



Department of
Environmental
Conservation

New York State Forest Action Plan

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Andrew M. Cuomo, Governor | Basil Seggos, Commissioner



Contents

- Acknowledgments iv**
 - Planning team, DEC’s Division of Lands and Forestsiv
 - New York State Forest Stewardship Coordinating Committeevi
- Glossary of Terms..... ix**
- Abbreviations xiii**
- Introduction 1**
 - Organization of the Plan..... 2
- GOAL #1: Keep New York’s Forests as Forests 3**
 - Assessment: New York’s forested landcover 4
 - Assessment: Private forestlands 5
 - Assessment: Forested State Lands 9
 - Assessment: Urban and community forests..... 11
 - Assessment: Federal lands with significant forests 12
 - Assessment: Land use trends and drivers of forestland conversion 13
 - Assessment: Effects of a changing climate and environment on New York’s forests 14
 - Assessment: Valuing forests for carbon storage and community adaptation to climate change..... 18
 - Assessment: Open Space Conservation Plan for forest protection 19
 - Assessment: Public land purchases for forest protection 21
 - Assessment: Conservation easements for forest protection..... 22
 - Priority Landscapes: Forest Legacy Program 22
 - Priority Landscapes: Metropolitan, urban, and suburban areas 24
 - Focus Area: Private forestland protection and management..... 25
 - Focus Area: Private Forest Stewardship Program..... 26
 - Focus Area: Indian Nations in our state 29
 - Strategy: Actively pursue afforestation and forest restoration efforts 30
 - Strategy: Maintain and restore connectivity between fragmented and parcelized forestland..... 31
 - Strategy: Establish buffers for existing protected forests through partnerships..... 33
 - Strategy: Promote more community-owned forests in urban and suburban areas..... 34
 - Strategy: Help private landowners keep and manage their forests sustainably 35
 - Strategy: Continue research and assessment efforts to document forest resources 36
 - Strategy: Understand and respond to negative effects of climate change on forests 36
- GOAL #2: Keep New York’s Forests Healthy 39**
 - Assessment: Forest health affected by potentially damaging agents 39
 - Assessment: Forest regeneration 42
 - Assessment: Status of forest biodiversity 46
 - Assessment: Connectivity of forests 52
 - Assessment: Soil resources in forests 53
 - Assessment: Forest health monitoring..... 55

Focus Area: Urban forest health	56
Strategy: Foster diversity of native plants and animals in forests	56
Strategy: Boost forest regeneration and healthy forest structure.....	57
Strategy: Defend against, remove, or mitigate impacts of invasive species and pests	58
Strategy: Manage forest fires for the benefit of forests	61
Strategy: Cooperatively implement indigenous knowledge for forest health	61
Strategy: Help private forest owners keep their forests healthy	62
Strategy: Continue forest health-related research initiatives	64
GOAL #3: Increase Forest Benefits for Humans and All Living Creatures.....	65
Assessment: Forest protection for drinking water quality and supply	65
Assessment: Benefits of urban tree canopy and green infrastructure	67
Assessment: Health, safety, and other benefits from forests.....	68
Assessment: Productive capacity of timberlands.....	70
Assessment: Costs of forest management	73
Assessment: Economic impact of New York’s forests	73
Assessment: Forest product manufacturing.....	74
Assessment: Forest-based public outdoor recreation opportunities	78
Assessment: Economic benefits of outdoor recreation	80
Priority Landscapes: Recreational hotspots and long-distance trails	81
Priority Landscape: Urban areas and urban forests	82
Focus Area: Forests and cultural resources	84
Focus Area: Resources and tenure rights of indigenous peoples	84
Focus Area: Managing wildfires and communities at wildfire risk.....	86
Strategy: Manage forest fires for public safety and benefit.....	90
Strategy: Conserve and manage working forests for multiple values and uses	91
Strategy: Manage forests for sustainable recreation opportunities.....	91
Strategy: Support forest management as a climate change mitigation and adaptation strategy.....	92
Strategy: Support the natural benefits forests provide to people	94
Strategy: Support, maintain, and develop sustainable markets for sustainable forest products	97
Strategy: Recognize indigenous peoples’ use of and care for forests.....	98
GOAL #4: Appreciate, Support, and Protect New York’s Forests.....	99
Assessment: Planning, zoning, and policies for resilience and forest protection	99
Assessment: Economic framework for sustainable private forestry	102
Assessment: Unsustainable or exploitative harvesting practices	102
Assessment: Legal and institutional framework for state-owned forest protection	103
Focus Area: Sustainable forestry and BMPs	104
Strategy: Increase incentives to use the latest science in forest management	105
Strategy: Increase technical expertise among forest owners and managers	106
Strategy: Provide access to forest data for cooperative stewardship	107
Strategy: Support local planning and zoning efforts to advance forest conservation	108

Strategy: Enhance legal protections and policy frameworks in support of forestry	110
Strategy: Engage communities about the importance of urban forestry	111
Strategy: Foster public literacy about forest health and sustainable forestry	112
Strategy: Provide forest stewardship support to landowners.....	113
Strategy: Develop cultural sensitivity training from indigenous peoples	115
Strategy: Manage recreational user impacts in New York's state-owned forests.....	115
Strategy: Increase institutional capacity, knowledge, and information exchange.....	116
Multistate Priority Areas and Issues	117
Northern Forest	117
Highlands Region	118
Berkshire-Taconic Landscape.....	119
Lake Champlain Basin	121
Chesapeake Bay Area	123
Great Lakes Restoration Initiative	124
References	127
Appendix A: Forest Legacy Program's Assessment of Need	129
Appendix B: Partner and Stakeholder Outreach and Participation	199
Appendix C: Survey of Stakeholders and DEC's Division of Lands and Forests Staff	203
Appendix D: New York's Forest and Woodland Community Types	213

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- DEC's Division of Forest Protection
- The New York State Natural Heritage Program
- The Center for Native Peoples and Environment at the SUNY College of Environmental Science and Forestry
- The New York State Office of Parks, Recreation and Historic Preservation

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Glossary of Terms

Acid rain – The deposition of a variety of acidic pollutants in either wet (e.g., rain, fog, or snow) or dry forms (e.g., gas or dust particles).

Adaptation to climate change – Adjustments in ecological, social, or economic systems in response to actual or expected climatic stimuli and their effects; changes in processes, practices, and structures to moderate potential damages or to benefit from opportunities associated with climate change.

Afforestation – Planting trees where there have not been any for decades or longer.

Aquifer – A saturated, permeable geologic unit of sediment or rock that can transmit significant quantities of water under ordinary hydraulic gradients.

Basal area – The square footage of land occupied by the cross-sectional area of all tree trunks, including the bark, measured at breast height (4.5 ft above the ground), for a given area of land.

Best Management Practice – Practice designed to be the most effective and practicable means to prevent or minimize environmental degradation, particularly nonpoint source water pollution (<http://www.dec.ny.gov/lands/37845.html>).

Biodiversity – The variety and variability of all living organisms.

Biotic – Pertaining to living organisms and their ecological and physiological relations.

Carbon Storage – The long-term isolation of carbon from the atmosphere.

Carbon sequestration – The process of taking up or removing carbon dioxide from the atmosphere so that the carbon is stored in a carbon pool other than the atmosphere.

Clearcut – A harvest in which all or almost all of the trees are removed in one cutting.

Community Forest – A wooded property usually owned by a municipality and managed for a variety of purposes, e.g., recreation, fuel wood, lumber, education, water quality, and other municipal and/or resident benefits. See also “*Urban Forest, Community Forest, Urban and Community Forest,*” below.

Connectivity – The degree to which the landscape facilitates or impedes movement among resource patches.

Ecosystem – A natural community (or group of communities) plus its physical surroundings, including atmosphere, soil, sunlight, and water.

Exurban sprawl – Expanding development, parcelization, and forest fragmentation occurring beyond the suburbs of an urban area.

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.

Forest Matrix Blocks – Large contiguous areas whose size and natural condition allow for the maintenance of ecological processes, viable occurrences of matrix forest communities, embedded large and small patch communities, and embedded species populations. (NHP)

Forestland – Land at least 10 percent stocked by forest trees of any size, including land that formerly had such tree cover and that will be naturally or artificially regenerated.

Forests – An ecosystem characterized by a more or less dense and extensive tree cover, often consisting of stands varying in characteristics such as species, composition, structure, age class, and associated processes, and commonly including meadows, streams, fish, and wildlife.

Fragmentation – A process in which the landscape occupied by a natural community or group of communities is reduced in area, subdivided into smaller units, or partitioned by barriers to movement.

Haudenosaunee – Literally “people living in a longhouse,” the six nations of Seneca, Cayuga, Onondaga, Oneida, Mohawk, and Tuscarora (also known as Iroquois).

High-grading – The removal of the most commercially valuable trees (by reason of size, quality, or species) at the expense of future growth, quality, or financial return, often leaving a residual stand composed of trees of poor condition or species composition.

Interfering vegetation – Invasive or native vegetation that inhibits the establishment or growth of tree regeneration.

Invertebrates – Animals without a backbone, such as insects and snails.

Limits of Acceptable Change – A visitor-use management framework based on the idea that management should be based on constant monitoring of a site as well as the objectives established for it.

Mitigation for climate change – Action taken to reduce the severity of climate change by reducing greenhouse gas emissions.

Natural community – Also known as ecological community. A group of species that occur together in a particular habitat.

Natural community type – The name applied to a natural community that occurs repeatedly throughout the landscape, such as “beech-maple mesic forest” or “dwarf shrub bog.”

Parcelization – The subdivision of single forest tracts in single ownership into multiple parcels with different individual owners.

Poletimber – A growing-stock tree at least 5.0 inches dbh, but smaller than sawtimber size (which is 12” dbh).

Recreational Opportunity Spectrum –

A system for classifying and managing recreation opportunities based on the following criteria: physical, social, and managerial settings. The settings can be divided into six (or fewer) categories, including urban, rural with roads, natural, semi-primitive motorized, semi-primitive non-motorized, and primitive categories.

Regeneration – 1) Tree seedlings or saplings existing in the stand; 2) The act of renewing tree cover by establishing young trees naturally or artificially.

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.

Silviculture – The science-based tending and regenerating of forest stands to realize property owner-desired benefits and to sustain them over time.

Stewardship – The careful and responsible administration and management of land and associated resources to ensure their availability for future generations in a healthy condition.

Tree City USA – A community that met the four standards established by the Arbor Day Foundation and the National Association of State Foresters, aimed to ensure that every qualifying community would have a viable tree management program and that no community would be excluded because of size.

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.

Urban Forest, Community Forest, Urban and Community Forest – All public and private trees in a town, village, city, or other defined developed area.

Urban Forestry, Community Forestry, Urban and Community Forestry – The management of urban and community forests for their many benefits: air and water quality, energy savings, environmental health, wildlife habitat, human health, and enhancing the quality of life for urban residents.

Wildfire – An uncontrolled fire spreading through natural or unnatural vegetation.

Working Forests – Forests that are capable of producing crops of timber or wood products and are not withdrawn or precluded from commercial production by law, regulation, or policy. These forests are, or can be, sustainably managed and harvested to produce wood products, often under direct voluntary third-party or regulatory management control, supervision, or certification.

Abbreviations

ALB	Asian longhorned beetle
APA	Adirondack Park Agency
AVID	Assessing Vegetation Impacts from Deer
BMP	Best Management Practice
CLCPA	Climate Leadership and Community Protection Act, a NYS 2019 law
DBH	Diameter at breast height
DEC	New York State Department of Environmental Conservation
EAB	Emerald ash borer
ECL	Environmental Conservation Law
EPF	Environmental Protection Fund
FMU	Forest management unit
HWA	Hemlock woolly adelgid
ISCMP	Invasive Species Comprehensive Management Plan
NRCS	Natural Resources Conservation Service
(NY)NHP	New York Natural Heritage Program
NYS	New York State
OPRHP	New York State Office of Parks, Recreation and Historic Preservation
PRISMs	Partnerships for Regional Invasive Species Management
SFAP	State Forest Action Plan
SGCN	Species of Greatest Conservation Need
SPSFM	Strategic Plan for State Forest Management
SUNY ESF	State University of New York College of Environmental Science and Forestry
SWAP	State Wildlife Action Plan
UAV	Unmanned Aerial Vehicle
UMP	Unit Management Plan
USDA	United States Department of Agriculture
WAVE	Water Assessments by Volunteer Evaluators

Introduction

Three centuries ago, forests dominated the landscape that would one day become the State of New York. As early European settlers cleared the land for timber and agriculture, the amount of forests rapidly dwindled to 25 percent of the state's area. Soon after the Civil War, concerned citizens recognized the importance of forests to the state's economy and the health of its residents, and began a movement to preserve and reestablish forests across the state. Today, 60 percent of our state is forested.

The existence and health of New York's forests are once again at a pivotal moment, according to a 2019 survey of forestry stakeholders (see *Appendix C*) conducted by the New York State Department of Environmental Conservation (DEC). Defending our forests from invasive plants and insects—identified as the top priority—requires constant vigilance. Excessive forest clearing and fragmentation remain concerns, particularly in suburban areas. In many parts of the state, forest regeneration continues to worsen, leaving tracts of forests without young trees to continue the forest life cycle.

New York's forests are poised to realize their full potential as part of the climate change solution. The value of our forests to naturally mitigate the effects of climate change is immense; they are the only large-scale, perpetual means on land for removing global CO₂ from the atmosphere.

The recommendations in this State Forest Action Plan (Plan or SFAP) outline the actions to be taken to ensure New York's forests are prepared for the challenges and opportunities of the next 10 years. The Plan provides an important framework for the

ongoing efforts of the New York State Climate Action Council to identify strategies, policies, and regulations to reach the State's climate goals through forest protection and management. This Plan's strategies also aim to stimulate public policy that safeguards the irreplaceable value of forests as climate change mitigators by preventing loss of forests to development or infrastructure.

Something that has not changed over time is the role our State's forests play in the lives of people. New York is committed to ensuring that our forests improve our residents' quality of life, including quality of life for those living in communities that have historically borne the brunt of environmental pollution, known as environmental justice communities. DEC strongly supports and promotes the principles of diversity, equity, and inclusion, and creating new ways to connect communities of color and underserved communities to forestland is a priority. Our natural resources are for everyone, and we will continue our efforts to build bridges, literally and figuratively, so that the benefits are accessible and shared by all New Yorkers.

The value of forests encompasses all the irreplaceable life-giving and life-enhancing benefits they provide. Managing our forests for the long-term will ensure that the citizens of our state, and the entire global community, continue to experience the vital benefits of forests, including the protection of our water and air, the conservation of wildlife habitat, and the employment of thousands of people in the forest products, outdoor recreation, and tourism industries.

New York State's Climate Goals

Under the 2019 Climate Leadership and Community Protection Act (CLCPA), New York State is committed to eliminating greenhouse gas emissions in the state and to ultimately achieve net zero emissions by 2050.

Forests and forest products are critically vital resources for reducing total carbon emission levels through carbon sequestration. In addition, State agencies are committed to making sure all programs consider the future physical risks from climate change and take action to minimize these risks in order to protect New Yorkers and our environment.

Organization of the Plan



This New York State Forest Action Plan is a 10-year strategic plan for DEC and New York’s forestry community. The purpose of the Plan is to provide long-term, comprehensive, coordinated strategies for addressing the challenges facing New York’s forests today, and to identify ways to invest state, federal, and leveraged partner resources in major management and landscape priorities.

The Plan also reflects a growing partnership with the Indian Nations of this region. In recent years, DEC has dedicated additional resources to improving the dialogue with indigenous people, including gaining a better understanding of how their traditions, cultures, and rights are impacted by the state’s land management policies. The SFAP takes the next step by proposing that future management and policy decisions incorporate these indigenous values and commit to an increased level of engagement.

The impetus for the SFAP lies in the federal Cooperative Forestry Assistance Act (CFAA)—amended by the 2008 Farm Bill—which requires each state forestry agency to develop “Statewide Assessment and Strategies for Forest Resources,” collectively referred to as the State Forest Action Plan. The U.S. Forest Service established three national priorities to be addressed by each state’s plan:

1. Conserve and manage working forest landscapes for multiple values and uses;
2. Protect forests from threats; and
3. Enhance public benefits from trees and forests.

New York’s Plan builds on these three national priorities and identifies four primary goals for our forests (see *diagram above*):

1. Keep New York’s forests as forests (“Forests as Forests”)
2. Keep New York’s forests healthy (“Healthy Forests”)
3. Ensure forests benefit humans and all living creatures (“Forests for People”)
4. Support, protect, and appreciate New York’s forests (“People for Forests”)

The Plan is dedicated to these four goals, with the following subsections under each goal:

- **Assessments** of current conditions, trends, and threats related to various aspects of forests and forestry programs in New York;
- **Priority Landscapes** or geographic areas of the state where resources will be focused;
- **Priority Focus Areas** or programs that will be administered and where resources will be focused; and
- **Strategies** for achieving the goals for New York’s forests.

Throughout the discussion of the four goals, especially in the strategies, the Plan specifies the myriad of resources necessary to achieve these goals, including additional research and monitoring, new or expanded programs and initiatives, enhanced partnerships and staffing, more training, better communication and outreach, and, of course, dedicated federal- and state-level funding sources to secure these resources and implement the outlined strategies.

To reach the ambitious goals and opportunities set forth in the Plan, our state government, industry leaders, not-for-profit organizations, and residents all need to develop policies and/or devote resources to help private landowners manage their 14 million acres of forestlands.

The Plan also includes multistate priorities and incorporates the New York State Wildlife Action Plan and Community Wildfire Protection Plan.

GOAL #1: Keep New York’s Forests as Forests

“Don’t let forests be the forgotten solution.”
JANE GOODALL

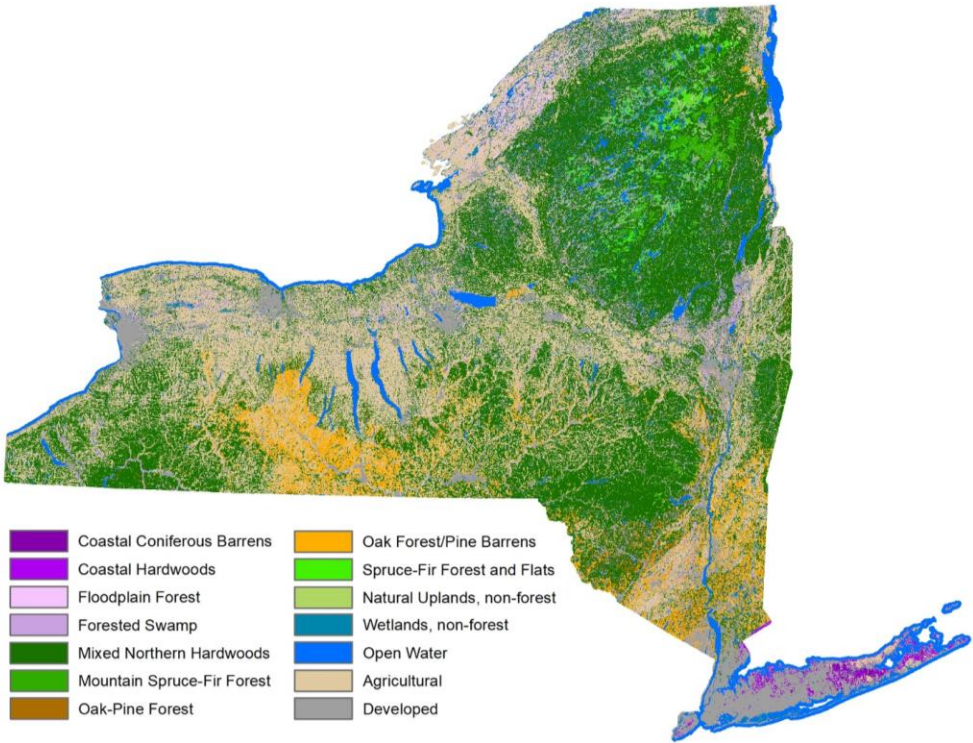
New York State is fortunate to have more than 18.7 million acres of forestland—almost 1 acre for every state resident—covering 63 percent of our state. In part, due to its size, New York continues to have the most total forestland in the Northeast.

According to recent data released by the U.S. Department of Agriculture’s Forest Service’s Forest Inventory and Analysis Program (FIA), there was a slight net forest loss in New York State of about one percent from 2012 to 2018. This marks the first decline in forest cover since the turn of the twentieth century. The strategies outlined in this goal are designed to maintain a no net loss of forests in New York.

The Plan’s first overarching goal—keep New York’s forests as forests—supports all three National State & Private Forestry (S&PF) Priorities. Our strategies to enhance New York’s

stewardship efforts for sustainable forest management and to regenerate forests all help New York to “*conserve and manage working forest landscapes for multiple values and uses.*” Our efforts to protect forests through a variety of tools (purchase of lands and easements, partnerships, research, community forestry, etc.) all “*protect forests from threats*” such as fragmentation, conversion, and loss of native biodiversity. “*Enhancing public benefits from trees and forests*” is inherent in every strategy and is explicitly developed in the subsequent three goals of this Plan.

Many of these initiatives are focused on helping New York’s private forest owners sustainably manage the nearly 14 million acres of private forestland in our state. Keeping forests as forests largely depends on them.



Map of New York State’s forested habitat types

Assessment: New York's forested landcover

The most heavily forested parts of the state remain the Western Adirondack, Eastern Adirondack, and Adirondack units. (see map below). Other large forest blocks include the Catskill Park and Allegany area (in the Southwest Highlands unit).

Forest composition and structure

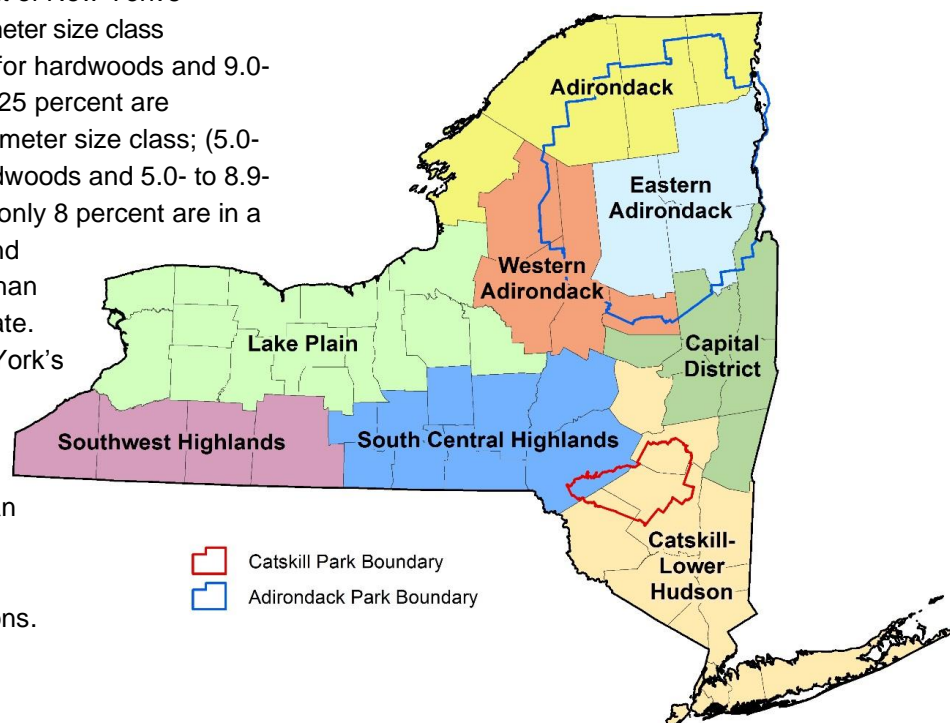
New York's forests are almost entirely of natural origin, meaning that they developed from seed dispersed by surrounding mature forest or from seed sources stored in the soil. Over 100 species of trees (commercial and non-commercial) populate New York's forests. New York's forestland continues to be dominated by the maple/beech/birch group (55 percent), followed by the oak/hickory group (18 percent), with the remaining types each having less than 10 percent of the remaining area. The maple/beech/birch type can be found in all inventory units across the state, but it is most prevalent in the Eastern Adirondack unit (71 percent). Oak/hickory is most ubiquitous in the Lake Plain, Capital District, and Catskill Lower Hudson units, where the maple/beech/birch type are least dominant.

Approximately 66 percent of New York's forests are in a large-diameter size class (minimum 11.0-inch dbh for hardwoods and 9.0-inch dbh for softwoods); 25 percent are classified as medium-diameter size class; (5.0- to 10.9-inch dbh for hardwoods and 5.0- to 8.9-inch dbh for softwoods); only 8 percent are in a stage where seedling- and sapling-size trees (less than 5.0--inch dbh) predominate. This indicates that New York's forests are growing and maturing. The low percentage of seedling- and sapling-size trees can affect the balance of other forest attributes, such as wildlife populations.

Specifically, the lack of early successional stages has led to the decline in bird populations, such as the golden-winged warbler, whip-poor-will, Canada warbler, yellow-breasted chat, American woodcock, and ruffed grouse.

This condition can be due to the prevailing timber management methods utilized in the state or the lack of timber management, the slowdown in acres reverting from an idle condition into a forested condition, and the high value of agricultural land remaining in cultivation.

Timberland is defined by the USDA's Forest Service's Forest Inventory and Analysis Program (FIA) as forestland producing or capable of producing crops of industrial wood (more than 20 cubic feet per acre per year) and not withdrawn from timber utilization (i.e., not in reserved forest status). Approximately 83 percent of all forestland in New York is currently considered timberland. This is an important distinction to make for policymakers, landowners, and land managers, as this is the percentage of forest resource that potentially could produce timber.



Map of New York State's Inventory Units, U.S. Forest Service, Forest Inventory and Analysis Program

Privately owned forestlands cover 13.62 million acres and represent 74 percent of New York’s forests. 10.2 million acres are considered family-owned or non-corporate forests. Nearly 700,000 private forest landowners provide the public with the benefits of clean air and water, carbon sequestration, wildlife habitat, and a forest-based economy. Approximately 187,000 landowners own 10 acres of forestland or more. In total, this group owns an aggregate of 9.2 million acres on which it is most practical to conduct forest stewardship and forest management activities.

State-owned forestlands. Since 1885, New York State has invested in acquiring and managing a significant amount of forested land in all regions of the state. These state lands are held as state forests, wildlife management areas, forest preserve, and state parks—each designation providing its own unique and complementary benefits, values, and public good. The Adirondack and Catskill Forest Preserve (managed by DEC) and the New York State Park System (managed by OPRHP) provide nearly 3.1 million acres of mostly forested open space on which timber harvesting is not allowed. Forest preserve lands are

constitutionally protected from harvesting and active management, and state park lands in New York are protected, by policy, from commercial tree cutting.

DEC manages more than 787,000 acres of state forests. State forests are located throughout New York State—excluding the Adirondack and Catskill Preserves—and include reforestation areas, multiple-use areas, unique areas, nature preserves, and historic preserves. On some of these lands, timber management is used as a tool to enhance biodiversity and to create habitat features that might be lacking in the landscape. Managed state forests provide timber for various markets and jobs ranging from logging to finish carpentry. Timber harvesting also creates additional financial opportunities.

Less than 1 million acres of forests originated as plantations, mostly planted by various landowners from the 1930s through 1970s. Approximately 350,000 acres of these plantations exist on state reforestation, unique, and wildlife management areas. The number of acres planted has waned substantially in recent decades, and some older plantations are being converted back to a natural forest condition.

Assessment: Private forestlands

Family forest owners hold 75 percent of all private forestland and 56 percent of total forestland in the state. Other private owners, including corporations and conservation organizations, as well as unincorporated clubs and partnerships, own the remaining 25 percent of private land in the state. The amount of acreage classified as family forest decreased by 880,000 acres from 2006 through 2017, representing a 6 percent decline. The number of family ownerships also fell by an estimated 11.9 percent.

Clearly, the future of New York’s forests and the benefits they provide lies primarily in the hands of private forest landowners.

Family forest owners find it increasingly difficult to keep and manage their forests as forests. The reasons for these difficulties are numerous. There are many economic factors related to the costs of buying, holding, and managing forestland. Property values, mortgage interest rates, taxes, costs of management, and management services are all important drivers. Local, national, and global market factors also affect the returns from direct investments in forestlands. Availability and viability of buyers and consumer trends for all manner of forest products, market preferences, and housing starts all influence wood markets and economic returns.

According to the National Woodland Owners Survey (NWOS), responding landowners ranked scenic beauty (97%), wildlife habitat (94%), and privacy (88%) as reasons why family forest

owners in New York own their lands. Managing specifically for forest products ranked fairly low (48%) as a reason that landowners own land in New York. However, advice on timber management was the number-one reason landowners sought the advice of a forester. Most often, harvests are conducted out of financial necessity or opportunity, without assistance from a forester or the guidance of a forest management plan.

Many landowners created limited liability corporations (LLCs) as legal protection for their assets, including forestland. This could explain some of the rise in the number of acres categorized as corporate. These LLCs essentially operate as family forests; however, it is difficult to differentiate between this category and true corporate ownership, such as a timber investment management organization or lumber company.

Regulatory factors can affect what family forest owners can and cannot do with their forests, and the benefits they might receive from them. Societal factors come into play as the attitudes of neighbors and others who do not own forestland weigh in on whether they support or even accept tree cutting within their sight or knowledge. Ultimately, some factors are individual, related to the age of the forest owners, their personal and financial situations, and the interest of their heirs in owning the family forests and keeping them as forested open spaces.

Threats

Increasing property ownership burdens, especially the traditional practice of assessing land for “highest and best use” when determining local property taxes, are a concern to many landowners. This makes buying, holding, and maintaining forestland expensive for private residents and can pressure current owners to sell their forest to capture that value and reallocate the assets into other investments or uses.

When forests are valued or assessed for their “highest and best use,” that use is generally not considered to be as forest. New York’s Forest

Tax Law seeks to address this issue; however, not all forest landowners are eligible, and many have different goals for their forestland than the law currently provides. Other ownership costs, including maintaining boundary lines and property security, preparing and following management plans, timber stand improvement, and invasive species control, as well as developing and maintaining forest infrastructure, also add up and increase over time.

The lack of professional forest management on private forestlands is a threat to the long-term economic viability and health of private forests. All too often, decisions about harvesting are made when opportunity arises, without the assistance of a forester. Only 25 percent of private landowners have used a forester (NWOS, 2017). Harvesting as directed by a professional forester can be an important tool to manage for many goals, such as wildlife habitat, privacy, or maintaining a resilient forest.

Even if a landowner is not planning a harvest, an examination of a woodlot can lead to early detection of forest health issues, including the detection of invasive species. This can help protect the forest resource from damage and help landowners avoid financial loss or incurring expensive treatments to protect their woodlot. Having a professional forester involved in forest management activities on private land increases the likelihood of deliberate forest management with long-term goals that are addressed with the landowner.

The availability of forest product markets is the single most important driver of active forest management on working private forest. Once the decision to conduct forestry activities is made, the ability of a forest landowner to profit from the sale of forest products often dictates if a treatment can be completed and how that treatment is executed. In other words, “No Markets, No Stewardship.” If there is a lack of low-grade markets, the landowner’s ability to conduct some prescribed forestry treatments is diminished because the cost of cutting and/or removing low-grade material is not offset by the ability to sell those products. This leads to less

healthy and productive stands, which not only will be worth less economically in the future, but also will be more susceptible to forest pests and disease. Revenue from timber sales is often used by landowners to help offset the costs of ownership as well as stewardship. Without diverse, strong forest product markets, a major tool for managing private forestlands is removed from forest landowners and policymakers alike.

State and federal income tax policies that favor or support development and land-use change away from forested open space often influence or drive behaviors and investments in ways that conflict with forest retention, especially the retention of large, unfragmented forest blocks.

Federal capital gains tax policies affecting timber assets, income, and timber investment tax treatment have also been cited as potential threats to long-term private forest ownership.

An aging landowner population is illustrated in the U.S. Forest Service's Forest Landowner Survey data, and it largely follows overall demographic trends. Recent statistics indicate that the average New York private forest owner is 61 years old. Similar to demographic issues facing farmers and agriculture, our state is rapidly approaching a significant intergenerational transfer of forestland ownership. As estates pass to heirs or are sold off to cover increased medical expenses of aging owners, the descendants of forest owners often do not share the interest in holding onto the family forest or practicing sustainable management.

Invasive forest pests also pose significant threats to forest retention and other forest values articulated elsewhere in this report. In urban forests especially, pests like the emerald ash borer or Asian longhorned beetle can cause extensive losses of trees and forest canopy. Rural forests are also threatened economically and ecologically by invasives, which have the potential to wipe out entire tree species.

Competing and incompatible land uses are also increasing threats to forest retention and the protection of lasting forest benefits and values. Various types of energy production installations and support infrastructure are often placed in forested areas. Oil and gas exploration and extraction have been common across parts of New York State, and have been impacting forest stands for decades. Exploration and extraction, with their associated road construction, well-site clearing, and transportation pipeline development, can impact the integrity of forests and lead to direct loss in some cases. In addition, surface mineral extraction and the expansion of existing mines for sand, gravel, bluestone, or other mineral resources may also affect forest retention and integrity through long-term land-use change. Similar to traditional energy projects, the increase in demand for renewable energy can also impact forests. Installation of renewable energy infrastructure in the future may require the clearing of forestland, though proper siting can minimize risks to forests and maximize the carbon sequestration values forests provide to the state's efforts to reduce greenhouse gas emissions.

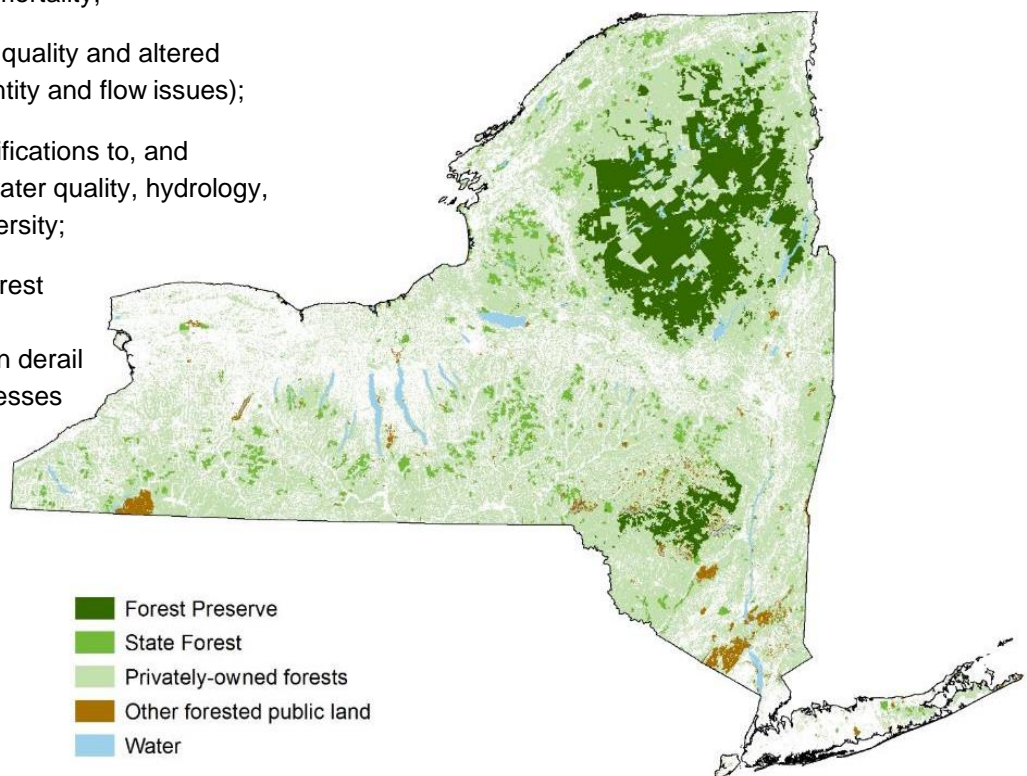
Lack of public awareness and support. The public relies on the ecosystem services that private forests provide, but they may be unaware of what it takes to keep private forests as forests or the critical role that sustainable forest management plays. The pressures and threats identified above mean that privately owned forests won't always stay as forests, or will be less vigorous, unless landowners can afford to keep them as such. Laws or local regulations that limit the ability of owners to practice sustainable forest management, or that significantly increase the costs of doing so, can have the opposite result from what was intended. Educating officials and representatives about the important role private forests have in providing a broad range of economic and ecological benefits that society receives free of charge from forest landowners is pivotal to advancing effective forest management policies adopted in New York.

Potential adverse impacts

The threats articulated by New York’s forestry stakeholders (see *Appendix C*) all have the potential, at their core, to change land use away from forested open space. Even if forests remain, they may be impacted in a variety of ways that reduce their ability or capacity to sustainably provide benefits and services. Forested open spaces may be parcelized (i.e., single large ownerships are broken up through subdivision and sale into multiple parcels with individual owners), fragmented (i.e., solid blocks are broken apart by deforested areas, such as farm fields, roads, or developments), or perforated (i.e., smaller holes are punched in a contiguous forest canopy for dispersed house lots).

Loss of forestland or changes within forests can have a wide variety of impacts. New York stakeholders have identified the following imminent impacts of concern to New York’s forests:

- Increased risk of introduction and spread of invasive species;
- Increased tree mortality;
- Reduced water quality and altered hydrology (quantity and flow issues);
- Long-term modifications to, and reductions in, water quality, hydrology, and aquatic diversity;
- Alterations in forest structure and function that can derail ecological processes that forests and forest dwellers depend on;
- Decreased native fish and wildlife populations and habitats;
- Decreased timber production and associated direct and multiplier economic activity;
- Landowners selling their forestland for development;
- Increased fire risk because increased housing densities in forested landscapes generate more potential for ignitions, making firefighting and fire preparedness in such areas more difficult, dangerous, and expensive and restricting available management options for mitigating threats to forestlands;
- Increased wildfire impacts and associated losses (ecological, social, and economic);
- Changes in scenic qualities and related social and economic benefits; and
- Changes in the quantity, quality, diversity, and cost of forest-based recreational opportunities.



Map of New York State's Forests by Ownership

Assessment: Forested State Lands

In New York, the majority of State land is in the following four categories: State forests, forest preserve, wildlife management areas, and State parks. The first three are managed by DEC, while state parks, including historic sites, are managed by OPRHP. In addition, DEC owns/manages working forest conservation easements on private forestland, and OPRHP owns/manages conservation easements on private land for public recreation.

The Forest Preserve: Adirondack and Catskill Parks

Of the 4.5 million acres of land managed by DEC, nearly 3 million acres, or 63 percent, are classified as forest preserve. New York's Forest Preserve is the largest state-designated wilderness in the country. Comprised of over 2.6 million acres in the Adirondack Forest Preserve and 287,000 acres in the Catskill Forest Preserve, these lands represent the majority of all state-owned property in the Adirondack and Catskill Parks.

The Adirondack and Catskill Parks were designated by the New York State Legislature near the turn of the twentieth century, and originally included only the state-owned forest preserve lands. The description of each park was revised in 1912 to include ALL lands, both public and private, within the "Blue Line." Today, the Adirondack Park is a 6-million-acre patchwork of public and private lands, while the Catskill Park is a mountainous region of 705,500 acres comprised of public and private lands. The two parks are a thriving mix of forests, wetlands, waterways, and human settlement.

New York's Forest Preserve is the largest State-designated wilderness in the country.

Protected as "forever wild" by Article XIV of the New York State Constitution, New York's Forest Preserve has exceptional scenic, recreational, and ecological value. Rugged mountain peaks, remote lakes and ponds, millions of acres of unfragmented forests, and nearly 2,000 miles of trails provide ample opportunity for many types of recreation, while also providing a variety of habitats for plants and wildlife. Striking a balance between recreational use and resource protection in the Forest Preserve is achieved through a park-wide land classification system and individual unit management plans (UMPs). Additional discussion about the recreational value of forest preserve lands can be found under Goal #3.

Forest preserve lands are further broken down into categories based on their capacity to withstand use. These categories are defined in the 1987 Adirondack Park State Land Master Plan, updated in 2019 (https://www.apa.ny.gov/Documents/Laws_Regs/APSLMP.pdf), and the 1985 Catskill Park State Land Master Plan, updated in 2014 (https://www.dec.ny.gov/docs/lands_forests_pdf/cpslmp.pdf). These plans are designed to guide the preservation, management, and use of state lands within the Adirondack and Catskill Parks. They also cover such topics as legislative mandates, acquisition policy recommendations, UMP development, classification guidelines, and area descriptions and delineations (wilderness areas, primitive areas, canoe areas, etc.)

The land classifications outlined in each plan include:

Both parks

- Wilderness
- Wild forest
- Intensive use
- State administrative

Catskills only

- Primitive bicycle corridor

Adirondacks only

- Canoe
- Primitive
- Wild, scenic, and recreational rivers
- Travel corridors
- Historic

State Forests

The 2010 Strategic Plan for State Forest Management (SPSFM) outlines ecosystem management, resource protection, land acquisition and infrastructure, public/permitted use, and forest management and health, as well as recreational opportunities. The plan can be found here: <https://www.dec.ny.gov/lands/64567.html>. The SPSFM is currently under review for updating.

State forests are located throughout New York, and their classification is based on different priorities for land usage, defined in several pieces of legislation (see page 12-14, SPSFM). They include:

- Reforestation areas
- Multiple use areas
- Unique areas
- State nature and historical preserves
- Miscellaneous

The 1929 State Reforestation Act and the 1931 Hewitt Amendment provided for the acquisition of abandoned farmland and overharvested woodlands outside of the Forest Preserve. These acres were then planted with seedlings from New York State nurseries, often by crews from the Civilian Conservation Corps.

State forests are currently dual-Green Certified by The Forest Stewardship Council (FSC) and Sustainable Forestry Initiative (SFI) to be sustainably managed, except for Long Island and New York City, where the state does not hold working forests. The methods used in the management of these lands are designed to respond to today's complex issues and ecological threats, such as shifting land use trends, invasive species, and climate change.

Over 798,375 acres play a unique role in the landscape because they are managed under public ownership by professional foresters, allow for the sustainable use of natural resources, are open to recreational use, provide watershed protection, and cover large land areas across the state.

State forest unit management plans are developed for all state forests. These plans address timber management, wildlife habitat, open space acquisition, outdoor recreation, recreational use and demand, infrastructure, resource protection, funding, and staffing.

State Parks and State Historic Sites

189 state parks and 35 historic sites throughout the state constitute more than 350,000 acres. These parks and historic sites provide many benefits in the form of recreation, environmental education, habitat and biodiversity protection, and many ecosystem benefits. Although not traditional working forests (logging is not allowed on NYS Parks properties), they provide many environmental, social, and economic benefits, and complement DEC's state forests. Forests, both mature and emerging, are the dominant vegetative cover on OPRHP properties.

