Using public surveys to determine the distribution of greater roadrunners in urban and suburban Tucson, Arizona

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Abstract

Public surveys have been used to gather information on wildlife, particularly in urban areas. Interpretation of this information, and possible biases it contains, are critical to the inferences that can be made. We conducted a survey of the public in metropolitan Tucson, Arizona to gather information on the distribution of greater roadrunners *(Geococcyx califnornianus)*. We compared this information on roadrunner distribution to surveys conducted on random sites throughout the study area. The public reported seeing >1,400 roadrunners over about 1.5 years and their ability to identify roadrunners compared to other common urban birds was excellent. The potential to see a roadrunner existed throughout all urban and suburban areas, but reported public sightings tended to correspond to residential areas. We had few sightings in the downtown and central, more developed and densely settled areas of the study area as well as along Interstate 10. We also report on characteristics of the public who participated in these surveys.

INTRODUCTION

Public surveys have been used to acquire information on a variety of wildlife species and wildlife-related issues. Fussell and Corbet (1992) used a public survey to find nests and examine nest site selection in bees (Bombus *spp., Psithyrus* spp.) in local communities in Britain, Quinn (1995) used sighting information from the public to investigate coyote *(Canis latrans)* use of urban habitat in Seattle, Washington, and Pyrovetsi (1997) used a public survey to assist in developing a management plan and education programs for Dalmatian pelicans *(Pelecanus crispus)* for local communities in Greece. Surveys have also been used to assess public knowledge of and concern about zoonotic disease and prevention efforts (McGuill et al. 1997).

Advantages of public surveys include the potential for maximizing the amount of data collected with minimum effort, time, and cost. For example, Fussell and Corbet (1992) reported that research on bee nests was often based on only a few records because nests are difficult to find. Nevertheless the public survey generated 432 nest sites over 3 years. Public surveys also allow information to be obtained from otherwise inaccessible private lands (Quinn 1995) and provide an opportunity to educate the public (Pyrovetsi 1997).

Although public surveys can be a useful tool, there are potential problems, including non-response, erroneous information, and a variety of other reporting biases. Non-response bias can vary depending on survey method, question format, influence of interviewer, and willingness of individuals to participate and answer truthfully (Salant and Dillman 1994). Bias can be temporal (people only report what they see while active during the day) or spatial (reports only come from locations where people are present or where the density of people is highest). Income, education, and interest level can also influence the outcome of public surveys. Additionally, people may not always be willing to

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reveal information such as bird nest locations for fear that biologists might cause disturbance.

During 1997-99, we investigated the status, distribution, and habitat of greater roadrunners *(Geococcyx californianus)* in metropolitan Tucson, Arizona. As part of this research, we conducted a public survey for roadrunner sighting locations throughout the study area. In this paper, we report on the results of that public survey, assess the accuracy of public information, compare distribution patterns of roadrunners from the public survey to our walking surveys, and describe potential problems and biases that may exist in public-based survey efforts.

STUDY AREA

Tucson is located in southeastern Arizona (32º1′ north latitude, 110º9′ west longitude) and lies in the Arizona Upland subdivision of the Sonoran Desert (Turner and Brown 1982). In 1990, the Tucson metropolitan area covered 24,000 km^2 (Bureau of the Census 1998). The Tucson basin is bordered by mountains to the north, east, and west, and the city is bounded by an international airport, military base, and the Tohono O'Odham Nation reservation to the south. Elevation averages 787 m and annual rainfall is about 28 cm/yr, 30-60% falling from June-August and 10-40% falling during winter (Turner and Brown 1982). The study area covered 601 km^2 and was made up of 232 contiguous 2.6-km^2 (1-mi^2) blocks within Tucson city limits and in adjacent suburbs including incorporated towns and unincorporated Pima County. Each block contained at least 25% development, such as roads, buildings, parks, and other man-made features. These blocks formed the basis for our walking surveys for roadrunners (Figure 1).

