Preparing Forests for more Frequent Disturbance

Gregg Sargis
The Nature Conservancy – NY
gsargis@tnc.org

Outline

- Brief background on resilience
- How forest resilience thinking was applied on Tug Hill
- Development of landowner geared Forest Health Scorecard

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Project Team

Project funded in part by the Wildlife Conservation Society Climate Adaptation Fund through the Doris Duke Charitable Foundation.

Project Team

- Cornell Cooperative Extension Onondaga County – emphasis on outreach
- SUNY ESF – with emphasis on the monitoring
- USFS – Northern Institute Applied Climate Science
- Cornell University – project design and outreach

Cornell Univeristy
Cooperative Extension
Agricultural Experiment Station

Cornell Cooperative Extension | Onondaga County

NIACS
Northern Institute of Applied Climate Science

ESF

What is resilience?

- The capacity of the woods to recover from disturbance or change and return to normal function and development following disturbance

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Why does resilience matter?

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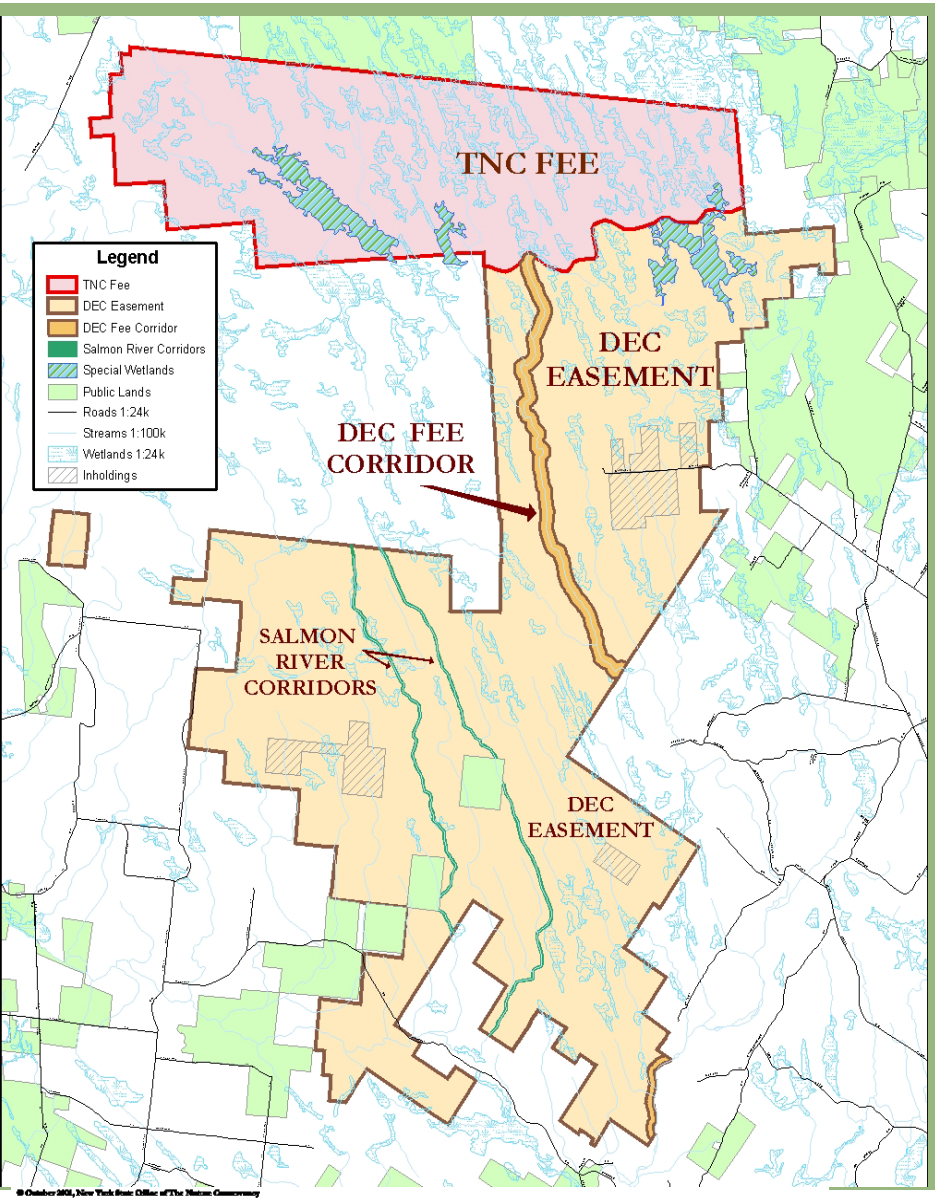
Principles of resilient forest management.

- Keep forests as forests
  - ✓ Larger, contiguous blocks of forest tend to be less impacted from stressors
  - ✓ Consider long-term protection tools like legacy planning and conservation easements
- Reduce stressors
  - ✓ Forests under pressure are more susceptible to pests and pathogens
  - ✓ Nurture and encourage healthy, younger trees
- Address vulnerabilities
  - ✓ Encourage a diversity of age, species, and structure

Applying principles of “good forestry” sustain a healthy, productive and resilient forest.

The Conservancy's history on “the Hill”



In 2002, purchased 45,000 acres.

TNC retained 15,000 acres and transferred the rest to DEC with a conservation easement.

Currently, we hold about 17,000 acres

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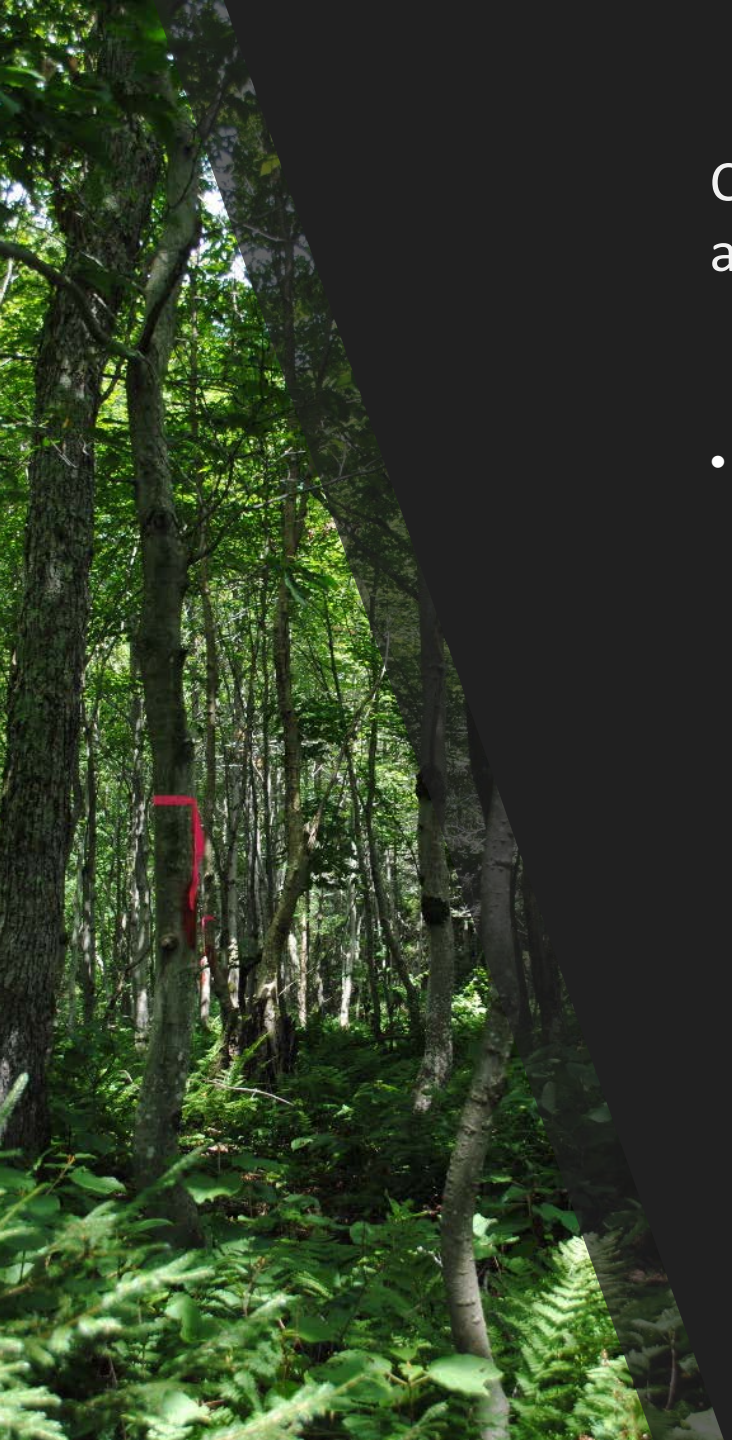
Tug Hill not just a lot of snow

- Snow
  - Easily over 200” a season (12.5ft)
- Not many people
  - Less than 50 people per sq mile.
- And lots of trees
  - Third largest forested area in NY, 75% of the four county area.
- Today the region supports 7,000 forest based jobs;

Strive for the past, or plan(t) for the future?

