

# Regeneration trees with deer: can anything be done?

Today's talk:

Describe the specific impacts of deer on tree regeneration in upland broad-leaved forests.

Describe other factors with similar negative impacts on tree regeneration

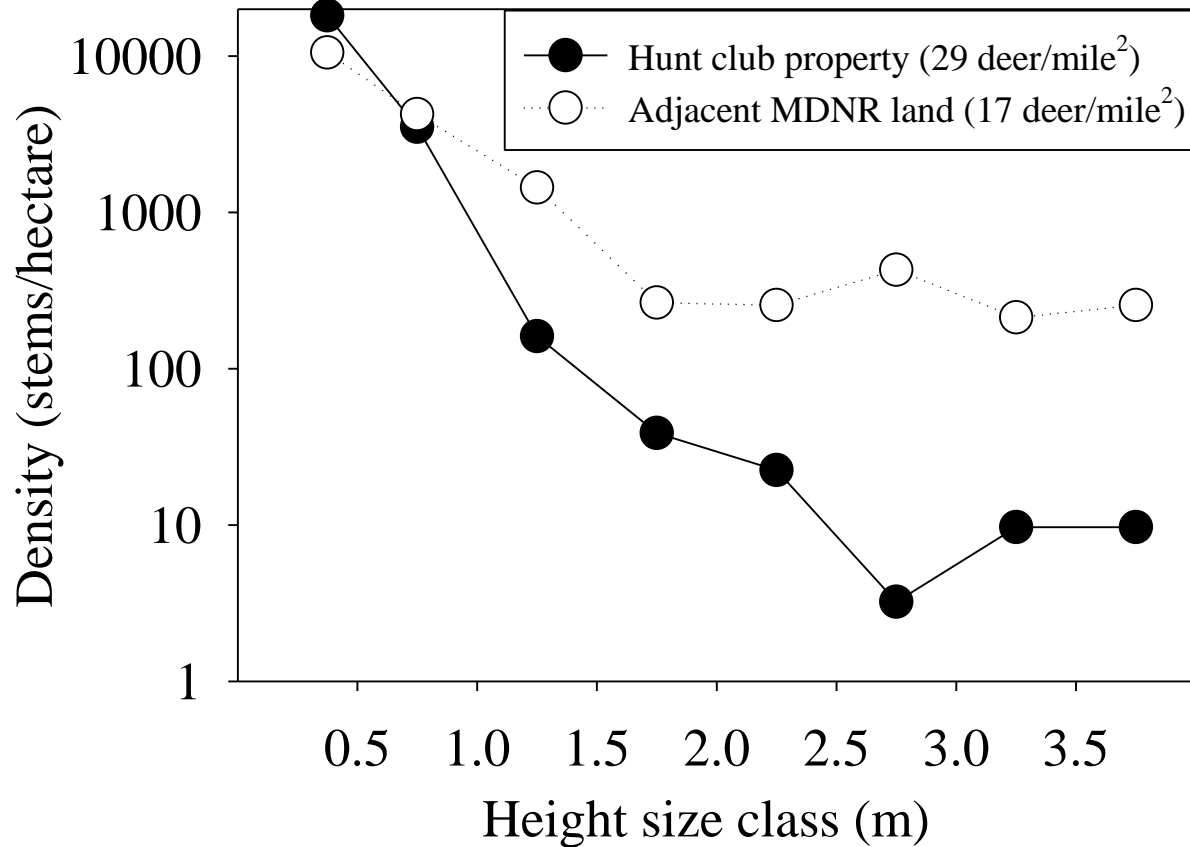
Some take homes, and suggestions for how to manage northern hardwood forests with high deer populations



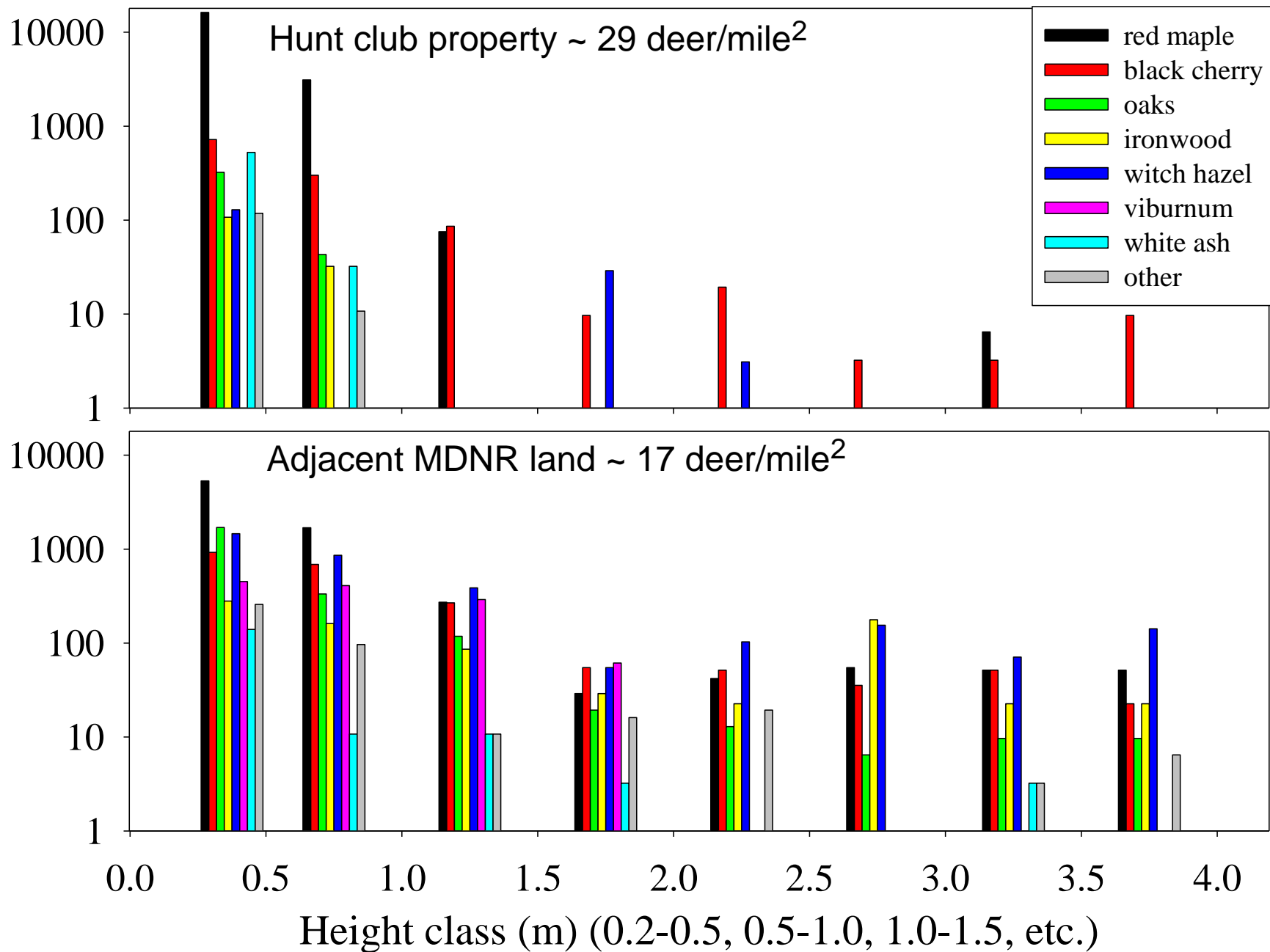
Work of many, including: Megan Matonis, James Millington, Jesse Randall, John Willis

# The Impacts

Tree and shrub stem density by size class in aspen stand understories  
Roscommon County, Michigan

