

***Trees for dinner: Exploring
how deer affect advance
regeneration at stand and
landscape scales.***

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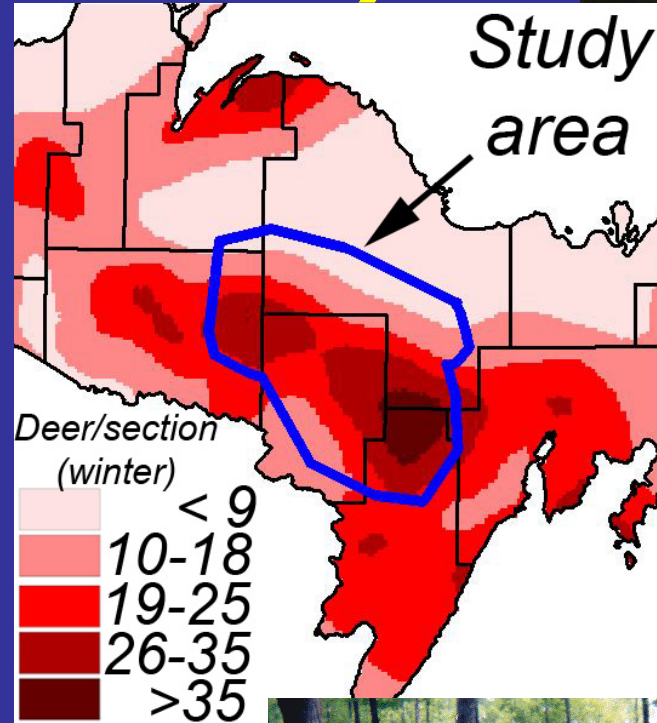
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The Issues (in brief):

- High deer densities blamed for changing character of vertical canopy structure
(i.e.; not enough high-quality hardwood regeneration)
- Implications:
 - Understory plant community diversity and richness
 - Overstory community composition
 - Economics of forest management
 - Mid-canopy nesting birds
 - Other wildlife

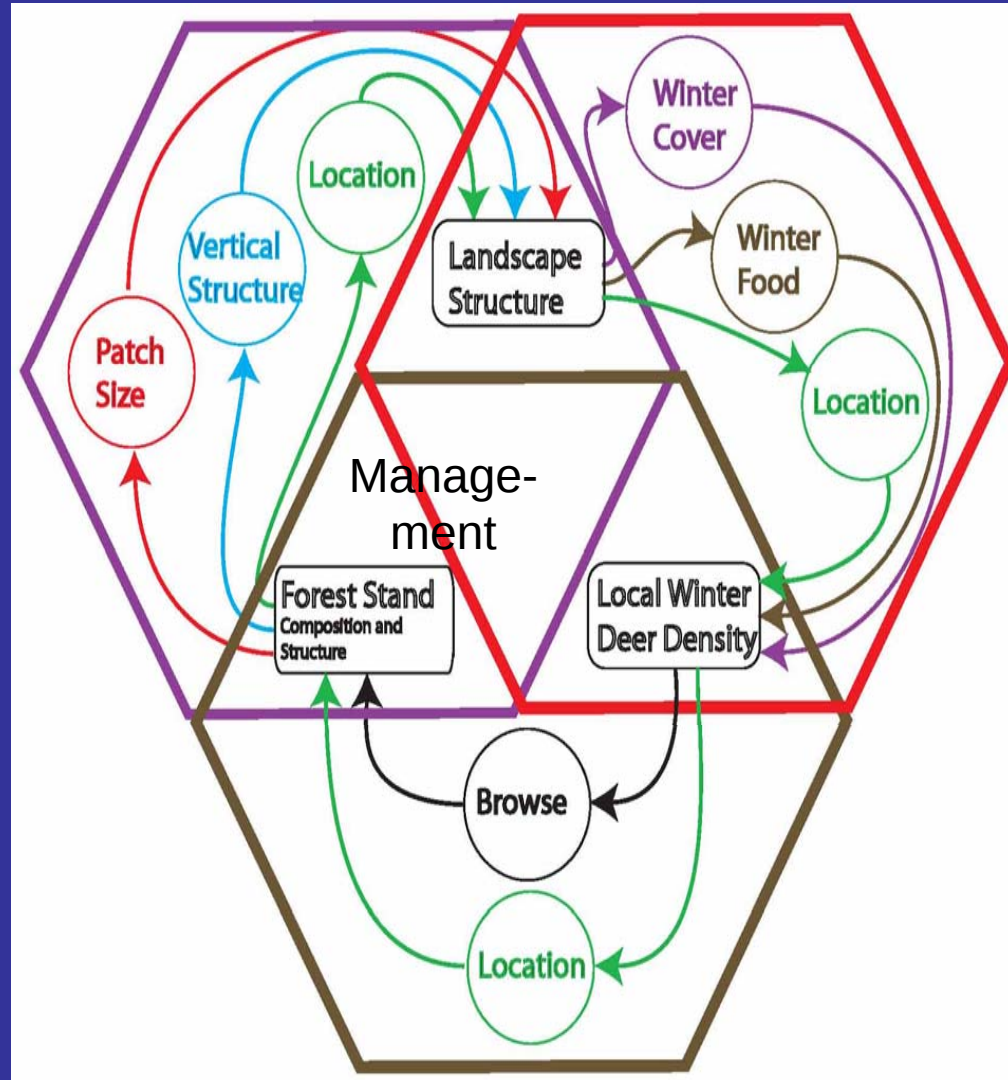


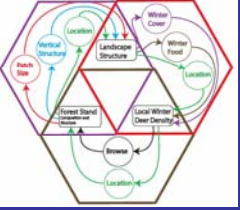
Conceptual Model

Landscape composition and structure drive local deer density.

