

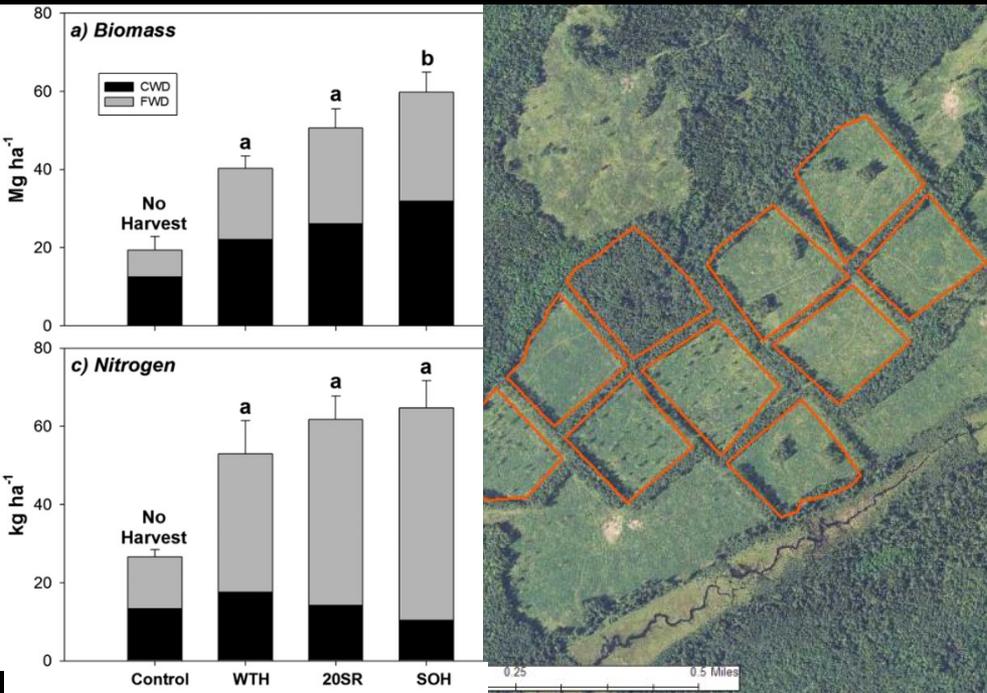
Are the guidelines effective?

