

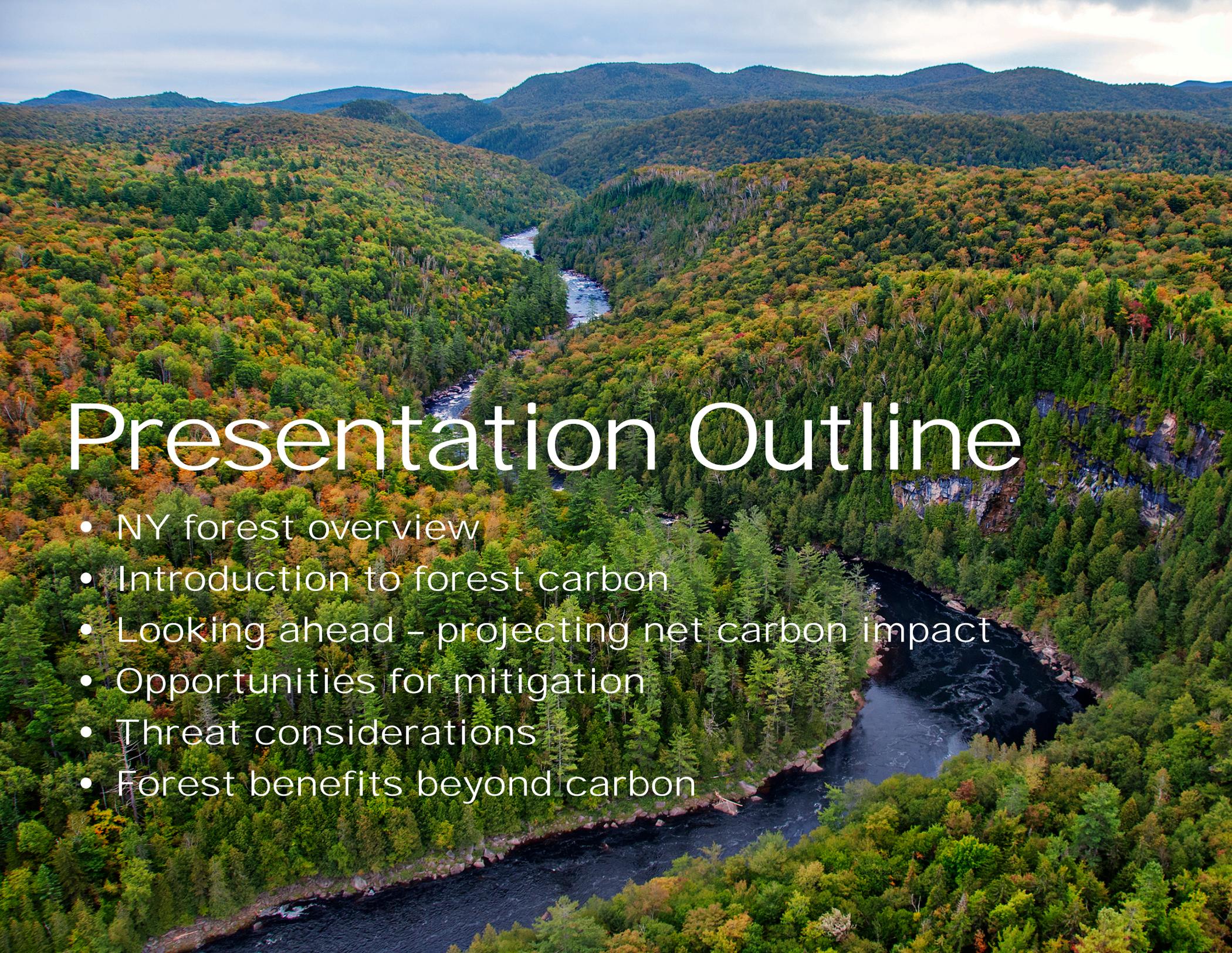
The Nature
Conservancy



NY Forests: Opportunities for Climate Mitigation and Resilience

Agriculture and Forestry Advisory Panel – November 2, 2020

Michelle Brown, The Nature Conservancy New York

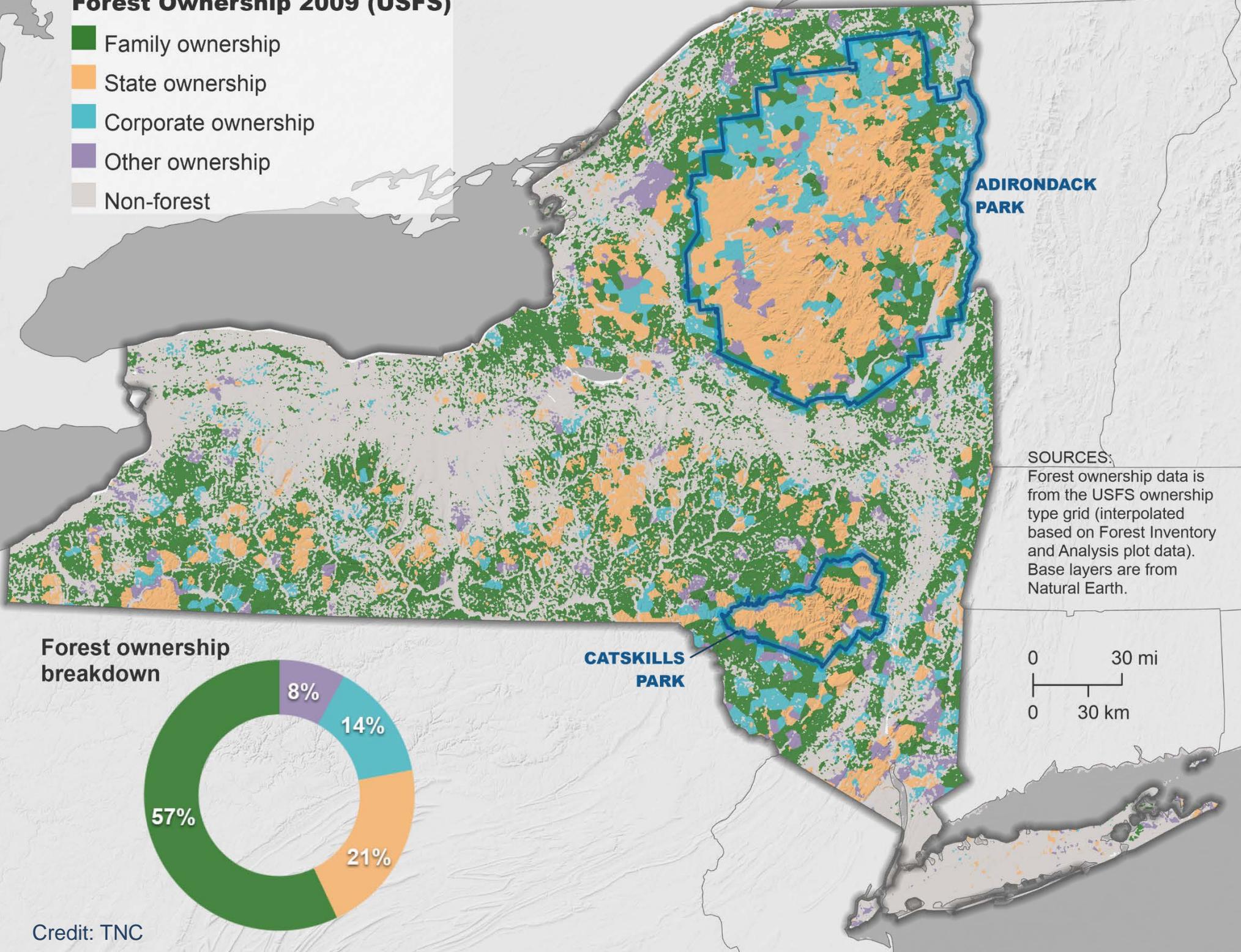
An aerial photograph of a river winding through a vast forest. The trees are in various stages of autumn, showing shades of green, yellow, orange, and red. The river is dark and flows from the upper center towards the lower right. In the background, there are rolling hills and mountains under a cloudy sky.

Presentation Outline

- NY forest overview
- Introduction to forest carbon
- Looking ahead – projecting net carbon impact
- Opportunities for mitigation
- Threat considerations
- Forest benefits beyond carbon

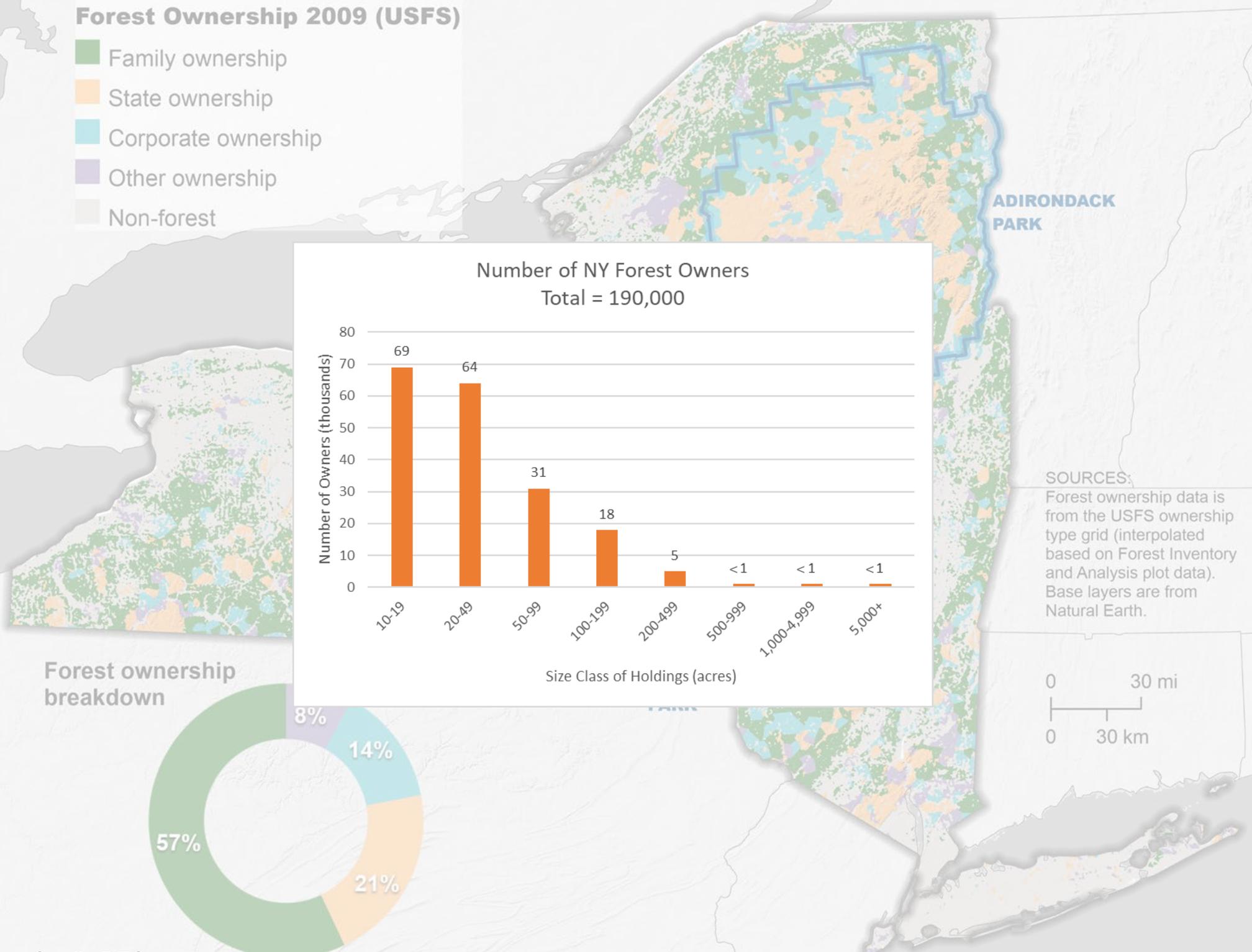
Forest Ownership 2009 (USFS)

- Family ownership
- State ownership
- Corporate ownership
- Other ownership
- Non-forest

