

Introduction and Methods

Human activities can sometimes transform habitats in ways that provide new and beneficial habitats for wild species. Here I document the changes in bird species diversity and frequency of observation over the period 1987-2004 at the Desert Botanical Garden (DBG), located within the heart of the Phoenix metropolitan area. The area surrounding the DBG is mostly native xeric Sonoran Desert vegetation (Figure 1). The core Garden, which dates from the late 1930s, exhibits desert vegetation but is lush and heavily irrigated (Figure 2). During the study period several major habitat exhibits have been added to the Garden, including a pond and cottonwood grove and a large wildflower garden, plus numerous small water features. The objective of this study was to document any changes in the DBG bird fauna over time, and to determine if these changes were correlated with construction projects or changes in Garden management.

At DBG, weekly bird walks were conducted throughout the 1987-2004 interval, recording species presence or absence. Observers made the same circuit of DBG each Monday (except when new exhibits were added), beginning at 7:00 am May-Sept. and 8:00 am Oct.-April. Records represent the pooled observations of a core group of long-term participants. 881 weekly observations were made, forming a nearly complete run except for 1987-88 (irregular, 69 combined obs.), 1992 (Oct.-Dec. missing), and when Dec. 25 fell on Monday.

Table 1. Species observed at DBG, arranged into temporal categories.

Species category	N	Examples
Year-round resident	27	Cactus wren, verdin
Year-round visitor	24	Orange-crowned warbler, kestrel
Winter resident	4	Yellow-rumped warbler, ruby-crowned kinglet
Summer resident	6	White-winged dove, black-chinned hummingbird
Winter visitor	9	Rock wren, Lincoln's sparrow
Summer visitor	3	Turkey vulture, cliff swallow
Regular migrant	18	Wilson's warbler, rufous hummingbird
Occasional migrant	3	Plumbeous vireo, Lucy's warbler
Rare migrant / visitor	72	Long-eared owl, western meadowlark
Observed outside walks	9	Mountain chickadee, painted redstart
Total species observed	175	

Figure 10 (below). Gambel's quail is a commonly encountered Sonoran Desert resident.

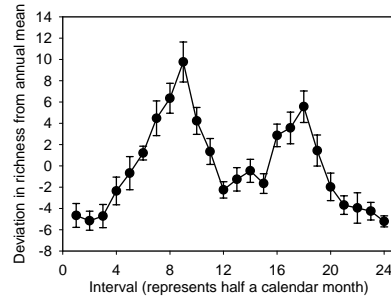


Figure 5 (above). Seasonal variation in species richness per weekly sample, 2000-2004.

Figure 6 (right). Examples of species' variation in frequency of abundance throughout the year. A) Species present year-round but with significant intra-annual variation. B) Through migrants. C) Winter residents. D) Summer residents.

Figure 7 (below). Examples of species that colonized the Garden during the study or greatly increased in frequency of observation.

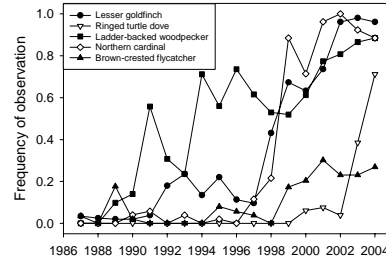


Figure 8 (left). The Maxwell Desert Wildflower Trail, opened in 2000.



Figure 9 (right). Small water features have steadily been added to the DBG since the early 1990s.

