Managing Riparian Habitats of the American Southwest: Birds in the Gila Lower Box, New Mexico

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Riparian habitats provide important habitat in summer as many Neotropical migrants depend on them for breeding. However, the conservation value of these habitats for winter bird communities has received little attention. This research compares avian diversity and community structure in summer and winter riparian habitat along a stretch of the Gila River, New Mexico. The purpose is to evaluate and describe the bird community of riparian areas in the Southwest in two distinct phases of the avian lifecycle: breeding and wintering, to emphasize the conservation importance of this habitat type for birds throughout the year. Point counts identified 3,322 individuals of 78 species, 54 species (1488 individuals) in summer and 48 species (1834 individuals) in winter, with 24 species occurring in both seasons. Five Threatened or Endangered species were observed: Southwestern Willow Flycatcher (21 individuals summer), Common Ground Dove (6 individuals summer), Bell's Vireo (133 individuals summer), Gila Woodpecker (16 individuals summer, 10 winter), and Abert's Towhee (93 individuals summer, 56 winter). The Shannon-Wiener diversity index (H′) revealed high avian diversity values that were similar in the two seasons (summer H′ = 3.16, winter H′ = 3.01). Sorensen's similarity index (0.32) indicated 68% turnover in species between these two seasons. This reveals that a much broader suite of species use riparian habitats throughout the year than would be considered if only breeding birds were surveyed. These results suggest that the conservation value of riparian areas in the Southwest should include the potential to provide winter habitat for birds. *Key Words: avian diversity, community similarity, conservation value, migratory status, riparian habitat, wintering birds*

Riparian habitats of the Southwest are those areas of vegetation adjacent to water that often manifest as a *ribbon of green* that is in stark contrast to the semi-arid landscape (Webb, Leake and Turner 2007). Many researchers have demonstrated the importance of vegetation in riparian areas as habitat for breeding birds (Hall et al. 2002; Knopf et al. 1988, Skagen et al. 1998) but few have evaluated the importance of riparian habitats in the Southwest for wintering birds (Szaro and Jakle 1985; Strong and Bock, 1990). Describing and comparing the avian community composition of a habitat in summer and winter

can provide a better estimate of how avian populations use riparian habitat throughout the year. Abundance and species richness are two components of community structure that may indicate the importance of a habitat. In addition, identifying species of conservation concern, including migratory populations and relating this to the seasonal avian community composition can better inform land managers of the relative conservation value of a habitat patch throughout the year.

Many species of birds have been reported as having population declines related to habitat loss (DeSante and George 1994, Donovan and Flather 2002, Robinson et al. 1995). Research focus has been on riparian obligate birds, many of which are Neotropical migrants that are negatively impacted by loss and degradation of their breeding habitat. DeSante and George (1994, 173) listed destruction of riparian habitat and overgrazing as major factors contributing to population declines of western migratory landbirds. They found that for western birds, more short-distance migrants showed population declines than long-distance migrants (DeSante and George 1994, 183). Their results prompted a call for complete protection of remaining riparian habitats because they not only provide critical habitat for breeding birds but also important wintering and stop-over habitat for long and short distance migrants.

Declines in bird populations appear to reflect reduced availability of habitat on both breeding grounds (Robinson et al. 1995) and wintering grounds (Keller and Yahner 2006; Rappole et al. 2003, 741). Thus conserving riparian habitats in the Southwest may benefit birds that use these habitats in all phases of the annual avian lifecycle. For birds occupying riparian habitats in winter, the inherent limited distribution and extent of riparian vegetation in the lower latitudes, coupled with large-scale anthropogenic alteration may negatively impact populations that are only seasonally associated with riparian habitats. Compared to summer, winter populations may have reduced habitat area, reduced habitat quality or both (Rappole et al. 2003, Mills 2006, Ohmart 1994, Ellis 1995). Rappole et al. (2003, 735) found that golden-cheek warbler populations were limited due to reduced habitat availability during winter. Mills (2006) found that for long-distance migratory species that breed in the eastern U.S., wintering habitat was limiting due to winter range compression in Central America where land mass is greatly reduced (Mills 2006, 41).

Birds exhibit different behaviors in the winter compared to the summer. These differences span the range from summer behavior in which solitary individuals compete for mates, defend territories and form pairs to breed, to winter behavior of a more social pattern of species forming large, sometimes mixed-species flocks. Resident species endure different competition pressure as migrants move through and into their home ranges. Some species exhibit partially migratory behavior, especially in mild winters. This demonstrates the range of variation to environmental pressures in the population and may give

an indication of how populations expand or contract distributional ranges in response to specific and changing conditions.

Habitat quality is variable in natural riparian systems largely because of the dynamic flood regime characteristic of river systems in the southwest. Ohmart (1994) estimated that 95% of western riparian habitats had been significantly degraded, altered or destroyed and noted that many species of protected birds are found only in riparian habitats (Ohmart 1994, 273). Ellis (1995) evaluated bird use of native and non-native habitats along the Middle Rio Grande, New Mexico and concluded that even though birds used non-native saltcedar habitats, native vegetation was necessary for the persistence of bird species in this area (Ellis 1995, 339).

