

# Avian Use of Xeroriparian Ecosystems in the North American Warm Deserts<sup>1</sup>

R. Roy Johnson<sup>2</sup> and Lois T. Haight<sup>2</sup>

---

Abstract.--Results of xeroriparian avian censuses are compared with paired desert upland censuses for various subdivisions of the Sonoran Desert. With few exceptions xeroriparian habitat supports 5 to 10 times the population densities and species diversity of surrounding desert uplands.

---

## INTRODUCTION AND BACKGROUND

The value of riparian ecosystems as avian habitat was first quantified in the late 1960's and early 1970's (Carothers and Johnson 1971, Johnson 1971, Carothers et al. 1974). These earlier avian investigations, however, dealt entirely with wet riparian ecosystems (hydroriparian and mesoriparian) and although dry riparian habitats had been defined a decade earlier as "desert riparian" (Lowe 1961), little has been done either qualitatively or quantitatively to further characterize these xeroriparian ecosystems.

These earlier avian studies were concerned with species diversity and population densities of breeding populations. One early study took a cursory look at wintering riparian birds (Johnson and Douglas 1972) and another more detailed analysis was made of the importance of wet riparian systems as migratory corridors and stopover habitat for transients (Stevens et al. 1977). A later analysis of the importance of the riparian zone to the lowland breeding avifauna of the southwestern United States also treated only wet riparian habitats (Johnson et al. 1977). Although there has been a thorough documentation of the loss of wet riparian ecosystems due to water projects and agricultural and urban development (Johnson and Carothers 1982), there has been no similar quantification of the loss of dry riparian habitat. This paper discusses a pilot project designed to quantify the high value of desert washes and arroyos as avian habitat.

## STUDY AREA AND METHODS

The vegetation along dry desert watercourse has been recognized as important habitat for birds for several decades (Hensley 1954). Lowe (1961, 1964) first delineated and defined these "desert riparian" ecosystems and further discussed and

classified the vegetation associated with these wash systems (Lowe and Brown 1973, Brown et al. 1979).

In 1980 we began avian investigations at Organ Pipe Cactus National Monument in the same region where Hensley (1954) had conducted his earlier studies. We are measuring species distribution and abundance of birds in various habitats during the different seasons of the year. Dry watercourses and their attendant xeroriparian vegetation often constitute almost 10% of the habitat of an area<sup>3</sup>. This is especially noticeable for 1st, 2nd, and 3rd order washes in desert foothills (Johnson et al. 1984). Our colleagues and other arid lands ecologists generally agree that birds and other vertebrates are apparently much more common along these well-vegetated washes. However, the only definitive papers we find for the North American deserts which address this issue are by Raitt and Maze (1968) for the Chihuahuan Desert, and Austin (1970) for the Mohave Desert. Both of these papers, however, give population densities only for the breeding season. Therefore, we have established methodology for comparing species diversity and population densities along these desert washes during all seasons and for comparing these data to the same information for nearby upland plots of equal size. The width of the xeroriparian plot (channel plus riparian habitat on both sides) varies from wash to wash, but the paired xeroriparian and upland plots in each instance are of equal size. Plot length depends on several factors including amount of stream-course braiding, density of riparian vegetation and negotiability of the wash. Severe stream braiding in large wash systems often causes problems in censusing. These problems are related to total width of the wash system and relative amount of vegetation to channel width (e.g., a single channel with a single band of riparian vegetation on each side vs. a multi-channeled wash with a reticulum of riparian vegetation). A single investigator, for

---

<sup>1</sup>Paper presented at the First North American Riparian Conference, Tucson, Arizona, April 16-18, 1985.

<sup>2</sup>R. R. Johnson and Lois T. Haight are with the National Park Service and School of Renewable Natural Resources, University of Arizona, Tucson, AZ.

