New England Adaptive Silviculture for Climate Change: Dartmouth's Second College Grant

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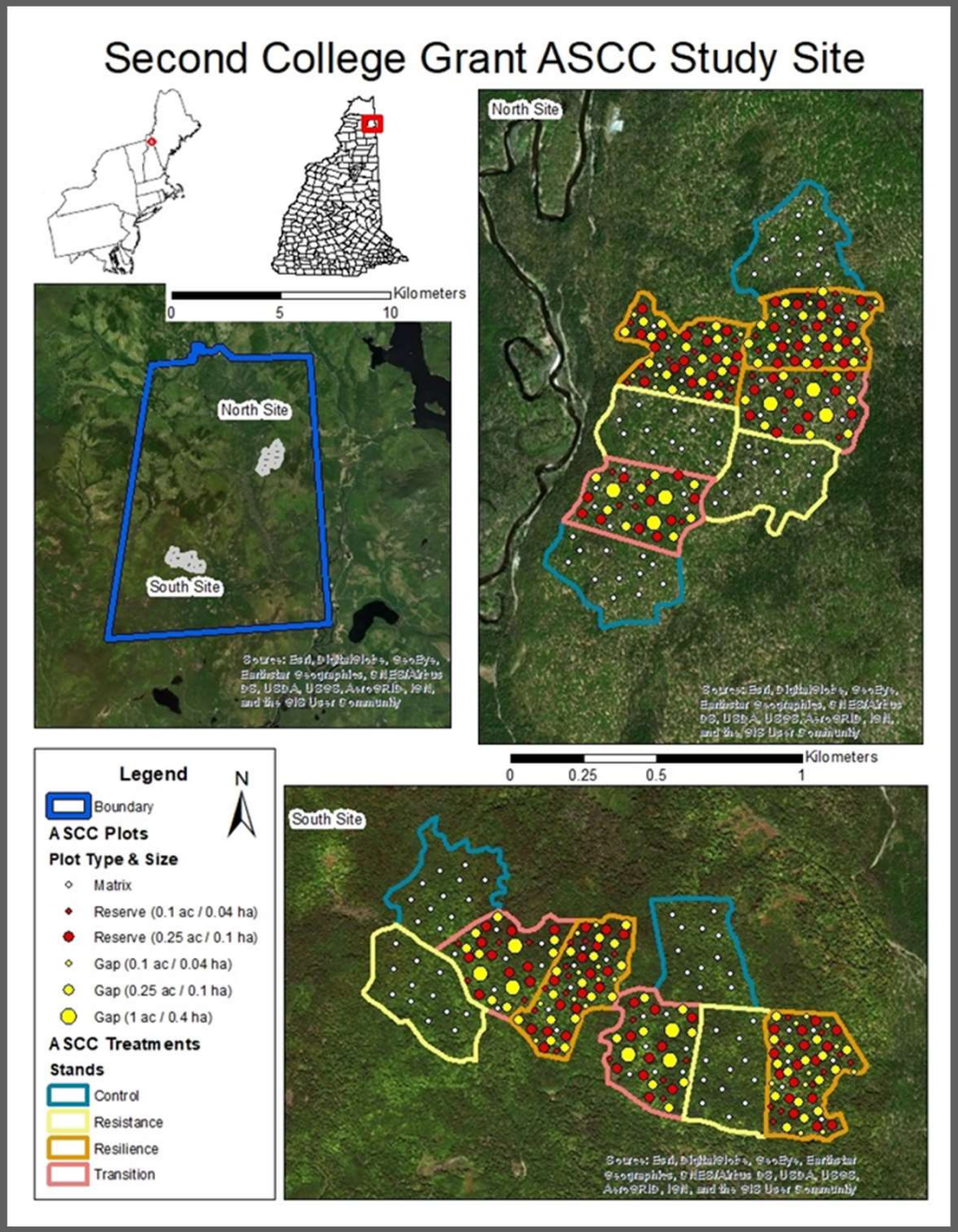
New England ASCC Installation