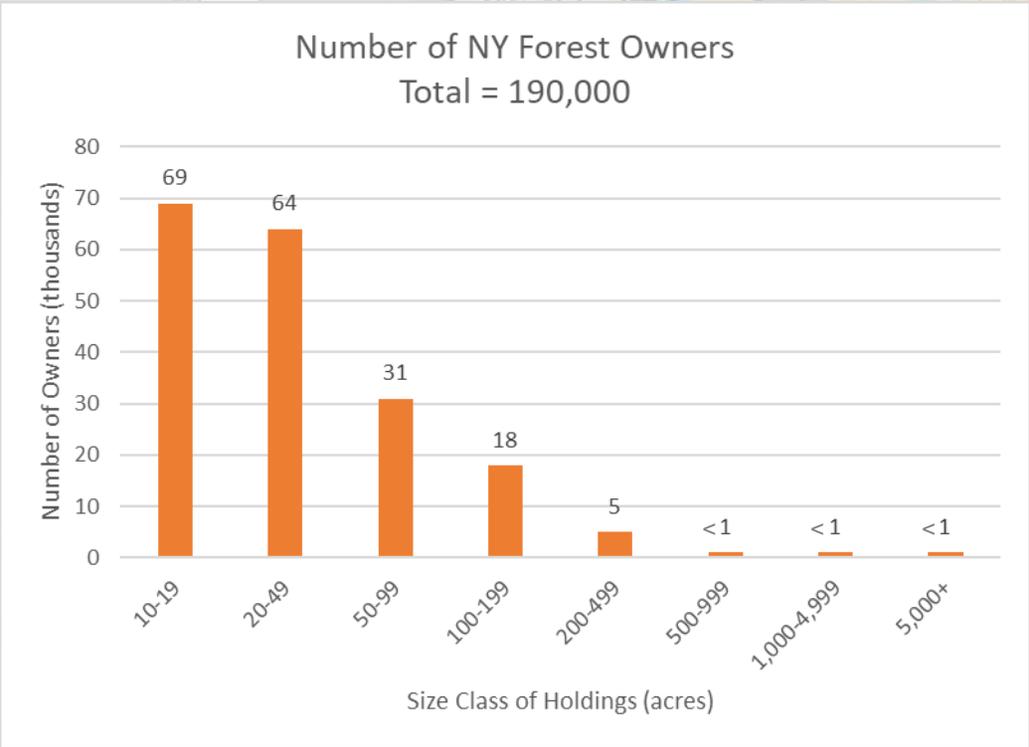


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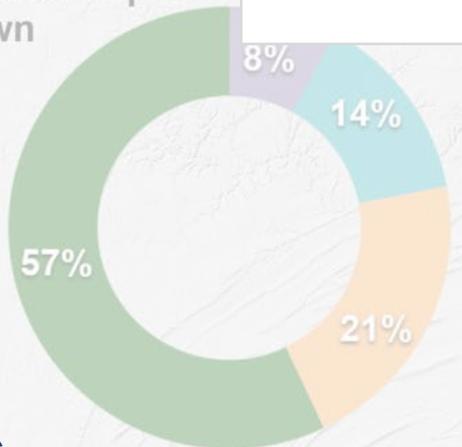
ADIRONDACK PARK



SOURCES:
 Forest ownership data is from the USFS ownership type grid (interpolated based on Forest Inventory and Analysis plot data). Base layers are from Natural Earth.



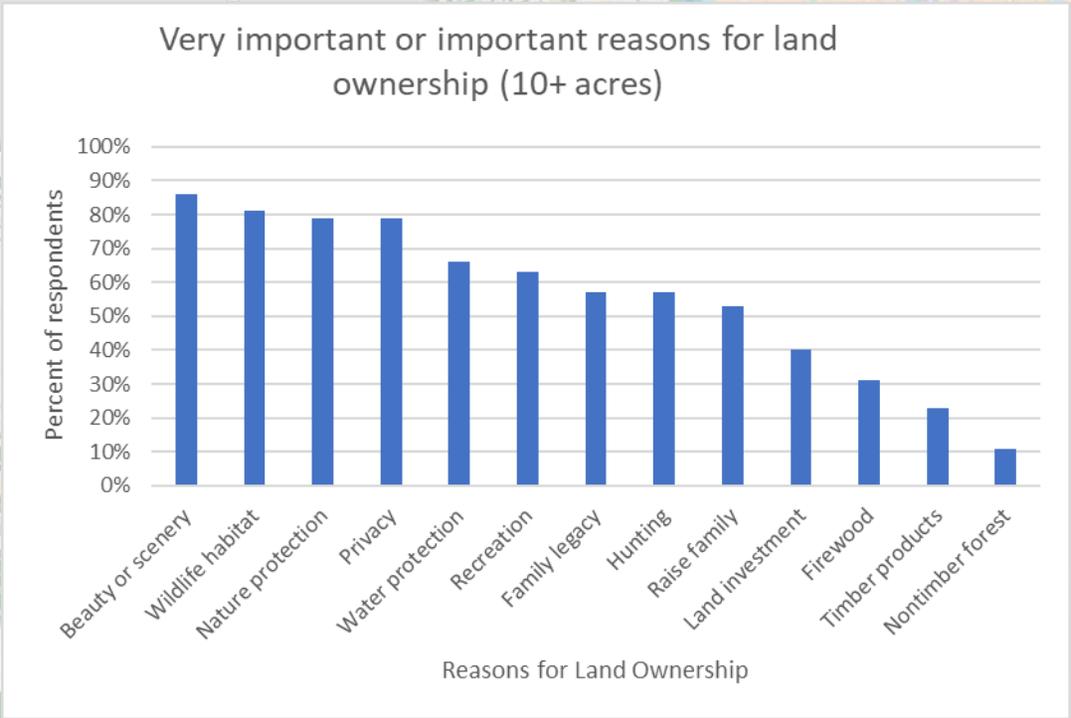
Forest ownership breakdown



Forest Ownership 2009 (USFS)

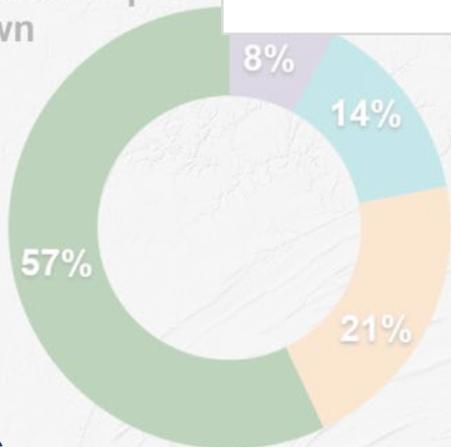
- Family ownership
- State ownership
- Corporate ownership
- Other ownership
- Non-forest

Very important or important reasons for land ownership (10+ acres)