Experimental approaches

Manipulation/control, causation

More expensive, limited inference

Example: biomass harvest study

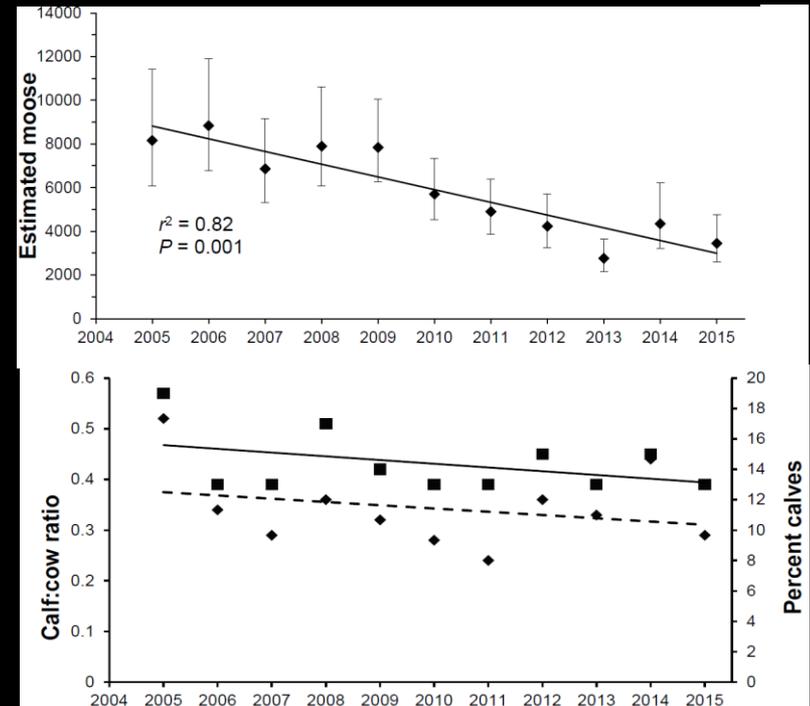


Observational approaches

Existing conditions, correlation

Less expensive, more inference

Example: moose



Observational – retrospective

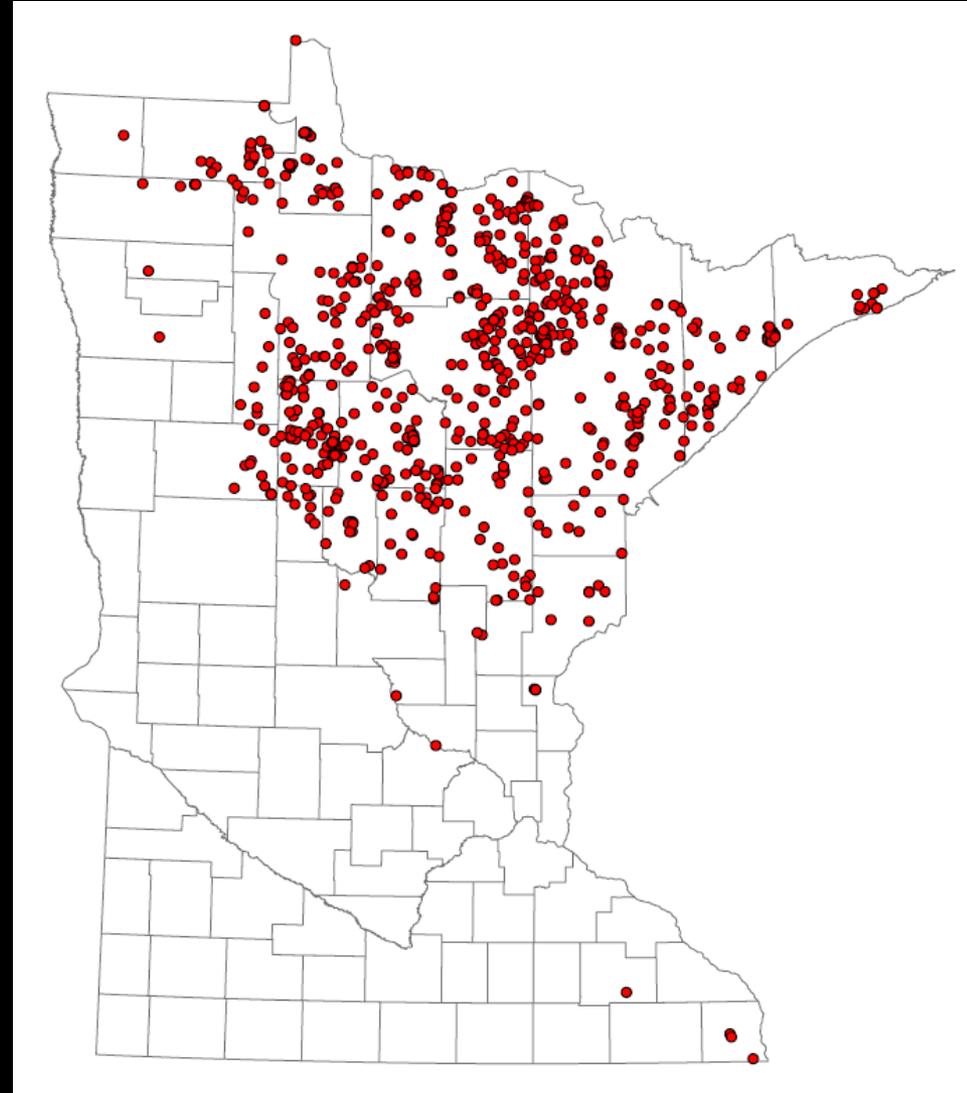
Utilize monitoring sites

Archived data

Wide range of conditions

Operational practices

Range of time





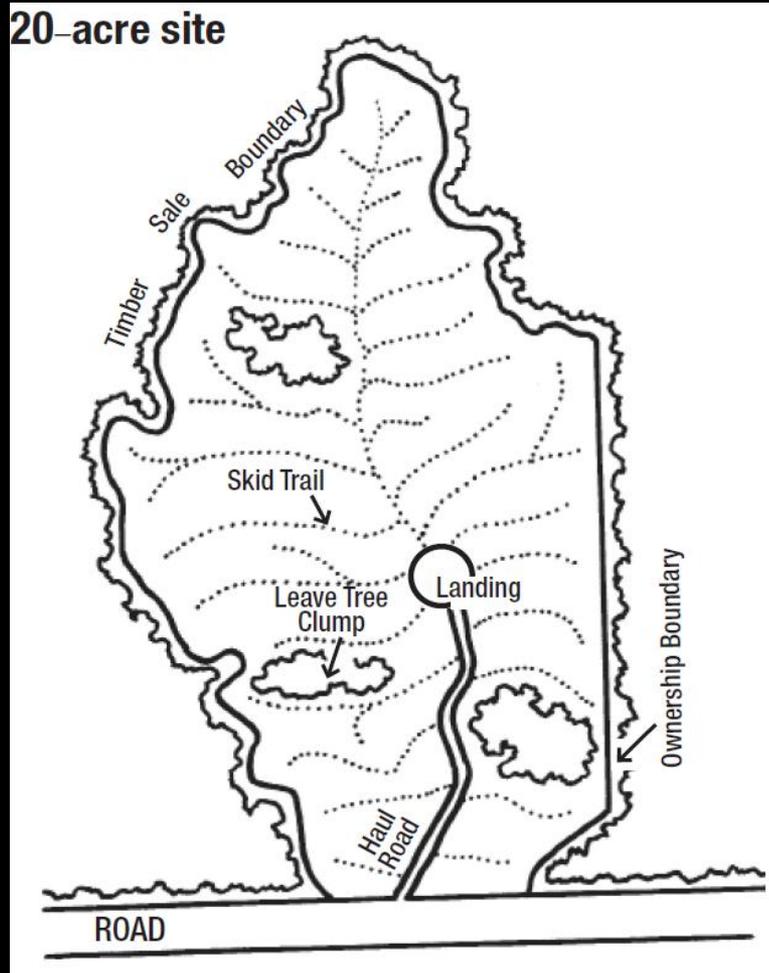
Using LiDAR to assess forest harvest landing impacts and the potential for recovery with time

**MFRC Meeting
January 13, 2016**

Rob Slesak and Tyler Kaebisch

Context

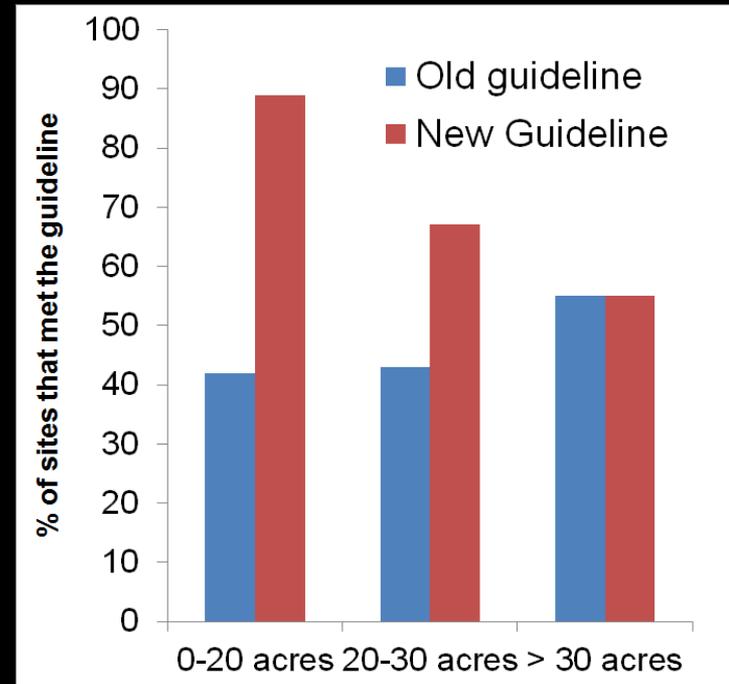
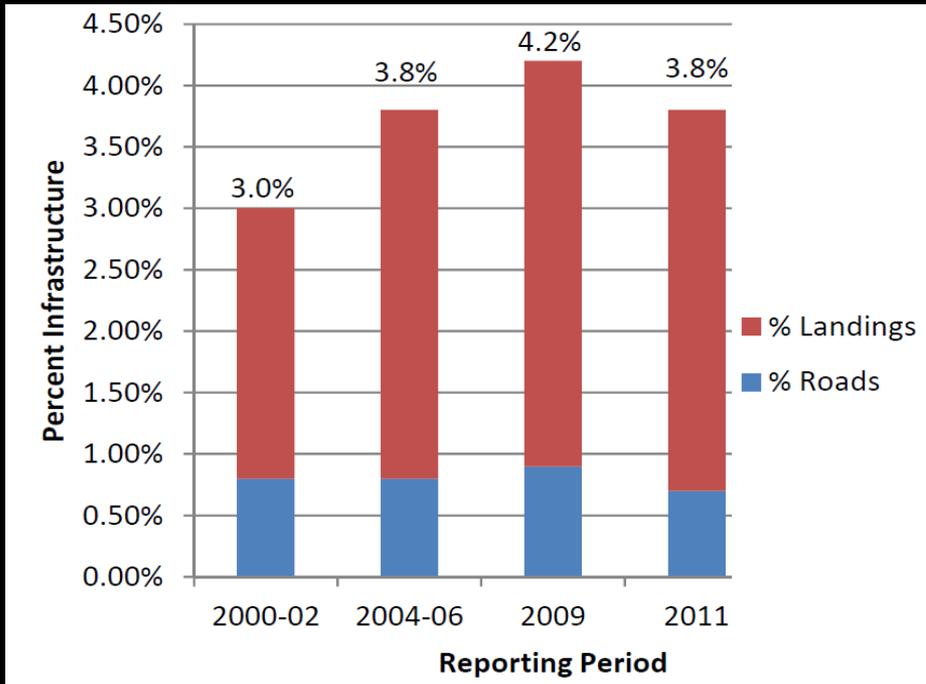
Landings are a central component of management