Local deer density drives stand-level vertical structure.

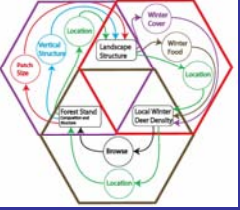
Sum of stand-level characteristics defines landscape composition and structure.





Hypotheses:

- Local deer density within a given northern hardwood forest stand is driven by the amount of winter thermal cover nearby;
- Browse damage to seedlings and saplings is correlated with local deer density;
- Deer browse intensity varies with tree species;
- Seedling densities in critical height classes within a stand are negatively correlated with deer density and deer browse intensity;
- The correlation between stem density in critical height classes and deer density varies with species.

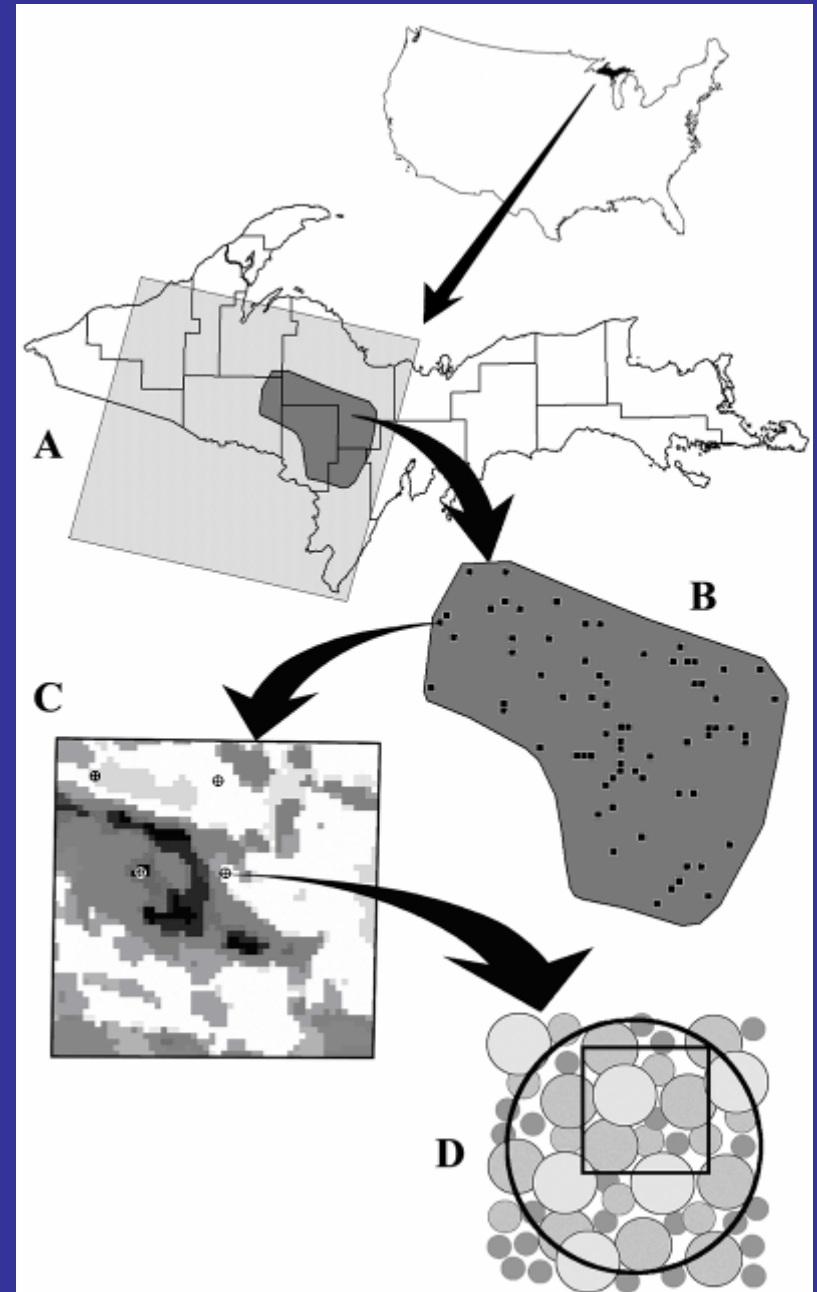


Study Area

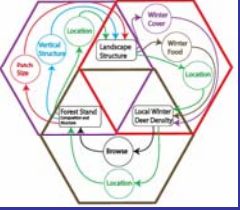
Predominantly forested, and managed for forest products.

Largely undeveloped; little agricultural or urban influences.

Buffered from exotic processes feared to occur near Lake Superior and Tierra del Cheese-head due to ecological and management anomalies.



