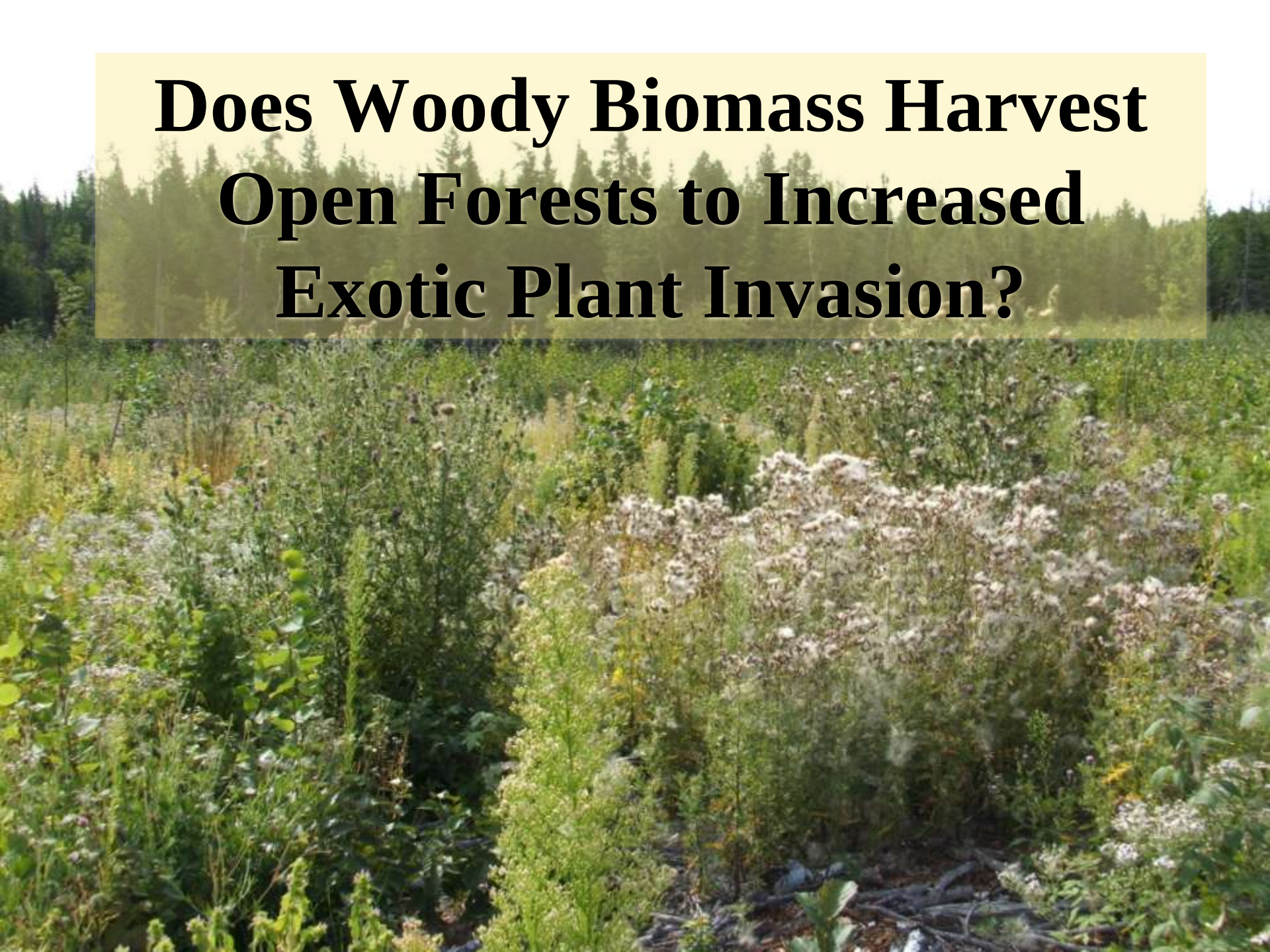
Does Woody Biomass Harvest Open Forests to Increased Exotic Plant Invasion?



Logging slash/woody biomass

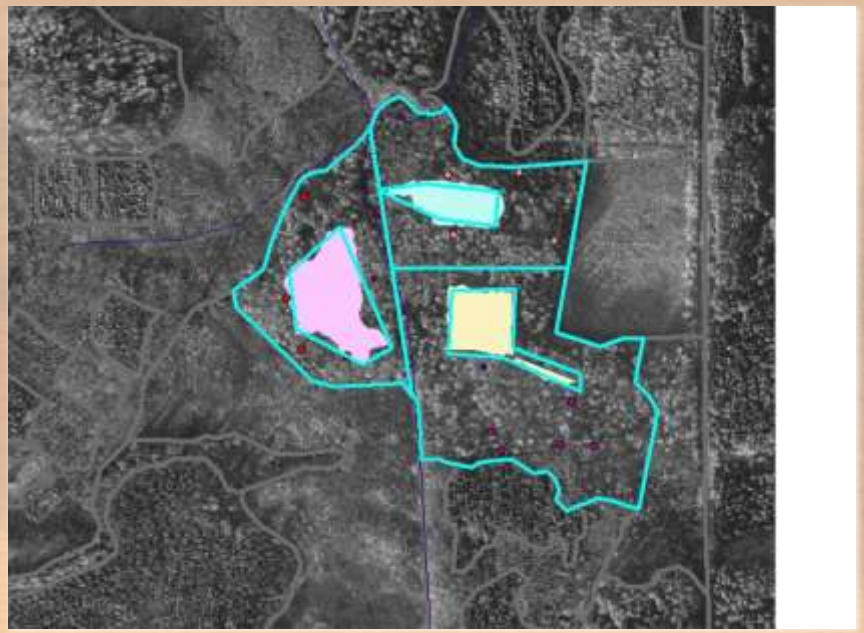
- The tops and branches of trees, as well as snags (and coarse woody debris
- “BMP” often call for retention of this resource in the forest.
- Of great value to wildlife.

