removal or as part of a construction activity and lowering stream banks to establish a stream crossing. In addition to state regulations, waterbodies can receive more comprehensive protection at the municipal level.

"It is important to note that the DEC waterbody classification does not relate directly to water quality; rather, it reflects the quality expected of a waterbody. The DEC Waterbody Inventory/Priority Waterbodies List tracks the degree to which waterbodies are meeting their 'best uses' based on their DEC classification, provides a summary of general water quality conditions, and monitors progress toward the identification and resolution of water quality problems, pollutants, and sources.

"To assess actual water quality and track human-induced impacts, many parameters are measured and monitored. Monitoring programs sample the chemical condition of water, sediments, and fish tissue to determine levels of constituents such as dissolved oxygen, nutrients, metals, oils, and pesticides. They also monitor physical conditions such as temperature, flow, sediments, and the erosion potential of stream banks and lakeshores. Biological monitoring or biomonitoring uses the abundance and variety of aquatic plant and animal life to provide information on the quality of streams and waterbodies. The results of these programs can be used

²⁷ Haeckel, Ingrid, and Laura Heady. Creating a Natural Resources Inventory: A Guide for Communities in the Hudson River Estuary Watershed. (Ithaca, NY: Department of Natural Resources, Cornell University, and New York State Department of Environmental Conservation, 2014): <https://www.dec.ny.gov/lands/100925.html>.

to describe water quality in the study area, identify potential threats, and develop recommendations in the NRI. Careful quality monitoring can help specify targeted mitigation, for example, where nutrient management is needed, where shading and stormwater controls are needed for thermal management, or where streambed/bank restoration is needed to stabilize sources of sediment.”²⁸

The data for these two maps came from the DEC Water Quality Standards and Classifications and the DEC Waterbody Inventory/Priority Waterbody List, respectively. The first map indicates which streams are considered as state-protected waters and the second map identifies the waterbodies that are not meeting their “best uses” and the relative impacts or lack thereof on their water quality. We decided to combine these two maps into one narrative since their interpretation is closely related.

Findings:

Stream Classifications:

Philipstown is home to several Class-A-rated streams, including that which flows from Lake Valhalla down into Clove Creek, two streams that flow into the Beacon Reservoir near East Mountain Road North, the upper half of Foundry Brook including a few tributaries, and the stream flowing from Jaycox Pond to Foundry Brook. The remainder of the Town is made up of numerous streams of either Class B or Class C rating, most of which are considered as protected streams if they are at least Class C (T) or higher.

As for Trout (T) and/or Trout Spawning (TS) streams, there are many sections of streams that meet such requirements within Philipstown, such as Foundry Brook, Clove Creek, Bull Creek, Trout Creek, Indian Brook, Philipse Brook, Annsville Creek and Canopus Creek and thus are considered protected streams by the NYS DEC. These are also highlighted on the map for Section 12. Streams and Waterbodies. It is clear that a large number of Philipstown streams are important habitat for trout and trout spawning, and thus should be carefully protected from potential hazards. Note that NYSDEC’s water quality information does not reflect site-specific habitat quality. As noted above, trout are sensitive to warmer temperatures, requiring well-shaded, cool-to-cold flowing water with low sedimentation, diverse macroinvertebrate communities, and low pollution. While all streams benefit from adequate streamside vegetation, it is especially important for maintaining clean, cold-water habitats that support native species like brook trout.²⁹ Thus the protection of riparian habitat, especially that which provides shade

²⁸ Town of Putnam Valley Committee for the Conservation of the Environment, Town of Putnam Valley Natural Resource Inventory, 2018: <https://putnamvalleyresidents.com/NRI.html>

²⁹ Town of Putnam Valley Committee for the Conservation of the Environment, Town of Putnam Valley Natural Resource Inventory, 2018: <https://putnamvalleyresidents.com/NRI.html>

over stream, should be a priority for efforts to protect brook trout. This will be discussed in more detail in Section 28. Stream Habitats.

Impaired Waterbody Ratings:

In addition to streams, this map also shows the ratings for the Hudson River estuary and lakes within Philipstown. Each of the waterbodies portrayed on this map is accompanied by a waterbody fact sheet that is available via the DEC's [Hudson Valley Natural Resource Mapper](#). To access the fact sheet for each waterbody, select any of the Priority Waterbody Lists under "Stream and Watershed Layers," and then click on a waterbody to open up a small window with a link to the factsheet. We will provide a brief overview of findings from this data set here, but we encourage readers to visit the Hudson Valley Natural Resource Mapper to access more in depth information on each waterbody. Here are summaries of a few primary waterbodies within the Town that have a rating of Impaired or Minor Impacts (CAPITALS indicate primary concerns):³⁰

1. Hudson River: **Impaired**

- Public Bathing - Stressed, Suspected
- FISH CONSUMPTION - Impaired, Known
- Recreation - Stressed, Known
- Habitat/Hydrology - Stressed, Suspected
- Habitat/Hydrology - Stressed, Suspected
- Type of Pollutant(s)
 - Known: METALS (cadmium), PRIORITY ORGANICS (PCBs);
 - Suspected: Pathogens, Problem Species, Thermal Changes;
 - Possible: - - -
- Source(s) of Pollutant(s)
 - Known: TOX/CONTAM. SEDIMENT, Comb. Sewer Overflow, Urban/Storm Runoff;
 - Suspected: Habitat Modification, Power Generation;
 - Possible: - - -

2. Canopus Creek: **Minor Impacts**

- Aquatic Life - Stressed, Suspected
- Type of Pollutant(s)
 - Known: - - -
 - Suspected: NUTRIENTS
 - Possible: Priority Organics (PAHs), Acid/Base (pH), Unknown Toxicity

³⁰ NYSDEC, Streams and Watershed Layers - Priority Waterbody Lists, Hudson Valley Natural Resource Mapper, <https://gisservices.dec.ny.gov/gis/hvnrm/>

- Source(s) of Pollutant(s)
 - Known: - - -
 - Suspected: AGRICULTURE, Urban/Storm Runoff
 - Possible: Atmosph. Deposition

3. Lake Celeste, **Needs Verification**

- Recreation - Stressed, Possible
- Type of Pollutant(s)
 - Known: NUTRIENTS (phosphorus)
 - Suspected: ALGAL/WEED GROWTH
 - Possible: - - -
- Source(s) of Pollutant(s)
 - Known: - - -
 - Suspected: AGRICULTURE, URBAN/STORM RUNOFF
 - Possible: - - -

4. Arden Brook, **Minor Impacts**

- Aquatic Life - Stressed, Suspected
- Type of Pollutant(s)
 - Known: - - -
 - Suspected: NUTRIENTS
 - Possible: - - -
- Source(s) of Pollutant(s)
 - Known: - - -
 - Suspected: AGRICULTURE, Urban/Storm Runoff
 - Possible: - - -

5. Philipse Brook, **Minor Impacts**

- Aquatic Life - Stressed, Suspected
- Type of Pollutant(s)
 - Known: - - -
 - Suspected: NUTRIENTS
 - Possible: - - -
- Source(s) of Pollutant(s)
 - Known: - - -
 - Suspected: AGRICULTURE, Urban/Storm Runoff
 - Possible: - - -

6. Breakneck Brook, **Minor Impacts**

- Aquatic Life - Stressed, Suspected

- Type of Pollutant(s)
 - Known: - - -
 - Suspected: NUTRIENTS
 - Possible: - - -
- Source(s) of Pollutant(s)
 - Known: - - -
 - Suspected: AGRICULTURE, Urban/Storm Runoff
 - Possible: - - -

The remaining streams and waterbodies on the map have either been Unassessed (e.g. Trout Creek, Indian Brook, Annsville Creek and all of the Town's lakes and ponds) or have been assessed and determined to have No Known Impact (Foundry Brook, Clove Creek, Bull Creek and Sand Spring Brook). Even the streams that have No Known Impact, however, are at risk for contamination and impairment due to current and potential activities that could occur in the watersheds, especially if further development takes place.

Further Study:

This dataset strongly suggests the need to assess streams and waterbodies within the Town that have yet to be assessed and also to confirm that the ratings given by the DEC match up-to-date water quality sampling. One obvious concern is that Cortlandt Lake has yet to be assessed , although it is fairly common knowledge within Philipstown that the lake is suffering issues with runoff and algae that are impairing its use as a recreational water source and also as wildlife habitat. Similarly, Indian Brook is one of the major streams in Philipstown, and it has yet to be assessed to determine its overall health.

With this in mind, the number-two voted issue from the recently held Philipstown Community Congress is “Clean Water,” and there is a local effort supported by the Town and the Hudson Highlands Land Trust in addition to community-member volunteers to conduct further studies and improve protections to ensure the health of Philipstown's water systems.³¹

Also, the Hudson River Estuary Program recommends using the NYS DEC's “Water Assessments by Volunteer Evaluators” (WAVE) program to organize local water quality monitoring efforts in unassessed areas. More information about the program can be found here:

<https://www.dec.ny.gov/chemical/92229.html>

³¹ Philipstown Community Congress, 2017 Voting Results,
<http://ecologicalcitizens.org/philipstowncommunitycongress>

Data Sources:

- NYS DEC Stream Classifications
 - NYS DEC Water Quality Classifications
<http://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1118>
- Impaired Waterbody Ratings
 - NYS DEC Water Inventory / Priority Waterbodies List
<http://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1117>

21. Threats to Water Quality

Description:

According to the Hudson River Estuary Program, “stormwater and wastewater problems can impact a community’s water resources. By including the locations of stormwater and wastewater infrastructure in the NRI, planners in Philipstown have access to additional information on potential threats to water quality. New York State uses the State Pollutant Discharge Elimination System (SPDES) to control wastewater and stormwater discharges to groundwater and surface water in accordance with the Clean Water Act. The SPDES program requires that a permit be obtained prior to initiation of construction or discharge of wastewater to surface or ground waters. The program also regulates construction or operation of sewage treatment plants and other disposal systems.”³² These SPDES point source locations within Philipstown were mapped to identify potential pollution locations.

A Municipal Separate Storm Sewer System (MS4) is a stormwater collection and conveyance system owned by a state, city, Town, village, or other public entity that is not part of a sewage treatment plant or combined sewer system. As a permit condition, designated MS4 municipalities are required to map their stormwater outfalls where polluted runoff can enter waterbodies, which are highlighted on the map as “Culverts in MS4.” Philipstown’s MS4 district in its southeast corner around Continental Village is shown on the map, as well. This MS4 system is only for stormwater runoff and does not involve household or commercial wastewater, which is dealt with in septic tanks. That said, they can still serve as major concentration points where road salt, silt from dirt roads and other chemicals can enter streams and other waterbodies. This will be explored in more detail in the *Findings* section below.

³² Haeckel, Ingrid, and Laura Heady. Creating a Natural Resources Inventory: A Guide for Communities in the Hudson River Estuary Watershed. (Ithaca, NY: Department of Natural Resources, Cornell University, and New York State Department of Environmental Conservation, 2014): <https://www.dec.ny.gov/lands/100925.html>.

In addition, NYS Department of Transportation (DOT) Large Culverts along or near State Highways and NYSDOT facilities were mapped. NYS Department of Transportation record plans were used to determine outfall locations when they occurred in closed systems or were inaccessible, but essentially show where large culverts pass under state roads. Due to their location along major roads, these culverts can be concentration points for road salt and other chemicals to enter into streams and other waterbodies and thus are important points to monitor for pollution. Improperly installed culverts can also prevent aquatic life from traveling up or downstream and thus can essentially create separate segments of streams, which can be detrimental to aquatic life, especially fish or amphibians that depend on accessing larger lengths of a stream.

NYS DEC Bulk Storage Locations were mapped, including Petroleum Bulk Storage, Chemical Bulk Storage (which can include Chlorine for water treatment, for example) and Major Oil Storage Facilities. These point sources came from the NYS DEC's "Bulk Storage Sites in NYS" Dataset, and were gathered to provide a digital representation of the locations of major oil, chemical and petroleum bulk storage facilities in New York State by the NYSDEC Division of Environmental Remediation. The extent of a storage area cannot be determined from this dataset. The points in this file represent only the existence of an active facility at these locations. It's also worth noting that although not included on the map, the Philipstown Highway Department and Cold Spring Highway Department Salt Sheds are discussed in the findings section below.

In addition, most roads within the Town were included both as reference points but also as potential sources of contamination for local habitats, especially streams, wetlands and other waterbodies, due to the use of road salt, silt runoff from dirt roads and runoff of other chemicals released by motor vehicles that travel on these roads.

Lastly, certain potential sources of contamination were not mapped, such as PCB's and other pollutants in the Hudson River, potential contamination from the now-remediated Marathon Battery Plant in Cold Spring (on the northern edge of Constitution Marsh), potential septic tank leakage from residential and commercial properties and potential fertilizer and herbicide/pesticide runoff also from residential, commercial and agricultural properties. Although, not mapped, each of these potential sources will be discussed in more detail below.

Findings:

As mentioned above, there are numerous potential sources of contamination that can negatively impact water quality within Philipstown. We'll explore those highlighted on the map first and then will cover those additional threats mentioned in other sections of this chapter as well as above.

NYSDOT Large Culverts:

There are numerous large culverts that pass under state roads within Philipstown, including those on Route 9, Route 9-D, Route 403 and Route 301. Due to their location along major roads, these culverts can be concentration points for road salt and other chemicals to enter into streams and other waterbodies and thus are important points to monitor for pollution. Potential leakage from upstream failing septic systems can also introduce harmful pathogens, which can concentrate around these large culverts. Also, many of these culverts are installed in ways that essentially divide sections of streams and make it difficult if not impossible for aquatic life to travel through a culvert. This is extremely damaging to aquatic life, especially larger animals like fish that depend on access to a large length of stream habitat to survive.

Although not yet fully complete, the NYSDEC's Hudson River Estuary Program is currently conducting an "Aquatic Connectivity" study of culverts within Philipstown through the North Atlantic Aquatic Connectivity Collaborative. Although this assessment is currently in progress, the results so far are covered in more detail in this report in Section 28. Stream Habitats & Section 29. Road-Stream Crossings in Philipstown and Putnam Valley. The assessment offers further point-source locations of culverts and outfalls, as well as photographs of such sites and any sampling done at each site. It also rates culverts and bridges based on how their construction allows or prevents the movement of aquatic life as well as water, and prioritizes each piece of infrastructure for replacement and upgrade based on these ratings. For more information, please see the following as well as the sections mentioned above:

https://www.dec.ny.gov/docs/remediation_hudson_pdf/culvertfactsheet19.pdf

State Pollutant Discharge Elimination System Point Source Locations:

The two SPDES sites on the map are 1) the Cold Spring Wastewater Treatment Plant located on Fair Street along the edge of the Hudson River in the Village of Cold Spring and 2) the Lake Surprise Camp Wastewater Treatment Plant located downstream of Lake Surprise on Breakneck Brook.

The Cold Spring Wastewater Treatment Plant treats wastewater from residential and commercial sanitary use within the Village of Cold Spring. It also has capacity to handle the wastewater of the neighboring Village of Nelsonville, whose residences and businesses currently rely on septic systems. The Cold Spring plant can handle a flow of 0.5 Million Gallons per Day (MGD) and releases its water following treatment into the Hudson River, which is classified as a Class B waterbody.³³ Occasionally during extremely heavy rainstorms, the system can be overwhelmed

³³ NYS DEC, Environmental Notice Bulletin SPDES Renewals, Consolidated Public Notice for SPDES Permit Renewal, https://www.dec.ny.gov/enb/20190213_spdes.html

with too much flow from the village's stormwater system, in which case some water that enters the Hudson River from the plant can be slightly contaminated, although this rarely happens. The plant is required to submit data sampling reports to the NYS DEC to ensure that water discharge effluent levels are below the required limits.

The wastewater treatment plant at Lake Surprise Camp is a private facility that receives flow from domestic users. Wastewater consists of domestic sanitary wastewater. The treatment plant provides tertiary treatment for a design flow of 0.05 MGD. Treatment consists of preliminary, primary, secondary, tertiary and disinfection. Treated sanitary sewage is discharged via Outfall 001 to Breakneck Valley Brook, a Class B waterbody. A State Environmental Quality Review determined that the plant will not have a significant impact on the environment. That said, contamination is possible, and thus the plant is required to provide monthly sampling data on water discharge.³⁴

NYSDEC Bulk Storage Locations:

The location of Petroleum Bulk Storage (PBS), Chemical Bulk Storage (CBS) facilities and Major Oil Storage Facilities are shown on the map. The NYSDEC defines petroleum bulk storage as one or more tank systems designed to store 1,100 combined gallons or more of petroleum in aboveground and/or underground storage tanks, or one or more underground tank systems designed to store 110 or more gallons of petroleum.³⁵ The map shows 39 PBS facilities in Philipstown, including facilities such as heating-fuel businesses, gasoline stations, schools and highway departments. Such facilities pose the potential of leaks that could contaminate local habitat as well as surface and potentially groundwater. Thus any property that meets the above criteria is considered a "facility" and all tank systems storing petroleum must be registered with DEC and managed in compliance with applicable regulations for the storage of petroleum. In addition, all aboveground and underground tank systems designed to store used oil, regardless of size, must be registered with DEC and managed with the applicable regulations for storage and handling of petroleum.

Looking at the map, one can see that many PBS facilities are located along or near primary waterbodies, such as the northern section of Route 9 along the Clove Creek (which flows into a significant drinking water supply for towns and villages north of Philipstown), numerous facilities along Foundry Brook in Nelsonville and within the Village of Cold Spring, which pose impacts to both the Foundry Brook and the Hudson River, including the fragile and ecologically essential habitat of Constitution Marsh, a clustering of facilities in Garrison that could impact both the Philipse Brook and Arden Brook, and a cluster of facilities along the southern section of Route 9 that can impact the Annsville Creek and the Continental Village MS4 stormwater

³⁴ NYS DEC, ENB Region 3 Completed Applications 07/08/2020, Putnam County, https://www.dec.ny.gov/enb/20200708_reg3.html

³⁵ NYSDEC 2018. Bulk Storage of Chemicals, Petroleum and Liquefied Natural Gas. [dec.ny.gov/chemical/287.html](https://www.dec.ny.gov/chemical/287.html)

discharge system. From the map it is evident that the proper management of oil storage facilities via the NYSDEC's Petroleum Bulk Storage Program is crucial. For reference, Table 7. Petroleum Bulk Storage Facilities at the end of this section lists the PBS sites found within Philipstown.

Within Philipstown there is only one Chemical Bulk Storage (CBS) site located at the Cold Spring Drinking Water Treatment Plant on Fishkill Road. This facility treats drinking water for the villages of Cold Spring and Nelsonville and is supplied by the Cold Spring Reservoir upstream. The facility uses Sodium Hypochlorite to disinfect the water of harmful microbes, and thus stores the chemical in large enough amounts to be classified as a Chemical Bulk Storage facility. The NYSDEC defines chemical bulk storage as 185 or more gallons of hazardous materials aboveground, and any amount below ground.³⁶ Although the chemicals on site are used to treat drinking water, if there were a spill, the chemicals would flow into the Foundry Brook, which could have harmful effects on downstream ecosystems, including the Constitution Marsh at the mouth of the brook. Thus, compliance with the CBS Program and required monitoring and reporting is essential to ensuring the continued safe use of these chemicals.

Also, although not considered as Chemical Bulk Storage sites, it is worth noting that the Philipstown Highway Department Salt Shed is located adjacent to the PBS site at 50 Fishkill Road (see Table 8), which is uphill from the Foundry Brook along Fishkill Road, and if improperly managed could be a major source of contamination for that watershed. The Salt Shed, however, is covered from the elements, and currently is not considered a concern to the Foundry Brook. The Cold Spring Highway Department Salt Shed is located uphill from the Hudson River adjacent to the PBS site at 49 Fair Street (also in Table 7) and poses similar potential risks, although it is also covered and is not currently considered to be a concern to downhill habitat. The potential impacts of road salt will be discussed later in this section.

Although within Philipstown there are no Major Oil Storage Facilities, which store a total of 400,000 gallons or more of petroleum in aboveground and underground storage tanks, it is worth noting that across the river at West Point Military Academy, there is such a facility. Of course, Philipstown has no jurisdiction over such a facility, but it is important to note its presence and the possibility of a major oil spill if the facility were severely compromised. The presence of this facility should inform preparation planning in case of such a spill and include communities both on this side and on the other side of the Hudson River in order to coordinate what a potential response would look like and what each community's responsibilities would be. Such a hazard mitigation plan could also potentially include the freight trains that transport petroleum along the west side of the Hudson River, in case of an accident and subsequent spill.

³⁶ NYSDEC 2018. Bulk Storage of Chemicals, Petroleum and Liquefied Natural Gas. dec.ny.gov/chemical/287.html

Philipstown MS4 + Culverts in MS4:

As noted above, MS4 stands for Municipal Separate Storm Sewer System, and Philipstown's MS4 is located in the southeast corner of Town around Continental Village. The purpose of this system is to control the flow of stormwater so as to avoid damaging property and infrastructure within the MS4 boundary. Stormwater outfalls within this system flow into Annsville Creek, Canopus Creek and Peekskill Hollow Creek, each of which eventually flows into the Hudson River. Although this system does not involve wastewater from households and businesses, which is instead handled via septic systems, there is still the potential for concentrated runoff and concentration of pesticides, fertilizers and other potentially hazardous chemicals used by private landowners within the MS4.

As you can see on the map, there are a lot of stormwater outfalls (where stormwater enters a stream or other waterbody) within the MS4, and are especially concentrated in the urbanized area of Continental Village. As a NYSDEC permit condition, designated MS4 municipalities, such as Philipstown, are required to map their stormwater outfalls where polluted runoff can enter waterbodies, which are highlighted on the map as "Culverts in MS4." These are also available in more detail on the Town's website at:

<https://philipstown.com/ms4%20maps.pdf>

In addition to these maps, the Town is required to submit an annual report documenting the proper management of its MS4 district, including information on Public Education, Public Involvement, Illicit Discharge, Construction Site Run Off, Post Construction and Pollution Prevention efforts. Each Annual Report can be found at the above website address. The majority of the effort so far has focused on educating property owners and construction contractors on best practices management of the MS4 stormwater system as it relates to failing septic systems, silt runoff, use of fertilizers and herbicides/pesticides and the illegal disposal of hazardous materials, such as paints, motor oils, and pharmaceuticals, among others. The Town has a variety of informational pamphlets available at the above website and has also organized public presentations in Continental Village and at Town Conservation Board meetings, in addition to posting signs within the MS4 discouraging the illegal dumping of pollutants, especially around storm drains. The Town has also improved mapping of stormwater drains and outfalls as well as cleaning practices and frequency of the MS4 components. A detailed account of the Town's future plans for improving the MS4 is available at the above website under the title "Annual Report 2019," and includes additional GIS mapping of the MS4 outfalls and catchment basins, improving communication between development contractors and government officials, improving accountability of post-construction stormwater management practices, and conducting

comprehensive water quality testing within the MS4 with the assistance of the Hudson Highlands Land Trust and the Chazen Companies.

Paved and Dirt Roads - Road Salt:

Many Paved and Dirt Roads were included on the map both as reference points and as potential sources of water contamination. Specifically the State, County and Town roads located within Philipstown are unfortunately significant sources of water quality pollution. Road salt applied in winter flows into adjacent streams, water bodies and aquifers, posing detrimental effects to local ecosystems. Specifically, increased salinity can be harmful to drinking water resources, especially wells located near heavily-salted roads. High salinity can also have serious impacts on aquatic life, such as cold water fish and amphibians, among others. High salt levels can also lower oxygen levels in certain waterbodies, such as lakes and ponds, by altering the gas exchange cycle of the base of such a waterbody. Furthermore, road salt run-off can increase chloride levels in local water systems. Chloride is toxic to aquatic life and even small amounts can be harmful, inhibiting growth and reproduction as well as harming food supplies. Road salt also progressively damages vehicles and infrastructure, such as bridges and culverts, accelerating the replacement cycle for each. Worst of all, road salt can linger in local ecosystems for decades and continue to have compounding effects as more road salt enters the ecosystem each winter. In short, something that many automobile drivers take for granted in order to keep roads drivable during the winter can have increasing consequences to the quality of our local water systems and our aquatic habitats and lifeforms.³⁷

In terms of specific locations, the State Route 9 corridor and State Route 301 corridor along Clove Creek receive substantial road salt applications during the winter, the run-off from which flows directly into the Clove Creek aquifer and subsequent public water supply for towns north of Philipstown. This also can affect water quality for property owners who depend on wells adjacent to both roadways. Similarly, Foundry Brook along Fishkill Road (a County Road) is exposed to road salt due to its close proximity to the road, which is a heavily trafficked commuter route for drivers heading from Route 9 to Route 9-D and the Palisades Parkway south to the New York City Metropolitan area. In addition, Arden Brook flows along a significant section of State Route 403 and is exposed to road salt runoff from this heavily trafficked commuter route which connects vehicles heading from Route 9-D to Route 9 heading south to Westchester County and the NY Metro area. Also, Annsville Creek along the southern section of State Route 9, is exposed to road salt due to its proximity to the road for a substantial portion of its length in Philipstown and thereafter in the Town of Cortlandt as it flows down into the Hudson River.

³⁷ Hinsdale, Jeremy, How Road Salt Harms the Environment, State of the Planet, Columbia University Earth Institute, December 11, 2018, <https://blogs.ei.columbia.edu/2018/12/11/road-salt-harms-environment/>

Furthermore, the significant use of road salt in the densely populated areas of Nelsonville and Cold Spring, the North Highlands population centers around Barrett Pond Road, Hustis Road and Perks Boulevard, and Continental Village lead to large amounts of road salt runoff entering the Foundry Brook, Clove Creek and Canopus Creek, respectively. Finally, the less-heavily trafficked Town roads, both paved and unpaved, receive road salt during the winter and similarly contribute to increasing salinity and chloride levels of nearby habitat and the Town's watersheds in general. Notable mentions are Old Albany Post Road, East Mountain Roads South and North, and Sprout Brook Road, due to their substantial length, use as residential roads, and especially due to the need to sufficiently salt the roads to provide safe access to school buses that transport students from these areas. While road salt increases the safety of winter use of the numerous roads throughout the Town, it also, unfortunately, increases the adverse effects on water quality and aquatic habitat, the consequences of which are still taking shape on the scale of decades.

Dirt Roads - Silt Runoff:

Certainly a controversial concern within Philipstown, the benefits of dirt roads are important to keep in mind, especially in terms of preserving rural historic character; however, it is also necessary to consider the unfortunately detrimental effects that dirt roads can have on local water systems, especially local aquatic life. According to an EPA report,³⁸ dirt roads can have serious impacts on aquatic life in waterbodies, especially streams, that are nearby. Specifically, animals like trout and stream insects, many of which require rocks or gravel or other clean surfaces to live on, can be harmed by dirt road runoff. When the fine sediments – silt, clay, and other fine particles – are washed off of dirt roads, they can smother the habitats for these animals. Sedimentation from unpaved roads can also raise streambeds, increasing the chances of flooding.

Additional Water Quality Threats:

Lastly, as mentioned above, although certain potential sources of contamination were not mapped - such as the presence of Polychlorinated biphenyls (PCBs) and other pollutants in the Hudson River, potential contamination from the now-remediated Marathon Battery Plant in Cold Spring (on the northern edge of Constitution Marsh), potential run-off from the capped and closed former Philipstown Landfill off of Lane Gate Road, potential septic tank leakage from residential and commercial properties and potential fertilizer and herbicide/pesticide runoff also from residential, commercial and agricultural properties - it is important to note the potential effects of these sites and activities. Each is covered in more detail below.

³⁸ EPA, Polluted Runoff: Nonpoint Source (NPS) Pollution, "Environmentally Sensitive Maintenance for Dirt and Gravel Roads," <https://www.epa.gov/nps/environmentally-sensitive-maintenance-dirt-and-gravel-roads>.

Hudson River PCBs:

As many locals know, the Hudson River has been polluted over the centuries in many ways, but the most egregious pollutant has been Polychlorinated biphenyls or PCBs. According to the US Environmental Protection Agency, PCBs “were widely used as a fire preventive and insulator in the manufacture of electrical devices, like transformers and capacitors, because of their ability to withstand exceptionally high temperatures. During a 30-year period ending in 1977, when the EPA banned the production of PCBs, it is estimated that approximately 1.3 million pounds of PCBs were discharged into the Hudson River from two General Electric (GE) capacitor manufacturing plants located in the towns of Fort Edward and Hudson Falls, New York. Once PCBs entered the river, they were deposited and mixed with the sediments at many locations on the river bottom and at some locations along the shoreline in the floodplain.

According to the EPA, “PCBs build up in the environment (bioaccumulate), increasing in concentration as they move up the food chain. The primary health risk associated with the site is the accumulation of PCBs in the human body through eating contaminated fish. Since 1976, high levels of PCBs in fish have led New York State to close various recreational and commercial fisheries and to issue advisories restricting the consumption of fish caught in the Hudson River. PCBs are considered probable human carcinogens and are linked to other adverse health effects such as low birth weight, thyroid disease, and learning, memory, and immune system disorders. PCBs in the river sediment also affect fish and wildlife. In 1984, 200 miles of river, between Hudson Falls and the Battery in New York City, was placed on EPA’s National Priorities List of the country’s most contaminated hazardous waste sites.

“Today the Hudson River exists as one of the most extensively studied rivers in the country, having been monitored almost continuously for a period of more than 25 years. Ongoing evaluations of water quality, sediment, air quality, fish, and wildlife by the Federal Government and the State of New York demonstrated that the river was not cleaning itself and PCBs in the sediment posed a serious risk to human health and the environment. Studies conducted to evaluate the extent of the problem revealed that most of the contaminated sediments were in “hot spots” situated in a 40-mile stretch of the river between the town of Fort Edward and the Troy Dam.”³⁹

According to the EPA, dredging efforts paid for by General Electric and overseen by the EPA have removed approximately 2.75 *million* cubic yards of PCB-contaminated sediment from the river bottom between 2009 and 2015. This removal took place in a 40-mile section of the Upper Hudson River from Fort Edward to Troy, NY. In addition, due to the presence of PCBs downriver in the lower Hudson River (from Troy to Manhattan), the EPA and numerous local

³⁹ EPA, Hudson River PCBs Superfund Site, Hudson River Cleanup, <https://www.epa.gov/hudsonriverpcbs/hudson-river-cleanup#quest1>

agencies have begun sampling and monitoring PCB levels in the water column, sediment, fish and habitat. Unfortunately, the section of the Hudson River adjacent to Philipstown is still considered an impaired waterbody due to PCB, Cadmium (covered below) and sewage pollution levels, as described above in Section 20. Impaired Waterbody Ratings. For more information on PCBs please visit: <https://www.epa.gov/hudsonriverpcbs/hudson-river-cleanup#quest1>.

Marathon Battery Plant:

The following is a summary from the EPA:

“A nickel-cadmium battery factory located in Cold Spring, NY operated from the 1950s to the 1970s and discharged contaminated wastewater into the Hudson River and adjacent cove and marsh and spewed contaminated dust onto neighboring residential yards. A small VOC-contaminated groundwater plume also exists on the former factory grounds. The remedies chosen in the three Records of Decision (1986, 1988, and 1989) included the dredging and excavation of contaminated sediments from the Hudson River, East Foundry Marsh and Cove, excavation of contaminated soils from the former factory grounds and adjacent yards, demolition of the former battery factory, restoration of the marsh and natural attenuation of the plume. The remedial construction occurred from 1993-1995 and the site was delisted in 1996. The marsh, cove and groundwater continue to be monitored. The former battery factory property is now owned by a developer and is awaiting redevelopment. The marsh and the adjacent (never contaminated) 87 acres are now owned by Scenic Hudson, a non-for-profit environmental preservation organization and have been reestablished into a public park, The West Point Foundry Preserve, a National Historic Site.”⁴⁰

Although this site has been declassified as a Superfund site, it is worth including here to note the severity of the contamination in terms of ecological and human health consequences and the extent and cost of work that had to be done to clean up the site. Furthermore, there is still evidence of trichloroethylene (TCE) contamination of the site’s groundwater and efforts continue to remove and monitor the presence of this contaminant. The damage created at this battery plant serves as a warning regarding the construction and operation of industrial facilities adjacent to residential areas and sensitive and precious natural communities, such as Constitution Marsh.

Herbicides/Pesticides, Fertilizer, Failing Septic Systems and other Hazardous Runoff:

Finally, it seems worthwhile to highlight that, although not depicted on the map, runoff from residential and commercial (including agricultural) properties of herbicides/pesticides, fertilizer,

⁴⁰ EPA, Superfund Success Stories: EPA Region 2, Marathon Battery Company Superfund Site, <https://www.epa.gov/superfund/superfund-success-stories-epa-region-2#marathon>

failing septic systems and other hazardous materials (e.g. pharmaceuticals, paints, and motor oils and fluids), although at an individual level may not seem so harmful, can be damaging to water quality and aquatic life in cumulative effect. As noted above in the MS4 section, public education, public participation and enforcement practices are essential to empowering property owners to use best practices when dealing with the above potential contaminants. Although outlined in more detail on the Town of Philipstown's Stormwater Management Program webpage, available at:

<https://philipstown.com/government/building-department/stormwater-management-program>, we have included the following summary of best practices for each issue, provided by the Putnam County Soil and Water Conservation District:

1. "Minimize the damage from herbicides and pesticides by applying organic alternatives, planting naturally pest-resistant vegetation and/or landscape in ways that do not require as much intervention. For example, rather than maintaining a pristine homogenous lawn that may require constant herbicide application, property owners can pursue alternative landscaping techniques such as wildflowers, bushes, mulch, rock gardens and so forth. Or having an imperfect lawn with occasional weeds can be a simpler compromise if a lawn already exists. Also, increased presence of trees and bushes can reduce the amount of surface stormwater that flows downstream into catchment basins and water bodies, reducing the chance of contaminants concentrating downstream. Avoiding cutting down trees and clearing bushes and adding trees and shrubs to a landscape can have positive effects on stormwater management
2. In terms of agriculture, herbicides, pesticides and fertilizer may be unavoidable, but using best organic practices as well as strategically using natural forms of fertilizer such as manure and compost and carefully containing stores of such fertilizer can prevent runoff from these potential pollutants from accumulating in waterbodies downstream from their place of application. Also, striving wherever possible to use organic farming and gardening practices can similarly reduce the quantity of harmful pollutants that enter the town's watersheds.
3. Putnam County Soil and Water Conservation District recommends having a septic system inspected at least every two years to avoid a failing system leaking harmful microbes and human waste into local ecosystems. Similarly, septic tanks must be pumped every 3 - 5 years to avoid tank failures. Planting trees or parking vehicles over a septic field can damage the system and lead to leaks. And lastly, disposing of any materials or substances (especially chemicals) other than human waste and toilet paper can harm essential bacteria that process the septic waste, and can lead to system blockages and failure.
4. Simply put, all hazardous materials must be disposed of properly, rather than poured down a sink or storm drain, flushed down the toilet, and thrown carelessly in the garbage can. Most hazardous substances such as paints, motor oils, batteries, and countless other chemicals should be safely stored and then disposed of at the annual Putnam County

Hazardous Waste Day or at a local waste collection facility that accepts such waste. The latter facilities accept almost all hazardous waste and are relatively inexpensive compared to the harmful and often expensive consequences to water quality and wildlife that improper disposal can have.”⁴¹

Further Study:

As mentioned above, the NYSDEC’s Hudson River Estuary Program is currently conducting a broad culvert assessment within Philipstown, the most recent results of which are covered in more detail in Section 28. Stream Habitats & 29. Road-Stream Crossings in Philipstown and Putnam Valley. The assessment information complements and expands upon the data presented in this map and can serve as an additional resource for improving road and stormwater management practices around culverts within the Town, especially in terms of prioritizing and better connecting segments of streams that have been divided by improperly designed culverts. Please see the above-mentioned sections for current results, and again, a summary of the program can be found here:

https://www.dec.ny.gov/docs/remediation_hudson_pdf/culvertfactsheet19.pdf

Also, periodically, wastewater monitoring data from SPDES permit sites can be requested from the NYSDEC or the treatment facility and evaluated to identify areas that are stressed or threatened due to increased effluent levels or cumulative land-use impacts. So far, the Town’s two SPDES sites are in compliance and are not deemed to be having a detrimental effect on local water quality.

The Town of Philipstown is also collaborating with the Hudson Highlands Land Trust, the Chazen Companies and the Philipstown Community Congress “Water Quality” committee to complete an updated Ground Water Study similar to that produced by the Chazen Companies for the Town back in 2007. So far, the study has covered Clove Creek and Foundry Brook and is covered in detail in Section 28. Stream Habitats. In addition, the Town’s 2007 Groundwater Report and Planning Resource (<https://www.philipstown.com/topgroundwater.pdf>) offers a much more in-depth analysis of the Town’s water resources and potential threats to water quality than is covered in this Natural Resource Inventory.

Lastly, further study could include a small project to map and research the impacts of additional smaller potential sources of pollution such as any junkyards located within the Town, sand and gravel quarries or storage areas, bulk landscaping/agricultural material storage sites and any additional locations that might store materials potentially hazardous to water quality.

⁴¹ Putnam County Soil and Water Conservation District, Preventing Stormwater Pollution: Tips for Homeowners, Pamphlet, https://philipstown.com/SW_preventing%20pollution.pdf

Data Sources:

- NYSDOT Large Culverts
 - NYSDOT Stormwater Outfalls
<http://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1160>
- SPDES Point Source Locations
 - State Pollutant Discharge Elimination System
<http://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1010>
- NYS DEC Bulk Storage Locations
 - Bulk Storage Sites in NYS
<http://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1253>
- Philipstown MS4 Boundary + Culverts in MS4
 - Philipstown Stormwater Management MS4 Boundary and Outfalls - Created by Hudson Highlands land Trust (GIS shapefiles obtained from the Town of Philipstown by Town Natural Resources Office). Source maps are found here:
<https://philipstown.com/ms4%20maps.pdf>

Table 7: Petroleum Bulk Storage Facilities⁴²

| Site Number | Facility Name | Site Address |
|-------------|--|-----------------------------|
| 3-011657 | GARRISON UNION FREE SCHOOL | 1100 ROUTE 9D |
| 3-012645 | TOWN OF PHILIPSTOWN HIGHWAY DEPARTMENT | RFD 35A FISHKILL RD |
| 3-033219 | ST BASIL ACADEMY | 79 ST. BASIL ROAD |
| 3-035920 | D. GIUSTI | 18 STONE RIDGE ROAD |
| 3-038687 | D & B SERVICE STATION INC. | 316 MAIN STREET |
| 3-068098 | FRANCISCAN SISTERS OF THE ATONEMENT | ST FRANCIS CONVENT GRAYMOOR |
| 3-068241 | FRANCISCAN SISTERS OF THE ATONEMENT | MOTHER LURANA HOUSE |
| 3-122904 | GLENCLYFFE | ROUTE 9D BOX 192 |
| 3-138819 | POLHEMUS CONSTRUCTION CO;INC. | 12 MANITOU STATION ROAD |
| 3-174947 | FRIARS OF ATONEMENT | ROUTE 9 D GRAYMOOR |
| 3-179345 | AT&T PUTNAM VALLEY NEW YORK FACILITY | RD #1 BOX 367 |
| 3-180254 | E & E ALLEN | 349 MAIN STREET |

⁴² NYSDEC 2018. Bulk Storage Database Search. dec.ny.gov/cfm/externalapps/derexternal/index.cfm?pageid=4

| | | |
|----------|--|------------------------|
| 3-408956 | HAROLD LYONS & SONS INC | 3175 ROUTE 9 |
| 3-409367 | NYS DOT | 1659 ROUTE 301 |
| 3-411736 | FRIARS OF THE ATONEMENT | US ROUTE 9 - GRAYMOOR |
| 3-413070 | APPALACHIAN EQUITIES LLC | 1467 ROUTE 9 |
| 3-486116 | LINE DRIVE PROPERTIES; LLC | 3021 ROUTE 9 |
| 3-600477 | GARRISON YACHT CLUB | GARRISON LANDING |
| 3-600562 | VAMCO REALTY OF PEEKSKILL INC. | 3090 ROUTE 9 |
| 3-600626 | STEPHEN GARY WEST | ROUTE 9 |
| 3-600775 | GLYNWOOD CENTER | ROUTE 301 |
| 3-600782 | RT 9 AUTO SERVICE INC. | 3467 ROUTE 9 |
| 3-600909 | TOWN OF PHILIPSTOWN HIGHWAY | 50 FISHKILL ROAD |
| 3-601260 | VILLAGE OF COLD SPRING | 49 FAIR STREET |
| 3-601291 | GARRISON MART | 1135 ROUTE 9D |
| 3-601353 | HRF DOCKSIDE | 10 WEST STREET |
| 3-601429 | BADEY & WATSON; P.C. | 3063 ROUTE 9 |
| 3-601483 | PIDALA OIL CO.; INC. | 3524 ROUTE 9 |
| 3-601498 | INN CREDIBLE CATERERS - BREAKNECK LODGE | 3250 ROUTE 9D |
| 3-601529 | GARRISON GARAGE | 1627 ROUTE 9 |
| 3-601552 | DOWNEY PROPERTY | MARKET STREET |
| 3-601664 | R&N REALTY CORP. | 3315 ROUTE 9 |
| 3-601733 | THE GARRISON INSTITUTE | 14 MARY'S WAY ROUTE 9D |
| 3-601942 | NORTH HIGHLANDS FIRE STATION | 504 FISHKILL ROAD |
| 3-601984 | RDR EQUITIES LLC | 1510 ROUTE 9 |
| 3-602031 | GARRISON GOLF CLUB | 2015 ROUTE 9 |
| 3-602098 | CLAUDIO MARZOLLO COMMUNITY CENTER | 107 GLENCLYFFE DRIVE |
| 3-602101 | RIVERVIEW INDUSTRIES INC. | 3012 ROUTE 9 |
| 3-602108 | RIVERVIEW INDUSTRIES; INC. | 3006 ROUTE 9 |
| 3-602221 | IMP. DEVELOPMENT CORP. | 37 FAIR STREET |
| 3-602389 | MAVIS DISCOUNT TIRE | 3212 ROUTE 9 |
| 3-602400 | OLSPAN; LLC | 2700 ROUTE 9 |
| 3-602414 | FORMER JULIA BUTTERFIELD HOSPITAL | 65 PAULDING AVENUE |
| 3-991148 | FLINN RESIDENCE | 88 CANOPUS HILL ROAD |

Chapter 4. Habitats and Wildlife

22. NYS Parks Biodiversity Indicator

Description:

According to Philipstown’s 2007 Natural Resource and Open Space Protection Plan, *biodiversity* is defined as the “variety of plants, animals and habitats that make up an ecosystem, and the interconnectedness of the system. Simply put, one species depends on many other species and habitats to live in balance - and to be sustained - including humans. The interdependence of species and ecosystems is not always obvious, and impairing one system or species can have serious, unintended consequences for biodiversity, and health of our community.”¹

According to the NYS Office of Parks, Recreation and Historic Preservation, “Intact, connected habitats are critical for the long-term survival of native biodiversity (plants, animals, and their habitats). To aid in biodiversity conservation, New York State Parks created a Biodiversity Indicator Tool (BIT). This GIS-based tool indicates areas throughout the state with potentially high biodiversity, including common and rare species and their habitats.

“This conservation planning tool can help inform decisions related to land conservation, land-use planning, and biodiversity protection, and can be useful for state agencies, land trusts, municipalities, and others. The tool can help to identify opportunities for open space protection statewide and for maintaining habitat connectivity between protected lands and natural areas across the landscape. While there are many criteria used for open space acquisition and other land protection measures, the Biodiversity Indicator Tool can be utilized to incorporate biodiversity into the decision making process. The BIT was developed using a scientifically-based methodology, and provides a credible basis for site comparisons when planning for open space conservation.

“The Biodiversity Indicator Tool was constructed by adding a suite of individual data layers, and then rescoring the combined result to a convenient scale of 0 – 100. These input layers included the richness of rare or threatened animals and plants; the presence of significant natural communities; the richness of common vertebrate species; the presence and size of contiguous blocks of core forest; the presence of other natural lands, such as grasslands; the presence of wetlands; proximity to streams and water bodies; and proximity to areas of high environmental stress caused by anthropogenic features and activities. Higher scores indicate that more biodiversity features from the input data layers were present; lower scores indicate fewer

¹ Chmar, Andy, *et al.*, Philipstown Natural Resources and Open Space Protection Plan, Comprehensive Plan Implementation Subcommittee on Natural Resources, Town of Philipstown, 2007, <https://www.philipstown.com/Final%20Draft%20Open%20Space%20Plan%20Oct%202007.pdf>

co-occurring features. The Biodiversity Indicator gives a general indication of areas that may have high value for biodiversity. As such, it is limited by the accuracy and choice of data layers used to construct it. The Biodiversity Indicator is a predictive model and is not a substitute for field work or detailed ecological knowledge of existing conditions on the ground.”²

It is essential to note that although this BIT resource was originally developed to measure biodiversity in state parks and their adjacent lands, it has been expanded upon and is now considered a statewide tool for indicating biodiversity levels on all types of lands throughout New York State. That said, since some of the input data on flora and fauna are much more developed for State Park lands (due to the ease of access to such lands compared to private property), there is a bias in the tool towards higher ratings for park lands. Nonetheless, “the Biodiversity Indicator Tool can support decision making in four key arenas at different geographic scales: 1) The tool provides information about potentially high biodiversity locations within State Parks and Sites; 2) BIT also provides priority ranking of areas for biodiversity protection on lands adjacent to OPRHP lands; 3) The tool can help identify opportunities for maintaining or increasing connectivity between State Park lands and natural areas within the landscape; and 4) Finally, the tool can be used to identify opportunities for open space protection statewide.”³

For more on the BIT tool, visit:

<https://parks.ny.gov/documents/environment/BITToolSummary.pdf>

Also, although we did not include it on the map because it covers the entire town, Philipstown is part of the “Hudson Highlands East” and “Mid Hudson River” Significant Biodiversity Areas as determined by the NYSDEC and its program partners: “The New York State Department of Environmental Conservation (NYSDEC) Hudson River Estuary Program worked with the New York Cooperative Fish and Wildlife Research Unit at Cornell University and the NY Natural Heritage Program to develop Significant Biodiversity Areas (SBAs) for the Hudson River estuary region of New York State. SBAs are landscape areas with a high concentration of biological diversity or value for regional biodiversity. As a set, the 22 areas count for much of the range in biodiversity found in the region, but should not be interpreted as the only important areas within the region. The SBAs were first described and published in Penhollow et al. (2006) (<http://www.dec.ny.gov/lands/5096.html>).”

“SBAs are defined by unique topography, geology, hydrology, and biology that distinguish them from neighboring areas. Biologists analyzed existing data provided by the US Fish and Wildlife Service (USFWS 1997), New York Natural Heritage Program (Finton et al. 1999, Finton et al.

² NYS Office of Parks, Recreation and Historic Preservation, “Biodiversity Indicator Tool,” <https://parks.ny.gov/environment/biodiversity-tool.aspx>

³ NYS Office of Parks, Recreation and Historic Preservation, “Biodiversity Indicator Tool (BIT) Product Summary, September 6th, 2016, <https://parks.ny.gov/documents/environment/BITToolSummary.pdf>

2000, Howard et al. 2002), the National Audubon Society (Wells 1998), and the New York Cooperative Fish and Wildlife Research Unit (Smith et al. 2001) to determine the general locations of significant ecological features. The areas were then further inventoried and the boundaries refined following two years of field survey by the NY Natural Heritage Program (Howard et al. 2002).

“Significant Biodiversity Areas carry no regulatory designation. Instead, it is hoped that recognition of these areas will serve as a basis for their voluntary conservation through conservation partnerships involving multiple stakeholders. Landscape conservation initiatives focusing on the Shawangunk Ridge, Hudson Highlands, and Albany Pine Bush involve partners such as non-profit organizations, landowners, businesses, and government agencies and serve as regional models for conservation of SBAs. The identification of SBAs supports research, monitoring, and conservation efforts focused on conserving the patterns and processes that maintain biodiversity at the local to northeast regional scales.”⁴ More information on our local SBAs can be found at: https://www.dec.ny.gov/docs/remediation_hudson_pdf/hrebcf2sba.pdf

Findings:

As the map shows, Philipstown has large expanses of extremely high biodiversity landscapes. Areas of note include the various sections of Hudson Highlands State Park, Constitution Marsh, Clarence Fahnestock State Park, and sections along the eastern border of the town, many of which are already protected as conservation easements or public lands. It is no coincidence that the areas that have the highest biodiversity also tend to be the largest contiguous protected areas. Diverse ecosystems need large areas to satisfy the needs of their innumerable life forms, and thus large forest blocks such as those found in the State parks and additional connected protected areas offer the best environment for species to flourish. On the other hand, one can see that despite many areas on the map being forested (see Section 38. Land Cover and Forest Types), those that are not part of large forest blocks tend to have much lower biodiversity. Forests divided by roads and other forms of development tend to be somewhat isolated and are hindered in their ability to provide sufficient resources for a complex and highly diverse ecosystem. This map clearly shows the importance of forest connectivity and large forest blocks. Furthermore, the map also shows how incredibly diverse Constitution Marsh is, despite it being a small area surrounded by low-biodiversity areas, such as the Village of Cold Spring. This highlights even further the importance of protecting these estuary wetlands. Also, most of the streams throughout the town show up on the map as red areas, which also emphasizes how important it is to protect our waterways, not only for the sake of the life forms that live in and along them, but also for those forms of life that travel from one biodiverse area to another via our stream corridors.

⁴ NYSDEC *et al.*, Hudson River Significant Biodiversity Areas, Metadata, 2006, http://gis.ny.gov/gisdata/metadata/nysdec.hr_sba.xml

The areas that show up looking grey on the map are sections that did not receive a biodiversity score and are thus “Not Rated.” Unfortunately we were unable to find an explanation for why some small areas were not rated. However, it is fairly safe to assume that their score is similar to the areas surrounding them. Further study could confirm their quality of habitat compared to similar areas and thus deduce a comparative biodiversity score.

We have also included the following figure to emphasize just how rare and precious the biodiversity found in our town is. As you can see in Figure 1, there are some but not many areas within New York State that show up as concentrations of red. One of the areas that do show up mostly red is the Hudson Highlands in the southeast part of New York State, from Rockland County into Putnam and Dutchess Counties. The red section to the east of the Hudson River comprises Hudson Highlands State Park and Clarence Fahnestock State Park in addition to the other areas mentioned above. This figure shows that we live in one of the most concentrated biodiverse areas not only in the Hudson Valley but in the entire state of New York. Thus, we have a great responsibility to protect it, and especially to ensure that the various high biodiversity areas within our Town are connected so that wildlife can move from one area to another as easily as possible.

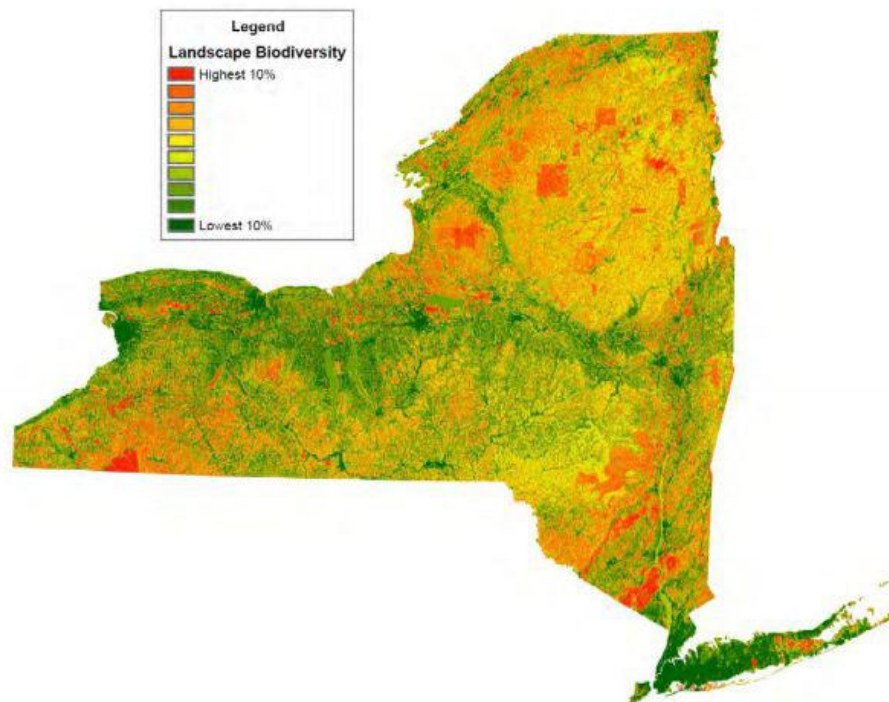


Figure 1: Statewide distribution of scores for the Biodiversity Indicator Tool.

Source: <https://parks.ny.gov/documents/environment/BITToolSummary.pdf>

In terms of the two Significant Biodiversity Areas that occur in Philipstown, a much more detailed description of each may be found at the following website, although we will also provide brief summaries below:

https://www.dec.ny.gov/docs/remediation_hudson_pdf/hrebcf2sba.pdf

Hudson Highlands East:

“This significant area represents one of the largest unfragmented landscape blocks in New York State that creates an important landscape corridor that links the mid-Atlantic states (New Jersey and Pennsylvania) with New England. Along with the continuous and relatively unfragmented forests, the area contains higher elevation ridges and several networks of relatively undisturbed wetlands in the valleys. The ecological significance of this area relates to its large, contiguous forest and wetland habitats and the disturbance sensitive species dependent on these habitats, as well as the diversity of plants, communities, and animals unique to this region.”⁵

Mid Hudson River:

“The Hudson River is one of the most extensive freshwater tidal river systems in the northeastern United States. The tidal communities found here are regionally and globally rare. Wetland habitats are the cornerstone of the Hudson River Estuary ecosystem because they play a critical role as nursery grounds for fish and shellfish species, nesting sites and migration stops for birds, and sources of nutrients to the food chain. The marshes and tidal flats of the Hudson River Estuary contribute essential nutrients to aquatic and terrestrial food webs that extend throughout the river system and far into the Atlantic Ocean.

“The productive and regionally significant Mid-Hudson River estuary is generally fresh water in winter and has low salinity in summer. This section encompasses regionally significant spawning migratory and nursery habitat for anadromous, estuarine, and freshwater fish, important winter feeding and roosting areas for the federally listed threatened bald eagle, and globally and regionally rare brackish and freshwater tidal communities and plants. The open water and tidal wetlands in this reach are spawning and nursery habitats and a migratory pathway between the upper and lower estuary for anadromous and resident fish.”⁶

Further Study:

As noted above, further study could confirm the biodiversity scores of areas on the map that show up grey or brown by comparing their habitats to similar areas and deducing a similar score for the unassessed areas.

⁵ NYSDEC, Hudson River Estuary Wildlife and Habitat Conservation Framework (p. 59-106) Part II - Significant Biodiversity Area Descriptions, 2006, https://www.dec.ny.gov/docs/remediation_hudson_pdf/hrebcf2sba.pdf

⁶ Ibid.

Also, once the town's ArcGIS Online mapping tool is live, the town and community will be able to overlap layers onto this Biodiversity Indicator layer to specifically prioritize parcels for protection, reforestation, and so forth, in addition to comparing how the town's zoning areas and land uses align or conflict with the biodiversity ratings of areas throughout the town.

Data Sources:

- Biodiversity Indicator
 - New York State Office of Parks, Recreation and Historic Preservation Biodiversity Indicator Tool
<https://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1338>.

23. Significant Natural Communities

Description:

According to the NYSDEC's Hudson River Natural Resource Mapper, "A natural community is an assemblage of interacting plant and animal populations that share a common environment; particular assemblages occur across the landscape in areas with similar environmental conditions. Natural communities include wetlands, forests, grasslands, streams, and other types of habitats, ecosystems, and natural areas. They are considered significant from a statewide perspective because they are rare or high quality based on size, habitat condition, and quality of the surrounding landscape. Significant natural communities may provide habitat for rare plants and animals, support intact ecological processes, and contribute other ecosystem benefits. Conservation and management guidance for significant natural communities is available through the New York Natural Heritage Program (NYNHP) online conservation guides."⁷

The features on this map "represent occurrences of rare or high-quality natural communities (ecological communities), as recorded by the New York Natural Heritage Program. An occurrence is one natural community type at one location. Examples of community types include deep emergent marsh, red maple-hardwood swamp, dwarf shrub bog, hemlock-northern hardwood forest, and tidal creek."⁸ Although this is a highly useful resource to guide conservation efforts, it should be noted that land with conservation easements aren't necessarily regularly included in NYNHP studies.

⁷ New York Natural Heritage Program, Significant Natural Communities, Hudson Valley Natural Resource Mapper, 2018, <https://giservices.dec.ny.gov/gis/hvnrm/layerInfo.html#snc>

⁸ GIS.NY.GOV, Natural Heritage Community Occurrences - NYNHP, Description, <http://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1241>

Findings:

There are thirteen different Significant Natural Communities located within or along the borders of Philipstown, as the map shows. Some, such as Chestnut Oak Forest, Appalachian Oak-Hickory Forest and Oak-Tulip Tree Forest, cover large or fairly large areas of Philipstown. Others, such as Rocky Summit Grassland, Red Cedar High Summit and Acidic Talus Slope Woodland (to name a few), have limited or very small areas in or around Philipstown. Each Significant Community is summarized below in Table 8. NYS Natural Heritage Communities - Community Types, which includes community descriptions, identification characteristics, state and global vulnerability rankings, and a link to more information on each community.

We have included the following detailed description of how the New York Natural Heritage Program determines the state and global rankings for each natural community (this is the same ranking system used for rare plants and animals covered in subsequent sections):

“Each natural community is assigned a rank based on its rarity and vulnerability. Like all state heritage programs, the NY Natural Heritage ranking system assesses rarity at two geographic scales. Each community is assigned a global rank and a state rank. The global rank reflects the rarity of the community throughout its range, whereas the state rank indicates its rarity within New York State. Both of these ranks are usually based on the range of the community, the number of occurrences, the viability of the occurrences, and the vulnerability of the community around the globe or across the state. As new data become available, the ranks may be revised to reflect the most current information.”⁹

“Explanation of ranks and codes used in Natural Heritage database reports: Each element has a global and state rank as determined by NY Natural Heritage. These ranks carry no legal weight but are believed to accurately reflect the relative rarity given of the element. The global rank reflects the rarity of the element throughout the world and the state rank reflects the rarity within New York State. The global rank for communities is an estimate of the rarity of the state type throughout its range:

“STATE RANK

- S1 = Critically Imperiled. Typically 5 or fewer occurrences, very few remaining individuals (for species), acres, or miles of stream, or some factor of its biology and/or ecology making it especially vulnerable in New York State.

⁹ Edinger, G. J., *et al.*, 2014. Ecological Communities of New York State, Second Edition, New York Natural Heritage Program, NYSDEC, p. xi, http://www.dec.ny.gov/docs/wildlife_pdf/ecocomm2014.pdf

- S2 = Imperiled. Typically 6 to 20 occurrences, few remaining individuals (for species), acres, or miles of stream, or factors demonstrably making it very vulnerable in New York State.
- S3 = Vulnerable. Typically 21 to 100 occurrences, limited acreage, or miles of stream in New York State.
- S4 = Apparently secure in New York State.
- S5 = Demonstrably secure in New York State.
- SH = Historically known from New York State, but not seen in the past 20 years.
- SX = Apparently extirpated from New York State.
- SE = Non-native species, not native to New York State.
- SR = State report only, no verified specimens (for species) known from New York State.
- SU = Status unknown.

“GLOBAL RANK

- G1 = Critically imperiled globally because of extreme rarity (5 or fewer occurrences), or very few remaining acres, or miles of stream) or especially vulnerable to extinction because of some factor of its biology and/or ecology.
- G2 = Imperiled globally because of rarity (6 - 20 occurrences, or few remaining acres, or miles of stream) or very vulnerable to extinction throughout its range because of other factors.
- G3 = Either rare and local throughout its range (21 to 100 occurrences), or found locally (even abundantly at some of its locations) in a restricted range (e.g., a physiographic region), or vulnerable to extinction throughout its range because of other factors.
- G4 = Apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery.
- G5 = Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.
- GH = Historically known, with the expectation that it might be rediscovered.
- GX = Species believed to be extinct.
- GU = Status unknown.”¹⁰

As Table 8 shows, some natural communities within Philipstown are considered apparently or demonstrably secure at the state or global level, emphasizing the effectiveness of conservation efforts so far to protect such communities and also the resilience that such communities may have in the face of the pressures from human development. On the other hand, there are also numerous communities within Philipstown which are considered vulnerable, imperiled or even

¹⁰ Edinger, G. J., *et al.*, 2014. Ecological Communities of New York State, Second Edition, New York Natural Heritage Program, NYSDEC, p. 145, http://www.dec.ny.gov/docs/wildlife_pdf/ecocomm2014.pdf

critically imperiled, and thus deserve immediate attention to prioritize efforts to protect them through town policy and the efforts of local organizations, volunteers and property owners. Luckily many of these areas are currently protected as public lands or through private conservation easements, but there may be areas that could be better protected. This will be easier to determine once the town's ArcGIS Online Mapper is live and allows the overlapping of this map layer with various other layers, such as the town's Zoning Districts, Land Cover and Forest Types, and Conservation Open Areas. In the meantime, although listed in Table 8 in more detail, and for immediate reference, Philipstown's most jeopardized natural communities (based on the most conservative state ranking) are:

Critically Imperiled (S1):

- Brackish Intertidal Mudflats

Imperiled (S2):

- Oak-Tulip Tree Forest

Vulnerable (S3):

- Acidic Talus Slope Woodland
- Hemlock-Northern Hardwood Forest
- Pitch Pine-Oak-Heath Rocky Summit
- Red Cedar Rocky Summit
- Rocky Summit Grassland
- Highbush Blueberry Bog Thicket
- Brackish Tidal Marsh

Although the descriptions of "Threats" to these natural communities are unfortunately too long to include here, they can be read at the linked website listed in Table 8 for each community. These links lead to pages within the New York Natural Heritage Program's "Online Conservation Guides" under the "Community Guides" section, for general reference.¹¹

Further Study:

According to the Hudson River Estuary Program NRI Guidebook "it is important to note that since many areas have never been surveyed for rare species, the NYNHP database is incomplete. Lack of records shouldn't be interpreted as evidence that rare species or significant natural communities are absent."¹² As the map shows, there are significant areas within Philipstown that

¹¹ New York Natural Heritage Program, Ecological Community Guides, NYSDEC, 2020, <https://guides.nynhp.org/communities/>

¹² Haeckel, Ingrid, and Laura Heady. Creating a Natural Resources Inventory: A Guide for Communities in the Hudson River Estuary Watershed. (Ithaca, NY: Department of Natural Resources, Cornell University, and New York State Department of Environmental Conservation, 2014): <https://www.dec.ny.gov/lands/100925.html>.

may not have been included in the NYNHP Significant Natural Communities study due to their lack of public park protections. Thus, a local study to compare identified significant natural communities to other areas in the town could yield additional areas worthy of special attention and protections.

Also, the Hudson River Estuary Program recommends carrying out an updated “biodiversity assessment... to document examples of rare or significant natural communities in the study area and also provide opportunities to document rare plants and animals in the field.”¹³ Such a study could complement the data presented in other sections of this chapter and could include local photographs of documented species within the studied natural communities.