In the United States, riparian habitat only covers about 1% of the land surface, yet riparian areas of the Southwest are cited as being the most productive and biologically important of all ecosystems in the United States (Knopf et al. 1988, 273; Skartvedt 2000). Riparian areas in general are decreasing in the United States and many have disappeared due to agriculture, grazing, rural development, and/or mining (Morrison et al. 1992, 7; Fleischner 1994; Briggs 1996; Popotnik and Giuliano 2000, 976). Grazing of riparian areas reduces the complexity of the woody riparian vegetation because cattle eat emergent vegetation, shoots and sprouts, in addition to trampling saplings and other under story plants. The result is a simplified canopy structure and age-class distribution with only mature plants persisting. Without recruitment the native gallery forests become more open and die back. Where the water flow is diverted, non -native plants become established in thick stands preventing native plant establishment. Because many riparian habitats have been destroyed or degraded the remaining intact habitats are critically important (Ohmart 1994).

In New Mexico, the Gila River retains some of the natural characteristics of native riparian habitats (Hubbard 1977; MacMahon 1998) such as high native plant, bird and mammal diversity that have been lost in western portions of the Gila River spanning Arizona (Rea 1983). The Gila River represents one of the last free-flowing rivers in the U.S. and was recently named as the Country's *7th Most Endangered River* by the American Rivers Association (2007). The lack of dams and diversions for agriculture are important factors in maintaining the Gila River's flood regime, which facilitates native tree seedling establishment in addition to other ecological services. Other riparian systems in New Mexico contain a mix of native and non-native vegetation (Finch et al. 1999, 9), and many riparian habitats in Arizona are dominated by monotypic stands of saltcedar (Sogge and Marshall 2000, 45). Research along the Rio Grande indicates that below Elephant Butte Dam riparian vegetation was removed when the river was channelized (1919) and it has not yet recovered. Up river along the middle Rio Grande, saltcedar and Russian olive have established dense patches excluding native trees such as cottonwood and willow

(*Salix spp.*). Further south in the Mesilla Valley, vegetation along the lower Rio Grande no longer supports many of the riparian obligate species, including Southwestern Willow Flycatcher,[i] which historically occurred in this region (Sogge et al. 2003).

This area is uniquely situated to provide habitat for species from five major ecoregions: the Chihuahuan Desert, the Sonoran Desert, the Rocky Mountains and the Great Basin (EPA ecoregions). Currently small remnant patches of intact riparian forest are widely distributed across many miles of desert in what Webb, Leake and Turner (2007) describe as a ribbon of green that stretches through a desert matrix. In addition, the Gila River is an east-west running river that lies perpendicular to the north-south paths of many migrants, and therefore may be especially important to migrating birds. This riparian habitat may act as an oasis or as stopover habitat that provides some of the few tall trees in a large region. For short-distance migrants the riparian vegetation may act as a dispersal corridor or provide stepping-stones of habitat that link the high country with lowlands during annual migration or dispersal events. Skagen et al. (1998) compared the use of riparian corridors and oases by migrating birds in southeast Arizona. Their research concluded that riparian patches or oases functioned as important stopover sites to en route migrants regardless of patch size or connectivity. Sabo et al. (2005, 56) determined that riparian areas contribute to regional species richness by harboring different, not more species than upland areas. Thus, riparian ecosystems play an important role in sustaining the rich biota of Arizona and New Mexico in all seasons (Ohmart 1994, Knopf 1985, 106).

The objective of this research is to describe the avian community of this riparian landscape in two seasons. This will identify birds that occupy the site in winter and better inform conservation efforts for birds occupying riparian habitats of the southwest in general, and the Gila River in New Mexico in particular. This includes describing the avian community in each season in terms of abundance and species richness, and compares the summer and winter bird community structure, diversity and similarity.

Methods

Study Area

The Gila Lower Box Wildlife Habitat Area (Gila LBWHA) is located in southwest New Mexico approximately 18 km east of the Arizona/New Mexico state line (Figure 1). The elevation is approximately 1195 meters and the river slopes ~2º along the 3 km stretch of river surveyed. The Bureau of Land Management (BLM), Las Cruces Field Office manages the Gila LBWHA as an Area of Critical Environmental Concern (ACEC) defined as follows:

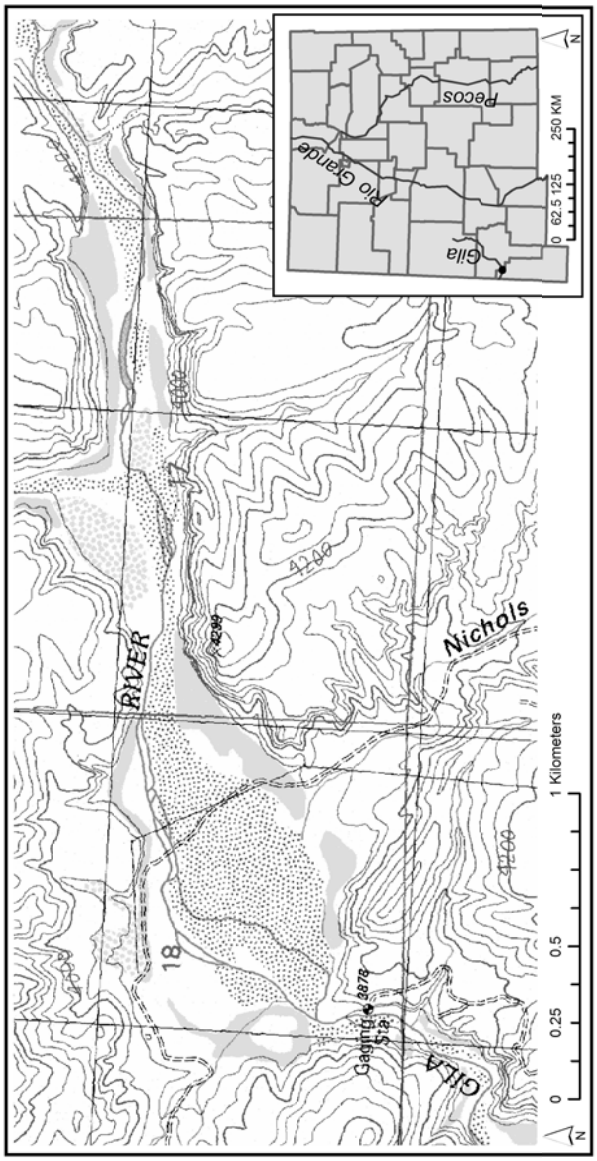

Figure 1. Map showing the location of study area along the Gila River, New Mexico.

> An area where special attention is required to protect and prevent irreparable damage to important historic, cultural or scenic values; fish and wildlife resources; or other natural systems or processes; or to protect life and safety from natural hazards (BLM 1991, 34).

The BLM has excluded livestock grazing from a 12.9 km stretch of the Gila River including the Gila LBWHA since 1990 (BLM 1993). The National Audubon Society has designated this area as an Important Bird Area citing that positive changes in the landscape have been observed since cattle grazing was excluded, including new vegetation patches near the river where before there was only gravel (Audubon 2006).

The study area encompasses riparian habitat within the 100-year floodplain adjacent to the Gila River in Nichol's Canyon. The east edge of the study area, which includes the confluence of Blue Creek with the Gila River, is pictured in Figure 2. The photograph shows patches of Fremont Cottonwood (*Populus fremontii*), Gooding Willow (*Salix goodingii*), and Seep Willow (*Baccharis glutinosa*) in strips along the edges of the current floodplain with mesquite (*Prosopsis glandulosa*) and catclaw (*Acacia gregii*) occupying the river bench in the center left of the photograph. The same general location in winter is pictured in Figure 3. Note the difference in water level between the winter and summer images.

The west end of the study area (Figure 4) shows the broad floodplain of Nichol's Canyon narrowing to the Lower Box, which is out of view beginning in the center of the image. The gauging station is just beyond the field of view labeled with an elevation of 3878 feet in Figure 1. The thin ribbon-like strips of cottonwood and willow saplings, which are a major component of the landscape, can be seen in Figure 5 in which the author is camouflaged while conducting a summer bird count. The author is pictured conducting a winter count in Figure 6. Note the frost covering the ground and the hat, gloves and waders, which were necessary attire to due to the freezing temperatures and two river crossings.

This area retains many qualities of native riparian areas such as maintaining a high diversity of native plants and woody riparian vegetation in various age classes and seral stages. Arizona Sycamore (*Plantanus wrightii*), Walnut (*Juglans spp.)* and Net-leaf Hackberry (*Celtis reticulata*) occur occasionally along recent and current river courses. A variety of other forbs, shrubby vegetation and cactus (*Opuntia spp.)* occupy the current floodplain with the *time since scouring flood* being a strong determinant of the community composition and age classes present (Webb et al. 2007). A few non-native trees occur within the study area including salt cedar (*Tamarix spp.)* and Russian olive (*Elaeagnus angustifolia*); vegetation surveys found these two species combined to contribute less than 5% of the woody vegetation in the study area (Campbell 2002, 94).