Context

Landing area has been increasing in recent years

Guidelines relaxed during revision to increase implementation

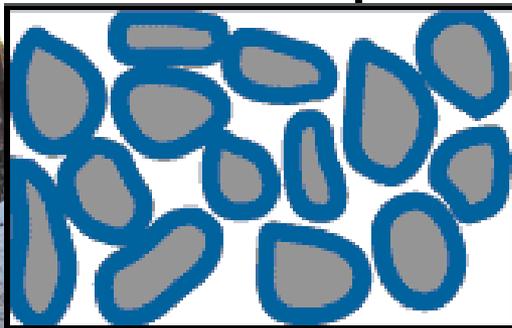


**Current
Guideline**

For harvest areas	Road and landing area should be less than:
<20 acres	1 acre
20-30 acres	5% of harvest area
>30 acres	3% of harvest area



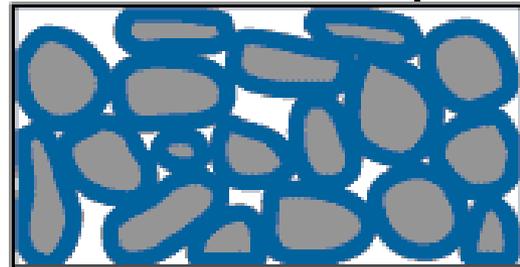
48 % Pore Space



Non-compacted

-  Soil Particles
-  Water
-  Air

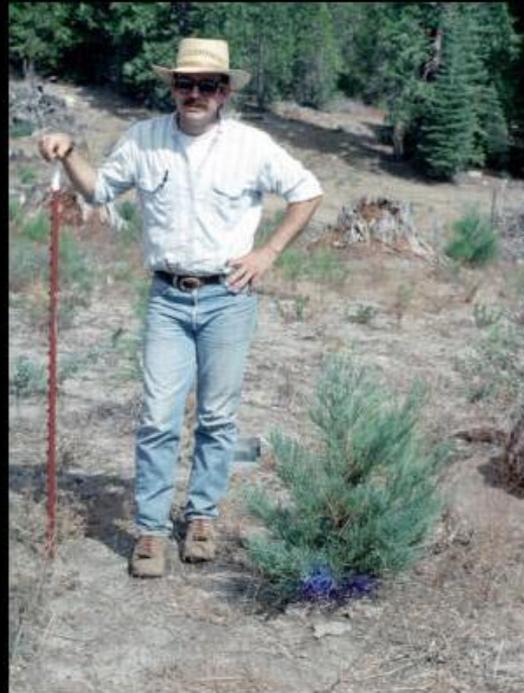
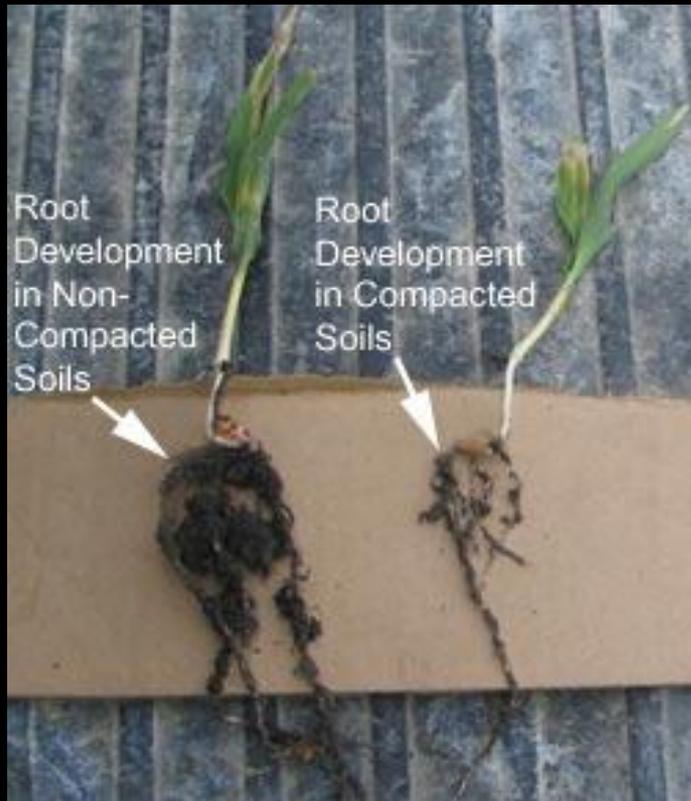
26 % Pore Space



Compacted



Effects on productivity



Severe



Control

Reduced rooting volume

Vegetation height good indicator of impact

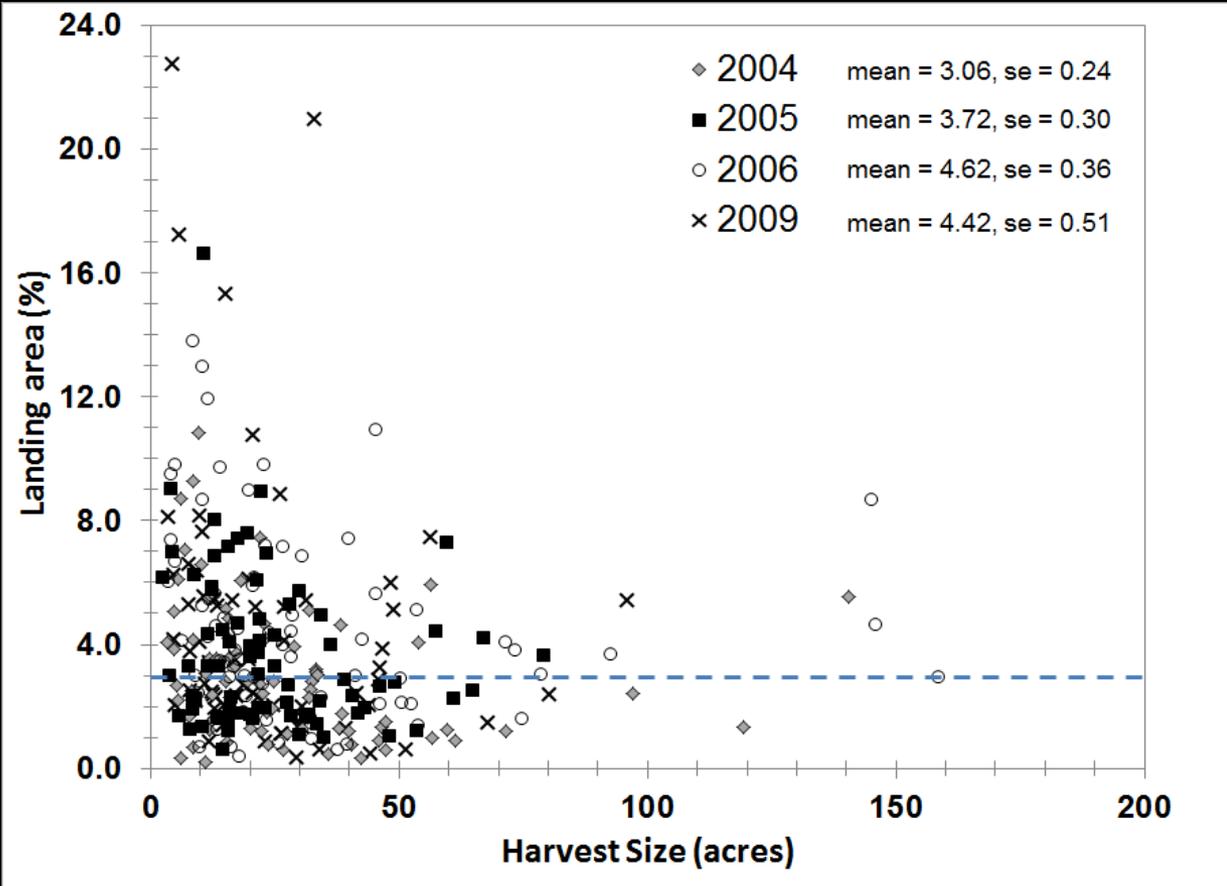
What about winter harvesting?



