

SWS Research Brief

October 2009

No. 2009-0006

Bird Assemblages in the Floodplain of the Lower Missouri River

Background

Floodplain forests provide some of the most densely populated and diverse avian habitat in North America. A number of studies have reported high species richness and high abundances of birds in these habitats. Unfortunately, large floodplain forests in the midwestern United States are now facing a number of ecological challenges such as conversion to agriculture and urbanization. Coincidentally, approximately half of the avian species breeding in the midwestern United States have declined significantly in the last several decades. These declines are attributed in part to the degradation and loss of migration and breeding habitat, including habitat along the Missouri River.

The lower Missouri River was once marked by frequent flooding, a shifting,

feet) in diameter and as much as 25 meters (82 feet) tall. Closer to the river and, thus, more subject to flooding and scouring, trees were generally unable to live long enough to grow to such size; thus, habitat in these ephemeral areas was maintained in an early successional state.

The Missouri River was dammed at Gavins Point, South Dakota in 1957, one of seven dams constructed on the upper Missouri River, separating the upper and lower Missouri River. In the subsequent half-century, dikes and revetments along the lower river have been constructed for flood protection, navigation, and irrigation. The result is that the lower one-third of the Missouri River is channelized and leveed. Its banks are stabilized, reducing the scouring of mature habitat and the formation of sandbars upon which new habitat is created (Fig. 1).

to become established in the floodplain. The abandonment of agriculture in parts of the floodplain also presented an opportunity for federal and state land management agencies to acquire new lands to add to the conservation estate. Efforts to understand contributions of these newly acquired areas for breeding and migratory birds are imperative for conserving species of special concern.



Indigo Buntings were counted on nearly half of surveys in mature forest.

Study Goal

Understanding the relationships between the floodplain avifauna and natural land cover of the lower Missouri River should benefit conservation efforts for birds.

Our objective was to describe the spring migrating and summer breeding bird assemblage associated with three stages of forest succession represented in the lower Missouri River floodplain, open areas dominated by wet prairie/forbs, young forests, and mid-successional forests, to gain insight into the role habitat along the lower Missouri River may play in conserving these declining bird populations.

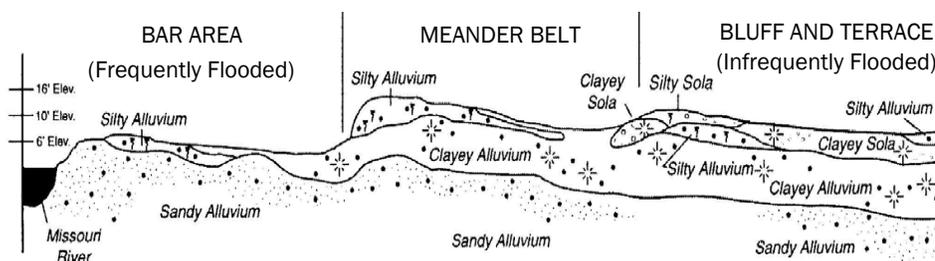


Figure 1. Flow regime determines the type and location of soils and, therefore, habitat.

braided channel, and high turbidity, resulting in a dynamic mosaic of wet prairie, early successional forest, and mature forest that was particularly suited to sustaining a diverse assemblage of birds. Historically, across the lower floodplain far from the river were generally old trees of large size; cottonwoods (*Populus deltoides*), for instance, were often found >2 meters (6.6

Despite these anthropogenic modifications, the lower Missouri River floodplain experienced severe and recurrent flood conditions in the 1990's (Fig. 2). As a result, large tracts of agricultural land were covered in sand splays that made land unsuitable for agricultural production. This series of climatic events provided an opportunity for young forests and open prairie habitats



“ABOUT ONE IN SEVEN BIRD SPECIES IN NORTH AMERICA OCCURS IN HABITAT ALONG THE LOWER MISSOURI RIVER”

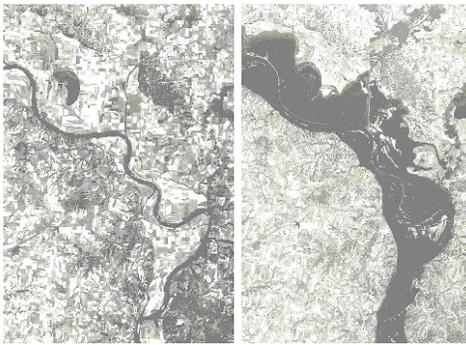


Figure 2. Aerial photo depicting the extent of flooding at Glasgow, Missouri, during the 1993 flood.