METHODS

We solicited information from the public on the location of roadrunners and roadrunner nests via voice messaging system for callers to leave information about their sightings. Variables of interest included the name, phone number, and address of the caller, and the exact location, time, and date of the roadrunner sighting. We estimated response to each survey method by documenting what the caller said such as, "I saw your article in the newspaper," and counting number of calls immediately following solicitation. We attempted to eliminate as many duplicate sightings as possible by deleting sightings of roadrunners that occurred close in time and area (e.g. sightings from the same residence on the same day). We returned about 25% of the calls to evaluate the accuracy of information we were receiving via the voice messaging system. We asked the people we contacted whether or not they fed roadrunners. As time permitted, we also asked people who seemed comfortable with providing personal information how long they have lived in Tucson, about their bird watching experience, and how often they saw roadrunners.

To evaluate for possible biases in the distribution of roadrunner sightings we received from the public, we conducted walking surveys for roadrunners (Webster 2000). We conducted 281 surveys on 0.65-km^2 (0.25-mi^2) blocks located at random throughout the study area. Survey days were divided into 3 time periods: AM = sunrise-1000 hr, midday (MD) = 1000-1400 hr, and PM = 1400 hr-sunset and survey times were selected at random for day of the week and time period within a day. Each survey was conducted on foot by a trained observer and covered 4-5 km or was 50-60 min long, whichever came first.

To evaluate the public's ability to identify roadrunners correctly, we conducted a bird identification test. We selected at random 20 people who called to report roadrunner sighting locations, and 20 people from the general public. For the people who called to report roadrunners, we telephoned each and asked if he or she would be willing to participate in a short, 1-2 minute survey on public awareness of bird species in the Tucson area. For people from the general public, we randomly selected customers entering a local grocery store and service station and asked if they would be willing to participate in the same survey. We asked each participant to identify photos of 6 bird species common to metropolitan Tucson; in addition to the roadrunner, we chose the cactus wren *(Campylorhynchus brunneicapillus)*, great-tailed grackle *(Quiscalus mexicanus)*, curve-billed thrasher *(Toxostoma curvirostre)*, rock dove *(Columba livia)*, and Gambel's quail *(Callipepla gambelii)*. One color photograph of each species was displayed on the same poster board and each participant was asked to identify as many birds as possible. Participants were not aware that this was part of a research project on roadrunners, and correct answers were given to the participant only after the completion of each survey.

RESULTS

Public Survey

Between February 1997 and August 1998, the public survey generated 1,449 phone calls with roadrunner sighting locations throughout metropolitan Tucson (Figure 2). The greatest number of calls (1,230) resulted from the 3 newspaper articles. We received an average of 107 (range 87-153) calls the day each article appeared in the morning paper,

but responses dropped off drastically after that (Figure 3). People also responded to our other requests for information: 140 to fliers, 40 to the television news segment, 30 to the 3 radio broadcasts, and 9 to word-of-mouth.

We returned 365 calls and successfully contacted 237 people; 26 people were willing to answer personal questions, however, not all 26 answered all questions. Callers reported having lived in Tucson for an average of 13 years (range 1-64) (n = 23). Of those who answered questions regarding birdwatching (n = 26), 61% were not birdwatchers, 35% considered themselves experienced birders, and 4% said they were novice birders; average years birding was 27 (range 4-50) (n = 6). Callers reported seeing roadrunners commonly (46%), occasionally (29%), or infrequently (25%) in Tucson (n = 24). Only 36% said they regularly fed roadrunners and 64% said they did not feed roadrunners on a regular basis (n = 237).

The public survey generated 1,015 locations of roadrunners within the study area boundary (70% of total). Highest density of sightings occurred in the east part of the study area (~50 km^2), with a smaller concentration of sightings (~15 km^2) in the west part of the study area (Figure 2). We noted 3 distinct areas with low density of sightings: (1) in the northwest part of the study area along Interstate 10 (~50 km^2), (2) near the city center (~20 km^2), and (3) in a long, narrow strip of land on the south side of the study area (~15 km^2).

