COLUMBIA
LAND CONSERVANCY

Taghkanic Headwaters Conservation Plan

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About the Columbia Land Conservancy

The Columbia Land Conservancy works with our community to conserve the farmland, forests, wildlife habitat, and rural character of Columbia County. We collaborate with partners and volunteers to improve the health of the land, ensure a thriving farm economy, create environmental education opportunities, provide access to outdoor experiences, and support municipal leaders in conservation-minded decision making.

The plan was written by Karen Strong and Christine Vanderlan, who are grateful for reviews and edits by Larissa Read, Rebecca Walker, Beth Mills, Ingrid Haeckel, Nate Nardi-Cyrus, and the stakeholders.

Vision statement

The Taghkanic Headwaters and the lands that surround it support clean water for people, plants, and animals, and provide vital wildlife habitat connections between New York and New England.

We envision a future Taghkanic watershed that is cared for by local communities and landowners to protect clean water and the ability of fish and wildlife to move across the landscape.

2022

Acknowledgements

CLC gratefully acknowledges the stakeholders, named below, who devoted their time and energy to this plan over the course of a year of unusual challenges. We extend our thanks to Ingrid Haeckel and Nate Nardi-Cyrus at the Hudson River Estuary Program for their participation and thoughtful guidance throughout the project. We are grateful to Karen Strong, Strong Outcomes, LLC and Larissa Read, Common Ground Consulting, LLC who developed and led a planning process inspired by the idea that the process is as important as the resulting plan.

Stakeholder committee

Town of Claverack

John Bradley – Claverack Climate Smart Task Force
Katy Flammia – Interested citizen

Town of Copake

Mary Ann Carrick – Copake Conservation Advisory Council
Tom Feeney – Interested citizen
Cara Boyle – Copake resident and Taghkanic Creek landowner

Town of Hillsdale

David Lewis – Hillsdale Conservation Advisory Council

Town of Taghkanic

Larry Kadish – Taghkanic Conservation Advisory Council
Tony LaSalvia – Taghkanic Conservation Advisory Council

Other stakeholders

Kenny Preusser – Interested citizen

Etienne Bissonette – Triform Camphill Community
(on lower Taghkanic Creek in the Town of Livingston)

Sachem Hawk Storm of Schaghticoke First Nations and
Dylan Meyer of Hudson participated in early stakeholder meetings.

Land acknowledgement

The lands and waters described in this plan are located on the ancestral homelands of the Mohican people, who are the Indigenous peoples of this land. Despite tremendous hardship in being forced from here, today their community resides in Wisconsin and is known as the Stockbridge-Munsee Community.

We acknowledge all Indigenous peoples who inhabit the Upper Hudson Valley in the past and present, including the Mohican, Munsee, Schaghticoke, and other Algonquin-speaking people, generations of whom stewarded the lands and waterways of this region. We pay honor and respect to their ancestors past and present as we commit to building a more inclusive and equitable space for all.

Language provided in part by the Stockbridge-Munsee Cultural Affairs Department.

Plan purpose

This Taghkanic Headwaters Conservation Plan was developed to protect forests for clean water and wildlife while meeting the needs of local communities and landowners. The plan was guided by a committee of local stakeholders in 2020-21. The plan includes an overview of natural resources in the region and establishes a vision for the future; identifies actions to protect forests for people, wildlife, and water in the Taghkanic Creek Headwaters; and presents a collection of tools that can be implemented by organizations, residents, landowners, local decision makers, and others to care for woods and water in the region.

Funding and support

This project was funded in part by a grant from the New York State Environmental Protection Fund, New York State Department of Environmental Conservation Hudson River Estuary Program.

Consultants

Strong Outcomes, LLC with assistance from
Common Ground Consulting, LLC

Table of Contents

CHAPTER ONE

What is the Taghkanic Headwaters and how was the plan created?

The Taghkanic Headwaters and this Conservation Plan

Purpose

Sharing a special place with others. Being part of a rural community. Safe and abundant drinking water. Creeks full of fish. Forests home to healthy habitats that support wildlife.

A community of volunteers worked with the Columbia Land Conservancy (CLC) to create this plan, driven by their shared values of care for this landscape and for community. Grounded in scientific data and guided by their vision for the future, they shaped a list of goals, actions, and strategies that, taken together, provide a framework for a Taghkanic Creek Headwaters that builds community.

What is in the Taghkanic Headwaters Conservation Plan?

Chapter 1: What is the Taghkanic Headwaters and how was the plan created?

Chapter 1 is an introduction to the Taghkanic Headwaters region and the conservation planning process. Key terms and concepts are defined, and the stakeholder process is described, as are the shared values that became the plan's vision.

Chapter 2: Why is it important to protect the Taghkanic Headwaters?

Chapter 2 describes the forests, wetlands, and water of the Taghkanic Headwaters region. It is based on a compilation of existing information about these resources. It also identifies specific forests, wetlands, and natural areas that are especially important for protecting water quality and providing corridors for wildlife within the watershed.

Chapter 3: How do we achieve a connected Taghkanic Headwaters?

Chapter 3 offers a roadmap to achieving the Taghkanic Headwaters vision. It includes three goals, which are steps toward implementing the vision for forests, water, and community. Each goal includes specific actions and outcomes that can be assessed to show progress.

Chapter 4: How do we protect this important place for people and wildlife?

Chapter 4 describes a selection of tools that residents and landowners, local governments, and community organizations can use to implement the goals and actions. Tools include education, community science, land protection, municipal land-use planning and decision-making, and land management. Each tool description includes relevant examples from the Hudson Valley region and resources for more information.

Appendices include more detailed information on water quality, rare species and unique habitats, and a glossary.

What is the Taghkanic Creek Headwaters?

The Taghkanic Creek is a stream in Columbia County that eventually flows into the Hudson River Estuary by way of the Claverack and Stockport Creeks. The Creek's headwaters begin in the central hills of Columbia County in Hillsdale. From there, the Taghkanic Creek flows generally east to west through the Towns of Copake, Taghkanic, Livingston, Greenport, and Claverack until it meets the Claverack Creek just west of the hamlet of Claverack. The Taghkanic Creek **watershed** includes all the land that drains into the Taghkanic Creek, which is shown in Figure 1. This plan is focused on the Taghkanic Creek Headwaters watershed, which includes the lands and waters that flow into the creek upstream of New Forge State Forest, shown outlined in orange in Figure 1.

The Taghkanic Headwaters watershed is a 50 square mile mosaic of woods, fields, farms, and wetlands. The region contains low-density development and includes portions of the Towns of Hillsdale, Copake, Taghkanic, and Claverack. Throughout this plan, the watershed outlined in orange in Figure 1 is referred to as the "Taghkanic Headwaters." Though we are using the watershed to define the geographic scope of the conservation plan, it is a plan for land as well as water.

Why is the Taghkanic Headwaters region important?

The Taghkanic Headwaters has numerous large, forested areas that provide many benefits to the community. Forests help maintain water quality and quantity in the Taghkanic Creek, which in turn supports clean drinking water in Taghkanic, Hillsdale, Claverack, and Copake, as well as the City of Hudson. Within the Taghkanic Headwaters, there are currently some larger forested areas that support varied wildlife habitats, including healthy forested wetlands and habitat for rare species. Taghkanic Headwaters' forests are part of a larger corridor that extend across multiple states, playing an important role in maintaining regional **forest connectivity**, as part of a crucial wildlife linkage that connects the Hudson Highlands, the Catskill Mountains, the Green Mountains in Vermont, and beyond (Figure 4). This corridor will only become more important as the climate changes.

The Taghkanic Headwaters watershed is a 50 square mile mosaic of woods, fields, farms, and wetlands.

The region's forests are not as healthy as they used to be. Though forests still cover 75% of the watershed, forest loss, overabundant and hungry deer, and invasive forest pests are causing serious injury. These harms to the forest are having ripple effects on wildlife, streams, wetlands, and our own health. The right actions are vital to ensure the forest is healthy and resilient, and able to keep all of us healthy.

As stewards of the watershed, we all have a responsibility to care for forests, wetlands, and streams and keep them healthy for future generations. Actions taken by the four towns and thousands of landowners today can improve the health of the forests and streams and make sure we pass on our world in good condition to those who follow.

What happens on the land affects the water

A watershed is made up of all the lands and waters that flow to a specific place. Watersheds come in all sizes - from the small area that flows to a backyard pond to the 13,400 square miles of land and water that drains to the Hudson River. Because water always flows downhill, the edges of a watershed are typically defined by ridges and hills.

No matter where you go, you are in a watershed. That includes natural areas as well as agricultural fields, parking lots, businesses, roadways, and neighborhoods. What we do on the land can affect streams

Figure 1. The Taghkanic Creek Watershed

Sources: Watershed sub-basins from the Natural Resources Conservation Service's Watershed Boundary Dataset, available from datagateway.nrcs.usda.gov. Streams and waterbodies data from the National Hydrograhy Dataset, US Geological Survey, 2013, available from nhd.usgs.gov. Roads and boundaries created by NYS Office of Information Technology Services, 2017, available from gis.ny.gov. Basemap from Esri, USGS, NOAA.

Map created Nov. 2021 by Arianna Ferrario, Columbia Land Conservancy

and wetlands, even when activities take place far away. Just as parts of the body are interconnected and dependent on one another, forests, streams, and wetlands in the Taghkanic Headwaters watershed play a vital role in regulating the health of the water and wildlife in our region.

The Taghkanic Headwaters Conservation Plan – a collaborative, community-based plan

Forests and streams cross political and property boundaries, so planning for forests and streams provides an opportunity for town leaders and residents to think across borders at a watershed and regional scale. That is why CLC reached out to leaders in Claverack, Copake, Hillsdale, and Taghkanic, and the City of Hudson before starting the plan.

The conservation planning process

Once awarded a grant from the New York State Department of Environmental Conservation (NYS DEC) Hudson River Estuary Program, CLC consulted with leaders in Claverack, Copake, Hillsdale, Taghkanic, and Hudson to identify local stakeholders to guide the creation of the plan. Together, the staff, volunteers, and consultants worked through an unprecedented time of challenges at both the personal and collective level to create this plan. The committee met remotely via Zoom eight times from December 2020 to November 2021. Stakeholders reviewed information, shared their knowledge and ideas, and identified what would help their communities maintain forests, streams, and wetlands in the headwaters of the Taghkanic Creek watershed. The group met outdoors in person once in April of 2021 to experience the watershed together and to learn about some of the different ways people manage the lands and waters.

Figure 2: Three ways healthy forests support clean water. Diagram used without modification. Source: "3 Surprising Ways Water Depends on Healthy Forests," Insights. By Katy Lyons and Todd Gartner, March 21, 2017. World Resources Institute.

Key watershed features

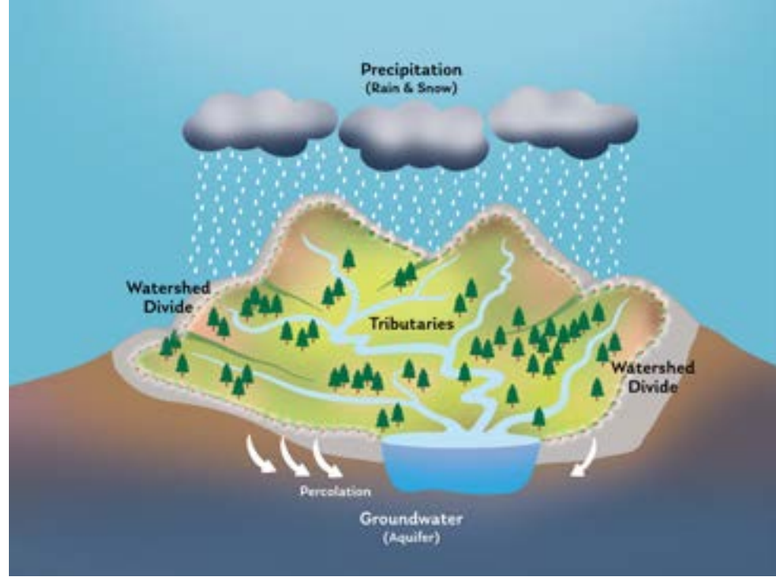


Figure 3: Diagram of a watershed. Source: Hudson River Watershed Alliance

Headwaters refer to the upper reaches of a stream, near the stream's origin. Many streams and associated wetlands in headwaters are small and do not appear on maps, yet are vitally important to the health of the larger stream system.

Forests are areas of land covered with trees. Watersheds with more forested land tend to have better water quality.* Healthy forests act as a filter to keep pollution out of water. Strong roots hold soil in place as it rains. Healthy soils provide a place for rain and melting snow to soak into the ground, slowing the flow of runoff and absorbing pollution carried in the water. When forests are disturbed and degraded by clearing, excessive browsing by deer, or forest pests, it is easier for sediment, nutrients, and other pollutants to flow into streams and harm water quality.

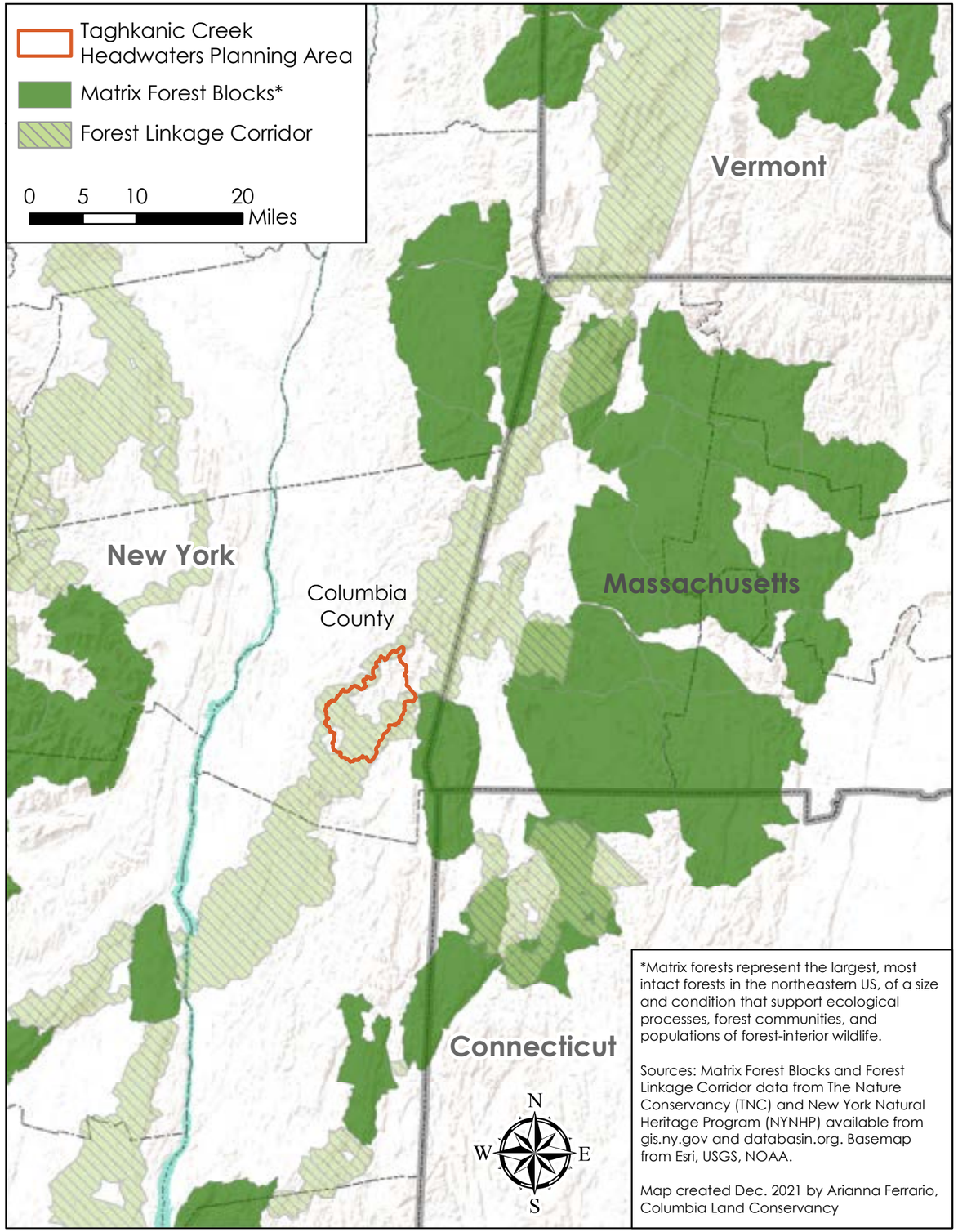
Streamside areas are an important part of stream systems and are sometimes called stream or riparian buffers. Streamside areas with a healthy mix of trees and shrubs support stream health and clean water by slowing runoff, filtering pollution, preventing soil erosion, and shading the stream to keep waters cool for fish. These areas can also absorb and slow flood waters, which protects property and human safety. Forested streamsides play an important role in maintaining clean water, even in watersheds that are mostly forested.+

Wetlands (swamps, marshes, bogs, and similar areas) are transition areas where the water table sits at or near the ground surface and which have plants adapted to the soggy conditions. Wetlands slow the flow of water and temporarily store it before releasing it downstream. Wetlands can hold a lot of water, which is why they help reduce flood risk. Wetlands also play an important role in recharging groundwater and maintaining stream flows during droughts.

