Effects of fire on community diversity and plant-pollinator interactions in the tall grass prairie.

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Introduction

- Prescribed fires are an important management tool for the regeneration and maintenance of tall grass prairie vegetation.
- Responses of plant-pollinator networks to fire are unstudied in this habitat.
- The Tall Grass Prairie Preserve of Manitoba manages the largest remaining fragment (~3000 ha) of tall grass prairie habitat in Canada.
- In fall 2009, an unplanned fire created the opportunity to study the recovery of tall grass prairie insects and plants within the preserve.
- I plan to compare pollination networks for habitats of differing burn ages by assessing community structure and interaction quality.

Table 1. Site descriptions and burn histories of study habitats, 2010-2011.

Site #	Site name	Habitat type	Year of burn	Class of burn
1	Dead Chicken (DC)	Upland	Fall 2009	New
2	Doyle	Upland	Fall 2009	New
3	Antonyshyn (Ant)	Upland	Spring 2005	Int
4	Shorehill Trail (Trail)	Upland	Spring 2006	Int
5	Mimic	Sedge	Spring 2000	Old[1]
6	Smook	Sedge	No record	Old[1]

[1] Sampling will be discontinued in 2011

A common prairie syrphid, *Toxomerus marginatus*, visiting *Crepis runcinata*.

Many species rely on healthy prairie.

Methods

Study design

- Data was collected in six prairie sites with varying burn histories (Table 1).
- Nine sample periods of three days each were conducted at 10-14 day intervals from May to September.
- Central transects (90m) and belts transects were established in each site for diversity and interaction surveys.

Community phenology and diversity

- Pan traps were used to sample a subset of active insect species.
- Percent cover estimates and open bloom counts (1 m^2 quadrats) were used to assess densities of flowering plants, shrubs, grasses and/or sedges, litter layer, and bare ground. Floral units were also counted along belt transects.

Network structure and interaction quality

- Standardized insect observation periods were used to record plant-pollinator interactions in habitats of differing burn ages.
- Insect contact with reproductive structures were recorded.