Economic benefits of state parks lands can be found at: <https://www.ptny.org/application/files/6515/0903/5031/Economic-benefits-of-NYS-parks.pdf>, and Parks update: <https://parks.ny.gov/documents/publications/NYParks2020UpdateReport.pdf>.

Wildlife Management Areas

The wildlife management area (WMA) system consists of nearly 260,000 acres managed by DEC's Division of Fish and Wildlife: (<https://www.dec.ny.gov/outdoor/8295.html>). These public lands include 125 wildlife management areas and 72 multiple use, unique, and cooperative hunting areas throughout the state. The WMA system is managed to provide quality wildlife habitat; promote increased productivity of wildlife populations; provide ample opportunities for hunting, wildlife observation, trapping, and fishing; and protect soil and water quality.

Forests cover about 65 percent of the WMA system. Management strives to provide a mosaic of forest age types and classes, including a sizable young forest component that provides habitat for a diversity of wildlife that includes ruffed grouse, American woodcock, whip-poor-will, golden-winged warbler, New England cottontail, and wild turkey. Older forest types are a home for migratory songbirds and raptors, including eagles and various buteos, falcons, and accipiters. All forest habitat types provide excellent opportunities for wildlife-dependent recreation. Providing habitat for wildlife and public access requires a careful analysis and balance. DEC is currently preparing habitat and public use plans to guide management of these areas in the future.

Assessment: Urban and community forests

The term “urban forest” may sound contradictory to some people, yet our streets, local parks, yards, and greenspaces are where most people are exposed to trees and their many benefits. This connection with the urban forest is how many residents learn to appreciate the benefits of forests outside their urban setting.

All of the trees within a town, village, or city make up the community forest. The community forest can include street and yard trees, parks, cemeteries, golf courses, school grounds, and undeveloped green spaces. Urban and community forestry is the management of community forests to establish and maintain healthy trees for air and water quality benefits, energy savings, and environmental health, as well as to enhance the quality of life in our urban areas, where a majority of our state's residents live and work.

We classify land as urban when it reaches a certain population density, while community land is defined by political boundaries. Unfortunately, tree canopy cover has been declining in both.

We classify land as urban when it reaches a certain population density, while community land is defined by political boundaries. “US Urban Forest Statistics, Values, and Projections” (Nowak et al., 2018) provides detailed data for New York State. Urban and community land constitutes 10.3 percent of New York State. Between 2000-2010, the urban and community area increased 7.2 percent. New York's total urban and/or human community area constitutes 3.53 million acres.

According to “Declining Urban and Community Tree Cover in the United State” (Nowak et al. 2018), tree canopy cover averages 48.6 percent in our state's urban and community areas, totaling 1.315 million acres. Unfortunately, between 2008 and 2013, the urban canopy cover dropped from 53.4 percent to 52.4 percent, an average statewide loss of 6,720 acres of canopy each year.

Assessment: Federal lands with significant forests

The list below only includes federal lands in New York **with significant forest cover**, not all federal lands in the state. There are additional smaller Wildlife Refuges, National Historic Sites, etc. that have forested lands. However, they are small or have minor forest cover. Examples are the federal FDR Presidential Library and Museum and Vanderbilt National Historic Site, or the Montezuma, Iroquois, and Shawangunk Grasslands National Wildlife Refuges, or DEC's Tonawanda and Oak Orchard Wildlife Management Areas.

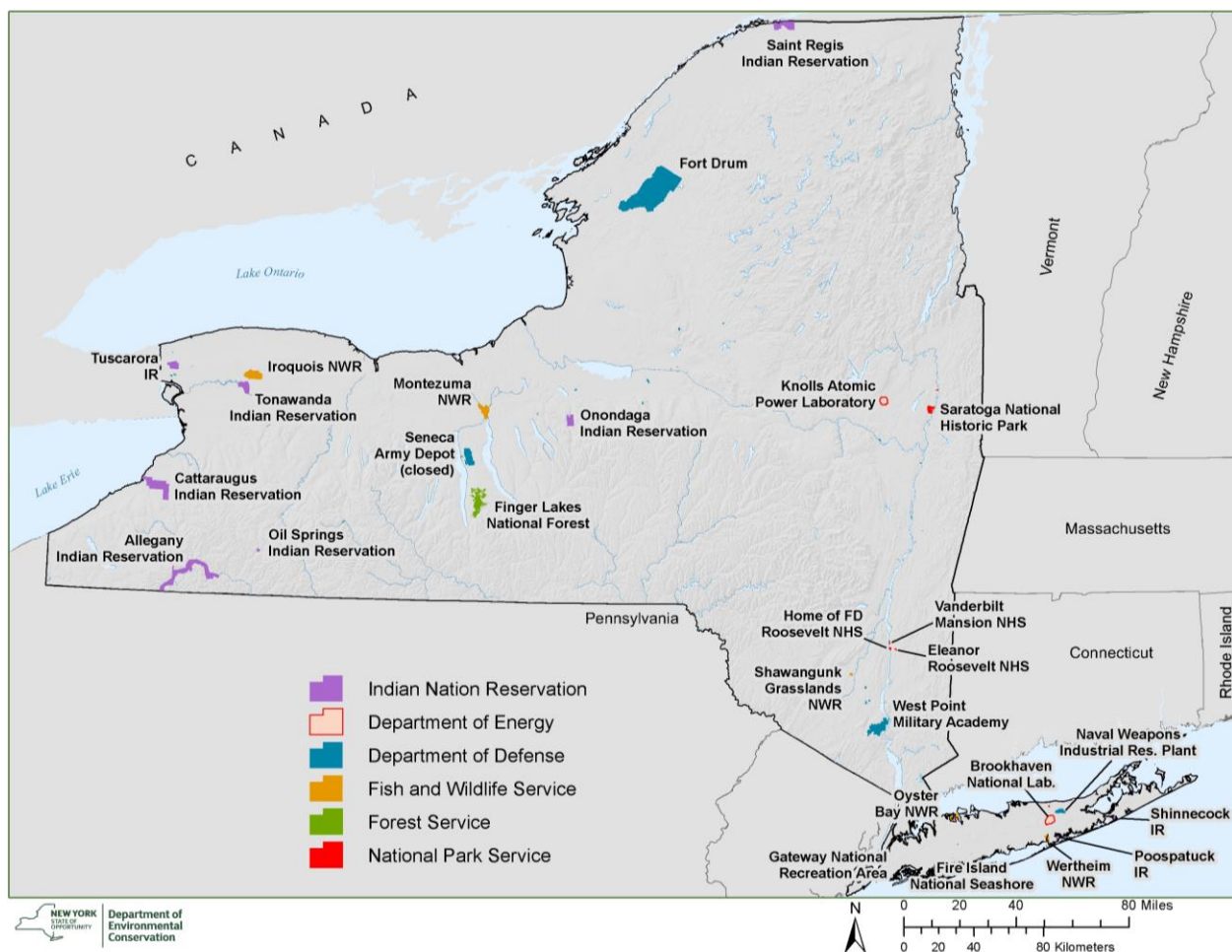
Forest Service: National Forests

The Finger Lakes National Forest's Land and Resource Management Plan, last revised in 2006, will guide the management of the Forest for the 2006 to 2021 planning period.

The purpose of the Plan is to provide management direction to ensure that ecosystems can provide a sustainable flow of beneficial goods and services to the public.

Fish and Wildlife Service: National Wildlife Refuges

Montezuma National Wildlife Refuge was established on September 12, 1938, as a refuge and breeding ground for migratory birds and other wildlife. The refuge provides resting, feeding, and nesting habitat for waterfowl and other migratory birds. Montezuma is situated in the middle of one of the most active flight lanes in the Atlantic Flyway, at the north end of Cayuga Lake in the Finger Lakes Region. The Refuge contains 7,068 acres and is situated in Seneca, Wayne, and Cayuga counties.



Map of New York State's Federal Lands and Indian Reservations

Department of Defense: Military Facilities

West Point has approximately 12,736 acres of forestland. It is the first and currently the only Army installation certified by the American Tree Farm System to have and maintain a tree farm, which has been going strong for 22 years. West Point is also a Tree City U.S.A.

Fort Drum contains 107,265 total acres. The primary purpose of the Fort Drum Forest Management Program is to manage the installation's 74,000 forested lands to support

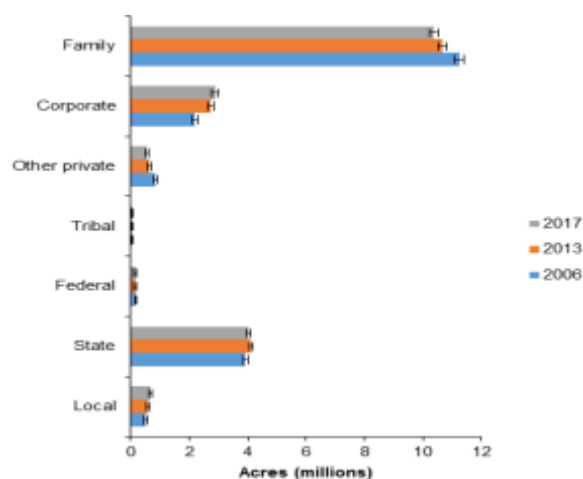
the Army training mission and to enhance ecosystem integrity through sound forest management practices. Additional objectives include the annual production of commercial forest products, enhancement of forested habitats to benefit wildlife, protection of watersheds, and increased opportunities for outdoor recreation. Forest management on Fort Drum is concerned with maintaining and enhancing the diversity of the forested ecosystem. This diversity allows the trainers access to different types of land formations and vegetative structures in order to provide optimal conditions for all training scenarios.

Assessment: Land use trends and drivers of forestland conversion

Forest parcelization and fragmentation are two land use trends that cause several problems and result in degraded forest health. Unfortunately, we expect these trends to continue in New York State, at least in the next 10 years. These fragmented landscapes support higher deer populations and also make the forest more susceptible to invasive species, which further undermine forest health.

Parcelization occurs when large parcels of land are divided up into smaller ones. Parcelization results in an increase in the number of owners. Fragmentation occurs when a continuous forest is broken up by development of roads and homes, commercial uses, and agricultural purposes.

The consequences include the spread of invasive plant species, which tend to establish around forest edges, often outcompeting native plants and disrupting entire forest ecosystems. Parcelization can—and fragmentation does—result in less interior forest for plants and animals that require this specific habitat. Parcelization also increases the number of forest landowners and can make the task of managing the forest resources of the state more difficult overall. Stewardship efforts must be of sufficient scale to target the large number of landowners responsible for managing these small woodlots. For the forest industry, parcelization increases costs and the complexity of doing business with private forest owners. For example, instead of negotiating for a timber sale on 200 acres with 1 owner, they may have to work with 5 different owners to access the same timber resource.



Area of forestland by ownership group, 2006, 2013, and 2017 (New York Forest, 2017)

Forest Loss in New York

According to recent data released by the U.S. Forest Service's FIA Program, there was a slight net forest loss in New York State of about 1 percent from 2012 to 2017. Around 390,000 acres of gross loss occurred as forestland changed classification to non-forest. Conversely, 250,000 acres reverted back to forestland, meaning that areas once cleared of forests for agriculture are now abandoned and left to

become forest again. Almost 50% of this gross loss can be explained by conversion to agriculture, while more than 30% is attributed to development. However, most of the land classified as agriculture was defined as idle agriculture and may not yet meet the U.S. Forest Service definition of forestland under the FIA sampling regime.

In New York State, parcelization and fragmentation due to development are concentrated around rural-suburban interfaces in the Hudson Valley bedroom communities and Long Island, as well as around some upstate cities. These forests are generally less healthy or productive than unfragmented forests and face a variety of threats, ranging from invasive plants and pests to overbrowsing by white-tailed deer.

What this means

The net loss of forestland reported in this inventory is small, with gross loss of forest partially offset by gross gain. Since the previous inventory, New York has seen a statistically significant loss of forestland, with a 0.29 percent average annual rate of decline, and a statistically significant gain in non-forest, with a 0.05 percent average annual rate of increase.

Assessment: Effects of a changing climate and environment on New York's forests

The New York State ClimAID assessment provides an authoritative source of information on climate change for our state, while the U.S. National Climate Assessment provides additional information for the Northeast region. The Forest Service's Northern Institute of Applied Climate Science developed two assessments of the specific vulnerabilities facing forest types in our state: the Mid-Atlantic Forest Ecosystem Vulnerability Assessment and Synthesis (<https://www.nrs.fs.fed.us/pubs/57325>), and the New England and Northern New York Forest Ecosystem Vulnerability Assessment and Synthesis (https://www.fs.fed.us/nrs/pubs/gtr/gtr_nrs173.pdf).

These changes have more than offset the gains that culminated in the maximum extent of forestland seen in the 2012 inventory, resulting in a 1 percent net loss over the past decade. Gains and losses from multiple causes are driving land-use change dynamics in New York. Movement between forest and non-forest classifications may be a result of land meeting or not meeting FIA's definition of forestland, due to small changes in understory disturbance, forest extent, or forest cover. Such changes are generally not permanent and may be more prevalent in stands of small-diameter trees. Additionally, the definition of forestland changed in 2013 from a minimum of 10 percent stocking to a minimum of 10 percent canopy cover. Over half of the forestland acreage lost to agricultural land uses (112,000 acres) was classified in the latest inventory as idle farmland, defined as areas taken out of agricultural production but not yet reverted to forestland. It is likely that much of the change was due, in part, to procedural changes in forestland classifications rather than true, on-the-ground land conversion. Monitoring this issue into the next inventory cycle should bring clarity to the question about what the true trend is in forest extent.

Threats and challenges to forest management due to our changing climate

- Extreme heat and droughts will limit available water for photosynthesis, which will restrict carbon sequestration and reduce plant productivity. These conditions also increase the threat of wildfires, which release a significant amount of carbon.
- Frequent heavy rain events will saturate roots and prevent efficient photosynthesis, and also increase windthrow, limiting carbon sequestration.

- By 2100, a warming climate is projected to have increased the growing season by one month,¹ which may increase the total amount of carbon sequestered. Yet, earlier budburst puts trees at greater risk of damage from spring frosts.
- An earlier budburst misaligns flowering with the phenology of spring pollinators. This may stunt regeneration and forest productivity of certain tree species.
- Changes in climatic conditions are projected to shift species ranges and alter forest composition:
 - Many northern and boreal tree species will face increasing stress from climate change. Boreal species of cold climates and high elevation (i.e., balsam fir, red spruce, and black spruce) are at greatest risk for decline, as they are projected to lose suitable habitat over the next century.² Ecosystem models agree that northern and boreal tree species may be less able to take advantage of longer growing seasons and warmer temperatures than warm-adapted, temperate forest species.
 - Populations in isolated and fragmented landscapes will have limited ability to migrate in response to a changing climate.
 - Common New York forest species, including American beech, eastern hemlock, white pine, and yellow birch, are expected to experience reduced habitat and growing potential. On the other hand, species with southern ranges, such as red maple, northern red oak, black cherry, and American basswood, may expand their suitable range northward.
- Invasive pests and pathogens are a growing threat to the productivity of New York's forests. Warmer temperatures and milder winters allow for faster spread of forest pests. Specifically, forests of low species diversity are at greatest risk of disturbance.
- Temperatures have risen on average 0.25°F per decade over the past century and are expected to rise across New York by up to 10.1°F by 2080, with the greatest warming in the northern regions of the state. This warming includes an increase in the number of extreme hot days (days at or above 90°F) and a decrease in the number of cold days (days at or below 32°F).
- New York is expected to experience winter precipitation more as rain than snow. On average, winter temperatures have risen more than 4.4°F since 1970.¹ In some areas of the state, the number of snow-covered days has already decreased as much as 20 days. A lack of snow cover exposes soil and roots to freezing temperatures.

A warming climate brings additional threats and challenges for forest management and conservation that are expected to amplify almost all stressors discussed in this Plan (Goal #2, Keeping New York's Forests Healthy).

¹ Mid-Atlantic Forest Ecosystem Vulnerability Assessment and Synthesis: A Report from the Mid-Atlantic Climate Change Response Framework Project identifies the vulnerabilities of forest ecosystems in the Mid-Atlantic region.

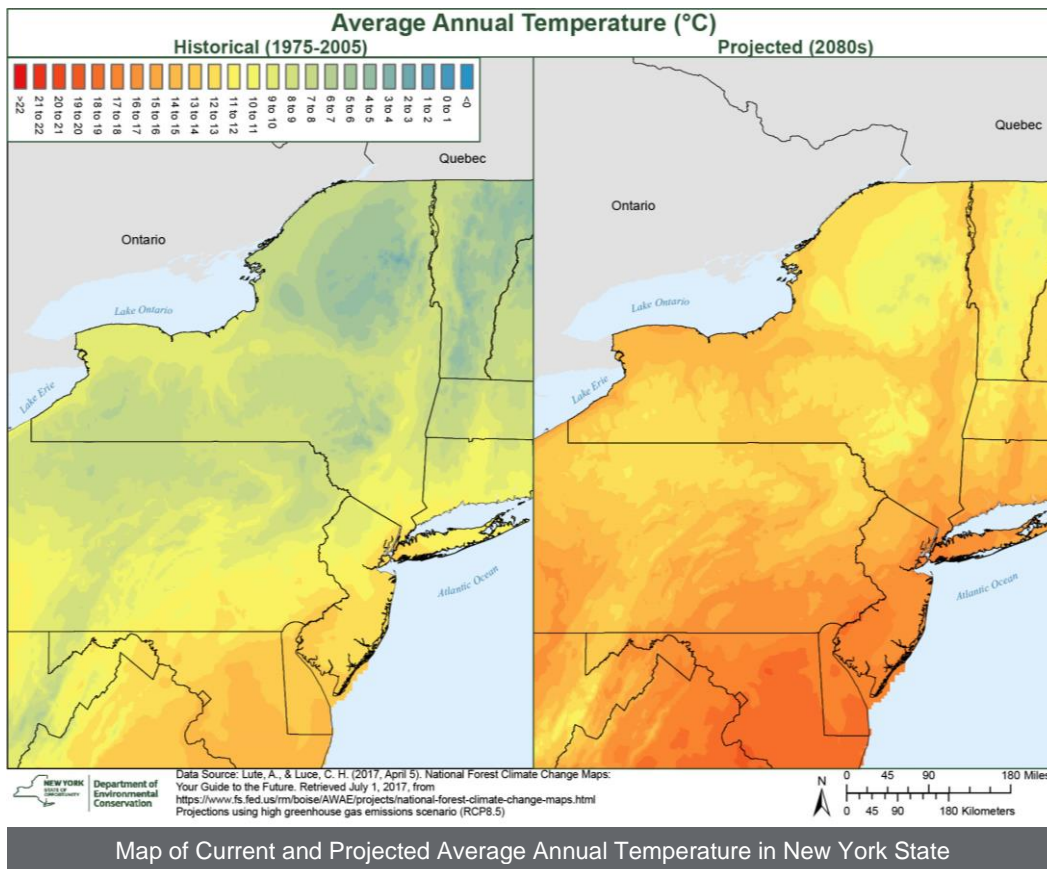
² New England and Northern New York Forest Ecosystem Vulnerability Assessment and Synthesis: A Report from the New England Climate Change Response Framework Project identifies forest ecosystem vulnerabilities in New England and northern NY region.

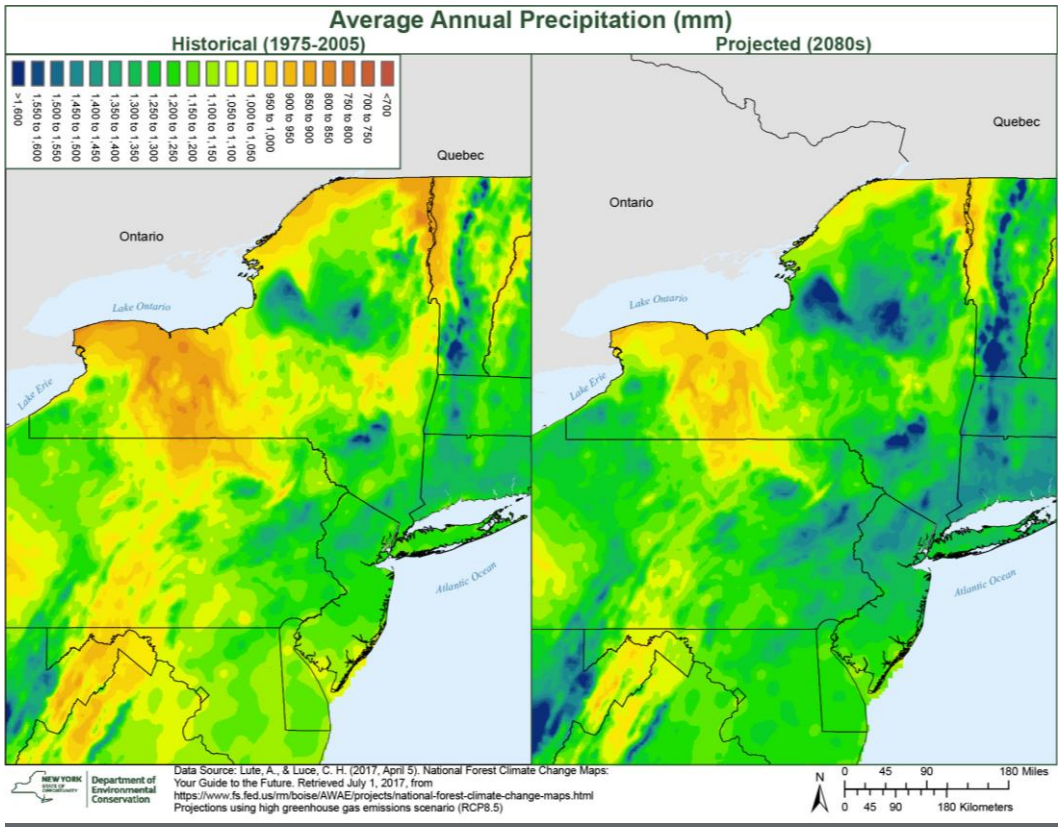
- Annual average precipitation in New York is projected to increase by up to 15 percent by the 2080s, with the greatest increases in the northern part of the state. The increased precipitation will not be evenly distributed over the course of the year; much of it is likely to occur during the winter months, while slightly reduced precipitation is possible for late summer and early fall. The recent trend of increased heavy downpours and less light precipitation is expected to continue.
- Conditions affecting tree regeneration and recruitment will change. Seedlings are more vulnerable than mature trees to changes in temperature, moisture, and other seedbed and early growth requirements;

they are also expected to be more responsive to favorable conditions.

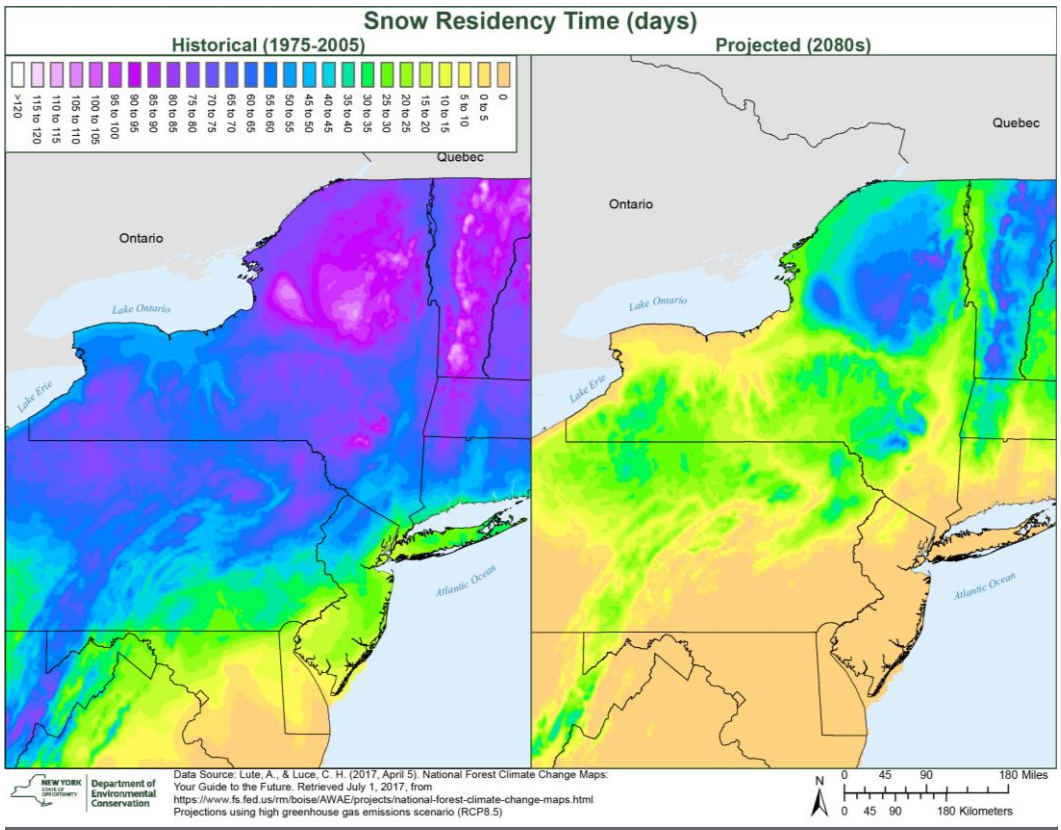
- Studies have examined the impact of climate change on forest productivity within the Mid-Atlantic region, but they disagree on how other factors, such as species composition, stand age, disturbance, or pollution, may interact to influence productivity. Changes are not expected to be consistent within a species, and the diversity of forest site conditions across the landscape suggests that changes will be spatially variable.

See also under Goal #2, Assessment: Forest biodiversity and Assessment: Connectivity of forests.





Map of Current and Projected Average Annual Precipitation in New York State



Map of Current and Projected Average Annual Snow Cover in New York State

Assessment: Valuing forests for carbon storage and community adaptation to climate change

Carbon storage

Forests are the most productive terrestrial vegetation able to absorb carbon from carbon dioxide, and they have the greatest potential for keeping that carbon out of the atmosphere long term. New York's forests help to control global climate change, and in doing so, they are providing a critical service to all New Yorkers and the global community. Carbon sequestration in New York's forests is also vital to achieving the State's net zero carbon emissions goal.

Forestlands are under pressure from development in some parts of the state. The installation of infrastructure can result in forest clearing and could contribute to forest loss. There are many questions with regard to the impact on our forests and forest resources. As in the case of land conversion for development, the impacts of energy infrastructure could be managed if the values that forests provide are recognized fully and balanced appropriately.

Based on Forest Inventory and Analysis data, New York's forests are storing approximately 1,976 million metric tons of carbon. However, according to the FIA, the net amount of carbon dioxide absorbed each year by New York's forests has been steadily decreasing in recent decades. If this trend were to continue, the annual uptake of carbon dioxide would be 20 percent lower in 2050 compared to 1990. This trend could reflect both decreasing forest area and reduced productivity. The latter may be caused by various factors, including invasive species and unsuccessful regeneration.

As the value of carbon sequestration for reducing greenhouse gas levels is becoming better understood, the role of forests in addressing climate change is gaining widespread attention. During photosynthesis, plants use carbon sequestered from the air to grow new tissue, effectively storing carbon. That carbon stays locked up in the plants as they grow, and in the case of wood products, long after the plants have been harvested. When forest biomass is combusted, such as in a wildfire or as a fuel source, this releases the carbon that had been stored. Therefore, the proper management of combustion is also a key component of maintaining carbon sequestration levels.

Forest stewardship to protect forests from land use changes and encourage productive forest growth and regeneration could increase carbon sequestration. Stewardship actions already taken by DEC include dual certification through both the Forest Stewardship Council (FSC) and Sustainable Forestry Initiative (SFI) on public lands that are not part of the Forest Preserve.

Importantly, the value of carbon sequestration is additive—it is a benefit that forests and forest products naturally provide, in addition to all other social, health, environmental, and economic benefits.

This means that the total value of healthy forests is that much higher. It also means the same strategies that are described throughout this Plan to preserve healthy forests are also strategies for maintaining carbon sequestration.

Community adaptation

Many New Yorkers place a high value on forestlands, whether for recreation, human health, watershed protection, diversity of plants, wildlife, and habitats, or for preserving local markets for forest products like timber. Forests also aid community adaptation and resilience to climate change. (See more under Goal #2, *Assessments on Forest Biodiversity and Connectivity of Forests*. See also *Carbon markets and TNC's Working Woodlands Program*; <https://www.nature.org/en-us/about-us/where-we-work/united-states/new-york/stories-in-new-york/new-york-working-woodlands/>.) Sometimes the value of the land may be treated as higher than the forest that grows on it, such as when assessing the property for development or conversion to other uses. Unfortunately, this disregards the cumulative value that forests provide — and have provided — to local and global communities alike for centuries. For example:

- Forests stabilize the surrounding air temperatures and alleviate extreme heat and desiccation for nearby buildings by providing shade and moisture from evapotranspiration.
- For communities, forests are buffers because they absorb stormwater, reduce flooding, and create windbreaks against damaging gusts. Heavy precipitation and extreme weather events are projected to become more frequent in New York.³
- Forests reduce coastline flooding and erosion by anchoring soil and absorbing water; thus, they protect threatened communities. If the sea level rises 0.33 to 0.63 m between 2080 and 2100, as it is projected to increase under the RCP 6.0 scenario, there will be approximately 1,886,000 people living under the high-tide lines in New York⁴, based on 2010 census data.

Assessment: Open Space Conservation Plan for forest protection

New York's 2016 Open Space Conservation Plan (OSP) (<https://www.dec.ny.gov/lands/317.html>) identifies priority open space conservation projects that are unique and irreplaceable open space resources warranting special conservation efforts due to their exceptional ecological, wildlife, recreational, scenic, and/or historical values.

While this Plan focuses on New York's forested landscape, the OSP guides protection of all landscapes in the state -- from small pocket parks and community gardens in New York City and other urban areas, to large forested tracts in the Adirondacks, to the two remaining Finger Lakes with undeveloped shorelines, all the way to the state's prime agricultural lands. Additionally, the OSP includes an extensive

policy discussion covering many topics, including recommendations relating to climate adaptation and mitigation strategies, many involving sustainable forest management and urban forestry. The OSP takes many priorities into account in addition to protecting forests. Moving forward, the SFAP will inform the next revision of the OSP just as the OSP informs the development of the Plan.

The map below represents the priority open space conservation projects as points. However, the project areas vary in size from small parcels to statewide priorities such as working forest conservation easements (*see more under 'private land easements for forest protection' below*).

³ New York State's 'ClimAID' report is the authoritative resources for observed and projected climate change in the state and is updated based on the global models produced by the Intergovernmental Panel on Climate Change.

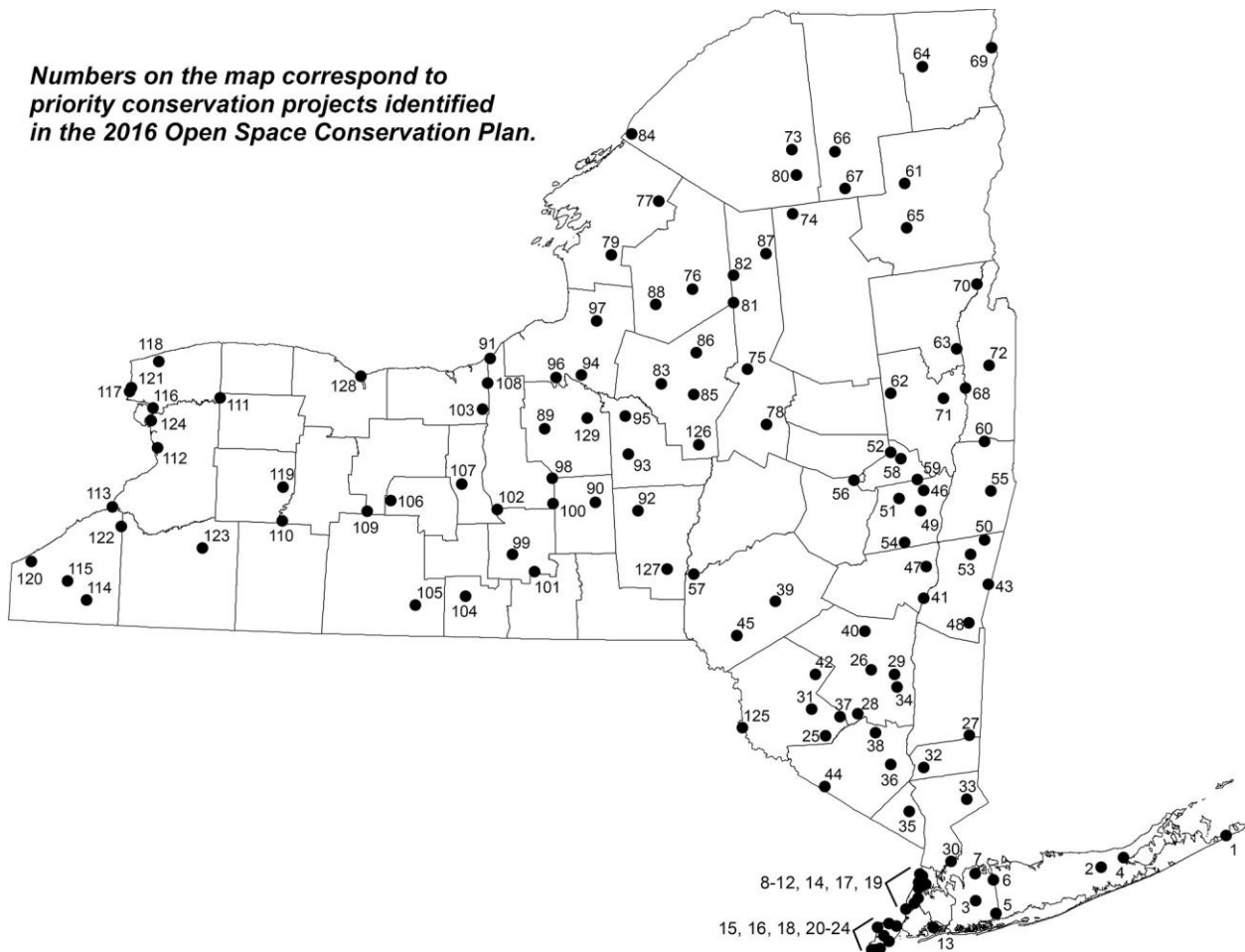
⁴ Strauss, B. H., Kulp, S., & Levermann, A. 2015. Carbon choices determine US cities committed to futures below sea level. *Proceedings of the National Academy of Sciences*, 112(44), 13508-13513. doi:10.1073/pnas.1511186112

Forest-related planning, assessment, policy & law

New York's Open Space Conservation Program began in 1990 and was designed to ensure citizen input into the land acquisition decisions made by DEC and OPRHP. Since its beginning, the program has developed a comprehensive statewide Open Space Conservation Plan (OSP)

that represents current open space conservation actions, tools, and programs administered by New York State's DEC, OPRHP, Department of State (DOS), Adirondack Park Agency (APA), Department of Agriculture & Markets (DAM), and Department of Transportation. The OSP has become an important and popular advocacy voice for conserving our state's open spaces—and the quality of life which they provide.

Numbers on the map correspond to priority conservation projects identified in the 2016 Open Space Conservation Plan.



Map of New York State's Open Space Conservation Plan Projects, 2016

Assessment: Public land purchases for forest protection

New York State has actively purchased land for conservation since 1885. Today, purchased lands must qualify under the OSP and represent a regional conservation benefit, such as helping to reduce fragmentation of state lands, protecting water resources, or improving climate resilience. Since the last Forest Action Plan in 2010, New York State has purchased 244,100 acres of forested land. The process to determine what land to purchase will continue to evolve with the OSP. It is also driven by the public's desire to sell. Landowners interested in selling their land work directly with one of DEC's 9 regional offices or OPRHP's 12 regional offices where the local knowledge of conservation needs is greatest. When a project is first considered, the region assesses how important the acquisition of the project is to the region and the management cost of acquiring the project.

The main funding for land acquisitions by New York State is the Environmental Protection Fund (EPF). There are additional federal funding sources, such as the Forest Legacy Program (*see below*) and the Pittman-Robertson Act. The latter is used by DEC to purchase land that is classified as a wildlife management area (WMA) and managed by the agency's Division of Fish and Wildlife (*see above, under 'forested state lands'*). While not all WMAs are forested, many are. There are a few other funding sources that are employed for land purchases on a smaller scale.

Case study: Boreas Ponds

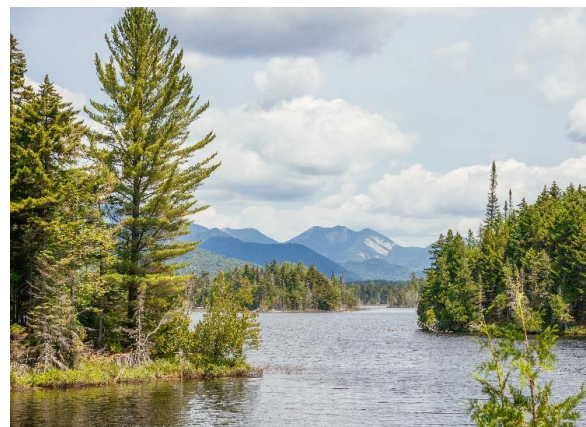
The 20,000-acre parcel was acquired by New York State and added to the Adirondack Forest Preserve in 2016. This parcel was the final piece of a multi-phased acquisition from the Nature Conservancy of 69,000 acres of former Finch Pruyn timberlands.

Trends and threats

Projects acquired by DEC since 2010 have resulted in an additional 2,400 miles of boundary line. Boundaries on forested land are required to be maintained every 7 years. This entails walking the length of boundaries, repainting the blazes, and putting up new signs. When the boundary lines are not maintained, they can be lost. When a boundary line cannot be found, it needs to be resurveyed to locate the line, which is a much more time-intensive and costly endeavor. Unfortunately, projects that need to be resurveyed get added to the backlog.

DEC is currently not able to survey all new acquisitions. Sometimes sections of new acquisitions are surveyed, or surveys occur after the land is purchased. This creates a backlog as more properties are acquired but don't get surveyed.

Another challenge in acquiring land is pushback from municipalities that do not want the State to own more land in their area. This is because the State sometimes pays less or no taxes on land it owns, as well as the municipality's perceived loss of income, or opportunity cost due to the loss of development opportunities for the parcel(s) or the inability set a higher assessment value. The recreational, human health, water filtration, and other ecological benefits of conserved land do not directly translate to municipal revenue.



Assessment: Conservation easements for forest protection

Conservation easements are another tool to keep forests as forests. They keep land in private ownership and on local tax rolls, while cost-effectively achieving tremendous environmental and outdoor recreation benefits. There are more than 900,000 acres of conservation easement lands in New York State, and 90 percent of them, i.e., nearly 807,000 acres, are DEC's working forest conservation easements, primarily in the Adirondacks and Tug Hill Plateau (<https://www.dec.ny.gov/lands/41156.html>).

New York State's working forest conservation easements require the landowner to professionally manage their property's forest resources so that the land permanently remains available for sustainable forestry. Most working forest conservation easements provide the landowner the choice of two management options: DEC's Forest Certification Program or a forest management plan approved by DEC.

Just over 710,500 acres of DEC-held conservation easements are certified to the forest management standards of either the Forest Stewardship Council (FSC) or Sustainable

Forestry Initiative (SFI), while nearly 482,000 acres are dual-certified to both FSC and the SFI program standards. About 96,000 acres of DEC-held conservation easement lands are managed under a DEC-approved forest management plan. Under the forest management plan option, the landowner works with a professional forester to create a forestry plan that is then approved by and filed with DEC forestry staff. DEC forestry staff conduct on-site audits to ensure the plan is being followed.

Similar to land acquisitions, conservation easements must be regionally important and fall into one of the categories in the OSP. The combination of the conservation easement tool and EPF have delivered the most successful conservation results in decades in New York, ensuring that our forests continue to provide environmental and economic benefits.

Threats to conservation easements are similar to challenges of public land purchases for conservation (*see above*), particularly an insufficient boundary survey and maintenance.

Priority Landscapes: Forest Legacy Program

The federal Forest Legacy Program (FLP) protects environmentally important, privately owned forest areas threatened by conversion to non-forest uses. In New York, the FLP is a partnership between DEC and the U.S. Forest Service.

The FLP is an entirely voluntary program that encourages and supports acquisition of conservation easements. The program requires that all managed forest resources follow a multi-resource management plan. FLP conservation easements restrict building development, protect natural resource values, and provide for public recreation opportunities. The FLP also supports fee-title land purchases in a limited number of situations where state ownership is necessary to accomplish the program's objectives.

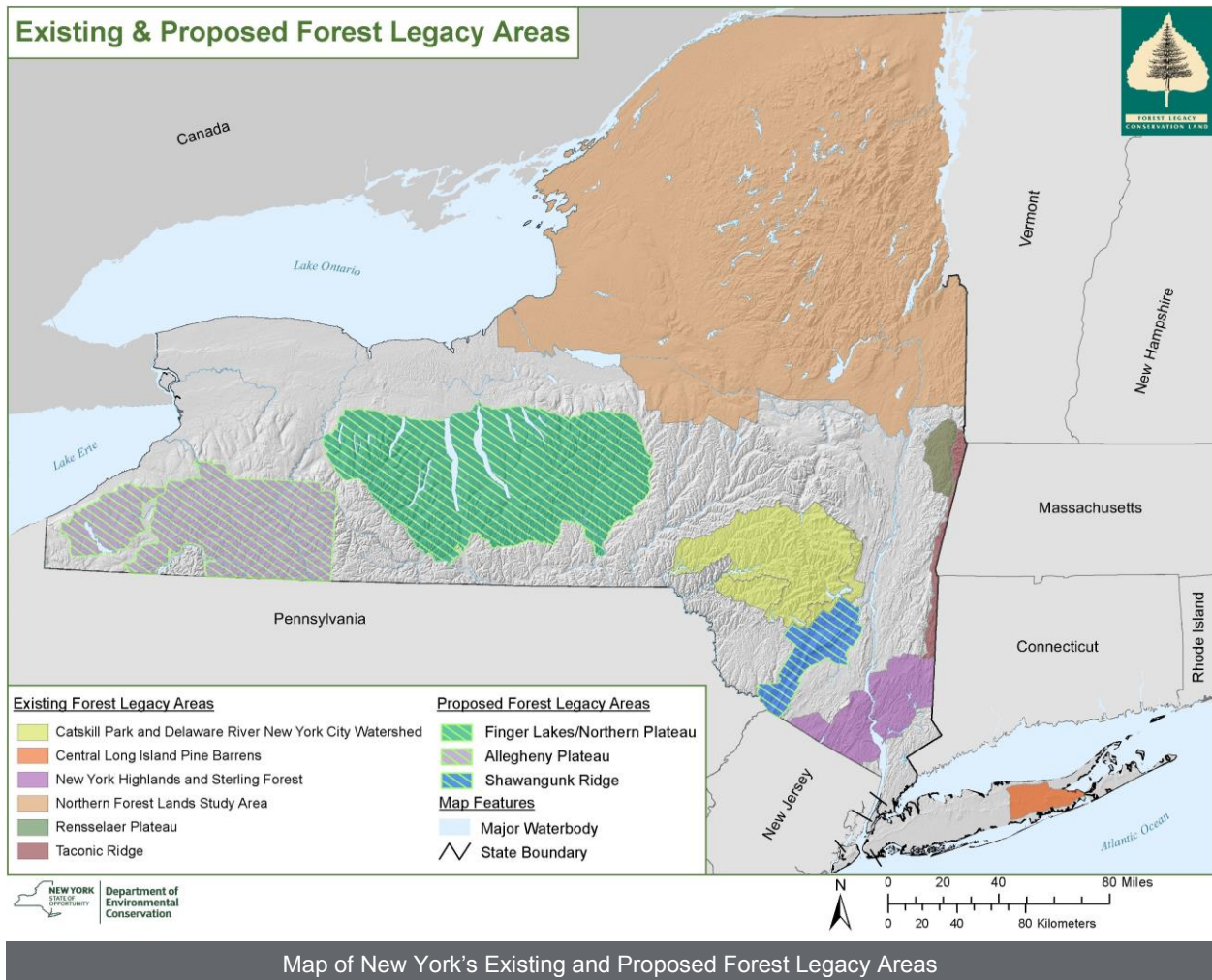
Current Forest Legacy Areas (FLAs) (*see map*):

- Catskill Park and the Delaware River New York City Watershed
- Central Long Island Pine Barrens
- New York Highlands and Sterling Forest
- Northern Forest Lands Study Area
- Rensselaer Plateau
- Taconic Ridge

Under the program, a participating state is required to develop an Assessment of Need (AON) that includes a summary of current forest conditions, program eligibility criteria, specific goals and objectives to be accomplished by the FLP, and identification of new Forest Legacy Areas (FLA) for designation, as well as the process that will be used to evaluate and prioritize projects considered for inclusion in the FLP.