Data Sources:

- NYS Natural Heritage Communities
 - Natural Heritage Community Occurrences - NYNHP
<http://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1241>

Table 8. NYS Natural Heritage Communities - Community Types¹⁴

| Common Name | Description | Characteristics Most Useful for Identification | State / Global Rank | Link to More Information |
|--------------------------------|--|---|---|---|
| Acidic Talus Slope Woodland | An open to closed canopy woodland that occurs on talus slopes composed of non-calcareous bedrock such as granite, quartzite, or schist. | The combination of vegetation indicating acidic soils and open areas showing a broken-up rocky slope (talus) generally identifies this community. Acidic tolerant trees include chestnut oak, red oak, white oak, white pine, red pine, paper birch, black birch, and mountain paper birch. Rock polypody is a fern often found on the rocks. | S3 - Vulnerable / G4? - Apparently Secure (uncertain) | https://guides.nynhp.org/acidic-talus-slope-woodland/ |
| Appalachian Oak-Hickory Forest | A hardwood forest that occurs on well-drained sites, usually on ridge tops, upper slopes, or south- and west-facing slopes. The soils are usually loams or sandy loams. This is a broadly defined forest community with several variants. The dominant trees include one or more species of oak. | This forest invariably has a mixture of tree oaks (red, white, black) and hickories (pignut, shagbark, sweet pignut). Also, maple-leaf viburnum is commonly found in the understory. | S4 - Apparently Secure / G4G5 - Apparently or Demonstrably Secure | https://guides.nynhp.org/appalachian-oak-hickory-forest/ |
| Chestnut Oak Forest | A hardwood forest that occurs on well-drained and often rocky sites in glaciated portions of the Appalachians and on the coastal plain. The combined cover of chestnut, red, | Dominant trees are typically chestnut oak (<i>Quercus montana</i>) and red oak (<i>Q. rubra</i>). Common associates are white oak (<i>Q. alba</i>), black oak (<i>Q. velutina</i>), and red maple (<i>Acer rubrum</i>). American chestnut | S4 - Apparently Secure / G5 - Secure | https://guides.nynhp.org/chestnut-oak-forest/ |

¹³ *Ibid.*

¹⁴ New York Natural Heritage Program, Ecological Community Guides, NYSDEC, 2020, <https://guides.nynhp.org/communities/>

| | | | | |
|----------------------------------|---|---|---|--|
| | <p>white, and black oak should generally exceed 25%. Typically, there is more chestnut oak than hickories. The understory may vary, with high abundance of mountain laurel, huckleberry, or Pennsylvania sedge. At least three edaphic variants with different understory dominants are known: 1) a tall shrub-dominated understory with 60-90% mountain laurel, 2) a short shrub-dominated understory with dense dwarf heaths, such as black huckleberry, and 3) a herb-dominated understory with Pennsylvania sedge.</p> | <p>(<i>Castanea dentata</i>) was a common associate in these forests prior to the chestnut blight; chestnut sprouts are still found in some stands. The shrub layer is predominantly ericaceous; characteristic shrubs are black huckleberry (<i>Gaylussacia baccata</i>), mountain laurel (<i>Kalmia latifolia</i>), and blueberry (<i>Vaccinium pallidum</i>). Common ground layer plants are Pennsylvania sedge (<i>Carex pensylvanica</i>), wild sarsaparilla (<i>Aralia nudicaulis</i>), wintergreen (<i>Gaultheria procumbens</i>), and cushions of the moss <i>Leucobryum glaucum</i>.</p> | | |
| Hemlock-Northern Hardwood Forest | <p>A mixed forest that typically occurs on middle to lower slopes of ravines, on cool, mid-elevation slopes, and on moist, well-drained sites at the margins of swamps. Eastern hemlock (<i>Tsuga canadensis</i>) is codominant with any one to three of the following tree species: American beech (<i>Fagus grandifolia</i>), sugar maple (<i>Acer saccharum</i>), red maple (<i>A. rubrum</i>), black cherry (<i>Prunus serotina</i>), white pine (<i>Pinus strobus</i>), yellow birch (<i>Betula alleghaniensis</i>), black birch (<i>B. lenta</i>), red oak (<i>Quercus rubra</i>), and basswood (<i>Tilia americana</i>). The relative cover of eastern hemlock is quite variable, ranging from nearly pure stands in some steep ravines to as little as 20% of the canopy cover. Striped maple (<i>Acer pensylvanicum</i>) is often prominent as a mid-story tree. This is a broadly defined and very widespread community with many variants. For example, in the Hudson Valley, eastern hemlock is sometimes codominant with red oak; in the Adirondacks, yellow birch and sugar maple are sometimes codominant.</p> | <p>A close-canopy forest with eastern hemlock present in the canopy. Hemlock may occur in nearly pure stands, with nearly 100% canopy cover, or reach an abundance as low as 20% canopy cover, intermingled with other canopy trees.</p> | <p>S3 - Vulnerable / G4G5 - Apparently or Demonstrably Secure</p> | <p>https://guides.nynhp.org/hemlock-northern-hardwood-forest/</p> |
| Oak-Tulip Tree Forest | <p>Oak tulip-tree forest is a mesophytic hardwood forest community that occurs on moist, well-drained sites in southeastern New York. The dominant trees include a mixture of oaks (<i>Quercus</i> spp.), tulip tree (<i>Liriodendron tulipifera</i>), American beech (<i>Fagus grandifolia</i>), black birch (<i>Betula lenta</i>), and red maple (<i>Acer rubrum</i>). The subcanopy often includes flowering dogwood (<i>Cornus florida</i>), and common understory associates include witch hazel (<i>Hamamelis virginiana</i>), sassafras (<i>Sassafras albidum</i>), and lowbush blueberries (<i>Vaccinium angustifolium</i>, <i>V. pallidum</i>). The herb layer is moderate to sparse and may include New York fern (<i>Thelypteris noveboracensis</i>), white wood aster (<i>Eurybia divaricata</i>), and Solomon's plume (<i>Maianthemum racemosum</i>).</p> | <p>A moist, well-drained, closed-canopy hardwood forest with codominating tulip tree and oak species. The subcanopy often includes flowering dogwood, and other common understory associates include witch hazel, sassafras, and lowbush blueberry.</p> | <p>S2S3 - Imperiled or Vulnerable / G4 - Apparently Secure</p> | <p>https://guides.nynhp.org/oak-tulip-tree-forest/</p> |

| | | | | |
|-----------------------------------|--|---|---|---|
| Pitch Pine-Oak-Heath Rocky Summit | A community that occurs on warm, dry, rocky ridge tops and summits where the bedrock is non-calcareous (such as quartzite, sandstone, or schist), and the soils are more or less acidic. The vegetation may be sparse or patchy, with numerous rocky outcrops. This community is broadly defined and includes examples that may lack pines and instead are dominated by scrub oak or heath shrubs; this variation is apparently related to fire regime. Pitch pine-oak-heath rocky summit communities are often surrounded by chestnut oak forest. | This community occurs on rocky slopes, ridges, or summits. When visiting these dry rocky sites, look for a short shrubby layer of heath species with scattered taller scrub oaks, tree oaks, and pitch pine. Characteristic species include pitch pine (<i>Pinus rigida</i>), chestnut oak (<i>Quercus montana</i>), red oak (<i>Q. rubra</i>), and scarlet oak (<i>Q. coccinea</i>). Other trees may include black cherry (<i>Prunus serotina</i>), red maple (<i>Acer rubrum</i>), gray birch (<i>Betula populifolia</i>), choke-cherry (<i>Prunus virginiana</i>), shadbush (<i>Amelanchier arborea</i>), white pine (<i>Pinus strobus</i>), and a few black gum (<i>Nyssa sylvatica</i>). Characteristic shrubs include scrub oak (<i>Q. ilicifolia</i>), common juniper (<i>Juniperus communis</i>), blueberry (<i>Vaccinium angustifolium</i> , <i>V. pallidum</i>), sweet-fern (<i>Comptonia peregrina</i>), and black huckleberry (<i>Gaylussacia baccata</i>). Other shrubs include highbush blueberry (<i>Vaccinium corymbosum</i>), sheep laurel (<i>Kalmia angustifolia</i>), mountain laurel (<i>Kalmia latifolia</i>), chokeberry (<i>Aronia</i> spp), and deerberry (<i>Vaccinium stamineum</i>). Characteristic herbs include Pennsylvania sedge (<i>Carex pensylvanica</i>), poverty-grass (<i>Danthonia spicata</i>), common hairgrass (<i>Deschampsia flexuosa</i>), three-toothed cinquefoil (<i>Potentilla tridentata</i>), and cow-wheat (<i>Melampyrum lineare</i>). Other herbs include bracken fern (<i>Pteridium aquilinum</i>), wintergreen (<i>Gaultheria procumbens</i>), little bluestem (<i>Schizachyrium scoparium</i>), and pink corydalis (<i>Corydalis sempervirens</i>). Characteristic lichens include various crustose, foliose, and fruticose lichens, such as <i>Cetraria arenaria</i> <i>Cladonia</i> spp. and <i>Cladonia</i> spp. Characteristic mosses include hair cap moss (<i>Polytrichum</i> spp.) and pincushion moss (<i>Leucobryum glaucum</i>). | S3S4 - Vulnerable or Apparently Secure / G4 - Apparently Secure | https://guides.nynhp.org/pitch-pine-oak-heath-rocky-summit/ |
| Red Cedar Rocky Summit | A community that occurs on warm, dry, rocky ridge tops and summits where the bedrock is calcareous (such as limestone or dolomite, but also marble, amphibolite, and calcsilicate rock), and the soils are more or less calcareous. The vegetation may be sparse or patchy, with numerous lichen-covered rock outcrops. This community is often surrounded by Appalachian oak-hickory forest. Eastern red cedar (<i>Juniperus virginiana</i>) is a characteristic tree. In many examples, dead or dying red cedars may be evident, which is often associated with the severe heat stress characteristic of this community (Edinger et al. 2014). | Red cedar rocky summits are characterized by a sparse to moderate woodland located on a rocky outcrop, ridge, or summit, featuring canopy species such as eastern red cedar, red oak (<i>Quercus rubra</i>), shagbark hickory (<i>Carya ovata</i>), white ash (<i>Fraxinus americana</i>), eastern hop hornbeam (<i>Ostrya virginiana</i>), and serviceberry (<i>Amelanchier</i> spp). A large variety of shrub and herbaceous species may comprise the understory, including lowbush blueberry (<i>Vaccinium pallidum</i> , <i>V. angustifolium</i>), scrub oak (<i>Quercus ilicifolia</i>), downy arrowwood (<i>Viburnum rafinesquianum</i>), little bluestem (<i>Schizachyrium scoparium</i>), tufted hairgrass (<i>Deschampsia flexuosa</i>), rockcresses (<i>Arabis</i> spp.), and maidenhair spleenwort (<i>Asplenium trichomanes</i>). Characteristic nonvascular species include lichens such as <i>Cladonia</i> spp., | S3 - Vulnerable / G3G4 - Vulnerable or Apparently Secure | https://guides.nynhp.org/red-cedar-rocky-summit/ |

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| | | and bryophytes such as <i>Polytrichum</i> spp. | | |
| Rocky Summit Grassland | A grassland community that occurs on rocky summits, ridges, and exposed outcrops. The vegetation is dominated by herbaceous plants, especially grasses. Woody species, such as red oak (<i>Quercus rubra</i>) and lowbush blueberry (<i>Vaccinium pallidum</i> , <i>V. angustifolium</i>), are sparse, and may be present near the community margins (Edinger et al. 2002). | Rocky summit grasslands occur on rocky outcrops and summits with thin soils, and are dominated by grass species such as little bluestem (<i>Schizachyrium scoparium</i>), tufted hairgrass (<i>Deschampsia flexuosa</i>), poverty-grass (<i>Danthonia spicata</i> , <i>D. compressa</i>), and Indian grass (<i>Sorghastrum nutans</i>). Also common are Pennsylvania sedge (<i>Carex pensylvanica</i>), ebony spleenwort (<i>Asplenium platyneuron</i>), and fragrant goldenrod (<i>Solidago odora</i>). | S3 - Vulnerable / G3G4 - Vulnerable or Apparently Secure | https://guides.nynhp.org/rocky-summit-grassland/ |
| Highbush Blueberry Bog Thicket | An ombrotrophic or weakly minerotrophic peatland dominated by tall, deciduous, ericaceous shrubs and peat mosses; the water is usually nutrient-poor and acidic. The dominant shrub is usually highbush blueberry. At least three regional variants are recognized in New York. The first is found throughout central and western New York, the second is primarily a northern variant, and the third is a southern variant with coastal plain species. | A peatland that is dominated by tall (2 m) highbush blueberry (<i>Vaccinium corymbosum</i>) shrubs. | S3 - Vulnerable / G4 - Apparently Secure | https://guides.nynhp.org/highbush-blueberry-bog-thicket/ |
| Brackish Tidal Marsh | Brackish tidal marsh communities occur where water salinity levels are between 0.5 to 18 parts per thousand (ppt) and water is less than 2 m (6 feet) at high tide. The vegetation is very dense, dominated by graminoid species, and is made up of a mix of salt marsh and freshwater tidal marsh species. Characteristic species include narrowleaf cattail (<i>Typha angustifolia</i>), crimson eyed rose mallow (<i>Hibiscus moscheutos</i>), seaside goldenrod (<i>Solidago sempervirens</i>), saltmarsh fleabane (<i>Pluchea odorata</i>), and various bulrushes (<i>Schoenoplectus</i> spp., <i>Bolboschoenus</i> spp.). Brackish tidal marshes that are dominated by reedgrass (<i>Phragmites australis</i> ssp. <i>australis</i>) as a result of anthropogenic disturbance are classified as cultural communities (e.g., estuarine impoundment marsh, estuarine dredge spoil). Brackish marshes that have had the tidal influence restricted may be classified as a palustrine cultural community, such as reedgrass/purple loosestrife marsh. | A brackish marsh community made up of a mix of salt marsh and freshwater tidal marsh species dominated by tall graminoids. Water salinity values range from 0.5 to 18 ppt and water depth is less than 2 m (6 feet). | S3S4 - Vulnerable or Apparently Secure / G4 - Apparently Secure | https://guides.nynhp.org/brackish-tidal-marsh/ |
| Brackish Intertidal Mudflats | Brackish intertidal mudflat communities occur on exposed intertidal mudflats in which the salinity ranges from 0.5 to 18 parts per thousand (ppt). The vegetation is usually sparse, and consists of aquatic species such as spongy arrowhead (<i>Sagittaria montevidensis</i>), strap-leaf arrowhead (<i>Sagittaria subulata</i>), mudwort (<i>Limnospira australis</i>), and | A sparsely-vegetated intertidal community on exposed mudflats where salinity ranges from 0.5 to 18 ppt. This community, which typically has low-growing rosette-leaved plants, is submerged during high tide, and exposed at low tide. | S1 - Critically Imperiled / G3G4 - Vulnerable or Apparently Secure | https://guides.nynhp.org/brackish-intertidal-mudflats/ |

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| | tapegrass (<i>Vallisneria americana</i>). The community is completely submerged at high tide, and completely exposed at low tide. | | | |
| Tidal River | The aquatic community of continuously flooded substrates that support no emergent vegetation. Within the river there are two zones; the deepwater zone includes areas in which substrates are usually over 2 m (6 feet) deep at low tide, the shallow zone includes submerged areas less than 2 m (6 feet) deep at low tide that lack rooted aquatic vegetation. In the river there is a vertical salinity gradient, with a surface layer of fresh water (with salinity values less than 0.5 parts per thousand) floating over a deeper layer of brackish water (with salinity values between 0.5 and 18.0 parts per thousand). Salinity values at any one place in the river may fluctuate as the tides flow in and out because the "salt wedge" of brackish water alternately rises and falls with the tides (Edinger et al. 2002). | A large river, such as the Hudson River, that has a salinity gradient (i.e., very salty at the river mouth, brackish upstream, and freshwater inland), and shows evidence of two daily tides along the shoreline. | S3 - Vulnerable / G4 - Apparently Secure | https://guides.nynhp.org/tidal-river/ |
| Cliff Community | A community that occurs on vertical exposures of resistant, non-calcareous bedrock (such as quartzite, sandstone, or schist) or consolidated material; these cliffs often include ledges and small areas of talus. There is minimal soil development, and vegetation is usually sparse. Plant species present are somewhat dependent on the microclimate conditions, which can range from shady and moist to sun-exposed and dry. Vegetation often inhabits shallow pockets of soil that accumulate on ledges, and in cracks and crevices within the cliff wall. | Characteristic species include rock polypody (<i>Polypodium virginianum</i>), marginal wood fern (<i>Dryopteris marginalis</i>), common hairgrass (<i>Deschampsia flexuosa</i>), mountain laurel (<i>Kalmia latifolia</i>), and eastern hemlock (<i>Tsuga canadensis</i>). Bryophytes that are characteristic of acidic cliffs include the mosses <i>Andreaea rothii</i> , <i>Dicranum fulvum</i> , <i>Dicranum montanum</i> , white cushion moss (<i>Leucobryum glaucum</i>), <i>Plagiothecium laetum</i> , <i>Pohlia nutans</i> , <i>Pylaisiadelphina tenuirostris</i> , and the leafy liverworts <i>Blepharostoma trichophyllum</i> , <i>Jamesoniella autumnalis</i> , and <i>Scapania nemorea</i> . The rare two-ranked moss (<i>Pseudotaxiphyllum distichaceum</i>) and the uncommon leafy liverwort <i>Herbertus aduncus</i> ssp. <i>tenuis</i> are also known from acidic cliff communities. The common raven (<i>Corvus corax</i>) is a characteristic bird that nests on cliffs. | S4 - Apparently Secure / G5 - Secure | https://guides.nynhp.org/cliff-community/ |

24. Important Areas for Rare Species

Description:

According to the Hudson River Estuary Program, “successful conservation of rare species requires protecting habitat rather than simply focusing on point locations where a species has been documented. Building on species occurrence records, the New York Natural Heritage Program has identified areas of importance for sustaining populations of rare plants and animals

based on their habitat requirements or the surrounding area required to maintain a natural community. Important Areas encompass the specific locations where rare species have been observed, habitat areas which may be used at different times of the year, and the associated areas critical to maintaining those habitats. 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 of rare animals and to the persistence and dispersal of rare plants.”¹⁵

Data for this map were obtained from the NYNHP’s “Natural Heritage Important Areas” dataset. Important Areas “are generated using GIS Important Area spatial models (IA models) applied to occurrences of rare plants and animals and significant natural communities in the New York Natural Heritage database, or applied to observation locations of other species obtained from other sources. IA models are specific to a species or species group, and are based on the life histories and habitats of that species or species group; for communities, models are based on the community type’s size and natural ecological processes.”¹⁶

It is important to “note that information regarding the locations of rare species is considered sensitive. The distribution of information which identifies the locations of rare species or their habitats may lead to the collection or disturbance of the animals and plants at those locations. NYSDEC has the legal authority, under New York State Environmental Conservation Law, to restrict access to such information, and has adopted a policy regarding the release of information compiled by the New York Natural Heritage Program. Under this policy, the level of detail provided about the locations and identities of rare species may be limited in order to protect the sensitive resources.”¹⁷

Findings:

As the map shows, Philipstown is almost completely considered important habitat for one species or another, whether plant or animal. The largest areas covering the town offer important habitat for bats, but there are also substantial areas that are important to terrestrial (land-based) animals as well as smaller areas important to wetland fauna (animals) as well as important habitat for rare plant species. As we noted in the previous section, it is important to understand that this map is not a complete picture of possible important habitats, many of which may exist in other areas within the town, but have not yet been accounted for. This map, however, gives a good summary of areas that are known to provide important habitat for rare species within and around Philipstown. Potential Species of Conservation Concern (endangered, protected, special

¹⁵ Haeckel, Ingrid, and Laura Heady. Creating a Natural Resources Inventory: A Guide for Communities in the Hudson River Estuary Watershed. (Ithaca, NY: Department of Natural Resources, Cornell University, and New York State Department of Environmental Conservation, 2014): <https://www.dec.ny.gov/lands/100925.html>.

¹⁶ NYSDEC, Natural Heritage Important Areas, Abstract, 2018, http://gis.ny.gov/gisdata/metadata/nysdec/IA_Animals_Aquatic.html

¹⁷ NYSDEC, Request Natural Heritage Information, NY Natural Heritage Program - Information Services, <https://www.dec.ny.gov/animals/31181.html>

concern, threatened, or rare species) that may be found in these areas are summarized below in Table 9 - Plants and Table 10 - Animals. Additional species of Birds, Reptiles & Amphibians and Fish that are not included in these tables will be covered in later sections of this report.

Although summarized in the tables below, we want to lend special attention to the Important Bat Foraging Areas layer on this map. The following is from the 2018 Putnam Valley NRI, which also applies to Philipstown due to the existence of old mines and potential caves in Philipstown that may serve as locations for hibernation as well as the similarity of many of Philipstown's forests to those of neighboring Putnam Valley:

“Bat hibernacula are sites where bats hibernate over the winter, most often caves. Indiana bat (US and NY – Endangered), northern long-eared bat (US and NY – Threatened) and other priority bat species have been found in a Putnam Valley cave and the surrounding forest. Bats will return year after year to the same hibernation site and are susceptible to human disturbance and disease. The recent spread of white-nose syndrome, a fungal disease, has devastated bat colonies throughout the northeast, resulting in large die-offs of bats across the region. Mapped important areas include the immediate areas surrounding known hibernaculum (wintering shelters) and summer roost sites.

“At-risk bats, including Indiana bat, northern long-eared bat, and others, 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 state and federal 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 Putnam Valley. NYSDEC 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.”¹⁸

The US Fish and Wildlife Service also has restrictions on harvesting trees in order to prevent damage to federally endangered bat species. For more information, visit:

<https://www.dec.ny.gov/animals/106090.html>.

For your convenience, we have also included again the following detailed description of how the New York Natural Heritage Program determines the state and global rankings for each of the species that we have listed in the tables below:

¹⁸ Town of Putnam Valley Committee for the Conservation of the Environment, Town of Putnam Valley Natural Resource Inventory, 2018: <https://putnamvalleyresidents.com/NRI.html>

“Explanation of ranks and codes used in Natural Heritage database reports: Each element has a global and state rank as determined by NY Natural Heritage. These ranks carry no legal weight but are believed to accurately reflect the relative rarity given of the element. The global rank reflects the rarity of the element throughout the world and the state rank reflects the rarity within New York State. The global rank for communities is an estimate of the rarity of the state type throughout its range.

“STATE RANK

- S1 = Critically Imperiled. Typically 5 or fewer occurrences, very few remaining individuals (for species), acres, or miles of stream, or some factor of its biology and/or ecology making it especially vulnerable in New York State.
- S2 = Imperiled. Typically 6 to 20 occurrences, few remaining individuals (for species), acres, or miles of stream, or factors demonstrably making it very vulnerable in New York State.
- S3 = Vulnerable. Typically 21 to 100 occurrences, limited acreage, or miles of stream in New York State.
- S4 = Apparently secure in New York State.
- S5 = Demonstrably secure in New York State.
- SH = Historically known from New York State, but not seen in the past 20 years.
- SX = Apparently extirpated from New York State.
- SE = Non-native species, not native to New York State.
- SR = State report only, no verified specimens (for species) known from New York State.
- SU = Status unknown.

“GLOBAL RANK

- G1 = Critically imperiled globally because of extreme rarity (5 or fewer occurrences), or very few remaining acres, or miles of stream) or especially vulnerable to extinction because of some factor of its biology and/or ecology.
- G2 = Imperiled globally because of rarity (6 - 20 occurrences, or few remaining acres, or miles of stream) or very vulnerable to extinction throughout its range because of other factors.
- G3 = Either rare and local throughout its range (21 to 100 occurrences), or found locally (even abundantly at some of its locations) in a restricted range (e.g., a physiographic region), or vulnerable to extinction throughout its range because of other factors.
- G4 = Apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery.
- G5 = Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.

- GH = Historically known, with the expectation that it might be rediscovered.
- GX = Species believed to be extinct.
- GU = Status unknown.

“TAXON RANK

- T1 - T5 = indicates a rank assigned to a subspecies following the Global Rank definitions above.
- Q = indicates a question exists whether or not the taxon is a good taxonomic entity.
- ? = indicates a question exists about the rank.”¹⁹

Also, the following are the definitions of New York State and Federal Legal Status for Plants and Animals:

“New York State Legal Status

“Animals - Categories of Endangered and Threatened species are defined in New York State Environmental Conservation Law section 11-0535. Endangered, Threatened, and Special Concern species are listed in regulation 6NYCRR 182.5.

E - Endangered Species: any species which meet one of the following criteria:

- Any native species in imminent danger of extirpation or extinction in New York.
- Any species listed as endangered by the United States Department of the Interior, as enumerated in the Code of Federal Regulations 50 CFR 17.11.

T - Threatened Species: any species which meet one of the following criteria

- Any native species likely to become an endangered species within the foreseeable future in NY.
- Any species listed as threatened by the U.S. Department of the Interior, as enumerated in the Code of Federal Regulations 50 CFR 17.11.

SC - Special Concern Species: those species which are not yet recognized as endangered or threatened, but for which documented concern exists for their continued welfare in New York.

P - Protected Wildlife: (defined in Environmental Conservation Law section 11-0103): wild game, protected wild birds, and endangered species of wildlife.

U - Unprotected: (defined in Environmental Conservation Law section 11-0103): the species may be taken at any time without limit; however a license to take may be required.

G - Game: (defined in Environmental Conservation Law section 11-0103): any of a variety of big game or small game species as stated in the Environmental

¹⁹ Edinger, G. J., *et al.*, 2014. Ecological Communities of New York State, Second Edition, New York Natural Heritage Program, NYSDEC, p. 145, http://www.dec.ny.gov/docs/wildlife_pdf/ecocomm2014.pdf

Conservation Law; many normally have an open season for at least part of the year, and are protected at other times.

“Plants - The following categories are defined in regulation 6NYCRR part 193.3 and apply to New York State Environmental Conservation Law section 9- 1503.

E - Endangered Species: listed species are those with:

- 5 or fewer extant sites, or
- fewer than 1,000 individuals, or
- restricted to fewer than 4 U.S.G.S. 7 ½ minute topographical maps, or
- species listed as endangered by U.S. Department of Interior, as enumerated in Code of Federal Regulations 50 CFR 17.11.

T - Threatened: listed species are those with:

- 6 to fewer than 20 extant sites, or
- 1,000 to fewer than 3,000 individuals, or
- restricted to not less than 4 or more than 7 U.S.G.S. 7 and ½ minute topographical maps, or
- listed as threatened by U.S. Department of Interior, as enumerated in Code of Federal Regulations 50 CFR 17.11.

R - Rare: listed species have:

- 20 to 35 extant sites, or
- 3,000 to 5,000 individuals statewide.

V - Exploitably Vulnerable: listed species are likely to become threatened in the near future throughout all or a significant portion of their range within the state if causal factors continue unchecked.

U - Unprotected: no state status.

“Federal Legal Status

“Plants and Animals - The categories of federal status are defined by the United States Department of the Interior as part of the 1974 Endangered Species Act (see Code of Federal Regulations 50 CFR 17). The species listed under this law are enumerated in the Federal Register vol. 50, no. 188, pp. 39526 - 39527. The codes below without parentheses are those used in the Federal Register. The codes below in parentheses are created by Heritage to deal with species which have different listings in different parts of their range, and/or different listings for different subspecies or varieties.

(blank): No Federal Endangered Species Act status.

LE: The element is formally listed as endangered.

LT: The element is formally listed as threatened.

PE: The element is proposed as endangered.

PT: The element is proposed as threatened.

C: The element is a candidate for listing.

LE, LT: The species is formally listed as endangered in part of its range, and as threatened in the other part; or, one or more subspecies or varieties is listed as endangered, and the others are listed as threatened.

LT, PDL: Populations of the species in New York are formally listed as threatened, and proposed for delisting.

(LE): If the element is a full species, all subspecies or varieties are listed as endangered; if the element is a subspecies, the full species is listed as endangered.

LT, T (S/A): One or more subspecies or populations of the species is formally listed as threatened, and the others are treated as threatened because of similarity of appearance to the listed threatened subspecies or populations.

PS: Partial status - the species is listed in parts of its range and not in others; or, one or more subspecies or varieties is listed, while the others are not listed.”²⁰

Lastly, and although threats to each species are covered in the webpage link for each, we will also briefly summarize the primary threats to species of conservation concern. This is taken from the town’s 2007 Natural Resource and Open Space Protection Plan:

“The following potential impacts from development pose a significant risk to biodiversity:

i. Forest Fragmentation: Fragmentation occurs when large, continuous forests are divided into smaller blocks, either by roads or other human development. Most of northern and eastern Philipstown is part of a vast forested landscape that extends east to Putnam Valley and north to Dutchess County. This unfragmented forest land provides habitat and travel corridors for a variety of species. As the forest becomes fragmented, the interconnectedness of species and habitat is negatively affected. Species associated with developed areas and having less specific habitat requirements (white tailed deer, Canada geese, etc.) thrive in fragmented areas and often replace development sensitive species, resulting in an overall loss of biodiversity. Recent research at the Institute of Ecosystem Studies demonstrates forest fragmentation can also directly affect human health. This research indicates that the tick population is considerably higher in small woodlots than in larger forests, leading to an increase in Lyme disease. Also, fragmentation makes it more difficult for species to adjust their habitat areas in response to climate change, as it can destroy the wildlife connectivity corridors (or “green corridors”) that allow wildlife to migrate to new habitats. This movement is especially important as wildlife move in response to climate change-induced pressures.

²⁰ NYSDEC, Conservation Status Definitions, New York Natural Heritage Program, <https://guides.nynhp.org/definitions/>

ii. Filling in/destroying vernal pools: Vernal pools usually retain standing water during the winter and spring and dry up by mid-summer. These shallow pools are surrounded by upland forest and serve as critical breeding places for several amphibians. Vernal pools can range from less than .2 acre to over 1 acre. Currently, wetland areas less than 1/4 acre are not regulated by the Town's Freshwater Wetlands and Watercourses Law; therefore, many vernal pools can be disturbed, damaged, or filled without a permit or notification to the Town.

iii. Decrease in large grasslands: Grasslands are often filled with native biodiversity – wildflowers, small mammals, birds, butterflies, and insects. A variety of bird species rely on grassland for breeding and foraging but grasslands areas are declining throughout the Hudson Valley due to a decline in farming, increase in development and transformation of abandoned farm fields to forests.

iv. Degradation of the Hudson River and its Tributaries: The Hudson River is tidal along the shores of Philipstown which creates distinct habitats, including mud flats, marshes, swamps and tributary mouths. Much of the River shoreline is unprotected from development. Throughout the Town, development can adversely affect the health of the river and its tributaries through polluted run-off and sedimentation, which often originate in the river tributaries. Also, a number of catadromous and anadromous fish rely on the river's tributaries for a portion of their life cycles and the river and/or ocean for another portion. Degradation of one aquatic habitat can have cascading effects on connected aquatic ecosystems.

v. Filling in and disturbance of wetland habitats: Wetlands provide critical habitat to a variety of plants and animals. Current threats to existing wetland habitat include increased invasive plants, sedimentation, and pollution. Currently, a 100 foot buffer zone is established to protect wetlands from the negative impact of development. These zones are not established on a site specific basis and do not consider the surrounding topography; therefore, current regulated buffer areas can fall short of protecting the upland habitat used by marsh animals. As noted in the previous section on water resources, wetland mitigation rarely succeeds in restoring the habitat functions of existing high quality wetlands.”²¹

²¹ Chmar, Andy *et al.* 2007, Natural Resource and Open Space Protection Plan, Town of Philipstown, <https://philipstown.com/government/building-department/town-code>

And we have also included here suggested measures to protect biodiversity from the town's 2007 Natural Resource and Open Space Protection Plan:

“Biodiversity

a) Require a Biodiversity Survey and Assessment to assess the existing environmental conditions, identify any areas of ecological sensitivity, and determine what the impact of the proposed development will be. Habitat review must be done from two perspectives - site specific and the context, or surrounding landscape. The Town of Milan in Dutchess County has a Biodiversity Assessment Guide that can be a model for Philipstown, see Appendix C.

b) A biodiversity assessment will identify habitats, but it is also necessary to recognize important biotic corridors. These corridors connect areas rich in biodiversity, or 'hubs', and allow species to travel between these hubs. Since flora and fauna do not recognize municipal and county boundaries it is important for Philipstown to coordinate efforts with neighboring towns to protect habitats, and to establish biotic corridors.

c) Review current wetlands law, timber harvest law, soil mining provisions, and other existing ordinances with a goal of modifying them for better overall habitat/biodiversity protection. For example, do wetland regulations protect appropriate buffers of upland habitats; does timber harvest have restrictions to prevent disturbance of nesting by rare species of birds during nesting seasons?

d) Though needing protection, endangered species should not be overemphasized at the expense of ignoring our common woodlands and forests. Philipstown's efforts should strive to protect proper abundances and distributions of common species that provide key ecological functions.

e) The Hudson River is rich in aquatic and terrestrial biodiversity. Develop protection measures along the shoreline to protect current habitats.”²²

Each of these suggestions, many of which are still applicable to current threats to species, can be further developed in the town's eventual Vulnerability Assessment and Climate Adaptation Plan, which will prioritize and plan out actions, respectively, to protect the town's natural resources as well as infrastructure from climate change and other threats. Links to descriptions of these potential projects can be found here:

²² *Ibid.*

Vulnerability Assessment:

<https://climatesmart.ny.gov/actions-certification/actions/#open/action/85>

Climate Adaptation Plan:

<https://climatesmart.ny.gov/actions-certification/actions/#open/action/88>

Further Study:

Recommendations for further study are similar to those for Significant Natural Communities, such as carrying out an updated biodiversity assessment to document rare plants and animals in the field. Such a study could complement the data presented in other sections of this chapter and could include local photographs of documented species within the studied natural communities, as well as more detailed descriptions of each species than can be provided in this inventory.

In addition, completion of a Vulnerability Assessment and Climate Adaptation Plan, as outlined above, will go a long way to protecting species for decades to come. These two projects should be priorities for the town in the next two or three years.

Lastly, a “Green Corridors” Study and Corresponding Action Plan for this area and surrounding Eastern Highlands municipalities is in progress. As the Hudson Highlands Land Trust and the Department of Environmental Conservation collect stakeholder input and complete the Plan, results showing priority green corridors could help inform planning to protect these critical wildlife movement zones. Similarly, establishing a Community Conservation Plan subcommittee and creating a Community Conservation Plan could describe how best to conserve lands that are important to the Philipstown community.

Data Sources:

- Important Habitat Areas
 - Natural Heritage Important Areas - NYNHP
<http://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1297>

Table 9. Plant Species of Conservation Concern within Philipstown²³

| Common Name | Scientific Name | Habitat | State / Federal Protection | State / Global Rank | Link to More Information |
|--------------------------|--|--|----------------------------|---------------------|---|
| Bog Huckleberry | <i>Gaylussacia bigeloviana</i> | Found in dwarf shrub bogs along the edge of a lake, in a shrub swamp within a pitch pine forest, and in wet, sphagnum openings along roadsides and trailsides | Endangered / Not Listed | S1S2 / G4G5 | https://guides.nynhp.org/northern-dwarf-huckleberry/ |
| Common Rattlebox | <i>Crotalaria Sagittalis</i> | Open disturbed sites with sandy soils, including pine plantations, pastures, and mowed fields | Endangered / Not Listed | S1 / G5 | https://guides.nynhp.org/rattlebox/ |
| Georgia Bulrush | <i>Scirpus georgianus</i> | Occurs in full sun in mesic to damp fields/meadows, edges of wet forests, and edges of marshes | Endangered / Not Listed | S1S2 / G5 | https://guides.nynhp.org/georgia-bulrush/ |
| Heart Sorrel | <i>Rumex hastatulus</i> | Brackish meadows and sandy shorelines | Endangered / Not Listed | SH / G5 | https://guides.nynhp.org/heart-sorrel/ |
| Hudson River Water Nymph | <i>Najas muenscheri</i> | Shallow water or pools of tidal mudflats of the Hudson River on mucky or gravel and rock soils | Endangered / Not Listed | S2 / G5T2 | https://guides.nynhp.org/hudson-river-water-nymph/ |
| Lily-Leaved Twayblade | <i>Liparis liliifolia</i> | Known to occur in a variety of both upland and wetland habitats. It has been found in several red maple-dominated swamps with a substrate of sphagnum peat, growing on hummocks. In contrast it also occurs in dry woods on limestone-influenced soil and wooded talus slopes, and along RR grades at the edge of swamps | Endangered / Not Listed | S1 / G5 | https://guides.nynhp.org/large-twayblade/ |
| New England Bulrush | <i>Bolboschoenus novae-angliae</i> | Brackish marshes along tidal creeks and rivers | Endangered / Not Listed | S1 / G5 | https://guides.nynhp.org/saltmarsh-bulrush/ |
| Ovate Spike Rush | <i>Eleocharis ovata</i> | Artificial ponds, shallow natural ponds in larger swamps, and from marshy area on river islands | Endangered / Not Listed | S1S2 / G5 | https://guides.nynhp.org/ovate-spike-rush/ |
| Sharp-Angled Spike Rush | <i>Eleocharis tenuis</i> var. <i>pseudoptera</i> | Wet, fresh, often calcareous meadows, swales, springy places, woods, prairie, | Endangered / Not Listed | S1 / G5T5? | https://guides.nynhp.org/slender-spike-rush/ |

²³ New York Natural Heritage Program, NYNHP Online Conservation Guides, NYSDEC, 2020, <https://guides.nynhp.org/>

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| | | serpentine barrens, ditches | | | |
| Shining Bedstraw | <i>Galium concinnum</i> | Hemlock-Northern Hardwood and Oak-Hickory forests, as well as along roadsides, trails, and riverside meadows | Endangered / Not Listed | S1 / G5 | https://guides.nynhp.org/shining-bedstraw/ |
| Smartweed Dodder | <i>Cuscuta polygonorum</i> | Cattail marshes and wet meadows | Endangered / Not Listed | S1 / G5 | https://guides.nynhp.org/smartweed-dodder/ |
| Southern Snailseed Pondweed | <i>Potamogeton diversifolius</i> | Ponds (including dammed ponds) usually on the margins where the water is shallow and in deep emergent marshes | Endangered / Not Listed | S1 / G5 | https://guides.nynhp.org/southern-snailseed-pondweed/ |
| Stalked Bugleweed | <i>Lycopus rubellus</i> | Marshes, fens, and flooded swamps | Endangered / Not Listed | S1 / G5 | https://guides.nynhp.org/stalked-bugleweed/ |
| Water Pigmyweed | <i>Crassula aquatica</i> | Tidal mud flats, marshes, and rocky shores along the lower Hudson River | Endangered / Not Listed | S1 / G5 | https://guides.nynhp.org/water-pigmyweed/ |
| Whorled Mountain Mint | <i>Pycnanthemum verticillatum</i> var. <i>verticillatum</i> | Fens, interdunal swales, and other open, calcareous wetlands, usually on wet sandy substrates | Endangered / Not Listed | S1S2 / G5T5 | https://guides.nynhp.org/whorled-mountain-mint/ |
| Alternate-flowered Water Milfoil | <i>Myriophyllum alterniflorum</i> | Lakes, ponds and streams | Threatened / Not Listed | S2 / G5 | https://guides.nynhp.org/alternate-flowered-water-milfoil/ |
| Annual Saltmarsh Aster | <i>Symphyotrichum subulatum</i> var. <i>subulatum</i> | Along the lower Hudson River it also occurs in brackish marshes and along brackish tidal drainages sometimes occurring in disturbed habitats adjacent to these marshes. | Threatened / Not Listed | S2S3 / G5 | https://guides.nynhp.org/annual-saltmarsh-aster/ |
| Atlantic White Cedar | <i>Chamaecyparis thyoides</i> | Swamps and ponds, typically at sites with a high water table and deep organic soils. | Threatened / Not Listed | S2 / G4 | https://guides.nynhp.org/atlantic-white-cedar/ |
| Clustered Sedge | <i>Carex cumulata</i> | Open rocky habitats, particularly in damp areas on acidic bedrock or shallow soil. Also found in recently burned areas with shallow soils and exposed bedrock, powerline corridors, open oak or woodlands, heathlands, and various successional habitats | Threatened / Not Listed | S2S3 / G4G5 | https://guides.nynhp.org/clustered-sedge/ |
| Cream-Colored Avens | <i>Geum virginianum</i> | Appalachian oak-hickory forests, northern-hardwood forests, woodlands on limestone bedrock and on sand dunes, muddy | Threatened / Not Listed | S2G5 | https://guides.nynhp.org/rough-avens/ |

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| | | riverbanks, forested swamps, marshes, and roadsides. | | | |
| Culver's Root | <i>Veronicastrum virginicum</i> | Forest edges, including along bike trails and driveways. It has been found on north or northwest-facing slopes as well as along the bottomlands of major rivers, prairie remnants, fens, and meadows; river banks; deciduous woodlands (especially with oaks); moist and dry upland woods and prairies | Threatened / Not Listed | S2 / G4 | https://guides.nynhp.org/culvers-root/ |
| False Hop Sedge | <i>Carex lupuliformis</i> | Silver maple-ash swamps, red maple hardwood swamps, floodplain forests, marshes, shrub swamps, and mucky soils | Threatened / Not Listed | S2 / G4 | https://guides.nynhp.org/false-hop-sedge/ |
| Great Plains Flat Sedge | <i>Cyperus lupulinus</i> ssp. <i>lupulinus</i> | Sandy soils at beaches, railroads, roadsides, pastures, dry woods and fields | Threatened / Not Listed | S1S2 / G5T5? | https://guides.nynhp.org/great-plains-flatsedge/ |
| Hill's Pondweed | <i>Potamogeton hillii</i> | Alkaline waterways including ponds, streams, lakes, ditches, and other impoundments. | Threatened / Not Listed | S2S3 / G3 | https://guides.nynhp.org/hills-pondweed/ |
| Meadow Horsetail | <i>Equisetum pratense</i> | A diversity of different upland habitats, both shaded and open, usually in rocky or gravelly soil, on slopes or banks adjacent to rivers, roads, or railroads | Threatened / Not Listed | S2 / G5 | https://guides.nynhp.org/meadow-horsetail/ |
| Purple Spring Cress | <i>Cardamine douglassii</i> | A variety of sites, generally with moist to wet, rich soils. These include wet places within upland deciduous forests, streambeds, alluvial woods and fields, swampy pastures, springs, and calcareous swamps | Threatened / Not Listed | S4 / G5 | https://guides.nynhp.org/purple-cress/ |
| Rhodora | <i>Rhododendron canadense</i> | Wetlands of acidic rocky summits and barrens, as well as boggy habitats containing a mixture of organic material and gravel | Threatened / Not Listed | S2 / G5 | https://guides.nynhp.org/rhodora/ |
| Smooth Beggar Ticks | <i>Bidens laevis</i> | Freshwater and brackish tidal mud flats and tidal marshes | Threatened / Not Listed | S2 / G5 | https://guides.nynhp.org/smooth-beggar-ticks/ |
| Spongy-Leaved Arrowhead | <i>Sagittaria montevidensis</i> ssp. <i>spongiosa</i> | Brackish to fresh-water tidal mudflats and salt marshes | Threatened / Not Listed | S2 / G5T4 | https://guides.nynhp.org/spongy-arrowhead/ |
| Spotted Pondweed | <i>Potamogeton pulcher</i> | Still or slowly moving water (1-2+ meters deep) of deep | Threatened / Not Listed | S2 / G5 | https://guides.nynhp.org/spotted-pondweed/ |

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| | | emergent marshes, small streams, small lakes/ponds, and open pools | | | |
| Stiff Flat-topped Goldenrod | <i>Solidago rigida</i> var. <i>rigida</i> | Open areas on dry shaley slopes or on limestone bedrock; open areas among shrubby thickets and edge of grasslands over shallow, dry, sandy and rocky soils on limestone; dry post-agricultural successional habitats, usually on alkaline soils; successional fields on clay soils; rocky summit grasslands on alkaline and circum-neutral soils; grassland habitats on dry, clayey, stony soils; woodland edges between calcareous woodlands and successional old fields; and dry shaly hillsides and slopes | Threatened / Not Listed | S2 / G5T5 | https://guides.nynhp.org/stiff-flat-topped-goldenrod/ |
| Swamp Cottonwood | <i>Populus heterophylla</i> | Wet pockets of red maple-hardwood swamps with some calcareous influences within the Hudson Valley and red maple-blackgum swamps along the swamp. It also may be found in swamp white oak wetlands, shallow emergent marshes adjacent to forested swamps, wet swales, and other types of hardwood swamps | Threatened / Not Listed | S2 / G5 | https://guides.nynhp.org/swamp-cottonwood/ |
| Toothcup | <i>Rotala ramosior</i> | Along the shorelines and edges of ponds and lakes, as well as those of artificial wetlands including reservoirs and roadside catchment basins. It also will occupy seasonally-wet sites such as wet meadows or agricultural fields, especially where paths or other disturbance provides bare soil substrate. It has been found growing in organic muck as well as in sandy soil | Threatened / Not Listed | S2 / G5 | https://guides.nynhp.org/tooth-cup/ |
| Violet Wood Sorrel | <i>Oxalis violacea</i> | Primarily on steep rocky slopes and open summits, generally on rocky, often rich soils. The most common surrounding forest type is oak-hickory, and at many sites the plants were found along trails, ledges, or other openings | Threatened / Not Listed | S2S3 / G5 | https://guides.nynhp.org/violet-wood-sorrel/ |
| Virginia Snakeroot | <i>Endodeca</i> | Well-drained wooded slopes, rocky slopes of oak | Threatened / Not Listed | S2 / G4 | https://guides.nynhp.org/virginia-snakeroot/ |

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| | <i>serpentaria</i> | woods, open woods, moist woods, rich woods, and only rarely in clearings. It particularly seems to favor drainage patterns on southwest to southeast facing slopes in oak-hickory forests or chestnut oak forest. | | | |
| Wild Hydrangea | <i>Hydrangea arborescens</i> | Slopes of forested ravines along the Southern Tier adjacent to the Pennsylvania border. It is often found in the upper headwater ravine systems where it may be close to the stream, along the ravine slopes, or occasionally on ledges. The moist soil may be rocky and/or have a high clay content | Threatened / Not Listed | S2 / G5 | https://guides.nynhp.org/wild-hydrangea/ |
| Wild Sweet William | <i>Phlox maculata</i> ssp. <i>maculata</i> | Open or shrubby wet sites, including fens, wet meadows, shrub swamps, cattail marshes, and roadside seeps and wet thickets | Threatened / Not Listed | S2 / G5T4T5 | https://guides.nynhp.org/wild-sweet-william/ |
| Woodland Agrimony | <i>Agrimonia rostellata</i> | Rich mesic forests, forested gorge slopes cutting through calcareous bedrock, streambanks in rich forests, forested slopes adjacent to streams, forested limestone benches, dry oak woods, wooded pastures on rich soil, shrub thickets, and other mesic sites that are typically wooded and on calcareous soils | Threatened / Not Listed | S2 / G5 | https://guides.nynhp.org/woodland-agrimony/ |
| Estuary Beggar Ticks | <i>Bidens bidentoides</i> | Freshwater tidal mudflats and marshes, often at the border between mudflat and marsh, or along sandy or muddy openings within a marsh | Rare / Not Listed | S3 / G3G4 | https://guides.nynhp.org/elmarva-beggar-ticks/ |
| Five-angled Dodder | <i>Cuscuta pentagona</i> | Stream banks, swamps, and a variety of dry and wet prairie, glade, and forest types. Also frequently a weed in fields and along railroads. Parasitizes a wide variety of woody and nonwoody plants. | Rare / Not Listed | S3 / G4G5 | https://guides.nynhp.org/five-angled-dodder/ |
| Small-flowered Buttercup | <i>Ranunculus micranthus</i> | South and southeast-facing slopes of ridges and summits. It seems to prefer neither open grasslands or shrublands, nor closed forest, but partial shade and small openings. Many, though not all, of these sites | Rare / Not Listed | S3 / G5 | https://guides.nynhp.org/small-flowered-crowfoot/ |

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| | | have rich soils and high plant diversity, although it has also been collected from apparently acidic, sandstone-derived soils as well. This species has been found in a wide variety of forest types, from beech-sugar maple, to oak-hickory, to red cedar summits | | | |
| Spreading Globeflower | <i>Trollius laxus</i> | Open areas of calcareous wetlands, including casually grazed pastures, openings in cedar, tamarack, or hemlock swamps, rich sloping fens, rich graminoid fens, powerline right-of-ways through rich shrub swamps, seepage areas, and other such sites | Rare / Not Listed | S3 / G5T3 | https://guides.nynhp.org/spreading-globeflower/ |

Table 10. Animal Species of Conservation Concern within Philipstown²⁴

| Common Name | Scientific Name | Habitat | State / Federal Protection | State / Global Rank | Link to More Information |
|---------------------|-------------------------------|--|--|---------------------|---|
| Bog Turtle | <i>Glyptemys muhlenbergii</i> | Open-canopy wet meadows, sedge meadows, and calcareous fens. | Endangered / Threatened | S2 / G2G3 | https://guides.nynhp.org/bog-turtle/ |
| Hessel's Hairstreak | <i>Callophrys hesseli</i> | Coastal and inland Atlantic White Cedar swamps | Endangered / Not Listed | S1 / G3 | https://guides.nynhp.org/hessels-hairstreak/ |
| Peregrine Falcon | <i>Falco peregrinus</i> | Often nest on ledges or holes on the faces of rocky cliffs. They will also nest on manmade structures such as bridges and tall buildings, especially near or in urban areas. Wintering birds frequent buildings, towers, and steeples in urban areas, and open areas with plentiful prey in more natural settings. | Endangered / Migratory Bird Treaty Act | S3B / G4 | https://guides.nynhp.org/peregrine-falcon/ |
| Shortnose Sturgeon | <i>Acipenser brevirostrum</i> | Inhabit the Hudson River estuary. These fishes reportedly prefer deep pools with soft substrates and vegetated bottoms, but individuals may vary in preference for various water depths and substrate types | Endangered / Endangered | S1 / G3 | https://guides.nynhp.org/shortnose-sturgeon/ |
| Atlantic Sturgeon | <i>Acipenser oxyrinchus</i> | During spawning, the Atlantic sturgeon can be found in the | Protected - no open season / | S1 / G3 | https://guides.nynhp.org/atlantic-sturgeon |

²⁴ New York Natural Heritage Program, NYNHP Online Conservation Guides, NYSDEC, 2020, <https://guides.nynhp.org/>

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| | | freshwater and brackish/salt water regions of the Hudson River north to Albany, but the species is usually confined to the deeper parts of the river. The adults spend most of their time at sea and the juveniles spend the first few years of their lives in freshwater streams. | Endangered | | / |
| Barn Owl | <i>Tyto alba</i> | Open and partly open country including grasslands, marshes, and agricultural areas. | Protected Bird / Migratory Bird Treaty Act | S1S2 / G5 | https://guides.nynhp.org/barn-owl/ |
| Great Blue Heron | <i>Ardea herodias</i> | Typically, Great Blue Heron habitat includes freshwater and brackish marshes that are near lakes, rivers, bays, lagoons, ocean beaches, fields, or meadows. Nests tend to be high in the trees of swamps and wooded areas. | Protected Bird / Migratory Bird Treaty Act | S5 / G5 | https://guides.nynhp.org/great-blue-heron/ |
| Kentucky Warbler | <i>Geothlypis formosa</i> | Rich, moist, flat or preferably hilly woodlands especially with stream-bearing ravines and a dense understory. | Protected Bird / Migratory Bird Treaty Act | S2B / G5 | https://guides.nynhp.org/kentucky-warbler/ |
| Cerulean Warbler | <i>Setophaga cerulea</i> | Found in both riparian and upland forest habitats in New York within landscapes that are heavily forested. They typically inhabit forested wetlands and riparian corridors with a mature canopy composed of sycamore, silver maple, red maple, and green ash, or dry ridge tops and side-slopes with mature oak-hickory or mixed mesophytic forest | Special Concern / Migratory Bird Treaty Act | S3?B / G4 | https://guides.nynhp.org/cerulean-warbler/ |
| Common Loon | <i>Gavia immer</i> | Breed on a wide variety of lakes and reservoirs in the Adirondacks ranging from oligotrophic (low-nutrient) to eutrophic (high-nutrient), small to large, shallow to deep, clear to turbid, and remote to heavily developed. Nonbreeding habitat is primarily seacoasts, bays, inlets, and estuaries, less frequently along lakes and rivers, and occasionally up to 100 km off the coast | Special Concern / Migratory Bird Treaty Act | S4 / G5 | https://guides.nynhp.org/common-loon/ |
| Eastern Small-footed Bat | <i>Myotis leibii</i> | Winter in caves and mines, and openings deep within rock crevices in outcrops, summer in a broad range of forested areas. | Special Concern / Not Listed | S1S3 / G4 | https://guides.nynhp.org/eastern-small-footed-myotis/ |
| Eastern Wormsnake | <i>Carphophis amoenus</i> | Moist (mesic) forests and drier forests may also be inhabited | Special Concern / Not Listed | S2 / G5 | https://guides.nynhp.org/eastern-wormsnake/ |
| Golden-winged Warbler | <i>Vermivora chrysoptera</i> | A variety of shrubby habitats with herbaceous cover including successional fields, regenerating clearcuts, utility line | Special Concern / Migratory Bird Treaty Act | S3B / G4 | https://guides.nynhp.org/golden-winged-warbler/ |

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| | | rights-of-way, beaver meadows, the edges of tamarack swamps, aspen clearcuts, young conifer plantations, pine barrens, and upland swamps (| | | |
| New England Cottontail | <i>Sylvilagus transitionalis</i> | Open woods, disturbed areas, shrubby areas, thickets, and marshes | Special Concern / Not Listed | S1S2 / G3 | https://guides.nynhp.org/new-england-cottontail/ |
| Red-headed Woodpecker | <i>Melanerpes erythrocephalus</i> | Open areas with scattered trees (e.g., parks, golf courses, roadsides), and open swamps and river bottoms with dead, standing trees | Special Concern / Migratory Bird Treaty Act | S2?B / G5 | https://guides.nynhp.org/red-headed-woodpecker/ |
| Spotted Turtle | <i>Clemmys guttata</i> | Clear, clean water with a soft substrate and aquatic or emergent vegetation. Vernal pools and small permanent pools are often used in the spring, although other habitats such as marshes, fens, and open early successional wetlands may also be used | Special Concern / Not Listed | S3 / G5 | https://guides.nynhp.org/spotted-turtle/ |
| Whip-poor-will | <i>Antrostomus vociferus</i> | Dry deciduous or mixed woods, pine barrens and barrens-like habitats, and some shrublands | Special Concern / Migratory Bird Treaty Act | S3B / G5 | https://guides.nynhp.org/whip-poor-will/ |
| Wood Turtle | <i>Glyptemys insculpta</i> | Clear, flowing streams and rivers or in the habitats surrounding them such as woodlands, meadows, and forest edges | Special Concern / Not Listed | S3 / G3 | https://guides.nynhp.org/wood-turtle/ |
| Bald Eagle | <i>Haliaeetus leucocephalus</i> | Typically found near large bodies of water, such as bays, rivers, and lakes, that support a healthy population of fish and waterfowl, their primary food source. Generally, Bald Eagles tend to avoid areas with human activities. They will perch in either deciduous or coniferous trees. Large, heavy nests are usually built near water in tall pine, spruce, fir, cottonwood, oak, poplar, or beech trees. | Threatened / Migratory Bird Treaty Act | S2S3B, S2N / G5 | https://guides.nynhp.org/bald-eagle/ |
| Blanding's Turtle | <i>Emydoidea blandingii</i> | Shallow wetlands such as shrub swamps, marshes, and shallow ponds. Vernal pools are used in the spring. Blanding's Turtles will frequently travel through uplands and cross roads, especially during the nesting period or when moving between wetlands. | Threatened / Not Listed | S2S3 / G4 | https://guides.nynhp.org/blandings-turtle/ |
| Fence Lizard | <i>Sceloporus undulatus</i> | Naturally occurring fence lizard populations are confined to the Hudson Highlands region of the | Threatened / Not Listed | S1 / G5 | https://guides.nynhp.org/fence-lizard/ |

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|-------------------------|-------------------------------|---|--|----------------|---|
| | | state. These areas are characterized by steep slopes with extensive open rocky areas that are surrounded by mixed-deciduous, oak-dominated, forests. | | | |
| Least Bittern | <i>Ixobrychus exilis</i> | Shallow or deep emergent marshes, freshwater tidal marshes (lower Hudson River), or brackish tidal marshes (Long Island). They prefer stands of cattails or bulrush with bur-reed, sedges, or common reed. | Threatened / Migratory Bird Treaty Act | S3B,S1N / G4G5 | https://guides.nynhp.org/least-bittern/ |
| Northern Harrier | <i>Circus hudsonius</i> | A wide range of open grasslands, shrubland, and salt and freshwater marshes | Threatened / Migratory Bird Treaty Act | S3B,S3N / G5 | https://guides.nynhp.org/northern-harrier/ |
| Northern Long-eared Bat | <i>Myotis septentrionalis</i> | Mature interior forest, tend to avoid woodlands with significant edge habitat, may most often be found in cluttered or densely forested areas including in uplands and at streams or vernal pools | Threatened / Threatened | S1 / G1G2 | https://guides.nynhp.org/northern-long-eared-bat/ |
| Pied-billed Grebe | <i>Podilymbus podiceps</i> | Quiet marshes, marshy shorelines of ponds, shallow lakes, or marshy bays and slow moving streams with sedgy banks or adjacent marshes; rarely in brackish marshes with limited tidal fluctuation. | Threatened / Migratory Bird Treaty Act | S3B,S1N / G5 | https://guides.nynhp.org/pied-billed-grebe/ |
| Timber Rattlesnake | <i>Crotalus horridus</i> | Mountainous or hilly deciduous or mixed deciduous-coniferous forests, often with rocky outcroppings, steep ledges, and rock slides | Threatened / Not Listed | S3 / G4 | https://guides.nynhp.org/timber-rattlesnake/ |
| Atlantic Needlefish | <i>Strongylura marina</i> | Primarily marine, but is a resident fish during the summer months in the Hudson River estuary | Not Listed / Not Listed | S2S3 / G5 | https://guides.nynhp.org/atlantic-needlefish/#habitat |
| Atlantic Silverside | <i>Menidia menidia</i> | Inhabit fresh, brackish, and salt water marshes in the lower Hudson River estuary and Long Island from the spring through the fall, although they may not be as inclined to enter fresh water as the inland silverside | Not Listed / Not Listed | S2S3 / G5 | https://guides.nynhp.org/atlantic-silverside/#habitat |
| Inland Silverside | <i>Menidia beryllina</i> | The shallows of tidal salt marshes and estuaries, showing a stronger preference for low salinity waters. They can also be found in freshwater ponds, lakes, and reservoirs and have been introduced into some locations | Not Listed / Not Listed | S2S3 / G5 | https://guides.nynhp.org/inland-silverside/#habitat |
| Needham's Skimmer | <i>Libellula needhami</i> | Coastal species that inhabits ponds, lakes, tidal river areas, and | Not Listed / Not Listed | S3 / G5 | https://guides.nynhp.org/needhams-skimmer/ |

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|---------------------|---------------------------------|--|-------------------------|-----------|---|
| | | brackish wetlands in New York State | | | mer/#habitat |
| Appalachian Azure | <i>Celastrina neglectamajor</i> | Rich deciduous forest with the foodplant Black Cohosh (<i>Actaea racemosa</i>) in the understory. | Not Listed / Not Listed | S1S3 / G4 | https://guides.nynhp.org/appalachian-azure/ |
| Comet Darner | <i>Anax longipes</i> | Inhabits a wide variety of (semi)permanent small lakes, coastal plain ponds, abandoned shallow quarry ponds, natural rocky ponds, and sometimes constructed farm ponds. The habitat feature in common seems to be an abundance of floating and submerged vegetation | Not Listed / Not Listed | S2S3 / G5 | https://guides.nynhp.org/comet-darner/#habitat |
| Tiger Spiketail | <i>Cordulegaster erronea</i> | Coldwater streams, small spring trickles, or seeps in partial shade that are too small for fish where there is a constant, slight water flow and a non-silt substrate | Not Listed / Not Listed | S1 / G4 | https://guides.nynhp.org/tiger-spiketail/ |
| Arrowhead Spiketail | <i>Cordulegaster obliqua</i> | Arrowhead spiketails oviposit and spend most of their time at small spring fed streams and seeps with soft bottoms and sometimes rocks. These streams are usually in forested areas although the seepage areas themselves may be in small areas of more open habitat types such as meadows dominated by ferns and other moisture dependent herbaceous plants. Adults may feed in forest clearings in the vicinity of the principal breeding habitat. | Not Listed / Not Listed | S3 / G4 | https://guides.nynhp.org/arrowhead-spiketail/ |
| Mocha Emerald | <i>Somatochlora linearis</i> | Inhabit small, shaded streams in forested areas that are about 1-3 yards wide with sand, gravel, or rocky substrates. Larvae are aquatic and found in the water during this life stage, whereas adults are terrestrial and are found in habitats surrounding forested streams. | Not Listed / Not Listed | S2S3 / G5 | https://guides.nynhp.org/mocha-emerald/ |

25. Terrestrial Areas of Ecological Importance

Description:

The integrity and richness of significant natural communities, especially forest communities, often depend on the expanse of contiguous forest surrounding each community. As we saw in previous sections of this chapter, the biodiversity of an ecosystem can be heavily influenced by

its total uninterrupted area, in addition to its connection to other rich ecosystems and the unique geology, topography and hydrology both within and around the ecosystem. With this in mind, we created this map in order to show the connection between significant natural communities and large forest areas within Philipstown.

According to the Hudson River Estuary Program, “Conserving and managing large forested areas is necessary to provide wildlife habitat, clean water, climate moderation, and economically viable forest products. In general, larger forests provide greater ecological value than smaller, fragmented patches. However, the value of each forest is relative to the values of other forests in the community, watershed, or natural landscape. Even small patches of forest can be extremely valuable depending on different factors. For example, a network of forest patches along a stream can create a riparian corridor that helps maintain water quality and wildlife habitat, and that serves as a travel route for forest animals. Similarly, wooded hedgerows in an agricultural landscape often provide a refuge for animals that do not typically use agricultural fields.

“A great diversity of forest types occur across the Hudson Valley, including a range of upland hardwood and conifer forest communities and more unusual occurrences such as pitch pine-oak-heath barrens, mountain spruce-fir forest, and patches of old growth. Mature lowland forests with uncompacted soils and diverse herbaceous plant communities are rare remnants of ecosystems that were once widespread in the region (Penhollow et al. 2006). Many wildlife species depend on intact forests isolated from human development, including migratory songbirds, red-shouldered hawk, bobcat, black bear, and timber rattlesnake.

“Despite their wide extent, experts are concerned with the future of New York’s forests. New York’s forest land is largely privately owned and unprotected from development. The fragmentation of large blocks of uninterrupted forests into smaller areas is a problem of statewide concern, and the number of large forest tracts is rapidly declining in many areas. Smaller forest blocks generally have reduced habitat value, are more vulnerable to the spread of invasive species, and are less viable for timber production. Limited forest regeneration is also a concern, particularly in southeastern New York State; sustained overbrowse by deer is one of the contributing factors (Shirer and Zimmerman 2010).”²⁵

Matrix forests blocks “represent the largest, most intact forests in the northeastern United States, whose size and natural condition allow for the maintenance of ecological processes, forest communities, and populations of forest-interior species. Conserving large, high quality forests and connections between them will allow plants and animals to move north and higher in

²⁵ Haeckel, Ingrid, and Laura Heady. Creating a Natural Resources Inventory: A Guide for Communities in the Hudson River Estuary Watershed. (Ithaca, NY: Department of Natural Resources, Cornell University, and New York State Department of Environmental Conservation, 2014): <https://www.dec.ny.gov/lands/100925.html>.

elevation as the climate warms.”²⁶ Data for this layer comes from the NYSDEC’s “Matrix Block and Linkages” dataset. The Matrix Forest Blocks were developed in partnership between the New York Natural Heritage Program and The Nature Conservancy. The goal of the matrix forest selection for this dataset was to “identify viable examples of the dominant forest types that, if protected and allowed to regain their natural condition, would serve as critical source areas for all species requiring interior forest conditions or associated with the dominant forest types.”²⁷

Forest Linkage Zones on the other hand are “largely intact forested connections between matrix forest blocks that allow animals and plants to move or disperse across the landscape. Forest linkages enable genetic exchange among populations and will allow plants and animals to move north and higher in elevation as the climate warms.”²⁸ This portion of the dataset was developed by the New York Natural Heritage Program.

“Critical Environmental Areas,” according to the NYSDEC, refers to “areas that have been designated as Critical Environmental Areas (CEAs) under 6 NYCRR Part 617 - State Environmental Quality Review (SEQR). Local agencies may designate specific geographic areas within their boundaries as a "Critical Environmental Area" (CEA). State agencies may also designate as a CEA a geographic area which they own, manage or regulate. To be designated as a CEA, an area must have an exceptional or unique character which has a benefit or threat to human health, a natural setting (e.g. fish and wildlife habitat, forest and vegetation, open space and areas of important aesthetic or scenic quality), agricultural, social, cultural, historic, archaeological, recreational, or educational values, or an inherent ecological, geological or hydrological sensitivity that may be adversely affected by any change.”²⁹ Although there are no designated Critical Environmental Areas within Philipstown, there are several along the borders of the town and thus we have included them on the map for reference.

We have also included generalized terrestrial layers for the New York Natural Heritage Program’s Significant Natural Communities, which were covered in detail in Section 23. Significant Natural Communities, in order to highlight how the majority of these significant communities occur within the Matrix Forest Block. All non-wetland forests and grasslands were generalized as “Terrestrial,” and freshwater wetlands were categorized as “Palustrine.” The following are the summary descriptions for each of these natural community categories:

²⁶ The Nature Conservancy Eastern Conservation Science and the New York Natural Heritage Program, Matrix Forest Blocks, Information About the Layers, Hudson Valley Natural Resource Mapper, 2006, <https://gisservices.dec.ny.gov/gis/hvnrm/layerInfo.html#mfb>

²⁷ The Nature Conservancy (TNC) Eastern Conservation Science, Matrix Forest Blocks and Linkages, Metadata - Purpose, 2012, http://gis.ny.gov/gisdata/metadata/nysdec.MatrixForestBlocksAndLinkages_Meta.xml

²⁸ The Nature Conservancy Eastern Conservation Science and the New York Natural Heritage Program, Forest Linkage Zones, Information About the Layers, Hudson Valley Natural Resource Mapper, 2006, <https://gisservices.dec.ny.gov/gis/hvnrm/layerInfo.html#flz>

²⁹ NYSDEC, Critical Environmental Areas in New York State, Metadata - Description, 2013, http://gis.ny.gov/gisdata/metadata/nysdec.Critical_Env_Areas_Metadata.html

“Palustrine: The palustrine system consists of non-tidal, perennial wetlands characterized by emergent vegetation. The system includes wetlands permanently saturated by seepage, permanently flooded wetlands, and wetlands that are seasonally or intermittently flooded (these may be seasonally dry) if the vegetative cover is predominantly growing in water and soils are hydric (soil that formed under conditions of saturation, flooding or ponding). Wetland communities are distinguished by their plant composition, substrate, and flooding regime. Peatlands, including bogs and fens, are a special type of wetland in which the substrate primarily consists of accumulated peat (partly decomposed plant material such as mosses, sedges, and shrubs) or marl (organically derived calcium carbonate deposits), with little or no mineral soil. In a natural landscape there are continuous gradients in soils from mineral soils to peat soils. The boundaries between different types of wetlands are not always discreet. Several different types of wetlands may occur together in a complex mosaic.

“Terrestrial: The terrestrial system consists of upland habitats. These habitats have well-drained soils that are dry to moist, and vegetative cover that is never predominantly growing in water, even if the soil surface is occasionally or seasonally flooded or saturated. In other words, this is a broadly defined system that includes everything except aquatic, wetland, and subterranean communities.”³⁰

Findings:

Much of Philipstown is part of the 51,402 acre “Hudson Highlands” matrix forest, which also covers most of Putnam Valley and sections of Fishkill, East Fishkill and Kent. This large matrix forest is connected to the 16,384 acre West Point/Black Rock matrix forest via the Forest Linkage Zone between Storm King Mountain and Crow’s Nest (horizontal lines near Route 218), and also is connected to the 28,730 Mid-Dutchess matrix forest via a Forest Linkage Zone that starts off the map in the town of Kent. To see these other matrix forests and linkage zones, please visit the Hudson Valley Natural Resource Mapper at <https://gisservices.dec.ny.gov/gis/hvnrm/> and select “Forest Linkage Zones” and “Matrix Forest Blocks” under the “Forest Layers” category.

It is also noteworthy that the majority of significant terrestrial and palustrine communities within Philipstown can be found within the Hudson Highlands matrix forest. This should be no surprise since we have already seen how high biodiversity, rare species and unique ecological communities often depend on large buffers from developed areas, and thus they are most likely to be found in large, high-quality forested areas. High quality estuarine communities, on the other hand, do not depend as much on forest buffers as they do on shoreline protection from

³⁰ NYSDEC, Ecological Community System Descriptions, New York Natural Heritage Program, 2020 <https://guides.nynhp.org/community-systems/#systems>

development, which is exemplified by conservation efforts along the shores of Constitution Marsh.

