STATUS OF BREEDING RIPARIAN-OBLIGATE BIRDS IN SOUTHWESTERN RIVERINE SYSTEMS

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Ecological values of riparian habitats have received much attention over the past decade. One issue confronting management agencies is the effect of intensive water management on riparian vegetation in the Southwest (e.g., the decline of native vegetation and the increase of exotic Salt Cedar [*Tamarix chinensis*]; Table 1).

Many bird species have declined in number or suffered extirpation along these riparian systems as habitat changes have occurred (Table 2). We examine breeding birds obligated to riparian habitats and draw qualitative conclusions on their status throughout their range below 1524 m elevation (Phillips et al. 1964, Ohmart 1982, Ohmart and Anderson 1982). Trends are also described for species that are breeding riparian obligates in one or more riparian systems but use nonriparian habitats elsewhere. Species are reviewed with respect to historical status and present status, as well as to riparian habitat use within and among riparian systems. We compare Salt Cedar as breeding habitat with native habitats, both within and among riparian systems, present possible explanations for existing patterns, and review management implications.

METHODS

Data on breeding birds in riparian habitats are from our studies and from other published information. Sites of studies include the upper Verde River (1969-1972, Carothers et al. 1974), the lower Colorado River (1972-1984, Anderson and Ohmart 1984), the Rio Grande near Presidio, Texas (1977-1978, Engel-Wilson and Ohmart 1978), the lower Verde River (1980, Higgins and Ohmart 1981), the middle Pecos River (1979-1981, Hildebrandt and Ohmart 1982), the middle Rio Grande (1981-1983, Hink and Ohmart 1984), the lower Virgin River (1982-1983, Kasprzyk 1984), the upper Gila River (1978-1979 in mixed broadleaf habitats only, Clark 1984), the lower and upper Gila River (1985-1986, Hunter 1987), the lower San Pedro River (1985-1986, Hunter 1987), and the upper San Pedro River (1986, Krueper and Corman unpubl.), the lower Salt, lower Santa Cruz, and middle Gila rivers (Rea 1983), the Colorado River through the Grand Canyon (Brown et al. 1981), and the upper Santa Cruz River (Arnold 1940). Climatic differences among riparian systems may have an important effect on a species' use of riparian habitat. We divided study sites into low-elevation (below 427 m) and high-elevation (427 m-1524 m) groups to investigate climatic effects on habitat use.

Bird species were grouped by four criteria: (1) dependence on broadleaf habitats (obligate, partial obligate, generalist); (2) type of nest (open, covered, cavity); (3) residency (permanent resident or summer visitor); and (4) period of peak egg laying (spring-early summer or midsummer).

Dependence on broadleaf riparian was determined from field studies. Nest type and residency status are drawn from the literature or personal observations. Peak egg-laying periods are primarily from Bent (1963-1968).

RESULTS

Broadleaf Obligates

Seventeen of the 32 riparian-dependent species are broadleaf obligates (Table 3). Two major groups within the 17 species are large raptors (seven species) and cavity nesters (seven species).

Broadfleaf-obligate raptors require tall, large trees for nest placement. Mature broadleaf trees constitute the most important raptor nest sites in riparian systems. Honey Mesquite (*Prosopis glandulosa*) and Salt Cedar are rarely used for nest platforms. The Mississippi Kite (*Ictinia mississippiensis*) requires

Table 1 Area Encompassed by Riparian Habitats along Each River Reach[a]

