

# A Comparison of Bird, Invertebrate, and Small Mammal Granivory at an Iowa Prairie

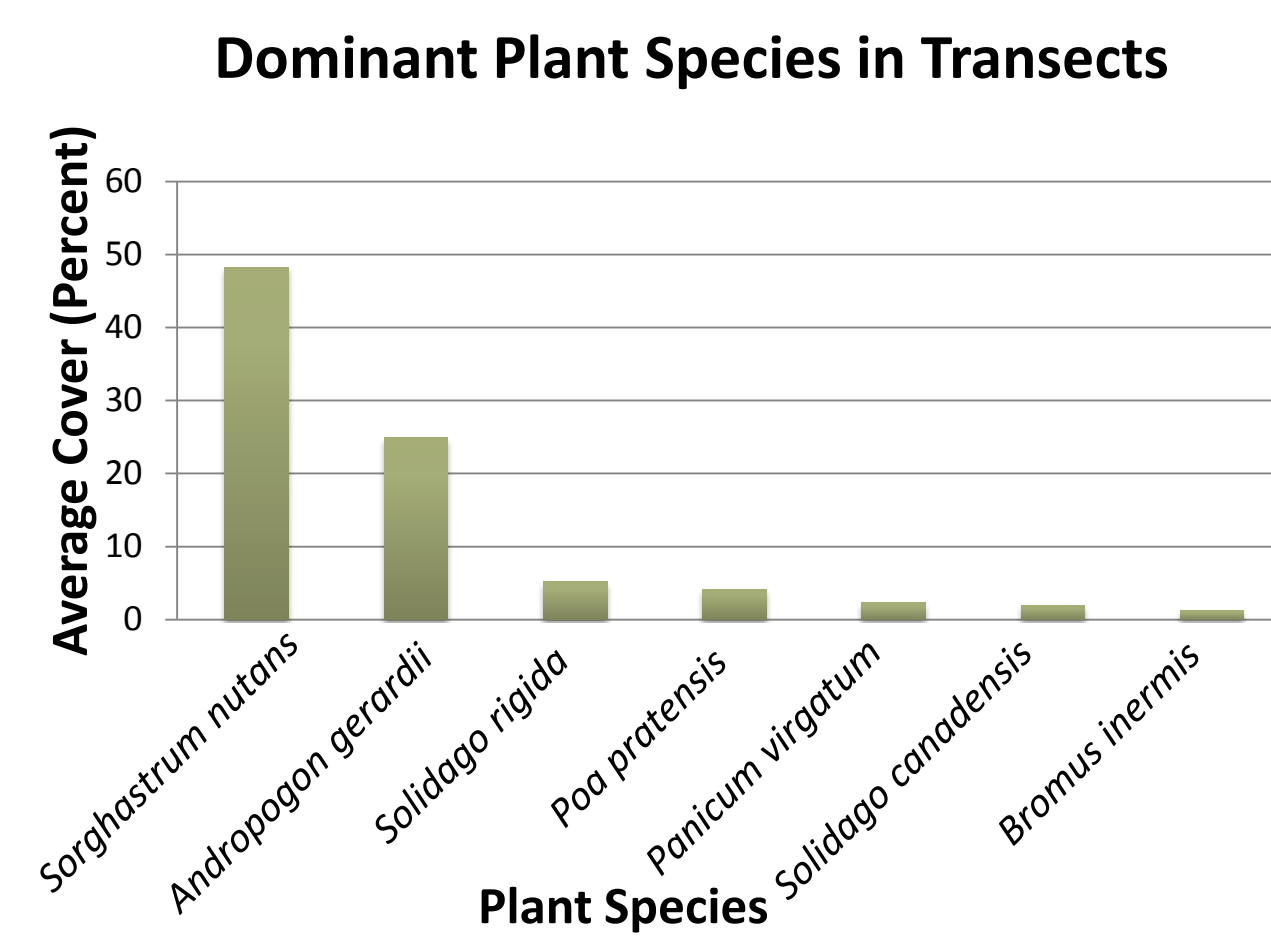
Allison Friedmann and Mark Hammer

Department of Life Sciences, Wayne State College, Wayne NE 68787

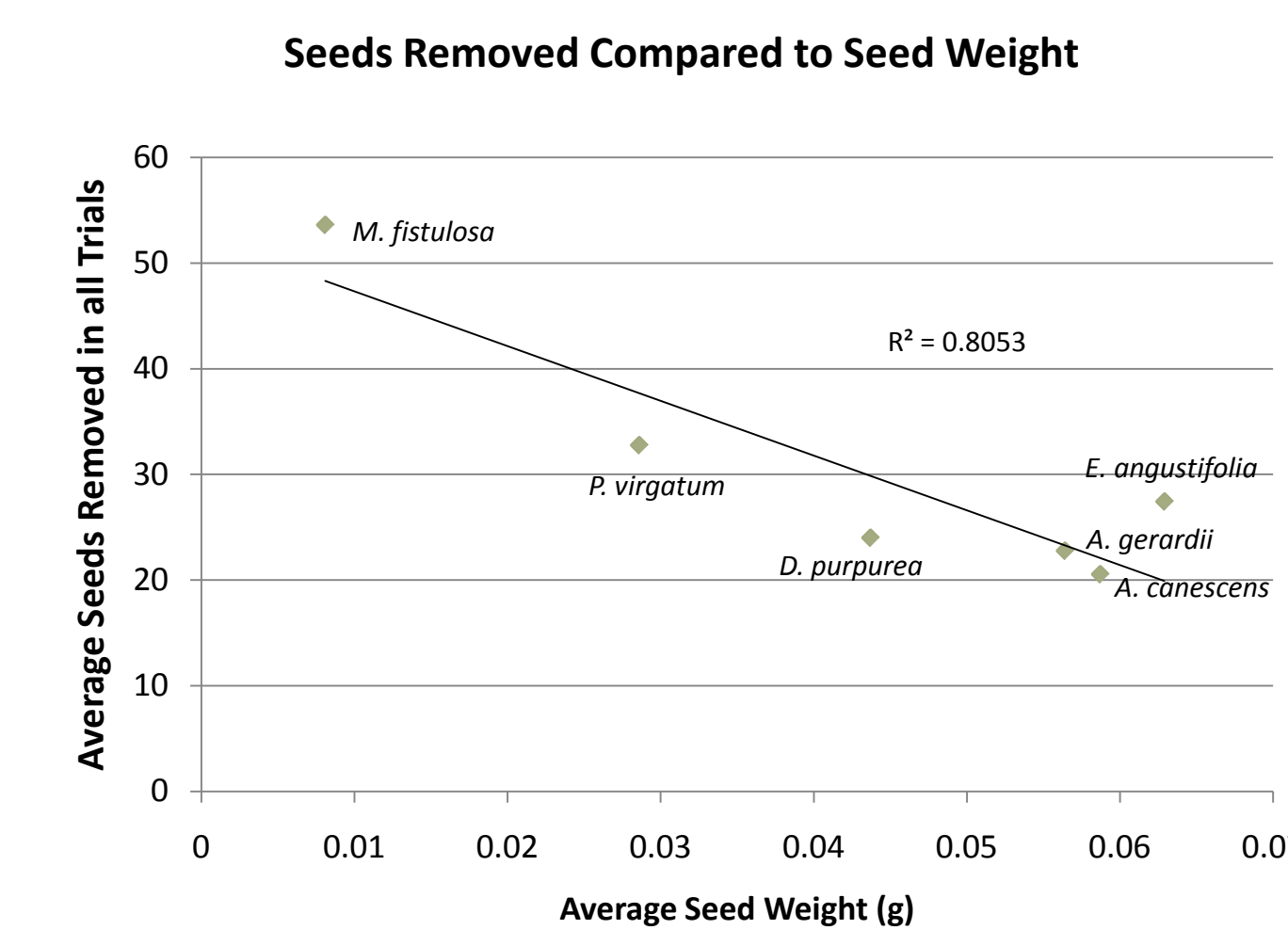


**Introduction**  
Granivory, or seed predation, is likely common in prairies. Certain species of rodents, birds, and invertebrates are seed eaters which could serve as granivores associated with prairie systems (Reed et al. 2004). Howe and Brown (1999) examined granivory in tallgrass prairie and found small vertebrates had a dramatic effect on plant diversity and plant biomass. In a similar study, predation by small mammals reduced seed densities, especially of rare species (Murillo et al. 2007). Harvester ants have been recognized as being granivorous (Anderson and MacMahon 2001). According to Lundgren (2005), some species of the family Carabidae (ground beetles) should also be recognized as being granivorous. The objectives of the present study were to determine if small mammals, birds, or invertebrates act as granivores of native prairie seed, and to determine the seed species preference of granivores.

