The Influence of Berms on Vegetation and Avian Composition in Seavy Meadows Wetland

Shayna Rogers

June 2008

INTRODUCTION

When the Oregon Department of State Lands (ODSL) grants a permit for placing fill or excavating in a jurisdictional wetland in Oregon, the agency requires the applicant to carry out *compensatory mitigation*. According to the ODSL, compensatory mitigation is "creating, restoring, or enhancing wetlands to replace or 'compensate' for the wetland area and functions lost through the permitted alteration" (Oregon Department of State Lands 2004). In other words, the applicant is obligated to employ strategies designed to reduce the harmful effects of his or her proposal.

A 1989 finding by the ODSL declared that "significant portions of the Seavy Meadows property [in Corvallis, Oregon] contains wetlands under the state's jurisdiction" (McCune 2004). The City has proposed potential mitigation strategies to compensate for the proposed housing in Seavy Meadows. One such proposal is to remove the three berms that occupy portions of Seavy Meadows. Raised banks of earth, the berms were created in Seavy Meadows as a result of early development efforts. While city officials see their removal as a possible mitigation tactic, local ecologists are not convinced. Present in the area for over two decades, the berms may have assumed important ecological functions in the wetland over the years.

To investigate how removal of the berms might impact Seavy Meadows, I developed a study to gauge the ecological significance of the structures by examining their influence on vegetation and wildlife composition. I hypothesized that the regions containing berms would support a broader array of plant and animal life than the portions of the wetland without berms as a result of their increased heterogeneity.

METHODS

Study Area

Located in the northeast region of Corvallis, Oregon, at 44.5922° N, -123.2411° W, Seavy Meadows is a seasonal wetland. Native *Deschampsia caespitosa*, or tufted hairgrass, is the primary vegetation in the area, growing on hydric Dayton soil (McCune 2004). Surrounded by development on all sides, the region is an oasis of wildlife habitat in the middle of a suburban community.

In the early 1980s, Seavy Meadows consisted of over 22 ha of pristine land. In 1982, over the protests of concerned neighbors, the City of Corvallis approved a proposal to build a housing development over large portions of the wetland. By 1989, only 12 of the original 22 ha remained undeveloped. In 2000, the City further disrupted Seavy Meadows by extending Walnut Boulevard through a portion of the wetland (McCune 2004). Although compensatory mitigation was performed, the ODSL did not find it satisfactory, and the City is required to mitigate further.

Field Methods

To explore the potential impact of berm removal as a compensatory mitigation strategy in Seavy Meadows, I compared vegetation and wildlife composition between areas with and without berms. I used birds as wildlife indicators because they are key members of any wetland community. I selected six study sites such that half contained berms and half did not (Appendix A). Over the course of four days, two mornings and two evenings, I visited each site each day. On the mornings that I sampled (05/20/07 and 05/26/07) I began collecting data at approximately 7am. On the evenings that I sampled (05/22/07 and 05/28/07) I began collecting data at approximately 7pm.

On the first morning, 05/20/07, I sampled vegetation. At each of the six sites, I created 2-m radius circular quadrats with a pin and measuring tape, and recorded the species of each shrub, herb and grass species present. I did so at four randomly selected locations per site. At each site I also used a 0.2 x 0.5 m quadrat to estimate ground cover classes of herb, grass, moss/lichen, rock, fine litter, soil and wood in four randomly selected areas per site. I used the following system to estimate cover classes: 0=absent,; 1=<1%; 2=1-5%; 3=5-25%; 4=25-50%; 5=50-75%; 6=75-95%; 7=95-99%; 8=>99% cover.

On each of the four days, I recorded data on avian composition at each site. To minimize temporal bias, I slightly staggered the times that I collected data. I started at site #1 on the first morning and sampled in numerical order until I finished at site #6. On the second morning, I started at site #6 and finished at site #1. I used the same sampling procedure for evening visits. At each site, I used the point-count method to measure avian presence (Hostetler and Main 2001). I stood at a fixed point in the center of a circle with a radius of 20 m and recorded the species of every bird that I saw or heard within that circumference for 15 min.