It is also worth emphasizing that the fairly large area of significant terrestrial communities in the southwest corner of town are not considered part of the Matrix Forest. This is most likely due to the number of roads surrounding the area that makes the contiguous forest too small to be considered a matrix forest block. This highlights how even a fairly sizable section of forest that is home to significant communities can be considered a lower quality forest due to being cut off from other continuous forest areas, even though the condition of the forest itself may be strong and rich with biodiversity (as the next section of this chapter will show). Thus, efforts to connect this area of forest to the larger matrix forest block are even more important in order to allow safe passage for wildlife and to maintain and even strengthen biodiversity within each forest. Groups such as the Hudson Highlands Land Trust have been working to permanently protect areas that can serve as corridors to connect high quality forests and other ecological communities. Please see Section 39. Conservation Open Areas and Open Space Overlay for more information on this effort.

Although not found within Philipstown, it's worth noting the presence of Critical Environmental Areas (CEAs) along the town's borders. First, along the border with Fishkill is the Fishkill Aquifer Protection Area, which was designated as a CEA in 1992 in order to protect the Clove Creek Aquifer for the Town of Fishkill's public drinking water supply. As noted above, CEAs are established either by a municipal government or state agency in order to provide additional protections to an area of significant natural resource. If the town of Philipstown wanted to establish a CEA for the section of the Clove Creek aquifer within Philipstown, for example, it could do so. For more information on CEAs, please visit:

<https://www.dec.ny.gov/permits/6184.html>.

Other nearby CEAs include the Peekskill Hollow Brook CEA on the southern border of Philipstown, which Westchester County designated in 1990 due to the brook's exceptional and unique character, both ecologically and historically, as well as the Hudson River CEA established by Westchester County in 1990 to protect the entire eastern shoreline of the Hudson River in Westchester County in order to preserve its unique and exceptional character from excessive development (although one can argue that there has been much deleterious development on the river's shores in Westchester nonetheless). The northern tip of this latter CEA is visible in the southwest corner of this NRI's map. To see the full scale of nearby CEA's as well as others throughout the state, please visit the Hudson Valley Natural Resource Mapper at: <https://gisservices.dec.ny.gov/gis/hvnrm/> and select "Critical Environmental Areas" under "Reference Layers."

Data Sources:

- Matrix Forest Blocks & Forest Linkage Zones
 - NYSDEC Matrix Forest Blocks and Linkages
<http://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1261>
- Critical Environmental Areas
 - Critical Environmental Areas - New York State (NYSDEC)
<https://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1330>
- Natural Communities
 - Natural Heritage Community Occurrences - NYNHP
<http://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1241>

26. Forest Condition Index*Description:*

According to the Hudson River Estuary Program’s Forest Condition Index Fact Sheet, “forests are a critical component of healthy watersheds, and have tremendous ecologic and economic value. They provide habitat for wildlife and plants, protect water and air quality, mitigate the effects of climate change, and provide opportunities for outdoor recreation and the forest products industry. While approximately 65% of the Hudson River estuary watershed is forested, the condition of that forest land is variable, with only about half meeting the criteria of higher-quality, intact core forest. In 2019, the Hudson River Estuary Program partnered with the New York Natural Heritage Program to assess the condition of forests in the watershed so that conservation, restoration, and management decisions can be informed by the best available data.

“The Forest Condition Index is a spatial data set that: 1) Identifies forest patches >100 acres using the most recent land cover data, and 2) Estimates the condition of each forest patch relative to other patches in the watershed using a variety of region-wide data. The 2019 index improves upon previous forest patch data for the estuary watershed by considering not only size, but also condition. Forests included in the index were identified using the 2016 National Land Cover Database. All roads and railroads were removed to reveal patches of continuous forest. Forests at least 100 acres in size were then selected to create a large forest patch data layer. The forest patches were further analyzed to delineate core forests, which are interior forest areas at least 100 meters from a forest edge.

“To create the index, large forest patches were assigned points for 22 metrics relating to forest size, fragmentation (e.g. proportion of core forest to overall patch size), habitat connectivity (e.g. proportion of forest cover in the surrounding area), stressors (e.g. density of nearby roads), habitat and ecosystem values (e.g. presence of rare species and significant ecosystems), and carbon sequestration. Points for each forest patch were summed and used to rank the forest patches by percentile. The resulting Forest Condition Index estimates the condition and relative importance of each large forest patch relative to other forests in the estuary watershed. The complete Forest Condition Index methodology is available in the project report at <https://www.nynhp.org/forest-patches>.”³¹

Findings:

As you can see, Philipstown is blessed with an enormous area of high quality forests, which in this case are considered to be in the top 20% or higher of forests in the Hudson Valley. Of the three largest forest blocks that meet this criteria, the block along the northeastern border of town is the highest quality, within the 98.6 percentile of Hudson Valley forests, followed by the forest block on the eastern border of town between Indian Brook Road and South Highlands Road, which is in the 97.9 percentile, and then the forest block that covers Hudson Highlands State Park and its vicinity, which is in the 93.6 percentile. Other areas rated as high quality within the town are between the 80th and 90th percentiles. Detailed scoring breakdowns for each of these forest blocks as well as the other blocks in and around Philipstown can be reviewed using the Hudson Valley Natural Resource Mapper at: <https://gisservices.dec.ny.gov/gis/hvnrm/>. Select “Forest Condition Index (Percentile)” under Forest Layers and then select a forest block to pull up a window with more details.

It is not surprising, unfortunately, that Route 9 serves as a major disconnecter between high quality forests within Philipstown, as the map shows. Both the Hudson Highlands State Park forest block as well as the forest block between Route 403, Route 9D and Route 9 are cut off from the high quality forest corridor along the eastern border of Philipstown and throughout Clarence Fahnestock State Park by the high-speed and busy corridor of Route 9. Those forest areas that are found between these high quality areas are much smaller and suffer from lower forest condition ratings, thus making it more challenging for wildlife to move between forest areas of higher quality. That said, even lower quality forests can still play important roles as habitat corridors and also in terms of carbon sequestration, which will be explored in more detail in Section 38. Land Cover and Forest Types. Some of the lower quality forests may be too small to do much about their forest condition rating since the size of their interior core forest (the section of forest that is at least 100 meters from the nearest forest edge) is so small and thus limits biodiversity and other ecosystem services, but other sections may benefit from strategic

³¹ Haeckel, Ingrid and Nate Nardi-Cyrus, Forest Condition Index Fact Sheet, Hudson River Estuary Program, NYSDEC, https://www.nynhp.org/sites/default/files/ForestIndex_FactSheet_FINAL.pdf

forest management, removal of invasive species, and changes to speed limits or other measures to limit the impacts of motor vehicles on forest quality, wherever possible.

The ratings of each forest index type “can be incorporated into proactive conservation and land-use planning by municipalities, land trusts, watershed alliances, and other groups. Combined with additional data sets and community input, the index can help set conservation goals. The index can also identify opportunities to preserve or restore forests with high landscape connectivity, habitat and ecosystem values, or other notable properties.”³² Specifically it can be used to prioritize which private parcels of land should be targeted for conservation easements or for potential public purchase and management both for the sake of improving habitat connectivity, but also to protect other vital ecosystem services such as carbon sequestration.

According to the Hudson River Estuary Program, “although thousands of acres of forest land in New York are protected by government agencies or conservation organizations, 14 million acres (75% of the state’s forested area) are privately owned and generally vulnerable to fragmentation and degradation. The Forest Condition Index can inform planning and stewardship to conserve large forests and the numerous benefits they provide. General measures to conserve forest values include:

- “Protect large, unfragmented forests.
- Avoid or minimize disturbance to core (interior) forest habitat. Preserve broad forest corridors to maintain habitat connectivity.
- Concentrate new development along existing roads or forest edges.
- Allow sound forestry and promote sustainable forest uses.”³³

Further Study:

The Hudson River Estuary Program recommends the following for further study:

- “Biodiversity assessment can produce more accurate and detailed information about forest cover, type, and habitat quality. See Appendix E for details. Managed forest land. Landowners with at least 50 contiguous acres of forest are eligible to participate in the New York State 480-A tax law program, which encourages the long-term management of woodlands to produce forest crops and offers landowners property tax reductions. Landowners must follow a DEC-approved forest management plan for 10 consecutive years upon entering the program. Information on parcels enrolled in the 480-A program can be obtained from the local tax assessor’s office or from the DEC Forest Stewardship Program.

³² Ibid.

³³ Haeckel, Ingrid and Nate Nardi-Cyrus, Forest Condition Index Fact Sheet, Hudson River Estuary Program, NYSDEC, https://www.nynhp.org/sites/default/files/ForestIndex_FactSheet_FINAL.pdf

- “Potential lands for sustainable forestry (silvicultural potential). Identifying and encouraging an increase in the acreage of sustainably managed forest can help maintain land in a forested use and benefit wildlife, water quality, and other natural resources. The analysis should exclude lands with steep slopes, which are more vulnerable to negative impacts from soil disturbance. A full methodology for identifying potential silvicultural lands is provided in the Green Infrastructure Center’s publication *Evaluating and Conserving Green Infrastructure Across the Landscape: A Practitioner’s Guide*.”³⁴

Also, the New York Natural Heritage program, which developed the Forest Condition Index suggests that local on-the-ground forest condition studies should complement this dataset to ensure that the forest condition ratings accurately represent the forest blocks within Philipstown: “The best way to assess the condition of a forest is to conduct a field survey and quantify the native species, invasive species, structural and habitat heterogeneity, forest health indicators, forest stress indicators, and other measures of forest condition. Lacking the ability to visit every forest patch, however, there are many remote measures that estimate different aspects of forest health that might be used, in concert, to estimate forest condition. These data are intended to be used to provide additional information and context to municipalities and land use managers about the character of their forests to aid in management, planning, and conservation priority setting. They are not meant to substitute for on the ground condition assessments.”³⁵ This suggests that follow up studies to confirm the findings of this Forest Condition Index dataset would be useful to the town’s long-term conservation goals.

Data Sources:

- Forest Condition Index
 - NYSDEC Hudson Valley Forest Index
<http://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1364>

27. Significant Coastal Habitat

Description:

According to the Hudson River Estuary Program, “the 153-mile stretch of the Hudson River from the Federal Lock and Dam in Troy to New York Harbor is tidal and thus defined as an estuary. The state of Hudson River shorelines varies from natural to engineered, from tidal

³⁴ Haeckel, Ingrid, and Laura Heady. *Creating a Natural Resources Inventory: A Guide for Communities in the Hudson River Estuary Watershed*. (Ithaca, NY: Department of Natural Resources, Cornell University, and New York State Department of Environmental Conservation, 2014): <https://www.dec.ny.gov/lands/100925.html>.

³⁵ Conley, A. K., et. al, Hudson Valley Forest Patch Update and Assessment, New York Natural Heritage Program, December 2019, https://www.nynhp.org/sites/default/files/Forest_Patch_Assessment_NYNHP_2019_20200228.pdf

habitat to industrial waterfront. Knowing the status of tidal shoreline habitat can help guide restoration and management of a more natural shoreline and identify natural shorelines that might be priorities for conservation. Furthermore, global sea level rise will fundamentally affect the shoreline of the Hudson River estuary in the coming decades. Natural shorelines will potentially allow for the migration of tidal and shoreline habitats as sea level rises.

“Tidal marshes, submerged aquatic vegetation (SAV), mudflats, and other significant habitats in and along the estuary support a great diversity of life and contribute to the economic significance of the estuary. More than 200 species of fish are found in the Hudson, including key commercial and recreational species like striped bass, and species of conservation concern like Atlantic and shortnose sturgeon. SAV beds consist of under-water plants that improve water quality in the Hudson and provide essential habitat for invertebrate animals, which feed fish and waterfowl that use the estuary. Tidal wetland habitats play a critical role as nursery grounds for fish and shellfish species, as well as providing nesting sites and migration stops for birds and sources of nutrients for the estuary food web. These wetland systems also help filter pollutants, buffer shoreline properties, and help stabilize the river’s shoreline.”³⁶

The Significant Coastal Habitat on this map comes from the NYSDEC, which “has identified and evaluated coastal habitats throughout the state’s coastal regions, providing recommendations to the New York State Department of State so that the most important or ‘significant’ habitats may be designated for protection in accordance with the New York Waterfront Revitalization and Coastal Resources Act (Executive Law, Article 42). The Significant Coastal Fish and Wildlife Habitats are useful for planning at the local level because they describe the highest quality habitats on the Hudson, outlining fish and wildlife values and activities that may have large impacts on the habitats.”³⁷

Specific protection for such areas involve a Habitat Impairment Test. Such a test “must be met for any activity that is subject to consistency review under Federal and State laws, or under applicable local laws contained in an approved local waterfront revitalization program. If the proposed action is subject to consistency review, then the habitat protection policy applies, whether the proposed action is to occur within or outside the designated area. The specific habitat impairment test that must be met is as follows. In order to protect and preserve a significant habitat, land and water uses or development shall not be undertaken if such actions would: 1. destroy the habitat; or, 2. significantly impair the viability of a habitat.”³⁸ More information on this test can be found at:

³⁶ Haeckel, Ingrid, and Laura Heady. *Creating a Natural Resources Inventory: A Guide for Communities in the Hudson River Estuary Watershed*. (Ithaca, NY: Department of Natural Resources, Cornell University, and New York State Department of Environmental Conservation, 2014): <https://www.dec.ny.gov/lands/100925.html>.

³⁷ Ibid.

³⁸ NYS Department of State (DOS), Coastal Fish and Wildlife Rating Form, Hudson Highlands, 2021, https://www.dos.ny.gov/opd/programs/consistency/Habitats/HudsonRiver/Hudson_Highlands_FINAL.pdf

https://www.dos.ny.gov/opd/programs/consistency/Habitats/HudsonRiver/Hudson_Highlands_FI_NAL.pdf

And a detailed summary of the rating system for Significant Coastal Habitats can be found at:

https://www.dos.ny.gov/opd/programs/pdfs/1984_SCFWH_technical_memorandum.pdf

Tidal Wetland Community Types were also included on the map. These wetlands “occur in slightly salty or brackish conditions in the southern and middle reaches of the estuary, and freshwater conditions in the northern reaches. The distribution of Hudson River estuary tidal wetlands from Hastings-on-Hudson to Troy was mapped in 2007. Each mapped wetland was assigned a classification; for example, lower intertidal mix or wooded swamp.”³⁹ This layer was created by Cornell University’s Institute for Resource Information Sciences (IRIS), the Hudson River National Estuarine Research Reserve and the Hudson River Estuary Program.

Findings:

Significant Coastal Habitat:

Philipstown has three Significant Coastal Habitats:

- Hudson Highlands: which extends along the eastern shore of the Hudson River from the border of Philipstown and the Town of Fishkill all the way down to Verplanck in the Town of Cortlandt.
- Constitution Marsh: Philipstown’s most substantial tidal wetland.
- Manitou Marsh: A tidal wetland located in the southwest corner of Philipstown.

We have included below the full program descriptions⁴⁰ of each of the above Significant Coastal Habitats for convenience. Each of these summaries, including point breakdowns showing how the habitats earned their “significant” ratings, can also be found at:

<https://www.dos.ny.gov/opd/programs/consistency/scfwhabitats.html#hudson>

³⁹ Haeckel, Ingrid, and Laura Heady. Creating a Natural Resources Inventory: A Guide for Communities in the Hudson River Estuary Watershed. (Ithaca, NY: Department of Natural Resources, Cornell University, and New York State Department of Environmental Conservation, 2014): <https://www.dec.ny.gov/lands/100925.html>.

⁴⁰ NYS Department of State, Significant Coastal Fish and Wildlife Habitats, Hudson River, <https://www.dos.ny.gov/opd/programs/consistency/scfwhabitats.html#hudson>

“Hudson Highlands:

“LOCATION AND DESCRIPTION OF HABITAT: Hudson Highlands extends roughly from Denning’s Point to Stony Point, in the Towns of New Windsor, Cornwall and Highlands, Orange County; Stony Point, Rockland County; Fishkill, Dutchess County; Philipstown, Putnam County; and Cortlandt, Westchester County (7.5' Quadrangles: West Point, N.Y.; and Peekskill, N.Y.; Haverstraw, N.Y.). The fish and wildlife habitat encompasses 6,700 acres of the main river channel below mean low water and adjacent shallows and shoals, over an approximate twentymile reach. This area is a very narrow and deep (up to 200 feet deep) section of the Hudson River with strong currents and a rocky bottom substrate. The land area bordering Hudson Highlands is predominantly steep, rocky, hillsides with a variety of land uses including undeveloped forestland (e.g., Storm King, Bear Mountain, and Hudson Highlands State Park Preserve), small urban centers, and the West Point Military Reservation. In addition, railroad tracks closely follow the shoreline on both sides of Hudson River in this habitat area. Water salinity throughout is variable as the salt front migrates up and down the river through this area depending on tidal conditions and the amount of freshwater inflows up-river, which are dependent on seasonal weather patterns and extreme events. US Geological Survey data between 1992 and 2012 show that the salt front can occur on a daily basis from as far south as the Battery (RM 0) to north of Poughkeepsie (RM 77), but during this 20 year period the salt front was generally between River Miles 30-70. The habitat also includes most of Iona Island, which is part of the Hudson River National Estuarine Research Reserve, an area dedicated to environmental research and education. The submerged aquatic vegetation beds occurring along the eastern shore are dominated by water celery (*Vallisneria americana*).

“FISH AND WILDLIFE VALUES: Hudson Highlands is the Hudson’s deepest and narrowest segment, with strong currents and rocky substrates. The inputs of three major tributaries (Wappinger, Fishkill, and Moodna Creeks) contribute to the development of strong currents within the narrow, deep river channel. The combination of swift currents, rocky substrates, and freshwater inflow (during spring runoff) over this large area provides highly favorable conditions for reproduction by coastal migratory fishes, especially striped bass (*Morone saxatilis*). Based on egg abundance data, Hudson Highlands is one of two areas of high striped bass egg deposition in the estuary. Generally, striped bass enter the area to spawn in May and June; the adults leave the area shortly after spawning and within several weeks the eggs have hatched and larval fish begin moving downstream to nursery areas in the brackish portion of the Hudson River. Although the commercial fishery for striped bass in the Hudson River was closed in 1985, the Hudson Highlands contributes to coastal commercial and recreational fisheries.

Deepwater areas such as Hudson Highlands are also used by concentrations of species that spawn elsewhere in the Hudson River estuary. Deep areas are used as migrational routes by Atlantic sturgeon (*Acipenser oxyrinchus*) (E) and shortnose sturgeon (*Acipenser brevirostrum*) (E) and are important nursery areas and summering areas for juvenile Atlantic sturgeon and summering areas for post-spawn adults. As the salt front moves up through this area a variety of marine species, such as bluefish, anchovy, silversides, and blue claw crab may also enter the area. Associated with the fisheries resources in Hudson Highlands is a significant concentration of wintering bald eagles (*Haliaeetus leucocephalus*) (T). Because this area rarely freezes in winter it provides a dependable forage habitat for these birds. Winter residence in the area generally extends from December through March. These birds feed throughout Hudson Highlands, and Iona Island is a primary roosting area; the latter has been designated an eagle sanctuary by the Palisades Interstate Park Commission. Other roosting areas include undisturbed woodlands along both sides of the river, especially near 3 sheltered coves. The concentrations of anadromous and marine fishes occurring in Hudson Highlands results in recreational fishing opportunities within the area, attracting visitors from throughout the lower Hudson Valley. Hudson Highlands is a critical habitat for most estuarine-dependent fisheries originating from the Hudson River. This area contributes directly to the production of in-river and ocean populations of food, game, and forage fish species. Consequently, commercial and recreational fisheries throughout the Atlantic Coast benefit from these biological inputs from the Hudson River estuary.

“IMPACT ASSESSMENT: Any activities that would degrade water quality, increase turbidity, increase sedimentation, or alter flows, temperature, or water depths in the Hudson Highlands would result in significant impairment of the habitat. Of primary concern in this deep estuarine area would be diversion of freshwater flows out of the Hudson, contamination by toxic chemicals, major structural alterations to the underwater habitat (e.g., dredging, filling, or construction of jetties), and thermal discharges. All species may be adversely affected by water pollution, such as chemical contamination (including food chain effects resulting from bioaccumulation), oil spills, excessive turbidity or sediment loading, nonpoint source runoff, and waste disposal (including vessel wastes). Discharges or runoff of sewage effluent, pesticides, or other hazardous materials into the river could result in adverse impacts on the habitat area. Any physical modification of the habitat or adjacent wetlands, through dredging, filling or bulkheading, would result in a direct loss of valuable habitat area. Transient habitat disturbances, such as dredging or in-river construction activities, could have significant impacts on striped bass populations during spawning and incubation periods (May-July, primarily). Habitat disturbances would be most detrimental during bird nesting, and fish spawning and nursery periods, which generally extend from April through August for most warm water species, as well as bald eagle overwintering periods (December through March). Thermal

discharges, depending on time of year, could have adverse effects on use of the area by migratory and resident species. Activities that result in the presence of significant electric, magnetic, or electromagnetic fields may affect benthic communities, migratory fish movement, and fish egg and larval development. Entrainment and impingement causes significant mortality to all life stages of fish, including endangered species. Activities that would enhance migratory, spawning, or nursery fish habitat, particularly where an area is essential to a species' life cycle or helps to restore an historic species population would be beneficial. It is essential that activities in the vicinity of Iona Island also be evaluated with respect to its use for environmental research and education, and the need to maintain natural or controlled experimental conditions.

“Constitution Marsh:

“LOCATION AND DESCRIPTION OF HABITAT: Constitution Marsh is located on the east side of the Hudson River, between the villages of Garrison and Cold Spring, in the Town of Philipstown, Putnam County (7.5' Quadrangle: West Point, N.Y.). The fish and wildlife habitat is an approximate 430 acre wetland, separated from the Hudson River by Constitution Island and the Metro North railroad. The predominant ecological communities in the area include tidal marshes and flats, ranging in salinity from freshwater to brackish. Approximately three-fourths of this area is tidal emergent marsh, dominated by narrow-leaved cattail (*Typha angustifolia*); the remainder is predominantly intertidal mudflats, and shallow, subtidal beds of aquatic vegetation, mainly water celery (*Vallisneria spiralis*). Constitution Marsh receives freshwater inflows from several small, high gradient, coldwater streams, including Foundry Brook, Indian Brook and Philipse Brook. The wetland is hydrologically connected to the Hudson River through openings in the railroad causeway at each end of Constitution Island. The land area surrounding Constitution Marsh is generally steep, rocky, currently undeveloped, forestland. Most of the Constitution Marsh fish and wildlife habitat is owned by New York State and is managed by the National Audubon Society as a wildlife sanctuary. Scenic Hudson owns and manages a portion of Foundry Cove. Remaining portions are privately owned. This area provides habitat for numerous threatened and endangered plant species: clustered sedge (*Carex cumulata*) (T), Eastern annual saltmarsh aster (*Symphyotrichum subulatum*) (T), Long's bittercress (*Cardamine longii*) (T), smooth bur-marigold (*Bidens laevis*) (T), spongy arrowhead (*Sagittaria calycina*) (T), and water pigmyweed (*Crassula aquatica*) (E). Habitat disturbances include invasive plant species including common reed (*Phragmites australis*), purple loosestrife (*Lythrum salicaria*) and water chestnut (*Trapa natans*) and past chemical pollution. The chemical pollution (especially cadmium and nickel) is the result of past discharges of wastewater from the Marathon Battery Company in Cold Spring. The contamination was concentrated at the

north end of Constitution Marsh in Foundry Cove and in the Hudson River. Remediation and restoration of the contaminated areas was completed in 1995.

“FISH AND WILDLIFE VALUES: Constitution Marsh is a large undeveloped tidal wetland with a diverse vegetation community and multiple freshwater inflows creating favorable habitat conditions for many fish and wildlife species. The extensive shallow water areas and stream mouths provide spawning and nursery habitat for a variety of coastal migratory and resident freshwater fishes. Species found in the area include alewife (*Alosa pseudoharengus*), blueback herring (*Alosa aestivalis*), white perch (*Morone americana*), striped bass (*Morone saxatilis*), American eel (*Anguilla rostrata*), banded killifish (*Fundulus diaphanous*), mummichog (*Fundulus heteroclitus*), four spined stickleback (*Apeltes quadracus*), and largemouth bass (*Micropterus salmoides*). Red-fiddler crabs (*Uca minax*) have been observed in the habitat area. Constitution Marsh is also used seasonally by snapper bluefish and Atlantic needlefish. The submerged aquatic vegetation provides food for fish, invertebrates and waterfowl as well as refuge for fish and invertebrates. This area also provides habitat for water snake (*Nerodia s. sipedon*), Eastern garter snake (*Thamnophis sirtalis*), black rat snake (*Elaphe obsoleta*), Eastern milk snake (*Lampropeltis triangulum*), red-spotted newt (*Notophthalmus v. viridescens*), Eastern redback salamander (*Plethodon cinereus*), Eastern American toad (*Bufo americanus*), gray treefrog (*Hyla versicolor*), spring peeper (*Pseudacris crucifer*), American bullfrog (*Rana catesbeiana*), green frog (*Rana clamitans*) and wood frog (*Rana sylvatica*). 3 Sizeable populations of common snapping turtle (*Chelydra serpentina*) have been reported in the area as well. Eighty-one bird species have been confirmed or are probable breeders at Constitution Marsh. This marsh is especially important for marsh-nesting birds; probable or confirmed breeding species include green backed heron (*Butorides virescens*), Virginia rail (*Rallus limicola*), least bittern (*Ixobrychus exilis*) (SC), Canada goose (*Branta canadensis*), mallard (*Anas platyrhynchos*), wood duck (*Aix sponsa*), spotted sandpiper (*Actitis macularia*), belted kingfisher (*Ceryle alcyon*), marsh wren (*Cistothorus palustris*), red winged blackbird (*Agelaius phoeniceus*), willow flycatcher (species at-risk) (*Empidonax traillii*), and swamp sparrow (*Melospiza georgiana*). A number of other birds are known to utilize the marsh and surrounding woodlands, including sora (*Porzana carolina*), American black duck (*Anas rubripes*), American goldfinch (*Carduelis tristis*), common yellowthroat (*Geothlypis trichas*), yellow warbler (*Dendroica petechia*), merlin (regular migrant) (*Falco columbarius*), blue-winged warbler (probable breeder), cerulean warbler (*Vermivora pinus*) (SC), worm-eating warbler (*Helmitheros vermivorus*) (species at-risk in adjacent woodlands), and Canada warbler (*Wilsonia canadensis*) (regular migrants). Concentrations of herons, waterfowl, and shorebirds also occur in Constitution Marsh during spring and fall migrations (March-April and September-November, respectively). American bittern (SC), osprey (*Pandion haliaetus*)(SC), bald eagle (*Haliaeetus*

leucocephalus) (T) Cooper's hawk (*Accipiter cooperii*)(SC), least bittern (*Ixobrychus exilis*) (T) hundreds of American black duck, bobolink (*Dolichonyx oryzivorus*), common grackle (*Quiscalus quiscula*), mallard (*Anas platyrhynchos*), red winged blackbird (*Agelaius phoeniceus*), swallows, willow flycatcher (*Empidonax traillii*), wood duck (*A. sponsa*), Northern harrier (*Circus cyaneus*)(T), osprey (*P. haliaetus*) (SC), peregrine falcon (*Falco peregrinus*)(E), pied-billed grebe (*Podilymbus podiceps*) (T), red-shouldered hawk (*Buteo lineatus*)(SC) and sharp-shinned hawk (*Accipiter striatus*)(SC) have been observed in this habitat. Bald eagles (*H. leucocephalus*) have been observed nesting in the vicinity of the marsh. The diversity and abundance of wildlife species in Constitution Marsh is unusual in the lower Hudson River. Opportunities for birdwatching, wildlife photography, and informal nature study attract visitors from throughout the Hudson Valley. In addition, the National Audubon Society has an active program of environmental education and research focused on this productive wetland area.

“IMPACT ASSESSMENT: It is essential that any potential impacts on Constitution Marsh be evaluated with respect to its use for environmental research and education, and the need to maintain natural or controlled experimental conditions. Any activity that would substantially degrade water quality, increase turbidity or sedimentation, reduce freshwater inflows, or alter tidal fluctuations in Constitution Marsh would result in significant impairment of the habitat. Elimination of wetlands or shallow areas, through dredging, filling, or bulkheading, would result in a direct impact on valuable fish and wildlife habitats. Activities that would subdivide this relatively large, undisturbed area into smaller fragments should be restricted. Habitat management activities, including expansion of productive littoral areas, may be designed to maintain or enhance populations of certain fish or wildlife species. Despite past remedial action, contaminated soils remain. Any activity, other than further remediation, that would mobilize existing contaminants should be avoided. Elimination of existing adjacent wetland and forested habitats would adversely affect the habitat. Existing vegetated riparian buffer zones woodlands bordering Constitution Marsh should be maintained for their value as cover, soil stabilization, perch sites, and buffer zones; significant human encroachment into the adjacent area could adversely affect certain species of wildlife. Habitat disturbances would be most detrimental during bird nesting, and fish spawning and nursery periods, which generally extend from April through August for most warm water species. The submerged aquatic vegetation beds would be negatively impacted by changes in the littoral zone through dredging and/or filling as well as changes in water quality. Where opportunities exist, appropriate restoration of intertidal and subtidal shallow habitats should be undertaken using the best available science and proper monitoring protocols. Restoration and enhancement efforts should be monitored, and the associated habitat effects should be reported and evaluated. The presence of invasive species and the

expansion of their range within the habitat may result in changes in native plant, vertebrate and invertebrate species composition and abundance. In particular, changes in plant communities may affect marsh-nesting birds. Effective control of invasive plant species, through a variety of means, may improve fish and wildlife species use of the area. Control methods, including biological controls and regulated use of herbicides must only be implemented, if other methods of control have been explored, and then only under permit with strict adherence to all precautionary measures to avoid impacts to non-target species. The primary goals of such efforts must be recovery and maintenance of habitat for native fish and wildlife species.

“Manitou Marsh:

“LOCATION AND DESCRIPTION OF HABITAT: Manitou Marsh is an approximately 75-acre enclosed freshwater to low salinity tidal marsh located on the eastern shore of the Hudson River in the Town of Philipstown in Putnam County (7.5' Quadrangles: Peekskill N.Y.). This marsh is almost completely hydrologically isolated from the Hudson River by a railroad causeway and natural ledge. Two culverts allow water interchange with the Hudson River. Manitou Station Road bisects the wetland into northern and southern sections, although water flows through a small culvert. The marsh is bordered by upland forest to the east and railway causeway to the west. This habitat is dominated by narrow-leaf cattail (*Typha angustifolia*) with arrow arum (*Peltandra virginica*) inhabiting banks of creeks and low elevation zones. The invasive species common reed (*Phragmites australis*) is the dominant plant in the northern portion of the site and is expanding into the southern portion of the marsh. Purple loosestrife (*Lythrum salicaria*) is distributed throughout the habitat. Beds of submerged aquatic vegetation, dominated by water celery (*Vallisneria spiralis*) are also found here. Manitou Marsh is part of Manitou Point Preserve, which is owned by Scenic Hudson and managed by the Scenic Hudson Land Trust. Disturbances to this habitat include activities related to a small residential community, activities along the railroad causeway, and expansion of invasive species.

“FISH AND WILDLIFE VALUES: Manitou Marsh provides important nursery habitat for resident freshwater, migratory and estuarine/marine species. Resident freshwater fish include carp (*Cyprinus carpio*), black-nose dace (*Rhinichthys atratulus*), yellow perch (*Perca flavescens*), redbreast sunfish (*Lepomis auritus*), golden shiner (*Notemigonus crysoleucas*), inland silverside (*Menidia beryllina*), pumpkinseed (*Lepomis gibbosus*), brown bullhead (*Ameiurus nebulosus*), bluegill (*Lepomis macrochirus*), Eastern silvery minnow (*Hybognathus regius*), largemouth bass (*Micropterus salmoides*). Migratory fish species include alewife (*Alosa pseudoharengus*), striped bass (*Morone saxatilis*), American eel (*Anguilla rostrata*), and blueback herring (*Alosa aestivalis*). Other estuarine resident species include: Northern pipefish (*Syngnathus fuscus*), naked goby (*Gobiosoma*

bosci), four-spined stickleback (*Apeltes quadracus*), mummichog (*Fundulus heteroclitus*), tessellated darter (*Etheostoma olmstedii*), spottail shiner (*Notropis hudsonius*), banded killifish (*Fundulus diaphanous*), white perch (*Morone americana*), Atlantic silverside (*Menidia menidia*), Atlantic needlefish (*Strongylura marina*), Atlantic blue crab (*Callinectes sapidus*) and grass shrimp. Red-jointed fiddler crab (*Uca minax*) have also been observed in the habitat area. The submerged aquatic vegetation, dominated by water celery (*Vallisneria americana*) provides food for fish, invertebrates and waterfowl as well as shelter for fish and invertebrates. Manitou Marsh supports a variety of waterfowl, wading birds and song birds including wood duck (*Aix sponsa*), mallard (*Anas platyrhynchos*), Virginia rail (*Rallus limicola*), great blue heron (*Ardea herodias*), belted kingfisher (*Ceryle alcyon*), marsh wren (*Cistothorus palustris*). Spotted turtle (*Clemmys guttata*) (SC), and wood turtle (*Clemmys insculpta*) (SC) have been observed in the area, however, additional information on the importance of the ecosystem to the species is needed prior to inclusion in the Species Vulnerability ranking. The area also provides habitat for spring peeper (*Pseudacris crucifer*), black racer (*Coluber constrictor*), snapping turtle (*Chelydra serpentina*), painted turtle (*Chrysemys picta*), Northern water snake (*Nerodia s. sipedon*) and green frog (*Rana clamitans*). Needham's skimmer (*Libellula needhami*) have also been observed in the area.

“IMPACT ASSESSMENT: Any activities that would degrade water quality, increase turbidity, increase sedimentation, or alter flows, temperature, or water depths in the Manitou Marsh would adversely affect the biological productivity of this area. All species may be affected by water pollution, such as chemical contamination (including food chain effects resulting from bioaccumulation), oil spills, excessive turbidity or sediment loading, nonpoint source runoff, and waste disposal. Any physical alteration of the habitat, through dredging, filling, or bulkheading, would result in a direct loss of valuable habitat area. However, habitat management activities, including expansion of productive littoral areas, may be designed to maintain or enhance populations of certain fish or wildlife species. Plans to reduce or eliminate the impacts of existing hydrological modifications should be developed, including improvements to fish passage, and/or the removal of obstructions or barriers. Habitat disturbances would be most detrimental during bird nesting, and fish spawning and nursery periods, which generally extend from April through August for most warm water species. Activities that would subdivide this largely undeveloped area into smaller fragments should not be allowed. Elimination or disturbance of wetland or shallow areas would result in a direct loss of valuable habitat. Vegetated upland buffer zones (e.g., wetlands and forested areas) should be protected, and where possible restored to provide bank cover, stabilize soil, maintain or improve water quality and provide buffer areas from development. Alteration to existing railroad causeways and bridges could affect the hydrology and extent of shoreline habitat areas. Any construction related to these structures should utilize the best available science and

technology to reduce and avoid negative impacts to the habitat area. The presence of invasive species and the expansion of their range within the habitat may result in changes in native plant, vertebrate and invertebrate species composition and abundance. In particular, expansion of common reed (*Phragmites australis*) has been correlated with reductions in populations of several marsh-breeding birds and declines in avian biodiversity. Effective control of invasive plant species, through a variety of means, may improve fish and wildlife species use of the area. Control methods, including biological controls and regulated use of herbicides must only be implemented, if other methods of control have been explored, and then only under permit with strict adherence to all precautionary measures to avoid impacts to non-target species. The primary goals of such efforts must be recovery and maintenance of habitat for native fish and wildlife species.”⁴¹

Tidal Wetland Community Types:

The following are descriptions, including common species, of each type of wetland community. Some species are found in more than one wetland community type. These descriptions come from the Hudson River Estuary Wetlands 2007 metadata under “Data Quality Information,” and were provided by the Cornell Institute for Resource Information Sciences (Cornell IRIS).⁴²

“Lower Intertidal Mix is found on periodically flooded sandflats and mudflats in brackish and freshwater tidal marshes. Classified as "LI", it is dominated by *Nuphar advena* in association with *Pontederia cordata*, *Scirpus tabernaemontani*, *Zizania aquatica*, *Sagittaria latifolia*, *Peltandra virginica*, *Spirodela polyrhiza*, *Trapa natans*, *Polygonum* sp., *Scirpus pungens*, *Typha angustifolia*, *Scirpus fluviatilis*, *Myriophyllum spicatum*, *Potamogeton perfoliatus*, *Sagittaria* sp., *Sagittaria calycina* and *Typha latifolia*.

Open Water: Occurs in or along areas that are very frequently if not always flooded. This community type was classified as "OW." *Panace* is often found in high and low salt marshes and was also classified "OW." It is a shallow depression with poor drainage and with or without standing water. Vegetation may or may not be present.

***Phragmites australis* (Common Reed):** Is found in the highest elevation zone of the freshwater tidal marshes and was classified as "PA." The vegetation is dominated by *Phragmites australis* in association with *Typha angustifolia*, *Peltandra virginica*, *Lythrum salicaria*, *Scirpus* sp., *Impatiens capensis*, *Spartina cynosuroides*, *Thelypteris palustris*,

⁴¹ Ibid.

⁴² Cornell Institute for Resource Information Sciences (Cornell IRIS), Hudson River Estuary Tidal Wetlands 2007, http://gis.ny.gov/gisdata/metadata/nysdec.hre_tidal_wetlands2007.shp.xml#Data_Quality_Information

Acorus calamus, *Spartina patens*, *Althaea officinalis*, *Scirpus americanus*, *Boehmeria cylindrica*, *Eupatoriadelphus fistulosus*, *Distichlis spicata*, *Hibiscus moscheutos*, *Pilea pumila*, *Scirpus pungens*, *Scutellaria galericulata*, *Onoclea sensibilis*, *Cicuta maculata*, *Cornus racemosa*, *Scirpus fluviatilis*, *Spartina alterniflora*, *Toxicodendron radicans* and *Vitis*.

Scrub / Shrub: is generally found in areas of higher elevation in freshwater marshes and was classified as "SS." The vegetation is dominated by *Salix* species in association with *Peltandra virginica*, *Lythrum salicaria*, *Typha angustifolia*, *Impatiens capensis*, *Equisetum fluviatile*, *Eupatoriadelphus fistulosus*, *Iris* sp., *Onoclea sensibilis*, *Polygonum* sp., *Panicum clandestinum*, *Sagittaria latifolia*, *Solidago* sp., *Scirpus fluviatilis*, *Fraxinus americanus*, *Acer* sp., *Platanus* sp., and *Apios americana*. The height of the canopy is approximately 10-12 feet or more.

Submerged Aquatic Vegetation: A community of continuously flooded substrates with rooted aquatic vegetation and was classified as "SV." It may be found in tidal channels or close to the shore of the Hudson River. Species present may include *Vallisneria americana*, *Myriophyllum spicatum*, *Ceratophyllum demersum*, *Elodea nuttallii*, *Najas* sp., and *Potamogeton perfoliatus*.

Trapa Natans (Water Chestnut): Was classified as "TN" and occupied open water/tidal channel areas. *Trapa natans* is dominant in association with *Spirodela polyrhiza*, *Myriophyllum spicatum*, and *Nuphar advena*.

Typha Angustifolia (Narrowleaf Cattail): Occurs in brackish and freshwater tidal marshes and was classified as "TA." It is dominated by *Typha angustifolia* in association with *Peltandra virginica*, *Lythrum salicaria*, *Impatiens capensis*, *Phragmites australis*, *Acorus calamus*, *Althaea officinalis*, *Scirpus fluviatilis*, *Sagittaria latifolia*, *Polygonum* sp., *Hibiscus moscheutos*, *Thelypteris palustris*, *Pontederia cordata*, *Scirpus* sp., *Salix* sp., *Ambrosia trifida*, *Iris* sp., *Scirpus tabernaemontani*, *Spartina patens*, *Leersia oryzoides*, *Nuphar advena*, *Pilea pumila*, *Sparganium eurycarpum*, *Zizania aquatica*, *Boehmeria cylindrica*, *Convolvulus* sp., *Distichlis spicata*, *Equisetum fluviatilis*, *Eupatoriadelphus fistulosus*, *Mentha* sp., *Onoclea sensibilis*, *Orontium aquaticum*, *Phalaris arundinacea*, *Sagittaria* sp., *Scirpus pungens*, *Spirodela polyrhiza*, *Trapa natans*, and *Ulmus* species. *Typha latifolia* and *Typha glauca* are included in this category.

Unvegetated Flats: Are mudflats along shores of tidal creeks or the river in both brackish and freshwater tidal marshes, and were classified as "UF." No species of plant is present.

Upland: Occurs at an elevation somewhat higher than that of the marsh and was classified as "UP." Species present may include *Ambrosia trifida*, *Ailanthus altissima*, *Aster* sp. Wrack Line occurs where debris and flotsam are deposited by high tide on the freshwater, brackish or salt marsh. Wrack Line was also classified as "UP."

Upper Intertidal Mix: Occurs in the higher sand flats of freshwater tidal marshes and was classified as "UI." The dominant species is *Scirpus americanus*. Associated species include *Phragmites australis*, *Typha angustifolia*, *Althaea officinalis*, *Distichlis spicata*, *Hibiscus moscheutos*, *Scirpus* sp., *Scirpus fluviatilis*, *Scirpus tabernaemontani*, *Spartina patens*, *Thelypteris palustris*, *Althaea officinalis*, *Distichlis spicata*, *Peltandra virginica*, *Zizania aquatica*, *Impatiens capensis*, *Lythrum salicaria*, *Sagittaria latifolia*, *Spartina cynosuroides*, *Boehmeria cylindrica*, *Onoclea sensibilis*, *Polygonum* sp., *Pontederia cordata*, *Scirpus pungens*, *Acorus calamus*, *Centaurea* sp., *Ceratophyllum demersum*, *Eupatoriadelphus fistulosus*, *Galium* sp., *Iris* sp., *Leersia oryzoides*, *Orontium aquaticum*, *Pilea pumila*, *Sagittaria* sp., *Sagittaria calycina*, *Sagittaria subulata*, *Spartina alterniflora* and *Spirodela polyrhiza*.

Wooded Swamp is characteristic of lowlands along large river systems with gentle slope gradients coupled with tidal influence and was classified as "WS." *Symplocarpus foetidus* is dominant and is associated with *Boehmeria cylindrical*, *Impatiens capensis*, *Salix* sp., *Liriodendron tulipifera*, *Quercus bicolor*, *Ulmus* sp., *Scutellaria galericulata*, *Scirpus* sp., *Thelypteris palustris*, *Acorus calamus*, *Leersia oryzoides*, *Onoclea sensibilis*, *Peltandra virginica*, *Typha angustifolia*, *Acer negundo*, *Acer rubrum*, *Berberis thunbergii*, *Betula lenta*, *Carya ovata*, *Carya tomentosa*, *Fraxinus americanus*, *Quercus alba*, *Quercus prinus*, *Quercus rubra*, *Quercus velutina*, *Rubus angustifolium*, *Tsuga Canadensis*, *Rubus occidentalis* and *Vaccinium angustifolium*. The height of the canopy may be as much as 60 to 90 feet and the difference in height between the canopy and the understory is quite large.⁴³

More detailed descriptions of each tidal wetland area within Philipstown, including fish and wildlife values as well as potential threats are covered above in the Significant Coastal Habitat section.

Data Sources:

- Significant Coastal Habitat
 - Significant Coastal Fish and Wildlife Boundaries
<http://gis.ny.gov/gisdata/inventories/details.cfm?DSID=318>
- Tidal Wetland Community Types

⁴³ Ibid.

- Hudson River Estuary Tidal Wetlands 2007
<https://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1210>

28. Stream Habitats &

29. *Third Party Map: Road-Stream Crossings in Philipstown and Putnam Valley*

Description:

According to the Hudson River Estuary Program, “streams and streamside or *riparian* areas are important transitional zones where land and water are linked. Riparian zones support the aquatic stream environment and are important ecosystems themselves, providing a suite of conditions that are optimal for many plants and animals. Streams and riparian areas often support high biological diversity and can provide potential routes for wildlife movement, seed dispersal, and gene flow across landscapes.

“Streams include channel habitat and riparian areas on the tops of the banks, the floodplain, and non-floodplain areas adjoining the stream. A typical stream channel contains microhabitats such as pools, riffles, and runs. Pools and slow runs may support submerged vegetation while channel bars and portions of lower banks are often vegetated by shrubs and plants that are tolerant of flooding and ice damage. Similarly, floodplains support habitats that can withstand occasional flooding, such as wet meadow, swamp, marsh, and lowland forest, as well as drier habitats like upland meadow. Riparian vegetation helps to stabilize banks and is a source of woody debris that helps to create microhabitat in the stream channel.

“Well-shaded, cool to coldwater streams with clean gravel substrate are able to support native coldwater fish such as brook trout that are sensitive to warmer temperatures and sedimentation. Some streams support migratory routes for diadromous fish, such as American eel and herring species. Many other species rely on streams for foraging, breeding, migration, hibernation, and refuge, including mink, muskrat, river otter, bats, woodcock, belted kingfisher, herons, wood turtle, stream salamanders, and many invertebrates, such as dragonflies.

“The suitability of stream and riparian habitat for supporting this biological diversity can be altered by agricultural and timber harvesting activities, the creation of physical structures such as buildings, roads, culverts, and dams, and other disturbances that cause clearing of vegetation, sedimentation, or pollution. Dams and poorly designed and installed culverts can isolate and severely limit the range of aquatic species and other organisms that use stream corridors, and can also have serious effects on local flooding and water quality. Such aquatic disconnections are significant barriers for resident species such as brook trout, as well as migratory fish species that

rely on aquatic connectivity along tributary streams to complete their life cycles. With proper planning and use of best management practices, stream corridors can continue to support natural and human communities.”⁴⁴

The first map in this section is an expansion on the map from Section 21. Threats to Water Quality. It combines the previous map layers on potential barriers to the movement of aquatic life as well as potential threats of contamination to aquatic habitat with the added layers showing various types of important aquatic habitat as well as potential trout streams. NYSDEC Dams, NYSDOT Large Culverts and Culverts in MS4 are already described in more detail in Section 21 of this report, but in summary, they each may prevent the movement of aquatic wildlife from one section of a stream to another, in effect creating fragmented streams, which decrease their potential to provide sufficient habitat for some aquatic species. These barriers may also serve as concentration points for pollution released upstream, further endangering the health of aquatic species that need to pass through the dam or culvert

Trout streams, also described above in Section 19. NYS DEC Stream Classifications, are those streams that have sufficient amounts of dissolved oxygen, cold water temperature, clean stream beds and low sedimentation and pollution levels to support trout and/or trout spawning. Waterbodies designated as trout streams are collectively referred to as protected streams, and are subject to additional regulations and require a State permit for disturbance of the bed or banks. Disturbance may be temporary or permanent in nature. Examples of activities requiring this permit include placement of structures in or across a stream, fill placement for bank stabilization or to isolate a work area, excavations for gravel removal or as part of a construction activity and lowering stream banks to establish a stream crossing.

The Important Aquatic Habitat layer comes from the New York Natural Heritage Program and “identifies areas of importance for sustaining known populations of rare animals based on occurrence records from the New York Natural Heritage Program (NYNHP) database. Important Areas include the specific locations where rare animals have been observed, as well as additional habitat needed to support animal populations. This includes areas which may be used by rare animals for breeding, nesting, feeding roosting, or over-wintering; and areas that support the ecological processes critical to maintaining the habitats of these rare animal populations. Proactive planning that avoids or minimizes impact to the habitat quality of Important Areas and maintains habitat connections for wildlife movement will contribute to the long-term survival of rare animal species and their associates. This 2018 update classifies rare animal Important Areas according to the primary habitat type used by the animal species: terrestrial, aquatic, and wetland. Note that the data set includes animals that are not listed as threatened or endangered, but are tracked by NYNHP. Important Areas for two non-tracked Special Concern turtle species

⁴⁴ Haeckel, Ingrid, and Laura Heady. Creating a Natural Resources Inventory: A Guide for Communities in the Hudson River Estuary Watershed. (Ithaca, NY: Department of Natural Resources, Cornell University, and New York State Department of Environmental Conservation, 2014): <https://www.dec.ny.gov/lands/100925.html>.

are also included based on records from the 1990-1999 NY Amphibian and Reptile Atlas,⁴⁵ which is covered in more detail in Section 31. Amphibians and Reptiles of Philipstown below.

The Important Diadromous Fish Habitat layer refers to areas important to migratory fish that travel between saltwater and freshwater. “This data set identifies areas of importance for sustaining known populations of migratory fish based on DEC Bureau of Fisheries surveys and other studies completed in New York since 1980. The important areas highlight stream reaches providing important passage for fish traveling between ocean and freshwater habitats, such as American eel and river herring. Routes were modeled from tributary stream reaches with documented migratory fish presence to the Atlantic Ocean. Specific documented migratory fish species may be identified using the Migratory Fish Runs data set, located under Estuary data layers [in the Hudson Valley Natural Resource Mapper]. The important areas include upstream habitat and stream adjacent areas that support the health and integrity of stream habitats used by migratory fish. Proactive planning that avoids or minimizes impacts to the habitat quality of Important Areas and maintains habitat connectivity will contribute to the long-term survival of migratory fish populations.”⁴⁶

Finally, the Important Cold Water Stream Habitat layer “identifies areas of importance for sustaining coldwater habitat based on New York State Department of Environmental Conservation (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. Brook trout inhabit clear, cool, well-oxygenated streams and lakes and depend on clean gravel areas for spawning. They are sensitive to increases in water temperature and sedimentation of stream habitats. Other threats include the introduction of exotic species such as smallmouth bass and non-native trout, which are better adapted to warm water temperatures. 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 map [layer] does not account for habitat fragmentation that might be caused by local dams and culverts. Please note that this map does 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.”⁴⁷

The second map - 29. Road Stream Crossings in Philipstown and Putnam Valley - was provided by Megan Lung of the NYSDEC and Hudson River Estuary Program as part of the North Atlantic Aquatic Connectivity Collaborative’s “Non-Tidal Connectivity Assessment” project.

⁴⁵ NYSDEC, Information About the Layers - Known Important Areas for Animals (Aquatic, Wetland, Terrestrial, Bat Foraging), Hudson Valley Natural Resource Mapper, 2018, <https://giservices.dec.ny.gov/gis/hvnrm/layerInfo.html#ira>

⁴⁶ Ibid.

⁴⁷ Ibid.

This project is ongoing, and thus the data presented on this map are incomplete, but the program has already assessed to what degree most stream crossings (culverts) within Philipstown act as barriers to the safe movement of aquatic life from one stream section to another. Each assessed culvert is given a rating somewhere between “No Barrier” to “Severe Barrier,” as shown in the map legend. Some culverts are yet unassessed and some culverts require still more data for a complete assessment, but this project is nearing its completion and data is progressively being updated. The full project data set as well as an online version of the culvert map can be accessed at:

https://naacc.org/naacc_search_crossing.cfm?start=1&sp=1&srt=11

To see the data from this page, scroll down until you see “Map with Google Maps.” Select this and a new window will open showing different color dots for various culverts within Philipstown. Make the map full screen and then click on any of the dots to pull up more information, including photographs showing why the dot is rated as it is. For the map legend, click on “Map Information” in the top left corner of the window. This tool will serve as an essential resource for improving the aquatic connectivity of some of Philipstown’s streams, which are unfortunately being fragmented by poorly installed or degrading culverts, as the map shows. We will discuss a few of the most severe culvert barriers below.

Findings:

As we’ve seen in other sections of this report, Philipstown is home to numerous streams, many of which are considered to be high quality, and thus provide important habitat to many species that live / breed in or migrate through Philipstown. The town of Philipstown has already completed several studies that look at the importance of Philipstown streams and waterbodies to aquatic species as well as other species and ecosystems. These prior studies will be referenced appropriately below.

Important Aquatic Habitat:

As the map shows, the New York Natural Heritage Program has identified several streams as Important Aquatic Habitat within Philipstown. These highlighted areas are essential both for rare species as well as other species that the NYNHP has identified for conservation concern that depend on such habitat for survival, whether or not they live along or in the stream. For the list of species, please see Table 10: Animal Species of Conservation Concern within Philipstown in Section 24. Important Areas for Rare Species. Notable species that may depend on these habitats include Atlantic Sturgeon, Shortnosed Sturgeon, Bog Turtle, Barn Owl, Great Blue Heron, Spotted Turtle, Wood Turtle, Bald Eagle, Atlantic Needlefish, and Blanding’s Turtle, among

many others. For detailed information please see Table 10, especially the Habitat description for each species.

Four key areas have been identified as Important Aquatic Habitat within Philipstown:

1. The Hudson River, including Constitution Marsh and Manitou Marsh.
2. The Foundry Brook system, which extends to the Cold Spring Reservoir and also includes tributaries draining from Jaycox Pond as well as the Catskill Aqueduct Tunnel.
3. The system of streams draining into Constitution Marsh from Lath's Pond and Dale's Pond.
4. The Philipse Brook system, which extends almost all the way up to Duck Pond over the border in Putnam Valley and includes a portion of the Catskill Aqueduct as well.

The protection and possible improved management of these highlighted areas is essential to the survival of the many animal species that depend on these habitats. Of these mentioned areas, both the Foundry Brook and Philipse Brook systems, in addition to many other streams throughout the town, are also considered to be potential Trout Streams and thus receive additional protections from development from the NYSDEC, as outlined in more detail Section 19. NYS DEC Stream Classifications. Although no native Brook Trout has been documented by the New York Natural Heritage Program in these above-mentioned streams, they have been spotted during previous local stream assessment studies, and many of the town's streams are still considered capable of hosting brook trout, especially if certain barriers are removed, which we will cover below.

Important Diadromous Fish Habitat:

As mentioned above, Diadromous fish are those that live in both saltwater and freshwater at different points in their lives, often traveling to freshwater to breed in the same location where they were spawned themselves. The only documented diadromous fish within Philipstown is the American Eel, although there is some likelihood that other species could travel from the Hudson up several of Philipstown's streams as well. One example might be the Alewife fish, which has been observed in Cascade Brook and Gordons Brook just over the northwest border of Philipstown in the Town of Fishkill. In addition, the following migratory fish species have been documented traveling along the Hudson River, indicating their possible use of some of Philipstown's streams or at least the outlets of such streams: Alewife, American Shad, Atlantic Tomcod, Blueback Herring, Rainbow Smelt, Sea Lamprey, Striped Bass and Shortnose Sturgeon.⁴⁸

⁴⁸ NYSDEC, Hudson River Estuary Layers - Migratory Fish Runs, Hudson Valley Natural Resource Mapper, original data from New York Natural Heritage Program and the Nature Conservancy, 2011, <https://gisservices.dec.ny.gov/gis/hvnrm/>

With respect to American Eel, NYSDEC Bureau of Fisheries data, and an aquatic habitat connectivity study by the NY Natural Heritage Program, indicate that sections of Foundry Brook and Indian Brook as well as the entire length of Canopus Creek are migratory routes for American Eel, which is considered a Species of Greatest Conservation Need, according to the NYS Wildlife Action Plan.⁴⁹ “This fish species begins life in the Atlantic Ocean and migrates to the headwaters of North American tributary streams as tiny ‘glass eels.’ American Eel is in decline throughout much of its range, and though eels are able to bypass certain dams, culverts, and other aquatic barriers, they rely on aquatic connectivity along streams to complete their life cycles and return to the sea to spawn.”⁵⁰

Important Cold Water Habitat / Trout Streams:

There is only one area in Philipstown that is reported as Important Cold Water Habitat, and that is the section of Clove Creek from where it combines with Sand Spring Brook until it is joined by Bull Creek, and includes sections of each of these tributaries. Although not specified by the New York Natural Heritage Program, it is likely that this section of Clove Creek and these two tributaries are habitat for wild Brook Trout as well as other species that thrive in cold water habitats, such as the Tiger Spiketail and Arrowhead Spiketail, both of which are rare dragonflies that have been documented in Philipstown. Essential components of high-quality cold water habitat are substantial shade cover over the stream, as well as cool, clean and well-oxygenated waters flowing over a sandy or gravel substrate. Threats to this habitat include deforestation, over sedimentation from dirt roads and construction, road salt runoff, general pollution runoff from pesticides, herbicides, fertilizers and other chemicals, and also the introduction of exotic species such as smallmouth bass and non-native trout, which are better adapted to warm water temperatures, and can outcompete native brook trout as average stream temperatures increase due to climate change.⁵¹

And as you can see, there are many other streams throughout Philipstown that could potentially be suitable habitat for brook trout and other cold water species. These streams include the rest of Clove Creek and its other tributaries, Trout Creek, Wiccopee Creek, Indian Brook, Philipse Brook, Annsville Creek and Canopus Creek. The removal of any significant stream connectivity barriers could potentially allow the reestablishment of brook trout in some of these streams if they are not already present.

⁴⁹ New York State Wildlife Action Plan. 2015. New York State Department of Environmental Conservation, Albany, NY. www.dec.ny.gov/animals/7179.html

⁵⁰ Town of Putnam Valley Committee for the Conservation of the Environment, Town of Putnam Valley Natural Resource Inventory, 2018: <https://putnamvalleyresidents.com/NRI.html>

⁵¹ NYSDEC, Information About the Layers - Known Important Areas for Cold Water Habitat, New York Natural Heritage Program, 2018, <https://giservices.dec.ny.gov/gis/hvnrm/layerInfo.html#irc>

Barriers to Aquatic Connectivity:

For this section, we will review each stream system to highlight the existing and potential barriers that may prevent or hinder the safe movement of aquatic life. For details on the culvert barriers for each of these locations, including photographs, please visit:

https://naacc.org/naacc_search_crossing.cfm?start=1&sp=1&srt=11

And use the following directions to navigate this webpage (also covered above in the *Description* section): To see the data from this page, scroll down until you see “Map with Google Maps.” Select this and a new window will open showing different color dots for various culverts within Philipstown. Make the map full screen and then click on any of the dots to pull up more information, including photographs showing why the culvert is rated as it is. For the map legend, click on “Map Information” in the top left corner of the window.

Clove Creek:

As Map 28. Stream Habitats shows, Clove Creek and its tributaries host an Important Cold Water Habitat as well as miles of potential trout habitat. A recent study by the Hudson Highlands Land Trust in partnership with the Town of Philipstown and Village of Cold Spring found that an abundance of mayflies, stoneflies and caddisflies were found at favorite fishing spots along Clove Creek, indicating high water quality since these insects can only thrive in areas with clean water. On the other hand, levels of these three insects were lower near dams, indicating lower water quality likely caused by the impact of dams.⁵² Similarly, although a number of culverts require further study or have not yet been studied by the Hudson River Estuary Program’s NAACC project (Map 29. Road-Stream Crossings in Philipstown and Putnam Valley), there is sufficient information to draw some conclusions about Clove Creek and its tributaries. Based on the study so far, Clove Creek is relatively unhindered by culverts, although there are several that should be prioritized for improvements to allow safer movement of aquatic life. These locations include severe barriers along East Mountain Road North, East Mountain Road South, Horton Road and at the outlet of Jordan Pond, a moderate barrier where Clove Creek first joins Route 301 (the yellow circle is almost entirely hidden by a green (insignificant barrier) circle, but when you zoom in close on the map, you can see the faint outline of the yellow point), and minor barriers on East Mountain Road North and near Route 9 as Clove Creek passes under East Mountain Road South. There are also a handful of dams along several tributaries of Clove Creek, which likely impede the movement of aquatic life along these streams and can reduce water

⁵² Smith, Michelle and Nicole Wooten, 2020, Keeping Our Water Clean: Good News from Recent Studies, Hudson Highlands Land Trust Special to the Putnam County News and Recorder, April 29th 2020, <https://www.pcnr.com/articles/keeping-our-water-clean-good-news-from-recent-studies/>

quality due to increased build-up of sediment upstream from the dam and reduced water flow downstream from each dam.

Trout Creek and Wiccopee Creek:

Both creeks are considered to be suitable as trout habitat although there have not been any reported sightings of native brook trout in these streams. Water quality is generally expected to be good in each creek, although the large number of dams on Trout Creek combined with proximity of the dirt road section of East Mountain Road South along certain sections of Trout Creek may decrease water quality due to higher levels of sedimentation. In terms of culverts, Trout Creek has several barriers that require further study, which has not yet been completed by NAACC program, as the second map shows. This stream deserves further analysis to determine the impacts of the dams and dirt road run-off.

Foundry Brook:

As mentioned above, Foundry Brook is a crucial stream within Philipstown. It delivers drinking water to the Villages of Nelsonville and Cold Spring, is considered suitable for trout habitat, is considered Important Aquatic Habitat, and the lower section of it is also considered Important Habitat for Diadromous Fish. Foundry Brook, according to the same recent Hudson Highlands Land Trust study also has upper sections that contain high levels of macroinvertebrates, thus suggesting high water quality.⁵³ On the other hand, Foundry Brook is also used for drinking water and thus has several dams as the map shows. And it was long ago used as a power source for the West Point Foundry, which had left the remnants of a dam where the brook passes underneath Route 9D, which may impede the movement of diadromous fish traveling upstream. As Map 29. Road-Stream Crossings... shows, there are also several severe barriers along the brook, which include a culvert where Foundry Brook passes under Peekskill Road and the culvert that connects a tributary that drains from Bull Hill and passes under Main Street in Nelsonville to connect with Foundry Brook. Furthermore a moderate barrier include a culvert at the intersection of Route 301 and Fishkill Road where Foundry Brook passes under Route 301 and Healy Road (on the map it is mostly covered by a blue circle signifying that the long culvert is not counted twice passing under both roads, which is confusing, but basically means that the very long culvert that passes under both roads is considered to be a moderate barrier). Other moderate barriers are present on tributaries of Foundry Brook draining from the Jaycox Pond and at the intersection of Route 301 and Jaycox Road. There are also three minor barriers located at several locations: a culvert where Foundry Brook crosses under Fishkill Road adjacent to the Cold Spring Drinking Water Treatment Plant, a culvert connecting the wetlands on both sides of Fishkill Road near North Highlands Fire Department, and a culvert where Foundry Brook passes under Lake Surprise Road following a long artificially channelled section of the brook that has

⁵³ Ibid.

been found in a previous local study to reduce water and habitat quality in that section of the brook.⁵⁴

Breakneck Brook:

Although not considered prime aquatic or trout habitat, Breakneck Brook is still located in a heavily forested area and potentially provides important water habitat for species that live in the Hudson Highlands State Park. Potential threats to this stream include the two dams located near Lake Surprise Camp as well as the WasteWater Treatment Facility located along the brook. Also, this area is heavily used by hikers on weekends between April - November, which can prevent local wildlife from visiting the brook for drinking water or other uses.

Laths Pond and Dales Pond Stream System:

These small streams are considered to be Important Aquatic Habitat and contain one dam at the outlet of Laths Pond as well as a NYSDOT Large Culvert that passes under Route 9D, which is considered to be a severe barrier in addition to a second severe barrier culvert that passes under Beverly Warren Road just downstream. Both of these barriers are on the stream that flows from Laths Pond. In addition another stream in this system that drains from Dales Pond must cross through a minor barrier culvert that crosses under Route 9D just north of Boscobel. Because both of these streams drain into Constitution Marsh, which is an incredibly rich aquatic habitat, it is reasonable to suspect that these barriers may prevent the safe movement of aquatic life that would benefit from a contiguous interconnection between Constitution Marsh and both Dales Pond and Laths Pond. These streams could benefit from further study to also determine the relative impact of these barriers.

Indian Brook:

This stream also drains into Constitution Marsh and is considered suitable for brook trout. It also has a significant section that is considered Important Habitat for Diadromous Fish. In terms of culvert barriers, Indian Brook has many points that remain to be studied, as the myriad black triangles on the second map show. That said, we can see on the first map that aquatic life traveling up or down Indian Brook must pass both the dam that has formed Loch Lyall as well as a NYSDOT Large Culvert that passes under Route 9. Based on a previous local study, an upper section of Indian Brook was deemed to have fair water quality due to its relatively good condition but due to its heavier levels of sedimentation from dirt road runoff was not able to provide quality habitat for macroinvertebrates, which also led to increased flooding of the brook. A lower section of the brook on the hand hand yielded abundant macroinvertebrates, thus

⁵⁴ Hudson Highlands Land Trust, Streamwalk 2004 - Philipstown, NY - Foundry Brook, Indian Brook, Philipse Brook & Clove Creek, 2004, <https://philipstown.com/government/conservation-board/cb-documents>

indicating high water quality. Some small brown trout were even observed by volunteer water samplers, although their species was not confirmed (still suspected to be native Brook Trout).⁵⁵

Philipse Brook:

This stream system is considered both Important Aquatic Habitat as well as potential trout habitat. One NYSDOT Large Culvert exists as Philipse Brook passes under Route 9 but according to the NAACC program has not yet been assessed for aquatic connectivity. The majority of assessed culverts have been deemed either as “no barrier” or “insignificant barrier,” although there is one “moderate barrier” located where Philipse Brook passes under South Highland Road before forming the pond where the Garrison Fish and Game Club is located. Based on a previous study of this stream system, the upper sections are deemed as good and fair quality due to relative forested stream sections but higher amounts of sedimentation from erosion and dirt road runoff, especially along the section adjacent to Philipse Brook Road. The section of Philipse Brook west of Route 9 along Philipse Brook, however, was rated as excellent due to great shading, clear water and deep pools within the stream. Another section from Snake Hill Road to Avery Road was deemed to be poor due to a large number of small dams, discharge pipes and bridges located along this section, in addition to the channelized nature of this segment. The lower section of Philipse brook, on the other hand was deemed to be excellent due to good canopy cover, clear water and a number of pools located within the stream.⁵⁶

Arden Brook:

Neither considered important aquatic habitat or suitable for brook trout, Arden Brook is further impacted by its proximity to Route 403 as well as having to pass through two NYSDOT Large Culverts and one Dam, the latter of which is located just west of Route 9D. The lower of the two NYSDOT Large Culverts has also been rated as a minor barrier by the NAACC program as the second map shows.

Curry Pond and Copper Mine Brook Stream Systems:

Although a dam and three NYSDOT Large Culverts impact each of these stream systems, they have either not been rated or are deemed to have insignificant barriers by the NAACC program. Neither stream is considered as an important habitat, but perhaps each could be studied in further detail to determine if there are any negative impacts from the existing culverts. Copper Mine Brook runs along the western portion of South Mountain Pass and used to be impacted by silt runoff from the former dirt road, which was not long ago paved for various reasons, including to reduce sedimentation of the stream. The eastern part of South Mountain Pass remains a dirt road,

⁵⁵ Ibid.

⁵⁶ Ibid.

however, which may have some sedimentation impact on the tributary of Annsville Creek covered below.

