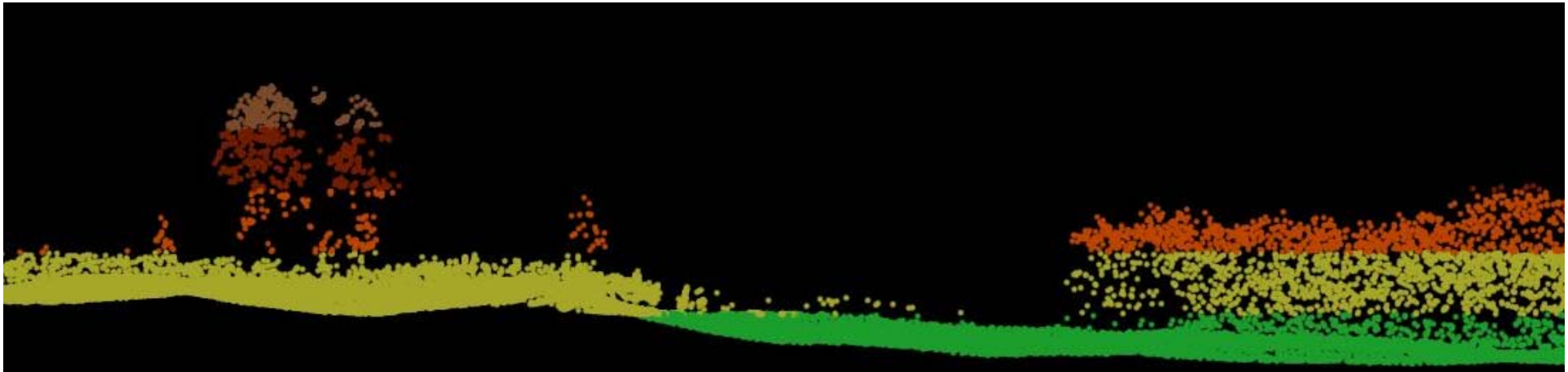


Using LiDAR to assess forest harvest landing impacts and the potential for recovery with time

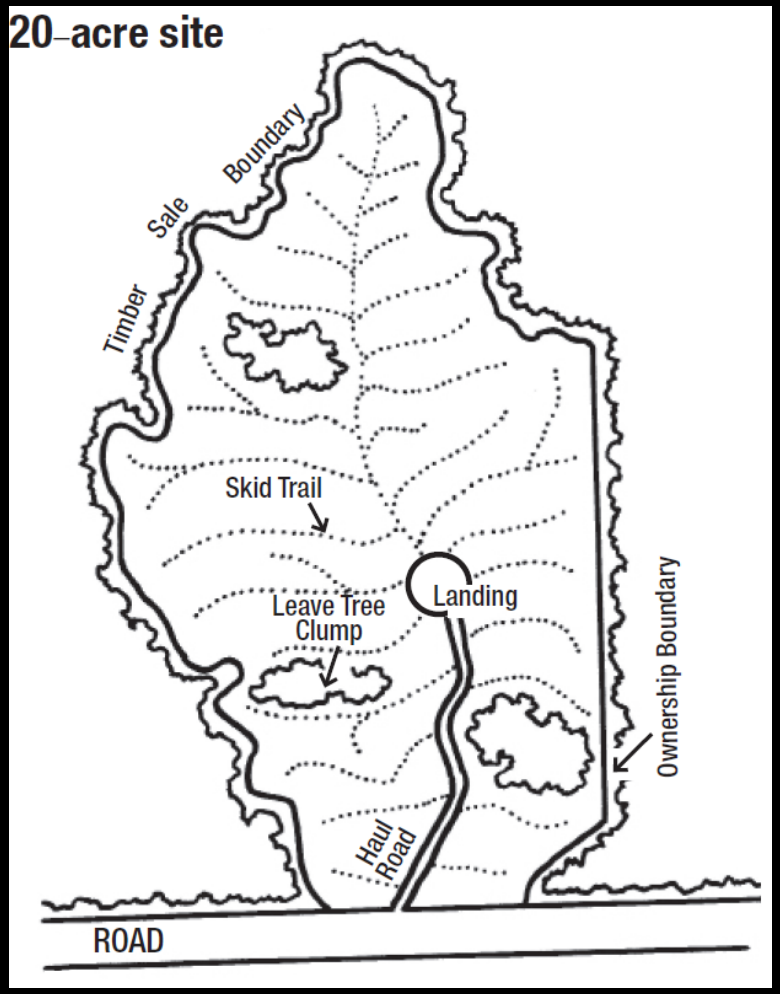
MFRC Meeting

January 13, 2016

Rob Slesak and Tyler Kaebisch

Context

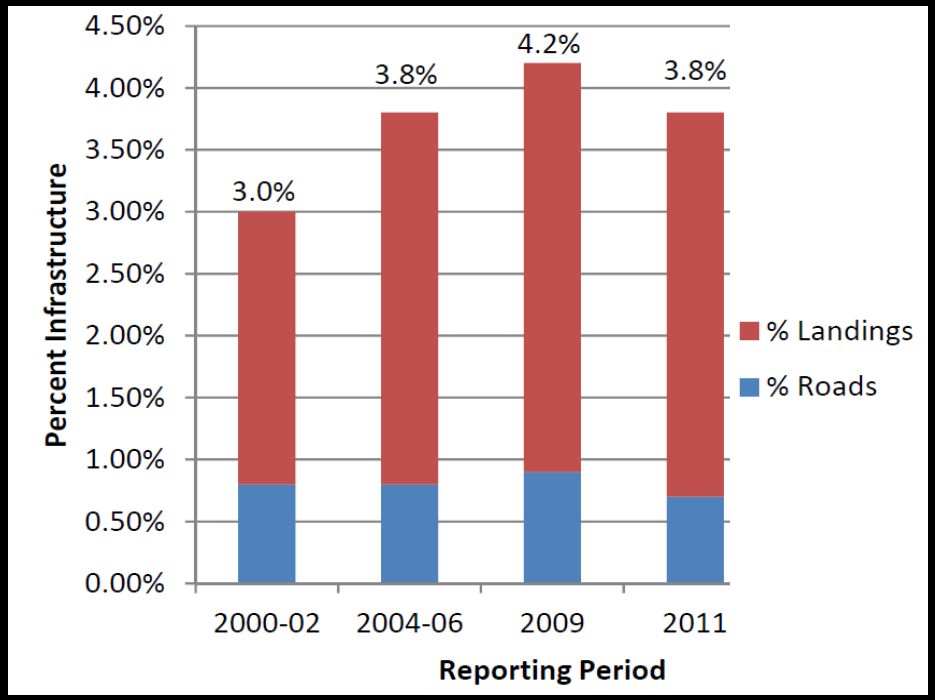
Landings are a central component of management