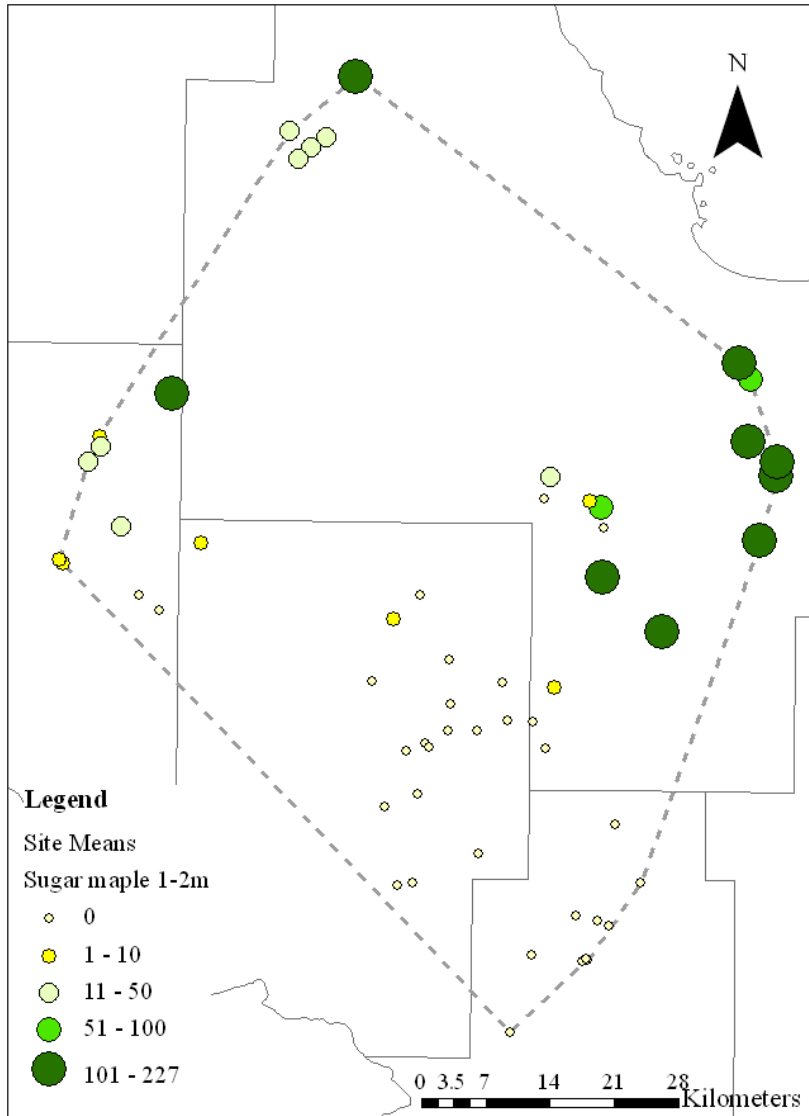


# Tree and shrub densities in aspen understories: Roscommon County, Michigan



# The Impacts

Gap densities of 1-2 m tall  
sugar maple saplings

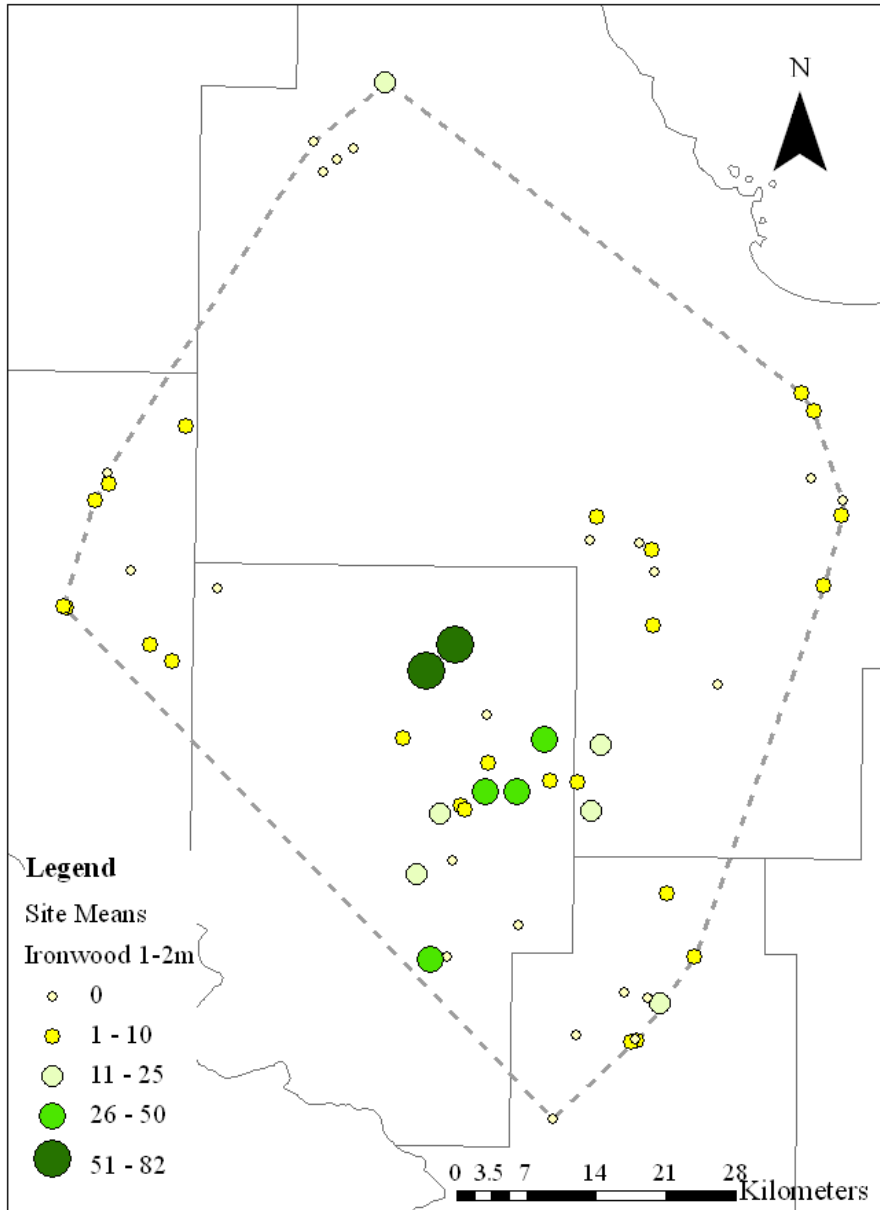


347 gaps distributed over 59 harvested  
northern hardwood stands

- 75% of all saplings ironwood and sugar maple
- No sugar maple sapling recruits in 50% of gap centered (14 m diameter) plots

Adapted from Matonis, Walters, Millington.  
Forest Ecology and Management 262: 286 -  
298

# Stand average gap densities 1-2 m ironwood saplings



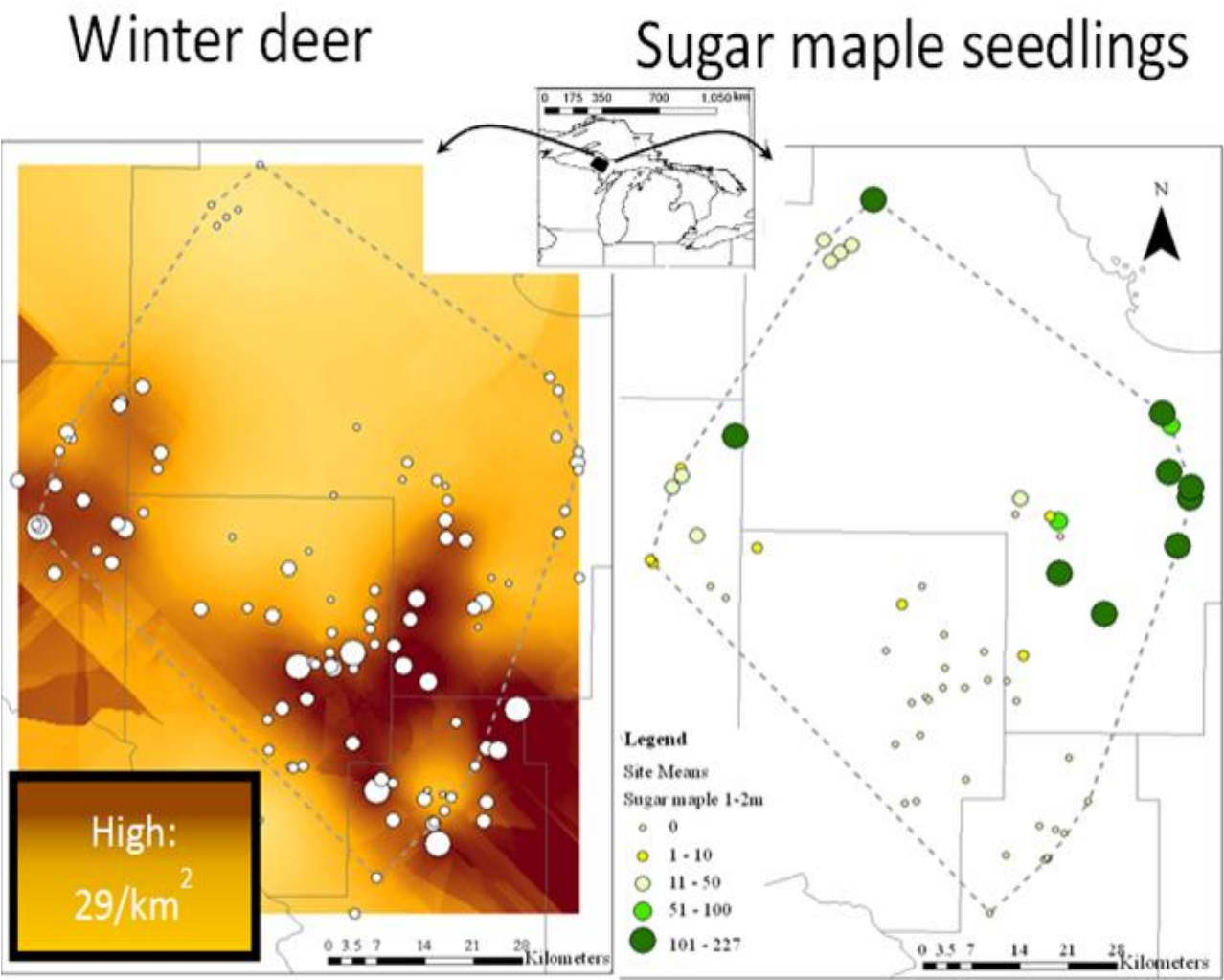
- Gaps instead occupied by other species, mostly ironwood, or nothing at all
- 12% of gap centered plots were empty





