Fire and oak regeneration research

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CONNECTICUT DEPARTMENT ENVIRONMENTAL PROTECTION

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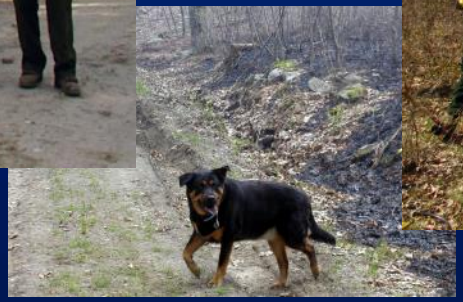
FOREST SERVICE US DEPARTMENT OF AGRICULTURE

Thank you



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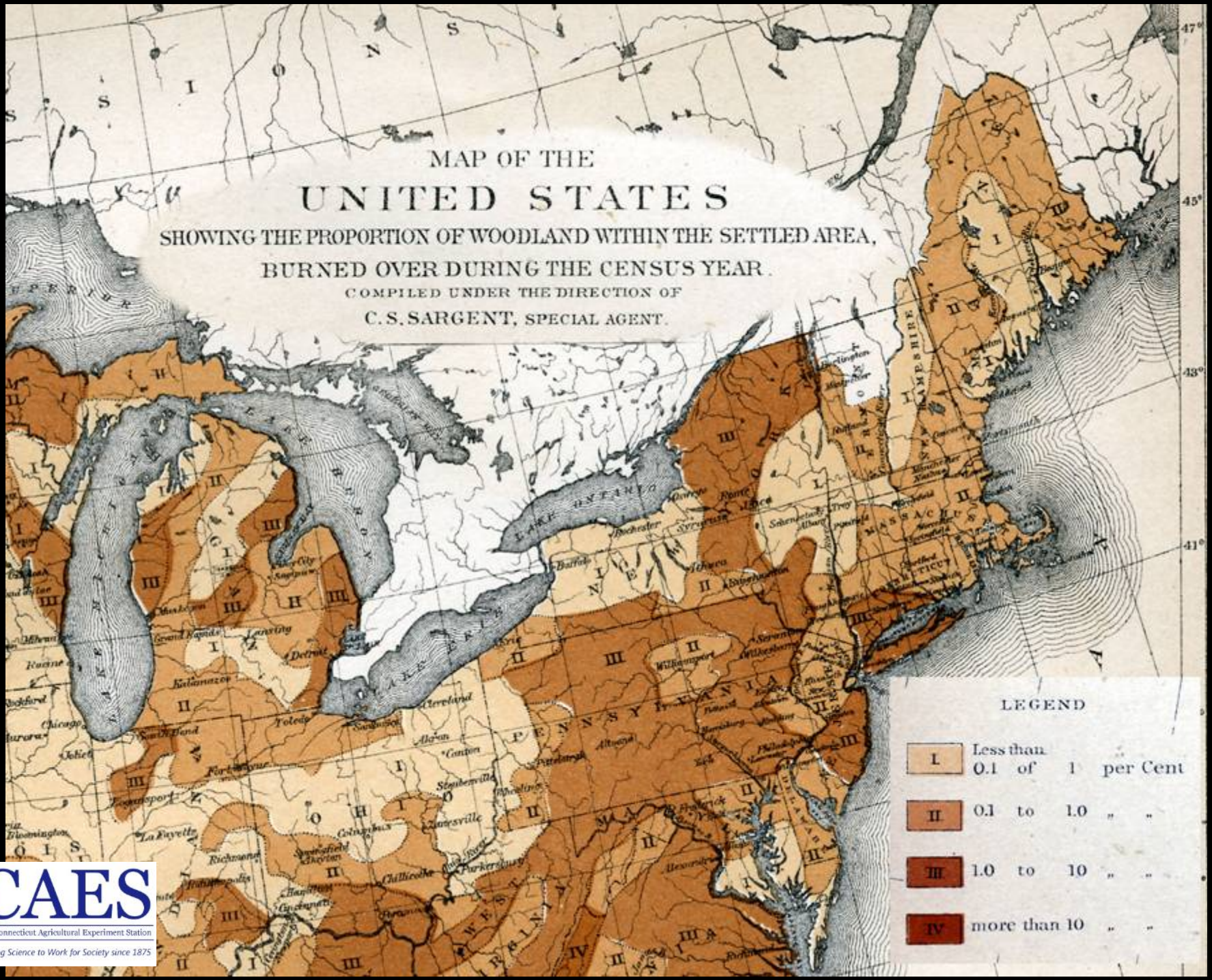
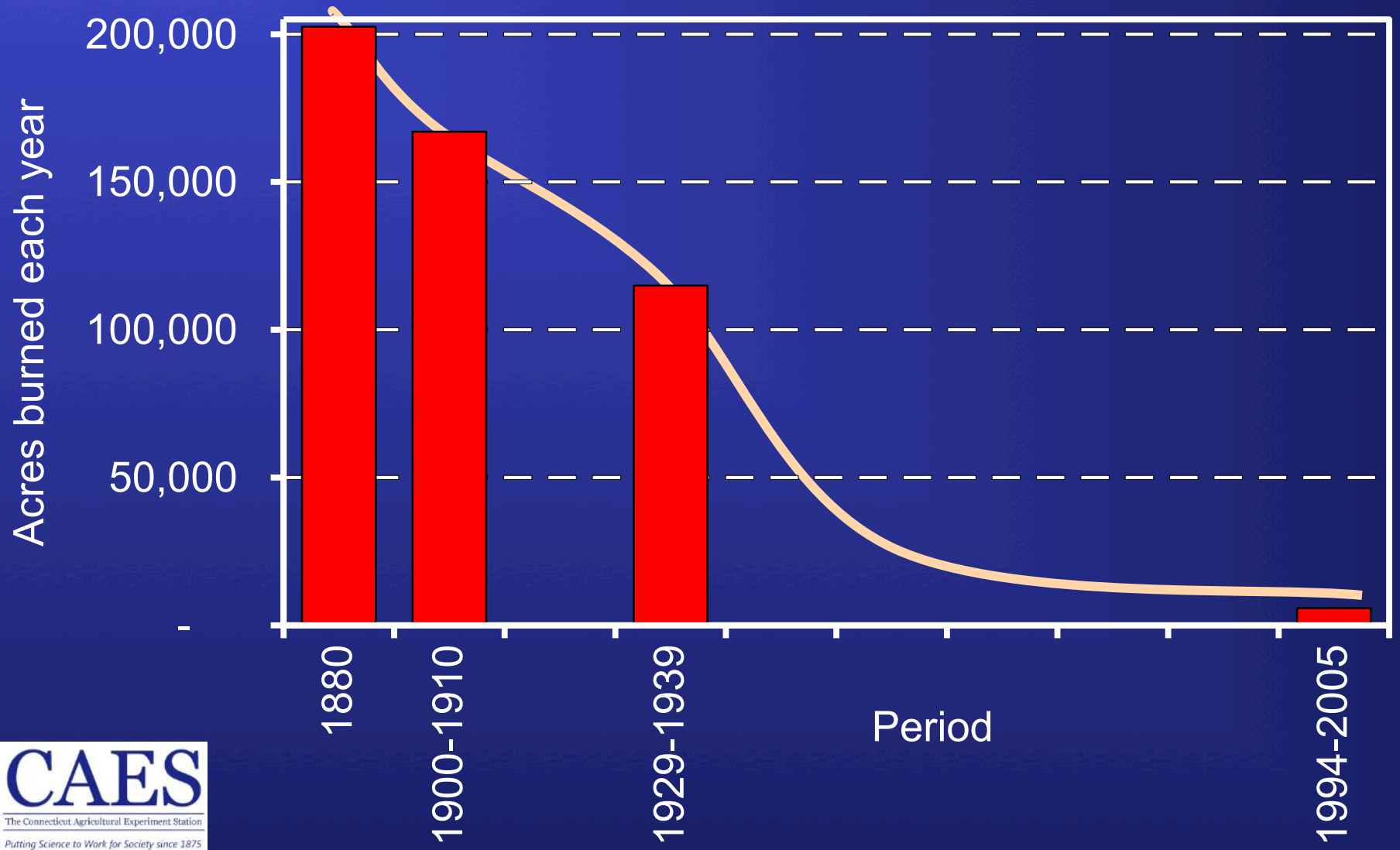
Overview

- Short history of fire in Northeast
- An unplanned experiment
- Prescribed burning in shelterwoods
- Fire / stand structure interactions



New England and New York

1880 does not include CT, NH, and RI



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Devastating early fires

Charred red maple

East Hartford 1905

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Causes of early fires

Forest pasture

Railroad fires

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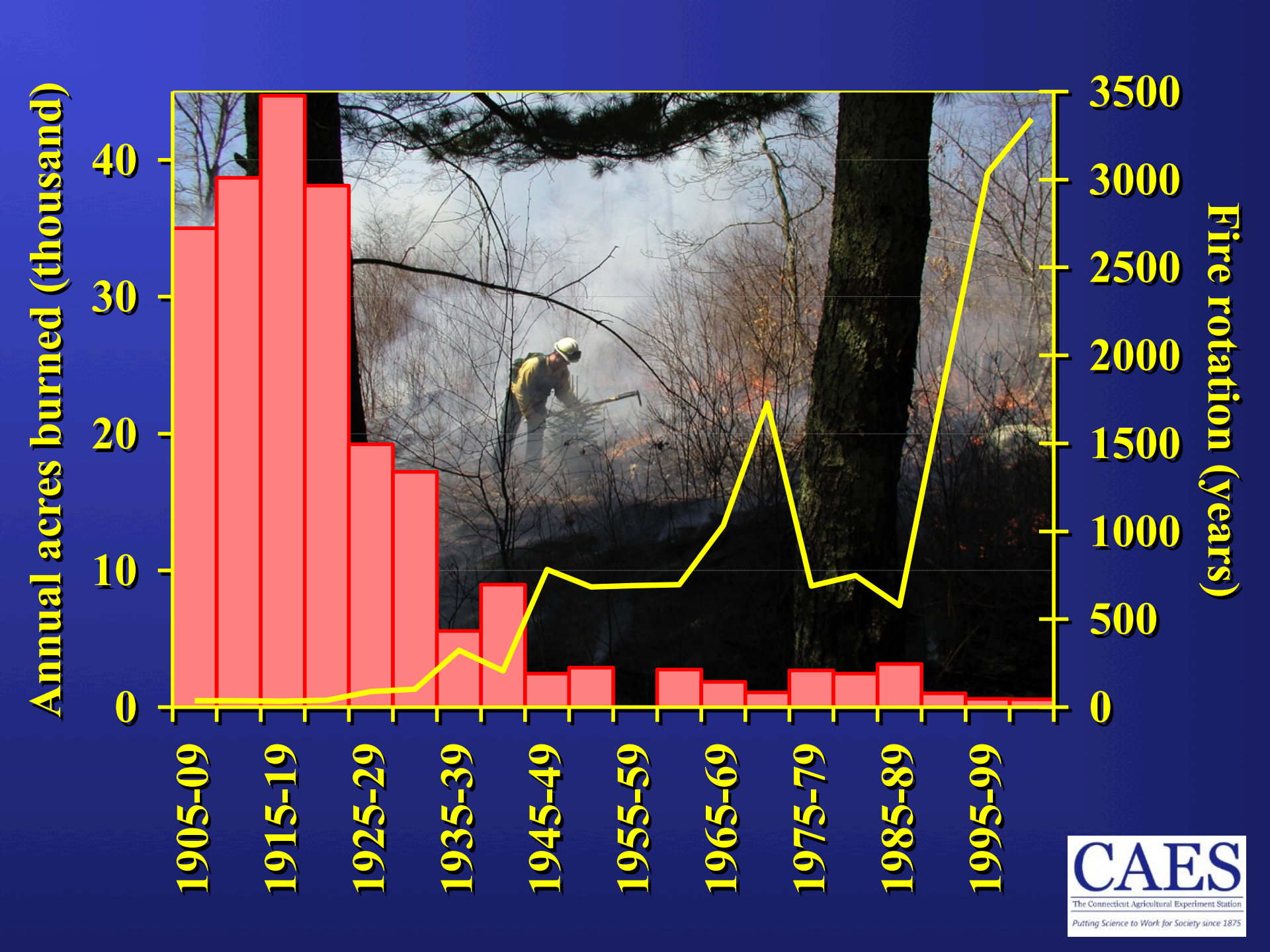