Streams and rivers are natural waterways with a detectable current and a defined channel. Streams may flow year-round, seasonally, or only during times of heavy rain or snow melt. Water that ends in streams comes from runoff from the land as well as groundwater. Streams and rivers move water and sediment across a watershed. A stream is a dynamic system, shaped by water, the organisms that live in it, and the sediment it carries.

*Morse, J., J.N. Welch, A. Weinberg, and P. Szabo. 2018. Literature review: Forest cover & water quality – implications for land conservation. Open Space Institute Report. Retrieved online on November 4, 2021
+Morse et al. 2018

Figure 4. Regional Forest Linkages



Resource values

Because a successful conservation plan builds on shared values and recognizes competing interests, conservation planning typically starts with a discussion of values. The stakeholders shared both community and resource values that guided the development of the vision. The values are described in this chapter. Values were also part of the conversations about data, goals, outcomes, and tools.

Review data

There are abundant natural resource data and spatial analyses available for the Taghkanic Headwaters and larger region. CLC compiled existing data on forests, water, and wildlife, for an inventory based on the vision developed by the stakeholders. Stakeholders informed what data were included and identified where additional information was needed.

Figure 5. The conservation planning process used by the stakeholders. Though the graphic shows a linear process, there were times when the stakeholders re-evaluated their understanding and adjusted the path forward.

Goals and outcomes

There are many actions people can take to support forests, water, and wildlife in the Taghkanic Headwaters. Stakeholder discussions about goals focused on what they hoped would happen because of this plan. This plan's goals help focus the work and prioritize implementation of those actions that will best implement the vision.

Tools and strategies

Numerous programs and resources are available for people seeking support in stewarding forests and waters that could help implement the goals, outcomes, and actions. Chapter 4 of this plan focuses on tools and examples that will best implement the goals and were informed by stakeholder input on what would work in their communities.

Make it happen

The plan was developed with the idea that many people, as individuals or working together in groups large or small, would be engaged in implementing the recommended actions. How the plan is implemented depends on the stakeholders, the towns, and CLC. Different people and organizations will pursue actions that align with their interests and energy. CLC will use this plan to guide its conservation work in the watershed, which encompasses education programs for landowners and residents, working with landowners to support active forest management, and partnering with municipalities.

Creating a vision based on shared values

To support the plan's focus on forests for water, wildlife, and people, stakeholders identified the natural resource values that were most important to them. These values were distilled into *primary conservation values* and co-benefits based on the purpose of the plan. The primary conservation values are the focus of the plan's vision and are reflected in Goals 1 and 2.

Table 1. Primary conservation values identified to guide the plan.	
Clean water for people and wildlife	Forests for plant and animal habitat connectivity
Clean drinking water for people in the City of Hudson and those on wells	Large forests
Supports habitat for eastern brook trout and other species	Forest connectivity
Stream buffers and floodplains along forests are protected	Resilient forests
Rich, diverse habitats including healthy wetlands	Supports native plants
Abundant and sufficient water supply	Supports ecosystem recovery
	Healthy wildlife

What is forest connectivity?

In this plan, forest connectivity refers to the degree to which forest patches are connected to each other to facilitate the movement of wildlife and other ecological processes.* Some animals spend their whole lives in a very small area, while others need to travel across the landscape to get to wintering, breeding, or feeding habitats in different seasons. The ways people have altered habitats and developed the landscape limits many animals' abilities to move safely – effects evident in roadkill and deer-motor vehicle collisions.

This plan focuses on physical features in the landscape that allow wildlife to move more easily, particularly forests. Forest connections were estimated through computer modelling and mapping.

Think of forest connectivity like a strand of lights. When every bulb is intact, the whole strand lights up. Break a bulb, though, and you may not see a single twinkle. In the landscape, breaking a bulb might look like paving a new road or a long driveway, draining a wetland, or building a house. Once broken, the habitat simply cannot function for much of the wildlife that call it home. Large blocks of land, especially forests, benefit people, too–filtering drinking water, storing carbon, and providing us with places to recreate. As the climate warms, these connections will become even more important as some species will need to move northward and higher in elevation to remain in a suitable temperature range.

*Definitions adapted from NYS Department of Environmental Conservation. 2020. NYS Forest Action Plan, Albany, NY and Staying Connected Initiative Website: www.stayingconnectedinitiative.org/our-region/geography/

The *co-benefits* are other resources of concern to stakeholders that may be addressed but are not the focus of the plan. For example, one co-benefit was accessible open spaces, such as Public Conservation Areas. One likely outcome for this plan is that additional areas will be protected from future development. These areas may provide recreational opportunities for the community; however, the plan does not assess the accessibility of these open spaces.

Co-benefits

- Support small farms and agricultural diversity
- Promote sustainable, regenerative agriculture in the watershed
- More natural, less "tidy" landscapes
- Accessible open space
- Peaceful rural character of the community

The stakeholders shared many personal, natural resource, and community values throughout the planning process. They started with values that guided the process and plan that emphasized community, care for the region, collaboration, learning, and sharing this work with others. These community-based values brought a shared sense of purpose for the project and are reflected in Goal 3.

A Vision for the future of Taghkanic Headwaters

The stakeholders adopted a long-term vision based on their values that represents what they hope to see in the watershed many years in the future:

This vision for the future is the core of the plan and affects everything that came afterward: including what data were included in the inventory (Chapter 2), the focus of the goals and actions (Chapter 3), as well as the tools for implementation (Chapter 4).

Vision Statement

The Taghkanic Headwaters and the lands that surround it support clean water for people, plants, and animals, and provide vital wildlife habitat connections between New York and New England.

We envision a future Taghkanic watershed that is cared for by local communities and landowners to protect clean water and the ability of fish and wildlife to move across the landscape.

CHAPTER TWO

Why is it important to protect the Taghkanic Headwaters?

Natural resources of the Taghkanic Headwaters

As part of the planning process, CLC, stakeholders, and consultants searched for existing data and drew from local knowledge to aid in understanding of the forests and waters of the Taghkanic Headwaters. This section starts with forested land, then moves to streamside areas where land and water meet, and ends with the Taghkanic Creek and tributaries. The content of this section is guided by the primary conservation values set out in the vision statement for the plan.

This chapter describes key features and resources, including water bodies, forests, and wildlife. It also covers the important benefits the forests and waters provide to people, as well as other values such as connectivity of habitat for wildlife. It reports what is known about the condition of resources such as forest health and water quality. Important potential threats are described, too. A guiding question for this chapter came from a stakeholder midway through the process who asked, "What is changing, what are the threats, and what is needed to maintain connectivity and water quality?"

The watershed is heavily forested with both large roadless forests and extensive wooded wetlands.

Finally, the chapter wraps up highlighting several places within the watershed that are particularly important to achieving the vision. These places, with more detailed planning, could become priorities for local protection through strategies such as development restrictions or creation of new municipal policies. Each of the four towns has one or more of these places of special focus.

Because the amount and quality of water in a stream is influenced by all the land that drains to it, we begin with a look at the land area of the watershed. Before discussing the creek and other waters in detail, we address streamside areas, where the land and water mingle most obviously.

Forests of the Taghkanic Headwaters

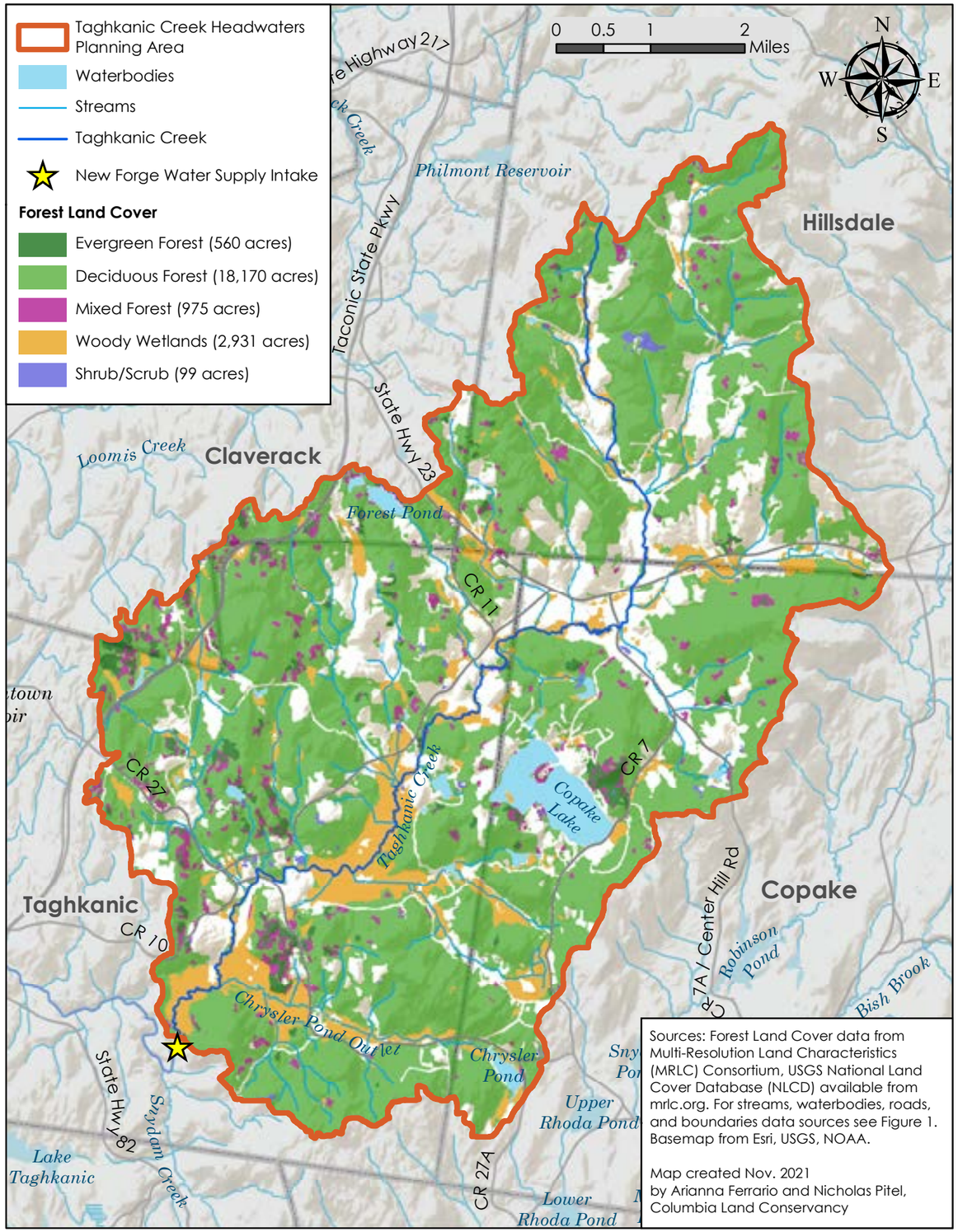
Though woods, fields, farms, wetlands, and development are all present in the Taghkanic Headwaters (Table 2), forests and woodlands dominate the watershed, covering an estimated 75% of the area (Figure 6). Agriculture covers an estimated 17% of the watershed, and the Taghkanic Creek and several tributary streams flow through farmland.

Many of the forests in the watershed are greater than 1,000 acres (Figure 7). Larger forested areas with few roads are more capable of rebounding following a major disturbance such as ice storms or insect damage. Smaller patches of forest (<500 acres) are less protected from these kinds of events, have a smaller bank of seeds for regeneration, and have more exposure to other influences that could impede regrowth of the forest, such as invasive species. Still, smaller forest areas are important stepping stones for wildlife, and can support water quality.

Most of the forested area in the watershed is one of two common forest types: hemlock-northern hardwood forest and Appalachian oak-hickory forest.[1] Hemlock-northern hardwood forests tend to be found on cooler areas on north-facing slopes and in ravines along streams. Appalachian oak-hickory forests are found on drier south and west-facing slopes. Different kinds of forests are at different risks to insects and climate change.

[1] Based on interpreted satellite data in Ferree, C and M. G. Anderson. 2013. A Map of Terrestrial Habitats of the Northeastern United States: Methods and Approach. The Nature Conservancy, Eastern Conservation Science, Eastern Regional Office. Boston, MA.

Figure 6. Forest Land Cover



Sources: Forest Land Cover data from Multi-Resolution Land Characteristics (MRLC) Consortium, USGS National Land Cover Database (NLCD) available from mrlc.org. For streams, waterbodies, roads, and boundaries data sources see Figure 1. Basemap from Esri, USGS, NOAA.

Map created Nov. 2021
by Arianna Ferrario and Nicholas Pitel, Columbia Land Conservancy

Table 2. Land Cover in the Taghkanic Creek Headwaters, 2016.[2]

Land Cover Category	Acres	Percent
Forest	22,730	75
Agriculture (cultivated crops and hay/pasture)	5,302	17
Wetlands	3,128	11
Developed	1,845	1
Water	620	2

Note: In this table, woody wetlands are counted in both the forest category and the wetlands category, resulting in a total percentage slightly over 100%. Wooded wetlands alone make up 10% of the watershed area.

The forests of the Taghkanic Headwaters provide vital connectivity for wildlife, but the connections are fragile.

Connectivity for wildlife is a primary conservation value for this plan. Today, the large forests of the watershed provide ample room for wildlife that range over large areas, such as bear, bobcat, and fisher. Over the long term, plants and animals also need the opportunity to find new homes in response to the warming climate. Species that require cooler conditions may find new homes on cooler northern slopes, at higher elevations, or by shifting northward. The large forests of the watershed offer these opportunities. But loss of forest could block wildlife from accessing more favorable habitats.

Forests in this watershed are large enough to function as connections among the largest forested areas in the northeastern United States. Figure 8 shows two local forest linkages bracketing the Taghkanic Headwaters. These linkage zones include many of the largest areas of forest in the watershed.

Forests are changing and are at risk

Although forests are still abundant, their future is fragile.