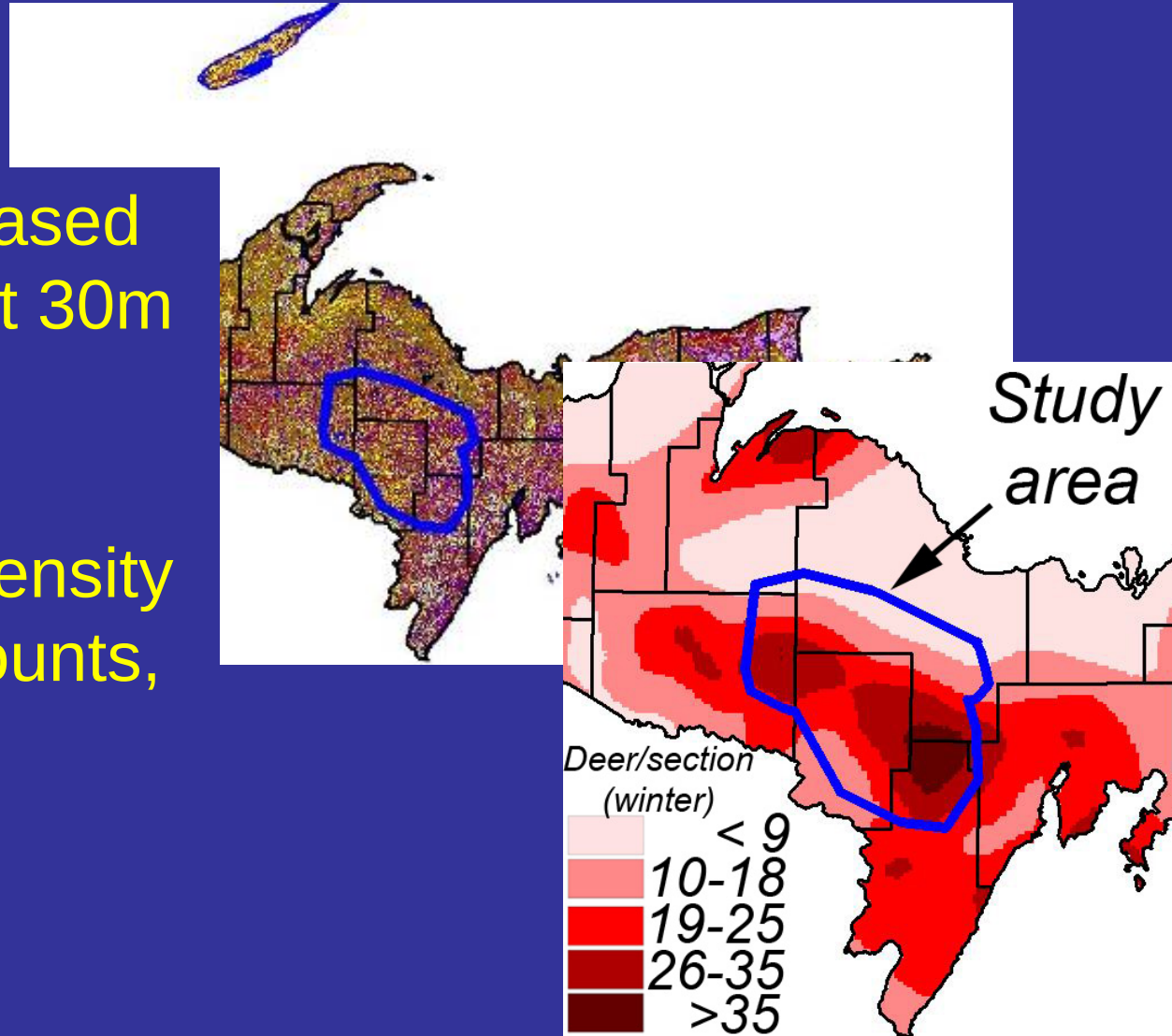
Thanks to Ed Laurent for study area figure!