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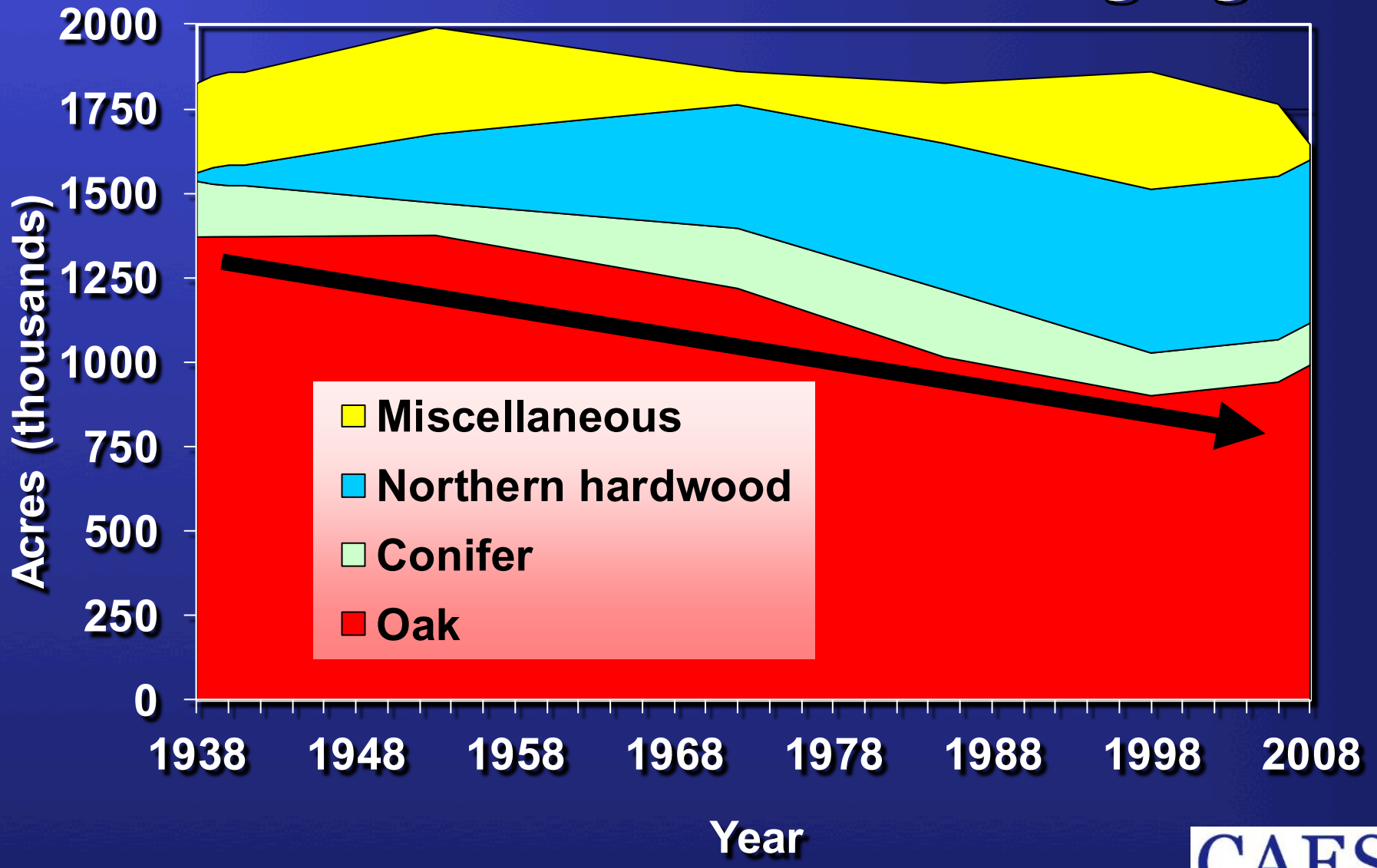
Connecticut's forest is changing



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The abundance of mature oaks in the current Connecticut forest is due, in part, to a history of periodic burning and short rotation clearcutting prior to 1920.

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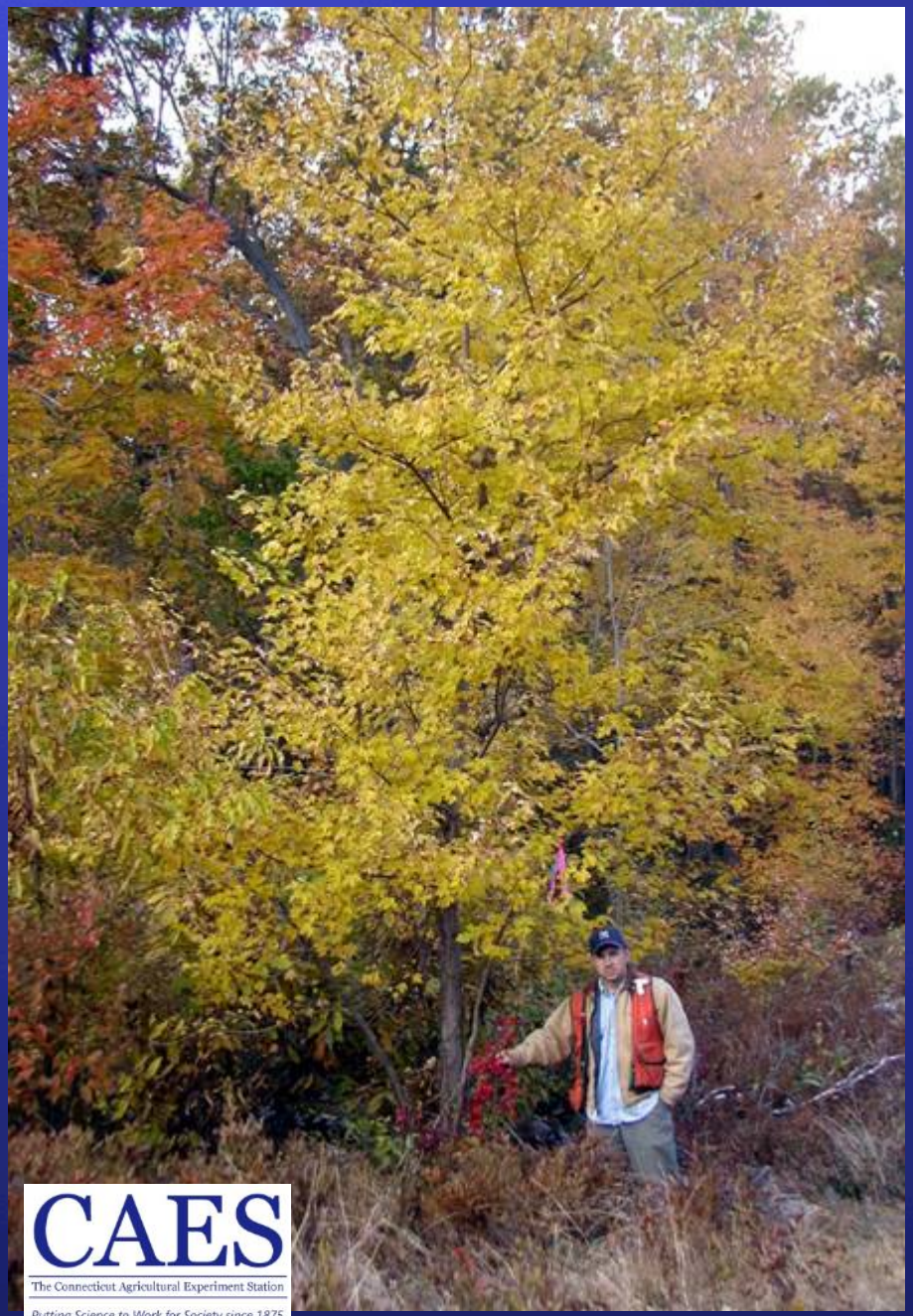

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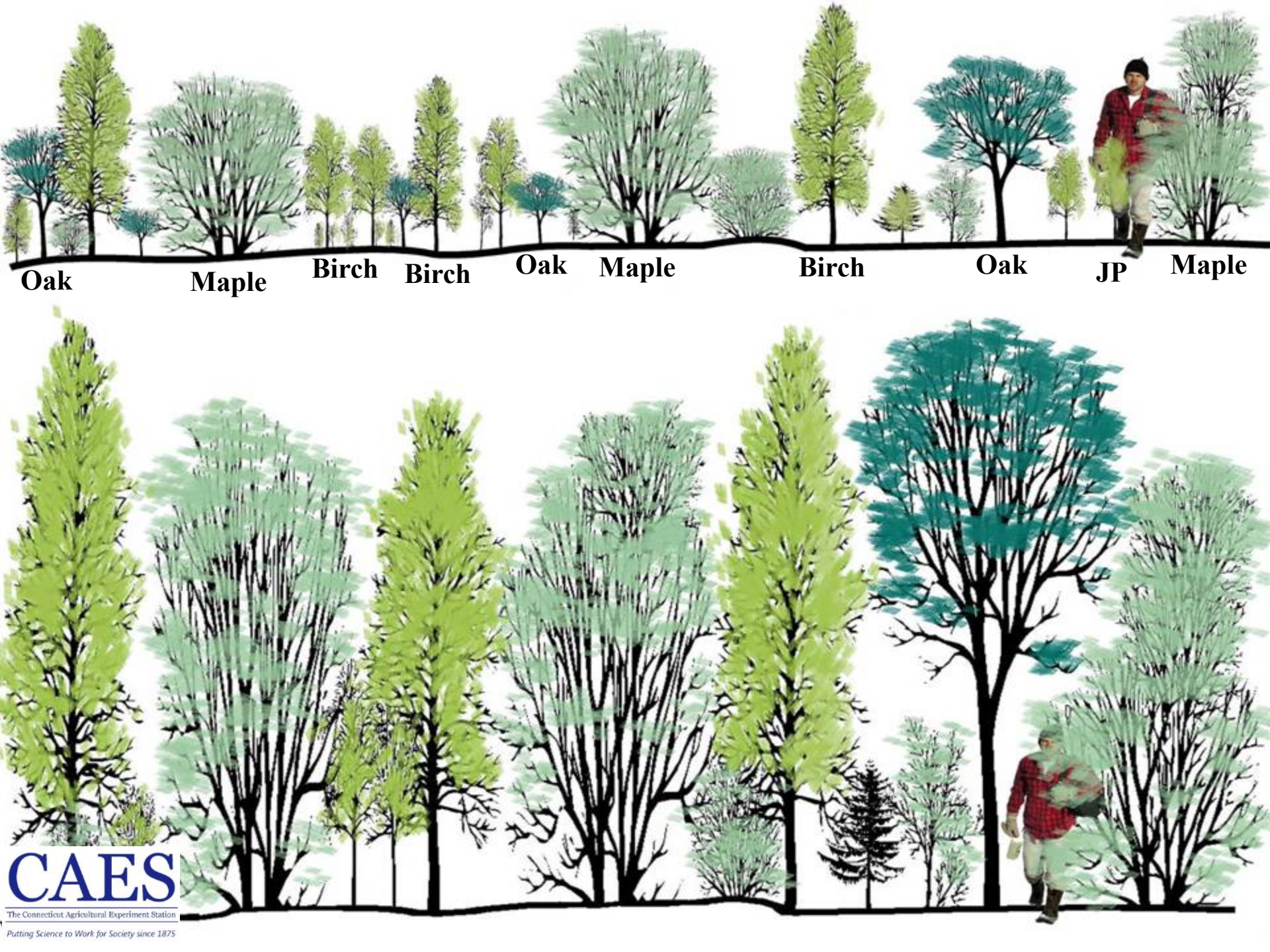
The Challenge

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

How could fire help?



