

Grassland Bird and Snake Use of Iowa Grassed Waterways is Influenced by Site and Landscape Characteristics



T. Knoot

Grassed waterway in southeastern IA

Conservation buffers provide perennial grassland cover in the Midwest

With the loss of more than 99 percent of grasslands in the tallgrass prairie region of North America, grassland dependent wildlife are restricted to scattered prairie remnants and working lands managed for other purposes (pastures, hayfields). Linear grassland habitats such as roadsides, field borders, fence rows, and conservation buffers (filter strips, grassed waterways) constitute a significant proportion of the grassland habitat available to wildlife. Promotion of conservation buffers through the Continuous Conservation Reserve Program (CRP) has resulted in approximately 1.5 million miles of conservation buffers or approximately 5.5 million acres of perennial cover, mostly in the form of grass concentrated in the Midwest.



T. Knoot

Researcher inspects artificial shelter for snakes

Grassland bird and snake use of grassed waterways assessed in relation to site and landscape characteristics

Conservation buffers are implemented to reduce soil erosion and intercept sediments, pesticides, and nutrients before they enter aquatic habitats. Whereas soil erosion and water quality are the primary purposes of buffers, conservation planners may also have an opportunity to enhance the wildlife value of buffers through design, placement, and management considerations. To identify opportunities for accommodating wildlife in buffers, researchers from Iowa State University evaluated bird and snake use of grassed waterways in southeastern Iowa in relation to buffer width, vegetation characteristics, and composition and configuration of the surrounding landscape. They chose to study both grassland birds and snakes because of the well-documented decline of grassland birds and increasing evidence that snakes are important predators of grassland bird nests. In addition, there is an overall lack of information of snake use of agricultural habitats, and 10 of the 27 snake species found in Iowa are listed as endangered, threatened, or of special concern.

In the summers of 2002 and 2003, researchers conducted twice-monthly surveys for birds in 33 Iowa grassed waterways and, in 2002, systematically searched each waterway for bird nests to identify nesting species and overall nest success. The selected waterways ranged in width from 20 to 80 feet (average, 42 ft). Vegetation measurements were taken twice each summer and consisted of measuring the vertical density; height of live and dead vegetation; and canopy coverage of grass, forbs, litter, and bare ground. Using aerial photos and GIS software, researchers evaluated landscape composition (amount of grassland habitat, wooded habitat, farmstead, and row crop) and configuration (nearest distance to grassland habitat, wooded habitat, and farmstead) within a half mile of each transect.

In the summer of 2003, researchers surveyed the grassed waterways for snakes using artificial shelters constructed of 3 x 3 feet sheets of a quarter-inch oriented strand board. Five shelters were placed in each waterway and checked for snakes weekly during the grassland bird nesting season, mid-May to early August. Snakes using shelters were captured, identified, recorded, individually marked, and released.



T. Knoop

Southeastern IA landscape

Vegetation and landscape characteristics of grassed waterways in southeastern Iowa

Maintenance mowing of waterways generally occurred after completion of surveys in early August. As expected, the majority of waterways had extensive grass coverage (averages for both years >60%) and low to moderate forb coverage (averages for both years <15%), but forb coverage varied widely among waterways (range, 0–46%). Row crop fields were by far the most dominant landcover type, encompassing between 40 to 90 percent of the landscape surrounding waterways. Grassland cover was substantially lower, averaging about 15 percent of the landscape, but composed nearly three-times more of the total landscape coverage than wooded habitat. The average distances from the grassed waterways to grasslands, woodlands, and farmsteads were similar; however, the individual distances ranged widely. For example, the average distance to wooded habitat was 690 feet, but varied between 76 to 2,300 feet.



USFWS

Western meadowlark

Bird and snake use of waterways was related to local and landscape characteristics

Birds

Researchers recorded 27 bird species using grassed waterways. Red-winged blackbirds (*Agelaius phoeniceus*) were by far the most abundant species (54%); followed by the barn swallow (*Hirundo rustica*, 12%) which foraged over the waterways; dickcissel (*Spiza americana*, 9%); ring-necked pheasant (*Phasianus colchicus*, 5%); and song sparrow (*Melospiza melodia*, 4%). Of these 27 species, 8 were found to nest in waterways, including the red-winged blackbird, dickcissel, ring-necked pheasant, song sparrow, eastern and western meadowlark (*Sturnella* sp.), indigo bunting (*Passerina cyanea*), and upland sandpiper (*Bartramia longicauda*). Seventy-five percent of the 106 nests found were red-winged blackbird nests. Only 21 percent of the nests were successful, and nearly 80 percent of the nest failures were due to predation. Nest success and predation rate was similar to previous research conducted in Iowa filter strips and roadsides.

