# A Tail of Two Forest Restoration Projects

## Forest Regeneration: A Key Process for Recovery and Resilience

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*The Nature Conservancy, New York*

# Road Map

1. Background
2. Tug Hill Climate Adapted Forest Restoration Project
3. Catskills Forest Regeneration and Resilience Pilot Project
4. Lessons Learned

# Background – Importance of Regeneration

Forest Climate Adaptation and Forest Carbon Management Strategies

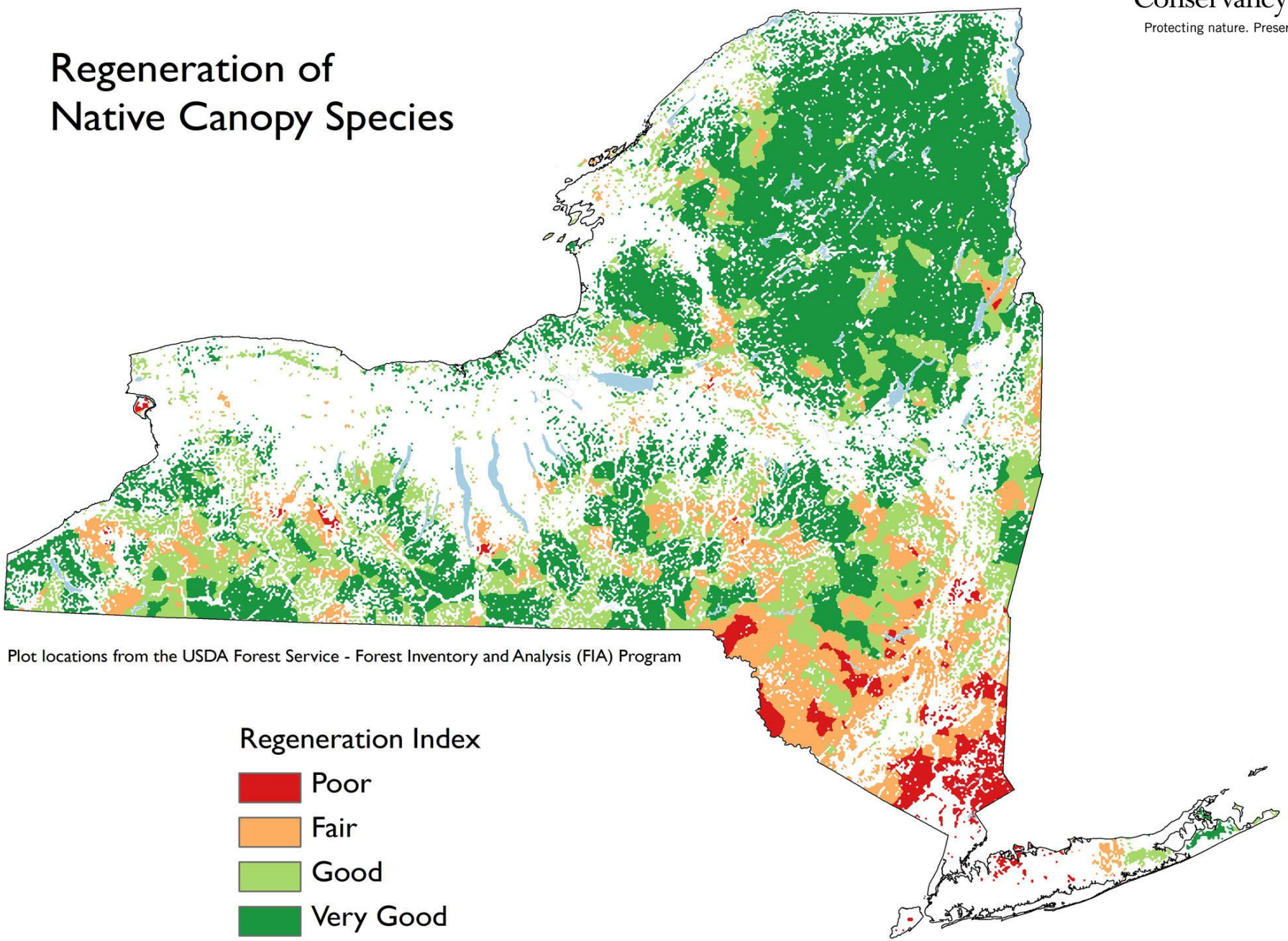
Enhance forest recovery following disturbance

- Promptly revegetate sites after disturbance
- Restore disturbed sites with a diversity of species that are adapted to future conditions
- Protect future-adapted seedlings and saplings
- Guide species composition at early stages of development to meet expected future conditions

**Cite as:** Ontl, T.A., Swanston, C.W., Janowiak, M.K., Daley, J. Practitioner's menu of adaptation strategies and approaches for forest carbon management. *In:* Ontl, T.A, Janowiak, M.K., Swanston, C.W., Daley, J., Handler, S.D., Cornett, M., Hagenbuch, S., Handrick, C., McCarthy, L., Patch, N. 2020. Forest management for carbon sequestration and climate adaptation. Journal of Forestry 118(1):86-101. doi:10.1093/jofore/fvz062.