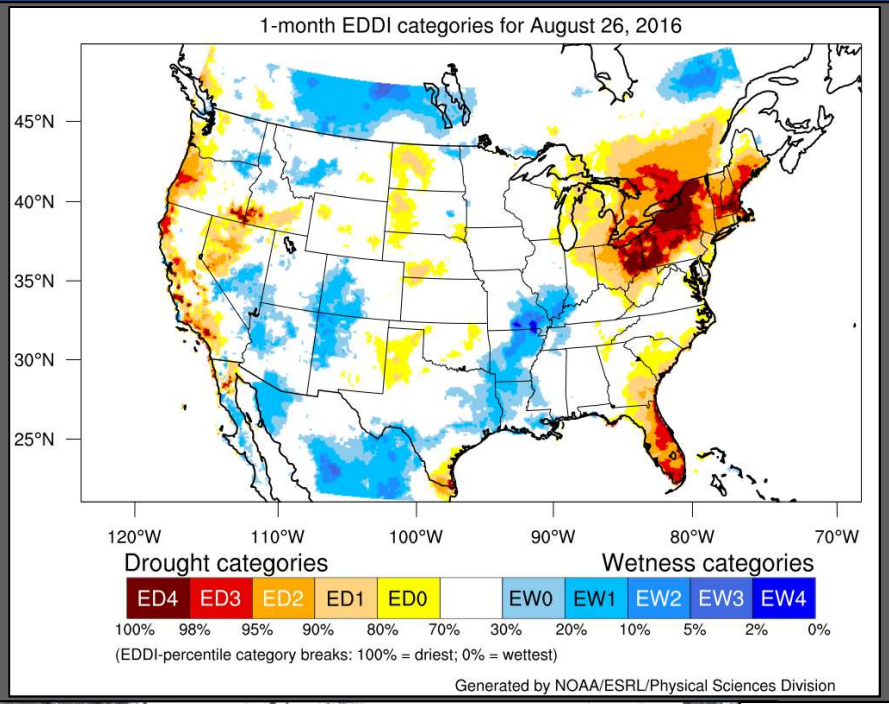


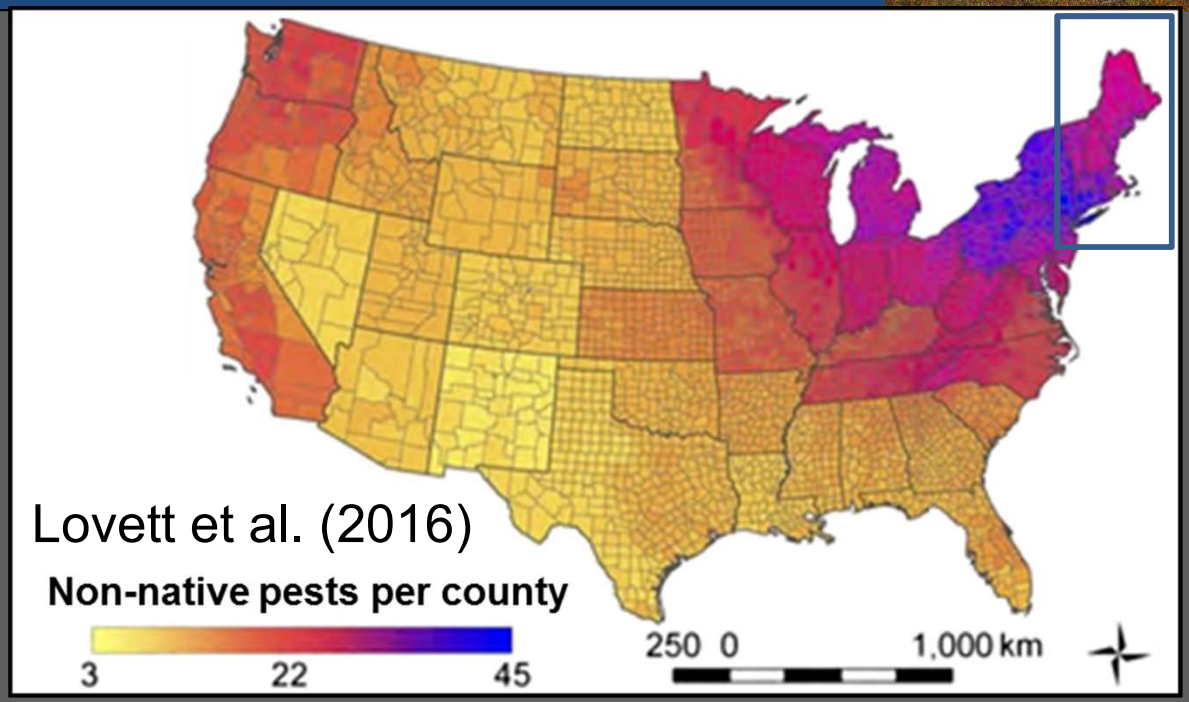
Second College Grant

- 27,000 ac property owned and managed by Dartmouth College since 1807
- Dominated by northern hardwoods and mixedwoods
- ASCC study co-developed in 2016