Forests and streams are central to human history in the Taghkanic Creek Headwaters, as elsewhere in the Hudson Valley. Indigenous people have lived sustainably on this land for thousands of years. Starting in the 1600s, European settlers cleared forests for fuel, building, manufacturing, and farming so that by 1900, Columbia County lost 80% of its forests.[3] The forest has mostly regrown since. However, it appears New York's forest cover peaked in the early 2000s, and now it is slowly declining; from 2001-2019, Columbia County had a net loss of about 300 acres of forest.[4]

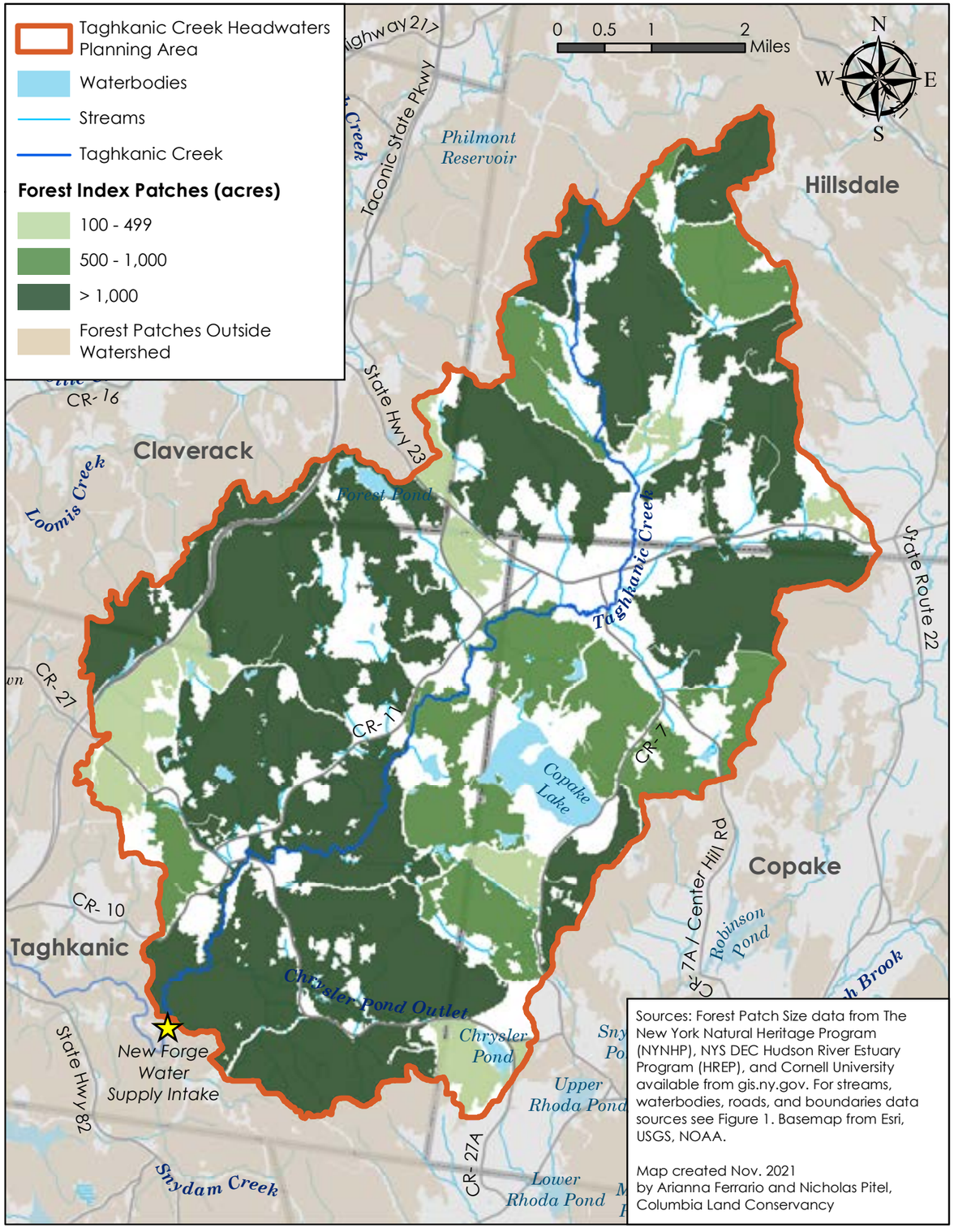
The forest is changing in other ways too. An analysis by the US Forest Service shows that the forest in Columbia County is becoming more fragmented over time. From 1990 to 2010, the areas where human

[2] Us Geological Survey. National Land Cover Data. The land cover data are derived from a satellite that captures images in 1000-square-foot blocks, which gives Figure 6 its boxy quality. Nationally, when these land cover data were compared to aerial photography, the data were correct about 86% of the time. That means people should not expect these data to be accurate at specific locations in the watershed. Wickham, J., S. Stehman, L. Gass, D. Sorenson, L. Gass, and J. Dewitz. 2021. Thematic accuracy assessment of the NLCD 2016 land cover for the conterminous United States. Remote Sensing of Environment, Vol. 257, 2021, 112357, ISSN 0034-4257, https://doi.org/10.1016/j.rse.2021.112357. Read more about the applications and limitations of these data on the National Land Cover Database factsheet.

[3] Vispo, Conrad. 2014. The Nature of Place: A History of Living with the Land in Columbia County, NY. Adonis, Hillsdale, NY; land use change data from www.mrlc.gov/eva/

[4] Albright, Thomas A.; et al. 2020. New York Forests 2017. Resource Bulletin NRS-121. Madison, WI: U.S. Department of Agriculture, Forest Service, Northern Research Station. 118 p. https://doi.org/10.2737/NRS-RB-121; Vispo, Conrad. 2014; Land cover change data from https://www.mrlc.gov/eva/

Figure 7. Forest Patch Size



development meets undeveloped vegetation in the county increased by more than 20%,[5] indicating that new building is happening in natural areas. Increased development has the potential to change how forests function.

Threats to forests

Development causes forest loss and fragmentation

Today, development is the biggest threat to forest connectivity in the Taghkanic Headwaters. It happens so slowly that it may not seem like there is an impact, but many small changes add up over time. The construction of roads, driveways, utility lines, and even recreational trails, which individually seem minor in a largely forested area, can have outsized impacts on wildlife. Animals move around to meet their needs. New construction splits habitat into smaller and smaller areas, a process called fragmentation. Impacts of new clearing and new development can extend 300 feet into the surrounding forest.[6] Evidence of the effect of fragmented forest on wildlife can be seen on wet nights in spring, when frogs and salamanders make the treacherous move from forest to wetlands: roads cutting across their path become high kill zones.

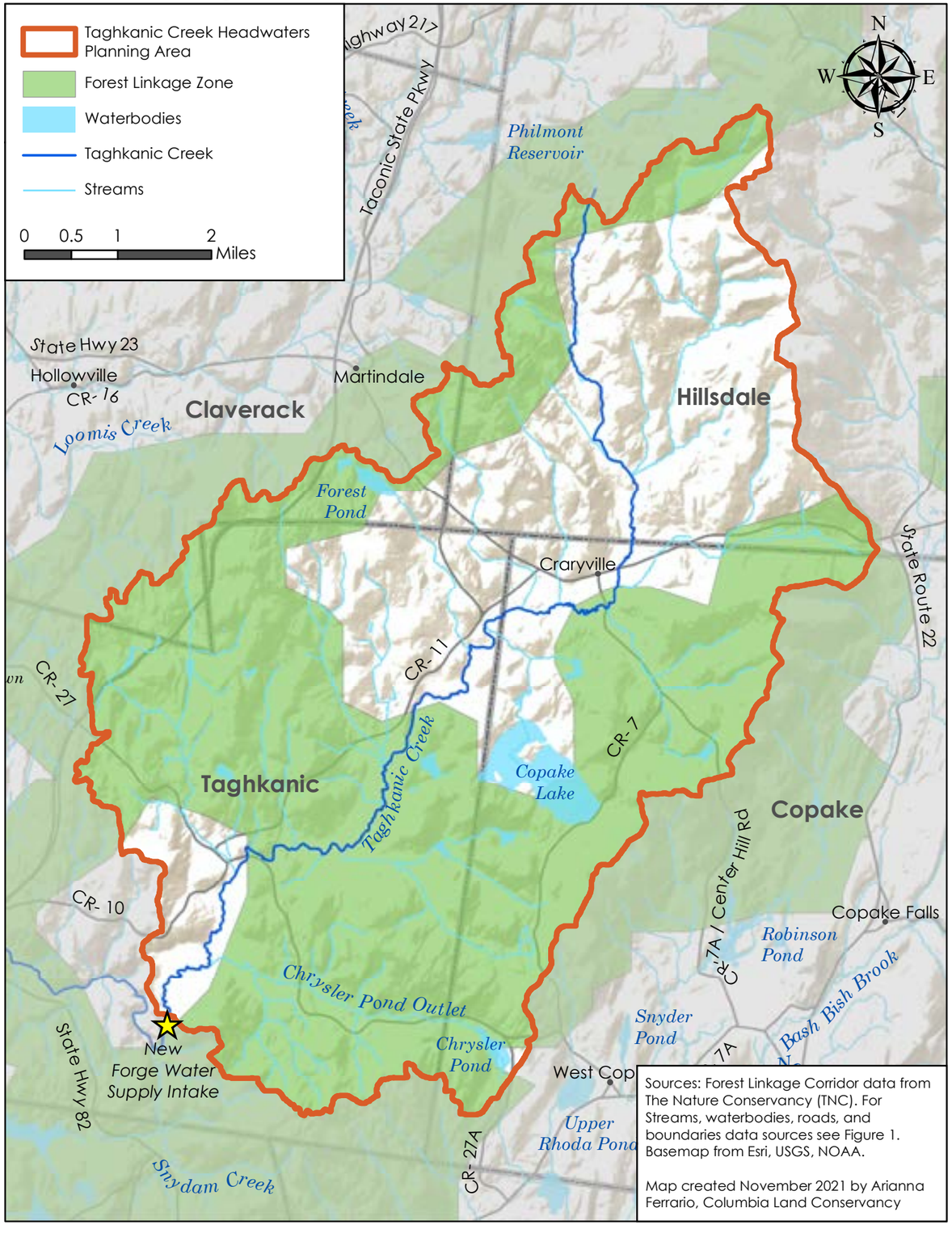
Eight percent of the watershed is protected from development by the state and conservation organizations (Figure 9). New York State owns and manages New Forge State Forest and Doodletown Wildlife Management Area. A number of private properties have voluntary preservation agreements with Columbia Land Conservancy which restricts future development. Although development is the greatest risk to forests, there are ways to site homes and driveways so that they have less impact on forests and wildlife.

Partners in regional conservation

Recognizing the crucial importance of the forest connections, many organizations have come together to work across boundaries on regional conservation. These efforts seek to restore and enhance landscape connections for the benefit of people and wildlife. CLC coordinates the Berkshire-Taconic Regional Conservation Partnership working with organizations in New York and three other states. The Staying Connected Initiative brings together organizations across the northern Appalachians in the eastern U.S. and Canada.

[5] Albright et al 2020.
[6] Vispo 2014

Figure 8. Localized View of Forest Linkage



Pests and pathogens weaken and kill forest trees

Forest pests and pathogens are a significant threat to forests in Columbia County and around the state. These include insects like emerald ash borer and hemlock wooly adelgid as well as beech bark disease, which is caused both by insects and a fungal pathogen. These pests represent a significant disturbance when they attack large numbers of trees, canopy species, and/or the trees which may make up a large portion of any one forested area.

Overbrowsing by deer prevents new growth

According to an analysis by The Nature Conservancy, New York State's forests are not regenerating well enough to become healthy, diverse woodlands in the future.[7] In the Hudson Valley, that is because there are too many white-tailed deer that eat most of the forest understory, including tree seedlings, which are essential to the future forest. The New York Forest Owners Association has concluded that deer browsing is the number one problem threatening the future of woodlands in New York.

Invasive plants

Invasive plants are another threat to forests. Non-native plants are tolerant of a wide range of conditions and thrive where soil has been disturbed. With few natural predators, they can grow unchecked, crowding native plants that provide food and cover to native wildlife. Plants like tree-of-heaven, Japanese barberry, and Oriental bittersweet can spread easily along wildlife and human corridors, often moved accidentally by people via nursery plants, clothes, footwear, or firewood. Driveways, trails, and other openings in the forests also become opportunities for invasive species that take advantage of disturbed ground.

Climate change

Climate change will affect all natural and human ecosystems and will exacerbate other threats. Forests have different abilities to adapt to the changes based on forest type and condition. The most common forest types in the Taghkanic Headwaters are expected to have low to moderate vulnerability to these changes overall, with drier oak forests experiencing fewer impacts from climate change than northern hardwood forests. Both these forest types are more resilient to change than the red-maple swamps along Taghkanic Creek.[8] Size, condition, and impact of other threats affect the ability of forests to adapt.

Streamside areas and wetlands

Streamside (or riparian) areas are dynamic. This can sometimes become obvious, as the photograph of the stream starting to undercut the foundation of the barn illustrates. A stream is more than the water flowing in the channel at any one time. At different times, water flows through the stream channel, across the wider floodplain, and sometimes onto higher ground. Streamside areas are critical to water quality, and to the quality of the habitat in the stream.

[7] Shirer, R., Zimmerman, C., 2010. Forest Regeneration in New York State. The Nature Conservancy, Eastern New York Chapter, Albany, NY.

[8] Janowiak, M.K.; D'Amato, A.W.; Swanston, C.W.; Iverson, L.; Thompson, F.R., III. [et al.]. 2018. New England and northern New York forest ecosystem vulnerability assessment and synthesis: a report from the New England Climate Change Response Framework project. Gen. Tech. Rep. NRS-173. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. 234 p. https://doi.org/10.2737/NRS-GTR-173

Pied Billed Grebe
Attribution: Dori, CC BY-SA 3.0, creativecommons.org/licenses/by-sa/3.0, via Wikimedia Commons

Stinkpot Turtle
Photo by Bruce Hallman/USFWS

Brook Trout
United States Fish and Wildlife Services, Public domain, via Wikimedia Commons

Smooth Greensnake
Attribution: Ryan Hodnett, CC BY-SA 4.0 <https://creativecommons.org/licenses/by-sa/4.0>, via Wikimedia Commons

Streamside areas are places of transition, and there is a lot of interplay between water and land in these areas. Woody vegetation along streams is especially important for stream health. Trees and shrubs have deep roots that stabilize streambanks, filter polluted runoff, and shade the stream, keeping it cooler. Recent studies suggest good water quality is likely if at least 70% of streams have forested buffers and 60% of the watershed is forested.[9]

Wetlands make up 11% of the Taghkanic Headwaters area. Most are woody wetlands found along the Taghkanic Creek and its tributaries. This type of wetland declined faster than any other land cover in Columbia County from 1996-2016, with a loss of 120 acres or about 2% of their total area. Figure 6 shows extensive areas of wooded wetlands in a light shade of orange. Large areas of streamside wetlands are found in Craryville (Copake and Hillsdale), Pumpkin Hollow (Taghkanic), and near New Forge State Forest (Taghkanic). These same areas also show up clearly in wetland maps (Figure 10).

The large, wooded wetland areas are most likely to be red-maple hardwood swamp. Not only does remote sensing indicate this type of wetland, but the New York Natural Heritage Program documented a very high-quality example of this natural community at New Forge State Forest. Smaller high-quality wetlands in the area include floodplain forest, emergent marsh, and temporary woodland pools called vernal pools.

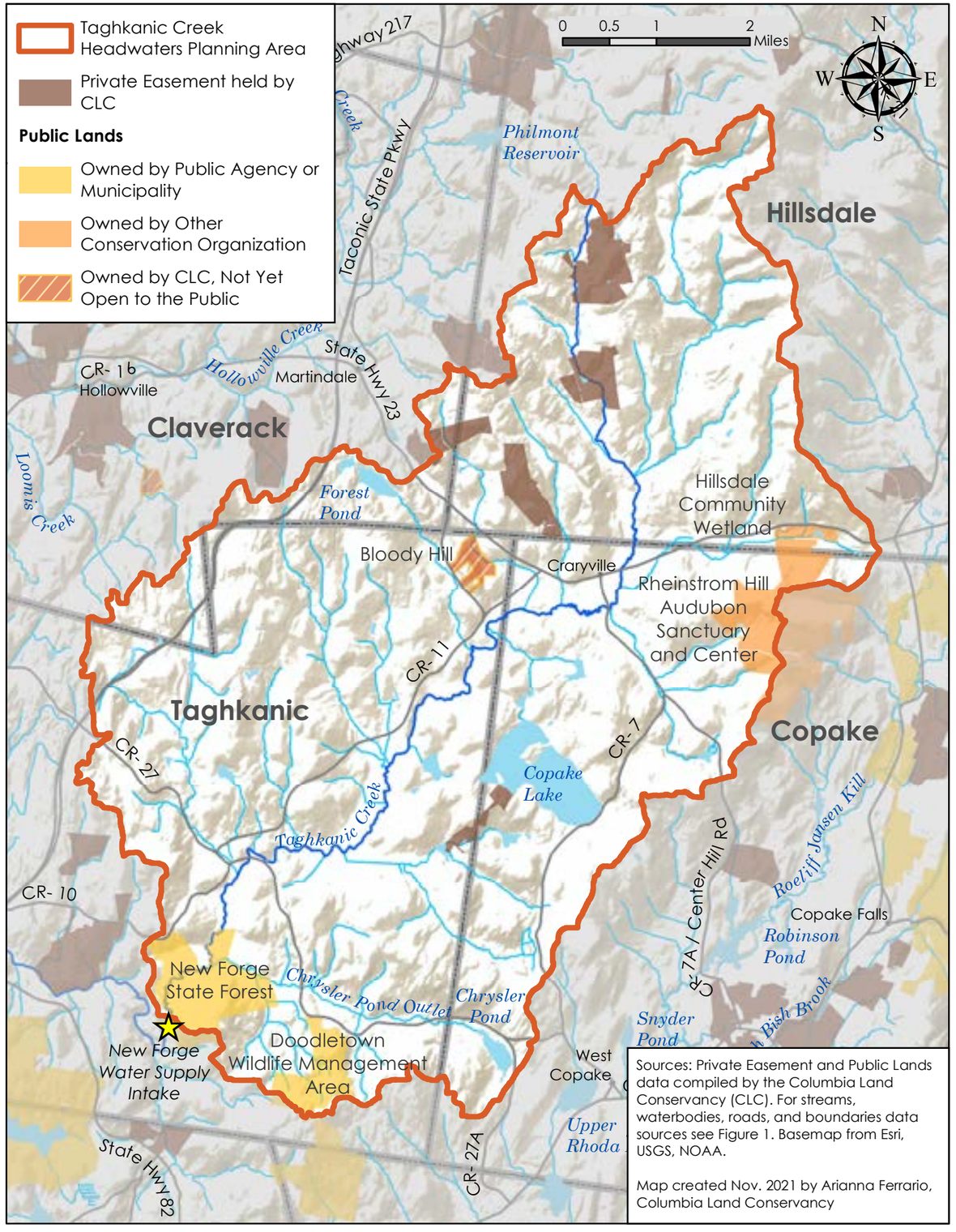
Streamside areas are where we find "ancient" floodplain forests. "Ancient" refers to the fact that these are the oldest forested floodplains in the area. the trees in these areas date to at least the 1940s. A Columbia County study of floodplain forests found that these areas are likely to be home to a greater variety of native plant species and to have fewer non-native or invasive plant species. The ancient floodplain forests of were found to be not only rare, but also "ecologically unique and potentially irreplaceable."[10]

Figures (L): Wetland and streamside habitats are important for rare and threatened species.

