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RAVENS, COWBIRDS, AND STARLINGS AT SPRINGS AND STOCK TANKS, MOJAVE NATIONAL PRESERVE, CALIFORNIA

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Key words: Common Raven, Brown-headed Cowbird, European Starling, water, Mojave Desert.

We investigated use of natural and artificial water sources by Common Ravens (Corvus corax), Brown-headed Cowbirds (Molothrus ater), and European Starlings (Sturnus vulgaris) in the Mojave National Preserve, California. Our study was motivated by earlier observations of these 3 species in which they were seen at stock tanks but not detected at springs. Ravens, cowbirds, and starlings have been viewed as detrimental to wildlife for a variety of reasons including depredations on endangered species (e.g., desert tortoise [Gopherus agassizii] by ravens, Boarman 1993), nest parasitism of native songbirds by cowbirds (Trail and Baptista 1993), and competitive displacement of cavity nesting birds by starlings (Weitzel 1988, Kerpez and Smith 1990).

The Mojave National Preserve, located in San Bernardino County, California, comprises approximately 681,000 ha. It falls within an area bounded on the north by U.S. Interstate Highway 15, the east by the Colorado River, the south by U.S. Interstate Highway 40, and the west by the convergence of these 2 highways. The study area consists of mountain ranges interspersed with basins varying in elevation from 280 m to 2400 m above sea level. The climate is seasonal and severe, being warm (>26°C) in summer and cool (<11°C) in winter, with an annual mean temperature of 17 ± 9°C (s). Average rainfall is <12 cm for most of the area, with most precipitation occurring from December through March (Johnson 1968). Vegetation consists of widely spaced shrubs, and the major floral communities include alkali sink, creosote bush (Larrea tridentata) scrub, Joshua tree (Yucca brevifolia) woodland, and pinyon-juniper (Pinus monophylla–Juniperus spp.) woodland (Munz and Keck 1959).

Between 2 June and 5 July 1993, we sampled 60 sites consisting of 20 springs, 20 stock tanks, and 20 points located away from springs and stock tanks (controls). Springs, stock tanks, and control points were chosen from U.S. Geological Survey maps. Control points were positioned >300 m from a road and >1 km from stock tanks or springs. All points were >3 km from human habitation. Stock tanks and springs all contained open, flowing water. Stock tanks were metal or concrete structures and averaged 3 m in diameter. Controls, springs, and stock tanks were located so as to represent as broad an area as possible within the Mojave National Preserve, maximize the distance between sites, and reflect dominant regional vegetation.

Because our study examined whether bird species were associated with water, but not diurnal activity patterns, we visited sites throughout daylight hours. There were no statistical differences in time of day when the 3 site categories (springs, stock tanks, controls) were visited (Kruskal-Wallis, $\chi^2 = 3.96, df = 2, P = 0.14$, PROC UNIVARIATE, SAS 1987). We restricted our analyses to bird detections ≤50 m from the water points using a fixed-distance circular-plot method (Reynolds et al. 1980). We counted all detections based on either visual or aural observations during a 10-min period and recorded behavior (perched, flying, singing, feeding, drinking). Observation points were positioned so as to offer clear views of water sources. Following each count,
we surveyed an area within a 50-m radius from the water source (or a designated center point for control sites) for sign (droppings, tracks, shells) of wild burros (*Equus asinus*) and domestic cows. Each site was surveyed only once.

The total number of individuals seen during each count was used to compute means (±SE) for each species within each of the 3 site categories. A G-statistic (PROC FREQ, SAS 1987) was used to test for independence of species occurrences at control sites, stock tanks, and springs.

Ravens, starlings, and cowbirds were not seen equally at stock tanks, springs, and control sites (*G* = 5.74, df = 2, *P* = 0.057). Ravens and starlings were seen only at stock tanks (ravens: 1.00 ± 0.26 [n = 20 individuals at 12 sites]; starlings: 0.60 ± 0.41 [n = 12 individuals at 4 sites]). Brown-headed Cowbirds were seen at stock tanks (0.45 ± 0.29 [n = 9 individuals; 5 stock tanks]), were never seen at control sites, and were detected only once at springs (0.10 ± 0.07, [n = 2 individuals]). Of the ravens seen at stock tanks, all but 4 were seen drinking (80%). Only 17% (n = 2) of starlings were seen drinking and only 1 cowbird was observed drinking.

Recent evidence of cattle use was observed at all stock tanks, at 10 control sites, and at 11 springs. Burro sign was found at half of the springs, at only 2 stock tanks, and at none of the control points. One tortoise shell was found at each of 2 different stock tanks; no tortoise shells were found elsewhere.

Ravens are a species native to the Mojave though evidence suggests their populations have increased substantially, concurrent with human presence associated with linear right-of-ways, sanitary landfills, and agriculture (Knight and Kawashima 1993, Knight et al. 1993). Ravens have been implicated as a causative factor in the decline of the desert tortoise, a federally threatened species (Boorman 1993), and shells of tortoises found at stock tanks are within the size class suspected of being consumed by ravens (Boorman 1993).

Brown-headed Cowbirds did not historically occur in the east Mojave Desert (Laymon 1987). In the east Mojave Desert, we encountered starlings only at stock tanks or in the vicinity of homes and towns and have yet to observe them at natural water sources or undisturbed parts of the desert.

When the U.S. Congress passed the California Desert Protection Act in 1995, it rewrote the maps of southeastern California. Two national monuments (Death Valley, Joshua Tree) were made national parks, and the East Mojave National Scenic Area (U.S. Bureau of Land Management) was made an administrative unit of the National Park Service and renamed the Mojave National Preserve. Artificial water structures are allowed in Joshua Tree National Park and discouraged in Death Valley National Park; there is not yet a policy regarding water in the Mojave National Preserve. Historically, water has been viewed as a limiting factor for wildlife in much of the desert Southwest. This belief has led to a virtually unquestioned belief that if some water is good for wildlife, then more water is better (Broyles 1995). Our study hints at a possibility that there may be unanticipated costs associated with water development which, in turn, may have implications for desert wildlife communities.

Although our results are based on a single field season and within only a portion of the Mojave Desert, our findings suggest that additional research on bird communities associated with desert water sources is warranted. More detailed studies might substantiate whether the pattern we present is indeed widespread. In addition, studies that quantify bird use of different types of water, and the physical and vegetative differences associated with water types, might reveal processes that explain ecological patterns observed.

We dedicate this paper to the late Jack Kawashima, an individual who cared more than many for the integrity of the Mojave Desert. Our work was made possible by Southern California Edison and Colorado State University.
LITERATURE CITED


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