Dartmouth College Second College Grant, NH

Context for Adaptation



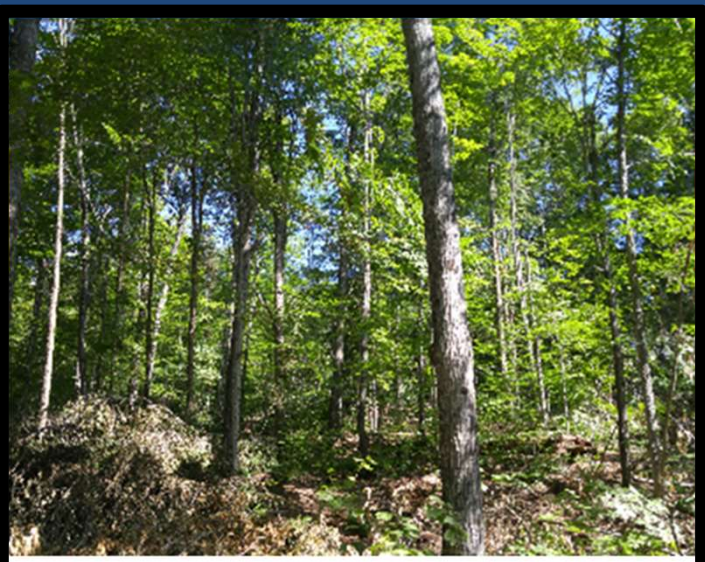


Adaptation Treatments

Treatments (including c

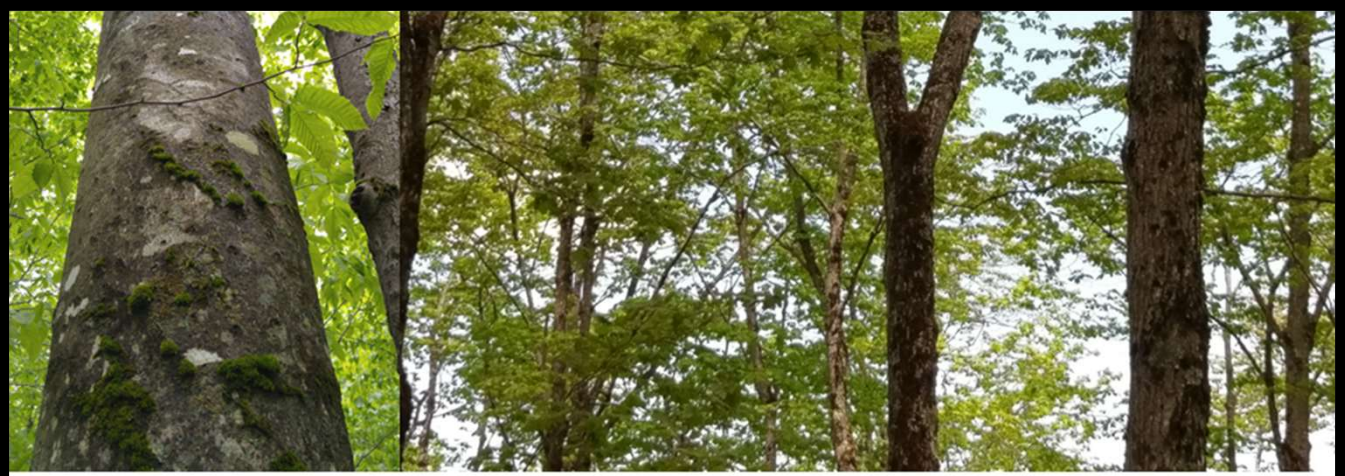
Resistance

Single-tree selection
16-18 m^2/ha
Multi-cohort structure
↑ downed dead wood
Favor beech bark disease and ice resistant residual stems



-Increased resource availability to residual trees
-Maintenance of multi-cohort condition, with SM dominance

-Increase downed logs to minimize impacts of hydrologic extremes (downpours/drought)



-Marking priority to favor disease resistant individuals
-Crown forms & species (yellow birch) resistant to ice damage

Adaptation Treatments

Treatments (including controls) replicated 4 time

Resistance

Single-tree selection
16-18 m^2/ha
Multi-cohort structure
↑ downed dead wood
Favor beech bark disease and ice resistant residual stems

Resilience

Group selection and single-tree selection
20% gaps 0.04-0.1 ha / **20% reserves** / matrix of 16-18 m^2/ha
Multiple pathways
↑ downed dead wood
↑ wind and ice resistant species

-Increased heterogeneity in resources & structure via canopy gaps, reserve patches, & single-tree removals
-Multiple response pathways

-Increase representation of ice, drought, & wind resistant spp. (yellow birch, red maple, red spruce) in harvest gaps