Data Analysis

To determine if the regions with berms support a more varied array of vegetation than the regions without, I compared shrub, herb and grass species richness between berm and non-berm sites. I also calculated the percentage of shrub, herb and grass species that occupied only berm sites, only non-berm sites and both types of sites. Additionally, I compared mean ground cover class estimates between berm and non-berm regions.

To determine if the regions with berms support more diverse avian populations than the regions without, I compared bird species richness between berm and non-berm sites. I also calculated the percentage of avian species that occupied only berm sites, only non-berm sites and both types of sites.

RESULTS

Shrub, herb and grass species richness at berm sites was found to be approximately 50% higher than richness at non-berm sites (Table 1). Approximately 53% of shrub, herb and grass species were present only at sites containing berms (Fig. 1). Of the 17 shrub, herb and grass species identified, only one shrub, *Crataegus sp.*, and two grasses, *Deschampsia caespitosa* and *Alopecurus pratensis*, were present at both berm and non-berm sites (Appendix B).

Mean cover classes of ground layers were fairly similar between berm and non-berm sites, though non-berm areas displayed a slightly higher level of heterogeneity. The fine litter and soil layers fell into higher cover classes in the non-berm sites (Table 2).

Avian species richness at berm sites was found to be approximately 55% higher than richness at non-berm sites (Table 3). A total of 17 avian species were identified and 16 of those species were present at the berm sites (Table 3, Appendix C). Although most species were present at both berm and non-berm sites, a notable percentage were observed only at sites containing berms. Just one species was unique to non-berm sites (Fig. 2).

DISCUSSION

The species richness data for shrubs, herbs and grass appear to support my hypothesis that the increased heterogeneity of the berms facilitates the growth of a broader array of vegetation than the rest of the wetland floor. A large percentage of the shrub, herb and grass species were present only at sites containing berms and this probably indicates that certain species are better suited for the berms than the wetland floor. The non-berm sites are saturated for a portion of the growing season and some plant species may not be able to tolerate prolonged exposure to high levels of moisture. It is also notable that only one shrub species and two grass species were present at both berm and non-berm sites. This observation further implies that vegetation growth is dependent on topography. Topography appears to be one of the proximal factors affecting vegetation composition.

The species richness data for birds are also in line with my hypothesis that the increased heterogeneity of the berms enables them to support a more diverse community of avian species. A higher percentage of avian species were observed inhabiting only berm sites than only non-berm sites and this seems to illustrate that the berms support unique ecological niches. It appears that the berms boast a number of ecological benefits for birds that the wetland floor does not. The varied topography provided by the berms appears to support a more diverse shrub, herb and grass community than the wetland floor. Subsequently, the relatively diverse vegetation may provide a hospitable habitat for higher numbers of bird species than occupy the more homogeneous non-berm sites. Vegetation appears to be a proximal factor affecting avian composition, while topography appears to be an ultimate factor.

In contrast, the ground layer data suggest that the non-berm sites actually support more heterogeneous ground composition than the berm sites. As shrub, herb and grass species richness was found to be higher in the berm sites, it seems logical that living ground layers were more prolific on the berms, leaving less space available for fine litter and soil. Therefore, the more heterogeneous ground layer composition in the non-berm sites is not necessarily indicative of a more diverse community of living organisms.

There are several areas in which this study left room for error. First of all, the berms are not the only source of heterogeneity within Seavy Meadows. Hedgerows and strips of woodland along the edges of the wetland are also present. A hedgerow was present within one of my berm sites and I cannot definitively state that avian presence was correlated with the berm and not the hedgerow. Secondly, my avian measurements may have been affected by the presence of traffic and passing trains, which made it difficult to decipher bird calls. Additionally, the dense vegetation present at the berm sites made it difficult to visually locate birds within plots. The limited visibility at berm sites may have produced results biased in favor of the non-berm sites.

