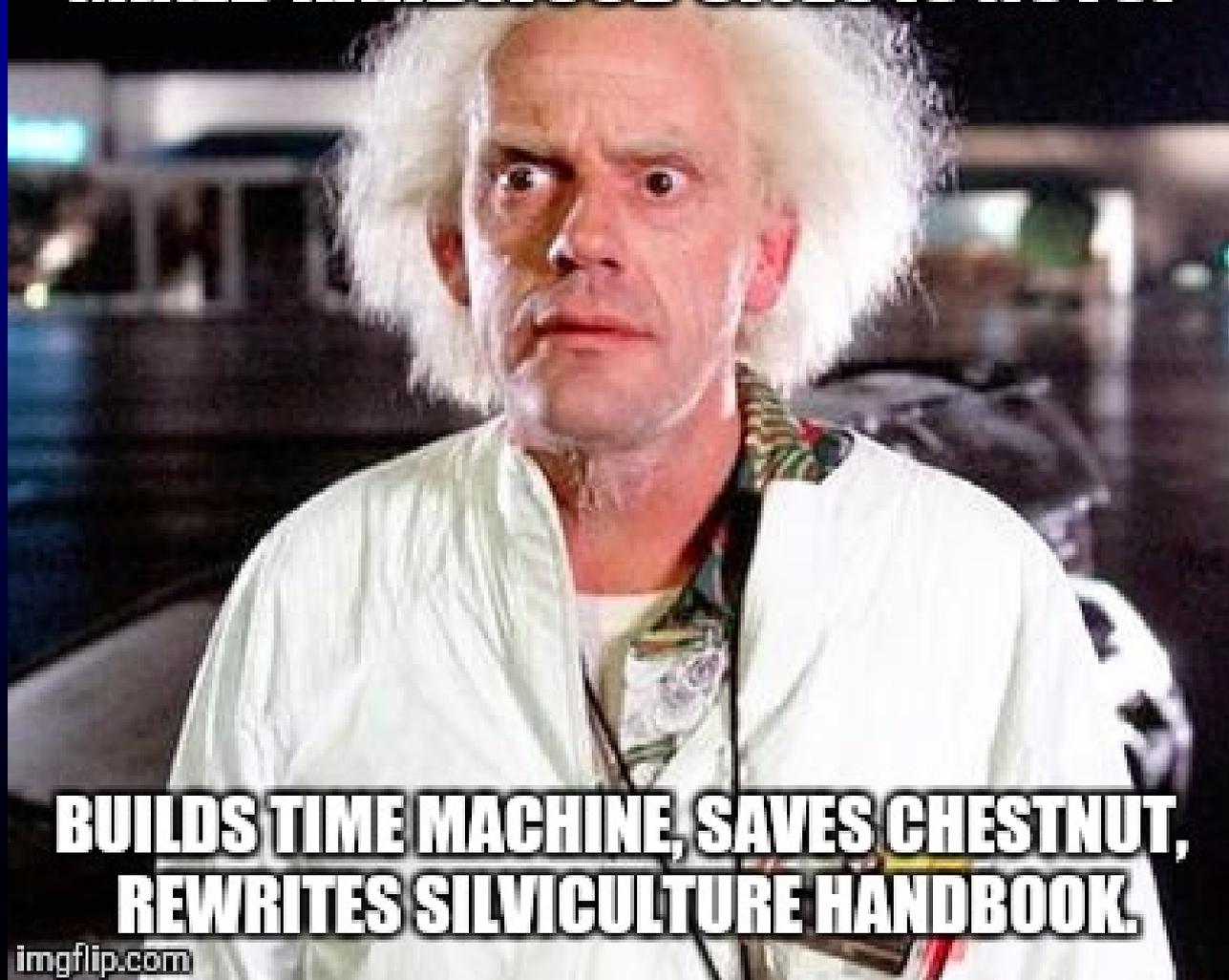
A photograph of a person wearing a red jacket, orange beanie, and brown pants walking along a narrow, snow-covered path in a forest. The path is flanked by tall, thin trees and some evergreens. In the background, a black bear is visible on the left side of the path. The scene is set in a wooded area with a mix of deciduous and coniferous trees.

# Wandering

**Jeffrey S. Ward, Station Forester**  
**Department of Forestry & Horticulture**  
**Connecticut Agricultural Experiment Station**  
**New Haven, Connecticut**

**SAYS MANAGING FOR OAK ON MESIC  
MIXED HARDWOOD SITES IS NUTS!**



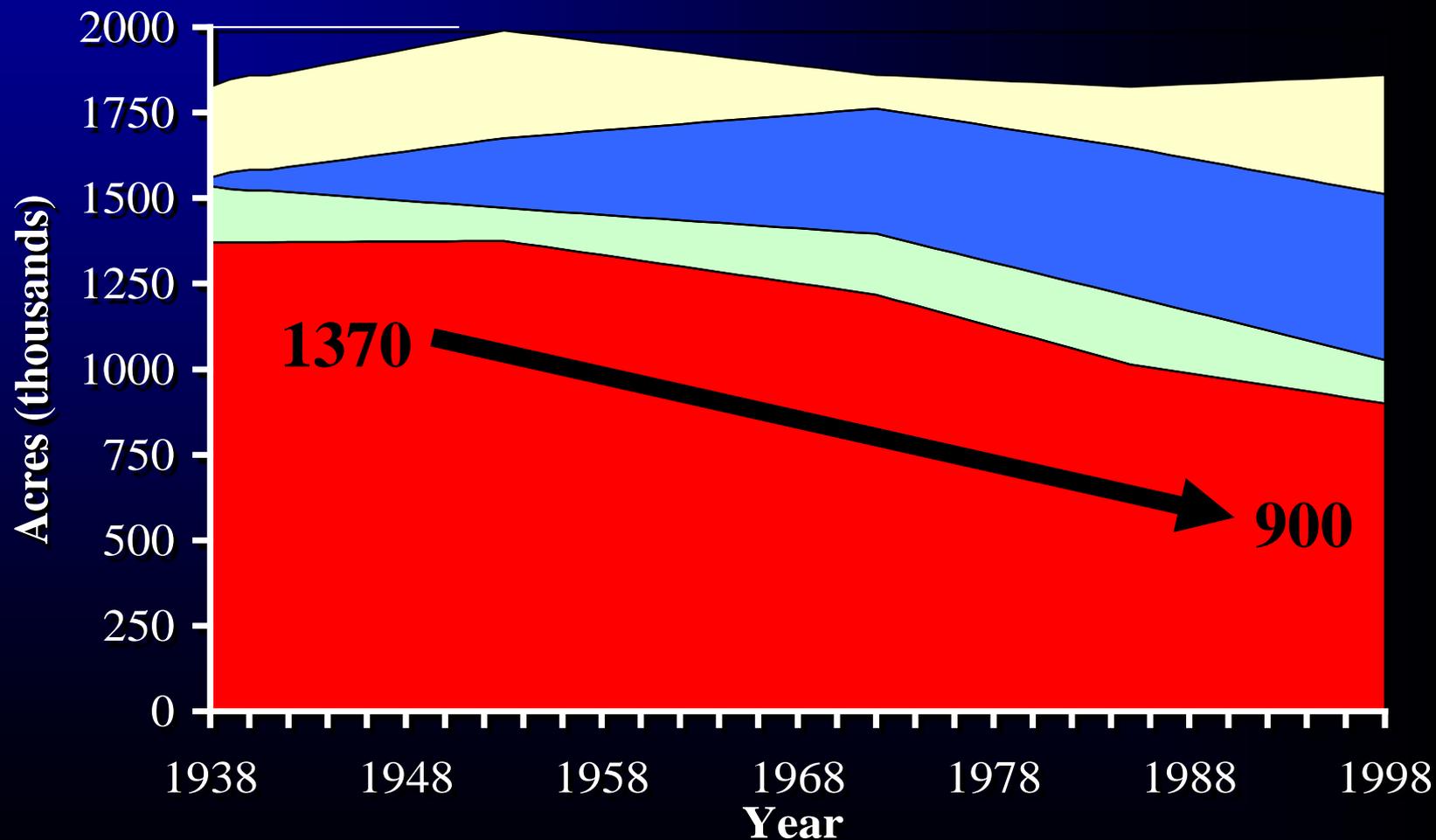
**BUILDS TIME MACHINE, SAVES CHESTNUT,  
REWRITES SILVICULTURE HANDBOOK.**



# Overlook

- **Oak regeneration and deer**
- **Oak stump sprouting**
- **Rehabilitation of high-graded stands**