Study Area Cont'd

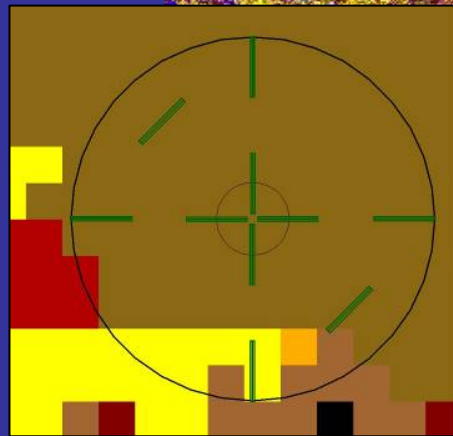
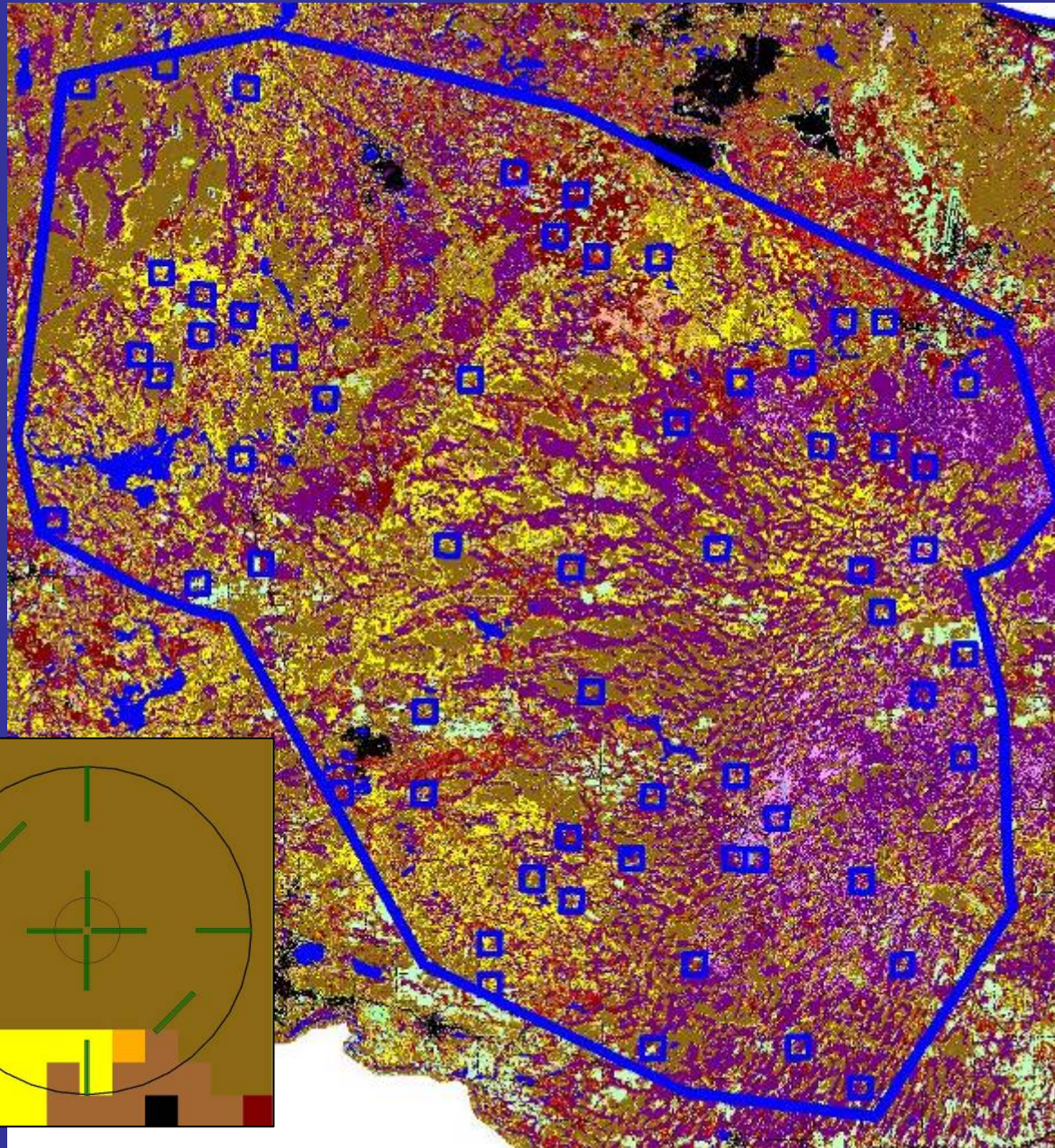
Land cover map based on 2001 Landsat 30m imagery

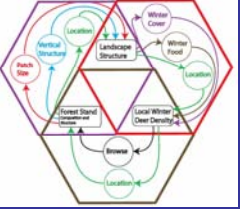
Strong gradient in historical deer density (MDNR pellet counts, 1980-2000)



Determining local deer density

- Conducted fecal pellet group surveys at 164 geopositioned vegetation sample plots.
- 10 transects, 50x4m, per vegetation plot.





Hypothesis 1:

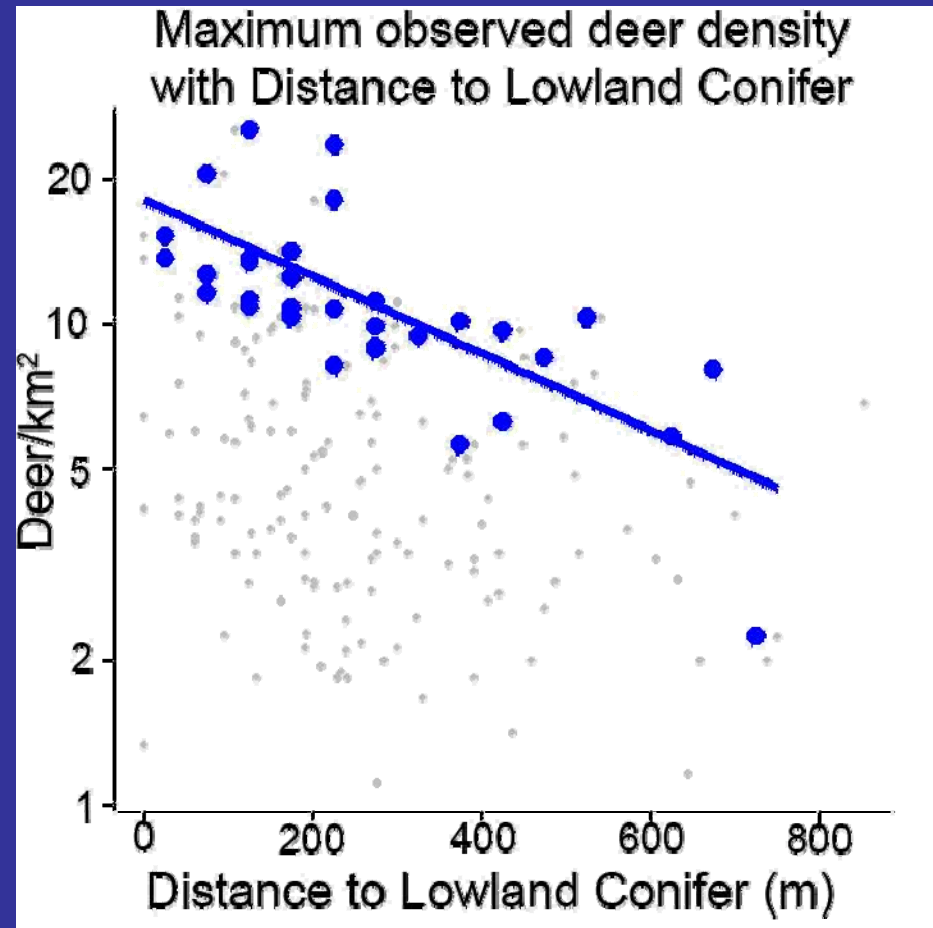
Local deer density is driven by winter thermal cover