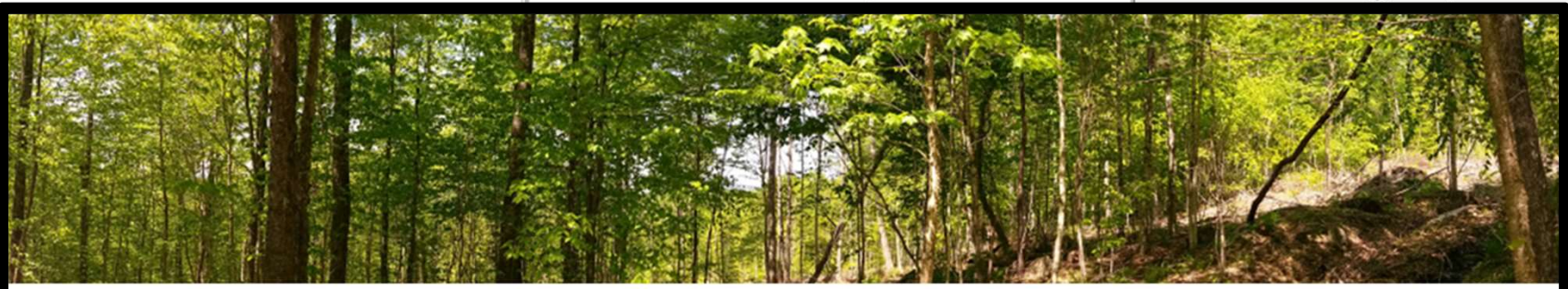
Adaptation Treatments

Treat[illegible]imes in 10-ha replicates

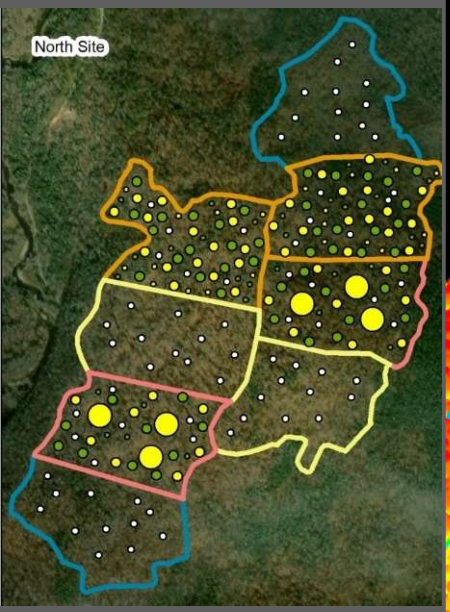
-Increase representation of future-adapted species via planting in large gaps
-Within-gap retention of reserves representing key