Common perception that impacts are low during winter.

Frozen soil may be more resistant to compaction

What about landing density?

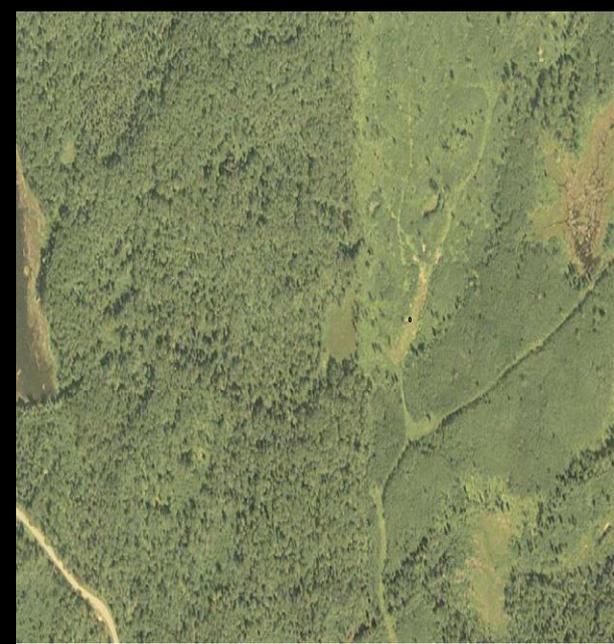


Total landing area is quite variable among sites

Do sites with more landings have lower overall impacts?

Is it better to spread it around or concentrate?

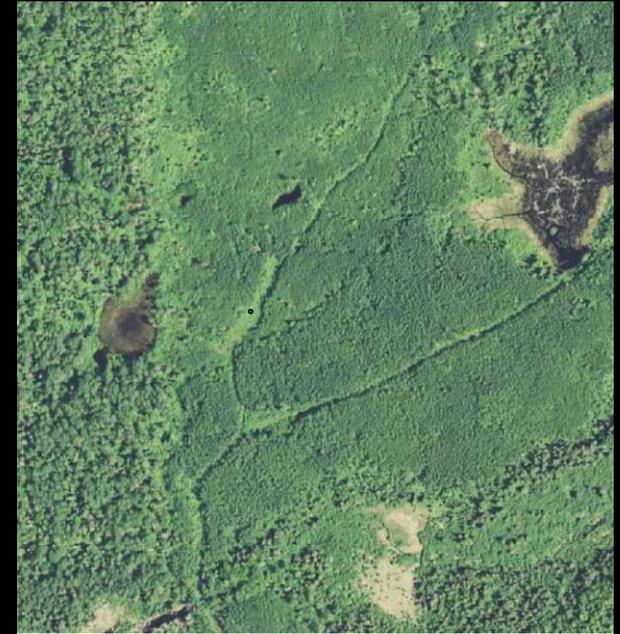
What about recovery?



