

Bird Migration Through Middle Rio Grande Riparian Forests, 1994 to 1997

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Abstract—Expanding human populations in the middle Rio Grande have increased demands on water, land, and other resources, potentially disrupting bird migration activities. From 1994 to 1997, a total of 26,350 birds of 157 species were banded and studied. Results include species composition, timing of migration, and habitat use. Recommendations for managers are included.

Although quantitative accounts of landbird migration along the middle Rio Grande riparian corridors in the literature are rare, the use of the Rio Grande as a migratory route by landbirds is an acknowledged behavior of southwestern birds (Yong and Finch 1997, Yong and others 1998, Finch and Yong *in press*). The availability of food, water, cover, resting sites and a suitable north-south route along the river provides potential stopover resources for neotropical migrants such as flycatchers, warblers, and vireos and short-distance migrants such as many sparrow species. Expanding human populations in the middle Rio Grande have placed increasing demands on water, land, and other resources associated with riparian habitats. Water management, recreation, transportation, grazing, urban development, and invasion of exotic plant species alter these riparian habitats, potentially disrupting bird migration activities. How habitat changes have affected or will affect landbirds migrating through the middle Rio Grande is unclear (Finch and others 1995).

In spring 1994, we initiated a study to investigate the use of the middle Rio Grande riparian corridors as stopover habitat by neotropical and short-distance landbird migrants. This study is now in its fifth year. We have also been cooperating with Rio Grande Bird Research, Inc. by adding to and analyzing a 17-year (1981-1997) capture data set of migrating landbirds at the Rio Grande Nature Center in Albuquerque, New Mexico. The objective of this paper is to update our earlier reports (Finch and others 1995, Finch and Yong *in press*) on species composition, relative abundance, timing of migration, and general habitat use along the middle Rio Grande.

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Methods

Study Sites

Our study sites were located at the Bosque del Apache National Wildlife Refuge (N33° 48' and W106° 52'), Socorro, NM, and the Rio Grande Nature Center (N35° 07' and W106° 41'), Albuquerque NM (fig. 1). Data were collected in spring (early April through early June) and in fall (early August through early November) 1994-1997. The Rio Grande Nature Center site was not studied during the spring of 1997. Both sites contained older Fremont cottonwood (*Populus fremontii*) forests and some younger forests of cottonwood, Gooding willow (*Salix gooddingii*), Russian olive (*Elaeagnus angustifolia*) and salt cedar (*Tamarix pentandra*). Sites also contained agricultural fields and riparian edges of coyote willow (*Salix exigua*). The Bosque del Apache site also included a homogeneous stand of salt cedar. Vegetation structure, plant species composition and tree size were measured to compare habitat characteristics.

Mist Netting

Between 20 and 40 nylon mist-nets (12 x 2.6 meter with 30 mm and 36 mm mesh) were used at each site to capture (and recapture) landbird migrants. Each net was set up 15 minutes before official sunrise and closed 6 hours later. The birds were removed from the nets, identified, measured and released as quickly and safely as possible. For more information about netting and banding procedures at our sites, see Kelly and Finch (1999 in this volume) and Finch and Kelly (1999 in this volume).

Point Counts

Sixteen transects were established in the dominant vegetation types in these areas: agricultural field edges, cottonwood, screwbean mesquite (*Prosopis pubescens*), mixed cottonwood, salt cedar and coyote willow. Each transect was 1 kilometer long and had point count stations located at 200 meter intervals (6 stations per transect). Birds were counted for five minutes at each station and birds detected between stations were also recorded. Behaviors and habitat use by birds were also recorded.