Elevation/river reach	Hectares/habitat type[b]						Total ha
	CW	SM	HM	SC	SH	MB	
Low (<427 m)							
Colorado	3,417	9,799	5,652	15,638	3,826		38,382
Gila	330		4,985	22,493	2,162		29,970
Salt	228			49			277
Santa Cruz	18		1,665	46			1,729
Subtotal	3,993	9,799	12,302	38,276	5,988		70,358
Percentage	5.7	13.9	17.5	54.4	8.5		
High (427-1524 m)							
Virgin	70			3,211			3,281
Grand Canyon	109		600	901			1,610
Gila	442		5,771	7,281	462		13,956
Salt	388		1,278	542	123	54	2,385
Santa Cruz	270		4,033				4,303
Lower San Pedro	490		2,976	715			4,181
Upper San Pedro	804		4,728	307			5,839
Lower Verde	2,309		2,426				4,735
Upper Verde	1,244		1,105			505	1,610
Lower Rio Grande	60	25	3,029	5,600			8,714
Middle Pecos	834		215	11,295			12,344
Subtotal	6,950	25	26,161	26,641	585	559	62,958
Percentage	10.9	0.0	40.7	46.5	0.9	0.9	

[a]From Ohmart (1982) except for the Pecos River (Hildebrandt and Ohmart 1982) and the lower Rio Grande (Engel-Wilson and Ohmart 1978).

[b]CW, cottonwood-willow; SM, Screwbean Mesquite; HM, Honey Mesquite; SC, Salt Cedar; SH, Salt Cedar-Honey Mesquite; MB, mixed broadleaf.

Table 2 Riparian Birds That Have Declined or Been Extirpated in the Southwest since 1900[a]

	River system and reach																	
	Colorado			Gila		Santa Cruz		Salt		San Pedro		Verde		Rio Grande		Middle	Total	Total
Species	L	GC	Virgin	L	U	L	U	L	U	L	U	L	U	L	M	Pecos	D and E	P
Cooper's Hawk	E			E	P	E	P		P	P	P	P	P		P		3	8
Zone-tailed Hawk	E				P		P		P	P	P	P	P				1	7
Common Black-Hawk			P		P		E	E	P	P	E	P	P		P		3	7
Harris' Hawk	E			E		E	P	E	P	P	P	P		P	P	P	4	8
Yellow-billed Cuckoo	D	P[b]	P	D	P	D	P	D	P	P	P	P	P	P	P	P	4	12
Elf Owl	D			D	P	D	P	D	P	P	P	P	P				4	7
Ferruginous Pygmy-Owl				E	E	E	P	E	E	P		E					6	2
Gila Woodpecker	D		P	P	P	P	P	P	P	P	P	P	P				1	11
Northern (Gilded) Flicker	D		P	P	P	P	P	P	P	P	P	P	P				1	11
Brown-crested Flycatcher	P	P[b]	P	E	P	E	P	E	P	P	P	P	P				3	10
Vermilion Flycatcher	D		P	E	P	E	P	E	P	P	P	P	P	P		P	4	10
Willow Flycatcher	E	P	E		P		E	E	E	P	D	E	E	E	D		10	3
Bell's Vireo	D	P	P	D	P	E	P	D-E	P	P	P	P	P	P			4	10
Yellow Warbler	E	P	P	E	P	E	P	E	P	P	P	P	P	E	P		5	10
Summer Tanager	D	P	P	E	P	E	P	E	P	P	P	P	P	P	P	P	4	12
Hooded Oriole	P	P	P	E	P	E	P	E	P	P	P	P	P	P			3	11
Yellow-breasted Chat	P	P	P	D	P	E	P	D	P	P	P	P	P	P	P	P	3	13
Total D and E	12	0	1	12	1	12	2	13	2	0	2	2	1	2	0	0		
Total P	3	8	11	2	15	2	15	2	15	17	14	15	14	7	8	5		

[a]D, declining; E, extirpated; P, still present in stable numbers; L, lower reach; M, middle reach; U, upper reach; GC, Grand Canyon.
[b]Status unclear.

an understory of Salt Cedar to provide one of its primary foods, the cicada (*Diceroprocta apache*; Glinski and Ohmart 1983). Besides this special case, no raptor extensively uses Salt Cedar anywhere in the Southwest. Breeding Cooper's Hawks (*Accipiter cooperii*) and Harris' Hawks (*Parabuteo unicinctus*) have been extirpated from the lower Colorado River and adjacent tributaries, while the Common Black-Hawk (*Buteogallus anthracinus*) has disappeared from the upper Santa Cruz and upper San Pedro rivers (Table 2).