# Connecticut's forest is changing



■ Oak ■ Conifer ■ Northern hardwood ■ Miscellaneous



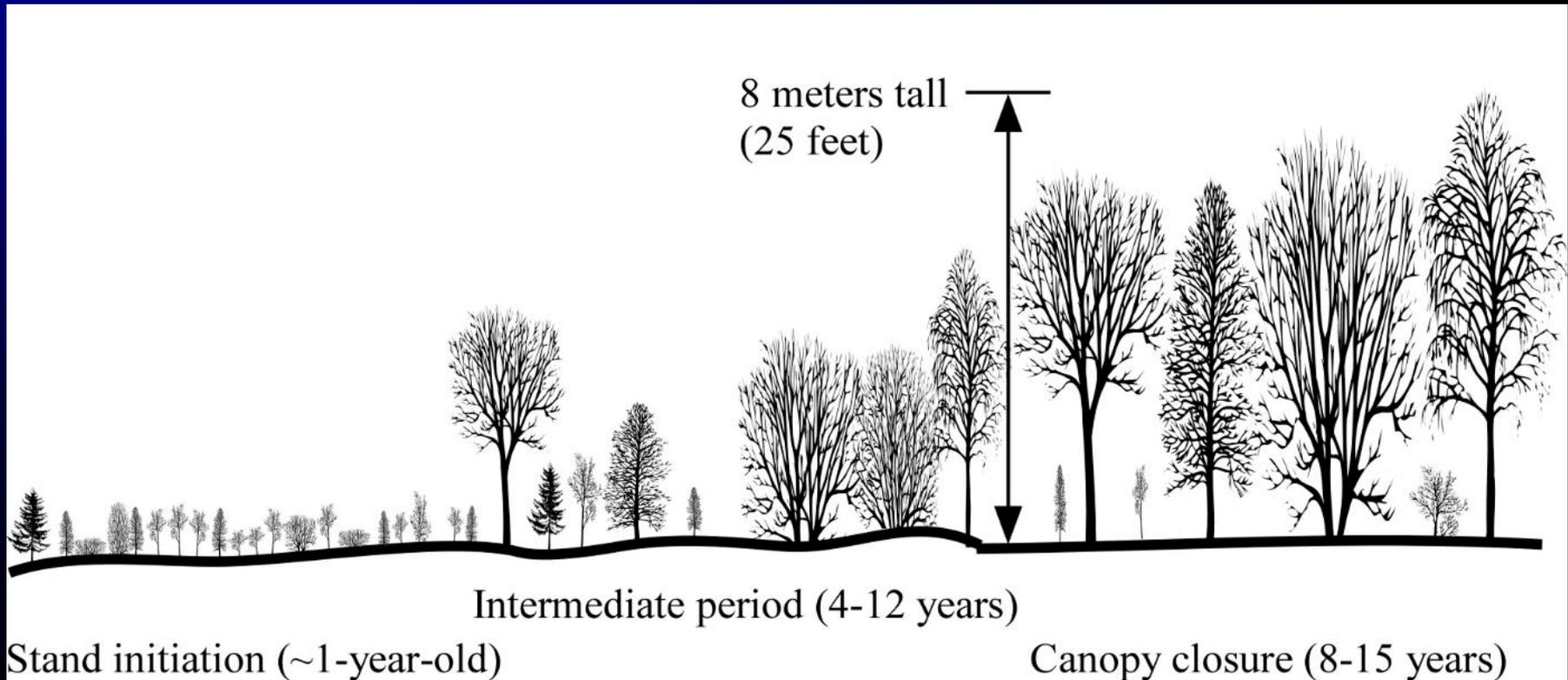
## **The Challenge**

**Oak regeneration on better quality sites is often hampered by taller red maple and birch that develop in earlier phases of stand management, especially after thinning and “selection” harvests.**

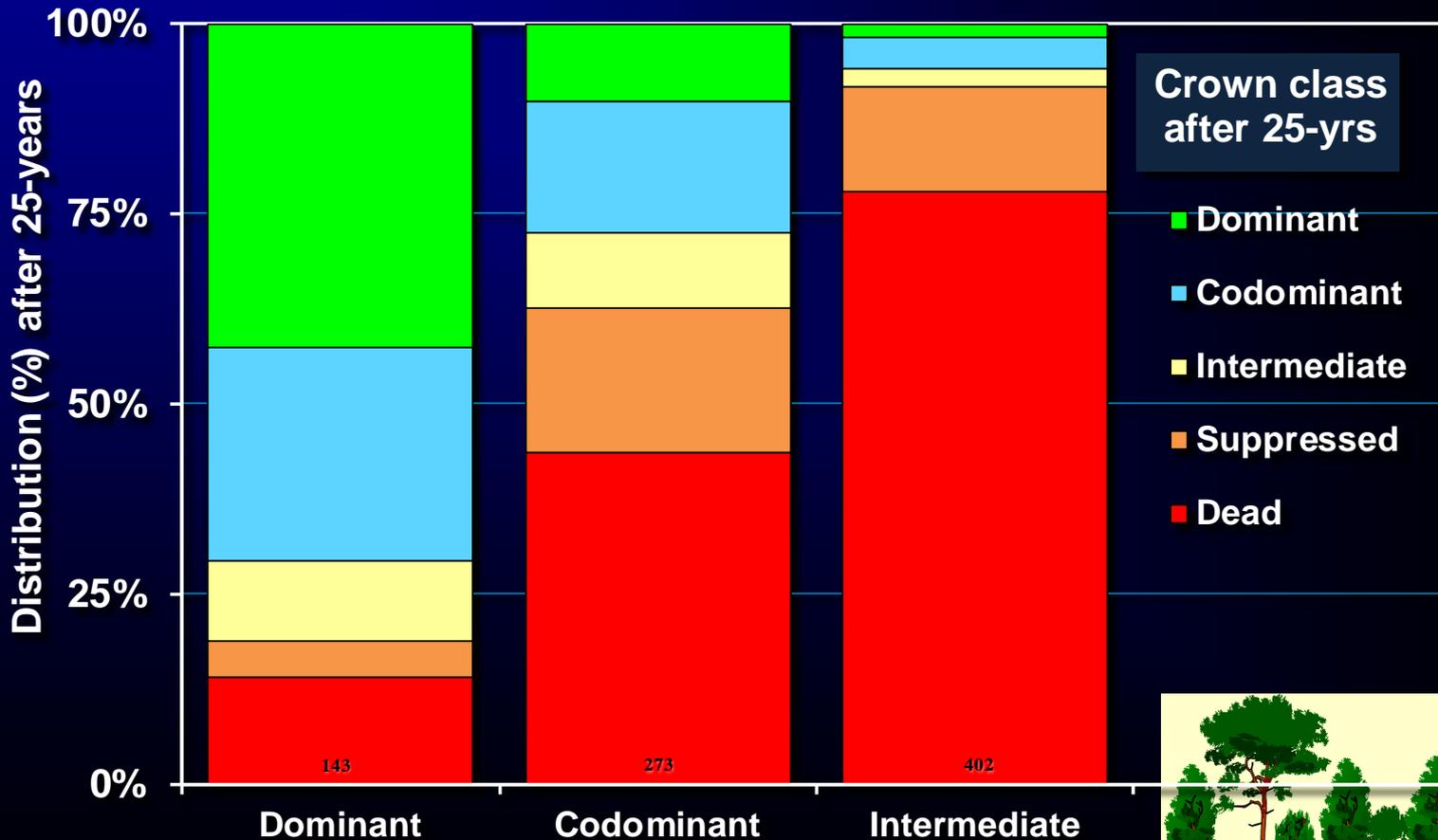


**7-year-old sand**

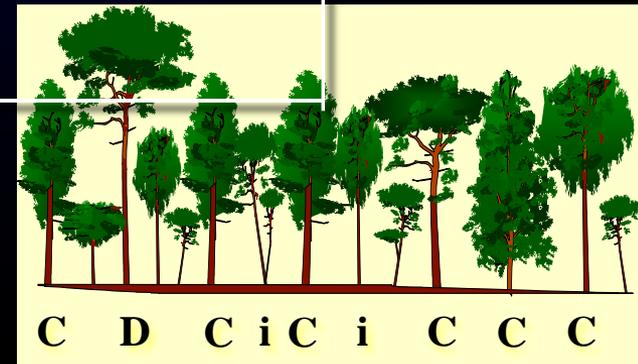
# Canopy closure begins the crucial period of rapid self-thinning



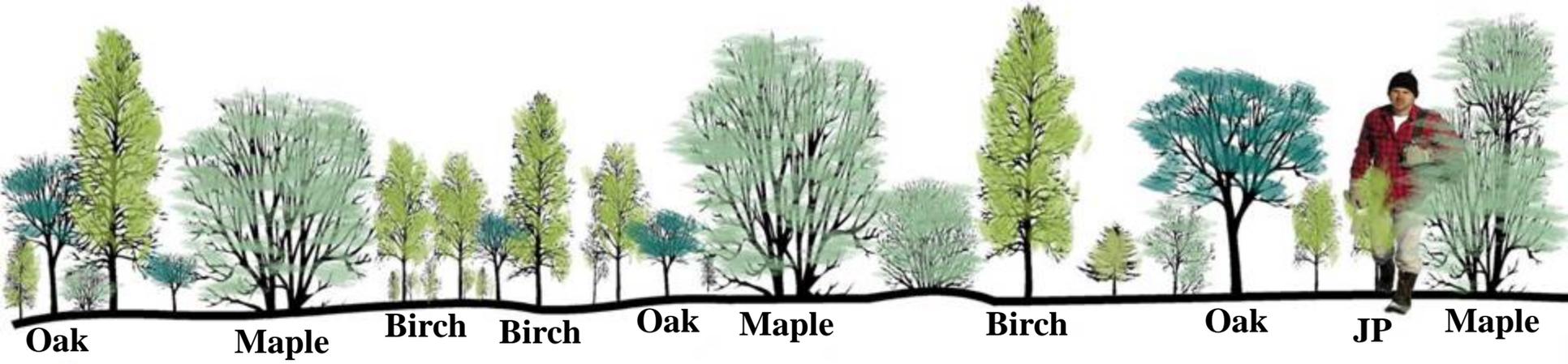
# Without release – most codominants & intermediates regress or die