# Possible reasons for low sugar maple regeneration density

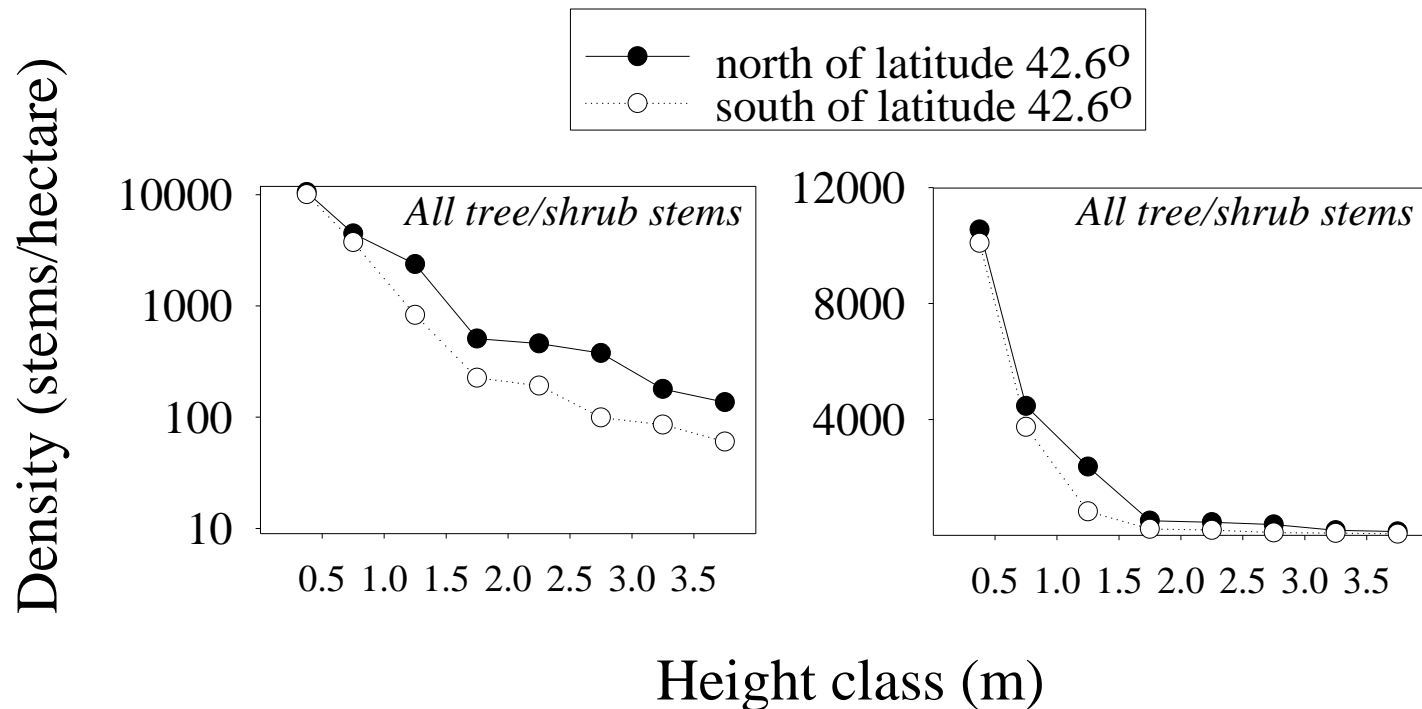
- Too many deer
- Harvest gaps too small
- Competing vegetation