Results and Discussion

Numbers of Species and Captures

We banded a total of 26,350 birds of 157 species from 1994-1997, of which 6,000 (22.7 percent) of these were recaptures (table 1). Fewer spring birds were banded (21 percent) than

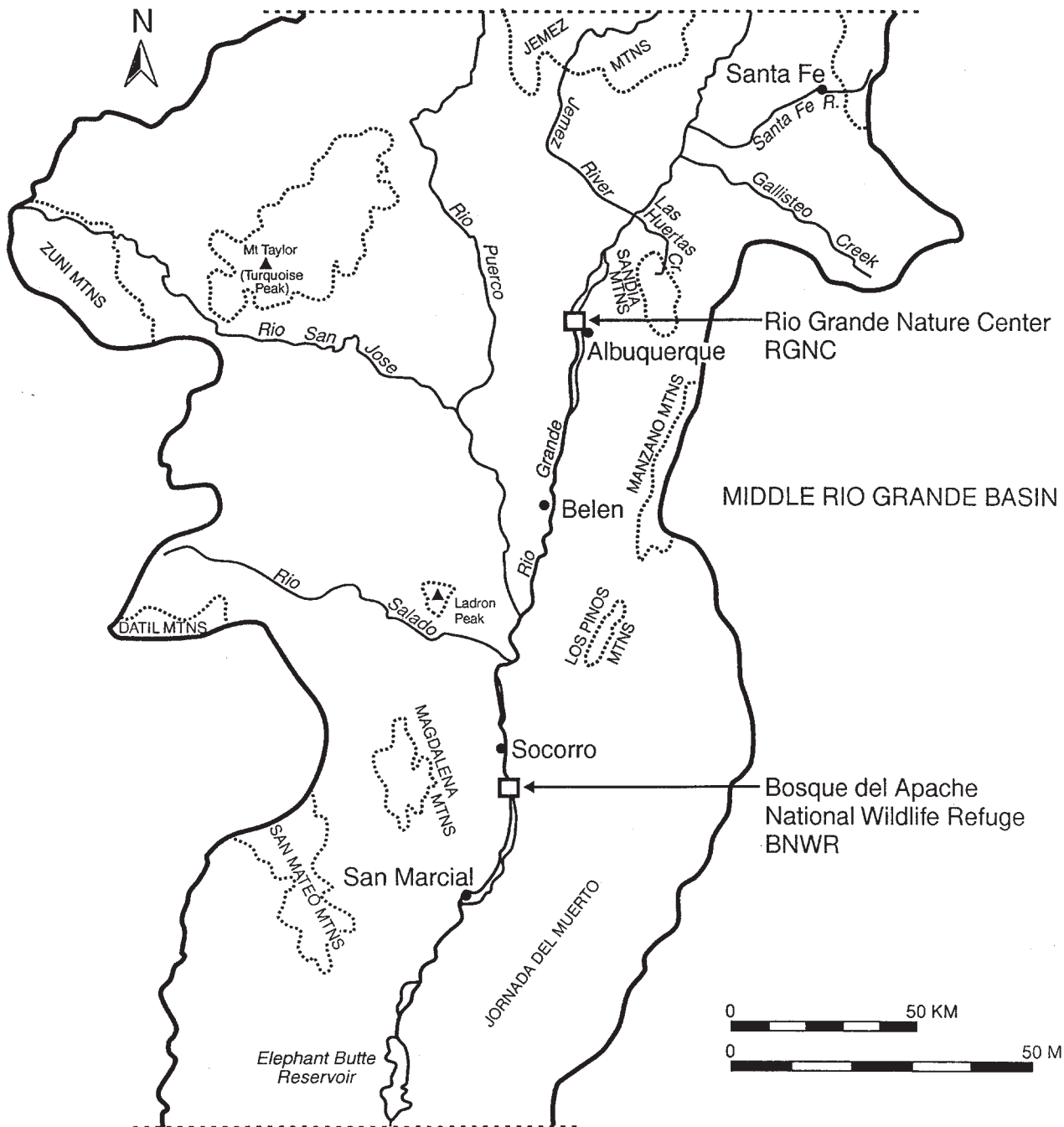


Figure 1—Study Sites: Bosque del Apache National Wildlife Refuge and Rio Grande Nature Center, NM.

