

Fig 2 500 m radius surrounding land use land cover maps for 4 sample grasslands.

Ant Communities are Structured by Patch- and Landscape-Level Factors

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Introduction

- Federal incentive programs, such as the Conservation Reserve Program, sponsor construction of prairie grasslands on formerly cultivated land to improve soil quality and promote biodiversity.^{1,2}
- Insect colonization is likely sourced from surrounding habitats and filtered by characteristics of the patch.³
- Ants are slow to colonize, have long term dependence on the patch, and exhibit habitat conservatism, making them potential indicators of recovery from agricultural disturbance.^{4,5,6}
- Identifying community and species specific responses at multiple levels can help us understand ant community assembly in conservation set-asides.

Objective & Hypotheses

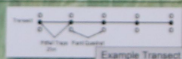
Objective: Determine relative role of patch and landscape-level factors on ant diversity in constructed grasslands

Hypotheses:

- Patch colonization by ants is determined by dispersal limitations and disturbance tolerance.
- Soil texture acts as a filter for ant composition.
- Ant communities respond to disturbance and abiotic characteristics rather than biotic.
- Surrounding landscape is the source of colonizing ants.

Methods

- 23 grasslands (sampled transects)
- Ant Collection:** pitfall traps
- Identified habitat specializations (Fig. 1, center)
- Patch Characteristics-**
 - Vegetation- 10 m² quadrats
 - Soil- bulk density, soil organic matter, texture
 - Age, Area, Management (time since burn)
- Landscape Characteristics**
 - Land use land cover mapped (Fig. 2, top left)
- Statistical Analysis:**
 - Ant richness- GLMs, Poisson dist., AIC selection
 - Species-level responses- trap frequency
 - Community composition- Distance-based Redundancy Analysis (dbRDA)



Habitat Specializations

Disturbance Tolerant

Tapinoma sessile
Tetramorium caespitum



Habitat generalists

Lasius alienus *Ponera pennsylvanica*
Alphaenogaster rufus *Myrmica latitrons*



Uncommon Specialists

Pheidole tysseri *Leptothorax ambiguus*
Stenamma brevisomae



Open habitat

Myrmica americana *Formica pallidifrons*
Solenopsis molesta *Lasius neoniger*
Monomorium minimum



Fig 1 Ant habitat specializations for 14 focal species. **Disturbance Tolerant**- preference for highly disturbed human habitats. **Uncommon Specialists**- found in less than 20 counties in Ohio. **Open Habitat**- common species typical of open habitats. **Habitat Generalists**- common species found in both open and woodland habitats.

Results

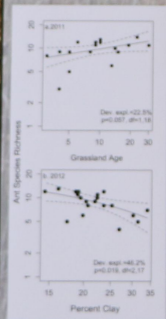


Fig 3 (left) GLMs- Total ant species richness was determined by grassland age and soil texture.

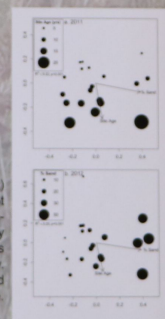


Fig 4 (right) Ordination plot (dbRDA)- Ant community composition was determined by grassland age and soil texture.

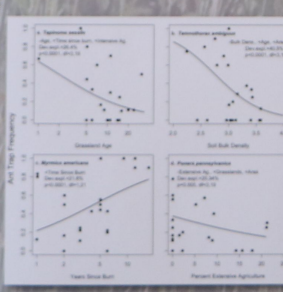


Fig 5 Individual species frequency responses were highly variable.

Disturbance Tolerant species- higher in younger sites, surrounded by intensive agriculture and urbanization

Uncommon specialists- higher in older, larger sites, surrounded by more grassland

Open Habitat species- mostly patch level variables

Habitat Generalists- various patch and landscape-level variables

Conclusions

- Ant community assembly in constructed grasslands is a time dependent process, shaped by physical characteristics of the patch and colonization from the landscape.
- Our work promotes ants as environmental indicators of management and soil characteristics, but notes that aggregate measures of ant diversity (species richness) may not be effective in documenting the more subtle shifts in ant community composition.
- Ant richness and Community Composition** is determined by patch level variables:
 - Age of the site** – higher richness as site ages
 - Soil texture** – higher richness in sandier sites
- Species-level responses
 - Disturbance Tolerant species** more frequent if:
 - Surrounded by **high disturbance land uses**
 - Grassland is young**
 - Uncommon Specialist species** more frequent if:
 - Grassland is older and larger**
 - More grasslands in landscape**
 - Soil properties are favorable** (low bulk density, high soil organic matter)
 - Open Habitat species** determined by:
 - Various **patch-level factors** (management, soil texture, age, C4 grass cover)
 - Habitat Generalists** determined by:
 - Various **Patch- and landscape-level factors**

Acknowledgements

Funding: Prairie Biotic Research, Inc., Ohio Biological Survey, Miami University
Field & Lab assistants: Garrett Dienno, Mayrolin Garcia, Christina Loyke, Sam Stephenson, Natalie Konig, Amanda McDonald, and Aaron Coleman.
Site Access: Private land owners, Metroparks of Butler County, Five Rivers Metroparks, Talaivanda High School, and Miller Coors LLC.

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