Annsville Creek:

This creek and its tributaries are considered suitable habitat for trout, but unfortunately run along a long section of Route 9 as well as along a dirt road portion of South Mountain Pass. This likely means that the creek is impacted by both silt runoff as well as large amounts of road salt from the heavily salted Route 9. The main branch of the creek passes through four NYSDOT Large Culverts within Philipstown as well as one smaller culvert in the Philipstown MS4 district. The southernmost Large Culvert that passes under Route 9 at Diamond Hill Road is rated as a severe barrier (although it is obscured by a blue circle that is placed directly over it on the second map). There are also numerous culverts that are predicted to be present but are yet to be rated, further suggesting that this stream may be segmented numerous times, which makes safe mobility for aquatic life difficult.

Canopus Creek:

This stream has a relatively small segment as it passes through Philipstown, but is considered both Important Diadromous Fish Habitat as well as suitable for trout. Despite being surrounded by countless culverts within the Philipstown MS4 District, the stream itself flows relatively unhindered through Continental Village and Putnam Valley. There are several dams located on its tributaries, which will impede the movement of aquatic life, as well as one severe barrier (passing under Old West Point Road East) and one minor barrier (passing under Old Albany Post Road), both of which impede the tributary that runs adjacent to Old Albany Post Road to the west of Canopus Creek. Outside of Philipstown across the border in neighboring Putnam Valley, there are a total of six severe barriers, two moderate barriers and four minor barriers along the Canopus Creek and its tributaries, which impact the ability of aquatic life to travel along the entire length of the creek, including the section that passes through Philipstown. And as noted in Section 21. Threats to Water Quality of this NRI, numerous other sources of pollution, such as pesticides, fertilizer and leaking septic systems, are potentially impacting the water quality and habitat quality of the Canopus Creek as it passes through Philipstown. This could potentially prevent some species from migrating further up the creek to the less developed areas of Putnam Valley, exemplifying why an inter-municipal approach to water protection planning is essential for watersheds that cross municipal lines.

Further Study:

Numerous studies have already been done on some streams within Philipstown, especially Foundry Brook and Clove Creek, and there are current studies that are in progress or planned.

The results from these reports will further inform decisions that Philipstown makes regarding its aquatic ecosystems. In addition, as we've seen, certain streams have received less attention, such as the streams draining from Dales Pond and Laths Pond, which might be worthy of further study due to their consideration as Important Aquatic Habitat. We will list here the previous studies that we are aware of that have focused on aquatic habitat quality with Philipstown, which can offer further information than can be covered in this inventory:

2004 Stream Walk - Philipstown, NY - Hudson Highlands Land Trust -
<https://philipstown.com/government/conservation-board/cb-documents>

2005 State of the Tributaries - Tidal Influenced Portions of Three Tributaries
 Philipstown, NY - Putnam County Soil and Water Conservation District & Hudson
 Highlands Land Trust -
<https://philipstown.com/government/conservation-board/cb-documents>

2007 Natural Resources and Open Space Protection Plan - Town of Philipstown -
<https://philipstown.com/government/building-department/town-code>

2007 Town of Philipstown Groundwater Report and Planning Resource - The Chazen
 Companies - <https://philipstown.com/government/building-department/town-code>

2014 Natural Areas and Wildlife in Your Community, A Habitat Summary Prepared for
 the Town of Philipstown - NYSDEC Hudson River Estuary Program -
<https://philipstown.com/government/conservation-board/cb-documents>

*Lastly, although it doesn't include the Town of Philipstown, the following study has
 recommendations that can be applied locally:*

2004 Croton-to-Highlands Biodiversity Plan, Metropolitan Conservation Alliance,
<https://www.yorktownny.org/planning/croton-highlands-biodiversity-plan>

Finally, the Hudson Highlands Land Trust recommends the formation of a local volunteer NYS
 DEC Water Assessments by Volunteer Evaluators (WAVE) group by local residents, which
 would help create an ongoing data record for reference and assessment of trends. More
 information is available on the WAVE program here:
<https://www.dec.ny.gov/chemical/92229.html>

Data Sources:

28. Stream Habitats

- Dams
 - NYS DEC Dams <http://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1130>
- NYS DOT Large Culverts
 - NYS Large Culverts <http://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1255>
- Culverts in MS4
 - Philipstown Stormwater Management MS4 Boundary and Outfalls, <https://philipstown.com/ms4%20maps.pdf>
- Streams & Lakes and Ponds
 - National Hydrography Dataset <http://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1337>
- Trout Streams
 - NYS DEC Water Quality Classifications <http://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1118>
- Important Aquatic Habitat
 - Natural Heritage Important Areas <http://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1297>
- Important Diadromous Fish Habitat
 - Natural Heritage Important Areas <http://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1297>
- Important Cold Water Stream Habitat
 - Natural Heritage Important Areas <http://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1297>

29. *Third Party Map:* Road-Stream Crossings in Philipstown and Putnam Valley

- Road-Stream Crossings in Philipstown and Putnam Valley
 - NYSDEC Hudson River Estuary Program - NAACC database https://naacc.org/naacc_search_crossing.cfm?sp=1

30. Important Bird Areas and Breeding Bird Atlas Blocks

Description:

Although covered to some degree in Section 24. Important Areas for Rare Species, additional resources such as the NYS Breeding Bird Atlas and Audubon New York's Important Bird Areas (IBAs) offer more detailed information on bird species that can be found within Philipstown as well as important bird habitat. Each of these resources offer much more detailed information than can be covered in this report, but we will give a general overview of the findings of each as well as links recommending where to find more information.

Specifically shown on this map, the “New York Breeding Bird Atlas is a statewide inventory of all the birds breeding in the state. The first Atlas was conducted from 1980-1985, the second from 2000-2005, and DEC is currently working with agency and conservation partners to conduct the third atlas from 2020-2024. Field work is conducted by dividing the state into small blocks (~9 miles²) within which volunteers record all the bird species using that area and document evidence of breeding. The primary products of the Atlas are detailed maps of the distribution of breeding birds in the state. Birds are a good choice for conducting such a detailed survey because they are easy to observe, identifiable by many people, and serve as indicators of environmental health. The results of the third Atlas will allow us to detect distributional changes in New York's avifauna over the last 40 years.”⁵⁷

The Breeding Bird Atlas Blocks shown on the map are those that include portions of Philipstown. It is important to note that “the Breeding Bird Atlas is a presence/absence survey. While a record of a species in a block is highly suggestive of its breeding presence, the lack of a record does not guarantee absence of the species as a breeder in the block. Atlasers were directed to work in a block until 76 species had been recorded; therefore the list of species reported breeding within a block was not intended to be comprehensive.”⁵⁸

Despite its limitations, “atlas data are proven to be among the most important tools for conservation and land management in the state. They provide critical information on where threatened and endangered species are breeding, which is invaluable for reviewing the impacts of proposed development projects like solar and wind farms. The distributional and change data are critical for determining which species are of conservation concern (e.g., Species of Greatest Conservation Need and Threatened and Endangered species) and knowing which areas should be protected or managed to support those species (e.g., Bird Conservation Areas). DEC has a Breeding Bird Atlas dataset for Google Maps and Google Earth that shows the location of the

⁵⁷ NYSDEC, 2020, New York State Breeding Bird Atlas, <https://www.dec.ny.gov/animals/7312.html>

⁵⁸ NYSDEC, Breeding Bird Atlas (2000 - 2005) - Description, NYS GIS Clearinghouse, <https://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1256>

Atlas survey blocks in New York State, a list of birds breeding in each block, and a map of the distribution for each species that breeds in New York.”⁵⁹ The link for this is available at:

<https://www.dec.ny.gov/pubs/103459.html#Wildlife>

In terms of the Important Bird Areas shown on the map, “Audubon New York has identified over 130 Important Bird Areas (IBAs) across the state through a rigorous scientific process by leading avian experts. Each recognized IBA meets one of three criteria: a place where birds congregate in large numbers at one time; a place for species that are at-risk; or a place that supports groups of birds representing certain habitats such as forests, wetlands, grasslands and shrublands. IBAs can be a catalyst for bird conservation through open space preservation, habitat management and restoration, monitoring, and education.”⁶⁰ Also it’s important to note that due to easier public access provided by state parks, this dataset may have a bias that indicates higher counts within state parks compared to private lands.

Findings:

NYS Breeding Bird Atlas:

The following findings are from the 2014 Habitat Summary completed for the Town of Philipstown by the NYSDEC Hudson River Estuary Program. For a list of referenced species as well as additional species, please see Table 11: Bird Species of Conservation Concern in Philipstown, provided by the Hudson River Estuary Program using data from the NYS Breeding Bird Atlas:⁶¹

“The NYS Breeding Bird Atlas has numerous records of birds that indicate the availability of high-quality forest habitat (e.g., northern goshawk, sharp-shinned Hawk, cerulean warbler) and high-quality riparian forest habitat (Louisiana waterthrush, yellow-throated vireo) in Philipstown. The remarkably intact forest communities and bird assemblages of the Highlands region were justifications for Audubon NY’s designation of the Fahnestock and Hudson Highlands State Parks Important Bird Area. Conserving the town’s large, contiguous forested areas, particularly those that provide broad, connected corridors; smaller forest patches that act as stepping stones between larger forests; and forested floodplains will help ensure there is adequate habitat to sustain these species, as well as other forest plants and animals. This strategy will also help to preserve

⁵⁹ *Ibid.*

⁶⁰ National Audubon Society, 2007, Important Bird Areas - New York, https://www.audubon.org/important-bird-areas/state/new-york?field_iba_status=All&priority=All&page=3

⁶¹ Haeckel, Ingrid, 2014, Natural Areas and Wildlife in Your Community, A Habitat Summary Prepared for the Town of Philipstown, NYSDEC Hudson River Estuary Program, <https://philipstown.com/government/conservation-board/cb-documents>

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

“Upland grassland or meadow habitat can support a variety of life, including rare plants, butterflies, reptiles, and birds, in addition to providing agricultural uses and scenic values. The quantity and quality of grasslands for wildlife have rapidly decreased in the Northeast 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. Breeding bird records from Philipstown indicate that grassland habitat is present in the town. Table 11 shows two grassland bird species of state conservation concern known to breed in Philipstown (NYS Breeding Bird Atlas): American kestrel and bobolink. 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. Audubon New York offers guidance on managing habitat for grassland birds.

“[And lastly,] the NYS Breeding Bird Atlas documented twelve species of conservation concern in Philipstown that prefer young forest and shrubland habitat, including American woodcock, ruffed grouse, and whip-poor-will. Extensive young forests and those that form large complexes with meadow habitats may be particularly important for nesting by these species, as well as for grassland nesting birds; for more information, see Audubon's guidance on managing habitat for shrubland birds.”⁶²

Important Bird Areas:

“Audubon New York has identified three areas of statewide importance for birds in Philipstown; summaries of the sites are available on the National Audubon Society webpage [and are also covered below]. The Lower Hudson River site, extending from Croton Point Park to the Newburgh-Beacon Bridge, is one of the most critical wintering bald eagle sites in the state, and becoming an important breeding area for bald eagles. Constitution Marsh hosts over 200 species of birds and large numbers of waterfowl use the area during winter and migration. The large unfragmented forest tract spanning Fahnestock and Hudson Highlands State Parks supports an assemblage of bird species representative of deciduous and mixed forests, including a large number of regional conservation priorities.”⁶³

⁶² Ibid.

⁶³ Ibid.

The following are the descriptions for each Important Bird Area, from the National Audubon Society.⁶⁴

“Lower Hudson River:

Key Species: Bald Eagle

This site includes the Lower Hudson River, extending just north of the Newburgh-Beacon Bridge south to, and including, Croton Point Park. Some additional winter roost sites for eagles in the surrounding uplands are also included. This site includes state, county, and private ownership.

Ornithological Summary: One of the most critical wintering Bald Eagle sites in the state, and becoming an important breeding area for Bald Eagles. Croton Point Park supports wintering and breeding grassland birds including the Northern Harrier (year-round), Short-eared Owl (up to six individuals in winter), Grasshopper Sparrow (observed in breeding season), Vesper Sparrow (observed during migration), and Henslow’s Sparrow (observed during migration). Supports about 10% of the state's winter Bald Eagle population.

Conservation Issues: This site is included in the 2002 Open Space Conservation Plan under the project name Hudson River Corridor Estuary and Greenway Trail. Inventory and monitoring of eagles should continue. Ensuring the protection of key winter roost sites is strongly recommended.”⁶⁵

For more, please visit: <https://netapp.audubon.org/iba/Reports/2790> and <https://www.audubon.org/important-bird-areas/lower-hudson-river>.

“Constitution Marsh Sanctuary:

Key Species: American Black Duck and Least Bittern

This site consists of a 4,000-5,000 year old fresh and brackish (depending on the time of year) tidal marsh (270 acres) and forested uplands (80 acres) located on the east shore of the Hudson River, directly opposite West Point Military Academy, and 52 miles north of New York City. There are a series of human-made dikes and channels that were constructed in the 1830s for wild rice farming within the marsh. The site is administered

⁶⁴ National Audubon Society, 2007, Important Bird Areas - New York, https://www.audubon.org/important-bird-areas/state/new-york?field_iba_status=All&priority=All&page=3

⁶⁵ Ibid.

by the New York State Office of Parks, Recreation and Historic Preservation (NYS OPRHP) and managed by Audubon New York.

Ornithological Summary: This important wetland site hosts a diversity of birds (more than 200 species have been identified). Characteristic wetland breeders at the site include Least Bitterns (2-4 pairs each year), Virginia Rails, Marsh Wrens, and Swamp Sparrows. Large numbers of waterfowl use the area during winter and migration, with average fall concentrations of 1,500 individuals and occasional peak counts of 2,000 that can include 700 Wood Ducks and several hundred American Black Ducks and Mallards. Mixed flocks of blackbirds (Bobolinks, Red-winged Blackbirds, and Common Grackles) numbering in the thousands, use the site as a staging area and migratory stopover in the fall. Other at-risk species using the site include Pied-billed Grebes (occasional migrants), American Bitterns (uncommon but regular migrants), Ospreys (regular migrants, non-breeding visitors), Bald Eagles (averaging 2-5 in winter, with a maximum of 30), Northern Harriers (regular migrants), Sharp-shinned Hawks (fairly common foragers), Cooper's Hawks (probable breeders), Red-shouldered Hawks (rare migrants), Merlins (regular migrants), Peregrine Falcons (occasional foragers), Willow Flycatchers (estimated 3-5 breeding pairs), Wood Thrushes (breed in adjacent woodlands), Blue-winged Warblers (possible breeders), Cerulean Warblers (regular migrants), Wormeating Warblers (breed in adjacent woodlands), and Canada Warblers (regular migrants). Until the mid-1990s, fall swallow concentrations at the site typically numbered about 20,000 individuals, but reached as high as 100,000. Today, swallow concentrations number in the thousands.

Conservation Issues: This site is listed in the 2002 Open Space Conservation Plan as a priority site under the project name Hudson River Corridor Estuary/Greenway Trail. The site is part of the Hudson Highlands State Park and is managed by Audubon New York as a wildlife conservation area. Portions have been designated as a state Bird Conservation Area. There is an Audubon Center on site that provides education programs to thousands of people each year. Non-native invasive plants and animals that require monitoring include common reed (*Phragmites australis*), purple loosestrife (*Lythrum salicaria*), European water chestnut (*Trapa natans*), zebra mussels (*Dreissena polymorpha*), and Mute Swans. The sanctuary is part of a federal Superfund Site and cadmium and nickel contamination have been remediated. Regular monitoring of contaminant levels is ongoing.”⁶⁶

For more information visit: <https://netapp.audubon.org/iba/Reports/767> and <https://www.audubon.org/important-bird-areas/constitution-marsh-sanctuary>

⁶⁶ Ibid.

“Fahnestock and Hudson Highlands State Parks:

Key Species: Eastern Wood-Pewee, Hooded Warbler, Least Flycatcher, Louisiana Waterthrush, Northern Flicker, Worm-eating Warbler, Yellow-throated Vireo, Rose-breasted Grosbeak, Scarlet Tanager, Wood Thrush, Black-and-white Warbler, Blue-gray Gnatcatcher

This rugged area (elevation change from sea level, along the Hudson River, to over 1,400 feet on the summit of Mt. Taurus) lies in a heavily wooded section of Putnam County, a very developed part of the state, and provides a resource for hiking, skiing, swimming, boating, fishing, bow hunting, camping, and other recreational activities. It includes the largest state park in the Taconic region, Fahnestock State Park, and the Hudson Highlands State Park. The Taconic Outdoor Education Center educates school and recreational groups and presents a variety of public programs. Within Fahnestock State Park, the Hubbard/ Perkins Conservation Area is a large unfragmented forest tract. The area includes six lakes, a hemlock stream ravine, and marsh habitat. Much of the forest is oak and mixed hardwoods, with an understory of mountain laurel. According to the NY GAP land cover data, approximately 90% of the site is forested, and includes Appalachian oak-pine, deciduous wetland, evergreen northern hardwood, evergreen plantation, oak, and sugar maple mesic forests. Also present are relatively large stands of hemlock and white pine.

Ornithological Summary: The deciduous and mixed forests support a representative bird community. Breeding birds include Ruffed Grouse, Sharp-shinned Hawks (confirmed breeders), Cooper’s Hawks (confirmed breeders), Red-shouldered Hawks (at least three breeding sites), Broadwinged Hawks, Northern Goshawks (foragers, probable breeders), Barred Owls, Whip-poor-wills (at least four breeding sites), Acadian Flycatchers, Yellow-throated Vireos, Blue-headed Vireos, Warbling Vireos, Winter Wrens, Blue-gray Gnatcatchers, Veeries, Hermit Thrushes, Blue-winged Warblers, Black-throated Green Warblers, Blackburnian Warblers (at least two locations), Prairie Warblers, Cerulean Warblers, Worm-eating Warblers, Kentucky Warblers (at least two locations), Canada Warblers (at least one location), Ovenbirds, Northern and Louisiana Waterthrushes, Hooded Warblers, Scarlet Tanagers, and Dark-eyed Juncos. The granite cliffs provide nesting sites for Peregrine Falcons and Common Ravens. The adjacent Hudson River supports migrating shorebirds, ducks, geese, and a variety of other waterbirds.

Conservation Issues: This site is listed in the 2002 Open Space Conservation Plan as a priority site under the project name Fahnestock State Park and the Highlands Greenway Corridor. Portions of the Fahnestock State Park have been designated a state Bird Conservation Area. There are some potential pollution problems from oil spills and

dumping in the Hudson River. Hiking traffic can be very heavy during the warmer months and could pose a threat to nesting Peregrine Falcons, so should be carefully monitored. Some wetlands have populations of invasive common reed (*Phragmites australis*), which should be monitored. Increased mountain bike traffic and the illegal use of all-terrain vehicles may be problematic and need to be monitored. Inventory and monitoring of breeding birds, especially at-risk species, are needed.”⁶⁷

For more information visit: <https://netapp.audubon.org/iba/Reports/868> and www.audubon.org/important-bird-areas/fahnestock-and-hudson-highlands-state-parks

Lastly, please see Table 11 below for a list of and more information on Bird Species of Conservation Concern within Philipstown.

Further Study:

The NYSDEC will be conducting its third Breeding Bird Atlas from 2020 - 2024. Following the completion of this third edition, Table 11 below should be updated in collaboration with the Hudson River Estuary Program with any changes to the list of bird species provided by the updated 2020- 2024 NYS Breeding Bird Atlas.

Also, the printed full version of the 2000 - 2005 NYS Breeding Bird Atlas, which offers much more information than can be covered here, is available for purchase at: https://www.buteobooks.com/mm5/merchant.mvc?Store_Code=BBBAO&Screen=PROD&Product_Code=12875. We recommend that the Town of Philipstown purchase two copies to keep at Town Hall - one for use by the Conservation Board and one as a reference for interested parties.

Data Sources:

- Breeding Bird Atlas Blocks
 - Breeding Bird Atlas (2000 - 2005)
 - <https://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1256>
- Important Bird Areas
 - Audubon Important Bird Areas
 - https://www.audubon.org/important-bird-areas/state/new-york?field_iba_status=All&priority=All&page=3

⁶⁷ Ibid.

Table 11: Bird Species of Conservation Concern within Philipstown^{*68}

| Common Name | Scientific Name | NYS Conservation Status** | Link to More Information |
|------------------------------|-------------------------------|------------------------------|---|
| Forest Birds | | | |
| Acadian Flycatcher | <i>Empidonax virens</i> | - | https://www.audubon.org/field-guide/bird/acadian-flycatcher |
| American Redstart | <i>Setophaga ruticilla</i> | - | https://www.audubon.org/field-guide/bird/american-redstart |
| Baltimore Oriole | <i>Icterus galbula</i> | - | https://www.audubon.org/field-guide/bird/baltimore-oriole |
| Black-and-white Warbler | <i>Mniotilta varia</i> | - | https://www.audubon.org/field-guide/bird/black-and-white-warbler |
| Black-throated Green Warbler | <i>Dendroica virens</i> | - | https://www.audubon.org/field-guide/bird/black-throated-green-warbler |
| Black-throated Blue Warbler | <i>Dendroica caerulescens</i> | SGCN | https://www.audubon.org/field-guide/bird/black-throated-blue-warbler |
| Broad-winged Hawk | <i>Buteo platypterus</i> | SGCN, SC | https://www.audubon.org/field-guide/bird/broad-winged-hawk |
| Cerulean Warbler | <i>Dendroica cerulea</i> | - | https://www.audubon.org/field-guide/bird/cerulean-warbler |
| Cooper's Hawk | <i>Accipiter cooperii</i> | SGCN, SC | https://www.audubon.org/field-guide/bird/coopers-hawk |
| Downy Woodpecker | <i>Picoides pubescens</i> | - | https://www.audubon.org/field-guide/bird/downy-woodpecker |
| Eastern Wood-Pewee | <i>Contopus virens</i> | - | https://www.audubon.org/field-guide/bird/eastern-wood-pewee |

⁶⁸ Haeckel, Ingrid, 2014, Natural Areas and Wildlife in Your Community, A Habitat Summary Prepared for the Town of Philipstown, NYSDEC Hudson River Estuary Program, <https://philipstown.com/government/conservation-board/cb-documents>

| | | | |
|----------------------------------|----------------------------------|----------|---|
| Hooded Warbler | <i>Wilsonia citrina</i> | - | https://www.audubon.org/field-guide/bird/hooded-warbler |
| Louisiana Waterthrush | <i>Seiurus motacilla</i> | SGCN | https://www.audubon.org/field-guide/bird/louisiana-waterthrush |
| Magnolia Warbler | <i>Dendroica magnolia</i> | - | https://www.audubon.org/field-guide/bird/magnolia-warbler |
| Northern Flicker | <i>Colaptes auratus</i> | - | https://www.audubon.org/field-guide/bird/northern-flicker |
| Northern Goshawk | <i>Accipiter gentilis</i> | SGCN, SC | https://www.audubon.org/field-guide/bird/northern-goshawk |
| Northern Parula | <i>Parula americana</i> | - | https://www.audubon.org/field-guide/bird/northern-parula |
| Red-shouldered Hawk | <i>Buteo lineatus</i> | SGCN, SC | https://www.audubon.org/field-guide/bird/red-shouldered-hawk |
| Rose-breasted Grosbeak | <i>Pheucticus ludovicianus</i> | - | https://www.audubon.org/field-guide/bird/rose-breasted-grosbeak |
| Scarlet Tanager | <i>Piranga olivacea</i> | SGCN | https://www.audubon.org/field-guide/bird/scarlet-tanager |
| Sharp-shinned Hawk | <i>Accipiter striatus</i> | SGCN, SC | https://www.audubon.org/field-guide/bird/sharp-shinned-hawk |
| Veery | <i>Catharus fuscescens</i> | - | https://www.audubon.org/field-guide/bird/veery |
| Wood Thrush | <i>Hylocichla mustelina</i> | SGCN | https://www.audubon.org/field-guide/bird/wood-thrush |
| Worm-eating Warbler | <i>Helmitheros vermivorum</i> | SGCN | https://www.audubon.org/field-guide/bird/worm-eating-warbler |
| Yellow-throated Vireo | <i>Vireo flavifrons</i> | - | https://www.audubon.org/field-guide/bird/yellow-throated-vireo |
| Young Forest and Shrubland Birds | | | |
| American Woodcock | <i>Scolopax minor</i> | SGCN | https://www.audubon.org/field-guide/bird/american-woodcock |
| Black-Billed Cuckoo | <i>Coccyzus erythrophthalmus</i> | SGCN | https://www.audubon.org/field-guide/bird/black-billed-cuckoo |

| | | | |
|------------------------|--------------------------------|----------|---|
| Blue-Winged Warbler | <i>Vermivora pinus</i> | SGCN | https://www.audubon.org/field-guide/bird/blue-winged-warbler |
| Brown Thrasher | <i>Toxostoma rufum</i> | SGCN | https://www.audubon.org/field-guide/bird/brown-thrasher |
| Canada Warbler | <i>Wilsonia canadensis</i> | SGCN | https://www.audubon.org/field-guide/bird/canada-warbler |
| Eastern Kingbird | <i>Tyrannus tyrannus</i> | - | https://www.audubon.org/field-guide/bird/eastern-kingbird |
| Eastern Towhee | <i>Pipilo erythrophthalmus</i> | - | https://www.audubon.org/field-guide/bird/eastern-towhee |
| Field Sparrow | <i>Spizella pusilla</i> | - | https://www.audubon.org/field-guide/bird/field-sparrow |
| Indigo Bunting | <i>Passerina cyanea</i> | - | https://www.audubon.org/field-guide/bird/indigo-bunting |
| Prairie Warbler | <i>Dendroica discolor</i> | SGCN | https://www.audubon.org/field-guide/bird/prairie-warbler |
| Ruffed Grouse | <i>Bonasa umbellus</i> | SGCN | https://www.audubon.org/field-guide/bird/ruffed-grouse |
| Eastern Whip-poor-will | <i>Antrostomus vociferus</i> | SGCN, SC | https://www.audubon.org/field-guide/bird/eastern-whip-poor-will |
| Willow Flycatcher | <i>Empidonax traillii</i> | SGCN | https://www.audubon.org/field-guide/bird/willow-flycatcher |
| Yellow-breasted Chat | <i>Icteria virens</i> | SGCN, SC | https://www.audubon.org/field-guide/bird/yellow-breasted-chat |
| Grassland Birds | | | |
| American Kestrel | <i>Falco sparverius</i> | - | https://www.audubon.org/field-guide/bird/american-kestrel |
| Bobolink | <i>Dolichonyx oryzivorus</i> | SGCN | https://www.audubon.org/field-guide/bird/bobolink |
| Wetland Birds | | | |
| Least Bittern | <i>Ixobrychus exilis</i> | SGCN, T | https://www.audubon.org/field-guide/bird/least-bittern |

| | | | |
|--------------------------------|---------------------------------|----------|---|
| Marsh Wren | <i>Cistothorus palustris</i> | - | https://www.audubon.org/field-guide/bird/marsh-wren |
| Purple Martin | <i>Progne subis</i> | - | https://www.audubon.org/field-guide/bird/purple-martin |
| Birds of Other Habitats | | | |
| Bald Eagle (open water/forest) | <i>Haliaeetus leucocephalus</i> | SGCN, T | https://www.audubon.org/field-guide/bird/bald-eagle |
| Belted Kingfisher (open water) | <i>Megaceryle alcyon</i> | - | https://www.audubon.org/field-guide/bird/belted-kingfisher |
| Chimney Swift (urban) | <i>Chaetura pelagica</i> | - | https://www.audubon.org/field-guide/bird/chimney-swift |
| Osprey (open water/wetland) | <i>Pandion haliaetus</i> | SGCN, SC | https://www.audubon.org/field-guide/bird/osprey |
| Peregrine Falcon (cliffs) | <i>Falco peregrinus</i> | SGCN, E | https://www.audubon.org/field-guide/bird/peregrine-falcon |

*This table was provided by the NYSDEC Hudson River Estuary Program to list bird species of conservation concern that were observed in Philipstown during the 2000-2005 New York State Breeding Bird Atlas. Species are included in the table if 1) they were documented in Atlas blocks that are more than 50% in Philipstown, and 2) they have been identified as Hudson River Valley Priority Birds by Audubon NY.⁶⁹ Young forest and shrubland habitat designations are from DEC Biologist Paul Novak. Updated links have been added to the table for each species, which will take you to much more information about each bird provided by the National Audubon Society, including bird calls, habitat, migration ranges and climate vulnerability.

**NYS Conservation Status Definitions:⁷⁰

E = Endangered Species are determined by the NYSDEC to be in imminent danger of extinction or extirpation in NY State, or are federally listed as endangered.

T = Threatened Species are determined by the NYSDEC as likely to become endangered within the foreseeable future in NY State, or are federally listed as threatened.

⁶⁹ Audubon NY. 2009. Bird Conservation in the Hudson River Valley, <http://ny.audubon.org/hudson-river-valley-conservation>

⁷⁰ NYSDEC, NYS Endangered and Threatened Species, Checklist of Amphibians, Reptiles, Birds and Mammals of New York State, 9th revision, 2010, Division of Fish, Wildlife and Marine Resources https://www.dec.ny.gov/docs/administration_pdf/lpendangerfs.pdf

SC = Species of Special Concern are those native species which are not yet recognized as endangered or threatened, but for which documented evidence exists relating to their continued welfare in NY State. The Special Concern category exists within NYSDEC rules and regulations, but such designation does not provide any additional protection. Special Concern species may be protected under other laws.

SGCN = Species of Greatest Conservation Need are those species that are rare or declining, and could potentially become threatened or endangered, and thus are qualified for conservation efforts funded by the NYSDEC Wildlife Grants program.⁷¹

31. Third Party Map: Amphibians and Reptiles of Philipstown

This map is an example from the NYSDEC's Amphibian & Reptile Atlas Project (Herp Atlas), and in this case shows occurrences of both the Blue-spotted Salamander (blue dots) and the hybridized Blue-spotted Salamander-Jefferson Salamander Complex (yellow rectangles), which will be explained in more detail below.

According to the NYSDEC Herp Atlas Project, “the word ‘herp’ is short for herpetofauna, which is the general term for amphibians and reptiles as a group. Frogs, toads, and salamanders are amphibians. Turtles, snakes, and lizards are reptiles. The Amphibian & Reptile Atlas Project (Herp Atlas) was a ten year survey (1990-1999) that was designed to document the geographic distribution of New York State's herpetofauna. There are approximately 70 species of amphibians and reptiles in New York State. They occur in a wide variety of habitats from the Adirondack Mountains to the Finger Lakes to Long Island's ocean waters, as well as in the cities and suburbs in between. Records prior to 1989 were also sought, and together the data was combined to form an overall NYS herpetological database.

“The unit of measurement for collecting atlas data is the USGS 7.5 minute topographic quadrangle. There are 979 atlas blocks (topographic quadrangles) in the state. The goal was to record at least 20 species in each of these quadrangles. Some quadrangles, such as those in the lower Hudson Valley, have many more species present. Others, such as those in the Adirondacks and where there are high human populations, have fewer. The species distribution maps show the known range of each species found in New York. In a few cases, new locations are noted on the maps with additional reports that were gathered up to 2007. Data from the Atlas should be carefully considered before used for environmental review purposes.

⁷¹ NYSDEC, Species of Greatest Conservation Need (SGCN), <https://www.dec.ny.gov/animals/9406.html>

“In order to monitor changes in populations and to make sound management decisions, we must have a reliable information base from which to work. The information gathered on the current status of our populations will help us to document what changes may be taking place. In the past decade or two there has been much discussion concerning the status of populations of amphibians. While there seems to be a general decline in this group of animals, long-term monitoring projects are the only way to address this problem with scientific accuracy.”⁷²

The goal of this section is to present the herpetological species that have been detected in Herp Atlas Blocks that include Philipstown and provide basic information as well as links to further information on each species. This will be covered below in Table 12: Amphibians and Reptiles of Philipstown. It is important to repeat that the numbers below indicate species found within a block that includes Philipstown. Herpetofauna are far less mobile than birds, so just because a herp was found in a block that includes Philipstown, it doesn't mean that it is present in the Town, although there is a high likelihood that it does occur within the Town due to the Town's comparatively extensive conserved land that includes a variety of significant natural communities and idea habitats for herpetofauna, as shown in previous sections of this chapter.

Findings:

According to the NYS Herp Atlas, the atlas blocks that include Philipstown are rich in amphibian and reptile species. Specifically there are:

- 11 species of salamanders
- 2 species of toads
- 8 species of frogs
- 11 species of turtles
- 2 species of lizards, and
- 13 species of snakes

Thus, 57 out of the documented 72 species from the NYS Herp Atlas can likely be found within Philipstown. This is a tremendous amount of herpetological biodiversity for one municipality. Most of these species are considered of Special Concern and some are Threatened or Endangered at the NYS level. Common habitat for many, if not all of these species includes wetlands, vernal (spring) pools, streams and forested areas, thus emphasizing how important it is for the Town of Philipstown to protect each of these ecological areas from fragmentation and other threats. Furthermore, due to a lack of data on local vernal pools, a follow-up study to document and map vernal pools and then add these areas to the existing wetlands protection overlay in the town's Zoning Code would go a long way to protecting many of the species listed in the table below.

⁷² NYSDEC, Herp Atlas Project, <https://www.dec.ny.gov/animals/7140.html>

For reference, the NYS Herp Atlas Distribution Maps for each group of amphibians and reptiles can be found at the following links:

- Salamanders: <https://www.dec.ny.gov/animals/7485.html>
- Toads and Frogs: <https://www.dec.ny.gov/animals/7487.html>
- Turtles: <https://www.dec.ny.gov/animals/7479.html>
- Lizards and Snakes: <https://www.dec.ny.gov/animals/7483.html>

Further Study:

As noted above, a study to document and map vernal pools within Philipstown could help protect areas that are currently not protected by the town's wetlands protection overlay in the town's zoning code. Putnam Valley has conducted such a study, which could be replicated in Philipstown. For information on this study, please see "Verified and Potential Vernal pools" in the "Wetlands" section of the Putnam Valley NRI, available at:

<https://putnamvalleyresidents.com/NRI%20files%20by%20chapter/Wetlands.pdf>

Data Sources:

- Amphibians and Reptiles of Philipstown
 - NYS Amphibian and Reptile (Herp) Atlas
<https://www.dec.ny.gov/animals/7140.html>

Table 12: Amphibians and Reptiles of Philipstown

| Common Name | Scientific Name | Habitat Description (from "More Information" link) | State / Federal Protection ⁷³ | State / Global Rank ⁷⁴ | Link to More Information |
|------------------------------|--|--|--|-----------------------------------|---|
| Salamanders | | | | | |
| Marbled Salamander | <i>Ambystoma opacum</i> | Upland and floodplain deciduous forests with wet depressions that provide fall breeding pools. | Special Concern / Not Listed | S3 / G5 | https://www.dec.ny.gov/docs/wildlife_pdf/sgcnmarblesalamander.pdf |
| Jefferson Salamander | <i>Ambystoma jeffersonianum</i> | Occur in deciduous forest and mixed deciduous-coniferous forests with abundant tree stumps and downed logs that provide shelter. They also occur in bottomland forests adjacent to disturbed and agricultural lands. Breeding occurs in ephemeral pools and in semipermanent wetlands adjacent to woodland habitats. Breeding pools are generally cool, slightly turbid, and with a forested shoreline and emergent vegetation on the bottom. Fish-free ponds are preferred but some populations will breed where fish are present | Special Concern / Not Listed | S4 / G4 | https://www.dec.ny.gov/docs/wildlife_pdf/sgcnjeffsalamander.pdf |
| Jefferson Salamander Complex | <i>Ambystoma jeffersonianum x laterale</i> | The Jefferson Salamander Complex is a hybrid mixed with the Blue-spotted Salamander. Requires similar habitat to either the Jefferson or Blue-spotted Salamander. | Special Concern / Not Listed | S4 / G4G5 | https://www.dec.ny.gov/docs/wildlife_pdf/sgcnbssalamander.pdf |
| Blue-spotted Salamander | <i>Ambystoma laterale</i> | Not a strong burrower, and can usually be found under logs, leaf litter and other ground cover. It occurs in damp deciduous or deciduous-coniferous forests, as well as open areas including pastures and grassy fields that support permanent or ephemeral pools or ponds. It is occasionally found in areas of sandy soils, but is also associated with bogs, marshes and other poorly drained sites. | Special Concern / Not Listed | S4 / G5 | https://www.dec.ny.gov/docs/wildlife_pdf/sgcnbssalamander.pdf |
| Spotted Salamander | <i>Ambystoma maculatum</i> | Hardwood and mixed forests close to stagnant water sources like swamps, ponds, and vernal pools | Not Listed / Not Listed | n/a | https://www.nwf.org/Educational-Resources/Wildlife-Guide/Amphibians/Spotted-Salamander |
| Red-spotted Newt | <i>Notophthalmus v. viridescens</i> | Moist forest floors and among leaf litter. Small bodies of fresh water such as ponds, lakes, marshes, and relatively slow-moving waters with a muddy substrate. They are commonly found in | Not Listed / Not Listed | n/a | https://www.dec.ny.gov/animals/67022.html |

⁷³ New York Natural Heritage Program, NYNHP Online Conservation Guides, NYSDEC, 2020, <https://guides.nynhp.org/>

⁷⁴ Ibid.

| | | | | | |
|-------------------------------|------------------------------|---|--|-----|---|
| | | beaver ponds and man-made water bodies. | | | |
| Northern Redback Salamander | <i>Plethodon c. cinereus</i> | Wooded areas. Found underground or underneath logs, stumps, rocks, and moist leaf litter. During rainy nights, may climb vegetation in search of prey. | Not Listed / Not Listed | n/a | https://wildlife.state.nh.us/wildlife/profiles/redback-salamander.html |
| Northern Slimy Salamander | <i>Plethodon glutinosus</i> | Eastern deciduous forests under bark or other debris on ground, especially on hillsides. | Not Listed / Not Listed | n/a | https://herpetology.inhs.illinois.edu/species-lists/ilspecies/northern-slimy-salamander/ |
| Four-toed Salamander | <i>Hemidactylum scutatum</i> | Occur in moist forest habitats of a wide variety as long as they include small ponds, seeps, bogs, or swamps. Eggs are laid in mossy areas that just overhang water, a microhabitat that may be limited even in relatively large wetlands. Vegetative moisture level appears to be more critical than the species of moss that are present. | Species of Greatest Conservation Need / Not Listed | n/a | https://www.dec.ny.gov/docs/wildlife/pdf/sgcnfourtoesalam.pdf |
| Northern Red Salamander | <i>Pseudotriton r. ruber</i> | Prefer cold, clear streams and are also found in wooded areas under rocks, bark and leaf litter. | Not Listed / Not Listed | n/a | https://nationalzoo.si.edu/animals/northern-red-salamander |
| Northern Two-lined Salamander | <i>Eurycea bislineata</i> | Generally is found close to streams. This species is associated with moderately to fast-flowing rocky streams, which may be tiny creeks or actual rivers, in deciduous or mixed forests. During the day, the northern two-lined salamanders can be found under nearby rocks. It spends the winter buried in the stream bed or tucked away in sheltered rocky or gravelly areas. | Not Listed / Not Listed | n/a | https://ontarionature.org/programs/citizen-science/reptile-amphibian-atlas/northern-two-lined-salamander/ |
| Toads | | | | | |
| Eastern American Toad | <i>Bufo a. americanus</i> | This toad prefers rocky, wooded areas and often lives along the edge of hardwood forests. Individuals hide during the day under rocks where there is loose, moist dirt, or they burrow into a depression where dead leaves have accumulated. Like most toads, this species becomes active at dusk. | Not Listed / Not Listed | n/a | https://nature.mdc.mo.gov/discover-nature/field-guide/eastern-american-toad |
| Fowler's Toad | <i>Bufo fowleri</i> | Fowler's toads can be found in a range of habitats associated with flood plains, including wooded areas, river valleys, near streams and ponds, marshlands and in agricultural fields. Fowler's toads burrow into the soil or hide under rocks, plants or other cover when inactive, usually during daylight hours. | Not Listed / Not Listed | n/a | https://nationalzoo.si.edu/animals/fowlers-toad |
| Frogs | | | | | |
| Gray Treefrog | <i>Hyla versicolor</i> | May be found in many types of tree and shrub communities located near permanent water. The species usually lives in woodlands but may also | Not Listed / Not Listed | n/a | https://ontarionature.org/programs/citizen-science/reptile-amphibian-atlas/gray-treefrog/ |

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| | | frequent orchards. The gray treefrog is a true “tree frog”: it can be found at the top of even the tallest trees. These frogs are rarely seen outside the breeding season. When they are not active, they hide in tree holes, under bark, in rotten logs, and under leaves and tree roots. Gray treefrogs overwinter under leaf litter and snow cover. Their eggs and larvae develop in shallow woodland ponds and marshes, puddles, ponds in forest clearings, swamps, bogs and many other kinds of permanent or temporary waterbodies that have no significant current, including ponds that humans have excavated. | | | y-treefrog/ |
| Northern Spring Peeper | <i>Pseudacris c. crucifer</i> | Deciduous woodlands, swamps, marshland fields and meadows. | Not Listed / Not Listed | n/a | https://www.paherps.com/herps/frogs-toads/northern_spring_peeper/ |
| Bullfrog | <i>Rana catesbeiana</i> | Along the banks, edges, and shallows of wetlands such as freshwater ponds and lakes, swamps, marshes, and slow moving streams and rivers. Bullfrogs are especially common where there are areas of emergent, submerged, or floating patches of plants that provide cover. | Not Listed / Not Listed | n/a | https://www.dec.ny.gov/animals/58652.html |
| Green Frog | <i>Rana clamitans melanota</i> | Found in ponds, marshes, lake fringes and sometimes along stream sides. | Not Listed / Not Listed | n/a | https://www.dec.ny.gov/docs/administration_pdf/frogs.pdf |
| Wood Frog | <i>Rana sylvatica</i> | Found in close-canopied forests, it breeds in cold, clear waters of temporary pools, and sometimes in beaver meadows, swamps and bogs | Not Listed / Not Listed | n/a | https://www.dec.ny.gov/docs/administration_pdf/frogs.pdf |
| Northern Leopard Frog | <i>Rana pipiens</i> | Submerged grassy habitats near marshes and ponds | Not Listed / Not Listed | n/a | https://www.dec.ny.gov/docs/administration_pdf/frogs.pdf |
| Southern Leopard Frog | <i>Rana sphenoccephala utricularius</i> | Submerged grassy habitats near marshes and ponds | Special Concern / Not Listed | n/a | https://www.dec.ny.gov/docs/administration_pdf/frogs.pdf |
| Pickerel Frog | <i>Rana palustris</i> | During spring mating season, they are found in aquatic habitats, including marshes, bogs, fens, rocky ravines, meadow streams, and the weedy, shallow borders of ponds and lakes. After breeding, they disperse into the surrounding terrestrial habitat and may be found in deciduous or mixed woods and low-lying open fields and meadows. | Not Listed / Not Listed | n/a | https://www.wildadironacks.org/adiroondack-amphibians-pickerel-frog-lithobates-palustris.html#habitat |
| Turtles | | | | | |
| Common Snapping Turtle | <i>Chelydra s. serpentina</i> | Lakes, ponds, rivers, streams, and marshes throughout New York, particularly in slow moving, shallow waters with a muddy bottom. One of the most adaptable reptiles in New York, they are even found in urban waterways. | Not Listed / Not Listed | n/a | https://www.dec.ny.gov/animals/55703.html |

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| | | Females move to upland nesting locations predominantly in the early morning or early evening. The preferred nesting locations are within 100 feet of the water and typically occur in sandy or loamy soils, making backyard gardens a frequent nesting location. | | | |
| Common Musk Turtle | <i>Sternotherus odoratus</i> | A variety of water bodies that have a soft, muddy substrate, submerged vegetation, and little or no current. They may be found in canals, ponds, large streams, marshes, and weedy coves of natural lakes and rivers | Species of Greatest Conservation Need / Not Listed | S5 / G5 | https://www.dec.ny.gov/docs/wildlife_pdf/sgcnemuskturtle.pdf |
| Spotted Turtle | <i>Clemmys guttata</i> | Spend their lives in marshy meadows, bogs, swamps, ponds, ditches, or other small bodies of still water. | Special Concern / Not Listed | S3 / G5 | https://www.dec.ny.gov/animals/7150.html |
| Wood Turtle | <i>Clemmys insculpta</i> | Clear, flowing streams and rivers or in the habitats surrounding them such as woodlands, meadows, and forest edges | Special Concern / Not Listed | S3 / G3 | https://guides.nynhp.org/wood-turtle/ |
| Bog Turtle* | <i>Clemmys muhlenbergii</i> | This is a semi-aquatic species, preferring habitat with cool, shallow, slow-moving water, deep soft muck soils, and tussock-forming herbaceous vegetation. In New York, the bog turtle is generally found in open, early successional types of habitats such as wet meadows or open calcareous boggy areas generally dominated by sedges | Endangered / Threatened | S2 / G2G3 | https://www.dec.ny.gov/animals/7164.html |
| Eastern Box Turtle | <i>Terrapene c. carolina</i> | Usually found near ponds, fields, meadows, and woodlands | Special Concern / Not Listed | n/a | https://www.nwf.org/Educational-Resources/Wildlife-Guide/Reptiles/Eastern-Box-Turtle |
| Northern Diamondback Terrapin | <i>Malaclemys t. terrapin</i> | Found in brackish waters of coastal salt marshes, tidal creeks, estuaries, bays, and coves. | Not Listed / Not Listed | n/a | https://www.dec.ny.gov/animals/59652.html |
| Common Map Turtle | <i>Graptemys geographica</i> | Found in waters that are stagnant or slow moving with a lot of vegetation. | Not Listed / Not Listed | n/a | https://turtleowner.com/native-turtles-of-new-york-with-pictures/#Common_Map_Turtle_(Graptemys_geographica) |
| Red-eared Slider | <i>Trachemys scripta elegans</i> | INVASIVE to NYS. Native to more southern regions of the USA. Red-eared sliders are well-poised to be effective invaders. They reach sexual maturity at a young age and have high fecundity. Red-eared sliders compete with native turtle species for food, habitat, and other resources. These turtles can get quite large (10-12") and are notoriously aggressive, and can bully native turtles out of basking sites, a critical resource for these reptiles. Reduced access to these sites can slow growth and increase mortality of native turtles. Additionally, turtles raised in captivity can develop diseases that are unfamiliar to wild turtles. Upon release, these red-eared | Not Listed / Not Listed | n/a | http://www.invasive-speciesinitiative.com/redeared-slider |

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| | | sliders can introduce diseases that can seriously harm native populations. | | | |
| Painted Turtle | <i>Chrysemys picta</i> | Prefer to live in freshwater, and they can be usually found in slow moving rivers, ponds, and lakes. | Not Listed / Not Listed | n/a | https://turtleowner.com/native-turtles-of-new-york-with-pictures/#Eastern_Painted_Turtle_(Chrysemys_picta) |
| Blanding's Turtle | <i>Emydoidea blandingii</i> | Found in isolated coves and weedy bays, and further inland in shallow, marshy waters and ponds, and can be found in shrubby wetlands dominated by woody vegetation such as buttonbush and willow. | Threatened / Not Listed | S2S3 / G4 | https://www.dec.ny.gov/animals/7166.html |
| Lizards | | | | | |
| Northern Fence Lizard | <i>Sceloporus undulatus hyacinthinus</i> | Naturally occurring fence lizard populations are confined to the Hudson Highlands region of the state. These areas are characterized by steep slopes with extensive open rocky areas that are surrounded by mixed-deciduous, oak-dominated, forests. | Threatened / Not Listed | S1 / G5 | https://guides.nynh.org/fence-lizard/ |
| Five-lined Skink | <i>Plestiodon fasciatus</i> | Prefer moist, partially wooded habitat that provides ample cover, trees as well as sites to bask in the sun. They live in forest edges, mixed pine-hardwood forests, along wooded river margins, in rocky areas, stumps, logs, brush piles or inside walls of abandoned buildings. | Species of Greatest Conservation Need / Not Listed | n/a | http://animalia.bio/american-five-lined-skink |
| Snakes | | | | | |
| Northern Water Snake | <i>Nerodia s. sipedon</i> | Northern water snakes like a wide variety of aquatic habitats. They can be seen basking on rocks and prefer slow-moving or standing water near places where they can bask in the sun, such as ponds, vernal pools (seasonal pools of water), and lakes. | Not Listed / Not Listed | n/a | https://www.nwf.org/Educational-Resources/Wildlife-Guide/Reptiles/Northern-Water-Snake |
| Northern Brown Snake | <i>Storeria d. dekayi</i> | This snake lives in moist to wet areas in woodland, prairies, marshes, and in the margins of swamps, bogs and ponds. In areas of human habitation it sometimes occurs in vacant lots and gardens. | Not Listed / Not Listed | n/a | https://www.oplin.org/snake/fact%20pages/brownsnake_n/brownsnake_n.html |
| Northern Redbelly Snake | <i>Storeria o. occipitamaculata</i> | Lives in wet fields, forests (both coniferous and deciduous), and gardens. These snakes are very secretive and often hide under large rocks, rotten logs and boards. | Not Listed / Not Listed | n/a | https://animalsofupstateny.weebly.com/red-bellied-snake.html |
| Common Garter Snake | <i>Thamnophis sirtalis</i> | New York's most common snake species, frequently found in lawns, old elds and woodland edges. | Not Listed / Not Listed | n/a | https://www.dec.ny.gov/docs/administration_pdf/snakes.pdf |
| Eastern Ribbon Snake | <i>Thamnophis sauritus</i> | Eastern Ribbon Snakes are semi-aquatic in nature and can be easily found in the wetlands and on the corners of bogs, streams, salt marshes and lakes. They | Not Listed / Not Listed | n/a | http://www.snake-removal.com/eastern-ribbonsnake.html |

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| | | are equally comfortable in water and on land. With the arrival of winters, they move into the dens and go into the state of hibernation. | | | |
| Eastern Hognose Snake | <i>Heterodon platirhinos</i> | Feeds almost exclusively on toads and is most frequently found in sandy habitats. | Not Listed / Not Listed | n/a | https://www.dec.ny.gov/docs/administration_pdf/snakes.pdf |
| Northern Ringneck Snake | <i>Diadophis punctatus edwardsii</i> | Ring-necked snakes are found in forested areas, including forest edges and clearings. These snakes are most common in areas with shallow soil and surface bedrock, where they are frequently found under rocks, logs or bark. They hibernate underground and will also retreat underground during especially warm weather. | Not Listed / Not Listed | n/a | https://ontarionature.org/programs/citizen-science/reptile-amphibian-atlas/northern-ring-necked-snake/ |
| Eastern Worm Snake | <i>Carphophis a. amoenus</i> | Moist forests and drier forests may also be inhabited | Special Concern / Not Listed | S2 / G5 | https://guides.nynhp.org/eastern-worm-snake/ |
| Northern Black Racer | <i>Coluber c. constrictor</i> | Black racer habitat includes lightly wooded areas, open forest, fields, meadows, powerline cuts and roadsides. | Species of Greatest Conservation Need / Not Listed | n/a | http://wildlifeofct.com/northern%20black%20racer.html |
| Black Rat Snake | <i>Elaphe o. obsoleta</i> | A woodland species, but is found around barns where it is highly desirable for its ability to seek and destroy mice and rats | Not Listed / Not Listed | n/a | https://www.dec.ny.gov/docs/administration_pdf/snakes.pdf |
| Eastern Milk Snake | <i>Lampropeltis t. triangulum</i> | A woodland species, but are frequently found in and around barns, outbuildings and houses where they are attracted to mice. | Not Listed / Not Listed | n/a | https://www.dec.ny.gov/docs/administration_pdf/snakes.pdf |
| Northern Copperhead | <i>Agkistrodon contortrix mokasen</i> | Copperheads live in a range of habitats, from terrestrial to semiaquatic, including rocky, forested hillsides and wetlands. They are also known to occupy abandoned and rotting wood or sawdust piles, construction sites and sometimes suburban areas. They climb into low bushes or trees to hunt prey and will also bask in the sun and swim in the water. | Not Listed / Not Listed | n/a | https://nationalzoo.si.edu/animals/northern-copperhead |
| Timber Rattlesnake | <i>Crotalus horridus</i> | Timber rattlesnakes are generally found in deciduous forests in rugged terrain. In the summer, gravid (pregnant) females seem to prefer open, rocky ledges where temperatures are higher, while the males and non-gravid females seem to prefer cooler, thicker woods where the forest canopy is more closed. Rattlers generally migrate from 1.3 to 2.5 miles from their den each summer, with a maximum movement of 4.5 miles observed. | Threatened / Not Listed | S3 / G4 | https://www.dec.ny.gov/animals/7147.html |

*Although these species' Herp Atlas Distribution Map doesn't show them occurring in Philipstown, they have been observed in other parts of Putnam County and/or in neighboring Dutchess County, and it is reasonable to suggest that they may be present in Philipstown as well. For this reason we have included them in this table.

35. Invasive Species

Description:

According to the New York Natural Heritage Program, “an invasive species is an organism that is introduced to an area outside its native range that causes or has the potential to cause harm to the environment, economy, or human health. [They are often problematic because they have few or no native predators that can keep their populations under control, and thus can quickly outcompete native species that have local checks on their populations]. One of the first steps to understanding the impact or potential impact of invasive species is to know where they occur. Many different groups of people are recording the locations of invasive species, but generally they are focused on a small local area or on lands that they directly manage.

“In order to get a large scale picture of where species are occurring, these sightings need to be shared. iMapInvasives was created to be an invasive species reporting and data management tool that is on-line and map-based. It was developed through a partnership between The Nature Conservancy, NatureServe, the New York Natural Heritage Program, and the Florida Natural Areas Inventory, with many other collaborators. The primary focus for iMapInvasives is to track invasive species locations and management efforts. iMapInvasives tools can be used by citizen scientists, land owners, natural resources managers, and others who are working to prevent, control, or manage invasive species. The project works with groups, institutions, and state government to gather data on aquatic and terrestrial invasive species, prioritize invasive species control, and assist in the restoration of natural habitats. Project information is used to analyze data gaps and prioritize survey efforts, create emerging invasive species watch lists, and publicize invasive species threats.”⁷⁵

The data used for this map comes from the iMapInvasives online mapping tool. Whereas the online tool presents individual points for every reported species (which unfortunately end up looking a bit like a blob of countless points unless zoomed in closely), instead, for the sake of presenting the information in a friendlier format, we have broken the iMapInvasives data into two parts:

⁷⁵ iMapInvasives, What is an Invasive Species?, New York Natural Heritage Program, <https://www.imapinvasives.org/what-makes-a-species-invasive>

- Map 32. Invasive Species, which simply shows the relative density of reported invasive species within and around Philipstown; and
- Table 13: Top Twenty Confirmed Invasive Species in Philipstown, which lists the twenty most-reported invasive species within Philipstown.

It is essential to note that *this map and list should not be interpreted as conclusive since the results are only based on volunteer reporting*; however, they should give a good indication of the areas that are being exposed the most to invasive species, what those species are, and what potential threats they pose to Philipstown's natural resources.

Findings:

As the map shows, there are numerous areas within Philipstown that have relatively high concentrations of confirmed reported invasive species, according to the iMapInvasives program. High reported occurrences could mean two things: there are a large number of invasive species and/or there is a higher rate of reporting in these areas (usually due to increased presence of people that are interested in reporting invasives). Separating one from the other is not possible based on the data available from iMapInvasives, but we can still draw certain conclusions about the type of areas that are showing high reporting levels of invasives.

1. Hudson River Shoreline - the map also shows that almost all of Philipstown's Hudson River shoreline has a high density of reported invasive species. This is not surprising since there are many aquatic invasive species, such as water chestnut, which can be introduced by human activities such as recreational boating. In addition, the Hudson River is used as a shipping route, which can also be the source of introduced species. This is especially problematic in Philipstown due to the precious existence of Constitution Marsh and Manitou Marsh along the Hudson River, which we have already learned are incredibly important habitat areas for many plant and animal species, some of which are rare or threatened.
2. State Parks and Popular Hiking Areas - the map shows that a large number of reports have occurred in the Hudson Highlands State Park, both in the northwestern and southwestern parts of Philipstown, including popular hiking areas such as Breakneck Ridge, Bull Hill, Sugarloaf and Anthony's Nose. Similarly, popular trail areas in Clarence Fahnestock Memorial State Park, such as off of Route 301 and East Mountain Road South, have high reporting densities of invasives. And the Appalachian Trail corridor, which connects the southwestern parts of Hudson Highlands State Park to Fahnestock State Park have high rates of reporting. Outside of Philipstown, popular hiking areas around Sunken Mine Road in Putnam Valley, Storm King across from

Breakneck Ridge and Bear Mountain across from Anthony's Nose also show high concentrations of reported invasives.

Why is this the case? Hiking trails often overlap with previous development in current recreational areas, such as along old logging or mining roads (e.g. within Fahnestock State Park) as well as areas that used to be developed private property (e.g. the Cornish Estate within Hudson Highlands State Park) and were accessed by motorized vehicles. These prior uses of the land around hiking trails are a major reason for the occurrence of invasive species in the same spaces where recreational use now occurs. Additionally, many invasives in Philipstown are carried by birds, other wild animals, wind, or intentional (historic or current) landscaping. Thus some invasive species may likely have been present for a long time, long preceding the presence of hikers. That said, there is the possibility of hikers introducing invasives into these areas by accident, such as by depositing plant seeds stuck in their boots, although this is unlikely compared to other causes.

Regardless of the means of introduction, there is an important bias to the iMapInvasives data: Because invasive species along trails are more visible to hikers, they are more likely to be seen and reported. Hiking trails also tend to begin along forest or field edges, which are common places for invasive species to establish themselves. Their higher visibility along these edges also makes them more likely to be seen and thus reported. And it is very likely the case that people who are out hiking on public trails are more likely to report invasive species due to their passion for the outdoors and increased motivation to report invasives in hopes of preserving native ecosystems in the beautiful areas that are currently popular for hiking. Thus, this data must be considered as suggestive but incomplete in terms of presenting a comprehensive picture of where invasives are occurring within Philipstown. Solutions to this are described in the Further Study section below.

To complement the map, Table 13 below shows the twenty most-reported invasive species within Philipstown, such as well-known invasives like *japanese barberry*, *water chestnut*, *common carp* and *hemlock wooly adelgid*, to name a few. In addition, the following invasive species have been reported in lesser numbers (but did not make the top twenty):

Norway Maple, Emerald Ash Borer, Bishops' Goutweed, Porcelain Berry, Orange-Eye Butterfly Bush, Goldfish, Narrowleaf Bittercress, Celandine, Chinese Mustersnail, Japanese Virgin's Bower, Scotch Broom, Chinese Yam, Zebra Mussel, Chinese Mitten Crab, Lesser Celandine, Brown Marmorated Stink Bug, English Ivy, Morning Glory, Yellow Flag Iris, Privet (species unknown), Japanese Honeysuckle, Morrow Honeysuckle, Giant Lupine, Moneywort, Purple Loosestrife, White Mulberry, True

Forget-me-not, Watercress, Boston Ivy, Empress Tree, Reed Canarygrass, Canada Bluegrass, Eastern Redbelly Turtle, Common Buckthorn, Black Jetbead, Black Locust, Cutleaf Blackberry, Rusty Willow, Crack Willow, Basket Willow, Red-eared Slider Turtle, Coltsfoot, Siberian Elm, Common Speedwell, Wisteria (species unknown).

After reviewing species descriptions for each of the top twenty invasives (available via the “More Information” links for each species in the table below), it became clear that there were four common themes for how most invasive species are introduced and where they thrive:

1. **Increased Forest Fragmentation:** Many terrestrial invasive plants thrive on the edge of forests and in open fields, but do not establish well in core forests. This clearly suggests that the increased fragmentation of forests will not only reduce the forests’ capacity to provide quality habitat to its many species (as covered in other sections of this chapter), but will also make it more likely that invasive species will become established and begin to compete with native species.
2. **Waterways:** As mentioned above, numerous aquatic invasive species have been introduced due to recreational and commercial human activities, much of which has concentrated on the Hudson River, but can also occur in local lakes due to the use of boats that have not been thoroughly cleaned. The NYSDEC has numerous regulations and educational material⁷⁶ dedicated to stopping the introduction of invasives by this means, but unfortunately these state efforts sometimes go ignored, which can lead to severe consequences for native flora and fauna, in addition to the integrity of recreational resources.
3. **Landscaping and Released Pets:** Many of the species reported in Philipstown are used as ornamental plantings on the yards of residences or businesses and unfortunately this can lead to the spread of these species beyond the boundaries of a given property. Seeds on the wind don’t have much concern for private property, after all. Similarly, some animal species, such as the Red-eared Slider Turtle have been kept as pets and then released into the wild, where they end up outcompeting and jeopardizing the survival of native species.
4. **Climate Change:** as noted in Chapter 5: Climate Change, increasingly mild winters are enabling non-native species to survive in Philipstown, and without native predators, these species have an advantage in outcompeting their native counterparts. Similarly, many invasive species that tend to thrive on forest edges, roadsides, etc. also tend to be more resilient to the unpredictability of climate change since they are not as finely-tuned to local weather patterns as native species. This means that, for example, following a natural disaster, such as a powerful wind storm that knocks over numerous trees, invasive species

⁷⁶ NYSDEC, Nuisance and Invasive Species, <https://www.dec.ny.gov/animals/265.html>

will be more likely to survive and take over the exposed open habitat. Once established, they will have an even better chance of expanding their range and further outcompeting native species. This feedback loop is unfortunately projected to worsen over the rest of the 21st century and will require active human intervention to remove invasive species and plant native species in order to level the playing field.⁷⁷

Further Study:

The NYSDEC has enacted numerous policies and programs, including grant opportunities, to prevent the spread of invasive species. The Town of Philipstown may take advantage of this information and these opportunities to better protect its natural resources from further damage by invasives. For more information, please visit: <https://www.dec.ny.gov/animals/265.html>.

Also, the Town of Philipstown in collaboration with local conservation organizations could organize a local invasive species reporting and removal program targeting the above-listed areas and sources of introduction as well as residential or commercial areas that have been less covered by participants of iMapInvasives. The program could prioritize the top twenty species listed in the table below, but also consider any of the less common species listed above. Such a project could also involve the Town's Climate Smart Task Force as part of the committee's efforts related to climate adaptation. More information and examples of such projects can be found at: <https://www.dec.ny.gov/animals/114620.html> and <https://www.imapinvasives.org/imap-in-action>

Data Sources:

- Density of Reported Invasive Species
 - NYNHP iMapInvasives <https://www.nyimapinvasives.org/data-and-maps>

⁷⁷ Burgiel, S.W. and Thomas Hall, Bioinvasions in a Changing World: A Resource on Invasive Species-Climate Change Interactions for Conservation and Natural Resource Management, The Ad Hoc Working Group on Invasive Species and Climate Change, NISC & USDA, https://www.fws.gov/uploadedFiles/Ad_Hoc_Working_Group_on_Invasive_Species_and_Climate_Change_2014.pdf

Table 13: Top Twenty Confirmed Invasive Species in Philipstown⁷⁸

| Common Name(s) | Scientific Name | Confirmed Occurrences | Percentage | Rank | More Information |
|--|--|-----------------------|------------|------|---|
| Japanese Barberry | <i>Berberis thunbergii</i> | 605 | 26.03% | 1 | https://www.invasivespeciesinfo.gov/terrestrial/plants/japanese-barberry |
| Multiflora Rose; Rambler Rose | <i>Rosa multiflora</i> | 261 | 11.23% | 2 | https://www.invasivespeciesinfo.gov/terrestrial/plants/multiflora-rose |
| Oriental Bittersweet | <i>Celastrus orbiculatus</i> | 254 | 10.93% | 3 | https://www.invasivespeciesinfo.gov/terrestrial/plants/oriental-bittersweet |
| Common Carp | <i>Cyprinus carpio</i> | 182 | 7.83% | 4 | https://nas.er.usgs.gov/queries/factsheet.aspx?speciesID=4 |
| Garlic Mustard | <i>Alliaria petiolata</i> | 161 | 6.93% | 5 | https://www.invasivespeciesinfo.gov/terrestrial/plants/garlic-mustard |
| Japanese Stiltgrass, Nepalese Browntop, Japanese stilt grass, Nepalgrass | <i>Microstegium vimineum</i> | 106 | 4.56% | 6 | https://www.invasivespeciesinfo.gov/terrestrial/plants/japanese-stiltgrass |
| Eurasian Water-milfoil; European Water-milfoil; Spiked Water-milfoil | <i>Myriophyllum spicatum</i> | 104 | 4.48% | 7 | https://www.invasivespeciesinfo.gov/aquatic/plants/eurasian-watermilfoil |
| Water Chestnut | <i>Trapa natans</i> | 97 | 4.17% | 8 | https://www.invasivespeciesinfo.gov/aquatic/plants/water-chestnut |
| Black Swallow-wort; Louise's Swallow-wort; Dog-strangling Vine | <i>Vincetoxicum louseae</i> | 62 | 2.67% | 9 | https://gobotany.nativeplanttrust.org/species/cynanchum/louiseae/ |
| Wineberry, Japanese Wineberry, Wine Raspberry | <i>Rubus phoenicolasius</i> | 59 | 2.54% | 10 | http://nyis.info/invasive_species/wineberry/ |
| Common Reed, phragmites, Common reed grass | <i>Phragmites australis ssp. australis</i> | 51 | 2.19% | 11 | http://nyis.info/invasive_species/common-reed/ |
| Honeysuckle (species unknown) | <i>Lonicera spp (species unknown)</i> | 40 | 1.72% | 12 | http://nyis.info/invasive_species/honeysuckle/ |
| Tree-of-heaven; Chinese Sumac; Ailanthus | <i>Ailanthus altissima</i> | 37 | 1.59% | 13 | https://www.invasivespeciesinfo.gov/terrestrial/plants/tree-heaven |

⁷⁸ NYSDEC, iMapInvasives Data, New York Natural Heritage Program, Invasive Species Database, 2020, <https://www.nyimainvasives.org/data-and-maps>

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| Brittle Naiad, Brittle Water-nymph, Lesser Naiad, Slender-leaved naiad | <i>Najas minor</i> | 34 | 1.46% | 14 | https://www.dnr.state.mn.us/invasives/aquaticplants/brittlenaiad/index.html |
| Japanese Angelica Tree | <i>Aralia elata</i> | 29 | 1.25% | 15 | http://adkinvasives.com/Invasive-Species/Detail/54 |
| Burning Bush, Winged Euonymus, Winged Burning Bush, Winged Spindletree | <i>Euonymus alatus</i> | 25 | 1.08% | 16 | https://www.invasive.org/alien/pubs/midatlantic/eual.htm |
| Japanese Knotweed, Japanese Bamboo | <i>Reynoutria japonica</i> var. <i>japonica</i> : <i>Fallopia japonica</i> var. <i>japonica</i> | 23 | 0.99% | 17 | http://nyis.info/invasive_species/japanese-knotweed/ |
| Mugwort | <i>Artemisia vulgaris</i> var. <i>vulgaris</i> | 21 | 0.90% | 18 | http://nyis.info/invasive_species/mugwort-draft/ |
| Hemlock Woolly Adelgid | <i>Adelges tsugae</i> | 17 | 0.73% | 19 | http://nyis.info/invasive_species/hemlock-woolly-adelgid/ |
| Mile-a-minute Weed, Mile-a-minute Vine, Asiatic Tearthumb | <i>Persicaria perfoliata</i> | 16 | 0.69% | 20 | http://nyis.info/invasive_species/mile-a-minute/ |
| | <i>All Other Invasive Species Combined</i> | 140 | 6.02% | - | |

Chapter 5: Climate Change

33. Sea Level Rise & Climate Conditions and Projections

Description:

According to the NYS Energy Research and Development Administration (NYSERDA), “climate in the Hudson Valley region is temperate and variable, from warm summers bringing occasional heat waves and droughts to cold, snowy winters. Climate change has already affected the normal variability in weather patterns, and is projected to continue to significantly alter climate conditions in the future. It is important for municipalities to understand the risks posed by changing climate conditions, and how they relate to local natural resources and human health, as well as to the built environment. Increasing temperature, sea level rise, and variability in precipitation are the primary climate change-related hazards in the Northeast region. These hazards may pose significant risks to natural resources and human communities, namely through heat waves, drought, flooding, and poor air quality. Recognizing the value of natural resources as ‘green infrastructure’ in devising climate adaptation strategies is essential.