The local site variables, vertical density of the vegetation and the amount of forb cover, were positively associated with bird occurrences. Meadowlarks occurred more often in wider waterways, while indigo buntings preferred narrow waterways, consistent with past studies that reported a positive response of eastern meadowlarks (*Sturnella magna*) to habitat area and preference by indigo buntings for edge habitat. Birds were also influenced by the composition and configuration of the surrounding landscape. Distance to farmsteads was the most important landscape variable explaining bird occurrences. Barn swallows, indigo buntings, and red-winged blackbirds

were most often found in waterways closer to farmsteads, while meadow-larks and ring-necked pheasants were associated with waterways that were positioned farther from farmsteads. Meadowlarks occurred more often in waterways that were surrounded by a higher amount of grassland cover, a finding that is consistent with previous grassland bird studies.



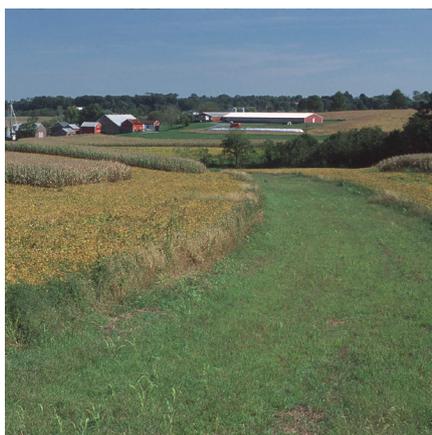
T. Knoop

Smooth green snake (*Lioclonorophis vernalis*)

Snakes

Researchers documented snake occurrence at nearly 80 percent of the grassed waterways and captured 119 individual snakes of five species; one of which, the smooth green snake (*Lioclonorophis vernalis*), is listed as a species of conservation concern in Iowa. The brown snake (*Storeria dekayi*, 44%) and two species of garter snakes (*Thamnophis* spp., 41%) were equally abundant. The smooth green snake and fox snake were less plentiful (8% and 7%), but each species was found in nearly 25 percent of the waterways. Snake activity varied throughout the survey period; 70 percent of the captures occurred between mid-May to mid-June.

Both local- and landscape-level characteristics were related to snake occurrences in grassed waterways. Waterway width was the most important local variable explaining snake presence and was positively associated with the occurrence of the brown snake and two species of garter snakes. The smooth green snake was more often found in waterways with more plant litter. In contrast, garter snakes were more likely to occur at sites with reduced plant litter and less crop residue in the surrounding crop field. The amount of grassland habitat in the surrounding landscape and distance to wooded habitat were most often associated with snake presence. For example, brown snakes were more likely to occur in waterways embedded in landscapes with a high proportion of grass. Whereas fox snakes were associated with sites that were closer to wooded habitat, plains garter snakes tended to avoid waterways with nearby woodlands. The variability among bird and snake species with respect to their association with local and landscape variables is consistent with the individual habitat requirements of the diverse group of species that were encountered in the waterways.



NRCS

Mowed grassed waterway

Site and landscape considerations for accommodating wildlife in grassed waterways

The primary purposes of grassed waterways are to minimize erosion and preserve water quality in agricultural runoff. Design and maintenance of waterways for these reasons often limit their potential for ground-nesting birds and snakes. Nonetheless, there are opportunities to improve and potentially maximize the value of these grassland buffers for wildlife through various aspects of waterway design, planning, and management.

Waterway design and management may improve value to birds and snakes—While researchers found that birds and snakes used even narrow grassed waterways, some species were more strongly associated with wider waterways. Therefore, by maximizing waterway width, agricultural landscapes may be able to support a more diverse array of wildlife. In addition, waterway management practices such as increasing forbs and limiting early summer disturbance may enhance the habitat for some wildlife species. For example, the seasonal activity pattern of snakes suggests that snake populations may be more vulnerable to grassed waterway mowing early in the season. It is important to note that previous research suggests that snake ac-

tivity increases again during autumn when snakes return to den sites prior to winter. More research is needed to evaluate the importance of grassland buffer disturbance on snakes during all active stages.

Landscape planning may increase wildlife use of waterways—

Researchers also found that the characteristics of the surrounding landscape influenced the likelihood of encountering some species of birds and snakes. For example, ring-necked pheasants and meadowlarks were found less often in waterways near farmsteads. Also, meadowlarks responded favorably to the occurrence of other suitable grassland habitat in the landscape. Therefore, it is possible that coordinating grassland conservation practices on the landscape could enhance the value of individual buffer practices to wildlife, although this approach was not assessed in this project.

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