

Southwestern Golf Courses Offer Needed Riparian Habitat for Birds

A comparison of golf courses with natural areas underscores the importance of golf courses as bird habitat.

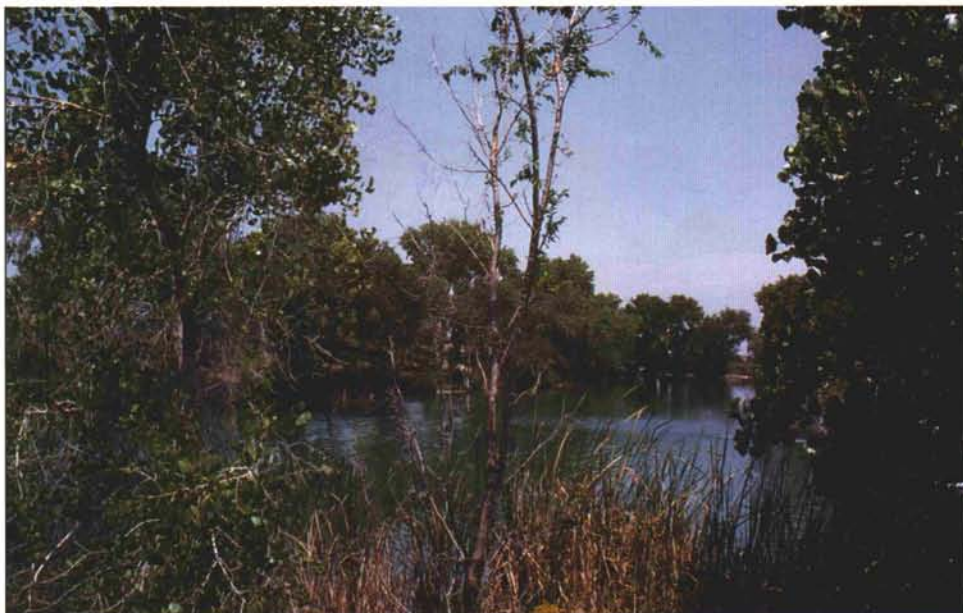
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Most studies of birds in urban areas have reported a decrease in avian species richness and/or diversity in association with urbanization, although density typically increases. In the southwestern United States, the greatest diversity of breeding birds is normally found in riparian habitats (areas surrounding rivers or lakes). It is estimated that the bird diversity in riparian zones surpasses that of all other western habitat types combined.

In a region characterized by low rainfall and often sparse vegetation, riparian zones act as an oasis for both migratory and resident birds, offering a relative abundance of the critical elements of water, food, and cover. Natural riparian systems are quickly disappearing, however, in response to the demands of a growing human population on these areas for water, recreation, and development, as well as degradation due to factors such as flood control efforts and improper grazing practices. Estimates are that up to 95% of western riparian habitats have been lost or degraded over the past century, and many of the bird species associated with these systems have been driven out or have experienced severe declines.

SOUTHWESTERN GOLF COURSES

Most golf courses in the Southwest provide a combination of habitat characteristics that are reminiscent of the riparian systems used by western



This pond at the UNM Championship Course demonstrates how golf courses may provide habitats that are very similar in structure and composition to natural riparian habitats. Cottonwoods, willows, and cattails surround the water, providing habitat for a variety of bird species, including red-winged blackbirds, black-crowned night herons, warbling vireos, yellow warblers, and western tanagers. Thirty-four species of birds were detected on this course, and 21 of these were riparian-associate species that were not found on the paired reference site.

birds. They often have permanent water sources, used as either water hazards, for irrigation, or both. They have deciduous trees that provide cover, shade, nest sites, and food. Depending upon the extent, composition, and structure of the vegetation in out-of-play areas, golf courses may potentially offer rewarding foraging and/or nesting habitat for birds that utilize shrub habitats as well as those that forage on the turf or in the canopy.

Given the extensive loss of riparian systems throughout the West and the potential similarity of habitats on golf courses to those of riparian areas, we

were interested in determining whether golf courses might possibly serve as surrogate riparian habitats for breeding birds in the Southwest. We hypothesized that golf courses in the Southwest would not only have greater avian species richness and abundance when compared to the surrounding natural environment, but that the golf courses would also support a greater number of bird species normally associated with riparian areas. The goals of our study were to determine: (1) how the presence of a golf course impacts the native bird community through comparisons of

abundance, species richness, diversity, evenness, and productivity between five golf courses and five undisturbed reference areas assumed to represent the original bird communities; (2) whether golf courses support high numbers of typically riparian bird species; and (3) if possible, identify those features of golf courses that are most conducive to supporting high numbers of native and riparian bird species.