A source of energy?

- Many now view this “logging slash” or coarse woody debris as a potential enrgy source.
- Laurentian Energy Authority is burning this biomass in its powerplant now, with potentially more plants to follow.
- This has the potential to be Carbon neutral source of energy, as well as an additional source of income for forest managers and loggers.

Project overview

- BACI (Before After Control Impact) Design
  - Vegetation surveyed once prior to treatment and for 2 subsequent years.
- 4 total sites
  - All in aspen or aspen/hardwood cover types
  - 1 lost in 2008
  - 1 removed from vegetation surveys
  - 2 Sites presented here



- Each site had 3 treatments
  - Control (no harvest)
  - Slash retained on site
  - Slash removed from site

Logging was done with standard heavy equipment

Sites on the Cloquet Forestry Center were logged in November of 2006, Carlton County land in January 2008

Slash leave: drag bole wood

Slash remove: whole tree skidding


Control


Slash retained

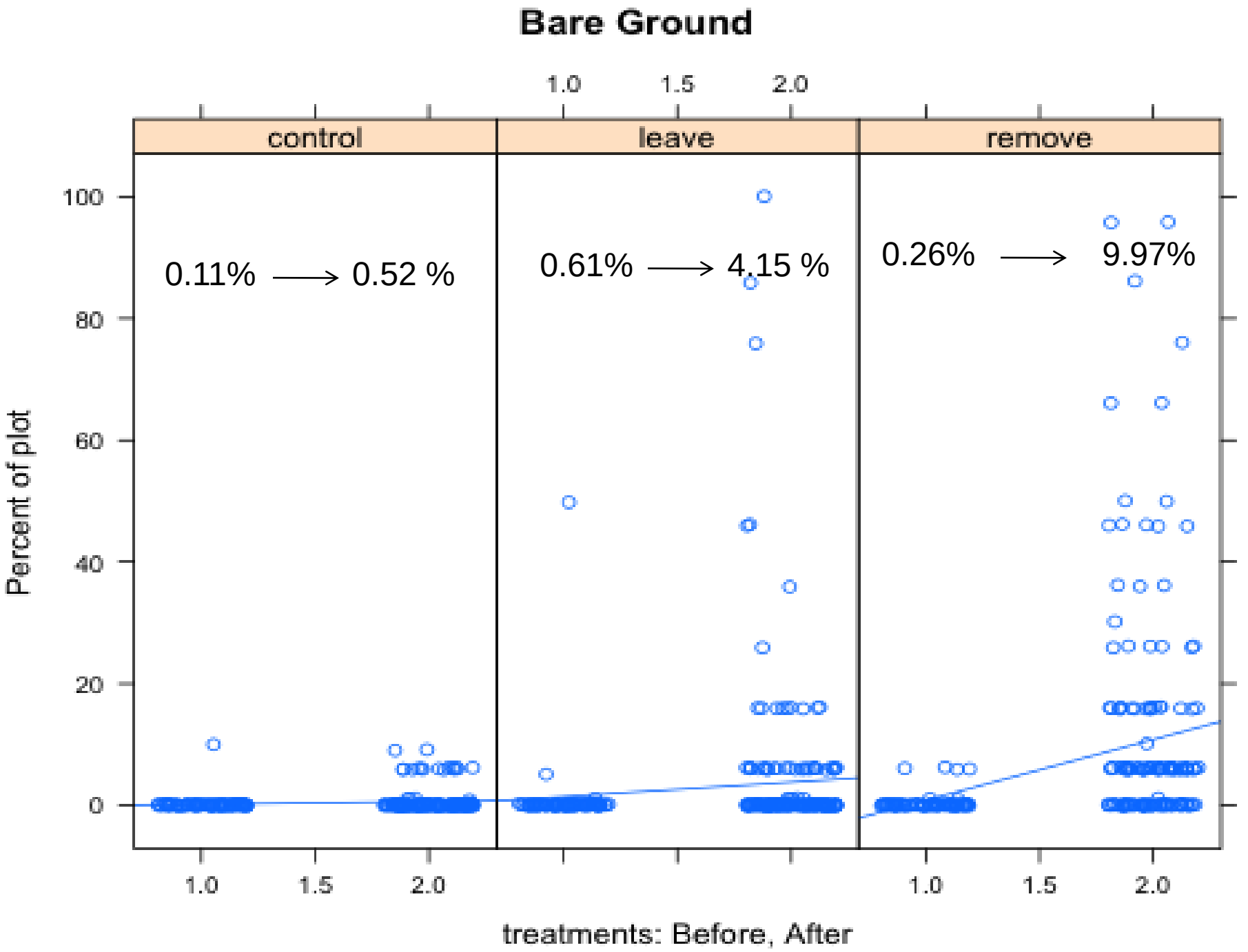
Slash removed

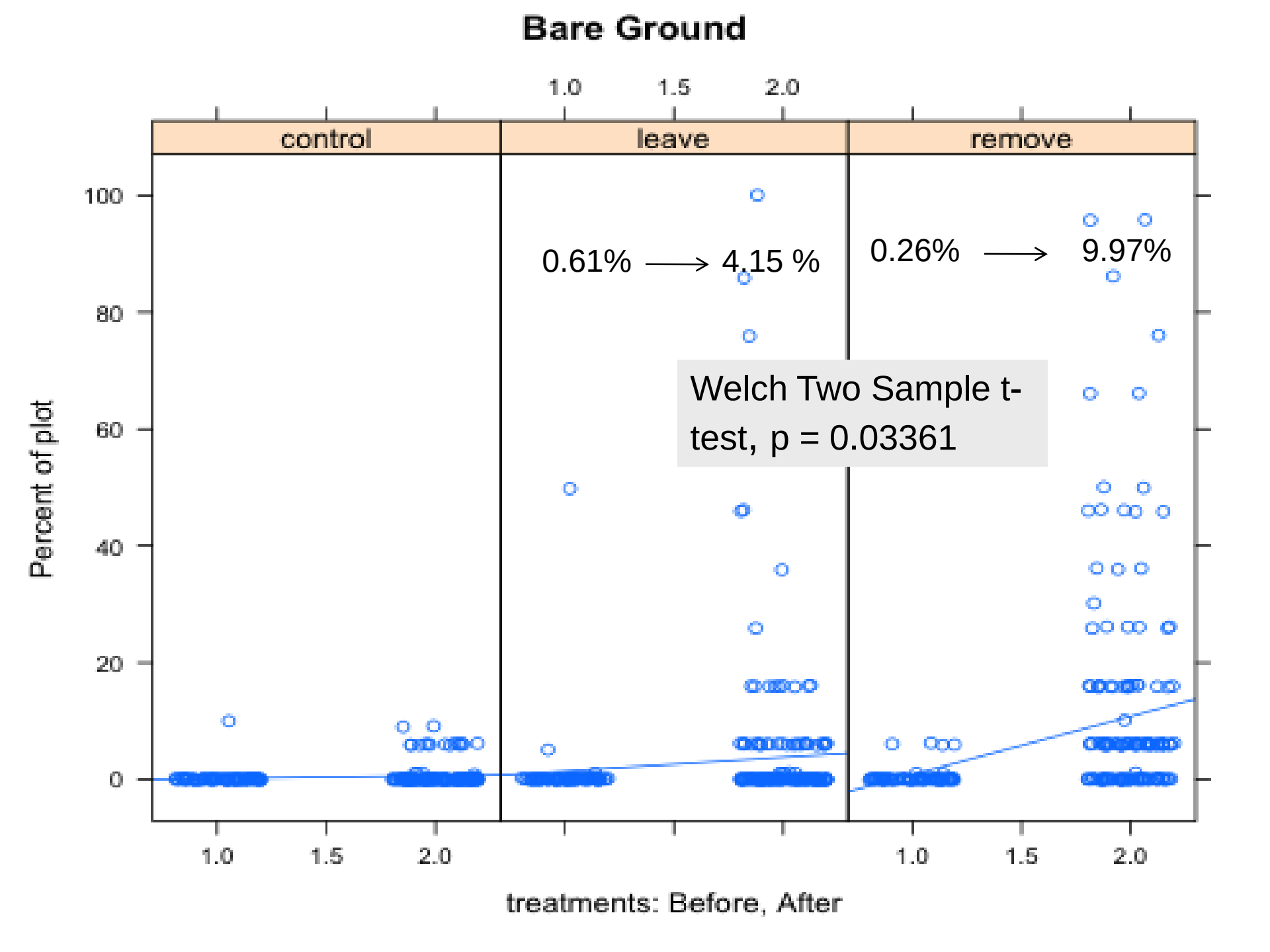
Methods

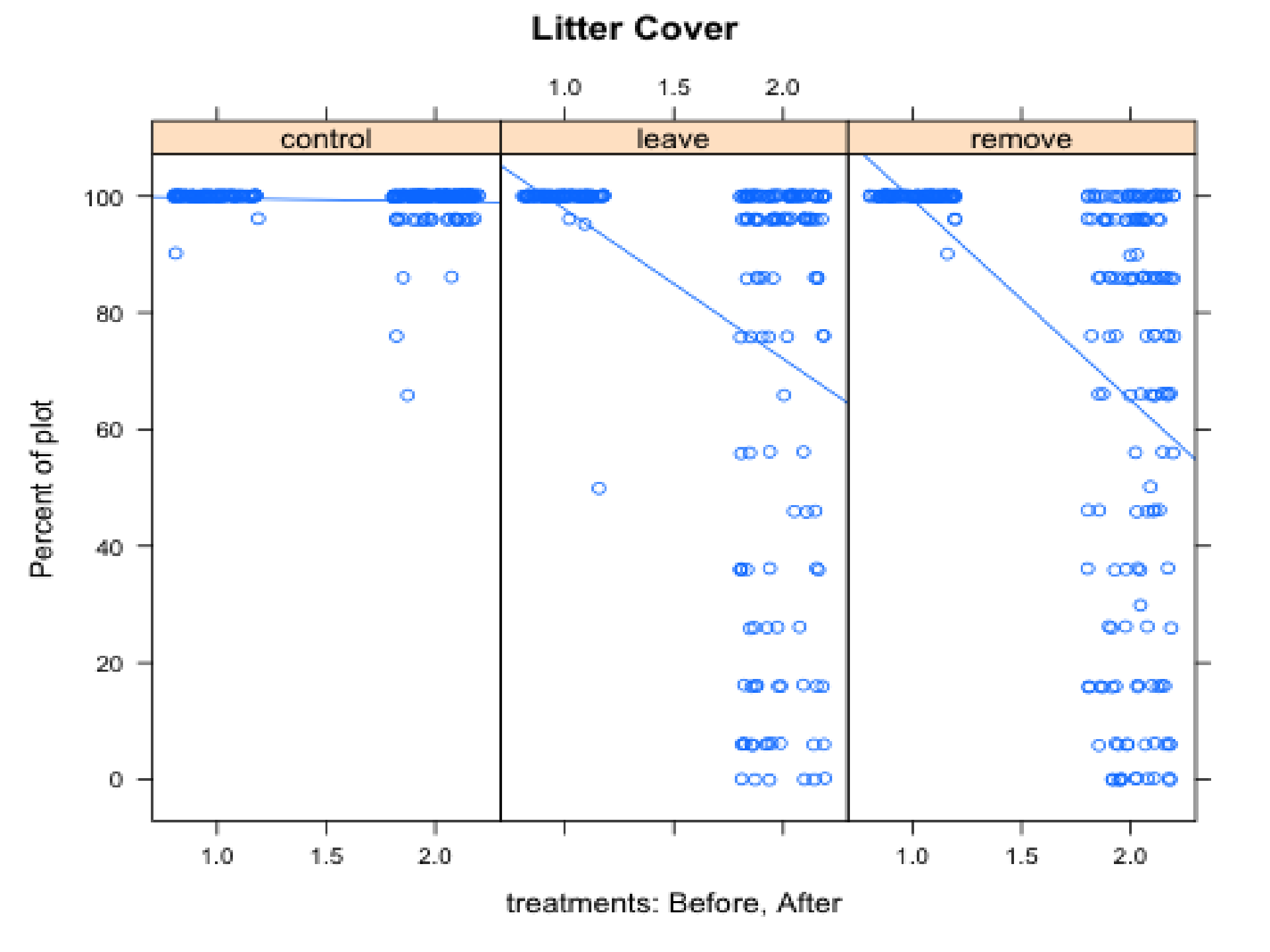
- 2 sites with 3 treatments each:
- 15 plots/treatment (initially)
  - 4, 1 sqm veg plots, 2.82 meters from plot center in cardinal directions
  - 60 total
  - “occular estimation” to decile
- 1 year pre-harvest, 2 post