2003



2008



2013

- Freeze / thaw cycles
- Shrink-swell in some soils
- Roots / soil fauna

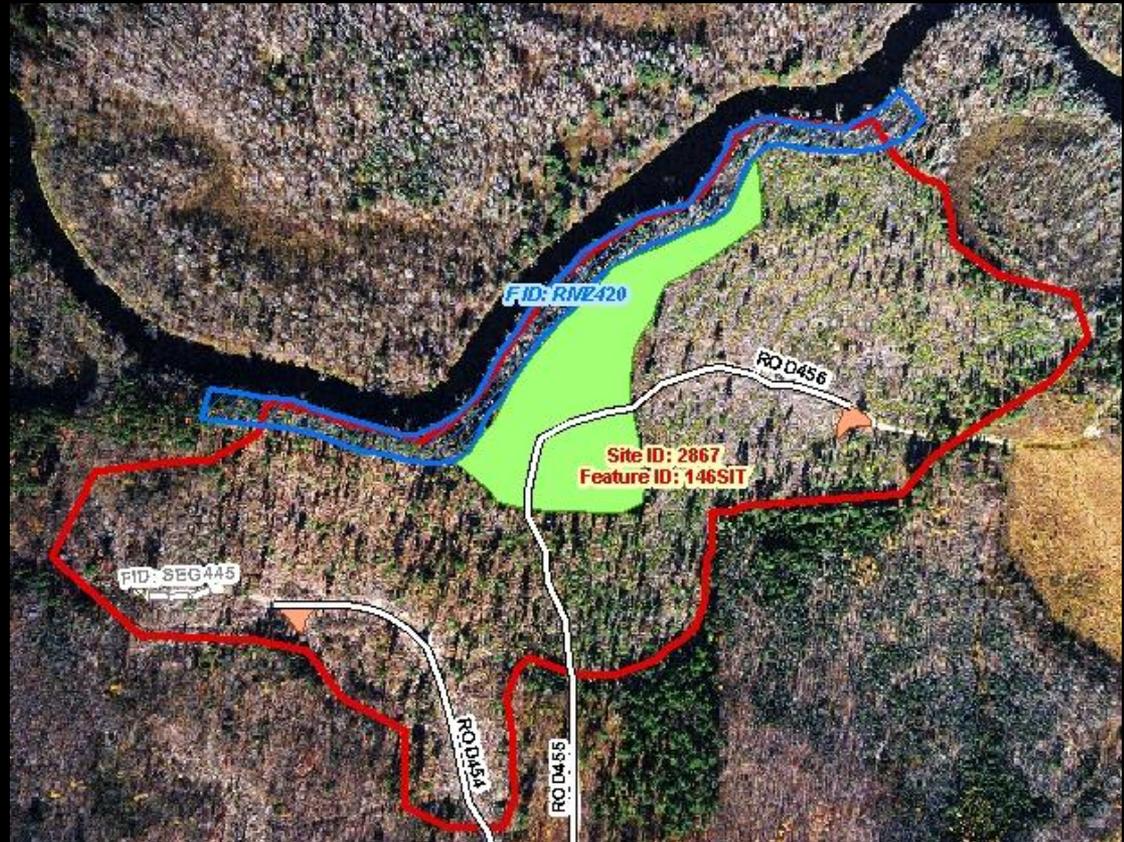
Retrospective Approach

Utilize previously monitored sites

Landing areas documented in field and recorded in GIS

2-15 years post harvest

Winter and dry season (summer+fall) harvest

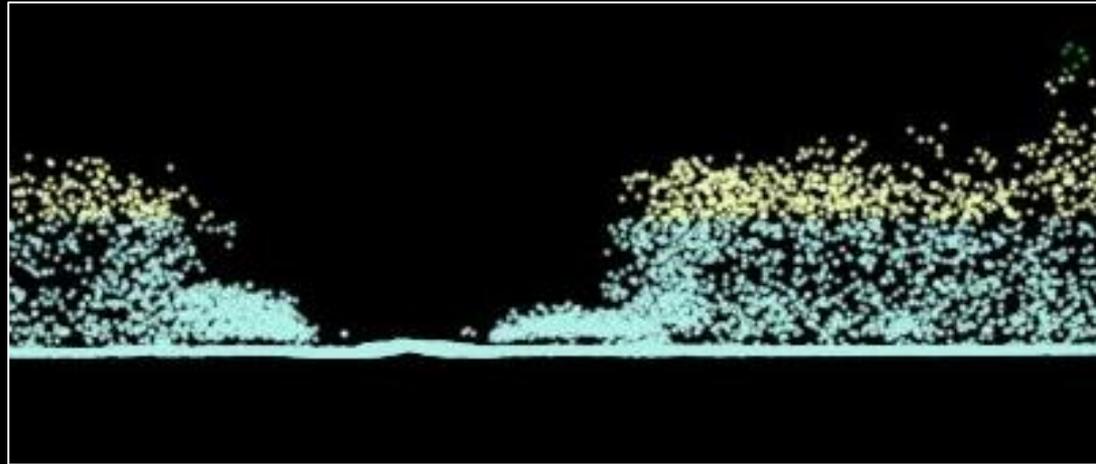


LiDAR Data and Analysis

Statewide 1-m LiDAR data

Collected during leaf off

Response =



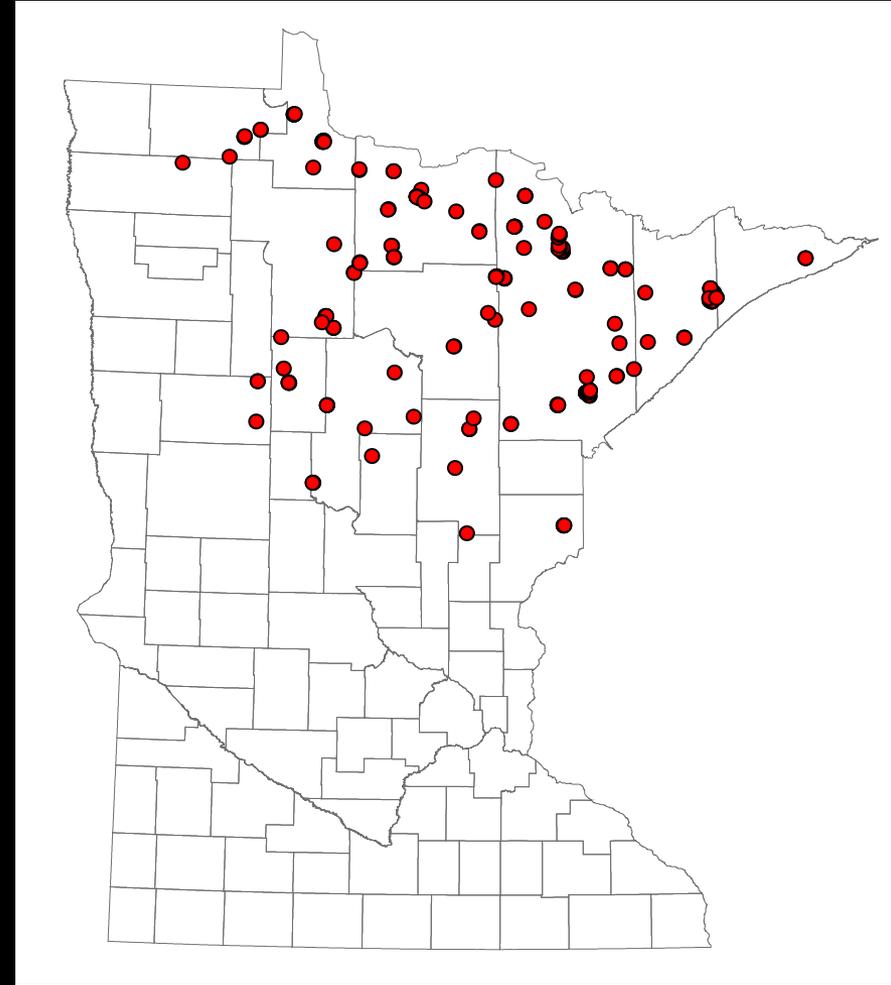
Mean height landing – mean height general harvest area

Removed points < 1m in height (near ground hits ~75% of total)