STUDY SITES

Our study sites were five golf courses and five paired reference sites in the high desert region of Albuquerque, New Mexico. Courses were chosen to represent a range of vegetation types, course features (e.g., water sources), and landscape settings. The participating golf courses were the Albuquerque Country Club (ACC), Four Hills Country Club (FH), Paradise Hills Golf Club (PH), PaaKo Ridge Golf Club (PK), and University of New Mexico Championship Course (UNM).

A paired reference site was selected for each golf course. Reference sites were nearby natural areas that reflected, as much as possible, the habitat conditions that would have been present prior to the construction of the companion course. The purpose of these reference sites was to provide an avian community baseline. Birds on the reference sites were assumed to represent the original bird community for its paired golf course.

RESULTS OF THE TWO-YEAR STUDY

Golf courses supported a greater number of birds than surrounding natural areas, a response that is common throughout studies of avian responses to urbanization. In contrast to many such studies, we also found increased avian species richness on most of the golf courses, as well as increased diversity. The increase in avian abundance on golf courses was to a large degree at the expense of more specialized native bird species, as has been witnessed in

numerous other studies of urbanization effects. We found that a relatively few widespread and abundant species made up the majority of individuals detected (including, but not limited to, house sparrows, house finches, common grackles, and European starlings), comprising from 69% to 76% of the individuals detected on three out of the five courses.

Although they had fewer species, the reference sites were composed primarily of native bird species, and these com-

species that were not components of the avian community in the surrounding natural areas. Of birds that were exclusive to our golf course observations, 54 (83%) were native species that we did not consider to be cosmopolitan or introduced species.

Furthermore, we found strong support for our hypothesis that golf courses would provide habitat for riparian birds. More than 70% of the species observed exclusively on golf courses were riparian associates. The numbers of individuals



Pied-billed grebe. Photo by Dennis Larson, courtesy U.S. Fish and Wildlife Service.

munities were more even in their distributions. The PaaKo Ridge golf course was exceptional in several aspects, as it demonstrated greater species richness and diversity, and similar evenness, when compared to its natural area reference site, and it was the only course that did not have significantly fewer native individuals.

Species richness of native birds was greater on golf courses, in contrast to the results of many other studies of birds in urban environments. This result held across all five of the courses we studied. The abundance of these native birds was not as great as that of cosmopolitan or introduced species, but golf courses supported numerous native bird

in this group were relatively low, particularly once we excluded those that are also considered cosmopolitan species (e.g., American robin). Still, 25% of the birds observed on golf courses were riparian associate species that were not represented in our samples of the surrounding natural area bird communities.

Our results add support to the hypothesis that avian species richness and/or diversity does not respond to urbanization in a linear fashion, but instead peaks at a level of intermediate disturbance or development. At the higher levels of urbanization, most of the land area is dominated by buildings or paved areas, and any vegetation is primarily ornamental. Golf courses,

however, represent an intermediate level of development in which most of the land area is still vegetated, some areas of native habitat may remain, and trees and ponds are common. Habitat diversity may actually increase under such a scenario, as structural diversity is added through changes in vegetation as well as the introduction of buildings and other structures that may serve as nest sites or perch sites, and openings are created for edge species. Moderate levels of development may increase food resources for

provide numerous shade trees, water sources, turf, structures, and vegetation types that are not available in the surrounding natural areas.

Riparian-like habitats surrounding ponds on the UNM Championship Course offer tall broad-leaved trees, multiple understory vegetation layers, and abundant water with emergent vegetation — all features that are absent from the desert habitat in the immediate area. In conjunction with numerous out-of-play areas dominated by remnant

ent from that of one that may be constructed, for example, in a forested area. In other studies, increased development in hardwood forests led to a loss of canopy-foraging or bark-gleaning birds, since canopy trees were lost from the habitat. This is consistent with the observation that the loss of bird diversity is likely when development occurs in an area that had an initially high diversity of habitats.

By contrast, the addition of a golf course actually added this component of habitat diversity (high canopy trees) at three out of five of our study sites (Four Hills, Paradise Hills, and UNM), thereby attracting canopy species or bark-gleaners that would not otherwise be present in the avian community. Several of the species that decreased in response to urbanization in these other studies (1, 2) were species that we detected exclusively on the golf courses in our study, including northern flickers, white-breasted nuthatches, downy woodpeckers, cliff swallows, and western wood-pewees. The only course we studied that had less habitat complexity and structural diversity than its reference site, the Albuquerque Country Club, was also the only course that had lower bird abundance, species richness, and diversity. Our study suggests that in the structurally simple desert landscape, the additional resources and habitat complexity provided by golf courses result in increased avian abundance and



The ponds on the desert golf courses attracted birds such as this black-crowned night heron. Photo by Lee Karney, courtesy U.S. Fish and Wildlife Service.

some guilds of birds. Scavenging opportunities increase, and areas of lawn or turf are capable of supporting high numbers of ground-foraging birds.