[9] Morse et al 2018

[10] Knab-Vispo, C. and C. Vispo. 2010. Floodplain forests of Columbia and Dutchess counties, NY: Distribution, biodiversity, classification, and conservation. Hawthorne Valley Farmscape Ecology Program, Ghent, NY. 67 p. + appendices.

Figure 9: Protected Lands



Rare plants and animals of streamside areas

Rare plants and animals documented in the Taghkanic Headwaters region are associated with wetlands and streamside areas, including the Least Bittern and Pied-billed Grebe. These wetland specialist birds inhabit marshes with clean water and plenty of small animal prey.

Rare plants

There are two plants considered to be rare in New York State that have been documented in the watershed. Dragon's mouth orchid, *Arethusa bulbosa* is a wetland plant, is considered threatened in New York. Schweinitz's flatsedge, *Cyperus schweinitzii* is found in sandy soils and requires disturbance to persist. Landowners can learn about these and other rare plants by consulting the New York Natural Heritage Program.

Several other animals that are considered by New York State to be at risk of endangerment or have another welfare concern (New York-designated "species of special concern") are found here. The smooth greensnake, snapping turtle, spotted turtle, stinkpot (or musk turtle), and wood turtle all depend on wetland areas. Habitat destruction is a main threat to these species in New York. Appendix B provides a list of species found in the watershed that have conservation status and their habitats.

Areas in the Taghkanic Headwaters that are known to be important to rare plants, rare animals, and significant natural communities are shown on a map in Appendix B.

Threats to streamside areas and wetlands

Streamside areas and wetlands are vulnerable to filling, clearing, and grading, as well as influences from activities nearby. A patchwork of local, state, and federal rules applies, which may provide limited protection to these sensitive areas.

The creek and tributaries support trout and, in some places, rare animals.

Figure 10. Taghkanic Creek, Tributaries, and Wetlands

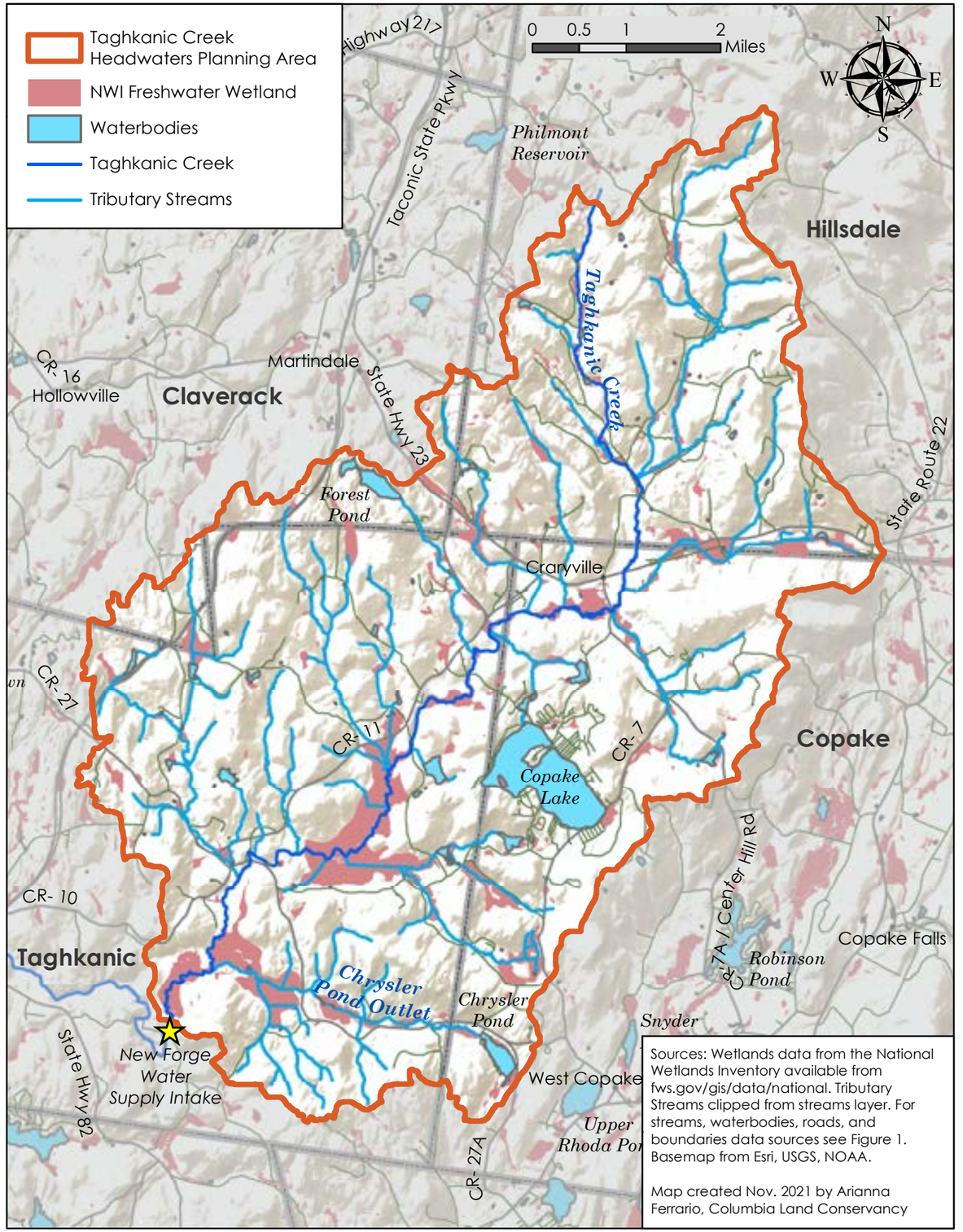
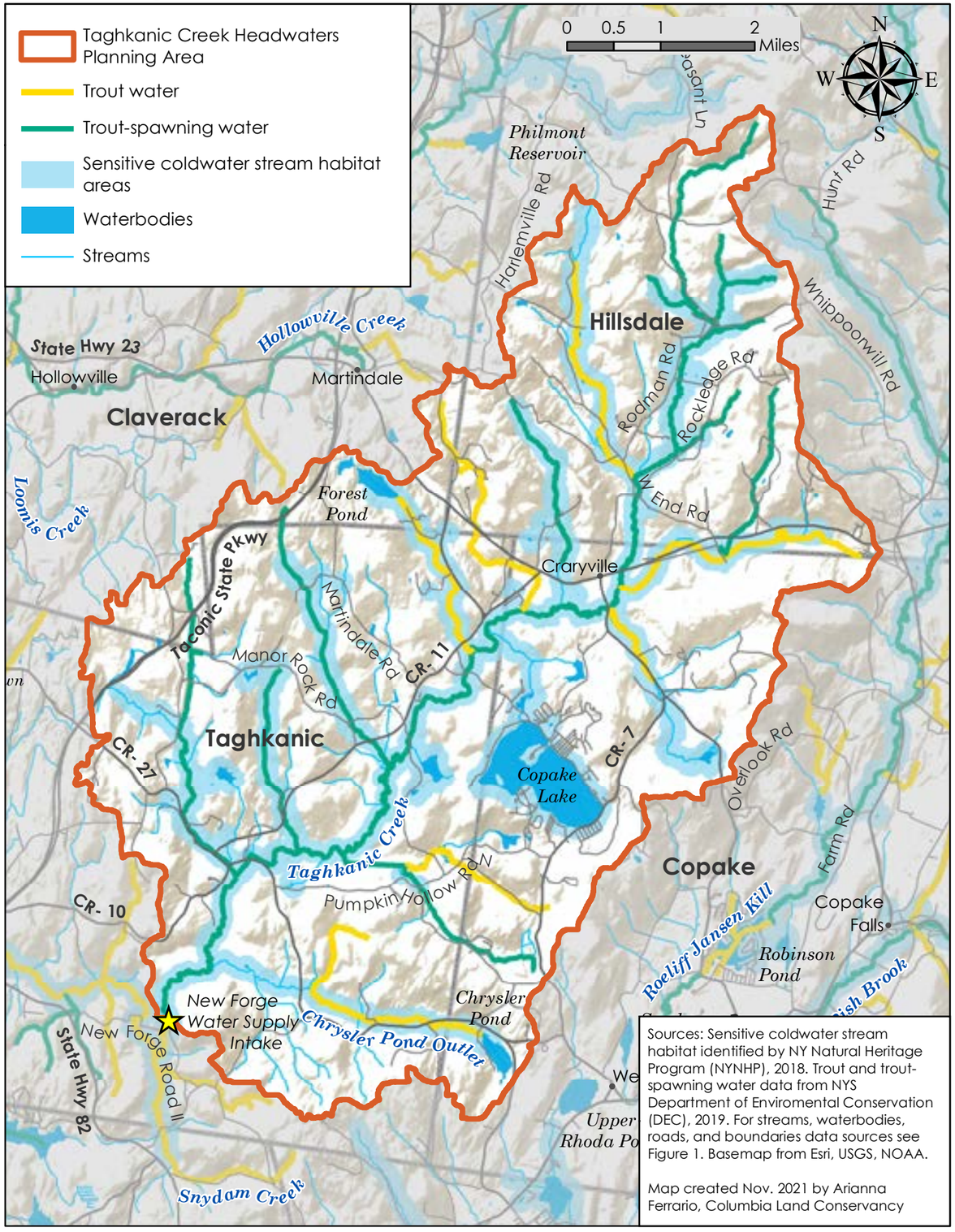


Figure 11. Sensitive Stream Habitat and Trout Waters



Sources: Sensitive coldwater stream habitat identified by NY Natural Heritage Program (NYNHP), 2018. Trout and trout-spawning water data from NYS Department of Enviromental Conservation (DEC), 2019. For streams, waterbodies, roads, and boundaries data sources see Figure 1. Basemap from Esri, USGS, NOAA.

Map created Nov. 2021 by Arianna Ferrario, Columbia Land Conservancy

Taghkanic Creek and tributaries

The Taghkanic Creek receives water, nutrients, and sediment from of a network of creeks and headwater streams, including both those that flow seasonally and year-round (Figure 10). People rely on these waters, from the unmapped springs and seeps that contribute clear, cool groundwater, to ponds and lakes. Copake Lake, which at 432 acres is the largest water body in all of Columbia County, and the nucleus of the densest development in the watershed. The City of Hudson relies on the creek to supply its residents with drinking water.

The watershed has streams in steep areas with swift-moving waters, and others that are lower-gradient, with slower water flow. The streams that flow to the Taghkanic Creek are largely unnamed, except for Chrysler Pond Outlet, which flows through Copake and Taghkanic. The other named water bodies include Copake Lake (Copake), Forest Pond (Claverack), and Melcher Pond (Copake). In headwater areas like this one, intermittent streams that flow only occasionally make up a significant proportion of the total network. These streams are often missed on existing maps and protection is overlooked. Springs and seeps are often unmapped as well, increasing their vulnerability to degradation, which can affect the Taghkanic Creek.


Taghkanic Creek

Streams are habitats for fish

The New York Natural Heritage Program has identified nearly all the streams in the Taghkanic Headwaters as “sensitive cold water stream habitat areas” (Figure 11). Cold water streams are sensitive to increased temperatures and stay cooler when trees remain in place. Available data suggest there is good quality habitat in the Taghkanic Creek and the other headwater streams. While brown trout are more tolerant of a range of temperatures, native brook trout prefer cooler temperatures and are more sensitive to pollution, and thus these fish are generally restricted to the upper reaches of the Taghkanic Creek and its tributaries.

Groundwater

The Taghkanic Creek and its tributaries receive water from the ground. In dry periods, groundwater entering the stream can be a significant amount of the total water flowing.[11] Groundwater stored in **aquifers** are found in several areas along the Taghkanic Creek and some of the tributary streams (Figure 12). A high-yield aquifer is mapped in the hamlet of Craryville in yellow. The potential to draw significant amounts of water from other aquifers, such as to supply a public drinking water system, has not been assessed for most aquifers in the watershed.[12]

The Taghkanic Headwaters provides drinking water

Throughout the watershed, residences, farms, and businesses rely on groundwater supplied by private wells or public water systems.[13] These wells draw water from relatively shallow aquifers or from deeper

[11] Winter, T.C., J.W. Harvey, O.L. Franke, and W.M. Alley. 1998. Ground water and surface water: A single resource. U.S. Geological Survey Circular 1139. 53pp. https://pubs.er.usgs.gov/publication/cir1139

[12] More information about groundwater sources is found in the municipal groundwater reports prepared by the New York Rural Water Association, and the Columbia County Natural Resources Inventory.

[13] Any system having at least 5 service connections or that regularly serves an average of at least 25 people daily for at least 60 days out of the year is considered a public water system.

sources in bedrock. Based on the towns' groundwater studies, most residents in the watershed are using wells that tap into bedrock. The towns of Copake, Hillsdale, and Taghkanic each have reports produced by the New York Rural Water Association that both describe the sources, quality, and quantity of groundwater and recommend ways communities may protect this important resource.

Residents of the City of Hudson rely on drinking water from the Taghkanic Creek. At New Forge, water is diverted from the Taghkanic Creek to supply the drinking water for the City of Hudson. The water flows through a pipe to the Churchtown Reservoir, where it is stored before being piped to a water treatment plant on Academy Hill in Hudson. If more water is needed, the City of Hudson can increase the flow of water from Copake Lake into a tributary to the Taghkanic Creek to supply adequate water to the city, which has happened at least once. [14]

Water quality in the Taghkanic Headwaters

The Taghkanic Headwaters provides clean water

The mix of land use in the watershed suggest that the water in the headwaters of the Taghkanic Creek will be good quality. The limited data we have about the water quality of the Taghkanic Creek also indicate that it is good. The NYS DEC collects water quality data in many streams throughout the state on a rotating basis. The lower and middle sections of the Taghkanic Creek and tributaries were sampled in 2002 and an assessment was published in 2007 (Appendix A). There are insufficient data to determine water quality in the headwaters of the Taghkanic Creek, which includes numerous tributaries, thus NYS DEC lists it as "unassessed." The portion of the Creek the closest to the New Forge intake has no known impacts based on a few samples. The water quality reports produced by the City of Hudson indicates the water in their system, once treated, meets all drinking water standards.

Copake Lake, Erin Philip

[14] personal communication, Rob Perry, September 4, 2019; Winkley, S. 2008. Draft Groundwater Protection Plan for the Town of Taghkanic, Columbia County, New York. NY Rural Water Association. Hudson, NY.

