

Environmental Case Study

Hutchinson, Kansas

Prairie Dunes Country Club: A Golf Course for Birdies

“All wilderness areas, no matter how small or imperfect, have a large value to land-science.”

-Aldo Leopold, wildlife biologist

Introduction

With the alarming declines in the populations of some wild birds, there is a need to incorporate more wildlife habitat into human landscapes such as golf courses. With increasing environmental awareness, there is also a growing public desire for more environmentally responsible golf developments that include more wildlife habitat. However, how effective could the small patches of habitat on a golf course be in promoting increased bird survival and reproduction? One way to answer this question is to compare the birds using a naturalized golf course with a similar natural area nearby. Information from a study like this could lead to more informed decisions about how to promote a higher diversity of birds on human-dominated landscapes.



Figure 1

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This case study covers the results of a six-year investigation of the birds found on Prairie Dunes Country Club in Kansas (Figure 1) and a nearby natural area, Sand Hills State Park. Part of an innovative cooperative arrangement between Prairie Dunes Country Club, Tabor College, and the United States Golf Association (USGA), this study was sponsored by a USGA Green Section Research grant. This unique team approach combines the resources of the academic and golf communities in the important endeavor to understand and preserve biodiversity on human-dominated landscapes. Prairie Dunes and Sand Hills present an ideal situation for an ecological study of this type. With the exception of tees, fairways, greens, and the buildings, Prairie Dunes is very similar to Sand Hills State Park in topography and vegetation. Both have native prairie plants and rolling dunes typical of the sand hills biotic region of Kansas. The public trail used for the bird census in the park is approximately the same shape and distance as a loop through both nine-hole layouts of the golf course.



Figure 2. The author beside a large patch of native grassland on Prairie Dunes Country Club, Hutchinson, Kansas.

Background

Prairie Dunes Country Club

Prairie Dunes is a highly regarded, intensively managed golf course that hosts more than 35,000 rounds of golf per year. It is also one of the most habitat rich golf courses in the world (Figure 2). Approximately 74 percent of the golf course is in a natural state with native plants growing not only in the roughs and out-of-play areas, but also in a natural buffer zone that partially surrounds the course, separating it from some of the nearby housing developments. Under the leadership of superintendent P. Stan George, C.G.C.S., Prairie Dunes has achieved full accreditation as a Cooperative Sanctuary by Audubon International for its efforts to be environmentally responsible. Even prescribed burning of on-course grass areas is carried out when conditions allow. Sand Hills State Park is a unique sand-dune-grassland natural area under the control of the Kansas Department of Wildlife and Parks. Located approximately four miles from Prairie Dunes, its 1123 acres contain public walking trails accessible only to walkers and permitted horseback riders. Like Prairie Dunes, the park is burned periodically to control woody plant invasions and maintain the dominant herbs and grasses. Habitats consist of the same sand dunes, grasslands, wetlands, and woodlands that make up the golf course. Compared to the golf course, however, the park is a low-impact area and has much less human disturbance.

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For six years, my students and I counted and recorded, by species, all birds seen along the public trail in the park and on the golf course. To adequately sample all birds using the areas in different seasons, we performed censuses during the autumn, winter, spring, and summer.

Results

A summary of the results is shown in Table 1. Both the golf course and the natural area supported complex bird communities, sharing many species in common. Sand Hills had fifteen species that did not occur in Prairie Dunes. Nine species occurred in the golf course but not in the park. A statistical comparison indicated no significant differences in the numbers of different kinds (species richness). However, there were significant differences in measures of relative abundance (the specific kinds, numbers, and proportions of the total of each kind). The birds were more evenly distributed in the natural area than in the golf course. Measures of community similarity and species diversity also indicated noticeable differences between the two areas.

Table 1 illustrates the comparisons in species richness and relative abundance. For the most part, birds with larger natural habitat requirements and perhaps less tolerance for disturbance (e.g., least flycatcher, yellow-breasted chat) occurred more frequently in the state park while those with less restrictive habitat needs and higher tolerances for disturbance frequented the golf course (e.g., American robin, common grackle, eastern kingbird).

Table 1. Summary of the comparison of the bird communities of Prairie Dunes Country Club and Sand Hills State Park.

Statistical Tests for Significant Differences

1. Chi-square contingency table analysis for differences in kinds and numbers of birds in the two sites. Chi-square value = 195.73, df = 27, $p < .001$ (statistically significant differences).
2. Chi-square contingency table analysis for differences in species richness between the two sites. Chi-square value = 13.286, df = 11, $p > .10$ (no statistically significant differences).