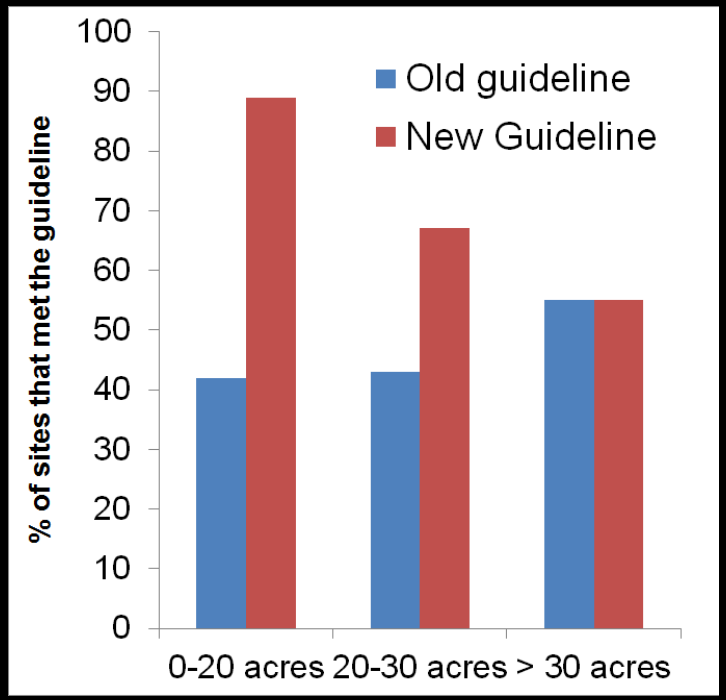


Context

Landing area has been increasing in recent years

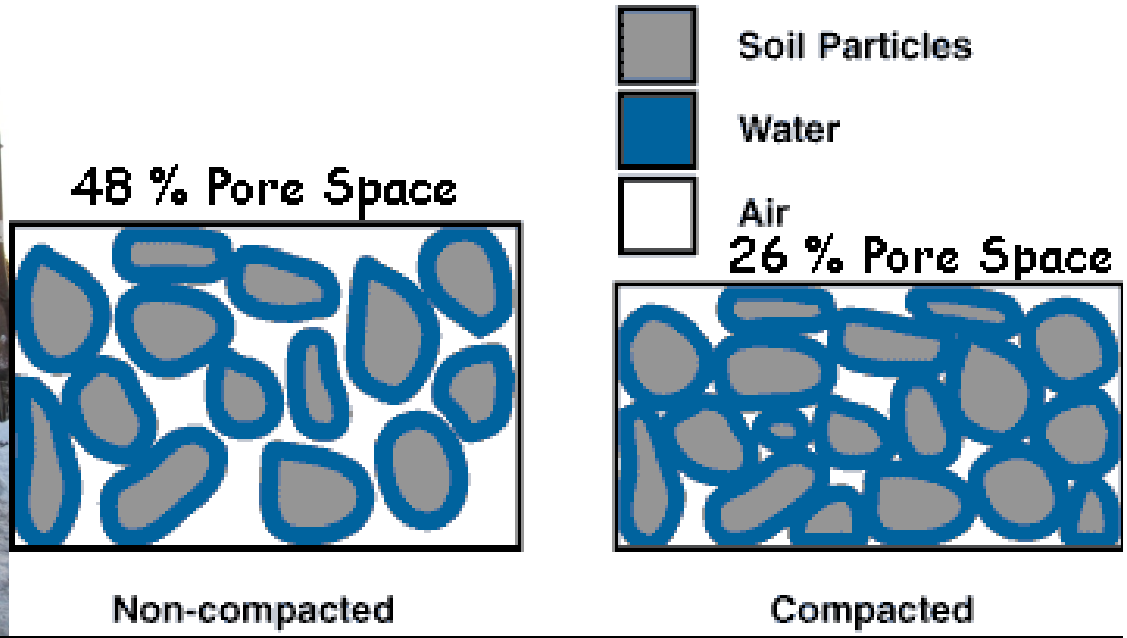
Guidelines relaxed during revision to increase implementation