Calculated for each site, weighted when multiple landing areas

Site Characteristics

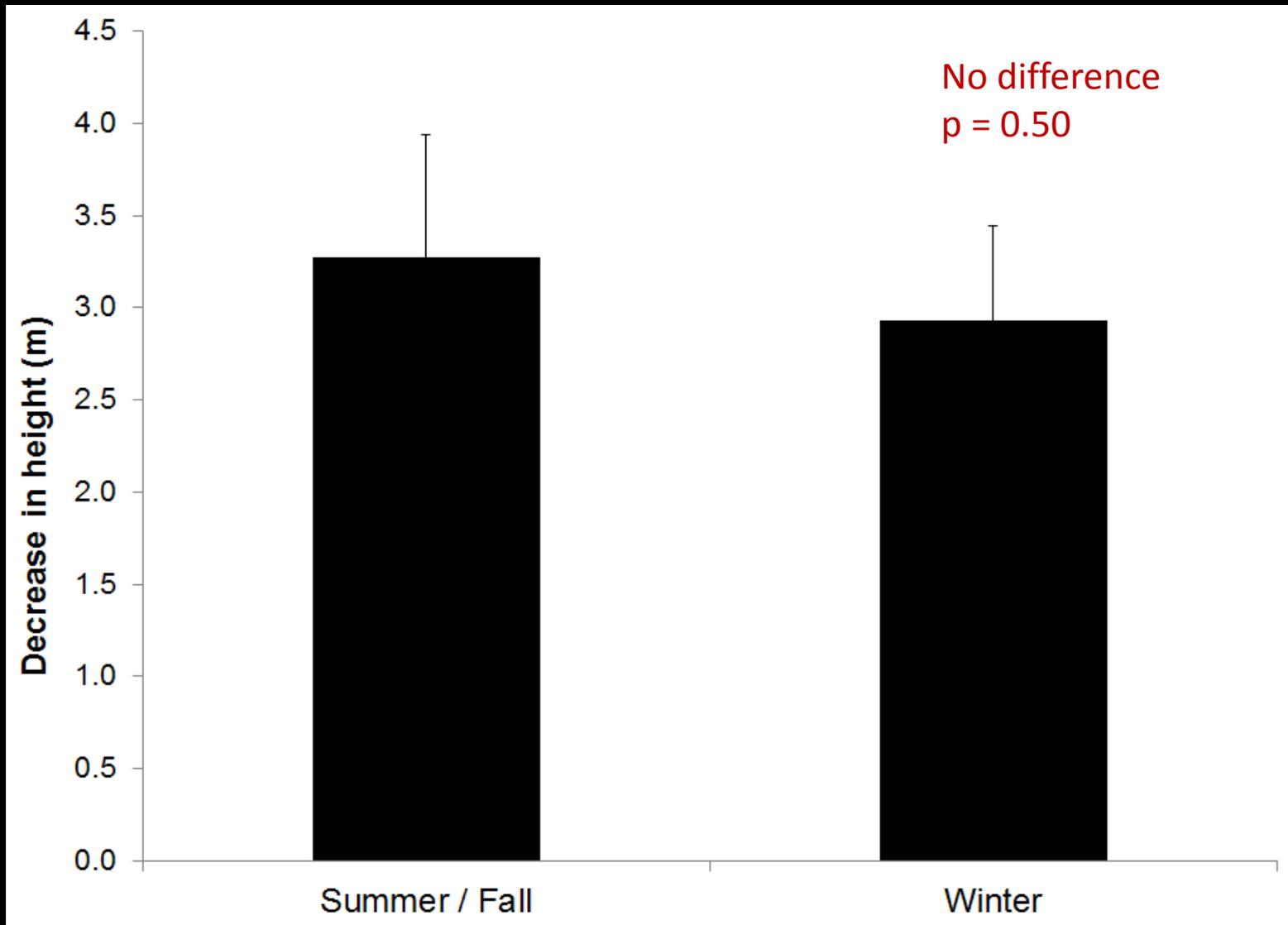
	Summer / fall	Winter
Harvest Size	47 (6)	44 (8)
Landings per site	2.5 (0.2)	1.9 (0.1)
Mean landing area (%)	2.5 (0.4)	2.3 (0.2)
Total sites	29	50



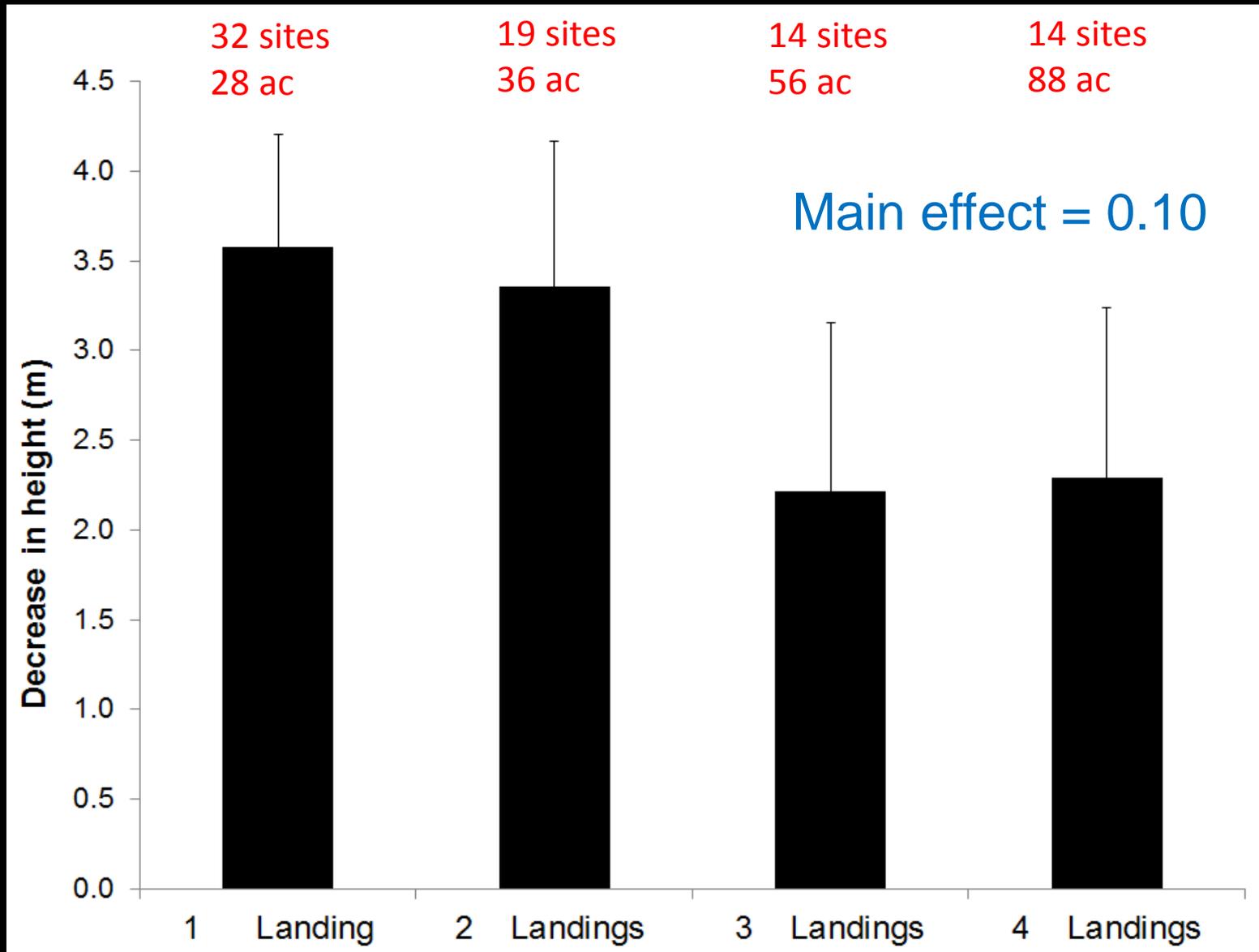
Questions

- Is there a difference among seasons?
- Does landing density influence the response?
- Is there evidence for recovery over time?