Walking Surveys

We covered about 1,250 km on 281 surveys distributed randomly throughout the study area and saw 52 roadrunners on 39 survey blocks east side of the study area (~50 km^2), and west side of the study area (~15 km^2). Lowest concentrations of sightings occurred in 2 areas: the city center (~50 km^2) and a northwest area along Interstate 10 (~30 km^2). The areas of high concentration formed a rough circular pattern of distribution around the periphery of the study area with a void near the city center.

Bird Identification Test

Tests were conducted during 7-12 December 1998. All people surveyed in both groups (those who called to report roadrunners and the general public) were able to correctly identify a roadrunner (Table 1). No other species was identified correctly by 100% of either group of people. Correct identifications for the other 5 species ranged from about 90% for Gambel's quail to about 10% for great-tailed grackle; there were some common mistakes in the identification of some species (Table 2).

DISCUSSION

We received a large number of responses from the public to our requests for roadrunner sighting locations. Most residents responded to the newspaper articles; the response rate was >8 times greater than any other technique. Most people responded the day the article (or news or radio report) appeared, and numbers of respondents dropped with each successive day. Number of responses would have been higher, but at the time of our first survey based on a newspaper article, our voice mail system could only hold 35 messages at one time (we later increased the capacity to 135 messages). The system was full by 9:20 a.m. that morning and was not cleared until 2:00 p.m. However, using newspaper the same number of sightings that were acquired from the public survey (1,449) we would have had to look for roadrunners 8 hr/day, 7 days/week for 3.5 years.

The distribution of roadrunner sightings resulting from the public survey represents the distribution of people who see and report roadrunners rather than the true distribution of roadrunners. However, these data do show that roadrunners are common in Tucson and can be found throughout the study area, although rarely in the more developed and higher housing density areas of the downtown business district and the central core of the city. In general, the distribution of roadrunner sightings from our walking surveys was somewhat similar to that of the public survey. However, the walking surveys revealed the pattern that we predicted: roadrunners were relatively more common in a wide band around the edge of the study area, where development and housing densities are lower, and were relatively rare near the city center.

Reporting bias was our greatest concern with using a public survey. Most callers responded to newspaper articles, so that respondents were people who could and did read the daily paper and had access to a telephone. Also, our requests for information were only in English and Tucson has a large Hispanic community; therefore, that portion of the population that speaks only Spanish may not have responded and sightings of roadrunners from primarily Hispanic sections of the study area were likely under-represented. These social influences may explain some of the variations we observed in roadrunner distribution. Most calls came from the east and west parts of the study area in areas with a housing density of >1-3 residences per acre. These callers may have higher incomes, which allows more leisure time to observe and report wildlife sightings or own larger house lots containing more wildlife. The void in the southern part of the study area may have resulted from a language barrier and the void

along Interstate 10 may be because few people live there. The public survey, however, did reveal the widespread distribution of roadrunners within the study area. The walking surveys may also have some bias. Private property was often inaccessible and, therefore, sightings occurred most often from roadways and washes.

Many callers made favorable comments about roadrunners, were glad that research was being done, and were willing to help by providing sighting information. This, plus the public's ability to identify roadrunners correctly, indicated high public interest in this species of urban wildlife. The roadrunner might be among the most readily identifiable birds in the United States. In an informal survey conducted in Washington, D.C., only 35% of the public were able to correctly identify a bald eagle (*Haliaeetus leucocephalus*), but 65% were able to correctly identify a roadrunner (J. Cornett, personal communication).

