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ABSTRACT

Human alteration of river flows in the Platte River has resulted in the development of riparian woodlands and shrublands in many reaches of the river in central Nebraska. Although these changes have had negative impacts on some migratory birds (e.g., cranes), the changes have likely benefited many woodland and shrubland birds. Little is known about the importance of these habitats to songbirds. In 1998 - 2001, I established a banding station in a woodland along the Platte River in Hall County, Nebraska, to capture breeding birds and spring and fall migrants. During the breeding season, I banded 1,190 birds from 46 species. Commonly banded breeding birds included American Goldfinch, Gray Catbird, House Wren, and Common Yellowthroat. Productivity (20%), as reflected in number of hatch-year (HY) birds captured, and recruitment (<3%), as reflected in number of recaptures that were banded as HY birds, were relatively low at the banding station, suggesting that these habitats may be functioning as sink habitats. During migration, I banded 346 birds from 20 migrants. Commonly banded migrants included Lincoln's Sparrow, Dark-eyed Junco, Orange-crowned Warbler, and Harris's Sparrow. Twelve of the 13 recaptured migrants exhibited weight loss during their stopover, suggesting that these habitats may provide poor stopover habitats. To better understand the importance of these riparian habitats to breeding and migrant birds, future research should focus on establishing long-term, constant-effort mist net stations in these habitats.

INTRODUCTION

The Platte River in central Nebraska has undergone dramatic hydrologic and morphologic changes due to altered river flows created by dams and diversion projects (Johnson 1994, Currier 1997). One consequence of the alteration of river flows has been the development of riparian woodlands and shrublands in reaches of the river that were once unvegetated, wide channels of shifting alluvial sand (Johnson 1994, Currier 1997). These habitat changes in the Platte River have had a negative impact on some migratory species that rely on the river during at least a portion of their annual cycle. For example, Whooping Cranes (*Grus americana*) and Sandhill Cranes (*G. canadensis*), which rely on the Platte River for nocturnal roosting, have abandoned many reaches of the river because of encroachment of riparian vegetation on the river and narrowing of river channels (U.S. Fish and Wildlife Service 1981, Krapu et al. 1984, Faanes and LeValley 1993). In contrast, woodland and shrubland birds have likely benefited from the expansion of riparian vegetation along the Platte River. These riparian habitats provide habitat for a diverse group of birds (Colt 1997, Davis 2005). In fact, as many as 56 breeding species may occur in these habitats (Davis 2005). However, little is known about the demographics (e.g., productivity, survivorship, recruitment, age ratios) of these breeding bird communities. Moreover, no data exist on the stopover ecology of migrant birds in these habitats. Unfortunately, development of sound conservation and management strategies for these habitats is hampered by this lack of information. Therefore, the goal of this study was to document demographic patterns in the breeding bird community and to evaluate the importance of these riparian woodlands as stopover habitat for migrant birds.

METHODS

Study site. —The banding station was located in a riparian woodland along the Platte River in Hall County in central Nebraska (40° 47' N, 98° 28' W). The width of the woodland community at the station ranged from 50 to 100 m. The entire area of the banding station was approximately 1 ha. The surrounding landscape was predominantly lowland grassland. Tree species occurring at the station included eastern cottonwood (*Populus deltoides*), red mulberry (*Morus rubra*), green ash (*Fraxinus pennsylvanica*), and eastern red cedar (*Juniperus virginiana*). Dominant shrub species at the station were rough-leaved dogwood (*Cornus drummondii*), western snowberry (*Symphoricarpos occidentalis*), sandbar willow (*Salix exigua*), eastern poison ivy (*Toxicodendron radicans*), desert false indigo (*Amorpha fruticosa*) and common pricklyash (*Zanthoxylum americanum*). Common ground cover species included poison hemlock (*Conium maculatum*), annual marshelder (*Iva annua*), common sunflower (*Helianthus annuus*), indiangrass (*Sorghastrum nutans*), switchgrass (*Panicum virgatum*), prairie cordgrass (*Spartina pectinata*), and big bluestem (*Andropogan gerardii*).