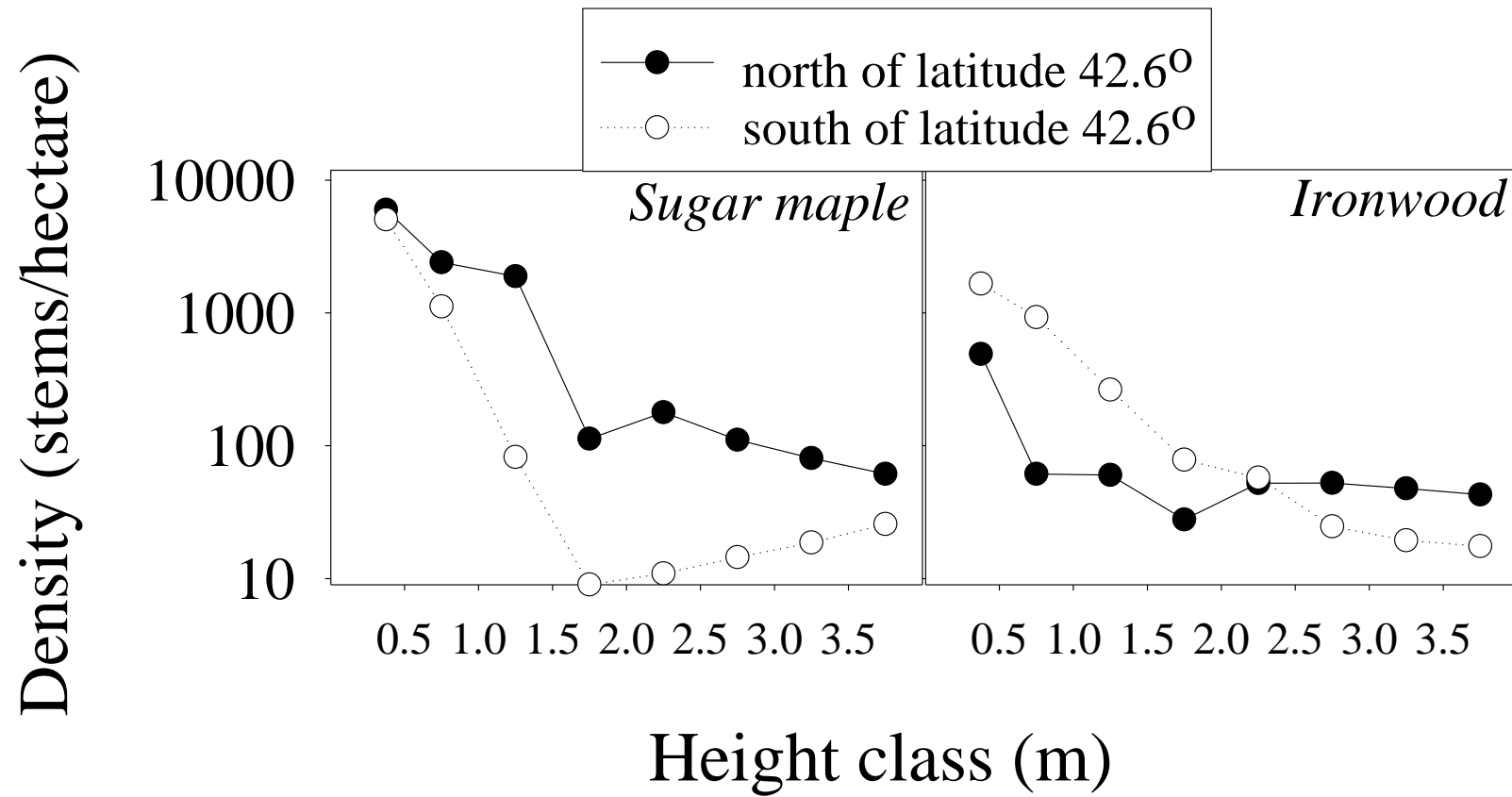


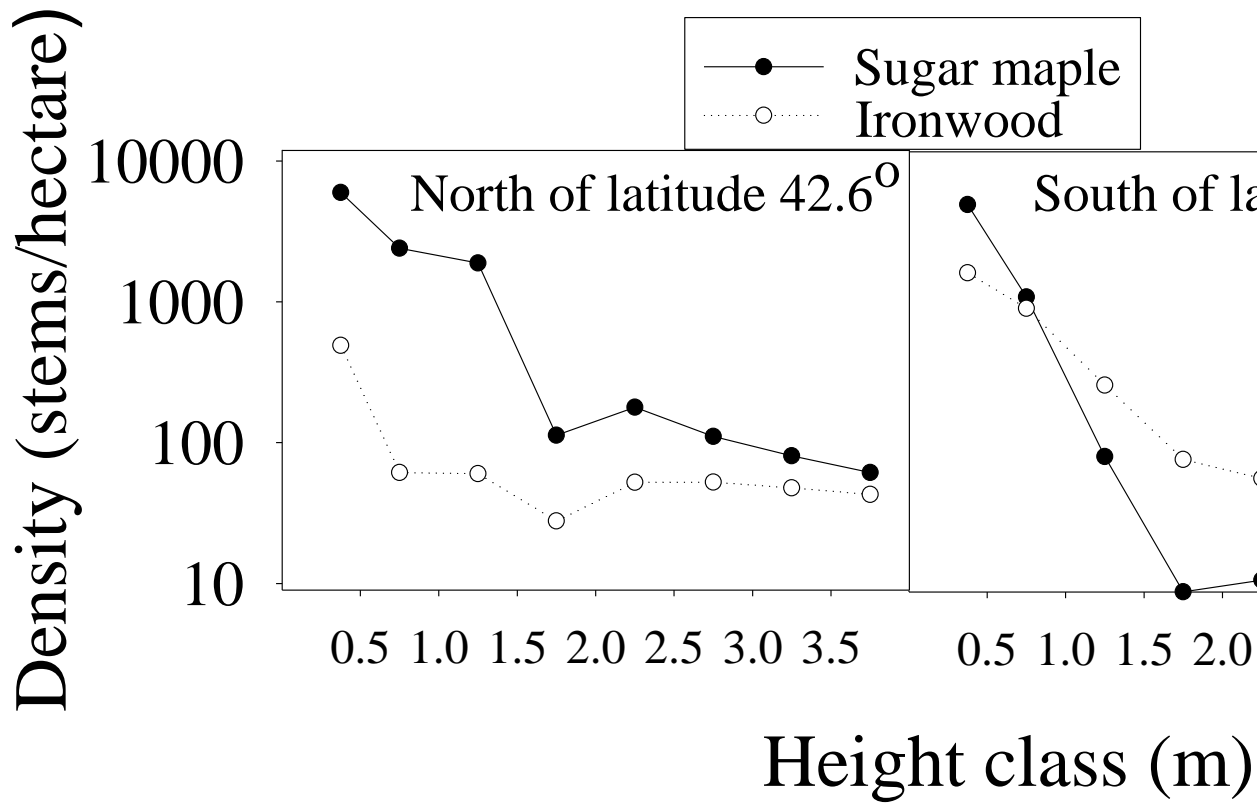


# The Impacts

Same central UP study area: 143 southern NH stands, 44 northern NH stands







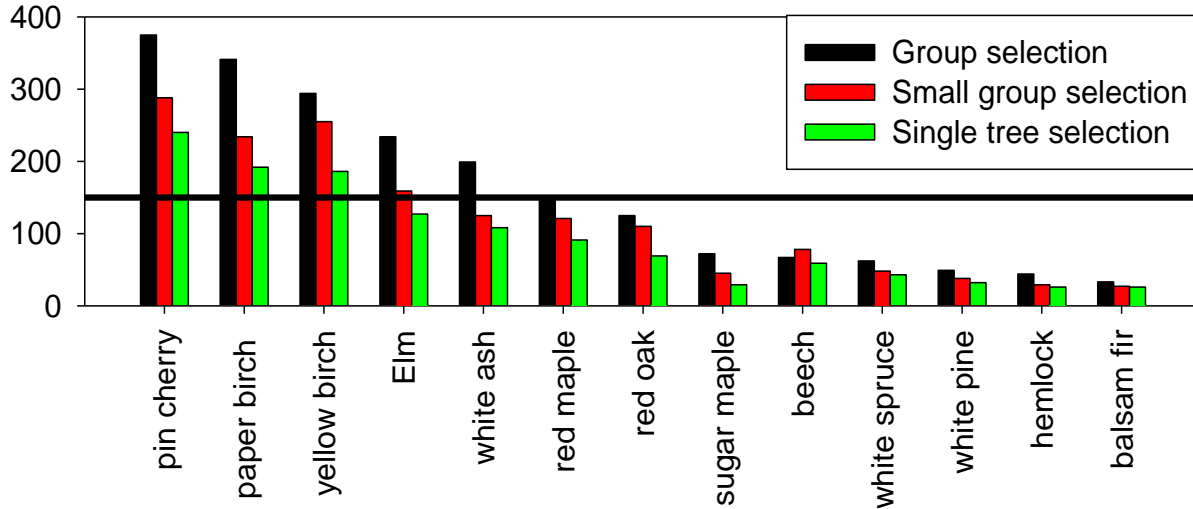
# The impacts

Two 40 acre installations,  
Emmet County, MI : 45 harvest  
gaps in each

Effects of gap size and deer  
on planted and natural  
seedlings



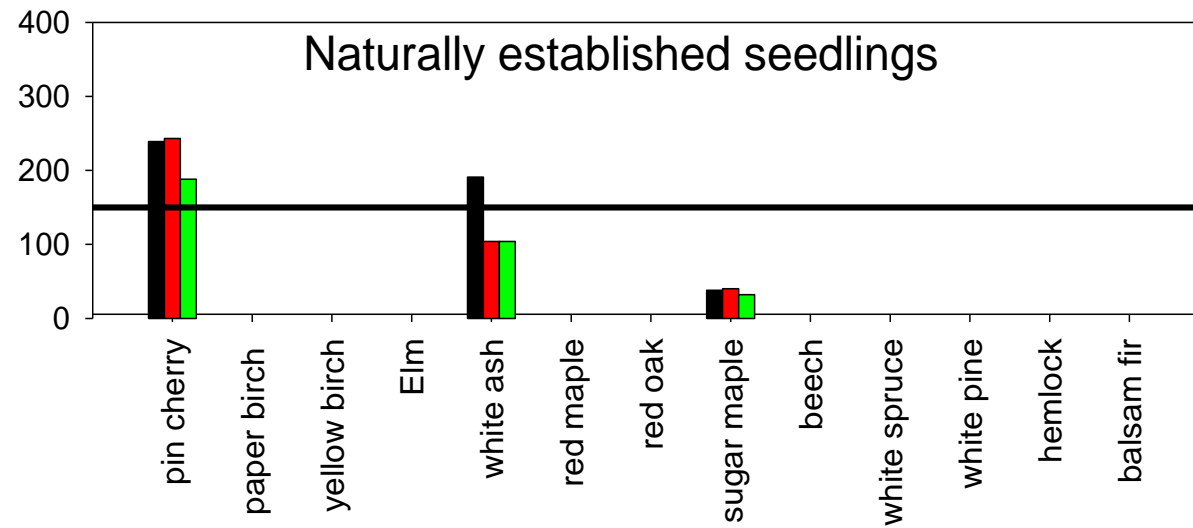
### Planted seedlings, kept weeded. Six years old



ST = <66ft diameter  
 SG= 66-75 ft  
 G = 75-110 ft

Planted and naturally established seedlings have similar growth dynamics....

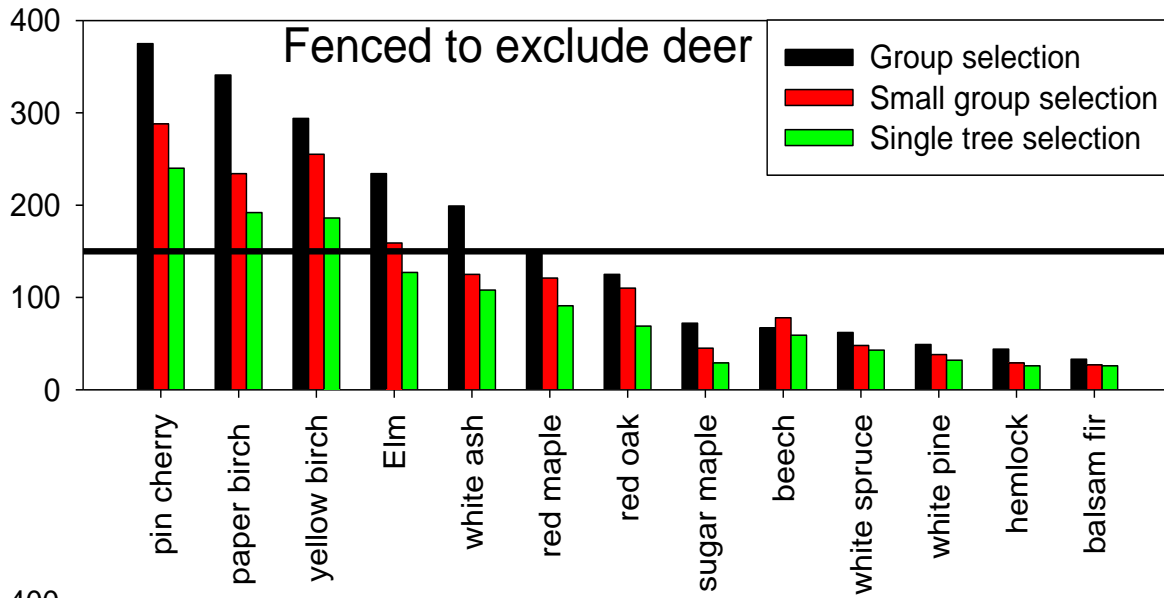
Height (cm)



On average, gap winners of sugar maple in all gap sizes are nowhere close to crossing 1.5 m threshold.

In larger openings, most sugar maple are still underneath competing vegetation

Planted seedlings, kept weeded. Six years old

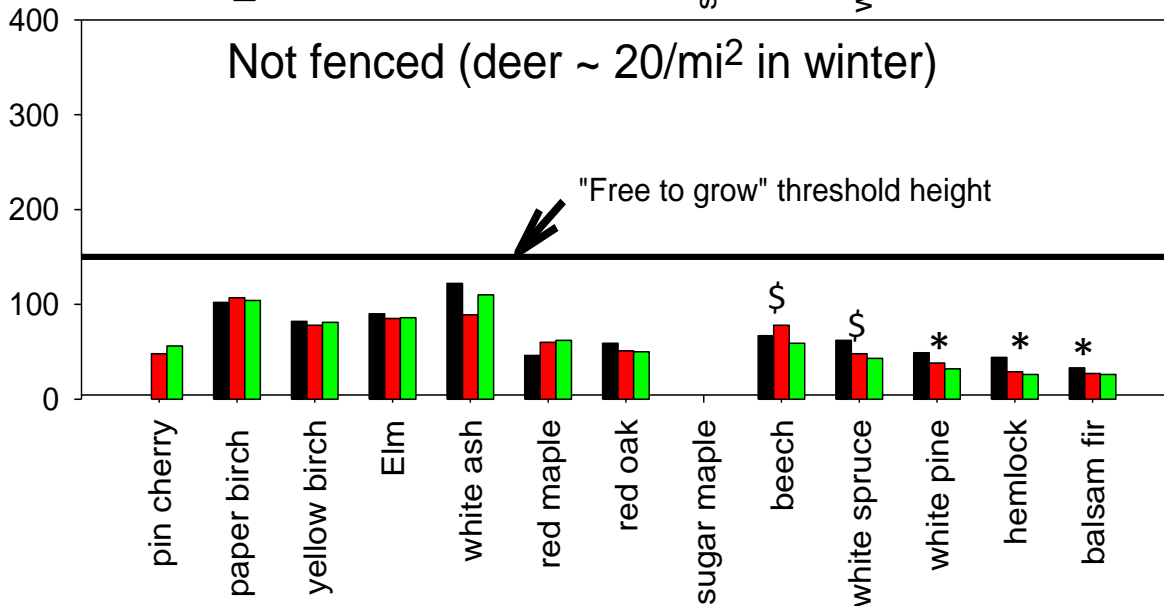


After six year's growth:

5/12 species transcend 1.5 m in height in large group selection gaps. 3/12 do so in single tree selection gaps.

Several species of management interest (red oak, sugar maple, white pine, hemlock) do not make 1.5 m.