Cavity-nesting species are locally obligated to riparian vegetation, and when so, are also obligated to broadleaf trees. In areas where Saguaro cacti (*Carnegiea gigantea*) do not occur, the Elf Owl (*Micrathene whitneyi*), Gila Woodpecker (*Melanerpes uropygialis*), Northern (Gilded) Flicker (*Colaptes auratus*), and Brown-crested Flycatcher (*Myiarchus tyrannulus*) are broadleaf obligates. The Elf Owl has declined to very low population levels along the lower Colorado River (Cardiff 1978); declines have also been noted on the lower Gila, lower Salt, and lower Santa Cruz rivers (Rea 1983). The status of the Ferruginous Pygmy-Owl (*Glaucidium brasilianum*) remains an enigma as this species has declined significantly since the late 1800s (Rea 1983). Cavity-nesting species are not known to occur in or regularly use Salt Cedar anywhere in the Southwest.

Remaining broadleaf obligates are the Rose-throated Becard (*Pachyramphus aglaiae*), Thick-billed Kingbird (*Tyrannus crassirostris*), and Northern Beardless Tyrannulet (*Camptostoma imberbe*). All are primarily tropical in distribution and occur locally along riparian systems in southeastern Arizona at the northern edge of their range.

In summary, all but two broadleaf obligate species (Thick-billed Kingbird and Northern Beardless Tyrannulet), require tall and mature broadleaf trees for nest sites whether for huge basket, large platform, or cavity nests. Honey Mesquite and Salt Cedar rarely grow tall enough to become suitable nest sites for these species.

Partial Broadleaf Obligates

Nine of the 32 species are broadleaf obligates in some areas but not in others (Table 3). All are broadleaf obligates in low-elevation river systems but nest in Salt Cedar and/or Honey Mesquite along high-elevation riparian systems.

The seven summer-visiting, midsummer-breeding builders of open nests were all found to nest in Salt Cedar in higher-elevation riparian systems but not at lower elevations. Four species—Yellow-billed Cuckoo (*Coccyzus americanus*), Bell's Vireo (*Vireo bellii*), Yellow-breasted Chat (*Icteria virens*), and Summer Tanager (*Piranga rubra*)—also use Honey Mesquite habitats along high-elevation river systems. Willow Flycatcher (*Empidonax traillii*) and Yellow Warbler (*Dendroica petechia*) have been extirpated from all low-elevation sites and some high-elevation sites.

Broadleaf habitats are required for the existence of all these species in low-elevation river systems. In high-elevation river systems, all of these species use Salt Cedar and/or Honey Mesquite as well as broadleaf habitats. All species in this category have declined at lower elevations but retain healthier populations at high elevations.

Riparian Generalists

Six of the 32 riparian-obligate species are riparian generalists throughout the Southwest (Table 3). These species use most, if not all, riparian habitats in all river systems. The Northern Cardinal (*Cardinalis cardinalis*) is very rare on the lower Colorado River but occurs in all riparian habitats from Gila Bend, Arizona, eastward. Blue Grosbeak (*Guiraca caerulea*) is the only midsummer-breeding riparian-obligate species to occur in Salt Cedar throughout the Southwest. Broadleaf habitats are not required for the occurrence of any of these species in the Southwest, nor are any declining within their range.

Characteristics of Broadleaf Obligates and Salt Cedar Users

All riparian-obligated raptors and cavity nesters at both low and high elevations are broadleaf obligates. However, more raptor and cavity-nesting species are found on high-elevation river systems. Differences in species composition of the broadlead riparian obligates between low and high elevations are in the number of raptor and cavity-nesting species vs. the number of partial broadleaf obligates (Table 4). The number of species using Salt Cedar at low vs. high elevations differs only in the number of midsummer-breeding summer visitors that build open nests. Six of the eight species in this category use Salt Cedar at high elevations but are broadleaf obligates at low elevations.