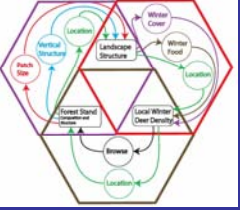


The mix of winter food and thermal cover drives deer presence at the stand and sub-stand scales.

Deciduous sites closer to conifer have higher probability of having a high deer density.

(Verme 1965, '68)



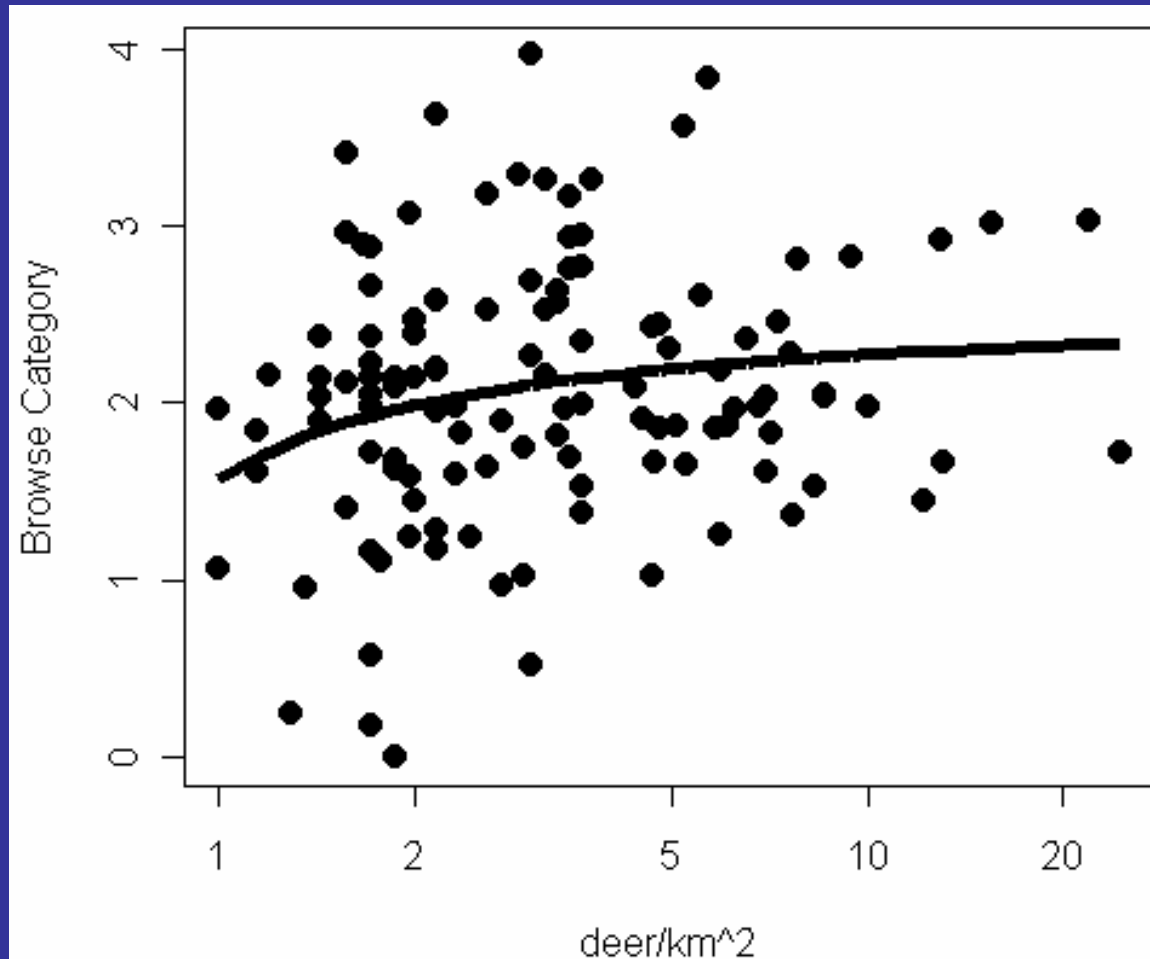


Hypothesis 2:

Browse damage is correlated with local deer density

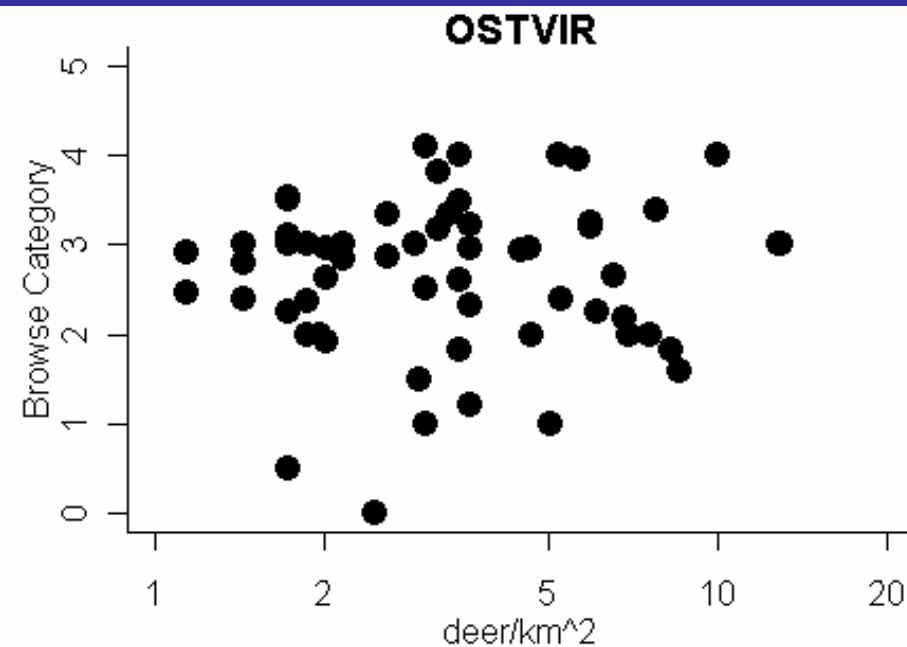
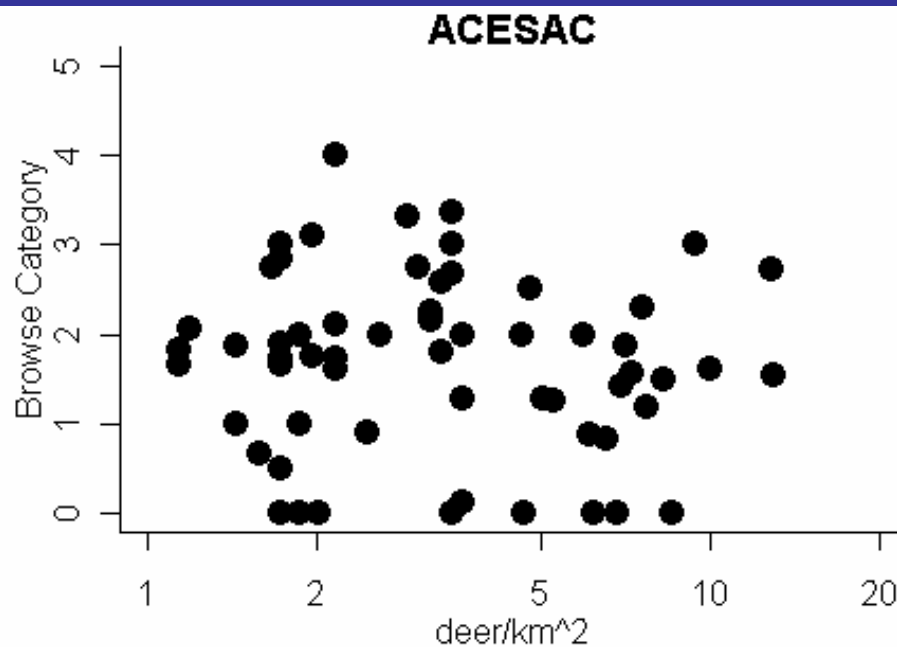
Browse damage followed a saturating function (Michaelis-Menton, $V_{max}=2.5$, $k=1$)