Figure 12. Aquifers

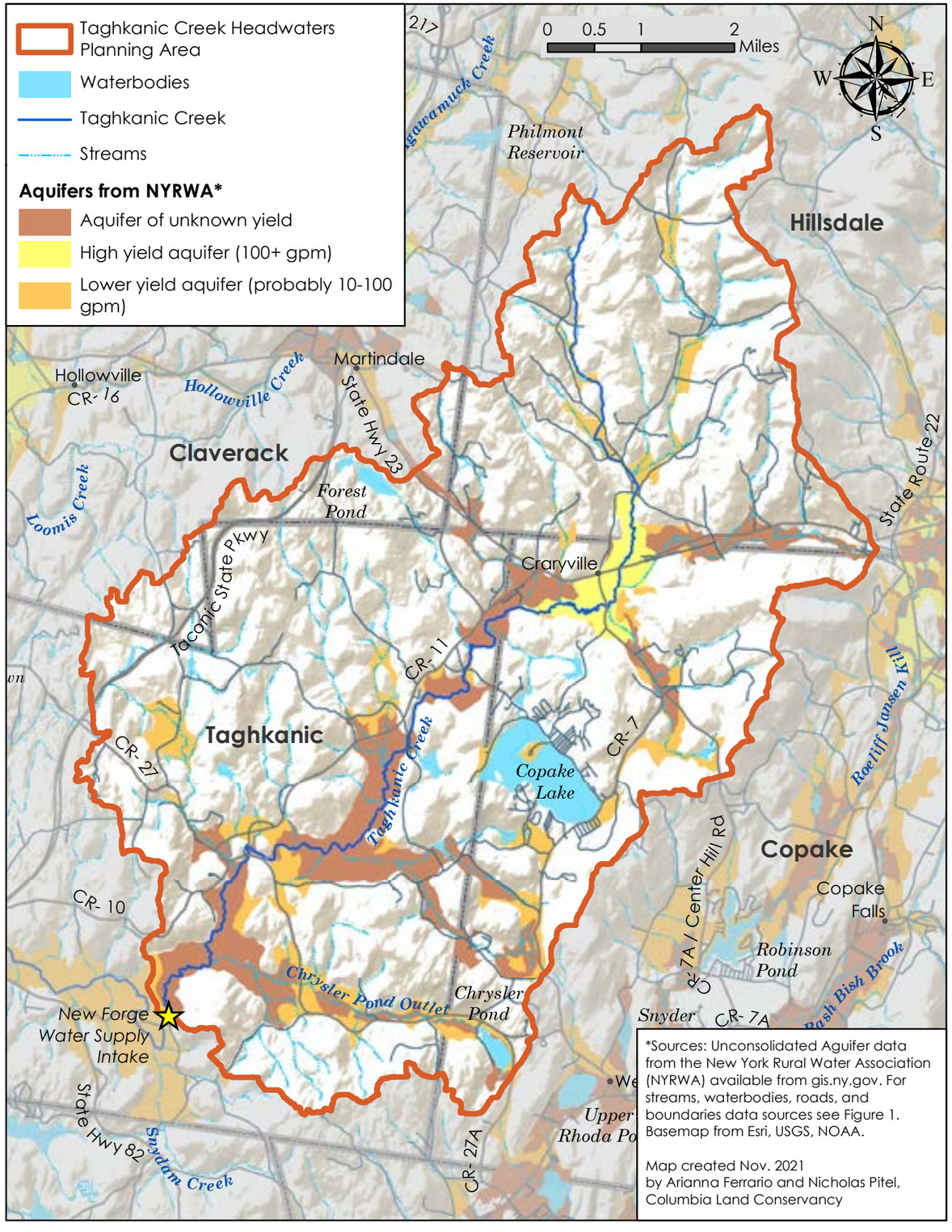
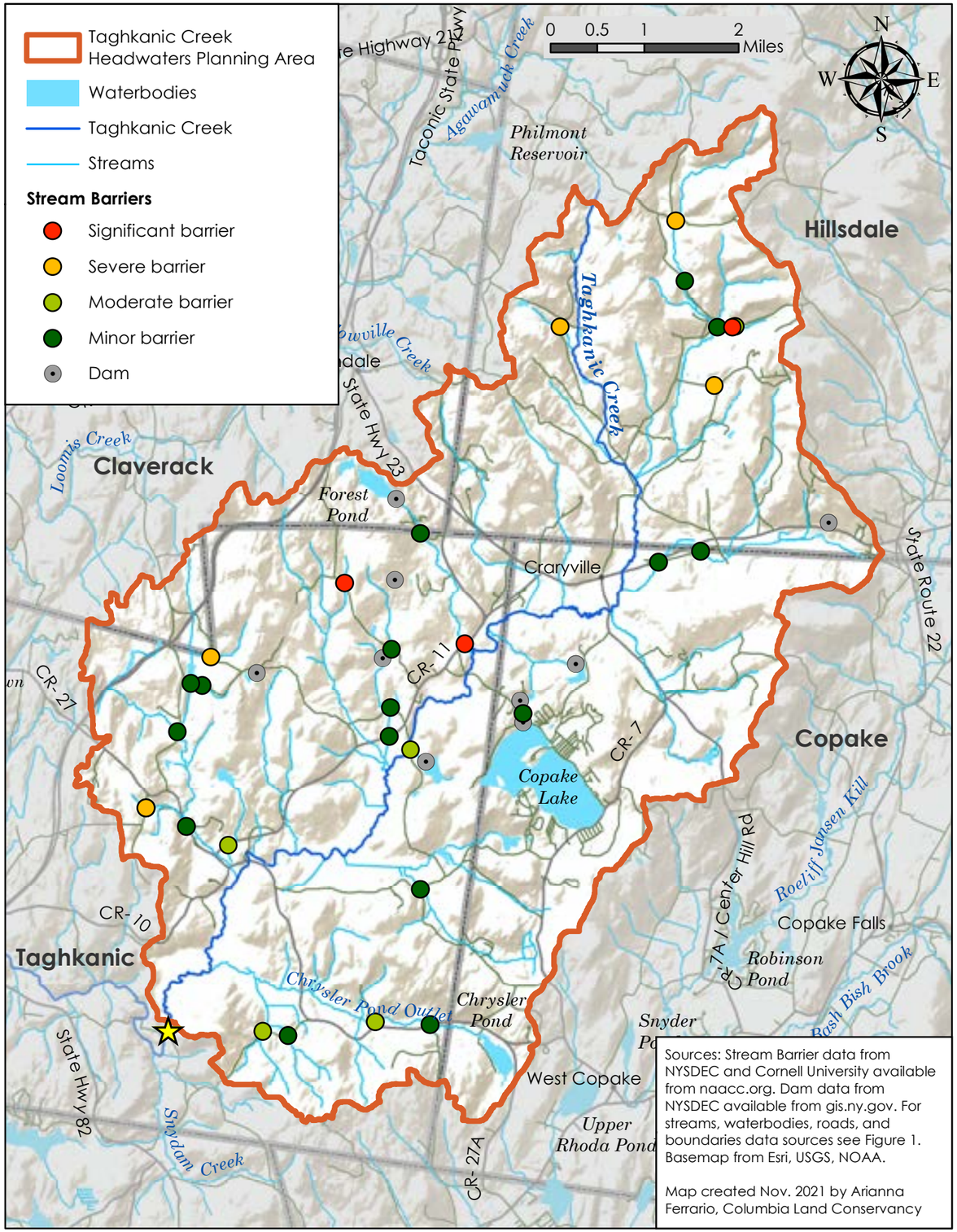


Figure 13. Stream Barriers



Water in Copake Lake, which flows to the Taghkanic Creek via a small stream, is impaired and being managed.

Copake Lake is listed as an impaired water body by the NYS DEC due to excessive nutrients.

Water quality is a challenge at Copake Lake. Partly natural and partly human-made, Copake Lake is the largest waterbody in the watershed. The community around the lake is the largest, most densely settled place in the watershed. The Copake Country Club relies on a private sewer system that discharges to Copake Lake.[15] Copake Lake is listed as an impaired water body by the NYS DEC due to excessive nutrients, which leads to large algal blooms and reduced levels of oxygen in the water, threatening the organisms living in the lake. These problems are attributed to development around the lake and associated runoff, as well as failures of septic systems. Recreation is affected by reduced water clarity and algal and weed growth in the lake.[16] The Copake Lake Conservation Society works to reduce phosphorous in the lake and to manage aquatic plants, leading to improvements in water quality.[17]

The Lower Taghkanic Creek is listed as threatened because the reduced water flow caused by the water withdrawals by the City of Hudson has the potential to increase temperatures in the creek. Higher temperatures may cause stress for trout, especially during the summer.[18] There has been little water quality sampling of the Taghkanic Creek, but the few samples, taken further downstream, have shown no impact or slight impact.[19]

Threats to the Taghkanic Creek and its tributaries

Any development close to a stream has the potential to impact water quality and habitats and near the stream. When stream banks are armored with rocky material (rip rap) or concrete, it can change the flow of water, which can have effects downstream, possibly increasing erosion and sediment entering the stream, degrading habitat quality. Cold water streams are sensitive to increased temperatures and stay cooler when trees remain in place.

Water withdrawals

According to the City of Hudson's acquisition of water rights in the early 1900s, the city may divert as much as 2.25 million gallons per day from the Taghkanic Creek at New Forge to secure a safe public water supply. On average, the City of Hudson presently delivers about 1 million gallons per day. However, it is not known how much water is taken or used with any precision. No one measures stream flow in the Taghkanic, the amount of water captured at the intake, nor water usage in the City.[20]

The lower Taghkanic is listed as threatened due to the potential impact of water withdrawals, and additional study is needed to know if the fish or aquatic life are affected.

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[15] (Town of Hillsdale Wastewater Collection & Treatment System Site Plan, Clark Engineering. https://hillsdaleny.com/wp-content/uploads/2019/12/Sewer-District-as-Built.pdf accessed July 9, 2021

[16] Stevens, G. and K.B. Travis. 2018. Natural Resources Inventory of Columbia County, New York Columbia County Environmental Management Council and NYS DEC Data sheet for Copake Lake, see Appendix A).

[17] Copake Lake Conservation Society website and NYS DEC Data sheet, Taghkanic Creek, Lower and tribs, see Appendix A).

[18] NYS DEC Data sheet, Taghkanic Creek, Lower and tribs, Appendix A.

[19] One NYS DEC sample from 2013 in West Taghkanic 2013 showed slight impacts. WAVE samples taken in West Taghkanic by volunteers in 2014, 2015, and 2016 showed no known impact. The Farmscape Ecology Program at Hawthorne Valley Farm reports a sample of benthic macroinvertebrates taken from the Taghkanic Creek at the western town boundary that showed no negative impacts.

[20] (personal communication with Rob Perry, Hudson Public Works Director, August 25, 2021)

Stakeholders expressed concern about growth in the City of Hudson and the potential impact on water demand. Though the City of Hudson's population declined from 6,713 in 2010 to 5,894 in 2020, population data do not tell the full story of potential water use. Businesses are also served by the water system, and part-time residents are not counted during the decennial census. Housing data show there has been an increase in housing units that are dedicated to seasonal or occasional use in Hudson in the past five years.[21]

Runoff from the land

Much of the development in the Taghkanic Headwaters has low levels of impervious surfaces. Roofs, roads, driveways, and other impervious surfaces negatively influence water quality, an effect that may become evident even when such surfaces cover a very low percent of the watershed (3% or even lower).[22] Water flowing across these surfaces picks up materials such as animal waste, litter, nutrients, and pollutants such as motor oil. These inputs to the stream degrade water quality and can harm the plants and animals living in and near the stream.[23] Although the threat to water is currently low, the Taghkanic Creek water quality is most likely affected to some degree by runoff from lawns, roads, and farms.

In some places in the watershed where good soils for farming are found, people are farming in valleys near the Taghkanic Creek or its tributaries. Some agricultural practices may be detrimental to water quality and streamside habitats, by causing runoff or erosion. Polluted Farms that implement best management practices for soil and water conservation can support water quality.

Vegetated stream buffers are key to reducing the impacts of development and agriculture on streams and wetlands. A lack of vegetated buffers allows more potential pollutants to enter a stream and increases the potential for erosion.

Road salt is a growing potential threat

Road salt deposited on roads, driveways, parking lots and sidewalks may wash into streams and ponds. This influx produces a spike in salinity and may also deplete the oxygen available to stream life.[24] Water quality reports from the City of Hudson show sodium has been detected at levels that should not be consumed by people on severely restrictive sodium diets though still within the acceptable range.[25] The Taghkanic Creek may be affected by road salt. Chloride is toxic to aquatic life, causing harm even at low levels.[26] Road salt accumulates in sediments in drainage ditches, ponds, lakes, and wetlands, as well as groundwater. There is no easy way to remove road salt from the environment, making it challenging to restore affected water bodies.[27]

[21] Capital Region Indicators, Vacancy Status, https://www.capitalregionindicators.org/profile/3635969, accessed November 4, 2021.
[22] Morse, et al. 2018
[23] New York State DEC: Stormwater. https://www.dec.ny.gov/chemical/8468.html; accessed August 3, 2021.
[24] Hinsdale, Jeremy. 2018 "How Road Salt Harms the Environment" State of the Planet, Columbia Climate School.
[25] City of Hudson Annual Drinking Water Quality Report, 2020. Retrieved on December 3, 2021.
[26] Hinsdale 2018; Kelly, et al, 2019. Road Salt: The Problem, the Solution, and How to Get There, the Cary Institute of Ecosystem Studies.
[27] Hinsdale 2018

Invasive plants

Invasive plants are another threat to streamside areas. Among the materials that streams carry are seeds and materials from invasive plants, such as Japanese knotweed. Invasive plants mt form extensive monocultures, replacing native plant communities and destabilizing streambanks. Other species that can cause problems for streamsides include purple loosestrife and multiflora rose. The best way to avoid invasive species problems along streams is to leave trees and shrubs in place.

Culverts and dams

Culverts, dams, and other related infrastructure present threats to stream habitats. These structures influence the movement of water, sediment, animals, and materials in ways that affect the health of the stream and the in-stream habitats for organisms. These structures often slow water flow, leading to warmer temperatures in the stream. Water impounded by a dam often has less tree cover, which leads to warmer water.

Many of the organisms that live in streams need to move up- and downstream to access the different kinds of habitats they need to feed, breed, and grow. Culverts and dams may be barriers to the movement of animals, and effectively reduce available habitat. In the Taghkanic Headwaters, and other parts of the Hudson Valley, teams of volunteers and professionals have been assessing the culverts and dams along streams to identify those that pose barriers, especially those that impede wildlife movement.[28] Approximately twelve culverts that are considered moderate to severe barriers are present along the creeks in the Taghkanic Headwaters, as shown in Figure 13. Dams present in the watershed may create lakes that support community needs, such reservoirs for drinking water or recreation. Other dams are remnants from past mill sites or other activities. While dams are shown on the map, they are not ranked for their potential to impede the movement of wildlife.

Threats to both forests and streams

Development is increasing even as population is declining

In Columbia County, as in much of rural New York, development pressure does not come from population growth, but a change in the way we live on the landscape. Of the four towns in the watershed, only Claverack's population grew from 2010-2020 and only by 37 people. Yet from 2001-2019, the developed area for Columbia County increased 3.73% and the impervious area increased 11.72%.[29] Although the increases in developed area are relatively small, these small impacts contribute to the loss of forest and increase in fragmentation.

There is a perception that low-density development has less of an impact on wildlife and water than higher density development but, all development has impacts, even one house in the woods. While the footprint of a new house and yard is obvious, these sites and the activities around them exert an "ecological influence goes well beyond the footprint of the house and beyond backyard."[30]

Some animals rely on a special combination of forest and wetlands, and roads often lie in their path between the two.

[28] per New York State Water Resources Institute https://wri.cals.cornell.edu/hudson-river-estuary/watershed-management/aquatic-connectivity-and-barrier-removal-culvert-dams/.
[29] Land use change data from www.mrlc.gov/eva/
[30] Vispo 2014

Climate change exacerbates risks to forests and water

The Hudson Valley is already experiencing the unpredictable weather expected to occur more frequently as the climate changes. Healthy forest and stream ecosystems will be more resilient to changes in the climate. Climate change is expected to bring myriad changes to:

- The amount and timing of precipitation. Columbia County is seeing an increase in rainfall amount and intensity, especially during winter to spring. Prolonged summer dry periods will result in more low-flow conditions in streams, stressing fish and other aquatic life.
  Winter processes. This region will experience a longer frost-free season and a reduction in snowpack. Frozen ground plus heavy winter rains increase susceptibility to runoff and erosion, especially on unvegetated lands.
- Temperatures. Annual average air temperature is already 1-3°C higher in the eastern US.[31] More heat waves are expected, and plant and animal species will need to shift northward, higher in elevation, or find cooler microclimates (such as north-facing slopes).