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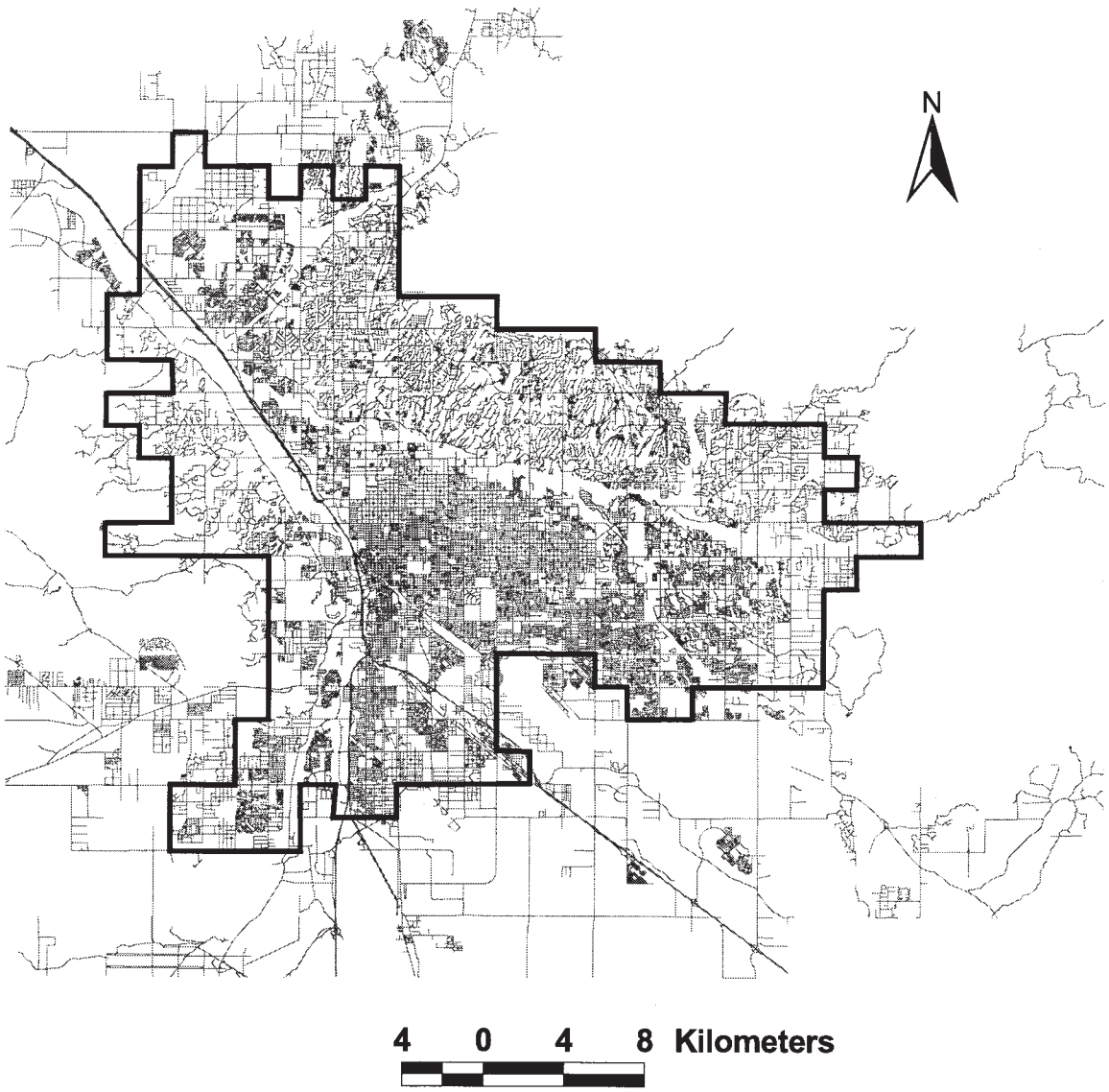

Figure 1.Study area (601 km^2) in Tucson metropolitan area where roadrunner distribution was documented.