Initial crown class at canopy closure



Upland oaks



Oak

Maple

Birch

Birch

Oak

Maple

Birch

Oak

JP

Maple



# Oak regeneration assessment



# Oak Regeneration Study

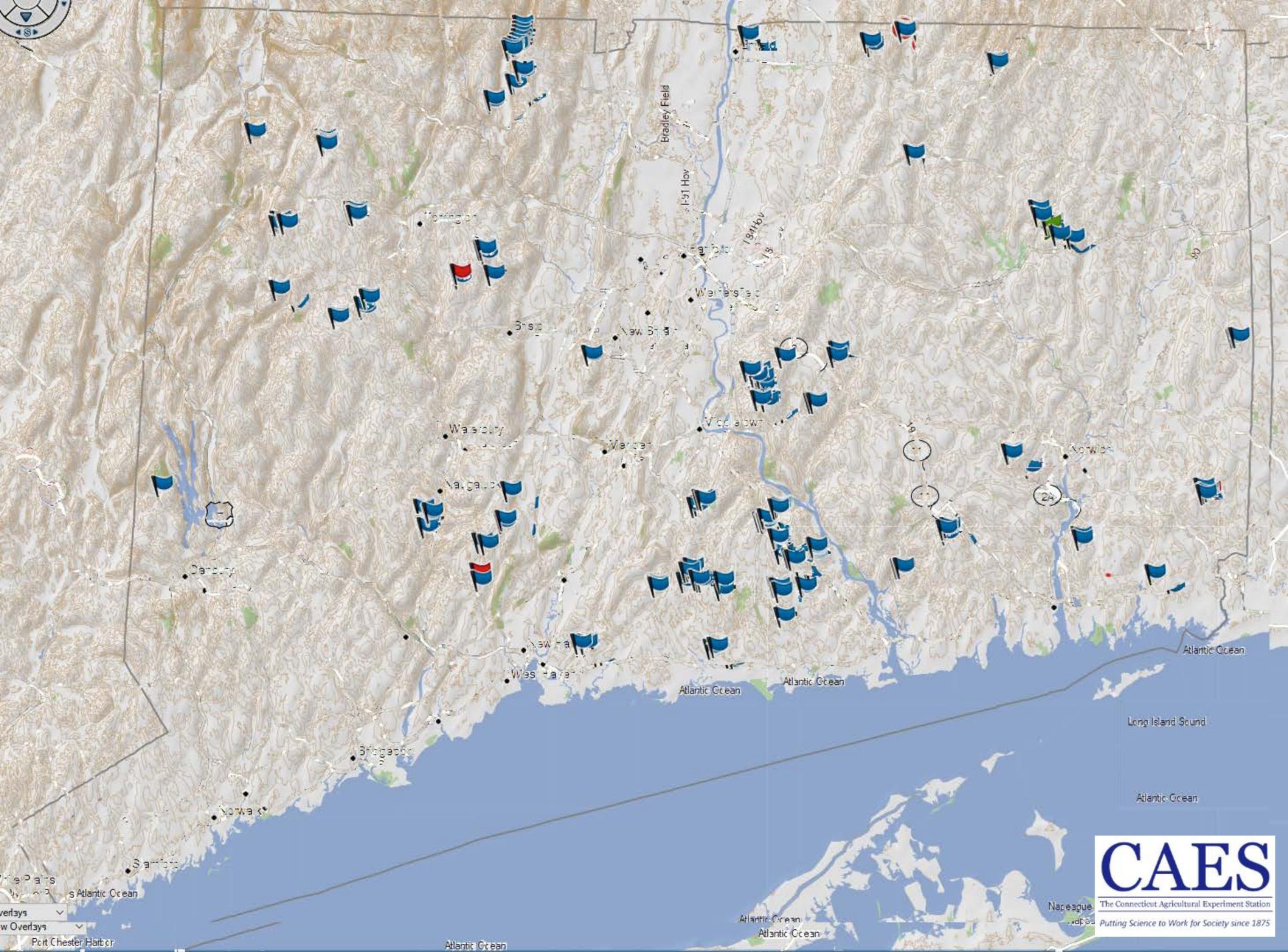
**108 stands**

**2210 points**

**4484 acres**

**~ 2.0 acres per point**





Map overlays  
with Overlays  
Port Chester Harbor



- 10-factor prism of residuals
- Cover of ferns, shrubs, overstory, midstory
- Will incorporate soils, LIDAR topo parameters



# Regeneration I

(1/1000 ha, ~1/400 acre)

All stems  $\geq$  3 feet

- Species
- Height class (3-6 ft, 6-9 ft, >9 ft)
- Free-to-grow (or not). In shelterwoods – presumed residuals would be cut



# Regeneration II

(1/2,500 ha, ~milacre)

**Oak, hickory, or eastern white pine 1-3 feet tall**

- **Species**
- **Height class (1-3 ft)**
- **Free-to-grow (or not)**



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**Open**  
**< 25ft<sup>2</sup>/acre (n=32)**

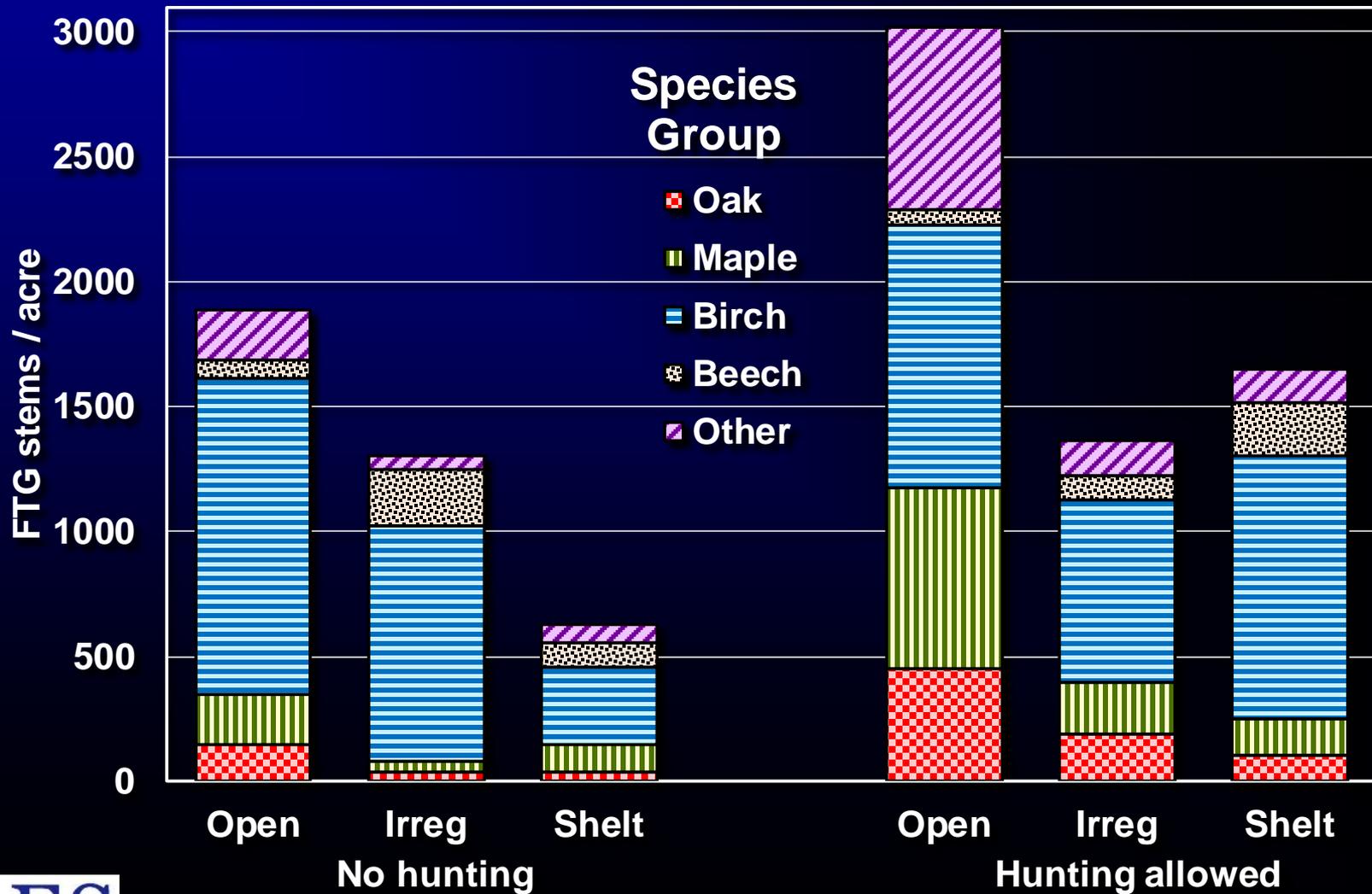


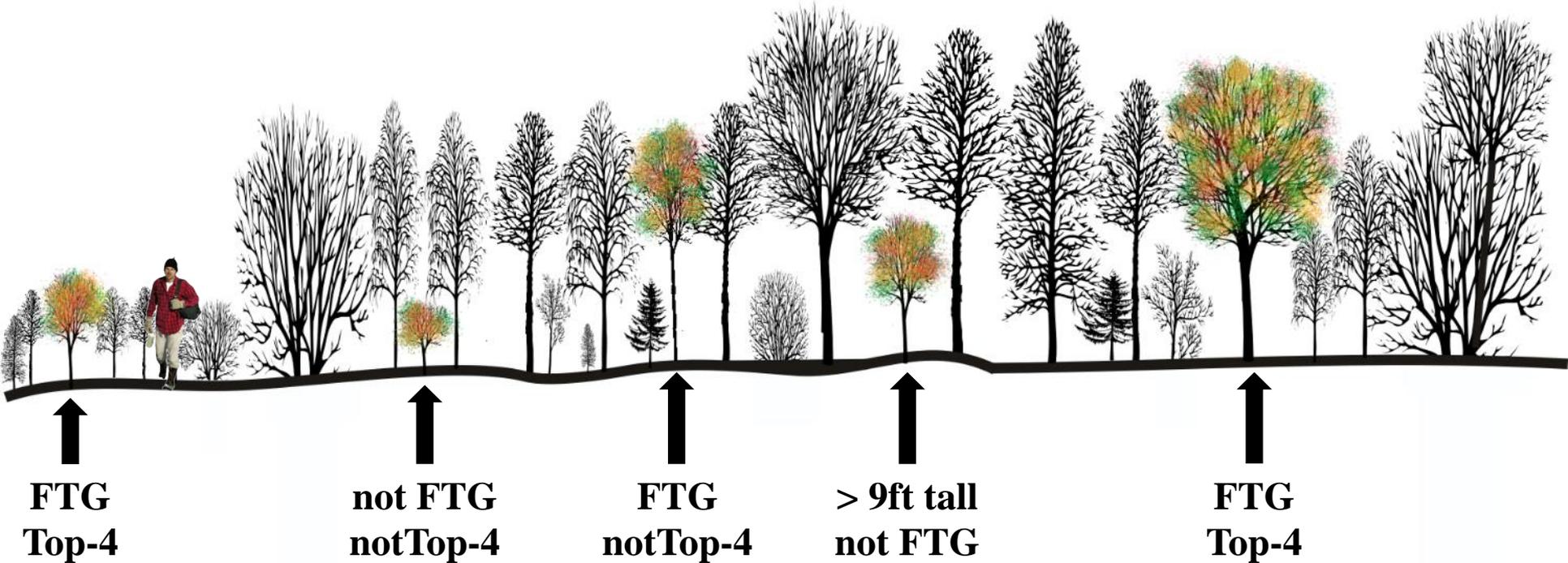
**Irregular shelterwood**  
**25-50 ft<sup>2</sup>/acre (n=45)**



**Shelterwood**  
**50-90 ft<sup>2</sup>/acre (n=31)**

# Birch is the future





## Top 4 trees

- Largest four (4) trees capable of forming part of upper canopy in a mature forest
- Had to be free-to-grow, no minimum height
- Could be fewer than four