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Overview

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- **An unplanned experiment**
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Old-Series Plots (1927-2007)
An unplanned experiment

1932 wildfire

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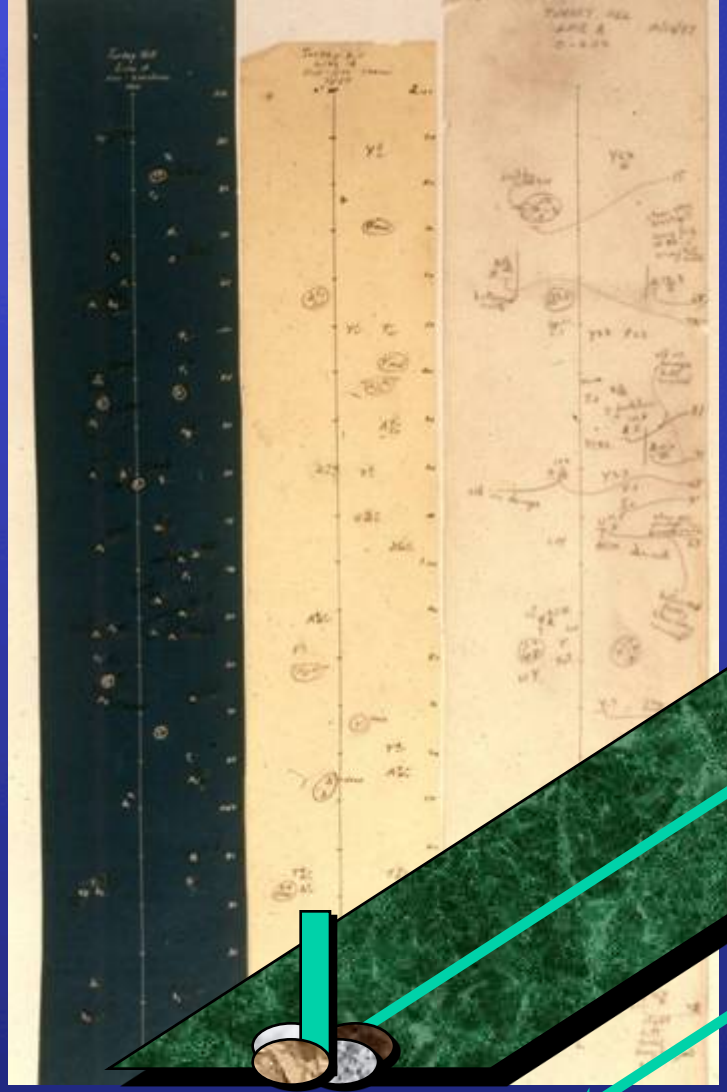

2 Chains
(20.11 m)

1 Rod (5.03 m)

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Disturbance Histories

Meshomasic plots

- Moderate to severe defoliation between stand ages 61-81

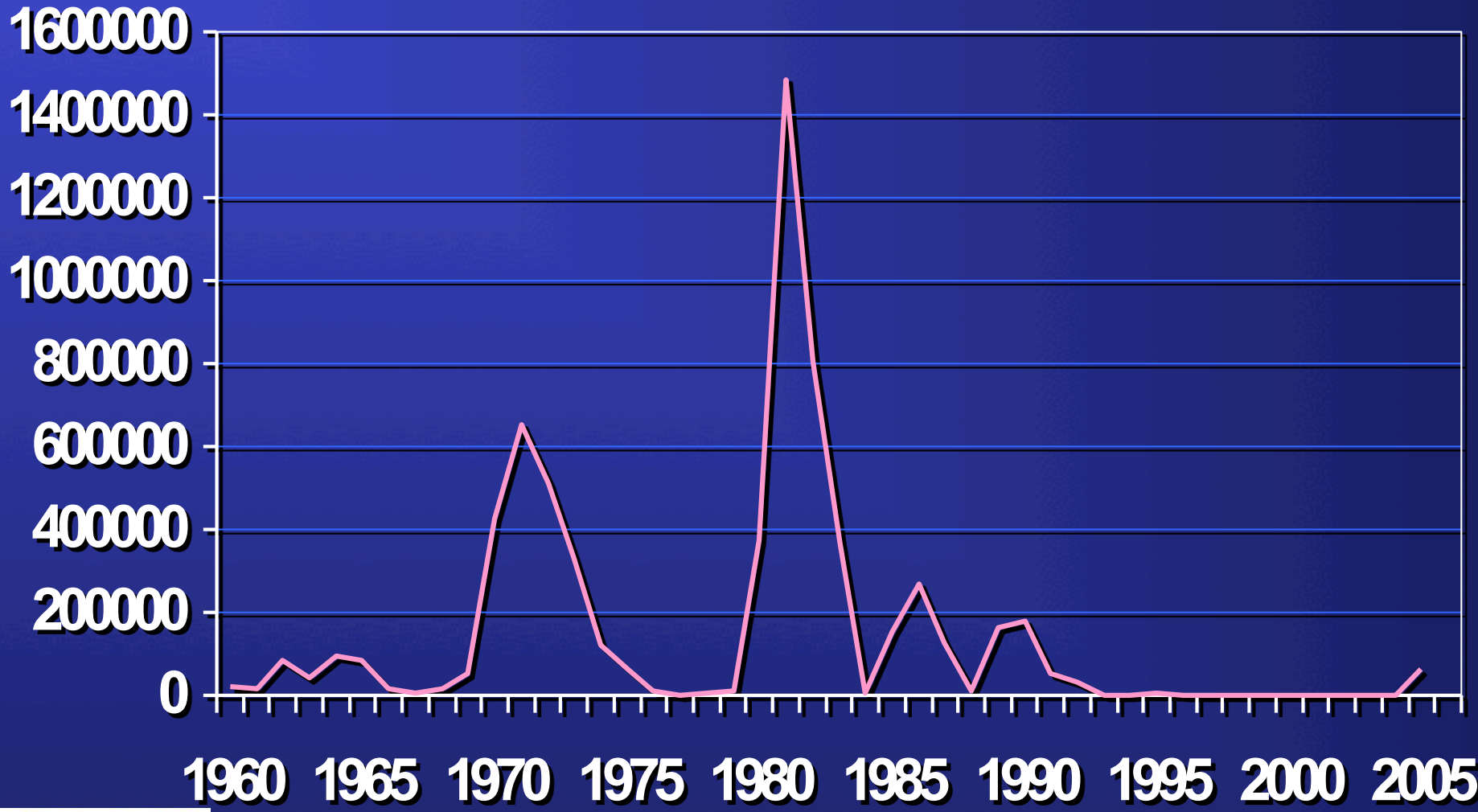
Turkey Hill - unburned section

- Light defoliation between ages 61-81

Turkey Hill - burned section

- Summer fire at stand age 32
- Light defoliation between ages 61-81

Gypsy moth defoliations



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Upper canopy decline or mortality
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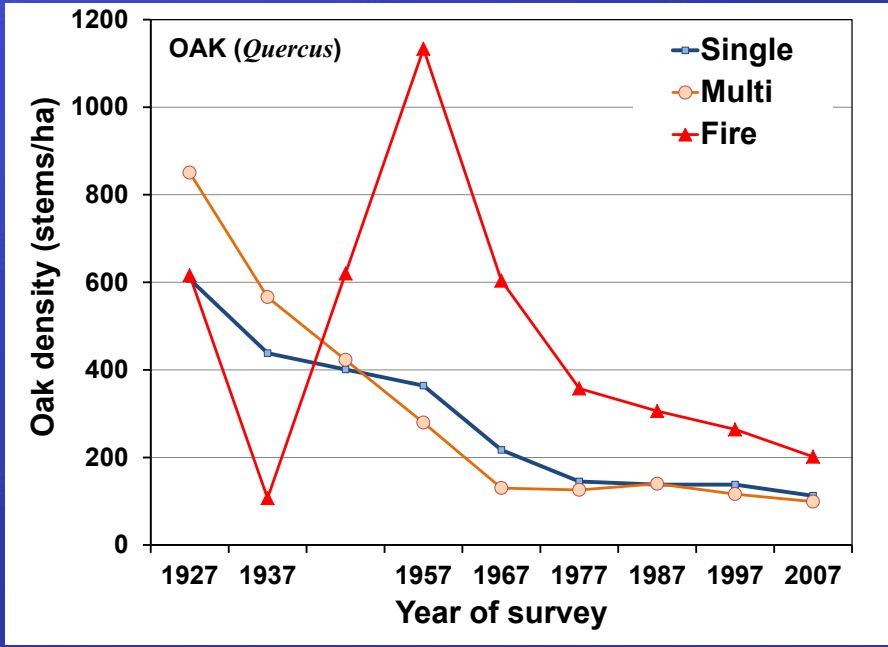
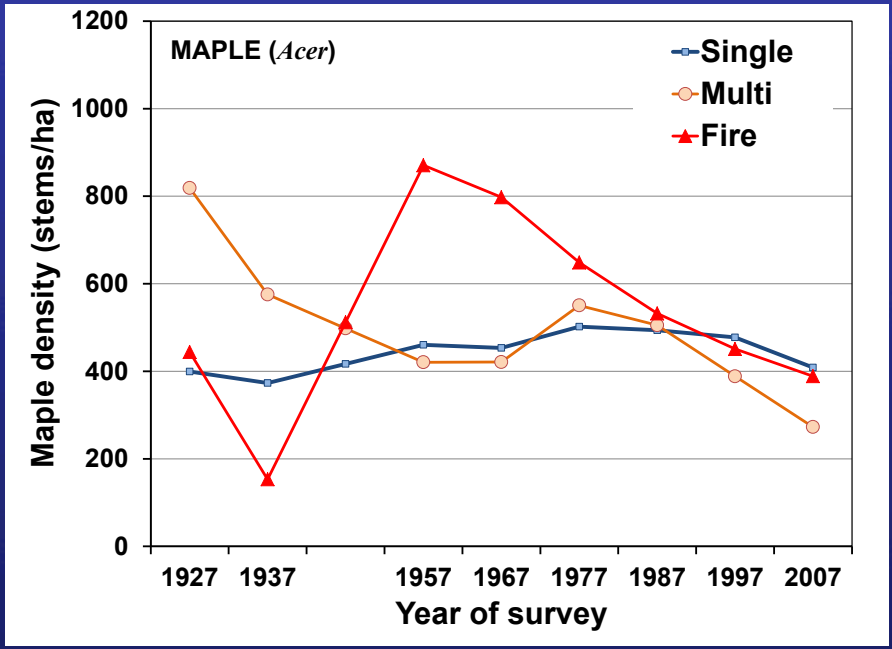
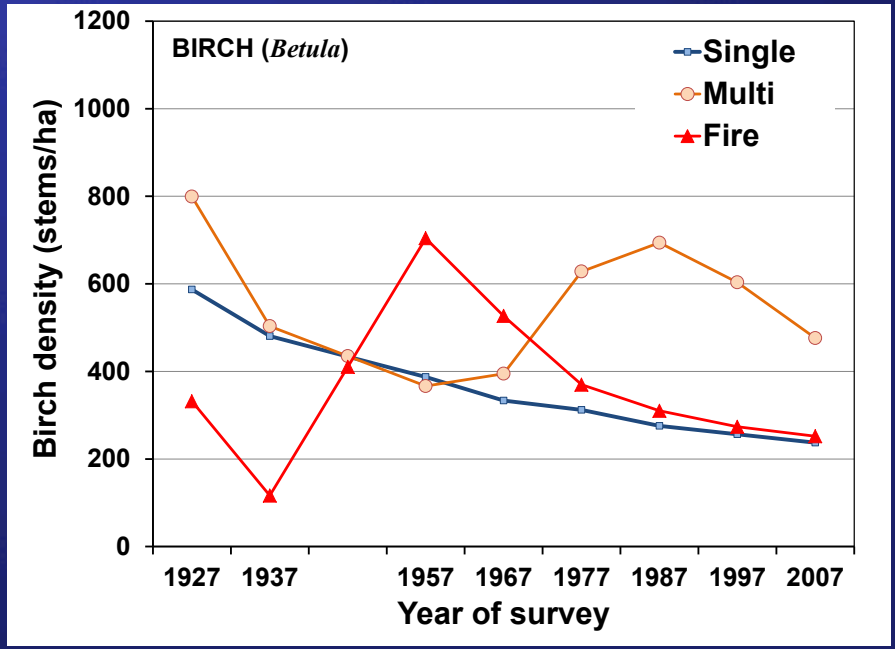
New regeneration