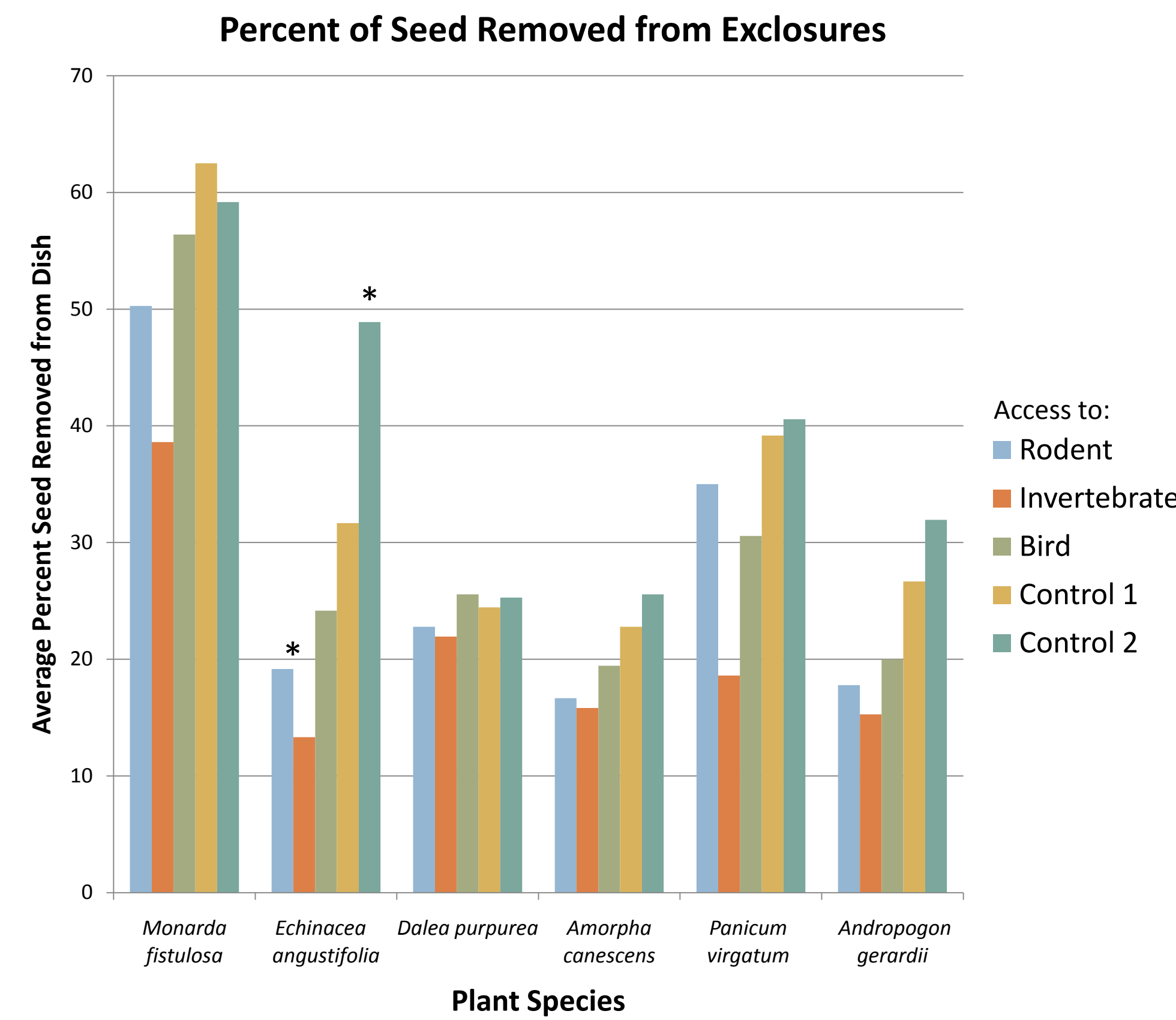
## Results



**Fig. 1** The average plant canopy cover along transects in the study site on 28 August 2009. Only species having > 1% average cover are shown.



**Fig. 3** The negative relationship between average seed weight and the average amount of seeds removed of each species. Granivorous animals choose seeds based on their caloric value when storing them for winter use, yet this relationship does not occur during summer granivory (Haight and Myster, 2007).



**Fig. 2** Seeds removed from Petri dishes over 48 hours as a percentage of that species initial seed amount (20). Using Multivariate ANOVA comparisons, seed removal did not differ due to enclosure except with *Echinacea angustifolia* seed where control 2 differed significantly from invertebrate-only access ( $P = 0.002$ ) and rodent-only access ( $P = 0.016$ ). Overall, there was a trend of more seed removal in the control dishes and more removal of *Monarda fistulosa* seed. There was also a trend towards less seed removal by invertebrates compared to the other granivores.