Local deer density alone predicts 4% of browse variation



Hypothesis 3: **Deer browse intensity varies with tree species**

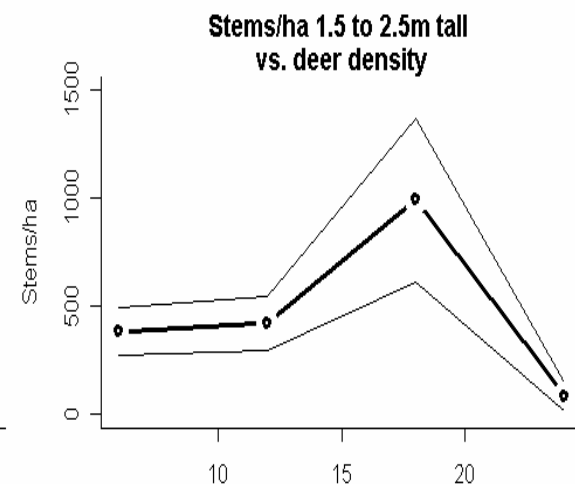
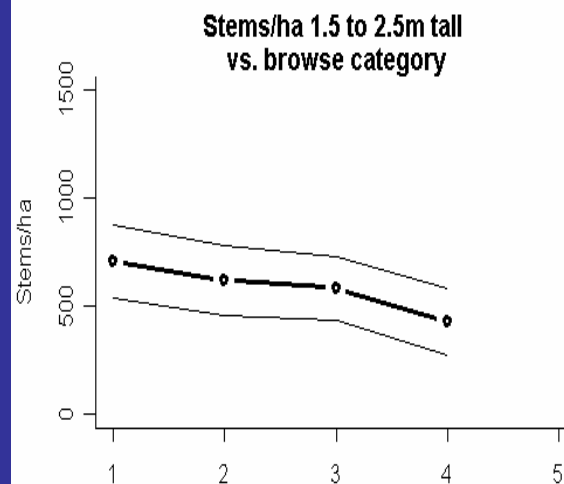
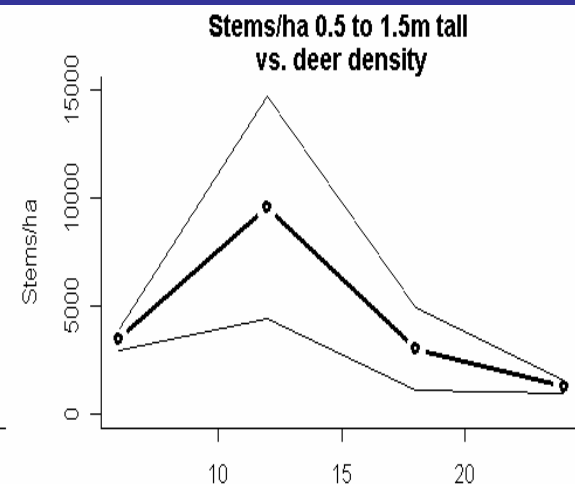
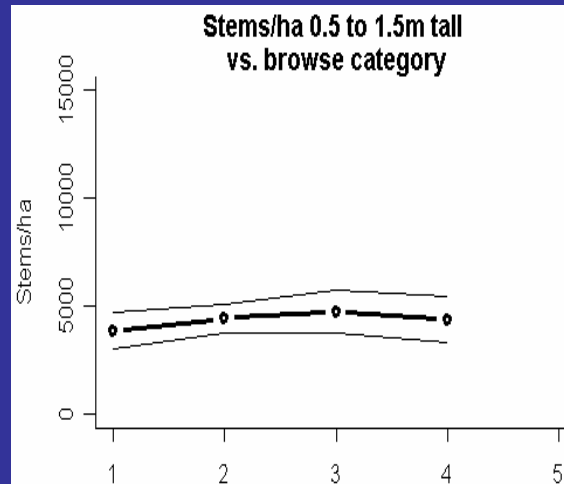
NO! The relationship between local deer density and browse category was not different for different species. e.g.: Sugar maple (*ACESAC* = *Acer saccharum*); and ironwood (*OSTVIR* = *Ostrya virginiana*)



Hypothesis 4:

Seedling density is negatively correlated with deer and with deer browse

- BROWSE is NOT correlated with density in shorter size-classes (0.5-1.5m)
- BROWSE IS correlated in 1.5 to 2.5m height class;
- BROWSE IS correlated in 2.5 to 5.5m height class
- DEER DENSITY is NOT correlated with stem density in any height class.