# Background – 2010 Report

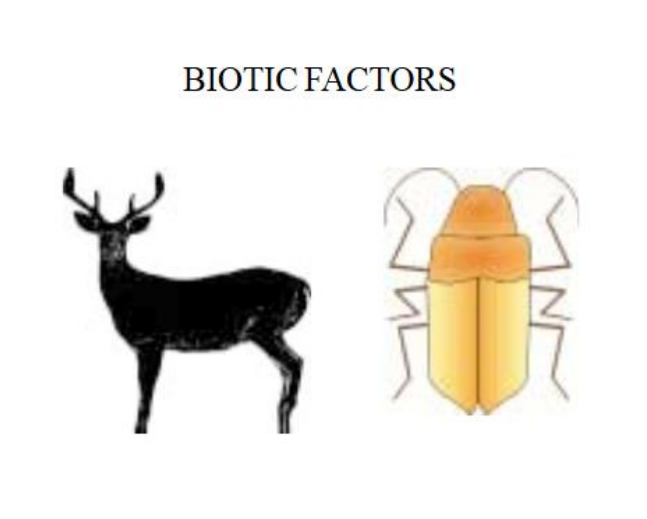
The Nature Conservancy
Protecting nature. Preserving life.™

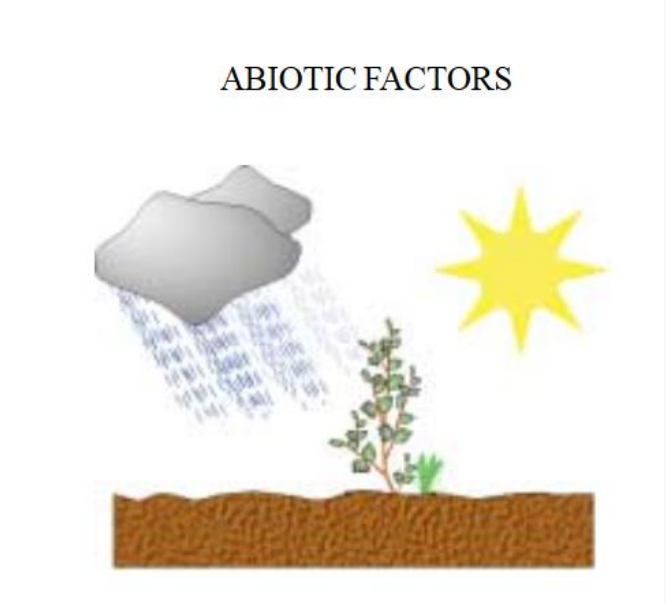


# Factors Influencing Regeneration

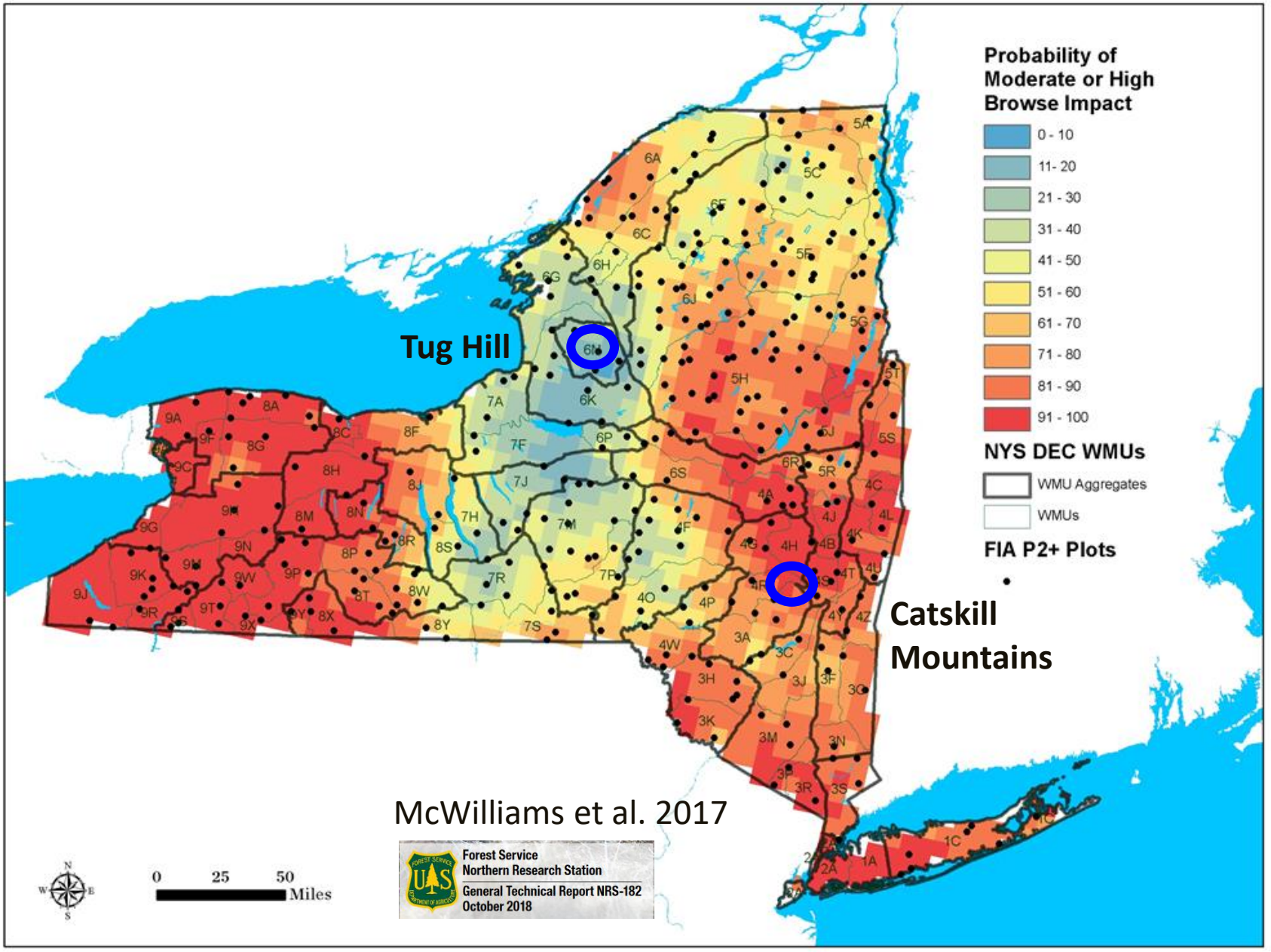
1. Deer Browse
2. Invasive and Competing Vegetation
3. Light and Space
4. Soil Moisture

REGENERATION HANDBOOK
Ward and Worthley
http://www.nysenvirothon.com/Referencesandother/ForestRegeneration_1_.pdf