The Conservancy evaluated if we should focus on restoration, or adaptation/resilience for the future.



Current Forest Condition (issues extend across northeast)

- Years of high grade logging ("cutting the best and leaving the rest") have:
  - Created young even aged forest stands with poor regeneration
  - Altered stand complexity (vertical structure)
  - Reduced tree species diversity
  - Eliminated mature forest characteristics (snags, coarse woody debris)
  - Generally have maximized short term gains for long-term losses.

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Current condition compounded by potentially altered weather patterns.

Decreased snow pack:

- Increasing deer pressure on regeneration

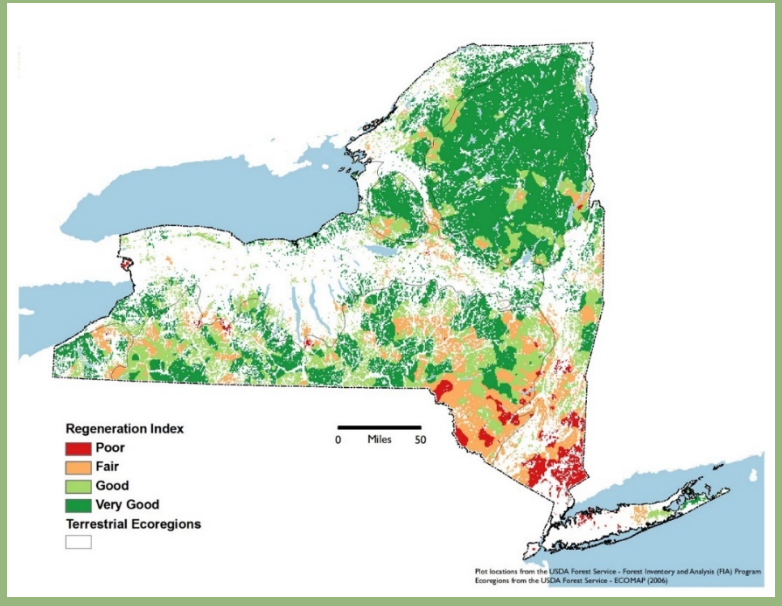
More frequent storms:

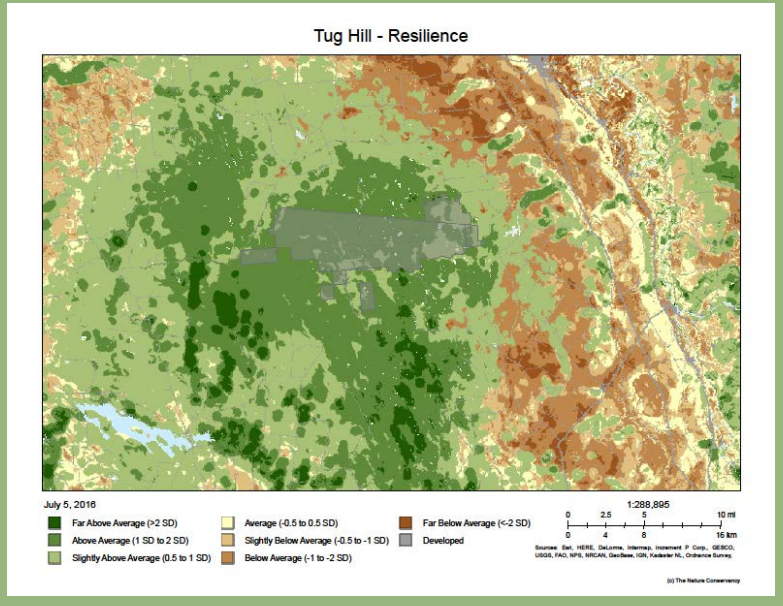
- Lack of diversity in species reduces resilience

Vulnerable to pests and pathogens

- Already present beech bark disease; with emerald ash borer, hemlock wooly adelgid on the way.

Compacted soils criss-cross the stands from years of harvesting.





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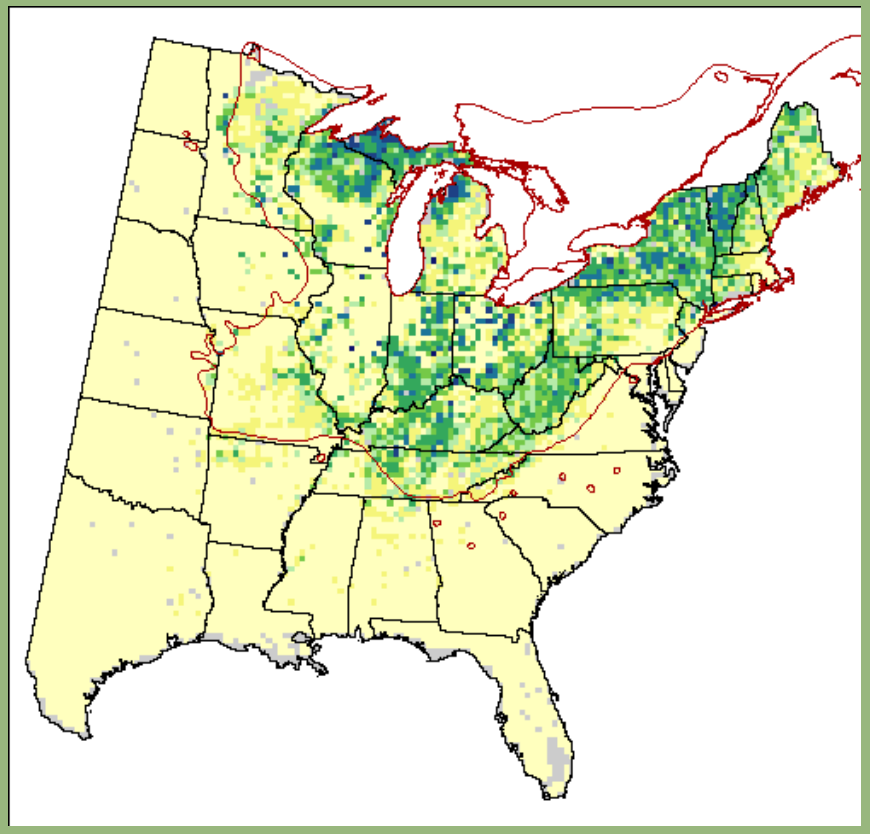
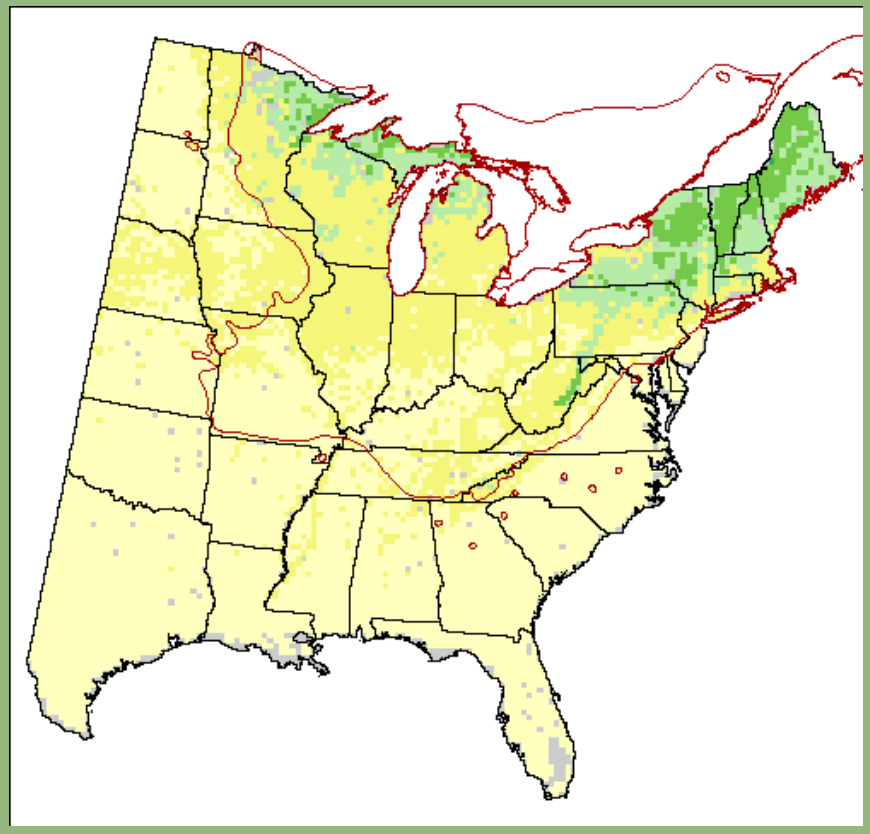
Warming temperature and changing precipitation…

…means altering species ranges (sugar maple)