This SFAP includes the revised AON (see *Appendix A*), which includes new eligibility criteria to bring New York in line with U.S. Forest Service standards. This AON also requests the addition of three proposed FLAs (see *map*):

- Allegheny Plateau
- Finger Lakes/Northern Plateau
- Shawangunk Ridge



Priority Landscapes: Metropolitan, urban, and suburban areas

Metropolitan, urban, and suburban areas make up 10.3 percent of New York State's land. Despite this relatively small percentage, these areas are home to 87.9 percent of New Yorkers, "US Urban Forest Statistics, Values, and Projections" (Nowak et al. 2018). Contributing to the creation of more livable urban and suburban communities for New York residents is a priority for DEC.

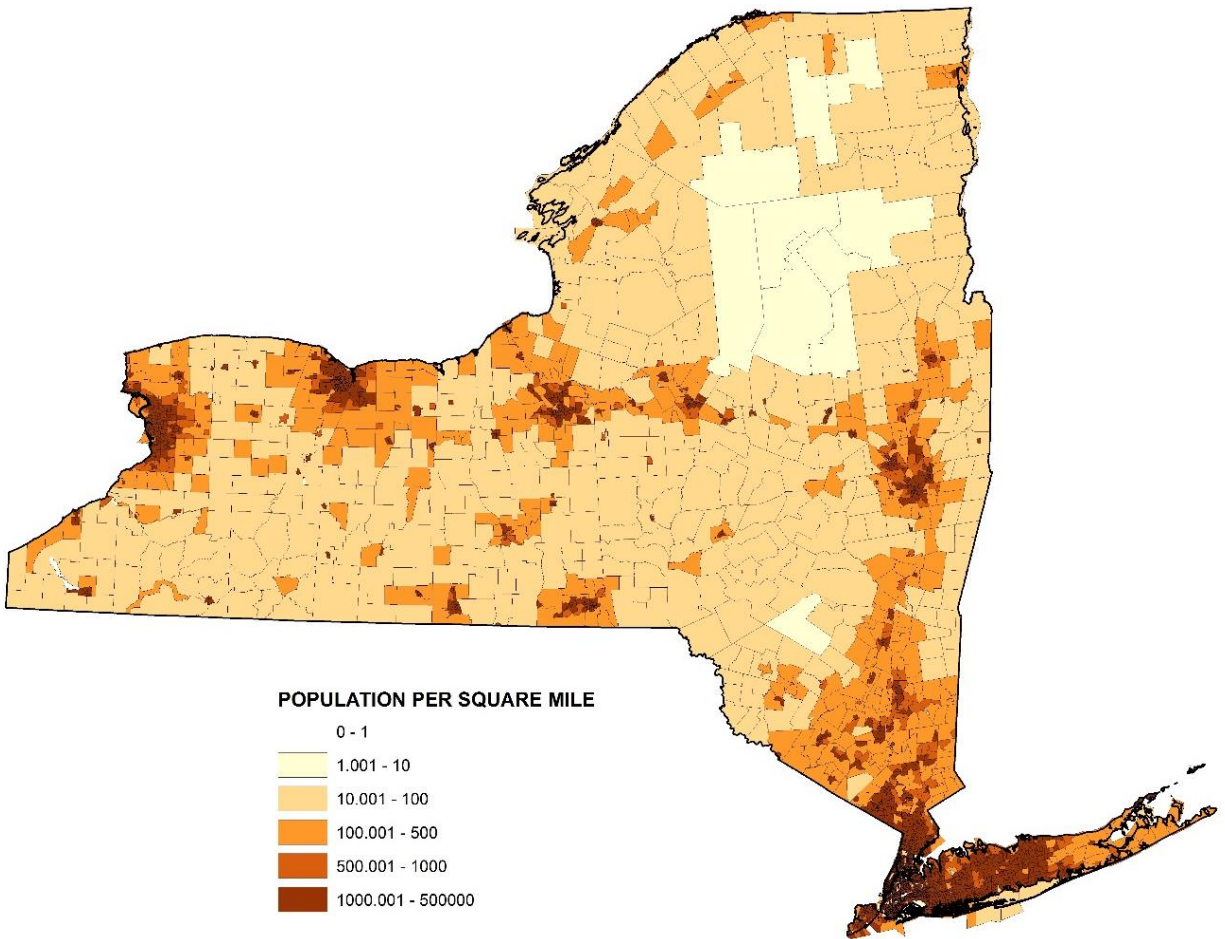
The reasons are twofold. On the one hand, fostering a healthy green infrastructure, i.e., the planting and care of community trees, represents a wise investment in what is perhaps the only part of a city's infrastructure that increases in value and contributions provided over time. Collectively, community trees can be thought of as a city's green infrastructure, while a city's roads, sewers, bridges, and water treatment plants compose its gray infrastructure. Among other benefits, this green infrastructure generates distinctive and attractive areas with a strong sense of place and walkable neighborhoods that provide opportunities for passive recreation, while also helping to protect the natural beauty and important environmental areas of New York's urban and suburban settings.

DEC recognizes that the majority of our state's residents get introduced to the joy and benefits from trees and forests through urban or suburban green infrastructure. Without this connection, we cannot foster public support for New York's forests.

New York's Urban and Community Forestry Program (UCF) (<https://www.dec.ny.gov/lands/4957.html>) is a partnership between DEC forestry professionals, public and private individuals, and volunteer organizations who care about trees in urban settings. The program's priority is to enhance urban and community forests via educational workshops, forester/arborist contacts, financial assistance, and access to the latest research.

The program's goals include:

- Increase the number of communities reaching "developing" and "managing" status;
- Integrate UCF into all scales of planning;
- Promote the role of UCF in human health and wellness;
- Promote the role of UCF in mitigating the effects of climate change in communities;
- Strengthen partnerships to help improve management, maintenance, and stewardship;
- Increase funding for UCF;
- Protect urban and community forests against threats from exotic invasive pests;
- Promote and increase utilization of waste wood from urban and community forests; and
- Encourage preparation for severe storms and the recovery of damaged landscapes.



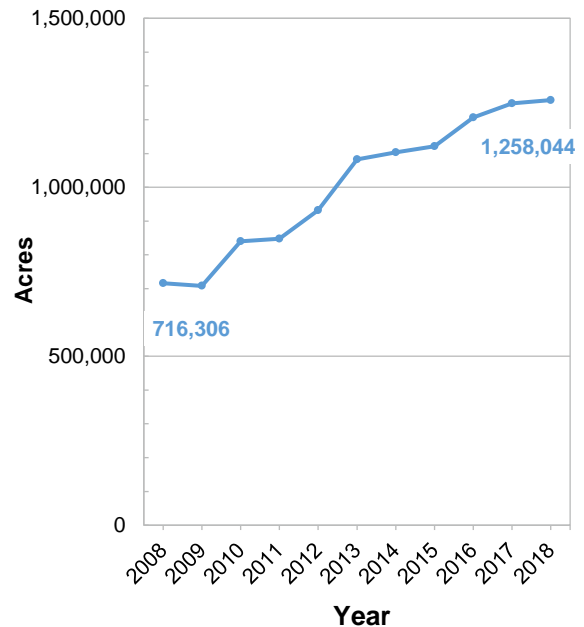
Map of New York State's Population Density, 2010

Focus Area: Private forestland protection and management

New York's Forest Tax Law 480a was enacted in 1974 to provide private forestland owners a tax benefit to continuously produce a merchantable forest crop under an approved forest management plan. To obtain such a plan, landowners with 50 or more eligible acres can task a private consulting forester to write a forest management plan, which is then reviewed/approved by DEC staff. As of 2018, there are over 3,400 forest landowners and 1.2 million acres of private land under professional forestry management.

Participation in the State Forest Tax Law Program is voluntary, though once lands are enrolled, it includes a rolling 10-year commitment to follow the accepted forest management plan. There are substantial penalties for failure to follow the plan or for conversion of any of the enrolled acres.

Acres Enrolled in 480a, 2008-2018



An ancillary benefit of the program is the fact that due to high penalties for conversion to a non-forestry use, properties enrolled in 480a tend to remain as intact forest tracts. Most of the forest tax enrollees are in the eastern half of the state. In the North Country, tracts enrolled in 480a tend to be larger, due to the presence of Timber Investment Management Organizations (TIMOs). Enrolled properties in the rest of the state tend to be owned by individuals or families and smaller in size. The program is becoming increasingly popular in the western and central parts of the state as real estate tax burdens on family forest owners continue to rise in these areas.

One of the great barriers to enrollment in 480a is the need for landowners to own 50 acres of eligible forestland to qualify. This is a high minimum acreage in comparison to other states. The strict penalties and regulatory oversight of the program also can deter landowners from

enrolling. An additional limiting factor in enrollment is the program's statutory focus on managing for timber production. Many landowners own their forestland for reasons other than timber, such as wildlife, aesthetics, and recreation.

The public also benefits from the ecosystem and economic services private forests provide, such as clean water, clean air, carbon storage and sequestration, aesthetic beauty, wildlife habitat, and contributions to a robust rural economy. Also, the services demanded from local municipalities by undeveloped forestland are few, except for road maintenance for access.

Recognizing all the benefits private forest landowners provide and why they own forestland is paramount to designing future financial incentives to help these owners keep their forests and manage them sustainably.

Focus Area: Private Forest Stewardship Program

New York's Private Forest Stewardship Program is a partnership with the U.S. Forest Service's Forest Stewardship Program, which was established in 1991, under the authority of the Cooperative Forestry Assistance Act of 1978. Between 2010 and 2017, this state program was responsible for the development of 3,744 Forest Stewardship Plans, covering 554,000 acres across New York. Since 1946, when New York's Forest Practice Act was adopted, DEC (including its predecessor, the New York State Conservation Department) has been providing forest management planning advice and assistance to private forest owners.

The goal of the Forest Stewardship Program is to provide sound, unbiased, forest management advice to private forestland owners in New York State. For many landowners, contacting a DEC Forester for advice is the first step on the road to sound forest management of their woodlot. There is a large forestry education component to the program, and landowners often develop a long-term relationship with their DEC Private Lands Forester that is passed down through generations. Traditionally, DEC has delivered

this program through landowner visits, forest stewardship plans, and technical assistance. The focus in the past 30 years has specifically been on management plan preparation. However, research has shown that forest management activities not paired with incentives or regulation to achieve recommended conservation practices do not necessarily improve with a voluntary plan (Van Brankle, 2006).

The general public continues to benefit from the ecosystem services provided by privately owned forests. Since most of the forestland in New York is owned, and will continue to be owned, by individuals, it is imperative to continue and even enhance our outreach to landowners and the general public about the importance of forest stewardship. The continuing challenge for the program moving forward is to find innovative techniques to reach as many landowners as possible, and for landowners to then practice sound forest management on their property.

Unfortunately, federal funding support to states for the Forest Stewardship Program's implementation has diminished since its inception. In New York, new strategies and efficiencies need to be found to deliver this program to landowners in the most impactful way. Developing private/public partnerships with industry, nonprofits, and private forestry consultants could be a way to expand the reach of the program to provide landowners with forestry services.

Third-party certification programs on public/private forestlands

Most of the forest management standards and guidelines for privately owned/family forests are, ultimately, voluntary. The private sector certification programs for industrial and family forests are all voluntary in nature. In each of these programs, a landowner voluntarily enrolls and agrees to manage his/her forest to the standards of the program. The landowners can also voluntarily remove their properties from the programs with little or no penalty.

Private Certification Programs:

- American Tree Farm System (ATFS) (http://www.treefarmssystem.org/cms/pages/26_19.html)
- Sustainable Forestry Initiative (SFI) (<http://www.sfiprogram.org>)
- Forest Stewardship Council (FSC) (<http://www.fscus.org>)
- Program for Endorsement of Forest Certification (PEFC) (<http://www.pefc.org>)



The Benefits of Long-Term Forest Stewardship: On a brisk day in March 2019, DEC Region 7 senior forester Matt Swayze met with the Sykes family of Onondaga County to update their forest stewardship plan. The Sykes' forest ownership is especially significant as it is in the headwaters of Carpenter's Brook, a popular trout stream that supplies clear, cool water to the county's fish hatchery.

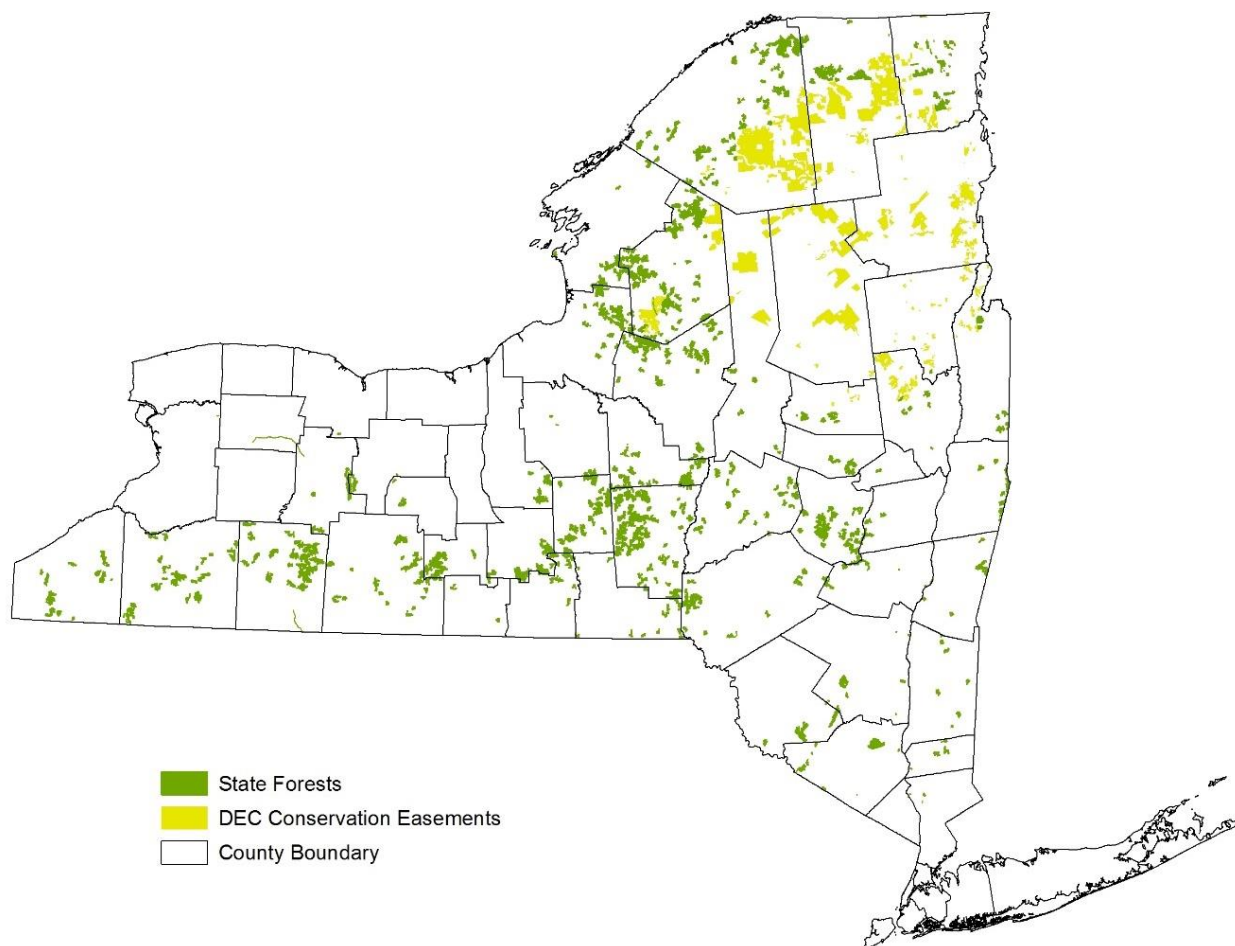
Matt is the third DEC forester to work with Mr. Sykes, who has collaborated with DEC for nearly three decades. Over the years, DEC has provided technical guidance regarding precommercial thinnings, recreational trail layouts, wildlife habitat improvements, tree plantings, and watershed protection. The relationship between the Sykes family and DEC foresters has been mutually beneficial, with both parties learning from each other during every site visit.

There is increasing interest in and promotion of third-party certification systems (SFI, FSC, ATFS, PEFC), prompted by certifying entities, environmental non-government organizations (ENGOs), environmentally conscious consumers, and corporations that target those consumers. Government organizations and elected officials are also targeted to specify the use of certified or sustainably produced wood products for publicly funded projects or purchasing.

The map below includes state-owned certified acres, as well as state-held working forest conservation easements, in the Adirondack Park that are certified, mostly under FSC or SFI. Throughout New York, there are many more acres of private forestlands certified under several programs, including:

- 624,922 acres are SFI-certified,
- 571,918 acres are FSC-certified,
- 508,987 acres are in the American Tree Farm Program,
- 5,749 acres are certified under Green Tag.

Note: These acreage figures cannot be added together as there is considerable overlap between them, with numerous properties holding dual certification (SFI and FSC, ATFS and FSC, or ATFS and Green Tag). The largest single block of (dual-) certified forestland is the 764,050 acres of state forest managed by DEC.



Map of New York State's Certified Forest Lands, 2019

Focus Area: Indian Nations in our state

DEC is engaged in a process of understanding how to meet the requirements regarding indigenous peoples' rights, consistent with the agency's conservation responsibilities. The Center for Native Peoples and the Environment at SUNY ESF has been working to facilitate this process through outreach and engagement with Indian Nations.

Before New York State was established, indigenous peoples lived in, cared for, and used these forestlands. Today, there are eight federally recognized Indian Nations and one state-recognized Indian Nation (the Unkechaug) in New York. See 'Map of New York State's Federal Lands and Indian Reservations' under 'Federal lands with Significant Forests' above in this Assessment section. Indigenous people continue their use of and care for forests. On reservations and throughout aboriginal territories, forests are considered essential for indigenous culture, health, and economic well-being.

The United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP), adopted by the UN in 2007, guarantees indigenous peoples rights to "lands, territories and resources which they have traditionally owned, occupied, or otherwise used or acquired," including forestlands. See "Who are indigenous people?" at https://www.un.org/esa/socdev/unpfii/documents/5session_factsheet1.pdf.

See https://www.un.org/development/desa/indigenouspeoples/wp-content/uploads/sites/19/2018/11/UNDRIP_E_web.pdf.

United Nations Declaration on the Rights of Indigenous Peoples

ARTICLE 26

- 1. Indigenous peoples have the right to the lands, territories and resources which they have traditionally owned, occupied or otherwise used or acquired.*
- 2. Indigenous peoples have the right to own, use, develop and control the lands, territories and resources that they possess by reason of traditional ownership or other traditional occupation or use ... or have otherwise acquired.*
- 3. States shall give legal recognition and protection to these lands, territories and resources... with due respect to the customs, traditions and land tenure systems of the indigenous peoples concerned*

ARTICLE 25

Indigenous peoples have the right to maintain and strengthen their distinctive spiritual relationship with their traditionally owned or otherwise occupied and used lands, territories, waters and coastal seas and other resources and to uphold their responsibilities to future generations...

Strategy: Actively pursue afforestation and forest restoration efforts

Maintaining or even increasing the percentage of forestland in the state, either by encouraging efforts to revert areas of non-forest or by planting trees, serves multiple benefits. It maintains young forests for wildlife habitat, helps to sequester and store more carbon, and provides storm resiliency along stream buffers, just to name a few. Known and unknown pressures on existing forests may encourage the need to establish new forests.

- Develop and grow the newly created “Regenerate NY” cost-share program to improve forest regeneration on private forestland throughout New York State. This state-funded program is available to forest landowners beginning in 2020 and will help defer the cost of forest regeneration practices such as interfering vegetation control, tree planting and maintenance, and site preparation. Deer fencing and tree protection are among the funded practices.
- Promote and encourage planting projects on state and private lands that use locally sourced plant material to help maintain diverse habitats for wildlife. For example, DEC’s Col. William F. Fox Memorial Saratoga Tree Nursery promotes and encourages various planting programs. Seedlings are used in many planting projects in state forests, and they are also available to the public. For more information see: <https://www.dec.ny.gov/animals/61320.html>.
- Identify old fields that have stagnated with regards to tree regeneration and promote planting and restoration efforts on these lands.



Young “Trees for Tribs” program participant

- Promote the “Trees for Tribs” program to help enhance stream corridors, also known as riparian areas, and restore damaged streamside and wetland areas. The goal of the program is to plant young trees and shrubs along stream corridors to prevent erosion, increase flood water retention, improve wildlife and stream habitat, and protect water quality. Trees for Tribs has engaged more than 8,700 volunteers in planting more than 101,400 trees and shrubs at 600+ sites across New York State. The plants are exclusively native and chosen based on location, soil type, site conditions, planting goals, etc. Diversity in plantings is a main goal of the program; some examples are red osier dogwood, wetland rose, elderberry, river birch, red oak, sand cherry, winterberry, silky dogwood, and northern white cedar (<https://www.dec.ny.gov/animals/113412.html>).

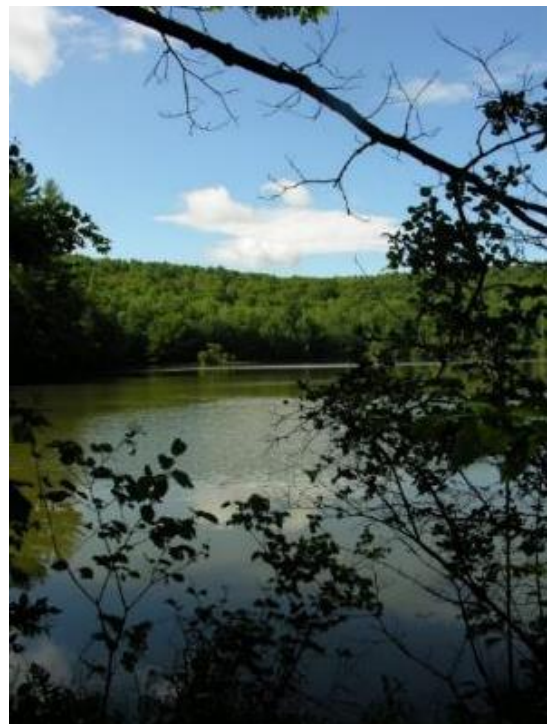
- Educate younger generations about the importance of planting native trees. Partner with schools to grow, plant, and maintain trees, and continue the school seedlings program that provides free seedlings to local schools. Since 1985, 23,779 orders were placed by schools or youth programs, and DEC has provided 879,150 seedlings (<https://www.dec.ny.gov/animals/9393.html>). Consider replicating successful watershed forestry education programs of the New York City's Watershed Agriculture Council.
- Continue complementing the Trees for Tribes program's efforts in mostly rural areas by planting trees in urban and suburban areas, as well as through the implementation of the Buffer in a Bag program, which began in 2019 (<https://www.dec.ny.gov/animals/115903.html>).

Strategy: Maintain and restore connectivity between fragmented and parcelized forestland

Case Study: Hand Hollow State Forest

Hand Hollow State Forest in the Town of New Lebanon, Columbia County, NY was created in 2014 with the purchase of 216 acres. Currently, Hand Hollow is 518 acres, with more acreage to be acquired in the future. This state forest includes a 10-acre lake, as well as opportunities for hiking, biking, skiing, paddling, and snowmobiling. With the adjacent 447 acres owned by the Columbia Land Conservancy, the state forest creates a large contiguous protected area.

Hand Hollow is one of the newest state reforestation areas acquired, and it exemplifies its traits: "forever devoted to reforestation and the establishment and maintenance thereon of forests for watershed protection, the production of timber, and for recreation and kindred purposes" (Article 9, Title 5, Environmental Conservation Law).



- Continue the multipronged approach to conserving or restoring landscape connections between fragmented and parcelized forestland, including community-level conservation, planning, and zoning; statewide tax law; private conservation easements; and state, municipal, and nonprofit land purchases.
- Continue conservation or enlargement of forest blocks through public and nonprofit land acquisitions, conservation easements, and private land recruitment through tax incentives or other measures, which is essential to keeping fragmented and parcelized areas connected. These conservation efforts will also reduce the threat of subdivision and land use change. *See DEC's efforts to connect New York's state forests and a map of forest matrix blocks, as well as The Nature Conservancy's work on regional connectivity, such as the Staying Connected Initiative* (<http://stayingconnectedinitiative.org>) (https://www.dec.ny.gov/docs/lands_forests_pdf/sfconnectivity.pdf) (<https://databasin.org/datasets/e6c7374107624643be052c44d29ad246>).
- Strive to maintain connectivity among forested habitats to allow movement of wildlife, including their migration in response to climate change, and also maintain the health of the habitat itself. Similarly, establish connections to improve the ability of tree or other plant species in isolated or fragmented landscapes to migrate in response to climate change.
- When planning to improve forest connectivity, include connectivity of streams and waterways impacted by man-made access infrastructure, plot division, logging, and other disturbances. As forest plots are divided and reduced in size, the amount of roads and trails increases, which can result in blocking natural stream flows, preventing fish and other creatures from access to their natural habitat.
- Continue public land acquisition, a valuable tool to protect forests with vulnerable species that are under high development pressure.
- Continue DEC's targeted land and easement acquisition program, which has a list of qualified categories, including reducing fragmented and parcelized forests. Lands or easements that can be purchased to connect fragmented or parcelized forests are usually of high regional importance and pursued by DEC. When a land acquisition or easement project is first considered, management costs are considered as a component of the overall project cost.
- Support community-level land use planning, which is critical for maintaining and restoring forest connectivity. *See our strategy to 'Support forest-protection-minded local planning and zoning efforts' under Goal #4.*
- Explore partnerships and creative/innovative solutions or funding sources to conserve forests.

Strategy: Establish buffers for existing protected forests through partnerships

- Buffers adjacent to protected forestlands serve to minimize conflicts with neighbors, avoid land use change, support and improve connectivity between forest blocks, and keep forests as forests.
- Establish buffers for already protected forestlands through partnerships, such as partnerships with municipal governments, nongovernmental organizations, or conservation-minded neighbors.
- Establish buffers through a variety of means: engagement with private neighbors or stewardship partners, municipal zoning guidelines, easements, Critical Environmental Areas, overlays, and land acquisitions.
- Manage these buffers through conservation-minded land use practices.

Case Study: Conserving Critical Environmental Areas

The undeveloped Rondout Valley in Wawarsing, New York connects the unfragmented forests of the Shawangunk Ridge and the Catskills. The area is a priority regional project in the New York State Open Space Conservation Plan, 2016. Wawarsing recognized the value of the Catskills-Shawangunks corridor as an important community resource in its 2014 open space inventory, 2015 comprehensive plan, and 2018 open space plan. (The town received funding and technical assistance for its open space inventory and open space plan from DEC’s Hudson River Estuary Program.) The town recommended the designation of Critical Environmental Areas (CEAs), two of which were adopted in 2019.



One CEA was the 3,000-acre Catskill-Shawangunk Greenway Corridor, a recreational link with agricultural and tourism potential. The community also cited the corridor’s biodiversity: “this may be the only remaining land complex that can provide ... habitat connection between two ... prominent conservation areas in New York.” The second, 8,000-acre CEA will help to protect Cedar Swamp, one of the largest wetlands in the Catskills, which was highlighted in the town’s and State’s open space plans. Cedar Swamp contains rare species and more than 800 acres of forested wetlands with nearly 500-year-old trees.

With a large portion of the state’s population residing in metropolitan, urban, and suburban areas, it is important that DEC’s Urban and Community Forest Program not only works with municipalities, but also with the general public. Education is a key component to connecting people with trees and recognizing their benefits. In addition, engaging students from k-12 and colleges to assist with these efforts will benefit current and future generations.

- Help to get the public outside, walking amongst trees along a street or in parks. It is key to securing the public’s support for government funding of community-owned forests.

- Communicate the benefits (health and economic) of green spaces.
- Continue to work with volunteer groups, colleges, and schools to promote the benefits of urban and community forests.
- Utilize waste tree wood from municipal-owned properties for future projects (park benches, shelters, etc.).

Strategy: Help private landowners keep and manage their forests sustainably

Increase the number of acres of private forestland under professional forest management from 1.7 million acres currently to 5 million acres by 2030.

Only 12 percent of the state’s private forestland is currently under 480a tax law plan or a U.S. Forest Service Forest Stewardship Plan.

Helping New York’s private landowners keep and manage their forestland benefits all New Yorkers. To reach our objective of increasing private forestland under professional forest management from the current 1.7 million acres to 5 million acres by 2030, we will take the following actions:

- Create efficiencies in enforcing the current 480a tax law program through regulation reform and modernization efforts that will allow field staff to spend more time in the field and less time administering the program.

- Work with federal, regional, state, and local agencies and organizations to support forest products markets for New York forest landowners to sell forest products derived from sustainable forestry management. Provide incentives and a policy and regulatory climate that promotes forest product markets while also supporting sustainable forestry.
- Explore developing a “Call Before You Cut Program” to connect landowners with a professional forester before harvest. This allows the forester to visit with a private landowner at the very pivot point when that landowner has identified the opportunity for a harvest. Many states have implemented this program.
- Work with public and private partners to create new financial and tax incentives to offset the costs of ownership and forest management for private forest landowners. Specifically allow for broader uses, such as wildlife management, sugar bush management, and carbon management, as well as traditional timber management.

- Develop and grow the newly created “Regenerate NY” cost-share program to improve forest regeneration on private forestland throughout New York State. This state-funded cost-share program became available to forest landowners in 2020.
- Develop and grow the Forest Conservation Easement Land Trust Grants program to protect private forestland. This program can focus on protecting smaller parcels, including working forests, from development.
- Investigate techniques that encourage forest landowners to incorporate forests and forest management planning into estate planning. Specifically support Cornell’s “Your land, Your legacy” program.
- Increase technical assistance by DEC staff for on-the-ground practices such as timber stand improvement, tree planting BMP layout, etc.

Strategy: Continue research and assessment efforts to document forest resources

- Continue to foster research projects in state forests and forest preserve by swiftly reviewing proposed protocols in a timely manner and, where appropriate, issuing permits. Research, field assessment, and mapping of various invasive species, tree diseases, and other topics are proactive ways to decide how to manage our forests in the future.
- Create a research consortium to support and advise the Climate and Applied Forest Research Institute (CAFRI) housed at SUNY ESF.
- Enhance carbon accounting in forests and wood products in NYS.

Strategy: Understand and respond to negative effects of climate change on forests

As forests face new stresses from climate change, stewardship needs to anticipate threats and work to minimize their effects on forests. Changes in climate and extreme weather events are also expected to affect infrastructure such as roads, bridges, and culverts on forestlands and will require our adaptive approach.

- Partner with academic institutions, federal agencies, and other entities to research effects of climate change on forests.
- Working with partners, identify areas with high connectivity and biophysical complexity (TNC’s “Resilient and Connected Network for New York State”), as well as ways to determine how ecosystem drivers and stressors will change in a particular area or for a particular forest community.
- Working with partners, provide technical assistance to forest managers to incorporate BMPs and stewardship strategies, based on the best available science, into the management of public and private forests.
- Ensure accessibility of climate science and resilience data to support state agencies, local governments, land trusts, and others in integrating climate change resilience into local and regional community planning, as well as conservation planning.

- Increase protection of resilient sites for species and communities. Evaluate New York's existing conservation lands to identify gaps that need to be filled to ensure conservation of the full range of habitats and support of the state's biodiversity. This is currently done by regional DEC staff identifying the gaps and new projects that are regionally significant, as well as by coordinating with key program staff to acquire regionally important lands from willing sellers.
- Protect unique forest areas as refugia for at-risk plant and animal species.
- Work to increase connectivity of vulnerable forests where connections would benefit the migration of species while continuing to isolate areas where invasive species pose a threat.
- Adjust the timing of activities, including timber removal, prescribed fire, and recreation, as temperatures and precipitation patterns change.

As our climate changes, we may also need to prepare for the following:

- As wildfire risks increase, more resources may be needed to reduce fuel loads, suppress fires after ignition, and manage ecosystems affected by wildfire.
- Management activities such as wildfire suppression or recreational activities such as snowmobiling and skiing may need to be altered as temperatures and precipitation patterns change.
- To manage forests and infrastructure, as well as to prepare for severe weather events, greater financial investments may be required.

The effects of climate change on forests and the essential role that forests play in mitigating climate change are outlined in Goal #1. Strategies to support forest management to address climate change are outlined under Goal #3.

GOAL #2:

Keep New York's Forests Healthy

The combination of numerous stressors, such as invasive species, increasingly severe and frequent weather events, a changing phenological calendar, unsustainable management practices and/or recreation, and localized imbalances of wildlife populations, along with outright loss of forests to development or agriculture, all threaten to undermine the health of New York's forests. In many cases, these stressors may increase or accelerate the damage and complicate the diagnosis and management of agents that impact forest health. Jointly with the first goal to keep New York's forests as forests, we strive to ensure our forests remain resilient, adaptive, ecologically intact living systems.

This overarching goal supports all three National State & Private Forestry Priorities. Not only do our strategies “*protect forests from threats*,” including invasive species, a changing climate,

and other stressors, they also “*enhance public benefits from trees and forests*” through continued research, assistance to private forest owners, targeted forest fire management, and implementing indigenous knowledge. This goal also supports the priority to “*conserve and manage working forest landscapes for multiple values and uses*,” since resilient, adaptive, and biologically diverse forests can be managed for a variety of benefits and values.

“Nature has introduced great variety into the landscape, but man has displayed a passion for simplifying it. Thus, he undoes the built-in checks and balances by which nature holds the species within bounds.”

RACHEL CARSON, *SILENT SPRING*

Assessment: Forest health affected by potentially damaging agents

Invasive pests, plants, and pathogens

The major contributors of annual damage to forest resources are from exotic invasive species like the emerald ash borer and southern pine beetle. Some large areas are affected by defoliation events caused by the gypsy moth or the forest tent caterpillar. The damage from these insects is exhibited in a cyclical nature, with few areas suffering more than three consecutive years of defoliation. Other agents of interest are breakage caused by wind and ice storms; declines in spruce, maple, and white pine from a variety of known and uncertain agents; flooding caused by beavers; wildfires; and more.

DEC conducts annual aerial and ground surveys to evaluate population trends of pests known to cause serious damage to forests and to determine the impact and cause of health problems on tree species or sites of concern. Most of the aerial observations lead to a ground-based inspection, and forest health diagnostic laboratory staff identify the damage-causing agent and store specimens.

Threats and challenges

New York's forests are facing accelerated threats from invasive insects, plants, and diseases, often brought into our country through international trade. The effects to our forests from these invasive agents are similar to the impact of western wildfires. These agents can potentially destroy millions of acres of trees and even eliminate certain species from our

ecosystems. They can drastically alter wildlife habitats, harm water quality, and reduce carbon sequestration by our forests. In addition, they may devastate forest-based industries, restrict recreational opportunities, and damage the tourism industry. Forest pests also affect the health of our watersheds, with consequences for human health.

The effects to our forests from these invasive agents are similar to the impact of western wildfires.

As previously mentioned, New York contains 18.9 million acres of forestland, more than any other state in the New York-New England region. It is a tremendous challenge to monitor such a vast forest for the presence of invasive pests and diseases. Once a pest is detected, it is necessary to determine the extent of the affected area and estimate the potential impact. An initial rapid response may have to be followed by a more extensive eradication effort. It is impossible to predict what pathogen will cause the next extirpation.

Select List of Significant Damage-Causing Agents in New York's Forests		
Agent	Forest Type Affected	Native/Exotic
Lepidoptera (moths & butterflies)		
Cherry oystershell moth	Prunus: cherry, apple, etc.	N
Fall webworm	Maple, birch, poplar	E
Gypsy moth	Hundreds of plants, especially oak, aspen	E
Spruce bud worm	Spruce, balsam	N
Tent caterpillars	Deciduous	N
Winter moth	Coniferous, deciduous, berries	E
Adelgids		
Balsam woolly adelgid	Fir	E
Hemlock woolly adelgid	Hemlock	E
Coleoptera (beetles)		
Asian longhorned beetle	Deciduous, especially maple	E
Brown spruce longhorned beetle	Spruce	E
Emerald ash borer	Ash	E
Hickory bark beetle	Hickory	N
Peach bark beetle	Cherry	E
Sugar maple borer	Sugar maple	N
Two lined chestnut borer	Oak, ash, maple, others	N
White pine weevil	White pine, Norway spruce	N
Southern pine beetle	Hard pines	E
Walnut twig beetle	All <i>Juglans</i>	E
Hymenoptera (flies and wasps)		
Sawflies – various, periodic outbreaks	Periodic multiple coniferous and deciduous hosts	N
Sirex noctilio	Pines	E

Select List of Significant Damage-Causing Agents in New York's Forests (<i>continued</i>)		
Hemiptera (true bugs)		
Spotted lanternfly	Tree of Heaven, maples, others	E
Diseases		
Anthracnoses	Multiple deciduous hosts, particularly maple, dogwood, sycamore, oak	N/E
Armillaria	All trees – fungal diseases that might be the killer of more trees than anything else in New York each year	N/E
Bacterial leaf scorch	Oak, particularly red oak	E
Beach bark complex	American beech	E
Butternut canker	Butternut	E
Caliciopsis canker	White pine	E?
Chestnut blight	Chestnut	E
Dutch elm disease	American elm	E
Oak wilt	Oaks – New in 2008	E
White pine blister rust	White pines	N
Beech leaf disease	Beech	E
Macrofauna		
Deer	Overbrowse of climax/species, hindering regeneration	N
Rabbits	Girdle seedlings, hindering regeneration	N
Voles	Girdle seedlings, hindering regeneration	N
Earthworms	Change in breakdown of leaf litter, soil nutrients, pH	E

Deer browse

White-tailed deer were nearly eliminated from New York by unregulated hunting in the 1800s and early 1900s. With the advent of protective regulations and science-based wildlife management, the deer population in New York rebounded. With abundant forest edge habitat and a lack of natural predators such as cougars and wolves, recreational hunting became the primary control on deer populations. Over the last 50 years, increased human development eliminated many of the locations formerly available to hunters, and societal changes reduced the number of hunters, resulting in overabundant deer populations. Now there is widespread recognition that the overabundant deer population is negatively impacting human and ecological communities.

Because mature trees are not affected, deer impacts on a forest may not be immediately evident, but they are profound and long-lasting.

Overbrowsing by deer reduces plant diversity in the forest understory and enables invasive species to out-compete natives. Deer browsing impairs forest regenerative processes, preventing seedlings from growing into the next generation of trees, which ultimately leads to fewer mature trees and a less diverse plant community in forests. The ecological changes brought about by deer cascade through forest plant communities also negatively impact wildlife, reducing the abundance and diversity of species that require understory and mid-canopy habitat. The State Wildlife Action Plan (https://www.dec.ny.gov/docs/wildlife_pdf/swapinaldraft2015.pdf) identified more than a dozen wildlife species that are threatened by deer overbrowsing, mostly forest-dwelling songbirds

and host plant-dependent lepidoptera. It is likely that reduced vegetation density in the understory also negatively impacts some species of amphibians, reptiles, and small mammals.

Direct measurement of deer population density can be difficult and expensive, but ecological impacts can be used as an indirect measure of deer density. DEC is collaborating with researchers at SUNY ESF and Cornell University to assess deer impacts. A protocol called Assessing Vegetation Impacts from Deer (AVID) has been developed based on forest inventory analysis data and incorporating deer harvest data as an index of deer density. A modeling project published in 2019 (link below) shows locations in New York where deer are significant factors causing poor forest regeneration, it and provides data to support efforts to reduce deer populations in those impacted areas (<https://www.sciencedirect.com/science/article/abs/pii/S0378112719305080>).

Threats from unsustainable recreational use

In addition to unintentionally introducing non-native or otherwise invasive species to New York's forests,

the increasing number of visitors, vacationers, and recreationists has the potential to cause direct impacts on forest health. Popular destinations on DEC and OPRHP lands, in the Adirondack and Catskill Forest Preserve in particular, continue to attract an extremely high number of users. There are many impacts associated with these high levels of use, including overcrowded parking areas; degradation of trail infrastructure; and crowding on trails, summits, and other popular destinations. The physical and ecological impacts of unsustainable recreation use include vegetation loss, human waste along trails, soil compaction, erosion, sedimentation, and displacement of certain wildlife species.

With the increase in recreational use of forests comes the increased potential for the spread of invasive species and other vectors affecting forest health. Recreation within forested areas is an important way to build support for forests, but negative recreational experiences caused by overuse or other factors have the potential to reduce this support.

Strategies to manage recreational impacts are outlined under Goal #4.