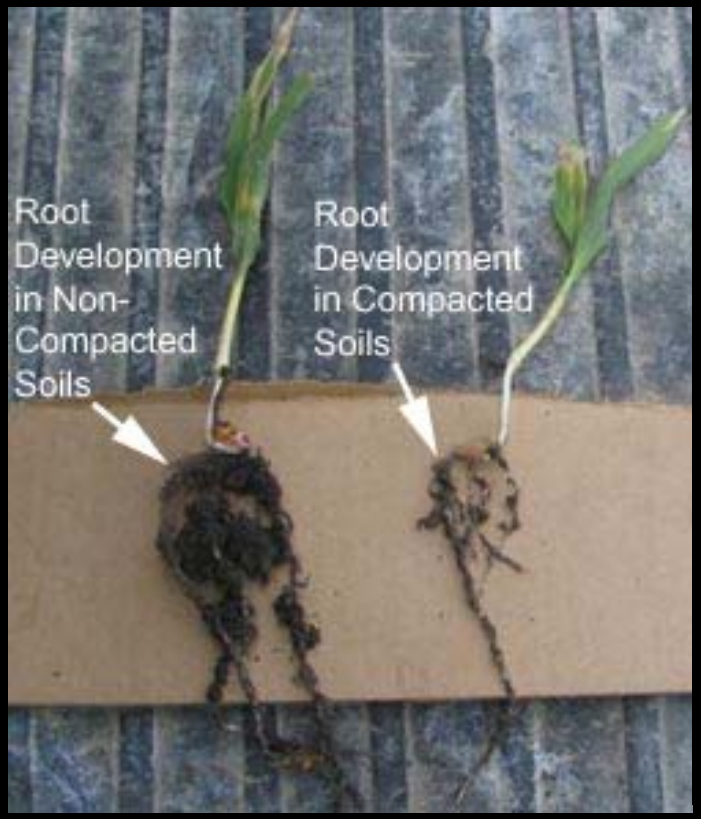


Current Guideline

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


Soil Particles
Water
Air
48 % Pore Space
26 % Pore Space
Non-compacted
Compacted

Effects on productivity



Severe

Control

Reduced rooting volume

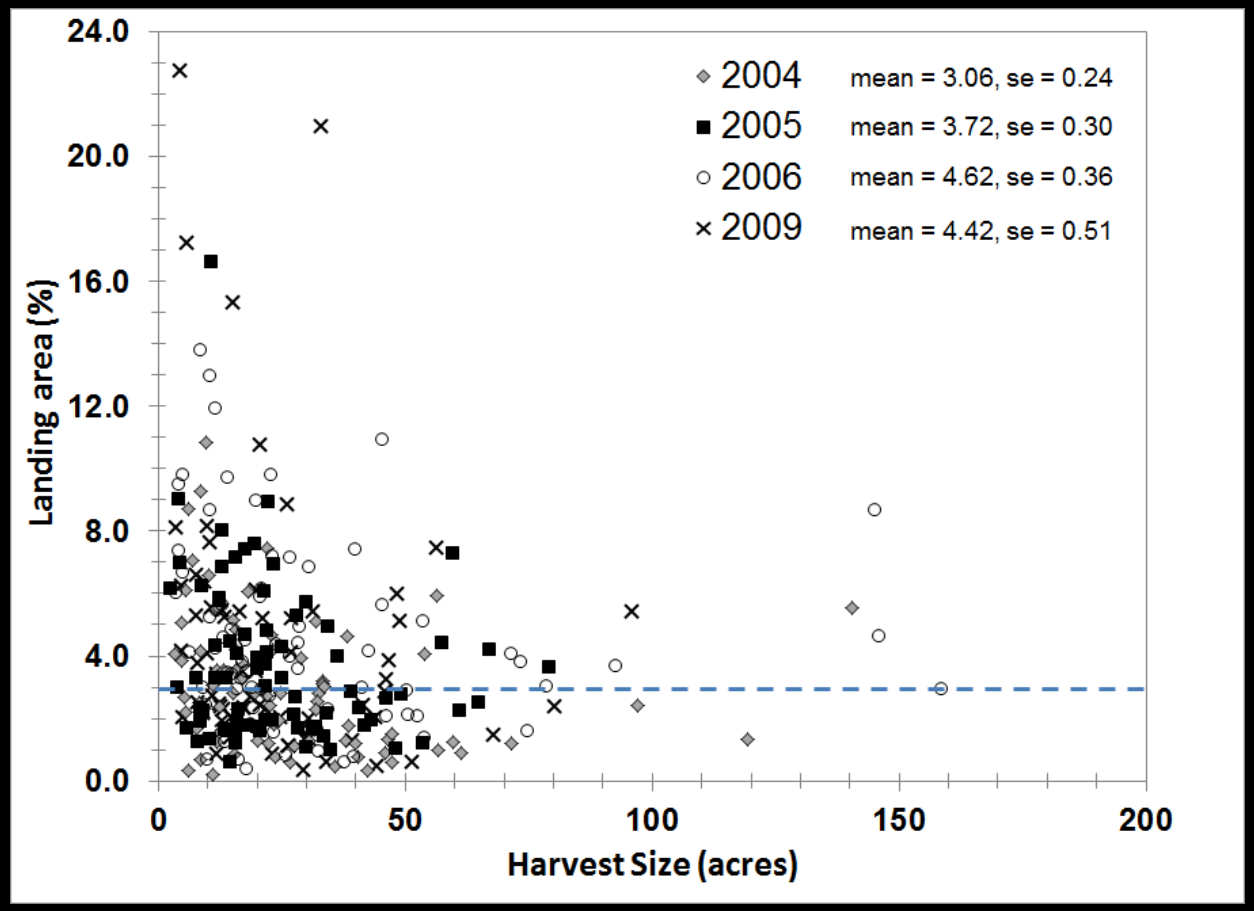
Vegetation <u>height</u> good indicator of impact

What about winter harvesting?

Common perception that impacts are low during winter.

Frozen soil may be more resistant to compaction

What about landing density?



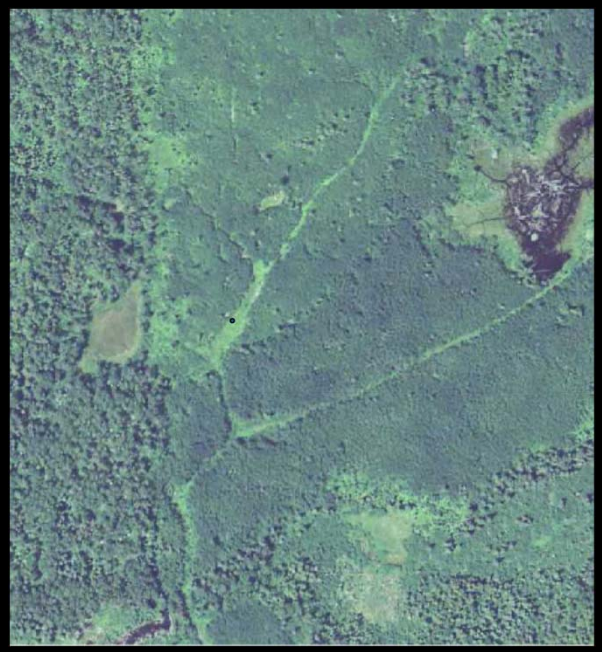
Total landing area is quite variable among sites

Do sites with more landings have lower overall impacts?