These changes foretell risks to forests and water. Soil moisture will likely decrease with warmer, less snowy winters, fewer steady rainfalls, and higher evaporation from increased temperatures. This could lead to more frequent and intense periods of short-term drought, stressing local drinking water supplies, agricultural production, forest, and stream systems.[32]

Existing protections are limited

There are some state-level rules that provide some limited protection for Taghkanic Creek and other surface water resources in the watershed. New York State has no protection for forests, outside of those in the Adirondack or Catskill Forest Preserves. This points to the need for local conservation action. It is important to understand the gaps in protection, to identify what local actions will mitigate the threats.

- Watershed Rules and Regulations for the City of Hudson prevent some uses within 300 feet of the Taghkanic Creek and its tributaries. The 1972 regulations are outdated and enforcement is challenging given the different jurisdictions.[33]
- A state stream permit is required for alterations to the bed and bank of "protected streams" which includes the Taghkanic itself, as well its tributary streams.
- A state wetland permit is required for alterations to state-mapped wetlands 12.4 acres and larger plus a 100' buffer. For context, 12.4 acres is the size of nine football fields. Not all wetlands this large are mapped, and smaller wetlands have less protection. Direct impacts of activities such as filling and/or alteration of water flow to non-regulated wetlands will degrade water quality in the headwaters. Some towns require setbacks from streams and waterbodies, which prohibit development within a certain distance (often 50 or 100 feet) of a stream. These may or may not encompass all the lands that directly affect the stream, such as the entire floodplain.

[31] USGCRP, 2018: Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II [Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, 1515 pp. doi: 10.7930/NCA4.2018.

[32] See also Rosenzweig, C., 2011. Responding to climate change in New York State: Synthesis report. New York State Energy Research and Development Authority.

[33] See factsheet on New York State's Watershed Rules and Regulations.

AREAS OF EXCEPTIONAL CONSERVATION VALUE

Stakeholders identified two primary conservation values to guide this plan:

- *clean water for people and wildlife, and*
- *connected forests for plants and animals.*

These conservation values can help identify areas of high importance. CLC and stakeholders reviewed available data related to plants and animals, forests, streams, and several analyses of connectivity for wildlife. Five places emerge, each with its own mix of features, but all intricately connected to forest connectivity and clean water. These areas are places where additional conservation efforts might be prioritized, including land protection and land management.

Forested ridges and valleys, Hillsdale

Large forests along the ridges to the west and north of Knapp Hollow in Hillsdale are important parts of the linkage between large forests regionally. The Taghkanic Headwaters includes just the southern part of Kijt Uit Mountain; the large forests there extend outside the watershed, and are an opportunity to protect a forest pinch point for wildlife shifting their ranges in response to climate change. These lands also drain to sensitive coldwater streams which provide habitat for trout. From the small streams in this area, water flows through Knapp Hollow before joining the Taghkanic Creek.

Forests, Eastern Claverack

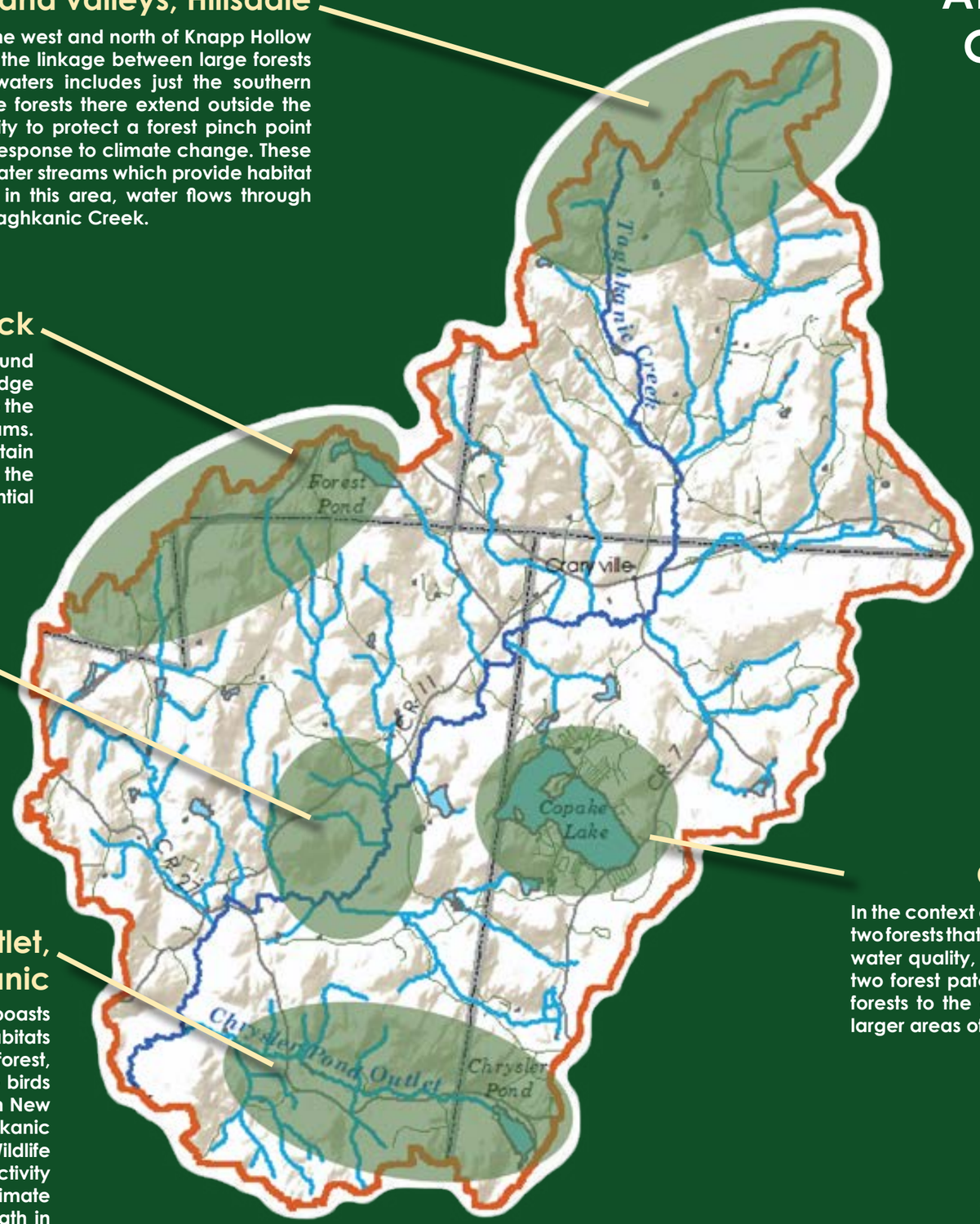
The largest forests in the Town of Claverack are found along the ridges and hills that make up the western edge of the watershed. The streams in this area, which flow to the Taghkanic Creek, are classified as trout spawning streams. Analysis by scientists highlights the opportunity to maintain forest connectivity in this area, with consideration for the size of the forests, road crossings, and other potential barriers for wildlife.

Pumpkin Hollow Swamp, Taghkanic

In Pumpkin Hollow swamp the Taghkanic Creek flows through the largest extent of forested wetlands and streamside habitat in the watershed. There is likely "ancient" floodplain forest here that supports a diversity of native plant species and has additional ecological importance. These extensive wooded wetlands help keep the stream cool, supporting brook trout spawning.

Chrysler Pond and Outlet, Copake and Taghkanic

The area around Chrysler Pond and along the outlet stream boasts an extensive complex of woods and wetlands. Important habitats include an exemplary red maple hardwood swamp, floodplain forest, vernal pools, "ancient" floodplain forest, and habitat for rare birds (including the Least Bittern, which is considered threatened in New York). Chrysler Pond outlet is a trout stream that joins the Taghkanic Creek at New Forge State Forest. Part of the Doodletown Wildlife Management Area is nearby. From the perspective of connectivity to support wildlife that are shifting their ranges in response to climate change, this area is of particular importance, providing a path in what is considered a pinch point in the surrounding landscape*.



Copake Lake forests, Copake

In the context of a densely developed lakeside community, the two forests that drain to Copake Lake are important for supporting water quality, which is somewhat degraded in the lake. These two forest patches are part of a linkage zone between larger forests to the east and west, providing connections between larger areas of forest (to the east and west).

*Anderson, M.G., Barnett, A., Clark, M., Prince, J., Olivero Sheldon, A. and Vickery B. 2016. Resilient and Connected Landscapes for Terrestrial Conservation. The Nature Conservancy, Eastern Conservation Science, Eastern Regional Office. Boston, MA

CHAPTER THREE

How do we achieve a connected Taghkanic Headwaters?

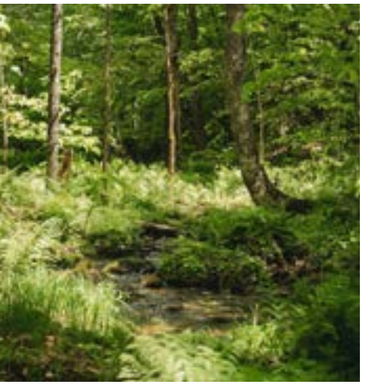
This chapter presents three goals consistent with achieving the vision. Each goal has outcomes or results that will show progress toward the goal. For each outcome, one or more actions are identified that CLC, committee members, watershed residents, or others might take to achieve the outcome. Some of the actions are already underway while others offer opportunities for creative partnerships. The tools and strategies introduced in this chapter are expanded on in Chapter 4.

GOAL ONE

The forests and woodlands that surround the Taghkanic Creek help keep drinking water clean and abundant, provide important habitat and pathways for wildlife, and provide other benefits for communities. In 2016, forests covered 75% of the Taghkanic Creek Headwaters. Forests of 500 acres in size and larger provide critical habitat for plants and animals over time and in the face of climate change.

Conserving forests is about more than protecting trees. The soil and understory (the plants that grow under trees) are a key part of the forest ecosystem and are essential to making sure forests remain in a healthy condition so that they can regrow and provide benefits. Cutting some trees allows light through so the understory can grow.

Forests and woodlands in the Taghkanic Headwaters are protected and managed so wildlife are able to move freely, water remains clean, and the woods are resilient to climate change.



Outcome 1.1

Large, forested areas remain throughout the watershed.

Purchase land and development rights in the areas of exceptional conservation value identified in this plan.

Enhance goals for protecting forests by recognizing forest connections, large forests, riparian forests, and forest types in local plans.

Minimize forest loss and fragmentation when siting new development, structures, utilities, or driveways.

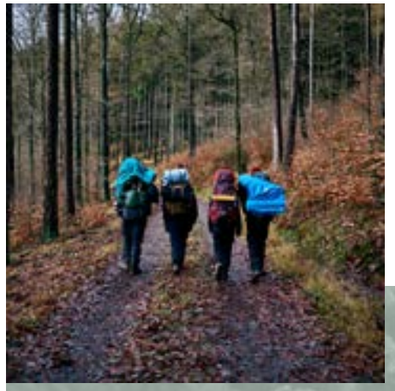
Outcome 1.2

People and communities throughout the watershed appreciate the value of forests and understand the connections among forests, drinking water, the Taghkanic Creek, and wildlife habitat.

Develop and share key messages about the important forests and streams of the watershed.

Identify and promote educational programs that highlight the importance of forests and woodlands in the watershed.

Recognize the importance of forests and wildlife habitats in municipal plans.



Outcome 1.3

Best forest management practices and tools become more widespread so there are healthy, diverse forests in conservation areas and on private lands.

Encourage landowners to monitor the condition of their forests.

Learn about forest management for wildlife by visiting Rheinstrom Hill Audubon Sanctuary and other demonstration sites.

Connect landowners to forest best management practices and resources.

Manage woodland and deer so new trees grow along with a lush understory to provide wildlife habitat improve resilience to climate change.

Allow active forest management practices to support improved forest health.

KEY TO SYMBOLS

Potential Partners

- Individual
- Group
- Municpal Government
- State Government
- Columbia Land Conservancy

Tools & Strategies

- Education
- Community Science
- Land Use Planning and Decision-making
- Land Management
- Land Protection

GOAL TWO

Abundant forest cover is crucial to water quality, and so to achieve the goal of "enough clean water," forest cover must be maintained. A recent review of scientific studies recommended that forests cover between 60 – 90% to support high quality water. Although the Taghkanic Headwaters is currently 74% forested, forest cover is declining. In addition to the total amount of forest, woody vegetation along streams is especially important for stream health. Trees and shrubs have deep roots that stabilize streambanks, filter polluted runoff, and shade the stream, keeping it cooler.

The Taghkanic Creek has enough clean water so it is a high quality habitat and it meets the needs of people, fish, and wildlife, including water supply and recreation.

Outcome 2.1

Taghkanic Creek has enough clean water.

Organize a group of citizen scientists to monitor water quality.

Share water-related information such as annual water quality, water withdrawal, and well water reports.

Outcome 2.2

People and communities are using land-based management practices and tools for protecting the creek, including protecting and restoring vegetated buffers along streams.

Encourage landowners to maintain or enhance woody plants along streams.

Promote programs that provide guidance and resources to help landowners implement stream best management practices.

Implement recommendations in municipal groundwater protection plans to limit hazardous uses in the most sensitive areas and ensure density regulations are protective of source water.

Use land use tools to reduce the impact of new development on streams, such as setbacks and siting to reduce erosion.

Outcome 2.3

Stakeholders throughout the watershed and the City of Hudson understand the connections among what happens on land, in the Taghkanic Creek, and for the City of Hudson.

Develop and share messages about the importance of streamside management.

Tell and promote stories about the connections.

Outcome 2.4

In-stream habitats are connected by removing or “right-sizing” dams and culverts.

Use culvert assessments to prioritize replacements of culverts.

Continue to work with partners to replace culverts and remove dams, where possible.

GOAL THREE

In the watershed, build connections among people and communities, including leaders in the watershed towns of Claverack, Copake, Hillsdale, and Taghkanic, and the City of Hudson.

Throughout the process, stakeholders expressed their hope that people who live in the watershed and use the Taghkanic Creek feel valued and empowered by this plan. They believe the plan is most valuable as a tool to bring people together to protect and steward the watershed in ways that build connections and cross boundaries, values, and worldviews. The stakeholders recognized that not all people are drawn to the Taghkanic Headwaters for the same reason, so there is a need to be empathetic about people's individual concerns and different ways of viewing the world.

There are many opportunities for more conversation and for stronger connections among people in these communities. One way to bring people together is to engage organizations and individuals in measuring forest and water quality. This approach that will help implement Goals 1 and 2 by filling gaps in information that can help identify the most effective actions to fulfill the plan's vision for the Taghkanic Headwaters.

Outcome 3.1

Towns and the City work together to address shared concerns for forests and water.

Develop and share a list of contacts involved in watershed planning, land use planning, and code enforcement.

Explore interest in periodic meetings to look at opportunities for advancing goals and actions.

Outcome 3.2

There is a community of stewards caring for the lands and waters of the Taghkanic Creek Headwaters.

Share information and resources about forest and water issues and conservation strategies through a Mobilize group.

Outcome 3.3

Community members, local leaders, and organizations help assess forests and water quality.

Encourage volunteers to participate in existing programs that monitor forests and water quality.

Collaborate to gather on-the-ground verification of forest and water status.

Learn from other groups that engage volunteers to test water quality.

Potential Partners

- Individual
- Group
- Municpal Government
- State Government
- Columbia Land Conservancy

Tools & Strategies

- Education
- Community Science
- Land Use Planning and Decision-making
- Land Management
- Land Protection

CHAPTER FOUR

How do we protect this important place for people and wildlife?

Tools and strategies to implement the plan

In implementing the vision for the watershed everyone can play a role: residents, landowners, municipalities, CLC and other conservation-minded organizations, and state and local agencies. Implementing this plan will be a multi-pronged effort including education, citizen science, land protection, and municipal strategies.

Education

Education can be a key first step in encouraging action by watershed residents and stakeholders. Raising awareness is often an essential step, but knowledge alone rarely moves people to act. Effective educational efforts begin with identifying clear, measurable goals and actions to be taken by specific audiences and linking those actions with their values.[34]

The vision and values in this plan will be important elements to education. When people see a connection to something they care about, they are more likely to make a change in behavior or try something new.