# Free-to-grow vs. Top-4

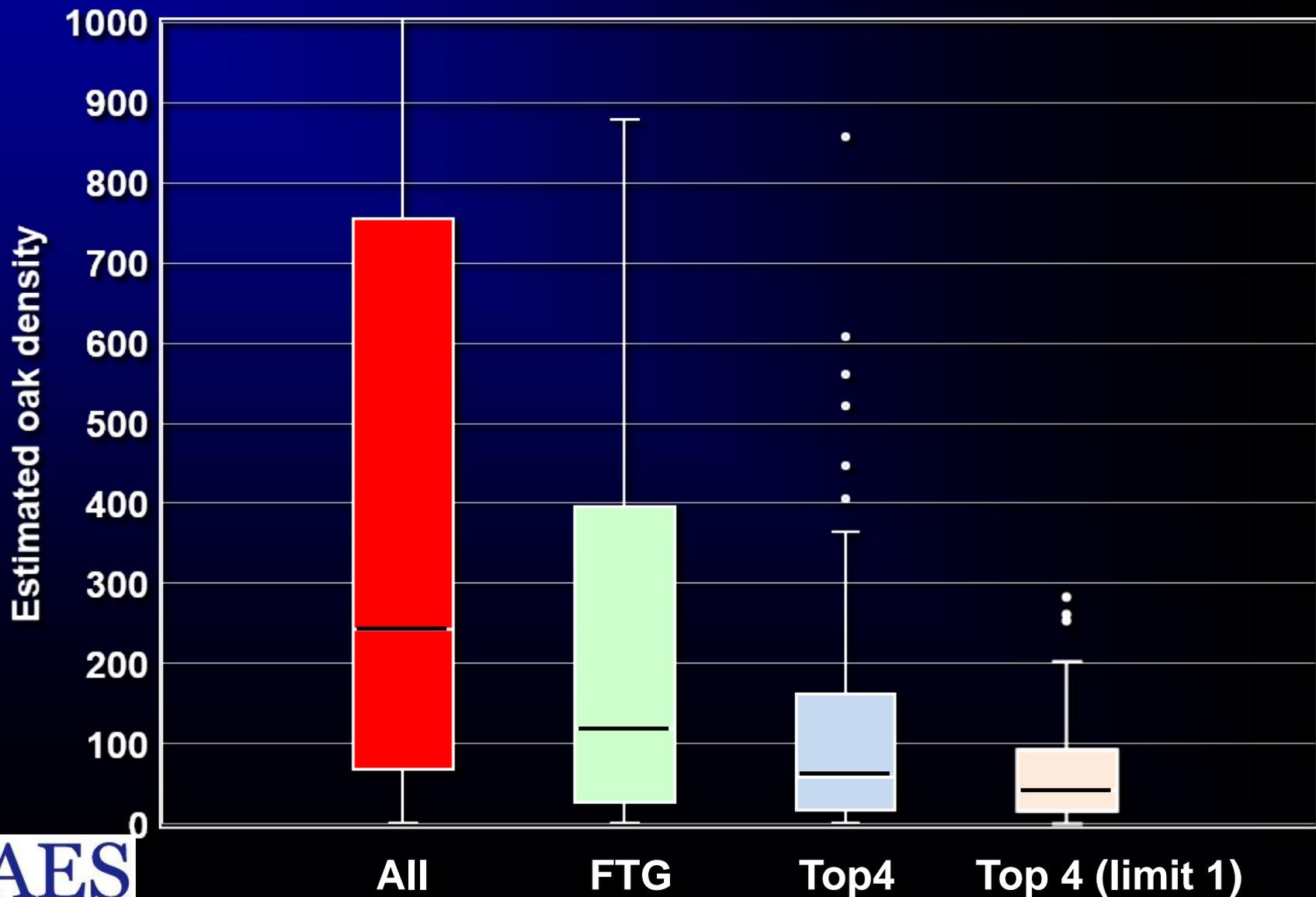


Free-to-grow, not Top-4



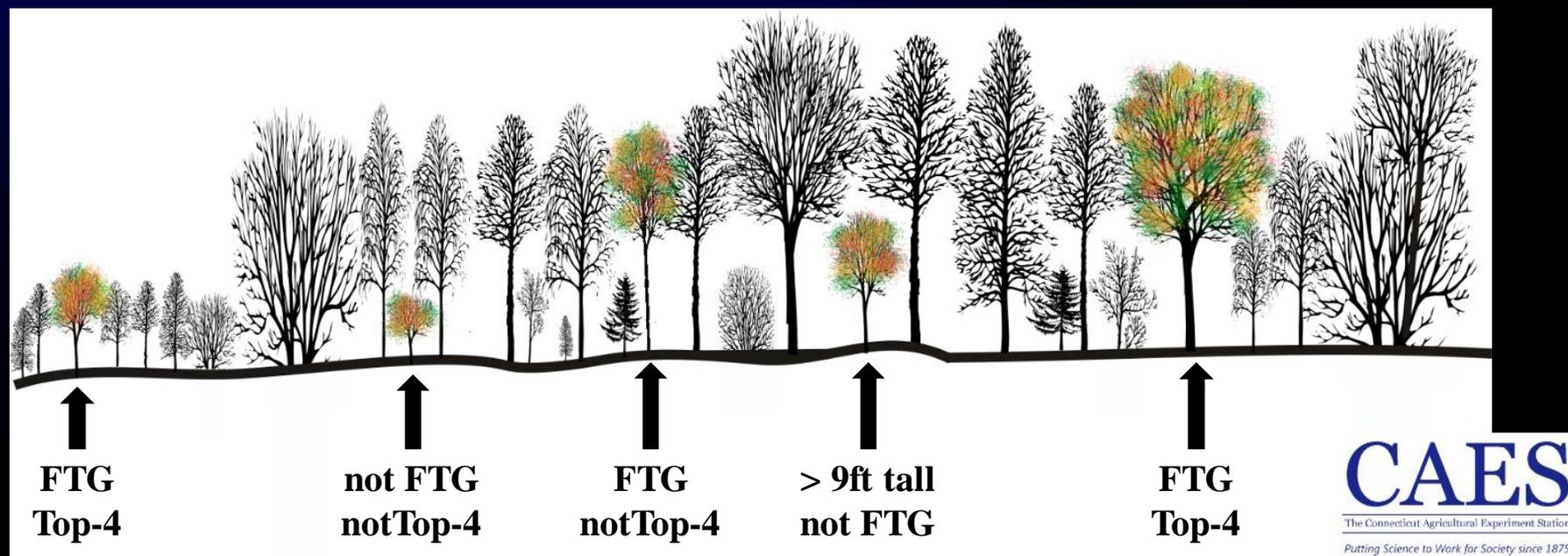
Top-4

# Oak density estimates by method



# Caveats for following

- Each 1/400 acre plot with a Top-4 oak will have an oak in upper canopy at canopy closure that will then persist through stand maturity.
- But, each 1/400 acre plot can only have one upper canopy oak that persists.



# Caveats for following

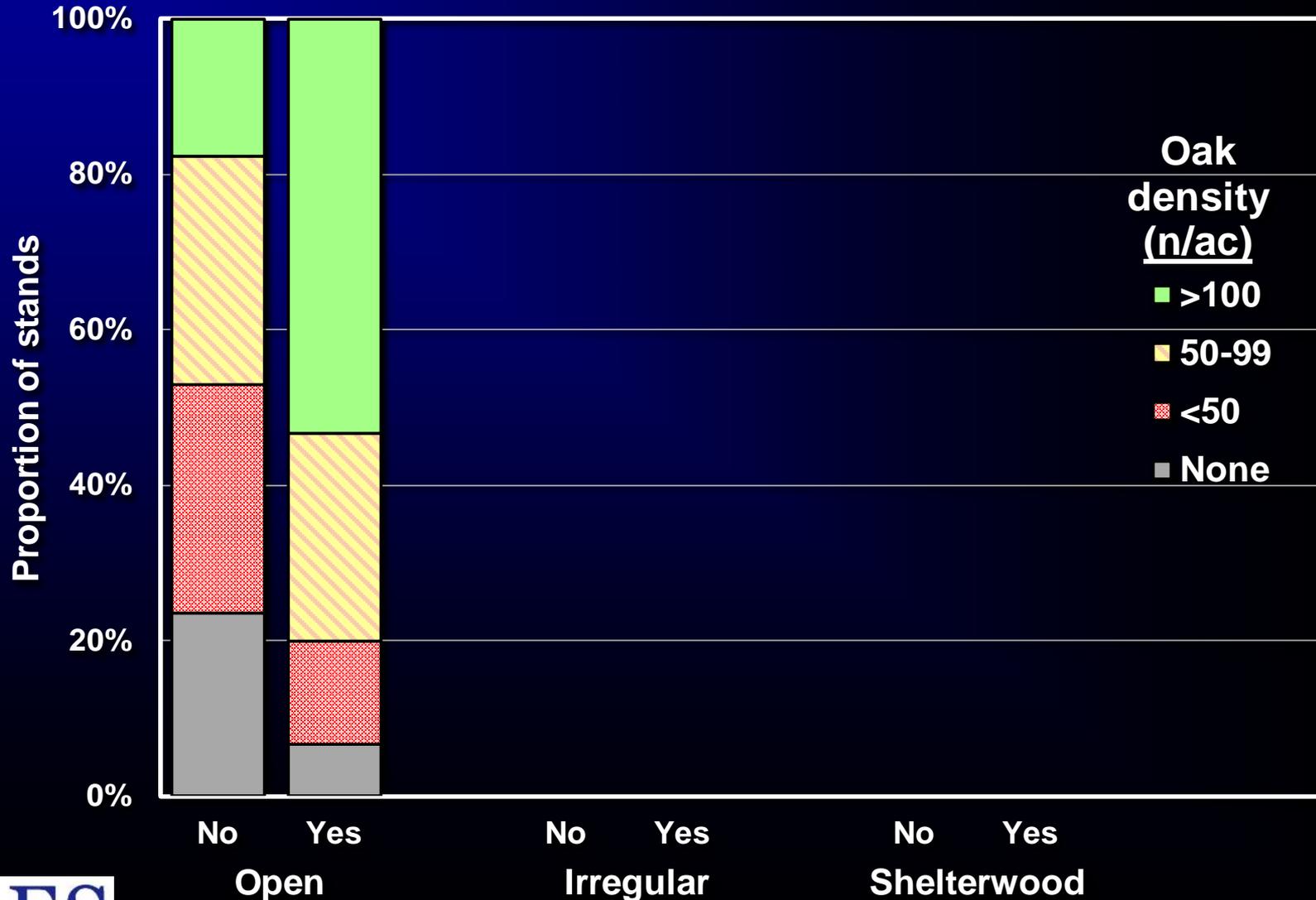
- Each 1/400 acre plot with a Top-4 oak will have an oak in upper canopy at canopy closure that will then persist through stand maturity.
- But, each 1/400 acre plot can only have one upper canopy oak that persists.