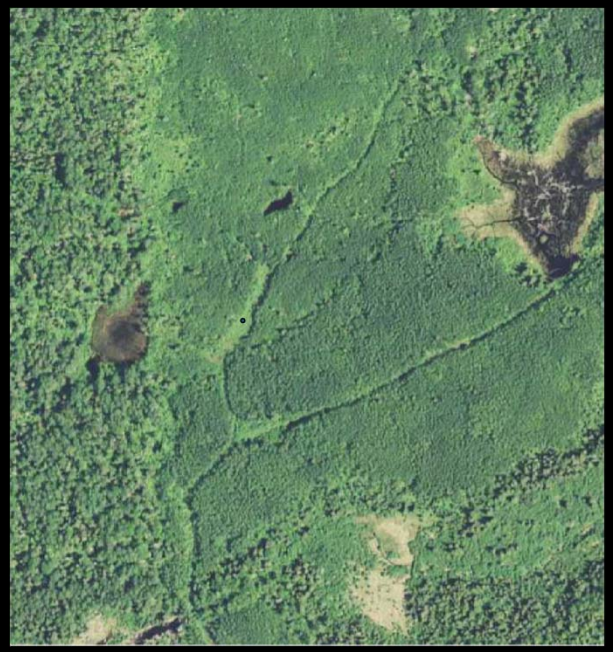
Is it better to spread it around or concentrate?

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

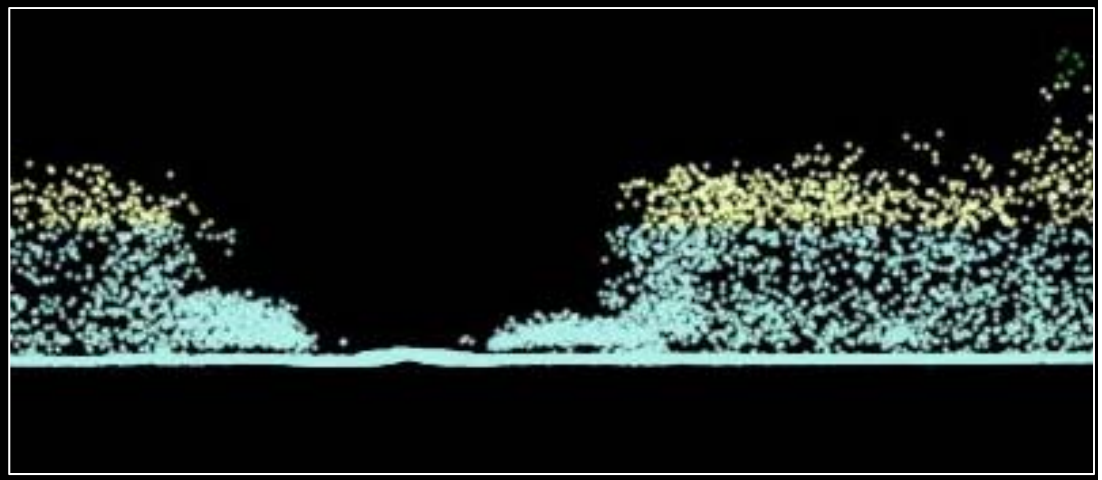
Winter and dry season (summer+fall) harvest

LiDAR Data and Analysis

Statewide 1-m LiDAR data

Collected during leaf off

Response =



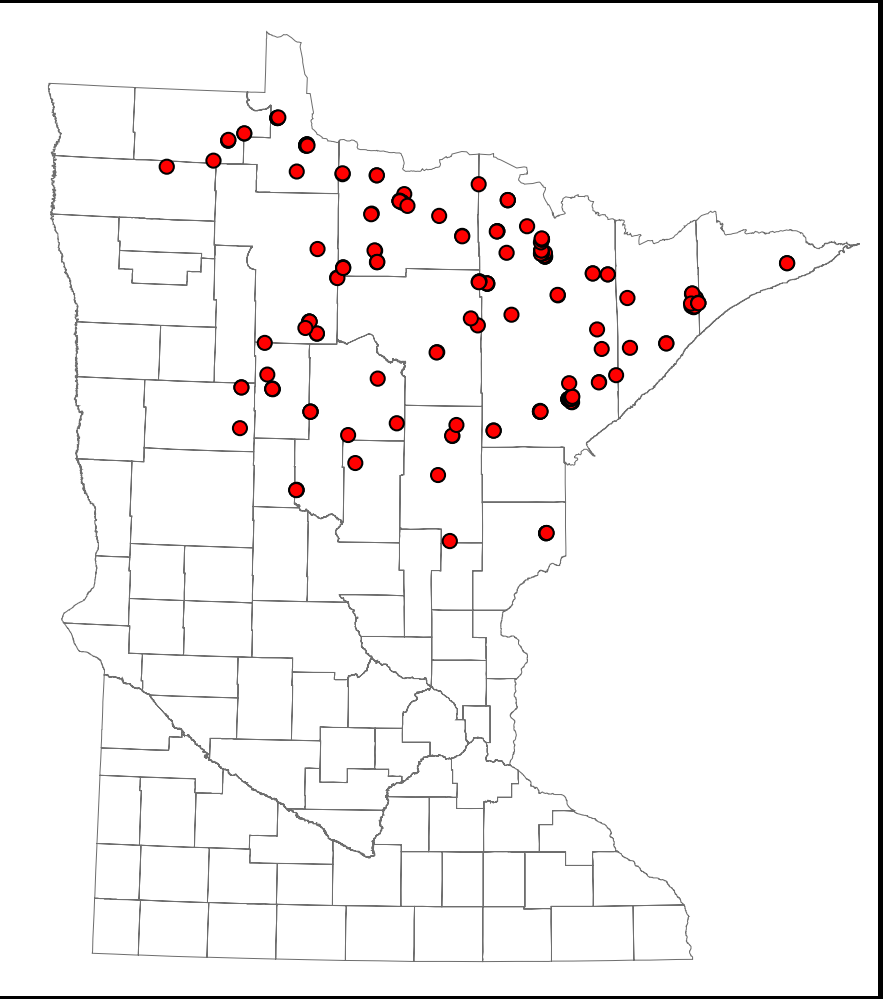
Mean height landing – mean height general harvest area