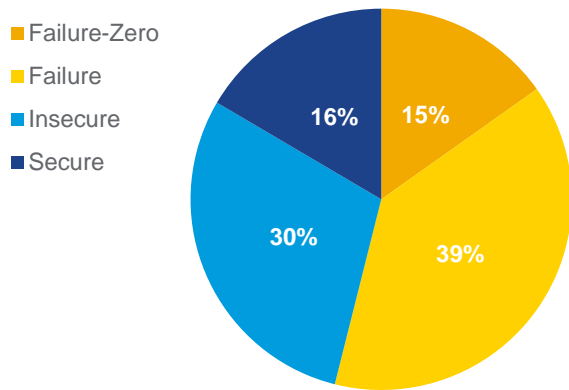
Assessment: Forest regeneration

A key component of keeping forests healthy in New York State is securing quality forest regeneration. Forests are regenerated either through natural or artificial means. Natural means include trees established by seed germination, sprouting, or root suckers. Most forests in New York rely on natural regeneration to renew themselves. The planting or seeding of forests by human intervention is considered artificial regeneration.

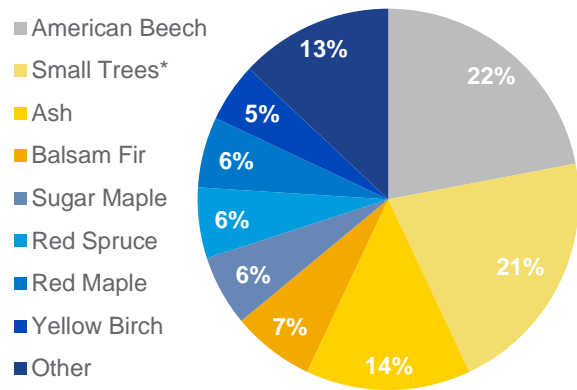
Advanced regeneration includes the seedlings and saplings that are currently established in a forest. This data is often a key guideline used in scientific forestry publications, and foresters rely on it to sustainably manage forests.

Successful regeneration of forests has become increasingly difficult due to several biological and societal factors.

FIA data from the U.S. Forest Service was analyzed by TNC New York (Zimmerman et al., 2020) to evaluate the status of forest regeneration for our state. Overall, forest regeneration of all tree species was found to meet the target regeneration objective in 46 percent of the 2,014 plots. Fifty-four percent of plots did not have sufficient advanced regeneration to produce a fully stocked stand after a timber harvest or disturbance to the forest canopy. Fifteen percent of FIA plot had no seedlings or saplings present. This analysis included all tree species.



Pie chart indicating the proportion of FIA plots in New York State by regeneration objective (n = 2,014). Zimmerman et al., 2020



Pie chart indicating the proportion of all tree seedlings by species in FIA plots in New York State.

*Small trees include: striped maple, hophornbeam, serviceberry, chokecherry and others.

Each FIA plot represents roughly 6,000 acres. Therefore approximately 6.5 million acres of forest in New York likely have insufficient advanced regeneration to fully recovery from a disturbance and will be difficult to regenerate successfully based on the criteria in the analysis outlined in this report.

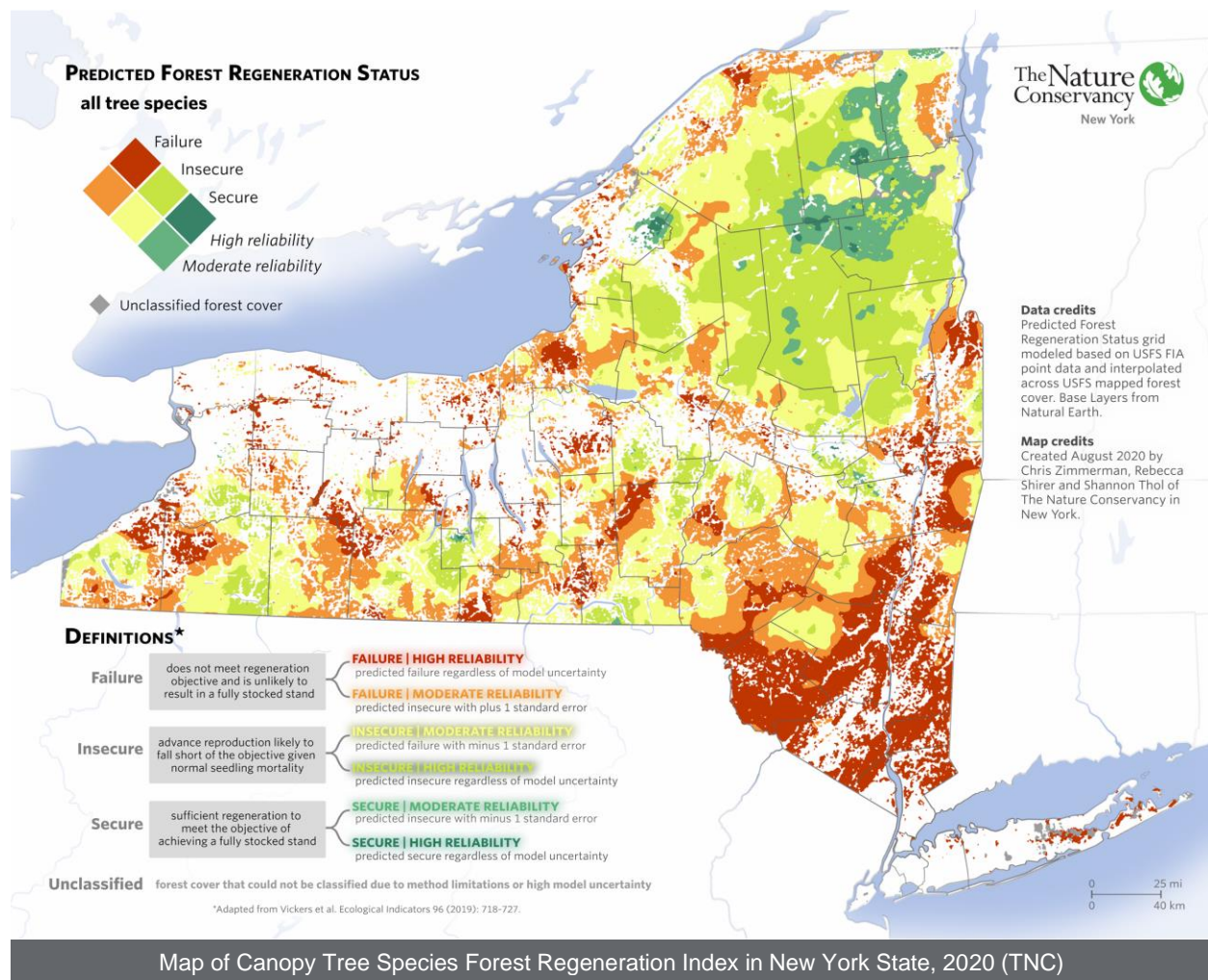
Composition of Seedlings

Thirty-six percent of seedlings were American beech and ash (*Fraxinus* spp.), which are currently impacted by widespread pests and pathogens, and 21 percent of seedlings were small trees, such as striped maple, that will not reach the forest canopy. Balsam fir, red spruce, sugar maple, red maple, and yellow birch ranged from 5 to 7 percent and totaled 29 percent of the seedlings. Oak (*Quercus* spp.) and hickory (*Carya* spp.) combined made up approximately 2 percent of total seedlings.

The FIA regeneration data was also analyzed by the USFS forest-type group. The maple/beech/birch group and spruce/fir had the greatest percent of plots meeting the regeneration target objective, at 57 and 52 percent of the plots respectively. The oak/hickory group had the greatest percent of plots in the “failure” category at 67 percent.

Spatial Analysis

Mapping was then completed for a forest regeneration index to highlight regeneration across the state. The regeneration is poorest in the Catskills and Lower Hudson Valley, as well as in smaller pockets across the Southern Tier region, while the northern regions of the state were doing the best. Regeneration in the Adirondacks is driven by low-value timber species such as American beech and balsam fir. It must be acknowledged, however, that these are critical species as wildlife habitat and a food source for wildlife, and they are also among the long-lived, shade-tolerant species of pre-colonial times.



Deer browsing and interfering vegetation

Deer browsing and interfering vegetation are cited as chief causes of the regeneration problem in New York (<https://counties.extension.wisc.edu/buffalo/files/2011/01/Impacts-of-White-Tailed-Deer-Overabundance-in-Forest-Ecosyst.pdf>). Another contributing factor to poor regeneration is the absence of appropriate timber management methods. Landowners often lack interest or are unwilling to implement/invest in recommended management practices (e.g., timber stand improvement) to control less desirable tree species. Unsustainable harvesting practices, such as high-grading, inhibit regeneration by maintaining an overstory of lower quality trees as the seed source, encouraging shade-tolerant species, and failing

to regenerate seedlings in sufficient numbers to outpace the negative effects of deer browse and competing vegetation. *See also this Plan's invasive species discussion.*

Timber regeneration

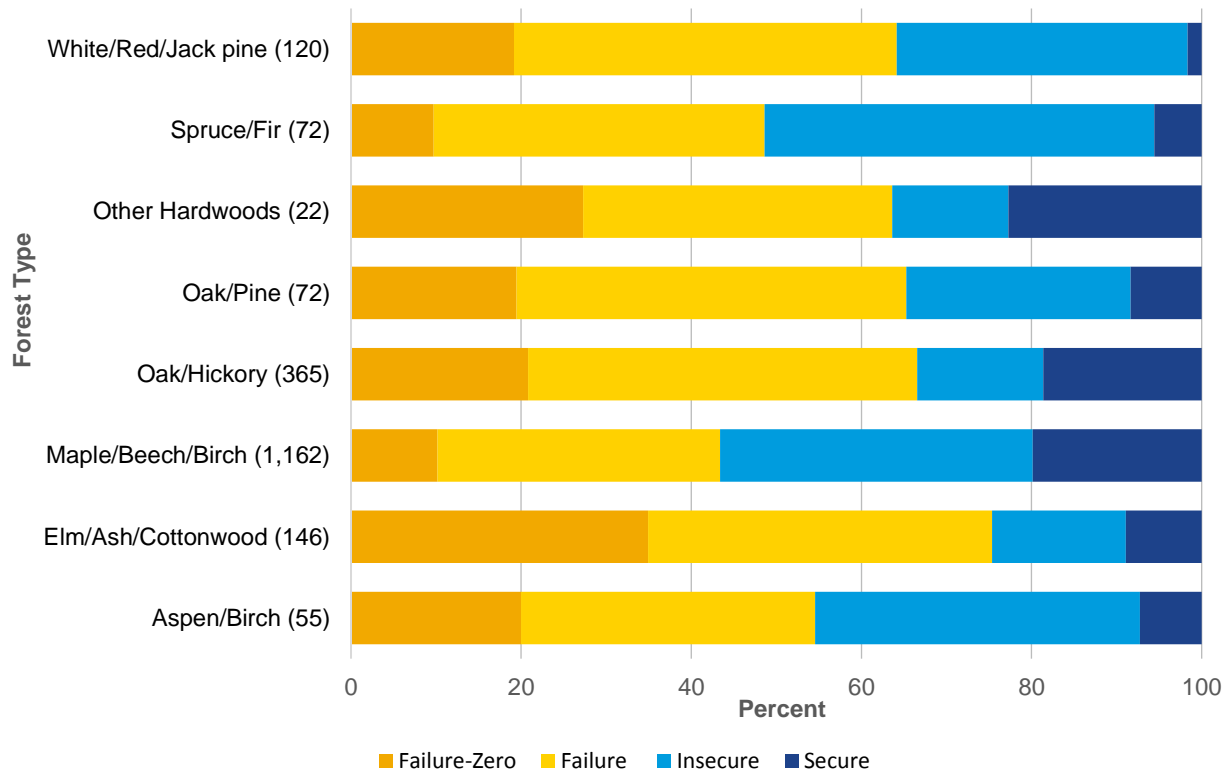
The lack of regeneration, especially with regards to timber species, is troubling, as it indicates an uncertain future for some species that now provide vital economic and ecosystem benefits for New York State. The composition of regeneration shows the establishment of commercial species such as sugar maple, ash, and red maple, but they are quickly dominated by beech. The regeneration of beech is problematic due to the prevalence of beech bark disease, which prevents a tree from reaching maturity. In addition, the increased sprouting in response to beech bark disease causes an

understory dominated by beech. This beech understory not only reduces the commercial viability of timberlands in New York, but also reduces the overall diversity of stands, which negatively impacts forest vitality and resilience.

The pie chart indicates FIA plots by regeneration objective; failure was assigned if the weighted regeneration was less than the target for a regeneration objective. Zero denotes no regeneration was present in the plot. Insecure

was assigned when advance regeneration was likely to fall short of the objective with normal seedling mortality. Secure was assigned to plots that had sufficient regeneration to meet objective and results in a full stocked stand. *Modified from Vickers et al., 2019.*

The number of FIA plots per forest-type group is shown in the parenthesis. See *Vickers et al (2019) for regeneration target objective for each forest-type group.*



Graph indicating the proportion of FIA plots in New York State by USFS forest-type group and regeneration objective rating.

Regeneration of fire-dependent forests

Wildfires are part of the natural environment and serve ecological and cultural purposes. New York experiences hundreds of wildland fires each year that burn forests, brush, and grasslands. Most of these fires are small, but occasionally some reach hundreds or thousands of acres.

New York has several fire-dependent ecosystems located across the state, ranging from pitch pine barrens in Albany and Long Island to oak openings (savannah) in Monroe County to the jack pine stands in Clinton County. Their existence and regeneration depend on regular fire disturbance. These ecosystems contain many of the state's rare and endangered plant and animal species, which are declining due to suppression of forest fires. We recognize, of course, that wildfires are also capable of exposing millions of New Yorkers to smoke and particulate matter, and can threaten homes and property.

Assessment: Status of forest biodiversity

The extent of biological diversity is a strong indicator of forest health and the forest's resiliency in the face of potentially damaging agents, disturbance, severe weather events, and a changing environment. Biological diversity (often shortened to biodiversity) refers to the variety of organisms, and their genetic variants, that occupy the earth. It includes all the ecosystems on the planet and their plants, animals, fungi, and microorganisms. Forest biodiversity encompasses not just trees, but all other life forms that depend on them. Therefore, biodiversity is a critical element of forest sustainability.

New York is home to 49 forest and woodland community types, catalogued and described by the New York Natural Heritage Program (Edinger, 2014). These include several state-rare communities, such as the maritime forests of coastal Long Island and the high alpine forests of the Adirondacks (See Appendix E, Table 1).

Of New York's 49 forest communities (listed in Appendix E, Table 1), 16 (33 percent) are classified as forested wetland (i.e., "swamp" or floodplain forest) and eight (16 percent) are "woodland" types that usually have less than 60 percent tree canopy cover. The remaining 25 (51 percent) are classified as upland forests, with greater than 60 percent canopy; these range from coniferous forests (e.g., spruce flats and balsam flats) to mixed conifer-deciduous forests (e.g., hemlock-northern hardwood forest, and pine-northern hardwood forest) to deciduous forests (e.g., beech-maple mesic forest and maple-basswood rich mesic forest). The distribution of the forest types generally follows ecoregional boundaries within the state (see map below). Within a given ecoregion, forests may occur as a matrix forest that blankets the ecoregion or as large and small patch forests embedded within the matrix forest.



Map of New York State's Ecoregions (Level III). (Source: http://maps.tnc.org/gis_data.html)

Northern Appalachian/Acadian Ecoregion (NAP):

- NAP matrix forests: beech-maple mesic forest, spruce-northern hardwood forest, spruce flats, and mountain spruce-fir forest.
- NAP large and small patch forests: “mountain” forests and “talus slope woodlands” (Appendix E, Table 2), plus hemlock-northern hardwood forest, maple-basswood rich mesic forest, and several swamp types.

Lower New England/Northern Piedmont Ecoregion (LNE):

- LNE matrix forests: chestnut oak forest, Appalachian oak-hickory forest, beech-maple mesic forest.
- LNE large and small patch forests: hemlock-northern hardwood forest, “talus slope woodlands” (Appendix E, Table 2), and several swamp types.

Great Lakes Ecoregion (GL):

- GL matrix forest: maple-basswood rich mesic forest.
- GL large and small patch forests: hemlock-northern hardwood forest and the more calcareous woodlands and forests (Appendix D, Table 1), and several swamp types, especially silver maple-ash swamp.

High Allegheny Plateau (HAP) and Western Allegheny Plateau (WAP) Ecoregions:

- HAP matrix forests: Allegheny oak forest, hemlock-northern hardwood forest, and beech-maple mesic forest.
- HAP large and small patch forests: rich mesophytic forest, maple-basswood rich mesic forest, hemlock-northern hardwood forest, and several swamp types.

North Atlantic Coast Ecoregion (NAC):

- NAC Matrix forests: oak-tulip tree forest, pitch pine-oak forest, coastal oak-heath forest, and coastal oak-hickory forest.
- NAC large and small patch forests: “coastal” and “maritime” forests (Appendix E, Table 2) and several swamp types, especially coastal plain Atlantic white cedar swamps.

Biodiversity Trends

Fragmented forests decrease benefits to neighboring towns and villages, such as clean water, mitigation of floods and droughts, pollination in agricultural fields, and pest control.

For the last several hundred years, New York’s forests have undergone a series of changes, from intense logging for lumber, land clearing and plowing for crops and livestock, reforestation to both native and non-native forest types, and natural reforestation. The result has been a progressive homogenization of forests in New York to early and mid-successional forest types, the landscape no longer dominated by the long-lived, shade-tolerant beech, maple, hemlock, and spruce forests of pre-colonial times. In the absence of human disturbance, over time, we would expect succession to bring about forests similar in composition, structure, and function to pre-settlement forest. This occurs in areas with high levels of protection, such as the Adirondack and Catskill Parks, and in some state parks like Allegany, Letchworth, and Minnewaska. While vast areas of the state are recovering from the rapid, broad-scale clearing of forests, comparisons of pre-colonial and existing forest data indicate that New York forests are still in early stages of recovery (Thompson, 2013). Furthermore, ongoing harvesting and land conversion associated with residential and industrial development, along with the side effects of this development (invasive species, deer browse, climate change,

etc.), as well as global trade practices over the last 150 years, all continue to impact the biodiversity of New York’s forests at both local and regional scales.

Natural disturbances, such as wind-blown trees, wildfires, tornadoes, hurricanes, ice storms, etc., also alter forested landscapes. These natural events, however, increase species diversity and structural diversity over the course of hundreds of years, both among and within forest stands, creating more resilient, uneven-aged natural forest systems. Trees fall and create gaps that are filled in by seedlings and saplings, and the fallen logs provide new areas for colonizing mosses and understory plants. What began as an even-aged forest will take hundreds of years to develop the age-class and structural diversity it had before a stand replacement event, such as clearcutting.

Fortunately, forests in New York’s Catskill and Adirondack Parks, as well as state parks, especially large ones like Allegany and Minnewaska, have been protected to allow

them to fully recover from the vast clearing that occurred before the turn of the twentieth century. The homogenization and simplification of our forests through historical clearing and ongoing human activities (see “Threats” section below) has reduced the overall integrity of our forests statewide by decreasing forest structure and the number of species found there. Native species richness, an observable measurement of biodiversity, has declined over time across the state, with about 3.5 percent (118) of NYNHP-tracked species extirpated, 5.3 percent (181) known only from historical records, and 38 percent (1,275) listed as Critically Imperiled to Vulnerable.

Data are not available specifically for forest species, but because of the predominance of forests in New York’s landscape, the status of species in general is likely to be mirrored in forests. Figure A below represents all vascular plants, vertebrates, and select invertebrates native to New York State across seven different categories of rarity or imperilment.

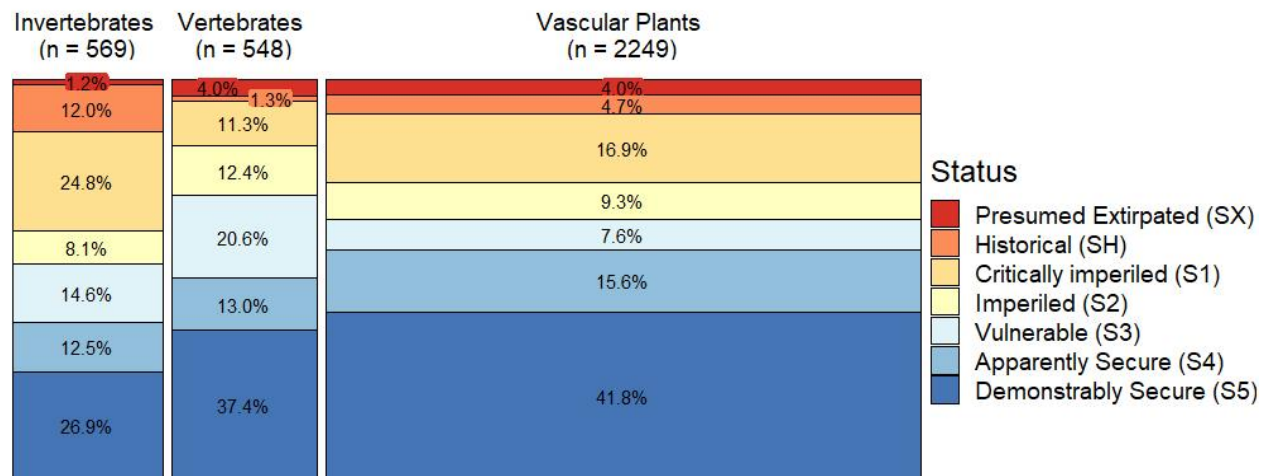


Figure A. Status of all native vascular plants, vertebrates, and select invertebrates in New York (nynhp.org)

Many of the plants and animals tracked in the New York Natural Heritage Program databases are dependent upon or associated with forests (Table 1, below). At minimum, 369 species of forest-dependent plants and animals tracked in the program’s databases are currently listed as Imperiled (S2) and Critically Imperiled (S1) in New York, as determined by expert opinion and the intersection of their occurrences with known forested lands.

Heritage-tracked animals include all species ranked as Critically Imperiled (S1), Imperiled (S2), and select Vulnerable (S3) species, and Heritage-tracked plants include all species ranked S1 and S2. This information is incomplete, however, as additional tracked species not found in these two data sources may be forest associates.

Taxonomic Group	# of Imperiled and Critically Imperiled Species
Animals (class)	
Mammals	10
Birds	23
Reptiles	9
Amphibians	5
Gastropods	1
Insects	118
Plants (subkingdom)	
Non-vascular plants	13
Vascular plants	190
TOTAL	369

Table 1. The number of forest-dependent rare species tracked by taxonomic group, NYNHP

In addition, species occurring in non-forested ecosystems *within forested landscapes* may depend upon the surrounding forest to a considerable extent. For example, aquatic species in streams, rivers, and ponds depend on adjacent forest as a buffer from development and a protectant of water quality. Deposits of coarse, woody debris in aquatic ecosystems provide

cover and oviposition sites for aquatic animals. Grassland plants may be pollinated by insects that emerge from the adjacent forest. Even marine and estuarine animals may benefit from nutrient uptake in adjacent forests, which prevent chemical changes due to runoff from developed areas.

Forest Diversity

Forest owners and managers in all circumstances (urban and rural) are often confronted with forests dominated by a single species or narrow age distribution. As noted in the Assessment portion of this Plan, much of New York State’s pre-colonial forest was cleared by the early 1900s for agriculture, timber, pulp, and development. Since then, a large part of the state has returned to forests, with many of those forests originating about the same time. With the exception of the few areas that have not seen ongoing activities or forest management (Adirondacks and Catskills), most forests in New York are composed of trees that are roughly the same age, what foresters call an “even-aged stand.” As previously discussed, this sameness poses concerns with respect to biodiversity and management options for forest owners.

Urban Forest Diversity

Urban forests are also unnaturally similar in age or species composition, often dating back to the time of settlement. Historically, many cities, towns, and villages were heavily populated with stately elm trees that succumbed to Dutch elm disease over a relatively short period of time. Communities often replaced those elms with Norway maples, silver maples, and ash, which have now proven to have their own problems and threats, especially from storms and invasive pests such as the Asian longhorned beetle. Urban foresters are finding that “too much of a good thing” is a bad idea, as they now recognize the importance of maintaining diversity in both species and ages within the urban forest environment.

Threats to Forest Biodiversity

A primary threat to New York’s forests includes linear infrastructure (e.g., roads) and land use

changes (e.g., development) that can fragment forest patches and reduce forest patch size. Forest fragmentation is possibly the largest threat to the integrity of the large matrix forests in the state. Fragmentation can restrict the movement of plants and animals through the forest, often resulting in the loss of species that require larger blocks of habitat (e.g., black bear, bobcat, certain bird species). The presence of invasive species (e.g., insects, diseases, and plants), overbrowsing by deer and the associated lack of regeneration, fire suppression, air pollution (e.g., ozone and acidic deposition), and climate change are other threats to forest conditions, as well as to native species richness and composition. See *“Effects of a changing climate and environment on forest health,” “Connectivity of forests,”* and *“Forest Health Monitoring”* in the Assessment of Goals #1 and #2 section.

Class	# of Forest Habitat-Dependent SGCN
Amphibian	10
Bird	42
Insect	92
Mammal	18
Reptile	18

Table 2. Forest Habitat Dependent SGCN
NYSDEC Division of Fish and Wildlife

Forest habitat-dependent Species of Greatest Conservation Need (SGCN)

This Plan and New York’s State Wildlife Action Plan (SWAP) have fundamental shared interests and priorities: conserving forested lands, protecting healthy watersheds, conserving and restoring diminished native tree species, conserving and creating young forest habitat, and using fire to enhance forest conditions.

The SWAP described the varied forest habitats in New York, and the diverse wildlife species these forest habitats support. A total of 180 different species—almost half of the 366 species

identified as SGCN in the SWAP—depend upon forest habitats, including representatives of all taxonomic groups that rely on terrestrial habitats, as shown in Table 2. The species assessment documents developed for the SWAP include details on forest habitat needs of these SGCN, such as tree species, canopy or ground layers, edge or interior, and size of forest blocks. The species assessments are available at <https://www.dec.ny.gov/animals/7179.html>.

Seventeen forest habitat types that support SGCN were identified (Table 3), but this does not include some early successional forests categorized as shrublands, nor aquatic habitats in streams flowing through forests. Some of these forest habitats, especially those restricted to coastal locations, are limited in distribution, while other forest types are widespread throughout the state.

Forest Habitat	# of SGCN
Atlantic White Cedar Swamp	4
Boreal Forested Peatland	15
Boreal Upland Forest	2
Coastal Coniferous Barren	19
Coastal Hardwood	7
Coastal Red Maple-Black Gum Swamp	3
Conifer Forest Swamp	6
Floodplain Forest	16
Hardwood Swamp	7
Mixed Hardwood Swamp	6
Mixed Northern Hardwood	20
Mountain Spruce-Fir Forest	3
Northeast Upland Forest	11
Oak Forest	12
Oak-Pine Forest	22
Pine Barren	20
Riparian Forest	7

Table 3. Forest Habitats that Support SGCN,
NYSDEC Division of Fish and Wildlife

Threats to SGCN

The process of drafting the SWAP assessed threats to species but did not directly evaluate threats to habitats. Loss of habitats, including forest habitats, is one of the major threats to the populations of SGCN. Forest habitat is most often lost to development, but for species that depend on young forests, their habitat is also lost to natural forest succession. Natural system modifications through alteration of fire regimes threatens 35 SGCN, especially those dependent on pine bush habitats. Logging is a threat to 51 SGCN, mostly related to siltation of aquatic habitats that can result from improper silviculture practices. Other threats to forest-dependent SGCN include gypsy moth, spruce budworm, and hemlock woolly adelgid infestations, deposition of

atmospheric pollutants, invasive species, climate change-induced habitat shifts, excessive human recreation, and overabundant white-tailed deer.

Forest management actions to improve habitats for SGCN are ongoing, including silvicultural harvest and prescribed fire. Protection of key forested lands through the purchase of fee title or a conservation easement is a recommended action in New York's SWAP. Protection of floodplain forests is especially important for the multiple conservation benefits these riparian areas provide: habitat, flood protection, and connectivity. (See also Audubon New York's "Forest Management for New York Birds. A Forester's Guide," 2017; http://ny.audubon.org/sites/default/files/audubonny_forestmgmtforbirds.pdf.)

Case study: Palmertown Range in Saratoga County, New York

The Southern Palmertown Conservation and Recreation Strategy (Open Space Institute, 2018) is a new vision for this unique area in northern Saratoga County. This area is an ecologically intact landscape with unfragmented, and diverse forests and wetlands. It is also an important ecological linkage between the Adirondack Park, Lake George, the Capital Region, the Hudson River Valley, the Taconic Mountains of Massachusetts, and the Green Mountains of Vermont. The Southern Palmertown Area is also in close proximity to growing population centers in Saratoga Springs, Glens Falls, and Wilton, and it has the potential to link these communities through thoughtful use of a connected landscape of already protected lands. This Strategy includes recommended conservation lands and recreational trails, with connections to many communities, businesses, and managed landscapes.

This plan suggests steps that local communities can take, combining thoughtful, cooperative planning and action to protect the environmental services and natural resources of the landscape and simultaneously stimulate compatible economic development activities (https://s3.amazonaws.com/osi-craft/PalmertownRangeFINAL_SUMMARY-for-Web.pdf?mtime=20181105163611).



Public workshop for the Southern Palmertown Conservation and Recreation Strategy, 2017

Assessment: Connectivity of forests

Protection of large blocks of forested land is an important component of wildlife conservation in New York, but connectivity of these protected forestlands is also crucial to provide wildlife the opportunity to move across the landscape. Habitat connectivity is important on many geographic scales, from the local scale of seasonal migration of amphibians between breeding pools and upland habitats, to the regional range expansion of moose between northeastern states. The unimpeded movement of animals is important to maintain their genetic diversity, and also allows wildlife to move to suitable habitats, which is an important adaptation strategy to climate change. Among its objectives, the SWAP identified “Promote habitat connectivity for SGCN.” Among actions to achieve this objective, the SWAP listed dam removal and culvert replacement for aquatic connectivity, and the restoration and maintenance of natural habitats in linkage areas for Northeast regional habitat connectivity.

The Habitat Assessment chapter of the SWAP identified five areas of large, relatively intact forests within New York—Adirondacks, Catskills, and the Allegheny, Tug Hill, and Rensselaer Plateaus—as well as smaller forest blocks that occur at several locations throughout the state. Connectivity to the Adirondacks has long been a conservation priority. The Algonquin to Adirondacks Collaborative has sought to maintain and restore connectivity between these two large protected areas across the heavily developed St. Lawrence River Valley. The

Staying Connected Initiative (<http://stayingconnectedinitiative.org>), led by TNC, utilized landscape permeability modeling to identify the least-cost path linkages across the Northeast. In New York, these linkages include Tug Hill to the Adirondacks across the Black River Valley, Adirondacks to the Green Mountains across the Lake Champlain Valley, and the Green Mountains to the Hudson Highlands through the Berkshires and Rensselaer Plateau. This conservation work has included partnering with transportation agencies on wildlife road crossing structures, strengthening local conservation planning capacity, protecting “stepping-stone” parcels in identified linkage areas, and developing tools to assess connectivity opportunities and measure project outcomes.

In addition to these Northeast regional-scale projects, habitat connectivity efforts are underway throughout New York to maintain connectivity between large forested areas, as well as between smaller forest blocks. The three large regions in our state that contain a matrix of smaller forest blocks are the Lake Ontario Plains, the Mohawk River Valley, and the Hudson River Valley. In these regions, forest blocks are often separated by agricultural areas, major highways, or both. The Strategic Plan for State Forest Management describes DEC’s work to identify connectivity between forest matrix blocks (<https://www.dec.ny.gov/lands/64567.html>).

Assessment: Soil resources in forests

Soil is important to forest sustainability since it is, literally, what supports trees. Soil conditions and their ability to support tree and forest growth are negatively impacted by a variety of factors, including development, compaction and hard-surfacing, erosion, land cover type, fire, severe weather events, changing soil temperature regimes, and even non-native earthworms.

Geology

Bedrock geology forms the framework of the landscape, influencing soil and water chemistry, drainage patterns, the shape and orientation of much of the topography, and the resulting local climate patterns.

The topography of New York has been shaped by a complex and turbulent geologic history, including multiple tectonic plate collisions, uplifts and erosions of several mountain ranges, and volcanic activity, as well as advancing and retreating sea levels. New York has one of the world's best fossil records of the Devonian Period (408 to 360 million years ago) with remarkably well-preserved marine sequences, and also non-marine fossils that show the transition to land. Most of the bedrock in New York is over 250 million years old, with younger rocks having been almost completely removed by erosion.

New York's present landscape is dominated by the impacts of the last ice age, which ended 15,000 years ago. Only a small area of the southwestern part of the state—the southwest corner of the High Allegheny Plateau Ecoregion—escaped glaciation. Glaciers shaped the high peaks in the Catskills and Adirondacks, created Long Island, formed huge lakes, changed hydrology, and covered much of the state with a layer of glacial till. Where huge glacial lakes once held meltwater, there are now thick sand and clay deposits, such as those in the Hudson Valley and parts of Central New York. The remnants of ice age features—such as sand dunes, river sand and gravel deposits, and muck-filled bogs—can be found

in many parts of the state. The most ubiquitous material left behind as the ice retreated is glacial till, the rough mixture of rocks, sand, and clay scraped up and bulldozed by the glacier's ice.

Soils and Associated Tree Species

Glaciers of the last ice age erased the existing forests and landforms of New York so thoroughly that there is almost no trace of the pre-glacial ecology. New soils slowly began to develop as organic matter accumulated, laying the foundation for plant succession. About 11,000 years ago, tree species, led by spruce, migrated back north from their glacial refuges. Some of the early trees arriving soon after white spruce included black spruce, elm, and black ash. One of the last major species to arrive in New York was chestnut, reaching the state about 2,000 years ago.

Most of the bedrock in New York, including shale, sandstone, and most metamorphic rock, produces acidic soils. Where the bedrock is limestone or marble, soils are high in calcium. The difference between forest types growing on acid soils and calcareous soils can be dramatic. Where sandstone bedrock is next to limestone bedrock, the change in vegetation is often abrupt. Pitch pines, chestnut oaks, blueberries, and other acid-loving plants do not grow well on limestone. Other species are more tolerant, notably red cedar, which grows well on rocky sites. For red cedar, lack of shade from competition is a more important factor than soil chemistry.

Many elements of a site affect a tree, including soil thickness and rooting depth, frost effects, soil chemistry, elevation, moisture availability, wind exposure, etc. Different species have different site requirements, and their health and vigor ultimately depend on where they grow. For example, sugar maple growing on a south-facing, dry slope is likely to be stressed by drought and heat, and more susceptible to insects and disease. However, many oak species would thrive on such a site since they generally prefer warm, well-drained conditions.

Forest Management Implications

Encouraging the growth of tree species on sites with optimal conditions is one of the important benefits of wise forest management. Foresters must rely on their knowledge of what each tree and forest community requires, so that their management efforts result in resilient and healthy forests. A harvest on a south-facing dry slope would focus on perpetuation of species that do best in those conditions, such as oak. This purposefully parallels what we observe on the landscape and know about species requirements for optimal growth.

Long-term Effects of Acid Rain on Forest Soils

In the 1980s, the worst pollutants from coal-burning utility plants in the Midwest, sulfur dioxide (SO₂) and nitrogen oxides (NO_x), were deposited across the Northeast in the form of acid rain or as dry acid particles. Unfortunately, many forests in the Catskills, Adirondacks, and Hudson Highlands grew on naturally acid soils with no buffering capacity to neutralize the acid deposition. Soils became even more acidic, leading to the release of unbound aluminum from soil compounds. Hundreds of lakes became too acidic and poisoned by aluminum to support any life, and the high-elevation forests were dying, their roots damaged by free aluminum in the thin acid soil.

New York passed the 1984 State Acid Deposition Control Act, which was later followed by Article IV of the 1990 EPA Clean Air Act, known as the Acid Rain Program, which required utilities to reduce emissions of SO₂ and NO_x. As precipitation became less acidic, forests began to recover.

Yet even today, the impact of acid rain has not gone away. Long-term studies of forest soils show that acid rain has caused major changes in ecosystem cycling of nitrogen, calcium, and carbon. Nitrogen deposition may be lower than it was before acid rain legislation was enacted, but it continues to accumulate in forest soils. Continued nitrogen deposition is especially

destructive. Even when it merely fertilizes hemlocks, it has been linked with increased vulnerability to adelgids. Soils can become saturated with nitrogen to the point that plants can no longer absorb it, and the excess nitrogen leaches out of the soil to contaminate water. Calcium leaching from acidic soils is a particularly serious problem, not only because soils become even more acidic, but also because calcium is critical for so many plant processes. Reduced soil calcium levels have been implicated in increased frost injury and long-term decline in New York's sugar maples and red spruces.

Effects of Climate Change on Forest Soils

Forest soils formed as a result of particular temperature and precipitation regimes, which in turn, affected forest development, composition, and productivity. Climate change impacts observed in New York are expected to continue to include rising temperatures and altered precipitation patterns. The resulting changes in soil temperature regimes have the potential to undermine the resilience of our forest species, both trees and understory plants. Shorter, warmer winters may not provide timely or sufficient cold periods for trees to become frost hardened, and frequent thaw-freeze cycles during winter may affect dormancy and essential early spring nutrient-uptake cycles. High temperatures and a potential lack of precipitation in the growing season may increase drought stress and the potential for non-native, drought-tolerant species to establish and outcompete native ones.

Note: The benefit of soils storing carbon is discussed under Goal #1, 'Assessment: Valuing forests for carbon storage and community adaptation.'

Assessment: Forest health monitoring

Since 2015, New York has regulated many invasive plants and animals that are particularly harmful to native species and/or human health. These invasives cannot be sold, imported, purchased, transported, or introduced without a permit (6 NYCRR Part 575, <https://www.dec.ny.gov/animals/99141.html>).

In 2018, DEC's Division of Lands and Forests established an Invasive Species Comprehensive Management Plan to guide New York agencies and their partners toward an effective and coordinated monitoring and response effort across the state, including on private and public forests. The goal of this Plan is to minimize the introduction, proliferation, and negative impacts caused by invasive species (https://www.dec.ny.gov/docs/lands_forests_pdf/iscmpfinal.pdf).

Prevention is the first line of defense against would-be invaders and is the preferred management strategy. Because of the potential for new preventative measures to affect commerce and trade, an economic assessment of the risk of harm from specific invasives can provide critical information for decision-makers. This allows them to evaluate the economic impacts of proposed prevention measures in the context of potential (negative) economic impacts of invasives. TNC's Forest Health Score Card offers an opportunity for collaboration in forest health assessment.

Though investment in prevention measures at all scales is the first line of defense, even the most robust prevention efforts will not be 100 percent effective. For this reason, early detection of invasives and a rapid response to infestations are essential. Emerging technologies may assist with early detection. For example, DEC has deployed a fleet of 22 Unmanned Aerial Vehicles (UAVs) for invasives detection. In addition, current and potential citizen science programs present important opportunities to expand early detection capabilities, complementing technological approaches with boots on the ground.

The iMapInvasives database provides a venue for citizens to report invasive species observations, and the PRISMs program (Partnerships for Regional Invasive Species Management, <https://www.dec.ny.gov/animals/47433.html>) is responsible for developing early detection networks comprised of trained staff and volunteers. Other existing programs, such as the Citizens Statewide Lake Assessment Program (CSLAP) and Water Assessments by Volunteer Evaluators (WAVE), involve many stakeholders across the state who collect ecological data. However, these programs are not specifically designed to detect invasives. There are opportunities to strengthen New York's early detection capacity and build partnerships through public engagement by expanding existing citizen monitoring programs to include invasive species, or creating similar programs with an invasives focus.

Threats and challenges

While these examples represent significant progress toward effective statewide prevention and early detection/monitoring systems, there is a need to take stock of current practices to identify gaps in the State's early detection program, including taxonomic expertise; technological, human, or financial resources; and spatial or ecosystem-specific gaps.

New York is a major port of entry for a wide range of taxa from other lands and waterways. For decades, state officials and resource managers have provided a critical line of defense to prevent the establishment and proliferation of invasive species that can harm public health, ecosystem integrity, agricultural productivity, and market access, as well as commerce. Despite these ongoing management efforts, global trade, climate change, and the spread of invasive species across state boundaries continue to elevate the risk invasive species pose to all New Yorkers.

Focus Area: Urban forest health

In urban communities, there are fewer trees, so each individual specimen is more important than it would be in a rural forest. Tree diversity and healthy trees make a community forest more resilient, which is important since these communities are where most New Yorkers live. Invasive species and diseases like ALB, EAB, and Dutch elm disease have threatened and devastated urban forests, causing associated economic and human health impacts.

Outreach to the general public and municipal staffs is essential to early detection of threats to our trees. Often, private citizens prove to be invaluable in these efforts because of the

increase in numbers of people looking for threats. For example, the first ALB in New York City was found by a private citizen.

Loss of trees due to Dutch elm disease and, to a lesser extent, EAB showed the importance of good urban forestry, including having inventories (i.e., knowing what you have and where it is located) and management plans for storms and other disasters. Streets and entire blocks used to be lined with elm trees. Ash trees were often planted to replace the elms, but when EAB infested communities again, street after street had to be cleared of dead ash.

Strategy: Foster diversity of native plants and animals in forests

- Continue to work with the State's NHP, DEC's Division of Fish and Wildlife, and OPRHP to identify, maintain, and encourage important natural communities and species of special concern through field surveys and mapping. Expand this effort to include sharing known occurrences with private landowners.
- Encourage landowner participation in Natural Resource Conservation Service (NRCS) programs, such as the Environmental Quality Incentives Program and Wildlife Habitat Improvement Program. These programs help to encourage and promote local native plant and animal diversity by utilizing cost-share programs for practices such as planting, wildlife food plots, habitat improvement, and reducing soil erosion.
- Focus conservation efforts on areas where forests will provide habitat for wildlife under warming climate conditions. Consider how shifts in the range of forest wildlife species will need to be accommodated as the species move to higher elevations or northward.

Low-diversity forest communities are at greater risk during severe weather events and shifting phenology schedules. Studies have consistently shown that diverse systems are more resilient to disturbance, and low-diversity ecosystems are more vulnerable to change.

Strategy: Boost forest regeneration and healthy forest structure

Private lands

The lack of forest regeneration in New York is a major threat to the economic and ecological productivity of its forestlands. The cost burden of establishing forest regeneration for 75 percent of the forested acres in the state falls directly on private landowners.