The following checklist could be a way to get started with planning a new educational effort.

- **What are the learning objectives?**
  The actions from Chapter 3 may be a starting point for creating specific objectives for an educational effort, but additional clarification will likely be needed.

- **Who is the audience?**
  Does the audience share the vision and values of this plan? What do people already know about forests, streams, and the Taghkanic Headwaters?

- **What is the message?**
  The answers to the previous questions will inform the message: what you communicate. Many different messages can be developed, building on the vision and values of this plan. As part of an educational effort guided by a single goal, somewhat different messages may be created for different audiences.

- **Where does the audience get their information?** Given the ever-expanding array of ways to communicate, choosing or finding the right way to reach a specific audience may require trial and error. Person-to-person and word of mouth are some of the best ways to reach people, whether in person or through social media.

[34] There are a number of ways you can learn about the values of your audiences. One great resource is the National Woodland Owner's survey, which is summarized clearly on the Tools for Engaging Landowners Effectively website: https://www.engaginglandowners.org

Community science

Community science - also known as citizen science - is scientific research conducted by volunteers, usually following a protocol developed by experts. Community science is most effective when the data collected and concepts examined are tied to specific goals. Some community science projects leverage volunteers to collect needed data, like water quality data for the Taghkanic Creek. In others, data-gathering serves as a tool for teaching complex concepts, like forest fragmentation. Participating in community science projects contributes to self-efficacy and can be a potential gateway for becoming a conservation leader. Research shows that the best community science efforts do not start and end with data collection; they use data collection as a tool for creating a more engaged citizenry who uses that data to advocate for change.

Community science in action: Stream water quality monitoring with the Roe Jan Watershed Community

The Roe Jan Watershed Community [www.roejanwatershed.org] is learning about the water quality in the Roeliff Jansen Kill, aka "the Roe Jan," another of the major streams of Columbia County. The Roe Jan Watershed Community is a non-profit organization created and run by volunteers from eight communities.

Many adults enjoy participating in community science projects, and they are also an opportunity to engage youth. The Taconic Hills School Campus is located along the Taghkanic Creek in Craryville, offering an opportunity to involve youth in conservation and community science right at the school campus. The school serves children in prekindergarten through grade 12 who live in ten towns, including the towns in the Taghkanic Headwaters. The City of Hudson Youth Department hosts a summer program as well as after school programs for youth, which have included hands-on science and water monitoring. Organizations that engage young people in environmental conservation, including CLC, Cornell Cooperative Extension, Columbia Greene Community College, the Greenagers (Greenagers.org), and others may be partners in developing community science opportunities for young people in the Taghkanic Headwaters.

Land protection

The most significant threats to wildlife connectivity and water quality are related to the impacts of development on the landscape. Purchasing land outright for conservation purposes or legally protecting it through voluntary conservation agreements called conservation easements where land remains in private ownership are just some of the tools that can be used to prevent or reduce the impacts of development.

Land protection is a tool typically used by land trusts, New York State, and municipalities. These entities work with landowners who voluntarily seek to restrict development on their property now and in the future. Audubon, CLC, and New York State have worked with landowners to protect lands in this watershed. Every project is different and may involve different partners, including landowners, municipalities, conservation groups, land trusts, and local or state government.

A conservation easement is a voluntary legal agreement that allows landowners to permanently protect the conservation qualities and attributes of their properties while continuing to own, live on, utilize, farm, and otherwise enjoy the land. Landowners may donate conservation easements. In some cases, federal, state, or private funds may be available to compensate landowners, or tax incentives may be available. New York State is creating a program to protect forest lands through purchase of conservation easements.

Creating Community Forests

Community forests are protected forests that allow for public access. The Community Forest and Open Space Conservation Program, managed by the US Department of Agriculture Forest Service, has conserved nearly 25,000 acres of forests throughout the United States. Community forests can be owned by local governments, tribal governments, or non-profits. Public access must be allowed, and the landowner must create and actively manage a community forest plan.

In a report, The Trust for Public Land says: "…the community forest model offers an alternative mechanism by which communities can come to own and manage forestland, with an ownership and management structure that is designed to meet the specific needs of the local population." In New York, examples include the Poestenkill Community Forest owned by the Rensselaer Plateau Alliance and one in Cambridge owned by the Agricultural Stewardship Association. Each community forest is managed by a committee of residents and local groups.

Land use planning and decision-making

The role of local governments is crucial for protecting forests. Municipalities have broad authority to enact protections for forests and streams, based on the state constitution and state laws.[35] Local safeguards may reduce impacts of development on resources that state and federal laws do not protect.

The watershed includes four towns, each with their own local plans and policies. The City of Hudson, which is entirely outside the watershed, has a limited authority over land use in the watershed based in obscure and largely outdated watershed rules in New York State law. Though they clearly share interests, these jurisdictions enact land-use planning independently.

The New Forge State Forest is an example of land acquisition for environmental protection. New York State purchased the property using authority created by state legislation dating to the early 20th century, which authorizes the NYS DEC to obtain land, through gift or purchase, for reforestation. The state's forest lands are managed for timber production, watershed protection, wildlife habitat, and recreation.

[35] NYS Department of State Division of Local Government Services. 2018. Local Government Handbook. Albany, NY.

As a starting point, towns can add information about forests and streams to existing plans and inventories such as Natural Resource Inventories, Open Space Plans, Comprehensive Plans, and Local Waterfront Revitalization Plans. Existing plans could be enhanced by setting goals for protecting forest linkage zones, large forests, and diverse forest types as well as wetlands and streamside areas. Such information can be a useful resource if a town decides to update town zoning, site plan, and/or subdivision regulations.

Towns have a number of options for protecting resources within local codes, among them:

- Conservation or forest overlay zones. Municipalities create these zones to add standards or limitations to protect sensitive features present in some areas of the underlying zoning districts, which are otherwise not protected.
- Natural resource protection zoning. Zoning districts may be created to promote sustainable forestry, recreation, and related uses.
- Rural siting guidance or standards. Municipalities may create voluntary guidelines for siting new development in relation to forests, streams, and other sensitive habitats; alternatively, these may be added to the code as required siting standards.

Municipalities can also offer special recognition to forests and streams using their State Environmental Quality Review authority to designate Critical Environmental Areas (CEAs). CEAs serve to alert landowners, developers, and others to the important resources or qualities that are present and help ensure that they consider potential impacts to those resources. A local example is the Town of Greenport Critical Environmental Area that highlights the value of the town's public water supply and its recharge area.

Managers at Audubon's Rheinstrom Hill Audubon Sanctuary and Center, which encompasses much of a forested hill above Route 23 in the eastern part of the watershed, are working to identify areas of the woods where regrowth is threatened by heavy deer browsing. As shown in the photo, the area of dense regrowth in the understory is the result of removing trees and excluding deer (with fencing) in small areas at the Sanctuary.

Where homes are placed on the landscape and in the context of the natural resources on and off the lot can have a large impact on the forests and water of the Taghkanic Creek watershed. Towns often utilize conservation design principles in the review of major subdivisions that are cluster or conservation subdivisions. Many projects in rural communities do not come before the planning board. One house is built at a time, on an existing lot, which often requires only a building permit and certificate of occupancy. Proposals that meet minimum the standards for these approvals require no further review. Some towns in Columbia County have used their zoning authority to require further review of development on individual lots to protect specific sensitive, important resources:

Towns have a number of options for protecting resources within local codes.

- The Town of Gallatin has two overlay zones that require site plan approval and special permits for any new development needing a certificate of occupancy or building permit: the Conservation Overlay District includes wetlands that are regulated by NYS DEC, and the Watercourse Protection Overlay District that includes the 100-year FEMA flood zone.

- The Town of Austerlitz recognizes that long driveways, given the hilly topography of the town, could negatively impact community character as well as risk environmental damage due to erosion. Applicants for single- or two-family homes on a lot with a driveway over 500 feet long must apply for site plan approval and special permit from the planning board. The law requires the planning board to minimize clearing, road cuts, and steep grades, and to examine the erosion and sediment controls. [Section 195-20, Town of Austerlitz, New York]

In addition to these approaches, utilizing natural resource information during the review of subdivision applications and site plans can identify ways to avoid or reduce impacts to sensitive areas.

Land management

Managing forests and streamside areas can promote the regrowth of forests, increase diversity of plants and animals, and help promote abundant, clean water. Active management is an effective way for landowners to protect forest and stream resources. How landowners decide to manage their forests is key to the future of the forest and to the plants and animals that will be able to live there.

Landowners manage their woodlands for a variety of reasons. Some choose to manage for timber, firewood, maple syrup, or other forest products. Other forest landowners enjoy their woods as is, without active management. Active management that protects wildlife habitat and water resources could involve selective cutting of mature trees, planting streamside trees, or removal of invasive plants. Some practices may look destructive initially, but make the forest healthier for water, wildlife, and climate resilience. In any case, sustainable forest management should be supervised by a qualified forester.

This plan does not provide the detail needed for landowners to implement specific recommendations on their properties. They will need detailed, site-specific information to create site development plans. There is guidance and support for landowners who want to manage their lands from resources listed below.

Planting trees along streams benefits the stream, wildlife, and people. Volunteers, CACs, and landowners can work with the NYS DEC "Trees for Tribs" or "Buffer in a Bag" program to plant trees and shrubs in streamside areas. Agricultural landowners can get technical and financial assistance from Soil and Water Conservation Districts.

Further resources

Education

- The local stakeholders, municipal Conservation Advisory Councils (CACs) involved in developing this plan. Contact information for CACs is available on the town websites.
- CLC offers numerous education programs and partners with educators from other organizations on programming.
- Cornell Cooperative Extension of Columbia and Greene Counties offers educational programs and assistance in natural resource conservation, climate change, and more.

Community science

- The NYS DEC's Water Assessments by Volunteer Evaluators (WAVE) program (link https://www.dec.ny.gov/chemical/92237.html) trains individuals or teams to collect information about tiny creatures like mayflies and caddisflies they find in a stream. The data volunteers collect could be used locally to plan stream protection or restoration activities. The WAVE program loans the needed sampling equipment, from a limited supply.
- Trout Unlimited (tu.org), a nationwide organization with local chapters works to protect the streams where trout spawn, remove barriers in streams, and restore waters where trout have been impacted by development. Members of local chapters monitor streams and study trout habitats. Trout Unlimited has worked with the towns of Copake, Hillsdale, and Taghkanic to assess and prioritize replacements of culverts and dams.
- The Amphibian Migrations and Road Crossings Project is a community science program of NYS DEC to help frogs and salamanders cross roadways safely when they migrate to their breeding habitats. CLC organizes an annual training for individuals wishing to participate. Seeing amphibians crossing roads is a visual reminder of how forest fragmentation affects wildlife, a phenomenon that can otherwise be hard to observe. This program can help people understand the connections between forests and wetlands and the threats of fragmentation.

Land protection

- CLC provides general information about land protection and conservation easements on its website, clctrust.org.
- The Community Forest Program within the United States Department of Agriculture, as described above.

Land use planning and decision-making

- CACs play an advisory role to municipal boards.
- Columbia County Planning Department provides data and an interactive mapper and supports the Environmental Management Council, which published the Columbia County Natural Resources Inventory.[36]
- Each of the towns in the watershed has a Groundwater Protection Study or Plan prepared by the New York Rural Water Association. These plans recommend density levels to protect groundwater and identify other actions to protect groundwater. See references.
- The NYS Department of State and NYS DEC developed model local laws for municipal wetland and watercourse protection in 2019.
- The Hudson River Estuary Conservation and Land Use Program is a program from NYS DEC and Cornell University to provide training, technical guidance, data, and funding to support municipalities who want to protect natural areas and wildlife in their communities.

Land management

- CLC operates the Landowner Engagement and Resource Network (LEARN) which provides tools for landowners interested in conservation-minded land management. Visit clctrust.org/learn to learn more.
- Audubon provides guidance on managing healthy forests for birds and other wildlife. People can visit the Rheinstrom Hill Audubon Center and Sanctuary in Copake and Hillsdale to see what management looks like and learn how it benefits birds.
- Regenerate NY is a NYS DEC program that provides cost-sharing to landowners who want to implement projects on their land that support the establishment and renewal of healthy forests.
- Trees for Tribs is a NYS DEC program that provides free plants and technical support for streamside landowners who want healthy stream buffers. The program's goal is to plant trees and shrubs along streams to create a forested riparian (streamside) buffer that helps decrease erosion, reduce flooding damage, improve wildlife and stream habitat, and protect water quality.
- NRCS Soil and Water Conservation District offers technical and financial assistance to farmers for practices to improve farm operations and the environment.
- Women Owning Woodlands hosts a web project that offers forestry information to woodland owners and forest practitioners. They publish news articles, blogs, personal stories and organize events.
- The Keep Forests Healthy Assessment and Scorecard was developed by The Nature Conservancy and Cornell Cooperative Extension to help landowners identify the strengths and risks to the long-term health of their woodlands.

[36] Stevens, G. and K.B. Travis. 2018. Natural Resources Inventory of Columbia County, New York. Columbia County Environmental Management Council.

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Definitions are from Natural Resources Inventory of Columbia County[37] unless otherwise noted.

[37] Stevens, G. and K.B. Travis. 2018. Natural Resources Inventory of Columbia County, New York. Columbia County Environmental Management Council.

Appendix A. Water Quality Assessment Reports

NYS DEC prepares assessment reports of streams and other water bodies. The assessment reports for two segments of the Taghkanic Creek (middle and lower) are included here, as is the report for Copake Lake. Further information about how NYS DEC monitors and evaluates water quality may be found on their webpage, www.dec.ny.gov.

Taghkanic Creek, Middle, and tribs (1310-0051) NoKnownImpct

Waterbody Location Information

Revised: 11/06/2007

Water Index No: H-204- 3- 8
Drain Basin: Lower Hudson River
Hydro Unit Code:
Str Class: A(TS)
Waterbody Type: River
Reg/County: 4/Columbia Co. (11)
Waterbody Size: 26.5 Miles
Quad Map: ANCRAM (M-26-4)
Seg Description: stream and tribs, from New Forge to East Taghkanic

Water Quality Problem/Issue Information

(CAPS indicate MAJOR Use Impacts/Pollutants/Sources)

Use(s) Impacted	Severity	Problem Documentation
NO USE IMPAIRMNT		

Type of Pollutant(s)
Known: - - -
Suspected: - - -
Possible: - - -

Source(s) of Pollutant(s)
Known: - - -
Suspected: - - -
Possible: - - -

Resolution/Management Information

Issue Resolvability: 8 (No Known Use Impairment)
Verification Status: (Not Applicable for Selected RESOLVABILITY)
Lead Agency/Office: n/a
Resolution Potential: n/a
TMDL/303d Status: n/a

Further Details

Water Quality Sampling
A biological (macroinvertebrate) assessment of Taghkanic Creek in New Forge (at New Forge Road) was conducted in 2002. Sampling results indicated non-impacted water quality conditions. The fauna was diverse and all screening criteria for waters having no known impacts were met. (DEC/DOW, BWAM/SBU, June 2005)

Segment Description
This segment includes the portion of the stream and all tribs from Suydam Creek (-21) in New Forge to unnamed tribs (-23) in East Taghkanic. The waters of this portion of the stream are Class A(TS). Tribs to this reach/segment, are Class A and C,C(T),C(TS). Lower/Upper Taghkanic Creek are listed separately.