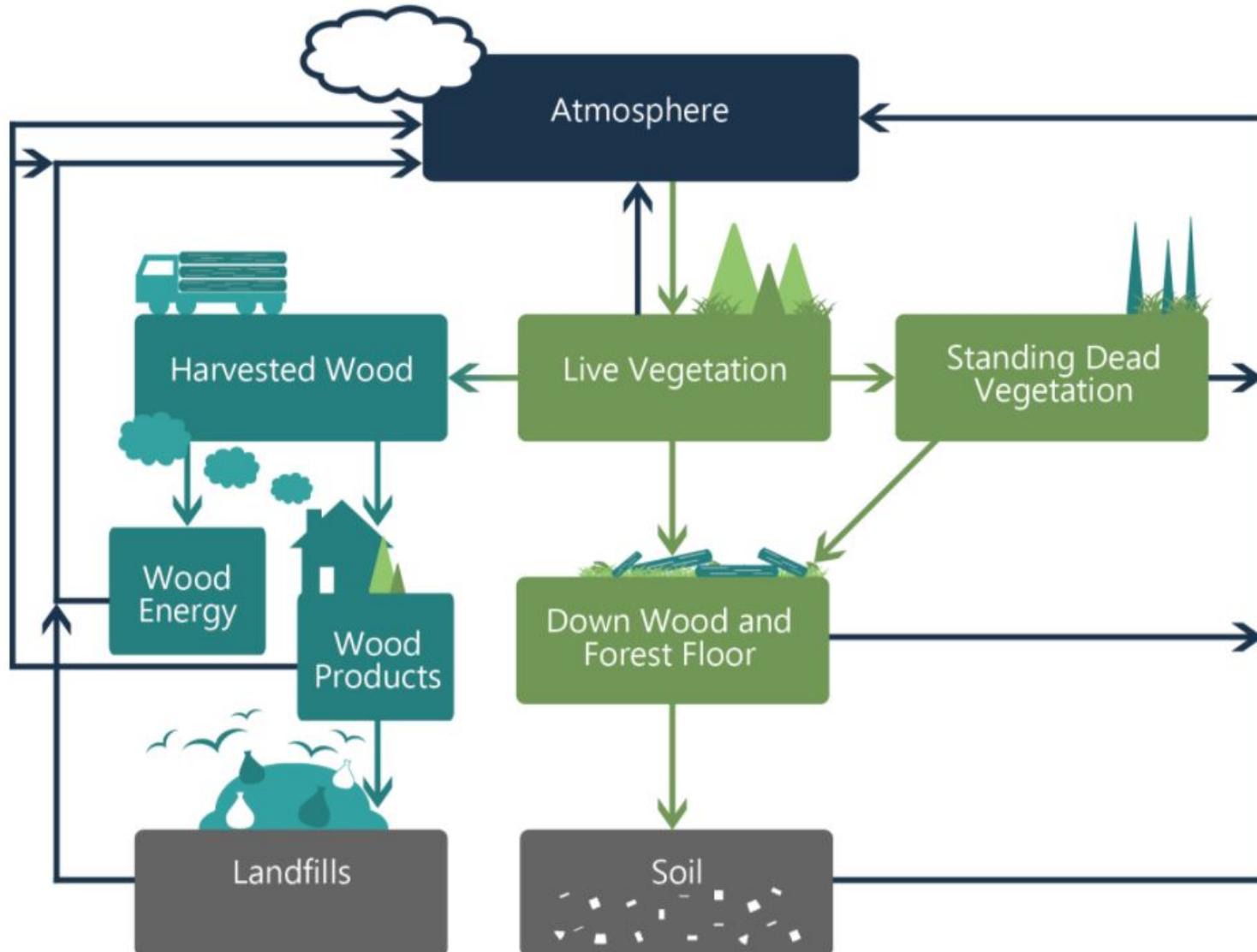


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Forest ownership breakdown

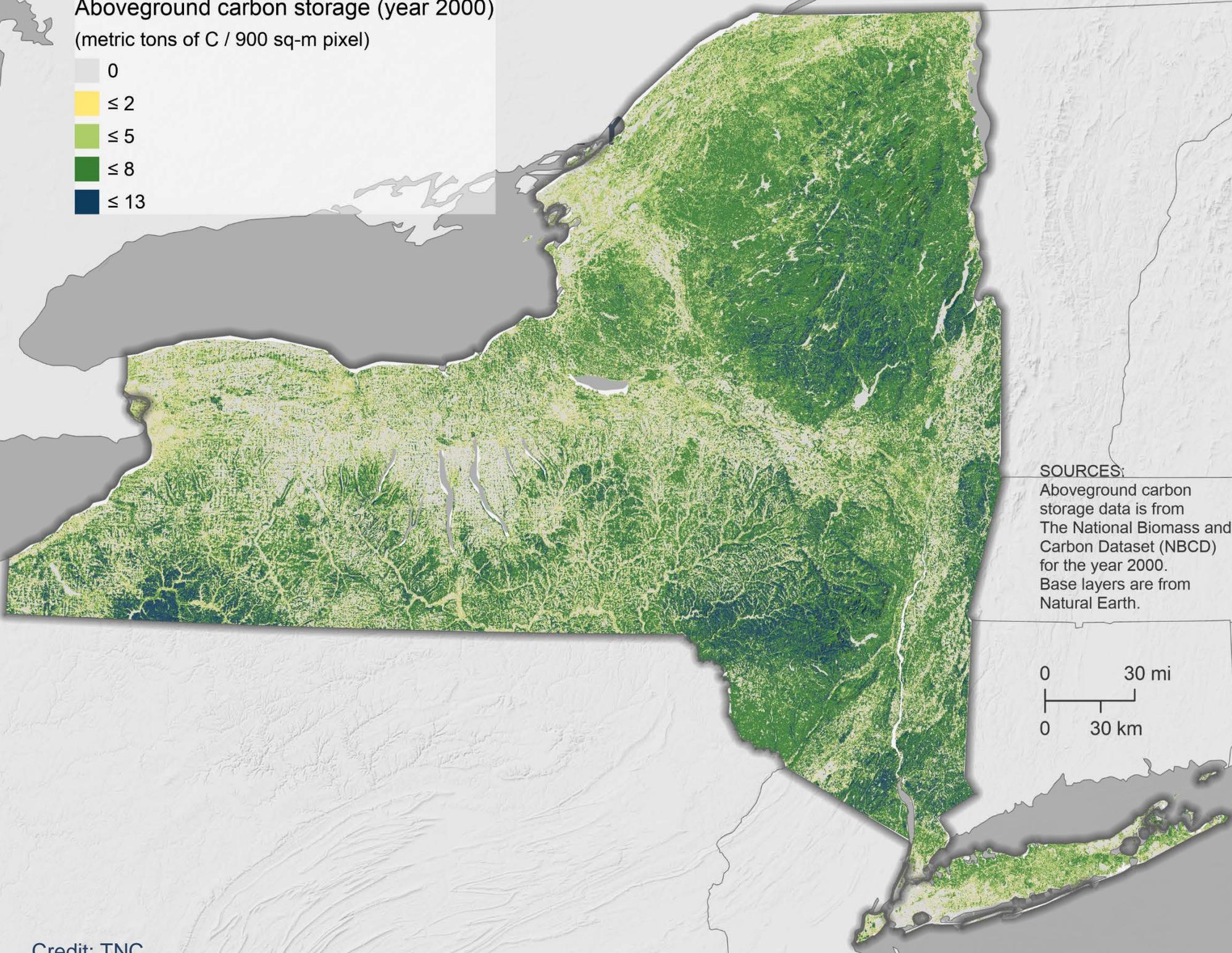


Forest Sector Carbon Cycle

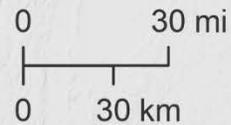


Aboveground carbon storage (year 2000)

(metric tons of C / 900 sq-m pixel)

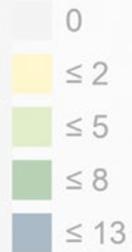


SOURCES:
Aboveground carbon storage data is from The National Biomass and Carbon Dataset (NBCD) for the year 2000. Base layers are from Natural Earth.



Aboveground carbon storage (year 2000)

(metric tons of C / 900 sq-m pixel)



2019 Carbon stocks in forest land remaining forest land (MMT C)

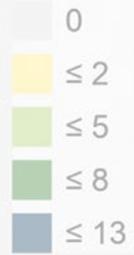
Carbon Stock	MMT C
Aboveground biomass	576
Belowground biomass	111
Dead Wood	60
Litter	105
Soil (Mineral)	1047
Soil (Organic)	12
Total Forest Ecosystem	1911

SOURCES:
 Aboveground carbon storage data is from the National Biomass and Carbon Dataset (NBCD) for the year 2000. Base layers are from Natural Earth.

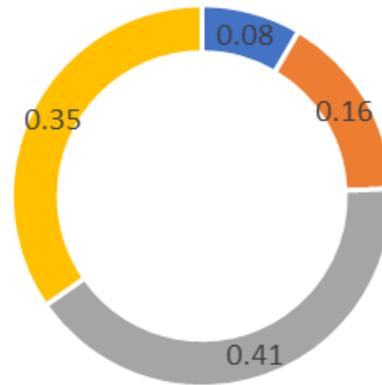


Aboveground carbon storage (year 2000)

(metric tons of C / 900 sq-m pixel)



Percent of Total Sequestration by Region (2015)



- Adirondack - working forest
- Adirondack - Forest Preserve
- Eastern NY Forestland
- Western NY Forestland

SOURCES:

Aboveground carbon storage data is from The National Biomass and Carbon Dataset (NBCD) for the year 2000. Base layers are from Natural Earth.



Looking Ahead – Projecting Net Carbon Impacts

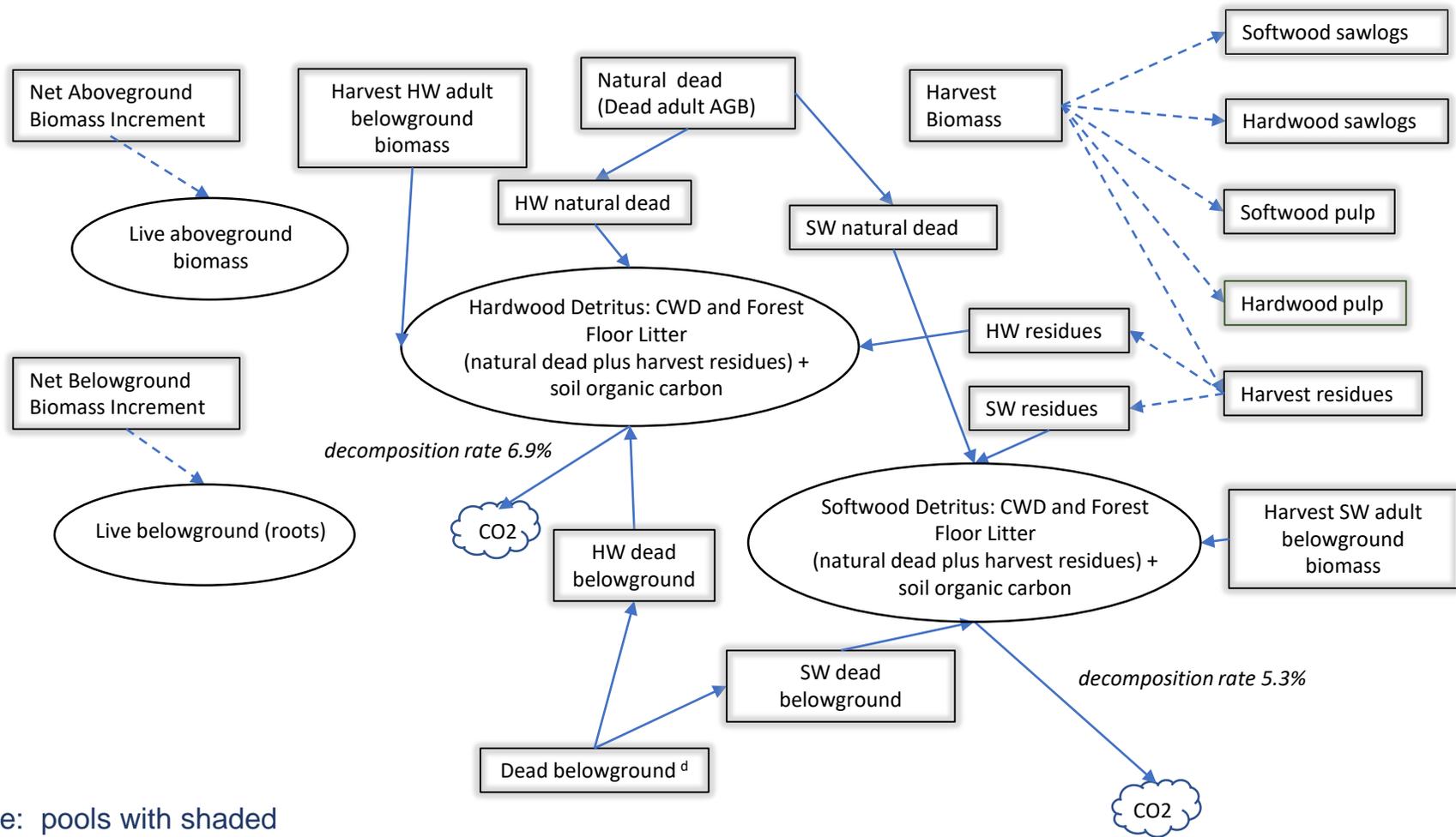
Background

Assessment of the **net carbon impacts** of forest biomass energy requires a holistic and quantitative analysis that can project the consequences of different proposals and policies for:

1. **Changes in carbon in stocks** of live and dead biomass within forests, averaged across the entire northern forest landscape
2. Changes in stocks of carbon stored in **forest products and landfills**
3. **Emissions** of carbon in the form of CO₂ and methane from decomposition in forests and landfills, and
4. Emissions of CO₂ from forest biomass energy production, balanced against potential **displacement of fossil fuel emissions** required to produce equivalent energy.