- Develop and grow the newly created “Regenerate NY” cost-share program to improve forest regeneration on private forestland. This state-funded program became available to forest landowners statewide in 2020 and will help defer the cost of forest regeneration practices, such as interfering vegetation control, tree planting and maintenance, and site preparation.
- Evaluate strategies and policies to reduce or remove barriers for consulting foresters and loggers to obtain pesticide licenses, as well as increase the number of commercial pesticide applicators statewide.
- Work with DEC’s Division of Fish and Wildlife and conservation partners to help landowners and communities manage deer populations.
- Explore shared stewardship opportunities with the U.S. Forest Service to discover and develop innovative solutions for solving forest regeneration problems.
- Develop outreach and education products and strategies to encourage private landowners to manage for intolerant tree species, where appropriate, through the use of clearcuts, seed trees, shelterwoods, and patch cuttings.
- Work with partners to develop innovative outreach methods and new products to attract landowners to forestry and efficiently meet their needs (Forest Health Plans, Snap-out plans, etc.). Implement management strategies that ensure the long-term health of the soil, root-zone, ground cover, understory, and canopy.
- Continue to provide native tree seedlings for forest restoration. Emphasize native plants, pollinators, and insects in forest management. Align forest health protection efforts with the NYSDEC Pollinator Protection Plan, 2016 (https://www.dec.ny.gov/docs/administration_pdf/nyspollinatorplan.pdf).
- Implement harvesting strategies and cycles with an eye toward long-term ecological productivity, climate change, and regeneration of all living organisms sustained by the forest.

State forests

- Manage state forests using an ecosystem management approach, integrating principles of landscape ecology, multiple use management, and silviculture to promote habitat biodiversity, while enhancing the overall health and resiliency of state forests. Because forests are dynamic systems that are constantly being shaped by the forces of nature, also apply adaptive management techniques to respond to insect and disease epidemics, wind and ice storms, and other natural occurrences. Follow guidelines established in the Strategic Plan for State Forest Management (<https://www.dec.ny.gov/lands/64567.html>).
- Manage state forests sustainably for forest products, utilizing accepted silvicultural methods to enhance existing specimens while regenerating future timber products.

- Advance DEC's Young Forests Initiative to increase acres in early successional habitat. These seedling- and shrubland acres are beneficial for migrant songbirds, native gamebirds, and other wildlife.
- Use uneven-aged management on state forests to achieve large unbroken expanses of woodland needed by many wildlife and birds.
- Assess stressors and threats outside of invasives and identify priorities in the SWAP.
- Partner with the plant conservation community to protect forests and the habitat they provide for native plants and animals.
- Educate New Yorkers to be part of adaptive conservation communities that are either proactive about stressors and threats to native plants and animals or respond quickly to changing conditions.
- Look to communities that are already modeling these efforts, even if they are not located in New York State.

Unit Management Plans and Master Plans for State lands

- Evaluate each DEC unit and each OPRHP State Park individually for forest regeneration opportunities, and work directly with DEC's Division of Fish and Wildlife and NYNHP while creating Unit Management Plans and Master Plans.
- Be wildlife and plant sensitive, as well as habitat oriented in trails and recreation planning.
- On DEC's state lands, implement harvesting strategies that will minimize effects on wildlife activity and habitat during forest management activities. (Tree harvesting in state parks is prohibited.)
- Limit or avoid human access to sensitive areas as an explicit strategy.

Strategy: Defend against, remove, or mitigate impacts of invasive species and pests

Multiple New York State agencies and partners have collectively developed a nationally recognized invasive species management program that is positioned to continue being a leader in invasive species prevention and management (https://www.dec.ny.gov/docs/lands_forests_pdf/iscmpfinal.pdf).

Continue to build partnerships and capacity

Overcoming the threats posed by invasive species requires the combined and synchronized actions of many parties, including private citizens, elected officials, and resource management agencies.

- Develop campaigns specifically targeted to reach private landowners to encourage them to manage invasives in their forests.
- Strengthen relationships with local municipalities to improve local engagement and buy-in.
- Engage climate change experts in invasive species collaborations.
- Utilize tools, such as IPMDAT, to improve invasive species management actions by considering the total landscape factors affecting an invasive species infestation.
- Coordinate management actions and funding sources to incentivize integrated management activities across the landscape, between resource managers and land ownership boundaries.
- Connect with national invasive species organizations and neighboring states to leverage knowledge and resources.

- Advance the capabilities of MapInvasives.
- Consider citizen science projects (i-Tree and other resources) to engage the public. Projects should not only look for and report invasives but help to document overall forest health. Leverage citizen science opportunities and other engagement with community members, students, and landowners to help implement monitoring or research projects that target detection or management of invasive species.

Continue to coordinate regional invasive species management functions

Eight Partnerships for Regional Invasive Species Management (PRISMs) provide complete coverage of New York, with a focus on facilitating cooperation between public and private interests.

- Continue building expertise within the eight PRISM regions of the state.
- Provide regionally adapted, on-the-ground actions regarding outreach, prevention, management, and monitoring.
- Identify regional priorities for allocation of resources.



DEC's Jess Cancelliere (on right), along with staff of the U.S. Forest Service, Long Island Pine Barrens Commission, and Dartmouth College investigate an outbreak on Long Island of southern pine beetle in white pine, which is not its traditional host. (DEC, 2017)

Develop a centralized framework for sharing invasive species information

- Establish a collaborative Horizon Scanning Committee focused on prioritization at the state level.
- Advance preparedness through information sharing.

Advance prevention, early detection, and rapid response to invasive species

- Maintain and expand resources dedicated to prevention and early detection.
- Conduct economic impact evaluations of invasive species to support cost-benefit analyses and set priorities.
- Support the advancement of the early warning notification system.
- Develop and apply emerging technologies to detect and manage invasive species
- Continue to support research and development.

Evaluate success

- Develop quantitative metrics designed to evaluate progress and outcomes of key recommendations.
- Develop a template for cooperators and contract partners to define objectives and measures of success.
- Conduct post-intervention monitoring to evaluate and document effectiveness in accordance with the pre-defined objectives and criteria.

Case Study: Iona Marsh Restoration Work

Located along the Hudson River in Bear Mountain State Park, Iona Island has seen various uses over the years, including housing a U.S. Navy arsenal. Five Navy buildings still stand on a small portion of the island. Most of the island, however, has returned to a more natural state, with woods, meadows, and rocky outcroppings, and currently serves as a sanctuary for wintering bald eagles. In 1974, the island achieved National Natural Landmark status, and was designated a New York State Bird Conservation Area and Audubon Important Bird Area shortly thereafter.



Cattail and blooming rose mallow have regrown where phragmites once was. Iona Marsh, 2016.

A key natural feature of Iona is the extensive marshlands, 153 acres on its western side. Part of the Hudson River National Estuarine Research Reserve, this brackish tidal marsh teems with life, including fish, waterfowl, waterbirds, plants, and crustaceans. However, the rich biodiversity, which includes a number of state-rare species, has been threatened in recent times. *Phragmites australis* (common reed) eventually covered nearly 80 percent of the marsh, concurrent with the decline in marsh specialist birds and specialized brackish marsh plants. In an effort to reverse these trends, the partnership of the Palisades Interstate Park Commission, the Hudson River National Estuarine Research Reserve, and the Highlands Environmental Research Institute began in 2008. This DEC-funded management program focused on a 10-acre test area, with the goal to reduce the presence of invasive phragmites and make room for native plants. If the program was successful in this small area, it could be expanded to additional marshlands.

A monitoring program was implemented and showed dramatic results. More than 90 percent of the phragmites in the test area were eliminated within a year and nearly 97 percent by the third year. Researchers saw the return of huge meadows of annual native marsh plants, including some state-threatened species, followed by native cattail stands. Marsh specialist birds, such as Virginia rail, least bittern (state-threatened), and marsh wren, soon followed. The project was expanded to an adjacent 32-acre marsh area known as Ring Meadow. Both target areas now have less than 5 percent phragmites cover, an overall success on the journey to reestablish native vegetation and improve the marsh ecosystem.

Strategy: Manage forest fires for the benefit of forests

New York's forest fire-dependent ecosystems and the rare species they support are declining because of fire suppression. Benefits of fire include recycling nutrients back into the soil, changing the soil chemistry and structure to promote the growth of certain species of plants, promoting seed germination, and creating gaps for light-dependent plants. Fire used in a prescribed manner can accomplish these goals. In addition, prescribed fire can be used to reduce fuels (e.g., dry matter on the forest floor) available in the event of a wildfire, thereby reducing the intensity and size of the wildfire, as well as reducing its overall impact to nearby communities.

- Improve minimal impact strategies and techniques (MIST) for containing wildfires by developing enhanced hand-crew firefighters and expanding aviation capabilities.
- Support state and local governments and non-government organizations using prescribed fire to manage fire-dependent ecosystems.
- Maintain and improve the expertise and capability of state agencies, compact members, and federal agencies to control wildfires.

- Increase the capacity for conducting prescribed fires, including pre-fire treatments and post-fire monitoring.
- During and post-fire, continue the productive collaboration between forest rangers and natural resource advisors at DEC and OPRHP.

Indigenous peoples' fire management

Indigenous peoples living in the boundaries of present-day New York, notably Shinnecock in the Pine Barrens, have a long history of using fire to care for and enhance forest resources. These practices help forests regenerate, reduce insect pests, and increase the availability of certain cultural resources. Many indigenous people, especially elders, still hold knowledge of burning practices.

- Engage indigenous peoples' fire management knowledge and practice.

See also Strategy below: Cooperatively implement indigenous knowledge to maintain forest health.

Strategy: Cooperatively implement indigenous knowledge for forest health

Indigenous peoples maintain extensive ecological knowledge systems, sometimes referred to as Traditional Ecological Knowledge (TEK). Far from being an anachronism, the widespread engagement of TEK to address contemporary issues such as climate change, sustainable resource management, and ecological restoration illustrates its value for contemporary sustainability solutions.

Cooperative implementation of this knowledge would include assessment, monitoring, management planning, and implementation (<https://us.fsc.org/preview.fsc-std-usa-v1-1-2018.a-719.pdf>.)

What is TEK?

TEK refers to the body of knowledge, practice, and belief concerning the relationship of living beings to one another and to the physical environment, which is held by people in societies with a long history of direct dependence on local resources (Berkes, 1993). TEK is part of the cultures it comes from. Like Western science, TEK is based on systematic observations of nature. Both knowledge traditions have predictive power, and in both traditions, observations are interpreted in a cultural context. TEK has value not only for its wealth of factual information, but also for the cultural framework of respect, reciprocity, and responsibility in which it is embedded (Kimmerer, 1998, Pierotti and Wildcat, 2000). Scientific approaches for sustainability solutions have been effective in certain arenas, but it has become clear that science alone is limited in its ability to address problems that include human values.

Forest Stewardship Council – Forest Management Standard

Principle 3: Indigenous Peoples' Rights

Criterion 3.4 *Indigenous peoples shall be compensated for the application of their traditional knowledge regarding the use of forest species or management systems in forest operations. This compensation shall be formally agreed upon with their free and informed consent before forest operations commence.*

Indicator 3.4.b *When traditional knowledge is used, written protocols are jointly developed prior to such use and signed by local tribes or tribal members to protect and fairly compensate them for such use.*

Indicator 3.4.c *The forest owner or manager respects the confidentiality of tribal traditional knowledge and assists in the protection of such knowledge.*

Strategy: Help private forest owners keep their forests healthy

Private landowners are increasingly finding it difficult to manage their forestland for forest health. Pests and interfering vegetation threaten the short- and long-term economic values of their property. Other values, such as ecological integrity and aesthetic beauty of their forestland, could also be diminished. The following strategies will be pursued to help landowners keep their forestland healthy (See more under Goal #4):

- Develop and grow the newly created “Regenerate NY” cost-share program to improve forest regeneration on private forestland. Cost-share forest regeneration practices include interfering vegetation control, tree planting and maintenance, and site preparation.

- Promote local wood markets and operations as a mechanism for removing and utilizing unhealthy trees to create healthier, more resilient forests on private forest lands in New York State.
- Implement a Forest Health Cooperator Program. Establish a network of long-term forest health monitoring plots on private forestland through voluntary agreements with forest landowners. Set up permanent forest health plots on private lands to assist with early detection of forest health issues.
- Provide landowners a “forest health check-up” assessment of private forests as part of DEC initiatives. Develop a “forest health checkup” as a targeted product for forest landowners who want to know if their land is healthy, but don’t want or don’t need a full forest stewardship or management plan. Engage landowners in assisting with a “check-up” and work to establish a protocol to monitor forest health issues that landowners can follow.
- Prior to—as well as during—timber harvest, as well as prior to allowing public access for recreation and hunting, landowners should consult with DEC fish and wildlife experts to incorporate strategies for specific forest types that maintain and enhance wildlife habitat activities, are wildlife- and plant-sensitive, and are habitat oriented.
- Limit human access to sensitive areas and take steps to avoid sensitive areas altogether as an explicit tool for forest health protection.
- Promote the “Trees for Tribes” program to improve stream health and increase connectivity, which support forest health and create or expand buffers to existing forest. Also promote the “Buffer in a Bag” program (<https://www.dec.ny.gov/animals/115903.html>) a program introduced in 2019, that provides a bag of tree and shrub seedlings for landowners to plant along streams.
- Develop additional property tax incentive programs to encourage sustainable forestry.
- Build DEC program capacity with more invasive species and forest health experts to assist private landowners with protection and management opportunities when the landowner is ready.
- Work with local, state, and federal agencies to incorporate considerations regarding forest health, forest pests, and invasive species in current private forestland programs and plans. Especially target water protection, adapting to climate change, and deer management.

The cost for landowners to maintain a healthy forest is high. Encouraging tree regeneration on private land through certain types of silviculture treatment is especially costly. High costs can deter forest owners from acting.

Strategy: Continue forest health-related research initiatives

- Investigate issues and strategies for overcoming forest regeneration problems.
- Determine what mosaic of forest age/type and other characteristics best support forest health and resist invasions or pests.
- Build and maintain statewide forest health data sets.
- Develop and implement monitoring/research projects that target detection and management of invasive species by:
 - Understanding invasive species biology, ecology, interactions, and impacts,
 - Forecasting and prioritizing invasive species for action,
 - Identifying and detecting invasive species,
 - Managing invasive species and altered ecosystems.
- Build a network of cooperating researchers to expand forest health research and promote New York State as a leader in forest health science.
- Maintain support and resources for the U.S. Forest Service's FIA Program and DEC staff's coordination of the program. The FIA Program, a comprehensive forest monitoring network used by New York, provides timely analysis of the status of our state's forests and is the best dataset for researchers to address top challenges, such as forest regeneration.
- Continue to develop forest health research projects that:
 - Answer biological questions about a tree or pest,
 - Assess the efficacy of our management of a pest or disease,
 - Improve forest management on a landscape level scale.
- Develop a robust research laboratory.
- Work with land managers to translate science into practical applications.
- Develop cutting-edge tools to analyze forest conditions, as well as accelerate the pace and scale of forest management or invasive species treatments.
- Increase research that will enhance the productivity, utilization, and sustainability of tree species threatened by climate change:
 - Implement experimental treatments in permanent research plots on state forestland to potentially increase the productivity and sustainability of vulnerable tree species,
 - Manage uncertainty by using results from permanent plots to develop and validate models that predict how forests change over time and how they respond to climate change, biotic invasions, and land management, and
 - Use research results to educate the public and increase acceptance of active forest management.



DEC's Liam Somers identifies nitidulid beetles under a microscope as part of an ongoing research project to study the important vectors of oak wilt (DEC, 2019)

GOAL #3: Increase Forest Benefits for Humans and All Living Creatures

“The best friend on earth of man is the tree. When we use the tree respectfully and economically, we have one of the greatest resources on the earth.”

FRANK LLOYD WRIGHT

Once New York’s strategies are in place to keep forests as forests and to keep them healthy (our first two goals), the stage is set for targeted efforts so humans and other living organisms can continue to receive vital benefits from our forests. New York’s forests generate life-sustaining clean air and water, contribute to

our mental and physical health and happiness, and supply us with food, shelter, and renewable economic goods. As changes in our environment and climate accelerate and threaten our access to these benefits, our forests become increasingly important, with beneficial impacts well beyond our state borders.

This goal directly addresses the National S&PF Priority to “*Enhance public benefits from trees and forests.*” The strategies identified under this goal also aim to “*conserve and manage working forest landscapes for multiple values and uses*” and to “*protect forests from threats,*” the other two National State & Private Forestry Priorities.

Assessment: Forest protection for drinking water quality and supply

Drinking Water Quality and Supply

Forests are the first line of defense when protecting water quality, which is essential for people and all living organisms. Forests and their soils act like huge sponges, soaking up enormous amounts of precipitation. By the time rain and snowmelt seep through forest soil into groundwater or nearby surface water, the precipitation is cleaned and purified. Forested watersheds also moderate water quantity by slowing surface runoff and increasing the infiltration of water into the soil. The result is less flooding, cleaner water downstream, and greater groundwater reserves (Ernst, Caryn, 2004). Watershed protection is the first and most fundamental step in a multiple-barrier approach to protecting drinking water. In 2018, DEC updated its *NYS Forestry Best Management Practices For Water Quality BMP Field Guide*, (<https://www.dec.ny.gov/lands/37845.html>).

In addition to being a forest-rich state, New York has a seeming abundance of clean, high quality water. Watershed protection is the first and most fundamental step in a multi-barrier approach to protecting drinking water.

New York State’s involvement in land acquisitions in critical watersheds has been essential to protecting drinking water quality throughout our state. Protecting natural ecosystems and the drinking water they provide is easier, more efficient, and more cost-effective than the engineered alternative. When communities invest in land protection as a way to protect their drinking water, they are investing in the long-term health and quality of life of their residents—guiding growth away from sensitive water resources, providing new parks and recreational opportunities, and protecting farmland and natural habitats, as well as preserving historic landscapes. Many communities don’t realize the natural filtration forests provide, and the cost-

saving benefits of source protection versus the potentially dramatic increase in treatment costs that can result from the loss of forests (Ernst, 2004).

New York State has taken many actions to protect forests in order to maintain and enhance water quality, including the creation of the Adirondack and Catskill Forest Preserve, the establishment of New York City's surface reservoir system, and the forest protection component of their Filtration Avoidance Determination.

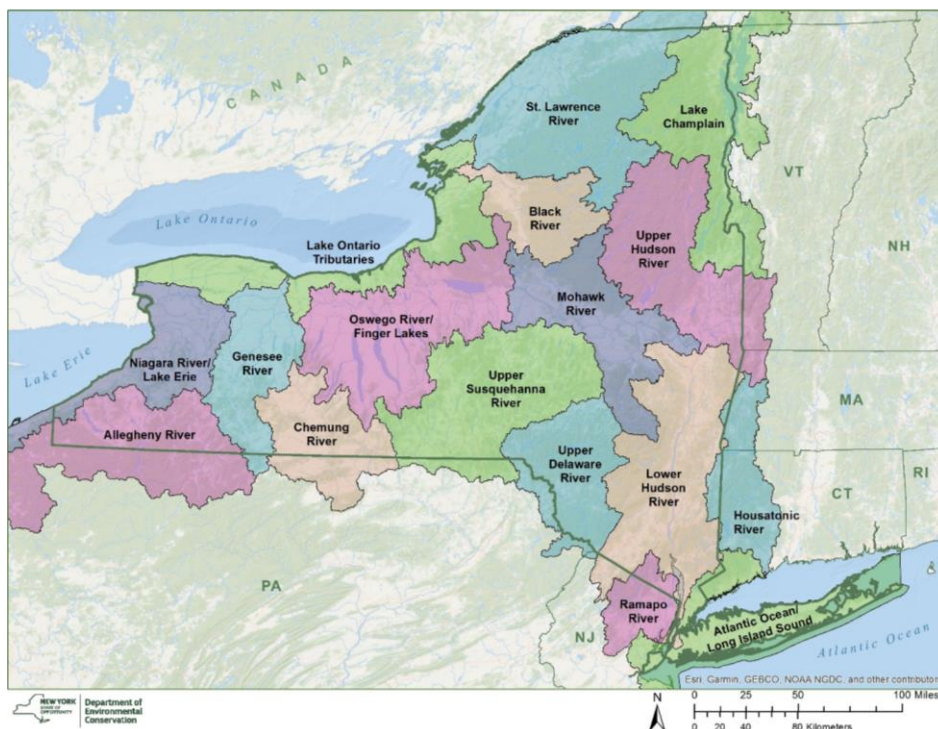
Example – New York City

The primary source of New York City's drinking water is the Catskill area watershed. The City works to protect and restore this watershed rather than build a multi-billion-dollar water filtration plant. New York City estimated the cost of installing filtration alone to be nearly \$7 billion, with over \$300 million in annual operating costs. Instead, they chose to support the quality of land management in its source watershed, which will sustain high water quality at a substantially lower investment. New York City manages about 55,000 acres in the Catskills, and the State

manages more than 200,000 acres in the Catskill Watershed. Jointly, the City and State encourage private owners in the New York City watershed to keep forests as forests, and implement forestry practices that restrict runoff, reduce sedimentation, and take up contaminants.

Example – Long Island

Similarly, the Long Island Pine Barrens and its underground aquifer provide virtually all the Island's drinking water, supplying millions of people. Two hundred years ago, the Pine Barrens blanketed a quarter of Long Island. Today, most of that land is developed. The approx. 106,000 acres remaining, as of 2019, have been divided into two categories by the New York State Central Pine Barrens Commission: the Core Preservation Area (over 57,000 acres) and the Compatible Growth Area (over 48,500 acres).⁵ The U.S. Environmental Protection Agency designated this aquifer system as the nation's first sole source aquifer, requiring special protection. It is managed jointly by state, county, and local governments.



Map of New York State's Watersheds

⁵ The Pine Barrens Legislation - NY Environmental Conservation Law Article 57.

Threats and challenges

Most people do not make the connection between forested watersheds, the water coming from their faucet, and stormwater or flood mitigation. Similarly, the public is generally unaware of the threats to their water supplies. Considering that the majority of New York's forests are privately owned, a similar statement can be made that most people don't make the connection between privately owned forests and the water coming from their faucet. This lack of public awareness can lead to poor management decisions and insufficient support for forest retention and management. This lack of support, in turn, leads to urban and suburban sprawl, or conversion of forests to agricultural use. The resulting loss of forested cover:

- Undermines the land's capacity to absorb and hold water,
- Increases pollutant runoff from paved surfaces, rooftops, treated lawns, agricultural lands, etc.,
- Disrupts the natural hydrology of water flows, volumes, rates, retention, and storage.

Protecting and managing forests in source watersheds is an essential part of future strategies for providing clean, safe drinking water that people can afford. One of the main reasons why suppliers are revisiting the idea of source protection is the growing realization that allowing untreated water quality to degrade increases treatment and capital costs.

Assessment: Benefits of urban tree canopy and green infrastructure

Collectively, community trees constitute an urban forest that can be thought of as a city's green infrastructure, while a city's roads, sewers, bridges, and water treatment plants constitute its gray infrastructure.

Social and economic urban benefits

Eighty-seven percent of New Yorkers live and work in urban or suburban areas (Nowak et al. 2018; *See also "Map of New York State's Population Density, 2010"* in Goal #1). Community forests represent most people's daily environment. Urban tree cover contributes to walkable neighborhoods, as well as distinctive and attractive places with a strong sense of place. The presence of parks and trees in neighborhoods encourages socializing, bonding, and exercise, and can reduce crime. As a result, trees and a property's proximity to parks have been shown to increase residential and commercial property values.

The urban tree canopy also reduces heating and cooling costs. In the summer, trees reduce the urban heat island effect: they shade buildings, sidewalks, streets, and other structures, keeping

them cooler and reducing air conditioning or other energy costs. In addition, strategically placed trees of appropriate species shelter buildings from cold winds in winter months, reducing heating costs.

Investment in maintaining green infrastructure pays off multifold: it reduces spending on high-cost gray infrastructure, such as facilities to manage stormwater and water pollution; it insulates against temperature extremes; and it filters and purifies our air. The planting and care of community trees represents a wise investment in what is perhaps the only part of a city's infrastructure that actually increases in value and contribution over time.

Thus, greening our urban areas and communities helps to support New York's Smart Growth initiative to combat urban sprawl, make our existing urban areas and communities more attractive, and mitigate pressures on open space conservation in rural areas that often attract sprawl-type development (www.dot.ny.gov/programs/smart-planning/smartgrowth-law).

Urban health and performance benefits

Social and economic benefits of the urban tree canopy are supplemented with improved mental and physical health, school performance, and patient recovery, among others. These benefits are explored further under ‘*Assessment: Human health, safety, and other ecosystem benefits from forests.*’ Decades of research shows that spending time around trees and being exposed to the chemicals they give off boosts our immune system, reduces stress levels, helps children learn better, and allows patients to recuperate faster when they have views of trees from their window. Just five minutes around trees can improve personal health. Most urban populations rely on urban forests to provide this exposure, since many people may not be able to visit rural forests during their workweek and some may never leave their urbanized environment. It is the urban forest that provides the above outlined benefits to the majority of New Yorkers.

Environmental urban benefits

Community forests are important for birds, pollinators, and other wildlife. In the natural food chain, trees provide food for insects, which, in turn, are food for birds and other wildlife. Parks can provide needed rest stops for migratory birds. Urban forests can also provide vital corridors between larger tracts of rural forests.

Impact of losing urban trees

The invasion of the emerald ash borer (EAB, *Agrilus planipennis*), which began in 2002, provided an unfortunate opportunity to look at the effect of tree loss on human health. EAB is a non-native, wood-boring beetle that can kill all species of ash trees within three years of infestation. In some communities, entire streets lined with ash were left barren after the beetle arrived in the neighborhood. A study that looked at human deaths related to heart and lung disease in areas affected by EAB infestations found that across 15 states, EAB was associated with an additional 6,113 deaths related to lung disease and 15,080 heart disease-related deaths.

Assessment: Health, safety, and other benefits from forests

Access to clean air and water

The life-sustaining and health benefits of clean air and water are undeniable. Both through their leaves and roots, trees naturally filter or absorb pollutants in air and runoff from farm fields or urban surfaces. Forests and their soils prevent these pollutants from entering streams, thereby improving water quality for entire watersheds and corresponding aquifers.

Additional human health benefits

Research in the U.S. and around the world is showing that being surrounded by trees or visiting a forest has real, quantifiable health benefits, both mental and physical. Exposure to forests boosts our immune system. When we breathe in fresh air, we also breathe in phytoncides, airborne chemicals that plants give off to protect themselves from insects.

Phytoncides have antibacterial and antifungal qualities. When people breathe in these chemicals, their bodies respond by increasing the number and activity of a type of white blood cells called natural killer cells, or NK. These cells kill tumor- and virus-infected cells in our bodies. In one study, increased NK activity from a 3-day, 2-night forest bathing trip lasted for more than 30 days. Japanese researchers are currently exploring whether exposure to forests can help prevent certain kinds of cancer.

Spending time around trees also reduces stress; lowers blood pressure and the stress-related hormones cortisol and adrenaline; decreases anxiety, depression, anger, confusion, and fatigue; and improves a person’s mood. And because stress inhibits the immune system, the stress-reduction benefits of forests are further magnified.

Spending time in nature helps people focus. Trying to focus on many activities or even a single thing for long periods of time can mentally drain us, a phenomenon called “Directed Attention Fatigue.” Spending time in nature, looking at plants or water, and observing wildlife give the cognitive portion of our brain a break, allowing us to focus better and renewing our ability to be patient. The part of the brain affected by attention fatigue is also involved in Attention-Deficit/Hyperactivity Disorder (ADHD). Studies show that children who spend time in natural outdoor environments have a reduction in attention fatigue. Similarly, children diagnosed with ADHD show a reduction in related symptoms. Researchers are investigating the use of natural outdoor environments to supplement current approaches to managing ADHD. Such an approach has the advantages of being widely accessible, inexpensive, and free of side effects.

Patients recover from surgery faster and better when they have a “green” view. Hospital patients may be stressed from a variety of factors, including pain, fear, and the disruption of normal routine. Research found that patients with views of trees had shorter postoperative stays, took fewer painkillers, and had slightly fewer postsurgical complications compared to those who had no view or only a view of a cement wall.

Note: the benefits of recreational opportunities are assessed separately under this Goal.

Flood and erosion resilience

The many benefits floodplain forests provide were lost with their disappearance. Floodplain forests help prevent catastrophic flooding downstream by storing and slowing floodwaters. Tree roots help stabilize riverbanks, controlling erosion.

Floodplain forests, once common along northeastern rivers before European settlement, are now a rare natural community. Their fertile soils with few stones were prized for farming and easy to build on, so most floodplain forests were cleared for agriculture and development. Current threats to our remaining floodplain forests include dams and invasive species. Dams alter the river’s natural flooding regime and trap nutrient-rich sediments that would normally be deposited in these forests. Invasive species, Japanese knotweed, for example, do well in the exposed soils and abundant sunlight of former floodplain forests and can outcompete native vegetation. Run-of-the-river dams, which allow normal flow except in periods of high water, are better for floodplain forests.

Wildlife benefits

The overhanging tree canopy of floodplain forests keeps the water cooler in summer, aiding coldwater fish such as brook trout, not to mention providing great fishing opportunities. The rich soils of a floodplain forest create ideal habitat for insects and amphibians, which in turn become prey for animals like woodcock, mink, and raccoon.

Spring flooding thaws the soils of floodplain forests earlier than the soils of surrounding areas, making insects available to birds earlier. For this reason, spring migrants follow rivers and feed in floodplain forests as they journey north. Some, like the warbling vireo, northern oriole, and great crested flycatcher, stay and nest in the Northeast, including northern New York. Birding enthusiasts enjoy exploring streamside forests in every season.

Note: The urban-specific ecosystem benefits of forests are discussed under Goal #3, ‘Assessment: Benefits of urban tree canopy and green infrastructure.’ The benefit of soils storing carbon is discussed under Goal #1, ‘Assessment: Valuing forests for carbon storage and community adaptation.’

Assessment: Productive capacity of timberlands

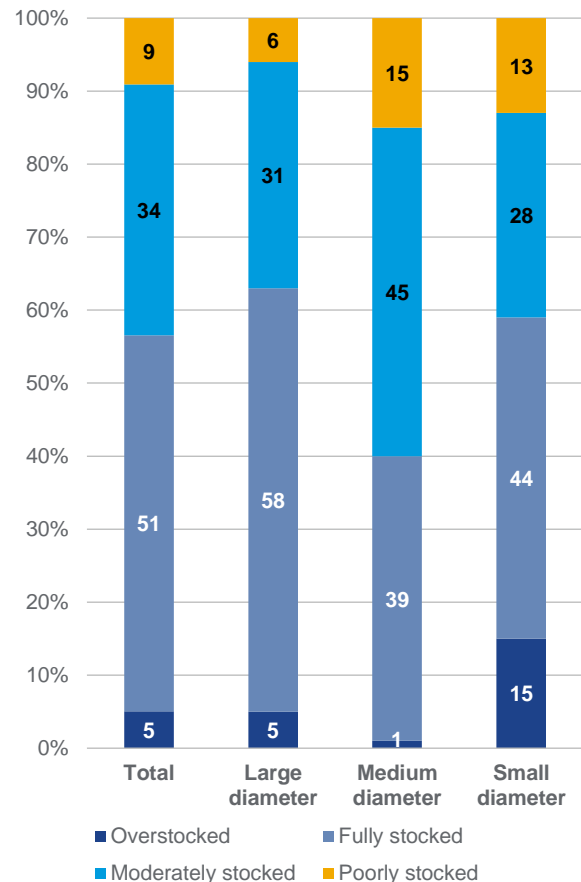
Over 15.5 million acres of forestland in New York are classified as timberland, according to the USDA Forest Service’s FIA Program—over 13 million acres of which are privately owned. The main economic benefit to both landowners and society at large is the production of traditional forest products from timberlands.

The most updated FIA inventory for New York was completed in 2017 (New York Forest, 2017). These data show that the trend in the structure of lands classified as timberlands closely follows that of all forestland in the state. Timberlands continue to grow older and larger: 65 percent of timberland area is classified as large tree size, or sawtimber, 25 percent is in poletimber class, and only 9 percent is in a stage where seedling- and sapling-size trees predominate.

Stocking is a measure of the area occupied by trees (usually expressed by basal area square feet/acre) that is generally used as a tool to help manage forests for timber production. Slightly more than 43 percent of timberland acres are poorly stocked or at the medium stocking level, with 57 percent of the total timberland acres being classified as fully or overstocked. A closer look at the stocking levels as they relate to size classes reveals that 63 percent of the sawtimber area is fully stocked or overstocked.

Over 15.5 million acres of forestland in New York are classified as timberland...

On the surface, this may indicate strong productive capacity to provide timber products. However, other characteristics—such as timber quality, stocking class, and species composition—have to be considered to assess future productive capacity.



Percentage of timberland area by live-tree stocking class & stand-size class. (New York Forest, 2017)

Additional analysis of the FIA data of commercially important forest types in New York shows that two of the predominant types, maple-beech-birch and oak-hickory, represent 71 percent of timberland acres. These forests showed a significant decrease in the percentage of acres in the poorly or medium stocked category: 57 percent in 2007 dropped to 41 percent in 2017. This points to the continued growth occurring in these two forest types, with 60 percent of them now classified as overstocked or fully stocked (up from 43 percent in 2007). Stands that are overstocked and/or fully stocked are often suited to a commercial harvest under various scientific silvicultural guides and regimes designed to maximize the growth rates of commercially viable species. Overall, nearly 90 percent of timberland acres are in a condition where trees of potential commercial value dominate.

Two important commercial species, sugar maple and northern red oak, show decreases or little growth in the number of dominant or co-dominant trees since 2007. These are trees 5 inches or more in diameter that are now in the main part of the forest canopy. Red maple continues to be New York's most abundant tree and has shown marginal change in its numbers since 2007. Other important species, such as black cherry, eastern white pine, and spruce, indicate little increase in numbers over the same time periods.

There are a few concerning trends with regards to the composition of seedling-sized trees in terms of commercial compared to non-commercial species. In the period between 2007 and 2017, there was a 37 percent decrease in the number of sugar maple seedlings and a 35 percent decrease in black cherry, while the percentage of non-commercial beech seedlings increased to 37 percent. There are a few bright spots, with increases in three commercial species: yellow birch (22 percent), red spruce (6 percent), and balsam fir (14 percent), but also a decrease in non-commercial striped maple (-25 percent). Decline in hardwood species may also be linked to decreased winter snow cover/warming.

The growth in beech tree numbers is a concern since beech has little prospect for being an important commercial species due to beech bark scale, which often kills beech after it reaches merchantable sizes. Regionally, beech saplings interfere with desired regeneration and continue to be a problem for foresters.

The decrease in sugar maple, the New York State Tree, is very concerning not only for the timber industry, but also for the maple syrup industry and ecotourism. Recent research indicates that lack of snow cover, an increasing threat as our climate changes, is among the factors that significantly diminish the growth rates of sugar maples (<https://theconversation.com/climate-change-is-shrinking-winter-snowpack-which-harms-northeast-forests-year-round-103410>). See also above, *Assessment: Soil resources in forests*.

While it may appear less than optimal to have acres in anything other than a fully stocked condition, in fact, levels below fully stocked may be desirable depending on ownership objectives, such as wildlife habitat, or if the condition is the result of deliberate and beneficial timber management practices. On the other hand, a less-than-fully-stocked condition can be deemed problematic in terms of carbon sequestration capacity since these levels indicate that additional forest biomass, or carbon, could be stored in the standing forest.

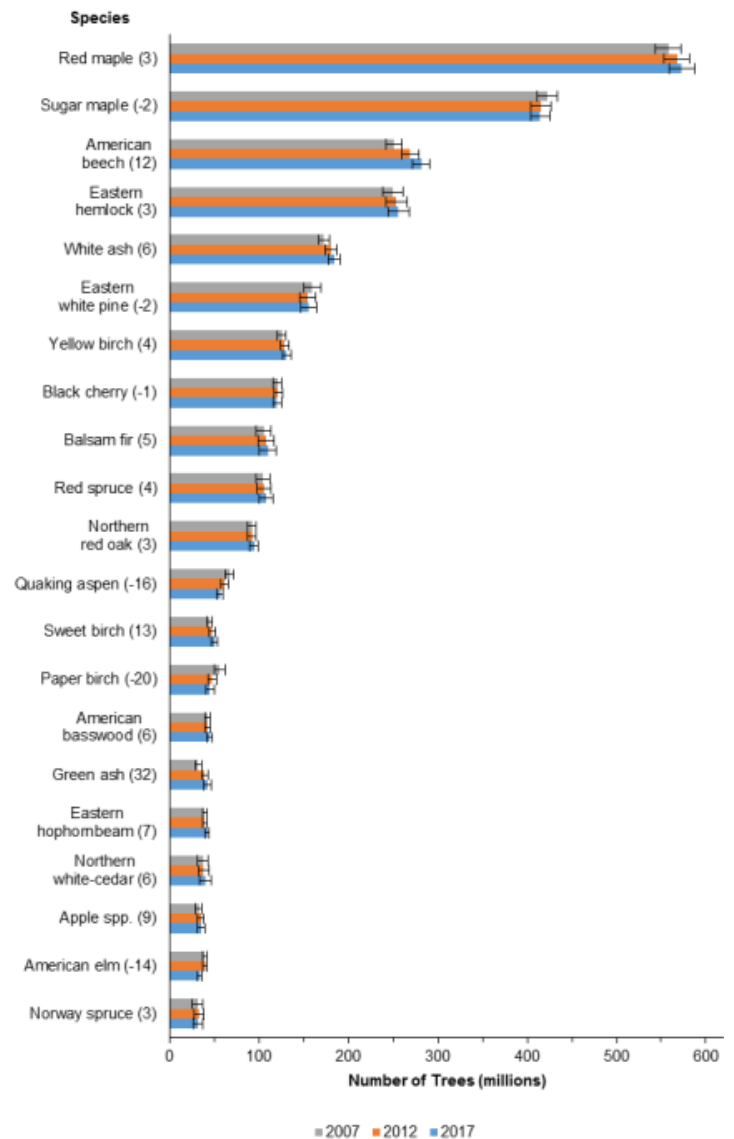


Chart indicating stocking for all forest types

Annual removal of merchantable wood volume compared with net growth

Comparisons of harvested volume to net growth is a useful way to evaluate the sustainability of harvesting practices. Simply dividing annual net growth volume by annual harvest volume produces a ratio showing the rate of growth compared to the rate of harvest. A net growth to harvest removal volume (G:R) over 1.0 indicates that net growth is outpacing removals. Thus, a ratio under 1.0 indicates volume is harvested at a rate exceeding growth, a situation that would be unsustainable long-term. The 2017 statewide G:R was 2.6, meaning that net growth was 2.6 times the harvested volume on an annual basis, an increase from the 2012 G:R of 2.3. Among the top 10 species ranked by total net volume, G:R was highest in yellow birch, with a net growth 5.6 times harvested volume (Fig. G4), followed by northern red oak (4.5), eastern white pine (4.1),

eastern hemlock (4.1), and red maple (3.4). Red pine was the only species with at least 1 percent of total net volume that had harvests exceeding net growth as shown by a G:R of 0.5, though several other species (sugar maple, American beech, American basswood, quaking aspen, and chestnut oak) had ratios of 2.0 or less.

Harvest patterns by major ownership groups remained consistent as compared to 2012 estimations, but strong differences were observed between the groups. Public timberland accounted for 13 percent of net volume in 2017 but was only 7 percent of annual harvest removals volume. This led to disparate G:R ratios in the two major ownership groups. Public timberland had a statewide G:R of 3.6 and privately held timberland was 2.8. While public timberland had the higher G:R, only 7 percent of volume harvested from public land was in rough cull trees, but 10 percent of private harvested volume was rough cull.

Annual change components as a percentage of net volume							
Unit	Net Volume (million ft ³)	Ratio of net growth to harvest removals (G:R)	Annual Net Growth	Annual Harvest Removals	Annual Other Removals	Annual Mortality	Net Change
Adirondack	4,113	1.9	2.3	1.2	0.0	1.5	1.1
Lake Plain	5,320	3.6	2.4	0.7	0.0	0.8	1.7
Western Adirondack	3,340	2.3	1.9	0.8	0.2	1.2	0.9
Eastern Adirondack	2,414	1.2	1.8	1.5	0.6	1.3	-0.3
Southwest Highlands	4,159	2.9	2.3	0.8	0.0	0.8	1.5
South-Central Highlands	6,330	3.2	2.1	0.6	0.0	0.8	1.4
Capitol District	3,600	4.2	2.3	0.6	0.0	0.9	1.8
Catskill-Lower Hudson	5,466	5.7	1.4	0.2	0.1	1.2	1.1
Statewide	34,743	2.8	2.1	0.7	0.1	1.0	1.2

Timberland net volume, net-growth-to-harvest (Forest Inventory and Analysis Report, New York Forest 2017)

Assessment: Costs of forest management

Ownership and management of forested lands entail significant costs. The initial purchase, mortgage, and liability or other insurance coverage, and the subsequent real property taxes, management practices, and maintenance activities all have associated costs. To many corporate entities, the bottom line may be a fixed dollar figure. To most family forest owners however, a dollar figure may not constitute the bottom line. Instead, the opportunity to see wildlife, to hunt or fish, to get away from it all, or to appreciate the scenery and open space may have substantial value that cannot be easily related to a dollar figure.

For forest owners, real property taxation continues to rank high among voiced obstacles to continued sustainable use of rural lands. There are state-level programs that offer to lessen the burden of real property taxes. New York's current Forest Tax Law offers preferential real property tax treatment to certain landowners who manage their land for timber harvest, and the local government bears the cost for this treatment through a reduction in tax revenues. A significant question is how to continue to raise funds for local government costs normally paid for by real property tax revenue without an undue transfer of tax liability to non-participating ownerships. Some argue

that State support of such preferential tax treatment is a fair way to support a societal benefit. Some form of State payment to affected municipalities or individuals (landowners), or an income tax credit are alternative forms of State support.

Income from the sale of forest products should not be taxed at such a rate that it becomes a disincentive to sustainable forestry. Enlightened capital gains treatment and recognition of the costs of long-term management should be reflected in income tax policy that is consistent with the promotion of sustainable land use and management.

Both the individual owner and the general public benefit from management actions that are conducted to enhance long-term forest health and productivity. These actions cost money. Publicly supported financial assistance programs implemented at the federal and state levels hold some promise to help keep forest as forests, with sustainable management as a basis for use of these lands. However, levels of funding need to be reevaluated to address the potential need and opportunity. Investment from the private sector may hold promise to address, at least in part, forest owners' need for financial support.

Assessment: Economic impact of New York's forests

New York's forest products industry is as diverse as any other state's, with businesses ranging from pulp-, paper-, and sawmills to biomass energy plants and secondary manufacturing of almost every type, as well as the foresters and logging/trucking contractors who produce raw materials and deliver them to a market.

New York's forest-based recreation contributes significantly to the state's overall economy. These opportunities are categorized as purchases at food and beverage stores, service stations, lodging, eating, and drinking establishments, and a host of other retail trade and service sectors. Wildlife viewing is the

largest contributor, with over 38 percent of the total sales in 2011, followed by, in order: hunting, camping, downhill skiing, hiking, cross-country skiing, fall foliage viewing, and snowmobiling.