fall birds (79 percent). This is because large numbers of hatch-year birds migrate south in the fall, increasing the number of fall captures. The majority of recaptures were resident breeders or winter residents. The most abundant neotropical migrants that return each year to breed at these sites were Common Yellowthroat (*Geothlypis trichas*), Blue Grosbeak (*Guiraca caerulea*), Black-Headed Grosbeak (*Pheucticus melanocephalus*) and Summer Tanager (*Piranga rubra*). The two most commonly recaptured short-distance migrants breeding in the areas were Spotted Towhee (*Pipilo erythrophthalmus*) and Bewick's Wren (*Thryomanes bewickii*).

We detected year-to-year fluctuations in species richness, numbers of captures, and age and sex ratios for our two sites. These fluctuations appeared to correspond to amounts of rainfall before and during the migration periods and may have influenced how concentrated migrants were relative to water sources. For example we have had much higher capture rates in drought years than wetter years. In addition, capture rates were generally higher at the Rio Grande Nature Center site in Albuquerque NM than at the Bosque del Apache. The Nature Center is surrounded by urban development whereas the Bosque del Apache is in a rural

Table 1—Total number of birds captured and banded, by family, at the Bosque del Apache National Wildlife Refuge and Rio Grande Nature Center from 1994 through 1997.^a