Community Similarity Indices

Jaccard coefficient	0.680
Sorensen coefficient	0.809
Horn index	0.721
Stander's	0.593
Morisita's index	0.566
Proportional similarity	0.504
Bray-Curtis	0.476
Canberra metric	0.372

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Species Diversity Indices

	Prairie Dunes	Sand Hills
Species richness	57	63
No. of individuals/km	459	286
No. of equally abundant		
Species	19.59	34.12
Simpson dominance	8.768	3.556
Shannon diversity	1.292	1.533
Simpson diversity	0.912	0.964
Sheldon evenness	0.343	0.541

Question	Statistic and Interpretation
<ul style="list-style-type: none"> Are the areas the same regarding the bird communities? 	<ul style="list-style-type: none"> Yes and no. There are no significant differences in the number of species in the two areas. However, they do differ in the specific kinds and relative abundance of the birds. The community similarity and species diversity indices indicate that the two areas are moderately similar. The golf course has different species and higher densities in fewer kinds. The natural area has fewer individuals but they are more evenly spread among more kinds. The natural area has fifteen species that did not occur on the golf course. The golf course has nine species that did not occur on the natural area. Because the golf course has natural habitat, it supports almost as many bird species as the natural area (but not the same kinds in the same proportions).
<ul style="list-style-type: none"> How do they differ? 	
<ul style="list-style-type: none"> How are they the same? 	

Discussion

Is it worthwhile to include natural habitat areas on golf courses? If providing a home for a significant number of birds is important, the answer is yes. Approximately sixty to eighty species of birds use the golf course habitats in some way. Some of these are birds in need of conservation, such as Henslow's sparrow, Bell's vireo, dickcissel, grasshopper sparrow, yellow-billed cuckoo, and Mississippi kite. Bell's vireo is a species of conservation concern that occurs in comparatively good numbers on

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Prairie Dunes. Apparently the patchy, low, shrubby habitat on the golf course meets the needs of this species very well.

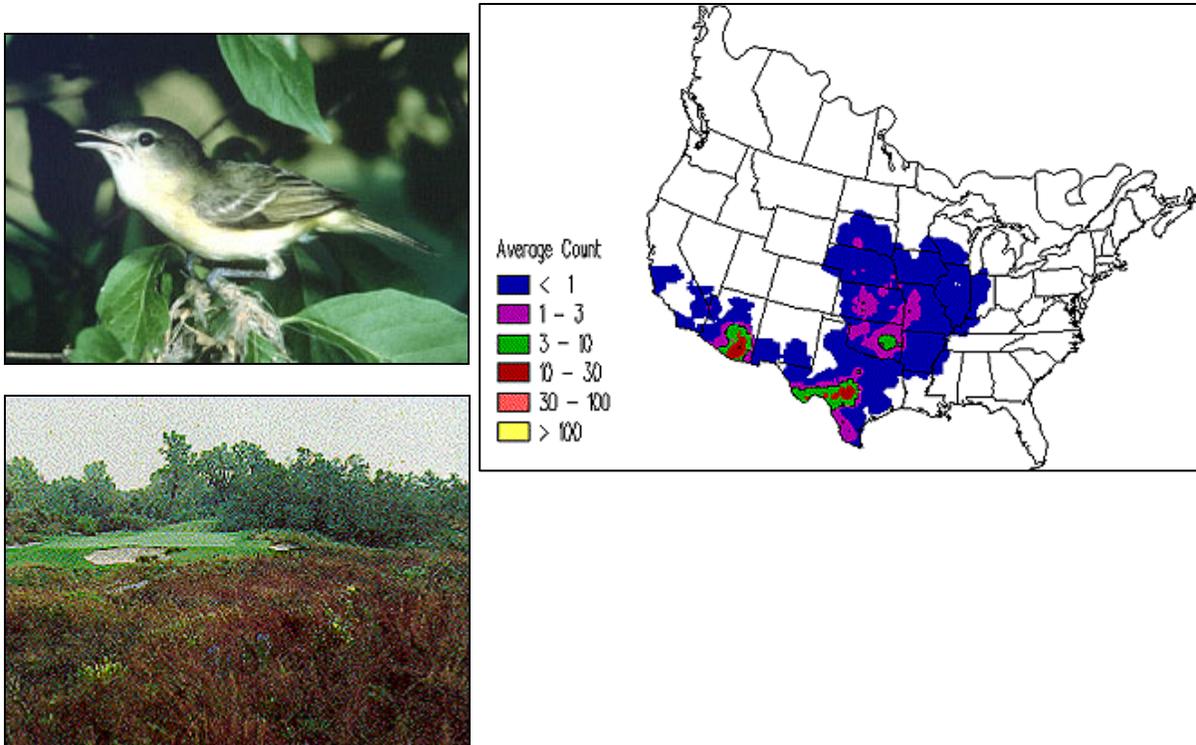


Figure 3. Bell's vireo, a species in need of conservation, its geographical range, and shrubby habitat on Prairie Dunes Country Club.