## A little math ...

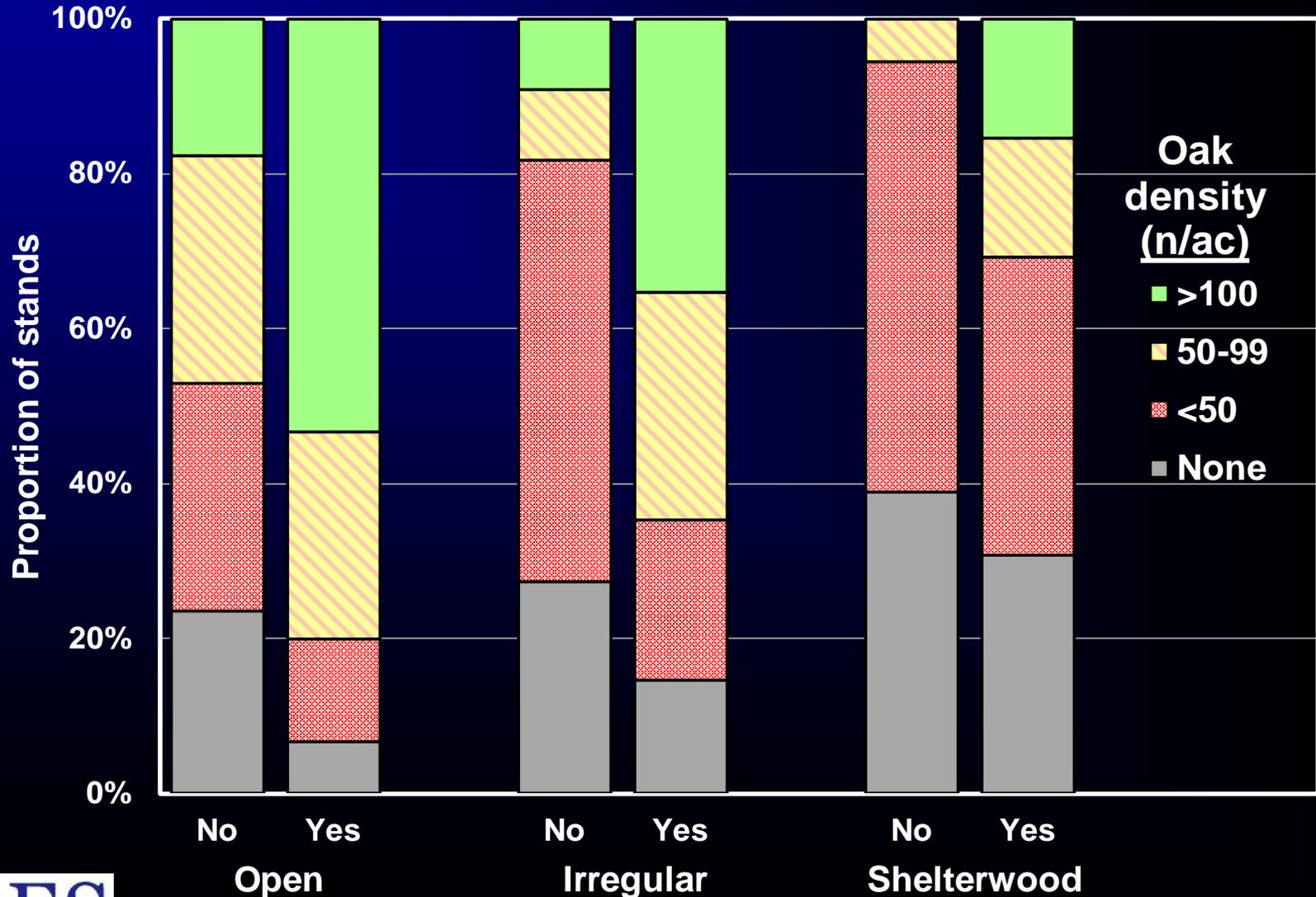
Expected oaks/acre =

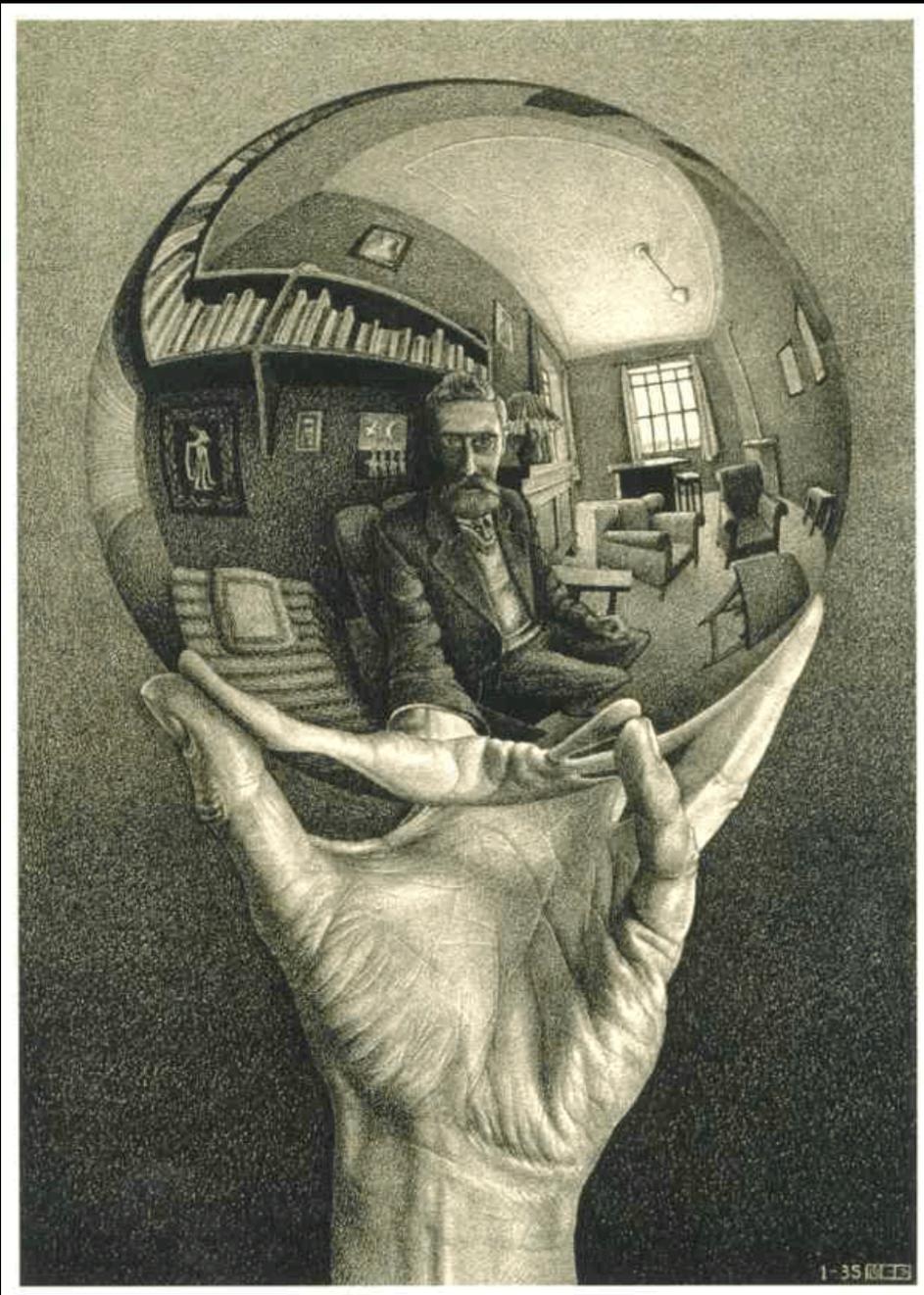
(% points with a Top-4 Oak) \* 400

# Hunting increases oak



# Overstory density not so good





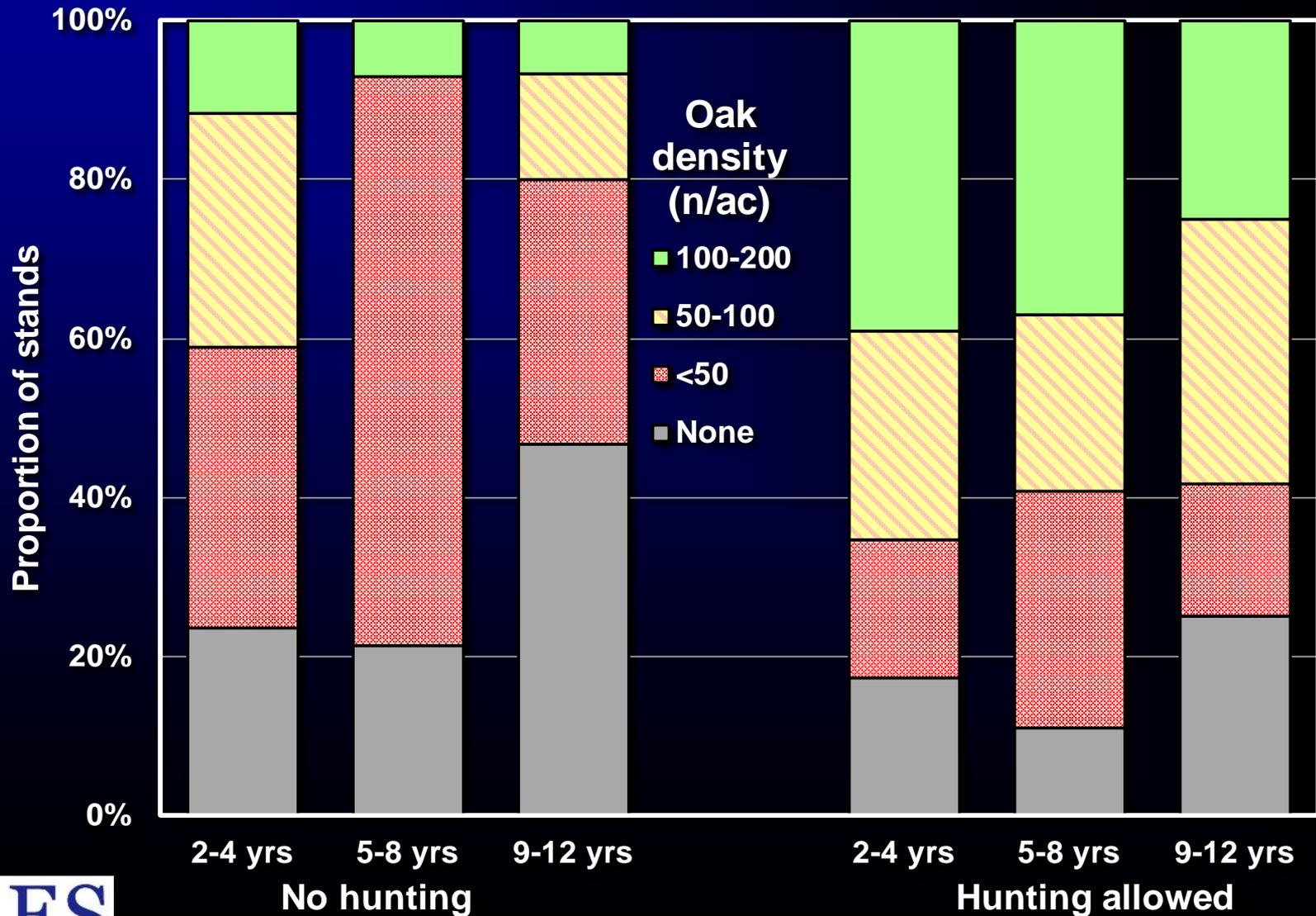
1-35

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# Oak fades without hunting



# Bad advice if you want oak



**No fires  
in forest**

**Leave  
the trees**



**Don't  
hunt**



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**CAES – New Haven**

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**jeffrey.ward@ct.gov**