Mist netting. — I captured birds using 10 four-shelved mist nets (12 m long, 38-mm mesh) in 1998 and 1999 and 12 four-shelved mist nests in 2000 and 2001. I operated mist nets usually once a week from 27 May - 28 Oct 1998, 9 May - 5 Nov 1999, 19 Apr - 11 Nov 2000, and 26 Apr - 11 Jul 2001. However, depending on weather conditions and availability of personnel, I deviated from the weekly schedule on occasion. Due to these deviations, we banded birds an average of 5.7 d/mo (range 3 - 11 d/mo). I opened nets for approximately 4 h beginning 30 min before sunrise, except in the cases of precipitation, high winds, or extreme temperatures (>30° C). Nets were checked every 15 - 20 min or sooner when weather conditions threatened the health of the birds. We recorded the species, sex, age (after hatch-year [AHY] or hatch-year [HY]), and reproductive status of captured birds and banded each bird with a uniquely-numbered U.S. Geological Survey metal band. Males were characterized as breeding or nonbreeding by development of a cloacal protuberance, while females were characterized as breeding or nonbreeding by development of a brood patch (Pyle 1997, DeSante et al. 2000). I also recorded date, time of capture, and body mass (to nearest 0.1 g with an Ohaus electronic digital balance) for each captured bird. I used HY percentages as an index of reproductive success (Bollinger and Linder 1994). For spring and fall migrant birds (birds not captured during the breeding season and breeding range does not include central Nebraska), I re-examined the body mass of any recaptured individuals at least one day past initial capture to evaluate the role of riparian woodlands along the Platte River as stopover habitat for migrants. I estimated minimum stopover duration for recaptured migrants by subtracting the initial capture date from the last recapture date.

RESULTS

During the four years of the study, I captured a total of 1,740 birds over 4,315 net-hours (40.3 birds/ 100 nh). Of the 1,740 captured birds, 204 individuals (11.7%) were recaptured. Most (71.1%) of the recaptured birds were captured during the year of their initial capture. The most frequently recaptured birds were Gray Catbird (44 recaptures), American Goldfinch (34 recaptures), Common Yellowthroat (28 recaptures), and House Wren (18 recaptures).

Breeding birds. — I banded 1,190 individuals from 46 species during the breeding season (mid May - August). Of the 46 breeding species, 38 species are migratory and eight are year-round residents (breeding and wintering ranges overlap in central Nebraska) (Root 1988, Price et al. 1995). Of the migratory species, 66% are long-distance migrant species (i.e., Neotropical migrants) and 34% are short-distance migrant species (i.e., continental migrants). American Goldfinch was the most frequently captured bird during the breeding season followed by Gray Catbird, House Wren, Common Yellowthroat, Song Sparrow, and Yellow Warbler (Table 1). Thirteen species were recaptured during banding operations in subsequent years, with the Gray Catbird being the species most frequently captured in subsequent years (Table 2). Of these recaptured birds, 83% were captured in a subsequent year, while 15% of these recaptured birds were captured in two subsequent years. One male Orchard Oriole was recaptured in three subsequent years. Gray

Catbird, Black-capped Chickadee, Field Sparrow, and Song Sparrow were the most productive species at the banding station as reflected in the higher proportions of HY birds banded at the station for these species (Table 1). Recruitment, as reflected in the number of recaptures that were banded as HY birds, was relatively low at the banding station. The proportion of banded HY birds that were recaptured during banding operations in subsequent years ranged from a low of 0% for eight species to a high of 11% for Black-capped Chickadees (Table 1).

Table 1. Most common birds banded during breeding season in a riparian woodland along the Platte River in central Nebraska, 1998-2001. Recaptures include only those individuals that were recaptured in years following the year of their initial capture.