Gleason was right

Different responses to disturbance has lead to different communities







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General observations

Burning – increased oak

Repeated defoliation – favored black birch

Minor defoliation – favored red maple

Ingrowth composition is influenced by disturbance type

Overview

- Short history of fire in Northeast
- An unplanned experiment
- **Prescribed burning in shelterwoods**
- Fire / stand structure interactions

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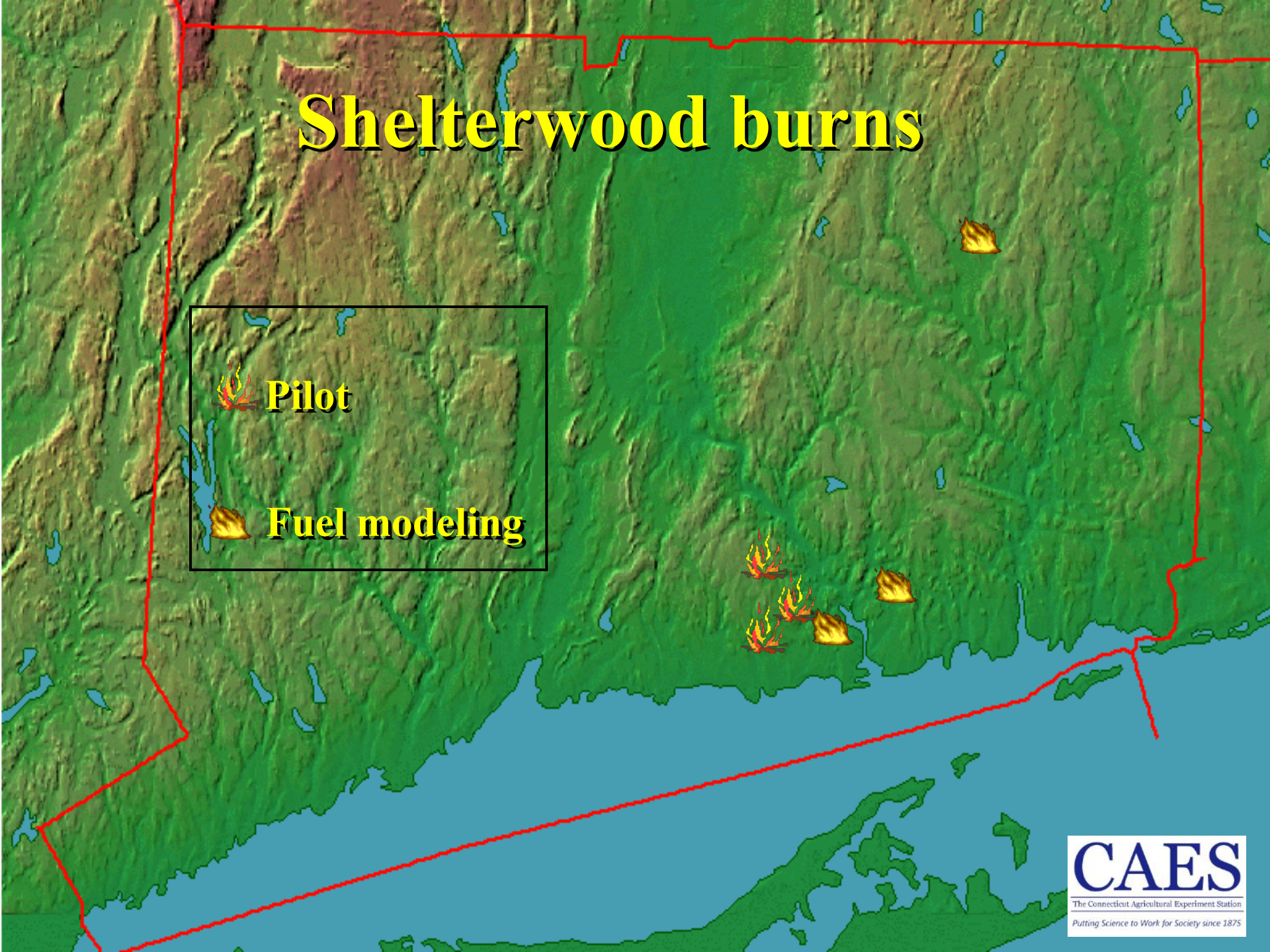
Shelterwood burns
Pilot
Fuel modeling
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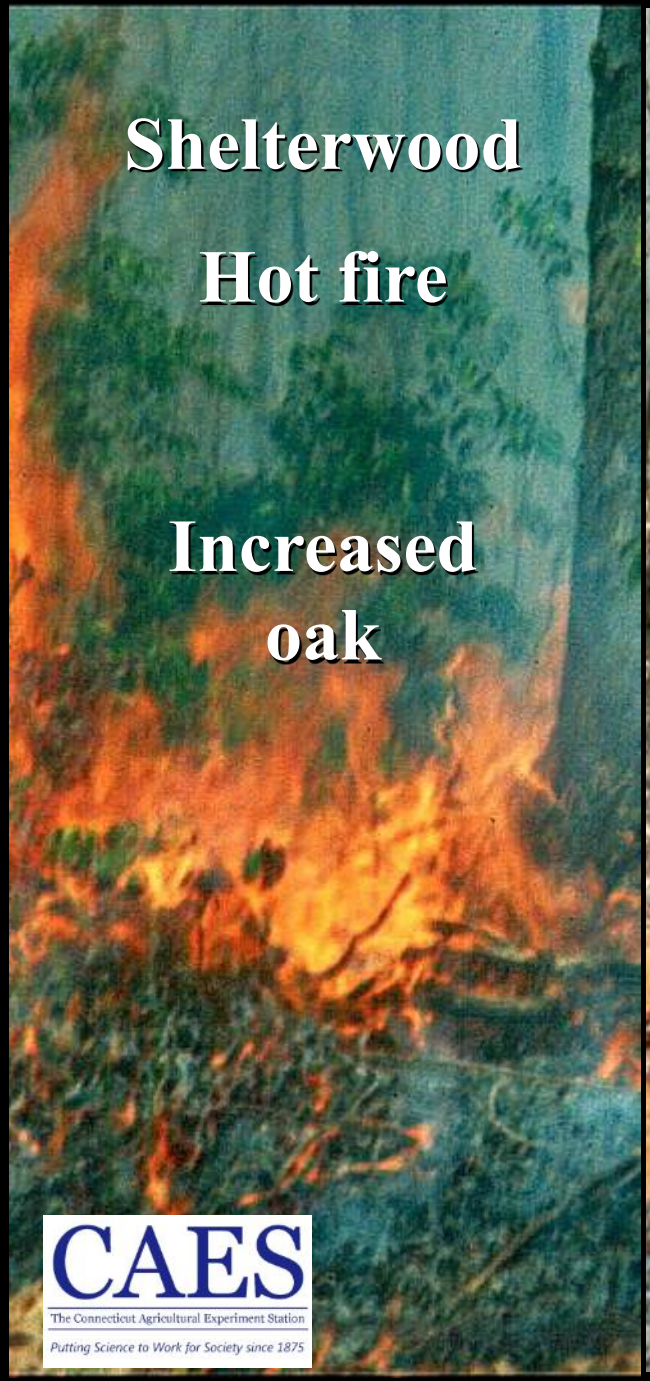
Shelterwood
Hot fire
Increased oak
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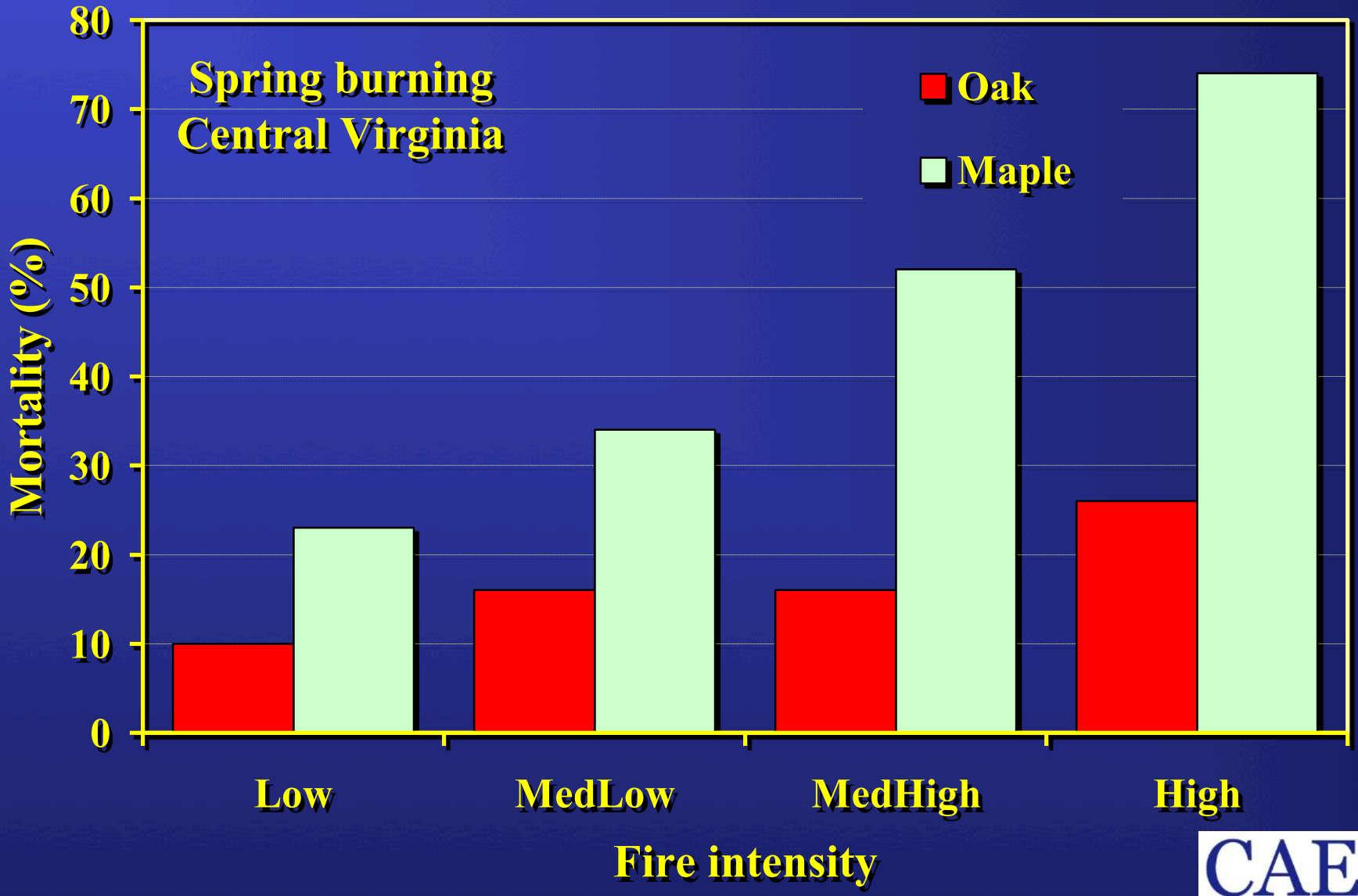
Medium fire
Shelterwood
Some oak


Cool fire
No shelterwood
No oak

Brose and Van Lear – Virginia



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How could fire influence species composition?