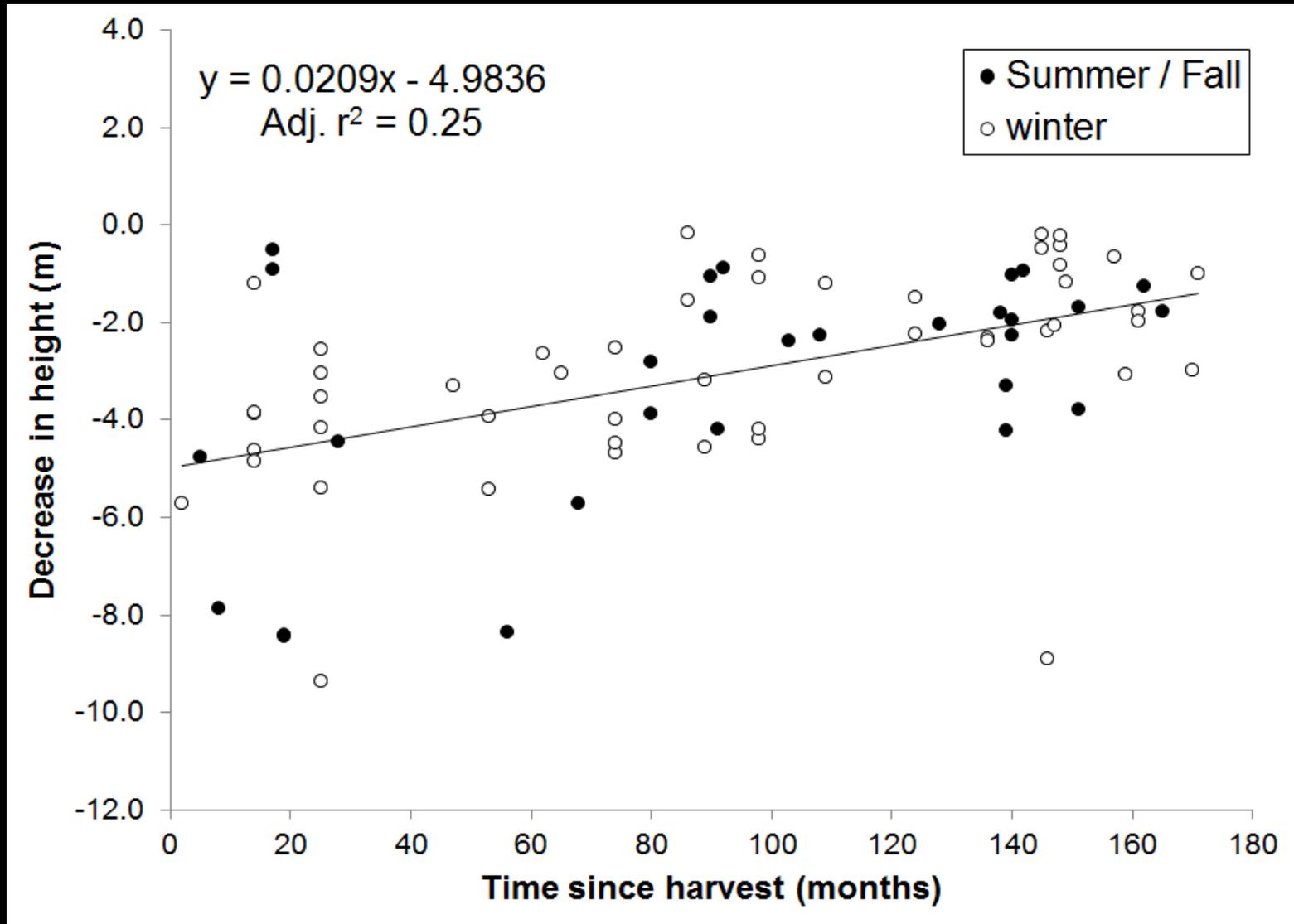
Effects similar between seasons



Effect of landing number



Evidence for recovery over time



Implications

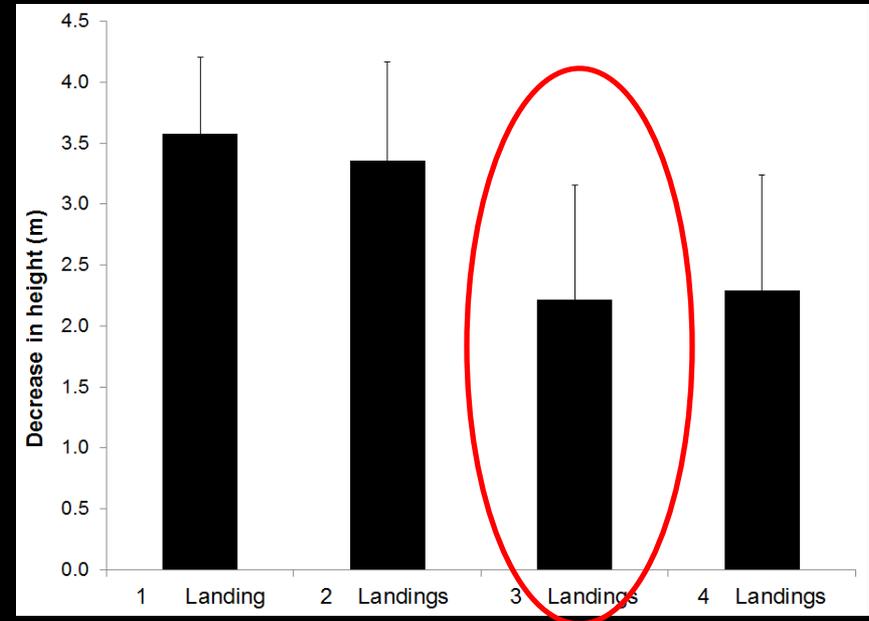
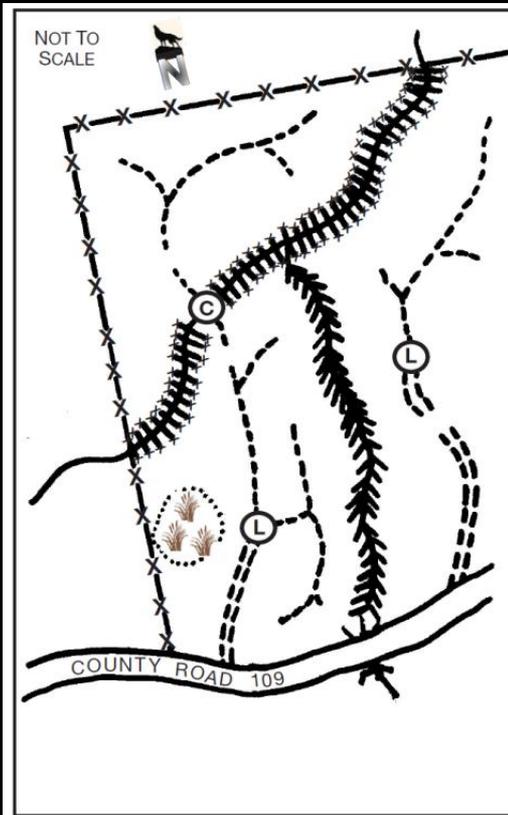
Impacts occur across all seasons – **limit landing area regardless the season**