“Air temperature, sea level, and the frequency and intensity of extreme precipitation events are projected to increase through 2100 in the Hudson Valley region. For example, New York’s annual average temperature has risen nearly two degrees Fahrenheit and winter temperature almost 5 degrees since 1970.¹ Sea level, which influences the Hudson River, has risen 15 inches in New York Harbor over the last 150 years. The Northeast has also experienced a 74% increase in the amount of precipitation occurring in heavy rainfall events between the periods of 1950-1979 and 1980-2009. These factors combine to create more frequent and severe heat waves, short-term drought, and flooding.”²

Specifically concerning sea level rise, Scenic Hudson states, “The Hudson River is an extension of the Atlantic Ocean, a 150-mile-long estuary that stretches from the Narrows in New York Harbor to the Federal Dam at Troy. Sea level along the entire estuary is thus linked to any changes in water levels in the Atlantic and around the globe. Over the past century, sea level on the Hudson has risen about a foot — more precisely about 2.8 mm per year — a rate greater than the global average. In recent decades, the rate of sea level rise has accelerated, averaging about 4.5 mm per year since 1991. The best data available indicates that we can expect the Hudson’s

¹ Rosenzweig, C., W. Solecki, A. DeGaetano, M. O’Grady, S. Hassol, P. Grabhorn (editors). 2011. Responding to Climate Change in New York State: The ClimAID Integrated Assessment for Effective Climate Change Adaptation. Synthesis Report. New York State Energy Research and Development Authority (NYSERDA), Albany, NY. nyserdera.ny.gov/climaid

² Haeckel, Ingrid, and Laura Heady. Creating a Natural Resources Inventory: A Guide for Communities in the Hudson River Estuary Watershed. (Ithaca, NY: Department of Natural Resources, Cornell University, and New York State Department of Environmental Conservation, 2014): <https://www.dec.ny.gov/lands/100925.html>.

water levels to continue rising six feet or more by the end of this century, and perhaps that much again during the next century.

“What’s at Stake? Over 9,000 acres of riverfront lands lie within the expanding reach of daily high tides, threatening both the most critical river habitats and approximately 3,600 households and 6,900 people. Accompanying shifts of flood-prone areas will put approximately 6,400 more households and 12,200 people at greater risk from damaging storm surges and floodwaters. At the same time, the most critical habitats of the Hudson River ecosystem — the 13,000 acres of tidal wetlands and shallow water vegetation beds — will be increasingly stressed by rising water levels.”³

Furthermore, Scenic Hudson says that, “Rising tides along the Hudson River will affect commuter and commercial rail transport, drinking water and wastewater plants, and a great variety of riverfront businesses, private properties and popular venues such as public parks. New systems and solutions will have implications for taxpayers.”⁴ Clearly, sea level rise poses expensive and ecologically dangerous threats to Philipstown’s shorelines, including those of the Village of Cold Spring.

The map for this section is a screenshot of Scenic Hudson’s “Sea Level Rise Mapper,” which is available for viewing here: <https://www.scenichudson.org/our-work/climate/sea-level-rise/>. The Mapper allows you to zoom into an area of interest, such as the Village of Cold Spring waterfront (which is at sea level on the Hudson River Tidal Estuary) in the example map, and then select various sea level rise scenarios as well as the Current 100-Year Flood Zone and what that flood zone would look like with varying sea level rise. The tool allows you to click on an inundated area for a projection of what the water depth would be at that point with that given amount of sea rise. The tool also has a chart that shows estimates of when various degrees of sea level rise will occur, and includes both “likely” and “possible” scenarios.

In terms of forecasting future climate conditions, the New York State Energy Research and Development Authority (NYSERDA) has been studying, documenting, and modeling the impacts of climate change in New York State for several years. Climate trends and projections for the East Hudson and Mohawk River Valleys come from NYSERDA’s Responding to Climate Change in New York State (ClimAID) and include projects for precipitation, temperature and sea-level rise.⁵

³ Scenic Hudson, Climate, Sea Level Rise, 2020, <https://www.scenichudson.org/our-work/climate/sea-level-rise/>

⁴ Scenic Hudson, Press Releases, Experts Help Municipal and Business Leaders with Climate Impacts Along the Hudson, April 27th, 2017, <https://www.scenichudson.org/press-release/experts-help-municipal-and-business-leaders-with-climate-impacts-along-the-hudson/>

⁵ Rosenzweig, C., W. Solecki, A. DeGaetano, M. O’Grady, S. Hassol, P. Grabhorn (editors). 2011. Responding to Climate Change in New York State: The ClimAID Integrated Assessment for Effective Climate Change Adaptation.

It is also important to add that Philipstown's forests, wetlands and open meadows, in addition to providing numerous other ecosystem services, also capture and store carbon from the atmosphere, thus helping to mitigate the effects of greenhouse gases on climate change. Specifically, Philipstown's ecosystems capture 40%, or approximately 80,000 Metric Tons of CO₂-equivalent, of the Town's total annual community greenhouse gas emissions in a year, most of which is performed by the Town's deciduous forests.⁶ The ability of our forests to capture carbon can be jeopardized by increased climatic chaos in the form of damaging storms, droughts, flooding and the migration of insects that can harm and even kill off large numbers of existing trees within our forests. This emphasizes how important it is to protect the integrity of our existing forests while also working tirelessly to reduce our greenhouse gas emissions to minimize the potential damage that could happen. Also, tree replanting initiatives will likely become necessary to keep pace with the damages described above.

Although the vast majority of carbon capture is done by the Town's deciduous forests, wetlands also play a hugely important role because they tend to store massive amounts of carbon in the peat and muck below their surfaces. This includes both tidal wetlands and inland wetlands. Specifically, Philipstown's wetlands currently store the equivalent of *20 years-worth*, or roughly 4 million Metric Tons of CO₂-equivalent, of annual Philipstown community greenhouse gas emissions.⁷ If these wetlands are damaged or lost, whether to development or climate changes such as extreme flooding or sea level rise, a potentially catastrophic release of carbon could occur, undermining the Town's current efforts to reduce its annual community emissions. Tidal wetlands, specifically, could release large amounts of such carbon if the sediment below is disturbed and removed by rising tides and stronger flowing currents within the existing wetlands areas.

Findings:

Three significant climate hazards are expected to affect Philipstown during the 21st century: sea level rise, increasing temperatures and changing precipitation patterns. These hazards will not only affect human activities, but also pose great threats to the balance of ecological communities and specifically will impact certain species more than others, such as some migratory birds, for example, that depend on arriving to feed at the exact time that their prey are in their greatest numbers, which can be completely thrown off by chaotic climate changes from year to year.

Synthesis Report. New York State Energy Research and Development Authority (NYSERDA), Albany, NY. nyserdera.ny.gov/climaid

⁶ Apicello J., J. Angell., *et al.*, "Sink, Store, Reduce, Offset," Philipstown Inventory Report 2020, Town of Philipstown + Ecological Citizens Project + ICLEI USA, 2020, <https://www.climatesmartphilipstown.org/>

⁷ *Ibid.*

Sea Level Rise:

As outlined above, the Hudson River has already risen 1 foot over the previous century and is forecast to rise somewhere between 2 to 6 feet by 2100, with some data suggesting it will be on the high side. As Scenic Hudson's Sea Level Rise Mapper shows, significant portions of the Cold Spring, Garrison's Landing and Manitou waterfronts will possibly be submerged by 2100. Large sections of Metro North train tracks will also be jeopardized by sea level rise, most likely requiring expensive adjustments to sections, especially causeways crossing marsh areas of Philipstown's shoreline. The 100-Year Flood Zone will also expand and could flood such important infrastructure as the Cold Spring Wastewater Treatment Plant, Fair Street in Cold Spring, most of Route 9D north of Cold Spring, the Cold Spring Metro North parking lot (See Sea Level Rise Mapper and Tables 14 and 18 below).

In terms of ecological impacts, both Constitution Marsh and Manitou Marsh will experience changes due to rising shorelines. Scenic Hudson has created an accompanying tool called Protecting the Pathways in order to “analyze the effects of sea level rise on Hudson River Estuary (HRE) tidal wetlands to project future wetland status and distribution.” Specifically, the Protecting the Pathways tools states that “through accretion, if there is enough sediment and organic matter being deposited by decomposing plants and sediment flowing from upstream. Wetlands can migrate upland, if there are no barriers. As the lower plants succumb to deeper waters, newly tidal areas grow new wetland plants. Wetlands will be lost to inundation if SLR [Sea Level Rise] rates are too high for accretion to keep up (and sediment inadequate) or barriers prevent migration.”⁸

Unfortunately, Constitution Marsh is forecasted to lose more wetlands than gain new wetlands from accretion and migration. This is because the marsh does not have much of a floodplain beyond and so it will have to depend heavily on accretion rather than migration to survive. On the other hand, Manitou Marsh is projected to expand in area due to sea level rise, although this projected expansion will possibly come into conflict with developed residential areas along the shore of the marsh.

Temperature:

Annual average temperatures have been steadily rising in New York State. Since 1970, they have been increasing at a rate of 0.6 degrees Fahrenheit (°F) per decade. In winter months, this warming effect is even greater, at 1.1°F per decade. Models project that annual average

⁸ Scenic Hudson, Protecting the Pathways, Case Study: Constitution Marsh, <https://arcg.is/1jbXG4>

temperature in the Lower Hudson Valley region will rise by an additional 4 to 6°F by 2050; and 6 to 11°F by 2100 (see Table 15).^{9,10}

Overall temperature increases accompanied by chaotic changes in temperature will have some positive effects, such as potentially extending the growing season for local agriculture, but can also lead to severe droughts, heat waves, the migration of invasives species and agricultural pests, and complicate growing practices in early spring and late fall caused by unpredictable seasonal temperature swings that can lead to unexpected frosts, for example. Temperature changes can also completely throw off the normal rhythms of our local ecosystems and can have disastrous consequences on certain species, such as local white-tailed deer, as locals have seen this year: the northward migration of midges carrying a deadly hemorrhagic virus has decimated Philipstown's white-tailed deer population. It is suspected that the midges were carried up to New York by late summer tropical storms, such as Tropical Storm Isaias in early August.¹¹ This is an example of how the increased chaos caused by temperature changes can wreak havoc on one species, which then can have tremendous consequences on the rest of its ecosystem.

Changing Precipitation Patterns:

According to the Putnam Valley NRI, “the Northeast has also experienced a 74% increase in the amount of precipitation occurring in heavy rainfall events between the periods of 1950-1979 and 1980-2009. Projections indicate that total annual precipitation could increase almost 15% by mid-century. In the future, Philipstown and other Hudson Valley communities can expect more dry periods intermixed with heavy rain events and decreased snow cover in winter (Table 16).”¹²

Similar to temperature changes, varying dry periods intermixed with heavy rain events and decreased snow cover will drastically reduce the predictability of local water cycles, impacting both human and ecosystem water needs. Changing from lighter rainfalls to heavier downpours leads to an increase in stormwater runoff and reduced water retention in local water tables since the sheer amount of water falling in a short period of time will more likely find its ways into streams that flow with speed towards the Hudson River. This can lead to a reduced presence of vernal pools, which are essential for the breeding of many amphibians in the spring, as well potentially lower aquifer levels for human use. Increased severe storm and rainfall events can also increase landslides and damage to steep slope ecosystems, potentially washing out existing

⁹ Rosenzweig, C., W. Solecki, A. DeGaetano, M. O’Grady, S. Hassol, P. Grabhorn (editors). 2011. Responding to Climate Change in New York State: The ClimAID Integrated Assessment for Effective Climate Change Adaptation. Synthesis Report. New York State Energy Research and Development Authority (NYSERDA), Albany, NY. nyserdera.ny.gov/climaid

¹⁰ Climate Smart Communities, New York State, climatesmart.ny.gov

¹¹ Cronin, B.P.J., Highlands Current, “State IDs Fatal Deer Virus,” September 11th, 2020, <https://highlandscurrent.org/2020/09/11/state-ids-fatal-deer-virus/>

¹² Town of Putnam Valley Committee for the Conservation of the Environment, Town of Putnam Valley Natural Resource Inventory, 2018: <https://putnamvalleyresidents.com/NRI.html>

wetlands (although their presence is essential to mitigate flood damage) and undermining the root systems of vegetation.

Also, as we've seen from Hurricane Irene, which landed in New York on August 28th, 2011, extreme rainfall in a short period of time overwhelmed local waterbodies and streams and led to severe flooding and destruction of several pieces of infrastructure: a dam adjacent to East Mountain Road South near Fahnestock State Park and bridges on Avery Road and Snake Hill Road in Garrison, in addition to damages to numerous residence. Unfortunately, storms like Hurricane Irene are projected to come more likely in the decades ahead as climate change progresses, and thus preparation for the worst and efforts to mitigate climate change are essential to avoid further damages and loss of life.

Summary of Climate Impacts:

According to the Town of Putnam Valley's NRI, "The [above] factors... will combine to create more frequent and severe heat waves [Table 17], short-term drought, and flooding [Table 18]. These climate risks will affect human health in Philipstown directly as well as change habitats and associated biotic communities. New York's changing climate presents new challenges and opportunities for communities. It is vital for our Town and county decision-makers to understand the community's vulnerability to changing climatic conditions and consider natural resources as an important asset in planning for resilience, managing climate risks, and recovering quickly from extreme weather events. Changing precipitation patterns will necessitate redrawing of flood zones around area waterways [see Section 18. Flood Zones]. The incentive to build in areas of higher elevation to house families displaced from flood zones in the Town and greater region may put pressure on current areas of open space."¹³

On a positive note, Philipstown already "has ecological assets that will contribute to its resilience, including large forest areas, wetlands, and healthy streams. The Town's forest habitats abut those in nearby areas providing corridors of connectivity that may help to preserve biodiversity in the face of a changing climate."¹⁴ Philipstown is in a good position to protect its natural resources from the detrimental effects of climate change and luckily has a motivated community of volunteers, non-profit staff, elected officials, government staff, homeowners and business-owners who are already working to ensure that our abundant natural resources last for generations despite the challenges that climate change will present to us.

¹³ *Ibid.*

¹⁴ *Ibid.*

Further Study:

The New York Climate Smart Communities program¹⁵ suggests numerous ways to put our Town's NRI in action for building climate resilience. Some examples include: completing a Vulnerability Assessment to rank resources and infrastructure vulnerable to climate change, reviewing and updating Town policies on Climate Resiliency, Hazard Mitigation, Flood Management and Heat Emergency Planning, and conserving or restoring wetlands and forests to manage stormwater, recharge groundwater and mitigate flooding. Each suggested action contains much more detail and guidance on best practices and how to earn points towards the Town's Climate Smart Certification goals.

Furthermore, a much more in-depth study of how the forecasted impacts of climate change - temperature, precipitation and sea level rise - will specifically impact the numerous resources accounted for in this NRI would be well-worth the time and expense. Specifically, such a study could use local data gathering to determine the types of local species most vulnerable to climate change, establish priority protection zones for these species and research best practices on how to support the resiliency of such species and their ecosystems in the face of the unavoidable effects of climate change.

Also, Cornell University offers useful guidance resources for municipalities on improving climate resilience through the Hudson Estuary Watershed Resilience Project. This includes Flood Guides, Managing Shore Zones and examples of what other municipalities have already done. It can be accessed at: <http://blogs.cornell.edu/estuaryresilience/resources/municipal-officials/>.

Finally, Columbia University offers an alternative sea level rise mapper called Hudson River Flood Impact, which can serve as an additional source of sea-level rise information for the Town's work in the future. The tool is available at: <http://www.ciesin.columbia.edu/hudson-river-flood-map/>

Data Sources:

- Sea level Rise
 - Scenic Hudson Sea Level Rise Mapper
<https://www.scenichudson.org/our-work/climate/sea-level-rise/>
- Climate Conditions and Projections
 - Responding to Climate Change in New York State: The ClimAID Integrated Assessment for Effective Climate Change Adaptation nyserda.ny.gov/climaid
 - Climate Projections In The Hudson River Estuary A Fact Sheet for the Public
dec.ny.gov/docs/remediation_hudson_pdf/cphv.pdf

¹⁵ Climate Smart Communities, New York State, climatesmart.ny.gov

Note: in the following tables, the categories “NYC/Lower Hudson Valley,” “Lower Hudson Valley,” and “Coastal New York” each include Philipstown.

Table 14. Sea Level Rise Projections for the Hudson¹⁶

| | Baseline 1971–2000 | 2020’s | 2050’s | 2080’s | 2100 |
|--|-------------------------------|---------------|---------------|---------------|-------------|
| Mid-Hudson Region | - | 1 - 9” | 5 - 27” | 10 - 54” | 11 - 71” |
| NYC/Lower Hudson Region | - | 2 - 10” | 8 - 30” | 13 - 58” | 15 - 75” |

Table 15. Air Temperature Projections for Lower Hudson Valley¹⁷

| | Baseline 1971–2000 | 2020’s | 2050’s | 2080’s | 2100 |
|---------------------------------------|-------------------------------|---------------|---------------|---------------|-------------|
| Average air temperature (°F) | 50 | 52.3 - 53.2 | 54.5 – 56.2 | 55.6 – 59.7 | 56.1 – 61.4 |
| Increase in annual average (°F) | - | 2.3 – 3.2 | 4.5 - 6.2 | 5.6 – 9.7 | 6.1 – 11.4 |

¹⁶ Climate Projections In The Hudson River Estuary A Fact Sheet for the Public, NYSDEC Hudson River Estuary Program, dec.ny.gov/docs/remediation_hudson_pdf/cphv.pdf

¹⁷ *Ibid.*

Table 16. Precipitation Projections for the Lower Hudson Valley¹⁸

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

Table 17. Heat Wave Projections for the Lower Hudson Valley¹⁹

| | Baseline 1971–2000 | 2020's | 2050's | 2080's | 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 | - |

¹⁸ *Ibid.*¹⁹ *Ibid.*

Table 18. Flood Projections for Coastal NY²⁰

| | Baseline 1971–2000 | 2020's | 2050's | 2080's | 2100 |
|--|-------------------------------|---------------|---------------|---------------|-------------|
| Increase in probability of 100-year flood | - | 20 – 50% | 70 - 190% | 140 - 610% | - |
| Flood height of 100-year flood (feet) | 15 | 15.3 - 15.7 | 15.9 - 16.8 | 16.5 - 18.3 | - |

²⁰ *Ibid.*

Chapter 6: Historic, Scenic & Recreational Resources

34. Historic Resources

Description:

According to the Hudson River Estuary Program, “local history is intimately linked with natural heritage. Historic districts and individual sites often reflect the availability of natural resources that supported economic activities and a way of life that may or may not continue to exist. Many times, they are associated with significant natural areas or open spaces. Documentation of historic resources in an NRI can broaden understanding of how a community developed, what makes it interesting from a historical perspective, and illuminate how land-use patterns today reflect patterns of growth in the past.

“The rural Hudson Valley landscape has many examples of historic features: prehistoric Native American settlements, colonial estates, Revolutionary War battlefields, bluestone quarries, parks and gardens designed by noted landscape architects, and vernacular barns, stonewalls, and other reminders of rural livelihoods in the past. Historic districts and sites establish a link with the past and help to provide a community’s sense of identity and stability.”¹

The data used for this map comes from the National Register of historic sites and buildings, made available by the NYSDEC. Data include buildings, structures, objects, and historic districts listed in the National Register. Archeological sites and properties determined eligible for listing were not included. Also, although there are none within Philipstown, we included data from the New York State Park and Historic Site Boundaries dataset, which included a state historic site just across the river at Fort Montgomery, in the southwest corner of the map.

Findings:

Historic resources are an essential part of the natural beauty and character of Philipstown, and offer a sense of connection to the past. Along with natural, recreational, and scenic resources, the Town is fortunate to have many well-preserved historic structures. Many of these historic resources, discussed below and shown on the Historic Resources map, should be considered when making development and other land-use decisions.

¹ Haeckel, Ingrid, and Laura Heady. Creating a Natural Resources Inventory: A Guide for Communities in the Hudson River Estuary Watershed. (Ithaca, NY: Department of Natural Resources, Cornell University, and New York State Department of Environmental Conservation, 2014): <https://www.dec.ny.gov/lands/100925.html>.

According to the Putnam Valley NRI, around Philipstown and Putnam Valley “the earliest known people were of the Canopus group of the Wappinger Confederacy, part of the Algonquin-speaking Mohican Nation.”² These communities left relics behind following their forced removal by Europeans. For example, many of the stonewalls in this region were built in part by Native Americans. The book “Sermons in Stone” by Susan Allport includes quotes from firsthand material showing that colonial settlers employed Native Americans in order to fill “debts” (often accrued by Native Americans continuing their normal practices that colonists had deemed illegal). One example described in the book is: “Some of the Indians who worked for the settlers were free men who were paid a daily wage, but others were slaves, captives from the King Philip’s Indian War of 1675 who had been subsequently awarded to colonists in compensation for their own participation in that war. Both of these groups of Indians were probably employed in building stone walls.” Allport also includes firsthand accounts demonstrating that enslaved Africans and African-Americans were also forced to build stonewalls.³

Unfortunately, Native American land rights were essentially disregarded from the first arrival of Europeans, and eventually Dutch and English settlers completely displaced them. As described in the Hudson Highland Land Trust’s “[Land Heist in the Highlands](https://www.hhlt.org/land-heist-in-the-highlands/)” article, the Wappingers land, which included current-day Philipstown and the rest of what became Putnam County, was illicitly taken from them by means of one questionable deed and one completely false deed which both involved one of the Town’s European founders, Adolph Philipse. Despite pleading their case - the efforts of which were led by their Chief Daniel Ninham, the Wappinger were forcibly removed from their lands, as well as multiple times from the lands they then moved to. Despite their forced removal by Europeans to Wisconsin, Oklahoma, Stockbridge, and areas in Canada, the Wappinger culture is still active in these regions and deserves recognition as the culture whose ancestral lands include Philipstown.⁴

Also, it is ethically essential while studying and preserving Philipstown’s history to learn the stories of people who were enslaved by landowners in or near Philipstown. Their stories are often overlooked and undertold and deserve further attention. Stories like that of Caesar, an African American miller enslaved by Adolph Philipse, the wealthy Dutch landowner who was involved in creating the false deed that stole most of what is now Putnam County from the Wappinger people. Or of families that were forcibly separated by their enslavers, such as Jack and Parthenia, who were married but held captive by different enslavers who cruelly prevented them from being together by sending Parthenia to Barbados without Jack. Stories like these are

² Town of Putnam Valley Committee for the Conservation of the Environment, Town of Putnam Valley Natural Resource Inventory, 2018: <https://putnamvalleyresidents.com/NRI.html>

³ Allport, Susan, Sermons in Stone: The Stone Walls of New England and New York, Second Edition, The Countryman Press, New York, September 17th, 2012

⁴ Cutul, Peter, Land Heist in the Highlands: Chief Daniel Ninham and the Wappinger Fight for Homeland, NYS Office of Parks, Recreation and Historic Preservation, Hudson Highlands Land Trust, <https://www.hhlt.org/land-heist-in-the-highlands/>

documented by Historic Hudson Valley's interactive virtual museum, "People Not Property."⁵ The resource can be found here: <https://peoplenotproperty.hudsonvalley.org/>. Also, the Hudson Highlands Land Trust has a webpage dedicated to the "People Not Property" virtual museum, which can be found here: <https://www.hhlt.org/people-not-property/>.

During the time of early European settlement, in 1669, the provincial government of New York designated a postal route between New York City and Albany, which were the two most important European population centers at the time. Before 1669, the route that the postal road followed was originally established by the Wiccoppee and Wappinger. Then in 1703, the provincial government mandated that the postal road become a "public and common general highway" to facilitate travel between the two cities.⁶ An original unpaved section of this route still exists today and is known as the "Old Albany Post Road Historic District," which is found on this map along the eastern border of Philipstown.

Philipstown officially became a township of Dutchess County on March 7, 1788, and later became a township of Putnam County when Putnam County broke off from Dutchess County in 1812.⁷ In terms of living conditions, the mostly steep slopes and rocky soils of Philipstown made farming difficult and limited the area's population prior to the construction of the West Point Foundry in the Village of Cold Spring in 1818. Even now the Town remains less developed than many nearby areas. As noted above, "the Town is latticed with historic stone walls - some constructed up to 300 years ago - which contained livestock and served as repositories for the seemingly endless rocks removed from fields to improve farming."⁸

Prior to the construction of the West Point Foundry, "farmers eked out a subsistence living cultivating berries and fruits, nuts, maple trees for syrup, bees for honey, flax for textiles, and the crops that could be successfully grown. Grazing animals provided meat, dairy products, and wool; trees were logged for railroad ties, ship timber, barrel hoops, and construction materials for the burgeoning cities. Ice harvesting from local lakes provided a winter income; cut ice was packed in straw, driven by wagon to the Hudson, ferried to New York City and then shipped around the globe."⁹

Following the construction of the West Point Foundry, the Village of Cold Spring and surrounding Philipstown began to boom, attracting newcomers who either worked the foundry or

⁵ Historic Hudson Valley, People Not Property: Stories of Slavery in the Colonial North, 2019, <https://peoplenotproperty.hudsonvalley.org/>

⁶ Hine, C.G., The New York and Albany Post Road, 1905, Project Gutenberg EBook, Released December 14th, 2007, <http://www.gutenberg.org/files/23857/23857-h/23857-h.htm>

⁷ McDonald, Don, A Brief History of Philipstown, 2004, <https://philipstown.com/history-of-philipstown>

⁸ Town of Putnam Valley Committee for the Conservation of the Environment, Town of Putnam Valley Natural Resource Inventory, 2018: <https://putnamvalleyresidents.com/NRI.html>

⁹ Life on a Rocky Farm: Rural Life Near New York City in the Late Nineteenth Century. Excelsior Editions/State University of New York, 2013.

formed a new middle class of doctors, lawyers, pastors, shop-owners, teachers and so forth. Furthermore, thanks to the influence of Gouverneur Kemble, who helped create the Foundry, Cold Spring and Philipstown became popular as fresh-air retreats for wealthy and famous New Yorkers, many of whom eventually purchased large estates as second or additional homes throughout the Town, and most prominently in the hamlet of Garrison, evidenced by the existence of such historic buildings as Castle Rock, the (Frederick) Osborne House, Eagle's Rest, and so forth.

Furthermore, the Hudson Highlands of Philipstown attracted painters from the Hudson River School, such as Thomas Cole, which further led to the fame of the region; however, the ever-hungry fires of the foundry eventually led to widespread deforestation throughout Philipstown, which took decades to replace, even after the foundry closed in 1911. The reforestation efforts, as mentioned in the Introduction to this NRI, were carried out in greatest number by the Civilian Conservation Corps during the years of the Great Depression, and are now largely protected in the form of public lands, private fee-owned properties and conservation easements (See Section 39. Conservation Open Areas and Open Space Overlay).¹⁰

As the map shows, there are a large number of historic districts within Philipstown, including those in the Villages of Cold Spring and Nelsonville, the majority of which are located near the Hudson River. The number of historic buildings and places within the Town is enormous and especially dominated by buildings and sites within Cold Spring and Nelsonville, which were and remain two of the most concentrated population centers of the Town. The section of Garrison near Moore House as well as the Valhalla Highlands Historic District both are home to numerous historic sites. These prominent areas include historic sites such as residences, businesses, churches, cemeteries, farms and preserved forest lands, as well as some of the old rock walls mentioned above. Also, while not located within Philipstown, it is worth noting the tremendous number of historic sites located across the river at West Point U.S. Military Academy and along the Hudson's shores to the south all the way to Bear Mountain. This includes, as mentioned above, the Fort Montgomery State Historic Site, which is highlighted in the southwest corner of the map.

Due to the sheer number of historic sites, we will not list and describe them in this inventory. However, more information about every single historic site and district depicted on this map can be accessed via the NYS Cultural Resource Information System (CRIS) online tool, made available by the NY State Historic Preservation Office (NY SHPO). This tool is free, open to the public and presents historic districts and sites in both GIS map form as well as in list form, and includes links to photographs and historic documents available for each site. This tool can be accessed here: <https://cris.parks.ny.gov/Login.aspx>. After reviewing the terms of access, click "I Agree" and then on the next page select "Proceed as Guest" to open the tool. Then in the

¹⁰ Dunwell, Frances F., *The Hudson River Highlands*, New York, Columbia University Press, 1991

navigation menu at the top of the page, select “Search” and then “Criteria” to enter Putnam County and Philipstown / Cold Spring / Nelsonville into the search boxes for either “USN” (Unique Site Number) or “National Register” to pull up a list of results for historic sites and districts. These will also appear on the map when you zoom in closely. Click on a given site or district on the map or list and then select “View” to pull up related documents about that site or district.

Also, once the Town of Philipstown launches its ArcGIS Online tool, readers will also be able to use that tool to pull up basic information on each historic site and district presented on this map, although more detailed information will be limited to access via the CRIS tool.

Further Study:

An additional study could compile a list of the historic sites and districts within Philipstown as well as detailed historic information, photographs, site maps, and so forth, and could be added to this NRI as an appendix. Such a study could also include stories about each site, including those of enslaved people, owners, family members and caretakers. Such a study should also go to lengths to document the way of life of the Wappinger and their influences on early European settlement, and emphasize that Philipstown remains the ancestral lands of many displaced Native American communities.

Also, in considering the racist history of Philipstown’s settlement, a tangible step that the Town of Philipstown could take to bring this history to light would be to develop an Anti-Racism Employee Training program that includes learning about the experiences of Native Americans and African Americans who were exploited by Europeans who claimed Philipstown as their own, and what effects such experiences have had on their relatives and displaced communities today. Such a program could involve the support of the Hudson Highlands Land Trust, which has expertise in this historic field, and could also lead to information sharing with local schools. The “People Not Property” virtual museum as well as the anti-racist historical articles available from the Hudson Highlands Land Trust offer a wealth of information that every Town employee and Philipstown community member would do well to learn.

Data Sources:

- State Historic Sites
 - NYS Historic Sites and Park Boundary
<http://gis.ny.gov/gisdata/inventories/details.cfm?DSID=430>
- Historic Buildings or Places
 - NYSDEC - National Register Sites
<http://gis.ny.gov/gisdata/inventories/details.cfm?DSID=429>

- NYS Historic Districts
 - NYSDEC - National Register Sites
<http://gis.ny.gov/gisdata/inventories/details.cfm?DSID=429>

35. Scenic Resources

Description:

According to the Hudson River Estuary Program, “a community’s landscape defines its cultural, natural, and historic heritage. Scenic roads, waterfronts, prominent high points, river trails, special landscape features, and vistas of all kinds contribute to a community’s sense of place and aesthetic quality. They can also provide tourism-related economic opportunities for communities. Poorly planned development can impact and undermine these values.

“Preserving the integrity of scenic vistas requires consideration of both scenic views and the areas visible from them, which together comprise “the viewshed.” Identifying the full suite of scenic resources is the first step toward assessing potential impacts from development and determining strategies for protection.”¹¹

Philipstown, due to its location in the heart of the Hudson Highlands, its long history of conservation as well as its numerous historic sites and districts, is one of the most scenic townships in NYS. Local, county, state and national efforts to protect scenic resources both within and within sight of Philipstown (e.g. Storm King Mountain) have led to a tremendous local consciousness about the importance of preserving Philipstown’s character and culture through the protection of its scenic resources.

Included in this map are NYS “Scenic Areas of Statewide Significance” (SASS), which were developed by the NYS Department of State to identify scenic resources in several Hudson Valley counties in 1993. SASS designation protects scenic landscapes through review of projects requiring State or federal actions, including direct actions, permits, or funding. These areas encompass unique, highly scenic landscapes accessible to the public and recognized for their outstanding quality. NYS Scenic Byways were included as well, and were provided by the NYS Department of Transportation’s list of “Designated Scenic Roads,” per Article 49 of NYS Environmental Conservation Law.

Philipstown’s Scenic Protection Overlay (SPO) was also added to this map and were taken from the Town’s zoning maps created in 2011. According to the Town Zoning Code, the Town’s SPO

¹¹ Haeckel, Ingrid, and Laura Heady. Creating a Natural Resources Inventory: A Guide for Communities in the Hudson River Estuary Watershed. (Ithaca, NY: Department of Natural Resources, Cornell University, and New York State Department of Environmental Conservation, 2014): <https://www.dec.ny.gov/lands/100925.html>.

was created to provide “Special protection of the Hudson River corridor and scenic road corridors is necessary to preserve the attractive rural and historic quality of the Town. The purpose of this section is to regulate land uses within designated scenic corridors to protect the Town's scenic beauty and rural character. This section is intended to apply to those sections of road and river corridors that are visible to the public and that substantially retain their scenic character.”¹² The details of this SPO will be covered below.

Lastly the Town’s Scenic Ridgelines were added to this map to highlight the most visible points throughout the Town. These ridgelines were taken from the Town’s 2011 “Ridgelines” Zoning Map. Philipstown designated these ridgelines and established ridgeline protections in order to “maintain the scenic beauty and rural character of the Town by minimizing visual intrusions into the landscape and preserving the important aesthetic, scenic, and ecological character of the Town's ridgelines and adjacent hillsides.”¹³ The details of the protection afforded to these ridgelines is also covered below.

Findings:

Scenic Areas of Statewide Significance:

The SASS located in Philipstown is titled “Hudson Highlands” and extends from Denning Point in the City of Beacon, Dutchess County, along the east and west shores of the Hudson River all the down to the southern border of Bear Mountain State Park in Rockland County. The Hudson Highlands are the namesake and heart of this scenic area and include such notable scenic resources as Storm King Mountain, Crow’s Nest, Mount Beacon, Breakneck Ridge, Bull Hill, Cold Spring, Nelsonville, Garrison, West Point, Highland Falls, Fort Montgomery, Bear Mountain and Anthony’s Nose, among many others. Suffice it to say that this area is one of the treasures of New York State due to its scenic beauty, historical significance and proximity to the state’s largest population centers, which allows nearby access to millions of state residents and visitors. This scenic area is broken up into 28 separate subunits that include the above-listed scenic highlights. Detailed descriptions of the entire scenic area as well as each subunit can be found in a tremendously comprehensive report written in 1993, titled “Scenic Areas of Statewide Significance,” which was produced by the New York State Department of State's Division of Coastal Resources and Waterfront Revitalization.¹⁴ This report can be accessed here:

<https://www.dos.ny.gov/opd/programs/HudsonSASS/Hudson%20River%20Valley%20SASS.pdf>

¹² Town of Philipstown, § 175-15 Scenic Protection Overlay District (SPO), <https://www.ecode360.com/6319090>

¹³ Town of Philipstown, § 175-36 Steep terrain and ridgeline protection regulations, <https://www.ecode360.com/6319176#6319342>

¹⁴ New York State Department of State, Scenic Areas of Statewide Significance, Division of Coastal Resources and Waterfront Revitalization, 1993 (reprinted 2004), pp. 269 - 367, <https://www.dos.ny.gov/opd/programs/HudsonSASS/Hudson%20River%20Valley%20SASS.pdf>

Scenic Byways:

Within the Town of Philipstown, there is only one official State Scenic Byway: an 8.08-mile section of State Route 9D which runs from Beacon to Bear Mountain Bridge via Philipstown, as shown on the map. According to the NYS Department of Transportation, “The New York State Scenic Byways program was created in 1992 by the State Legislature. The program encourages both economic development and resource conservation, recognizing that each of these aspects of a byway must be fostered to ensure the success of the other. State Scenic Byways are transportation corridors that are of particular statewide interest. They are representative of a region's scenic, recreational, cultural, natural, historic or archaeological significance.”¹⁵

As Route 9D winds its way through Philipstown it offers dramatic views of the Hudson Highlands while passing through the Village of Cold Spring and by historic buildings, farms and estates on its way through Garrison down to the Historic Bear Mountain Bridge and beyond. The route is a popular drive for daytrippers as well as cyclists. Although a popular cycling route, the scenic byway is notorious for safety concerns due to its tight shoulders and high-speed commuter traffic, despite being designated as a section of the official NYS Bike Route 9, which according to the NYSDOT, “is a signed on-road bicycle route that extends 345 miles from New York City to Rouses Point on the New York - Quebec border. This route connects with the Velo Quebec cycling routes in Quebec and eastern Canada. It also intersects with the New York City bicycle route network and State Bicycle Routes 5, 11 and 17, and the NYS Canalway Trail.”¹⁶

Scenic Protection Overlay:

Philipstown’s Scenic Protection Overlay provides special protections for scenic districts within the Town, including most of the state, county and Town roads within the Town, such as Old Albany Post Road, as well as the entire length of Philipstown between the Hudson River and State Route 9D, as the maps shows. Specifically the SPO has the following regulations from Philipstown Code:

“§ 175-15 Scenic Protection Overlay District (SPO).

A. Findings and purpose. Special protection of the Hudson River corridor and scenic road corridors is necessary to preserve the attractive rural and historic quality of the Town. The purpose of this section is to regulate land uses within designated scenic corridors to

¹⁵ NYS Department of Transportation, NYS Byways Program, <https://www.dot.ny.gov/display/programs/scenic-byways/programs>

¹⁶ NYS Department of Transportation, Bicycling in New York, State Bike Route 9, 2008, https://www.dot.ny.gov/portal/pls/portal/MEXIS_APP.DYN_BIKE_TRAIL_DETAIL_MAIN.show?p_arg_names=p_trail_id&p_arg_values=145

protect the Town's scenic beauty and rural character. This section is intended to apply to those sections of road and river corridors that are visible to the public and that substantially retain their scenic character.

B. Boundaries. The SPO District includes all land shown on the Resource Protection Overlay Districts Zoning Map as part of the SPO District, including land lying between the Hudson River shoreline and New York State Route 9D and land lying within 250 feet of the right-of-way of all state, county and Town roads, excluding land lying within a SR, OC, HC, M, HM, or HR District.

C. Regulatory effect on land uses. Within the SPO District, all of the underlying land use district regulations remain in effect, except as they are specifically modified by this section.

D. Site plan approval requirement. The provisions of this § 175-15 shall apply only to uses, construction, or other land disturbance where other provisions of this chapter require site plan review or a special permit. Within the SPO District, site plan approval shall also be required for the construction of any dwelling exceeding 3,000 square feet in floor area. Site plan approval shall also be required for any land disturbance of more than 10,000 square feet within any one-year period or more than 20,000 square feet in total over any time period, in any location that is visible from a publicly accessible place (as defined in § 175-74) when there are no leaves on the trees. Nothing in this section shall affect the ability of landowners to cut, clear, or remove vegetation on their property as necessary to keep and maintain views that existed on the date of original adoption of this § 175-15.

E. Site plan approval exemptions. Within the SPO District, the site plan approval requirement shall not apply to:

- (1) Agricultural uses, except for agricultural structures with a footprint exceeding 10,000 square feet.
- (2) The repair and maintenance of existing structures.
- (3) Activities carried out pursuant to a site plan or special use permit approved prior to the enactment of this section.
- (4) Clearing and grading associated with construction of unpaved hiking trails.
- (5) Any other activity not included in Subsection D above.

F. General standards where site plan review or a special permit is required. Within the SPO District, site plan approval may only be granted if, with appropriate conditions attached, the proposed activity:

- (1) Will minimize degradation of scenic character and will satisfy the requirements in Subsections G through J below, except where site features are screened from public roads or trails.
 - (2) Will minimize the removal of native vegetation, and avoid such removal if it would permit any structure to become visible from publicly accessible places. This shall not prevent trimming or removal of vegetation, either to open up small "keyhole views" from private property or to protect public visibility of scenic views and panoramas from publicly accessible places.
 - (3) Will locate and cluster buildings and other structures in a manner that minimizes their visibility from publicly accessible places.
- G. Landscape requirements where site plan review or a special permit is required.
- (1) A continuous green buffer, consisting of existing vegetation or new landscaping, at least 100 feet deep along Routes 9 and 9D and the Hudson River, and at least 50 feet deep along the other scenic roads, shall be maintained, except where the land is not visible from the scenic road or river. This buffer shall consist of trees and shrubs, as well as fields, meadows, and lawns. Invasive species shall not be planted and native species are preferred as provided in the list of designated native species approved by the Town Board. Bike paths and/or sidewalks may be constructed within this landscaped buffer. This buffer requirement shall not apply in the immediate area around existing residences located within the buffer area. This buffer requirement may be modified by the Planning Board in the course of site plan review where the Planning Board determines that it is unnecessary, does not serve the purposes of this section, or would be impractical to implement.
 - (2) Shade trees shall be provided within 25 feet of the right-of-way at intervals averaging every 50 feet. An applicant for site plan or special permit approval shall not be required to plant more than one shade tree per 1,000 square feet of floor area proposed to be developed on the parcel.
 - (3) To the maximum extent practicable, existing noninvasive trees, lawns, and shrubs shall be preserved, unless they are proposed to be replaced by native trees or other noninvasive vegetation deemed appropriate by the Planning Board.
 - (4) Trees and shrubs shall be planted as deemed necessary by the Planning Board to reduce visibility of new structures from public roads or trails.
 - (5) Existing stone walls and historic mileposts lying within 100 feet of a road right-of-way shall be preserved, except that portions of stone walls may be removed where necessary for driveway entrances, provided that the portions of such walls adjoining the sections removed are reconstructed in a manner consistent with the historic character of the existing stone wall.

(6) The Route 9D Scenic Byway Corridor Management Plan (2006) shall be consulted for guidance in compliance with the requirements in this subsection as applicable to Route 9D.

H. Architecture where site plan review or a special permit is required.

(1) Existing structures with historic or architectural significance, as determined by any historic or architectural survey approved by the Town Board or by the eligibility criteria for listing on the National or State Register of Historic Places, shall be retained to the extent practicable. Alterations to such structures shall be compatible with the architecture of the existing structure. New structures shall be compatible with the historic structures in their vicinity.

(2) The Planning Board shall consult the building form guidelines referred to in § 175-5 in considering any applications under this section.

I. Fences where site plan review or a special permit is required.

(1) Stockade or other fence designs that block visual access to land in a scenic road corridor shall be prohibited, unless such fences are necessary to screen a preexisting use that does not conform to the requirements of this section.

(2) Fences that are likely to inhibit the passage of wildlife, as determined by the Natural Resources Review Officer, shall be limited to those that enclose, in the aggregate, no more than the larger of 40,000 square feet or 30% of the area of any lot. However, the total area enclosed by such fencing on any parcel shall not exceed 10 acres.

(3) The Natural Resources Review Officer may allow exceptions to the requirements of Subsection I(2) above based upon the site-specific impacts on wildlife, including consideration of the maintenance and improvement of wildlife corridors.

(4) The restrictions in this Subsection I shall not apply to a farm operation growing crops or raising livestock for commercial sale or to not-for-profit organizations that manage wildlife preserves, demonstration farms, or gardens where the intrusion of wildlife would interfere with the fulfillment of the organization's objectives.

J. Ridgeline and hillside protection. See § 175-36C.

K. Rural siting principles where site plan review or a special permit is required. New development in the SPO District shall comply with the rural siting principles in § 175-31 to the extent practicable.”¹⁷

¹⁷ Town of Philipstown, § 175-15 Scenic Protection Overlay District (SPO), <https://www.ecode360.com/6319090>

Scenic Ridgelines:

As the map shows, there are numerous ridgelines located throughout the Town, generally running southwest to northeast with some exceptions. The following section of the Town of Philipstown Zoning Code summarizes the goals of protecting the Town's ridgelines as well as the restrictions on developing those ridgelines:

“§ 175-36 Steep terrain and ridgeline protection regulations.

...

C. Ridgeline and hillside protection. The purpose of this Subsection C is to maintain the scenic beauty and rural character of the Town by minimizing visual intrusions into the landscape and preserving the important aesthetic, scenic, and ecological character of the Town's ridgelines and adjacent hillsides. The Town of Philipstown Resource Protection Zoning Map, Scenic Ridgelines designates significant ridgelines for protection. [Amended 9-7-2011 by L.L. No. 4-2011]

(1) Designation of ridgeline and hillside protection area. The ridgeline and hillside protection area shall consist of all land lying 50 feet downslope, measured vertically, below a ridgeline indicated on the Zoning Map.

(2) Review of development within protection area. Within the ridgeline and hillside protection area, any structure containing 500 square feet or more of floor area or that is more than 20 feet in height, and any land disturbance (as defined herein) of 2,000 square feet or more, shall be subject to site plan review. Structures built within the ridgeline and hillside protection area shall be no more than 30 feet in height, notwithstanding the provisions of § 175-30E, and shall not project above such ridgeline when viewed from any publicly accessible place. Vegetative screening of new structures shall be required as necessary to minimize visibility from publicly accessible places, consistent with the limitations in Subsection C(3) below. The Planning Board may, but shall not be required to, waive this site plan review requirement if it finds that the proposed development site is not visible from any publicly accessible place.

(3) Notwithstanding any other provision in this chapter, landowners shall not be required to plant vegetative screening and shall be permitted to cut, clear, or remove vegetation on their property to the extent necessary to keep and maintain views that existed on May 5, 2011, the date of original adoption of this § 175-36.”¹⁸

¹⁸ Town of Philipstown, § 175-36 Steep terrain and ridgeline protection regulations, <https://www.ecode360.com/6319176#6319342>

Further Study:

According to the Hudson River Estuary Program, “A comprehensive inventory of local scenic resources can begin the process of prioritizing and protecting areas with scenic value or serve to update previous scenic resource identification efforts. Many methods exist to inventory and evaluate scenic resources according to a wide range of attributes, including physical features (e.g., farm structures), as well as measures of the diversity, pattern, disturbance, contrast, access, and other important aspects of scenic views. Community-led scenic resources inventories can be challenging because views are complex and their values are subjective and often elicit emotional reactions. However, priorities usually emerge as the community begins the process of identifying important scenic attributes.

“The work group should determine the most appropriate criteria for assessing local scenic values and fully document methods. A survey of community residents can help identify important scenic viewpoints and their vistas or viewsheds. Consultants can help to carry out surveys, conduct viewshed analyses in GIS, or undertake the entire scenic resources inventory.

“Scenic information can be added manually to an existing map or digitized for use in GIS. Scenic vistas can be marked as numbered point locations and listed in an accompanying descriptive table. Designated scenic roads can be shown by highlighting the appropriate section of road on the map. Photographs are useful components of scenic resources inventories, and can be included in the report that accompanies the inventory maps. Using GIS data layers, GIS providers can conduct a viewshed analysis from key vistas or multiple vantage points to determine the most visible areas.”¹⁹

Lastly, the Hudson River Estuary Program just finalized a handbook for landowners on how to create views to the Hudson that balance historic, scenic, and conservation values. This can serve as a reference document for landowners and also for the Town’s Zoning, Planning and Conservation Boards in their work balancing development and preservation / conservation needs. The handbook can be accessed here:

https://www.dec.ny.gov/docs/remediation_hudson_pdf/hrviewshbk.pdf

Data Sources:

- Scenic Areas of Statewide Significance
 - NYS SASS <http://gis.ny.gov/gisdata/inventories/details.cfm?DSID=321>
- Scenic Byways

¹⁹ Haeckel, Ingrid, and Laura Heady. Creating a Natural Resources Inventory: A Guide for Communities in the Hudson River Estuary Watershed. (Ithaca, NY: Department of Natural Resources, Cornell University, and New York State Department of Environmental Conservation, 2014): <https://www.dec.ny.gov/lands/100925.html>.

- NYSDOT Scenic Roads
<https://www.dot.ny.gov/display/programs/scenic-byways/ScenicRoads-no-detail-info>
- Scenic Overlay District
 - Philipstown Resource Protection Overlay District Zoning Map - Scenic Overlay District <https://philipstown.com/zmspoapril.pdf>
- Scenic Ridgelines
 - Philipstown Resource Protection Overlay District Zoning Map - Scenic Ridgelines <https://philipstown.com/ridgelineapril.pdf>

39. Recreational Resources

Description:

According to the Hudson River Estuary Program, “the Hudson Valley is well-known for the quality and variety of its recreational resources, which include hiking trails, camping areas, trout streams, mountains, whitewater, rock-climbing, ski areas, lakes, ponds, wetlands, and the Hudson River estuary. Public lands such as the Catskill Park, state parks, county parks, and municipal parks, as well as private nonprofit conservation areas provide important recreational opportunities. In addition, some private landowners allow public access to their land for recreational purposes, e.g., snowmobile and hiking trails. Land-use changes, ownership changes, and misuse of recreational areas can threaten the availability of privately owned land for recreational use. Conversely, the expansion or creation of new parks and conservation areas and the rails-to-trails movement can expand access to public and private lands, provide new recreational opportunities, and help generate local tourism and economic growth.”²⁰

Philipstown and its vicinity offers many recreational opportunities, especially hiking trails, but also public athletic fields, fishing locations, boat launches and designated bicycle routes. Included in this map are public lakes accessible to fishing from the NYSDEC Public Fishing Recommended Sites data set; Bike Routes from the NYS Department of Transportation’s “Biking in New York” program; and Hiking Trails and Carriage Roads, which were gathered by Philipstown volunteer Emily Cheadle as part of the Philipstown Community Congress’s “Trails Committee,” and which includes both hiking trails within state parks (the boundaries of which are included on the map) as well as trails and old carriage roads on federal, county, municipal and private land, some of which are open to the public. As the map legend notes, however, some of the trails outside of state parks may not be open to the public. Thus, this map is not intended to be used as a trail map, but rather as a planning resource for the Town as it finds ways to connect

²⁰ *Ibid.*

existing trails with potential trails and preserve areas that have old historic trails or carriage roads that are not yet protected from development.

Findings:

As the map shows, Philipstown is criss-crossed with hiking trails and old carriage roads, the majority of which are located within the Hudson Highlands and Clarence Fahnestock State Parks. The names and descriptions of these state park trails are available here:

<https://parks.ny.gov/recreation/trails/trails-in-state-parks.aspx>

There are also some trails that are located on other government lands (e.g. Appalachian Trail on Federal Lands east of Route 9) as well as on private lands that permit public access, such as the trails around Manitou Station Road or in the Village of Nelsonville. Trail summaries and guides for such trails are available at the New York New Jersey Trail Conference website at the following link: https://www.nynjtc.org/hike-finder-map#!/filter_hike=hike

Although none are located within Philipstown, the NYS DEC has highlighted lakes with public fishing access, which are located at Lake Canopus in the northeast corner of the map and at Hessian Lake at Bear Mountain as shown on the map. We also highlighted the NYS Department of Transportation's designated section of the official NYS Bike Route 9, as it passes through Philipstown. Heading south from Fishkill, the route follows Route 9, turns right onto Route 301, left on Peekskill Road in Nelsonville, left onto Route 9D and finally crosses the Bear Mountain Bridge to leave the Town, after which it turns left to continue south on Route 9W. The route, according to the NYSDOT, "is a signed on-road bicycle route that extends 345 miles from New York City to Rouses Point on the New York - Quebec border. This route connects with the Velo Quebec cycling routes in Quebec and eastern Canada. It also intersects with the New York City bicycle route network and State Bicycle Routes 5, 11 and 17, and the NYS Canalway Trail."²¹

Although not shown, there are several potential biking / walking trail projects in the works or in their infancy stages. A proposed Hudson Highlands Fjord trail is projected to connect the Village of Cold Spring to the City of Beacon via Route 9D and adjacent lands. This project is being developed by NYS and Scenic Hudson, along with other partners, to improve safety and non-motorized access for locals and visitors who want to hike the numerous trails throughout the Hudson Highlands State Park. More information can be found at:

<https://www.scenichudson.org/our-work/trail-projects/hudson-highlands-fjord-trail/>

²¹ NYS Department of Transportation, Bicycling in New York, State Bike Route 9, 2008, https://www.dot.ny.gov/portal/pls/portal/MEXIS_APP.DYN_BIKE_TRAIL_DETAIL_MAIN.show?p_arg_names=p_trail_id&p_arg_values=145

Also, although in its early stages, the Philipstown Community Congress's Trails Committee is researching and exploring the possibility of developing a community biking / walking trail to connect Cold Spring to Garrison via such sites as Boscobel, Constitution Marsh, Philipstown Park and the Philipstown Recreation Center. The goal is to create a safe, fun and non-motorized alternative to traveling north and south within the Town by motor vehicle. For more information or to get involved, please visit:

<http://ecologicalcitizens.org/philipstowncommunitycongress>.

In addition to the resources shown on the map, the Town of Philipstown also offers a variety of other recreational opportunities. These include:

- Philipstown Recreation Department facilities: Claudio Marzollo Community Center, the Depot Theatre, Philipstown Park and North Highlands Park (open to Town residents)
- Continental Village Clubhouse and surrounding facilities (open to Continental Village residents)
- Mayor's Park in Cold Spring (open to the public)
- Haldane Central School District athletics fields (open to the public except during interscholastic competitions)
- Garrison Union Free School athletic fields (open to the public except during interscholastic competitions)
- North Highlands baseball fields (open to the public)
- Hudson Valley Shakespeare Festival (now relocated to a new property adjacent to The Garrison golf course)
- St. Basil Academy soccer field (private but often hosts tournaments open to the public)
- Garrison Fish and Game Club (members only)

Further Research:

The above-mentioned Philipstown Trails Committee is still working on documenting all trails and carriage roads throughout the Town, so those shown on this map may be added to in the years ahead.

Although not offered by online resources, which mostly limited the scope of this report (due to time and budget constraints), a supplemental project could document and add to this map the locations of public boat launches, and public fishing access points along the Hudson River, and also highlight athletic fields and municipal parks. At the same time, recreational resources within the Town have generally become heavily used by tourists in recent years, making hiking local trails a crowded experience on weekends from late spring to late autumn, and so there may be some wisdom in keeping some of our recreational resources under the radar for the sake of maintaining quiet access for locals.

Data Sources:

- Public Lakes Accessible to Fishing
 - NYSDEC Public Fishing Recommended Sites
<http://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1252>
- Bike Routes
 - NYSDOT Bike Routes
<https://gisportalny.dot.ny.gov/portalny/apps/webappviewer/index.html?id=e1f0619b174740fabdcd13667888b1ed>
- Documented Hiking Trails
 - Philipstown Community Congress Trails Committee - accessed by personal request. For more information on and to contact the Committee, please visit:
<http://ecologicalcitizens.org/philipstowncommunitycongress>
- NYS Parks
 - NY Protected Areas Database <http://nypad.org/Download>

Chapter 7: Land Use

37. Zoning

Description:

According to the Hudson River Estuary Program, “local governments have the authority to enact zoning regulations to promote the public health, safety, and general welfare of their communities, among other purposes. Zoning is primarily enacted to control the use of land and the density of those uses, as deemed appropriate for the community. Zoning can encourage a variety of uses that are desirable, strictly regulate those that may be potentially inharmonious, or prohibit those uses that are unwanted in the community. Zoning laws can protect important natural areas and cultural resources such as historic landmarks or districts, wetlands, floodplains, groundwater, wildlife habitats, and scenic areas. Various statutes define the use of zoning to encourage ‘the most appropriate use of land.’

“An overlay map of current zoning at the scale of the NRI will give a general indication of land use as it relates to the natural resource base. This map may reveal areas that are zoned for uses that can threaten a critical resource or for which the resource base cannot reasonably or economically support. For example, an overlay map of zoning might point out that portions of the community’s groundwater supply are zoned to allow for conflicting land uses, such as allowing gas stations, petroleum bulk storage, or salt storage over important aquifers. Or the overlay may reveal that an area designated for high-density residential homes is situated in a large, unfragmented forest where the headwaters of a recreational creek are located.

“Parcel-based tax map information is also helpful when reviewed together with the other NRI maps. A tax map overlay can help in the implementation phase of the NRI project, and can provide helpful information for a voluntary land protection program.”¹

For this section we used the Town of Philipstown’s “Land Use and Development Overlay Zoning Map,” which was created for the Town of Philipstown by the Hudson Highlands Land Trust in 2011. Zoning districts are determined by Town Zoning Code and tax parcels, which are also portrayed on the map, were provided by the Putnam County IT Department.

In addition to this map, the Town also has several other zoning maps, the data from which are covered in other sections of this report. Although their implications will be covered mostly in

¹ Haeckel, Ingrid, and Laura Heady. Creating a Natural Resources Inventory: A Guide for Communities in the Hudson River Estuary Watershed. (Ithaca, NY: Department of Natural Resources, Cornell University, and New York State Department of Environmental Conservation, 2014): <https://www.dec.ny.gov/lands/100925.html>.

other sections, for reference, these other zoning districts and their respective sections in this report are:

1. Open Space Overlay and Open Space Index - Map 45. Conservation Open Areas & Open Space Overlay
2. Scenic Protection Overlay District - Map 40. Scenic Resources
3. Cold Spring Watershed Overlay District and Aquifer Overlay District - Map 18. Cold Spring Watershed and Aquifer Overlay Districts
4. Scenic Ridgelines - Map 40. Scenic Resources
5. Wetlands and Watercourses - Map 16. Wetlands

Each of the Town's original maps portraying these zoning districts and protected resources can be found at: <https://philipstown.com/government/building-department/zoning-maps>

Findings:

As shown on the map, the Town of Philipstown has 12 Land Use / Development Overlay Districts as well as the above mentioned resource protection overlay districts. Overlay districts are intended to provide additional protection of important environmental resources and/or to permit certain types of economically productive uses that would not otherwise be allowed in a particular land use district. Overlay districts may overlap different land use districts, but they do not change the use and dimensional requirements of the underlying land use districts unless specifically stated in the Town's Zoning Code. The following are summary explanations of the Town's Overlay Districts from Town Zoning Code section § 175-7:²

“A. Rural Conservation District (RC). The purpose of this district is to promote land conservation, agriculture, forestry, recreation, and the preservation of open space, as well as other compatible rural uses, by encouraging such activities and by discouraging large-scale residential development, while allowing low-density residential uses.

B. Institutional Conservation District (IC). The purpose of this district is to preserve existing institutional uses of property of 20 acres or more that maintain significant amounts of contiguous open space and/or historic structures.

C. Rural Residential District (RR). The purpose of this district is to allow residential uses in a rural setting at a lower density than is allowed in the hamlets.

D. Hamlet Mixed-Use District (HM). The purpose of this district is to allow the creation and expansion of hamlets in the traditional scale, density, architectural style, and

² Town of Philipstown, Zoning Code, Article II Land Use and Overlay Districts, § 175-7 Establishment of Districts, <https://www.ecode360.com/6319062>

mixed-use character of the existing hamlets of Garrison and Garrison Landing and of the Villages of Cold Spring and Nelsonville.

E. Hamlet Residential District (HR). The purpose of this district is to maintain the traditional scale, density, and character of residential hamlets such as Continental Village, as well as residential neighborhoods surrounding designated hamlet mixed-use areas.

F. Suburban Residential (SR). The purpose of this district is to maintain the character of existing suburban density residential developments and to allow a limited extension of suburban growth patterns.

G. Highway Commercial District (HC). The purpose of this district is to allow commercial uses that rely heavily on automobile and truck access and that would not be compatible with a hamlet mixed-use area.

H. Office/Commercial/Industry Mixed-Use District (OC). The purpose of this district is to allow areas for light industrial, service commercial, office, and research facilities. Such districts may also include, where compatible, housing and limited retail commercial development intended to support the primary uses or to provide adaptive reuses for existing commercial or industrial buildings.

I. Industrial/Manufacturing District (M). The purpose of this district is to allow industrial and related uses that are not compatible with most commercial, office, or residential uses, in isolated and well-buffered locations.

J. Floodplain Overlay District (FPO). The purpose of this overlay district is to control development within the one-hundred-year floodplain in order to minimize flood damage and protect water resources. This district also incorporates by reference the Town's existing Floodplain Protection Law, Chapter 90 of the Town Code. See § 175-13.

K. Cold Spring Watershed Overlay District (WSO). The purpose of this overlay district is to protect the water supply of the Villages of Cold Spring and Nelsonville, which includes the entire watershed of Foundry Brook. See § 175-14.

L. Scenic Protection Overlay District (SPO). The purpose of this overlay district is to protect the character of scenic resources in the Town, including designated scenic road corridors and the Hudson River viewshed. See § 175-15.

M. Aquifer Overlay District (AQO). The purpose of this overlay district is to protect groundwater resources that provide drinking water for private wells and that may be used in the future to provide public water supplies. See § 175-16.

N. Soil Mining Overlay District (SMO). The purpose of this overlay district is to provide appropriate locations for soil mining to occur where landowners can achieve a reasonable

return on their land from sand and gravel mining without adversely impacting their neighbors. See § 175-17.

O. Open Space Conservation Overlay District (OSO). The purpose of this overlay district is to afford special protections to tracts of land that have been identified in the Town of Philipstown Open Space Index and that are 30 acres or more in size. See § 175-18.

P. Mobile Home Park Overlay District (MHO). The purpose of this overlay district is to provide appropriate locations for mobile home parks, consistent with the requirements of § 175-44.”

Although it was not feasible to include all of these zoning layers on one map, readers will be able to combine any of these layers once the Town’s ArcGIS Online tool is up at the end of 2020. This tool will greatly facilitate the analysis of how different overlay districts overlap with each other and the myriad resources within the Town and how zoning districts could potentially be improved on to better protect the Town’s resources while allowing necessary development. An example would be using the ArcGIS tool to combine the layers from this map with the Biodiversity Indicator layer or the Areas of Ecological Importance layers from Chapter 4 to see how well zoning code is actually protecting ecological rich areas. Also, once this tool is ready, the Town’s Planning Board, Zoning Board and Conservation Board, among others, will be able to take the next steps of reviewing current overlays and consider updates to better protect sensitive or threatened resources..

In the meantime, we can briefly point out some findings from looking at the Zoning map. As has often been the case throughout human history, much development - both of roads and of houses, businesses, and industry - has occurred along waterways, especially rivers and streams, and Philipstown is no different. Looking at the map, you can see how many residential, commercial and even industrial zoned areas there are along the Clove Creek and over the Clove Creek Aquifer along the northern corridor of Route 9. Even a Soil Mining Overlay District exists directly over the Clove Creek Aquifer. Similarly, there are concentrated commercial and residential areas in the two Villages of Cold Spring and Nelsonville, through which passes Foundry Brook on its way to Constitution Marsh, in the section of Garrison between Philipse Brook and Arden Brook, along the southern portion of Route 9 adjacent to Annsville Creek, and also along and around Canopus Creek in Continental Village. Much of this historical development is perhaps unavoidable since Philipstown has so many steeply sloped areas, which are not only protected but also limit development to the flatter floodplain valleys of the Town, which also happen to be where most of the Town’s streams pass through.

That said, compared to many neighboring towns, the Town of Philipstown is also doing an excellent job through its zoning code of protecting both the historical character of its many hamlets and rural areas as well as conserving its abundant natural landscapes and resources. It is no coincidence, for example, that the majority of the Town is zoned as Rural Conservation, much of which is already protected as State Park or by conservation easements (see Section 43. Protected Lands for more on this). Following that, the numerous Institutional Conservation and Rural Residential zoned areas throughout the Town help to preserve much more open space than the hamlet sections of Town, and discourage destructive overdevelopment and isolation of natural areas. In addition, the Town has designated numerous properties as priority conservation properties within its Open Space Overlay, which will be covered in more detail in the next several sections of this chapter. Likewise, the Town's Scenic Resource Overlays, Water Resource Overlays and Wetlands maps will also offer additional insights when combined with other layers within this inventory, and may inform further protection measures in the years ahead.

Further Study:

Most further study can revolve around using the Town's ArcGIS Online tool to take a much deeper dive into analyzing how the zoning overlays are actually protecting resources within the Town. In addition, the Town can look further into examples of what other towns have done to protect certain natural resources or change zoning overlays based on updated natural resources data. A major focus could revolve, for example, on how to reduce the negative impacts of concentrated development along Clove Creek via updated zoning restrictions.

Data Sources:

- Zoning Districts
 - Town of Philipstown Zoning Code and Zoning Maps
<https://philipstown.com/government/building-department/zoning-maps>
- Tax Parcels
 - Putnam County IT Department - eParcel
<https://www.putnamcountyny.com/itgis/eparcels/>

38. Land Cover and Forest Types

Description:

According to the Hudson River Estuary Program, “patterns of human land uses and natural land cover in a watershed strongly influence water resources and biological communities through the interactions of water, soil, organisms, and chemical components. Changes in natural land cover (especially forests, floodplains, and wetlands) accompanying conventional development patterns often result in substantial increases in impervious surfaces (e.g., roofs, parking lots, and roads) and can drastically alter stream health and hydrology by adding pollutants and sediment. Research has found that increases in impervious cover are linked to degradation in water quality and aquatic habitat value and an increase in flooding problems (Walsh et al. 2005).³ Without the use of best management practices, extensive agricultural land use in a watershed can likewise impair water quality through delivery of excess nutrients, sediment, and potentially pathogens to waterways. Furthermore, the fragmentation of natural areas by roads and development impedes wildlife movement, facilitates the spread of invasive species, and reduces overall habitat value.