<sup>3</sup>Warren, Peter L. 1985. Personal conversation. Office of Arid Lands Studies, University of Arizona, Tucson, Ariz.

example, can census a half kilometer plot in a single-channeled, third order wash in less than an hour while a braided wash of similar size and order may require a similar amount of time by each of three or four investigators because of the greater width of the wash and the associated dense vegetation. Denser vegetation requires more census time because of decreased visibility and, generally, larger numbers of birds. Dense vegetation in the wash channel, large rocks, and deep sand all increase the difficulty of walking a census "line."

Upland plots were selected far enough from xeroriparian plots to minimize movement of birds between each xeroriparian and matched upland plot. This is especially important for breeding bird censuses where one is trying to determine territorial pairs. By sitting on a nearby hill or the highest part of the upland plot for an hour or two in the

morning (and, if possible, off and on throughout the day) one can check the frequency of movement of birds between paired plots. Censuses should be run on a minimum of two days in a row, reversing the census order for riparian and upland plots from the first to the second day.

The time of day for censusing varies greatly, depending on season, local weather, and avian activity. Censusing generally begins at sunrise. During the breeding season, however, censusing generally begins as soon as light is sufficient to allow the location and identification of birds. Some species, e.g., the Brown Towhee (Pipilo fuscus), sing even before light and may cease at sunup. By contrast, we often postpone winter censusing for an hour or more after sunrise, especially for a canyon or a heavily vegetated wash that remains shaded and cool. In such situations the census taker(s) can

Table 1.--Randomly selected sample winter census from paired plots in southwestern Arizona's Arizona Upland subdivision of the Sonoran Desert.

Paired plots = 500 by 60 m in Alamo Wash, Ajo Mountains and Alamo Canyon Upland, Organ Pipe Cactus National Monument			
Weather conditions: Still, Clear		R. Roy Johnson	
30 December 1981, 0825 to 0925 h			
Common name <sup>1</sup>	Scientific name	Number of individuals	
		Xeroriparian <sup>2</sup> plot	Upland <sup>3</sup> plot
Common (Gilded Flicker)	<u>Colaptes auratus mearnsi</u>	1	
Gila Woodpecker	<u>Melanerpes uropygialis</u>	4	
Ladder-backed Woodpecker	<u>Picoides scalaris</u>	1	
Verdin	<u>Auriparus flaviceps</u>	2	
Rock Wren	<u>Salpinctes obsoletus</u>	1	
Cactus Wren	<u>Campylorhynchus brunneicapillus</u>	3	
Black-tailed Gnatcatcher	<u>Polioptila melanura</u>	3	
Ruby-crowned Kinglet	<u>Regulus calendula</u>	2	
Curve-billed Thrasher	<u>Toxostoma curvirostre</u>	1	
Crissal Thrasher	<u>Toxostoma dorsale</u>	1	
Phainopepla	<u>Phainopepla nitens</u>	6 males, 6 females	
Black-throated Sparrow	<u>Amphispiza bilineata</u>	9	
Brown Towhee	<u>Pipilo fuscus</u>	4	
Dark-eyed Junco	<u>Junco hyemalis</u>	8	
White-crowned Sparrow	<u>Zonotrichia leucophrys</u>	19	
House Finch	<u>Carpodacus mexicanus</u>	2	
Thrasher sp.?	<u>Toxostoma sp.?</u>	2	
	Individuals (incl. 2 unidentified thrashers)	75	0
	Species	16	0

<sup>1</sup>After A.O.U. Checklist, Sixth edition (American Ornithologists' Union, 1983).

<sup>2</sup>Predominant vegetation of Prosopis velutina, Lycium spp., Ambrosia ambrosioides, Sapium biloculare, Cercidium floridum.

<sup>3</sup>Predominant vegetation of Cereus giganteus, C. thurberi, Opuntia fulgida, Ambrosia deltoidea, Larrea, Cercidium microphyllum.

Table 2.--Randomly selected sample winter census from paired plots in northwestern Sonora's Lower Colorado subdivision of the Sonoran Desert.