- Top-kill rates vary by species
- Resprouting rates vary by species
- Resprout height growth varies by species
- Post-fire seed input

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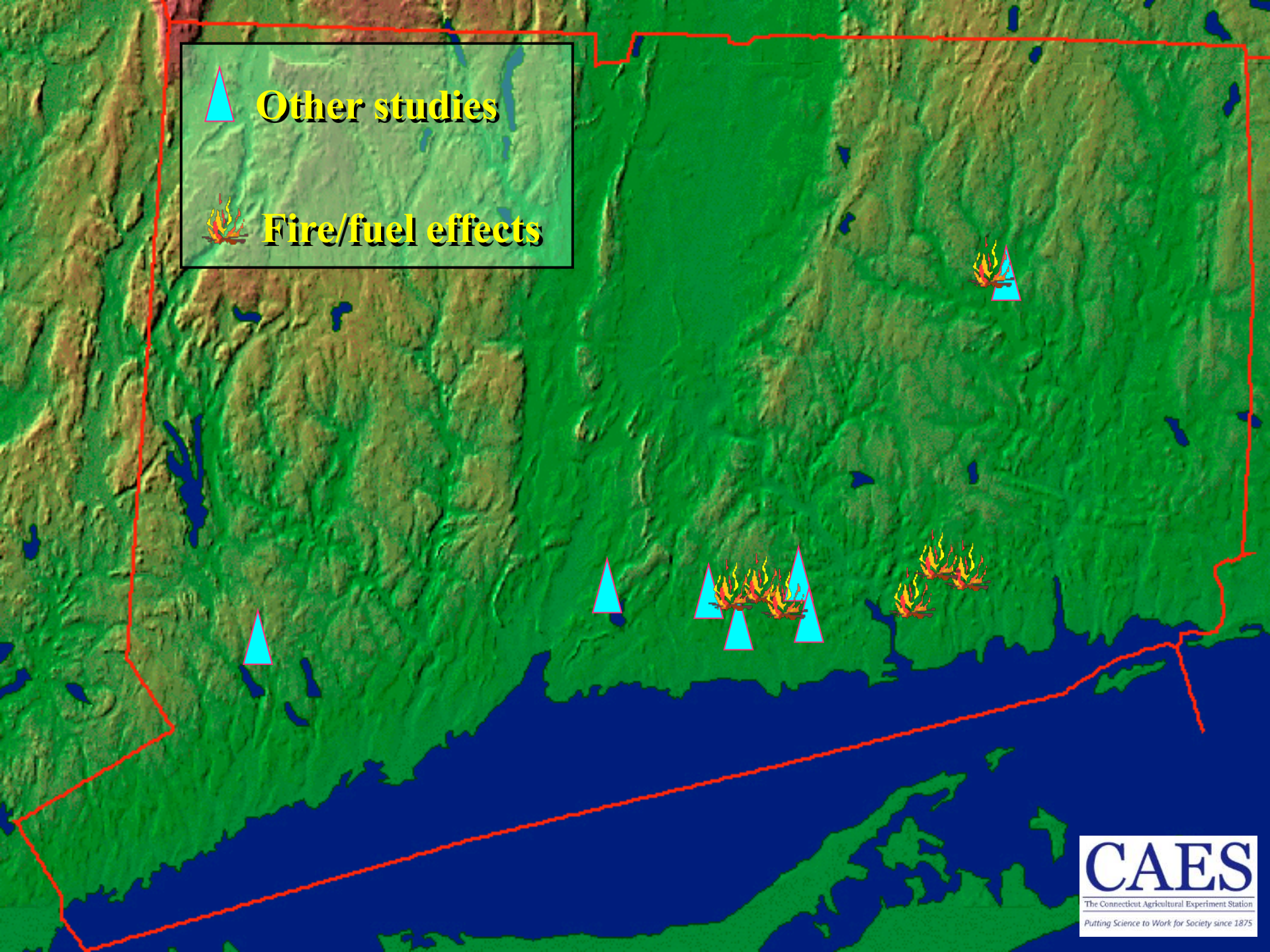
Other studies
Fire/fuel effects
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Stand structure of 2000-2004 burns

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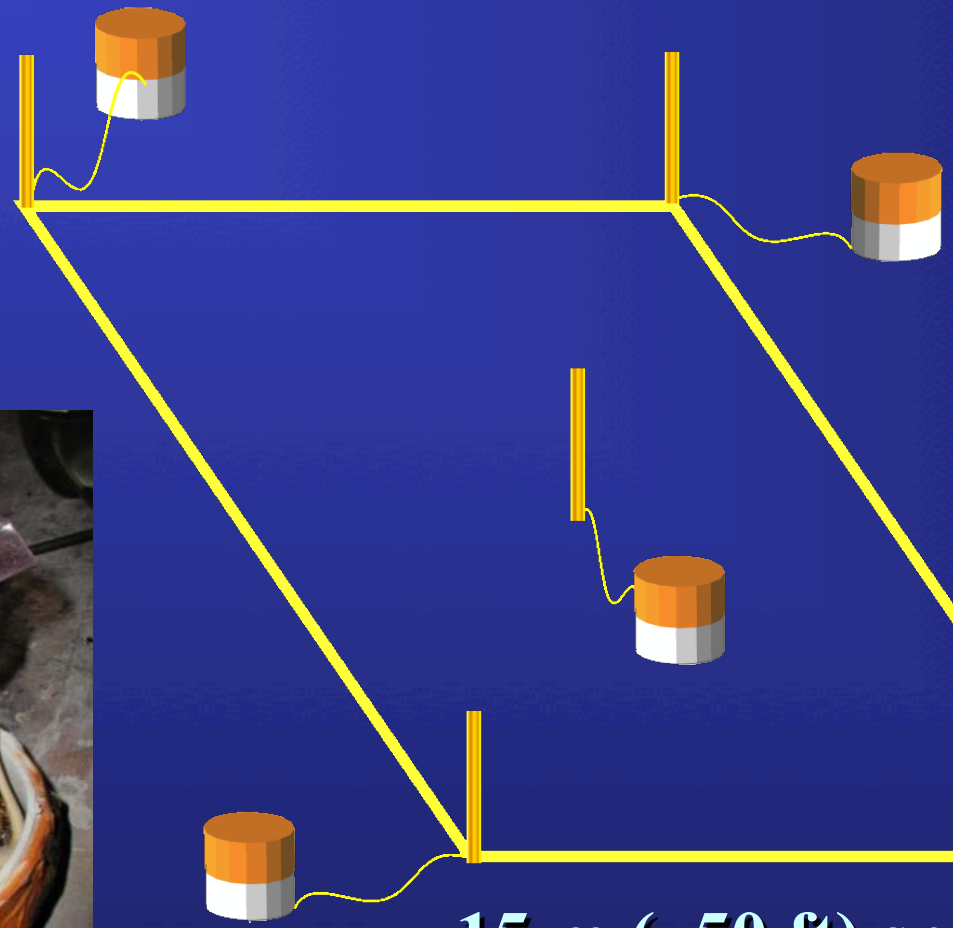
3-8 quincunx arrays per site



15 m (~50 ft) spacing

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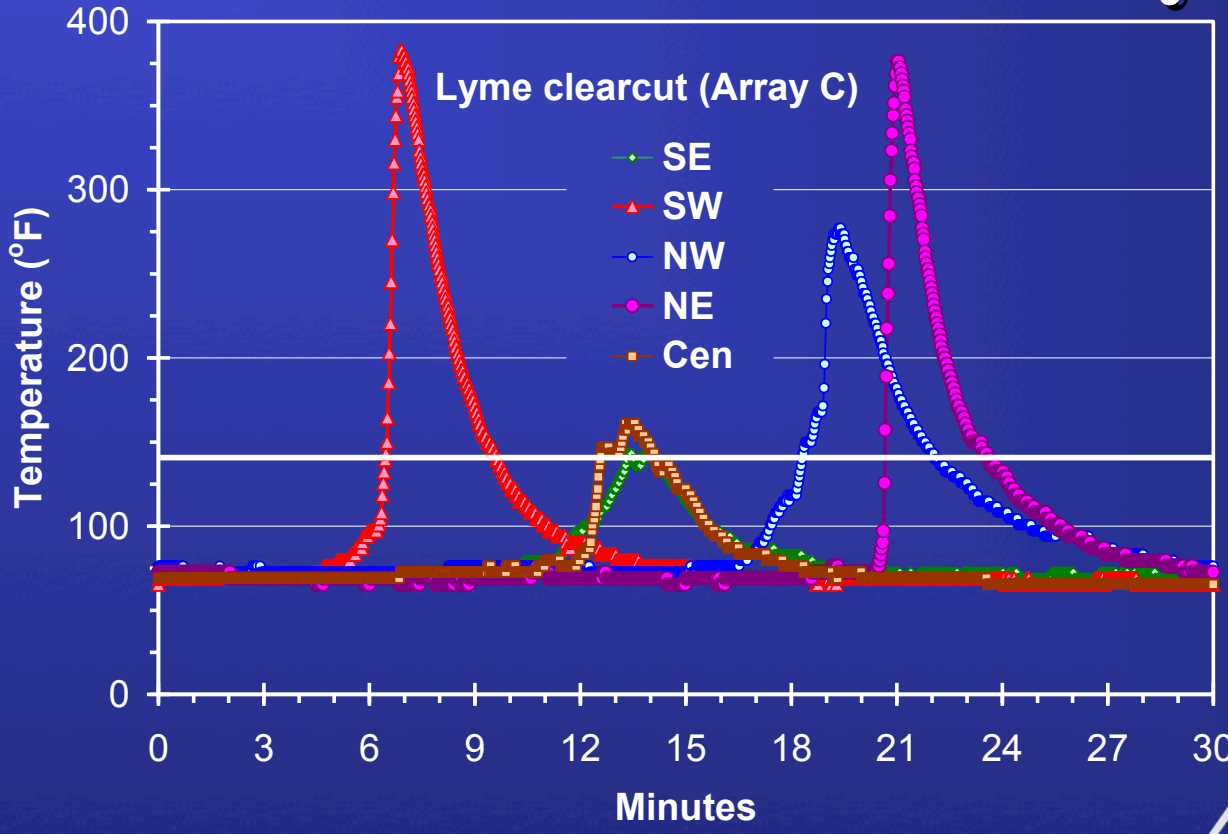
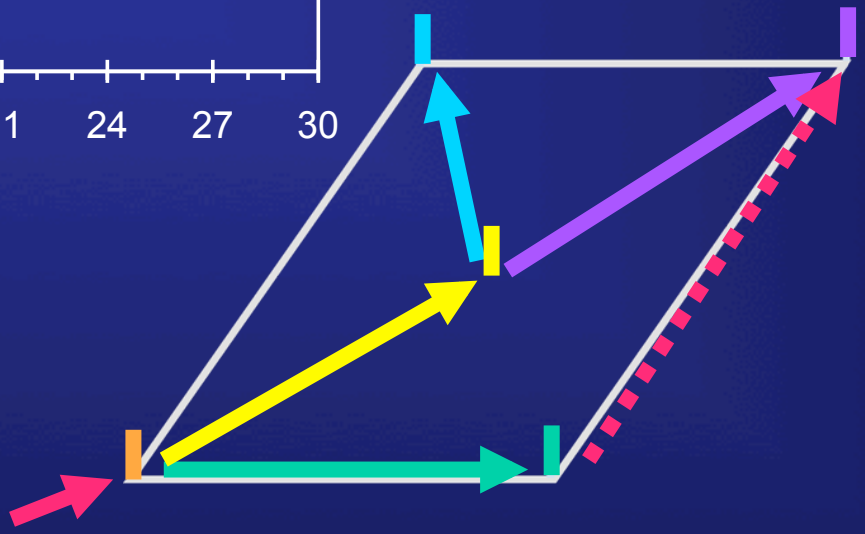
Fire intensity