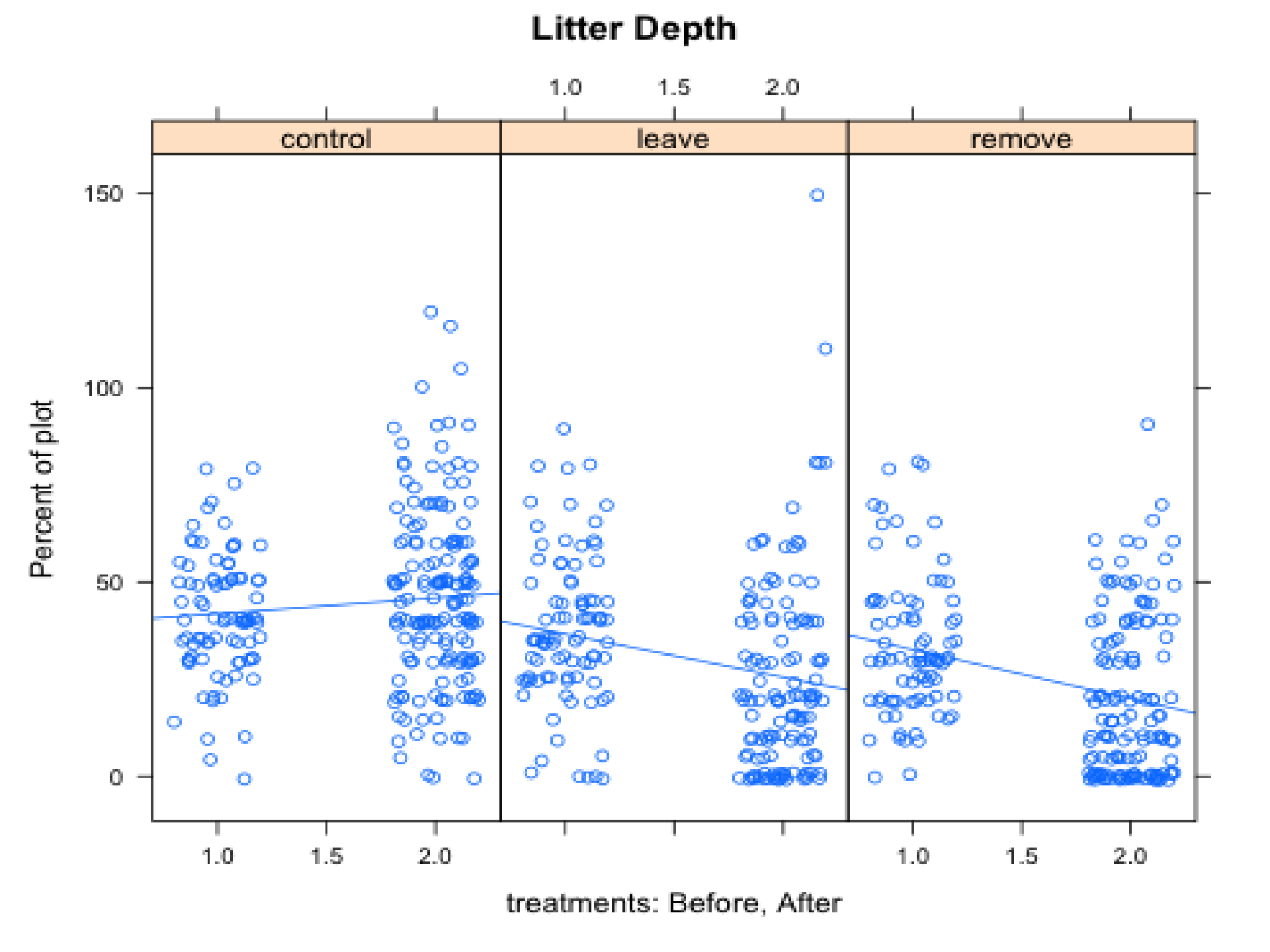
Analysis details

- The 2 sites were lumped, unless otherwise noted.
- “After” values are combined over the 2 post-treatment years unless otherwise noted.
- Only plots common to all 3 years included in analysis
- Analysis done in R


Bare Ground
control
leave
remove
0.11% ⟶ 0.52 %
0.61% ⟶ 4.15 %
0.26% ⟶ 9.97%
Percent of plot
treatments: Before, After