“Knowing the general distribution of land use and land cover in a municipality and its larger watershed context can help a community better understand past and present development patterns and plan for future growth. Directing new development to existing centers uses land more efficiently and saves money by taking advantage of existing infrastructure and allowing for greater density in already settled areas. Concentrating greater density in existing centers is often the best option to protect water resources, biological communities, and farmland because it takes pressure off development of the community’s remaining green spaces.”⁴

This guest map was created by Philipstown resident and volunteer Emily Cheadle as part of the Town of Philipstown and Ecological Citizens Project’s collaborative 2020 Community Greenhouse Gas Emissions Inventory report titled “Sink, Store, Reduce, Offset,” which can be accessed at climatesmartphilipstown.org. It shows National Land Cover Database (NLCD) land cover types within the Town as well as tax parcels from the Putnam County IT Department. This map uses the most up to date NLCD dataset, from 2016.

³ Walsh, C., A. Roy, J. Feminella, P. Cottingham, P. Groffman, and R. 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.

⁴ Haeckel, Ingrid, and Laura Heady. Creating a Natural Resources Inventory: A Guide for Communities in the Hudson River Estuary Watershed. (Ithaca, NY: Department of Natural Resources, Cornell University, and New York State Department of Environmental Conservation, 2014): <https://www.dec.ny.gov/lands/100925.html>.

Findings:

“Philipstown’s area is roughly 33,000 acres, of which 79.9% is forested, 7.4% is developed open space (i.e., lawns and golf courses), 2.8% is developed impervious (i.e., buildings, roads, driveways), 2.4% open water (Hudson River, lakes and streams), 2.3% woody wetlands, with the remaining land use types occupying less than 2% of Town land each.”⁵

In terms of undeveloped land, Philipstown contains large blocks of primarily deciduous forest and also has smaller but significant clusters of woody wetlands and hay/pasture. As described in other sections of this report, these land cover types perform countless ecosystem functions and provide numerous benefits to all forms of life, especially the Town’s forests and wetlands. The next section will cover how many acres of the Town’s land are protected and the types of land cover found within protected areas. It’s interesting to note how relatively little farm land there is within Philipstown compared to other areas of the Hudson Valley or the United States. As seen above and in the subsequent Section. 40 Farmland, Philipstown’s geology does not lend itself easily to farming and the large areas of already protected and forested land as well as their relatively high prices per acre discourage to some degree the development of farms. However, it is important to note that the development of local agriculture is an essential step in developing resilience to climate change, as noted above in Chapter 5, and it is thus important as the Town continues to make land use and land conservation decisions to take into account a likely future need to expand farmed land or convert existing hay/pasture into areas of cultivated crops. This will be explored further in Section 40. Farmland.

As for developed land, the Town has a handful of development clusters, namely Cold Spring and Nelsonville, Continental Village, sections of Garrison along Route 9D and Route 9 and the northern section of Route 9 above the Clove Creek Aquifer. Overall, the Town has done well to limit development to concentrated areas so as to limit deforestation, fragmentation and other damages to ecosystems in the remaining sections of Town. Unfortunately, as we’ve already seen, some sections of high density development are located near fragile wetland ecosystems like the area around Barrett Pond, or adjacent to or above drinking water supplies, such as along Clove Creek. Concentrated development has also created septic and stormwater runoff issues in some areas, such as Continental Village, where the MS4 district focuses on community education to reduce pollution of local ecosystems and water bodies. These development issues are perhaps unavoidable to some degree due to the relatively large percentage of sloped areas of Philipstown and limited areas that are flat enough for many forms of development. Unfortunately, this also puts many of these areas at risk for flooding, especially with the forecasted increase in flooding events caused by climate change, as described in Chapter 5. Climate Change.

⁵ Apicello J., J. Angell., *et al.*, “Sink, Store, Reduce, Offset,” Philipstown Inventory Report 2020, Town of Philipstown + Ecological Citizens Project + ICLEI USA, 2020, <https://www.climatesmartphilipstown.org/>

Solutions for such concerns may have to involve limits on development even in areas zoned for such uses, or development of concentrated multi-housing zones to reduce the amount of impervious surfaces per capita as more newcomers are attracted to the many charms and beauty of Philipstown and choose to move here.

Data Sources:

- Land Cover and Forest Types
 - Apicello J., J. Angell, *et al.*, “Sink, Store, Reduce, Offset,” Philipstown Inventory Report 2020, Town of Philipstown + Ecological Citizens Project + ICLEI USA, 2020, <https://www.climatesmartphilipstown.org/>

39. Conservation Open Areas and Open Space Overlay

Description:

According to the Hudson River Estuary Program, “by definition, protected lands are properties that are generally undeveloped and protected from future development. Mapping the study area’s protected lands helps identify potential needs and opportunities for expanding these areas to provide links between protected areas, or to add buffers to sensitive areas. The protected lands map can also be used to identify priority resource areas currently limited or lacking in protection. These lands can include a variety of public and privately-owned lands. Public lands may include federal, state, county, and municipally-owned lands. Note that public land ownership doesn’t necessarily ensure that land is protected in perpetuity. Land trusts are private, non-profit organizations that protect land through a variety of voluntary methods, including outright purchase and conservation easements, a legal agreement between a landowner and a land trust or government agency that permanently limits uses of the land in order to protect its conservation values. In addition to private lands under protection from development, lands held by religious or educational institutions might be considered to function as protected lands.”⁶

Local land trusts that are active in Philipstown include Scenic Hudson Land Trust, Open Space Institute and Hudson Highlands Land Trust, which work towards conservation of important natural resources. Their conservation mechanisms include partnering with state agencies to purchase land for conservation, managing donated lands, and establishing conservation easements with private landowners.

⁶ Haeckel, Ingrid, and Laura Heady. Creating a Natural Resources Inventory: A Guide for Communities in the Hudson River Estuary Watershed. (Ithaca, NY: Department of Natural Resources, Cornell University, and New York State Department of Environmental Conservation, 2014): <https://www.dec.ny.gov/lands/100925.html>.

The map for this section was developed by Julia Rogers of the Hudson Highlands Land Trust (HHLT) in February of 2020. It shows conservation areas in Philipstown that are either permanently protected public land (e.g. State Parks), protected private land owned by a conservation land trust (e.g. HHLT), or private land protected by a conservation easement managed by a local land trust (e.g. Scenic Hudson).

The map also shows the Town's Open Space Conservation Overlay District (OSO), which was created to afford special protections to tracts of land that have been identified in the Town of Philipstown Open Space Index and that are 30 acres or more in size. The Open Space Index was originally created in 2007 as part of the Town's Natural Resource and Open Space Protection Plan and then updated in 2016. The map used here is the most up-to-date version and contains parcels conserved since 2016 as well as those covered in the 2016 Open Space Index update. For more information, please review the 2007 Natural Resource and Open Space Protection Plan as well as the 2016 Open Space Index Update, which contains descriptions of each OSO area presented on the map, available here:

<https://philipstown.com/government/building-department/town-code>

Findings:

Conservation Open Areas:*

**For more information on specific parcels referenced in this section, including their legal means of conservation, please visit: <https://www.putnamcountyny.com/itgis/eparcels/>.*

The majority of protected land within Philipstown is State Park, namely the Hudson Highlands State Park and the Clarence Fahnestock Memorial State Park (see Section. 36. Recreational Resources). The latter is contiguous, and the former is broken up into various sections within Philipstown, including the main section along the Fishkill Ridge, a small section that covers Constitution Marsh, and various disconnected sections in southern Philipstown, including Anthony's Nose and Sugarloaf. One key finding from this map is the importance of connecting sections of the Hudson Highlands State Park to each other via other land protections, such as federal, county, town and non-profit lands as well as private conservation easements. Luckily, as the map shows, this work is well underway, thanks to the efforts of local land trusts and landowners. That said, you can also see that there are many gaps and various thin corridors that connect some of the larger protected areas, which, as we already discussed in Chapter 4. Habitats and Wildlife, is a step in the right direction, but due to their narrowness can make it challenging for wildlife to safely migrate from one larger forest area to another while avoiding roads and developed areas.

Federal Protected lands within Philipstown include Constitution Island as well as a section of the Appalachian Trail east of Route 9, which is conserved to maintain public access for hikers using

this section of the trail not protected by State Parks. For more information on the Appalachian Trail, including additional maps, visit: <https://www.nps.gov/appa/index.htm>

Putnam County owns various protected properties within Philipstown, mostly in Continental Village, but also a small conservation area in the Manitou section of Garrison along the Hudson River (southwest part of Town) and a property adjacent to Mayor's Park in Cold Spring, which includes a lagoon separated from the Hudson River by a Metro North Railroad causeway. These various protected County properties vary from public parks to undeveloped land. More information on County lands may be found here:

<https://www.putnamcountyny.com/itgis/eparcels/>

The cities of Beacon and New York also own protected land within Philipstown. This land includes parcels owned by the City of Beacon along East Mountain Road North, which are protected as a reservoir for the City's water supply. New York City also owns land that cuts diagonally across Philipstown from northwest to southeast, which is part of the Catskill Aqueduct system that serves New York City with potable water. It is managed by the New York City Department of Environmental Protection. For more information, please visit:

<https://www1.nyc.gov/site/dep/water/current-water-distribution.page>

Philipstown itself also owns various conservation properties to protect either recreational land or land used by water delivery facilities. These include, from north to south,

- The Philipstown Park at Glasbury Court off of Route 9, which includes an enclosed dog park for residents, a pond, and walking trails;
- The Philipstown Park located on Route 9D south of St. Basil Academy, which includes athletic fields and hiking trails that access a waterfall vista of Philipse Brook;
- A new property that was recently donated to the Town by the Open Space Institute. The property is located at the intersection of Route 403 and Route 9D, with access located across Route 403 from the Desmond Fish Library entrance. This property will be partially used for the "New Leaf" community garden, and possibly for additional athletic fields and a solar panel array in the future;
- The Philipstown Community Center (also known as the Recreation Center) located on Route 9D, which consists of athletic fields and an former school building converted into offices, community classrooms and athletic facilities;
- A small park along Canopus Creek and Winston Lane in Continental Village; and
- A larger set of properties that includes the Continental Village Club House, its adjacent buildings and part of Cortlandt Lake.

The Village of Cold Spring owns two properties outside of the village, which include the Cold Spring Reservoir and the Foundry Brook water treatment plant, as well as Dockside Park in the Village along the Hudson River. The Village of Nelsonville also owns several protected properties along the east boundary of Hudson Highlands State Park, which are home to numerous public hiking trails and are protected by conservation easements held by the Open Space Institute. Two new protected sections are currently being added to this area, which will be included on a future update of this map.

Throughout the Town there are also numerous protected properties owned by Scenic Hudson, the Open Space Institute and the Hudson Highlands Land Trust or privately owned and protected by conservation easements held by one of these land trusts. As noted in Chapter 4, one of the main efforts of these organizations is to connect isolated parcels of protected land to each other by creating *conservation corridors*. These corridors allow the movement of all manner of species from one high quality ecosystem to another and especially prioritize facilitating the north-south movement of wildlife in response to climate change. A notable example is how the Hudson Highlands Land Trust has been able to conserve lands that connect a section of the Hudson Highlands State Park to the Federally owned section of the Appalachian Trail corridor to the east of Route 9. The Hudson Highlands Land Trust is currently coordinating a partnership project called “Green Corridors.” Its purpose is to identify key lands in Philipstown, Putnam Valley, and beyond that are important for wildlife movement, as well as what tools, partners, and partners are available to support the conservation of these lands.

Also, a notable recent addition to the list of protected lands is the group of properties (green striped parcels in the northwest corner of the map) located around Lake Valhalla, which consist of 1,178 acres of most deciduous forest that were recently purchased by Scenic Hudson. According to an article by the Highlands Current (a local newspaper), 520.5 acres of this land will eventually be donated to NYS and incorporated into the Hudson Highlands State Park, 193.5 acres will be transferred to a Lake Valhalla homeowner association and will remain protected under a conservation easement to limit development, and 52 acres, with one or two homes, would be sold but similarly protected by a conservation easement. The remaining 412 acres will remain under Scenic Hudson ownership and be protected as a fee-owned property.⁷ Ensuring the conservation of these 1,178 acres is a great achievement by Scenic Hudson, and it will have the tremendous long-term benefits of protecting the Cold Spring and Nelsonville drinking water supply via the adjacent Cold Spring Reservoir, protecting high quality contiguous forest along Hudson Highlands State Park, and ensuring continued access to Lake Valhalla for local homeowners.

⁷ Schevchuk Armstrong, Liz, Philipstown Approves Lake Valhalla Split, 9/26/2020
<https://highlandscurrent.org/2020/09/26/philipstown-approves-lake-valhalla-split/>

Land Cover of Protected Areas:

As noted in the previous section, “Philipstown’s area is roughly 33,000 acres, of which 79.9% is forested, 7.4% is developed open space (i.e., lawns and golf courses), 2.8% is developed impervious (i.e., buildings, roads, driveways), 2.4% open water (Hudson River, lakes and streams), 2.3% woody wetlands, with the remaining land use types occupying less than 2% of Town land each.”⁸

The vast majority of protected lands consist of deciduous forest. There are also scatterings of evergreens and mixed forest within those deciduous forest areas. As the 2020 Philipstown Community GHG Emissions Inventory explains, only 50% of Philipstown’s forests are protected. However, all of the forests are capturing carbon dioxide from the atmosphere and storing it in their trunks and the soil, thus performing an essential service to prevent Philipstown’s ghg emissions from rising higher than they already are and to work towards the Town’s carbon emission goal of 100% reduction by 2040. These forests also provide innumerable other benefits to all forms of life that reside or pass through Philipstown, and their *sustained* protection is essential for preserving the integrity of the Town’s forests, which emphasizes the importance of working to conserve as much of the remaining unprotected forested lands throughout the Town as is economically possible.

In addition there are numerous wetlands, especially within Fahnestock State Park, in protected areas, but only 36% of the Town's total inland wetlands are currently protected. These wetlands perform countless essential ecosystem services, one of which is to store enormous amounts of carbon in their peat or muck below the surface, which if developed, would release enormous amounts of CO₂ back into the atmosphere, undermining the Town’s GHG emissions reduction efforts.⁹

Also, there are numerous protected hay/pasture areas as well as “developed open space” areas which consist of lawns and golf courses. The hay/pasture areas offer numerous ecosystem services, especially for predatory birds and small rodents, but also capture decent amounts of CO₂ from the atmosphere and thus require sufficient protection as well. On the other hand, due to mowing practices, lawns and golf courses tend to capture little net carbon from the atmosphere in addition to performing far fewer ecosystem services. Compared to an open meadow, for example, a lawn is a fairly inhospitable and barren ecosystem, despite its aesthetic and recreational qualities. This information should be incorporated into community conservation and climate change campaigns to inform land owners about best practices when it comes to land protection and landscaping choices.

⁸ Apicello J., J. Angell., *et al.*, “Sink, Store, Reduce, Offset,” Philipstown Inventory Report 2020, Town of Philipstown + Ecological Citizens Project + ICLEI USA, 2020, <https://www.climatesmartphilipstown.org/>

⁹ *Ibid.*

All of this said, it is evident that Philipstown already has a tremendous conservation ethic compared to many neighboring communities, and although there remain large areas of unprotected lands with precious forested, wetland and meadow habitats, the Town is well on its way to protecting as much land as possible with the help of other levels of government as well as local land conservation organizations, whose contributions cannot be overstated.

Open Space Overlay (OSO):

Town Code § 175-18 Open Space Conservation Overlay District states the following with respect to the OSO:

- A. “Findings and purpose. Special protection of large tracts of land identified as important for conservation by the Town's Open Space Index is necessary to preserve the Town's natural resources and attractive rural quality. The purpose of this section is to afford special protection to such tracts by reducing potential development and ensuring that the important resource values of these areas are preserved.
- B. Boundaries. The OSO District includes all land shown on the Resource Protection Overlay Districts Zoning Map^[1] as part of the OSO District. The OSO District shall include land shown in the Open Space Index that is located on parcels of 30 acres or more, as such parcels existed on January 1, 2010. The OSO District shall consist of only the land shown on the index, which may be a portion of a larger tract. Only that portion of a tract which has been mapped on the Open Space Index shall be included in the district. Any land not mapped by the Town Board as part of the OSO District shall not be part of the district, and the map shall take priority over any conflicting language in this subsection. Land lying within a SR, OC, HC, M, HM, or HR District shall be excluded from the OSO District.
- C. Regulatory effect on land uses. Within the OSO District, all of the underlying land use district regulations remain in effect, except that:
 - (1) The maximum density for a conservation subdivision shall be five acres per dwelling unit;
 - (2) The minimum lot area for a conventional subdivision shall be 15 acres; and
 - (3) The minimum percentage of open space to be preserved in a conservation subdivision shall be 80%.
- D. Institutional uses. The provisions in Subsection C above shall not apply in the IC District.
- E. Use of Open Space Index. The conservation resource values identified in the Open Space Index shall be preserved to the maximum extent practicable in any development approval.”¹⁰

¹⁰ Town of Philipstown, Zoning Code, § 175-18 Open Space Conservation Overlay District, <https://www.ecode360.com/6319173?highlight=open%20space.overlay&searchId=29619260457455342#6319173>

As the map shows, some of these OSO properties prioritized for conservation have already been protected as either fee-owned properties or via conservation easements during the period between 2007 - 2016 and some more recently between 2016 and 2020. As noted above, a recent major success has been the protection of 1,178 acres in the Lake Valhalla conservation area (green-striped parcels in the north-west corner of the map), thanks to efforts by Scenic Hudson. Also, one can see that a number of properties were protected between 2007 - 2016, especially in the southern part of Town around South Mountain Pass and along Route 9 and Old Albany Post Road. These recently protected lands, as noted above, have formed corridors connecting other protected lands, which enables the movement of wildlife between protected areas.

More work remains to be done, but the conservation organizations within Philipstown that are leading this effort should be extremely proud of their accomplishments so far, and we hope that Philipstown community members understand and celebrate the efforts of our local land protectors - Hudson Highlands Land Trust, Open Space Institute and Scenic Hudson - as well as the local governments, nonprofit organizations and private landowners that have agreed to convert their properties to conservation easements.

Further Study:

Additional study, as noted in the previous section, could focus on conducting a local in-the-field study to confirm the land cover classifications for various parcels within the Town, due to the limited scope of accuracy of the National Land Cover Database.

Furthermore, additional properties are being protected on a constant basis and periodic updating of this section of the report, including incorporating the results of the Hudson Highlands Land Trust's "Green Corridors" project, as well as creating an updated map every several years, would be useful to maintain the most up-to-date understanding of protected lands and remaining lands to prioritize for protection, based on information in this section and other sections of this report.

Data Sources:

- Conservation Open Areas and Open Space Overlay
 - This map was produced by the Hudson Highlands Land Trust using data from the Town of Philipstown (OSO), NY Protected Areas Database (conserved land) and the Putnam County IT Department (Tax Parcels); for more information about this map, please contact Hudson Highlands Land Trust at: <https://www.hhlt.org/>

40. Farmland

Description:

According to the Hudson River Estuary Program, “farmland includes cropland, hayfields, pastures, orchards, and nurseries. Millions of acres of crop and pasture land in New York State have been converted to non-farm uses or allowed to revert to forest cover in the last century. In many cases, marginal farmland has been abandoned and prime farmland preserved. In other cases, prime farmland is rapidly being converted to residential development. According to the American Farmland Trust, over the last 25 years, New York has lost almost half a million acres of farmland to subdivisions, strip malls, and scattered development, threatening food security and local economies. An inventory of valuable farmland is important to understand the extent of local resources and prioritize the most important areas to conserve.

“Farmlands provide much more than a place to produce crops and livestock. In New York’s primarily forested landscape, fields and other agricultural lands provide habitat for a variety of wildlife species and are important elements of rural community character and scenic views. Farmlands also provide an important historic link with the past. Conserved farm properties safeguard wildlife habitat and environmentally sensitive areas such as meadows, woodlands, wetlands, and streams. In fact, as much as 50% of the current acreage of Hudson Valley farm properties is forested or wetland habitat.

“Prime farmland, as defined by the USDA Natural Resource Conservation Service (NRCS), is land best suited to food, feed, forage, fiber, and oilseed crops. It may be cultivated land, pasture, woodland, or other land potentially available for growing crops, but does not include developed land or surface water areas. Prime farmland soils produce the highest yields with minimal expenditure of energy and economic resources. Prime farmland soils with current agricultural use are the most valuable farmland assets. Soils of Statewide Importance are lands, in addition to prime farmlands, that are of statewide importance for crop production [but may require improvement to perform as well as prime farmland]. Both prime farmland soils and soils of statewide importance are derived from county soil surveys based on soil unit attributes supplied by NRCS.”¹¹

This map contains two data sources: 1) Prime Farmland Soils and Soils of Statewide Importance, which were derived from the NRCS’s Web Soil Survey, which was also used for the Chapter 2. Soils, and 2) properties designated as Putnam County “Agricultural District,” which were obtained from the NYSDEC Agricultural District Boundaries dataset. According to the Putnam

¹¹ Haeckel, Ingrid, and Laura Heady. Creating a Natural Resources Inventory: A Guide for Communities in the Hudson River Estuary Watershed. (Ithaca, NY: Department of Natural Resources, Cornell University, and New York State Department of Environmental Conservation, 2014): <https://www.dec.ny.gov/lands/100925.html>.

Valley NRI, “Enacted in 1971, New York’s Agricultural Districts Law (ADL) is a very effective tool for maintaining lands in agriculture and ensuring New York’s position as an outstanding agricultural state. These Agricultural Districts have been designated on the basis of proposals from landowners. The land designated by Putnam County’s Agricultural and Farmland Protection Board and the County Planning Board as an Agricultural District must be at least 250 acres in size and show viable farming activity. Land owners of such properties receive partial real property tax relief (agricultural assessment and special benefit assessments), and protections against overly restrictive local laws, government funded acquisition or construction projects, and private nuisance suits involving agricultural practices.”¹²

Findings:

Not surprisingly, due to its high percentage of steep slopes, bedrock and glacial till, much of Philipstown’s land (76%) is unsuitable for agriculture. Prime Farmland makes up 8.3% of the Town’s area and farmland with Soils of Statewide Importance, a step down from Prime Farmland, makes up 5.7% of the Town’s area. The percentages of each soil type shown on the map as well as additional soil properties are presented in Table 19: Prime Farmland and Soils of Statewide Importance.

Thus, only 14% of the total acreage in Philipstown supports soils suitable for farmland, though much of that area is either forested or used for other development purposes today, as seen when comparing this map with the map from Section 38. Land Cover and Forest Types. For example, there are quality soils around Lake Valhalla, Hustis Rd, Barrett Pond and also along the northern border of Town that are not being used for agriculture. This is not surprising since many of these areas are also located along waterways and flood plains and thus tend to collect the types of soils that are much more amenable to growing crops or feed for livestock. As is often the case, the competition for flat or less sloped land within Philipstown has led to conflicts of use between different forms of development as well as with efforts to protect essential ecological services. Thus, most of the quality farmland soil in this area in northern Philipstown is instead covered by forest or has been developed for residential and commercial purposes, and is ironically covered with what are very likely healthy lawns rather than used for efficient food production.

And it’s even more complicated. The irony is that although many of the soils in this area are of high quality for agriculture, if they were developed for such purposes, potential fertilizer / herbicide / pesticide runoff could have disastrous effects on the Clove Creek Aquifer and adjacent water supplies, and thus there would need to be strict regulation and enforcement of such agriculture to prevent these potential negative effects. This highlights the importance of comparing various layers of this NRI to each other using the ArcGIS Online tool to determine

¹² Town of Putnam Valley Committee for the Conservation of the Environment, Town of Putnam Valley Natural Resource Inventory, 2018: <https://putnamvalleyresidents.com/NRI.html>

which areas of the Town are being used or protected in the best possible way to balance development with conservation needs. This is not a simple process and will require careful further analysis by the Town over the years and decades ahead. Luckily, it will potentially provide much guidance as the Town continues to grow, adapt to climate change and protect its precious resources for future generations.

Similarly, there are numerous other areas across Town that offer quality farming soils but are currently not being used as such. These include the central Route 9 corridor from Perk's Boulevard to Land Gate Road; the Route 301 corridor between Route 9 and Nelsonville; a large central section of Garrison between Indian Brook Road, Old Albany Post Road, Upper Station Road and Route 9D; as well as smaller sections along southern Route 9D and in the vicinity of Continental Village. Although there are agricultural districts within some of these areas, you can see how many quality soils are not being used for farming, but rather are forested or used for residential or commercial buildings.

The majority of existing farms grow hay/pasture for livestock (confirmed by Section 38. Land Cover and Forest Types), although there are a handful of farms that also or only grow vegetables for sale. Some registered Agricultural Districts of note include (this information and more details are publically available via Putnam County's eParcel database):

- Glynwood off of Route 301;
- Land belonging to the Healy family along Healy Road and Lane Gate Road;
- Land belonging to the Buck family along Route 9D southeast of Cold Spring;
- Saunders Farm and adjacent agricultural districts along Old Albany Post Road and South Highland Road in eastern Garrison;
- Land belonging to the Will family and land belonging to the Lanza family between Upper Station Road and Nelson Lane in western Garrison;
- Land belonging to the Cook family between Sugarloaf and Route 9D in southern Garrison near the Hudson River; and
- Land belonging to the Hilpert family along southern Route 9 in Garrison near Old Highland Turnpike.¹³

Interestingly, although some Agricultural Districts overlap with prime or important farmland soils, there are several districts that include significant areas of poor agricultural soils or have hardly any quality agricultural soils at all. This speaks to the value of determining the quality of soils within the Town and potentially facilitating the use of certain parts of Town for agricultural purposes, especially to prioritize access to tax relief provided for by the NYS Agricultural Districts Law. This is not to say that existing farms with poor soils should not also continue to receive tax relief to preserve historically and communally important agriculture, but rather to

¹³ Putnam County, eParcel Database, 2020, <https://www.putnamcountyny.com/itgis/eparcel/>

best guide the creation and sustainability of future farms within the Town.

According to the Putnam Valley NRI, “Tax relief is an important issue for New York farmers. Farms need land to operate and property taxes on farmland are often a significant expense. At the same time, farmland tends to pay more in property tax than it requires in public services. ‘Cows and corn don’t go to school,’ [after all]. Cost of Community Services studies from around the country have demonstrated that farm and forest land generate a net property tax ‘profit’ while houses generally cause a property tax ‘loss’ (due to the high cost of their associated public services). Thus, having farmland in a community can help maintain a lower demand for public services and keep property taxes lower. By maintaining a balance of land uses and by focusing growth in areas with access to underutilized infrastructure, communities can promote fiscal efficiency, preserve farmland and open space, and avoid other costs of sprawl. Increasingly, state and local governments are recognizing that keeping farmland in production may help control the cost of providing community services.”¹⁴

As Chapter 5. Climate Change has shown, as climate change progresses, the need for more resilient local agriculture will increase and PhilipsTown currently has a shortage of locally-produced food. The need to convert certain land areas to agricultural use should be informed by the quality of soils presented on this map, especially considering that “regenerative agriculture,” which focuses on top-soil regeneration and can improve the capacity of soils to store carbon from the atmosphere.

The Town could also go further by using this map to develop an “Agricultural Soils Overlay District” to provide special protections and privileges to parcels that contain prime and important farmland, in preparation for a greater need to expand local agricultural production. Furthermore, these potential farms could contribute to the Town’s Open Space goals and add to the historic character of the region.

In addition, local farms tend to be community hubs, both economic and cultural, as exemplified by the Community Supported Agriculture approaches of several existing farms, including Long Haul Farm on South Mountain Pass and Glynwood on Route 403. Community Support Agriculture (CSA) is a term for farming that relies on up-front membership payments by customers, which reduces the need for farmers to take out loans to finance production and thus reduces some of the up-front risk involved in running a farm. Customers then receive weekly deliveries or pick-ups of produce in exchange for their initial investment. CSA’s can also request “sweat equity” from customers who agree to contribute a certain number of hours of farm labor per season in order to reduce the cost of their membership, which can further contribute to a sense of community. Local farms also further support the existence of the year-round Cold

¹⁴ Town of Putnam Valley Committee for the Conservation of the Environment, Town of Putnam Valley Natural Resource Inventory, 2018: <https://putnamvalleyresidents.com/NRI.html>

Spring Farmers Market, which has become a major community hub over the years, and a key location of sustainability education and outreach.

In summary, Philipstown's existing farms already contribute to the Town's food production, culture and ecosystem services in many ways. The expansion of farms will inevitably conflict with other needs presented in the rest of this inventory. Thus it will be essential to prioritize creation of farms in areas that have quality agricultural soils, as shown on this map. Using this information, the Town of Philipstown can wisely guide the development of more small local farms in a way that minimizes their negative aspects and maximizes their essential contributions to our community.

Further Study:

Additional research could include organizing a local study of existing farms to document their specific agricultural production and community participation (e.g. CSA, Farmer's Markets, Community Events, etc.).

Also, a study to confirm the existence of prime and important agricultural soils at each of the areas displayed on the map would help to best inform a potential Agricultural Soils Overlay District that could be created by the Town of Philipstown.

Lastly, a study to determine if any existing small farms are not protected as Agricultural Districts and to see if there are alternative ways to afford such farms appropriate tax relief, if possible, would help to preserve smaller farms that are not eligible for Putnam County Agricultural District classification due to its 250-acre minimum requirement (as noted in the Description section above). This would greatly enable start-up small farmers to access additional support within Philipstown.

Data Sources:

- Agricultural Districts
 - NYSDEC Agricultural District Boundaries
<http://gis.ny.gov/gisdata/inventories/details.cfm?DSID=400>
- Prime Farmland and Soils of Statewide Importance
 - NRCS SSURGO Database
<https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm>

Table 19: Prime Farmland and Soils of Statewide Importance¹⁵

| Soil Symbol | Description | Acreage | Percentage of Total Soils | Farmland Class | Parent Material ¹⁶ | Drainage Class | Septic Tank Absorption Fields Rating ¹⁷ |
|---|--|---------------|---------------------------|-------------------------|-------------------------------|---------------------------|--|
| HnB | Hinckley loamy sand, 3 to 8 percent slopes | 38.6 | 0.10% | Of Statewide Importance | Outwash | Excessively drained (dry) | Very limited |
| WdC | Woodbridge loam, 8 to 15 percent slopes | 143.3 | 0.40% | Of Statewide Importance | Till | Moderately Well Drained | Very Limited |
| RdA | Ridgebury complex, 0 to 3 percent slopes | 6.10 | 0.00% | Of Statewide Importance | Till | Poorly Drained | Very Limited |
| RdB | Ridgebury complex, 3 to 8 percent slopes | 61.80 | 0.20% | Of Statewide Importance | Till | Poorly Drained | Very Limited |
| Sh | Sun loam | 201.3 | 0.60% | Of Statewide Importance | Till | Very Poorly Drained | Very Limited |
| ChC | Charlton fine sandy loam, 8 to 15 percent slopes | 779.8 | 2.30% | Of Statewide Importance | Till | Well Drained | Very limited |
| PnC | Paxton fine sandy loam, 8 to 15 percent slopes | 595.40 | 1.80% | Of Statewide Importance | Till | Well drained | Very Limited |
| RhC | Riverhead loam, 8 to 15 percent slopes | 114.9 | 0.30% | Of Statewide Importance | Outwash | Well Drained | Very Limited |
| Total Soils Of Statewide Importance: | | 1941.2 | 5.70% | | | | |
| SuA | Sutton loam, 0 to 3 percent slopes | 44.6 | 0.10% | Prime | Till | Moderately Well Drained | Very Limited |
| SuB | Sutton loam, 3 to 8 percent | 182.2 | 0.50% | Prime | Till | Moderately Well | Very Limited |

¹⁵ Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey: websoilsurvey.sc.egov.usda.gov/

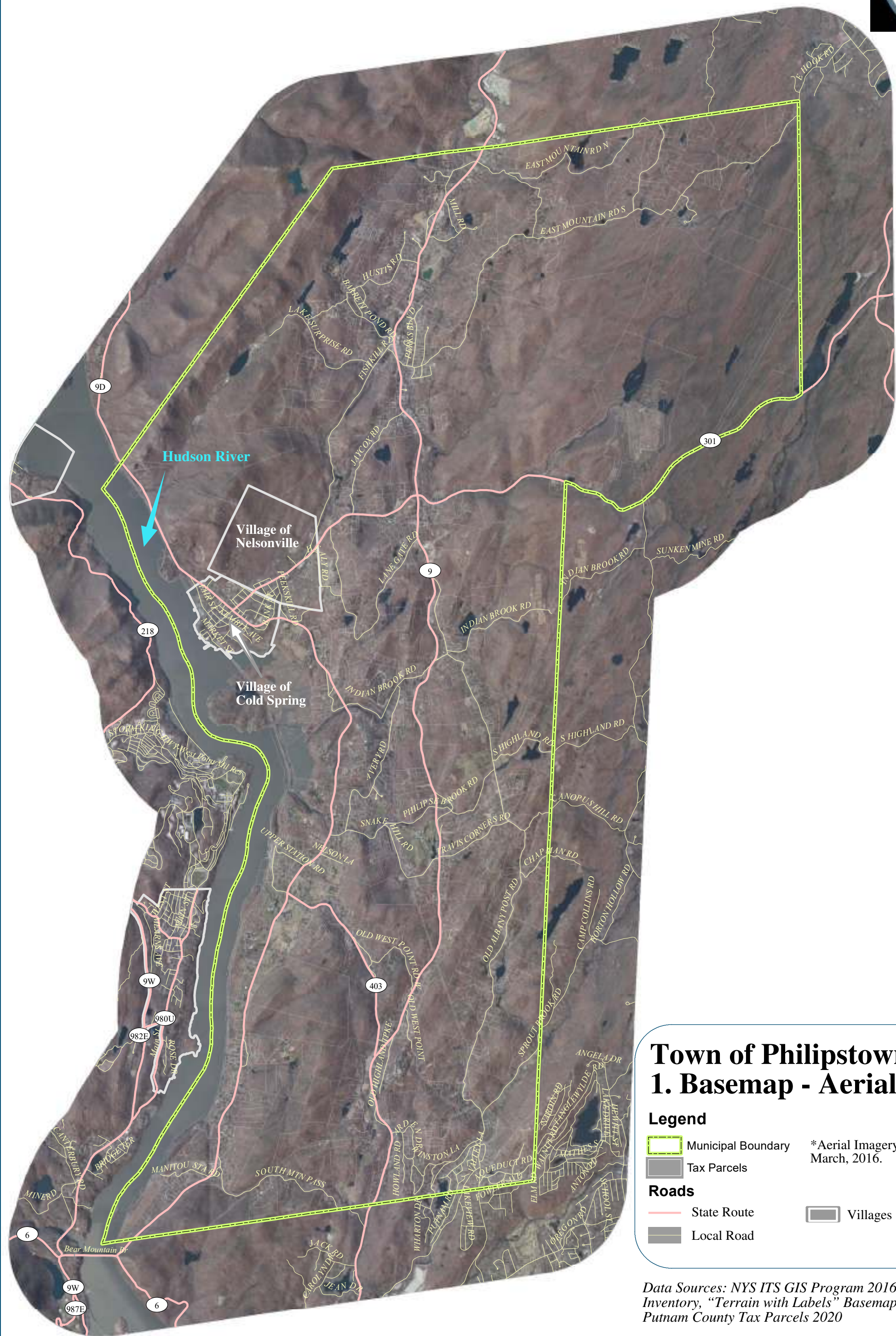
¹⁶ Heady, Laura, and Gretchen Stevens. Guidebook for Biodiversity Assessment. Hudsonia, 2017

¹⁷ Web Soil Survey, United States Department of Agriculture Natural Resources Conservation Service: websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx

| | | | | | | | |
|--|--|-----------------|---------------|-------|------------|------------------------------|------------------|
| | slopes | | | | | Drained | |
| WdB | Woodbridge loam, 3 to 8 percent slopes | 159 | 0.50% | Prime | Till | Moderately Well Drained | Very Limited |
| Fr | Fredon silt loam | 36.7 | 0.10% | Prime | Outwash | Poorly Drained | Very Limited |
| KnB | Knickerbocker fine sandy loam, 2 to 8 percent slopes | 8.2 | 0.00% | Prime | Outwash | Somewhat Excessively Drained | Very limited |
| Pw | Pompton silt loam, loamy substratum | 48.3 | 0.10% | Prime | Outwash | Somewhat Poorly Drained | Very Limited |
| Ce | Catden muck, 0 to 2 percent slopes | 222.9 | 0.70% | Prime | Organic | Very Poorly Drained | Very Limited |
| ChB | Charlton fine sandy loam, 3 to 8 percent slopes | 1,157.90 | 3.50% | Prime | Till | Well Drained | Somewhat limited |
| PnB | Paxton fine sandy loam, 3 to 8 percent slopes | 364.9 | 1.10% | Prime | Till | Well drained | Somewhat Limited |
| RhA | Riverhead loam, 0 to 3 percent slopes | 77.30 | 0.20% | Prime | Outwash | Well Drained | Very Limited |
| RhB | Riverhead loam, 3 to 8 percent slopes | 427.5 | 1.30% | Prime | Outwash | Well Drained | Very Limited |
| UdB | Unadilla silt loam, 2 to 6 percent slopes | 17 | 0.10% | Prime | Lacustrine | Well Drained | Not Rated |
| Ra | Raynham silt loam | 29.2 | 0.10% | Prime | Lacustrine | Poorly Drained | Somewhat Limited |
| Total Prime Farmland Soils: | | 2,775.70 | 8.30% | | | | |
| Sum Total Quality Farmland Soils: | | 4,716.90 | 14.00% | | | | |

Town of Philipstown

Natural Resource Inventory

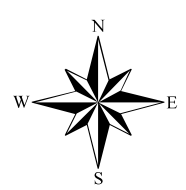


Town of Philipstown 1. Basemap - Aerial*

Legend

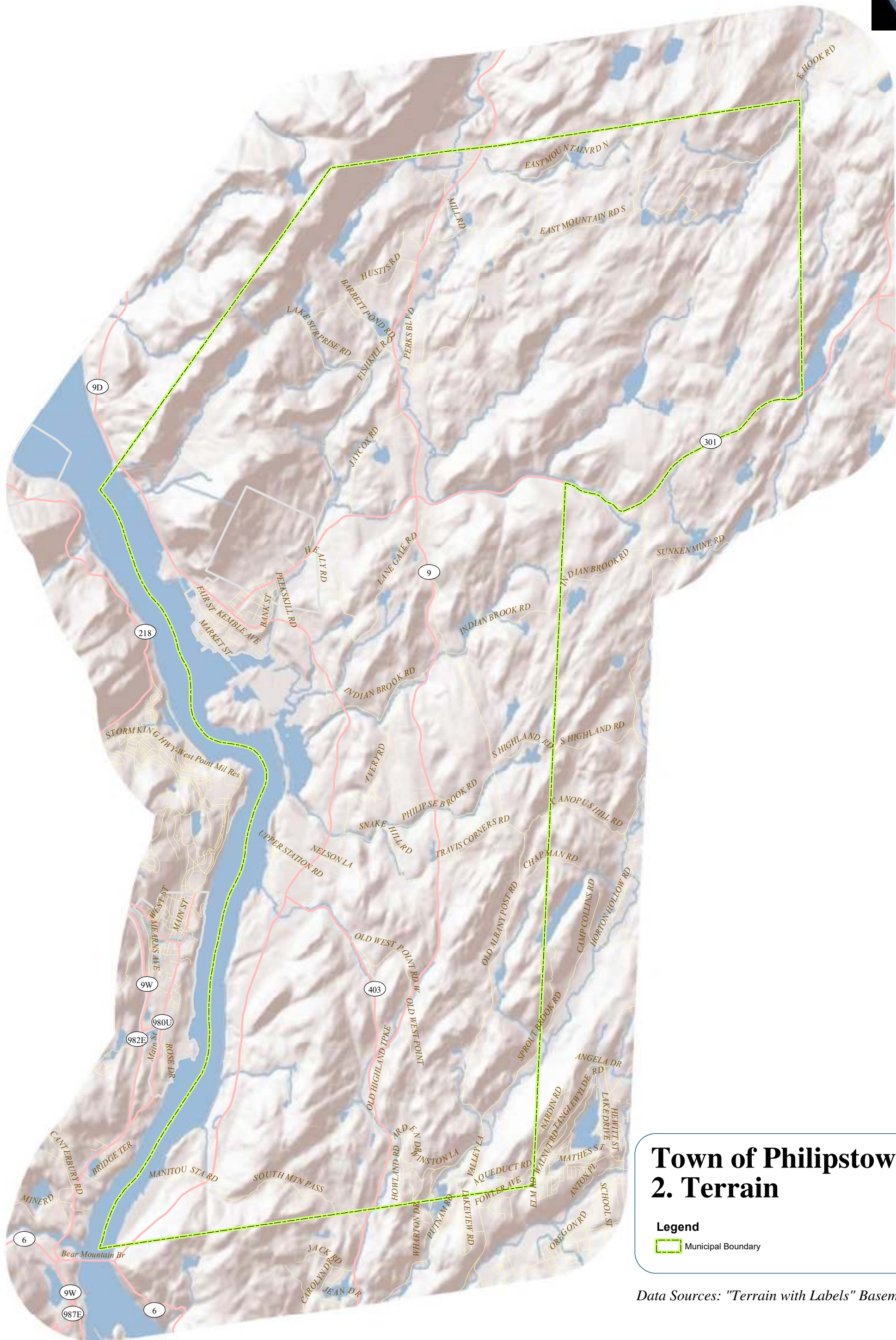
| | |
|--------------------|---------------------------------------|
| Municipal Boundary | *Aerial Imagery taken in March, 2016. |
| Tax Parcels | |
| Roads | |
| State Route | Villages |
| Local Road | |

Data Sources: NYS ITS GIS Program 2016 Orthoimagery Inventory, "Terrain with Labels" Basemap - ESRI ArcGIS, Putnam County Tax Parcels 2020



Town of Philipstown

Natural Resource Inventory



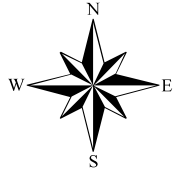
Town of Philipstown 2. Terrain

Legend
Municipal Boundary

Data Sources: "Terrain with Labels" Basemap - ESRI ArcGIS

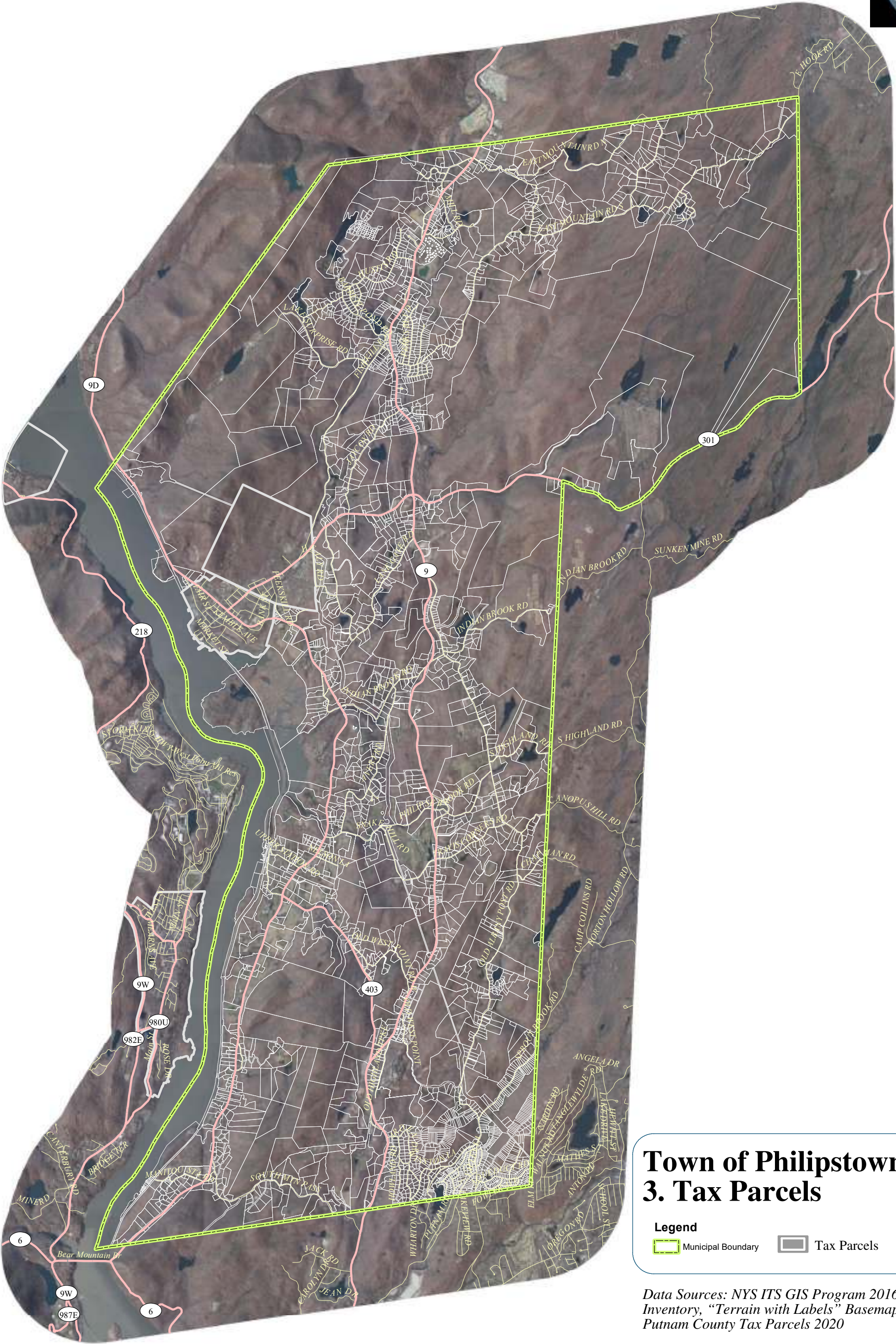
1 in = 1 miles

0 0.5 1 2 3 Miles



Town of Philipstown

Natural Resource Inventory



Town of Philipstown

3. Tax Parcels

Legend

Municipal Boundary

Tax Parcels

Data Sources: NYS ITS GIS Program 2016 Orthoimagery Inventory, "Terrain with Labels" Basemap - ESRI ArcGIS, Putnam County Tax Parcels 2020

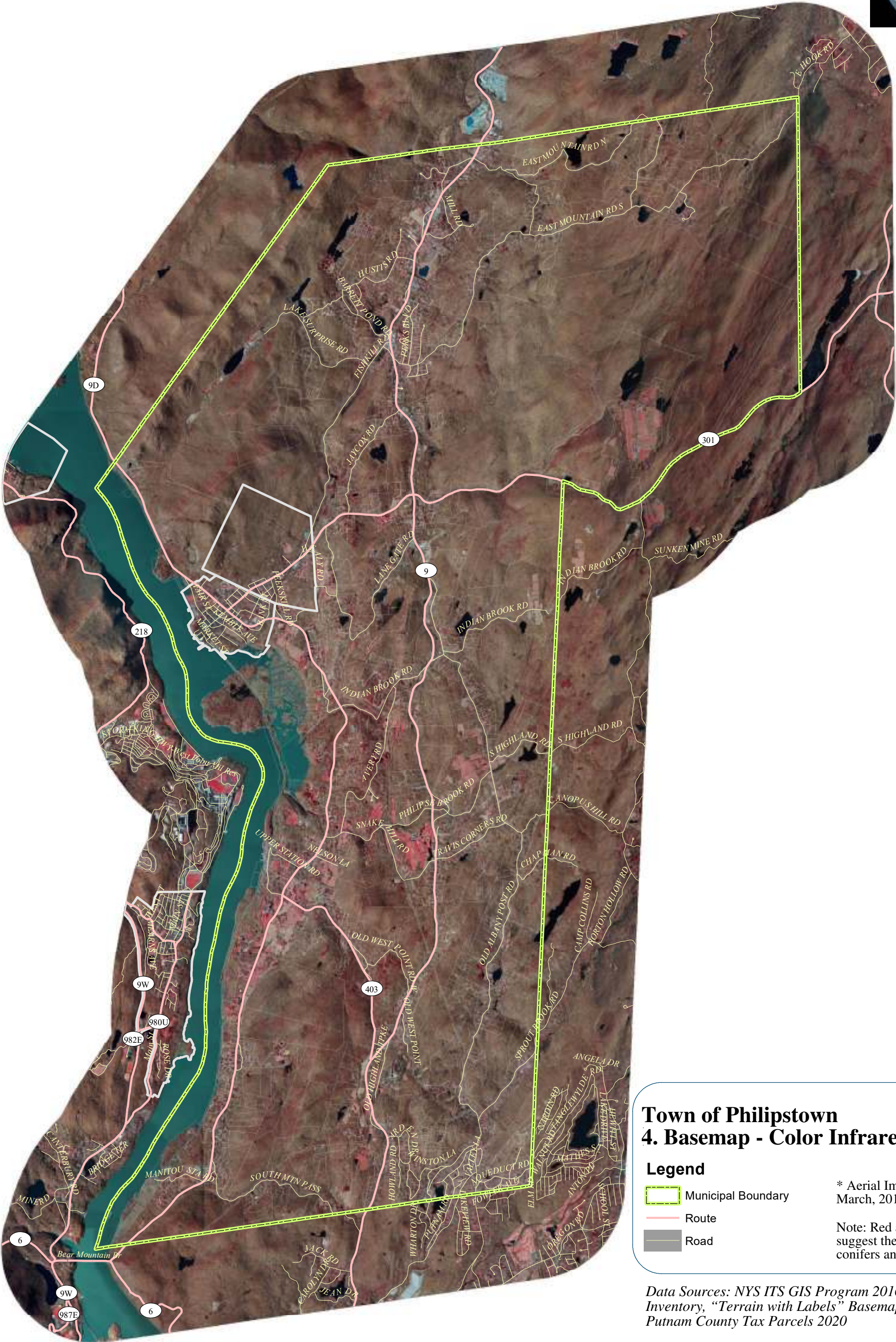


1 in = 1 miles



Town of Philipstown

Natural Resource Inventory



Town of Philipstown

4. Basemap - Color Infrared Aerial*

Legend

- Municipal Boundary
- Route
- Road

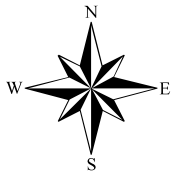
* Aerial Imagery taken in March, 2016.

Note: Red and pink suggest the presence of conifers and grassy areas.

Data Sources: NYS ITS GIS Program 2016 Orthoimagery Inventory, "Terrain with Labels" Basemap - ESRI ArcGIS, Putnam County Tax Parcels 2020

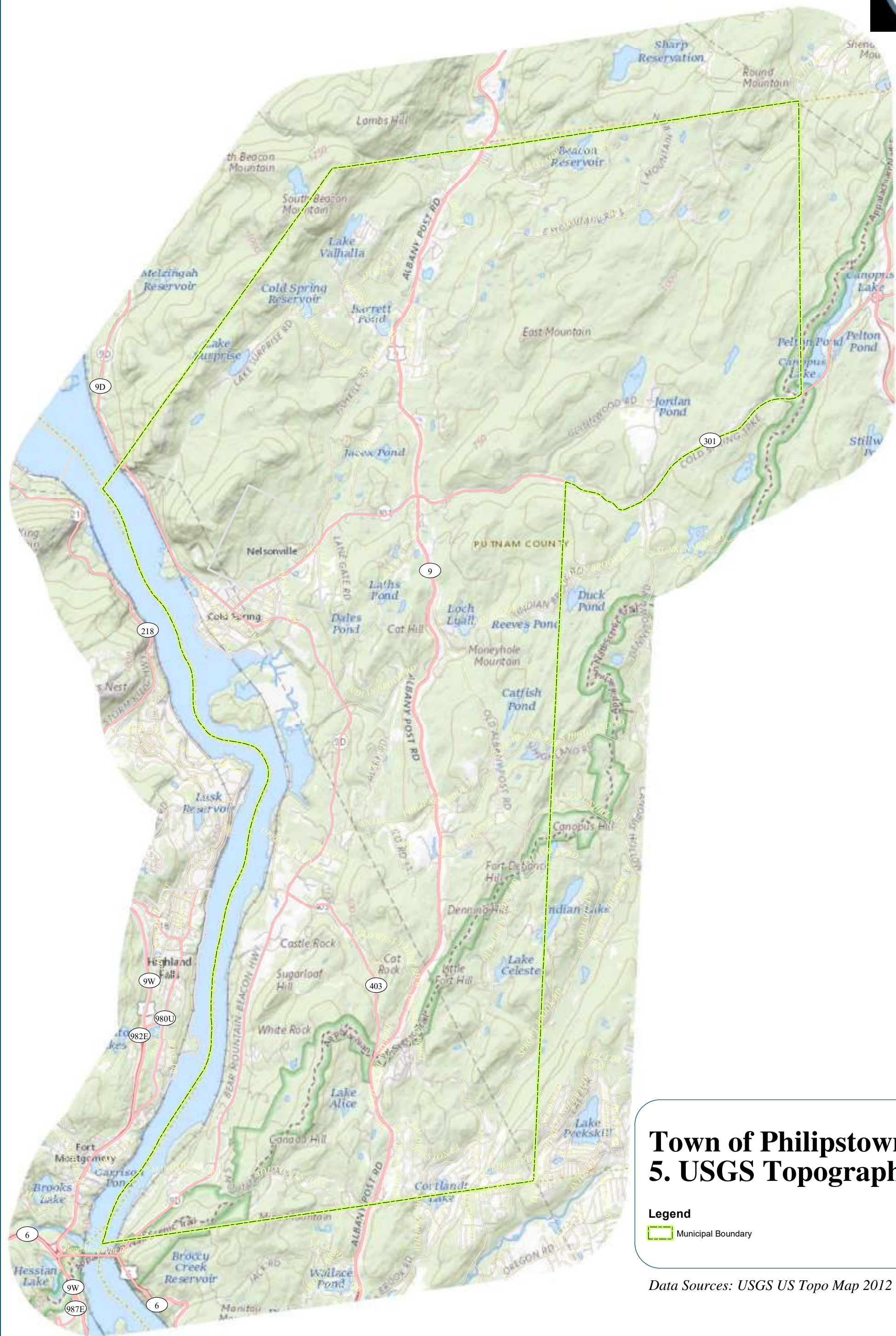
1 in = 1 miles

0 0.5 1 2 3 Miles



Town of Philipstown

Natural Resource Inventory



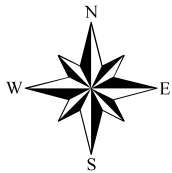
Town of Philipstown 5. USGS Topography

Legend
Municipal Boundary

Data Sources: USGS US Topo Map 2012

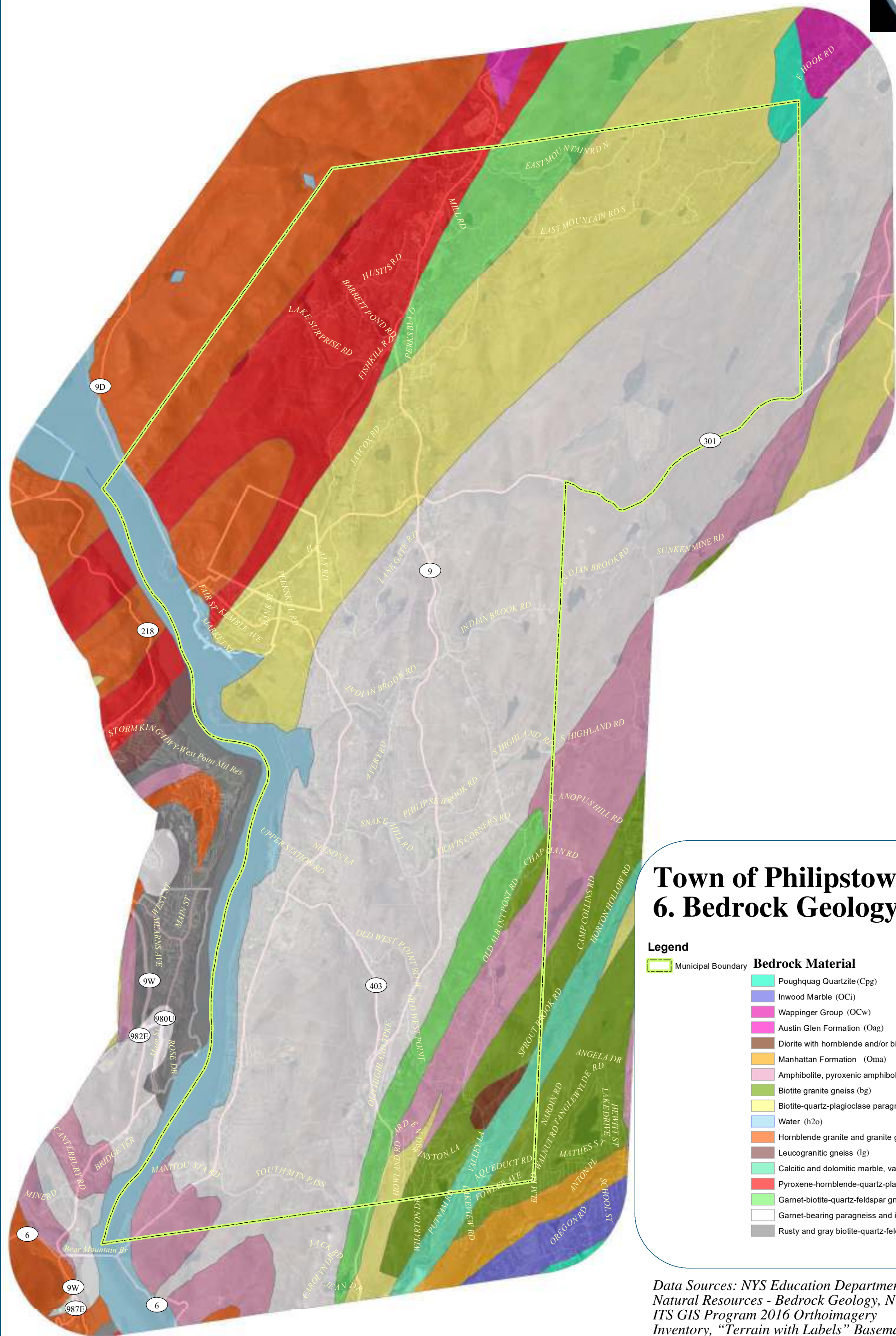
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Town of Philipstown

Natural Resource Inventory



Town of Philipstown 6. Bedrock Geology

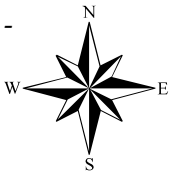
Legend

Municipal Boundary

Bedrock Material

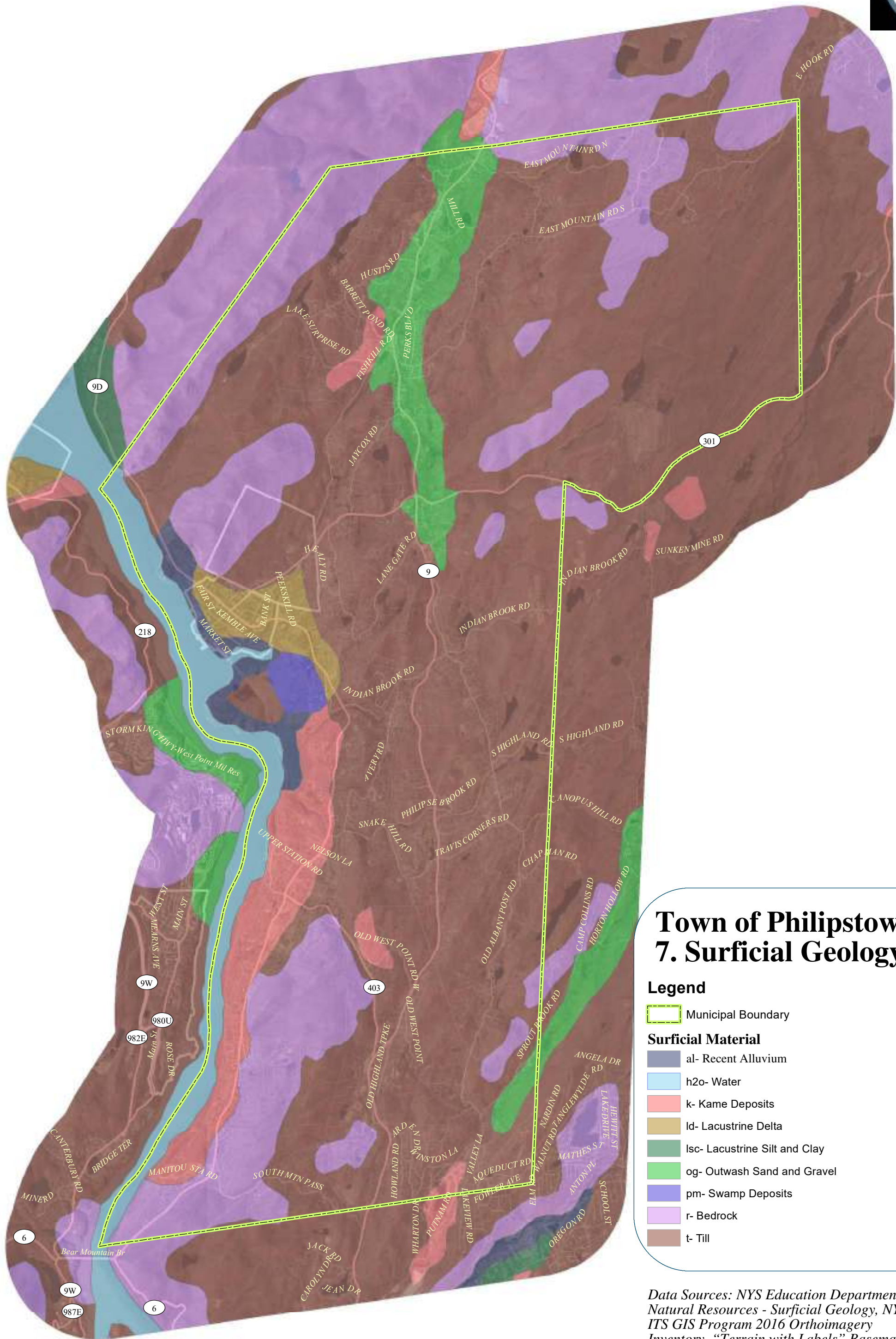
- Poughquag Quartzite (Cpg)
- Inwood Marble (OCi)
- Wappinger Group (OCw)
- Austin Glen Formation (Oag)
- Diorite with hornblende and/or biotite (Od)
- Manhattan Formation (Oma)
- Amphibolite, pyroxenic amphibolite (am)
- Biotite granite gneiss (bg)
- Biotite-quartz-plagioclase paragneiss (bqpc)
- Water (h2o)
- Hornblende granite and granite gneiss (hg)
- Leucogranitic gneiss (lg)
- Calcitic and dolomitic marble, variably siliceous (mb)
- Pyroxene-hornblende-quartz-plagioclase gneiss (qpg)
- Garnet-biotite-quartz-feldspar gneiss (qtcs)
- Garnet-bearing paragneiss and interlayered quartzite (qtlg)
- Rusty and gray biotite-quartz-feldspar paragneiss (rg)

Data Sources: NYS Education Department - Natural Resources - Bedrock Geology, NYS ITS GIS Program 2016 Orthoimagery Inventory, "Terrain with Labels" Basemap - ESRI ArcGIS, Putnam County Tax Parcels 2020



Town of Philipstown

Natural Resource Inventory



Town of Philipstown 7. Surficial Geology

Legend

Municipal Boundary

Surficial Material

- al- Recent Alluvium
- h2o- Water
- k- Kame Deposits
- ld- Lacustrine Delta
- lsc- Lacustrine Silt and Clay
- og- Outwash Sand and Gravel
- pm- Swamp Deposits
- r- Bedrock
- t- Till

Data Sources: NYS Education Department -
Natural Resources - Surficial Geology, NYS
ITS GIS Program 2016 Orthoimagery
Inventory, "Terrain with Labels" Basemap -
ESRI ArcGIS, Putnam County Tax Parcels 2020

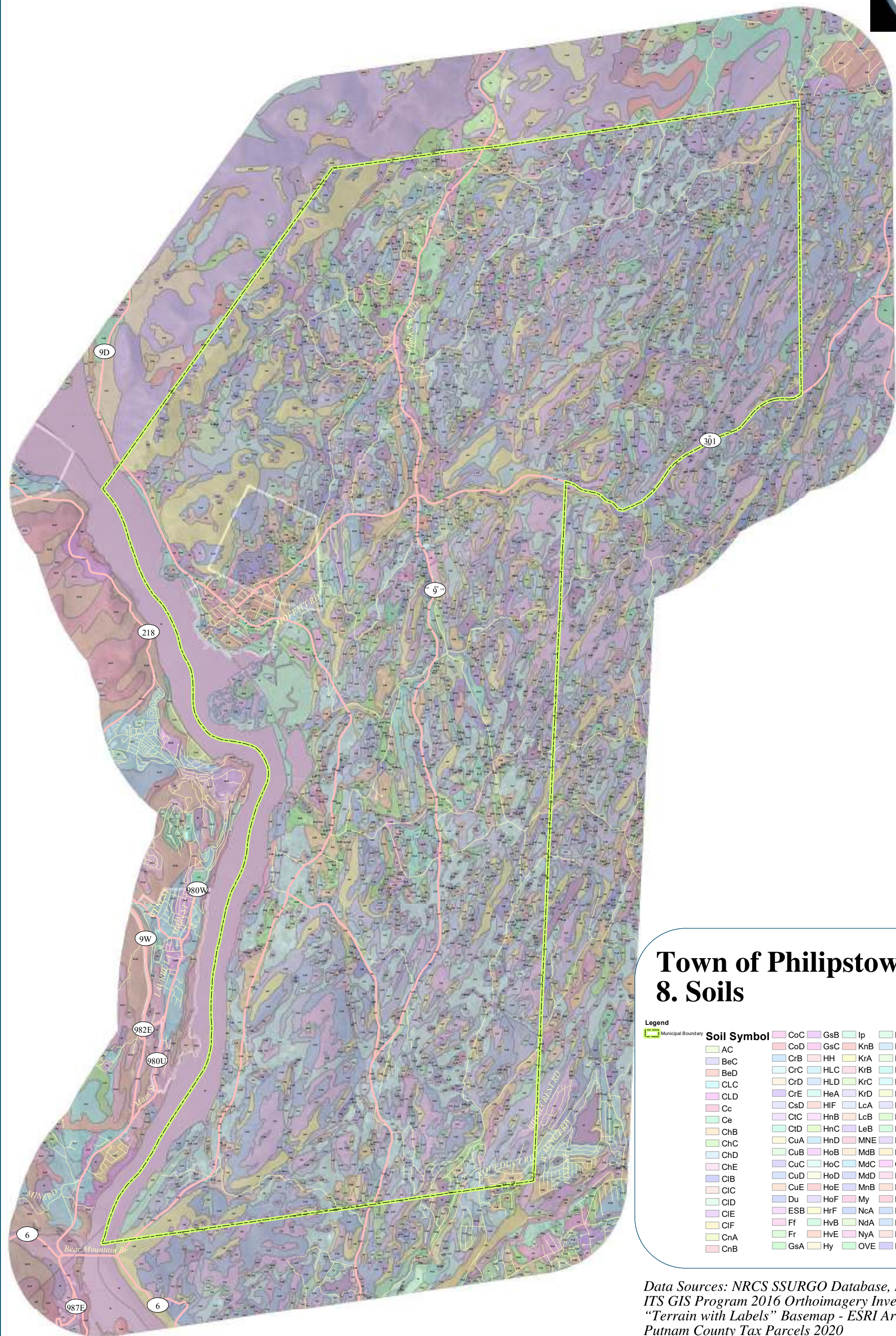


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Town of Philipstown

Natural Resource Inventory



Town of Philipstown

8. Soils

Legend

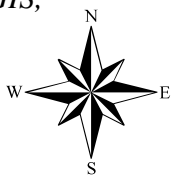


Soil Symbol

| | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|
| AC | CoC | GsB | Ip | Pg | RhA | Uc |
| BeC | CoD | GsC | KnB | PnB | RhB | Ud |
| BeD | CrB | HH | KrA | PnC | RhC | UdB |
| CLC | CrD | HLD | KrC | PnD | RhD | Uf |
| CLD | CrE | HeA | KrD | PoB | RhE | UhB |
| Cc | CsD | HIF | LcA | PoD | SXC | UhC |
| Ce | CIC | HnB | LcB | Ps | SXD | UIC |
| ChB | CID | HnC | LeB | Pt | SkC | UvB |
| ChC | CuA | HnD | MNE | Pv | SkD | UwB |
| ChD | CuB | HoB | MdB | Pw | Sm | Ux |
| ChE | CuC | HoC | MdC | Qu | SmB | W |
| CIB | CuD | HoD | MdD | ROC | SrB | Wd |
| CIC | CuE | HoE | MnB | ROD | Su | WdB |
| CID | Du | HoF | My | ROF | SuA | WdC |
| CIE | ESB | HrF | NcA | Ra | SuB | We |
| CIF | Ff | HvB | NdA | RdA | SwB | Wy |
| CnA | Fr | HvE | NyA | RdB | UH | |
| CnB | GsA | Hy | OVE | RgB | Ub | |

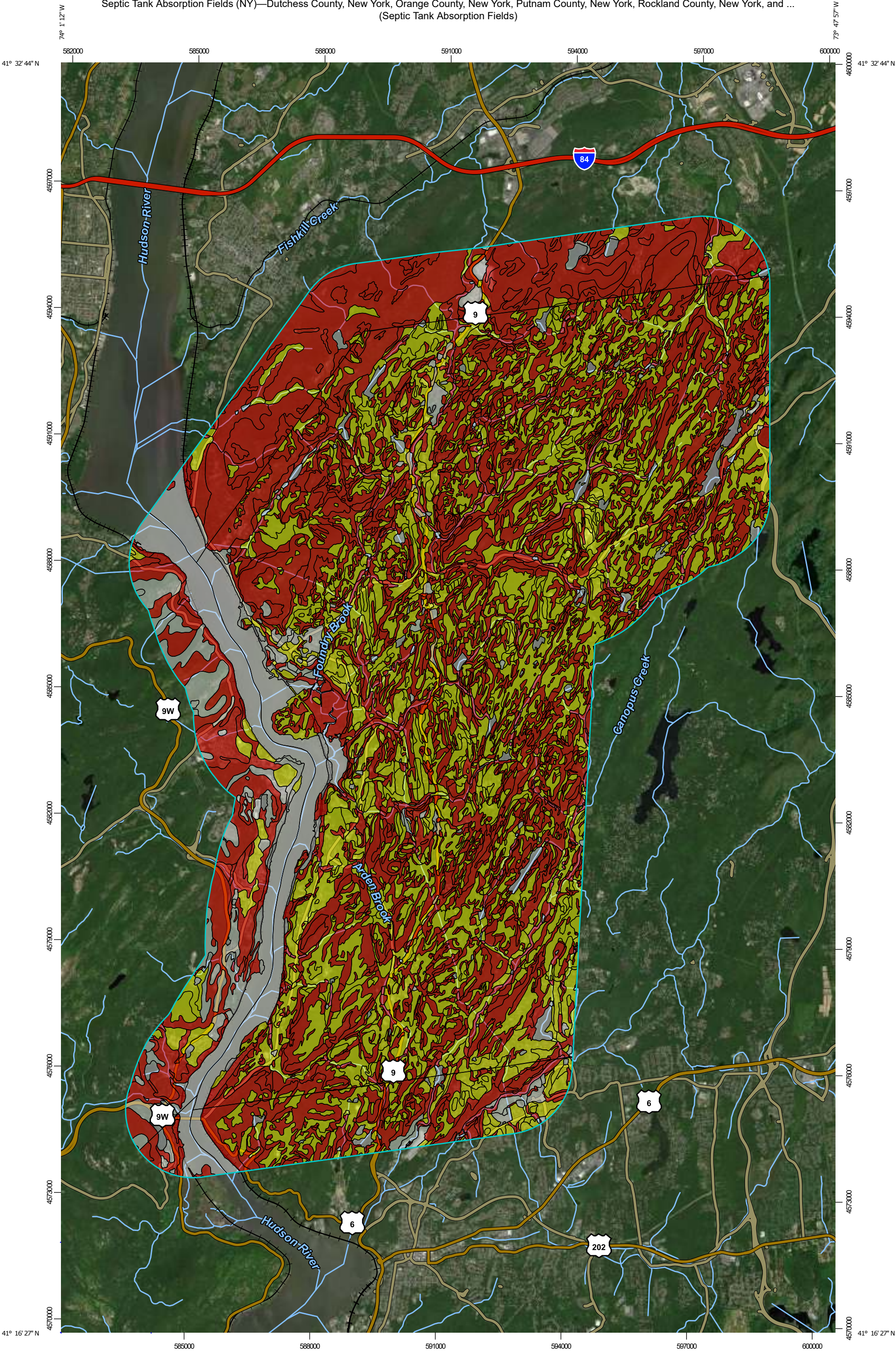
Data Sources: NRCS SSURGO Database, NYS ITS GIS Program 2016 Orthoimagery Inventory, "Terrain with Labels" Basemap - ESRI ArcGIS, Putnam County Tax Parcels 2020

1 in = 1 miles



9. Third Party Map - Septic Tank Absorption Fields (page 1 of 2)

Septic Tank Absorption Fields (NY)—Dutchess County, New York, Orange County, New York, Putnam County, New York, Rockland County, New York, and ...
(Septic Tank Absorption Fields)



Map Scale: 1:84,400 if printed on B portrait (11" x 17") sheet.