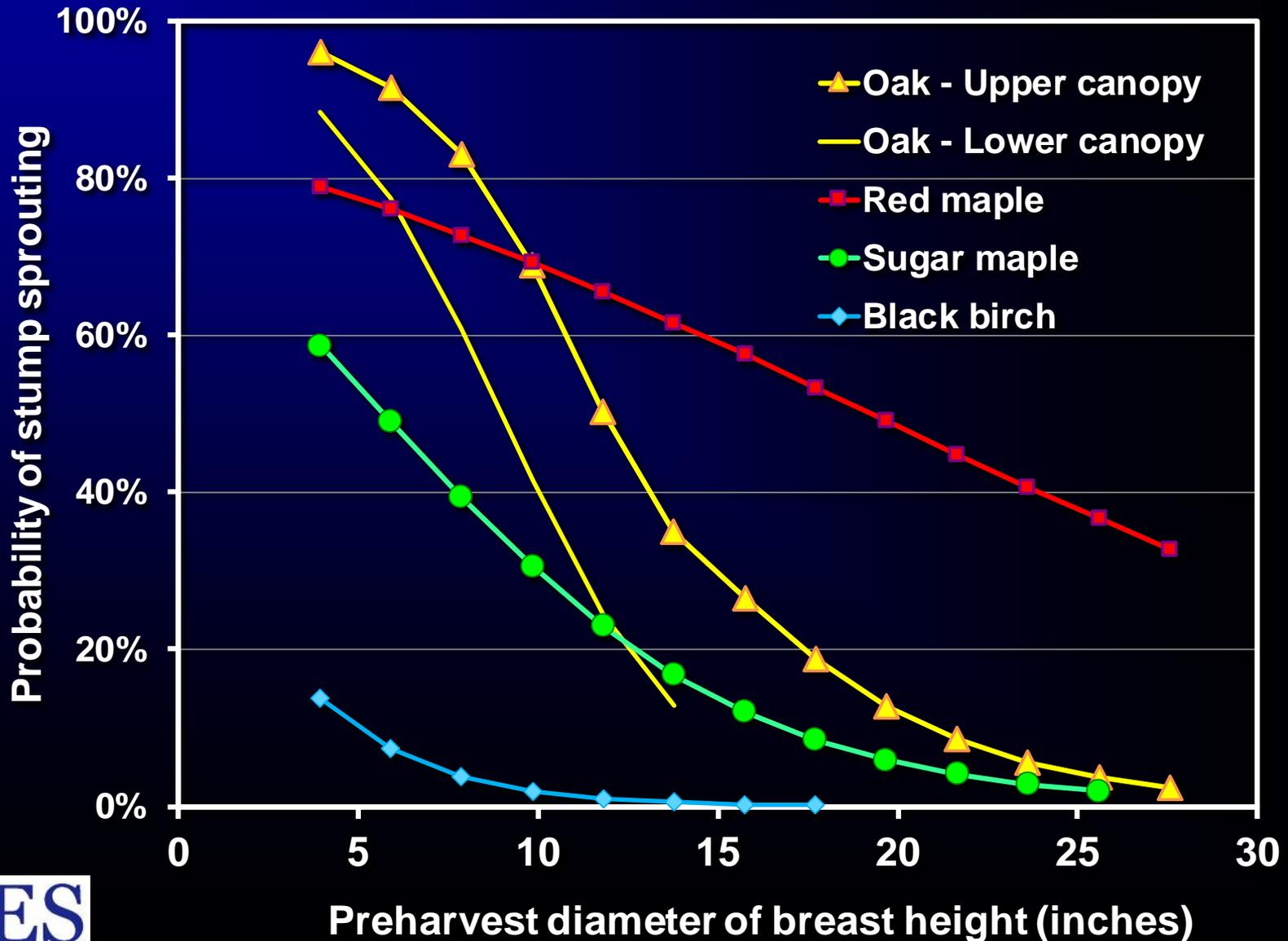






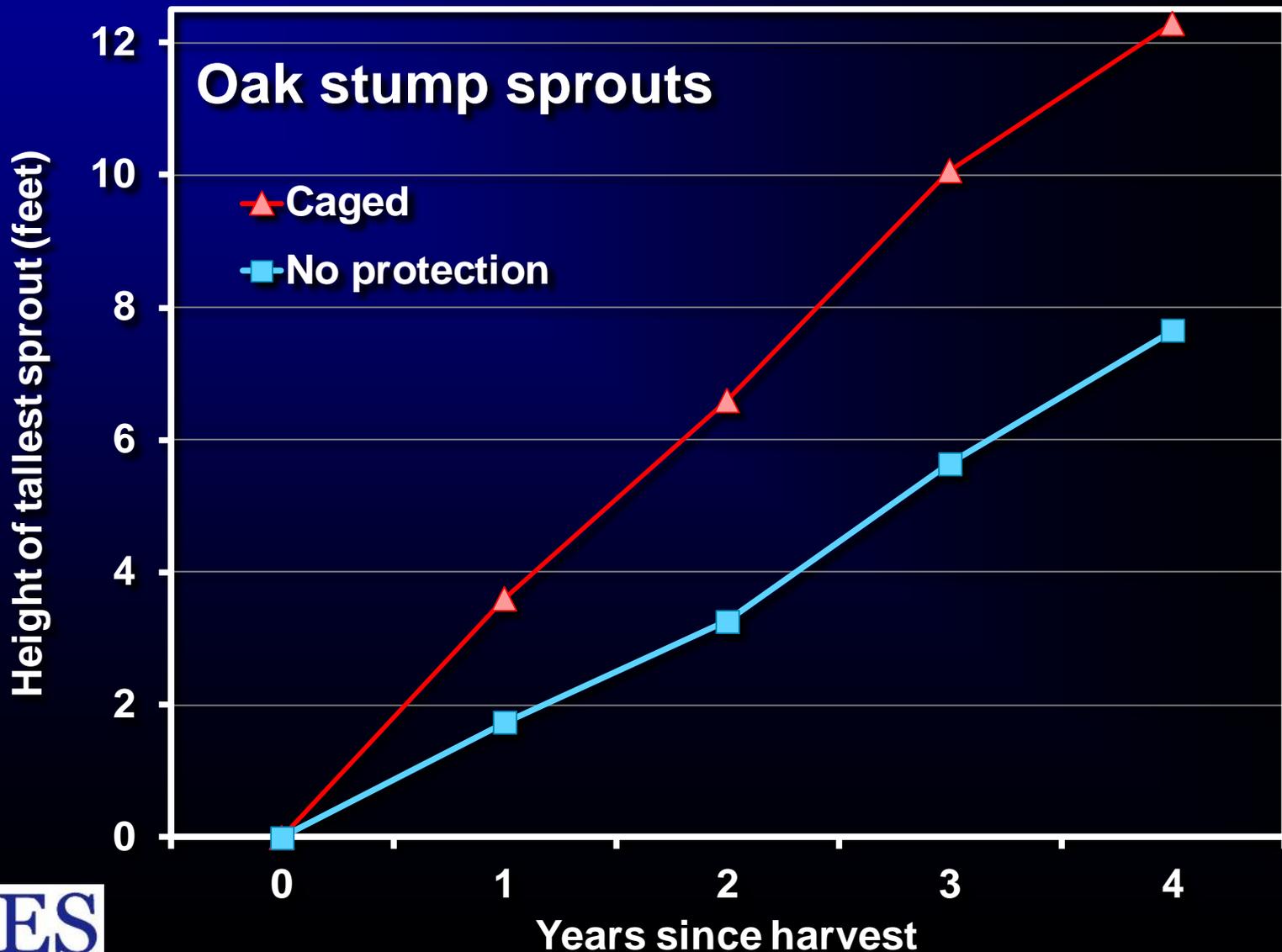
**4-yr-old sprout**

# Big oaks don't sprout

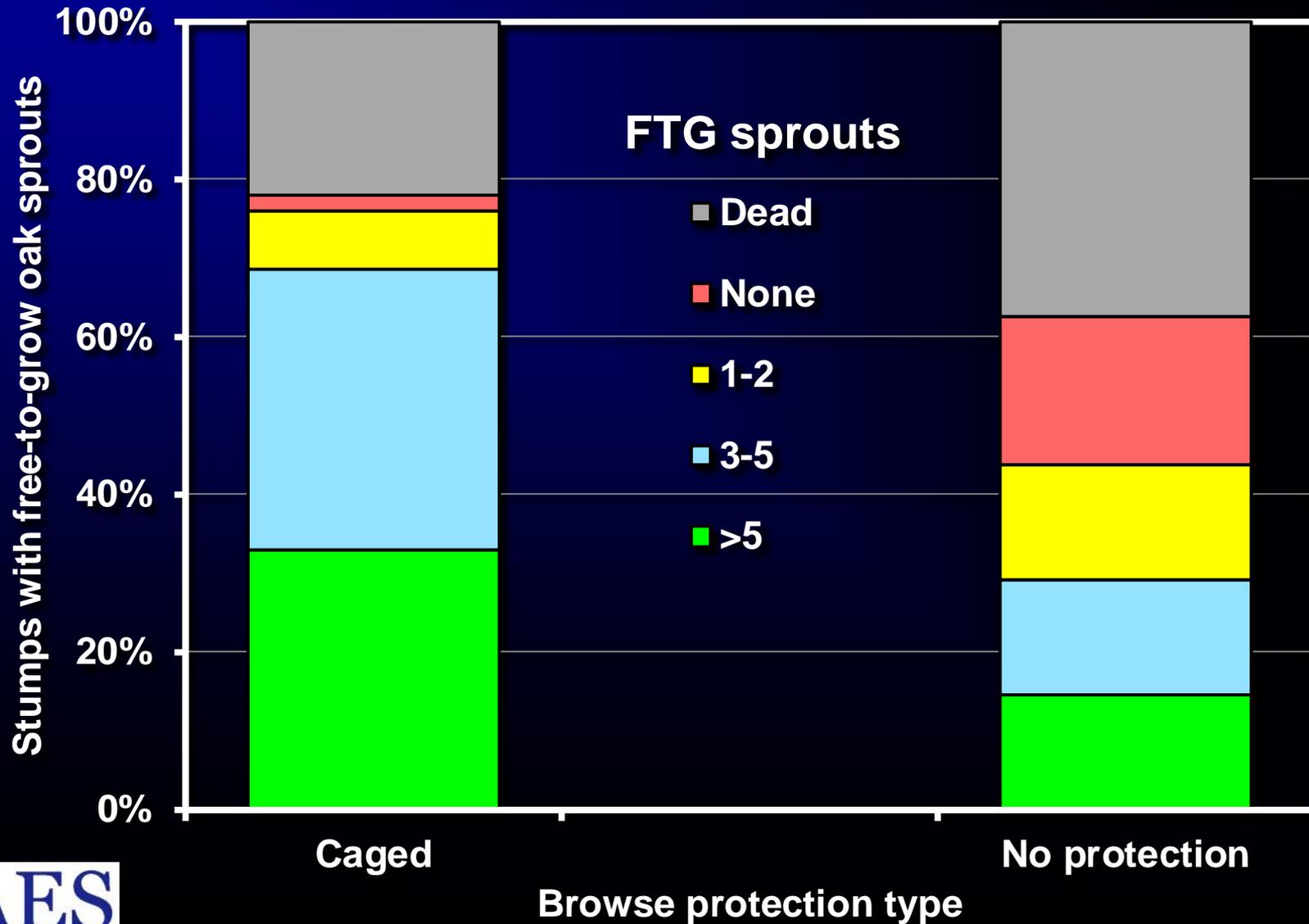




# Browse slows growth just enough

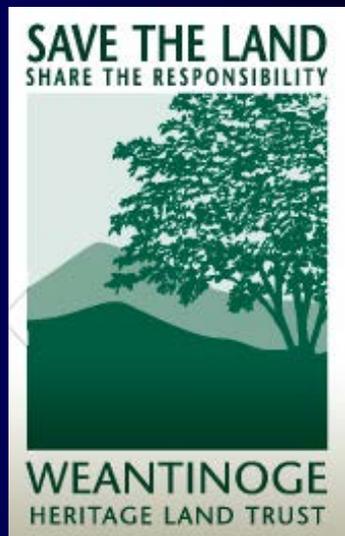


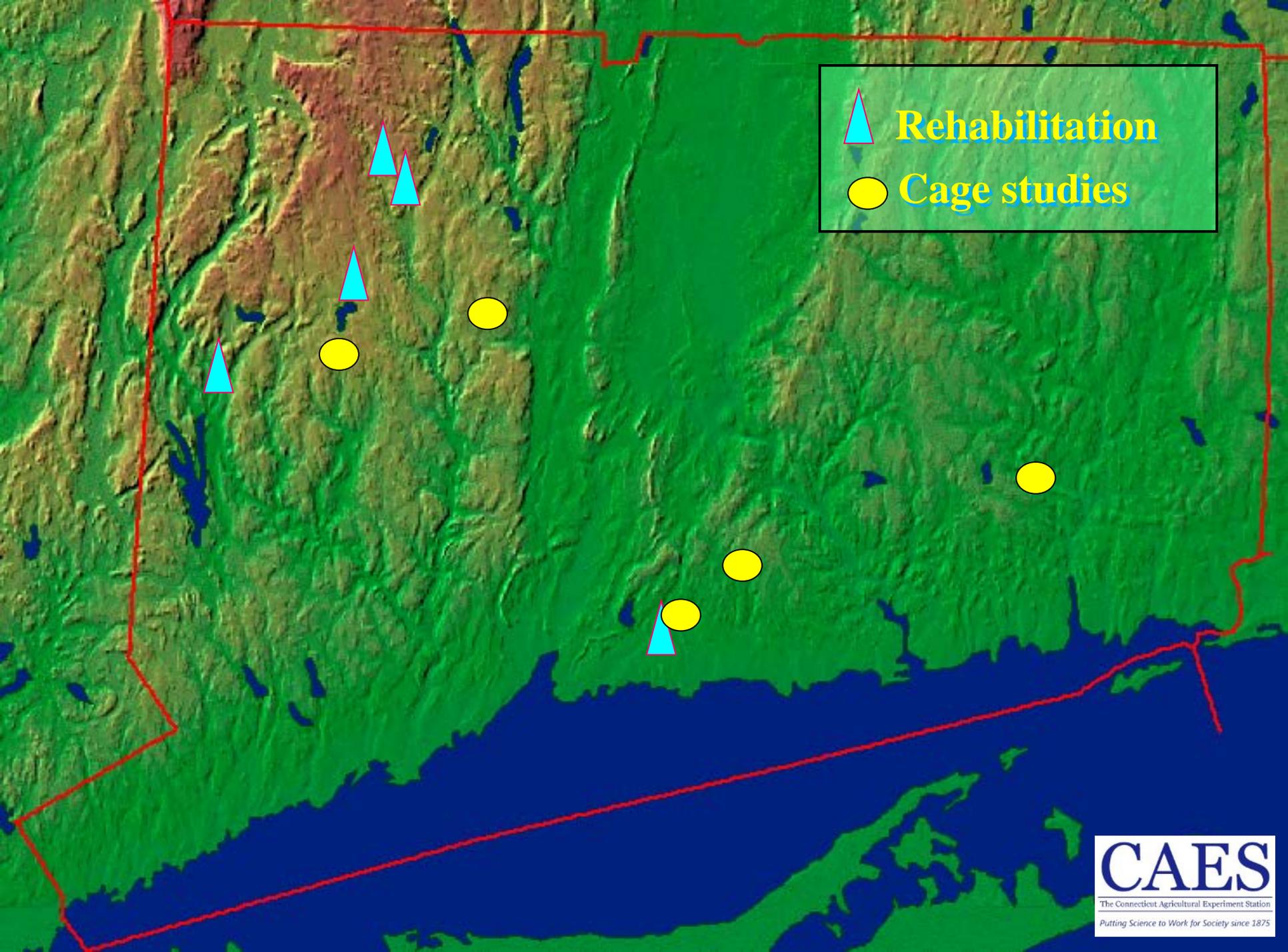
# A little browse damage ...





# Forest Rehabilitation





 **Rehabilitation**

 **Cage studies**

# Decision chart

## Low intensity rehabilitation

### INITIAL PLOT CONDITION

At least five well-spaced quality poletimber trees

Yes →

### PRESCRIPTION GOAL

#### Poletimber plot

Cut larger competitors of five to ten target poles