**Table 1** Invertebrate taxa found using pitfall traps along transects.

Taxa	Number of Individuals
Order Orthoptera (Grasshoppers, Crickets, Katyids)	39
Order Coleoptera (Beetles) *Not including Family Carabidae	38
Family Carabidae (Ground Beetles)	12
Order Dermaptera (Earwigs)	6
Family Formicidae (Ants)	4
Superfamily Apoidea (Bees & Wasps)	3
Order Phalangida (Daddy Longlegs)	3
Order Araneae (Spiders)	2
Class Chilopoda (Centipedes)	1
Class Diplopoda (Millipedes)	1

**Table 2** Avian taxa observed on 30 August 2009 at The Sioux City Prairie.

Grasshopper Sparrow	Purple Martin
Northern Bobwhite	Eastern Bluebird
American Crow	American Goldfinch
Blue Jay	Dickcissel
Catbird	Field Sparrow
Common Yellowthroat	Eastern Meadowlark
Wild Turkey	Tree Swallow
Indigo Bunting	American Robin
House Sparrow	Eastern Kingbird
Ring-necked Pheasant	Bell's Vireo
Eastern Towhee	Mourning Dove

No small mammals were captured during the sampling periods. No evidence of small mammals, except for seed removal, was noted at the seed stations.

## Conclusions

Small mammals, birds, and invertebrates may act as granivores of native prairie seed. Our data indicates granivores prefer the smaller *Monarda fistulosa* seed during the summer months.

## Management Implications

During prairie restoration, managers broadcasting seed should note the potential for granivory which could affect the composition of the planned plant community.

## Acknowledgements

We thank Scott Moats of the Iowa Nature Conservancy for permission to conduct this survey and Jerry Probst for assistance in bird identification.

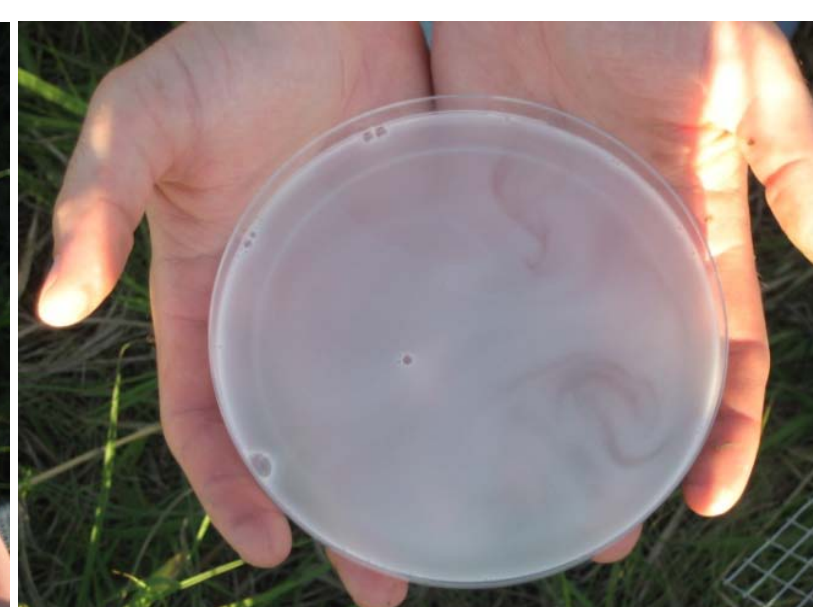
## Materials and Methods



The study was conducted at The Nature Conservancy's Sioux City Prairie. Three 100-meter long transects each containing five seed stations were established.



All stations had a Petri dish containing 20 seeds of each of the following species: *Monarda fistulosa* (wild bergamot), *Amorpha canescens* (leadplant), *Dalea purpurea* (purple prairie-clover), *Panicum virgatum* (switchgrass), *Andropogon gerardii* (big bluestem), and *Echinacea angustifolia* (narrow-leaf purple coneflower).



Each seed dish for bird-only access and rodent-only access enclosures was placed into a larger Petri dish that held a mixture of water (60%), vegetable oil (10%), and detergent (30%) to prevent access of invertebrates (Folgarait and Sala 2002).



Enclosures were 40cm x 40cm boxes made from 1.27cm<sup>2</sup> wire mesh. **Rodent-only access** consisted of four openings (15cm x 8cm) at the base of each wall and a roof.



**Invertebrate-only access** consisted of no wall openings and a roof.



**Bird-only access** consisted of no wall openings and an open top.



**Control 1** consisted of a seed-containing Petri dish only, without an enclosure.



**Control 2** consisted of an enclosure with four wall openings (15cm x 8cm) and an open top to allow potential access to any granivores.

Three trials were conducted from June 2009 to August 2009 and were each four days in length. Seed dishes were left open for 48 hours. Seeds were collected from each dish and replaced by a second set of seeds during each trial. Each set of seeds were then sorted by species and counted. To determine potential invertebrate granivores, two pitfall traps containing alcohol were placed at each transect on August 28. Invertebrates collected after 24 hours were stored and identified in the lab. A bird survey was conducted with Jerry Probst on the morning of August 30 to determine potential avian granivores. Ten Sherman live traps were placed along each transect on August 28 and September 6 to determine potential small mammal granivores. Twelve 20x50cm quadrats per transect were used to measure vegetation canopy cover on August 28.

## Literature Cited

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