ecological & adaptation functions (beech, red maple, yellow birch, red spruce)

Transition

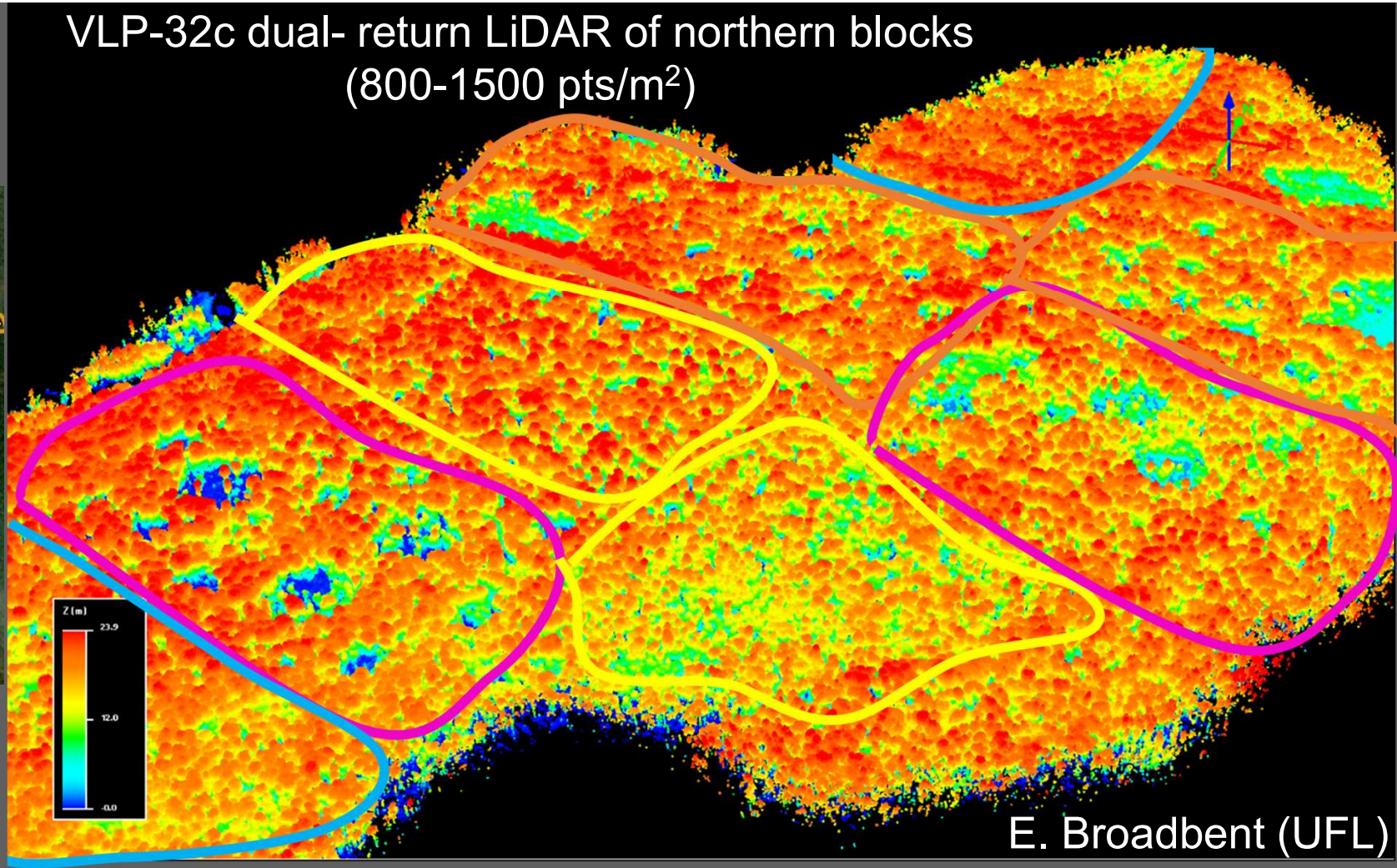
Continuous cover irregular shelterwood
20% gaps 0.1-0.4 ha / **10-20% reserves** / matrix 16-18 m^2/ha
↑ **future-adapted component through planting**

