

# Above- and Belowground Responses to Invasive Shrub Removal Methods

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## Introduction

- Amur honeysuckle (*Lonicera maackii*) forms dense thickets in forest understories
  - Inhibits woody regeneration and herbaceous communities
  - Cascading effects on wildlife
- Mulching heads (Fecon) offer rapid removal of invasive shrubs. May impact recovery of understory vegetation.
- Conflicting literature on honeysuckle effects on soil chemistry and microbial communities



Mulching heads disturb soil and deposit a layer of woody mulch

## Methods

- Study Areas: Oak-hickory secondary forests at Purdue FNR Lugar Farm and Purdue Wildlife Area, West Lafayette, Indiana
- Experimental Design:
  - 2 X 2 split plot design + reference, 4 sites, 96 total plots
  - Cut-stump or Fecon head removal
  - Mulch addition (cut-stump) or removal (Fecon)
- Methods:
  - Groundcover estimates (spring and summer) and seedling counts
  - Community-level physiological profiles of soil microbial communities (MicroResp)
  - Soil chemistry analyses
- Analyses:
  - Linear Mixed Models
  - Redundancy Analysis (RDA)



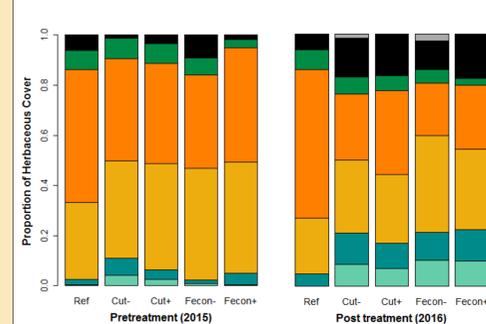
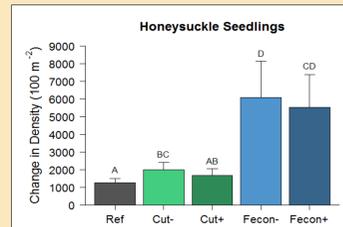
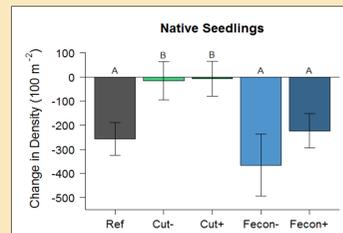
MicroResp system used to measure soil microbial catabolic activity

## Results

### Understory Responses

Compared to cut-stump method, Fecon head removal led to:

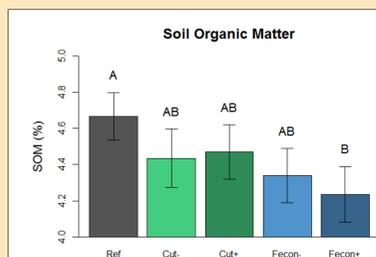
- Lower densities of native seedlings
- Higher densities of honeysuckle seedlings



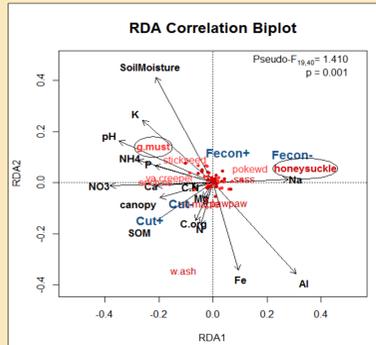
Increased proportions of annuals and exotics across treatments

Greater reduction in proportion of vines following Fecon removal

### Soil Chemistry



SOM was lower in all removal treatments, particularly following Fecon removal. Total Exchange Capacity followed a similar trend.

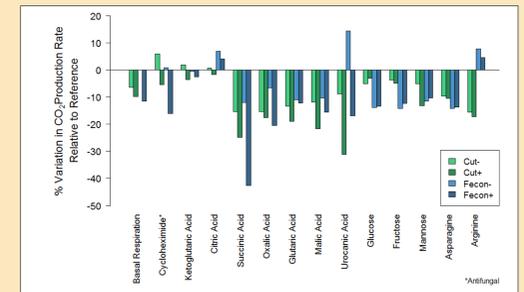


Between removal treatments, honeysuckle seedling abundance was negatively associated with nutrient availability and canopy cover

Garlic mustard was positively associated with the same gradients

## Microbial Community Profile

- Reduced microbial catabolic activity in removal areas
- Differences linked to SOM and/or pH and dications



## Discussion

- Fecon head removal may be necessary for large-scale invasions, but risks inhibiting native seedlings
- Few differences in composition of recovering herbaceous communities between removal methods
- Higher  $\beta$ -glucosidase activity beneath honeysuckle invasion<sup>1</sup> does not explain SOM loss; likely due to higher soil temperatures or to priming effects from resprouting<sup>2</sup>
- Changes in soil chemistry and microbial community function following honeysuckle removal challenge previous findings<sup>3</sup>

## Ongoing Work

- Collect second growing season of the same data to assess stability of current patterns
- Assess how chemistry and microbial communities in rhizosphere soil of resprouting honeysuckle relate to differences in bulk soil between treatments.
- Determine effects of Fecon treatment intensity on honeysuckle survival and understory community response

## References

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