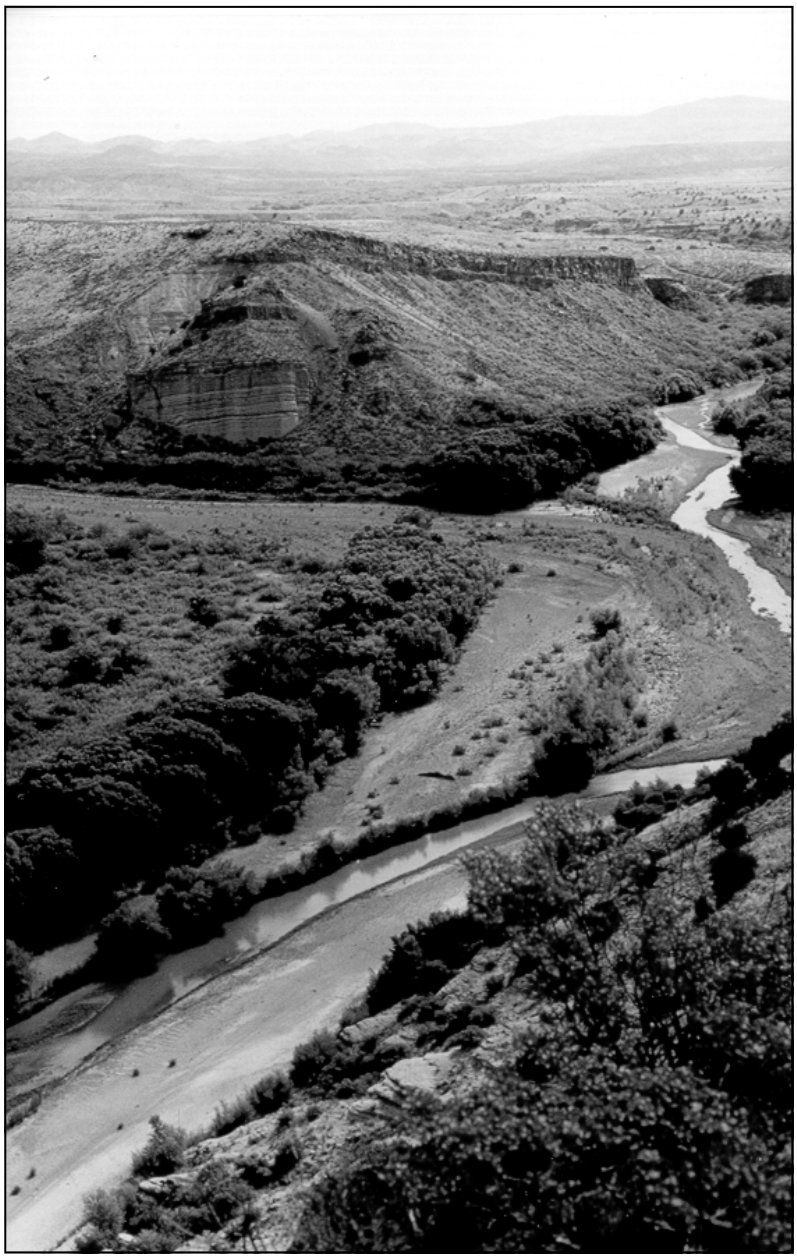

Figure 2. Photograph of Blue Creek confluence with the Gila River in summer.

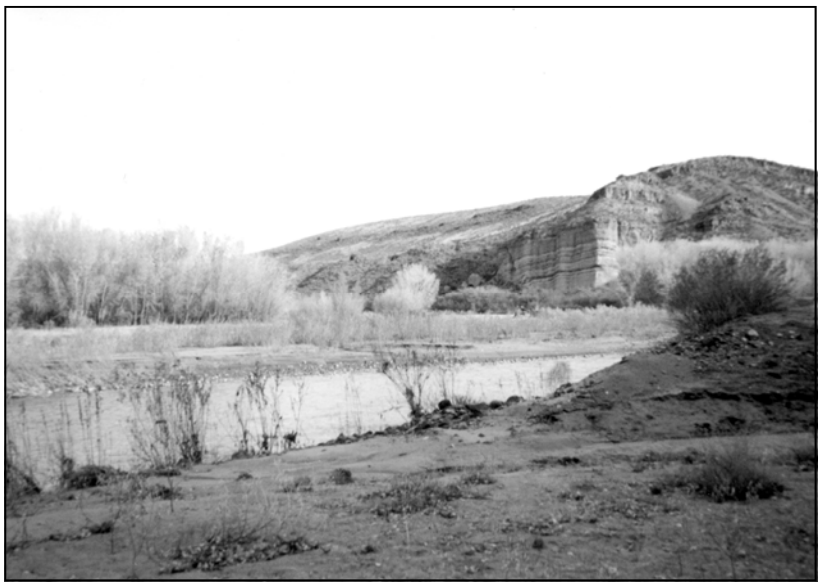

Figure 3. Photograph of Blue Creek confluence with the Gila River in winter.

Figure 4. Photograph of the western portion of Nichol's Canyon, New Mexico.

Figure 5. Photograph of the author conducting a summer bird count in a willow patch.

Figure 6. Photograph of the author conducting a winter bird count in frosty conditions.

Bird Surveys - Point Counts

Point counts were conducted once a month from June of 2000 to July of 2001 at 40 point-count stations which were spaced at least 100 m apart within the riparian habitats of the Gila LBWHA. Variable distance point counts recorded birds in concentric rings around the observer in two distance categories: 25 m and 50 m. The species and the number of individuals within each category were recorded. The variable-distance method was deemed preferable to fixed distance counts due to the heterogeneous nature of the vegetation as seen in Figure 4, which shows the western portion of the survey area and an overview of Nichol's Canyon. Counts lasted 5 minutes, began about 15 minutes after sunrise, and concluded within 4 hours of sunrise. The order of stations surveyed was alternated to avoid effects related to time of day. Counts were not conducted during windy or rainy conditions (Ralph et al. 1993, 29). Two days of surveys were necessary to count all 40 stations. A maximum of 6 days elapsed between surveys of a specific month with many surveys completed in one weekend.