Taghkanic Creek, Lower, and tribs (1310-0015) Threatened

Waterbody Location Information

Revised: 11/06/2007

Water Index No: H-204- 3- 8
Drain Basin: Lower Hudson River
Hydro Unit Code: 02020006/110
Str Class: C(T)
Middle Hudson River
Waterbody Type: River
Reg/County: 4/Columbia Co. (11)
Waterbody Size: 123.1 Miles
Quad Map: CLAVERACK (M-26-1)
Seg Description: stream and tribs, from mouth to New Forge

Water Quality Problem/Issue Information

(CAPS indicate MAJOR Use Impacts/Pollutants/Sources)

Use(s) Impacted	Severity	Problem Documentation
Habitat/Hydrolgy	Threatened	Known

Type of Pollutant(s)
Known: - - -
Suspected: WATER LEVEL/FLOW, THERMAL CHANGES
Possible: - - -

Source(s) of Pollutant(s)
Known: - - -
Suspected: HYDRO MODIFICATION
Possible: - - -

Resolution/Management Information

Issue Resolvability: 1 (Needs Verification/Study (see STATUS))
Verification Status: 4 (Source Identified, Strategy Needed)
Lead Agency/Office: ext/WQCC
Resolution Potential: Medium
TMDL/303d Status: n/a

Further Details

Overview
Hydrologic/habitat uses in Taghkanic Creek are thought to be impacted by drinking water withdrawals upstream by the City of Hudson. These withdrawals reduce flow in the creek and result in thermal stresses on the fishery during the summer. Under adequate flow conditions Fisheries staff indicates that this is a productive trout stream and should be protected. (DEC\FWMR, Region 4, 1996)

Water Quality Sampling
A biological (macroinvertebrate) assessment of Taghkanic Creek in Linlithgo (at Water Road) was conducted in 2002. Sampling results indicated non-impacted water quality conditions. The fauna was diverse and all screening criteria for waters having no known impacts were met. (DEC/DOW, BWAM/SBU, June 2005)

Segment Description
This segment includes the portion of the stream and all tribs from the mouth near Claverack to/including Suydam Creek (-21) in New Forge. The waters of this portion of the stream are Class C(T). Tribs to this reach/segment, including Loomis Creek (-2), Mud Creek (-4) and Suydam Creek (-21) are Class C,C(T),C(TS). Middle/Upper Taghkanic Creek are listed separately.

Copake Lake (1310-0014) Impaired Seg

Waterbody Location Information

Revised: 04/30/2008

Water Index No: H-204- 3- 8-32-P108a
Hydro Unit Code: 02020006/110 **Str Class:** B
Waterbody Type: Lake
Waterbody Size: 420.2 Acres
Seg Description: entire lake

Drain Basin: Lower Hudson River
Middle Hudson River
Reg/County: 4/Columbia Co. (11)
Quad Map: HILLSDALE (M-26-2)

Water Quality Problem/Issue Information

(CAPS indicate MAJOR Use Impacts/Pollutants/Sources)

Use(s) Impacted	Severity	Problem Documentation
Aquatic Life	Stressed	Possible
RECREATION	Impaired	Known
Aesthetics	Stressed	Known

Type of Pollutant(s)
Known: ALGAL/WEED GROWTH (aquatic vegetation)
Suspected: NUTRIENTS (phosphorus)
Possible: D.O./Oxygen Demand

Source(s) of Pollutant(s)
Known: HABITAT MODIFICATION
Suspected: ON-SITE/SEPTIC SYST, URBAN/STORM RUNOFF
Possible: Agriculture

Resolution/Management Information

Issue Resolvability: 1 (Needs Verification/Study (see STATUS))
Verification Status: 4 (Source Identified, Strategy Needed)
Lead Agency/Office: DEC/Reg4 **Resolution Potential:** Medium
TMDL/303d Status: n/a->4c*

Further Details

Overview
Recreational uses in Copake Lake are considered to be impaired due to aquatic weed and algal growth and low water transparency. Somewhat elevated nutrient (phosphorus) loads attributed to nonpoint sources contribute to recreational uses and aesthetic.

Water Quality Sampling
Copake Lake has been sampled as part of the NYSDEC Citizen Statewide Lake Assessment Program (CSLAP) from 1996 through 2000. An Interpretive Summary report of the findings of this sampling was published in 2001. These data indicate that the lake continues to be best characterized as eutrophic, or highly productive, based on low water transparency, and elevated nutrient (primarily phosphorus) and algae levels. Phosphorus levels in the lake consistently exceed the state phosphorus guidance value indicating impacted/stressed recreational uses. Corresponding transparency measurements occasionally fail to meet what is recommended for swimming beaches. Eutrophication indicators showed some improving in the most recent sampling years. Measurements of pH typically fall within the state water quality range of 6.5 to 8.5; occasionally high pH does not appear to impact aquatic life. The lake water color does not appear to influence transparency. (DEC/DOW, BWAM/CSLAP, June 2001)

Recreational Assessment
Public perception of the lake and its uses is also evaluated as part of the CSLAP program. This most recent assessment (2005) indicates recreational suitability of the lake to be only somewhat favorable. The recreational suitability of the lake is described most frequently as "slightly" impacted for most recreational uses. The lake itself is most often described as having "definite algae greenness," an assessment that is somewhat lower than indicated by measured water quality characteristics. Assessments have noted that aquatic plants typically grow to the lake surface, and are reported as being dense. Rooted aquatic growth appears to be driving the recreational assessment. (DEC/DOW, BWAM/CSLAP, June 2001)

Lake Uses
This lake waterbody is designated class B, suitable for use as a public bathing beach, for general recreation and aquatic life support, but not as public water supply. Water quality monitoring by NYSDEC focuses primarily on support of general recreation and aquatic life. Samples to evaluate the bacteriological condition and bathing use of the lake or to evaluate contamination from organic compounds, metals or other inorganic pollutants have not been collected as part of the CSLAP monitoring program. Monitoring to assess potable water supply and public bathing use is generally the responsibility of state and/or local health departments.

Previous Assessment
Residential development along the lake shore has increased the concern regarding lawn runoff, and inadequate on-site septic systems as potential sources. (A few homes that previously discharged raw sewage to the lake now discharge to a holding tank.) Nutrient and fertilizer runoff from a nearby golf course may also contribute to water quality problems. (Columbia County WQCC, 1996)

Section 303(d) Listing
Copake Lake is not currently included on the NYS 2008 Section 303(d) List of Impaired Waters. While this updated assessment suggests it is appropriate to consider the lake to be impaired due to aquatic weed growth, more recent sampling to verify nutrient levels in the lake is recommended before listing the waterbody for phosphorus. (DEC/DOW, BWAM/WQAS, May 2008)

Appendix B. Information about significant habitats and species

The watershed is home to several significant habitats and species. This map shows areas in the Taghkanic Headwaters that are known to be important to rare plants, rare animals, and significant natural communities. These areas are based on data collected since the 1980s by the New York Natural Heritage Program and include buffers that are important to the sustaining the habitats and ecosystems.* Specific location information about the plants and animals is closely guarded to protect them from collection, harassment, or habitat destruction.

The natural communities are found along the Taghkanic Creek in New Forge are red-maple hardwood swamp, emergent marsh, floodplain forest, and vernal pools. These communities are not rare in New York but were mapped because these are very high-quality examples of these communities.

*Update of Natural Heritage Important Areas for the Hudson River Valley - NY Natural Heritage Program (nynhp.org); https://www.nynhp.org/projects/hudson-river-important-areas/; accessed July 28, 2021.

Animals of the Taghkanic Headwaters Having Conservation Status in New York State					
Common Name	Scientific Name	General Habitat	Species of Greatest Conservation Need (SGCN) HP = High Priority SGCN	NYS Species of Special Concern	NYS Threatened Species
Birds					
Bald Eagle	*Haliaeetus leucocephalus*	lake, stream, forest	Yes		NY
Least Bittern	*Ixobrychus exilis*	wetland	Yes		NY
Pied-billed Grebe	*Podilymbus podiceps*	wetland	Ys		NY
Reptiles					
Eastern Rat Snake	*Pantherophis alleghaniensis*	forest	Yes		
Smooth Greensnake	*Opheodrys vernalis*	stream, lake, wetland	Yes		
Snapping Turtle	*Chelydra serpentina*	wetland, stream, forest, lake	Yes		
Spotted Turtle	*Clemmys guttata*	wetland	HP	Yes	
Stinkpot	*Sternotherus odoratus*	wetland, stream	HP		
Wood Turtle	*Clemmys insculpta*	stream	HP	Yes	
Amphibians					
Blue-spotted Salamander	*Ambystoma laterale*	vernal pool, forest	HP	Yes	
Fish					
American Eel	*Anguilla rostrata*	stream	HP		
Brook Trout	*Salvelinus fontinalis*	stream	Yes		

Sources: New York Natural Heritage Program and the New York Atlas of Reptiles and Amphibians

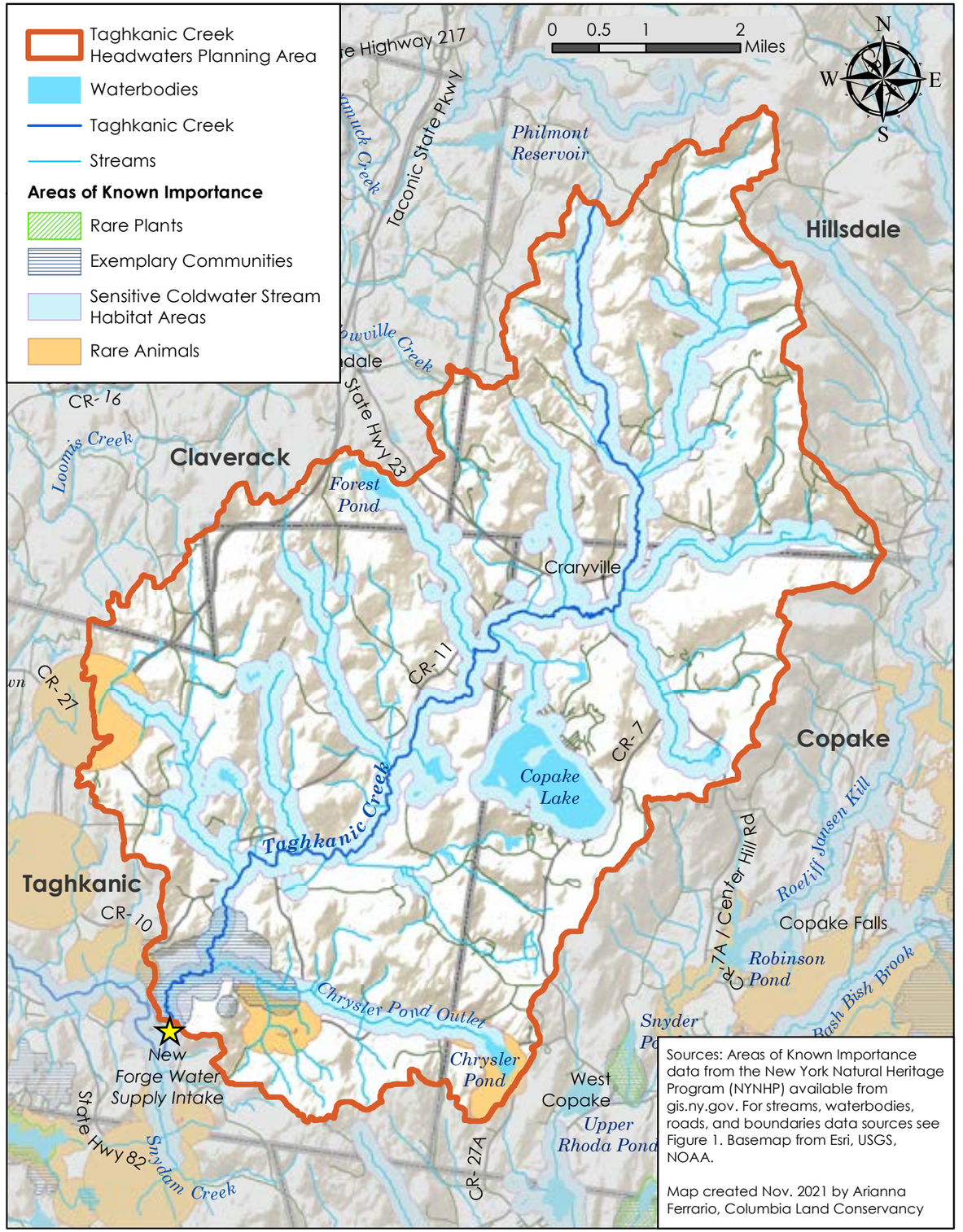
Species of greatest conservation need, high priority: These species are being evaluated by the New York State Department of Environmental Conservation for possible listing as threatened or endangered. https://www.dec.ny.gov/animals/68645.html

Special concern: "Any native species for which a welfare concern or risk of endangerment has been documented in New York State." This designation does not provide any additional protection.

Threatened: 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.

Endangered: 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.

Exemplary natural communities and areas important for rare plants and animals



Sources: Areas of Known Importance data from the New York Natural Heritage Program (NYNHP) available from gis.ny.gov. For streams, waterbodies, roads, and boundaries data sources see Figure 1. Basemap from Esri, USGS, NOAA.

Map created Nov. 2021 by Arianna Ferrario, Columbia Land Conservancy

Appendix C. Glossary

aquifer
A water-bearing formation, e.g., in bedrock fractures or solution cavities, or in unconsolidated surface material, such as sands and gravels.

best management practice
Activity designed to be the most effective and practicable means to prevent or minimize environmental degradation, particularly nonpoint source water pollution.[38]

biodiversity
All the variety of plants, animals, and other living things. The term encompasses diversity at all scales, including landscapes, ecosystems, ecological communities, species, and their genes.

buffer
Any area that serves to protect natural areas from human alteration. Often used in reference to streams and wetlands.[39]

disturbance
Stresses and destructive agents such as invasive species, diseases, and fire; changes in climate and severe weather events such as hurricanes and ice storms; pollution of the air, water, and soil; real estate development of forest lands; and timber harvest. Some of these are caused by humans, in part or entirely; others are not.[40]

forest connectivity
The degree to which forest patches are connected to each other to facilitate the movement of wildlife and other ecological processes.[41]

forest linkage zones
Areas of largely intact forested connections between large, priority forest blocks identified by the Nature Conservancy in 2003.[42] The forest patches within these areas are potential forest corridors, stepping stones, and travel routes for migrating species.[43]

forest management
The practical application of biological, quantitative, economic, social, and policy principles to the regeneration, utilization, and conservation of forests to meet specified goals and objectives while maintaining the productivity of the forest.[44]

fragmentation
The process where large, continuous habitats are subdivided into smaller, more isolated fragments or partitioned by barriers to movement. Habitats can be fragmented by roads, driveways, utility corridors, other developed features. Patch size, distance between patches, and edge length affect the habitat quality of forest fragments.[45]

habitat
The place or environment where an organism normally spends all or part of its life. A habitat is defined by both the biological (e.g., plants and animals) and the non-biological (soil, bedrock, water, sunlight, temperatures, etc.)

[38] NYS DEC 2020.
[39] Strong, K. 2008. Conserving Natural Areas and Wildlife in Your Community. NYS Department of Environmental Conservation. Albany, NY.
[40] Janowiak, et al. 2018.
[41] NYS DEC 2020
[42] Barbour, H., M.G. Anderson et al. 2003. Lower New England – Northern Piedmont Ecoregional Conservation Plan; First Iteration, Edited. The Nature Conservancy, Northeast & Caribbean Division, Boston, MA
[43] The Nature Conservancy Eastern Conservation Science and NY Natural Heritage Program. 2006. Metadata for the Forest Linkage Zones. NYS DEC and Cornell University. Hudson Valley Natural Resource mapper. https://gisservices.dec.ny.gov/gis/hvnrm/layerInfo.html#flz
[44] NYS DEC 2020
[45] Adapted from NYS DEC 2020 and Strong 2008

components.

headwaters
The upper reaches of a stream's watershed; small tributary streams near a stream's origin.

impervious surface
Surfaces such as roofs, pavement, or compacted soils that impede or prevent the local infiltration of water to the soils or underlying substrate.

regeneration
1) Tree seedlings or saplings existing in a forest stand; 2) The act of renewing tree cover by establishing young trees naturally or artificially.[46]

resilience
The capacity for a community and its ecosystem to withstand extreme events and other forces or risks, quickly recover in the aftermath of a disaster, and develop ongoing adaptability to rapidly changing environmental conditions and forces.[47]

riparian
Within or adjacent to a stream or river.

stewardship
The careful and responsible administration and management of land and associated resources to ensure their availability for future generations in a healthy condition.[48]

tributary
A stream that flows into a larger stream, river, or lake.

understory
Vegetation below the forest canopy. For example, wildflowers and shrubs that grow in a forest under the trees; even small trees below the forest canopy are understory plants.[49]

watershed
The entire land area that drains water, sediment, and dissolved materials downslope to a particular place such as a stream, wetland, or pond.

wetland
Area saturated by surface or ground water sufficient to support distinctive vegetation adapted for life in saturated soil conditions. There are many types of wetlands including swamps, marshes, bogs, and fens.[50]

[46] NYS DEC 2020
[47] NYS DEC 2020
[48] NYS DEC 2020
[49] NYS DEC 2020
[50] NYS DEC (https://www.dec.ny.gov/lands/305.html)

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