Students in this study analyzed other golf courses in the area without wildlife habitat and seldom does the species count exceed twenty-seven, and rarely do we find as many sensitive species. Providing habitat on privately managed landscapes does attract an exceptional number of birds. Furthermore, these areas may be especially important to migratory birds needing a place to stop and refuel (yellow-rumped warbler) or to spend the winter (Harris sparrow).

Are naturalistic golf courses the same as natural areas in the kinds of bird communities they support? The answer here is no, since many birds require larger, less fragmented areas away from human activities. The high amount of human disturbance, patchiness, and edge habitat on golf courses is problematic for these birds. This is an important consideration in decisions regarding development on undisturbed natural areas. Perhaps golf courses that include larger areas of undisturbed habitat (such as the approximately 100 acres of natural area on Prairie Dunes) will lose fewer numbers of bird species with development. We found area-sensitive birds such as wild turkeys, bobwhite, Henslow's sparrows, and yellow-billed cuckoos using these larger, undisturbed areas on Prairie Dunes.

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The Issues

In Praise of the Rough

Naturalistic golf courses (those using the natural environment of a region as a development template) offer much promise in the larger struggle to preserve plant, animal, and ecosystem diversity. If managed correctly, naturalistic courses may fit well into the emerging new philosophy of ecosystem management that recognizes the immense potential of smaller parcels of public and private lands for preserving nature. With the involvement of ecologists, golf courses - commonly thought to be environmental problems - could become ecological assets. Especially attractive in this regard are the naturalized golf courses built on already disturbed land such as old mines, landfills, and highly eroded or otherwise negatively impacted landscapes.

In Search of a Habitat Mosaic

In theory, the ecological role of golf courses and smaller habitat parcels may be to serve as stepping stones for dispersing birds leaving natural areas. Larger habitats such as Sand Hills State Park give a wide variety of species a chance to reproduce, and individuals spread out across the countryside from these reproductive "fountains." Dominant individuals secure territories on the natural area and younger individuals then move out as the area fills up with offspring dispersing from the nests. Prairie Dunes then receives these dispersing individuals and provides them a home if they can adapt to the smaller habitat patches and human activity of the golf course. Other species may use Prairie Dunes only as a stepping stone on their way to other larger habitats. Undisturbed, pristine habitats commonly are the choice of ecologists in search of knowledge about the machinery of nature. However, with the spread of urbanization, it is time for ecological scientists to also study human-dominated landscapes such as golf courses. Many opportunities exist for helping developers make ecologically sound decisions. For ecologists such as myself who happen to be avid golfers, the relationship between science and golf is quite natural (see Terman, M., 1997, *Messages From An Owl*, Princeton University Press). In the final analysis, we must be stewards of those special places - both small and large - for which the esteemed naturalist John Muir so eloquently pleaded with these words:

"Man needs beauty as well as bread, places to play in and pray in where nature can heal and cheer and give strength to body and soul alike."

References

Websites

1. Conservation International at <http://www.biodiversityhotspots.org/xp/Hotspots>
2. Prairie Preservation Alliance at www.prairiepreservationalliance.org/
3. World Wildlife Fund at <http://www.panda.org/>

Key Principles

1. Providing habitats on human landscapes.
2. Biodiversity indicators
3. Species diversity comparisons between human and natural areas.
4. Landscape ecology and conservation biology theory.

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Ethical Considerations

1. How should people develop and manage our human landscapes?
2. Are small patches of habitat on human dominated landscapes worth maintaining?
3. What is the value of keeping large natural areas as well as small habitats?
4. What is the value of protecting an area's biodiversity?

Civic Engagement & Service Opportunities

1. Volunteer for a local community group that works in prairie protection and restoration.
2. Write or e-mail your local politicians about the preservation of prairies in your area.
3. Form a student group having an environmental preservation mission.
4. Set up a public forum at your school discussing habitat protection and the value of prairies in your area.

Learn more about community service as part of your educational enrichment by visiting the following websites: <http://www.learnandserve.org/>, <http://www.servicelearning.org/>.

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