Common name	Family	Captures	Common name	Family	Captures
Sharp-shinned Hawk	Accipitridae	16.00	House Finch	Fringillidae	335.00
Red-tailed Hawk	Accipitridae	14.00	American Goldfinch	Fringillidae	297.00
Cooper's Hawk	Accipitridae	9.00	Cassin's Finch	Fringillidae	6.00
Swainson's Hawk	Accipitridae	5.00	Evening Grosbeak	Fringillidae	1.00
Ferruginous Hawk	Accipitridae	4.00	White-winged Crossbill	Fringillidae	1.00
Northern Harrier	Accipitridae	2.00	Barn Swallow	Hirundinidae	41.00
Common Bushtit	Aegithalidae	51.00	Northern Rough-winged Swallow	Hirundinidae	27.00
Belted Kingfisher	Alcedinidae	8.00	Bank Swallow	Hirundinidae	1.00
Common Nighthawk	Caprimulgidae	1.00	Violet-green Swallow	Hirundinidae	1.00
Lazuli Bunting	Cardinalidae	635.00	Red-winged Blackbird	Icteridae	255.00
Blue Grosbeak	Cardinalidae	512.00	Bullock's Oriole	Icteridae	87.00
Black-headed Grosbeak	Cardinalidae	366.00	Brown-headed Cowbird	Icteridae	55.00
Indigo Bunting	Cardinalidae	36.00	Great-tailed Grackle	Icteridae	17.00
Lark Bunting	Cardinalidae	14.00	Yellow-headed Blackbird	Icteridae	14.00
Painted Bunting	Cardinalidae	6.00	Western Meadowlark	Icteridae	9.00
Pyrrhuloxia	Cardinalidae	4.00	Common Grackle	Icterida	8.00
Rose-Breasted Grossbeak	Cardinalidae	3.00	Orchard Oriole	Icteridae	3.00
Dicksissel	Cardinalidae	2.00	Northern Mockingbird	Mimidae	22.00
Brown Creeper	Certhiidae	29.00	Gray Catbird	Mimidae	18.00
Killdeer	Charadriidae	7.00	Brown Thrasher	Mimidae	1.00
Mourning Dove	Columbidae	47.00	Crissal Thrasher	Mimidae	1.00
White-winged Dove	Columbidae	3.00	Sage Thrasher	Mimidae	1.00
Common Ground Dove	Columbidae	1.00	Mountain Chickadee	Paridae	41.00
Chihuahuan Raven	Corvidae	24.00	Black-capped Chickadee	Paridae	31.00
Scrub Jay	Corvidae	24.00	Plain Titmouse	Paridae	1.00
Western Scrub Jay	Corvidae	3.00	Wilson's Warbler	Parulidae	3771.00
American Crow	Corvidae	1.00	MacGillivray's Warbler	Parulidae	1372.00
Yellow-billed Cuckoo	Cuculidae	16.00	Orange-crowned Warbler	Parulidae	871.00
Greater Roadrunner	Cuculidae	7.00	Audubon's Warbler	Parulidae	822.00
Chipping Sparrow	Emberizidae	2722.00	Yellow Warbler	Parulidae	572.00
Gambel's White-crowned Sparrow	Emberizidae	1660.00	Common Yellowthroat	Parulidae	279.00
Oregon Junco	Emberizidae	779.00	Virginia's Warbler	Parulidae	265.00
Lark Sparrow	Emberizidae	576.00	Yellow-breasted Chat	Parulidae	73.00
Brewer's Sparrow	Emberizidae	557.00	Myrtle Warbler	Parulidae	60.00
Song Sparrow	Emberizidae	468.00	Northern Waterthrush	Parulidae	37.00
Lincoln's Sparrow	Emberizidae	464.00	Townsend's Warbler	Parulidae	17.00
Mountain White-crowned Sparrow	Emberizidae	405.00	Ovenbird	Parulidae	15.00
Savannah Sparrow	Emberizidae	317.00	Nashville Warbler	Parulidae	10.00
Spotted Towhee	Emberizidae	297.00	Lucy's Warbler	Parulidae	8.00
Vesper Sparrow	Emberizidae	251.00	American Redstart	Parulidae	5.00
Green-tailed Towhee	Emberizidae	241.00	Black-throated Gray Warbler	Parulidae	5.00
Clay-colored Sparrow	Emberizidae	213.00	Black-and-white Warbler	Parulidae	4.00
Gray-headed Junco	Emberizidae	168.00	Prothonotary Warbler	Parulidae	4.00
White-crowned Sparrow	Emberizidae	58.00	Hooded Warbler	Parulidae	3.00
White-throated Sparrow	Emberizidae	15.00	Kentucky Warbler	Parulidae	3.00
American Tree Sparrow	Emberizidae	6.00	Magnolia Warbler	Parulidae	3.00
Canyon Towhee	Emberizidae	6.00	Blue-winged Warbler	Parulidae	2.00
Black-throated Sparrow	Emberizidae	4.00	Chestnut-sided Warbler	Parulidae	2.00
Dark-eyed Junco	Emberizidae	3.00	Golden-winged Warbler	Parulidae	2.00
Grasshopper Sparrow	Emberizidae	3.00	Yellow-rumped Warbler	Parulidae	2.00
Sage Sparrow	Emberizidae	3.00	Bay-breasted Warbler	Parulidae	1.00
Slate-colored Junco	Emberizidae	3.00	Black-throated Blue Warbler	Parulidae	1.00
Swamp Sparrow	Emberizidae	3.00	Blackburnian Warbler	Parulidae	1.00
Golden-crowned Sparrow	Emberizidae	2.00	Canada Warbler	Parulidae	1.00
Cassin's Sparrow	Emberizidae	1.00	Lawrence's Warbler	Parulidae	1.00
Fox Sparrow	Emberizidae	1.00	Mourning Warbler	Parulidae	1.00
Harris' Sparrow	Emberizidae	1.00	Prairie Warbler	Parulidae	1.00
American Kestrel	Falconidae	50.00	Tennessee Warbler	Parulidae	1.00
Prairie Falcon	Falconidae	1.00	Western Palm Warbler	Parulidae	1.00
Pine Siskin	Fringillidae	1687.00	House Sparrow	Passeridae	60.00
Lesser Goldfinch	Fringillidae	397.00	Red-shafted Flicker	Picidae	52.00

(con.)