Based on the results of this study, however, it appears that the topographic variation provided by the berms has led to an increased range of ecological niches within Seavy Meadows. This inference is in line with literature published by Columbia University's Center for International Earth Science Information Network (CIESIN). The CIESIN article reads, "Topographical variations in the landscape lead to higher species diversity…recognition that some areas possess higher levels of biodiversity…has fueled interest in the identification of biogeographical areas of species richness, and therefore of high conservation value" (de Sherbinin 2002). This article not only supports my conclusions, but also suggests that the increased levels of species richness associated with the berms make them valuable from a conservation perspective. Removing the berms would therefore not be a wise compensatory mitigation tactic for the city of Corvallis to employ. Such a strategy might actually do more harm than good.

REFERENCES

Aversa, T., H. Nehls, and H. Opperman. 2004. Birds of the Willamette Valley Region. R.W. Morse Company, Olympia. 389 pp.

Cornell Lab of Ornithology. 2003. All about birds. http://www.birds.cornell.edu/AllAboutBirds. Accessed April 29, 2007.

de Sherbinin, A. 2002. A guide to Land-Use and Land-Cover Change (LUCC). Center for International Earth Science Information Network. http://sedac.ciesin.org/tg/guide_frame.jsp?rd=LU&ds=1. Accessed May 27, 2007.

Elliot, L. and M. Read. 1998. Common Birds And Their Songs. Houghton Mifflin Company, Boston. 127 pp.

Hostetler, M.E. and M. Main. 2001. Florida monitoring program: point-count method to survey birds. University of Florida. http://edis.ifas.ufl.edu/UW140. Accessed April 26, 2007.

Marshall, D.B. and A.L. Contreras. 2003. Birds of Oregon: A General Reference. Oregon State University Press, Corvallis. 752 pp.

McCune, B. 2004. Seavy Meadows Wetland open-space park: a vision for the future. http://www.proaxis.com/~mccune/seavy/htm. Accessed April 26, 2007.

Oregon Department of State Lands – Wetlands Program. 2004. Just the facts…about compensatory mitigation for wetland impacts. 1-2. Oregon Department of State Lands, Salem, OR.

Table 1. A comparison of shrub, herb and grass species distribution between sites with and without berms in Seavy Meadows.

	Total number of shrub, herb and grass species identified	Shrub, herb and grass species richness (species/m^2)
Berm sites	12	0.0032
Non-berm sites	8	0.0021

Table 2. Mean cover class for ground layer types at sites with and without berms in Seavy Meadows (0=absent; 1=<1%; 2=1-5%; 3=5-25%; 4=25-50%; 5=50-75%; 6=75-95%; 7=95-99%; 8=>99%).

	Mean cover class						
	Herb	**Grass**	**Moss/lichen**	**Rock**	**Fine litter**	**Soil**	**Wood**
Berm sites	2	6	0	0	1	0	0
Non-berm sites	2	5	0	0	2	1	0

Table 3. A comparison of avian species distribution between sites with and without berms in Seavy Meadows.

	Total number of avian species identified	Avian species richness (species/m^2)
Berm sites	16	0.0042
Non-berm sites	10	0.0027