Bird Surveys - Analysis

In order to compare the bird community composition in each season, three months of surveys were subset from the yearlong census. Counts typically occurred near the end of the month with at least 3 weeks between counts. Summer was determined to include May, June and July because many species have completed nesting by the middle of July. Winter included November, December and January. The 25 and 50 m distances were combined to include the full list of species and the sum of all individuals observed. This was deemed reasonable because very few new species were identified in the greater distance category and also because the count at the greater distance only included birds seen and so represents a minimum number of individuals.

The sum of the three counts at each point was used for the point analysis (Ralph et al. 1993, 30), as was the sum of the 40 points for the seasonal analysis. Because some birds recorded were transient, wide-ranging and generally rare, species counts that included only one individual in the three-month period were excluded from analyses. Total abundance was calculated as the sum of all individuals; species richness was calculated as the total number of species observed.

Two community indices, the first describing diversity and the second comparing similarity, were employed to quantify the seasonal bird community. Species richness and total abundance were combined in the Shannon-Wiener Diversity Index (H′) (Krebs 1989, 361; Magurran 1988, 168).

Equation 1: $H' = - \sum p_i (\ln p_i)$

In the formula above, p_i is the proportion of individuals of the i^{th} species calculated as the number of individuals of the i^{th} species divided by the total number of individuals of all species in the survey. The opposite/negative sum of the proportional abundances of each species in a season's counts gives the diversity for that season. When this index is computed from multiple points in an area as it is in the present research, it is termed beta diversity. When H′ is computed for each point the term is referred to as alpha diversity. The index can be interpreted as the level of uncertainty that a random individual will be the same species as the previous sample. In simple communities with only a few species the uncertainty and the H′ value is small. As the community increases in complexity, the uncertainty of predicting the next species increases. Magurran found the index typically ranges from values of about 1.0 to 3.5 (Magurran 1988, 35). The index increases with species richness and theoretically can become large, but in practice an H′ value of 5.0 seems to be a maximum in biological communities (Washington 1984, 667) with the highest values occurring in the tropics (Tramer 1974, 123). Comparisons between studies encompassing different total areas are not valid due to the species area relationship (Arrhenius 1921, 95) however Washington (1984) plotted H′ data from a variety of sources and typically used 3.5 as the upper limit to the graph (Washington 1984, 662, 664).

The similarity of these two seasonal bird communities was quantified by applying Sorenson's Similarity Index (C_s) (Magurran 1988, 174), which ranges from 0 – 1; one when the species composition is identical and zero when no species are in common (Nur et al. 1999, 11).

Equation 2: $C_s = 2j /(a + b)$

In the similarity formula above "j" is the number of species common to both sample "a" and sample "b"; "a" is the species richness in sample "a", and "b" is the species richness in sample "b". The coefficient compares species richness at one site in two time periods, in this case the samples represent the two seasons, and it is easily converted to a percentage such that 1 = 100% of the species being the same and 0 being none of the species are the same. Species turnover was then calculated as $1\text{-}C_s$. The Sorenson's index only uses species richness so it compares similarity in species composition only and ignores abundance.

The link between migratory status and conservation began with the passing of the Migratory Bird Treaty Act of 1918. Most species of birds are protected under this treaty and this justifies a discussion of the community organization as it relates to migratory status. Migratory status for each species observed was derived from the conservation category reported in Ehrlich et al. (1988) and organized into three categories: birds that winter in Mexico or further south called long-distance migrants (LD), birds that winter in northern

Mexico and southern U.S. called short-distance migrants (SD), and residents (R) are birds called winter residents by Ehrlich et al. (1988). For the purposes of this study conservation status will focus on threatened and endangered species in New Mexico. The current conservation status of observed species was determined via the Biota Information System of New Mexico (BISON-M).

Results and Discussion

A total of 3,322 individual birds representing 78 species were observed in the two seasons: 54 species in summer, 48 species in winter, and with 24 of these species occurring in both seasons. Table 1 gives a complete list of all species surveyed organized taxonomically after Ehrlich et al. (1988). During the summer the 54 species included 1,488 individual birds with an average of 27.5 individuals per species; during the winter 1,834 individuals of 48 species were recorded with an average of 38.2 individuals per species. The total seasonal abundance, total species richness, and community indices are summarized in Table 2. Avian diversity was high in both seasons ($H' = 3.16$ summer, $H' = 3.01$ winter) with summer values highest. Winter abundance was higher than summer by 346 individuals but summer had higher species richness with six more species than in the winter. This demonstrates the H' indices sensitivity to species richness over abundance. The Sorensen's Similarity Index (0.32) reveals low similarity between summer and winter bird community species composition and indicates a 68% turnover in species between summer and winter bird communities.

Species of Special Conservation Status

Five species observed have special legal status in New Mexico (Table 1). Southwestern Willow Flycatcher and Common Ground Dove are listed as "endangered" in New Mexico. Bell's Vireo, Gila Woodpecker and Abert's Towhee are included on the state list as "threatened". All of these species are riparian habitat specialists and the cause for listing is cited as population declines related to the reduction of suitable riparian habitat (BISON_M 2008).