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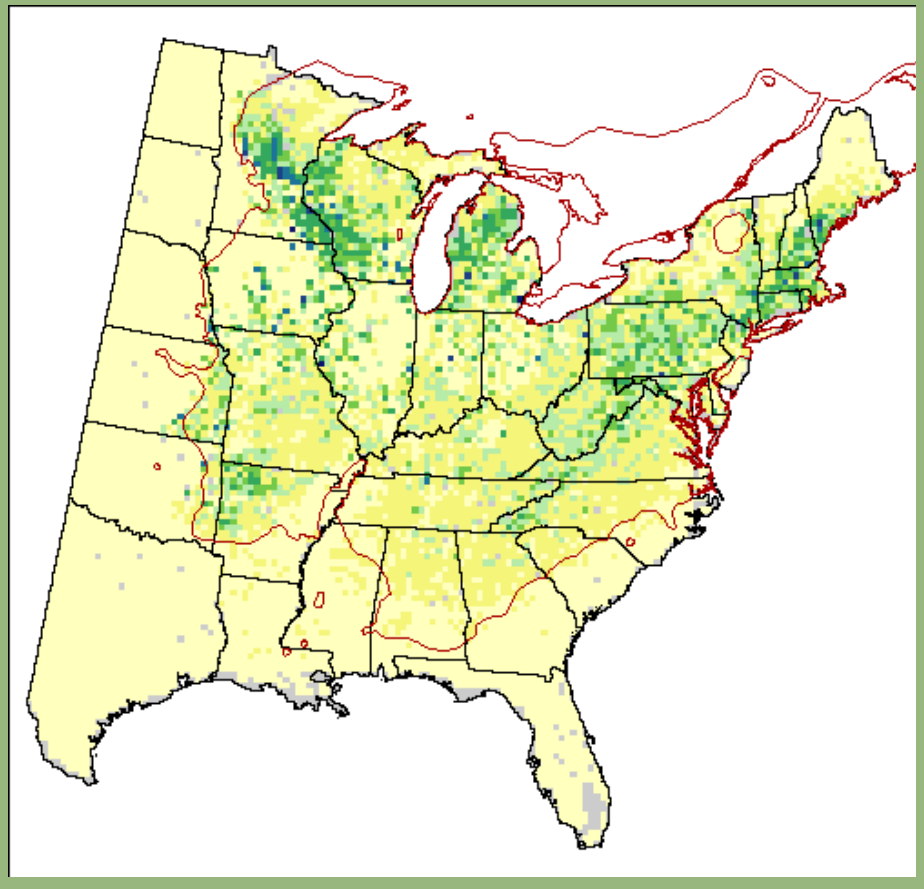
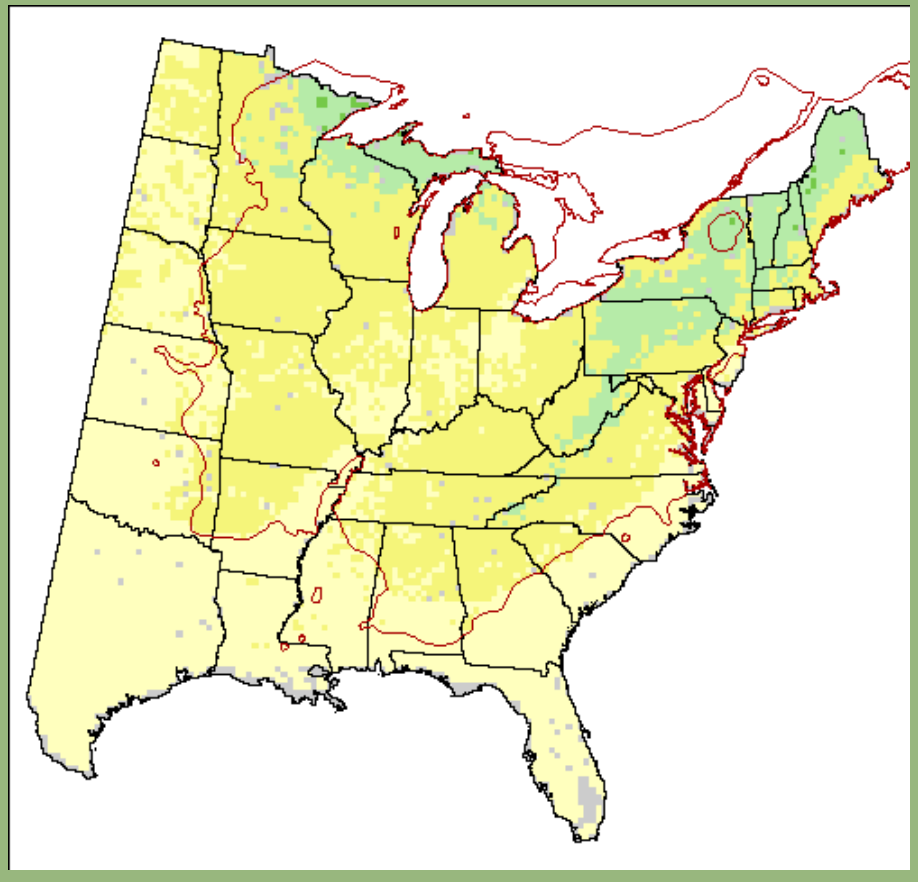
Northern Red Oak





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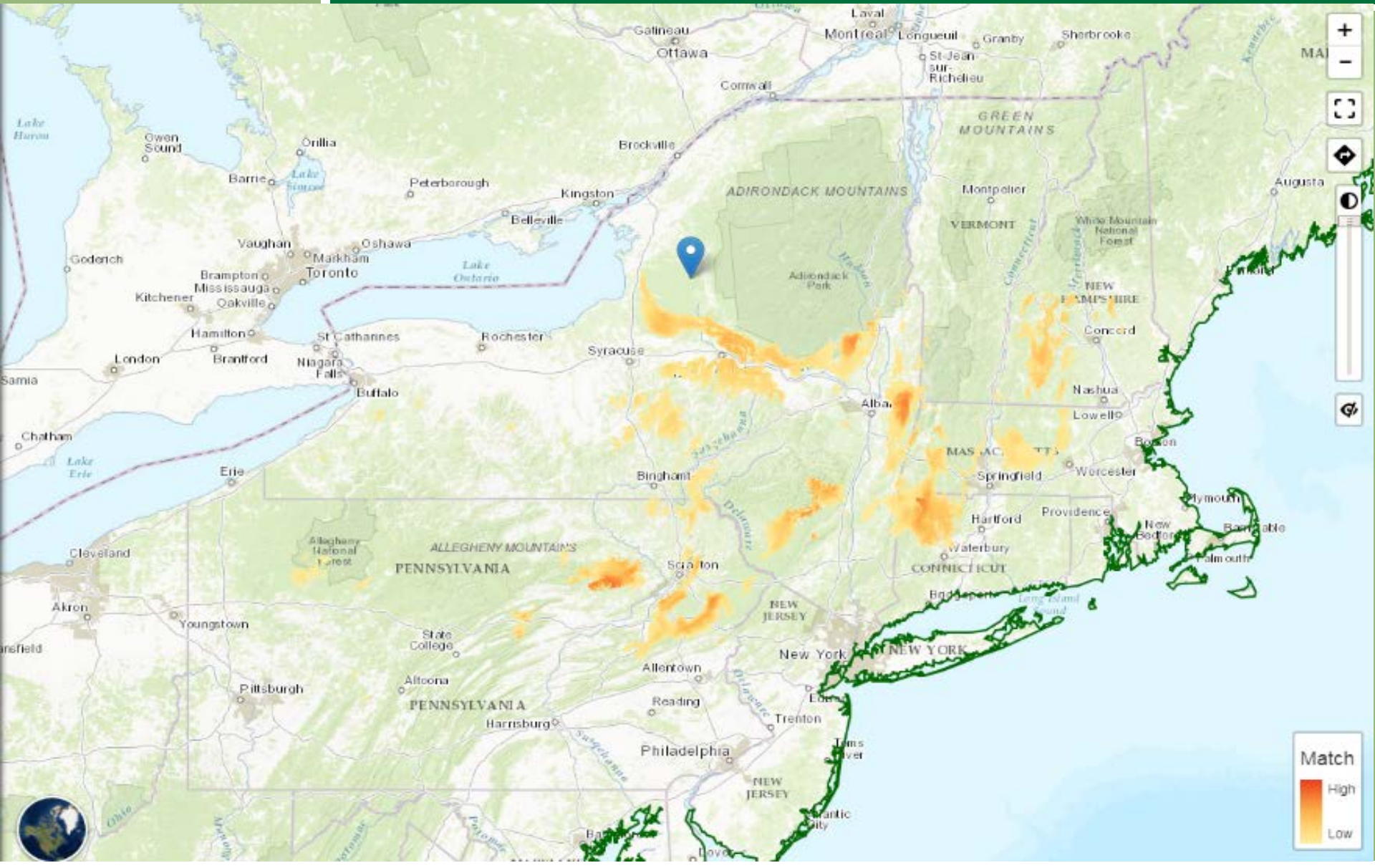
2041-2070