Table 1 (Con.)

Common name	Family	Captures
Downy Woodpecker	Picidae	22.00
Red-naped Sapsucker	Picidae	11.00
Hairy Woodpecker	Picidae	8.00
Ladder-backed Woodpecker	Picidae	6.00
Williamson's Sapsucker	Picidae	2.00
Northern Flicker	Picidae	1.00
Northern Flicker Intergrade	Picidae	1.00
Ruby-crowned Kinglet	Regulidae	787.00
Golden-crowned Kinglet	Regulidae	6.00
Verdin	Remizidae	6.00
White-breasted Nuthatch	Sittidae	24.00
Red-breasted Nuthatch	Sittidae	13.00
Burrowing Owl	Strigidae	8.00
Great Horned Owl	Strigidae	8.00
Western Screech-owl	Strigidae	7.00
Flammulated Owl	Strigidae	2.00
European Starling	Sturnidae	5.00
Blue-gray Gnatcatcher	Sylviidae	14.00
Western Tanager	Thraupidae	144.00
Summer Tanager	Thraupidae	118.00
Hepatic Tanager	Thraupidae	4.00
Scarlet Tanager	Thraupidae	1.00
Black-chinned Hummingbird	Trochilidae	4.00
Rufous Hummingbird	Trochilidae	1.00
Bewick's Wren	Troglodytidae	198.00
House Wren	Troglodytidae	161.00
Marsh Wren	Troglodytidae	11.00
Cactus Wren	Troglodytidae	2.00
Rock Wren	Troglodytidae	2.00
Carolina Wren	Troglodytidae	1.00
Winter Wren	Troglodytidae	1.00
American Robin	Turdidae	307.00
Hermit Thrush	Turdidae	259.00
Swainson's Thrush	Turdidae	12.00
Townsend's Solitaire	Turdidae	4.00
Dusky Flycatcher	Tyrannidae	436.00
Willow Flycatcher	Tyrannidae	255.00
Western Wood-Pewee	Tyrannidae	225.00
Western Flycatcher	Tyrannidae	77.00
Gray Flycatcher	Tyrannidae	73.00
Black Phoebe	Tyrannidae	67.00
Ash-throated Flycatcher	Tyrannidae	48.00
Western Kingbird	Tyrannidae	42.00
Hammond's Flycatcher	Tyrannidae	41.00
Say's Phoebe	Tyrannidae	12.00
Olive-sided Flycatcher	Tyrannidae	10.00
Brown-crested Flycatcher	Tyrannidae	5.00
Least Flycatcher	Tyrannidae	4.00
Common Barn-owl	Tytonidae	15.00
Warbling Vireo	Vireonidae	259.00
Solitary Vireo	Vireonidae	67.00
Gray Vireo	Vireonidae	2.00
Red-eyed Vireo	Vireonidae	2.00
Bell's Vireo	Vireonidae	1.00
Yellow-throated Vireo	Vireonidae	1.00

^aSee Kelly and Finch (this volume) for scientific names of bird species and for summaries of mist-netting standardized by number of netting hours.

setting. Urban development may narrow the corridor width available to migrants, causing them to concentrate as they funnel through a narrower band of vegetation at the Nature Center than at the Bosque del Apache. Annual fluctuations in numbers of juvenile birds also influenced overall numbers of captures.

Species Composition

A total of 272 species were detected using both mist-netting and point counts. Of those, 222 species were landbirds and the remainder were waterbirds and shorebirds. Of the landbirds, 98 species were neotropical migrants (44.4 percent); 107 species were short-distance migrants (48.2 percent); 6 were crossborder breeders (2.7 percent) and 11 species were year-round residents (5.0 percent). Many of the short-distance migrants were winter residents at our study sites.