DISCUSSION

The Importance of Broadleaf Riparian Vegetation

Broadleaf trees within riparian systems provide secure, suitable nest platforms for raptors. Woodpeckers excavate the large dead, softwood limbs, and these cavities are subsequently used by other species. Where Saguaro cacti are absent, broadleaf trees are apparently vital to these species.

Dependence of midsummer breeders on broadleaf riparian is more difficult to explain. Some species may be adversely affected by the extremely high summer temperatures at low elevations outside the structurally complex mature broadleaf forests. Temperature stress may affect survival of eggs during midsummer. The upper physiological limit for embryo life is 43°C (Walsberg and Voss-Roberts 1983). This limit is exceeded on over 25% of all days at elevations below 427 m (Hunter 1987). This stress rarely exists above 427 m elevation, where all midsummer breeders expand into habitats other than broadleaf riparian. Thus, nest-site selection appears to be a very important determinant in the breadth of habitat use among these species in southwestern riparian systems.

Management of Riparian Obligate Species

Management of southwestern riparian birds has often centered on the few Federally and state listed endangered and threatened species. The only terrestrial bird in the Southwest that is Federally listed as an endangered species is the Bald Eagle (*Haliaeetus leucocephalus*). The Arizona race of the Bell's Vireo (*V.b. arizonae*) is no longer being considered for listing while the western population of the Yellow-billed Cuckoo (*C.a. occidentalis*) is presently being considered. California considers 16 of the riparian obligates as endangered,

Table 3 Riparian-Obligate Species and Their Life-History Characteristics

Broadleaf dependency/species	Nest type	Residency status[a]	Peak egg laying[b]	Locations of Salt Cedar use[c]		Habitats other than broadleaf used[d]
				LE	HE	
Obligate						
Bald Eagle	Open	PR	Sp-early Su	No	No	None
Mississippi Kite	Open	SV	Mid-Su	No	No	None
Cooper's Hawk[e]	Open	PR	Sp-early Su	No	No	None
Gray Hawk	Open	SV	Sp-early Su	No	No	None
Zone-tailed Hawk[e]	Open	SV	Sp-early Su	No	No	None
Common Black-Hawk	Open	SV	Sp-early Su	No	No	None
Harris' Hawk[e]	Open	PR	Sp-early Su	No	No	None
Elf Owl[e,f]	Cavity	SV	Sp-early Su	No	No	None
Ferruginous Pygmy-Owl[e,f]	Cavity	PR	Sp-early Su	No	No	None
Gila Woodpecker[e,f]	Cavity	PR	Sp-early Su	No	No	None
Northern (Gilded) Flicker[e,f]	Cavity	PR	Sp-early Su	No	No	None
Thick-billed Kingbird	Open	SV	Mid-Su	No	No	None
Brown-crested Flycatcher[e,f]	Cavity	SV	Mid-Su	No	No	None
Rose-throated Becard	Covered	SV	Mid-Su	No	No	None
Northern Beardless Tyrannulet	Covered	PR	Mid-Su	No	No	None
Bridled Titmouse[e]	Cavity	PR	Sp-early Su	No	No	None
White-breasted Nuthatch[e]	Cavity	PR	Sp-early Su	No	No	None
Partial Obligate						
Yellow-billed Cuckoo	Open	SV	Mid-Su	No	Yes	SC, HM
Tropical Kingbird	Open	SV	Mid-Su	No	Yes	SC
Vermilion Flycatcher[e]	Open	PR	Sp-early Su	No	No	HM
Willow Flycatcher	Open	SV	Mid-Su	No	Yes	SC
Bell's Vireo	Open	SV	Mid-Su	No	Yes	SC, HM
Yellow Warbler	Open	SV	Mid-Su	No	Yes	SC
Yellow-breasted Chat	Open	SV	Mid-Su	No	Yes	SC, HM
Hooded Oriole	Covered	SV	Mid-Su	No	No	HM
Summer Tanager	Open	SV	Mid-Su	No	Yes	SC, HM
Generalists						
Crissal Thrasher[e]	Open	PR	Sp-early Su	Yes	Yes	SM,SC,HM
Lucy's Warbler	Covered	SV	Sp-early Su	Yes	Yes	SM,SC,HM
Northern Cardinal	Open	PR	Mid-Su	Yes	Yes	HM,SC
Blue Grosbeak	Open	SV	Mid-Su	Yes	Yes	SM,SC,HM
Abert's Towhee	Open	PR	Sp-early Su	Yes	Yes	SM,SC,HM
Northern Oriole	Covered	SV	Sp-early Su	Yes	Yes	SM,SC,HM