Twenty-one Southwestern Willow Flycatchers were observed in summer 2001 and concurrent studies identified six breeding pairs in this area, some with successful nests (Campbell 2009). There is a positive trend for Southwestern Willow Flycatcher populations in this area (Sogge et al. 2003, 10), as in habitat further east along the Gila in the Cliff-Gila Valley (Sogge et al. 2003, 10). Bell's Vireo prefers similar nesting habitat as Southwestern Willow Flycatcher; both of these species benefit from complex woody vegetation structure yet each rely on different twig configurations for nest construction. According to Ehrlich et al. (1988, 388), Southwestern Willow Flycatchers use an upright fork compared to a horizontal fork for the hanging Bell's Vireo nest (Ehrlich et al. 1988, 492); both nest under dense canopy.

Table 1. Summary of birds observed in two seasons: Summer (S) and Winter (W). Common name and Latin name are ordered after Ehrlich et al. 1988. Abundance is the sum of individuals observed in three surveys. LD indicates long-distance migrants, SD indicates short-distance migrants, R indicates resident species. T denotes threatened species, E denotes endangered species. Blanks indicate zeros which were omitted from the table to improve interpretation.

Status	Common Name	Latin Name	S	W
LD	Great Blue Heron	*Ardea herodias*	16	2
LD	Blue-winged Teal	*Anas discors*	3	
LD	Mallard	*Anas platyrhynchos*	6	20
LD	Killdeer	*Charadrius vociferus*	6	5
LD	Spotted Sandpiper	*Actitis macularius*		4
LD	Sharp-shinned Hawk	*Accipiter striatus*		2
R	Common Black Hawk	*Buteogallus anthracinus*	3	3
SD	Zone-tailed Hawk	*Buteo albonotatus*	3	
R	Gambel's Quail	*Callipepla gambelii*	107	10
LD	Mourning Dove	*Zenaida macroura*	109	28
SD	White-winged Dove	*Zenaida asiatica*		2
R	Common Ground-Dove ^{E}	*Columbina passerina*	6	
LD	White-throated Swift	*Aeronautes saxatalis*	4	
LD	Belted Kingfisher	*Ceryle alcyon*		5
R	Gila Woodpecker ^{T}	*Melanerpes uropygialis*	16	10
SD	Northern Flicker	*Colaptes auratus*		10
R	Downy Woodpecker	*Picoides pubescens*		3
R	Ladder-backed Woodpecker	*Picoides scalaris*	14	
R	Hairy Woodpecker	*Picoides villosus*		2
LD	Western Kingbird	*Tyrannus verticalis*	37	7
SD	Brown-crested Flycatcher	*Myiarchus tyrannulus*	10	
LD	Ash-throated Flycatcher	*Myiarchus cinerascens*		5
LD	Western Wood-Pewee	*Contopus sordidulus*	3	
R	Black Phoebe	*Sayornis nigricans*	29	27
LD	Vermilion Flycatcher	*Pyrocephalus rubinus*	30	
LD	Southwestern Willow Flycatcher ^{E}	*Empidonax traillii extimus*	21	
LD	Violet-green Swallow	*Tachycineta thalassina*	2	

Table 1. Continued.

Status	Common Name	Latin Name	S	W
LD	Bank Swallow	*Riparia riparia*	4	
SD	Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	2	
LD	Cliff Swallow	*Petrochelidon pyrrhonota*	5	3
R	Western Scrub-Jay	*Aphelocoma californica*	3	20
R	Chihuahuan Raven	*Corvus cryptoleucus*	2	
R	Bridled Titmouse	*Baeolophus wollweberi*		16
LD	Mountain Chickadee	*Poecile gambeli*		42
R	Verdin	*Auriparus flaviceps*	3	2
R	Bushtit	*Psaltriparus minimus*	2	
SD	Brown Creeper	*Certhia americana*		3
R	White-breasted Nuthatch	*Sitta carolinensis*		4
SD	House Wren	*Troglodytes aedon*	38	56
R	Bewick's Wren	*Thryomanes bewickii*	13	11
R	Canyon Wren	*Catherpes mexicanus*	27	33
LD	Golden-crowned Kinglet	*Regulus satrapa*		36
SD	Ruby-crowned Kinglet	*Regulus calendula*		6
LD	Blue-gray Gnatcatcher	*Polioptila caerulea*	8	
SD	Western Bluebird	*Sialia mexicana*		208
SD	Townsend's Solitaire	*Myadestes townsendi*		78
LD	Hermit Thrush	*Catharus guttatus*	2	4
SD	American Robin	*Turdus migratorius*		257
LD	Cedar Waxwing	*Bombycilla cedrorum*		61
LD	Phainopepla	*Phainopepla nitens*	16	5
LD	Bell's Vireo [T]	*Vireo bellii*	133	
R	Hutton's Vireo	*Vireo huttoni*	6	
LD	Plumbeous Vireo	*Vireo plumbeus*	2	4
SD	Warbling Vireo	*Vireo gilvus*	3	
LD	Orange-crowned Warbler	*Vermivora celata*	2	32
SD	Virginia's Warbler	*Vermivora virginiae*	3	
SD	Lucy's Warbler	*Vermivora luciae*	39	
LD	Yellow Warbler	*Dendroica petechia*	76	
LD	Common Yellowthroat	*Geothlypis trichas*	19	

Table 1. Continued.