Number of Species by Family

Of the 157 species of landbirds banded, 64 species (40.8 percent) and 22,400 individuals (84.9 percent) were common; 52 species (33.1 percent) and 4,100 individuals (15.6 percent) were uncommon and 41 species (26.1 percent) and 117 individuals (0.4 percent) were rare in New Mexico (table 1). The Family Parulidae (warblers) had the most species captured (32) followed by the family Emberizidae (sparrows, grosbeaks, blackbirds) with 26 species. The third most dominant family, Tyrannidae (flycatchers) had 13 species captured. Species with over 1,000 individuals captured were the Wilson's Warbler (*Wilsonia pusilla*), Chipping Sparrow (*Spizella passerina*), White-crowned Sparrow (*Zonotrichia leucophrys*), Pine Siskin (*Carduelis pinus*) and MacGillivray's Warbler (*Oporornis tolmiei*) (table 1). For capture rates of individual species standardized by constant mist-netting effort, see Kelly and Finch (1999 in this volume).

Timing of Migration

Spring migration occurred primarily during the middle of April through the end of May with a core period of 5 weeks. Average captures/day at each site showed little fluctuation by week within the core period (fig. 2). The mean number of captures at the Nature Center from 1994-1997 tended to be higher than at the Bosque del Apache in early spring. The peak period of spring migration was about a week later at the Nature Center which is 150 km north of the Bosque del Apache.

Fall migration was more prolonged than spring migration (fig. 2). Mean number of captures peaked during the first 2 weeks of September at both sites. The mean number of captures from 1994-1997 was lower in fall at the Bosque del Apache NWR than at the Rio Grande Nature Center. The Nature Center had small fields containing nutritional crops (sunflower and corn) that were located within and near the mist-netting study area. This may have influenced capture rates at the Nature Center by drawing more birds into the vicinity than at the Bosque del Apache.