GOLF COURSE OASES IN THE DESERT LANDSCAPE

This potential increase in habitat diversity at low to moderate levels of development is particularly noticeable in the desert landscape. In general, there is a strong positive correlation between bird species diversity and habitat diversity such that any increase in habitat diversity, particularly in a relatively simple landscape such as a desert, is likely to result in increased species richness. The features added to the landscape during the development of a golf course often stand in sharp contrast to those of the desert environment. Courses may

native shrublands and expansive open areas of turf, this golf course collectively provides a range of habitats that supports a wide variety of birds, including such diverse species as yellow warblers, spotted sandpipers, greater roadrunners (*Geococcyx californianus*), ash-throated flycatchers, northern rough-winged swallows, and American robins. Given this diversity of habitat types, it is hardly surprising that the UNM course had a greater number of species, including greater numbers of native species, than its comparison reference site. This contrast in habitat diversity associated with greater species richness was also apparent at the golf courses at Four Hills, Paradise Hills, and PaaKo.

The impact of a golf course on avian community composition in the desert environment appears to be very differ-



The western tanager was one of the native species observed on several golf courses, but not on any of the paired reference sites in this study. Photo by Gary Kramer, courtesy U.S. Fish and Wildlife Service.

species richness, including increased native species richness.

ECO-FRIENDLY CHARACTERISTICS OF PAAKO RIDGE

Certain characteristics of the PaaKo Ridge golf course deserve attention, as this course was exceptional in both the abundance and diversity of native bird species. PaaKo is what has been termed a “naturalistic” golf course, one that retains “the native vegetation, land form, soils, and typical habitat units of a region.” The course at PaaKo is based upon the natural topography of the Sandia foothills, turf is minimized, and the out-of-play areas are indistinguishable from the surrounding pinyon-juniper woodlands. PaaKo was the only course that had greater abundance, species richness, diversity, and comparable evenness of native species with its reference site; 76% of the individuals observed at this course were native species. No native species were excluded from the PaaKo course, and 27 species were added to the community. PaaKo was also the only course where native cavity-nesters used the nest boxes, and the productivity at the golf course was comparable to that of the comparison natural areas.

In addition to increased habitat diversity, the greater native species richness at PaaKo, and the continued dominance of its avian community by native species is likely attributable to the extensive areas of undisturbed native vegetation on the course. Increased numbers of native bird species and the ability to exclude invasive avian species are associated with the amount of native vegetation present.

WHAT WE LEARNED

Golf courses in the high desert area of Albuquerque have the potential to support large numbers of native bird species. In addition, the resources and habitat diversity provided on these courses may mitigate, to some extent, the loss of riparian systems in the



The relatively simple habitat structure of the reference site for the UNM Championship Course can be deduced from this photograph. This undeveloped natural area, located directly across from the golf course, offers less for many bird species in terms of habitat diversity, complexity, and resources, which is reflected in lower overall species richness (16 species). However, this site did support some of the desert specialist species that were not detected on any of the golf courses in our study, including scaled quail and burrowing owls.

Southwest. However, the conservation value of golf course habitats in this desert region could be improved to support greater numbers of native birds and exclude more invasive exotics or pest species by increasing the complex vertical structure and diversity of plant species composition in the out-of-play areas on the courses, and, in particular, by increasing the extent and usage of native plants. Such improvements, even on a very small, localized scale, have the potential to effect changes in bird species composition, and golf courses that are dominated by native vegetation may support significant numbers of native bird species.

Our data showing increased species richness of native birds, and particularly high numbers of riparian species on these courses, demonstrate that these golf courses may be capable of providing valuable stopover habitat for the numerous species of migratory birds that utilize riparian corridors in the Southwest. The potential for desert golf

courses to serve as surrogate riparian areas for these species has important conservation implications, as many migratory birds in the western U.S. are currently experiencing population declines associated with the loss of riparian habitats.

Editor’s Note: For a more complete report of this research, including comparative tables of observed bird species, methodology, and graphs of the results, visit the USGA’s Turfgrass and Environmental Research Online at <http://usgatero.msu.edu/v04/n14.pdf>. TERO publishes the results of studies funded through USGA’s Turfgrass and Environmental Research Program.

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