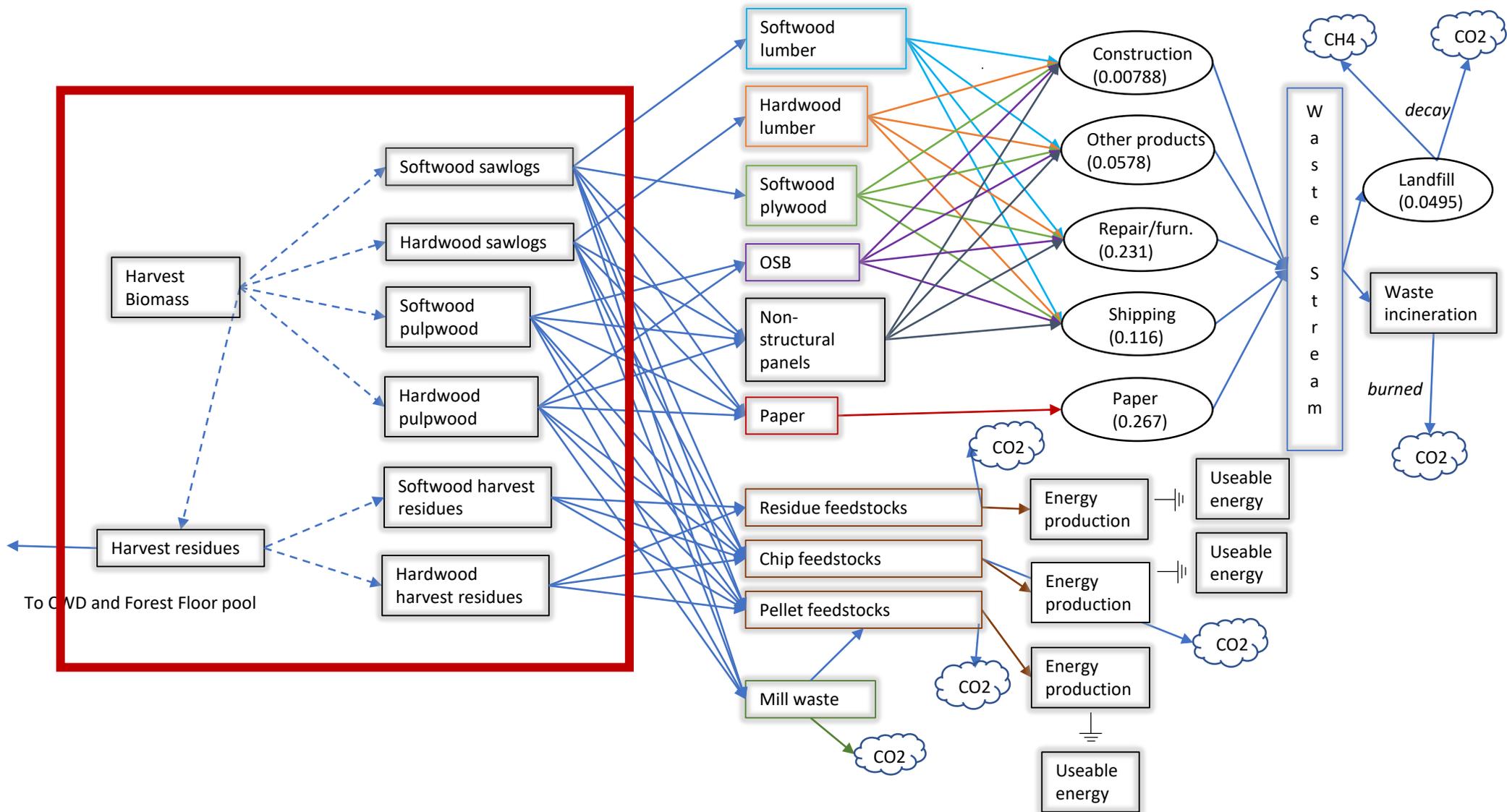


SORTIE-ND – Forest Dynamics

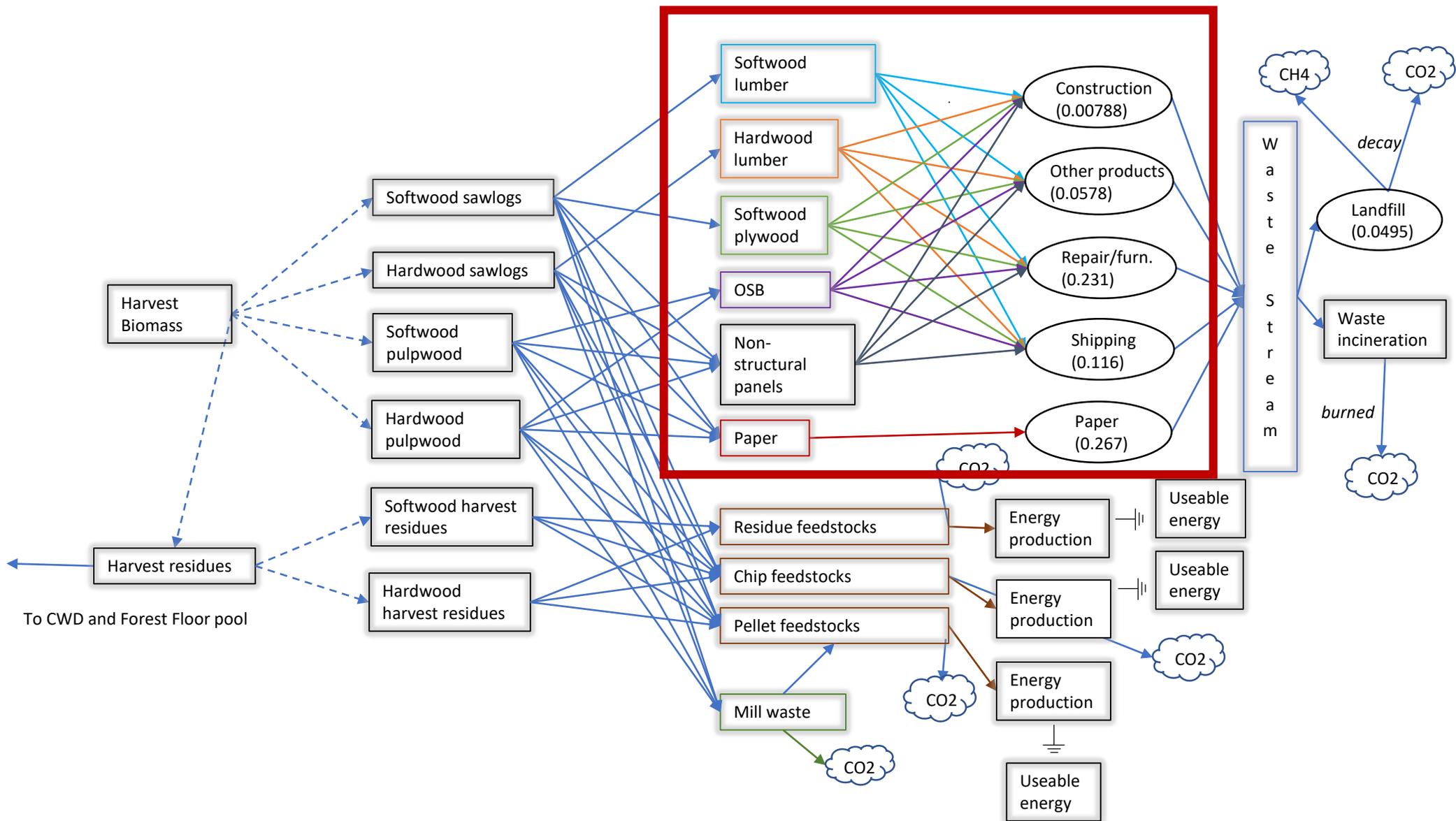


Note: pools with shaded boundaries are annual amounts and do not accumulate over time

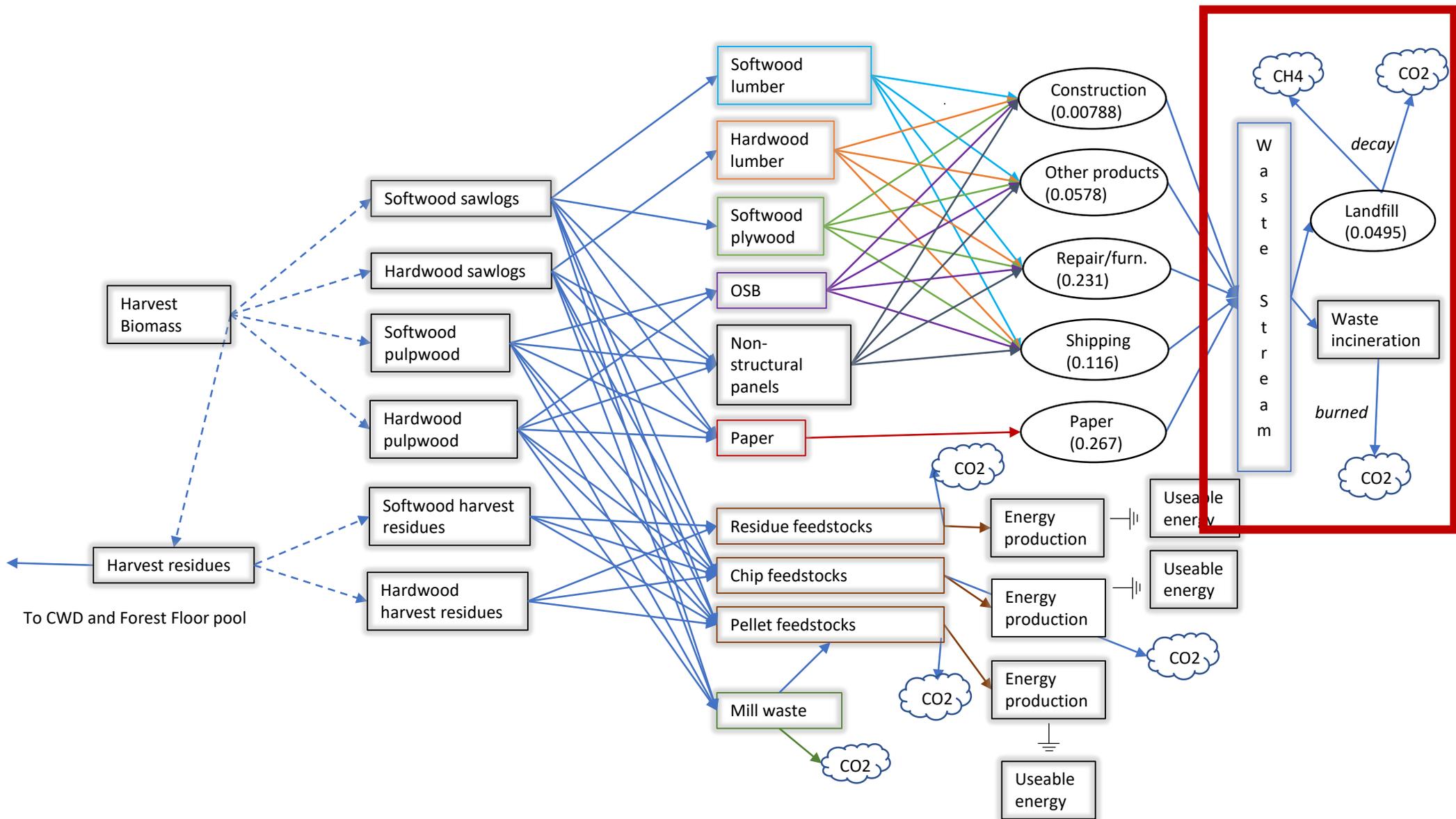
ForGATE – Forest Product Dynamics



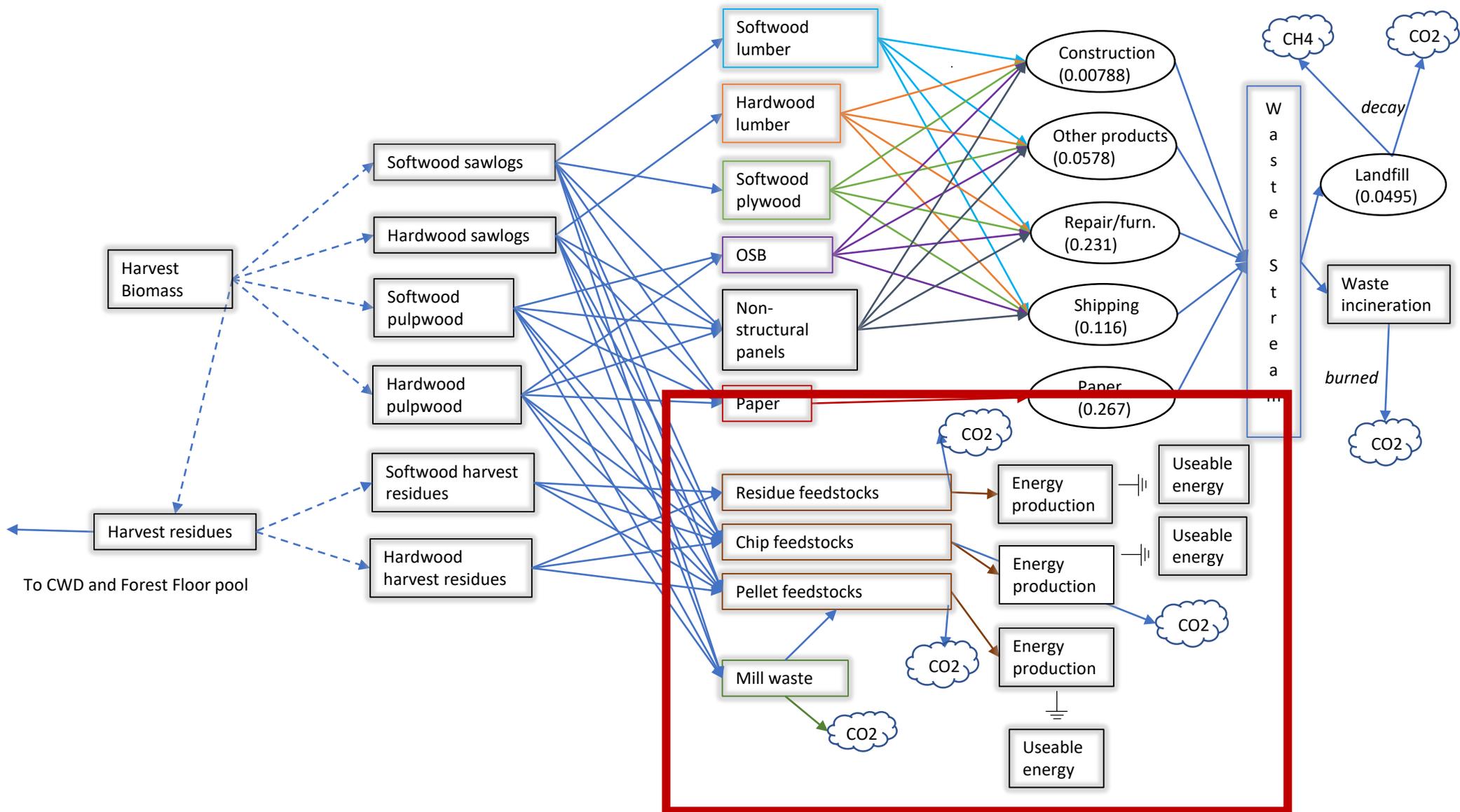
ForGATE – Forest Product Dynamics



ForGATE – Forest Product Dynamics



ForGATE – Forest Product Dynamics



Harvest Regimes & Bioenergy Feedstock Scenarios

The baseline harvest regime (**Run 1**) was estimated empirically from FIA data for the 4-state region – the probability of harvest in a stand and the fraction of basal area removed if harvested vary as a function of:

- Forest type (spruce/fir, aspen/birch, northern hardwood, oak/hickory, bottomland)
- Region (Maine vs. the other 3 states for northern hardwood forests)
- Distance from the nearest improved road

We examined 4 alternates, including a “no-harvest” regime (**Run 0**). The other three alternatives increased either harvest frequency or intensity or both

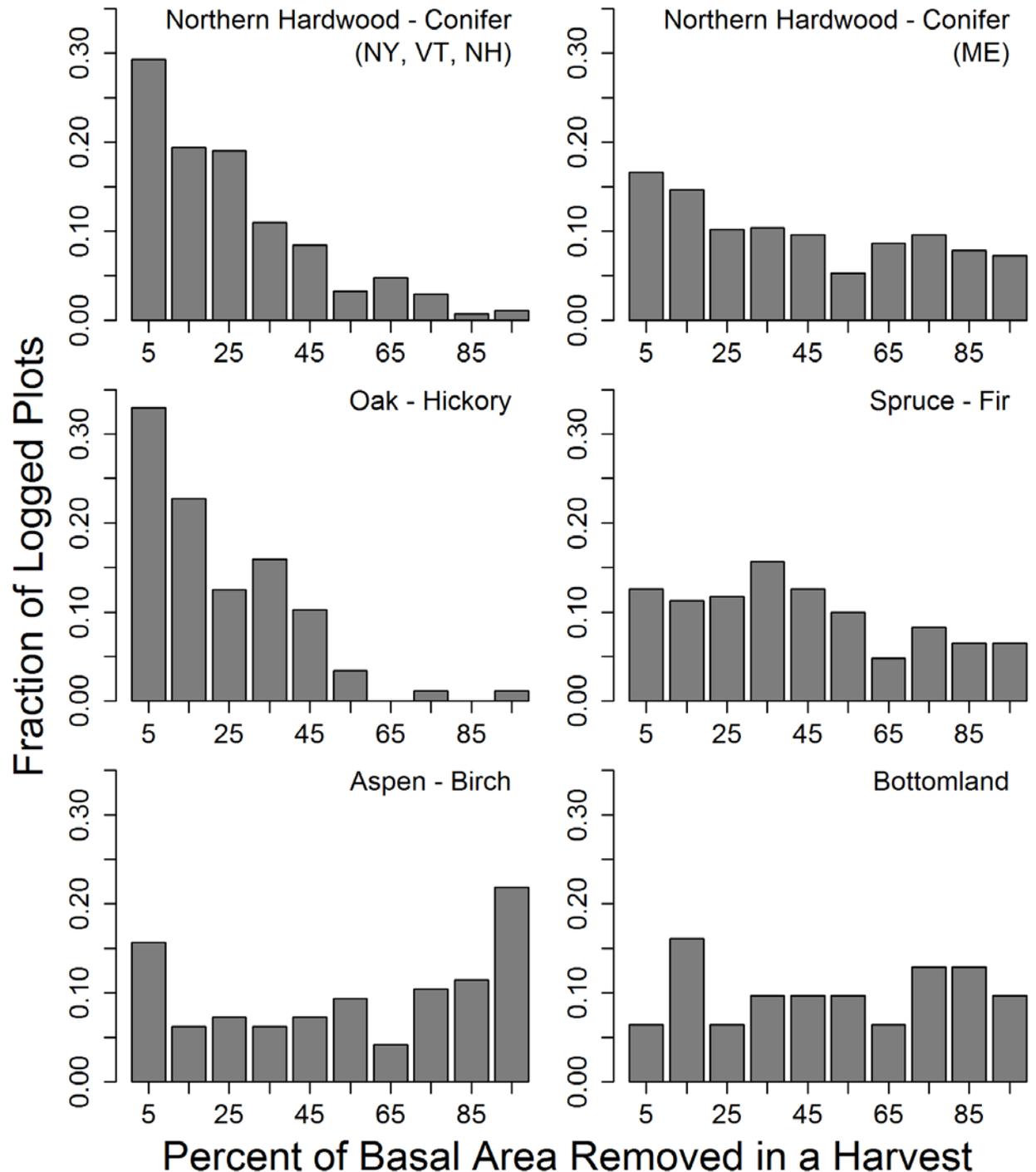
- **Run 2**: 50% increase in the average fraction of basal area removed
- **Run 4**: 75% increase in the probability that a stand was harvested
- **Run 5**: 50% increase in fraction of basal area removed & doubling of the probability that a stand was harvested

There were 3 different scenarios of biomass feedstock production:

- **Scenario 0**: no bioenergy feedstock except mill waste
- **Scenario 1**: 5% of sawlogs, 20% of pulpwood and 25% of harvest residues used as feedstocks (in addition to mill waste) [*this was considered the business as usual case*]
- **Scenario 2**: 20% of sawlogs, 80% of pulpwood, and 50% of harvest residues used as bioenergy feedstocks – this was designed as an aggressive feedstock production regime
- The biomass was evenly divided among “residue”, “chip” and “pellet” feedstocks

Key Results

Distributions of the intensity of harvest, by forest type



Key Results – Net Carbon Impact

Net Carbon Impact

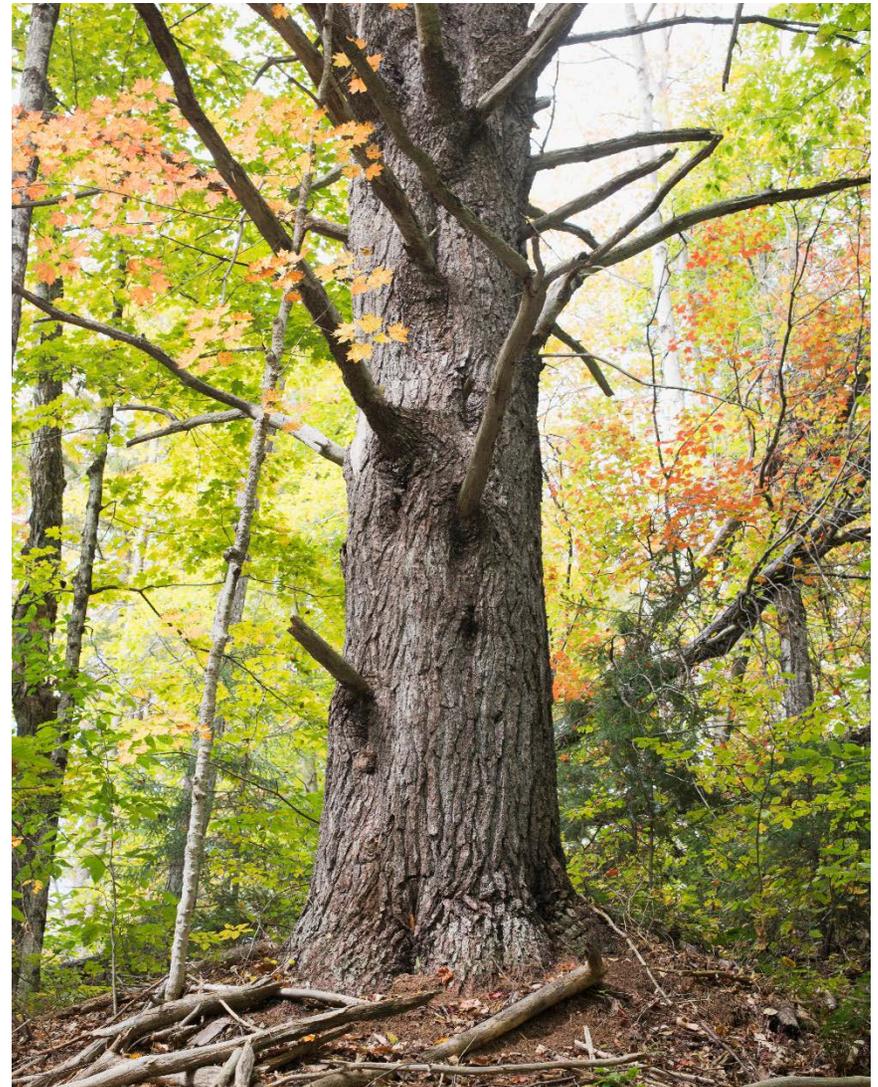
Three main components

Emissions of carbon to the atmosphere from forest and landfill decomposition and carbon emissions from wood energy

Sequestration of carbon from net increases in the forest carbon pools and forest product pools, including landfills

Displacement of fossil fuel CO₂e emissions by the energy produced from forest biomass energy

**Net Carbon Impact =
Sequestration + Displacement – Emissions**



Key Results

NY forests are projected to sequester an average of 3.2 metric tons CO₂e/ha/yr = 24.5 MMT CO₂e

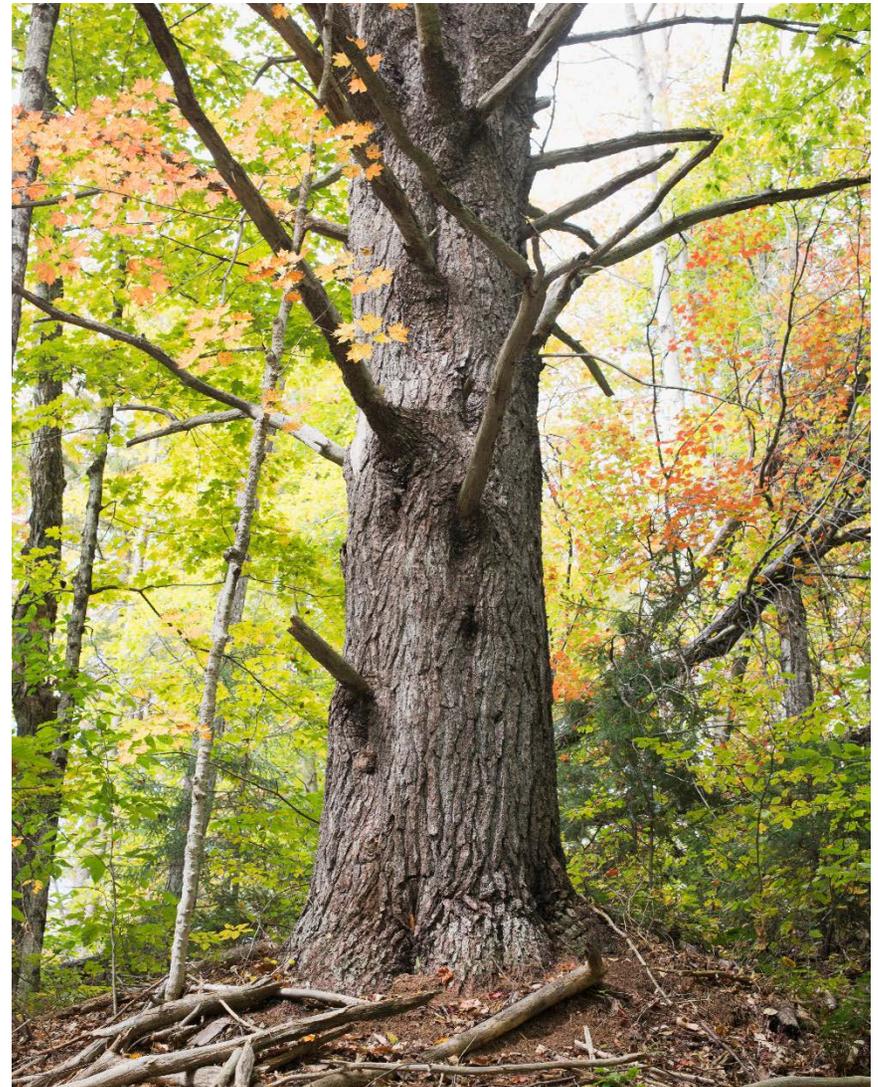
Increasing the proportion of the BAU harvest used as energy feedstock increases the sequestration rate slightly (to 3.4 metric tons CO₂e/ha/yr)

Increasing harvest, decreases net carbon sequestration

All scenarios, even our most aggressive harvest scenario result in significant net positive carbon sequestration over the next 50 years

The no harvest scenario outperformed every other scenario by around 50% (annual MMT CO₂e sequestered)