Results and Discussion

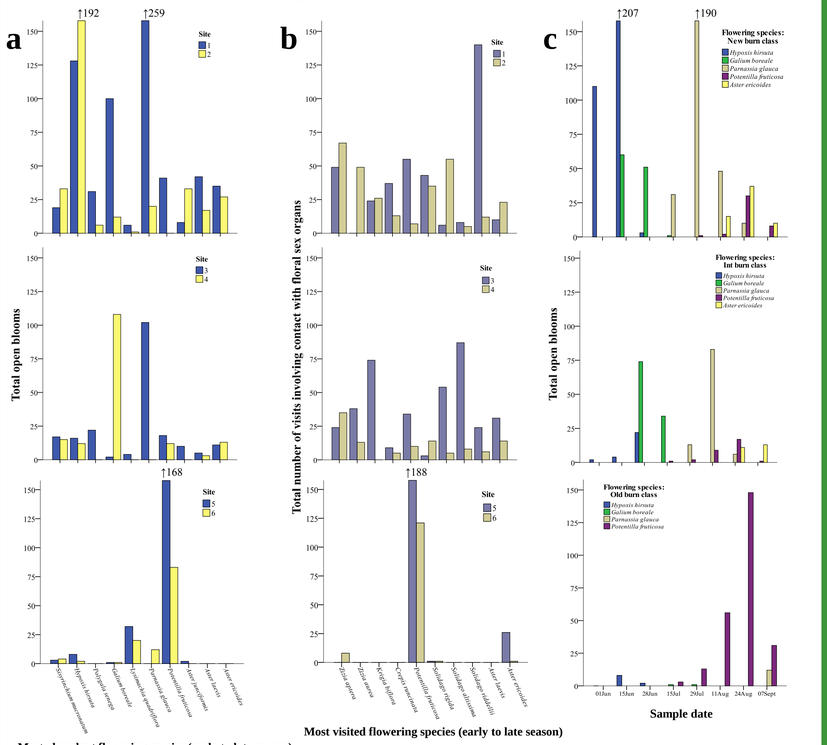

Figure 1a. Flowering plant composition within differing burn sites from early to late summer. The top ten most abundant flowering species are displayed for comparison with **Figure 1b**, which shows the top ten most visited flowering species from early to late summer. Notice that abundances do not correspond to visitation rates. **Figure 1c.** Phenology of the top five most abundant flowering plants showing accelerated bloom times for the new burn class. Total open blooms were counted using 1m^2 quadrats. Visited blooms were counted during plant-pollinator observations.

Flowering plant abundance, phenology, and 'popularity'

- The new burn class exhibited earlier bloom times, as well as a greater abundance of open blooms over the summer (Fig. 1a).
  - This was likely a result of the removal of litter by fire.
- The abundance of open blooms did not determine visitation frequency (Fig. 1b).
  - Only three flowering species (*P. fruticosa, A. laevis, A. ericoides*) were both abundant and heavily visited.
  - Flower abundance may not be a dominant factor when determining network structure.
- Old burn classes (sedge meadow) had lagging bloom times and low flowering species richness (Fig. 1c).
  - This could be due to the length of time since burn, or differences in habitat structure between upland prairie and sedge meadow.

Table 2. Top five visiting insect families for each burn class. Visitors were in contact with floral reproductive structures.

Order	Family	# of visits
New Burn Class		
Diptera	Syrphidae	571
	Ulidiidae	73
	Stratiomyidae	64
Hymenoptera	Halictidae	55
	Apidae	47
Intermediate Burn Class		
Diptera	Syrphidae	448
	Sarcophagidae/Tachinidae	42
Hymenoptera	Apidae	45
	Halictidae	23
Coleoptera	Mordellidae	51
Old Burn Class		
Diptera	Requires identification	115
	Syrphidae	114
	Ulidiidae	81
	Sarcophagidae/Tachinidae	28
	Stratiomyidae	19

Do you know this fly? This species was responsible for 115 late season visits in the old burn class.

Visiting insects

- Syrphids were responsible for the majority of observed pollinating visits, and were most active in the new burn class (Table 2, Fig. 2).
- Hymenopterans showed peak activity (*) early in the new burn class (June 14) and late in the intermediate class (August 9) (Fig. 2).
- Dipterans were observed as the primary pollinators of the old burn class (Table 2, Fig. 2).

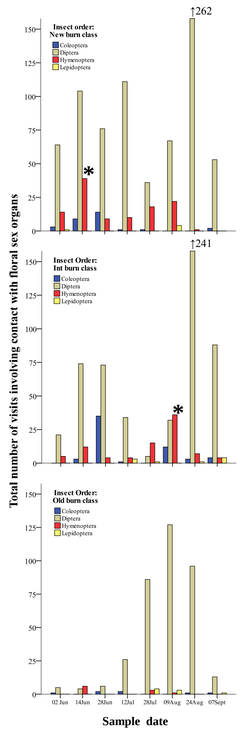

Figure 2. Phenology of the top four insect orders observed in contact with floral sex organs during visitations. Stars (*) signify peak activity in Hymenoptera.

Future Directions

- Further surveys will be completed in 2011 to better understand network response to fire.
- Pollen supplementation and pollen load analysis will be used to assess pollinator services in different burn sites and classes.
- Multi-year sampling will assess temporal variation in phenology, diversity and network structure.

Acknowledgements
We would like to thank C. Borkowski, B. Ford, and the CANPOLIN network for continued support and advice during this study. Thank you to M. Olynyk, J. Sumlak, M. Pearn, and S. Halwas for assistance in the field. Funding was/is provided by NSERC-CANPOLIN, NSERC Discovery Grant, Manitoba Conservation, Manitoba Hydro, and the Canada Summer Jobs Initiative.

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