The data below, from the forest product and forest-based recreation industry, highlights some economic benefits:

- In 2017, the direct contribution of the forest products industry to the New York economy was over \$13 billion.*
- In 2017, the forest products industry directly employed 40,000 people and

provided \$3.2 billion in direct labor income.* The average salary for workers in this industry is over \$79,000 dollars.

- In 2011, forest-based recreation and tourism provided 31,926 jobs and generated payrolls of \$936 million.**
- In 2011, revenues from forest-related recreation and tourism activities totaled \$8.2 billion.**
- In 2011, New York rural landowners received estimated stumpage revenue of over \$250 million.**
- In 2018, New York was the second leading maple syrup producer in the United States, with the value of maple syrup production totaling over \$26 million.

* "New York State Forest Industry-An Economic Overview-2017 Draft," written by Marial Cavo, John Wagner, and David Newman on behalf of the New York State Wood Products Development Council.

** *The Economic Importance of New York's Forest Based Economy. 2013. Northeast State Foresters Association; https://www.dec.ny.gov/docs/lands_forests_pdf/economicimportance2013.pdf.*

*** National Agricultural Statistics Service report: https://www.nass.usda.gov/Statistics_by_State/Pennsylvania/Publications/Survey_Results/2019/Maple%20Syrup%202019.pdf

Threats and challenges

For the forest products industry, challenges are persistent and require innovation by not only investing in new equipment, but also investing in the training and development of employees. Challenges experienced by all sectors result from global competition, high energy costs, and other business-related expenses. The current workforce shortage in logging—trucking in particular—is a major challenge for the industry. Natural factors also provide challenges. For example, quarantines as a result of exotic and invasive forest pests make it more difficult to operate a business as usual. Those in the industry who continue to do well have the flexibility to try new methods, invest in the latest equipment, and seek out and hire the best employees.

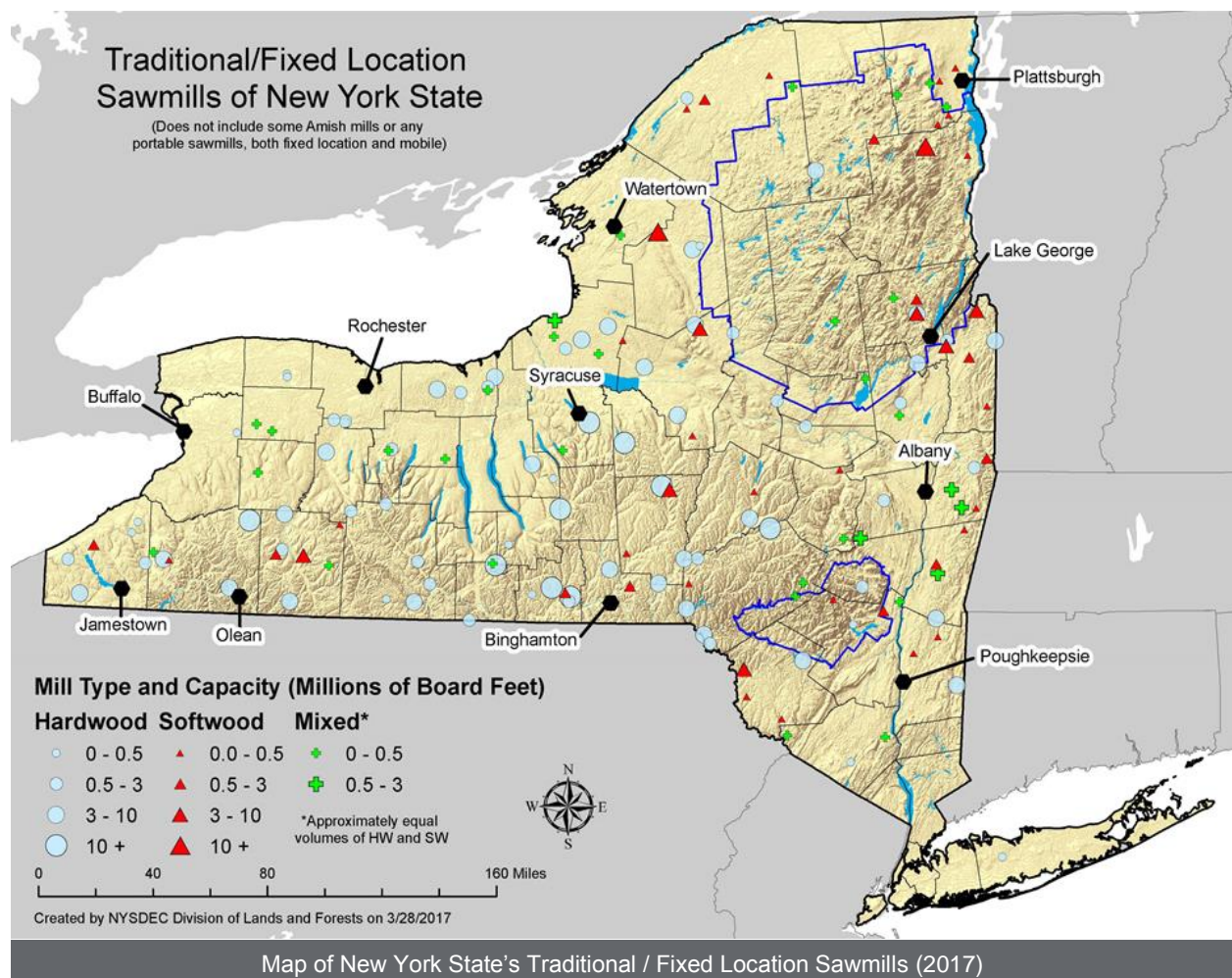
Assessment: Forest product manufacturing

Wood products are environmentally friendly and renewable, and the proper management of their raw source, trees, supports the sequester and storage of carbon. Wood products also provide economic benefits in the form of jobs and manufacturing. Markets for the goods and services derived from forests are essential to generating revenues and returns on investments. Markets need to be diverse, distributed across the state, and accessible by all forest owners. Access to markets should not be unduly restricted by regulations, policies, or laws. These preferred conditions support and sustain private forest ownership, retention, and management.

Traditional markets for wood products include sawmills, veneer mills, pulp and paper manufacturers, pallet mills, and firewood. These users are often called “primary markets,” as they take logs from the woods in round form and convert them into products. Over the last two decades, as many pulp- and paper mills closed or switched to imported/purchased pulp, and numerous sawmills closed or consolidated, New York, like much of the Northeast, saw a decline in the number and diversity of traditional primary wood markets. Loss of these markets has limited management options for forest owners and managers, as well as reduced potential returns. Losses also occurred among secondary wood products manufacturers that buy local lumber and turn it into furniture, cabinetry, flooring, tool handles, and other finished or semi-finished goods. These manufacturers are essential to providing the next link in the economic chain, keeping local mills and harvesters in business.

At the same time, some wood products markets are emerging, such as those for energy biomass or chemical production, known as the bioeconomy, but these markets are not yet well developed or geographically dispersed in New York. In addition to using logs, many of these markets also rely on byproducts of other wood processors, including bark, chips, slabs, edgings, and even papermill sludge. These users can provide an important secondary revenue stream for sawmills, pulp mills, and timber harvesters, which helps them stay viable. However, the vitality of biomass users may depend on the mills staying in business and continuing to generate affordable byproducts. Whether those businesses can survive is often dictated by other market conditions far beyond the biomass users' control.

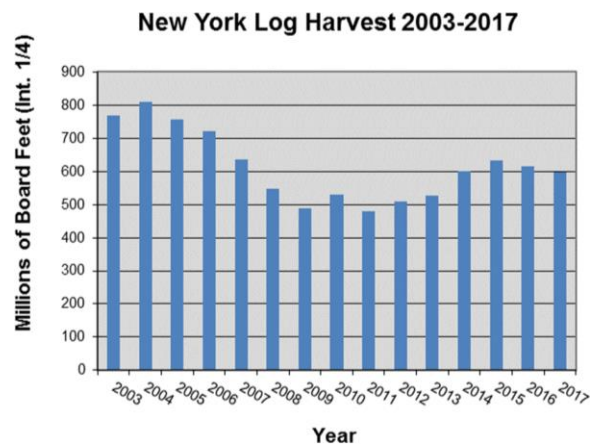
Currently, most harvesting of low-grade timber products takes place in the 14-county North Country region of New York. These markets provide direct economic benefits to landowners by allowing them to sell low-value trees. These markets also provide long-term benefits by 1) improving the overall quality and health of the residual forest by removing poorly formed, diseased, and underperforming trees; and 2) stimulating the regeneration of seedlings and saplings by allowing light to hit the forest floor. Further diversification of markets could safeguard the ability to continue harvesting low-grade timber at high levels. The expansion of low-grade markets into other parts of the state will improve the overall health and productivity of our managed forests.



There is a growing interest and need to explore new economic opportunities for forest landowners, typically called non-traditional markets. These opportunities can range from recreational or hunting leases to harvesting special forest products, such as ginseng, mushrooms, nuts, fruits, and decorative botanicals, to payments for ecosystem services, such as carbon sequestration, wildlife habitat conservation, or water quality protection. Forestland leasing has been a historic practice in many areas of New York, especially on large ownerships formerly held by forest products industries. Payments for ecosystem services are starting to receive a great deal of attention as a method for landowners to monetize these services, on par with traditional forest product markets. If issues of quantification, verification, permanence, valuation, and funding sources can be worked out, this approach could provide significant economic motivation and compensation for forest owners to retain and sustainably manage their woodlands.

In 1999, DEC's Forest Utilization Program initiated an industrial timber harvest production and consumption reporting program to account for timber product harvest and disposition on an annual basis. This report provides an enhanced understanding of the forest industry's economic contribution to rural New York, and it augments information provided by U.S. Forest Service's FIA Program. The report is widely distributed to forestry partners and industry in New York. It is also made available to the forestry research community and the general public. In recent years, the report has been utilized effectively by potential developers of biomass energy facilities investigating woody biomass feedstock availability.

After high harvest levels in the early 2000s, New York saw a decrease in the level of log harvest during the Great Recession years of 2007 through 2012. Steady annual increases occurred through 2015, with slight decreases in annual harvest levels in 2016 and 2017. Prices stabilized after the recession years, creating a favorable market for landowners to sell their wood products. Most of the wood harvested in New York is kept in state and consumed by state mills. There is a steady export market to China for light-colored hardwoods such as ash and maple.

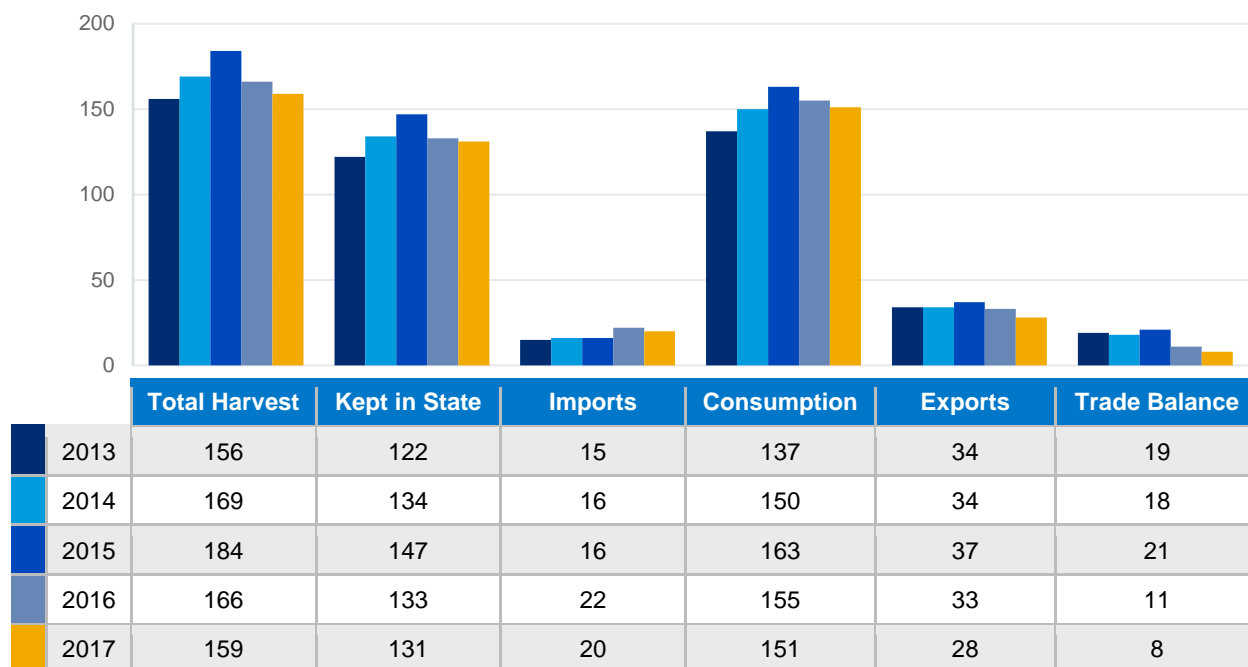


Threats and challenges

Failure to gain additional markets for low-grade timber products reduces the ability to renovate degraded stands and contributes to forests becoming under- or moderately stocked and underproductive.

Exploitative harvesting practices of high-grading and diameter limit cutting is driven by the lack of viable low-grade markets and the lack of scientific forest management. These practices sacrifice long-term tree quality and health for short-term financial gain. Often, this extends the period until the next harvest can take place and lowers the merchantability of the next harvest. In addition, the lack of forest management on private forest lands also poses some risks for the forest products industry, as well as overall forest health and productivity. Neglected stands are often not growing at an optimum rate or have serious forest health issues which affect not only the quality, but also the quantity, of raw material in the near future.

Most of the forestry and logging jobs in New York are located in the North Country, supported by low-grade markets, TIMOs, forest management firms, and traditional pulp-, paper-, and lumbermills. The majority of New York's valuable hardwood industry is, however, located in the Western, Central, and Southern Tier regions of the state. High-quality hardwood forests and the mills that surround them provide for a viable rural economy in these traditionally economically depressed areas. Private and public landowners benefit from the close proximity to markets and a tradition of forest management.

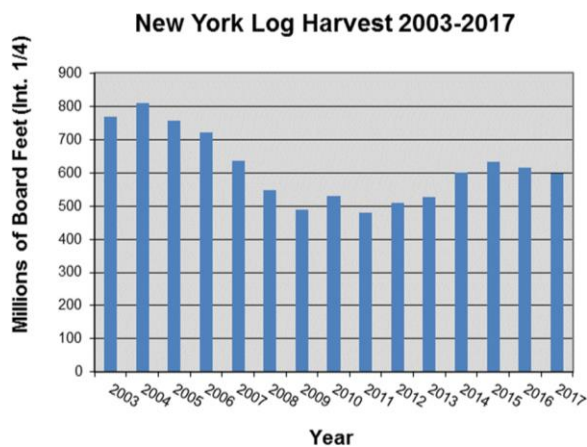


Wood and wood product production, consumption, and trade

The Capital Region, Catskills, and Lower Hudson Valley regions of the state have particular challenges when it comes to traditional forestry activities and viable forest markets. These areas have lost much of the mill capacity they traditionally had, sometimes making it difficult for landowners to sell their forest products and manage their property sustainably. Traditional sawmill infrastructure is important to maintain, as it affects the overall wood products supply chain. Sawdust and chips often are used to supply the local pulp mill or biomass facility. When these supplies are cut off due to a mill closure, it often results in the loss of low-grade markets as well.

The loss of local low-grade facilities results in less opportunities for landowners to sell their defective or poorly formed trees. Access for owners in these regions to low-grade markets located in the Adirondacks does exist and can provide some opportunities. However, the existence of more local facilities closer to the wood source would provide landowners with more access and opportunities to manage their woodlots. The lack of these opportunities means landowners will have to pay out of pocket to perform some clearing and thinning activities associated with traditional forest management

regimes. This can also contribute to a culture of high-grading to keep a harvest economically profitable for the landowner. Many times, that lack of markets fosters inactivity on the part of the landowner as far as traditional forest management is concerned, which can lead to slower growth rates and unhealthy or degrading forest conditions. A degraded forest provides less traditional economic benefit to the landowner through the production of wood products, which in some cases affects a landowner's willingness to hold forestland for the long term. This, in turn, creates the possibility of conversion to non-forest or exploiting the resource for short-term economic gain at the expense of long-term benefits.



Assessment: Forest-based public outdoor recreation opportunities

Many of the state's most beloved open spaces are dealing with a "new normal" from the impacts of increased visitation and a changing climate. In light of this new reality, proactive planning with defined action is essential to protect our outdoor recreation areas, and natural and historic resources.

New York State offers public access to recreation on a variety of public lands, including state forests, state parks, wildlife management areas, and forest preserve. In addition, there are abundant recreational opportunities beyond the boundaries of state-managed lands.

Recreational planning in state forest and state park management accommodates diverse activities, such as hiking, biking, snowmobiling, horseback riding, hunting, fishing, picnicking, cross-country skiing, snowshoeing, nature watching, geocaching, paragliding, rock climbing, and many others. The New York State Statewide Comprehensive Outdoor Recreation Plan (SCORP) 2020-2025, prepared by OPRHP every five years, provides an assessment, along with a vision and broad policy for recreation in our state. The SCORP includes plans for statewide trails and open space, as well as regional initiatives, such as the Great Lakes and Lake Champlain Basin programs, that help achieve regional management goals.

More frequent and intense storms and higher water levels at waterfront parks on Lake Ontario and Lake Erie are causing shoreline erosion, infrastructure damage, and chronically wet campsites. Coastal parks on Long Island have lost boardwalks, and fragile barrier islands and dune ecosystems have been damaged. High winds, high-intensity rain events, and flooding are also impacting many interior areas, bringing down trees, washing out trails, and damaging recreational infrastructure overall.

Regarding increased visitation, *see the strategy below, 'Manage forests for sustainable recreation opportunities,' and the strategy in Goal #4, 'Manage recreational user impacts in New York's state-owned forests.'*

State Parks and Historic Sites

OPRHP administers more than 350,000 acres of land, with 189 state-owned parks and historic sites. The agency allows public access to some of the state's most scenic natural landscapes, and offers year-round programs to visitors at nature centers, visitor centers, education centers, and the outdoors. OPRHP offers recreation at campsites, cabins, and cottages; on trails, day-use areas, beaches, and swimming pools; at a multitude of historic sites; and fishing access sites, etc. The agency administers 30 nature centers offering environmental education programs for children, families, adults, and school groups across the state. Stewardship of these natural resources is managed by OPRHP's Division of Environmental Stewardship and Planning.

OPRHP's framework for resource planning is a progression from statewide policy and goals to system management directions, to park and site plans, and, finally, to implementation of capital projects and resource management actions. OPRHP undertakes environmental stewardship projects focused on habitat restoration to benefit rare, threatened, and endangered species, and species of greatest conservation need.

With continued losses of natural areas through development, New York recognizes the critical need for new parkland designations for places with wildlife, flora, and scenic, historical, and archeological sites that are unique and rare in the state. Article 20 of the Parks, Recreation and Historic Preservation Law gave OPRHP's commissioner the authority to designate Park Preserves. The Article also allowed the creation of Park Preservation Areas to conserve areas of state parks, parkways, and historic sites, as well as recreational facilities that, although the entire facility does not qualify as a Park Preserve, nonetheless possess outstanding ecological values, including assemblages of flora and fauna that are unique or rare in New York.

OPRHP's Park Preserve system currently consists of eight Park Preserves and eight Park Preservation Areas, constituting more than a third of total lands under OPRHP's jurisdiction. Nearly 80 percent of the State Park system consists of natural areas with varied geologic features and ecological habitats. These notable landscapes include the waterfalls and gorges of the Finger Lakes region, the Genesee River Gorge at Letchworth State Park, the old growth forests of Allegany, and the islands of the St. Lawrence and Hudson Rivers, as well as cliffs at Minnewaska State Park Preserve (Hudson Valley region), and the Helderberg Escarpment of John Boyd Thacher State Park (rising over the Hudson and Mohawk Valleys).



Breakneck Ridge Trail in Hudson Highlands State Park Preserve (OPRHP) has granite outcroppings that afford breathtaking views of the Hudson River Valley. In 2018, this trail was a Leave No Trace hotspot due to high and growing visitation that challenges the protection of resources in this Park Preserve.

State Forests, Wildlife Management Areas, and the Forest Preserve

DEC administers nearly 5 million acres of land, including approximately 3 million acres of forest preserve, over 800,000 acres of state forests, nearly 200,000 acres of wildlife management areas, and over 900,000 acres of conservation easements. These lands are rich in both recreational opportunity and ecological significance, and are home to 52 campgrounds, 12 fish hatcheries, 1,280 miles of easements for public fishing rights, over 400 boat launch and fishing access sites, 2 Submerged Heritage preserves, several day-use areas, and about 2,800 miles of trails, as well as several environmental education centers and summer camps. Within the mandate of New York's Environmental Conservation Law (ECL), which requires the Department to first and foremost protect New York's environmental resources, there are a variety of opportunities for public enjoyment of the state's public lands, including hiking, camping, canoeing, hunting, fishing, trapping, snowmobiling, skiing, mountain biking, and rock climbing.

The Adirondack Park Agency (APA) works with DEC in a concerted effort to undertake planning that is critical to improving recreation opportunities throughout the Adirondack Park, where the majority of State lands exist. Numerous unit management plans (UMPs) have been approved for specific areas that span the range of diversity from popular public campgrounds to the region's more remote, less-used wilderness areas. Through this interagency planning process, a primary objective is to facilitate practices such as a "Limits of Acceptable Change" management approach to protecting natural resources, and a "Recreational Opportunity Spectrum" method of inventorying the Park's available recreational resources.

Public use of wildlife management areas is regulated by Title 6, Chapter I, Part 51 of the New York State Codes, Rules, and Regulations. Activities not compatible with the primary management goals are not allowed. Prohibited

activities include any use of motorized vehicles except on town, county, or state highway roads, use of boats with motors, and overnight mooring or boat storage. Snowmobiles are allowed only on designated routes. Swimming is prohibited, and fires are only allowed for cooking, warmth, or smudge. These and other regulations and restrictions protect habitat and wildlife, as well as preclude conflicts with legitimate public use.



Mountain biking has become an increasingly popular activity on public lands. To accommodate this interest and also protect forest resources, state agencies engage in a planning process with stakeholders and the public to ensure that trail systems are sustainably designed and able to withstand compatible uses.

Examples of successful mountain biking systems on state lands include Elm Ridge Wild Forest in the Catskills, Wilmington Wild Forest in the Adirondacks, and Grafton Lakes State Park in the Capital Region.

Assessment: Economic benefits of outdoor recreation

When people recreate, they improve their health and support the state's economy. International and out-of-state visitors who come to Niagara Falls, Long Island's beaches, the Adirondack Mountains, or other scenic areas or landmarks in New York State help support nearby restaurants, lodging facilities, and car rental companies. Bikers along the Empire State Trail support convenience stores, bike shops, eateries, bed and breakfasts, and inns. And visitors to the state's many freshwater and marine beaches support Main Street businesses, private recreation providers, and other local entities. According to a 2010 report, outdoor recreation contributes approximately \$11.3 billion to New York's tourism economy—more than 25 percent of the state's total tourism industry—and \$800 million in tax revenue.

Approximately 52 percent of state residents participate in some form of non-motorized recreation annually. This generates approximately \$41.8 billion in consumer

spending in New York each year, directly supporting 313,000 jobs, providing \$14 billion in wages and salaries, and producing about \$3.6 billion in state and local tax revenue.

New York's State Park system alone received roughly 67 million visits, and visitors spent about \$4 billion, from April 2015 to March 2016, according to a 2016 report. This spending supported nearly 54,000 jobs. For every dollar of direct spending generated by OPRHP facilities, an additional \$9 of spending was induced statewide. The report also noted benefits that were more difficult to measure, such as increased tax receipts and increased valuation of nearby properties.

Note: this information was obtained from the New York State Statewide Comprehensive Outdoor Recreation Plan (SCORP) 2020-2025, prepared by OPRHP (<https://parks.ny.gov/inside-our-agency/documents/SCORP20202025PublicWebinarPresentation.pdf>.)

Priority Landscapes: Recreational hotspots and long-distance trails

Immersion in the beauty and diversity of New York’s forests, as well as opportunities for a wilderness experience, are among the main draws of long-distance trails in our state. New York is fortunate to be home to several, including ones that connect our state to its neighbors or to multistate landscapes.

Long Path – except for its first 14 miles, the 375-mile long hiking trail traverses the west side of the Hudson River in New York, connecting Ft. Lee, New Jersey to Altamont, New York (<https://www.nynjtc.org/region/long-path>).

Finger Lakes Trail – the main Finger Lakes Trail (FLT) from the Pennsylvania-New York border in Allegany State Park to the Long Path in the Catskill Forest Preserve offers 580 miles of hiking. There also are 6 branch trails and 29 loop trails and spur trails that extend from the main FLT, which total an additional 412 miles. The Finger Lakes Trail System (the Main Trail and all branch, loop, and side trails) offers nearly 1,000 miles of hiking in New York State (<https://fingerlakestrail.org/>).

Beyond offering unique opportunities for extended forest-based adventure, these trails also provide connections between larger forest blocks hundreds of miles apart.

It is no surprise that long-distance trails are a priority project of their own in New York’s Open Space Plan. These trails are also great examples of uniting public and private lands, and the trails represent opportunities for targeted conservation efforts through broad partnerships.

Appalachian Trail – a total of 88.4 miles of this approximately 2,200-mile-long hiking trail is in New York’s Hudson Highlands area. This historic and internationally renowned trail traverses the Appalachian Mountain range and connects Springer Mountain, Georgia, to Mount Katahdin, Maine (www.appalachiantrail.org).

Northville-Placid Trail – the 138-mile trail passes through what many consider the wildest and most remote parts of the Adirondack Park, connecting Northville and Lake Placid (<http://www.nptrail.org/>).

North Country National Scenic Trail – the New York section of this 4,600-mile, multistate trail traverses 717 miles, primarily as a footpath. The eastern terminus of the NCNST is in New York’s Crown Point State Historic Site and Campground, which is on Lake Champlain at the Vermont border. The trail runs west through the Adirondack Park and culminates its New York section in Allegany State Park at the Pennsylvania border. Important to note is that the trail was officially extended into Vermont in 2019, although the route on the ground remains in the planning phase. The proposed extension east will meet with the Long Trail in Vermont (<https://northcountrytrail.org/>).

Empire State Trail – the goal of this proposed multiuse trail is to link communities across New York, interpreting the history and beauty of the Hudson River Valley, the Erie Canal, and the Champlain Valley. The trail aims to promote connections to regional bicycling and hiking trails, such as the Hudson Greenway Trails, Appalachian Trail, the trails of the Adirondack and Catskill Parks, the St. Lawrence Seaway Trail, the Genesee Valley Greenway, and many others (<https://www.ny.gov/empire-state-trail/about-empire-state-trail>).



Priority Landscape: Urban areas and urban forests

The goal of New York's Urban and Community Forestry program (UCF) is to support municipalities, volunteer groups, and professional organizations in the planning and management of urban and community forests in the state; in other words, to help communities develop their own UCF programs. The U.S. Forest Service, which provides funding for this program, directed community support to focus on technical assistance and the development of tree ordinances, tree boards, and management plans for these communities. The Forest Service tracks the state's activities through the Community Accomplishment Reporting System (CARS). Close to 800 communities in New York State are capable of undertaking a UCF program. In other words, these communities have public trees along streets and in parks.

As of 2018, about 430, or 60 percent, of the CARS communities were engaged in urban forestry programs or activities.

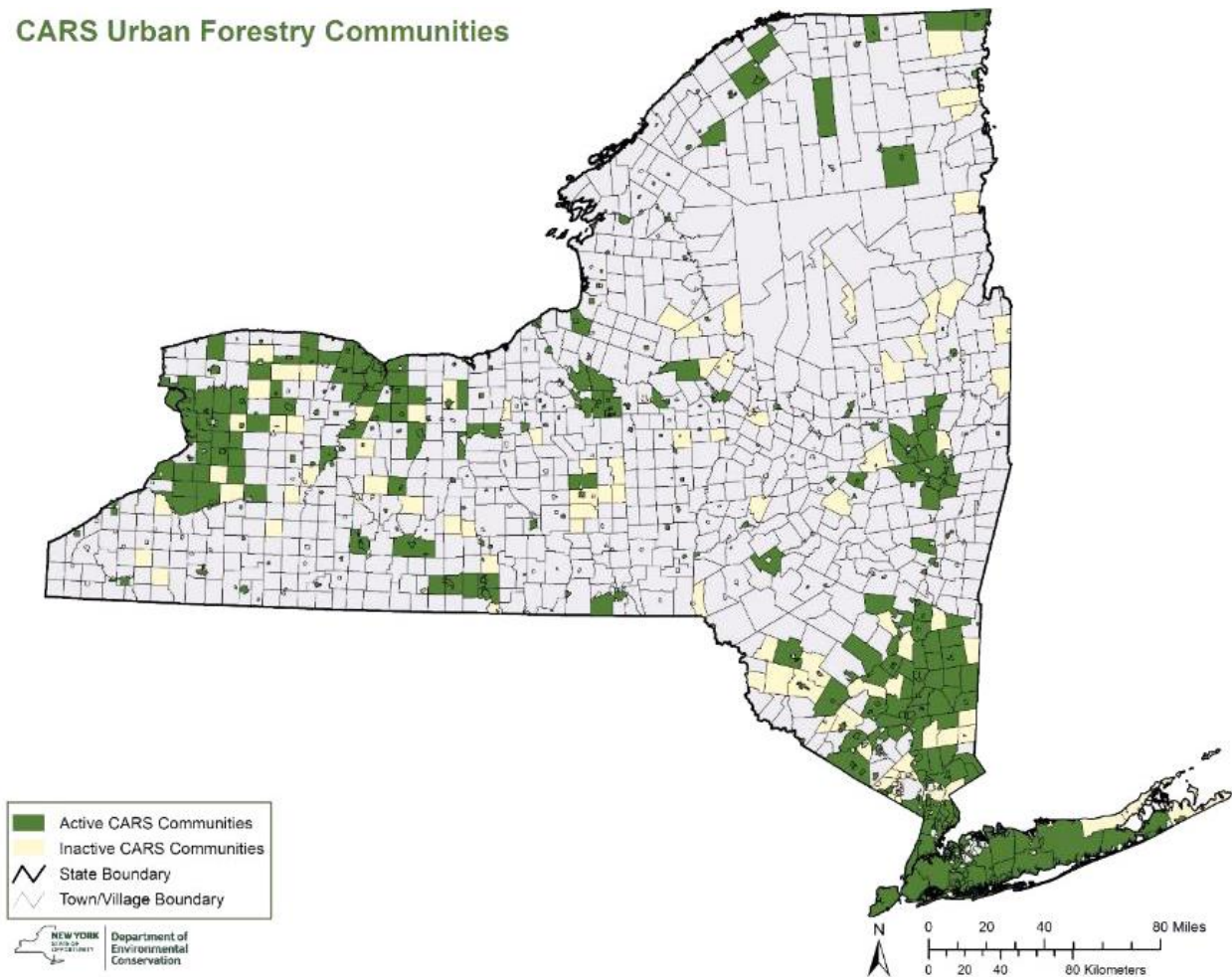
Trees have numerous positive effects on human health and our quality of life. When people utilize parks and shady, tree-lined streets, they are more likely to meet and establish bonds with their neighbors, which helps to create a sense of community. When people enjoy spending time in their neighborhoods, they develop pride and a sense of ownership in their communities.

The connection to trees in urban settings is the cornerstone of garnering support for rural forests among urban residents.

More than half of New York’s communities have an organized tree program. Some are completely run by volunteers, while others are driven by and funded by municipal programs. Many programs fit somewhere in-between. Most community forestry programs continue to seek outside technical assistance from DEC, New York State ReLeaf (a partnership between DEC, tree care professionals, and volunteers), and other tree care experts to improve their knowledge and programs.

Communities continue to need support in the form of educational workshops, forester contact, financial assistance, and access to the latest research in order to begin or improve a program. New York Town Law, Section 271, amended in 2007, requires members of town planning boards, zoning boards of appeals, and county planning boards to receive a minimum number of hours of training each year. These trainings introduce the benefits of trees and demonstrate how to create and maintain greenspaces when developing zoning laws or approving site plans.

CARS Urban Forestry Communities



Map of New York State’s Communities in Community Accomplishment Reporting System (CARS)

Focus Area: Forests and cultural resources

Protection of cultural resources, in forests as well as other areas, is of utmost importance to indigenous peoples. “Examples of sites of current or traditional cultural, archeological, ecological, economic, or religious significance may include ceremonial, burial, or village sites; areas used for hunting, fishing, or trapping; current areas for gathering culturally important materials (e.g., ingredients for baskets, medicinal plants, or plant materials used in dances or other ceremonies); current areas for gathering subsistence materials (e.g., mushrooms, berries, acorns, etc.)” (FSC 2019) (<https://us.fsc.org/preview.fsc-std-usa-v1-1-2018.a-719.pdf>.)

While it is understood that most of New York State is potentially significant for indigenous peoples, it would be informative to identify priority landscapes from their perspective and to explore how those landscapes overlap with the State’s land conservation efforts. This is an opportunity for collaboration with native peoples that DEC would like to explore further.

Focus Area: Resources and tenure rights of indigenous peoples

Treaty rights

One key treaty between the U.S. and a confederacy of indigenous peoples is the 1794 Treaty of Canandaigua. It established peace between the U.S. and Haudenosaunee, guaranteed that the U.S. will not claim Haudenosaunee lands, reaffirmed the Haudenosaunee and U.S. as separate sovereign nations, and affirmed the right of the Haudenosaunee to “free use and enjoyment of their lands,” including hunting, fishing, and gathering. Indigenous peoples across the continent consistently reserved these “usufruct” rights, not only on reservations, but throughout their larger aboriginal territories because of the absolute necessity and cultural importance of these practices.

These rights remain an essential part of life to Haudenosaunee, Shinnecock, and other native peoples of the lands now called New York State (<https://us.fsc.org/preview.fsc-std-usa-v1-1-2018.a-719.pdf>.)

Doctrine of Reserved Rights, Supreme Court United States v. Winans 1905: A treaty is not a grant of rights to the Indians [sic] but a grant of rights from them. Any right not explicitly extinguished... is considered to be "reserved" to the tribe.

Forest Stewardship Council – Forest Management Standard

Principle 3: Indigenous Peoples' Rights

Criterion 3.2 *Forest management shall not threaten or diminish, either directly or indirectly, the resources or tenure rights of indigenous peoples.*

Guidance: “Tribal resources” may include but are not limited to: subsistence hunting and gathering areas, fisheries, cultural sites, and other resources on or off the forest management unit (FMU) that may be adversely affected by management activities.

Indicator 3.2.a *During management planning, the forest owner or manager consults with American Indian groups that have legal rights or other binding agreements to the FMU to avoid harming their resources or rights.*

Consultation entails active, culturally appropriate outreach to tribes or designated tribal representatives. It is recognized that actual consultation is out of the control of the forest owner or manager, but that attempts must be made to invite such consultation.

For family forests, small private landowners may rely on government-to-government consultation between the State and Indian Nations, and abide by the outcome.

Indicator 3.2.b *Demonstrable actions are taken so that forest management does not adversely affect tribal resources. When applicable, evidence of, and measures for, protecting tribal resources are incorporated in the management plan. This includes resources that may not be directly on the FMU but may be affected by its management.*

Criterion 3.3 *Sites of special cultural, ecological, economic or religious significance to indigenous peoples shall be clearly identified in cooperation with such peoples, and recognized and protected by forest managers.*

Indicator 3.3.a *The forest owner or manager invites consultation with tribal representatives in identifying sites of current or traditional cultural, archeological, ecological, economic or religious significance. If consultation was not possible, regional databases or references that contain relevant data may be used to compile this information.*

Indicator 3.3.b *In consultation with tribal representatives, the forest owner or manager develops measures to protect or enhance areas of special significance (see also Criterion 9.1).*

Confidentiality of sensitive information is to be maintained. Public management plans may omit specific information.

Focus Area: Managing wildfires and communities at wildfire risk

Wildfire is defined as an uncontrolled fire spreading through natural or unnatural vegetation that often has the potential to threaten lives and property. Wildfires that burn or threaten to burn buildings and other structures are referred to as *wildland-urban interface fires*. Wildfires do not include naturally or purposely ignited fires, a.k.a. prescribed burns, that are controlled for the purpose of managing vegetation for one or more benefits.

New York has large tracts of diverse forestlands, many of which are the result of historic destructive wildfires. Although these destructive fires do not occur on an annual basis, New York has a cycle of fire occurrence that can result in human death, property loss, forest destruction, and air pollution.

New York State is 30.9 million acres in size, with 18.9 million acres of non-federal forested lands and an undetermined amount of non-forested lands with significant wildfire potential. All of New York's 19.8 million residents are affected by the most serious wildfires. Smoke and particulate matter from wildfires 500 miles north in Quebec often drift to New York City. Wildfires in the surrounding wildland-urban interface of New York City suburbs often do the same.

Community and individual protection from wildfire

Local communities and residents have the greatest role at preventing fires, loss of life, or property damage. The number of wildfires caused by debris burning, campfires, smoking, and children continues to decline due to prevention strategies and behavioral changes. However, regardless of prevention strategies, destructive wildfires will continue to occur when weather, fuels, and topography support rapid fire spread. Communities at risk to wildfire should

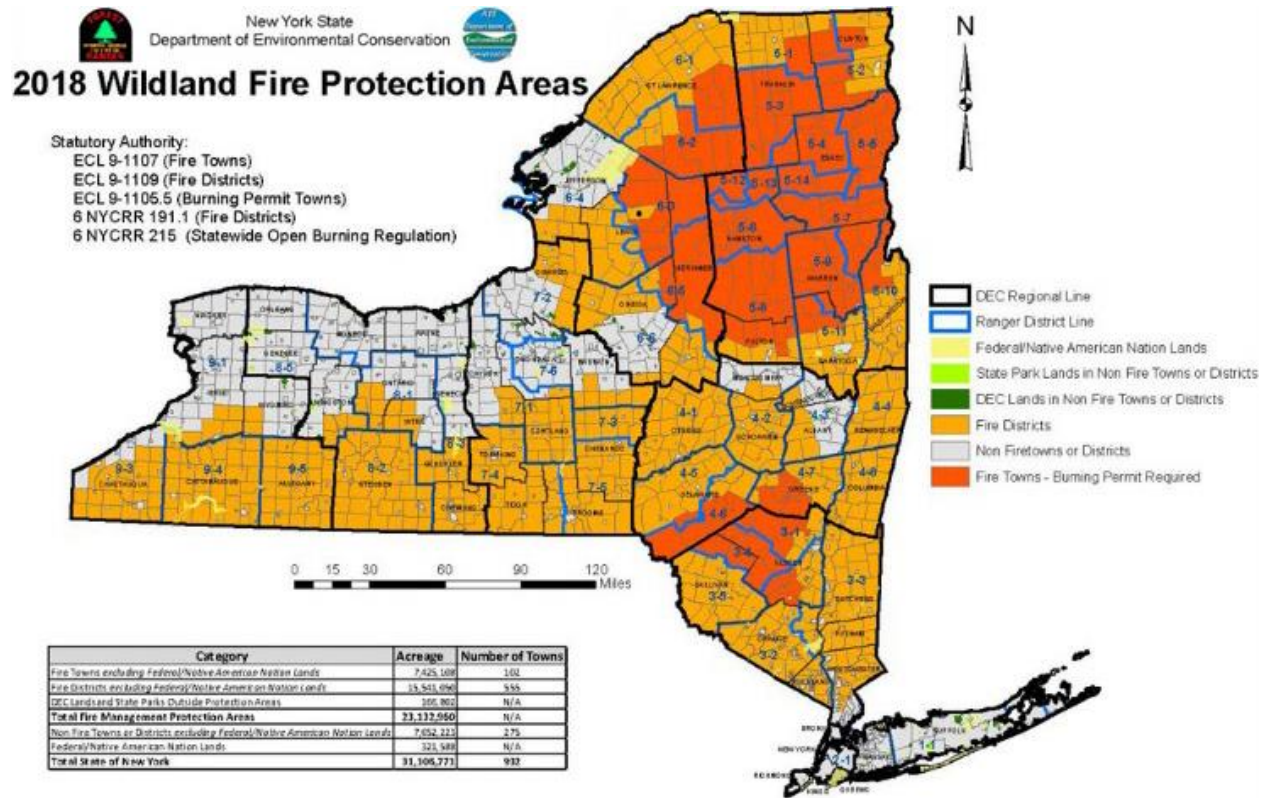
develop Community Wildfire Protection Plans (CWPPs) as a comprehensive means of addressing risk issues and mitigation strategies. The statewide "Firewise NY" program (<https://www.dec.ny.gov/lands/42524.html>) provides specific recommendations for communities, homeowners, and individuals to protect themselves and their properties from destructive wildfires.

Existing Community Wildfire Protection Plans

New York State currently has a few CWPPs:

1. The 2,816-acre Shawangunk Ridge CWPP, created in 2012, for the Town of Wawarsing, Ulster County, covering the historic Cragmoor hamlet. Note: Awosting Reserve, Minnewaska State Park, Roosa Gap State Forest, and Shawangunk Ridge State Park are located near Plan boundaries.
2. The 13,680-acre Ridge-Manorville-Calverton CWPP, updated June 2016, for the hamlets of Ridge, Manorville, and Calverton in the Towns of Brookhaven and Riverhead, Suffolk County.
3. A Draft CWPP for the 3,558-acre Eastern Shore of Staten Island (New York City), Richmond County, completed by New York City Parks in 2012, affects all or portions of the communities of Oakwood Beach, New Dorp Beach, Midland Beach, South Beach, Old Town, Grasmere, Arrochar, and Shore Acres, as well as over 1,350 acres of publicly owned open space.

For a full listing of CWPP, requirements, etc., see: <https://usfs.maps.arcgis.com/apps/opdashboard/index.html#/5a31e5f2e3fa4f77ac71ca366067ded2>.



Map of New York State's Wildland Fire Protection Areas (2018)

DEC's forest rangers have a statutory requirement to provide a forest fire protection system for 657 of the 932 townships throughout New York. This area excludes cities and villages; it covers 23.5 million acres of land, including state-owned lands outside the 657 towns. The Lake Ontario Plains and New York City-Long Island region are the general areas not included in the statutory protection.

Existing Fire Management Plans (FMP)

New York State currently has several FMPs:

1. The 13,000-acre Albany Pine Bush Fire Management Plan, renewed May 13, 2019, affects residents in the towns of Colonie and Guilderland, the Village of Colonie, and the City of Albany, all located in Albany County. DEC is in a cooperative agreement with the Albany Pine Bush Preserve (CA00440).
2. The 90,000-acre Northern Shawangunk Ridge Fire Management Plan, completed in February 2011, affects residents in the cities of Wawarsing, Shawangunk, Rochester, Gardiner, New Paltz, Marletown, and Rosendale, and the Village of Ellenville, all located in Ulster County.