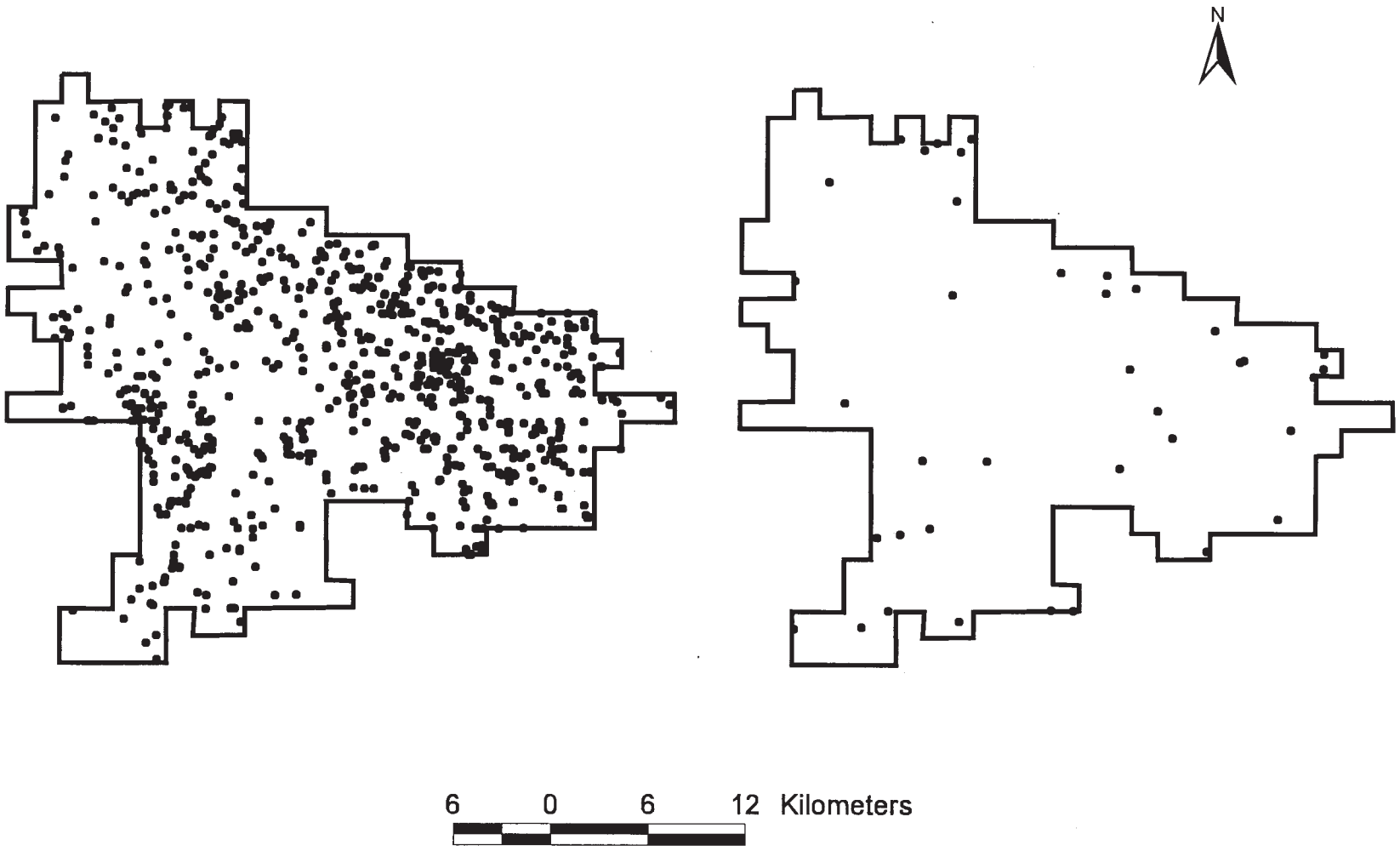

Figure 2. Distribution of greater roadrunner sightings reported by the public (left map)and observed during walking surveys (right map) in metropolitan Tucson, Arizona.