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

Calculated for each site, weighted when multiple landing areas

Site Characteristics

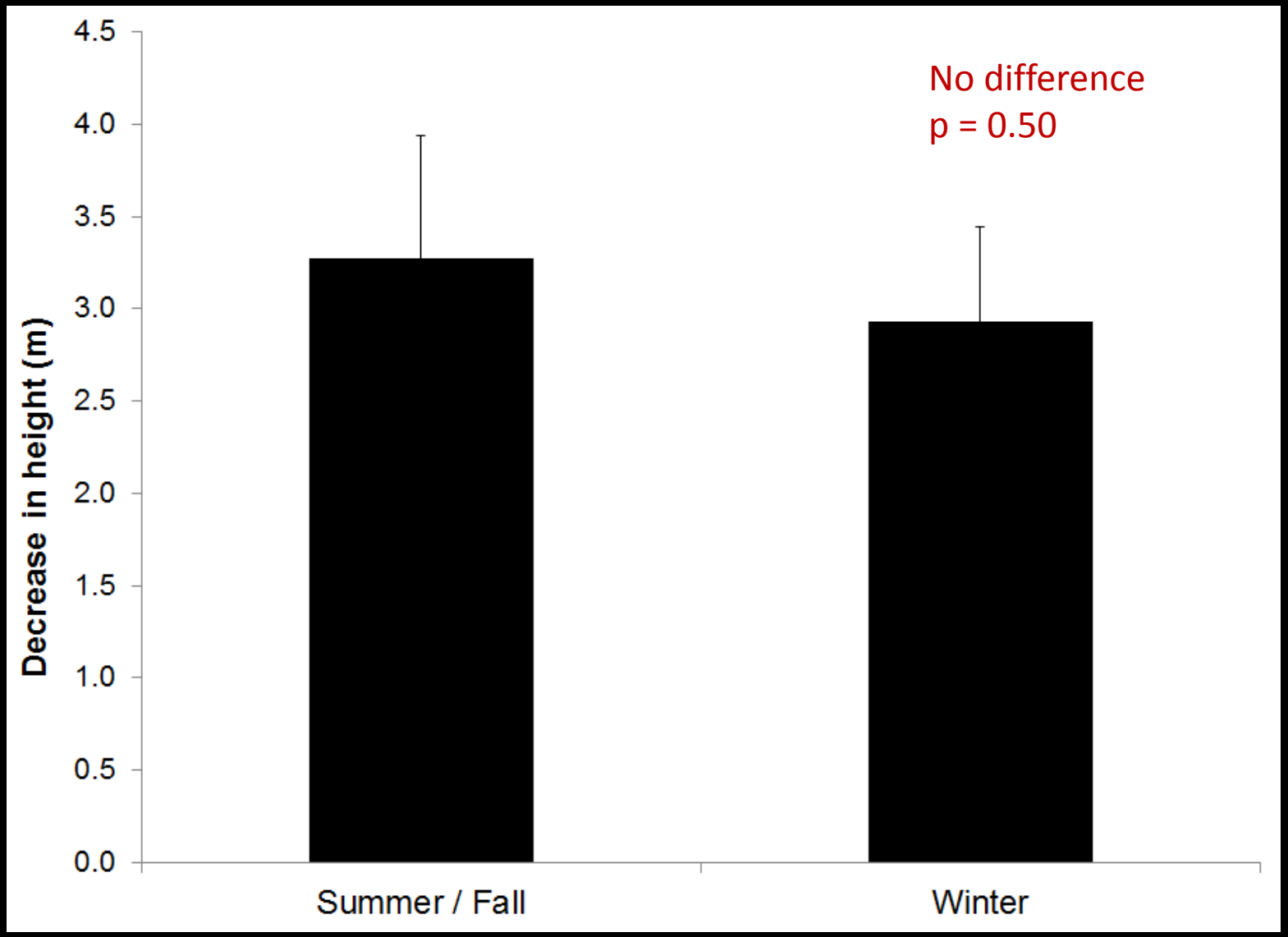
	Summer / fall	Winter
Harvest Size	47 (6)	44 (8)
Landings per site	2.5 (0.2)	1.9 (0.1)
Mean landing area (%)	2.5 (0.4)	2.3 (0.2)
Total sites	29	50