No ↓

Ten well-spaced saplings of desirable species

Yes →

#### Sapling plot

Cut all poles and culls

No ↓

Two to four well-spaced quality poletimber trees

Yes →

#### Two-aged plot

Cut all poles and culls except target poles

No ↓

#### Regeneration plot

Advanced regeneration or saplings of desirable species present

Yes →

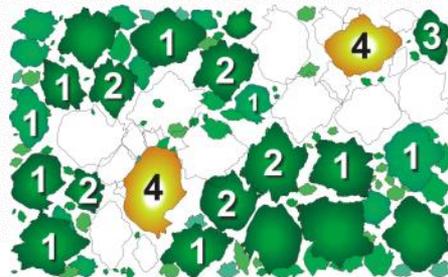
#### Release regeneration

Cut all poles and culls

No ↓

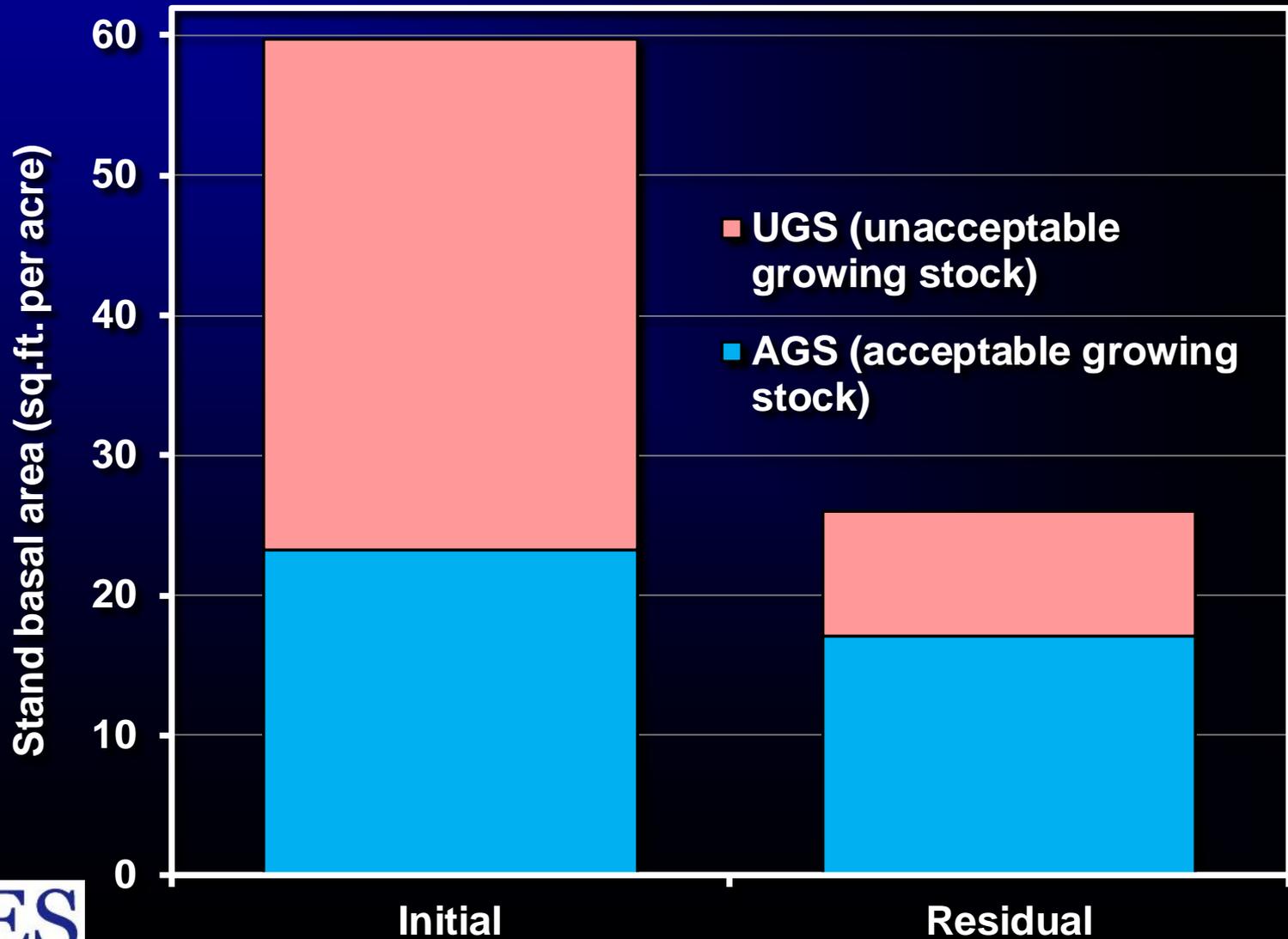
#### Initiate regeneration

Cut all culls and poles except those retained as seed source; broadcast control of interfering vegetation if needed.