---

Paired plots = 500 by 60 m in Papago Wash, Pinacate Area,  
Sonora, Mexico and Papago Tanks Upland

R. Roy Johnson  
31 December 1981, 9845 to 0930 h

Common name <sup>1</sup>	Scientific name	Number of individuals	
		Xeroriparian <sup>2</sup> plot	Upland <sup>3</sup> plot
Mourning Dove	<u>Zenaida macroura</u>	1	
Ladder-backed Woodpecker	<u>Picoides scalaris</u>	1	
Verdin	<u>Auriparus flaviceps</u>	6	
Black-tailed Gnatcatcher	<u>Poliophtila melanura</u>	5	
Crissal Thrasher	<u>Toxostoma dorsale</u>	1	
Phainopepla	<u>Phainopepla nitens</u>	9 males ,	5 females
Ruby-crowned Kinglet	<u>Regulus calendula</u>	1	
Yellow-rumped Warbler	<u>Dendroica coronata</u>	1	
House Finch	<u>Carpodacus mexicanus</u>	2	
	Individuals	32	0
	Species	9	0

---

<sup>1</sup>After A.O.U. Checklist, Sixth edition (American Ornithologists' Union, 1983).

<sup>2</sup>Predominant vegetation of Olneya, Cercidium floridum, Prosopis, Acacia gregii, Lycium, Hyptis emoryi, Phoradendron californicum.

<sup>3</sup>Predominant vegetation of Larrea, Ambrosia dumosa.

begin the census as soon as avian activity begins. This requires being on the plot at sunrise to monitor activity. Because of open terrain and scant vegetation, upland plots can nearly always be censused by a single observer. Direct counts are conducted as the census taker traverses the plot along a median "line." Heavily wooded washes often need two observers, one on each side of the channel or one in the bottom and one walking parallel on an overlooking hill or bank. In such cases, upland counts are also conducted by the same two observers for purposes of standardization. Horned Owls (Bubo virginianus), Western Screech Owls (Otus kennicottii), Ferruginous Pygmy-Owls (Glaucidium brasilianum), and Elf Owls (Micrathene whitneyi) are all active during crepuscular hours, at dusk and/or dawn, and present a special censusing problem (Johnson et al. 1981).

#### DISCUSSION, CONCLUSIONS, AND SUMMARY

Paired strip transects were established for comparing avian populations in xeroriparian habitat (common along dry desert watercourses) with those populations in surrounding desert upland habitat. From 1980-1985 these plots were censused for avian species diversity and population densities in the Mohave Desert, Chihuahuan Desert, and subdivisions of the Sonoran Desert (Shreve 1941). We had hypothesized that dry riparian habitats should be affected by the same factors which result in greater avian diversity and densities in wet riparian ecosystems

compared to adjacent uplands. On rare occasions we have also observed high avian use of desert upland habitats during seasons other than summer. Such rare observations of exceptional upland use have included hundreds of White-crowned Sparrows in creosotebush flats near Phoenix, Arizona in winter. In spring we have recorded flights of warblers in the desert uplands near Phoenix (especially Wilsons, Townsend's, and Yellow-rumped Warblers) as well as sparrows in creosotebush-microphyll desert near Tucson and Phoenix (mostly Black-chinned, Brewer's, Chipping, and White-crowned Sparrows).