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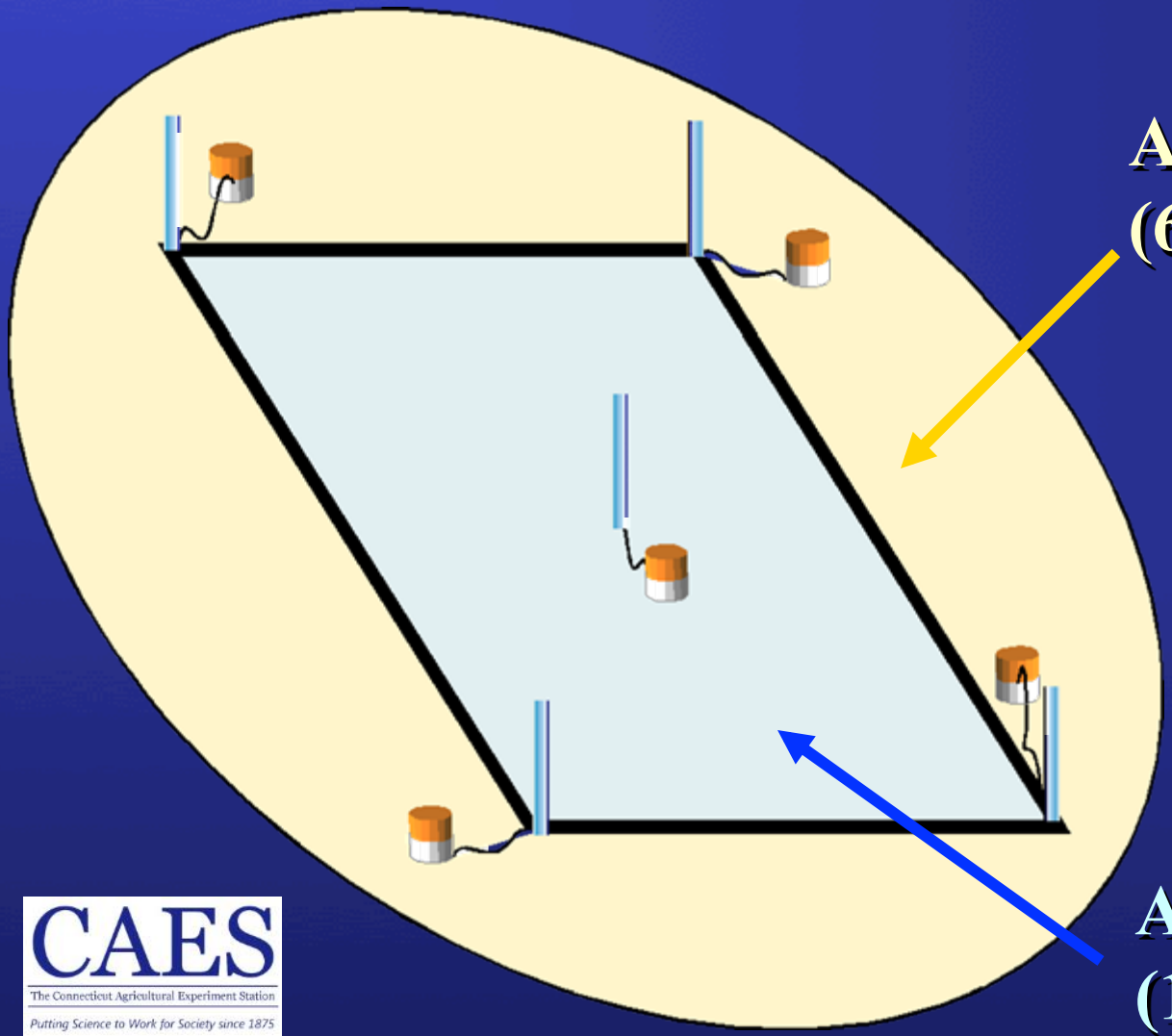
Fire survival sampling



All stems ≥ 2.5” dbh
(6 cm dbh)

All stems ≥ 4.5 ft tall
(140 cm)

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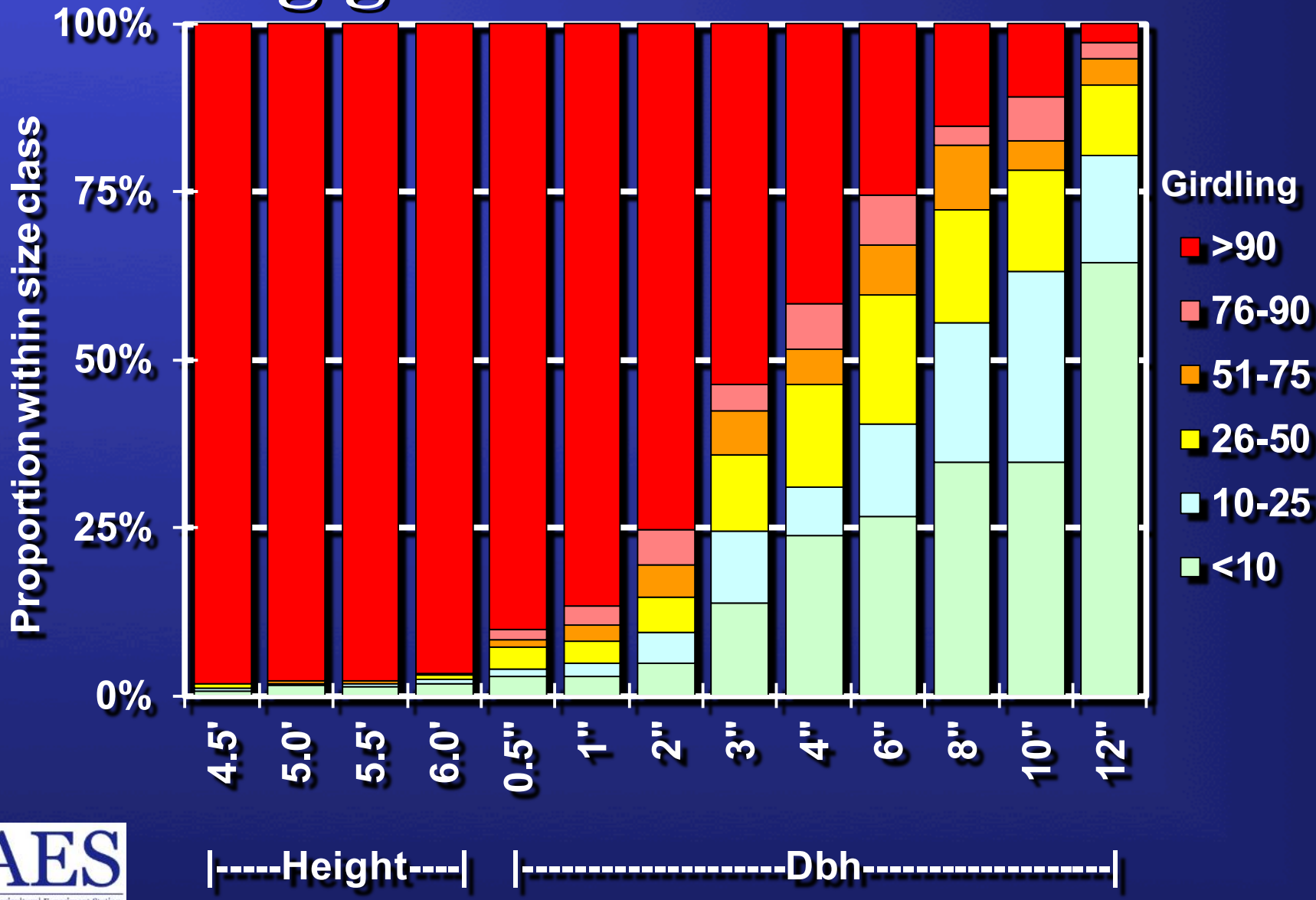
Girdling greater for smaller stems



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Top-Kill Analysis
(90% girdled)

Logistic model: Top-Kill (%) = e^x / (1+e^x)

No difference among *Acer*, *Quercus*, *Betula*, Other tree, and *Kalmia* species groups.

Stand structure, maximum temperature, and initial size were significant factors.

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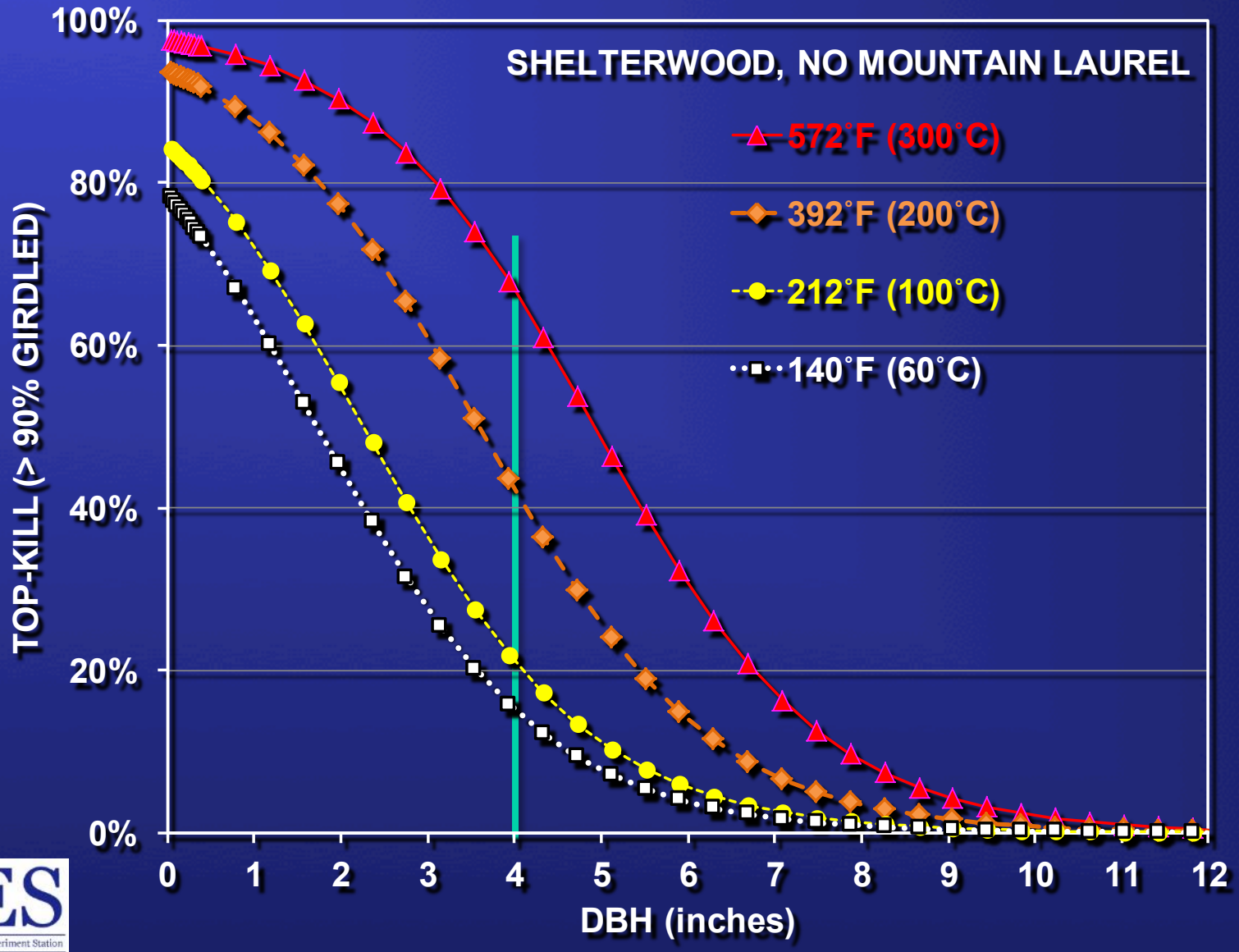
Top-kill increased with temperature