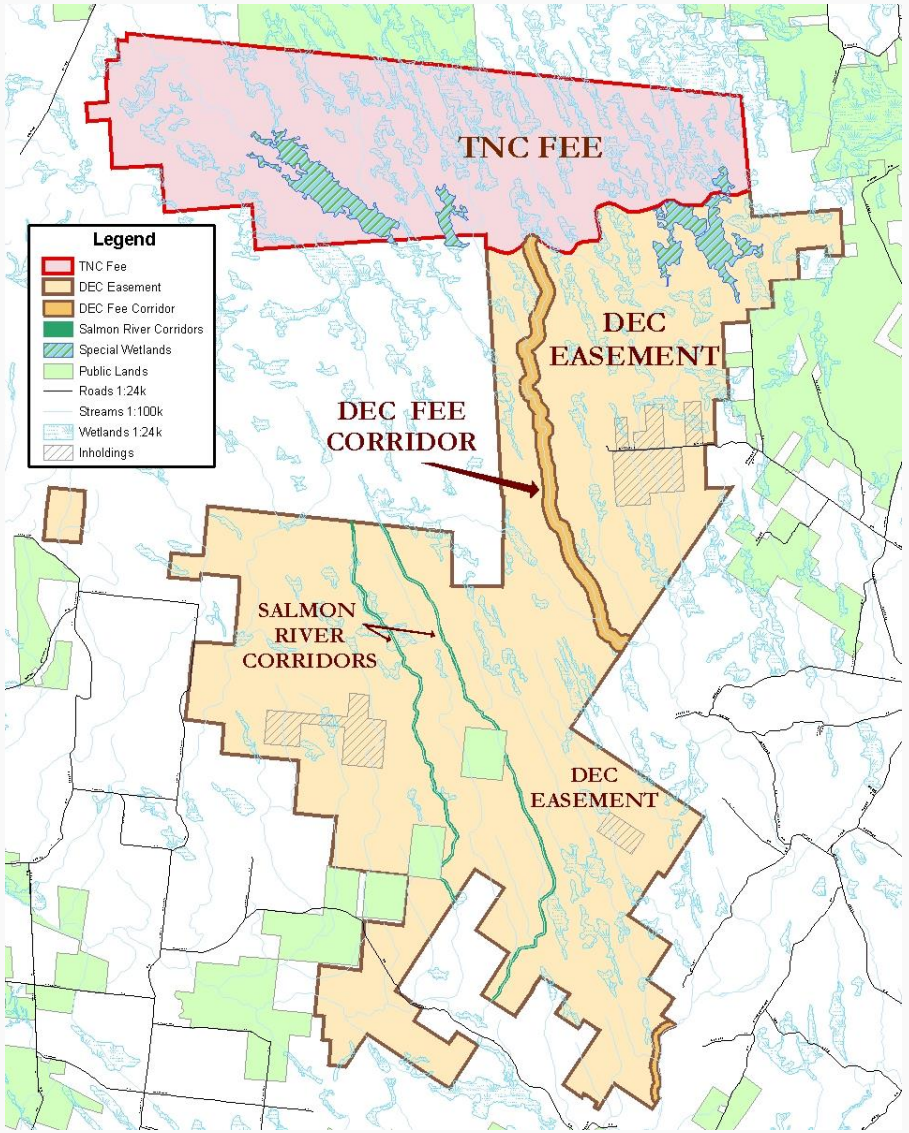



# Probability of Occurrence for Moderate or High Browse Impacts on