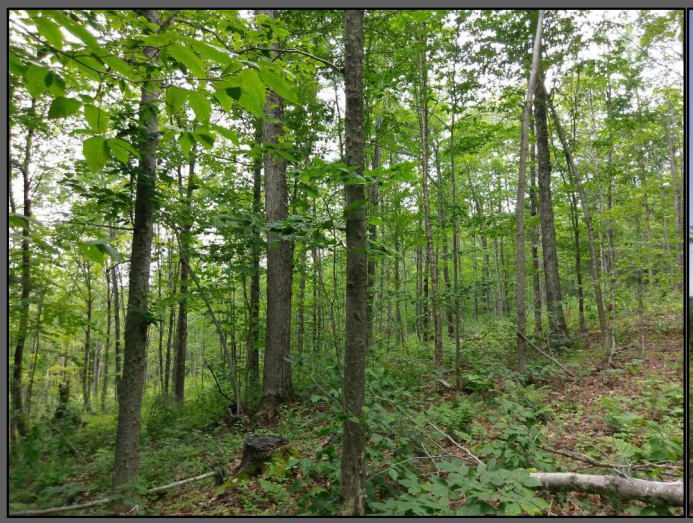


-Continuous cover irregular shelterwood (variable density thinning) to create heterogeneity, maintain multicohort structure, & provide recruitment opportunity for less tolerant species



VLP-32c dual- return LiDAR of northern blocks
(800-1500 pts/m^2)





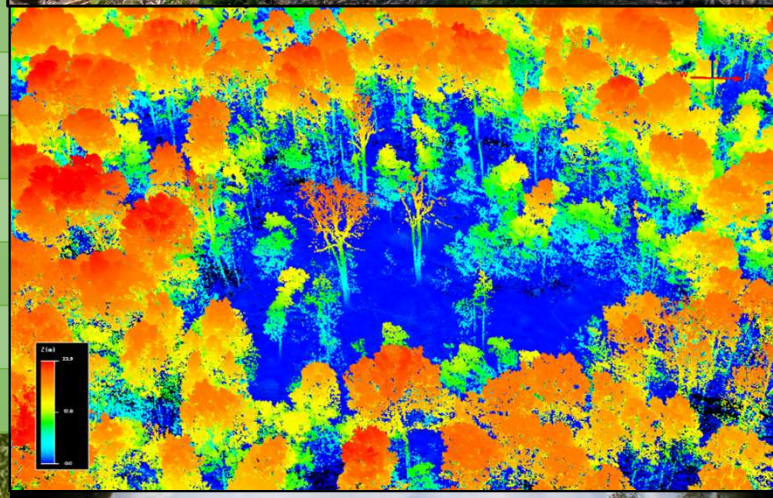
What is future adapted?