Ht	PsDbh
140	0.01
150	0.15
160	0.30
170	0.45
180	0.60
190	0.75
200	0.90

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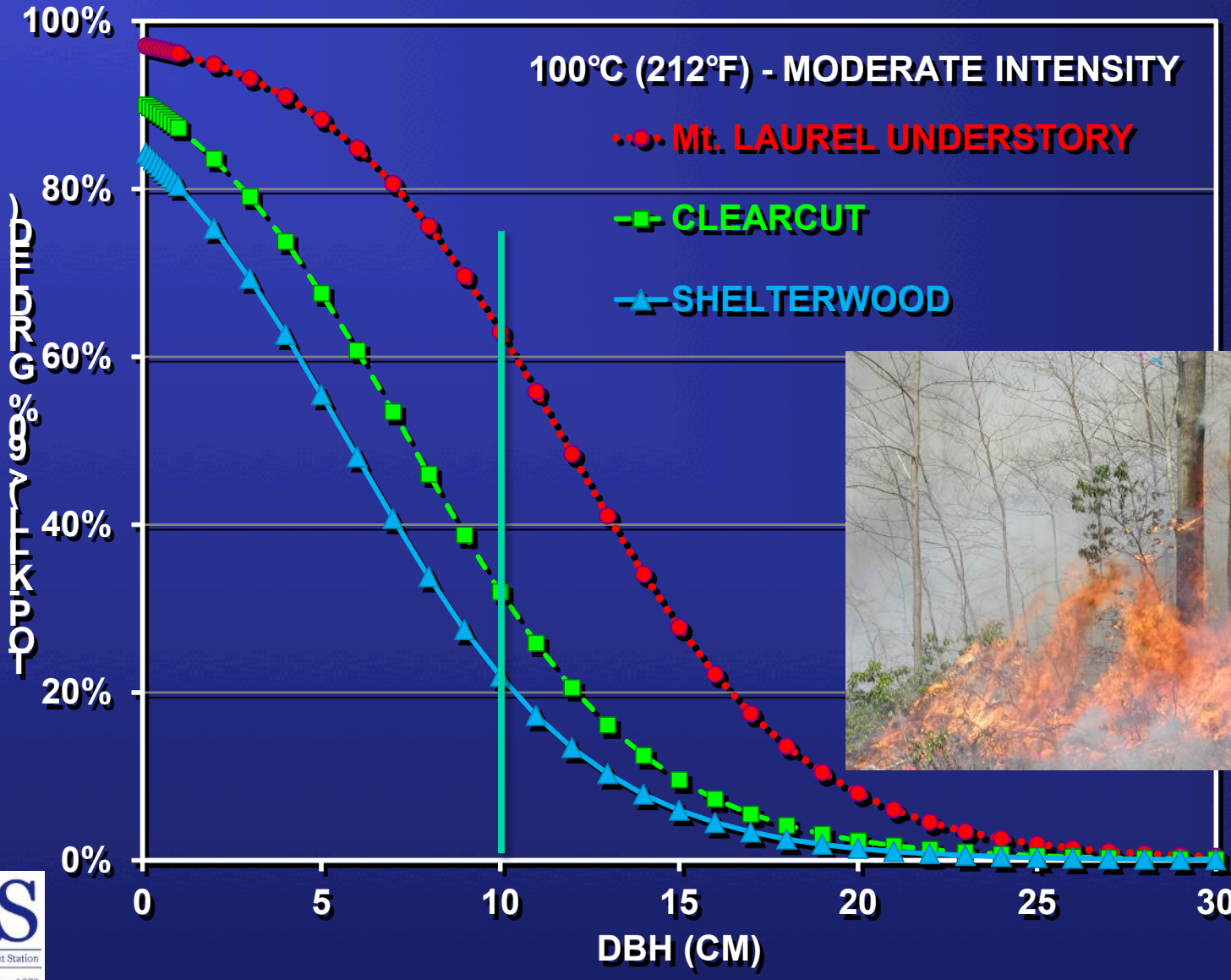
Top-kill differed by stand structure



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New sprouts
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Advanced regeneration is key for Red Maple and Oak

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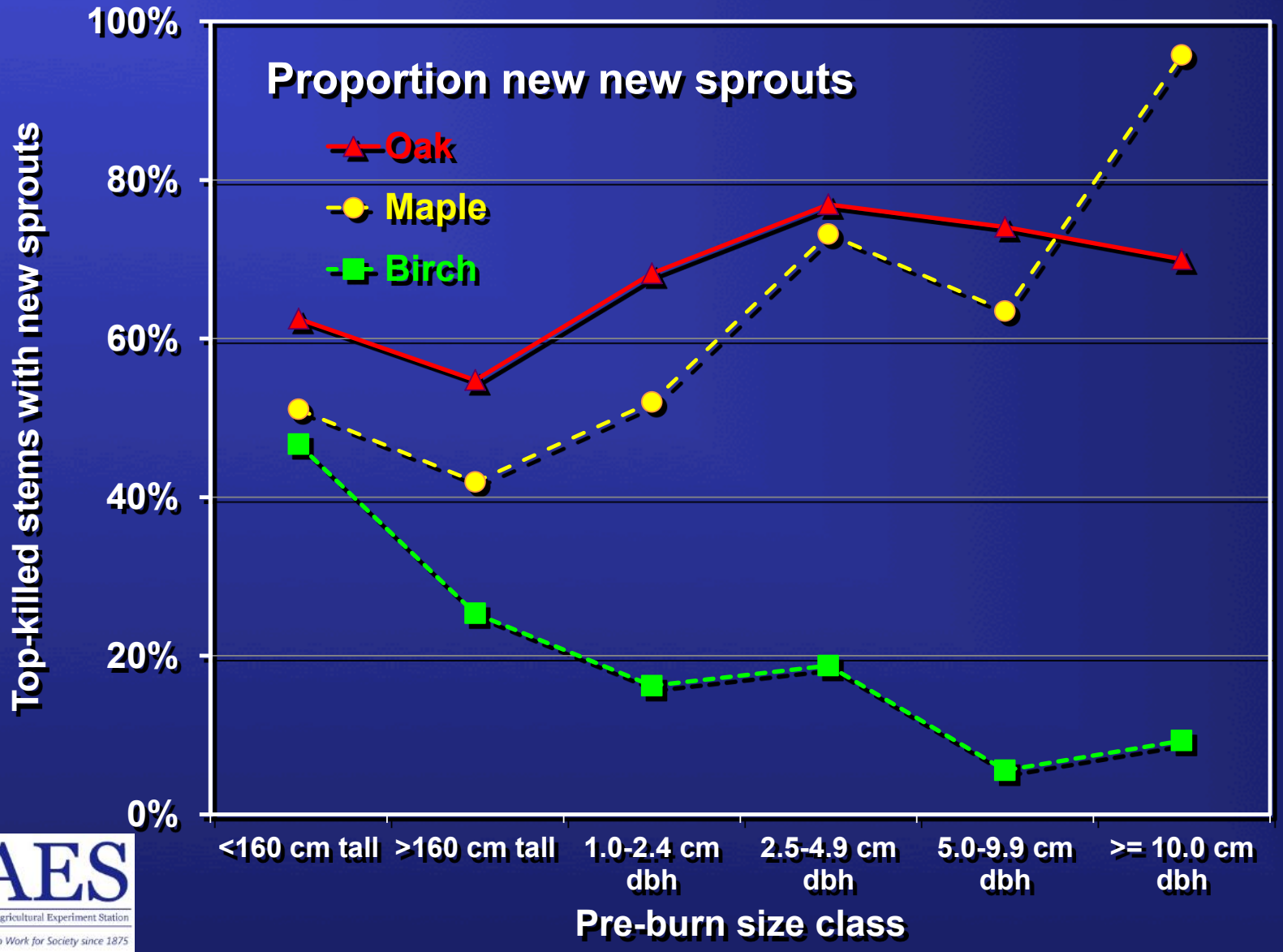
Sprouting differed by species group



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Fires area a deer magnet


Overwhelming vegetation
in clearcut burn
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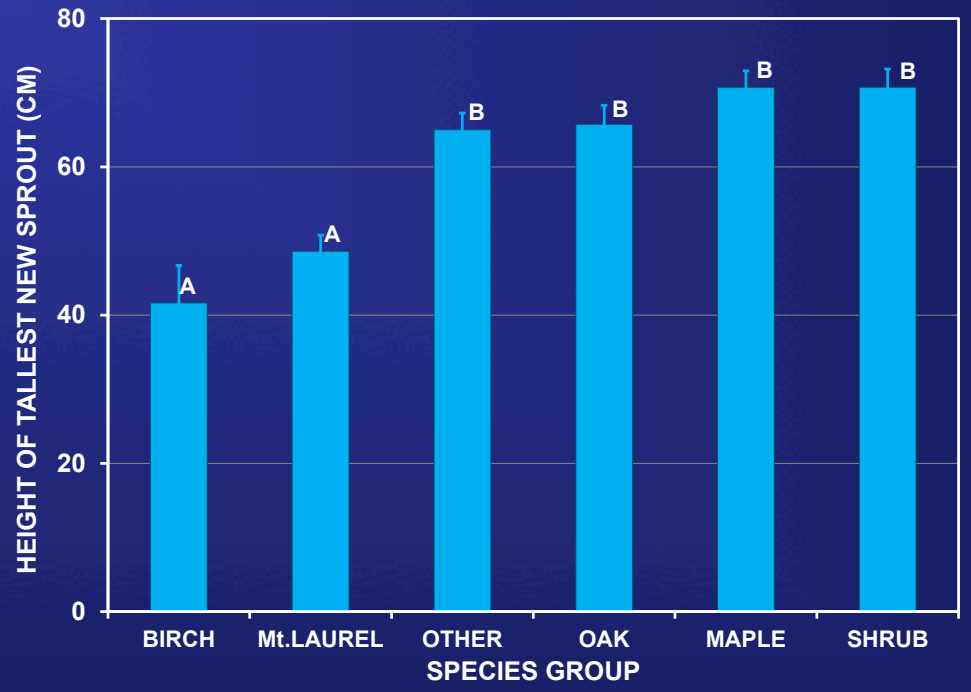
Red maples had more sprouts than oak (though oak had plenty)

Height of oak and maple sprouts did not differ



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Overview

- Short history of fire in Northeast
- Long-term impact of 1932 wildfire
- Prescribed burning in shelterwoods
- Fire / stand structure interactions

Summary

1. Fire can have a profound, long-term influence on species composition.
2. Intensity and timing are important.
3. Larger stems more resistant to fire

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Stand structure is important


Clearcuts


Mt. laurel understory


Shelterwoods

Low success if:

- No oak regeneration to start
- Overstory removal is delayed
- Heavy fern cover

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Consider burning in young clearcuts

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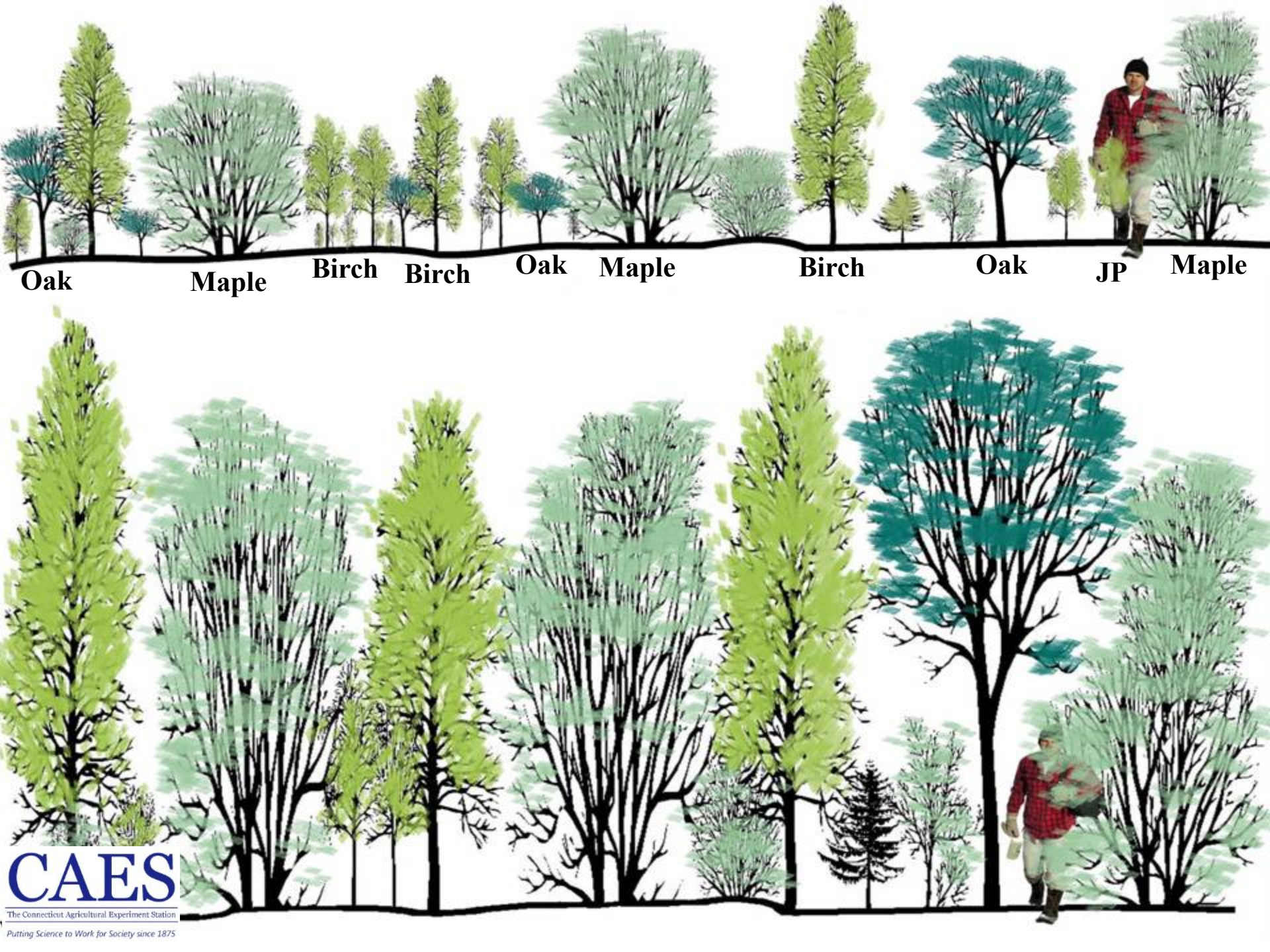