Driving 75% of all wood products to long-lived construction products, result in increased net carbon sequestration (3.9 metric tons CO₂e/ha/yr)



Final thoughts

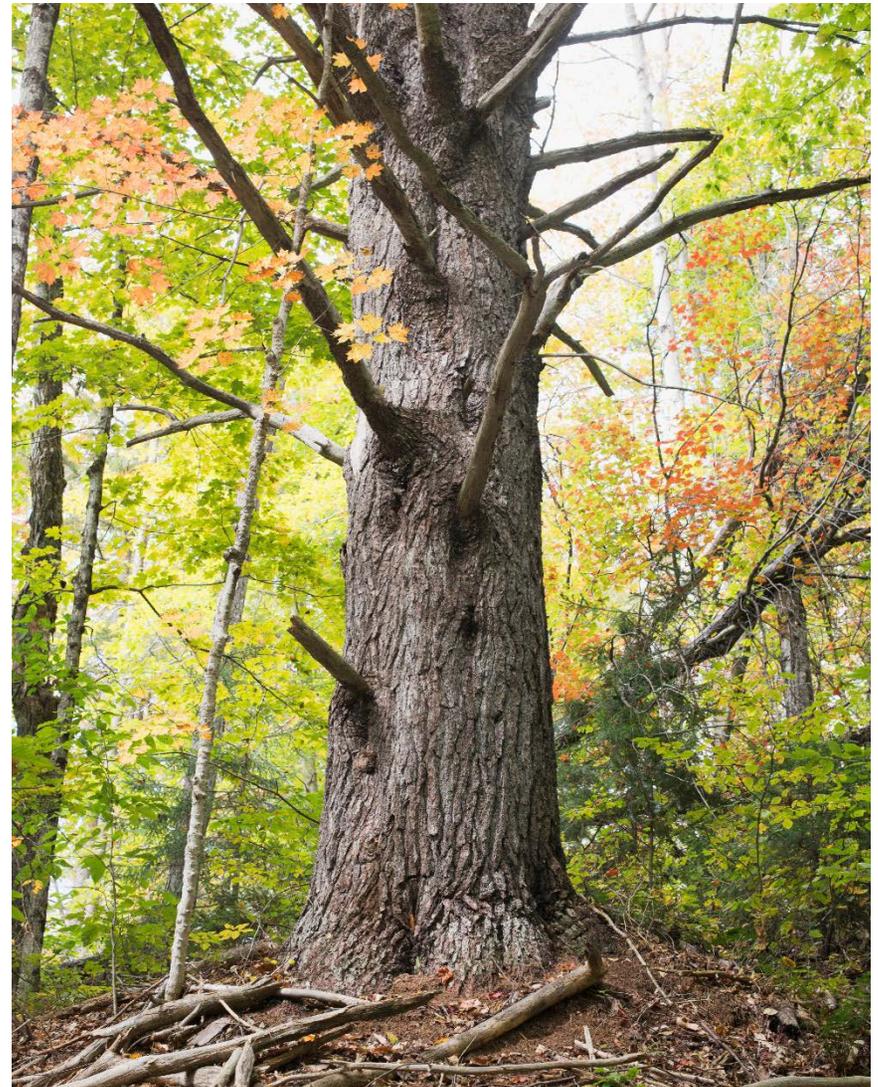
Maintaining the current harvest regime results in the highest net carbon sequestration over the next 50 years

Methane from landfills plays a surprisingly large role in the story

Increasing the proportion of carbon stored in long-lived wood products yields promising net sequestration results

This modeling approach could be modified to examine new harvest and wood product scenarios.

Don't forget about other forest values!



Meeting our Goals

2030 – 30 MMT of net annual CO₂e sequestered on forested lands

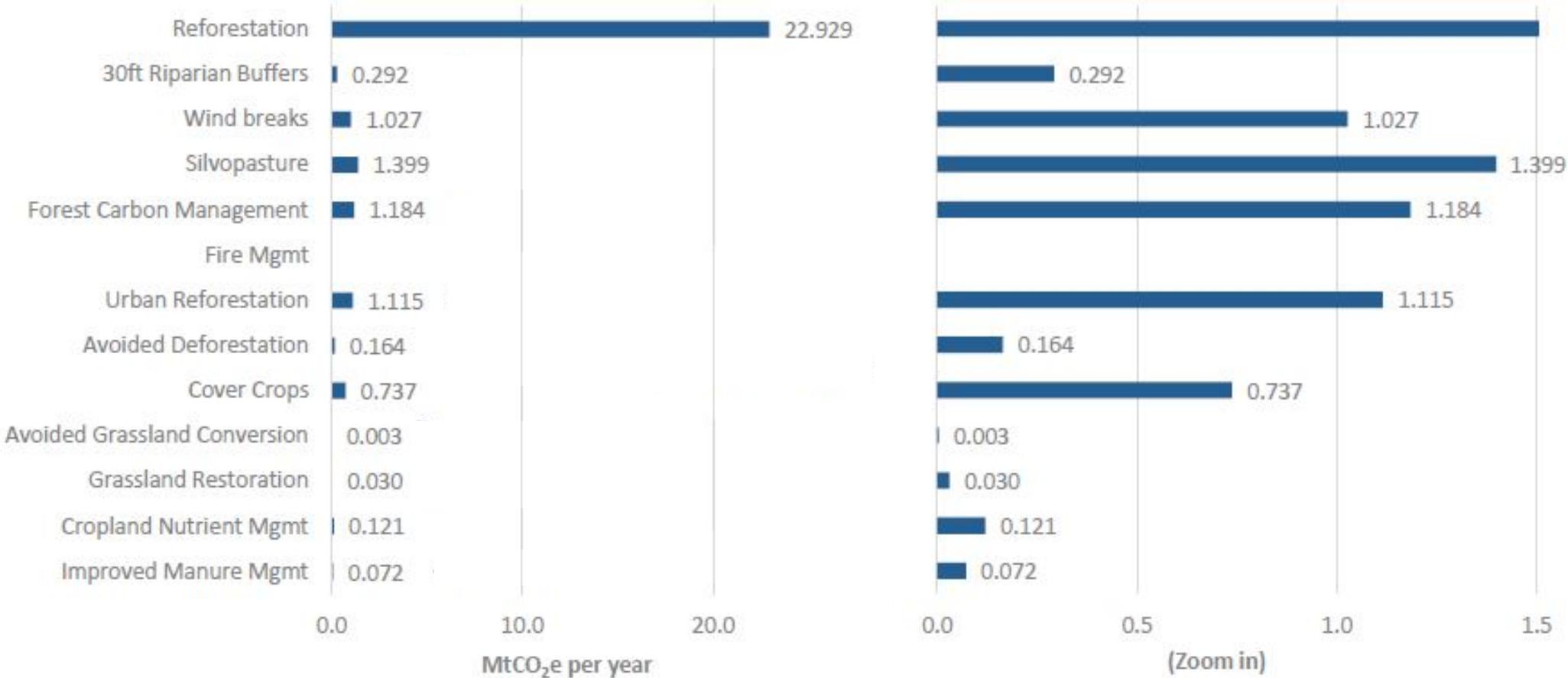
2050 – 60 MMT of net annual CO₂e sequestered across all land types



Natural and Working Lands Opportunities Assessment



Natural and Working Lands Opportunities Assessment



Credit: WRI, TNC, academic partners

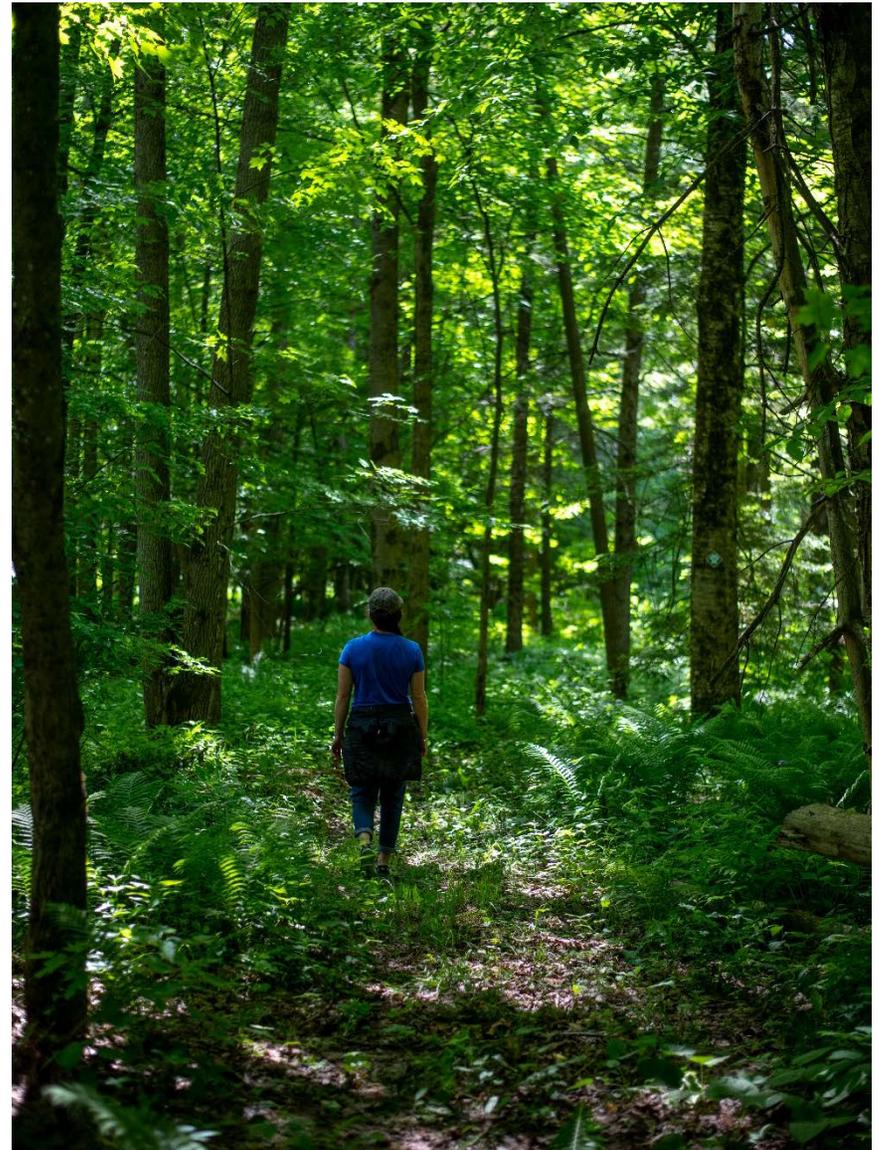
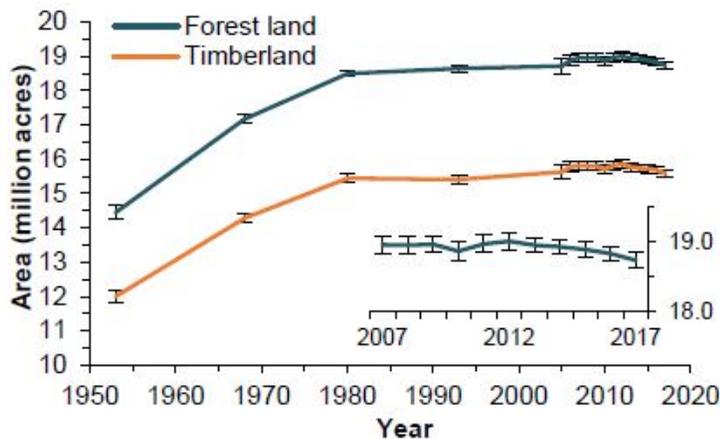
Protect Opportunities – Avoided Conversion

Forest land acreage had been stable for nearly four decades, prior to the 2017 FIA survey