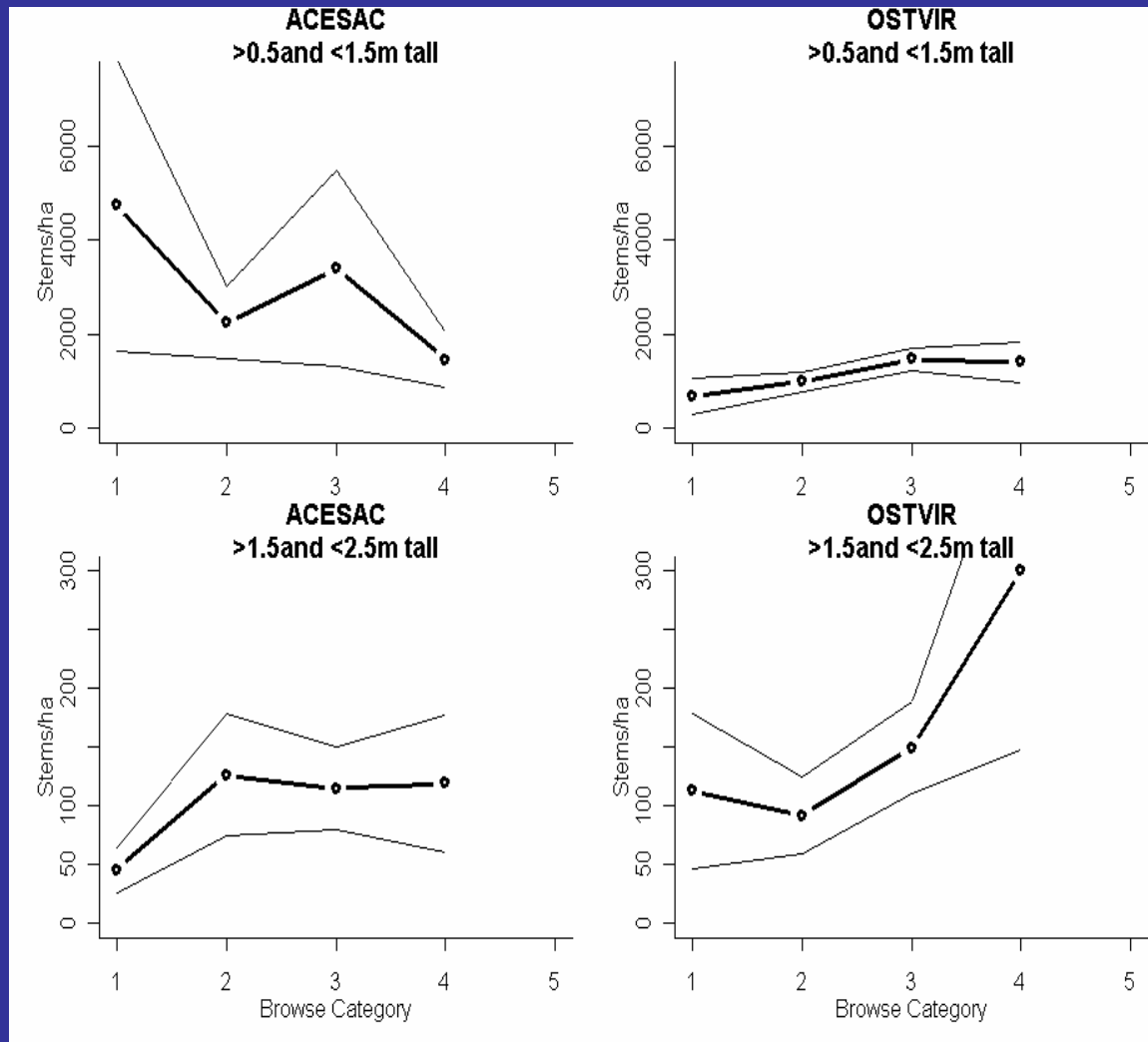
Browse Category

Deer/km2 at plot center

Hypothesis 5:

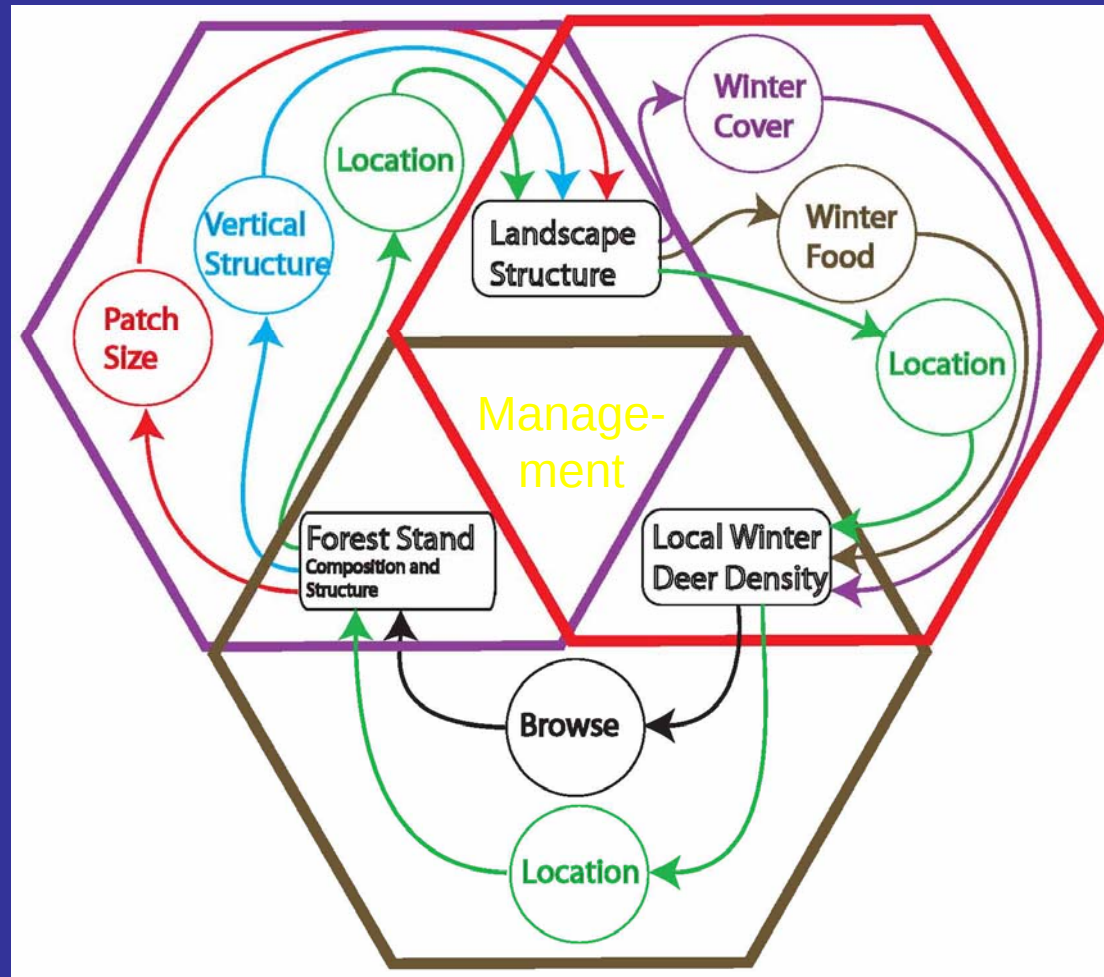
Stem density : Browse relationship varies with species

- Sugar maple density decreases with increasing browse
- Ironwood density increases with increasing browse
- Community composition changes as deer density increases



Conceptual Model Revisited

- Landscape composition and structure drive local deer density.
- Local deer density drives stand-level vertical structure.
- Sum of stand-level characteristics defines landscape composition and structure.





Thanks to:

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