0 1000 2000 4000 6000 Meters

0 4000 8000 16000 24000 Feet


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

9. Third Party Map - Septic Tank Absorption Fields (page 2 of 2)


Septic Tank Absorption Fields (NY)—Dutchess County, New York, Orange County, New York, Putnam County, New York, Rockland County, New York, and Westchester County, New York (Septic Tank Absorption Fields)

MAP LEGEND

Area of Interest (AOI)





 Area of Interest (AOI)

Background





 Aerial Photography

Soils





Soil Rating Polygons

-  Very limited
-  Somewhat limited
-  Not limited
-  Not rated or not available


Soil Rating Lines

-  Very limited
-  Somewhat limited
-  Not limited
-  Not rated or not available






Soil Rating Points

-  Very limited
-  Somewhat limited
-  Not limited
-  Not rated or not available

Water Features

 Streams and Canals

Transportation

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

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at scales ranging from 1:12,000 to 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 Survey Area: Orange County, New York
Survey Area Data: Version 21, Jun 11, 2020

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

Soil Survey Area: Rockland County, New York
Survey Area Data: Version 18, Jun 11, 2020

Soil Survey Area: Westchester County, New York
Survey Area Data: Version 16, Jun 11, 2020

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

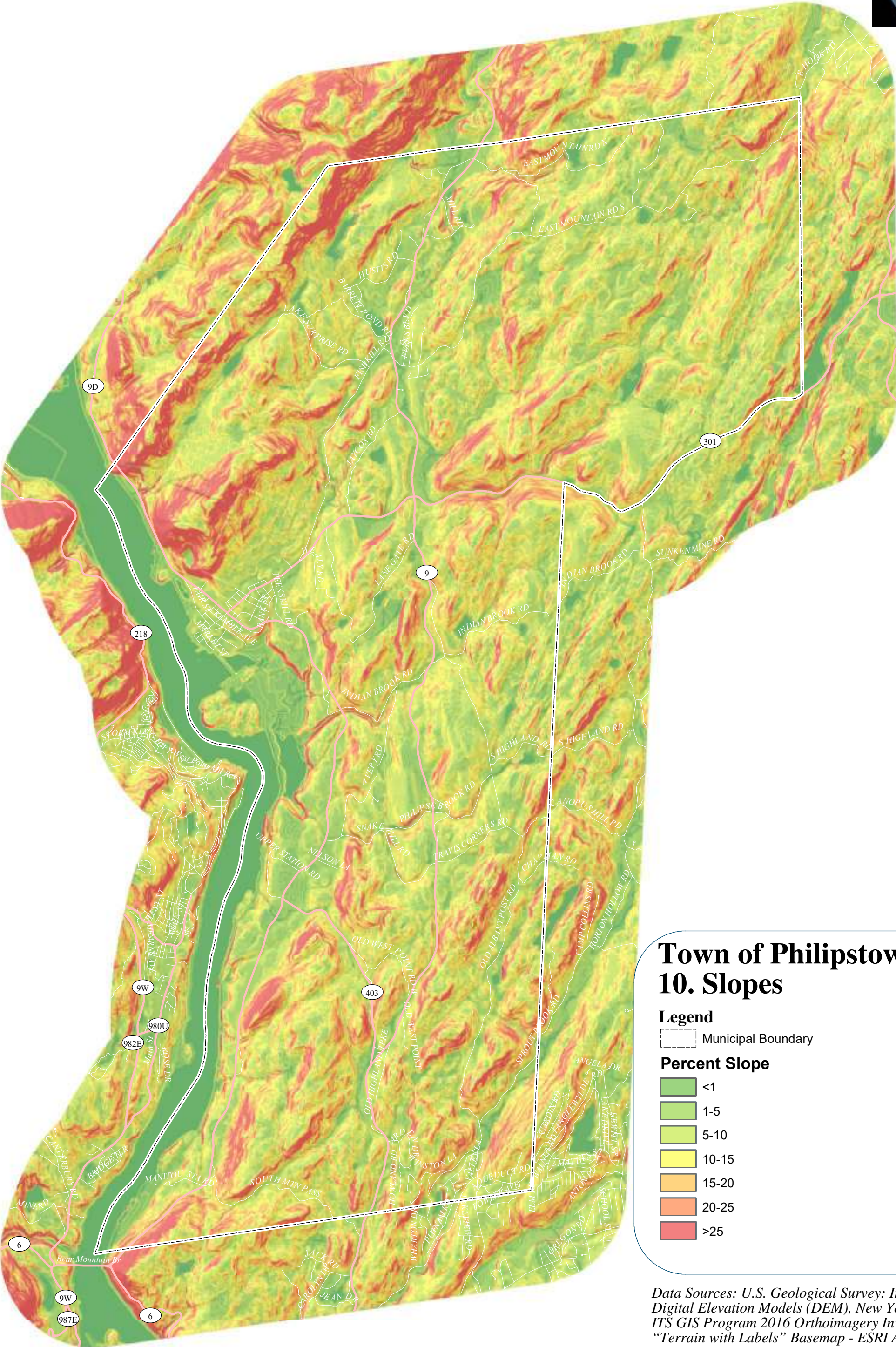
Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 31, 2009—Oct 17, 2017



Town of Philipstown

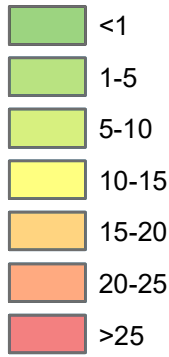
Natural Resource Inventory



Town of Philipstown 10. Slopes

Legend
Municipal Boundary

Percent Slope



Data Sources: U.S. Geological Survey: Index of Digital Elevation Models (DEM), New York, NYS ITS GIS Program 2016 Orthoimagery Inventory, "Terrain with Labels" Basemap - ESRI ArcGIS, Putnam County Tax Parcels 2020

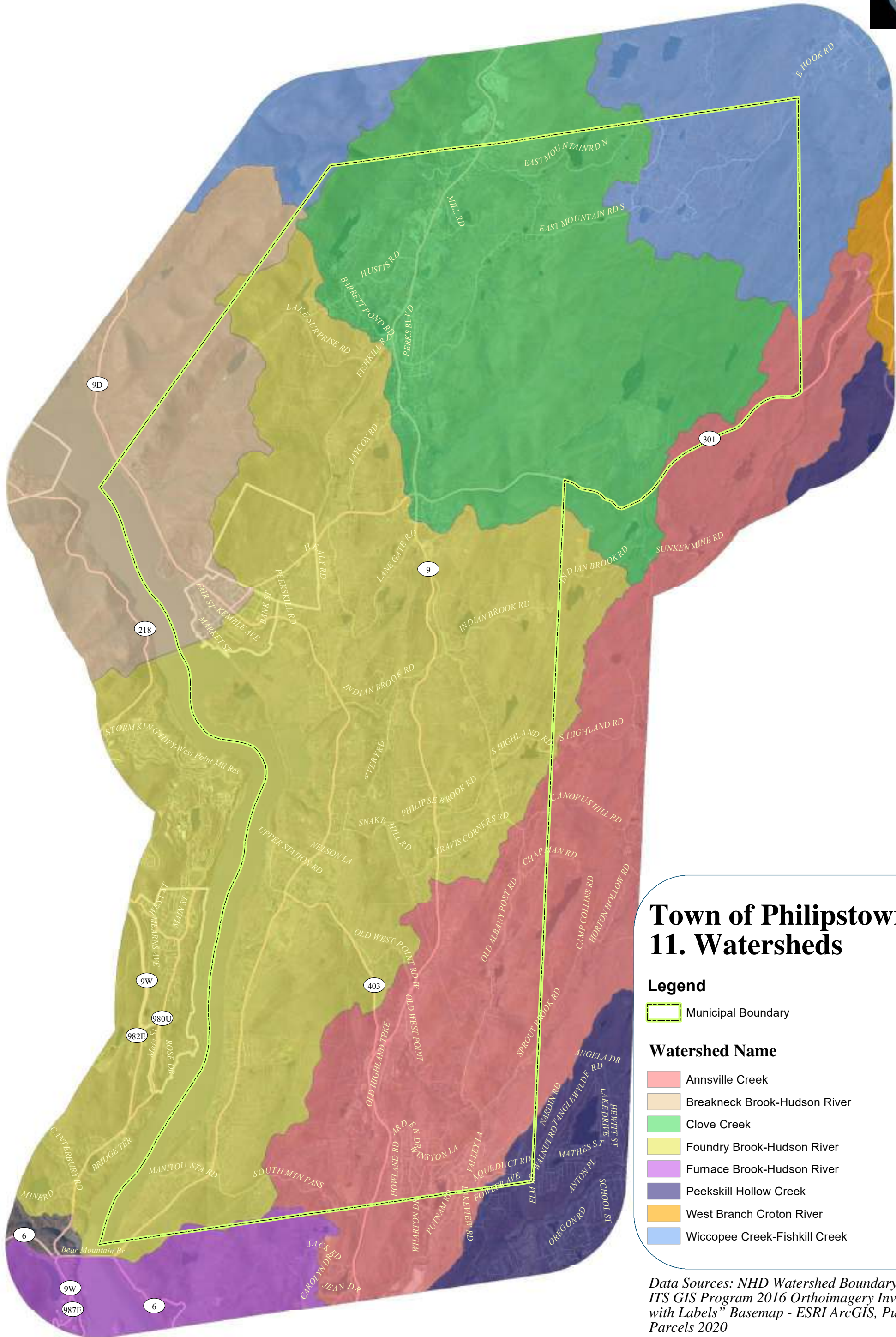


1 in = 1 miles



Town of Philipstown

Natural Resource Inventory



Town of Philipstown 11. Watersheds

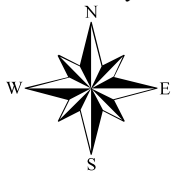
Legend

Municipal Boundary

Watershed Name

- Annsville Creek
- Breakneck Brook-Hudson River
- Clove Creek
- Foundry Brook-Hudson River
- Furnace Brook-Hudson River
- Peekskill Hollow Creek
- West Branch Croton River
- Wicopee Creek-Fishkill Creek

Data Sources: NHD Watershed Boundary Dataset, NYS ITS GIS Program 2016 Orthoimagery Inventory, "Terrain with Labels" Basemap - ESRI ArcGIS, Putnam County Tax Parcels 2020

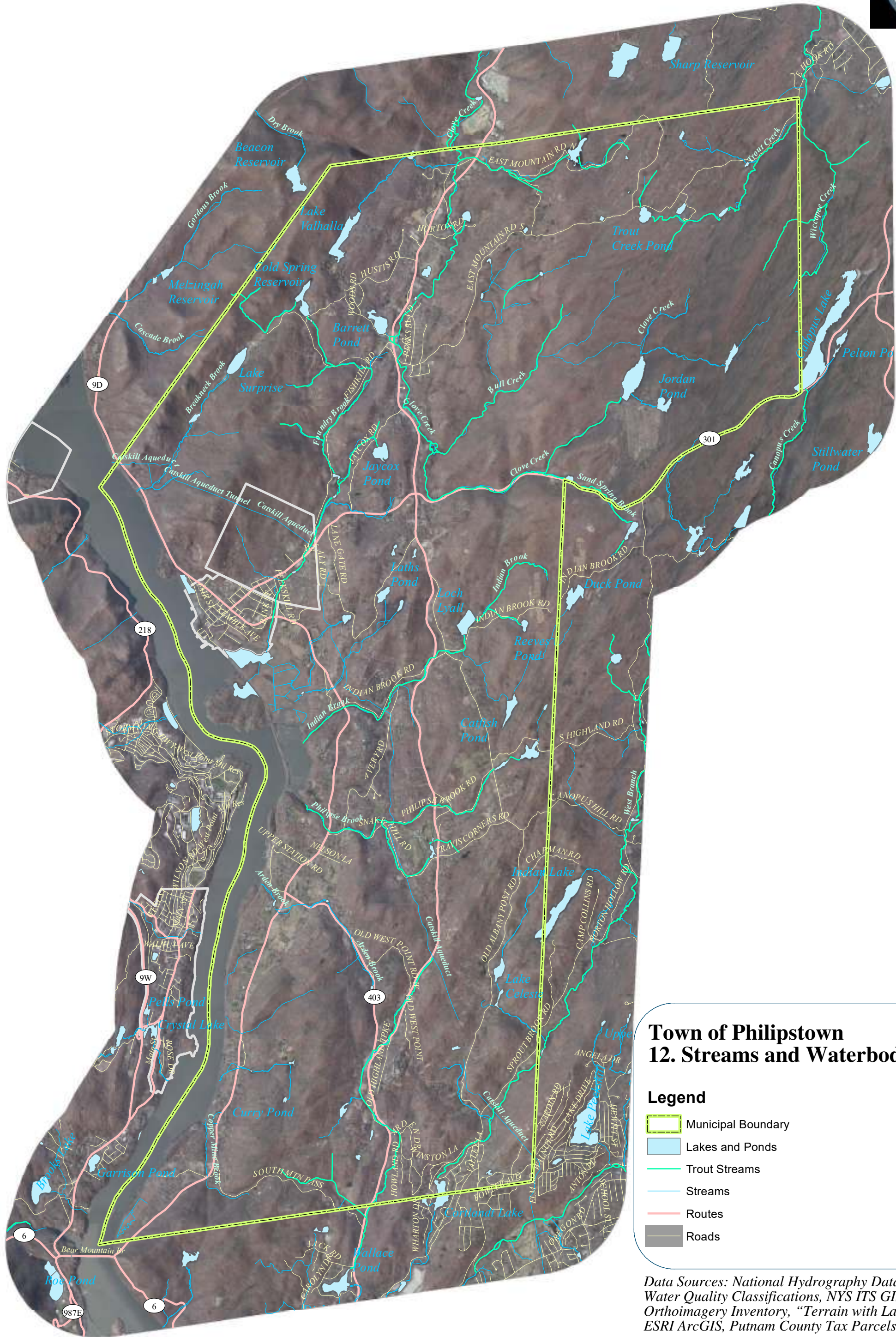


1 in = 1 miles

0 0.5 1 2 3 Miles

Town of Philipstown

Natural Resource Inventory



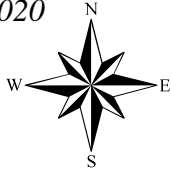
Town of Philipstown 12. Streams and Waterbodies

- Legend**
- Municipal Boundary
 - Lakes and Ponds
 - Trout Streams
 - Streams
 - Routes
 - Roads

Data Sources: National Hydrography Dataset, NYS DEC Water Quality Classifications, NYS ITS GIS Program 2016 Orthoimagery Inventory, "Terrain with Labels" Basemap - ESRI ArcGIS, Putnam County Tax Parcels 2020

1 in = 1 miles

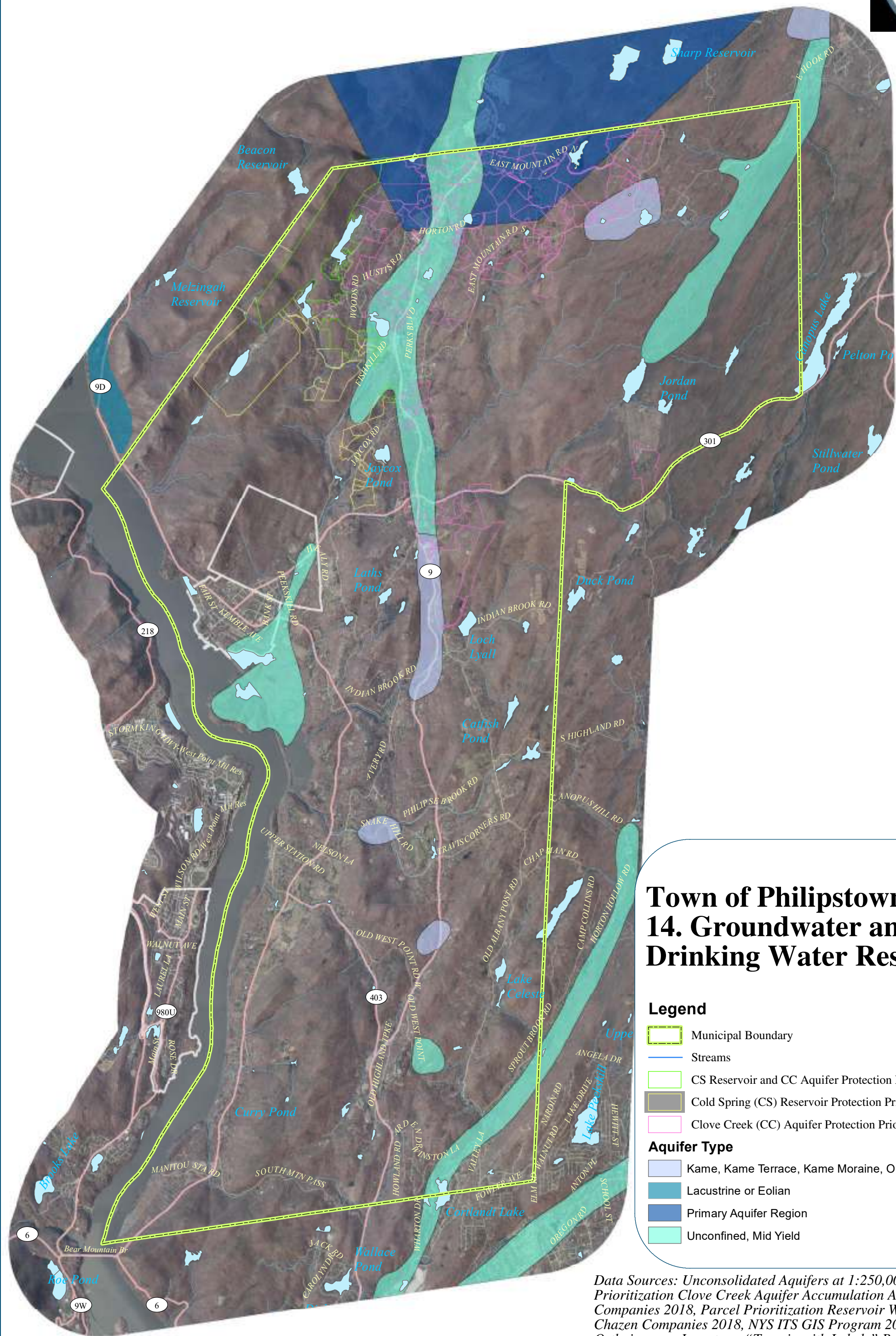
0 0.5 1 2 3 Miles





Town of Philipstown

Natural Resource Inventory



Town of Philipstown 14. Groundwater and Drinking Water Resources

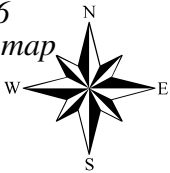
Legend

- Municipal Boundary
- Streams
- CS Reservoir and CC Aquifer Protection Priority Parcels
- Cold Spring (CS) Reservoir Protection Priority Parcels
- Clove Creek (CC) Aquifer Protection Priority Parcels

Aquifer Type

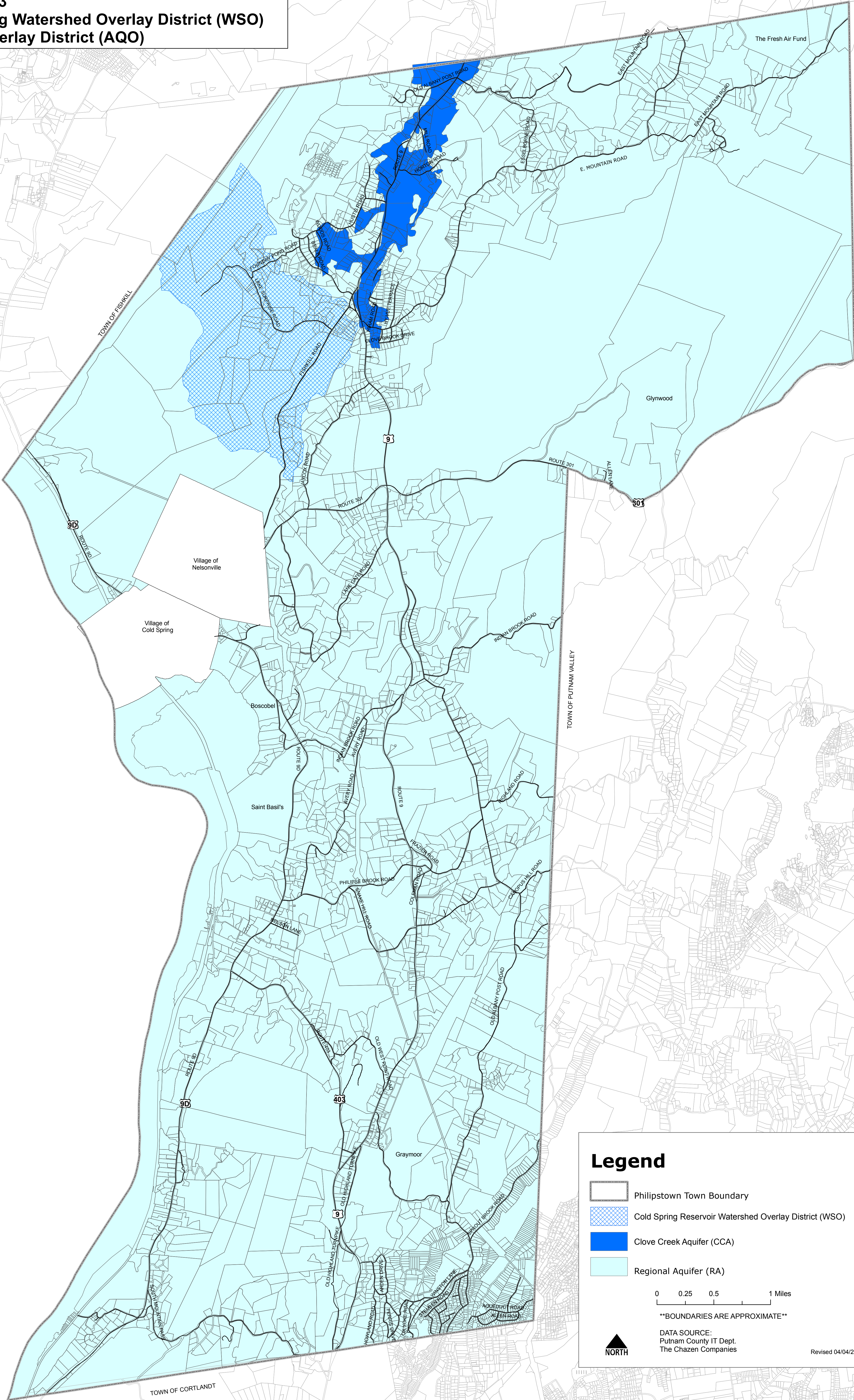
- Kame, Kame Terrace, Kame Moraine, Outwash, Alluvium
- Lacustrine or Eolian
- Primary Aquifer Region
- Unconfined, Mid Yield

Data Sources: Unconsolidated Aquifers at 1:250,000, Parcel Prioritization Clove Creek Aquifer Accumulation Area - The Chazen Companies 2018, Parcel Prioritization Reservoir Watersheds - The Chazen Companies 2018, NYS ITS GIS Program 2016 Orthoimagery Inventory, "Terrain with Labels" Basemap - ESRI ArcGIS, Putnam County Tax Parcels 2020



15. Third Party Map - Cold Spring Watershed and Aquifer Overlay Districts

Town of Philipstown
Resource Protection Overlay District Zoning Map
Sheet 3 of 3
Cold Spring Watershed Overlay District (WSO)
Aquifer Overlay District (AQO)



Legend

- Philipstown Town Boundary
- Cold Spring Reservoir Watershed Overlay District (WSO)
- Clove Creek Aquifer (CCA)
- Regional Aquifer (RA)

0

0.25

0.5

1 Miles

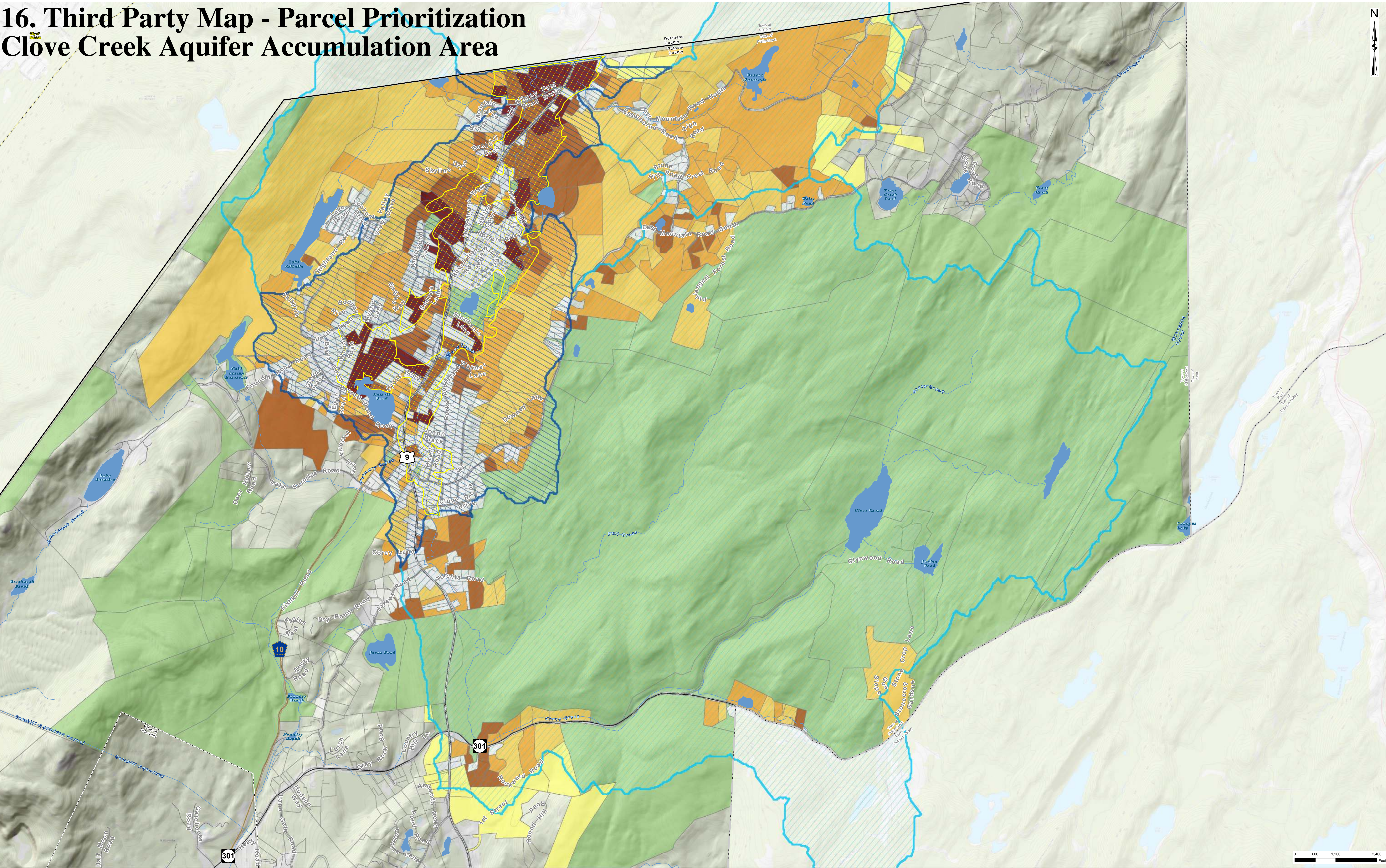
****BOUNDARIES ARE APPROXIMATE****

NORTH

DATA SOURCE:
Putnam County IT Dept.
The Chazen Companies

Revised 04/04/2011

16. Third Party Map - Parcel Prioritization Clove Creek Aquifer Accumulation Area



THE
Chazen
COMPANIES
Proud to be Employee Owned
Engineers
Land Surveyors
Planners
Environmental & Safety Professionals
Landscape Architects

CHAZEN ENGINEERING, LAND SURVEYING & LANDSCAPE ARCHITECTURE CO., D.P.C.

Office Locations:

Dutchess County Office:
21 Fox Street
Poughkeepsie, NY. 12601
Phone: (845) 454-3980

Capital District Office:
547 River Street
Troy, NY. 12180
Phone: (518) 273-0055

North Country Office:
375 Bay Road
Queensbury, NY. 12804
Phone: (518) 812-0513

This map is a product of The Chazen Companies. It should be used for reference purposes only. Reasonable efforts have been made to ensure the accuracy of this map. The Chazen Companies expressly disclaims any responsibilities or liabilities from the use of this map for any purpose other than its intended use.

- Clover Creek Aquifer
- Protected Land
- Tax Parcels
- Direct Flow
- Stream Input

Clove Creek Aquifer Accumulation Area

Prioritization based on score per acre

- Highest Priority
- High Priority
- Moderate Priority
- Lower Priority
- Lowest Priority

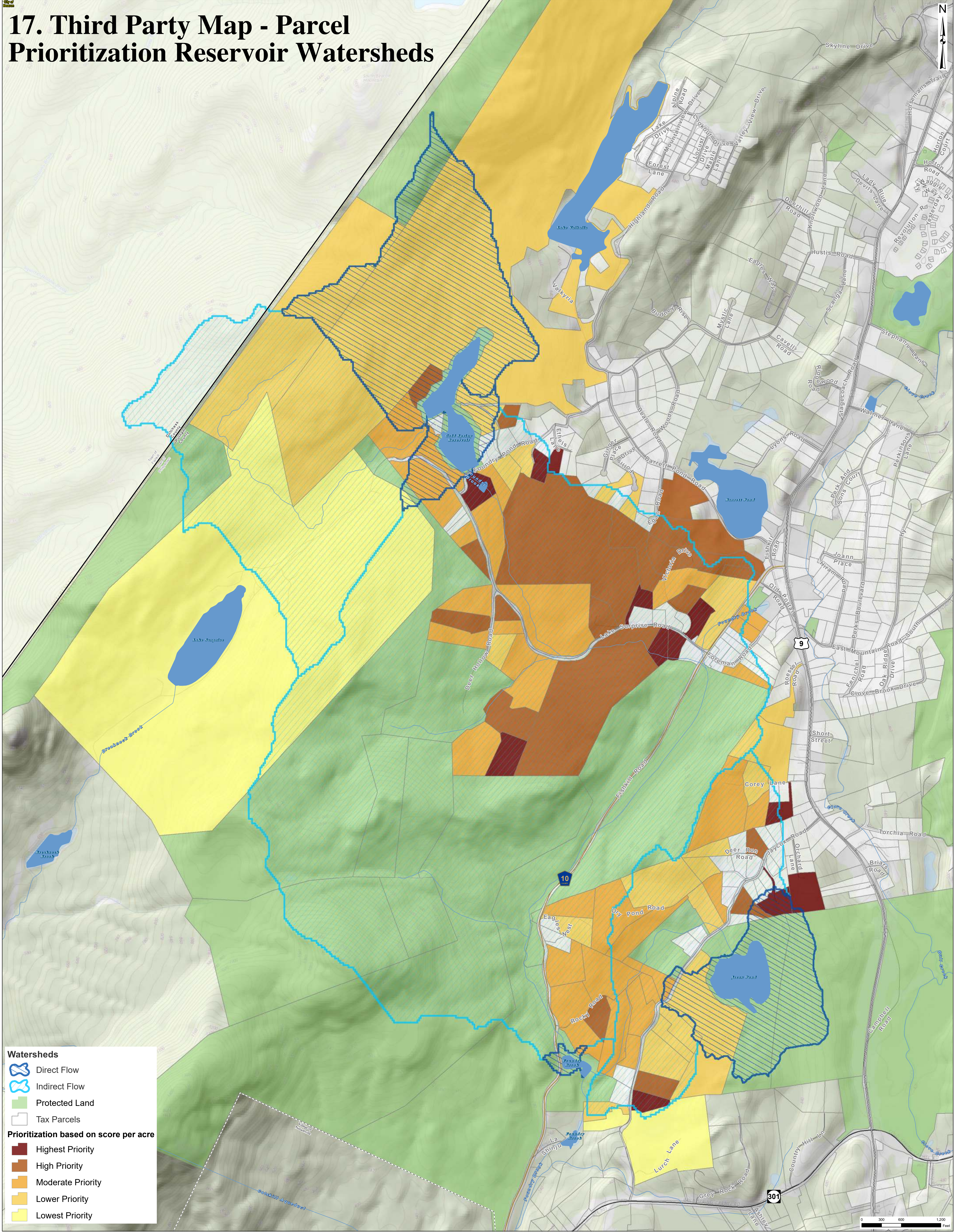
Philipstown Groundwater Resource Management

**Parcel Prioritization
Clove Creek Aquifer Accumulation Area**

Town of Philipstown - Putnam County, New York

| | |
|-------------|---------------------|
| Created by: | RL-B |
| Date: | 07/18/2018 |
| Scale: | 1 inch = 1,000 feet |
| Project: | 41824.00 |
| Figure: | X |

17. Third Party Map - Parcel Prioritization Reservoir Watersheds



Office Locations:

Dutchess County Office:
21 Fox Street
Poughkeepsie, NY, 12601
Phone: (845) 454-3980

Capital District Office:
547 River Street
Troy, NY, 12180
Phone: (518) 273-0055

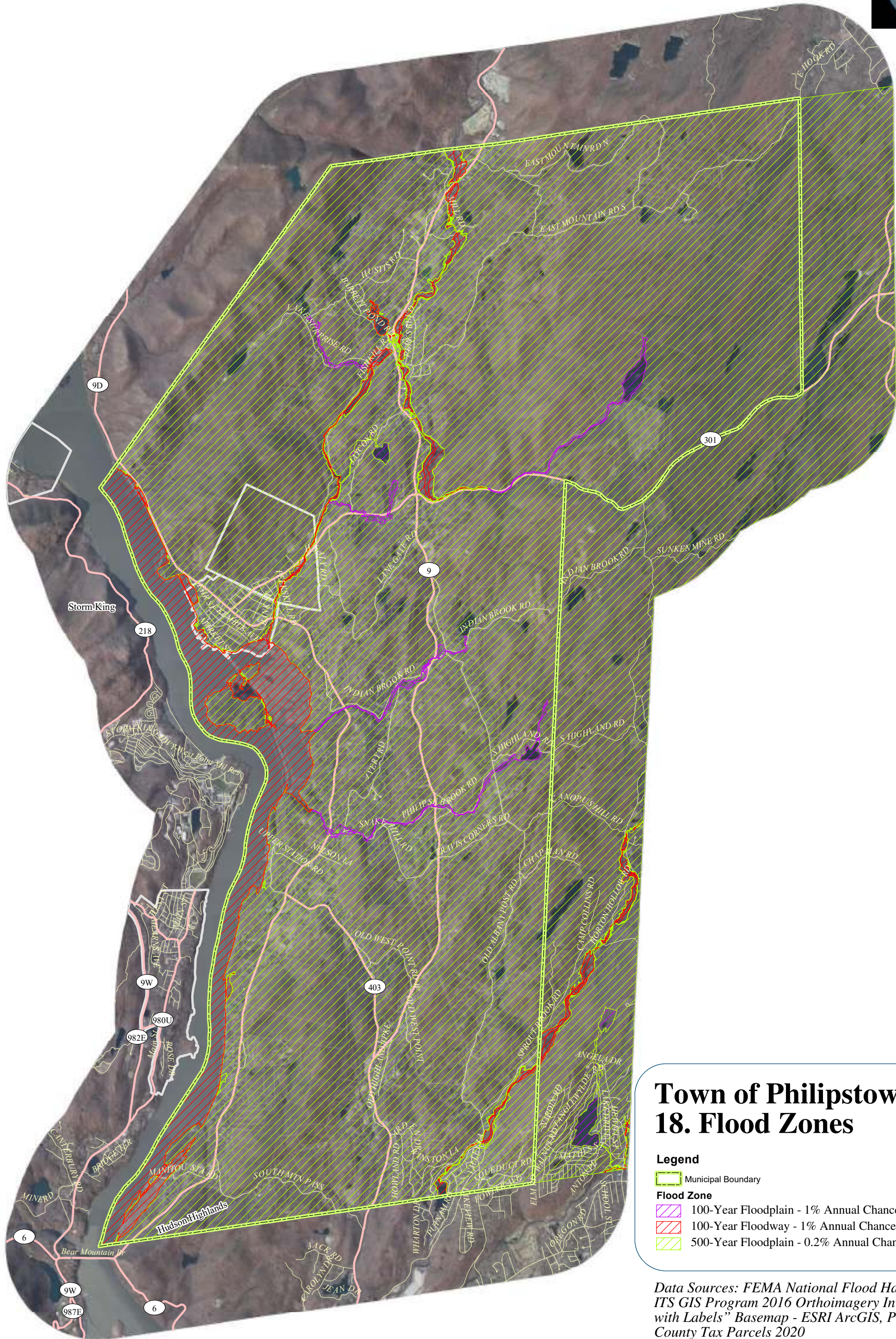
North Country Office:
375 Bay Road
Queensbury, NY, 12804
Phone: (518) 812-0513

This map is a product of The Chazen Companies. It should be used for reference purposes only. Reasonable efforts have been made to ensure the accuracy of this map. The Chazen Companies expressly disclaims any responsibilities or liabilities from the use of this map for any purpose other than its intended use.

Parcel Prioritization Reservoir Watersheds

Town of Philipstown

Natural Resource Inventory



Town of Philipstown 18. Flood Zones

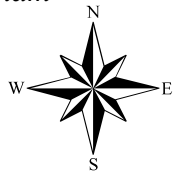
Legend

Municipal Boundary

Flood Zone

- 100-Year Floodplain - 1% Annual Chance of Flooding
- 100-Year Floodway - 1% Annual Chance of Flooding
- 500-Year Floodplain - 0.2% Annual Chance of Flooding

Data Sources: FEMA National Flood Hazard Layer, NYS ITS GIS Program 2016 Orthoimagery Inventory, "Terrain with Labels" Basemap - ESRI ArcGIS, Putnam County Tax Parcels 2020

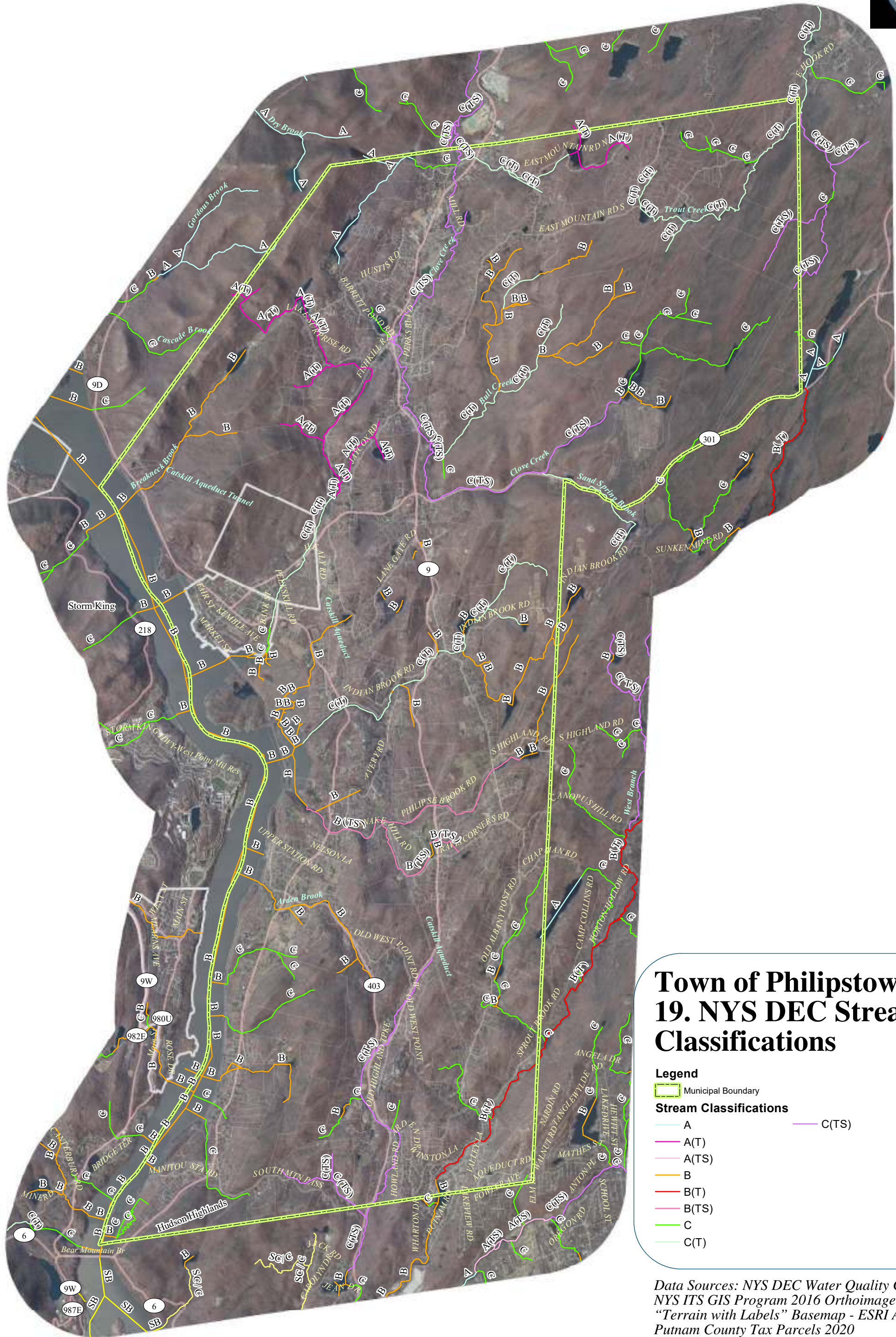


1 in = 1 miles

0 0.5 1 2 3 Miles

Town of Philipstown

Natural Resource Inventory



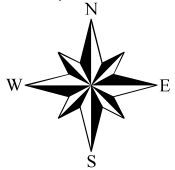
Town of Philipstown 19. NYS DEC Stream Classifications

- Legend**
- Municipal Boundary
 - Stream Classifications**
 - A
 - A(T)
 - A(TS)
 - B
 - B(T)
 - B(TS)
 - C
 - C(T)
 - C(TS)

Data Sources: NYS DEC Water Quality Classifications, NYS ITS GIS Program 2016 Orthoimagery Inventory, "Terrain with Labels" Basemap - ESRI ArcGIS, Putnam County Tax Parcels 2020

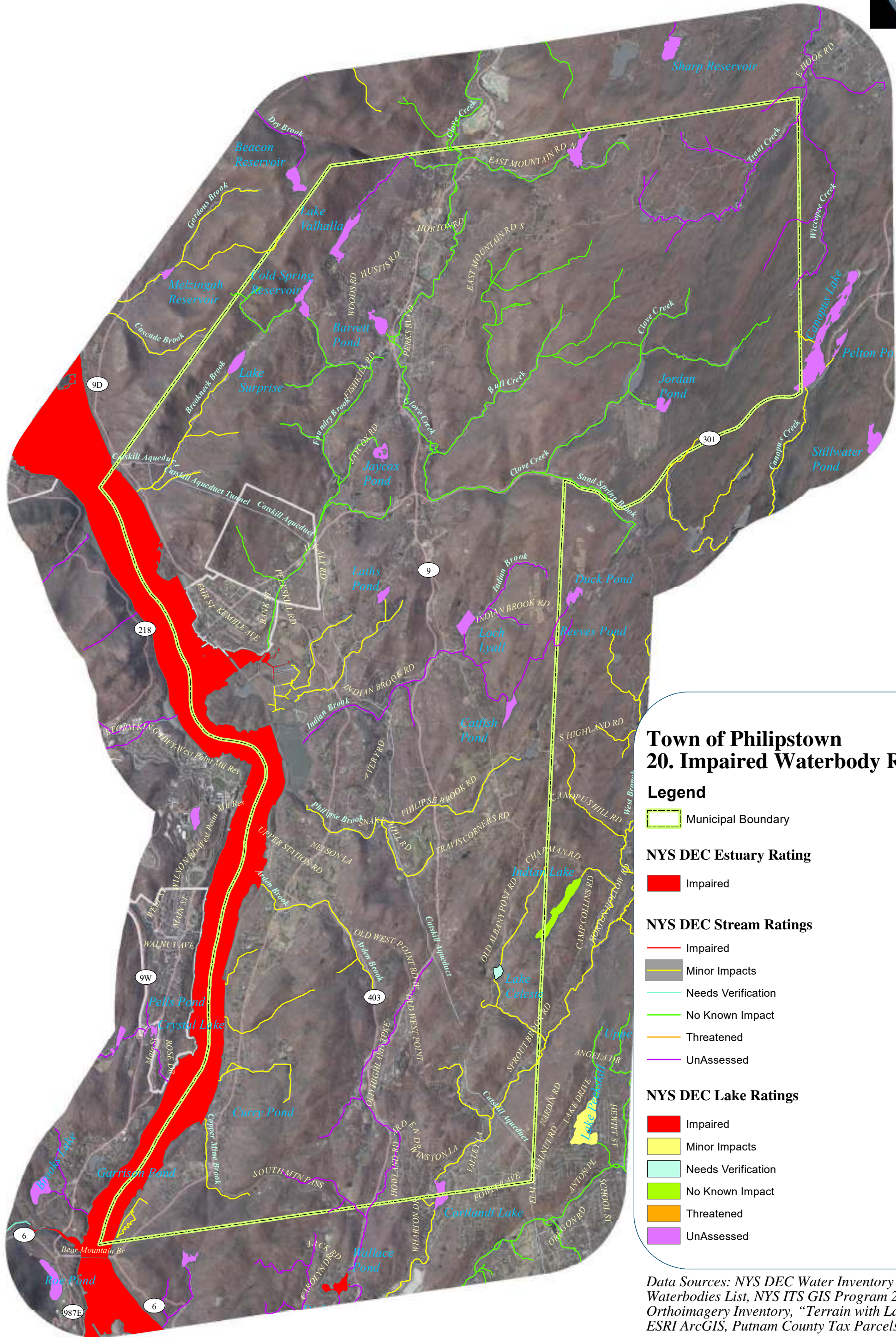
1 in = 1 miles

0 0.5 1 2 3 Miles



Town of Philipstown

Natural Resource Inventory



Town of Philipstown 20. Impaired Waterbody Ratings

Legend

Municipal Boundary

NYS DEC Estuary Rating

Impaired

NYS DEC Stream Ratings

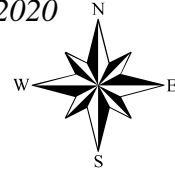
- Impaired
- Minor Impacts
- Needs Verification
- No Known Impact
- Threatened
- UnAssessed

NYS DEC Lake Ratings

- Impaired
- Minor Impacts
- Needs Verification
- No Known Impact
- Threatened
- UnAssessed

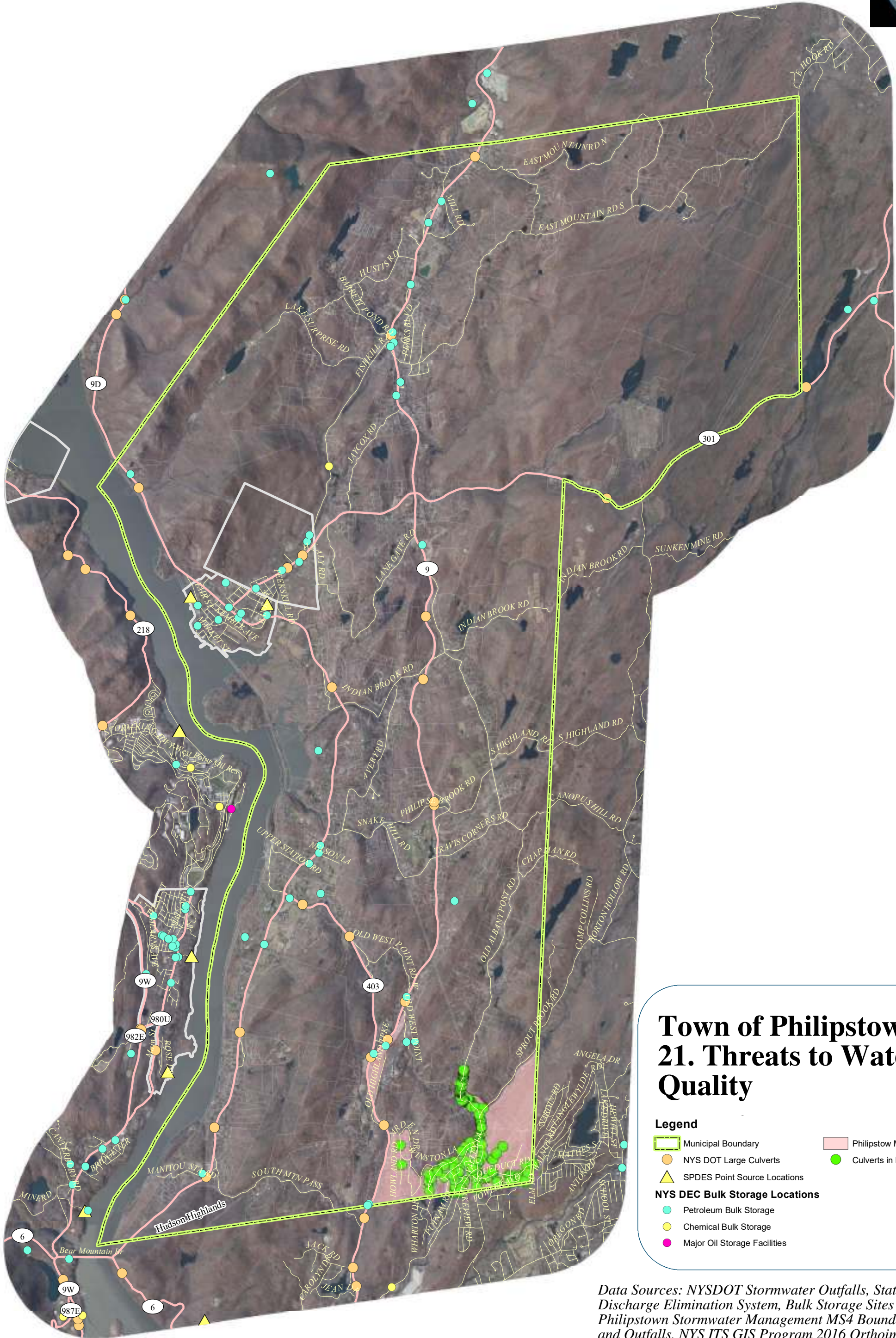
Data Sources: NYS DEC Water Inventory / Priority Waterbodies List, NYS ITS GIS Program 2016
Orthoimagery Inventory, "Terrain with Labels" Basemap - ESRI ArcGIS, Putnam County Tax Parcels 2020

1 in = 1 miles



Town of Philipstown

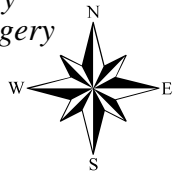
Natural Resource Inventory



Town of Philipstown 21. Threats to Water Quality

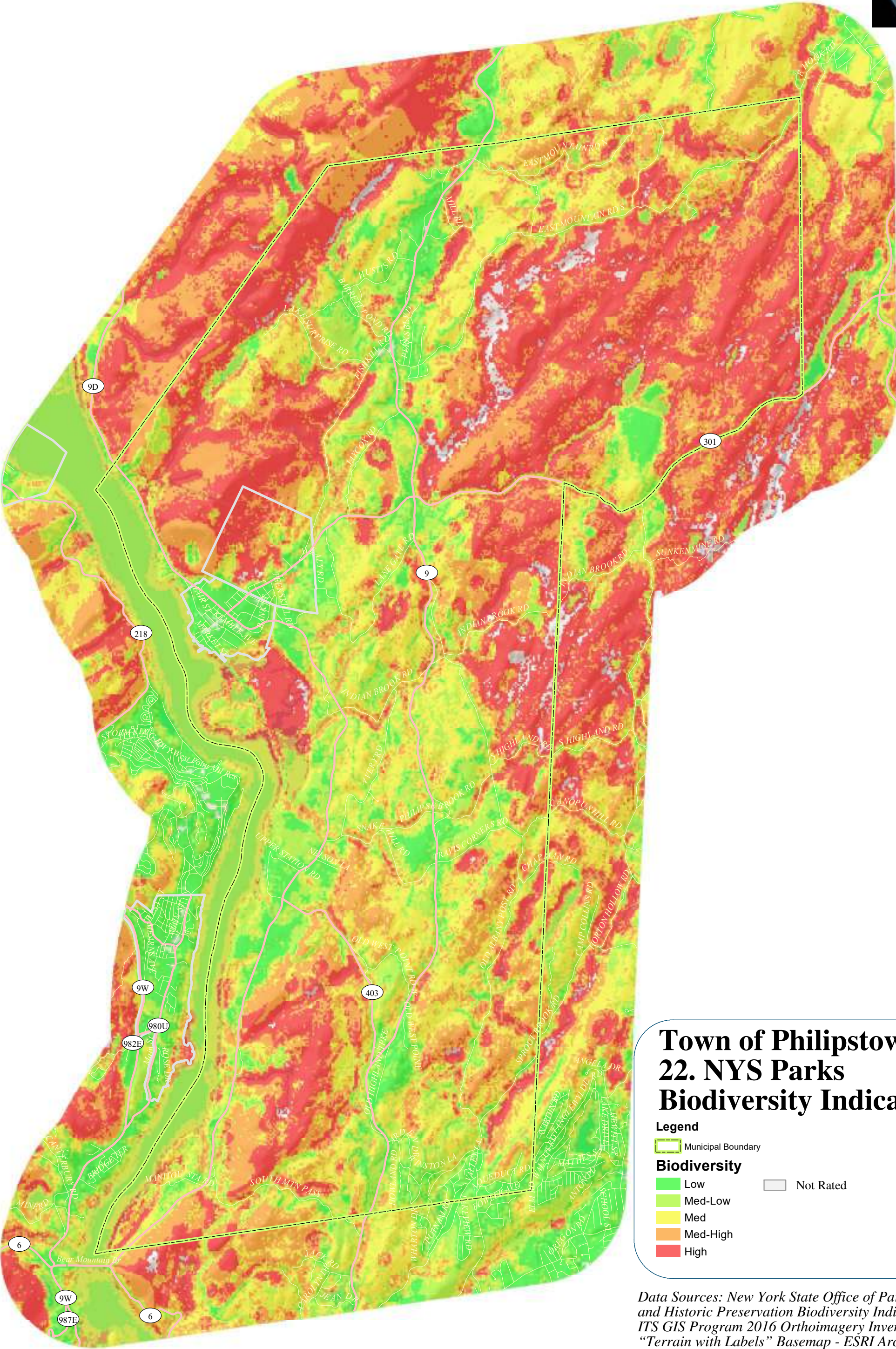
- Legend**
- Municipal Boundary
 - Philipstown MS4 Boundary
 - NYS DOT Large Culverts
 - Culverts in MS4
 - SPDES Point Source Locations
 - NYS DEC Bulk Storage Locations**
 - Petroleum Bulk Storage
 - Chemical Bulk Storage
 - Major Oil Storage Facilities

Data Sources: NYSDOT Stormwater Outfalls, State Pollutant Discharge Elimination System, Bulk Storage Sites in NYS, Philipstown Stormwater Management MS4 Boundary and Outfalls, NYS ITS GIS Program 2016 Orthoimagery Inventory, "Terrain with Labels" Basemap - ESRI ArcGIS, Putnam County Tax Parcels 2020



Town of Philipstown

Natural Resource Inventory



Town of Philipstown 22. NYS Parks Biodiversity Indicator

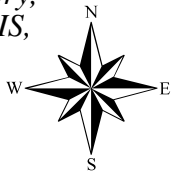
Legend

Municipal Boundary

Biodiversity

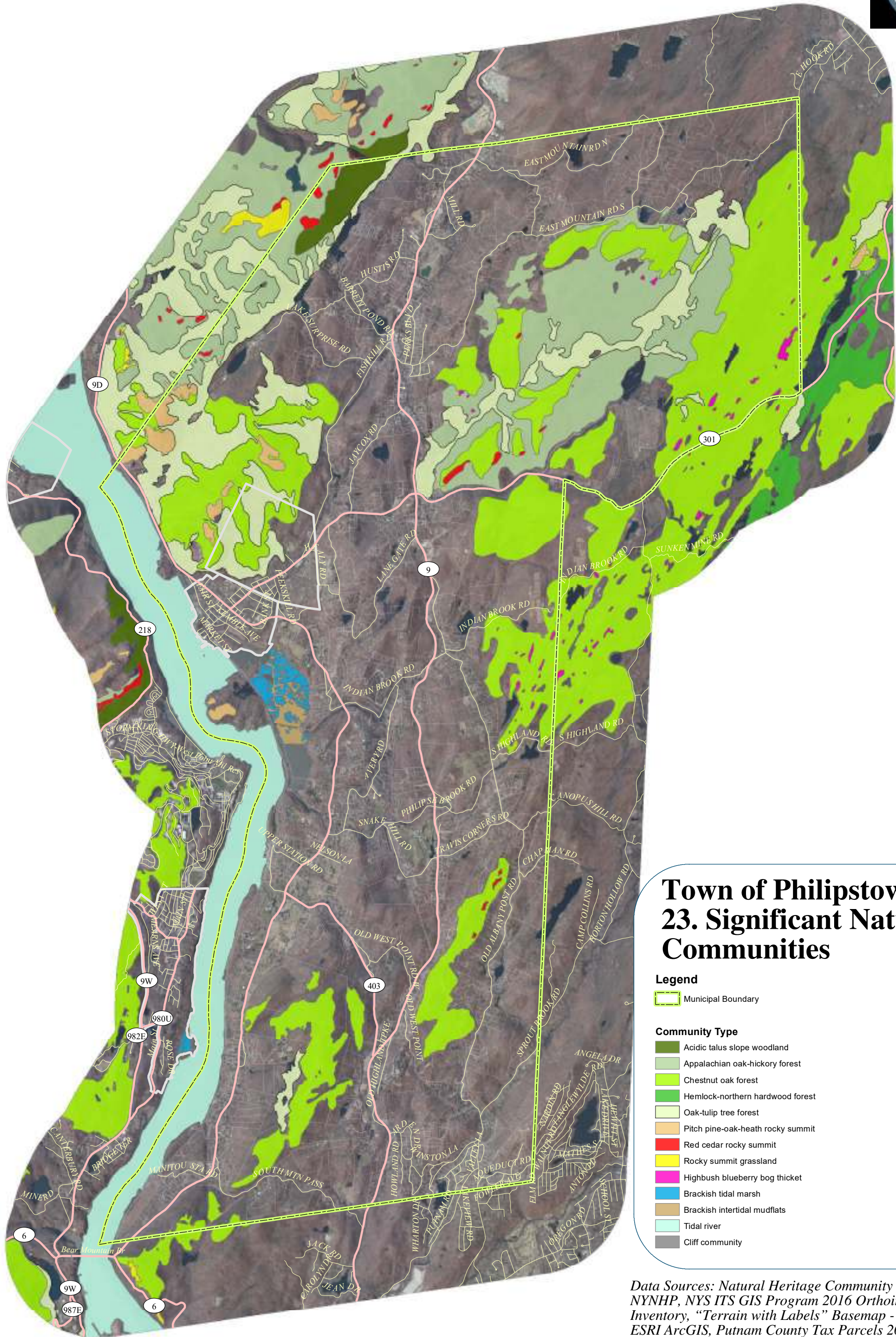
| | |
|----------|-----------|
| Low | Not Rated |
| Med-Low | |
| Med | |
| Med-High | |
| High | |