Forest Land (2017)



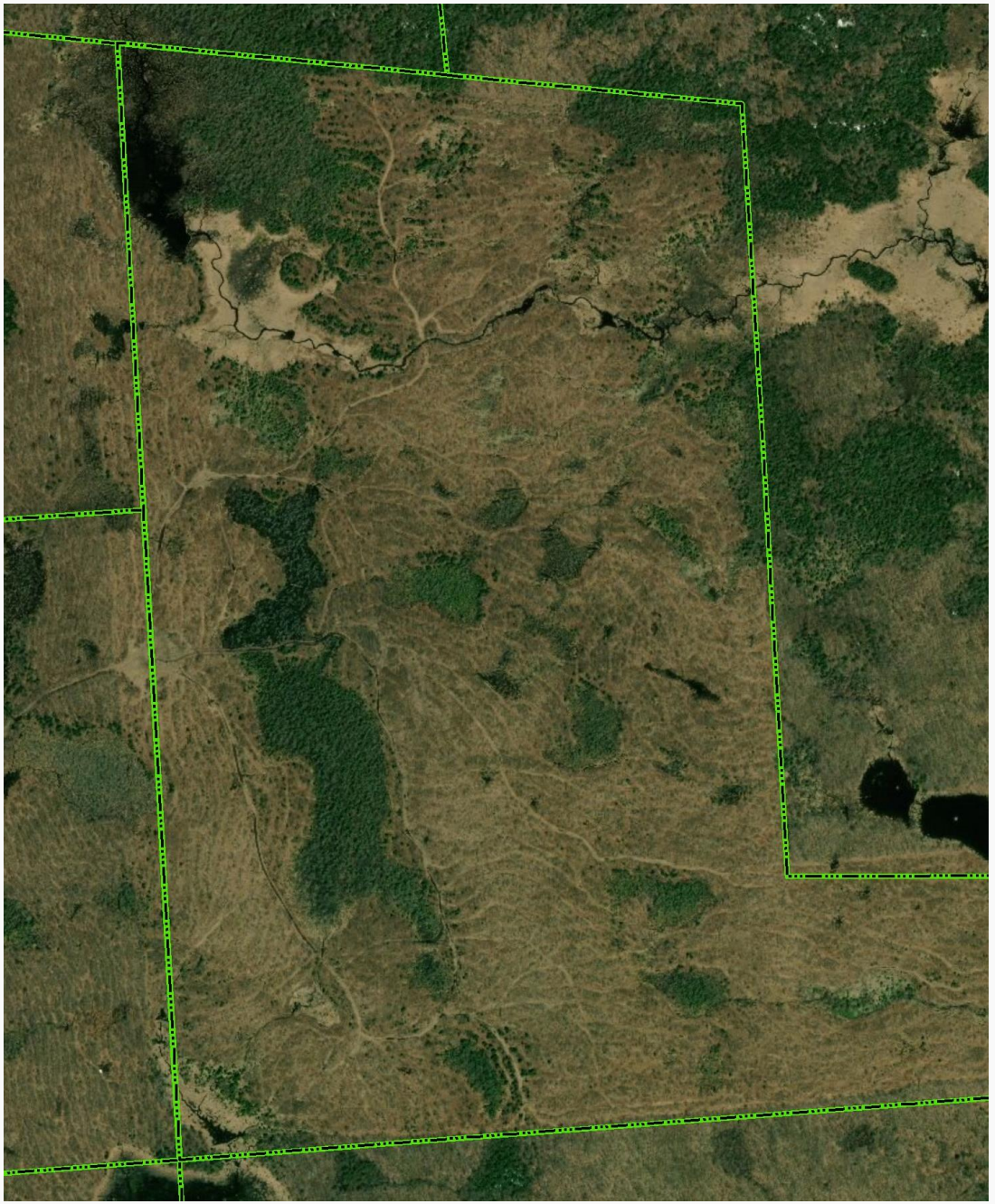
# Tug Hill Climate Adapted Forest Restoration Project