Xeroriparian plots were established in the Arizona Upland subdivision of the Sonoran Desert at Blue Point Cottonwoods (Johnson and Simpson 1971), Saguaro National Monument near Tucson, and Organ Pipe Cactus National Monument (table 1) on the U.S.-Mexican boundary. In addition we established plots in the Pinacate lava fields of the Lower Colorado subdivision of the Sonoran Desert in northwestern Sonora, Mexico (table 2). Several plots were studied in the Central Gulf Coast of Sonora, Baja California, and Baja California Sur as well as the Vizcaino subdivision of the Sonoran Desert in Baja California (table 3). Sample plots were run in the Plains of Sonora, Foothills of Sonora, and Magdalena subdivision of the Sonoran Desert in northern Mexico. Although a complete analysis by season for the desert regions is currently underway, the purpose of this report is to demonstrate our findings regarding the high relative value of xeroriparian ecosystems as avian habitat. The tables in this paper present the

results of randomly selected censuses from three of the seven subdivisions of the Sonoran Desert in which we worked. Similar information has been provided elsewhere for the Chihuahuan Desert (Johnson and Haight, in press).

Censusing in all desert subdivisions--extensively in some, preliminarily in others--and a wide variety of vegetation types has produced similar results--species diversity and/or population densities of approximately five to ten times that of identical plots in the surrounding uplands--with one exception. Plots censused during migration in March 1981, near Punta Prieta, Baja California produced similar results for xeroriparian and upland plots. This is a particularly densely vegetated section of the Vizcaino Desert with tree species consisting of

boojums (Fouquieria columnaris) and cardones (Cereus pringeli) and numerous shrubs (e.g., Viscainoa, Opuntia molesta, Ambrosia spp., Simmondsia, and others). Large numbers of Fringillids and other species were moving through the hillside vegetation as well as along the denser streamside vegetation.

Our data demonstrate a much greater avian use of xeroriparian ecosystems when compared with upland ecosystems during all seasons in most of the subdivisions and the vegetation types in which we worked in the Sonoran Desert. Preliminary investigations indicate that the same is true for most seasons in other subdivisions of the Sonoran Desert as well as for the Chihuahuan and Mohave deserts. Additional studies are now in progress to further quantify avian activities in xeroriparian ecosystems of the North American deserts.

Table 3.--Randomly selected sample winter census from paired plots in the Viscaino subdivision of the Sonoran Desert.

Paired plots = 800 by 30 m in Catavina Arroyo, Baja California and Catavina Upland			
R. Roy Johnson and Lois T. Haight			
27 December 1983, 0900 to 0940 h			
Common name <sup>1</sup>	Scientific name	Number of individuals	
		Xeroriparian <sup>2</sup> plot	Upland <sup>3</sup> plot
Verdin	<u>Auriparus flaviceps</u>	1	
Rock Wren	<u>Salpinctes obsoletus</u>	1	
Black-tailed Gnatcatcher	<u>Polioptila melanura</u>	2	
Loggerhead Shrike	<u>Lanius ludovicianus</u>	2	No census
Brewer's Sparrow	<u>Spizella breweri</u>	2	
White-crowned Sparrow	<u>Zonotrichia leucophrys</u>	13	
House Finch	<u>Carpodacus Mexicanus</u>	2 males + 2	
	Individuals	25	
	Species	7	
28 December 1983, 0830 to 0945 h			
Costa's (?) Hummingbird	<u>Calypte costae</u>	Pair courting	
Black-tailed Gnatcatcher	<u>Polioptila melanura</u>	5	
Gray Thrasher	<u>Toxostoma cinereum</u>	3 + 2 singing	
Phainopepla	<u>Phainopepla nitens</u>	Male	
Green-tailed Towhee	<u>Pipilo chlorurus</u>	1	
Black-throated Sparrow	<u>Amphispiza bilineata</u>	1 singing	
White-crowned Sparrow	<u>Zonotrichia leucophrys</u>	18	
	Individuals	33	0
	Species	7	0

<sup>1</sup>After A.O.U. Checklist, Sixth edition (American Ornithologists' Union 1983).

<sup>2</sup>Predominant vegetation of Prosopis, Ephedra, Lycium, Acacia gregii.

<sup>3</sup>Predominant vegetation of Larrea, Ambrosia cf. dumosa, Agave.