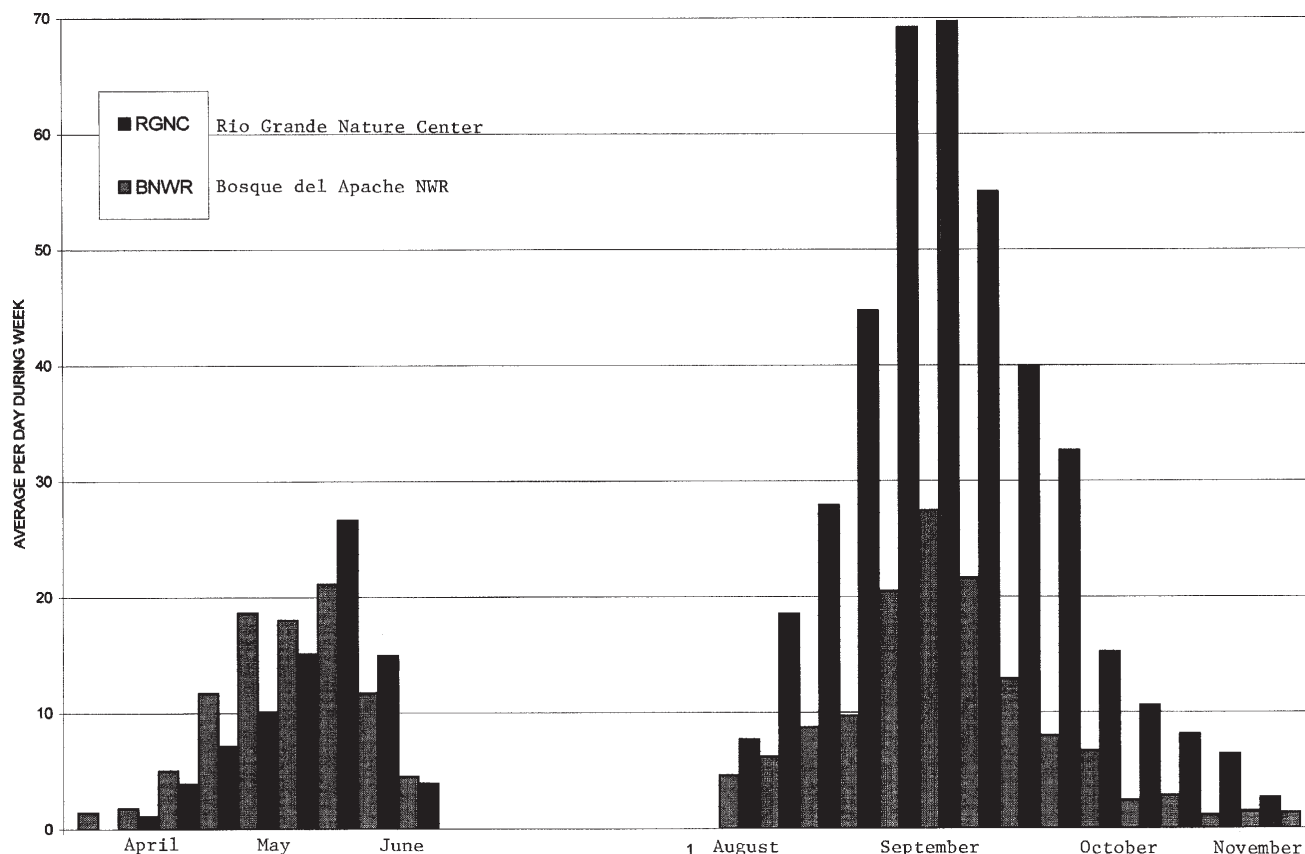


Figure 2—Weekly averages of Neotropical migrant bird captures at the Bosque del Apache NWR and the Rio Grande Nature Center Spring and Fall 1994-1997.

Habitat Use

Results of point counts in different dominant vegetation types suggested differential use of habitats by migrating species. More birds were detected in agricultural-edge habitats than in other habitats, particularly in the fall when the crops had matured. Second highest bird counts were in the two cottonwood habitat types (fig. 3). Birds were counted more frequently in willow habitat in spring than in fall.

Point count results differed from netting results in terms of species dominance patterns. We suggest that counts in open habitats (agricultural edge and cottonwood) may over-represent open-habitat species whereas counts in denser habitat (willow) may under-represent shrub bird species. For example, small, quiet passerines that stop in dense willow thickets during migration may not be readily heard or seen during point count sessions but may be detected through netting efforts. Also, birds and nets are more visible in open habitats than in closed habitats, and presumably therefore, more birds may be detected by sight in open habitats during point counts than at nets which, if easily seen, will be avoided.

Many migrants stayed at sites to breed. We have many records of individual birds returning year after year to the same areas to breed. Also, at the start of spring season and

the end of fall season, we encountered many birds that winter at the sites. Stopover times for most of the migrants were limited to one or two days except for the winter residents and resident breeders. Because stopover times were short and low numbers of neotropical migrants were recaptured, it is difficult to determine the underlying basis for stopover habitat selection (i.e., habitat structure, food supply, presence of water). Nevertheless, it was clear that certain species were observed or captured more often in some habitats than in others. For example, the Wilson's Warbler, a very abundant species, was most frequently caught or counted in willow habitats each year even though willow is less common at our sites than many other habitats, suggesting that Wilson's Warbler preferentially selected willow during stopover.

Habitats at our study sites have not been altered during our period of study except for willow which is periodically mowed along irrigation ditches and water conveyance channels (see Kelly and Finch 1999 in this volume). Given that willow habitat is used by many migrants, we suggest that managers evaluate their mowing designs to determine if mowing is really needed, and if so, whether the schedule or protocol can be modified to allow willows to grow high enough to enhance bird use.