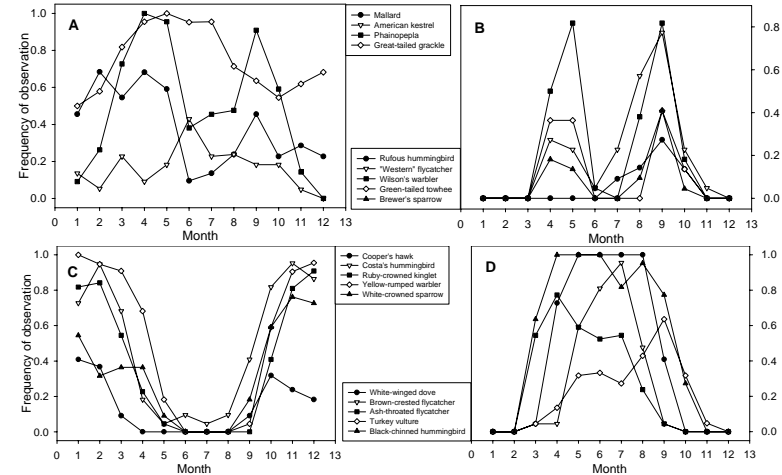


Figure 1 (above). The periphery of the Desert Botanical Garden is visually striking non-irrigated foothill Sonoran Desert vegetation.

Figure 3 (below). Number of species observed, averaged over all weeks in a given year.

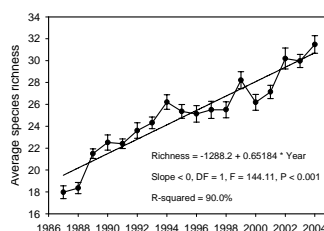


Figure 4 (below). Cumulative number of species observed, beginning in 1987.

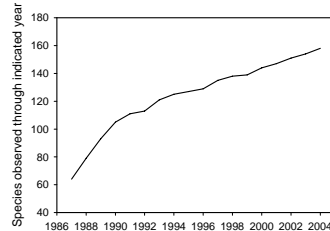


Figure 2 (above). The central Desert Botanical Garden is heavily irrigated with many specimen trees and plants, and thus is relatively lush with a complex vegetation structure.

Summary of Results and Discussion

Between 1987 and 2004 observed bird richness increased significantly (Figure 3), and the total number of species observed grew steadily without apparent asymptote (Figure 4). 175 species, grouped by temporal guild, were observed at least once (Table 1). There was a strong seasonal pattern, with species richness highest during the two migration seasons and lowest during the winter (Figure 5). Many species often displayed striking seasonal patterns, either residing at DBG for a specific season or were present at all times of year but with differing frequencies of occurrence (Figure 6). 22 species increased significantly in frequency of observation, and two seasonal residents significantly increased their length of stay (white-winged dove, summer resident; ruby-crowned kinglet, winter resident). Several species which were previously absent or rare visitors became permanent residents of the Garden during the course of the study, or increased dramatically in frequency of observation (Figure 7). Overall, species have steadily colonized the Garden and increased in frequency of observation, with no notable losses of individual species in the process.

Several major exhibit construction projects were undertaken during the time considered. In 1987-88 the 1/3 mi. long "Plants and People of the Sonoran Desert Trail" was built, adding irrigated high and low desert vegetation, and more importantly a "desert oasis" consisting of a small pond with reeds and aquatic vegetation and ringed by willows and cottonwoods. A new larger-capacity irrigation system was added to the central Garden in 1988. Small wildflower gardens were added in 1990 and 1991. In 1999-2000 the 1/3 mi. long irrigated "Harriet K. Maxwell Desert Wildflower Trail" was built (Figure 8), providing a habitat where annual and perennial wildflowers bloom at most times of year. Four additional small fountains or other permanent water sources were added at different times in the 1990s and 2000s (Figure 9). Current observations suggest that the Wildflower Trail is particularly enticing to seed-eating sparrows and finches, and to residents of the surrounding desert. The desert oasis also attracts herons, ducks, rails and migrating warblers and icterids, which would otherwise be unlikely to occur in the Garden. Anecdotal information suggests that many species have become easier to observe in the central Garden, in association with the added water features. I was not able to credibly associate specific colonizations by bird species with specific construction projects, but the larger picture suggests that the Garden is becoming a more attractive 'urban desert oasis' over time.

Acknowledgments

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