3. The Wildland Fire Management Plan for Brookhaven National Laboratory, a 5,265-acre site located in the heart of the Central Pine Barrens on Long Island, completed in 2014, affects residents in neighboring Suffolk County communities, predominantly residential developments scattered among wooded acreage.
4. The Central Pine Barrens Fire Management Plan, April 1999. The largest portion of the approx. 80,000-acre Central Pine Barrens lies within the Town of Brookhaven, with the rest extending to the towns of Riverhead and Southampton, and the northern portion of the villages of Quogue and Westhampton Beach. DEC is a member of the task force that helped write the plan and is part of the Fire Management Plan.

Compact and/or federal agreement

During the occasional years when wildfire occurrence is beyond the ability of fire departments and forest rangers to adequately control, New York has extensive mutual aid support from surrounding states, several federal agencies, and four Canadian provinces. New York has been a member of the Northeastern Forest Fire Protection Compact since 1949. The mandate of the Northeastern Forest Fire Protection Compact is to provide the means for its seven member states, five Canadian provinces, and four federal land management agencies to cope with fires that are beyond the capacity of individual jurisdictions through resource sharing (mutual aid) (<https://www.nffpc.org/en/information/about>). In addition, New York has an annual agreement with the U.S. Forest Service, National Park Service, and U.S. Fish and Wildlife Service to exchange firefighting personnel and resources, as needed, to combat the most nationally severe wildfires.

Responsibilities for wildfire control

The Department of Environmental Conservation's Division of Forest Protection ("Forest Ranger Division") is New York's designated lead agency for wildfire mitigation in the State's Comprehensive Emergency Management Plan (CEMP, Vol2, ESF #4) (<http://www.dhSES.ny.gov/planning/cemp/volume-2.cfm>).

New York's large size, diverse topography, and variety of climates require the state be divided into distinct units for describing wildfire potential and risk. Through research and 35 years of wildfire occurrences linked to fire weather indices, New York is divided into 10 fire danger rating areas (FDRAs) (<https://www.dec.ny.gov/lands/68329.html>). FDRAs are defined by areas of similar vegetation, climate, and topography, in conjunction with agency regional boundaries, National Weather Service fire weather zones, political boundaries, fire occurrence history, and other influences. See *New York's hazard mitigation plan for wildfire*: <http://www.dhSES.ny.gov/recovery/mitigation/documents/2014-shmp/Section-3-17-Wildfire.pdf>.

New York is a home rule state. In the case of wildfire, the local fire department has the primary responsibility (incident command) for the control and containment of wildfires in its jurisdiction. New York State does not adhere to the "Let It Burn" policy, as the Northeast U.S. has a longstanding land ethic that is different from states farther west that have large tracks of open space.

The Catskill Park and Adirondack Park fall under the Environmental Conservation Law, Sec. 91105. 1 (c): *Setting of forestland on fire except where necessary to implement any provision of this chapter, including, but not limited to, paragraph v of subdivision two of section 3-0301 of this chapter; provided, however, that nothing contained in this paragraph shall permit the setting on fire of any land constituting forest preserve or of any state land within the Adirondack Park or the Catskill Park for any purpose other than fire suppression. The Department shall promulgate regulations governing the use of fire which shall include provisions for notification of, or waiver of notification by, local fire officials.*

Wildfire causes

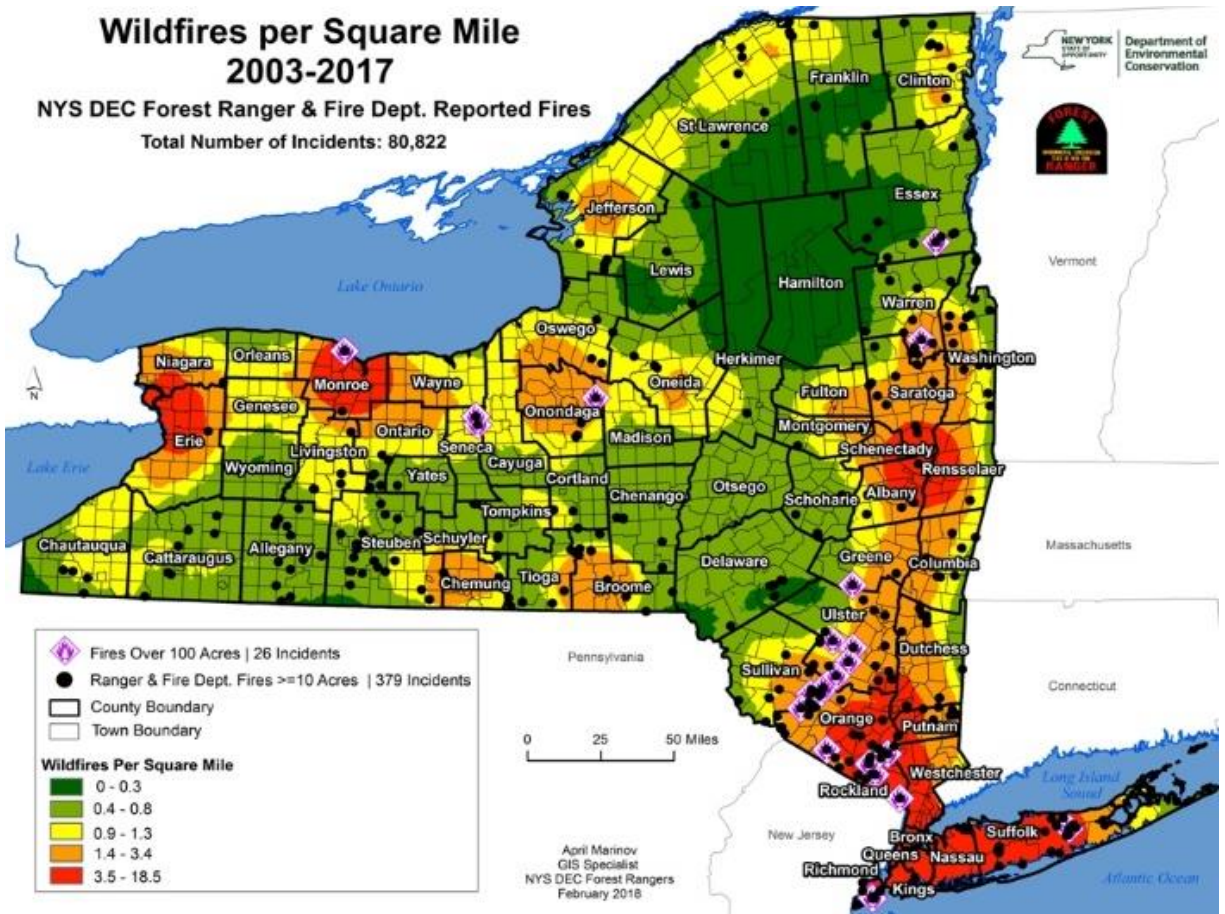
Beginning in 2010, New York enacted revised open burning regulations that ban brush burning statewide from March 15 through May 15, a period when 47 percent of all fire department responses occur. Forest ranger data indicates that this new statewide ban resulted in 46 percent fewer spring wildfires caused by debris burning in upstate New York from 2010-2017 than the previous 8-year average. Debris burning has been prohibited in New York City and Long Island for more than 40 years. Since compliance with this regulation is a continuing objective, historical fire occurrence data from forest rangers and fire departments will serve as a benchmark for analysis of wildfire occurrence. As wildfires caused by debris burning decline through regulatory enforcement, incendiary or arson fires will likely be the primary cause of wildfires in the future. Addressing this issue will require a greater intensity of enforcement than current enforcement for all other causes combined.

Wildfire occurrence

Over the past 25 years (1994-2018), Division of Forest Protection records indicate that rangers suppressed 5,090 wildfires that burned a total of 49,872 acres. New York, however, does not have a consistent wildfire season, and its fire history indicates periods of time when wildfires are much more numerous and destructive than the 25-year average would indicate. For example, in 2012, a 992-acre wildfire burned through Long Island's Central Pine Barrens, destroying three homes and one fire engine. In 2015, a 2,759-acre wildfire burned from Roosa Gap, Sullivan County, to Cragsmoor, Ulster County, threatening 50 residences before being contained. In 2016, the Sam's Point Fire in Ulster County burned 2,028 acres, threatening a radio communication tower complex that serves the Lower Hudson Valley and southern Catskill Mountains.

According to DEC's 1993-2017 wildfire occurrence data, almost 95 percent of wildfires in New York are caused by humans, while lightning is responsible for 5 percent.

Debris burning accounts for 33 percent of all wildfires, incendiary fires account for 16 percent, campfires cause 16 percent, and children are responsible for 4 percent. Smoking, equipment, railroads, and miscellaneous causes contribute to the remaining 25 percent of wildfires.



Map of New York State's Wildfire Incidents, 2003 – 2017

Strategy: Manage forest fires for public safety and benefit

To minimize the occurrence of wildfires and the associated property loss, forest damage, and potential loss of life, New York will need to accomplish the following objectives:

- Maintain a highly trained, well-equipped forest ranger force that uses its expertise and resources to contain the most serious fires.
- Support fire departments with their responsibility for the initial attack on most wildfires.
- Enforce fire prevention laws, especially the apprehension of people who purposely set fires.
- Use wildfire predictive services to notify the public and fire officials of fire danger potential. Conduct fire prevention programs in areas of greatest need.
- Support and implement Firewise and Ready, Set, Go! programs.
- Practice safe debris burning and recreational fires in all forests and wildland-urban interface environments as allowed by state and local regulations.
- Support fuel reduction techniques in critical wildland-urban interface communities.
- Support communities with CWPPs, and also identify communities –at risk of destructive wildfires and support the development of CWPPs for these communities.

See also: <https://www.dec.ny.gov/lands/42378.html>.

Prescribed burns

Wildfires do not include naturally or purposely ignited fires that are controlled for the purpose of managing vegetation for one or more benefits. The safe and controlled reintroduction of fire into fire-dependent ecological systems is part of a suite of management actions designed to improve forest health and habitat for native wildlife species. It is important to continue managing prescribed burns to:

- Improve wildlife habitat. For example, promote the growth of grasses for the habitat improvement of the short-eared owl.
- Help to restore, improve, and maintain the health of the pitch pine-oak-heath rocky summit by reintroducing fire to this fire-dependent community. Exclusion of

fire from this landscape has resulted in significant degradation of the pitch pine-oak-heath rocky summit woodlands by allowing the growth of species that are undesirable to this fire-dependent community, such as white pine and red maple.

- Reduce fuels such as brush and other vegetation, which will decrease wildfire threats in the area and surrounding communities.
- Enhance opportunities for wildlife-based recreation, such as hunting, birdwatching, and wildlife photography, since controlled burns benefit the habitat of native wildlife species.
- Help prevent or manage the southern pine beetle. Prescribed burn plans will need to be compliant with 6NYCRR Part 194.

Strategy: Conserve and manage working forests for multiple values and uses

- Maintain the ability of public and private forest-owners to practice active, sustainable management on appropriate forestlands not set aside for special purposes (such as forest preserve, unique areas, state parks, and special protection areas). This allows working forests to provide the full spectrum of benefits.
- Implement and demonstrate sustainable forest management on public lands.
- Educate the public on forest stewardship and all the benefits of working forests.

- Purchase working forest conservation easements.
- Encourage landowner participation in forest carbon markets.

Simply keeping forests as forests is not enough, on its own, to meet the needs of present and future generations. Many of the desirable and essential benefits, goods, and services that forests provide can come from working forests.

Strategy: Manage forests for sustainable recreation opportunities

Managing for forest health also provides opportunities for sustainable recreation. Access to enjoyable recreation improves the public's appreciation of the outdoors and their support for forestland protection and management. Given the steady increase in

visitation numbers, along with a significant jump in 2020 due to the pandemic, it is increasingly important to identify high value recreation areas and protect them for future generations. To fight increasing numbers of forest pests, strategies should prioritize unique and critical

environments that provide opportunities for public use and access.

- Identify high-priority forest ecosystems that are critical to recreation and public access. Prioritize resources to protect these unique and critical environments.
- Manage invasive species in priority areas to minimize impacts to recreation and public access.
- Survey for forest health threats at recreation and public use facilities.
- Work with land managers and stakeholders to identify new forest pests that may affect sustainable recreation, public use, and access.
- Educate land managers and support the implementation of actions to enhance forest health, biodiversity, and resilient forest ecosystems.

- Improve public outreach and awareness of invasive species at high-use recreation areas.
- Ensure that forest health management activities (e.g., cutting, herbicides, trapping, and other treatments) are explained via signs or kiosks to inform and educate the public.
- Recognize changing statewide demographics: the number of state residents is growing, more people are living in urban/suburban areas, and the ethnic/cultural composition of residents is constantly changing.
- Monitor for changes in habits of public land use and corresponding land management.
- Wherever possible, maintain/enhance/create buffers to mitigate impacts to recreational areas.

Strategy: Support forest management as a climate change mitigation and adaptation strategy

Since all forests are critical tools for mitigating the effects of climate change and adapting to them, management strategies and actions designed to keep trees and forests healthy, expand or maintain forest cover, and help forests and local communities withstand climate change impacts are a priority for New York—both to meet the goals of New York’s Forest Action Plan and to achieve the State’s climate change goals.

- Explore and identify what forest management practices are beneficial to climate change mitigation. Expand forester training to include those forest management and harvest BMPs that help to adapt to a warmer, wetter climate.
- Enhance forest carbon assessments and monitoring. Research and communicate forestry BMPs for climate mitigation and adaptation, including through the Climate and Applied Forest Research Institute (CAFRI) at SUNY ESF.

- Promote regenerative forest stewardship on private lands to bolster growing forests and increase resilience to disturbance.
- Support forest carbon markets to protect forestland. Improve management to increase the amount of forest carbon sequestered and the accompanying benefits of forests. (See *TNC’s Working Woodlands as one example*: <https://www.nature.org/en-us/about-us/where-we-work/united-states/working-woodlands/>.)
- Encourage long-term carbon storage by promoting forest product uses and markets.

- Develop clear guidance on the carbon benefits of forests by type, size, age class, etc., to ensure proper accounting of net carbon benefits of forests. Work to minimize all impacts on forests. For more on municipal planning and zoning for forest protection, see *Goal #4, Assessment: Planning, zoning, and policies for resiliency and forest protection*.
- Promote regenerative forest stewardship on private lands to bolster growing forests and increase resilience to disturbance.
- Work with NGOs and municipalities to promote private land conservation on parcels not suited for direct protection by the State. Continue and strengthen forest conservation efforts to avoid forestland conversion.
- Promote various stages of succession for multiple benefits: mitigation, adaptability, diversity of age structures. Continue planting a diversity of native species in a variety of habitats.
- Increase the magnitude of prescribed burns in response to temperature rise and amplified frequency of droughts, which will help prevent the buildup of fuel and lower the risk of wildfires.

Urban forests

A robust green infrastructure, through active planning and management, strengthens a community's resilience and plays an important role in mitigating the effects of climate change. Communities that invest in their forests can reduce pollution, stormwater runoff, grey infrastructure costs, and energy costs. DEC's Urban and Community Forest (UCF) Program will support these efforts through grants, as well as education and outreach. The UCF program also supports New York's climate goals to address the effects of climate change. (See 'Enhance forest contributions to ecosystem benefits' below.)

- Engage and educate communities on the importance of urban forestry and green infrastructure.
- Educate planners on the importance of trees in development and green infrastructure projects.
- Partner with climate change and green infrastructure programs to include urban forestry in more urban planning.
- Increase the capacity of urban NGOs and land trusts to steward and acquire urban parcels that could become small community forests or "pocket forests." (<https://www.americanforests.org/blog/picking-pocket-forests/>).
- Encourage preparations for storms and recovery of damaged landscapes.
- Increase the total tree canopy level across urban areas with tree plantings to increase carbon sequestration, decrease energy use, and reduce greenhouse emissions.
- Promote the conversion of brownfield sites to green areas that could potentially site alternative energy projects (e.g., solar).

Strategy: Support the natural benefits forests provide to people

Drinking water

Forests are critical to the quantity and quality of our drinking water supply. Good forestry and management methods can safeguard water quality.

The importance of forests is reinforced by current research on the public health impacts of urban and agricultural runoff in untreated water sources, and by the recognition that technological fixes have high costs and significant limitations (Barnes et al., 2009). According to the EPA, nonpoint source pollution from cities, highways, residential lawns, farms, and failed or inadequate septic systems contribute to more than 60 percent of U.S. water pollution. In New York State, the Section 303(d) list of impaired waters from 2016 includes approximately 400 waterbodies. The list identifies those waters that do not support appropriate uses and that require development of a Total Maximum Daily Load (TMDL) or other restoration strategy.

- Educate municipalities about the Water Quality Improvement Project (WQIP) and other funding opportunities through the Clean Water Infrastructure Act of 2017 for land acquisition in areas where forestlands can be established, maintained, or improved to protect drinking water sources.
- Engage communities about the importance of forest management as it relates to the protection of New York's waters and drinking water quality.
- Promote the often low-cost forestry practices and techniques for environmentally-sustainable timber harvest, outlined in the *NYS Forestry BMPs for Water Quality* (2018), (<https://www.dec.ny.gov/lands/37845.html>).

- Better leverage the WQIP to increase transactions, especially to encourage more land trusts to work with private landowners on conservation easements, to increase the pace of forest conservation.
- Encourage the installation and maintenance of natural buffers along waterways in forested areas. Continue DEC's "Trees for Tribs" program. These techniques are used in many water-focused management programs to improve or safeguard water quality.
- Educate municipalities about available state and federal technical assistance programs to protect sources of drinking water in forestlands.
- Educate forestry professionals and stakeholders about the location of drinking water sources. Knowing where those sources are allows them to use strategies that protect not only potable water, but all New York waters.

Erosion and flood control

In recent years, watershed associations have been planting buffer strips of trees along rivers with native, flood-tolerant trees and shrubs. There also have been a few encouraging initiatives in the Northeast to restore whole floodplain forests. Floodplain forest species, such as marsh bedstraw, willows, and dogwoods, have sprouted from the natural seed bank that remained in the soil and from seeds washed in by floods.

- Utilize different silvicultural systems to enhance habitat for wildlife species. The types of trees that do well vary with the duration of flooding.
- Maintain and reestablish riparian buffers to decrease erosion and increase fisheries quality.

Case Study: Niagara River Restoration Projects

In 2018, DEC and OPRHP began to restore wetlands and riparian areas at several sites along the Niagara River, named by the U.S. EPA as an “Area of Concern” in 1987. The project sites, Spicer Creek Wildlife Management Area and Beaver Island and Buckhorn Island State Parks, are important habitats that support the Niagara River fishery and the nationally designated “Important Bird Area.” Buckhorn’s East River Marsh has the largest remaining riverine emergent wetland, hydrologically connected to a unique forested wetland/wet meadow habitat once abundant along the Niagara River corridor. The work will contribute to restoring the beneficial use impairment “Loss of Fish and Wildlife Habitat” in the “Area of Concern” program.

Completed in 2018, the Beaver Island State Park project restored approximately 10 acres of natural habitat along the shores of the upper Niagara River. In the 1950s, the original wetlands were filled during dredging associated with recreational improvements at the Park. The completed restoration included extensive native plantings, such as red maple and black willow, and a new nesting platform for ospreys, a state-listed Species of Special Concern. In addition, native trees were planted at various locations in the Park. The Beaver Island project is one of eight Habitat Improvement Projects that are part of the 2007 relicensing of the New York Power Authority's (NYPA) Niagara Power Project by the Federal Energy Regulatory Commission. As part of the 50-year term of its license, NYPA has made a commitment to provide additional funds for operation and maintenance of the Habitat Improvement Projects, in cooperation with DEC.



An eroded shoreline at a former ferry slip in Beaver Island State Park was regraded and planted with native riparian species. The inlet now offers sheltered areas for improved fish habitat.

Urban benefits

Urban and community forests provide a wide variety of benefits, such as stormwater retention, flood control, improved air quality, and reduced heat island effects. They can also provide health benefits. It is essential to continue educating communities about opportunities to improve and increase their urban forest cover and to instill a greater appreciation for forests that surround us. Since 2008, New York State has observed a decrease in the forested cover in urban areas. If this trend continues, it could cause a decrease in the benefits communities receive from the trees.

- Encourage and support tree planting and revegetation efforts, particularly following storms and severe weather events, or after other disturbances, such as EAB-related management. Promote tree plantings as green infrastructure.
- Highlight “Rock Star” projects (a public outreach term DEC uses to highlight outstanding activities) that maintain and enhance forest contributions to natural systems and human benefits. Explore how other communities can benefit from or replicate such projects. For example, the City of Buffalo’s project that turns vacant lots into planted areas to reduce stormwater runoff (<https://www.epa.gov/green-infrastructure/greening-vacant-lots>).
- Provide technical assistance to communities to ensure that community forests maintain a high diversity of tree species. Provide funding for communities to plant and maintain their trees. Encourage native planting when possible.
- Encourage/educate communities on how to plan, design, and manage urban forests to improve health and wellness.
- Educate various municipal departments (Planning, DPW, Mayor’s Office, etc.) on the importance of integrating urban planning and forestry in all levels of planning.
- Partner with climate change and green infrastructure programs to include urban forestry in more city planning.
- Encourage communities to work with partners to plant more trees through grants, nonprofits, private funding sources, volunteers, etc. Explore the idea of county-level partnerships to develop regional tree nurseries to make our urban and suburban forests easier to reestablish.
- Increase pervious surfaces in urban areas.
- Develop incentives for communities with exceptional canopy cover.
- Establish and measure baseline urban canopy metrics and continue measuring metrics.
- Encourage, promote, and support opportunities to enhance the tree canopy in environmental justice areas (<https://www.dec.ny.gov/public/915.html>).
- Collaborate and look for partnerships with healthcare and affordable housing NGOs.
- Work with federal and state agencies (FEMA and SEMO) and communities to encourage enhanced preparation for severe weather events and the recovery of damaged or deteriorated landscapes to more healthy and resilient conditions.
- Educate foresters and planners on post-storm/event trauma and how to talk with residents who are rebuilding in tree-damaged communities.

Strategy: Support, maintain, and develop sustainable markets for sustainable forest products

Healthy forest product markets provide an efficient pathway to sound forest stewardship. Landowners and forest managers are able to remove trees as prescribed by scientific forest management at no cost or at a profit. This creates healthier forests and more vigorously offsets the cost of forest management for private landowners. Landowners will be better able to manage their forests sustainably if there are stable forest product markets throughout New York State. There is a growing interest in new economic opportunities for what are typically called nontraditional markets. Equally significant, the more wood products are used to replace materials that heavily rely on fossil fuels in their production, the less carbon will be released into the atmosphere.

The following actions will be taken to support sustainable traditional and nontraditional forest product markets in New York State:

- Incorporate updated messaging on the importance of carbon markets into forest stewardship outreach materials.
- Keep current markets and grow new ones, including low-grade markets by working with stakeholders to identify opportunities.
- Find opportunities and support research to promote mass timber and cross laminated timber in commercial, institutional, and residential building.
- Encourage traditional uses of forestland to include wood products; agroforestry, i.e., the harvest of forest products, such as maple sap; and recreation, including hunting, fishing, trapping, camping, hiking, wildlife viewing, etc.
- Create a bioeconomy task force to attract new, wood-based product manufacturing to New York, such as biofuels, bioplastics, etc.
- Look for ways to leverage private funding to support forest management practices that enhance carbon sequestration and mitigate the effects of climate change. This can be pursued through public-private partnerships.
- Support partners in workforce development efforts to recruit high school students into the logging and forestry industries.
- Promote the use of trained and certified professional loggers to private forest landowners through DEC's Forest Stewardship and Forest Tax Law programs.
- Explore incentives for mills, loggers, foresters, and landowners to follow best management practices (BMPs), remove invasives, and improve the forest for the future.
- Target federal stewardship dollars and outreach efforts in the Southern Tier and Western regions, where the majority of New York's valuable hardwood resources and hardwood mills are located. Focusing state stewardship efforts on landowners will support the local rural economy in traditionally economically depressed regions where the forest industry is essential.
- Work with partners to create new financial incentives to offset the cost of ownership and forest management for private forest landowners. Specifically, allow management for forest benefits (i.e., clean water, erosion control, etc.), as well as traditional forest management.

Strategy: Recognize indigenous peoples' use of and care for forests

Lessons from tribal forest management could help improve sustainable management of non-tribal public forestlands.

Case Study: Forest Co-management

At Brasher State Forest in the St. Lawrence Flatlands Unit, New York, Haudenosaunee (indigenous peoples) have a cooperative agreement with DEC to manage the forest for black ash, a cultural keystone species used by Haudenosaunee for basket making. This agreement is included in DEC's forest management plan.

Basket making, along with many other land-based practices, is socially and economically integral for indigenous communities. This work has resulted in renewal of traditional knowledge and increased study of black ash ecology, benefitting both indigenous communities and the ecosystem, and, in turn, helping DEC fulfill its environmental responsibilities and take steps toward recognition of the land rights of indigenous peoples.

TRAINING OPPORTUNITY

TRIBAL FOREST ADAPTATION PLANNING AND PRACTICES WORKSHOP



DETAILS

September 10-11, 2019
Akwesasne Mohawk Casino Resort
873 NY-37, Hogansburg, NY 13655

INTERESTED?

Sign up!
Contact Les Benedict, Saint Regis Mohawk Tribe, to register:
les.benedict@srmt-nsn.gov
(518) 358-5937 x118

A \$50 registration fee will help offset the workshop costs (waived for tribal staff). Lunch and refreshments will be provided.


Organized by NIACS, USDA Northern Forests Climate Hub, and Saint Regis Mohawk Tribe Environment Division. **This workshop has requested CFE credits from the Society of American Foresters.**

www.forestadaptation.org/SRM

“Tribal Forest Adaptation Planning and Practices Workshop.”

A training for natural resource managers, organized by NIACS, Northern Forest Climate Hub, and Saint Regis Mohawk tribe Environment Division.

GOAL #4:

Appreciate, Support, and Protect New York's Forests

On the one hand, this goal builds on New York's previous target to ensure continued benefits from forests. From our recognition of these benefits follows our willingness to support and protect forests. On the other hand, this goal also brings us full circle to the first target to keep our forests as forests; without our efforts to support and protect them, our forests will not remain forests. The pressures on forests from human activities and associated changes in our environment require us to act. In sum, this goal is the keystone that ensures the success of the other three goals in New York's circular framework.

"We must protect the forests for our children, grandchildren and children yet to be born.

We must protect the forests for those who can't speak for themselves, such as the birds, animals, fish and trees."

QWATSINAS (HEREDITARY CHIEF EDWARD MOODY), NUXALK NATION

This final goal directly targets two National S&PF Priorities: "*protect forests from threats*" and "*enhance public benefits from trees and forests.*" The third national priority, "*conserve and manage working forest landscapes for multiple values and uses,*" is embedded in the outlined strategies.

Assessment: Planning, zoning, and policies for resilience and forest protection

Comprehensive planning and local zoning ordinances are tools often used to manage or direct growth, help maintain open space or other environmental benefits, or ensure that infrastructure, such as water supply or sewage capacity, is not overburdened. Depending on how such ordinances are written and enforced, they can be great tools for promoting forest sustainability. However, they can also have unintended consequences that put them in direct conflict with sustaining forests.

New York is a home rule state. Authority for planning and zoning rests with municipal governments. While the State does not require municipalities to adopt either a comprehensive plan or a zoning ordinance, those that adopt zoning and other land use regulations must ensure that they are "in accordance" with an adopted comprehensive plan.

When it was enacted in 2014, the Community Risk and Resiliency Act (CRRRA) required applicants in some permit programs—and for funding in the Open Space Program—to demonstrate consideration of sea level rise, storm surge, and flooding. The Climate Leadership and Community Protection Act of 2019 revised this Act; it expanded the permitting programs included and required New York State to consider all future physical risks due to climate change (<https://www.dec.ny.gov/energy/102559.html>).

The CRRRA required DEC to provide guidance on the use of natural resilience measures, including forests and riparian buffers among others, to reduce risks associated with flooding, storm surge, and sea level rise. All CRRRA guidance documents have been released (https://www.dec.ny.gov/docs/administration_pdf/crranaturalmeasuresgndc.pdf).

Indigenous worldviews recognize the rights of the lands and waters to carry out their own duties and responsibilities. The Haudenosaunee Thanksgiving Address, a protocol for understanding of and engagement with the natural world, specifically mentions the duties of Mother Earth, the Waters, and the Fish, among other elements of Creation. The recognition and correlated responsibility of human beings to protect these rights of nature can be a motivating and guiding principle in conservation and protection efforts.

DEC will develop program-specific guidance in its permit programs to incorporate flood-risk reduction recommendations developed pursuant to CRRA, as well as consideration of other climate hazards significant to each project type.

Also pursuant to CRRA, in 2019 the New York State Department of State released a toolkit of model local laws to enhance community resilience. In addition to coastal measures, this guidance includes wetland and watercourse protection approaches, stormwater control, and the management of floodplain development. To download the documents, visit: <https://www.dos.ny.gov/opd/programs/resilience/index.html>.

MODEL LOCAL LAWS TO INCREASE RESILIENCE 

New Yorkers are at increased risk from the effects of climate change and extreme-weather events. Recognizing this risk, the Department of State worked with the Department of Environmental Conservation and other partners to create model local laws to help local governments be more resilient to sea-level rise, storm surge, and flooding.

The below materials may be downloaded from [dos.ny.gov/opd/](https://www.dos.ny.gov/opd/):

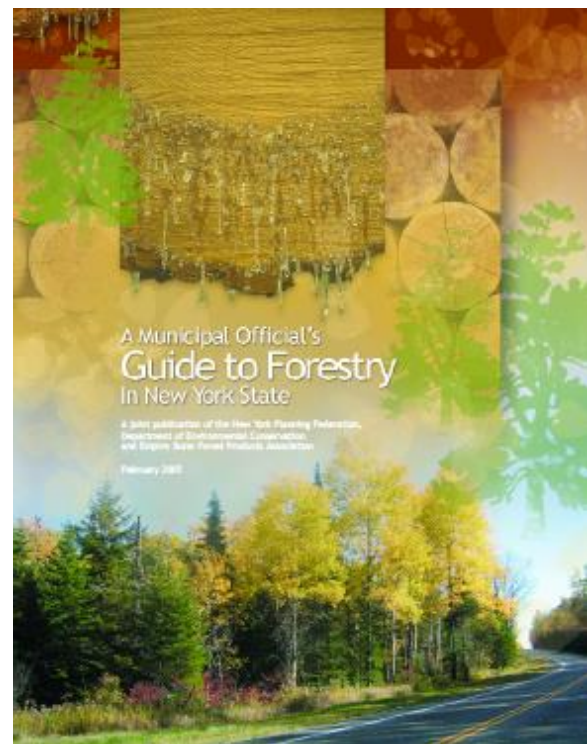
- Basic Land Use Tools for Resiliency
- Wetland and Watercourse Protection Measures
- Coastal Shoreline Protection Measures
- Management of Floodplain Development
- Stormwater Control Measures
- Choosing What Local Laws to Adopt

Cities, towns, and villages are invited to adapt model local laws to meet the resilience needs of the community with the assistance of their municipal attorneys.

www.dos.ny.gov/opd/ | opd@dos.ny.gov | 518-474-6000

More specific municipal planning efforts related to forestry are outlined in *A Municipal Official's Guide to Forestry in New York State* (NYPF, NYSDEC, and ESFPA, 2005).

Many municipalities lack either a comprehensive plan or zoning ordinance, or both. Even among municipalities with both, one may be out-of-date or inconsistent with the other, which can be confusing. Such documents can discourage multiple forest uses and forest retention. They can provide mixed or unreliable messages to landowners, forest businesses, and residents about forest-related expectations or community goals and objectives. The State's "Right to Practice Forestry Act," adopted in 2004, calls on localities to support and facilitate the practice of forestry in the development of local comprehensive land use plans, zoning ordinances, or regulations, and provides for review and comment on proposed ordinances by the Department of Environmental Conservation.



In an attempt to regulate land clearing, many communities facing development pressure have adopted local ordinances that end up restricting sustainable forestry practices. Private forest landowners, timber harvesters, foresters, and the wood products industry are concerned about

overly restrictive local ordinances. For many private landowners, the opportunity to periodically earn income from their forests is an important, if not essential, factor contributing to their ability to sustainably manage their forests and resist pressure to subdivide or develop them. Most towns want to find the right balance between preserving traditional uses, such as agriculture and forestry, with economic development and resource protection or preservation.

Planning should begin with a Natural Resource Inventory (NRI) that identifies important forest resources in the community. A comprehensive plan should ideally articulate goals and objectives for forest uses and conservation; for example, “to protect forestland for multiple-use forestry, including timber production, watershed management, fish and wildlife habitat, and recreation” (from the *Municipal Guide*).

DEC’s Hudson River Estuary Program is an excellent resource that provides guidance to communities with their planning efforts (https://www.dec.ny.gov/docs/remediation_hudson_pdf/nrifactsheet.pdf and https://www.dec.ny.gov/docs/remediation_hudson_pdf/nricover.pdf).

On September 15, 2020, the Hudson River Estuary Program and Cornell Department of Natural Resources and the Environment launched a new website called “Conservation Planning in the Hudson River Estuary Watershed” (<https://hudson.dnr.cals.cornell.edu>). The site compiles information from nearly two decades of biodiversity conservation and land use planning research and extension by the Estuary Program, Cornell, and partners.

Zoning is the mechanism by which a government regulates certain aspects of land use, such as the siting and density of development and allowable uses. It is also a way for a community to identify land uses (i.e., residential, commercial, etc.) that are compatible with each other and the setting in which they exist. As such, zoning is the best tool for preserving and enhancing forested landscapes. The identification of land use goals within planning documents can provide the groundwork for adopting zoning laws or regulations that enforce the protection of those areas. Zoning should ideally define forest uses and include forestry as a permitted use within appropriate zoning districts. The *Municipal Guide* offers instruction on crafting a municipal forestry law or ordinance that balances the right to practice forestry with the desire for a reasonable local review process. The Timber Harvesting Law by the Town of Hyde Park, New York, serves as a good example based on the *Municipal Guide*; (<https://ecode360.com/14987313>).

Communities need planning and zoning that protect forests and their benefits, while allowing sustainable forest uses.

Assessment: Economic framework for sustainable private forestry

Establishing a viable economic framework begins with providing forest landowners with incentives for practicing sustainable forestry on their property. These incentives can either come through the economic markets or through payments or services rendered at a lower cost. Markets for goods and services that forest landowners provide can be through traditional forest product markets or value-added markets, such as maple syrup, ginseng, mushrooms, etc., all of which have economic value. However, some timber markets are not available to all landowners in the state. The continuing contraction of the forest industry means that landowners will no longer have the main economic driver to motivate them to perform sustainable forest management. As stated earlier, the lack of markets removes an economic tool for landowners to keep and manage their property, and may pressure some to liquidate their forestland, considering it a bad investment. Keeping landownership viable economically is critical to not only a robust timber industry, but for all the other benefits our society obtains from forestland.

Lowering real property taxes on forestland, offering an income tax benefit, or even providing a direct payment to landowners are all ways to lower costs for these property owners. Most other states have recognized the benefit forest landowners provide to the rest of society, and those states provide incentives through tax abatement, current use programs, and some direct payment programs.

Among new emerging markets is a carbon offset market, where net polluters are compelled through regulation to offset their carbon emissions with purchased credits. For example, a company that emits carbon would be allowed to purchase a certain amount of credits in order to counter the impacts of its carbon releases. These credits represent a net uptake of carbon through the conservation of forests using sound, scientific forest management techniques. Some of the credits sold in a carbon market are provided by forest landowners who agreed to adopt standards designed to manage their forest for carbon storage and uptake.

Assessment: Unsustainable or exploitative harvesting practices

The average family or farm forest owner has many different reasons for owning woodlots, and many different goals and objectives for the property. With appropriate management, property owners can maintain their forests indefinitely, while using them today for many different purposes. That is the essence of sustainable forestry. It means keeping forests healthy, productive, and available for future generations, while reaping benefits today. This includes monitoring forest health and other conditions; maintaining appropriate numbers, kinds, and ages of trees; enhancing the growth and vigor of desirable species; and regenerating new trees and forests when the current ones reach maturity or no longer serve landowners' objectives.

Because trees of good form and desired species have market value for a host of products people depend on for daily living, woodlot owners can often sell trees to generate revenue and pay off their investments in ownership and management. These periodic timber harvests and sales can help meet short- and long-term needs and objectives if planned and executed with the future in mind. Unfortunately, many woodlot owners and harvesters do not practice sustainable forestry. Instead, they employ unsustainable cutting practices, such as diameter-limit cutting. This simplistic approach basically removes the largest, most valuable trees, and leaves smaller ones. Typically, the smaller trees left behind are also the poorest form or quality, or are suppressed trees that will

not respond with increased quality growth. Removing only (and all) the marketable trees or harvesting only selected species or certain quality of trees, are also unsustainable practices. These practices are often characterized as high-grading, which has been as a significant threat to U.S. forests.

Neither diameter-limit cutting nor high-grading tries to maintain or improve forest health or productivity, which are key elements of sustainable forestry practice. Nor do these practices deliberately regenerate new, desirable trees to replace the ones removed—ensuring and improving future woodlots. As a result, the next forest may have a patchy and irregular mix of open and crowded areas, short and poorly formed trees, or trees of limited diversity and low economic and ecological value, or lacking other desired characteristics. This creates undesirable conditions within the forest, reduces the potential for producing consistent amounts of wood products (including firewood, pulpwood, biomass, or timber) and the potential economic returns from those products, and may adversely impact vegetative wildlife habitats and other forest values. It also may open forests to being

dominated by ferns or beech sprouts, or invaded by non-native plants, such as garlic mustard, buckthorn, Japanese barberry, or multiflora rose. The situation usually worsens when a second or third diameter-limit cut is conducted in the same area in future years.

Better stewardship of wooded lands following recognized, sustainable forestry principles and the advice of a professional forester can help avoid these forest sustainability threats. With public benefits at stake, such as clean air, clean water, wildlife habitat, and future timber supplies, as well as personal benefits for forest owners, some states and localities have implemented regulations designed to ensure sound forest stewardship and conservation. To date, New York State largely relies on education and technical and financial assistance for private woodlot owners to voluntarily promote sustainable forestry. Professional forestry services and assistance are available from DEC foresters, as well as private sector foresters (such as those participating in DEC's Cooperating Forester Program) or other forestry professionals working in the public and private sectors.

Assessment: Legal and institutional framework for state-owned forest protection

The body of law that established the New York State Department of Environmental Conservation (DEC) and authorizes its programs is called the Environmental Conservation Law (ECL). DEC is responsible for administration and enforcement of the ECL (<https://www.dec.ny.gov/regulations/391.html>).

Cooperative Forestry Assistance Act (1978): This federal law provides the foundation for cooperative forestry programs implemented by states with federal support. The Cooperative Forestry Assistance Act authorizes key programs, including Rural Forestry Assistance, Forest Stewardship, Forest Legacy, Forest Health Protection, Urban and Community Forestry, Rural Fire Prevention & Control, and Community Fire Protection.

Forest Practice Act (1946): This act authorizes forestry assistance for private forest owners to encourage the practice of forestry so that damage to the environment caused by unplanned overcutting can be avoided. The act also assists in helping to stabilize New York industries that are dependent on forest products.

Article 14 (1894): New York's Forest Preserve lands are protected as "forever wild" by Article XIV of the State Constitution. New York's Forest Preserve is the largest state-designated wilderness in the country.

Criterion 7 in New York's 2010 SFAP offers an extensive overview of "Legal, Institutional & Economic Framework for Forest Conservation & Sustainable Management." See: http://www.dec.ny.gov/docs/lands_forests_pdf/fras070110.pdf

Focus Area: Sustainable forestry and BMPs

Sustainable forest management has been and continues to be a central goal for New York State and DEC. Ultimately, forest sustainability is determined by the people and practices that directly act upon the landscape. The decisions and choices landowners make about their forestland, and those made by foresters, timber harvesters, recreationists, and other forest users, all influence and change the resource. Since the vast majority of New York's forestland is in private ownership, this section focuses on the issues affecting that group and strategies to address those issues.

Regardless of whether a forest landowner has ever used the services of a professional forester or not, if that landowner wants to sell timber products, they will typically involve a timber harvester or logger. Very few landowners have the equipment or skills needed to conduct a commercial timber harvest on their own. The harvester is one of the most vital links in the forestry economic chain and, arguably, will have the most direct influence on the forests they work on and the future forests that grow. Timber harvesters also have direct market knowledge that landowners do not possess.

There are two key sustainable forestry issues related to timber harvesters. The first is demographic. Numerous studies have shown that the overall population of loggers is aging and fewer new workers are joining this field. Many factors contribute to this trend. Logging is a very hazardous occupation. It's seen as low-tech and low-paying, and it is rarely recommended by high school guidance counselors or career counselors. The work environment can be challenging—outdoors in all kinds of weather. Costs of entry to this business can be prohibitively high. The large equipment necessary (skidders, forwarders, processors, chippers, and trucks) can all be very expensive, and financing can be difficult. As the current generation of timber harvesters ages out of the workforce, many people question whether there will be an adequate supply of woods workers to accomplish vital forest management objectives in the future.

Secondly, it is critically important to forest sustainability and natural resource protection that timber harvesters are well trained—skilled in harvesting techniques, business practices, and resource protection. They also need appropriate incentives, direction, and financial motivation to apply BMPs in the woods. At the end of the day, the logger is where the “boots meet the dirt” for most of the forests in New York State.

New York has a vast and diverse forestland base, held in a combination of public and private ownerships. State forests managed by DEC are dual-certified under the Sustainable Forestry Initiative and Forest Stewardship Council “green certification,” and can serve as models of sustainable forest management for other landowners. Urban forests are protected and managed by communities, and, as discussed elsewhere, local, state, and national programs are in place to promote their sustainable management.

Some significant and emerging areas of forest and natural resource science and management still have gaps in knowledge, and, as a result, have uncertainties over strategies and impacts. These questions require further research to be answered, and further technology development to identify future actions:

- What are the effects of climate change on our forest ecosystems?
- How should forests be managed to mitigate or adapt to climate change?
- How do we detect, eradicate, or manage invasive pests?
- How do we prevent or deal with the impacts of air pollution and acidic deposition on forests?
- How do we restore habitats and/or maintain certain ecosystems, particularly for rare, threatened, and endangered forest-dependent species?

Strategy: Increase incentives to use the latest science in forest management

Incorporating the latest scientific data and knowledge into practical forest management activities creates better outcomes for landowners and society in general. Management solutions also need to be scale appropriate for small versus large landowners.