Species	Scientific Name	No. Banded	% HY	No. Recaptured	No. Recaptured Banded as HY
American Goldfinch	*Carduelis tristis*	175	18.3	9	0
Gray Catbird	*Dumetella carolinensis*	127	37.8	14	1
House Wren	*Troglodytes aedon*	121	28.1	7	2
Common Yellowthroat	*Geothlypis trichas*	101	26.7	7	0
Song Sparrow	*Melospiza melodia*	76	31.6	5	0
Yellow Warbler	*Dendroica petechia*	71	19.7	1	0
Willow Flycatcher	*Empidonax traillii*	66	4.5	0	0
Northern Cardinal	*Cardinalis cardinalis*	64	29.7	4	1
Field Sparrow	*Spizella pusilla*	40	32.5	1	1
American Robin	*Turdus migratorius*	33	0	0	0
Spotted Towhee	*Pipilo maculatus*	33	0	0	0
Black-capped Chickadee	*Poecile atricapillus*	27	33.3	5	1
Orchard Oriole	*Icterus spurius*	27	7.4	9	0
Baltimore Oriole	*Icterus galbula*	19	10.5	0	0
Least Flycatcher	*Empidonax minimus*	17	0	0	0
Bell's Vireo	*Vireo bellii*	17	0	0	0
Brown Thrasher	*Toxostoma rufum*	16	0	0	0
Warbling Vireo	*Vireo gilvus*	15	0	0	0
Eastern Towhee	*Pipilo erythrophthalmus*	13	0	1	0
Eastern Kingbird	*Tyrannus tyrannus*	12	0	0	0
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	12	0	0	0
Indigo Bunting	*Passerina cyanea*	11	0	0	0
Brown-headed Cowbird	*Molothrus ater*	11	0	2	0
Downy Woodpecker	*Picoides pubescens*	10	0	2	0
Cedar Waxwing	*Bombycilla cedrorum*	10	0	0	0

Table 2. Summary of breeding birds recaptured in the year(s) following the year of their initial capture in a riparian woodland along the Platte River in central Nebraska, 1998-2001. F=Female, M=Male, U=Unknown.

		No. Recaptured After		
Species	No. of Birds	1 Year	2 Years	3 Years
Gray Catbird	9 M, 3 F	8	4	0
American Goldfinch	3 F, 3 M	3	3	0
Orchard Oriole	3 M, 3 F	2	1	3
Common Yellowthroat	7 M	6	1	0
House Wren	5 M, 1 F	5	1	0
Black-capped Chickadee	2 U, 2 F	3	1	0
Song Sparrow	5M	5	0	0
Northern Cardinal	1 F, 2 M	2	1	0
Downy Woodpecker	2 M	2	0	0
Brown-headed Cowbird	1 F	2	0	0
Yellow Warbler	1 F	1	0	0
American Robin	1 F	1	0	0
Field Sparrow	1 F	2	0	0
Eastern Towhee	1 M	1	0	0

Table 3. Most common migrant birds banded in a riparian woodland along the Platte River in central Nebraska, 1998-2001. Minimum stopover duration (days ± SE) and mass change (g ± SE) for four species recaptured during spring and fall migration.

Species	Scientific Name	No. Banded	No. Recaptured	Minimum Stopover Duration	Mass Change
Lincoln's Sparrow	*Melospiza lincolnii*	67	5	3.4 ± 0.9	-0.82 ± 0.64
Dark-eyed Junco (Slate-colored)	*Junco hyemalis*	42	3	6.7 ± 8.1	-0.23 ± 0.73
Dark-eyed Junco (Oregon)	*Junco hyemalis*	41	0		
Orange-crowned Warbler	*Vermivora celata*	41	0		
Harris's Sparrow	*Zonotrichia querula*	39	4	9.8 ± 2.7	-0.15 ± 1.08
Swainson's Thrush	*Catharus ustulatus*	13	0		
White-throated Sparrow	*Zonotrichia albicollis*	13	0		
Yellow-rumped Warbler (Myrtle)	*Dendroica coronata*	12	0		
Ruby-crowned Kinglet	*Regulus calendula*	11	0		
Clay-colored Sparrow	*Spizella pallida*	10	0		
White-crowned Sparrow	*Zonotrichia leucophrys*	8	1	2.0	0.10
Wilson's Warbler	*Wilsonia pusilla*	7	0		
Nashville Warbler	*Vermivora ruficapilla*	6	0		

Migrant birds. — I banded 346 individuals from 20 migratory species during spring and fall migration. Dark-eyed Junco was the most frequently captured migrant, followed by Lincoln's Sparrow, Orange-crowned Warbler, and Harris's Sparrow (Table 3). No banded migrants were recaptured during banding operations in subsequent years, but four migrants (Lincoln's Sparrow, Harris's Sparrow, Dark-eyed Junco, and White-crowned Sparrow) were recaptured during the year of their initial capture. Three of these species (Lincoln's Sparrow, Harris's Sparrow, and Dark-eyed Junco) seemed to lose mass during their stopover at the banding station (Table 3). The minimum stopover duration for the four recaptured migrants ranged from 2 - 10 d.