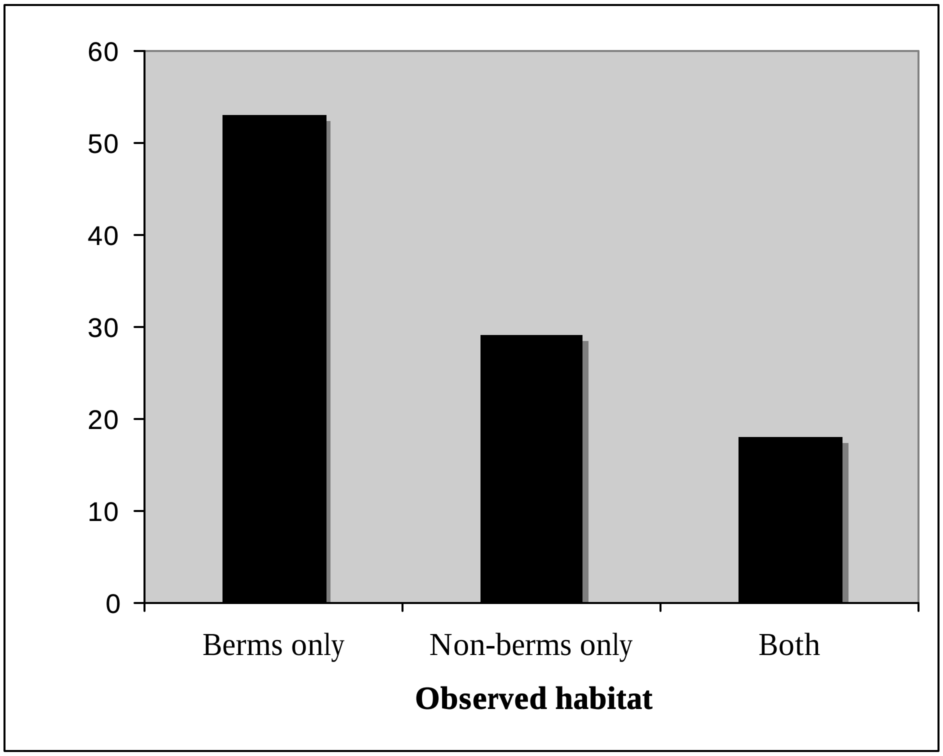


Figure 1. Percentages of shrub, herb and grass species associated with various habitats in Seavy Meadows.