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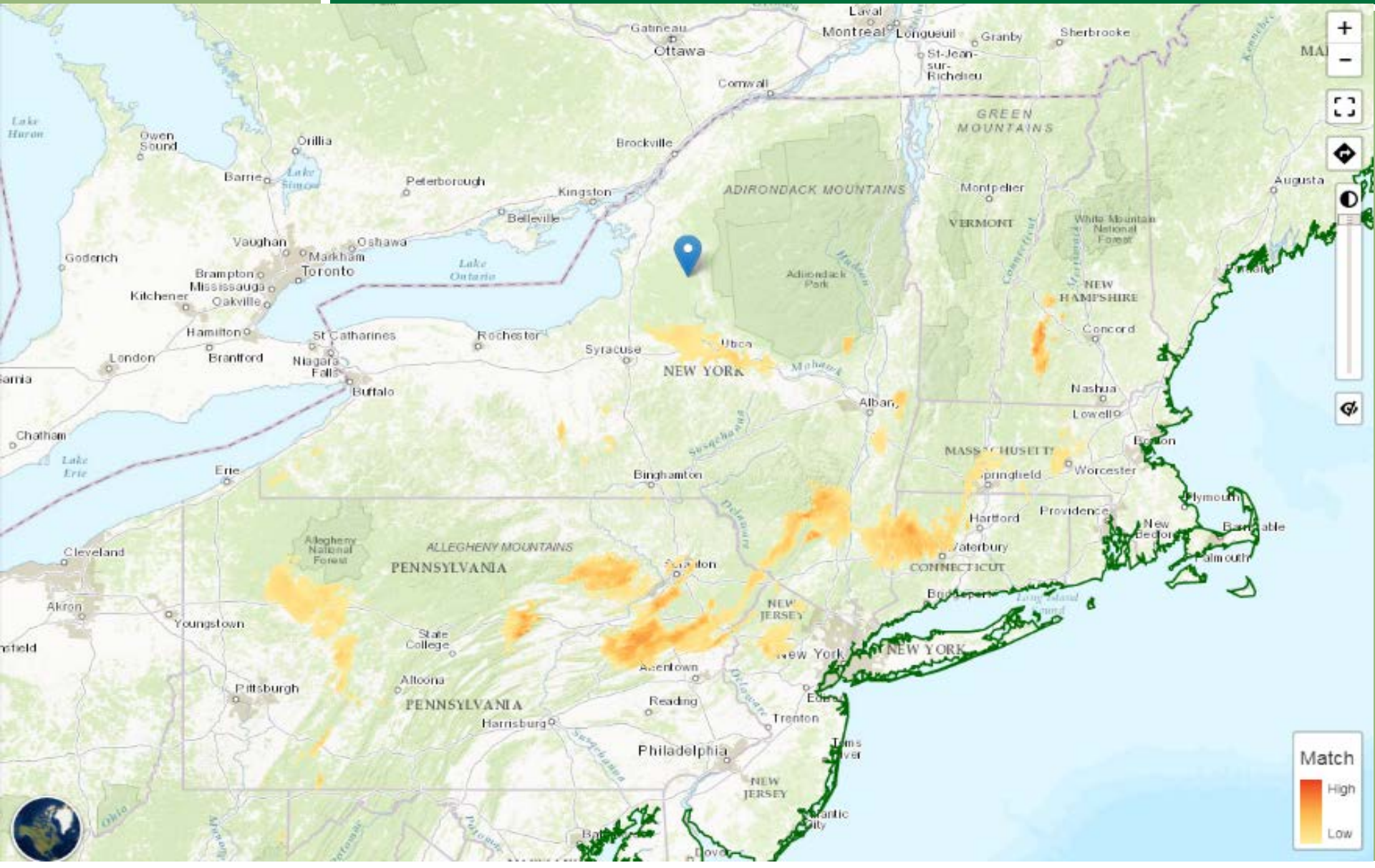
2071-2100



Adaptation forestry actions

- Increase species diversity
  - Planted some potential climate winners.
- Shift towards multiple age classes
  - Created small gaps, favoring large trees to help them to grow faster
- Improve Regeneration
  - Removed interfering vegetation
- Increase Coarse Woody Debris
  - Removed and girdled large beech

General Project Locations

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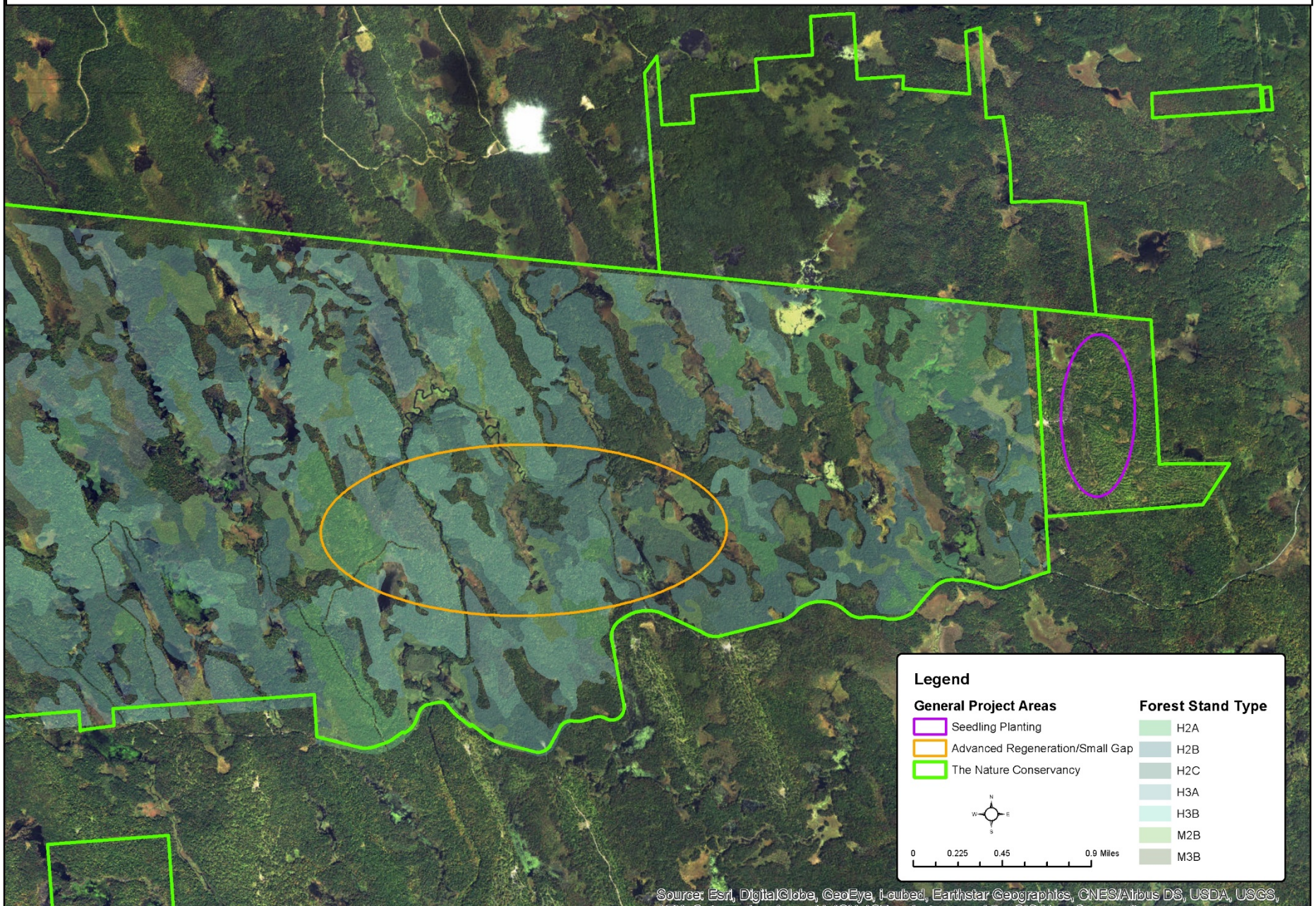
New York



In 2015 we purchased a “clean slate”

- Planted over 35,000 trees:
- Refugia Trees:
  - Maples
  - Cherry
- Transitional:
  - Oaks (Red/White)
  - Hickory (Mockernut, bitternut)
- Hemlock Hedge:

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Climate adaption planting

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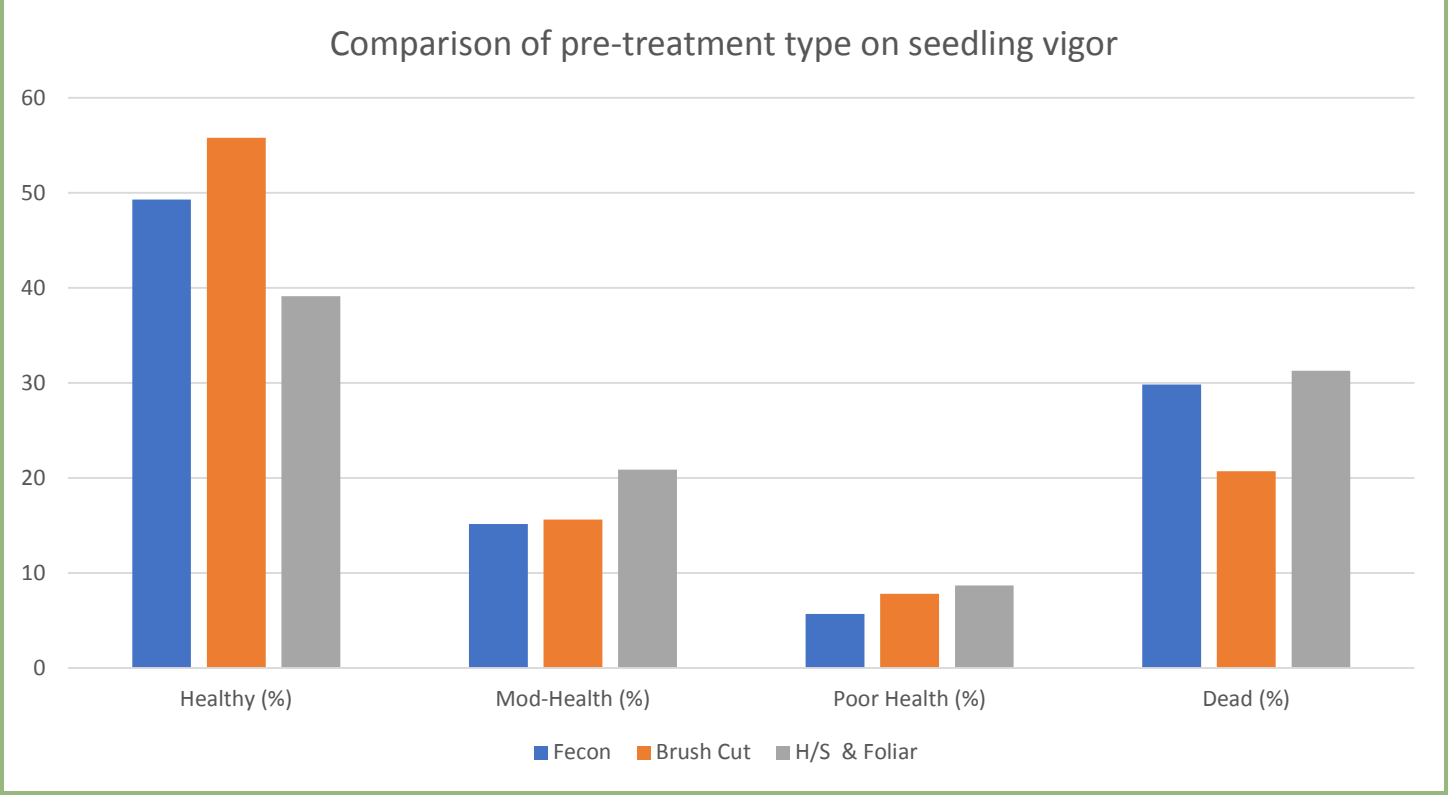
Pre-treatment type



	No Tree Tube		Tree Tube	
Tree Species	Thriving (%)	Dead (%)	Thriving (%)	Dead (%)
Black Cherry	76	0	86	4
Maple	66	11	86	6
Oak	69	7	71	6
White Pine	41	26	23	49
White Spruce	32	31	22	41

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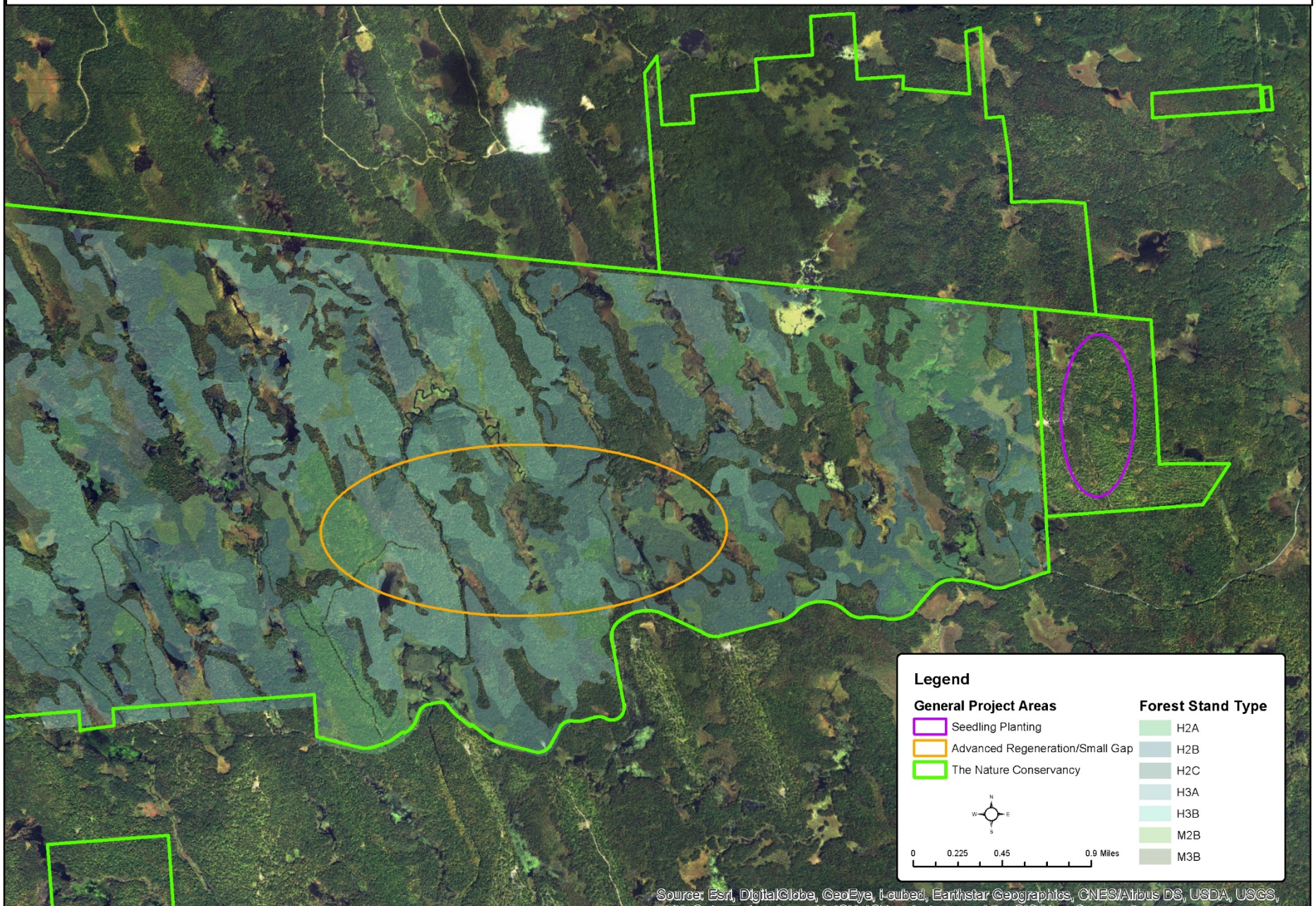
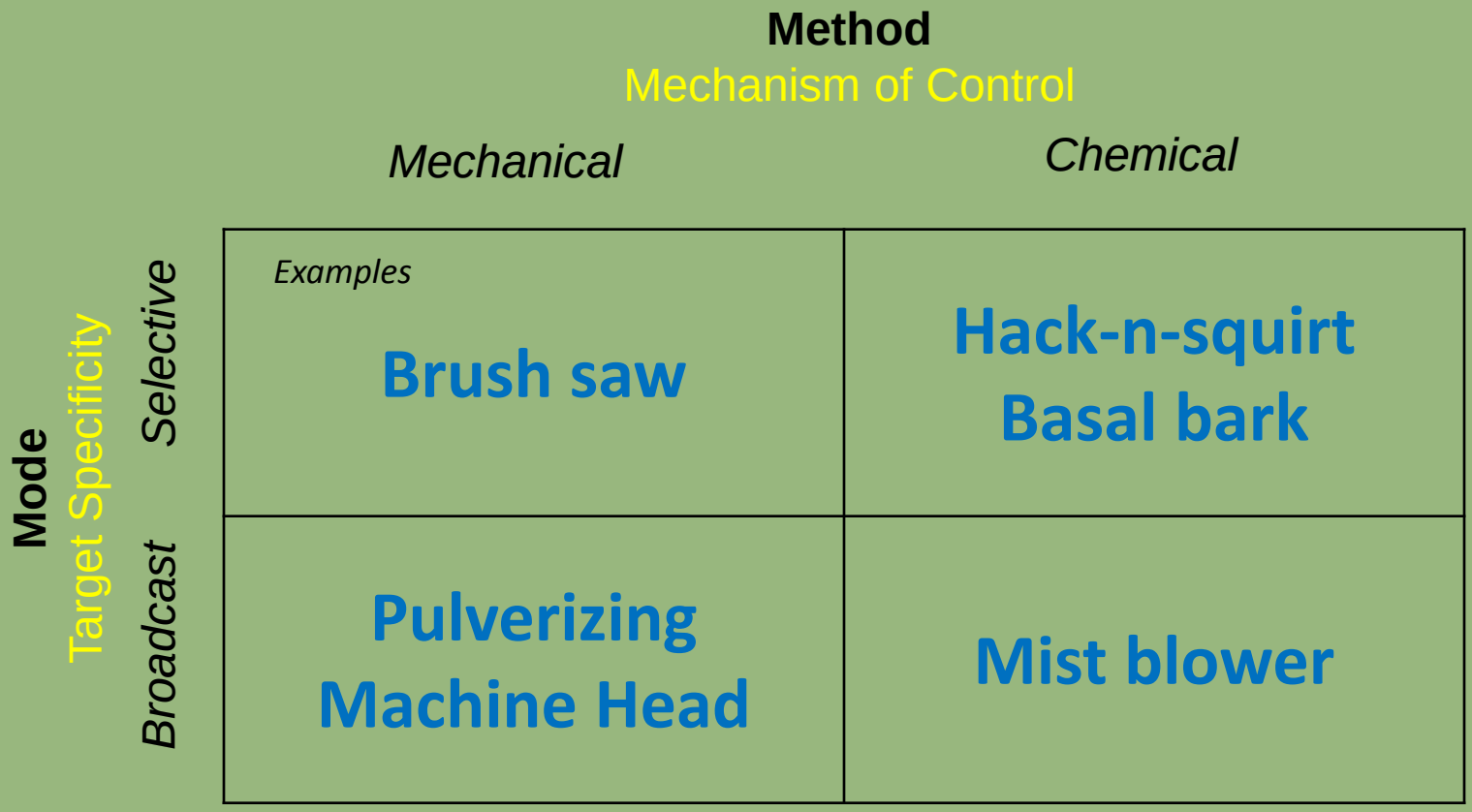