Height (cm)

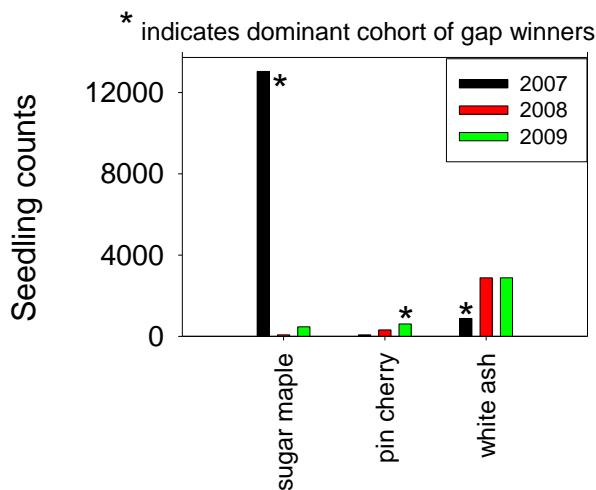
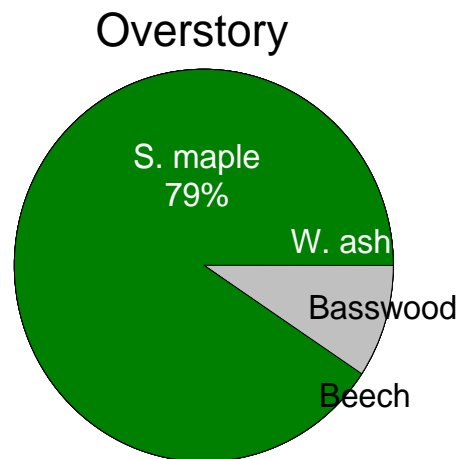
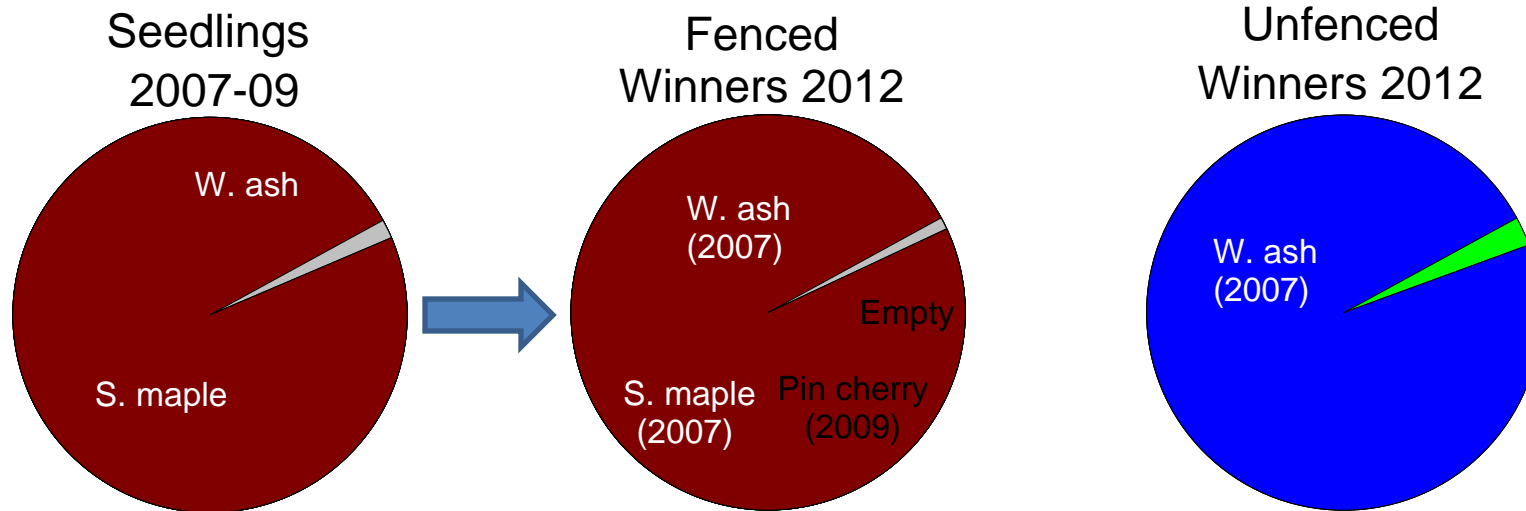


If not fenced, no one makes it yet...

\* browse damage observed, but no effect on height yet

\$ browse damage not observed

## Naturally established seedlings

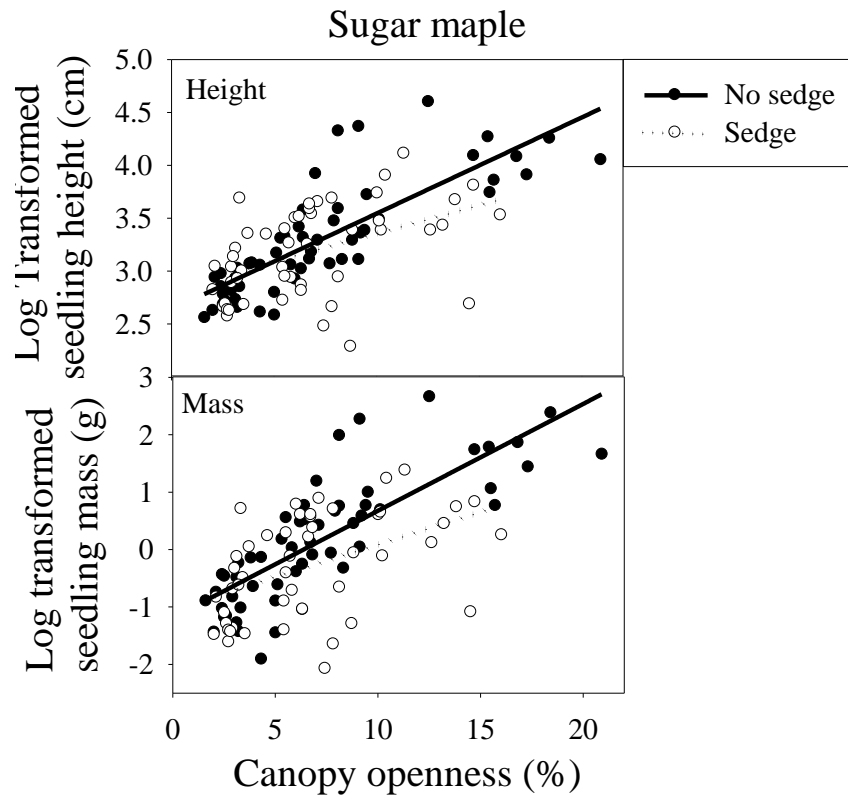


- Stocking of seedlings is high, but diversity is low
- Gap winners disproportionately ash and pin cherry. Why? rapid growth for pin cherry and ash, slow growth and 90% mortality for maple
- Ash nearly completely dominates if deer are not excluded.

- 85% of post-harvest seedlings (22,270 tallied, 214,000/acre) were of just two species.