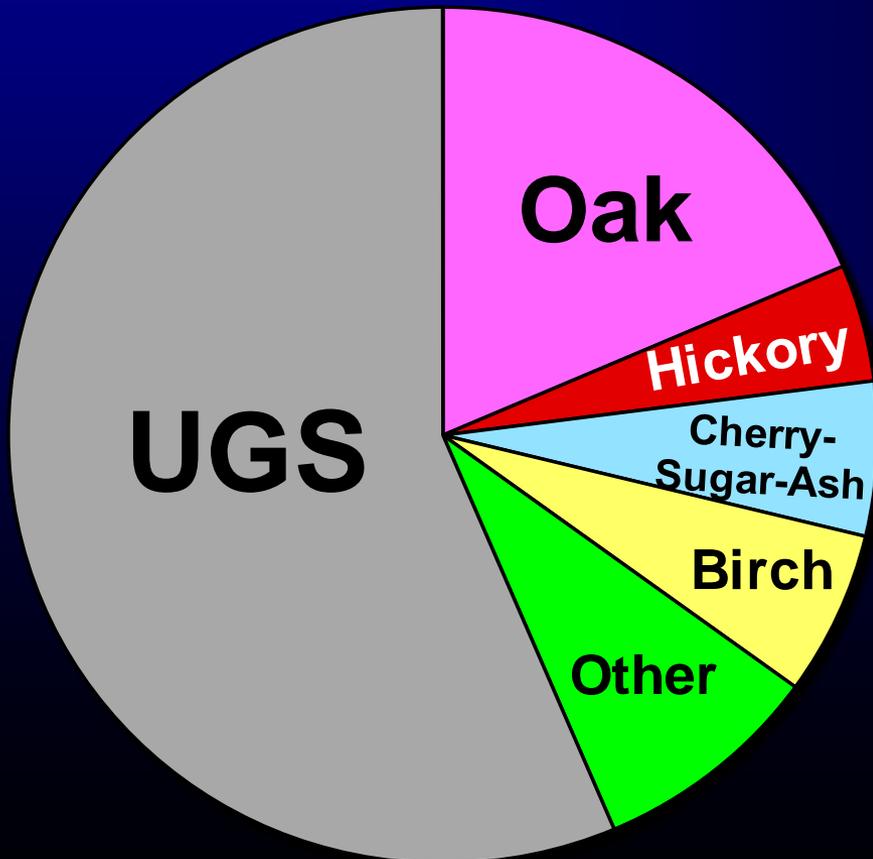
1/10 acre plots,  
~30 ft radius

# We removed most of UGS

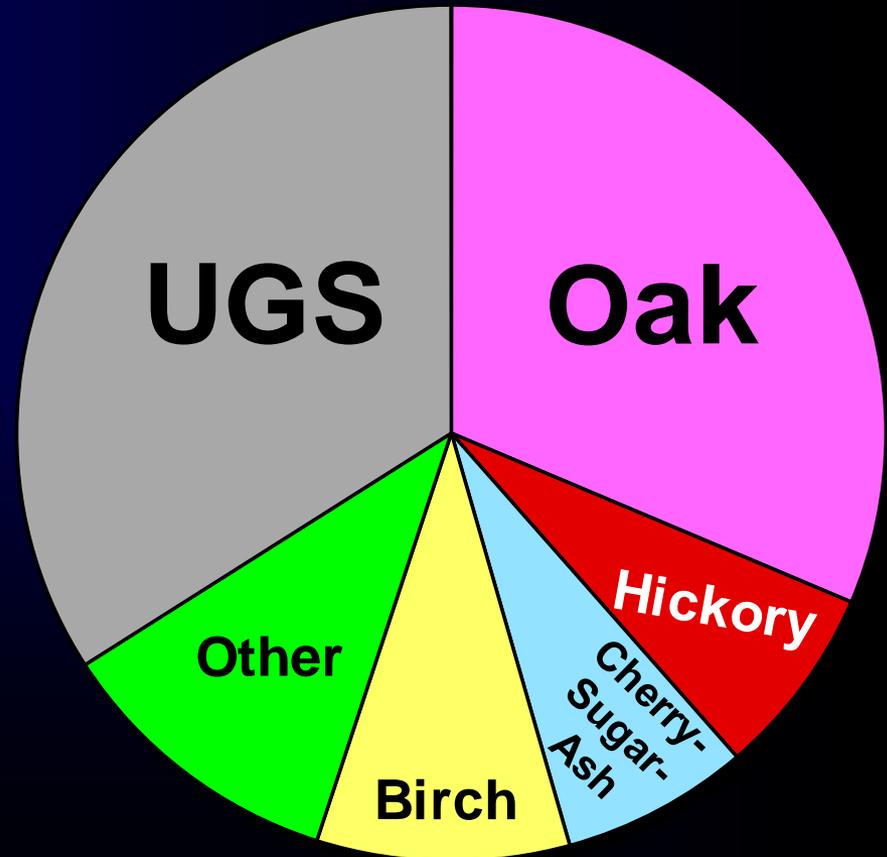


# Release improved stand composition

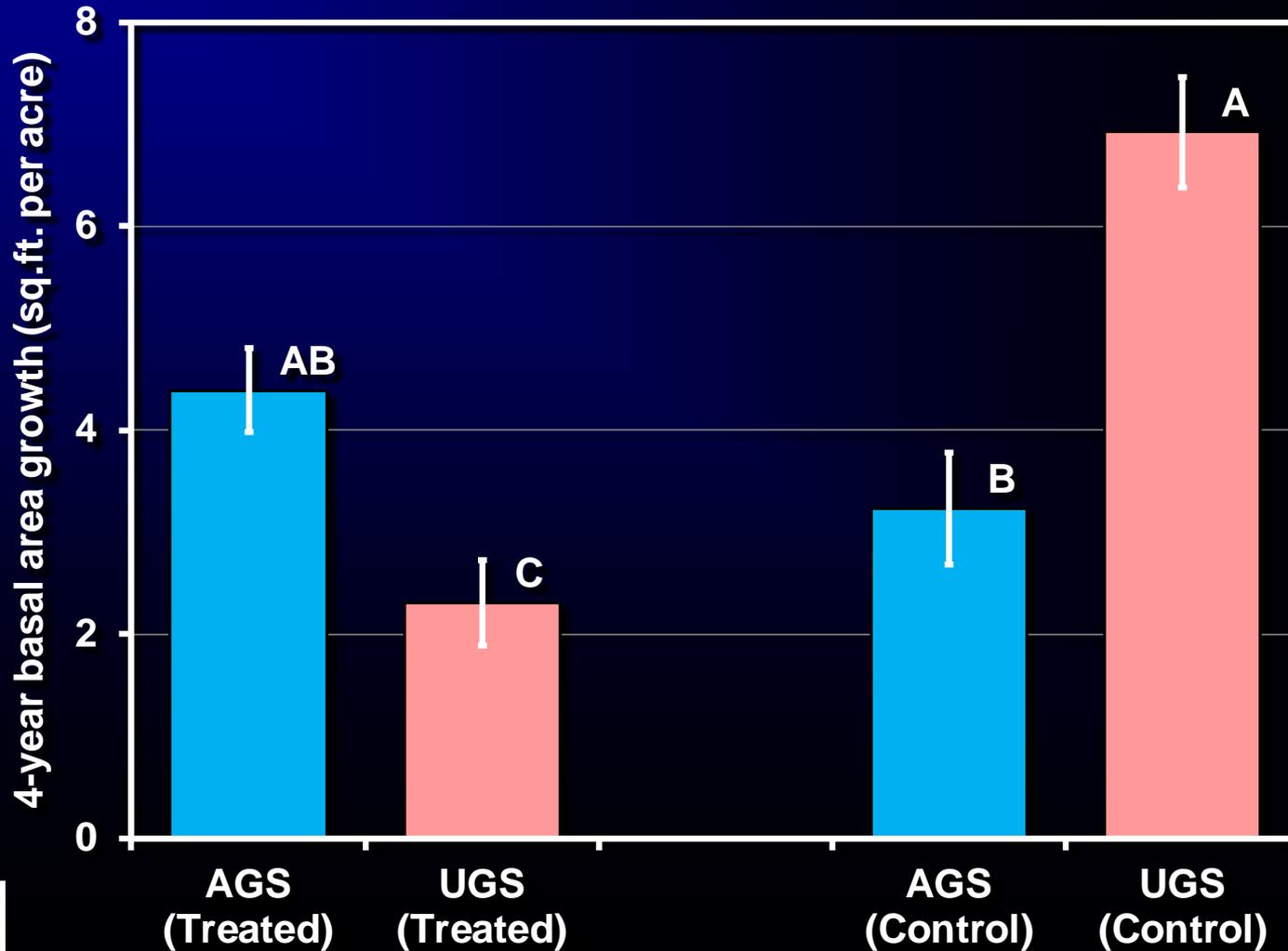
## Pre-treatment



## Post-treatment



# Release increased stand AGS growth relative to UGSs





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