Study Area

Ten study sites were chosen within the lower Missouri River alluvial floodplain, stretching from northwestern Missouri (near St. Joseph) to east-central Missouri (near St. Louis; Fig. 3). These 10 sites were located in three United States Fish and Wildlife Service National Wildlife Refuges (Big Muddy, Swan Lake, and Squaw Creek), three Missouri Department of Conservation Areas (Overton Bottoms South, Eagle Bluffs, and Howell Island), and the Department of Defense’s Fort Leavenworth. All sites were on public land and all except two (Swan Lake and Squaw Creek) were riverward of a levee.

limestone and sandstone bluffs. Soils are moderately well drained to well drained. The river floodplain varies in width from 3 to 16 kilometers (2 to 10 miles); low river benches, terraces, and the remains of former river channels are common.

The western portion of the lower Missouri river occurs in the Central Dissected Till-plains ecological region, whereas the eastern portion occurs in the Ozark Highlands ecological region. The western portion is characterized by a mix of clay, sand, gravel, and boulders deposited by glacial action and dissected by glacial runoff. The Ozark Highlands are characterized by a broad plateau dissected by erosion.

Most commonly counted birds of the lower Missouri River floodplain

Common Name	Proportion Of Occurrence	Total Birds Counted
Red-winged Blackbird	0.937	7,494
Common Yellowthroat	0.745	1,766
Dickcissel	0.566	1,749
Indigo Bunting	0.842	2,108
Northern Cardinal	0.605	716
American Goldfinch	0.367	715
Baltimore Oriole	0.495	637
Common Yellowthroat	0.507	636
Brown-headed Cowbird	0.416	607
House Wren	0.485	1,166
Northern Cardinal	0.622	1,035
Indigo Bunting	0.495	1,017
Red-bellied Woodpecker	0.681	921
Rose-breasted Grosbeak	0.333	569

Species observed in wet prairie are highlighted in yellow with those commonly found in mature forest highlighted in green. Young forest species are the intermediate set of species. Northern Cardinal was common to both young and mid-successional forest.

Methods

Bird data were collected in spring migration (15 April–14 May) and summer breeding (15 May–30 June) in 2002–2004 at 365 locations (survey points), each spaced >250 meters apart. Counts were conducted within a half an hour before sunrise to three hours after sunrise (Fig. 4). Each point was off-road and a minimum of 100 m from the habitat edge. We used statistical ordination to characterize avian assemblages of each habitat. We also identified species indicative of each habitat—those primarily found in only one type of habitat.

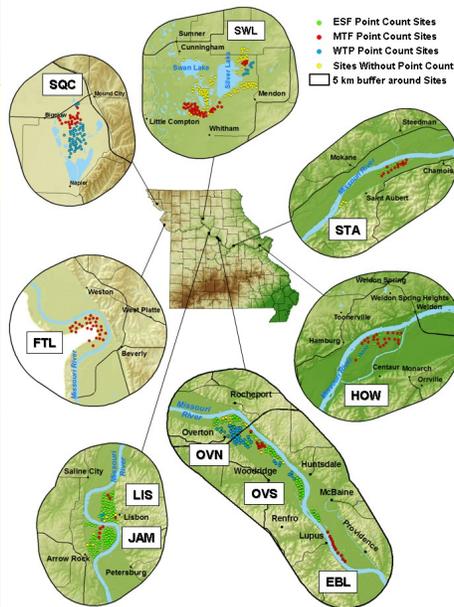


Figure 3. Ten study sites span the lower Missouri River.

The region is characterized by loess deposits ranging from 3 to 27 meters deep, overlying limestone bedrock and bounded by

Figure 4. Skilled surveyors are essential for collecting good data on bird numbers.