Forestry incentive programs such as the Forest Land Enhancement Program (FLEP), Wildlife Habitat Improvement Program (WHIP), and Environmental Quality Incentive Program (EQIP) have been used in New York to promote and facilitate preparation of Forest Stewardship Plans for private forest owners, and to implement various forest and environmental improvement practices, including timber stand thinning, invasive species removal, reforestation and tree planting, riparian buffer establishment, wildlife habitat improvement, forest road stabilization, and water quality protection.

- Expand funding for forestry incentive programs to directly enhance and complement other efforts for retaining forests and implementing sustainable forestry on the ground. Demand for these practices from New York forest owners and managers has always well exceeded available funding, indicating a far greater potential for applying conservation practices.
- Develop and grow the newly created “Regenerate NY” cost-share program to improve forest regeneration on private forestland throughout the state.
- Develop forest management workshops and training for forestry professionals on the latest scientific forestry topics.
- Update forest tax law regulations to allow for new silvicultural methods.
- Establish an online silvicultural library that consulting foresters and staff maintain and contribute to.
- Offer financial means for private landowners to improve forest health through a partnership with DEC’s Division of Lands and Forests:
 - Continue to incorporate forest health, forest pests, and invasive species considerations into updating the 480a Forest Tax Law, the EQIP, and working forest conservation easements. There are various cost-share programs available to private landowners to address invasive species on their property.
 - Create a cost-share or tax rebate program for targeted invasive species removals, thinning, restoration, and forest management to improve forest health and lower the risk of attacks by invasive species and/or pests.
 - Create invasive species and forest pest tree removal programs that provide some financial assistance (e.g., cost share, tax rebates, etc.) to remove previously infested hazard trees in areas that have been most impacted.

Strategy: Increase technical expertise among forest owners and managers

Empower private landowners and property managers through forest health education and technical advice.

- Following surveys, inform private landowners of the presence of invasive species and forest pests on their properties, and offer technical advice. Provide management plans and BMPs on invasive species (i.e., dealing with dead ash after EAB infestation, invasives management post-harvesting).
- Continue to provide workshops and other learning opportunities to private forest owners:
 - Encourage them to attend Invasive Species Awareness Week (ISAW) events. ISAW is an annual educational campaign that offers many opportunities to learn more about invasive species impacting their community and what they can do to manage them. Activities include guided hikes, plant and animal identification workshops, MapInvasives training, and much more.
 - Collaborate with organizations, such as the New York State Forest Owners Association, My Woodlot, Cornell Cooperative Extension, Soil & Water Conservation Districts, and others to provide education and outreach.
 - Conduct regional workshops and provide consultations, management recommendations, and more across the state.
- Create and promote native plant lists for nurseries, landscape centers, garden centers, and private landowners. Educate about the benefits of native plants and how to choose native alternatives and avoid invasives.
- Continue to connect the public and private land managers to the technical advice they need:
 - Provide identification services for invasive species and forest pests through the Forest Health Diagnostic Lab (foresthealth@dec.ny.gov and isinfo@dec.ny.gov) and the Forest Health Information Line (1-866-640-0652).
 - Connect private landowners with DEC's Division of Lands and Forest foresters, biologists, and Partnerships for Regional Invasive Species Management (PRISMs) for technical advice.
 - Connect private landowners with Consulting Foresters for additional technical advice.
 - Provide sufficient basic and technical information on the DEC website and New York State's Invasive Species Information Clearinghouse (<http://nyis.info/>).
 - Develop and provide innovative forest assessment tools that forest owners and/or managers can easily use and understand. An example is the Forest Health Outreach Tool and Scorecard, jointly developed by Cornell Cooperative Extension, the U.S. Forest Service, and The Nature Conservancy (<https://forestadaptation.org/learn/resource-finder/ny-checklist>).
 - Continue to raise awareness of forest health-related issues through print media, broadcast media, social media, etc.

- Continue to increase the use of iMapInvasives for tracking and sharing invasive species data.
- To keep private landowners and the public informed, continue to increase the availability and accessibility of location and management data for forest pests and invasive species through iMapInvasives.
- Increase the number of demonstration forests statewide, which highlight forest management practices promoting forest health, and showcase these forests for technical examples and education.
- Encourage foresters and timber harvesters to learn and adopt new, better ways to engage forest landowners, and better techniques to conserve forest resources to achieve the sustainable forestry objectives of landowners.
- Increase scientific knowledge and/or application expertise among forest owners to improve their ability to practice sustainable forest management.
- Promote silvicultural practices and guidelines, and timber harvesting BMPs to protect water quality and natural resources. In addition, work to improve and ensure sustainability by employing forest biomass harvesting guidelines, wildlife habitat management standards, invasive species control and management, carbon management practices, and recreational development.

Strategy: Provide access to forest data for cooperative stewardship

For cooperative stewardship of all forested lands, it is important to provide access to forest data for all involved in local or regional land use and management decisions. New York State’s DEC, NHP, OPRHP, additional state and federal agencies, and others have information, including GIS maps, that can be useful and relevant for a variety of land use planners, organizations, and entities. For example, the Hudson Valley Natural Resource Mapper is a tool developed by DEC for viewing natural features in the Hudson River Estuary Watershed (<https://www.dec.ny.gov/lands/112137.html>). Sharing could be deployed via the new Department-wide mapping tool, with reference to the GIS clearinghouse for underlying layers.

- Enable Indigenous peoples and other stewardship partners to access the same research, data, and technology that DEC uses, which will provide consistent tools to care for New York’s forests and improve results of forest stewardship efforts.

- Provide access to forest data to planning and zoning boards, Conservation Advisory Councils (https://www.dec.ny.gov/docs/remediation_hudson_pdf/cacfsheet.pdf), and land trusts.

Providing access to data helps forest managers fulfill FSC Criterion 3.1: “Indigenous peoples shall control forest management on their lands and territories” (FSC 2019).

Good stewardship of forestlands will help provide our country’s needs for clean water and air, thriving populations of fish and wildlife, quality outdoor recreation experiences, and a continual supply of wood products, and will help to meet our state’s climate goals.

State, federal, and other agencies also have information and data about Indian reservation lands, as well as indigenous peoples' aboriginal territories spanning New York State. The data pertains to lands, waters, sites, species, and materials of cultural importance to Native people.

- Provide access for representatives of indigenous communities to ensure their sovereignty by giving them data needed to care for lands and resources. Share data to ensure equity in indigenous peoples' participation in management and use decisions about forests and forest resources in aboriginal territories.

Strategy: Support local planning and zoning efforts to advance forest conservation

- Develop clear guidance on the carbon benefits of forests by type, size, age, class, etc., to properly evaluate the net carbon effects of conversion to any other land cover, including renewable energy facilities and transmission infrastructure, and to ensure proper accounting of the net carbon benefits of forests. A carbon program can give landowners another way to contribute to a solution for climate change and help New York State achieve our CLCPA goals.

Comprehensive planning and local zoning ordinances are tools often used to manage or direct growth, help maintain open space or other environmental benefits, or ensure that infrastructure, such as water supply or sewage capacity, are not overburdened. These tools can be used to prioritize conservation and sustainable management of important forest areas and to avoid forest fragmentation.

See also Assessment: Planning, zoning, and policies for resiliency and forest protection, under Goal #4.

A site-specific calculation of each and every benefit (or ecosystem service) provided by a forest would need to be tallied, and then weighed against the potential value/cost of harvesting the timber and developing the land. These forest benefits include the value of hunting/fishing areas, wildlife habitat, food sources, erosion control, water filtration, carbon sequestration/global warming mitigation benefits, aesthetics, recreational value, various livelihoods, etc. This will provide the private landowner with important information to decide what is in their long-term best interests.

However, based on their regulations and policies, local (and state) governments can influence landowner decisions to support various initiatives, such as carbon sequestration, renewable energy generation, or simply keeping forests as forests. Projects are often subject to the limitations of the site, the long-term goals of the landowner, and the financial resources available to achieve those priorities. An example is the financial ability of large landowners like TIMOs (Timber Investment Management Organization) versus a local landowner's resources. By helping aggregate small-scale carbon sequestration projects in a geographical area, municipal agencies can alleviate transaction costs for individual landowners. Doing this can help mitigate the current trend of

parcelization and habitat fragmentation. This aggregation would also provide small landowners a means to earn income through carbon sequestration. The science is knowing all the tools available; the art is putting them together to support natural processes in producing the best result. Professional foresters have the tools to meet both the capabilities of the site and the needs of the local and broader communities.

- Develop outreach on BMPs for the conservation of trees and forest stands during different phases of site planning and construction.
- Begin planning with a Natural Resource Inventory (NRI) that identifies important forest resources in the community, including large forest blocks, forest linkage zones, riparian forest buffers, and exemplary forest communities. Forest and other natural resource data should be analyzed to identify priority areas for maintaining forest cover and uses. Inventories can be developed in the context of a comprehensive plan, Open Space Plan, or as a stand-alone reference document. The results of an NRI should be available for use by municipal officials, county planning agencies, interested community and watershed groups, developers, and residents. Some applications of an NRI include: environmental review of development proposals; identification of conservation priorities; comprehensive plan updates; zoning and subdivision regulation updates; open space planning and acquisition; and Critical Environmental Area (CEA) designation. *See our Case Study for CEAs: Conserving critical environmental areas in Wawarsing*, under Goal #1.
- Develop model local laws for timber harvesting and forest and tree conservation.

- Engage local governments regarding the availability of DEC staff to review and comment on proposed timber harvesting ordinances.
- In conjunction with the New York State Department of State's Local Government Training Program, develop a municipal training presentation focused on planning and zoning for forests, with guidance tailored to different regions of the state. Develop a schedule for offering the presentation at planning and zoning conferences on a regular basis.
- Provide grant funding to support municipal forest planning and zoning.
- Engage local conservation advisory councils and boards, or encourage their establishment. Conservation advisory councils counsel municipal boards on matters related to the environment and assist with the review of proposed development projects.

Strategy: Enhance legal protections and policy frameworks in support of forestry

Municipalities often install tree ordinances or road bond requirements that target forest management activities in their village or town. This deters landowners from conducting activities that would improve the health of their forest and provide an economic benefit to the landowner and community.

As forest health issues multiply in New York's forests, it may become important to track where forest products are harvested from, in order to certify compliance with local, state, and federal quarantines. Regulation and policy need to reflect these challenges moving forward.

- Ensure that forests play a critical role in climate action plans.
- In addition to incentives, education, and outreach, also consider targeted policies and regulations that motivate retention, expansion, and beneficial management of forests, while discouraging deforestation.
- Explore strengthening land use and zoning regulations to protect forestland and forestry activities.
- Investigate avenues for raising the profile of professional forestry, the professional forester, and the professional logger in New York State.
- Explore developing a notification system for timber harvesting on private lands. The purpose of this system could be the monitoring of forest health agents and water quality.
- Expand policies (e.g., the state building code) that protect current markets, and encourage diversification of markets (including low-grade markets).
- Build on management strategies that promote healthy, productive, and sustainable forests based on articulated,

long-term goals and values; utilize the guidance and expertise of a professionally educated forester; consider many variables, such as wildlife habitat, water quality, and recreation, as well as timber and economic returns.

- Incorporate BMPs (See *Focus Area: Sustainable forestry and BMPs*) and other investments that protect natural resources and increase long-term values derived from forests.
- Use trained loggers who have the skills to perform low-impact harvesting.

Policy and regulation frameworks designed to protect communities from the negative effects of poor forestry practices, but not to restrict forestry activities, are important in maintaining community support of forestry.

Strategy: Engage communities about the importance of urban forestry

Most New Yorkers live and/or work near community forests, yet they often don't realize how important the trees in front of their home, along their route to work, and outside their workplace are to their health and well-being. With more and more people living in urban areas, it's increasingly important to improve the health of urban forests to ensure they thrive.

To appreciate trees, municipal workers and residents first need to be aware of their importance. That will motivate people to act to protect and increase this vital resource. The integration of urban forestry into all levels of city, regional, and state master planning will promote a greater awareness, elevate the value of urban trees and urban forest ecosystems, and educate people about their importance for community sustainability and resilience.

- Develop an Urban Forest Planning guide for municipalities/community groups.
- Educate various municipal departments (Planning, DPW, Mayor's Office, etc.) on the importance of integrating urban forestry in all levels of planning.
- Provide presentations and training to communities interested in learning about urban forestry. Include schools and municipal employees (beyond DPW workers) in these efforts.
- Increase statewide connectivity and communications among urban forestry organizations and municipalities.
- Hold statewide educational seminars, workshops, and webinars on urban forestry topics.
- Create educational webpages and print products aimed at different audiences, e.g., classroom posters, pamphlets for city planners about the benefits of trees, etc.
- Create an urban forestry newsletter, sharing UCF news and success stories from around the state.
- Identify community organizations for partnerships. For example, explore implementing a Stewardship Mapping and Assessment Project for all of New York.
- Participate in outreach events to reach more communities and residents.
- Update forest tax law regulations to allow for new silvicultural methods to be explored. Create invasive species and forest pest tree removal programs that provide some financial assistance (e.g., cost share, tax rebates, etc.) to remove previously infested hazard trees areas that have been the most impacted.

Municipalities need to integrate urban and community forestry into all levels of planning, including community comprehensive and master planning efforts.

Strategy: Foster public literacy about forest health and sustainable forestry

The majority of New York's population resides in urban areas, and traditional forestry is not part of their culture. This can lead to the public being misinformed about forestry and timber harvesting, and it helps to foster a negative view of one of New York's most environmentally sustainable industries. Improving the productivity and health of New York's forests requires motivated landowners to conduct sound forestry practices on the ground.

- Improve and update private lands outreach materials to provide more consistent messaging. Develop materials that emphasize the connection between forest landowners and the general public, as well as all the benefits of conserving and sustainably managing forests.
- Create an outreach strategy that clearly explains the relationship between healthy, thriving forest product markets and healthy, thriving forests. Creating products out of wood from New York's forests emits much less carbon than products made from other materials.
- Develop a social media strategy to connect users of private lands programs to each other. These programs include the Forest Tax Law Program and the Forest Stewardship Program. This would also provide an opportunity for the public to participate in citizen science.
- Educate urban New Yorkers about the benefits of traditional forest management.
- Establish "Your Local Forest Day" events modeled after "Local Farm Day" events to promote the connection between forest products, forest landowners, and the general public. Forest landowners would hold events and invite the public to their property to talk about forestry issues.
- Create a "Your Neighborhood Forest Program" that would hold forestry forums and outreach events across the state for targeted neighbors of state lands in order to model forestry practices.
- With partners, develop a New York State Private Forest Landowners Conference to be held every two years to focus on issues related to private forests in our state.
- Create forestry education materials for the New York State Legislature to promote forestry and private land stewardship.
- Maintain "green certification."
- Incorporate science-based forestry material into primary/secondary school curricula.
- Conduct regional workshops and provide consultations, management recommendations, and more to landowners and the general public. Encourage private forest owners to attend Invasive Species Awareness Week (ISAW) events. ISAW is an annual educational campaign each July that offers many opportunities for New Yorkers to learn more about the invasive species impacting their community and what they can do to manage them. Activities include guided hikes, plant and animal identification workshops, [MapInvasives](#) training, and other events.
- Create and promote native plant lists for nurseries, landscape centers, garden centers, and private landowners on the benefits of native plants and how to choose native alternatives in place of invasive species.

- Inform private landowners of the presence of invasive species and forest pests on their properties following surveys, as well as offer technical advice. Provide identification services for invasive species and forest pests through the Forest Health Diagnostic Lab (foresthealth@dec.ny.gov) and the Forest Health Information Line (1-866-640-0652). Connect private landowners with DEC Division of Lands and Forest foresters, biologists, and the Partnerships for Regional Invasive Species Management (PRISMs) for technical advice. Provide management plans and BMPs on invasive species (i.e., dealing with dead ash after EAB infestation, invasives management post-harvesting).
- Continue to raise awareness of forest health-related issues through agency communications vehicles.
- Provide access to forest data to planning and zoning boards, Conservation Advisory Councils (https://www.dec.ny.gov/docs/remediation_hudson_pdf/cacfsheet.pdf), and land trusts. State, federal, and other agencies also have information and data about Indian reservation lands, as well as indigenous peoples' aboriginal territories spanning New York State. The data pertains to lands, waters, sites, species, and materials of cultural importance to Native people. Enable indigenous peoples and other stewardship partners to access the same research, data, and technology that DEC uses, which will provide consistent tools to care for New York's forests and improve results of forest stewardship efforts

Strategy: Provide forest stewardship support to landowners

The right to own land is among the most treasured and valued rights of American citizens. The ownership of land not only gives landowners the right to pursue personal goals, but also carries the responsibility of good stewardship. Life and the natural systems that support it depend on strong stewardship or ethics we apply to caring for earth's resources.

Landowners who follow a forest stewardship ethic aim to guard against soil erosion and the depletion of soil productivity; protect wetlands, riparian areas, and stream and river corridors; mitigate climate change and the build-up of carbon dioxide; protect forests from insects, diseases, wildfire, overgrazing, and poor harvesting practices; conserve New York's biological diversity by protecting endangered species and rare forest communities; ensure future generations have forests to enjoy and that meet their needs; and contribute to the natural beauty of the earth.

Forestry is uniquely positioned to provide economic and ecological benefits to all New Yorkers. Education of the public is paramount in developing support for forests, forestry, and private forest landowners.

Efforts to strengthen this stewardship ethic can be focused on multi-generational landowners, as well as new landowners who don't have a history of ownership or management:

- Engage landowners in citizen science or efforts that have a community/regional connection.

- Develop outreach materials that recognize the various types of landowners, size of ownerships, and the reasons why landowners own forests.
- Continue to offer planning assistance through the Forest Stewardship Program.
- Continue to encourage private landowners to develop a stewardship plan and work with private foresters through the Forest Stewardship Program.
- Continue to promote the existence of healthy young forests through the Young Forest Initiative.
- Continue to support the Deer Management Assistance Program to help address large deer populations, which severely impact forest regeneration.
- Offer planning assistance to private landowners for developing an invasive species and/or forest pest management plan if the development of this plan does not fit into one of the above-listed programs.
- Pursue allowances for treatment of aquatic and land-based invasive species on private lands through the Environmental Conservation Law.
- Continue to work with private landowners to conduct invasive species and forest pest eradication and management efforts on their lands, when feasible.
- Work with the Colonel William F. Fox Memorial Saratoga Tree Nursery to create a restoration program for areas impacted by invasive species or forest pests to help landowners obtain access to native trees, shrubs, and plants for replanting.
- Strive to identify private land near areas of ecological concern and provide outreach to those landowners to help prevent new invasions.
- Identify and address underlying problems attributable to invasive species and forest pest damages, such as overcrowding, eutrophication, and the creation of clearings or other disturbances.
- Educate urban New Yorkers about the benefits of traditional forest management. Establish a “Your Local Forest Day” modeled after “Local Farm Day” events to promote the connection between forest products, forest landowners, and the general public. Forest landowners would hold events and invite the public to their property to talk about forestry issues.
- With partners, develop a New York State Private Forest Landowners Conference to be held every two years to focus on issues related to private forests in our state. Incorporate science-based forestry material into primary/secondary school curricula.

Strategy: Develop cultural sensitivity training from indigenous peoples

Work cooperatively with Indian Nations to further develop educational materials and educational opportunities, determined by Indian Nations, to help both New York State government employees and private citizens learn about these Nations.

The need for education in cross-cultural understanding responds to concerns expressed by Indian Nations that treaties and rights, as well as hunting, fishing, and gathering protocols and

practices, are not well understood by many DEC personnel or by surrounding non-Native communities. Both public and private landowners would benefit from better understanding of these topics. Cultural sensitivity training materials are currently available through the Office of Environmental Justice. Forest owners are encouraged to learn about the history and present concerns of indigenous peoples.

Strategy: Manage recreational user impacts in New York's state-owned forests

Throughout the country, recreational use of public lands has risen exponentially in the last decade, and New York is no exception.

- Steps should be taken to ensure that public use of these areas occurs in a manner that maintains public safety within communities, along roadways, at trailheads, and in interior areas; protects natural resources and recreation infrastructure; provides a quality recreation experience; supports local economic vitality; and is based on science and/or the best available data.
- Use various steward programs (backcountry stewards, front country stewards, and others) to help educate the public about the basic principles of the Leave No Trace program, protecting sensitive vegetation, wildfire prevention, wilderness preparedness, etc.
- In trail and recreation planning, be wildlife and plant sensitive, and habitat oriented.
- Explicitly limit, discourage, or prevent human access to sensitive areas.
- Construct trails and other facilities in a manner that accommodates the expected level of use with minimal maintenance, while factoring in climate change (i.e., extreme weather events) as an added impact on facilities.
- Using Volunteer Stewardship Agreements, encourage individuals and groups to help with maintenance of various facilities on state lands (e.g., trails, infrastructure, etc.).

Strategy: Increase institutional capacity, knowledge, and information exchange

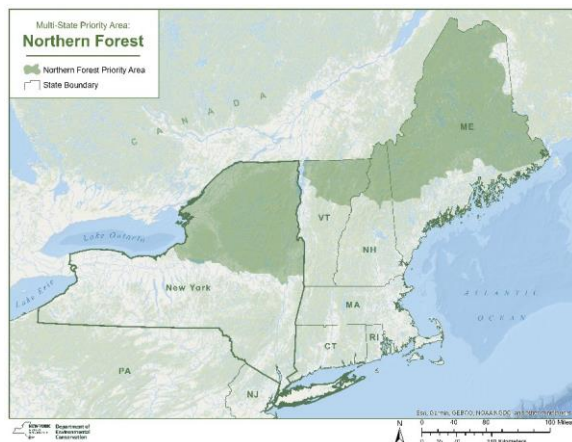
In addition to the myriad of resources listed throughout this plan that are necessary to implement our strategies (partnerships, financial and staffing needs, new programs, improved outreach and education, expanded research tools, sharing of knowledge, etc.), DEC identified the following needs:

- Improve the delivery of programs to private landowners and implement strategies in the State Forest Action Plan through targeted investments and resources. The relationships that DEC staff and forest landowners develop is important in fostering good forest stewardship practices over the long term. Having staff available for field visits, quick assessments, advice, and follow-up is key to increasing the amount of private land engaged under professional forest management.
- Grow New York's private lands engagement program to serve the 700,000 forest landowners who own 75 percent of the forest resource.
- Work with the New York State Department of Civil Service to develop separate "Outreach Forester" positions placed in each region to coordinate public outreach on forestry issues.
- Support and grow the NY Protected Areas Database as a critical tool for identifying gaps, links, and opportunities for future forest protection efforts, while allowing NGOs, municipalities, and the State to coordinate more closely.
- Develop a customer- and public service-based message and approach throughout all state private land programs.
- Explore certifications for DEC's Urban and Community Forestry Program staff that are relevant to the program's goals and objectives.

Multistate Priority Areas and Issues

Northern Forest

States: Maine, New Hampshire, New York, and Vermont



The Northern Forest region includes over 26 million acres stretching from New York’s Tug Hill and Adirondack Park areas through northeast Vermont, Coos County in New Hampshire, and into the Great North Woods of Maine.

Issues associated with the area

- Decreasing forest acreage caused by rapid and unrelenting conversion of forests to developed uses,
- Change in ownership patterns due to the transfer of lands into smaller parcels,
- Loss of forestland and fragmented forests, which undermines the integrity of forest ecosystems and fragile wildlife and fisheries habitats, and
- Uncertain markets present challenges to forest products-based economic development, infrastructure, and communities.

Existing efforts

1. The four states have entered into an MOU with the U.S. Forest Service and the Natural Resource Conservation Service to actively cooperate in the conservation and management of working forest landscapes in the area.

More specifically, this effort is intended to demonstrate, through pilot projects, how the partners can pool resources and coordinate efforts so that working private forestlands areas are conserved and protected from conversion to other uses.

2. Engaging stakeholders in developing an implementation strategy for how to keep the Northern Forest region’s “forests as forests.”
3. Engaged in the New England Governor’s Conference Commission on Land Conservation Forest Conservation Initiative.

Opportunities for partnership, cooperation, and projects

- Offer outreach to public officials, the forest industry, environmental groups, private forest landowners, and other interested members of the public in support of forest conservation.
- Address the loss of productive forestland to other uses, and potential impacts in the Northern Forest.
- Explore/expand economic and ecological partnerships with Canada
- Engage forest landowners in stewardship efforts by providing technical and financial assistance for improved forest management.
- Work to maintain and diversify the markets for wood products that allow sustainable forest management.
- Promote third-party certification to recognize sustainable forest management.
- Recommend policies that encourage sustainable practices.
- Work to acquire forest conservation easements to maintain working forests.

Highlands Region

States: Pennsylvania, New Jersey, New York, and Connecticut



The Highlands are a region of national significance bordering an expanding metropolitan area. The 3.4 million-acre region, with 319 municipalities and 25 counties, has abundant forests, fields, and natural resources that provide quality drinking water, recreation, and economic opportunities to its residents, but pressures to alter land use are great.

Issues associated with the area

- This area is identified by TNC and others as a critical forest corridor connecting Appalachian forests of the Mid-Atlantic to the Northern Forests of New England. This corridor also provides a significant migration pathway for plants and animals adapting to a changing climate.
- Urbanization and sprawl are big issues in this corridor and a driver of forest fragmentation.
- Protecting surface- and groundwater quality. Millions of residents in and outside the Highlands depend on drinking water from this region.
- Conserving the landscape for wildlife, rare and native plants, and environmental quality. Deer browse and the resulting lack of forest regeneration is also an acute issue in this area.

- Retaining working forests and farms to ensure economic viability.
- Providing appropriate recreational opportunities near and along the urban corridor.

Existing efforts

1. In 2010, the U.S. Forest Service completed its update about the natural resources in Connecticut and Pennsylvania, including identification of high conservation value lands, the effects of land use change on the resources, and strategies for conserving them. Respective studies for New York and New Jersey were completed in 1992 and 2002, respectively.
2. Highland Regional Study (https://www.fs.usda.gov/naspf/sites/default/files/publications/highlands_regional_study_ct_pa_10_screen.pdf)
3. Hudson to Housatonic RCP for regional land conservation and stewardship (<https://h2hrpc.org/>)
4. Staying Connected Initiative, connecting the southern Green Mountains in Vermont to the Hudson Highlands in New York (<http://stayingconnectedinitiative.org/our-places/greens-to-hudson-linkage/>).
5. Forest Legacy projects. The New York-New Jersey Highlands are part of this regional landscape and are Forest Legacy Areas, as designated by the U.S. Forest Service. *See sections in this Forest Action Plan about the Forest Legacy program.*
6. NPS: Appalachian Trail corridor protection. The Appalachian Trail traverses the Highlands Region in New York, New Jersey, and Connecticut (<https://www.nps.gov/appa/learn/management/upload/AT-report-web.pdf>).

7. New York state forests, DEC: Sterling Forest has tremendous value as the single largest block of intact forest in the New York Highlands and serves as a source of drinking water for more than 2 million New Jersey residents. Sterling Forest also links existing parks in New York and New Jersey, and it is part of a vision to create a regional greenbelt.
8. Hudson River Estuary Program, DEC: The Highlands Region includes several Significant Biodiversity Areas.
9. Audubon New York: Large areas are recognized as Important Bird Areas for forest habitat.

Opportunities for partnership, cooperation, and projects

- Partner with land trusts, conservation organizations, local communities, and state agencies to maintain connectivity between forests across the region. Resources are needed to continue land acquisition and easement purchases to protect habitats.
- Continued support for forest health and monitoring programs is important. Invasive species prevention and removal strategies minimize new invasive species and treat existing invasives to promote native forest regeneration.
- Outreach to local communities, including counties, to gather support for ecosystem protection.
- Acquiring fee interest or conservation restrictions over the largest remaining parcels of unprotected, high conservation value forestland, as identified in the U.S. Forest Service Highlands studies, within the forest core and working forest easements in buffer areas reduces the threat of development in these forests.
- Funding for trails and recreation would maintain and expand recreation opportunities. For example, the Appalachian National Scenic Trail (AT) is managed by a public-private partnership of numerous entities of all four states in the Highlands region.

Berkshire-Taconic Landscape

States: New York, Vermont, Massachusetts, Connecticut



Composed of several sub-ranges of the Appalachian Mountains, the Taconic Mountain range runs from northwest Connecticut to northeast New York and extends through western Massachusetts and western Vermont. The Landscape is unique in New England as the only intact forest block to have 16,000 acres of forest protected primarily for biodiversity.

With a high degree of ecological integrity and little fragmentation, these forests provide a critical, intact link between the extensive forests of the Northern and Central Appalachians. It is heavily forested and provides recreation, such as the Appalachian Trail, numerous state parks, and waterways.

Issues associated with the area

- This area is identified by TNC and others as a critical forest corridor connecting Appalachian forests of the Mid-Atlantic to New England. This corridor also provides a significant migration pathway for plants and animals adapting to a changing climate.
- The area is vulnerable to development for second homes.
- This heavily forested area provides habitat to rare plants and animals.
- This area offers many opportunities for conservation practices, including conservation easements and land trust projects. Forestland here is a priority for acquisition. This area contains significant sites and landscapes related to New York's (and the nation's) history.
- Ecological protection and restoration are of utmost importance, making it critical to remove invasive species that affect trees and the forest environment. In addition, invasive forest pests are either in this region (hemlock woolly adelgid and emerald ash borer), or nearby, with a high potential to occur in the Landscape (Asian longhorned beetle).

Existing efforts

1. The last few decades of successful conservation efforts in the Landscape have set the stage for implementing broad and ambitious new conservation strategies. These strategies will leverage private money with public funds, improve the resiliency of the Landscape, and pioneer adaptation to climate change.
2. The Berkshire-Taconic Regional Conservation Partnership (<http://taconics.org/>)
3. The Staying Connected Initiative, connecting the southern Green Mountains in Vermont to the Hudson Highlands in New York (<http://stayingconnectedinitiative.org/our-places/greens-to-hudson-linkage/>)

4. Forest Legacy projects. The Rensselaer Plateau in New York and the tri-state Taconic Ridge are Forest Legacy Areas, designated by the U.S. Forest Service. See *sections in this Forest Action Plan about the Forest Legacy program.*
5. Conservation Fund acquisitions, including lands on the Taconic Ridge/Rensselaer Plateau (<https://www.conservationfund.org/news/press-releases/1682-the-fund-buys-23-000-acres-of-forestland-in-ny-vt-ma>)
6. NPS: Appalachian Trail corridor protection. The Appalachian Trail traverses the Berkshire-Taconic Landscape (<https://www.nps.gov/appa/learn/management/upload/AT-report-web.pdf>).
7. The Berkshire-Taconic Landscape Complex is a Northeast regional priority recognized by DEC, TNC, USFWS, Hudson River Estuary Program, and others. The 40,000-acre contiguous Complex is one of the most intact forested landscapes within the Lower New England/Northern Piedmont Ecoregion, spanning from Maine to New Jersey. This complex is recognized as a Northeast regional priority for its significant habitats and biodiversity areas.
8. Hudson River Estuary Program, DEC: Two Significant Biodiversity Areas of the estuary watershed are recognized in this area: the Taconic Mountains and the Harlem Valley Calcareous Wetlands Complex, which includes significant sections of the southern Berkshire-Taconic Landscape.
9. U.S. Forest Service: The Berkshire-Taconic region, spanning New York, Massachusetts, Connecticut, and Vermont, is identified as a multistate priority area (USFS, 2010), and is adopted in the Forest Action Plans of these respective states.

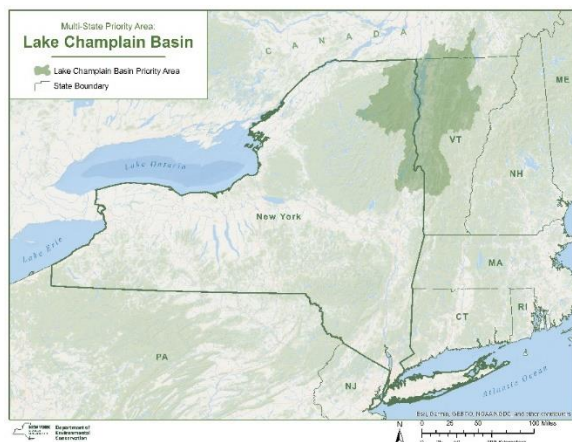
Opportunities for partnership, cooperation, and projects

- Protecting regional forest connectivity through partnerships with land trusts, conservation organizations, local communities, and state agencies. The Berkshire-Taconic Regional Conservation Partnership is a working example (<http://taconics.org/partners>). The Rensselaer Plateau Alliance, a local land trust, is ready to be a partner. Outreach to local communities will garner support for ecosystem protection.
- Acquiring fee interest or conservation restrictions over the largest remaining parcels of unprotected forestland within the forest core and working forest easements in buffer areas would reduce the threat of development in these forests.
- Invasive species prevention and removal strategies minimize the introduction of invasive species and treat existing invasives to promote native forest regeneration.
- Resources are needed to continue land acquisition and easement purchases to protect habitats. Continued support for forest health and monitoring programs is also important.

- Funding for trails and recreation would maintain and expand recreation opportunities while protecting ecological and historic resources as well. For example, the Appalachian National Scenic Trail (AT) is managed by a public-private partnership of numerous entities in all four states of this Landscape. Connecting trails in New York that run only a few miles from the AT would expand recreational opportunities in the Berkshire-Taconic Landscape. Similarly, strengthen partnerships with other organizations (ADK and NYNJTC) that maintain long-distance trails, such as the Taconic Crest Trail or the South Taconic Trail, to further the Landscape-scale goals.
- A cross-border rail trail partnership between New York and Vermont on the site of the historic D&H rail bed that Vermont manages as a multiuse trail along the New York border.
- There are opportunities for partnership with the Green Mountain National Forest, which has significant holdings in Vermont.

Lake Champlain Basin

States and countries: New York and Vermont, and Quebec, Canada



The Lake Champlain basin is a multinational resource of more 5.2 million acres that is affected by urban development and agricultural runoff.

Challenges include maintaining tree canopy and watershed health to reduce pollution and protect water quality. The effort is being coordinated by the Lake Champlain Basin Program. The basin was also a pilot Signature Landscape of the America's Great Outdoors Initiative. Forestry efforts include the Skidder Bridge Loan Program, which provides free use of skidder bridges for logging operations to implement

BMPs in an affordable way. The area continues to be the top priority, and efforts also include an urban green infrastructure initiative in Plattsburgh, which is the most densely populated portion of the basin in New York.

Issues associated with the area

- Forest fragmentation reduces quality wildlife habitat and increases watershed vulnerability.
- Lack of coordinated development and planning to safeguard sustainable forest use results in decreased water quality and increased runoff or pollutants entering the watershed.
- Nitrogen and other runoff into the lake, primarily from agricultural land use, undermine its water quality and can affect recreation (such as swimming) and/or drinking water from the lake.
- Urban stormwater runoff increases the volume of polluted water running into Lake Champlain.
- Invasive species in forested areas, such as hemlock woolly adelgid in Lake George forests or the emerald ash borer, weaken forest health and undermine water quality in the watershed.
- In certain areas, such as Clinton County, forests are lost due to conversion back to cropland.

Existing efforts

1. A basin-wide management plan from 2017, coordinated by the Lake Champlain Basin Program, that includes activities for many different agencies and organizations. The plan's four goals—clean water, healthy ecosystems, thriving communities, and an informed and involved public—serve as the framework for LCBP's work (https://3paj56ulke64foefopsmdbue-wpengine.netdna-ssl.com/wp-content/uploads/2016/11/Opportunities-for-Action_2017.pdf).

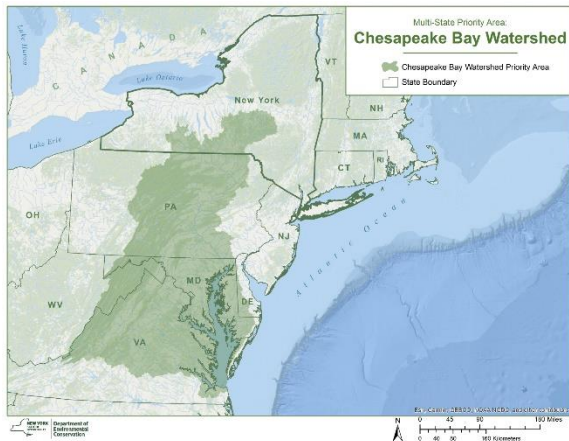
2. Partnership between federal and state agencies in the region, including DEC, the U.S. Forest Service, and NPS, to advance key initiatives.

Opportunities for partnership, cooperation, and projects

- Urban forestry projects that provide increased urban forest canopy and stormwater mitigation through plantings. Work with local developers and communities to include forested areas, vegetation plantings, and stormwater runoff mitigations.
- Control the introduction, spread, and impact of nonnative plant species in surrounding forests to preserve the integrity of the Lake Champlain ecosystem.
- Establish and expand forested riparian buffers, which help stabilize streambanks, reduce erosion and nutrient loadings, provide habitat corridors, and also provide shade to help cool stream temperatures for fish survival.
- Expand the “Trees for Tribs” initiative. Following Tropical Storm Irene in 2011, local groups continue to make use of this program.
- TNC is working on a planning effort to identify and conserve priority habitat connections for species requiring large habitat tracts, connecting the Green Mountains with the Adirondacks.
- Explore coordinating efforts with volunteer organizations such as the Greater Adirondack Resource Conservation and Development Council.

Chesapeake Bay Area

States: New York, Pennsylvania, Delaware, Maryland, Virginia, West Virginia, and Washington, D.C.



More than 150 major rivers and streams of the six states flow into the Bay's approx. 64,000-square-mile drainage basin, including the northern headwaters of the Susquehanna River in New York. Although forests once covered 95 percent of the Chesapeake Bay watershed, due to intense development, only 57 percent is forested today. The Chesapeake Bay itself, located in Maryland and Virginia, is the country's largest estuary.

In 2014, the six watershed states and Washington, D.C., along with the federal government, signed the Chesapeake Bay Watershed Agreement, which set goals for the protection of habitat, water quality, and aquatic organisms, as well as for stewardship (https://www.chesapeakebay.net/documents/FINAL_Ches_Bay_Watershed_Agreement.withsignatures-Hires.pdf).

Issues associated with the area

- Watershed restoration, urbanization, water quality, and invasive species

Existing efforts

1. Coordination between the Chesapeake Bay Program, the U.S. Forest Service, state agencies, and nonprofits through the Bay Program's Forestry Workgroup ensures that forestry issues are addressed in partnership (<https://www.chesapeakebay.net/>).
2. State and federal government agencies provide the leadership to restore the Chesapeake Bay Watershed, in part, through forestry partnerships and practices.
3. In 2010, the EPA established the landmark Chesapeake Bay Total Maximum Daily Load, setting limits on the amount of nutrients and sediment that can enter the Bay and its tidal rivers as a means to meet water quality goals. The seven Bay state jurisdictions, in coordination with federal and local partners, created Watershed Implementation Plans (WIPs) that spell out specific steps each jurisdiction will take to meet these pollution reductions by 2025. Federal, state, and local governments coordinate through the Chesapeake Bay Program to develop the WIPs.
4. The seven Bay state jurisdictions released their final Phase III of the WIPs in 2019. Recognizing the important role of restoring forest cover, Bay states and partners have set lofty forestry targets in three primary areas: 1) restoring riparian forest buffers, 2) increasing urban tree cover, and 3) permanently protecting forests. These practices provide cost-effective ways to improve water quality in the Chesapeake watershed while providing important co-benefits for wildlife and local communities. To support the implementation of these practices, the Forestry Workgroup at the Chesapeake Bay Program developed a Guide for Forestry Practices in Phase III WIPs.

Opportunities for partnership, cooperation, and projects

Shared Stewardship: In 2020, the partnership will publish an updated Chesapeake Forest Restoration Strategy (<https://federalleadership.chesapeakebay.net/FINAL%20ChesapeakeForestRestoration>

Strategy_GPO_130225.pdf). It will be the basis for a watershed-wide Shared Stewardship agreement. Working in partnership across the watershed to coordinate forest restoration and management activities will help maximize the benefits these forestry practices provide to the Chesapeake Bay and residents of the watershed.

Great Lakes Restoration Initiative

States and countries: New York, Illinois, Indiana, Michigan, Minnesota, Ohio, Pennsylvania, and Wisconsin, and the Canadian Province of Ontario

Lakes: Erie, Huron, Michigan, Ontario, and Superior



The Great Lakes Restoration Initiative (GLRI) is a resource of federal, state, and local governments, tribal/first nations, and other entities to fund and promote the protection and restoration of the Great Lakes by concentrating efforts on five Priority Focus Areas (<https://www.epa.gov/great-lakes-funding/great-lakes-restoration-initiative-glri>):

- Toxic substances and areas of concern (AOCs)
- Invasive species
- Nearshore health and nonpoint source pollution
- Habitat and wildlife protection and restoration

- Accountability, education, monitoring, evaluation, communication, and partnerships

This initiative relies on U.S. states and Canada working together through lakewide management partnerships (LMPs). Water in New York's Great Lakes Basin flows to Lake Ontario and Lake Erie, as well as the Niagara and St. Lawrence Rivers. Accordingly, New York participates in the Lake Erie and Lake Ontario LMPs.

Issues associated with the area

- Control aquatic invasive species
- Prevent habitat and species loss
- Increase coastal health
- Restore beneficial uses of water resources in 31 Areas of Concern
- Reduce nonpoint source pollution
- Remediate contaminated sediments and toxic pollutants
- Coordinate scientific data collection and communication
- Develop indicators for measuring the health of the Great Lakes

Existing efforts

1. The GLRI began in 2010 with funding to implement work that protects, cleans up, and restores the Great Lakes ecosystem in accordance with the 2010-2014 Great Lakes Action Plan (https://www.dec.ny.gov/docs/regions_pdf/glriplan.pdf).
 - a. The latest GLRI Action Plan for 2020-2024 is currently under development (<https://www.glri.us/node/122>).
2. The two lakewide action and management plans (LAMPs) New York State participates in are for Lake Ontario and Lake Erie:
 - a. Lake Erie (<https://www.epa.gov/greatlakes/lake-erie-lamps-and-associated-reports>)
 - b. Lake Ontario (<https://www.epa.gov/greatlakes/lake-ontario-lamps-and-associated-reports>)
 - c. Lake Erie State Park: Installed an innovative mushroom-based mycofiltration system to reduce high levels of *e.coli* bacteria. Funding support came from the Great Lake Restoration Initiative (<https://nystateparks.blog/2019/12/10/mushroom-tech-cleans-up-at-lake-erie-state-park/> and <https://parks.ny.gov/environment/documents/posters/RemovingEColiMushroomsMicrofiltrationLakeErieStatePark.pdf>).

Opportunities for partnership, cooperation, and projects

- Partner with land trusts, conservation organizations, local communities, and state agencies to protect or restore riparian forests and upland habitats.
- Partner with state water quality regulatory agencies to promote the use of urban forests for stormwater reduction and on-site infiltration.

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