LITERATURE CITED

- Austin, G. T. 1970. Breeding birds of the desert riparian habitat in southern Nevada. *Condor* 72:431-436.
- Brown, D. E., C. H. Lowe, and C. P. Pase. 1979. A digitized classification system for the biotic communities of North America, with community (Series) and association examples for the Southwest. *J. Arizona-Nevada Acad. Sci.* 14 (Suppl.1):1-16.
- Carothers, S. W., and R. R. Johnson. 1971. A summary of the Verde Valley breeding bird survey, 1970. *Ariz. Game and Fish Dept. Completion Report FW 16-10:46-64.*
- Carothers, S. W., R. R. Johnson, and W. W. Aitchison. 1974. Population structures and social organization of southwestern riparian birds. *Amer. Zool.* 14:97-108.
- Hensley, M. M. 1954. Ecological relations of the breeding bird population of the desert biome in Arizona. *Ecol. Monogr.* 24:185-207.
- Johnson, R. R. 1971. Tree removal along southwestern rivers and effects on associated organisms. *Amer. Phil. Soc. Yrbk.* 1970:321-322.
- Johnson, R. R., B. T. Brown, L. T. Haight, and J. M. Simpson. 1981. Playback recordings as a special avian censusing technique. *Studies in Avian Biology* No. 6:68-75.
- Johnson, R. R., and S. W. Carothers. 1982. Riparian habitats and recreation: Interrelationships and impacts in the Southwest and Rocky Mountain region. *Eisenhower Cons. Bull.* No. 12, USDA For. Serv. Rocky Mtn. For. and Range Exp. Stn., Ft. Collins, Colo. 31 p.
- Johnson, R. R., and C. L. Douglas. 1972. Highways and their impact on the wildlife of the pinyon-juniper-oak woodland in north-central Arizona. *Ariz. Highway Dept.*, Phoenix. 149 p.
- Johnson, R. R., and L. T. Haight. In Press. Avian use of xeroriparian systems in the Big Bend region, Texas. *Proceedings 2nd Symposium on Chihuahuan Desert*, C.D. Res. Inst., Alpine, Tex.
- Johnson, R. R., L. T. Haight, and J. M. Simpson. 1977. Endangered species vs. endangered habitat. p. 68-79 *In* *Proceedings of symposium on importance, preservation, and management of the riparian habitat.* USDA For. Serv. Gen. Tech. Rpt. RM-43, Rocky Mtn. For. and Range Expt. Stn., Ft. Collins, Colo. 217 p.
- Johnson, R. R., and J. M. Simpson. 1971. Important birds from Blue Point Cottonwoods, Maricopa County, Arizona. *Condor* 73:379-380.
- Lowe, C. H., Jr. 1961. Biotic communities in the sub-Mogollon region of the inland Southwest. *J. Ariz. Acad. Sci.* 2(1):40-49.
- Lowe, C. H. 1964. Arizona landscapes and habitat. p. 1-132 *In* C. H. Lowe (Ed.), *The vertebrates of Arizona.* University of Arizona Press, Tucson, Ariz. 270 p.
- Lowe, C. H., and D. G. Brown. 1973. The natural vegetation of Arizona. *Arizona Resources Information System Cooperative Publication.* No.2. 53 p.
- Raitt, R. J., and R. L. Maze. 1968. Densities and species composition of breeding birds of a creosotebush community in southern New Mexico. *Condor* 70:193-205.
- Shreve, F. 1951. *Vegetation of the Sonoran Desert.* Carnegie Inst. Wash. Publ. 591. 192 p.; maps and photos.
- Stevens, L., B. T. Brown, J. M. Simpson, and R. R. Johnson. 1977. The importance of riparian habitats to migrating birds. p. 156-164 *In* *Proceedings of symposium on importance, preservation, and management of the riparian habitat.* USDA For. Serv. Gen. Tech. Rpt. RM-43, Rocky Mtn. For. and Range Exp. Stn., Ft. Collins, Colo. 217 p.