Forest Vegetation Management - Method and Mode



Select a management option(s) that is compatible with owner objectives, efficient, effective, and minimizes negative impacts

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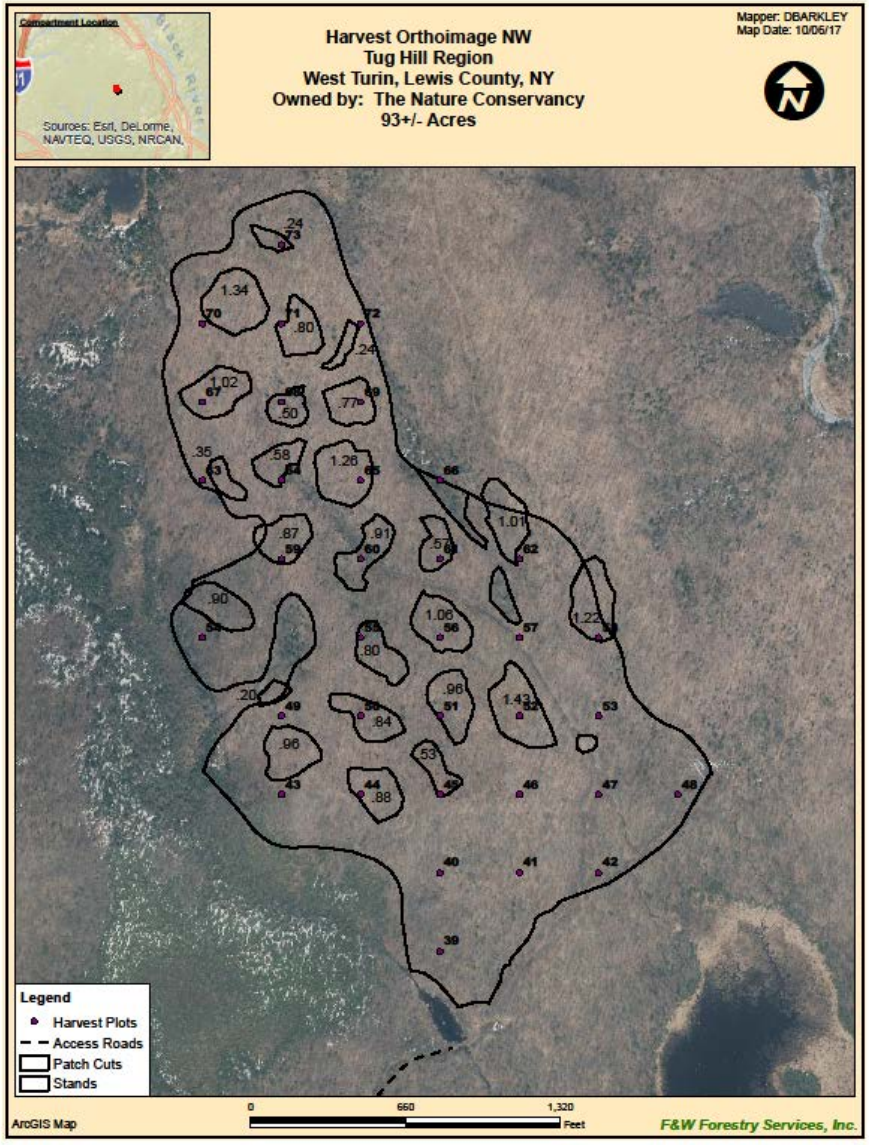
Three Project Areas Treated (multiple stands)

1. Two stands with patch cuts (image)
2. "Matrix"

- Forest Vegetation Management (FVM) to:
  - Increase diversity
  - Regulate size distribution
  - Favor seedling development



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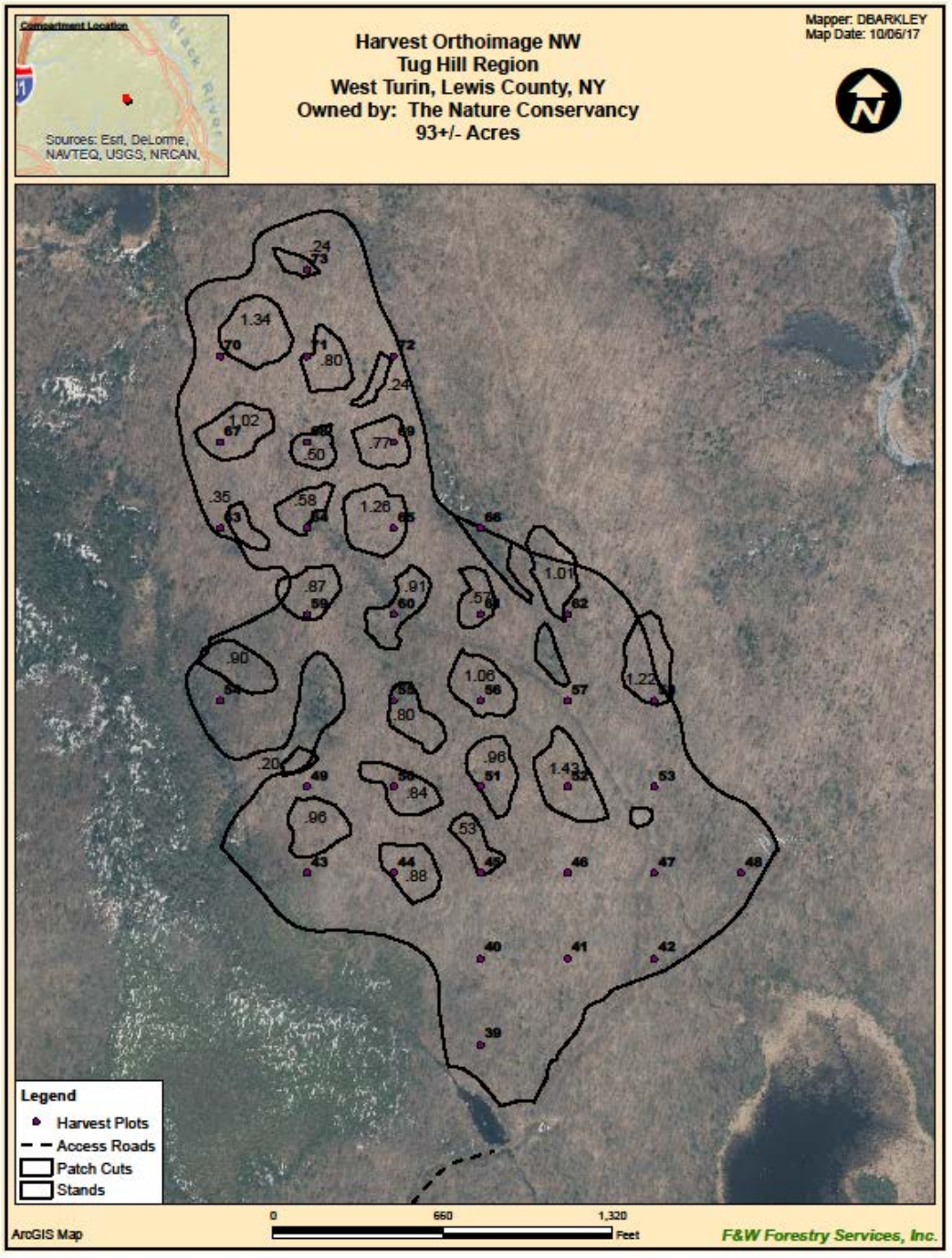
- Patch cuts
  - Stump treatment with glyphosate BEE REM
  - 4 exclosures
- High-Grade
  - Fecon areas
  - Brush saw
  - Herbicide
- TSI in matrix