DISCUSSION

Breeding birds. — Riparian woodlands along the Platte River provide habitat for a wide variety of breeding birds. In my study, I captured 46 breeding species that were predominantly composed of Neotropical migrants. In similar habitats along the Platte River, Colt (1997) reported observing 50 breeding species and Davis (2005) reported observing 56 breeding species. The lower number of breeding species recorded in my study may be related to some species (e.g., aerial or canopy-foraging species) being missed by mist netting (Rappole et al. 1998) and a more thorough sampling of riparian habitats by the previous studies (i.e., point count surveys were conducted in riparian habitats throughout the Platte River Valley). However, similar to Colt (1997) and Davis (2005), most of the birds captured and the most frequently captured birds (American Goldfinch, Gray Catbird, House Wren, and Common Yellowthroat) during my study were edge and open forest generalists. The abundance of edge and open forest generalists is likely related to the patchy nature of these woodlands. Many of these woodlands, including the woodland containing my banding station, are narrow and linear in configuration and contain many tree-fall gaps (Colt 1997).

Overall productivity at my station was low, with 20% of the birds captured being HY. Bollinger and Linder (1994) reported low reproductive success (29%) for migrant birds nesting in a fragmented forest in Illinois. They attributed the low reproductive success to nest predation. In my study, this is a likely explanation for the low reproductive success. Given the configuration of the woodland (narrow, long and edge-dominated) where banding occurred, it seems plausible that predation was probably high. Numerous studies have reported increased predation rates in fragmented woodlands, especially in edge-dominated landscapes (Gates and Gysel 1978, Wilcove 1985, Marini et al. 1995), which may occur because edge habitats have a higher diversity and higher abundance of predators (Chalfoun et al. 2002). Brown-headed Cowbird parasitism may have also contributed to the lower productivity, however, Brown-headed Cowbird occurrence in the woodland was quite low (<1% of the captures were cowbirds). The low productivity and recruitment (<3% of banded HY birds were recaptured) at my study site might suggest that woodlands along the Platte River may represent sink habitats where reproduction within the habitat is insufficient to balance local mortality (Pulliam 1988). Additionally, low return rates of AHY birds (<5%) indicates that high turnover rates may also be occurring at this site. Immigration and emigration by HY birds during the breeding season, shifts in territory locations by returning banded birds, net shyness of banded birds, and variation in banding effort over the years—all can affect subsequent recaptures. Hence, my indices should be considered cautiously as evidence for sink habitats along the Platte River.

Migrant birds. — Clearly, riparian woodlands and shrublands are important in providing stopover habitat for migrant birds (Finch and Wang 2000). Riparian woodlands along the Platte River provide habitat for a diverse group of migrants. During my study, I captured 20 different species during spring and fall migration. Because these woodlands are embedded in a landscape of mostly cropland, homesteads, and some pasturelands, these riparian habitats likely provide an important stopover site for spring and fall migrants. Of the 13 recaptured migrants, only one recaptured migrant (White-crowned Sparrow) exhibited a mass gain during its stopover. The mass loss by most of the recaptured migrants suggests that the quality of these woodlands as stopover habitat may be poor (e.g., scarce food resources). However, the possibility of these woodlands providing poor quality stopover habitat should be viewed with some reservations due to small samples sizes and the fact that the recaptured migrants are short-distance migrants that may not exhibit extreme fattening similar to Neotropical migrants. Additionally, other factors such as weather, body condition, stopover length, competition, arrival date, and age and experience of the birds may also explain the mass loss in these birds.

CONCLUSIONS

Riparian woodlands along the Platte River are used by a myriad of songbird species for breeding and as stopovers during migration. The low productivity and recruitment of breeding birds suggest that these habitats might be sink habitats, whereas mass loss by migrants suggests that the suitability

of these habitats as stopovers may be poor for migrants to replenish depleted energy reserves. To elucidate the importance of Platte River riparian woodlands to breeding and migrant birds, conservationists should encourage the establishment of long-term, constant-effort mist net stations in these habitats.

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