- In 2002, purchased 45,000 acres.
- TNC retained 15,000 acres.
- 30,000 acre DEC with a conservation easement.
- In 2014, acquired 415 parcel



# New TNC Tug Hill Acquisition - Site Conditions (2016)

300 acre commercial clearcut



# Site Vulnerabilities

Is this 300 acre high graded clearcut area resilient to climate change?

- Lack of overstory cover
- Poor stocking
- Poor tree health
- Low abundance and diversity of tree regeneration
- Climate change – Likely increase in seasonal drought

# Climate Adapted Forest Restoration Project

Goals:

1. Increase density and diversity of tree regeneration
2. Established climate adapted tree species

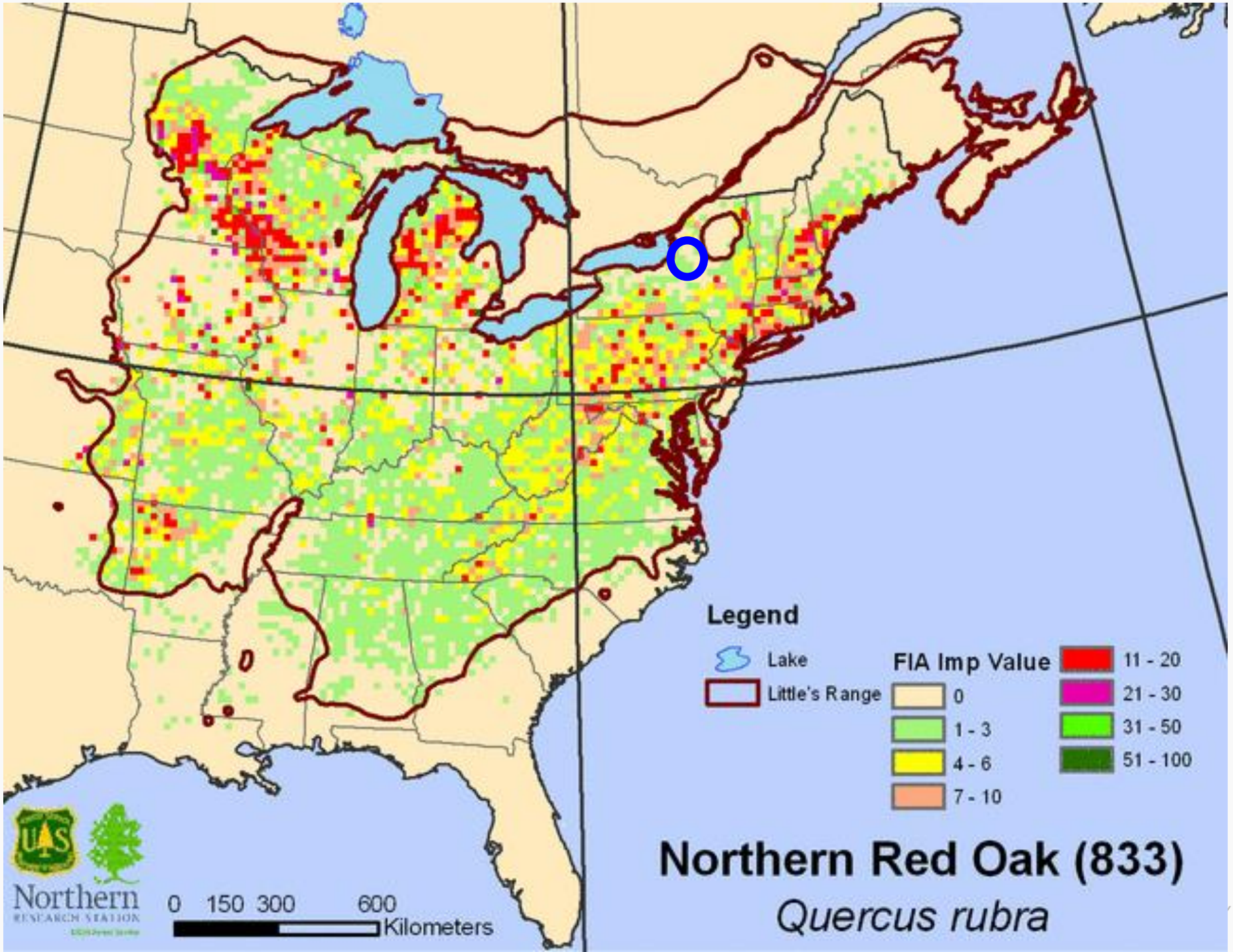
Management Actions:

1. Manage competing vegetation
2. Planted 35,000 tree seedlings across 50 acres

# Tree Species Planting Mix Grouped using USFS Climate Change Tree Atlas

| | PCM B1 | GFDL A1FI | Group |
|---|---|---|---|
| **Larch** | small decrease | small decrease | Decrease |
| **White Spruce** | small decrease | large decrease | Decrease |
| **White Pine** | no change | small decrease | Decrease with high emissions |
| **Sugar Maple** | no change | small decrease | Decrease with high emissions |
| **Red Pine** | no change | large increase | Increase with high emissions |
| **Black Cherry** | no change | small increase | Increase with high emissions |
| **White Oak** | small increase | large increase | Increase |
| **Red Oak** | small increase | small increase | Increase |
| **Silver Maple** | small increase | large increase | Increase |
| **Sweet Birch** | small increase | small increase | Increase |

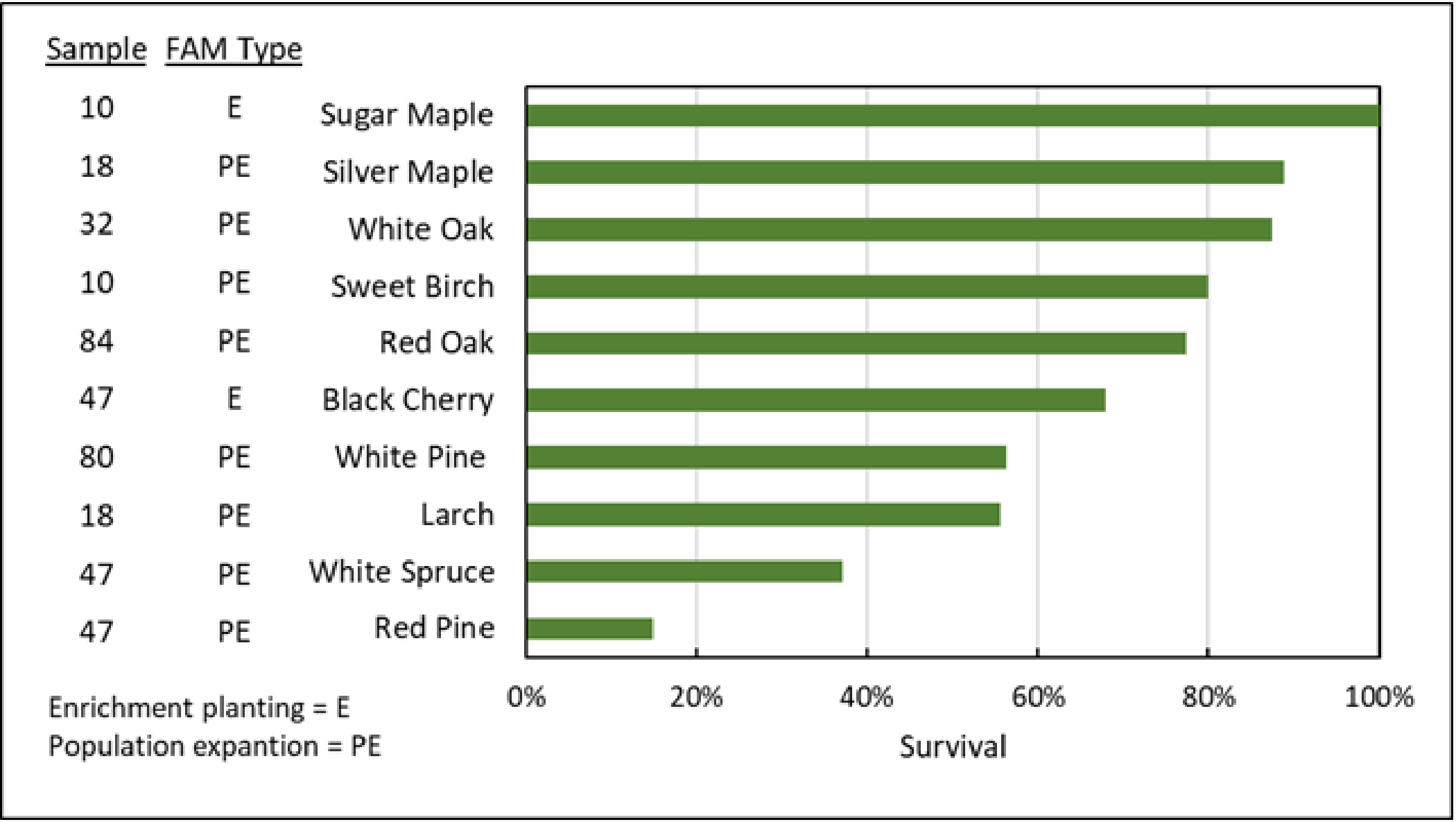
# Assisted Migration – Range Expansion



# Planted 35,000 Seedlings - Spring 2017

# Tree Survival (2 Years Post Planting)

32% average survival



# Lessons Learned

- Project cost ~ $70,000 to plant 50 acres
- Project success TBD
- Seasonal drought can substantially impact tree seedling survival.
- Drought tolerate tree species had greater survival.
- Apply best practices for assisted migration.