Status	Common Name	Latin Name	S	W
LD	Yellow-breasted Chat	*Icteria virens*	198	
LD	Black-headed Grosbeak	*Pheucticus melanocephalus*	2	
R	Northern Cardinal	*Cardinalis cardinalis*	176	88
LD	Blue Grosbeak	*Passerina caerulea*	41	
SD	Lazuli Bunting	*Passerina amoena*	6	
R	Spotted Towhee	*Pipilo maculatus*		91
R	Abert's Towhee [T]	*Pipilo aberti*	93	56
SD	Savannah Sparrow	*Passerculus sandwichensis*		5
R	Song Sparrow	*Melospiza melodia*	14	73
LD	Black-throated Sparrow	*Amphispiza bilineata*	3	
LD	Chipping Sparrow	*Spizella passerina*	14	44
LD	Dark-eyed Junco	*Junco hyemalis*		286
LD	Golden-crowned Sparrow	*Zonotrichia atricapilla*		2
LD	White-crowned Sparrow	*Zonotrichia leucophrys*		122
SD	Brown-headed Cowbird	*Molothrus ater*	52	
SD	Hooded Oriole	*Icterus cucullatus*	9	
LD	Summer Tanager	*Piranga rubra*	39	
SD	Pine Siskin	*Carduelis pinus*		29
R	House Finch	*Carpodacus mexicanus*	8	12

[T] indicates listing as Threatened by the State of New Mexico.
[E] indicates listing as Endangered by the State of New Mexico.

Table 2. Summary of avian community indices in summer and winter.

Index	Summer	Winter
Abundance	1488	1834
Species Richness	54	48
Diversity (H′)	3.16	3.01
Total Richness	*78*	
Species in Common	*24*	
Similarity (C_s)	*0.32*	

Six Common Ground Doves were observed in summer with none observed in winter. Interactions with other doves and ground nesting species should be explored, especially with Mourning Doves that occur in high abundance (summer n^{ii} = 109, winter n = 28) and are considered nest generalists using ground depressions, forks of trees or shrubs and sometimes reusing nests of other species (Ehrlich et al. 1988, 278). Gila Woodpecker was observed in summer (n = 16) and winter (n = 10) and observations of Gila Woodpeckers inside cavities in mature cottonwood and sycamore trees were noted. Ehrlich et al. (1988, 340) indicate that Gila Woodpecker nests occur primarily in Saguaro cactus, in which nests are excavated in the year prior to use in order to allow hardening of sap in cavity. Saguaro cactus does not occur in the Gila Lower Box. Possibly Gila Woodpeckers are using secondary cavities in the Gila Lower Box. It is not known if Gila Woodpeckers excavate in sycamore or cottonwood in this area, or if they use pre-existing cavities. Of these five species with special status, the resident species (Common Ground Dove, Abert's Towhee and Gila Woodpecker) all have limited range extent making the conservation of this site and similar habitats crucial to their survival.

Migratory Status

Overall, the community composition was 47% LD migrants, 24% SD migrants, and 28% R species. This suggests that a larger number of migratory species may benefit from conservation efforts in this area than resident species. The general migratory status as described by Ehrlich et al. (1988) does not match the seasonal behavior of birds in this study. Only half of the resident species were observed in both seasons (12 species: Common Black Hawk, Gambel's Quail, Gila Woodpecker, Black Phoebe, Western Scrub Jay, Verdin, Bewick's Wren, Canyon Wren, Northern Cardinal, Abert's Towhee, Song

Sparrow, House Finch). One species of SD migrant (House Wren) was seen in both seasons (summer n = 38, winter n = 56.) This indicates nearly a complete turnover in SD species between summer and winter. Eleven species of long distance migrants (30% of LD migrants) were observed both seasons in the Gila Lower Box: Great Blue Heron, Mallard, Killdeer, Mourning Dove, Western Kingbird, Phainopepla, Plumbeous Vireo, Orange-crowned Warbler, and Chipping Sparrow. This result suggests that southwestern riparian habitats may provide habitat to species expanding their ranges north in response to global warming or those whose populations demonstrate plasticity in two life-history characteristics: tolerance for cold temperatures and migratory behaviors. Summer community structure was composed of 54% LD migrants, 11% SD migrants and 35% R., while winter community structure had 39% LD migrants, 36%, SD migrants and 25% R.

A large number of transient individuals use the Gila LBWHA. Twenty-one species were observed at very low abundance (<5 individuals in both seasons, Table 1). Water birds such as Great Blue Heron, Mallard, Blue-winged Teal, Belted Kingfisher, Spotted Sandpiper and Black Phoebe occupy riparian habitats that provide access to water year-round. Irruptive species such as Cedar Waxwing, which follow ephemeral resources, also use these habitats during winter. Low numbers of individuals of species with large ranges were observed including: Chihuahuan Raven, Sharp-shinned Hawk, Common Black Hawk and Zone-tailed Hawk.