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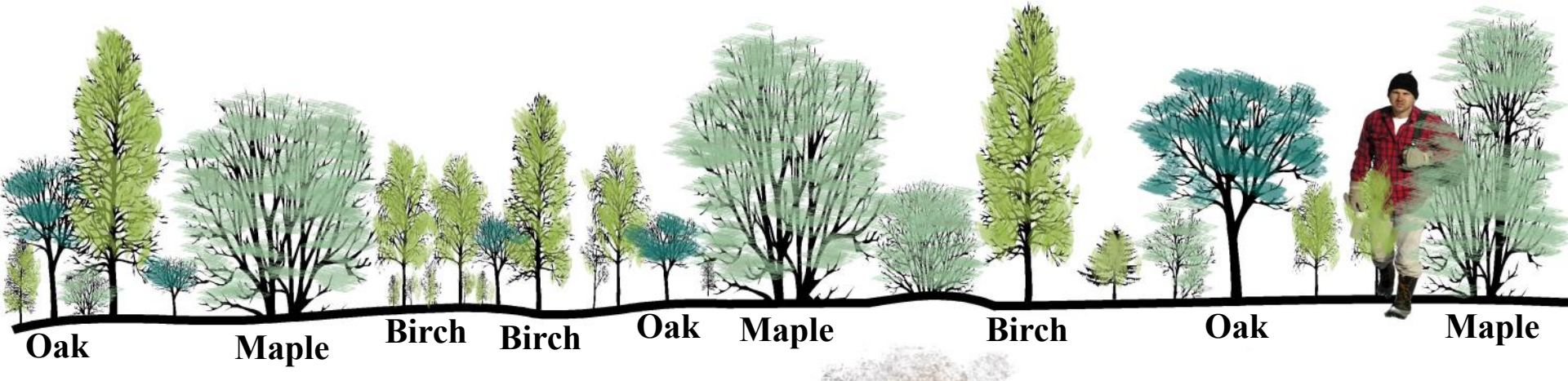

Height of new sprouts similar,
Oaks are now free-to-grow

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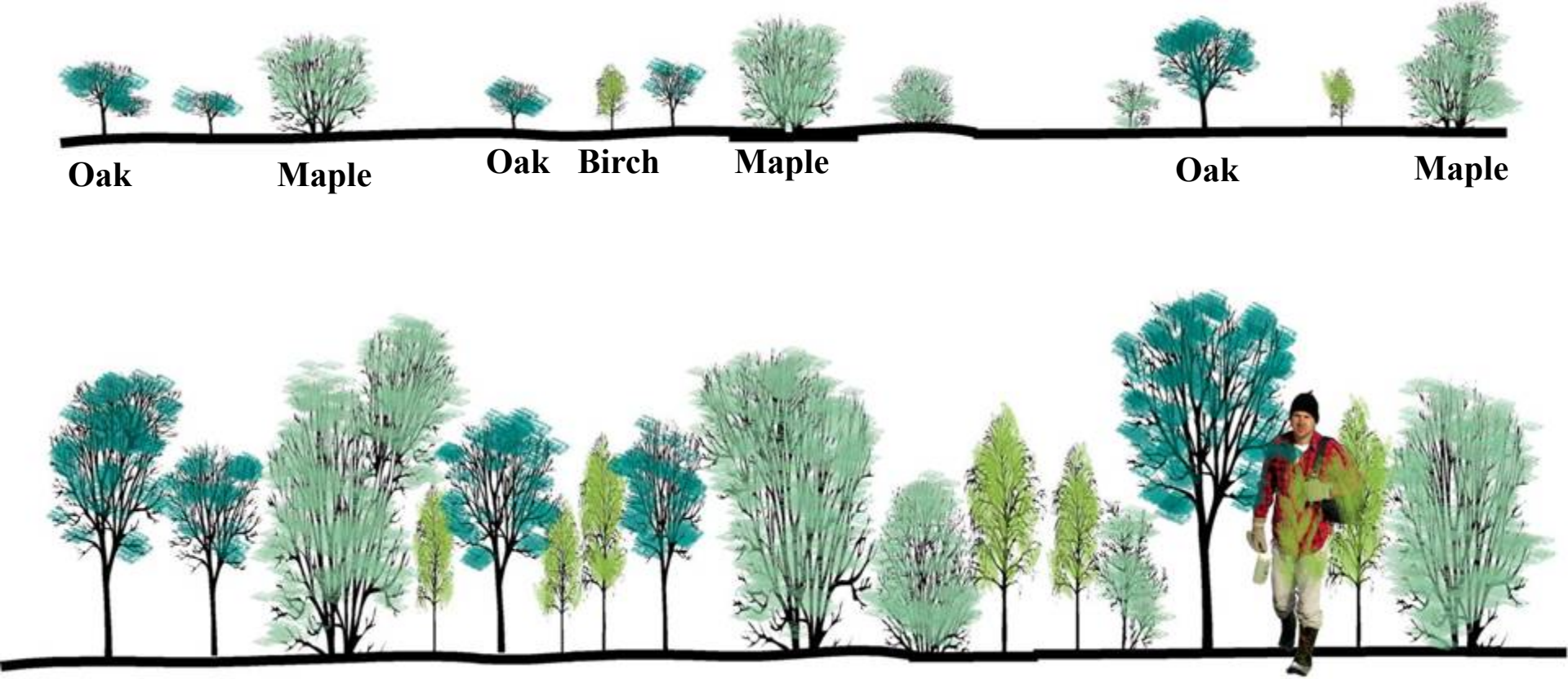
Root/shoot



Free-to-grow oak seedlings have a better chance of persisting through canopy closure, and therefore, form part of the mature stand

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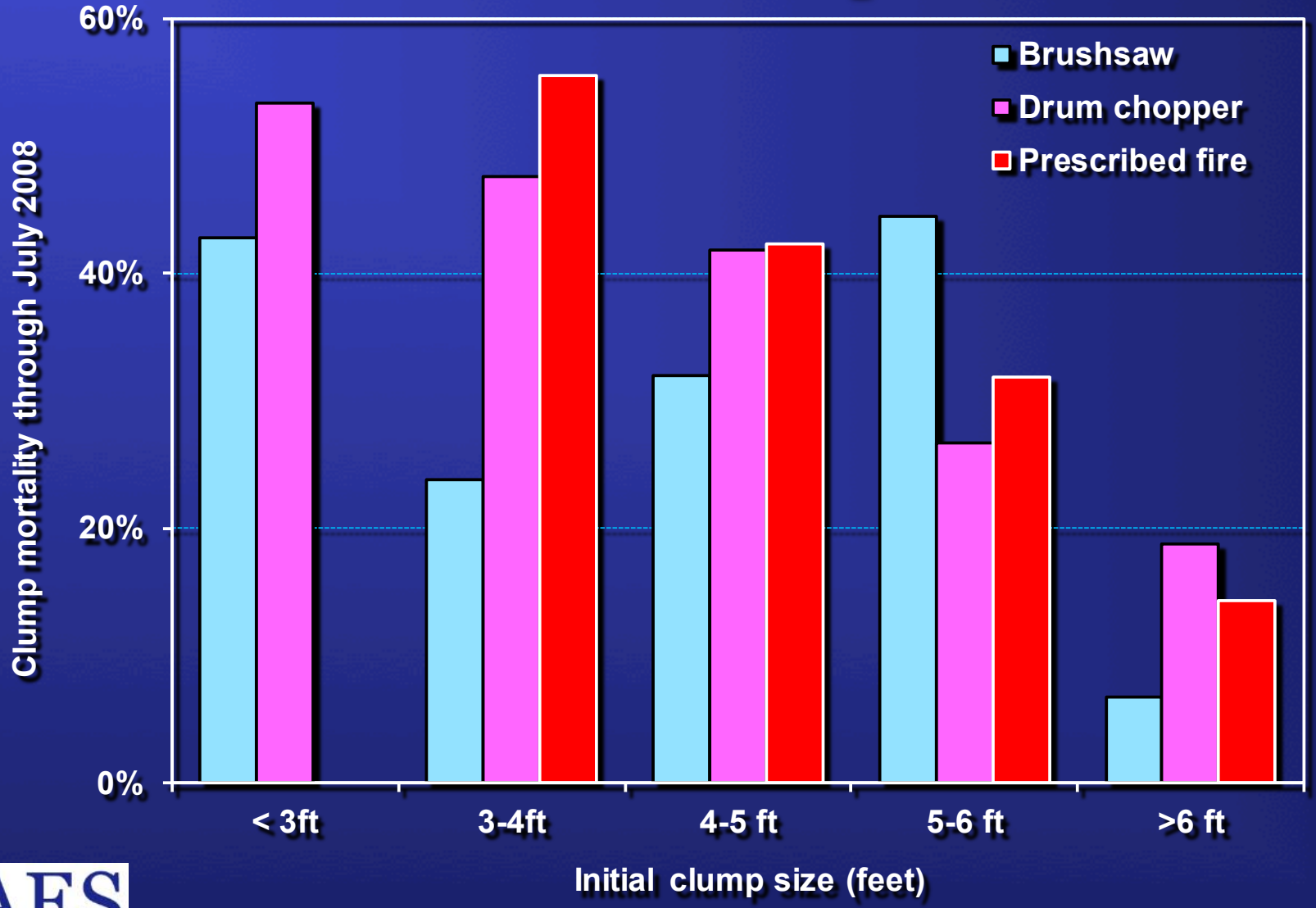
Fire - alternative 1st step for invasives



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100% top kill

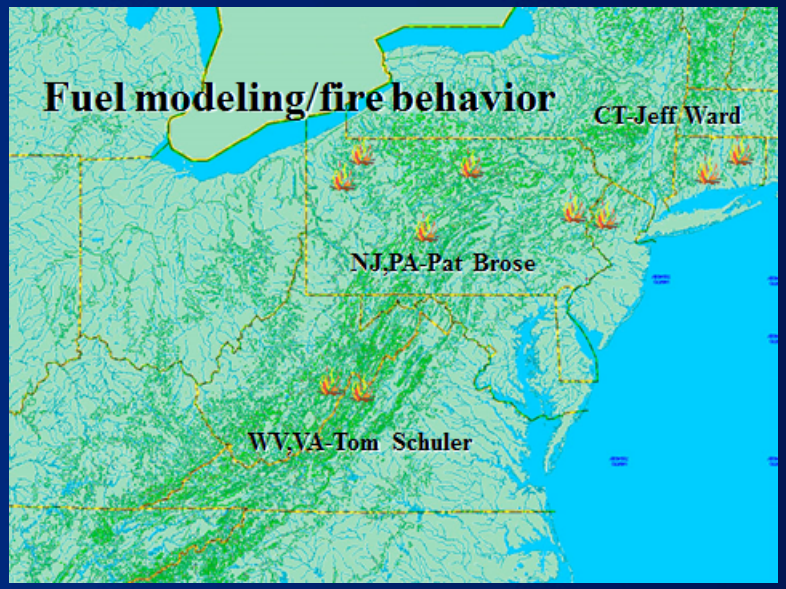
Fuel modeling/fire behavior

Acknowledgements

**Division of Forestry –
Connecticut DEEP**

**Partial Funding:
Joint Fire Science Program
McIntire-Stennis Program**

**Patrick Brose & Thomas Schuler
Northeastern Research Station
USDA Forest Service**



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