# Catskills Forest Regeneration Pilot Project

Site Vulnerabilities:

1. In 2014 ~30% of forest overstory (white ash) killed by emerald ash borer
2. Lack of advanced regeneration
3. High deer herbivory
4. Invasive plants (stiltgrass, multiflora rose, bittersweet)
5. Climate change – Likely increase in seasonal drought

# Catskills Forest Regeneration Pilot Project

Goals:

1. Increase tree seedling and sapling density and diversity.
2. Long-term – Restore canopy cover and increase forest stocking.

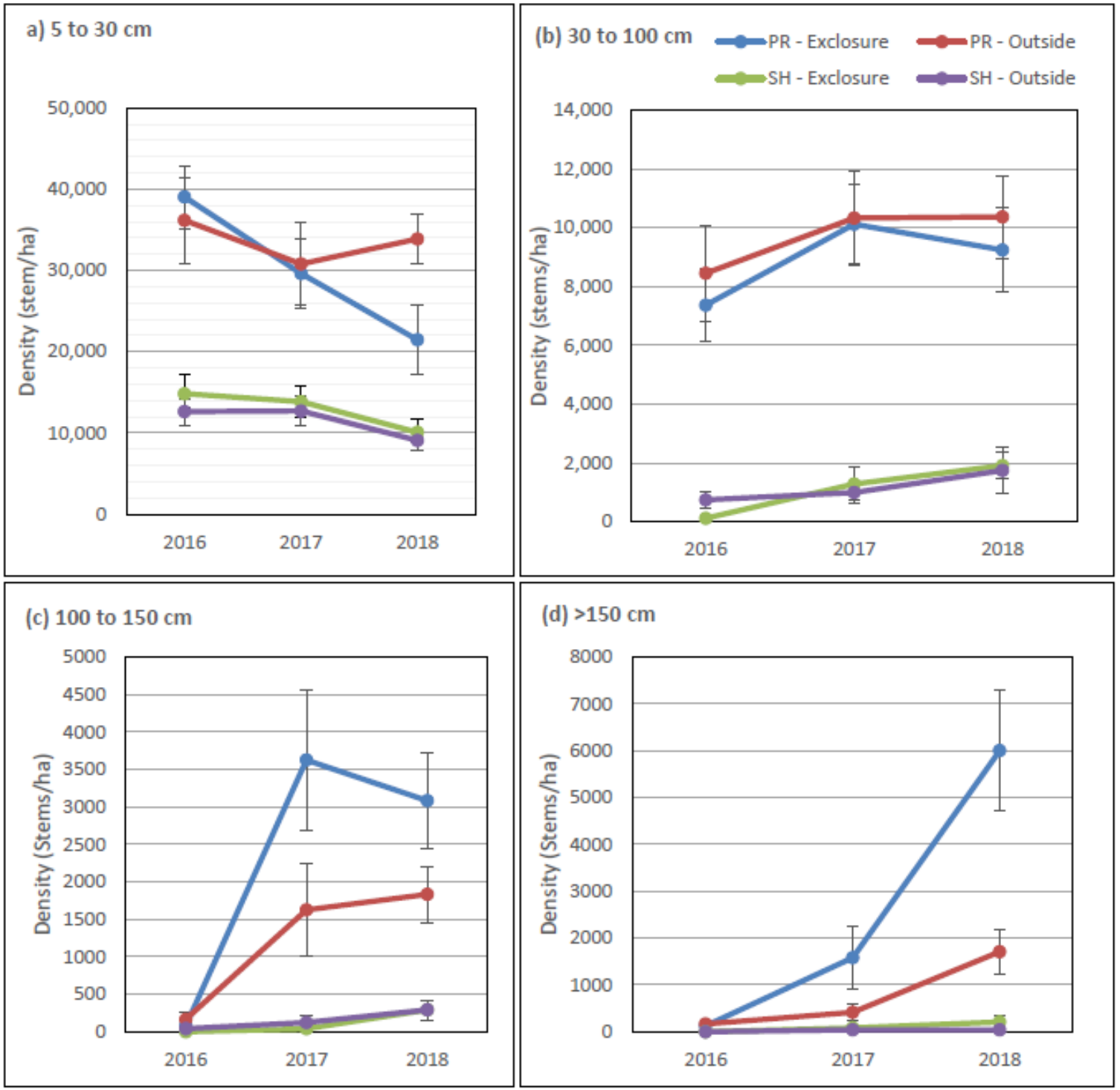
Management Actions:

1. Installed exclosure (8ft. Fence) around  1 ha (~ 3 ac.) at two stands
2. Removed multiflora rose and bareberry

# Results

## Tree Seedling and Sapling Density (3rd year)

# **Results** - Tree Seedling Density (3rd year)



# **Results** - Tree Seedling Richness and Diversity (3rd year)

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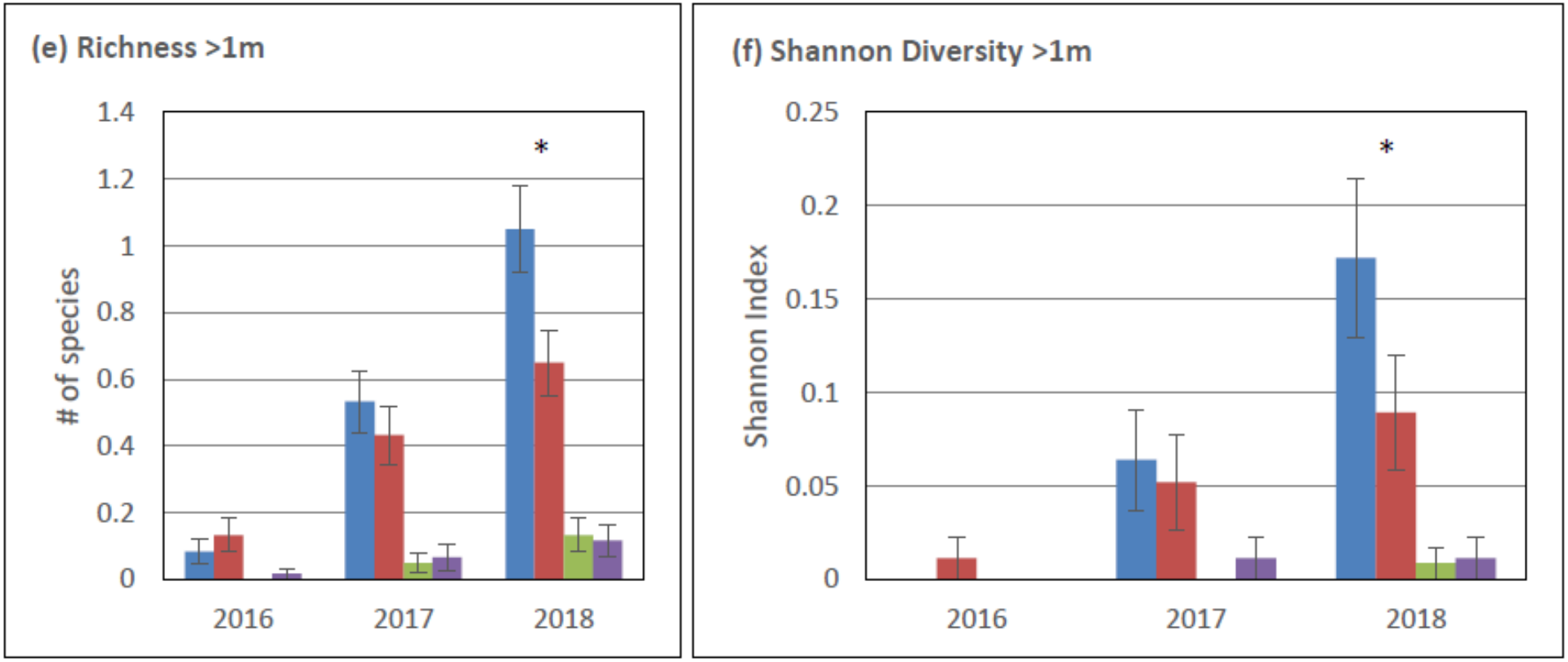

# Lessons Learned

- Project cost ~ $9,000 for 3 acre exclosure
- Initial results promising
- Fence maintenance required
- Scalability uncertain
- Small exclosures refugia?
- Does high deer browse limit forests ability to adapt overtime?

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
- SUNY ESF
- USFS – Northern Institute Applied Climate Science
- Cornell University and outreach

Cornell Univeristy
Cooperative Extension
Agricultural Experiment Station

Cornell Cooperative Extension | Onondaga County

NIACS
Northern Institute of
Applied Climate Science

ESF

WILDLIFE CONSERVATION SOCIETY
WCS
125 YEARS

# Thank You!