Between 2012 - 2017, approximately 1.7% of forest lands were lost

A majority of forest land was converted to farmland

Forest loss trends are continuing



Protect Opportunities – Ongoing Research

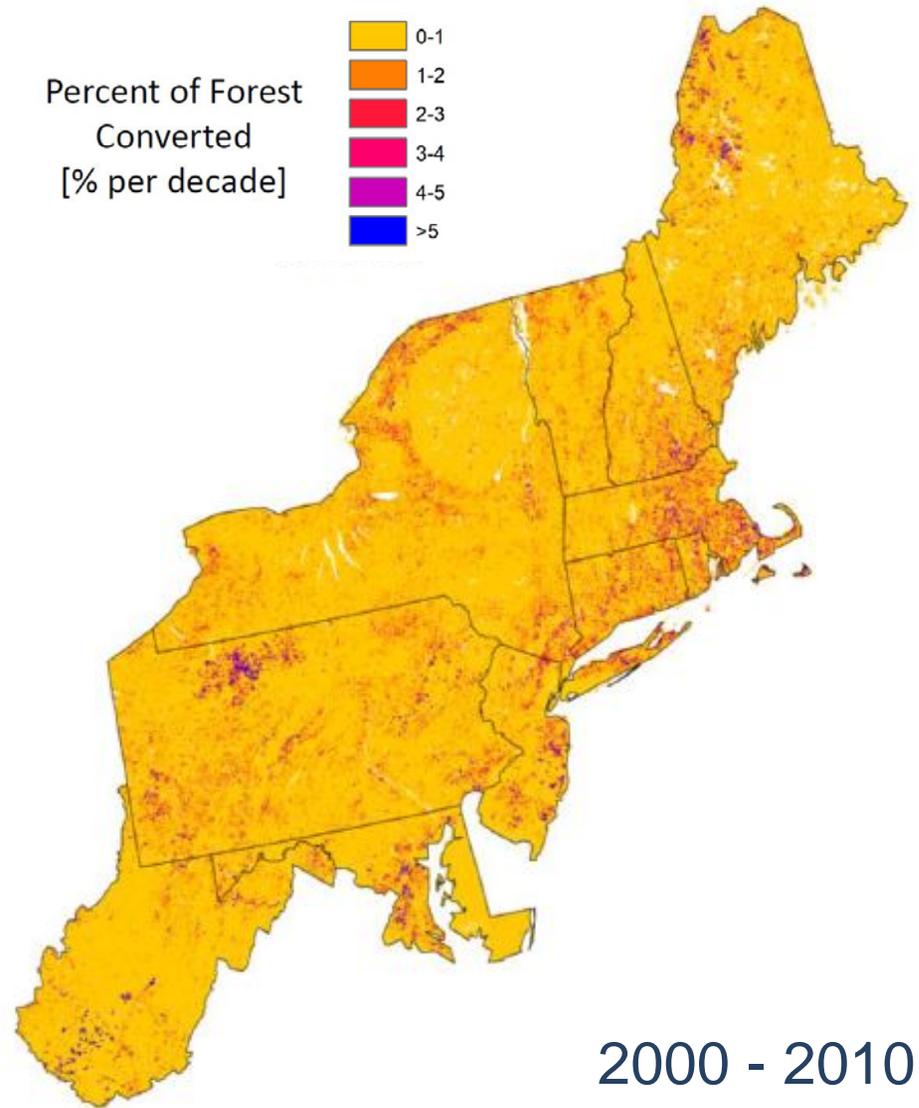
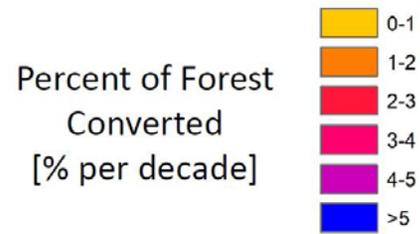
Products

High resolution maps representing historic, current, and future forest loss (1990 – 2050)

Emissions and foregone sequestration estimates associated with forest conversion, including future development scenarios

High resolution carbon storage map representing current and future carbon storage (2000 – 2050)

High resolution carbon sequestration map representing current and future carbon sequestration (2000 – 2050)



Management Opportunities

Multi-objective forest management

Harvested wood product substitution

Forestry through foresters

Innovation!



Working Woodlands – A Unique Partnership

Opportunity for landowners to generate revenue, address climate change and protect their forest

Forest certification

We help landowner to actively manage their forest in a sustainable way, including updating management plans and providing forest certification.

Forest carbon

More carbon is sequestered and stored, which can be sold as carbon offset credits to generate new revenue for landowner.

Forest protection

We work with landowner to design flexible working forest protection mechanism keep their forest as forest.



Landowner Pilot in Pennsylvania

- **Growing Mature Forests** practice – Promotes the growth of larger, higher quality trees by limiting harvesting over a 20-year contract period, in line with landowner’s management plans
- **Enhancing Future Forests** practice – Promotes robust successful regeneration of new forests by reducing competing vegetation following or preceding a regeneration harvest. This will allow quality trees to have the space, sunlight, and water needed to grow.

New York State – 7 million acres potentially eligible (family forest ownership between 40 and 2,400 acres)



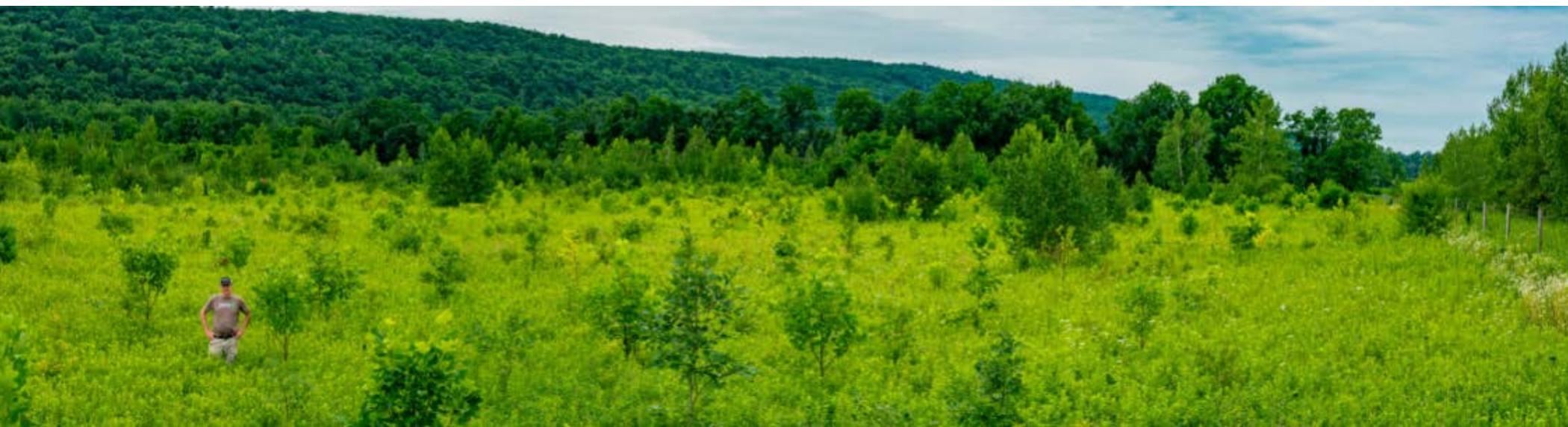
Restore Opportunities

Forest Restoration Opportunity by Land Cover Type

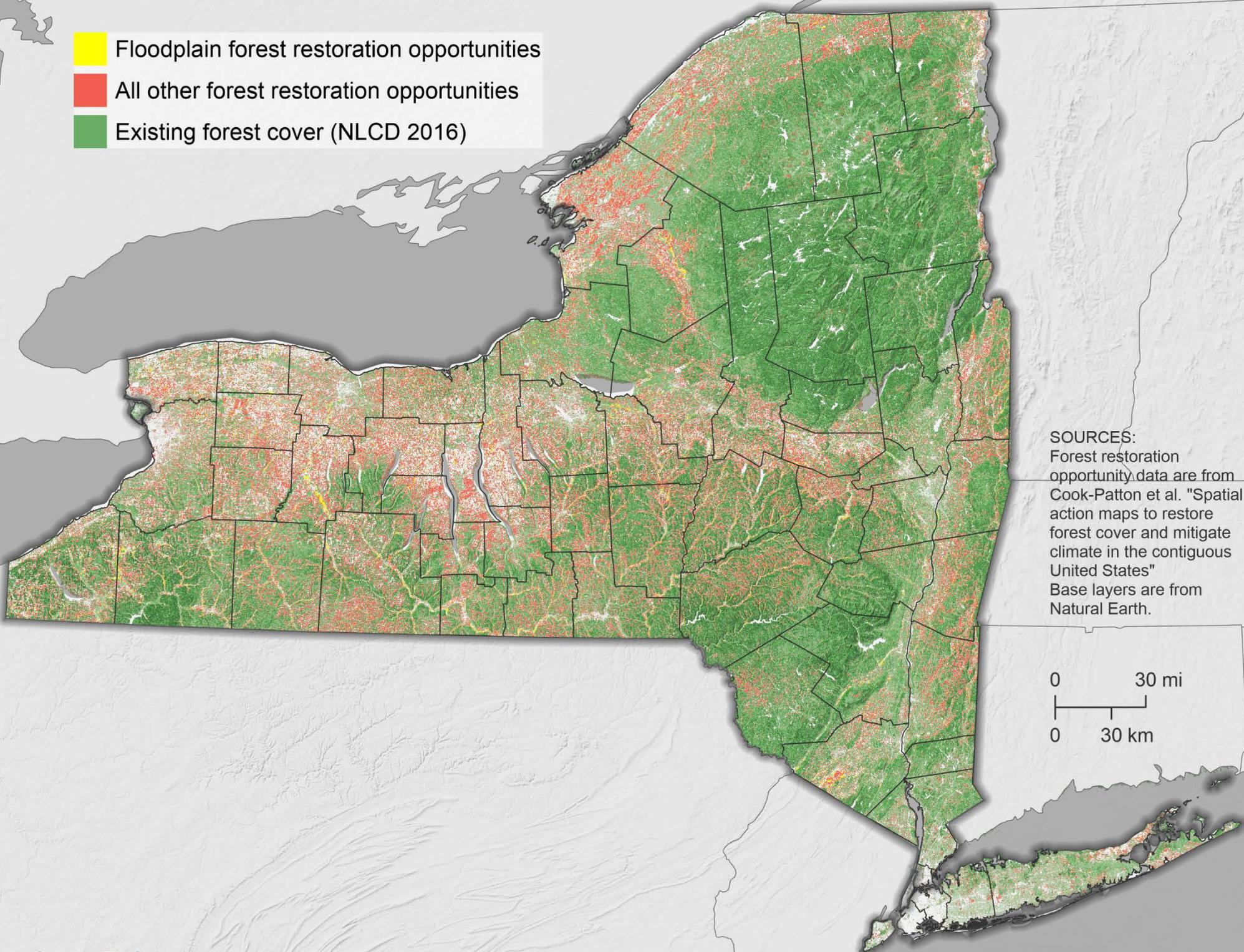
Land Cover Classes (NLCD)	Acres	(MMT CO2/yr)
Unstocked forest & shrub	29,158	0.118
Pasture – poor soils	350,642	1.1833
Other pasture	2,643,035	8.7718
Crop – poor	124,047	0.4005
Urban open space	494,457	1.6862
Remaining NLCD classes	11,861	0.0477
Total	3,653,200	12.2075

Forest Restoration Opportunity by Ownership

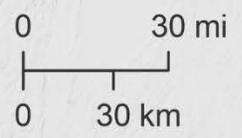
Ownership	Opportunity (ac)	(MMT CO2/yr)
Private	3,595,872	12.014
Private - NGO	988	0.0038
Federal	7,660	0.0242
State	22,734	0.0771
Public - Other	23,228	0.0789
Tribal	2,965	0.0095



-  Floodplain forest restoration opportunities
-  All other forest restoration opportunities
-  Existing forest cover (NLCD 2016)



SOURCES:
Forest restoration opportunity data are from Cook-Patton et al. "Spatial action maps to restore forest cover and mitigate climate in the contiguous United States"
Base layers are from Natural Earth.



Threat Considerations

PREDICTED FOREST REGENERATION STATUS

all tree species



The Nature Conservancy
New York

Data credits

Predicted Forest Regeneration Status grid modeled based on USFS FIA point data and interpolated across USFS mapped forest cover. Base Layers from Natural Earth.

Map credits

Created August 2020 by Chris Zimmerman, Rebecca Shire and Shannon Thol of The Nature Conservancy in New York.