# Other factors

- Competing vegetation



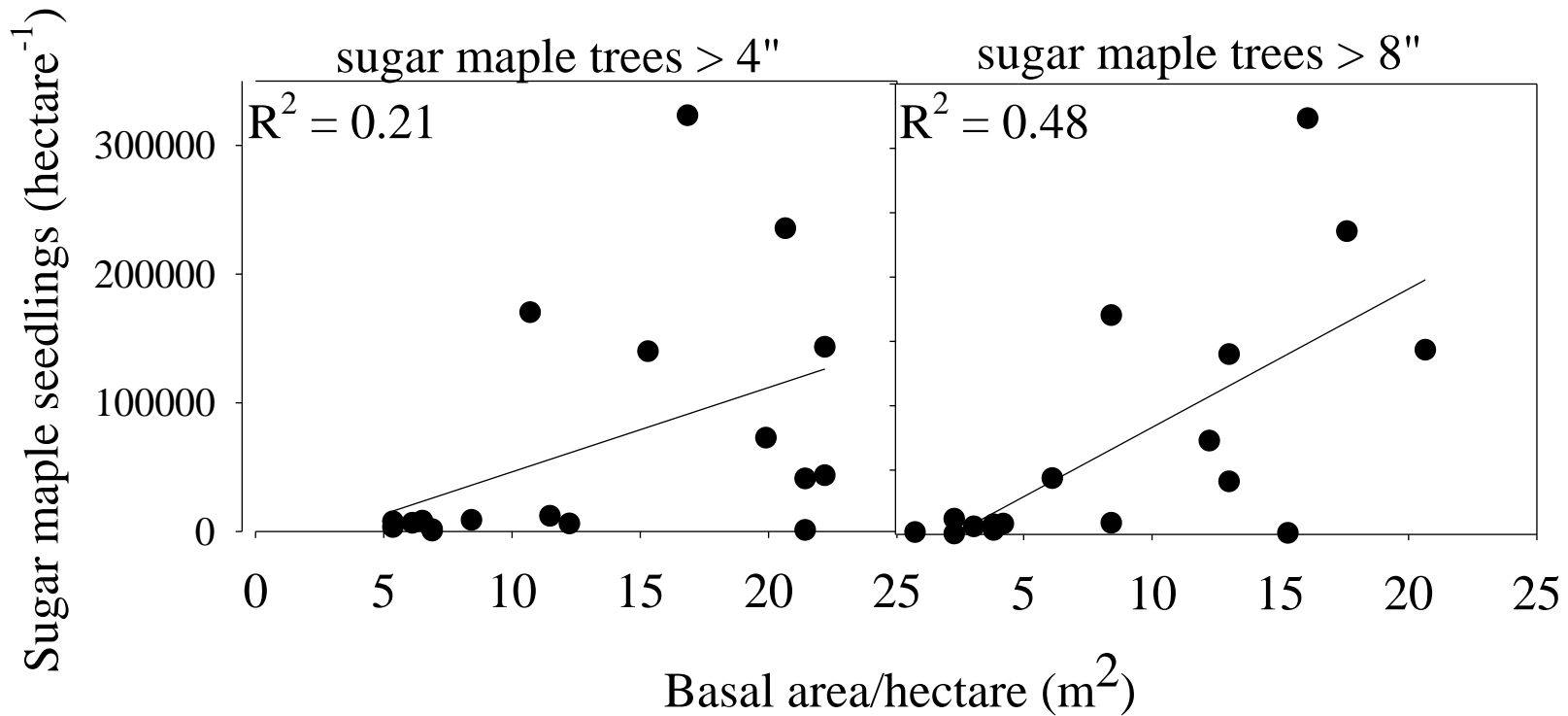
Randall and Walters, In preparation



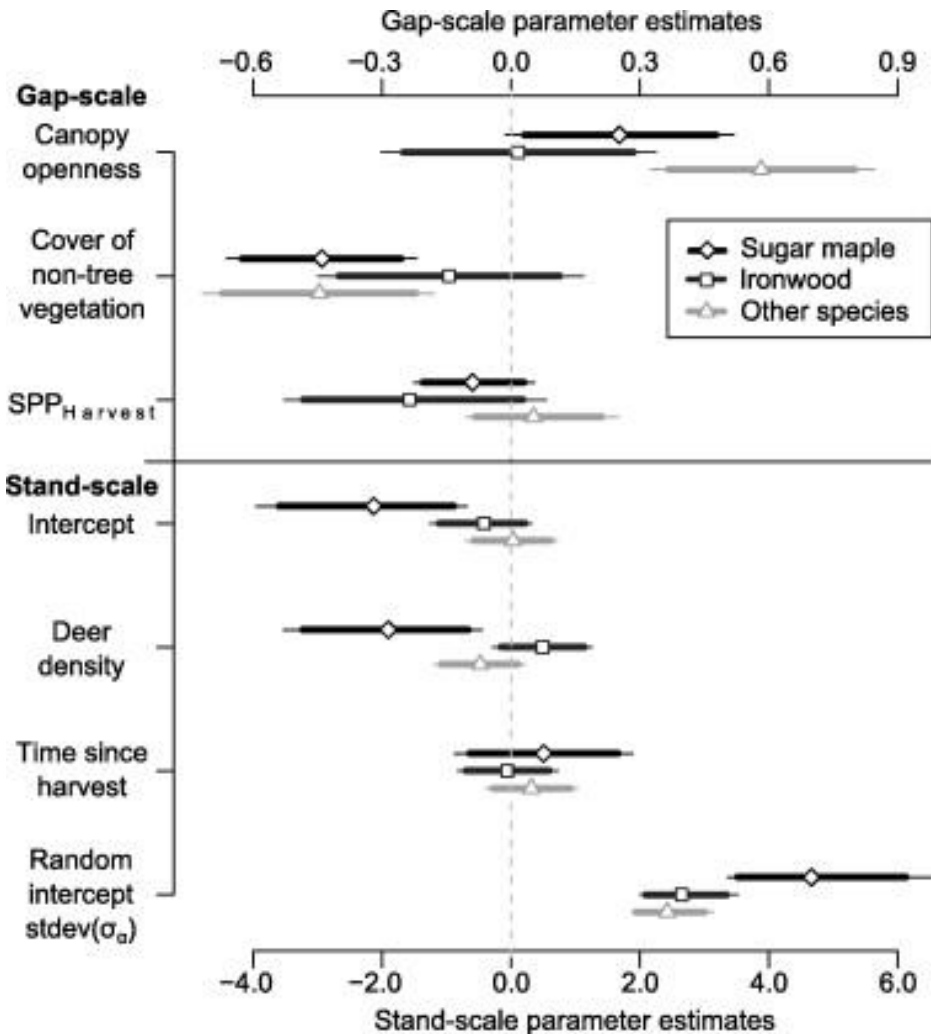


# Other factors

Local seed sources may be absent or seed source trees may be too small



# Other factors



## Harvest gaps too small

Increasing gap size (bole to bole sizes in Megan's study 90- 900 m<sup>2</sup>) increases sugar maple and other seedlings.

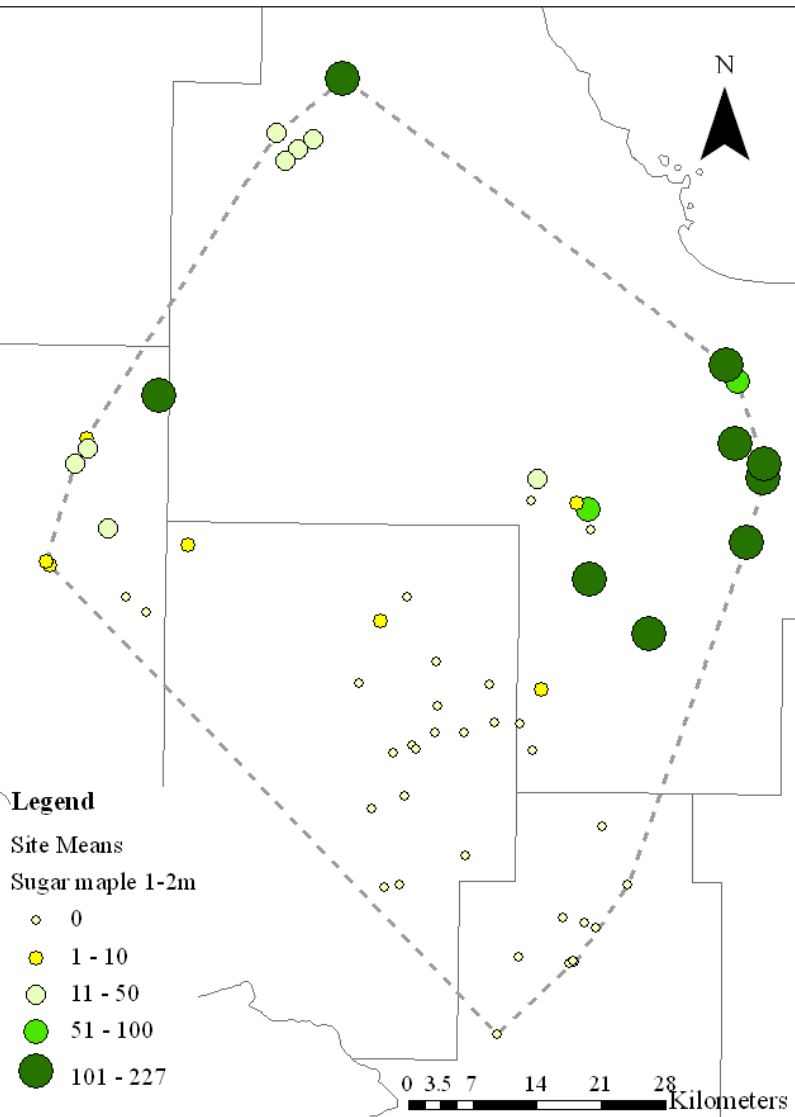
Other important point: gap size, competing vegetation and deer simultaneously impact seedling recruitment.

# Other possible factors

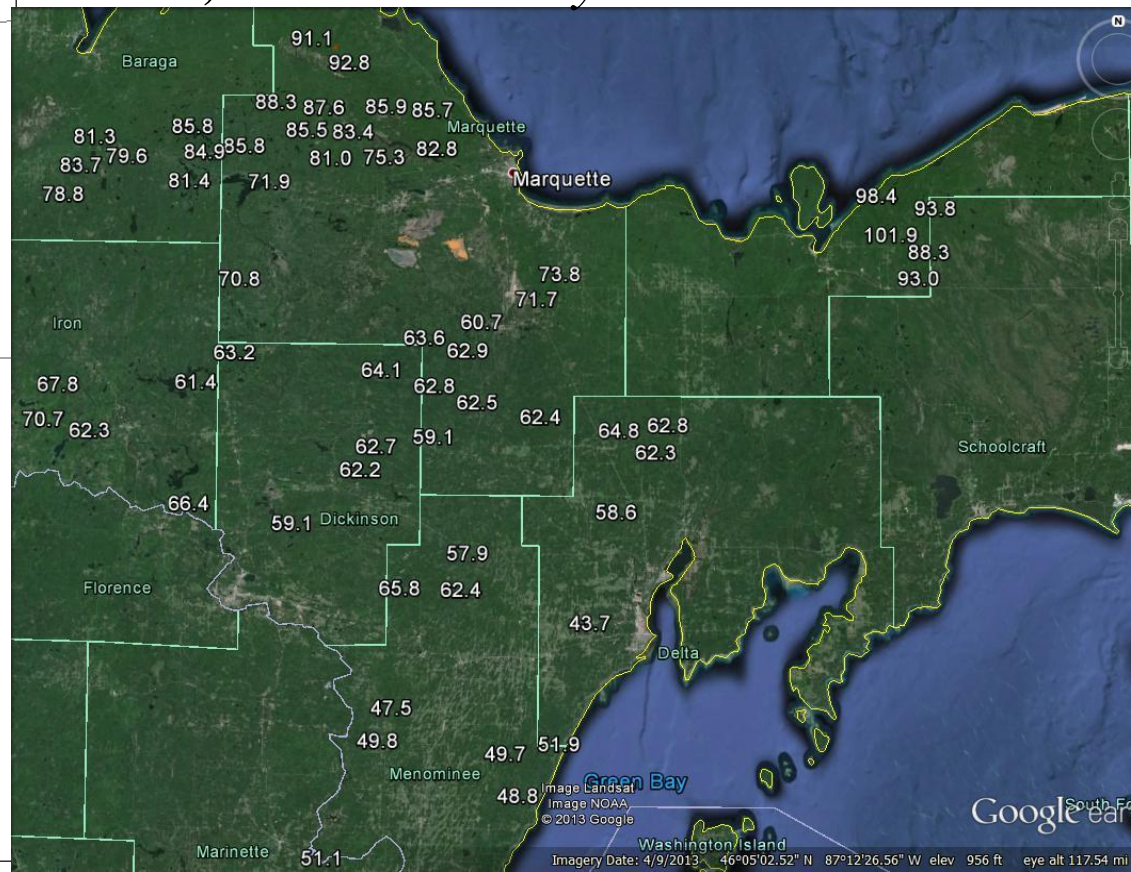
Northern hardwood forests are associated with lake effect “snow-belts” (Henne et al. 2007, Booth et al 2012)