Guidelines already recommend this, but some ambiguity if it applies to winter

Implications

Relative tradeoffs of more landings per site unclear



Lowest impact
Lowest relative area =

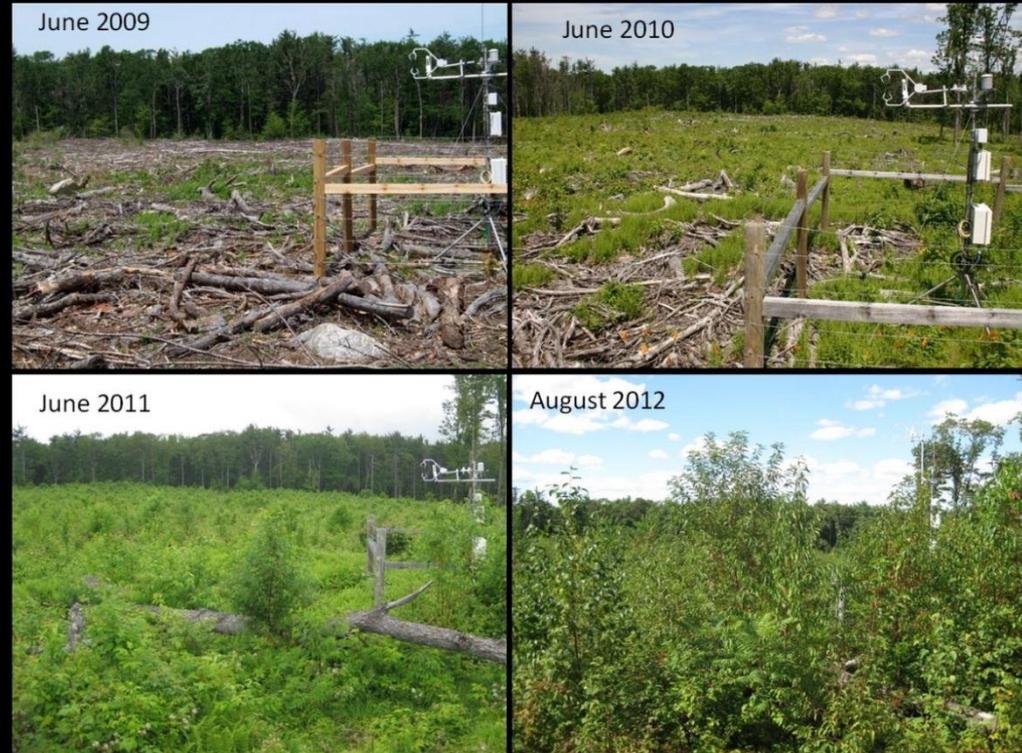
The “Sweet” spot??

Potential for optimized harvest designs

Implications

Natural recovery may negate the need for any active mitigation.

Recovery of height in ~20yrs on average



Other considerations

Ecosystem management - landings may provide benefits to wildlife



FOREST OPENINGS FOR WILDLIFE HABITAT (647) *Biology Job Sheet #4*

Natural Resources Conservation Service (NRCS) - Minnesota

WHAT ARE FOREST OPENINGS?

A forest opening is a grassy field dominated by herbaceous plants. Openings are important because they provide edge, produce important foods during critical times of the year, and are used for nesting and bedding areas. Openings provide a nutritious, high protein source of food, especially in the early spring and late fall when



other foods are limited

- The recommended size of openings varies by species requirements. Forest openings should have a 3:1 ratio of length to width, and generally range from 0.5 acres to 10.0 acres in size. Forest openings of 1-3 acres are typically desirable. Woodland sites <40.0 acres in size generally will not benefit from openings.
- Caution should be exercised when proposing forest openings in woodland sites larger than 250 contiguous acres in size. Forest openings in this situation should not exceed 1.0 acres, since large openings may lead to habitat fragmentation for non-target forest interior nesting species.
- A number of scattered openings are more beneficial than a single large opening of comparable size. Forest openings scattered

New landing studies

Assessing benefits to wildlife and mitigation



Effects of seeding / tillage (Crow Wing Co. SWCD)

Wildlife use of forest landings (MN DNR – Div. Wildlife)

Other new studies

Leave tree effectiveness –
NRRI, MFRC, UMN (LCCMR)

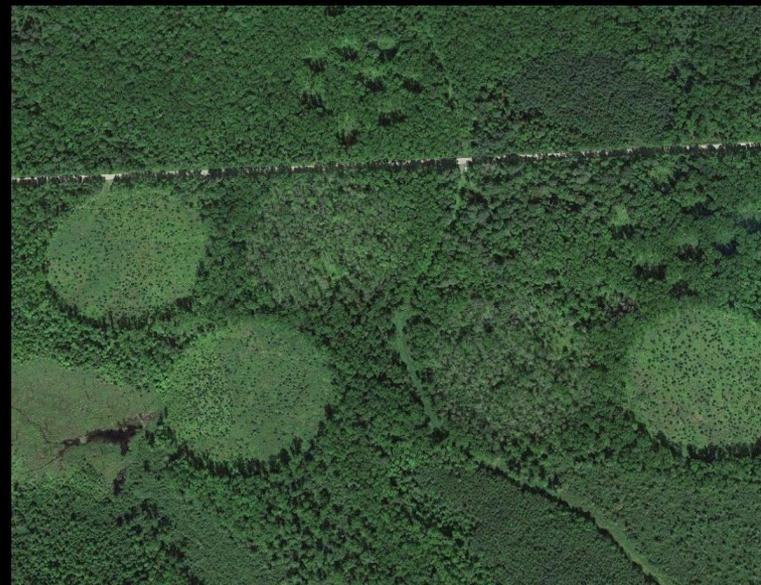


Black ash / EAB

- Wildlife: NRRI, MFRC, USFS, UVM (LCCMR)



- Soil / water quality: MFRC, USFS



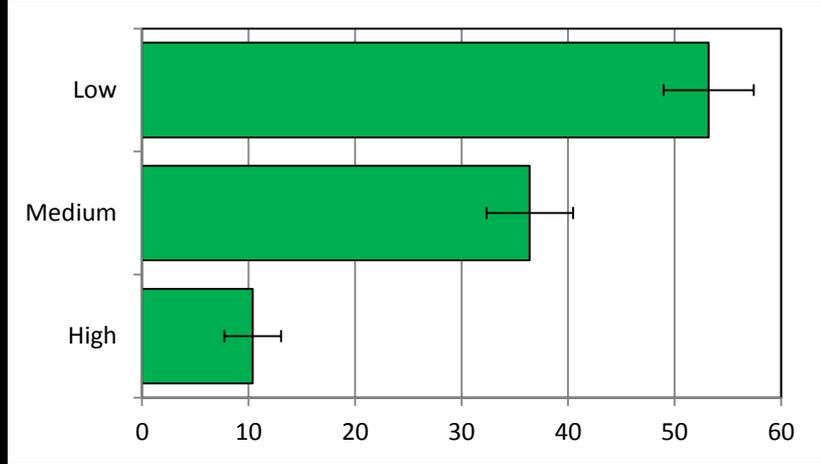
Other new studies

Browse damage / deer density

UMN, MFRC



Browse Impact



Percent of Sample FIA plots



Erosion control effectiveness:

UMN, MFRC



Forest disturbance patterns, 1975 to present – UMN, MFRC, MN DNR