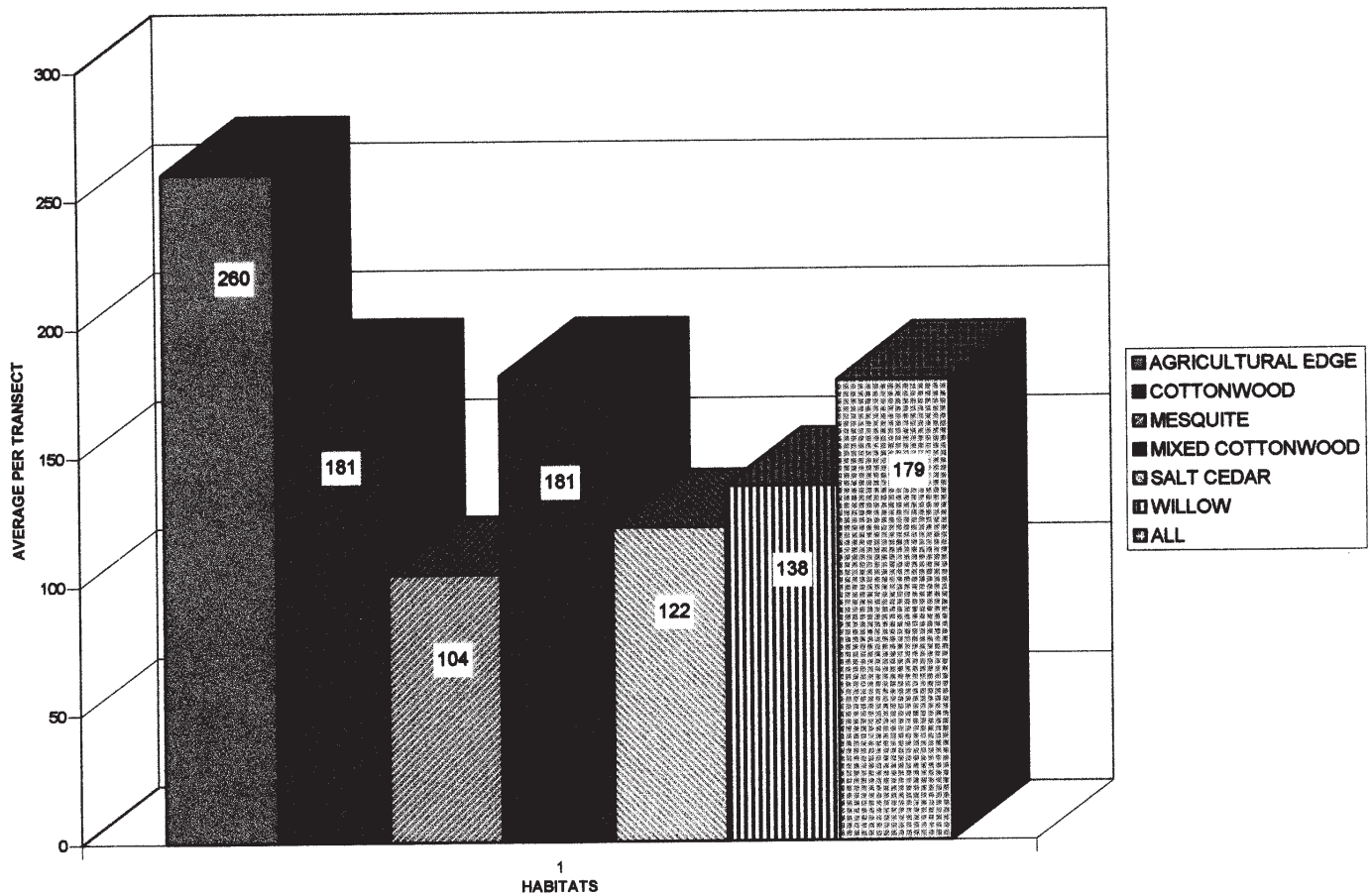


Figure 3—Use of habitats during spring and fall migration in the middle Rio Grande Riparian Corridor 1994-1997.

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