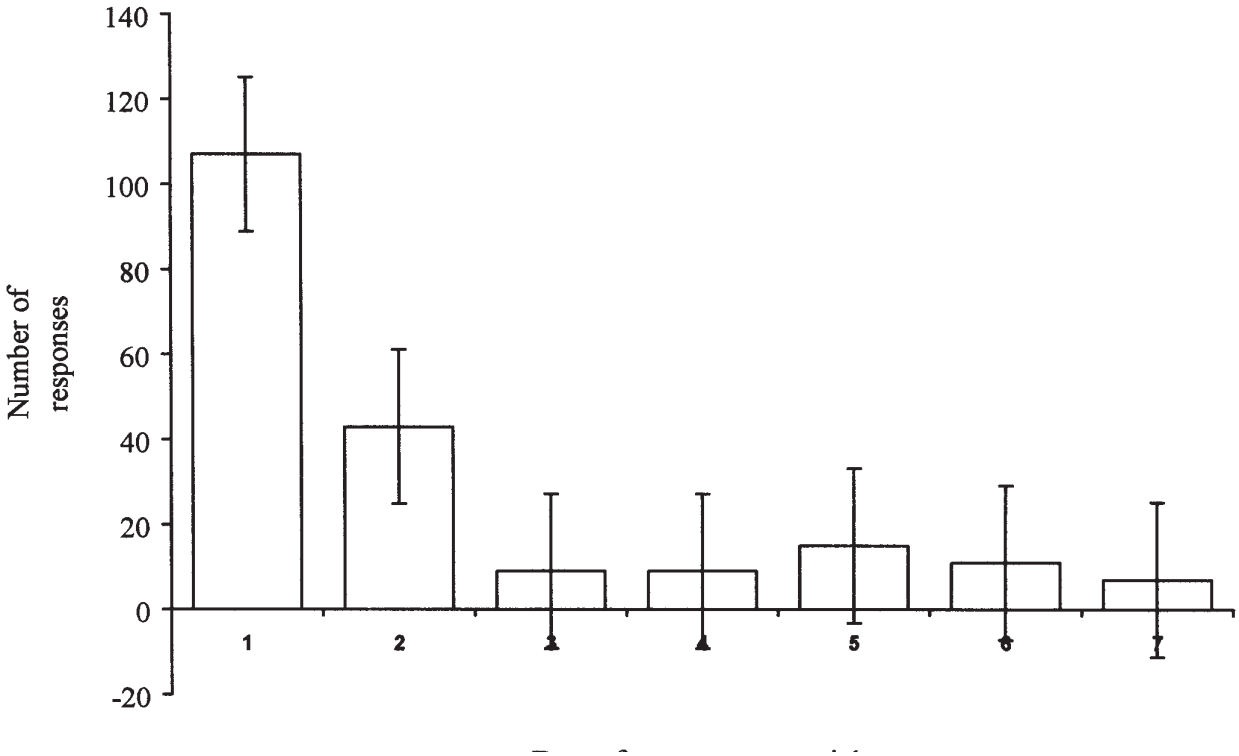

Figure 3. Frequency of responses (mean) by day, following publication of 3 newspaper articles requesting information on roadrunner sightings in metropolitan Tucson, Arizona.

Table 1. Correct answers by 2 groups of residents (those who responded to a request for information and a sample of the general public at large) in Tucson, Arizona for a bird identification test.

Species	Correctly identified (%) by respondents ($n = 20$)	Correctly identified (%) by general public ($n = 20$)	Average (%) ($n = 40$)
Roadrunner	100	100	100
Gambel's quail	90	85	88
Rock dove	60	75	68
Cactus wren	60	45	53
Curve-billed thrasher	30	10	20
Great-tailed grackle	20	0	10

Table 2. Incorrect answers to bird identification test given to the public in Tucson, Arizona. All 40 participants correctly identified the roadrunner, but not all participants correctly identified the other 5 species on the test.

Species	Incorrect response
Gambel's quail	Parrot (1), "Don't know" (4)
Rock dove	Dove (9), "Don't know" (4)
Cactus wren	Sparrow (4), woodpecker (1), hawk (1), cowbird (1), "Don't know" (12)
Curve-billed thrasher	Cactus wren (3), dove (1), brown thrasher (1), woodpecker (1), finch (1), "Don't know" (25)
Great-tailed grackle	Raven (8), crow (7), bluebird (1), blackbird (1), starling (1), magpie (1), "Don't know" (17)