Data Sources: New York State Office of Parks, Recreation and Historic Preservation Biodiversity Indicator Tool, NYS ITS GIS Program 2016 Orthoimagery Inventory, "Terrain with Labels" Basemap - ESRI ArcGIS, Putnam County Tax Parcels 2020



Town of Philipstown

Natural Resource Inventory



Town of Philipstown 23. Significant Natural Communities

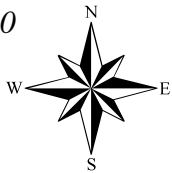
Legend

Municipal Boundary

Community Type

- Acidic talus slope woodland
- Appalachian oak-hickory forest
- Chestnut oak forest
- Hemlock-northern hardwood forest
- Oak-tulip tree forest
- Pitch pine-oak-heath rocky summit
- Red cedar rocky summit
- Rocky summit grassland
- Highbush blueberry bog thicket
- Brackish tidal marsh
- Brackish intertidal mudflats
- Tidal river
- Cliff community

Data Sources: Natural Heritage Community Occurrences -
NYNHP, NYS ITS GIS Program 2016 Orthoimagery
Inventory, "Terrain with Labels" Basemap -
ESRI ArcGIS, Putnam County Tax Parcels 2020

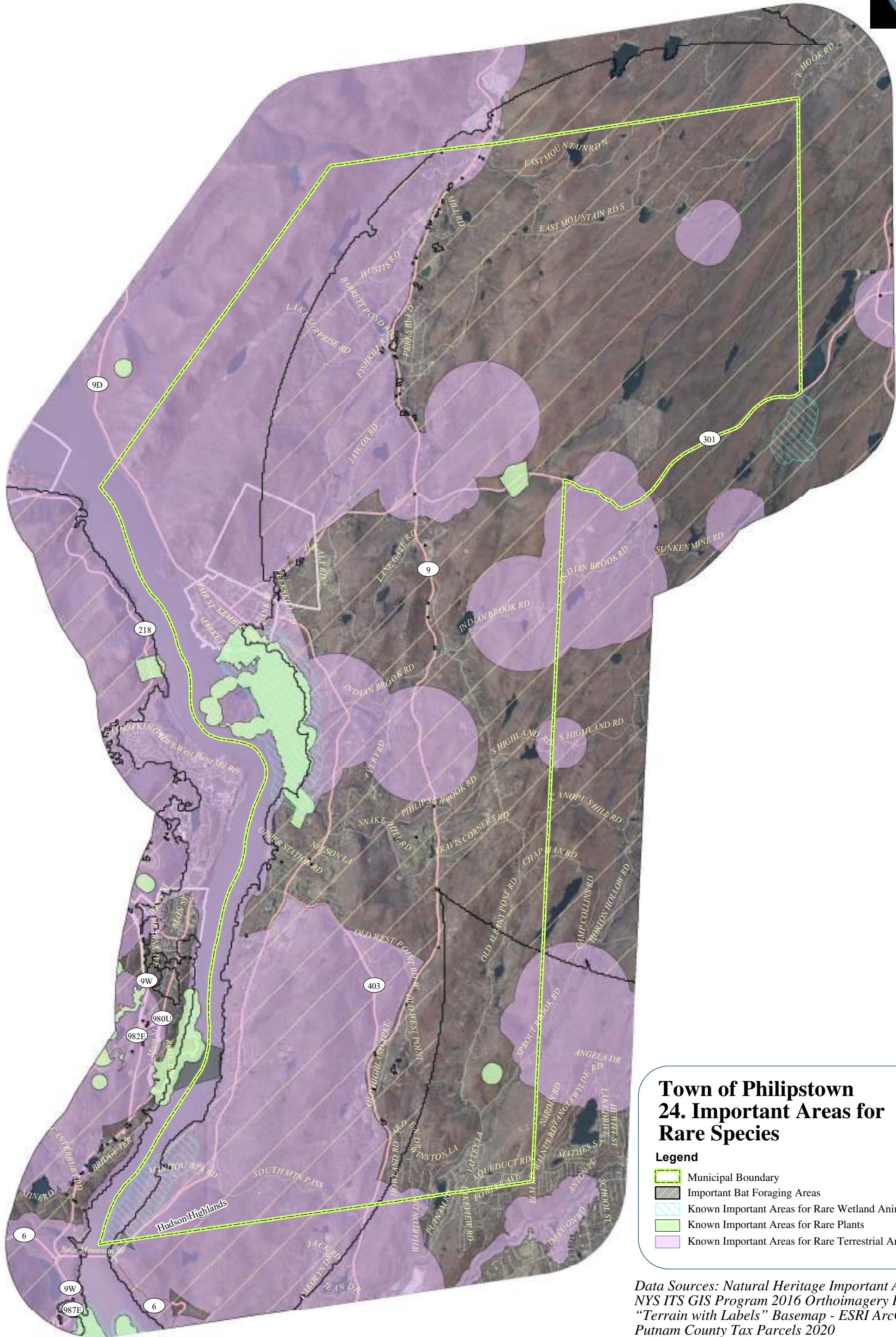


1 in = 1 miles

0 0.5 1 2 3 Miles

Town of Philipstown

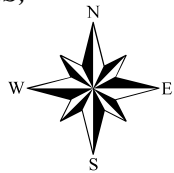
Natural Resource Inventory



Town of Philipstown 24. Important Areas for Rare Species

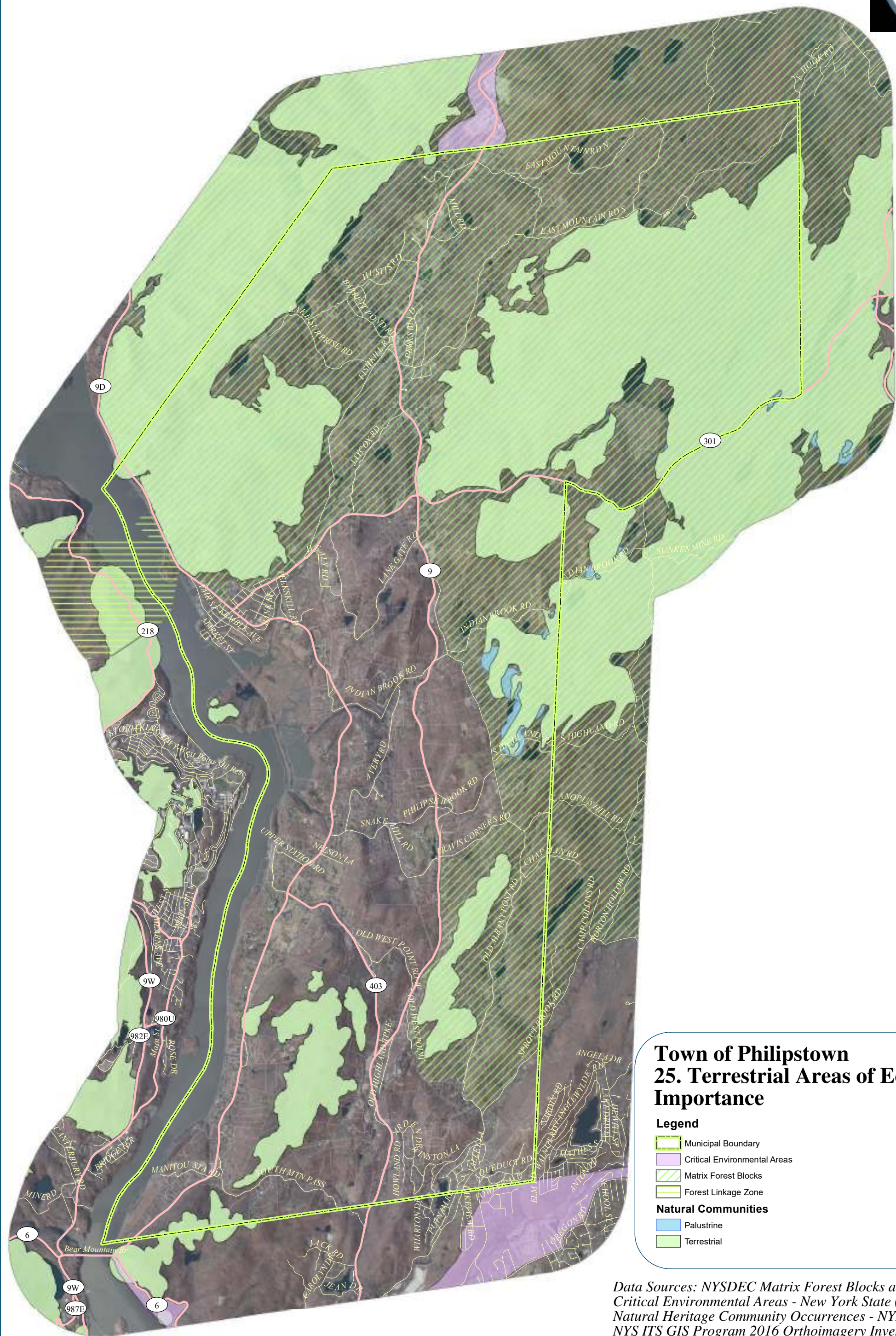
- Legend**
- Municipal Boundary
 - Important Bat Foraging Areas
 - Known Important Areas for Rare Wetland Animals
 - Known Important Areas for Rare Plants
 - Known Important Areas for Rare Terrestrial Animals

Data Sources: Natural Heritage Important Areas - NYNHP, NYS ITS GIS Program 2016 Orthoimagery Inventory, "Terrain with Labels" Basemap - ESRI ArcGIS, Putnam County Tax Parcels 2020



Town of Philipstown

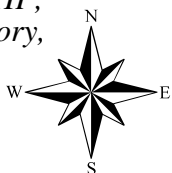
Natural Resource Inventory



Town of Philipstown 25. Terrestrial Areas of Ecological Importance

- Legend**
- Municipal Boundary
 - Critical Environmental Areas
 - Matrix Forest Blocks
 - Forest Linkage Zone
 - Natural Communities**
 - Palustrine
 - Terrestrial

Data Sources: NYSDEC Matrix Forest Blocks and Linkages, Critical Environmental Areas - New York State (NYSDEC), Natural Heritage Community Occurrences - NYNHP, NYS ITS GIS Program 2016 Orthoimagery Inventory, "Terrain with Labels" Basemap - ESRI ArcGIS, Putnam County Tax Parcels 2020

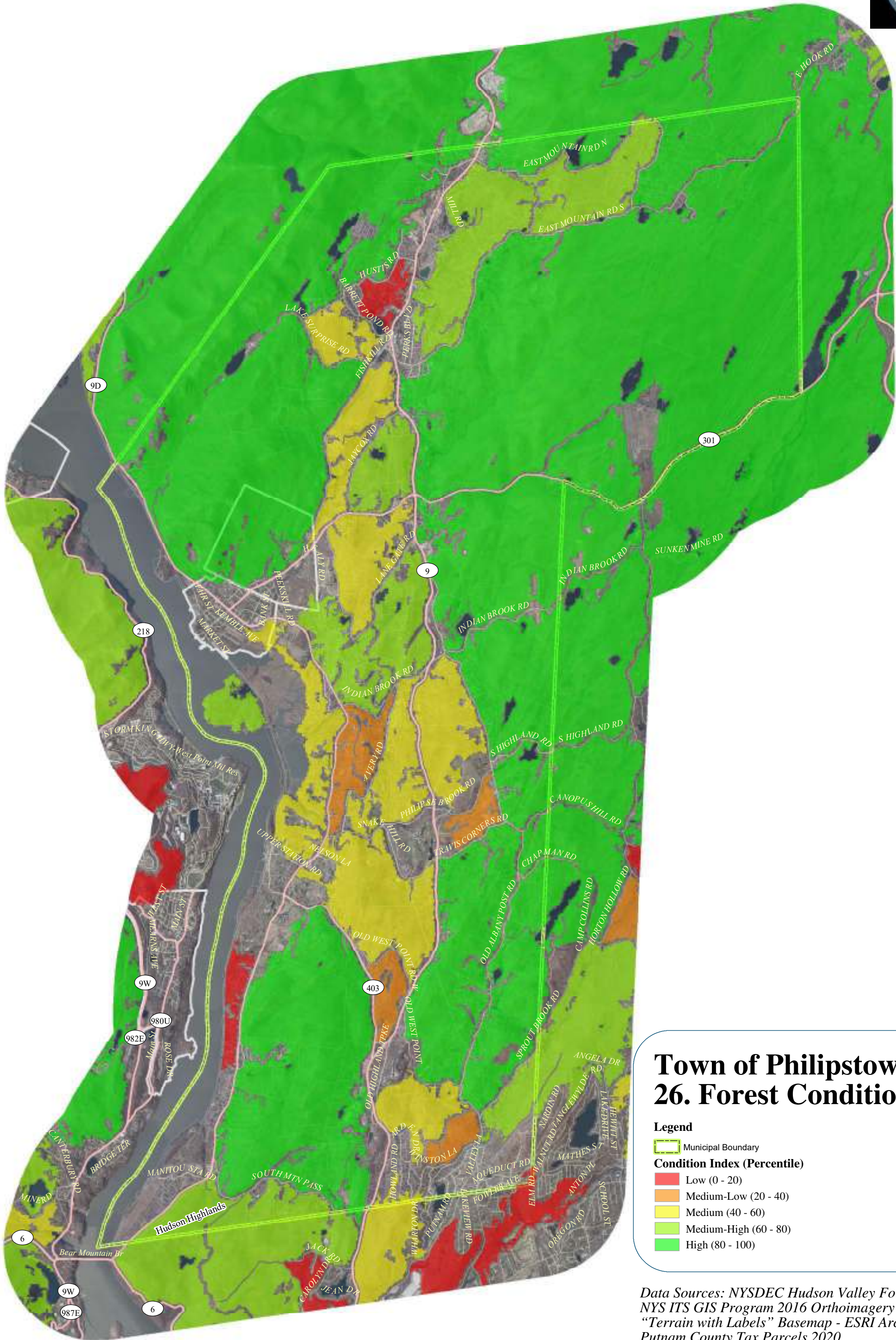


1 in = 1 miles



Town of Philipstown

Natural Resource Inventory

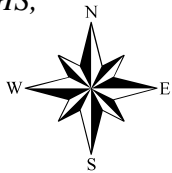


Town of Philipstown 26. Forest Condition Index

Legend

- Municipal Boundary
- Condition Index (Percentile)**
 - Low (0 - 20)
 - Medium-Low (20 - 40)
 - Medium (40 - 60)
 - Medium-High (60 - 80)
 - High (80 - 100)

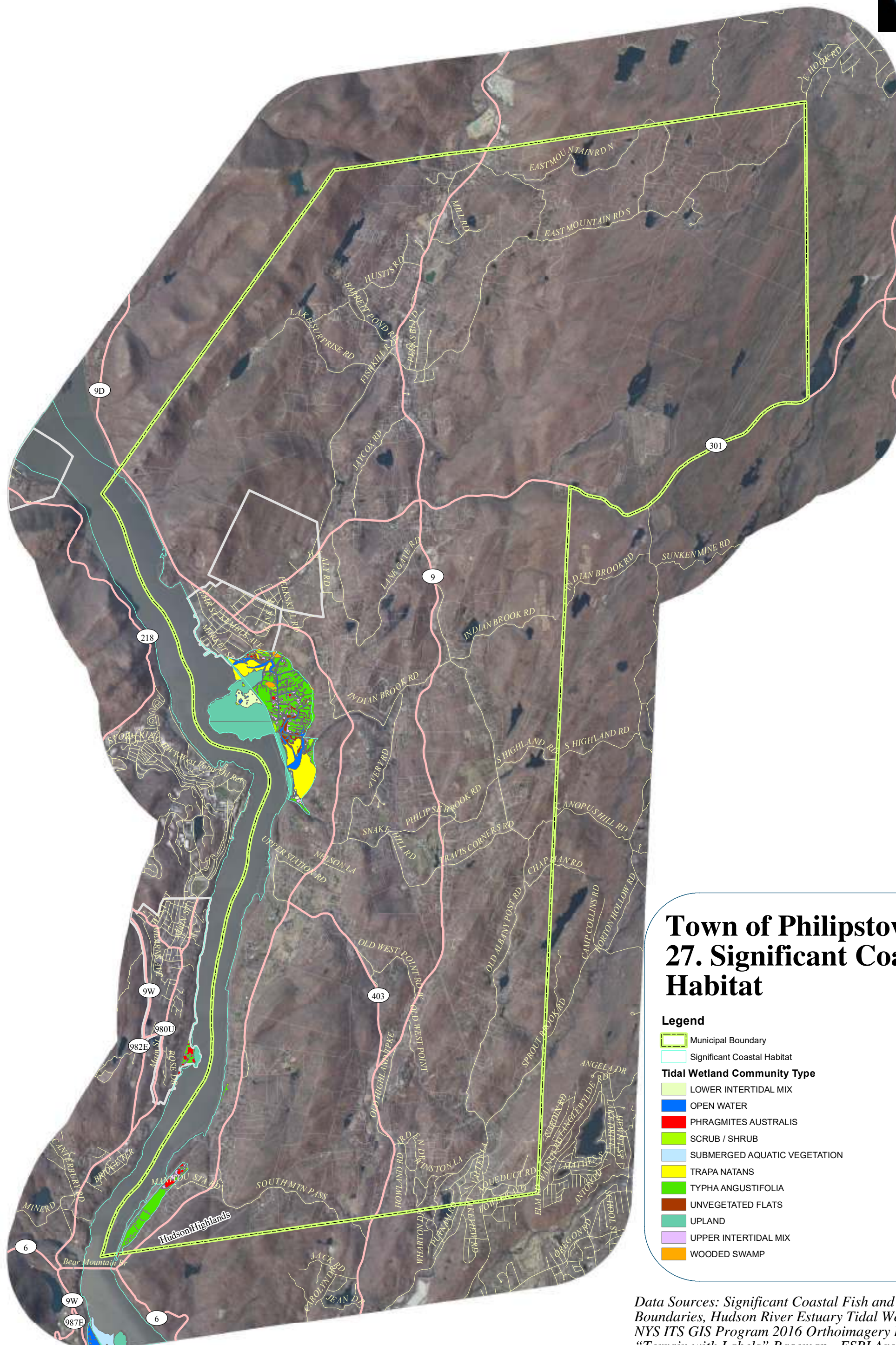
Data Sources: NYSDEC Hudson Valley Forest Index, NYS ITS GIS Program 2016 Orthoimagery Inventory, "Terrain with Labels" Basemap - ESRI ArcGIS, Putnam County Tax Parcels 2020



1 in = 1 miles



Natural Resource Inventory



Town of Philipstown 27. Significant Coastal Habitat

Legend

- Tidal Wetland Community Type**

 - LOWER INTERTIDAL MIX
 - OPEN WATER
 - PHRAGMITES AUSTRALIS
 - SCRUB / SHRUB
 - SUBMERGED AQUATIC VEGETATION
 - TRAPA NATANS
 - TYPHA ANGUSTIFOLIA
 - UNVEGETATED FLATS
 - UPLAND
 - UPPER INTERTIDAL MIX
 - WOODED SWAMP

Data Sources: Significant Coastal Fish and Wildlife Boundaries, Hudson River Estuary Tidal Wetlands 2007, NYS ITS GIS Program 2016 Orthoimagery Inventory, "Terrain with Labels" Basemap - ESRI ArcGIS, Putnam County Tax Parcels 2020



1 in = 1 miles

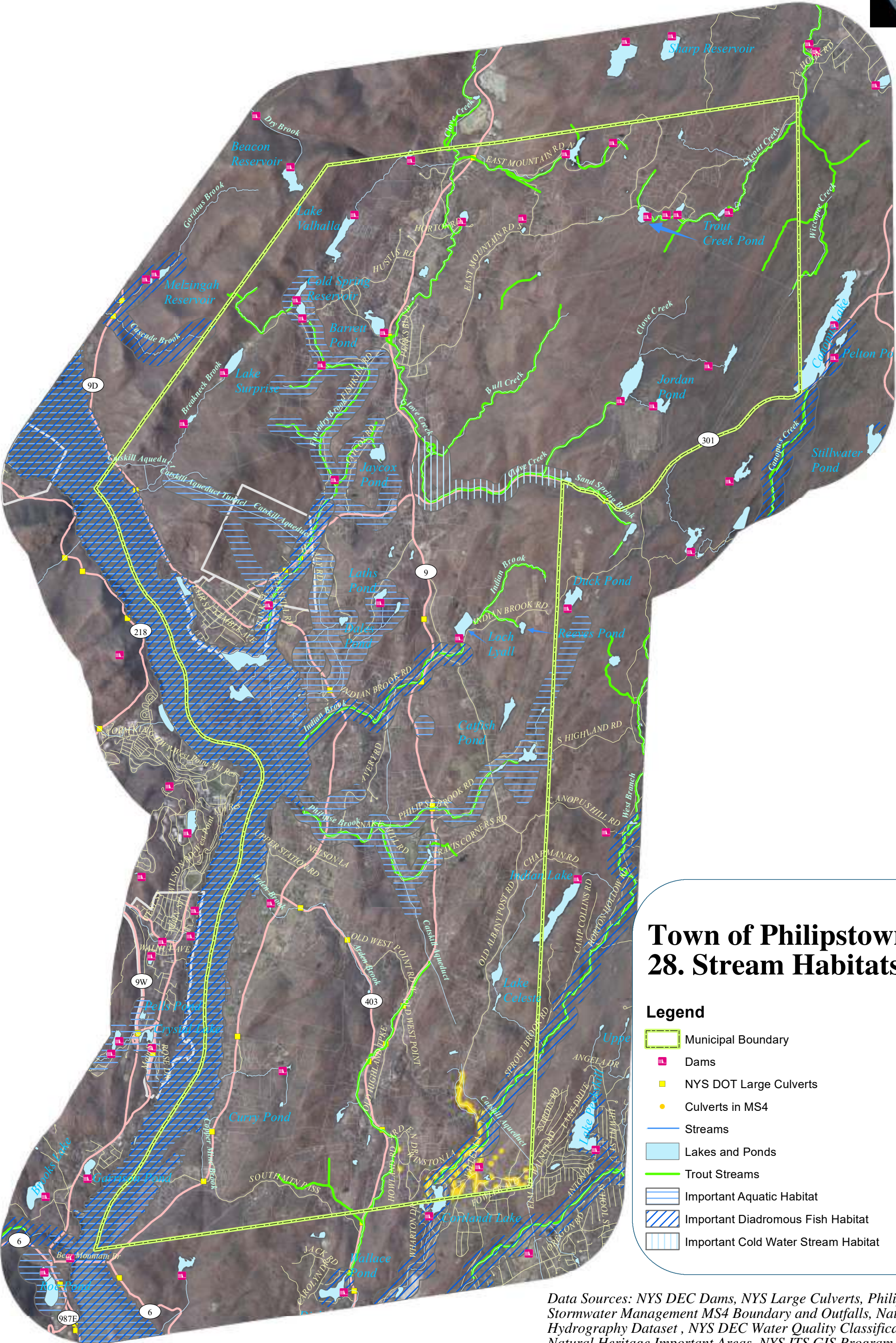
0 0.5 1 2 3 Miles

Date: 12/9/2020

This map is intended for informational purposes only and should not be used for legal determinations.

Town of Philipstown

Natural Resource Inventory



Town of Philipstown 28. Stream Habitats

Legend

- Municipal Boundary
- Dams
- NYS DOT Large Culverts
- Culverts in MS4
- Streams
- Lakes and Ponds
- Trout Streams
- Important Aquatic Habitat
- Important Diadromous Fish Habitat
- Important Cold Water Stream Habitat

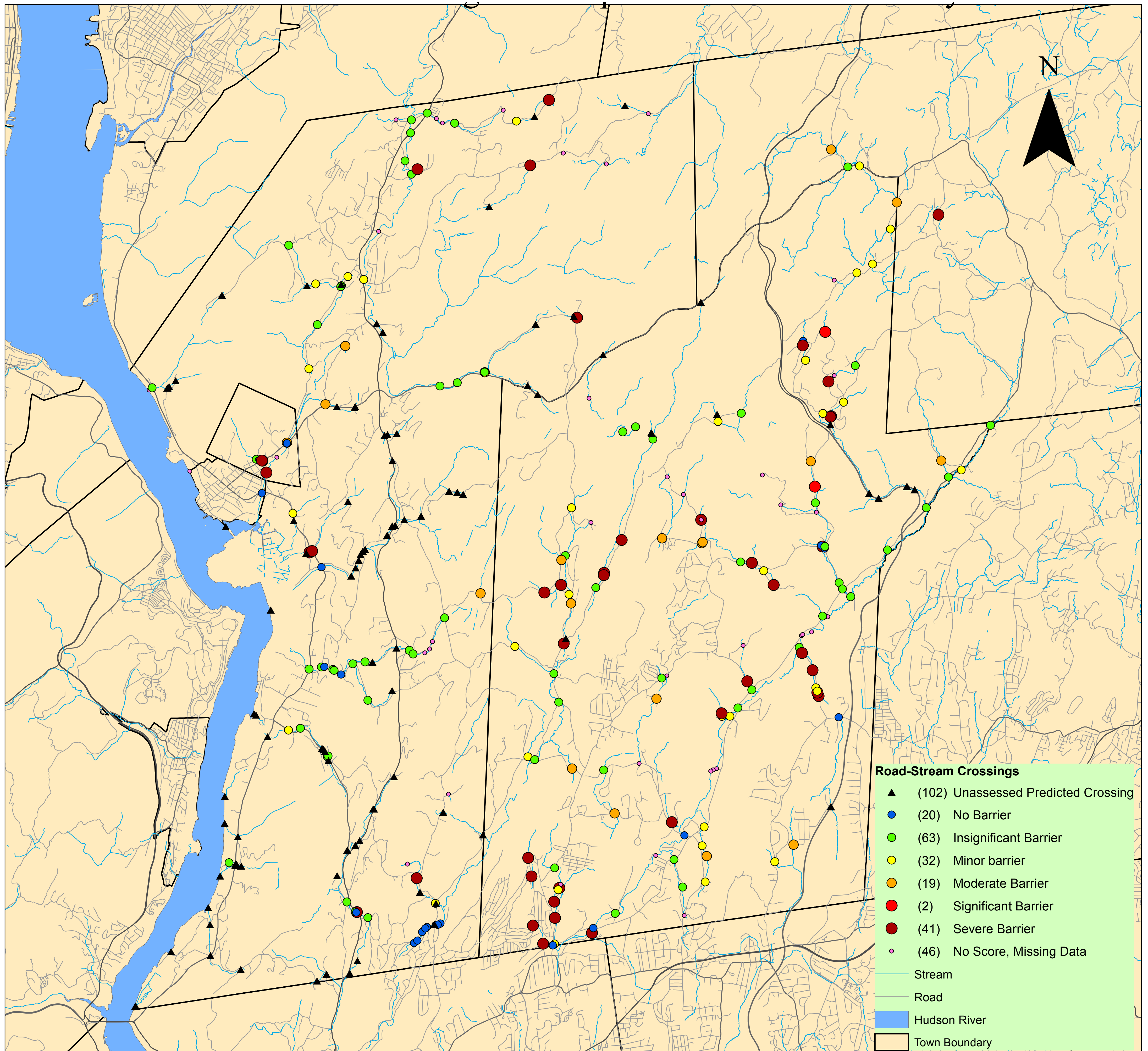
Data Sources: NYS DEC Dams, NYS Large Culverts, Philipstown Stormwater Management MS4 Boundary and Outfalls, National Hydrography Dataset, NYS DEC Water Quality Classifications, Natural Heritage Important Areas, NYS ITS GIS Program 2016 Orthoimagery Inventory, "Terrain with Labels" Basemap - ESRI ArcGIS, Putnam County Tax Parcels 2020



1 in = 1 miles

0 0.5 1 2 3 Miles

29. Third Party Map - Road-Stream Crossings in Philipstown and Putnam Valley



A Program of the New York State Department of Environmental Conservation

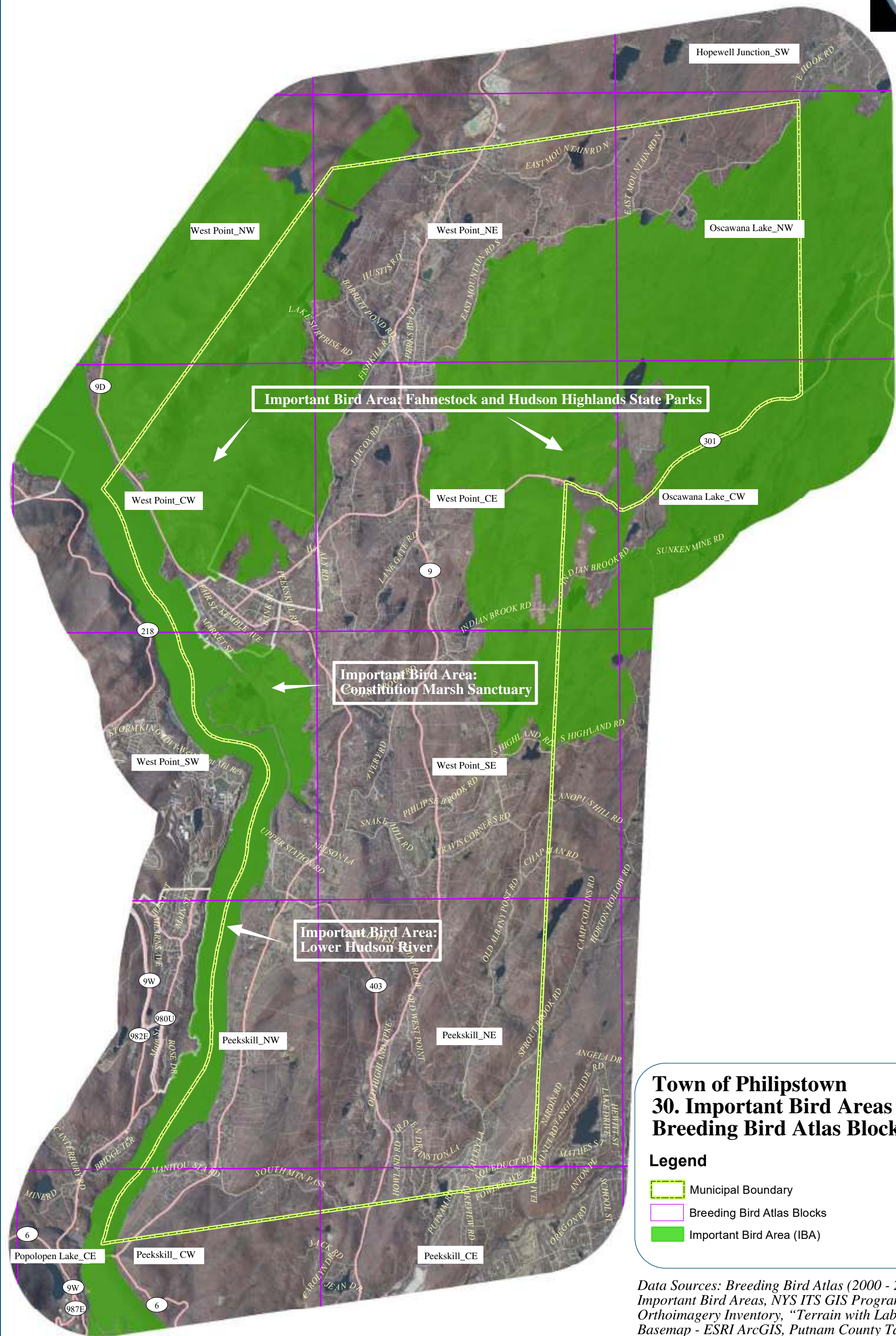
**Hudson River
Estuary Program**



student
conservation
association

Town of Philipstown

Natural Resource Inventory

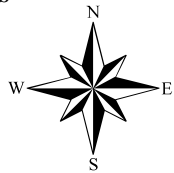


Town of Philipstown 30. Important Bird Areas and Breeding Bird Atlas Blocks

Legend

- Municipal Boundary
- Breeding Bird Atlas Blocks
- Important Bird Area (IBA)

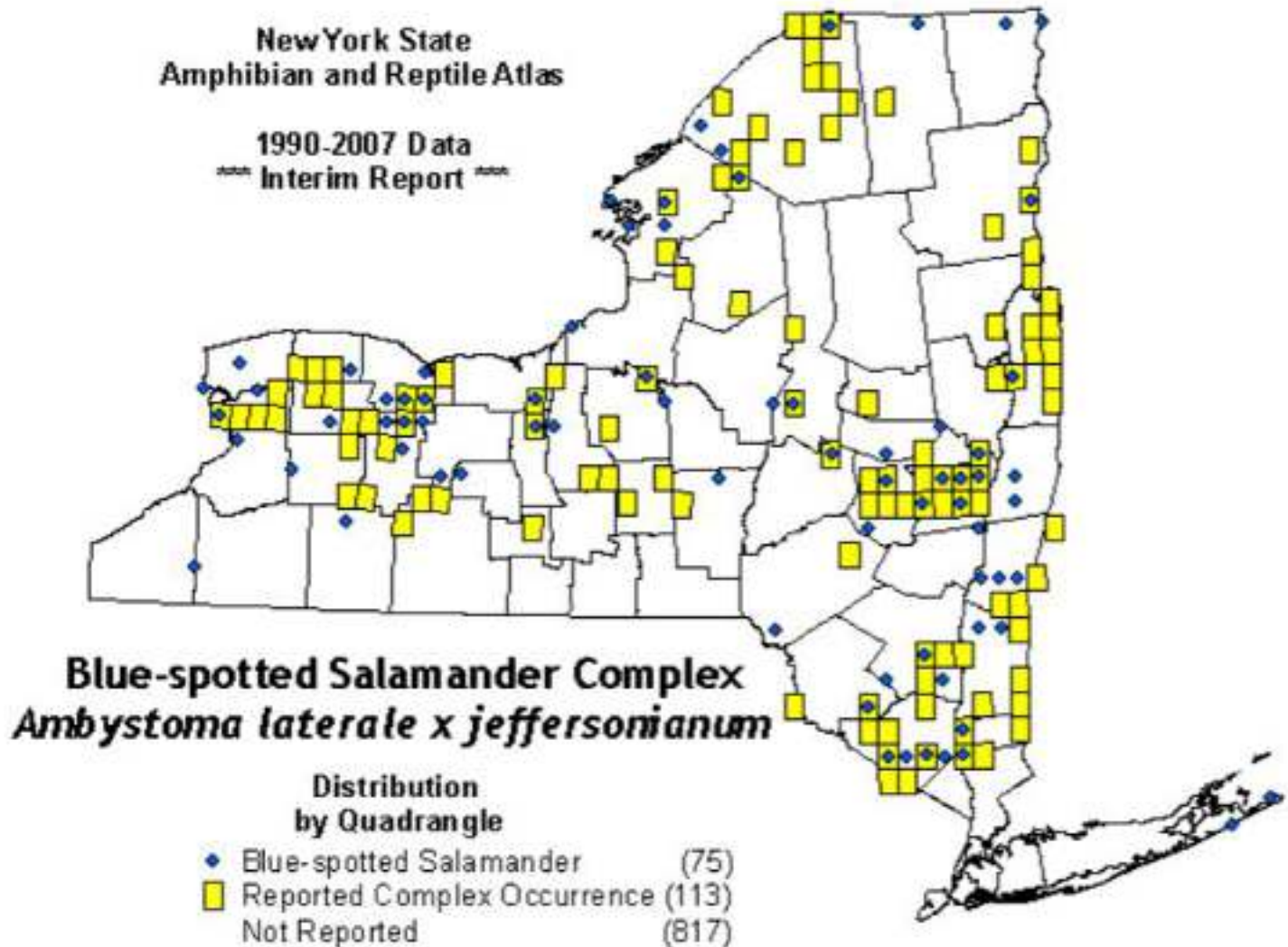
Data Sources: Breeding Bird Atlas (2000 - 2005), Audubon Important Bird Areas, NYS ITS GIS Program 2016 Orthoimagery Inventory, "Terrain with Labels" Basemap - ESRI ArcGIS, Putnam County Tax Parcels 2020



1 in = 1 miles

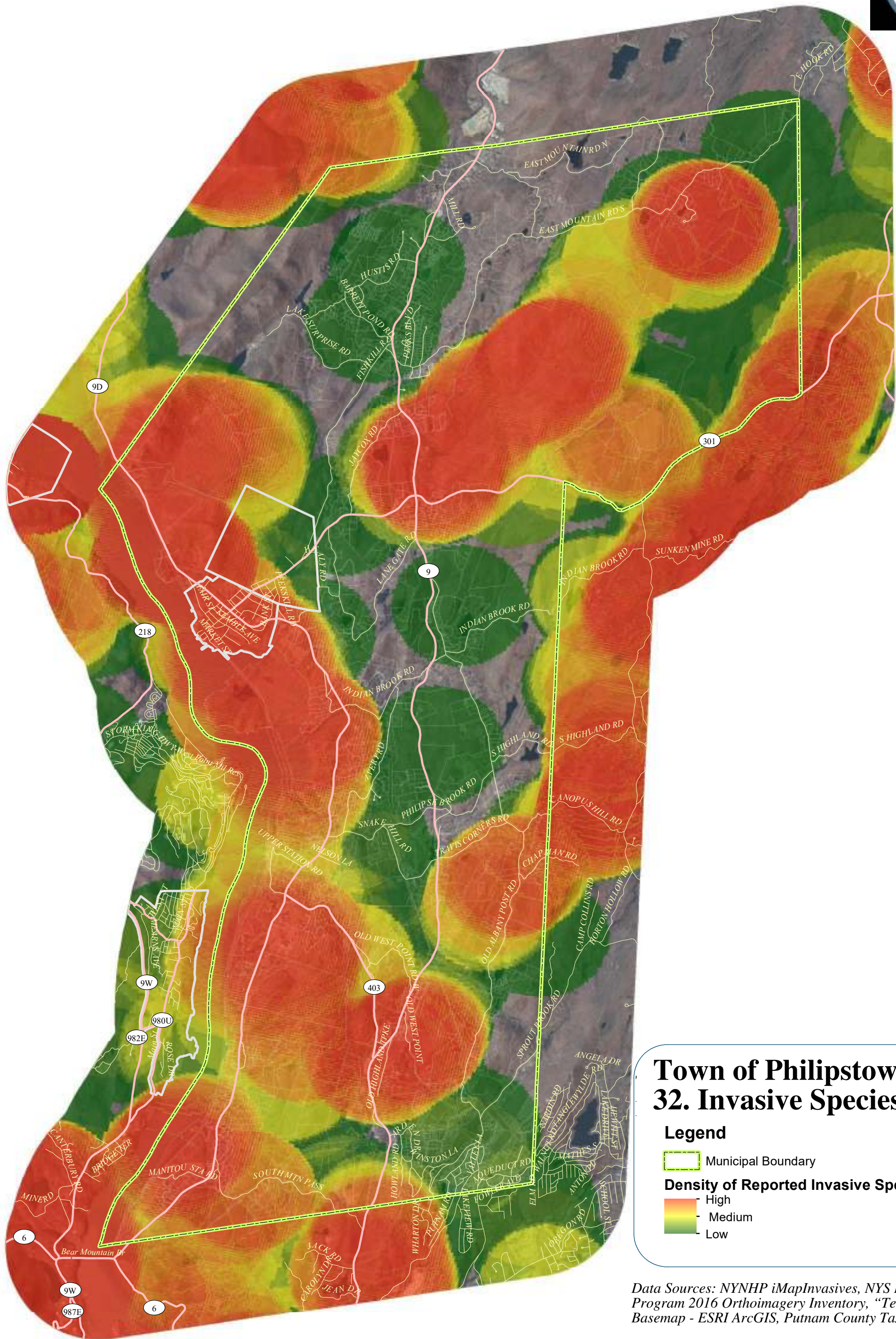
0 0.5 1 2 3 Miles

31. Third Party Map - Important Amphibian and Reptile Areas (Example Map)



Town of Philipstown

Natural Resource Inventory



Town of Philipstown 32. Invasive Species

Legend

Municipal Boundary

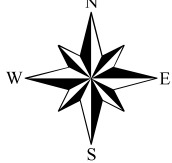
Density of Reported Invasive Species

High
 Medium
 Low

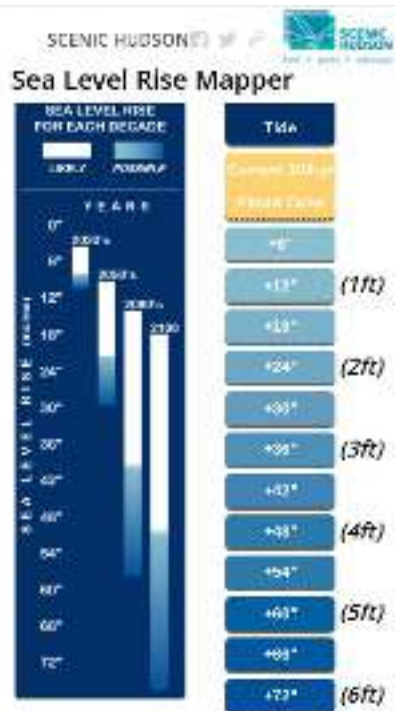
Data Sources: NYNHP iMapInvasives, NYS ITS GIS
Program 2016 Orthoimagery Inventory, "Terrain with Labels"
Basemap - ESRI ArcGIS, Putnam County Tax Parcels 2020

1 in = 1 miles

0 0.5 1 2 3 Miles

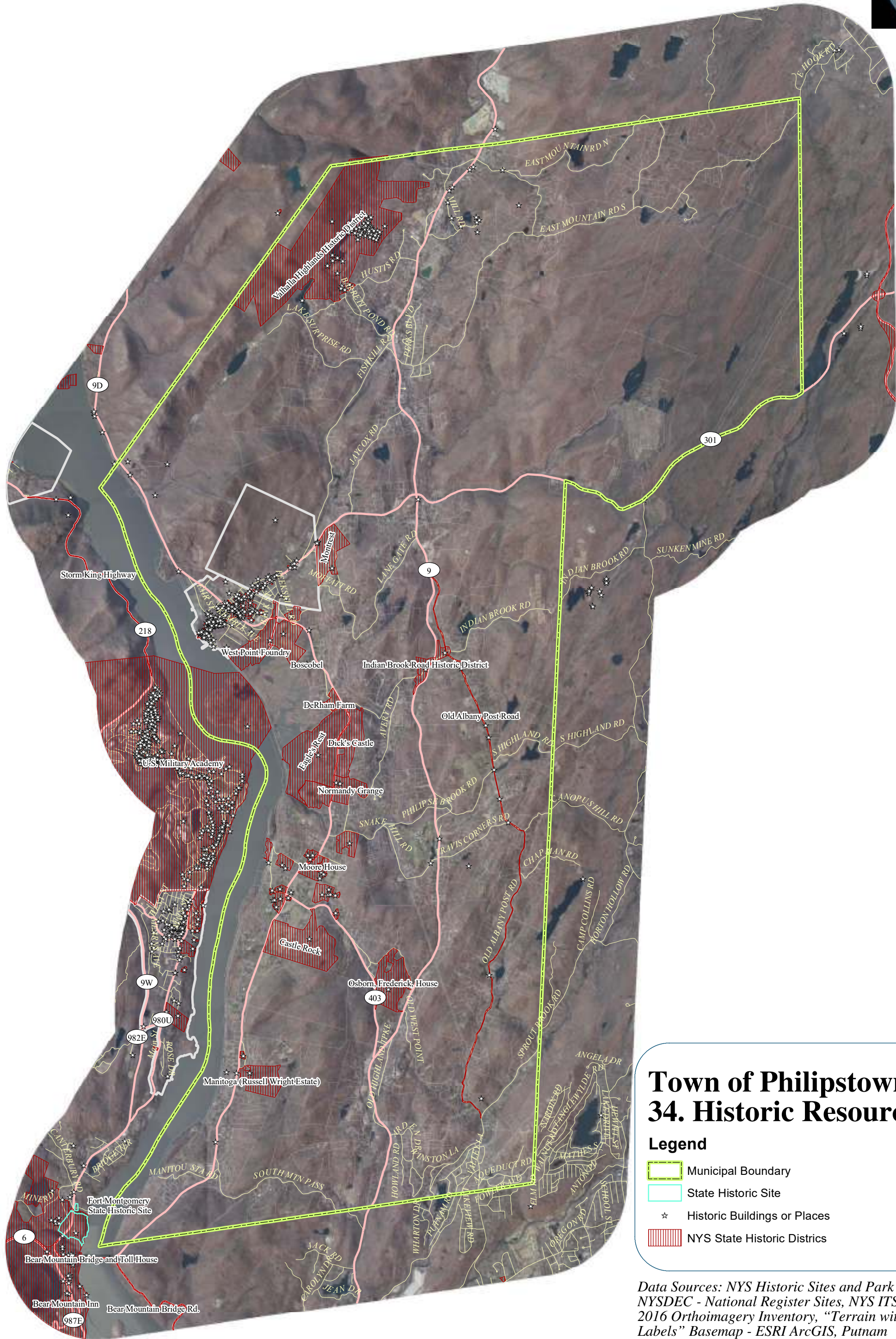


33. Third Party Map - Sea Level Rise (Example Shoreline)



Town of Philipstown

Natural Resource Inventory

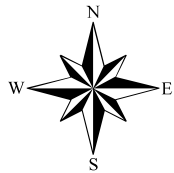


Town of Philipstown 34. Historic Resources

Legend

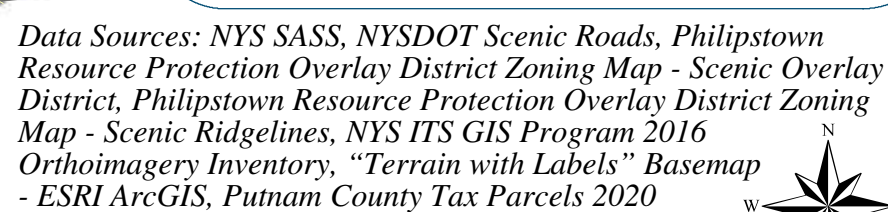
- Municipal Boundary
- State Historic Site
- Historic Buildings or Places
- NYS State Historic Districts

Data Sources: NYS Historic Sites and Park Boundary, NYSDEC - National Register Sites, NYS ITS GIS Program 2016 Orthoimagery Inventory, "Terrain with Labels" Basemap - ESRI ArcGIS, Putnam County Tax Parcels 2020

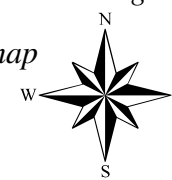


1 in = 1 miles

0 0.5 1 2 3 Miles

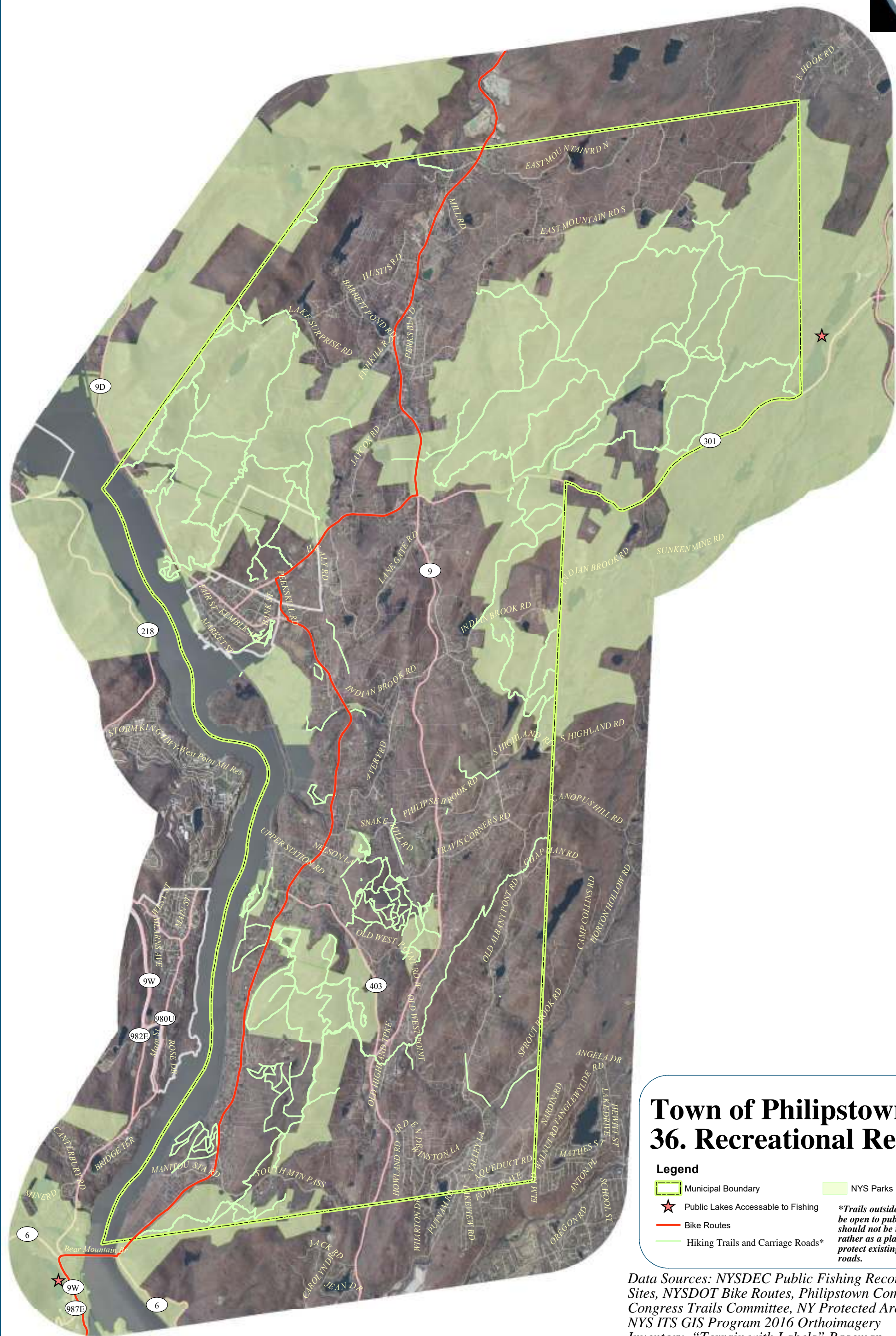


This map is intended for informational purposes only and should not be used for legal determinations.



Town of Philipstown

Natural Resource Inventory



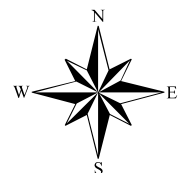
Town of Philipstown 36. Recreational Resources

Legend

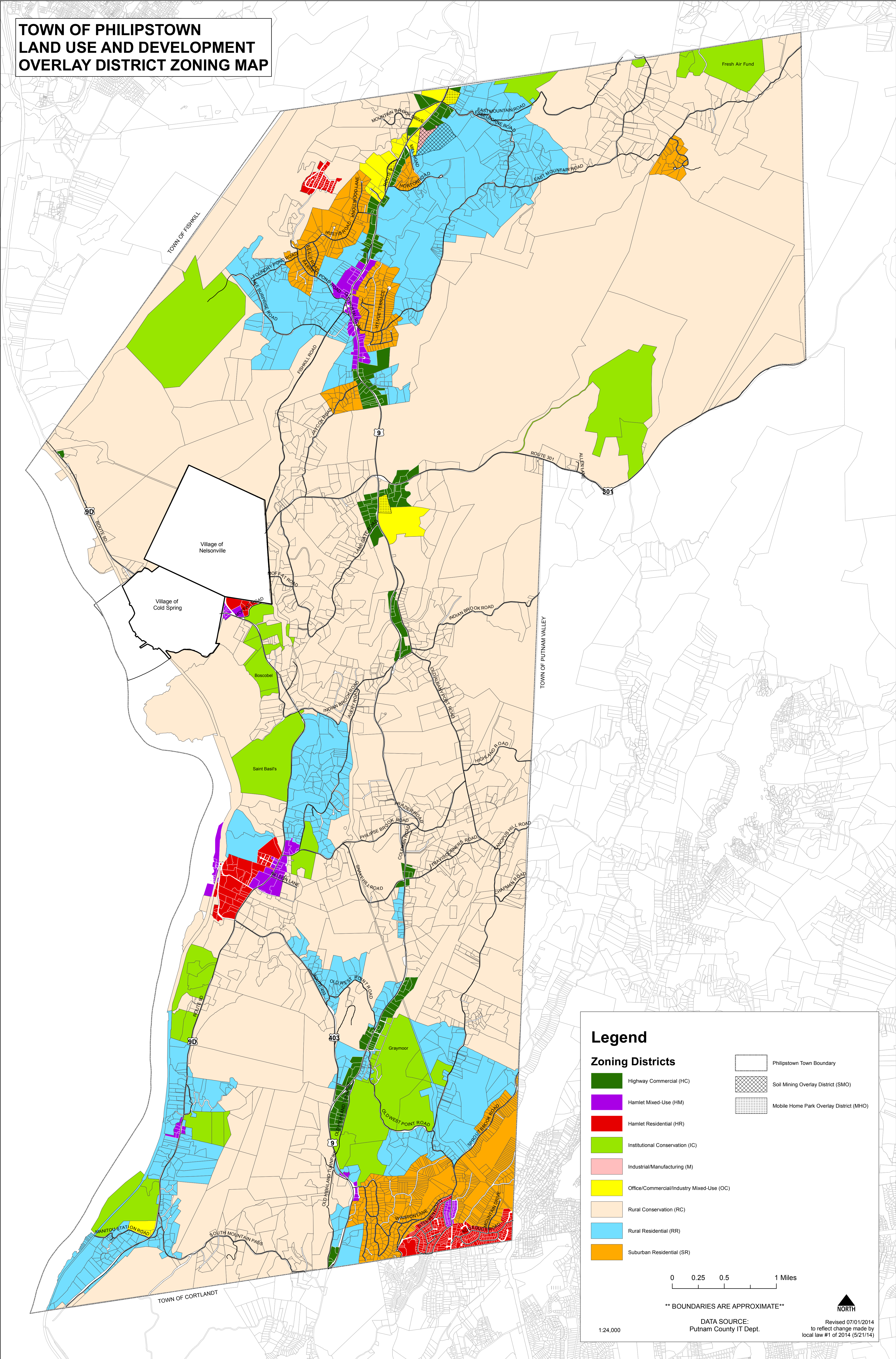
- Municipal Boundary
- Public Lakes Accessable to Fishing
- Bike Routes
- Hiking Trails and Carriage Roads*
- NYS Parks

**Trails outside of state parks may not be open to public access. This map should not be used as a trail map, but rather as a planning reference to protect existing trails and carriage roads.*

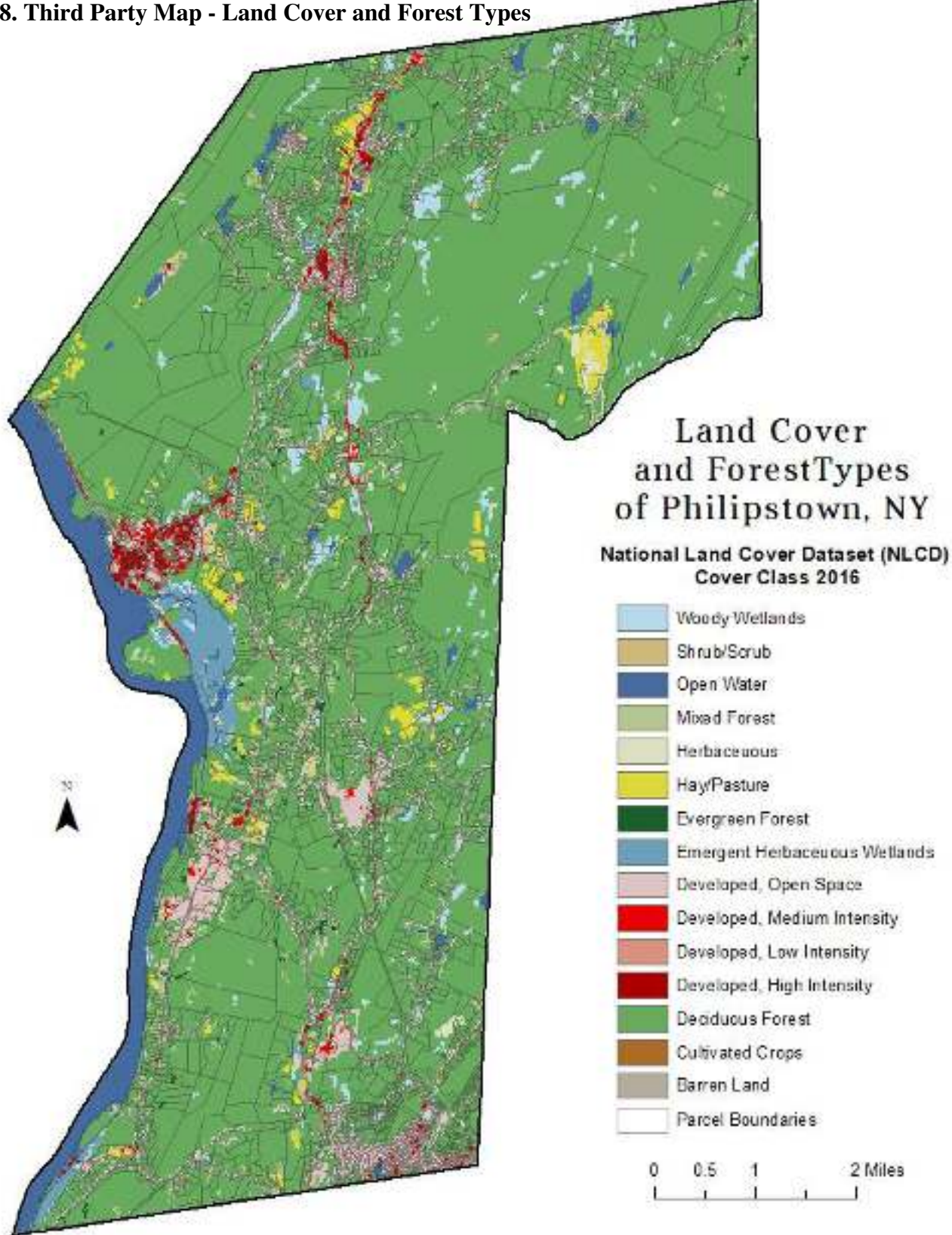
Data Sources: NYSDEC Public Fishing Recommended Sites, NYSDOT Bike Routes, Philipstown Community Congress Trails Committee, NY Protected Areas Database, NYS ITS GIS Program 2016 Orthoimagery Inventory, "Terrain with Labels" Basemap - ESRI ArcGIS, Putnam County Tax Parcels 2020



37. Third Party Map - Zoning Districts

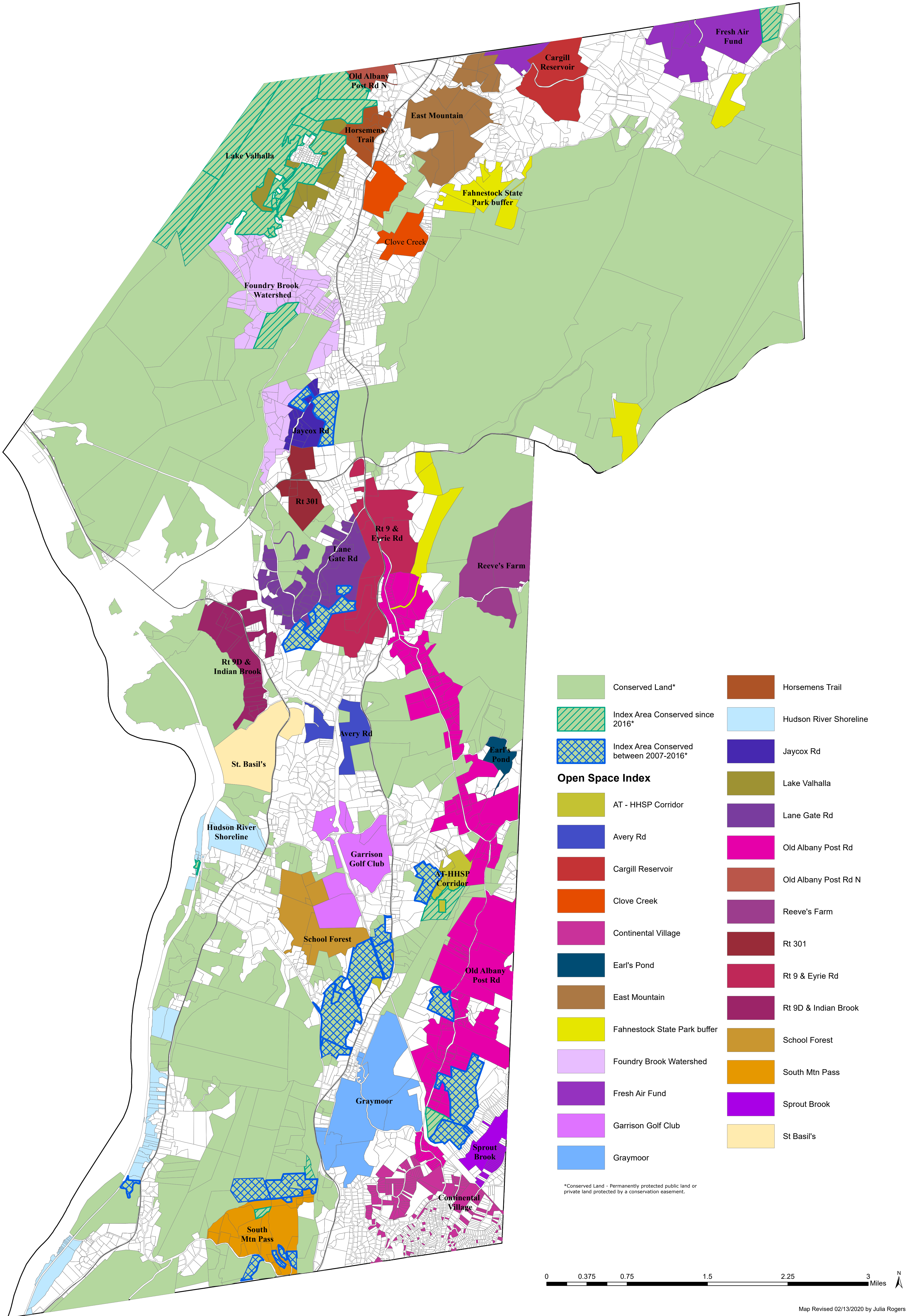


38. Third Party Map - Land Cover and Forest Types



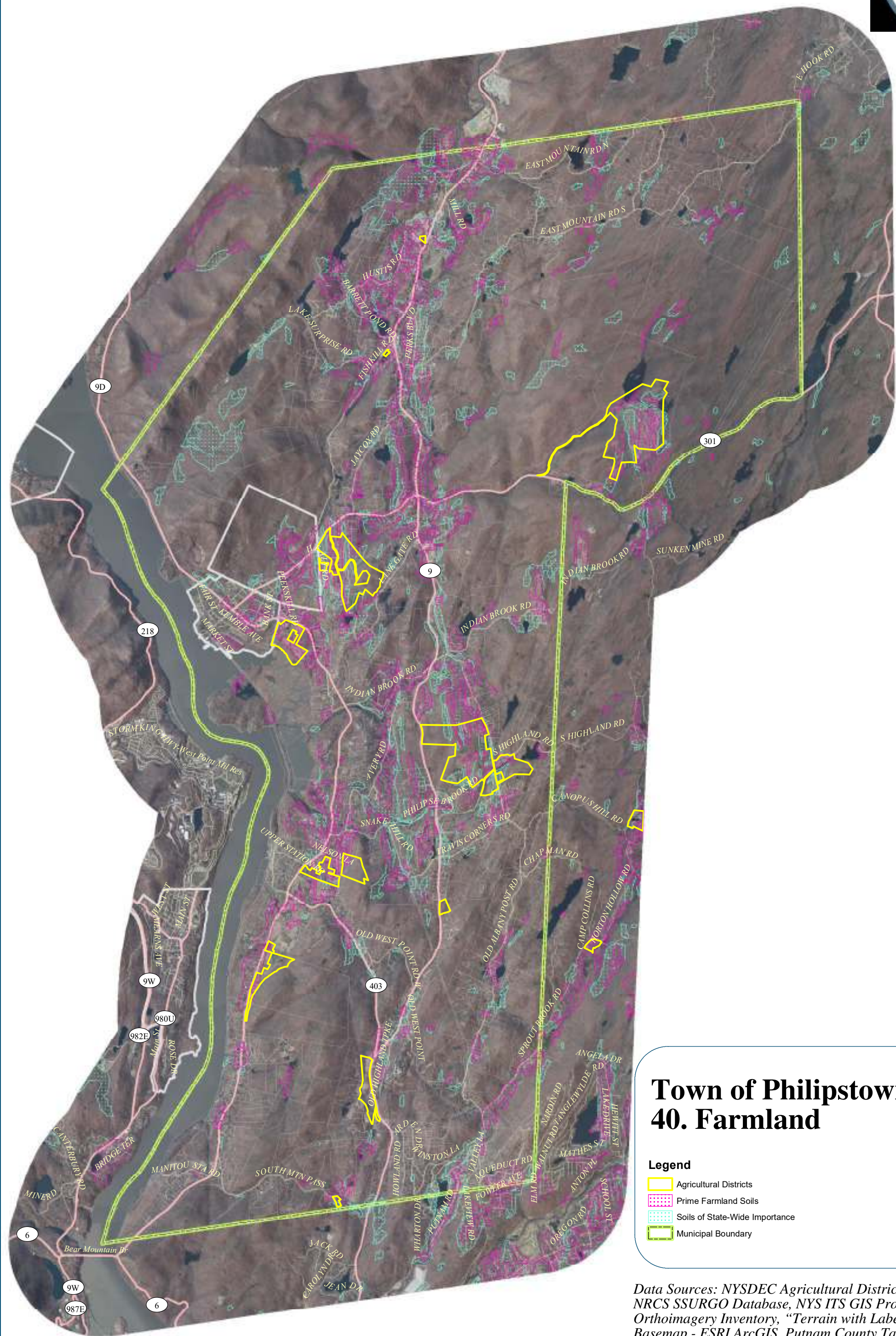
39. Third Party Map - Conservation Open Areas and Open Space Overlay

Conservation Open Areas Map
Philipstown, NY
(Updated June 2016)
(Draft updated February 2020)



Town of Philipstown

Natural Resource Inventory



Town of Philipstown 40. Farmland

- Legend**
- Agricultural Districts
 - Prime Farmland Soils
 - Soils of State-Wide Importance
 - Municipal Boundary

Data Sources: NYSDEC Agricultural District Boundaries, NRCS SSURGO Database, NYS ITS GIS Program 2016 Orthoimagery Inventory, "Terrain with Labels" Basemap - ESRI ArcGIS, Putnam County Tax Parcels 2020