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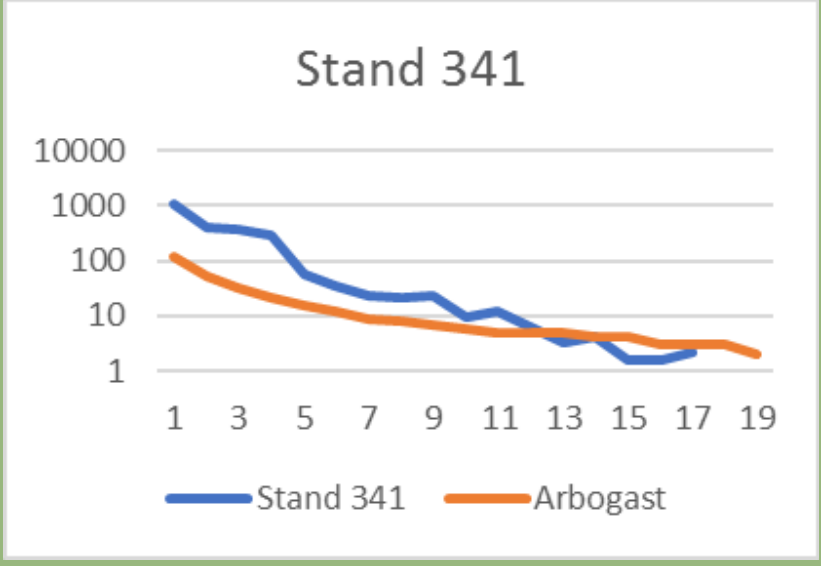
Forested Stands –

Overstocked Understory

- Using current stand data and reference data of mature uneven-aged northern hardwood stand determined small size classes way over stocked.
  - Strategy to remove on average a couple hundred stems/ac in small size classes of beech and red maple.
  - Using brush saw/basal treatment and hack/squirt.



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Timber Stand Improvement –

The Forest Resilience Scorecard:
An entry point for landowners

The Forest Resilience Scorecard: An entry point for landowners

- Intended to guide the conversation of landowners with foresters or trained peer-to-peer volunteers
- Identifies potential risks and highlights management practices that may help a forest cope with changing conditions, increased pressures
- Intersects with assessment and planning for health and productivity of your woodlot
- **Not intended to take the place of professional consultation or advice of a forester**

Four categories essential to forest health and productivity:

- Forest Diversity and Composition
- Forest Structure
- Regeneration
- Site Level Risks

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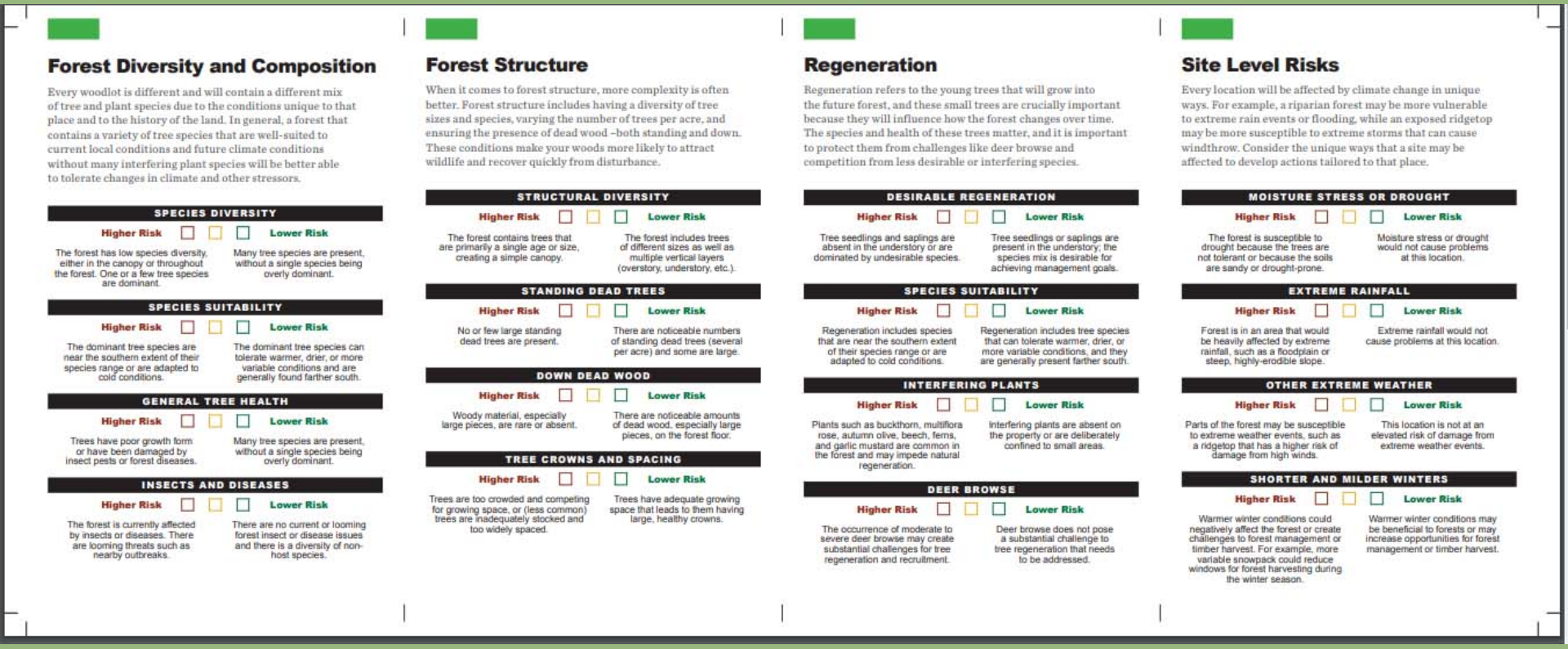
The Forest Resilience Scorecard: An entry point for landowners



Forest Diversity and Composition

Every woodlot is different and will contain a different mix of tree and plant species due to the conditions unique to that place and to the history of the land. In general, a forest that contains a variety of tree species that are well-suited to current local conditions and future climate conditions without many interfering plant species will be better able to tolerate changes in climate and other stressors.

SPECIES DIVERSITY

Higher Risk ☐ ☐ ☐ Lower Risk

The forest has low species diversity, either in the canopy or throughout the forest. One or a few tree species are dominant.

Many tree species are present, without a single species being overly dominant.

SPECIES SUITABILITY

Higher Risk ☐ ☐ ☐ Lower Risk

The dominant tree species are near the southern extent of their species range or are adapted to cold conditions.

The dominant tree species can tolerate warmer, drier, or more variable conditions and are generally found farther south.

GENERAL TREE HEALTH

Higher Risk ☐ ☐ ☐ Lower Risk

Trees have poor growth form or have been damaged by insect pests or forest diseases.

Many tree species are present, without a single species being overly dominant.

INSECTS AND DISEASES

Higher Risk ☐ ☐ ☐ Lower Risk

The forest is currently affected by insects or diseases. There are looming threats such as nearby outbreaks.

There are no current or looming forest insect or disease issues and there is a diversity of non-host species.

Forest Structure

When it comes to forest structure, more complexity is often better. Forest structure includes having a diversity of tree sizes and species, varying the number of trees per acre, and ensuring the presence of dead wood –both standing and down. These conditions make your woods more likely to attract wildlife and recover quickly from disturbance.

STRUCTURAL DIVERSITY

Higher Risk ☐ ☐ ☐ Lower Risk

The forest contains trees that are primarily a single age or size, creating a simple canopy.

The forest includes trees of different sizes as well as multiple vertical layers (overstory, understory, etc.).

STANDING DEAD TREES

Higher Risk ☐ ☐ ☐ Lower Risk

No or few large standing dead trees are present.

There are noticeable numbers of standing dead trees (several per acre) and some are large.

DOWN DEAD WOOD

Higher Risk ☐ ☐ ☐ Lower Risk

Woody material, especially large pieces, are rare or absent.

There are noticeable amounts of dead wood, especially large pieces, on the forest floor.

TREE CROWNS AND SPACING

Higher Risk ☐ ☐ ☐ Lower Risk

Trees are too crowded and competing for growing space, or (less common) trees are inadequately stocked and too widely spaced.

Trees have adequate growing space that leads to them having large, healthy crowns.

Regeneration

Regeneration refers to the young trees that will grow into the future forest, and these small trees are crucially important because they will influence how the forest changes over time. The species and health of these trees matter, and it is important to protect them from challenges like deer browse and competition from less desirable or interfering species.

DESIRABLE REGENERATION

Higher Risk ☐ ☐ ☐ Lower Risk

Tree seedlings and saplings are absent in the understory or are dominated by undesirable species.

Tree seedlings or saplings are present in the understory; the species mix is desirable for achieving management goals.

SPECIES SUITABILITY

Higher Risk ☐ ☐ ☐ Lower Risk

Regeneration includes species that are near the southern extent of their species range or are adapted to cold conditions.

Regeneration includes tree species that can tolerate warmer, drier, or more variable conditions, and they are generally present farther south.

INTERFERING PLANTS

Higher Risk ☐ ☐ ☐ Lower Risk

Plants such as buckthorn, multiflora rose, autumn olive, beech, ferns, and garlic mustard are common in the forest and may impede natural regeneration.