DEFINITIONS*

Failure

does not meet regeneration objective and is unlikely to result in a fully stocked stand

FAILURE | HIGH RELIABILITY
predicted failure regardless of model uncertainty

FAILURE | MODERATE RELIABILITY
predicted insecure with plus 1 standard error

Insecure

advance reproduction likely to fall short of the objective given normal seedling mortality

INSECURE | MODERATE RELIABILITY
predicted failure with minus 1 standard error

INSECURE | HIGH RELIABILITY
predicted insecure regardless of model uncertainty

Secure

sufficient regeneration to meet the objective of achieving a fully stocked stand

SECURE | MODERATE RELIABILITY
predicted insecure with minus 1 standard error

SECURE | HIGH RELIABILITY
predicted secure regardless of model uncertainty

Unclassified forest cover that could not be classified due to method limitations or high model uncertainty

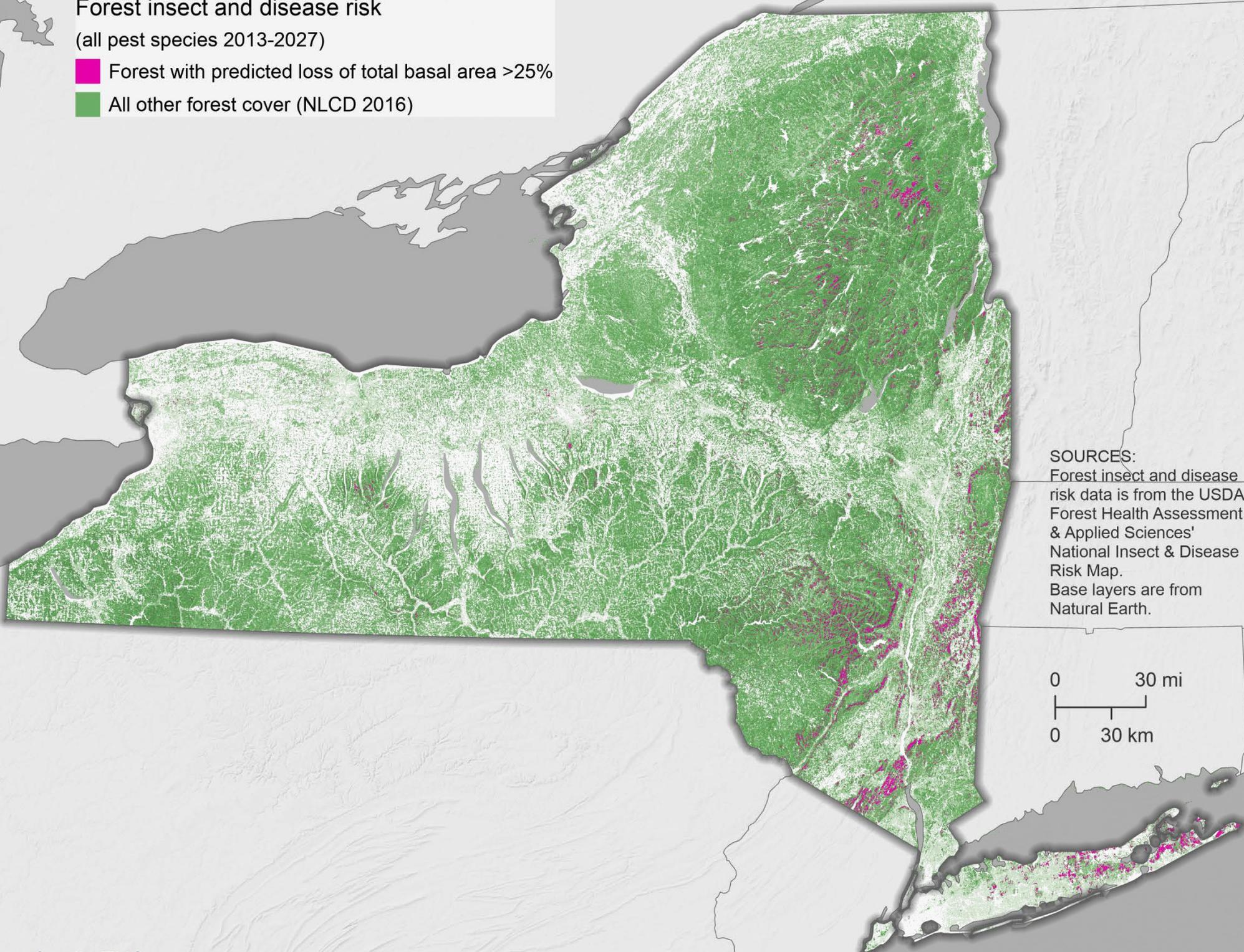
*Adapted from Vickers et al. Ecological Indicators 96 (2019): 718-727.



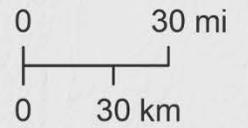
Forest insect and disease risk

(all pest species 2013-2027)

-  Forest with predicted loss of total basal area >25%
-  All other forest cover (NLCD 2016)



SOURCES:
Forest insect and disease risk data is from the USDA Forest Health Assessment & Applied Sciences' National Insect & Disease Risk Map.
Base layers are from Natural Earth.



Forest Co-benefits



Moving forward: Considerations



Identify solutions that meet the needs of the full range of forest landowners

Consider strategies that increase carbon storage and sequestration

Consider co-benefits and other state goals

Consider strategies that both mitigate carbon and build resilience into our forests

Identify and fill data gaps

Consider a full suite of solutions across the whole carbon cycle – forest ecosystems and harvested wood products

Moving forward: Recommendations

Protect – Keep forests as forests, mitigate unavoidable losses

- Develop incentives/regulations to avoid conversion of forest
- Focus funding for open space protection in places with high risk of carbon loss
- Reduce barriers to landowner enrollment in tax relief programs
- Explore new ways to help landowners keep their forests as forests

Manage – Increase the productivity and resilience of forestlands

- Explore financial solutions to help landowners maintain and improve their forests
- Address issues limiting the regeneration of NY's forests, such as, deer, invasive species, and management practices
- Address forest pest and pathogen impacts
- Increase the use of consulting foresters and forest management plans
- Increase the proportion of harvest directed to durable wood products

Restore – Promote the establishment of new and restored forests

- Expand the use of existing reforestation programs (i.e., Trees for Tribes)
- Explore new ways to significantly scale up reforestation
- Increase urban forest canopy and open space



Thank you



Moving Forward

- 1) No net loss of forests through land protection, regulations and incentives
- 2) Scale up improved forest management to maintain and increase carbon sequestration
- 3) Incentives and regulations to ensure professional forest management is occurring on private lands
- 4) Develop regulations and incentives to report harvests and harvested wood products in NYS
- 5) Develop incentives to increase the manufacture and use of NYS grown wood products
- 6) Increase statewide afforestation/reforestation efforts
- 7) Increase tree cover and wood utilization in urban and settlement areas



Recommendations

No net loss of forests through land protection, regulations and incentives

Forestry-Avoided Conversion

Mitigation: The latest FIA forest inventory conducted by the Forest Service reported a slight decrease in total forest land area, 18.9 million acres to 18.3 million acres. To reach the ambitious sequestration goals and to maintain the many benefits from forests a “no net loss of forest policy” could be developed

Current Efforts: Conservation Easements, 480a

Proposed Actions:

- Regulations to mitigate the loss of forests
- Increase funding for easement programs
- Reform the real property tax laws (including 480a) to reduce the cost of owning and maintaining open space/forests



Recommendations

Scale up improved forest management to maintain and increase carbon sequestration

Forestry- Improved Forest Management, Avoided Conversion

Mitigation: Forestry programs such as 480a, EQIP and Regenerate NY are designed to help reduce the cost of forest ownership and management. The Forest Stewardship Program provides a free walk through and forestry advice for private owners. Currently these programs reach around 1.7 to 2.0 million acres of private lands. The state forest system in New York is actively managed by DEC for multiple benefits and is third party certified. The challenge to improving carbon sequestration in NY forests is scaling up these efforts to reach as many acres as possible.

Current Efforts: 480a, Cost Share Programs, Forest Stewardship Program, Forest Management on State Forest

Proposed Actions:

- Reduce the costs of owning and managing forests by reforming real property tax assessment system on a statewide basis
- Maintaining and enhancing forest product markets
- Increase public and/or public/private financing for improved forestry specifically target practices to mitigate invasive species and deer browse
- Improve public knowledge of forestry and programs through increased outreach efforts.
- Monetize forest carbon on private and publicly owned forests



Recommendations

Incentives and regulations to ensure professional forest management is occurring on private lands

Forestry-Improved Forest Management

Mitigation: Professional forest management is needed to manage for forest carbon. Voluntary efforts such as the Cooperating Forester Program and the Trained Logger Certification (TLC) set a standard for foresters and loggers, but these are not statewide requirements.

Current Efforts: Cooperating Forester Program, TLC(non-DEC), 480a, EQIP

Proposed Actions:

- Mill/Logger incentives for improved forest management
- Forester and/or logger licensing or certification
- Requiring a timber sale contracts on harvests
- State income tax incentives for using a certified or licensed forester in a harvest
- Regulation that harvests must have a certified or licensed logger



Recommendations

Develop regulations and incentives to report harvests and harvested wood products

Forestry-Harvested Wood Products, Improved Forest Management

Mitigation: Capturing and tracking wood products harvested and processed in New York State has been occurring through the Timber Production and Output Report since 1999. The survey response rate is around 50% and the data has been used to help promote the forestry and wood products industries in New York. Harvested wood products provide continued carbon storage and substitution benefits.

Current Ongoing Efforts: Timber Production and Output Report

Proposed Actions:

- Incentives for reporting Harvesting Wood Products
- Harvest location reporting by industry

Recommendations

Develop incentives to increase manufacture and use of NYS grown wood products

Forestry-Harvested Wood Products, Improved Forest Management

Mitigation: Maintaining and expanding wood products markets not only provides carbon storage and substitution benefits but a healthy forest products industry provides the main financial incentive for improved forest management. Promoting and marketing the use of more wood products in the state will increase these benefits

Current Efforts: DEC Forest Utilization Program, Wood Products Development Council

Proposed Actions:

- Use carbon credit financing to assist existing and attract new forest product business to New York
- Expand New York Grown and Certified to more forest products
- Incentives for expanding the use of wood products in place of carbon intensive products
- Adapt building codes to allow for more wood to be used
- State Procurement Preference
- Improve the “Right to Practice Forestry Law”

Recommendations

Increase statewide afforestation/reforestation efforts

Forestry-Afforestation/Reforestation, Improved Forest Management

Mitigation: Planting and maintaining trees on more acres of lands will help buffer forest loss possibility increase the number of acres in forest overall. Reforestation of harvested lands and enhancing and ensuring regeneration in existing forest can help maintain carbon stocks. Species selection and maintenance are also important considerations in maximizing the carbon sequestration benefits

Current Efforts: Trees for Tribes, Buffer in a Bag, Regenerate NY, State Forest Management

Proposed Actions:

- Develop a Civilian Conservation Corp style program to plant and maintain trees on private and state lands
- Increase capacity of the NYS State Nursery to support planting programs
- Public/Private partnership to develop tree planting programs
- State income tax incentive for landowners to plant trees
- Expand current tree and shrub planting programs including in riparian areas, urban and settlement areas and abandoned agriculture lands
- Restore degraded shrub lands by removing invasive species



Recommendations

Increase Tree Canopy Cover and Wood Utilization in Urban and Settlement Areas

Forestry-Afforestation/Reforestation

Mitigation: Increasing the overall percentage of tree canopy in urban and settlement areas provide substantial carbon benefits through the planting and maintenance of trees. Utilizing urban wood created from construction, deconstruction, regular maintenance and events (weather and forest health) provides a way to reduce waste and costs while also continuing to store carbon.

Current Efforts: DEC Urban and Community Forestry Program, Urban Forestry Grants

Proposed Actions:

- Provide incentives to municipalities to plant and maintain trees
- Public/Private partnership for deconstruction and utilization of buildings
- Improved training and technical assistance for tree care for municipalities
- Incentives for municipalities and private business to utilize urban wood