“LOSING WET PRAIRIE HABITAT WILL RESULT IN THE LOSS OF 20% OF GRASSLAND BIRD SPECIES”

Findings

One-hundred-thirty-one species were recorded in wet prairie during 2002–2004 (Fig. 5). Red-winged Blackbird, Common Yellowthroat, and Dickcissel (a species of conservation concern, Fig. 6) were the most ubiquitous species, each occurring at a frequency of >50% and a mean count of >2 birds/visit; 121 species were recorded in early successional floodplain forest. Indigo Bunting, Northern Cardinal, and Common Yellowthroat were the most commonly occurring species in this land cover, each occurring with a frequency of >50%; 140 species were recorded in mid-successional forest. The most ubiquitous species were House Wren, Northern Cardinal, Indigo Bunting, and Red-bellied Woodpecker, each occurring with a frequency of >45% and a mean count of >1 bird/visit. In all habitats, typically three-quarters of species were infrequently counted (mean count <0.1 birds per survey).

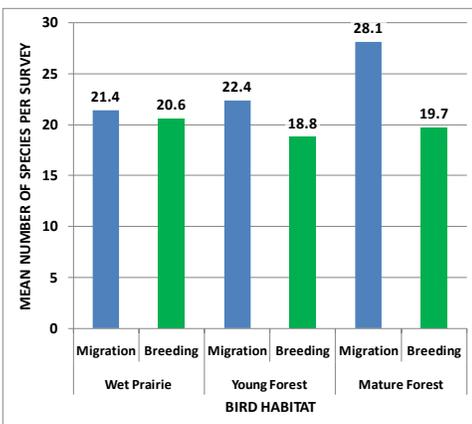


Figure 5. Mean number of species per survey was high in each habitat during migration and breeding.

Even though approximately half of all species were observed, at least incidentally, in each of the three habitats, species composition varied primarily by habitat rather than study area, season, or year. Young forest appeared to have a bird assemblage intermediate to mid-successional forest and wet prairie, coincident with the notion that birds along the lower Missouri River were responding to a gradient in habitat succession.



Figure 6. Wet prairie along the Missouri River is an important source of habitat for Dickcissels and other grassland birds.

At least twice as many avian species were unique to wet prairie (33 and 28 species during migration and breeding, respectively) relative to the number unique to either early (3 species each) or mid-successional forest (15 and 14 species, respectively).

Northern Harrier and Bobolink were completely indicative of wet prairie habitat. The Bell’s Vireo was the only species indicative of early successional floodplain forest, whereas Northern Parula (Fig. 7) and Prothonotary Warbler were among several species indicative of mid-successional forest.



Figure 7. Northern Parulas were one of several indicator species for mature floodplain forest.

Significance

Despite the overlap among habitats in avifaunal assemblages, a complete avifaunal assemblage in the lower Missouri River will best occur through maintenance of an array of habitat conditions. Unfortunately, conservation of species in wet prairie habitats along the lower Missouri River will require considerable investment of resources. Wet prairie is largely an ephemeral habitat, and without natural processes associated with recurrent flooding, this habitat will need to be maintained by herbicide and mechanical treatments and prescribed fire. Allowing succession of these wet prairies to forest conditions will lead to a loss of the 20% of the grassland avifauna unique to wet prairie habitat.

In a related study, we modeled successional fate of agricultural lands abandoned after the 1990s floods and identified whether areas acquired by the refuge system were likely to become grassland or forest sites. The next step should integrate these data with the bird assemblage information to assess the conservation benefit of the lands acquired by the refuge system.

Additional Information

Citation: Thogmartin, W. E., M. Gallagher, N. Young, J. J. Rohweder, F. Durbian, and M. G. Knutson. 2009. Avian assemblages in the lower Missouri River floodplain. *Wetlands* 29:552-562. <http://www.bioone.org/doi/abs/10.1672/08-65.1>

Additional Reading:

Thogmartin, W. E., M. Gallagher, N. Young, J. J. Rohweder, and M. G. Knutson. 2009. Factors associated with succession of abandoned agricultural lands along the lower Missouri River. *Restoration Ecology* 17:290–296.

Thogmartin, W. E., B. R. Gray, M. Gallagher, N. Young, J. J. Rohweder, and M. G. Knutson. 2007. Power to detect trend in short-term time series of bird abundance. *Condor* 109:943–948.

Acknowledgments: I thank the many surveyors counting birds for this study. Funding for this research was provided by the US Army Corp of Engineers, Kansas City District (with special thanks to Kelly Ryan and Glenn Covington), U.S. Fish and Wildlife Service Non-game bird program (with special thanks to Steve Lewis), USFWS Service Challenge Grant program (with special thanks to Steve Kuftrin), Upper Mississippi River / Great Lakes Joint Venture (with special thanks to Barbara Pardo), and Missouri Department of Conservation

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