Interfering plants are absent on the property or are deliberately confined to small areas.

DEER BROWSE

Higher Risk ☐ ☐ ☐ Lower Risk

The occurrence of moderate to severe deer browse may create substantial challenges for tree regeneration and recruitment.

Deer browse does not pose a substantial challenge to tree regeneration that needs to be addressed.

Site Level Risks

Every location will be affected by climate change in unique ways. For example, a riparian forest may be more vulnerable to extreme rain events or flooding, while an exposed ridgetop may be more susceptible to extreme storms that can cause windthrow. Consider the unique ways that a site may be affected to develop actions tailored to that place.

MOISTURE STRESS OR DROUGHT

Higher Risk ☐ ☐ ☐ Lower Risk

The forest is susceptible to drought because the trees are not tolerant or because the soils are sandy or drought-prone.

Moisture stress or drought would not cause problems at this location.

EXTREME RAINFALL

Higher Risk ☐ ☐ ☐ Lower Risk

Forest is in an area that would be heavily affected by extreme rainfall, such as a floodplain or steep, highly-erodible slope.

Extreme rainfall would not cause problems at this location.

OTHER EXTREME WEATHER

Higher Risk ☐ ☐ ☐ Lower Risk

Parts of the forest may be susceptible to extreme weather events, such as a ridgetop that has a higher risk of damage from high winds.

This location is not at an elevated risk of damage from extreme weather events.

SHORTER AND MILDER WINTERS

Higher Risk ☐ ☐ ☐ Lower Risk

Warmer winter conditions could negatively affect the forest or create challenges to forest management or timber harvest. For example, more variable snowpack could reduce windows for forest harvesting during the winter season.

Warmer winter conditions may be beneficial to forests or may increase opportunities for forest management or timber harvest.

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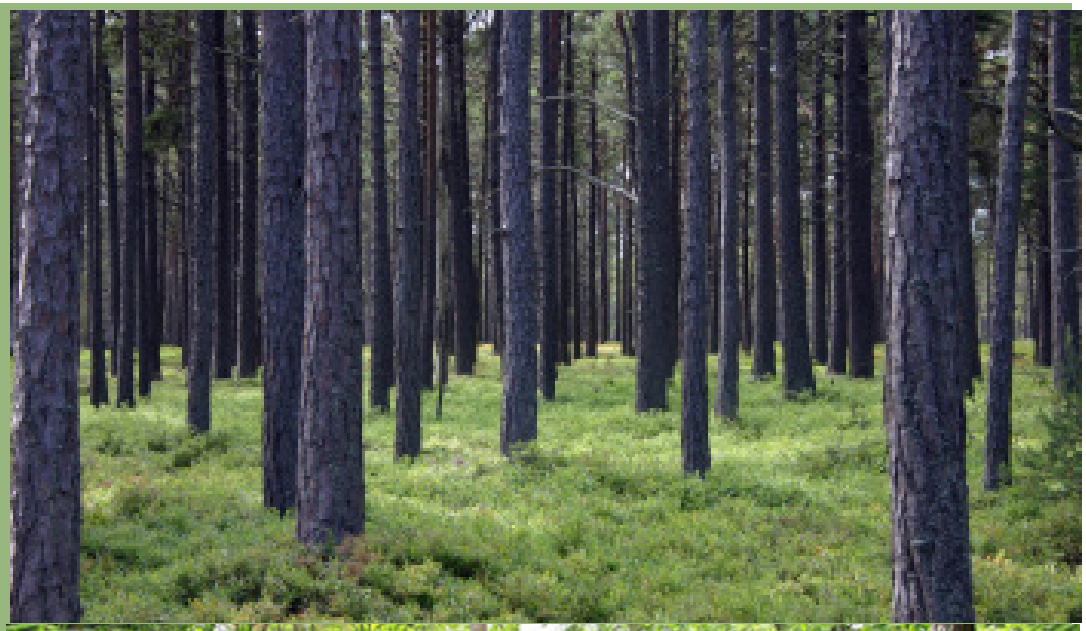
Forest Structure



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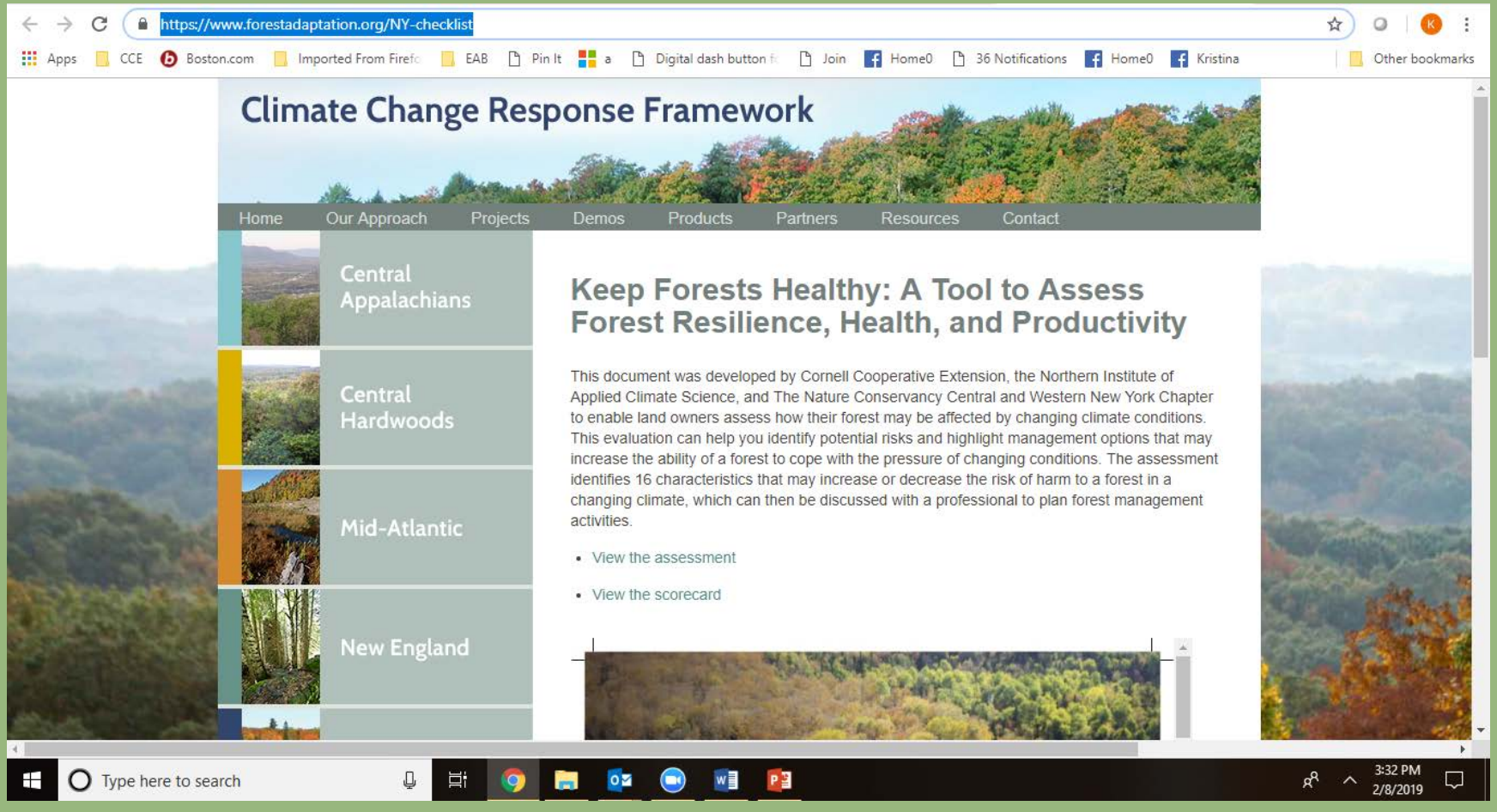
Forest Structure - Strategies

CONCERNS	STRATEGIES
Structural Diversity The forest contains trees that are primarily a single age or size, creating a simple canopy.	• Use forest management to emulate aspects of natural disturbance to support the establishment of different age classes. Stands containing trees of different ages and sizes may be more resilient than even-aged stands.
Standing Dead Trees No or few standing dead trees are present.	• Leave or create standing dead trees during forest management activities where they do not create a hazard. • Leave standing dead trees during salvage operations where they do not create a hazard. • Allow some trees to grow to larger sizes so that they can provide value to wildlife and serve as future dead wood.
Down Dead Wood Woody material, especially large pieces, are rare or absent.	• Leave large pieces of woody material on the ground after disturbances and forest management activities.
Tree Crowns & Spacing Trees are inadequately stocked and too widely spaced, or trees are too crowded and competing for growing space.	• Thin stands by identifying crop trees, creating room to grow for desirable species of good form.

Where can you download the score card?

https://www.forestadaptation.org/NY-checklist



Monitoring Long-term Trends

- Seedling survival; seedling height growth
- Forest condition
  - Tree growth
  - Structure
  - Natural regen
- Cost/time/ROI
- Carbon projections

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Thank you!