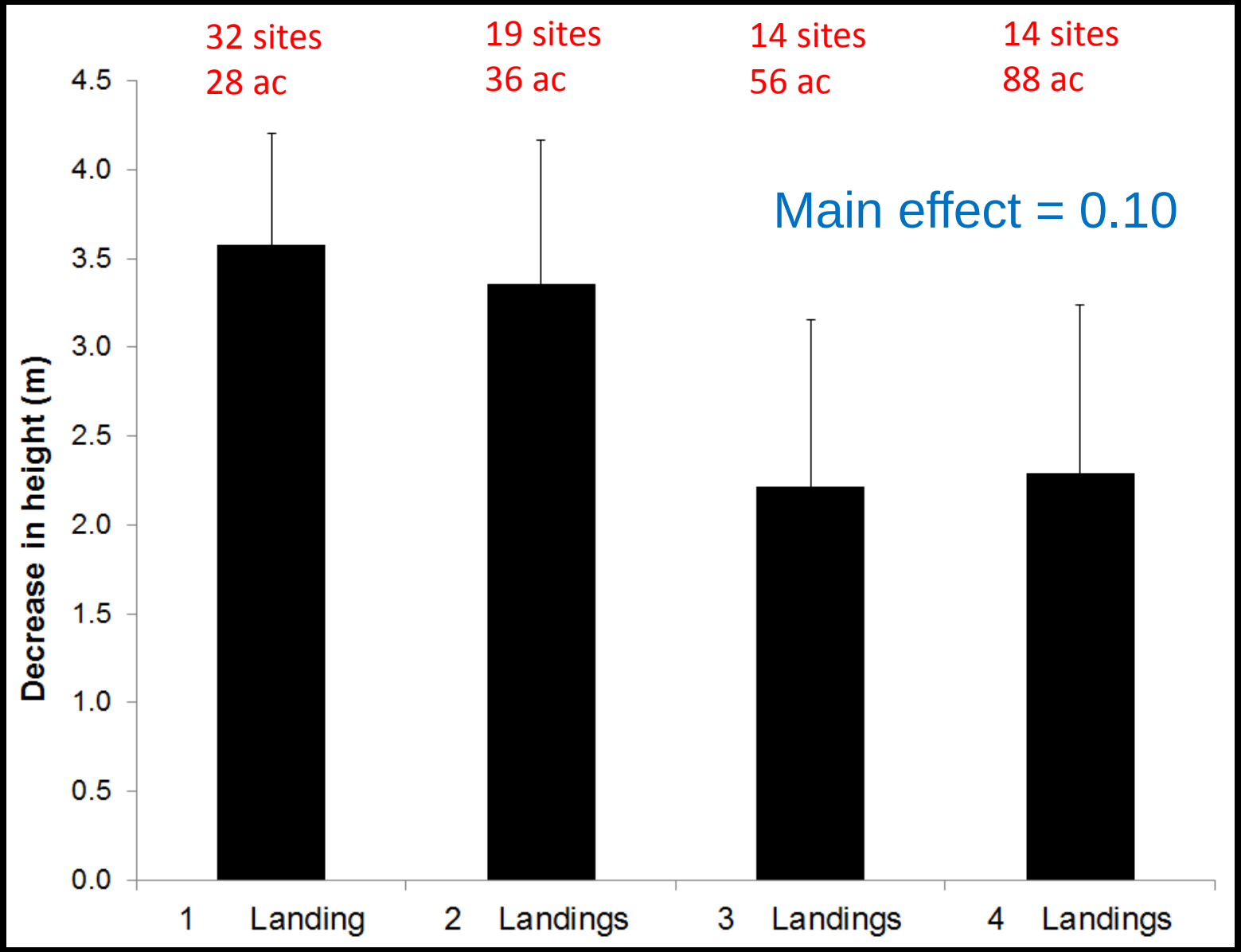
Questions

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

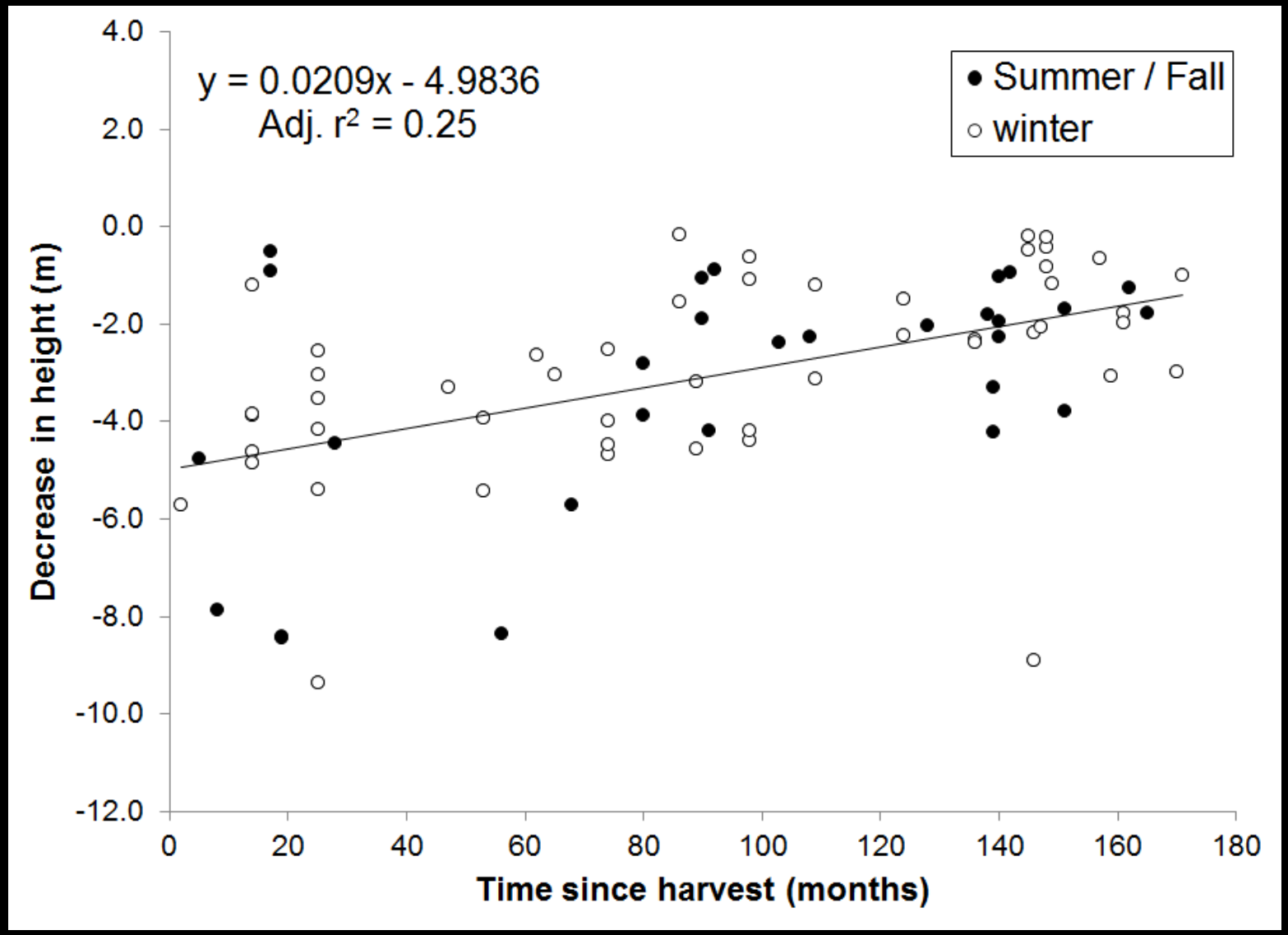
Effects similar between seasons



Effect of landing number



Evidence for recovery over time



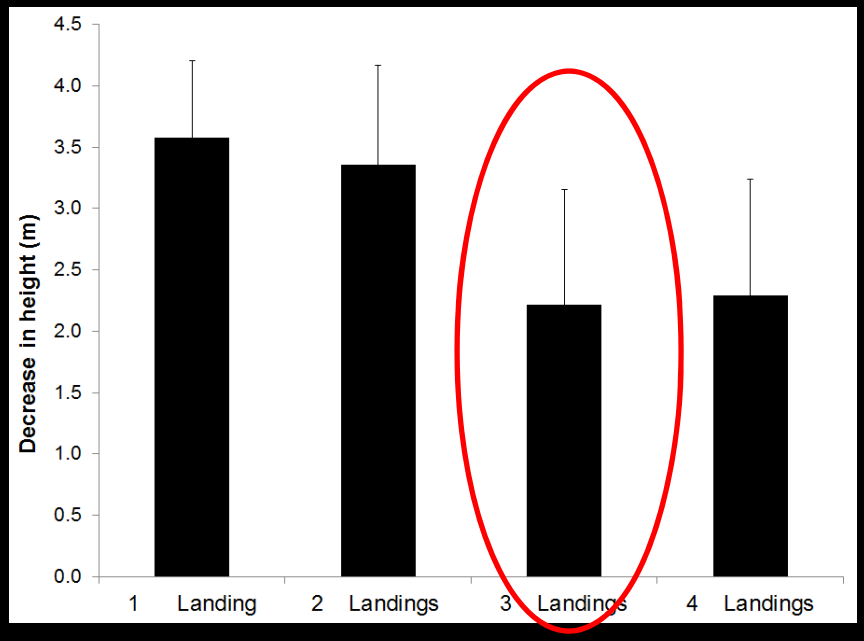
Implications

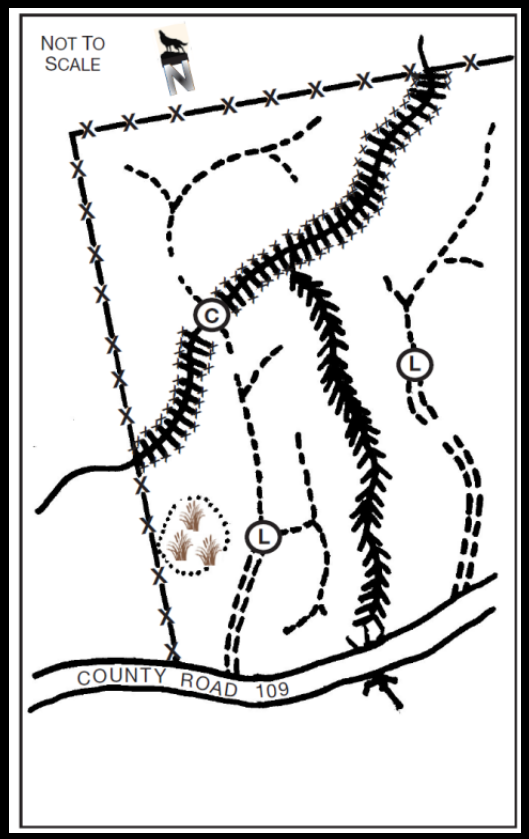