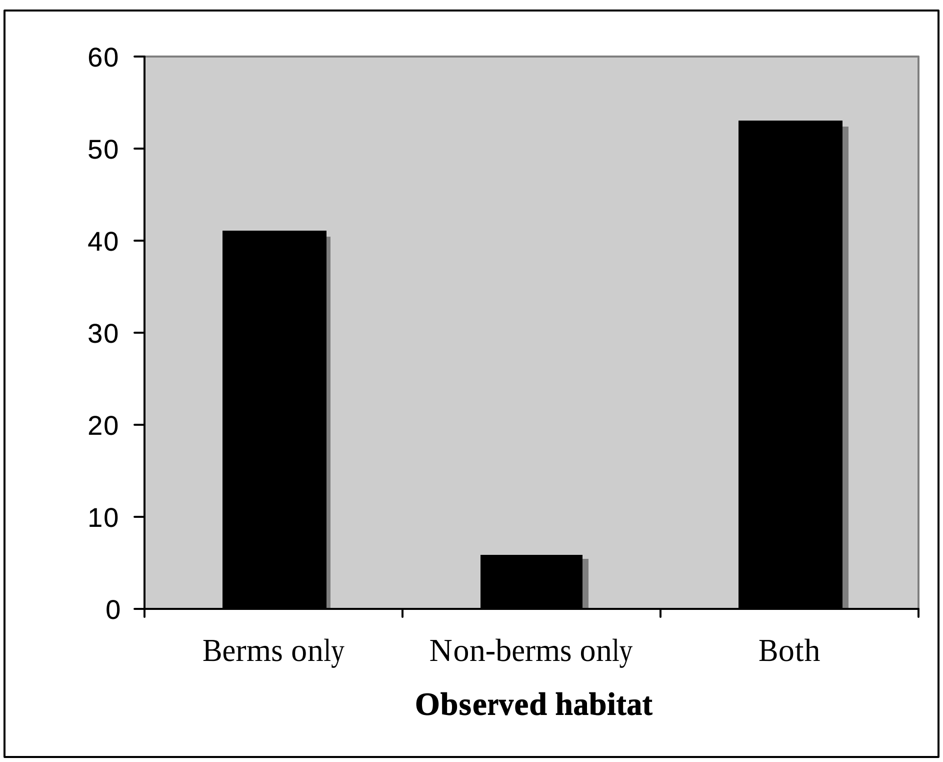
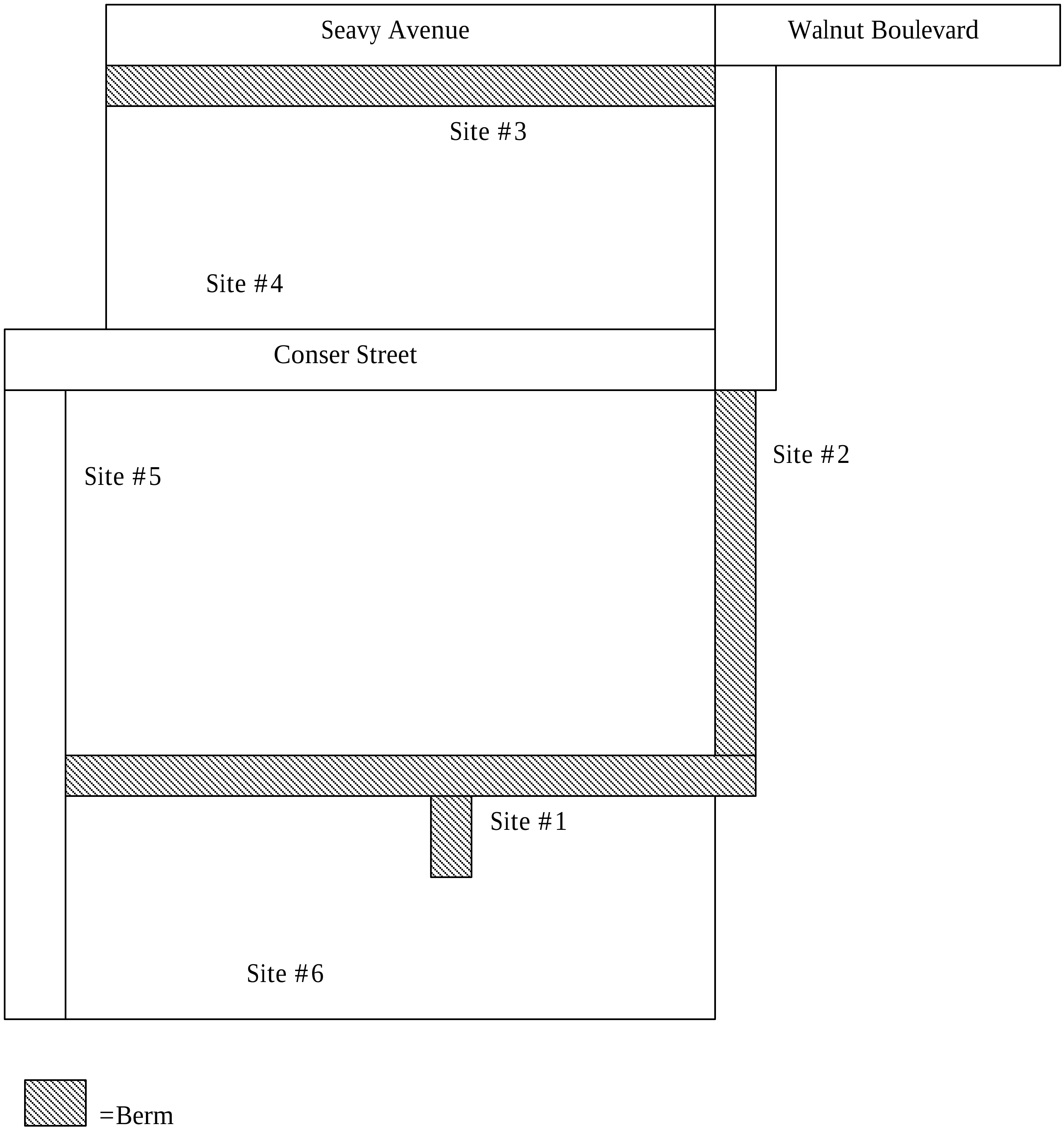


Figure 2. Percentages of avian species associated with various habitats in Seavy Meadows.