Abundance - summer

A few species made up the majority of individuals in each season. In the summer five species had abundance <100 individuals and these made up 47% of the total abundance of individuals (n = 723): Yellow-breasted Chat, Bell's Vireo, Mourning Dove, Gambel's Quail and Northern Cardinal. Yellow-breasted Chat was the most abundant species in summer (n = 198) and has been reported by the Audubon Society to exhibit population increases in the west (Audubon IBA's 2007). It is important to note that Bell's Vireo was abundant in this study because overall their populations are in decline because of destruction of the low, dense, riparian vegetation they require for nests (Audubon 2007). Gambel's Quail (n = 107) and Northern Cardinal (n = 176) are two resident species that dominate the shrubby habitat of this riparian area in summer. The quail tended to be concentrated in large groups with a vocal sentry drawing attention to the whereabouts of the covey, in contrast to the Northern Cardinal, which occupied the edge habitats in smaller groups and with more even spacing. Although Abert's Towhee did not make the top five abundant species in summer, they share the shrubby habitat and also occurred in relative abundance (n = 93).

Abundance - winter

The most abundant species in winter was the Dark-eyed Junco (n = 286). Four species occurred in abundance < 100 individuals in winter (873 individuals) and these represented 45% of the abundance in winter: American Robin (n = 257), Western Bluebird (n = 208), Dark-eyed Junco (mentioned above) and White-crowned Sparrow (n = 122). These four species formed two distinct groups of mixed-species flocks that foraged in different vegetation and land cover types. The Junco/Sparrow flock foraged on open ground where grasses and forbs had dried leaving their seeds. These large flocks erupted from the ground when approached and included Song Sparrow, Chipping Sparrow, and Pine Siskin. The photograph in Figure 7 shows the open floodplain containing the habitat they occupied. The Robin/Bluebird foraging groups primarily occupied fruit and nut bearing trees such as net-leaf hackberry and walnut. The photograph in Figure 8 shows the woody habitat in which large numbers of these species were observed. These flocks also contained some forest special ists such as Townsend's Solitaire, Mountain Chickadee, Bridled Titmouse, Brown Creeper, Western Wood-Pewee, Ruby-crowned Kinglet and Golden-crowned Kinglet. This suggests that the variety of food types (seeds and fruit) and cover types available in this riparian area contributes to the high avian species diversity in winter.

Conclusion

This research reports on 3,322 individual birds of 78 species occupying a recovering riparian habitat patch along the Gila River, New Mexico. Five species of special legal status were observed. The high diversity and low similarity between seasonal bird communities in this riparian landscape indicates that riparian habitats of the Southwest are important to both winter and summer bird populations. This study suggests that a larger suite of species will benefit from conservation efforts in the Gila LBWHA and riparian areas in the Southwest than when considering only summer populations because wintering birds have been under-surveyed in the past. Based on seasonal proportions of birds in the community, this area is important to a much greater number of migrants in summer and winter than it is to resident species. This conclusion is similar to that by Skagen et al. (1998) in Arizona and combined these findings indicate riparian areas should be considered for their potential to provide winter habitat in addition to providing summer breeding habitat.

This report on the high conservation potential of riparian habitat demonstrates that natural and dynamic processes result in diverse habitat with complex vegetative structure. The ACEC management strategy in this small patch appears to be effective to improve avian habitat quality of this riparian area. A positive indicator of this is that large numbers of riparian obligate species are

Figure 7. Photograph of open/shrubby junco/sparrow habitat in winter.

Figure 8. Photograph of dense woody robin/bluebird habitat in winter.

present including Bell's Vireo, Southwestern Willow Flycatcher, Yellow-breasted Chat, and Yellow Warblers. Further research into the productivity and habitat specificity of these species in this and similar habitats is warranted.

Conservation efforts for the riparian specialists may act as a conservation umbrella by establishing "critical habitat" in riparian sites such that other species are covered. Efforts to control the dynamic nature of this ecosystem and reduce this complexity include grazing, water diversion and development. Such activities may limit the potential of these ribbon-like habitats to respond to the historic flood regime and continue to support high avian diversity. The negative effects of seasonal competition for resources to year round residents may be mitigated by providing a broader range of niches via a complex canopy, landscape structure and high plant diversity. This may be especially important to the three species of special conservation status and with limited ranges that are among the residents: Abert's Towhee, Common Ground Dove, and Gila Woodpecker.

The results of this study demonstrate that a different suite of species use woody riparian habitats in winter than in summer and ignoring some of their specific habitat needs, such as fruit and nut bearing trees, and tree cavities may result in population declines on their wintering grounds. Future research in this site should emphasize the relationships of bird diversity to specific vegetation characteristics such as plant type, patch structure, vegetation community composition and structure, and canopy height. In addition, monitoring avian productivity in the different aged stands and patch types may identify source-sink dynamics. Species-specific research is also needed regarding Gila Woodpecker cavity excavation to determine if they act as primary or secondary cavity nesters in this ecosystem. This would help determine if they depend on other species for construction of nest sites in this region (a potentially limiting factor) or if they excavate their own nests where the substrate is mature and large enough to support a cavity. The potential of this site to act as stopover habitat in spring and fall has yet to be evaluated. The high seasonal turnover of SD migrants indicates that effective conservation efforts for these species should include winter habitats. All of these projects will combine to better inform land managers and conservation workers of the seasonal specific conditions that impact avian populations and improve our ability to conserve avian diversity.

Notes

[i] All Latin names are provided in Table 1 with only common names used in the body of the text.

[ii] n = number of individuals

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