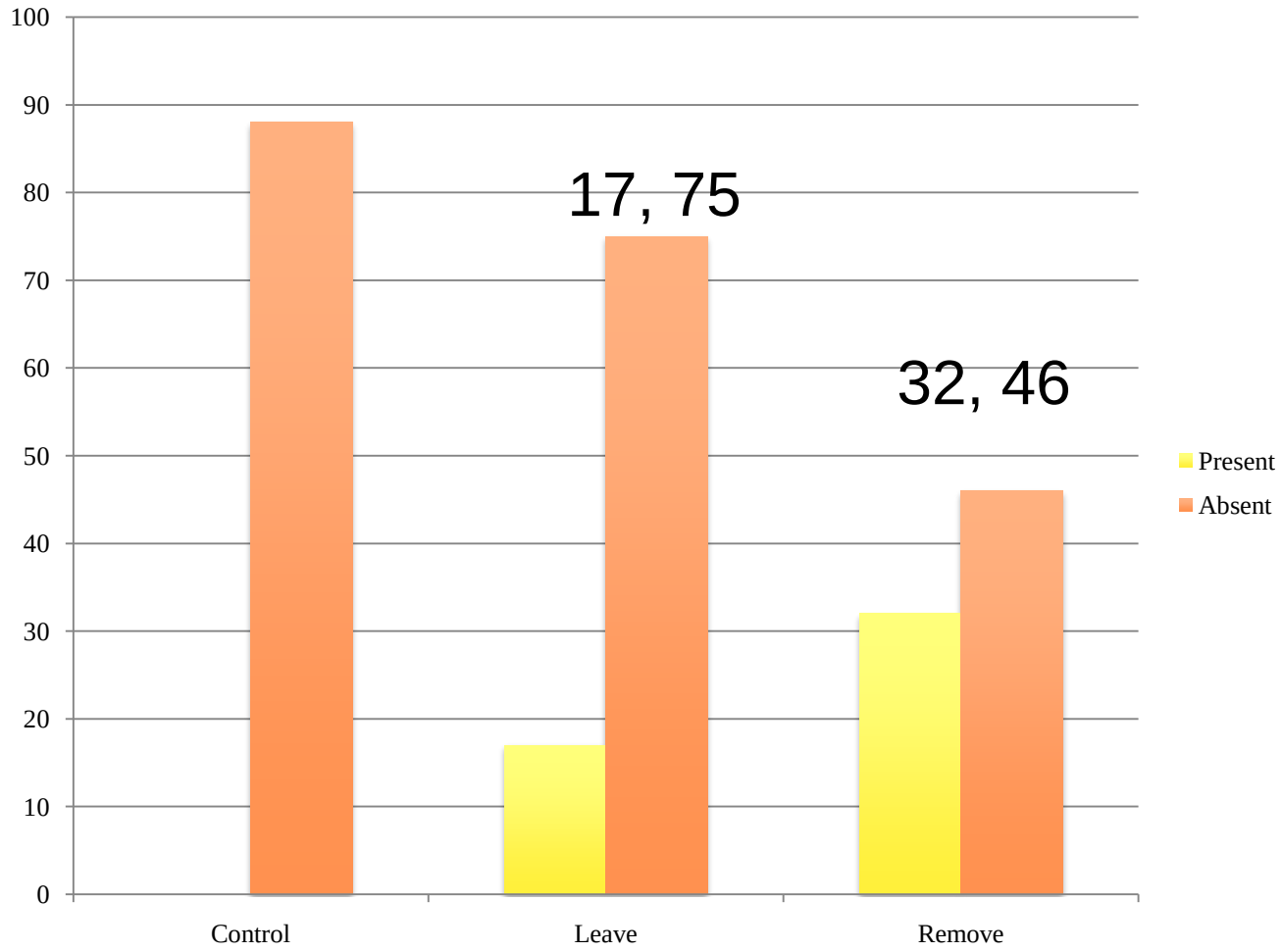

Bare Ground
control
leave
remove
0.61% ⟶ 4.15 %
0.26% ⟶ 9.97%
Welch Two Sample t-test, p = 0.03361
Percent of plot
treatments: Before, After


Litter Cover
control
leave
remove
Percent of plot
treatments: Before, After
