Local Winter Deer Density

Effects of Forest Structure and Snow in a Managed Forest Landscape

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Project Partners

Government
Agencies

Private Industry

Non-Profit

Interacting Forest Disturbances

Timber Harvest

Deer Herbivory

Disturbance: Timber Harvest

Selection Harvest

Intends to mimic
gap-phase
dynamics

Shade-tolerant
species regenerate
in understory

Immediate effects
on stand structure

Potential future effects on
forest pattern

Disturbance: White-Tailed Deer

From: <http://www.michigan.gov/dnr/>

Disturbance: Deer Herbivory

Nature Precedings : doi:10.1038/npre.2009.3666.1 : Posted 20 Aug 2009

10-year deer exclosure

Disturbance: Deer Herbivory

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White-Tailed Deer Forest Habitat

Juxtaposition of upland hardwood and lowland conifer stands

Provides winter food and thermal cover in close proximity

Simulation Model

Nature Precedings : doi:10.1038/npre.2009.3666.1 : Posted 20 Aug 2009

Interacting Disturbances

Deer Density Estimates

Fecal pellet survey (ten 50m transects) at 51 sites

Independent Variables

Regional

Ecoregion

Snow Depth

Distance to Conifer

Independent Variables

Regional

Ecoregion

Snow Depth

Distance to Conifer

Independent Variables

Regional

Ecoregion

Snow Depth

Distance to Conifer

Independent Variables

Local Forest Structure

Proportion of:

Northern Hardwoods

Lowland Conifer

Aspen

Number of Stands

Mean N. Hardwood Diameter-at-Breast-Height (DBH, cm)

Mean N. Hardwood Stand Basal Area (m² per hectare)

Independent Variables

■ Regional

- ☐ ~~Ecoregion~~
- ☐ Snow Depth
- ☐ Distance to Lowland Conifer

■ Local

- ☐ ~~Proportion of Aspen~~
- ☐ Proportion of Lowland Conifer
- ☐ ~~Proportion of Northern Hardwood~~
- ☐ ~~Number of stands~~
- ☐ Mean N. Hardwood DBH
- ☐ Mean N. Hardwood Basal Area

Single Variable Relationships

Bayesian Model Averaging

Distance to Lowland Conifer and Hardwood DBH
are the most probable predictors from our set

Multiple Linear Regression

'Best' Model	Univariate		
	β	P	R^2
Intercept	1.185	0.001	
Distance Lowland Conifer	-0.650	0.007	0.14
Hardwood DBH	-0.020	0.028	0.11
Hardwood Basal Area	.	.	.
Proportion Lowland Conifer	.	.	.
Snow Depth	.	.	.

Model $R^2 = 0.22$, Model $P = 0.001$, Model $\tau = 0.31$ ($pc = 0.65$)

Models are better predictors of
relative deer density than absolute

Spatial Estimates

Forest Cover – Control

Spatial Estimates

Forest Cover – Conifer Removal

Spatial Estimates

Deer Density – Control

Spatial Estimates

Deer Density – Conifer Removal

Uncertainty in Model Estimates

Summary

We find important factors for deer density are:

Distance to nearest lowland conifer

Local mean stand DBH

Our data and predictive model are best used for **relative** deer density estimates

Spatial estimates for management options

Importance of uncertainty estimates (from model ensemble)

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