Impacts occur across all seasons – limit landing area regardless the season

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

Implications

Relative tradeoffs of more landings per site unclear





Lowest impact with 3 landings per site
Low relative landing area as well = 2.0%

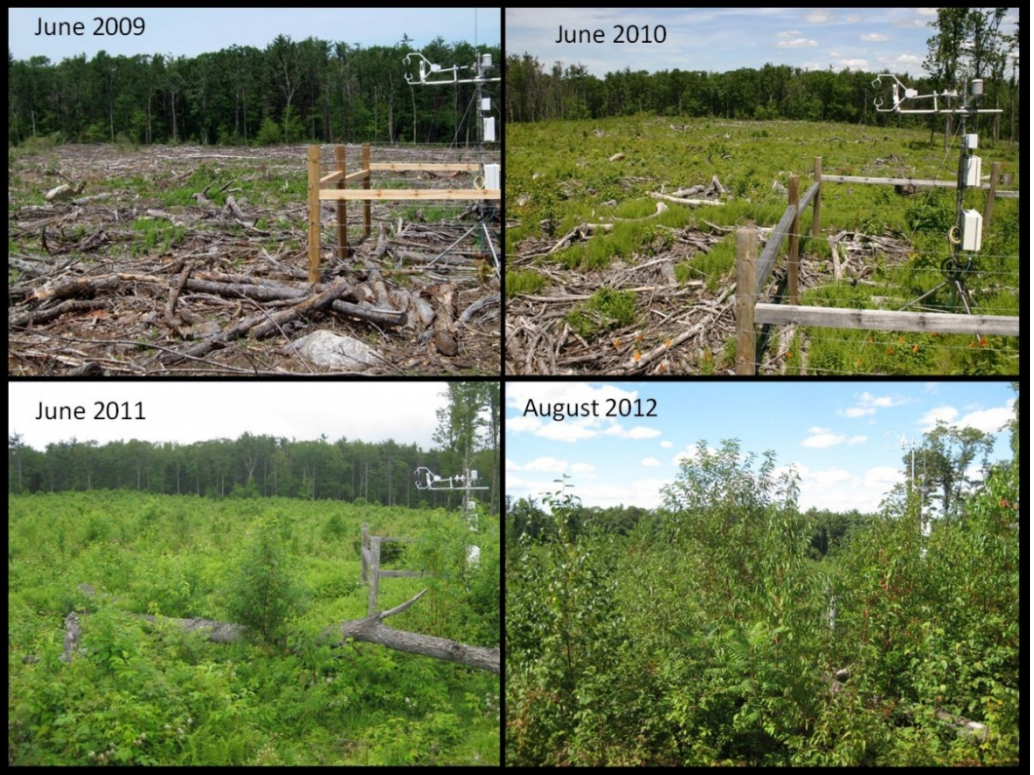
The “Sweet” spot??

