

Kelley Flaherty
Instructor - Department of Biological and Environmental Sciences
California University of Pennsylvania
California, PA 15419

Dr. David Argent
Chairman - Department of Biological and Environmental Sciences
California University of Pennsylvania
California, PA 15419

Student Researcher – Justin Peel
California University of Pennsylvania

**POTENTIAL FOR SEED DISPERSAL BY RESIDENT AND MIGRATORY CANADA GEESE
POPULATIONS: RSC PROJECT NO. 2013-006
FINAL REPORT – AUGUST 30, 2014**

Upon completion of this study, faculty and students from California University of Pennsylvania, completed 11 of the planned 12 sample collections at Presque Isle State Park. Snow cover prevented the collection of fecal samples during the final sampling period. Samples were collected from around the Perry monument, Waterworks pond, beach 11, ranger station, dead man's trail, and the kayak launch areas (Figure 1). We altered our planting protocol to maximize the potential germination of both upland and wetland species. We attempted to germinate all fecal samples under upland conditions. Any samples that did not germinate were then subjected to moist-soil treatment and finally, an additional submerged treatment.

We collected and planted 434 samples. Of those, 2/3 were planted in upland conditions immediately and 1/3 were cold-stratified 6°C for 3 months and then planted in upland conditions. Ninety-two plants germinated and of those, 80 germinated in the upland treatment, 11 in the moist-soil treatment and 1 in the submerged treatment. Those species that were successfully identified are presented in table 1. In those that have germinated, 3% were non-vascular, 48% were graminoid, and 49% were forb species. A higher species diversity was found in summer ($H' = 2.16$) than in fall ($H' = 1.68$). We observed a greater proportion of graminoids in summer samples (73%) than in fall samples (22%, $z = 4.6$, $p < 0.0001$). There were no invasive plants germinating in our collected samples.

Our results indicate that resident geese do facilitate seed dispersal by means of endozoochory, and may influence the diversity and composition of resident plant populations differently than migratory geese, seasonally. Our results parallel a study done in British Columbia which resulted in a forb dominated data set (Miriam et al. 2010). The abundance of germinated upland species suggest that geese are more likely to spread seeds of upland plants as opposed to wetland or aquatic plants. We compared our results with those of another study in which waterfowl were found to be an important asset to the dispersal of wetland plants (Raulings

et al 2011). The contrast in our data could suggest that geese may not be as important as other waterfowl to wetlands seed dispersal.

Miriam, I.R., J.R. Bennet, R.J. Best and P. Arcese. 2010. Effects of introduced Canada geese (*Branta canadensis*) on native plant communities of the Southern Gulf Islands, British Columbia. *Ecoscience* 17(4): 394-399.

Raulings E., K. Morris, R. Thompson and R. MacNally. 2011. Do birds of a feather disperse plants together? *Freshwater Biology* 56: 1390-1402.

Project Output

Peel, J., K. L. Flaherty, and D. G. Argent. 2014. Evaluating diversity and composition of plant species dispersed by resident and migratory Canada geese. The 21st Annual National Wildlife Society Conference, Pittsburgh, PA. (**Pending** - Accepted as a Poster Presentation)

Peel, J., K.L. Flaherty, and D.G. Argent. 2014. Potential for Seed Dispersal by Resident and Migratory Canada Geese Populations. Proceedings of the 45th Annual Meeting Commonwealth of Pennsylvania University Biologists. Bloomsburg, PA (undergraduate student research - Poster)

Peel, J., K.L. Flaherty, and D.G. Argent. 2013. Potential for Seed Dispersal by Resident and Migratory Canada Geese Populations. The 9th Annual Regional Science Consortium Research Symposium. Erie, PA. (undergraduate student research)

Table 1. Plant species identified germinating from goose fecal samples.

Scientific Name	Common Name
<i>Oxalis stricta</i> L.	common yellow wood sorrel
<i>Chenopodium album</i> L.	<u>lambsquarters</u>
<i>Agrostis perennans</i> (Walter) Tuck.	<u>upland bentgrass</u>
<i>Eragrostis spectabilis</i> (Pursh) Steud.	<u>purple lovegrass</u>
<i>Carex brunnescens</i> (Pers.) Poir.	<u>brownish sedge</u>
<i>Muhlenbergia schreberi</i> J.F. Gmel.	<u>nimblewill</u>
<i>Urticaceae</i> spp.	<u>nettle</u>
<i>Marchantia polymorpha</i>	<u>umbrella liverwort</u>



Figure 1: Map of Presque Isle State Park, Erie, Pennsylvania. Red dots indicate sampling sites.