1.0
1.5
2.0
0
20
40
60
80
100


Litter Depth
control
leave
remove
Percent of plot
150
100
50
0
1.0
1.5
2.0
treatments: Before, After

Invasive Species Presence

post-treatment



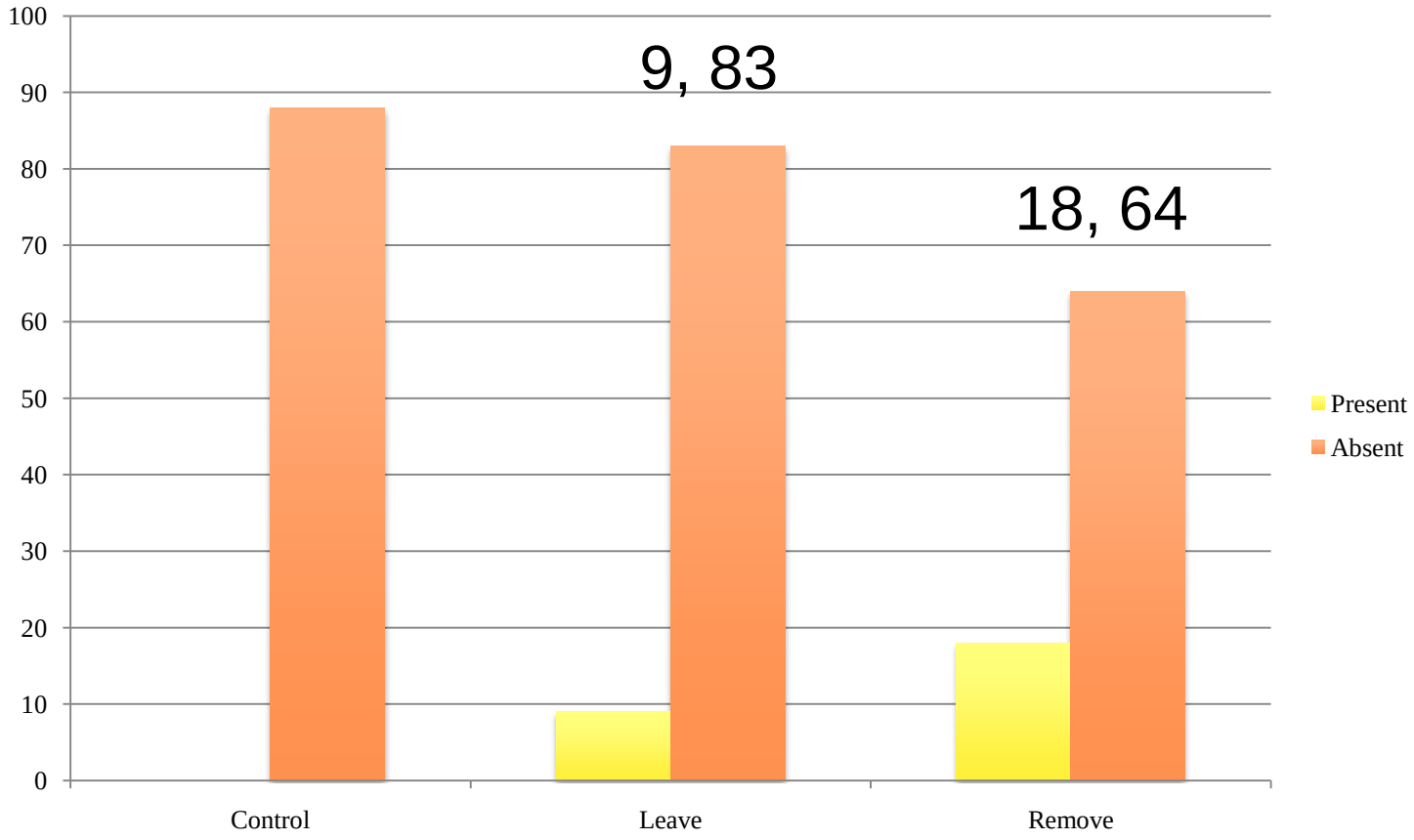
Leave vs Remove:

Fisher's Exact Test for Count Data

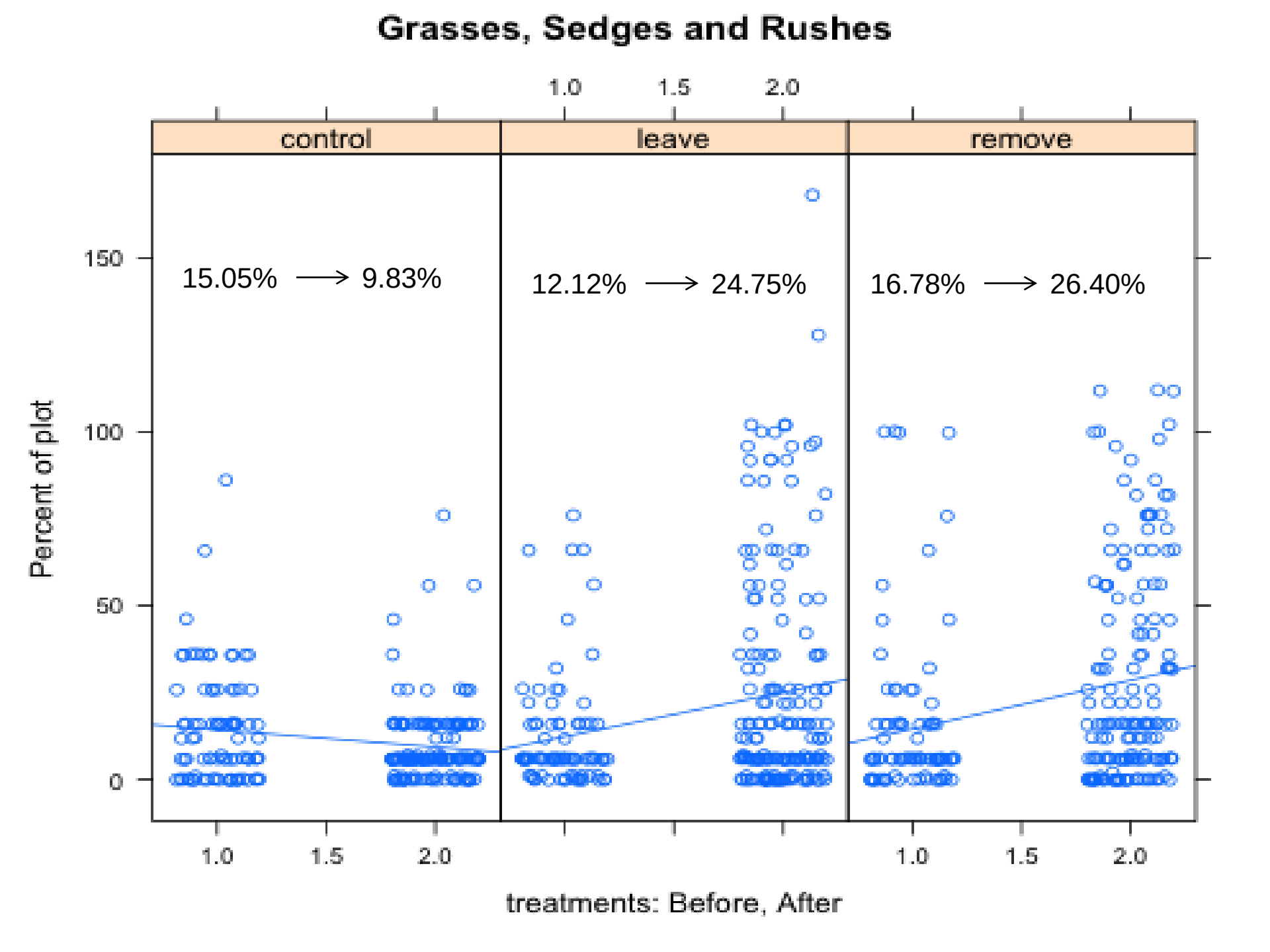
P- 0.002047

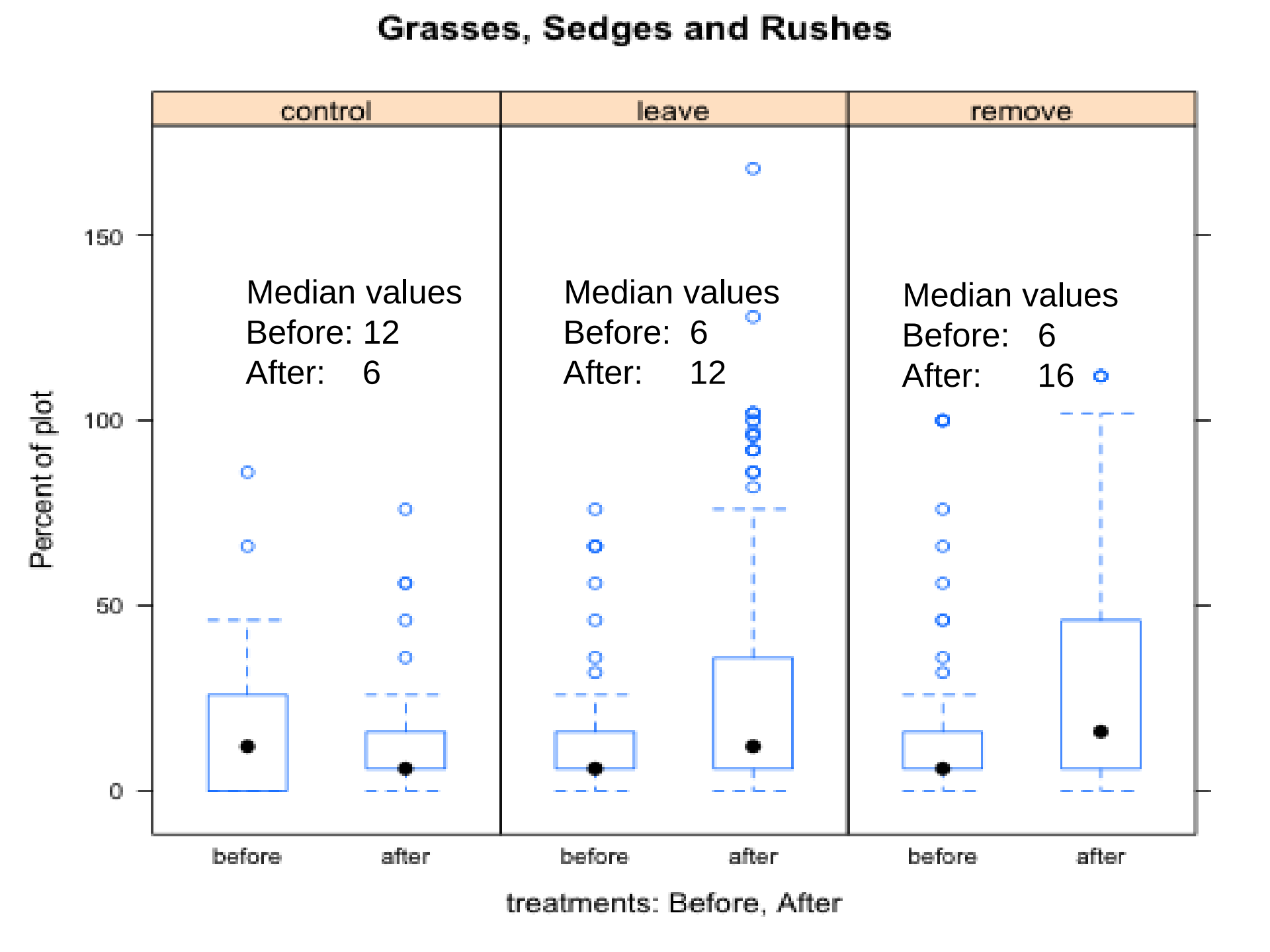
Convulvulus bind weed

change in presence



Leave vs Remove:
Fisher's Exact Test for Count Data
p-value = 0.03544


Grasses, Sedges and Rushes
control
leave
remove
15.05% ⟶ 9.83%
12.12% ⟶ 24.75%
16.78% ⟶ 26.40%
Percent of plot
0
50
100
150
1.0
1.5
2.0
treatments: Before, After


Grasses, Sedges and Rushes
control
leave
remove
Median values
Before: 12
After: 6
Median values
Before: 6
After: 12
Median values
Before: 6
After: 16
150
100
50
0
Percent of plot
before
after
before
after
before
after
treatments: Before, After

Impacts on forest

More pronounced in slash remove than slash retain

Impacts on forest

More pronounced in slash remove than slash retain

- Increase in bare ground

Impacts on forest

More pronounced in slash remove than slash retain

- Increase in number of plots with invasive plants
  - Leave: 18% of sub-plots
  - Remove: 41% of sub-plots
- Increase in bare ground

Impacts on forest

More pronounced in slash remove than slash retain

- Increase in% cover of some invasives
  - Hemp nettle
  - *Convulvulus* bindweed
- Increase in number of plots with invasive plants
  - Leave: 18% of sub-plots
  - Remove: 41% of sub-plots
- Increase in bare ground

Impacts on forest

Changes similar between harvest treatments

Impacts on forest

Changes similar between harvest treatments

- Decrease in litter depth

Impacts on forest

Changes similar between harvest treatments

- Decrease in litter cover
- Decrease in litter depth

Impacts on forest

Changes similar between harvest treatments

- Increase in invasive plants and weeds
  - White campion
  - Clover
  - Thistle
    - ??????? I disagree!
- Decrease in litter cover
- Decrease in litter depth

Impacts on forest floor

- Difference in impacts likely due to increased equipment traffic on site
- Also whole tree skidding
- Impacts *may* be minimized in frozen ground.

IS IT WORTH IT????

Acknowledgements

- My family
- Ron Severs
- Cloquet Forestry Center Staff
- Eric Zenner
- Michael Soma and Aaron Rendahl: Uof M Stats Clinic