Potential for optimized harvest designs

Implications

Natural recovery may negate the need for any active mitigation.

Recovery of <u>height</u> in ~20yrs on average



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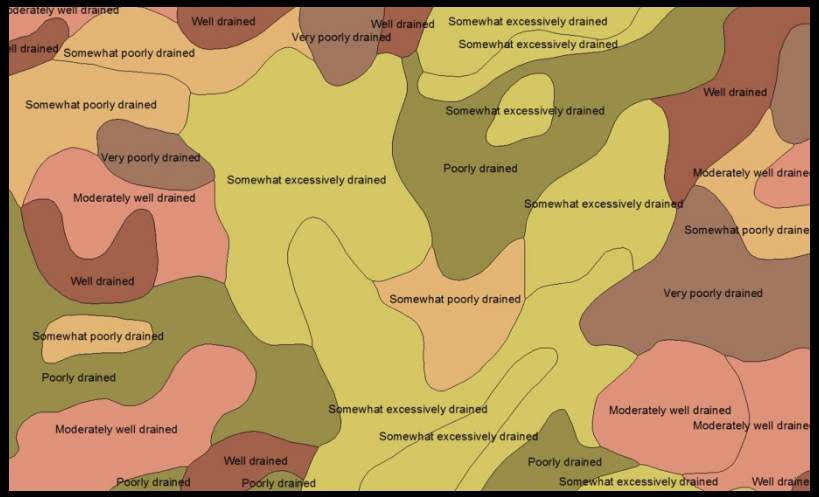
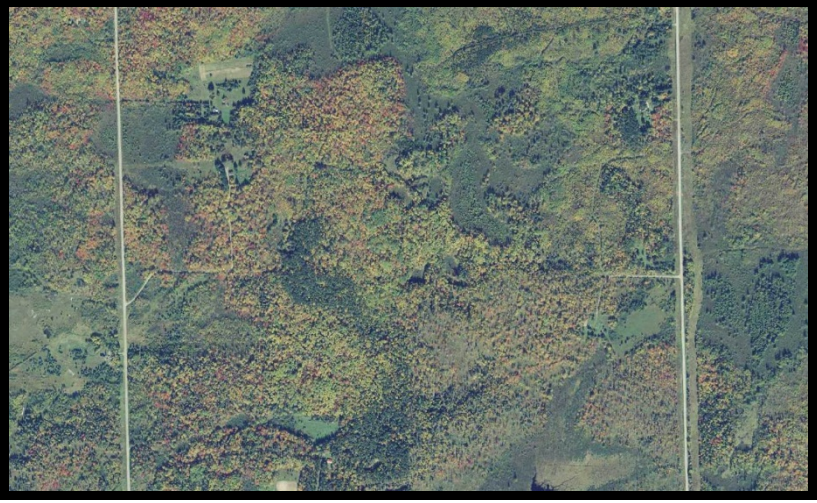
Inference and limitations

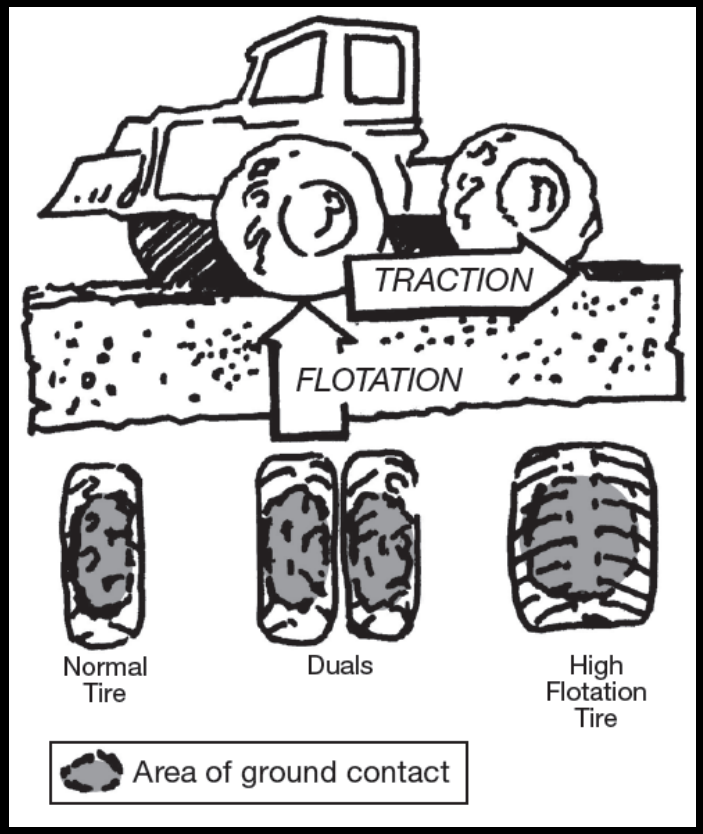
Robust inference to statewide conditions, but site-specific responses / mechanisms unclear



Soils



Cover type



Equipment mix

Other considerations

Ecosystem management - landings may provide benefits to wildlife

USDA

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