[a]PR, permanent resident; SV, summer visitor.
[b]Sp, spring; Su, summer.
[c]LE, low elevation (<427 m); HE, high elevation (427-1524 m).
[d]Vegetation abbreviations as in Table 1.
[e]Locally obligated to riparian.
[f]These species may construct or use cavities in very large mesquites, but primarily use soft-wood riparian trees.

Table 4 Numbers of Broadleaf Obligates and Salt-Cedar-Using Species Compared by Life-History Characteristics between Low (L) and High (H) Elevations

	Permanent resident Sp-early Su		Summer visitor Sp-early Su		Permanent resident Mid-Su		Summer visitor Mid-Su		Total	
Nest type	L	H	L	H	L	H	L	H	L	H
Broadleaf obligates										
Open	4(3)*	3(3)	0	3(3)			6	2(1)	10(3)	8(7)
Cavity	2	5	1	0			1	1	4	6
Covered					0	1	1	1	1	2
Total	6(3)	8(3)	1	3(3)	0	1	8	4(1)	15(3)	16(7)
Salt-Cedar users										
Open	2	2			1	1	1	8	4	11
Cavity										
Covered			2	2					2	2
Total	2	2	2	2	1	1	1	8	6	13

*Numbers within parentheses represent numbers of raptor species included in the totals.

threatened, or species of special concern. New Mexico lists four species of special concern along the upper Gila River. Arizona lists seven species as threatened native wildlife. An additional seven species have declined from at least half of their historical range in Arizona. Finally, the Ferruginous Pygmy-Owl and Willow Flycatcher are not listed, though they have disappeared from most of their historical range in Arizona.

Despite the Federal listing of the Bald Eagle, this species does not greatly influence riparian habitat management where many bird species have declined or been extirpated. The greatest problem afflicting effective riparian management throughout the Southwest, especially at lower elevations, is the attention given to single species at the expense of an entire community of species that is in trouble.

The change in status of any single species is insufficient to indicate the loss of native riparian habitat regionwide. The Arizona Bell's Vireo has declined tremendously at lower elevations but remains common and has even spread at higher elevations (Brown et al. 1983). Listing throughout its range is therefore inappropriate, while listing of declining populations at lower elevations is needed. The same problem may apply to western populations of the Yellow-billed Cuckoo. The listing of Yellow-billed Cuckoo populations at low elevations, where they are declining, will not protect populations of cuckoos or other riparian birds at high elevations. Listing of any one species will not protect all other declining species of riparian birds in the Southwest. A radical change in orientation is needed, from the piecemeal approach of protecting single species (which is still essential) to protecting habitats. Native riparian systems must be protected for what they are—endangered ecosystems. Only by river system management can we effectively stem the decline of our riparian avifauna. The priority should be the return of healthy stands of broadleaf trees.

To maximize the growth of broadleaf trees, natural regeneration should be encouraged, large-scale revegetation efforts should be initiated, and Salt Cedar should be controlled. The need for mature broadleaf trees as nesting platforms and for cavity excavation is unequivocal; in addition, mature and structurally complex stands of broadleaf trees may also provide the thermal cover necessary for successful nesting of midsummer breeders at low elevations. The most effective management for riparian-obligate breeding species is to return the breeding habitat they require.

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