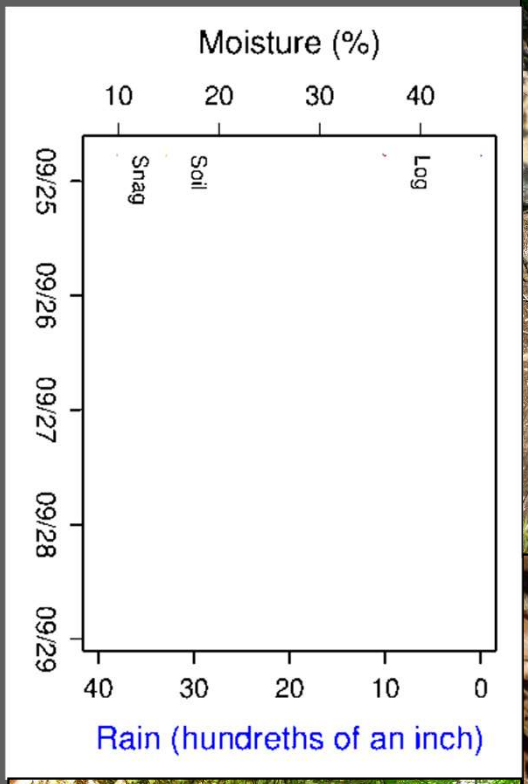
Projected changes in suitable habitat for select tree species at New England ASCC site (northern New Hampshire) by 2100 (Climate Change Tree Atlas)

Decreasing	No change	Increasing
Fagus grandifolia	*Pinus strobus*	*Quercus rubra*
Betula alleghaniensis	*Populus grandidentata*	*Betula lenta*
Picea rubens	*Castanea dentata*	*Carya cordiformis*
Acer saccharum	*Acer rubrum*	*Prunus serotina*
Tsuga canadensis		

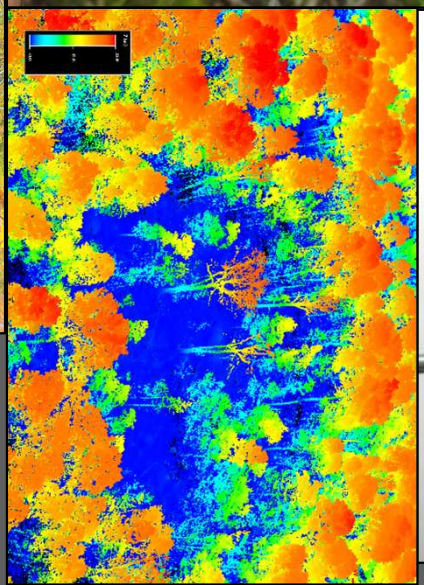
- 6500 bare-root seedlings planted at ASCC
- Planted *only in gaps* within Transition
- Species selected for functional redundancy
- Operational context, not provenance trial

SPECIES	FUTURE HABITAT
Picea rubens	*Decrease
Tsuga canadensis	*Decrease
Pinus strobus	No Change
Populus grandidentata	No Change
B3F3 *Castanea dentata* (seed)	No Change
Carya cordiformis	**Increase**
Betula lenta	**Increase**
Prunus serotina	**Increase**
Quercus rubra	**Increase**




Moisture (%)
10
20
30
40
Snag
Soil
Log
09/25
09/26
09/27
09/28
09/29
40
30
20
10
0
Rain (hundreths of an inch)


TN3
M2
44.9287
-81.0834
TheCornellLab of Ornithology
Bioacoustics Research Program



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Northern Research Station, USDA Forest Service

NE CASC Northeast Climate Adaptation Science Center

USDA NIFA United States Department of Agriculture National Institute of Food and Agriculture

The University of Vermont

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