# Areas where we found higher sugar maple density also coincide with high snowfall areas



*Snow depth (cm), 68 northern hardwood stands, late Feb-early Mar 2014.*



# Take home

When assessing potential deer problems important to keep in mind that other factors may be contributing to lack of regeneration: insufficient local seed sources, competing vegetation

- Lack of seed sources
- Lack of suitable substrates for some species (Willis)
- Competing vegetation
- Small harvest gaps

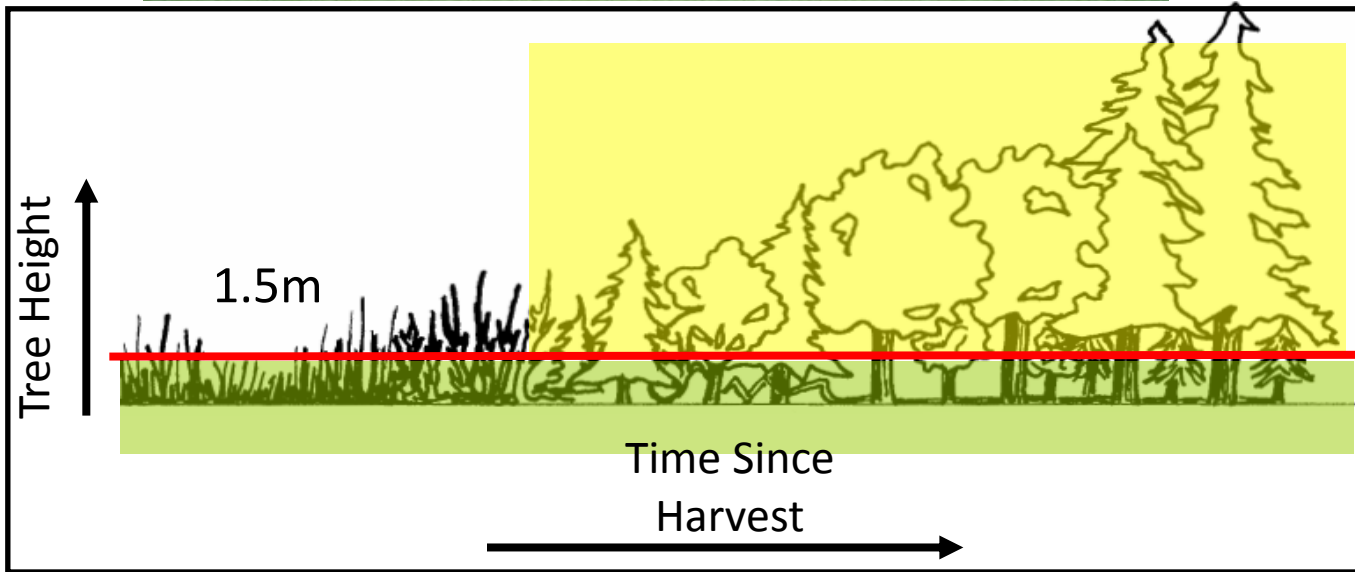
# Don't count seedlings, count canopy recruits

- Seedling abundance < 1.5 m doesn't mean much. High densities of small seedlings can be maintained at high deer concentrations.
- Seedlings 1-2 meters strongly affected by deer (density and composition).
- Can't count as successful regeneration until > 1.5 m in height.

## Take home



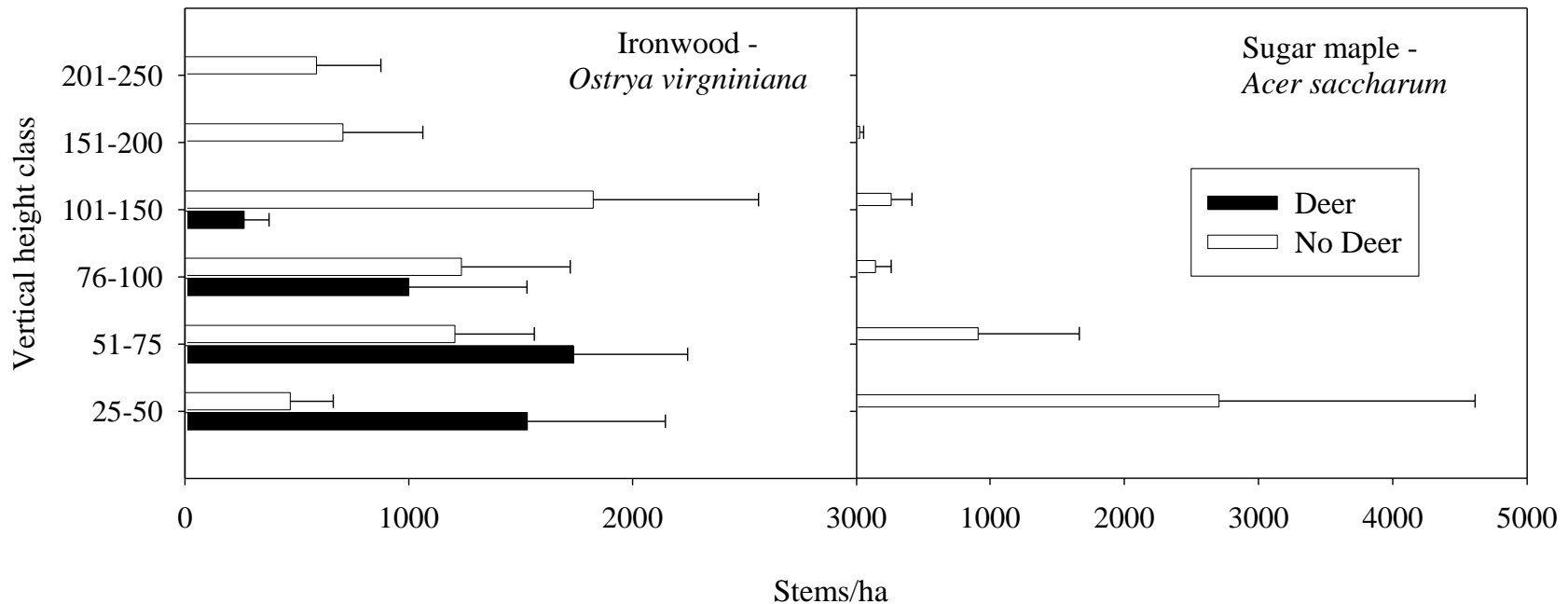
Deer  
Browse,  
Competing  
vegetation



# Take home

If deer are removed and you have advanced regeneration, what you see is what you'll get

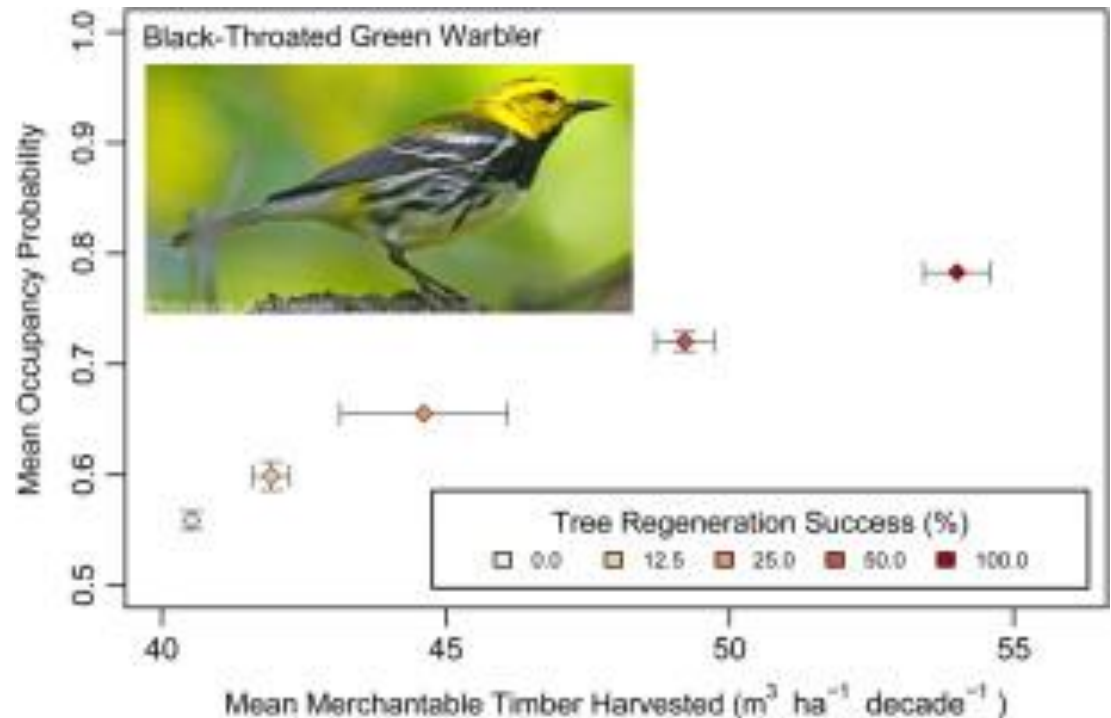
Faithorn, Menominee County: Exclosures up for six years