APPENDIX

Appendix A. Map of Seavy Meadows Wetland.



Appendix B. Complete listing of all shrub, herb and grass species encountered.

Site #1 (berm)	Site #2 (berm)	Site #3 (berm)	Site #4 (non-berm)	Site #5 (non-berm)	Site#6 (non-berm)
Alopecurus pratensis *Cirsium vulgaris* *Daucus carota* *Deschampsia caespitosa* *Dipsacus sp.* *Galium aparine* *Rubus armeniacus*	*Alopecurus pratensis* *Daucus carota* *Deschampsia caespitosa* *Dipsacus sp.* *Rosa eglanteria* *Rubus armeniacus*	*Alopecurus pratensis* *Craetegus sp.* *Daucus carota* *Deschampsia caespitosa* *Eschscholzia californica* *Lathyrus sp.* *Rubus armeniacus* *Toxicodendron diversilobum*	*Alopecurus pratensis* *Craetegus sp.* *Deschampsia caespitosa*	*Alopecurus pratensis* *Anaphalis margaritacea* *Deschampsia caespitosa* *Epilobium sp.* *Rumex sp.*	*Alopecurus pratensis* *Deschampsia caespitosa* *Eryngium petiolatum* *Fraxinus latifolia* *Rumex sp.*

Appendix C. Complete listing of all avian species encountered.

Site #1 (berm)	**Site #2 (berm)**	**Site #3 (berm)**	**Site #4 (non-berm)**	**Site #5 (non-berm)**	**Site #6 (non-berm)**
Aphelocoma californica (Western Scrub Jay)	*Aphelocoma californica* (Western Scrub Jay)	*Branta Canadensis* (Canada Goose)	*Euphagus cyanocephalus* (Brewer's Blackbird)	*Corvus brachyrhynchos* (American Crow)	*Agelaius phoeniceus* (Red-winged Blackbird)
Corvus brachyrhynchos (American Crow)	*Carduelis tristis* (American Goldfinch)	*Corvus brachyrhynchos* (American Crow)	*Hirundo rustica* (Barn Swallow)	*Gallinago delicata* (Wilson's Snipe)	*Corvus brachyrhynchos* (American Crow)
Euphagus cyanocephalus (Brewer's Blackbird)	*Charadrius vociferous* (Killdeer)	*Hirundo rustica* (Barn Swallow)	*Tachycineta thalassina* (Violet-green Swallow)	*Hirundo rustica* (Barn Swallow)	*Hirundo rustica* (Barn Swallow)
Gallinago delicata (Wilson's Snipe)	*Euphagus cyanocephalus* (Brewer's Blackbird)	*Junco hyemalis* (Dark-eyed Junco)	*Turdus migratorius* (American Robin)		*Junco hyemalis* (Dark-eyed Junco)
Hirundo rustica (Barn Swallow)	*Falco columbarius* (Merlin)	*Melospiza melodia* (Song Sparrow)			*Melospiza melodia* (Song Sparrow)
Melospiza melodia (Song Sparrow)	*Hirundo rustica* (Barn Swallow)	*Tachycineta bicolor* (Tree Swallow)			*Tachycineta bicolor* (Tree Swallow)
Tachycineta bicolor (Tree Swallow)	*Melospiza melodia* (Song Sparrow)	*Tachycineta thalassina* (Violet-green Swallow)			*Tachycineta thalassina* (Violet-green Swallow)
Tachycineta thalassina (Violet-green Swallow)	*Poecile atricapilla* (Black-capped Chickadee)	*Turdus migratorius* (American Robin)			
Zonotrichia leucophrys (White-crowned Sparrow)	*Tachycineta bicolor* (Tree Swallow)				
	Tachycineta thalassina (Violet-green Swallow)				

ACKNOWLEDGEMENTS

I would like to thank Dr. Patricia Muir and Dominic Maze for their willingness to assist with plant identification. I would also like to thank Karl Fairchild for his eagerness to share his knowledge of ornithology.