# Take home

Effects strong enough to ultimately diminish timber productivity (and change other values), so this issue needs to be addressed if long-term sustainable harvest is a goal

Our simulations show that: given current average stand conditions in the UP a 75% reduction in 7m tall sugar maple from complete stocking results in a 20% reduction in harvested timber and a decline in warbler habitat over 100 years



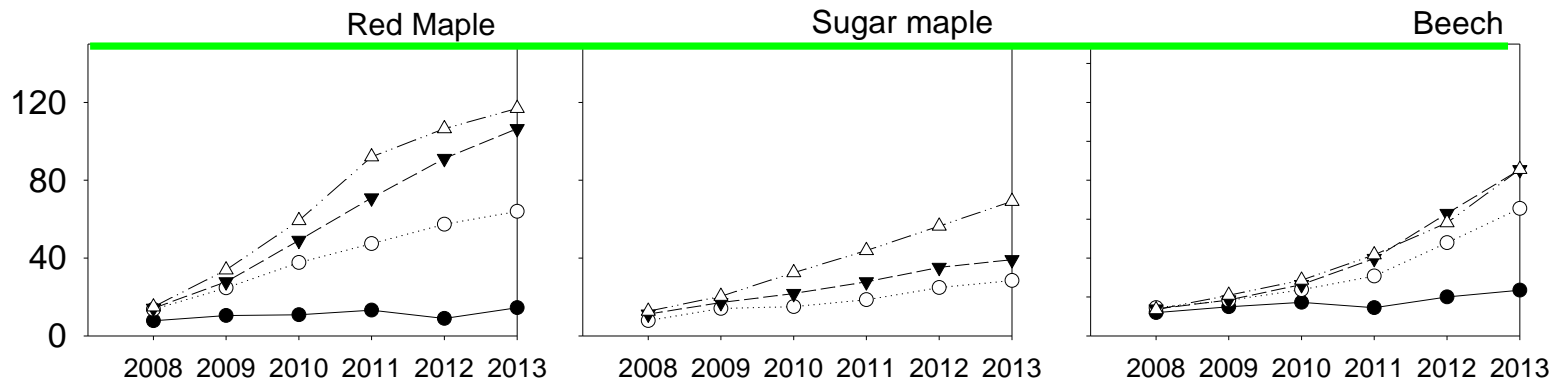
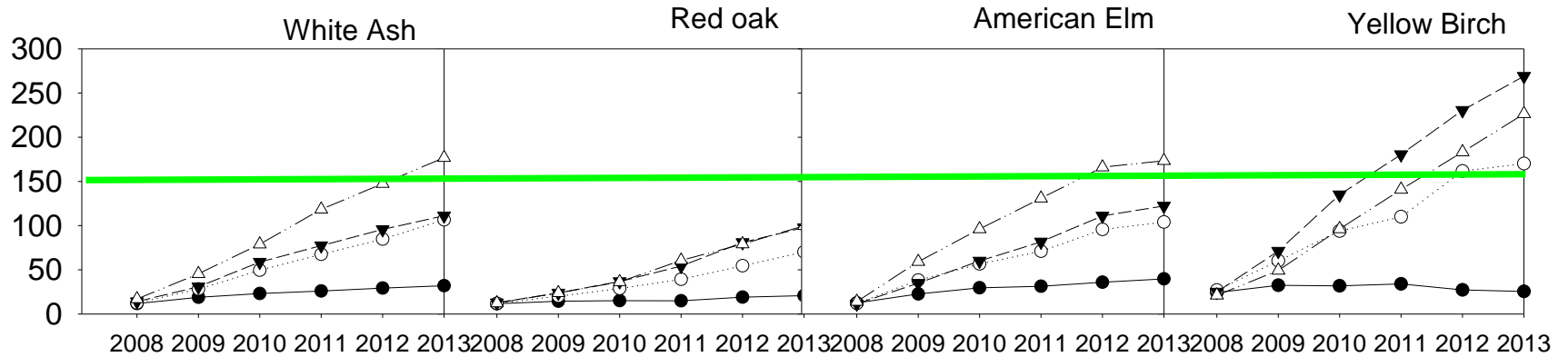
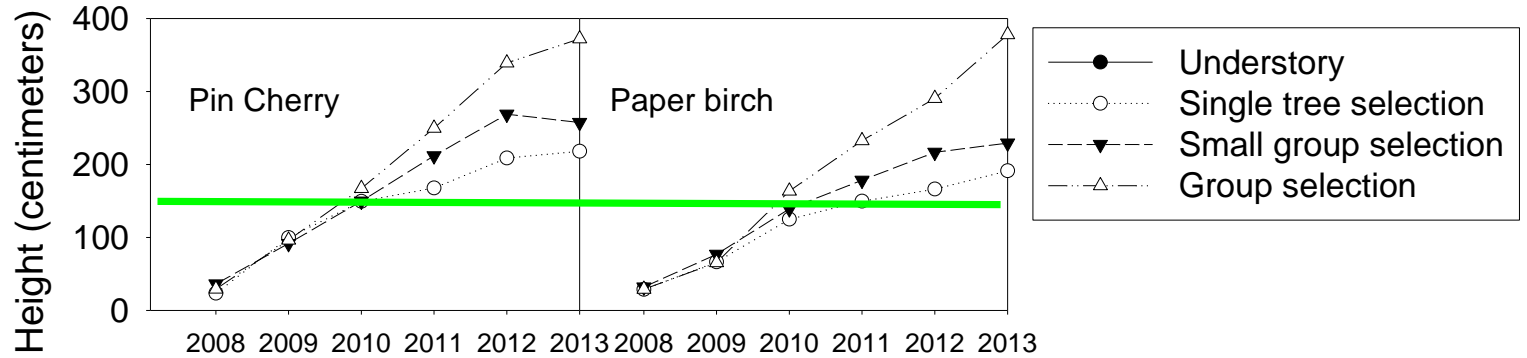


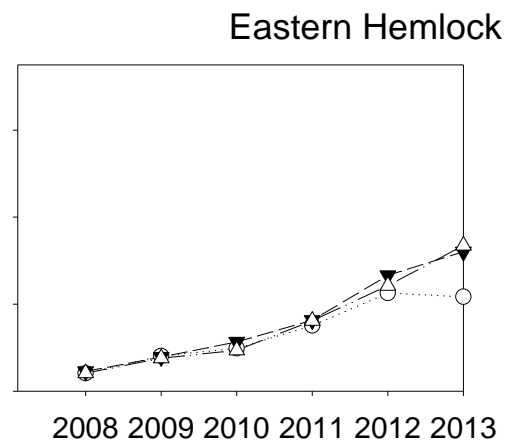
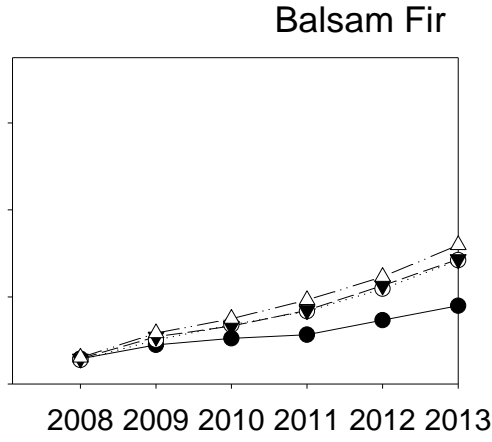
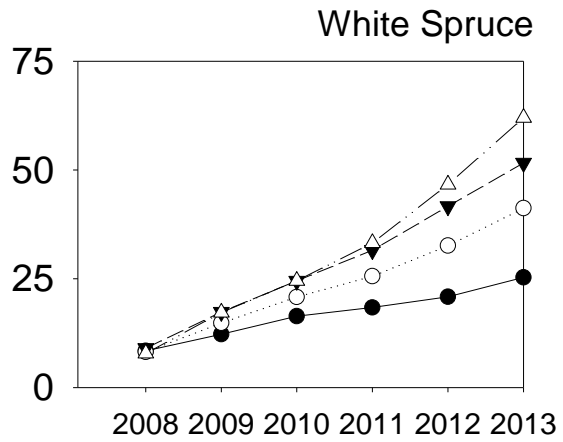
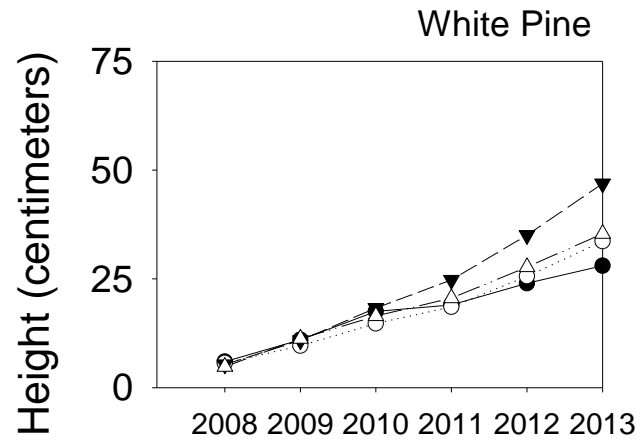
# Ways to manage around deer

Find alternatives to single tree selection  
silviculture

- Group selection?

# Planted seedlings, seven years old





# Shelterwoods?

- Leave larger seed trees of predominantly sugar maple but also of other desirable species. Develop large seedling cohort before overstory removal allows them to “bolt” past deer browse risk.

# Thanks to

- MDNR
- USFS
- USDA
- Forests for the Future (Fred Prince)
- Industry Partners